SERVICE AND APPLICATION NOTES

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Charging HFC-410A Refrigerant Heat Pumps in Heating or Cooling Modes

In the past when heat pumps needed to be charged in temperatures below 60°F, the weigh in refrigerant method was used and system charging was verified the next cooling season. The information and charts below provide the field with accurate refrigerant amounts to properly charge systems from 20°F (-7°C) to 115°F (49°C)

NOTE - For the right sub cooling values for each system match up, refer to the information in the installation instructions or the charging sticker supplied with the unit.

SETTING UP TO CHECK CHARGE

1.. Close manifold gauge set valves. Connect the center manifold hose to an upright cylinder of HFC-410A.

2.. Connect the manifold gauge set to the unit's service ports as illustrated in figure 1.

- low pressure gauge to ***vapor service port***
- high pressure gauge to ***liquid service port***

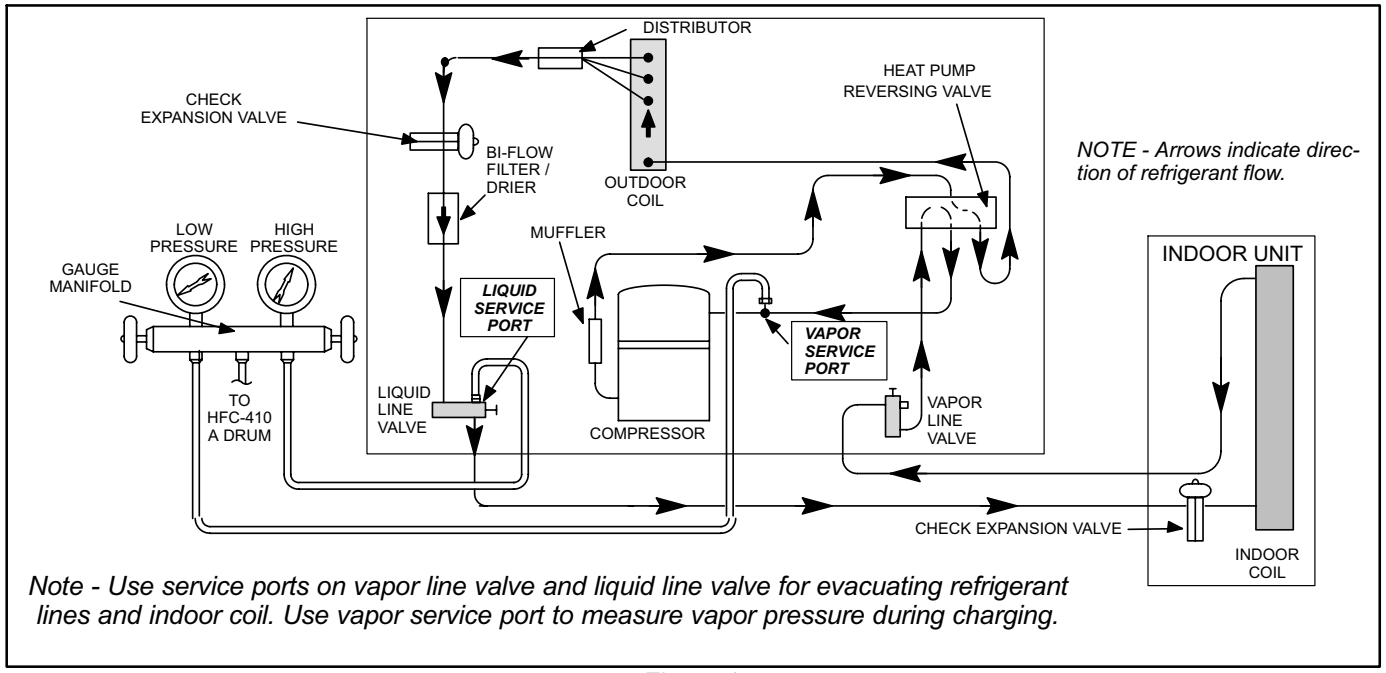
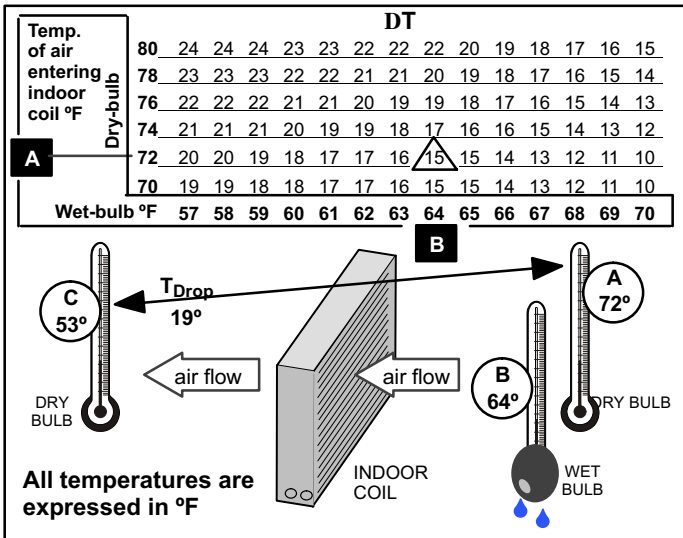


Figure 1



1. Determine the desired DT—Measure entering air temperature using dry bulb (**A**) and wet bulb (**B**). **DT** is the intersecting value of **A** and **B** in the table (see triangle).

2. Find temperature drop across coil—Measure the coil's dry bulb entering and leaving air temperatures (**A** and **C**). Temperature Drop Formula: (T_{Drop}) = **A** minus **C**.

3. Determine if fan needs adjustment—If the difference between the measured T_{Drop} and the desired **DT** (T_{Drop}–**DT**) is within ±3º, no adjustment is needed. See examples: Assume **DT** = 15 and **A** temp. = 72º, these **C** temperatures would necessitate stated actions:

Cº	T_{Drop}	–	DT	=	ºF	*ACTION*
53º	19	–	15	=	4	*Increase the airflow*
58º	14	–	15	=	-1	*(within ±3º range) no change*
62º	10	–	15	=	-5	*Decrease the airflow*

4. Adjust the fan speed—See indoor unit instructions to increase/decrease fan speed.

Changing air flow affects all temperatures; recheck temperatures to confirm that the temperature drop and DT are within ±3º.

NOTE - CFM calculation is based on an accurately charged unit and clean and unobstructed coils

Figure 2

COOLING MODE INDOOR AIRFLOW CHECK

Check airflow using the Delta-T (DT) process using the illustration in figure 2.

HEATING MODE INDOOR AIRFLOW CHECK

NOTE - Radiant heat on the temperature probe from the indoor coil may effect calculation.

Blower airflow (CFM) may be calculated by energizing electric heat and measuring:

- temperature rise between the return air and supply air temperatures at the indoor coil blower unit,
- measuring voltage supplied to the unit,
- measuring amperage being drawn by the heat unit(s).

Then, apply the measurements taken in following formula to determine CFM for Electric Heat.

$$\text{CFM} = \frac{\text{Amps x Volts x 3.41}}{\text{1.08 x Temperature rise (F)}}$$

Blower airflow (CFM) may be calculated by energizing gas heat and measuring:

- temperature rise between the return air and supply air temperatures at the indoor coil blower unit,
- clock the gas meter to determine firing rate of furnace

Then, apply the measurements taken in following formula to determine CFM for Gas Heat.

$$\text{CFM} = \frac{\text{Input x Efficiency}}{\text{1.08 x Temperature rise (F)}}$$

CALCULATING CHARGE

If the system is void of refrigerant, first, locate and repair any leaks and then weigh in the refrigerant charge into the unit. To calculate the total refrigerant charge:

Amount specified on name plate		Adjust amount. for variation in line set length listed in table 1.		Additional charge specified per indoor unit match-up listed in normally operating pressure tables found in the unit installation instructions or unit charging sticker		Total charge
_____	±	_____	+	_____	=	_____

CHARGE USING THE WEIGH-IN METHOD -

1.. Recover the refrigerant from the unit.

2.. Conduct leak check; evacuate as previously outlined.

3.. Weigh in the unit nameplate charge plus any charge required for line set differences from 15 feet and any extra indoor unit match-up amount per table 1)

NOTE - If weighing facilities are not available, use the subcooling method.

Table 1

Liquid Line Set Diameter	Oz. per 5 ft. (g per 1.5m) adjust from 15 ft. (4.6m) line set*
3/8 in. (9.5mm)	3 ounce per 5 ft. (85g per 1.5m)
NOTE - *If line length is greater than 15 ft. (4.6 m), add this amount. If line length is less than 15 ft. (4.6 m), subtract this amount.	

CHARGE USING THE SUBCOOLING METHOD -

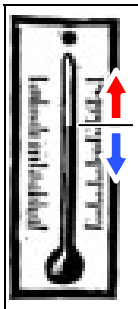
Requirements—these items are required for charging:

- Manifold gauge set connected to unit.
- Thermometers for measuring outdoor ambient, liquid line, and vapor line temperatures.

When to use cooling mode—When outdoor temperature is 60°F (15°C) and above, use cooling mode to adjust charge.

When to use heating mode—When the outdoor temperature is below 60°F (15°C), use the heating mode to adjust the charge.

Table 2



Use cooling mode 60ºF (15ºC) – Use heating mode

1. Check the airflow using figure 2 to be sure the indoor airflow is as required. (Make any air flow adjustments before continuing with the following procedure.)
2. Measure outdoor ambient temperature; determine whether to use **cooling mode** or **heating mode** to check charge.
3. Connect gauge set.
4. Check Liquid and Vapor line pressures. Compare pressures with Normal Operating Pressures on the charging sticker supplied with the unit or installation instructions *Expect minor pressure variations. Significant differences may mean improper charge or other system problem.*)
5. Set thermostat for heat/cool demand, depending on mode being used:

   Using cooling mode—When the outdoor ambient temperature is 60°F (15°C) and above. Target subcooling values in table below are based on 70 to 80°F (21-27°C) indoor return air temperature; if necessary, operate heating to reach that temperature range; then set thermostat to cooling mode setpoint to 68ºF (20ºC). When pressures have stabilized, continue with step 6..

   Using heating mode—When the outdoor ambient temperature is below 60°F (15°C). Target subcooling values in table below are based on 65-75°F (18-24°C) indoor return air temperature; if necessary, operate cooling to reach that temperature range; then set thermostat to heating mode setpoint to 77ºF (25ºC). When pressures have stabilized, continue with step 6..

SATº _____
LIQº – _____
SCº = _____

6. Read the liquid line temperature; record in the LIQº space.
7. Read the liquid line pressure; then find its corresponding temperature in the temperature/ pressure table 3) and record it in the SATº space.
8. Subtract LIQº temp. from SATº temp. to determine subcooling; record it in SCº space.
9. Compare SCº results with the charging sticker supplied with the unit or installation instructions being sure to note any additional charge for line set and/or match-up.
10. If subcooling value is greater than shown in table, remove refrigerant; if less than shown, add refrigerant.
11. If refrigerant is added or removed, repeat steps 5. through 10. to verify charge.

TABLE 3
. HFC-410A Temp. (°F) - Pressure (Psig)

Temperature °F	Pressure Psig	Temperature °F	Pressure Psig	Temperature °F	Pressure Psig	Temperature °F	Pressure Psig
32	100.8	63	178.5	94	290.8	125	445.9
33	102.9	64	181.6	95	295.1	126	451.8
34	105.0	65	184.3	96	299.4	127	457.6
35	107.1	66	187.7	97	303.8	128	463.5
36	109.2	67	190.9	98	308.2	129	469.5
37	111.4	68	194.1	99	312.7	130	475.6
38	113.6	69	197.3	100	317.2	131	481.6
39	115.8	70	200.6	101	321.8	132	487.8
40	118.0	71	203.9	102	326.4	133	494.0
41	120.3	72	207.2	103	331.0	134	500.2
42	122.6	73	210.6	104	335.7	135	506.5
43	125.0	74	214.0	105	340.5	136	512.9
44	127.3	75	217.4	106	345.3	137	519.3
45	129.7	76	220.9	107	350.1	138	525.8
46	132.2	77	224.4	108	355.0	139	532.4
47	134.6	78	228.0	109	360.0	140	539.0
48	137.1	79	231.6	110	365.0	141	545.6
49	139.6	80	235.3	111	370.0	142	552.3
50	142.2	81	239.0	112	375.1	143	559.1
51	144.8	82	242.7	113	380.2	144	565.9
52	147.4	83	246.5	114	385.4	145	572.8
53	150.1	84	250.3	115	390.7	146	579.8
54	152.8	85	254.1	116	396.0	147	586.8
55	155.5	86	258.0	117	401.3	148	593.8
56	158.2	87	262.0	118	406.7	149	601.0
57	161.0	88	266.0	119	412.2	150	608.1
58	163.9	89	270.0	120	417.7	151	615.4
59	166.7	90	274.1	121	423.2	152	622.7
60	169.6	91	278.2	122	428.8	153	630.1
61	172.6	92	282.3	123	434.5	154	637.5
62	195.5	93	286.5	124	440.2	155	645.0