WATERLESS® GEOTHERMAL

Vacuum & System Charging Instructions

(All Compressor Units)

Disclaimer

Proper installation and servicing of the Total Green Mfg. Heat Pump is essential to its reliable performance. All Total Green Mfg. systems must be installed and serviced by a qualified HVAC contractor. Equipment sizing, selection and installation are the sole responsibility of the installing contractor.

Installations of equipment on an existing copper earth loop design that does not match a current Total Green Mfg. earth loop design is not permitted, will void all warranties on the equipment, and are the sole responsibility of the installing contractor. Installation must be made in accordance with the instructions set forth in this manual. Failure to provide installation by a qualified HVAC contractor in a manner consistent with this manual will void and nullify the limited warranty coverage for the system.

Total Green Mfg. 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 any field specified components.

Please read through the following instructions thoroughly prior to vacuuming and charging the system. If you have any questions regarding these procedures, please contact Total Green Mfg. Technical Support at 419-678-2032 for assistance prior to starting the vacuum and charging process.

If unit does NOT start…

The unit may be in lock-out as the safety switches may have opened the 24 volt control circuit. Verify this by checking the “X” LED, activated by the presence of 24 volts between terminals “C” (common) and “X” on the control wiring terminal strip. If the LED is on, the unit is in lock out. To reset the 24 volt control circuit, power to the low voltage transformer must be switched off for 10 seconds. The lock-out will reset once control power is reapplied.

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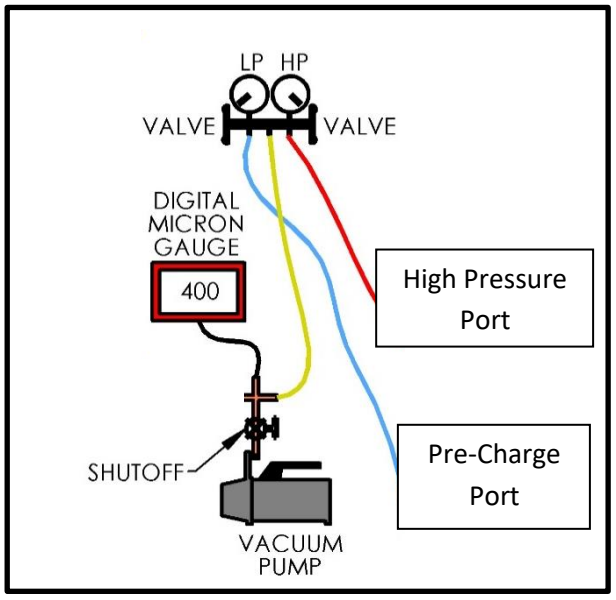
1. Pulling a Vacuum

IMPORTANT: Being **PATIENT** will work in your favor. A proper and thorough vacuum takes time and is one of the most critical steps to assure a successful Waterless Geothermal® installation.

1) It is recommended to use two Schrader core removal tools. One installed on the Pre-Charge port of the rail assembly and the other installed on the High Pressure port. Removal of the Schrader cores will greatly reduce the time to achieve the desired vacuum.

NOTE: Make sure you have released all of the nitrogen used during your leak check from the system prior to connecting your vacuum pump if you haven't already done so.

2) Attach a manifold gauge and hose set to the Schrader core removal tools. The low-side hose should be attached to the pre-charge port and the high-side hose to the high-pressure port. (*The same manifold gauge and hose set will later be used in this position for pre-charging the system as well*).



3) Attach a good quality micron gauge to vacuum pump.

4) Attach a well-maintained vacuum pump. 7 CFM or greater is recommended. If your vacuum pump does not have an isolation valve, you will need to install one between the vacuum pump and micron gauge. Ensure that the vacuum pump oil has been changed prior to initiating the evacuation process to assure a deep vacuum.

5) Open both valves of your manifold gauge set. Open the vacuum pump isolation valve and start the vacuum pump. **Evacuate the system down to at least 400 MICRONS or less** as read on the micron gauge.

6) After 400 micron or less has been achieved, close the isolation valve between the manifold gauge set and vacuum pump, turn off the vacuum pump, and wait 5 minutes before reading the micron gauge. **System pressure must not exceed 500 MICRONS**. If 500 microns is exceeded, restart your pump and let it run a minute or more prior to re-opening your isolation valve. Continue the vacuum to remove any remaining non-condensable from within the system. A dry system will hold below 500 microns. ***Do NOT move to the next step until this vacuum requirement of holding below 500 microns of vacuum for 5 minutes is achieved***.

7) When the system has been successfully evacuated, valve off your manifold gauge set and remove the vacuum pump. You are now ready to pre-charge the unit. **DO NOT remove the manifold gauges or hoses prior to pre-charging as air will be drawn into the system, defeating the vacuum process**. Only after the system is under refrigerant pressure by pre-charging should you remove or switch any hose.

SIDE EFFECTS OF AN IMPROPER VACCUM

1. Non-condensables (air, moisture, etc.) remaining in the system. Non-condensables mixed with refrigerant and oil forms acid, which will destroy the internals of a system over time.
2. Non-condensables in addition to the above will plug the filter drier causing reliability and performance issues.

2. Pre-charging the System

8) With your manifold gauge set still connected to the Schrader core removal tools at the High Pressure port and Pre-Charge port, connect your refrigerant drum to the charging hose of your manifold gauge set. Purge the hose by loosening it from the manifold until liquid refrigerant escapes.

   Please note that charging must be done with liquid refrigerant. Turn your refrigerant drum upside down, (valve to the bottom) to charge the system with liquid.

9) Open the low-side valve of your manifold gauge set, this sends liquid refrigerant to the Pre-Charge port on the rail assembly. **Continue to add refrigerant until 5 lbs. per system ton (4 lbs. per system ton for "H" units only) has been added.** In cold weather, it may be necessary to warm the refrigerant container to achieve the full pre-charge. Please reference the charts below.

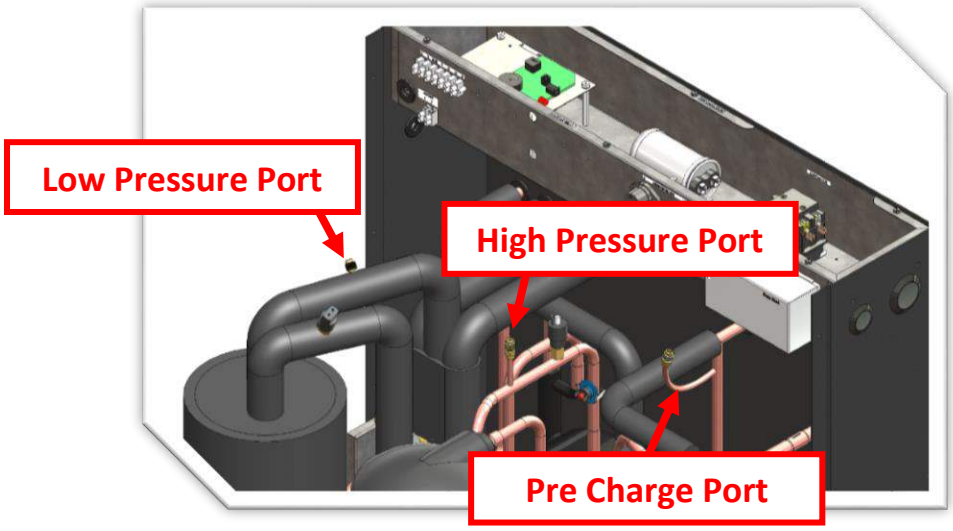
Forced Air (WG*A*) Systems Pre-Charge Amount

Unit Model Numbers	System Size	Pre-charge Amount
WG*A-XX WG*AD-XX WG*AH-XX	(24) 2 ton	10 lbs.
	(30) 2.5 ton	12.5 lbs.
	(36) 3 ton	15 lbs.
	(42) 3.5 ton	17.5 lbs.
	(48) 4 ton	20 lbs.
	(54) 4.5 ton	22.5 lbs.
	(60) 5 ton	25 lbs.

Hydronic (WG*H) System Pre-Charge Amount

Unit Model Numbers	System Size	Pre-charge Amount
WG*H-XX	(36) 3 ton	12 lbs.
	(42) 3.5 ton	14 lbs.
	(48) 4 ton	16 lbs.
	(54) 4.5 ton	18 lbs.
	(60) 5 ton	20 lbs.
	(66) 5.5 ton	22 lbs.
	(72) 6 ton	24 lbs.

10) The system is now Pre-Charged. If Schrader core removal tools were used, reinstall your Schrader cores and remove the Schrader core tools. Re-connect your manifold gauge set hoses to the High Pressure Port and the Low Pressure port to complete the final charge.



3. Charge Verification Procedures

11) Verify Air Flow or Water flow based on the Unit model

a. Disconnect the compressor's wiring harness plug to prevent the compressor from running while verifying air flow or water flow requirements. Once verified, be sure the compressor's wiring harness plug is inserted fully back into the compressor and is tight, prior to starting the compressor.

b. Forced Air Systems (WG*A*): Verify Air Flow prior to starting the compressor unit by referencing your air handler manual to assure 400 CFM per unit ton across the indoor coil. Return Air Temperature should be between 65°F and 75°F.

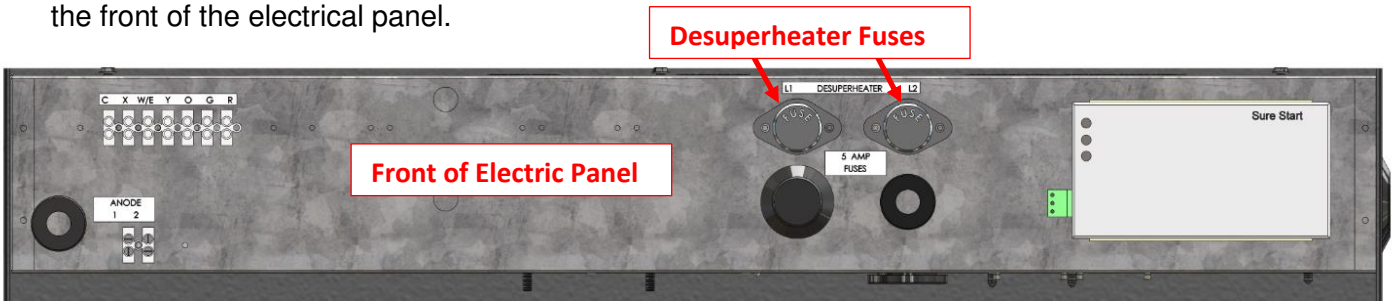
c. 100% Hydronic Heated and Chilled Water Systems (WG*H)**:** Water Flow rates across the heat exchanger should be verified at 3 to 4 GPM per ton prior to starting the compressor.

d. Once you have verified the above (air flow or water flow), reconnect the compressor wiring harness

12) Start all units up in heating mode, air heating (WG*A*) and hydronic heating (WG*H) models.

a. **For all units:** Disconnecting the control wire from the "O" terminal on the thermostat/zone board input terminal strip assures the unit stays in heating mode during the "Charge Verification Procedures".

b. **For Units with a Desuperheater:** Remove the top 2 fuses marked "L1 Desuperheater L2" located on the front of the electrical panel.



c. **For two-stage units:** The unit must be running in second-stage. Placing a temporary jumper between Y1 and Y2 on the thermostat/zone board input terminal strip will assure second-stage operation during the Charge Verification Procedures.

d. **If the unit is air zoned:** All zones **must** be open.

TECH TIP: If the unit does not start, it may be in lock-out as the safety switches may have opened the 24 volt control circuit. Verify this by checking the "X" LED activated by the presence of 24 volts between terminals "C" (common) and "X" on the control wiring terminal strip. if the LED is on, the unit is in lock out. To reset the 24 volt control circuit, power to the low voltage transformer must be switched off for 10 seconds. The lock-out will reset once control power is reapplied.

If unit kicks off while verifying charge, the discharge line temperature switch may have tripped. Check/reset discharge line temperature switch then shut off 24 volt power to the unit for 10 seconds then back on again to reset.

13) Take the following Charge Verification Readings

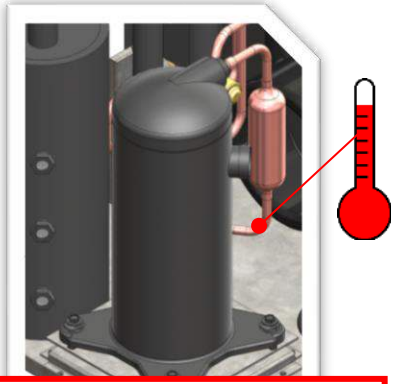
IMPORTANT:

Being PATIENT will work in your favor. It is important to wait long enough (typically 5-10 minutes) to allow the system to stabilize before taking the Charge Verification Readings.

a. Take discharge superheat by doing the following**:** Measure the discharge line temperature just below the compressor muffler and record this temperature.

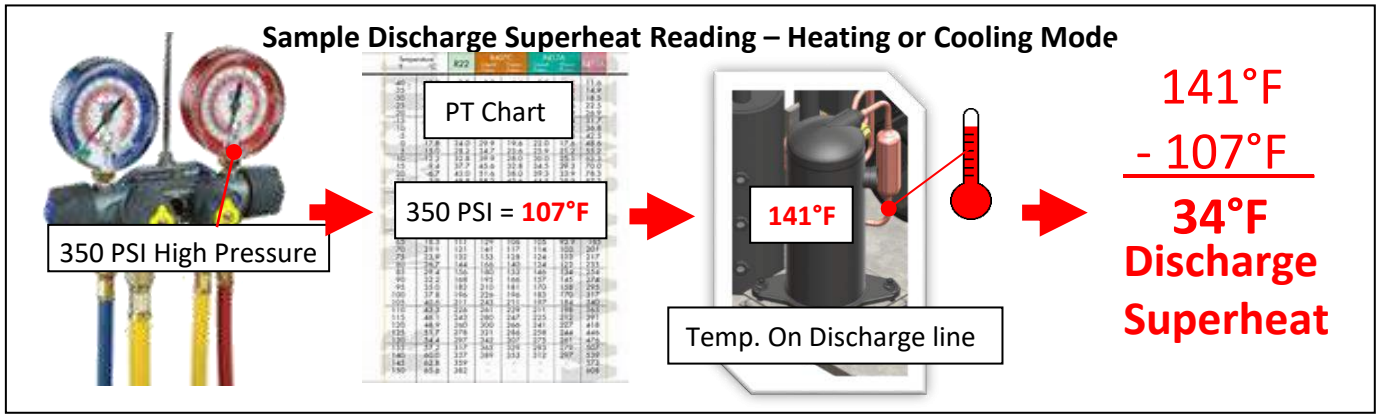
b. Take a high pressure reading and record this reading.

c. Convert the pressure reading to the saturation temperature using a refrigerant P/T (pressure/temperature) chart following the vapor pressure column. Record this reading. A P/T (Pressure/Temperature) chart can be referenced in the back of this manual.



Discharge Line Temp. location for taking Superheat Reading

d. Do the Math: Subtract the discharge temperature given in the pressure/temperature chart following the vapor pressure column from the discharge line temperature. The difference is the discharge superheat value. This reading should be between 25°F and 50°F. A P/T (Pressure/Temperature) chart can be referenced in the back of this manual.



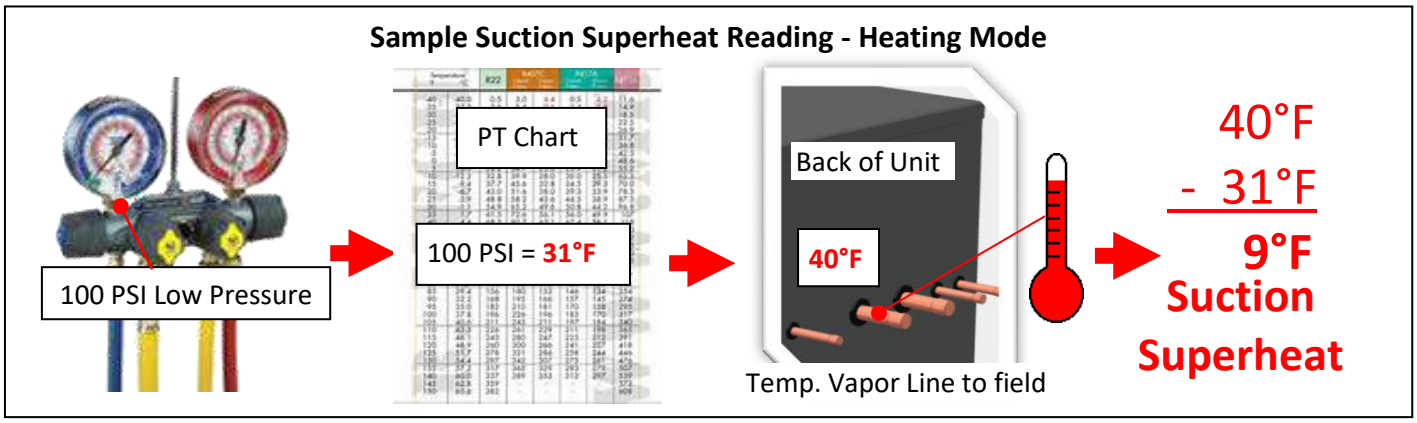
e. Discharge superheat should fall be between 25°F and 50°F. If so, continue. If discharge superheat is higher than 50°F, **STOP!** Advance to Section 4 on page 9 “Charge Correction Procedures”. Once the “Charge Correction Procedures” have been followed, come back to this section and complete the following steps.

f. Check suction superheat while in heating mode. Measure the temperature on the Earth Loop vapor line (large line) within 6” off the back of the compressor cabinet.

g. Take the low pressure reading from the Low Pressure port and record this reading.

h. Convert the pressure reading to the saturation temperature using a refrigerant P/T (pressure/temperature) chart following the vapor pressure column. Record this reading.

i. Do the Math: Subtract the Suction temperature given in the pressure/temperature chart from the suction line temperature. The difference is your suction superheat reading.



j. Verify the unit is operating within 2°F-12°F degrees of suction superheat while in cooling mode Please note that the superheat will fluctuate as the TXV actuates, however, if the range is outside of 2°F - 12°F degrees, contact Total Green Mfg. Technical Support at 419-678-2032 for assistance. **DO NOT** attempt to adjust suction superheat by adjusting the charge.

14) Switch unit to Cooling Mode: If the "O" wire was disconnected from the thermostat input terminal strip, reconnect it now.

IMPORTANT: Being PATIENT will work in your favor. It is important to wait long enough (typically 5-10 minutes) to allow the system to stabilize before taking the Charge Verification Readings.

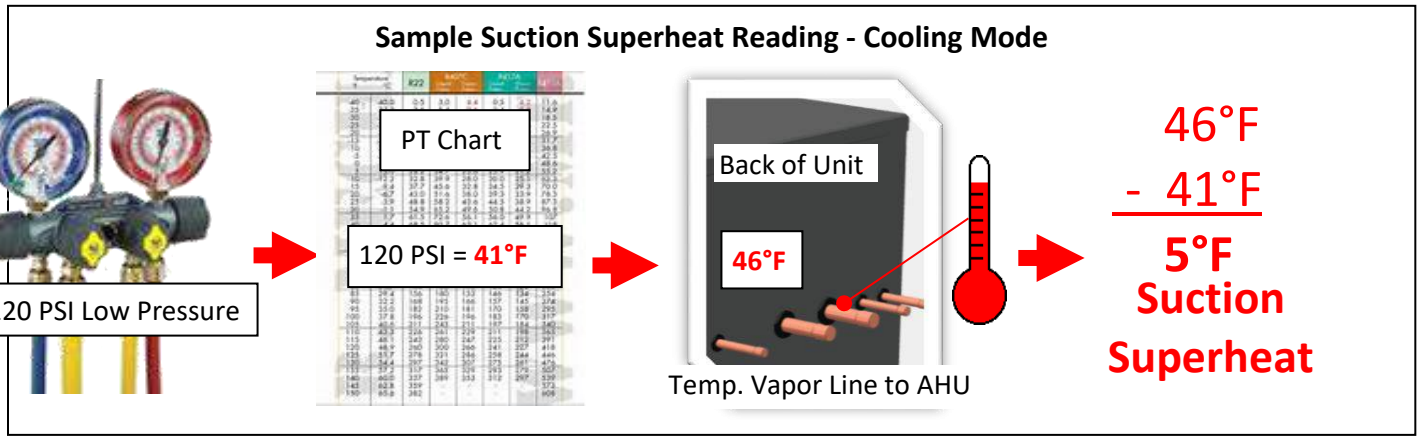
a. Take the discharge superheat reading again (repeat a, b, c and d from step 13 in section 3 "Charge Verification Procedures" from above. Discharge superheat should fall be between 25°F and 50°F. If so, continue. If discharge superheat is above 50°F, **STOP!** Advance to Section 4 on page 9 "Charge Correction Procedures".

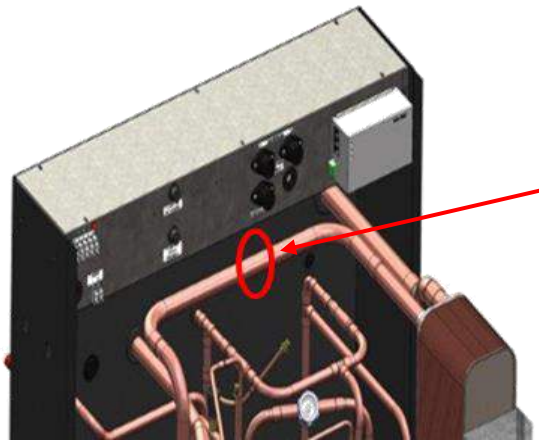
b. Take Suction Superheat**:** Measure the temperature on the air handler vapor line (large line) within 6" off the back of the compressor cabinet for all WG*A* air units or, check temperature on the vapor line (large line) between the refrigerant to water heat exchanger and reversing valve in the compressor unit cabinet for hydronic (WG*H) units.

c. Take the low pressure reading from the Low Pressure port and record this reading.

d. Convert the pressure reading to the saturation temperature using a refrigerant P/T (pressure/temperature) chart following the vapor pressure column. Record this reading.

e. Do the Math: Subtract the Suction temperature given in the pressure/temperature chart from the suction line temperature. The difference is your suction superheat reading.





Please note: for 100% Hydronic units, while in chilled water mode for cooling, check temperature on the vapor line (large line) between the refrigerant to water heat exchanger and reversing valve in the compressor unit cabinet.

f. Verify the unit is operating within 2°F-12°F degrees of suction superheat while in cooling mode. Please note that the superheat will fluctuate as the TXV actuates, however, if the range is outside of 2°F - 12°F degrees, contact Total Green Mfg. Technical Support at 419-678-2032 for assistance. **DO NOT** attempt to adjust suction superheat by adjusting the charge.

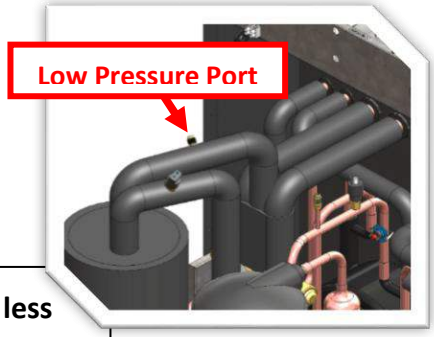
4. Charge Correction Procedures

STOP & READ CAREFULLY! If, and only if the discharge superheat temperature is above 50°F degrees in either steps 13 or 14, additional refrigerant needs to be added to the system. **DO NOT** add more refrigerant for any other reason. Once this procedure is complete, go back and finish the rest of the steps in sections 13 and 14.

Charging slowly is critical so as to prevent refrigerant from overfilling the accumulator. Overfilling the accumulator will result in an overcharge condition which can potentially flood and damage the compressor. The refrigerant level in the accumulator should **never** rise above the top sight glass at any time. When adding refrigerant, raise the suction pressure shown on your low pressure gauge no more than 3 to 5 psi above the actual suction pressure.

a. Place the unit back in heating mode and allow the unit time (5 to 10 minutes) to stabilize. **NEVER** add additional refrigerant in any other mode.

b. **Slowly add refrigerant** through the low pressure port while watching both your refrigerant scale and, the accumulator site glasses. Add refrigerant until it is seen in the top site glass of the accumulator or, until you've added a maximum of 5 additional lbs., **whichever occurs first**. If less than 5 lbs. is added and refrigerant is seen in the top site glass, the charge is complete. If you've added 5 lbs. and still don't see refrigerant in the top site glass, your charge is complete. Again, this is an either or scenario, **NOT** both.



If you've added 5 lbs. of refrigerant but it is not seen in the top site glass, your charge is complete.

If you've added less than 5 lbs. of refrigerant but refrigerant is seen in the top site glass, your charge is complete.

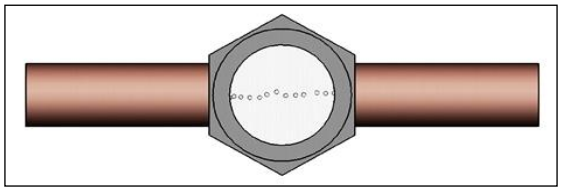
Never allow the refrigerant level to rise above the top site glass of the accumulator as compressor damage will occur.

The level of refrigerant in the accumulator will vary and at times may be empty. Level in the accumulator is not an indication of charge.

Now, retake all readings from 13 and 14 in both heating and cooling modes. You should find all your readings in range. You'll want to record these readings for the startup sheet. This is required for your warranty registration and warranty upgrade approval.

If any of the charging conditions cannot be met while following these procedures, stop the charging process and contact Total Green Mfg. Technical Support at 419-678-2032 for assistance.

5. Tech Info, Trouble Shooting



Inline sight glass. (From clear to bubbles as seen above as the TXV actuates)

NOTE: The inline site glass is for moisture indication and assuring liquid refrigerant is entering the metering device. **This is not used for charging!**

If discharge superheat is outside of the 25°F to 50°F temperature range, check the following

- **Low discharge superheat**, below 25°F, usually indicates the following;
  - An overcharged system in heating or cooling mode.
  - Low air or water flow and/or a dirty fan coil or heat exchanger in cooling mode.

- Improper air zoning. I.E. zones that are too small resulting in high static pressure and low air flow while in cooling mode. (.5" w.c. is Maximum Acceptable Static Pressure)
- TXV improperly adjusted. (Suction superheat should be between 2°F and 12°F.)

DO NOT attempt to adjust the TXV without first contacting Total Green Mfg. Technical Support at 419-678-2032.

- **High discharge superheat**, above 50°F.
  - An undercharged system in heating or cooling mode.
  - Low air or water flow and/or a dirty fan coil or heat exchanger in heating mode.
  - Improper air zoning. I.E. zones that are too small resulting in high static pressure and low air flow while in heating mode. (.5" w.c. is Maximum Acceptable Static Pressure)
  - Clogged filter/dryer or TXV improperly adjusted. (Suction superheat should be between 2°F and 12°F).

DO NOT attempt to adjust the TXV without first contacting Total Green Mfg. Technical Support at 419-678-2032.

6. Ideal Operating Conditions

Note: The information below are averages. Varying conditions may place some system configurations outside of these ranges and may not indicate a problem with the equipment. Contact Total Green Mfg. technical support with any questions or concerns. All readings for 2 stage equipment should be taken in second stage operation. Return air temperature should be between 65 and 75 degrees.

* Indicates no limit.

Heating/Cooling Mode Checkpoints	Heating		Cooling	
	Min	Max	Min	Max
1) Return Air Temp	65	75	65	75
2) Air Temp Diff.	25	35	15	25
3) Suction Pressure (in P.S.I.)	80	*	100	125
4) Discharge Pressure (in P.S.I.)	300	400	225	400
5) Discharge Superheat	25	50	25	50
6) Suction Superheat	2	12	2	12
7) Accumulator sight glass status	bottom	top	empty	Middle
8) Side of compressor temp @ suction	cool	cool	cool	cool
9) Line Voltage to Unit	208	245	208	245
10) Unit amp draw (based on compressor model)	*	RLA	*	RLA

Pressure-Temperature Chart for R-410A

Saturation Pressure-Temperature Data for R-410A (psig)*

Temp. (°F)	Pressure Liquid	Pressure Vapor	Temp. (°C)	Temp. (°F)	Pressure Liquid	Pressure Vapor	Temp. (°C)	Temp. (°F)	Pressure Liquid	Pressure Vapor	Temp. (°C)	Temp. (°F)	Pressure Liquid	Pressure Vapor	Temp. (°C)
-49	5.5	5.4	-45.0	1	49.7	49.5	-17.2	51	145.8	145.2	10.6	101	323.1	322.1	38.3
-48	6.0	5.9	-44.4	2	51.1	50.8	-16.7	52	148.4	147.9	11.1	102	327.7	326.7	38.9
-47	6.6	6.5	-43.9	3	52.4	52.2	-16.1	53	151.1	150.5	11.7	103	332.4	331.4	39.4
-46	7.1	7.1	-43.3	4	53.8	53.5	-15.6	54	153.8	153.2	12.2	104	337.1	336.1	40.0
-45	7.7	7.6	-42.8	5	55.2	54.9	-15.0	55	156.5	156.0	12.8	105	341.9	340.9	40.6
-44	8.3	8.2	-42.2	6	56.6	56.3	-14.4	56	159.3	158.7	13.3	106	346.7	345.7	41.1
-43	8.9	8.8	-41.7	7	58.0	57.8	-13.9	57	162.1	161.5	13.9	107	351.6	350.5	41.7
-42	9.5	9.4	-41.1	8	59.5	59.2	-13.3	58	164.9	164.4	14.4	108	356.5	355.4	42.2
-41	10.1	10.0	-40.6	9	60.9	60.7	-12.8	59	167.8	167.2	15.0	109	361.4	360.4	42.8
-40	10.8	10.7	-40.0	10	62.4	62.2	-12.2	60	170.7	170.1	15.6	110	366.4	365.4	43.3
-39	11.4	11.3	-39.4	11	63.9	63.7	-11.7	61	173.7	173.1	16.1	111	371.5	370.4	43.9
-38	12.1	12.0	-38.9	12	65.5	65.2	-11.1	62	176.7	176.0	16.7	112	376.6	375.5	44.4
-37	12.7	12.6	-38.3	13	67.1	66.8	-10.6	63	179.7	179.0	17.2	113	381.8	380.7	45.0
-36	13.4	13.3	-37.8	14	68.6	68.4	-10.0	64	182.7	182.1	17.8	114	387.0	385.9	45.6
-35	14.1	14.0	-37.2	15	70.3	70.0	-9.4	65	185.8	185.2	18.3	115	392.3	391.2	46.1
-34	14.8	14.7	-36.7	16	71.9	71.6	-8.9	66	188.9	188.3	18.9	116	397.6	396.5	46.7
-33	15.6	15.5	-36.1	17	73.5	73.3	-8.3	67	192.1	191.4	19.4	117	403.0	401.9	47.2
-32	16.3	16.2	-35.6	18	75.2	74.9	-7.8	68	195.3	194.6	20.0	118	408.4	407.3	47.8
-31	17.1	16.9	-35.0	19	76.9	76.6	-7.2	69	198.5	197.8	20.6	119	413.9	412.8	48.3
-30	17.8	17.7	-34.4	20	78.7	78.4	-6.7	70	201.8	201.1	21.1	120	419.4	418.3	48.9
-29	18.6	18.5	-33.9	21	80.4	80.1	-6.1	71	205.1	204.4	21.7	121	425.0	423.9	49.4
-28	19.4	19.3	-33.3	22	82.2	81.9	-5.6	72	208.4	207.7	22.2	122	430.7	429.5	50.0
-27	20.2	20.1	-32.8	23	84.0	83.7	-5.0	73	211.8	211.1	22.8	123	436.4	435.2	50.6
-26	21.0	20.9	-32.2	24	85.8	85.5	-4.4	74	215.2	214.5	23.3	124	442.1	441.0	51.1
-25	21.9	21.8	-31.7	25	87.7	87.4	-3.9	75	218.7	217.9	23.9	125	447.9	446.8	51.7
-24	22.7	22.6	-31.1	26	89.6	89.2	-3.3	76	222.2	221.4	24.4	126	453.8	452.7	52.2
-23	23.6	23.5	-30.6	27	91.5	91.1	-2.8	77	225.7	224.9	25.0	127	459.8	458.6	52.8
-22	24.5	24.4	-30.0	28	93.4	93.1	-2.2	78	229.3	228.5	25.6	128	465.8	464.6	53.3
-21	25.4	25.3	-29.4	29	95.4	95.0	-1.7	79	232.9	232.1	26.1	129	471.8	470.7	53.9
-20	26.3	26.2	-28.9	30	97.4	97.0	-1.1	80	236.5	235.8	26.7	130	477.9	476.8	54.4
-19	27.3	27.1	-28.3	31	99.4	99.0	-0.6	81	240.2	239.4	27.2	131	484.1	483.0	55.0
-18	28.2	28.1	-27.8	32	101.4	101.1	0.0	82	244.0	243.2	27.8	132	490.3	489.2	55.6
-17	29.2	29.0	-27.2	33	103.5	103.1	0.6	83	247.8	246.9	28.3	133	496.6	495.5	56.1
-16	30.2	30.0	-26.7	34	105.6	105.2	1.1	84	251.6	250.7	28.9	134	503.0	501.9	56.7
-15	31.2	31.0	-26.1	35	107.7	107.3	1.7	85	255.4	254.6	29.4	135	509.4	508.3	57.2
-14	32.2	32.0	-25.6	36	109.9	109.5	2.2	86	259.3	258.5	30.0	136	515.9	514.8	57.8
-13	33.2	33.1	-25.0	37	112.1	111.7	2.8	87	263.3	262.4	30.6	137	522.5	521.4	58.3
-12	34.3	34.1	-24.4	38	114.3	113.9	3.3	88	267.3	266.4	31.1	138	529.1	528.0	58.9
-11	35.4	35.2	-23.9	39	116.5	116.1	3.9	89	271.3	270.4	31.7	139	535.8	534.7	59.4
-10	36.5	36.3	-23.3	40	118.8	118.4	4.4	90	275.4	274.5	32.2	140	542.5	541.4	60.0
-9	37.6	37.4	-22.8	41	121.1	120.7	5.0	91	279.5	278.6	32.8	141	549.3	548.3	60.6
-8	38.7	38.5	-22.2	42	123.4	123.0	5.6	92	283.6	282.7	33.3	142	556.2	555.2	61.1
-7	39.9	39.7	-21.7	43	125.8	125.3	6.1	93	287.9	286.9	33.9	143	563.2	562.1	61.7
-6	41.0	40.8	-21.1	44	128.2	127.7	6.7	94	292.1	291.2	34.4	144	570.2	569.2	62.2
-5	42.2	42.0	-20.6	45	130.6	130.1	7.2	95	296.4	295.5	35.0	145	577.3	576.3	62.8
-4	43.4	43.2	-20.0	46	133.0	132.6	7.8	96	300.7	299.8	35.6	146	584.5	583.5	63.3
-3	44.6	44.4	-19.4	47	135.5	135.0	8.3	97	305.1	304.2	36.1	147	591.7	590.7	63.9
-2	45.9	45.7	-18.9	48	138.0	137.5	8.9	98	309.5	308.6	36.7	148	599.0	598.1	64.4
-1	47.1	46.9	-18.3	49	140.6	140.1	9.4	99	314.0	313.1	37.2	149	606.4	605.5	65.0
0	48.4	48.2	-17.8	50	143.2	142.6	10.0	100	318.6	317.6	37.8	150	613.9	613.0	65.6

R−410A QUICK REFERENCE GUIDE

- R−410A refrigerant operates at 50% − 70% higher pressures than R−22. Be sure that servicing equipment and replacement components are designed to operate with R−410A.
- R−410A systems should be charged with liquid refrigerant only.
- R−410A is only compatible with POE oil. The oil used in a Waterless® Geothermal system is **Copeland Ultra 32-3 MAF**. Using any other brand or type will void the manufacture's equipment warranty.
- POE oils absorb moisture rapidly. Do not expose oil to atmosphere. Always flow nitrogen anytime a system is open to prevent atmosphere from entering any part of the system.
- Vacuum pumps will not remove moisture from oil.
- Never open system to atmosphere while it is under a vacuum.
- A liquid line filter drier is required on every unit.
- Wrap all filter driers and service valves with wet cloth when brazing.
- When system must be opened for service, break vacuum with dry nitrogen and replace all filter driers.
- Wrap all filter driers and service valves with wet cloth when brazing.
- Do not vent R−410A into the atmosphere.