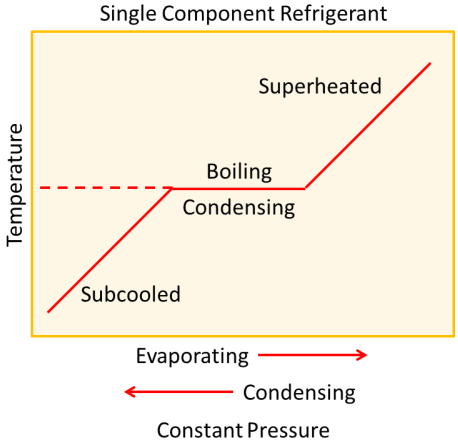
Refrigerant Blends—A Better Understanding

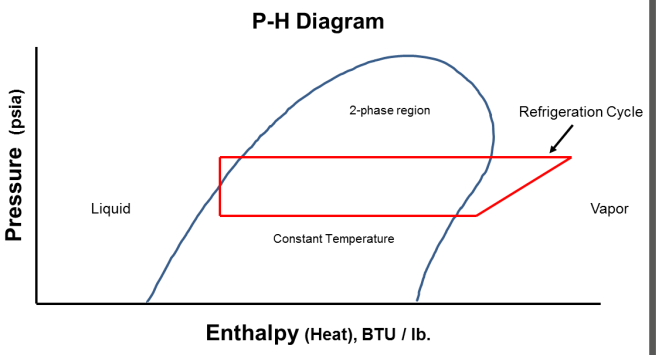
Part 1 of 2 June 2013

The pressure-temperature (PT) chart is a valuable tool that service technicians can use to check proper system operation. PT charts are most often used for the purposes of: (1) checking coil pressure so that the refrigerant produces the desired temperature, (2) check the amount of superheat above the saturated vapor condition at the outlet of the evaporator and (3) check the amount of subcooling below the saturated liquid condition at the end of the condenser.

Traditional PT charts list the saturated refrigerant pressure, in psig, with a column for temperature. Single component refrigerants and azeotropes boil and condense at one temperature for a given pressure. Therefore, only one column is needed to show the pressure-temperature relationship for any phase-change process in a system.



Pressure-Temperature Chart (psig)			
T (°F)	R-12	R-22	R-502
37	34.2	64.3	74.3
38	35.1	65.7	75.9
39	36.0	67.1	77.4
40	36.9	68.6	79.0
42	38.7	71.5	82.1
44	40.6	74.5	85.4
46	42.6	77.6	88.7
48	44.6	80.8	92.1
50	46.6	84.1	95.6

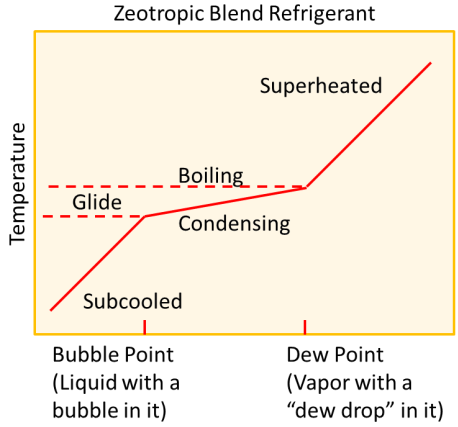


The properties of zeotropic blends are different than the traditional refrigerants. Zeotropic blends shift in composition during the boiling or condensing process. As the blend changes phase, more of one component will transfer to the other phase faster than the rest.

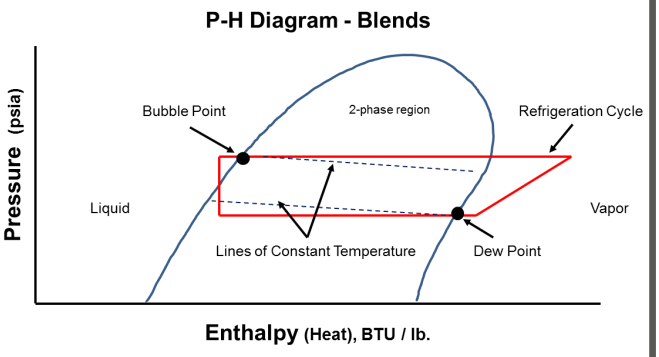
This property is called fractionation. The changing composition of the liquid causes the boiling point temperature to shift as well. The overall shift of temperature from one side of the heat exchanger to the other is called the temperature glide.

Zeotropic blends cannot be defined by a single pressure-temperature relationship. The temperature glide will cause different values for temperature at a given pressure, depending on how much refrigerant is liquid and how much is vapor. The most important values for checking superheat and subcool are the end points of the glide or the pressure-temperature relationship for saturated liquid and saturated vapor.

Use the "DEW POINT" for Superheat calculations. Use the "BUBBLE POINT" for Subcooling calculations.



Pressure-Temperature Chart (psig)			
T (°F)	R-12	R-407C Dew Point	R-407C Bubble Point
37	34.2	58.9	75.4
38	35.1	60.3	77.0
39	36.0	61.7	78.6
40	36.9	63.2	80.2
42	38.7	66.1	83.6
44	40.6	69.2	87.0
46	42.6	72.3	90.6
48	44.6	75.5	94.2
50	46.6	78.8	97.9



Sources: How to use a two-column PT Chart by Jim Lavelle (National Refrigerants), Sporlan "Cold WAR" issue #9