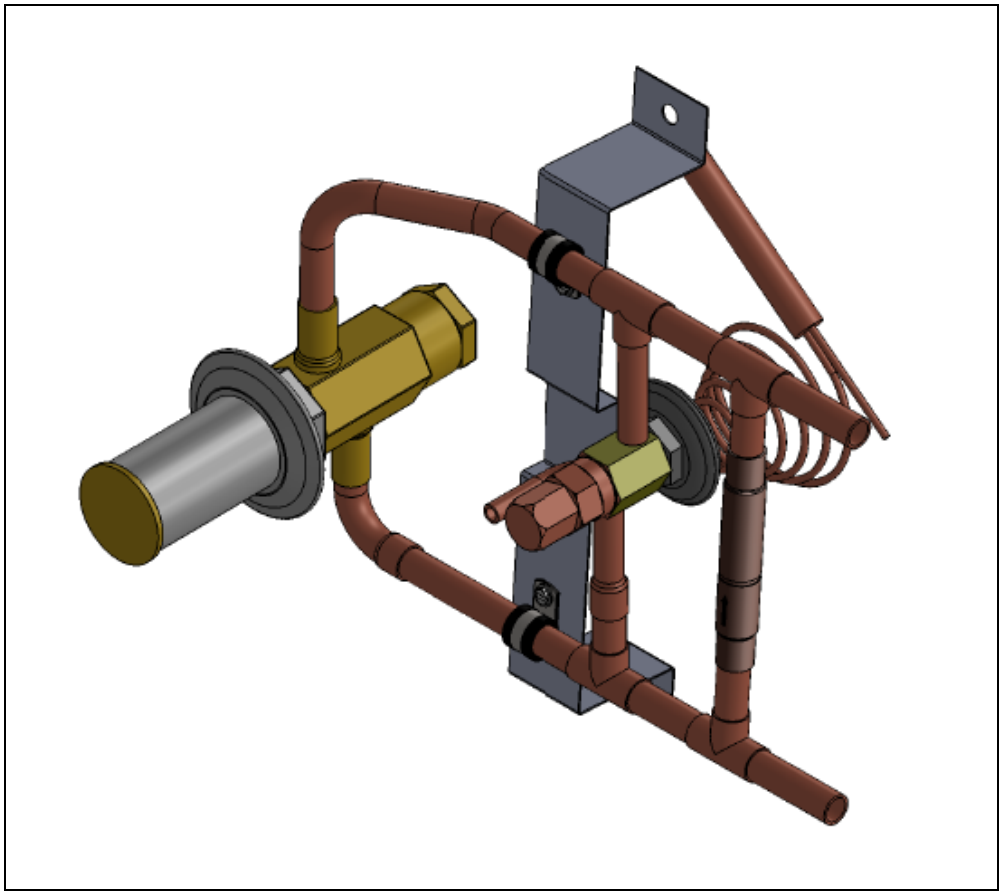
EarthLinked® TXV Kit

Installation Manual for

CCS Cased Coils with SC, SD, SW Compressor Units and R-407C Refrigerant



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 a CCS Series direct expansion cased coil.

The TXV Kit must be matched with the appropriately sized SC, SD or SW series compressor unit and the CCS series cased coil. See table below for correctly matched components.

R-407C COMPONENT MATCHING TABLE		
SC, SD, SW COMPRESSOR UNIT NOMINAL CAPACITY, BTUH	**TXV KIT MODEL**	**CASED COIL MODEL CCS -**
-018 (18,000)	TXV-018B	CCS-1824
-024 (24,000)	TXV-024B	CCS-1824
-030 (30,000)	TXV-030B	CCS-3036
-036 (36,000)	TXV-036B	CCS-3036
-042 (42,000)	TXV-042B	CCS-4248
-048 (48,000)	TXV-048B	CCS-4248
-060 (60,000)	TXV-060B	CCS-6000

IMPORTANT!

5 ft. of 1/2" ACR copper tubing and a 1/2" x 90° ell are to be field supplied for the installation of the TXV kit.

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

1. Compressor unit rail assembly conversion
2. Cased Coil conversion
3. System Start-Up

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.**

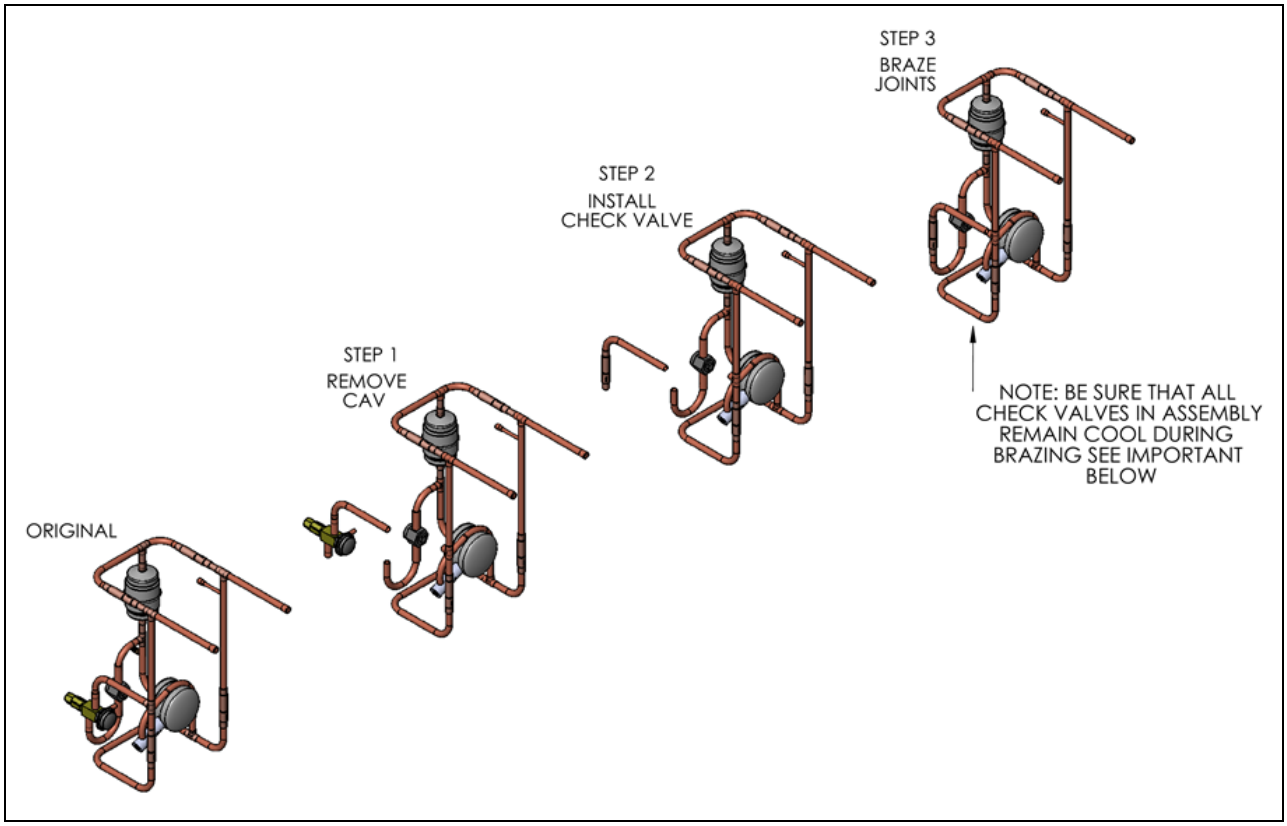


Figure 1. Compressor Unit Rail Conversion

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. Cased Coil Conversion

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

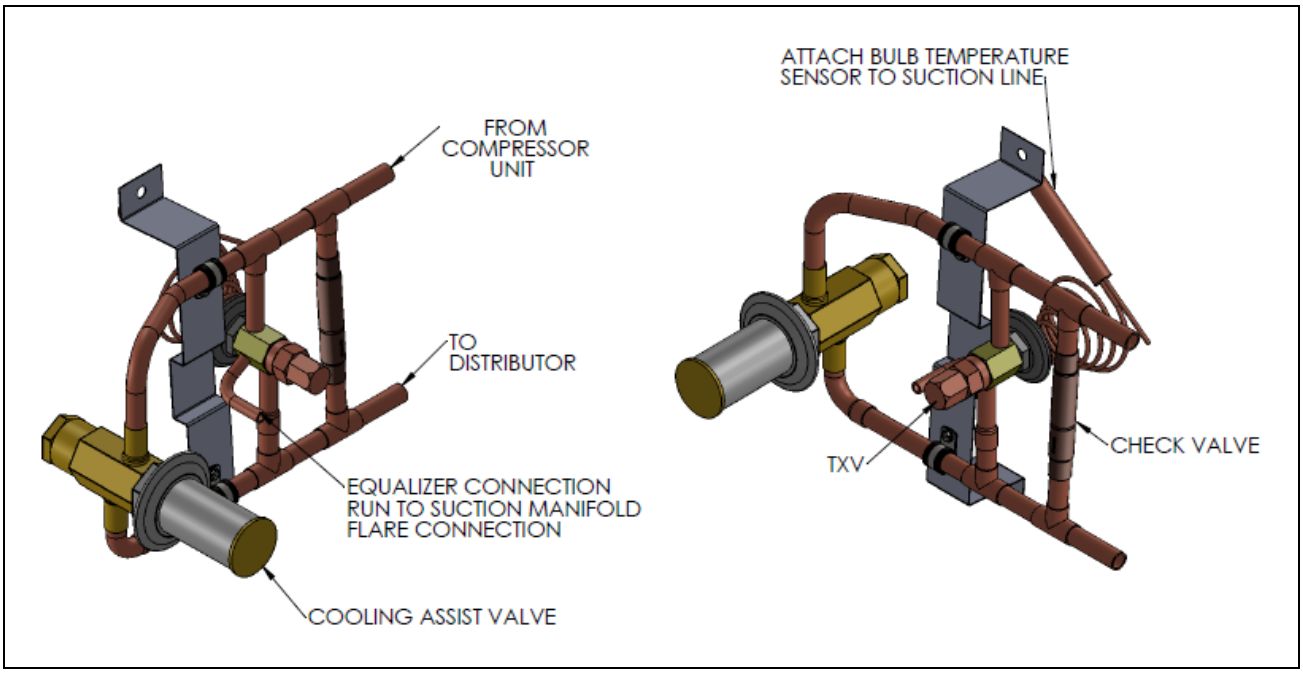


Figure 2. TXV/CAV Assembly

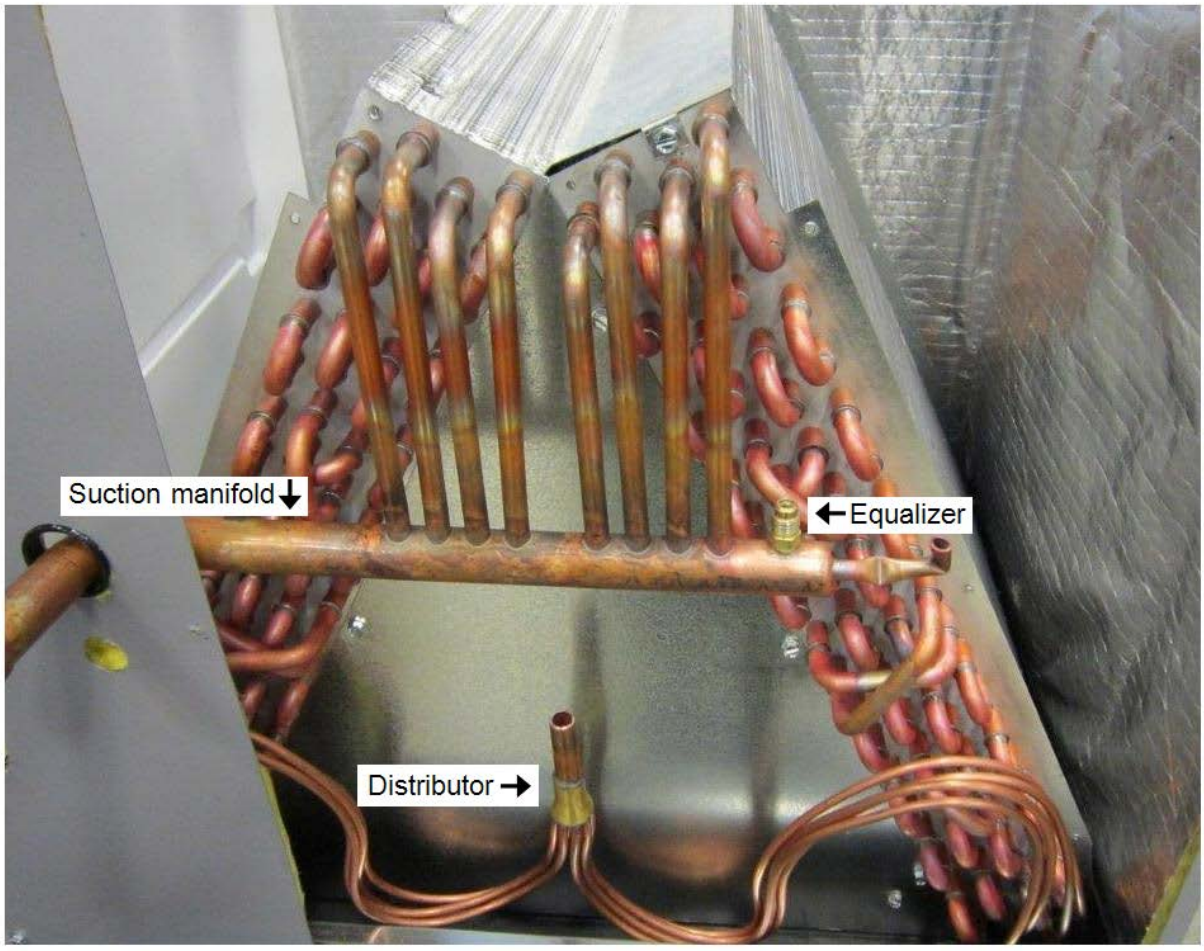
IMPORTANT!

The following instructions are for installation of the TXV Kit to the ETI Series CCS Cased Coils. These instructions will apply to other field supplied cased coils with appropriate product-specific installation modifications.

IMPORTANT

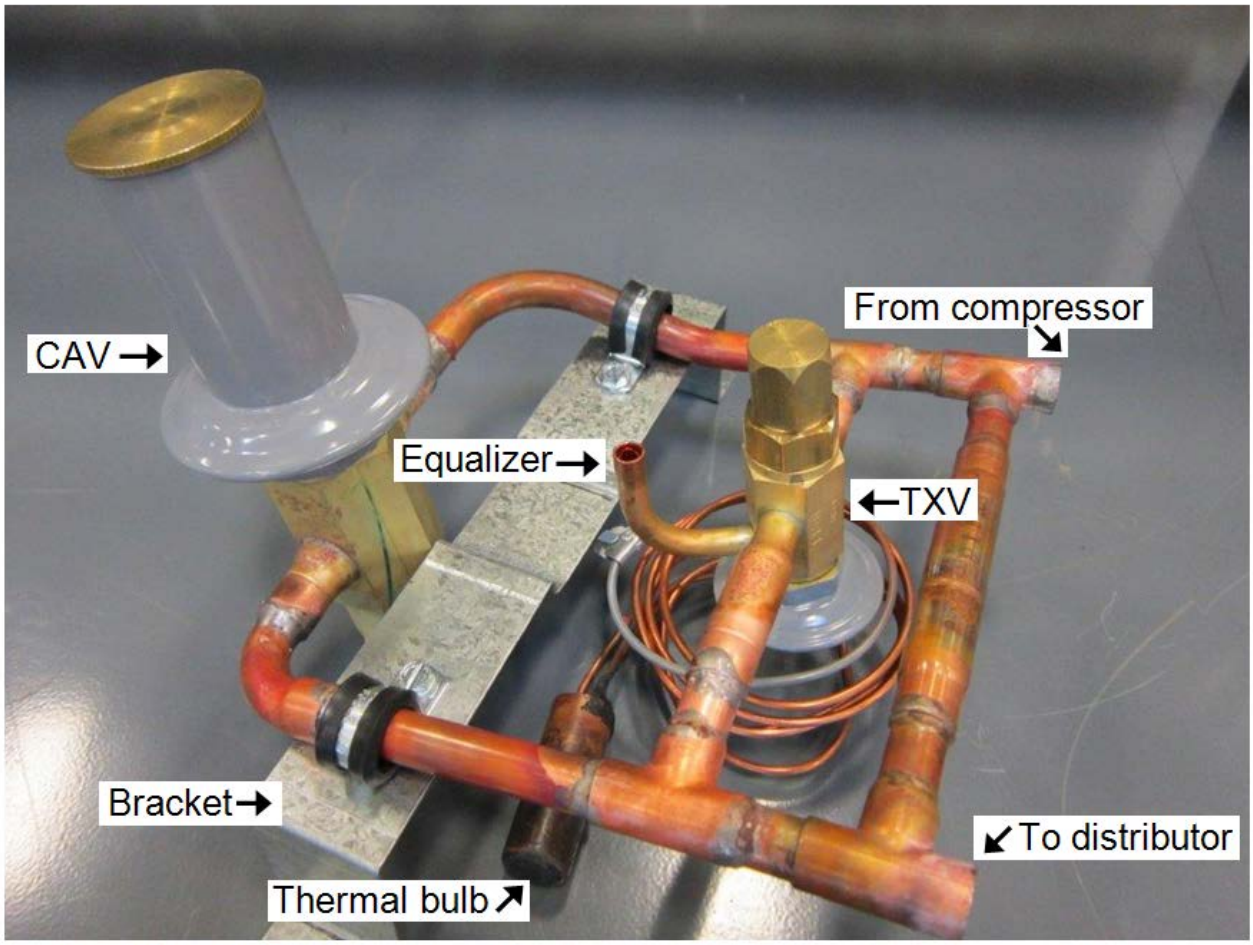
The following installation instructions are illustrated for a cased coil intended to be installed in the VERTICAL position. The same instructions apply to a cased coil that will be installed in the HORIZONTAL position, noting that for the HORIZONTAL position, (1) the TXV ASSEMBLY must be located for condensate from tubing to fall into the base pan, (2) the BULB TEMPERATURE SENSOR must be located on the suction line consistent with acceptable positions and (3) the distiributor orientation must be vertical.

Remove the cabinet door of the cased coil. With the cased coil in the vertical position, and facing the front of the cased coil, follow the illustrations of Figure 3a. through Figure 3k. to install the TXV assembly.



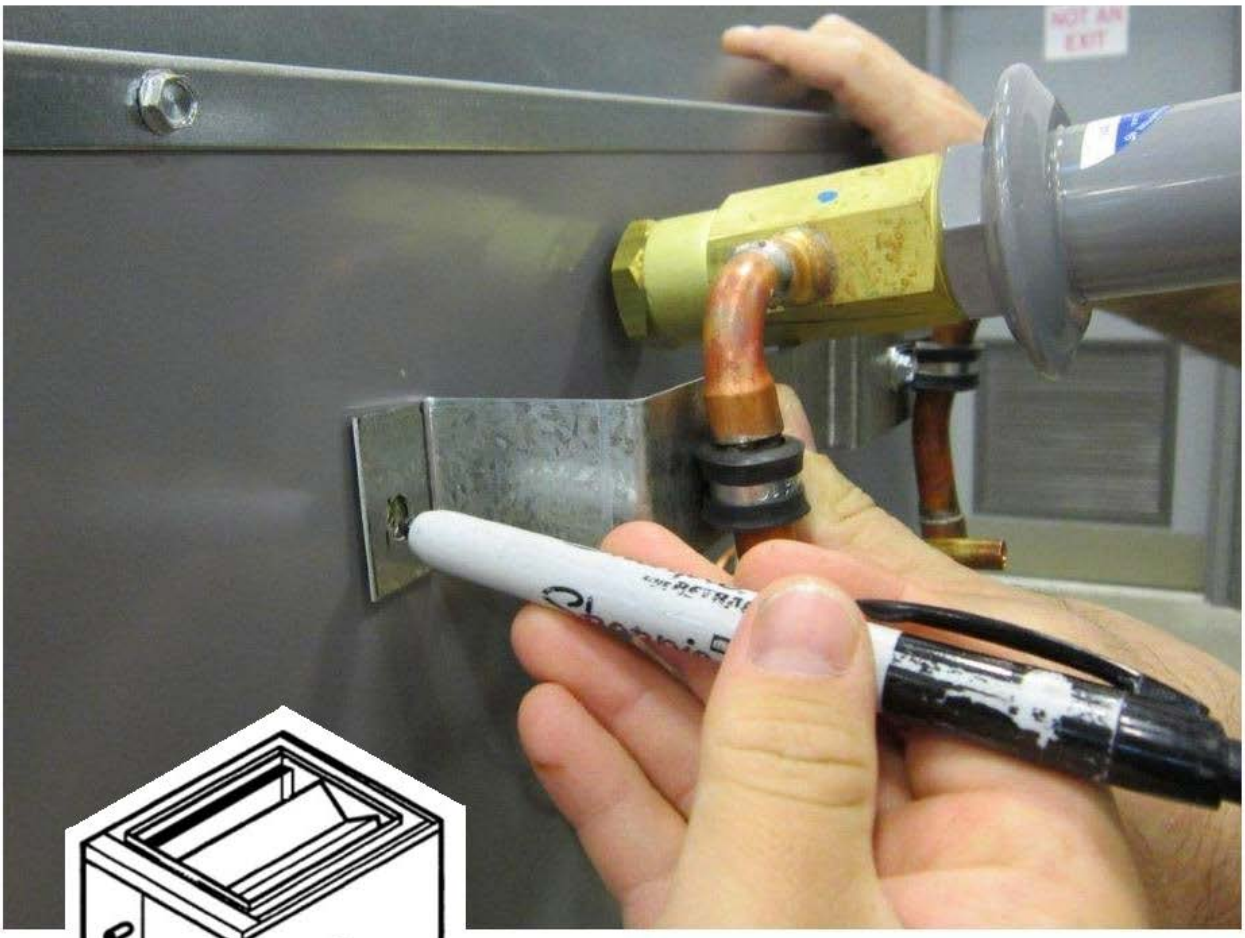
View of A-coil inside the CCS Series cased coil cabinet with suction manifold, pressure equalizer threaded connection and distributor identified. Distributor orientation shown is for VERTICAL installation. If cased coil were to be applied in the horizontal position, the distributor would be rotated 90° in the clockwise direction. If a field supplied cased coil is being converted, the cased coil must have feeder tubes at least 3/16" OD, and the distributor must be drilled out per the instructions in the current ***EarthLinked® Heating and Cooling Systems Installation Manual.***

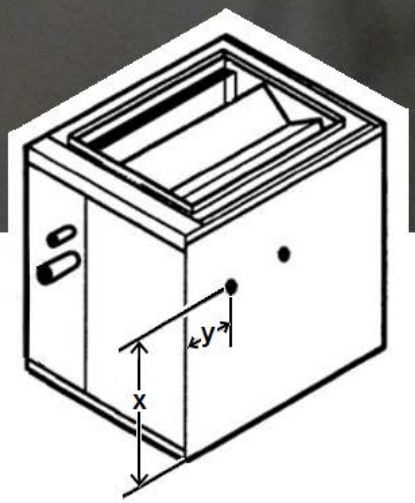
Figure 3a. Cased Coil Conversion



The TXV/CAV assembly with identification of parts and connections.

Figure 3b. Cased Coil Conversion





CCS-1824 } **x = 16 inches**
y = 5 inches

CCS-3036
CCS-4248 } **x = 20 inches**
CCS-6000 **y = 4 inches**

The TXV/CAV assembly location is marked on the cased coil cabinet as shown, with the locator hole x inches up from the cabinet base and y inches in from the front opening of the cabinet. Use the TXV/CAV assembly bracket for a template to mark the location of the second hole, as shown.

Figure 3c. Cased Coil Conversion

Drill two holes where marked with a 5/16” drill bit, being careful not to damage the insulation on the side of the cabinet or the A-coil.

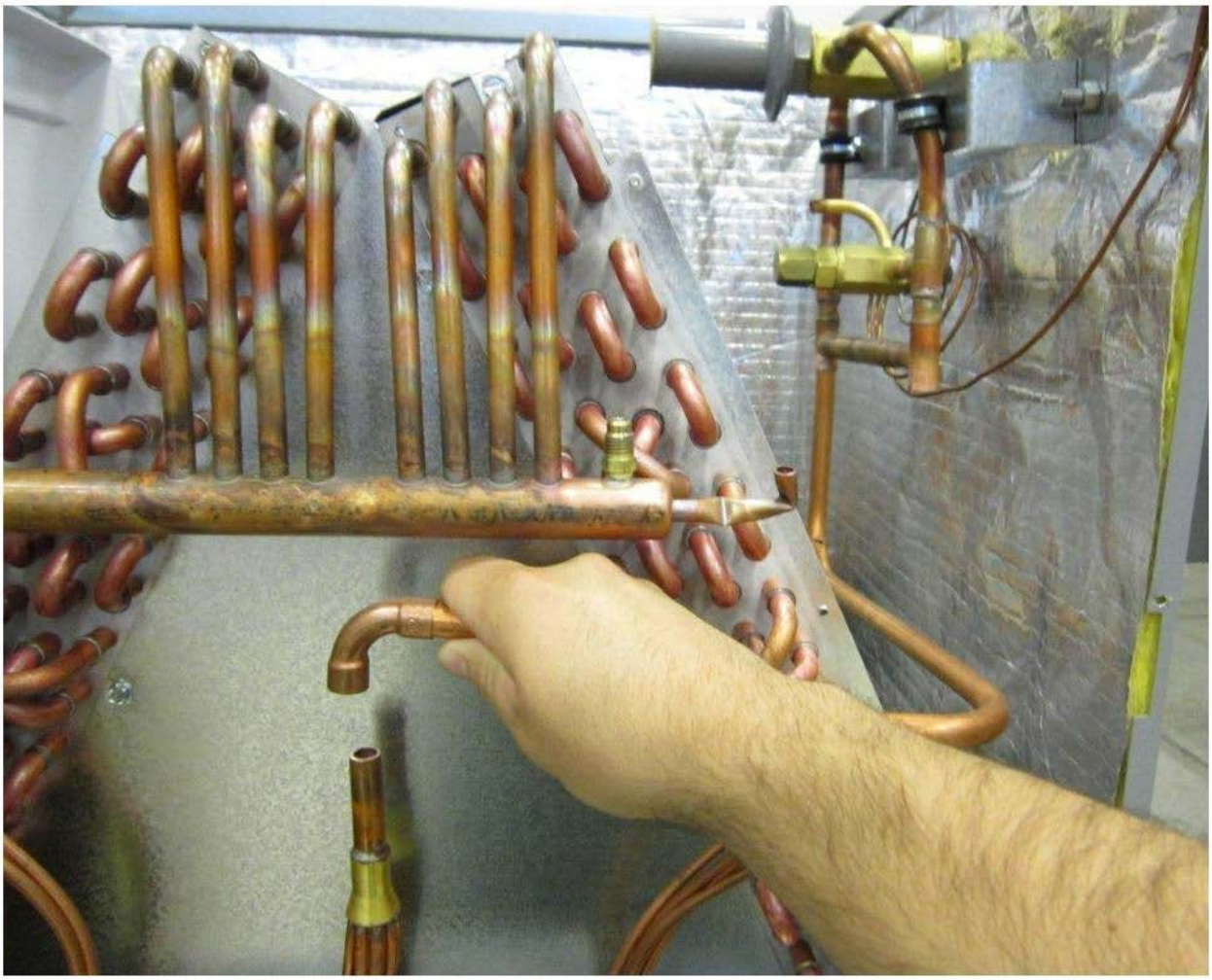
The A-coil distributor must be drilled out in accordance with the EarthLinked® Heating/Cooling System Installation Manual. The coil feeder tubes must each be at least 3/16” OD.

Figure 3d. Cased Coil Conversion

Insert the provided bolts thru two drilled holes from the outside of the cabinet. Install the TXV/CAV assembly inside the cabinet onto the two bolts in the orientation shown. Install locknuts and tighten until assembly is held firmly against the insulated cabinet.

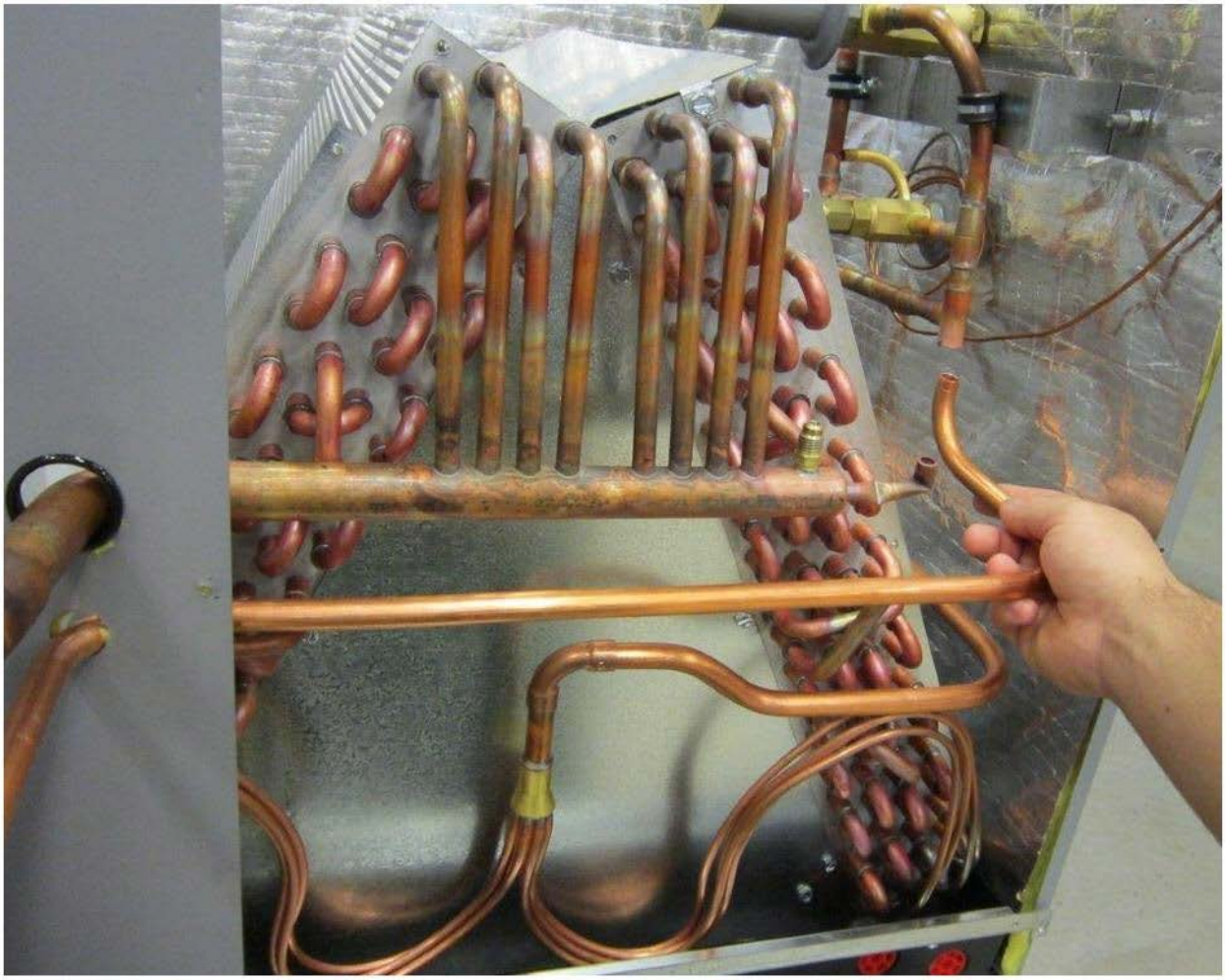
If the installation is on a field supplied cased coil, (non-CCS Series), the TXV/CAV assembly should be located internal to the cabinet such that the condensate from the assembly falls onto the A-coil for vertical installations, and falls into the drain pan for horizontal installations. If it is not possible to locate the TXV/CAV assembly inside the cabinet, the assembly can be mounted on the outside of the cabinet, but must be totally insulated with Pretite® insulation or the equivalent, to prevent moisture dripping outside the cabinet. Additional holes will have to be drilled in the cabinet to accommodate the thermal bulb and tubing, distributor tube, and pressure equalizer tube.

Figure 3e. Cased Coil Conversion



Rough cut a 2 ft. length of 1/2” ACR copper tubing. Bend (large radius-no kinks) and trim to reach from the TXV/CAV assembly to the distributor as shown. A 1/2” x 90° copper ell can be used to make the connection to the 1/2” distributor stub out tube.

Figure 3f. Cased Coil Conversion



Bend (large radius – no kinks) and trim cut a 3 ft. length of 1/2" ACR copper tubing to reach from the TXV/CAV assembly through the liquid line entry hole in the cabinet, from the compressor unit, as shown.

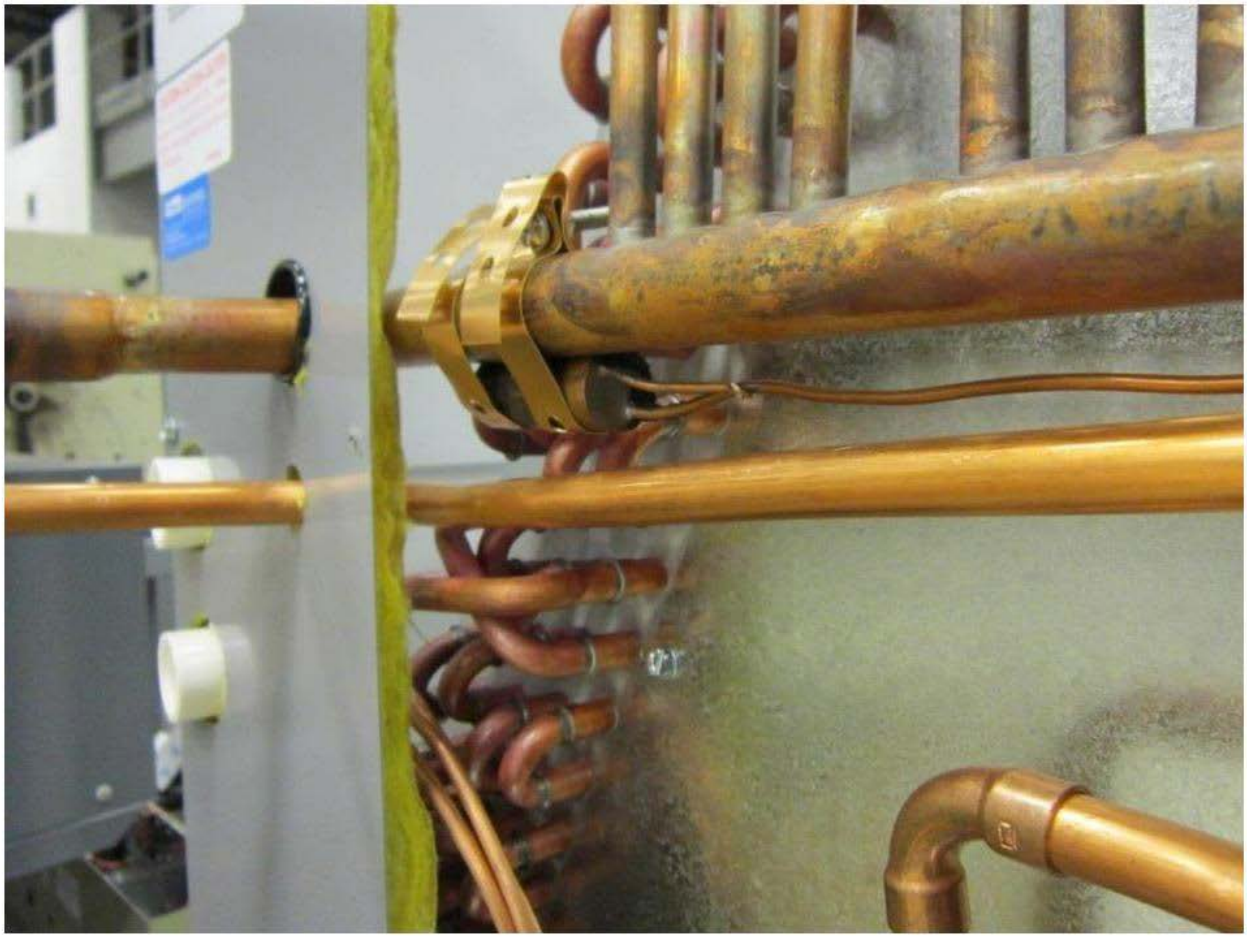
If a field supplied non-CCS series cased coil is being converted and the TXV/CAV assembly is mounted on the outside of the cabinet, this line must be run on the outside of the cabinet, as appropriate.

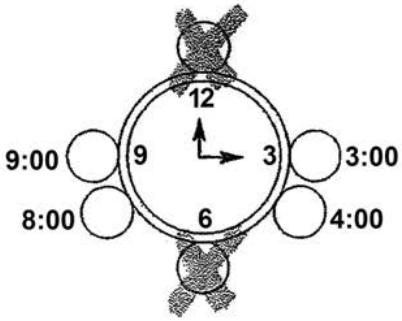
Figure 3g. Cased Coil Conversion

Bend (large radius – no kinks) and trim cut a 3 ft length of 1/4" ACR copper tubing provided with a flare nut at one end to make the pressure equalizer connection on the suction manifold to the equalizer port on the TXV/CAV assembly as shown. Tighten the flare nut after the tubing is trim cut and fitted to the swaged port of the TXV/CAV assembly.

If a field supplied cased coil (non-CCS Series) is being converted, alternate means of tapping into the suction manifold may be required. If it is necessary to drill a hole in the suction manifold, be sure to slightly pressurize (1 to 2 psi) the suction manifold with dry nitrogen to prevent metal chips or other contaminants from entering the suction manifold.

Figure 3h. Cased Coil Conversion





Carefully uncoil the thermal bulb tubing and route the bulb to the suction manifold as near the exit to the cabinet as possible. Position the bulb as shown in one of the locations shown 3, 4, 8 or 9 o'clock, based on the final orientation of the cased coil. Be sure there is good thermal contact between the bulb and the suction manifold. Clamp the bulb securely with the two straps and fasteners as shown. Bend the excess strap as shown.

Figure 3i. Cased Coil Conversion

Wrap the provided Prestite® insulation firmly around the area where the thermal bulb contacts the suction manifold such that there is a good insulative seal around the contact area and it is isolated from the air flowing through the cased coil.

Figure 3j. Cased Coil Conversion

Connect refrigerant lines to compressor unit, and proceed to braze all joints inside and outside of the converted cased coil cabinet, using the nitrogen brazing technique. Pressurize the system to 150psig and check all newly brazed joints for leaks. When the system is leak-free, proceed to the start-up procedure in the next section.

Figure 3k. Cased Coil 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!

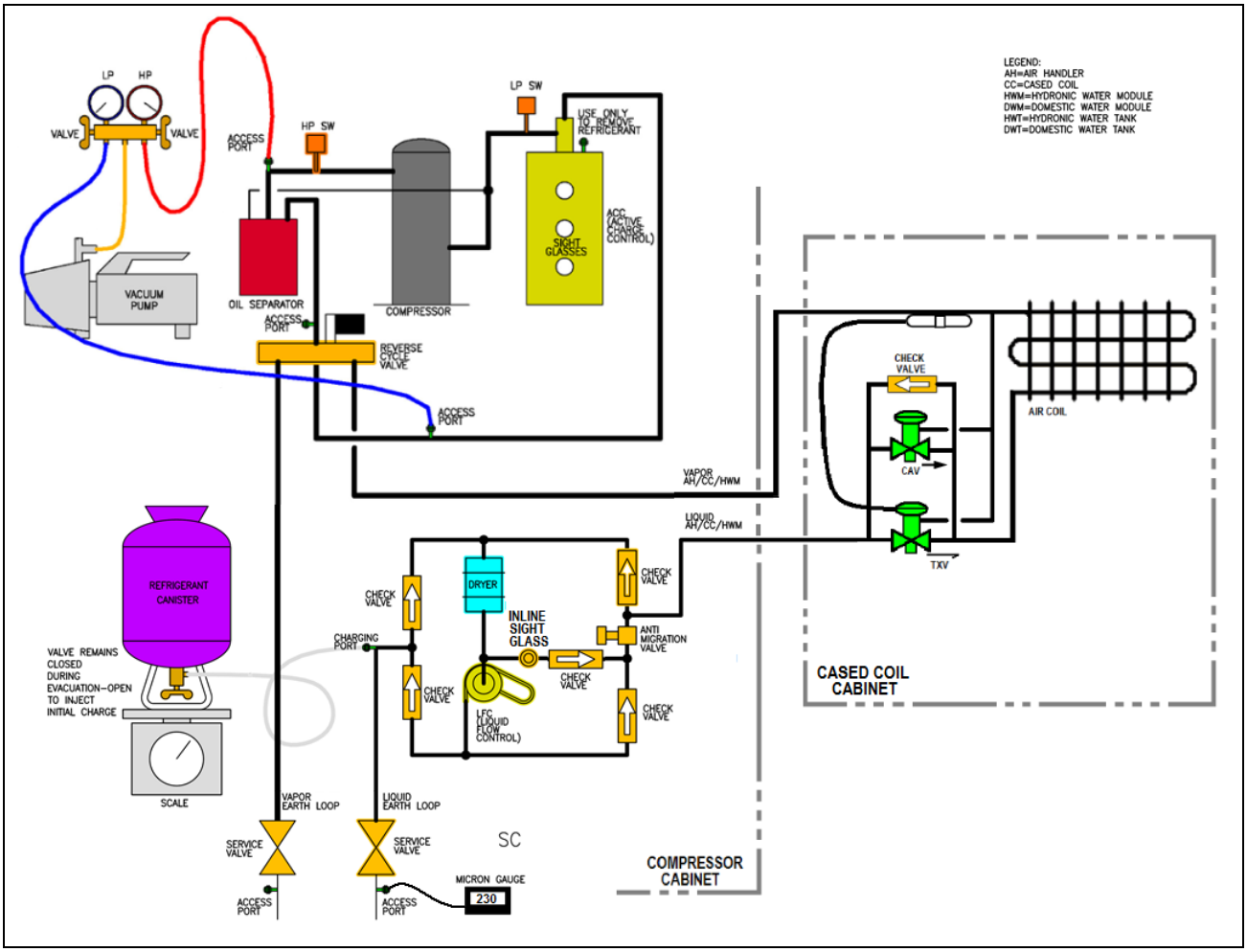


Figure 4. Typical Evacuation & Initial Charge Set-up for SC, SD and SW, Compressor Models (SC model shown).

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 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.**

Cased Coil Systems

If AIR heating is provided by one of the following DX cased coil systems, as listed in Figure 5, the return air to the cased coil during the final charging is to be maintained in the range of 70°F to 80°F.

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 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).

Figure 5. Systems Heating with DX Cased Coils

Final charging is done in the COOL mode as follows, with the charging set up described in Figure 6:

1. Continue measuring the refrigerant charge weight as shown in Figures 6.
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 air entering the cased coil is between 70°F and 80°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 9.** 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.

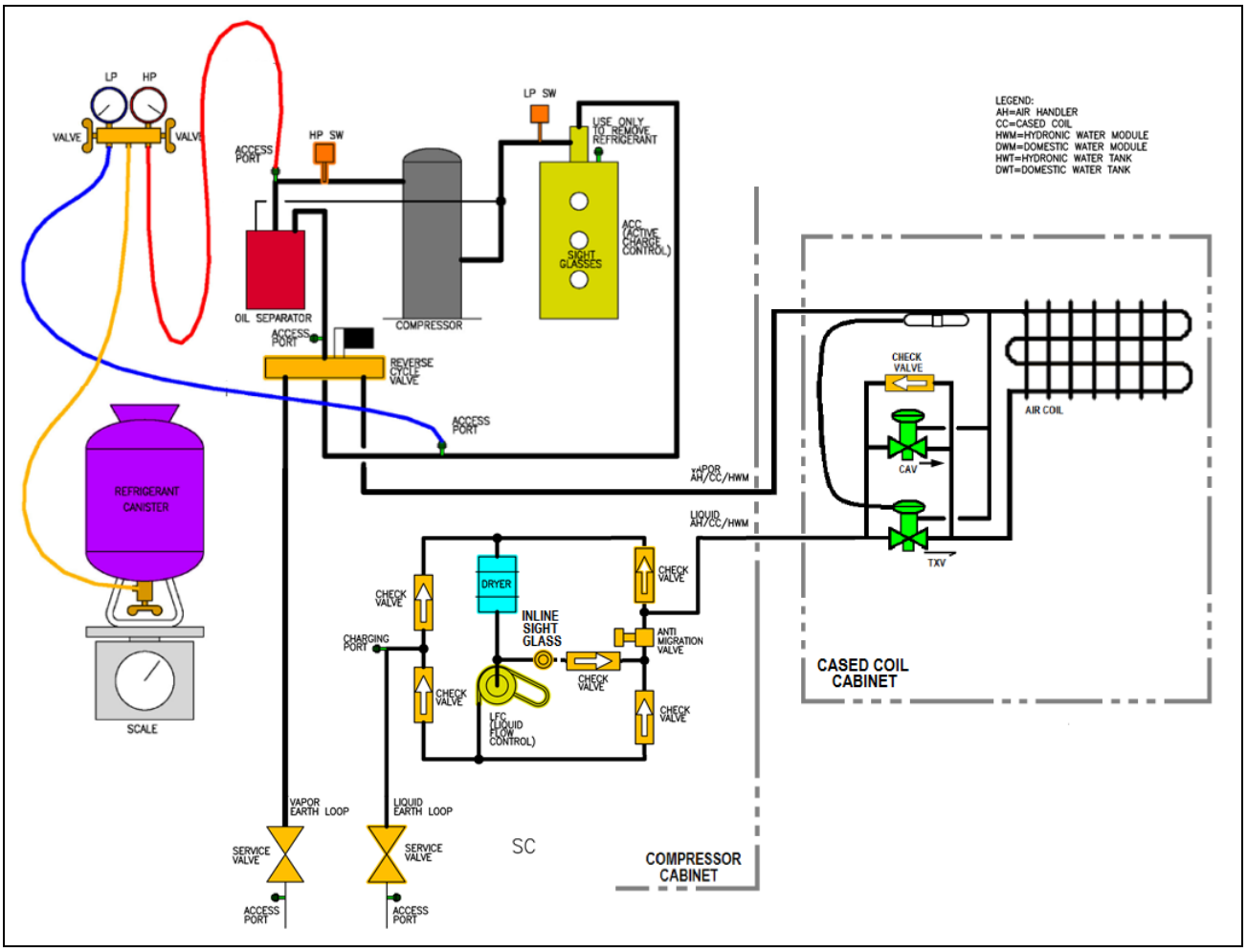


Figure 6. Typical Final Charge Set-up for SC, SD and SW Compressor Units (SC Model shown).

9. Next, the TXV is to be adjusted to provide 12° to 15°F (or less) superheat while running in cooling mode. The first step is to utilize the access port and LP gage in Figure 7 to measure suction pressure. **Next, apply a thermocouple at the compressor suction port as shown in Figure 7,** by attaching the thermocouple lead with electrical tape, and wrapping with ½" thick insulation.

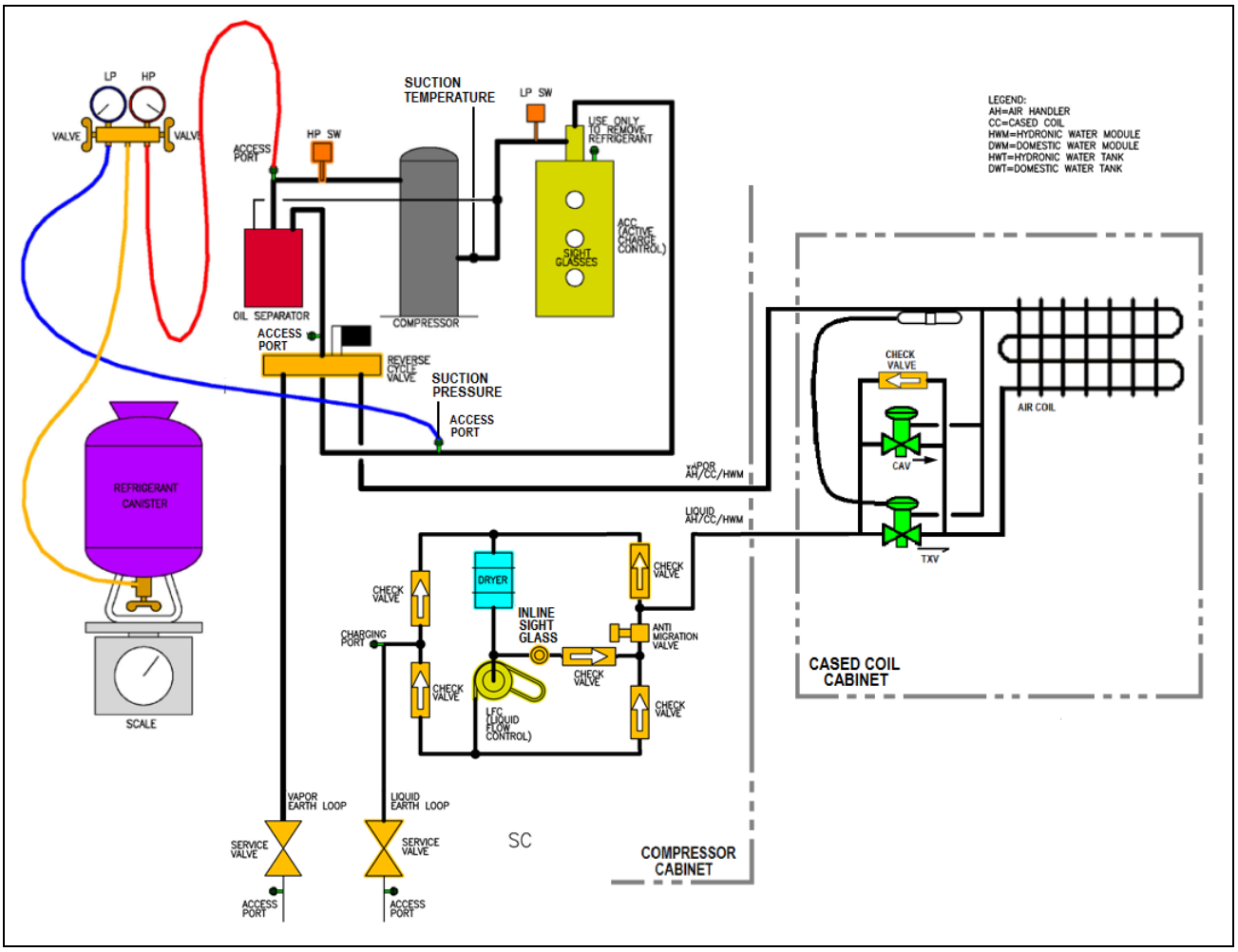


Figure 7. Superheat Measurements for SC, SD and SW Compressor Units (SC Model shown).

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 8 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 8. 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 compressor suction 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 9 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 systems with an air handler or cased coil, the return air temperature must be in the range of 70° to 80°F.

18. After equilibrium conditions have been achieved, read the suction pressure as shown in Figure 7 and determine the evaporating temperature from Figure 8, 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 9, 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.**

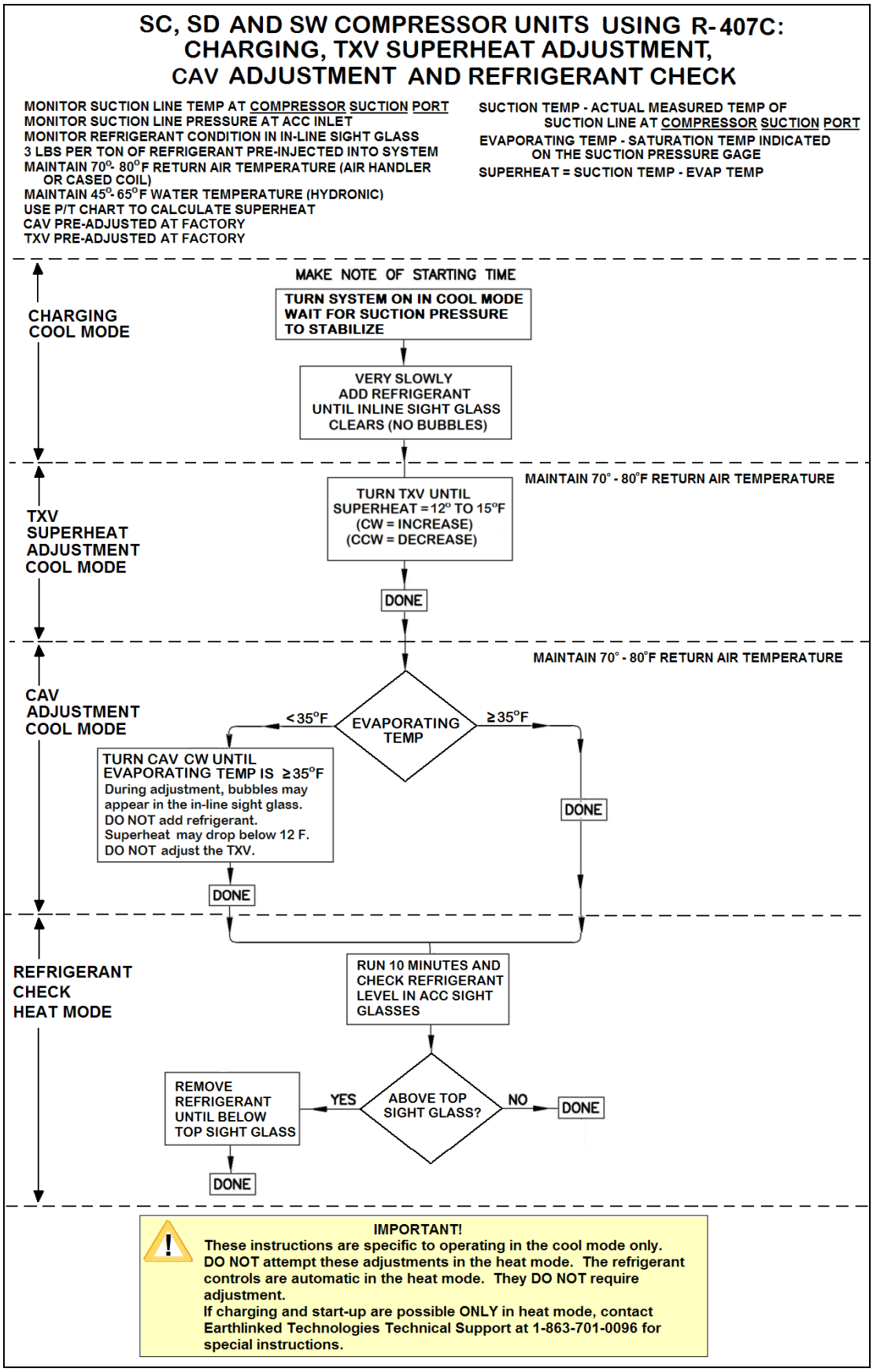


Figure 9. Charging and Superheat Adjustment Process