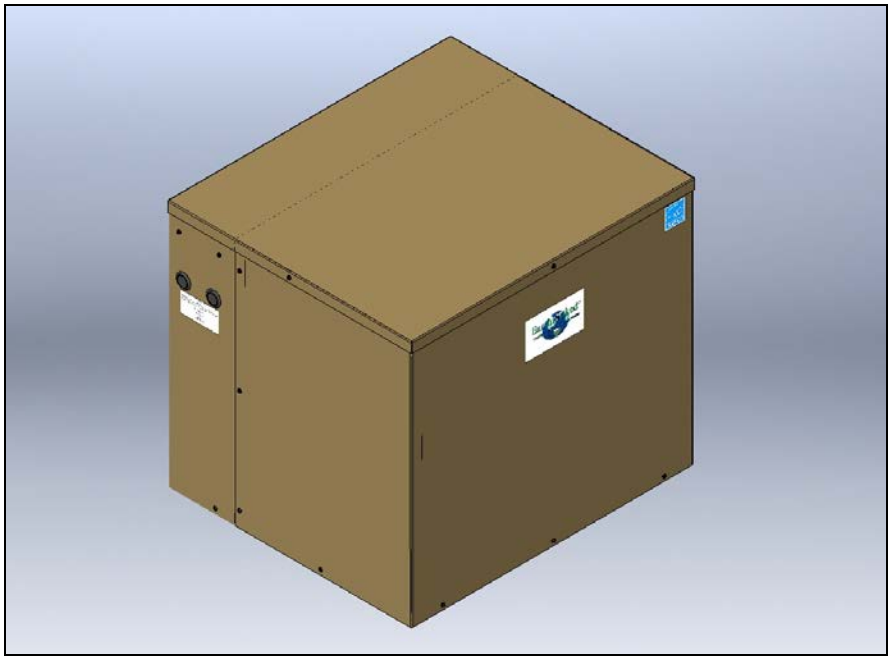
EarthLinked®
SW Series Compressor Unit
R-407C
Quik-Start Instructions



Disclaimer

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 System 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 void the limited warranty coverage for the system.

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 field specified components.

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

Earthlinked Technologies, Inc.
4151 South Pipkin Road
Lakeland, Florida 33811
tel. 863-701-0096 ● fax 863-701-7796
info@earthlinked.com ● www.earthlinked.com

CSI # 23 80 00

Pre-Installation

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.

IMPORTANT!

THIS MODEL SW COMPRESSOR UNIT MUST BE CONNECTED WITH THE APPROPRIATE MODEL AVS AIR HANDLER, CCS CASED COIL OR APPROPRIATE MODEL HWM HYDRONIC WATER MODULE (FOR CHILLED WATER APPLICATIONS) TO FUNCTION AS A SYSTEM. CHECK FIGURE 1 BELOW TO ENSURE THAT YOU HAVE THE APPROPRIATE MATCHING SYSTEM COMPONENTS.

IF YOU ARE INSTALLING A FIELD SPECIFIED (NON-ETI) BRAND AIR HANDLER, CASED COIL OR HYDRONIC WATER MODULE TO UTILIZE WITH AN SW COMPRESSOR UNIT, YOU MUST INSTALL THE APPROPRIATE TXV KIT TO THE FIELD SPECIFIED COMPONENT TO MAKE THE SYSTEM OPERATIONAL. ORDER THE APPROPRIATE TXV KIT FROM ETI CUSTOMER SERVICE.

HEAT/COOL and COOL ONLY Applications							
Compressor Unit[1]	Air Handler[4] AVS -	Cased Coil CCS -	Hydronic Water Module	Domestic Water Module	Auxiliary Cooling Module[3]	Earth Loop[2]	Cathodic Protection System
-018	0018-B*	0018-B*	HWM-18B	DWM-1836	ACM-1836B	-018	CPS-1830
-024	0024-B*	0024-B*	HWM-24B	DWM-1836		-024	CPS-1830
-030	0030-B*	0030-B*	HWM-30B	DWM-1836		-030	CPS-1830
-036	0036-B*	0036-B*	HWM-36B	DWM-1836		-036	CPS-3642
-042	0042-B*	0042-B*	HWM-42B	DWM-4248	ACM-4272B	-042	CPS-3642
-048	0048-B*	0048-B*	HWM-48B	DWM-4248		-048	CPS-4872
-060	0060-B*	0060-B*	HWM-60B	DWM-6072		-060	CPS-4872
-072	0068-BV	NA	HWM-72B	DWM-6072		-072	CPS-4872

1. All SC, SD, SCW and SW series compressor units contain:
   - compressor unit
   - four L-shaped hold down brackets
   - service valves-liquid and vapor
   - adapters for service valves and earth loop line set
   - product literature
2. All series Earth Loops: V1, D1, T1, V1.5, D1.5, V2, D2, D3, H1, H5
3. ACMs are for SC, SD, SCW and SW compressor units.
4. Air Handler Models AVS-0068-BV is for VERTICAL installation only.

Note: Desuperheater and all EarthLinked® thermostats can be utilized throughout capacity range.

Figure 1. Model Numbers

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.

Guidelines for the general layout of the system components is shown in Figure 2. Before placing the compressor unit (outside or indoors) review the guidelines in Figure 2.

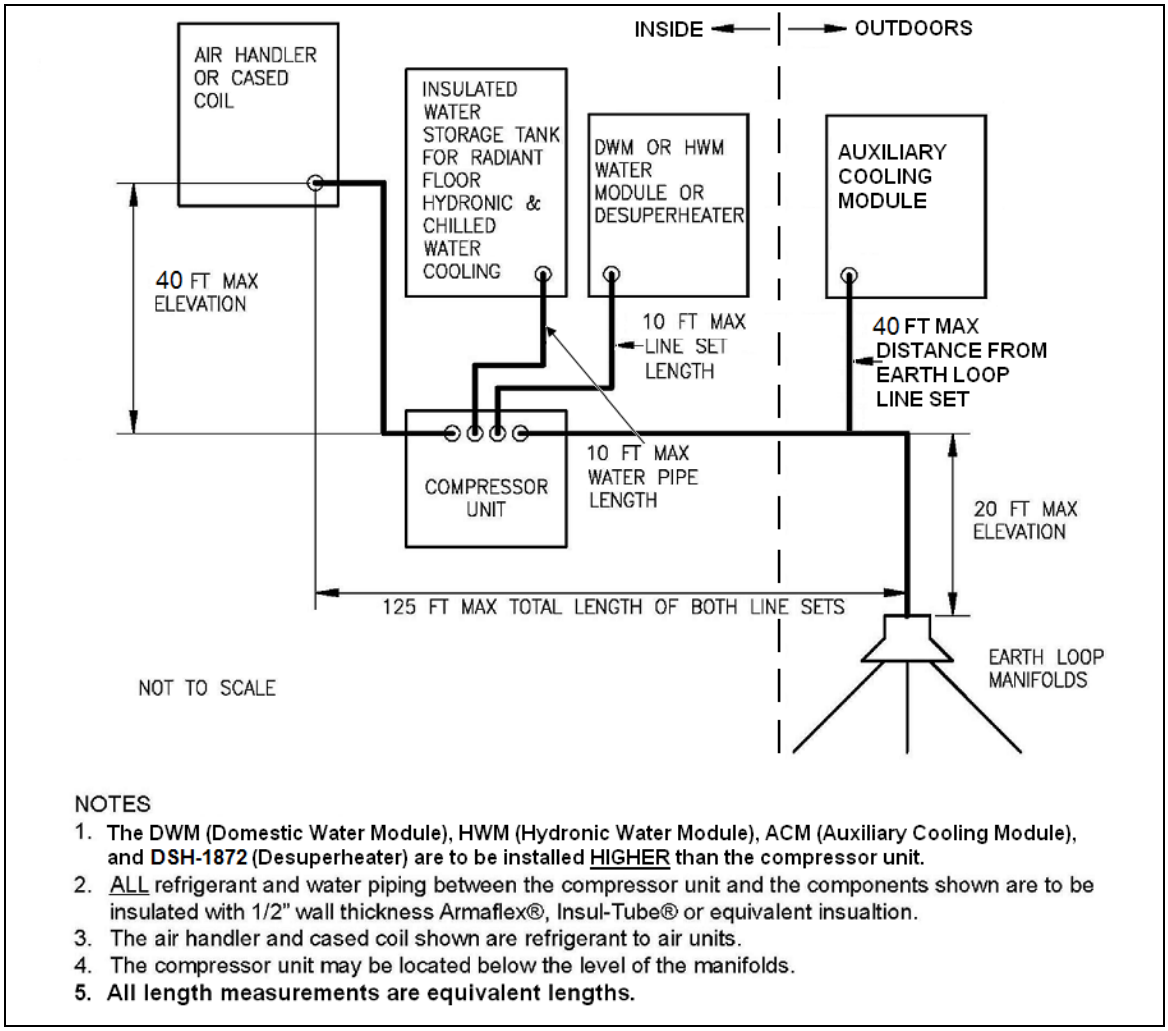


Figure 2. General System Layout

Placement and Mechanical Information

EarthLinked® compressor units may be located outside or inside the building, following these guidelines.

OUTSIDE

Locate compressor unit:

- On a standard HVAC condensing unit pad, resting on firm, level, settled ground.
- Same as for INSIDE placement. See below.

INSIDE

Locate compressor unit:

- On a solid, level hard surface. If compressor unit is to be fastened, see Figure 3 for bracket installation.
- Where compressor unit sound and vibration will not disturb human activities. Compressor unit may be located in garage, basement, crawl space or utility room. Avoid placing compressor unit in kitchen, bedroom, family/living/dining room areas.

- In a condensate pan.
- On vibration pads.
- Attic installations, where necessary, must include a drip pan, anti-vibration pads and are to be suspended from the rafters with suspension isolators.
- For SD compressor units (which have potable domestic water connections) where the surrounding air temperature remains above 40°F.
- Where suggested clearance is 3 feet on both sides, top and front, for access. However, local codes and applicable regulations take precedence. Clearance from back panel to wall and minimum side clearance should be at least one foot. See Figure 4 for details.
- Where the total length of refrigerant line sets (from manifolds to compressor and from compressor to air handler) do not exceed 125 feet, as shown in Figure 2.
- Where the compressor unit is no more than 20 feet higher than the earth loop manifolds. Compressor unit may be located lower than the earth loop manifolds. See Figure 2.

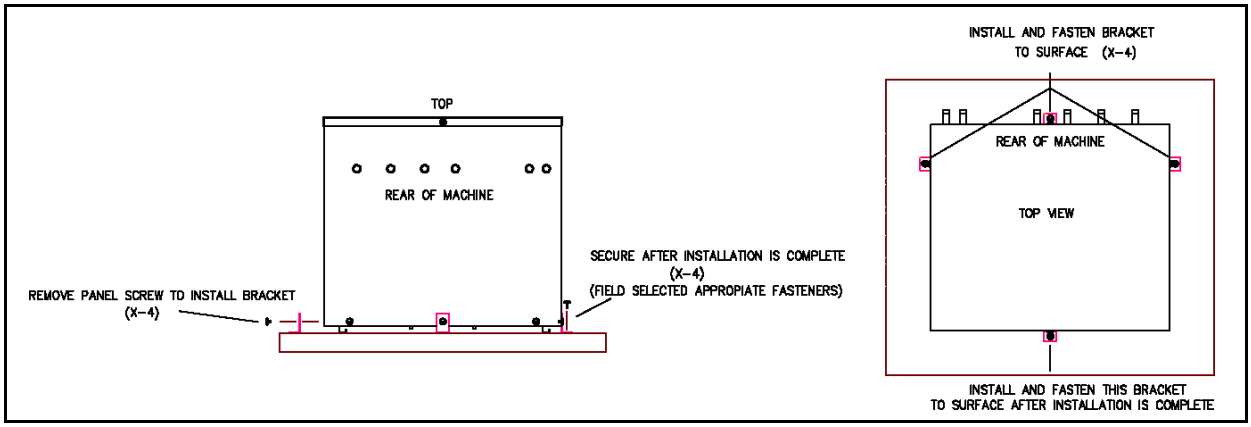


Figure 3. Compressor Unit Bracket Installation

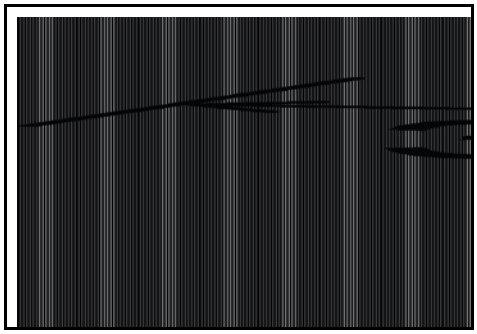


Figure 4. Compressor Unit Clearance

IMPORTANT!

REFRIGERANT PIPING CONNECTIONS

Refrigerant piping joints and connections in the EarthLinked® heating and cooling system, including the DIRECT AXXESS® earth loop system are to be brazed with 15% silver content brazing alloy, utilizing the **NITROGREN BRAZING PROCESS.**

IMPORTANT!
NITROGEN BRAZING PROCESS

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

TECHNIQUE:
"Trickle" 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 nitrogen, and relieve pressure at the joint to atmospheric prior to brazing.

CONSEQUENCES:
Failure to displace oxygen with 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.

Compressor units are shipped from the factory with a low pressure nitrogen holding charge. Carefully relieve the holding charge when the compressor unit is being prepared to connect refrigerant system piping.

The compressor unit package contains a service valve kit and an adapter kit. **The two service valves are to be installed on the earth loop vapor and liquid connections of the compressor unit,** using the adapters to right-size to the proper earth loop line set.

Installation of the service valves will provide isolation of the earth loop system from the compressor unit and provide easy access to the refrigerant system.

The service valve configuration provided is illustrated in Figure 4a. The valve stem is accessed by removing the cap. The service port is equipped with a Schrader valve insert.

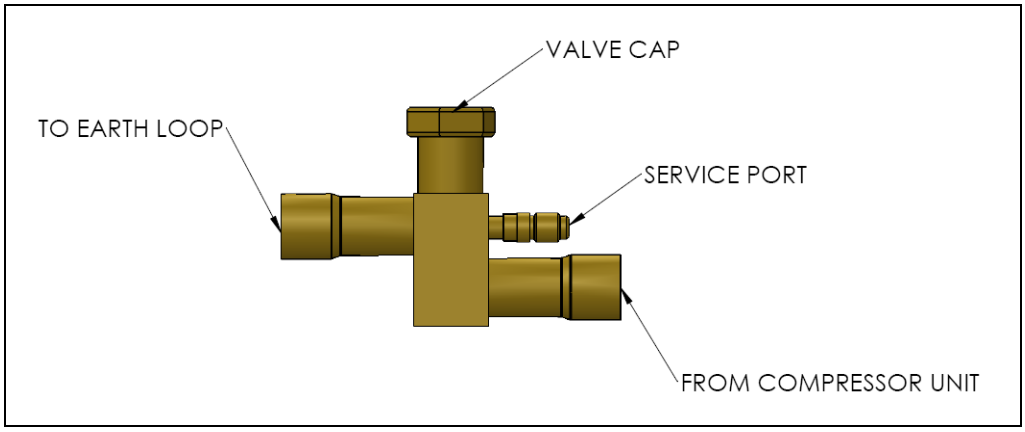


Figure 4a. Service Valve Orientation

Complete service valve installation instructions are contained in the ***Service Valve Kit Installation Manual***, included with the service valves.

IMPORTANT

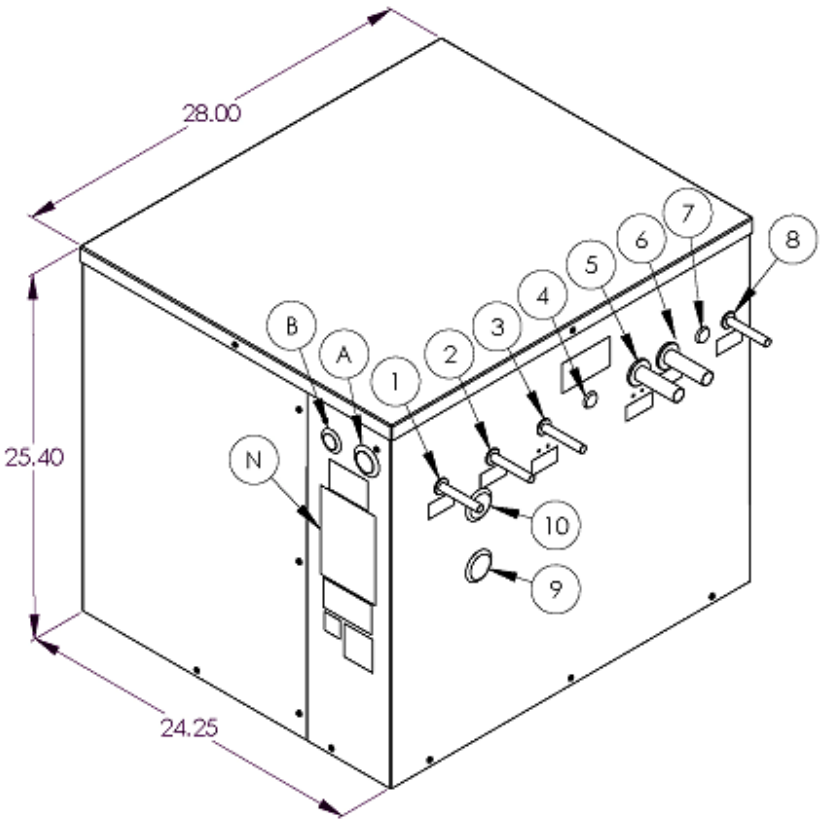
ALL COMPRESSOR UNITS COME FROM THE FACTORY EQUIPPED WITH ONE LINE SET ADAPTER KIT FOR THE EARTH LOOP LINE SET ONLY.

LINE SET ADAPTERS REQUIRED FOR THE AIR HANDLER, CASED COIL, HYDRONIC WATER MODULE AND DOMESTIC WATER MODULE ARE FIELD SUPPLIED. CHECK ALL APPROPRIATE COMPRESSOR UNIT STUB-OUT TUBING SIZES FOR REQUIRED FIELD SUPPLIED ADAPTERS!

EARTHLOOP, AIR HANDLER, CASED COIL LINE SETS			DWM/HWM LINE SETS		
COMPRESSOR UNIT SIZE	LINE SET O.D., INCHES		MODEL	LINE SET O.D., INCHES	
	LIQUID*	VAPOR*		LIQUID*	VAPOR*
1.5 Tons (-018)	5/16	5/8	-1836	3/8	1/2
2.0 Tons (-024)	3/8	3/4	-1836	3/8	1/2
2.5 Tons (-030)	3/8	3/4	-1836	3/8	1/2
3.0 Tons (-036)	3/8	3/4	-1836	3/8	1/2
3.5 Tons (-042)	1/2	7/8	-4248	1/2	5/8
4.0 Tons (-042)	1/2	7/8	-4248	1/2	5/8
5.0 Tons (-060)	1/2	1-1/8	-6072	1/2	3/4
6.0 Tons (-072)	1/2	1-1/8	-6072	1/2	3/4

*Liquid and Vapor lines must BOTH be insulated with Armaflex®, Insul-Lock® or equivalent with at least 1/2" wall thickness for the full length of the line set.

When EarthLinked® systems are installed (1) in commercial cooling load applications and (2) where local earth temperature is 70°F or above; the Heating Performance Enhancement Kit is required for field installation on the compressor unit to ensure peak performance. It is listed on the compressor price pages.
For SW series compressor units that are being installed with a hydronic water module for heating and a DX air handler for cooling, it is necessary to install the SWT Timer Kit (SWT-1872) which can be ordered from the SW compressor price pages.



*includes 1/2" cabinet base standoffs

PORT	FUNCTION	TYPE OF CONNECTION	SIZE, INCHES							
			018	024	030	036	042	048	060	072
A[1]	Electrical, Power	1-1/4" Hole	1	1	1	1	1	1	1	1
B[1,2]	Electrical, Control	7/8" Hole	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
1	AH/CC/HWM Liquid	MS, OD	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
2	DWM/HWM Liquid	MS, OD	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
3	EL Liquid*	MS, OD	5/16	3/8	3/8	3/8	1/2	1/2	1/2	1/2
4	Plugged	---	---	---	---	---	---	---	---	---
5	EL Vapor*	MS, OD	5/8	3/4	3/4	3/4	7/8	7/8	1-1/8	1-1/8
6	AH/CC/HWM Vapor	MS, OD	3/4	3/4	3/4	3/4	7/8	7/8	7/8	7/8
7	Plugged	---	---	---	---	---	---	---	---	---
8	DWM/HWM Vapor	MS, OD	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
9	Plugged	---	---	---	---	---	---	---	---	---
10	Plugged	---	---	---	---	---	---	---	---	---

N = Nameplate and other information
1: Nominal electrical connector sizes
2: Two additional electrical control ports on opposite side, same size
*Line set sizes with provided compressor unit adapters

LEGEND
AH = Air Handler
CC = Cased Coil
EL = Earth Loop
HWM = Hydronic Water Module
DWM = Domestic Water Module
HWT = Hydronic Water Tank
DWT = Domestic Water Tank

Figure 5. SW Connections

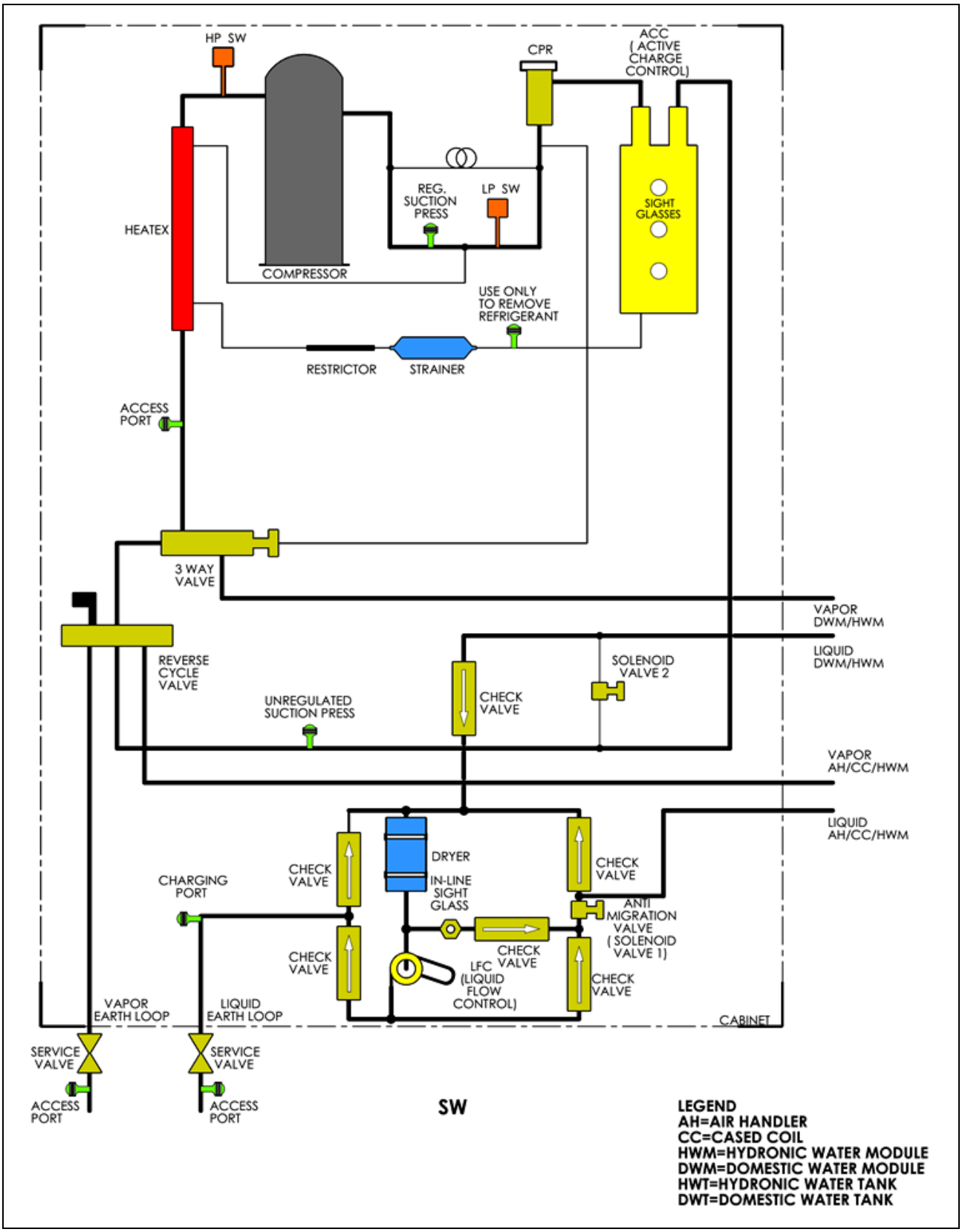


Figure 6. SW Internal Flow Schematic

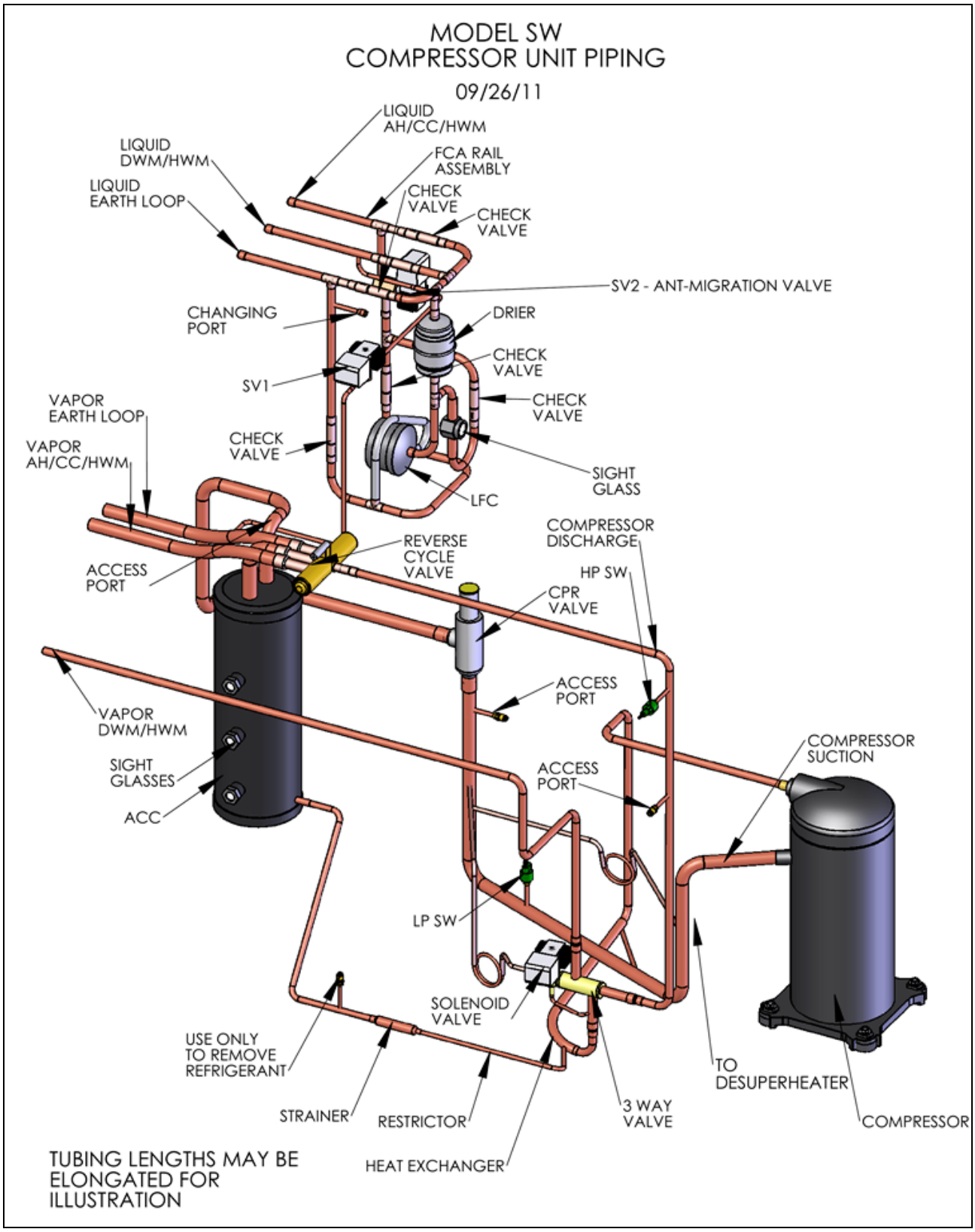
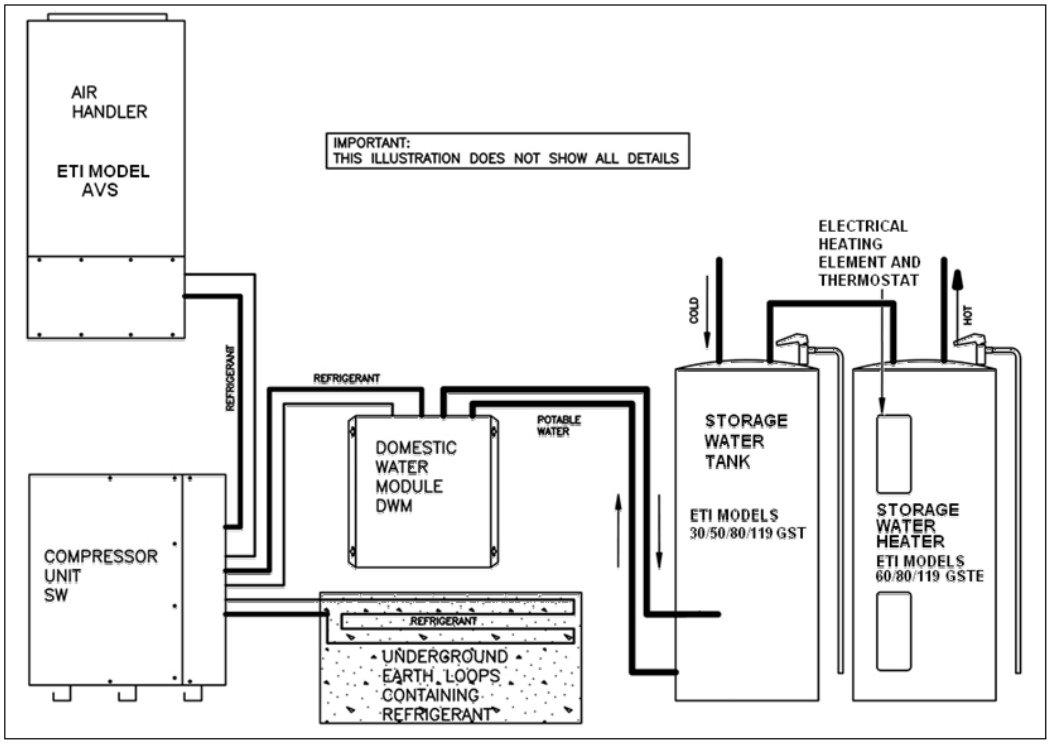


Figure 7. SW Piping

System Application Options



FIELD SPECIFIED & SUPPLIED PARTS, EQUIPMENT AND MATERIALS		
ITEM	**DESCRIPTION**	**REFERENCE**
1.	Electrical disconnects, breakers and power, control and thermostat wire	Figure 11 and Air Handler Installation Manual and local codes.
2.	Nitrogen and 15% brazing alloy	Pages 5,6
3.	Refrigerant	Page 27
4.	Line Sets	Page 7
5.	Pipe Insulation (refrigerant)	Figure 2.
6.	Condensate pan, vibration pads	Page 4
7.	Water pipe, fittings and insulation from DWM to water storage tank	SHC-IOM*
8.	Water filtration system	SHC-IOM*
9.	Domestic water heating temperature controller	SHC-IOM*
10.	Storage Water Tank	ETI Storage Water Tank Installation Manual
11.	Storage Water Heater	ETI Storage Water Heater Installation Manual
* EarthLinked® Heating and Cooling System Installation, Operation and Maintenance Manual		

Figure 8. SW Air Heating, Cooling and Domestic Hot Water by Priority Heating with DWM

CAUTION

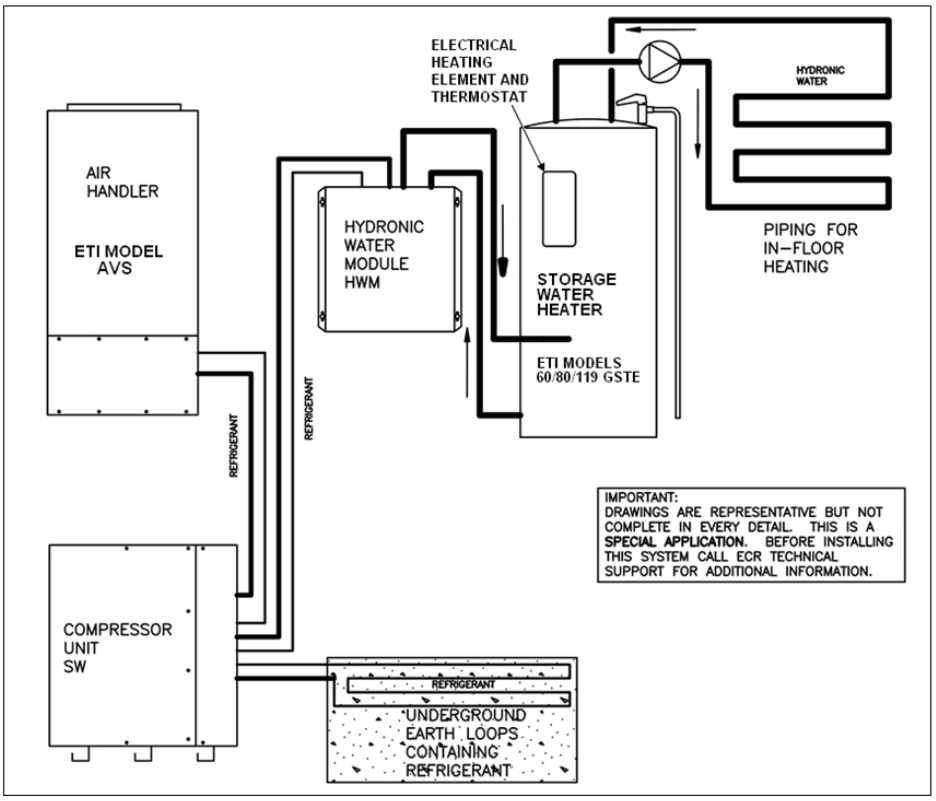
The domestic water module and associated water piping must be freeze protected by maintaining the ambient temperature higher than 40°F. Failure to do so may result in equipment and property damage.

IMPORTANT

FOR COMMERCIAL COOLING LOADS AND EARTH TEMP ≥ 70°

REQUIRES FIELD-INSTALLED HEATING PERFORMANCE ENHANCEMENT KIT, HPE-1872

SEE COMPRESSOR UNIT PRICE PAGES.



FIELD SPECIFIED & SUPPLIED PARTS, EQUIPMENT AND MATERIALS		
ITEM	**DESCRIPTION**	**REFERENCE**
1.	Electrical disconnects, breakers and power, control and thermostat wire	Figure 11 and Air Handler Installation Manual and local codes.
2.	Nitrogen and 15% brazing alloy	Pages 5,6
3.	Refrigerant	Page 27
4.	Line Sets	Page 7
5.	Pipe Insulation (refrigerant)	Figure 2.
6.	Condensate pan, vibration pads	Page 4
7.	Water pipe, fittings and insulation from HWM to water storage tank	SHC-IOM*
8.	Freeze protection switch	SHC-IOM*
9.	Domestic water heating temperature controller	SHC-IOM*
10.	Storage Water Heater	ETI Storage Water Heater Installation Manual
* EarthLinked® Heating and Cooling System Installation, Operation and Maintenance Manual		

Figure 9. SW Radiant Panel Hydronic Heating and Air Heating and Cooling

IMPORTANT

FOR HYDRONIC HEATING AND DX AIR COOLING:

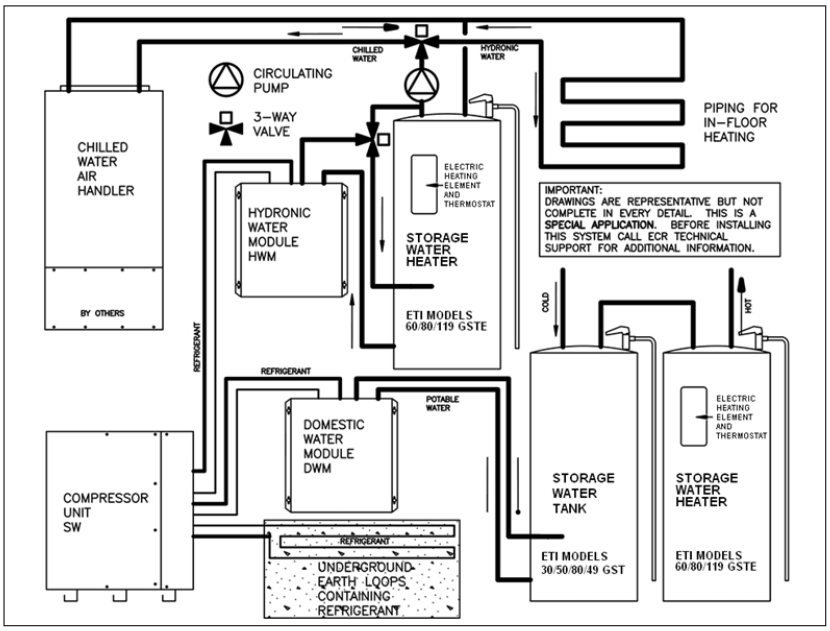
REQUIRES FIELD-INSTALLED SWT TIMER KIT, SWT-1872.

FOR COMMERCIAL COOLING LOADS AND EARTH TEMP ≥ 70°:

REQUIRES FIELD-INSTALLED HEATING PERFORMANCE ENHANCEMENT KIT, HPE-1872

SEE COMPRESSOR UNIT PRICE PAGES.

REQUIRES ANTIFREEZE PROTECTION OF THE HYDRONIC WATER CIRCULATING SYSTEM.



FIELD SPECIFIED & SUPPLIED PARTS, EQUIPMENT AND MATERIALS		
ITEM	**DESCRIPTION**	**REFERENCE**
1.	Electrical disconnects, breakers and power, control and thermostat wire	Figure 11 and Air Handler Installation Manual and local codes.
2.	Nitrogen and 15% brazing alloy	Pages 5, 6
3.	Refrigerant	Page 27
4.	Line Sets	Page 7
5.	Pipe Insulation (refrigerant)	Figure 2.
6.	Condensate pan, vibration pads	Page 4
7.	Freeze protection switch	SHC-IOM*
8.	Three-way zone valve	SHC-IOM*
9.	Hydronic heating temperature controller	SHC-IOM*
10.	Chilled water temperature controller	SHC-IOM*
11.	Primary circuit water pipe and insulation	SHC-IOM*
12.	Chilled water air handler	Mfr. Installation Manual
13.	DWM to water storage tank water piping, insulation and fittings	SHC-IOM*
14.	Water filtration system	SHC-IOM*
15.	Storage Water Tank	ETI Storage Water Tank Installation Manual
16.	Storage Water Heater	ETI Storage Water Heater Installation Manual
* EarthLinked® Heating and Cooling System Installation, Operation and Maintenance Manual		

Figure 10. SW Radiant Panel Hydronic Heating and Air (Chilled Water) Cooling and Domestic Hot Water by Priority Heating with DWM

CAUTION

The domestic water module and associated water piping must be freeze protected by maintaining the ambient temperature higher than 40°F. Failure to do so may result in equipment and property damage.

IMPORTANT

FOR HYDRONIC HEATING APPLICATIONS:

REQUIRES FIELD-INSTALLED PUMP WIRE KIT, PW1-1872 FOR 230-1-60, 230-3-60, 460-3-60 AND 575-3-60 POWER SUPPLY.

FOR COMMERCIAL COOLING LOADS AND EARTH TEMP ≥ 70°: REQUIRES FIELD-INSTALLED HEATING PERFORMANCE ENHANCEMENT KIT, HPE-1872

SEE COMPRESSOR UNIT PRICE PAGES.

REQUIRES ANTIFREEZE PROTECTION OF THE HYDRONIC WATER CIRCULATING SYSTEM.

Antifreeze Protection

When **HWM hydronic water modules** are applied to radiant panel hydronic heating and/or 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/OR 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 table.

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

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 the table above.

WARNING!

ALWAYS REMOVE THE ANODE ROD(S) FROM THE STORAGE WATER TANK OR 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.

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

Electrical and Sound Data

Model	Voltage/Phase/Hz	Voltage		LRA	RLA	MCA	MFS	Sound Pressure Level * @10 ft, dB(A)
		Min.	Max.					
-018-1B	230-1-60	207	253	45.0	9.6	12.0	20	59.0
-024-1B	230-1-60	207	253	63.0	12.2	15.0	25	59.0
-024-2B	230-3-60	207	253	55.0	8.6	11.0	20	59.0
-024-3B	460-3-60	414	506	27.0	4.3	5.0	10	59.0
-030-1B	230-1-60	207	253	73.0	13.5	17.0	25	59.0
-030-2B	230-3-60	207	253	63.0	10.7	13.0	20	59.0
-030-3B	460-3-60	414	506	31.0	5.0	6.0	10	59.0
-030-6B	575-3-60	518	632	24.0	4.3	5.0	10	59.0
-036-1B	230-1-60	207	253	95.0	16.5	20.0	30	62.0
-036-2B	230-3-60	207	253	77.0	10.3	13.0	20	62.0
-036-3B	460-3-60	414	506	39.0	5.7	7.0	10	62.0
-036-6B	575-3-60	518	632	31.0	4.2	5.0	10	62.0
-042-1B	230-1-60	207	253	109.0	18.3	23.0	35	62.0
-042-2B	230-3-60	207	253	88.0	13.9	17.0	25	62.0
-042-3B	460-3-60	414	506	44.0	7.1	9.0	15	62.0
-042-6B	575-3-60	518	632	34.0	5.4	7.0	10	62.0
-048-1B	230-1-60	207	253	137.0	19.9	24.0	35	62.0
-048-2B	230-3-60	207	253	91.0	14.7	18.0	30	62.0
-048-3B	460-3-60	414	506	50.0	7.1	9.0	15	62.0
-048-6B	575-3-60	518	632	37.0	5.1	6.0	10	62.0
-060-1B	230-1-60	207	253	148.0	28.8	35.0	50	65.0
-060-2B	230-3-60	207	253	128.0	18.6	23.0	35	65.0
-060-3B	460-3-60	414	506	63.0	9.0	11.0	15	65.0
-060-6B	575-3-60	518	632	50.0	7.1	9.0	15	65.0
-072-1B	230-1-60	207	253	176.0	28.8	35.0	50	65.0
-072-2B	230-3-60	207	253	156.0	18.6	23.0	35	66.0
-072-3B	460-3-60	414	506	75.0	9.0	11.0	15	66.0
-072-6B	575-3-60	518	632	54.0	7.4	9.0	15	66.0

LRA = Locked Rotor Amps
RLA = Rated Load Amps
MCA = Minimum Circuit Ampacity
MFS = Maximum Fuse or HACR Circuit Breaker Size (External)
AWG = Consult NEC and Local Codes

*Data Source is published Copeland Compressor Sound Power Levels converted to Sound Pressure Level in dB(A) at 10 Feet, having two reflective surfaces. Effects of ETI compressor unit cabinet and components not included.

Figure 11. Compressor Unit Electrical and Sound Data

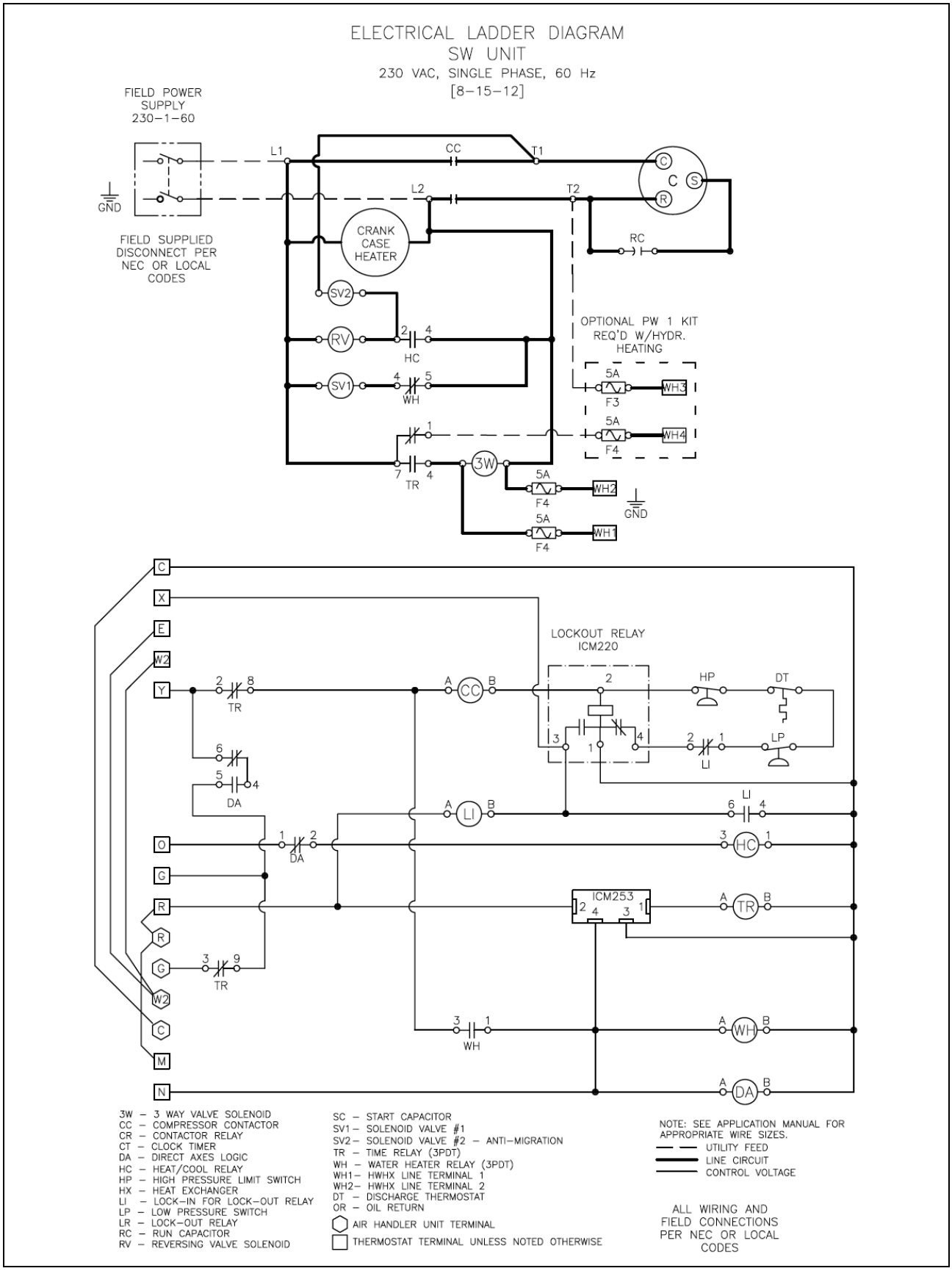


Figure 12. SW Electrical Ladder Diagram (230-1-60)

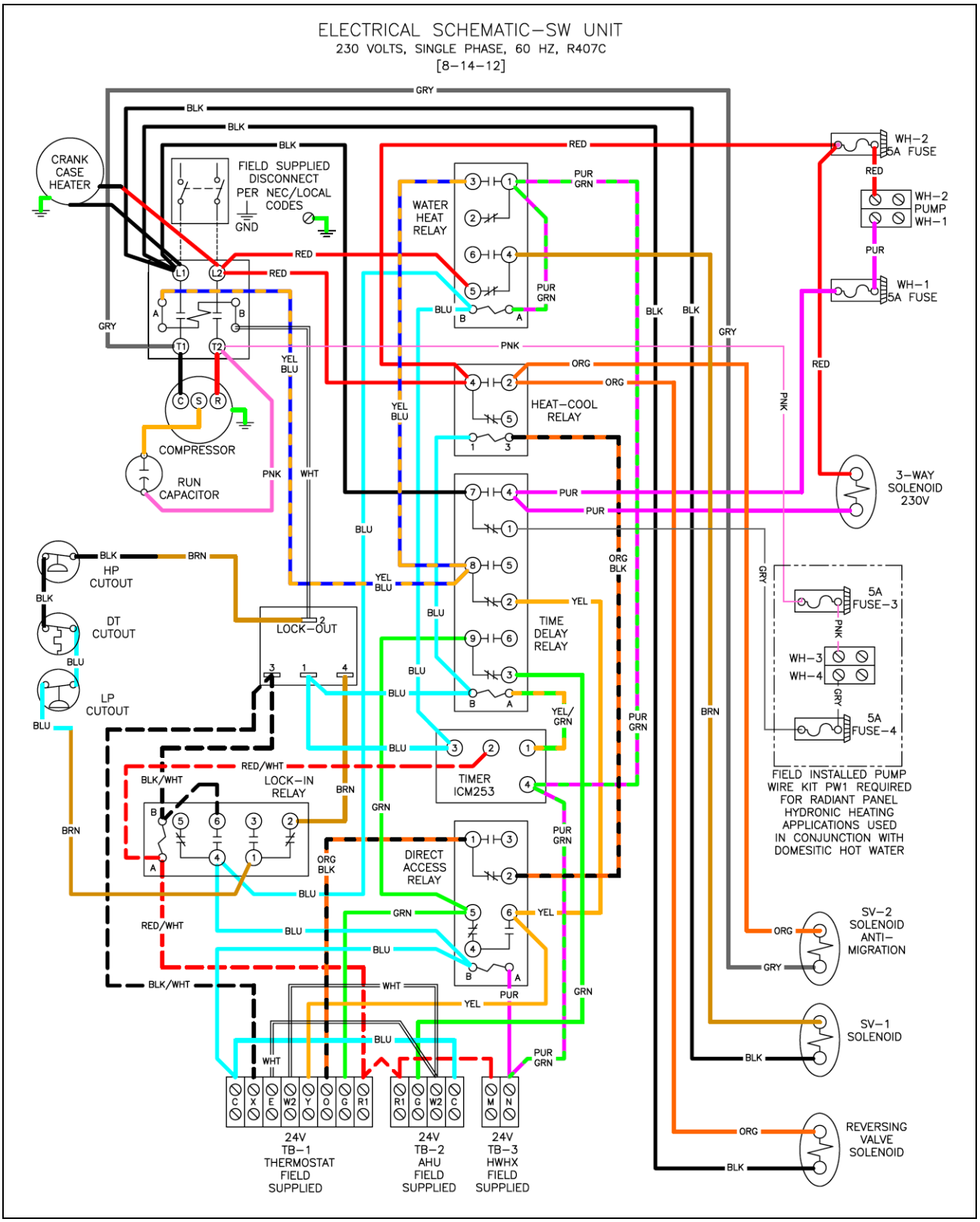


Figure 13. SW Electrical Schematic (230-1-60)

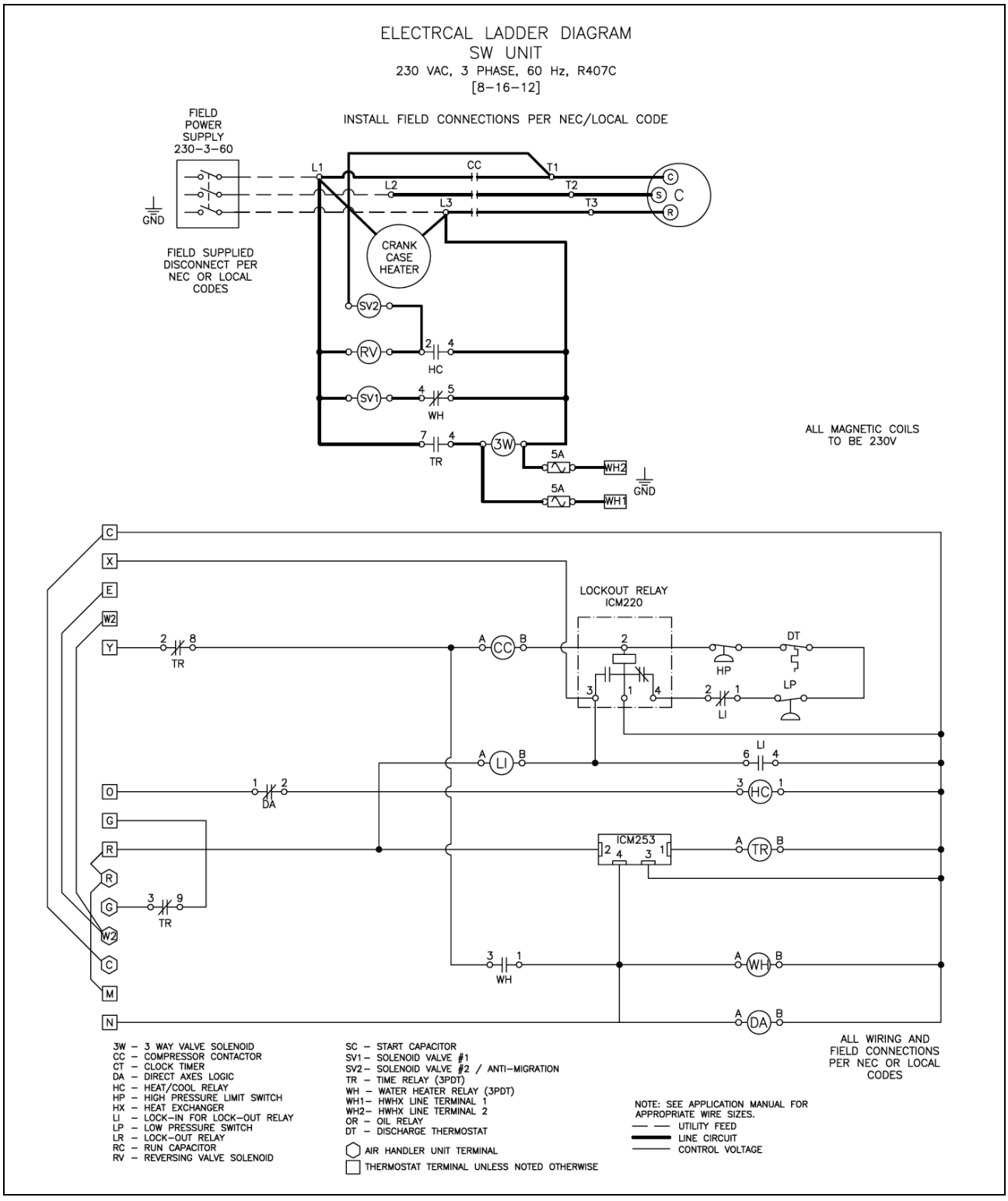


Figure 14. SW Series 230-3-60 Electrical Ladder Diagram

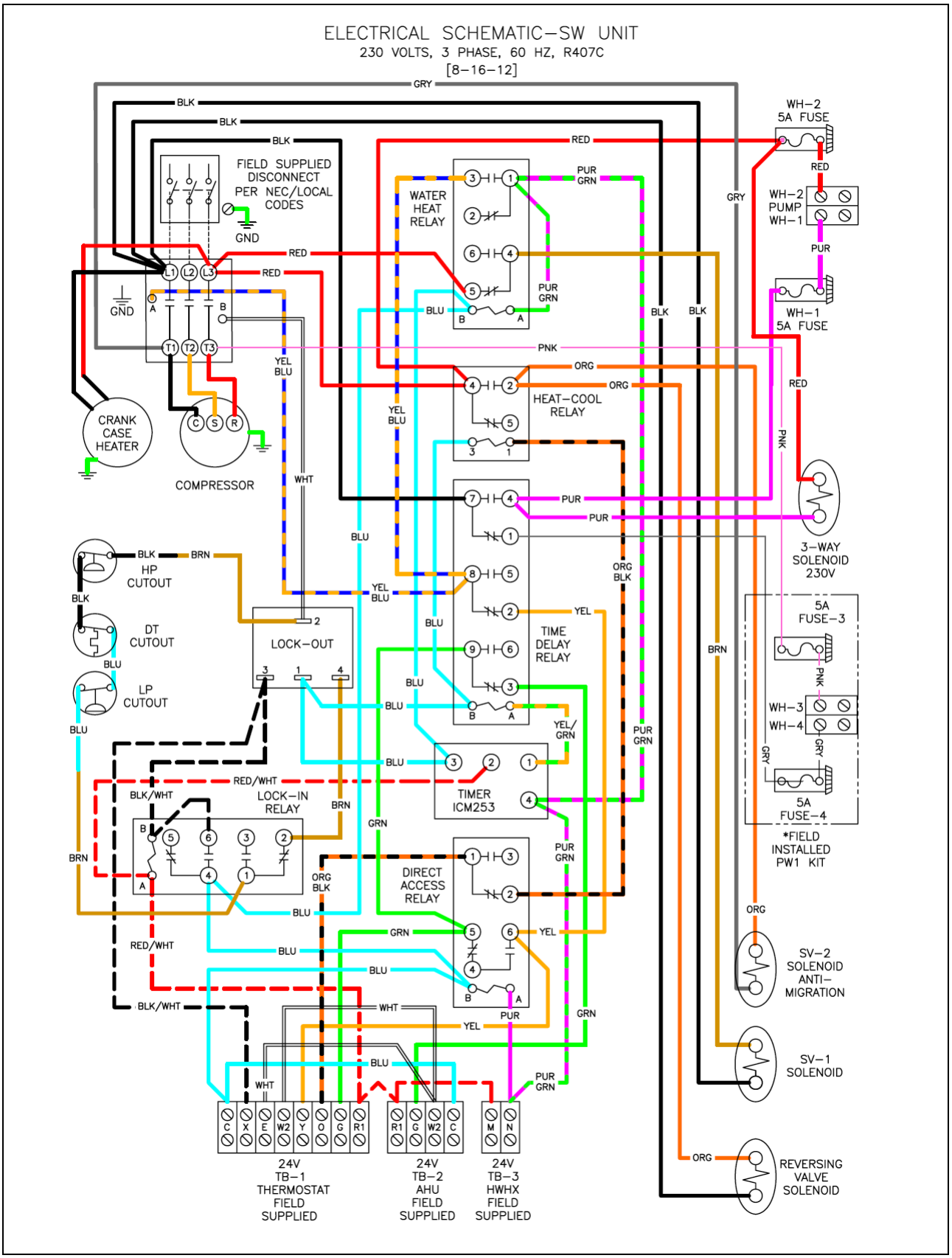


Figure 15. SW Series 230-3-60 Electrical Schematic

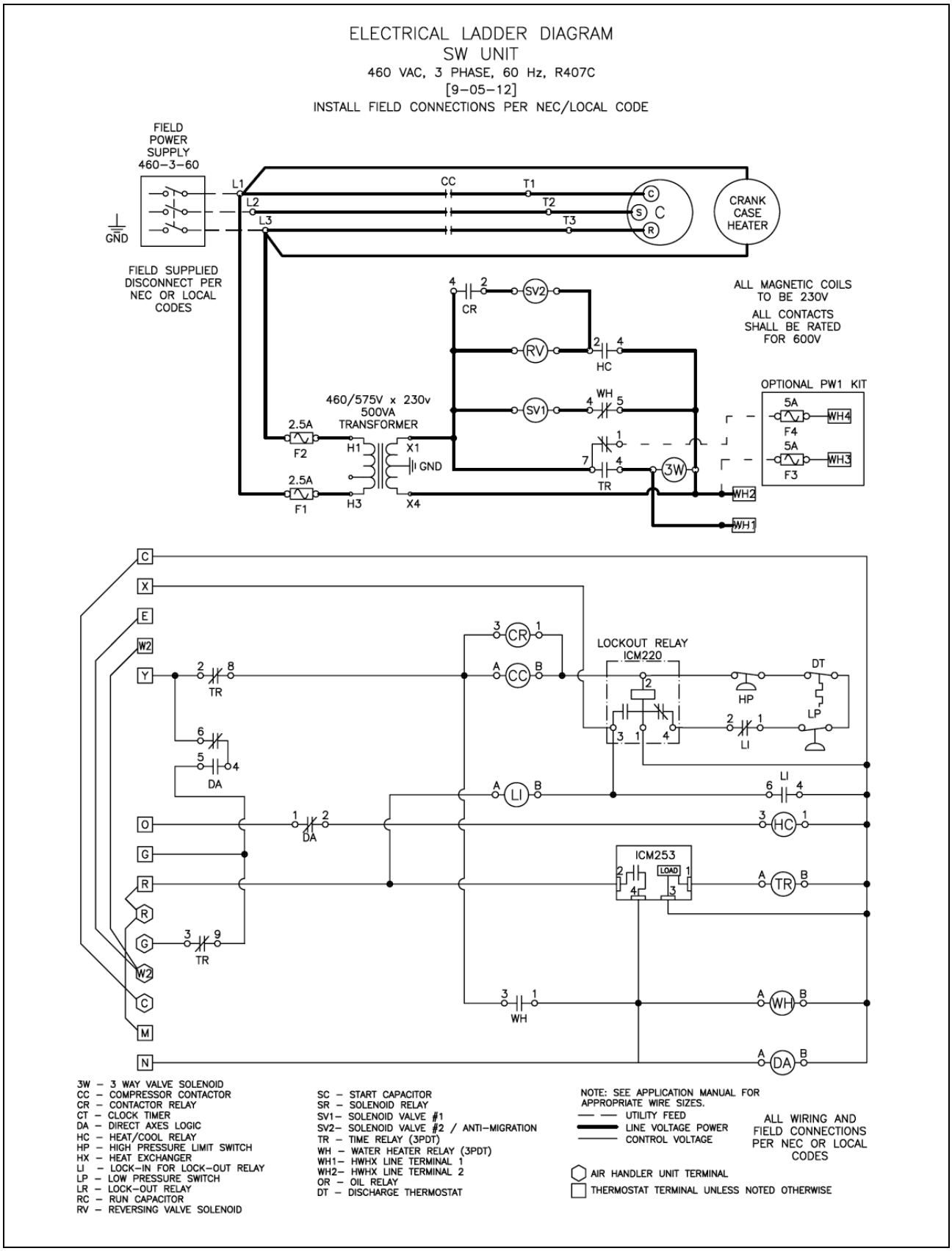


Figure 16. SW Series 460-3-60 Electrical Ladder Diagram

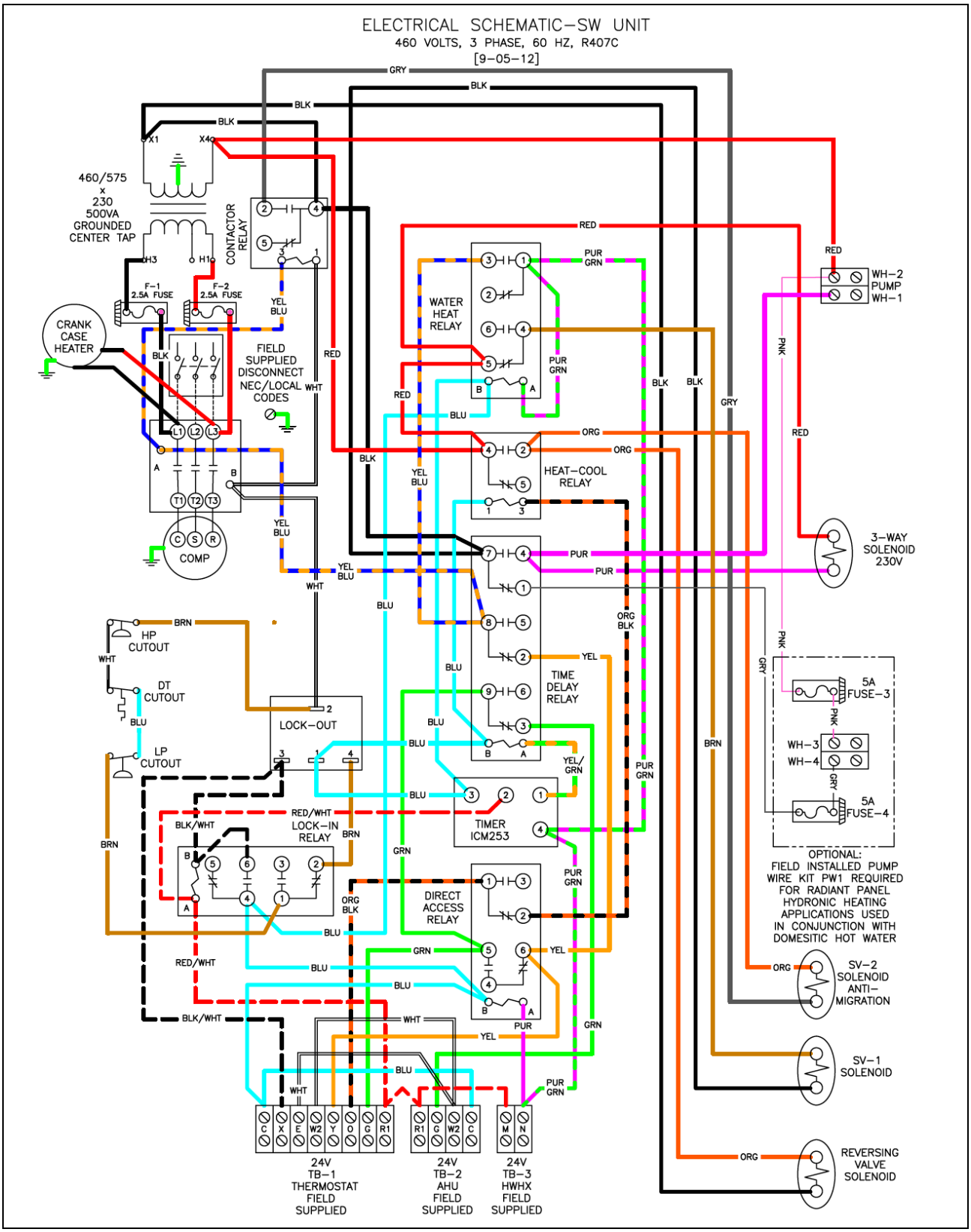


Figure 17. SW Series 460-3-60 Electrical Schematic

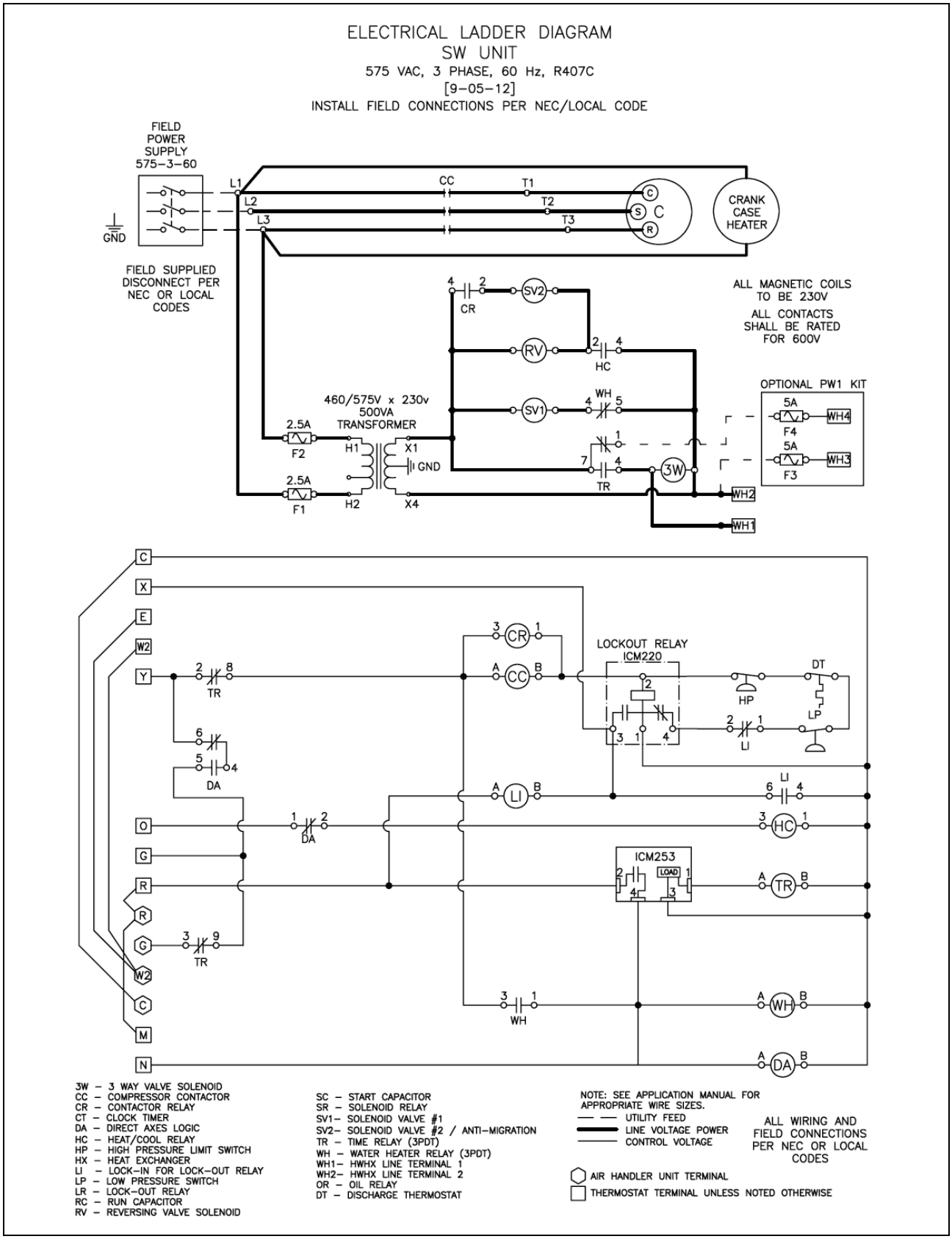


Figure 18. SW Series 575-3-60 Electrical Ladder Diagram

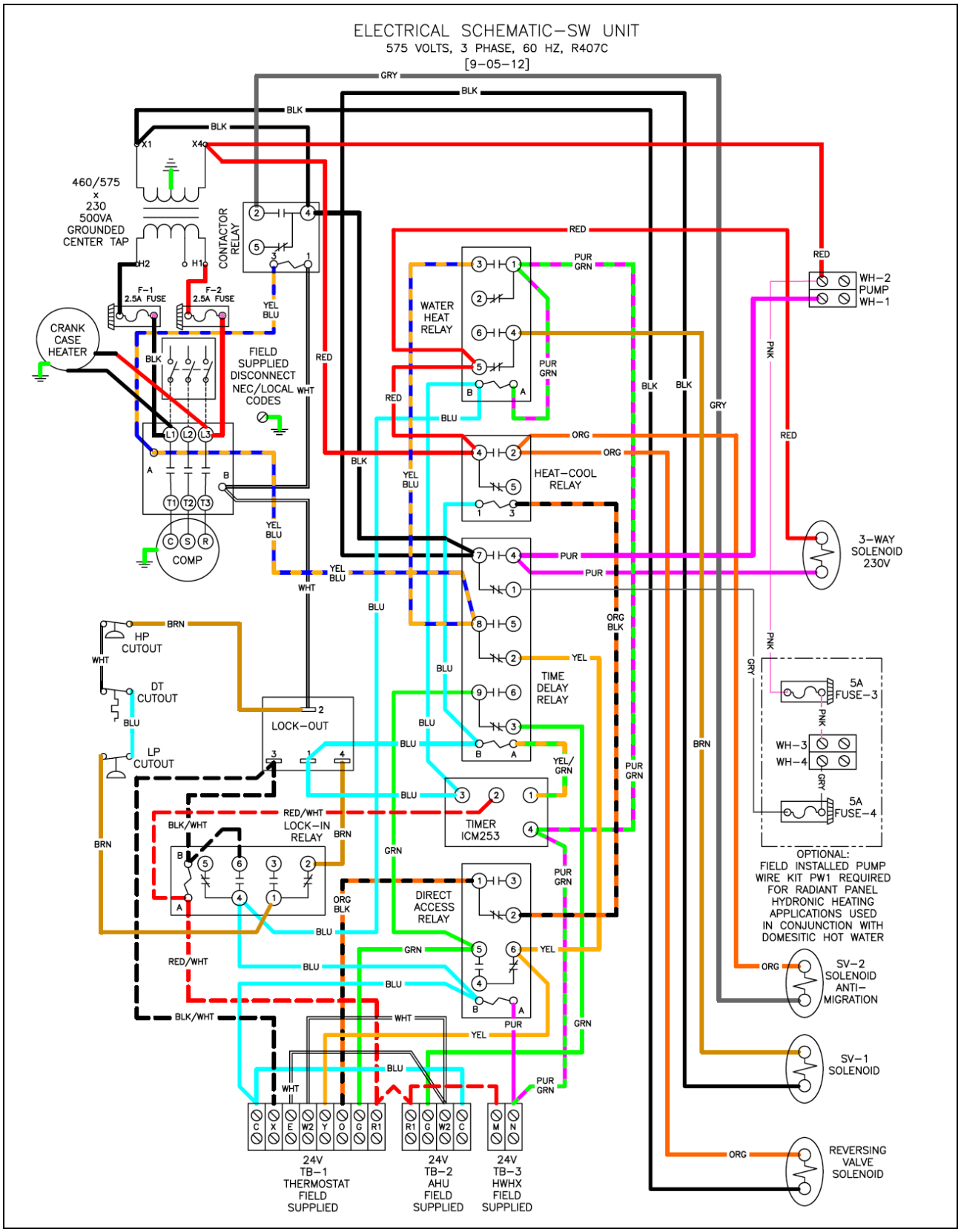


Figure 19. SW Series 575-3-60 Electrical Schematic

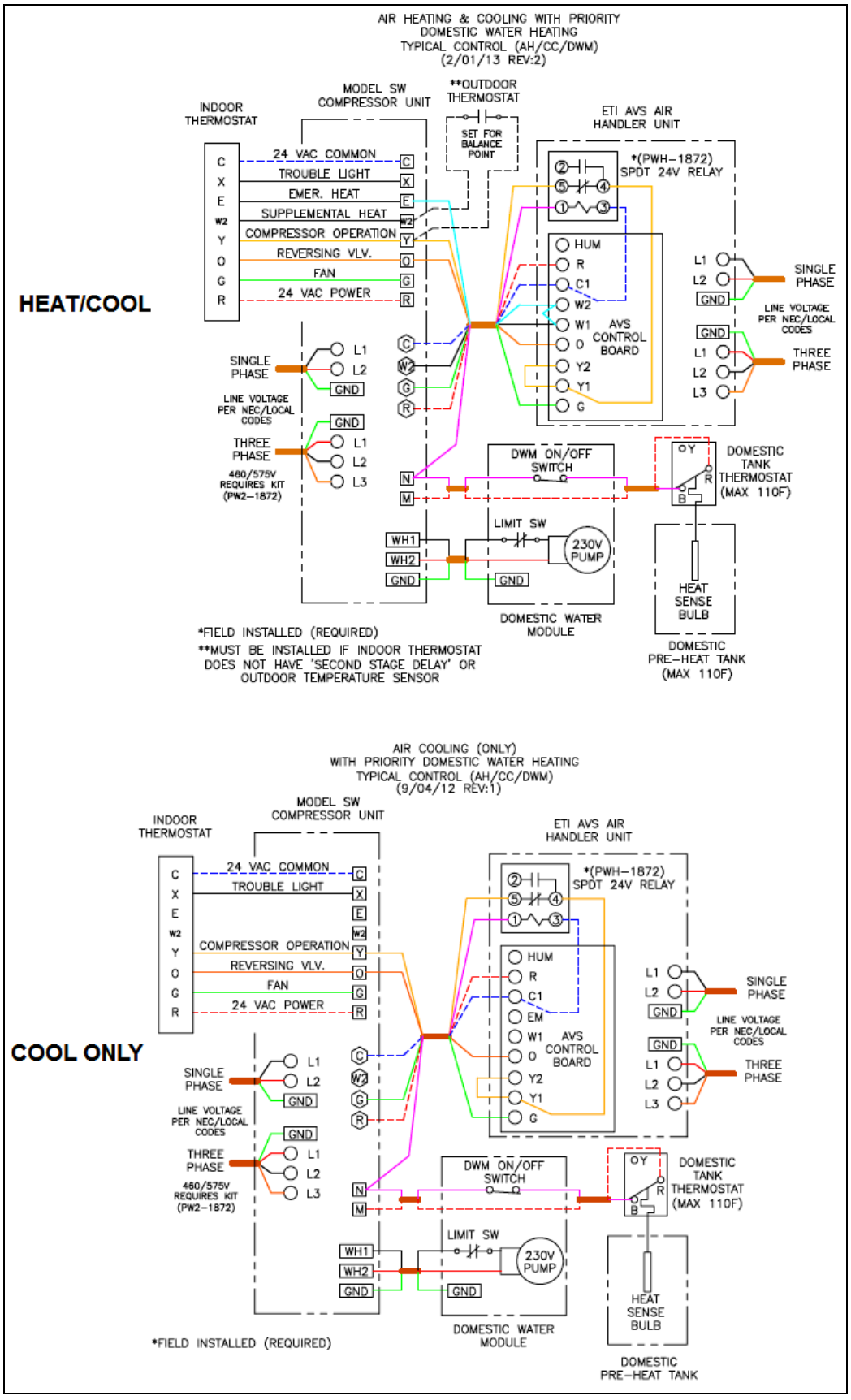


Figure 20. (Part 1 of 3) SW Field Wiring Diagram (Reference Figure 8)

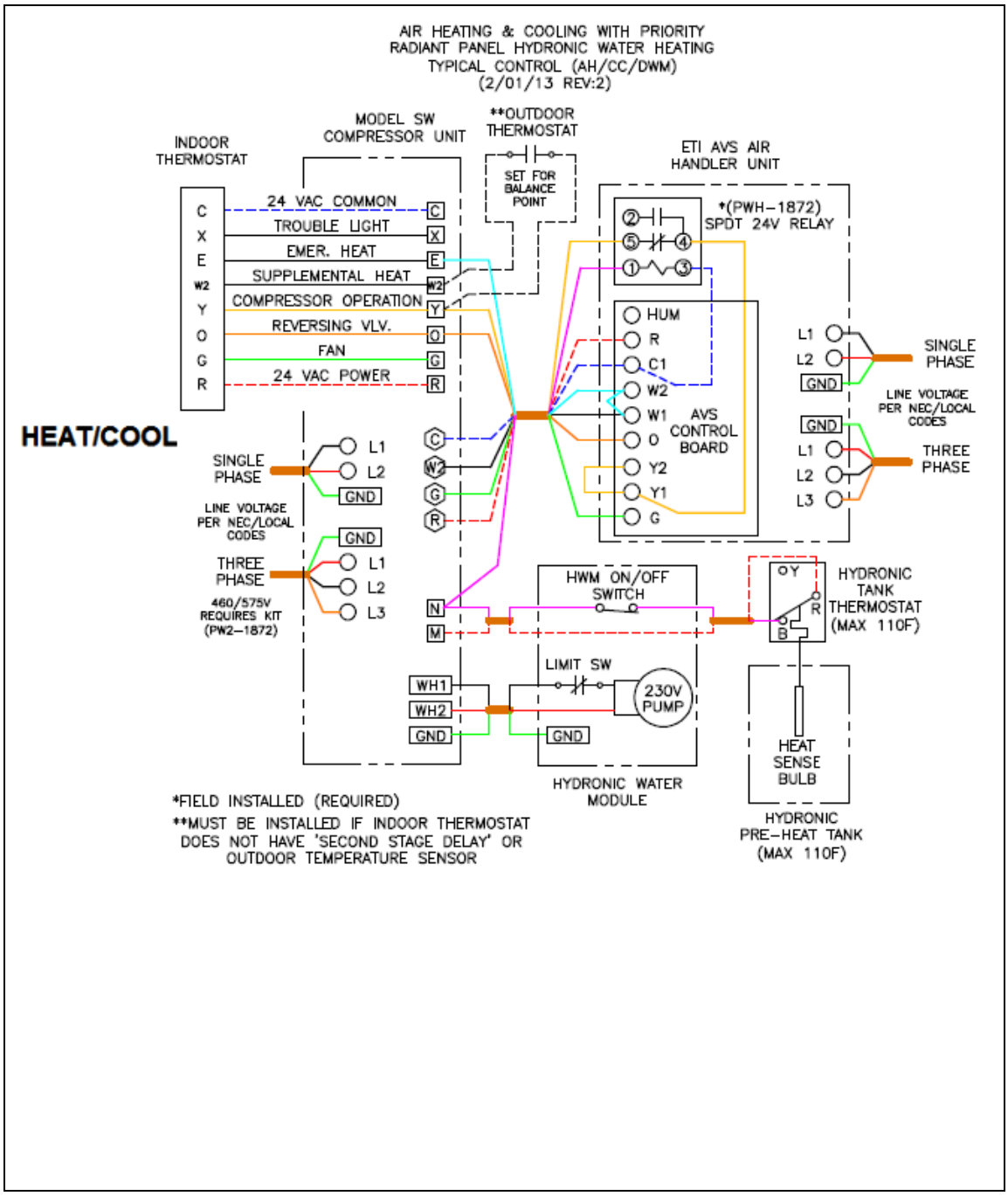


Figure 20. (Part 2 of 3) SW Field Wiring Diagram (Reference Figure 9)

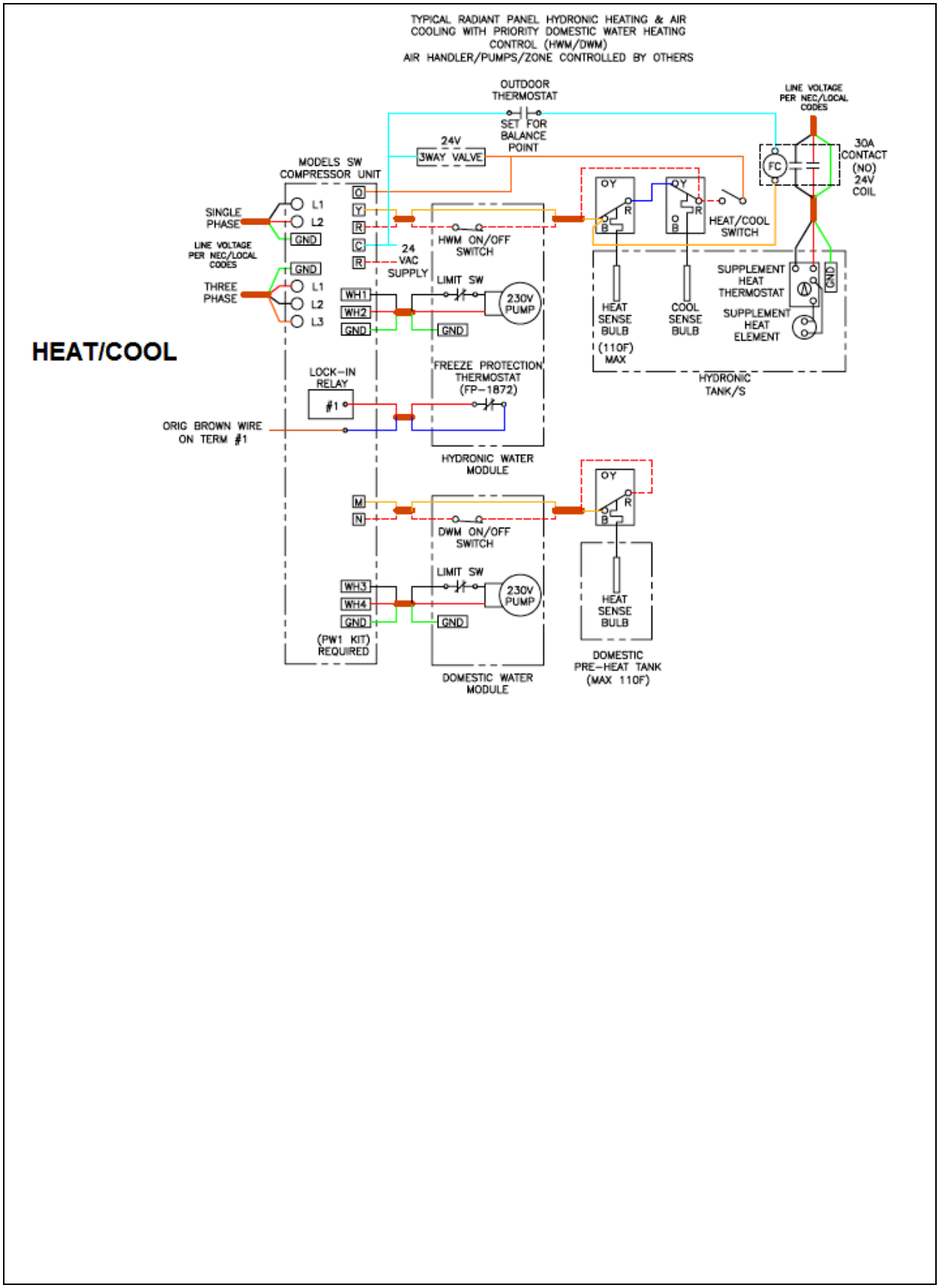


Figure 20. (Part 3 of 3) SW Field Wiring Diagram
(Reference Fig 10)

When the **SW compressor unit** is connected to the **ETI AVS Series variable speed air handler** and the **domestic water module (DWM)** or the **hydronic water module (HWM)**, as illustrated in Figures 8, 9 or 10, the system must be field wired in accordance with Figure 20a, shown below.

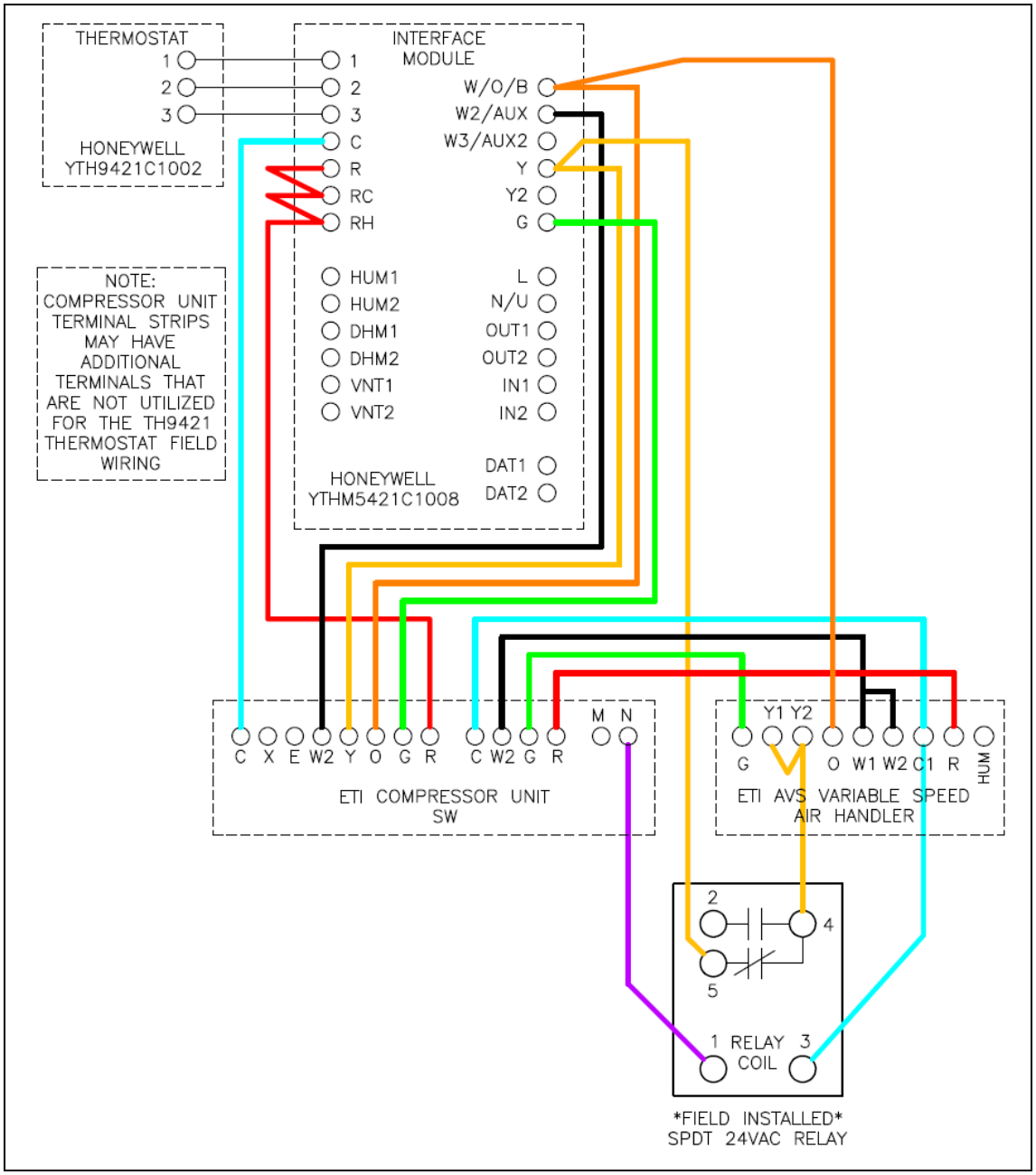


Figure 20a. Special Field Wiring for SW Compressor Unit with ETI AVS Series Variable Speed Air Handler and DWM or HWM.

System Start-up

Evacuation/Charging

IMPORTANT

Proper installation and servicing of the EarthLinked® Heating and Cooling System is essential to its reliable performance. All the EarthLinked® systems must be installed and serviced by an authorized, trained installer 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. Failure to provide installation and service by an authorized, trained installer in a manner consistent with the subject manual will void and nullify the limited warranty coverage for the system.

IMPORTANT

Prior to evacuating the EarthLinked® Heating and Cooling System, ensure the electrical power to all components of the system is "OFF".

SC, SD, SCW and SW Models

Refer to Figure 21 and the following description:

Evacuation and Initial Charge

WARNING!

This compressor unit is equipped with POE lubricant. POE lubricant absorbs significant amounts of moisture from the air very rapidly. Exposure of POE lubricant to air must be minimized. Even a few minutes of exposure to air can be harmful to the system.

After the initial nitrogen holding charge has been released from the compressor unit, it is critical that air not be allowed to enter the compressor unit during the process of preparing compressor unit refrigerant connections (tube cutting deburring, cleaning, brazing, etc.).

To ensure air does not enter the compressor unit while preparing refrigerant connections, "trickle" dry nitrogen through the compressor unit, entering at the access port nearest the Active Charge Control (ACC), to keep airborne moisture out of the compressor unit and the POE lubricant.

Complete preparing and brazing all compressor unit refrigerant connections at one setting to minimize exposure of open connections to air.
Failure to implement the above precautions will result in an extended period of time to effectively evacuate the system, and may adversely affect system performance and cause system failure.

1. Carefully vent the nitrogen charge from the compressor unit.
2. After installing and nitrogen brazing the HVAC system components and compressor unit service valves, turn the Service Valves to **FULL open** and pressurize the HVAC components to 150 psig with dry nitrogen and a trace of refrigerant. Valve off the nitrogen Tank from the HVAC system components and check joints with a sensitive Electronic Leak Detector to ensure they are sealed. Repair any leaks and re-test as appropriate.

3. After venting the pressurized system, connect the Gage Block, Refrigerant Container and Hoses as shown in Figure 21. LP and HP valves are fully open. Both Service Valves are fully opened.

4. As illustrated in Figure 21, connect a good quality Digital Micron Gage to the Liquid Line Service Valve Access Port with an Isolation Hose/Valve. Connect a quality Vacuum Pump (at least 6 CFM capacity) to the Gage Block.

5. Connect the Refrigerant Hose from the Refrigerant Container to the Charging Port.

IMPORTANT

DO NOT ENERGIZE THE COMPRESSOR WHILE THE SYSTEM IS UNDER VACUUM. THIS WILL CAUSE DAMAGE TO THE COMPRESSOR.

6. Initiate the system evacuation. **Evacuate the system down to 230 MICRONS** as read on the digital micron gage. After 230 microns has been achieved, turn off the LP and HP valves and turn "OFF" the vacuum pump**. Reading the digital micron gage, the system pressure must not exceed 280 MICRONS WITHIN 5 MINUTES.** If pressure rises to greater than 280 microns, open LP and HP valves, crack the refrigerant valve and allow just enough refrigerant into the system until 20 inches of Hg vacuum is read on the LP gage. Close the refrigerant valve, and initiate the evacuation process again and until the above conditions are met.

IMPORTANT

DO NOT CHARGE THE SYSTEM UNTIL THE CONDITIONS OF STEP #6 ARE COMPLETED!

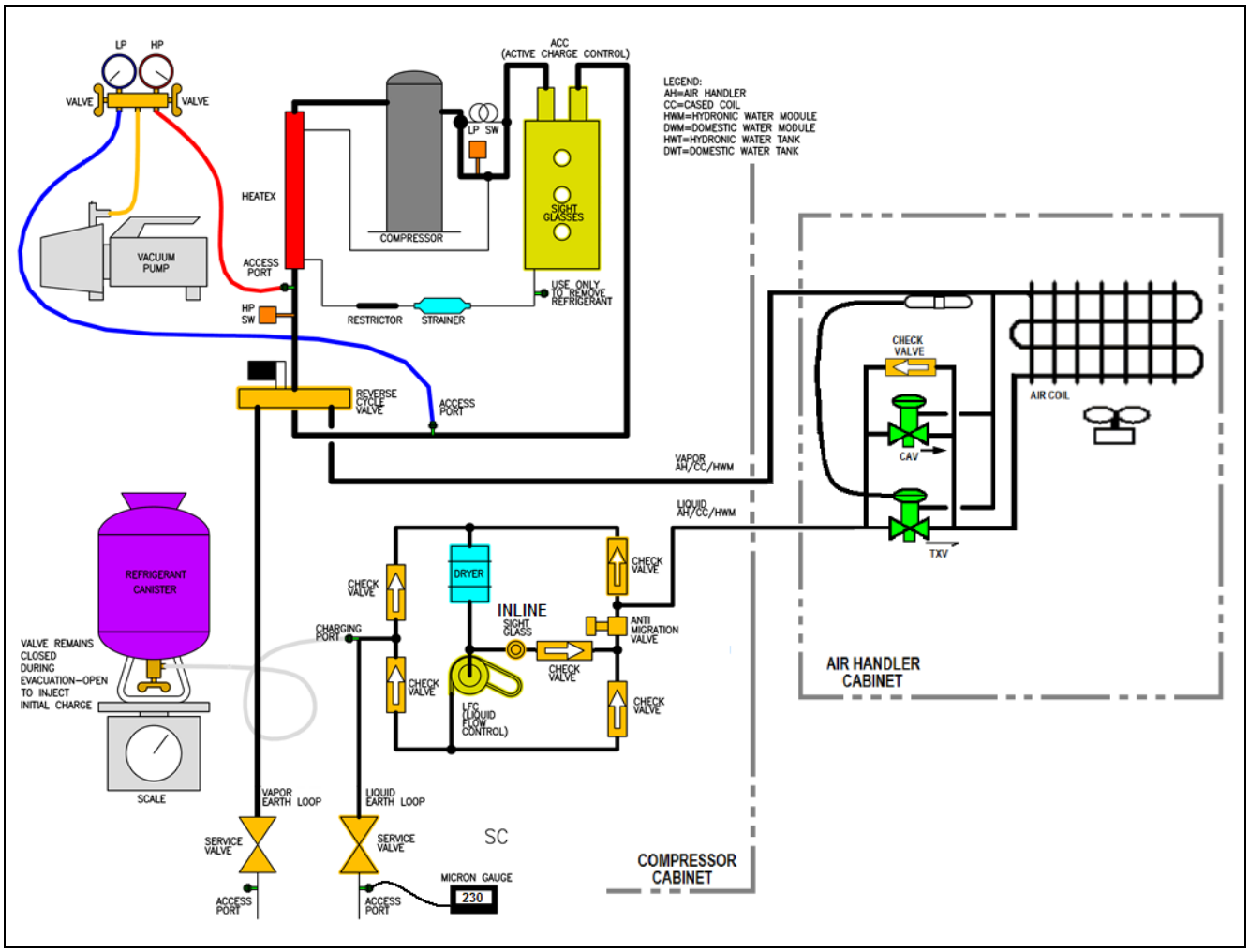


Figure 21. Typical Evacuation & Initial Charge Set-up for SC, SD, SCW and SW Compressor Models (SC model shown).

7. Close the LP and HP valves on the gage block. Disconnect the vacuum pump and the utility hose from the gage block. Isolate/protect the Digital Micron Gage from the liquid Earth Loop Service Valve until the initial refrigerant charge is complete.

WARNING!

Inhalation of high concentrations of refrigerant gas vapor is harmful and may cause heart irregularities, unconsciousness or death. Vapor reduces oxygen available for breathing and is heavier than air. Decomposition products are hazardous. Liquid contact can cause frostbite. Avoid contact of liquid with eyes and prolonged skin exposure. Liquid and gas are under pressure. Deliberate inhalation of refrigerant gas is extremely dangerous. Asphyxiation can occur without warning due to lack of oxygen. Before using, read the material safety data sheet.

8. Open the refrigerant container valve and **inject liquid refrigerant into the charging port** as shown in Figure 21.

9. Charge with liquid refrigerant until **3 pounds** of refrigerant per ton of system capacity, has entered the system.

   Liquid entering the system at the charging port goes directly to the system earth loops. It does not go to the compressor. Should the pressures equalize and prevent the intended charge from entering completely, terminate the process of initial charging. Note and document the amount of refrigerant.

10. When the initial refrigerant charge (see step 9 above) has entered the system, close the refrigerant container valve and disconnect the refrigerant hose from the charging port. Note and document the amount of refrigerant.

11. The system has now been initially charged. Disconnect the Digital Micron Gage.

Final Charge

It is critical to control the conditions under which the compressor unit operates while final charging the system. **Final charging must be done in HEAT mode.**

Air Handler Systems

If <u>AIR</u> heating is provided by one of the following DX air handler systems, as listed in Figure 22, the return air to the air handler during the final charging is to be maintained in the range of 70°F to 80°F. If necessary, the air can be warmed with electric supplemental heat in the air handler. (Shunt "R" to "W2" at the terminal block.)

Item	Comp. Unit	Air Htg.	Hydronic Htg.	Air Clg	Domestic Wtr. Htg.	System Functions
1.	SC	Yes		Yes		Air heating and cooling
2.	SC	Yes		Yes	Yes[1]	Air heating and cooling, domestic hot water by field installed desuperheater
3.	SD	Yes		Yes	Yes[1]	Air heating and cooling, domestic hot water by desuperheater
4.	SW	Yes		Yes	Yes[2]	Air heating and cooling, domestic hot water by priority heating with DWM

[1]Includes Desuperheater Model DSH-1872 to supplement water heating.
[2]Priority water heating provided with separately purchased Domestic Water Module (Series DWM)

Figure 22. Systems with DX Air Handlers

Hydronic Systems

If heating is provided through the SCW compressor unit or a hydronic water module, HWM, as listed in Figure 23, the circulating water in the primary circuit (see Figures 24 and 25) for the hydronic system is to be maintained in the 95°F to 105°F range. Water from the main supply can be flushed through the primary circuit to maintain this water temperature range while final charging the compressor unit.

Item	Comp. Unit	Air Htg.	Hydronic Htg.	Air Clg	Domestic Wtr. Htg.	System Functions
1.	SC		Yes[3]	Yes[3]		Radiant panel hydronic heating and air cooling (chilled water handler)
2.	SC		Yes[3]	Yes[3]	Yes[1]	Radiant panel hydronic heating and air cooling (chilled water handler); and domestic hot water by field installed desuperheater
3.	SD		Yes[3]	Yes[3]	Yes[1]	Radiant panel hydronic heating and air cooling (chilled water handler); and domestic hot water by desuperheater
4.	SW		Yes[3]	Yes		Radiant panel hydronic heating and air cooling
5.	SW		Yes[3]	Yes[3]	Yes[2]	Radiant panel hydronic heating and air cooling (chilled water handler); and domestic hot water by priority heating with DWM
6.	SCW		Yes[4]	Yes[4]		Radiant panel hydronic heating and air cooling (chilled water air handler)

[1]Includes Desuperheater Model DSH-1872 to supplement water heating.
[2]Priority water heating provided with separately purchased Domestic Water Module (Series DWM)
[3]Hydronic (radiant floor) water heating provided with separately purchased Series HWM Hydronic Water Module.
[4]Has internal refrigerant/water heater exchanger. Requires field supplied water circulating pump.

Figure 23. Systems with Hydronic Heat Exchangers

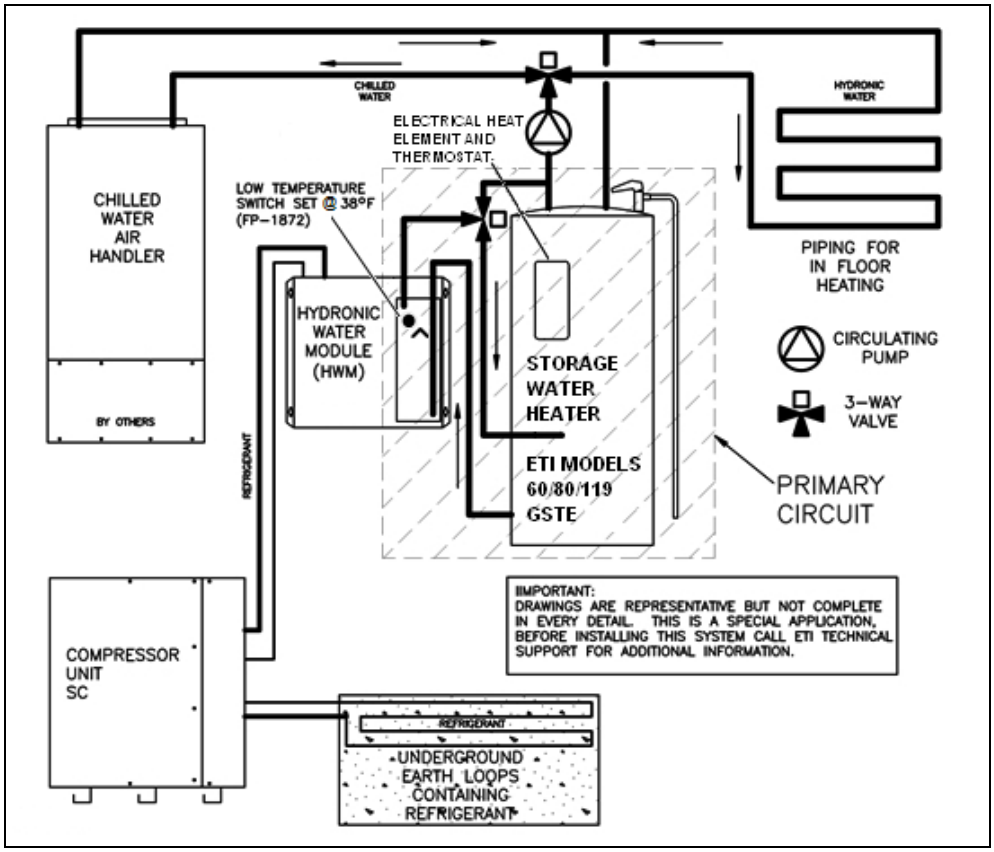


Figure 24. Primary Circuit with Hydronic Water Module (HWM)

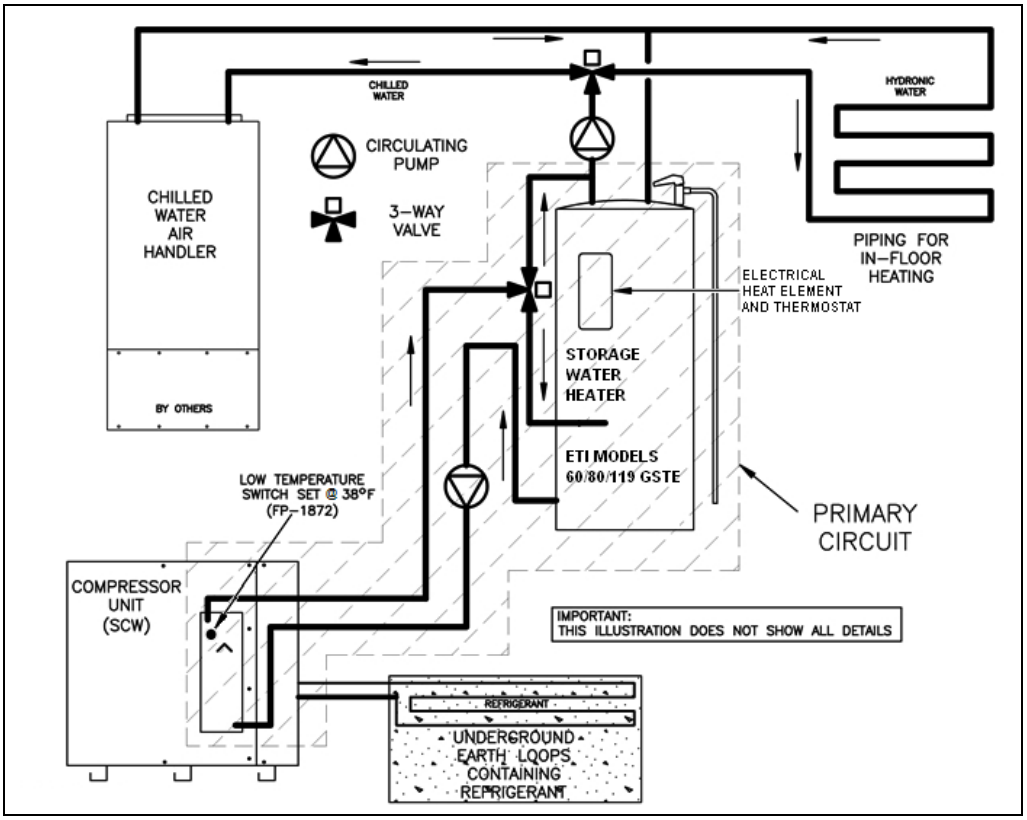


Figure 25. Primary Circuit with Compressor Unit Heat Exchanger

Final charging is done in the HEAT mode as follows, with the charging set up described in Figure 26:

1. Continue measuring the refrigerant charge weight as shown in Figure 26.

2. Be sure that air entering the air handler is between 70°F and 80°F. If the system is a hydronic primary circuit, circulating water is to be maintained between 95°F and 105°F.

3. Close the HP valve. **Then turn the system on in the HEAT mode**.

4. Initiate final charging by opening the refrigerant container valve and the gage manifold LP valve to allow liquid refrigerant to enter the system **SLOWLY** as shown in Figure 26. The ACC will not allow liquid refrigerant to enter the compressor.

5. Adding liquid refrigerant will raise the liquid level in the ACC. Continue to add liquid refrigerant to the system until the liquid level has reached the middle sight glass, as shown in Figure 27.

6. **When the liquid level is at the middle sight glass, as shown in Figure 27, turn the refrigerant container valve OFF.**

7. When the system has run for 20 minutes (in HEAT mode), read the evaporating temperature and condensing temperature.

   The evaporating temperature can be read by attaching a thermocouple lead to the Earth Loop Vapor Line with electrical tape, then wrapped with ½" thick insulation. The condensing temperature can be read by attaching a thermocouple lead to the Air

Handler/CC/HWM liquid line coming into the compressor unit with electrical tape, then wrapped with ½" thick insulation. Use an accurate temperature indicator.

In Figure 28, locate the evaporating temperature on the horizontal axis. The corresponding condensing temperature reading should fall between the upper and lower parallel lines in Figure 28.

The temperature profile in Figure 28 is valid for the air handler systems with an air flow of 400CFM per Ton. If condensing temperature is above acceptable range, the air flow is low. If condensing temperature is below the acceptable range, air flow is too high. **Adjust air flow as appropriate.**

For hydronic systems, if the condensing temperature is above acceptable range, the water flow is too low. If condensing temperature is below the acceptable range, the water flow is too high. Adjust water flow as appropriate.

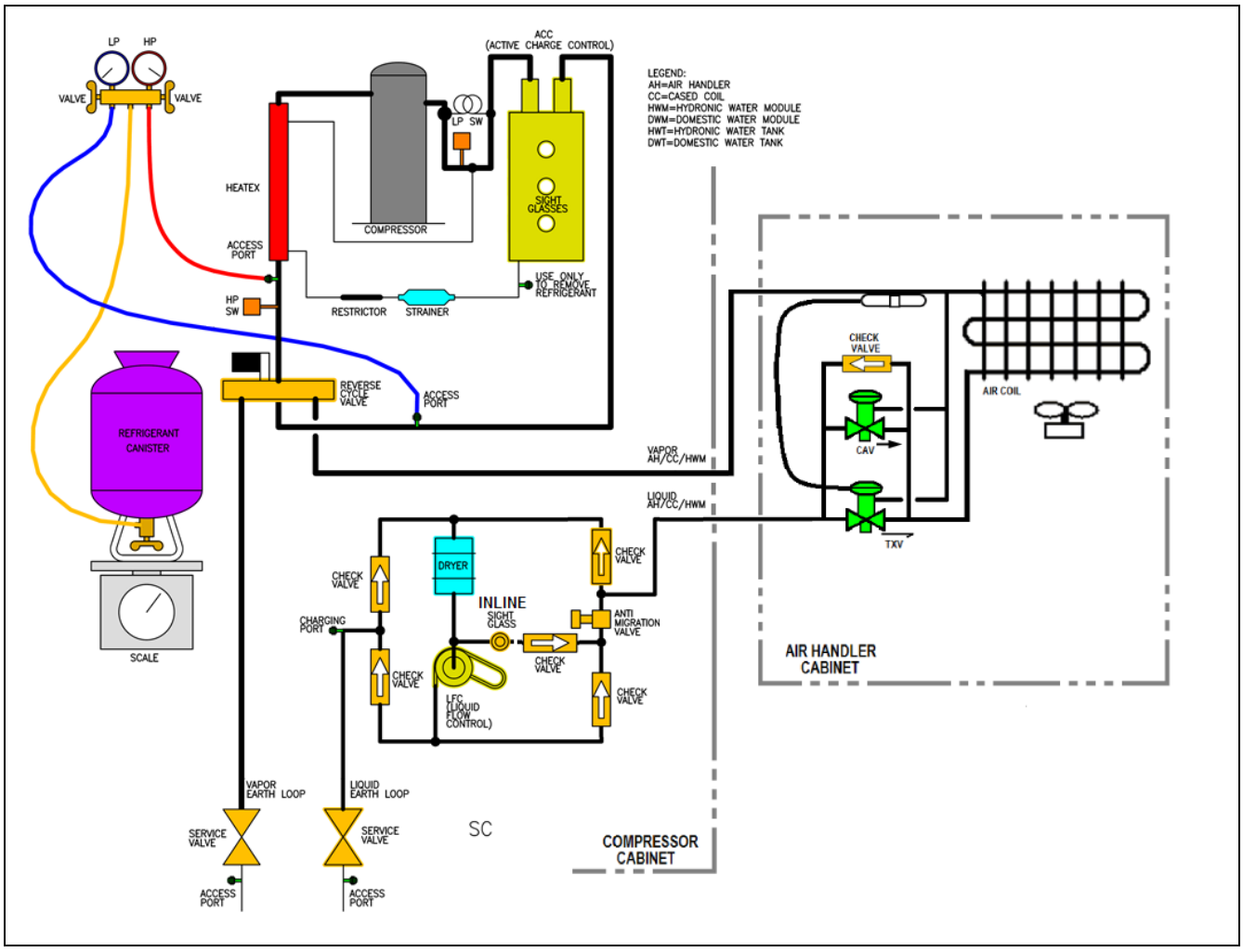


Figure 26. Typical Final Charge Set-up for SC, SD, SCW and SW Compressor Units (SC Model shown).

8. Check the suction saturation temperature to verify that it is within ±3°F for the measured suction pressure. The suction temperature should be approximately 15 to 20°F lower than the local earth temperature.

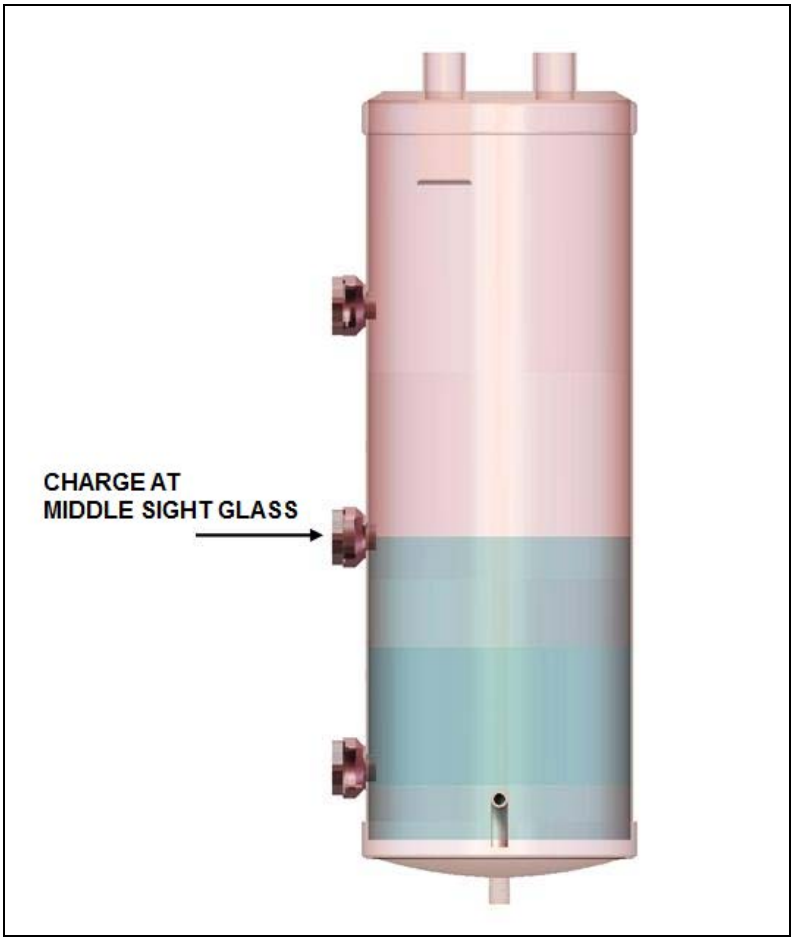


Figure 27. Charge at Middle Sight Glass

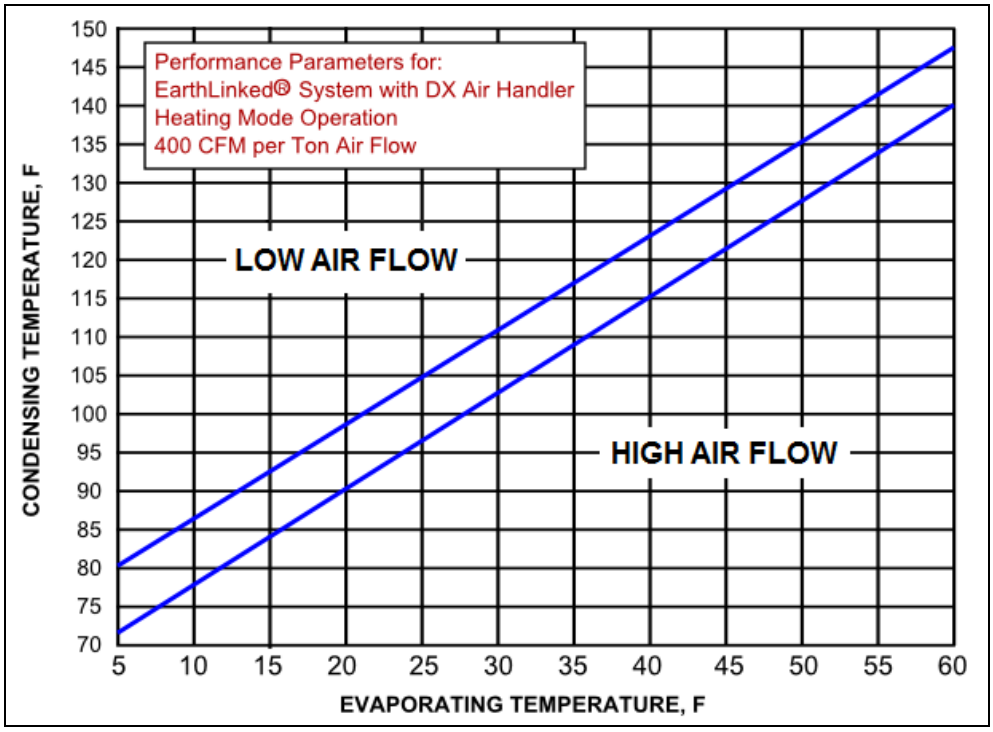


Figure 28. EarthLinked® Performance Parameters

9. While the system is still operating in **HEAT** mode, add refrigerant to the system to bring the liquid refrigerant level up to the top sight glass on the ACC. See Figure 29. Document the total weight of refrigerant charge in the system.

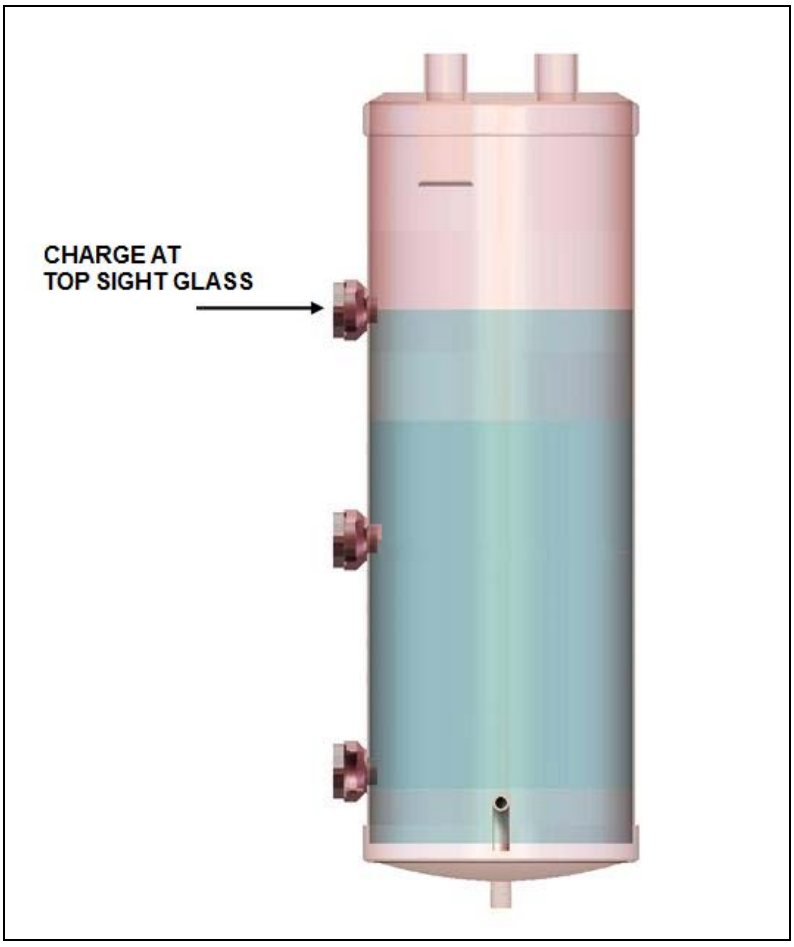


Figure 29. Charge at Top Sight Glass

10. The following additional steps in the system start-up process are required if the system is to operate in Heat/Cool or Cool Only modes. These following steps require that the system be run in the **COOL** mode.

IMPORTANT!

If site conditions prevent maintaining an air handler return air temperature between 70° F and 80° F, the cooling system start-up steps can be completed at a later time. If the cooling mode start-up process is delayed, the system can run in heat mode only and the cooling mode must be disable until the cooling mode start-up process is initiated. If the cooling mode start-up process is initiated after running the system in heat only mode, the system should remain OFF for 48 hours after running in the heat mode to allow the earth temperature surrounding the earth loops to stabilize.

Cooling Mode Start-Up Process

These following steps are to be followed if the system **is to be run in Heat/Cool or Cool Only**. **The process flow chart for these steps is illustrated in Figure 35**. Be sure the cooling mode for the system is enabled. Start the system in COOL mode and run system until the suction pressure stabilizes.

IMPORTANT!

Be sure the return air to the air handler is maintained in the range of 70° F to 80° F. If the system is hydronic maintain the return water temperature in the range of 95° F to 105° F.

1. After suction pressure has stabilized, determine the system superheat. This is done by utilizing the access port and LP gage in Figure 33 to measure suction pressure. **Next, apply a thermocouple at the compressor suction port** as shown in Figure 33 by attaching a thermocouple lead with electrical tape, and wrapping with ½" thick insulation.

2. **Using an accurate temperature indicator, read the suction temperature at the compressor suction port.** Read the suction pressure at the access port on the LP gage.

3. Enter the Pressure-Temperature Table in Figure 34 and for the suction pressure read on the LP gage, determine the saturation temperature (evaporating temperature) from the chart, interpolating if necessary.

4. To determine the degrees of Superheat, subtract the saturation temperature from the suction temperature read at the compressor suction port thermocouple. The difference in temperatures is the superheat.

   (Superheat, ºF) = (Suction Temp., ºF) – (Saturation Temp., ºF)

5. **If Superheat is less than 5ºF (<5ºF), adjust the CAV by turning it COUNTER-CLOCKWISE, until Superheat is in the range of 10ºF to 15ºF. Wait 5 minutes and go to step 6. If Superheat is greater than 5ºF (>5ºF), wait 5 minutes and go to step 6.**

6. Determine what the liquid level is in the ACC by viewing it through the sight glasses in the ACC. If the liquid level is at or above the lowest sight glass, repeat steps 1 through 5. The liquid level should be dropping with time. Repeat the observations of liquid level in the ACC sight glasses and the steps 1 through 5 until the liquid level has dropped below the lowest sight glass, or until 2 hours pass. After 2 hours, if the liquid level has not dropped below the lowest sight glass, call ETI Technical Services at 1-863-701-0096.

7. When the liquid refrigerant level drops below the ACC lowest sight glass, **observe the INLINE sight glass** (not the ACC sight glasses) for the status of the refrigerant flow. There are three possibilities:

   A. **INLINE** sight glass is **CLEAR**: As illustrated in Figure 30, a clear sight glass means the refrigerant flow is liquid. Remove 1 pound of refrigerant from the system, wait 10 minutes, and observe again. Continue this until bubbles appear in the sight glass.

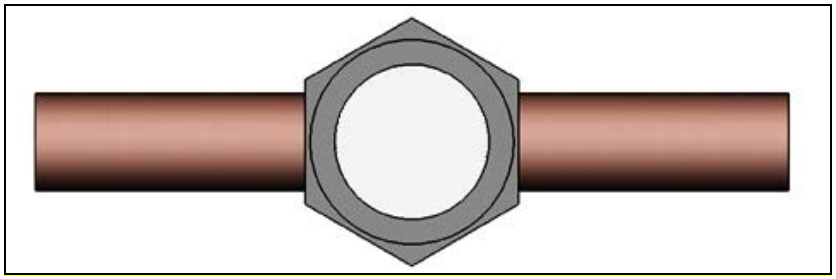


Figure 30. Clear-Inline Sight Glass

B. **INLINE** sight glass has **MANY BUBBLES**: This is illustrated in Figure 31. Wait 10 minutes and observe the sight glass again. If many bubbles are still present, repeat the 10 minute wait cycle until the bubbles become few, or you have waited 2 hours. After a 2 hour wait, and many bubbles still exist in the sight glass, the process is done. No further adjustment in cool mode is required, and the system is operational.

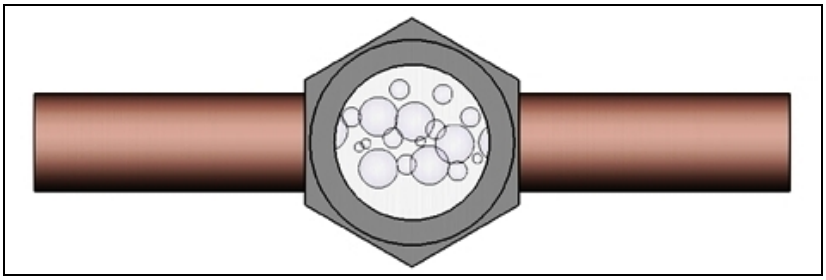


Figure 31. Many Bubbles-Inline Sight Glass

C. **INLINE** sight glass has **FEW BUBBLES**: This is illustrated in Figure 32. When this condition exists, the next steps are to check the superheat and adjust the TXV as necessary.

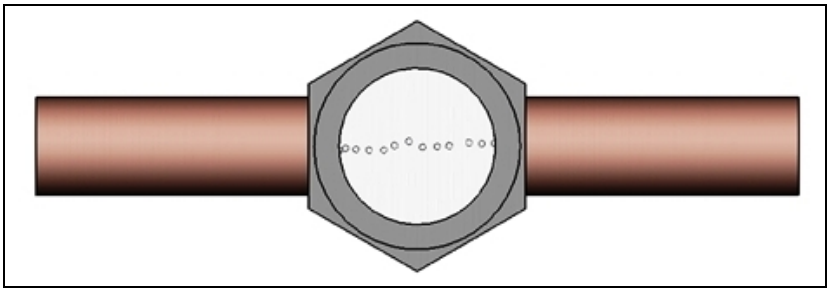


Figure 32. Few Bubbles-Inline Sight Glass

8. The TXV is to be adjusted to provide 10ºF to 15ºF superheat while running in cooling mode. Superheat is to be determined as detailed previously in steps 1 through 5.

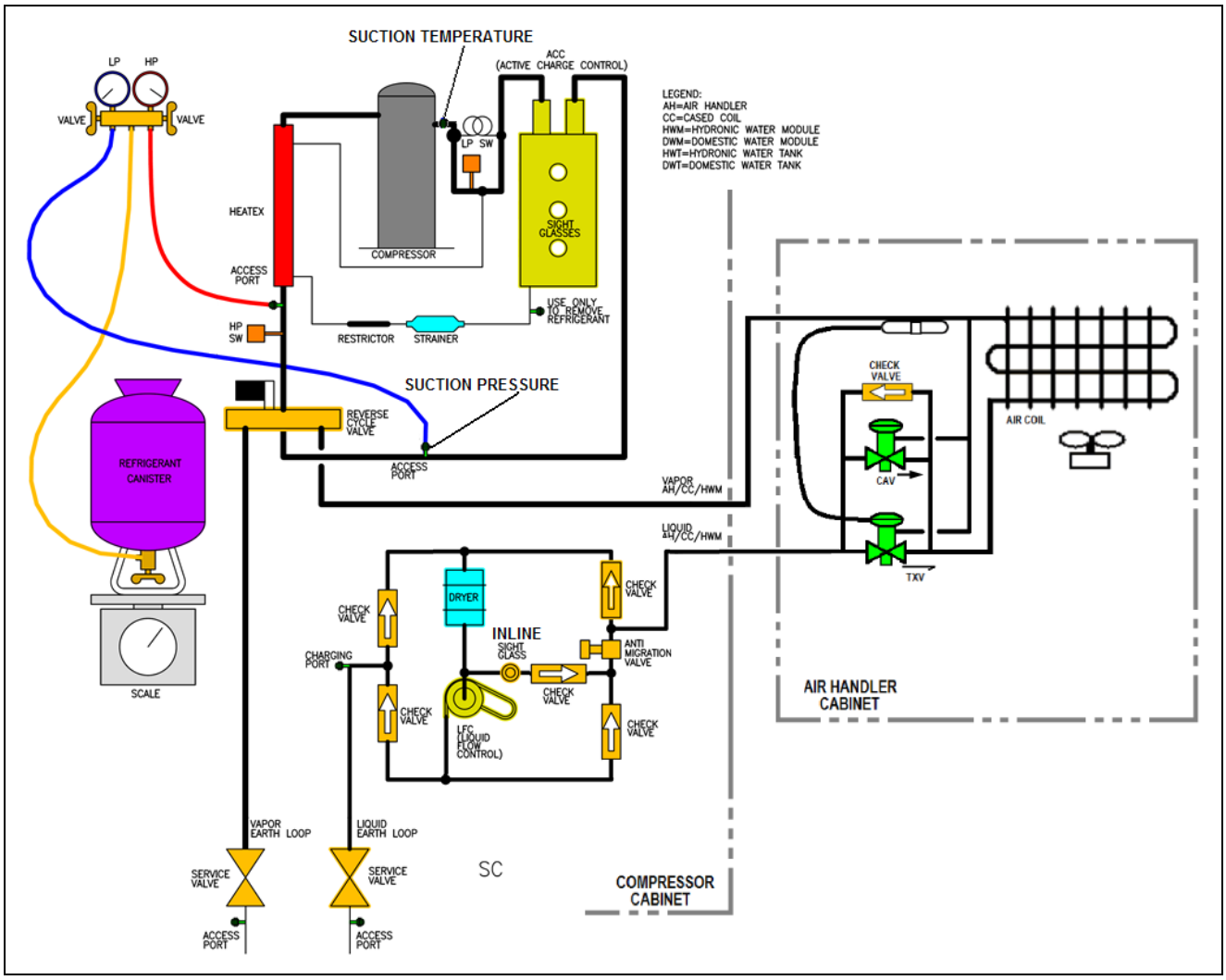


Figure 33. Superheat Measurements for SC, SD, SCW and SW Compressor Units (SC Model shown).

SATURATION TEMPERATURE (°F)	SUCTION PRESSURE (psig)	SATURATION TEMPERATURE (°F)	SUCTION PRESSURE (psig)
-20	6.5	70	117.3
-15	9.3	75	128.6
-10	12.3	80	140.5
-5	15.7	85	153.2
0	19.4	90	166.7
5	23.5	95	181.0
10	27.9	100	196.1
15	32.7	105	212.1
20	37.9	110	229.0
25	43.5	115	246.9
30	49.6	120	265.8
35	56.1	125	285.7
40	63.2	130	306.7
45	70.7	135	328.8
50	78.8	140	352.1
55	87.5	145	376.6
60	96.8	150	402.5
65	106.7		

Figure 34. Pressure-Temperature for R-407C

9. If superheat is greater than 20°F, **decrease the superheat by adjusting the setting on the TXV in the counter clockwise direction.**

10. See Figure 35 and follow the guidelines to bring the superheat into the 10^0F to 15^0F range. When superheat is adjusted to within this range, the system is fully operational and needs no further adjustment.

11. Document the **net weight** of the refrigerant charge in the system. **Net weight is equal to the final refrigerant charge minus refrigerant removed from the system.** Write it down on the **Warranty Registration Card** and inside the compressor unit on the electrical diagram, for future reference. **This is the full system charge.**

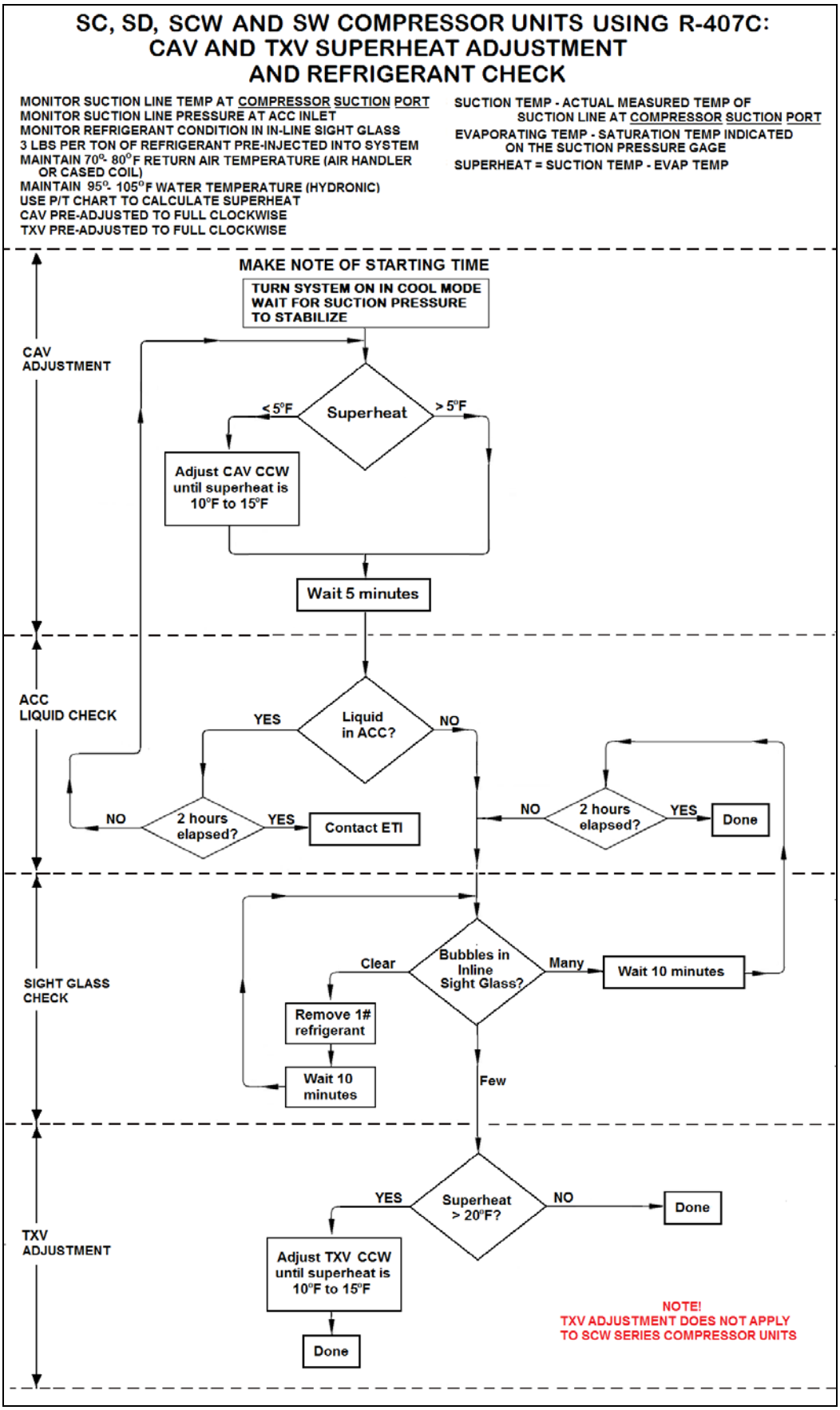


Figure 35. R-407C Cooling Mode Start-Up Process