

GW Series

Water-to-Water Geothermal Heat Pump

Sizes 024, 036, 048, 060, 120

Installation, Operation and Maintenance Instructions

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

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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

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.

! WARNING



EXPLOSION HAZARD

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

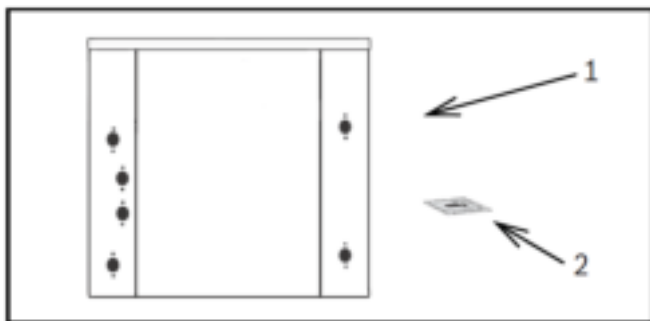
Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.

! 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.

Standard GW Package



1. Packet containing: Installation, Owner's Manual, Warranty Certificate and badges

A14176

Fig. 1 – Standard Package

GENERAL DESCRIPTION

The GW Water-to-Water Heat Pumps provide the best combination of performance and efficiency available.

All units are performance certified to American Heating and Refrigeration Institute (AHRI) ISO Standard 13256-2. All GW Water-to-Water Heat Pumps conform to UL1995 standard and are certified to CAN/CSA C22.2 No 236 by Intertek-ETL. The GW Water-to-Water Heat Pumps are designed to operate with entering fluid temperature between 30°F to 90°F in the heating mode and between 50°F to 110°F in the cooling mode.

IMPORTANT: A heat pump operating under extreme conditions will have limitations on air/fluid flow rates and/or temperatures.

! CAUTION

UNIT DAMAGE HAZARD

Failure to follow this Caution could result in unit damage.

50° F Minimum Entering Water Temperature (EWT) is recommended for water applications with sufficient water flow to prevent freezing. Antifreeze solution is required for all closed-loop applications and EWT below 50°F.

Geothermal applications should have sufficient antifreeze solution to protect against extreme conditions and equipment failure. Frozen water coils are not covered under warranty. Other equivalent methods of temperature control are acceptable.

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 and 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.

! WARNING

UNIT DAMAGE HAZARD

Failure to follow this warning could lead to unit damage

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

- Do not stack units larger than 6 tons.
- For units less than 6 tons, stack no more than three high.

Initial Inspection

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.

UNIT INSTALLATION

LOCATION AND SELECTION

Install the unit in an indoor area that allows easy access to the panels, and has enough room for service personnel to perform maintenance or repair. Provide sufficient room to make fluid, electrical, and duct connection(s).

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

INSTALLATION

The series unit must 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. 2).

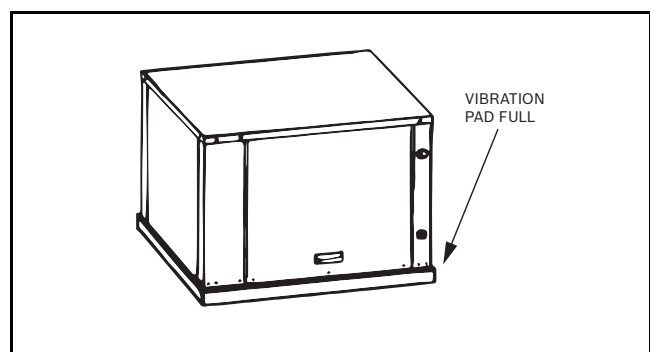


Fig. 2 – Vibration pad

Piping

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

Flexible hoses should be used between the unit and the rigid system to avoid possible vibration.

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

units are supplied with either a copper or optional cupro-nickel Water to refrigerant Heat Exchanger. Copper is adequate for ground water that is not high in mineral content (See Table 5).

NOTE: Proper testing is required to ensure the well water quality is suitable for use with water source equipment. When in doubt, use cupro-nickel (see Table 5 - Water Quality Table).

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 must 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 their high-pressure drop and poor throttling characteristics.

Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing.

! CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution could result in unit equipment damage. Never exceed the recommended water flow rates as per AHRI ratings since 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 in this document.

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

IMPORTANT: Do not overtighten the connections

Electrical

Refer to electrical component box layout. (See Fig. 3)

IMPORTANT: Field wiring must comply with local and national electric codes.

! CAUTION

UNIT OPERATION DAMAGE HAZARD

Failure to follow this caution could result in unit damage or improper operation.

Power to the unit must be within the operating voltage range indicated on the unit's 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 the 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.

Low voltage field wiring should enter a grommet on the right. High voltage should enter a grommet on the left. Keep separation from low and high voltage. Copper conductors only.

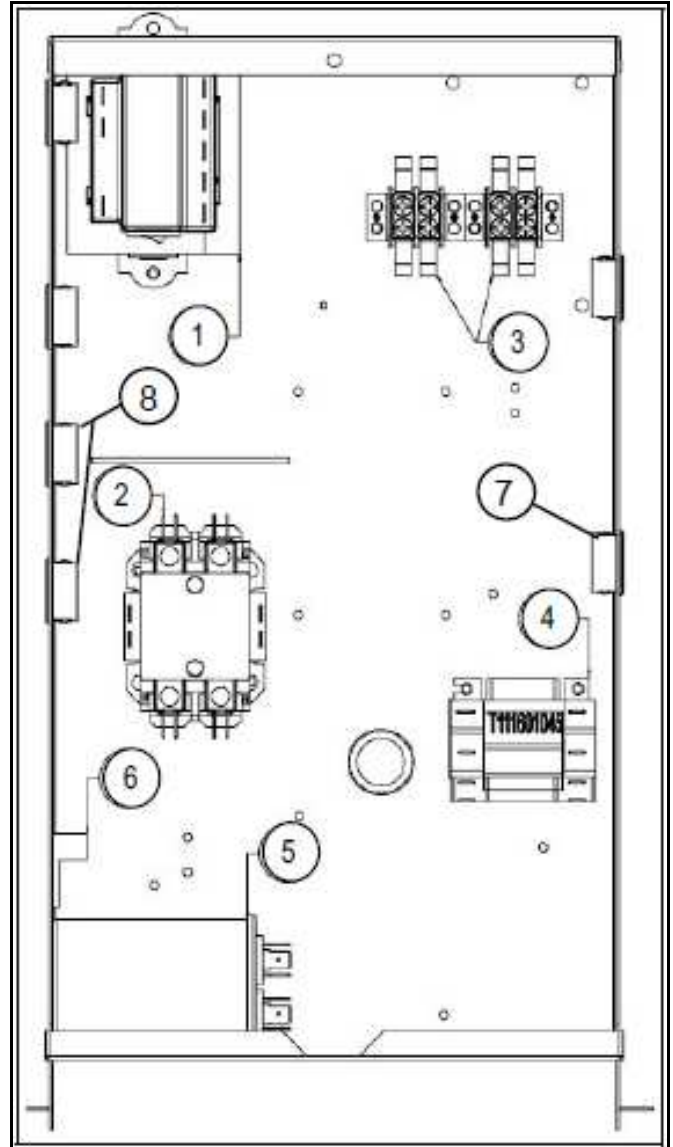


Fig. 3 – Electrical component box layout

- [1] Transformer
- [2] Compressor Contactor
- [3] Seven-Pin Terminal Block
- [4] Pump/Valve Relay
- [5] Compressor Capacitor
- [6] Chassis Ground Lug+
- [7] [Low Voltage Field Wire (24VAC T-Stat)
- [8] High Voltage Field Wire (L, N, G)

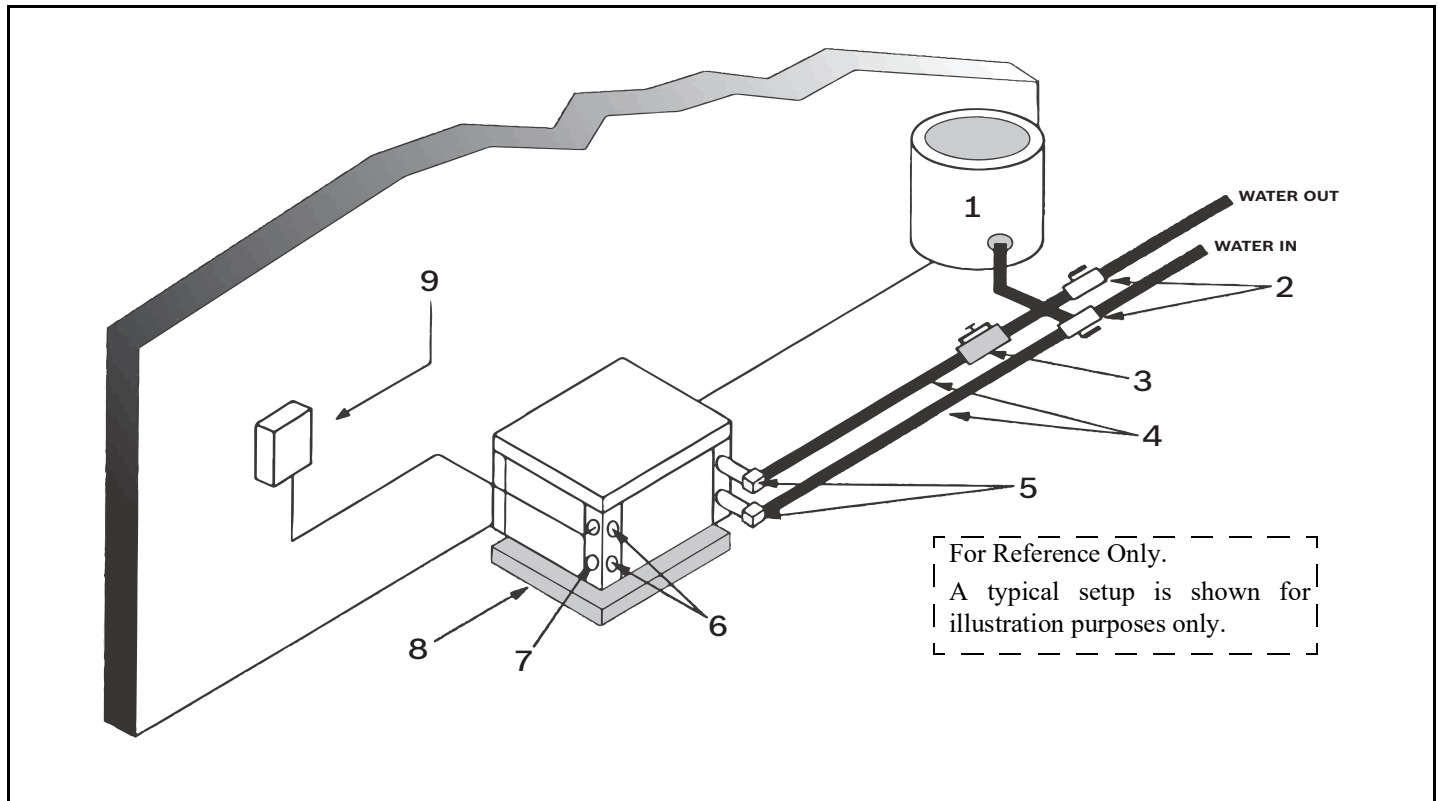
FOR REFERENCE ONLY Actual control box layout may vary from this example. Always refer to the wiring diagram attached to the unit.

SPECIFIC APPLICATION CONSIDERATIONS

Well Water Systems

Copper is adequate for ground water that is not high in mineral content. Should your well driller express concern regarding the quality of the well water available or should any known hazards exist in your area, we recommend proper testing to ensure the well water quality is suitable for use with water source equipment (See [Table 5](#) - Water Quality table). In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is recommended. 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 ensure that the well can provide sufficient flow for both. In well water applications, a slow-closing solenoid valve must be used and installed on the leaving-water side of coaxial to prevent water hammer. Solenoid valves should be connected across Y1 and C for all. Make sure that the VA draw of the valve does not exceed the contact rating of the controls (See [Fig. 4](#)).



[1] Pressure Tank

[2] Ball Valves

[3] Solenoid Valve

[4] Hose Kit

[5] P/T Kit

[6] Load-Side Connections

[7] Low-Voltage Control Connection

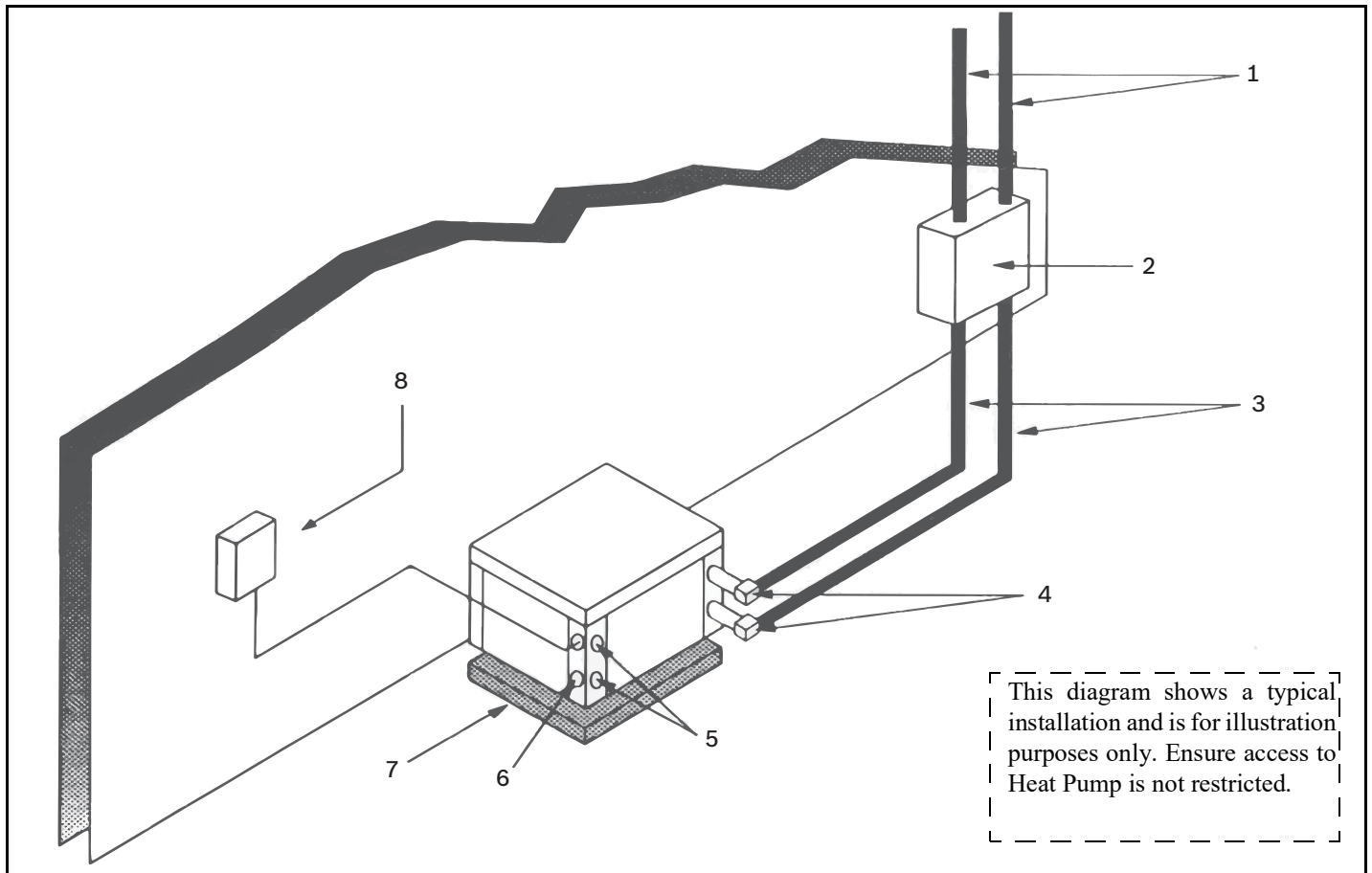
[8] Vibration Pad

[9] Line-Voltage Control Connection

Fig. 4 – Typical well water setup

Geothermal Systems

Closed-loop and pond applications require specialized design knowledge. No attempt at these installations should be made unless the dealer/loop installer has received specialized training. Using factory recommended accessories in the Geothermal Accessories Catalog makes the installation of flow centers easy. Anti-freeze solutions are utilized when low-evaporating conditions are expected to occur. Refer to the flow center or flush cart installation manuals for specific instructions.



- [1] Polybutylene or Polyethelene with insulation
- [2] Flow Center
- [3] Ground loop connection kit
- [4] P/T ports

- [5] Load-side connection
- [6] Low-voltage control connection
- [7] Vibration pad
- [8] Line voltage disconnect

Fig. 5 – Typical Geothermal System Setup

POST-INSTALLATION SYSTEM CHECKOUT

After completing the installation and before energizing the unit, the following system checks **MUST** 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 the 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. Verify that vibration isolation has been provided.
8. Ensure the unit is serviceable.
9. Confirm that all access panels are secured in place.

IMPORTANT:

- 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 secondary control voltage of 18 volts. 24 volts is ideal for best operation.
- Long-length thermostat and control wiring leads may create voltage drop. Increase wire gauge or up-size transformers may be required to ensure 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 installation criteria.

SYSTEM OPERATION

UNIT START-UP

IMPORTANT: Be aware that initial start-up is best in cooling mode, and condensation may be generated on system/application piping during cooling mode. Precautions should be taken to remove condensate/condensation to avoid property damage.



CAUTION

Property Damage Hazard

Failure to follow this caution may result in property damage.

initial start-up is best in cooling mode, and condensation may be generated on system/application piping during cooling mode. Precautions should be taken to remove condensation to avoid property damage.

1. Set the thermostat to the highest setting.
2. Set the thermostat system switch to "COOL." The reversing valve solenoid should energize. The compressor should not run.
3. Reduce the thermostat setting approximately five degrees below the 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 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 degrees above the room temperature.
10. Verify the heat pump is operating in the heating mode.
11. Set the thermostat to maintain the desired space temperature.
12. Check for vibrations, leaks, etc.

Also see Initial Start-Up of a HRP System in this document.

SEQUENCE OF OPERATION

Cooling Mode

Energizing the "O" terminal energizes the unit reversing valve thus placing the unit into cooling mode. When the thermostat calls for first-stage cooling (Y1) the loop pump or solenoid valve, if present, is energized and the first stage of the compressor capacity starts.

When the thermostat calls for second-stage cooling (Y2) the second stage (or full-compressor capacity) is initiated. Once the thermostat is satisfied, the compressor shuts down accordingly.

Heating Mode

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

OPTIONS

Heat Recovery Package (HRP)

The heat recovery package is a factory-installed option on GW 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 when installed in a conditioned space and no risk for freezing water in HRP loop is present.

The HRP consists of three major components:

- Double-wall, vented refrigerant-to-water heat exchanger
- Circulating pump
- 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 120°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 HAZARD

Failure to follow this caution may result in unit damage.

If the 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.

ACCESSORIES

Pump/Valve Relay

The factory-installed pump relay can be used to energize a supply pump or solenoid valve when there is a call for compressor operation. This relay can be used to switch either high- or low-voltage power.

NOTE: See the Geothermal Accessories Catalog for the complete list of accessories available.

HEAT RECOVERY PACKAGE (HRP) SETUP

Water Tank Preparation

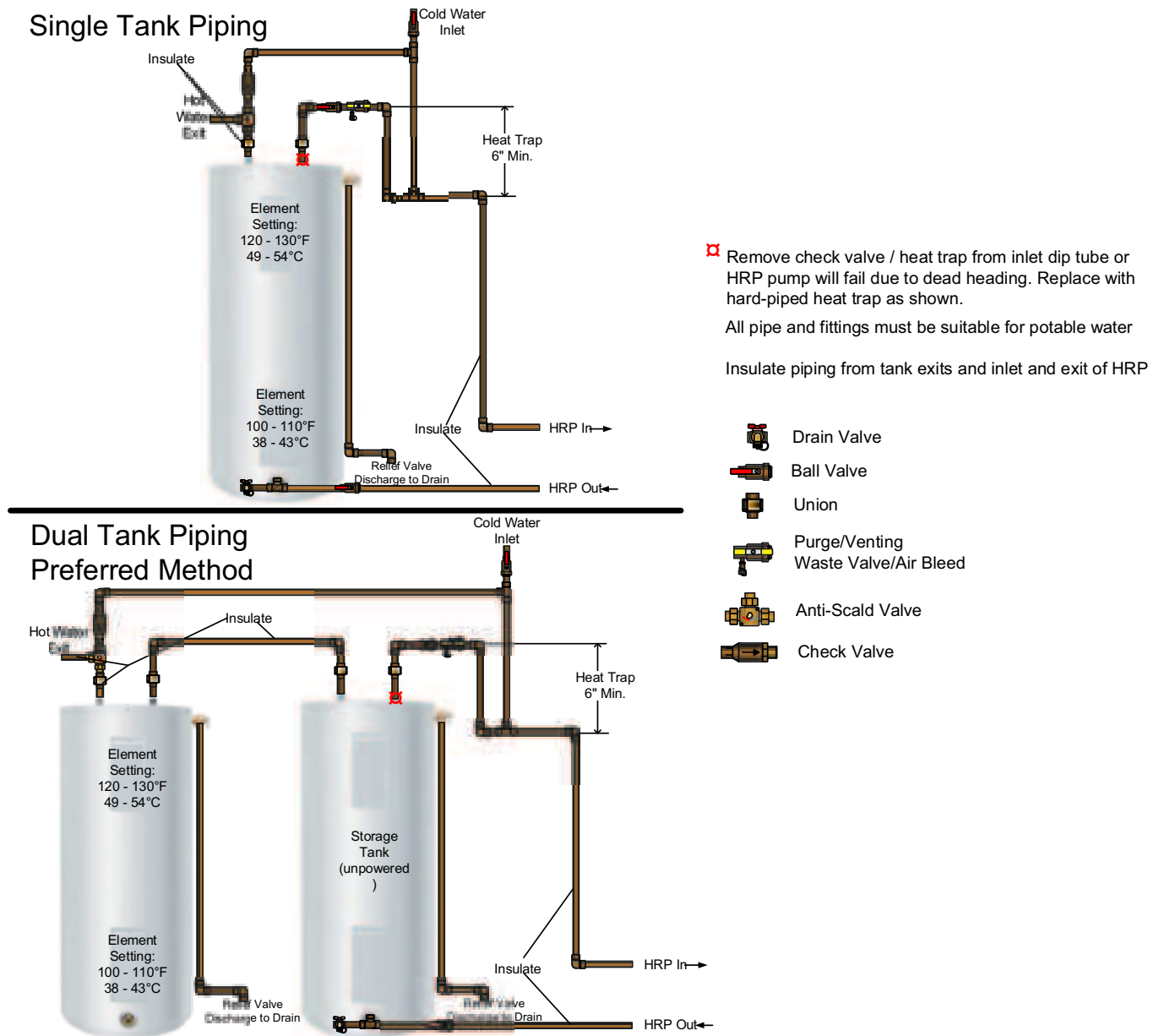
1. Turn off electrical or fuel supply to the water heater.
2. Attach garden hose to water tank drain connection and run other end of hose out doors or to an open drain.
3. Close cold water inlet valve to water heater tank.
4. Drain tank by opening drain valve on the bottom of the tank, then open pressure 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 HR water piping.

IMPORTANT: All piping from HRP to domestic water tank must be copper.

All hot water piping **MUST** be a minimum of 3/8" O.D. copper tubing 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.

Refer to local codes for other requirements. Remove the check valve/heat trap valve on the cold inlet dip tube of the heating tank, or the storage tank for dual tank application. Removing this valve will prevent damage to the HRP circulator. It is recommended to hard pipe a heat trap in lieu of this valve for additional energy savings. Install an air bleed, venting waste valve (or other fitting that allows air purge for initial install) on the HRP piping at the highest point. Use a 50 - 80 gallon water heater, or two 50-gallon water heaters connected in series (preferred method) as shown.

(See Fig. 6).



Heat pump not shown..

Fig. 6 – HRP Water Piping

A150174A

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. Press 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. Be sure all air is purged from the HRP piping.
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 the heat available from the refrigeration system and conserve the most energy. On tanks with both upper and lower elements and thermostats, the lower element should be turned down to 100°F, while the upper element should be adjusted to 120°F. Depending upon the specific needs of the customer, you may need to adjust the upper element differently. On tanks with a single thermostat, lower the thermostat setting to 120°F or the "LOW" position. After thermostat adjustments are completed, replace access cover and restore electrical or fuel supply to water heater.

Initial Start-Up of a HRP System

IMPORTANT: Make sure all valves in the heat recovery water piping system are open. **NEVER OPERATE THE 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° to 15°F.
4. "Burp" the HRP pump by unscrewing the slotted bleed screw during pump operation. Tighten screw when air is bled, and water begins to drip. **Do not over-tighten.**
5. 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.

SAFETY DEVICES AND UPM CONTROLLER

W024, GW036, W048, and GW060 models are equipped with the Unit Protection Module (UPM).

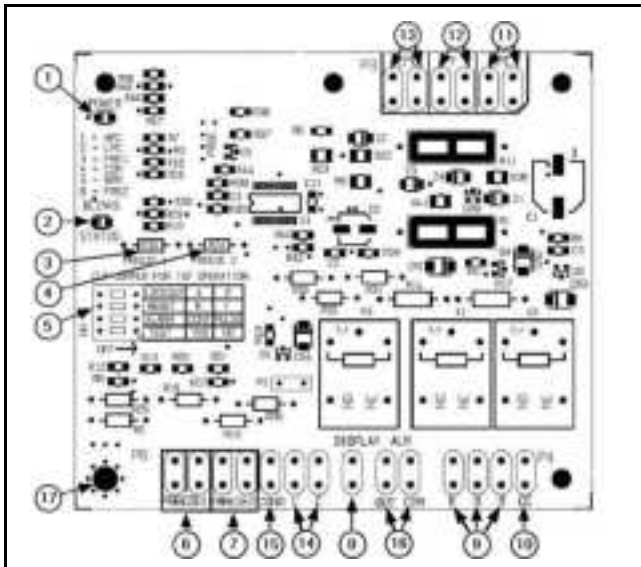


Fig. 7 – UPM controller board

1. Board Power Indicator
2. UPM Status LED Indicator (Fault Status)
3. Water Source Coil Freeze Protection Temperature Selection (R30, FREEZE 1)
4. Load Water Coil Freeze Protection Temperature Selection (R24, FREEZE 2)
5. UPM Board Settings
6. Source Coax Freeze Connection (FREEZE 1)
7. Load Coax Freeze Connection (FREEZE 2)
8. LCD Unit Display Connection (Not Applicable to Water-to-Water Units)
9. 24VAC Power Input (R)
10. Compressor Contact Output (Y1 Output)
11. High-Pressure Switch Connection
12. Call for Compressor (Y1 24VAC Input)
13. Low-Pressure Switch Connection
14. 24VAC Power Common (C)
15. Condensate overflow Sensor (Not Applicable to Water-to-Water Units)
16. Dry Contact
17. UPM Ground Standoff

NOTE: When a malfunction light is used for diagnostic purposes, the connection is made at the dry contact connection terminals of the UPM board. Shown in Fig. 7.

NOTE: 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 installed.

The GW Series is equipped with the 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.

- 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. 7, item 3 for resistor location), refer to Fig. 8 for sensor location.

NOTE: The UPM Board Dry Contacts are Normally Open (NO).

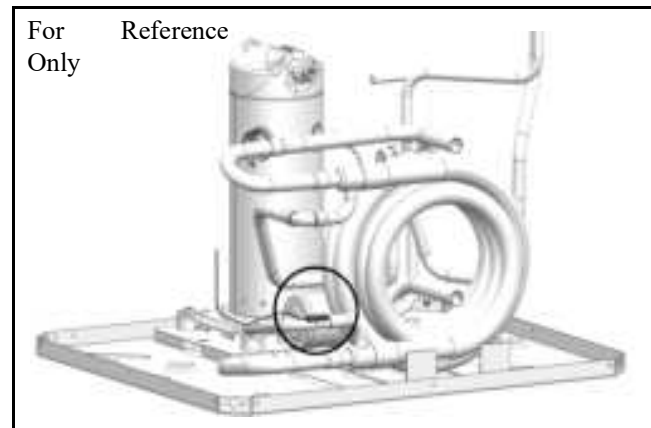


Fig. 8 – Sensor location

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution could result in unit damage.

If the 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 (do not cut R30 resistor) 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.

Table 1 – UPM Board Factory Default Settings

UPM Board Factory Default Settings	
TEMP	26°F
LOCKOUT	2
RESET	Y
ALARM	PULSE
TEST	NO

Table 2 – UPM DIP Switch Selectable Positions

UPM DIP SWITCH SELECTABLE POSTIONS			
	Lockout	4	2
	Reset	R	Y
	Alarm	Cont	Pulse
	Test	Yes	No

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 or 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. The reset signal is either a Y or R signal depending on the position of the dip switch as shown in Table 2. If the reset is set to R, the board must be manually powered off and powered back on to exit the hard lock out.
- **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. For blink code explanation, see Table 9. The remote device must have a malfunction detection capability when the UPM board is set to "PULSE."

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

- **TEST DIP SWITCH:** A test dip switch is provided to reduce all time delays settings to 10 seconds during troubleshooting or verification of unit operation.

 **CAUTION**

UNIT DAMAGE HAZARD

Failure to follow this caution may result in unit damage. 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 (sensor number 1); however, this can be changed to 15°F by cutting the R30 resistor located on top of the DIP switch SW1. Since Freeze Sensor 2 is dedicated to monitor the load side 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 (3 times) the code associated with this alarm condition. 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. 8. 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 6 times the code associated with this alarm condition. 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.

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

- **INTELLIGENT RESET:** If a fault condition is initiated, the 5-minute delay on break time period is initiated and the unit will restart after these delays expire. During this period the fault LED will indicate the cause of the fault. If the fault condition still exists or occurs 2 or 4 times (depending on 2 or 4 setting for Lockout dip switch) before 60 minutes, the unit will go into a hard lockout and requires a manual lockout reset.
- **LOCKOUT RESET:** A hard lockout can be reset by turning the unit thermostat off and then back on when the "RESET" dip switch is set to "Y" or by shutting off unit power at the circuit breaker when the "RESET" dip switch is set to "R."

SAFETY DEVICES AND UPM II CONTROLLER

The GW120 Model is equipped with the Unit Protection Module II (UPM II).

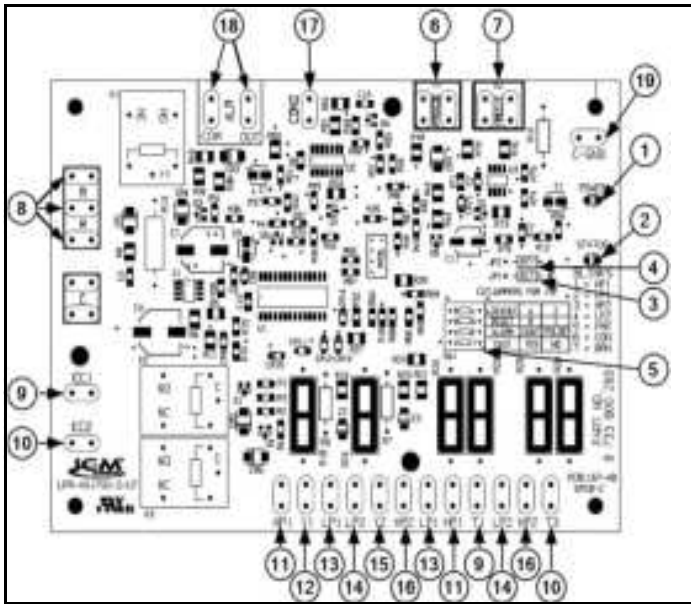


Fig. 9 – UPM II controller board

1. Board Power Indicator
2. UPM II Status LED Indicator (Fault Status)
3. Circuit 1 Freeze Protection Temperature Selection (R17)
4. Circuit 2 Freeze Protection Temperature Selection (R77)
5. UPM II Board Settings
6. Circuit 1 Freeze Connection
7. Circuit 2 Freeze Connection
8. 24VAC Power Input (R)
9. Compressor Contactor 1 Output Circuit
10. Compressor Contactor 2 Output Circuit
11. High-Pressure Circuit 1 Switch Connections
12. Call for Compressor (Y1 24VAC Input)
13. Low-Pressure Circuit 1 Switch Connections
14. Low-Pressure Circuit 2 Switch Connections
15. Call for Compressor 2 (Y1 24VAC Input)
16. High-Pressure Circuit 2 Switch Connections
17. Condensate Overflow Sensor (Not applicable for Water-to-Water Units)
18. Dry Contact
19. Chassis Ground Connection

IMPORTANT: When a malfunction light is used for diagnostic purposes, the connection is made at the dry contact connection terminals of the UPMII board. Shown in Fig. 9.

The UPM II controls the compressor operations and monitors the safety controls that protect the unit.

Safety controls include the following:

- **High-pressure switches:** located in the refrigerant discharge lines and wired across terminals HP1 and HP2 on the UPM II.
- **Low-pressure switches:** located in the unit refrigerant suction lines and wired across terminals LP1 and LP2 on the UPM II.
- **Water-side freeze protection sensors:** mounted close to the load and source condensing water coils, monitor refrigerant temperature between condensing water coils and thermal expansion valves. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shut down the compressors 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 R17 Freeze1 resistor and the R77 Freeze2 resistor located on top of DIP switch SW1 (Refer to Fig. 9, item [3] for resistor location), refer to Fig. 10 for sensor location.

NOTE: The UPM II Board Dry Contacts are Normally Open (NO).

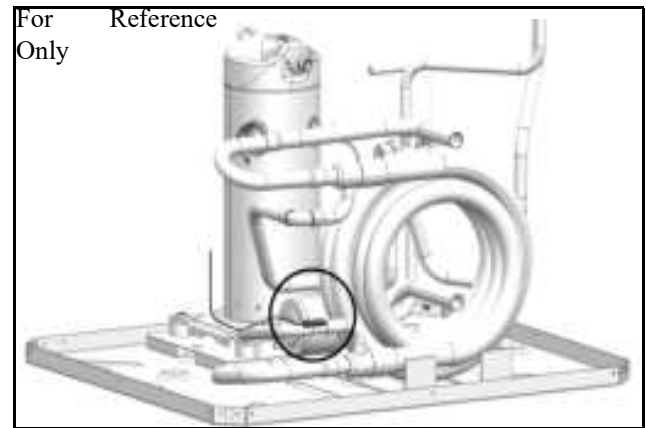


Fig. 10 – Sensor location

UNIT DAMAGE HAZARD

Failure to follow this caution could result in unit damage.

If the unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the Freeze1 R17 and Freeze2 R77 resistor set to 26°F (do not cut R17 or R77 resistor) 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.

Table 3 – UPM II Board Factory Default Settings

UPM II Board Factory Default Settings	
TEMP	26°F
LOCKOUT	2
RESET	Y
ALARM	PULSE
TEST	NO

Table 4 – UPM DIP Switch Selectable Positions

UPM II DIP SWITCH SELECTABLE POSITIONS			
	Lockout	4	2
	Reset	R	Y
	Alarm	Cont	Pulse
	Test	Yes	No

The UPMII 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 or 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. The reset signal is either a Y or R signal depending on the position of the dip switch as shown in [Table 4](#). If the reset is set to R, the board must be manually powered off and powered back on to exit the hard lock out.
- **BROWNOUT/SURGE/POWER INTERRUPTION PROTECTION:** The brownout protection in the UPM II 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. For blink code explanation, see [Table 10](#). The remote device must have a malfunction detection capability when the UPM II board is set to "PULSE."

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

- **TEST DIP SWITCH:** A test dip switch is provided to reduce all time delays settings to 10 seconds during troubleshooting or verification of unit operation.

- **FREEZE SENSOR:** The default setting for the freeze limit trip is 26°F; however, this can be changed to 15°F by cutting the R17 and R77 resistors located on top of the DIP switch SW1. The UPM II controller will constantly monitor the refrigerant temperature with the sensor mounted close to the water coils 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 (3 times) the code associated with this alarm condition. If this alarm occurs 2 times (or 4 if Dip switch is set to 4) within an hour the UPM II 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 [Table 10](#). 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 6 times the code associated with this alarm condition. 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.

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

- **INTELLIGENT RESET:** If a fault condition is initiated, the 5-minute delay on break time period is initiated and the unit will restart after these delays expire. During this period the fault LED will indicate the cause of the fault. If the fault condition still exists or occurs 2 or 4 times (depending on 2 or 4 setting for Lockout dip switch) before 60 minutes, the unit will go into a hard lockout and requires a manual lockout reset.
- **LOCKOUT RESET:** A hard lockout can be reset by turning the unit thermostat off and then back on when the "RESET" dip switch is set to "Y" or by shutting off unit power at the circuit breaker when the "RESET" dip switch is set to "R."

CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution could result in unit damage.

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.

Table 5 – Water Quality Table

POTENTIAL PROBLEM	Water Characteristic	Acceptable Value	
		Copper	Cupro-Nickel
	pH (Acidity/Alkalinity)	7–9	7–9
SCALING	Hardness (CaCO ₃ , MgCO ₃)	< 350 ppm	< 350 ppm
	Ryznar Stability Index	6.0–7.5	6.0–7.5
	Langelier Saturation Index	-0.5 – +0.5	-0.5 – +0.5
CORROSION	Hydrogen Sulfide (H ₂ S)	< 0.5 ppm*	10–50 ppm
	Sulfates	< 125 ppm	< 125 ppm
	Chlorine	< 0.5 ppm	< 0.5 ppm
	Chlorides	< 20 ppm	< 150 ppm
	Carbon Dioxide	< 50 ppm	< 50 ppm
	Ammonia	< 2 ppm	< 2 ppm
	Ammonia Chloride	< 0.5 ppm	< 0.5 ppm
	Ammonia Nitrate	< 0.5 ppm	< 0.5 ppm
	Ammonia Hydroxide	< 0.5 ppm	< 0.5 ppm
	Ammonia Sulfate	< 0.5 ppm	< 0.5 ppm
	Dissolved Solids	< 1,000 ppm	< 1,500 ppm
IRON FOULING	Iron (Fe ₂ + Iron Bacteria Potential)	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	< 1 ppm	< 1 ppm
EROSION	Suspended Solids	< 10 ppm, < 600 µm size**	< 10 ppm, < 600 µm size**
	Maximum Water Velocity	6 ft/sec	6 ft/sec
* No "rotten egg" smell present at < 0.5 ppm H ₂ S.			
** Equivalent to 30 mesh strainer			

TROUBLESHOOTING

IMPORTANT: A possible fault may be one or a combination of causes and solutions. Check each cause and verify each before making any conclusion. page #2

Table 6 – Unit Troubleshooting

PROBLEM	POSSIBLE CAUSE	CHECKS AND CORRECTIONS
ENTIRE UNIT DOES NOT RUN	Power Supply Off	Close disconnect, apply power
	Blown Fuse/Tripped Breaker	Replace fuse or reset circuit breaker. If using fuses, ensure they are the correct size.
	Voltage Supply Low	If voltage is below minimum voltage specified on unit data plate, contact local power company.
UNIT OFF DUE TO HIGH-PRESSURE CONTROL	Discharge Pressure is Too High	If in “COOLING” mode: Lack of or inadequate water flow. Entering water temperature is too warm. Scaled or plugged condenser. If in “HEATING” mode: Lack of or inadequate load side fluid flow.
	Refrigerant Charge	The unit is overcharged with refrigerant. Reclaim refrigerant, evacuate and recharge with factory recommended charge.
	High-Pressure Switch	Check for a defective or improperly calibrated high-pressure switch.
	High-Pressure Fault	If the unit has UMC and a 40° F freeze sensor is being used, this sensor is in series with HP switch and this will show as a HP fault and not a freeze fault.
UNIT OFF TO LOW-PRESSURE CONTROL	Suction Pressure Too Low	If in “COOLING” mode: Lack of or inadequate Source side fluid. flow. Entering water temperature is too cold. If 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.
	Low-Pressure Fault	If the unit has UMC and the DPS option is being used, this sensor is in series with LP switch and this will show as a LP fault and not a DPS fault.
UNIT SHORT CYCLES	Unit Oversized	Recalculate heating and or cooling loads.
	Thermostat	If the thermostat is installed near a supply air grill, relocate thermostat. Adjust the heat anticipator.
	Wiring and Controls	Check for defective or improperly calibrated low-pressure switch.
INSUFFICIENT COOLING OR HEATING	Unit Undersized	Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem.
	Fluid Flow	Check for the lack of adequate fluid flow.
	Refrigerant Charge	Refrigerant charge low 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, Non-condensables	The refrigerant system may be contaminated with moisture or non-condensables. Reclaim refrigerant, replace filter dryer, evacuate the refrigerant system, and recharge with factory recommended charge.

Table 7 – HRP Troubleshooting

Problem	Possible Cause	Checks and Corrections
NO FLOW LOW FLOW	No Power	Check the power supply.
	On/Off Switch Position	Set switch to “ON” position.
	Compressor Contactor	Engage the heat pump contactor.
	Broken or loose wires	Repair or tighten the wires.
	Air Lock	Purge the air from piping system.
	Stuck Pump Shaft/Impeller	Remove the pump cartridge and clean.
	Defective Pump	Replace the pump.
	Kinked or Undersized Water Piping	Repair the kink and check for proper line size.
HIGH-WATER TEMPERATURE	Water Temp Limit Closed	Check for a stuck limit switch. Check for a sensor not securely attached to the line.
LOW HEAT OUTPUT	Scaled or Fouled Heat Exchanger	Clean the heat exchanger.

Unit Lockouts

Periodic lockouts almost always are caused by 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: water flow problems, water temperature problems. Use of the pressure and temperature charts for the unit may be required to properly determine the cause.

ELECTRICAL DATA

Table 8 – Electric Data Table

Model	Voltage Code	Rated Voltage	Voltage Min/Max	Compressor					
				QTY	RLA	LRA	Min Circuit Amps	MOP Calculation	Max Fuse/HACR
W024	1	208–230/60/1	197/253	1	11.7	58.3	14.6	26.2	25
W036	1	208–230/60/1	197/253	1	15.6	83.0	19.5	35.1	35
W048	1	208–230/60/1	197/253	1	21.2	104.0	26.4	47.6	45
W060	1	208–230/60/1	197/253	1	26.9	139.0	33.6	60.5	60
GW120	1	208–230/60/1	197/253	2	26.9	139.0	60.5	87.4	80

UPM LED STATUS INDICATOR (Blink Code) DATA

The LED status indicator is found on the UPM boards. See [Fig. 7](#) for the UPM Board. See [Fig. 9](#) for the UPM II Board.

Table 9 – UPM LED Status Indications

Indication Color	Blinks	Description
GREEN	Solid	18–30 VAC power is present
RED	1	High-pressure lockout
RED	2	Low-pressure lockout
RED	3	Freeze 1 sensor lockout
RED	4	Condensate overflow
RED	5	Brownout
RED	6	Freeze 2 sensor lockout

Table 10 – UPM II LED Status Indications

Indication Color	Blinks	Description
GREEN	Solid	18–30 VAC power is present
RED	1	High-pressure lockout — Circuit 1
RED	2	Low-pressure lockout — Circuit 1
RED	3	High-pressure lockout — Circuit 2
RED	4	Low-pressure lockout — Circuit 2
RED	5	Freeze sensor lockout
RED	6	Condensate overflow
RED	7	Brownout

MAINTENANCE

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.

An annual “checkup” by a trained and qualified HVAC mechanic is required. Complete the Unit Start-up Checklist when performing the annual maintenance checkup. Recording the performance measurements of volts, amps, and water temperature differences for 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.

DECOMMISSIONING INFORMATION

Only trained and qualified technicians are allowed to decommission and dispose of equipment following the requirements of the Local Authority Having Jurisdiction (AHJ).

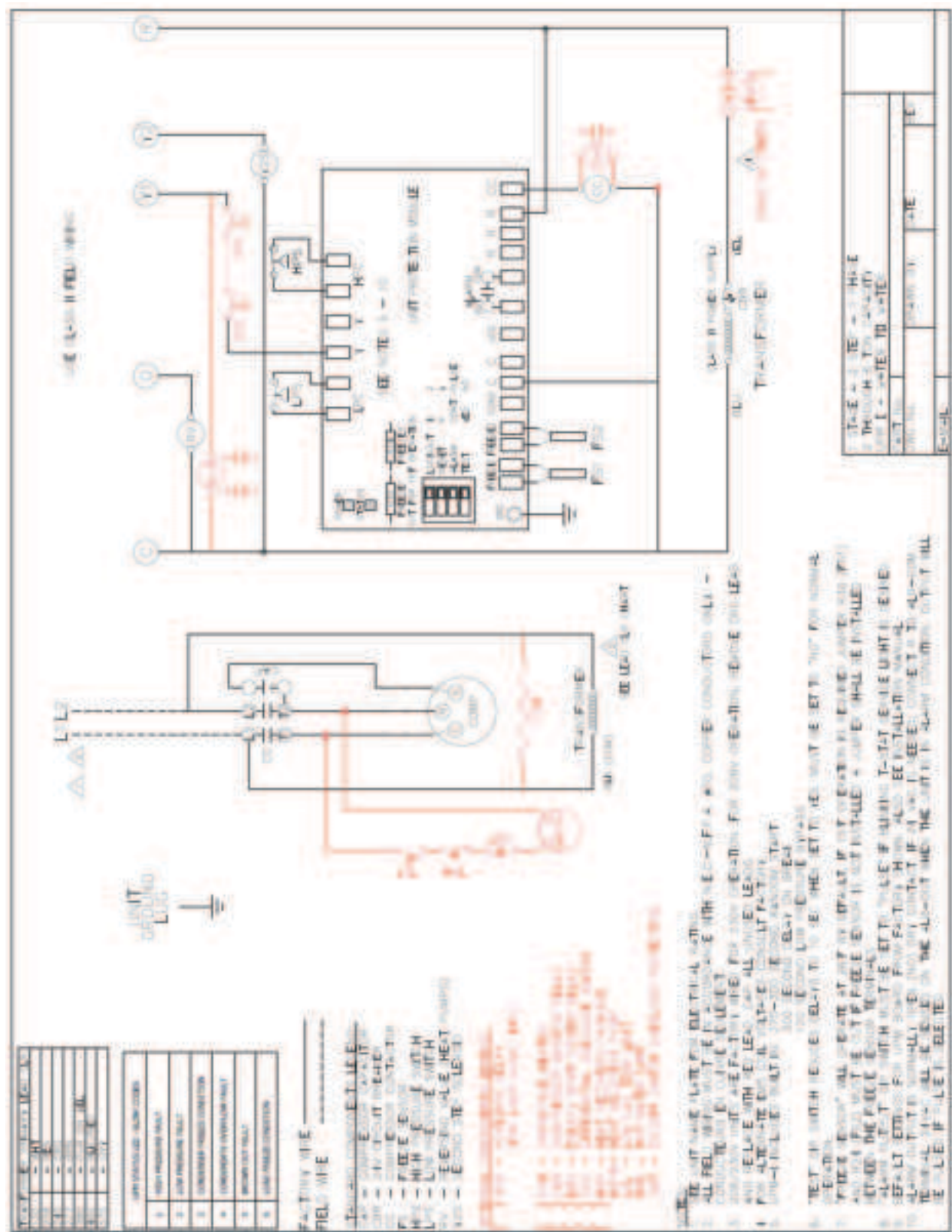
WARNING

PERSONL INJURY AND ENVRIONMENTAL HAZARD

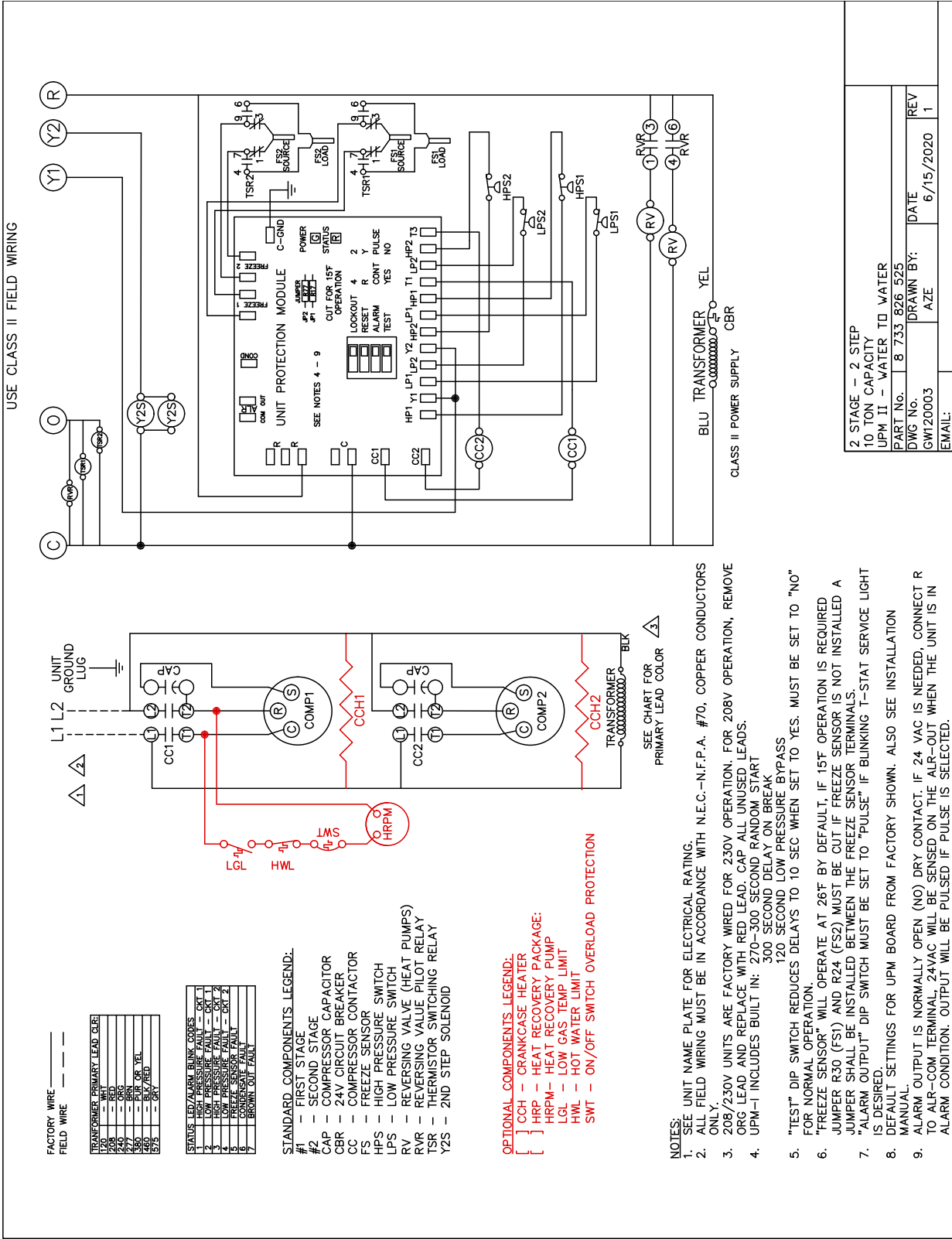
Failure to follow this warning could result in personal injury or death. Relieve pressure and recover all refrigerant before system repair or final unit disposal. Use all service ports and open all flow--control devices, including solenoid valves.

Federal regulations require that you do not vent refrigerant to the atmosphere. Recover during system repair or final unit disposal.

WIRING DIAGRAMS

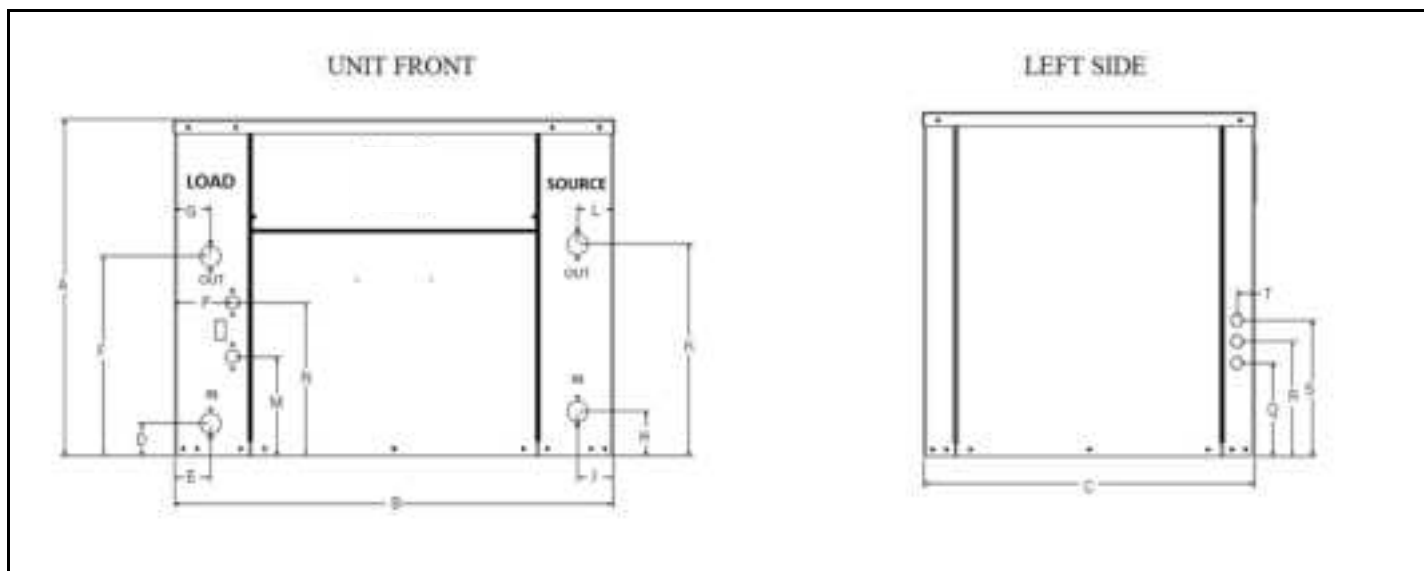


FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.



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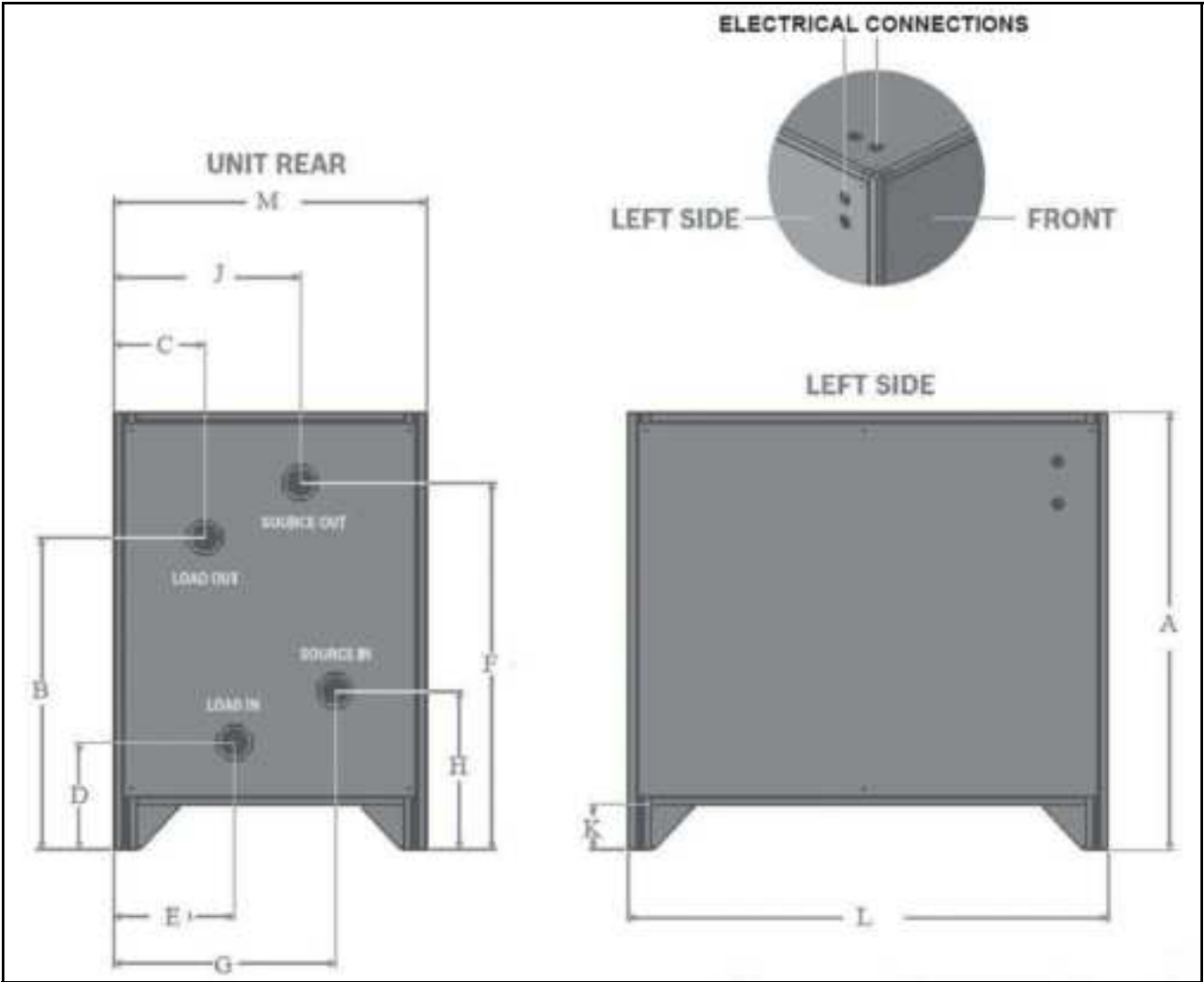
DIMENSIONAL DRAWINGS



MODEL SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	WATER CONN	HRP CONN
	Height	Width	Depth																	
024	24	32.5	24	2.70	2.50	13.70	2.50	3.25	1.95	14.25	1.95	7.15	11.0 0	4.25	6.55	8.05	9.55	1.25	3/4 FPT	1/2 FPT
036	24	32.5	24	2.30	2.55	14.30	2.65	3.80	2.67	15.80	2.67	7.24	11.1 2	4.31	5.80	8.05	10.3	1.25	3/4 FPT	1/2 FPT
048	24	32.5	24	2.90	2.19	16.90	2.19	3.10	2.17	17.10	2.17	7.24	11.1 2	4.31	5.80	8.05	10.3	1.25	1 FPT	1/2 FPT
060	24	32.5	24	2.90	2.19	16.90	2.19	3.10	2.17	17.10	2.17	7.24	11.1 2	4.31	5.80	8.05	10.3	1.25	1 FPT	1/2 FPT

NOTES: All dimensions within +/- 0.125"

Specifications subject to change without notice.



MODEL SIZE	A	B	C	D	E	F	G	H	J	K	L	M	WATER CONN.
120	37.75	27.25	8.13	8.00	10.53	32.75	20.13	13.50	17.63	3.75	46.00	28.00	1-1/4" PPT

NOTES: All dimensions within +/- 0.125"
Specifications subject to change without notice.