GB Series
Geothermal Heat Pump
Sizes 018, 024, 030, 036, 042, 048, 060

Installation Instructions

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

TABLE OF CONTENTS

Information in these installation instructions pertains only to GB 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.

⚠ 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.

INSTALLATION RECOMMENDATIONS

The GB Water-to-Air Heat Pumps are performance certified to American Heating and Refrigeration Institute (AHRI) ISO Standard 13256-1. All GB 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.

Safety devices are built into each unit to provide the maximum system protection possible when properly installed and maintained.

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. Earth Coupled (Geothermal) 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.

⚠ 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.

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. Horizontals 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 DAMAGE AND/OR OPERATION HAZARD

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

It is extremely important to take the proper precautions to insure that the heat pump unit is installed in the proper location and that measures have been taken to prevent rupturing the water coil due to freezing conditions.

Frozen water coils are not covered under the limited product warranty.

APPLICATION CONSIDERATIONS

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.

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

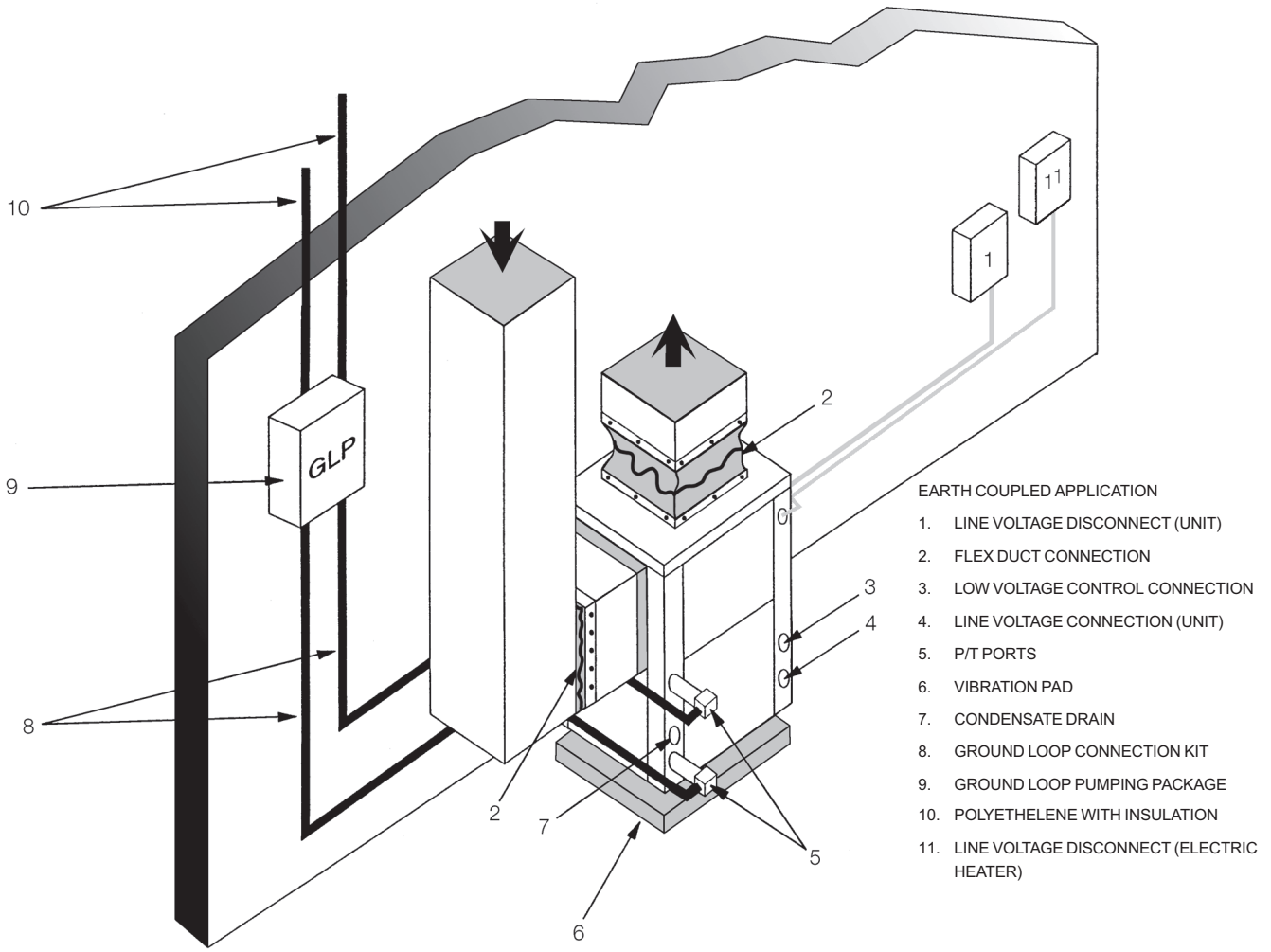


Fig. 1 - Earth Coupled Application

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 l<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 well water is used exclusively for supplying water to the heat pump, the pump should operate only when the heat pump operates. A 24 volt double pole single throw (DP/ST) contactor (Fig. 2) can be used to operate the well pump with the heat pump.

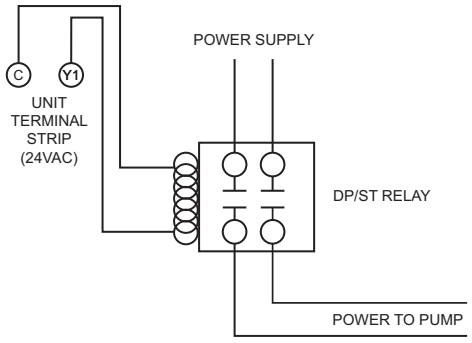


Fig. 2 - 24 volt DP/ST Contactor

When two or more units are supplied from one well, the pump can be wired to operate independently from either unit (see Fig. 3). An up-sized VA transformer may be required in either case.

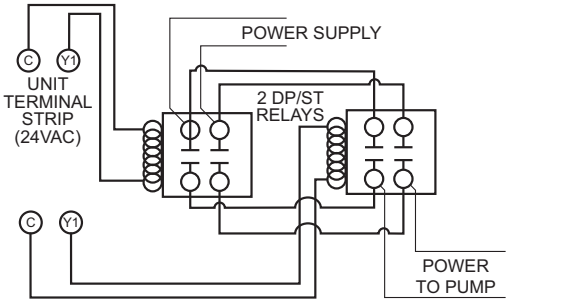


Fig. 3 - DP/ST Independent Wiring

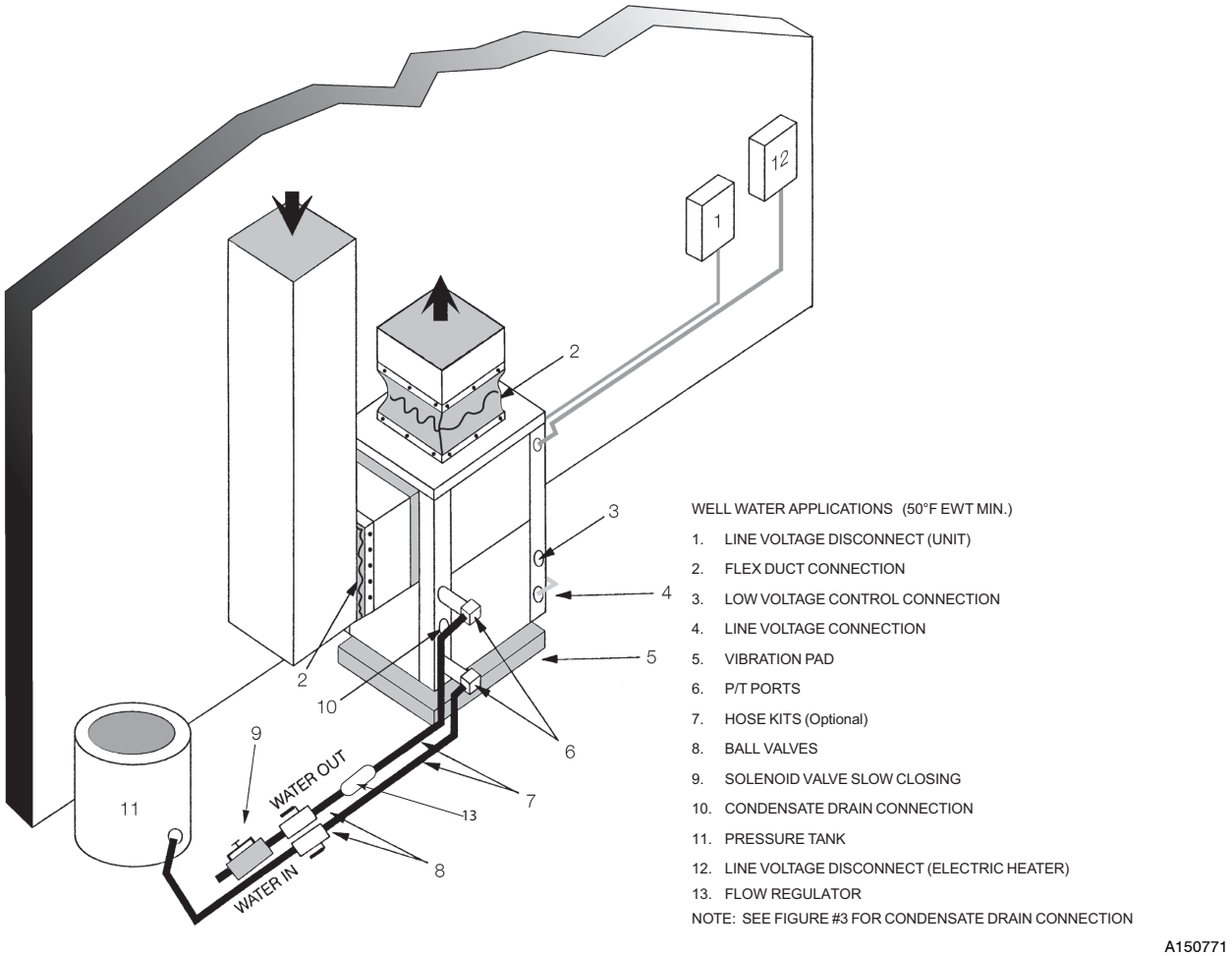


Fig. 4 - Well Water Application

Pressure/temperature ports are recommended in both the supply and return lines for system flow balancing. The water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See the unit specification sheets for the water flow and pressure drop information in the back of this manual.

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

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.

Solenoid valves should be connected across Y and C on the interface board for all. Make sure that the VA draw of the valve does not exceed the contact rating of the thermostat.

Pressure/temperature ports are recommended in both supply and return lines for system flow balancing. Water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See specification sheets for water flow vs. pressure drop information in the back of this manual.

⚠ CAUTION

UNIT OPERATION HAZARD

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

Water piping exposed to extreme low ambient temperatures is 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.

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

Water Quality Parameter	HX Material	Closed Recirculating	Open Loop and Recirculating Well		
Scaling Potential - Primary Measurement Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below:					
pH/Calcium Hardness Method	All	--	pH <7.5 and Ca Hardness <100ppm		
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	--	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		
Iron Fouling					
Iron Fe^{2} (Ferrous) (Bacterial Iron Potential)	All	--	<0.2 ppm (Ferrous) If Fe^{2*} (ferrous) >0.2 ppm with pH 6-8, O2<5 ppm check for iron bacteria		
Iron Fouling	All	--	<0.5 ppm of Oxygen Above this level deposition will occur		
Corrosion Prevention					
pH	All	6 - 8.5 Monitor/treat as needed	6 - 8.5 Minimize steel pipe below 7 and no open tanks with pH <8		
Hydrogen Sulfide (H_2S)	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			**Maximum Allowable at Maximum Water Temperature**		
			50°F	**75°F**	**100°F**
	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
	Titanium	--	>1000 ppm	>550 ppm	>375 ppm
Erosion and Clogging					
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		

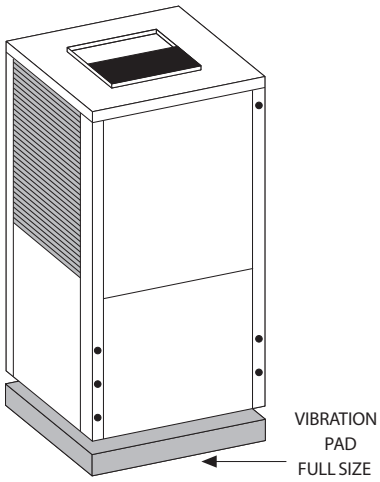
NOTES:

- 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

MOUNTING VERTICAL UNITS

GB Vertical units up to five 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. 5.

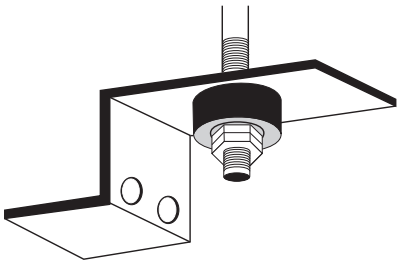


A14151

Fig. 5 - Vibration Absorbing Pad

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. 6). The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details.



A14165

Fig. 6 - Hanger Bracket Kit

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.

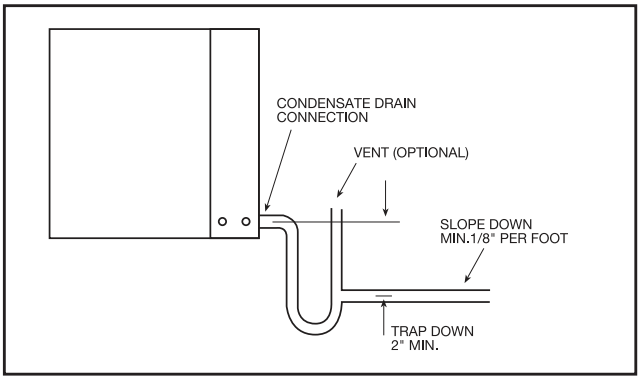
In both cases, a 3/4"drain connected to this secondary pan should be run to an eave at a location that will be noticeable. If the unit is located in a crawl space, the bottom of the unit must be at least 4" above grade to prevent flooding of the electrical parts due to heavy rains.

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

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

CONDENSATE DRAIN

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



A14118

Fig. 7 - 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.

A vertical air vent is sometimes required to avoid air pockets (see Fig. 7). 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.

Fold the duct flange outwards along the perforated line. Refer to unit Dimensional Drawings for physical dimensions of the collar and flange.

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. Refer to Table 2 for ECM motor speeds and settings.

Table 2 – GB Motor CFM Selection (Constant Torque ECM Motor)

UNITS	MOTOR HP	TAP1	TAP2	TAP3	TAP4	TAP5
GB018	1/3	LOW	MED	HIGH	-	-
GB024	1/3	LOW	MED	HIGH	-	-
GB030	1/3	LOW	MED	HIGH	-	-
GB036	3/4	LOW	MED	HIGH	-	-
GB042	3/4	LOW	MED	HIGH	-	-
GB048	3/4	LOW	MED	HIGH	-	-
GB060	1	LOW	MED	HIGH	-	-

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.

GB units are supplied with either a copper or optional cupronickel 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 cupronickel.

In conditions anticipating moderate scale formation or in brackish water, a cupronickel 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.

Improper heat exchanger water flow due to piping, valve arrangement 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 Product Data for sizes.

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 (on open-loop systems).

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.

ELECTRICAL

⚠ 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.

⚠ 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.
- Power to the unit must be within the operating voltage range indicated on the unit nameplate.
- On three-phase units, phases must be balanced within 2%.
- 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. Flexible wiring and conduit should be used to isolate vibration and noise from the building structure.

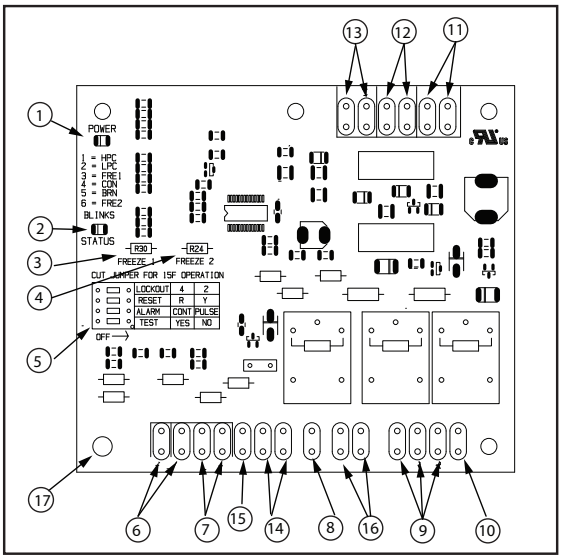
Always connect the ground lead to the grounding lug provided in the control box and power leads to the line side of compressor contactor as indicated on the wiring diagrams.

IMPORTANT: **Units supplied with internal electric heat require two (2) separate power supplies:**

1) Unit compressor

2) Electric Heat, blower motor and control circuit. Refer to the *ELECTRIC HEATER PACKAGE OPTION* section. See data plate for minimum circuit ampacities and maximum fuse/breaker sizing.

SAFETY DEVICES & UPM CONTROLLER



A14120

(1) Board Power Indicator
(2) UPM Status LED Indicator
(3) Water Coil Freeze Protection Temperature Selection [R30]
(4) Air Coil Freeze Protection Temperature Selection
(5) UPM Board Settings
(6) Water Coil Freeze Connection
(7) Air Coil Freeze Connection
(8) LCD Unit Display Connection
(9) 24VAC Power Input
(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
(16) Dry Contact
(17) UPM Ground Standoff

Fig. 8 - Safety Device and UPM Controller

NOTES:

1. If the unit is being connected to a thermostat with a malfunction light, this connection is made at the unit malfunction output or relay. Refer to Fig. 8.
2. 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.
3. 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.

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.

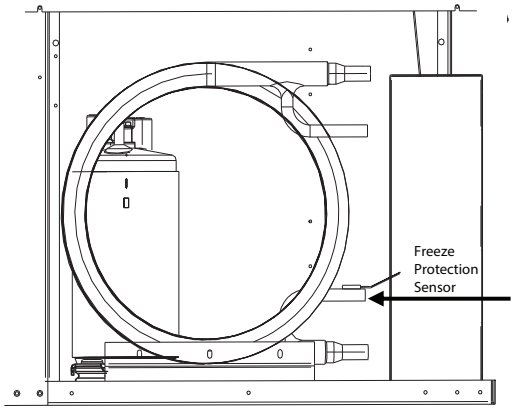
Safety controls include the following:

- 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.

NOTE: UPM Board Dry Contacts are normally open (NO)

- Water side freeze protection sensor, mounted close to condensing water coil, 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 or Freeze1 resistor located on top of DIP switch SW1 (Refer to Fig. 8, item (3) for resistor location), Refer to Fig. 9 for sensor location.



A14156

Fig. 9 - Freeze Protection Sensor Location

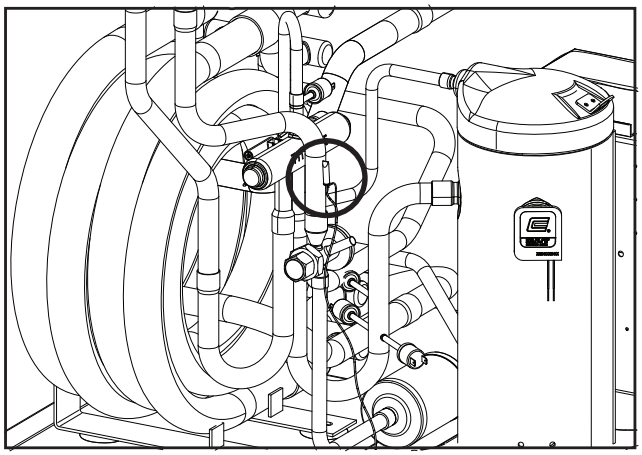
⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

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

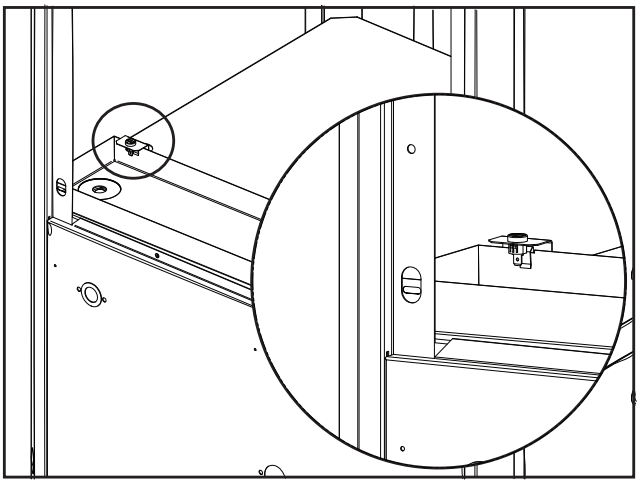
If unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the Freeze1 R30 resistor set to 26°F in order to shut down the unit at the appropriate leaving water temperature and protect your heat pump from freezing if a freeze sensor is included.

- 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. 10.



A14122

Fig. 10 - Evaporator Freeze Protection Sensor Location



A14123

Fig. 11 - Condensate Overflow Protection Sensor Location

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

Considerations

4. 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.
5. Long length thermostat and control wiring leads may create voltage drop. Increase wire gauge or up-size transformers may be required to insure minimum secondary voltage supply.
6. 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.
7. Do not apply additional controlled devices to the control circuit power supply without consulting the factory. Doing so may void equipment warranties.
8. Check with all code authorities on requirements involving condensate disposal/ over flow protection criteria.

The UPM includes the following features:

- **ANTI-SHORT CYCLE TIME**—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 to reduce the chances of multiple units simultaneously starting after initial power up or after a power interruption, creating a large electrical spike.
- **LOW PRESSURE BYPASS TIMER**—If the compressor is running and the low pressure switch opens, then the control will keep the compressor on for 120 seconds. After 2 minutes, if the low pressure switch remains open, the control 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 goes above 18 VAC and the 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 "CONT", a continuous 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 LED 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

- **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. Note that operation of the unit while in test mode can lead to accelerated wear and premature failure of the unit. The "TEST" switch must be set back to "NO" for normal operation.
- **FREEZE SENSOR**—The freeze sensor input is active all the time, if a freeze option is not selected the freeze terminals will need a jumper. There are 2 configurable freeze points, 26°F & 15°F. The unit will enter a soft lock out 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 90 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. (Refer to Table 3)

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

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

If unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the "Freeze" jumper R30 resistor set to 26°F in order to shut down the unit at the appropriate leaving water temperature and protect your heat pump from freezing if a freeze sensor is included.

- **EVAPORATOR FREEZE SENSOR**—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 30°F. (Refer to Table 3)
- **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.

Table 3 – 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

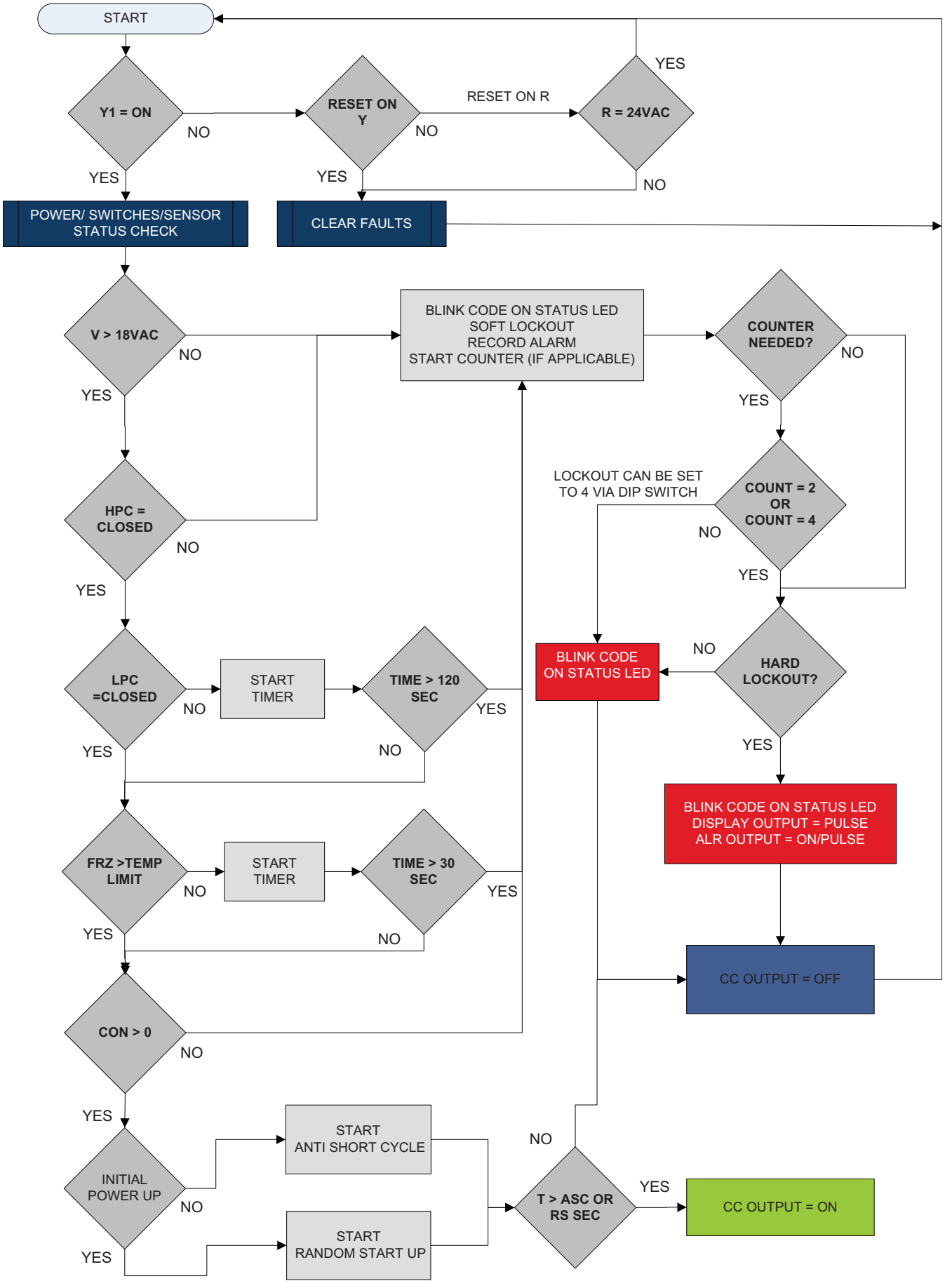


Fig. 12 - UPM Sequence of Operation (SOO) Flow Chart

OPTIONAL HEAT RECOVERY PACKAGE (HRP)

The heat recovery package is a factory installed option on GB 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.

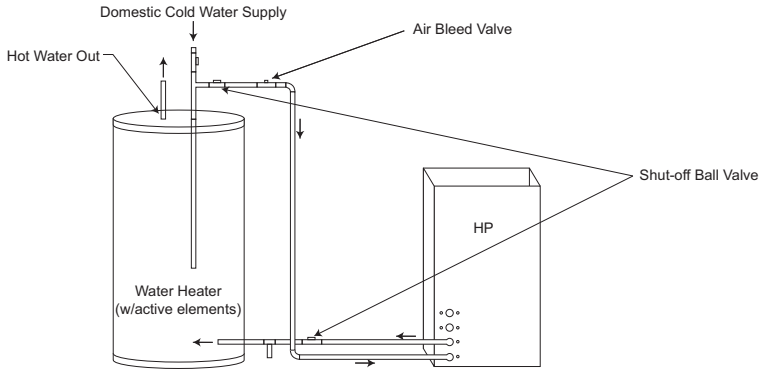
Water Tank Preparation

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.

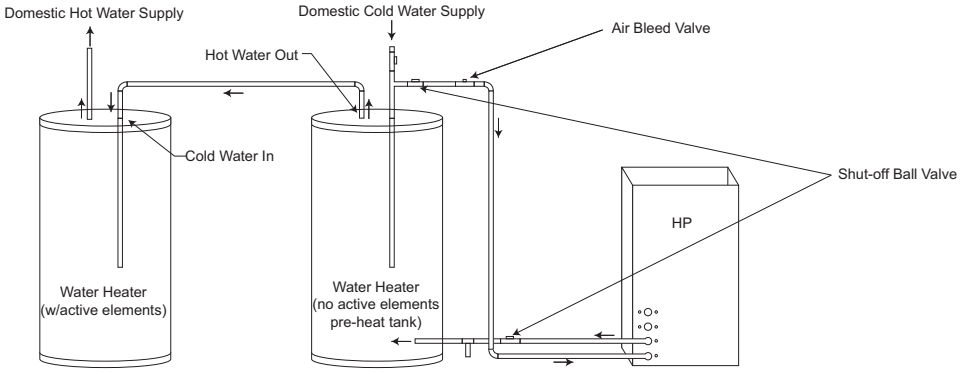
HRP Water Piping

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. 13)

One Tank System



Two Tank System (preferred)



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

A150174

Fig. 13 - HRP Water Piping

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 HR 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 5, 10, 15 and 20 Kw sizes. For installation procedures, refer to the instructions shipped with the heaters. Table 4 lists compatible heaters with GB units.

Table 4 – Electric Heater Compatibility

Aux. Heat Size Compatibility				
GHP Model	5 Kw	10 Kw	15 Kw	20 Kw
GB018	•	—	—	—
GB024	•	•	—	—
GB030	•	•	—	—
GB036	•	•	•	—
GB042	•	•	•	—
GB048	•	•	•	•
GB060	•	•	•	•

• = 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

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.

When the thermostat calls for cooling (Y), the loop pump or solenoid valve, if present, is energized and compressor will start. Once the thermostat is satisfied, the compressor shuts down accordingly and the fan ramps down to either FAN ONLY mode or OFF over a span of 30 seconds (ECM Motors).

NOTE: A fault condition initiating a lockout will de-energize the compressor.

Heating Mode

Heating operates in the same manner as cooling, but with the reversing valve de-energized. The compressor will run until the desired setpoint temperature on the thermostat is achieved.

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

THERMOSTAT CONNECTIONS

Thermostat wiring is connected to a 7 position low voltage terminal block in the electrical box. The thermostat connections and their functions are as follows:

Y	Compressor Operation
G	Fan
O	Reversing Valve (energized in cooling)
C	Transformer 24 VAC Common - 3 Connections
R	Transformer 24 VAC Hot

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

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.**

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.
10. Verify that blower support has been removed.
11. Verify that ductwork has been properly fastened to supply and return duct collars.
12. Make sure return air filters are positioned correctly in the filter rack.

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.

NOTE: Horizontal units containing two filters are taped together at the factory to facilitate removal. This should be done by end user as new filters are installed.

⚠ 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.

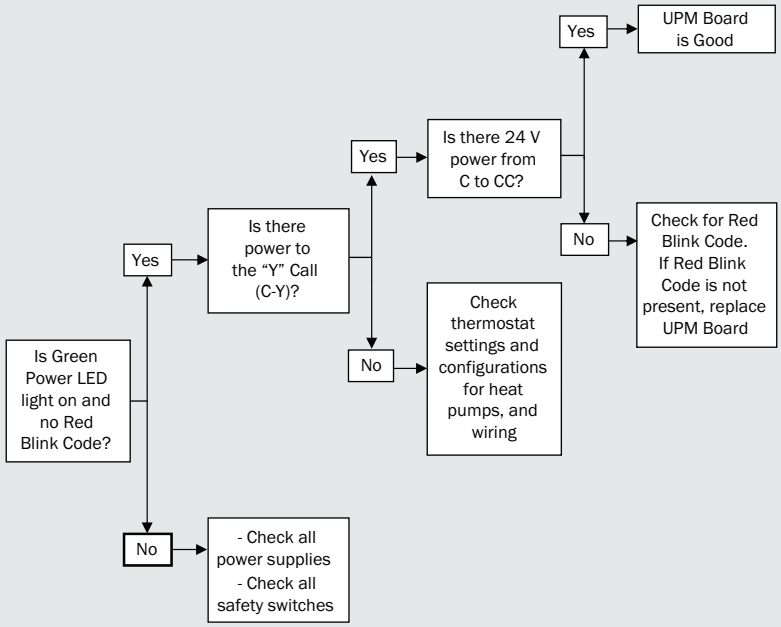
2. An annual “checkup” is recommended by a licensed refrigeration mechanic. Recording the performance measurements of volts, amps, and water temperature differences (both heating and cooling) is recommended. This data should be compared to the information on the unit’s data plate and the data taken at 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 hecks 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 (reversing valve deenergized). 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 that 24 volts is available at the 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”. 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.
	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 ductwork.
	Refrigerant charge	The unit is overcharged with refrigerant. Reclaim refrigerant, evacuate and recharge with factor 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 ductwork In “HEATING” mode: Lack of or inadequate water flow. Entering water temperature is 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 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 T XV for possible restriction or defect. Replace if necessary.
	Moisture, noncondensables	The refrigerant system may be contaminated with moisture or noncondensibles. Reclaim refrigerant, replace filter dryer, evacuate the refrigerant system, and recharge with factory recommended charge.
UPM board trouble shooting	Compressor will not run, no fault blink code	

Fluid Pressure Drops			
Model	**Flow Rate (GPM)**	**Pressure Drop (FOH)**	**Pressure Drop (PSI)**
018	3	4.1	1.80
	4	7.0	3.02
	5	10.4	4.52
	6.5	16.7	7.25
	8	24.2	10.53
024	3	2.0	0.87
	4.5	4.1	1.80
	6	6.9	3.01
	8	11.6	5.06
	10	17.4	7.56
030	4	1.2	0.51
	5.5	2.1	0.91
	7	3.2	1.41
	10	6.1	2.67
	13	9.9	4.28
036	5	2.3	1.01
	7.5	4.8	2.09
	10	8.1	3.51
	12.5	12.1	5.25
	15	16.8	7.29
042	7	2.8	1.22
	8.75	4.2	1.82
	10.5	5.8	2.53
	13.25	8.9	3.85
	16	12.4	5.41
048	8	3.6	1.55
	10.67	6.0	2.61
	12	7.4	3.22
	14	9.8	4.25
	16	12.4	5.41
060	9	3.7	1.60
	12	6.2	2.69
	15	9.2	4.02
	17.5	12.2	5.30
	20	15.5	6.74

Air Temperature Rise/Fall

Entering Fluid Temp °F	COOLING		HEATING	
	Entering Air Temp °F	Air Temp Drop °F	Entering Air Temp °F	Air Temp Rise °F
30			60	16-8 - 25.1
			70	15.9 - 23.7
			80	14.8 - 22.1
40	75/63	21.9 - 27.2	60	20.0 - 28.5
	80/67	22.9 - 28.5	70	19.0 - 27.0
	85/71	23.8 - 29.5	80	17.7 - 25.2
50	75/63	20.5 - 25.8	60	23.3 - 32.8
	80/67	21.5 - 27	70	22.0 - 31.0
	85/71	22.3 - 28.1	80	20.5 - 29.0
60	75/63	19.2 - 24.7	60	26.5 - 37.1
	80/67	20.1 - 25.8	70	25.1 - 35.1
	85/71	20.9 - 26.8	80	23.4 - 32.7
70	75/63	17.9 - 23.8	60	29.8 - 41.4
	80/67	18.7 - 24.9	70	28.2 - 39.1
	85/71	19.5 - 25.8	80	26.3 - 36.4
80	75/63	16.6 - 23.0	60	32.7 - 45.7
	80/67	17.4 - 24.0	70	30.9 - 43.1
	85/71	18.1 - 25.0	80	28.8 - 40.2
85	75/63	16.0 - 22.6		
	80/67	16.8 - 23.6		
	85/71	17.4 - 24.5		
90	75/63	15.4 - 22.2		
	80/67	16.1 - 23.2		
	85/71	16.8 - 24.1		
100	75/63	14.2 - 21.4		
	80/67	14.9 - 22.4		
	85/71	15.4 - 23.3		
110	75/63	13.0 - 21.1		
	80/67	13.7 - 22.1		
	85/71	14.2 - 23.0		

Refrigerant Pressure Ranges

Entering Fluid Temp °F	Fluid Δ T	COOLING						HEATING			
		Entering Air Temp (Dry Bulb)						Entering Air Temp (Dry Bulb)			
		70 °F		75 °F		80 °F		60 °F		70 °F	
		Suction	Discharge	Suction	Discharge	Suction	Discharge	Suction	Discharge	Suction	Discharge
30	5							68 - 79	233 - 266	71 - 84	246 - 281
	10							65 - 76	222 - 255	68 - 80	235 - 269
	15							59 - 71	216 - 248	62 - 75	228 - 261
40	5	113 - 147	138 - 156	117 - 152	142 - 161	119 - 155	145 - 164	80 - 95	244 - 282	85 - 100	257 - 297
	10	113 - 147	145 - 164	117 - 152	150 - 170	119 - 155	153 - 173	77 - 91	237 - 274	82 - 96	250 - 289
	15	113 - 147	151 - 170	117 - 152	156 - 175	119 - 155	159 - 179	72 - 86	226 - 262	76 - 90	238 - 276
50	5	115 - 149	164 - 185	119 - 154	170 - 191	121 - 157	173 - 195	95 - 113	255 - 302	100 - 119	269 - 319
	10	115 - 149	173 - 194	119 - 154	178 - 200	121 - 157	182 - 204	91 - 109	248 - 290	96 - 115	261 - 306
	15	115 - 149	179 - 200	119 - 154	184 - 207	121 - 157	188 - 211	86 - 103	237 - 282	90 - 108	250 - 297
60	5	117 - 151	194 - 218	121 - 156	200 - 224	123 - 159	204 - 229	111 - 133	270 - 324	117 - 141	285 - 342
	10	117 - 151	204 - 228	121 - 156	211 - 235	123 - 159	215 - 240	106 - 129	258 - 311	112 - 136	273 - 329
	15	117 - 151	211 - 235	121 - 156	218 - 242	123 - 159	222 - 247	101 - 122	251 - 302	106 - 128	265 - 319
70	5	119 - 153	228 - 254	122 - 158	235 - 262	125 - 161	240 - 267	129 - 158	282 - 343	136 - 167	297 - 362
	10	119 - 153	238 - 265	122 - 158	246 - 273	125 - 161	251 - 279	124 - 150	274 - 333	131 - 159	289 - 351
	15	119 - 153	246 - 273	122 - 158	254 - 281	125 - 161	259 - 287	117 - 146	262 - 320	123 - 154	276 - 337
80	5	121 - 155	265 - 294	124 - 160	273 - 303	127 - 163	279 - 309	148 - 184	299 - 366	156 - 194	315 - 387
	10	121 - 155	276 - 306	124 - 160	285 - 316	127 - 163	291 - 322	143 - 176	286 - 352	151 - 185	302 - 371
	15	121 - 155	285 - 315	124 - 160	294 - 325	127 - 163	300 - 332	136 - 169	278 - 343	143 - 179	294 - 362
90	5	123 - 157	306 - 337	126 - 162	316 - 348	129 - 165	322 - 355				
	10	123 - 157	319 - 351	126 - 162	329 - 363	129 - 165	336 - 370				
	15	123 - 157	329 - 362	126 - 162	339 - 373	129 - 165	346 - 381				
100	5	124 - 159	351 - 387	128 - 164	363 - 399	131 - 167	370 - 407				
	10	124 - 159	367 - 403	128 - 164	378 - 416	131 - 167	386 - 424				
	15	124 - 159	376 - 413	128 - 164	388 - 426	131 - 167	396 - 435				
110	5	126 - 161	403 - 441	130 - 166	416 - 455	133 - 169	424 - 464				
	10	126 - 161	419 - 458	130 - 166	432 - 472	133 - 169	441 - 482				
	15	126 - 161	429 - 470	130 - 166	443 - 485	133 - 169	452 - 495				

Blower Performance

Model	Available External Static Pressure (ins., Gauge, Wet coil and filter included)												
	Motor Speed	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.00**	**1.10**	**1.20**
018	High	700	665	635	605	560	525	510	475	440	-	-	-
	Medium	615	590	550	510	480	440	400	-	-	-	-	-
	Low	520	490	440	400	380	360	-	-	-	-	-	-
024	High	950	920	900	885	855	830	800	780	720	690	630	-
	Medium	830	810	780	750	735	690	630	610	590	-	-	-
	Low	700	675	650	615	550	520	-	-	-	-	-	-
030	High	1200	1190	1180	1155	1130	1110	1080	1060	1035	995	925	900
	Medium	1070	1040	1015	1005	980	960	935	920	910	885	850	815
	Low	930	905	880	855	840	815	790	755	745	675	-	-
036	High	1440	1410	1385	1360	1290	1225	1165	1095	1030	940	860	-
	Medium	1310	1275	1270	1250	1220	1190	1150	1075	1000	930	840	-
	Low	1155	1120	1080	1050	1035	1020	1000	975	950	920	-	-
042	High	1710	1680	1650	1630	1600	1530	1440	1350	1300	1250	-	-
	Medium	1500	1470	1440	1400	1360	1345	1330	1275	-	-		-
	Low	1275	1240	1195	1185	1125	1085	-	-	-	-	-	-
048	High	2000	1885	1870	1845	1815	1770	1745	1720	1710	1700	1680	-
	Medium	1750	1700	1660	1625	1615	1590	1565	1540	1500	-	-	-
	Low	1500	1470	1440	1400	1360	1345	1330	-	-	-	-	-
060	High	2370	2325	2300	2275	2255	2200	2190	2150	2100	2060	2050	2030
	Medium	2090	2080	2030	1995	1950	1925	1900	1865	1820	1770	1730	1680
	Low	1745	1700	1650	1620	1590	1560	1530	1490	1450	1390	-	-

8733927108 (04/14)

 Edition Date: 11/15

Catalog No: IM–GB–02

Replaces: IM–GB–01