



Vacuum & System Charging Instructions

R-454B

(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 is 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.

All commissioning and registration paper work must be filled out at start up and returned to Total Green Mfg. for full warranty coverage.



This equipment is designed for use with R-454B refrigerant that has an A2L classification. Only personnel trained in the proper handling of A2L refrigerants using compatible A2L service and installation tools should carry out services and installation of this equipment. This equipment ships without refrigerant with a dry nitrogen holding charge. Installing and service personnel are solely responsible for the proper servicing and charging of this equipment as set forth in this, and all Total Green Mfg. service and installation manuals.



**THIS UNIT REQUIRES SERVICE EQUIPMENT
COMPATIBLE WITH R-454B REFRIGERANT**



**Refrigerant
Safety Group
A2L**

⚠ WARNING

**RISK OF FIRE.
FLAMMABLE REFRIGERANT USED.
TO BE REPAIRED ONLY BY TRAINED
SERVICE PERSONNEL.
DO NOT PUNCTURE REFRIGERANT
TUBING.**

⚠ WARNING

**RISK OF FIRE.
DISPOSE OF PROPERLY IN
ACCORDANCE WITH FEDERAL
OR LOCAL REGULATIONS.
FLAMMABLE REFRIGERANT USED.**

⚠ WARNING

**RISK OF FIRE.
AUXILIARY DEVICES WHICH MAY
BE IGNITION SOURCES SHALL
NOT BE INSTALLED IN THE
DUCTWORK, OTHER THAN
AUXILIARY DEVICES LISTED FOR
USE WITH THE SPECIFIC
APPLIANCE. SEE INSTRUCTIONS.**

⚠ AVERTISSEMENT

**RISQUE D'INCENDIE.
REFRIGERANT UTILISÉ INFLAMMABLE.
SEUL UN PERSONNEL D'ENTRETIEN
FORMÉ PEUT RÉPARER CE PRODUIT.
NE PAS PERFORER LE TUBE
REFRIGÉRANT.**

⚠ AVERTISSEMENT

**RISQUE D'INCENDIE.
ÉLIMINER CORRECTEMENT ET
CONFORMÉMENT AUX
RÈGLEMENTATIONS FÉDÉRALES
OU LOCALES. REFRIGERANT UTILISÉ
INFLAMMABLE.**

⚠ AVERTISSEMENT

**RISQUE D'INCENDIE. LES DISPOSITIFS
AUXILIAIRES QUI PEUVENT ÊTRE DES
SOURCES D'INFLAMMATION NE
DOIVENT PAS ÊTRE INSTALLÉS DANS
LE RÉSEAU DE CONDUITS, À
L'EXCEPTION DES DISPOSITIFS
AUXILIAIRES ÉNUMÉRÉS
POUR UNE UTILISATION
AVEC L'APPAREIL SPÉCIFIQUE.
VOIR LES INSTRUCTIONS.**

NOTICE

**LEAK DETECTION SYSTEM
INSTALLED.
UNIT MUST BE POWERED
EXCEPT FOR SERVICE.**

AVIS

**SYSTÈME DE DÉTECTION
DE FUITE INSTALLÉ.
L'APPAREIL DOIT ÊTRE
ALIMENTÉ, SAUF POUR
LA MAINTENANCE.**

WARNING

**RISK OF FIRE. AUXILIARY DEVICES
WHICH MAY BE IGNITION SOURCES
SHALL NOT BE INSTALLED IN THE
DUCTWORK, OTHER THAN
AUXILIARY DEVICES LISTED
FOR USE WITH THE SPECIFIC
APPLIANCE.
SEE INSTRUCTIONS.**

AVERTISSEMENT

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AUXILIAIRES ÉNUMÉRÉS POUR
UNE UTILISATION AVEC
L'APPAREIL SPECIFIQUE.
VOIR LES INSTRUCTIONS.**

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IMPORTANT: This Document is customer property and is to remain with this unit. Please return to service information packet upon completion of work.

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Please note: Illustrations in these manuals are for reference only and may not show all detail. Also, specifications are subject to change without notice. It is imperative that only the manuals shipped with the equipment be used for each installation.

Please read 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.

1) POE OIL PRECAUTIONS:

The compressor oil used in a Waterless® Geothermal system is **Copeland Ultra 32-3 MAF**. Using any other brand or type will void the manufacturer's equipment warranty.

- POE oils absorb moisture rapidly. Do **not** expose oil to atmosphere. Always flow dry nitrogen anytime a system is open to prevent atmosphere from entering any part of the system, as it will make its way to the compressor oil. This includes line sets, earth loops, earth loop manifolds, air handlers, cased coils and any other piece of equipment that is to be connected to the refrigerant circuit. All components **must be swept** with dry nitrogen of atmosphere to keep the system dry when installing or servicing. Flowing dry nitrogen is **not** just for brazing.
- Vacuum pumps will **not** remove moisture from POE oil.
- **Never** open a system to atmosphere while it is under a vacuum.
- A liquid line filter drier is required and installed in every compressor unit from the factory.
- Wrap all filter driers and service valves with a wet cloth when brazing.
- When the system must be open for service, break vacuum after refrigerant recovery with dry nitrogen and always replace the filter drier.

2) If unit does NOT start:



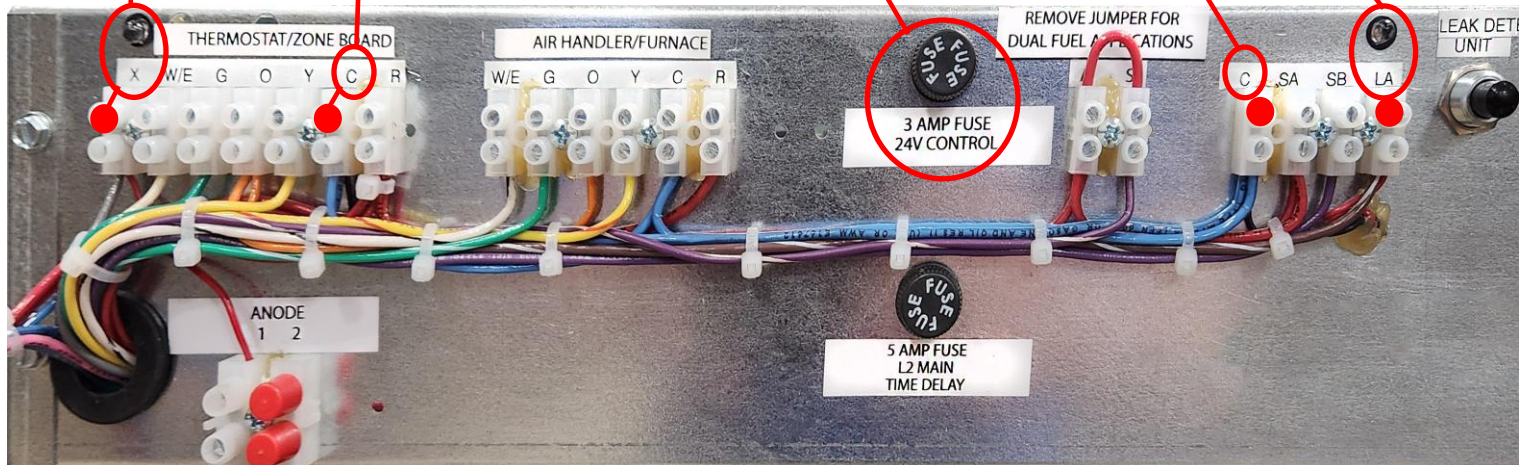
The unit may be in lock-out as the safety switches may have opened or, the refrigerant leak detection system may have been activated. Verify this by checking the “X” LED, activated by the presence of 24 volts between terminals “C” (common) and “X” on the control wiring terminal strip. If the LED is on, the unit is in lock out. If the leak detection system has been activated, the “LA” (Leak Alert LED) will be on. This is triggered by the presence of 24 volts between terminals “C” (common) and “LA” on the control wiring terminal strip. To reset the unit, remove the “3 AMP 24V CONTROL” fuse located on the front of the unit electrical box disabling the unit’s 24 volt control circuit. Wait 10 seconds, then reinstall the fuse. The Safety circuits should reset.

Please reference the picture below. WG1A box shown as reference. The same terminals are present on all units.

“X” Light and terminal. This light will be on and 24 volts AC will be present across the “X” and “C” (common) terminals if the unit is locked-out because of high discharge pressure/temperature or low pressure.

To reset a lock out, remove this fuse, wait 10 seconds, then reinsert fuse.

“LA” (Leak Alert) Light and terminal. This light will be on and 24 volts AC will be present across the “LA” and “C” (common) terminals if the unit is locked out do to a refrigerant leak being detected either, at the unit or, the air handler/cased coil. The “X” light and terminal will be active as well.



A note on leak detection: All Total Green Mfg. Waterless Geothermal ® systems utilize R-454B leak detection sensors in the compressor unit and in the air handler/cased coil assembly. If either sensor detects a refrigerant leak, the unit will go into lockout mode disabling the compressor and backup heat source. The blower on forced air units will be activated and, the “LA” (Leak Alert) light along with the “X” (Lock Out) will turn on along with the “LA” terminal being energized with 24 volts AC. This terminal can be used as a trigger, if required by your local building codes, to set off a remote alarm and/or trigger a mechanical room exhaust fan in the event of a refrigerant leak. Please refer to your specific unit manual for detailed instructions.

3) Pulling a Vacuum:

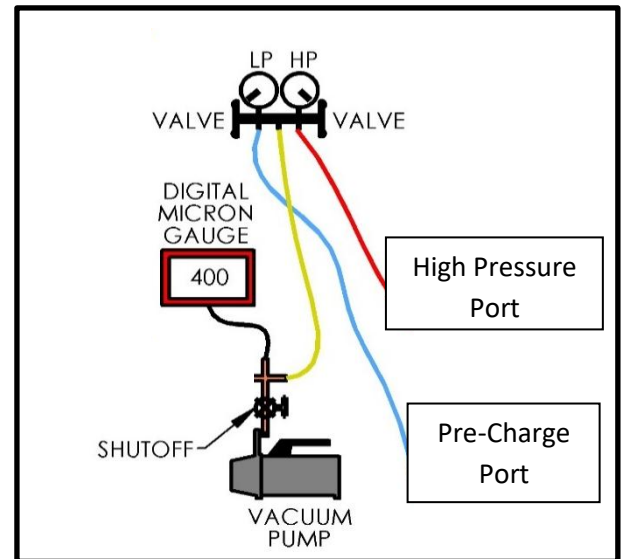
IMPORTANT: Being **PATIENT** will work in your favor. A proper and thorough vacuum takes time and is one of the most critical steps to assure a successful Waterless Geothermal® installation.

- 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 and, that all service valves are open prior to connecting your vacuum pump if you have not already done so. Please be sure hoses and manifolds gauges are purged to prevent cross contamination of refrigerants.

- 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 2 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 2 minutes is achieved.**

SIDE EFFECTS OF AN IMPROPER VACCUM

1. Non-condensables (air, moisture, etc.) remaining in the system. Non-condensables mixed with refrigerant and oil forming 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.

- 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.

3) Pre-charging the System:

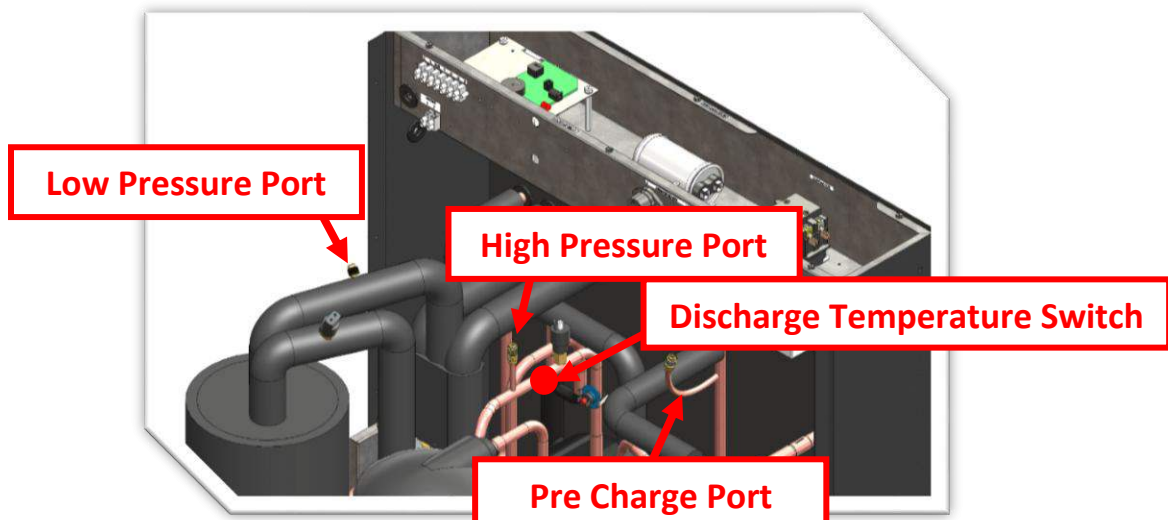
- 8) With your manifold gauge set still connected to the Schrader core removal tools at the High Pressure port and Pre-Charge port, connect your refrigerant drum to the charging hose of your manifold gauge set. Purge the hose by loosening it from the manifold until liquid refrigerant escapes.

Please Note: that R-454B is a refrigerant blend and charging **must be done** with liquid refrigerant. Turn your refrigerant drum upside down, (valve to the bottom) to charge the system with liquid. R-454B tank valves have left-handed threading requiring specific A2L connectors

- 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			Hydronic (WG1H) System Pre-Charge Amount		
Unit Model Numbers	System Size	Pre-charge Amount	Unit Model Numbers	System Size	Pre-charge Amount
WG1A-XX WG2A-XX WG2AD-XX WG2AH-XX	(24) 2 ton	10 lbs.	WG1H-XX	(36) 3 ton	12 lbs.
	(30) 2.5 ton	12.5 lbs.		(42) 3.5 ton	14 lbs.
	(36) 3 ton	15 lbs.		(48) 4 ton	16 lbs.
	(42) 3.5 ton	17.5 lbs.		(54) 4.5 ton	18 lbs.
	(48) 4 ton	20 lbs.		(60) 5 ton	20 lbs.
	(54) 4.5 ton	22.5 lbs.		(66) 5.5 ton	22 lbs.
	(60) 5 ton	25 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 charge verification procedures starting on the next page.



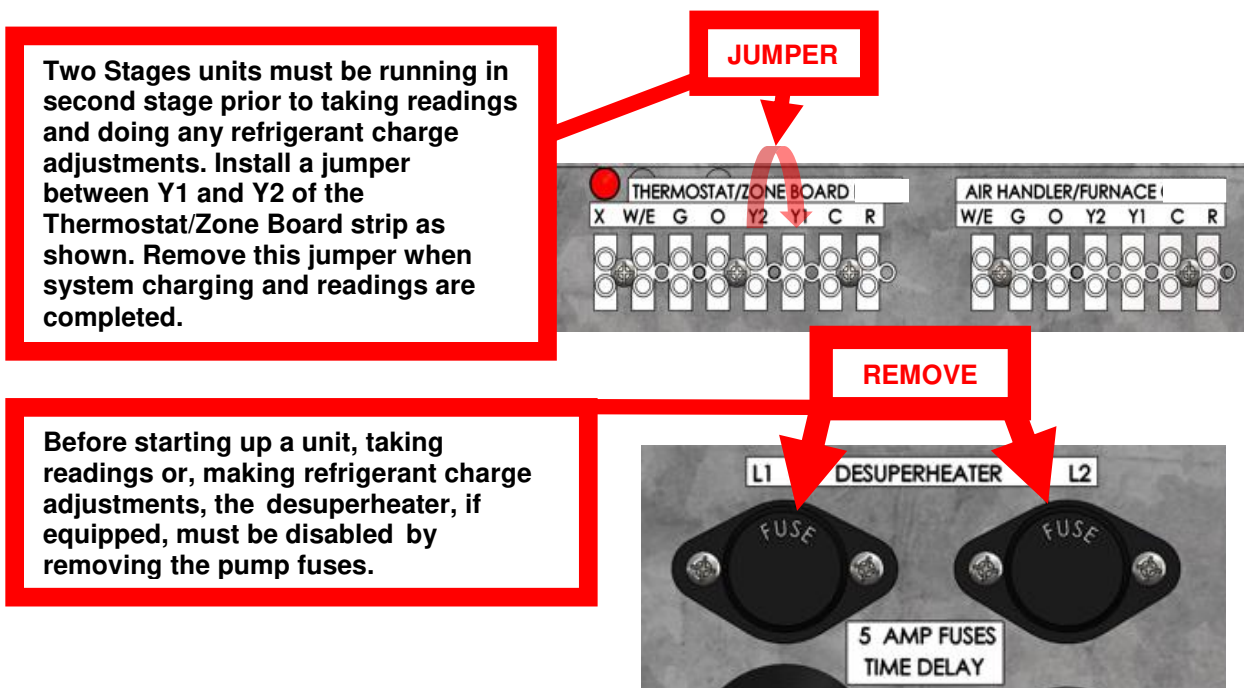
4) Charge Verification Procedures

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 unit 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 only**, 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 terminal strip assures the unit stays in heating mode during the "Charge Verification Procedures".
- b. **For Units with a Desuperheater:** Remove the 2 fuses marked "L1 Desuperheater L2" located on the front of the electrical panel. Please reference the picture below.
- 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 terminal strip will assure second-stage operation during the Charge Verification Procedures. Please reference the picture below.



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

TECH TIP: If the unit does not start, it may be in lockout as the low-pressure switch may have tripped during the vacuum process. Please refer back to section 2) on page 6 to reset the unit.

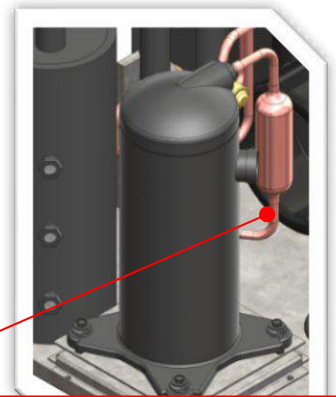
If unit kicks off while verifying charge, the discharge line temperature switch may have tripped. This switch must be manually reset prior to resetting lockout mode. Check/reset the discharge line temperature switch by depressing the red button located on the switch and then, shut off 24-volt power by removing the 3-amp, 24-volt control fuse for 10 seconds as described in section 2) on page 6.

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.

- Take a discharge superheat measurement by doing the following:
Measure the discharge line temperature just below the compressor muffler and record this temperature.
- Check the high-pressure reading and record the pressure.
- Convert the pressure reading to the saturation temperature using the R-454B refrigerant P/T (pressure/temperature) chart included at the back of this manual. Record this reading.



**Discharge Line Temp. location
for taking Superheat Reading**

- 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 30°F and 70°F. See example reading below.

Sample Discharge Superheat Reading – Heating or Cooling Mode

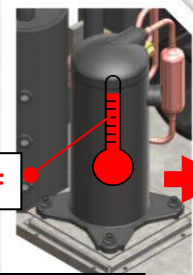


252 PSI High Pressure

PT Chart

Pressure (PSI)	Temperature (°F)
252	90
250	89
240	88
230	87
220	86
210	85
200	84
190	83
180	82
170	81
160	80
150	79
140	78
130	77
120	76
110	75
100	74
90	73
80	72
70	71
60	70
50	69
40	68
30	67
20	66
10	65

252 PSI = 90°F

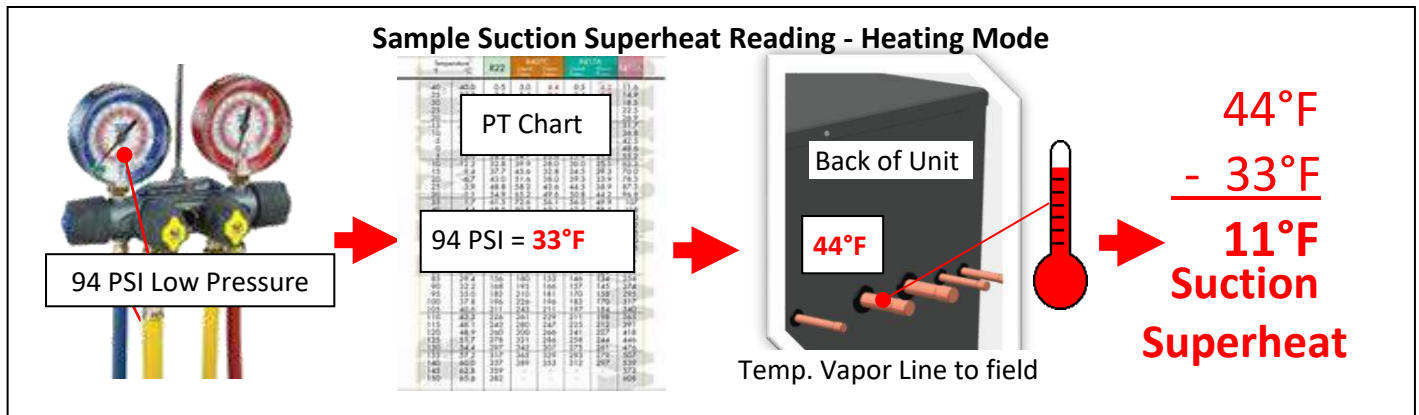


141°F

Temp. On Discharge line

141°F
- 90°F
**51°F
Discharge
Superheat**

- e. Discharge superheat should fall between 30°F and 70°F. If so, continue. If discharge superheat is higher than 70°F, **STOP!** Advance to Section 6 on page 13 “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) connected to the service valve as near to the valve as possible. There should be a label above this valve marked “Earth Loop Vapor”. Record this temperature reading.
- 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 the R-454B refrigerant P/T (pressure/temperature) chart included at the back of this manual. 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 value. See example reading below. Please note that the service valve is not shown. This illustration is only for general location.



- j. Verify the unit is operating within 4°F-18°F degrees of suction superheat while in heating mode. Please note that the superheat will fluctuate as the TXV actuates, however, if the range is outside of 4°F - 18°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 or any other means prior to contacting Technical Support.

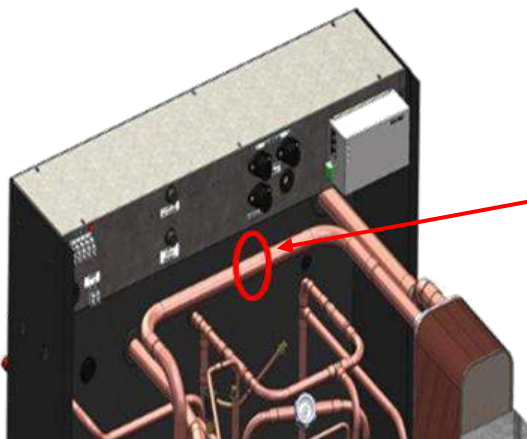
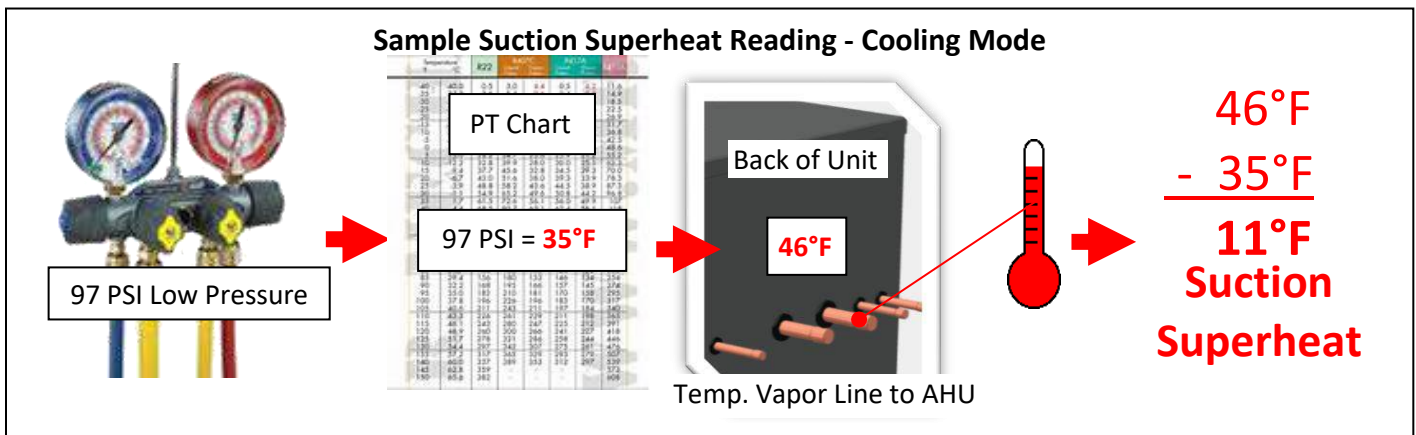
14) Switch unit to Cooling Mode: If the “O” wire was disconnected from the thermostat/zone board terminal strip, reconnect it now.

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, d and e from step 13, pages 10 and 11. Discharge superheat should again fall between 30°F and 70°F. If so, continue. If discharge superheat is above 70°F, **STOP!** Advance to Section 6 on page 13 “Charge Correction Procedures”. Follow those steps and return to this page.

- b. Take Suction Superheat: Check suction superheat while in cooling mode. Measure the temperature on the AH/CC vapor line (large line) connected to the service valve as near to the valve as possible. There should be a label above this valve marked “AH/CC Vapor”. Record this temperature reading.
- * For WG1H units check temperature on the vapor line (large line) between the refrigerant to water heat exchanger and reversing valve in the compressor unit cabinet. Record this temperature reading.
- 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 the R-454B refrigerant P/T (pressure/temperature) chart included at the back of this manual. 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 value. See example reading below. Please note that the service valve is not shown. This illustration is only for general location.



* **Please note:** for 100% Hydronic “WG1H” 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. This line is insulated. Open the insulation and reseal after you have taken your temperature reading.

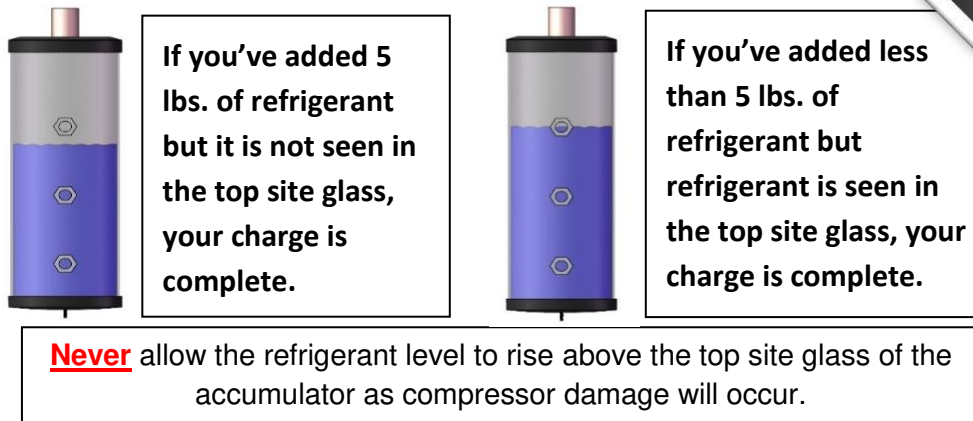
- f. Verify the unit is operating within 4°F-18°F degrees of suction superheat while in cooling mode. Please note that the superheat will fluctuate as the TXV actuates, however, if the range is outside of 4°F – 18°F degrees, contact Total Green Mfg. Technical Support at 419-678-2032 for assistance. **DO NOT** attempt to adjust suction superheat by adjusting the charge or any other means prior to contacting Technical Support.

5) Charge Correction Procedures

STOP & READ CAREFULLY! If, and only if the discharge superheat temperature is above 70°F degrees in either steps 13 or 14 in section 5, 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 to section 5 and verify steps 13 and 14 again.

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. has been 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.

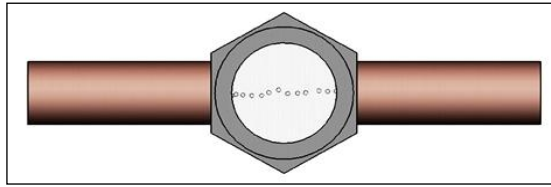


The level of refrigerant in the accumulator will vary and at times may be empty. Level in the accumulator is not an indication of charge.

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.

6) 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 30°F to 70°F temperature range, check the following

- **Low discharge superheat**, below 30°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 issue. (Suction superheat should be between 4°F and 18°F.)

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

- **High discharge superheat**, above 70°F, usually indicates the following;
 - 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 issue. (Suction superheat should be between 4°F and 18°F).

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

7) 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	<u>Heating</u>		<u>Cooling</u>	
	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.)	75	*	95	120
4) Discharge Pressure (in P.S.I.)	290	385	205	385
5) Discharge Superheat	30	70	30	70
6) Suction Superheat	4	18	4	18
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

8) R-454B Pressure/Temperature Chart

Temperature (°F):	R-454B Vapor Pressure (psig):	Temperature (°F):	R-454B Vapor Pressure (psig):
-40°F	8.8 psig	-8°F	34.4 psig
-39°F	9.4 psig	-7°F	35.4 psig
-38°F	10.0 psig	-6°F	36.5 psig
-37°F	10.6 psig	-5°F	37.6 psig
-36°F	11.2 psig	-4°F	38.7 psig
-35°F	11.9 psig	-3°F	39.8 psig
-34°F	12.5 psig	-2°F	40.9 psig
-33°F	13.2 psig	-1°F	42.1 psig
-32°F	13.9 psig	0°F	43.3 psig
-31°F	14.6 psig	1°F	44.5 psig
-30°F	15.3 psig	2°F	45.7 psig
-29°F	16.0 psig	3°F	46.9 psig
-28°F	16.7 psig	4°F	48.1 psig
-27°F	17.5 psig	5°F	49.4 psig
-26°F	18.2 psig	6°F	50.7 psig
-25°F	19.0 psig	7°F	52.0 psig
-24°F	19.8 psig	8°F	53.3 psig
-23°F	20.6 psig	9°F	54.7 psig
-22°F	21.4 psig	10°F	56.1 psig
-21°F	22.2 psig	11°F	57.5 psig
-20°F	23.0 psig	12°F	58.9 psig
-19°F	23.9 psig	13°F	60.3 psig
-18°F	24.8 psig	14°F	61.8 psig
-17°F	25.7 psig	15°F	63.2 psig
-16°F	26.6 psig	16°F	64.7 psig
-15°F	27.5 psig	17°F	66.2 psig
-14°F	28.4 psig	18°F	67.8 psig
-13°F	29.4 psig	19°F	69.3 psig
-12°F	30.3 psig	20°F	70.9 psig
-11°F	31.3 psig	21°F	72.5 psig
-10°F	32.3 psig	22°F	74.2 psig
-9°F	33.3 psig	23°F	75.8 psig

R-454B Pressure/Temperature Chart

Temperature (°F):	R-454B Vapor Pressure (psig):	Temperature (°F):	R-454B Vapor Pressure (psig):
24°F	77.5 psig	56°F	144.9 psig
25°F	79.2 psig	57°F	147.5 psig
26°F	80.9 psig	58°F	150.1 psig
27°F	82.7 psig	59°F	152.7 psig
28°F	84.4 psig	60°F	155.4 psig
29°F	86.2 psig	61°F	158.1 psig
30°F	88.1 psig	62°F	160.8 psig
31°F	89.9 psig	63°F	163.6 psig
32°F	91.8 psig	64°F	166.4 psig
33°F	93.7 psig	65°F	169.3 psig
34°F	95.6 psig	66°F	172.1 psig
35°F	97.6 psig	67°F	175.1 psig
36°F	99.5 psig	68°F	178.0 psig
37°F	101.5 psig	69°F	181.0 psig
38°F	103.6 psig	70°F	184.0 psig
39°F	105.6 psig	71°F	187.0 psig
40°F	107.7 psig	72°F	190.1 psig
41°F	109.8 psig	73°F	193.2 psig
42°F	112.0 psig	74°F	196.4 psig
43°F	114.1 psig	75°F	199.6 psig
44°F	116.3 psig	76°F	202.8 psig
45°F	118.5 psig	77°F	206.0 psig
46°F	120.8 psig	78°F	209.3 psig
47°F	123.1 psig	79°F	212.7 psig
48°F	125.4 psig	80°F	216.1 psig
49°F	127.7 psig	81°F	219.5 psig
50°F	130.1 psig	82°F	222.9 psig
51°F	132.5 psig	83°F	226.4 psig
52°F	134.9 psig	84°F	229.9 psig
53°F	137.3 psig	85°F	233.5 psig
54°F	139.8 psig	86°F	237.1 psig
55°F	142.3 psig	87°F	240.8 psig

R-454B Pressure/Temperature Chart

Temperature (°F):	R-454B Vapor Pressure (psig):	Temperature (°F):	R-454B Vapor Pressure (psig):
88°F	244.4 psig	100°F	291.6 psig
89°F	248.2 psig	105°F	313.6 psig
90°F	251.9 psig	110°F	336.4 psig
91°F	255.7 psig	115°F	360.5 psig
92°F	259.6 psig	120°F	385.8 psig
93°F	263.5 psig	125°F	412.4 psig
94°F	267.4 psig	130°F	440.5 psig
95°F	271.4 psig	135°F	470.0 psig
96°F	275.4 psig	140°F	501.0 psig
97°F	279.5 psig	145°F	533.7 psig
98°F	283.6 psig	150°F	568.2 psig
99°F	286.7 psig		

NOTES:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.