WATERLESS® GEOTHERMAL

# H SERIES

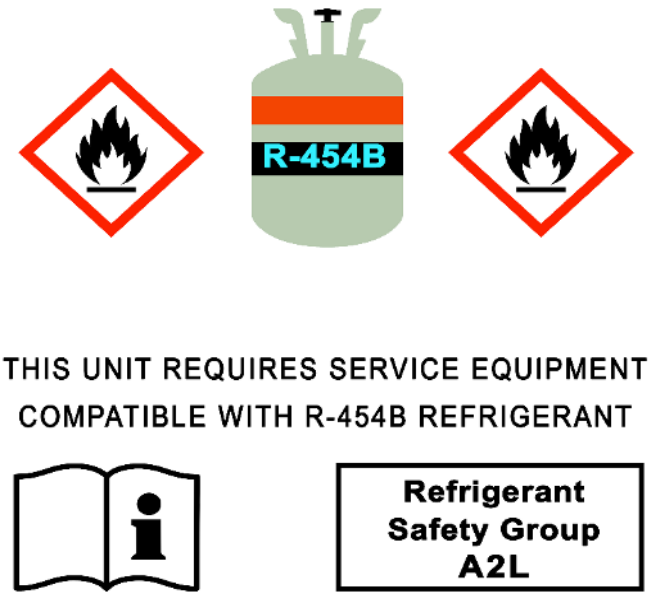
## WG1H

### R-454B

### Hydronic Heating and Cooling


# Installation Manual

**This equipment is designed for use with R-454B refrigerant that has an A2L classification. Only personnel trained in the proper handling of A2L refrigerants using compatible A2L service and installation tools should carry out services and installation of this equipment. This equipment ships without refrigerant with a dry nitrogen holding charge. Installing and service personnel are solely responsible for the proper servicing and charging of this equipment as set forth in this, and all Total Green Mfg. service and installation manuals.**




**⚠ WARNING**

RISK OF FIRE.
FLAMMABLE REFRIGERANT USED.
TO BE REPAIRED ONLY BY TRAINED SERVICE PERSONNEL.
DO NOT PUNCTURE REFRIGERANT TUBING.

**⚠ WARNING**

RISK OF FIRE.
DISPOSE OF PROPERLY IN ACCORDANCE WITH FEDERAL OR LOCAL REGULATIONS.
FLAMMABLE REFRIGERANT USED.

**⚠ WARNING**

RISK OF FIRE.
AUXILLARY DEVICES WHICH MAY BE IGNITION SOURCES SHALL NOT BE INSTALLED IN THE DUCTWORK, OTHER THAN AUXILLARY DEVICES LISTED FOR USE WITH THE SPECIFIC APPLIANCE. SEE INSTRUCTIONS.

**⚠ AVERTISSEMENT**

RISQUE D'NCENDIE.
RÉFRIGERANT UTILISÉ INFLAMMABLE.
SEUL UN PERSONNEL D'ENTRETIEN FORMÉ PEUT RÉPARER CE PRODUIT.
NE PAS PERFORER LE TUBE RÉFRIGÉRANT.

**⚠ AVERTISSEMENT**

RISQUE D'NCENDIE.
ELIMINER CORRECTMENT ET CONFORMÉMENT AUX REGLEMENTATIONS FÉDERALES OU LOCALES. REFRIGERANT UTILISÉ INFLAMMABLE.

**⚠ AVERTISSEMENT**

RISQUE D'NCENDIE. LES DISPOSITIFS AUXILIARES QUI PEUVENT ÉTRE DES SOURCES D'INFLAMMATION NE DOIVENT PAS ÉTRE INSTALLES DANS LE RÉSEAU DE CONDUITS, Á L'EXCEPTION DES DISPOSITIFS AUXILIAIRES ENUMÉRES POUR UNE UTILISATION AVEC L'APPAREIL SPÉCIFIQUE. VOIR LES INSTRUCTIONS.

**⚠ NOTICE**

LEAK DETECTION SYSTEM INSTALLED.
UNIT MUST BE POWERED EXCEPT FOR SERVICE.

**⚠ AVIS**

SYSTÈME DE DÉTECTION DE FUITE INSTALLÉ.
L'APPAREIL DOIT ÊTRE ALIMENTÉ, SAUF POUR LA MAINTENANCE.

**⚠ WARNING**

RISK OF FIRE. AUXILIARY DEVICES WHICH MAY BE IGNITION SOURCES SHALL NOT BE INSTALLED IN THE DUCTWORK, OTHER THAN AUXILIARY DEVICES LISTED FOR USE WITH THE SPECIFIC APPLIANCE.
SEE INSTRUCTIONS.

**⚠ AVERTISSEMENT**

RISQUE D'INCENDIE, LES DISPOSITIFS AUXILIAIRES QUI PEUVENT ÉTRE DES SOURCES D'INFLAMMATION NE DOIVENT PAS ÉTRE INSTALLES DANS LE RÉSEAU DE CONDUITS, Á L'EXCEPTION DES DISPOSITIFS AUXILIAIRES ÉNUMERES POUR UNE UTILISISATION AVEC L'APPAREIL SPECIFIQUE.
VOIR LES INSTRUCTIONS.

**ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES.**

**IMPORTANT**: This document is customer property and is to remain with this unit. Please return to service information packet upon completion of work.



**Please note that illustrations in these manuals are for reference only and may not show all detail. Also, specifications are subject to change without notice. It is imperative that only the manuals shipped with the equipment be used for each installation.**

This equipment is classified as a partial system and must be paired only with other equipment approved by Total Green Mfg. that is UL 60335-2-40/CSA C22.2 No. 60335-2-40 compliant.

## 1) POE OIL PRECAUTION

The compressor oil used in a Waterless® Geothermal system is **Copeland Ultra 32-3 MAF**. Using any other brand or type will void the manufacture's equipment warranty.

- POE oils absorb moisture rapidly. Do **not** expose oil to atmosphere. Always flow dry nitrogen anytime a system is open to prevent atmosphere from entering any part of the system, as it will make its way to the compressor oil. This includes line sets, earth loops, earth loop manifolds, air handlers, cased coils and any other piece of equipment that is to be connected to the refrigerant circuit. All components **must be swept** of atmosphere with dry nitrogen to keep the system dry when installing or servicing. Flowing dry nitrogen is **not** just for brazing.

- Vacuum pumps will **not** remove moisture from POE oil.

- **Never** open a system to atmosphere while it is under a vacuum.

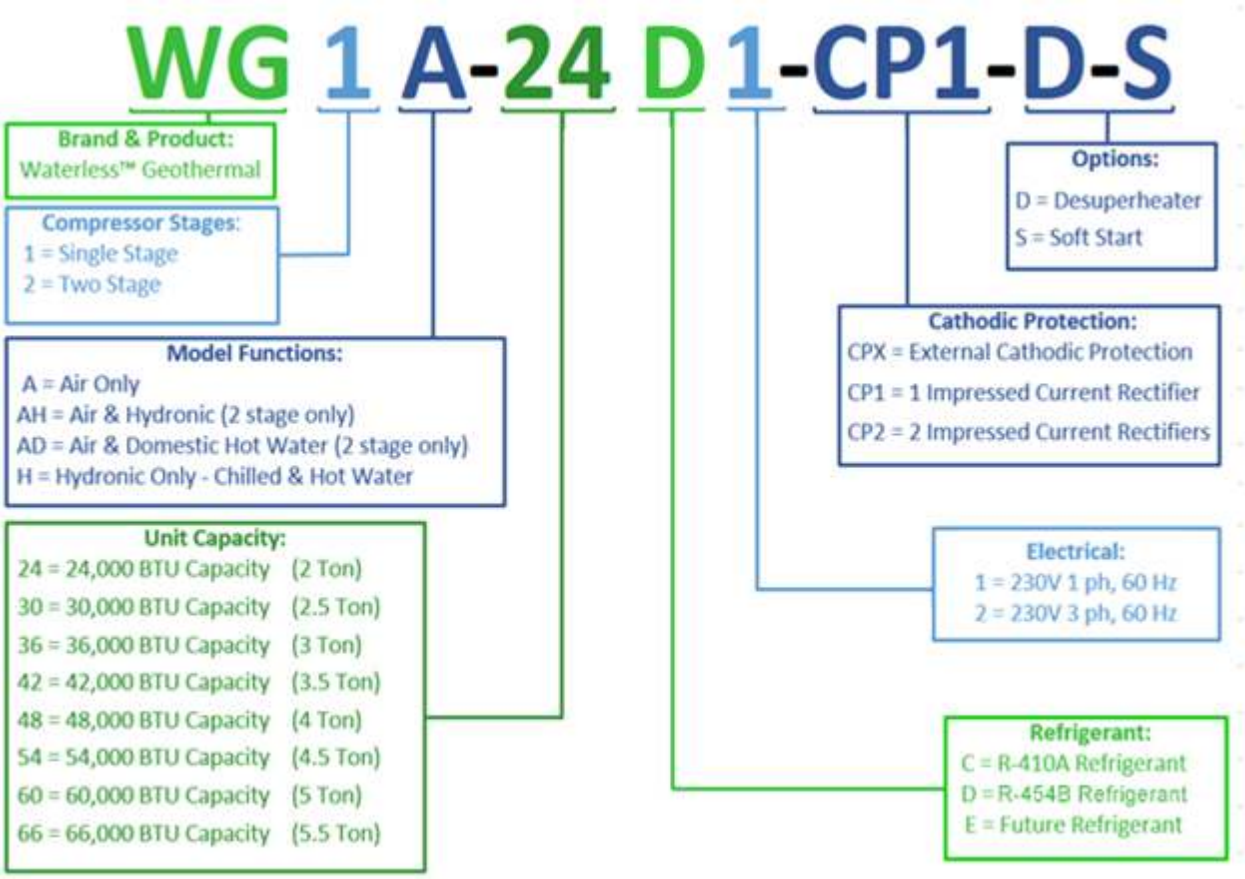
- A liquid line filter drier is required and installed in every compressor unit from the factory.

- Wrap all filter driers and service valves with wet cloth when brazing.

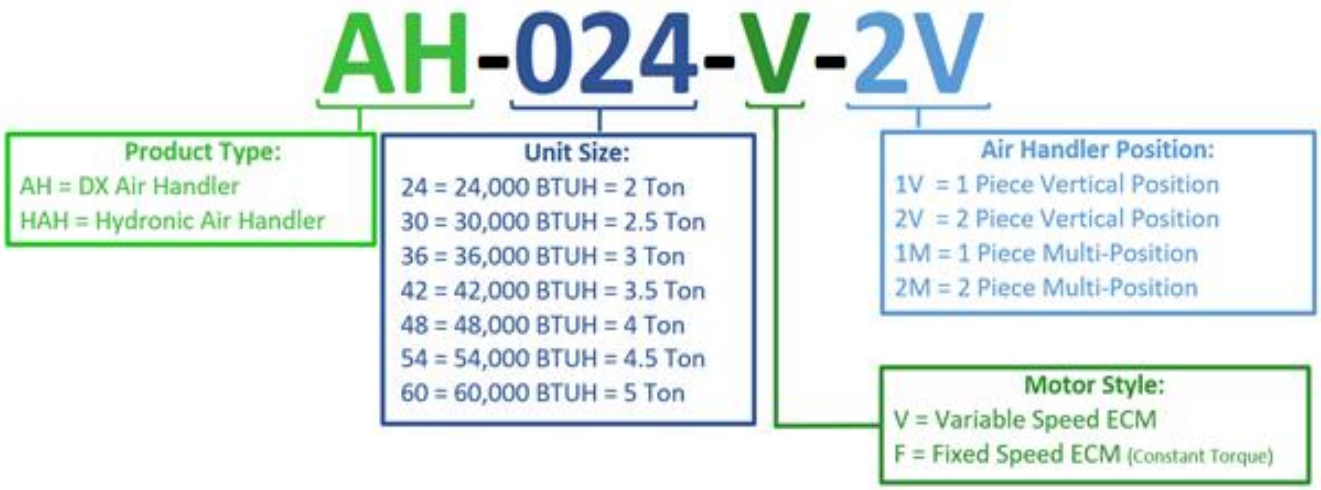
- When the system must be open for service, break vacuum after refrigerant recovery with dry nitrogen and always replace the filter drier.

## 2) EQUIPMENT NOMENCLATURE

### COMPRESSOR UNIT




### Air Handler Unit




## 3) Installation Guide Lines

- All refrigerant and water lines between these above ground components must be insulated with at least 1/2" wall thickness Armaflex, Insul-Tube or equivalent insulation.
- All line set fittings must be factored in when calculating equivalent length.
- Please use the following chart to figure the fittings equivalent length.

**Pipe Fitting Equivalent Lengths**

**Long Radius 90 = 3 ft.** **Coupling = 1 ft.** **Swaged Connection = 1ft.** **45 Degree Elbow = 1.5 ft.**

**Important Note: Short Radius 90° elbows are NOT permitted to be used in any piping.**

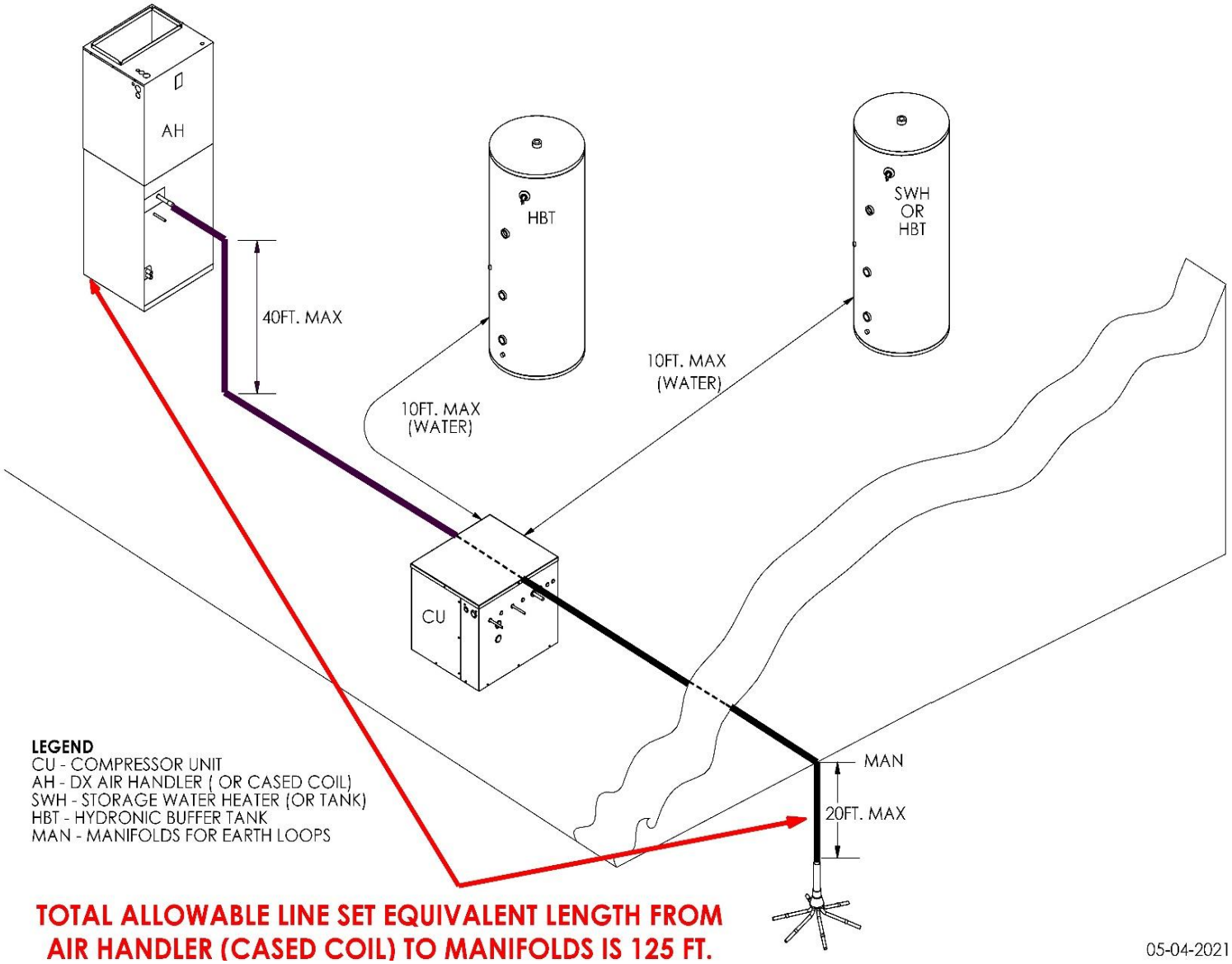

AH
HBT
SWH
OR
HBT
40FT. MAX
10FT. MAX
(WATER)
10FT. MAX
(WATER)
CU
MAN
20FT. MAX
LEGEND
CU - COMPRESSOR UNIT
AH - DX AIR HANDLER ( OR CASED COIL)
SWH - STORAGE WATER HEATER (OR TANK)
HBT - HYDRONIC BUFFER TANK
MAN - MANIFOLDS FOR EARTH LOOPS
TOTAL ALLOWABLE LINE SET EQUIVALENT LENGTH FROM
AIR HANDLER (CASED COIL) TO MANIFOLDS IS 125 FT.
05-04-2021

***Figure 1***

## 4) Compressor Unit Placement

- Total Green Mfg. compressor units may be located inside or outside. If outside, place compressor unit on a standard HVAC outdoor unit pad. If inside, place it on a level, hard surface. If the compressor unit is to be fastened down, see Figure 2 for bracket installation.
- Avoid placing the compressor unit in or near sound sensitive areas of the residence.
- Clearance around the unit for service is illustrated in Figure 3. However, local codes and applicable regulations take precedence.

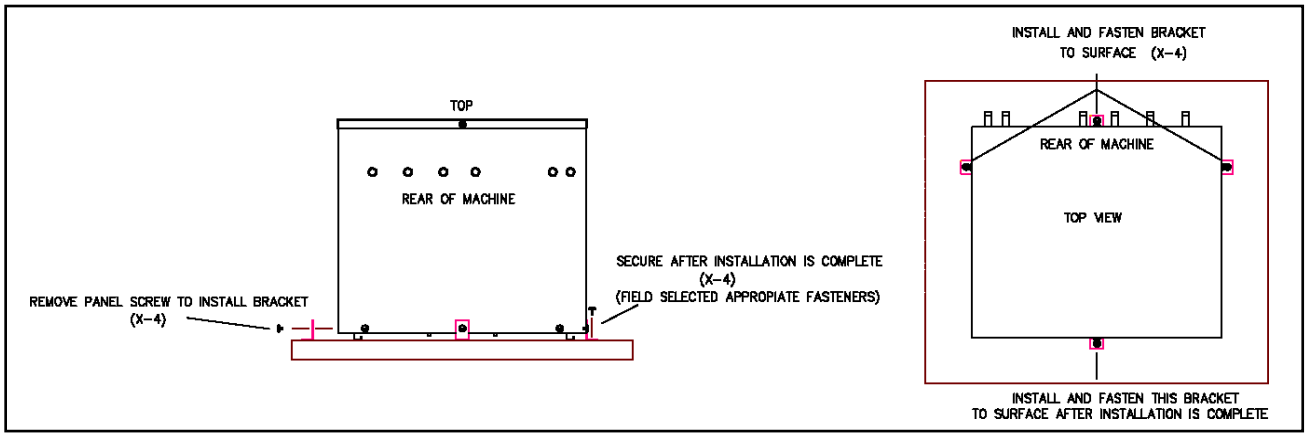



***Figure 2**. Compressor Unit Bracket Installation*

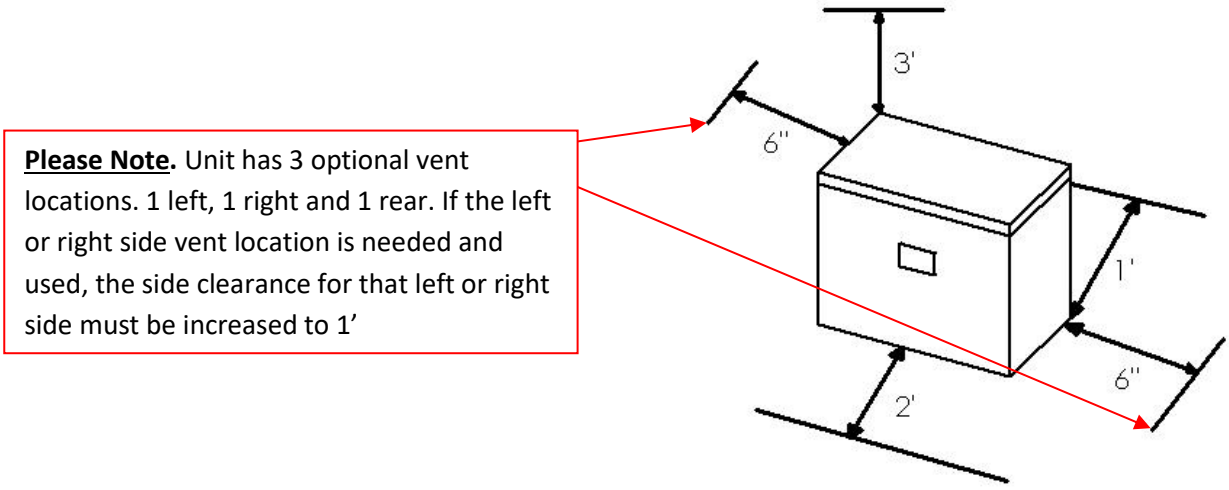
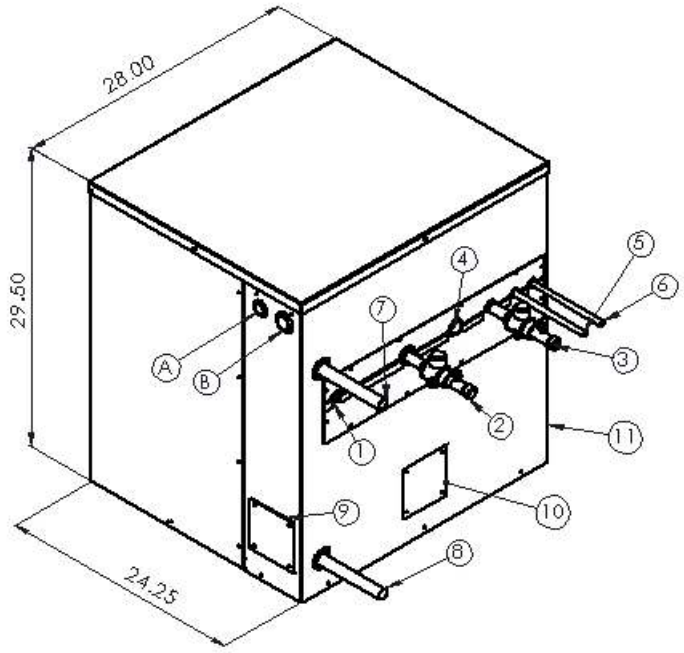



***Figure 3**. Compressor Unit Clearance*

Placement instructions for other pieces of equipment that make up the Total Green Mfg. System are included with those pieces of equipment and, are included in the unit service information package.

## 5) Refrigeration Piping

After the Total Green Mfg. compressor unit and other system components are placed, the refrigeration system tubing is run from the compressor unit to the other components, as appropriate. Figure 4 illustrates the refrigeration and electrical connection points for the compressor unit. **All pipe connections are measured in O.D.**




| PORT | FUNCTION | CONNECTION | |
|---|---|---|---|
| A | ELECTRICAL | 7/8" HOLE | |
| B | ELECTRICAL | 1-1/4" HOLE | |
| | | 3 TON UNIT ONLY | 3.5 THRU 5.5 TON UINTS ONLY |
| 1 | N/A | PLUGGED | PLUGGED |
| 2 | EARTH LOOP LIQUID SERVICE VALVE | 3/8" | ½" |
| 3 | EARTH LOOP VAPOR SERVICE VALVE | 3/4" | 7/8" to 5 TON<br>1 1/8" 5.5 TON |
| 4 | N/A | PLUGGED | PLUGGED |
| 5 | (OPT.) DESUPERHEATER OUT | ½" | |
| 6 | N/A | ½" | |
| 7 | HX OUT | 1 1/8" | |
| 8 | (OPT.) DESUPERHEATER IN | 1 1/8" | |
| 9, 10 and 11 | (OPT.) VENTS | See Leak Mitigation Manual for Details on Venting | |

***Figure 4**. Connections*

Compressor units are shipped from the factory with a dry nitrogen holding charge and Isolation Valves on all unit refrigerant line connections. **DO NOT** open these service valves until all brazing is complete and all connected components have been swept with dry nitrogen. Please refer back to Section 1) page 5, POE OIL PRECAUTIONS.

## REQUIREMENT

**REFRIGERANT PIPING CONNECTIONS**

**Refrigerant joints must be brazed with 15% silver content brazing alloy,** utilizing the DRY NITROGEN BRAZING PROCESS.

## CAUTION!

**NITROGEN BRAZING PROCESS**

**PURPOSE: Utilize the DRY NITROGEN BRAZING PROCESS on all brazed refrigerant piping connections. This process eliminates oxidation products from inside joint surfaces.**

**TECHNIQUE: "Trickle" dry nitrogen gas at 1-2 psi pressure through the joint area being brazed, to displace the oxygen. When oxygen has been displaced, turn off the dry nitrogen, and relieve the pressure at the joint to atmospheric prior to brazing.**

**CONSEQUENCES: Failure to displace oxygen with dry nitrogen at the brazed joint will result in particulate matter being released into the system. The result is discoloration of refrigerant oil, contamination of the system and possible system failure.**

## !!!REQUIREMENT!!!

**Dry nitrogen should always be flowing through unit and any component and/or piping even when not brazing. This is to prevent atmosphere which contains moisture from entering the system which will make its way to the compressor oil. This moisture cannot be vacuumed out of the oil once captured. Only the filter/drier removes this moisture.**

**Please refer back to Section 1) page 5, POE OIL PRECAUTION**

For field supplied line set sizes, refer to Figure 5. Line set sizes are for field manifolds to compressor unit. Lines set length is from field manifolds to air handler or cased coil with the compressor being anywhere in between. Line set length **cannot** exceed 125 ft. of equivalent length. For maximum efficiency, line set lengths should not exceed 100 ft. Line set lengths as stated are equivalent lengths, not actual. Fittings must be accounted for. Example; a coupling is equal to 1 ft. of line set and a long radius elbow is equal to 3 ft. of line set. In addition, never use close radius elbows in the system piping.

**Pipe Fitting Equivalent Lengths**

**Long Radius 90 = 3 ft. Coupling = 1 ft. Swaged Connection = 1 ft. 45 Degree Elbow = 1.5 ft.**

**Important Note: Short Radius 90° elbows are NOT permitted to be used in any piping.**

**LINE SET PIPING MAY REQUIRE ADAPTERS. TOTAL GREEN MFG. ATTACHES AND SHIPS THESE ADAPTERS WITH COMPONETS AS REQUIRED. HOWEVER, SOME ADAPTERS MAY NEED TO BE FIELD SUPPLIED. PLEASE BE SURE TO REVIEW THE REQUIRED LINE SET SIZE CHART BELOW TO ACCOUNT FOR ANY NEEDED ADAPTERS.**

## R-454B EARTHLOOP LINE SETS

| COMPRESSOR UNIT SIZE | R-454B LINE SET O.D., INCHES | |
|---|---|---|
| | LIQUID | VAPOR |
| 3.0 Tons (-036) | 3/8 | 3/4 |
| 3.5 Tons (-042) | 1/2 | 7/8 |
| 4.0 Tons (-048) | 1/2 | 7/8 |
| 4.5 Tons (-054) | 1/2 | 7/8 |
| 5.0 Tons (-060) | 1/2 | 7/8 |
| 5.5 Tons (-066) | 1/2 | 1-1/8 |

***Figure 5**. Units using R-454B*

## 6) Service Valves

All Total Green Mfg. “H” units’ ship with service valves for the field connections installed and approximately 75 P.S.I.G. of dry nitrogen in the compressor unit. These valves are used to isolate the field from the compressor unit. These valves are to remain closed until all components and piping is complete and has been swept with dry nitrogen.

**These valves MUST be wrapped with wet rags when brazing to protect them from heat damage.**

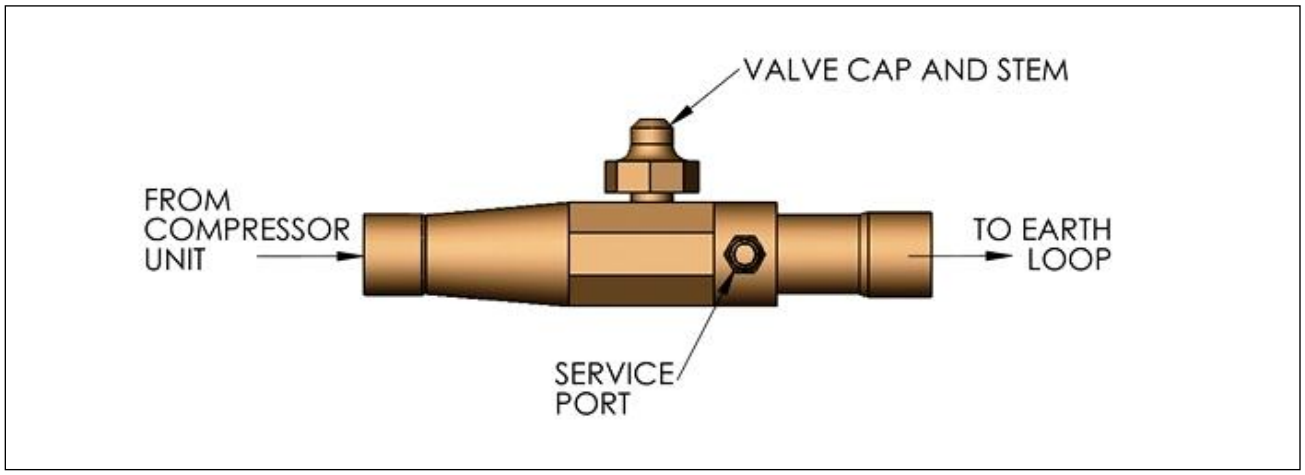



***Figure 6.*** *Ball Valve*

Please refer to the applicable manual for installation of other Total Green Mfg. equipment:

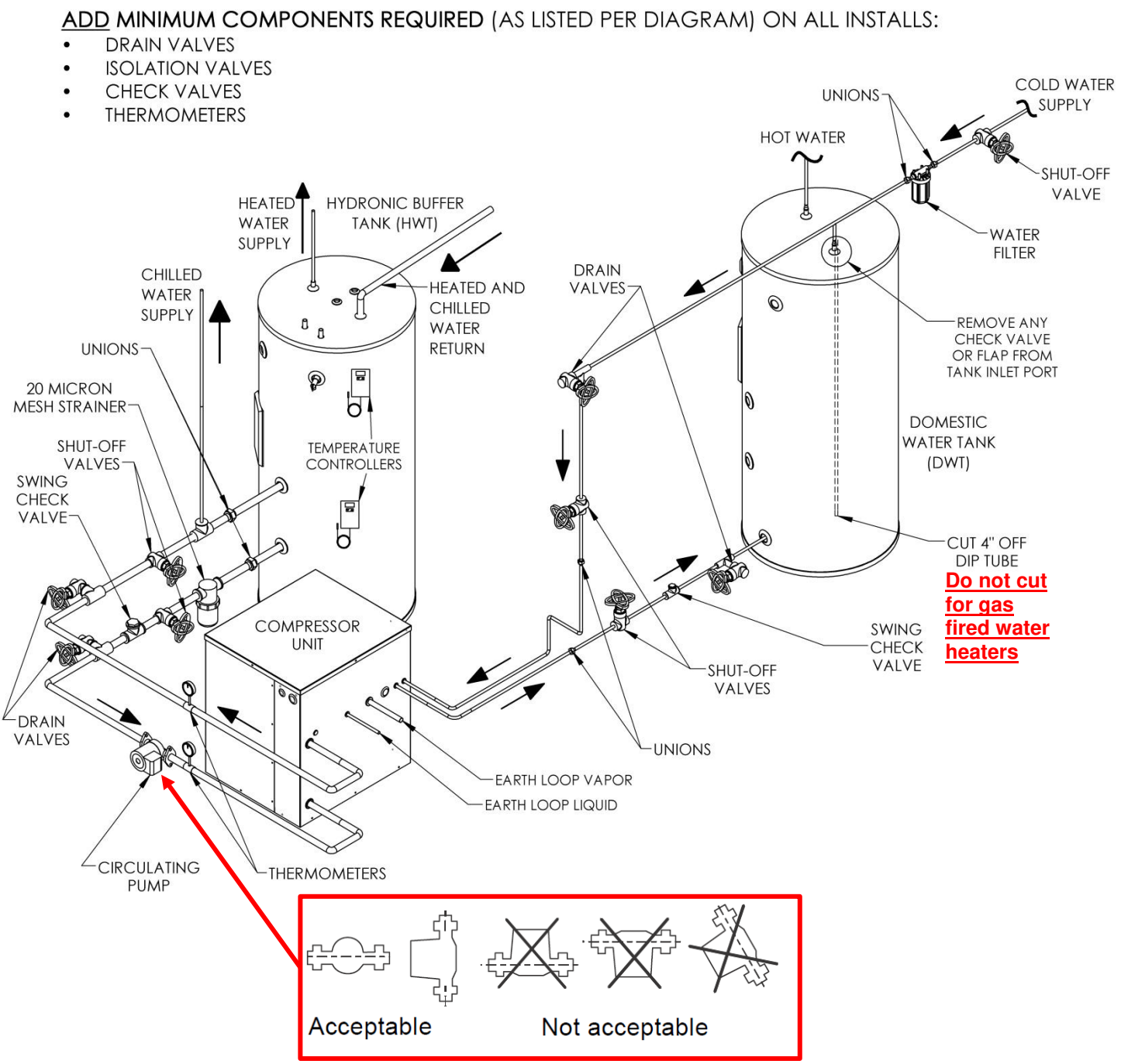
- ***Water Tanks***
- ***Earth Loops***

After installing, dry nitrogen brazing and, dry nitrogen sweeping the HVAC system components, turn the Service Valves to **Full Open** releasing the compressor unit’s dry nitrogen charge into the rest of the system. Add additional dry nitrogen as needed to pressurize the refrigeration system to 150 psig. Valve off the dry nitrogen tank from the HVAC system components and check for leaks. Please follow the seal test procedures later in this manual.

**NOTE:** Service valve ports are open to the earth loop side of the system when service valves are closed. This provides a means to isolate the field for dry nitrogen purging, pressure testing, etc. without exposing the compressor unit to atmosphere.

## 7) Storage Tanks and Water Piping

Refer to Figure 7. Shown with optional Desuperheater.




**Important:** The circulating pump must be installed with the motor shaft positioned horizontally. Under no circumstances should the pump be installed with the shaft vertical or where the shaft falls below the horizontal plane.

**Figure 7**. Typical WG1H Primary Hydronic Circuit Plumbing

# The components are as follows:

1. **Circulating Pump:** Circulating pumps, flange kits and mounting brackets are included and ship with the equipment. The design flow rate of the water circuit for the WG1H should be 3 to 4 GPM per unit ton. This should be easily accomplished using the supplied circulator pump and following the piping instruction set forth in this manual. To verify the appropriate flow rate through the compressor unit heat exchanger, begin by fastening thermocouples securely on the water supply and water return copper stub outs of the compressor unit. Start the unit in heating mode. After the system has stabilized, determine the temperature differential between the supply temperature and the return temperature. The flow rate is correct if the temperature differential is 8 degrees or less. Ideally, no more than 7 degrees. If the temperature differential is higher than 8 degrees, corrections are to be made as needed to raise the flow rate.

2. **Important:** The circulating pump must be installed with the motor shaft positioned horizontally. Under no circumstances should the pump be installed with the shaft vertical or where the shaft falls below the horizontal plane.

3. **Temperature Controllers:** Digital thermostats can be provided by Total Green Mfg. These thermostats can be mounted remotely and come with a Sensor Wire 6.5 feet long.

3. **Tank:** Tanks are available through Total Green Mfg. in 80 and 119/120 US Gallon capacities, and are designed for use with Waterless® geothermal systems. These tanks are equipped with a 4.5 kW supplemental electric heating element.

4. **Other Plumbing Components and Parts:** Fittings, isolation valves, drain valves, strainer, unions, copper pipe, pipe insulation, etc. meeting USA industry and local code standards are commercially available through plumbing supply outlets. All elbows should be long radius and all valves should be full port.

All plumbing installations are to be in accordance with the applicable local and national codes.

Required minimum and recommended tank capacities and piping sizes are shown in Figure 8, for the nominal tonnage of the compressor unit specified. All field supplied tanks and piping must match what is listed.

| *Compressor Unit Model/Capacity, BTUH* | *Tank Size, US Gallons* | *Minimum Nominal Type L Hard Copper Pipe & Fittings, inches* |
|---|---|---|
| 3, 3.5 Ton (36 and 42) | 60, 80 | 1-1/4 I.D. |
| 4,4.5 and 5 Ton (48,54 and 60) | 80, 119/120 | 1-1/2 I.D. |
| 5.5 (66) | 119/120 | 1-1/2 I.D. |

***Figure 8.*** *Storage Tank Capacity per Unit Size*

**Note: All water piping to be insulated with ½ inch wall pipe insulation.**

## 8) Hydronic Heated & Chilled Water Specifications

| Water Flow Design Guide = 3 to 4 GPM per ton | | | |
|---|---|---|---|
| Hydronic Water Design Temp | | *Up to 110°F [1] | *Down to 42°F [2] |
| System Size[3] | System Capacity | Heating Flow Rate in GPM | Cooling Flow Rate in GPM |
| 3 Ton | 36,000 BTU | 9 to 12 gpm | 9 to 12 gpm |
| 3½ Ton | 42,000 BTU | 10.5 to 14 gpm | 10.5 to 14 gpm |
| 4 Ton | 48,000 BTU | 12 to 16 gpm | 12 to 16 gpm |
| 4½ Ton | 54,000 BTU | 13.5 to 18 gpm | 13.5 to 18 gpm |
| 5 Ton | 60,000 BTU | 15 to 20 gpm | 15 to 20 gpm |
| 5½ Ton | 66,000 BTU | 16.5 to 22 gpm | 16.5 to 22 gpm |

* All temperatures given are as measured from the outlet pipe of the unit heat exchanger.
[1] We recommend using a 100°F heating design temperature. The maximum heating design temperature is 110°F
[2] We recommend using a 45°F cooling design temperature. The minimum cooling design temperature is 42°F
[3] For all units, a minimum of 20% Propylene Glycol with inhibitor is required for anti-freeze and corrosion protection.

**FAILURE TO USE ANTIFREEZE WILL VOID THE MANUFACTURER'S LIMITED WARRANTY**

### Hydronic Water Heating Maximum Temperature is 110°F as Measured at the Heat Exchanger Outlet

**The water tank thermostat should be adjusted, regardless of the temperature shown on its display, to satisfy the call when the above condition is met. It is also recommended, for maximum efficiency, that the water temperature as measured from the water outlet of the heat exchanger be kept at 100°F or less. Your hydronic heating distribution, such as a radiant floor system, should be designed to operate at 100°F or less. If a hydronic water temperature higher than 110°F is desired, that difference in temperature should be made up with a supplemental heat source.**

### Hydronic Chilled Water Minimum Temperature is 42°F as Measured at the Heat Exchanger Outlet

**The water tank thermostat should be adjusted, regardless of the temperature shown on its display, to satisfy the call when the above condition is met. It is also recommended, for maximum efficiency, that the water temperature as measured from the water outlet of the heat exchanger be kept at 45°F or higher. Your hydronic cooling distribution, such as a chilled water air handlers, should be designed to operate at 45°F or higher.**

## 9) Antifreeze Protection

The water circulating system must be protected from potential damage from corrosion, build-up and freeze-up by utilizing a 20% minimum of Propylene-glycol antifreeze with an Inhibitor to water solution. This antifreeze protection is provided by the installer prior to system start-up. Prior to adding glycol with an inhibitor, **tank anode rods**, if any, **must be removed so as not to react with the glycol and inhibitor**.

Propylene-glycol antifreeze solution with an inhibitor is the type of antifreeze solution required for Total Green Mfg. products utilized in hydronic heating and chilled water systems. These systems shall be freeze protected consistent with the application-specific minimum temperature as shown in the table below. Propylene-glycol antifreeze solutions should always be in the range of 20% to 50% by volume, as indicated in Figure 9.

| TEMPERATURE, °F | PROPYLENE GLYCOL, % |
|---|---|
| 18 | 20 |
| 8 | 30 |
| -7 | 40 |
| -29 | 50 |

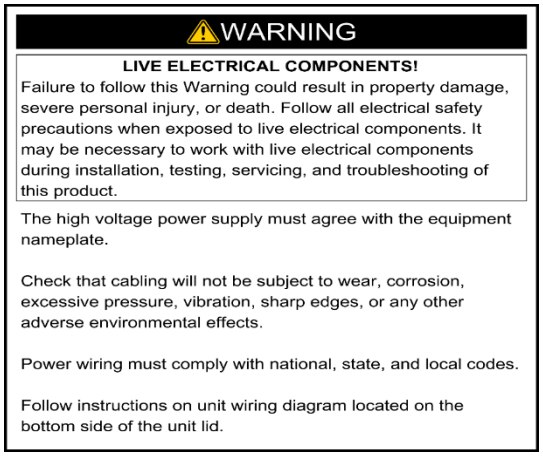
***Figure 9.*** *Propylene Glycol Freeze Protection Table*

**ALWAYS REMOVE THE ANODE ROD(S) FROM THE STORAGE TANK UTILIZED IN A HYDRONIC WATER CIRCUIT. IF THE ANODE ROD(S) ARE NOT REMOVED, THE PROPYLENE-GLYCOL SOLUTION WILL REACT WITH THE ANODE ROD(S) TO CREATE PARTICLES THAT BLOCK FLOW AND CAUSE SYSTEM FAILURE.**

Please refer to the applicable manual for installation of other Total Green Mfg. equipment such as:

- ***Water Tanks***
- ***Earth Loops***
- ***Hydronic Air Handlers***

## 10) Electrical Data and Field Control Wiring



**⚠WARNING**

**LIVE ELECTRICAL COMPONENTS!**

Failure to follow this Warning could result in property damage, severe personal injury, or death. Follow all electrical safety precautions when exposed to live electrical components. It may be necessary to work with live electrical components during installation, testing, servicing, and troubleshooting of this product.

The high voltage power supply must agree with the equipment nameplate.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects.

Power wiring must comply with national, state, and local codes.

Follow instructions on unit wiring diagram located on the bottom side of the unit lid.

**Please Note:** Electrical data is subject to change without notice. Please refer to the equipment data label for the most

| WG-1-XXX-D-1-XX R-454B SINGLE STAGE SINGLE PHASE | | | | | |
|---|---|---|---|---|---|
| **TON** | **SINGLE PHASE** | **LRA** | **RLA** | **MCA** | **MFS** |
| **3 TON (036)** | 230V - 60HZ | 123 | 17.3 | 21.6 | 35 |
| **3.5 TON (042)** | 230V - 60HZ | 126 | 22.4 | 28 | 40 |
| **4 TON (048)** | 230V - 60HZ | 143 | 21.8 | 27.3 | 40 |
| **4.5 TON (054)** | 230V - 60HZ | 155 | 25.6 | 32 | 45 |
| **5 TON (060)** | 230V - 60HZ | 170 | 30.1 | 37.9 | 50 |
| **5.5 TON (066)** | 230V - 60HZ | 183.9 | 32.8 | 41 | 55 |
| MFS = Maximum Fuse or HACR Circuit Breaker Size<br>MCA = Minimum Circuit Ampacity | | | | | |

| WG-1-XXX-D-2-XX R-454B SINGLE STAGE THREE PHASE | | | | | |
|---|---|---|---|---|---|
| **TON** | **3 PHASE** | **LRA** | **RLA** | **MCA** | **MFS** |
| **3 TON (036)** | 230V - 60HZ | 102.8 | 12.8 | 16 | 25 |
| **3.5 TON (042)** | 230V - 60HZ | 120.4 | 12.8 | 16 | 25 |
| **4 TON (048)** | 230V - 60HZ | 156.4 | 16 | 20.0 | 30 |
| **4.5 TON (054)** | 230V - 60HZ | 155 | 18.6 | 23.3 | 35 |
| **5 TON (060)** | 230V - 60HZ | 156.5 | 21.2 | 26.5 | 40 |
| MFS = Maximum Fuse or HACR Circuit Breaker Size<br>MCA = Minimum Circuit Ampacity | | | | | |

## Field Wiring

Refer to compressor unit wiring diagram on the underside of the cabinet lid for more detail.

Refer to figure 10 for field wiring as it pertains to your equipment.

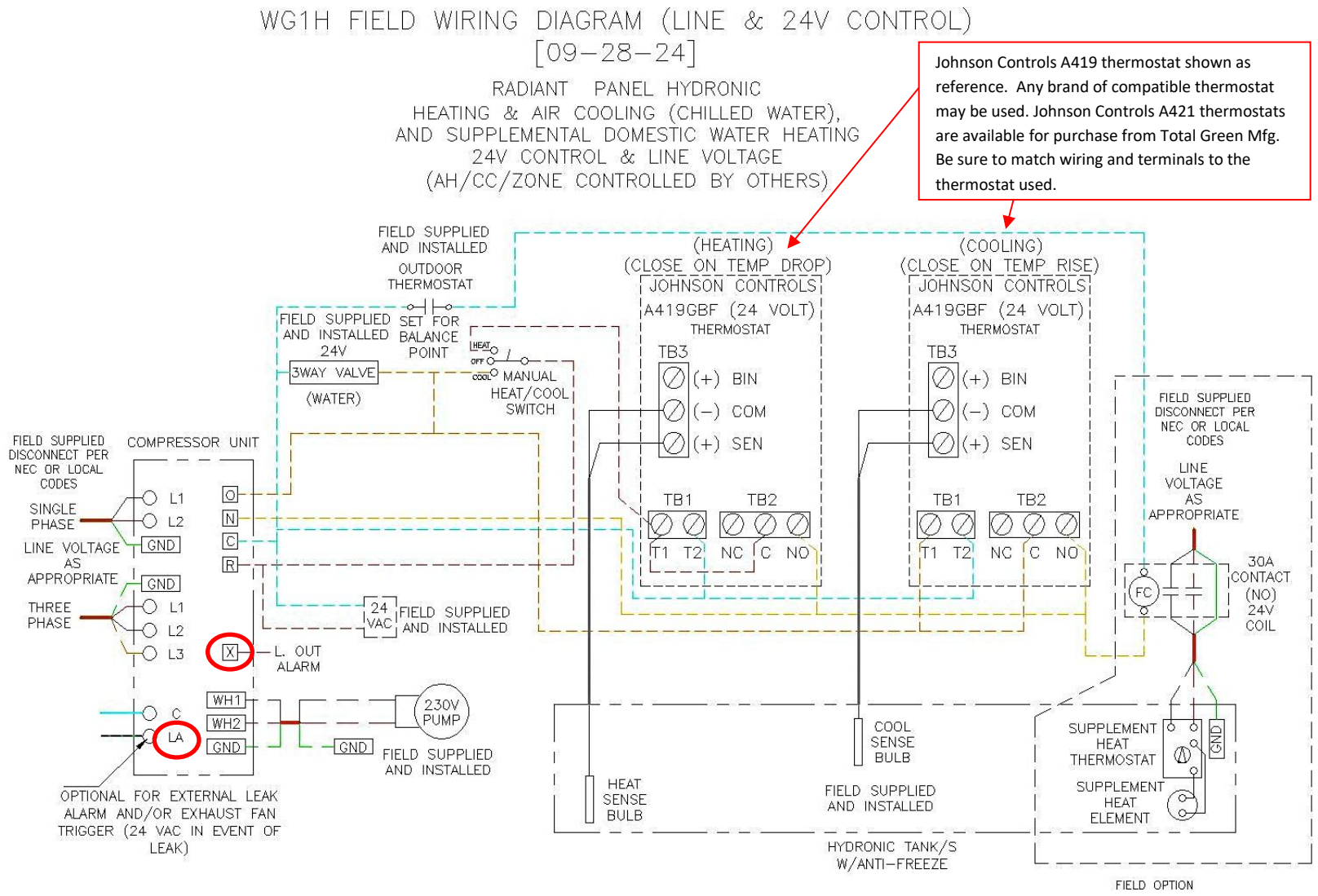



***Figure 10**. WG1H Field Wiring Diagram*

## 11) Using the “X” and “LA” terminals

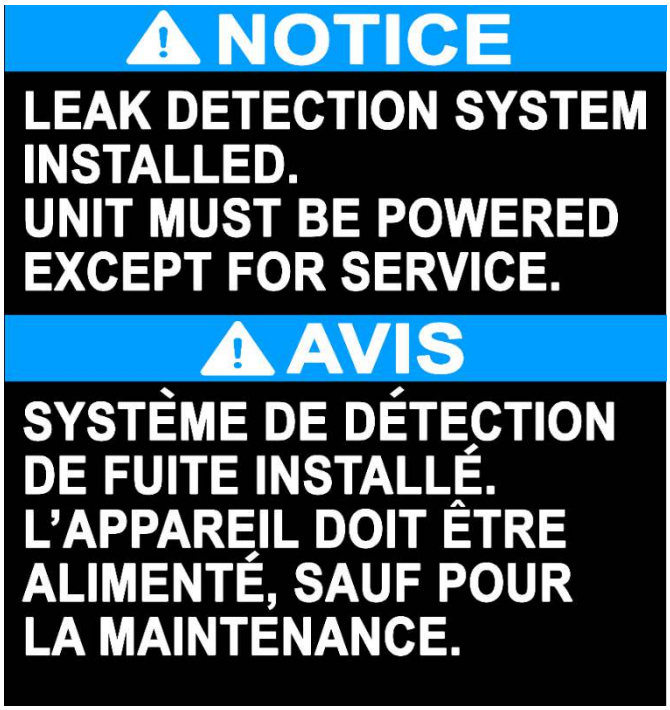
**Using the “X” terminal**. Please note the “X” terminal circled in red on figure 10 on page 17. All Total Green Mfg. Waterless® Geothermal units utilize the “X” terminal along with an LED fault indicator light located above the “X” terminal on the field wiring terminal strip of the unit’s electrical box. In the event of a system lock out, low pressure, high pressure, discharge temperature fault or, a refrigerant leak having been detected, the “X” terminal energizes so that 24 volts can be read between ”X” and the common terminal “C”. The LED fault light will also light indicating a system lockout. The lockout circuit is in place to protect the compressor unit from damage in the event the operating parameters of the system are out of range and, in the event of a refrigerant leak having been detected. Should a lockout occur, the system should be evaluated and, any corrections are to be made prior to placing the unit back into service. Please note that repeatedly resetting the lockout without any needed service can still result in compressor damage and may void the equipment warranty.

## Using the “LA” terminal

**Using the “LA” terminal**. Please note the “LA” terminal circled in red on figure 10 on page 18. All Total Green Mfg. Waterless® Geothermal units utilize the “LA” terminal along with an LED fault indicator light located above the “LA” terminal on the field wiring terminal strip of the unit’s electrical box. “LA” is a refrigerant leak alert signal. The compressor unit is equipped with an A2L refrigerant leak sensor.

If the sensor detects a refrigerant leak, the unit will go into lockout mode disabling the compressor and, the “LA” (Leak Alert) light along with the “X” (Lock Out) will turn on along with the “LA” terminal being energized with 24 volts AC. This terminal can be used as a trigger, if required by your local building codes, to set off a remote alarm and/or trigger a mechanical room exhaust fan in the event of a refrigerant leak. Please refer to the “Leak Mitigation Manual” in the unit’s service information packet for more information about leak mitigation as it applies.

**Leak Sensor Information: The leak sensors used in Total Green’s Waterless® Geothermal systems are designed for no less than a 15 year service life. Should a sensor failure occur during the life of the system, contact Total Green. Mfg. for replacement. No other sensor type nor source should be considered. A sensor failure will result in the equipment staying in leak mitigation mode.**




## 12) Seal Test

After brazing in the earth loop system (includes manifolds, earth loops and earth loop line set, but NOT the

**WARNING!**

**To avoid personal injury and equipment damage, follow all safety procedures set forth by OSHA, in the handling of high pressure gases. Always use a pressure regulator and hoses that are capable of withstanding the pressures prescribed herein. Do not subject system components OTHER than the earth loop/manifold/line set configuration to 400 PSIG dry**

compressor unit or any other HVAC refrigeration system component), the complete underground system is to be seal tested with at least 400 PSIG of dry nitrogen. After connecting a high pressure hose from the regulator on the nitrogen tank to a Schrader port temporarily installed on the vapor line of the line set, slowly increase the dry nitrogen pressure to no less than 400 PSIG while checking for any obvious leaks audibly.

If no audible leaks are detected, check all joints to ensure they are sealed, by one of the following methods:

1. Ultrasonic Leak Detector or Bubble Solution Leak Detector
2. Electronic Leak Detector (requires a trace amount of refrigerant in the system)

**IMPORTANT – LOOP READINESS**

**Check for leaks by either of these methods or any other reliable method to ensure that there are no leaks and the earth loop system is sealed! It is absolutely necessary that the earth loop/manifold/line set assembly be completely sealed at no less than 400 psig of dry nitrogen. Recheck all leak detector readings. Local codes may require higher loop testing pressures. Always abide by your local codes.**

When the line set/manifolds/earth loops are deemed leak free and sealed, **valve off the nitrogen source and monitor the pressure on the underground system to ensure that at least 400 psig has been maintained for minimum of 8 hours.**

Monitor the pressure reading during the backfilling operation to ensure that the earth loop system remains sealed.

**Important:** Final Whole System Seal Test.

After having tested the field at no less than 400 P.S.I. as stated above, once the remaining equipment such as the compressor unit, air handler or cased coil, ETC, is installed, and the unit service valves have been open, the entire system should be pressurized to 150 P.S.I. and left to stand for a min. of 8 hours for a total system seal test.

**Please refer to your Vacuum and Charging procedures manual in your unit's service packet for startup**

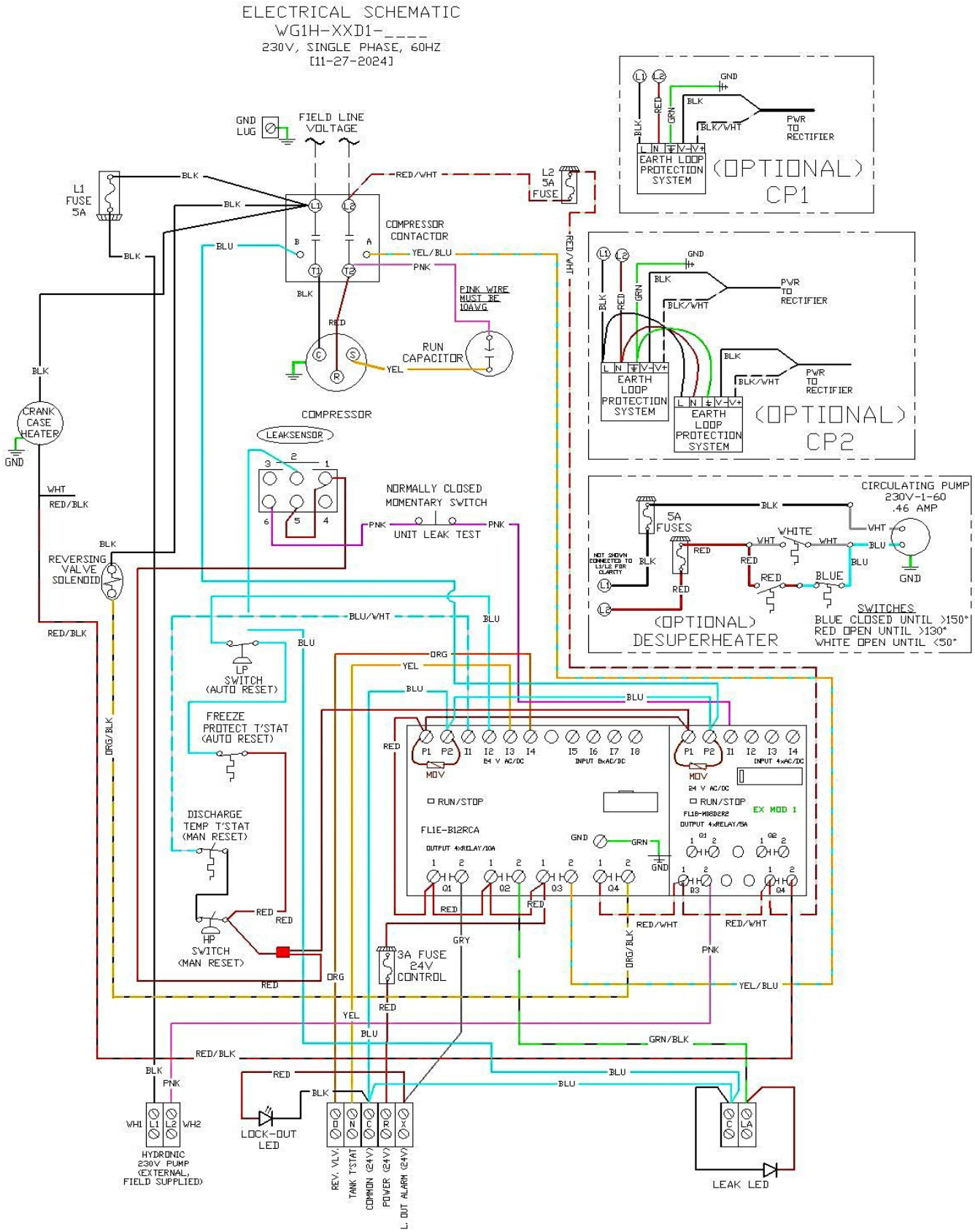
If you have any questions regarding these procedures, please contact Total Green Mfg. technical support at 419-678-2032.

**!IMPORTANT!**

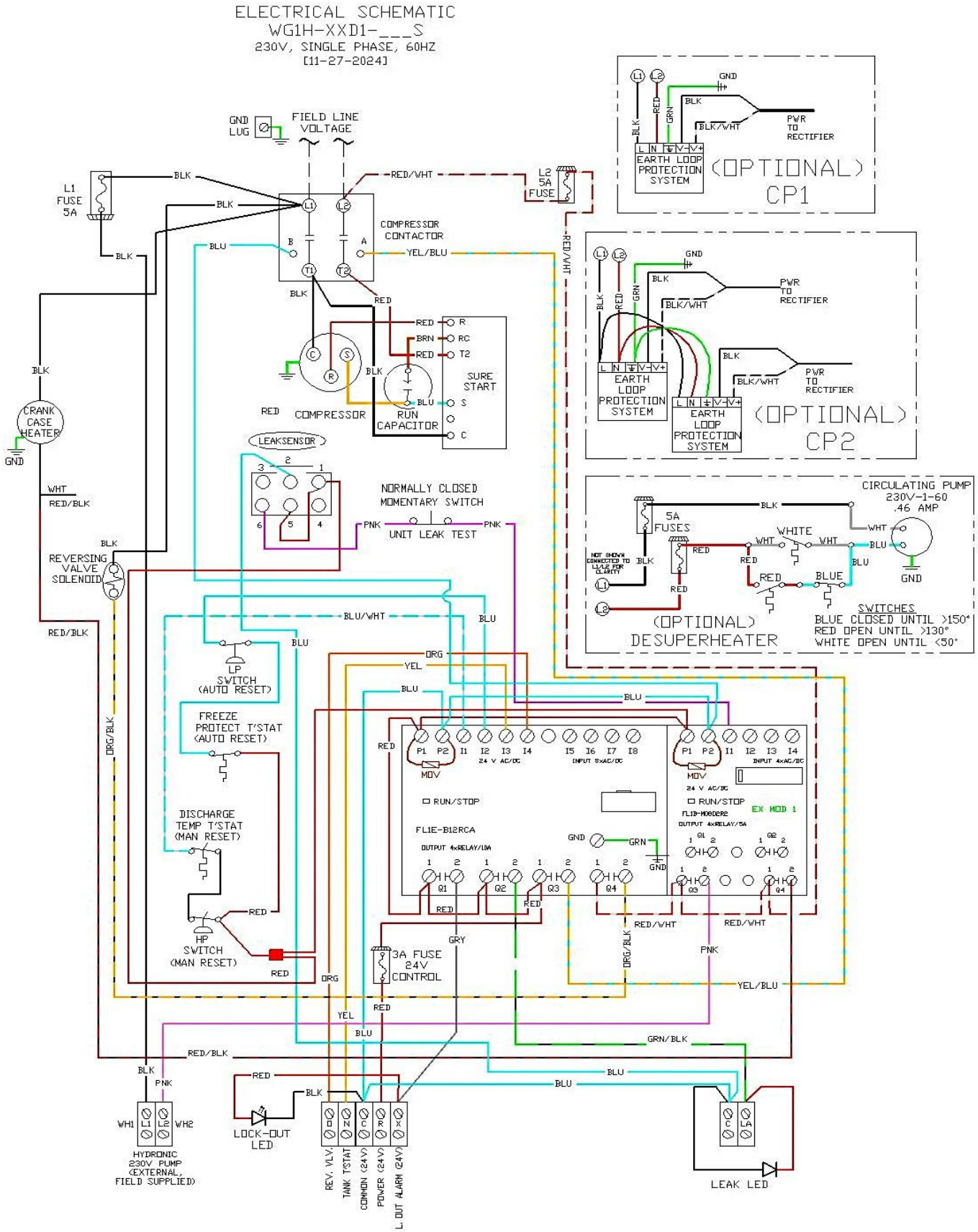
**If any specifications in this manual that cannot be met, contact Total Green Mfg. for a possible solution and approval. Any approved solutions that differ from the specifications in this manual must be approved with a written variance from Total Green Mfg.**

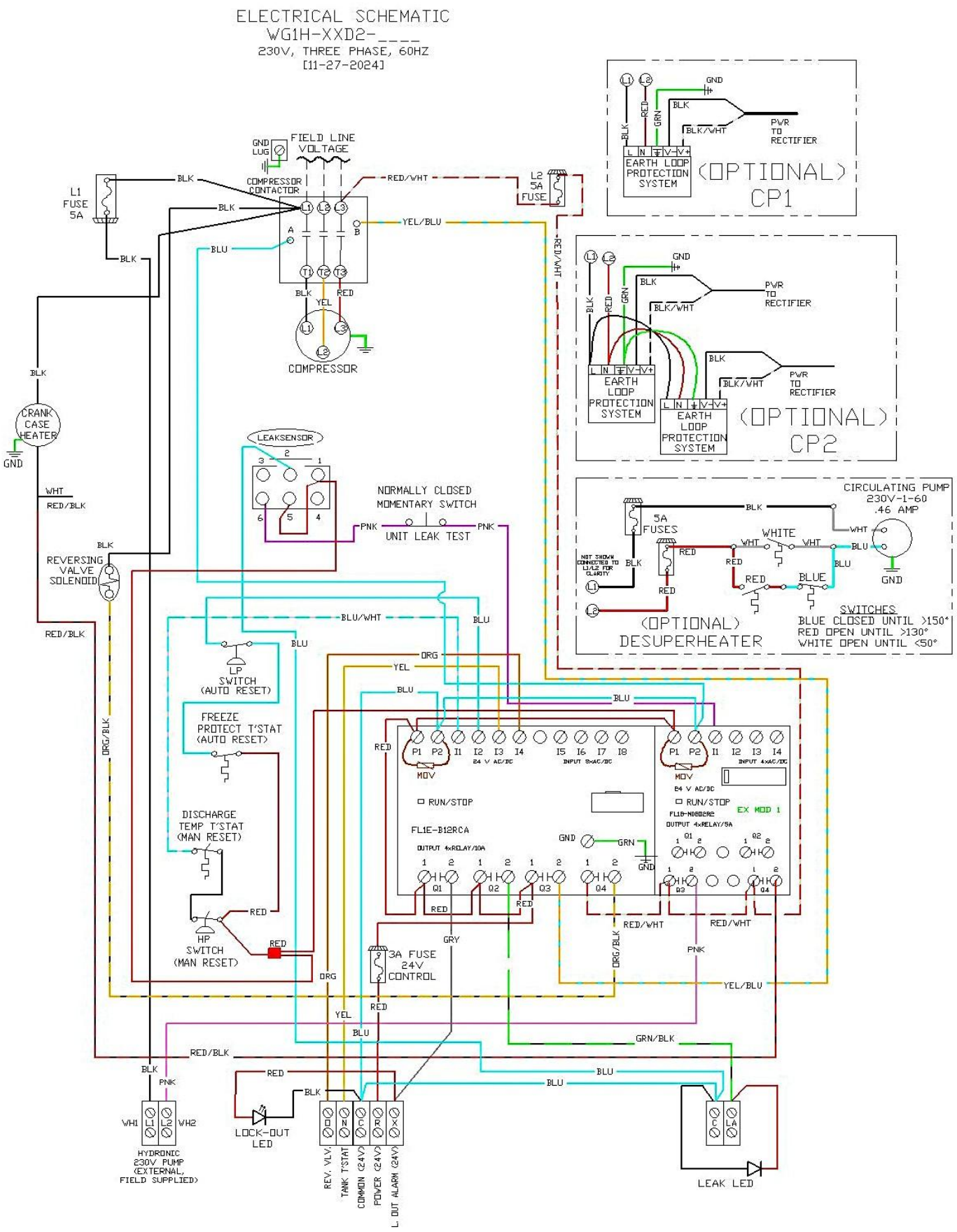
## 13) Compressor Unit Wiring Schematics

WG1H Without Sure Start, Single phase, 230 Volts



# WG1H With Sure Start, Single phase, 230 Volts

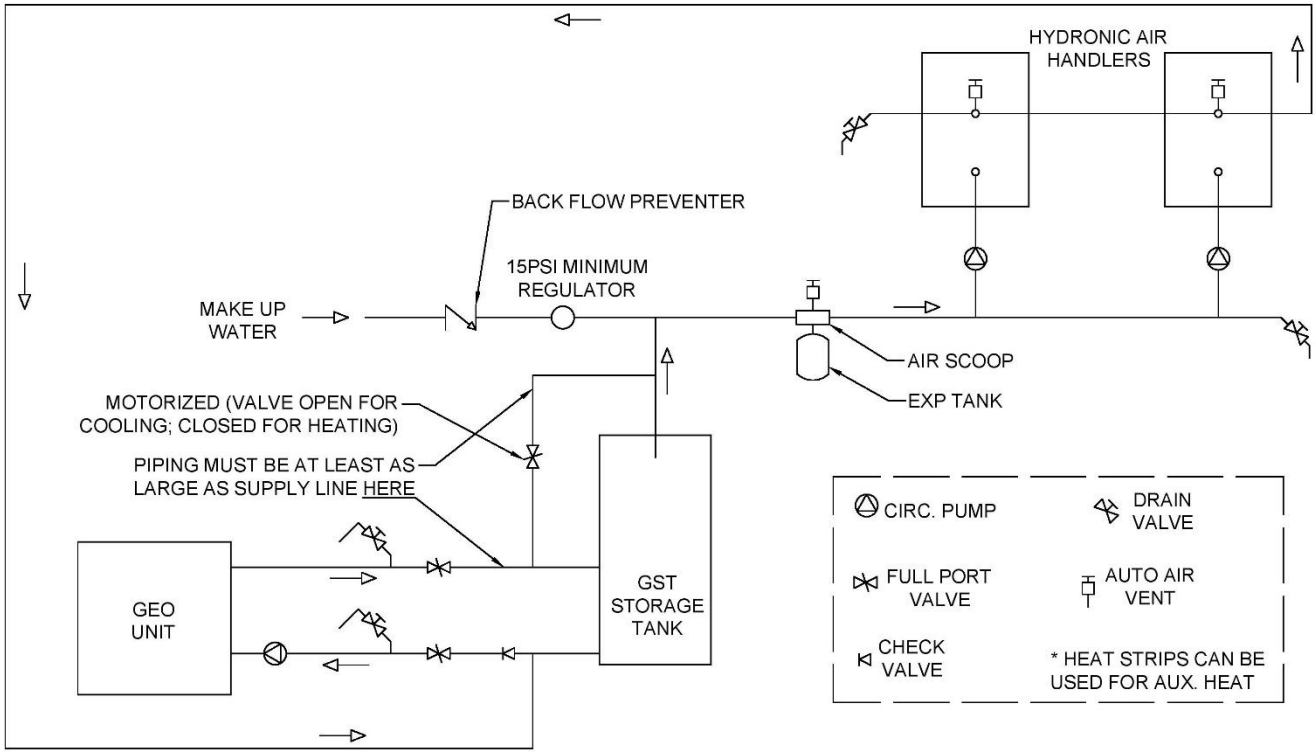



ELECTRICAL SCHEMATIC
WG1H-XXD2-____
230V, THREE PHASE, 60HZ
[11-27-2024]
FIELD LINE VOLTAGE
GND LUG
COMPRESSOR CONTACTOR
L1 FUSE 5A
L2 5A FUSE
COMPRESSOR
CRANK CASE HEATER
LEAKSENSOR
NORMALLY CLOSED MOMENTARY SWITCH
UNIT LEAK TEST
REVERSING VALVE SOLENOID
LP SWITCH (AUTO RESET)
FREEZE PROTECT T'STAT (AUTO RESET)
DISCHARGE TEMP T'STAT (MAN RESET)
HP SWITCH (MAN RESET)
3A FUSE 24V CONTROL
LOCK-OUT LED
LEAK LED
HYDRONIC 230V PUMP (EXTERNAL, FIELD SUPPLIED)
REV. VLV.
TANK T'STAT
COMMON (24V)
POWER (24V)
L. OUT ALARM (24V)
EARTH LOOP PROTECTION SYSTEM
PWR TO RECTIFIER
(OPTIONAL) CP1
(OPTIONAL) CP2
CIRCULATING PUMP 230V-1-60 .46 AMP
5A FUSES
(OPTIONAL) DESUPERHEATER
SWITCHES
BLUE CLOSED UNTIL >150°
RED OPEN UNTIL >130°
WHITE OPEN UNTIL <50°
FL1E-B12RCA
RUN/STOP
EX MOD 1

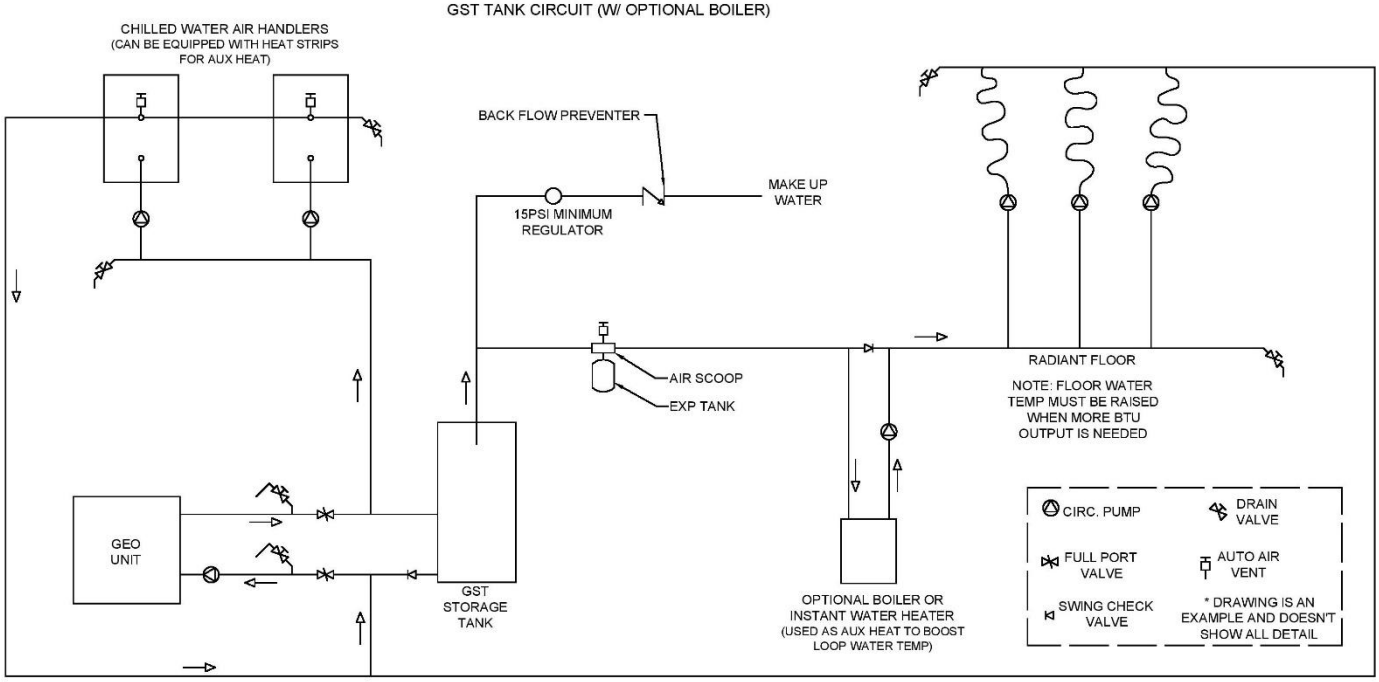
## 14) Generic Distribution Piping, Tank and Design Examples

The following examples are for reference only as a guide to assist in the proper design of your hydronic distribution system.

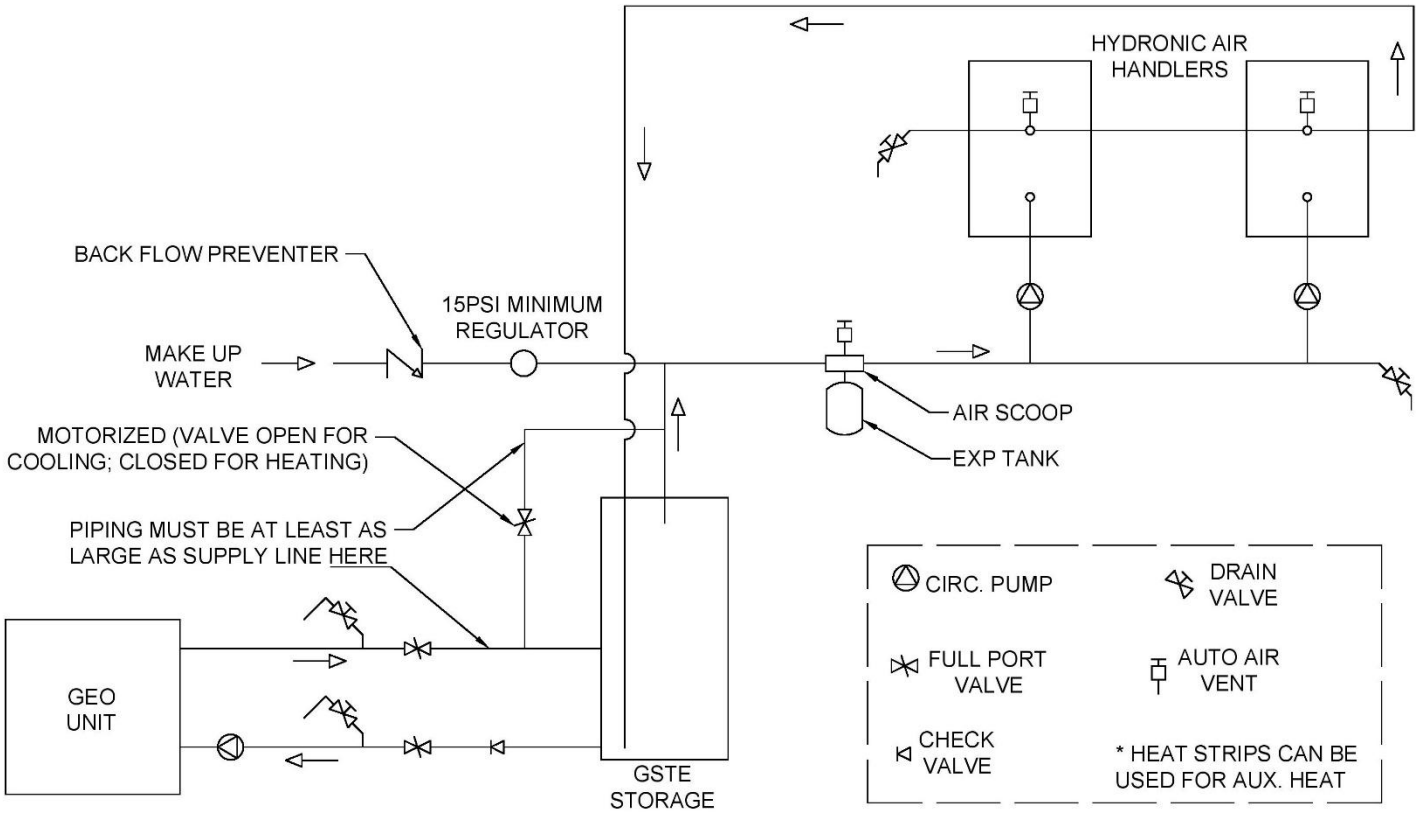
GST TANK CIRCUIT (AIR HANDLERS ONLY)

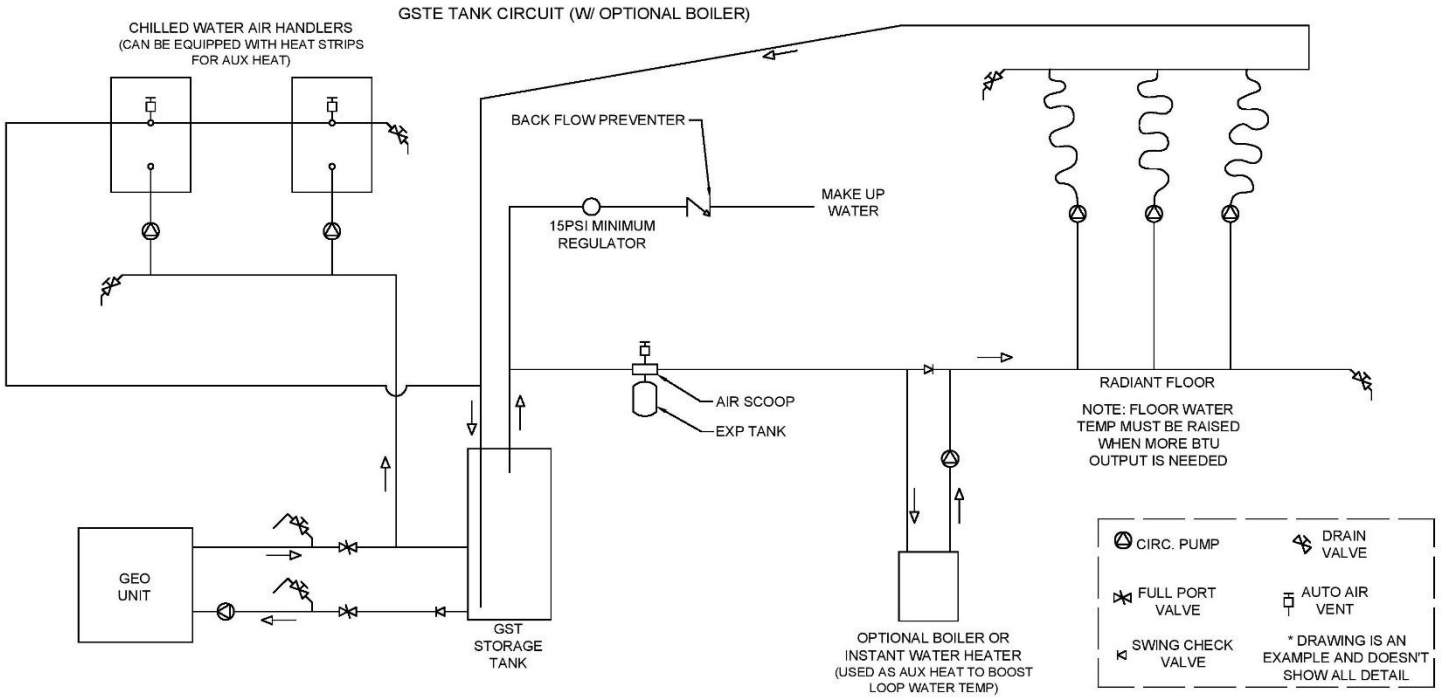



GST TANK CIRCUIT (W/ OPTIONAL BOILER)

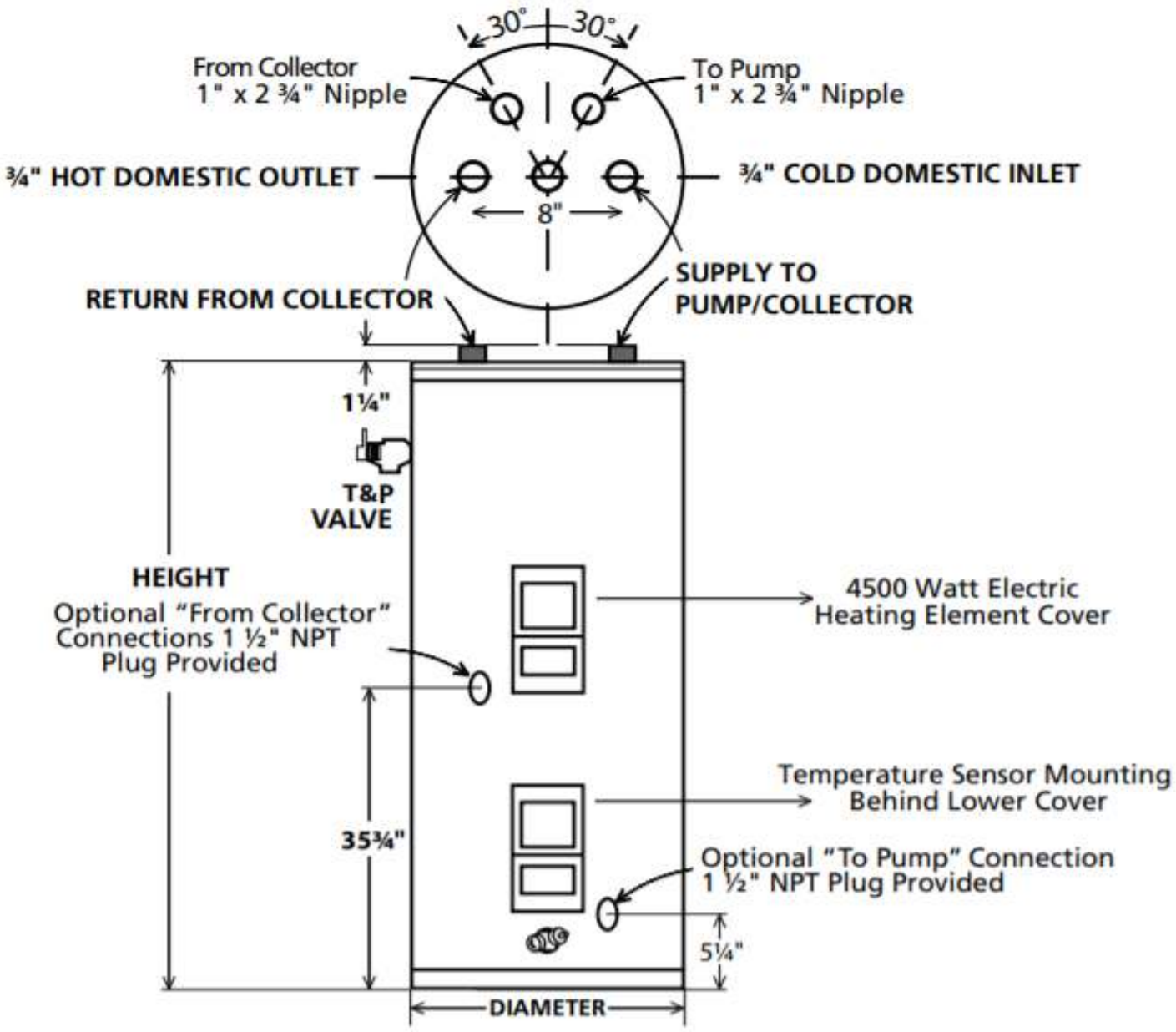


GSTE TANK CIRCUIT (AIR HANDLERS ONLY)



## Use the below drawing as reference for tank pipe connections.



Notes: