Charging Systems With Alternative Refrigerants

New A/C units are available from the factory with non-HCFC refrigerants. R-417A (also known as NU-22® or Isceon 59®) is a direct drop-in replacement for R22. It will work with Alkyl Benzene and mineral lubricants so standard compressors can be used. Note that some self-contained units (with rotary compressors) and chillers (with scroll compressors) might have R-407C with POE lubricant.

Both R-417A and R-407C are blended refrigerants, meaning they are made up from multiple component refrigerants. In most cases the user will not notice a change in operation or performance of these systems, but charging a system with a ***blend*** requires some special considerations.

- We currently don't have charging curves for either gas. A system with a ***blend*** must be charged by superheat.
- The system should be charged with liquid refrigerant from the tank to prevent ***fractionation***. Note that some tanks have a dip tube so the tank is used in the upright position, while other tanks will need to be turned upside down to get liquid. This should be clearly marked on the tank.
- A partial leak in the system doesn't necessarily mean that the refrigerant needs to be removed and recharged. However, it is possible that enough ***fractionation*** can occur that would require a complete evacuation and recharge. This will be evident when trying to charge the system and the temperature/pressures will not respond correctly.

To charge a split system with a blend:

1. Evacuate lines and evaporator (cooling unit) as normal.
2. Open base valves to release the refrigerant in the condensing unit.
3. Attach an accurate thermometer or temperature sensor to the suction line near the base valve, at the 3 or 9 o'clock position on the line. Insulate over the sensor so that the ambient temperature does not affect the reading.
4. Open the suction base valve to the test position. The low-side gauge should now register a pressure reading.
5. Turn on the system in the cooling mode, and set the thermostat to a low setting so the unit will stay on.
6. Allow the system to run for five minutes so the pressures will stabilize, then measure the superheat. This must be done using the ***Dew Point*** for conversion.

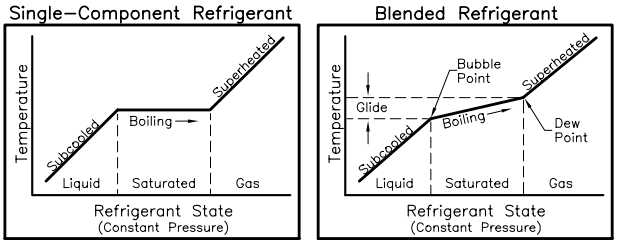
   Note: There is no ideal superheat temperature. It should be in the range of 10° to 20°F (5.6° to 11.1°C), depending on the heat load. On cool days, superheat will be lower, and on hot days it will be higher.
7. To reduce superheat, slowly add liquid refrigerant to the suction line. Do this in very small increments and allow the system to stabilize before taking another reading. DO NOT OVERCHARGE! If the system is overcharged, refrigerant must be removed from the liquid line, using an approved recovery cylinder.

   Warning: You are charging with liquid refrigerant. To prevent liquid from "slugging" the compressor, open the manifold valve only a small amount to allow the refrigerant to flash from liquid to vapor in the charging hose. GO SLOWLY! A special valve is available for charging liquids.
8. Once the superheat is set properly, close the manifold gauge valves, and backseat the discharge base valve. Tighten the stem packing nuts, remove manifold gauges, and replace service port caps.

Pressure - Temperature Chart

Temp ˚F	*R-22*	*R-417A*		*R-407C*		*Temp ˚C*
		Bubble	*Dew*	*Bubble*	*Dew*	
0	24	22	18	30	19	**-17.8**
5	28	26	21	34	23	**-15.0**
10	33	30	25	40	28	**-12.2**
15	38	34	29	45	33	**-9.4**
20	43	39	34	51	38	**-6.7**
25	49	45	39	58	43	**-3.9**
30	55	57	44	65	49	**-1.1**
35	62	56	50	72	56	**1.7**
40	69	62	56	80	63	**4.4**
45	76	69	63	89	71	**7.2**
50	84	76	70	98	79	**10.0**
55	93	87	77	108	87	**12.8**
60	116	96	85	118	97	**15.6**
65	111	105	94	129	107	**18.3**
70	121	114	103	141	117	**21.1**
75	132	124	113	154	129	**23.9**
80	144	134	123	167	140	**26.7**
85	156	146	134	180	153	**29.4**
90	168	157	145	195	167	**32.2**
95	182	170	158	210	181	**35.0**
100	196	183	170	227	196	**37.8**
105	211	196	134	244	212	**40.6**
110	226	211	198	261	229	**43.3**
115	243	226	212	280	247	**46.1**
120	260	241	227	300	267	**48.9**
125	278	258	244	320	285	**51.7**
130	297	275	261	342	306	**54.4**
135	317	293	279	365	328	**57.2**
140	337	312	297	388	351	**60.0**

All pressures are in psig



Glossary

Blend - A refrigerant that is made up of two or more single-component refrigerants.

Fractionation - Change in the composition of a blend because one (or more) of the component refrigerants is lost (or removed faster than the others). This happens because the components have different boiling points. It can occur in a tank or system that has lost gas, or locally in a system component such as a coil or accumulator.

Temperature Glide - Because of the different boiling temperatures of the components, a blend will evaporate over a range of temperatures (at a constant pressure). The difference between the Bubble Point and the Dew Point is the Temperature Glide.

Superheat - The "extra" heat (beyond what is required to fully evaporate the refrigerant) that the refrigerant picks up in the evaporator. Superheat is determined by measuring the refrigerant temperature (at the suction line) and then subtracting the saturation temperature (found from the pressure-temperature chart using suction pressure). Use the Dew Point pressure for blends.

Bubble Point - The pressure at which a blend starts to boil. Listed in the pressure-temperature chart.

Dew Point - The pressure at which a blend finishes boiling. Listed in the pressure-temperature chart.