



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 servicing or repairing 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.

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

WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation and service. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

CAUTION

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations. DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed. Failure to follow these procedures may result in damage to equipment.

GENERAL

The Aquazone™ 50PSW water source heat pump (WSHP) is a single-package vertically mounted unit with electronic controls designed for year-round cooling and heating.

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 and 2 for unit physical data. Refer to Fig. 1-2 for overall unit dimensions.

Units are designed for indoor installation only. Be sure to allow adequate space around the unit for servicing. See Fig. 4 for service clearances.

These units are not approved for outdoor installation and must be installed indoors in the structure being conditioned. Do not locate in areas where ambient conditions are not maintained within 40°F to 100°F.

IMPORTANT: It is the installing contractors responsibility to ensure that all equipment is installed with proper access for services, start-up, installation of accessories, configuration of control and other components, and equipment removal in accordance with Carrier's recommended service clearances and installation instructions. Please refer to the Carrier Commercial WSHP Warranty Statement (document number 04-570008-01) for details on warranty exclusions regarding equipment, access, removal and clearances.

CAUTION

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

Step 2 — Check Unit

INSPECTION

Upon receipt of shipment, 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 on both the interior and exterior. 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 5 days of receipt of shipment.

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

STORAGE

If the equipment is not needed for immediate installation upon its arrival at the jobsite, it should be left in its shipping carton and stored in a clean, dry area between 50°F and 95°F. Units must be stored in an upright position at all times. If carton stacking is necessary, stack units a maximum of 3 cartons high. Do not remove any equipment from its shipping package until it is needed for installation.

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. Be sure the location chosen for unit installation provides ambient temperatures maintained above freezing. Well water applications are especially susceptible to freezing.
 4. 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.
5. Provide sufficient access to allow maintenance and servicing of the compressor and coils.
 6. Wait to remove the packaging until the unit is ready for installation.
 7. Verify that the refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
 8. Inspect all electrical connections. Be sure connections are clean and tight at the terminals.
 9. Loosen bolts and remove shipping clamps on compressors equipped with external spring vibration isolators. Compressors are internally spring-mounted.
 10. Locate and verify any accessory kit located in compressor section.
 11. Remove any access panel screws that may be difficult to remove once unit is installed.

PROTECTION

Once the units are properly positioned on the jobsite, they must be covered with either a shipping carton, vinyl film, or an equivalent protective covering. Open ends of pipes stored on the jobsite must

be capped. This precaution is especially important in areas where painting, plastering, or spraying of fireproof material, etc., is not yet complete. Foreign material that is allowed to accumulate 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.

Step 3 — Locate Unit

The following guidelines should be considered when choosing a location for the WSHP:

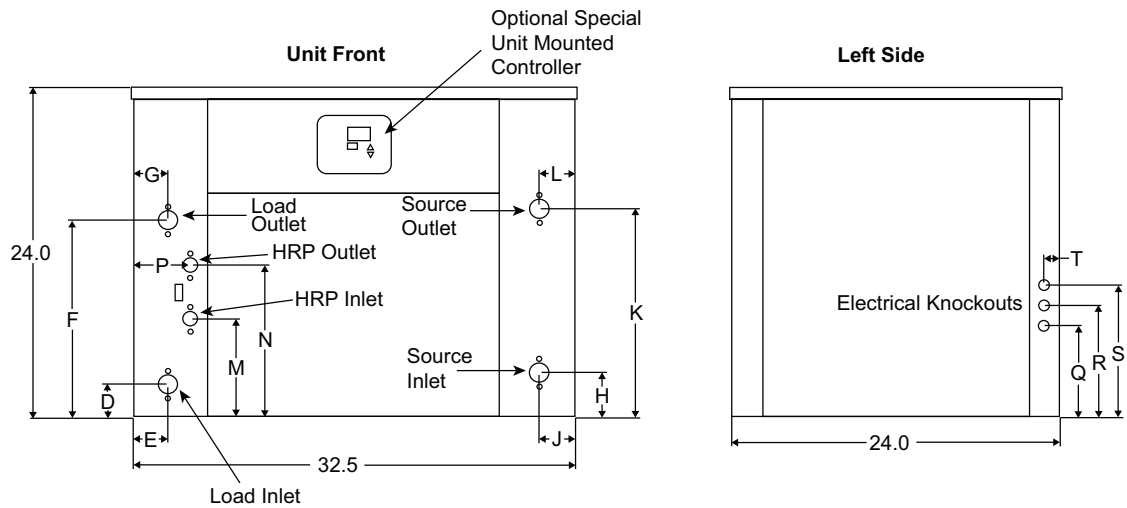
- Units are for indoor use only.
- Provide sufficient space for water and electrical connections.
- Locate unit in an area that allows for easy access and removal of access panels.
- Allow enough space for service personnel to perform maintenance.

Table 1 — 50PSW025-071 Unit Physical Data

50PSW UNIT SIZE	025	035	049	061	071
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll
Quantity	1	1	1	1	1
Maximum Water Working Pressure (psig/kPa)	450/3100	450/3100	450/3100	450/3100	450/3100
Water Connection Size (in.)					
FPT	3/4	3/4	1	1	1
Refrigeration Charge (oz/ckt)	48	59	62	72	90
Coaxial Coil Volume (gal)	0.49	0.49	0.64	0.77	1.05
Operating Weight (lb)	240	250	280	310	430
Shipping Weight (lb)	260	270	300	330	450

Table 2 — 50PSW0122-420 Unit Physical Data

50PSW UNIT SIZE	122	180	210	240	360	420
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Quantity	2	1	1	2	2	2
Maximum Water Working Pressure (psig/kPa)	450/3100	450/3100	450/3100	450/3100	450/3100	450/3100
Water Connection Size (in.)						
FPT	1-1/4	1-1/2	1-1/2	2	2	2
Coaxial Coil Volume (gal)	1.00	3.31	3.31	1.00	3.31	3.31
Refrigeration Charge (oz/ckt)	85	210	220	140	210	220
Operating Weight (lb)	720	850	890	1230	1550	1700
Shipping Weight (lb)	740	870	910	1260	1580	1730



UNIT SIZE	DIMENSIONS (INCHES)															FIELD CONN. ^a	HRP CONN.
	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T		
025	2.20	1.70	13.20	1.70	3.75	1.50	14.25	1.95	7.15	11.00	4.25	6.55	8.05	9.55	1.25	3/4	1/2
035	2.30	2.30	14.30	2.50	3.70	2.55	15.7	2.55	7.15	11.00	4.25	6.55	8.05	9.55	1.25	3/4	1/2
049	2.30	2.10	14.30	2.65	2.75	2.65	14.75	2.65	7.15	11.00	4.25	6.55	8.05	9.55	1.25	1	1/2
061	2.80	1.38	14.80	2.63	2.51	2.00	14.38	3.40	7.15	11.00	4.25	6.55	8.05	9.55	1.25	1	1/2
071	3.00	2.25	17.25	2.25	3.25	2.25	17.00	2.25	7.15	11.00	4.25	6.55	8.05	9.55	1.25	1	1/2

NOTE(S):

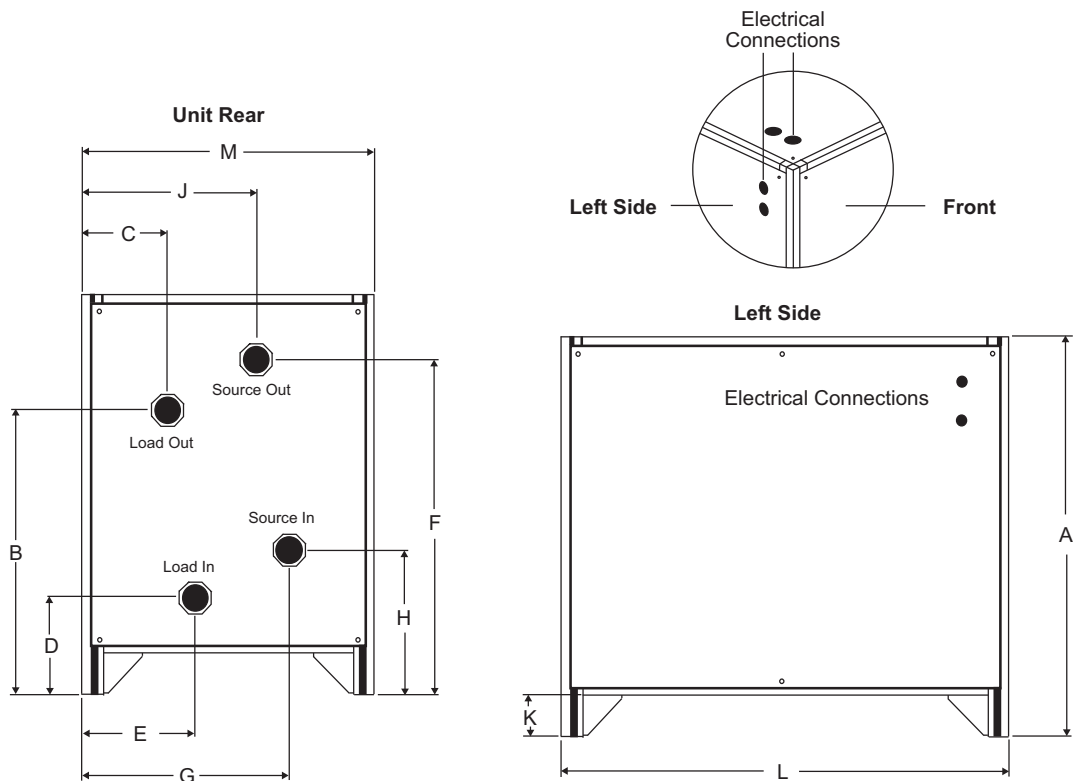
a. Refers to both load and source fluid connections.

b. All dimensions are within ± 0.125 in. Specifications subject to change without notice.

LEGEND

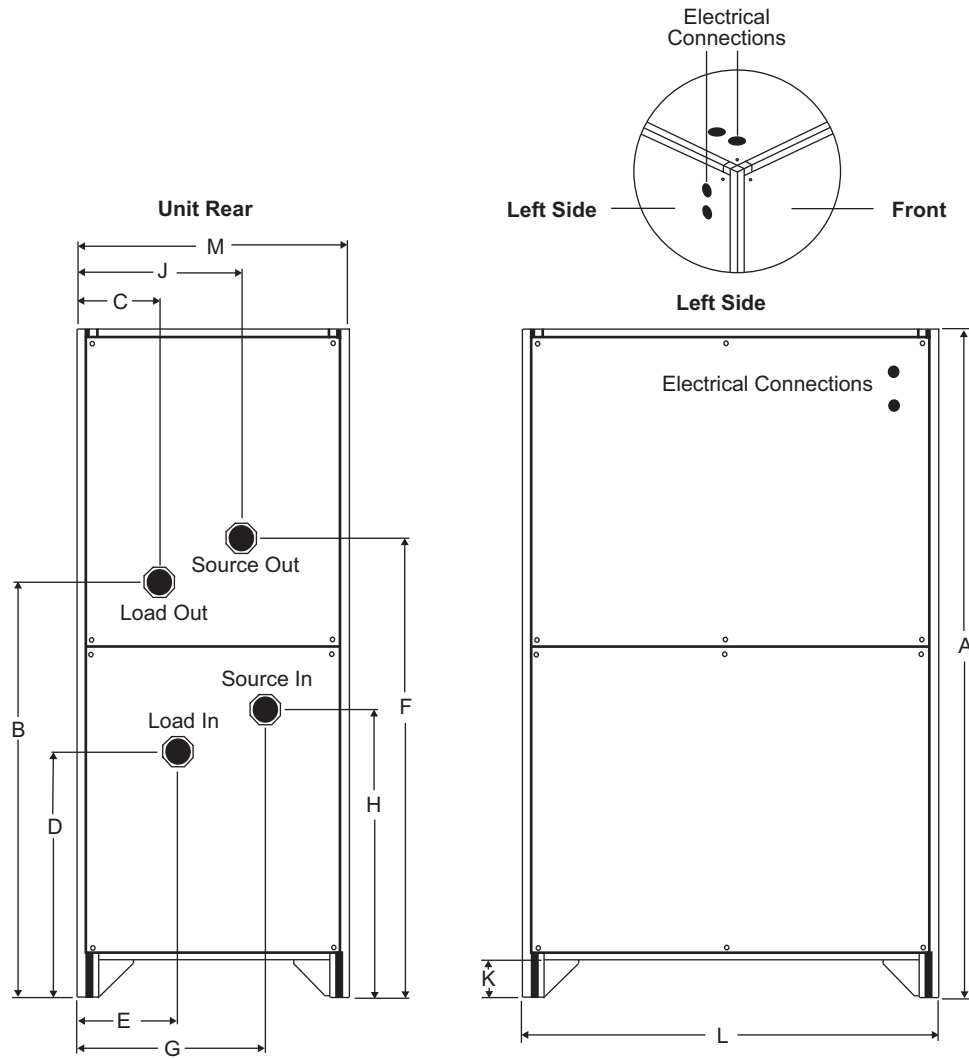
HRP — Heat Recovery Package

Fig. 1 — 50PSW025-071 Unit



UNIT SIZE	DIMENSIONS (INCHES)												WATER CONN. (FPT)
	A	B	C	D	E	F	G	H	J	K	L	M	
122	37.5	27.62	8.5	8.37	10.5	32.25	19.5	13.5	17.5	3.5	46	28	1-1/4
180	37.5	27.62	4.5	8.37	10.5	32.25	23.5	13.5	17.5	3.5	46	28	1-1/2
210	37.5	27.62	4.5	8.37	10.5	32.25	23.5	13.5	17.5	3.5	46	28	1-1/2

Fig. 2 — 50PSW122-210 Unit



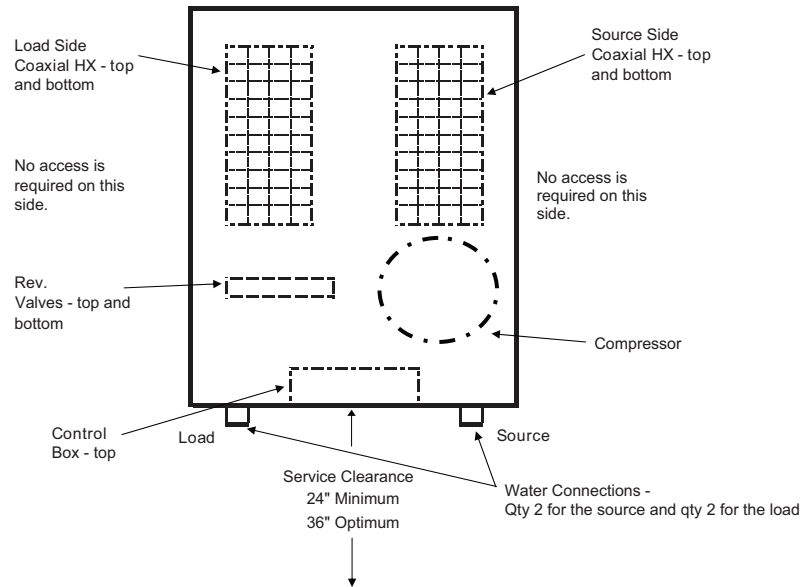
UNIT SIZE	DIMENSIONS (INCHES)												WATER CONN. (FPT)
	A	B	C	D	E	F	G	H	J	K	L	M	
240	70	43.5	8.5	24.5	10.5	48.5	19.5	29.25	17.5	3.5	46	28	2
360	70	43.5	4.5	24.5	10.5	48.5	23.5	29.25	17.5	3.5	46	28	2
420	70	43.5	4.5	24.5	10.5	48.5	23.5	29.25	17.5	3.5	46	28	2

Fig. 3 — 50PSW240-420 Unit

Sizes 025 thru 071

(Top View)

No access panels are located on this side.



Access on this side of the unit is required for piping and insulation.

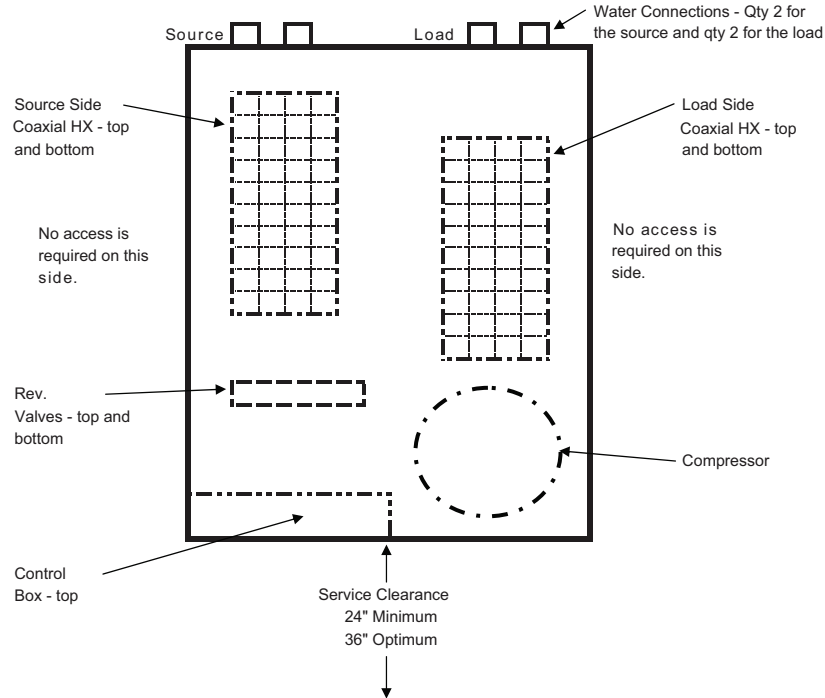
NOTE: Any work required to gain full access to the unit for repair or service is not covered under the scope of the product warranty.

Sizes 122 thru 210

(Top View)

Access on this side of the unit is required for piping and insulation.

No access panels are located on this side.

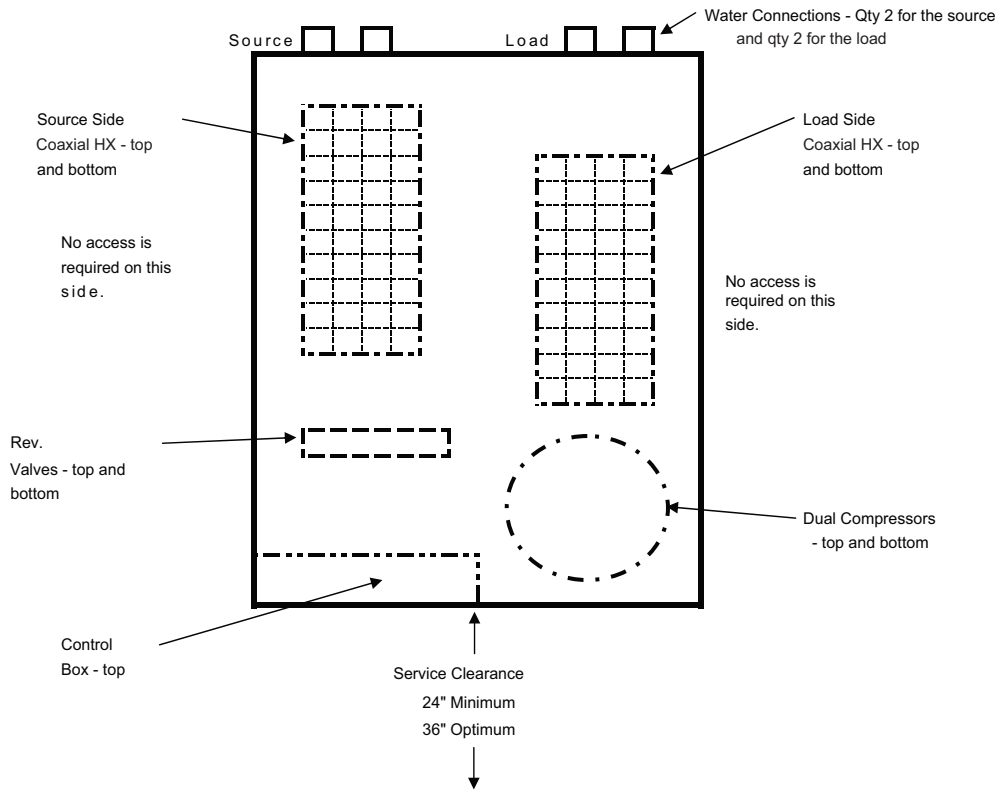


NOTE: Any work required to gain full access to the unit for repair or service is not covered under the scope of the product warranty.

Fig. 4 — Service Clearances

Sizes 240 thru 420
(Top View)

Access on this side of the unit is required for piping and insulation.
No access panels are located on this side.



NOTE: Any work required to gain full access to the unit for repair or service is not covered under the scope of the product warranty.

Fig. 4 — Service Clearances (cont)

Step 4 — Mount Unit

The Water-to-Water series units should be mounted level on a vibration absorbing pad slightly larger than the base to minimize vibration transmission to the building structure. It is not necessary to anchor the unit to the floor.

Step 5 — Connect Piping

Supply and return piping must be as large as the unit connections on the heat pump (larger on long runs). Never use flexible hoses of a smaller inside diameter than that of the water connections on the unit. The water-to-water series units are supplied with either a copper or optional cupro-nickel condenser. Should your well driller express concern regarding the quality of the well water available or should any known hazards exist in your area, Carrier recommends proper testing to assure the well water quality is suitable for use with water source equipment. In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is recommended.

CAUTION

Galvanized pipe or fittings are not recommended for use with these units due to the possible galvanic corrosion.

Both the supply and discharge water lines will sweat if subject to low water temperature. These lines should be insulated to prevent damage from condensation.

All manual flow valves used in the system must be ball valves. Globe and gate valves must not be used due to high pressure drop and poor throttling characteristics.

Never exceed the recommended water flow rates. Serious damage or erosion of the water to refrigerant heat exchanger could occur.

CAUTION

Improper heat exchanger fluid flow due to piping, valving or improper pump operation is hazardous to the unit and constitutes abuse which will void the heat exchanger and compressor warranty.

Always check carefully for water leaks and repair appropriately. Units are equipped with female pipe thread fittings. Consult the specification sheets for sizes. Thread sealant should be used when connecting water piping connections to the units to ensure against leaks and possible heat exchanger fouling. Do not overtighten the connections. Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit flow balancing.

WATER SUPPLY AND QUALITY

Check water supply. Water supply should be plentiful and of good quality. See Table 3 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.

INSTALLATION OF HOT WATER GENERATOR OPTION (ONLY 025-71 SIZES)

The hot water generator (HWG) or Heat recovery package (HRP) is a factory-installed option capable of providing hot water in the range of 110 to 140°F as a supplemental domestic hot water source. The HWG is a desuperheater that uses recovered heat from the hot discharge gas leaving the compressor. Included with the HWG is a vented, double wall coil, circulating pump, high water temperature limit switch (set at 140°F), discharge gas temperature limit switch, and an ON/OFF switch with built-in circuit breaker. The generator operates independently and is not factory wired to the unit controller.

NOTE: The HWG will reduce the amount of heat available to the load side and it is recommended to deactivate the HWG in heating mode via the ON/OFF switch.

Water Tank Preparation

1. Turn off electrical or fuel supply to the water heater.
2. Attach garden hose to water tank drain connection and run other end of hose outdoors or to an open drain.
3. Close cold water inlet valve to water heater tank.
4. Drain tank by opening drain valve on the bottom of the tank, then open pressure relief valve or hot water faucet.
5. Once drained the tank should be flushed with cold water until the water leaving the drain hose is clear and free of sediment.
6. Close all valves and remove the drain hose.
7. Install HWG water piping. All hot water piping should be a minimum of 3/8 in. OD copper tube to a maximum distance of fifteen feet. For distances beyond fifteen feet but not exceeding sixty feet use 1/2 in. copper tube. Separately insulate all exposed surface of both connecting water lines with 3/8 in. wall closed cell insulation. Install isolation valves on supply and return to the hot water generator. See Fig. 5.

NOTE: Diagram is for illustration purposes only. Ensure access to heat pump is not restricted. All plumbing and piping connections must comply with local plumbing codes.

TYPICAL HOT WATER GENERATOR INSTALLATION

Water Tank Refill

1. Open the cold water supply to the tank.
2. Open a hot water faucet to vent air from the system until water flows from the faucet, then close.
3. Depress the hot water tank pressure relief valve handle to ensure there is no air remaining in the tank.
4. Carefully inspect all plumbing for water leaks. Correct as required.

5. Purge all air from HWG by depressing the Schrader valve on the HR unit. Allow all air to bleed out until water appears at the valve.
6. Before restoring the power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to ensure maximum utilization of heat available from the refrigeration system and to conserve the most energy. On tanks with thermostats and both upper and lower elements, the lower element should be turned down to 100°F, while the upper element should be adjusted to 120°F. Depending upon the specific needs of the customer, you may need to adjust the upper element differently. On tanks with a single thermostat, lower the thermostat setting to 120°F or the "LOW" position. After thermostat adjustments are completed, replace access cover and restore electrical or fuel supply to water heater.

Initial Start-Up

1. Turn on the heat pump. The circulating pump should not run if the compressor is not running.
2. Turn HWG switch to the "ON" position. The pump will operate if entering water temperature to HWG is below 120°F.
3. Ensure the temperature difference between the water entering and leaving the heat recovery is 5 to 15°F.
4. Allow the unit to operate for 20 to 30 minutes to ensure it is functioning properly. The pump should shut off when the water temperature entering the generator reaches 120°F.

COOLING TOWER/BOILER APPLICATION

To assure adequate cooling and heating performance, the cooling tower and boiler fluid loop temperature should be maintained between 50°F and 100°F. In the cooling mode, heat is rejected from the unit into the condenser water loop. A cooling tower provides evaporative cooling to the loop water; thus, maintaining a constant supply temperature to the unit. When utilizing an open cooling tower, chemical water treatment is mandatory to ensure the water is free of corrosive materials. A secondary heat exchanger (plate frame between the unit and the open cooling tower) may also be used. It is imperative that all air is eliminated from the closed loop side of the heat exchanger to prevent condenser fouling. (See Fig. 6.)

In the heating mode, heat is absorbed from the condenser water loop to the unit. A boiler can be utilized to maintain the loop within the proper temperature range. In milder climates a "flooded tower" concept is often used. This concept involves adding make-up water to the cooling tower sump to maintain the desired loop temperature. No unit should be connected to the supply or return piping until the water system has been completely cleaned and flushed to remove any dirt, piping chips or other foreign material. Supply and return hoses should be connected together during this process to ensure the entire system is properly flushed. After the cleaning and flushing has taken place, the unit may be connected to the water loop and should have all valves wide open.

Pressure/temperature ports are recommended in both the supply and return lines for system flow balancing. Water flow can be accurately set by measuring the refrigerant-to-water heat exchangers water side pressure drop.

WELL WATER SYSTEMS

Water quantity should be plentiful, between 1.5 and 2.5 gpm per ton of cooling, and of good quality. To avoid the possibility of freezing the well water should be above 50°F.

Water pressure must always be maintained in the heat exchanger by placing a water control valve on the outlet of the water-to-water unit. A bladder type expansion tank may be used to maintain pressure on the system.

Avoid using low voltage (24 volt) solenoids, using them may overload the unit transformer or interfere with the lock-out circuit. Line voltage solenoids connected across the load side (T1, T2) of the compressor contactor are preferred.

Pilot operated or slow closing valves are recommended to reduce water hammer.

The discharge water from the water-to-water unit is not contaminated in any manner and can be disposed of in various ways depending on the local codes (i.e. discharge well, dry well, storm sewer, drain field, stream, pond, etc.)

EARTH COUPLED GEOTHERMAL SYSTEMS

Closed loop and pond applications require specialized design knowledge. No attempt at these installations should be made unless the dealer has received specialized training.

Utilizing the Ground Loop Pumping Package (GLP), makes the installation easy. Anti-freeze solutions are utilized when entering loop temperatures drop below 40°F or where piping will be routed through areas subject to freezing. A flow rate between 2.5 to 3.0 gpm per nominal ton of cooling is recommended for this application.

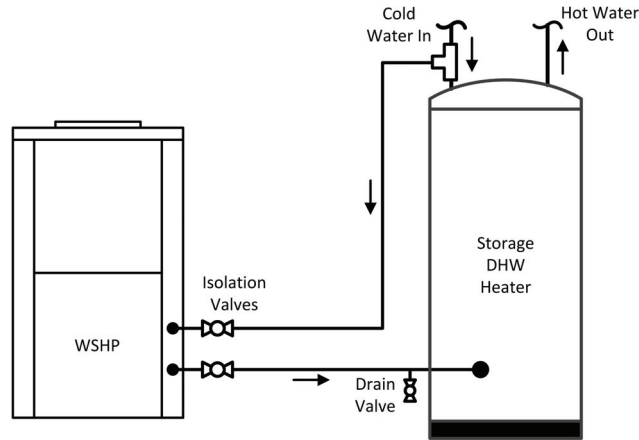


Fig. 5 — Typical Hot Water Generator Installation

- 1 — Ball Valves
- 2 — Hose Kits
- 3 — P/T Plugs
- 4 — Load Side Connections*
- 5 — Low Voltage Control Connection*
- 6 — Vibration Pad
- 7 — Line Voltage Disconnect
- 8 — Supply and Return Lines of Central System

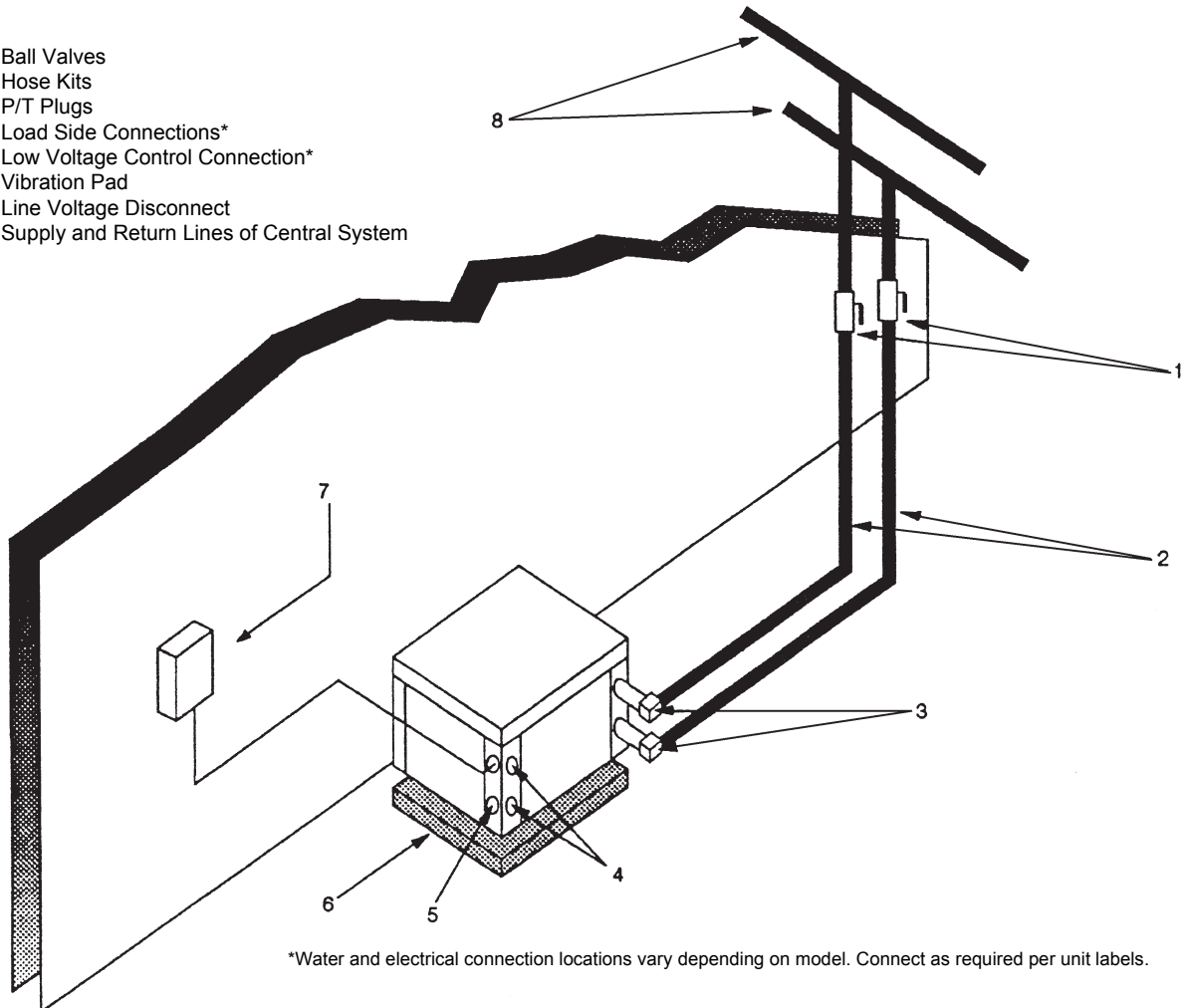


Fig. 6 — Typical Cooling Tower/Boiler Application (Source Side)

Table 3 — Water Quality Guidelines

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

NOTE(S):

- Heat exchanger materials considered are copper, cupronickel, 304 SS (stainless steel), 316 SS, titanium.
- Closed recirculating system is identified by a closed pressurized piping system.
- Recirculating open wells should observe the open recirculating design considerations.
- If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists. Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity can 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 registers a pH of 7.0. To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

LEGEND

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

Step 6 — Wire Field Power Supply

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. Install lockout tag.

CAUTION

Use only copper conductors for field-installed electrical wiring. Unit terminals are not designed to accept other types of conductors. Failure to heed this warning could result in equipment damage.

All field wiring must comply with local and national fire, safety and electrical codes. Power to the unit must be within the operating voltage range indicated on the unit's nameplate. On three phase units, phases must be balanced within 2%.

Properly sized fuse or HACR (heating, air-conditioning, and refrigeration) circuit breakers must be installed for branch circuit protection. See equipment rating plate for maximum size.

The unit is supplied with an opening for attaching conduit. Be certain to connect the ground lead to the ground lug in the control box. Connect the power leads as indicated on the unit wiring diagram. See Table 4 and Fig. 7-15.

Table 4 — 50PSW Electrical Data

50PSW UNIT SIZE	VOLTAGE (V-Ph-Hz)	COMPRESSOR			MCA	MAX FUSE
		QTY	RLA	LRA		
025	208/230-1-60	1	11.7	58.3	14.6	25
	265-1-60	1	9.1	54.0	11.4	20
	208/230-3-60	1	6.5	55.4	8.1	15
	460-3-60	1	3.5	28	4.4	15
035	208/230-1-60	1	15.6	83.0	19.5	35
	265-1-60	1	13.0	72.0	16.3	25
	208/230-3-60	1	11.6	73.0	14.5	25
	460-3-60	1	5.7	38.0	7.1	15
049	208/230-1-60	1	21.2	104.0	26.5	45
	208/230-3-60	1	14.0	83.1	17.5	30
	460-3-60	1	6.4	41.0	8.0	15
061	208/230-1-60	1	26.9	152.9	33.6	60
	208/230-3-60	1	16.5	110.0	20.6	35
	460-3-60	1	7.2	52.0	9.0	15
071	208/230-1-60	1	29.7	179.2	37.1	60
	208/230-3-60	1	17.6	136.0	22.0	35
	460-3-60	1	8.5	66.1	10.6	15
122	208/230-1-60	2	28.3	178.0	63.7	90
	208/230-3-60	2	19.2	136.0	43.2	60
	460-3-60	2	8.7	66.1	19.6	25
	575-3-60	2	6.9	55.3	15.5	20
180	208/230-3-60	1	48.1	245.0	60.1	100
	460-3-60	1	18.6	125.0	23.3	40
	575-3-60	1	14.7	100.0	18.4	30
210	208/230-3-60	1	55.8	340.0	69.8	125
	460-3-60	1	26.9	173.0	33.6	60
	575-3-60	1	23.7	132.0	29.6	50
240	208/230-3-60	2	33.3	239.0	74.9	100
	460-3-60	2	17.9	125.0	40.3	50
	575-3-60	2	12.8	80.0	28.8	40
360	208/230-3-60	2	48.1	245.0	108.2	150
	460-3-60	2	18.6	125.0	41.9	60
	575-3-60	2	14.7	100.0	33.1	45
420	208/230-3-60	2	55.8	340.0	125.6	175
	460-3-60	2	26.9	173.0	60.5	80
	575-3-60	2	23.7	132.0	53.3	70

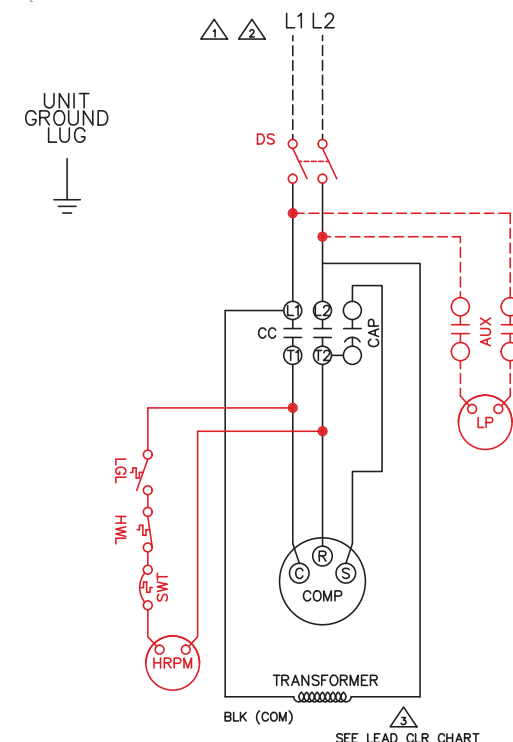
LEGEND

LEGEND

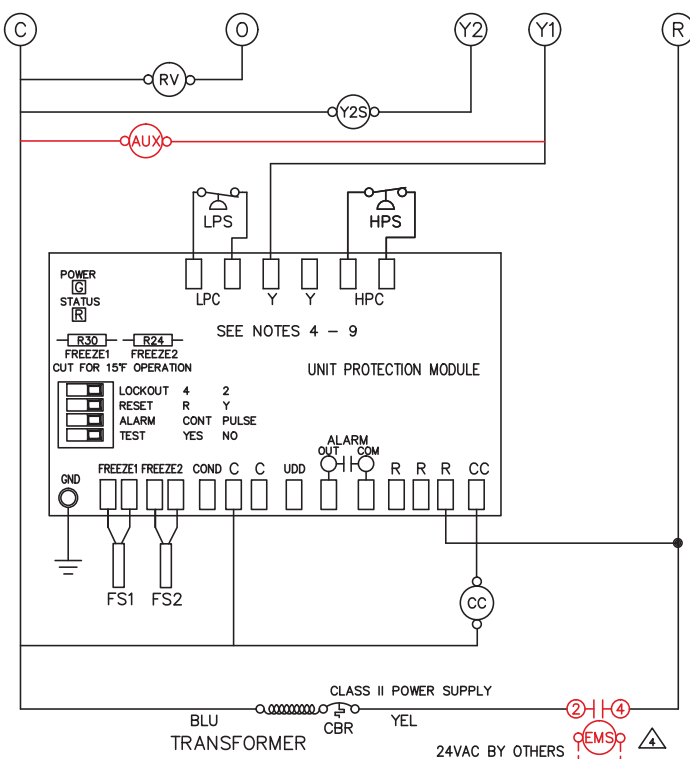
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps

LEGEND

RLA — Rated Load Amps



USE CLASS II FIELD WIRING



TRANSFORMER PRIMARY LEAD CLR:	
120	- WHT
208	- RED
240	- ORG
277	- BRN
380	- PUR OR YEL
460	- BLK/RED
575	- GRY

UPM STATUS LED - BLINK CODES	
1	HIGH PRESSURE FAULT
2	LOW PRESSURE FAULT
3	CONDENSER FREEZE CONDITION
4	CONDENSATE OVERFLOW FAULT
5	BROWN OUT FAULT
6	LOAD FREEZE CONDITION

FACTORY WIRE _____
FIELD WIRE - - - - -

STANDARD COMPONENTS LEGEND:

CAP - COMPRESSOR CAPACITOR
CBR - 24V CIRCUIT BREAKER
CC - COMPRESSOR CONTACTOR
FS - FREEZE SENSOR
HPS - HIGH PRESSURE SWITCH
LPS - LOW PRESSURE SWITCH
RV - REVERSING VALVE (HEAT PUMPS)
Y2S - SECOND STEP SOLENOID

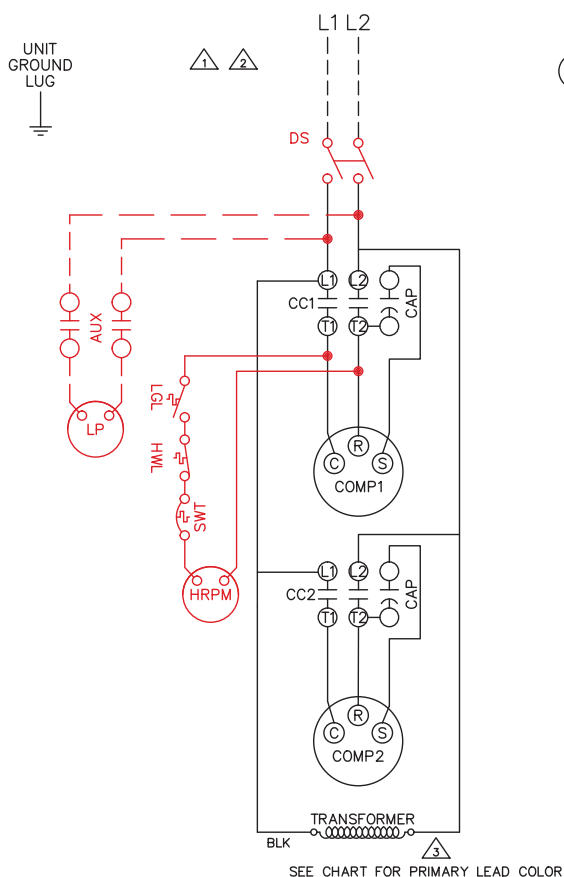
OPTIONAL COMPONENTS LEGEND:

[] AUX - AUXILIARY RELAY (FOR LOOP PUMP, ETC)
[] DS - DISCONNECT SWITCH
[] EMS - ENERGY MGMT SYSTEM RELAY
[] HRP - HEAT RECOVERY PACKAGE:
HRPM - HEAT RECOVERY PUMP MOTOR
LGL - LOW GAS TEMPERATURE LIMIT
HWL - HOT WATER LIMIT
SWT - ON/OFF SWITCH OVERLOAD PROTECTION
[] LP - LOOP PUMP (FIELD INSTALLED)

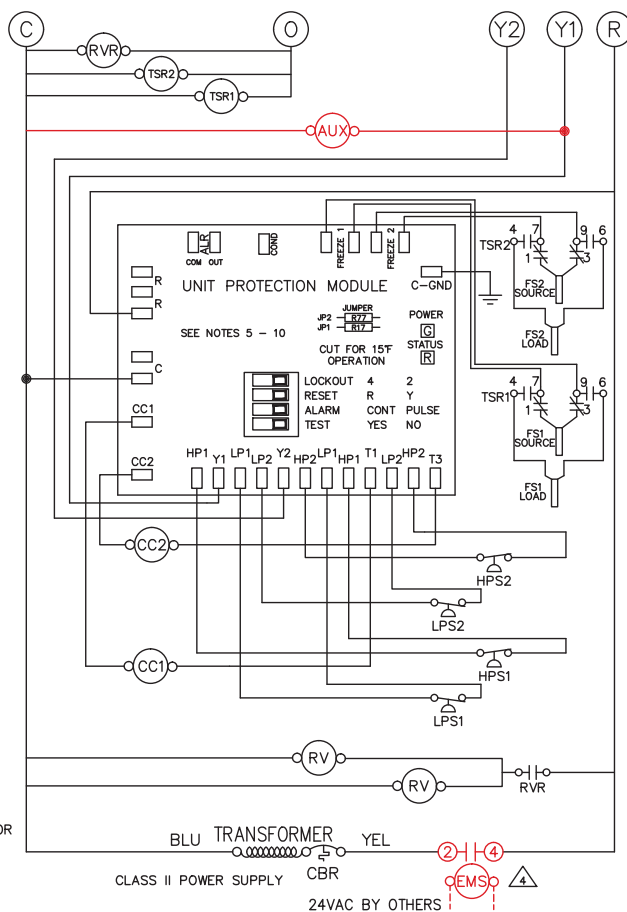
NOTES:

- SEE UNIT NAME PLATE FOR ELECTRICAL RATING.
- ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A. #70, COPPER CONDUCTORS ONLY. - CONDUCTEURS EN CUIVRE SEULEMENT.
- 208/230V UNITS ARE FACTORY WIRING FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
- FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
- UPM-I INCLUDES BUILT IN: 270-300 SECOND RANDOM START
300 SECOND DELAY ON BREAK
120 SECOND LOW PRESSURE BYPASS
- "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
- "FREEZE SENSOR" WILL OPERATE AT 26°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPER R30 (FS1) AND R24 (FS2) MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
- "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
- ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.

Fig. 7 — Unit Sizes 025-071, 1-Phase, Complete C/Deluxe D Control Package



USE CLASS II FIELD WIRING



TRANSFORMER PRIMARY LEAD CLR:	
120	- WHI
208	- RED
240	- ORG
277	- BRN
380	- PUR OR YEL
460	- BLK/RED
575	- GRY

STATUS LED/ALARM BLINK CODES	
1	HIGH PRESSURE FAULT - CKT 1
2	LOW PRESSURE FAULT - CKT 1
3	HIGH PRESSURE FAULT - CKT 2
4	LOW PRESSURE FAULT - CKT 2
5	FREEZE SENSOR FAULT
6	CONDENSATE FAULT
7	BROWN OUT FAULT

FACTORY WIRE —————
FIELD WIRE - - - - -

STANDARD COMPONENTS LEGEND:

#1 - FIRST STAGE
#2 - SECOND STAGE
CAP - COMPRESSOR RUN CAPACITOR
CC - COMPRESSOR CONTACTOR
CBR - 24V CIRCUIT BREAKER
FS - FREEZE SENSOR
TSR - THERMISTOR SWITCHING RELAY
HPS - HIGH PRESSURE SWITCH
LPS - LOW PRESSURE SWITCH
RV - REVERSING VALVE (HEAT PUMPS ONLY)
RVR - REVERSING VALVE PILOT RELAY

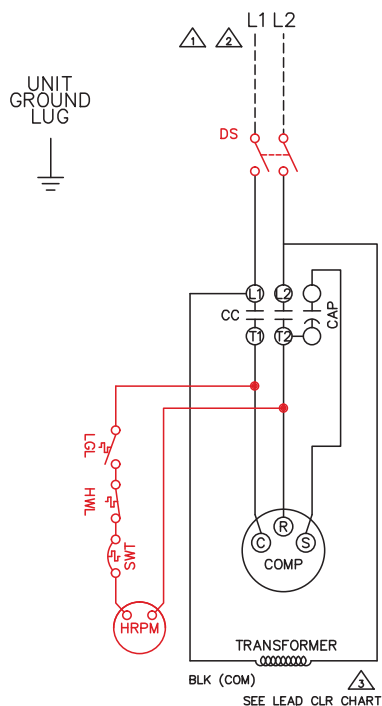
OPTIONAL COMPONENTS LEGEND:

[] AUX - AUXILIARY RELAY (FOR LOOP PUMP, ETC.)
[] DS - DISCONNECT SWITCH
[] EMS - ENERGY MGMT SYSTEM RELAY
[] HRP - HEAT RECOVERY PACKAGE
HRPM - HEAT RECOVERY PUMP MOTOR
HWL - HOT WATER LIMIT (120 OR 140 DEG)
LGL - LOW GAS TEMPERATURE LIMIT
SWT - ON/OFF SWITCH AND OVERLOAD PROTECTION
[] LP - LOOP PUMP (FIELD INSTALLED)

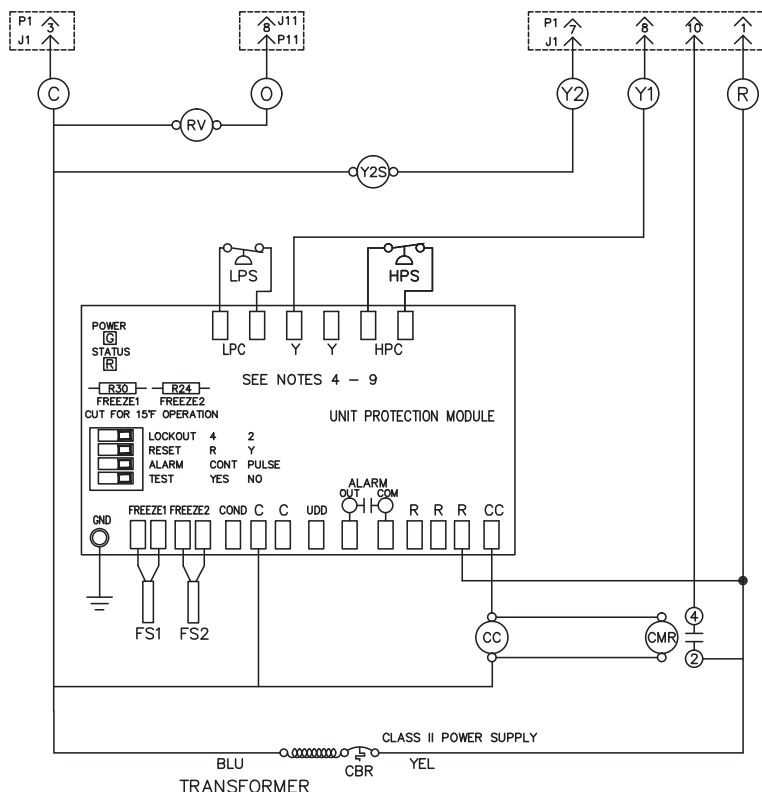
NOTES:

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- 208/230V UNITS ARE FACTORY WIRING FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
- FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
- UPM-I INCLUDES BUILT IN: 270-300 SECOND RANDOM START
300 SECOND DELAY ON BREAK
120 SECOND LOW PRESSURE BYPASS
- "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
- "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPERS R77 AND R17 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
- "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
- ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.

Fig. 8 — Unit Size 122,1-Phase, Complete C/ Deluxe D Control Package



USE CLASS II FIELD WIRING – TO WSHP OPEN INTERFACE J1 AND J11



TRANSFORMER PRIMARY LEAD CLR:	
120	- WHT
208	- RED
240	- ORG
277	- BRN
380	- PUR OR YEL
460	- BLK/RED
575	- GRY

UPM STATUS LED - BLINK CODES	
1	HIGH PRESSURE FAULT
2	LOW PRESSURE FAULT
3	CONDENSER FREEZE CONDITION
4	CONDENSATE OVERFLOW FAULT
5	BROWN OUT FAULT
6	LOAD FREEZE CONDITION

FACTORY WIRE _____

FIELD WIRE - - - - -

STANDARD COMPONENTS LEGEND:

CAP - COMPRESSOR CAPACITOR

CBR - 24V CIRCUIT BREAKER

CC - COMPRESSOR CONTACTOR

CMR - COMPRESSOR MONITOR RELAY

FS - FREEZE SENSOR

HPS - HIGH PRESSURE SWITCH

LPS - LOW PRESSURE SWITCH

RV - REVERSING VALVE (HEAT PUMPS)

Y2S - SECOND STEP SOLENOID

OPTIONAL COMPONENTS LEGEND:

[] DS - DISCONNECT SWITCH

[] HRP - HEAT RECOVERY PACKAGE:

[] HRPM - HEAT RECOVERY PUMP MOTOR

[] LGL - LOW GAS TEMPERATURE LIMIT

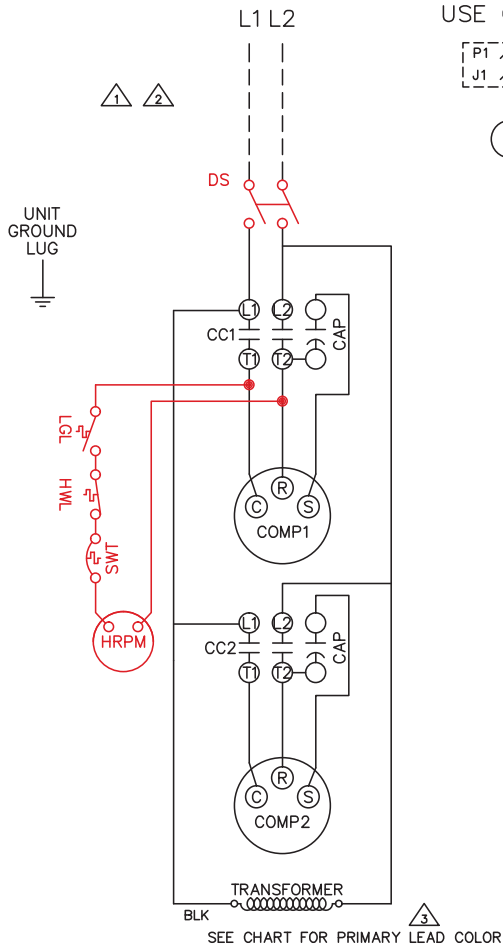
[] HWL - HOT WATER LIMIT

[] SWT - ON/OFF SWITCH OVERLOAD PROTECTION

NOTES:

- SEE UNIT NAME PLATE FOR ELECTRICAL RATING.
- ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A. #70, COPPER CONDUCTORS ONLY. - CONDUCTEURS EN CUIVRE SEULEMENT.
- 208/230V UNITS ARE FACTORY WIRING FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
- UPM-I INCLUDES BUILT IN: 270-300 SECOND RANDOM START
300 SECOND DELAY ON BREAK
120 SECOND LOW PRESSURE BYPASS
- "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
- "FREEZE SENSOR" WILL OPERATE AT 26°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPER R30 (FS1) AND R24 (FS2) MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
- "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
- ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.

Fig. 9 — Unit Sizes 025-071, 1-Phase, W2W Open Control Package



TRANSFORMER PRIMARY LEAD CLR:	
120	- WHT
208	- RED
240	- ORG
277	- BRN
380	- PUR OR YEL
460	- BLK/RED
575	- GRY

STATUS LED/ALARM BUNK CODES	
1	HIGH PRESSURE FAULT - CKT 1
2	LOW PRESSURE FAULT - CKT 1
3	HIGH PRESSURE FAULT - CKT 2
4	LOW PRESSURE FAULT - CKT 2
5	FREEZE SENSOR FAULT
6	CONDENSATE FAULT
7	BROWN OUT FAULT

FACTORY WIRE ———
FIELD WIRE - - - - -

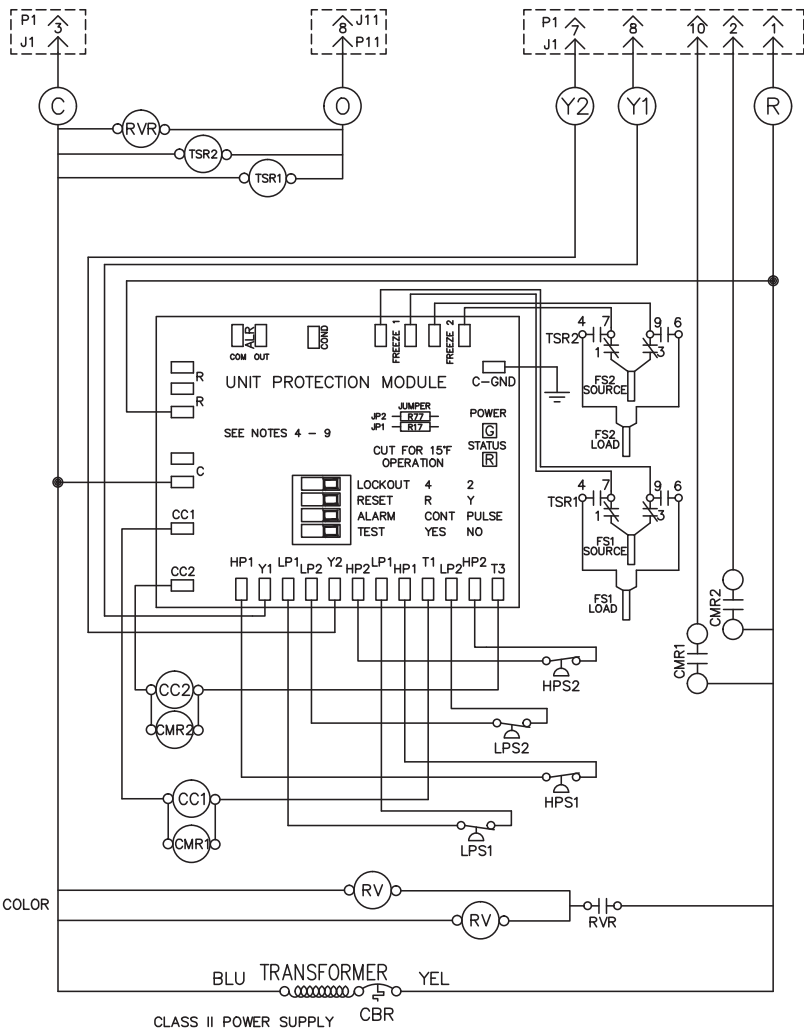
STANDARD COMPONENTS LEGEND:

#1 - FIRST STAGE
#2 - SECOND STAGE
CAP - COMPRESSOR RUN CAPACITOR
CC - COMPRESSOR CONTACTOR
CBR - 24V CIRCUIT BREAKER
CMR - COMPRESSOR MONITOR RELAY (1&2)
FS - FREEZE SENSOR
TSR - THERMISTOR SWITCHING RELAY
HPS - HIGH PRESSURE SWITCH
LPS - LOW PRESSURE SWITCH
RV - REVERSING VALVE (HEAT PUMPS ONLY)
RVR - REVERSING VALVE PILOT RELAY

OPTIONAL COMPONENTS LEGEND:

[] DS - DISCONNECT SWITCH
[] HRP - HEAT RECOVERY PACKAGE:
HRPM - HEAT RECOVERY PUMP MOTOR
HWL - HOT WATER LIMIT (120 OR 140 DEG)
LGL - LOW GAS TEMPERATURE LIMIT
SWT - ON/OFF SWITCH AND OVERLOAD PROTECTION

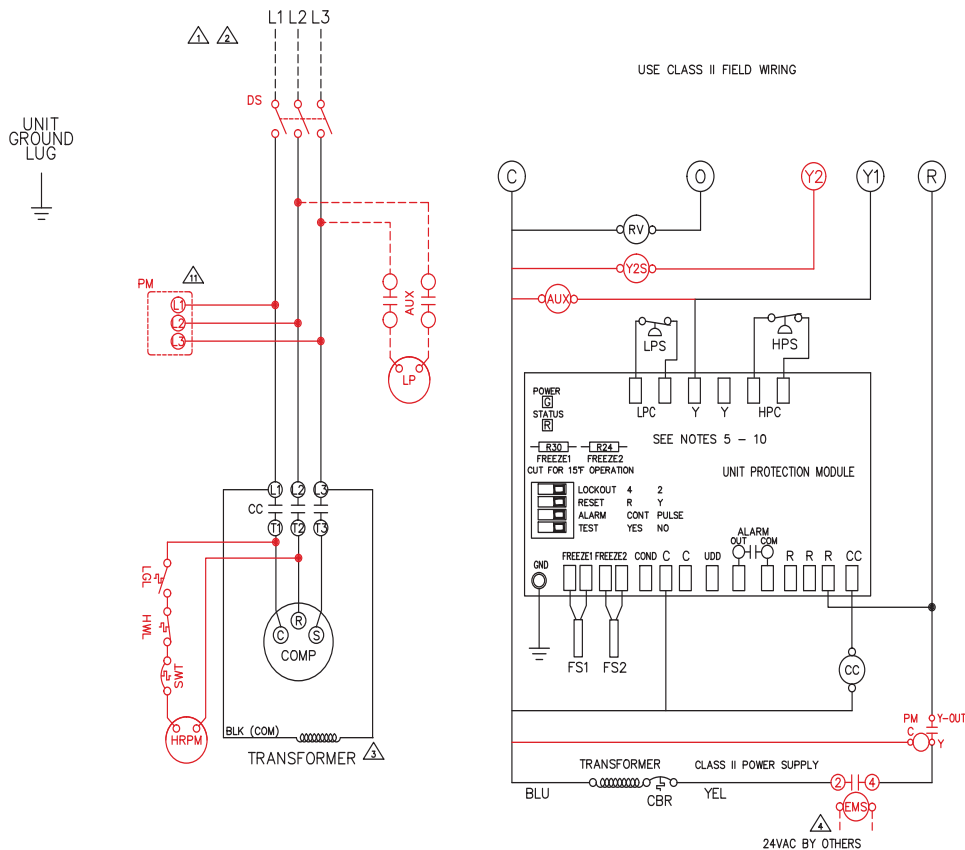
USE CLASS II FIELD WIRING - TO WSHP OPEN INTERFACE J1 AND J11



NOTES:

- SEE UNIT NAME PLATE FOR ELECTRICAL RATING
- ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A. #70, COPPER CONDUCTORS ONLY. CONDUCTEURS EN CUIVRE SEULEMENT
- 208/230V UNITS ARE FACTORY WIRING FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
- UPM-I INCLUDES BUILT IN: 270-300 SECOND RANDOM START
300 SECOND DELAY ON BREAK
120 SECOND LOW PRESSURE BYPASS
- "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
- "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPERS R77 AND R17 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
- "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
- ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL. 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.

Fig. 10 — Unit Sizes 122, 1-Phase, W2W Open Control Package



UPM STATUS LED - BLINK CODES	
1	HIGH PRESSURE FAULT
2	LOW PRESSURE FAULT
3	CONDENSER FREEZE CONDITION
4	CONDENSATE OVERFLOW FAULT
5	BROWN OUT FAULT
6	EVAPORATOR FREEZE CONDITION

TRANSFORMER PRIMARY LEAD CLR:	
120	- WHI
208	- RED
240	- ORG
277	- BRN
360	- PUR OR YEL
460	- BLK/RED
575	- GRV

FACTORY WIRE —————

FIELD WIRE - - - - -

STANDARD COMPONENTS LEGEND:

CBR - 24V CIRCUIT BREAKER

CC - COMPRESSOR CONTACTOR

FS - FREEZE SENSOR

HPS - HIGH PRESSURE SWITCH

LPS - LOW PRESSURE SWITCH

RV - REVERSING VALVE (HEAT PUMPS)

OPTIONAL COMPONENTS LEGEND:

[] AUX - AUXILIARY RELAY (FOR LOOP PUMP, ETC)

[] EMS - ENERGY MGMT SYSTEM RELAY

[] HRP - HEAT RECOVERY PACKAGE

[] HRP - HEAT RECOVERY PUMP MOTOR

[] HWL - HOT WATER LIMIT

[] LGL - LOW GAS TEMPERATURE LIMIT

[] SWT - ON/OFF SWITCH AND OVERLOAD

[] PM - PHASE MONITOR

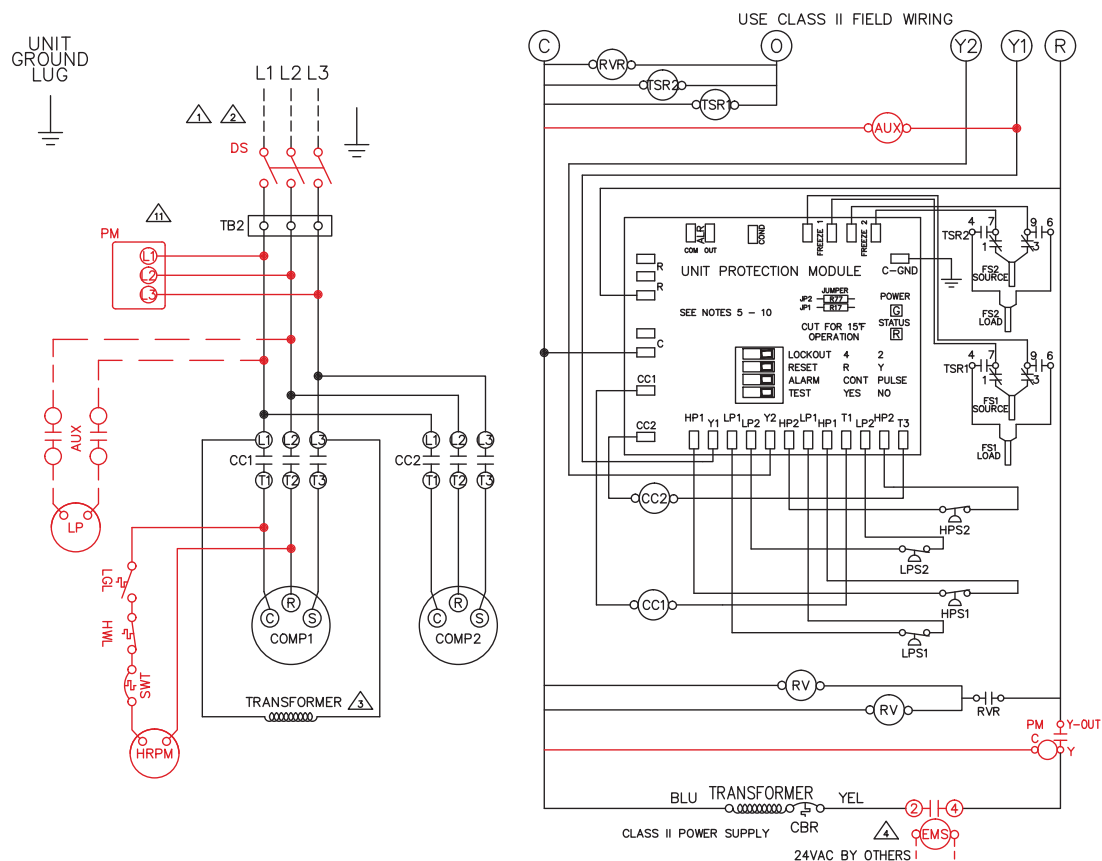
[] Y2S - SECOND STEP SOLENOID

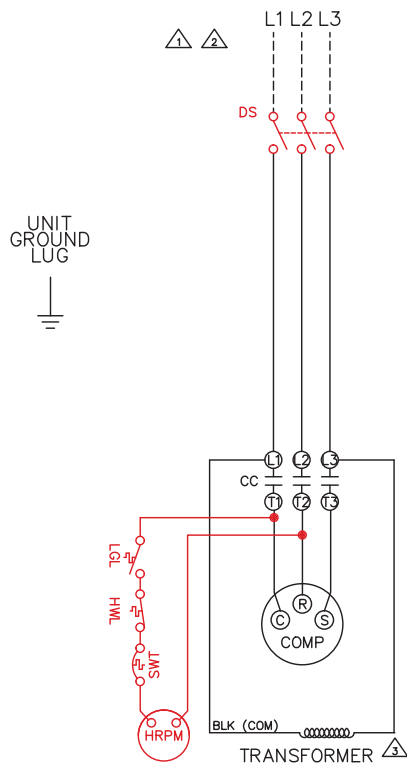
[] LP - LOOP PUMP (FIELD INSTALLED)

NOTES

- SEE UNIT NAME PLATE FOR ELECTRICAL RATING.
- ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A. #70, COPPER CONDUCTORS ONLY. CONDUCTEURS EN CUIVRE SEULEMENT.
- 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
- FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
- UPM-I INCLUDES BUILT IN: 270-300 SECOND RANDOM START
300 SECOND DELAY ON BREAK
120 SECOND LOW PRESSURE BYPASS
- "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
- "FREEZE SENSOR" WILL OPERATE AT 26°F BY DEFAULT. IF 15°F OPERATION IS REQUIRED, JUMPER R30 MUST BE CUT. IF FREEZE SENSOR IS NOT INSTALLED, A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
- "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE." IF BLINKING, T-STAT SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY IS SHOWN. ALSO SEE INSTALLATION MANUAL.
- ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL. 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL PULSED IF PULSE IS SELECTED.
- CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS, REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
- SECOND STEP OF COMPRESSOR (Y2 AND Y2S) IS APPLICABLE ONLY FOR 025-071 SIZES.

Fig. 11 — Unit Size 025-71 (Dual Stage), 180, 210 (Single Stage); 3-Phase; Complete C/Deluxe D Control Package





UPM STATUS LED - BLINK CODES	
1	HIGH PRESSURE FAULT
2	LOW PRESSURE FAULT
3	CONDENSER FREEZE CONDITION
4	CONDENSATE OVERFLOW FAULT
5	BROWN OUT FAULT
6	EVAPORATOR FREEZE CONDITION

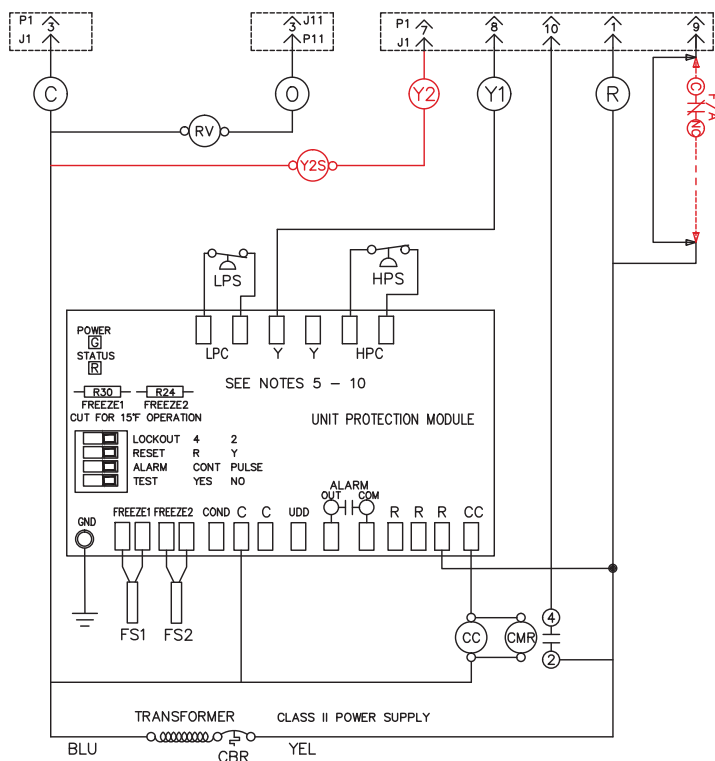
TRANSFORMER PRIMARY LEAD CLR:	
120	- WHI
208	- RED
240	- ORG
277	- BRN
380	- PUR OR YEL
460	- BLK/RED
575	- GRY

FACTORY WIRE _____
FIELD WIRE - - - - -

STANDARD COMPONENTS LEGEND:
CBR - 24V CIRCUIT BREAKER
CC - COMPRESSOR CONTACTOR
FS - FREEZE SENSOR
HPS - HIGH PRESSURE SWITCH
LPS - LOW PRESSURE SWITCH
RV - REVERSING VALVE (HEAT PUMPS)

OPTIONAL COMPONENTS LEGEND:
[] DS - DISCONNECT SWITCH
[] HRP - HEAT RECOVERY PACKAGE:
HRPM - HEAT RECOVERY PUMP MOTOR
LGL - LOW GAS TEMPERATURE LIMIT
SWT - ON/OFF SWITCH AND OVERLOAD
[] Y2S - SECOND STEP SOLENOID

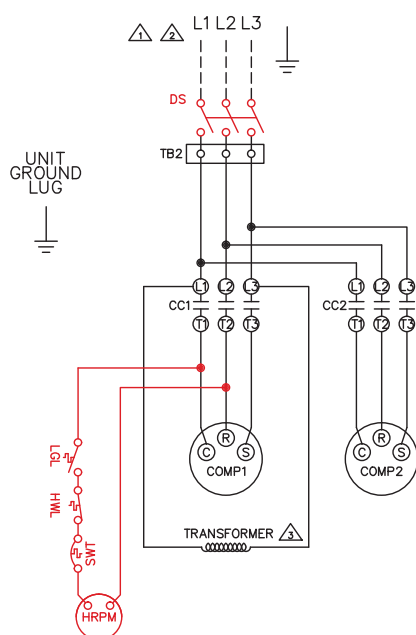
USE CLASS II FIELD WIRING - TO WSHP OPEN INTERFACE J1 AND J11



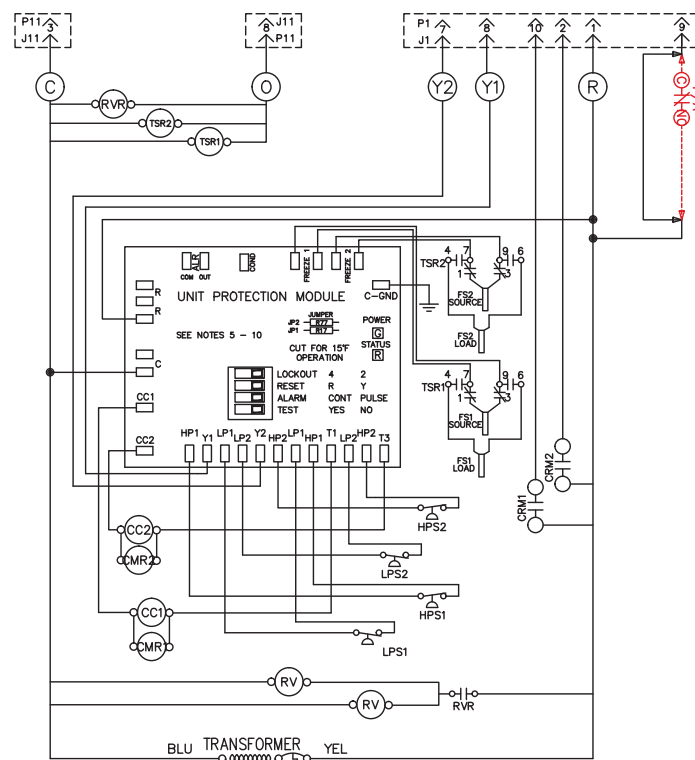
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- UPM-I INCLUDES BUILT IN: 270-300 SECOND RANDOM START
300 SECOND DELAY ON BREAK
120 SECOND LOW PRESSURE BYPASS
- "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
- "FREEZE SENSOR" WILL OPERATE AT 26°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPER R30 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
- "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
- ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.

Fig. 13 — Unit Size 025-071, 180, 210; 3-Phase W2W Open Control Package



USE CLASS II FIELD WIRING – TO WSHP OPEN INTERFACE J1 AND J11



TRANSFORMER PRIMARY LEAD CLR:	
120	- WHI
208	- RED
240	- ORG
277	- BRN
380	- PUR OR YEL
460	- BLK/RED
575	- GRN

STATUS LED/ALARM BLINK CODES	
1	HIGH PRESSURE FAULT - CKT 1
2	LOW PRESSURE FAULT - CKT 1
3	HIGH PRESSURE FAULT - CKT 2
4	LOW PRESSURE FAULT - CKT 2
5	FREEZE SENSOR FAULT
6	CONDENSATE FAULT
7	BROWN OUT FAULT

FACTORY WIRE ———
FIELD WIRE - - - - -

STANDARD COMPONENTS LEGEND:

#1 - FIRST STAGE
#2 - SECOND STAGE
CC - COMPRESSOR CONTACTOR
CBR - 24V CIRCUIT BREAKER
FS - FREEZE SENSOR
TSR - THERMISTOR SWITCHING RELAY
HPS - HIGH PRESSURE SWITCH
LPS - LOW PRESSURE SWITCH
RV - REVERSING VALVE (HEAT PUMPS ONLY)
RVR - REVERSING VALVE PILOT RELAY
TB2 - TERMINAL BLOCK LINE VOLT CONNECTION

OPTIONAL COMPONENTS LEGEND:

[] DS - DISCONNECT SWITCH
[] HRP - HEAT RECOVERY PACKAGE
[] HRP - HEAT RECOVERY PUMP MOTOR
HWL - HOT WATER LIMIT (120 OR 140 DEG)
LGL - LOW GAS TEMPERATURE LIMIT
SWT - ON/OFF SWITCH AND OVERLOAD PROTECTION

NOTES:

- SEE UNIT NAME PLATE FOR ELECTRICAL RATING
- ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A. #70, COPPER CONDUCTORS ONLY. CONDUCTEURS EN CUIVRE SEULEMENT
- 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
- UPM-I INCLUDES BUILT IN: 270-300 SECOND RANDOM START
300 SECOND DELAY ON BREAK
120 SECOND LOW PRESSURE BYPASS
- "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
- "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPERS R77 AND R17 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
- "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL
- ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.

Fig. 14 — Unit Size 122, 240-420; 3-Phase W2W Open Control Package

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. Transformer switched to lower voltage tap if necessary.
10. Service/access panels are in place.
11. Control field-selected settings are correct.

Wire Control Connections

All units have the option for a control package for use with a field installed thermostat or DDC (Complete C or Deluxe D) or a factory installed DDC controller capable of standalone operation (W2W Open).

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

COMPLETE C AND DELUXE D CONTROL

All control wiring is connected to a terminal block located in the unit electrical box. Refer to the unit wiring diagram for connection details.

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.

WARNING

Do not route control wiring through the same conduit as power supply wiring. Electrical noise and transients from the power wiring can cause communication issues or damage to the control wiring and connected control components.

Units with the Complete C or Deluxe D control packages are controlled using the included thermostat inputs (R, O, Y1, Y2, C) along with a two-stage thermostat or field installed Direct Digital Controller (DDC). NOTE: The reversing valve on the unit is energized when the unit is in the cooling mode.

AUXILIARY RELAY (DELUXE D ONLY)

All units with Deluxe D control include an auxiliary relay that can be field wired to enable a field provided loop pump or solenoid valve when there is a call for compressor operation.

ENERGY MANAGEMENT SWITCH (DELUXE D ONLY)

All units with Deluxe D control include an energy management switch (EMS) relay that can be field wired to disable unit operation when a 24v signal is removed from the relay. Removing the 24v signal causes the relay to open, which cuts 24v power to the unit control circuit. All unit components will be disabled when the EMS is deactivated. (See Fig. 11.)

PHASE MONITOR

All 3-Phase units with Deluxe D Control will include a 3-Phase Line Monitor that protects against phase loss, phase reversal, and phase unbalance. Ideally suited to protect your unit's scroll compressor(s) from reverse rotation.

ALARM OUTPUT

If the unit is being connected to a thermostat or DDC control with an alarm indicator, this connection is made at the unit malfunction output on the Unit Protection Module (UPM). See malfunction output section of Configure Unit Control Components.

W2W OPEN CONTROL

W2W Open is a factory installed DDC controller. W2W Open is not compatible with thermostats or third-party temperature sensors.

All W2W Open wiring is completed at the W2W Open control board. See the applicable wiring diagrams within this document for details. For further instructions on W2W Open, please visit HVACPartners.com or Carrier.com for the W2W Open Integration Guide and Points/Properties Guide.

CONTROL TRANSFORMER

All units include a 75VA transformer. The VA capacity of the transformer should be considered when applying low voltage accessories, such as shut off valves, thermostats, or DDC controls.

Configure Unit Control Components

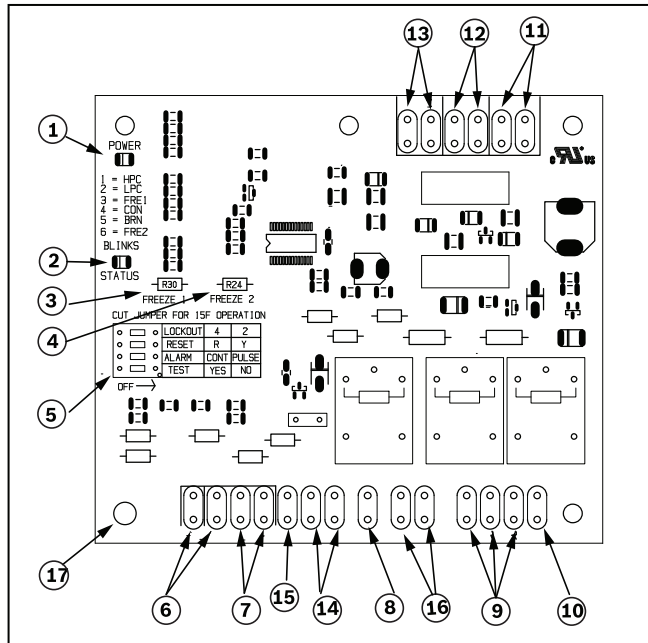
Each unit is provided with a unit protection module (UPM) which controls the compressor and provides the unit safety controls and monitoring. See Fig. 16-18 for the UPM board layout and Freeze Sensor.

Safety Controls include the following:

1. High Pressure Switch (HPS):
located in the refrigerant discharge line and set for a high-pressure cutout control of 600 PSIG. A single HPS is wired across HPC on UPM1 and two HPS are wired across HP1 and HP2 on UPM2.
2. Low Pressure Switch (LPS):
located in the unit refrigerant suction line and set for a low-pressure cutout of 40 PSIG. A single LPS is wired across LPC on UPM1 and two LPS are wired across LP1 and LP2 on UPM2.
3. Source Side Freeze Protection (FS Source):
mounted close to coaxial coil to monitor refrigerant temperature between the coaxial refrigerant to water heat exchanger and the thermal expansion valve and prevent water freezing conditions. Wired Across Freeze 1 terminals on the UPM.
4. Load Side Freeze Protection (FS Load):
mounted close to coaxial coil to monitor refrigerant temperature between the coaxial refrigerant to water heat exchanger and the thermal expansion valve to prevent water freezing conditions. Wired Across Freeze 2 terminals on the UPM.

The default limit trip for both FREEZE sensors 1 and 2 is 26°F refrigerant temperature. However, this can be changed to 15°F by cutting the associated resistor (UPM I: R30 Source, R24 Load; UPM II: R17 Source, R77 Load). Typically, only the source side freeze protection would be adjusted to account for systems utilizing anti-freeze with low entering water temperatures (<40°F). If the temperature drops below or remains at the freeze limit trip for 30 seconds, the controller will shut down the compressor and enter a soft lockout condition.

NOTE: Freeze protection will not guard against the loss of water flow. A flow switch is recommended to prevent the unit from running if water flow is lost or insufficient.



NUMBER	ITEM
1	Board Power Indicator
2	UPM Status LED Indicator
3	Water Source Coil Freeze Protection Temperature Selection (R30)
4	Load Water Coil Freeze Protection Temperature Selection (R24)
5	UPM Board Settings
6	Source Coax Freeze Connection (Freeze 1)
7	Load Coax Freeze Connection (Freeze 2)
8	LCD Unit Display Connection
9	24VAC Power Unit
10	Compressor Contact Output
11	High Pressure Switch Connection
12	Call for Compressor Y1
13	Low Pressure Switch Connection
14	24VAC Power Common
15	Condensate Overflow Sensor (not applicable on 50PSW)
16	Dry Contact
17	UPM Ground Standoff

**Fig. 16 — UPM I Control Board
(Single Compressor Units)**

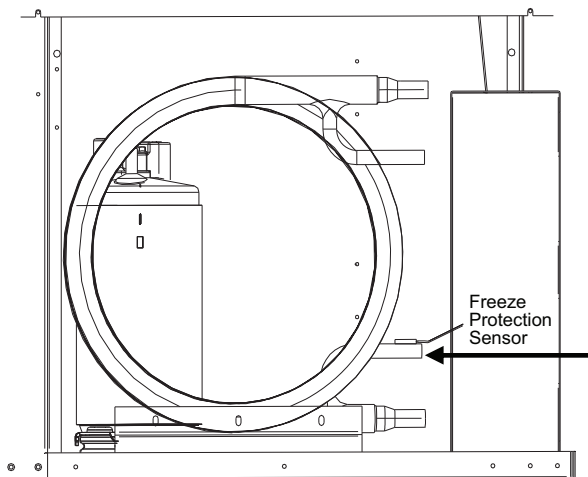
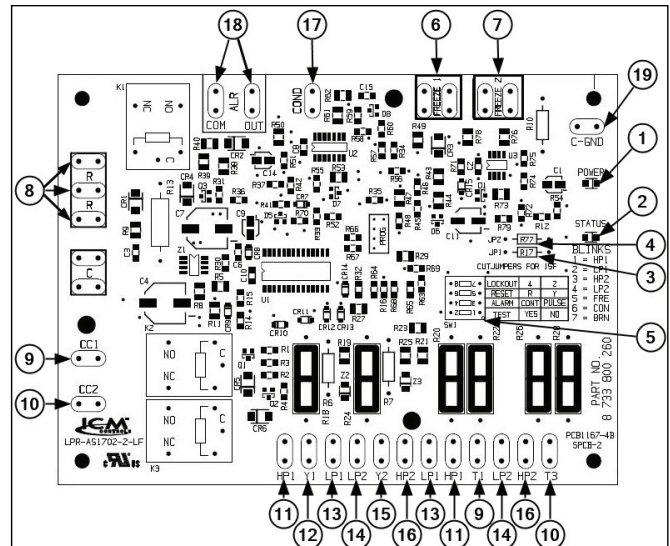


Fig. 17 — Freeze Protection Sensor



NUMBER	ITEM
1	Power LED Indicator
2	Status LED Indicator
3	Source Freeze 1 Protection Temperature Selection (R17)
4	Load Freeze 2 Protection Temperature Selection (R77)
5	UPM II Board Settings
6	Freeze Connection (Freeze 1)
7	Load Coax Freeze Connection (Freeze 2)
8	Power 24VAC-R
9	Compressor 1 Control Output
10	Compressor 2 Control Output
11	High Pressure Switch 1st Stage
12	Thermostat Y1 Call
13	Low Pressure Switch 1st Stage
14	Low Pressure Switch 2nd Stage
15	Thermostat Y2 Call
16	High Pressure Switch 2nd Stage
17	Condensate Switch (Not Applicable)
18	Alarm Output Dry Contact N.O.
19	Ground Connection

**Fig. 18 — UPM II Control Board
(Dual Compressor Units)**

UPM CONFIGURATION

Several of the UPM features are configurable via dip switches on the UPM. Table 5 outlines the default configuration.

Table 5 — UPM Default Configurations

SWITCH NUMBER	DIP SWITCH LABEL	ON FUNCTION	OFF FUNCTION (DEFAULT)
1	Test	YES	NO
2	Alarm	Continuous	Pulse
3	Reset	R (T-Stat)	Y (Unit Power)
4	Lockout	4	2

UPM FEATURES

Anti-Short Cycle Timer

5-minute delay on break timer to prevent compressor short cycling.

Random Start

Each controller has a unique random start delay ranging from 270 to 300 seconds on initial power up to reduce the chance of multiple units simultaneously starting at the same time (after

power up or after a power interruption), thus avoiding creating a large electrical spike.

Low Pressure Bypass Timer

If the compressor is running and the low-pressure switch opens, the controller will keep the compressor on for 120 seconds. After 2 minutes if the low-pressure switch remains open, the controllers will shut down the compressor and enter a soft lockout. The compressor will not be energized until the low-pressure switch closes and the anti-short cycle time delay expires. If the low-pressure switch opens 2-4 times in 1 hour, the unit will enter a hard lockout. To exit the hard lockout power to the unit would need to be reset.

Brownout/Surge/Power Interruption Protection

The brownout protection in the UPM board will shut down the compressor if the incoming power falls below 18 VAC. The compressor will remain OFF until the voltage is above 18 VAC and ANTI-SHORT CYCLE TIMER (300 seconds) times out. The unit will not go into a hard lockout.

Malfunction Output

Alarm output is Normally Open (NO) dry contact. If pulse is selected the alarm output will be pulsed. The fault output will depend on the dip switch setting for "ALARM". If it is set to "CONST", a constant signal will be produced to indicate a fault has occurred and the unit requires inspection to determine the type of fault. If it is set to "PULSE", a pulse signal is produced, and a fault code is detected by a remote device indicating the fault. See L.E.D Fault Indication Table 12 on page 39 in the trouble shooting section of this document for blink codes. The remote device must have a malfunction detection capability when the UPM board is set to "PULSE".

NOTE: If 24 VAC output is needed R must be wired to ALR-COM terminal; 24 VAC will be available to the ALR-OUT terminal when the unit is in the alarm condition.

Test Dip Switch

A test dip switch is provided to reduce all time delay settings to 10 seconds during troubleshooting or verification of unit operation.

IMPORTANT: Operation of unit in test mode can lead to accelerated wear and premature failure of components. The "TEST" switch must be set back to "NO" after troubleshooting/servicing.

Intelligent Reset

If a fault condition is initiated, the 5-minute delay on break time period is initiated and the unit will restart after these delays expire. During this period, the fault LED will indicate the cause of the fault. If the fault condition still exists or occurs 2 or 4 times (depending on 2 or 4 setting for Lockout dip switch) before 60 minutes, the unit will go into a hard lockout and requires a manual lockout reset.

Lockout Reset

A hard lockout can be reset by turning the unit thermostat off and then back on when the "RESET" dip switch is set to "Y" or by shutting off unit power at the circuit breaker when the "RESET" dip switch is set to "R".

CONSIDERATIONS

1. Always check incoming line voltage power supply and secondary control voltage for adequacy. Transformer primaries are dual tapped for 208 and 230 volts. Connect the appropriate tap to ensure a minimum of 18 volts secondary control voltage. 24 volts is ideal for best operation.
2. Long length thermostat and control wiring leads may create voltage drop. Increasing wire gauge or up-size transformers may be required to ensure minimum secondary voltage supply.

3. Carrier recommends the following guidelines for wiring between a thermostat and the unit: 18 GA up to 60 ft, 16 GA up to 100 ft and 14 GA up to 140 ft.
4. Do not apply additional control devices to the control circuit power supply without consulting the factory. Doing so may void equipment warranties.
5. Check with all code authorities on requirements involving condensate disposal/over flow protection criteria.

START-UP

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

NOTE: This equipment is designed for indoor installation only.

Unit Start-Up

1. Set the primary controller to the highest setting.
2. Set the primary controller system switch to "COOL." The reversing valve solenoid should energize. The compressor should not run.
3. Reduce the primary controller setting approximately 5 degrees below return fluid temperature.
4. Verify the heat pump is operating in the cooling mode.
5. Check the cooling refrigerant pressures against the values listed in Table 6.
6. Turn the primary controller system switch to the "OFF" position. The unit should stop running and the reversing valve should de-energize.
7. Leave the unit off for approximately (5) minutes to allow for system equalization.
8. Turn the primary controller to the lowest setting.
9. Set the primary controller switch to "HEAT."
10. Increase the primary controller setting approximately 5 degrees above the return fluid temperature.
11. Verify the heat pump is operating in the heating mode.
12. Check the heating refrigerant pressures against the values listed in Table 7.
13. Set the primary controller to maintain the desired return fluid temperature.
14. Check for vibrations, leaks, etc.
15. Instruct the owner on the unit and control operation.

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. (See Table 8.)

POWER SUPPLY

A voltage variation of $\pm 10\%$ of nameplate utilization voltage is acceptable.

NOTE: These operating conditions are not normal or continuous operating conditions. It is assumed that start-up is for the purpose of bringing the building space up to occupancy temperature. (See Table 8.)

⚠ 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.

Table 6 — Cooling Mode Operating Pressure (psig)

ENTERING LOAD/ EVAP TEMP (°F)	ENTERING SOURCE CONDENSER TEMPERATURE (°F)					
	75°F		85°F		95°F	
	SUCTION PRESSURE	DISCHARGE PRESSURE	SUCTION PRESSURE	DISCHARGE PRESSURE	SUCTION PRESSURE	DISCHARGE PRESSURE
65	99-116	290-320	107-123	325-358	107-123	370-400
55	91-107	265-311	91-107	303-350	99-116	370-400
45	76- 91	265-311	76- 91	295-345	83-99	358-390

Table 7 — Heating Mode Operating Pressure (psig)

ENTERING LOAD TEMP (°F)	ENTERING SOURCE CONDENSER TEMPERATURE (°F)					
	40°F		60°F		80°F	
	SUCTION PRESSURE	DISCHARGE PRESSURE	SUCTION PRESSURE	DISCHARGE PRESSURE	SUCTION PRESSURE	DISCHARGE PRESSURE
70	68-83	255-290	99-116	270-305	130-145	290-325
90	76-91	350-380	99-116	358-390	130-165	370-400
110	76-91	455-480	99-116	470-500	139-165	480-575

Table 8 — 50PSW Unit Operating Limits

COOLING	°F
Minimum ambient air temperature °F	50
Maximum ambient air temperature °F	100
Minimum entering load fluid temperature °F	50
Typical entering load fluid temperature °F	55
Maximum entering load fluid temperature °F	90
Minimum entering source fluid temperature °F	50
Water loop typical entering source fluid range temperature °F	70-90
Maximum entering source fluid temperature °F	110
HEATING	°F
Minimum ambient air temperature °F	50
Maximum ambient air temperature °F	100
Minimum entering load fluid temperature °F	60
Typical entering load fluid temperature °F	100-110
Maximum entering load fluid temperature °F	120
Minimum entering source fluid temperature °F	30 ^{abc}
Water loop typical entering source fluid range temperature °F	50-70
Maximum entering source fluid temperature °F	90

NOTE(S):

- Antifreeze solution is required at these fluid temperatures.
- Maximum and minimum fluid conditions are at unit rated air flow.
- Maximum and minimum operating limits may not be combined. If one value is at either maximum or minimum, the other value(s) must be within normal operating range.

Scroll Compressor Rotation

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

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

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

1. 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.

CAUTION

When the compressor is rotating in the wrong direction, the unit makes an elevated level of noise and does not provide cooling. Damage to compressor will occur if allowed to operate in this manner.

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.

Cleaning and Flushing

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

⚠ 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. Install lockout tag.

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

1. Verify electrical power to the unit is disconnected and lockout tag installed.
2. Install the system with the supply hose connected directly to the return riser valve. Use a single length of flexible hose.
3. Open all air vents. Fill the system with the water. DO NOT allow system to overflow. Bleed all air from the system. Pressurize and check the system for leaks and repair appropriately.
4. Verify all strainers are in place. Start the pumps, and systematically check each vent to ensure all air is bled from the system.
5. Verify make-up water is available. Adjust make-up water appropriately to replace the air which was bled from the system. Check and adjust the water/air level in the expansion tank.
6. Raise the loop temperature to approximately 85°F. Open the drain at the lowest point in the system. Adjust the make-up water replacement rate to equal the rate of bleed.
7. Refill the system and add trisodium phosphate in a proportion of approximately one pound per 150 gal. of water (or other equivalent approved cleaning agent).

⚠ CAUTION

To avoid possible damage to a plastic (PVC) piping system, do not allow temperatures to exceed 110°F.

8. Raise the loop temperature to 100°F. Circulate the solution for a minimum of 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if desired.
9. When the cleaning process is complete, remove the short-circuited hose. Reconnect the hoses to the proper supply, and return the connections to each of the units. Refill the system and bleed off all air.
10. Test the system pH with litmus paper. The system water should be slightly alkaline (pH of 7.5 to 8.5). Add chemicals, as appropriate, to maintain acidity levels.
11. When the system is successfully cleaned, flushed, refilled and bled, restore power.
12. Check the main system panels, safety cutouts and alarms. Set the controls to properly maintain loop temperatures.

⚠ CAUTION

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

Antifreeze

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

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

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

Calculate the total volume of fluid in the piping system. (See Table 9.) Use the percentage by volume in Table 10 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

The freeze sensor input is active at all the times. There are 2 configurable freeze points, 26°F and 15°F. Refer to Configure Unit Control Componentson page 21 for more information regarding the freeze sensors. The unit will enter a soft lockout until the temperature climbs above the set point and the anti-short cycle time delay has expired. The freeze sensor will shut the compressor output down after 30 seconds of water flow loss and report a freeze condition. It is recommended to have a flow switch to prevent the unit from running if water flow is lost.

Table 9 — 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 10 — 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

System Flow

FLOW VERIFICATION

The 50PSW WSHP units do not include a factory flow switch as standard. It is recommended to field install a flow switch or special order a flow switch as factory installed to prevent the compressor from operating without loop flow.

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. Adjust the water control valve until the desired flow rate is achieved. Since the pressure constantly varies, two pressure gauges may be needed in some applications. See Start-Up Checklist for flow rates based on waterside pressure drop.

An alternate method of flow regulation is to install an automatic flow control valve. These valves feature a removable cartridge that controls the maximum flow through the valve assembly.

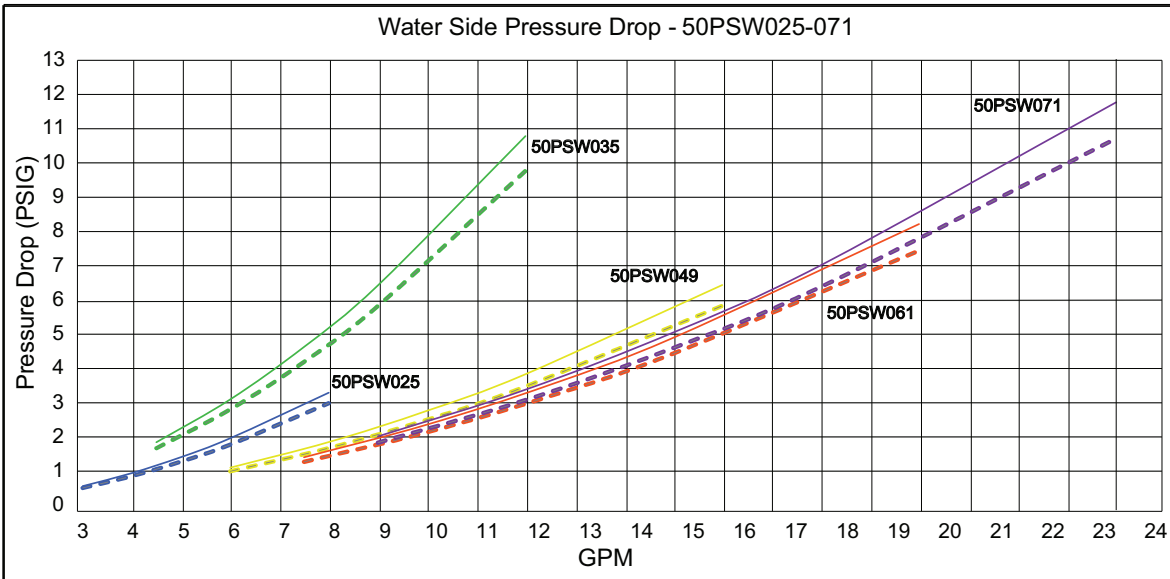
Verify that the water flow control cartridge matches the application flow requirement. (See Fig. 19 and 20.)

Cooling Tower/Boiler Systems

These systems typically use a common loop maintained at 60°F to 90°F. The use of a closed circuit evaporative cooling tower with a secondary heat exchanger between the tower and the water loop is recommended. If an open type cooling tower is used continuously, chemical treatment and filtering will be necessary.

Ground Coupled, Closed Loop and Plateframe Heat Exchanger Well Systems

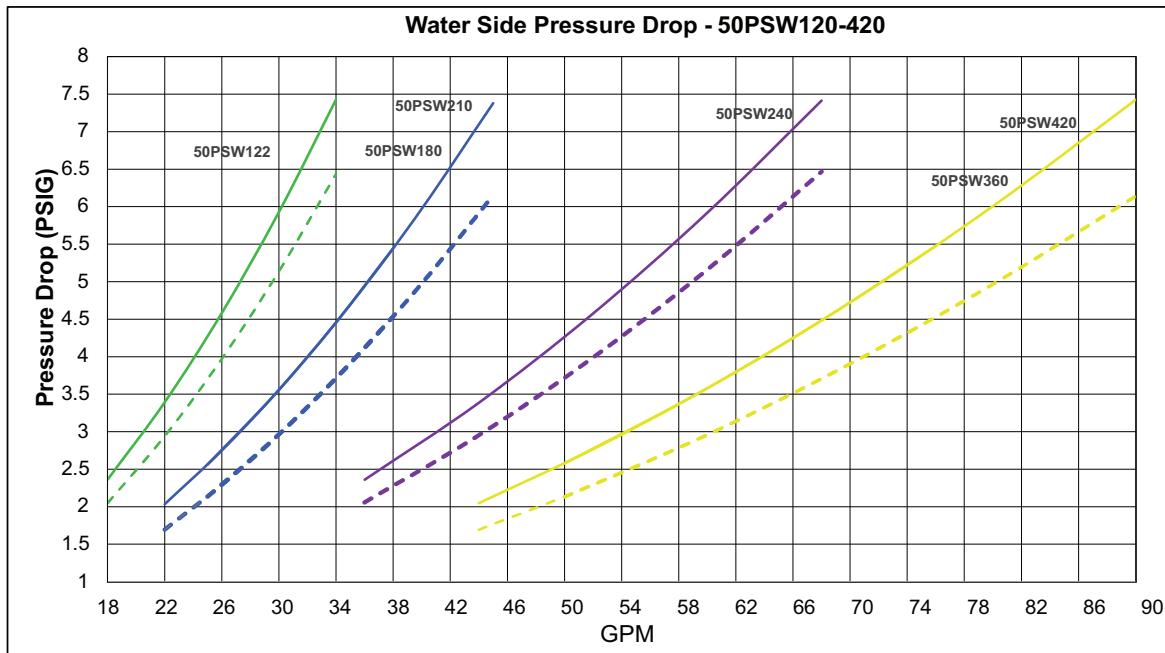
These systems allow water temperatures from 30°F to 110°F. The external loop field is divided up into a 2 in. polyethylene supply and return lines. Each line has valves connected in such a way that upon system start-up, each line can be isolated for flushing using only the system pumps. Air separation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



LEGEND
 Load Side (55F) ———
 Source Side (85F) - - -

50PSW025 Load Side ———
 50PSW025 Source Side - - -
 50PSW035 Load Side ———
 50PSW035 Source Side - - -
 50PSW049 Load Side ———
 50PSW049 Source Side - - -
 50PSW061 Load Side ———
 50PSW061 Source Side - - -
 50PSW071 Load Side ———
 50PSW071 Source Side - - -

Fig. 19 — Water Pressure Drop Curves (025-071)



LEGEND
 Load Side (55F) ———
 Source Side (85F) - - -

50PSW122 Load Side ———
 50PSW122 Source Side - - -
 50PSW180 Load Side ———
 50PSW180 Source Side - - -
 50PSW210 Load Side ———
 50PSW210 Source Side - - -
 50PSW240 Load Side ———
 50PSW240 Source Side - - -
 50PSW360 Load Side ———
 50PSW360 Source Side - - -
 50PSW420 Load Side ———
 50PSW420 Source Side - - -

Fig. 20 — Water Pressure Drop (120-420)

OPERATION

Power Up Mode

The unit will not operate until all the inputs, terminals and safety controls are checked for normal operation. (See Fig. 21 and 22.)

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

Unit Protection Model (UPM)

Figure 22 shows the UPM sequence of operation for unit safeties. All 50PSW units are equipped with a UPM.

Units with Complete C or Deluxe Controls

COOLING MODE

Energizing the "O" terminal energizes the unit reversing valve thus placing the unit into cooling mode. When the thermostat calls for first stage cooling (Y1) the loop pump or solenoid valve if present is energized and the first stage of compressor capacity starts. When the thermostat calls for second stage cooling (Y2) the second stage (or full compressor capacity) is initiated. Once the thermostat is satisfied, the compressor shuts down accordingly.

HEATING MODE

The first two stages of heating (Y1 and Y2) operate in the same manner as cooling, but with the reversing valve de-energized. Once the thermostat is satisfied, the compressor shuts down.

Units with W2W Open Controls

Units with W2W Open still feature a UPM board for unit operation, so the operation will be similar to the sequence for the other control packages. W2W Open features advanced functionality, such as outdoor air reset and intelligent alarming, which will differ from the other control packages. Below is an overview of the different features for the W2W Open controls. For more details of the W2W Open operation, please refer to the W2W Open Integration Guide and the W2W Points/Properties Manual. See Fig. 21 for W2W Open Control Board overview.

SEQUENCE OF OPERATION

WSHP Open W2W

OCCUPANCY

Scheduling

Scheduling is used to start/stop the unit based upon a time period to control the leaving water temperature to specified heating or cooling setpoints. By default, the modules schedule is continuously occupied and will thus be enabled to operate as configured to maintain the leaving water temperature and the water supply setpoint.

Time schedules may be configured with Bacview6, Field Assistant, or i-Vu Open. See the appropriate machine interface User's Guide for specific instructions for setting time schedules. NOTE: The modules' local time and date must be set for these functions to operate properly.

System occupancy

The system occupancy function provides a means for W2W controls installed as part of an i-Vu Open system to have their occupancy determined by another module on the controls network. A Binary Network input (BNI2) object is utilized to read the present value of the Occupancy Status variable of another module. System Occupancy requires Field Assistant, or iVu Open Server for setup.

BAS (BUILDING AUTOMATION SYSTEM) ON/OFF

The BAS On/Off function provides a means for W2W controls installed as part of a Third-party BACnet system to have their occupancy determined by another device on the controls network. A Network Visible, BACnet Multi-state Value object may be

written by the third-party device to set the controls occupied state as required. This method of occupancy determination takes precedence over all others. No special configuration is necessary to utilize this function. Object address information is also described in the W2W Integration Guide.

REMOTE OCCUPANCY CONTACT

The W2W has the capability to utilize an external dry contact closure to determine the occupancy status of the unit. The external contact may be normally closed or normally opened. Assuming a normally open contact, the module will be unoccupied when the remote contact is open, and occupied when the contact is closed. A normally closed contact will be unoccupied when the remote contact is closed, and occupied when the remote contact is open.

SHUTDOWN

The W2W includes a unit shutdown function. Shutdown is a software switch that allows an operator to stop unit operation. Shutdown is a BACnet binary value (object name "**shutdown**") and is accessed in the **Status** expander via the **Shutdown** variable. Setting **Shutdown "Active"** will immediately stop compressor operation. The pump and valve outputs will remain energized until their respective off delays have expired (see pump and valve section).

The equipment will remain off as long as **Shutdown** is **active**. **Shutdown's** default state is **inactive**. **Shutdown** may be invoked from the UI, or accessed via the network (where the module is part of a BACnet MSTP network).

POWER FAIL RESTART DELAY

The W2W control includes an adjustable Power Fail Restart Delay (PFRD). The PFRD holds off the equipment startup until the configured delay time has expired, and may be utilized to stagger equipment starts after a power outage. The PFRD default value is 60 seconds but may be adjusted between 0 and 600 seconds.

CHANGEOVER TIMEGUARD

The W2W control utilizes a fixed 5 minute **Changeover Timeguard** to protect the equipment in the event of any immediate mode change between heating and cooling. The timeguard stops compressor operation for **5 minutes** to allow water temperatures and refrigerant pressures to normalize before restarting the compressor. The status (**Inactive / Active**) of the **Changeover Timeguard** may be viewed in the module's **Maintenance** expander.

LOAD PUMP

The W2W has a dedicated binary output to control a Load Pump. The load pump output will be energized whenever the unit is occupied.

When power is first applied to the control, or reapplied after a power outage, the pump output will be energized after the Power Fail Restart Delay (described previously) expires.

The pump control includes a configurable Pump Stop Delay. The stop delay defines the time the pump will continue to operate after heating or cooling is stopped, should the unit transition to unoccupied. The Pump Stop Delay default value is 45 seconds and may be adjusted between 0 and 180 seconds. NOTE: On a request for unit shutdown (described previously), the pump will continue to operate until all compression is disabled and then additionally until the configured pump delay expires.

SOURCE WATER ISOLATION VALVE/SOURCE WATER PUMP OUTPUT

The W2W has a dedicated binary output to control a Source Water Isolation Valve or dedicated source water pump. The output will be energized prior to starting any compression stage.

The output includes a configurable close/off delay. The delay defines the time the isolation valve will remain open or the pump will continue to operate after the last stage of compression stops.

The Iso Valve Close Delay default value is 45 seconds and may be adjusted between 0 and 180. NOTE: On a request for unit shutdown (described previously), the valve will remain open until all compression is disabled and then additionally until the configured valve close delay expires.

COOLING (SINGLE MODULE)

When configured for "Single/Secondary Unit" operation, The W2W control will operate up to four stages of compression to maintain the desired chilled water setpoint. The control point can be selected by setting the "Control Type" to either the leaving water temperature sensor (default) or the entering water temperature sensor. While in the cooling mode, the compressor outputs are controlled by the PI (Proportional-integral) cooling loop and cooling stages capacity algorithm. The algorithms calculate the desired number of stages needed to satisfy the load water setpoint by comparing the actual water temperature sensor value to the chilled water setpoint.

Additionally, an independent leaving load water temperature safety check is included to verify that sufficient load water flow is provided. Regardless of the control type, as the leaving load water temperature exceeds the configured "Chilled Water Supply Setpoint", the compressor stages will start to be reduced as required.

The following conditions must be true in order for the cooling algorithm to run:

- Unit is occupied (see Occupancy Section above).
- The lockout temperature (OAT, SPT, or T1) is greater than the Cooling lockout temperature setpoint.
- Cooling mode is set to Enable.
- Heat mode is not active, the compressor time guard has expired.
- The Changeover time guard has elapsed.
- Load water temp is above the Chilled Water Supply Setpoint.

If all the above conditions are met, the compressor(s) will be energized as required to satisfy the cooling requirements. While cooling, the reversing valve output will be held in the cooling position (either B or O type as configured) even after compression is stopped. The valve will not switch position until the heating mode is required.

During cooling operation, the control employs a 5 minute time delay before each subsequent stage of compression is energized to allow the leaving water temperature (LWT) to achieve a stable temperature and avoid overshoot. Once energized, a stage of compression will have to run for at least 180 seconds before being staged off to avoid short-cycling.

Once a compressor is staged off, it may not be restarted again until a five minute time guard delay period expires.

The module provides three (binary) compressor status inputs to monitor compressor operation. These inputs are monitored to determine if the compressor status matches its commanded state. These inputs are used to determine if a refrigerant safety switch or other safety device has tripped and has caused the compressor to stop operating normally. If this should occur, an alarm will be generated to indicate the faulted compressor condition. The Compressor Status Alarm includes a 6 minute delay to avoid nuisance alarms.

ADDITIONAL COOLING FUNCTIONS

Cooling Setpoint OA Rest

The W2W control may be configured to reset the chilled water setpoint proportionally based upon OAT. The amount of reset and the reset range are both user configurable. This feature can provide energy savings by operating the unit at a higher load water temperature setpoint when the minimum chilled water temperature is not required. It also can be used to better match the chilled water temperature to the cooling load requirements.

The following conditions must be true in order for the Cooling Setpoint OA Reset algorithm to run:

- The preconditions for cooling operation (described previously) have been met.
- The module has a valid Outdoor Air Temperature.
- Cooling Setpoint OA Reset is Enabled.

RH Cooling Setpoint Rest

When the OAT Cooling Setpoint Reset function (described previously) is enabled, The W2W control has the capability to limit the (OAT) chilled water setpoint reset based upon the difference between the High RH setpoint and the measured RH value (Space RH or Outdoor Air RH).

The RH Cooling Setpoint reset override uses a PI function to determine the limit applied to the Cooling Setpoint OA Reset function.

The following conditions must be true in order for the RH Cooling Setpoint Reset algorithm to run:

- The preconditions for cooling operation (described previously) have been met.
- The preconditions for Cooling Setpoint OA Reset operation (described previously) have been met.
- The module has a valid Relative Humidity value.
- RH Cooling Setpoint OA Reset is Enabled.

COOLING CONTROL MODES

The following control modes are available for cooling operation. These modes may be selected by the installing technician, or by an operator of sufficient access privileges using one of the available man machine interfaces (BACview, Field Assistant, or i-Vu Open Server). See the Controls Configuration sections for additional instructions.

Manual Cool

Configuring the Control Mode Selection for Manual Cool places the control in a cooling only configuration and the machine operates as a chiller. The module will operate as described in the Cooling section while configured for Manual Cool. The Outdoor Air and Relative Humidity Cooling setpoint reset functions are available provided their associated preconditions (described previously) are met.

When the Control Mode Selection is set to Manual Cool, the lockout temperature (OAT, SPT, or T1) is overridden, even when the input is available. The control will operate as required to maintain the Chilled Water Supply Temperature setpoint, regardless of the any previously configured lockout temperature.

The following conditions must be true in order for the cooling algorithm to run in the Manual Cool control mode:

- Control Mode Selection is set to Manual Cool.
- Cool Enable is set to Enable.
- Unit is occupied (see Occupancy Section above).
- Load water temp is above the Chilled Water Supply Setpoint.

OAT

Configuring the Control Mode Selection for OAT sets the control to change modes between heating and cooling automatically based on the Outdoor Air Temperature (OAT). The control will compare the OAT to the configured lockout temperatures for heating and cooling and select the appropriate operating mode. A valid outdoor air temperature reading (hardware or network) is required for this mode. Once enabled, equipment control is as described for heating and cooling.

When conditions require cooling, the module will operate as described in the Cooling section above. The Outdoor Air and Relative Humidity Cooling setpoint reset functions are available provided their associated preconditions (described previously) are met.

The following conditions must be true in order for the cooling algorithm to run in the OAT control mode:

- A valid Outdoor Air Temperature is present.
- Control Mode Selection is set to OAT.
- Cool Enable is set to Enable.
- Unit is occupied (see Occupancy Section above).
- The OAT is greater than the Cooling lockout temperature setpoint.
- Heat mode is not active and the compressor time guard has expired.
- The Changeover time guard has elapsed.
- Load water temp is above the Chilled Water Supply Setpoint.

SPT

Configuring the Control Mode Selection for SPT sets the control to change modes between heating and cooling based on the Space Temperature sensor located in the space or return air plenum (SPT). The control will compare the SPT to the configured lockout temperatures for heating and cooling and select the appropriate operating mode. A valid space temperature reading (hardware or network) is required for this mode. Once enabled, equipment control is as described for heating and cooling.

When conditions require cooling, the module will operate as described in the Cooling section. The Outdoor Air and Relative Humidity Cooling setpoint reset functions are available provided their associated preconditions (described previously) are met.

The following conditions must be true in order for the cooling algorithm to run in the SPT control mode:

- A valid SPT is present.
- Control Mode Selection is set to SPT.
- Cool Enable is set to Enable.
- Unit is occupied (see Occupancy Section above).
- The SPT is greater than the Cooling lockout temperature setpoint.
- Heat mode is not active and the compressor time guard has expired.
- The Changeover time guard has elapsed.
- Load water temp is above the Chilled Water Supply Setpoint.

System T1 Temp

Configuring the Control Mode Selection for System T1 Temp sets the control to change modes between heating and cooling based on a network temperature. The control will compare the network temperature to the configured lockout temperatures for heating and cooling and select the appropriate operating mode. The System T1 Temperature network input object must be addressed to read the desired temperature and communicating for this mode. Once enabled, equipment control is as described for heating and cooling.

When conditions require cooling, the module will operate as described in the Cooling section. The Outdoor Air and Relative Humidity Cooling setpoint reset functions are available provided their associated preconditions (described previously) are met.

The following conditions must be true in order for the cooling algorithm to run in the T1 control mode:

- A valid network T1 Temperature is present.
- Control Mode Selection is set to T1.
- Cool Enable is set to Enable.
- Unit is occupied (see Occupancy Section above).
- The T1 Temperature is greater than the Cooling lockout temperature Setpoint.
- Heat mode is not active and the compressor time guard has expired.

- The Changeover time guard has elapsed.
- Load water temp is above the Chilled Water Supply Setpoint.

HEATING (SINGLE MODULE)

When configured for "Single/Secondary Unit" operation, The W2W control will operate up to four stages of compression to maintain the desired hot water supply setpoint. The control point can be selected by setting the "Control Type" to either the leaving water temperature sensor (default) or the entering water temperature sensor. While in the heating mode, the compressor outputs are controlled by the PI (Proportional-integral) heating loop and heating stages capacity algorithm. The algorithms calculate the desired number of stages needed to satisfy the load water setpoint by comparing the actual water temperature sensor value to the hot water supply setpoint.

Additionally, an independent leaving load water temperature safety check is included to verify that sufficient load water flow is provided. Regardless of the control type, as the leaving load water temperature exceeds the configured "Hot Water Supply Setpoint, the compressor stages will start to be reduced as required.

The following conditions must be true in order for the heating algorithm to run:

- Unit is occupied (see Occupancy Section above).
- The lockout temperature (OAT, SPT, or T1) is less than the Heating lockout temperature setpoint.
- Heat Enable is set to Enable.
- Cool mode is not active and the compressor time guard has expired.
- The Changeover time guard has elapsed.
- Load water temp is below the Hot Water Supply Setpoint.

If all the above conditions are met, the compressors will be energized as required to satisfy the heating requirements. While heating, the reversing valve output will be held in the heating position (either B or O type as configured) even after compression is stopped. The valve will not switch position until the cooling mode is required.

During heating operation, the control employs a 5 minute time delay before each subsequent stage of compression to allow the leaving water temperature (LWT) to achieve a stable temperature and avoid overshoot. Once energized, a stage of compression will have to run for at least 180 seconds before being staged off to avoid short-cycling.

Once a compressor is staged off, it may not be restarted again until a five minute time guard delay period expires.

The module provides three (binary) compressor status inputs to monitor compressor operation. These inputs are monitored to determine if the compressor status matches its commanded state. These inputs are used to determine if a refrigerant safety switch or other safety device has tripped and have caused the compressor to stop operating normally. If this should occur, an alarm will be generated to indicate the faulted compressor condition. The Compressor Status Alarms include a 6 minute delay to avoid nuisance alarms.

ADDITIONAL HEATING FUNCTIONS

Heating Setpoint OA Reset

The W2W control may be configured to reset the hot water supply setpoint proportionally based upon OAT. The amount of reset and the reset range are both user configurable. This feature can provide energy savings by operating the unit at a lower load water temperature setpoint when the maximum hot water supply temperature is not required. It also can be used to better match the hot water temperature to the heating load requirements.

The following conditions must be true in order for the Heating Setpoint OA Reset algorithm to run:

- The preconditions for heating operation (described previously) have been met.
- The module has a valid Outdoor Air Temperature.
- Heating Setpoint OA Reset is Enabled.

HEATING CONTROL MODES

The following control modes are available for heating operation. These modes may be selected by the installing technician, or by an operator of sufficient access rights using one of the available machine interfaces (BACview, Field Assistant, or i-Vu Open Server). See the Controls Configuration sections for additional instructions.

Manual Heat

Configuring the Control Mode Selection for Manual Heat places the control in a heating only configuration. The module will operate as described in the Heating section while configured for Manual Heat. The Heating Setpoint OA Reset function is available provided the associated preconditions (described previously) are met.

When the Control Mode Selection is set to Manual Heat, the lockout temperature (OAT, SPT, or T1) is overridden, even when the input is available. The control will operate as required to maintain the Hot Water Supply Temperature setpoint, regardless of the any previously configured lockout temperature.

The following conditions must be true in order for the heating algorithm to run in the Manual Heat control mode:

- Control Mode Selection is set to Manual Heat.
- Heat Enable is set to Enable.
- Unit is occupied (see Occupancy Section above).
- Load water temp is below the Hot Water Supply Setpoint.

OAT

Configuring the Control Mode Selection for OAT sets the control to change modes between heating and cooling automatically based on the Outdoor Air Temperature (OAT). The control will compare the OAT to the configured lockout temperatures for heating and cooling and select the appropriate operating mode. A valid outdoor air temperature reading (hardware or network) is required for this mode. Once enabled, equipment control is as described for heating and cooling.

When conditions require heating, the module will operate as described in the Heating section. The Outdoor Air Hot Water Supply setpoint reset function is available provided its associated preconditions (described previously) are met.

The following conditions must be true in order for the heating algorithm to run in the OAT control mode:

- A valid Outdoor Air Temperature is present.
- Control Mode Selection is set to OAT.
- Heat Enable is set to Enable.
- Unit is occupied (see Occupancy Section above).
- The OAT is less than the Heating lockout temperature setpoint.
- Cool mode is not active and the compressor time guard has expired.
- The Changeover time guard has elapsed.
- Load water temp is below the Hot Water Supply Setpoint.

SPT

Configuring the Control Mode Selection for SPT sets the control to change modes between heating and cooling based on the Space Temperature sensor located in the space or return air plenum (SPT). The control will compare the SPT to the configured lockout temperatures for heating and cooling and select the appropriate operating mode. A valid space temperature reading

(hardware or network) is required for this mode. Once enabled, equipment control is as described for heating and cooling.

When conditions require heating, the module will operate as described in the Heating section. The Outdoor Air Hot Water Supply setpoint reset function is available provided its associated preconditions (described previously) are met.

The following conditions must be true in order for the heating algorithm to run in the SPT control mode:

- A valid SPT is present.
- Control Mode Selection is set to SPT.
- Heat Enable is set to Enable.
- Unit is occupied (see Occupancy Section above).
- The SPT is less than the Heating lockout temperature setpoint.
- Cool mode is not active and the compressor time guard has expired.
- The Changeover time guard has elapsed.
- Load water temp is below the Hot Water Supply Setpoint.

System T1 Temp

Configuring the Control Mode Selection for System T1 Temp sets the control to change modes between heating and cooling based on a network temperature. The control will compare the network temperature to the configured lockout temperatures for heating and cooling and select the appropriate operating mode. The System T1 Temperature network input object must be addressed to read the desired temperature and communicating for this mode. Once enabled, equipment control is as described for heating and cooling.

When conditions require heating, the module will operate as described in the Heating section. The Outdoor Air Hot Water Supply setpoint reset function is available provided its associated preconditions (described previously) are met.

The following conditions must be true in order for the heating algorithm to run in the System T1 Temp control mode:

- A valid network T1 Temperature is present.
- Control Mode Selection is set to T1.
- Heat Enable is set to Enable.
- Unit is occupied (see Occupancy Section above).
- The T1 Temperature is less than the Heating lockout temperature setpoint.
- Cool mode is not active and the compressor time guard has expired.
- The Changeover time guard has elapsed.
- Load water temp is below the Hot Water Supply Setpoint.

Demand Limit

The W2W control has the ability to accept a demand limit signal from the network. The demand limit function provides a means for W2W controls installed as part of an i-Vu Open system to have their heating and chilled water setpoints expanded (lowered and raised respectively) to lower the equipments electricity consumption. The amount of setpoint adjustment for each of the three demand levels is user adjustable for both heating and cooling. The configured demand level values are cumulative, as such a level 3 demand limit incorporates the reset values of demand level 1 + demand level 2 + demand level 3.

If both outdoor air setpoint reset and demand level limiting are active simultaneously, the reset value applied will be the greater of the two individual reset functions in effect but NOT the cumulative total of both.

MUTLI-UNIT PRIMARY

On installations having multiple Water to Water Source Heat Pumps serving a common load, the heat pumps may be controlled as a singular heating or cooling source utilizing the Multi-unit MS/TP Operating Mode.

For these installations, the modules are networked together. One of the installed Water to Water Source Heat Pumps operates as a Primary control, with the remaining modules operating as Secondary. Configured thus, the number of stages required to meet load conditions are determined by the Primary control. Secondary modules will receive the number of stages required from the Primary, and will energize their compressor outputs appropriately in sequence.

In this fashion, a Multi-unit MS/TP system can provide for up to eight total stages of control. A Multi-unit MS/TP system will provide coordinated heat pump operation with the same feature set and sequences of operation as that provided by a Single Unit configuration.

In this configuration, an independent leaving load water temperature safety check at each unit is included to verify that sufficient load water flow is provided. Should the leaving load water temperature fall below the configured "Chilled Water Setpoint" in cooling or the "Hot Water Setpoint" in heating, the compressor stages for any unit (primary or secondary) will be reduced as needed without reducing the system staging requirements.

IMPORTANT: Be sure to configure each secondary unit for standalone operation as a fail-safe. Many individual configuration parameters that are not required or used during secondary operation such as the chilled water and hot water setpoints are hidden once the secondary is linked to a primary unit.

EQUIPMENT ALARM

The W2W provides an alarm output that will illuminate an equipment mounted alarm lamp, and generate a generic Equipment Alarm under certain alarm conditions configured by an

operator. See the Equipment Alarm configuration section for configuration instructions related to Equipment Alarm.

SERVICE TEST

The W2W provides a built in Service Test function to allow the installing technician a means to test the modules process outputs independently.

1. The Isolation Valve Test energizes the control's Isolation Valve Binary Output.
2. The Water Pump Test energizes the control's Water Pump Binary Output.
3. The Compressor Test energizes the control's Compressor Binary Outputs.
4. The Alarm Indicator Test energizes the control's Alarm Indicator Binary Output.

Invoking the Service Test function will disable normal equipment operation. Service Test will operate in accordance with the control's configuration. For example, initiating the Compressor Test function of Service Test on a two-stage heat pump configured to provide both heating and cooling will energize the stages of compression in sequence; first staging up in Cooling, then changing the reversing valve before staging down in Heating. Although the isolation valve and water pump outputs may be tested independently, they will be automatically energized when the Compressor Test is enabled.

Service Test will time out (disable) automatically after 60 minutes should the technician neglect to disable it after completing the test.

Invoking the Service Test function will disable normal equipment operation. Service Test will operate in accordance with the controls' configuration. For example, initiating the Compressor Test function of Service Test on a two-stage heat pump configured to provide both heating and cooling will energize the stages of compression in sequence; first staging up in Cooling, then changing the reversing valve before staging down in Heating. Although the isolation valve and water pump outputs may be tested independently, they will be automatically energized when the Compressor Test is enabled.

Service Test will time out (disable) automatically after 60 minutes should the technician neglect to disable it after completing the test.

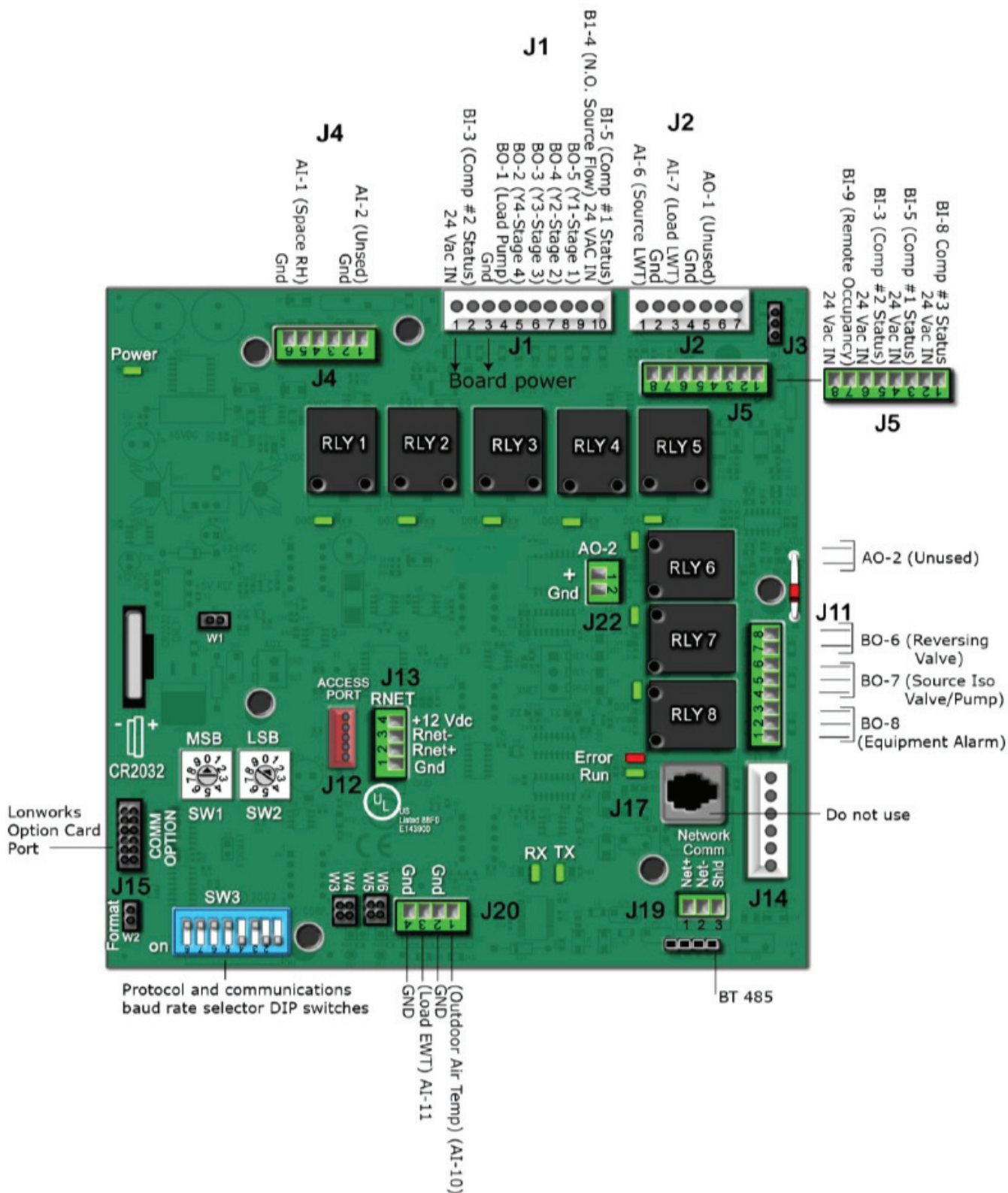


Fig. 21 — W2W Open Control Board

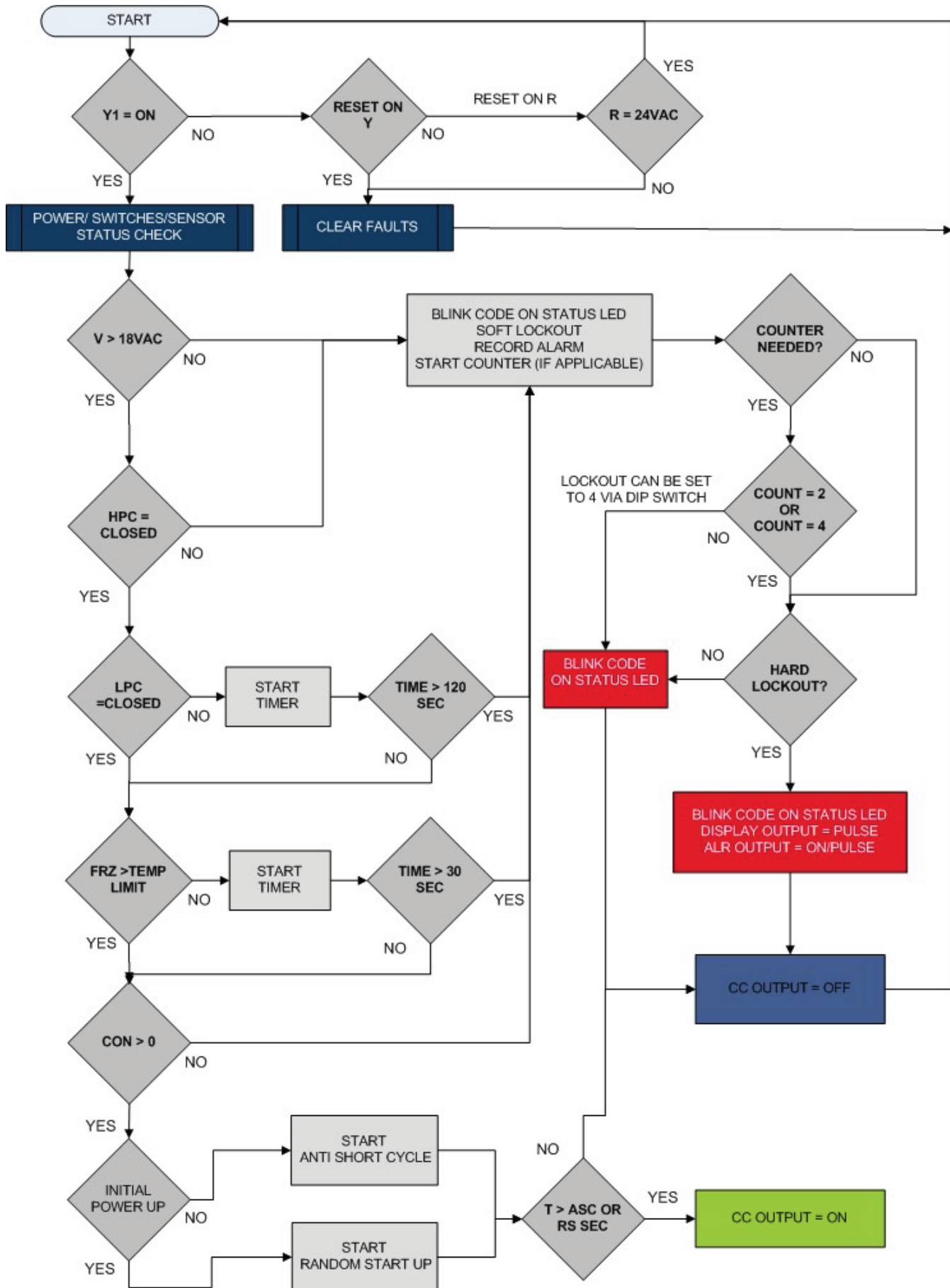


Fig. 22 — Unit Protection Module (UPM) Sequence Of Operation

Configuring Multiple W2W WSHP for MS/TP Operation

On installations having multiple Water-to-Water Source Heat Pumps serving a common load, the heat pumps may be controlled as a singular heating or cooling source utilizing the **Multi-unit MS/TP Operating Mode**.

For these installations, the modules are networked together over the BACnet MS/TP bus. One of the installed Water-to-Water Source Heat Pumps operates as a Primary control, with the remaining modules operating as Secondary. Configured thus, the number of stages required to meet load conditions are determined by the Primary control. Secondary modules will receive the number of stages required from the Primary, and will energize their compressor outputs appropriately in sequence.

In this fashion, a Multi-unit MS/TP system can provide for up to eight total stages of control. A Multi-unit MS/TP system will provide coordinated heat pump operation with the same feature set and sequences of operation as that provided by a Single Unit configuration.

In this configuration, an independent leaving load water temperature safety check at each unit is included to verify that sufficient load water flow is provided. Should the leaving load water temperature fall below the configured "Chilled Water Setpoint" in cooling or the "Hot Water Setpoint" in heating, the compressor stages for any unit (primary or secondary) will be reduced as needed without reducing the system staging requirements.

NOTE: Before configuring the units as a Multi-unit Primary systems, be sure to verify configuration for each secondary unit for standalone operation as a fail-safe. Many individual configuration parameters that are not required or used during secondary operation such as the chilled water and hot water setpoints are hidden (see screen captions below for hidden points) once the secondary is linked to a primary unit. See Fig. 23-25 for visual representations of configuration.

W2W PRIMARY CONFIGURATION PARAMETERS

The following configuration parameters can be accessed in the following figures. (See Fig. 23-25.) Properties→Control Program→Configuration→Service Configuration

Operation Type

Multi-unit MS/TP (default value is Single/Secondary Unit)

Total Controlled Stages

1 - 8 (this variable is the total number of stages of all W2W units to be linked into one single system)

Control Mode Selection

For two pipe systems Manual Heat or Manual/Cool, four pipe systems SPT, OAT, or System T1Temp

Refrigerant Circuits

Configure for the correct number of refrigerant circuits in the unit

Compressor Stages

1 - 4 (this variable is how many stages the Primary unit is capable of using) Default value is 2

W2W SECONDARY CONFIGURATION

The following configuration parameter can be accessed in the following table. Properties→Network Points.

1. **Total Req Sys Comp Stgs** = bacnet://<device instance of primary>/av:88001.

NOTE: This parameter needs to be configured first because configuration parameters for steps #3, #5, #6 below are hidden until the Secondary and Primary units are linked together through **Total Req Sys Comp Stgs**.

The following configuration parameters can be accessed in the following table. Properties→Control Program→Configuration→Service Configuration.

2. **Operation Type** - Single/Secondary unit.
3. **System Stage # Assigned to Y1** - This value defines when each secondary unit will start its first stage Y1 output of control for system staging.
4. **Compressor Stages** - Total number of compressor stages for each individual unit.
5. **Stage Number of 2nd Compressor** - (Option available when **Compressor Stages** = > 2) - On each unit with **Compressor Stages** set to 2 or more, will be used to identify which output stage (if any) will be used to verify feedback of the second compressor, using the second stage feedback input. This is always a one to one relationship unless unloaders are present.
6. **Stage Number of 3rd Compressor** - (Option available when **Compressor Stages** = > 3) - On each unit with **Compressor Stages** set to 3 or more, used to identify which output stage (if any) will be used to verify feedback of the third compressor, using the third stage feedback input. This is always a one to one relationship unless unloaders are present.

Below is an example screen shot of the Service Configuration of a Secondary Unit that has bound to a Primary W2W unit. The Secondary unit has 2 stages of compression and will be the third stage in the system.

Unit Configuration

<u>Heat Enable</u>	(BBV) Enable	Default Value:	Enable ▾	☐ Lock at value:	Disable ▾
<u>Heating Lockout Temperature</u>	(BAV) 60 °F	Default Value:	60.00	☐ Lock at value:	0
<u>Heating Setpoint OA Reset</u>	(BBV) Disable	Default Value:	Disable ▾	☐ Lock at value:	Disable ▾
<u>Cool Enable</u>	(BBV) Enable	Default Value:	Enable ▾	☐ Lock at value:	Disable ▾
<u>Cooling Lockout Temperature</u>	(BAV) 65 °F	Default Value:	65.00	☐ Lock at value:	0
<u>Cooling Setpoint OA Reset</u>	(BBV) Disable	Default Value:	Disable ▾	☐ Lock at value:	Disable ▾
<u>Power Fail Restart Delay</u>	(BAV) 60 sec	Default Value:	60.00	☐ Lock at value:	0
<u>Occupancy Schedules</u>	(BBV) Disable	Default Value:	Disable ▾	☐ Lock at value:	Disable ▾

Fig. 23 — W2W Primary Configuration Parameters - Unit Configurations

Setpoints

Cooling Supply Water Temperature

Chilled Water Supply Setpoint (BAV) 44 °F Default Value: 44.00 ☐ Lock at value: 0

Heating Supply Water Temperature

Hot Water Supply Setpoint (BAV) 120 °F Default Value: 120.00 ☐ Lock at value: 0

Heating Demand Limit

Demand Level 1 Heat Adj (BAV) 3 °F Default Value: 3.00 ☐ Lock at value: 0

Demand Level 2 Heat Adj (BAV) 5 °F Default Value: 5.00 ☐ Lock at value: 0

Demand Level 3 Heat Adj (BAV) 7 °F Default Value: 7.00 ☐ Lock at value: 0

Cooling Demand Limit

Demand Level 1 Cool Adj (BAV) 3 °F Default Value: 3.00 ☐ Lock at value: 0

Demand Level 2 Cool Adj (BAV) 3 °F Default Value: 3.00 ☐ Lock at value: 0

Demand Level 3 Cool Adj (BAV) 4 °F Default Value: 4.00 ☐ Lock at value: 0

Fig. 24 — W2W Primary Configuration Parameters - Setpoints

Service Configuration

<u>Unit Size - Nominal Capacity</u>	(BAV) 10 tons	Default Value:	10.00
<u>Operation Type</u>	(BBV) Single/Slave Unit	Default Value:	Single/Slave Unit ▾
<u>System Stage # Assigned to Y1</u>	(BAV) 3	Default Value:	3.00
<u>Compressor Stages</u>	(BMSV) Two Stage	Default Value:	Two Stage ▾
<u>Refrigeration circuits</u>	(BMSV) Dual	Default Value:	Dual ▾
<u>Stage Number of 2nd Compressor</u>	(BMSV) Three	Default Value:	Three ▾

Fig. 25 — W2W Primary Configuration Parameter - Service Configuration

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: 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: 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.

⚠ WARNING

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

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

Check P trap frequently for proper operation.

⚠ CAUTION

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

Refrigerant System

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

Condenser Cleaning

Water-cooled condensers may require cleaning of scale (water deposits) due to improperly maintained closed-loop water systems. 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.)

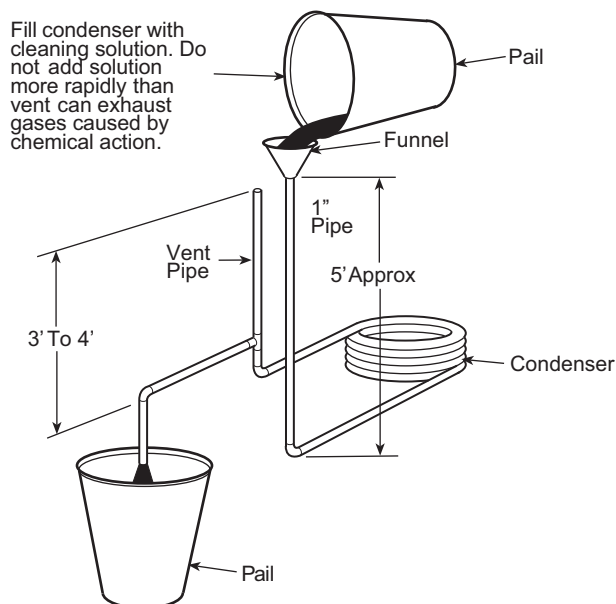


Fig. 26 — Gravity Flow Method

FORCED CIRCULATION METHOD

Fully open vent pipe when filling condenser. The vent may be closed when condenser is full and pump is operating. (See Fig. 27.) Regulate flow to condenser with a supply line valve. If pump is a non-overloading type, the valve may be fully closed while pump is running.

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

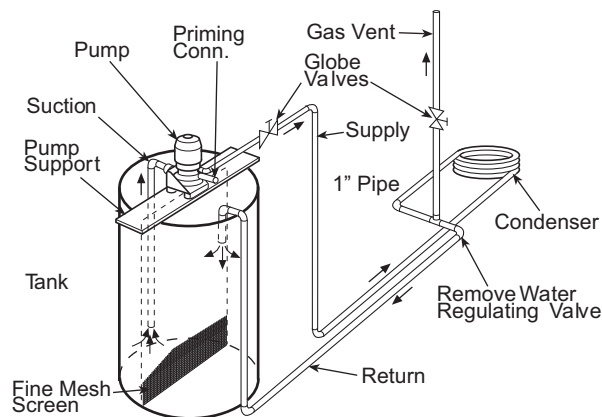


Fig. 27 — Forced Circulation Method

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 gauge.
NOTE: Operate unit a minimum of 15 minutes before checking charge. From standard field-supplied Pressure-Temperature chart for R-410A, find equivalent saturated condensing temperature.
4. Read liquid line temperature on thermometer; then subtract from saturated condensing temperature. The difference equals subcooling temperature.

Refrigerant Charging

WARNING

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

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

TROUBLESHOOTING

When troubleshooting problems arise with a WSHP, refer to Table 11 for fault codes. See Table 12 for troubleshooting solutions. The UPM on each unit includes an alarm indicator with blink codes to indicate UPM fault.

Table 11 — Fault Codes

BLINK CODE	SINGLE COMPRESSOR SIZES 025-071, 180, AND 210	DUAL COMPRESSOR SIZES 122, 240-420
One Blink	High Pressure	High Pressure 1
Two Blinks	Low Pressure	Low Pressure 1
Three Blinks	Source Side Freeze	High Pressure 2
Four Blinks	Not Used on PSW	Low Pressure 2
Five Blinks	Brown Out	Freeze (Load or Source)
Six Blinks	Load Side Freeze	Not Used on These Sizes
Seven Blinks	Not Used on These Sizes	Brown Out

Table 12 — Troubleshooting

FAULT	POSSIBLE CAUSE	SOLUTION
COMPRESSOR DOES NOT OPERATE	Power Supply Off	Apply power, close disconnect.
	Blown Fuse	Replace fuse or reset circuit breaker. Check for correct fuses.
	Broken or Loose Wires	Replace or tighten the wires. Check for loose or broken wires at compressor, capacitor, or contactor..
	Voltage Supply Low	If voltage is below minimum voltage specified on unit data plate, contact local power company.
	Controller	Set controller to "COOL" and lowest temperature setting, the unit should run in the cooling mode (reversing valve energized). Set unit to "HEAT" and the highest temperature setting, the unit should run in the heating mode. If the compressor does not run in all cases, the controller could be miswired or faulty. To ensure miswired or faulty thermostat verify 24 volts is available on the unit section low voltage terminal strip between "R" and "C," "Y" and "C," and "O" and "C." Replace the controller if defective.
	Safety Controls	Reset the controller to "OFF." After a few minutes turn to "COOL" or "HEAT." If the compressor runs, unit was off on one of the safety controls. (See problem for possible causes).
	Compressor Overload Open	If the compressor is cool and the overload will not reset, replace compressor.
	Compressor Motor Grounded	Internal winding grounded to the compressor shell. Replace compressor. If compressor burnout, install suction filter drier.
	Compressor Windings Open	After compressor has cooled, check continuity of the compressor windings. If the windings are open, replace the compressor.
UNIT OFF ON HIGH-PRESSURE SWITCH	Discharge Pressure Too High	In "COOLING" mode: SOURCE COIL - Lack of or inadequate water flow. Entering water temperature too warm. Scaled or plugged condenser. In "HEATING" mode: LOAD COIL - Lack of or inadequate water flow. Entering water temperature too warm. Scaled or plugged load coil.
	Refrigerant Charge	The unit is overcharged with refrigerant. Recover refrigerant, evacuate and recharge with factory recommended charge.
	High-pressure Switch	Check for defective or improperly calibrated high-pressure switch.
UNIT OFF ON LOW-PRESSURE SWITCH	Suction Pressure Too Low	In "COOLING" mode: LOAD COIL - Lack of or inadequate fluid flow. Entering water temperature too cold. Scaled or plugged load coil. In "HEATING" mode: SOURCE COIL - Lack of or inadequate fluid flow. Entering water temperature too cold. Scaled or plugged source coil.
	Refrigerant Charge	The unit is low on refrigerant. Check for refrigerant leak, repair, evacuate and recharge with factory recommended charge.
	Low-pressure Switch	Check for defective or improperly calibrated low-pressure switch.
UNIT SHORT CYCLES	Unit Oversized	Recalculate heating and or cooling loads.
	Wiring and Controls	Loose connections in the wiring or a defective compressor contactor.
	Fluid Volume	Inadequate load side fluid volume.
INSUFFICIENT COOLING OR HEATING	Unit Undersized	Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem. Unit may be short of refrigerant.
	Refrigerant Charge	Unit may be short on refrigerant charge.
	Compressor	Check for defective compressor. If discharge is too low and suction pressure is too high, compressor is not pumping properly. Replace compressor.
	Reversing Valve	Defective reversing valve creating bypass of refrigerant from discharge to suction side of compressor. Replace reversing valve.
	Operating Pressures	Compare unit operating pressures to the pressure / temperature chart for the unit.
	TXV	Check TXV (thermostatic expansion valve) for possible restriction or defect. Replace if necessary.
	Moisture, Noncondensables	The refrigerant system may be contaminated with moisture or noncondensables. Recover refrigerant, evacuate and recharge with factory recommended charge. Note: a liquid line drier may be required.

**50PSW
START-UP CHECKLIST**

NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation, Start-Up and Service Instructions.

CUSTOMER: _____ JOB NAME: _____
MODEL NO.: _____ SERIAL NO.: _____ DATE: _____
LOOP TYPE: _____ ANTIFREEZE TYPE AND %: _____

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 _____ PHASE CA VOLTS _____
(if 3 phase) (if 3 phase)

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

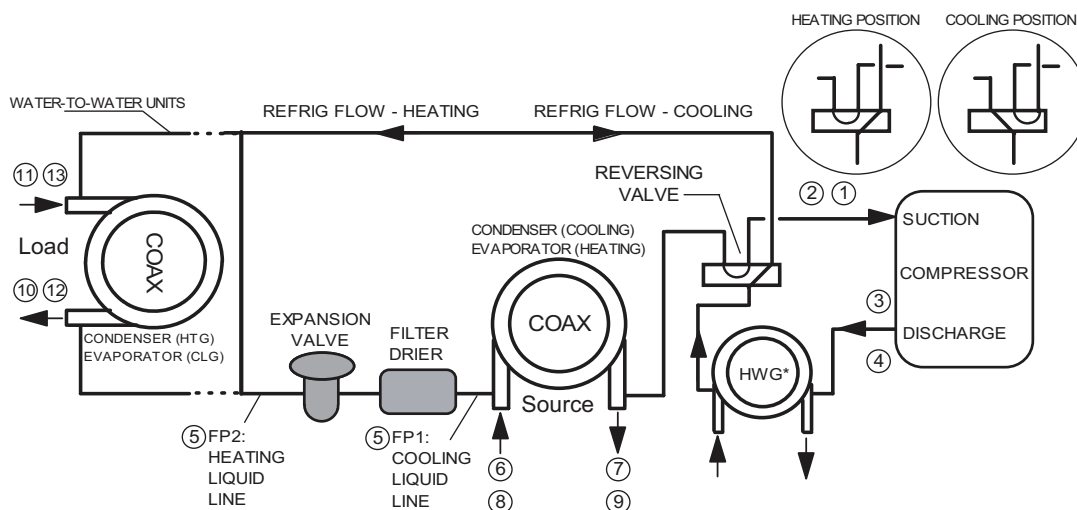
COAXIAL HEAT EXCHANGER COOLING CYCLE:
 FLUID IN _____ F FLUID OUT _____ F _____ PSI _____ FLOW

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 AND COOLING CYCLE ANALYSIS



LEGEND

CLG — Cooling
 HTG — Heating

*Turn off HWG (hot water generator)
 before troubleshooting.

DESCRIPTION	HEATING	COOLING	NOTES
Voltage			
Compressor Amp			
1 Suction Temperature			
2 Suction Pressure			
2a Saturation Temperature			
2b Superheat			
3 Discharge Temperature			
4 Discharge Pressure			
4a Saturation Temperature			
4b Subcooling			
5 Liquid Line Temperature			
6 Source Water In Temperature			
7 Source Water Out Temperature			Temperature Difference —
8 Source Water In Pressure			
9 Source Water Out Pressure			
9a Pressure Drop			
9b Flow Rate (gpm)			
10 Load Water In Temperature			
11 Load Water Out Temperature			Temperature Difference —
12 Load Water In Pressure			
13 Load Water Out Pressure			
13a Pressure Drop			
13b Flow Rate (gpm)			

HEAT OF EXTRACTION (ABSORPTION) OR HEAT OF REJECTION =

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

SUPERHEAT = SUCTION TEMPERATURE – SUCTION SATURATION TEMPERATURE
= _____ (DEG F)

SUBCOOLING = DISCHARGE SATURATION TEMPERATURE – LIQUID LINE TEMPERATURE
= _____ (DEG F)

*Use 500 for water, 485 for antifreeze.

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE