EarthLinked® TXV Kit

Installation Manual for

HWM Hydronic Water Module with SC, SD, SW Compressor Units and R-407C Refrigerant

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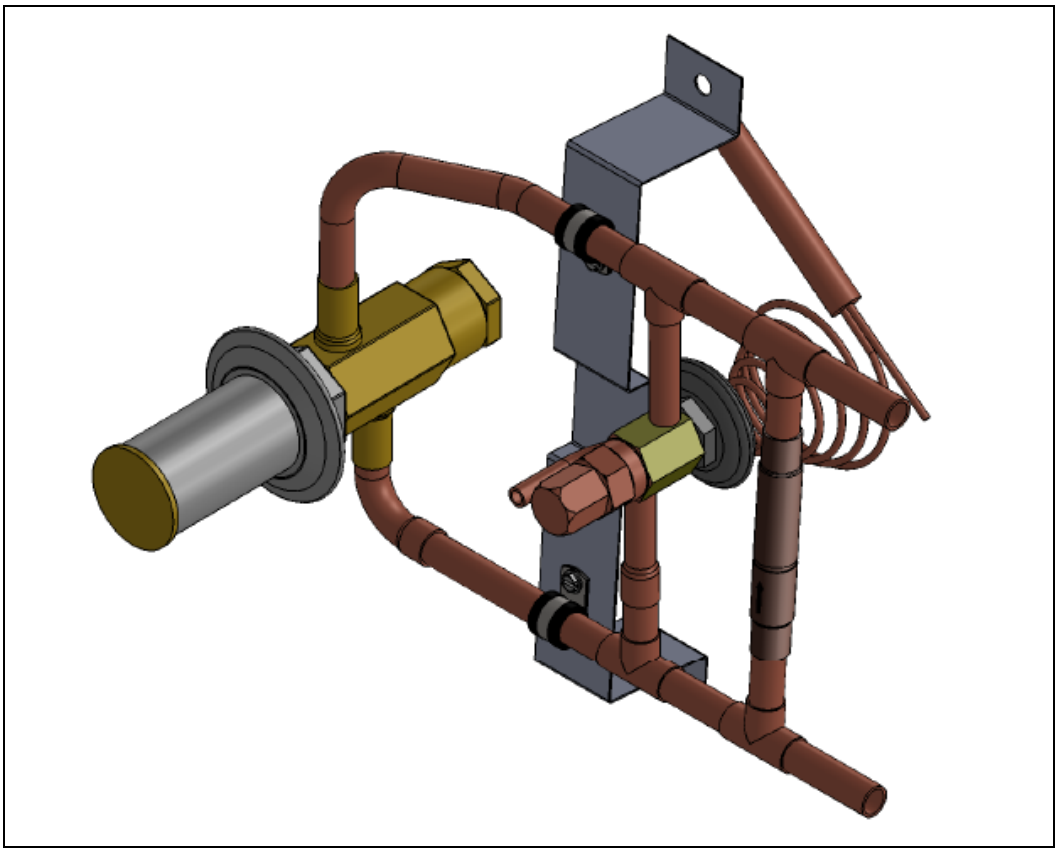

Disclaimer

Proper installation and servicing of this EarthLinked® Kit is essential to the Heating and Cooling Systems reliable performance. All EarthLinked® systems and kits 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. Failure to provide installation and service by an authorized, trained installer in a manner consistent with this manual will nullify 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.

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CSI # 23 80 00

1. Pre-Installation

Upon receipt of the TXV Kit carefully check the model number against the bill of lading.

The TXV Kit is designed to improve performance of an R-407C EarthLinked® air heating and cooling system utilizing an **HWM Hydronic Water Module to provide chilled water.**

The TXV Kit must be matched with the appropriately sized SC, SD, or SW series compressor unit and the HWM series hydronic water module. See table below for correctly matched components.

R-407C COMPONENT MATCHING TABLE		
SC, SD, SW COMPRESSOR UNIT NOMINAL CAPACITY, BTUH	**TXV KIT MODEL**	**HYDRONIC WATER MODULE MODEL**
-018 (18,000)	TXV-018BH	HWM-1836
-024 (24,000)	TXV-024BH	HWM-1836
-030 (30,000)	TXV-030BH	HWM-1836
-036 (36,000)	TXV-036BH	HWM-1836
-042 (42,000)	TXV-042BH	HWM-4248
-048 (48,000)	TXV-048BH	HWM-4248
-060 (60,000)	TXV-060BH	HWM-6072
-072 (72,000)	TXV-072BH	HWM-6072

There are three steps to the field installation of the TXV Kit:

1. Compressor unit rail assembly conversion
2. Hydronic Water Module conversion
3. System Start-Up

IMPORTANT!

5 ft. of 1/2" ACR copper tubing, a 1/2" OD SWT copper coupling and sufficient 1/2" wall thickness Armflex®, Insul-Tube® (or equivalent) pipe insulation for the site-specific installation, similar to that shown in Figure 3p.

WARNING

BEFORE REMOVING ANY ACCESS PANELS AND INITIATING ANY PHASE OF THIS INSTALLATION MAKE SURE THAT POWER IS TURNED "OFF" TO ALL EARTHLINKED® AND FIELD SUPPLIED SYSTEM COMPONENTS. FAILURE TO DO SO COULD RESULT IN PROPERTY DAMAGE, SERIOUS INJURY OR DEATH.

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.

2. Compressor Unit Rail Assembly Conversion

Remove and reclaim all refrigerant from the compressor unit and all components, including the earth loop system.

If the system has service valves at the compressor/earth loop line set connections, close the service valves to isolate the earth loop system from the compressor and air handler.

Access the compressor unit rail assembly shown in Figure 1. **Cut the copper tube on the inlet and outlet of the Cooling Assist Valve (CAV) as shown in Step 1, being sure to determine the cut locations consistent with matching the replacement check valve assembly shown in Step 2. Braze the check valve assembly into the same location as the CAV formerly occupied, shown in Step 3. Be sure the check valve assembly is in the vertical position and employ the nitrogen brazing process for all refrigerant system joints. Protect all check valves from heat when brazing joints.**

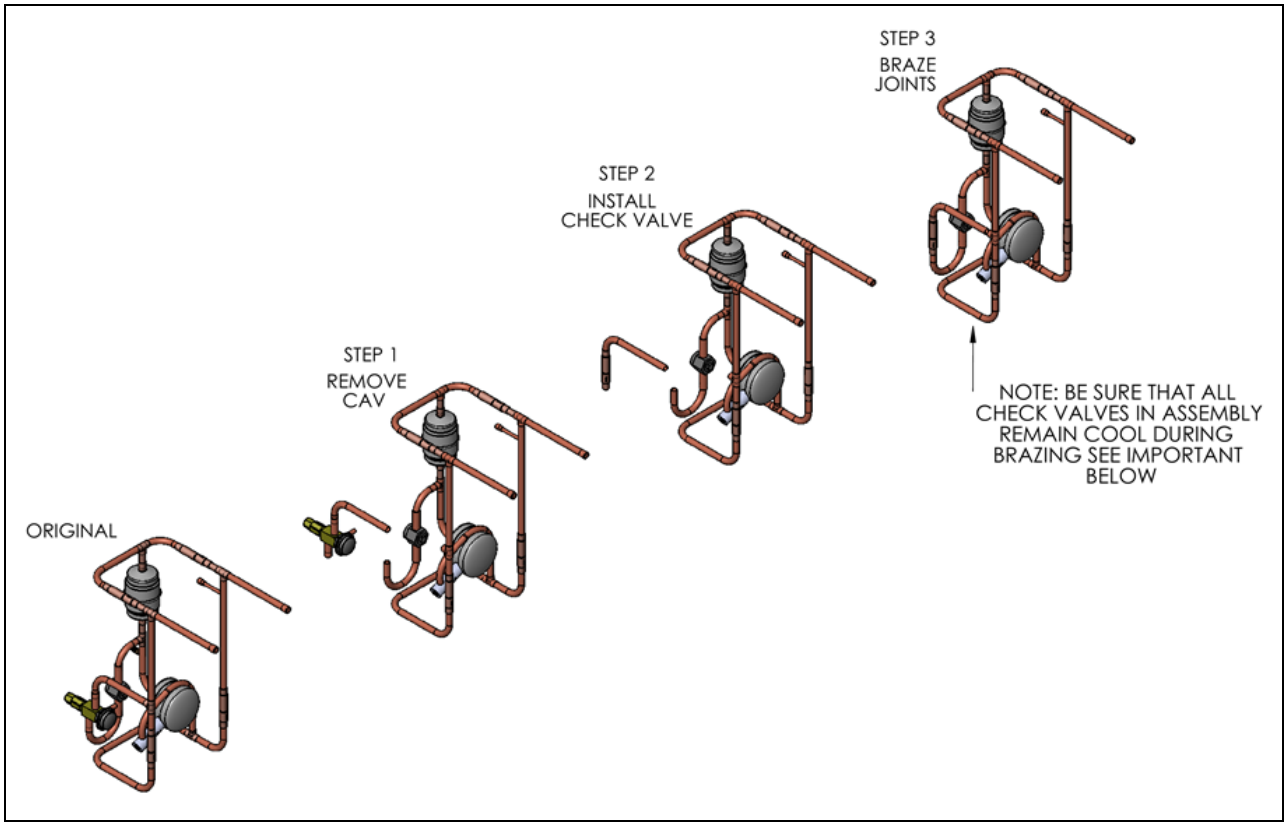


Figure 1. Compressor Unit Rail Conversion

IMPORTANT

Heating of the check valve in this position (or any of the check valves in the rail assembly) could cause the valve seat to expand and capture the ball when it cools. The valve body must remain cool during brazing. When brazing is complete, confirm that the ball is free by sliding a strong magnet up and down along the valves length. A clinking sound should be heard when the ball moves freely.

WARNING

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 the flow of nitrogen can be terminated.

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.

3. Hydronic Water Module Conversion

The **TXV ASSEMBLY** is illustrated in Figure 2. Familiarize yourself with the tube connections **TO DISTRIBUTOR** and **FROM COMPRESSOR UNIT**. Also note the **EQUALIZER CONNECTION** and the **BULB TEMPERATURE SENSOR**. These will be addressed in Figures 3.a. through 3p.

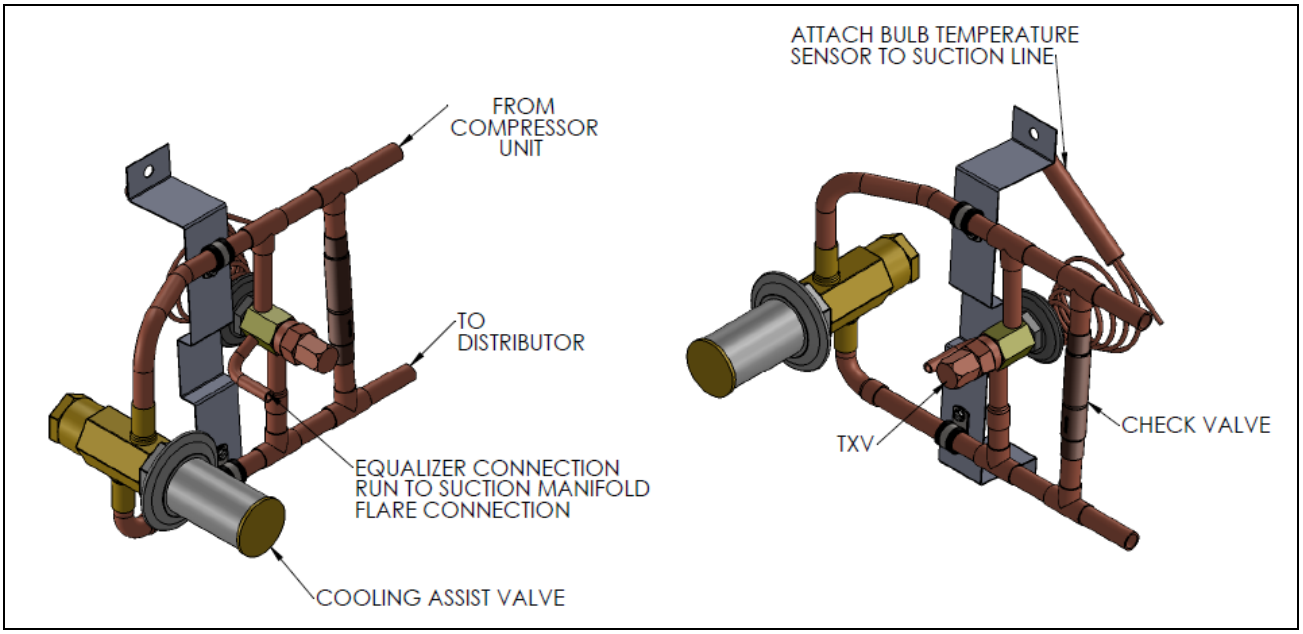


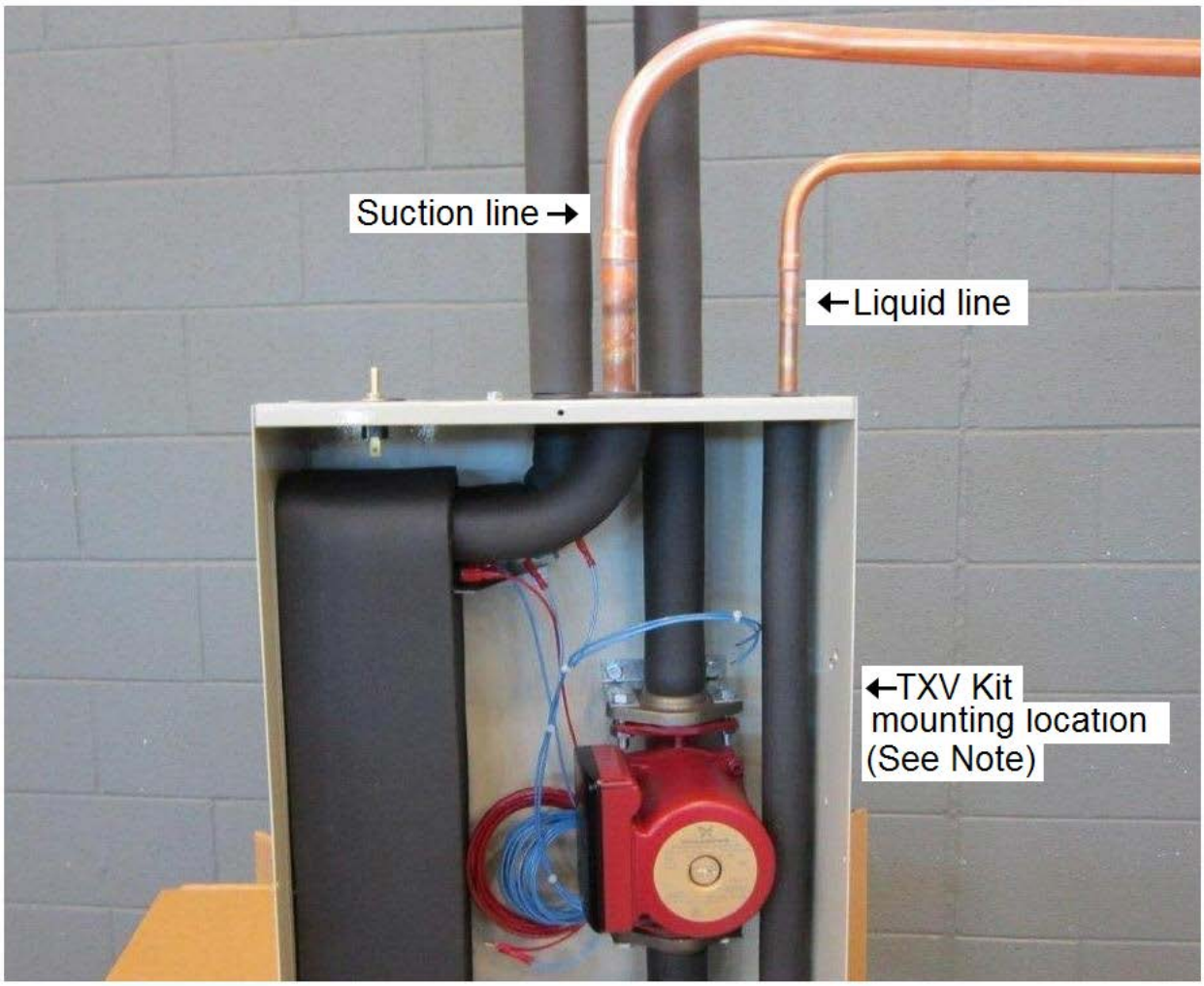
Figure 2. TXV/CAV Assembly

IMPORTANT!

The TXV/CAV Assembly illustration in Figure 2 is shown without the factory applied insulation for the purpose of clarity. Factory-installed insulation must remain on the TXV/CAV Assembly to prevent condensate dripping during cooling operation.

The following instructions are for the installation of the TXV Kit to the ETI Series HWM Hydronic Water Module. These instructions will apply to other field supplied hydronic water modules with appropriate product-specific installation modifications.

Remove the cabinet door of the HWM Hydronic Water Module and follow the illustrations of Figure 3a through Figure 3p to install the TXV assembly.



View of the HWM Series Hydronic Water Module cabinet with the liquid and suction lines identified. The TXV Kit will mount on the outside of the cabinet as shown.

Figure 3a. Hydronic Water Module Conversion

NOTE: The mounted TXV/CAV assembly projects 7-1/2" from the cabinet. Provide 15" clearance on the right side of the cabinet to access to TXV/CAV assembly.

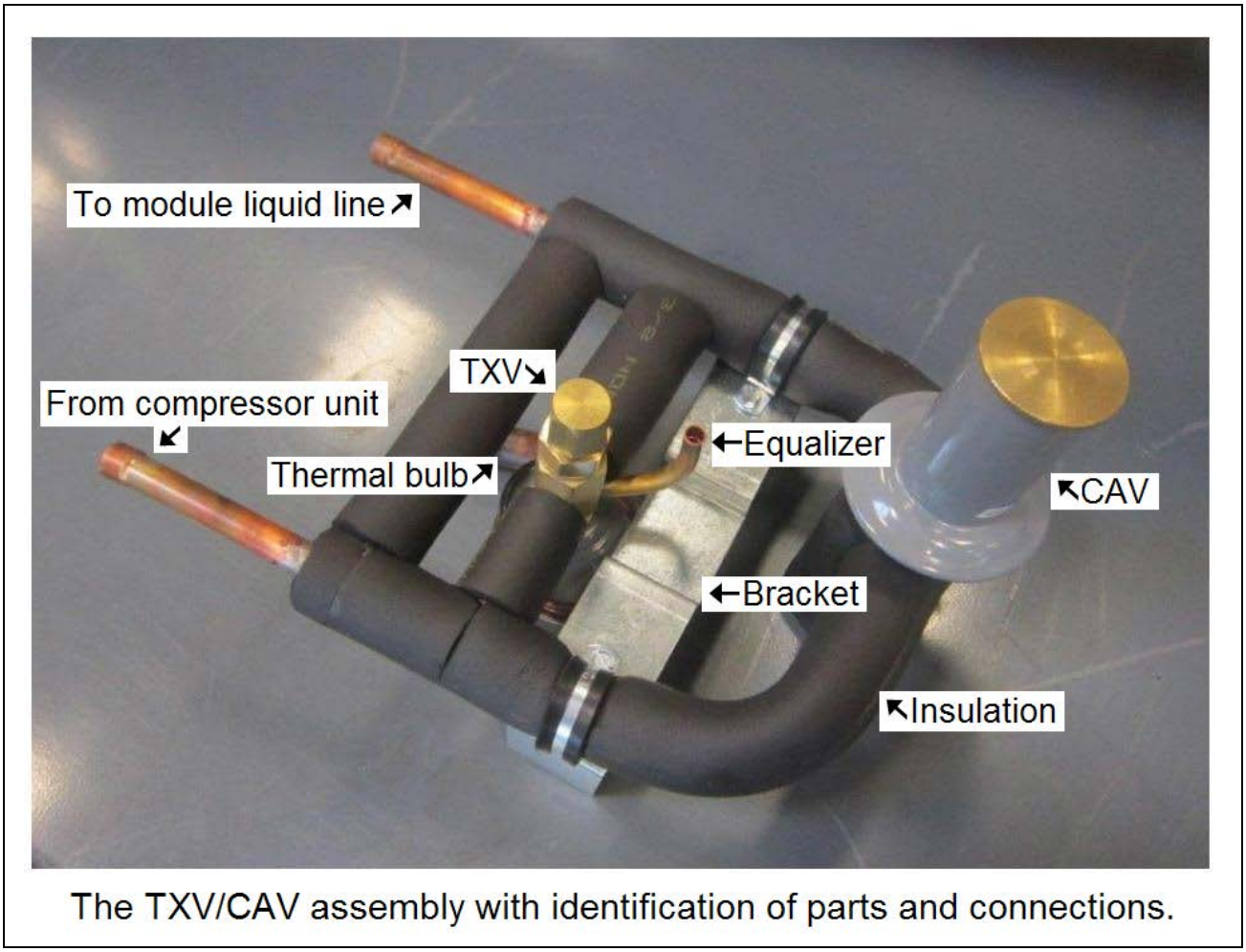
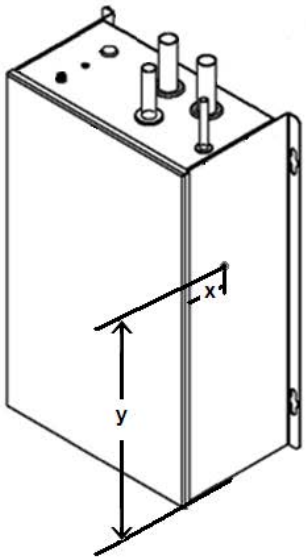
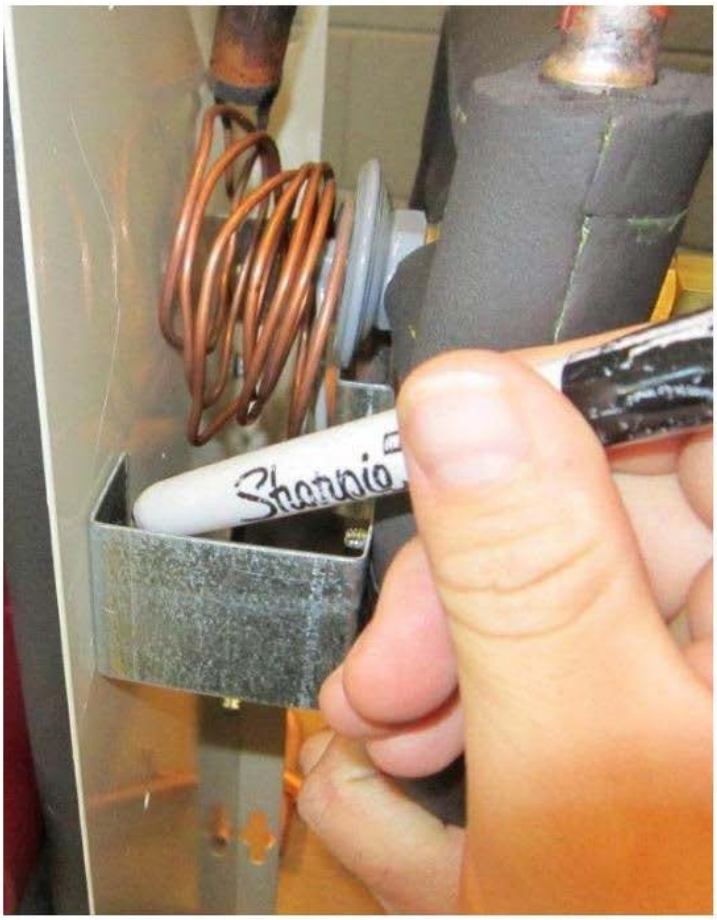


Figure 3b. Hydronic Water Module Conversion

x = 1-1/4 inches

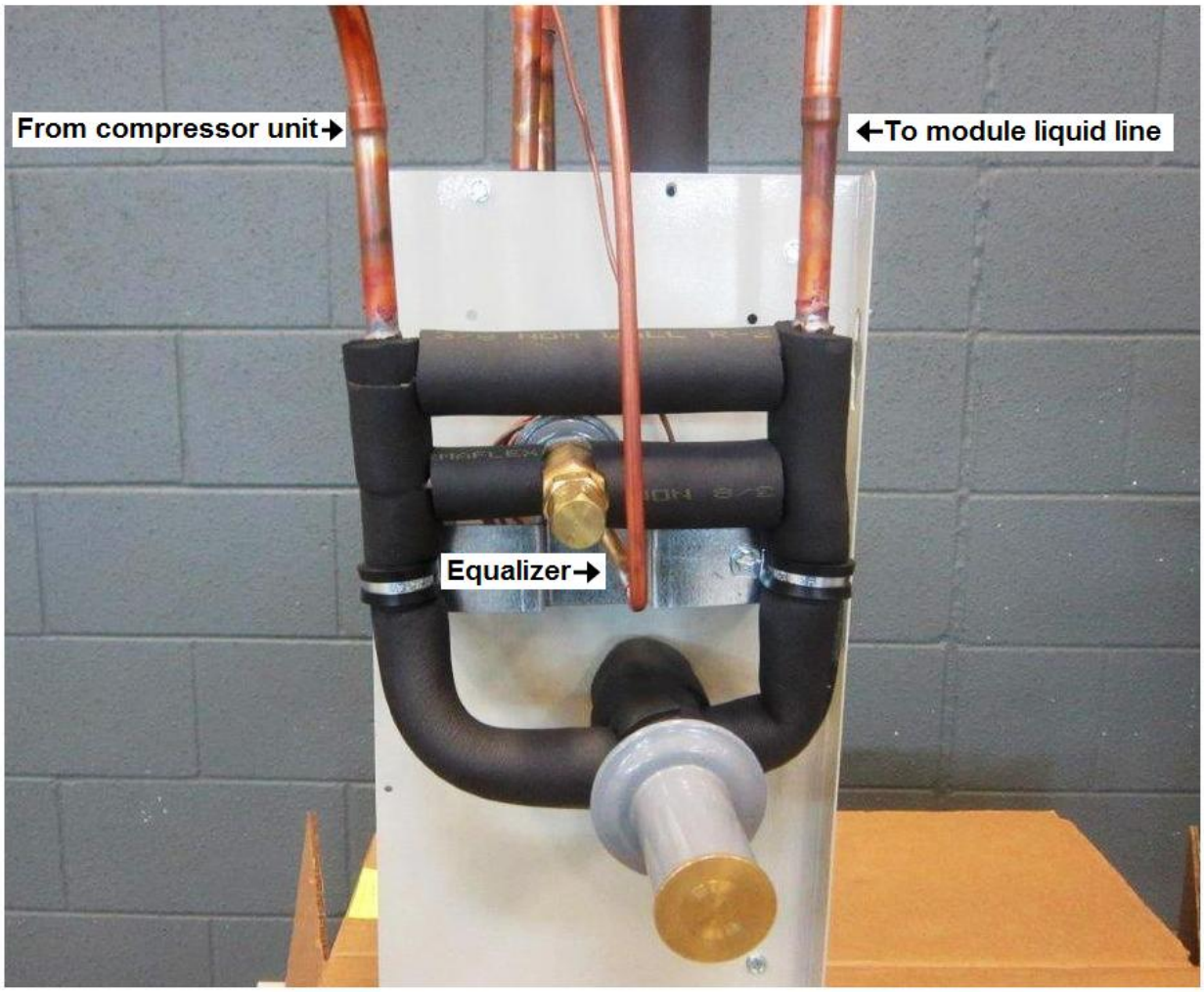
y = 16 inches





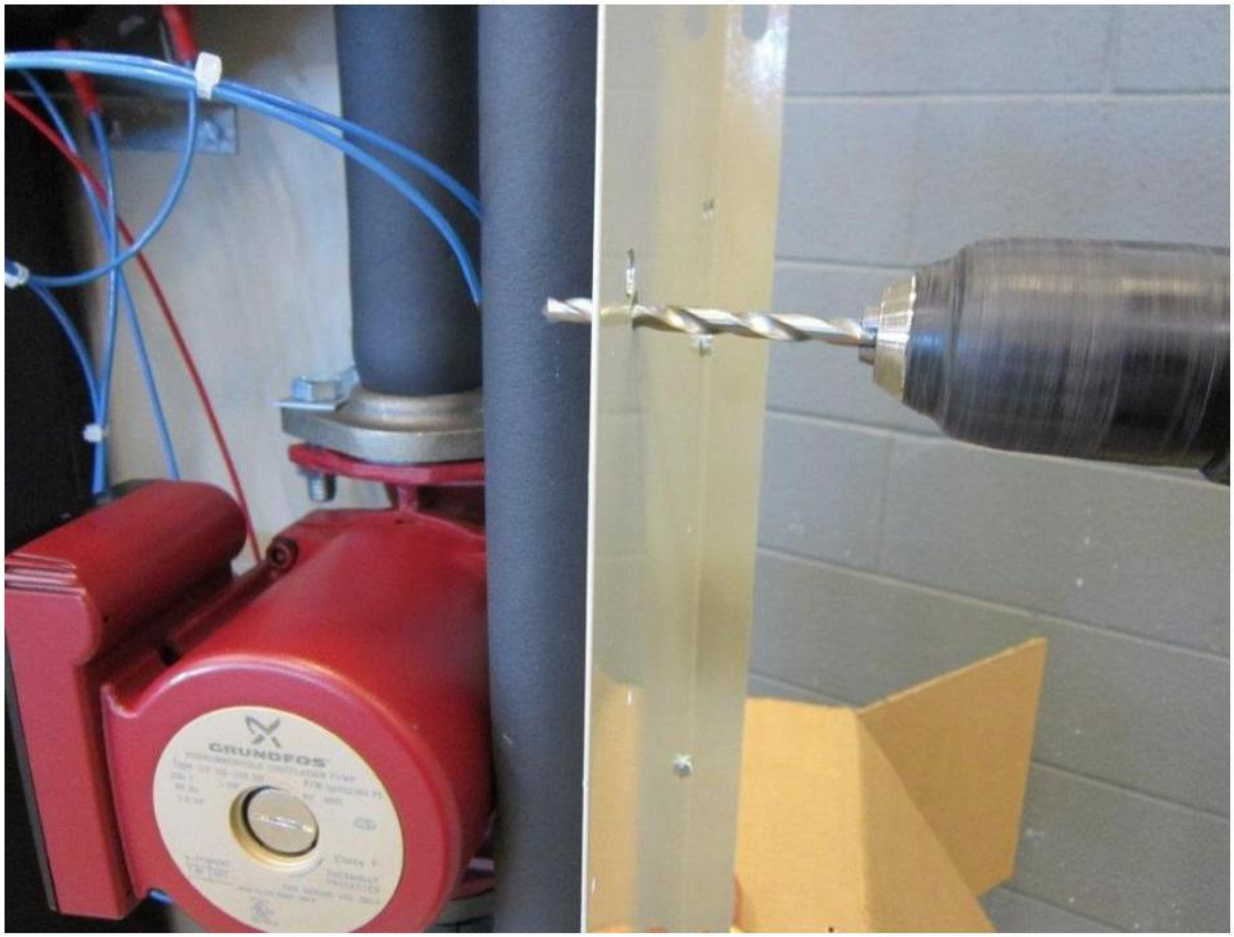
The TXV/CAV assembly location is marked on the HWM Hydronic Water Module cabinet (right side when looking at the cabinet facing the cabinet door). The TXV/CAV assembly bracket is used as a template to mark the second bracket hole location, when the TXV/CAV assembly is located as shown in Figure 3d.

Figure 3c. Hydronic Water Module Conversion



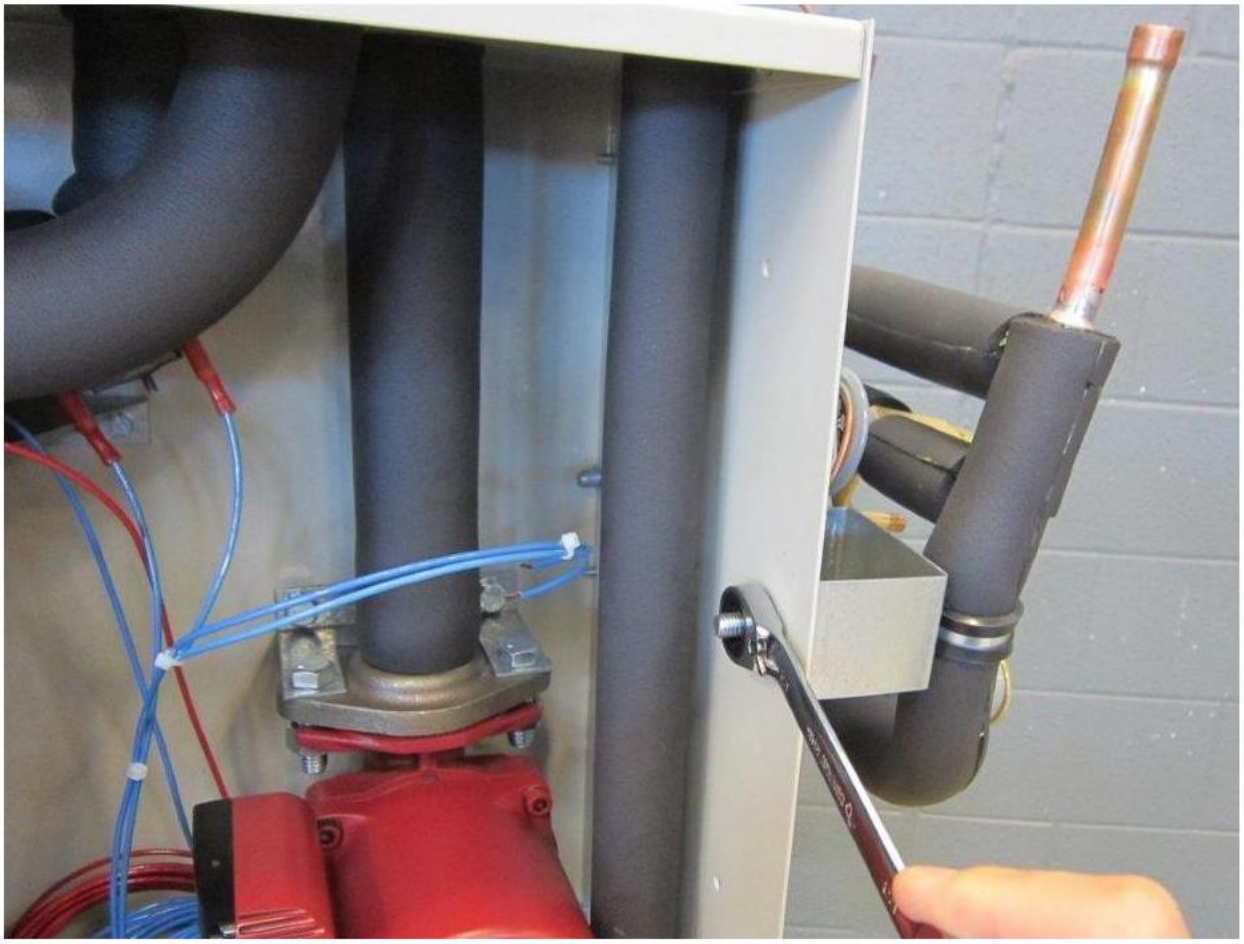
The TXV/CAV assembly, located on the right side of the HWM Hydronic Water Module cabinet. The refrigeration connections are identified.

Figure 3d. Hydronic Water Module Conversion



Drill two holes where marked on cabinet with a 5/16” drill bit, being careful not to damage any hydronic water module parts inside the cabinet.

Figure 3e. Hydronic Water Module Conversion

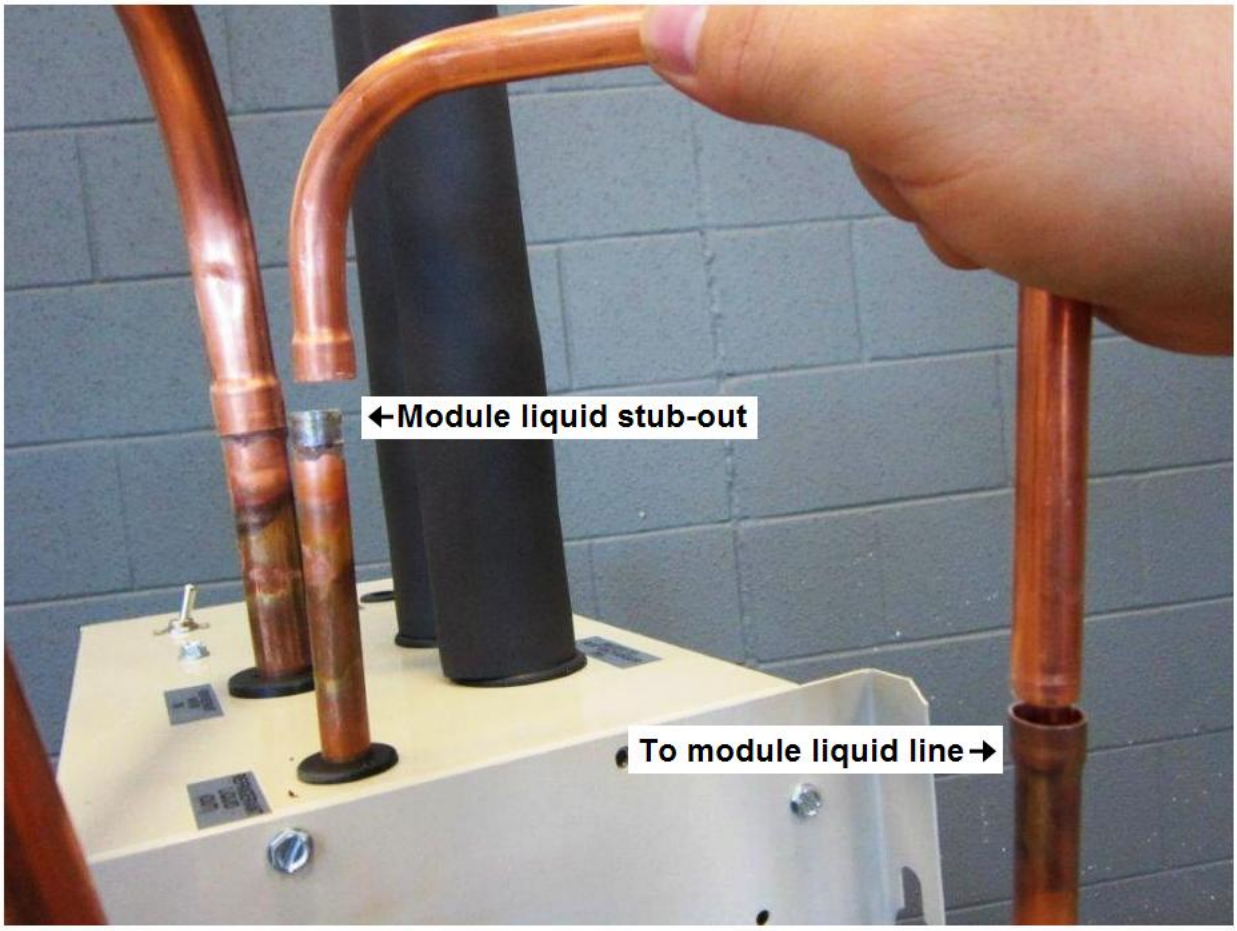


Insert the provided bolts thru the TXV/CAV assembly holes and then thru two drilled holes from the outside of the cabinet. Fasten with the two locknuts inside the cabinet as shown. Tighten the assembly until it is held firmly against the cabinet wall.

Figure 3f. Hydronic Water Module Conversion

Cut the liquid line as shown such that the liquid line from the compressor can be re-connected to the TXV/CAV assembly with a conveniently short piece of 1/2” ACR copper tubing.

Figure 3g. Hydronic Water Module Conversion



Trim cut the liquid line stub-out from the module as shown. Form a U-bend (no kinks) shaped piece of 1/2" ACR copper tubing to connect the module liquid stub-out to the liquid line connection on the TXV/CAV assembly as shown. A 1/2" copper coupling can be used to connect the tubing at the module or it can be a field-swaged connection.

Figure 3h. Hydronic Water Module Conversion

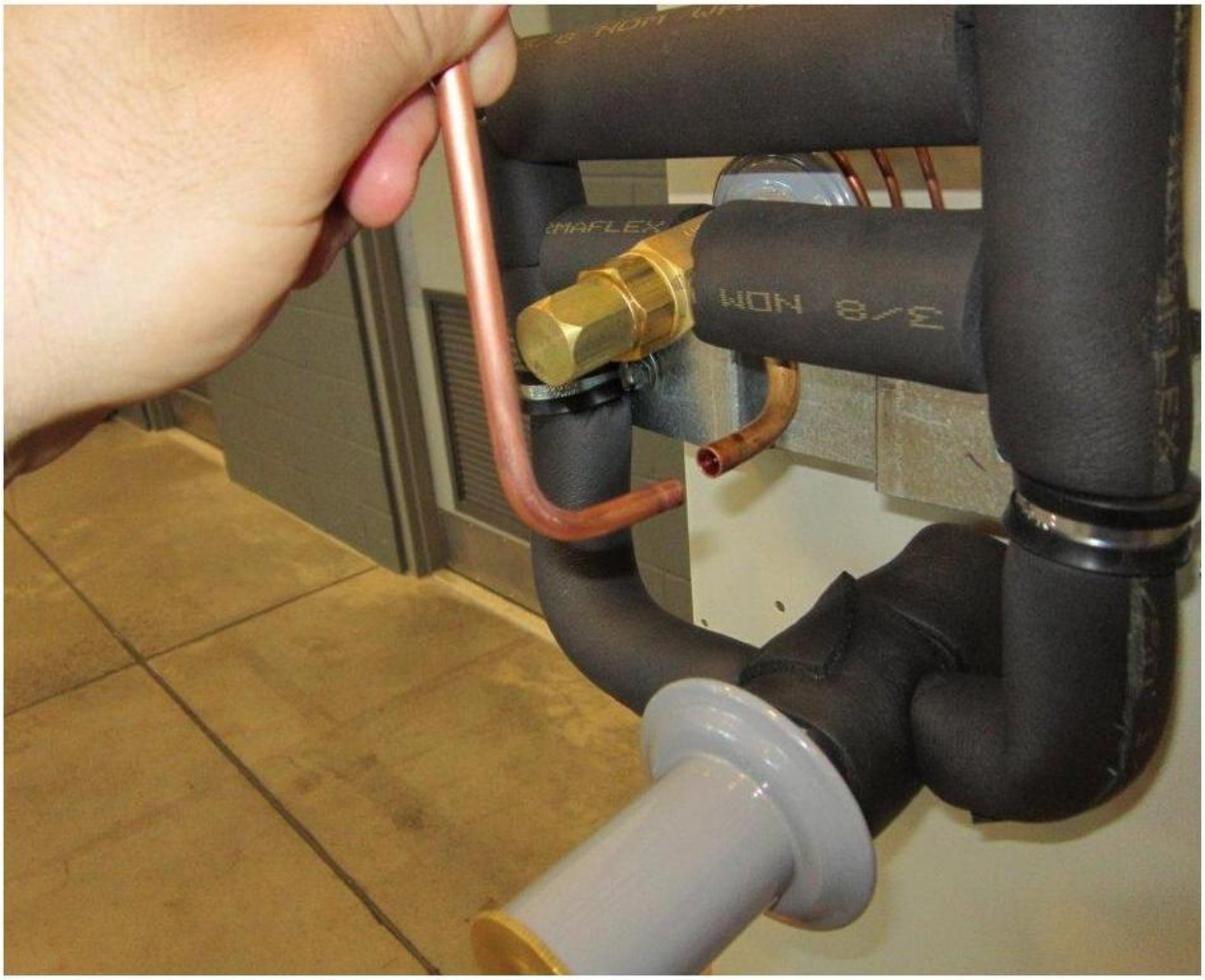
Drill a 1/4” hole in the suction line 18” to 24” from the point where the suction line exits the top of the cabinet. This will be the equalizer connection to the suction line.

Pressurize the suction line with dry nitrogen (1 to 2 psi) while drilling to prevent metal chips from entering the suction line.

Figure 3i. Hydronic Water Module Conversion

After de-burring the (pressurized) drilled hole, shape and trim cut the provided equalizer tube which will be inserted into the suction tube by not more than 1/4". The other end of the tubing will be inserted into the equalizer port on the TXV/CAV assembly.

Figure 3j. Hydronic Water Module Conversion



Equalizer tube is fit into the swaged connection at the TXV/CAV assembly.

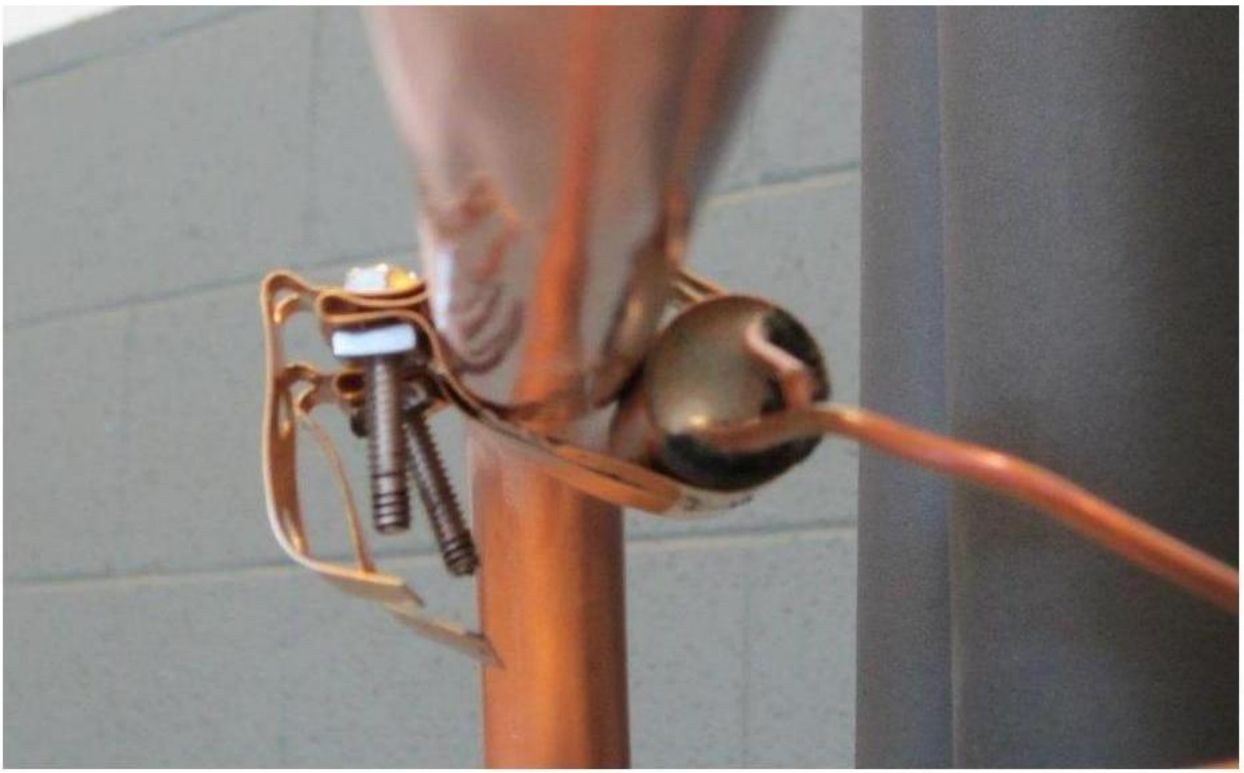
Figure 3k. Hydronic Water Module Conversion

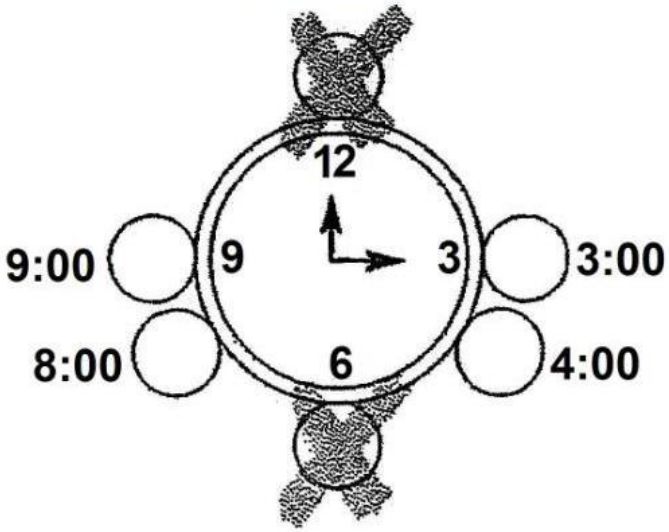
Bend and shape a short piece of 1/2” ACR copper tubing to connect the liquid line from the compressor unit to the swaged port of the TXV/CAV assembly as shown.

Figure 3l. Hydronic Water Module Conversion

Position the thermal bulb on the HORIZONTAL suction line as close to the hydronic water module as possible, as shown. Clean the surfaces to ensure good contact between the thermal bulb and the suction line. LOOSELY clamp the thermal bulb to the suction line with the two provided strap clamps and fasteners. Position the thermal bulb on the suction line as shown in Figure 3n.

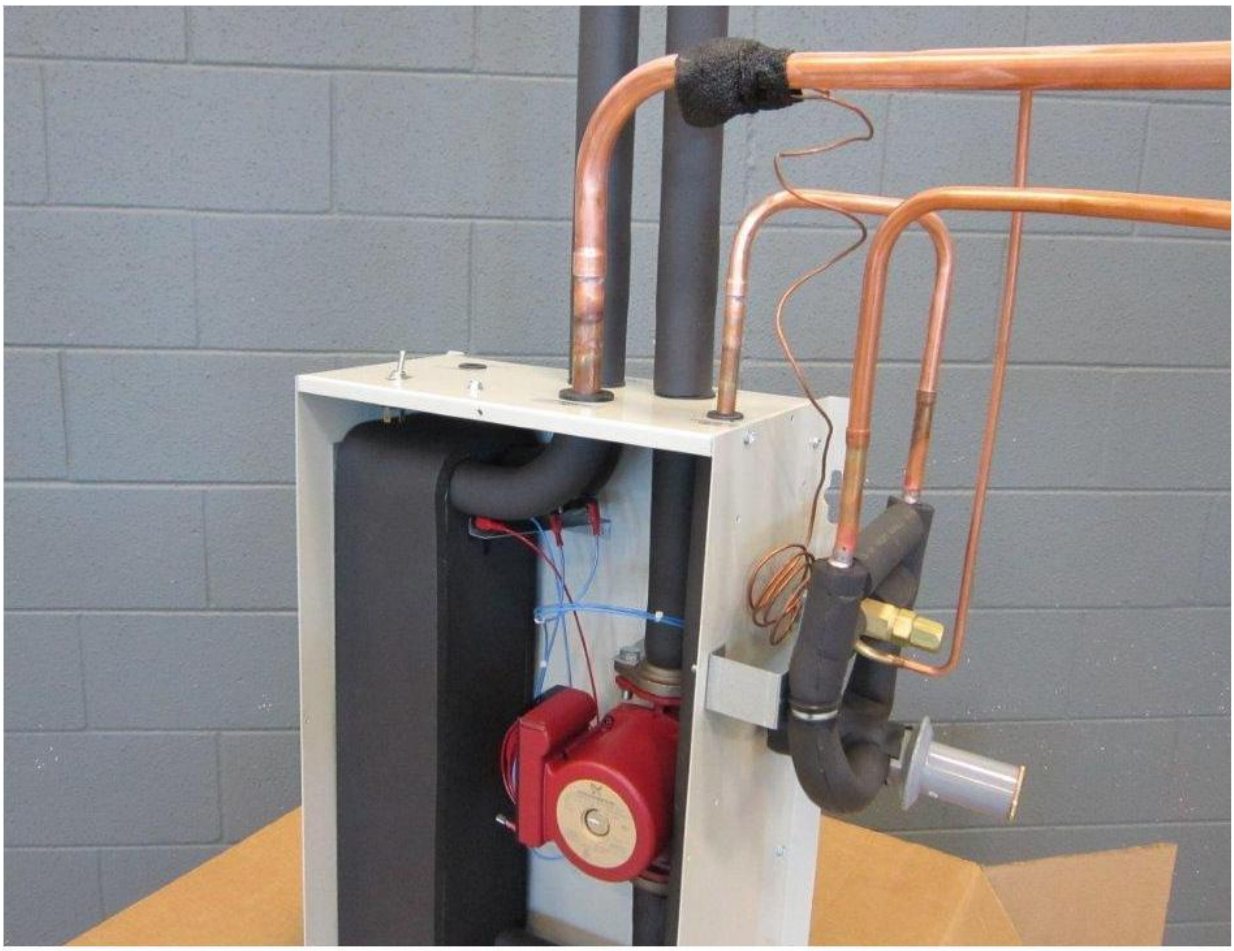
Figure 3m. Hydronic Water Module Conversion





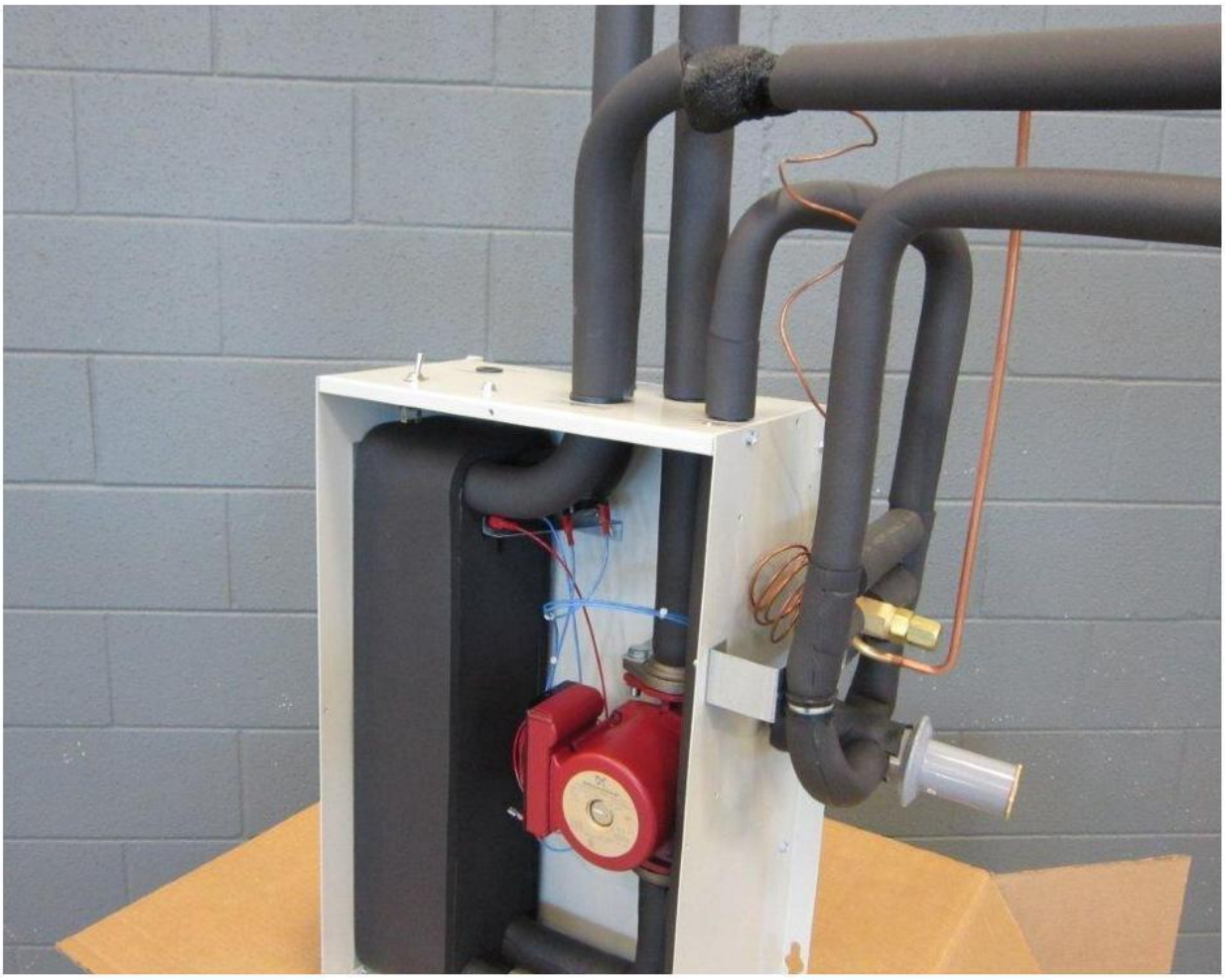
Rotate the thermal bulb on the suction tube until it is positioned at one of the locations shown in the diagram above: 3, 4, 8 or 9 o'clock. When the thermal bulb has been positioned properly, tighten both strap clamp fasteners to hold the thermal bulb in tight contact with the suction tube, as shown above. Bend the excess strap to conform to the thermal bulb/suction tube contour.

Figure 3n. Hydronic Water Module Conversion



Wrap the provided Prestite® insulation around the thermal bulb and suction line contact location to isolate the thermal bulb from the ambient conditions.
The installed TXV Kit is shown ready to be brazed. Be sure to employ the nitrogen brazing process. Leak test the system at no more than 150 psig dry nitrogen before installing pipe insulation.

Figure 3o. Hydronic Water Module Conversion



Apply 1/2” wall thickness Armaflex® , InsulTube® or the equivalent field supplied pipe insulation to ALL refrigeration tubing involved in the installation of the TXV Kit, as shown.

Figure 3p. Hydronic Water Module Conversion

4. 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".

1. SC, SD and SW Models

Refer to Figure 4 and the following description:

a. Seal Test Evacuation and Initial Charge

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 “OFF” 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. Check the Pressure gage after 15 minutes and verify the original pressure has not decreased. 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 4. LP and HP valves are fully open. Both Service Valves are fully opened.
4. As illustrated in Figure 4, 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. Purge the Charging Hose of air, tighten the hose connection to the Charging Port and close the Valve on the Refrigerant Container.

IMPORTANT

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

6. Initiate the system evacuation. **<u>Evacuate the system down to 230 MICRONS</u>** 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<u>, the system pressure must not exceed 280 MICRONS WITHIN 5 MINUTES.</u>** 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 MET!

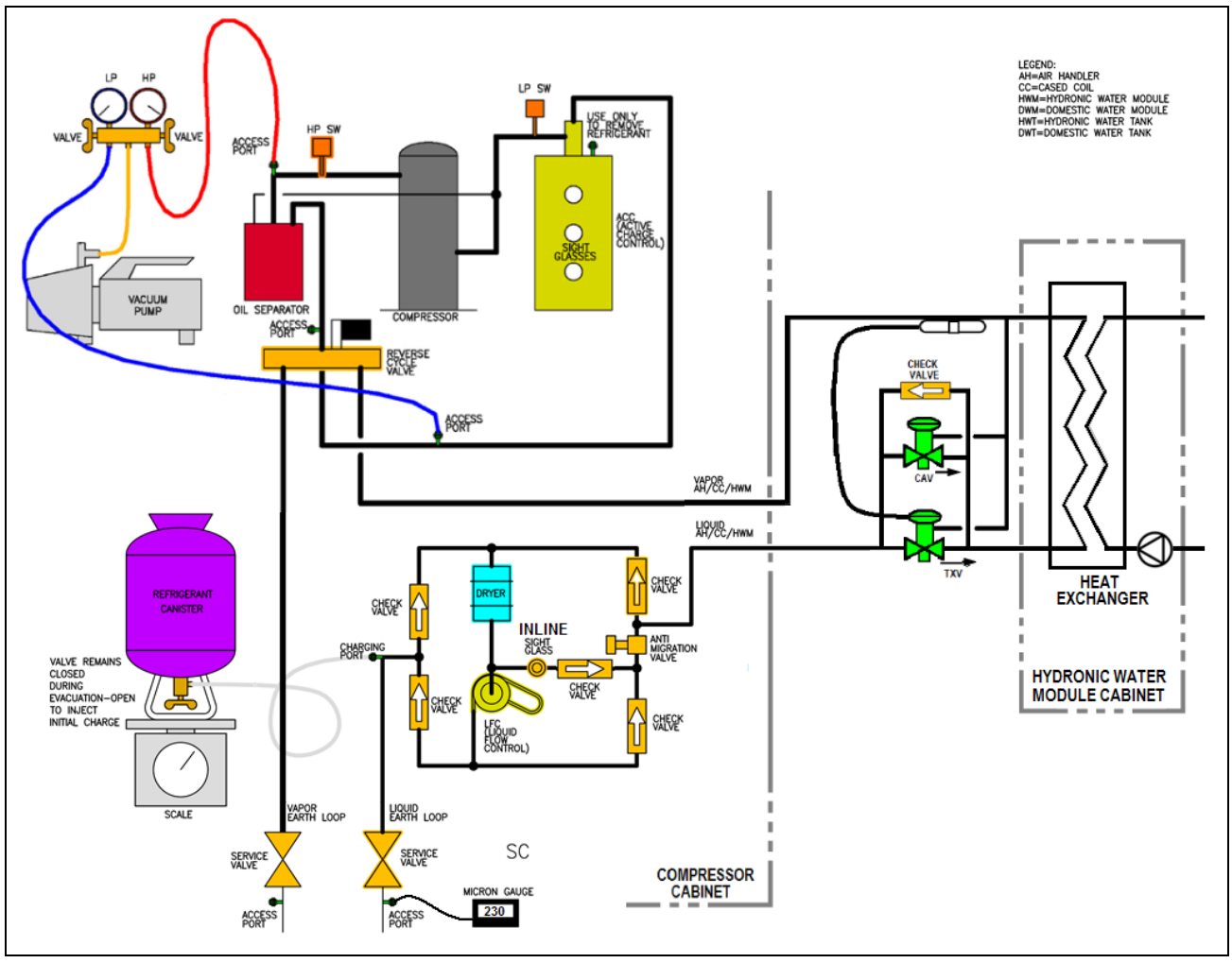


Figure 4. Typical Evacuation & Initial Charge Set-up for SC, SD, SCW andSW, Compressor Models (SC model shown).

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 4.
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 COOL mode.**

Hydronic Systems

If heating is provided by a hydronic water module, HWM, as listed in Figure 5, the circulating water in the primary circuit (see Figures 6) for the hydronic system is to be maintained in the 45°F to 65°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		Yes3	Yes3	Yes1	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		Yes3	Yes3	Yes2	Radiant panel hydronic heating and air cooling (chilled water handler); and domestic hot water by priority heating with DWM

[1]Includes Desuperheater Model DESPK to supplement water heating as a by-product when system is operating in cooling mode only.
[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 heat exchanger. Requires field supplied water circulating pump.

Figure 5. Systems Heating with Hydronic Heat Exchangers

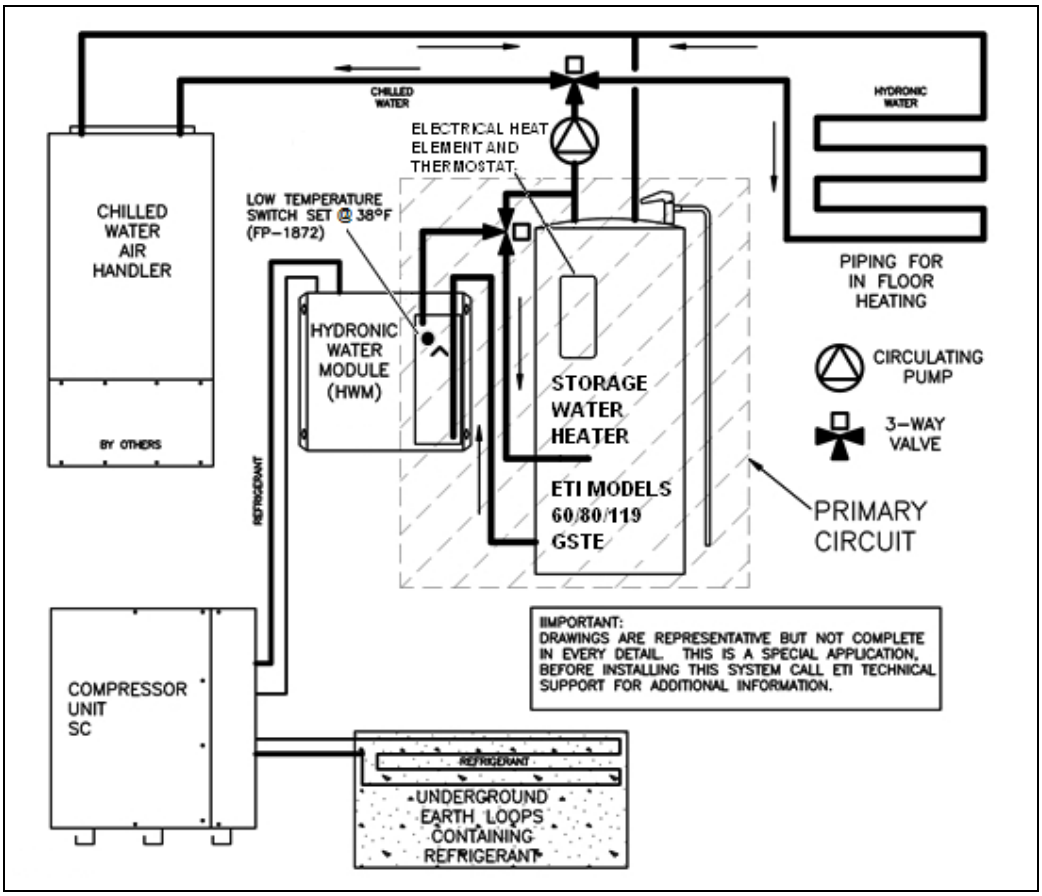


Figure 6. Primary Circuit with Hydronic Water Module (HWM)

Final charging is done in the COOL mode as follows, with the charging set up described in Figure 7:

1. Continue measuring the refrigerant charge weight as shown in Figures 7.
2. If the system is equipped with a domestic water module (DWM) in addition to the primary heating system, be sure the DWM switch is OFF.
3. Be sure that circulating water is maintained between 45°F and 65°F.
4. Close the HP valve. **Then turn the system on in the COOL mode**. **The charging process is detailed in the flow chart illustrated in Figure 10.** When complete, return to step 8 below.
5. Initiate final charging by opening the refrigerant container valve and the gage manifold LP valve to allow liquid refrigerant to enter the system SLOWLY. The ACC will not allow liquid refrigerant to enter the compressor.
6. Continue to add liquid refrigerant to the system until the bubbles disappear from the in-line sight glass and **the flow becomes clear, indicating full liquid flow**.
7. When the liquid flow in the sight glass becomes clear, turn off the refrigerant container valve. Charging is complete.
8. Document the total weight of refrigerant charge in the system. The system is now ready for adjustment of the TXV.

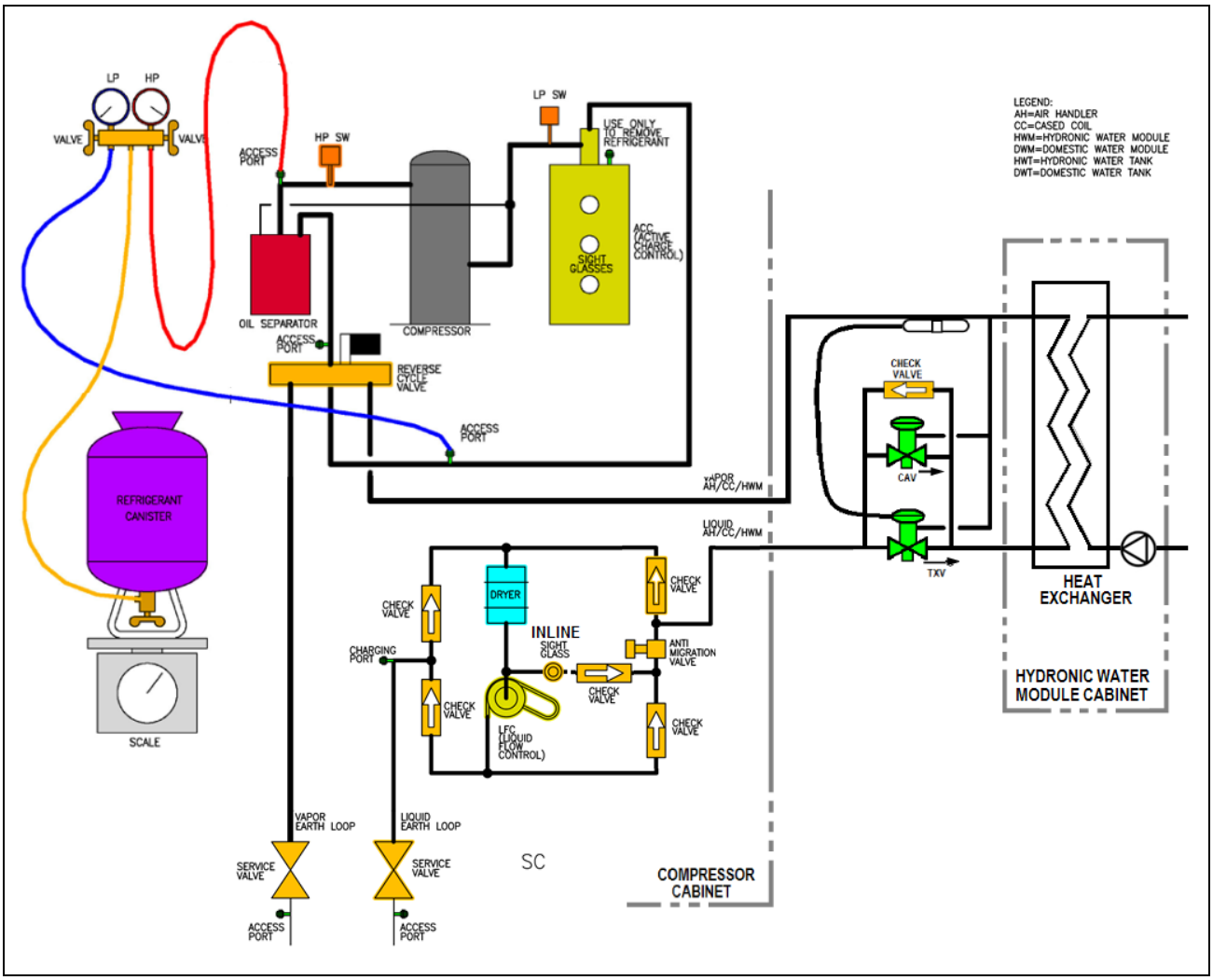


Figure 7. Typical Final Charge Set-up for SC, SD and SW Compressor Units (SC Model shown).

9. Next, the TXV is to be adjusted to provide 12°F to 15°F superheat while running in cooling mode. The first step is to utilize the access port and LP gage in Figure 8 to measure suction pressure. **Next, apply a thermocouple at the compressor suction port** as shown in Figure 8, by attaching the thermocouple lead with electrical tape, and wrapping with ½" thick insulation.

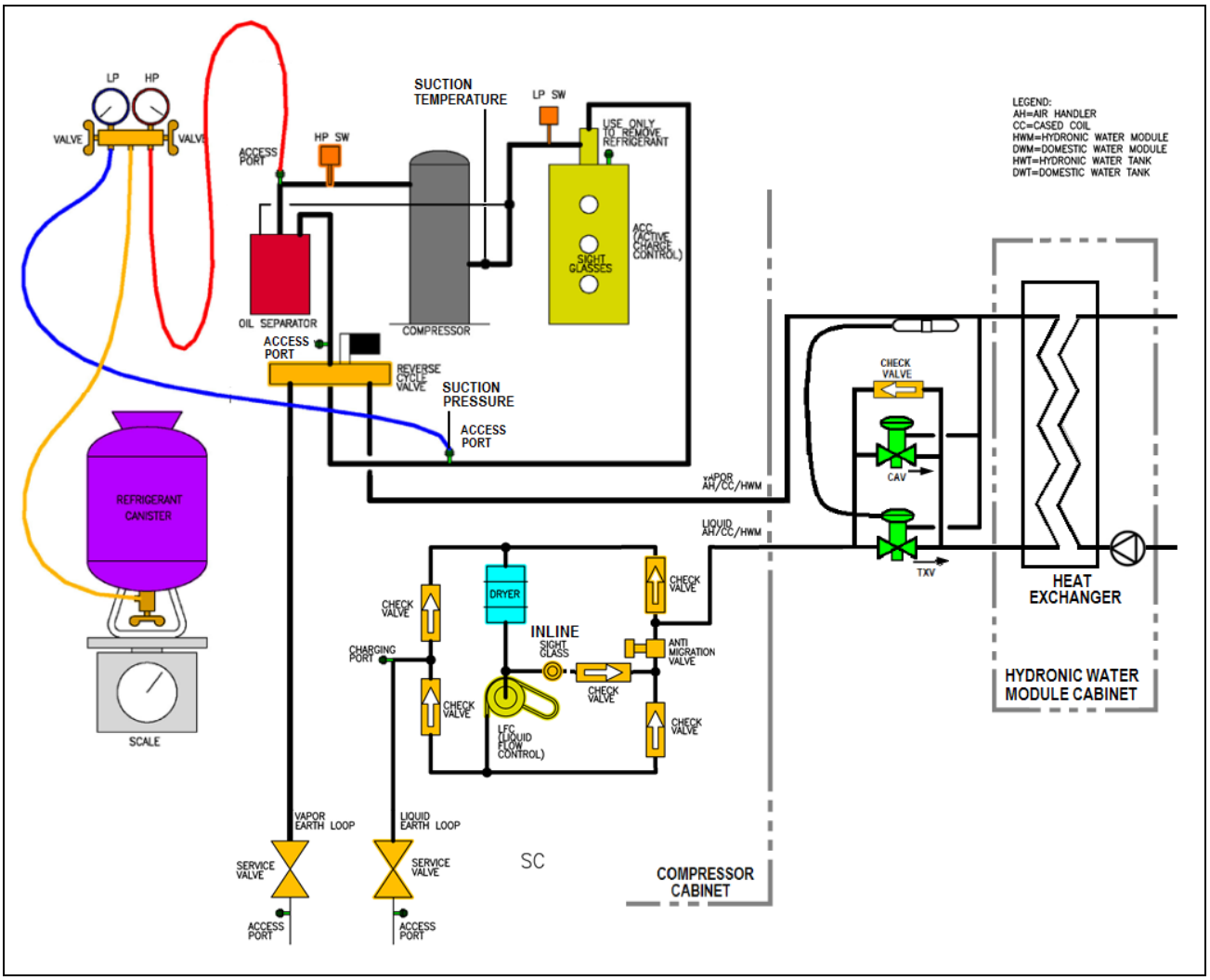


Figure 8. Superheat Measurements for SC, SD and SW Compressor Units (SC Model shown).

10. **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.

11. Enter the Pressure-Temperature Table in Figure 9 and for the suction pressure read on the LP gage, determine the saturation temperature (evaporating temperature) from the chart, interpolating if necessary.

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 9. Pressure-Temperature for R-407C

12. To determine the degrees of Superheat, subtract the saturation temperature determined in step 11 from the suction temperature read at the access port thermocouple. The difference in the temperatures is the superheat.

    (Superheat, °F) = (Suction Temp., °F) - (Saturation temp., °F)

13. If superheat is less than 12°F, **increase the superheat by adjusting the setting on the TXV in the clockwise direction.**

14. If superheat is greater than 15°F, wait for the ground surrounding the earth loops to warm up. The TXV valve is factory set at MINIMUM superheat and the TXV cannot be further adjusted to decrease the superheat until the ground warms up.

15. See Figure 10 and follow the guidelines to bring the superheat into the 12^0F to 15^0F range.

16. Document the refrigerant charge. The next step is to adjust the Cooling Assist Valve (CAV).

17. Operate the system in the COOL mode until conditions stabilize, prior to initiating the CAV adjustment process. For hydronic systems, the circulating water temperature must be in the range of 45° to 65°F.

18. After equilibrium conditions have been achieved, read the suction pressure as shown in Figure 8 and determine the evaporating temperature from Figure 9, interpolating if necessary.

19. If the evaporating temperature is equal to or greater than 35°F, there is no further adjustment of the CAV necessary. If, as shown in Figure 8, the evaporating temperature is less than 35°F, turn the CAV adjustment **clockwise** until the evaporating temperature is 35°F.

20. When the evaporating temperature is equal to or greater than 35°F, the CAV has been properly adjusted.

21. Check system operation in the HEAT mode. Refrigerant control is automatic. Do not attempt adjustments to the TXV control in the HEAT mode. If the refrigerant level is higher than the top sight glass on the ACC, remove refrigerant from the system until the refrigerant level in the ACC falls below the top sight glass.

22. Document the **net weight** of 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 reference. **This is the full system charge.**

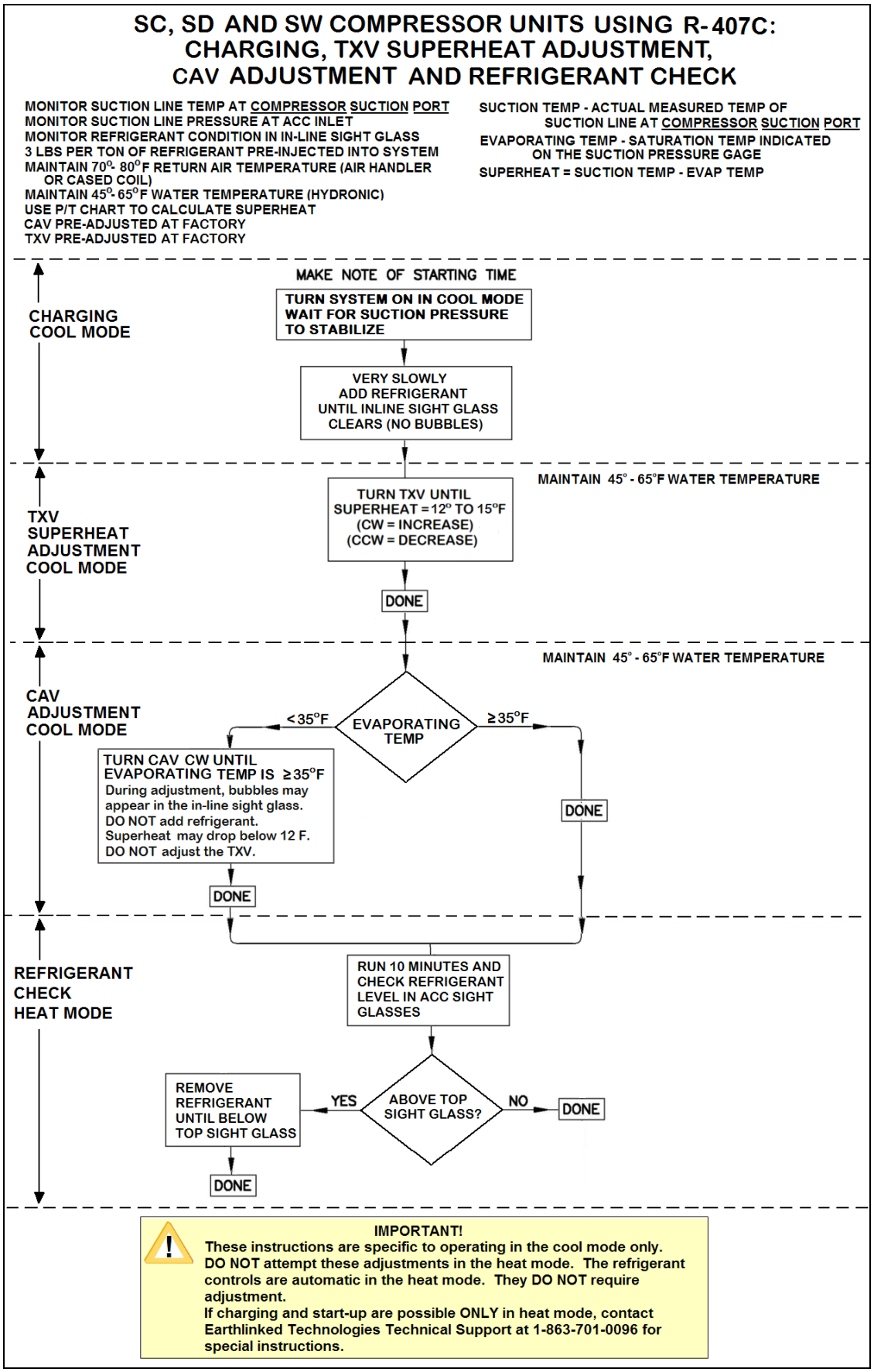


Figure 10. Charging and Superheat Adjustment Process