



LEAK MITIGATION MANUAL A2L REFRIGERANT R-454B



Installation Manual

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.

Please Note: Electrical data given in this manual is subject to change without notice. Please refer to the equipment data label for the most up to date specifications.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

WARNING

LIVE ELECTRICAL COMPONENTS!

Failure to follow this Warning could result in property damage, severe personal injury, or death. Follow all electrical safety precautions when exposed to live electrical components. It may be necessary to work with live electrical components during installation, testing, servicing, and troubleshooting of this product.

The high voltage power supply must agree with the equipment nameplate.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects.

Power wiring must comply with national, state, and local codes.

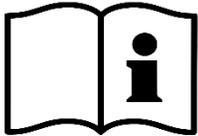
Follow instructions on unit wiring diagram located on the bottom side of the unit lid.



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.

⚠ AVERTISSEMENT

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

⚠ WARNING

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

⚠ AVERTISSEMENT

RISQUE D'INCENDIE. ELIMINER CORRECTMENT ET CONFORMÉMENT AUX RÉGLEMENTATIONS FÉDÉRALES OU LOCALES. RÉFRIGÉRANT UTILISÉ INFLAMMABLE.

⚠ 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. 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.

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ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES.

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

- 1) INTRODUCTION.....Page 5
- 2) LEAK SENSORS AND CONTROL WIRING.....Pages 6 AND 7
- 3) “LA” LEAK ALERT TERMINAL AND LIGHT.....Page 8
- 4) COMPRESSOR UNIT CABINET VENTING.....Pages 9 and 10
- 5) LEAK DETECTION TESTING.....Pages 11 and 12
- 6) LEAK MITIGATION VENTING/EXHAUST TABLES.....Pages 13 and 14

Please note that 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.

1) INTRODUCTION

Total Green Mfg.'s Waterless® Geothermal equipment is designed for use with A2L class R-454B refrigerant. One of the most significant advantages of R-454B refrigerant is its eco-friendly nature. Compared to older refrigerants like R-22 and R-410A, R-454B has a significantly lower global warming potential (GWP), making it a more environmentally sustainable choice. Additionally, R-454B offers improved energy efficiency. This makes R-454B refrigerant a perfect choice with use in our Waterless® Geothermal equipment.

While R-454B offers numerous benefits, it's essential to exercise caution when handling this refrigerant. One key consideration is its flammability. R-454B is classified as an A2L refrigerant, which means it has a low risk of ignition but is not non-existent, which requires careful handling and installation by trained professionals. Additionally, regular maintenance by trained professionals is crucial to ensure the safe and efficient operation of systems using R-454B. By prioritizing safety and maintenance, end users can enjoy the benefits of R-454B without compromising on safety.

When installing Total Green Mfg. equipment, all local codes for installing an A2L based heating and cooling system are to be followed.

To assist in meeting any local code requirements when installing Waterless® Geothermal equipment, we have incorporated optional compressor unit ventilation panels to give installation flexibility, leak sensors in the compressor units as well as leak sensors to be installed in air handlers and cased coils and, a leak mitigation control system.

2) LEAK SENSORS AND CONTROL WIRING

As stated in the introduction, all Total Green Mfg.'s Waterless® Geothermal compressor units are equipped with A2L compliant R-454B leak sensors. Leak sensors are required to be installed in our matching air handlers and cased/coils and must be connected as follows. Each handler and cased coil to be equipped with a leak sensor and terminals as shown below in figure 1.

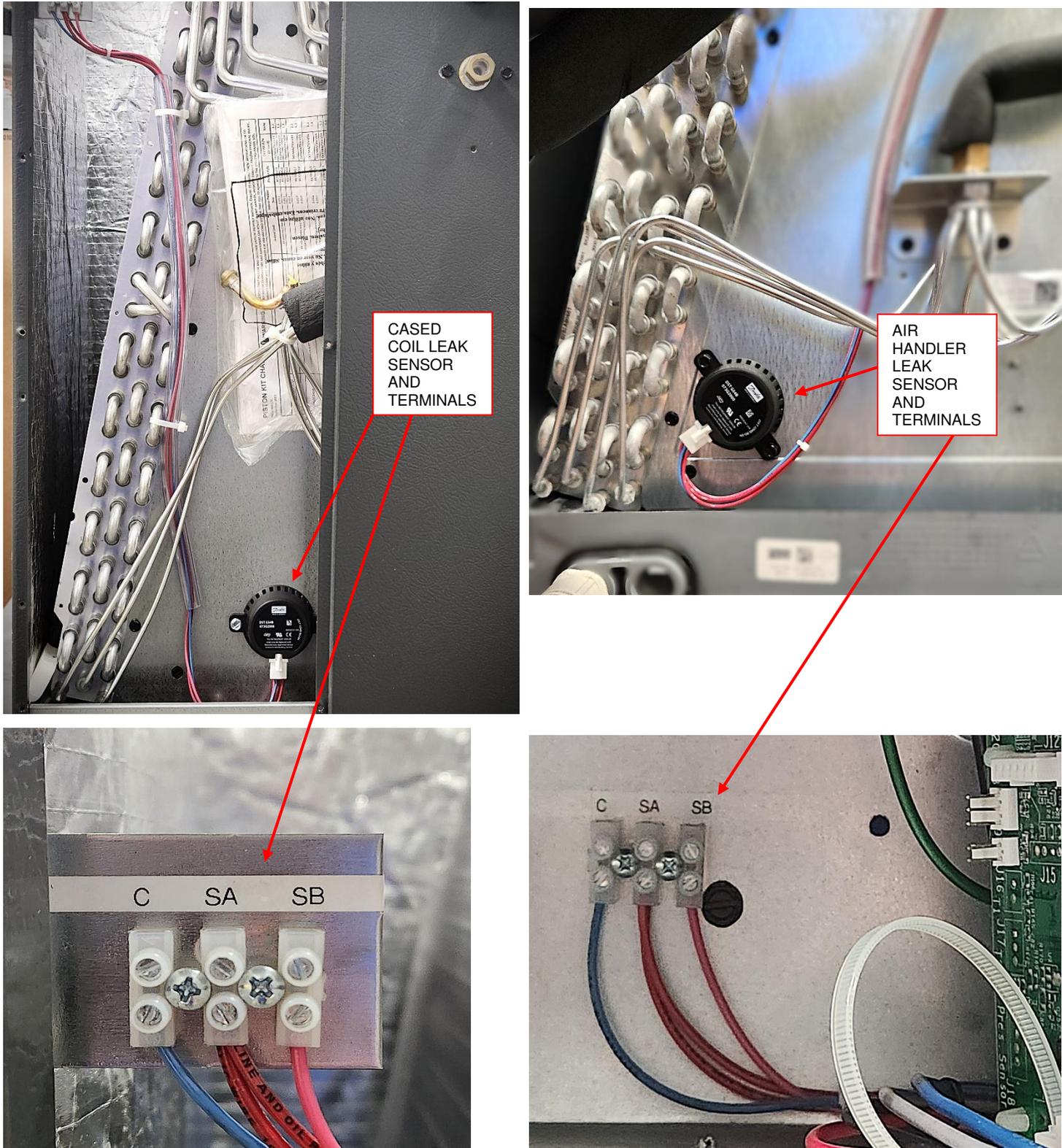


Figure 1

Each compressor unit will have the same three terminals, “C”, “SA” and “SB” as shown in figure 2A and 2B below. Using 18 gauge thermostat wire, these three terminals must be wired from the compressor unit to the air handler or cased coil. Please refer to the specific compressor unit manual located in the unit service packet for more detail.

TO AIR HANDLER OR CASED COIL TERMINALS AS SHOWN IN FIGURE 3 ON PAGE 10



Figure 2A

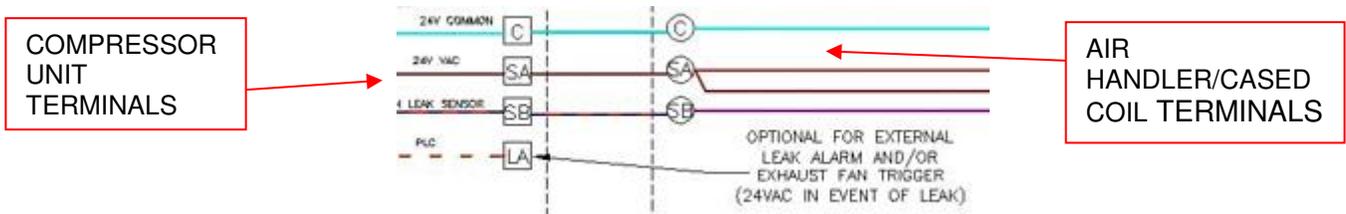


Figure 2B

IMPORTANT: Failure to make these connections will result in the compressor unit remaining in lock out and leak mitigation mode.

Please Note: “H” models (100%) hydronic heated and chilled water systems will not have an air handler sensor connection as they are designed for use with non-refrigerant based hydronic air handlers and radiant floor systems but still use a leak sensor in the compressor unit.

3) “LA” Leak Alert Terminal and Light

“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.

“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.

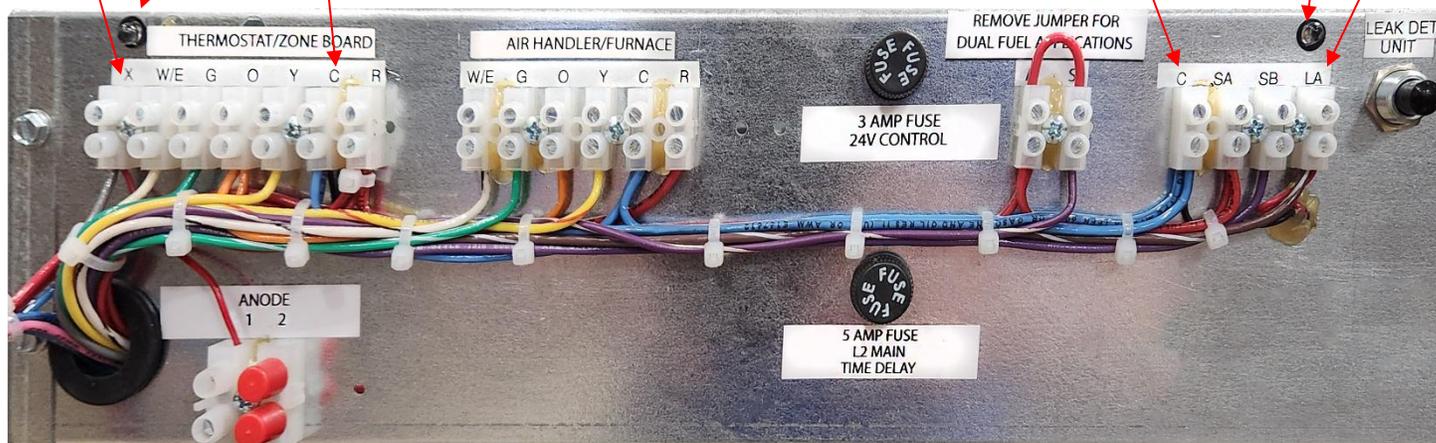


Figure 3

(WG1A TERMINALS SHOWN AS REFERENCE)

If either the compressor unit or, the air handler/cased coil sensor detects a refrigerant leak, the unit will go into lockout mode disabling the compressor, backup heat source and the compressor heater. 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.

Activating the air handler/cased coil blower of forced air systems in the event of a refrigerant leak having been detected, reduces the concentration of refrigerant to air mitigating any potential of the refrigerant igniting.

Please Note: “H” models (100%) hydronic heated and chilled water systems will not have an air handler sensor connection as they are designed for use with non-refrigerant based hydronic air handlers and radiant floor systems but still use a leak sensor in the compressor unit and, still incorporate the “LA” (LEAK ALERT) terminal and light.

4) Compressor Unit Cabinet Venting

Each compressor unit cabinet has three cover plates. One on each the left rear and right rear bottom sides as well as one directly on the lower back of the unit. Please refer to figure 3A below.

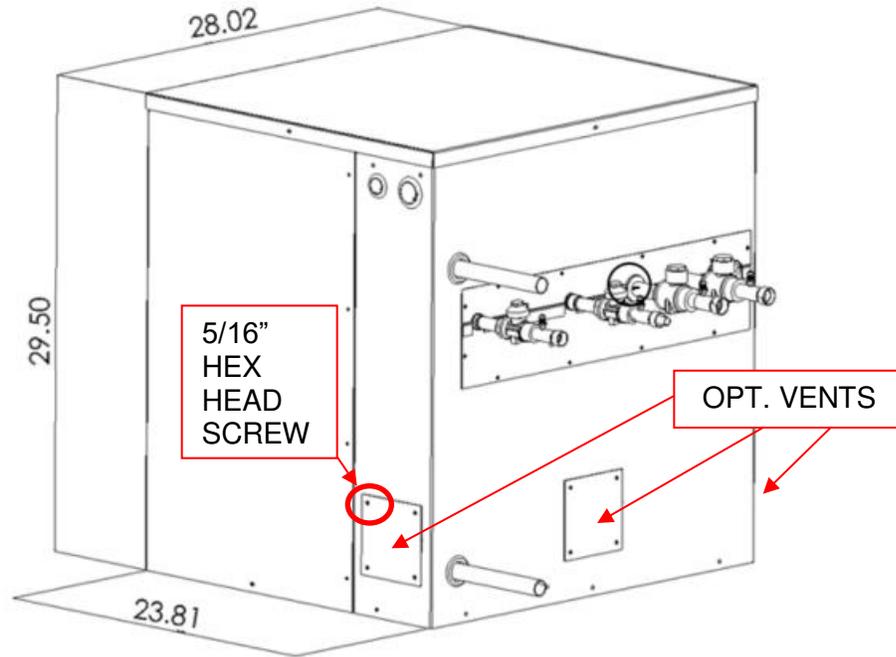


Figure 3A

If the compressor unit is installed indoors and, if required by your local code, either of, or a combination of these vents can be opened by removing four, 5/16\" hex head screws. Behind the cover is a 4\" circular opening. **NOTE:** There may be sheet foam sound deadening material covering the hole. This should be cut out using a sharp knife.

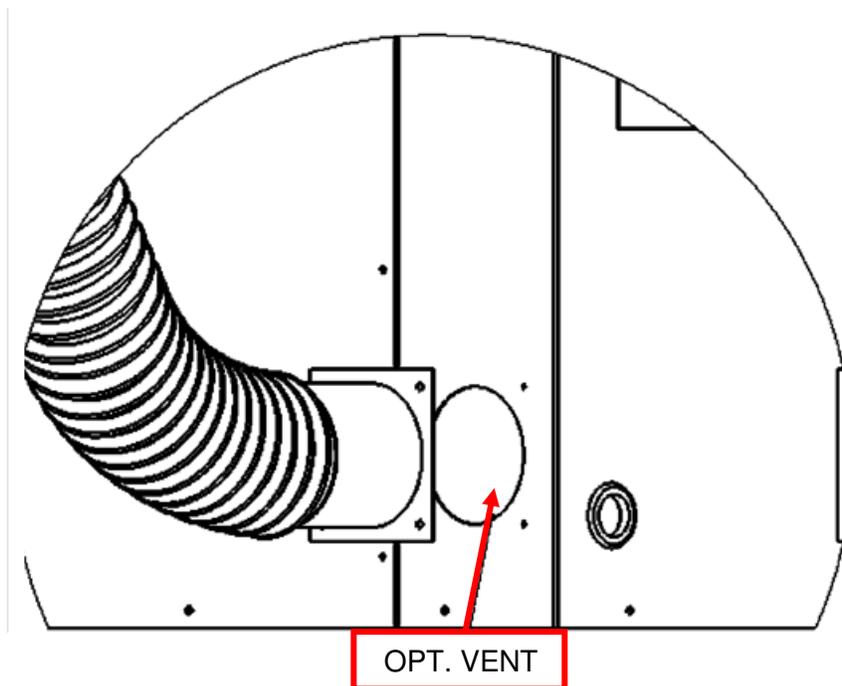


Figure 3B

Please reference figure 3B on page 9. If your local code requires, either of the opt. vent openings can be fitted with a 4" flange collar and a 4" flex duct, the same used for dryer venting. This flange and duct would be field supplied if needed. This duct can be vented outdoors and/or used in conjunction with an exhaust fan using the "LA" terminal as described in section 3, page 8 of this manual. If the air handler is located near the compressor unit, this vent duct can be tied into the air handler return for venting as well.

These vents, the ducting instructions, etc. are provided as optional means to vent the compressor cabinet in the event of a refrigerant leak should your local code require such venting. It is the sole responsibility of the installing HVAC contractor to be familiar with and, to comply with those local codes.

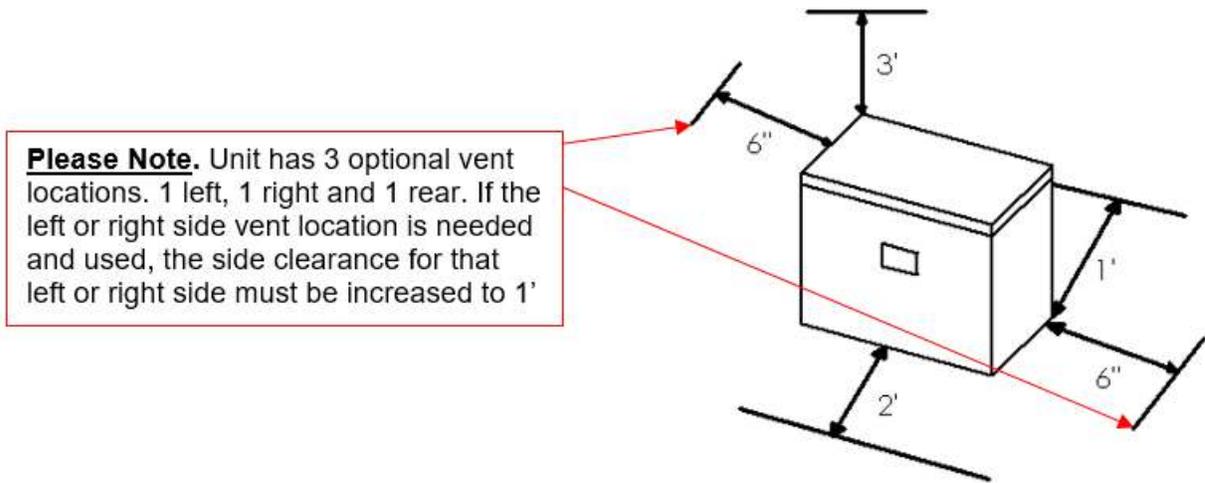


Figure 4

Please refer to figure 4 above. As per your unit installation manual, the listed clearances are a minimum of 12" (1') on the left and/or right sides if either of those vent locations are used. Your local code takes precedence.

5) Leak Detection Testing



Figure 5A



Figure 5B

Each compressor is equipped with leak detection test buttons as shown in figure 5A. One for the compressor unit leak detection sensor, and one for the air handler/cased coil leak detection sensor. “H” unit (100% heated and chilled water hydronic systems) will only have the unit leak detection test button.

At least annually, the leak sensor and leak mitigation system should be tested by following these steps.

- A) For forced air and hydronic units, while in normal operating mode, press fully the **UNIT** leak test button and hold it in for 2 seconds, then release.
- B) Verify that both the “X” lockout light and the “LA” leak alert light illuminates. See figures 5C and 5D.
- C) Verify the presence of 24 volts ac between the “X” and “C” terminals of the thermostat/zone board terminal strip. See figure 5C.



Figure 5C

- D) Verify the presence of 24 volts ac between the “LA” and “C” terminals of the sensor terminal strip.
NOTE: “H” model units only have “C” and “LA” terminals. See figure 5D.

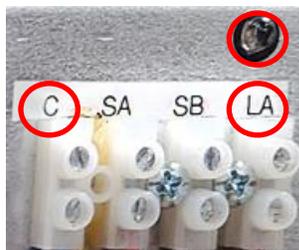


Figure 5D

- E) For forced air systems, verify the blower fan is running.
- F) If an external alarm and/or an exhaust fan that is using the “LA” terminal as trigger is being used, verify their function. The exhaust fan and/or external alarm should be functioning.
- G) Once all of the above has been verified, reset the unit by removing the 24 volt control fuse shown in figure 5B on page 11. After 5 seconds, re-install the fuse. All alerts and indicator lights should be off and normal system operation restored.

If system is forced air, repeat the same steps by pressing the **AHU** leak test button after having reset the unit from the previous test.

Leak Sensor Information: The leak sensors used in Total Green’s Waterless® Geothermal systems are designed for no less than a 15 year service life. Should a sensor failure occur during the life of the system, contact Total Green. Mfg. for replacement. No other sensor type nor source should be considered. A sensor failure will result in the equipment staying in leak mitigation mode.

Should any of these test procedures fail, contact Total Green Mfg. technical support at 419-678-2032.

!!! Never attempt to bypass the leak mitigation system or sensors !!!

6) Leak Mitigation Venting/Exhaust Tables

Forced Air Units Only. Models WGxA, AD and AH Models

Unit Size	Max Charge	Min. Conditioned Room Area	Minimum Mitigation Air Flow
(24) 2 tons	15 Lbs.	237 Sq. ft.	406 CFM
(30) 2.5 Tons	17.5 Lbs.	276 Sq. ft.	474 CFM
(36) 3 Tons	20 Lbs.	315 Sq. ft.	542 CFM
(42) 3.5 Tons	22.5 Lbs.	355 Sq. ft.	609 CFM
(48) 4 tons	25 Lbs.	394 Sq. ft.	677 CFM
(54) 4.5 Tons	27.5 Lbs.	434 Sq. ft.	744 CFM
(60) 5 Tons	30 Lbs.	473 Sq. ft.	812 CFM

Hydronic Units Only. WG1H. 100% heated and chilled water.

Unit Size	Max Charge	Min. Conditioned Room Area	Minimum Mitigation Air Flow
(36) 3 Tons	17 Lbs.	268 Sq. ft.	460 CFM
(42) 3.5 Tons	19 Lbs.	300 Sq. ft.	514 CFM
(48) 4 tons	21 Lbs.	331 Sq. ft.	569 CFM
(54) 4.5 Tons	23 Lbs.	363 Sq. ft.	623 CFM
(60) 5 Tons	25 Lbs.	394 Sq. ft.	677 CFM
(66) 5.5 Tons	30 Lbs.	473 Sq. ft.	812 CFM

Altitude Adjustment factors. The above tables are based at sea level. When installing in areas where altitude is higher than 2000 ft. above sea level, use the following multiplier tables for both room area and mitigation CFM for minimum requirements.

Height above Sea Level	Multiplier
2000 to 3000 ft.	1.02
3000 to 4000 ft.	1.07
4000 to 5000 ft.	1.12
5000 to 6000 ft.	1.15
6000 to 7000 ft.	1.21
7000 to 8000 ft.	1.25
8000 to 9000 ft.	1.28
9000 to 10000 ft.	1.36

Example. A 2 ton forced air unit is installed at 4000 ft. above sea level.

Min. room area of 237 Sq. ft. at sea level. At 4000 ft. above sea level, the adjustment factor is 1.12. $237 \times 1.12 = 265.44$. Min. room area at this elevation is now 265.44 Sq. ft.

Min. Mitigation air flow is 406 CFM at sea level. At 4000 ft. above sea level, the adjustment factor is 1.12. $406 \times 1.12 = 454.72$. Min. Mitigation air flow at this elevation is 454.72 CFM.

