



AQUAZONE™

Water Source Heat Pump Units

50RHC,RVC,RHR,RVR,RHS,RVS,RDS

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 the National Electrical Code (NEC) 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.

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

⚠ 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

This Installation and Start-Up Instructions literature is for Aqazone™ Water Source Heat Pump systems.

Water Source Heat Pumps (WSHP) are single-package horizontally and vertically mounted units with electronic controls designed for year-round cooling and heating. Aqazone WSHP are available in the following unit configurations:

- RHC standard efficiency with horizontal airflow and right, left or back discharge
- RHR high efficiency with horizontal airflow and right, left or back discharge
- RHS premium efficiency with horizontal airflow and right, left or back discharge
- RVC standard efficiency with vertical airflow and top discharge
- RVR high efficiency with vertical airflow and top discharge
- RVS premium efficiency with vertical airflow and top discharge
- RDS premium efficiency with vertical airflow and bottom discharge (downflow)

IMPORTANT: The installation of 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 — 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. See Tables 1-3 for unit physical data.

HORIZONTAL UNITS (50RHC,RHR,RHS) — Horizontal units are designed for indoor installation only. Be sure to allow

adequate space around the unit for servicing. See Fig. 1-3 for overall unit dimensions. Refer to Fig. 4 for an illustration of a typical horizontal installation.

VERTICAL AND DOWNFLOW UNITS (50RVC,RVR,RVS,RDS) — Vertical units are designed for indoor installations. While vertical units are typically installed in a floor-level closet or a small mechanical room, the unit access guidelines for these units are very similar to those described for horizontal units. See Fig. 5-8 for overall dimensions. Refer to Fig. 9 for an example of a typical vertical installation. Refer to Fig. 10 for a sample downflow installation.

⚠ 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 becomes clogged with construction dirt and debris which may cause system damage.

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.

1. Verify unit is correct model for entering water temperature of job.
2. Be sure that the location chosen for unit installation provides ambient temperatures maintained above freezing. Well water applications are especially susceptible to freezing.
3. Be sure the installation location is isolated from sleeping areas, private offices and other acoustically sensitive spaces.
NOTE: A sound control accessory package may be used to help eliminate sound in sensitive spaces.
4. Check local codes to be sure a secondary drain pan is not required under the unit.
5. Be sure unit is mounted at a height sufficient to provide an adequate slope of the condensate lines. If an appropriate slope cannot be achieved, a field-supplied condensate pump may be required.
6. Provide sufficient space for duct connection.
7. Provide adequate clearance for filter replacement and drain pan cleaning. Do not allow piping, conduit, etc. to block filter access.
8. Provide sufficient access to allow maintenance and servicing of the fan and fan motor, compressor and coils. Removal of the entire unit from the closet should not be necessary.
9. Provide an unobstructed path to the unit within the closet or mechanical room. Space should be sufficient to allow removal of unit if necessary.
10. Provide ready access to water valves and fittings, and screwdriver access to unit side panels, discharge collar, and all electrical connections.
11. Where access to side panels is limited, pre-removal of the control box side mounting screws may be necessary for future servicing.

STORAGE — If the equipment is not needed immediately at the jobsite, it should be left in its shipping carton and stored in a clean, dry area of the building or in a warehouse. Units must be stored in an upright position at all times. If carton stacking is necessary, stack units a maximum of 3 high. Do not remove any equipment from its shipping package until it is needed for installation.

PROTECTION — Once the units are properly positioned on the jobsite, cover them with either a shipping carton, vinyl film, or an equivalent protective covering. Cap open ends of pipes on the jobsite. This precaution is especially important in areas where painting, plastering, or spraying of fireproof material, etc. is not yet complete. Foreign material that accumulates within the units can prevent proper start-up and necessitate costly clean-up operations.

Before installing any of the system components, be sure to examine each pipe, fitting, and valve, and remove any dirt or foreign material found in or on these components.

▲ CAUTION

DO NOT store or install 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.

INSPECT UNIT — To prepare the unit for installation, complete the procedures listed below:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Verify that the unit is the correct model for the entering water temperature of the job.
3. Do not remove the packaging until the unit is ready for installation.
4. Verify that the refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
5. Inspect all electrical connections. Be sure connections are clean and tight at the terminals.
6. Compressors are internally isolated. Compressors equipped with external spring vibration isolators must have bolts loosened and shipping clamps removed.
7. Remove any blower support cardboard from inlet of the blower.
8. Locate and verify any accessory kit located in compressor section.
9. Remove any access panel screws that may be difficult to remove once unit is installed.

Step 3 — Unit Location — The following guidelines should be considered when choosing a location for WSHP:

- Units are for indoor use only
- Locate in areas where ambient temperatures are between 40 F and 100 F and relative humidity is no greater than 75%
- Provide sufficient space for water, electrical and duct connections
- Locate unit in an area that allows easy access and removal of filter and access panels
- Allow enough space for service personnel to perform maintenance
- Return air must be able to freely enter the space if unit needs to be installed in a confined area such as a closet

NOTE: Correct placement of the horizontal unit can play an important part in minimizing sound problems. Since ductwork is normally applied to these units, the unit can be placed so that the principal sound emission is outside the occupied space in sound-critical applications. A fire damper may be required by the local code if a fire wall is penetrated.

FIELD CONVERSION OF DISCHARGE AIR — The discharge air of the 50RHC,RHR,RHS horizontal units can be converted between side and back discharge in the field. The conversion process is the same for right and left return configurations. See Fig. 11 and 12.

NOTE: It is not possible to convert return air between left or right return models in the field due to refrigerant piping changes.

Preparation — The unit should be on the ground in a well lit area for conversion. Hung units should be taken down to ground level before converting.

Side to Back Discharge Conversion

1. Remove screws to free the top and discharge panels. See Fig. 11.
2. Remove the access panel and set aside.
3. Lift the discharge panel from side of unit and rotate it to back using care not to damage blower wiring.
4. Check blower wire routing and connections for undo tension or contact with sheet metal edges. Re-route if necessary.
5. Check refrigerant tubing for contact with other components. Adjust if necessary.
6. Reinstall top panel using screws set aside in Step 1.

NOTE: Location for some screws at bottom of discharge panel may have to be changed.

7. Manually spin fan wheel to check for obstructions. Adjust for any obstruction found.
8. Replace access panel.

Back to Side Discharge Conversion — Follow instructions above for Side to Back Discharge Conversion, noting the panels would be reversed.

Table 1 — Physical Data — Aquazone™ 50RHC,RVC018-060 Units

UNIT 50RHC,RVC	018	024	030	036	041*	042	048	060	
COMPRESSOR (1 each)	Reciprocating							Scroll	
FACTORY REFRIGERANT CHARGE VERTICAL (oz)	26	38	37	42	50	51	66	74	
FACTORY REFRIGERANT CHARGE HORIZONTAL (oz)	25	38	37	41	50	51	66	74	
PSC FAN MOTOR AND BLOWER									
Fan Motor Type/Speeds	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	
Fan Motor (Hp)	1/6	1/4	3/4	1/2	3/4	3/4	3/4	1	
Blower Wheel Size (D x W) (in.)	8 x 7	9 x 7	9 x 7	9 x 8	9 x 8	9 x 8	10 x 10	11 x 10	
WATER CONNECTION SIZE (FPT)	1/2	3/4	3/4	3/4	3/4	3/4	1	1	
VERTICAL									
Air Coil									
Dimensions (H x W) (in.)	20 x 17.25	20 x 17.25	20 x 17.25	24 x 21.25	1 — 20 x 17.25	24 x 21.25	24 x 28.25	20 x 28.25	
Total Face Area (ft ²)	2.4	2.4	2.4	3.62	2.4	3.62	4.71	4.71	
Tube Size (in.)	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	
Fin Spacing (FPI)	12	12	12	14	11	12	12	12	
Number of Rows	2	3	3	2	4	3	3	3	
Filter Standard — 1-in. Throwaway	1 — 20 x 20	1 — 20 x 20	1 — 20 x 20	1 — 24 x 24	1 — 20 x 20	1 — 24 x 24	1 — 14 x 24 1 — 18 x 24	1 — 14 x 24 1 — 18 x 24	
Weight (lbs)									
Operating	181	189	197	203	207	218	263	278	
Packaged	186	194	202	209	212	224	270	285	
HORIZONTAL									
Air Coil									
Dimensions (H x W) (in.)	16 x 22	16 x 22	16 x 22	20 x 25	—	20 x 25	20 x 35	20 x 35	
Total Face Area (ft ²)	2.44	2.44	2.44	3.47	—	3.47	4.86	4.86	
Tube Size (in.)	3/8	3/8	3/8	3/8	—	3/8	3/8	3/8	
Fin Spacing (FPI)	12	12	12	14	—	12	12	12	
Number of Rows	2	3	3	2	—	3	3	3	
Filter Standard — 1-in. Throwaway	1 — 16 x 25	1 — 16 x 25	1 — 16 x 25	1 — 20 x 28 2 — 20 x 14	—	1 — 20 x 28 2 — 20 x 14	1 — 20 x 24 1 — 20 x 14	1 — 20 x 24 1 — 20 x 14	
Weight (lbs)									
Operating	181	189	197	203	—	218	263	278	
Packaged	186	194	202	209	—	224	270	285	

LEGEND

PSC — Permanent Split Capacitor

*RVC units only.

NOTES:

1. All units have grommet compressor mountings, and 1/2- and 3/4-in. electrical knockouts.
2. Check serial plate for refrigerant type (R-22 or R-407c).
3. All sizes available as high static units.

Table 2 — Physical Data — Aquazone 50RHR,RVR006-060 Units

UNIT 50RHR,RVR	006*	009	012	015	019	024	030	036	042	048	060
COMPRESSOR (1 each)	Rotary						Reciprocating				Scroll
FACTORY CHARGE R-22 (oz)	12	15	15	30	30	30	41	44	46	54	80
PSC FAN MOTOR AND BLOWER											
Fan Motor Type/Speeds	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3
Fan Motor (Hp)	1/25	1/10	1/10	1/6	1/5	1/3	1/2	3/4	3/4	3/4	1
Blower Wheel Size (D x W) (in.)	5 x 5	5 x 5	6 x 5	9 x 7	9 x 7	9 x 7	9 x 7	10 x 10	10 x 10	10 x 10	11 x 10
WATER CONNECTION SIZE (FPT)	1/2	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1
VERTICAL											
Air Coil											
Dimensions (H x W) (in.)	10 x 16			16 x 16			20 x 20		28 x 20		28 x 25
Total Face Area (ft ²)	1.1			1.8			2.8		3.9		4.9
Tube Size (in.)	3/8			3/8			3/8		3/8		3/8
Fin Spacing (FPI)	12			12			12		12		10
Number of Rows	3			3			3		3		4
Filter Standard — 1-in. Throwaway	10 x 20			16 x 20			20 x 24		28 x 24		28 x 30
Weight (lbs)											
Operating	110	112	121	147	169	193	219	229	257	267	323
Packaged	120	122	131	157	179	203	231	241	269	279	338
HORIZONTAL											
Air Coil											
Dimensions (H x W) (in.)	10 x 16			16 x 16			18 x 22		18 x 31		20 x 35
Total Face Area (ft ²)	1.1			1.8			2.8		3.9		4.9
Tube Size (in.)	3/8			3/8			3/8		3/8		3/8
Fin Spacing (FPI)	12			12			12		12		10
Number of Rows	2	2	3	3			3		3		4
Filter Standard — 1-in. Throwaway	1 — 10 x 20			1 — 16 x 20			1 — 18 x 24		2 — 18 x 18		1 — 12 x 20 1 — 25 x 20
Weight (lbs)											
Operating	110	112	121	147	169	193	219	229	257	267	323
Packaged	120	122	131	157	179	203	231	241	269	279	338

LEGEND

PSC — Permanent Split Capacitor

*Size 006 available in 50RHR unit only.

NOTES:

1. All units have spring compressor mountings, TXV (thermostatic expansion valve) expansion devices, and 1/2- and 3/4-in. electrical knockouts.
2. Size 048 available as high-static unit.

Table 3 — Physical Data — Aquazone™ 50RHS,RVS,RDS015-070 Units

UNIT 50RHS,RVS,RDS	015	018	024	030	036	042	048	060	070
COMPRESSOR (1 each)	Rotary			Scroll					
FACTORY CHARGE R-22 (oz)	44	44	48	48	60	74	74	102	104
PSC FAN MOTOR AND BLOWER	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3
Fan Motor Type/Speeds	1/6	1/6	1/5	1/3	1/2	1/2	3/4	3/4	1
Fan Motor (Hp)	9 x 7	9 x 7	9 x 7	9 x 7	9 x 7	10 x 10	10 x 10	11 x 10	11 x 10
Blower Wheel Size (D x W) (in.)	3/4	3/4	3/4	3/4	3/4	1	1	1	1
WATER CONNECTION SIZE (FPT)	3/4	3/4	3/4	3/4	3/4	1	1	1	1
VERTICAL/DOWNFLOW									
Air Coil									
Dimensions (H x W) (in.)	20 x 20		24 x 20		28 x 20		28 x 25		32 x 25
Total Face Area (ft ²)	2.8		3.3		3.9		4.9		5.6
Tube Size (in.)	3/8		3/8		3/8		3/8		3/8
Fin Spacing (FPI)	12		12		12		10		10
Number of Rows	3		3		3		4		4
Filter Standard — 1-in. Throwaway	1 — 20 x 24		1 — 24 x 24		2 — 14 x 24		2 — 14 x 30		2 — 10 x 30 1 — 12 x 30
Weight (lbs)									
Operating	174	184	250	252	266	323	327	416	443
Packaged	184	194	260	262	276	333	337	426	453
HORIZONTAL									
Air Coil									
Dimensions (H x W) (in.)	18 x 22		18 x 27		18 x 31		20 x 35		20 x 40
Total Face Area (ft ²)	2.8		3.4		3.9		4.9		5.6
Tube Size (in.)	3/8		3/8		3/8		3/8		3/8
Fin Spacing (FPI)	12		12		12		10		10
Number of Rows	3		3		3		4		4
Filter Standard — 1-in. Throwaway	1 — 18 x 24		2 — 18 x 18		2 — 18 x 18		2 — 12 x 20 1 — 20 x 25		1 — 18 x 20 1 — 24 x 20
Weight (lbs)									
Operating	179	189	250	252	266	323	327	416	443
Packaged	189	199	260	262	276	333	337	426	453

LEGEND

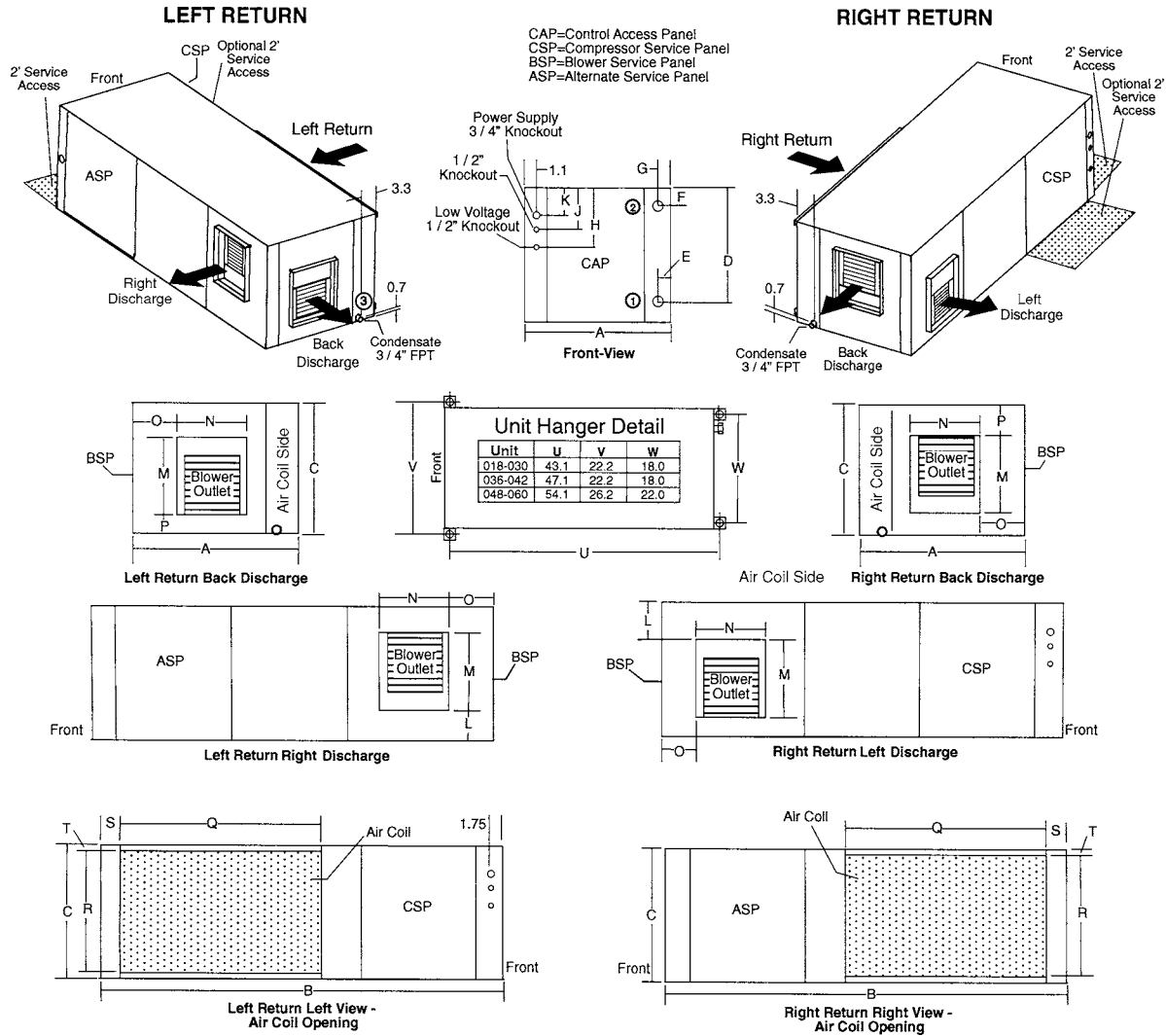
PSC — Permanent Split Capacitor

NOTES:

1. All units have spring compressor mountings, TXV (thermostatic expansion valve) expansion devices, and 1/2- and 3/4-in. electrical knockouts.
2. Size 030 and 036 available as high-static units.

50RHC UNITS	OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (±0.10 in.)					RETURN CONNECTION Using Air Coil Opening			
				1 — In		2 — Out		H 1/2 conduit	J 1/2 conduit	K 3/4 conduit									
	A Width	B Depth	C Height	D	E	F	G	Low Voltage	Ext Pump	Power Supply	L	M Supply Height	N Supply Depth	O	P	Q Return Depth	R Return Height	S	T
018-030	in. 51.1	43.1 109.5	17.1 43.4	15.3 38.9	2.4 6.1	1.9 4.9	2.1 5.3	12.1 30.8	9.1 23.2	6.1 15.6	2.6 6.6	13.3 33.8	9.9 25.1	4.1 10.5	1.3 3.3	23.0 58.4	15.0 38.1	1.1 2.8	1.0 2.5
036-042	in. 51.1	47.1 119.6	21.1 53.6	18.8 47.6	2.2 5.5	4.7 11.9	1.2 3.0	16.1 41.0	13.1 33.3	10.1 25.7	2.5 6.3	16.1 40.9	11.0 27.9	3.0 7.7	2.5 6.4	25.9 65.8	19.0 48.3	1.1 2.8	1.0 2.5
048	in. 61.2	54.1 137.4	21.1 53.6	19.4 49.2	5.9 14.9	4.3 11.0	2.3 5.8	16.1 41.0	13.1 33.3	10.1 25.7	3.7 9.5	16.1 41.0	13.7 34.8	4.1 10.3	1.3 3.2	35.9 91.2	19.0 48.3	1.1 2.8	1.0 2.5
060	in. 61.2	54.1 137.4	21.1 53.6	19.4 49.2	5.9 14.9	4.3 11.0	2.3 5.8	16.1 41.0	13.1 33.3	10.1 25.7	1.7 4.4	18.1 46.0	13.7 34.8	4.1 10.3	1.3 3.2	35.9 91.2	19.0 48.3	1.1 2.8	1.0 2.5

- NOTES:
1. Condensate is 3/4-in. FPT copper.
2. Horizontal unit shipped with filter bracket only. This bracket should be removed for return duct connection.
3. Hanger kit is factory installed.
4. Verify high static option discharge connection dimensions with Carrier.



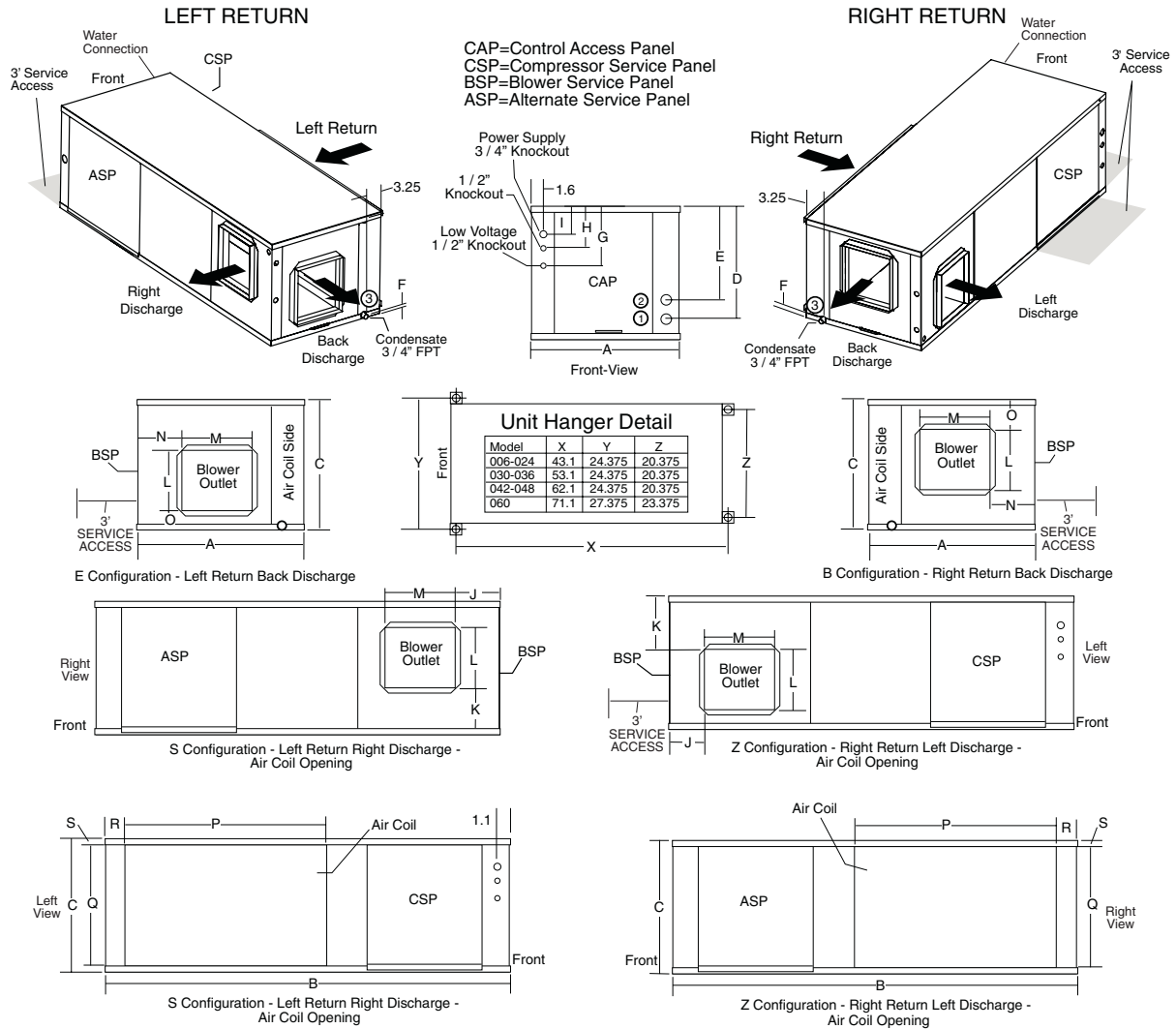
AIRFLOW CONFIGURATION		
Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

Fig. 1 — 50RHC Dimensional Data

50RHR UNITS	OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (± 0.10 in.)					RETURN CONNECTION Using Return Air Opening					
				1	2	3	Loop Water FPT	G 1/2 conduit	H 1/2 conduit	I 3/4 conduit	J	K	L Supply Height	M Supply Depth	N	O	P Return Depth	Q Return Height	R	S	
	D In	E Out	F Condensate	Low Voltage	Ext Pump	Power Supply															
006-012	in. cm	22.4 56.8	43.1 109.5	11.3 28.7	2.4 6.1	5.4 13.7	0.6 1.5	1/2	3.5 8.9	5.5 14.0	8.2 20.8	5.8 14.7	4.0 10.2	5.8 14.7	8.0 20.3	5.8 14.7	1.5 3.8	17.1 43.4	9.3 23.6	2.2 5.6	1.0 2.5
015-024	in. cm	22.4 56.8	43.1 109.5	17.3 43.9	2.4 6.1	4.9 12.4	0.6 1.5	3/4	3.5 8.9	7.5 19.1	10.2 25.9	5.0 12.7	5.6 14.2	10.4 26.4	9.3 23.6	5.0 12.7	1.5 3.8	17.1 43.4	15.3 38.9	2.2 5.6	1.0 2.5
030	in. cm	22.4 56.8	53.2 135.1	19.3 49.0	2.4 6.1	5.4 13.7	0.6 1.5	3/4	5.7 14.5	9.7 24.6	12.2 31.0	5.0 12.7	6.8 17.3	10.4 26.4	9.3 23.6	5.0 12.7	2.1 5.3	23.1 58.7	17.3 43.9	2.2 5.6	1.0 2.5
036	in. cm	22.4 56.8	53.2 135.1	19.3 49.0	2.4 6.1	5.4 13.7	0.6 1.5	3/4	5.7 14.5	9.7 24.6	12.2 31.0	2.9 7.4	3.8 9.7	13.5 34.3	13.1 33.3	2.9 7.4	1.9 4.8	23.1 58.7	17.3 43.9	2.2 5.6	1.0 2.5
042-048	in. cm	22.4 56.8	62.2 158.0	19.3 49.0	2.4 6.1	5.4 13.7	0.6 1.5	1	5.7 14.5	9.7 24.6	12.2 31.0	2.9 7.4	3.8 9.7	13.5 34.3	13.1 33.3	2.9 7.4	1.9 4.8	32.1 81.5	17.3 43.9	2.2 5.6	1.0 2.5
060	in. cm	25.4 64.5	71.2 180.8	21.3 54.1	2.4 6.1	5.4 13.7	0.6 1.5	1	8.1 20.6	11.7 29.7	14.2 36.1	5.8 14.7	5.0 12.7	13.6 34.5	13.3 33.8	5.8 14.7	2.9 7.4	36.1 91.7	19.3 49.0	2.2 5.6	1.0 2.5

NOTES:

1. Condensate is 3/4-in. FPT copper.
2. Horizontal unit shipped with filter bracket only. This bracket should be removed for return duct connection.
3. Hanger kit is factory installed. Isolation grommets are provided.
4. Right and left orientation is determined by looking at water connection side.

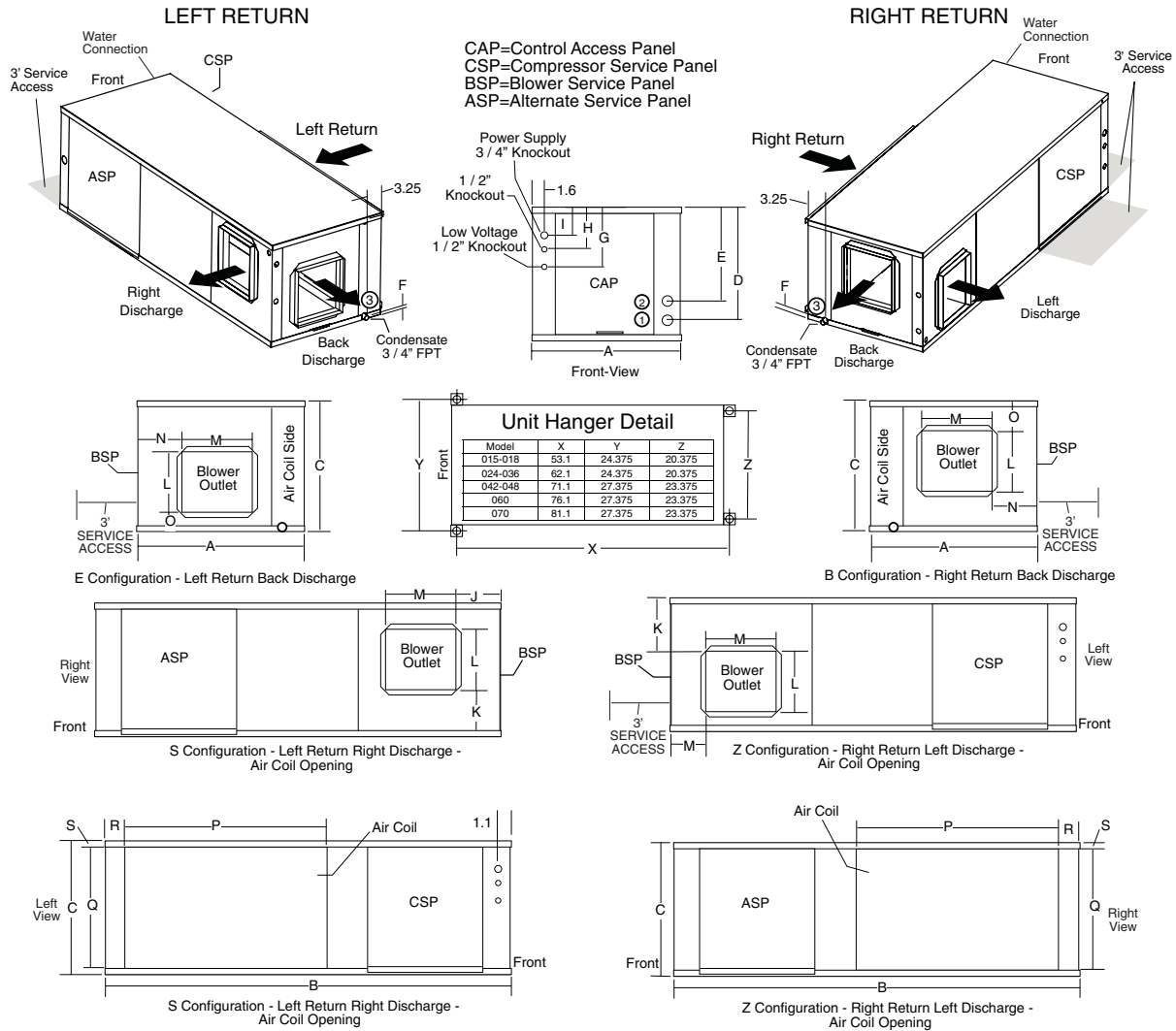


AIRFLOW CONFIGURATION		
Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

Fig. 2 — 50RHR Dimensional Data

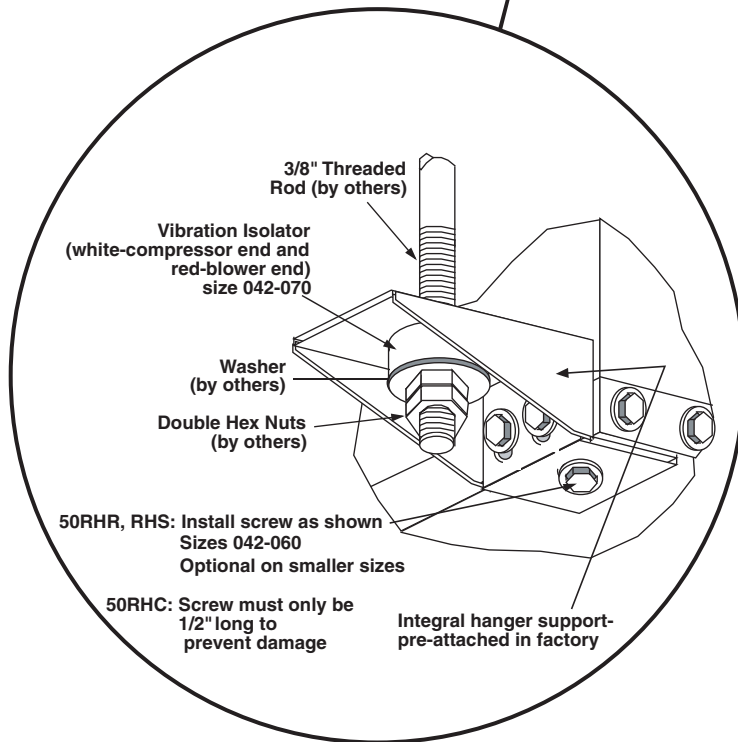
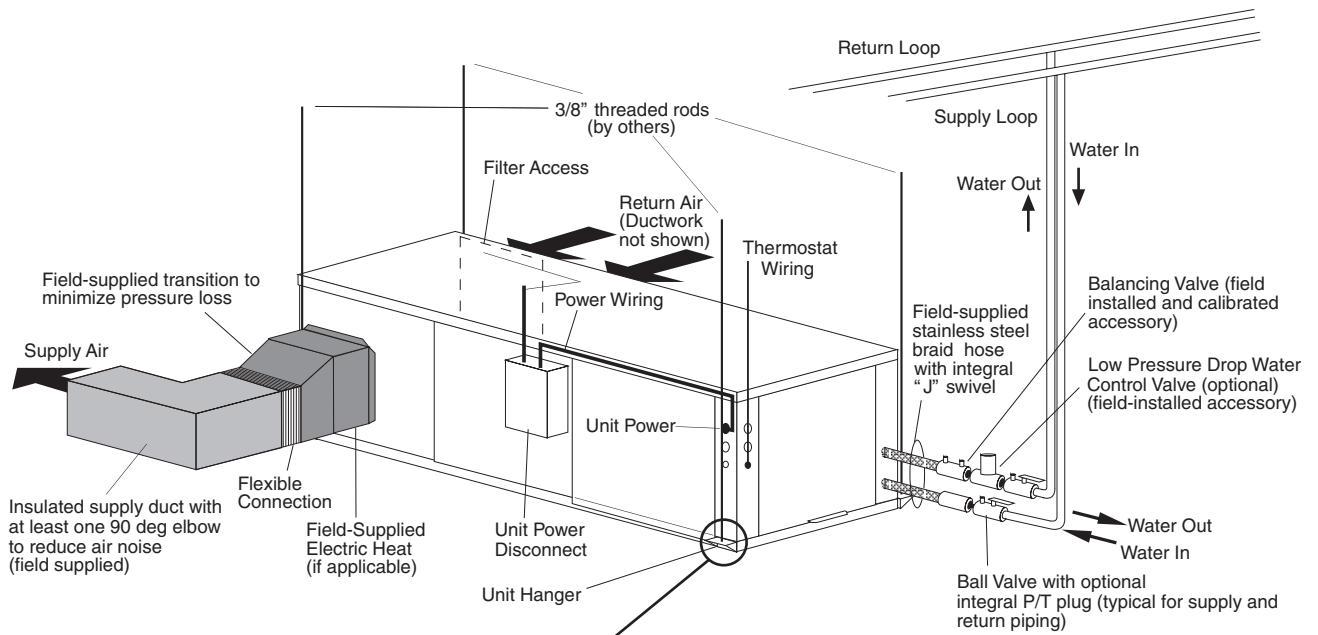
50RHS UNITS		OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (±0.10 in.)					RETURN CONNECTION Using Air Coil Opening				
					1	2	3	Loop Water FPT	G 1/2 conduit	H 1/2 conduit	I 3/4 conduit	J	K	L	M	N	O	P	Q	R	S
		A Width	B Depth	C Height	D In	E Out	F Condensate		Low Voltage	Ext Pump	Power Supply	Supply Height	Supply Depth	Return Depth	Return Height	Return Height	Return Height	Return Height	Return Height		
015-018	in. cm	22.4 56.8	53.2 135.1	19.3 49.0	2.4 6.1	5.4 13.7	0.6 1.5	3/4	5.7 14.5	9.7 24.6	12.2 31.0	5.0 12.7	6.8 17.3	10.4 26.4	9.3 23.6	5.0 12.7	2.1 5.3	23.1 58.7	17.3 43.9	2.2 5.6	1.0 2.5
024-030	in. cm	22.4 56.8	62.2 158.0	19.3 49.0	2.4 6.1	5.4 13.7	0.6 1.5	3/4	5.7 14.5	9.7 24.6	12.2 31.0	5.0 12.7	6.8 17.3	10.4 26.4	9.3 23.6	5.0 12.7	2.1 5.3	28.1 71.4	17.3 43.9	2.2 5.6	1.0 2.5
036	in. cm	22.4 56.8	62.2 158.0	19.3 49.0	2.4 6.1	5.4 13.7	0.6 1.5	3/4	5.7 14.5	9.7 24.6	12.2 31.0	5.0 12.7	6.8 17.3	10.4 26.4	9.3 23.6	5.0 12.7	2.1 5.3	32.1 81.5	17.3 43.9	2.2 5.6	1.0 2.5
042-048	in. cm	25.4 64.5	71.2 180.8	21.3 54.1	2.4 6.1	5.4 13.7	0.6 1.5	1	8.1 20.6	11.7 29.7	14.2 36.1	5.8 14.7	5.0 12.7	13.6 34.5	13.3 33.8	5.8 14.7	2.9 7.4	36.1 91.7	19.3 49.0	2.2 5.6	1.0 2.5
060	in. cm	25.4 64.5	76.2 193.5	21.3 54.1	2.4 6.1	5.4 13.7	0.6 1.5	1	8.1 20.6	11.7 29.7	14.2 36.1	5.8 14.7	5.0 12.7	13.6 34.5	13.3 33.8	5.8 14.7	2.9 7.4	41.1 104.4	19.3 49.0	2.2 5.6	1.0 2.5
070	in. cm	25.4 64.5	81.2 206.2	21.3 54.1	2.4 6.1	5.4 13.7	0.6 1.5	1	8.1 20.6	11.7 29.7	14.2 36.1	5.8 14.7	5.0 12.7	13.6 34.5	13.3 33.8	5.8 14.7	2.9 7.4	46.1 117.1	19.3 49.0	2.2 5.6	1.0 2.5

- NOTES:
1. Condensate is 3/4-in. FPT copper.
2. Horizontal unit shipped with filter bracket only. This bracket should be removed for return duct connection.
3. Hanger kit is factory installed. Isolation grommets are provided.
4. Right and left orientation is determined by looking at water connection side.



AIRFLOW CONFIGURATION		
Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

Fig. 3 — 50RHS Dimensional Data

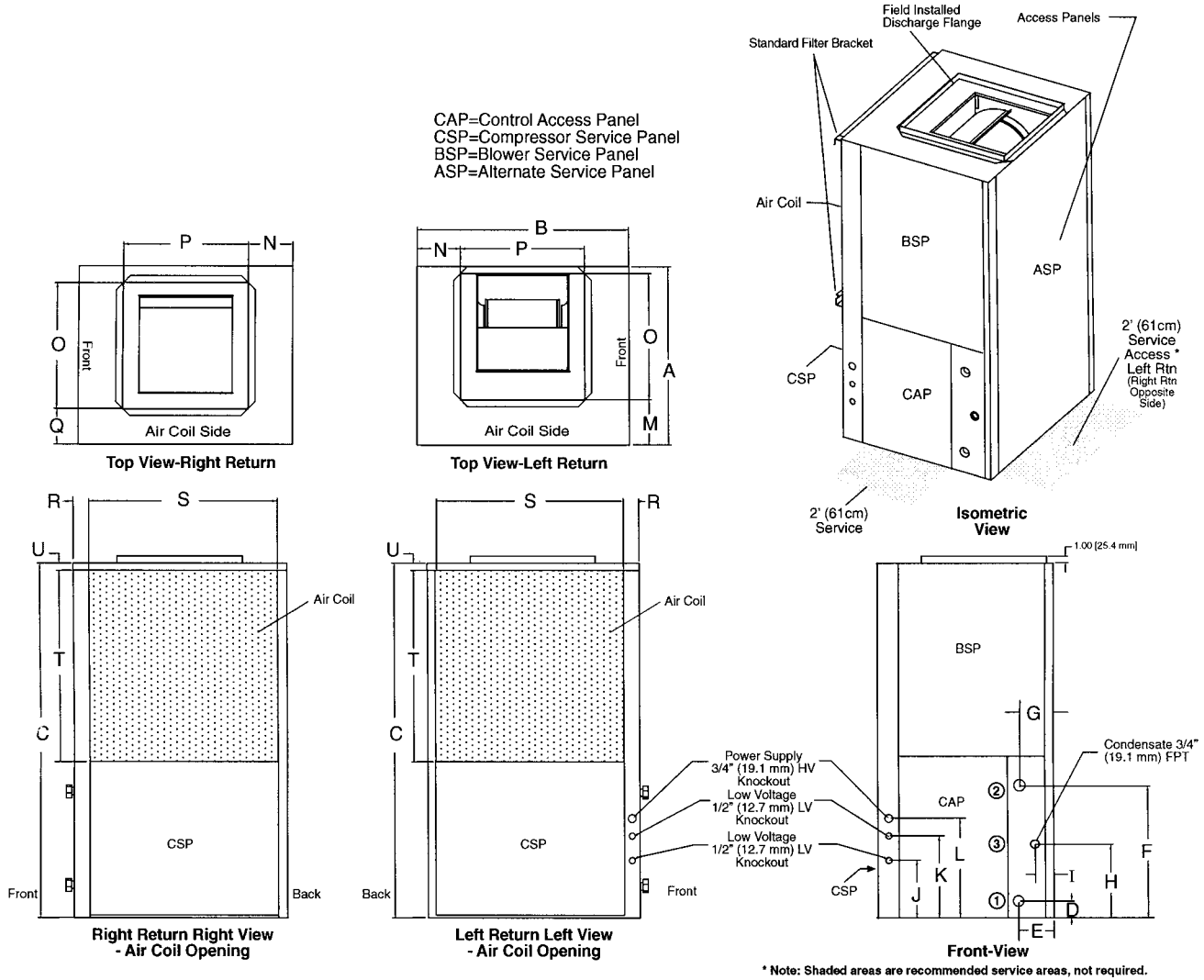


UNIT HANGER ISOLATION DETAIL

Fig. 4 — Typical Installation — 50RHC,RHR,RHS Units

50RVC UNITS	OVERALL CABINET			WATER CONNECTIONS						ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (±0.10 in.)					RETURN CONNECTION Using Air Coil Opening				
				1		2		3		Water FPT Size	1/2 conduit	1/2 conduit	3/4 conduit	M	N	O Supply Width	P Supply Depth	Q	R	S Return Depth	T Return Height	U
	D	E	F	G	H	I	Low Voltage	Low Voltage	Power Supply													
018-030	in. 21.5	in. 21.5	in. 39.0	1.8	3.8	15.2	3.6	8.1	2.3	3/4	4.1	7.1	10.1	6.4	3.8	14.0	14.0	5.3	2.3	18.3	20.2	0.7
	cm 54.6	cm 54.6	cm 99.1	4.5	9.7	38.6	9.1	20.6	5.8	1.9	10.5	18.1	25.7	16.1	9.5	35.6	35.6	13.6	5.8	46.5	51.3	1.9
036 & 042	in. 21.5	in. 26.0	in. 44.0	2.0	3.7	16.2	2.6	10.4	2.3	3/4	4.1	7.1	10.1	6.4	3.8	14.0	14.0	5.1	2.3	22.8	24.2	0.7
	cm 54.6	cm 66.0	cm 111.8	5.1	9.4	41.1	6.6	28.4	5.8	1.9	10.5	18.1	25.7	16.1	9.5	35.6	35.6	13.1	5.8	57.9	61.4	1.9
041	in. 21.5	in. 21.5	in. 39.0	1.7	3.6	16.4	2.6	8.1	2.3	3/4	4.1	7.1	10.1	6.4	3.8	14.0	14.0	5.3	2.3	18.3	20.2	0.7
	cm 54.6	cm 54.6	cm 99.1	4.4	9.1	41.7	6.6	20.6	5.8	1.9	10.5	18.1	25.7	16.1	9.5	35.6	35.6	13.6	5.8	46.5	51.3	1.9
048-060	in. 24.0	in. 32.5	in. 46.0	1.8	5.9	16.7	2.3	10.1	2.3	1	4.1	7.1	10.1	6.9	7.3	16.0	18.0	5.1	2.3	29.3	24.2	0.7
	cm 61.0	cm 82.6	cm 116.8	4.5	14.9	42.4	5.8	25.7	5.8	2.5	10.5	18.1	25.7	17.4	18.4	40.6	45.7	13.1	5.8	74.4	61.4	1.9

- NOTES:
1. Condensate is 3/4-in. (19.1 mm) FPT.
2. Filter bracket extending from unit 2.5-in. (6.4 cm). This bracket should be removed when connecting return duct.
3. Discharge flange field installed.



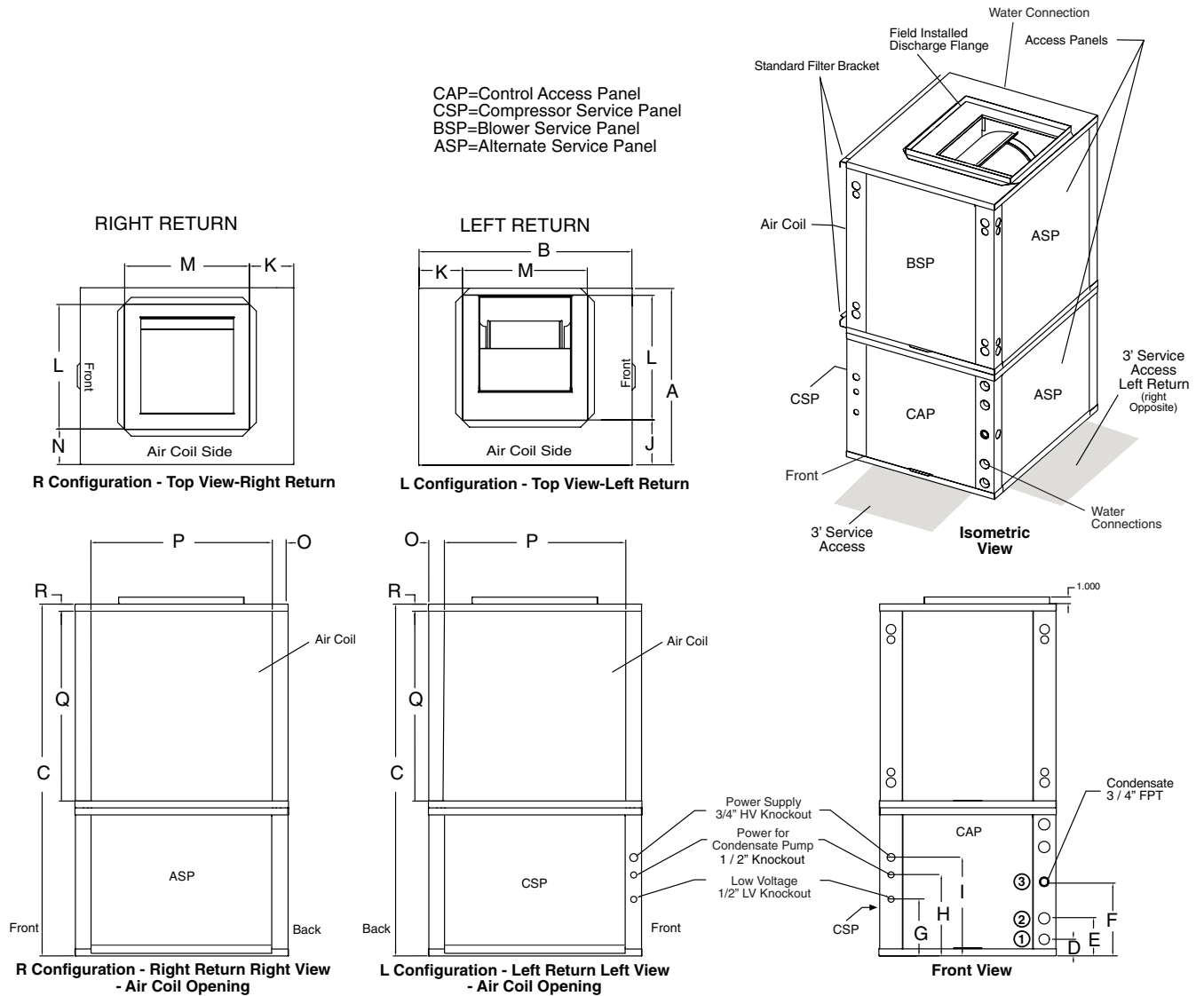
AIRFLOW CONFIGURATION		
Code	Return	Discharge
L	Left	Top
R	Right	Top

Fig. 5 — 50RVC Dimensional Data

50RVR UNITS	OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (±0.10 in.)					RETURN CONNECTION Using Air Coil Opening				
				1	2	3	Loop Water FPT	G 1/2 conduit	H 1/2 conduit	I 3/4 conduit	J	K	L Supply Height	M Supply Depth	N	O	P Return Depth	Q Return Height	R	
	A Width	B Depth	C Height	D In	E Out	F Condensate		Low Voltage	Ext Pump	Power Supply	Low Voltage	Ext Pump	Power Supply	Low Voltage	Ext Pump	Power Supply	Low Voltage	Ext Pump	Power Supply	
009-012	in. cm	22.4 56.8	21.6 54.9	22.6 57.4	2.6 6.6	5.4 13.7	7.8 19.8	1/2	3.5 8.9	5.5 14.0	8.2 20.8	10.6 26.9	6.8 17.3	5.8 14.7	8.0 20.3	6.0 15.2	2.2 5.6	17.1 43.4	9.3 23.6	1.0 2.5
015-024	in. cm	22.4 56.8	21.6 54.9	34.6 87.9	2.4 6.1	4.8 12.2	8.5 21.6	3/4	3.5 8.9	7.5 19.1	10.2 25.9	7.2 18.3	3.8 9.7	14.0 35.6	14.0 35.6	4.3 10.9	2.2 5.6	17.1 43.4	15.3 38.9	1.0 2.5
030	in. cm	22.4 56.8	25.6 65.1	40.6 103.1	2.4 6.1	5.4 13.7	9.7 24.6	3/4	5.7 14.5	9.7 24.6	12.2 31.0	7.2 18.3	5.8 14.7	14.0 35.6	14.0 35.6	4.3 10.9	2.2 5.6	21.1 53.6	19.2 48.8	1.0 2.5
036	in. cm	22.4 56.8	25.6 65.1	40.6 103.1	2.4 6.1	5.4 13.7	9.7 24.6	3/4	5.7 14.5	9.7 24.6	12.2 31.0	7.2 18.3	5.8 14.7	14.0 35.6	14.0 35.6	4.3 10.9	2.2 5.6	21.1 53.6	19.2 48.8	1.0 2.5
042-048	in. cm	22.4 56.8	25.6 65.1	48.6 123.4	2.4 6.1	5.4 13.7	9.7 24.6	1	5.7 14.5	9.7 24.6	12.2 31.0	7.2 18.3	5.8 14.7	14.0 35.6	14.0 35.6	4.3 10.9	2.2 5.6	21.1 53.6	27.2 69.1	1.0 2.5
060	in. cm	25.4 64.5	30.6 77.8	50.6 128.5	2.4 6.1	5.4 13.7	10.7 27.2	1	8.1 20.6	11.7 29.7	14.2 36.1	15.7 40.0	6.2 16.0	18.0 45.7	18.0 45.7	5.1 13.0	2.2 5.6	26.1 66.3	27.2 69.1	1.0 2.5

NOTES:

1. Condensate is 3/4-in. FPT and is switchable from side to front.
2. Vertical unit shipped with filter bracket only extending from unit 2.5 inches. This bracket should be removed when connecting return duct.
3. Discharge flange field installed.
4. Right and left orientation is determined by looking at water connection side.

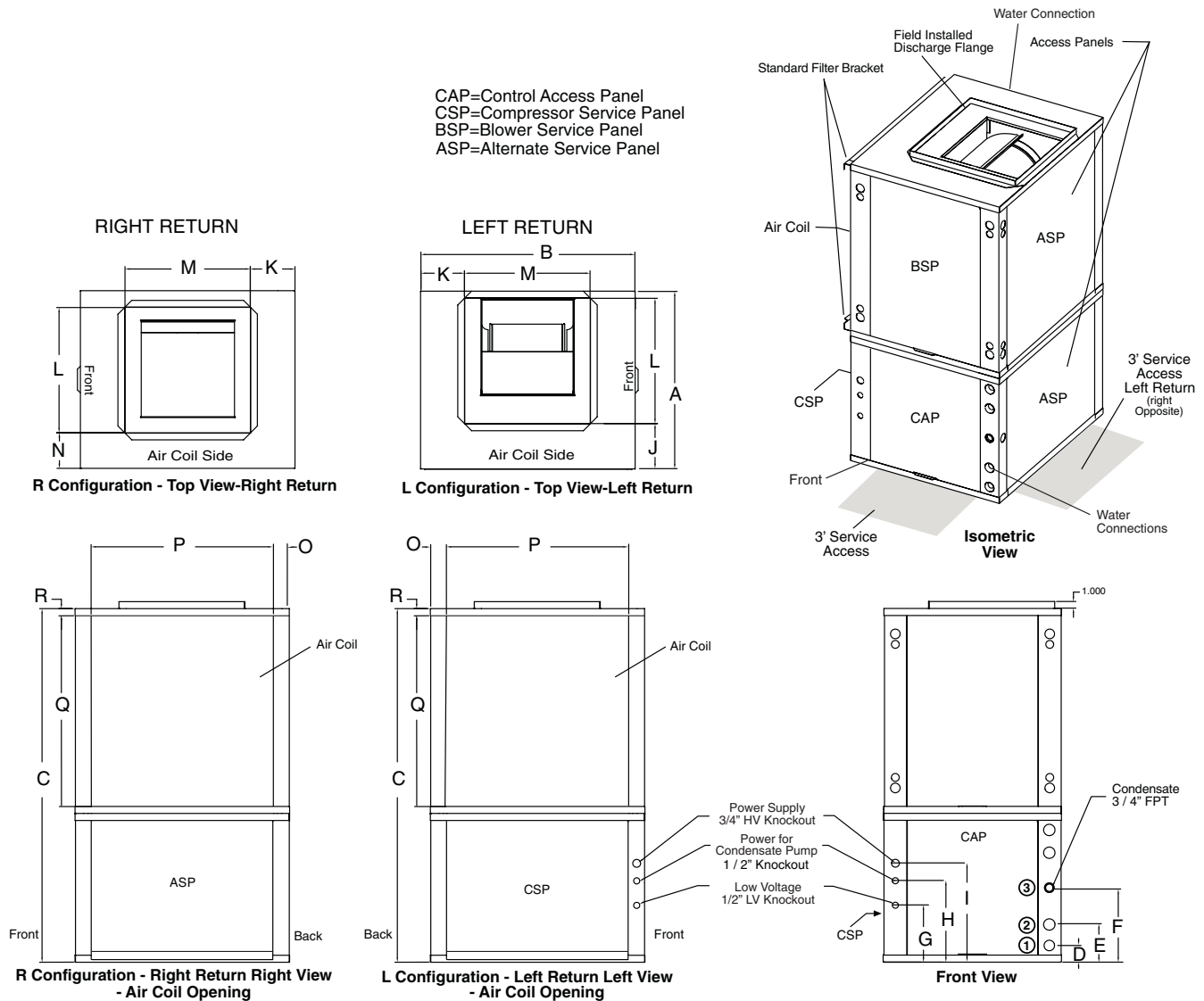


AIRFLOW CONFIGURATION		
Code	Return	Discharge
L	Left	Top
R	Right	Top

Fig. 6 — 50RVR Dimensional Data

50RVS UNITS	OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (±0.10 in.)					RETURN CONNECTION Using Air Coil Opening				
				1	2	3	Loop Water FPT	G 1/2 conduit	H 1/2 conduit	I 3/4 conduit										
	A Width	B Depth	C Height	D In	E Out	F Condensate		Low Voltage	Ext Pump	Power Supply	J	K	L Supply Height	M Supply Depth	N	O	P Return Depth	Q Return Height	R	
015-018	in. cm	22.4 56.8	25.6 65.1	40.6 103.1	2.4 6.1	5.4 13.7	9.7 24.6	3/4	5.7 14.5	9.7 24.6	12.2 31.0	7.2 18.3	5.8 14.7	14.0 35.6	14.0 35.6	4.3 10.9	2.2 5.6	21.1 53.6	19.2 48.8	1.0 2.5
024-030	in. cm	22.4 56.8	25.6 65.1	44.6 113.3	2.4 6.1	5.4 13.7	9.7 24.6	3/4	5.7 14.5	9.7 24.6	12.2 31.0	7.2 18.3	5.8 14.7	14.0 35.6	14.0 35.6	4.3 10.9	2.2 5.6	21.1 53.6	23.2 58.9	1.0 2.5
036	in. cm	22.4 56.8	25.6 65.1	48.6 123.4	2.4 6.1	5.4 13.7	9.7 24.6	3/4	5.7 14.5	9.7 24.6	12.2 31.0	7.2 18.3	5.8 14.7	14.0 35.6	14.0 35.6	4.3 10.9	2.2 5.6	21.1 53.6	27.2 69.1	1.0 2.5
042-048	in. cm	25.4 64.5	30.6 77.8	50.6 128.5	2.4 6.1	5.4 13.7	10.7 27.2	1	8.1 20.6	11.7 29.7	14.2 36.1	6.2 15.7	6.3 16.0	18.0 45.7	18.0 45.7	5.1 13.0	2.2 5.6	26.1 66.3	27.2 69.1	1.0 2.5
060	in. cm	25.4 64.5	30.6 77.8	54.6 138.7	2.4 6.1	5.4 13.7	10.7 27.2	1	8.1 20.6	11.7 29.7	14.2 36.1	6.2 15.7	6.3 16.0	18.0 45.7	18.0 45.7	5.1 13.0	2.2 5.6	26.1 66.3	31.2 79.2	1.0 2.5
070	in. cm	25.4 64.5	30.6 77.8	58.6 148.8	2.4 6.1	5.4 13.7	10.7 27.2	1	8.1 20.6	11.7 29.7	14.2 36.1	6.2 15.7	6.3 16.0	18.0 45.7	18.0 45.7	5.1 13.0	2.2 5.6	26.1 66.3	35.2 89.4	1.0 2.5

- NOTES:
1. Condensate is 3/4-in. FPT and is switchable from side to front.
2. Vertical unit shipped with filter bracket only extending from unit 2.5 inches. This bracket should be removed when connecting return duct.
3. Discharge flange field installed.
4. Right and left orientation is determined by looking at water connection side.



AIRFLOW CONFIGURATION		
Code	Return	Discharge
L	Left	Top
R	Right	Top

Fig. 7 — 50RVS Dimensional Data

50RDS UNITS	OVERALL CABINET (in.)			WATER CONNECTIONS (in.)								ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Outlet Opening Only (in.)					RETURN CONNECTION Using Return Air Opening (in.)				
				1	2	3	4	5	Loop Water FPT (in.)	HWG FPT (in.)	J 1/2 conduit	K 1/2 conduit	L 3/4 conduit	M	N	O Supply Width	P Supply Depth	Q	R	S Return Depth	T Return Height	U		
	A Width	B Depth	C Height	D In	E Out	F HWG In	G HWG Out	H Condensate	Low Voltage	Ext Pump	Power Supply													
015-018	in. 22.4 56.8	25.6 65.1	44.6 113.3	16.9 42.9	13.9 35.3	5.4 13.7	2.4 6.1	3.5 8.9	3/4	1/2	13.6 34.5	9.7 24.6	7.2 18.3	6.1 15.4	8.2 20.8	10.4 26.4	9.3 23.5	11.0 27.9	2.2 5.6	21.1 53.6	20.2 51.3	20.4 51.8		
024-030	in. 22.4 56.8	25.6 65.1	48.6 123.4	16.9 42.9	13.9 35.3	5.4 13.7	2.4 6.1	3.5 8.9	3/4	1/2	13.6 34.5	9.7 24.6	7.2 18.3	6.1 15.4	8.2 20.8	10.4 26.4	9.3 23.5	11.0 27.9	2.2 5.6	21.1 53.6	24.2 61.5	20.4 51.8		
036	in. 22.4 56.8	25.6 65.1	52.6 133.6	16.9 42.9	13.9 35.3	5.4 13.7	2.4 6.1	3.5 8.9	3/4	1/2	13.6 34.5	9.7 24.6	7.2 18.3	6.1 15.4	8.2 20.8	10.4 26.4	9.3 23.5	11.0 27.9	2.2 5.6	21.1 53.6	28.2 71.6	20.4 51.8		
042-048	in. 25.4 64.5	30.6 77.8	54.6 138.7	18.9 48.0	15.9 40.4	5.4 13.7	2.4 6.1	3.5 8.9	1	1/2	13.1 33.3	9.7 24.6	7.2 18.3	7.2 18.3	8.7 22.1	13.6 34.4	13.3 33.7	10.5 26.7	2.2 5.6	26.1 66.3	28.2 71.6	22.4 56.9		
060	in. 25.4 64.5	30.6 77.8	58.6 148.8	18.9 48.0	15.9 40.4	5.4 13.7	2.4 6.1	3.5 8.9	1	1/2	13.1 33.3	9.7 24.6	7.2 18.3	7.2 18.3	8.7 22.1	13.6 34.4	13.3 33.7	10.5 26.7	2.2 5.6	26.1 66.3	32.2 81.8	22.4 56.9		
070	in. 25.4 64.5	30.6 77.8	62.6 159.0	18.9 48.0	15.9 40.4	5.4 13.7	2.4 6.1	3.5 8.9	1	1/2	13.1 33.3	9.7 24.6	7.2 18.3	7.2 18.3	8.7 22.1	13.6 34.4	13.3 33.7	10.5 26.7	2.2 5.6	26.1 66.3	36.2 91.9	22.4 56.9		

NOTES:

1. Condensate is 3/4-in. PVC FPT and is switchable from side to front.
2. Vertical unit shipped with filter bracket only extending from unit 2.5 inch. This bracket should be removed when connecting return duct.

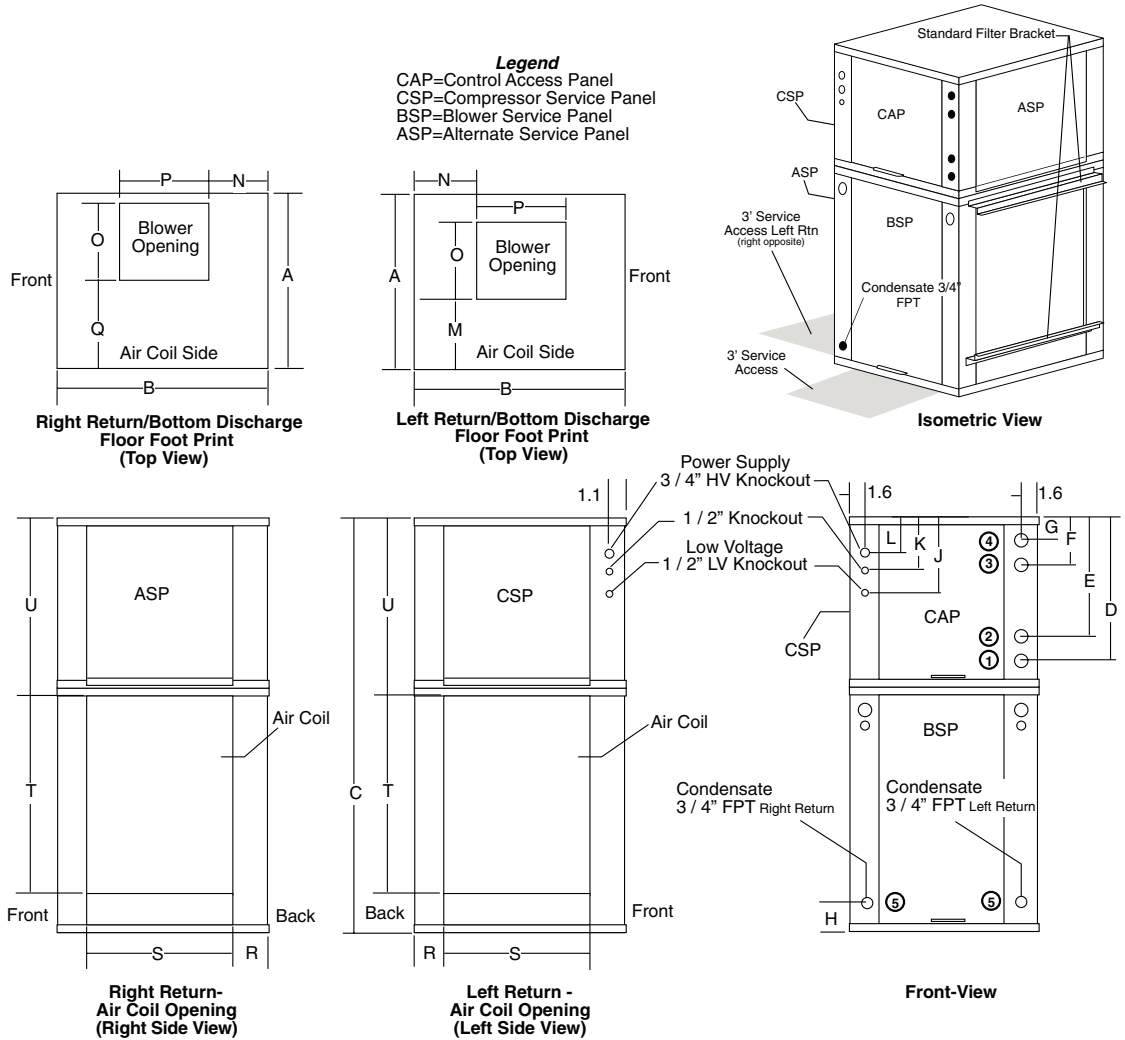
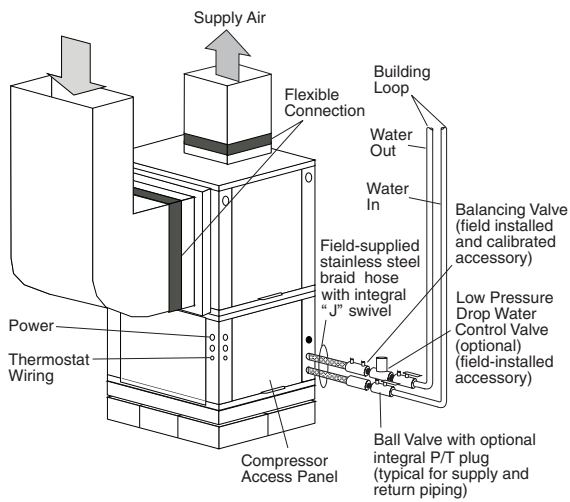


Fig. 8 — 50RDS Dimensional Data



NOTE: Ball valve with integral pressure temperature plug recommended.

Fig. 9 — Typical Vertical Installation — 50RVC,RVR,RVS Units

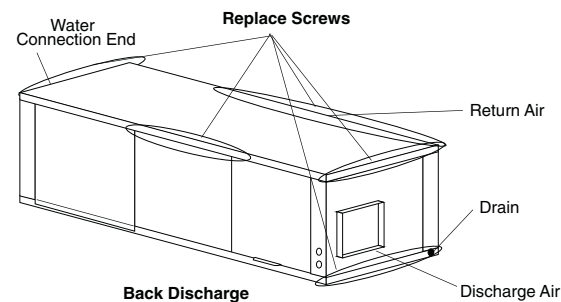
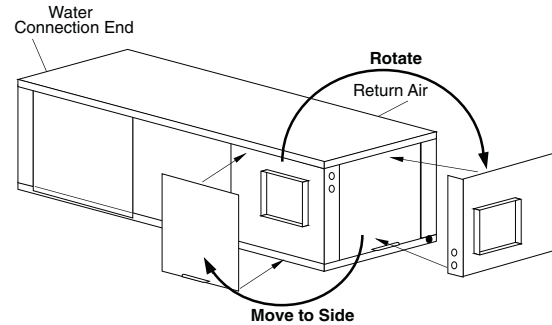
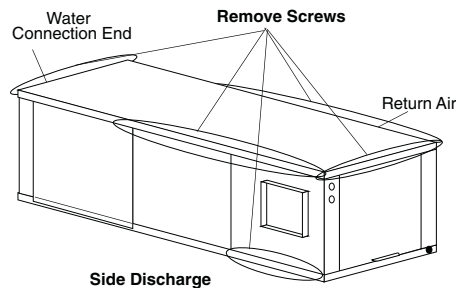
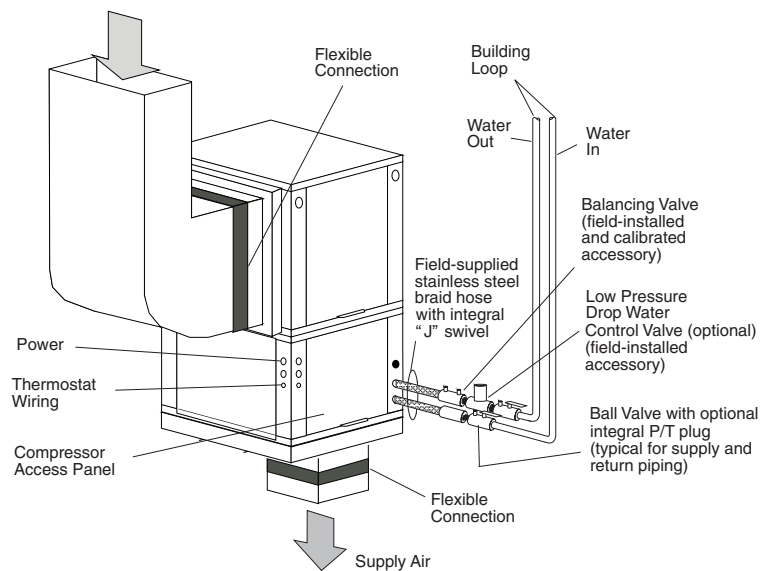


Fig. 11 — Conversion Left Return, Side Discharge to Back Discharge



NOTE: Ball valve with integral pressure temperature plug recommended.

Fig. 10 — Typical Downflow Installation — 50RDS Units

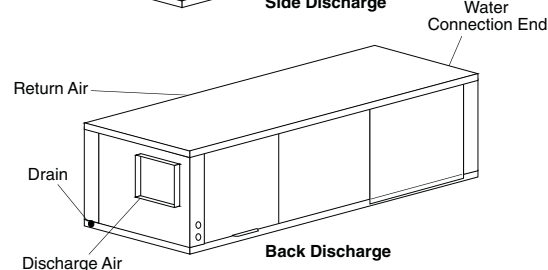
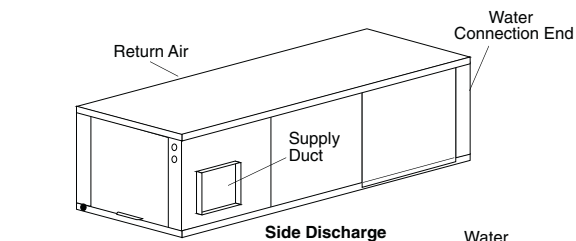


Fig. 12 — Conversion Right Return, Side Discharge to Back Discharge

Step 4 — Mounting the Unit

HORIZONTAL UNITS (50RHC,RHR,RHS) — Horizontal units should be mounted using the factory-installed hangers. Proper attachment of hanging rods to building structure is critical for safety. See Fig. 4 and 13. Rod attachments must be able to support the weight of the unit. See Tables 1-3, for unit operating weights.

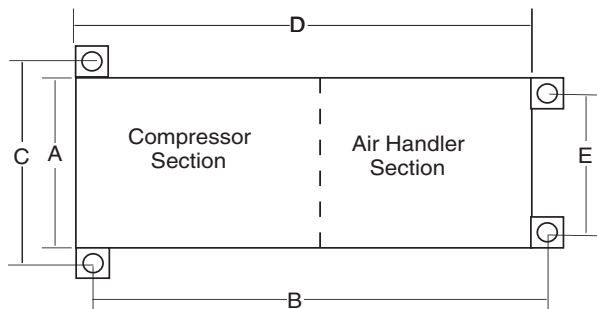
VERTICAL UNITS (50RVC,RVR,RVS,RDS) — Vertical and downflow units are available in left or right return air configurations. See Fig. 6-8. Mount the unit (except 50RDS) on a vibration absorption pad slightly larger than the entire base to minimize vibration transmission. It is not necessary to mount the unit on the floor. See Fig. 14.

NOTE: Some codes require the use of a secondary drain pan under vertical units. Check local codes for more information.

Step 5 — Duct System — Size the duct system to handle the design airflow quietly.

NOTE: Depending on the unit, the fan wheel may have a shipping support installed at the factory. This must be removed before operating unit.

SOUND ATTENUATION — To eliminate the transfer of vibration to the duct system, a flexible connector is recommended for both discharge and return air duct connections on metal duct systems. The supply and return plenums should include internal duct liner of fiberglass or be made of duct board construction to maximize sound attenuation of the blower. Installing the WSHP unit to uninsulated ductwork in an unconditioned space is not recommended since it will sweat and adversely affect the unit's performance.



50RHC UNITS	DIMENSIONS (in.)				
	A	B	C		
018-030	18	43.1			
036-042	18	47.1			
048-060	22	54.1			

50RHR UNITS	DIMENSIONS (in.)				
	A	B	C	D	E
006-024	22.375	43.1	24.375	43.1	20.375
030,036	22.375	52.1	24.375	52.1	20.375
042,048	22.375	61.1	24.375	61.1	20.375
060	25.375	71.1	27.375	71.1	23.375

50RHS UNITS	DIMENSIONS (in.)				
	A	B	C	D	E
015,018	22.375	51	24.375	53	20.375
024-036	22.375	61	24.375	63	20.375
042,048	25.375	70	27.375	72	20.375
060	25.375	75	27.375	77	23.375
070	25.375	80	27.375	82	23.375

Fig. 13 — Horizontal Hanger Bracket (Factory Installed)

To reduce air noise, at least one 90 degree elbow could be included in the supply and return air ducts, provided system performance is not adversely impacted. The blower speed can also be changed in the field to reduce air noise or excessive airflow, provided system performance is not adversely impacted.

EXISTING DUCT SYSTEM — If the unit is connected to existing ductwork, consider the following:

- Verify that the existing ducts have the proper capacity to handle the unit airflow. If the ductwork is too small, install larger ductwork.
- Check existing ductwork for leaks and repair as necessary.

NOTE: Local codes may require ventilation air to enter the space for proper indoor air quality. Hard-duct ventilation may be required for the ventilating air supply. If hard ducted ventilation is not required, be sure that a proper air path is provided for ventilation air to unit to meet ventilation requirement of the space.

Step 6 — Condensate Drain

HORIZONTAL UNITS (50RHC,RHR,RHS) — Slope the unit toward the drain at a 1/4 in. per foot pitch. See Fig. 15. If it is not possible to meet the required pitch, install a condensate at the unit to pump condensate to building drain.

Horizontal units are not internally trapped, therefore an external trap is necessary. Install each unit with its own individual trap and means to flush or blowout the condensate drain line. Do not install units with a common trap or vent. For typical condensate connections see Fig. 16.

NOTE: Never use a pipe size smaller than the connection.

VERTICAL UNITS (50RVC,RVR,RVS) — Each unit uses a condensate hose inside all cabinets as a trapping loop, therefore an external trap is not necessary. See Fig. 17.

Each unit must be installed with its own individual vent and means to flush or blowout the condensate drain line. Do not install units with a common trap or vent.

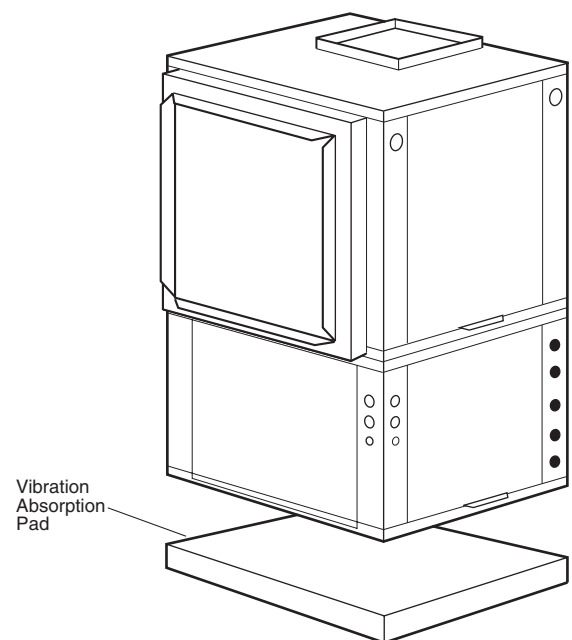


Fig. 14 — 50RVC,RVR,RVS Units Mounted With Vibration Absorption Pad

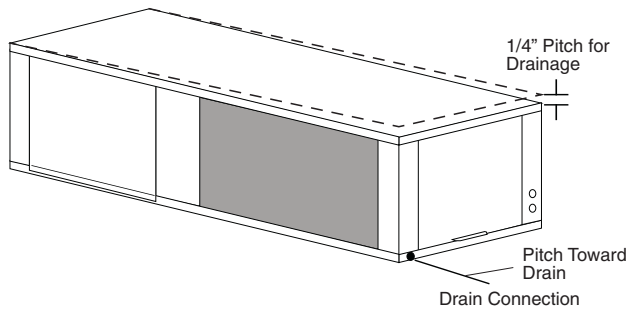
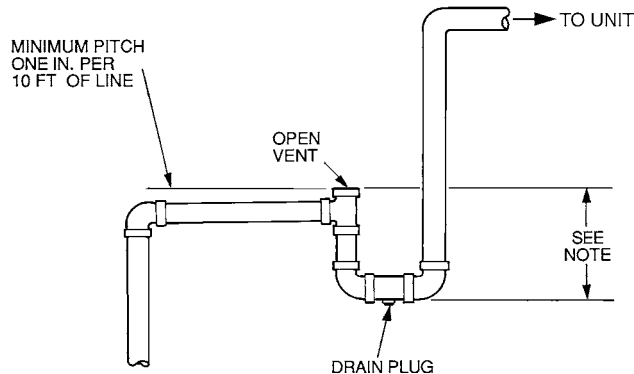
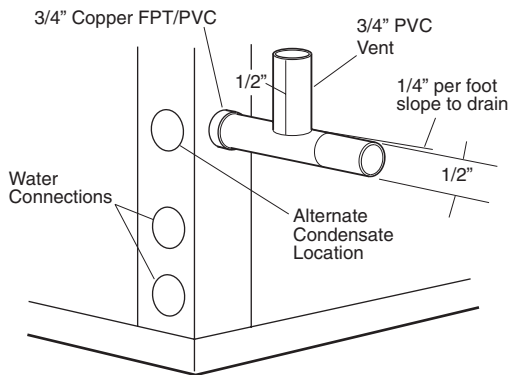


Fig. 15 — Horizontal Unit Pitch



NOTE: Trap should be deep enough to offset maximum unit static difference. A 4-in. trap is recommended.

Fig. 16 — Trap Condensate Drain



NOTE: Unit does not need to be sloped toward drain.

Fig. 17 — Vertical Condensate Connection

VENTING — Install a vent in the condensate line of any application that may allow dirt or air to collect in the line. Consider the following:

- Always install a vent where an application requires a long horizontal run.
- Always install a vent where large units are working against higher external static pressure and to allow proper drainage for multiple units connected to the same condensate main.
- Be sure to support the line where anticipated sagging from the condensate or when “double trapping” may occur.
- If condensate pump is present on unit, be sure drain connections have a check valve to prevent back flow of condensate into other units.

Step 7 — Piping Connections — Depending on the application, there are 3 types of WSHP piping systems to choose from: water loop, ground-water and ground loop. Refer to Piping Section of Carrier System Design Manual for additional information.

All WSHP units use low temperature soldered female pipe thread fittings for water connections to prevent annealing and out-of-round leak problems which are typically associated with high temperature brazed connections. Refer to Tables 1-3 for connection sizes. When making piping connections, consider the following:

- Use a backup wrench when making screw connections to unit to prevent internal damage to piping.
- Insulation may be required on piping to avoid condensation in the case where fluid in loop piping operates at temperatures below dew point of adjacent air.
- Piping systems that contain steel pipes or fittings may be subject to galvanic corrosion. Dielectric fittings may be used to isolate the steel parts of the system to avoid galvanic corrosion.

WATER LOOP APPLICATIONS — Water loop applications usually include a number of units plumbed to a common piping system. Maintenance to any of these units can introduce air into the piping system. Therefore, air elimination equipment comprises a major portion of the mechanical room plumbing.

The flow rate is usually set between 2.25 and 3 gpm per ton of cooling capacity. For proper maintenance and servicing, pressure-temperature (P/T) ports are necessary for temperature and flow verification.

In addition to complying with any applicable codes, consider the following for system piping:

- Piping systems using water temperatures below 50 F require 1/2-in. closed cell insulation on all piping surfaces to eliminate condensation.
- Avoid all plastic to metal threaded fittings due to the potential to leak. Use a flange fitted substitute.
- Teflon tape thread sealant is recommended to minimize internal fouling of the heat exchanger.
- Use backup wrench. Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Flush the piping system prior to operation to remove dirt and foreign materials from the system.

GROUND-WATER APPLICATIONS (Not Applicable to 50RHC,RVC Units) — Typical ground-water piping is shown in Fig. 18. In addition to complying with any applicable codes, consider the following for system piping:

- Install shut-off valves for servicing.
- Install pressure-temperature plugs to measure flow and temperature.
- Connect boiler drains and other valves using a “T” connector to allow acid flushing for the heat exchanger.
- Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Use PVC SCH80 or copper piping material.

NOTE: PVC SCH40 should *not* be used due to system high pressure and temperature extremes.

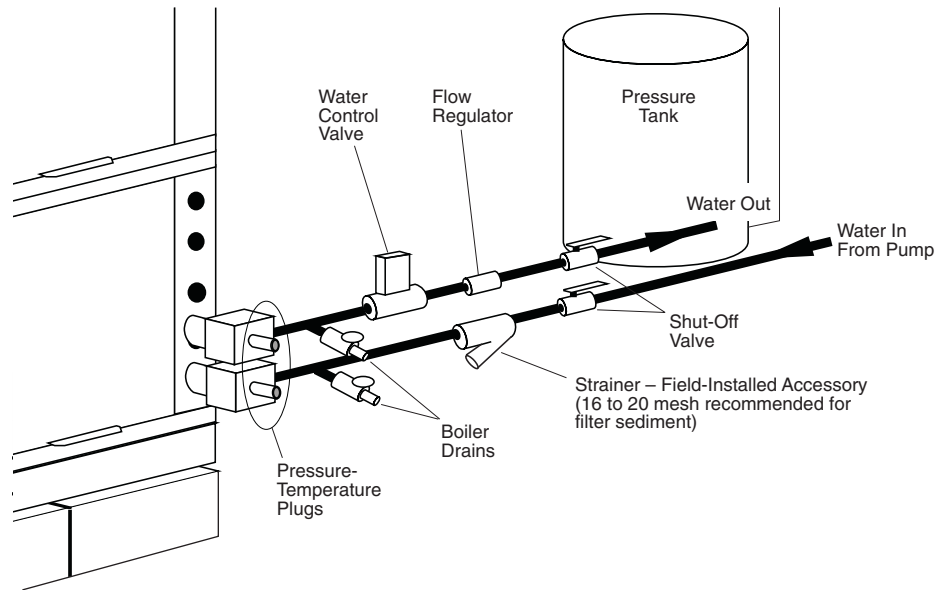


Fig. 18 — Typical Ground-Water Piping Installation

Water Supply and Quantity — Check water supply. Water supply should be plentiful and of good quality. See Table 4 for water quality guidelines.

IMPORTANT: Failure to comply with the above required water quality and quantity limitations and the closed-system application design requirements may cause damage to the tube-in-tube heat exchanger that is not the responsibility of the manufacturer.

In all applications, the quality of the water circulated through the heat exchanger must fall within the ranges listed in the Water Quality Guidelines table. Consult a local water treatment firm, independent testing facility, or local water authority for specific recommendations to maintain water quality within the published limits.

GROUND-LOOP APPLICATIONS (Not Applicable to 50RHC,RVC Units) — Temperatures between 25 to 110 F and a cooling capacity of 2.25 to 3 gpm of flow per ton is recommended. In addition to complying with any applicable codes, consider the following for system piping:

- Limit piping materials to only polyethylene fusion in the buried sections of the loop.
- Do not use galvanized or steel fittings at any time due to corrosion.
- Avoid all plastic to metal threaded fittings due to the potential to leak. Use a flange fitted substitute.
- Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Use pressure-temperature (P/T) plugs to measure flow of pressure drop.

Step 8 — Electrical Wiring

⚠ 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 the National Electrical Code (NEC) as well as applicable local codes. In addition, all field wiring must conform to the Class II temperature limitations described in the NEC.

Refer to unit wiring diagrams Fig. 19 and 20 for a schematic of the field connections, which must be made by the installing (or electrical) contractor. Refer to Electrical Data for fuse sizes.

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 when using field-supplied disconnect.

Operating voltage must be the same voltage and phase as shown in Electrical Data shown in Tables 5-7.

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

Table 4 — Water Quality Guidelines

CONDITION	ACCEPTABLE LEVEL		
pH	7 to 9 range for copper. Cupronickel may be used in the 5 to 9 range.		
Total Hardness	Calcium and magnesium carbonate should not exceed 20 grains per gallon (350 ppm).		
Iron Oxides	Less than 1 ppm.		
Iron Bacteria	No level allowable.		
Corrosion*	Ammonia, Ammonium Hydroxide Ammonium Chloride, Ammonium Nitrate Ammonium Sulfate Chlorine/Chlorides Hydrogen Sulfide†	Max Allowable Level 0.5 ppm 0.5 ppm 0.5 ppm 0.5 ppm None Allowable	Coaxial Metal Cu Cu Cu CuNi —
Brackish	Use Cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

*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.

NOTE: To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

POWER CONNECTION — Make line voltage connection by connecting the incoming line voltage wires to the L side of the CC terminal as shown in Fig. 21. See Tables 5-7 for correct wire and maximum overcurrent protection sizing.

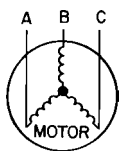
SUPPLY VOLTAGE — Operating voltage to unit must be within voltage range indicated on unit nameplate.

On 3-phase units, voltages under load between phases must be balanced within 2%. Use the following formula to determine the percentage voltage imbalance:

% Voltage Imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60.



AB = 452 volts
BC = 464 volts
AC = 455 volts

$$\begin{aligned} \text{Average Voltage} &= \frac{452 + 464 + 455}{3} \\ &= \frac{1371}{3} \\ &= 457 \end{aligned}$$

Determine maximum deviation from average voltage:

(AB) 457 – 452 = 5 v
(BC) 464 – 457 = 7 v
(AC) 457 – 455 = 2 v

Maximum deviation is 7 v.

Determine percent voltage imbalance.

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{7}{457} \\ &= 1.53\% \end{aligned}$$

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

Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components.

NOTE: If more than 2% voltage imbalance is present, contact local electric utility.

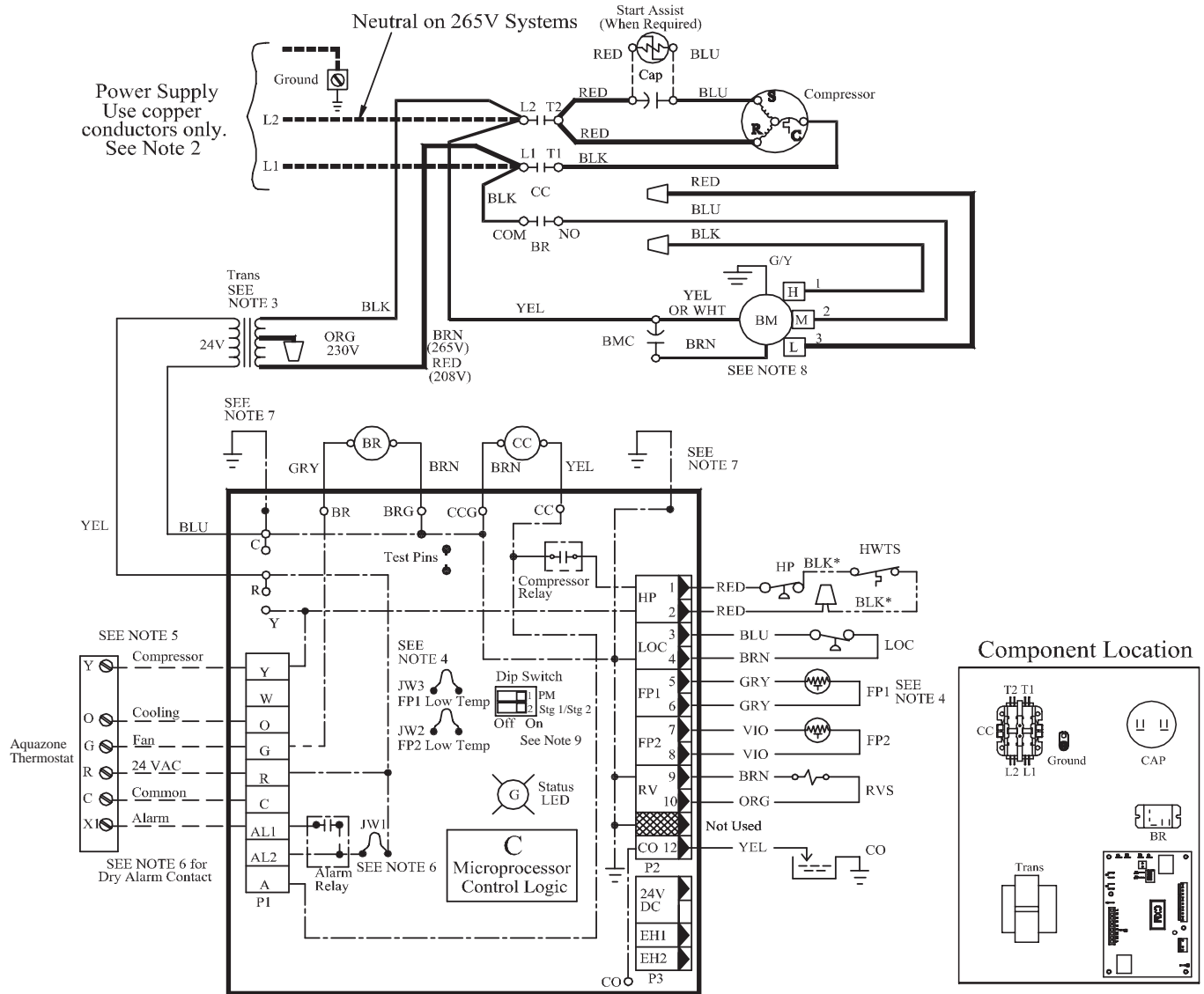
208-VOLT OPERATION — All 208-230 volt units are factory wired for 208 volts. The transformers may be switched to 230-volt operation by switching the red (208 volt) wire with the orange (230 volt) wire at the L1 terminal.

PSC (PERMANENT SPLIT CAPACITOR) BLOWER SPEED SELECTION — All Water Source Heat Pumps are factory set to deliver rated airflow at nominal static (0.15 in. wg) on medium speed. Where higher static is needed, high speed can be utilized (0.4 to 0.5 in. wg). Low speed will deliver approximately 85% of rated airflow (0.10 in. wg). The PSC blower fan speed can be changed on all units by swapping wires connected to the relay contacts that control the fan. See Tables 8-10.

For 50RHR,RVR,RHS,RVS and RDS Units — On the control, the black wire is connected to High, blue wire is connected to Medium and red wire is connected to Low. See Fig. 19, 20 and 22.

NOTE: Available airflows for all units are shown in Tables 8-10.

For 50RHC,RVC Units — PSC blower fan speed can be changed by moving the blue wire on the fan motor terminal block to the desired speed as shown in Fig. 22. The 50RHC,RVC units are designed to deliver rated airflow at nominal static (0.15 in. wg) on medium speed (factory setting) and rated airflow at a higher static (0.4 to 0.5 in. wg) on high speed for applications where higher static is required. Low speed will deliver approximately 85% of rated airflow at 0.10 in. wg. An optional 'High Static' blower is available by using the special option code in the model nomenclature.



LEGEND

- AL** — Alarm Relay Contacts
- BM** — Blower Motor
- BMC** — Blower Motor Capacitor
- BR** — Blower Relay
- CAP** — Capacitor
- CC** — Compressor Contactor
- CO** — Sensor, Condensate Overflow
- FP1** — Sensor, Water Coil Freeze Protection
- FP2** — Sensor, Air Coil Freeze Protection
- HP** — High-Pressure Switch
- HWTS** — High (Leaving) Water Temperature Switch

- JW1** — Jumper, Alarm
- LOC** — Loss of Charge Pressure Switch
- NEC** — National Electrical Code
- PEC** — Field Wiring Terminal Block
- PM** — Performance Monitor
- RVS** — Reversing Valve Solenoid
- Trans** — Transformer
- Field Line Voltage Wiring
- Field Low Voltage Wiring
- - - Printed Circuit Trace
- · - Optional Wiring

- Relay/Contactor Coil
- Condensate Pan
- Solenoid Coil
- Temperature Switch
- Thermistor
- Ground
- Wire Nut

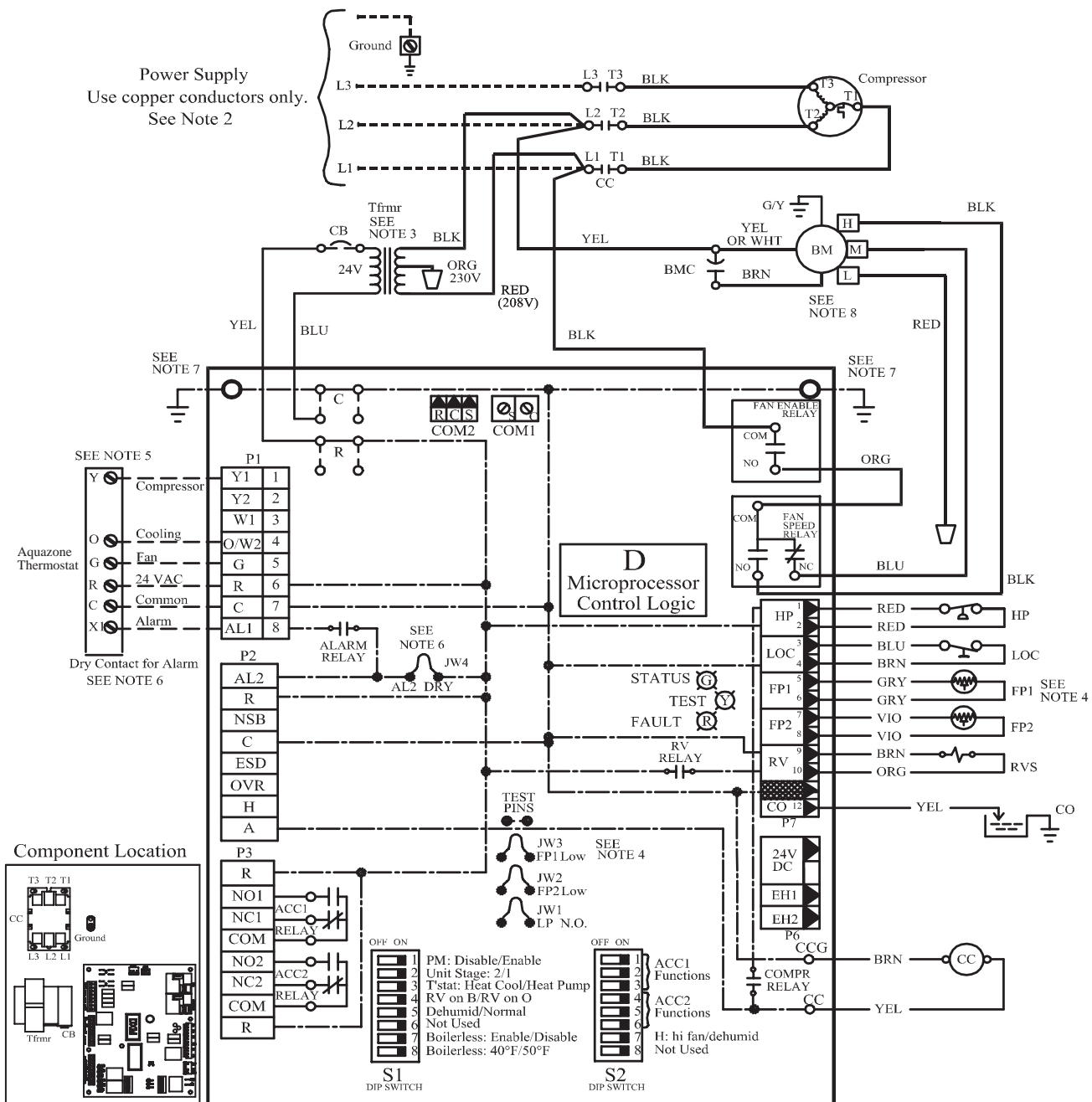
*Optional wiring.

NOTES:

1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 265 v (BRN) lead for 265/1/60 units, or 208 v (RED) lead for 208/1/60. For 230/1/60 switch RED and ORG leads at L1 and insulate RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.

6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via control board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. For high or low speed remove BLU wire from BR 'NO' and replace with BLK or RED wire respectively. Tape off unused terminal.
9. Both DIP switches need to be in the ON position.

Fig. 19 — Typical Aquazone™ Complete C Control Wiring



LEGEND

- | | | |
|---|---|----------------------|
| AL — Alarm Relay Contacts | LOC — Loss of Charge Pressure Switch | Relay/Contactor Coil |
| BM — Blower Motor | NEC — National Electrical Code | Condensate Pan |
| BMC — Blower Motor Capacitor | P1 — Field Wiring Terminal Block | Solenoid Coil |
| CB — Circuit Breaker | PM — Performance Monitor | Thermistor |
| CC — Compressor Contactor | RVS — Reversing Valve Solenoid | Ground |
| CO — Sensor, Condensate Overflow | Tfmr — Transformer | Wire Nut |
| FP1 — Sensor, Water Coil Freeze Protection | Field Line Voltage Wiring | |
| FP2 — Sensor, Air Coil Freeze Protection | Field Low Voltage Wiring | |
| HP — High-Pressure Switch | Printed Circuit Trace | |
| JW1 — Jumper, Alarm | | |

NOTES:

- Compressor and blower motor thermally protected internally.
- All wiring to the unit must comply with NEC and local codes.
- Transformer is wired to 208 v (RED) lead for 208/3/60. For 230/3/60 switch RED and ORG leads at L1 and insulate RED lead.
- FP1 thermistor provides freeze protection for water. When using anti-freeze solutions, cut JW3 jumper.
- Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
- 24-v alarm signal shown. For dry alarm contact, cut AL2 dry jumper and dry contact will be available between AL1 and AL2.
- Transformer secondary ground via control board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
- Blower motor is factory wired for medium and high speeds. For any other combination of speeds, attach the lower speed wire to fan speed relay N.O. wire.

Fig. 20 — Typical Aquazone™ Deluxe D Control Wiring

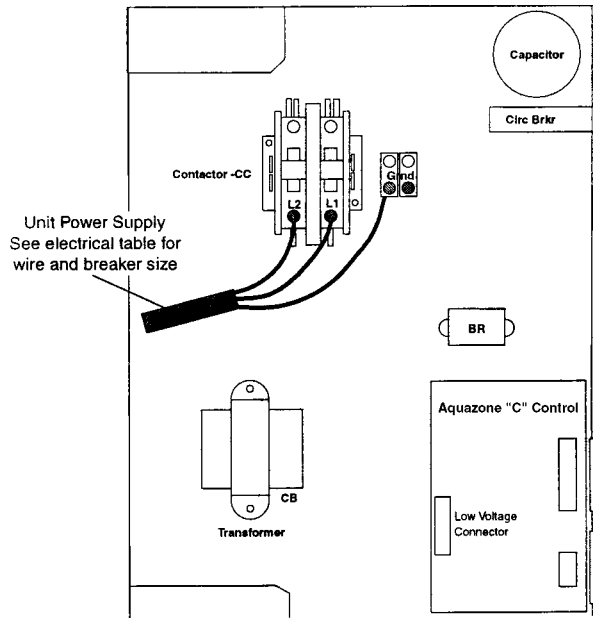


Fig. 21 — 50RHC,RVC,RHR,RVR,RHS,RVS,RDS Typical Single-Phase Line Voltage Power Connection

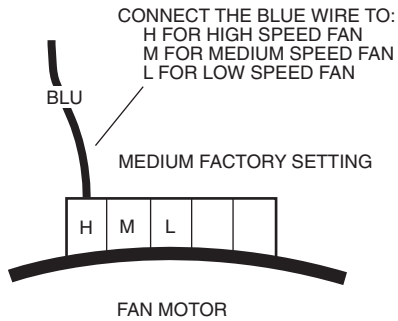


Fig. 22 — 50RHC,RVC Blower Speed Selection

Table 5 — 50RHC,RVC Electrical Data

50RHC,RVC UNITS	VOLTS-PHASE 60 Hz	VOLTAGE MIN/MAX	COMPRESSOR		FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/HACR
			RLA	LRA				
018	208/230-1	197/254	8.6	49.0	1.00	9.6	11.7	20
	265-1	239/292	8.1	44.0	0.86	8.9	11.0	15
024	208/230-1	197/254	9.8	56.0	1.50	11.3	13.8	20
	265-1	239/292	9.1	55.0	1.30	10.4	12.7	20
	208/230-3	197/254	6.7	51.0	1.50	8.2	9.9	15
	460-3	414/506	3.5	25.0	0.76	4.2	5.1	15
030	208/230-1	197/254	11.2	61.0	3.00	14.2	16.9	25
	265-1	239/292	10.0	58.0	2.70	12.7	15.2	25
	208/230-3	197/254	6.9	55.0	3.00	9.9	11.7	15
	460-3	414/506	3.6	28.0	1.70	5.3	6.2	15
036	208/230-1	197/254	15.4	82.0	1.80	17.2	21.1	35
	265-1	239/292	14.4	83.0	2.00	16.4	20.0	30
	208/230-3	197/254	9.6	70.0	1.80	11.4	13.8	20
	460-3	414/506	4.9	33.0	1.24	6.1	7.4	15
041*	208/230-1	197/254	16.2	96.0	3.00	19.2	23.2	35
	208/230-3	197/254	10.3	75.0	3.00	13.3	15.8	25
	460-3	414/506	4.3	40.0	1.70	6.0	7.1	15
	575-3	518/633	4.3	34.0	1.40	5.7	6.8	15
042	208/230-1	197/254	17.1	105.0	3.00	20.1	24.3	40
	208/230-3	197/254	10.7	85.0	3.00	13.7	16.4	25
	460-3	414/506	5.3	42.0	1.70	7.0	8.3	15
	575-3	518/633	3.7	31.0	1.50	5.2	6.1	15
048	208/230-1	197/254	18.3	102.0	3.40	21.7	26.3	40
	208/230-3	197/254	12.6	91.0	3.40	16.0	19.2	30
	460-3	414/506	5.7	42.0	1.80	7.5	8.9	15
	575-3	518/633	4.7	39.0	1.40	6.1	7.2	15
060	208/230-1	197/254	25.6	170.0	4.30	29.9	36.4	60
	208/230-3	197/254	14.7	124.0	4.30	19.0	22.7	35
	460-3	414/506	7.4	59.6	2.50	9.9	11.8	15
	575-3	518/633	5.9	49.4	1.90	7.8	9.3	15

LEGEND

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

*041 in vertical only.

NOTES:

1. HACR circuit breaker in U.S.A. only.
2. All fuses Class RK-5.

Table 6 — 50RHR,RVR Electrical Data

50RHR,RVR UNITS	VOLTS-PHASE 60 Hz	VOLTAGE MIN/MAX	COMPRESSOR		FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/HACR
			RLA	LRA				
006*	208/230-1	197/254	2.9	17.7	0.40	3.3	4.0	15
	265-1	239/292	2.5	15.0	0.35	2.8	3.5	15
009	208/230-1	197/254	3.9	22.2	0.80	4.7	5.7	15
	265-1	239/292	3.3	18.8	0.90	4.2	5.0	15
012	208/230-1	197/254	5.3	27.9	0.80	6.1	7.5	15
	265-1	239/292	4.2	22.2	0.90	5.1	6.2	15
015	208/230-1	197/254	5.9	29.0	1.00	6.9	8.4	15
	265-1	239/292	5.4	27.0	0.86	6.3	7.7	15
019	208/230-1	197/254	7.9	48.3	1.10	9.0	11.0	15
	265-1	239/292	7.1	41.0	0.90	8.0	9.7	15
024	208/230-1	197/254	8.7	48.3	1.30	10.0	12.1	20
	265-1	239/292	8.3	47.0	1.58	9.9	12.0	20
	208/230-3	197/254	6.0	50.0	1.30	7.3	8.8	15
	460-3	414/506	3.2	25.0	0.85	4.1	4.9	15
030	208/230-1	197/254	11.2	60.0	1.90	13.1	15.9	25
	265-1	239/292	10.3	58.0	1.66	11.9	14.5	20
	208/230-3	197/254	6.4	50.0	1.90	8.3	9.9	15
	460-3	414/506	3.2	25.0	1.00	4.2	5.0	15
036	208/230-1	197/254	14.1	84.0	3.00	17.1	20.6	30
	265-1	239/292	13.5	83.0	2.70	16.2	19.5	30
	208/230-3	197/254	8.2	63.4	3.00	11.2	13.3	20
	460-3	414/506	4.1	36.0	1.70	5.8	6.8	15
042	208/230-1	197/254	16.2	96.0	3.00	19.2	23.2	35
	208/230-3	197/254	10.3	75.0	3.00	13.3	15.8	25
	460-3	414/506	4.3	40.0	1.70	6.0	7.1	15
	575-3	518/633	3.7	31.0	1.50	5.2	6.1	15
048	208/230-1	197/254	18.3	102.0	3.40	21.7	26.2	40
	208/230-3	197/254	12.6	91.0	3.40	16.0	19.2	30
	460-3	414/506	5.7	42.0	1.80	7.5	8.9	15
	575-3	518/633	4.7	39.0	1.60	6.3	7.5	15
060	208/230-1	197/254	25.6	170.0	4.30	29.9	36.4	60
	208/230-3	197/254	14.7	124.0	4.30	19.0	22.7	35
	460-3	414/506	7.4	59.6	2.50	9.9	11.8	15
	575-3	518/633	5.9	49.4	2.20	8.1	9.8	15

LEGEND

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

*Size 006 is available in 50RHR units only.

Table 7 — 50RHS,RVS,RDS Electrical Data

50RHS,RVS,RDS UNITS	VOLTS-PHASE 60 Hz	VOLTAGE MIN/MAX	COMPRESSOR		FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/HACR
			RLA	LRA				
015	208/230-1	197/254	4.9	26.0	1.00	5.9	7.2	15
	265-1	239/292	4.4	28.0	0.86	5.2	6.3	15
018	208/230-1	197/254	7.1	38.0	1.00	8.1	9.8	15
	265-1	239/292	5.5	32.0	0.86	6.4	7.8	15
024	208/230-1	197/254	10.3	56.0	1.10	11.4	13.9	20
	265-1	239/292	8.7	47.0	0.90	9.6	11.7	20
	208/230-3	197/254	7.1	45.0	1.10	8.2	9.9	15
	460-3	414/506	3.5	22.4	0.57	4.1	5.0	15
030	208/230-1	197/254	12.2	67.0	1.30	13.5	16.5	25
	265-1	239/292	10.9	56.0	1.58	12.5	15.2	25
	208/230-3	197/254	7.7	55.0	1.30	9.0	10.9	15
	460-3	414/506	3.8	27.0	0.85	4.7	5.7	15
036	208/230-1	197/254	13.5	73.0	1.80	15.3	18.6	30
	265-1	239/292	12.8	71.0	2.00	14.8	18.0	30
	208/230-3	197/254	9.6	63.0	1.80	11.4	13.8	20
	460-3	414/506	4.5	31.0	1.24	5.7	6.8	15
042	208/230-1	197/254	16.5	95.0	1.90	18.4	22.6	35
	208/230-3	197/254	10.3	77.0	1.90	12.2	14.7	25
	460-3	414/506	5.1	39.0	1.00	6.1	7.4	15
	575-3	518/633	4.2	31.0	0.80	5.0	6.1	15
048	208/230-1	197/254	18.3	109.0	3.00	21.3	25.9	40
	208/230-3	197/254	12.4	88.0	3.00	15.4	18.5	30
	460-3	414/506	6.4	44.0	1.70	8.1	9.7	15
	575-3	518/633	4.8	34.0	1.50	6.3	7.5	15
060	208/230-1	197/254	25.0	169.0	3.40	28.4	34.6	50
	208/230-3	197/254	17.3	123.0	3.40	20.7	25.0	40
	460-3	414/506	6.7	49.5	1.80	8.5	10.2	15
	575-3	518/633	5.8	40.0	1.60	7.4	8.8	15
070	208/230-1	197/254	28.8	169.0	4.30	33.1	40.4	60
	208/230-3	197/254	17.3	137.0	4.30	21.6	25.9	40
	460-3	414/506	9.0	62.0	2.50	11.5	13.7	20
	575-3	518/633	6.6	49.0	2.20	8.8	10.5	15

LEGEND

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

Table 9 — 50RHR,RVR Blower Performance

50RHR,RVR UNITS	RATED CFM	MIN CFM	FAN SPEED	AIRFLOW (Cfm)																
				External Static Pressure (in. wg)																
				0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90		
006*	200	150	HI	300	290	280	270	260	250	240	230	210	190	160	110					
			MED	240	230	220	210	200	190	180	160	140	130	110						
			LO	220	210	200	200	190	180	160	150	130	130							
009	300	225	HI	450	440	430	420	400	390	370	350	320	310	300	230					
			MED	410	400	390	380	360	350	340	330	310	290	270						
			LO	370	360	350	340	320	320	310	300	280	260	240						
012	375	300	HI	470	460	450	440	430	420	400	390	380	370	350	330	290				
			MED	410	400	380	370	360	360	350	340	330	320	310	290					
			LO	340	330	320	320	310	310	300	300	290	290							
015	500	375	HI	750	730	710	700	680	660	630	600	570	540	500	400					
			MED	660	640	620	610	590	570	550	530	500	470	440	370					
			LO	580	570	550	540	520	500	480	460	430	400	370						
019	600	450	HI	850	820	790	770	740	710	670	640	600	560	520	450					
			MED	700	680	660	640	620	590	560	530	500	470	440						
			LO	600	580	560	540	510	490	460										
024	800	600	HI	980	950	920	890	860	830	790	760	720	680	640	540					
			MED	850	830	800	770	740	720	690	660	620	580	540	460					
			LO	700	680	660	650	630	610	590	560	530	500	470						
030	1000	750	HI	1330	1300	1260	1230	1190	1150	1100	1050	1000	960	920	830					
			MED	1210	1190	1160	1130	1100	1050	1000	970	930	880	830	720					
			LO	1050	1030	1010	980	950	920	890	850	810	770	730						
036	1200	900	HI	1580	1540	1500	1470	1440	1410	1370	1330	1280	1240	1200	1090	940				
			MED	1400	1370	1340	1310	1280	1250	1220	1190	1150	1100	1050	920					
			LO	1100	1080	1060	1040	1010	980	950	920	890	890							
042	1400	1050	HI	1790	1760	1730	1700	1660	1630	1590	1550	1510	1480	1440	1370	1270	1120			
			MED	1500	1490	1470	1450	1420	1400	1380	1350	1320	1300	1270	1180	1070				
			LO	1110	1100	1090	1080	1060	1050	1040										
048	1600	1200	HI	1910	1880	1840	1800	1750	1730	1700	1650	1600	1540	1480	1380	1300	1180			
			MED	1830	1790	1740	1700	1660	1620	1570	1540	1500	1450	1400	1320	1210	1120			
			LO	1700	1670	1640	1600	1560	1530	1490	1460	1430	1390	1340	1250	1170				
High Static 048	1600	1200	HI	2180	2140	2090	2060	2030	1990	1940	1870	1800	1750	1690	1580	1440	1270	990		
			MED	2080	2050	2020	1970	1920	1870	1820	1740	1650	1640	1620	1530	1320	1220			
			LO	1990	1950	1910	1880	1840	1810	1770	1710	1650	1620	1580	1460	1340	1180			
060	2000	1500	HI	2230	2220	2200	2160	2120	2090	2060	2040	2010	1990	1960	1880	1790	1660			
			MED	2040	2020	1990	1970	1940	1920	1890	1860	1830	1810	1780	1710	1620				
			LO	1840	1830	1810	1800	1780	1760	1730	1700	1670	1640	1600	1510					

LEGEND

— Shaded areas are below minimum CFM. This data is provided for troubleshooting information only.
CFM — Cubic Feet Per Minute

*Size 006 available in 50RHR units only.

NOTES:

1. Units factory shipped on medium speed. Other speeds require field selection.
2. All airflow is rated on 208 v operating with wet coil and clean air filter.
3. All units ARI/ISO/ASHRAE 13256-1 rated on high fan speed.
4. Only two speed fan (H & M) available on 575-v units.

Table 10 — 50RHS,RVS,RDS Blower Performance

50RHS,RVS,RDS UNITS	RATED AIRFLOW	FAN SPEED	AIRFLOW (Cfm)															
			External Static Pressure (in. wg)															
			0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.00
015	500	Hi	880	860	840	830	820	800	780	750	730	690	660	610	—	—	—	—
		Med	770	760	750	740	720	710	690	670	640	620	600	—	—	—	—	—
		Low	670	660	660	650	640	630	620	600	580	550	520	—	—	—	—	—
018	600	Hi	870	860	840	830	820	800	780	750	730	690	660	610	—	—	—	—
		Med	770	760	750	740	720	710	690	670	640	620	600	—	—	—	—	—
		Low	670	660	660	650	640	630	620	600	580	550	520	—	—	—	—	—
024	800	Hi	1130	1110	1090	1060	1040	1010	980	950	920	880	840	720	—	—	—	—
		Med	950	940	930	920	910	880	860	820	790	760	730	—	—	—	—	—
		Low	880	870	860	840	830	810	800	770	730	700	660	—	—	—	—	—
030	1000	Hi	1240	1230	1200	1180	1160	1120	1090	1050	1000	970	930	850	650	—	—	—
		Med	1180	1150	1120	1090	1070	1030	1000	970	950	910	870	—	—	—	—	—
		Low	1040	1020	1000	980	960	930	910	870	840	820	790	—	—	—	—	—
Hi Static 030	1000	HS Hi	1380	1360	1320	1280	1250	1220	1200	1150	1110	1070	1020	940	850	690	—	—
		HS Med	1260	1240	1220	1190	1170	1130	1100	1070	1040	990	950	—	—	—	—	—
		HS Low	1170	1150	1130	1100	1080	1050	1020	990	960	930	900	—	—	—	—	—
036	1150	Hi	1390	1360	1320	1280	1250	1220	1200	1150	1110	1070	1020	940	850	690	—	—
		Med	1260	1240	1220	1190	1170	1130	1100	1070	1040	990	950	—	—	—	—	—
		Low	1170	1150	1130	1100	1080	1050	1020	990	960	930	900	—	—	—	—	—
Hi Static 036	1150	HS Hi	1790	1760	1730	1700	1660	1630	1590	1550	1510	1470	1440	1370	1270	1120	—	—
		HS Med	1510	1490	1470	1450	1420	1400	1380	1350	1320	1300	1270	1180	1070	—	—	—
		HS Low	1110	1100	1090	1080	1060	1050	1040	—	—	—	—	—	—	—	—	—
042	1400	Hi	—	—	—	1670	1630	1600	1570	1540	1510	1440	1380	1290	1130	—	—	—
		Med	1610	1580	1550	1510	1480	1450	1420	1390	1360	1320	1270	—	—	—	—	—
		Low	1270	1260	1250	1240	1220	1210	1190	1160	1120	1080	1030	—	—	—	—	—
048	1600	Hi	—	—	—	2010	2000	1940	1880	1830	1780	1690	1610	1540	1310	1190	—	—
		Med	1940	1910	1870	1820	1780	1740	1700	1670	1630	1570	1520	1410	1310	1170	—	—
		Low	1470	1460	1450	1440	1430	1410	1380	1360	1330	1280	1220	1110	1040	—	—	—
060	2000	Hi	—	—	—	—	—	2270	2230	2200	2170	2140	2110	2040	1970	1870	1720	1640
		Med	2260	2240	2220	2190	2170	2140	2110	2100	2080	2050	2020	1960	1870	1760	1660	1550
		Low	2050	2030	2010	1990	1970	1950	1930	1910	1880	1850	1830	1780	1700	1650	1570	1430
070	2300	Hi	—	—	—	—	—	2460	2430	2390	2340	2310	2280	2230	2180	1990	1860	1740
		Med	2530	2500	2470	2450	2420	2400	2370	2340	2310	2280	2260	2200	2100	1890	1740	1640
		Low	2270	2260	2250	2240	2230	2210	2180	2160	2140	2120	2100	2040	1900	1790	1690	1570

LEGEND

— — Not Recommended

NOTES:

1. Includes allowance for wet coil and clean factory-installed filter.
2. Units factory shipped on medium speed (015 on Low). Other speeds require field selection.
3. All airflow is rated on 208 v operating with wet coil and clean air filter.
4. All units ARI/ISO/ASHRAE 13256-1 rated on high (015 rated on medium).

Step 9 — Low Voltage Wiring

THERMOSTAT CONNECTIONS — The thermostat should be wired directly to the Aquazone™ control board. See Fig. 19, 20, and 22.

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 13 F when using antifreeze in colder earth loop applications. See Fig. 24.

AIR COIL FREEZE PROTECTION — The air coil freeze protection jumper JW2 (FP2) is factory set for 30 F and should not need adjusting.

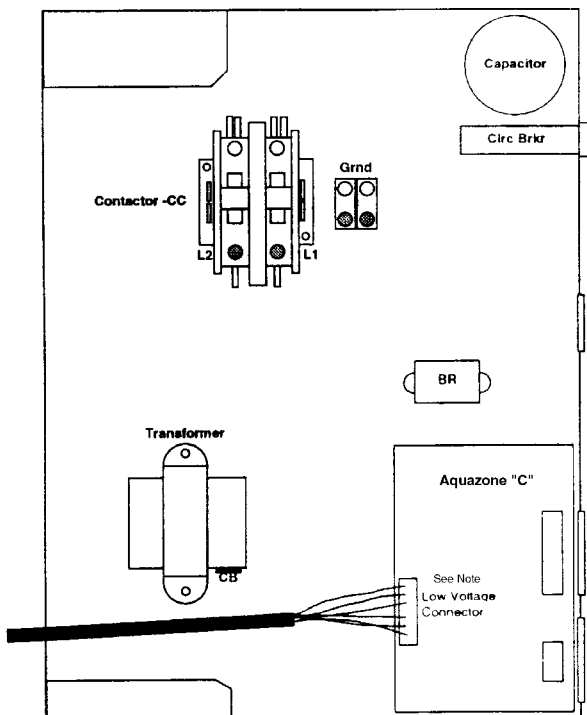
ACCESSORY CONNECTIONS — Terminal A on the control is provided to control accessory devices such as water valves, electronic air cleaners, humidifiers, etc. This signal operates with the compressor terminal. See Fig. 25. Refer to the specific unit wiring schematic for details.

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

WATER SOLENOID VALVES — Water solenoid valves may be used on primary secondary pump and ground water installations. A typical well water control valve wiring, which can limit waste water in a lockout condition is shown in Fig. 25. A slow closing valve may be required to prevent water hammer. When using a slow closing valve, consider special wiring conditions. The valve takes approximately 60 seconds to open (very little water will flow before 45 seconds) and it activates the compressor only after the valve is completely opened by closing its end switch. When wired as shown, the valve will have the following operating characteristics:

1. Remain open during a lockout
2. 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.



NOTE: Low voltage connector may be removed for easy installation.

Fig. 23 — Low Voltage Field Wiring

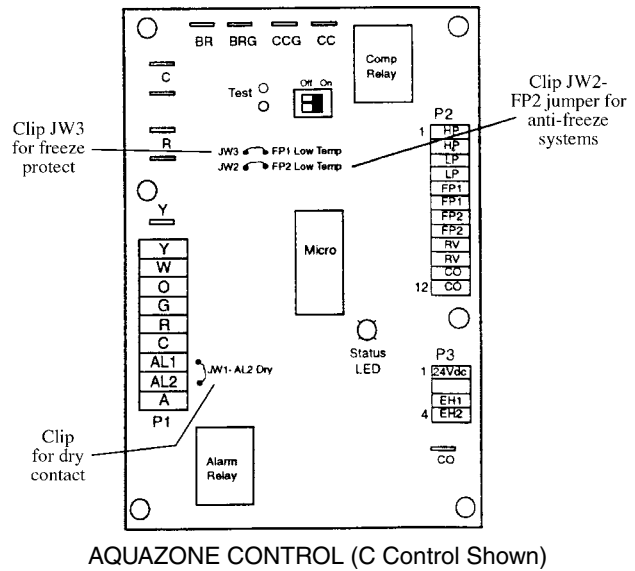


Fig. 24 — Typical Aquazone Control Board Jumper Locations

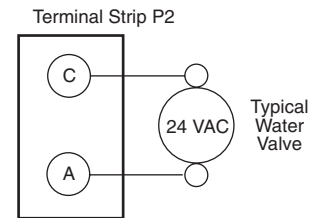


Fig. 25 — Typical D Control Accessory Wiring

PRE-START-UP

System Checkout — When the installation is complete, follow the System Checkout procedure outlined below before starting up the system. Be sure:

1. Voltage is within the utilization range specifications of the unit compressor and fan motor and voltage is balanced for 3 phase units.
2. Fuses, breakers and wire are correct size.
3. Low voltage wiring is complete.
4. Piping and system flushing is complete.
5. Air is purged from closed loop system.
6. System is balanced as required. Monitor if necessary.
7. Isolation valves are open.
8. Water control valves or loop pumps are wired.
9. Condensate line is open and correctly pitched.
10. Transformer switched to lower voltage tap if necessary.
11. Blower rotates freely — shipping support is removed.
12. Blower speed is on correct setting.
13. Air filter is clean and in position.
14. Service/access panels are in place.
15. Return air temperature is between 40 to 80 F heating and 50 to 110 F cooling.
16. Air coil is clean.
17. Control field selected settings are correct.

AIR COIL — To obtain maximum performance, clean the air coil before starting the unit. A ten percent solution of dishwasher detergent and water is recommended for both sides of the coil. Rinse thoroughly with water.

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.

C Control Jumper Settings (See Fig. 19)

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

AIR COIL FREEZE PROTECTION (FP2) LIMIT SETTING — Select jumper 2 (JW2-FP2 Low Temp) to choose FP2 limit of 10 F or 30 F. To select 30 F as the limit, DO NOT clip the jumper. To select 10 F as the limit, clip the jumper.

ALARM RELAY SETTING — Select jumper 1 (JW1-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.

C Control DIP Switches — The C Control has 1 DIP switch block with two switches. See Fig. 19.

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.

NOTE: The alarm relay will not cycle during Test mode if switch is set to OFF, stage 2.

D Control Jumper Settings (See Fig. 20)

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

AIR COIL FREEZE PROTECTION (FP2) LIMIT SETTING — Select jumper 2 (JW2-FP2 Low Temp) to choose FP2 limit of 10 F or 30 F. To select 30 F as the 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 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.

D Control DIP Switches — The 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. 20.

DIP SWITCH BLOCK 1 (S1) — This set of switches offers the following options for 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 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) — This set of DIP switches is used to configure accessory relay options. See Fig. 20.

Switches 1 to 3 — These DIP switches provide selection of Accessory 1 relay options. See Table 8 for DIP switch combinations.

Switches 4 to 6 — These DIP switches provide selection of Accessory 2 relay options. See Table 9 for DIP switch combinations.

**Table 11 — DIP Switch Block S2 —
Accessory 1 Relay Options**

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

LEGEND

NSB — Night Setback
OAD — Outside Air Damper

NOTE: All other DIP switch combinations are invalid.

**Table 12 — DIP Switch Block S2 —
Accessory 2 Relay Options**

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

LEGEND

NSB — Night Setback
OAD — Outside Air Damper

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.

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

CYCLE WITH FAN — In this configuration, the relay will be ON any time the Fan Enable relay is on.

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

DIGITAL NIGHT SET BACK (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 inputs are automatically configured for mechanical operation.

MECHANICAL NIGHT SET BACK — When NSB input is connected to ground C, all thermostat inputs are ignored. A thermostat set back heating call will then be connected to the OVR input. If OVR input becomes active, then the 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.

Outside Air Damper (OAD) — If relay is configured for OAD, the relay will normally be ON any time the Fan Enable relay is energized. The relay will not start for 30 minutes following a return to normal mode from NSB, when NSB is no longer connected to ground C. After 30 minutes, the relay will start if the Fan Enable is set to ON.

CAUTION

To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless anti-freeze 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.

NOTE: This equipment is designed for indoor installation only.

Operating Limits

ENVIRONMENT — This equipment is designed for indoor installation ONLY. Extreme variations in temperature, humidity and corrosive water or air will adversely affect the unit performance, reliability and service life.

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

UNIT STARTING CONDITIONS — Depending on the model, units start and operate in an ambient temperature of 45 F with entering air temperature at 40 F or 50 F, entering water temperature at 20 F or 50 F and with both air and water at the flow rates used.

NOTE: These operating limits are not normal or continuous operating conditions. Assume that such a start-up is for the purpose of bringing the building space up to occupancy temperature. See Tables 13 and 14 for operating limits.

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. Restore power to system.
2. Turn thermostat fan position to ON. Blower should start.
3. Balance airflow at registers.
4. Adjust all valves to the full open position and turn on the line power to all heat pump units.
5. Operate unit in the cooling cycle. Refer to Tables 13 and 14 for unit operating limits.

NOTE: Three factors determine the operating limits of a unit: (1) entering air temperature, (2) water temperature and (3) ambient temperature. Whenever any of these factors are at a minimum or maximum level, the other two factors must be at a normal level to ensure proper unit operation. See Tables 13 and 14.

Table 13 — Operating Limits — 50RHC,RVC Units

AIR LIMITS	50RHC,RVC	
	Cooling	Heating
Min. Ambient Air – db	45 F	45 F
Rated Ambient Air – db	80.6 F	68 F
Max. Ambient Air – db	110 F	85 F
Min. Entering Air – db/wb	70/61 F	50 F
Rated Entering Air – db/wb	80.6/66.2 F	68 F
Max. Entering Air – db/wb	95/76 F	80 F
WATER LIMITS		
Min. Entering Water	50 F	50 F
Normal Entering Water	60-90 F	60-70 F
Max. Entering Water	110 F	90 F
Normal Water Flow	2.5-3.0 gpm per ton	

LEGEND

db — Dry Bulb
wb — Wet Bulb

**Table 14 — Operating Limits —
50RHR,RHS,RVR,RVS,RDS Units**

AIR LIMITS	COOLING (F)	HEATING (F)
Min. Ambient Air	45	45
Rated Ambient Air	80	70
Max. Ambient Air	100	85
Min. Entering Air	50	40
Rated Entering Air db/wb	80/67	70
Max. Entering Air db/wb	110/83	80
WATER LIMITS		
Min. Entering Water	30	20
Normal Entering Water	50-90	30-60

LEGEND

db — Dry Bulb
wb — Wet Bulb

NOTE: Value in heating column is dry bulb only. Any wet bulb reading is acceptable.

Scroll Compressor Rotation — It is important to be certain compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction:

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

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

1. Turn off power to the unit. Install disconnect tag.
2. Reverse any two of the unit power leads.
3. Reapply power to the unit and verify pressures are correct.

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

When the compressor is rotating in the wrong direction, the unit makes more noise and does not provide cooling.

After a few minutes of reverse operation, the scroll compressor internal overload protection will open, thus activating the unit lockout. This requires a manual reset. To reset, turn the thermostat on and then off.

NOTE: There is a 5-minute time delay before the compressor will start.

Unit Start-Up Cooling Mode

1. Adjust the unit thermostat to the warmest position. Slowly reduce the thermostat position until the compressor activates.

2. Check for cool air delivery at unit grille a few minutes after the unit has begun to operate.
3. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger using P/T plugs. See Table 15. Check the elevation and cleanliness of the condensate lines; any dripping could be a sign of a blocked line. Be sure the condensate trap includes a water seal.
4. Check the temperature of both supply and discharge water. Compare to Table 16. If temperature is within range, proceed. If temperature is outside the range, check the cooling refrigerant pressures in Table 16.
5. Check air temperature drop across the coil when compressor is operating. Air temperature drop should be between 15 and 25 F.

**Table 15 — Water Temperature Change
Through Heat Exchanger**

WATER FLOW RATE (GPM)	COOLING RISE (F)		HEATING DROP (F)	
	Min	Max	Min	Max
For Closed Loop: Ground Source or Cooling/Boiler Systems at 3 gpm/ton	9	12	4	8
For Open Loop: Ground Water Systems at 1.5 gpm/ton	20	26	10	17

Unit Start-Up Heating Mode

NOTE: Operate the unit in heating cycle after checking the cooling cycle. Allow five minutes between tests for the pressure or reversing valve to equalize.

1. Turn thermostat to lowest setting and set thermostat switch to HEAT position.
2. Slowly turn the thermostat to a higher temperature until the compressor activates.
3. Check for warm air delivery at the unit grille within a few minutes after the unit has begun to operate.
4. Check the temperature of both supply and discharge water. Compare to Table 16. If temperature is within range, proceed. If temperature is outside the range, check the heating refrigerant pressures in Table 16.
5. Once the unit has begun to run, check for warm air delivery at the unit grille.
6. Check air temperature rise across the coil when compressor is operating. Air temperature rise should be between 20 and 30 F after 15 minutes at load.
7. Check for vibration, noise and water leaks.

Table 16 — Typical Unit Operating Pressures and Temperatures

ENTERING WATER TEMP (F) (EWT)	GPM/TON	COOLING						HEATING					
		Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Superheat (F)	Subcooling (F)	Water Temp Rise (F)	Air Temp Drop (F) DB	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Superheat (F)	Subcooling (F)	Water Temp Drop (F) DB	Air Temp Rise (F)
30	1.5	75-85	90-105	25-40	12-20	21-24	21-26	34- 39	167-186	12-16	1-4	7.6- 8.4	14-20
	2.3	74-84	80- 95	25-40	11-18	13-16	21-26	37- 43	172-191	12-16	1-4	4.8- 5.6	16-22
	3.0	73-83	70- 85	25-40	10-16	6-11	21-26	40- 46	177-196	12-16	1-4	3.4- 4.2	16-22
50	1.5	75-85	125-155	12-20	10-18	20-23	20-25	50- 60	180-210	10-17	1-5	10.8-11.9	23-29
	2.3	74-84	120-142	12-20	9-16	12-15	20-25	53- 62	185-215	10-17	1-5	6.7- 8.1	24-30
	3.0	73-83	115-138	12-20	8-14	8-12	20-25	55- 65	190-220	10-17	1-5	5.1- 5.9	25-31
70	1.5	75-85	179-198	9-16	8-15	19-22	19-24	71- 82	205-230	14-19	1-5	14.0-15.2	28-34
	2.3	74-84	168-186	9-16	8-14	12-17	19-24	73- 85	210-238	14-19	1-5	9.0-10.2	30-37
	3.0	73-83	158-175	9-16	8-12	7-12	19-24	76- 88	215-242	14-19	1-5	6.7- 7.9	31-38
90	1.5	75-85	229-251	9-17	8-15	18-21	17-23	85- 95	220-260	18-28	2-5	14.4-16.6	32-39
	2.3	74-84	218-241	9-17	8-14	10-14	17-23	90-100	225-265	18-28	2-5	10.8-12.4	33-41
	3.0	73-83	208-230	9-17	8-12	6-11	17-23	95-105	230-270	18-28	2-5	7.2- 8.3	35-42
110	1.5	77-87	280-320	8-15	10-25	17-20	15-20						
	2.3	76-86	270-310	8-15	10-24	9-13	15-20						
	3.0	75-85	260-300	8-15	10-22	5-10	15-20						

LEGEND

DB — Dry Bulb
EAT — Entering Air Temperature

NOTES:

1. Based on nominal 400 cfm per ton airflow, 70 F EAT heating and 80/67 F EAT cooling.
2. Cooling air and water numbers can vary greatly with changes in humidity.
3. Subcooling is based upon the head pressure at compressor service port.

Flow Regulation — Flow regulation can be accomplished by two methods. Most water control valves have a flow adjustment built into the valve. By measuring the pressure drop through the unit heat exchanger, the flow rate can be determined. See Tables 17-19. Adjust the water control valve until the flow of 1.5 to 2 gpm is achieved. Since the pressure constantly varies, two pressure gages may be needed in some applications.

An alternative method is to install a flow control device. These devices are typically an orifice of plastic material designed to allow a specified flow rate that are mounted on the outlet of the water control valve. 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 well water setup.

▲ WARNING
To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position before flushing system.

Flushing — Once the piping is complete, units require final purging and loop charging. A flush cart pump of at least 1.5 hp is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop. Flush the loop in both directions with a high volume of water at a high velocity. Follow the steps below to properly flush the loop:

1. Verify power is off.
2. Fill loop with water from hose through flush cart before using flush cart pump to ensure an even fill. Do not allow the water level in the flush cart tank to drop below the pump inlet line to prevent air from filling the line.
3. Maintain a fluid level in the tank above the return tee to avoid air entering back into the fluid.
4. Shutting off the return valve that connects into the flush cart reservoir will allow 50 psi surges to help purge air pockets. This maintains the pump at 50 psi.
5. To purge, keep the pump at 50 psi until maximum pumping pressure is reached.
6. Open the return valve to send a pressure surge through the loop to purge any air pockets in the piping system.
7. A noticeable drop in fluid level will be seen in the flush cart tank. This is the only indication of air in the loop.

NOTE: If air is purged from the system while using a 10 in. PVC flush tank, the level drop will only be 1 to 2 in. since liquids are incompressible. If the level drops more than this, flushing should continue since air is still being compressed in the loop. If level is less than 1 to 2 in., reverse the flow.

8. Repeat this procedure until all air is purged.
9. Restore power.

Antifreeze may be added before, during or after the flushing process. However, depending on when it is added in the process, it can be wasted. Refer to the Antifreeze section for more detail.

Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the warmer months. This fluctuation is normal and should be considered when charging the system initially. Run the unit in either heating or cooling for several minutes to condition the loop to a homogenous temperature.

When complete, perform a final flush and pressurize the loop to a static pressure of 40 to 50 psi for winter months or 15 to 20 psi for summer months.

After pressurization, be sure to remove the plug from the end of the loop pump motor(s) to allow trapped air to be

discharged and to ensure the motor housing has been flooded. Be sure the loop flow center provides adequate flow through the unit by checking pressure drop across the heat exchanger. Compare the results to the data in Tables 17-19.

Table 17 — 50RHC,RVC Coaxial Water Pressure Drop

UNIT 50RHC,RVC	GPM	WATER TEMPERATURE (F)		
		60 F	80 F	90 F
		Pressure Drop (psi)		
018	2.3	2.1	1.9	1.9
	3.4	3.0	2.8	2.7
	4.5	4.3	4.0	3.9
024	3.0	2.0	1.9	1.8
	4.5	3.8	3.6	3.5
	6.0	6.4	6.0	5.9
030	3.8	1.6	1.5	1.4
	5.6	2.8	2.6	2.6
	7.5	4.4	4.1	4.0
036	4.5	1.8	1.7	1.6
	6.8	3.2	3.0	2.9
	9.0	5.1	4.8	4.6
041*	5.3	1.0	0.9	0.9
	7.9	2.2	2.1	2.0
	10.5	4.0	3.8	3.7
042	5.3	1.0	1.0	0.9
	8.0	2.7	2.8	2.8
	11.0	5.8	8.2	5.0
048	6.0	1.2	1.2	1.1
	9.0	2.9	2.7	2.7
	12.0	5.3	5.0	4.8
060	7.8	4.4	4.1	4.0
	11.3	7.6	7.1	6.9
	18.0	11.5	10.8	10.5

*Vertical unit only.

Table 18 — 50RHR,RVR Coaxial Water Pressure Drop

UNIT 50RHR,RVR	GPM	WATER TEMPERATURE (F)			
		30 F	50 F	70 F	90 F
		Pressure Drop (psi)			
006*	0.8	0.8	0.8	0.7	0.7
	1.1	1.2	1.1	1.0	1.0
	1.5	2.0	1.9	1.8	1.7
009	1.1	1.2	1.1	1.0	0.9
	1.7	1.7	1.6	1.5	1.4
	2.2	3.5	3.2	3.0	2.8
012	1.5	2.8	2.6	2.4	2.3
	2.3	6.0	5.6	5.2	4.9
	3.0	9.6	9.0	8.3	7.9
015	1.8	2.5	2.3	2.1	2.0
	2.6	4.8	4.5	4.1	3.9
	3.5	8.1	7.6	7.0	6.6
019	2.3	1.9	1.7	1.6	1.5
	3.4	3.4	3.1	2.9	2.7
	4.5	6.6	6.2	5.7	5.4
024	3.0	2.0	1.9	1.7	1.6
	4.5	4.2	3.9	3.6	3.4
	6.0	7.0	6.5	6.0	5.7
030	3.8	1.4	1.3	1.2	1.2
	5.5	2.4	2.3	2.1	2.0
	7.5	3.9	3.7	3.4	3.2
036	4.5	1.1	1.1	1.0	0.9
	6.8	2.1	2.0	1.9	1.8
	9.0	3.5	3.3	3.0	2.9
042	5.3	1.4	1.3	1.2	1.2
	7.9	2.9	2.7	2.5	2.3
	10.5	4.6	4.2	3.9	3.7
048	6.0	2.1	1.9	1.8	1.7
	9.0	3.9	3.7	3.4	3.2
	12.0	6.4	5.9	5.5	5.2
060	7.5	2.9	2.7	2.5	2.4
	11.3	5.7	5.3	4.9	4.7
	15.0	9.4	8.7	8.1	7.7

*Size 006 available in 50RHR units only.

Table 19 — 50RHS,RVS,RDS Coaxial Water Pressure Drop

UNIT 50RHS,RVS,RDS	GPM	WATER TEMPERATURE (F)			
		30 F	50 F	70 F	90 F
		Pressure Drop (psi)			
015	1.8	0.6	0.5	0.5	0.5
	2.8	1.0	0.9	0.8	0.8
	3.8	1.5	1.4	1.3	1.2
018	2.2	0.7	0.7	0.6	0.6
	3.5	1.3	1.2	1.1	1.1
	4.5	1.8	1.8	1.6	1.5
024	3.0	0.6	0.6	0.5	0.5
	4.5	1.1	1.1	1.0	0.9
	6.0	1.8	1.7	1.5	1.5
030	3.7	0.8	0.8	0.7	0.7
	5.5	1.6	1.4	1.3	1.3
	7.5	2.6	2.4	2.2	2.1
036	4.5	1.3	1.2	1.1	1.1
	7.0	2.1	1.9	1.8	1.7
	9.0	3.9	3.7	3.4	3.2
042	5.2	1.6	1.5	1.4	1.3
	8.0	3.2	3.0	2.8	2.6
	10.5	5.1	4.7	4.4	4.1
048	6.0	2.1	1.9	1.8	1.7
	9.0	3.9	3.7	3.4	3.2
	12.0	6.4	5.9	5.5	5.2
060	7.5	1.1	1.0	1.0	0.9
	11.3	2.2	2.1	1.9	1.8
	15.0	3.6	3.4	3.1	3.0
070	9.0	1.5	1.4	1.3	1.2
	13.5	3.0	2.8	2.6	2.5
	18.0	5.0	4.7	4.3	4.1

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 fuming.

Calculate the total volume of fluid in the piping system. See Table 20. Use the percentage by volume in Table 21 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 13 F) set point to avoid nuisance faults.

Table 20 — 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 21 — 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 temperature 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 (50RHR,RVR, RHS,RVS,RDS Only) — 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. Locate air separation 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 upon power up.

Units with Aquazone™ Complete C Control

STANDBY — 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 — 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 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 temperature is greater than 45 F and FP2 is greater than 110 F.

EMERGENCY HEAT — In emergency heat 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 continual 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 are 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 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 immediately 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.

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 increased 15 times. See Fig. 19.

Test Mode — To enter Test mode on C or 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 22 and 23. To exit Test mode, short the terminals for 3 seconds or cycle the power 3 times within 60 seconds.

NOTE: 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.

Table 22 — 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	C Control is non-functional	Open
Slow Flash	Fault Retry	Open
Fast Flash	Lockout	Closed
Slow Flash	Over/Under Voltage Shutdown	Open (Closed after 15 minutes)
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 23 — 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-down to power-up 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	Sense overflow (grounded) for 30 continuous seconds
7 (Autoreset)	Over/Under Voltage Shutdown	"R" power supply is <19VAC or >30VAC
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

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

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 D Control:

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

TEST LED — Test LED will be activated any time the 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 on the and appear as 1 fast flash alternating with a 10-second pause. See Table 24.

SERVICE

Perform the procedures outlined below periodically, as indicated.

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 which meet local, state and federal proficiency requirements.

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

Filters — Filters must be clean for maximum performance. Inspect filters every month under normal operating conditions. replace when necessary.

IMPORTANT: Units should never be operated without a filter.

Water Coil — Keep all 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. Keep the heat exchanger 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 PSI during the summer and 40 PSI during the winter.

Check P trap frequently for proper operation.

Table 24 — Aquazone 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
- ESD — Emergency Shutdown
- FP — Freeze Protection
- HP — High Pressure
- LP — Low Pressure
- PM — Performance Monitor

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.

⚠ 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.

Condensate Drain Pans — Check condensate drain pans for algae growth twice a year. If algae growth is apparent, consult a water treatment specialist for proper chemical treatment. Applying an algicide every three months will typically eliminate algae problems in most locations.

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

Check to see that unit is within the superheat and subcooling temperature ranges shown in Table 16. If the unit is not within these ranges, recover and reweigh in refrigerant charge.

Condensate Drain Cleaning — Clean the drain line and unit drain pan at the start of each cooling season. Check flow by pouring water into drain. Be sure trap is filled to maintain an air seal.

Air Coil Cleaning — Remove dirt and debris from evaporator coil as required by condition of the coil. Clean coil with a stiff brush, vacuum cleaner, or compressed air. Use a fin comb of the correct tooth spacing when straightening mashed or bent coil fins.

Condenser Cleaning — Water-cooled condensers may require cleaning of scale (water deposits) due to improperly maintained closed-loop water systems. Sludge build-up may need to be cleaned in an open water tower system due to induced contaminants.

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

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. 26.

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. 27.

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.

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.

4. From standard field-supplied Pressure-Temperature chart for R-22, find equivalent saturated condensing temperature.

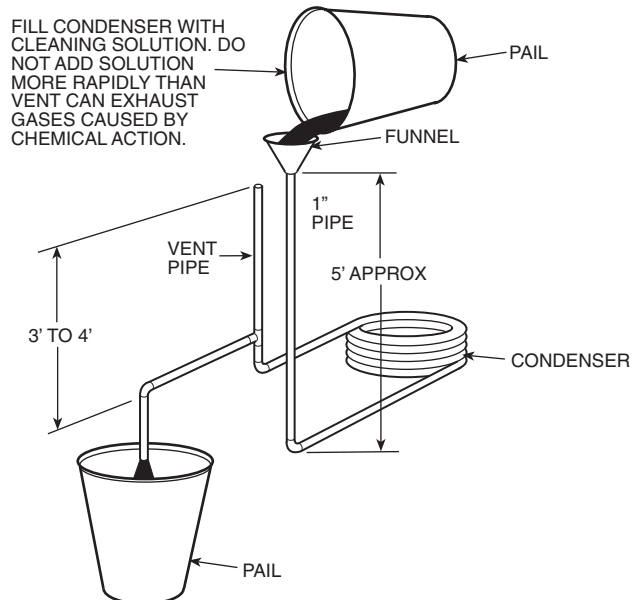


Fig. 26 — Gravity Flow Method

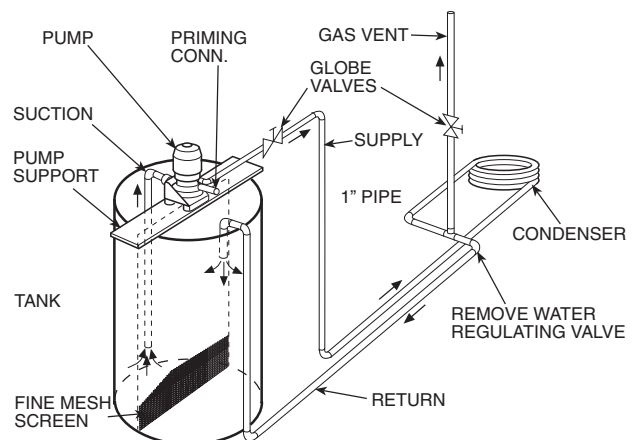


Fig. 27 — Forced Circulation Method

5. Read liquid line temperature on thermometer; then subtract from saturated condensing temperature. The difference equals subcooling temperature.
6. Compare the subcooling temperature with the normal temperature listed in Table 16. If the measured liquid line temperature does not agree with the required liquid line temperature, ADD refrigerant to raise the temperature or REMOVE refrigerant (using standard practices) to lower the temperature (allow a tolerance of $\pm 3^{\circ}\text{F}$).

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 reclaim 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.

Disconnect motor power wires 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.

TROUBLESHOOTING (Fig. 28 and Table 25)

When troubleshooting problems with a WSHP, consider the following.

Thermistor — A thermistor may be required for single-phase units where starting the unit is a problem due to low voltage. See Fig. 28 for thermistor nominal resistance.

Control Sensors — The control system employs 2 nominal 10,000 ohm thermistors (FP1 and FP2) that are used for freeze protection. Be sure FP1 is located in the discharge fluid and FP2 is located in the air discharge. See Fig. 29.

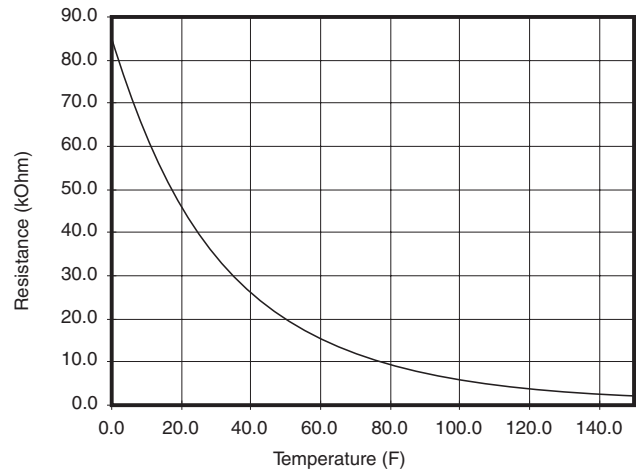
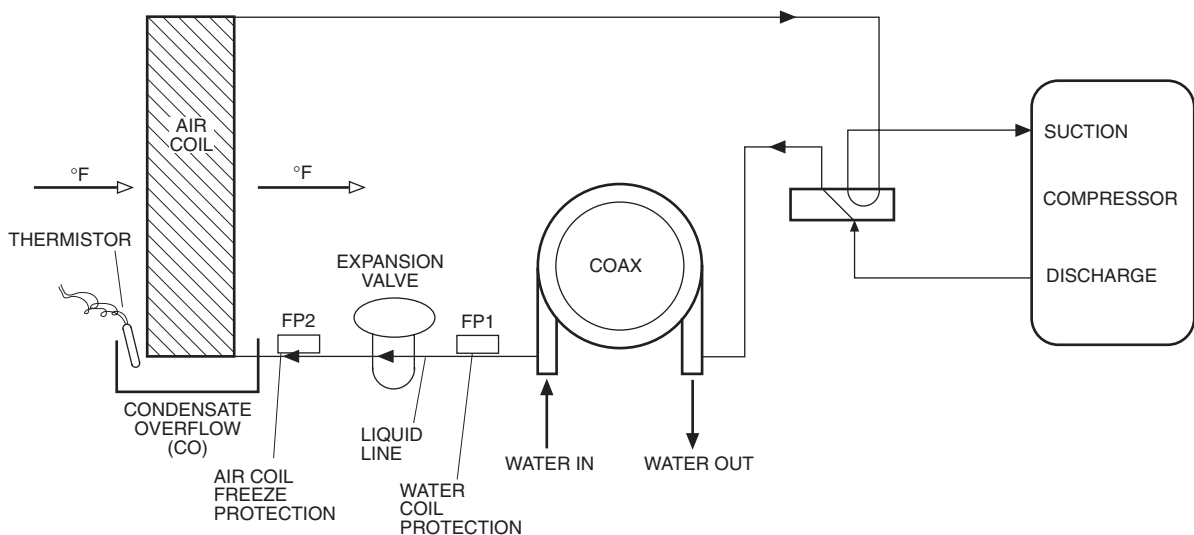


Fig. 28 — Thermistor Nominal Resistance



LEGEND

- COAX — Coaxial Heat Exchanger
- Airflow
- Refrigerant Liquid Line Flow

Fig. 29 — FP1 and FP2 Thermistor Location

Table 25 — 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. External static too high. Check Tables 9 and 10.			
	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 Table 16.				
X	X	Bad HP switch	Check switch continuity and operation. Replace.				
LP/LOC 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 (30 F vs 10 F)	Clip JW2 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. External static too high. Check Tables 9 and 10.		
		X			Air temperature out of range	Too much cold vent air. Bring entering air temperature within design parameters.	
		X			Improper freeze protect setting (30 F vs 10 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.			
				X	X	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.
	X			Heating mode FP2>125 F	Check for poor airflow or overcharged unit.		
Performance Monitor — Code 8		X	Cooling mode FP1>125 F OR FP2< 40 F	Check for poor water flow or airflow.			
	X		FP1 temperature is higher than FP2 temperature.	Swap FP1 and FP2 thermistors.			
FP1 and FP2 Thermistors — Code 9			X	FP2 temperature is higher than FP1 temperature.	Swap FP1 and FP2 thermistors.		
	No Fault Code Shown	X	X	No compressor operation	See scroll compressor rotation section.		
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

RV — Reversing Valve

Table 25 — 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.	
	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.	
	X	X	Thermostat wiring	Check Y and W wiring at heat pump. Jumper Y and R for compressor operation in test mode.	
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 'Click'.	
Insufficient capacity/ Not cooling or heating properly	X	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. External static too high. Check blower Tables 9 and 10.	
		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. External static too high. Check blower Tables 9 and 10.	
	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 Table 16.	
	X	X	Restricted metering device	Check superheat and subcooling Table 16. 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. External static too high. Check blower Tables 9 and 10.
			X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting. Check water flow adjust to proper flow rate. See Table 15.
		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 per Table 16. 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. External static too high. Check blower Tables 9 and 10.	
		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 Tables 9 and 10.	
	X		Poor performance	See 'Insufficient Capacity'.	
High humidity		X	Too high airflow	Check blower Tables 9 and 10.	
		X	Unit oversized	Recheck loads and sizing check sensible cooling load and heat pump capacity.	

LEGEND

RV — Reversing Valve

**50RHC,RVC,RHR,RHS,RVR,RVS,RDS
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) _____
- IF 3-PHASE SCROLL COMPRESSOR IS PRESENT, VERIFY PROPER ROTATION PER INSTRUCTIONS. (Y/N) _____

UNIT VOLTAGE — COOLING OPERATION

PHASE AB VOLTS _____	PHASE BC VOLTS _____ (if 3 phase)	PHASE CA VOLTS _____ (if 3 phase)
PHASE AB AMPS _____	PHASE BC AMPS _____ (if 3 phase)	PHASE CA AMPS _____ (if 3 phase)

CONTROL VOLTAGE

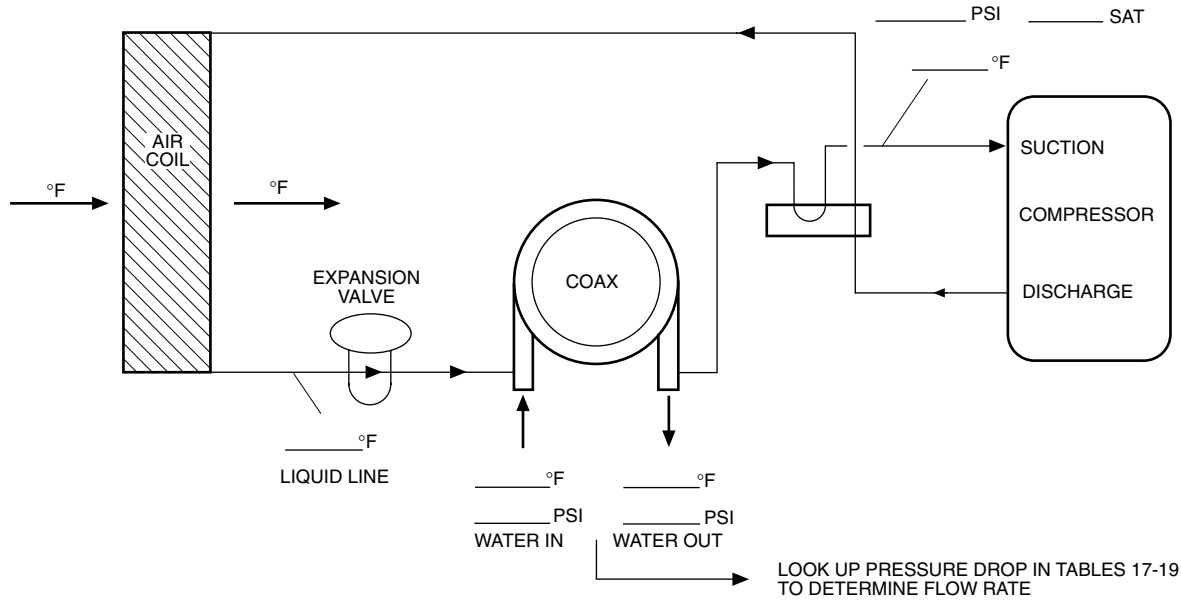
- IS CONTROL VOLTAGE ABOVE 21.6 VOLTS? (Y/N) _____.
- IF NOT, CHECK FOR PROPER TRANSFORMER CONNECTION.

TEMPERATURES

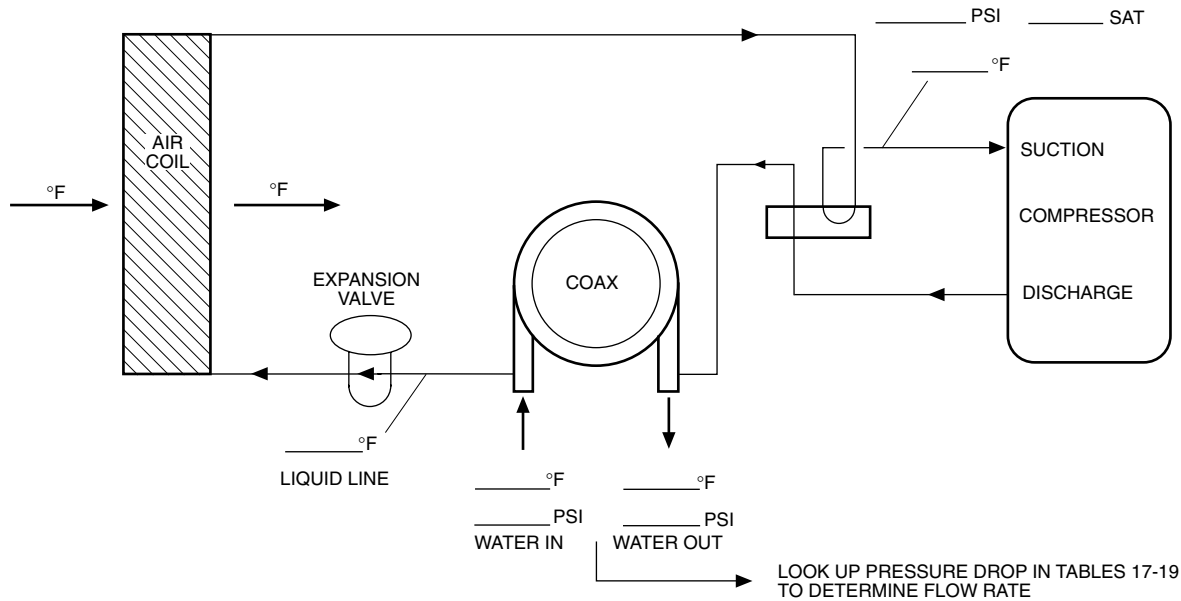
FILL IN THE ANALYSIS CHART ATTACHED.

COAXIAL HEAT EXCHANGER	COOLING CYCLE:	FLUID IN _____ F	FLUID OUT _____ F	_____ PSI	_____ FLOW
	HEATING CYCLE:	FLUID IN _____ F	FLUID OUT _____ F	_____ PSI	_____ FLOW
AIR COIL	COOLING CYCLE:	AIR IN _____ F	AIR OUT _____ F		
	HEATING CYCLE:	AIR IN _____ F	AIR OUT _____ F		

HEATING CYCLE ANALYSIS



COOLING CYCLE ANALYSIS



HEAT OF EXTRACTION (ABSORPTION) OR HEAT OF REJECTION =

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

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

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

$$\text{SUBCOOLING} = \text{DISCHARGE SATURATION TEMPERATURE} - \text{LIQUID LINE TEMPERATURE}$$

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

*Use 500 for water, 485 for antifreeze.



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CUT ALONG DOTTED LINE