GT-PCS Digital Indoor Split Series (50YGS Models)
GT-PCS Digital Outdoor Split Series (50YGP Models)

Installation, Operation and Maintenance Instructions

Residential Split
Geothermal Heat Pumps

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Model Nomenclature: for Indoor Split Series

	1 2 3	4 5 6	7	8	9	10	11	12	13
50	YGS	0 2 6	N	D	2	C	3	1	1

PREFIX

SERIES (Extended Range UltraHigh Efficiency)
YGS = Indoor Split Residential

UNIT SIZE
026
038
049
064

AIR FLOW CONFIGURATION
N= Not Applicable

CONTROLS
D=DXM2

WATER CIRCUIT OPTIONS
2 = Internal Flow Controller High Head Magna Pump
5 = Motorized Valve (Modulating)
Closed Loop Applications, Low System Pressure Drop
6 = Motorized Valve (Modulating)
Open Loop Applications, High System Pressure Drop

In Position 9 and 10, only the following combinations are available:

With HWG	Without HWG	Description
2C	2A	Internal Flow Controller with Copper Water Coil
5C	5A	Motorized Modulating Valve with Copper Water Coil
6N	6J	Motorized Modulating Valve with Cupro-Nickel Water Coil

HEAT EXCHANGER OPTIONS

	Copper	Cupro-Nickel
HWG w/Pump (Standard)	C	N
No - HWG	A	J

VOLTAGE
3 = 208-230/60/1

REVISION LEVEL
1=Current Revision

PACKAGING
1 = Single Pack, Domestic

Model Nomenclature: for Outdoor Split Series

	1 2 3	4 5 6	7	8	9	10	11	12	13
50	YGP	0 2 6	N	D	2	A	3	1	1

PREFIX

SERIES (Extended Range UltraHigh Efficiency)
YGP = Outdoor Split Residential

UNIT SIZE
026
038
049
064

AIR FLOW CONFIGURATION
N= Not Applicable

CONTROLS
D=DXM2

WATER CIRCUIT OPTIONS
2 = Internal Flow Controller High Head Magna Pump

HEAT EXCHANGER OPTIONS
A = Non Hot Water Generator with Copper

VOLTAGE
3 = 208-230/60/1

REVISION LEVEL
1=Current Revision

PACKAGING
1 = Single Pack, Domestic

Safety

Safety

Warnings, cautions and notices appear throughout this manual. Read these items carefully before attempting any installation, service, or troubleshooting of the equipment.

DANGER: Indicates an immediate hazardous situation, which if not avoided will result in death or serious injury. DANGER labels on unit access panels must be observed.

WARNING: Indicates a potentially hazardous situation, which if not avoided could result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation or an unsafe practice, which if not avoided could result in minor or moderate injury or product or property damage.

NOTICE: Notification of installation, operation or maintenance information, which is important, but which is not hazard-related.

⚠ WARNING! ⚠

WARNING! To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

⚠ WARNING! ⚠

WARNING! All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

⚠ CAUTION! ⚠

CAUTION! To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. The mechanical components and filters will quickly become clogged with construction dirt and debris, which may cause system damage.

General Information

Inspection
Upon receipt of the equipment, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the packaging of each unit, and inspect each unit for damage. Insure that the carrier makes proper notation of any shortages or damage on all copies of the freight bill and completes a common carrier inspection report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. If not filed within 15 days, the freight company can deny the claim without recourse. Note: It is the responsibility of the purchaser to file all necessary claims with the carrier. Notify your equipment supplier of all damage within fifteen (15) days of shipment.

Storage
Equipment should be stored in its original packaging in a clean, dry area. Store units in an upright position at all times. Stack units a maximum of 3 units high.

Unit Protection
Cover units on the job site with either the original packaging or an equivalent protective covering. Cap the open ends of pipes stored on the job site. In areas where painting, plastering, and/or spraying has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. Physical damage and contamination may prevent proper start-up and may result in costly equipment clean-up.

Examine all pipes, fittings, and valves before installing any of the system components. Remove any dirt or debris found in or on these components.

Pre-Installation
Installation, Operation, and Maintenance instructions are provided with each unit. Horizontal equipment is designed for installation above false ceiling or in a ceiling plenum. Other unit configurations are typically installed in a mechanical room. The installation site chosen should include adequate service clearance around the unit. Before unit start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check the system before operation.

Prepare units for installation as follows:
1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Keep the cabinet covered with the original packaging until installation is complete and all plastering, painting, etc. is finished.
3. Verify refrigerant tubing is free of kinks or dents and that it does not touch other unit components.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.
5. Locate and verify any hot water generator (HWG) or other accessory kit located in the compressor section.

⚠ CAUTION! ⚠

CAUTION! DO NOT store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move and store units in an upright position. Tilting units on their sides may cause equipment damage.

⚠ CAUTION! ⚠

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, safety glasses and gloves when handling parts and servicing heat pumps.

Equipment Selection

The installation of geothermal heat pump units and all associated components, parts, and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

General

Proper indoor coil selection is critical to system efficiency. Using an older-model coil can affect efficiency and may not provide the customer with rated or advertised EER and COP. Coil design and technology have dramatically improved operating efficiency and capacity in the past 20 years. Homeowners using an older coil are not reaping these cost savings and comfort benefits. NEVER MATCH AN R-22 INDOOR COIL WITH AN Puron® COMPRESSOR SECTION.

Newer indoor coils have a larger surface area, enhanced fin design, and grooved tubing. These features provide a larger area for heat transfer, improving efficiency and expanding capacity. Typical older coils may only have one-third to one-half the face area of these redesigned coils.

Indoor Coil Selection – GT-PCS (50YGS and 50YGP)

Split system heat pumps are designed for and rated in the AHRI directory with specific air handlers and cased coils. GT-PCS models are rated with FE/FV4 Air Handlers and CNP Cased coils. ***Applying these heat pumps to other brands/ models of air handlers or cased coils may result in unsatisfactory performance and make them ineligible for the Energy Star program, utility rebates, or tax credits.***

See Table 1 in this publication for the AHRI system match.

Table 1: GT-PCS Component Matches for AHRI Ratings

Unit Size	26	38	49	64
Air Handler Model FE/FV4	002	005	006	006
Cased Coil Model CNP	24	36	48	60

Due to limitations in combining a geothermal split unit with a Carrier Infinity fan coil, furnace or Infinity Control; or a Bryant Evolution fan coil, furnace or Evolution Control, refer to Service Bulletins SMB 10-0007 and DSB 10-0007.

Installation

The installation of geothermal heat pump units and all associated components, parts and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

Removing Existing Condensing Unit (Where Applicable)

1. Pump down condensing unit. Close the liquid line service valve of existing condensing unit and start compressor to pump refrigerant back into compressor section. Then, close suction service valve while compressor is still running to trap refrigerant in outdoor section. Immediately kill power to the condensing unit.
2. Disconnect power and low voltage and remove old condensing unit. Cut or unbraze line set from unit. Remove condensing unit.
3. If condensing unit is not operational or will not pump down, refrigerant should be recovered using appropriate equipment.
4. Replace line set, especially if upgrading system from R-22 to Puron® refrigerant. If line set cannot be replaced, it must be thoroughly flushed before installing new compressor section. Puron® compressors use POE oil instead of mineral oil (R-22 systems). Mineral oil is not compatible with POE oil, and could cause system damage if not completely flushed from the line set.

“Indoor” Compressor Section Location

Both “indoor” and “outdoor” versions of the geothermal split system compressor section are available. “Indoor” version is not designed for outdoor installation. Locate the unit in an INDOOR area that allows enough space for service personnel to perform typical maintenance or repairs without removing unit. Units are typically installed in a mechanical room or closet. Never install units in areas subject to freezing or where humidity levels could cause cabinet condensation (such as unconditioned spaces subject to 100% outside air). Consideration should be given to access for easy removal of service access panels. Provide sufficient room to make water, electrical, and line set connections.

Any access panel screws that would be difficult to remove after the unit is installed should be removed prior to setting the unit. Refer to Figure 1 for an illustration of a typical installation. Refer to “Physical Dimensions” section for dimensional data. Conform to the following guidelines when selecting unit location:

1. Install the unit on a piece of rubber, neoprene or other mounting pad material for sound isolation. The pad should be at least 3/8” [10mm] to 1/2” [13mm] in thickness. Extend the pad beyond all four edges of the unit.
2. Provide adequate clearance for maintenance and service. Do not block access panels with piping, conduit or other materials.
3. Provide access for servicing the compressor and heat exchanger without removing the unit.
4. Provide an unobstructed path to the unit within the closet or mechanical room. Space should be sufficient to allow removal of the unit, if necessary.
5. Provide access to water valves and fittings and screwdriver access to the unit side panels and all electrical connections.

“Outdoor” Compressor Section Location

Locate the unit in an outdoor area that allows easy loop and lineset access and also has enough space for service personnel to perform typical maintenance or repairs. The “outdoor” compressor section is usually installed on a condenser pad directly outside the lineset access into the building. The loop access end should be located away from the building. Conform to the following guidelines when selecting unit location:

1. Provide adequate access for loop trench excavation.
2. Locate unit directly outside lineset penetration if possible. Utilize existing condenser pad where possible.
3. Provide access for servicing and maintenance.

“Outdoor” compressor section may be mounted on a vibration isolation pad with loop access hole as shown in Figure 3. When mounting on an existing concrete condenser pad, 3” [76 mm] holes should be bored through the pad to accommodate the pipe (1-¼” - 32mm) and insulation (½” [13mm] wall thickness). Figure 3 illustrates location and dimensions of the holes required.

Air Handler Installation

This manual specifically addresses the compressor section of the system. Air handler location and installation should be according to the instructions provided with the air handling unit.

⚠ CAUTION! ⚠

CAUTION! To avoid equipment damage, DO NOT allow system water pressure to exceed 100 psi. when using the Internal Flow Controller option. The expansion tank in the flow controller has a maximum working water pressure of 100 psi. Any pressure in excess of 100 psi may damage the expansion tank.

Installation

Figure 1: 50YGS Installation

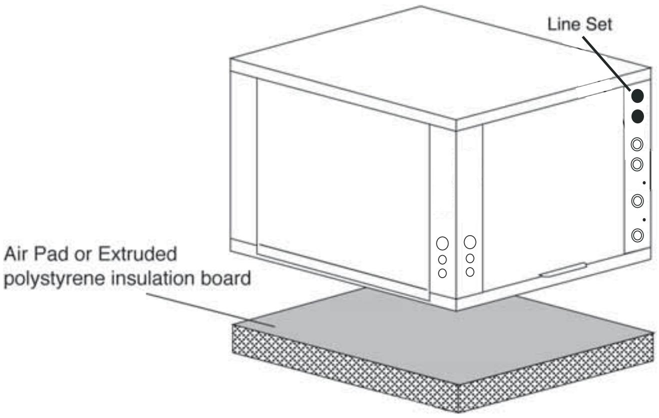
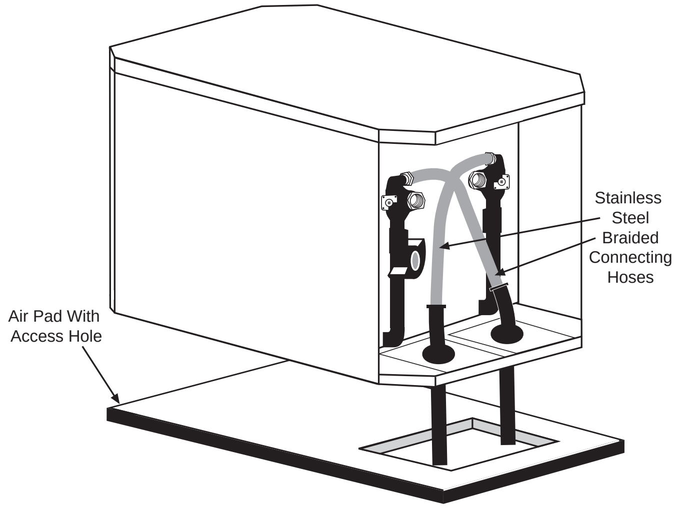
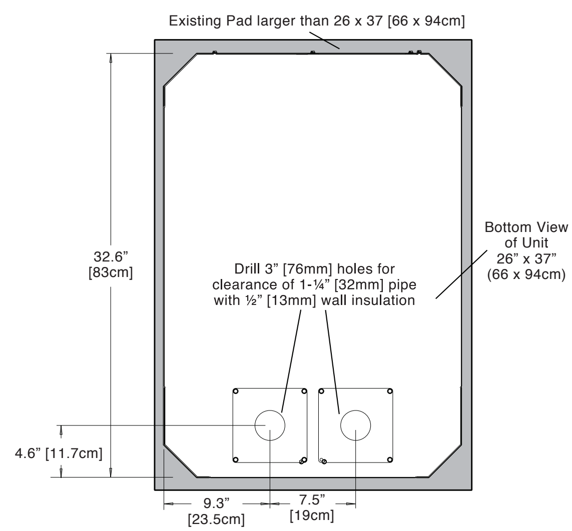


Figure 3: 50YGP Installation



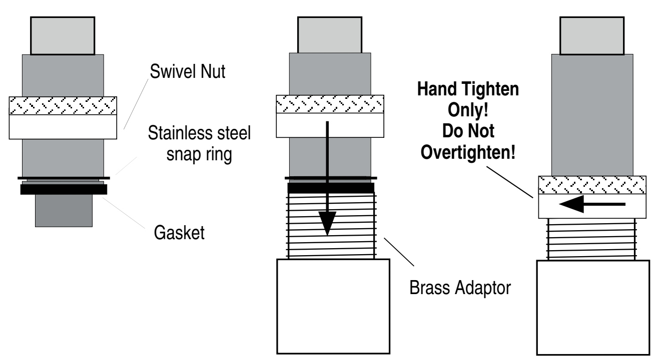


Water Connections

The TTS models utilize swivel piping fittings for water connections that are rated for 450 psi (3101 kPa) operating pressure. The connections have a rubber gasket seal similar to a garden hose gasket, which when mated to the flush end of most 1" threaded male pipe fittings provides a leak-free seal without the need for thread sealing tape or joint compound. Check for burrs and ensure that the rubber seal is in the swivel connector prior to attempting any connection (rubber seals are shipped attached to the swivel connector). DO NOT OVER TIGHTEN or leaks may occur.

The female locking ring is threaded onto the pipe threads which holds the male pipe end against the rubber gasket, and seals the joint. HAND TIGHTEN ONLY! DO NOT OVERTIGHTEN!

Figure 2: Water Connections (50YGS Series)



NOTE: Outdoor Unit Water Connections

50YGP026 and 038 units are shipped with ¾" stainless steel braided hoses connected to unit piping.

50YGP049 and 064 units are shipped with 1" stainless steel braided hoses connected to unit piping.

Integrated Variable-Speed Water Flow Control Heat Pump Applications Overview

Integrated Variable-Speed Water Flow Control is a revolutionary new, intelligent, and efficient way to circulate water (or water plus antifreeze) using INTERNAL, variable water flow control. The factory-installed high-efficiency variable-speed pump uses 60%-80% less wattage than a traditional fixed speed pump. Integrated Variable-Speed Water Flow Control technology improves performance of the unit by reducing the amount of energy required to optimize the flow of water throughout a GHP System and also reduces the space, cost, and labor required to install external water flow control mechanisms (flow controllers, solenoid and flow control valves).

Integrated Variable-Speed Water Flow Control Configurations:

1) **Internal Flow Controller - For Closed Loop Applications**
   This is the most common configuration for closed loops. With this factory-installed standard option, the unit is built with an Internal Variable Speed Pump and other components to flush and operate the unit correctly (including an expansion tank, flush ports and flushing valves). The pump speed is controlled by the DXM2 control based on the difference in entering and leaving water temperatures (ΔT). The Internal Flow Controller pump includes an internal check valve for multiple unit installations. A copper water coil is standard with this option.

   Note: Internal Flow Controllers are also very suitable for multiple unit installations depending on pump performance requirements.

2) **Internal Modulating Motorized Valve – For Large Closed Loop Applications (external central pumping)**
   Primarily for use on multi-unit closed loop applications with central pumping. With this factory-installed option, the unit includes a low pressure drop modulating motorized valve that is controlled by the DXM2 microprocessor control based on the difference in the entering and leaving water temperatures (ΔT). A Copper Water Coil is standard with this option. The modulating valve in this option has a higher Cv than the open loop option. (50YGS Models only)

3) **Internal Modulating Motorized Valve - For Open Loop Applications**
   For use on open loop applications. With this factory-installed, standard option, the unit is built with an internal modulating motorized valve controlled by the Communicating DXM2 control board based on entering and leaving water temperatures (ΔT). A low Cv modulating motorized valve is used for this application to provide more precise control against the higher system pressure differential of open loop applications. A Cupro-Nickel water coil comes standard with this option. (50YGS Models only)

Details on these options are included in the following sections on ground loop and ground water applications.

Figure 4a: Typical Closed-Loop Application (with Internal Flow Controller Shown)

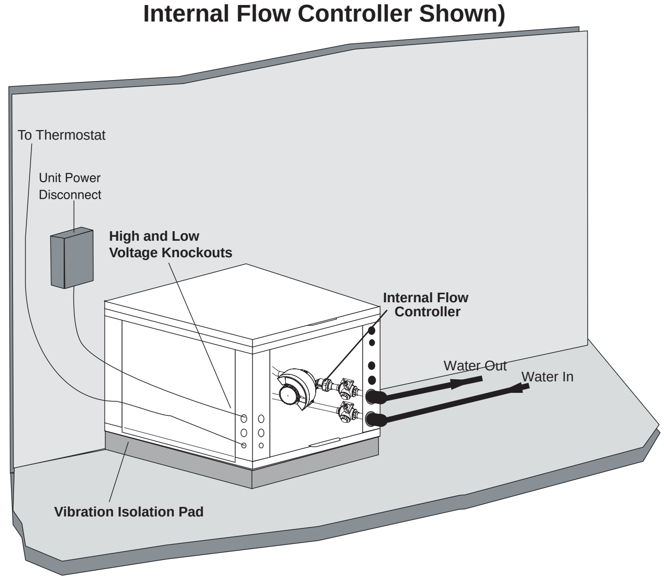
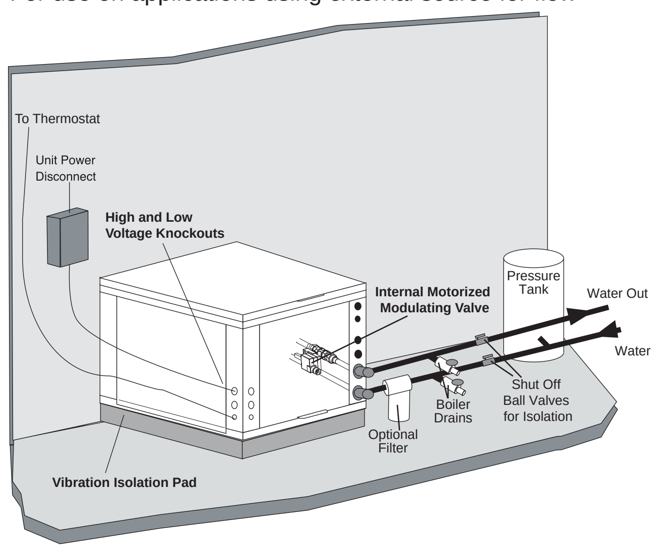


Figure 4b: Typical Open Loop Application (with Internal Modulating Motorized Valve Shown)

For use on applications using external source for flow



⚠ CAUTION! ⚠

CAUTION! The following instructions represent industry accepted installation practices for closed loop earth coupled heat pump systems. Instructions are provided to assist the contractor in installing trouble free ground loops. These instructions are recommendations only. State/provincial and local codes MUST be followed and installation MUST conform to ALL applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

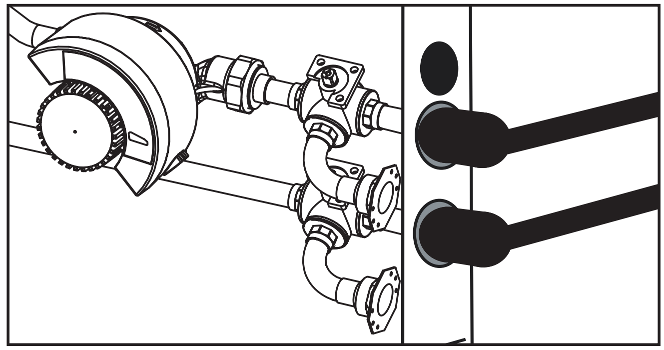
Closed Loop Heat Pump Applications with Internal Flow Controller

Units with internal flow control come with a built-in variable speed pump, an expansion tank, flushing ports and three-way valves (used to flush the unit). The variable speed pump is controlled by the Communicating DXM2 board based on the difference between the entering and leaving water temperature (ΔT). For operation outside of the normal entering water temperature range (50° or 60°F - 110°F for cooling, 30°F-70°F for heating) the DXM2 controller may automatically adjust the control ΔT to account for the abnormal entering water temperatures, maintaining an appropriate flow rate for proper unit operation. When entering water temperatures are abnormally low for cooling, or abnormally high for heating, the DXM2 controller will maintain a constant leaving water temperature which will allow the unit to operate properly under those conditions. The internal expansion tank helps to maintain constant loop pressure despite the natural expansion and contraction of the loop as the seasons and loop temperatures vary. The expansion tank also helps to avoid flat loop callbacks.

Pre-Installation
Prior to installation, locate and mark all existing underground utilities, piping, etc. Install loops for new construction before sidewalks, patios, driveways, and other construction has begun. During construction, accurately mark all ground loop piping on the plot plan as an aid in avoiding potential future damage to the installation.

Piping Installation
The typical closed loop ground source system is shown in Figures 4a. All earth loop piping materials should be limited to polyethylene fusion only for in-ground sections of the loop and it is also recommended for inside piping. Galvanized or steel fittings should not be used at any time due to their tendency to corrode. All plastic to metal threaded fittings should be avoided due to their potential to leak in ground loop applications. Loop temperatures can range between 25 and 110°F [-4 to 43°C]. Flow rates between 2.25 and 3 gpm per ton [2.41 to 3.23 l/m per kW] of cooling capacity is recommended in these applications.

Figure 5: Internal Flow Controller



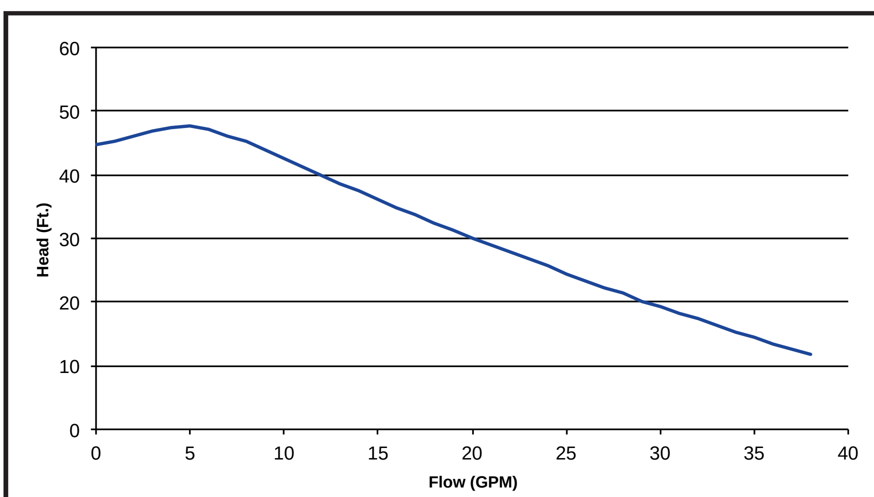
Test individual horizontal loop circuits before backfilling. Test vertical U-bends and pond loop assemblies prior to installation. Pressures of at least 100 psi [689 kPa] should be used when testing. Do not exceed the pipe pressure rating. Test entire system when all loops are assembled.

The following section will help to guide you through flushing a unit with internal flow control.

Water Pressure Schrader Ports
The pressure ports built in to the unit are provided as a means of measuring pressure drop through the water-to-refrigerant heat exchanger. The water pressure ports are schrader ports smaller than refrigerant schrader ports. They are the same size as tire schrader ports. A digital pressure gauge is recommended for taking pressure readings through these ports. The water flow through the unit can be determined by measuring the water pressure at the “water pressure out” port and subtracting it from the water pressure at the “water pressure in” port. Comparing the pressure differential to the pressure drop in Table 14 will determine the flow rate through the unit.

Digital Pressure Gauge

Figure 6: Internal Flow Controller Pump Performance



GPM	Head (ft)	GPM	Head (ft)
0.0	44.7	22.0	27.8
1.0	45.4	23.0	26.7
2.0	46.1	24.0	25.6
3.0	46.8	25.0	24.5
4.0	47.5	26	23.4
5.0	47.7	27	22.3
6.0	47.1	28	21.3
7.0	46.1	29	20.2
8.0	45.3	30	19.2
9.0	43.9	31	18.2
10.0	42.6	32	17.3
11.0	41.2	33	16.3
12.0	39.9	34	15.4
13.0	38.7	35	14.4
14.0	37.4	36	13.5
15.0	36.1	37	12.6
16.0	34.9	38	11.7
17.0	33.7		
18.0	32.5		
19.0	31.3		
20.0	30.1		
21.0	28.9		

Flushing the Earth Loop

Once piping is completed between the unit and the ground loop, final purging and charging of the loop is needed.

A flush cart (at least a 1.5 hp [1.1kW] pump) is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. All air and debris must be removed from the earth loop piping system before operation, **Flush the loop with a high volume of water at a high velocity (2 fps [0.6 m/s] in all piping)**, using a filter in the loop return line, of the flush cart to eliminate debris from the loop system. See Table 2 for flow rate required to attain 2fps [0.6 m/s]. The steps below must be followed for proper flushing.

Table 2: Minimum Flow Required to Achieve 2 ft/sec velocity

PE Pipe Size	Flow (GPM)
3/4"	4
1"	6
1 1/4"	10
1 1/2"	13
2"	21

Units with internal variable speed pumps also include a check valve internal to the pump. It is not possible to flush backwards through this pump. Care must be taken to connect the flush cart hoses so that the flush cart discharge is connected to the “water in” flushing valve of the heat pump.

Loop Fill
Fill loop (valve position A, see Figure 8a) with water from a garden hose through flush cart before using flush cart pump to ensure an even fill and increase flushing speed. When water consistently returns back to the flush reservoir, switch to valve position B (Figure 8b).

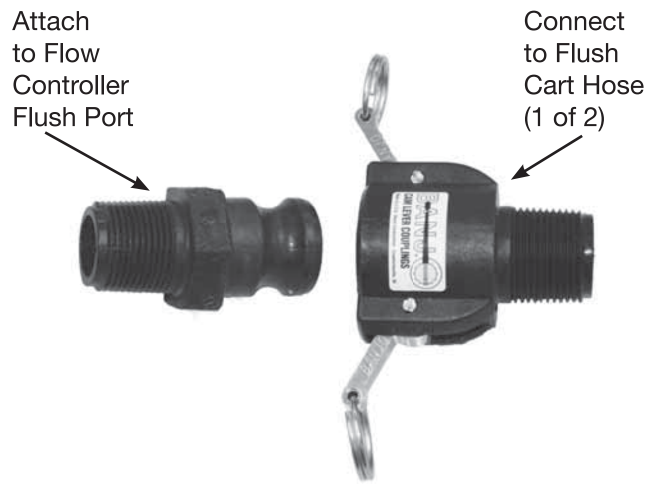
Isolate expansion tank for flushing procedure using the ball valve. During dead heading of flush cart pump, isolation will prevent compression of bladder in the expansion tank and flush cart fluid level dropping below available capacity.

Figure 7a: Typical Cleanable Flush Cart Strainer (100 mesh [0.149mm])

⚠ WARNING! ⚠

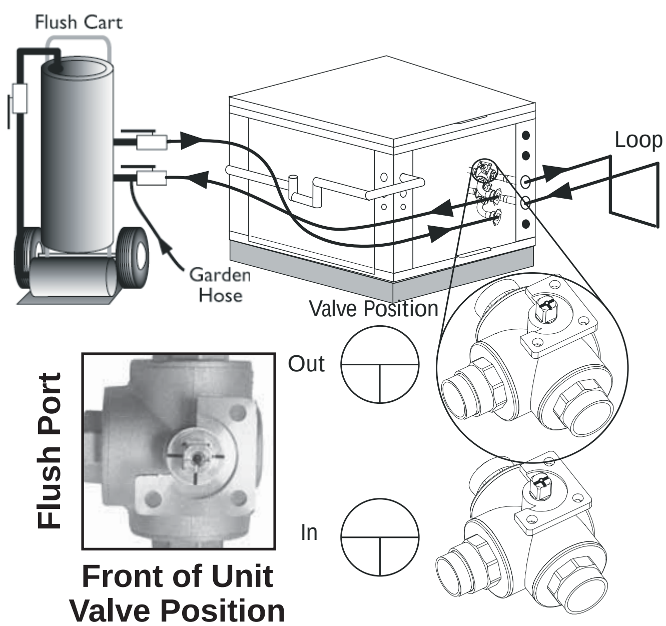
WARNING! Disconnect electrical power source to prevent injury or death from electrical shock.

Figure 7b: Cam Fittings for Flush Cart Hoses



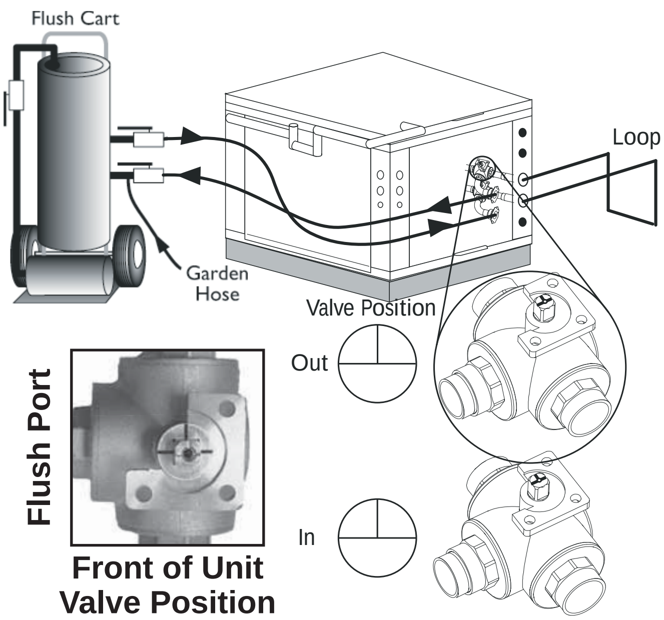
NOTICE: A hydrostatic pressure test is required on ALL piping, especially underground piping before final backfill per IGSHPA and the pipe manufacturers recommendations.

Figure 8a: Valve Position A - Loop Fill/Flush



Flushing the Earth Loop

Figure 8b: Valve Position B - Unit Fill / Flush



Unit Fill

Unit fill valves should be switched to Position B while flush cart is pumping to fill the unit heat exchanger (see Figure 8b). The valves position should be maintained until water is consistently returned into the flush reservoir.

Loop Flush

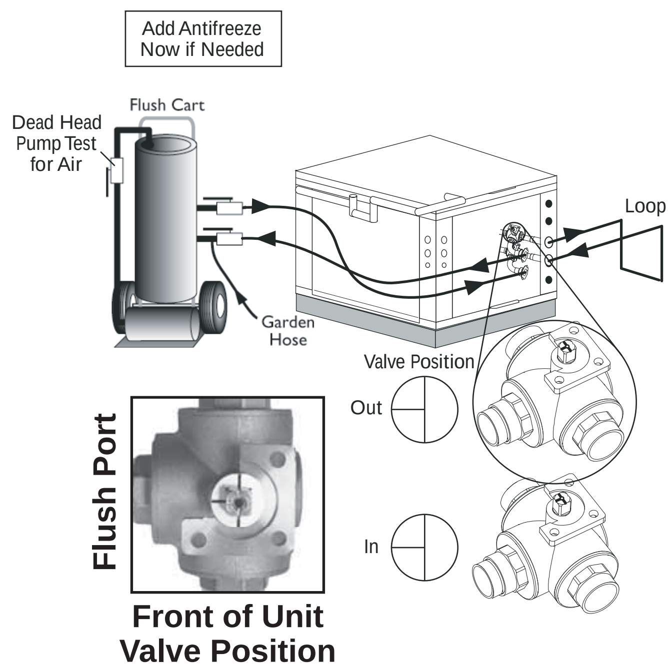
Switch to valve Position A. The supply water may be shut off and the flush cart turned on to begin flushing. Once the flush reservoir is full, do not allow the water level in the flush cart tank to drop below the pump inlet line or air can be pumped back out to the earth loop. Try to maintain a fluid level in the tank above the return tee so that air can not be continuously mixed back into the fluid. Surges of 50 psi [345 kPa] can be used to help purge air pockets by simply shutting off the flush cart return valve going into the flush cart reservoir. This process 'dead heads' the pump to 50 psi [345 kPa]. To dead head the pump until maximum pumping pressure is reached, open the valve back up and a pressure surge will be sent through the loop to help purge air pockets from the piping system. Notice the drop in fluid level in the flush cart tank. If all air is purged from the system, the level will drop only 3/8" in a 10" [25.4 cm] diameter PVC flush tank (about a half gallon [1.9 liters]) since liquids are incompressible. If the level drops more than this level, flushing should continue since air is still being compressed in the loop fluid. Do this a number of times.

NOTICE: Actual flushing time require will vary for each installation due to piping length, configuration, and flush cart pump capacity. 3/8" or less fluid level drop is the ONLY indication that flushing is complete.

Switch valves to Position B to flush the unit. Flush through the unit until all air pockets have been removed.

Move valves to position C. By switching both valves to this position, water will flow through the loop and the unit heat exchanger. Finally, the dead head test should be checked again for an indication of air in the loop. Fluid level drop is your only indication of air in the loop.

Figure 8d: Valve Position C - Full Flush



Pressurize and Operate

As shown in Figure 8e, close the flush cart return valve to pressurize the loop to at least 50 psi [345 kPa], not to exceed 75 psi [517 kPa]. Open the isolation valve to the expansion tank and bleed air from the expansion tank piping using the schraeder valve located in front of the expansion tank. This will allow loop pressure to compress the expansion tank bladder, thus charging the expansion tank with liquid. After pressurizing, close the flush cart supply valve to isolate the flush cart. Move the Flow Controller valves to Position D.

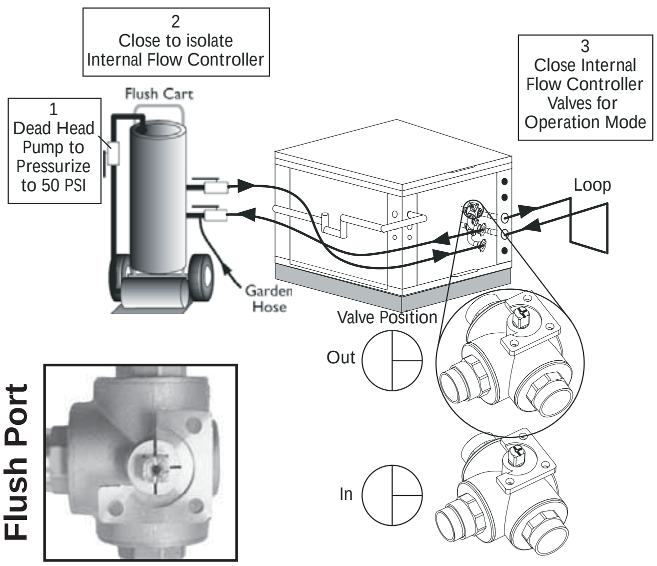
Loop static pressure will fluctuate with the seasons and pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when charging the system initially. Unhook

Flushing the Earth Loop

the flush cart from the Internal Flow Controller. Install Flow Controller caps to ensure that any condensation/leakage remains contained within the Flow Controller package.

If the loop pressure is between 50 and 75 psi [345 to 517 kPa] upon completion of flushing, pressures should be sufficient for all seasons.

Figure 8e: Valve Position D - Pressurize and Operation



Front of Unit Valve Position

NOTICE: It is recommended to run the unit in the cooling, then heating mode for 15-20 minutes each to 'temper' the fluid temperature and prepare it for pressurization. This procedure helps prevent the periodic "flat" loop condition of no pressure.

Multiple Unit Piping and Flushing

Often projects require more than one heat pump. Where possible, it makes sense for multiple units to share a common ground loop. Common ground loops for multiple units bring new challenges including the need to avoid backward flow through inactive units, increased pumping requirements, and more complex flushing needs. Three types of multiple unit systems are described below along with guidelines for installation of each type.

Integrated Variable-Speed Water Flow Control internal variable flow technology is a great assist for systems with multiple units and is available in three different configurations:

1. Internal flow controller
2. Internal modulating valve for closed loops
3. Internal modulating valve for open loops

The internal modulating valve for open loops version should never be used on closed loops.

The internal flow controller version includes an internal Magna variable speed circulator controlled by the DXM2 microprocessor, internal 3-way flushing valves, an internal bladder type expansion tank, and front-mounted pressure ports that allow access to the pressure drop across the coaxial heat exchanger only. The pump includes an internal check valve. The pump curve for the circulator is shown in Figure 6. The internal expansion tank will operate as a pressure battery for the geothermal system. It will absorb fluid from the loop when loop pressure rises and inject fluid into the loop when loop pressure falls. In this way the expansion tank will help to maintain a more constant loop pressure and avoid flat loops due to seasonal pressure changes in the loop.

When using the internal variable speed pump as the loop pump in multiple unit installations it is important to ensure that the variable speed pump can provide adequate flow through the heat pump against the loop head when all units are operating.

It may be possible to flush a multiple unit system through the unit's flushing valves. Flushing pressure drop of the valve may be calculated to determine if it is acceptable. Engineering data for the 3-way flushing valves can be found in Table 3.

Table 3: Internal 3-Way Flushing Valve Data

Model	Flushing Connection	Straight Flow Cv	90° Flow Cv
50YGS/P026 - 038	1" FPT	25	10.3
50YGS/P049 - 064	1" FPT	58	14.5

For example, if a system includes two 2-ton units and four ¾ loop circuits we can calculate the flushing pressure drop as follows. From Table 2 we know that it will take 4 gpm to flush each ¾" circuit. If there is no provision to isolate the circuits for flushing, we will have to flush with a minimum of 4 circuits x 4 gpm/circuit = 16 gpm total. A check of other piping sizes used must be done to ensure that 16 gpm total flow will flush all piping.

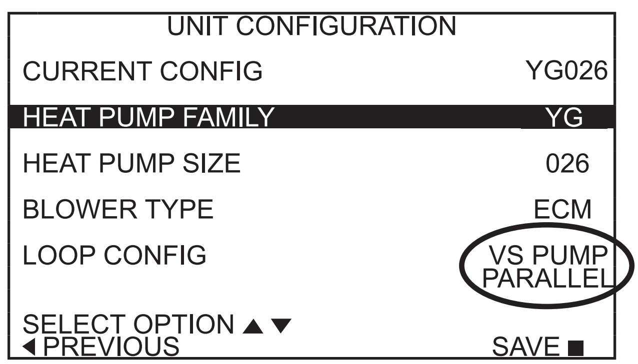
Pressure drop through the flushing valve can be calculated using the following formula.

$\Delta P = (GPM/Cv)^2$ where,
ΔP = pressure drop in psi through the valve while flushing
GPM = flushing flow in gallons per minute
Cv = valve Cv in flushing mode

We know from Table 3 that the Cv for the flushing valve in a 50YGS/P026 is 10.3 in the flushing mode (90° flow). Therefore, $\Delta P = (GPM/Cv)^2 = (16/10.3)^2 = 2.4$ psi per valve (there are two flushing valves). So long as the flushing pump is able to provide 16 gpm at the flushing pressure drop of the loop plus the 2.4 x 2 valves = 4.8 psi of the flushing valves, the internal flushing valves may be used. If the flushing pump is not able to overcome the pressure drop of the internal flushing valves, then larger external flushing valves must be used.

Unit Configuration

Multiple units with internal variable-speed flow controller and check valve, piped in parallel sharing a common loop MUST be configured for 'VS PUMP PARALLEL' in Installer Settings Menu.



Installer Settings → System Config → Unit Config → Loop Config

Multiple Units with Internal Flow Controllers

The simplest multiple unit system is one with two (or more) units utilizing internal Flow Controllers with no external pumps or flushing valves. In this case the units are piped in parallel and use the internal flushing valves to flush the system. The variable speed pump includes an internal check valve to prevent back (short circuiting) flow through the units.

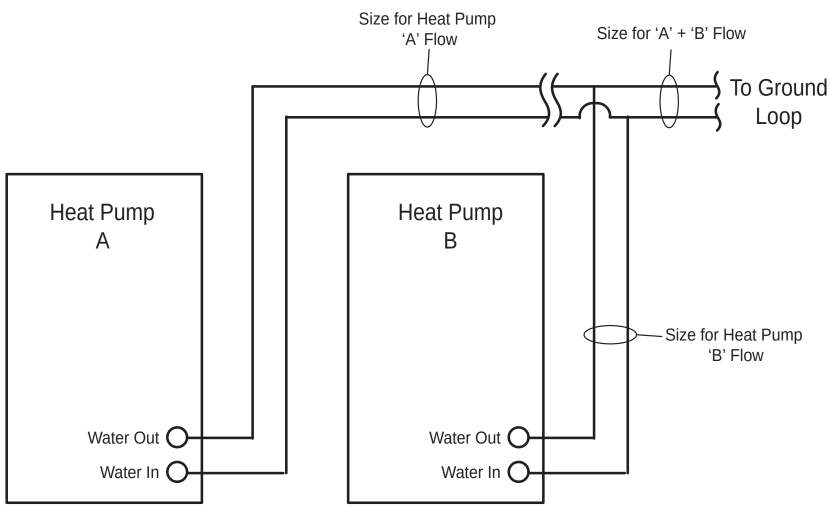
In this case, flush the loop through the internal flushing valves in the unit farthest from the loop first. Once the loop is flushed, then change the internal flushing valves to flush the heat pump. Next, move the flushing cart to the next closest unit to the loop.

Multiple Unit Piping and Flushing

Again, flush the loop through the internal flushing valves. This is important as there may be air/debris in the lines from this unit to the common piping. Once flushing begins the air will be move into the loop and will need to be flushed out. After the loop is flushed through the second unit, change the flushing valves to flush the second unit. This process should be repeated for additional units working from the farthest from the loop to the closest to the loop.

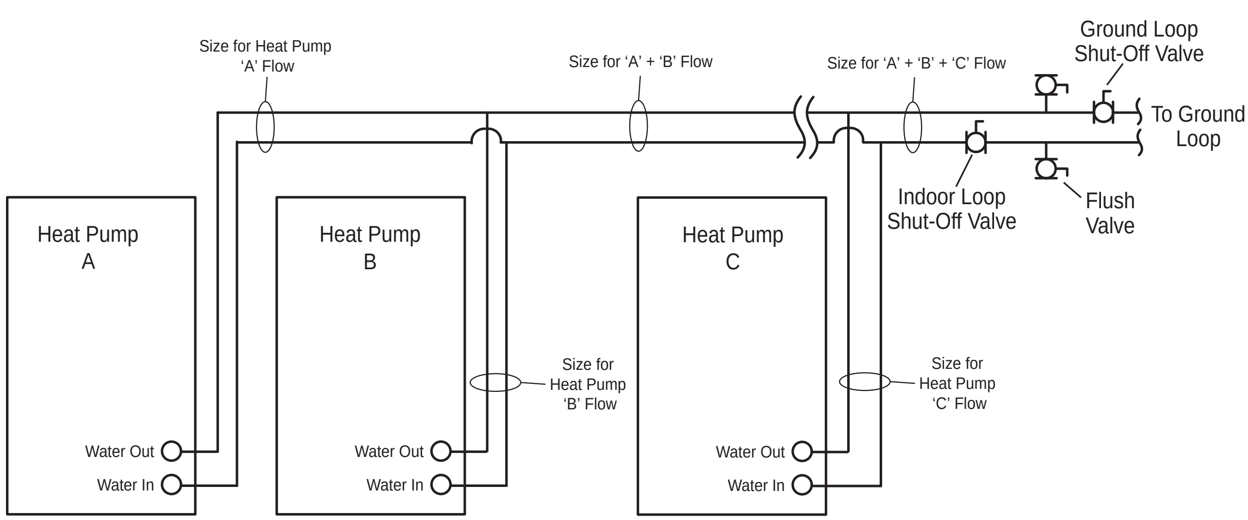
This type of application can generally be employed for systems to 12 tons depending on loop design. However, it is important perform appropriate calculations to confirm that the variable speed pump can provide adequate flow through all heat pumps against the loop head when all units are operating.

Figure 9a: Multiple Units with Internal Flow Controllers



When the number of units or flushing requirements reaches a point where it is no longer feasible to flush through the internal valves (generally systems of more than 12 tons depending on loop design), external flushing valves should be installed. In this case, three-way flushing valves should be used or additional isolation valves must be installed to be able to isolate the loop during flushing.

Figure 9b: Multiple Units with Internal Flow Controllers and External Flushing Valves



First, flush the ground loop. The installer should close the indoor loop shut-off valve (or the internal flushing valves in all units) and open the ground loop shut-off valve to prevent flow through the indoor loop while flushing the ground loop.

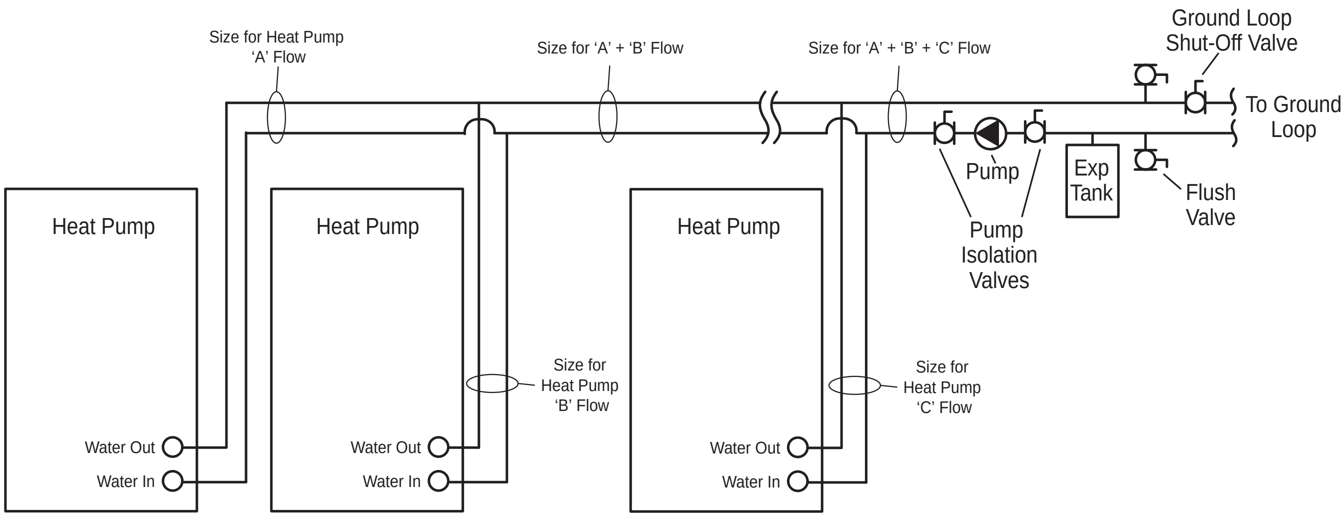
Once the ground loop is flushed, close the ground loop shut-off valve and open the indoor loop valve(s) to flush the units and indoor piping. Remember that there is an internal check valve in the variable speed pump and that backward flow the unit is not possible.

Multiple Unit Piping and Flushing - Indoor Split (50YGS Only)

Multiple Units with Internal Modulating Valves and Central Pump

This is an application where multiple units are used in conjunction with a central, variable speed pump. In this case, units with closed loop modulating valves are used (do not use open loop modulating valves on a closed loop system). External flushing valves are required. This application is for larger systems, including commercial.

Figure 9c: Multiple Units with Internal Modulating Valves and Central Pump



Before flushing, the installer should manually open all modulating valves as detailed in Closed Loop – External Central Pumping section of this manual. Next, flush the ground loop. The installer should close a pump isolation valve and open the ground loop shut-off valve to prevent flow through the indoor loop while flushing the ground loop.

Once the ground loop is flushed, close the ground loop shut-off valve and open the pump isolation valve to flush the units and indoor piping. Once the system is flushed remember to return the modulating valves to their normal operating position.

Ground Loop Heat Pump Applications

Antifreeze Selection - General
In areas where minimum entering loop temperatures drop below 40°F [4.4°C] or where piping will be routed through areas subject to freezing, antifreeze is needed. Alcohols and glycols are commonly used as antifreeze solutions. Your local representative should be consulted for the antifreeze best suited to your area. Freeze protection should be maintained to 15°F [8.5°C] below the lowest expected entering loop temperature.

Initially calculate the total volume of fluid in the piping system using Table 4. Then use the percentage by volume shown in Table 5 for the amount of antifreeze. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Table 4: Fluid Volume

Fluid Volume (gal [liters] per 100' [30 meters] Pipe)		
Pipe	Size	Volume (gal) [liters]
Copper	1"	4.1 [15.3]
	1.25"	6.4 [23.8]
	2.5"	9.2 [34.3]
Polyethylene	3/4" IPS SDR11	2.8 [10.4]
	1" iPS SDR11	4.5 [16.7]
	1.25" IPS SDR11	8.0 [29.8]
	1.5" IPS SDR11	10.9 [40.7]
	2" IPS SDR11	18.0 [67.0]
Unit Heat Exchanger	Typical	1.0 [3.8]
Flush Cart Tank	10" Dia x 3ft tall [254mm x 91.4cm tall]	10 [37.9]

⚠ WARNING! ⚠

WARNING! Always dilute alcohols with water (at least 50% solution) before using. Alcohol fumes are flammable and can cause serious injury or death if not handled properly.

When handling methanol (or any alcohol), always wear eye protection and rubber gloves as alcohols are easily absorbed through the skin.

Table 5: Antifreeze Percentages by Volume

Type	Minimum Temperature for Low Temperature Protection			
	10°F [-12.2°C]	15°F [-9.4°C]	20°F [-6.7°C]	25°F [-3.9°C]
Methanol	21%	17%	13%	8%
Propylene Glycol	29%	24%	18%	12%
Ethanol*	23%	20%	16%	11%

* Must not be denatured with any petroleum based product

⚠ WARNING! ⚠

WARNING! Always use properly marked vehicles (D.O.T. placards), and clean/suitable/properly identified containers for handling flammable antifreeze mixtures. Post and advise those on the jobsite of chemical use and potential dangers of handling and storage.

NOTICE: DO NOT use automotive windshield washer fluid as antifreeze. Washer fluid contains chemicals that will cause foaming.

⚠ CAUTION! ⚠

CAUTION! Always obtain MSDS safety sheets for all chemicals used in ground loop applications including chemicals used as antifreeze.

Antifreeze Charging
It is highly recommended to utilize premixed antifreeze fluid where possible to alleviate many installation problems and extra labor.

The following procedure is based upon pure antifreeze and can be implemented during the Full Flush procedure with three way valves in the Figure 8d - Valve Position C. If a premixed mixture of 15°F [-9.4°C] freeze protection is used, the system can be filled and flushed with the premix directly to prevent handling pure antifreeze during the installation.

1) Flush loop until all air has been purged from system and pressurize to check for leaks before adding any antifreeze.
2) Run discharge line to a drain and hook up antifreeze drum to suction side of pump (if not adding below water level through approved container). Drain flush cart reservoir down to pump suction inlet so reservoir can accept the volume of antifreeze to be added.
3) Calculate the amount of antifreeze required by first calculating the total fluid volume of the loop from Table 4. Then calculate the amount of antifreeze needed using Table 5 for the appropriate freeze protection level. Many southern applications require freeze protection because of exposed piping to ambient conditions.
4) Isolate unit and prepare to flush only through loop (see Figure 8a). Start flush cart, and gradually introduce the required amount of liquid to the flush cart tank (always introduce alcohols under water or use suction of pump to draw in directly to prevent fuming) until attaining the proper antifreeze protection. The rise in flush reservoir level indicates amount of antifreeze added (some carts are marked with measurements in gallons or liters). A ten inch [25.4 cm] diameter cylinder, 3 foot [91.4 cm] tall holds approximately 8 gallons [30.3 liters] of fluid plus the hoses (approx. 2 gallons, [7.6 liters], which equals about 10 gallons [37.9 liters] total. If more than one tankful is required, the tank should be drained immediately by opening the waste valve of the flush cart noting the

Ground Loop Heat Pump Applications

color of the discharge fluid. Adding food coloring to the antifreeze can help indicate where the antifreeze is in the circuit and prevents the dumping of antifreeze out the waste port. Repeat if necessary.

5) Be careful when handling methanol (or any alcohol). Always wear eye protection and rubber gloves. The fumes are flammable, and care should be taken with all flammable liquids. Open flush valves to flush through both the unit and the loop and flush until fluid is homogenous and mixed. It is recommended to run the unit in the heating and cooling mode for 15-20 minutes each to ‘temper’ the fluid temperature and prepare it for pressurization. Devoting this time to clean up can be useful. This procedure helps prevent the periodic “flat” loop condition.
6) Close the flush cart return valve; and immediately thereafter, close the flush cart supply valve, leaving a positive pressure in the loop of approximately 50 psi [345 kPa]. This is a good time to pressure check the system as well. Check the freeze protection of the fluid with the proper hydrometer to ensure that the correct amount of antifreeze has been added to the system. The hydrometer can be dropped into the flush reservoir and the reading compared to Chart 1a for Methanol, 1b for Propylene Glycol, and 1c for Ethanol to indicate the level of freeze protection. Do not antifreeze more than a +10°F [-12.2°C] freeze point. Specific gravity hydrometers are available in the residential price list. Repeat after reopening and flushing for a minute to ensure good second sample of fluid. Inadequate antifreeze protection can cause nuisance low temperature lockouts during cold weather.
7) Close the flush cart return valve; immediately thereafter, close the flush cart supply valve, shut off the flush cart leaving a positive pressure in the loop of approximately 50-75 psi [345-517 kPa]. Refer to Figure 8e for more details.

⚠ WARNING! ⚠

WARNING! Always dilute alcohols with water (at least 50% solution) before using. Alcohol fumes are flammable and can cause serious injury or death if not handled properly.

When handling methanol (or any alcohol), always wear eye protection and rubber gloves as alcohols are easily absorbed through the skin.

Low Water Temperature Cutout Setting - DXM2 Control When antifreeze is selected, the LT1 jumper (JW3) should be clipped to select the low temperature (antifreeze 10°F [-12.2°C]) set point and avoid nuisance faults (see “Low Water Temperature Cutout Selection” in this manual).

Chart 1a: Methanol Specific Gravity

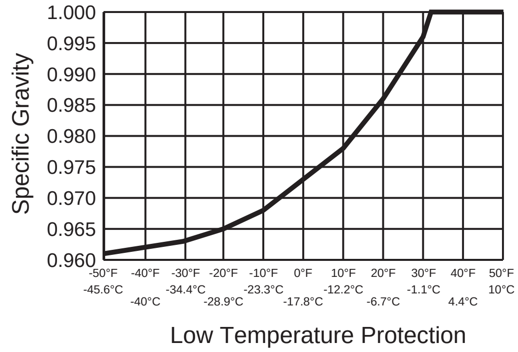


Chart 1b: Propylene Glycol Specific Gravity

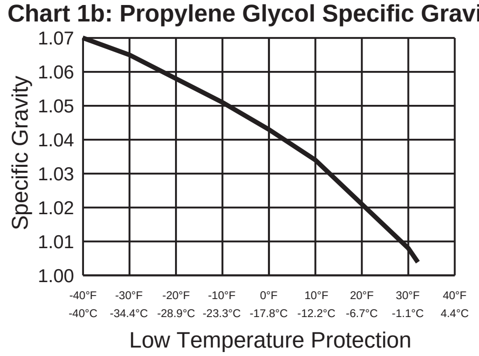


Chart 1c: Ethanol Specific Gravity

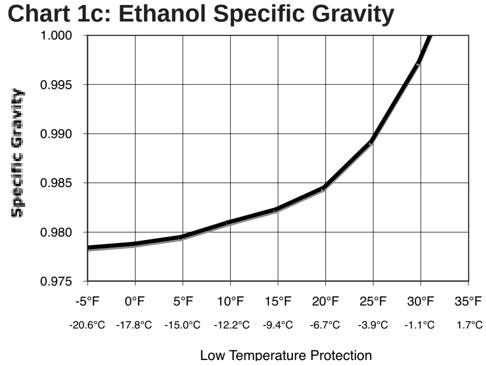
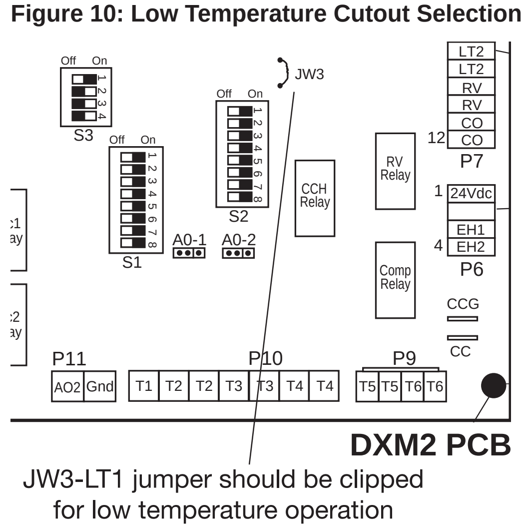
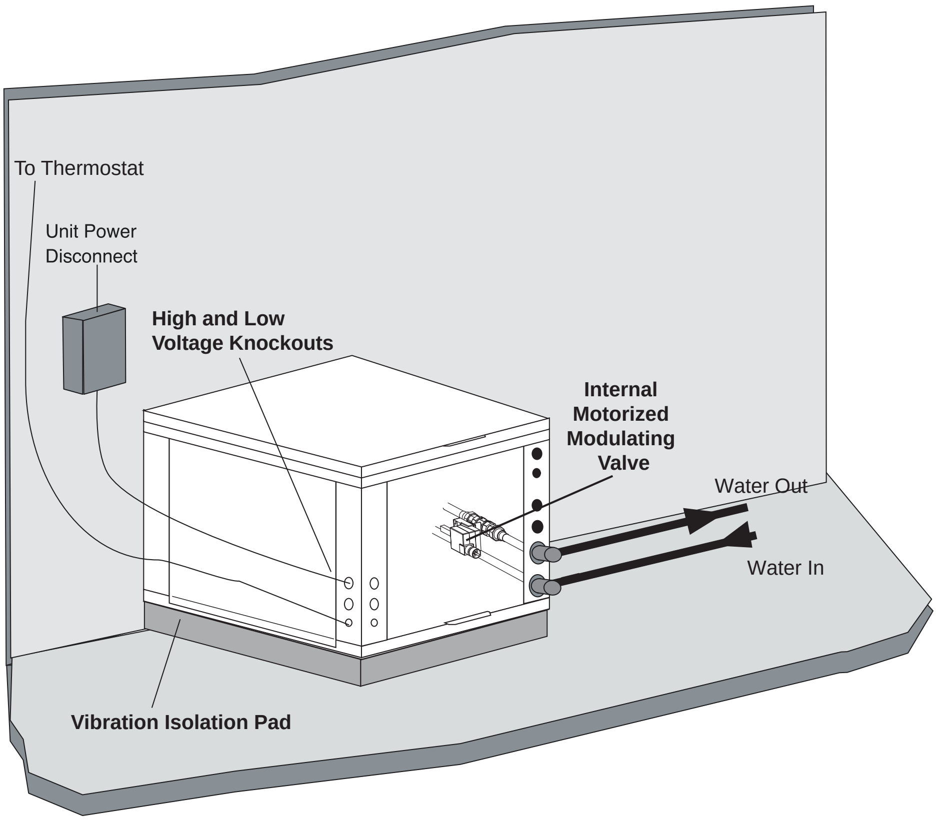


Figure 10: Low Temperature Cutout Selection



Closed Loop - External Central Pumping Applications (Indoor Split 50YGS Only)

Figure 11: Typical Closed Loop with Central Pumping Application (with Internal Modulating Motorized Valve Shown)



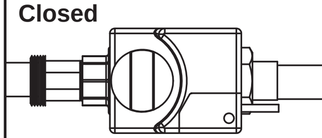
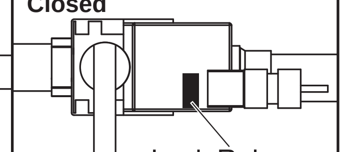
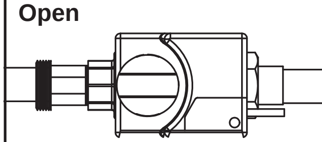
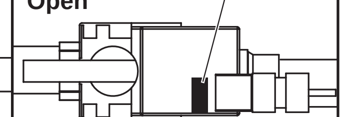
GT-PCS Indoor Digital units are available with a modulating water valve option for closed-loop applications with external central pumping (designated by a 5 in the 9th position of the unit model number). With this option, the Modulating Valve is regulated by the Communicating DXM2 board based on entering and leaving water temperature (ΔT). The DXM2 board outputs a 0-10v signal to determine valve position (flow rate). The modulating valve defaults to closed position if it loses signal but still has 24V power running to it. If the motorized modulating valve loses both signal from the DXM2 board AND 24V power, it will remain in the same position it was in when it lost 24V power.

Note: The Cv (flow coefficient) of the valve used in these units is DIFFERENT that the Cv of the valve used in the open loop unit. It is not advisable for use in open loop applications as sound/noise issues may result. Units with the water circuit for closed loop, central pumping option are only available with a copper water coil.

To manually open the internal modulating motorized water valve in 50YGS026 – 049 push down on the handle to unlock it. Then rotate the handle to the open position as shown in Figure 12. This fully opens the valve for flushing. Once flushing is complete, return the valve handle to its normally closed position.

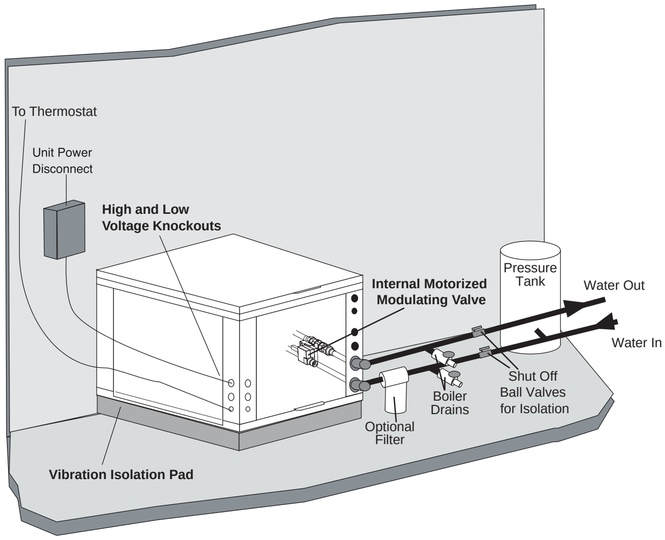
To manually open the internal modulating motorized water valve in 50YGS064, push down on the lock release button while turning the handle to the open position as shown in Figure 12. This fully opens the valve for flushing. Once flushing is complete, press the lock release again and return the valve handle to its normally closed position.

Figure 12: Internal Modulating Motorized Valve Positions

Sizes 026-049	Size 064
Closed 	**Closed** 
Open 	**Open** 

Open Loop or Ground-Water Heat Pump Applications

Figure 13: Typical Open Loop/Well Application



⚠ CAUTION! ⚠

CAUTION! Refrigerant pressure activated water regulating valves should never be used with this equipment.

GT-PCS Digital Indoor Split (50YGS) units are available with a water circuit option for open loop applications (designated by a 6 in the 9th position of the unit model number).

The Motorized Modulating Valve is regulated by the Communicating DXM2 board based on entering and leaving water temperature (ΔT). The DXM2 board gives a 0-10v signal to determine flow rate. The motorized modulating valve defaults to closed position if it loses signal but still has 24V power running to it. If the motorized modulating valve loses both signal from the DXM2 board AND 24V power, it will remain in the same position it was in when it lost 24V power. DO NOT USE open loop units in closed loop applications due to significant pressure drop through the open loop motorized modulating valve. This option is only available with Cupro-Nickel Water Coil.

To manually open the internal modulating motorized water valve in 50YGS026 – 049 push down on the handle to unlock it. Then rotate the handle to the open position as shown in Figure 12. This fully opens the valve for flushing. Once flushing is complete, return the valve handle to its normally closed position.

To manually open the internal modulating motorized water valve in 50YGS064 – 072, push down on the lock release button while turning the handle to the open position as shown in Figure 12. This fully opens the valve for flushing. Once flushing is complete, press the lock release again and return the valve handle to its normally closed position.

Open Loop - Ground Water Systems

Typical open loop piping is shown in Figure 13. Shut off valves should be included for ease of servicing. Boiler drains or other valves should be “tee’d” into the lines to allow acid flushing of the heat exchanger. Shut off valves should be positioned to allow flow through the coax via the boiler drains without allowing flow into the piping system. Schrader ports built into unit may be used to measure heat exchanger pressure drop. Water temperature can be viewed on the communicating thermostat. Piping materials should be limited to copper, PE, or PVC SCH80. Note: Due to the pressure and temperature extremes, PVC SCH40 is not recommended.

Water quantity should be plentiful and of good quality. Consult Table 6 for water quality requirements. Integrated Variable-Speed Water Flow Control units for open loop applications always come with Cupro-Nickel coils. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, an open loop system is not recommended. Heat exchanger coils may over time lose heat exchange capabilities due to build up of mineral deposits. Heat exchangers must only be serviced by a qualified technician, as acid and special pumping equipment is required. Desuperheater coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional acid flushing. In some cases, the desuperheater option should not be recommended due to hard water conditions and additional maintenance required.

Water Quality Standards

Table 6 must be consulted for water quality requirements. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH <7.5 and the Calcium hardness is less than 100 ppm, scaling potential is low. If this method yields numbers out of range of those listed, a monitoring plan should be implemented in these probable scaling situations. Other water quality issues such as iron fouling, corrosion prevention and erosion and clogging should be referenced in Table 6.

Pressure Tank and Pump

Use a closed, bladder-type pressure tank to minimize mineral formation due to air exposure. The pressure tank should be sized to provide at least one minute continuous run time of the pump using its drawdown capacity rating to prevent pump short cycling. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local building codes (e.g. recharge well, storm sewer, drain field, adjacent stream or pond, etc.). Most local codes forbid the use of sanitary sewer for disposal. Consult your local building and zoning department to assure compliance in your area.

Open Loop or Ground-Water Heat Pump Applications

The pump should be sized to handle the home's domestic water load (typically 5-9 gpm [23-41 l/m]) plus the flow rate required for the heat pump. Pump sizing and expansion tank must be chosen as complimentary items. For example, an expansion tank that is too small can cause premature pump failure due to short cycling. Variable speed pumping applications should be considered for the inherent energy savings and smaller pressure tank requirements.

Water Coil Low Temperature Limit Setting
For all open loop systems the 30°F [-1.1°C] LT1 setting (factory setting-water) should be used to avoid freeze damage to the unit. See "Low Water Temperature Cutout Selection" (Figure 10) in this manual for details on the low limit setting.

Table 6: Water Quality Standards

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 66°C for direct use and HWG applications, and at 32°C 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 66°C HWG and Direct well, 29°C 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	-	**<0.5 ppm** At H_2S>0.2 ppm, avoid use of copper and copper nickel piping or HX's. 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.		
			10°C	24°C	38°C
	Copper	-	<20ppm	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 reinjection) 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.		

Rev.: 3/22/2012

This Water Quality Table provides water quality requirements for the coaxial heat exchangers. When water properties are outside of these requirements, an external secondary heat exchanger must be used to isolate the heat pump heat exchanger from the unsuitable water. Failure to do so will void the warranty for the coaxial heat exchanger.

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.

Refrigeration Installation

⚠ CAUTION! ⚠

CAUTION! Puron® systems operate at higher pressures than R-22 systems. Be certain that service equipment (gauges, tools, etc.) is rated for Puron®. Some R-22 service equipment may not be acceptable.

⚠ CAUTION! ⚠

CAUTION! Installation of a factory supplied liquid line bi-directional filter drier is required. Never install a suction line filter in the liquid line.

Line Set Installation

Figures 4a and 4b illustrate typical installations of a compressor section matched to either an air handler (fan coil) or add-on furnace coil. Table 7 shows typical line-set diameters at various lengths. Lineset lengths should be kept to a minimum and should always be installed with care to avoid kinking. Line sets over 60 feet [18 meters] long are not recommended due to potential oil transport problems and excessive pressure drop. If the line set is kinked or distorted, and it cannot be formed back into its original shape, the damaged portion of the line should be replaced. A restricted line set will effect the performance of the system.

Split units are shipped with a filter drier (loose) inside the cabinet that must be installed in the liquid line at the line set. **All brazing should be performed using nitrogen circulating at 2-3 psi [13.8-20.7 kPa] to prevent oxidation inside the tubing. All linesets should be insulated with a minimum of 1/2” [13mm] thick closed cell insulation. Liquid lines should be insulated for sound control purposes. All insulation tubing should be sealed using a UV resistant paint or covering to prevent deterioration from sunlight.**

When passing refrigerant lines through a wall, seal opening with silicon-based caulk. Avoid direct contact with water pipes, duct work, floor joists, wall studs, floors or other structural components that could transmit compressor vibration. Do not suspend refrigerant tubing from joists with rigid straps. Do not attach line set to the wall. When necessary, use hanger straps with isolation sleeves to minimize transmission of line set vibration to the structure.

Installing the Lineset at the Compressor Section

Braze the line set to the service valve stubs as shown in Figure 14. Remove the schraeder cores and heat trap the valves to avoid overheating and damage. On installations with long line sets, copper adapters may be needed to connect the larger diameter tube to the stubs. Nitrogen should be circulated through the system at 2-3 psi **[13.8-20.7 kPa]** to prevent oxidation contamination. Use a low silver phos-copper braze alloy on all brazed connections. **Compressor section is shipped with a factory charge. Therefore, service valves should not be opened until the line set has been leak tested, purged and evacuated**. See “Charging the System.”

Installing the Indoor Coil and Lineset

Figure 15 shows the installation of the lineset and TXV to a typical indoor coil. An indoor coil or air handler (fan coil) with a TXV is required. Coils with cap tubes may not be used. If coil includes removable fixed orifice, the orifice must be removed and a TXV must be installed as shown in Figure 15. Fasten the copper line set to the coil. Nitrogen should be circulated through the system at 2-3 psi **[13.8-20.7 kPa]** to prevent oxidation inside the refrigerant tubing. Use a low silver phos-copper braze alloy on all brazed connections.

Table 7: Lineset Diameters and Charge Information

Model	Factory† Charge (oz) [kg]	Basic* Charge (oz) [kg]	20 Feet [6 meters]		40 Feet [12 meters]		60 Feet [18 meters]	
			Liquid	Suction	Liquid	Suction	Liquid	Suction
GT-PCS Series								
026	93 [2.64]	78 [2.21]	3/8"	3/4"	3/8"	3/4"	3/8"	3/4"
038	120 [3.40]	105 [2.98]	3/8"	7/8"	3/8"	7/8"	3/8"	7/8"
049	137 [3.88]	122 [3.46]	3/8"	7/8"	3/8"	7/8"	3/8"	7/8"
064	212 [6.01]	182 [5.16]	1/2"	7/8"	1/2"	7/8"	1/2"	7/8"

• Basic charge includes only the amount required for the condensing unit and the evaporating coil.
An additional amount should be added allowing 0.6oz per ft. for 3/8” [0.6g per cm] and 1.2oz per ft. for 1/2” [1.1g per cm] of lineset used.
†Factory charge is preset for 25’ [7.6 meters] lineset.

Refrigeration Installation

Figure 14: Braze Instructions

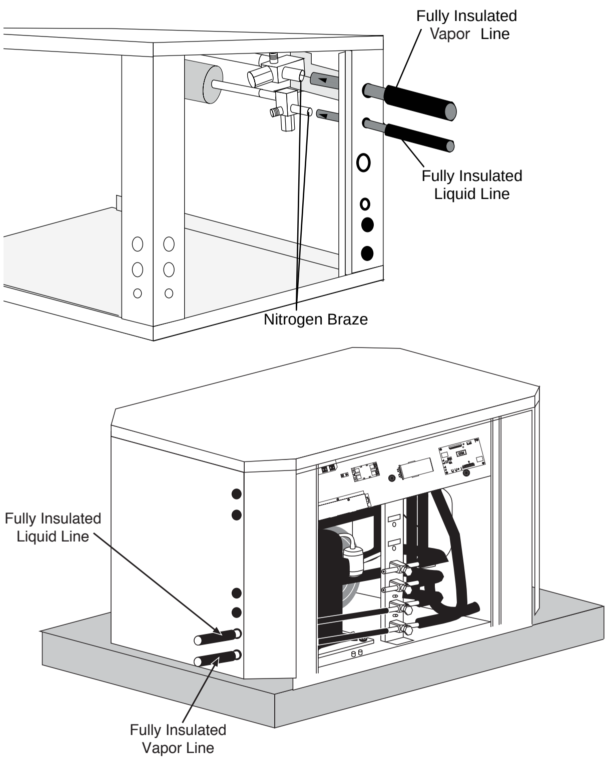


Table 8: Service Valve Positions

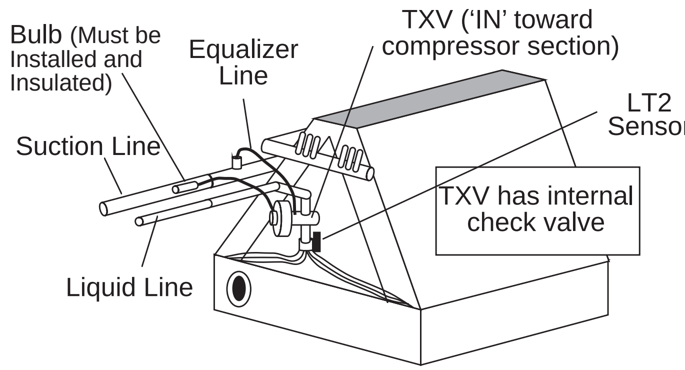
Position	Description	System	Service Port
CCW - Full Out	Operation Position	Open	Closed
CCW - Full Out 1/2 turn CW	Service Position	Open	Open
CCW - Full In	Shipping Position	Closed	Open

Re-Using Existing Line Set - R-22 to Puron® Conversion

New line sets are always recommended, but are required if;

- The previous system had a compressor burn out.
- The existing line set has oil traps.
- The existing line set is larger or smaller than the recommended line set for the Puron® system.
- The existing line set is damaged, corroded, or shows signs of abrasion/fatigue

Figure 15: Air Coil Connection



⚠ WARNING! ⚠

WARNING! If at all possible, it is recommended that a new line set be used when replacing an existing R-22 system with an Puron® system. In rare instances where replacing the line set is not possible, the line set must be flushed prior to installation of the Puron® system. It is also important to empty all existing traps.
Polyolester (POE) oils are used in units charged with Puron® refrigerant. Residual mineral oil can act as an insulator on the wall of the coil tubing, hindering proper heat transfer and thus reducing system efficiency and capacity. Another important reason to thoroughly flush the line set is remove any trash and other contaminants that may be present which could clog the thermal expansion valve.
Failure to properly flush the system per the instructions below will void the warranty.

⚠ WARNING! ⚠

WARNING! The Environmental Protection Agency prohibits the intentional venting of HCFC and HFC refrigerants during maintenance, service, repair and disposal of appliance. Approved methods of recovery, recycling or reclaiming must be followed.

⚠ CAUTION! ⚠

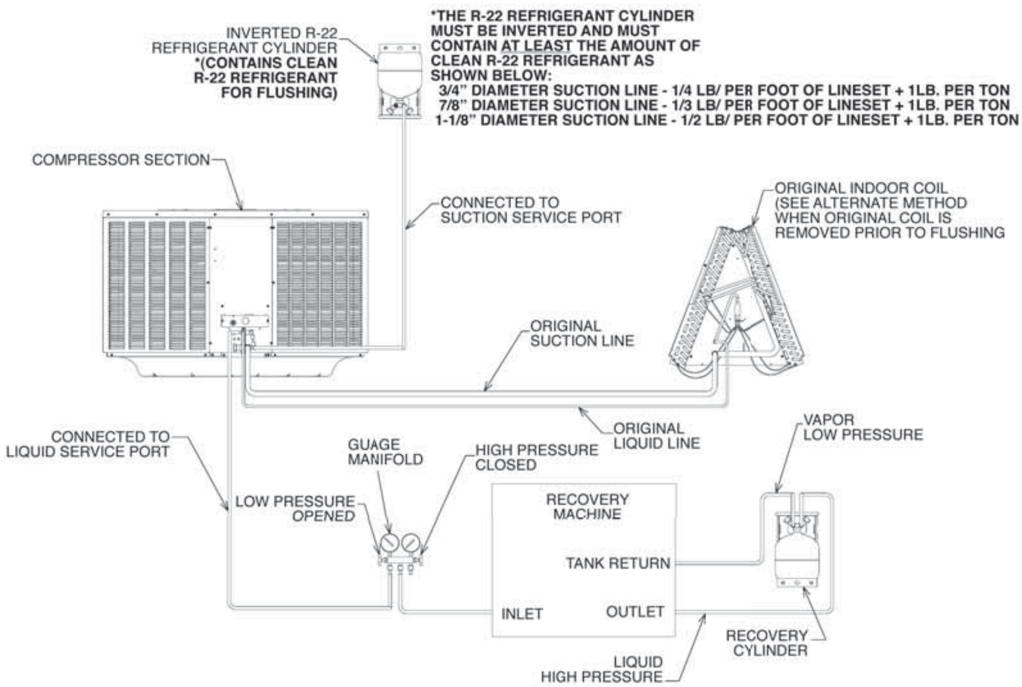
CAUTION! This procedure should not be performed on systems which contain containments (Example: compressor burn out).

Required Equipment

The following equipment will be required in order to flush the indoor coil and existing line set:

- Two R-22 recovery cylinders
- Refrigerant recovery machine with a pump down feature
- Two sets of gauges (one used for R-22 and one used with the Puron®).
- Cylinder of clean R-22 (minimum amount required to adequately flush shown below)

Refrigeration Installation



- 3/4" Diameter suction lines: 1/4 lb. per foot of line set + 1 lb. per ton for indoor coil.
- 7/8" diameter suction lines: 1/3 lb. per foot of line set + 1 lb. per ton for indoor coil
- 1-1/8" diameter suction lines: 1/2 lb. per foot of line set + 1 lb. per ton for indoor coil.

Example: 3-ton system with 40 ft. long line set and 3/4" suction line.
Line set: 1/4 lb./ft. x 40 ft. = 10 lb.
Indoor coil: 1 lb./ton x 3 tons = 3 lbs. (not required if coil is removed and lines are connected together)
Total: 10 lbs. + 3 lbs. = 13 lbs. to adequately flush line set and indoor coil.

The Flushing Procedure

1. Remove the existing R-22 refrigerant by selecting the appropriate procedure stated below.

If the unit is not operational, follow steps A-E.

- A.) First, disconnect all power supply to the existing outdoor unit.
- B.) Connect a clean refrigerant recovery cylinder and the refrigerant recovery machine to the existing unit according to the instructions provided with the recovery machine.
- C.) Remove all R-22 refrigerant from the existing system.
- D.) Check the gauges after shutdown to confirm all refrigerant has been completely removed from the entire system.
- E.) Disconnect the liquid and vapor lines from the existing outdoor unit.

If the unit is operational, follow steps F- L.

- F.) First, start the existing R-22 system in the cooling mode and close the liquid line valve.
- G.) Completely pump all existing R-22 refrigerant into the outdoor unit. It will be necessary to bypass the low pressure switch if the unit is so equipped to ensure that the refrigerant is completely evacuated.)
- H.) The low side system pressures will eventually reach 0 psig. When this happens, close the vapor line valve and immediately shut the outdoor unit off.
- I.) Check the gauges after shutdown to confirm that the valves are not allowing refrigerant to leak back into the low side of the system.
- J.) Disconnect power to the indoor furnace or air-handler to kill low voltage to the outdoor unit.
- K.) Disconnect the power supply wiring from the existing outdoor unit.
- L.) Unsweat the liquid and vapor lines from the existing outdoor unit.

2. Remove the existing outdoor unit.
3. Set the new Puron® unit in place and braze the liquid and vapor lines to the unit connections. Connect the low voltage and line voltage to the new outdoor unit. Do not turn on power supply to the unit and do not open the outdoor unit service valves at this time.
4. The indoor coil can be left in place for the flushing process or removed.
5. If the indoor coil is removed, the suction and liquid line must be connected together on the indoor coil end. See illustration for recommended method for connecting these together.
6. If the indoor coil is left in place during flushing, removing

Refrigeration Installation

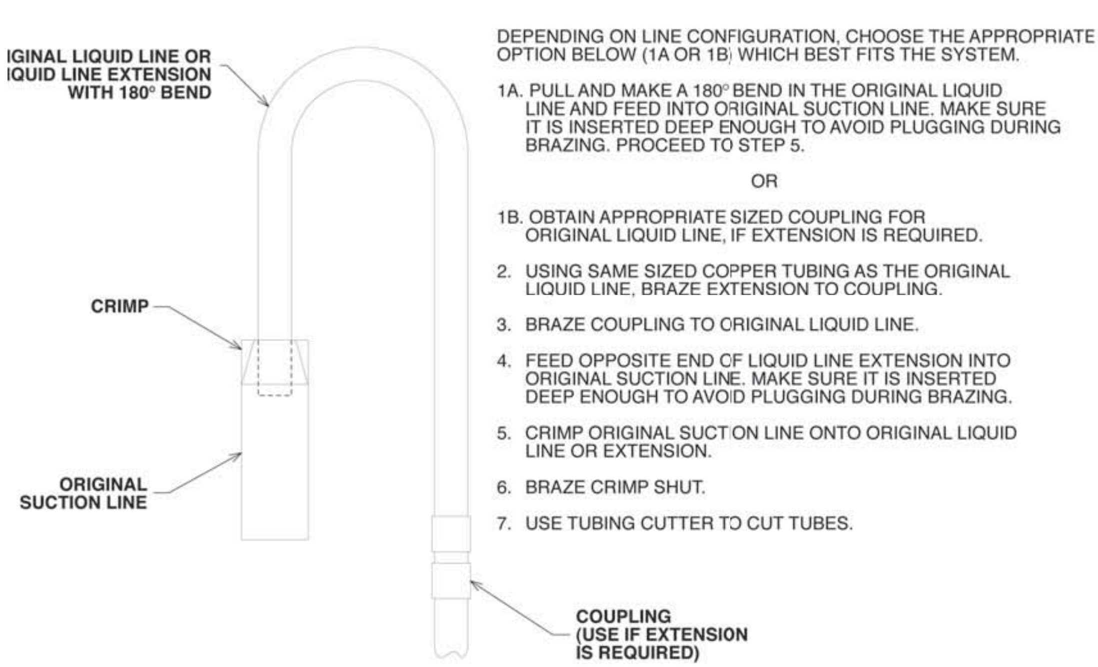
the existing refrigerant flow control orifice or thermal expansion valve prior to flushing is highly recommended to assure proper flushing. Use a field-provided fitting or piece of copper tubing to reconnect the lines where the thermal expansion valve was removed.

7. Remove the pressure tap valve cores from the outdoor unit's service valves.
8. Connect an R-22 cylinder of clean R-22 refrigerant to the vapor service valve. (see "Required Equipment Section" for minimum required amount of R-22 for adequate flushing)
9. Connect the low pressure side of an R-22 gauge set to the liquid line valve.
10. Connect a hose from the recovery machine with an empty recovery drum to the common port of the gauge set.
11. Set the recovery machine for liquid recovery and start the machine.
12. Open the gauge set low side valve. This will allow the recovery machine to pull a vacuum on the existing system line set.
13. Make sure to invert the cylinder of clean R-22 refrigerant and open the cylinder's valve to allow liquid refrigerant to flow into the system through the vapor line valve. (This should allow the refrigerant to flow from the cylinder and through the line set before it enters the recovery machine.) The cylinder should not be inverted if it is the type with separate liquid and vapor valves. Use the liquid valve on the cylinder in this case, keeping the cylinder upright.
14. Once the liquid refrigerant has been completely recovered, switch the recovery machine to vapor recovery so that the R-22 vapor can be completely recovered.

IMPORTANT! Always remember, every time the system is flushed you must always pull a vacuum with a recovery machine on the system at the end of each procedure. (If desired, a second flushing with clean refrigerant may be performed if insufficient amounts of mineral oil were removed during the initial flush.)

15. Tightly close the valve on the inverted R-22 cylinder and the gauge set valves.
16. Completely pump all remaining R22 refrigerant out of the recovery machine and turn the machine off.
17. Before removing the recovery machine, R-22 refrigerant cylinder and gauges, break the vacuum on the refrigerant lines and indoor coil using dry-nitrogen.
18. Unsweat the liquid and vapor lines from the old indoor coil or from each other and install a new matched Puron® indoor coil, connecting the flushed refrigerant lines to the new coil using field supplied connectors and tubing.
19. Reinstall pressure tap valve cores into unit service valves.
20. Pressurize the lines and coil and check for leaks in the line set connection points using a soap solution.
21. Thoroughly evacuate the line set and indoor coil per the instructions found in this manual.
22. Open the liquid and vapor service valves, releasing the Puron® refrigerant contained in the outdoor unit into the evacuated line set and indoor coil.
23. Energize the system and adjust the refrigerant charge according to the charging procedures found in this manual.

ALTERNATE METHOD



Refrigeration Installation

FP2 Sensor Installation
An FP2 sensor with violet wiring is shipped loose with the compressor section. This is the air coil low temperature protection sensor. Install this sensor on the refrigerant line between the indoor expansion valve and the air coil using thermal compound and the supplied mounting clips. Ensure that the sensor makes good thermal contact with the refrigerant line and insulate the sensor.

Air coil low temperature protection will not be active if this sensor is installed incorrectly or is not installed.

Add-On Heat Pump Applications
The indoor coil should be located in the supply side of the furnace to avoid condensation damage to the furnace heat exchanger for add-on heat pump applications. A high temperature limit switch should be installed as shown in Figure 16b just upstream of the coil to de-energize the compressor any time the furnace is energized to avoid blowing hot air directly into the coil, elevating refrigerant pressures during operation. The heat pump will trip out on high pressure lockout without some method of disengaging the compressor during furnace operation. Alternatively, some thermostats with “dual fuel” mode will automatically de-energize the compressor when second stage (backup) heat is required.

The TXV should be brazed into place as shown in Figure 15, keeping the “IN” side toward the compressor section. The TXV has an internal check valve and must be installed in the proper direction for operation. Always keep the valve body cool with a brazing shield and wet rags to prevent damage to the TXV. Attach the bulb to the suction line using the supplied hose clamp. Be careful not to overtighten the clamp and deform the bulb.

NOTICE! The air coil should be thoroughly washed with a filming agent, (dishwasher detergent like Cascade) to help condensate drainage. Apply a 20 to 1 solution of detergent and water. Spray both sides of coil, repeat and rinse thoroughly with water.

Evacuation and Charging the Unit
LEAK TESTING - The refrigeration line set must be pressurized and checked for leaks before evacuating and charging the unit. To pressurize the line set, attach refrigerant gauges to the service ports and add an inert gas (nitrogen or dry carbon dioxide) until pressure reaches 60-90 psig [413-620 kPa]. Never use oxygen or acetylene to pressure test. Use a halogen leak tester or a good quality bubble solution to detect leaks on all connections made in the field. Check the service valve ports and stem for leaks. If a leak is found, repair it and repeat the above steps. For safety reasons do not pressurize system above 150 psig [1034 kPa]. System is now ready for evacuation and charging.

Turn service valves full out CCW (see Table 8) and then turn back in one-half turn to open service ports. Add the required refrigerant so that the total charge calculated for the unit and line set is now in the system. Open the service valve fully counter clockwise so that the stem will backseat and prevent leakage through the schrader port while it is not in use. Start unit in the heating mode and measure superheat and subcooling values after 5 minutes of run time. See tables 16a-16d for superheat and sub-cooling values. Superheat is measured using suction temperature and pressure at the compressor suction line. Subcooling should be measured using the liquid line temperature immediately outside the compressor section cabinet and either the liquid line service valve pressure or the compressor discharge pressure. Note that different values from tables 16a-16d will be obtained due to the pressure losses through the condenser heat exchanger. Adding refrigerant will increase sub-cooling while superheat should remain fairly constant allowing for a slight amount of hunting in TXV systems. This increase in subcooling will require 5 minutes or so of operation before it should be measured. After values are measured, compare to the chart and go to “FINAL EVALUATION.”

PARTIAL CHARGE METHOD - Open service valve fully counterclockwise and then turn back in one-half turn to open service port. Add vaporized (Gas) into the suction side of the compressor until the pressure in the system reaches approximately 100-120 psig. Never add liquid refrigerant into the suction side of a compressor. Start the unit in heating and add gas to the suction port at a rate not to exceed five pounds [2.27 kg] per minute. Keep adding refrigerant until the complete charge has been entered. Superheat is measured using suction temperature and pressure at the compressor suction line. Subcooling should be measured using the liquid line temperature immediately outside the compressor section cabinet and either the liquid line service valve pressure or the compressor discharge pressure. Note that different values from tables 16a-16d will be obtained due to the pressure losses through the condenser heat exchanger. Adding refrigerant will increase sub-cooling while superheat should remain fairly constant allowing for a slight amount of hunting in TXV systems. This increase in subcooling will require 5 minutes or so of operation before it should be measured. After values are measured, compare to the chart and go to “FINAL EVALUATION.”

FINAL EVALUATION -In a split system, cooling subcooling values can be misleading depending on the location of the measurement. Therefore, it is recommended that charging be monitored in the heating mode. Charge should be evaluated by monitoring the subcooling in the heating mode. After initial check of heating sub-cooling, shut off unit and allow to sit 3-5 minutes until pressures equalize. Restart unit in the cooling mode and check the cooling superheat against Tables 16a-16d. If unit runs satisfactorily, charging is complete. If unit does not perform to specifications the cooling TXV (air coil side) may need to be readjusted (if possible) until the cooling superheat values are met.

Checking Superheat and Subcooling

Refrigeration Installation

Figure 16a: Typical Split/Air Handler Installation

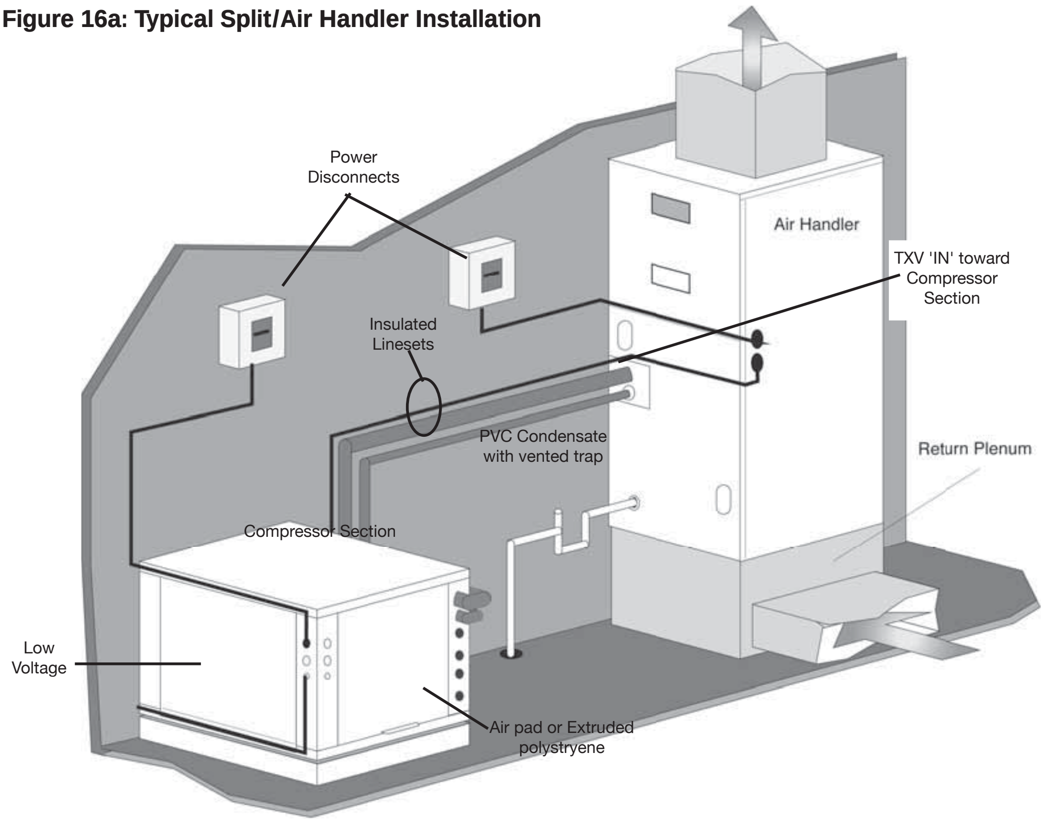
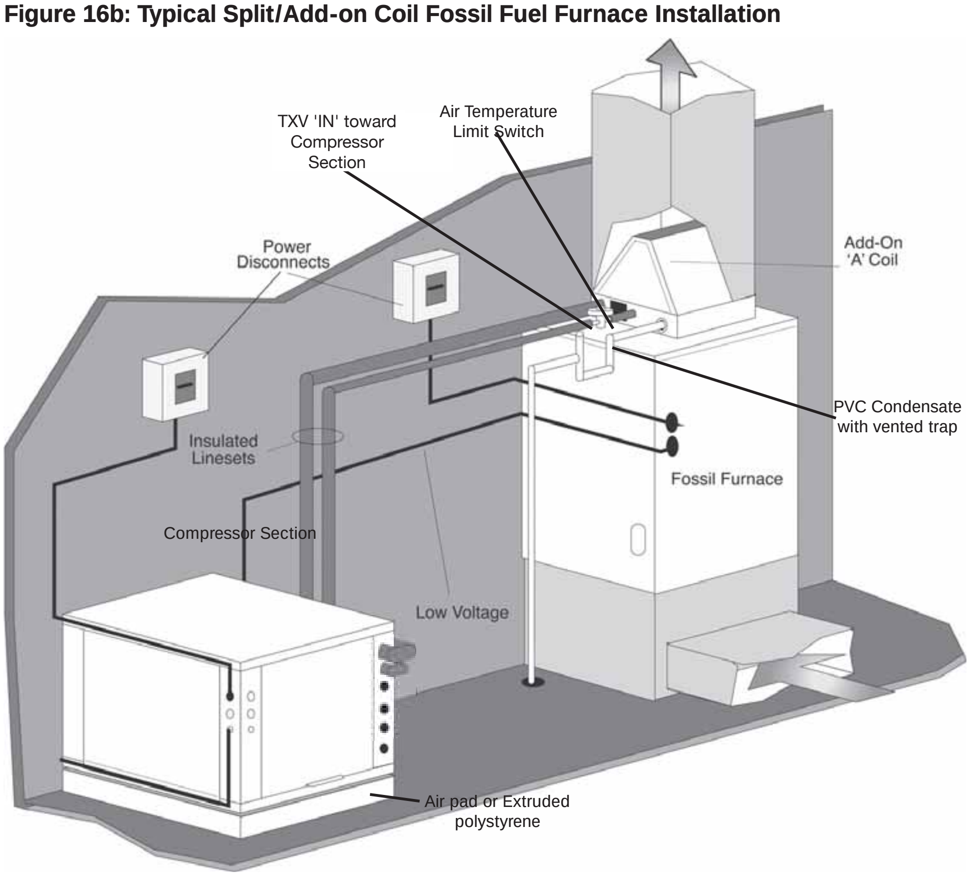


Figure 16b: Typical Split/Add-on Coil Fossil Fuel Furnace Installation



Refrigeration Installation

Determining Superheat:

1. Measure the temperature of the suction line at a point near the expansion valve bulb.
2. Determine the suction pressure by attaching refrigeration gauges to the suction schrader connection at the compressor.
3. Convert the pressure obtained in step 2 to saturation temperature (boiling point) by using the pressure/ temperature conversion table on the gauge set.
4. Subtract the temperature obtained in step 3 from step 1. The difference will be the superheat of the unit or the total number of degrees above saturation temperature. Refer to Tables 16a-16d for superheat ranges at specific entering water conditions.

Example:
The temperature of the suction line at the sensing bulb is 50°F. The suction pressure at the compressor is 110 psig which is equivalent to 36°F saturation temperature from the Puron® press/temp conversion table on the gauge set.
36°F subtracted from 50°F = 14°F Superheat.

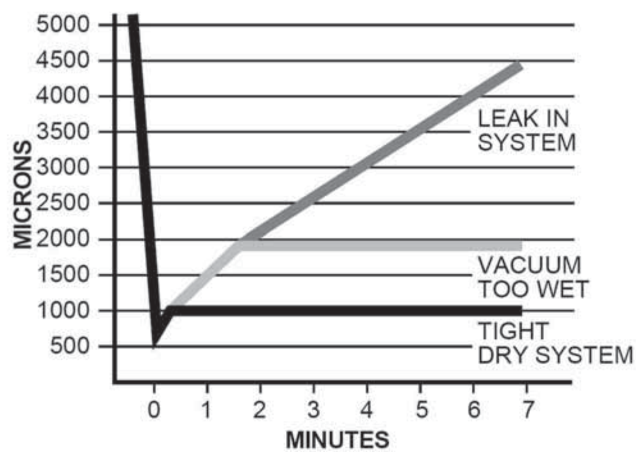
Determining Sub-Cooling:

1. Measure the temperature of the liquid line on the smaller refrigerant line (liquid line) just outside of the cabinet. This location will be adequate for measurement in both modes unless a significant temperature drop in the liquid line is anticipated.
2. Determine the condensor pressure (high side) by attaching refrigerant gauges to the schrader connection on the liquid line service valve. If the hot gas discharge line of the compressor is used, refer to the appropriate column in Tables 16a-16d.
3. Convert the pressure obtained in step 2 to the saturation temperature by using the press/temp conversion table on the gauge set.
4. Subtract the temperature of Step 3 from the temperature of Step 1. The difference will be the sub-cooling value for that unit (total degrees below the saturation temperature). Refer to Tables 16a-16d for sub-cooling values at specific entering water temperatures.

Example:
The condenser pressure at the service port is 335 psig, which is equivalent to 104°F saturation temperature. Discharge pressure is 365 psig at the compressor (109°F saturation temperature). Measured liquid line temperature is 100°F. 100°F subtracted from 104°F = 4 degrees sub-cooling (9 degrees if using the compressor discharge pressure).

Evacuation Of The Lineset And Coil
The line set and coil must be evacuated to at least 500 microns to remove any moisture and noncondensables. Evacuate the system through both service ports in the shipping position (full CW in - see table 8) to prevent false readings on the gauge because of pressure drop through service ports. A vacuum gauge or thermistor capable of accurately meausuring the vacuum depth is crucial in determining if the system is ready for charging. If the system meets the requirements in Figure 17, it is ready for charging.

Figure 17: Evacuation Graph



⚠ NOTICE! ⚠

NOTICE: Use tables 16a to 16d for superheat/ subcooling values. These tables use discharge pressure (converted to saturation temperature) and liquid line temperature for subcooling calculations. If using liquid line pressure, subtract 3°F from the table values.

Charging The System
There are two methods of charging a refrigerant system. One method is the total charge method, where the volume of the system is determined and the refrigerant is measured and added into the evacuated system. The other method is the partial charge method where a small initial charge is added to an evacuated system, and remaining refrigerant added during operation.

Total Charge Method - See Table 7 for the compressor section basic charge. For line sets with 3/8" liquid lines add 0.6 ounces of refrigerant to the basic charge for every installed foot of liquid line [0.6 grams per cm]. Add 1.2 oz. per foot [1.1 grams per cm] if using l/2" line. Once the total charge is determined, the factory pre-charge (Table 7) is subtracted and the remainder is the amount needed to be added to the system. This method should be used with the AHRI matched air handler.

Hot Water Generator

The HWG (Hot Water Generator) or desuperheater option provides considerable operating cost savings by utilizing excess heat energy from the heat pump to help satisfy domestic hot water requirements. The HWG is active throughout the year, providing virtually free hot water when the heat pump operates in the cooling mode or hot water at the COP of the heat pump during operation in the heating mode. Actual HWG water heating capacities are provided in the appropriate heat pump performance data.

Heat pumps equipped with the HWG option (indoor model only) include a built-in water to refrigerant heat exchanger that eliminates the need to tie into the heat pump refrigerant circuit in the field. The control circuit and pump are also built in for residential equipment. Figure 18 shows a typical example of HWG water piping connections on a unit with built-in circulating pump. This piping layout reduces scaling potential.

The temperature set point of the HWG is field selectable on DXM2 to 125°F or 150°F . The 150°F set point allows more heat storage from the HWG. For example, consider the amount of heat that can be generated by the HWG when using the 125°F set point, versus the amount of heat that can be generated by the HWG when using the 150°F set point.

In a typical 50 gallon two-element electric water heater the lower element should be turned down to 100°F, or the lowest setting, to get the most from the HWG. The tank will eventually stratify so that the lower 80% of the tank, or 40 gallons, becomes 100°F (controlled by the lower element). The upper 20% of the tank, or 10 gallons, will be maintained at 125°F (controlled by the upper element).

Using a 125°F set point, the HWG can heat the lower 40 gallons of water from 100°F to 125°F, providing up to 8,330 btu's of heat. Using the 150°F set point, the HWG can heat the same 40 gallons of water from 100°F to 150°F and the remaining 10 gallons of water from 125°F to 150°F, providing a total of up to 18,743 btu's of heat, or more than twice as much heat as when using the 125°F set point.

This example ignored standby losses of the tank. When those losses are considered the additional savings are even greater.

Electric water heaters are recommended. If a gas, propane, or oil water heater is used, a second preheat tank must be installed (Figure 19). If the electric water heater has only a single center element, the dual tank system is recommended to insure a usable entering water temperature for the HWG.

Typically a single tank of at least 52 gallons (235 liters) is used to limit installation costs and space. However, a dual tank, as shown in Figure 19, is the most efficient system, providing the maximum storage and temperate source water to the HWG.

It is always advisable to use water softening equipment on domestic water systems to reduce the scaling potential and lengthen equipment life. In extreme water conditions, it may be necessary to avoid the use of the HWG option since the potential cost of frequent maintenance may offset or exceed any savings. Consult Table 6 for scaling potential tests.

⚠ WARNING! ⚠

WARNING! A 150°F SETPOINT MAY LEAD TO SCALDING OR BURNS. THE 150°F SET POINT MUST ONLY BE USED ON SYSTEMS THAT EMPLOY AN APPROVED ANTI-SCALD VALVE.

Figure 18: Typical HWG Installation (Indoor Compressor Section)

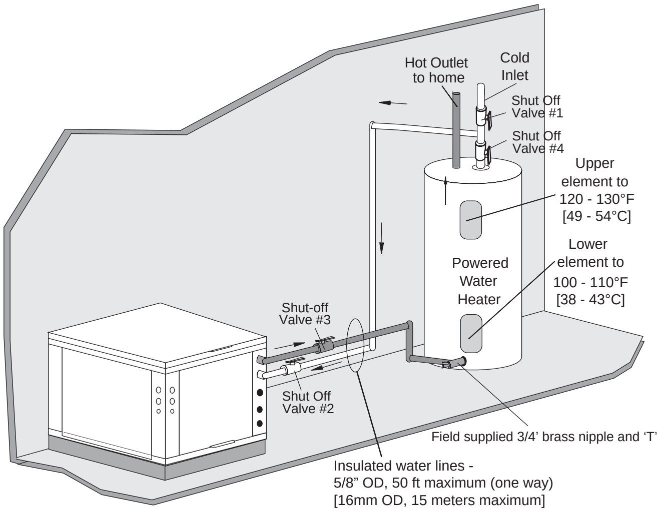
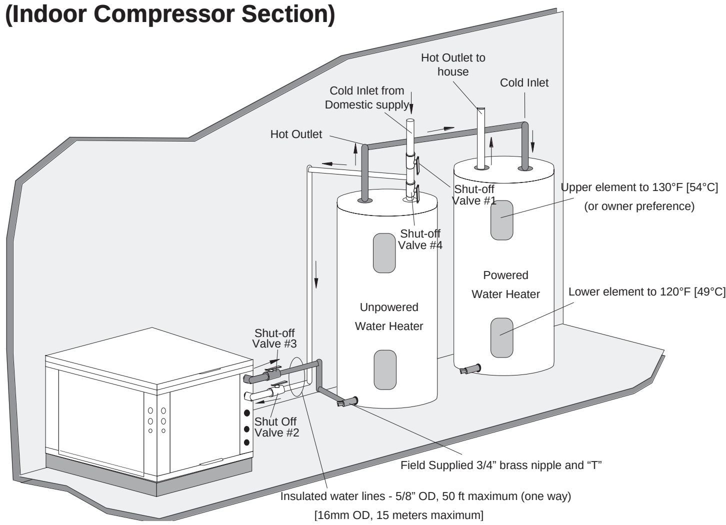


Figure 19: HWG Double Tank Installation (Indoor Compressor Section)



Hot Water Generator

Installation
The HWG is controlled by two sensors and the DXM2 microprocessor control. One sensor is located on the compressor discharge line to sense the discharge refrigerant temperature. The other sensor is located on the HWG heat exchanger's "Water In" line to sense the potable water temperature.

⚠ WARNING! ⚠

WARNING! UNDER NO CIRCUMSTANCES SHOULD THE SENSORS BE DISCONNECTED OR REMOVED. FULL LOAD CONDITIONS CAN DRIVE HOT WATER TANK TEMPERATURES FAR ABOVE SAFE TEMPERATURE LEVELS IF SENSORS DISCONNECTED OR REMOVED.

The DXM2 microprocessor control monitors the refrigerant and water temperatures to determine when to operate the HWG. The HWG will operate any time the refrigerant temperature is sufficiently above the water temperature. Once the HWG has satisfied the water heating demand during a heat pump run cycle, the controller will cycle the pump at regular Intervals to determine if an additional HWG cycle can be utilized.

When the control is powered and the HWG pump output is active for water temperature sampling or HWG operation, the DXM2 status LED will slowly flash (On 1 second, Off 1 second).

If the control has detected a HWG fault, the DXM2 status LED will flash a numeric fault code as follows:

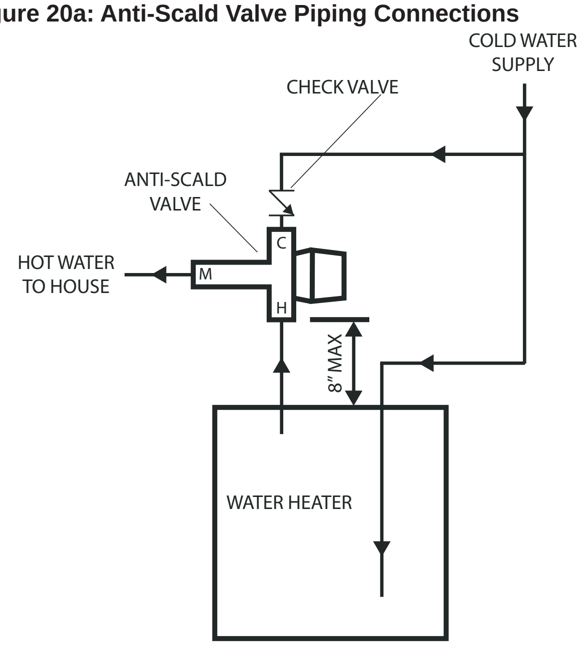
High Water Temperature (>160ºF)	5 flashes
Hot Water Sensor Fault	6 flashes
Compressor Discharge Sensor Fault	6 flashes

Fault code flashes have a duration of 0.3 seconds with a 10 second pause between fault codes. For example, a "Compressor Discharge sensor fault" will be six flashes 0.3 seconds long, then a 10 second pause, then six flashes again, etc.

⚠ WARNING! ⚠

WARNING! USING A 150°F SETPOINT ON THE HWG WILL RESULT IN WATER TEMPERATURES SUFFICIENT TO CAUSE SEVERE PHYSICAL INJURY IN THE FORM OF SCALDING OR BURNS, EVEN WHEN THE HOT WATER TANK TEMPERATURE SETTING IS VISIBLY SET BELOW 150°F. THE 150°F HWG SETPOINT MUST ONLY BE USED ON SYSTEMS THAT EMPLOY AN APPROVED ANTI-SCALD VALVE (PART NUMBER AVAS4) AT THE HOT WATER STORAGE TANK WITH SUCH VALVE PROPERLY SET TO CONTROL WATER TEMPERATURES DISTRIBUTED TO ALL HOT WATER OUTLETS AT A TEMPERATURE LEVEL THAT PREVENTS SCALDING OR BURNS!

Figure 20a: Anti-Scald Valve Piping Connections



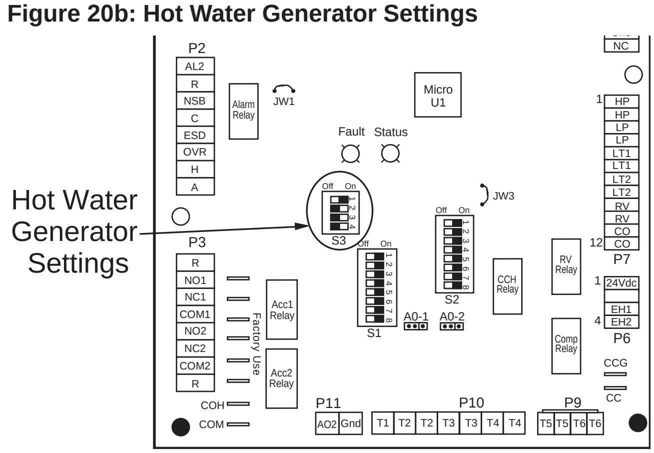
Hot Water Generator settings are determined by DIP switches 3-2, 3-3, and 3-4.

DIP 3-2 controls the HWG Test Mode. It provides for forced operation of the HWG output, activating the HWG pump for up to five minutes. ON = HWG test mode, OFF = normal HWG operation. The control will revert to standard operation after five minutes regardless of switch position.

DIP 3-3 determines HWG set point temperature. It provides for selection of the HWG operating set point. ON = 150°F (66°C), OFF = 125°F (52°C).

DIP 3-4 is for the HWG status. It provides HWG operation control. ON = HWG mode enabled, OFF = HWG mode disabled. Units are shipped from the factory with this switch in the OFF position.

Figure 20b: Hot Water Generator Settings



Hot Water Generator
For Indoor and Outdoor Compressor Section

Warning! The HWG pump Is fully wired from the factory. Use extreme caution when working around the microprocessor control as it contains line voltage connections that presents a shock hazard that can cause severe injury or death!

The heat pump, water piping, pump, and hot water tank should be located where the ambient temperature does not fall below 50°F [10°C]. Keep water piping lengths at a minimum. DO NOT use a one way length greater than 50 ft. (one way) [15 m]. See Table 9 for recommended piping sizes and maximum lengths.

All installations must be in accordance with local codes. The installer is responsible for knowing the local requirements, and for performing the installation accordingly. DO NOT energize the pump until "water tank refill" section, below is completed. Powering the pump before all installation steps are completed may damage the pump.

Water Tank Preparation

1. Turn off power or fuel supply to the hot water tank.
2. Connect a hose to the drain valve on the water tank.
3. Shut off the cold water supply to the water tank.
4. Open the drain valve and open the pressure relief valve or a hot water faucet to drain tank.
5. When using an existing tank, it should be flushed with cold water after it is drained until the water leaving the drain hose is clear and free of sediment.
6. Close all valves and remove the drain hose.
7. Install HWG water piping.

HWG Water Piping

1. Using at least 5/8" [16mm] O.D. copper, route and install the water piping and valves as shown in Figures 18 or 19. Install an approved anti-scald valve if the 150°F HWG setpoint is or will be selected. An appropriate method must be employed to purge air from the HWG piping. This may be accomplished by flushing water through the HWG (as In Figures 18 and 19) or by Installing an air vent at the high point of the HWG piping system.
2. Insulate all HWG water piping with no less than 3/8" [10mm] wall closed cell insulation.
3. Open both shut off valves and make sure the tank drain valve is closed.

Water Tank Refill

1. Close valve #4. Ensure that the HWG valves (valves #2 and #3) are open. Open the cold water supply (valve #1) to fill the tank through the HWG piping. This will purge air from the HWG piping.
2. Open a hot water faucet to vent air from the system until water flows from faucet; turn off faucet. Open valve #4.
3. Depress the hot water tank pressure relief valve handle to ensure that there is no air remaining in the tank.
4. Inspect all work for leaks.
5. Before restoring power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to insure 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 [38°C] or the lowest setting; the upper element should be adjusted to 120-130°F [49-54°C]. Depending upon the specific needs of the customer, you may want to adjust the upper element differently. On tanks with a single thermostat, a preheat tank should be used (Fig 19).
6. Replace access cover(s) and restore power or fuel supply.

Initial Start-Up

1. Make sure all valves in the HWG water circuit are fully open.
2. Turn the heat pump power and remote HWG power "off" and switch dip switch DIP 3.4 on the HWG controller to the "off" (enabled) position to activate the HWG.
3. The HWG pump should not run if the compressor is not running.
4. The temperature difference between the water entering and leaving the HWG should be approximately 5-10 °F [3-6 °C].
5. Allow the unit to operate for 20 to 30 minutes insure that it is functioning properly.
6. Always turn dip switch DIP 3.4 on the HWG controller to the "on" (disabled) position to deactivate the HWG when servicing the outdoor compressor section.

Table 9: HWG Water Piping Size and Length

Unit Nominal Tonnage	Nominal HWG Flow (gpm)	1/2" Copper (max length*)	3/4" Copper (max length*)
1.5	0.6	50	-
2.0	0.8	50	-
2.5	1.0	50	-
3.0	1.2	50	-
3.5	1.4	50	-
4.0	1.6	45	50
5.0	2.0	25	50
6.0	2.4	10	50

*Maximum length is equivalent length (in feet) one way of type L copper.

⚠ CAUTION! ⚠

CAUTION! Use only copper piping for HWG piping due to the potential of high water temperatures for water that has been in the HWG heat exchanger during periods of no-flow conditions (HWG pump not energized). Piping other than copper may rupture due to high water temperature and potable water pressure.

Hot Water Generator Module Refrigeration Installation For Outdoor Compressor Section Only

General Information
The HWG Module consists of an all-copper, vented double-wall heat exchanger and a water-cooled water circulating pump. The pump is controlled by a microprocessor in the HWG module. Power for the pump is provided from a remote 115 vac power source.

Location/Mounting
The HWG module should be mounted as close to the heat pump outdoor section as possible, in order to minimize the length of refrigerant run. Indoor mounting is preferred, where practical, to reduce the likelihood of freezing ambient temperature. It is recommended that the HWG module be mounted above the system compressor in order to promote proper oil movement and drain-down. **This means that the HWG module can be wall mounted in any orientation except for stubs up.** Mounting should be accomplished by fastening the HWG module cabinet to the wall or other selected vertical surface. Mounting holes are provided at the rear of the unit. Any fastener suitable for supporting a 12 pound [5.4] vertical load is acceptable.

The HWG, water piping and hot water tank should be located where the ambient temperature does not fall below 50°F [10°C]. Keep water piping lengths at a minimum. DO NOT use a one-way length greater than 50 ft. (one way) [15 m]. See Table 9 for maximum water piping lengths.

All installations must be in accordance with local codes. The installer is responsible for knowing the local requirements, and for performing the installation accordingly

SPECIAL NOTE: The selected mounting location and orientation must allow the circulator pump to be positioned with the motor shaft horizontal. **DO NOT install the Heat Recovery Unit flat on its back.**

Refrigerant Line Installation
Before starting the installation into the refrigerant circuit, inspect and note the condition and performance of the heat pump. Disconnect power to the heat pump outdoor unit. Any system deficiencies must be corrected prior to installing the HWG module. Addition of the unit will not correct system problems. Record the suction and discharge pressures and compressor amperage draw. These will be used for comparison with system operation after the refrigerant line installation is complete and before the water line installation is performed.

Install the Add-On HWG Kit
Locate the HWG as close to the water heater as possible. Install the lineset to the desuperheater valves in the outdoor compressor section and the refrigerant line connections on the HWG. Maximum length should be 30 feet one way. Evacuate the lineset to 500 microns through the hot gas valves in the outdoor unit. Open the HWG valves in the compressor section up fully (and close the desuperheater bypass valve). See Figures 21a through 21d. Check the lineset for leaks. Verify that lineset tubing is completely insulated with a minimum 1/2” thick closed cell and painted to prevent deterioration of the insulation due to ultra violet light and weather. Make the connections with high temperature solder or brazing rod. The recommended refrigerant line size is dependent on the one way distance between the Heat Recovery Unit and the compressor; and the size of the system. Use Table 10 as a guideline.

Wiring
Refer to Wire Diagrams for Remote HWG Wiring.

NOTICE! Make sure the compressor discharge line is connected to the “Hot Gas In” stub on the Heat Recovery Unit.

⚠ WARNING! ⚠

WARNING! The HWG module is an appliance that operates in conjunction with the heat pump system, the hot water system and the electrical system. Installation should only be performed by skilled technicians with appropriate training and experience. The installation must be in compliance with local codes and ordinances. Local plumbing and electrical building codes take precedence over instructions contained herein. The Manufacturer accepts no liability for equipment damaged and/or personal injury arising from improper installation of the HWG module.

⚠ CAUTION! ⚠

CAUTION! The HWG module must be installed in an area that is not subject to freezing temperatures.

⚠ CAUTION! ⚠

CAUTION! Locate Refrigerant lines to avoid accidental damage by lawnmowers or children.

Hot Water Generator Module Refrigeration Installation Outdoor Compressor Section Only

Figure 21a: Outdoor Compressor Section HWG Installation

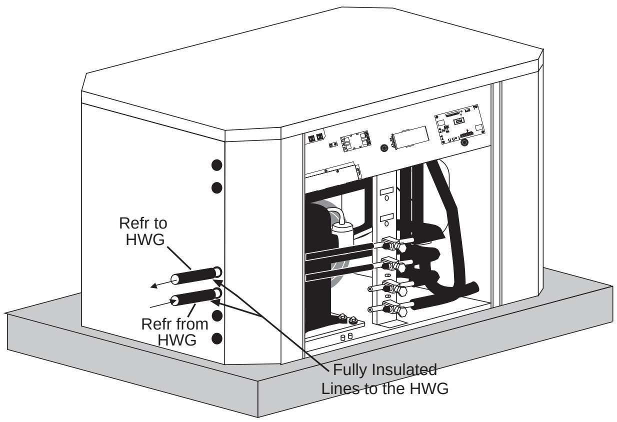


Figure 21b: Remote HWG Module

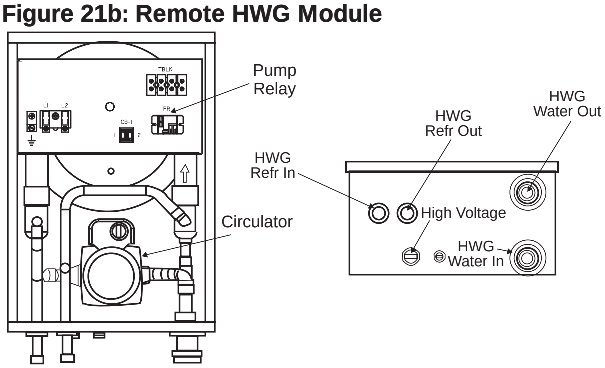


Figure 21c: HWG Bypass Valve

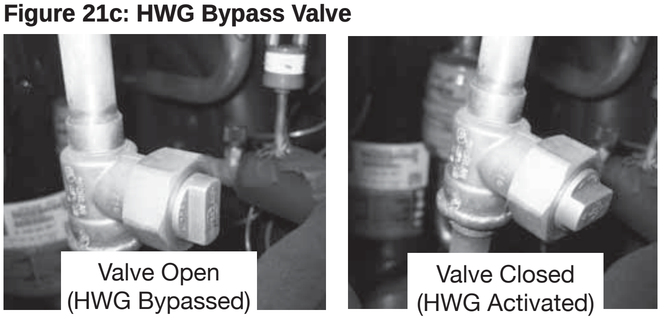


Figure 21d: HWG Service Valves

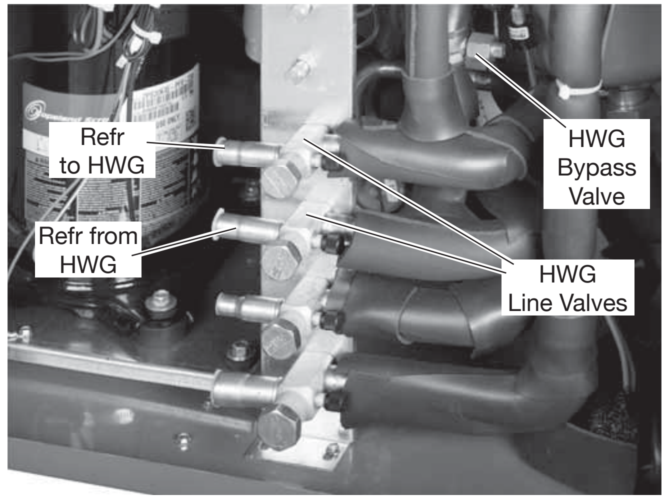


Table 10: HWG Refrigerant Line Sizing

Capacity	Line Set Size		
	1/2" OD	5/8" OD	3/4" OD
2 Ton	Up to 16 ft. [4.9m]	Up to 30 ft. [9.1m]	N/A
3 Ton	Up to 9 ft. [2.7m]	Up to 25 ft. [7.6m]	Up to 30 ft. [9.1m]
4 Ton	Up to 5 ft. [1.5m]	Up to 13 ft. [4.0m]	Up to 30 ft. [9.1m]
5 Ton	N/A	Up to 9 ft. [2.7m]	Up to 25 ft. [7.6m]

Electrical - Line Voltage

⚠ WARNING! ⚠

WARNING! To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.

⚠ CAUTION! ⚠

CAUTION! Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

Electrical - Line Voltage

All field installed wiring, including electrical ground, must comply with the National Electrical Code as well as all applicable local codes. Refer to the unit electrical data for fuse sizes. Consult wiring diagram for field connections that must be made by the installing (or electrical) contractor.

All final electrical connections must be made with a length of flexible conduit to minimize vibration and sound transmission to the building.

General Line Voltage Wiring

Be sure the available power is the same voltage and phase shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable.

Power Connection

Line voltage connection is made by connecting the incoming line voltage wires to the “L” side of the contactor as shown in Figures 22 and 23. Consult Table 11a - 11c for correct fuse size.

208-230 Volt Operation

Verify transformer tap with air handler wiring diagram to insure that the transformer tap is set to the correct voltage, 208V or 230V.

Table 11a: 50YGS Series with Modulating Valve Electrical Data

Model	Compressor			HWG Pump FLA	Total Unit FLA	Min Circuit Amps	Max Fuse/ HACR
	RLA	LRA	Qty				
026	11.7	58.3	1	0.5	12.2	15.1	25
038	15.3	83.0	1	0.5	15.8	19.6	30
049	21.2	104.0	1	0.5	21.7	27.0	45
064	27.1	152.9	1	0.5	27.6	34.3	60

Rated Voltage of 208/230/60/1
HACR circuit breaker in USA only
Min/Max Voltage of 197/254
All fuses Class RK-5

Table 11b: 50YGS Series with Internal Variable Speed Flow Controller Electrical Data

Model	Compressor			HWG Pump FLA	Total Unit FLA	Min Circuit Amps	Max Fuse/ HACR
	RLA	LRA	Qty				
026	11.7	58.3	1	0.5	13.9	16.8	25
038	15.3	83.0	1	0.5	17.5	21.3	35
049	21.2	104.0	1	0.5	23.4	28.7	45
064	27.1	152.9	1	0.5	29.3	36.0	60

Rated Voltage of 208/230/60/1
HACR circuit breaker in USA only
Min/Max Voltage of 197/254
All fuses Class RK-5

Table 11c: 50YGP Series with Internal Variable Speed Flow Controller Electrical Data

Model	Compressor			Total Unit FLA	Min Circuit Amps	Max Fuse/ HACR
	RLA	LRA	Qty			
026	11.7	58.3	1	13.4	16.3	25
038	15.3	83.0	1	17.0	20.8	35
049	21.2	104.0	1	22.9	28.2	45
064	27.1	152.9	1	28.8	35.6	60

Rated Voltage of 208/230/60/1
HACR circuit breaker in USA only
Min/Max Voltage of 197/254
All fuses Class RK-5

Table 11d: Hot Water Generator Electrical Data

HWG Module	Voltage	Pump FLA	Total FLA	Min Circuit Amps	Min Wire Size
AHWG1BACS	115/60/1	0.52	0.52	1.20	14 ga.
AHWG1BGCS	208/230/60/1	0.40	0.40	0.90	14 ga.

Electrical - Power Wiring

Figure 22: Indoor Compressor Section (50YGS) Line Voltage Field Wiring

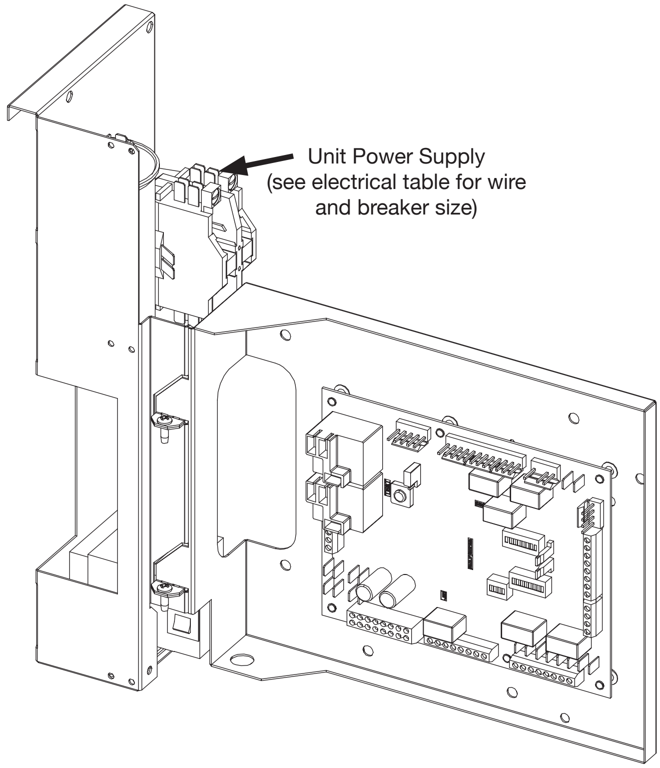
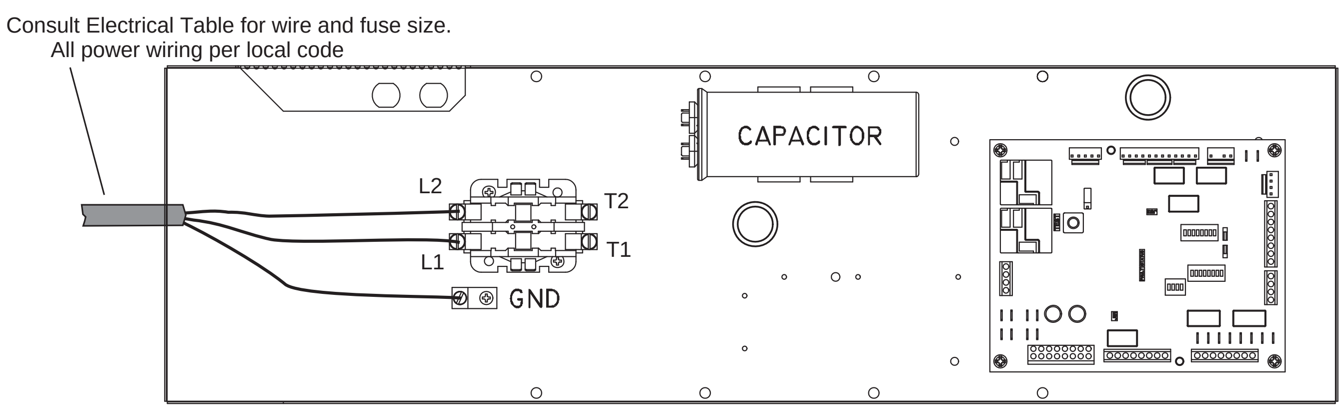


Figure 23: Outdoor Compressor Section (50YGP) Line Voltage Field Wiring



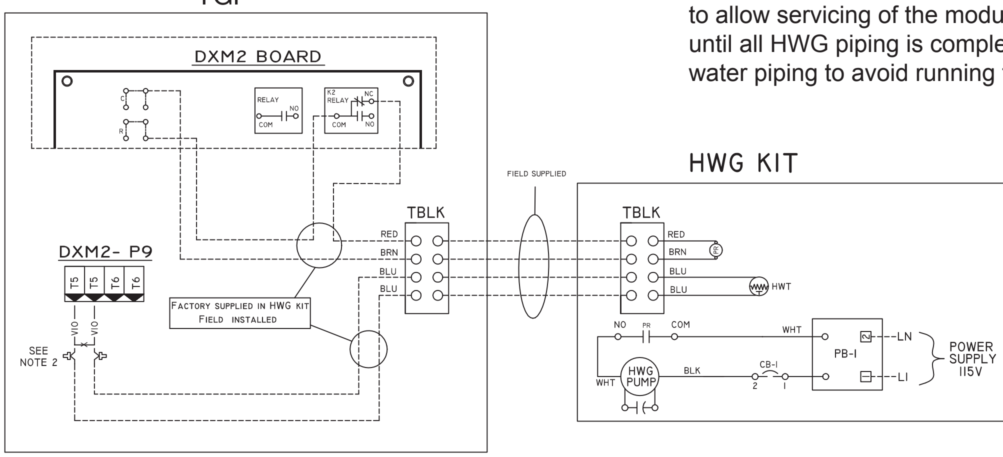
Electrical - HWG Wiring

Remote HWG Kit Wiring Installation

1. Disconnect power to outdoor unit and HWG kit module.
2. Open access panel to locate factory-installed terminal block inside the HWG module.
3. Connect four T-stat field-supplied wires on the opposite side of terminal block where thermistors are connected. Next, route T-stat wires thru HWG module kit cabinet to the outdoor unit.
4. Remove outdoor unit side panel to access control box
5. Install factory-supplied terminal block as shown in Fig. 23a.
6. Locate violet jumper that is installed in “T5” terminal on DXM2.
7. Cut the jumper and connect one end of the factory supplied blue color wires to the cut jumper using wire nuts and connect the other side of the blue wires to the terminal block in outdoor unit.
8. Connect factory-supplied brown wire from “C” on DXM2 to terminal block. Connect factory-supplied red wire from “R” on DXM2 to “COM” on K2 relay on DXM2 and connect the other red wire from “NC” to terminal block (refer to Fig. 23a).
9. Verify proper wiring connections before turning on power.

Fig. 23a: HWG Kit Wiring Diagram

YGP

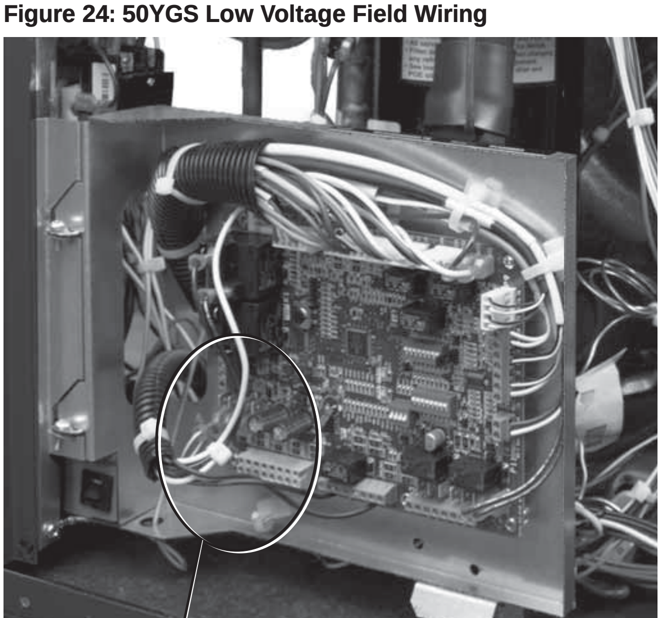


HWG Module Wiring - For “Outdoor” Compressor Section

The HWG module should be wired to a 115 or 240 vac power supply as shown in the wire diagrams. A safety disconnect should be installed at the HWG module as required by code to allow servicing of the module. DO NOT energize the pump until all HWG piping is completed and air is purged from the water piping to avoid running the pump “dry”.

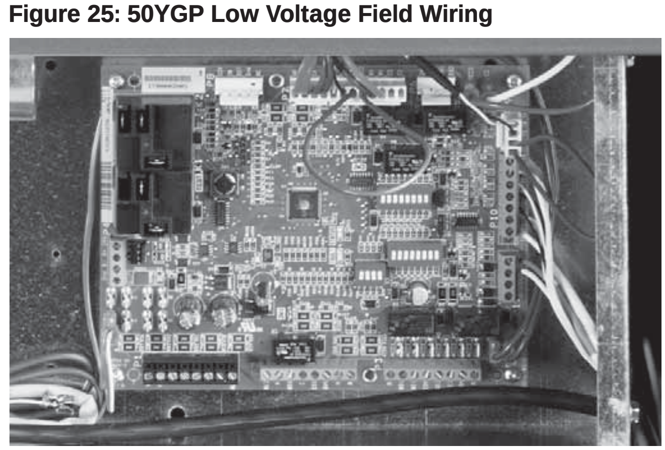
ELECTRICAL - LOW VOLTAGE WIRING

Figure 24: 50YGS Low Voltage Field Wiring



Low Voltage Field Wiring

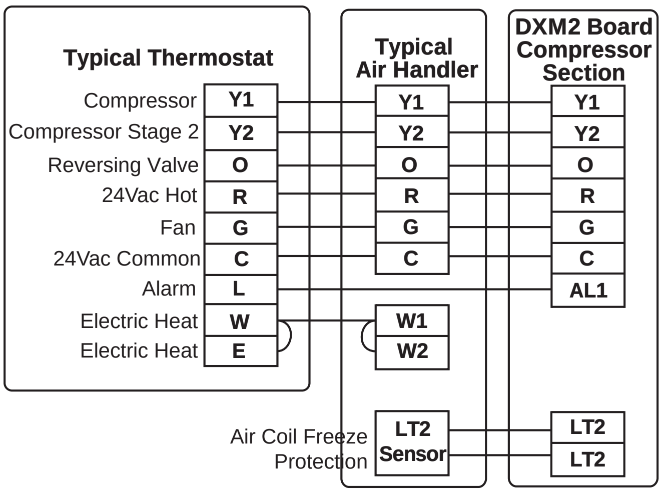
Figure 25: 50YGP Low Voltage Field Wiring



The primary low voltage wiring from the GT-PCS is to the Air Handler.

Electrical - Thermostat Wiring

Figure 26: Connection to thermostat and Air Handler/ Furnace



Note: LT2 sensor is shipped with GT-PCS unit.

Low Air Temperature Sensor Installation
An LT2 (Low Air Temperature) sensor is shipped with the compressor section.

Mount the LT2 sensor in the air handler. On the DXM2 in the compressor section, clip the VIO jumper (see diagram) and connect the violet leads from LT2 sensor to the clipped violet leads on the DXM2 board.

Figure 27: LT2 Sensor Location

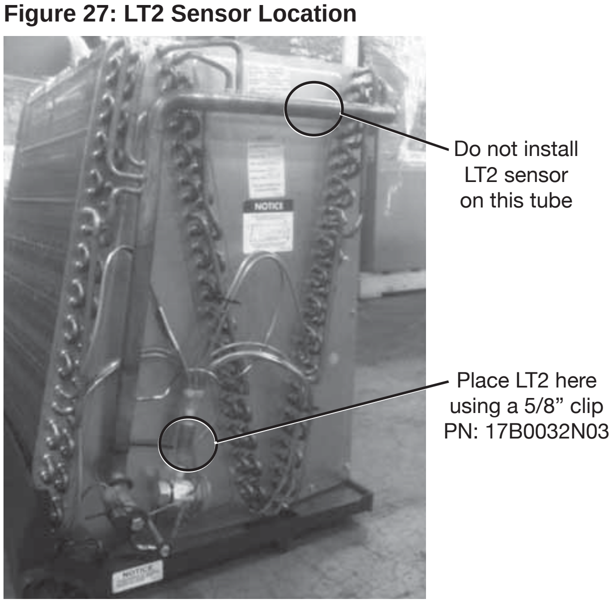
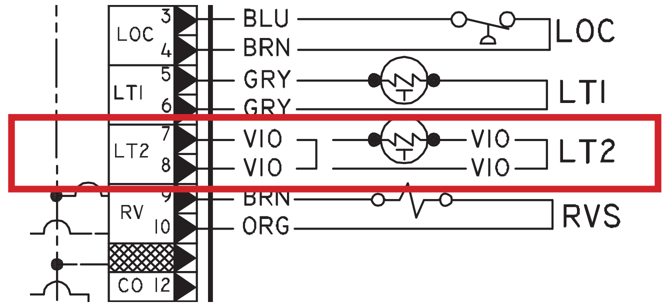


Figure 28: DXM2 LT2 VIO Connection



Thermostat Installation
The thermostat should be located on an interior wall in a larger room, away from supply duct drafts. DO NOT locate the thermostat in areas subject to sunlight, drafts or on external walls. The wire access hole behind the thermostat may in certain cases need to be sealed to prevent erroneous temperature measurement due to air infiltration through the wall cavity. Position the thermostat back plate against the wall so that it appears level and so the thermostat wires protrude through the middle of the back plate. Mark the position of the back plate mounting holes and drill holes with a 3/16" (5mm) bit. Install supplied anchors and secure plate to the wall. Thermostat wire must be 18 AWG or larger wire. Wire the appropriate thermostat as shown in Figure 26 or on the wiring diagram contained in the unit. Practically any heat pump thermostat will work with these units, provided it has the correct number of heating and cooling stages.

⚠ CAUTION! ⚠

CAUTION! Refrigerant pressure activated water regulating valves should never be used with manufacturer's equipment.

⚠ CAUTION! ⚠

CAUTION! A communicating service tool (ACDU01A) must be used to configure and diagnose this system.

DXM2 Controls

DXM2 Controller
The DXM2 is capable of 2-way communications with the Internal Flow Controller pump and the ACDU01A Configuration/Diagnostic tool.

For most residential applications, configuration, monitoring and diagnostics can all be done from the Configuration/ Diagnostic tool so there's no need to read LEDs and change DIP switches.

For details on installer/service settings on the ACDU01A configuration/diagnostic tool, refer to operation manual (part # 97B0106N02).

For further details on the DXM2 control, refer to the DXM2 Application, Operation and Maintenance Manual (part # 97B0003N15). The DXM2 AOM is shipped with each unit.

Field Hardware Configuration Options - Note: In the following field hardware configuration options, changes should be made ONLY when power is removed from the DXM2 control.

Water coil low temperature limit setting: Jumper 3 (JW3-LT1 Low Temp) provides field selection of temperature limit setting for LT1 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature).

Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].

A0-2: Configure Modulating Valve or Variable-Speed Pump (Internal water flow Models Only)

A0-2 jumper (Figure 30) Factory Set to "IOV" if using Internal Modulating Motorized Valve or "PMW" if using Internal Variable-Speed Pump. This applies only to units with Internal Water Flow Control.

DIP Switches – There's no need to change the DIP switches settings on Residential units. All DIP switches in S1 and S2 should be "on". In S3, S3-1 should be "on" and the rest should be "off". For more details on DIP switches, refer to the DXM2 AOM (part # 97B0003N15).

DXM2 Control Start-up Operation
The control will not operate until all inputs and safety controls are checked for normal conditions. The compressor will have a 5 minute anti-short cycle delay at power-up. The first time after power-up that there is a call for compressor, the compressor will follow a 5 to 80 second random start delay.

After the random start delay and anti-short cycle delay, the compressor relay will be energized. On all subsequent compressor calls, the random start delay is omitted.

⚠ CAUTION! ⚠

CAUTION! Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

Test Mode Button
Test mode allows the service technician to check the operation of the control in a timely manner. By momentarily pressing the TEST push button, the DXM2 control enters a 20 minute test mode period in which all time delays are sped up 15 times.

Figure 29: Test Mode Button

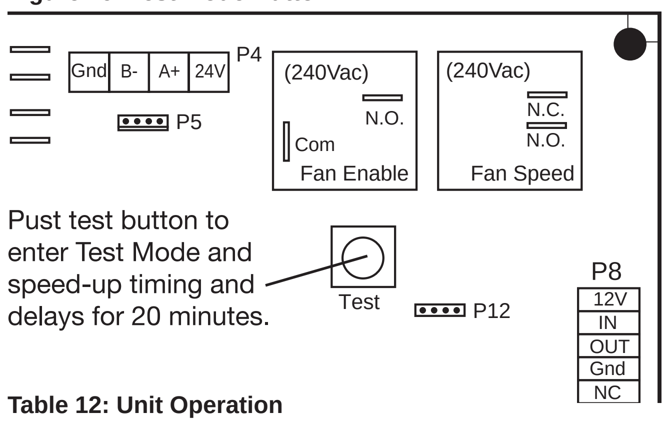


Table 12: Unit Operation

Conventional T-stat signal	Unit ECM fan
G	Fan only
G, Y1	Stage 1 heating[1]
G, Y1, Y2	Stage 2 heating[1]
G, Y1, Y2, W	Stage 3 heating[1]
G, W	Emergency heat
G, Y1, O	Stage 1 cooling[2]
G, Y1, Y2, O	Stage 2 cooling[2]

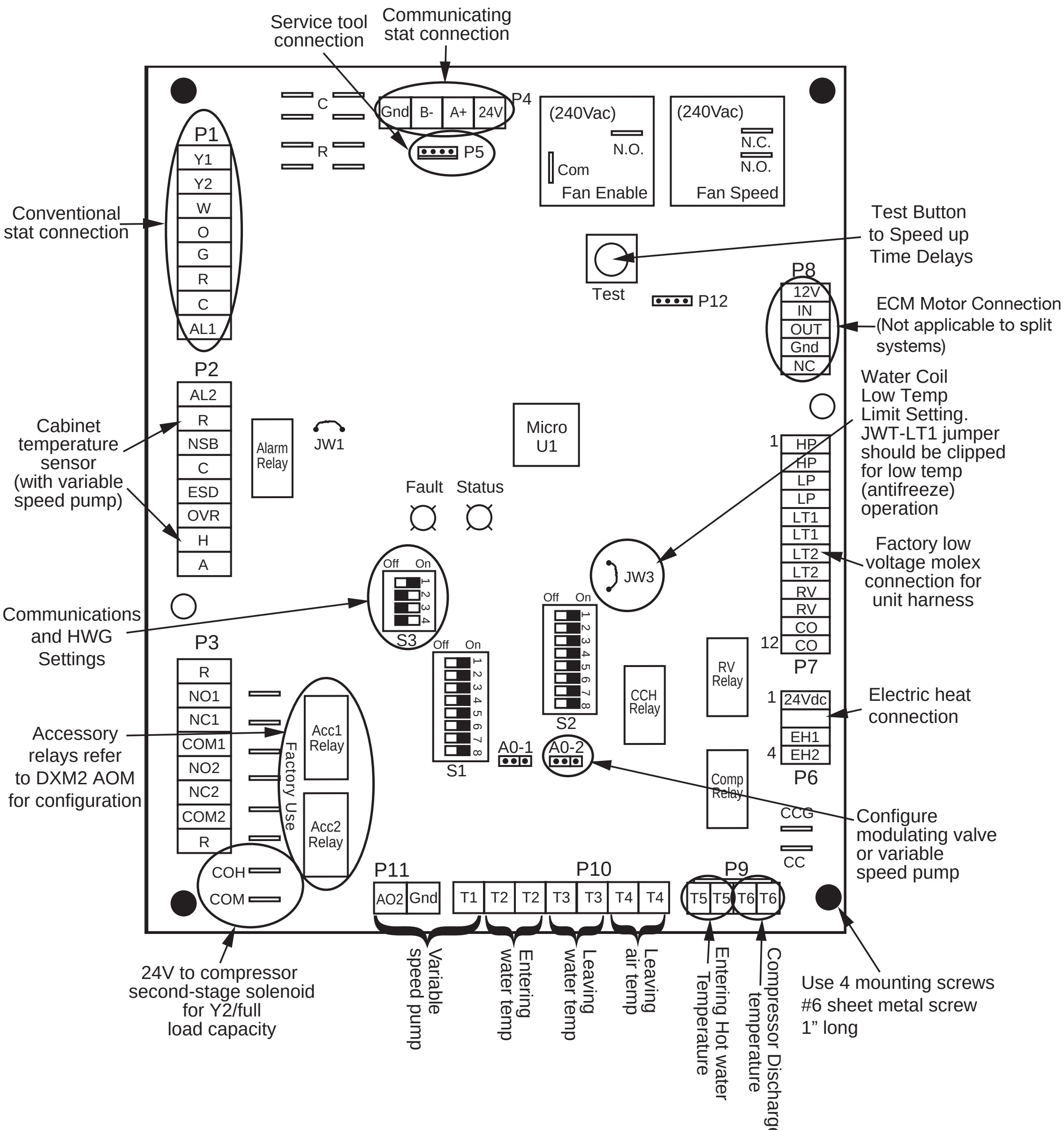
1 Stage 1 = 1st stage compressor, 1st stage fan operation
Stage 2 = 2nd stage compressor, 2nd stage fan operation
Stage 3 = 2nd stage compressor, auxiliary electric heat, 3rd stage fan operation
2 Stage 1 = 1st stage compressor, 1st stage fan operation, reversing valve
Stage 2 = 2nd stage compressor, 2nd stage fan operation, reversing valve

DXM2 Layout and Connections

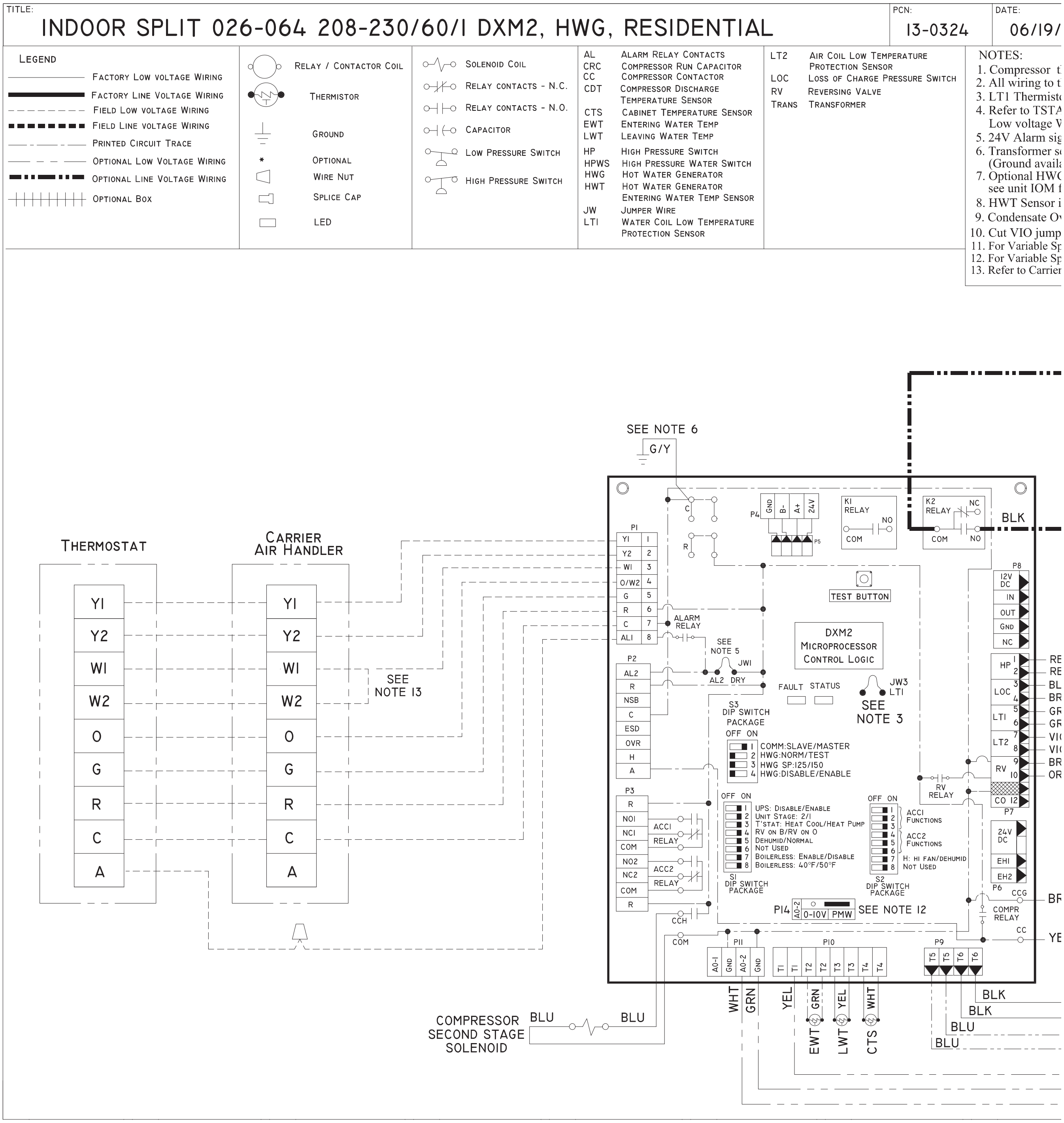
Low Water Temperature Cutout Selection
The DXM2 control allows the field selection of low water (or water-antifreeze solution) temperature limit by clipping jumper JW3, which changes the fault cutout temperature associated with thermistor LT1. Note that the LT1 thermistor is located on the refrigerant line between the coaxial heat exchanger and expansion device (TXV). Therefore, LT1 is sensing refrigerant temperature, not water temperature, which is a better indication of how water flow rate/ temperature is affecting the refrigeration circuit.

The factory setting for LT1 is for systems using water (30°F [-1.1°C] refrigerant temperature cutout or fallout). In low water temperature (extended range) applications with antifreeze (most ground loops), jumper JW3 should be clipped as shown in Figure 30 to change the setting to 10°F [-12.2°C] refrigerant cutout or fallout temperature, a more suitable temperature when using an antifreeze solution. All residential units include water/refrigerant circuit insulation to prevent internal condensation, which is required when operating with entering water temperatures below 59°F [15°C].

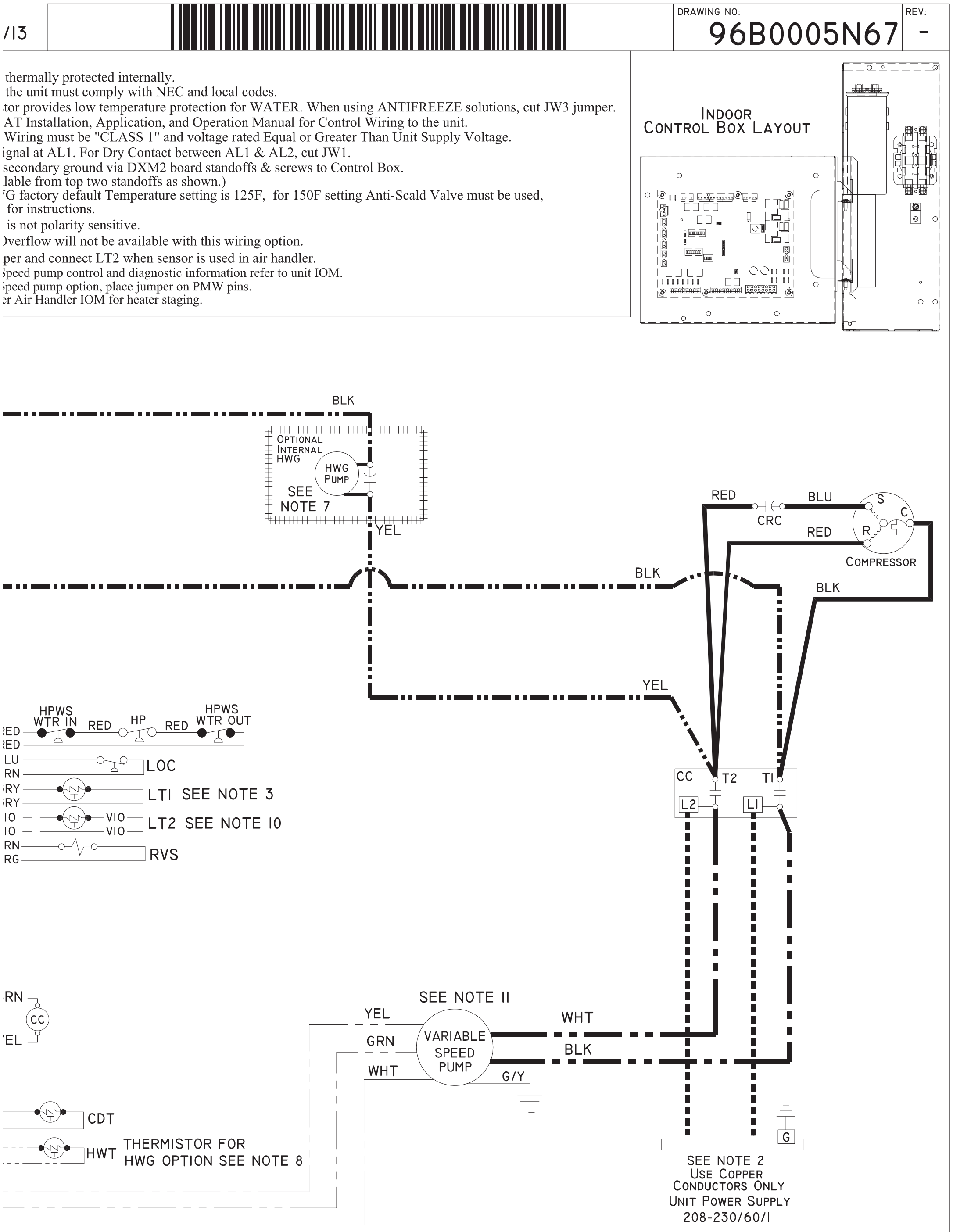
Figure 30: DXM2 Layout and Connections

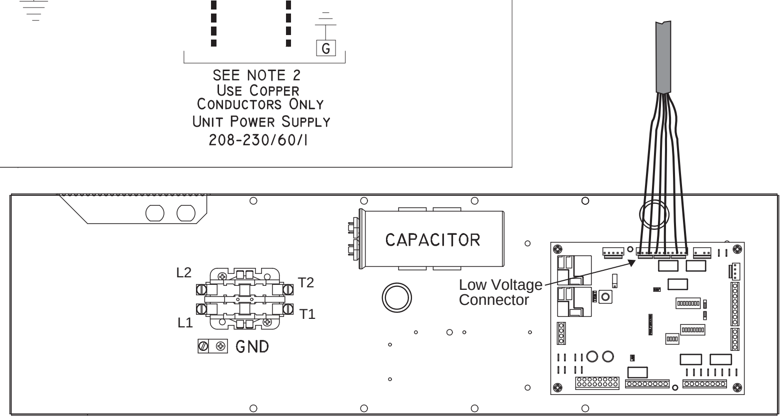


Indoor Split (50YGS) DXM2 Wiring Diagram with Internal Flow Controller - 96B0005N67

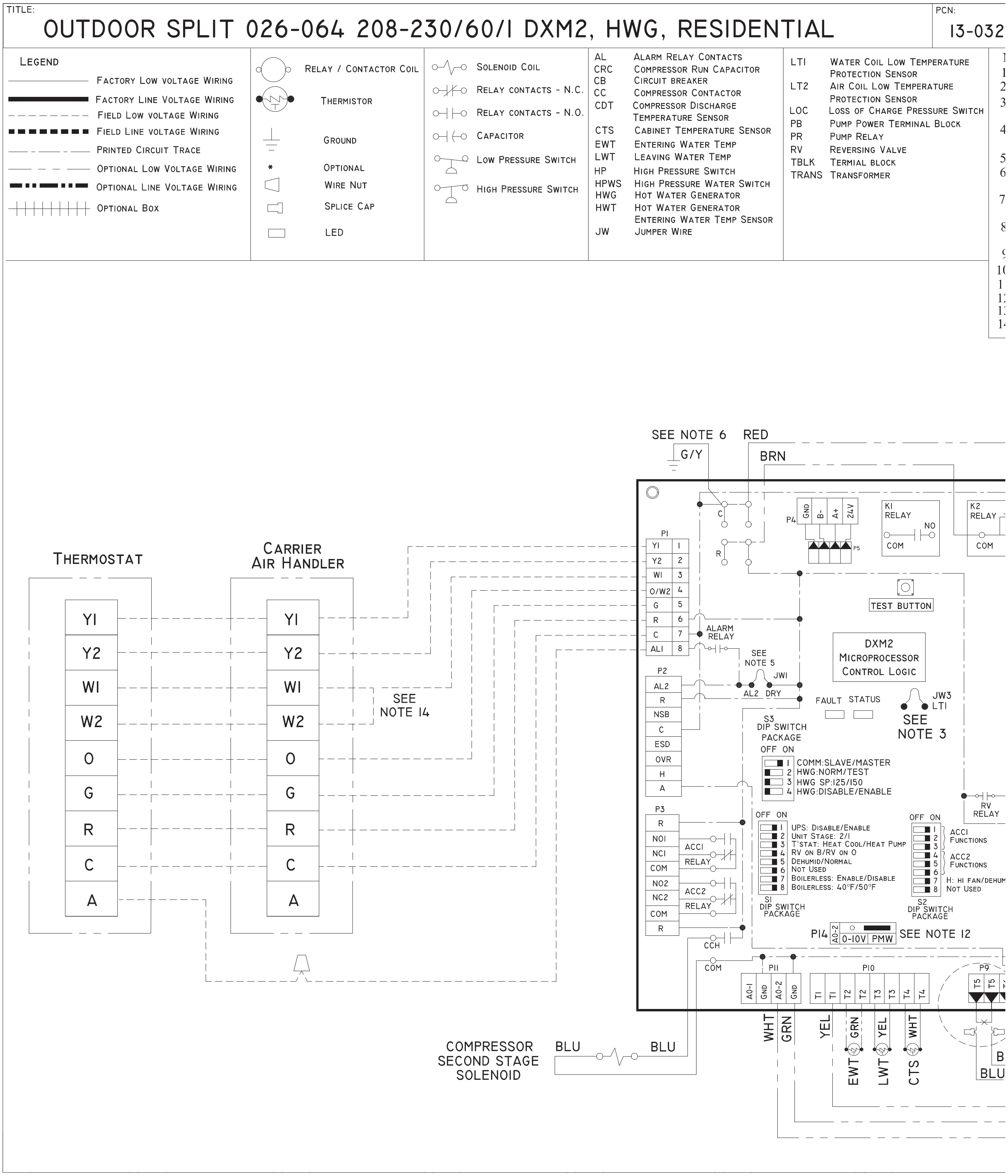


Indoor Split (50YGS) DXM2 Wiring Diagram with Internal Flow Controller - 96B0005N67





Outdoor Split (50YGP) DXM2 Wiring Diagram with Internal Flow Controller - 96B0005N66

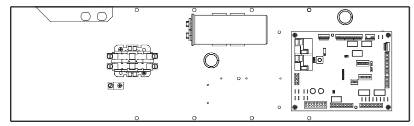


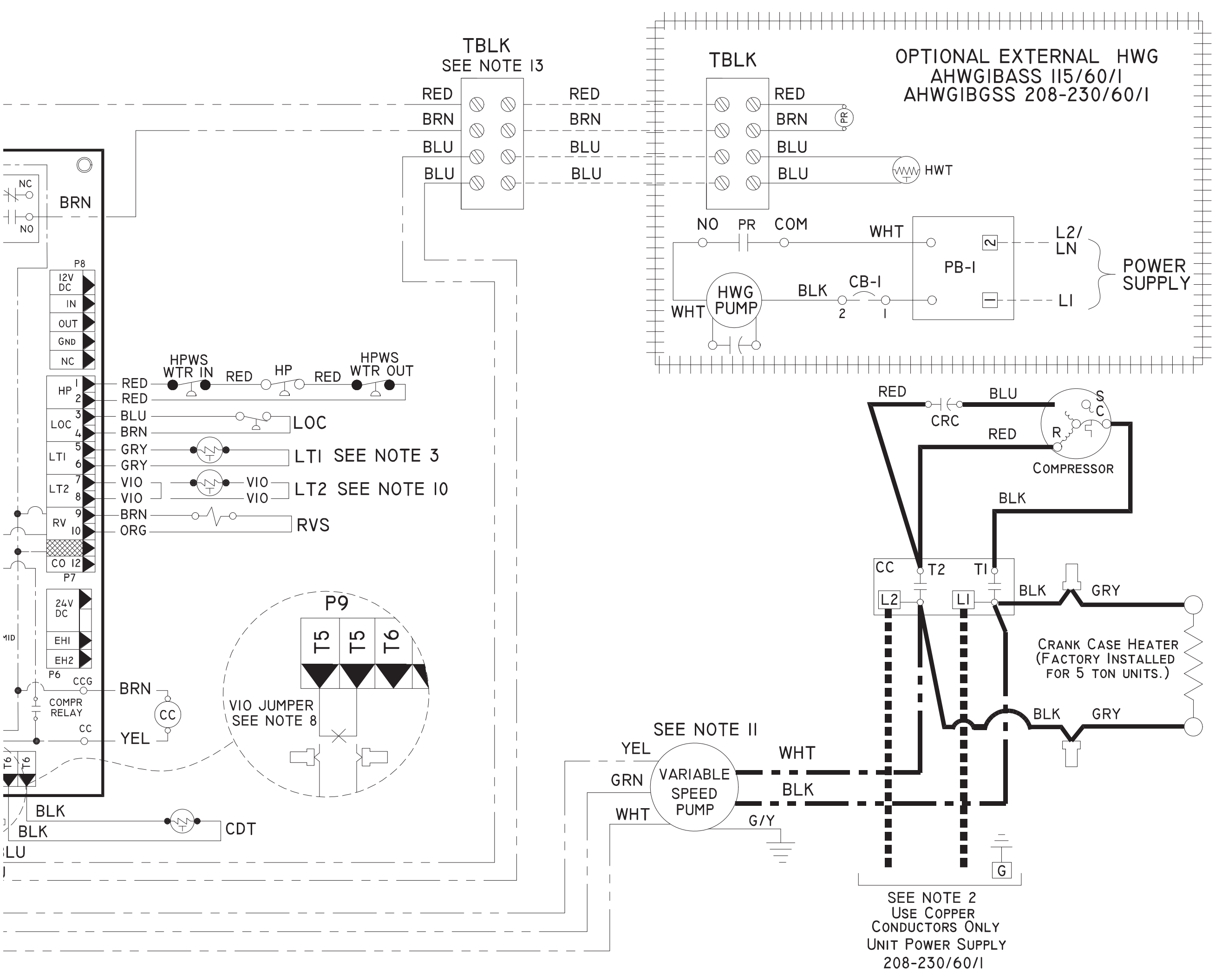
Outdoor Split (50YGP) DXM2 Wiring Diagram with Internal Flow Controller - 96B0005N66

4	DATE: 06/10/13	DRAWING NO: 96B0005N66	REV: -

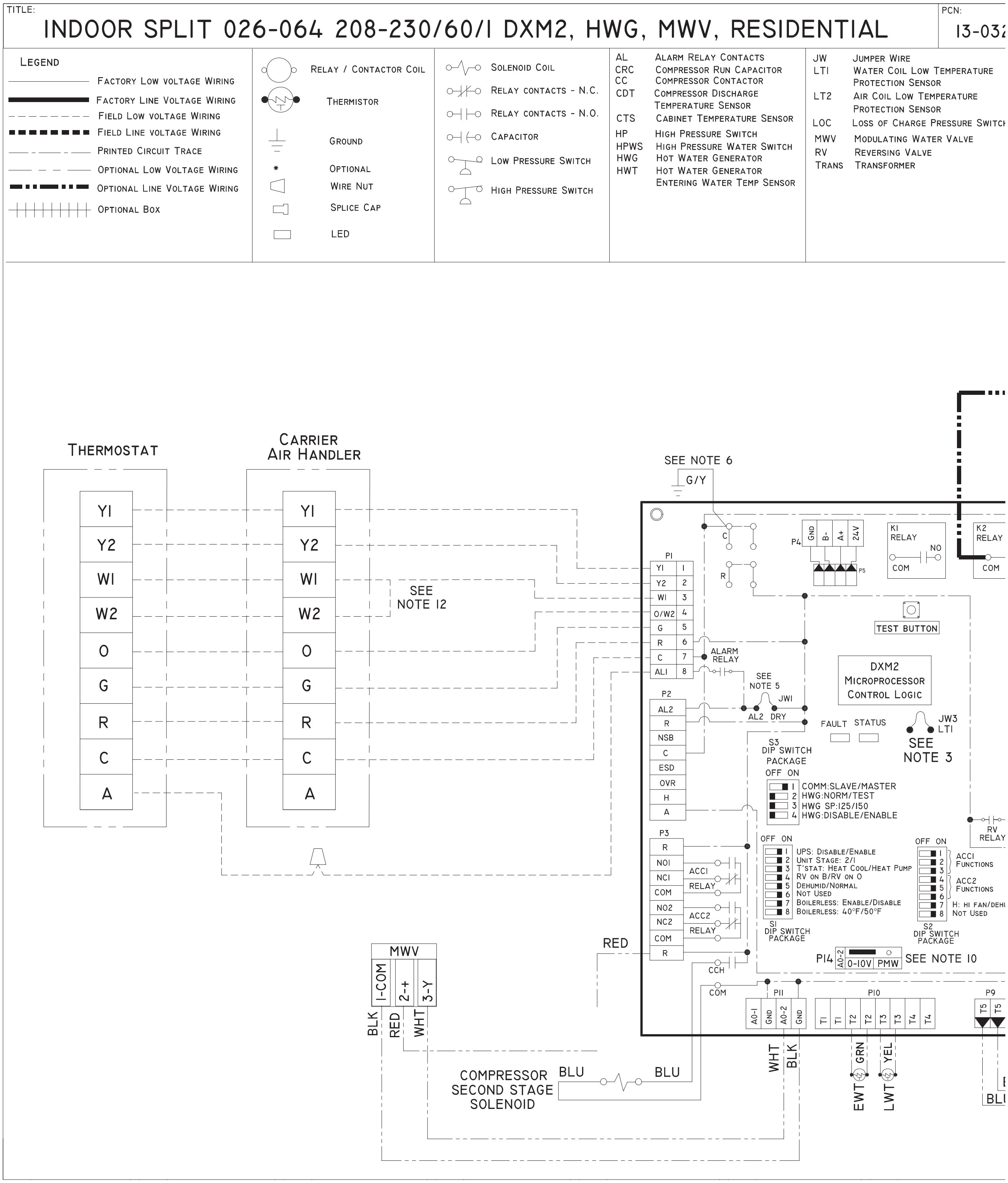
NOTES:
1. Compressor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. LT1 Thermistor provides low temperature protection for WATER. When using ANTIFREEZE solutions, cut JW3 jumper. For outdoor splits using antifreeze (JW3 clipped) , the loop must be protected to a minimum temperature of 20F
4. Refer to TSTAT Installation, Application, and Operation Manual for Control Wiring to the unit. Low voltage Wiring must be "CLASS 1" and voltage rated Equal or Greater Than Unit Supply Voltage.
5. 24V Alarm signal at AL1. For Dry Contact between AL1 & AL2, cut JW1.
6. Transformer secondary ground via DXM2 board standoffs & screws to Control Box. (Ground available from top two standoffs as shown.)
7. Optional HWG factory default Temperature setting is 125F, for 150F setting Anti-Scald Valve must be used, see unit IOM for instructions.
8. For outdoor splits, used with the HWG Kit, cut and strip the VIO jumper. HWT Sensor is not polarity sensitive. Using field supplied thermostat wire connect cut VIO wires to the HWT Sensor in the Hot Water Generator Kit.
9. Condensate Overflow will not be available with this wiring option.
10. Cut VIO jumper and connect LT2 when sensor is used in air handler.
11. For Variable Speed pump control and diagnostic information refer to unit IOM.
12. For Variable Speed pump option, place jumper on PMW pins.
13. Factory supplied terminal block in HWG kit. To be installed in outdoor split control box.
14. Refer to Carrier Air Handler IOM for heater staging.

Outdoor Control Box Layout





Indoor Split (50YGS) DXM2 Wiring Diagram with Motorized Modulating Water Valve - 96B0005N68



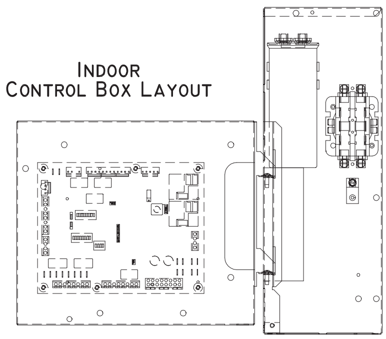
Indoor Split (50YGS) DXM2 Wiring Diagram with Motorized Modulating Water Valve - 96B0005N68

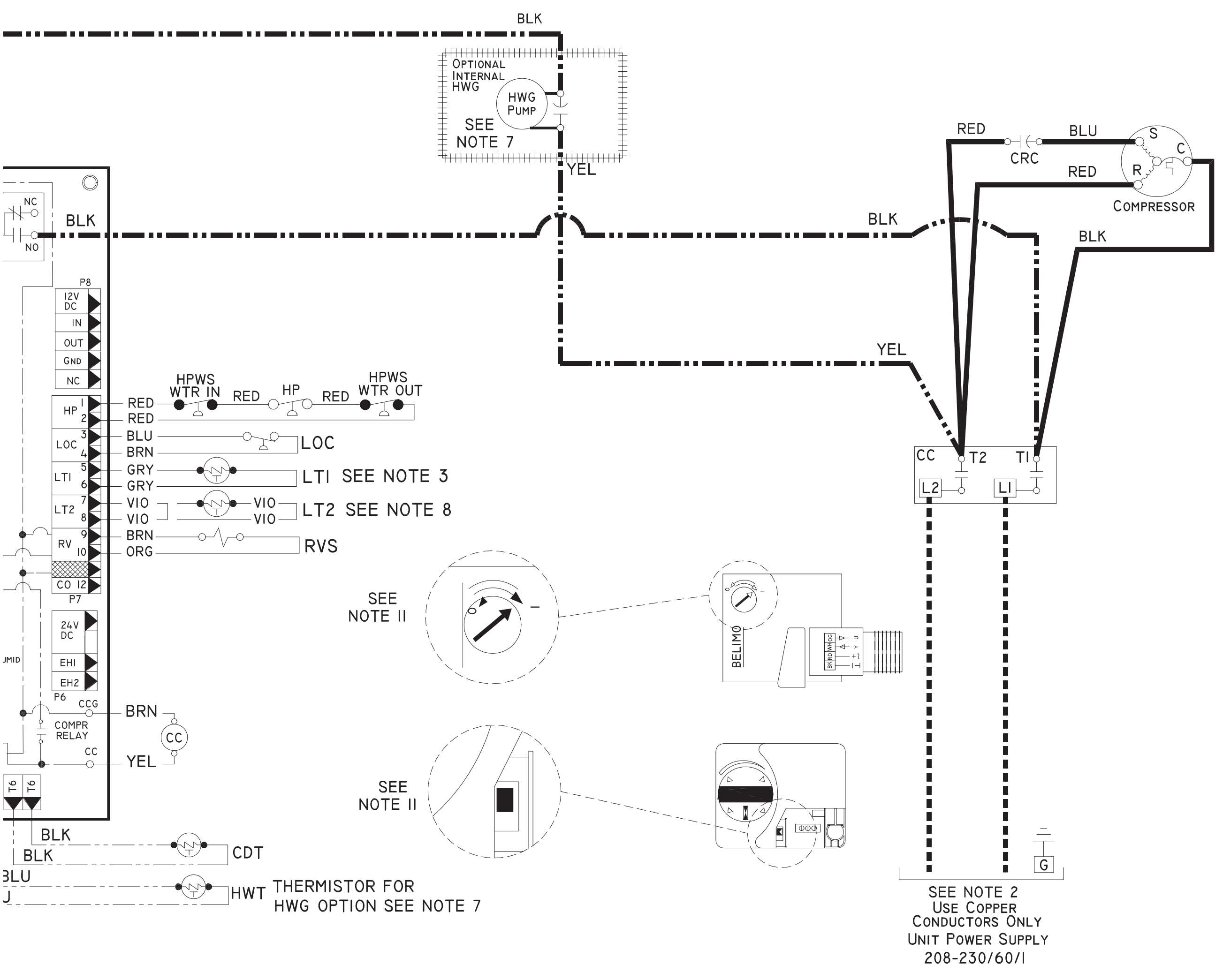
DATE:	DRAWING NO:	REV:
06/19/13	96B0005N68	-

NOTES:

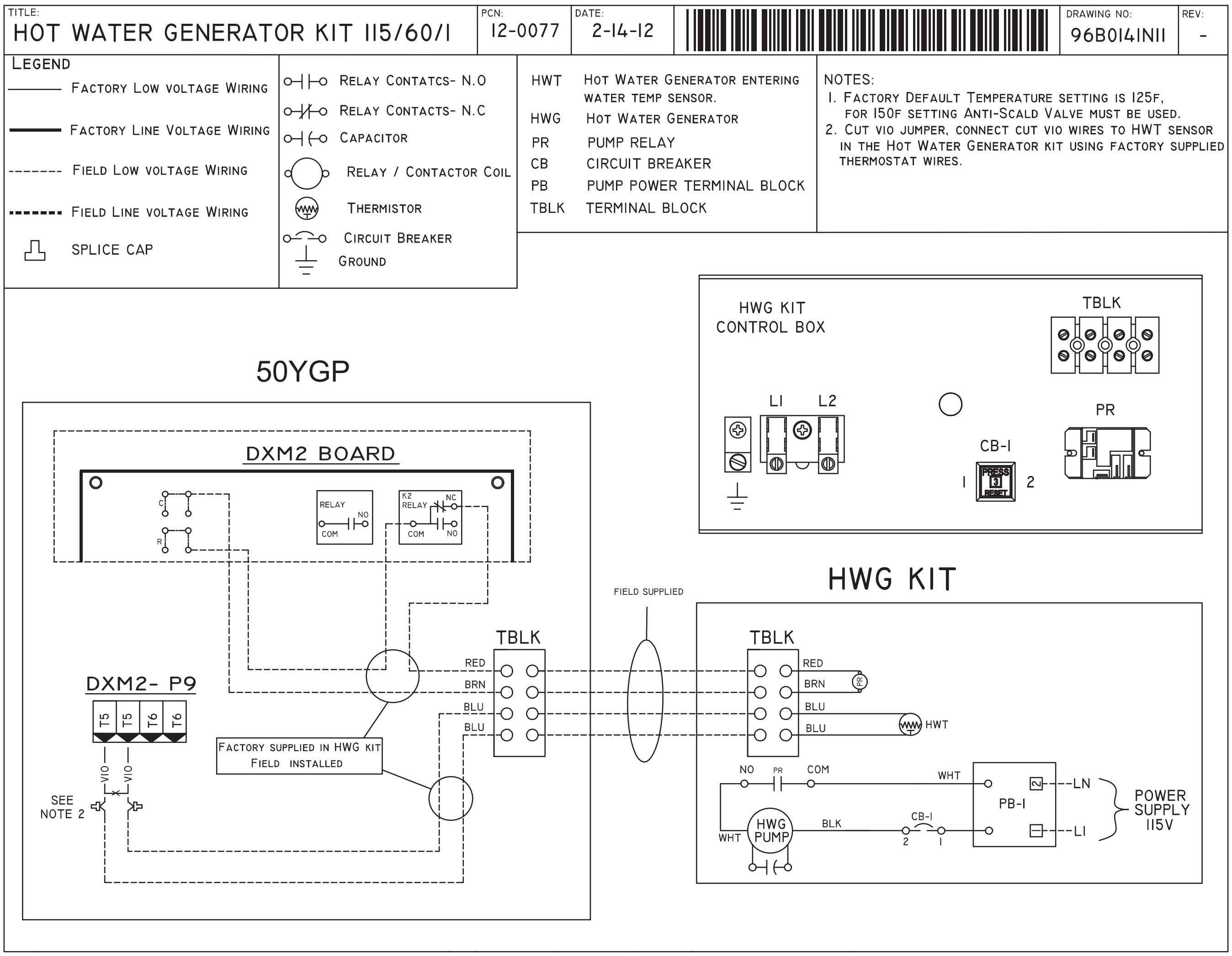
1. Compressor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. LT1 Thermistor provides low temperature protection for WATER. When using ANTIFREEZE solutions, cut JW3 jumper.
4. Refer to TSTAT Installation, Application, and Operation Manual for Control Wiring to the unit. Low voltage Wiring must be "CLASS 1" and voltage rated Equal or Greater Than Unit Supply Voltage.
5. 24V Alarm signal at AL1. For Dry Contact between AL1 & AL2, cut JW1.
6. Transformer secondary ground via DXM2 board standoffs & screws to Control Box. (Ground available from top two standoffs as shown.)
7. HWG and Heat Exchanger pump only in models with Hot Water Generator option. Factory default Temperature setting is 125F, for 150F setting Anti-Scald Valve must be used, see unit IOM for instructions.
8. Cut VIO jumper and connect LT2 when sensor is used in air handler.
9. Condensate Overflow will not be available with this wiring option.
10. For Modulating Water Valve option, place jumper on 0-10v pins.
11. For MWV option, ensure actuator direction switch is set as shown.
12. Refer to Carrier Air Handler IOM for heater staging.

Indoor Control Box Layout





115V Hot Water Generator Kit (AHWG1BACS) Wiring Diagram - 96BN0141N11



230V Hot Water Generator Kit (AHWG1BGCS) Wiring Diagram - 96BN0141N12

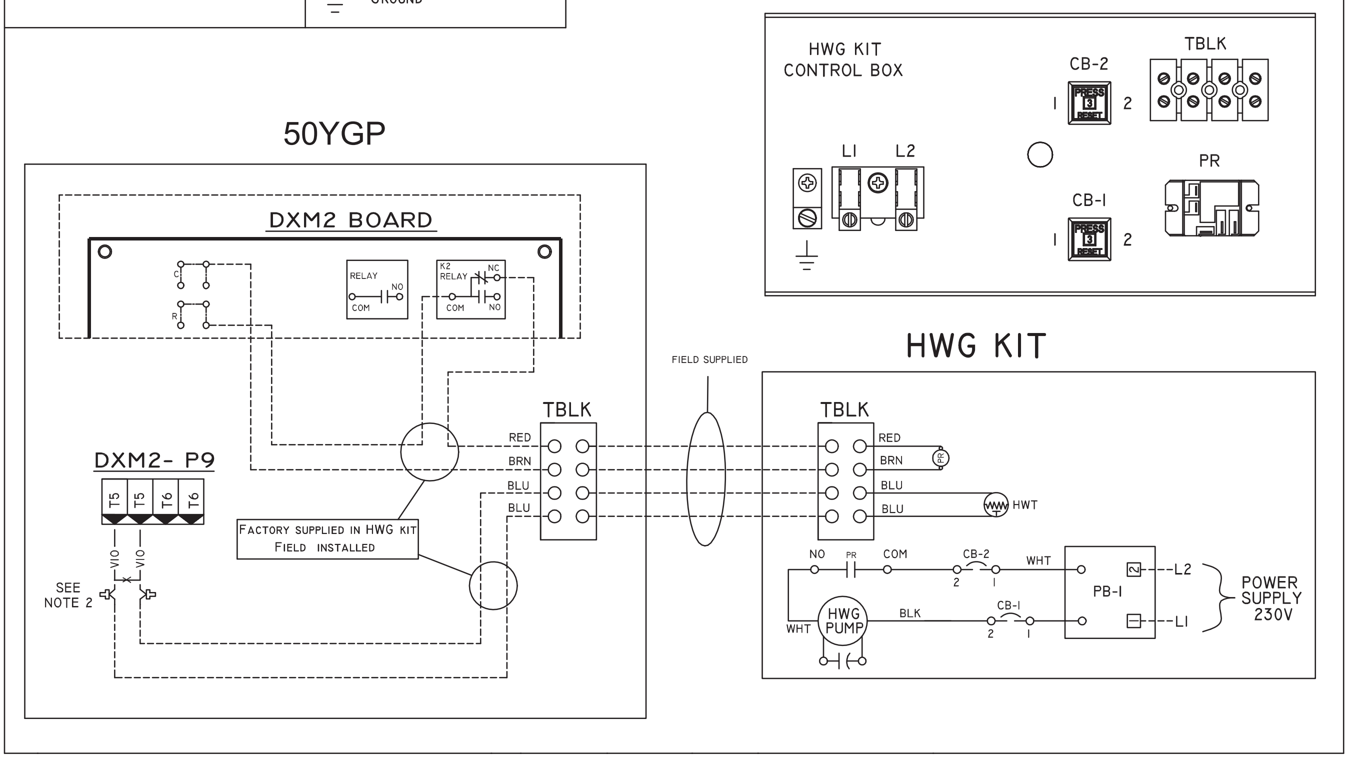
TITLE:	PCN:	DATE:	DRAWING NO:	REV:
HOT WATER GENERATOR KIT 230/60/1	12-0077	2-14-12	96B0141N12	-

LEGEND

- Factory Low voltage Wiring
- Factory Line Voltage Wiring
- Field Low voltage Wiring
- Field Line voltage Wiring
- Splice Cap
- Relay Contatcs- N.O
- Relay Contacts- N.C
- Capacitor
- Relay / Contactor Coil
- Thermistor
- Circuit Breaker
- Ground

HWT	Hot Water Generator entering water temp sensor.
HWG	Hot Water Generator
PR	PUMP RELAY
CB	CIRCUIT BREAKER
PB	PUMP POWER TERMINAL BLOCK
TBLK	TERMINAL BLOCK

NOTES:
1. Factory Default Temperature setting is 125F, for 150F setting Anti-Scald Valve must be used.
2. Cut vio jumper, connect cut vio wires to HWT sensor in the Hot Water Generator kit using factory supplied thermostat wires.



Unit Starting and Operating Conditions

Operating Limits

Environment – Units are designed for indoor installation only. Never install in areas subject to freezing or where humidity levels could cause cabinet condensation (such as unconditioned spaces subject to 100% outside air). Power Supply – A voltage variation of +/– 10% of nameplate utilization voltage is acceptable.

Determination of operating limits is dependent primarily upon three factors: 1) return air temperature. 2) water temperature, and 3) ambient temperature. When any one of these factors is at minimum or maximum levels, the other two factors should be at normal levels to insure proper unit operation. Extreme variations in temperature and humidity and/or corrosive water or air will adversely affect unit performance, reliability, and service life. Consult Tables 13a - 13b for operating limits.

Table 13a: Building Operating Limits - 50YGS

Operating Limits	50YGS	
	Cooling	Heating
Air Limits		
Min. ambient air, DB	45ºF [7ºC]	39ºF [4ºC]
Rated ambient air, DB	80.6ºF [27ºC]	68ºF [20ºC]
Max. ambient air, DB	130ºF [54ºC]	85ºF [29ºC]
Min. entering air, DB/WB	65/45ºF [18/7ºC]	50ºF [10ºC]
Rated entering air, DB/WB	80.6/66.2ºF [27/19ºC]	68ºF [20ºC]
Max. entering air, DB/WB	100/75ºF [38/24ºC]	80ºF [27ºC]
Water Limits		
Min. entering water	30ºF [-1ºC]	20ºF [-6.7ºC]
Normal entering water	50-110ºF [10-43ºC]	30-70ºF [-1 to 21ºC]
Max. entering water	120ºF [49ºC]	90ºF [32ºC]
Normal Water Flow	1.5 to 3.0 gpm / ton [1.6 to 3.2 l/m per kW]	

Created: 2 Aug., 2012B

Table 13b: Building Operating Limits - 50YGP

Operating Limits	50YGP	
	Cooling	Heating
Air Limits		
Min. ambient air, DB	-10ºF [-23ºC]	-10ºF [-23ºC]
Rated ambient air, DB	80.6ºF [27ºC]	68ºF [20ºC]
Max. ambient air, DB	130ºF [54ºC]	85ºF [29ºC]
Min. entering air, DB/WB	65/45ºF [18/7ºC]	50ºF [10ºC]
Rated entering air, DB/WB	80.6/66.2ºF [27/19ºC]	68ºF [20ºC]
Max. entering air, DB/WB	100/75ºF [38/24ºC]	80ºF [27ºC]
Water Limits		
Min. entering water	30ºF [-1ºC]	20ºF [-6.7ºC]
Normal entering water	50-110ºF [10-43ºC]	30-70ºF [-1 to 21ºC]
Max. entering water	120ºF [49ºC]	90ºF [32ºC]
Normal Water Flow	1.5 to 3.0 gpm / ton [1.6 to 3.2 l/m per kW]	

Created: 2 Aug., 2012B

Commissioning Limits

Consult Tables 13c - 13d for the particular model. Starting conditions vary depending upon model and are based upon the following notes:

Notes:

1. Commissioning limits in Tables 13c - 13d are not normal or continuous operating conditions. Minimum/maximum limits are start-up conditions to bring the building space up to occupancy temperatures. Units are not designed to operate under these conditions on a regular basis.
2. Voltage utilization range complies with AHRI Standard 110.

Table 13c: Building Commissioning Limits - 50YGS

Commissioning Limits	50YGS	
	Cooling	Heating
Air Limits		
Min. ambient air, DB	45ºF [7ºC]	39ºF [4ºC]
Rated ambient air, DB	80.6ºF [27ºC]	68ºF [20ºC]
Max. ambient air, DB	130ºF [54ºC]	85ºF [29ºC]
Min. entering air, DB/WB	60ºF [16ºC]	40ºF [4.5ºC]
Rated entering air, DB/WB	80.6/66.2ºF [27/19ºC]	68ºF [20ºC]
Max. entering air, DB/WB	110/83ºF [43/28ºC]	80ºF [27ºC]
Water Limits		
Min. entering water	30ºF [-1ºC]	20ºF [-6.7ºC]
Normal entering water	50-110ºF [10-43ºC]	30-70ºF [-1 to 21ºC]
Max. entering water	120ºF [49ºC]	90ºF [32ºC]
Normal Water Flow	1.5 to 3.0 gpm / ton [1.6 to 3.2 l/m per kW]	

Created: 2 Aug., 2012B

Table 13d: Building Commissioning Limits - 50YGP

Commissioning Limits	50YGP	
	Cooling	Heating
Air Limits		
Min. ambient air, DB	-10ºF [-23ºC]	-10ºF [-23ºC]
Rated ambient air, DB	80.6ºF [27ºC]	68ºF [20ºC]
Max. ambient air, DB	130ºF [54ºC]	85ºF [29ºC]
Min. entering air, DB/WB	60ºF [16ºC]	40ºF [4.4ºC]
Rated entering air, DB/WB	80.6/66.2ºF [27/19ºC]	68ºF [20ºC]
Max. entering air, DB/WB	110/83ºF [43/28ºC]	80ºF [27ºC]
Water Limits		
Min. entering water	30ºF [-1ºC]	20ºF [-6.7ºC]
Normal entering water	50-110ºF [10-43ºC]	30-70ºF [-1 to 21ºC]
Max. entering water	120ºF [49ºC]	90ºF [32ºC]
Normal Water Flow	1.5 to 3.0 gpm / ton [1.6 to 3.2 l/m per kW]	

Created: 2 Aug., 2012B

Unit Start-Up and Operating Conditions

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with Puron® refrigerant. POE oil, if it ever comes in contact with PVC or CPVS piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing Puron® as system failures and property damage may result.

Unit and System Checkout
BEFORE POWERING SYSTEM, please check the following:

UNIT CHECKOUT

- ❑ Shutoff valves: Insure that all isolation valves are open.
- ❑ Line voltage and wiring: Verify that voltage is within an acceptable range for the unit and wiring and fuses/ breakers are properly sized. Verify that low voltage wiring is complete.
- ❑ Unit control transformer: Insure that transformer has the properly selected voltage tap. Residential 208-230V units are factory wired for 230V operation unless specified otherwise.
- ❑ Loop/water piping is complete and purged of air. Water/ piping is clean.
- ❑ Antifreeze has been added if necessary.
- ❑ Entering water and air: Insure that entering water and air temperatures are within operating limits of Tables 13a and 13b.
- ❑ Low water temperature cutout: Verify that low water temperature cut-out on the DXM2 control is properly set.
- ❑ HWG is switched off at SW 3-4 unless piping is completed and air has been purged from the system.
- ❑ Unit air coil and filters: Insure that filter is clean and accessible. Clean air coil of all manufacturing oils.
- ❑ Unit controls: Verify that DXM2 field selection options are properly set. Low voltage wiring is complete.
- ❑ Blower CFM and Water ΔT is set on communicating thermostats or diagnostic tool.
- ❑ Service/access panels are in place.

SYSTEM CHECKOUT

- ❑ System water temperature: Check water temperature for proper range and also verify heating and cooling set points for proper operation.
- ❑ System pH: Check and adjust water pH if necessary to maintain a level between 6 and 8.5. Proper pH promotes system longevity (see Table 6).
- ❑ System flushing: Verify that all air is purged from the system. Air in the system can cause poor operation or system corrosion. Water used in the system must be potable quality initially and clean of dirt, piping slag, and strong chemical cleaning agents. Some antifreeze solutions may require distilled water.
- ❑ Internal Flow Controller: Verify that it is purged of air and in operating condition.
- ❑ Low water temperature cutout: Verify that low water temperature cut-out controls are set properly (LT1 - JW3).
- ❑ Miscellaneous: Note any questionable aspects of the installation.

⚠ CAUTION! ⚠

CAUTION! Verify that ALL water valves are open and allow water flow prior to engaging the compressor. Freezing of the coax or water lines can permanently damage the heat pump.

⚠ CAUTION! ⚠

CAUTION! To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless antifreeze is added to the water loop. Heat exchangers never fully drain by themselves and will freeze unless winterized with antifreeze.

Unit Start-up Procedure

1. Turn the thermostat fan position to “ON.” Air Handler Blower should start.
2. Turn Blower off.
3. Ensure all valves are adjusted to their full open position. Ensure line power to the heat pump is on.
4. Room temperature should be within the minimum-maximum ranges of listed in the unit IOM. During start-up checks, loop water temperature entering the heat pump should be between 30°F [-1°C] and 95°F [35°C].
5. It is recommended that water-to-air units be first started in the cooling mode, when possible. This will allow liquid refrigerant to flow through the filter-drier before entering the TXV, allowing the filter-drier to catch any debris that might be in the system before it reaches the TXV.
6. Two factors determine the operating limits of geothermal heat pumps, (a) return air temperature, and (b) entering water temperature. When either of the factors is at a minimum or maximum level, the other factor must be at normal levels to insure proper unit operation.
   a. Place the unit in Manual Operation. When in manual mode activate Y1,Y2, and O to initiate the cooling mode. Next adjust pump speed % until desired loop temperature difference (leaving water temperature minus entering water temperature) is achieved. (For modulating valve adjust valve %).

```
INSTALLER SETTINGS

THERMOSTAT CONFIG
SYSTEM CONFIG
ACCESSORY CONFIG
INPUT DEALER INFO
HUMIDITY CONFIG
TEMPERATURE ALGORITHM
DEMAND REDUCTION CNFG
SERVICE MODE
RESTORY DEFAULTS

SELECT OPTION ▲▼
◄ PREVIOUS
```

Unit Start-Up Procedure

SERVICE MODE

MANUAL OPERATION
CONTROL DIAGNOSTICS
DIPSWITCH CONFIG
FAULT HISTORY
CLEAR FAULT HISTORY

SELECT OPTION ▲▼
◄ PREVIOUS SELECT ■

MANUAL OPERATING MODE

Y1	COMM	OUTPUT	OFF
Y2	COMM	OUTPUT	OFF
W	COMM	OUTPUT	OFF
O	COMM	OUTPUT	OFF
G	COMM	OUTPUT	OFF
H	COMM	OUTPUT	OFF
DH	COMM	OUTPUT	OFF
ECM	AIRFLOW		0
PUMP	SPEED		0%
TEST	MODE		OFF

SELECT OPTION ▲▼
◄ PREVIOUS SELECT ■

b. Check for cool air delivery at the unit grille within a few minutes after the unit has begun to operate.

NOTE: Units have a five minute time delay in the control circuit that can be bypassed on the DXM2 control board by placing the unit in the "Test" mode as shown in the unit IOM. Check for normal air temperature drop of 15°F to 25°F (cooling mode).

c. Verify that the compressor is on and that the water temperature rise (cooling mode) is within normal range.

Water Flow, gpm (l/m)	Rise, Cooling °F
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	9 - 12
For Open Loop: Ground Water Systems at 1.5 gpm per ton (2.0 l/m per kw)	18 - 24

d. Check the elevation and cleanliness of the condensate lines. Dripping may be a sign of a blocked line. Check that the condensate trap is filled to provide a water seal.
e. Turn thermostat to "OFF" position. A hissing noise indicates proper functioning of the reversing valve.

7. Allow five (5) minutes between tests for pressure to equalize before beginning heating test.
   a. Go into Manual Mode activate Y1, and Y2 for Heating. Next adjust pump speed % until desired loop temperature difference (entering water temperature minus leaving water temperature) is achieved. (For modulating valve adjust valve %).
   b. Check for warm air delivery at the unit grille within a few minutes after the unit has begun to operate.

NOTE: Units have a five minute time delay in the control circuit that can be bypassed on the DXM2 control board by placing the unit in the "Test" mode as shown in the unit IOM. Check for normal air temperature rise of 20°F to 30°F (heating mode).

Water Flow, gpm (l/m)	Drop, Heating °F
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	4 - 8
For Open Loop: Ground Water Systems at 1.5 gpm per ton (2.0 l/m per kw)	7 - 19

   c. Verify that the compressor is on and that the water temperature drop (heating mode) is within normal range.
   e. Check for vibration, noise, and water leaks.

8. If unit fails to operate properly, perform troubleshooting analysis (see troubleshooting section in the unit IOM). If the check described fails to reveal the problem and the unit still does not operate, contact a trained service technician to insure proper diagnosis and repair of the equipment.
9. When testing is complete, exit the Installer Menu and set thermostat to maintain desired comfort level for normal operation.

Unit performance may be verified by calculating the unit heat of rejection and heat of extraction. Heat of Rejection (HR) can be calculated and compared to the performance data pages in this IOM. The formula for HR is as follows: HR = TD x GPM x 500 (or 485 for anti-freeze solutions), where TD is the temperature difference between the entering and leaving water, and GPM is the flow rate in U.S. GPM determined by comparing the unit heat exchanger pressure drop to Table 14.

Heat of Extraction (HE) can also be calculated and compared to the performance data pages in this IOM. The formula for HE is as follows: HE = TD x GPM x 500 (or 485 for anti-freeze solutions), where TD is the temperature difference between the entering and leaving water, and GPM is the flow rate in U.S. GPM determined by comparing the unit heat exchanger pressure drop to Table 14.

If performance during any mode appears abnormal, refer to the DXM2 section or troubleshooting section of this manual.

NOTE: To obtain maximum performance, the air coil should be cleaned before start-up. A 10% solution of dishwasher detergent and water is recommended.

⚠ WARNING! ⚠

WARNING! When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.

Unit Operating Conditions

Table 14: Coax Water Pressure Drop

Model	GPM	Pressure Drop (psi) 30°F	50°F	70°F	90°F
026	2.3	0.7	0.4	0.4	0.5
	3.0	1.1	0.7	0.6	0.7
	3.4	1.3	0.9	0.8	0.8
	4.5	2.0	1.4	1.2	1.2
	6.0	3.1	2.3	1.9	1.8
038	3.0	0.7	0.9	0.8	0.9
	4.5	1.1	1.7	1.5	1.5
	6.0	1.3	2.7	2.3	2.2
	6.8	2.0	3.2	2.7	2.6
	9.0	3.1	5.2	4.4	4.1
049	4.5	0.7	0.6	0.5	0.3
	6.0	1.1	1.1	1.0	0.9
	6.8	1.3	1.4	1.3	1.2
	9.0	2.0	2.5	2.3	2.2
	12.0	3.1	4.2	3.8	3.5
064	6.0	0.9	0.2	0.2	0.3
	7.5	1.7	0.9	0.7	0.8
	9.0	2.5	1.5	1.3	1.4
	11.3	3.7	2.6	2.3	2.3
	12.0	4.1	3.0	2.6	2.6
	15.0	6.1	4.7	4.1	4.0

Table 15: Water Temperature Change Through Heat Exchanger

Water Flow, gpm (l/m)	Rise, Cooling °F	Drop, Heating °F
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	9 - 12	4 - 9
For Open Loop: Ground Water Systems at 1.5 gpm per ton (2.0 l/m per kw)	18 - 24	7 - 19

Table 16a: Size 026 Typical Unit Operating Pressures and Temperatures

Entering Water Temp °F	Water Flow GPM	Full Load Cooling - without HWG active: Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Full Load Heating - without HWG active: Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	1.7	128-138	214-234	14-19	15-20	40.0	18-24	70-80	280-300	2-7	6-11	7.3-9.3	14-20
	1.7	128-138	214-234	14-19	15-20	40.0	18-24	72-82	280-300	3-8	6-11	6.0-8.0	14-20
	1.7	128-138	214-234	14-19	15-20	40.0	18-24	75-85	280-300	3-8	6-11	4.7-6.7	14-20
50	3	128-138	216-236	13-18	15-20	18.0-20.0	18-24	105-115	310-330	4-9	6-11	10.1-12.1	19-25
	3.4	128-138	214-234	14-19	15-20	20.0	18-24	105-115	310-330	5-10	6-11	8.4-10.4	19-25
	3.4	128-138	214-234	14-19	15-20	20.0	18-24	110-120	310-330	6-11	6-11	6.6-8.6	19-25
70	3	131-141	290-310	12-17	15-20	17.3-19.3	17-23	130-140	340-360	11-16	7-12	12.8-14.8	23-28
	4.5	131-141	290-310	12-17	14-19	14.3-16.3	17-23	130-140	340-360	13-18	7-12	10.6-12.6	23-28
	6	131-141	275-295	12-17	13-18	11.3-13.3	17-23	132-142	340-360	15-20	8-13	8.3-10.3	23-28
90	3	138-148	138-148	11-16	18-23	16.5-18.5	16-22	145-155	360-380	22-27	10-15	25.0	26-32
	4.5	138-148	138-148	11-16	16-21	13.6-15.6	16-22	145-155	360-380	22-27	10-15	25.0	26-32
	6	138-148	138-148	11-16	15-20	10.7-12.7	16-22	145-155	360-380	22-27	10-15	25.0	26-32
110	3	142-152	480-500	10-15	19-24	15.0-17.0	16-22	145-155	360-380	22-27	10-15	45.0	45.0
	4.5	142-152	465-485	11-16	17-22	13.1-15.1	16-22	145-155	360-380	22-27	10-15	45.0	45.0
	6	142-152	451-471	11-16	16-21	10.3-12.3	16-22	145-155	360-380	22-27	10-15	45.0	45.0

*Based on 15% methanol antifreeze solution

Table 16b: Size 038 Typical Unit Operating Pressures and Temperatures

Entering Water Temp °F	Water Flow GPM	Full Load Cooling - without HWG active: Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Full Load Heating - without HWG active: Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	2.5	125-135	210-230	15-20	13-18	40.0	17-23	67-77	274-294	8-13	1-6	8.3-10.3	15-21
	2.5	125-135	210-230	15-20	13-18	40.0	17-23	71-81	278-298	9-14	1-6	6.2-8.2	16-22
	2.5	125-135	210-230	15-20	13-18	40.0	17-23	75-85	282-302	9-14	1-6	4.0-6.0	16-22
50	4.5	125-135	216-236	15-20	13-18	21.0-23.0	17-23	95-105	304-324	11-16	1-6	10.7-12.7	21-27
	4.9	125-135	210-230	15-20	13-18	20.0	17-23	100-110	308-328	12-17	1-6	7.9-8.9	21-27
	4.9	125-135	210-230	15-20	13-18	20.0	17-23	104-114	311-331	12-17	1-6	5.2-7.2	21-27
70	4.5	130-140	290-310	14-19	15-20	20.4-22.4	17-23	123-133	331-351	14-19	1-6	13.5-15.5	26-32
	6.75	130-140	274-294	14-19	12-18	15.1-17.1	17-23	127-137	335-355	16-21	1-6	10.1-12.1	26-32
	9	129-139	256-276	14-19	9-14	9.7-11.7	17-23	132-142	340-360	17-22	1-6	6.7-8.7	26-32
90	4.5	137-147	410-430	14-19	17-22	19.6-21.6	15-21	142-152	350-370	20-25	1-6	25.0	30-36
	6.75	137-147	390-410	14-19	14-19	14.5-16.5	15-21	142-152	350-370	20-25	1-6	25.0	30-36
	9	137-147	370-390	13-18	11-16	9.3-11.3	15-21	142-152	350-370	20-25	1-6	25.0	30-36
110	4.5	141-151	476-496	13-18	17-22	19.2-21.2	15-21	142-152	350-370	20-25	1-6	45.0	30-36
	6.75	141-151	457-477	13-18	14-19	14.1-16.1	15-21	142-152	350-370	20-25	1-6	45.0	30-36
	9	141-151	439-459	13-18	11-16	9.0-11.0	15-21	142-152	350-370	20-25	1-6	45.0	30-36

*Based on 15% methanol antifreeze solution

Unit Operating Conditions

Table 16c: Size 049 Typical Unit Operating Pressures and Temperatures

Entering Water Temp °F	Water Flow GPM	Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
		Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	3.1	117-127	222-242	16-21	12-17	40.0	17-23	63-73	277-297	9-14	2-7	8.2-10.2	15-21
	3.1	117-127	222-242	16-21	12-17	40.0	17-23	66-76	280-300	10-15	2-7	6.1-8.1	15-21
	3.1	117-127	222-242	16-21	12-17	40.0	17-23	68-78	285-305	11-16	2-7	4.0-6.0	16-22
50	6	118-128	224-244	16-21	12-17	19.9-21.9	17-23	96-106	312-332	16-21	2-7	10.9-12.9	20-26
	6.2	117-127	222-242	16-21	12-17	20.0	17-23	100-110	316-336	16-21	2-7	8.1-10.1	21-27
	6.2	117-127	222-242	16-21	12-17	20.0	17-23	103-113	320-340	17-22	2-7	5.4-7.4	21-27
70	6	125-130	300-320	15-20	13-18	19.5-21.5	16-22	120-130	339-359	27-32	3-8	13.6-15.6	25-31
	9	125-130	280-300	15-20	10-15	14.4-16.4	16-22	122-132	341-361	27-32	3-8	10.1-12.1	25-31
	12	123-133	260-180	15-20	7-12	9.3-11.3	16-22	124-134	344-364	27-32	3-8	6.5-8.5	25-31
90	6	132-142	419-439	15-20	15-20	19.0-21.0	15-21	138-148	359-379	40-45	4-9	25.0	27-33
	9	130-140	396-419	15-20	12-17	13.8-15.8	15-21	138-148	359-379	40-45	4-9	25.0	27-33
	12	129-139	374-394	15-20	9-14	8.8-10.8	15-21	138-148	359-379	40-45	4-9	25.0	27-33
110	6	137-147	490-510	15-20	16-21	16-21	14-20	138-148	359-379	40-45	4-9	45.0	27-33
	9	135-145	464-484	15-20	13-18	13-18	14-20	138-148	359-379	40-45	4-9	45.0	27-33
	12	133-143	442-462	15-20	10-15	10-15	14-20	138-148	359-379	40-45	4-9	45.0	27-33

*Based on 15% methanol antifreeze solution

Table 16d: Size 064 Typical Unit Operating Pressures and Temperatures

Entering Water Temp °F	Water Flow GPM	Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
		Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	3.8	118-128	222-242	15-20	10-15	40.0	20-26	65-75	286-306	7-12	2-8	8.0-10.0	18-24
	3.8	118-128	222-242	15-20	10-15	40.0	20-26	69-79	290-310	7-12	2-8	7.0-9.0	18-24
	3.8	118-128	222-242	15-20	10-15	40.0	20-26	71-81	290-310	7-12	2-8	4.0-6.0	18-24
50	7.5	118-128	223-243	15-20	10-15	19.4-21.4	20-26	98-108	323-343	6-11	3-8	10.6-12.6	24-30
	7.6	118-128	222-242	15-20	10-15	20.0	20-26	102-112	323-343	7-12	3-8	7.9-9.9	24-30
	7.6	118-128	222-242	15-20	10-15	20.0	20-26	105-115	330-350	8-13	3-8	5.2-7.2	24-30
70	7.5	125-135	290-310	11-16	14-19	19.0-21.0	19-25	126-136	355-375	11-16	4-9	13.4-15.4	29-35
	11.25	125-135	280-300	11-16	11-16	13.9-15.9	19-25	130-140	360-380	13-18	4-9	10.0-12.0	29-35
	15	124-134	260-280	13-18	8-13	9.0-11.0	19-25	134-144	367-387	15-20	4-9	6.5-8.5	29-35
90	7.5	132-142	420-440	10-15	19-24	18.3-20.3	18-24	142-152	370-390	20-25	4-9	25.0	32-38
	11.25	131-141	410-430	10-15	16-21	13.4-15.4	18-24	142-152	370-390	20-25	4-9	25.0	32-38
	15	130-140	400-420	11-16	14-19	9.0-11.0	18-24	142-152	370-390	20-25	4-9	25.0	32-38
110	7.5	18-24	490-510	8-13	22-27	17.9-19.9	18-24	142-152	370-390	20-25	4-9	45.0	32-38
	11.25	18-24	490-510	9-14	20-25	13.1-15.1	18-24	142-152	370-390	20-25	4-9	45.0	32-38
	15	18-24	490-510	10-15	18-23	8.3-10.3	18-24	142-152	370-390	20-25	4-9	45.0	32-38

*Based on 15% methanol antifreeze solution

Table 17: Antifreeze Correction Table

Antifreeze Type	Antifreeze %	Cooling			Heating		WPD Corr. Fct. EWT 30°F
		EWT 90°F			EWT 30°F		
		Total Cap	Sens Cap	Power	Htg Cap	Power	
Water	0	1.000	1.000	1.000	1.000	1.000	1.000
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070
	15	0.986	0.986	1.009	0.968	0.990	1.210
	25	0.978	0.978	1.014	0.947	0.983	1.360
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.070
	15	0.990	0.990	1.007	0.968	0.990	1.160
	25	0.982	0.982	1.012	0.949	0.984	1.220
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140
	15	0.994	0.994	1.005	0.944	0.983	1.300
	25	0.986	0.986	1.009	0.917	0.974	1.360
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040
	15	0.994	0.994	1.004	0.980	0.994	1.120
	25	0.988	0.988	1.008	0.966	0.990	1.200

Table 18a: Performance Data — 50YGS/50YGP Model 026 Full Load

850 CFM Nominal (Rated) Airflow Cooling, 850 CFM Nominal (Rated) Airflow Heating

EWT °F	Cooling - EAT 80/67°F											Heating - EAT 70°F										
	GPM	WPD		TC	SC	kW	HR	EER	LWT	YGS HWC	YGP HWC	GPM	WPD		HC	kW	HE	COP	LAT	LWT	YGS HWC	YGP HWC
		PSI	FT										PSI	FT								
20	1.3	0.6	1.4	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	6.0	3.7	8.6	16.2	1.36	11.5	3.5	85.6	16.2	1.6	1.5
30	1.7	0.5	1.1	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	3.0	1.1	2.5	18.2	1.39	13.5	3.8	87.8	21.0	1.7	1.6
	1.7	0.5	1.1	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	4.5	2.0	4.6	19.2	1.41	14.4	4.0	88.9	23.6	1.9	1.8
	1.7	0.5	1.1	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	6.0	3.1	7.1	19.8	1.42	14.9	4.1	89.5	25.0	1.9	1.8
40	2.2	0.5	1.2	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	3.0	0.9	2.0	21.3	1.45	16.4	4.3	91.2	29.1	2.1	2.0
	2.2	0.5	1.2	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	4.5	1.6	3.8	22.5	1.47	17.5	4.5	92.4	32.2	2.2	2.1
	2.2	0.5	1.2	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	6.0	2.6	6.0	23.1	1.48	18.0	4.6	93.1	34.0	2.3	2.2
50	3.0	0.7	1.6	29.3	20.6	1.23	33.5	23.8	72.3	1.5	1.4	3.0	0.7	1.6	24.2	1.50	19.1	4.7	94.3	37.3	2.5	2.4
	3.4	0.8	1.9	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	4.5	1.4	3.2	25.4	1.53	20.2	4.9	95.6	41.0	2.6	2.5
	3.4	0.8	1.9	29.5	20.6	1.20	33.6	24.5	70.0	1.4	1.3	6.0	2.3	5.2	26.0	1.54	20.8	5.0	96.3	38.4	2.7	2.6
60	3.0	0.7	1.5	28.2	20.1	1.36	32.8	20.8	81.9	1.9	1.8	3.0	0.7	1.5	26.8	1.56	21.5	5.1	97.1	45.7	2.8	2.7
	4.5	1.3	2.9	29.0	20.5	1.26	33.4	23.0	74.8	1.6	1.5	4.5	1.3	2.9	28.0	1.58	22.6	5.2	98.5	49.9	3.0	2.9
	6.0	2.0	4.7	29.4	20.6	1.22	33.5	24.2	71.2	1.4	1.3	6.0	2.0	4.7	28.7	1.59	23.2	5.3	99.1	52.3	3.1	2.9
70	3.0	0.6	1.5	26.7	19.4	1.50	31.9	17.8	91.2	2.4	2.3	3.0	0.6	1.5	29.2	1.60	23.7	5.3	99.7	54.2	3.2	3.0
	4.5	1.2	2.7	27.8	19.9	1.39	32.6	19.9	84.5	2.0	1.9	4.5	1.2	2.7	30.3	1.63	24.8	5.5	101.0	59.0	3.4	3.2
	6.0	1.9	4.4	28.3	20.1	1.34	32.9	21.1	81.0	1.9	1.8	6.0	1.9	4.4	30.9	1.64	25.3	5.5	101.6	61.6	3.5	3.3
80	3.0	0.7	1.5	25.1	18.6	1.67	30.8	15.0	100.5	3.1	2.9	3.0	0.7	1.5	31.2	1.65	25.6	5.5	101.9	62.9	3.5	3.3
	4.5	1.2	2.7	26.3	19.2	1.55	31.5	16.9	94.0	2.6	2.5	3.5	0.8	1.8	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	6.0	1.8	4.2	26.8	19.5	1.49	31.9	18.0	90.6	2.4	2.3	3.5	0.8	1.8	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
90	3.0	0.7	1.6	23.3	17.8	1.87	29.7	12.5	109.8	3.8	3.6	2.1	0.5	1.2	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	4.5	1.2	2.7	24.5	18.3	1.73	30.4	14.1	103.5	3.3	3.1	2.1	0.5	1.2	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	6.0	1.8	4.1	25.1	18.6	1.67	30.8	15.1	100.3	3.0	2.9	2.1	0.5	1.2	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
100	3.0	0.7	1.6	21.7	16.9	2.12	28.9	10.2	119.3	4.6	4.4	1.5	0.4	0.9	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	4.5	1.2	2.7	22.8	17.5	1.95	29.4	11.6	113.1	4.0	3.8	1.5	0.4	0.9	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	6.0	1.8	4.1	23.3	17.7	1.88	29.7	12.4	109.9	3.8	3.6	1.5	0.4	0.9	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
110	3.0	0.7	1.5	20.2	16.3	2.42	28.5	8.3	129.0	5.5	5.2	1.2	0.3	0.7	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	4.5	1.1	2.6	21.1	16.7	2.22	28.7	9.5	122.7	4.9	4.7	1.2	0.3	0.7	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	6.0	1.7	4.0	21.6	16.9	2.13	28.9	10.1	119.6	4.6	4.4	1.2	0.3	0.7	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
120	3.0	0.5	1.2	Operation Not Recommended								0.9	0.1	0.2	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	4.5	1.0	2.4	19.7	16.1	2.55	28.4	7.8	132.6	5.8	5.5	0.9	0.1	0.2	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4
	6.0	1.7	3.9	20.1	16.3	2.44	28.4	8.3	129.5	5.5	5.2	0.9	0.1	0.2	31.6	1.66	26.0	5.6	102.4	65.0	3.6	3.4

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation within the shaded areas.

Table 18b: Performance Data — 50YGS/50YGP Model 038 Full Load

1250 CFM Nominal (Rated) Airflow Cooling, 1250 CFM Nominal (Rated) Airflow Heating

EWT °F	Cooling - EAT 80/67°F											Heating - EAT 70°F										
	GPM	WPD PSI	WPD FT	TC	SC	kW	HR	EER	LWT	YGS HWC	YGP HWC	GPM	WPD PSI	WPD FT	HC	kW	HE	COP	LAT	LWT	YGS HWC	YGP HWC
20	2.1	1.5	3.4	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	9.0	8.3	19.2	24.7	1.98	17.9	3.5	86.2	16.0	2.1	2.0
30	2.6	1.2	2.8	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	4.5	2.6	6.0	27.3	2.02	20.4	3.6	88.1	20.9	2.4	2.3
	2.6	1.2	2.8	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	6.8	4.6	10.6	28.6	2.05	21.6	3.6	89.2	23.6	2.6	2.5
	2.6	1.2	2.8	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	9.0	6.9	16.0	29.4	2.06	22.3	3.6	89.7	25.0	2.6	2.5
40	3.5	1.4	3.2	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	4.5	2.0	4.7	31.5	2.10	24.3	4.1	91.3	29.2	2.9	2.8
	3.5	1.4	3.2	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	6.8	3.8	8.8	33.1	2.13	25.8	4.1	92.5	32.3	3.1	2.9
	3.5	1.4	3.2	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	9.0	5.9	13.6	34.0	2.15	26.7	3.9	93.1	34.1	3.2	3.0
50	4.5	1.7	3.9	45.5	31.1	1.93	52.1	23.5	73.1	1.9	1.8	4.5	1.7	3.9	35.7	2.18	28.3	4.3	94.4	37.4	3.4	3.2
	5.2	2.1	4.9	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	6.8	3.3	7.6	37.6	2.22	30.0	4.4	95.8	41.1	3.6	3.4
	5.2	2.1	4.9	45.7	31.2	1.88	52.2	24.4	70.0	1.9	1.8	9.0	5.2	11.9	38.6	2.24	31.0	4.5	96.6	43.1	3.7	3.5
60	4.5	1.5	3.5	44.0	30.6	2.12	51.2	20.7	82.8	2.6	2.5	4.5	1.5	3.5	40.0	2.27	32.2	4.6	97.5	45.7	3.9	3.7
	6.8	2.9	6.8	45.2	31.0	1.97	51.9	22.9	75.4	2.1	2.0	6.8	2.9	6.8	42.2	2.32	34.2	4.7	99.2	49.9	4.1	3.9
	9.0	4.7	10.8	45.6	31.1	1.90	52.1	24.0	71.6	1.9	1.8	9.0	4.7	10.8	43.4	2.35	35.4	4.7	100.0	52.1	4.2	4.0
70	4.5	1.5	3.4	41.8	29.8	2.34	49.8	17.9	92.1	3.4	3.2	4.5	1.5	3.4	44.3	2.37	36.2	4.8	100.7	53.9	4.4	4.2
	6.8	2.8	6.4	43.5	30.4	2.17	50.9	20.0	85.1	2.8	2.7	6.8	2.8	6.4	46.8	2.42	38.5	4.9	102.6	58.6	4.6	4.4
	9.0	4.4	10.1	44.2	30.7	2.09	51.4	21.1	81.4	2.5	2.4	9.0	4.4	10.1	48.2	2.46	39.8	5.0	103.6	61.1	4.7	4.5
80	4.5	1.5	3.4	39.2	28.7	2.61	48.1	15.0	101.4	4.3	4.1	4.5	1.5	3.4	48.7	2.47	40.3	5.0	104.0	62.1	4.8	4.6
	6.8	2.7	6.2	41.1	29.5	2.41	49.4	17.1	94.6	3.7	3.5	5.6	2.0	4.7	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	9.0	4.2	9.7	42.1	29.9	2.31	50.0	18.2	91.1	3.3	3.1	5.6	2.0	4.7	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
90	4.5	1.5	3.5	36.4	27.5	2.93	46.4	12.4	110.6	5.4	5.1	3.3	1.0	2.4	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	6.8	2.7	6.2	38.4	28.4	2.70	47.6	14.2	104.1	4.7	4.5	3.3	1.0	2.4	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	9.0	4.1	9.5	39.4	28.8	2.59	48.2	15.2	100.7	4.3	4.1	3.3	1.0	2.4	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
100	4.5	1.5	3.5	33.5	26.1	3.32	44.9	10.1	119.9	6.6	6.3	2.4	0.7	1.7	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	6.8	2.7	6.1	35.5	27.0	3.05	45.9	11.6	113.6	5.8	5.5	2.4	0.7	1.7	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	9.0	4.1	9.4	36.5	27.5	2.92	46.4	12.5	110.3	5.4	5.1	2.4	0.7	1.7	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
110	4.5	1.4	3.2	30.9	24.8	3.81	43.9	8.1	129.5	8.1	7.7	1.9	0.4	1.0	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	6.8	2.6	6.0	32.6	25.6	3.48	44.5	9.4	123.2	7.1	6.7	1.9	0.4	1.0	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	9.0	4.0	9.2	33.5	26.1	3.32	44.9	10.1	120.0	6.7	6.4	1.9	0.4	1.0	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
120	4.5	1.1	2.6	Operation Not Recommended								1.5	0.1	0.1	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	6.8	2.4	5.5									1.5	0.1	0.1	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7
	9.0	3.9	8.9	30.8	24.7	3.82	43.9	8.1	129.7	8.1	7.7	1.5	0.1	0.1	50.4	2.51	41.8	5.9	105.2	65.0	4.9	4.7

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation within the shaded areas.

Table 18c: Performance Data — 50YGS/50YGP Model 049 Full Load

1500 CFM Nominal (Rated) Airflow Cooling, 1500 CFM Nominal (Rated) Airflow Heating

EWT °F	Cooling - EAT 80/67°F											Heating - EAT 70°F										
	GPM	WPD PSI	WPD FT	TC	SC	kW	HR	EER	LWT	YGS HWC	YGP HWC	GPM	WPD PSI	WPD FT	HC	kW	HE	COP	LAT	LWT	YGS HWC	YGP HWC
20	2.7	0.3	0.6	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	12.0	5.3	12.1	33.3	2.77	23.9	3.5	88.5	16.0	3.3	3.1
30	3.4	0.3	0.6	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	6.0	1.2	2.8	36.0	2.81	26.4	3.8	90.2	21.2	3.5	3.3
	3.4	0.3	0.6	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	9.0	2.8	6.4	37.5	2.84	27.8	3.9	91.1	23.8	3.5	3.3
	3.4	0.3	0.6	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	12.0	4.7	10.8	38.4	2.85	28.7	3.9	91.6	25.2	3.6	3.4
40	4.5	0.5	1.1	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	6.0	1.0	2.3	41.2	2.90	31.3	4.2	93.4	29.6	3.7	3.5
	4.5	0.5	1.1	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	9.0	2.4	5.6	43.3	2.94	33.3	4.3	94.7	32.6	3.8	3.6
	4.5	0.5	1.1	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	12.0	4.2	9.7	44.5	2.96	34.4	4.4	95.4	34.3	3.9	3.7
50	6.0	0.9	2.0	58.1	38.9	2.60	66.9	22.3	72.3	2.4	2.3	6.0	0.9	2.0	47.1	3.01	36.8	4.6	97.0	37.7	4.0	3.8
	6.7	1.1	2.6	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	9.0	2.2	5.1	49.8	3.06	39.3	4.8	98.6	41.3	4.1	3.9
	6.7	1.1	2.6	58.4	39.0	2.55	67.1	22.9	70.0	2.3	2.2	12.0	3.9	9.0	51.3	3.09	40.7	4.9	99.6	43.2	4.2	4.0
60	6.0	0.8	1.9	56.3	38.3	2.85	66.0	19.8	82.0	2.9	2.8	6.0	0.8	1.9	53.3	3.13	42.6	5.0	100.8	45.8	4.4	4.2
	9.0	2.0	4.7	57.7	38.8	2.66	66.7	21.7	74.8	2.5	2.4	9.0	2.0	4.7	56.4	3.20	45.5	5.2	102.8	49.9	4.5	4.3
	12.0	3.6	8.4	58.2	39.0	2.57	67.0	22.6	71.2	2.3	2.2	12.0	3.6	8.4	58.2	3.24	47.1	5.3	103.8	52.1	4.6	4.4
70	6.0	0.8	1.8	54.0	37.4	3.14	64.8	17.2	91.6	3.7	3.5	6.0	0.8	1.8	59.5	3.27	48.4	5.3	104.7	53.9	4.8	4.6
	9.0	2.0	4.5	55.7	38.1	2.92	65.7	19.1	84.6	3.1	2.9	9.0	2.0	4.5	63.0	3.34	51.6	5.5	106.8	58.5	5.0	4.8
	12.0	3.5	8.1	56.5	38.4	2.82	66.1	20.0	81.0	2.9	2.8	12.0	3.5	8.1	64.9	3.39	53.4	5.6	108.0	61.1	5.1	4.8
80	6.0	0.8	1.8	51.4	36.4	3.48	63.3	14.8	101.1	4.5	4.3	6.0	0.8	1.8	65.6	3.40	54.0	5.6	108.4	62.0	5.2	4.9
	9.0	1.9	4.4	53.3	37.1	3.23	64.3	16.5	94.3	3.9	3.7	7.4	1.3	3.0	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	12.0	3.4	7.8	54.2	37.5	3.11	64.9	17.4	90.8	3.6	3.4	7.4	1.3	2.9	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
90	6.0	0.8	1.9	48.5	35.2	3.88	61.8	12.5	110.6	5.6	5.3	4.5	0.4	1.0	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	9.0	1.9	4.4	50.6	36.1	3.60	62.8	14.1	104.0	4.9	4.7	4.5	0.4	1.0	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	12.0	3.3	7.7	51.6	36.5	3.46	63.4	14.9	100.6	4.6	4.4	4.5	0.4	1.0	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
100	6.0	0.8	1.9	45.5	34.1	4.36	60.4	10.4	120.1	6.9	6.6	3.2	0.2	0.5	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	9.0	1.9	4.3	47.6	34.9	4.03	61.3	11.8	113.6	6.1	5.8	3.2	0.2	0.5	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	12.0	3.3	7.6	48.6	35.3	3.87	61.8	12.6	110.3	5.7	5.4	3.2	0.2	0.5	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
110	6.0	0.8	1.8	42.4	32.9	4.92	59.2	8.6	129.7	8.5	8.1	2.5	0.1	0.3	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	9.0	1.8	4.3	44.4	33.7	4.54	59.9	9.8	123.3	7.5	7.1	2.5	0.1	0.3	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	12.0	3.3	7.5	45.5	34.1	4.36	60.4	10.4	120.1	7.0	6.7	2.5	0.1	0.3	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
120	6.0	0.7	1.6	Operation Not Recommended								2.0	0.1	0.2	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	9.0	1.8	4.1									2.0	0.1	0.2	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1
	12.0	3.2	7.4	42.3	32.8	4.93	59.2	8.6	129.9	8.6	8.2	2.0	0.1	0.2	67.6	3.45	55.9	5.7	109.7	65.0	5.4	5.1

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation within the shaded areas.

Table 18d: Performance Data — 50YGS/50YGP Model 064 - Full Load

1850 CFM Nominal (Rated) Airflow Cooling, 1850 CFM Nominal (Rated) Airflow Heating

EWT °F	Cooling - EAT 80/67°F											Heating - EAT 70°F										
	GPM	WPD		TC	SC	kW	HR	EER	LWT	YGS HWC	YGP HWC	GPM	WPD		HC	kW	HE	COP	LAT	LWT	YGS HWC	YGP HWC
		PSI	FT										PSI	FT								
20	3.1	0.1	0.1	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	15.0	7.3	16.8	40.0	3.65	27.6	3.2	86.5	16.3	3.8	3.6
30	3.9	0.1	0.2	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	7.5	1.7	3.9	44.9	3.73	32.2	3.5	88.0	21.4	4.0	3.8
	3.9	0.1	0.2	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	11.3	3.7	8.6	47.3	3.77	34.4	3.7	88.9	23.9	4.1	3.9
	3.9	0.1	0.2	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	15.0	6.1	14.1	48.6	3.79	35.6	3.8	89.3	25.2	4.1	3.9
40	5.2	0.1	0.3	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	7.5	1.2	2.7	52.6	3.87	39.4	4.0	90.8	29.5	4.3	4.1
	5.2	0.1	0.3	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	11.3	3.0	7.0	55.5	3.93	42.1	4.1	92.0	32.5	4.4	4.2
	5.2	0.1	0.3	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	15.0	5.3	12.2	57.1	3.96	43.6	4.2	92.6	34.2	4.5	4.3
50	7.5	0.9	2.0	67.5	46.6	3.27	78.6	20.6	71.0	2.8	2.7	7.5	0.9	2.0	60.2	4.02	46.5	4.4	93.8	37.6	4.6	4.4
	7.9	1.1	2.4	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	11.3	2.6	6.0	63.5	4.10	49.6	4.5	95.2	41.2	4.8	4.6
	7.9	1.1	2.4	67.5	46.6	3.24	78.6	20.8	70.0	2.8	2.7	8.0	1.1	2.5	65.3	4.14	51.2	4.6	95.9	43.2	4.9	4.7
60	7.5	0.8	1.7	65.9	46.2	3.56	78.1	18.5	80.8	3.4	3.2	7.5	0.8	1.7	67.7	4.19	53.4	4.7	96.7	45.8	5.1	4.8
	11.3	2.4	5.4	67.1	46.6	3.35	78.6	20.0	74.0	2.9	2.8	11.3	2.4	5.4	71.3	4.27	56.7	4.9	98.1	49.9	5.3	5.0
	15.0	4.3	10.0	67.5	46.6	3.26	78.6	20.7	70.5	2.7	2.6	15.0	4.3	10.0	73.2	4.32	58.5	5.0	98.8	52.2	5.4	5.1
70	7.5	0.7	1.7	63.5	45.3	3.91	76.8	16.3	90.5	4.3	4.1	7.5	0.7	1.7	74.7	4.36	59.9	5.0	99.3	54.0	5.5	5.2
	11.3	2.3	5.2	65.3	46.0	3.66	77.8	17.8	83.8	3.7	3.5	11.3	2.3	5.2	78.6	4.45	63.4	5.2	100.5	58.7	5.8	5.5
	15.0	4.1	9.6	66.0	46.3	3.55	78.1	18.6	80.4	3.4	3.2	15.0	4.1	9.6	80.6	4.50	65.2	5.2	101.0	61.3	5.9	5.6
80	7.5	0.8	1.8	60.4	44.1	4.30	75.1	14.1	100.0	5.4	5.1	7.5	0.8	1.8	81.4	4.52	66.0	5.3	101.2	62.4	6.1	5.8
	11.3	2.2	5.2	62.6	44.9	4.03	76.3	15.5	93.6	4.7	4.5	9.0	1.3	3.1	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	15.0	4.1	9.4	63.6	45.3	3.90	76.9	16.3	90.2	4.3	4.1	9.0	1.3	3.1	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
90	7.5	0.8	2.0	57.0	42.6	4.75	73.2	12.0	109.5	6.7	6.4	5.4	0.1	0.3	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	11.3	2.3	5.2	59.3	43.6	4.44	74.4	13.3	103.2	5.8	5.5	5.4	0.1	0.3	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	15.0	4.0	9.3	60.4	44.1	4.30	75.1	14.1	100.0	5.4	5.1	5.4	0.1	0.3	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
100	7.5	0.9	2.0	53.4	41.1	5.27	71.4	10.1	119.0	8.1	7.7	3.9	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	11.3	2.3	5.2	55.7	42.1	4.92	72.5	11.3	112.9	7.2	6.8	3.9	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	15.0	4.0	9.3	56.9	42.6	4.76	73.1	11.9	109.7	6.7	6.4	3.9	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
110	7.5	0.8	1.8	50.0	39.7	5.86	69.9	8.5	128.7	9.7	9.2	3.0	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	11.3	2.2	5.1	52.1	40.6	5.48	70.8	9.5	122.6	8.7	8.3	3.0	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	15.0	4.0	9.2	53.2	41.0	5.29	71.3	10.1	119.5	8.2	7.8	3.0	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
120	7.5	0.6	1.3	46.9	38.6	6.54	69.2	7.2	138.5	11.5	10.9	2.5	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	11.3	2.0	4.7	48.7	39.2	6.11	69.6	8.0	132.4	10.4	9.9	2.5	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8
	15.0	3.8	8.8	49.7	39.6	5.90	69.9	8.4	129.3	9.9	9.4	2.5	0.1	0.2	83.3	4.57	67.7	5.3	110.7	65.0	6.1	5.8

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation within the shaded areas.

Preventive Maintenance

Water Coil Maintenance
(Direct ground water applications only)
If the system is installed in an area with a known high mineral content (125 P.P.M. or greater) in the water, it is best to establish a periodic maintenance schedule with the owner so the coil can be checked regularly. Consult the well water applications section of this manual for a more detailed water coil material selection. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. Therefore, 1.5 gpm per ton [2.0 l/m per kW] is recommended as a minimum flow. Minimum flow rate for entering water temperatures below 50°F [10°C] is 2.0 gpm per ton [2.6 l/m per kW].

Water Coil Maintenance
(All other water loop applications)
Generally water coil maintenance is not needed for closed loop systems. However, if the piping is known to have high dirt or debris content, it is best to establish a periodic maintenance schedule with the owner so the water coil can be checked regularly. Dirty installations are typically the result of deterioration of iron or galvanized piping or components in the system. Open cooling towers requiring heavy chemical treatment and mineral buildup through water use can also contribute to higher maintenance. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. However, flow rates over 3 gpm per ton (3.9 l/m per kW) can produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

Hot Water Generator Coils
See water coil maintenance for ground water units. If the potable water is hard or not chemically softened, the high temperatures of the desuperheater will tend to scale even quicker than the water coil and may need more frequent inspections. In areas with extremely hard water, a HWG is not recommended.

Compressor
Conduct annual amperage checks to insure that amp draw is no more than 10% greater than indicated on the serial plate data.

Cabinet - “Indoor” Compressor Section
Do not allow water to stay in contact with the cabinet for long periods of time to prevent corrosion of the cabinet sheet metal. Generally, cabinets are set up from the floor a few inches [7 - 8 cm] to prevent water from entering the cabinet. The cabinet can be cleaned using a mild detergent.

Refrigerant System
To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Reference the operating charts for pressures and temperatures. Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

Troubleshooting

General
If operational difficulties are encountered, perform the preliminary checks below before referring to the troubleshooting charts.

- Verify that the unit is receiving electrical supply power.
- Make sure the fuses in the fused disconnect switches are intact.

After completing the preliminary checks described above, inspect for other obvious problems such as leaking connections, broken or disconnected wires, etc. If everything appears to be in order, but the unit still fails to operate properly, refer to the “DXM2 Troubleshooting Process Flowchart” or “Functional Troubleshooting Chart.”

DXM2 Board
DXM2 board troubleshooting in general is best summarized as verifying inputs and outputs. After inputs and outputs have been verified, board operation is confirmed and the problem must be elsewhere. Below are some general guidelines for troubleshooting the DXM2 control.

Field Inputs
Conventional thermostat inputs are 24VAC from the thermostat and can be verified using a voltmeter between C and Y1, Y2, W, O, G. 24VAC will be present at the terminal (for example, between “Y1” and “C”) if the thermostat is sending an input to the DXM2 board.

Proper communications with a thermostat can be verified using the Fault LED on the DXM2. If the control is NOT in the Test mode and is NOT currently locked out or in a retry delay, the Fault LED on the DXM2 will flash very slowly (1 second on, 5 seconds off), if the DXM2 is properly communicating with the thermostat.

Sensor Inputs
All sensor inputs are ‘paired wires’ connecting each component to the board. Therefore, continuity on pressure switches, for example can be checked at the board connector. The thermistor resistance should be measured with the connector removed so that only the impedance of the thermistor is measured. If desired, this reading can be compared to the thermistor resistance chart shown in Table 19. An ice bath can be used to check the calibration of the thermistor.

Table 19: Nominal resistance at various temperatures

Temp (ºC)	Temp (ºF)	Resistance (kOhm)	Temp (ºC)	Temp (ºF)	Resistance (kOhm)
-17.8	0.0	85.34	55	131.0	2.99
-17.5	0.5	84.00	56	132.8	2.88
-16.9	1.5	81.38	57	134.6	2.77
-12	10.4	61.70	58	136.4	2.67
-11	12.2	58.40	59	138.2	2.58
-10	14.0	55.30	60	140.0	2.49
-9	15.8	52.38	61	141.8	2.40
-8	17.6	49.64	62	143.6	2.32
-7	19.4	47.05	63	145.4	2.23
-6	21.2	44.61	64	147.2	2.16
-5	23.0	42.32	65	149.0	2.08
-4	24.8	40.15	66	150.8	2.01
-3	26.6	38.11	67	152.6	1.94
-2	28.4	36.18	68	154.4	1.88
-1	30.2	34.37	69	156.2	1.81
0	32.0	32.65	70	158.0	1.75
1	33.8	31.03	71	159.8	1.69
2	35.6	29.50	72	161.6	1.64
3	37.4	28.05	73	163.4	1.58
4	39.2	26.69	74	165.2	1.53
5	41.0	25.39	75	167.0	1.48
6	42.8	24.17	76	168.8	1.43
7	44.6	23.02	77	170.6	1.39
8	46.4	21.92	78	172.4	1.34
9	48.2	20.88	79	174.2	1.30
10	50.0	19.90	80	176.0	1.26
11	51.8	18.97	81	177.8	1.22
12	53.6	18.09	82	179.6	1.18
13	55.4	17.26	83	181.4	1.14
14	57.2	16.46	84	183.2	1.10
15	59.0	15.71	85	185.0	1.07
16	60.8	15.00	86	186.8	1.04
17	62.6	14.32	87	188.6	1.01
18	64.4	13.68	88	190.4	0.97
19	66.2	13.07	89	192.2	0.94
20	68.0	12.49	90	194.0	0.92
21	69.8	11.94	91	195.8	0.89
22	71.6	11.42	92	197.6	0.86
23	73.4	10.92	93	199.4	0.84
24	75.2	10.45	94	201.2	0.81
25	77.0	10.00	95	203.0	0.79
26	78.8	9.57	96	204.8	0.76
27	80.6	9.16	97	206.6	0.74
28	82.4	8.78	98	208.4	0.72
29	84.2	8.41	99	210.2	0.70
30	86.0	8.06	100	212.0	0.68
31	87.8	7.72	101	213.8	0.66
32	89.6	7.40	102	215.6	0.64
33	91.4	7.10	103	217.4	0.62
34	93.2	6.81	104	219.2	0.60
35	95.0	6.53	105	221.0	0.59
36	96.8	6.27	106	222.8	0.57
37	98.6	6.01	107	224.6	0.55
38	100.4	5.77	108	226.4	0.54
39	102.2	5.54	109	228.2	0.52
40	104.0	5.33	110	230.0	0.51
41	105.8	5.12	111	231.8	0.50
42	107.6	4.92	112	233.6	0.48
43	109.4	4.72	113	235.4	0.47
44	111.2	4.54	114	237.2	0.46
45	113.0	4.37	115	239.0	0.44
46	114.8	4.20	116	240.8	0.43
47	116.6	4.04	117	242.6	0.42
48	118.4	3.89	118	244.4	0.41
49	120.2	3.74	119	246.2	0.40
50	122.0	3.60	120	248.0	0.39
51	123.8	3.47	121	249.8	0.38
52	125.6	3.34	122	251.6	0.37
53	127.4	3.22	123	253.4	0.36
54	129.2	3.10			

Troubleshooting

Outputs
The compressor and reversing valve relays are 24VAC and can be verified using a voltmeter. The alarm relay can either be 24VAC as shipped or dry contacts for use with DDC controls by clipping the JW1 jumper. Electric heat outputs are 24VDC "ground sinking" and require a voltmeter set for DC to verify operation. The terminal marked "24VDC" is the 24VDC supply to the electric heat board; terminal "EH1" is stage 1 electric heat; terminal "EH2" is stage 2 electric heat. When electric heat is energized (thermostat is sending a "W" input to the DXM2 controller), there will be 24VDC between terminal "24VDC" and "EH1" (stage 1 electric heat) and/or "EH2" (stage 2 electric heat). A reading of 0VDC between "24VDC" and "EH1" or "EH2" will indicate that the DXM2 board is NOT sending an output signal to the electric heat board.

Test Mode
Test mode can be entered for 20 minutes by pressing the Test pushbutton. The DXM2 board will automatically exit test mode after 20 minutes.

Advanced Diagnostics
To properly troubleshoot advanced control features, and to aid in troubleshooting basic control features, a communicating thermostat or diagnostic tool must be used.

Service Mode
The Service Mode provides the installer with several functions for troubleshooting, including Manual Operation, Control Diagnostics, Control Configuration, and Fault History.

Manual Operation – The Manual Operation mode allows the installer to bypass normal thermostat timings and operating modes, to directly activate the thermostat inputs to the DXM2, activate the DXM2 Test mode, and directly control the ECM blower, internal flow center, and proportional valve.

Control Diagnostics – The Control Diagnostics menus allow the installer to see the current status of all DXM2 control switch inputs, values of all temperature sensor inputs, control voltage, internal flow center, and proportional valve operating status and parameters.

Dipswitch Configuration – The Dipswitch Configuration menus allow the installer to easily see the current DXM2 control configuration.

Fault History – In addition to the fault code, the DXM2 stores the status of all control inputs and outputs when a fault condition is detected. The fault history covering the last five lockout conditions is stored and may be retrieved from the DXM2. After a specific fault in the fault history is selected, the operating mode and time when the fault occurred are displayed, with options to select specific control status values when the lockout occurred.

Fault Temp Conditions – This option displays the DXM2 temperature and voltage values when the lockout occurred.

Fault Flow Conditions – This option displays the DXM2, pump, and valve operating parameters when the lockout occurred.

Fault I/O Conditions – This option displays the status of the DXM2 physical and communicated inputs and the relay outputs when the lockout occurred.

Fault Configuration Conditions – This option displays the status of the DXM2 option selections when the lockout occurred.

Fault Possible Causes – This option displays a list of potential causes of the stored fault.

Clear Fault History – The Clear Fault History option allows the fault history stored in the non-volatile memory of the DXM2 to be cleared.

DXM2 Troubleshooting Process Flowchart/Functional Troubleshooting Chart
The "DXM2 Functional Troubleshooting Process Flowchart" is a quick overview of how to start diagnosing a suspected problem, using the fault recognition features of the DXM2 board. The "Functional Troubleshooting Chart" on the following page is a more comprehensive method for identifying a number of malfunctions that may occur, and is not limited to just the DXM2 controls. Within the chart are five columns:

- The "Fault" column describes the symptoms.
- Columns 2 and 3 identify in which mode the fault is likely to occur, heating or cooling.
- The "Possible Cause column" identifies the most likely sources of the problem.
- The "Solution" column describes what should be done to correct the problem.

⚠ WARNING! ⚠

WARNING! HAZARDOUS VOLTAGE! DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.
Failure to disconnect power before servicing can cause severe personal injury or death.

DXM2 Process Flow Chart

⚠ WARNING! ⚠

WARNING! HAZARDOUS VOLTAGE! DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.
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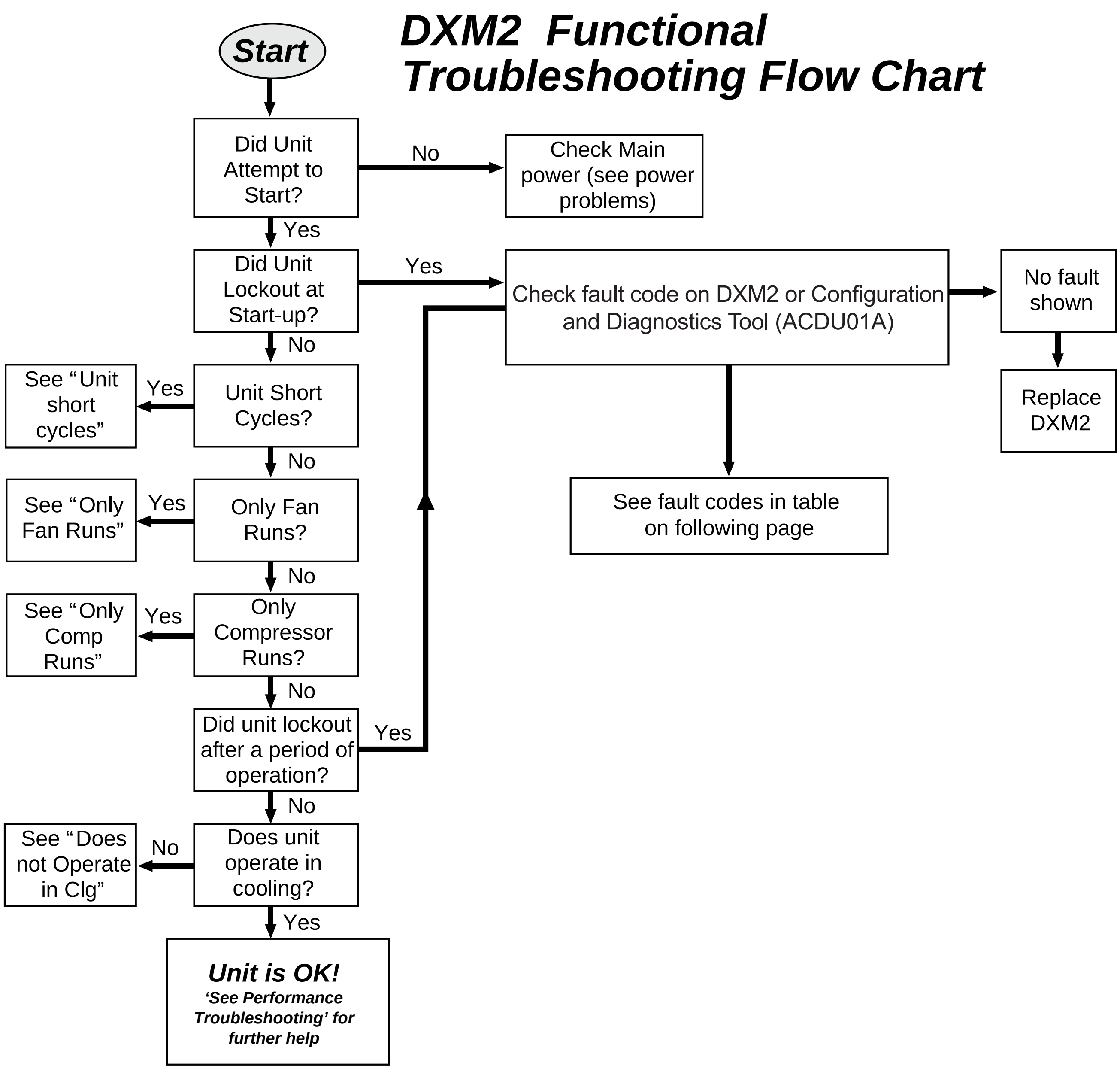


Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
Main Power Problems	X	X	Green status LED off	Check Line Voltage circuit breaker and disconnect
				Check for line voltage between L1 and L2 on the contactor
				Check for 24VAC between R and C on DXM
				Check primary/secondary voltage on transformer
HP Fault Code 2 High Pressure		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting
				Check water flow adjust to proper flow rate
		X	Water temperature out of range in cooling	Bring water temp within design parameters
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Dirty air coil- construction dust etc.
				Too high of external static. Check static vs blower table
	X		Air temperature out of range in heating	Bring return air temp within design parameters
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table
	X	X	Bad HP switch	Check switch continuity and operation - Replace
	X		Frozen water heat exchanger	Thaw heat exchanger
	X	X	Bad HPWS Switch	Replace HPWS Switch
LP/LOC Fault-Code 3 Low Pressure/Loss of Charge	X	X	Insufficient charge	Check for refrigerant leaks
	X		Compressor pump down at start-up	Check charge and start-up water flow
LT1 Fault - Code 4 Water Low Temperature	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting
				Plugged strainer or filter - clean or replace
				Check water flow adjust to proper flow rate
	X		Inadequate anti-freeze level	Check antifreeze density with hydrometer
	X		Improper low temperature setting (30°F vs 10°F)	Clip LT1 jumper for antifreeze (10°F) use
	X		Water temperature out of range	Bring water temp within design parameters
	X	X	Bad thermistor	Check temp and impedance correlation per chart
LT2 Fault - Code 5 **Low Air Temperature** **(Air Handler)**		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
		X	Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
		X	Improper low temperature setting (30°F vs 10°F)	Normal airside applications will require 30°F only
	X	X	Bad thermistor	Check temp and impedance correlation per chart
Condensate Fault-Code 6 **High Condensate Level** **(Air Handler)**	X	X	Blocked drain	Check for blockage and clean drain
	X	X	Improper trap	Check trap dimensions and location ahead of vent
		X	Poor drainage	Check for piping slope away from unit
				Check slope of unit toward outlet
				Poor venting - check vent location
		X	Moisture on sensor	Check for moisture shorting to air coil
	X	X	Plugged air filter	Replace air filter
	X	X	Restricted return air flow	Find and eliminate rectriction - increase return duct and/or grille size
Over/Under Voltage-Code 7 (Auto Resetting)	X	X	Under voltage	Check power supply and 24VAC voltage before and during operation
				Check power supply wire size
				Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer tap for correct power supply voltage
	X	X	Over voltage	Check power supply voltage and 24VAC before and during operation.
				Check 24VAC and unit transformer tap for correct power supply voltage

Functional Troubleshooting (cont.)

Fault	Htg	Clg	Possible Cause	Solution
Unit Performance Sentinel-Code 8	X		Heating Mode LT2>125°F	Check for poor air flow or overcharged unit
		X	Cooling Mode LT1>125°F OR LT2< 40°F	Check for poor water flow, or air flow
Swapped Thermistor Code 9	X	X	LT1 and LT2 swapped	Reverse position of thermistors
ECM Fault - Code 10 (Air Handler)	X	X	Blower does not operate	Check blower line voltage
				Check blower low voltage wiring
			Blower operating with incorrect airflow	Wrong unit size selection
				Wrong unit family selection
				Wrong motor size
				Incorrect blower selection
Low Air Coil Pressure Fault (ClimaDry) Code 11		X	Reduced or no air flow in cooling or ClimaDry	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
			Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
			Bad pressure switch	Check switch continuity and operation - replace
Low Air Coil Temperature Fault - (ClimaDry) Code 12		X	Reduced airflow in cooling, ClimaDry, or constant fan	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
			Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
			Bad thermistor	Check temp and impedance correlation per chart
IFC Fault Code 13 Internal Flow Controller Fault	X	X	No pump output signal	Check DC voltage between A02 and GND - should be between 0.5 and 10 VDC with pump active
			Low pump voltage	Check line voltage to the pump
			No pump feedback signal	Check DC voltage between T1 and GND. Voltage should be between 3 and 4 VDC with pump OFF, and between 0 and 2 VDC with the pump ON
			Bad pump RPM sensor	Replace pump if the line voltage and control signals are present at the pump, and the pump does not operate
ESD - ERV Fault (DXM Only) Green Status LED Code 3	X	X	ERV unit has fault (Rooftop units only)	Troubleshoot ERV unit fault
No Fault Code Shown	X	X	No compressor operation	See 'Only Fan Operates'
	X	X	Compressor overload	Check and replace if necessary
	X	X	Control board	Reset power and check operation
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filter
	X	X	Unit in 'Test Mode'	Reset power or wait 20 minutes for auto exit
	X	X	Unit selection	Unit may be oversized for space - check sizing for actual load of space
	X	X	Compressor overload	Check and replace if necessary
Only Fan Runs	X	X	Thermostat position	Insure thermostat set for heating or cooling operation
	X	X	Unit locked out	Check for lockout codes - reset power
	X	X	Compressor overload	Check compressor overload - replace if necessary
	X	X	Thermostat wiring	Check thermostat wiring at DXM2 - put in Test Mode and jumper Y1 and R to give call for compressor

Performance Troubleshooting

Symptom	Htg	Clg	Possible Cause	Solution
Insufficient Capacity/ Not Cooling or Heating Properly	X	X	Dirty filter	Replace or clean
	X		Rduced or no air flow in heating	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present
	X	X	Low refrigerant charge	Check superheat and subcooling per chart
	X	X	Restricted metering device	Check superheat and subcooling per chart - replace
		X	Defective reversing valve	Perform RV touch test
	X	X	Thermostat improperly located	Check location and for air drafts behind stat
	X	X	Unit undersized	Recheck loads & sizing check sensible clg load and heat pump capacity
	X	X	Scaling in water heat exchanger	Perform Scaling check and clean if necessary
	X	X	Inlet water too hot or cold	Check load, loop sizing, loop backfill, ground moisture
High Head Pressure	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting
				Check water flow adjust to proper flow rate
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture
	X		Air temperature out of range in heating	Bring return air temp within design parameters
		X	Scaling in water heat exchanger	Perform Scaling check and clean if necessary
	X	X	Unit over charged	Check superheat and subcooling - reweigh in charge
	X	X	Non-condensables insystem	Vacuum system and reweigh in charge
	X	X	Restricted metering device	Check superheat and subcooling per chart - replace
Low Suction Pressure	X		Reduced water flow in heating	Check pump operation or water valve operation/setting
				Plugged strainer or filter - clean or replace
				Check water flow adjust to proper flow rate
	X		Water temperature out of range	Bring water temp within design parameters
		X	Reduced air flow in cooling	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
		X	Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
	X	X	Insufficient charge	Check for refrigerant leaks

Performance Troubleshooting (cont.)

Symptom	Htg	Clg	Possible Cause	Solution
Low Dischage Air Temperature in Heating	X		Too high of air flow	Check fan motor speed selection and airflow chart
	X		Poor performance	See “Insufficient Capacity”
High Humidity		X	Too high of air flow	Check fan motor speed selection and airflow chart
		X	Unit oversized	Recheck loads and sizing check sensible clg load and heat pump capacity
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation.
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for Line voltage across blower relay contacts.
				Check fan power enable relay operation (if present)
	X	X	Fan motor	Check for line voltage at motor. Check capacitor
	X	X	Thermostat wiring	Check thermostat wiring at or DXM2. Put in Test Mode and then jumper Y1 and W1 to R to give call for fan, compressor and electric heat.
Unit Doesn't Operate in Cooling		X	Reversing Valve	Set for cooling demand and check 24VAC on RV coil.
				If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	For DXM2 check for “O” RV setup not “B”.
		X	Thermostat wiring	Check O wiring at heat pump. DXM2 requires call for compressor to get RV coil “Click.”
Modulating Valve Troubleshooting	X	X	Improper output setting	Verify the AO-2 jumper is in the 0-10V position
			No valve output signal	Check DC voltage between AO2 and GND. Should be O when valve is off and between 3.3v and 10v when valve is on.
			No valve operation	Check voltage to the valve
				Replace valve if voltage and control signals are present at the valve and it does not operate

Troubleshooting Form

Split System Troubleshooting

Customer: ______________________ Antifreeze: ______________

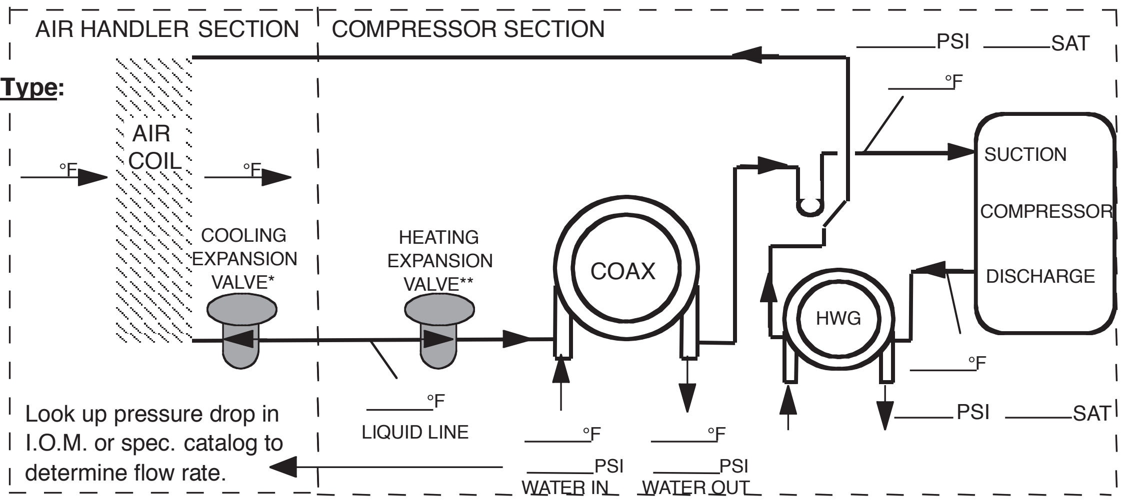
Model#: ______________ Serial#: __________ Loop type: __________

Complaint: ____

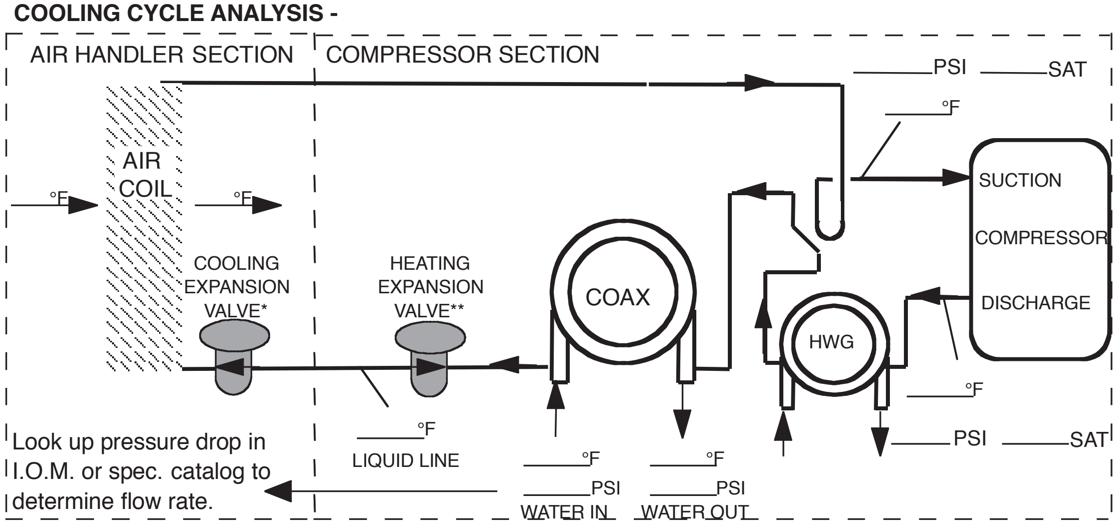
HEATING CYCLE ANALYSIS -

Refrigerant Type:

HFC-410A



COOLING CYCLE ANALYSIS -



*Cooling expansion valve meters in the cooling mode, and bypasses in the heating mode.
**Heating expansion valve meters in the heating mode, and bypasses in the cooling mode.

Heat of Extraction (Absorbtion) or Heat of Rejection =

________ flow rate (gpm) x ________ temp. diff. (deg. F) x __________ fluid factor † = ____________ (Btu/hr)

Superheat = suction temperature - suction saturation temp. = ______________ (deg F)

Subcooling = discharge saturation temp. - liquid line temp. = ______________ (deg F)

†Use 500 for water, 485 for antifreeze.

Note: Never connect refrigerant gauges during startup procedures. Conduct water-side analysis using P/T ports to determine water flow and temperature difference. If water-side analysis shows poor performance, refrigerant troubleshooting may be required. Connect refrigerant gauges as a last resort.

Warranty

CARRIER CORPORATION
LIMITED EXPRESS WARRANTY/LIMITATION OF REMEDIES AND LIABILITY FOR RESIDENTIAL GEOTHERMAL PRODUCTS WITH LABOR ALLOWANCE

It is expressly understood that unless a statement is specifically identified as a warranty, statements made by Carrier Corporation, a Delaware corporation, ("Carrier") or its representatives, relating to Carrier's products, whether oral, written or contained in any sales literature, catalog or agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely Carrier's opinion or commendation of Carrier's products. **EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF CARRIER'S PRODUCTS. CARRIER MAKES NO WARRANTY AGAINST LATENT DEFECTS. CARRIER MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.**

GRANT OF LIMITED EXPRESS WARRANTY
Carrier warrants its residential geothermal products, purchased and retained in the United States of America and Canada, to be free from defects in material and workmanship under normal use and maintenance as follows: (1) Residential geothermal air conditioning, heating and/or heat pumps with model numbers beginning with 50Y that are built or sold by Carrier ("Carrier Geothermal Units") for ten (10) years from the Warranty Inception Date (as defined below); (2) Auxiliary electric heaters and geothermal pumping modules built or sold by Carrier, when installed with Carrier Geothermal Units, for ten (10) years from the Warranty Inception Date (as defined below); (3) Sealed refrigerant circuit components of Carrier Geothermal Units (which components only include the compressor, refrigerant to air/water heat exchangers, reversing valve body and refrigerant metering device) for ten (10) years from the Warranty Inception Date (as defined below); and (4) Other accessories and parts built or sold by Carrier, when installed with Carrier Geothermal Units, for one (1) year from the date of shipment from Carrier. The "Warranty Inception Date" shall be the date of original unit installation, or six (6) months from date of unit shipment from Carrier, whichever comes first.

To make a claim under this warranty, parts must be returned to Carrier in Oklahoma City, Oklahoma, freight prepaid, no later than ninety (90) days after the date of the failure of the part; if Carrier determines the part to be defective and within Carrier's Limited Express Warranty, Carrier shall, when such part has been either replaced or repaired, return such to a factory recognized distributor, dealer or service organization, F.O.B. Carrier, Oklahoma City, Oklahoma, freight prepaid. The warranty on any part repaired or replaced under warranty expires at the end of the original warranty period.

This Limited Express Warranty shall cover the labor incurred by Carrier authorized service personnel in connection with the installation of a new or repaired warranty part that is covered by this Limited Express Warranty only to the extent specifically set forth in the then existing labor allowance schedule provided by Carrier's Warranty Department and only as follows: (1) Carrier Geothermal Units for two (2) years from the Warranty Inception Date; (2) Auxiliary electric heaters and geothermal pumping modules built or sold by Carrier, when installed with Carrier Geothermal Units, for two (2) years from the Warranty Inception Date; and (3) Sealed refrigerant circuit components of Carrier Geothermal Units (which components only include the compressor, refrigerant to air/water heat exchangers, reversing valve body and refrigerant metering device) for five (5) years from the Warranty Inception Date. Actual Labor costs are not covered by this Limited Express Warranty to the extent they exceed the amount allowed under said allowance schedule, they are not specifically provided for in said allowance schedule, they are not the result of work performed by Carrier authorized service personnel, they are incurred in connection with a part not covered by this Limited Express Warranty, or they are incurred more than the time periods set forth in this paragraph after the Warranty Inception Date.

This warranty does not cover and does not apply to: (1) Air filters, fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) Any portion or component of any system that is not supplied by Carrier, regardless of the cause of the failure of such portion or component; (4) Products on which the unit identification tags or labels have been removed or defaced; (5) Products on which payment to Carrier, or to the owner's seller or installing contractor, is in default; (6) Products subjected to improper or inadequate installation, maintenance, repair, wiring or voltage conditions; (7) Products subjected to accident, misuse, negligence, abuse, fire, flood, lightning, unauthorized alteration, misapplication, contaminated or corrosive air or liquid supply, operation at abnormal air or liquid temperatures or flow rates, or opening of the refrigerant circuit by unqualified personnel; (8) Mold, fungus or bacteria damages; (9) Corrosion or abrasion of the product; (10) Products supplied by others; (11) Products which have been operated in a manner contrary to Carrier's printed instructions; (12) Products which have insufficient performance as a result of improper system design or improper application, installation, or use of Carrier's products; or (13) Electricity or fuel costs, or any increases or unrealized savings in same, for any reason whatsoever.

This Limited Express Warranty provides the limited labor allowance coverage set forth above. Otherwise, Carrier is not responsible for: (1) The costs of any fluids, refrigerant or system components supplied by others, or associated labor to repair or replace the same, which is incurred as a result of a defective part covered by Carrier's Limited Express Warranty; (2) The costs of labor, refrigerant, materials or service incurred in diagnosis and removal of the defective part, or in obtaining and replacing the new or repaired part; (3) Transportation costs of the defective part from the installation site to Carrier, or of the return of that part if not covered by Carrier's Limited Express Warranty; or (4) The costs of normal maintenance.

This Limited Express Warranty applies to Carrier residential geothermal products ordered from Carrier on or after July 1, 2010 (This would generally include Carrier Geothermal Units with serial numbers beginning with "2710V" and later), and is not retroactive to any products ordered from Carrier prior to July 1, 2010 (this would generally include Carrier Geothermal Units with serial numbers beginning with "2610V" and earlier). If you are unsure if this Limited Express Warranty applies to the product you have purchased, contact Carrier at the phone number or address below.

Limitation: This Limited Express Warranty is given in lieu of all other warranties. If, notwithstanding the disclaimers contained herein, it is determined that other warranties exist, any such express warranty, including without limitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Warranty.

LIMITATION OF REMEDIES
In the event of a breach of the Limited Express Warranty, Carrier will only be obligated at Carrier's option to repair the failed part or unit, or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to Carrier's factory in Oklahoma City, Oklahoma of each defect, malfunction or other failure, and a reasonable number of attempts by Carrier to correct the defect, malfunction or other failure, and the remedy fails of its essential purpose, Carrier shall refund the purchase price paid to Carrier in exchange for the return of the sold good(s). Said refund shall be the maximum liability of Carrier. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR PURCHASER AGAINST CARRIER FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR CARRIER'S NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY
Carrier shall have no liability for any damages if Carrier's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any war, civil unrest, government restrictions or restraints, strikes, or work stoppages, fire, flood, accident, shortages of transportation, fuel, material, or labor, acts of God or any other reason beyond the sole control of Carrier. CARRIER EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR CARRIER'S NEGLIGENCE OR AS STRICT LIABILITY.

OBTAINING WARRANTY PERFORMANCE
Normally, the dealer or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any Carrier recognized distributor, dealer or service organization. If assistance is required in obtaining warranty performance, write or call:

Customer Service • 7300 SW 44th Street • Oklahoma City, Oklahoma 73179 • (405) 745-2920

NOTE: Some states or Canadian provinces do not allow limitations on how long an implied warranty lasts, or the limitation or exclusions of consequential or incidental damages, so the foregoing exclusions and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and from Canadian province to Canadian province.

Please refer to the Carrier Installation, Operation and Maintenance Manual for operating and maintenance instructions.

Rev.: 6/10
Part No.: CA234

Notes

Revision History

Date	Page #	Description
29 Aug., 13	All	First Published

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Quality: First & Always

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