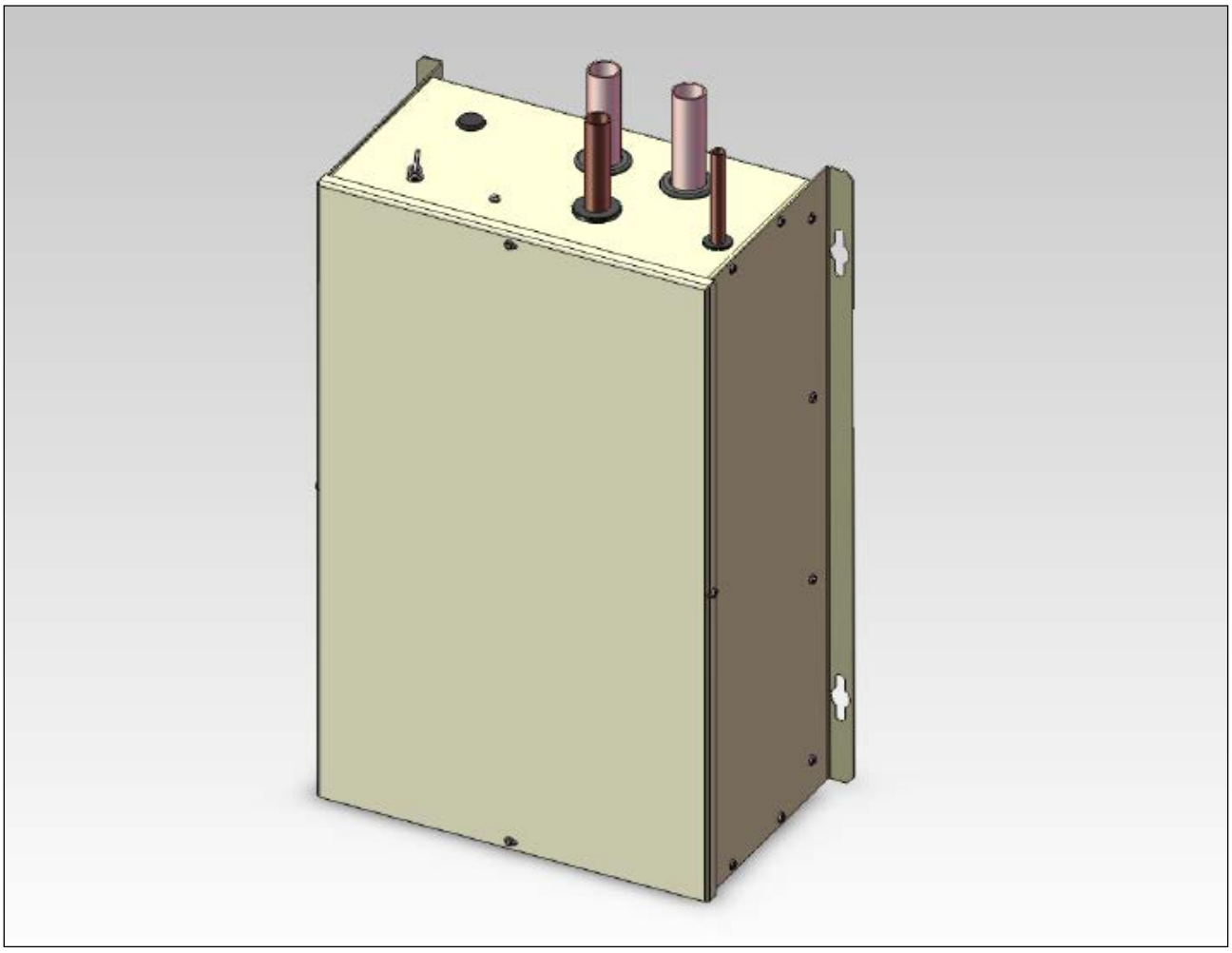
EarthLinked®
Hydronic Water Module

Installation, Operation & Maintenance Manual

for

R-407C Heat/Cool and Cool Only Systems



ETL LISTED
CONFORMS TO
UL STD 1995
US CERTIFIED TO CAN/CSA
STD C22.2 NO. 236-05

COMPLIES WITH
IEC 60204-1
IEC 60335-2-40
IEC 61000-3-11

Disclaimer

This manual contains instructions for the EarthLinked® Hydronic Water Module which is combined with other EarthLinked® system components, field specified hydronic heating and chilled water cooling components, thermostats, storage water heaters, storage water tanks and associated fittings, controls and piping.

EarthLinked® Technologies manufactures and sells only the EarthLinked® system components and the performance information contained herein is based on performance of EarthLinked® Technologies' supplied Products.

Therefore, EarthLinked® Technologies shall not be liable for any defect, unsatisfactory performance, damage or loss, whether direct or consequential, relative to the design, manufacture, construction, application or installation of the above mentioned field specified items.

Proper installation and servicing of the EarthLinked® Heating and Cooling System is essential to its reliable performance. All EarthLinked® systems must be installed and serviced by an authorized, trained technician who has successfully completed the training class and passed the final examination. Installation and service must be made in accordance with the instructions set forth in this manual and the current *EarthLinked Heating and Cooling Installation, Operation and Maintenance Manual*. Failure to provide installation and service by an authorized, trained installer in a manner consistent with the subject manuals will nullify the limited warranty coverage for the system.

IMPORTANT!
FAILURE OF THE INSTALLER TO PROVIDE ADEQUATE ANTIFREEZE SOLUTION PROTECTION IN EARTHLINKED® RADIANT PANEL HYDRONIC HEATING AND/OR CHILLED WATER COOLING SYSTEMS AT THE TIME OF SYSTEM START-UP WILL VOID THE EARTHLINKED® LIMITED WARRANTY FOR HEATING AND COOLING SYSTEMS.

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IMPORTANT!

Proper installation and servicing of the EarthLinked® Hydronic Water Module is essential to its reliable performance. All EarthLinked® systems and components must be installed and serviced by an authorized, trained technician who has successfully completed the training class and passed the final examination. Installation and service must be made in accordance with the instructions set forth in this manual and the *EarthLinked® Heating and Cooling Installation, Operation and Maintenance Manual.* Failure to provide installation and service by an authorized, trained technician in a manner consistent with the subject manuals will nullify the limited warranty coverage for the system.

WARNING

The hydronic water module (HWM) must be isolated from the water system when the system undergoes a "superchlorination" or "shock chlorination" flushing process. Closing the isolation valves as shown in Figure 6 prior to initiating the system flushing process isolates the HWM. The water entering the HWM after the system flush must not exceed a chlorine level consistent with local municipal water purification standards. Failure to isolate the HWM will damage the heat exchanger and circulating pump, causing system failure. Allowing highly chlorinated water to enter the HWM will void the EarthLinked® Limited Warranty.

1. Inspection/Pre-Installation

A. Inspection

Upon receipt of the equipment, carefully check the shipment against the bill of lading. Reference EarthLinked® matching system component model numbers in Figure 1. Make sure all units have been received and model numbers are the same as those ordered.

COMPRESSOR UNIT MODEL/CAPACITY	R-407C HYDRONIC WATER MODULE MODEL
-018 (18,000 BTUH)	HWM-18B
-024 (24,000 BTUH)	HWM-24B
-030 (30,000 BTUH)	HWM-30B
-036 (36,000 BTUH)	HWM-36B
-042 (42,000 BTUH)	HWM-42B
-048 (48,000 BTUH)	HWM-48B
-060 (60,000 BTUH)	HWM-60B
-072 (72,000 BTUH)	HWM-72B

Figure 1. Matching Component Model Numbers

Inspect the carton or crating of each unit, and inspect each unit for damage. Assure the carrier makes proper notation of any shortages or damage on all copies of the freight bill and he 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.**

Equipment should be stored in its packaging in a clean, dry area. Store equipment in an upright position at all times. Equipment is to be stacked in accordance with the notation on the packaging. **DO NOT remove equipment from shipping cartons until equipment is required for installation.**

Cover equipment on the job site with either shipping cartons, vinyl film or an equivalent protective covering. In areas where painting, plastering and/or spraying has not been completed, all due precautions must be taken to avoid physical damage to the equipment and contamination by foreign material. Physical damage and contamination may prevent proper start-up and may result in costly equipment clean up. Examine all equipment before installing.

WARNING

WEAR ADEQUATE PROTECTIVE CLOTHING AND PRACTICE ALL APPLICABLE SAFETY PRECAUTIONS WHILE INSTALLING THIS EQUIPMENT. FAILURE TO DO SO MAY RESULT IN EQUIPMENT AND/OR PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

B. Pre-Installation

Prior to installing the Hydronic Water Module and other EarthLinked® space heating and cooling system above-ground components, you will need tools and equipment listed in Section 8 to properly install the system.

Installation of the Hydronic Water Module must be done in accordance with this manual and the EarthLinked® Technical Manual.

Prepare the Hydronic Water Module (HWM) for installation as follows:

1. Compare the data on the unit nameplate or packaging with ordering and shipping information to verify the correct unit has been shipped (See Figure 1.)
2. Keep the HWM covered with the packaging until installation is begun and all plastering, painting, etc. is finished.
3. Verify refrigerant tubing is free of kinks or dents.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.

IMPORTANT!

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

2. General System Layout

Guidelines for the general layout of the Hydronic Water Module and other EarthLinked® system components are shown in Figure 2.

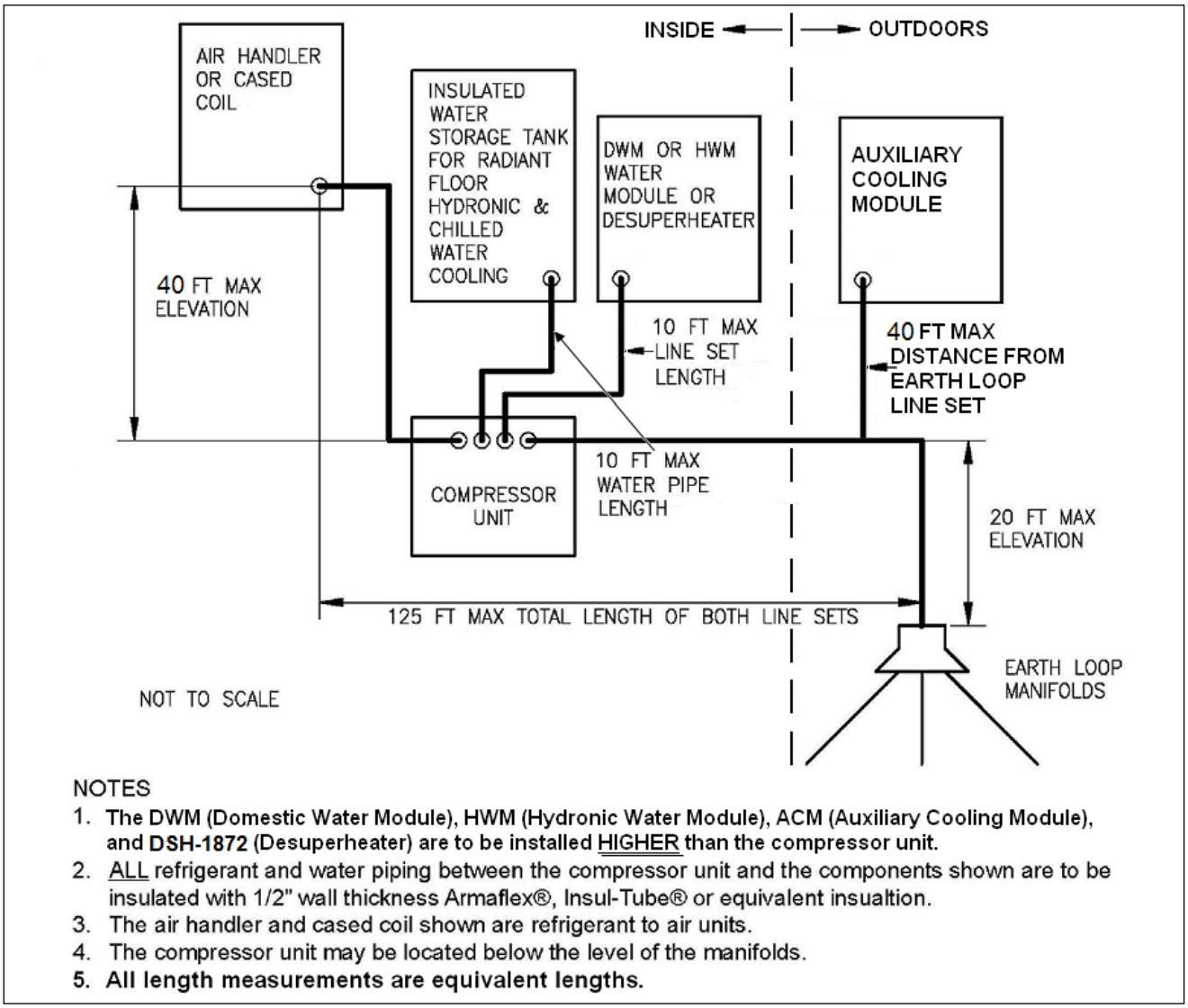


Figure 2. General System Layout

3. Applications

A typical application of the Hydronic Water Module to a **chilled water cooling and radiant panel hydronic heating system** is illustrated in Figures 3.

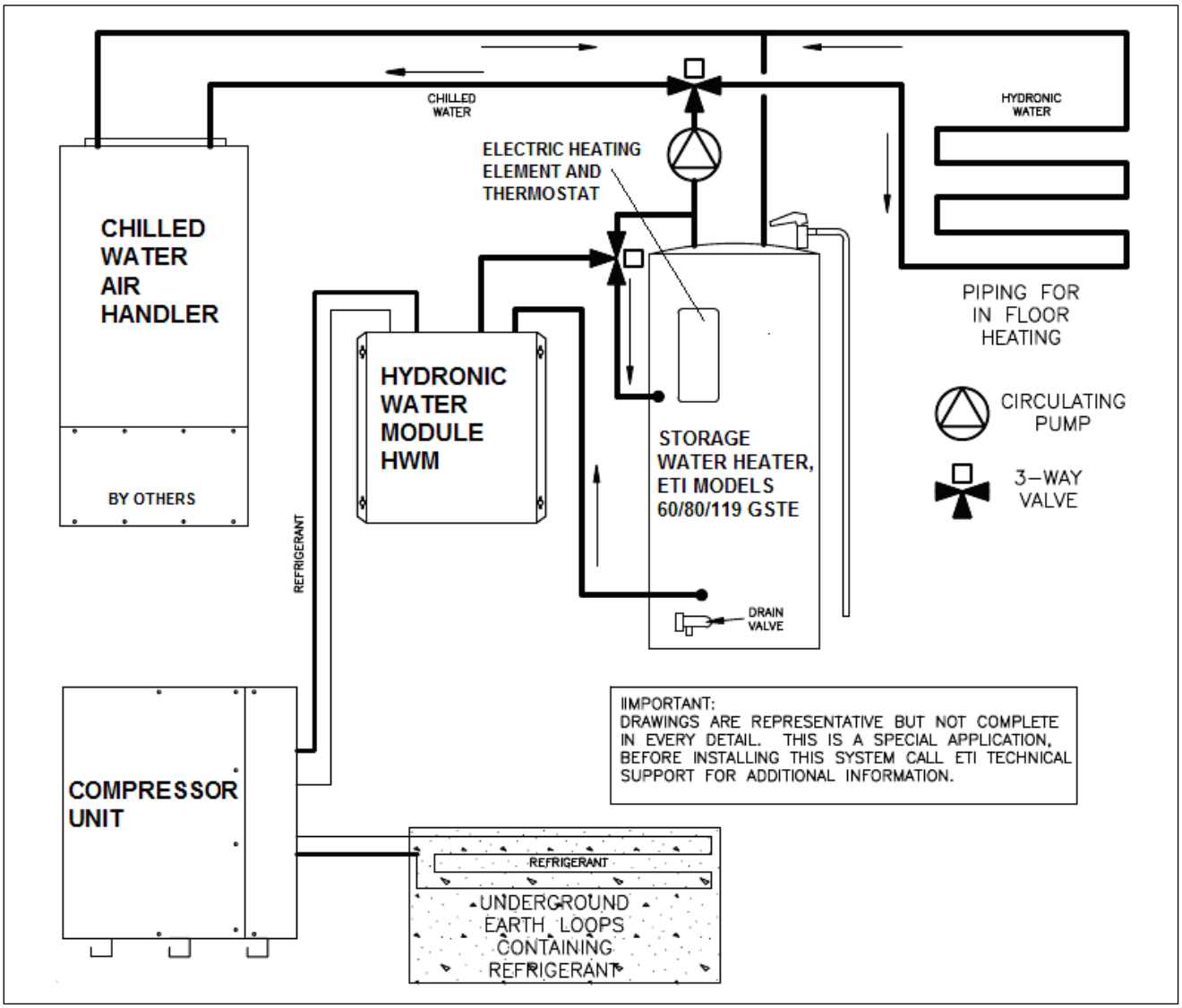


Figure 3. Typical Chilled Water Cooling and Radiant Panel Hydronic Heating System

IMPORTANT

The chilled water controller should be set to turn the compressor unit off at approximately 5°F higher temperature than the specified leaving water temperature.

A typical application of the Hydronic Water Module to a **chilled water cooling system** is illustrated in Figures 4.

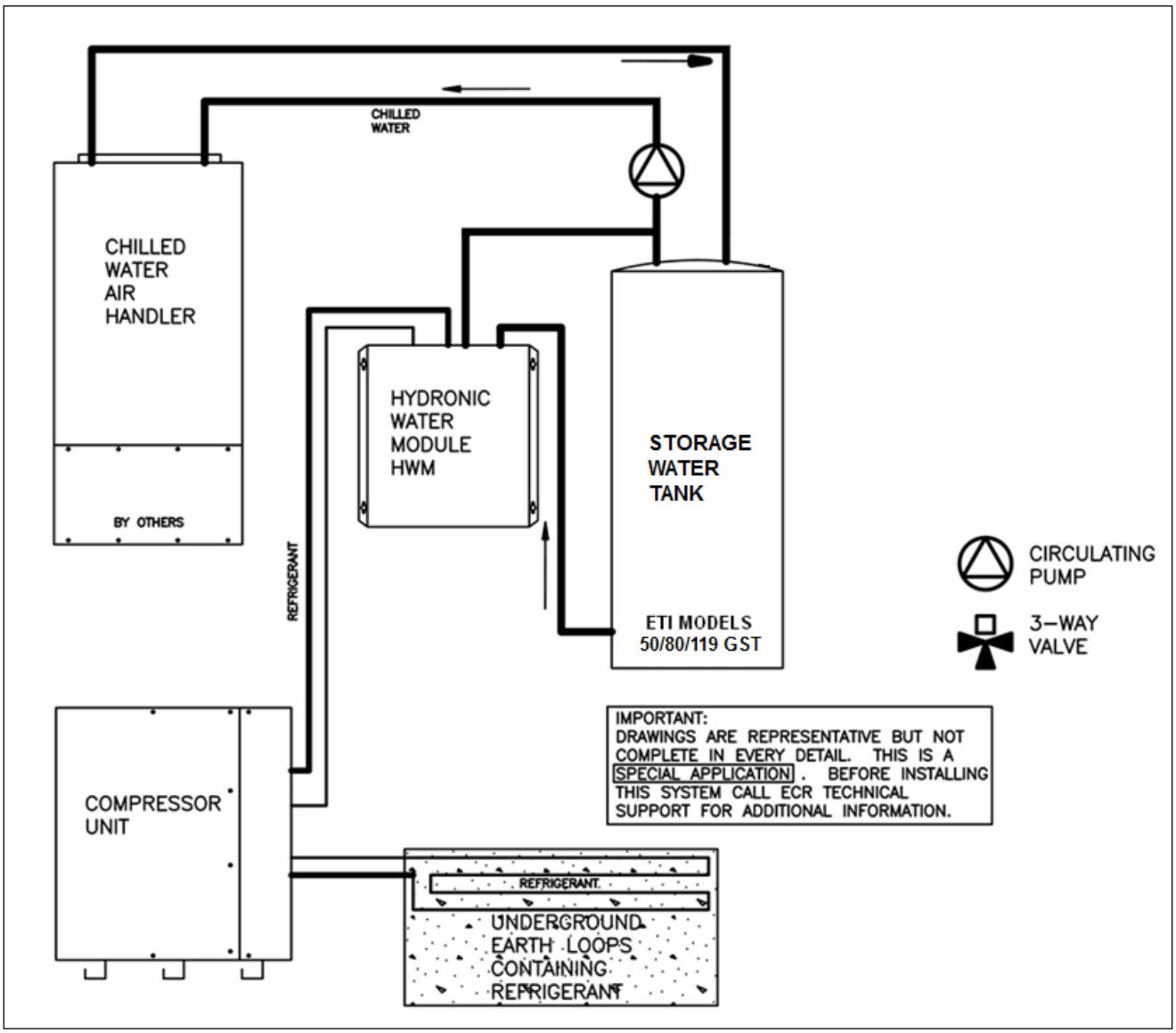


Figure 4. Typical Chilled Water Cooling System

IMPORTANT

The chilled water controller should be set to turn the compressor unit off at approximately 5°F higher temperature than the specified leaving water temperature.

4. The Primary Circuit

A. Plumbing

The primary circuit in a typical HWM installation is shown in Figure 5.

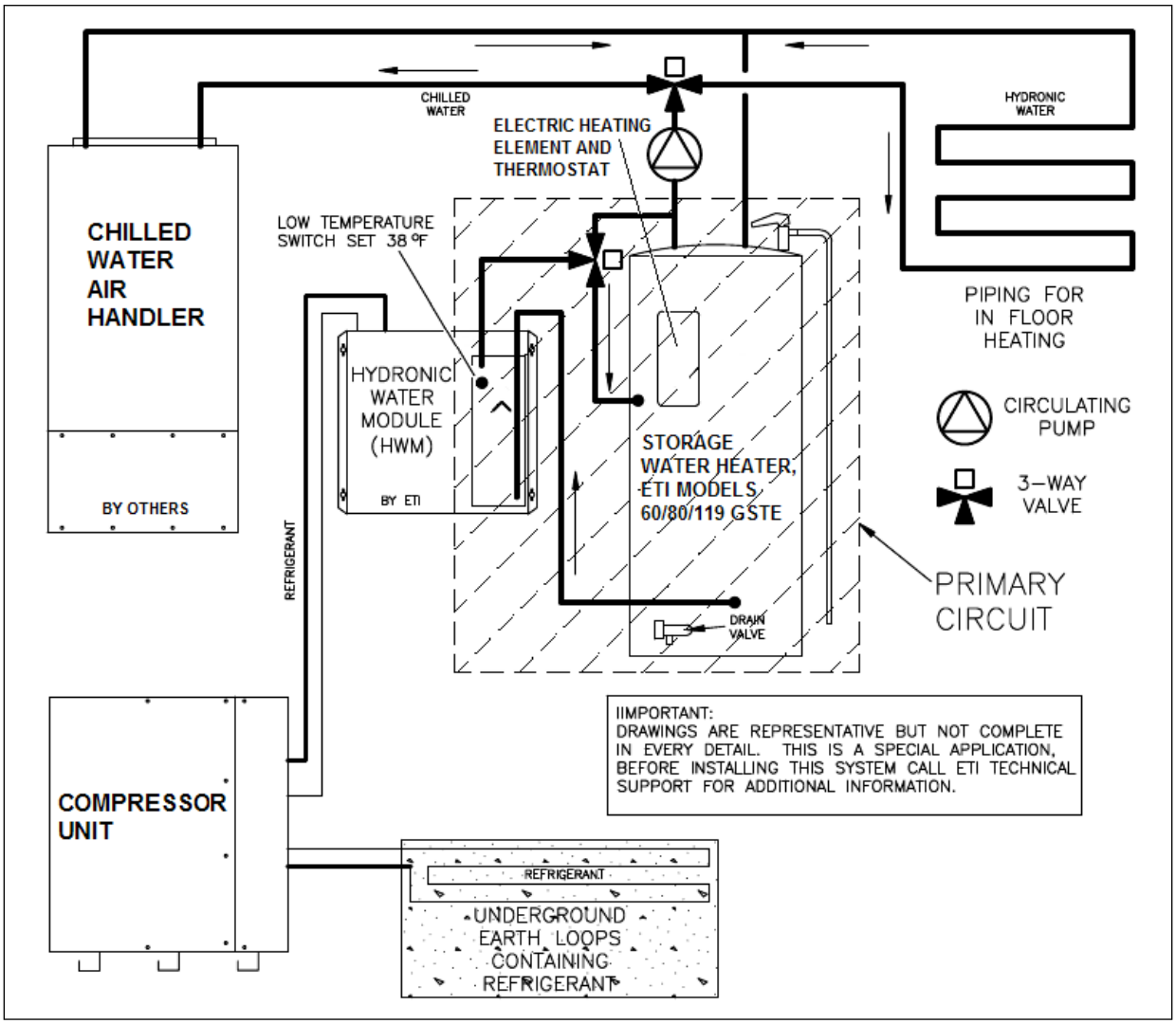


Figure 5. Primary Circuit for EarthLinked® System with HWM

WARNING

The ETI Hydronic Water Module (HWM) is factory equipped with ETI Model FP-1872 Freeze Protection Thermostat, located on the heat exchanger flat plate near the water outlet. The thermostat shuts the compressor off when the circulating water drops to 38°F. The Freeze Protection Thermostat must be wired into every chilled water system application. Not doing so may cause extensive system damage and will nullify the EarthLinked® Heating and Cooling System Limited Warranty.

The Hydronic Water Module primary circuit water solution plumbing must be installed consistent with local codes and industry practice. At a minimum, the HWM should have the fittings as shown in Figure 6. The minimal fittings shown in Figure 6 will facilitate maintaining and servicing the Hydronic Water Module. Additional fittings may be required to satisfy local codes and other hydronic system requirements.

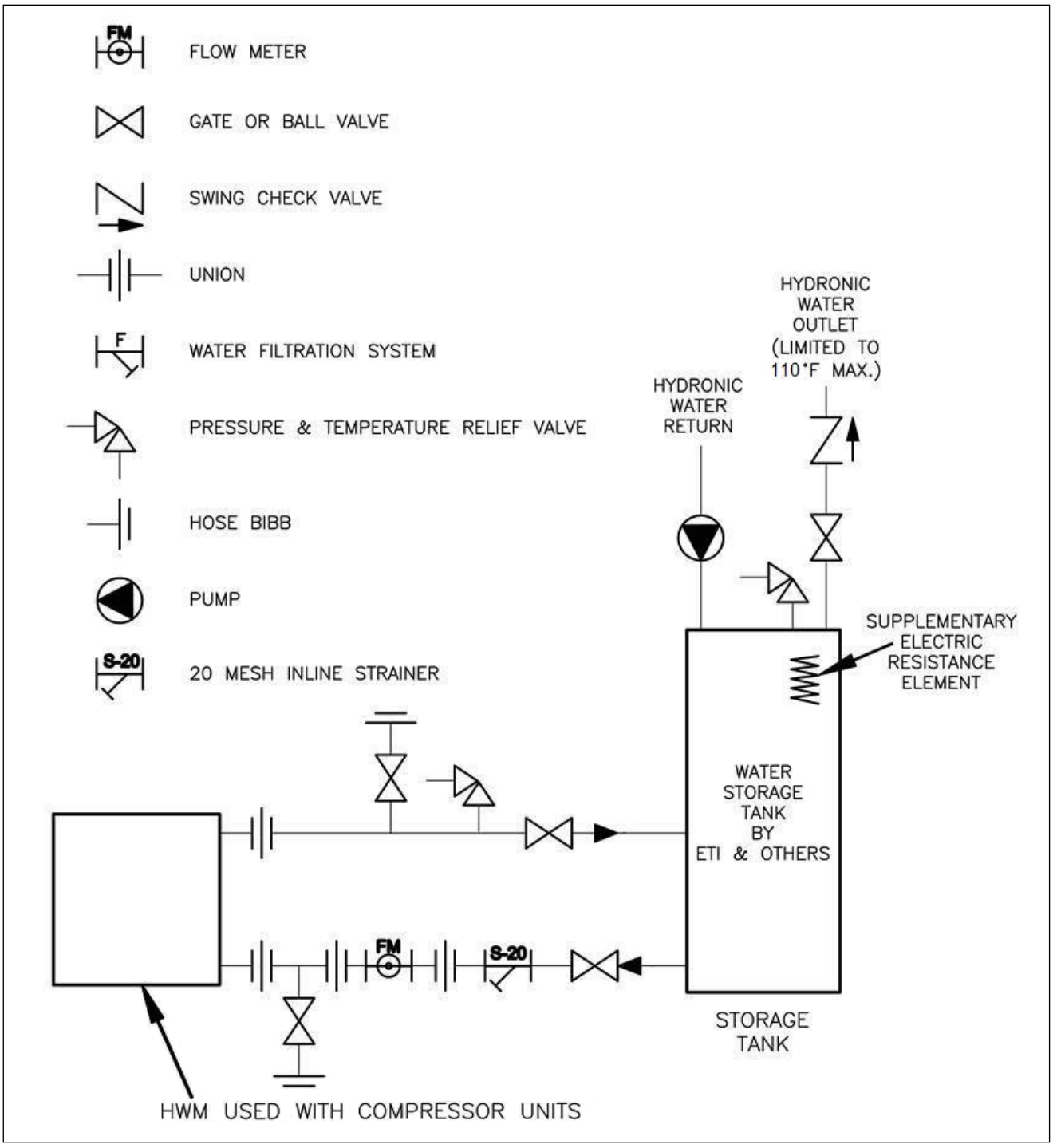


Figure 6. Typical HWM Primary Circuit Plumbing

B. Antifreeze Protection

When the **HWM hydronic water module** is applied to radiant panel hydronic heating and chilled water cooling systems, the water circulating system must be protected from potential damage due to freeze-up by utilizing an adequate antifreeze solution. The antifreeze protection is provided by the installer prior to the EarthLinked® system start-up.

IMPORTANT!

FAILURE OF THE INSTALLER TO PROVIDE ADEQUATE ANTIFREEZE SOLUTION PROTECTION IN EARTHLINKED® RADIANT PANEL HYDRONIC HEATING AND CHILLED WATER COOLING SYSTEMS AT THE TIME OF SYSTEM START-UP WILL VOID THE EARTHLINKED® LIMITED WARRANTY FOR HEATING AND COOLING SYSTEMS.

Propylene-glycol antifreeze solution with an inhibitor is the type of antifreeze solution required for Earthlinked® products utilized in radiant panel hydronic heating and/or chilled water cooling 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 the Figure 7.

TEMPERATURE, °F	PROPYLENE GLYCOL, %	WATER SOLUTION MULTIPLIER FACTOR (WSMF)
18	20	x 1.03
8	30	x 1.07
-7	40	x 1.11
-29	50	x 1.16

Figure 7. Propylene Glycol Freeze Protection Table

IMPORTANT!

Because addition of propylene-glycol to water changes the specific heat of water, the required flow rate of propylene-glycol solution (for the same heat transfer as water) must be increased by the water solution multiplier factor shown in Figure 7 above. See Section 7 for details.

WARNING!

ALWAYS REMOVE THE ANODE ROD(S) FROM THE STORAGE WATER HEATER UTILIZED IN A RADIANT PANEL HYDRONIC HEATING AND/OR CHILLED WATER COOLING SYSTEM. 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.

Propylene-glycol can be purchased in the straight form and mixed with an inhibitor prior to filling the system, or it can be purchased as inhibited propylene-glycol. The following are examples of manufacturers for the above:

Straight propylene-glycol: Chemical Specialties, Inc. (www.chemicalspec.com/spg.html)
Inhibitor: Nu-Calgon Products, Ty-Ion B20 (www.nucalgon.com/products)
Inhibited propylene-glycol: Houghton Chemical Corp., SAFE-T-THERM®, www.houghton.com/fluids/safe-t-therm/index.html)

General guidelines for introducing propylene glycol into the water circulating system follow. The manufacturer's specific instructions and industry standards always take precedence when introducing propylene-glycol to the system.

- **Calculate the quantity of inhibited propylene-glycol (fluid) required to achieve the desired results.**
- **Introduce a sufficient quantity of water to the system and pressure check to ensure a sealed system.**

- **Drain some water from the system to provide enough volume for the calculated amount of fluid.**
- **Add the correct amount of fluid and any water needed to completely refill the system, allowing for liquid expansion due to operating temperature.**
- **Circulate the inhibited propylene-glycol antifreeze solution for at least 24 hours to ensure complete mixing. Check the liquid concentration to assure that the correct mixture is obtained.**

C. Water Quality

IMPORTANT!
Always follow the propylene-glycol manufacturer's instructions concerning the water quality specifications before filling the water circulating system.

Water quality in hydronic systems is important to the life and efficiency of the system. Water of poor quality can cause a decrease in heat transfer ability and cause leaks.

Ensuring proper quality water is a key step in the installation of the hydronic water module (HWM) and circulating water system.

Water quality parameters and the recommended ranges are listed in Figure 8a. The antifreeze manufacturer's water quality requirements take precedence over the ranges listed in Figure 8a.

IMPORTANT
THE SERVICES OF A QUALIFIED WATER TREATMENT SPECIALIST ARE REQUIRED FOR THE APPROPRIATE WATER ANALYSIS AND TREATMENT.

Parameter	Optimal Conditions	Comments
Glycol Freeze Protection	20% to 50%	Below 20% can promote the growth of bacteria. Concentrations higher than 50% will dramatically reduce the heat transfer ability. Glycol seepage can occur at o-rings and seals.
Corrosion inhibitor Molybdate inhibitor or Nitrite inhibitor	100-150ppm 800-1200ppm	Without the addition of Nitrite or Molybdate inhibitors, corrosion of the metallic components will begin and eventually lead to leaks.
pH	9-10.5 pH units	A pH below 9.0 will allow the corrosion of steel and above 10.5 will allow the corrosion of brass and copper.
Conductivity	700-3200µS/cm	Conductivity above 3500µS/cm will cause the water to become physically abrasive and damage the o-rings. Addition of chemicals to the water will raise the conductivity.
Hardness	100-300ppm	Artificially soft water can be aggressive to the system. The use of unsoftened water is recommended. Do not use distilled or purified water.
Bacteria/Mold	No Bacteria or Mold	The growth of bacteria will cause erosion of seals and the deposit of a bacterial slime will clog the system. Bacteria can attack the o-rings and cause premature failure. Glycol above 20% will kill any bacteria.

Figure 8a. Hydronic System Water Quality Parameters

IMPORTANT

THE SERVICES OF A LICENSED WATER TREATMENT SPECIALIST ARE REQUIRED FOR THE APPROPRIATE WATER ANALYSIS AND TREATMENT.

D. Storage Water Heater Sizing and Connections

Storage water heaters are necessary with EarthLinked® radiant panel hydronic heating and chilled water cooling systems, as illustrated in Figures 3, 5 and 6.

IMPORTANT

A STORAGE WATER HEATER USED FOR HYDRONIC HEATING MUST BE EQUIPPED WITH SUPPLEMENTAL ELECTRIC HEATING WITH A RATING OF AT LEAST 20% OF THE DESIGN HEATING LOAD. FAILURE TO DO SO WILL VOID THE EARTHLINKED® HEATING AND COOLING SYSTEM LIMITED WARRANTY.

ETI Models 60, 80 or 119 GSTE storage water heaters are configured specifically for hydronic heating and chilled water cooling and meet all requirements for these applications.

Recommended water storage heater capacities are shown in Figure 8b, based on the nominal tonnage of the compressor unit specified. Typical water heater plumbing connections are illustrated in Figure 8c.

Compressor Unit Model/Capacity, BTUH	*HWM Model*	*ETI Storage Water Heater Size, US Gallons*	*ETI Storage Water Heater Element Rating, kW*	*Minimum Nominal Type L Hard Copper Pipe & Fittings, inches*
-018/18,000	-18B	60*	4.5	3/4
-024/24,000	-24B	60*	4.5	3/4
-030/30,000	-30B	60*	4.5	1
-036/36,000	-36B	60*	4.5	1
-042/42,000	-42B	80	4.5	1-1/2
-048/48,000	-48B	80	4.5	1-1/2
-060/60,000	-60B	80	4.5	1-1/2
-072/72,000	-72B	80	4.5	1-1/2
*** NOTE: These sizes are valid only for hydronic heating. If chilled water cooling is to be provided, 80 gallon ETI Model 80 GST storage water tank is required.**				

Figure 8b. Storage Tank Capacities and Pipe Sizes

IMPORTANT

The hydronic water module (HWM) is to be mounted on a wall or fixed rigidly in place. The HWM is to be placed no more than 10 FEET AWAY FROM THE STORAGE WATER HEATER. Orient the HWM with "pipes up" only.

All interconnecting water piping between the HWM and the water tank are to be insulated with 1/2" wall thickness Armaflex® , Insul-Lock® or the equivalent insulation.

The HWM is to be mounted lower than the isolation valves that connect to the water storage tank.

Storage water heaters used with the HWM for radiant panel hydronic heating and chilled water cooling appliances are to be ETI Models/GSTE storage water heaters.

Storage water tanks used with the HWM for chilled water cooling only are to be ETI Models GST storage water tanks.

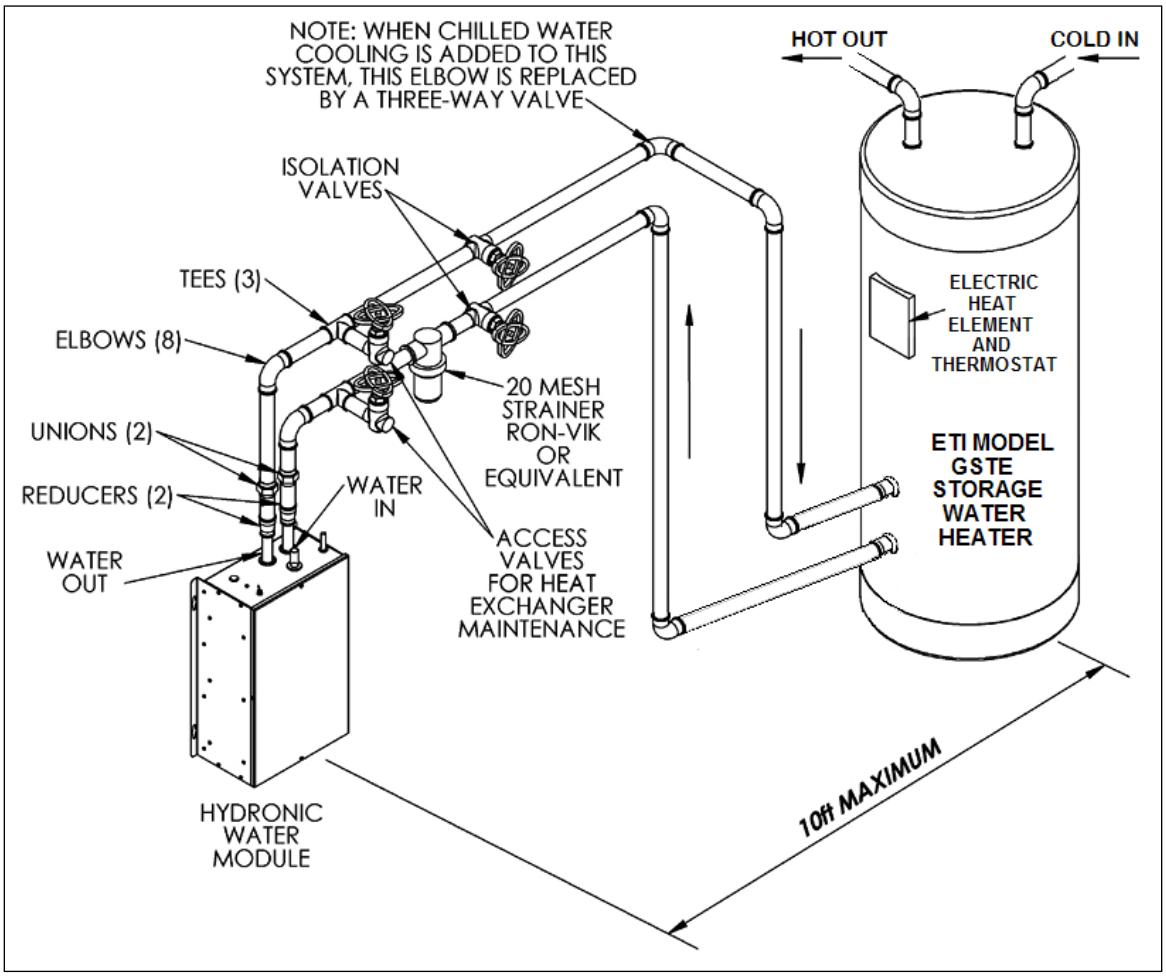
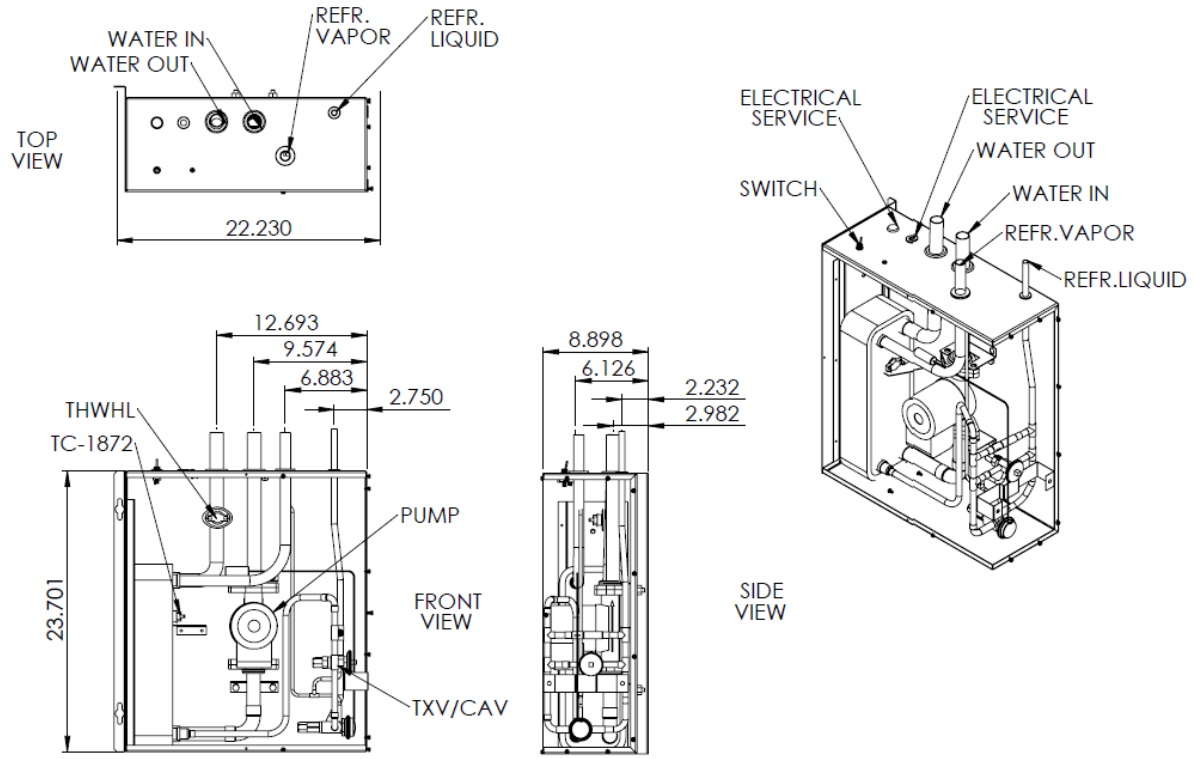


Figure 8c. Typical HWM Piping Illustration

E. Circulating Pump, Piping, Strainer and Flowmeter

The HWM system primary circuit piping arrangements for chilled water (to air) cooling and radiant panel hydronic heating are illustrated in Figures 3 and 4.

The Hydronic Water Module physical dimensions as well as water solution piping connections are illustrated in Figure 9.



HWM Recovery Rate 60°F Temperature Rise*		
Compressor Model	**HWM Model**	**Recovery Rate, US Gal/Hr**
-018	-18B	38
-024	-24B	50
-030	-30B	62
-036	-36B	74
-042	-42B	86
-048	-48B	101
-060	-60B	117
-072	-72B	128
*60°F Earth Temperature, H-5 Earth Loop, 40°F Entering Water Temp, 100°F Leaving Water Temp.		

HWM MODEL	TUBING CONNECTION SIZES INCHES O.D.				LINE SET SIZES INCHES O.D.	
	WATER IN	WATER OUT	REFR. VAPOR	REFR. LIQUID	REFR. VAPOR	REFR. LIQUID
-18B thru -36B	7/8	7/8	7/8	1/2	1/2	3/8
-42B thru -48B	1-1/8	1-1/8	7/8	1/2	5/8	1/2
-60B thru -72B	1-1/8	1-1/8	7/8	1/2	3/4	1/2

Figure 9. Hydronic Water Module (HWM)

IMPORTANT

Maximum hot water temperature, from the Hydronic Water Module is 110°F.

Figure 10a lists the minimum nominal Type L hard copper pipe and fitting sizes, and the strainer required for the primary circuit between the hot water module (HWM) and the storage water heater.

Compressor Unit Size & Capacity, BTUH	HWM Models	Minimum Nominal Type L Hard Copper Pipe and Fittings, Inches	ETI Strainer Model, Size
-018 (18,000)	-18B	3/4	ST-1836 1in FPT
-024 (24,000)	-24B	3/4	
-030 (30,000)	-30B	1	
-036 (36,000)	-36B	1	
-042 (42,000)	-42B	1-1/2	ST-4272 1-1/2in FPT
-048 (48,000)	-48B	1-1/2	
-060 (60,000)	-60B	1-1/2	
-072 (72,000)	-72B	1-1/2	

Figure 10a. Minimum Water Pipe, Fitting and Strainer Sizes to Storage Water Heater

The flow meter illustrated in Figure 5 is an important component of the system to (1) commission the performance of the system at startup and (2) determine when maintenance to the system strainer and/or HWM heat exchanger is required. (See Maintenance in Section 7.)
ETI part number ETI-A1-116000-1 flowmeter kit has a range of 5-50 GPM and can be field calibrated for the appropriate antifreeze mixture for the specific application. The kit includes the flowmeter and the 5 gallon calibration container.
The flow meter kit (see Figure 10b) may be purchased at http://www.buygpi.com/eti-a1-116000-1.aspx.

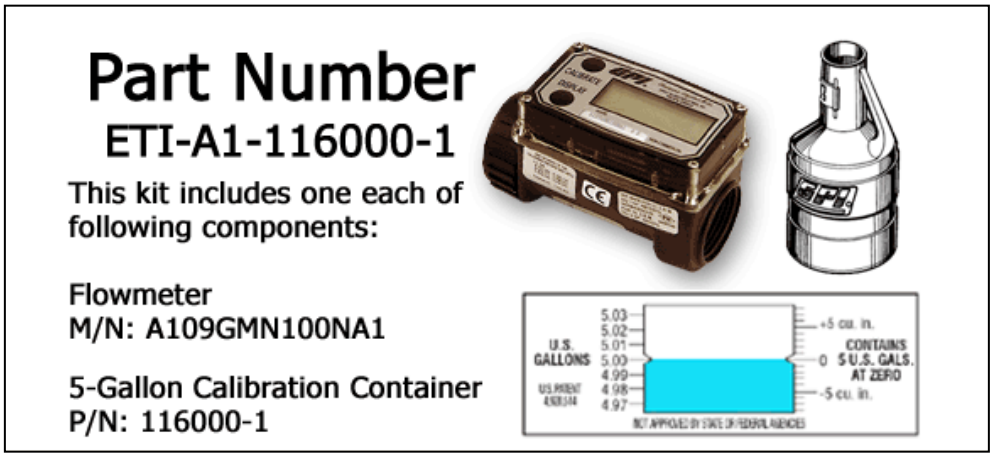


Figure 10b. Flowmeter Kit

F. Refrigerant Piping

Refrigerant piping connections and line set sizes are listed in Figure 9.

5. Controls and Electrical

IMPORTANT

When the Hydronic Water Module (HWM) is being installed with an SC or SD Series Compressor Unit, the following Pump Wire Kit must be field installed:

PW1-1872 for 230/208-1-60 and 230/208-3-60 power supply

PW2-1872 for 460-3-60 and 575-3-60 power supply

A. Hydronic Heating and Chilled Water Cooling

Figures 3 and 5 illustrate a typical hydronic heating and chilled water cooling primary circuit configurations. The use of a three-way valve is shown in these illustrations. For heating, the valve is normally open with the flow from the HWM directed DOWNWARD providing heated water to the storage water heater. When cooling is called for, the valve is energized and directs chilled water UPWARD to the hydronic circulating pump.

The electrical field wiring for the HHK-1872 hydronic hot water temperature controller and the electric heating element/thermostat; and the CWK-1872 chilled water temperature controller is illustrated in Figure 10c (Part 1 of 2) and 10c (Part 2 of 2).

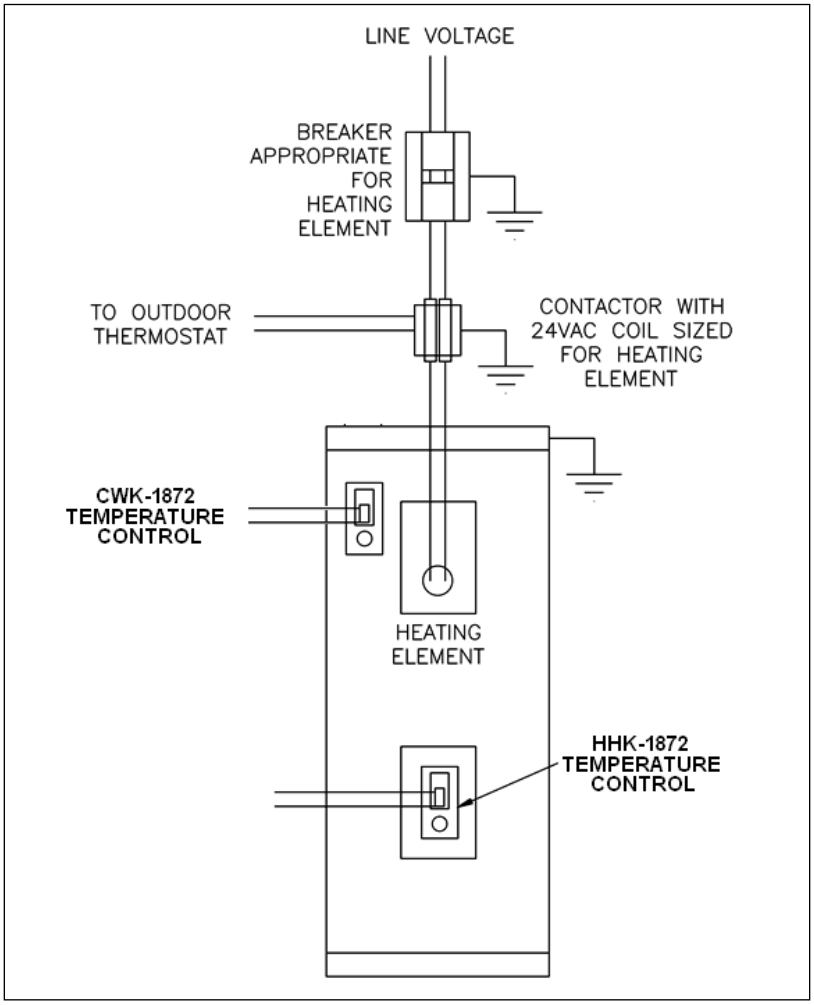


Figure 10c. (Part 1 of 2) Electrical Field Wiring – Hydronic Heating and Chilled Water Cooling (HWM)

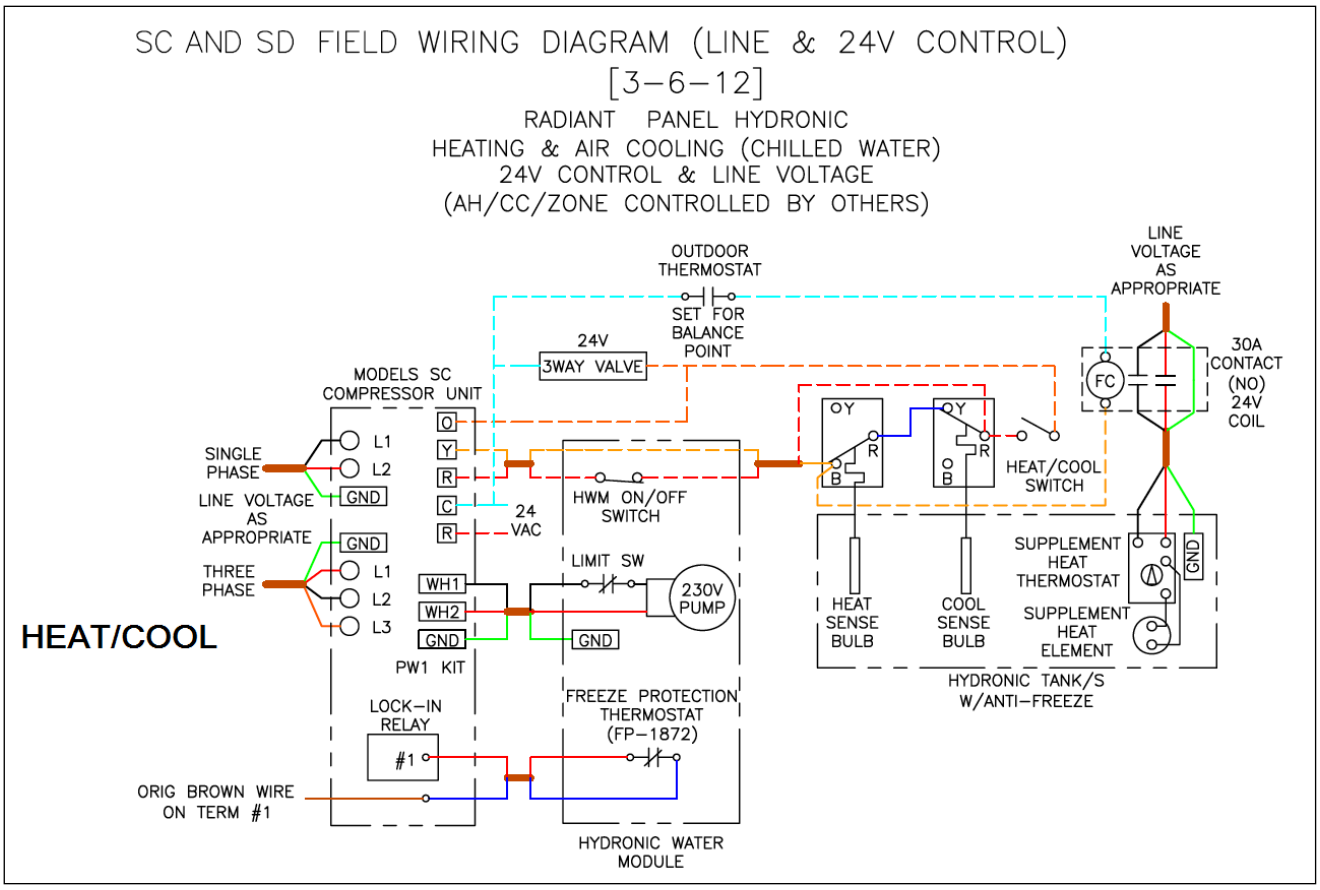


Figure 10c. (Part 2 of 2) Electrical Field Wiring – Hydronic Heating and Chilled Water Cooling (HWM)

IMPORTANT

The chilled water controller should be set to turn the compressor unit off at approximately 5°F higher temperature than the specified leaving water temperature.

B. Chilled Water Cooling

The electrical field wiring for the CWK-1872 chilled water temperature controller is illustrated in Figure 10d (Part 1 of 2) and 10d (Part 2 of 2).

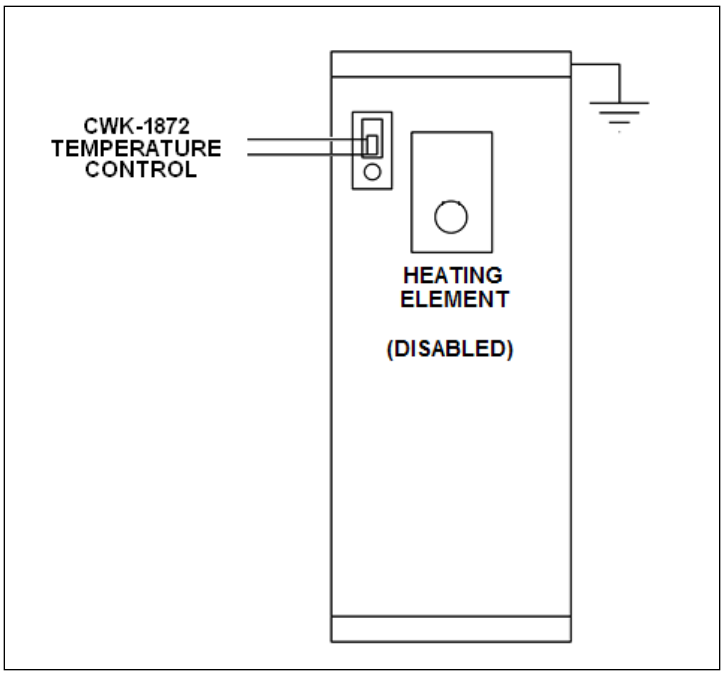


Figure 10d. (Part 1 of 2) Electrical Field Wiring – Chilled Water Cooling (HWM)

IMPORTANT

The chilled water controller should be set to turn the compressor unit off at approximately 5°F higher temperature than the specified leaving water temperature.

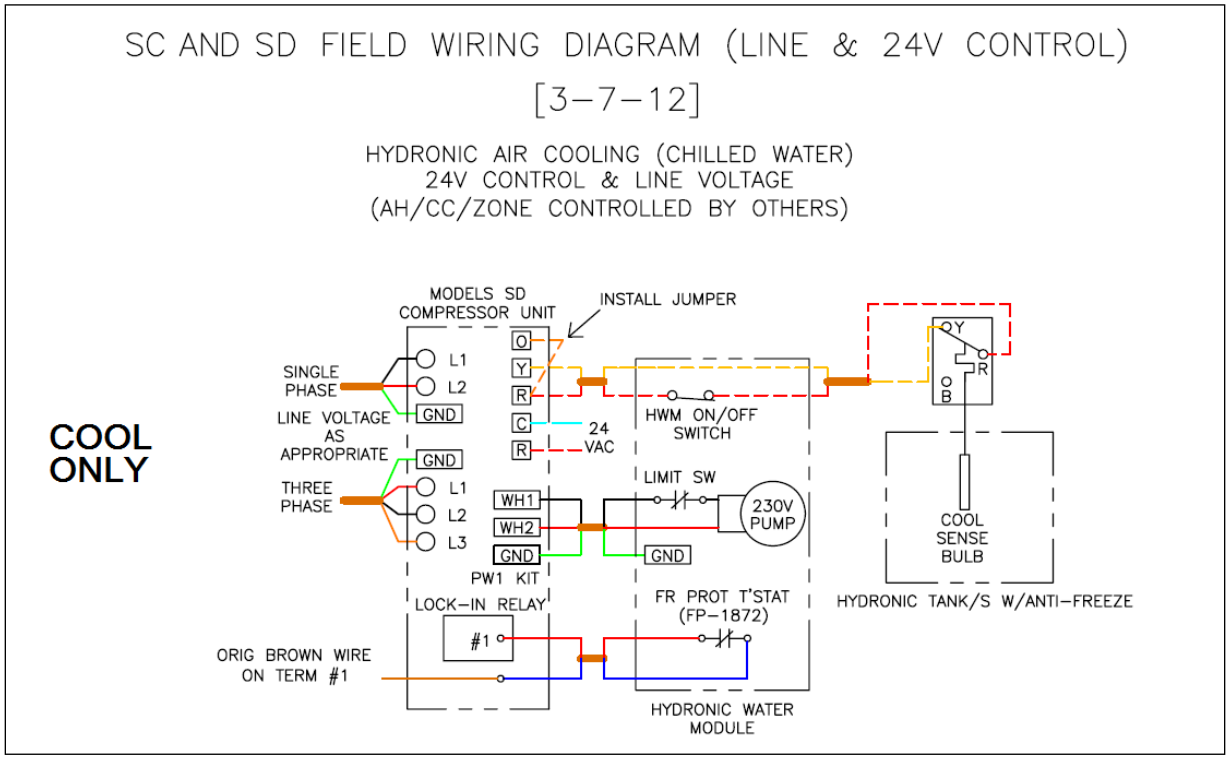


Figure 10d. (Part 2 of 2) Electrical Field Wiring – Chilled Water Cooling (HWM)

C. HWM Freeze Protection Thermostat

1. The freeze protection thermostat is factory installed. The thermostat wiring must be connected when the HWM is installed. Run the wire through the electrical port in the top panel of the Hydronic Water Module cabinet. After attaching the wire to the switch terminals, run it into the Compressor Unit (using a control wiring port), in accordance with applicable electrical codes.
2. Once the freeze protection switch wire leads are inside the Compressor Unit, locate the lock-in relay in the Compressor Unit electric box.
3. Proceed to make the electrical connections as shown in the three steps illustrated in Figure 10e. Check all electrical connections to ensure a tight fit and good contact.

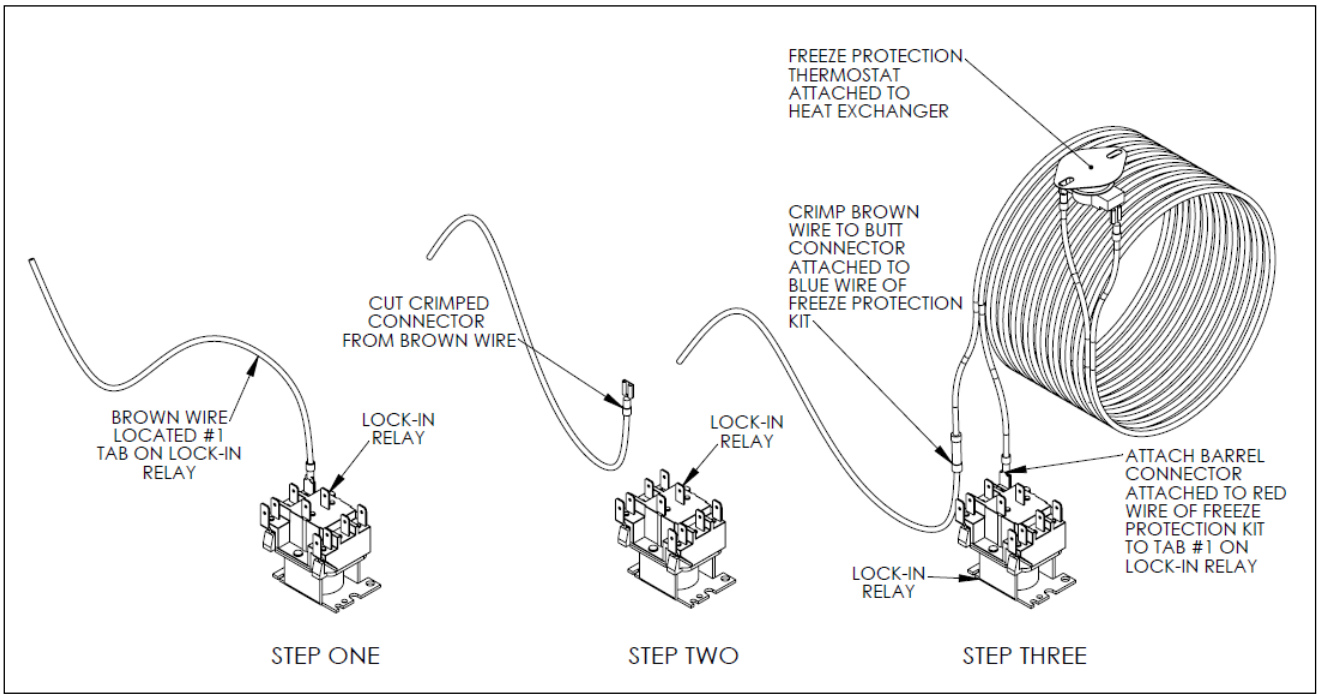


Figure 10e. Three-Step Electrical Installation for Freeze Protection Thermostat

4. Replace the cabinet cover to the HWM Hydronic Water Module.
5. If the water solution temperature drops to 38°F, the pre-set switch will trigger and cause the lock-in relay to terminate power to the compressor. The system requires a manual restart.
6. Follow the Start-Up Procedure in Section 6.

6. Start-Up

IMPORTANT

PRIOR TO IMPLEMENTING THE FOLLOWING HYDRONIC WATER MODULE START-UP PROCEDURE, BE SURE THAT THE EARTHLINKED® SYSTEM HAS BEEN PROPERLY PREPARED FOR START-UP. REFERENCE THE EARTHLINKED® HEATING AND COOLING INSTALLATION, OPERATION AND MAINTENANCE MANUAL.

The following conditions must be met before starting the HWM:

- The toggle switch on the HWM cabinet must be “OFF”.
- The system has been charged according to instructions.
- Heating elements in the hot water storage tank are “OFF”.
- Temperature of water in hot water storage tank is less than 100°F.
- HWM pump is primed and tank water pressure is normal.
- Gage manifold set is connected to high and low pressure connections on the compressor unit.
- The storage water heater temperature controller is adjusted to the highest desired water temperature setting (110°F maximum).
- An accurate temperature sensor is connected to the “Water Out” tube of the HWM and insulated from ambient air temperature.

IMPORTANT

The EarthLinked® system with HWM will heat water up to a maximum of 110°F. **The objective in starting the HWM is to achieve the desired hot water temperature, and not exceed 350 psig discharge pressure.**

The HWM start-up steps are as follows:

1. Turn the HWM toggle switch to “ON”.
2. Start system running and monitor compressor discharge pressure and HWM “Water Out” temperature as water temperature rises.
3. If compressor discharge pressure reaches 350 psig before desired hot water temperature is achieved, adjust the storage tank temperature controller setting to turn the compressor off, or (next):
4. When “Water Out” temperature is achieved (pressure < 350 psig), adjust water storage tank temperature controller to turn compressor unit “OFF”. Reference Figure 11.

IMPORTANT

The HWM “Water Out” temperature is approximately 5°F higher than actual hot water temperature in water storage tank.

5. The water storage tank temperature controller setting should be verified by draining some hot water from the tank and cycling the system again.

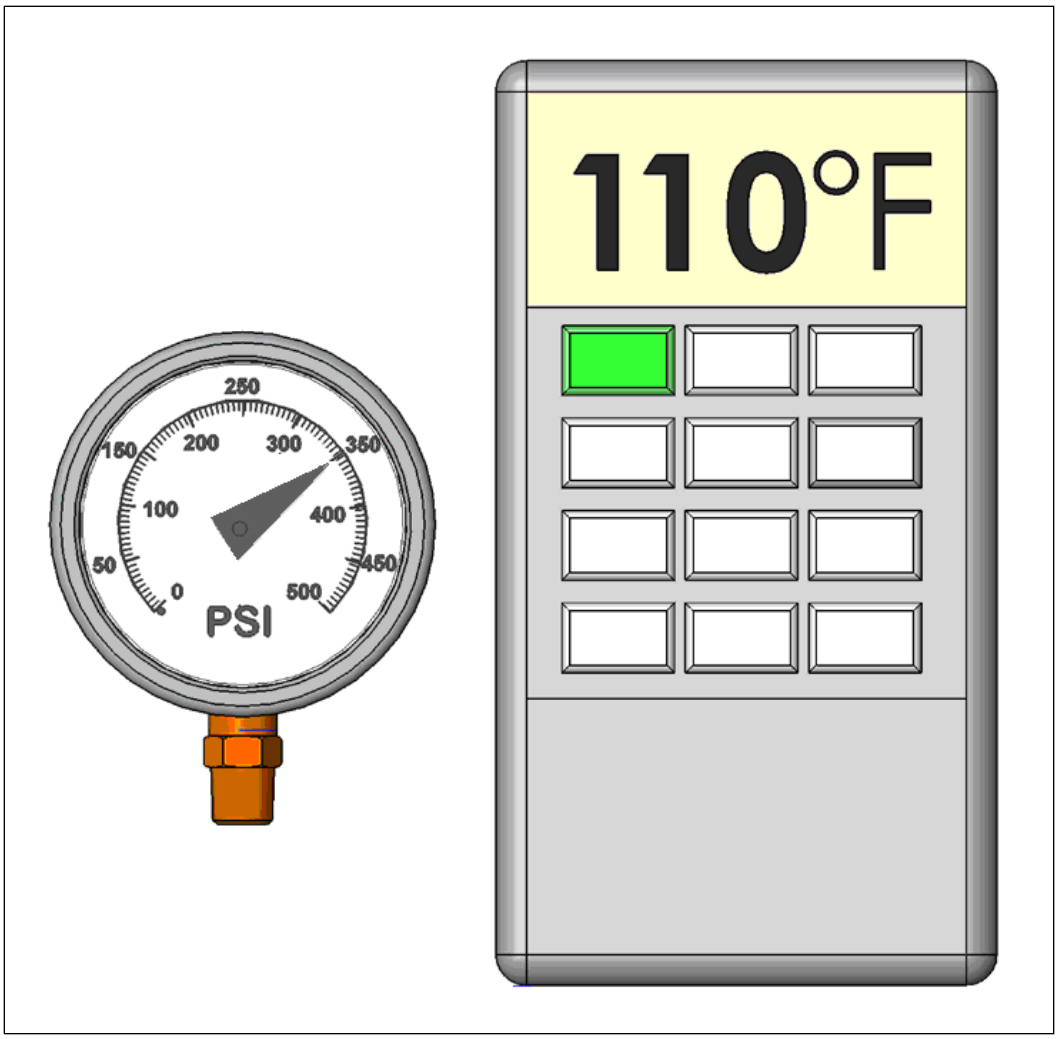


Figure 11. Maximum Operating Conditions (R-407C)

6. As appropriate, adjust chilled water controller to a temperature cut out point which is approximately 5°F above the desired chilled water leaving temperature.

7. Heat Exchanger Maintenance

WARNING

The Hydronic water module (HWM) must be isolated from the water system when the system undergoes a "superchlorination" or "shock chlorination" flushing process. Closing the isolation valves as shown in Figure 6 prior to initiating the system flushing process isolates the HWM. The water entering the HWM after the system flush must not exceed a chlorine level consistent with local municipal water purification standards. Failure to isolate the HWM will damage the heat exchanger and circulating pump, causing system failure. Allowing highly chlorinated water to enter the HWM will void the EarthLinked® Limited Warranty

A compact brazed heat exchanger is utilized in the Hydronic Water Module.

The water flow rate designed into each of these heat exchangers is 2 or more gallons per minute per ton of nominal system capacity.

IMPORTANT!

Before checking flow rate through HWM heat exchanger, be certain that the strainer screen is clean.

The acceptable water flow rate range for each system is shown in Figure 12. While it is important for the proper performance of the heat exchanger to maintain water flow rate between the minimum and maximum shown, **it is CRITICAL that the flow rate not drop below the minimum.**

COMPRESSOR UNIT SIZE & CAPACITY, BTUH	HWM MODELS	MIN. WATER FLOW RATE, GPM
-018 (18,000)	-18B	3.0
-024 (24,000)	-24B	4.0
-030 (30,000)	-30B	5.0
-036 (36,000)	-36B	6.0
-042 (42,000)	-42B	7.0
-048 (48,000)	-48B	8.0
-060 (60,000)	-60B	10.0
-072 (72,000)	-72B	12.0

Figure 12. Minimum Heat Exchanger Water Flow Rates

Figure 13 shows minimum antifreeze solution flow rates for various mixtures of propylene glycol and water.

Compressor Unit Size/Capacity (BTUH)	HWM Model	Minimum Propylene Glycol/Water Solution Flow Rates, GPM			
		20% PG	30% PG	40% PG	50% PG
-018 (18,000)	-18B	3.1	3.2	3.3	3.5
-024 (24,000)	-24B	4.1	4.3	4.4	4.6
-030 (30,000)	-30B	5.2	5.4	5.6	5.8
-036 (36,000)	-36B	6.2	6.4	6.7	7.0
-042 (42,000)	-42B	7.2	7.5	7.8	8.1
-048 (48,000)	-48B	8.2	8.6	8.9	9.3
-060 (60,000)	-60B	10.3	10.7	11.1	11.6
-072 (72,000)	-72B	12.4	12.8	13.3	13.9

Figure 13. Minimum Heat Exchanger Propylene Glycol/Water Solution Flow Rates

To test the solution flow through the hydronic water module, average three solution flow rate readings when the HWM is in continuous operation as shown in Figure 6.

Check the flow rate against the appropriate rates in Figures 12 or 13.

If flow rate is less than the appropriate minimum shown in Figures 12 or 13, **and the strainer mesh is clean**, the heat exchanger is to be cleaned by setting the system up as noted in Figure 14.

IMPORTANT!

Be sure gate valves (5) and (6) are tightly shut before cleaning the heat exchanger.

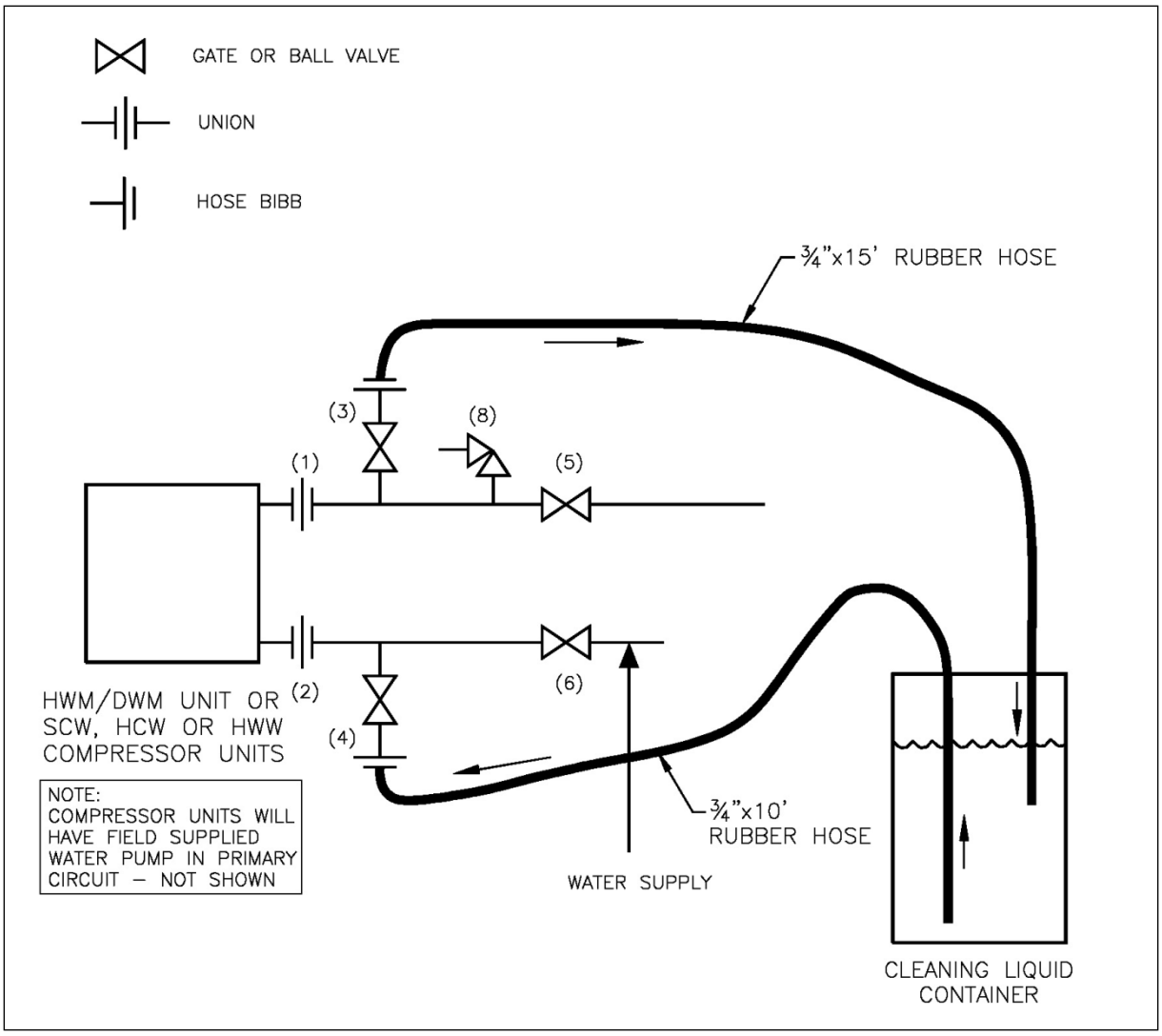


Figure 14. HWM Heat Exchanger Cleaning Set-up

Disconnect power from HWM and be sure pump is off.
Mix heat exchanger cleaning solution in a 55 gallon drum can be sealed and disposed of in accordance with local and federal chemical waste regulations, when the cleaning process is completed.

The concentrated cleaning solution for the heat exchanger cleaning process is liquid ice machine cleaner which is available at any distributor who handles ice machine supplies (Johnstone Supply, W.W. Grainger, etc).

Two gallons of concentrated liquid ice machine cleaner are recommended for each heat exchanger cleaning. Recommended brands and manufacturer order numbers are:

Virginia KMP (1 Gallon), Mfr. H419
Nu-Calgon (1 Gallon), Mfr. 4207-48

IMPORTANT

Use splash goggles, wear appropriate clothing to prevent skin exposure, and rubber gloves while handling cleaning solution. Have good ventilation if vapors, mists or dusts are formed. Have eye wash and shower in area.

FIRST AID
Wash skin and eyes thoroughly with water after contact. If swallowed give water or milk to drink and ice to suck. DO NOT induce vomiting. Get medical attention.

SPILLS
Cover spill with soda ash or inert material, then place in a chemical waste container. Dispose of in a manner consistent with federal and local law.

IMPORTANT

ALWAYS pour concentrated cleaning solution into water.

Mix 1 gallon of concentrated liquid ice machine cleaner per 15 gallons of water in a 55 gallon drum as shown in Figure 14.

Connect the 3/4" ID x 15' heavy duty hose to the hose bibb on gate valve (3) and return to the container holding the cleaning solution. Connect the 3/4" ID x 10' heavy duty hose to the hose bibb on gate valve (4) and run near to the bottom of the container holding cleaning solution. See Figure 14.

Start the closed circuit cleaning by ensuring that gate valves (5) and (6) are tightly shut and then energize the HWM water circulating pump.

Circulate the cleaning solution through the HWM closed circuit for approximately an hour or until there is no further change in the color of the cleaning solution.

When cleaning process is completed, turn off the water circulating pump and close gate valve (4). Disconnect hose from hose bibb on gate valve (4) and drain cleaning solution into drum. Safely dispose of hose.

Slowly open gate valve (6) to flush the heat exchanger water system clear of cleaning solution. The flushed mixture is routed into the 55 gallon drum. Approximately 20 gallons of water flushed through the system will ensure cleaning solution has been thoroughly flushed out of the system and into the drum.

Close gate valve (3) and remove the hose from the hose bibb on gate valve (3), draining residual water into the drum.

Safely dispose of hose. Close and seal drum and safely dispose of drum containing used cleaning solution.

Re-open gate valve (5) as appropriate.

Reconnect power to the HWM in the normal operational mode.

Establish a schedule for regular maintenance of the HWM heat exchanger, based on the results of the first heat exchanger cleaning.

8. Tools and Equipment

The purpose of the following list is to highlight key pieces of equipment, tools and materials necessary for the installation, maintenance and servicing of EarthLinked® Heating and Cooling System HVAC (above ground) equipment.
The professional HVAC technician is expected to have a compliment of standard tools for the general servicing of refrigeration equipment.

Equipment, Tools and Materials

ITEM	DESCRIPTION
1.	Vacuum Pump (6 CFM minimum capacity)
2.	Evacuation Manifold (for vacuum pump)
3.	Digital Vacuum (micron) Gauge
4.	Charging/Evacuating Manifold for R-407C
5.	Charging/Hi-Vacuum Hoses (black, quantity of 6)
6.	Digital Refrigerant Scale
7.	Digital Thermometer
8.	Digital Sling Psychrometer
9.	Air Flow Meter (for air handlers)
10.	Nitrogen Tank with 0 – 600 psig Regulator and Handtruck
11.	Oxy-acetylene Welding Torch Set
12.	15% Silver Brazing Alloy
13.	Refrigerant Recovery Unit (1/2 #/minute minimum vapor capacity)
14.	Recovery Cylinder (50# capacity)
15.	Halogen Leak Detector
16.	Digital VOM
17.	Digital Clamp-on Ammeter
18.	Digital Water Flowmeter (3 to 30 gpm)
19.	Tubing Cutters
20.	Tubing Benders
21.	Nut Driver
22.	Cordless Drill (3/8”)
23.	Swaging Kit
24.	Deburring Tool
25.	Drill Bit Set
26.	Inspection Mirror

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