

**GP Series  
Geothermal Heat Pump  
Sizes 024, 036, 048, 060, 072**

# Installation Instructions

**NOTE:** Read the entire instruction manual before starting the installation.

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Information in these installation instructions pertains only to GP series units.

## SAFETY CONSIDERATIONS

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

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes and current editions of the National Electrical Code ( NEC ) NFPA 70. In Canada, refer to current editions of the Canadian electrical code CSA 22.1.

Recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words; DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **would** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.



## WARNING

### ELECTRICAL SHOCK HAZARD

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

Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position. There may be more than 1 disconnect switch. Lock out and tag switch with a suitable warning label.



## WARNING



### EXPLOSION HAZARD

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

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

# APPLICATION CONSIDERATIONS

## 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.

Anti-freeze solutions are utilized when low evaporating conditions are expected to occur. Refer to the Flow Center installation manuals for more specific instructions. (See Fig. 1)

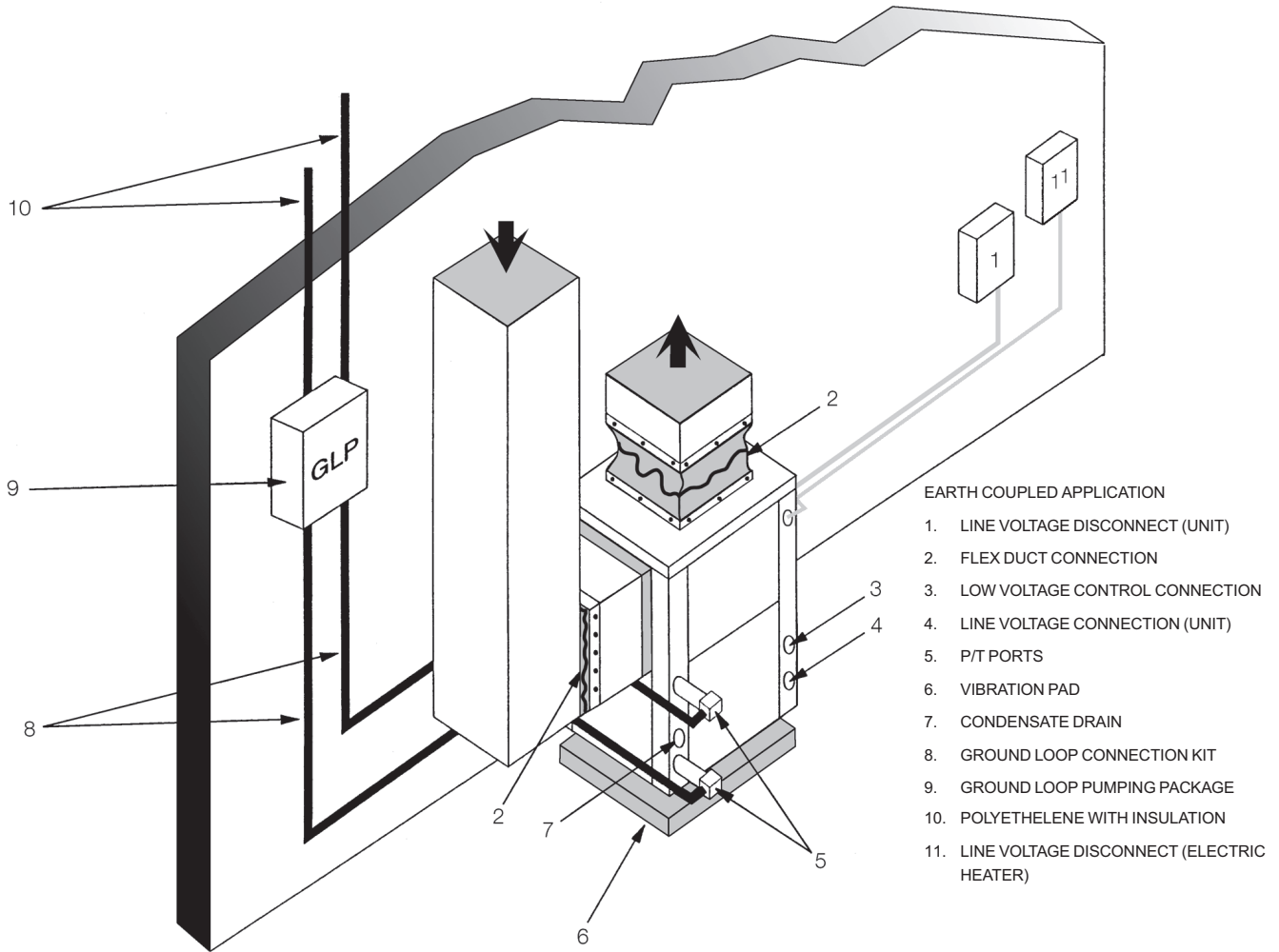


Fig. 1 - Earth Coupled Application

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## Well Water Systems

**IMPORTANT:** Table 1 must be consulted for water quality requirements when using open loop systems. A water sample must be obtained and tested, with the results compared to the table. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH is <7.5 and the calcium hardness is <100 ppm, the potential for scaling is low. For numbers out of the range listed, a monitoring plan must be implemented due to probable scaling.

Other potential issues such as iron fouling, corrosion, erosion and clogging must be considered. Careful attention to water conditions must be exercised when considering a well water application.

Failure to perform water testing and/or applying a geothermal heat pump to a water supply that does not fall within the accepted quality parameters will be considered a mis-application of the unit and resulting heat exchanger failures will not be covered under warranty. Where a geothermal system will be used with adverse water conditions, a suitable plate-frame heat exchanger **MUST** be used to isolate the well water from the geothermal unit.

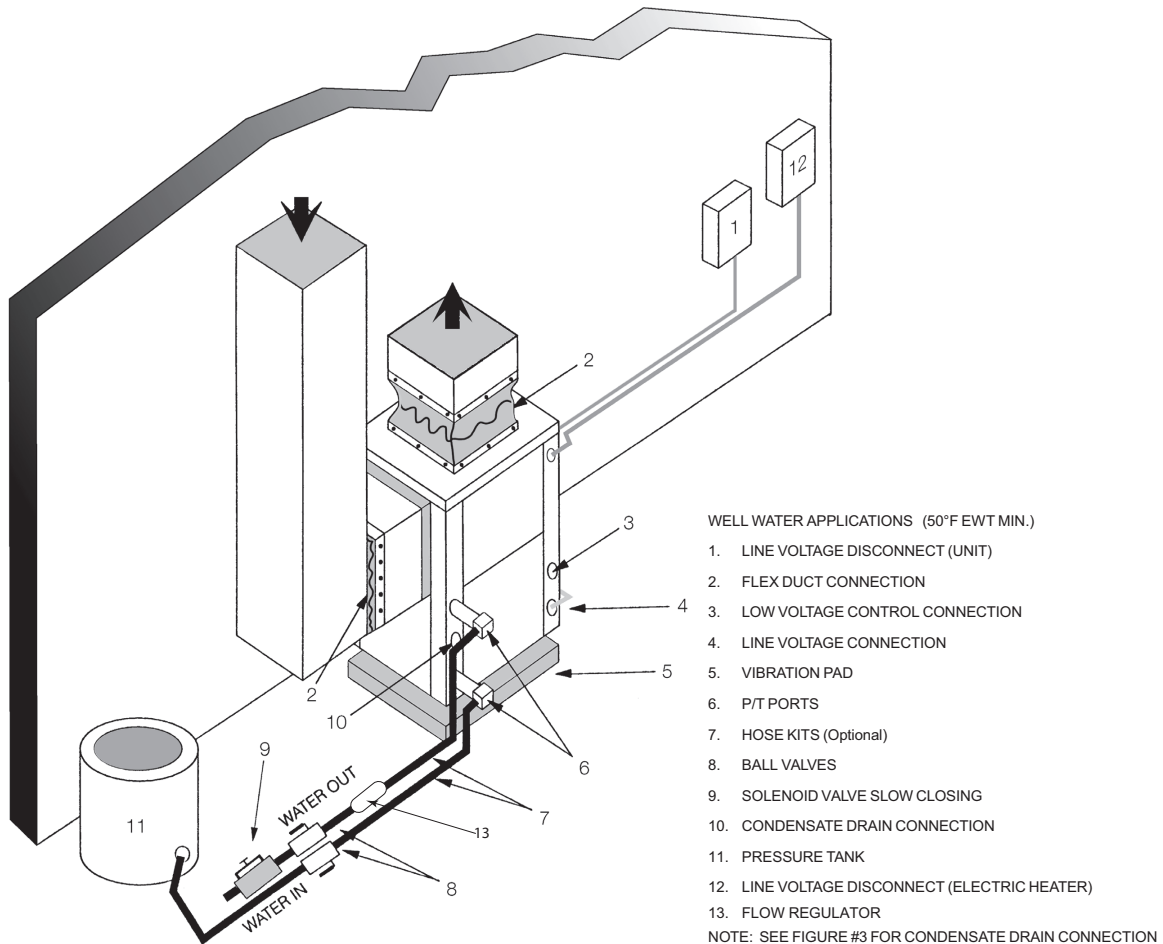
Proper testing is required to assure the well water quality is suitable for use with water source equipment.

In conditions anticipating moderate scale formation or in brackish water, a cupronickel heat exchanger is recommended. Copper is adequate for ground water that is not high in mineral content.

In well water applications, water pressure must always be maintained in the heat exchanger. This can be accomplished with either a control valve or a bladder type expansion tank.

When using a single water well to supply both domestic water and the heat pump, care must be taken to insure that the well can provide sufficient flow for both.

In well water applications, a slow closing solenoid valve must be used to prevent water hammer (hammering or stuttering sound in the pipeline). Solenoid valves should be connected across Y1 and C1 on the interface board for all. Make sure that the VA draw of the valve does not exceed the contact rating of the thermostat. (See Fig. 2)



**Fig. 2 - Well Water Application**

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**Table 1 – Water Quality Requirements for Open-Loop Geothermal Heat Pump System**

Water Quality Parameter	HX Material	Closed Recirculating	Open Loop and Recirculating Well		
<b>Scaling Potential - Primary Measurement</b> Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below:					
pH/Calcium Hardness Method	All	--	pH <7.5 and Ca Hardness <100ppm		
<b>Index Limits for Probable Scaling Situations - (Operation outside these limits is not recommended)</b> 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	--	6.0 - 7.5 If > 7.5 minimize steel pipe use		
Langelier Saturation Index	All	--	-0.5 to +0.5 If <-0.5 minimize steel pipe use. Based upon 150°F HWG and Direct well, 84°F Indirect Well HX		
<b>Iron Fouling</b>					
Iron Fe <sup>2</sup> (Ferrous) (Bacterial Iron Potential)	All	--	<0.2 ppm (Ferrous) If Fe <sup>2+</sup> (ferrous) >0.2 ppm with pH 6-8, O <sub>2</sub> <5 ppm check for iron bacteria		
Iron Fouling	All	--	<0.5 ppm of Oxygen Above this level deposition will occur		
<b>Corrosion Prevention</b>					
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 <sub>2</sub> S)	All	--	At H S>0.2 ppm, avoid use of copper and copper nickel piping or HXs. Rotten egg smell appears at 0.5 ppm level. Copper alloy (bronze or brass) cast components are OK to <0.5 ppm		
Ammonia ion as hydroxide, chloride, nitrate and sulfate compounds	All	--	<0.5 ppm		
Maximum Chloride Levels			<b>Maximum Allowable at Maximum Water Temperature</b>		
			<b>50°F</b>	<b>75°F</b>	<b>100°F</b>
	Copper	--	<20 ppm	NR	NR
	cupronickel	--	<150 ppm	NR	NR
	304 SS	--	<400 ppm	<250 ppm	<150 ppm
	316 SS	--	<1000 ppm	<550 ppm	<375 ppm
			>1000 ppm	>550 ppm	>375 ppm
<b>Erosion and Clogging</b>					
Particulate Size and Erosion	All	<10 ppm of particles and a maximum velocity of 1.8 m/s. Filtered for maximum 841 micron [0.84 mm 20 mesh] size	<10 ppm (<1 ppm "sandfree" for re-injection) of particles and a maximum velocity of 1.8 m/s. Filtered for maximum 841 micron [0.84 mm. 20 mesh] size. Any particulate that is not removed can potentially clog components		

**NOTES:**

- Closed recirculating system is identified by a closed pressurized piping system.
- Recirculating open wells should observe the open recirculating design considerations.
- NR - application not recommended
- "—" No design Maximum

## INSTALLATION RECOMMENDATIONS

These Water-to-Air Heat Pumps provide the best combination of performance and efficiency available. Safety devices are built into each unit to provide the maximum system protection possible when properly installed and maintained.

The GP Water-to-Air Heat Pumps are performance certified to American Heating and Refrigeration Institute (AHRI) ISO Standard 13256-1. All GP Water-to-Air Heat Pumps conform to UL1995 standard and are certified to CAN/CSA C22.1 No 236 by Intertek-ETL. The Water-to-Air Heat Pumps are designed to operate with entering fluid temperature between 20°F to 90°F in the heating mode and between 30°F to 120°F in the cooling mode.

**IMPORTANT:** 50° Min. EWT (entering water temperature) for well water applications with sufficient water flow to prevent freezing. Antifreeze solution is required for all closed loop applications. Cooling Tower/Boiler and Earth Coupled (Geo Thermal) applications should have sufficient antifreeze solution to protect against extreme conditions and equipment failure. **Frozen water coils are not covered under warranty.**

**IMPORTANT:** This product should not be used for temporarily heating or cooling during construction. Doing so may effect the unit's warranty.

### **WARNING**

#### **UNIT OPERATION AND SAFETY HAZARD**

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

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

### **CAUTION**

#### **CUT HAZARD**

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing and gloves when handling parts.

## Check Equipment and Job Site

### Moving and Storage

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal upright position as indicated by the "UP" arrows on each carton at all times.

### **CAUTION**

#### **EQUIPMENT DAMAGE HAZARD**

Failure to follow this caution may result in equipment damage.

If unit stacking is required for storage, stack units as follows:

**Do not stack units larger than 6 tons!**

Vertical units: less than 6 tons, no more than two high.

Horizontal units: less than 6 tons, no more than three high.

### Inspect Equipment

Be certain to inspect all cartons or crates on each unit as received at the job site before signing the freight bill. Verify that all items have been received and that there are no visible damages; note any shortages or damages on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damages not discovered until after removing the units from the packaging must be reported to the carrier within 24 hours of receipt.

### Location / Clearance

Locate the unit in an indoor area that allows easy removal of the filter and access panels, and has enough room for service personnel to perform maintenance or repair. Provide sufficient room to make fluid, electrical, and duct connection(s). If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the space. On horizontal units, allow adequate room below the unit for a condensate drain trap and do not locate the unit above supply piping.

### **CAUTION**

#### **UNIT OPERATION HAZARD**

Failure to follow this caution may result in equipment damage or improper operation.

These units are not approved for outdoor installation; therefore, they must be installed inside the structure being conditioned. Do not locate in areas that are subject to freezing.

### **CAUTION**

#### **UNIT OPERATION HAZARD**

Failure to follow this caution may result in equipment damage or improper operation.

Discharge air configuration change is not possible on Heat Pumps equipped with Electric Heat Option.

## MOUNTING VERTICAL UNITS

Vertical units up to six tons are available in left or right air return configurations. Vertical 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. See Fig. 3.

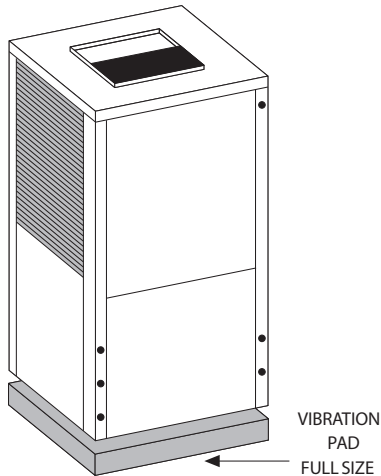


Fig. 3 - Vibration Absorbing Pad

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## MOUNTING HORIZONTAL UNITS

While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. The manufacturer recommends these be attached to the unit corners by hanger bracket kits (see Fig. 4). The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details.

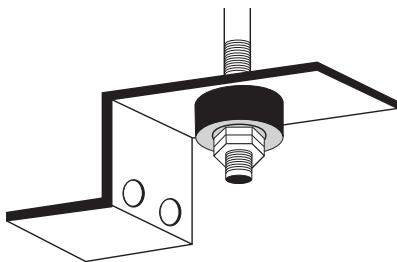


Fig. 4 - Hanger Bracket Kit

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**IMPORTANT:** Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan, if required by code, should be at least four inches larger than the bottom of the heat pump.

Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc. Some applications require an attic floor installation of the horizontal unit. In this case, the unit should be set in a full size secondary drain pan on top of a vibration absorbing mesh.

The Secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling.

The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing mesh.

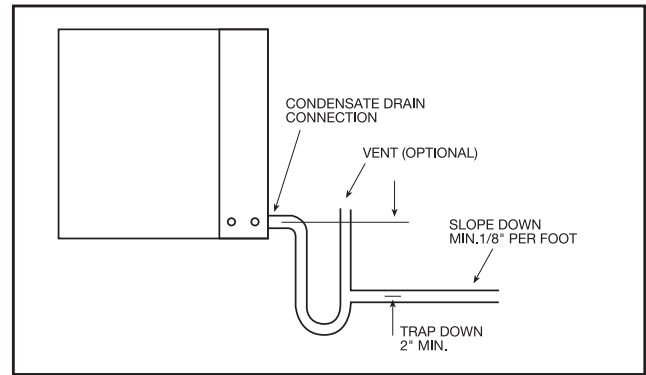
In both cases, a 3/4" drain connected to this secondary pan should be run to an eave at a location that will be noticeable. If the unit is located in a crawl space, the bottom of the unit must be at least 4" above grade to prevent flooding of the electrical parts due to heavy rains.

**IMPORTANT:** Horizontal (HZ) units must be installed pitched toward the Condensate Drain Connection 1/8" per foot.

**NOTE:** HZ unit condensate drain pan is NOT internally sloped.

## CONDENSATE DRAIN

**IMPORTANT:** If equipped with float style condensate overflow switch, final adjustment must be made in the field.



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Fig. 5 - Condensate Drain

A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the unit.

**IMPORTANT:** This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow. Heat Pumps are not internally trapped.

A vertical air vent is sometimes required to avoid air pockets. The length of the trap depends on the amount of positive or negative pressure on the drain pan. A second trap must not be included.

## DUCT SYSTEM

A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. Refer to the individual Product Data for physical dimensions of collar and flange.

**NOTE:** Supply air duct and return air duct flanges are shipped unfolded with unit.

A flexible connector is recommended for supply and return air duct connections on metal duct systems. All metal ducting should be insulated with a minimum of one inch duct insulation to avoid heat loss or gain and prevent condensate from forming during the cooling operation.

Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected.



## CAUTION

### UNIT OPERATION HAZARD

Failure to follow this caution may result in improper equipment operation.

Do not connect discharge ducts directly to the blower outlet.

The factory provided air filter must be removed when using a filter back return air grill. The factory filter should be left in place on a free return system.

If the unit will be installed in a new installation which includes new duct work, the installation should be designed using current ASHRAE procedures for duct sizing.

If the unit is to be connected to existing duct work, a check should be made to assure that the duct system has the capacity to handle the air required for the unit application.

If the duct system is too small, larger duct work should be installed. Check for existing leaks and repair.

The duct system and all diffusers should be sized to handle the designed air flow quietly. To maximize sound attenuation of the unit blower, the supply and return air plenums should be insulated. There should be no direct straight air path through the return air

grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air grille. If air noise or excessive air flow are a problem, the blower speed can be changed to a lower speed to reduce air flow.

### PIPING

Supply and return piping must be as large as the unit connections on the heat pump (larger on long runs).

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in improper equipment operation.

Never use flexible hoses of a smaller inside diameter than that of the fluid connections on the unit.

GP units are supplied with either a copper or optional cupro-nickel condenser. Copper is adequate for ground water that is not high in mineral content.

**NOTE:** Proper testing is recommended to assure the well water quality is suitable for use with water source equipment. When in doubt, use cupro-nickel.

In conditions anticipating moderate scale formation or in brackish water, a cupro-nickel heat exchanger is recommended.

Both the supply and discharge water lines will sweat if subjected 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.

⚠ CAUTION

EQUIPMENT DAMAGE AND/OR UNIT OPERATION HAZARD

Failure to follow this caution may result in equipment damage and/or improper operation.

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

Always check carefully for water leaks and repair appropriately. Units are equipped with female pipe thread fittings. Consult Unit Dimensional Drawings.

**NOTE:** Teflon tape sealer should be used when connecting water piping connections to the units to insure against leaks and possible heat exchanger fouling.

**NOTE:** The unit is shipped with water connection O-rings. A 10 pack of O-rings (part #4026) can be ordered through Replacement Components Division (RCD).

**IMPORTANT: Do not over-tighten 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 water flow balancing.

## ELECTRICAL

Refer to electrical component box layout. See Fig. 6.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in equipment damage and/or improper operation.

- Field wiring must comply with local and national electrical codes.
- Aluminum wire is not acceptable for use.
- Power to the unit must be within the operating voltage range indicated on the unit nameplate or on the performance data sheet.
- Operation of unit on improper line voltage or with excessive phase imbalance will be hazardous to the unit, constitutes abuse, and may void the warranty.

Properly sized fuses or HACR circuit breakers must be installed for branch circuit protection. See unit nameplate for maximum fuse or breaker size.

The unit is provided with a concentric knock-out for attaching common trade sizes of conduit, route power supply wiring through this opening.

Always connect the ground lead to the grounding lug provided in the control box and power leads to the line side of compressor contactor as indicated on the wiring diagrams and *Heater Package Compatibility Table*.

**IMPORTANT: Units supplied with internal electric heat require two (2) separate power supplies; one for the unit compressor and one for the electric heater elements, blower motor and control circuit.**

**See data plate for minimum circuit ampacities and maximum fuse/breaker sizing.**

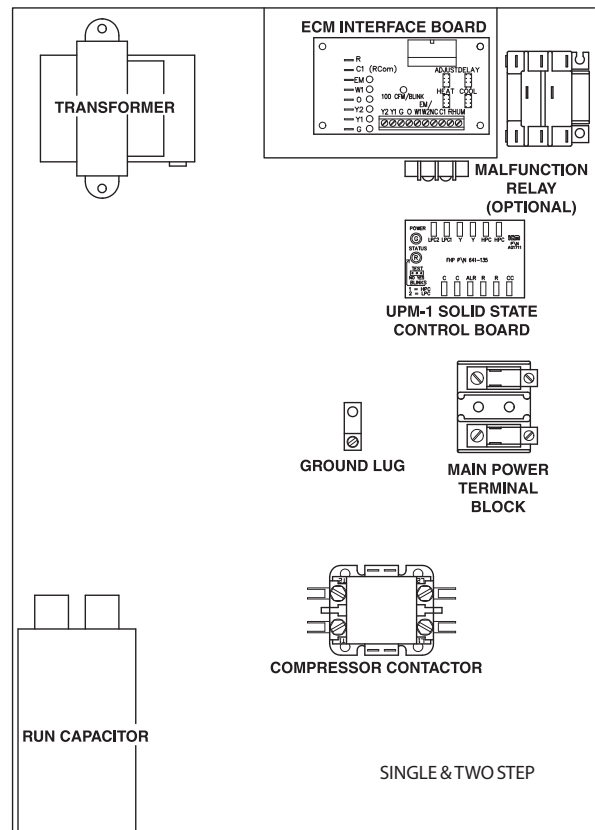
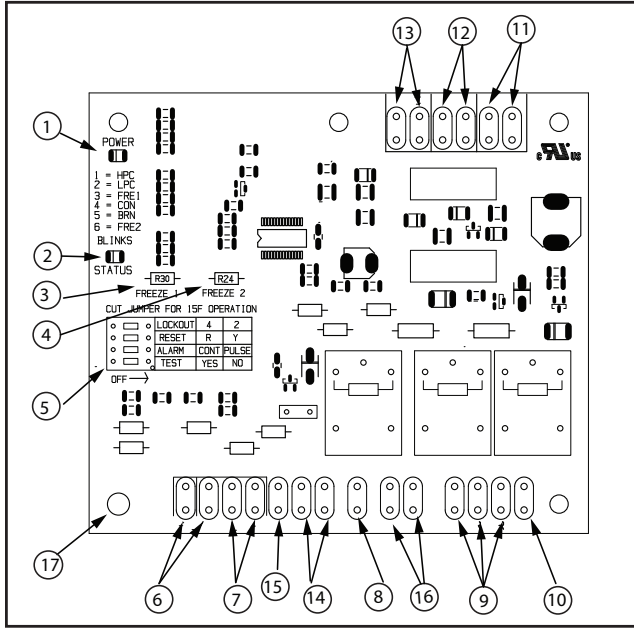


Fig. 6 - Electrical Component Box Layout

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# SAFETY DEVICES AND UPM CONTROLLER



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- |  |                                      |
|--|--------------------------------------|
| (1) Board Power Indicator                                    | (10) Compressor Contact Output       |
| (2) UPM Status LED Indicator                                 | (11) High Pressure Switch Connection |
| (3) Water Coil Freeze Protection Temperature Selection [R30] | (12) Call for Compressor Y1          |
| (4) Air Coil Freeze Protection Temperature Selection         | (13) Low Pressure Switch Connection  |
| (5) UPM Board Settings                                       | (14) 24VAC Power Common              |
| (6) Water Coil Freeze Connection                             | (15) Condensate Overflow Sensor      |
| (7) Air Coil Freeze Connection                               | (16) Dry Contact                     |
| (8) LCD Unit Display Connection                              | (17) UPM Ground Standoff             |
| (9) 24VAC Power Input  |                                      |

**Fig. 7 - Unit Protection Module (UPM)**

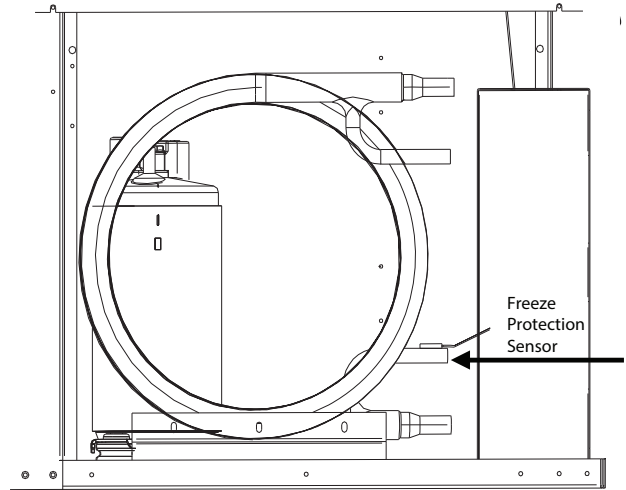
Each unit is factory provided with a Unit Protection Module (UPM) that controls the compressor operation and monitors the safety controls that protect the unit (see Fig. 7).

Safety controls include the following:

- High pressure switch located in the refrigerant discharge line and wired across the HPC terminals on the UPM
- Low pressure switch located in the unit refrigerant suction line and wired across terminals LPC1 and LPC2 on the UPM.
- Freeze protection sensor, mounted close to condensing water coil (see Fig. 8), monitors refrigerant temperature between condensing water coil and thermal expansion valve. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shut down the compressor and enter into a soft lockout condition. The default freeze limit trip is 26°F, however this can be changed to 15°F by cutting the R30 resistor located on top of DIP switch SW1.
- Evaporator freeze protection sensor, mounted after the thermal expansion device and the evaporator, monitors refrigerant temperature between the evaporator coil and thermal expansion valve. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shut down the compressor and enter into a soft lockout condition. The default freeze limit trip is 26°F. See Fig. 9.

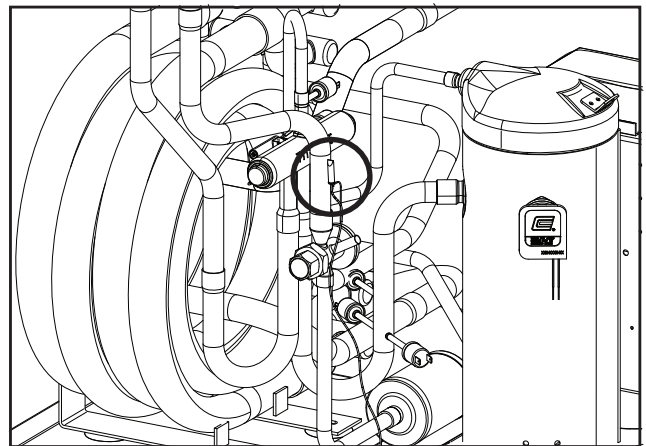
UPM Board Factory Default Settings	
TEMP	30°F
LOCKOUT	2
RESET	Y
ALARM	PULSE
TEST	NO

UPM DIP SWITCH DEFAULT POSITION			
	lockout	4	2
	reset	R	Y
	alarm	Cont	pulse
	test	yes	no



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**Fig. 8 - Freeze Protection Sensor Location**

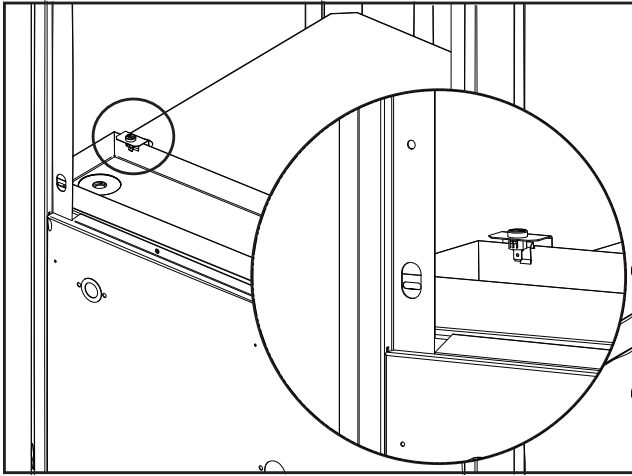


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**Fig. 9 - Evaporator Freeze Protection Sensor Location**



- The condensate overflow protection sensor is located in the drain pan of the unit and connected to the "COND" terminal on the UPM board. See Fig. 10.



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**Fig. 10 - Condensate Overflow Protection Sensor Location**

The UPM Board includes the following features:

- **ANTI-SHORT CYCLE TIMER:** 5 minute delay on break timer to prevent compressor short cycling.
- **RANDOM START:** Each controller has an unique random start delay ranging from 270 to 300 seconds on initial power up to reduce the chance of multiple unit simultaneously starting at the same time after power up or after a power interruption, thus avoiding creating 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. In order to exit 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 below for blink code explanation. 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 on the ALR-OUT terminal when the unit is in the alarm condition.

- **LED FAULT INDICATION-** Two LED Indicators are provided.

**GREEN:** Power LED indicates 118-30 VAC present at the board.

**RED:** Fault indicator with blink codes as follows:

- One Blink -- High pressure lockout
- Two Blinks -- Low pressure lockout
- Three Blinks -- Freeze sensor lockout
- Four Blinks -- Condensate overflow
- Five Blinks -- Brownout

- **DISPLAY OUTPUT:** The Display output is a pulse output connected to the Unit Diagnostic Display (UDD) and it pulses 24VAC when the unit is in an lockout 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.



## CAUTION

### UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

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.

- **FREEZE SENSOR:** The default setting for the freeze limit trip is 26°F refrigerant temperature (sensor number 1); however this can be changed to 15°F by cutting the R30 resistor located on top of the DIP switch SW1. The default setting for the freeze limit trip is 30°F (sensor number 2); however this can be changed to 15°F by cutting the R24 resistor located on top of the DIP switch SW1. Since freeze sensor 2 is dedicated to monitor the evaporator coil, it is recommended to leave the factory default setting on the board. The UPM controller will constantly monitor the refrigerant temperature with the sensor mounted close to the condensing water coil between the thermal expansion valve and water coil. If temperature drops below or remains at the freeze limit trip for 30 seconds, the controller will shut the compressor down and enter into a soft lockout condition. Both the status LED and the Alarm contact will be active.

The LED will flash the code associated with this alarm condition three (3) times. If this alarm occurs 2 times (or 4 if Dip switch is set to 4) within an hour, the UPM controller will enter into a hard lockout condition. It will constantly monitor the refrigerant temperature with the sensor mounted close to the evaporator between the thermal expansion valve and evaporator coil as shown in Fig. 9.

If temperature drops below or remains at the freeze limit trip for 30 seconds, the controller will shut the compressor down and enter into a soft lockout condition. Both the status LED and the alarm contact will be active. The LED will flash the code associated with this alarm condition six (6) times. If this alarm occurs 2 times (or 4 if Dip switch is set to 4) within an hour, the controller will enter into a hard lockout condition.



## CAUTION

### UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Freeze sensor will not guard against the loss of water. A flow switch is recommended to prevent the unit from running if water flow is lost or reduced.

**Table 2 – 10K Temperature Sensor Resistance Table**

°C	°F	OHM	°C	°F	OHM	°C	°F	OHM	°C	°F	OHM
-55	-67	963,800	-9	16	52,410	37	99	6,015	83	181	1,141
-54	-65	895,300	-8	18	49,660	38	100	5,774	84	183	1,105
-53	-63	832,100	-7	19	47,070	39	102	5,545	85	185	1,071
-52	-62	776,800	-6	21	44,630	40	104	5,326	86	187	1,038
-51	-60	719,900	-5	23	42,330	41	106	5,116	87	189	1,006
-50	-58	670,200	-4	25	40,160	42	108	4,916	88	190	975
-49	-56	624,200	-3	27	38,120	43	109	4,725	89	192	945
-48	-54	581,600	-2	28	36,190	44	111	4,542	90	194	916
-47	-53	542,200	-1	30	34,370	45	113	4,368	91	196	889
-46	-51	505,800	0	32	32,650	46	115	4,201	92	198	862
-45	-49	472,000	1	34	31,030	47	117	4,041	93	199	836
-44	-47	440,700	2	36	29,500	48	118	3,888	94	201	811
-43	-45	411,600	3	37	28,050	49	120	3,742	95	203	787
-42	-44	384,700	4	39	26,690	50	122	3,602	96	205	764
-41	-42	359,700	5	41	24,400	51	124	3,468	97	207	741
-40	-40	336,500	6	43	24,170	52	126	3,339	98	208	720
-39	-38	314,900	7	45	23,020	53	127	3,216	99	210	699
-38	-36	294,900	8	46	21,920	54	129	3,099	100	212	679
-37	-35	276,200	9	48	20,890	55	131	2,986	101	214	659
-36	-33	258,800	10	50	19,900	56	133	2,878	102	216	640
-35	-31	242,700	11	52	18,970	57	135	2,774	103	217	622
-34	-29	227,600	12	54	18,090	58	136	2,674	104	219	604
-33	-27	213,600	13	55	17,260	59	138	2,579	105	221	587
-32	-26	200,500	14	57	16,470	60	140	2,488	106	223	571
-31	-24	188,300	15	59	15,710	61	142	2,400	107	225	555
-30	-22	177,000	16	61	15,000	62	144	2,316	108	226	539
-29	-20	166,400	17	63	14,330	63	145	2,235	109	228	525
-28	-18	156,400	18	64	13,380	64	147	2,157	110	230	510
-27	-17	147,200	19	66	13,070	65	149	2,083	111	232	496
-26	-15	138,500	20	68	12,490	66	151	2,011	112	234	483
-25	-13	130,400	21	70	11,940	67	153	1,942	113	235	470
-24	-11	122,800	22	72	11,420	68	154	1,876	114	237	457
-23	-9	115,800	23	73	10,920	69	156	1,813	115	239	445
-22	-8	109,100	24	75	10,450	70	158	1,752	116	241	433
-21	-6	102,900	25	77	10,000	71	160	1,693	117	243	422
-20	-4	97,080	26	79	9,573	72	162	1,637	118	244	411
-19	-2	91,620	27	81	9,166	73	163	1,583	119	246	400
-18	0	86,500	28	82	8,778	74	165	1,531	120	248	389
-17	1	81,700	29	84	8,409	75	167	1,480	121	250	379
-16	3	77,190	30	86	8,057	76	169	1,432	122	252	370
-15	5	72,960	31	88	7,722	77	171	1,386	123	253	360
-14	7	68,980	32	90	7,402	78	172	1,341	124	255	351
-13	9	65,250	33	91	7,098	79	174	1,298	125	257	342
-12	10	61,740	34	93	6,808	80	176	1,256	126	259	333
-11	12	58,440	35	95	6,531	81	178	1,216	127	261	325
-10	14	55,330	36	97	6,267	82	180	1,178	128	262	317

- **HIGH PRESSURE SWITCH:** The high pressure switch safety is designed to shut down the compressor if it exceeds limits. Cut in 420 +/- 15 psig and cut out 600 +/- psig.
- **LOW PRESSURE SWITCH:** The low pressure switch safety is designed to shut down the compressor of loss of charge. Cut in 60 +/- 15 psig and cut out 40 +/- psig.
- **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.  
A single condensate overflow fault will cause the unit to go into a hard lockout immediately, and will require 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”.

**NOTE:** The blower motor will remain active during a lockout condition.

- **ECM TEST MODE:** ECM test mode is to override the motor to constant torque mode for motor troubleshooting. If the motor runs in ECM test mode, the module and motor are good. To engage in ECM test mode, only one switch can be selected. Select TEST ON and all others OFF. Reset the board to NORM ON and TEST OFF when test is complete.

If the unit remains in test mode for normal operation, the system will not run different CFMs based on thermostat call such as Y1, Y2 or dehumidify. It may also experience problems with nuisance strip during electric heat operation.

There is no way to check CFM based on number of blinks if the board is set to test mode.

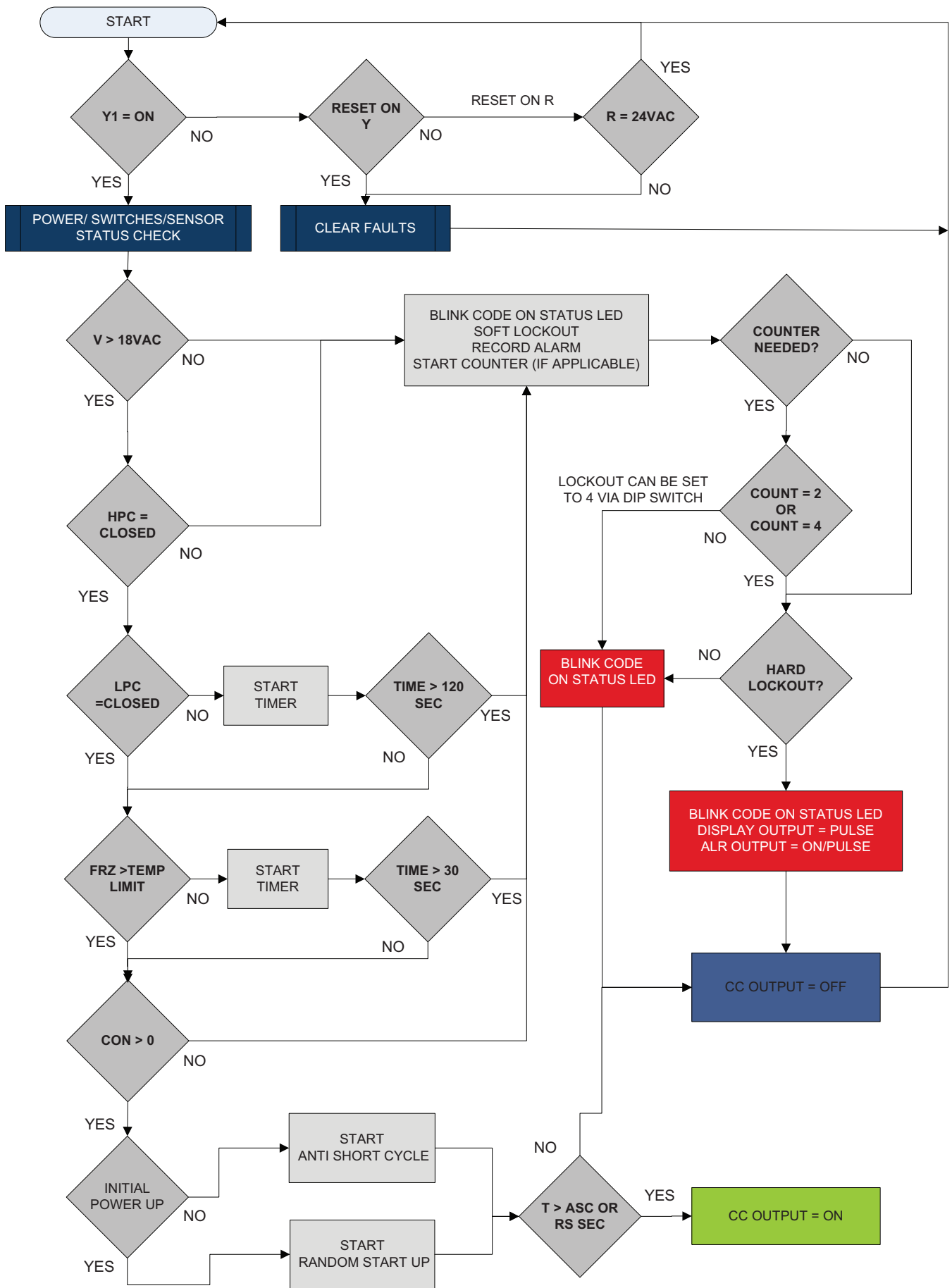
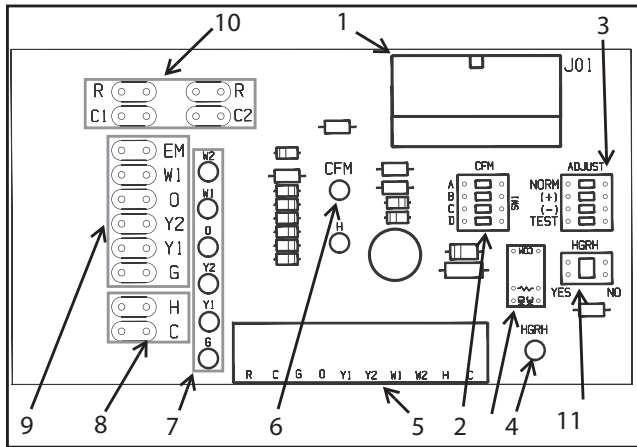


Fig. 11 - UPM Sequence of Operation (SOO) Flow Chart

## ECM INTERFACE BOARD

Refer to Fig. 6, for ECM interface board location. In addition to providing a connecting point for thermostat wiring, the interface board also translates thermostat inputs into control commands for the Electronic Commutated Motor (ECM) DC fan motor and provides thermostat signals to unit's UPM board. The thermostat connections and their functions are as follows:



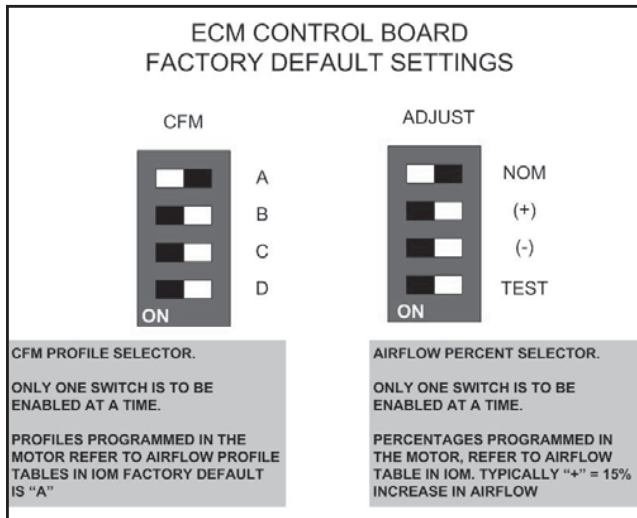
A14124

- |                                 |  |
|---------------------------------|--|
| (1) Motor Harness Plug          | (7) Thermostat Input Status Indication |
| (2) Blower CFM Adjustment       | (8) Reheat Digital Outputs             |
| (3) Motor Settings              | (9) Thermostat Outputs                 |
| (4) Dehumidification Indication | (10) 24 VAC                            |
| (5) Thermostat Contact Inputs   | (11) Dehumidification Method Selector  |
| (6) CFM Count Indicator         |  |

**Fig. 12 - ECM Interface Board**

**NOTE:** CFM LED indication is an approximation. Utilize conventional Test and Balance equipment for accurate airflow measurement.

- CFM count indicator (see Fig. 12, item 6) blinks to indicate approximate airflow in CFM and may flicker when the unit is off.
- Each blink of the LED represent approximately 100 CFM of air delivery so if the LED blinks 12 times, pauses, blinks 12 times, etc. the blower is delivering approximately 1200 CFM.



A14125

**Fig. 13 - ECM Control Board Factory Settings**

## Thermostat Connections

Thermostat wiring is connected to the 10 pin screw type terminal block on the lower center portion of the ECM Interface Board (see Fig 12). In addition to providing a connecting point for thermostat wiring, the interface board also translates thermostat inputs into control commands for the variable speed programmable ECM DC fan motor and displays an LED indication of operating status. The thermostat connections and their functions are as follows:

### Thermostat Outputs

- |       |   |
|-------|---|
| Y1    | First Stage Compressor Operation                              |
| Y2    | Second Stage Compressor Operation                             |
| G     | Fan   |
| O     | Reversing Valve (energized in cooling)                        |
| W1    | Auxiliary Electric Heat (runs in conjunction with compressor) |
| EM/W2 | Emergency Heat (electric heat only)                           |
| NC    | Transformer 24 VAC Common (extra connection)                  |
| C1    | Transformer 24 VAC Common (primary connection)                |
| R     | Transformer 24 VAC Hot  |
| H     | Dehumidification Mode   |

If the unit is being connected to a thermostat with a malfunction light, this connection is made at the unit malfunction output or relay.

**IMPORTANT:** If the thermostat is provided with a malfunction light powered off of the common (C) side of the transformer, a jumper between "R" and "COM" terminal of "ALR" contacts must be made.

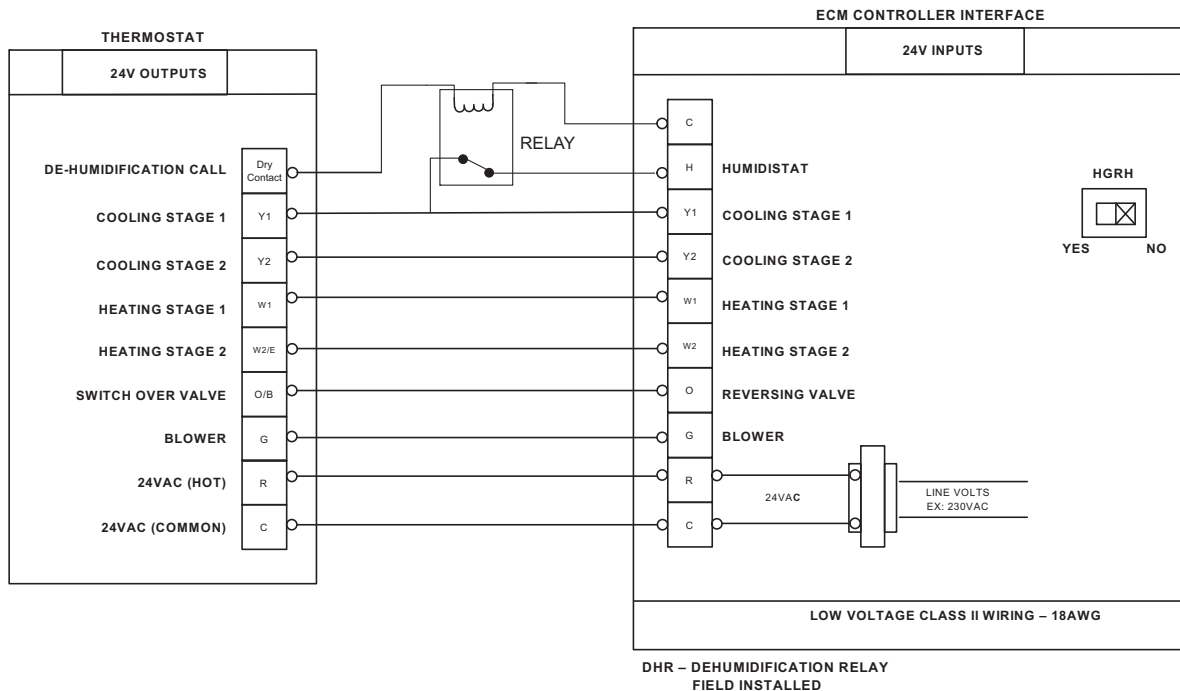
**IMPORTANT:** If the thermostat is provided with a malfunction light powered off of the hot (R) side of the transformer, then the thermostat malfunction light connection should be connected directly to the (ALR) contact on the unit's UPM board.

To the left of the thermostat connection block are a row of 2 red and 4 green LEDs. These LEDs indicate the operating status of the unit. They are labeled as follows:

- |            |   |
|------------|---|
| EM (red)   | Emergency Heat On                                   |
| W1 (red)   | Auxiliary Heat On                                   |
| O (green)  | Reversing Valve Energized (unit is in cooling mode) |
| Y2 (green) | Second Stage Compressor On                          |
| Y1 (green) | First Stage Compressor On                           |
| G (green)  | Fan On  |

**NOTE:** When unit is used with Carrier and Bryant thermostats with Relative Humidity Control (Carrier Edge TP-PRH or TP-NRH / Bryant Preferred T6-PRH or T6-NRH), the unit's dehumidification mode is in reverse logic and will not activate dehum unless a relay, as shown in Fig. 14, is used. A simplified explanation of the reverse logic follows.

	RH	ECM
	Stat Logic:	Board Logic:
No Dehum Demand:	Dh - energized	Dh-not energized
Dehum Demand:	Dh - de-energized	Dh - energized



**Fig. 14 - Cool to Dehumidify Application for Thermostats with Dehumidification (Not required for Cor / Housewise thermostats)**

A150487

Just above the connector block is a single red LED labeled CFM that will blink intermittently when the unit is running and may flicker when the unit is off. This LED indicates the air delivery of the blower at any given time. Each blink of the LED represent approximately 100 CFM of air delivery so if the LED blinks 12 times, pauses, blinks 12 times, etc. the blower is delivering 1200 CFM. Refer to *Motor Profile Air Flow Table* for factory programmed air delivery settings for the GP Series.

**NOTE:** To the right of the thermostat connection block is a green LED labeled “Dehumidify”.

Just above and to the right of the thermostat connection block are four sets of jumper pins labeled ADJ, DELAY, HEAT and COOL. The ADJ set of pins are labeled NORM, (+), (-) and TEST.

GP units will all be set on the NORM position from the factory, however, airflow can be increased (+) or decreased (-) by 15% from the pre-programmed setting by relocating the jumper in this section. The TEST position is used to verify proper motor operation. If a motor problem is suspected, move the ADJ jumper to the TEST position and energize G on the thermostat connection block. If the motor ramps up to 100% power, then the motor itself is functioning normally. Always remember to replace the jumper to NORM, (+) or (-) after testing and reset the unit thermostat to restore normal operation.

**IMPORTANT:** Do not set the ADJ jumper to the (-) setting when electric heaters are installed. Doing so may cause the heaters to cycle on their thermal overload switches, potentially shortening the life of the switches.

The other three sets of jumper pins are used to select the proper program in the ECM motor for the unit. Refer to Table 3 for the proper jumper placement.

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Always disconnect power before changing jumper positions on the interface board and reset the unit afterward.

To the left of the red and green status LEDs is a row of 1/4” male quick connects. These are used to pass thermostat inputs on to the rest of the control circuit. Remember to always turn off unit power at the circuit breaker before attaching or disconnecting any wiring from these connections to avoid accidental short circuits that can damage unit control components.

Units on dehumidification call, the heat pump fan will operate at a lower speed to increase dehumidification while cooling. Dehumidification selector (see Fig. 12, item 11) should be selected to “NO”.

⚠ CAUTION

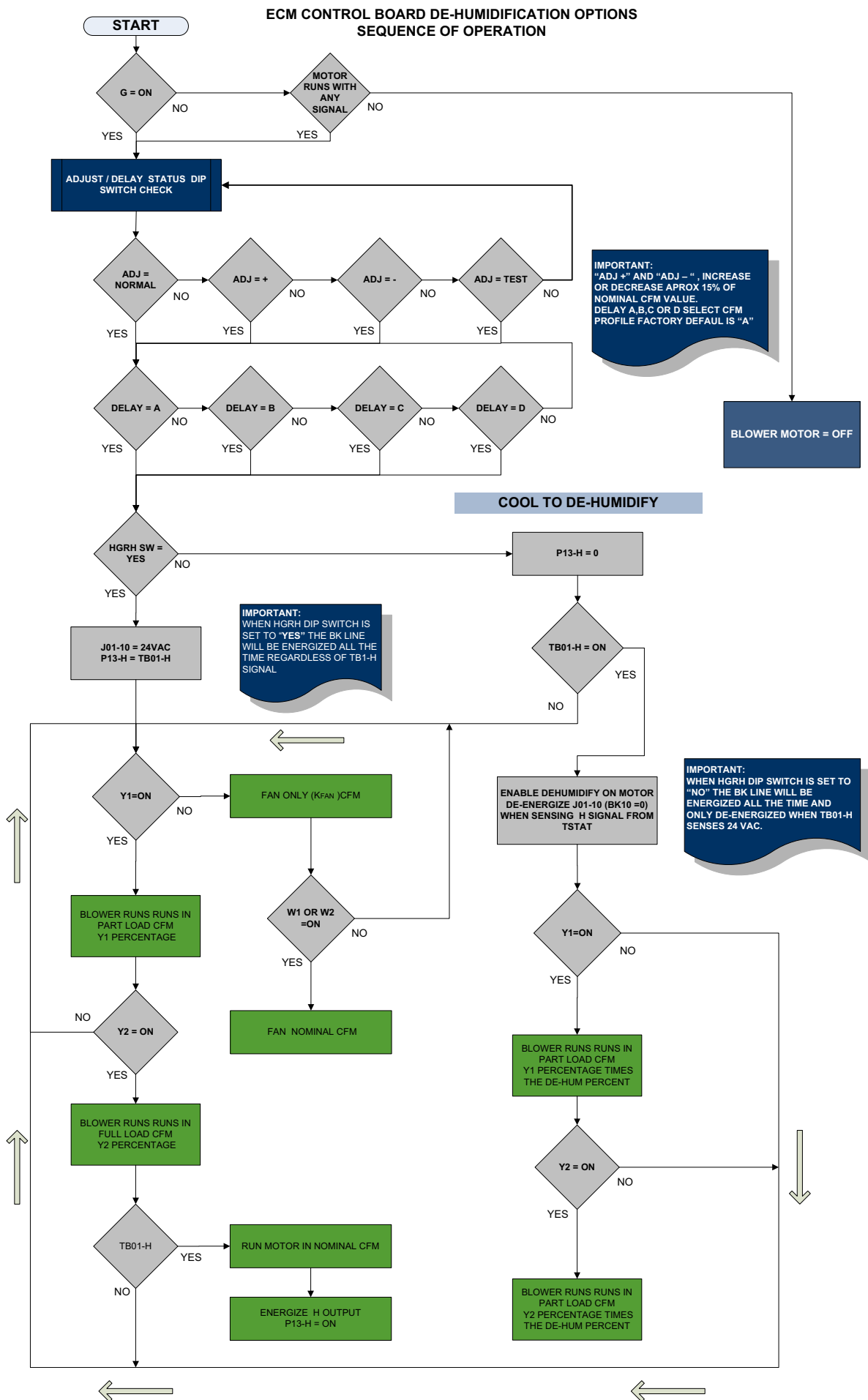
UNIT OPERATION HAZARD

Failure to follow this caution may result in improper equipment operation.

The unit will operate dehumidification mode if thermostat provides both compressor (“Y”) and dehumidification (“H”) call. Refer to the thermostat Installation Instruction to ensure what signals the thermostat provides at dehumidification call

**Table 3 – Motor Profile Air Flow Table CFM 2 Stage Units**

MODEL	FAN ONLY	Y1 COOL/HEAT	Y2 COOL/HEAT	AUX HEAT	EMERG HEAT	PLUS ADJ	MINUS ADJ	TAP COOL/HEAT/DELAY
GP024	450	500	800	800	800	900	700	A
GP036	700	800	1200	1200	1200	1400	1000	A
GP048	900	1000	1600	1600	1600	1800	1400	B
GP060	1200	1400	2000	2000	2000	2100	1900	A
GP072	1600	1600	2200	2200	2200	2300	1900	A



**Fig. 15 - ECM Sequence of Operation**



## FACTORY INSTALLED FEATURES

### Heat Recovery Package (HRP) (optional)

The heat recovery package is a factory installed option on GP series heat pumps. The HRP can be used to heat potable water during unit operation using waste heat from the compressor discharge gas. In some cases the HRP can provide most or all of the hot water requirements for a typical home.

The HRP consists of three major components:

1. Double wall, vented refrigerant to water heat exchanger
2. Circulating pump
3. Control circuit

The heat exchanger is rated for use with potable water and is acceptable for use as a domestic water heating device in most building codes.

The pump circulates water between the domestic hot water tank and HRP heat exchanger in the Heat Pump. The control circuit ensures that the HRP only operates when there is available heat from the compressor and when the water is within a safe temperature range of below 140°F. When the heat pump compressor operates, the HRP will monitor the temperature of the discharge gas from the compressor. Once discharge gas is hot enough to provide useful heat to the domestic water tank, the circulating pump will be enabled, drawing water from the tank, through the HRP heat exchanger and then depositing the heated water back into the tank.

If the water temperature reaches 140°F, the circulating pump is disabled to prevent over heating of the domestic water. The HRP is provided with an on/off switch in case the end user desires that the HRP be inactivated (typically during the winter months when space heating is most important).



## CAUTION

### UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

If heat recovery unit is installed in an area where freezing may occur, the unit must be drained during winter months to prevent heat exchanger damage. Heat exchanger ruptures that occur due to freezing will void the heat recovery package warranty along with the heat pump warranty.

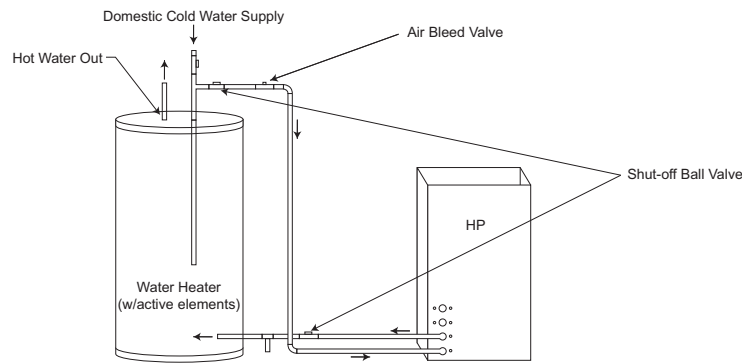
### Water Tank Preparation

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 out doors 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 HRP water piping.

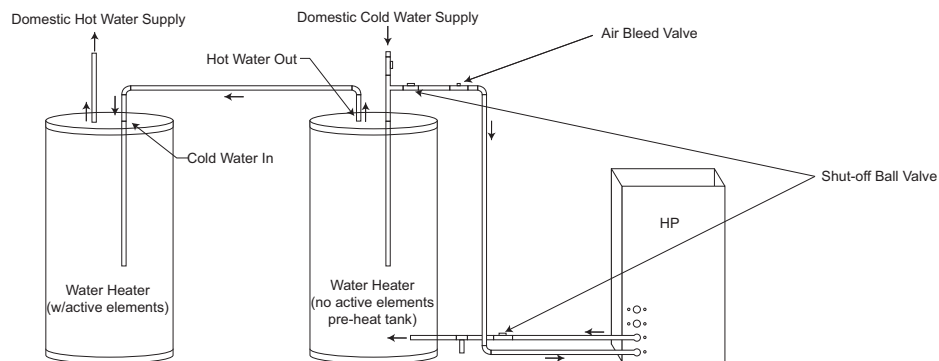
### HRP Water Piping

All hot water piping **MUST** be a minimum of 3/8" O.D. copper tube to a maximum distance of 15 feet. For distances beyond 15 feet, but not exceeding 60 feet, use 1/2" copper tube. Separately insulate all exposed surface of both connecting water lines with 3/8" wall closed cell insulation. Install isolation valves on supply and return to the heat recovery. (See Fig. 16)

#### One Tank System



#### Two Tank System (preferred)



Package unit shown. GP split unit arrangement similar with different water locations on unit.

Fig. 16 - HRP Water Piping

A150174

## 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 HRP 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.

**IMPORTANT: Copper should be used for piping from HRP to domestic water tank(s). Use 5/8" (16mm) O.D. copper or larger. Refer to local codes for hot water piping. Insulate the water lines between the GHP and the water heater with a minimum of 3/8" (10mm) closed cell insulation.**

## Initial Start-Up



## CAUTION

### UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Make sure all valves in heat recovery water piping system are open. NEVER OPERATE HR PUMP DRY.

1. Turn on the heat pump. The HR pump should not run if the compressor is not running.
2. Turn HRP switch to the "ON" position. The pump will operate if entering water temperature to HR is below 120°F.
3. The temperature difference between the water entering and leaving the heat recovery should be 5°F 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 heat recovery reaches 120°F.

## FIELD INSTALLED ACCESSORIES

### Auxiliary Heaters

Internally mounted auxiliary heaters are available in 10 Kw, 15 Kw and 20 Kw sizes. For installation procedures, refer to the instructions shipped with the heaters. Table 4 lists compatible heaters with GP units.

**Table 4 – Electric Heater Compatibility**

GHP Model	Aux. Heat Size Compatibility (Kw)			
	KWBEH0101N		KWBEH0101B	
	05	10	15	20
GP024	•	•	—	—
GP036	•	•	—	—
GP048	•	•	•	—
GP060	•	•	•	•
GP072	•	•	•	•

• = Heater Kit compatible / — = Heater Kit NOT compatible

### Flow Centers and Associated Loop Accessories

A wide variety of flow centers are available for both closed and open loop installations, along with hose kits, fittings, solenoid valves, etc. Refer to the instructions shipped with these components for further details.

## SEQUENCE OF OPERATION - 2-STAGE UNITS

### Cooling Mode

Energizing the "O" terminal energizes the unit reversing valve thus placing the unit into cooling mode. The fan motor starts when the "G" terminal is energized.

**NOTE:** The fan motor will take 30 seconds to ramp up to operating speed and will run at fan only rated air flow as long as there is no call for compressor or heater operation.

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. The fan ramps up to first stage cooling air flow in 30 seconds.

When the thermostat calls for second stage cooling (Y2), the second stage (or full compressor capacity) is initiated. The fan ramps up to full cooling air flow.

Once the thermostat is satisfied, the compressor shuts down and the fan ramps down to either FAN ONLY mode or OFF over a span of 30 seconds.

**NOTE:** A fault condition initiating a lockout will de-energize the compressor irrespective of which stage is engaged.

### Heating Mode

The first two stages of heating (Y1 & Y2) operate in the same manner as cooling, but with the reversing valve de-energized. On a call for auxiliary heat (W1), the fan ramps up to auxiliary heat air flow immediately and the electric heater package is energized along with the compressor.

As the thermostat is satisfied, the heaters will shut off as soon as W1 is de-energized, and the compressors will remain on until the thermostat stages are satisfied.

**NOTE:** If the unit compressor locks out for any reason at this time, the electric heaters will continue to function normally.

Once the thermostat is satisfied, the compressor shuts down and the fan ramps down to either FAN ONLY mode or OFF over a span of 30 seconds.

If Emergency heat (W2/WM) is called for, the fan will ramp up to emergency heat air flow immediately and the heater package will energize in emergency heat mode, all heater elements coming on. On shutdown, the fan will ramp down over a period of 30 seconds.



## SYSTEM CHECKOUT

After completing the installation, and before energizing the unit, the following system checks should be made:

1. Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
2. Make sure that all electrical connections are tight and secure.
3. Check the electrical fusing and wiring for the correct size.



### WARNING

#### ELECTRICAL SHOCK HAZARD

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

Ensure cabinet and electrical box are properly grounded

4. Verify that the low voltage wiring between the thermostat and the unit is correct.
5. Verify that the water piping is complete and correct.
6. Check that the water flow is correct, and adjust if necessary.
7. Check the blower for free rotation, and that it is secured to the shaft.
8. Verify that vibration isolation has been provided.
9. Unit is serviceable. Be certain that all access panels are secured in place.

Considerations:

- 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.
- Long length thermostat and control wiring leads may create voltage drop. Increase wire gauge or up-sized transformers may be required to insure minimum secondary voltage supply.
- The following guidelines are recommended for wiring between a thermostat and the unit: 18 GA up to 60 foot, 16 GA up to 100 ft and 14 GA up to 140 ft.
- Do not apply additional controlled devices to the control circuit power supply without consulting the factory. Doing so may void equipment warranties.
- Check with all code authorities on requirements involving condensate disposal/overflow protection criteria.

## UNIT START-UP

**NOTE:** A unit Start-Up checklist is included in the unit packet. Complete the Checklist and place it in the customer file at your dealership.

1. Set the thermostat to the highest setting.
2. Set the thermostat system switch to “COOL”, and the fan switch to the “AUTO” position. The reversing valve solenoid should energize. The compressor and fan should not run.
3. Reduce the thermostat setting approximately 5 degrees below room temperature.
4. Verify the heat pump is operating in the cooling mode.
5. Turn the thermostat system switch to the “OFF” position. The unit should stop running and the reversing valve should de-energize.
6. Leave the unit off for approximately five (5) minutes to allow for system equalization.
7. Turn the thermostat to the lowest setting.
8. Set the thermostat switch to “HEAT”.

9. Increase the thermostat setting approximately five (5) degrees above room temperature.
10. Verify the heat pump is operating in the heating mode.
11. Set the thermostat to maintain desired space temperature.
12. Check for vibrations, leaks, etc.

## MAINTENANCE

1. Filter changes or cleanings are required at regular intervals. The time period between filter changes will depend upon type of environment the equipment is used in.

In a single family home, that is not under construction, changing or cleaning the filter every 60 days is sufficient. In other applications such as motels, where daily vacuuming produces a large amount of lint, filter changes may need to be as frequent as biweekly.



### CAUTION

#### UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Equipment should never be used during construction due to likelihood of wall board dust accumulation in the air coil of the equipment which permanently affects the performance and may shorten the life of the equipment.

2. An annual “checkup” is recommended by a licensed refrigeration mechanic. Recording the performance measurements of volts, amps, and water temperature differences (both heating and cooling) is recommended. This data should be compared to the information on the unit’s data plate and the data taken at the original startup of the equipment.
3. Lubrication of the blower motor is not required, however may be performed on some motors to extend motor life. Use SAE-20 non-detergent electric motor oil.
4. The condensate drain should be checked annually by cleaning and flushing to insure proper drainage.
5. Periodic lockouts are commonly caused by air or water flow problems. The lockout (shutdown) of the unit is a normal protective measure in the design of the equipment. If continual lockouts occur, call a mechanic immediately and have them check for the following:
  - Water flow problems
  - Water temperature problems
  - Air flow problems
  - Air temperature problems.

Use of the pressure and temperature charts for the unit may be required to properly determine the cause.

# TROUBLESHOOTING

Problem	Possible Cause	C checks and Corrections
Entire unit does not run	Power Supply Off	Apply power, close disconnect
	Blown Fuse	Replace fuse or reset circuit breaker. Check for correct fuses
	Voltage Supply Low	If voltage is below minimum voltage specified on unit data plate, contact local power company.
	Thermostat	Set the fan to "ON", the fan should run. Set thermostat 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 neither the blower or compressor run in all three cases, the thermostat could be miswired or faulty. To ensure miswired or faulty thermostat verify 24 volts is available on the condensing section low voltage terminal strip between "R" and "C", "Y" and "C", and "O" and "C". If the blower does not operate, verify 24 volts between terminals "G" and "C" in the air handler. Replace the thermostat if defective.
Blower operates but compressor does not	Thermostat	Check setting, calibration, and wiring
	Wiring	Check for loose or broken wires at compressor, capacitor, or contactor.
	Safety Controls	Check UPM board red default L.E.D. for Blink Code
	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 dryer.
	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 control	Discharge pressure too high	In "COOLING" MODE: Lack of or inadequate water flow. Entering water temperature is too warm. Scaled or plugged condenser. In "HEATING" mode: Lack of or inadequate air flow. Blower inoperative, clogged filter or restrictions in duct work.
	Refrigerant charge	The unit is overcharged with refrigerant. Reclaim refrigerant, evacuate and recharge with factory recommended charge.
	High pressure	Check for defective or improperly calibrated high pressure switch.
Unit off on low pressure control	Suction pressure too low	In "COOLING" mode: Lack of or inadequate air flow. Entering air temperature is too cold. Blower inoperative, clogged filter or restrictions in duct work  In "HEATING" mode: Lack of or inadequate water flow. Entering water temperature is too cold. Scaled or plugged condenser.
	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.
	Thermostat	Thermostat installed near a supply air grill; relocate thermostat. Readjust heat anticipator.
	Wiring and controls	Check for defective or improperly calibrated low pressure switch.

## TROUBLESHOOTING (CONT.)

Insufficient cooling or heating	Unit undersized	Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem
	Loss of conditioned air by leakage	Check for leaks in duct work or introduction of ambient air through doors or windows
	Airflow	Lack of adequate air flow or improper distribution of air. Replace dirty filter.
	Refrigerant charge	Low on refrigerant charge, causing inefficient operation
	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 of suction side of compressor. Replace reversing valve
	Operating pressures	Compare unit operation pressures to the pressure/temperature chart for the unit.
	TXV	Check TXV for possible restriction or defect. Replace if necessary.
	Moisture, noncondensables	The refrigerant system may be contaminated with moisture or noncondensables. Reclaim refrigerant, replace filter drier, evacuate the refrigerant system, and recharge with factory recommended charge. Note: a liquid line dryer may be required.
UPM board trouble shooting	Compressor will not run, no fault blink code	<pre> graph TD     Q1[Is Green Power LED light on and no Red Blink Code?] -- No --&gt; A1["- Check all power supplies - Check all safety switches"]     Q1 -- Yes --&gt; Q2[Is there power to the "Y" Call (C-Y)?]     Q2 -- No --&gt; A2[Check thermostat settings and configurations for heat pumps, and wiring]     Q2 -- Yes --&gt; Q3[Is there 24 V power from C to CC?]     Q3 -- No --&gt; A3[Check for Red Blink Code. If Red Blink Code is not present, replace UPM Board]     Q3 -- Yes --&gt; A4[UPM Board is Good]     </pre>

# OPERATING PRESSURES AND TEMPERATURES

Operating Data										
			COOLING				HEATING (+)			
Model	Entering Water Temp. °F	Water Flow GPM	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Drop °F	Air Temp Rise °F
GP024 First Step	30°	2					75-91	264-322	5-6	15-17
		4					79-96	270-331	3-4	16-18
	40°	2	120-146	186-228	14-17	18-21	88-107	277-339	6-7	17-20
		4	115-140	175-214	8-9	19-23	92-112	284-348	4-5	18-21
	50°	2	129-157	218-267	14-17	18-20	98-122	291-356	7-8	20-23
		4	124-151	204-250	8-9	19-22	110-130	298-364	5-6	21-24
	60°	2	134-163	249-305	13-16	17-20	112-136	304-372	8-10	22-26
		4	128-156	233-287	8-9	18-21	117-143	312-381	6-7	23-28
	70°	2	138-168	281-341	13-16	17-19	124-152	318-389	9-11	24-29
		4	133-161	263-323	7-9	18-21	131-159	325-398	6-8	26-31
	80°	2	143-174	317-388	13-16	16-19	136-166	331-405	11-13	27-32
		4	137-167	297-366	7-9	17-20	143-174	339-415	7-9	28-33
	90°	2	147-179	357-437	13-16	16-18	149-181	345-422	12-14	29-35
		4	141-172	335-411	7-9	17-20	156-190	352-432	8-10	31-37
	100°	2	151-185	402-492	13-15	15-18				
		4	146-177	378-459	7-9	16-19				
GP024 Full Capacity	30°	4					76-92	242-297	3-4	13-14
		6					80-97	249-304	2-3	13-15
	40°	4	125-151	180-221	14-18	19-22	89-108	255-312	4-5	15-17
		6	120-146	169-207	8-10	20-23	93-113	261-320	3-3	16-18
	50°	4	134-163	211-258	14-18	18-21	106-118	267-327	5-6	17-19
		6	129-157	198-242	8-10	19-23	104-112	274-335	3-4	18-21
	60°	4	139-169	241-295	14-17	18-21	113-138	280-342	6-7	19-22
		6	134-163	227-278	8-10	19-22	119-145	287-351	4-5	20-23
	70°	4	144-175	272-333	14-17	17-20	126-155	292-358	7-8	21-24
		6	138-168	255-313	8-10	18-21	133-162	300-367	5-6	22-26
	80°	4	148-181	307-375	14-17	17-19	138-168	305-373	8-9	23-27
		6	143-174	288-353	8-10	18-21	145-177	312-382	5-6	24-29
	90°	4	153-186	346-423	14-17	16-19	151-184	317-388	8-10	25-29
		6	147-179	325-398	8-9	17-20	158-193	325-398	6-7	26-31
100°	4	158-191	389-477	13-16	16-18					
	6	152-185	366-448	8-9	17-20					
GP036 First Step	30°	2.5					73-89	266-325	5-6	15-18
		4.5					77-94	272-333	3-4	16-19
	40°	2.5	117-143	189-231	14-17	18-22	86-105	279-341	6-7	17-21
		4.5	112-137	178-217	8-9	19-24	90-110	286-350	4-5	18-22
	50°	2.5	126-154	221-270	14-17	18-21	162-198	293-358	7-8	20-24
		4.5	121-148	207-253	8-9	19-23	170-208	300-366	5-6	21-25
	60°	2.5	131-160	252-308	13-16	17-21	110-134	306-374	8-10	22-27
		4.5	125-153	237-290	8-9	18-22	115-141	314-383	6-7	23-29
	70°	2.5	135-165	284-347	13-16	17-20	122-150	320-391	9-11	24-30
		4.5	130-158	266-326	7-9	18-22	129-157	327-400	6-8	26-32
	80°	2.5	140-171	320-391	13-16	16-20	134-164	333-407	11-13	27-33
		4.5	134-164	300-367	7-9	17-21	141-172	341-417	7-9	28-35
	90°	2.5	144-176	360-440	13-16	16-19	147-179	347-424	12-14	29-36
		4.5	138-169	338-414	7-9	17-21	154-188	355-434	8-10	31-38
	100°	2.5	149-182	405-495	13-15	15-19				
		4.5	143-174	381-465	7-9	16-20				

# OPERATING PRESSURES AND TEMPERATURES

Operating Data										
			COOLING				HEATING (+)			
Model	Entering Water Temp. °F	Water Flow GPM	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Drop °F	Air Temp Rise °F
GP036 Full Capacity	30°	4.5					74-90	244-299	3-4	13-15
		9.0					78-95	251-306	2-3	13-16
	40°	4.5	122-149	183-224	14-18	19-23	87-106	257-314	4-5	15-18
		9.0	117-143	172-210	8-10	20-24	91-111	263-322	3-3	16-19
	50°	4.5	131-160	214-261	14-18	18-22	164-201	269-329	5-6	17-20
		9.0	126-154	201-245	8-10	19-24	173-211	276-337	3-4	18-22
	60°	4.5	136-166	244-298	14-17	18-22	111-136	282-344	6-7	19-23
		9.0	131-160	230-281	8-10	19-23	117-143	289-353	4-5	20-24
	70°	4.5	141-172	275-336	14-17	17-21	124-152	294-360	7-8	21-25
		9.0	135-165	258-316	8-10	18-22	131-160	302-369	5-6	22-27
	80°	4.5	145-178	310-378	14-17	17-20	136-166	307-375	8-9	23-28
		9.0	140-171	291-356	8-10	18-22	143-175	314-384	5-6	24-30
	90°	4.5	150-183	349-426	14-17	16-20	149-182	319-390	8-10	25-30
		9.0	144-176	328-401	8-9	17-21	156-191	327-400	6-7	26-32
	100°	4.5	155-189	392-480	13-16	16-19				
		9.0	149-182	369-451	8-9	17-21				
GP048 First Step	30°	4.0					64-78	248-303	5-6	15-18
		6.0					67-82	254-311	3-4	16-19
	40°	4.0	109-134	183-224	18-22	19-23	75-91	261-319	6-8	17-21
		6.0	105-128	172-210	10-12	20-25	79-96	267-327	4-5	18-23
	50°	4.0	118-144	214-261	18-22	19-23	142-173	273-334	8-10	20-24
		6.0	113-138	201-245	10-12	20-24	149-182	280-342	5-7	21-26
	60°	4.0	122-149	244-298	17-21	18-22	96-117	286-349	9-11	22-27
		6.0	117-143	230-281	10-12	19-24	101-123	293-358	6-8	24-29
	70°	4.0	126-154	275-336	17-21	18-22	107-131	299-365	11-13	25-30
		6.0	121-148	258-316	10-12	19-23	113-138	306-374	7-9	26-32
	80°	4.0	130-159	310-378	17-21	17-21	117-143	311-380	12-15	27-33
		6.0	132-153	291-356	10-12	18-22	123-151	319-390	8-10	29-35
	90°	4.0	134-164	349-426	17-20	17-20	128-157	324-396	13-16	29-36
		6.0	129-158	328-401	9-12	18-22	135-165	332-406	9-11	31-38
	100°	4.0	139-170	392-480	16-20	16-20				
		6.0	133-163	369-451	9-11	17-21				
GP048 Full Capacity	30°	6.0					71-87	277-339	6-7	15-19
		12.0					75-92	284-347	4-5	16-20
	40°	6.0	118-144	194-237	21-25	19-23	84-102	291-356	7-9	18-22
		12.0	113-138	182-223	12-14	20-24	88-108	299-365	5-6	19-23
	50°	6.0	127-155	226-276	21-25	18-22	159-194	305-373	9-11	20-25
		12.0	122-149	213-260	12-14	19-24	167-204	313-383	6-7	21-26
	60°	6.0	131-160	259-316	21-25	18-22	108-132	320-391	10-13	23-28
		12.0	126-154	243-297	12-14	19-23	113-138	328-400	7-9	24-29
	70°	6.0	136-166	291-355	20-25	17-21	120-147	334-408	12-15	25-31
		12.0	130-159	273-334	12-14	18-22	126-154	342-418	8-10	27-32
	80°	6.0	140-171	328-401	20-24	17-20	131-161	348-425	14-17	27-34
		12.0	135-165	308-377	11-14	18-22	138-169	356-436	9-11	29-36
	90°	6.0	145-177	369-451	20-24	16-20	144-176	362-442	15-18	30-37
		12.0	139-170	347-424	11-14	17-21	151-185	371-453	10-12	32-39
	100°	6.0	149-183	415-508	19-24	16-19				
		12.0	143-175	391-477	11-14	17-21				

# OPERATING PRESSURES AND TEMPERATURES

Operating Data										
			COOLING				HEATING (+)			
Model	Entering Water Temp. °F	Water Flow GPM	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Drop °F	Air Temp Rise °F
GP060 First Step	30°	5.0					68-84	256-313	5-7	19-23
		7.0					73-89	261-319	4-5	20-25
	40°	5.0	113-138	172-210	18-22	19-23	81-99	277-339	7-8	22-26
		7.0	110-134	161-196	12-14	20-24	86-105	283-346	5-6	23-28
	50°	5.0	116-142	206-252	17-21	19-23	93-114	299-365	8-9	24-29
		7.0	112-137	193-236	12-14	19-24	99-121	305-373	6-7	25-31
	60°	5.0	118-145	241-294	17-21	18-23	106-129	321-392	9-11	26-32
		7.0	115-140	225-275	11-14	19-23	113-138	327-400	7-8	28-34
	70°	5.0	121-148	275-336	17-21	18-22	118-145	342-418	10-12	29-35
		7.0	117-143	257-314	11-14	19-23	126-154	349-427	8-9	30-37
	80°	5.0	123-151	309-378	16-20	18-22	131-160	364-444	11-14	31-38
		7.0	120-146	289-353	11-13	19-23	139-170	371-454	8-10	33-40
	90°	5.0	126-154	344-420	16-20	18-22	143-175	385-471	12-15	33-41
		7.0	122-149	321-392	11-13	18-22	152-186	393-480	9-11	35-43
	100°	5.0	128-157	378-462	16-19	17-21				
		7.0	125-152	353-432	11-13	18-22				
GP060 Full Capacity	30°	7.0					68-84	256-313	5-7	19-23
		14.0					73-89	261-319	4-5	20-25
	40°	7.0	117-143	182-222	15-19	21-26	81-99	277-339	7-8	22-26
		14.0	114-139	170-208	11-14	22-27	86-105	283-346	5-6	23-28
	50°	7.0	120-147	215-263	15-18	20-25	93-114	299-365	8-9	24-29
		14.0	117-143	201-246	11-14	21-26	99-121	305-373	6-7	25-31
	60°	7.0	123-150	248-304	14-17	20-24	106-129	321-392	9-11	26-32
		14.0	119-146	232-284	11-13	21-25	113-138	327-400	7-8	28-34
	70°	7.0	126-154	282-344	14-17	19-24	118-145	342-418	10-12	29-35
		14.0	122-149	263-322	10-13	20-25	126-154	349-427	8-9	30-37
	80°	7.0	129-157	315-385	13-16	19-23	131-160	364-444	11-14	31-38
		14.0	125-153	294-360	10-12	19-24	139-170	371-454	8-10	33-40
	90°	7.0	132-161	348-426	13-16	18-22	143-175	385-471	12-15	33-41
		14.0	128-156	326-398	10-12	19-23	152-186	393-480	9-11	35-43
	100°	7.0	134-164	382-466	12-15	17-21				
		14.0	131-160	357-436	9-11	18-22				
GP072 First Step	30°	10.0					71-87	259-316	5-7	19-23
		16.0					76-92	264-322	4-5	20-25
	40°	10.0	116-141	175-213	18-22	19-23	84-102	280-342	7-8	22-26
		16.0	113-137	164-199	12-14	20-24	89-108	286-349	5-6	23-28
	50°	10.0	119-145	209-255	17-21	19-23	96-117	302-368	8-9	24-29
		16.0	115-140	196-239	12-14	19-24	102-124	308-376	6-7	25-31
	60°	10.0	121-148	244-297	17-21	18-23	109-132	324-395	9-11	26-32
		16.0	118-143	228-278	11-14	19-23	116-141	330-403	7-8	28-34
	70°	10.0	124-151	278-339	17-21	18-22	121-148	345-421	10-12	29-35
		16.0	120-146	260-317	11-14	19-23	129-157	352-430	8-9	30-37
	80°	10.0	126-154	312-381	16-20	18-22	134-163	367-447	11-14	31-38
		16.0	123-149	292-356	11-13	19-23	142-173	374-457	8-10	33-40
	90°	10.0	129-157	347-423	16-20	18-22	146-178	388-474	12-15	33-41
		16.0	125-152	324-395	11-13	18-22	155-189	396-483	9-11	35-43
	100°	10.0	131-160	381-465	16-19	17-21				
		16.0	128-155	356-435	11-13	18-22				

# OPERATING PRESSURES AND TEMPERATURES

Operating Data										
			COOLING				HEATING (+)			
Model	Entering Water Temp. °F	Water Flow GPM	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Drop °F	Air Temp Drop °F	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Drop °F	Air Temp Rise °F
GP072 Full Capacity	30°	10.0					71-87	259-316	5-7	19-23
		16.0					76-92	264-322	4-5	20-25
	40°	10.0	120-146	185-225	15-19	21-26	84-102	280-342	7-8	22-26
		16.0	117-142	173-211	11-14	22-27	89-108	286-349	5-6	23-28
	50°	10.0	123-150	218-266	15-18	20-25	96-117	302-368	8-9	24-29
		16.0	120-146	204-249	11-14	21-26	102-124	308-376	6-7	25-31
	60°	10.0	126-153	251-307	14-17	20-24	109-132	324-395	9-11	26-32
		16.0	122-149	235-287	11-13	21-25	116-141	330-403	7-8	28-34
	70°	10.0	129-157	285-347	14-17	19-24	121-148	345-421	10-12	29-35
		16.0	125-152	266-325	10-13	20-25	129-157	352-430	8-9	30-37
	80°	10.0	132-160	318-388	13-16	19-23	134-163	367-447	11-14	31-38
		16.0	128-156	297-363	10-12	19-24	142-173	374-457	8-10	33-40
	90°	10.0	135-164	351-429	13-16	18-22	146-178	388-474	12-15	33-41
		16.0	131-159	329-401	10-12	19-23	155-189	396-483	9-11	35-43
	100°	10.0	137-167	385-469	12-15	17-21				
		16.0	134-163	360-439	9-11	18-22				

