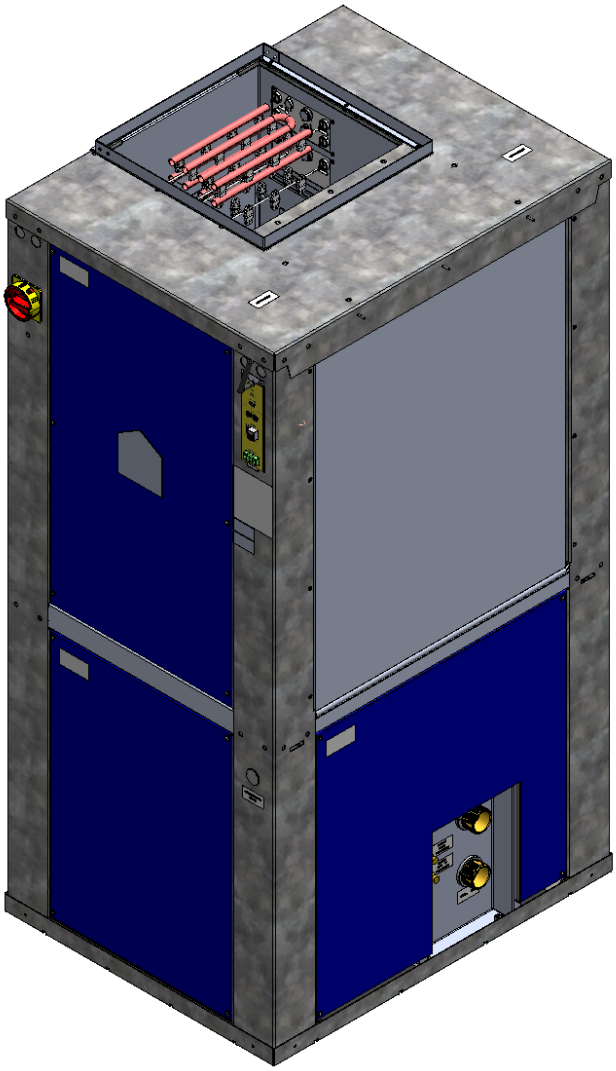
Dandelion Geo

Installation & Operations Manual

Packaged Water Source Heat Pump Model DP1G

Revision 3



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FIGURES & TABLES

SECTION 1: MODEL IDENTIFICATION

Understanding Dandelion Model and Specification Data

Use the nomenclature decoder below to understand your unit's initial specifications. Each Geo unit's model type and specifications are mounted just below the gateway module/gateway blank on both the front and back side of the unit.

Nomenclature Decoder

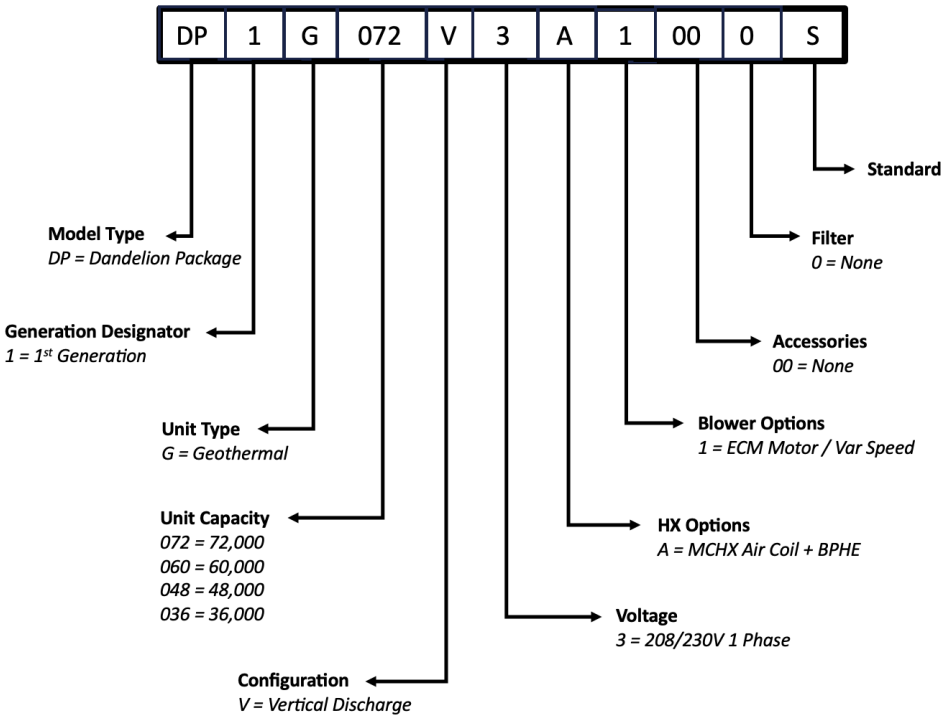


Figure 1 Geo model nomenclature decoder

Model Type: **DP** denotes "Dandelion Package".

Generation Designator: 1-9, where **1** denotes "1st Generation".

Unit Type: G denotes "Geothermal".

Unit Capacity: The nominal tonnage, in MBtu/hr.

Configuration: Configuration type where **V** denotes "Vertical".

Voltage: **3**, denotes **"**1 Phase 208/230V Power".

Heat Exchanger Options: **A** denotes "Microchannel Air Coil" + "Brazed Plate Water Coil".

Blower Options: **1** denotes "ECM Motor with Variable Speed".

Accessories: **00** denotes "None" and is the default configuration.

Filter Option: 0 denotes no filter. **1** denotes a 2" MERV 11 filter.

Trim Option: **S** denotes "Standard".

NOTE: Throughout this document, there are slight differences in specifications, instructions, etc. based on hardware revision. The hardware revision of a unit is encoded in digits 8-9 of the serial number.

SECTION 2: PRE INSTALLATION

General Information

The **Dandelion Geo** units are designed for indoor installation only. Units are assembled, wired, charged, and run-tested at the factory.

Certification of Cooling Models

- Certified as a domestic central air conditioner with electrically operated compressors.
- Certified for indoor installation only.
- Certified with refrigerant R-410A coils.

Codes and Ordinances

Dandelion geothermal units have been tested and certified by ETL, in accordance with UL Safety Standard 60335-2-40.

The system should be sized in accordance with the American Society of Heating, Refrigeration and Air Conditioning Engineers Handbook.

Installation of units must conform to the ICC standard of the International Mechanical Code, the International Building Code, Installation of Air Conditioning and Ventilating Systems Standard, NFPA 90A, and local building, plumbing, and waste water codes. All appliances must be electrically grounded in accordance with local codes, or in the absence of local codes, the current National Electric Code, ANSI/NFPA 70.

Receiving the Unit

When the unit arrives, it should be checked for damage that might have occurred in transit. The unit will be secured to a pallet and covered with a cardboard top cap. The coil is protected by a cardboard side cover and the entire unit is plastic wrapped. The nameplate should be checked to ensure the correct model sizes and voltages have been received to match the job requirements. If installation is conducted by a third party team, the following should be observed:

- If repairs must be made to damaged goods, then Dandelion should be notified before any repair action is taken in order to protect the warranty.
- Certain equipment alteration, repair, and manipulation of equipment without Dandelion’s consent may void the product warranty.
- Contact the Dandelion Warranty Department for assistance with damaged goods, repairs, freight claims or installation questions.

Storage

If the Geo installation does not occur immediately following delivery, store equipment in a dry, protected area away from construction traffic and in the proper orientation as marked on the packaging. Keep all internal packaging in place. Secure all loose-shipped items.

SECTION 2: PRE INSTALLATION

Common Component Description

Main Control Board: Primary circuit board assembly for heat pump energization, monitoring, and control.

Voltage Sense Board[1]: Circuit board assembly to measure the unit's electric current, voltage and power.

Gateway Thermostat Board: Internet-connected thermostat circuit board assembly for real-time monitoring of heat pump performance.

Transformer: Primary transformer for the unit's low voltage electrical distribution.

Low Voltage Resettable Breaker: Prevents electrical overcurrent on 24VAC circuit

Compressor Contactor: Enables high voltage current for operation of the compressor.

Primary Float Switch: Electronic water sensor for the unit that prevents condensate pan overflow.

Safety Contactor: Regulates on or off state of compressor or emergency heater.

Soft Start: Supplement to AC electric motor that reduces strain during the compressor power-up phase.

Line Temperature Sensor: NTC Type III 10k ohm thermistors, placed on refrigerant lines and water lines to monitor system performance.

Air Coil: Aluminum Microchannel heat exchanger with built-in channels that house and distribute refrigerant.

Ground Pumps: Electronically controlled, recirculating water pumps.

Bi-Flow Filter Drier: Absorbs any excess dirt, moisture, or particulates in order to maintain clean refrigerant.

Reversing Solenoid Valve: Allows directional change in refrigerant flows for cooling and heating modes.

Pressure Transducers[1]: Electronic pressure sensors, placed on the discharge (high) side and suction (low) side of the refrigeration system.

Low-Pressure Switch: Low voltage switch that senses suction pressure in refrigerant lines.

High-Pressure Switch: Low voltage switch that senses discharge pressure in refrigerant lines.

Freeze Protection Switch[1]: Low voltage temperature switch that protects evaporator coils from freezing.

[1] Only present on DP1G models of hardware revision '00'

SECTION 2: PRE INSTALLATION

Installation Considerations

Special care should be taken in locating the geothermal unit. All units should be located in an indoor area where the ambient temperature will remain above 55°F and should be located in a way that piping and ductwork or other permanently installed fixtures do not have to be removed for servicing and filter replacement.

A trained and licensed installer or technician must perform this product's installation, start-up, and commissioning. Read the entire installation manual and make yourself comfortable with the installation standards and sequence of operation.

Other safety precautions and steps are provided throughout. Always refer to the nameplate of the unit for electrical and installation specifications unique to each model. Consider the placement of the unit in relationship to electrical utilities, plumbing, condensation management, and ductwork.

When installing a geothermal heating and cooling unit, there are several items that the installer should consider before placing the equipment:

- **Service Access and Installation Space**
  A minimum service clearance is required. See **Figure 21** for a diagram of minimum clearances. The unit can not be located next to any combustible materials.

- **Unit Air Pad**
  All vertical geothermal heating and cooling equipment should be placed on either a formed plastic air pad or a high-density, closed-cell polyethylene pad. This helps eliminate vibration noise that could be transmitted through the floor. The use of corner pads alone is not recommended (**Figure 3**).

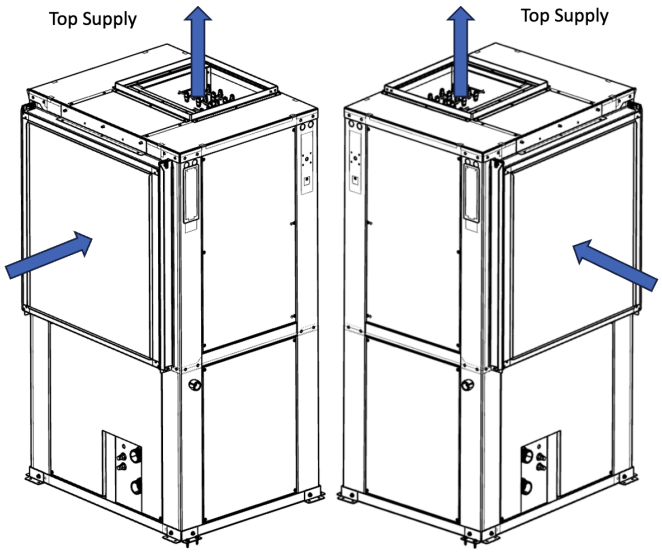
- **Verify Infrastructure Components**
  The installer has verified that all applicable wiring, ductwork, piping, and accessories are correct and on the job site.

- **Verify Air Pattern Location**
  Determine left or right side return air pattern before the unit assembly and installation (**Figure 2**).

- **Ground Loop**
  The Geo is designed for use with closed-loop ground loops only, containing water-antifreeze mix. See **Section 4** for more details on water quality requirements.

SECTION 2: PRE INSTALLATION

Figure 2 Return air pattern direction



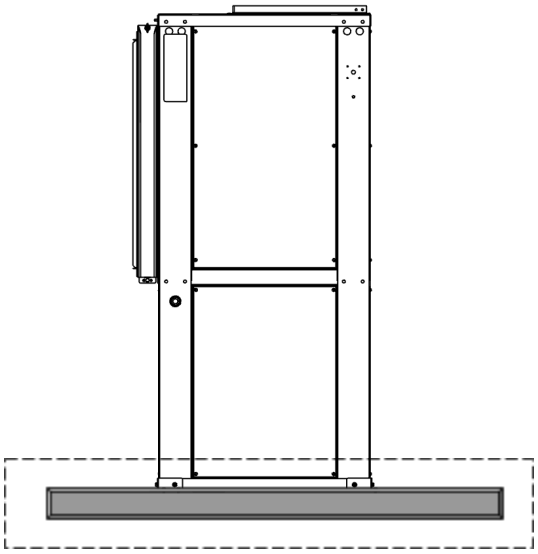


Figure 3 Unit air pad

- **Review Access Door Locations**
  This is a multi-positional, vertical package unit. Service access doors are on all four (4) sides of the unit. Clearance information shown is for a right hand return unit. Flip clearance requirements along dashed line for a left hand return.The control box can be accessed by removing the panel under the air coil (**Figure 13**). A minimum of 28” of access is required at the front OR the rear in order to permit filter changes.

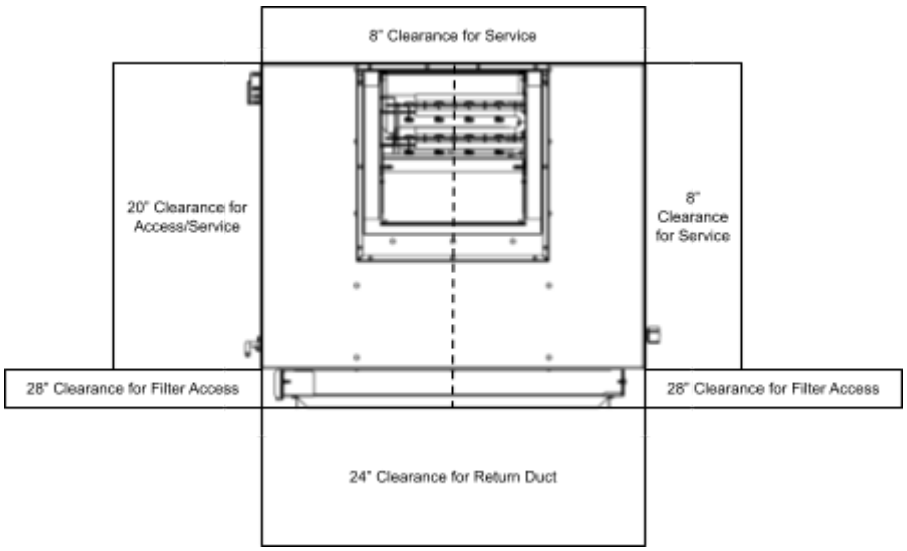


Figure 4 Access door locations

- **Emergency Stop (Disconnect) Switch Location**
  The Emergency Stop (disconnect) switch is installed on the front side of the unit. The front side is determined at the time of installation and depends on the desired direction of the return air duct. The switch can be installed on either the front or rear side, depending on unit positioning. **All Emergency Stop switch components must be integrated at the time of heat pump installation.**

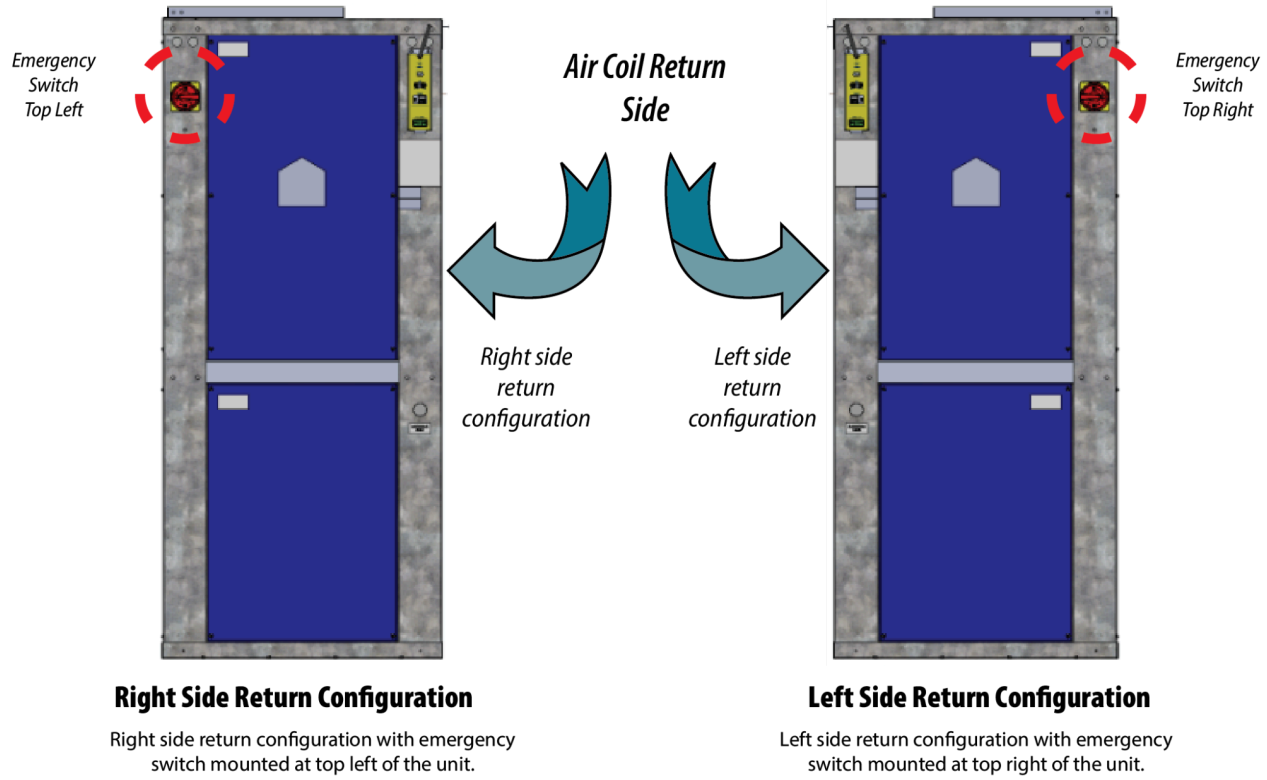


Figure 5 Emergency stop switch placement

Additional Installation Notes

- The Dandelion Geo is designed for indoor use only.
- Unit should not be operated on or around active construction sites.
- Unit should be stored in an upright position at all times.

SECTION 2: PRE INSTALLATION

Duct Work

All new ductwork shall be designed as outlined in Sheet Metal and Air Conditioning Contractors National Association (SMACNA) or Air Conditioning Contractors of America (ACCA) or American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) handbooks. In summary:

- All models do not have more than 2% air leakage. All supply / return plenums should be isolated from the unit by a flexible connector (canvas) or equivalent to prevent the transfer of vibration noise to the ductwork.
- The flex connector should be designed so as not to restrict airflow. A radius should be used on any transition with airflow over 500 CFM.
- If the unit is being installed with existing ductwork, the ductwork must be designed to handle the air volume required by the unit being installed.
- When running a cooling or heating load on a building, size ductwork according to the building design load and heat pump CFM.

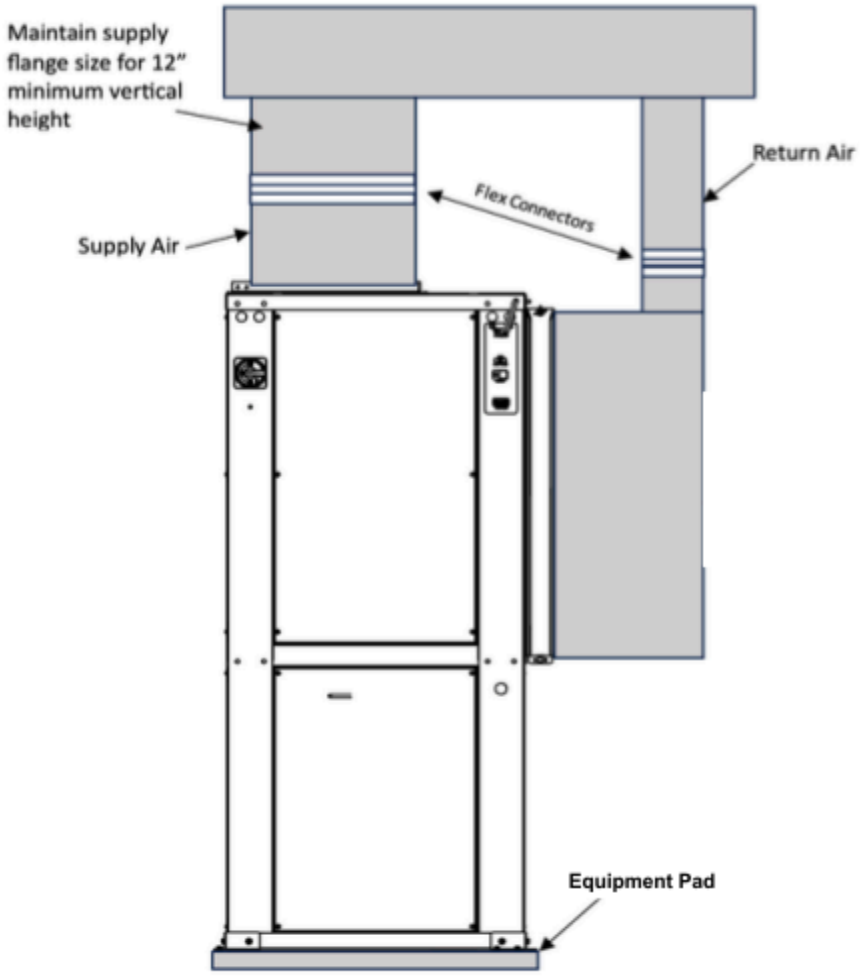


Figure 6 Ductwork configuration for right hand return

SECTION 2: PRE INSTALLATION

Electrical Considerations

Fuse and Circuit Breaker Information

The Dandelion Geo heat pump system runs off 208/230V and the current rating for the system is 10A per nominal ton. There are no in-line fuses for the system. The only circuit breaker for the system is by way of the user's circuit breaker located at their home breaker panel. There is a low voltage circuit breaker in the Geo unit that handles the 24VAC control voltage.

Note: INSTALLATION MUST CONFORM WITH LOCAL BUILDING CODES OR, IN THE ABSENCE OF LOCAL CODES, WITH NATIONAL ELECTRICAL CODE ANSI/ NFPA 70 CURRENT EDITION

Voltage Connection Points

High voltage connection point and thermostat connection point as shown here.

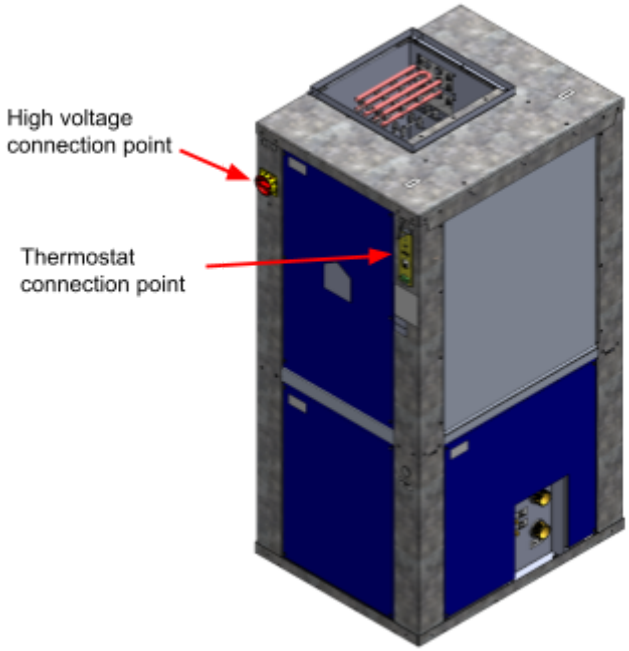


Figure 7 Voltage connections, right hand return configuration

Warning Labels

All Dandelion Geo panels with access to areas with high voltage or uninsulated live parts are marked with a hazardous warning label as shown here. These are located on all removable exterior panels.

Figure 8 Electrical warning labels

SECTION 3: UNIT INSTALLATION

Dandelion Geo Installation Steps

1. After inspection, temporarily add the shipping covers on the return side of the unit to protect it during transportation to the installation point.
2. The unit must be set on a vibration isolation or air pad. Make sure the unit orientation is correct for the supply and return duct access. Ensure there is access to the front of the unit to allow for an electrical connection to both the Emergency Stop (Disconnect) switch and the Gateway Module.
3. Once the unit is set in place, remove all shipping covers and any remaining packaging.
4. Access the blower cabinet by removing the top front access panel. Remove the blower shipping foam support and blower motor shipping support bracket (**Figure 9**). Find and remove the accessory kit located inside the airbox compartment.
5. Carefully turn the blower with your hand to confirm it turns freely.
6. Assemble and attach the air filter kit **(Dandelion PN 2003332[2], Figure 10**), inserting the hooks from the filter rack into the openings provided below the return air coil, and rotate into place at the top. Depending on the hardware revision, there will either be 3 nuts or 3 screws to fixture the top of the filter rack (provided with the filter rack kit). ***Detailed installation instructions are included in the Air Filter Kit box.***
7. Remove the filter rack door by loosening the thumb screw fastener at the top and bottom (**Figure 18**).
8. Slide in the 2" Merv 11 pleated filters and re-attach the filter rack door. *Note the performance/pressure drop data* (see **Filter Performance**, **page 52**).
9. Secure the return plenum with vibration break onto the filter rack (**Figure 6**).
10. Secure the supply plenum transition onto the supply air flange with a vibration break. A 90-degree elbow is best off supply transition for noise reduction (**Figure 6**).

NOTE: DO NOT INSTALL ADDITIONAL SCREWS NEAR THE AIR COIL - DOING SO COULD DAMAGE/RUPTURE THE AIR COIL

[2] For DP1G models of hardware revision '00', this is PN 1003156

Dandelion Geo Installation Steps (cont.)

Figure 9 Blower bracket and foam support removal

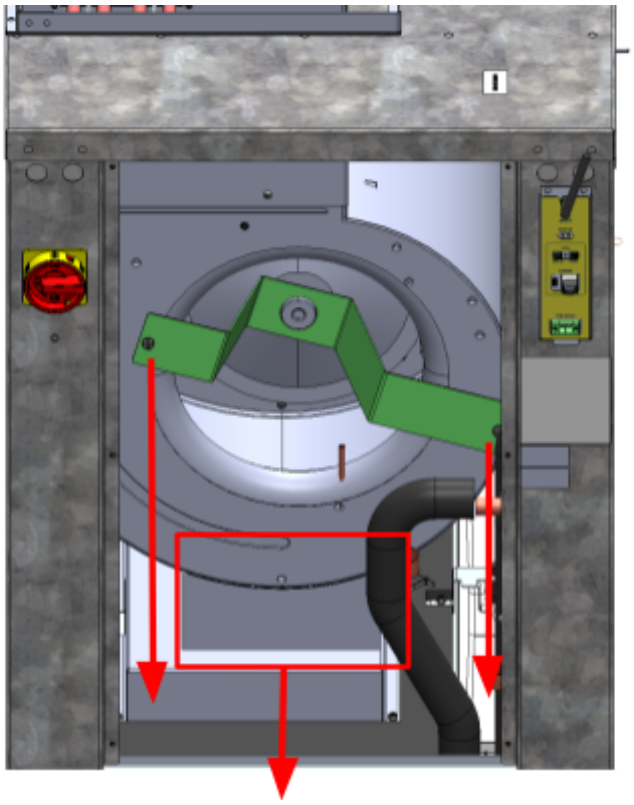
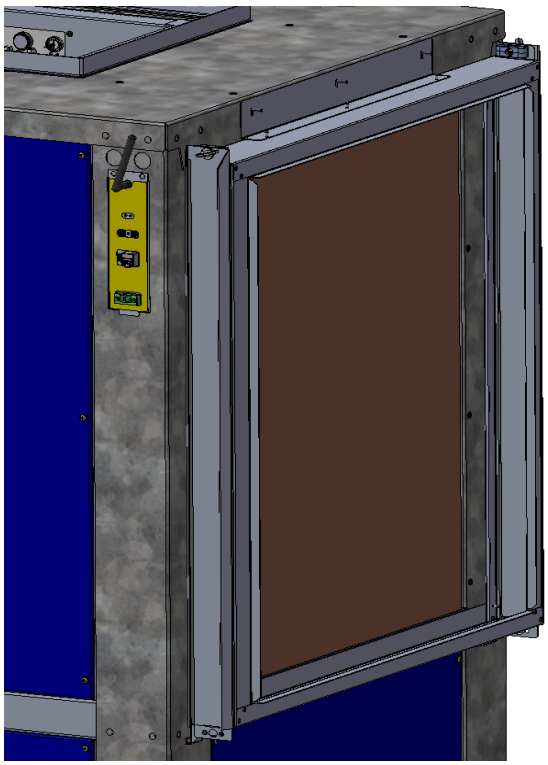


Figure 10 Air filter kit



SECTION 3: UNIT INSTALLATION

Dandelion Geo Installation Steps (cont.)

11. **Route main power line to the unit** (**Figure 11**):
    a. Knock-out a conduit connector hole at the top corner of the unit where power entry is best located for the particular installation.
    b. Install ½" conduit connector rated for the gauge of wire to be used.
    c. Route wires into the unit through the conduit connector.

12. **Land high voltage wires to the power disconnect switch and attach to the unit:**
    a. Remove the power disconnect switch from the chassis of the unit by removing the four (4) phillips head screws that secure the switch to the corner post.
    b. Land high voltage wires (**L1**, **L2**) to the disconnect switch.
    c. Land ground wire to the ground terminal block located on the inside other tab of the chassis corner.
    d. Re-attach disconnect to chassis using four (4) phillips head screws, while adding the yellow disconnect faceplate (faceplate included in the accessory kit).
    e. Attach the red disconnect knob (included in the accessory kit) to the post of the disconnect switch.

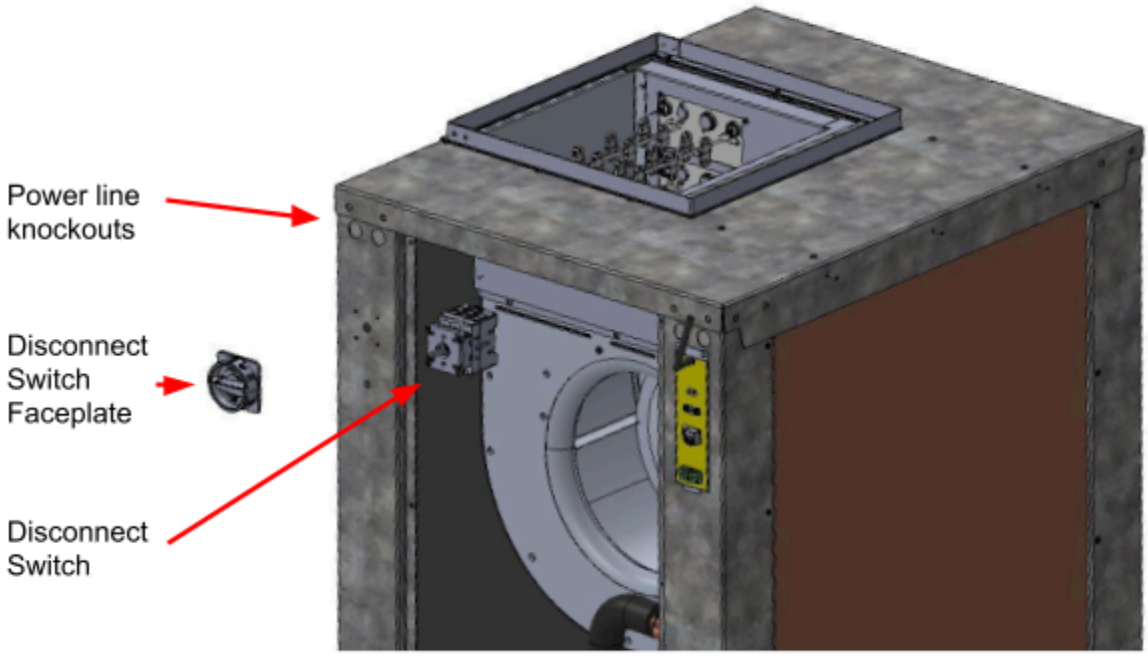


Figure 11 Main power line to unit connection

Note: INSTALLATION MUST CONFORM WITH LOCAL BUILDING CODES OR, IN THE ABSENCE OF LOCAL CODES, WITH NATIONAL ELECTRICAL CODE ANSI/ NFPA 70 CURRENT EDITION

SECTION 3: UNIT INSTALLATION

Dandelion Installation Steps (cont.)

13. **Route thermostat wires & supply/return air temperature sensors to gateway (Figure 12)**:
    a. Determine which side of the unit is best for mounting the gateway for your installation
    b. Retrieve the gateway module from inside the airbox - note system cables are connected.
    c. Route the Gateway module through the gateway opening, leaving the system cables attached.
    d. Add appropriate strain relief to the top of the unit over the gateway card opening, route the thermostat wires through the strain relief and land the low voltage wires from the thermostat
    e. Field-install the supply and return air sensors into the ductwork. Install at least 18” from the outlet of the unit (farther away is preferred) to provide proper mixing.
    f. Route the air sensor leads through the strain relief at the top of the gateway card block and attach the air sensor wires to the gateway card block.
    g. Attach the gateway module to the unit by engaging the tab into the sheet metal at the bottom of the slot, then using the screws or plastic push pins provided to fasten the top (also included in the accessory kit)
    h. If a zone control board is being utilized, there are optional 24VAC power leads provided on the front of the gateway module.

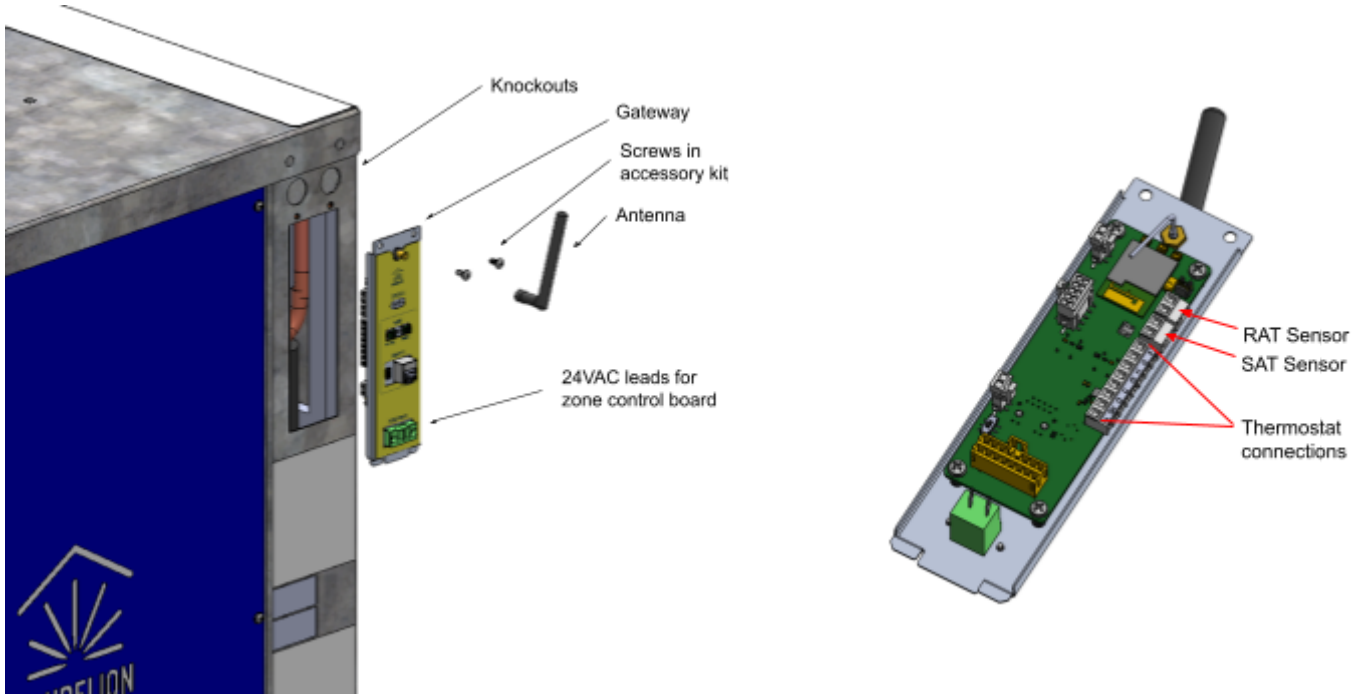


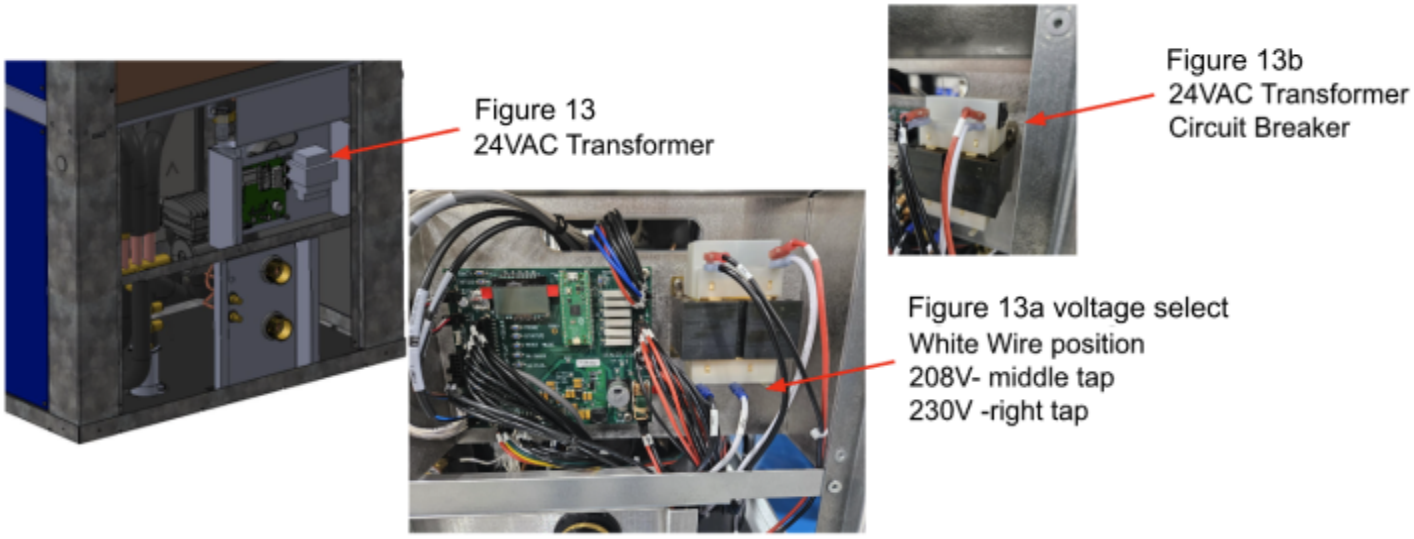
Figure 12 Control wiring
**See SECTION 8: ELECTRICAL DATA AND WIRING for details.*

SECTION 3: UNIT INSTALLATION

Dandelion Installation Steps (cont.)

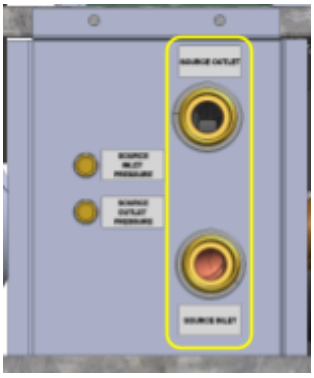
14. **Set voltage taps on the 24VAC control transformer** (**Figures 13, 13a,** and **13b**):
    a. Remove the access panel below the return duct to expose the main controller and 24VAC transformer.
    b. Ensure the transformer has the properly selected voltage tap of 208/230 VAC (located in the control panel drawer).
    c. Replace access panel.

Figures 13, 13a, and 13b 24VAC Control transformer voltage taps



15. **Ground source (water) connection (Figure 14):** Male Flo-Link connectors are provided at the ground loop water in and out. These are labeled **Source Inlet** and **Source Outlet**.
    a. Ensure ground loop and trim kit connections are leak tested.
    b. Flush ground loop and trim kit with flush cart to remove dirt, particulate and all air bubbles.
    c. Connect the female Flo-Link adapters from the ground loop/trim kits to the corresponding “Inlet” and “Outlet” ports on the unit.

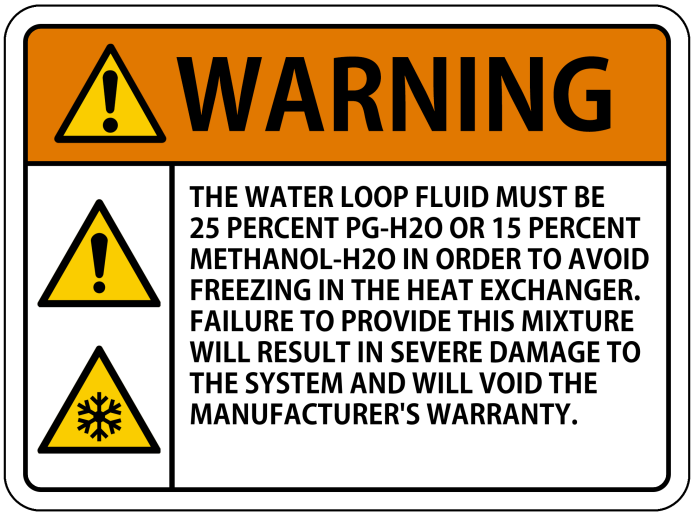
Figure 14 Ground source water connections



SECTION 3: UNIT INSTALLATION

Dandelion Installation Steps (cont.)

d. Fill the system with clean water + antifreeze mix per IGSHPA & Geo Water Content Standards in this manual (**Section 4**). Dandelion recommends 25% propylene glycol or 15% methanol.



e. Pressurize the system between 20 and 50 PSI.

16. **Condensate drain line connection**: Outlet ports for the condensate connection (**Figure 15**) are provided on either side of the unit. A hose, hose barb connector, and hose clamp are included in the accessory kit[3]

a. Connect the small end of the hose to the hose barb from the condensate tray.
b. Position the hose to align with the desired condensate outlet point.
c. Push the hose barb connector through the hole within the chassis and continue into the hose.
d. Using the hose clamps, secure both ends of the hose to the hose barbs.
e. Connect 3/4” PVC tube x (desired fitting) to the external port to route condensate to an external trap, floor drain and/or external condensate pump (not supplied).

[3] For DP1G models of hardware revision ‘00’, the included condensate hose is an integrated p-trap. Installation is the same process, but an external trap **SHOULD NOT** be installed in addition to the internal trap. Doing so will prevent water from draining.

Dandelion Installation Steps (cont.)

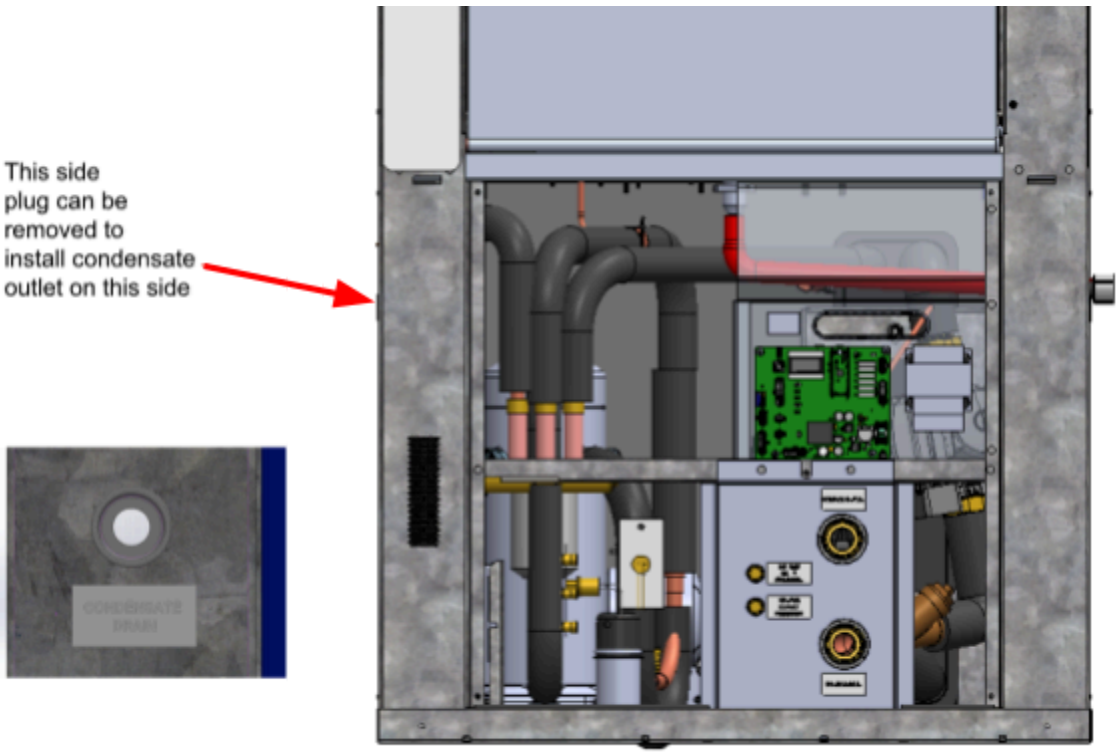


Figure 15 Condensate drain linea
(Electrical box metal hidden in this view)

SECTION 4: GROUND LOOP REQUIREMENTS

Understanding Local Water Quality

In order to prevent corrosion and scaling of wetted internal surfaces of the heat pump and/or biological growth, water of high quality must be used in the ground loop. This water must also be mixed with an anti-freeze to prevent freezing. The antifreeze should also contain inhibitors to help prevent corrosion, scaling and biological growth.

Poor water quality will not only cause scaling and corrosion problems, but could also prevent corrosion inhibitors in the glycol from providing protection.

Hardness levels in water with high ion content (Ca2+, Mg2+, and Fe2+) can cause corrosion. In addition, higher hardness levels result in increased electrical conductivity and total dissolved solids (TDS), ultimately contributing to scaling and corrosion. Alternatively, softer water may have a low buffering capacity and lead to corrosion. When hardness levels are outside the recommended range, parameters such as oxygen content, conductivity, and pH should be considered to evaluate corrosion risks.

Chlorides and sulfates produce high concentrations of corrosive ions that can destroy the corrosion protection provided by inhibitors.

Sulfates and nitrates act as inhibitors for pitting corrosion caused by chlorides in pH-neutral environments.

Electrical conductivity and oxygen content play an important role in accelerating corrosion. In general, if conductivity is above 100 mS/cm, oxygen content should stay below 0.02 ppm.

pH levels below 6 increases corrosion risk while pH levels above 7.5 decreases corrosion risk.

Ferric cation (Fe3+) and **Manganese ion** (Mn4+) are strong oxidants and may increase the risk for localized corrosion on stainless steels in combination with brazing material copper.

Determining Ground Loop Water Quality

Under ideal conditions, antifreeze diluted with demineralized water removes both corrosive and hardness ions. However, local or municipal water will vary in content and hardness. It's important to understand the integrity of your local water supply. The Department of Natural Resources or your local municipality can direct you to the proper testing agency in order to understand your water content and its quality limitations to a ground loop system.

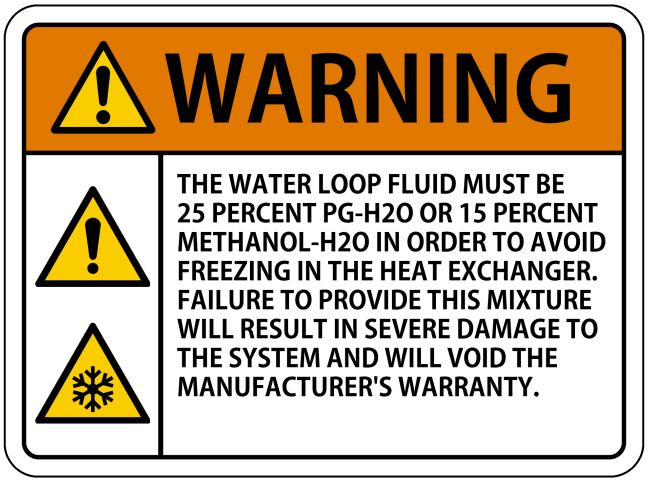
SECTION 4: GROUND LOOP REQUIREMENTS

Recommended Antifreeze/H_2O Mixture

The Geo installation team will combine antifreeze with the water available on-site. The Dandelion Geo is engineered to be used with a ground loop heat exchanger, designed and installed per International Ground Source Heat Pump Association (IGSHPA) guidelines for ground loop systems.

To prevent freezing in the heat pump heat exchanger, a minimum of 25% Propylene Glycol or 15% Methanol should be used to charge the ground loop. An inhibited propylene glycol designed for ground source heat pump loops must be used to prevent corrosion and bacterial growth.

Source water and/or fill water, must be filtered to prevent fouling/clogging of the heat pump heat exchanger. Particulates larger than **0.8mm (800 microns)** must be filtered from the ground loop fluid before connecting to the unit. This will ensure long term reliability of circulation components in the Dandelion Geo system, especially valves and pumps.



SECTION 4: GROUND LOOP REQUIREMENTS

IGSHPA & Geo Water Content Standards

IGSHPA provides a baseline standard for ensuring the quality, efficiency, performance, and safety of closed-loop/geothermal heat pump systems. As such, the IGSHPA committee has established baseline water quality results listed below from its 2017 Design and Installation Standards which can be found online.

The Dandelion Geo water quality specifications are shown below in **Table 1**.

Table 1 Geo water quality specifications

WATER CONTENT	Goal (ppm)	Allowable* (ppm)
Alkalinity (HCO3-)	70-300	> 300
Sulphate (SO42-)	70-300	> 300
HCO3-/SO42-	>1	<1
Electrical Conductivity [2]	>500 mS/cm	>500 mS/cm
pH [3,4]	6.0-10	>10
Ammonimum (NH4+)	2-20	>20
Chlorides (Cl-)	< 100	<200
Free Chlorine (Cl2)	<1	
Hydrogen Sulfide (H2S)	>0.05	>0.05
Free (aggressive) CO2	>20	>20
Total hardness [5]	70-200 mg/l CaCO3	
Nitrate (NO3-) [1]	>100	>100
Iron (Fe) [6]	>0.2	>0.2
Aluminum (Al)	>0.2	>0.2
Manganese (Mn)[6]	>0.1	>0.1
* Allowable if most other factors are within goal ratings		

Footnotes

[1] Sulfates and nitrates act as inhibitors for pitting corrosion caused by chlorides in pH-neutral environments.

[2] If Electrical conductivity above 100 mS/cm, Oxygen content should be below 0.02 ppm

[3] In general low pH (below 6) increases corrosion risk and high pH (above 7.5) decreases corrosion risk.

[4] In District Energy systems, due to good control over water quality, pH values up to 10 are considered safe: +

[5] Total Hardness/corrosion: water with high hardness can cause corrosion problems due to its high ion content (Ca+2, Mg+2, Fe+2) which also means a high electrical conductivity as well as a high total dissolved solid (TDS). For this reason, too high hardness values should be avoided not only due to higher risk of scaling but also for corrosion risk.
On the other hand, soft water, but not necessarily cation exchange softened water, may in contrast have a low buffering capacity and so be more corrosive. If the hardness values are outside the recommended range, other parameters such as oxygen content, conductivity and pH values should be considered to evaluate the corrosion risk.

[6] Fe3+ and Mn4+ are strong oxidants and may increase the risk for localized corrosion on stainless steels in combination with brazing material copper.

SECTION 5: CONTROLS

Note: Firmware updates which change functionality will be accompanied by an updated IOM, and changes will be documented in the changelog at the end of this document with details on firmware versions.

Main Control Board Buttons

Rotary Dial
Used for scrolling through lists, making selections, and changing configuration values.

Enter
Select menu item or confirm configuration change.

Back
Return to the parent menu. If used during adjusting a setting, the setting will return to its previous value.

Menu
Displays menu of all functions available on the LCD display.

Status
Button advances through status screens. Status screens display operating mode, sensor readings, and faults present.

Test Mode
Button toggles test mode on and off.

Blower
Brings up a display on the controller that allows customization of airflows for all operating modes.

Freeze Protection[4]
Configure antifreeze type, percentage or freeze protection threshold.

Blower + Freeze Protection[4]
Pressing both buttons displays the pump configuration screen.

Gateway Thermostat Board Buttons

Setup
To reset wifi configuration to factory default, hold Setup button for 15 seconds / until blue light rapidly flashes.

Reset
Resets networking interface. Heat pump is not affected by this button.

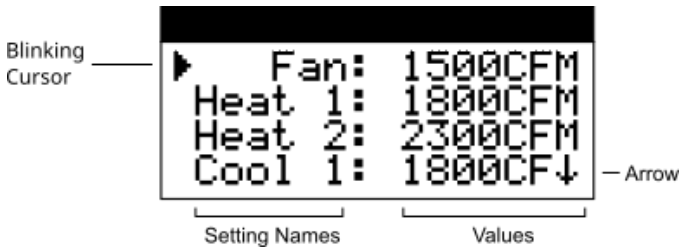
[4] On DP1G models of hardware type ‘00’, this button is labeled “GLYCOL”

SECTION 5: CONTROLS

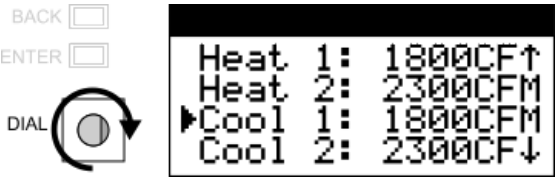
LCD Interface Example

Many LCD screens are lists of parameters that can be adjusted. In this screen the list extends past the end of the screen indicated by the down arrow on the bottom right.

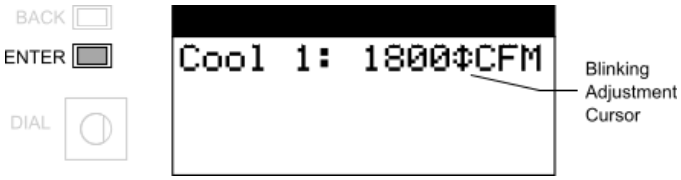
Figure 16 LCD overview



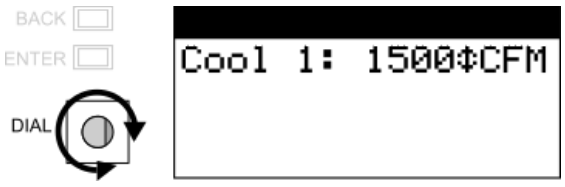
Turning the dial moves the cursor to the desired setting to view or change.



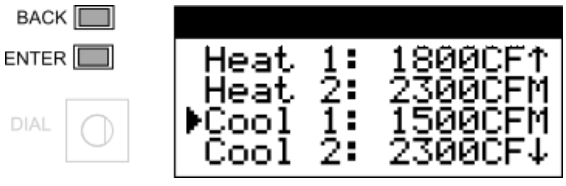
Pressing **ENTER** selects the setting for editing.



The dial adjusts the setting up or down.



Press **ENTER** to apply this change, or **BACK** to discard the change.



SECTION 5: CONTROLS

Gateway Status Indicators

The two LEDs on the gateway module (referred to as left and right in the table below) indicate what mode of operation the unit is in.

Table 2 Gateway Status Indicators

Left LED Color and Pattern	Right LED Color and Pattern	Status
White	-	Idle
White - Breathing	-	Fan
Reddish Orange - Slow Breathing	-	Heating Part Load
Reddish Orange - Fast Breathing	-	Heating Full Load
Light Blue - Slow Breathing	-	Cooling Part Load
Light Blue - Fast Breathing	-	Cooling Full Load
Red - Blinking	-	Fault/Lockout
-	Reddish Orange - Solid	Aux/Emergency Heat

Gateway Internet Status Indicators

The LED on the gateway module between the two wifi setup buttons indicates the internet connectivity status

Table 3 Gateway Internet Status Indicators

Color and Pattern	Status
Light Blue - Slow Breathing	Connected - no action needed
Light Blue - Blinking	Connecting to the cloud
Green / Blue - Blinking	Internet not setup
Purple - Solid	Performing self-update
Red - Solid	Error (okay if temporary)

SECTION 5: CONTROLS

Features

Startup/Random Start
When the unit powers up, before the compressor or blower can power on, the controller waits for the minimum compressor off duration plus a random duration between 3 and 60 seconds. This delay minimizes current draw from multiple heat pumps being energized at the same time.

Test Mode
All delays enforced by this controller are disabled in test mode for use in troubleshooting. Additionally, **AHX Near Freeze Protection** is disabled. Test mode will remain enabled until the button is toggled or the board resets.

Blower
For each operating mode, the blower speed can be configured. Typically set to match duct capacity. Airflow can be adjusted anywhere between the min and max settings provided in **Table 15**, but it's recommended that the airflow be set as high as possible to maximize unit efficiency. Setting the airflow for a mode below minimum will disable that mode.

The blower operates for at least 10 seconds prior to heating / cooling operation and remains on for 10 seconds after the heating / cooling call ends.

If airflow for dehumidify is set below the cooling full load minimum (see **Table 15**) the unit will only run the compressor in part load for dehumidify

Integrated Ground Loop Pumps
The pumps can run at either a fixed flow rate[5] (default) or fixed speed as configured on the control board. The unit comes factory configured to provide constant flow at 3 GPM per nominal ton up to maximum rated external pressure drop (see **Table 20**). This enables sharing of the ground loop with other heat pumps operating on the same loop. If using the factory default fixed flow rate, flow rate should still be verified via pressure drop as described in **Section 6 - Flow Performance Check**.

The pump configuration screen allows for switching between fixed flow and fixed speed modes, and fixed speed adjustment. There is an adjustment knob next to the display. To start editing, press the ENTER button. To increase flow, turn the knob clockwise. To decrease flow, turn the knob counter-clockwise. When done, press ENTER to save the new flow rate, or BACK to cancel changes. Setting the pump speed to 0 will enable automatic fixed flow mode. During adjustment the display updates to show the pump setting. The pumps automatically run while adjusting this setting to allow for pressure delta flow measurements.

[5] Pump flow control uses pump speed and power feedback to estimate flow through the ground loop.

SECTION 5: CONTROLS

Operations

Fan Only
When the thermostat calls for fan (**G**), the blower operates at the fan speed setting.

Heating Part Load
When the thermostat calls for part load (stage 1) heating (**Y1**), the controller waits for any minimum off durations or inter-stage delays to expire. It then starts the blower at low speed and the ground loop pumps before finally turning on the compressor at 67% capacity. Reversing valve is set to heat.

Heating Full Load
When the thermostat calls for full load (stage 2) heating (**Y1 + Y2**), the controller waits for any minimum off durations or inter-stage delays to expire. It then starts the blower at high speed and the ground loop pumps before finally turning on the compressor at 100% capacity. Reversing valve is set to heat.

Cooling Part Load
When the thermostat calls for part load (stage 1) cooling (**Y1 + O**), the controller waits for any minimum off durations or inter-stage delays to expire. It then starts the blower at low speed and the ground loop pumps before finally turning on the compressor at 67% capacity. Reversing valve is set to cool.

Cooling Full Load
When the thermostat calls for full load (stage 2) cooling (**Y1 + Y2 + O**), the controller waits for any minimum off durations or inter-stage delays to expire. It then starts the blower at high speed and the ground loop pumps before finally turning on the compressor at 100% capacity. Reversing valve is set to cool.

Dehumidification
When the thermostat calls for dehumidification (**DH**), the controller waits for any minimum off durations or inter-stage delays to expire. It then operates the blower at the dehumidify setting and the ground loop pumps before finally turning on the compressor. The compressor capacity depends on the dehumidify blower setting. Reversing valve is set to cool.

Auxiliary Heat (W1)
When the thermostat calls for auxiliary heating (**W1**), the controller will set the blower for high speed and close the contacts to enable the **Boost Heat** coil to become energized.

If the compressor is inactive, then the **Emergency Heat** coil is also energized to supplement the boost heater. This occurs under two conditions:

- The thermostat is calling for Aux Heat only (**W1** only)
- The thermostat is calling for Aux Heat and Compressor (**W1** and **Y1**) but the compressor is locked out. See **Emergency Heat** below.

Emergency Heat
When the thermostat calls for both the compressor and electric heat (**W1** and **Y1**) AND a safety fault has occurred in the system (see **Faults** section on next page), the system will automatically divert power from the compressor to the emergency heater while also engaging the boost heater.

SECTION 5: CONTROLS

Table 4 Operating state modes by component

Mode	Compressor Part Load	Compressor Full Load	Reversing Valve	Blower*	Ground Pumps	Boost Heat	Emergency Heat
Idle	OFF	OFF	-	OFF	OFF	OFF	OFF
Fan	OFF	OFF	-	ON	OFF	OFF	OFF
Heating Part Load	ON	OFF	OFF (Heat)	ON	ON	OFF	OFF
Heating Full load	ON	ON	OFF (Heat)	ON	ON	OFF	OFF
Aux Only / Emergency Heat	ON	ON	-	HIGH	OFF	ON	ON
Part Load + Aux	ON	OFF	OFF (Heat)	ON	ON	ON	OFF
Full Load + Aux	ON	ON	OFF (Heat)	ON	ON	ON	OFF
Cooling Part Load	ON	OFF	ON (Cool)	ON	ON	OFF	OFF
Cooling Full Load	ON	ON	ON (Cool)	ON	ON	OFF	OFF
Dehumidify	ON	OFF**	ON (Cool)	ON	ON	OFF	OFF

* Blower speeds vary per mode, see fan performance data table in **Section 8**

** Dehumidify compressor stage depends on airflow setting. See **Section 8** for more information

SECTION 5: CONTROLS

Faults / Alarm States

Faults listed below are monitored by either mechanical switches in series with the compressor relay or by thermistors monitored by the controller. When any of these indicate a fault condition, the compressor contactor will not engage and the compressor remains off. The controller LCD display reports information about fault. When multiple faults are present, only the first fault is displayed.

High Discharge Pressure (HPS)
The pressure in the compressor's refrigerant discharge line exceeds normal operating range. The compressor is disabled to ensure refrigerant lines do not over-pressurize. Each trip contributes to the **Safety Lockout** count.

Low Suction Pressure (LPS)
The pressure in the compressor's suction line is below normal operating range. The compressor is disabled to avoid ingesting liquid refrigerant. Each trip contributes to the **Safety Lockout** count.

Internal Condensate Overflow (COF)
The condensate switch inside the airbox's condensate tray is triggered. The condensate drain may be clogged. The compressor is disabled to avoid generating additional condensate. Each trip contributes to the **Safety Lockout** count.

Ground Loop Freeze Protection / Low Ground Loop Temperature (FPS)
The unit monitors ground loop temperatures during heating operation to prevent freezing of the ground loop fluid, depending on antifreeze content. The antifreeze content should be set in the **Freeze Protection**[6] screen during unit installation. When the ground loop temperature is below the freeze protection threshold, the compressor is disabled to prevent freezing in the water heat exchanger. Each trip contributes to the **Safety Lockout** count.

> **WARNING:** Never set this below the freezing point of the ground loop. This setting must only be adjusted AFTER adding an antifreeze agent to the ground loop and verifying concentration. If this is set too low, operating the heat pump in heating mode may cause the ground loop to freeze and damage the unit.

Air Coil Freeze Protection / Low Air Coil Temperature (AFP)
The unit monitors the refrigerant and air temperatures during cooling mode to prevent air coil freezing. This operates in two stages:

> **(1) AHX Near Freeze Protection:** If the air coil temperature drops below 38°F, cooling full load is disabled and only cooling part load will run if cooling is called. This clears after the air coil is above the cutoff temperature for 30 minutes.
>
> **(2) AHX Freeze Protection:** If the air coil temperature drops below 32°F cooling is fully disabled. This will clear after 5 minutes if the air coil temperature rises above the cutoff. Each trip contributes to the **Safety Lockout** count, unless the entering water temperature is cold.

[6] On DP1G models of hardware type ‘00’, this button is labeled “GLYCOL”

Table 5 Alarm state table

Safety Switch	Trip Point
High pressure	Discharge pressure > 610 PSI
Low pressure	Suction pressure < 50 PSI
Water freeze protection	Temp set based on fluid, default < 32°F
Coil freeze protection	Near trip < 38°F, Full trip <32°F*
Condensate overflow	Main condensate pan level high

* See features section above for clarity on coil freeze protection

Safety Lockout

As faults are detected in the system the safety lockout counter will be incremented (see fault details for exactly when that happens). When the counter reaches three faults detected the unit will lock it out until main power is cycled to the unit or the controller board is reset.

SECTION 5: CONTROLS

Gateway Internet Setup

The gateway board connects the heat pump with the Dandelion cloud for remote monitoring. It supports:

1. **Hardwired Ethernet Connection** Connect the gateway board to a hardwired network by plugging an ethernet cable into the RJ45 jack on the gateway.
2. **Wi-Fi Connection** Connect the gateway board to a wireless hotspot by configuring the gateway using the Dandelion Wi-Fi Setup application

If connecting via Wi-Fi, follow the instructions that come with the Dandelion Wi-Fi Setup application – instructions provided below are for reference only:

1. Connect your computer to the gateway card using a USB-C cable.
2. Visit **geothermal.cloud** to launch the Wi-Fi setup application.
3. Select device, then select “P2” on the following screen.
4. Wait for the Wi-Fi scan to complete.
5. Choose a Wi-Fi network and enter the corresponding password and connect.

Main Control Board Firmware Update

Over The Air Updates (OTA)
By connecting the Geo to the internet, it will automatically receive the latest firmware updates. See **Gateway Internet Setup** above.

Wired Updates
Wired updates are only required in a debug scenario or when it is not possible to connect a Geo to the internet. For normal installs where the Geo is connected to the internet and controller firmware is v0.21 or greater the following is not required.

Visit https://dandelionenergy.com/geo_support for information on minimum allowable firmware versions. To check the current firmware version, press **RESET** on the controller - after a few seconds, the LCD will display the Dandelion logo with the firmware version. If the unit is not internet connected, updates can be performed manually following the instructions below. Use the most up-to-date controller firmware for access to the latest features. Follow the instructions that come with the firmware file – instructions provided below are for reference only:

1. Connect your computer to the main control board using a Micro-USB cable.
2. Hold down ***Reset*** and ***Bootsel*** buttons at the same time. Release the ***Reset*** button first. Then release the ***Bootsel*** button.
3. You should see the control board show up as a USB storage device named **RPI-RP2** on your computer.
4. Copy the firmware file into the USB storage device.
5. After the copy operation completes, the control board will automatically reboot and start running the new firmware.

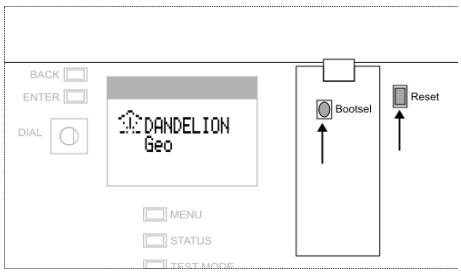


Figure 17 Control board firmware update

SECTION 6: EQUIPMENT START-UP PROCEDURES

Equipment Startup-Process

Check the following before power is applied to the equipment.

Electrical:

- ☐ High voltage wiring and breakers are properly sized and installed
- ☐ Low voltage wiring is correct and completely installed
- ☐ Source voltage is correct and matches the data plate

Plumbing:

- ☐ Loop piping is completed, properly sized, and purged of all air and debris.
- ☐ The correct amount of antifreeze has been added
- ☐ All valves are open
- ☐ Condensate is trapped (if necessary) and properly piped to drain

Mechanical:

- ☐ Filter is installed and clean
- ☐ Packaging and shipping foam are removed from the blower assembly
- ☐ Blower turns freely
- ☐ Flex connections installed on supply plenum & return drop
- ☐ Replace all service panels and screws (upper box only required for operation)

Equipment Start-Up:

1. Energize the unit with high voltage.
2. Make sure secondary/low voltage is between 20V and 29V. Check the transformer's primary connections at the main contactor for the correct voltage (right tap = 230V; white wire position = center for 208V). Correct any possible voltage drops in the main voltage.
3. Connect Geo to the internet following the **Gateway Internet Setup** in **Section 5**.
4. If connected to the internet, the controller will automatically update to the latest firmware version. If not connected, manually update controller to newest required firmware release (see **Section 5** for more detail).
5. Set the **Freeze Protection** setting on the ground loop**.** Press the **Freeze Protection**[7] button on the controller to bring up the **Antifreeze %** menu. Select the antifreeze type and adjust to the installed percentage.
6. Set the thermostat to **HEAT** or **COOL**. For some thermostats it may be necessary to adjust the set point to trigger the desired mode. The Geo's compressor will energize after delays expire (typically a 2 minute delay).
7. Check water flow with pressure drop conversion. Pressure drop tables must be used to convert the pressure drop to GPM. The pressure drop can be obtained by checking water pressure in and water pressure out at the pressure ports **ON THE UNIT**. Adjust flow up or down using the controller functions for adjusting flow if needed (see **Figure 16**). Refer to **Tables 6/7** for pressure drop data.
8. Check the geothermal unit's electrical readings listed in **Table 14**.
9. Check the source water temperature in and out using the readout on the controller LCD (see **Section 5** for more information on the controller. Allow 10 minutes of operation before recording temperature drop.
10. Calculate the heat of extraction or heat of rejection.
11. Check the temperature difference of the load air coil (water-to-air). The line temperatures can be used to check the temperature difference.

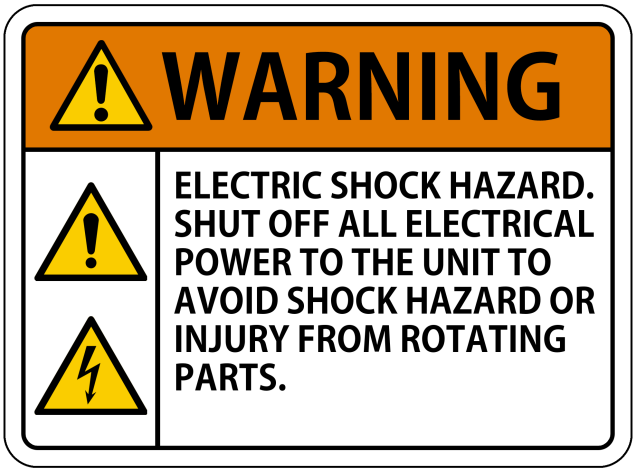
[7] On DP1G models of hardware revision '00', this button is labeled "GLYCOL"

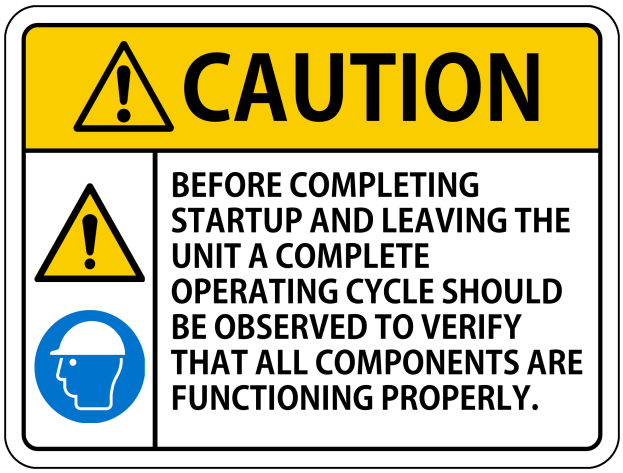
SECTION 6: EQUIPMENT START-UP PROCEDURES

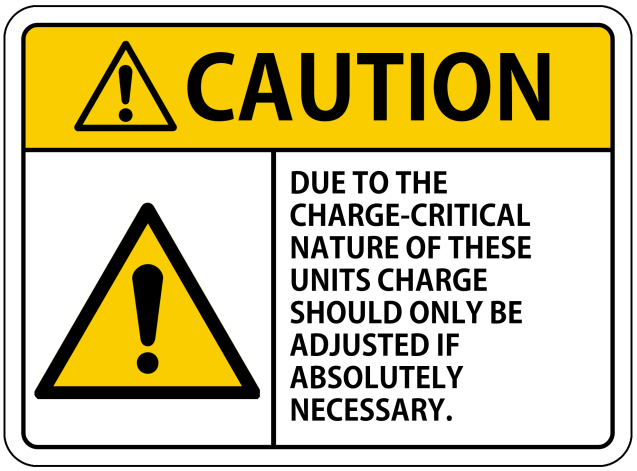
Equipment Startup-Process (cont.)

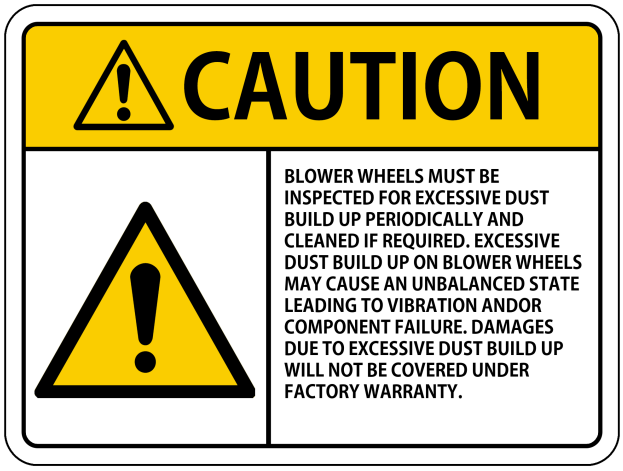
12. Check the data in the opposite mode as the previous tests. Current draws as well as temperature differences and flow rate should be recorded.

13. Check auxiliary heat operation by adjusting the thermostat set point 5°F above the room temperature in **HEAT** mode, or whatever method the particular thermostat requires to engage an AUX heat call. Record voltage, amperage, and air temperature.









SECTION 6: EQUIPMENT START-UP PROCEDURES

Water Flow Calculations and Selection

Proper flow rate is crucial for reliable operation of geothermal heat pumps. The performance data tables in **Section 11** show two flow rates for each entering water temperature (EWT column).

At install water flow needs to be set and the nominal flow rate of (3 GPM/ton) achieved in all modes of operation by a qualified geothermal professional. Not doing so can cause noise and performance issues and can potentially void the equipment warranty. This is particularly important when the unit is configured with multiple heat pumps on the same ground loop.

Minimum Flow Rate: Minimum closed loop system flow rate (2.5 gpm/ton)
Nominal Flow Rate: Nominal (optimum) closed loop system flow rate (3.0 gpm/ton).

NOTE: Flow rate greater than nominal is acceptable.

Flow Performance Check

Equipment should be in full load operation for a minimum of 10 minutes in either mode.

1. Determine flow rate in gallons per minute
    a. Check the water temperature using the readout on the controller
    b. Check entering and leaving water pressures at the corresponding pressure tap on the unit (not on external fittings), using a ⅛" diameter pressure test probe (¼" NPT threaded fitting)

2. After the information is recorded, refer to **Tables 6** and **7**
    a. Find the corresponding hardware revision table, and entering water temperature column in the pressure drop vs flow tables
    b. Find pressure differential in PSI column
    c. Read the GPM column to determine flow in GPM

3. If the flow is below the minimum allowable, adjust the water flow of the unit:
    a. Push the **BLOWER** and **FREEZE PROTECTION**[8] buttons on the controller to put the controller in flow adjustment mode
    b. Turn the knob clockwise to increase flow or counterclockwise to decrease flow. Verify the new flow rate using the same pressure measurement method

NOTE: Always use the same pressure gauge & temperature measuring device as calibration errors between different gauges will cause errors in flow adjustment. Water flow must be above the minimum flows as shown in the table.

[8] On DP1G models of hardware revision '00', this will say "GLYCOL"

SECTION 6: EQUIPMENT START-UP PROCEDURES

Flow Performance Check (cont.)

Table 6 Pressure tap pressure drop vs. loop flow, hardware revision '00'

Tonnage		Flow [GPM]	Pressure Delta (dP) at:		
			30°F [PSI]	50°F [PSI]	80°F [PSI]
6T	Target	18	2.0	1.7	1.4
	Minimum	15	1.4	1.2	1.0
5T	Target	15	1.9	1.7	1.3
	Minimum	12.5	1.4	1.2	0.9
4T	Target	12	1.9	1.6	1.2
	Minimum	10	1.4	1.2	0.85
3T	Target	9	1.3	1.1	0.84
	Minimum	7.5	0.95	0.8	0.6

Table 7 Pressure tap pressure drop vs. loop flow, hardware revision '01'

Tonnage		Flow [GPM]	Pressure Delta (dP) at:		
			30°F [PSI]	50°F [PSI]	80°F [PSI]
6T	Target	18	3.7	4.0	4.3
	Minimum	15	2.7	2.9	3.1
5T	Target	15	3.5	3.7	4.0
	Minimum	12.5	2.5	2.7	2.9
4T	Target	12	3.4	3.5	3.6
	Minimum	10	2.4	2.5	2.6
3T	Target	9	3.3	3.4	3.5
	Minimum	7.5	2.4	2.5	2.6

SECTION 7: MAINTENANCE AND SERVICE

Air Filter Replacement

Dandelion recommends regular replacement of the air filter, every six (6) months or whenever the airflow in the system starts to decrease. The air filter type used by the Geo system is listed in **Table 22**.

To replace the air filter:

1. Remove power from the unit by turning the red power disconnect switch to the **OFF** position.
2. Locate the filter access door on the side of the air filter kit.
3. Loosen the thumbscrews on the top and the bottom of the door and remove the door.

   NOTE: The thumbscrews are captive. **DO NOT** completely remove them from the door.

4. Slide out the old air filter
5. Slide in the new air filter
   a. The 30” long edge of the filter should be vertical.
   b. Be sure to orient the filter with the arrow pointed towards the heat pump (airflow direction).
6. Replace the door and tighten the thumbscrews by hand.
7. Restore power to the unit by turning the red power disconnect switch to the **ON** position.

Figure 18 Dandelion Geo external panels

SECTION 7: MAINTENANCE AND SERVICE

Condensate Pan/P-trap Cleaning

These instructions are primarily applicable to hardware revision '00' units, which have the integrated P-trap. It is still recommended to periodically inspect units without the internal P-trap and clean as necessary.

Dandelion recommends yearly cleaning of the condensate pan and associated internal 'P-trap'. Doing so will prevent unwanted buildup of organic material and associated clogging/overflow of the condensate management system. Dandelion also recommends periodically adding an EPA-approved antimicrobial agent to the condensate pan to prevent sludge build-up in the condensate system between preventative maintenance.

To clean the condensate system:

1. Remove power from the unit by turning the red power disconnect switch to the 'OFF' position.

2. Locate the side of the unit that has the condensate drain. On that same side of the unit (as referenced in **Figure 31**) remove the top side panel (with the Dandelion logo) by loosening the six (6) phillips head screws that secure the door to the unit. Remove the bottom side panel in the same manner.

   NOTE: These screws are captive so do not completely remove them.

3. Using water, a brush, and/or cleaning cloth, clean out any organic matter or scaling that may have accumulated in the condensate pan. Be careful not to interfere or move the condensate pan float switch while cleaning the condensate pan **(**see **Figure 19).**

4. Using a long bottle brush, run the bristles of the brush down into the drain hole of the P-trap and push along until the brush has run the entire length of the P-trap to clear any debris in the trap.

5. Remove the brush. Visually inspect for any remaining debris in the P-trap. See **Figure 19** for details on the P-trap line.

6. *Perform externally to the unit* - remove the condensate line drain cap and push the brush down the external pipe to the condensate pump base. Replace the cap.

7. Using a pitcher, add water to the condensate pan to make sure the water drains all the way to the external condensate pump (which also primes the P-trap).

8. Check the P-trap contains water (i.e. is primed) by visually inspecting.

9. Add an antimicrobial agent to the drain pan, following the manufacturer's guidelines for the cleaning and maintenance of HVAC drain pans and lines. The agent should contain ammonium chloride as the active ingredient. Recommended antimicrobial agents:

   a. Sta-Clean® Antimicrobial Tablets
   b. Totaline® Condensate Pan Strip P902-3800X (size appropriately for system tonnage)

10. Replace the top and bottom panels and secure the phillips head screws that hold them in place.

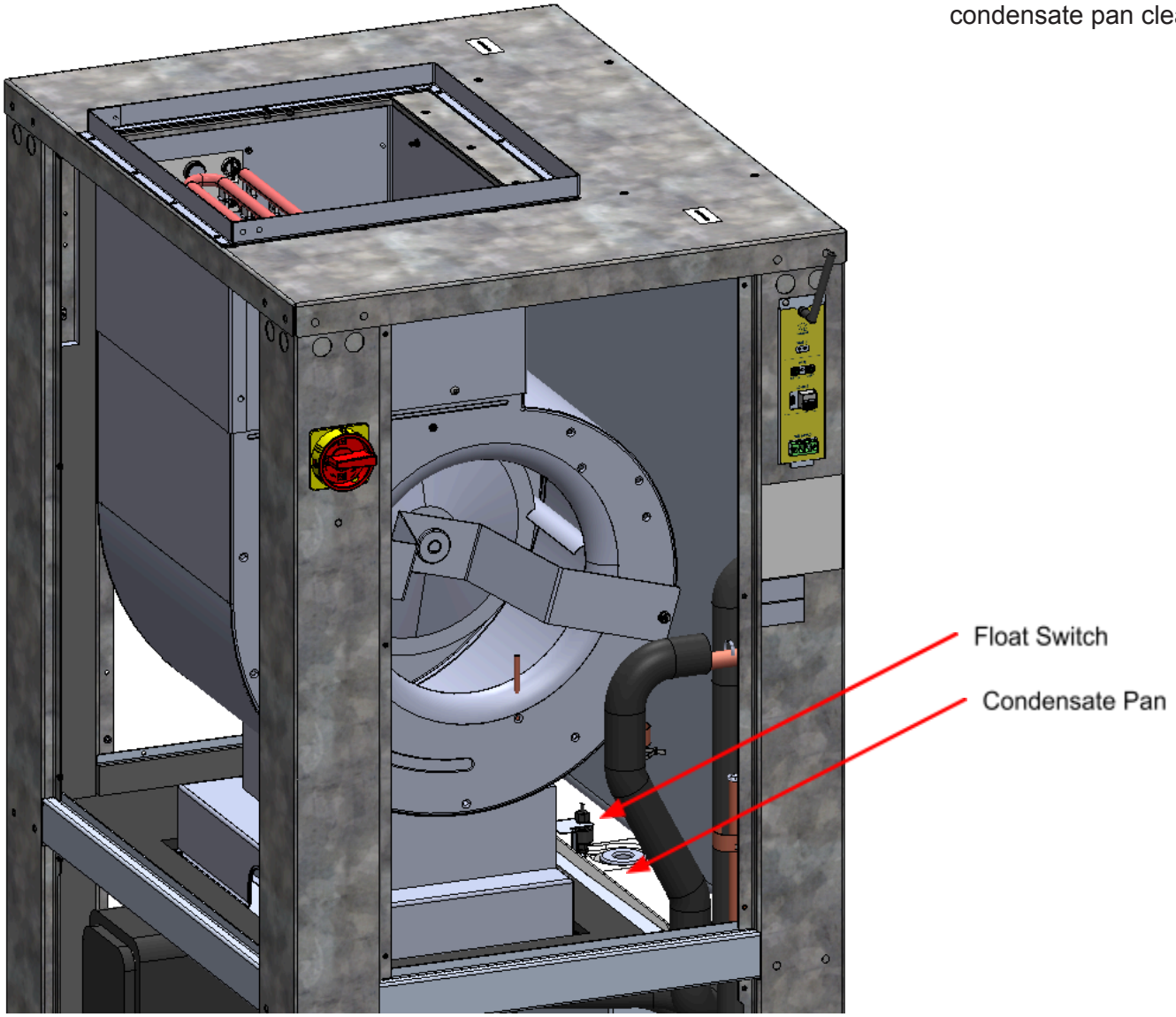
SECTION 7: MAINTENANCE AND SERVICE

Condensate Pan/P-trap Cleaning (cont.)

NOTE: A snug tightness is sufficient. **DO NOT** overtighten! If your installation includes a condensate pump, follow the manufacturer's instructions for cleaning the condensate pump.

11. Restore power to the unit by turning the red power disconnect switch to the **ON** position.

Figure 19 Internal features - condensate pan cleaning



SECTION 7: MAINTENANCE AND SERVICE

Common Parts

Table 8 Major Service Components - Common to all Models

Part	Description	Dandelion Part #
Main Control Board	HEAT PUMP MAIN PCBA	41-0005-00*
Gateway Thermostat Board	GATEWAY PCBA MODULE	41-0003-00
Transformer	TRANSFORMER, 208/230VAC TO 24V, 100VA	42-0071-00
Compressor Contactor	600V POWER RELAY CONTACTOR, 40A, 24V COIL	40-0028-00
Primary Float Switch	SWITCH, NC, FLOAT	47-0009-00
Safety Contactor	RELAY, DPDT, 24VAC, 40A, OPEN	42-0066-00
Soft Start	System Soft Start SS1B16-32SN	40-0010-00
Line Temperature Sensor	THERMISTOR, 10 kOHM NTC, 1/4" OD SS SHEATH, SURFACE MOUNT	47-0012-00
Air Coil	3/6 MICROCHANNEL AIR COIL, 25 X 36", ALUM	37-0004-00
Ground Pumps	RECIRCULATING WATER PUMP, 12.5 M, 180W	33-0001-00
Bi-Flow Filter Drier	FILTER DRIER BIDIRECTIONAL , 5-6 TON	37-0003-02
Discharge Muffler	Discharge Muffler, ½” ODF	37-0012-02
Reversing Valve Solenoid	COIL KIT REVERSING VALVE, 24VAC 5 WATTS	37-0007-00
Pressure Transducer	PRESSURE TRANSDUCER, 0-667PSI 0-4.5VDC	37-0009-00**
Low Pressure Switch	LOW, PRESSURE SWITCH	47-0013-00
High Pressure Switch	PRESSURE SWITCH, 610 PSI OPEN	47-0014-00
Air coil Freeze Protection Switch	SWITCH, LOW TEMPERATURE, SNAP ACTING, 35F	47-0008-00**
Subcool Coil	AIR COIL, AUX SUBCOOLER	37-0013-00
Check Valve	CHECK VALVE, MAGNETIC	37-0021-00
Water Inlet Strainer	MESH, STRAINER, SS	34-0129-00

* For DP1G models of hardware revision ‘00’, this is PN 41-0002-00
** Only present on some DP1G models of hardware revision ‘00’

SECTION 7: MAINTENANCE AND SERVICE

3 Ton (DP1G036) Model Parts

Table 9 Major Service Components - 3 Ton Model

Part	Description	Dandelion Part #
Compressor	SCROLL COMPRESSOR, 2 STAGE, R410A, 3 TON	37-0001-03
Capacitor	370V / 45 MFD Run Cap	40-0036-00
Bi-Flow TXV	EXPANSION VALVE, R410A BI DIRECTIONAL, 3 TON NOMINAL	37-0015-03
Reversing Valve	REVERSING VALVE, 3-5T	37-0002-07
Braze Plate	PLATE HX, 36 PLATE, SS, 3 TON	37-0022-03*
Blower Motor	BLOWER MOTOR, 48Y FRAME, .5 HP	39-0006-03
Auxiliary Boost Heat Strips	HEATER ASSEMBLY, BOOST, 1.0kW	11-0008-10
Aux Heat Limit 1	SWITCH, 1-SHOT CUTOUT, 175F OPEN	40-0024-00
Aux Heat Limit 2	SWITCH, AUTO RESET, 145 F OPEN, 115F CLOSE	40-0029-00
Emergency Heat Strips	HEATER ASSEMBLY, BACKUP, 3.0kW	11-0008-30
Emergency Heat Limit 1	SWITCH, 1-SHOT CUTOUT, 175F OPEN	40-0024-00
Emergency Heat Limit 2	SWITCH, AUTO RESET, 145 F OPEN, 115F CLOSE	40-0029-00

* For DP1G models of hardware revision ‘00’, this is PN 37-0019-03

SECTION 7: MAINTENANCE AND SERVICE

4 Ton (DP1G048) Model Parts

Table 10 Major Service Components - 4 Ton Model

Part	Description	Dandelion Part #
Compressor	SCROLL COMPRESSOR, 2 STAGE, R410A, 4 TON NOMINAL	37-0001-04
Capacitor	370V / 35 MFD Run Cap	40-0034-00
Bi-Flow TXV	EXPANSION VALVE, R410A BI DIRECTIONAL, 4 TON NOMINAL	37-0015-04
Reversing Valve	REVERSING VALVE, 3-5T	37-0002-07
Braze Plate	PLATE HX, 40 PLATE, SS, 4 TON	37-0022-04*
Blower Motor	BLOWER MOTOR, 48Y FRAME, .75 HP	39-0006-02
Auxiliary Boost Heat Strips	HEATER ASSEMBLY, BOOST, 1.5kW	11-0008-15
Aux Heat Limit 1	SWITCH, 1-SHOT CUTOUT, 175F OPEN	40-0024-00
Aux Heat Limit 2	SWITCH, AUTO RESET, 145 F OPEN, 115F CLOSE	40-0029-00
Emergency Heat Strips	HEATER ASSEMBLY, BACKUP, 4.0kW	11-0008-40
Emergency Heat Limit 1	SWITCH, 1-SHOT CUTOUT, 175F OPEN	40-0024-00
Emergency Heat Limit 2	SWITCH, AUTO RESET, 145 F OPEN, 115F CLOSE	40-0029-00

* For DP1G models of hardware revision ‘00’, this is PN 37-0019-04

SECTION 7: MAINTENANCE AND SERVICE

5 Ton (DP1G060) Model Parts

Table 11 Major Service Components - 5 Ton Model

Part	Description	Dandelion Part #
Compressor	SCROLL COMPRESSOR, 2 STAGE, R410A, 5 TON NOMINAL	37-0001-05
Capacitor	440vac / 40 mfd +/- 6%	40-0037-00
Bi-Flow TXV	EXPANSION VALVE, R410A BI DIRECTIONAL, 5 TON NOMINAL	37-0015-05
Reversing Valve	REVERSING VALVE, 3-5T	37-0002-07
Braze Plate	PLATE HX, 50 PLATE, SS, 5 TON	37-0022-05*
Blower Motor	BLOWER MOTOR, 48Y FRAME, 1 HP	39-0006-01
Auxiliary Boost Heat Strips	HEATER ASSEMBLY, BOOST, 1.8kW	11-0008-18
Aux Heat Limit 1	SWITCH, 1-SHOT CUTOUT, 175F OPEN	40-0024-00
Aux Heat Limit 2	SWITCH, AUTO RESET, 145 F OPEN, 115F CLOSE	40-0029-00
Emergency Heat Strips	HEATER ASSEMBLY, BACKUP, 6.0kW	11-0008-60
Emergency Heat Limit 1	SWITCH, 1-SHOT CUTOUT, 175F OPEN	40-0024-00
Emergency Heat Limit 2	SWITCH, AUTO RESET, 145 F OPEN, 115F CLOSE	40-0029-00

* For DP1G models of hardware revision ‘00’, this is PN 37-0019-05

SECTION 7: MAINTENANCE AND SERVICE

6 Ton (DP1G072) Model Parts

Table 12 Major Service Components - 6 Ton Model

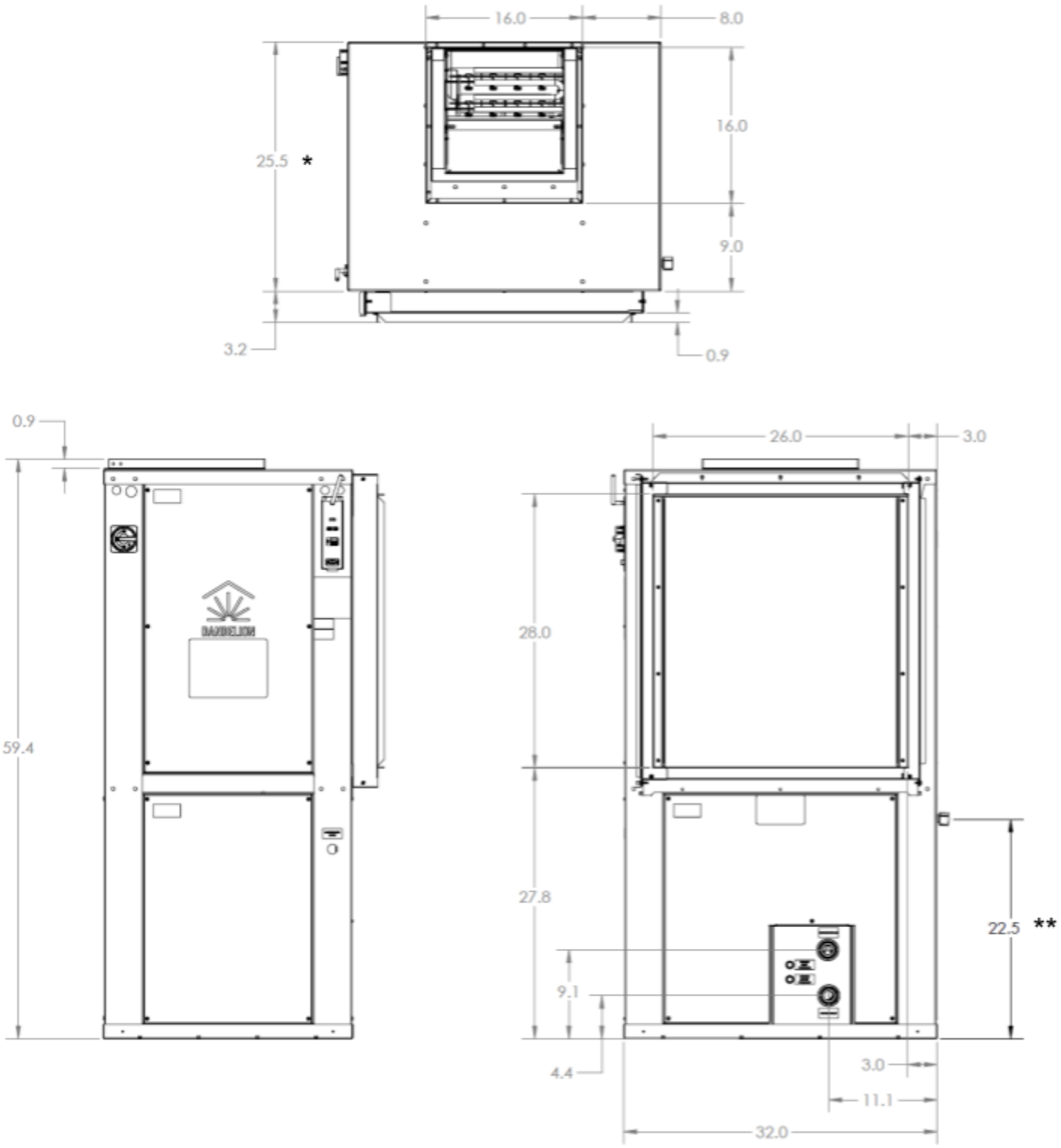
Part	Description	Dandelion Part #
Compressor	SCROLL COMPRESSOR, 2 STAGE, R410A, 6 TON NOMINAL	37-0001-06
Capacitor	440vac / 40 mfd +/- 6%	40-0037-00
Bi-Flow TXV	EXPANSION VALVE, R410A BI DIRECTIONAL, 6 TON NOMINAL	37-0015-06
Reversing Valve	REVERSING VALVE, 6T	37-0002-08
Braze Plate	PLATE HX, 60 PLATE, SS, 6 TON	37-0022-06*
Blower Motor	BLOWER MOTOR, 48Y FRAME, 1 HP	39-0006-01
Auxiliary Boost Heat Strips	HEATER ASSEMBLY, BOOST, 1.8kW	11-0008-18
Aux Heat Limit 1	SWITCH, 1-SHOT CUTOUT, 175F OPEN	40-0024-00
Aux Heat Limit 2	SWITCH, AUTO RESET, 145 F OPEN, 115F CLOSE	40-0029-00
Emergency Heat Strips	HEATER ASSEMBLY, BACKUP, 6.0kW	11-0008-60
Emergency Heat Limit 1	SWITCH, 1-SHOT CUTOUT, 175F OPEN	40-0024-00
Emergency Heat Limit 2	SWITCH, AUTO RESET, 145 F OPEN, 115F CLOSE	40-0029-00

* For DP1G models of hardware revision ‘00’, this is PN 37-0019-06

SECTION 8: UNIT DATA

Unit Dimensional Data

Figure 20 Unit dimensional data (inches)



Notes: Right handed air return configuration. ***On DP1G models of hardware revision '00', this dimension should be increased by 0.5"** for maneuvering to the install location, to account for mounting studs which extend from the air coil side of the unit. ****On DP1G models of hardware revision '00', this dimension is 0.7" larger**.

SECTION 8: UNIT DATA

Accessory Kit Contents

Dandelion Geo units are provided with a set of components that are intended for field install. These items are contained inside of a plastic bag that's included with the unit. Inspect and inventory the kit for the following contents:

Table 13 Accessory kit contents

ITEM #	QTY	Dandelion PN	DESCRIPTION
1	1	56-0002-00	Dandelion Geo quickstart guide
2	1	20-0157-00	Gateway tray, blank
3	10	31-0129-00	Washer, self-retaining, #8 screw, nylon
4	6	31-0163-00	Screw, pan head, 8-32 x 0.375"
5	1	34-0093-00	PVC Fitting, ¾ barb to ¾ cement
6	2	34-0094-00	Clamp, worm drive
7	1	25-0045-00*	Straight drain, condensate, ¾" ID
8	1	43-0007-00	Antenna
9	2	47-0006-00	Thermistor
10	1	42-0070-00	Disconnect switch parts (screws, handle, faceplate)

* For DP1G models of hardware revision '00', this part is 25-0034-00 "P-trap, condensate tube"

SECTION 8: UNIT DATA

Unit Clearances - Dimensional Data

Figure 21 Optimal service & operating clearances - dimensional data (inches).
Right hand return configuration shown, mirror along dashed line for left hand return. Filter access clearance is only required on one side, not both.

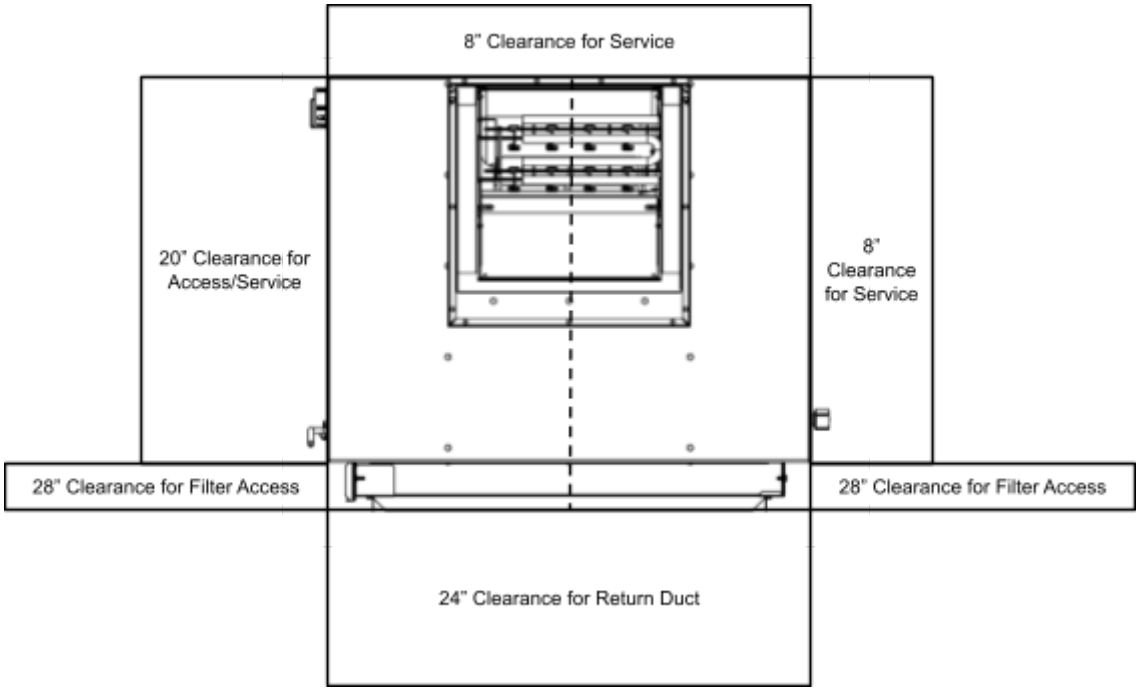
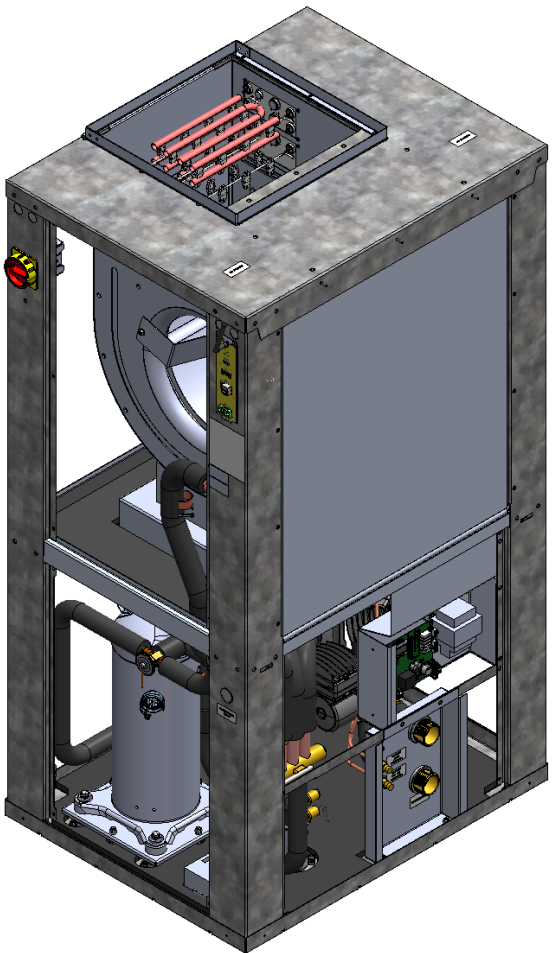


Figure 22 Isometric view without panels



SECTION 8: UNIT DATA

Unit Specifications by Model

Table 14 Unit specifications summary by model

Specification	DP1G036 (3T)	DP1G048 (4T)	DP1G060 (5T)	DP1G072 (6T)
Overall				
Voltage (1 Phase)	208/230	208/230	208/230	208/230
MCA [A]	30.1	42.4	49.1	55.1
MOP [A]	40	60	60	60
FLA [A]	25.4	35.6	41.4	46.2
Compresor				
Voltage	208/230	208/230	208/230	208/230
FLA [A]	14.1	20.4	22.6	27.6
LRA [A]	84.2	122.1	147.4	189.9
RLA [A]	14.1	20.4	22.6	27.6
RPM	3500	3500	3500	3500
Stages	2	2	2	2
Blower				
Voltage	208/230	208/230	208/230	208/230
FLA [A]	4.2	5.9	7.5	7.5
Fan Motor [HP]	0.5	0.75	1	1
Max ESP [“H2O]	1.2	1.15	1.1	0.95
Max RPM	1050	1050	1050	1050
Blower Wheel Housing	9R - 9 x 11”	9R - 9 x11”	11R - 11 x 12”	11R - 11 x 12”
Ground Pumps*				
Voltage	208/230	208/230	208/230	208/230
RLA [A]	1.42	1.42	1.42	1.42
Electric Heat				
Aux Heat [kW]	1	1.5	1.8	1.8
Emergency Heat [kW]**	3	4	6	6
Water Connections				
Ground Loop	Flo-Link Double O-Ring 1”	Flo-Link Double O-Ring 1”	Flo-Link Double O-Ring 1”	Flo-Link Double O-Ring 1”
Condensate	3/4” PVC Tubing	3/4” PVC Tubing	3/4” PVC Tubing	3/4” PVC Tubing
Weight				
Unpackaged [lbs]	307	342	358	367
Packaged [lbs]	340	375	391	400

NOTE: *There are 2 pumps per unit. **Emergency heat is only used when the compressor is disabled.

SECTION 8: UNIT DATA

Reference Tables

ACRONYMS

LRA (**LOCKED ROTOR AMPS)**: The current a motor will draw if the motor becomes locked/cannot turn.

RLA (**RATED LOAD AMPS)** The maximum current a motor can draw under ANY rated load condition.

FLA (**FULL LOAD AMPS)** The current a motor draws as its rated horsepower. Also, the current a heater draws at its rated voltage.

TOTAL UNIT FLA The sum of all motor and heater full load amps.

Minimum Circuit Ampacity (MCA) The minimum current carrying capacity of electrical service to the unit. Also, the minimum breaker size that will avoid nuisance trips.

MOP (**Maximum Overcurrent Protection)** The largest breaker size that can be used to properly protect the equipment under fault conditions.

Table 15 Fan performance data

Model	Default Airflow Heating [CFM]		Default Airflow Cooling [CFM]		Default Dehumidify [CFM]	Default Fan [CFM]	Min Airflow Heating [CFM]	Min Airflow Cooling [CFM]	
	Part Load	Full Load	Part Load	Full Load			Part Load & Full Load	Part Load	Full Load
DP1G072	1800	2300	1800	2300	1500	1500	1380	1420	1900
DP1G060	1500	1900	1600	2000	1300	1250	1150	1175	1600
DP1G048	1350	1600	1420	1680	1150	1130	920	940	1400
DP1G036	1130	1350	1130	1400	970	750	690	720	1210

NOTES: Operate as close to default airflows as acceptable to maximize performance and efficiency. Setting any mode's airflow below the minimum value will disable that mode. When part load cooling airflow is set near the minimum value, low thermostat settings will be limited (the unit will shut off with cold return air temperatures to protect the air coil from freezing). In emergency heat mode, blower will be set to maximum flow. If airflow for dehumidify is set below the cooling full load minimum the unit will only run the compressor in part load for dehumidify.

SECTION 8: Unit Data

Reference Tables (cont.)

Table 16 AHRI performance data

Model	Full Load Cooling		Full Load Heating		Part Load Cooling		Part Load Heating	
	Capacity [BTU/HR]	Efficiency [EER]	Capacity [BTU/HR]	Efficiency [COP]	Capacity [BTU/HR]	Efficiency [EER]	Capacity [BTU/HR]	Efficiency [COP]
DP1G036	39200	19.8	31000	4.6	29100	24.8	25000	5.1
DP1G048	51500	18.8	41500	4.4	37200	23.5	32700	4.9
DP1G060	62000	17.0	53000	4.5	47000	25.0	42000	4.7
DP1G072	70000	17.5	61000	4.3	57000	24.5	49000	4.6
AHRI Conditions								
EAT DB (°F)	80.6		68		80.6		68	
EAT WB (°F)	66.2		59		66.2		59	
EWT (°F)	77		32		68		41	

Table 17 Air max/min operating temperatures and pressures

Model	Max Entering Air Temp, Cool [°F]	Min Entering Air Temp, Cool [°F]	Max Entering Air Temp, Heat [°F]	Min Entering Air Temp, Heat [°F]	Max Static Pressure [“H2O]
DP1G036	90	65	80	50	1.2
DP1G048					1.15
DP1G060					1.1
DP1G072					0.95

Table 18 Water max/min operating temperatures & pressures

Model	Max Ground Loop Temp [°F]	Min Ground Loop Temp [°F]	Max Ground Loop Pressure [PSI]	Min Ground Loop Pressure [PSI]
DP1G036	104	23	60	10*
DP1G048				
DP1G060				
DP1G072				

All values are for 25% PG/H20

****Net positive suction head requirement (with pumps operating) at inlet to unit is 2PSI minimum***

SECTION 8: Unit Data

Reference Tables (cont.)

Table 19 R-410A refrigerant charge and maximum/minimum allowable pressures

Hardware Revision	Model	Refrigerant Type	Refrigerant Mass [lbs]	Refrigerant System Max Pressure [PSI]	Refrigerant System Min Pressure [PSI]
00	DP1G036	R410A	5.3	650	60
	DP1G048		6.0		
	DP1G060		6.0		
	DP1G072		6.0		
01	DP1G036		5.1		
	DP1G048		6.0		
	DP1G060		6.2		
	DP1G072		6.4		

Table 20 Ground loop flow vs. pressure

Hardware Revision	Model	Min Flow [GPM]	Max External Pressure Drop [ft H20]	Nominal Flow [GPM]	Max External Pressure Drop [ft H20]
00	DP1G036	7.5	75.3	9	70
	DP1G048	10	66.1	12	57.9
	DP1G060	12.5	56.4	15	46.5
	DP1G072	15	48.1	18	36.6
01	DP1G036	7.5	71	9	65
	DP1G048	10	62	12	53
	DP1G060	12.5	55	15	42
	DP1G072	15	41	18	27

All values are for 25% PG/H20 at 30°F entering water temperature

SECTION 8: UNIT DATA

Filter Performance

The blower performance data listed below takes into account performance WITHOUT A FILTER. In order to determine the approximate blower performance WITH FILTER, apply the filter pressure drop value for the filter being used or calculate the pressure as follows.

Below is typical filter performance data and should only be used as a guideline. Actual performance may vary between manufacturers.

Table 21 Filter performance data

	Return Size		
Model	**Height (in.)**	**Width (in.)**	**Area (ft^2)**
DP1G036	28	24	4.66
DP1G048			
DP1G060			
DP1G072			
Filter Type	**Thickness (in.)**	**Rated Velocity (fpm)**	**Initial Resistance (in. w.c.)**
MERV 8	2	500	0.19
MERV 11	2	500	0.30
MERV 13	2	500	0.30

To determine the Total ESP of a unit with the filter in place, follow the steps below:

1. Select the filter type and determine **Rated Velocity** and **Initial Resistance**.
2. For the model being considered, determine **Max ESP**, **CFM** and **Return Area**.
3. Determine filter pressure drop (ΔPs) using the equation below.
4. Measure (or calculate) the ESP without a filter in place.
5. Calculate **Total ESP = Measured ESP + Filter Pressure Drop**.
6. Total ESP should be less than or equal to Max ESP.

To calculate filter pressure drop:

$$Filter\ \Delta Ps = \left[\frac{\left|\frac{CFM}{Area}\right|}{Rated\ Velocity}\right] \times Initial\ Resistance$$

Filter Information

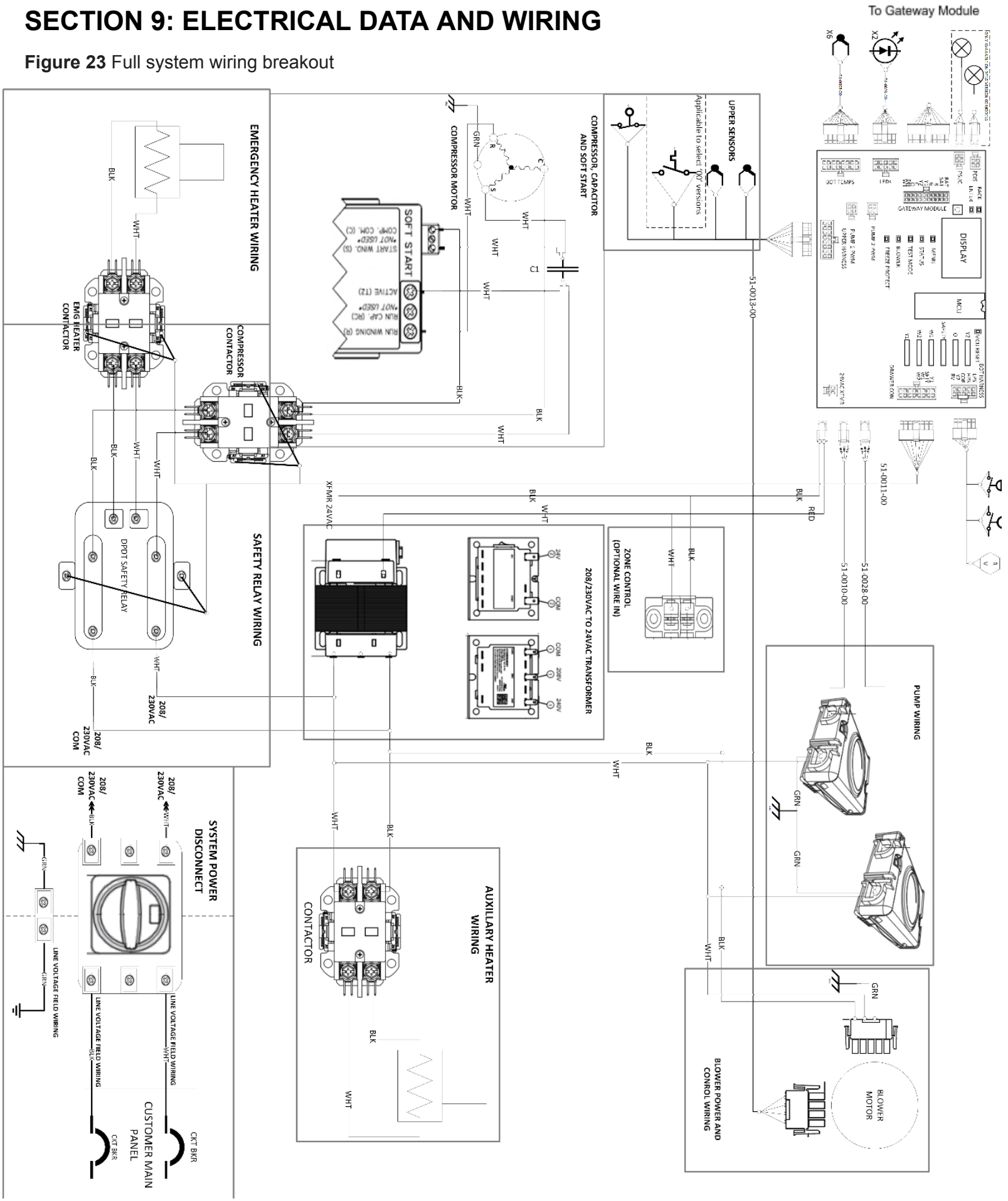
The filter rack on the Dandelion Geo accommodates 2” filters. Filters are factory default, industry standard sizes and can be easily sourced from local hardware stores.

Table 22 Recommended filters

Nominal Size (W x H x D)	Style	Filter Quantity
28” x 30” x 2”	Pleated Merv 11	1

SECTION 9: ELECTRICAL DATA AND WIRING

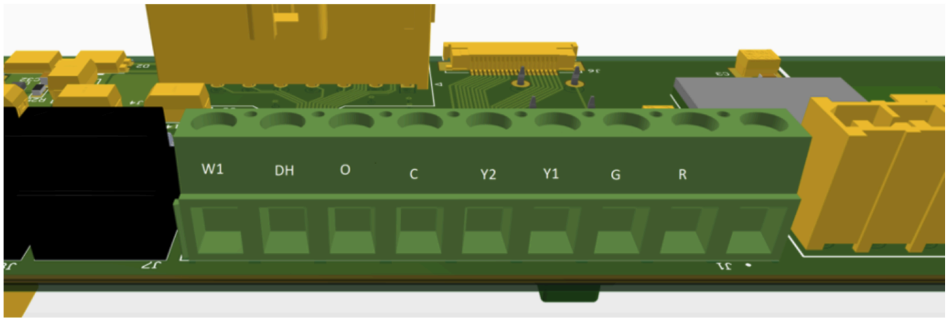
Figure 23 Full system wiring breakout

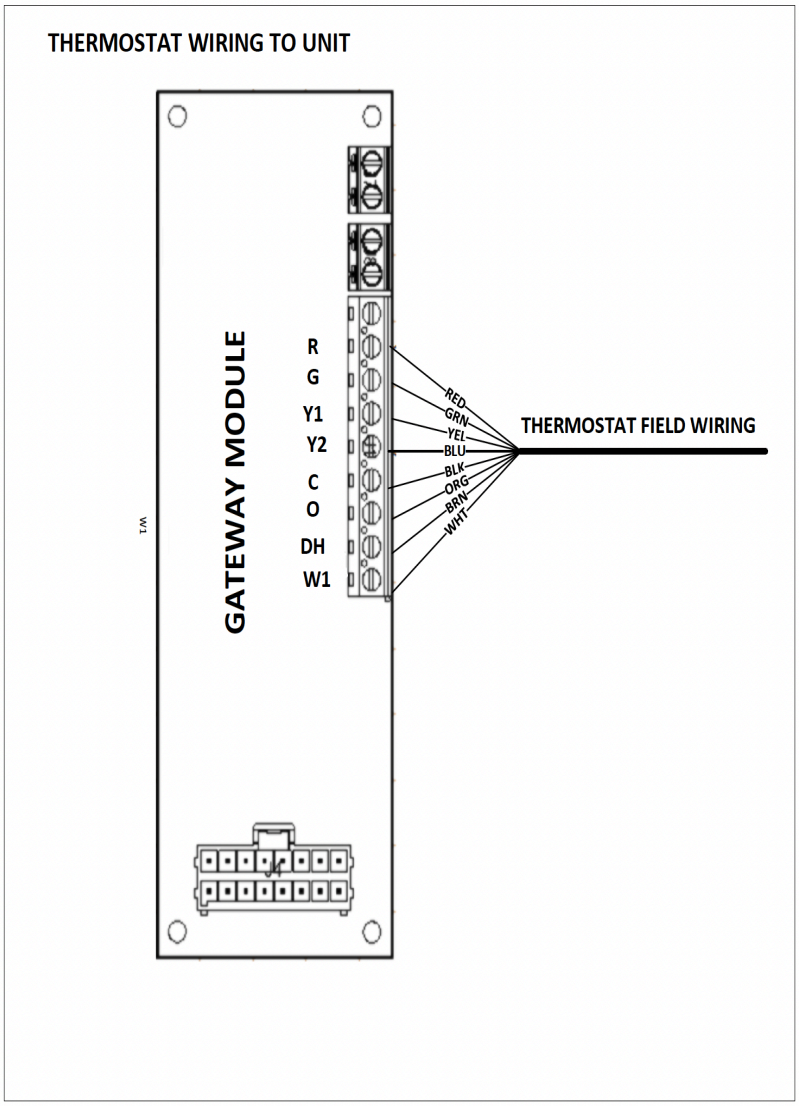


SECTION 9: ELECTRICAL DATA & WIRING

Thermostat Connections & Field Wiring

Figure 24 Thermostat wiring





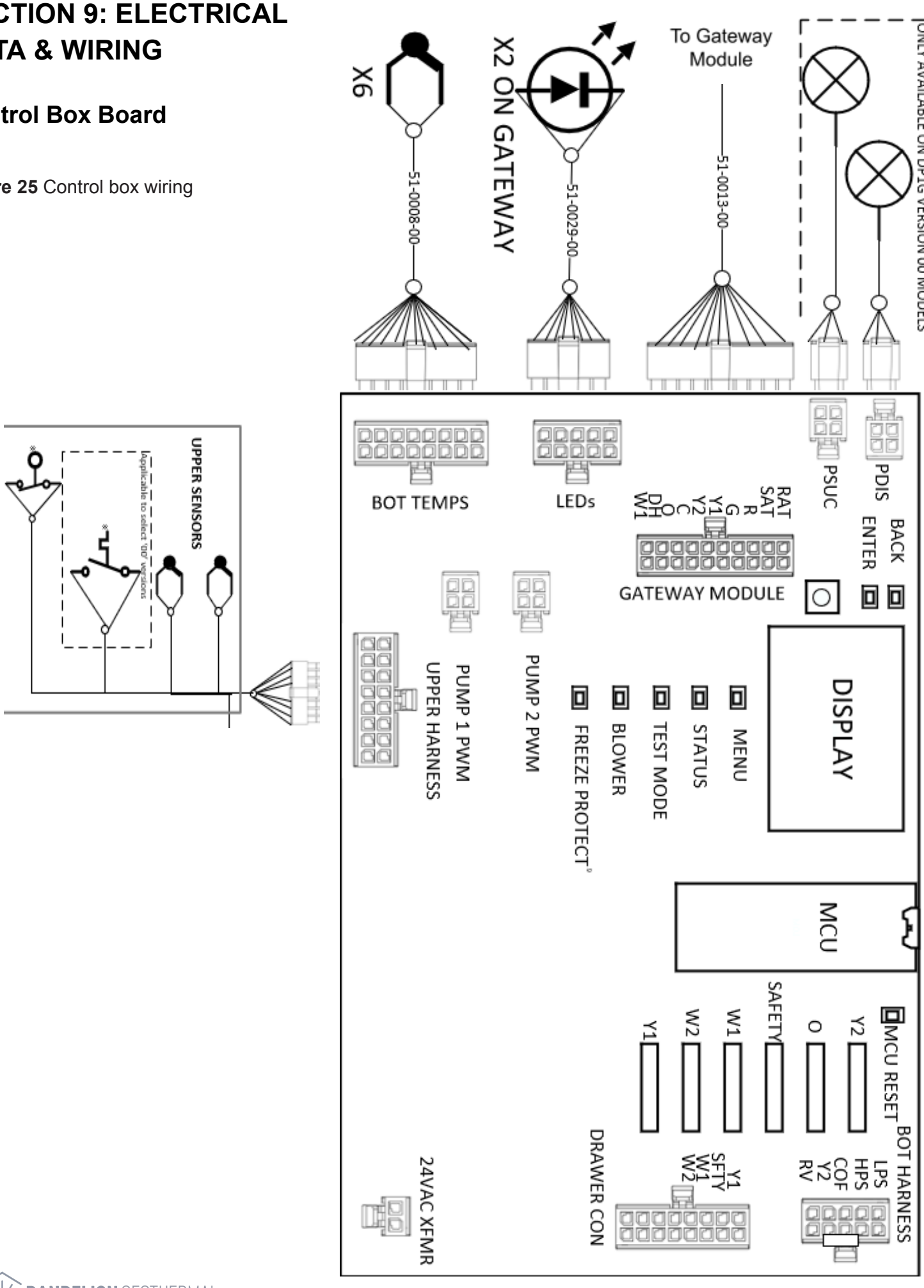
NOTES:

- Drawings represent a typical installation using wiring input knockouts marked on the outside of the control box cover.
- National and local electrical codes must be followed during installation of this unit.
- Use caution to avoid damaging the wiring and components during installation.
- Wiring shall be routed to avoid contact with other connections and temperature sensitive components.
- Assure all connections are securely fastened and routed to their proper locations.
- Install the thermostat per the manufacturer's instructions provided with that unit.

SECTION 9: ELECTRICAL DATA & WIRING

Control Box Board

Figure 25 Control box wiring

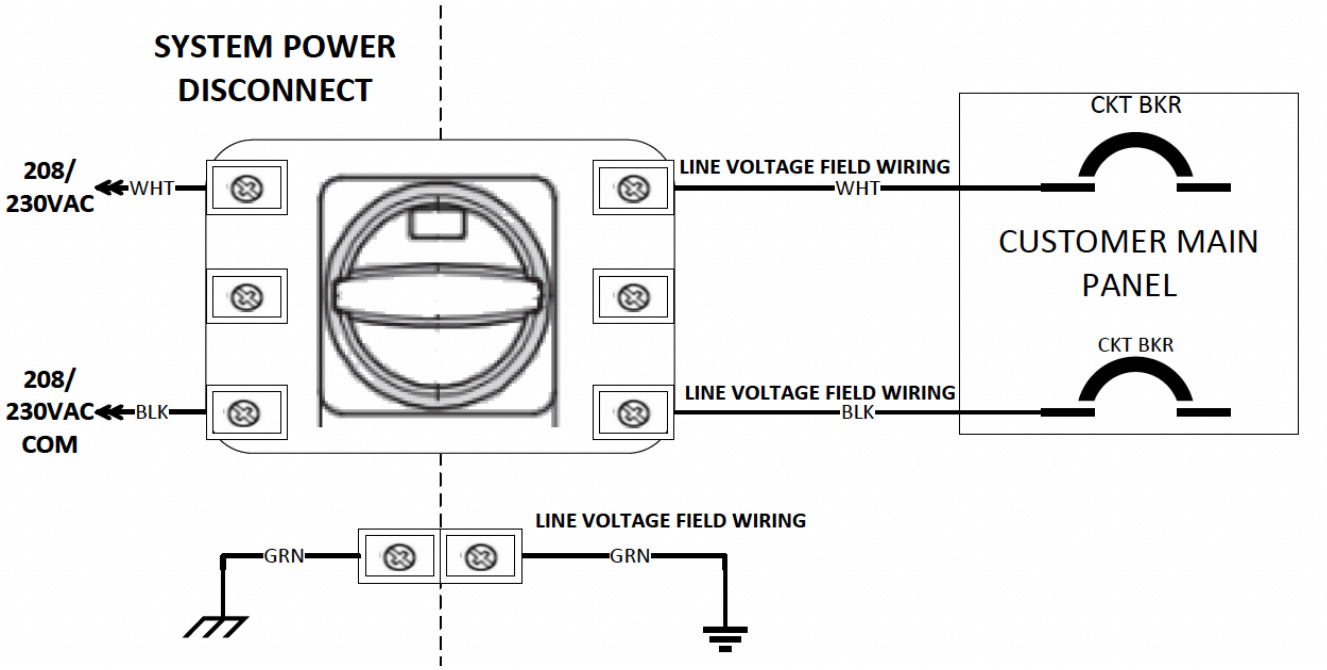


SECTION 9: ELECTRICAL DATA & WIRING

Emergency Stop (Disconnect) Switch

In the event of overvoltage or other emergency conditions, the Dandelion Geo unit includes an **Emergency Stop** switch. The switch enables full contact separation in all poles and complete disconnection from the supply mains.

Figure 26 System disconnect wiring



SECTION 10: UNIT WARNING MARKINGS/SAFETY

Warning markings physically located on the unit can be found here.

Electrical Warning Label

Located on the top left corner of all seven Geo removable panels.

Figure 27 Electrical warning label

Packaging Fragile Warning

Located along the top of each side of the Geo unit's packaging.

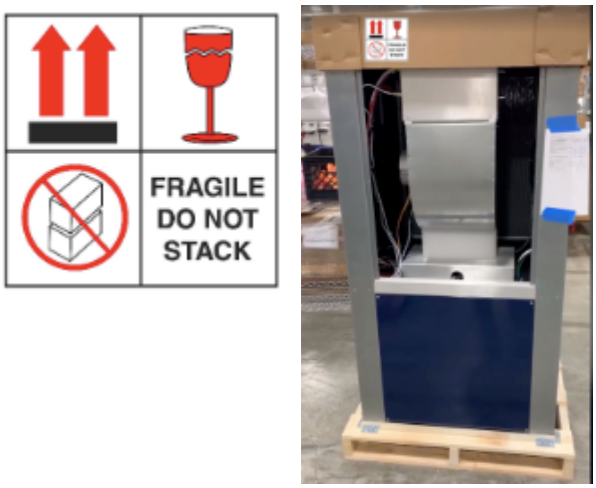


Figure 28 Packaging fragile warning

R-410A Refrigerant Label

Located directly on the compressor.

Figure 29 R-410A refrigerant label

SECTION 10: UNIT WARNING MARKINGS/SAFETY

Safety

NOTICES, CAUTIONS, WARNINGS, NOTES, & DANGERS

Attention should be paid to the following statements:

"NOTICE" is a notification of installation, operation, or maintenance information which is important, but is NOT hazard-related.

"CAUTION" indicates a potentially hazardous situation or an unsafe practice which, if not avoided, COULD result in minor or moderate injury or product or property damage.

"WARNING" indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

"DANGER" specifies an immediately hazardous situation which, if not avoided, WILL result in death or serious injury.

"NOTE" Notes are intended to clarify the unit installation, operation, and maintenance.

READ THE ENTIRE INSTALLATION, OPERATION, AND MAINTENANCE MANUAL. OTHER IMPORTANT SAFETY PRECAUTIONS ARE PROVIDED THROUGHOUT THIS MANUAL.

TAKE PRECAUTIONS DURING THE INSTALLATION OF THIS SYSTEM

1. The appliance must be installed in accordance with national wiring regulations.

2. The space necessary for the correct installation of the appliance must allow for the minimum permissible distance to adjacent structures.

3. Keep all units covered on the job site with either the original packaging or protective covering to prevent damage or contamination from foreign materials.

4. Cap or recap unit connections and all piping until the unit is installed.

5. All geothermal units should be stored inside original packaging in a clean, dry location.

6. Units should be stored in an upright position at all times and not stacked unless specially noted on the packaging.

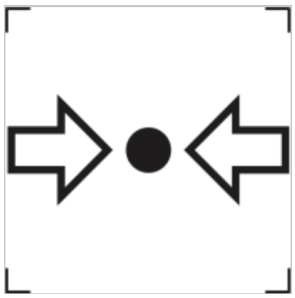
7. Geothermal units removed from service should have all components, oils, antifreeze, and refrigerants properly disposed of according to all local and national environmental recycling codes, regulations, standards, and rules.

8. The appliance is not to be used 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. Children being supervised are not to play with the appliance.

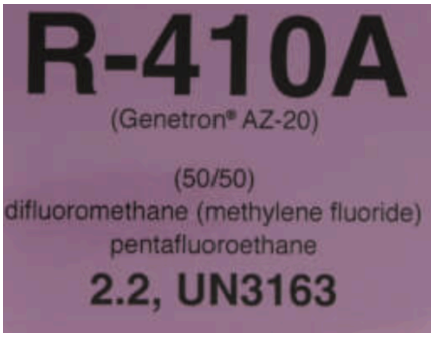
SECTION 10: UNIT WARNING MARKINGS/SAFETY

Safety (cont.)

9. The system contains refrigerant under very high pressure and must only be serviced by qualified persons.



R-410A Max Pressure = 4.2 MPa



10. This system uses R-410A refrigerant and has been tested for safe use where the maximum pressure as determined in Annex EE (UL 60335-2-40) is **4.2 MPa**.

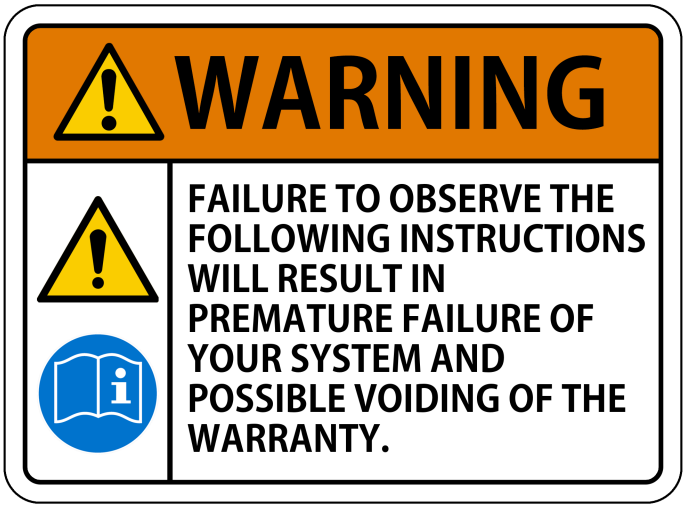
11. All systems are factory assembled, leak tested, and run tested.

12. Startup and service must be performed by a factory trained Service Technician.

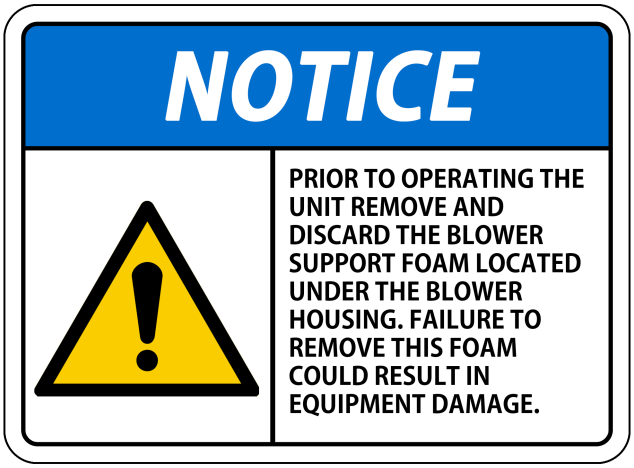
13. The unit is for indoor use only.

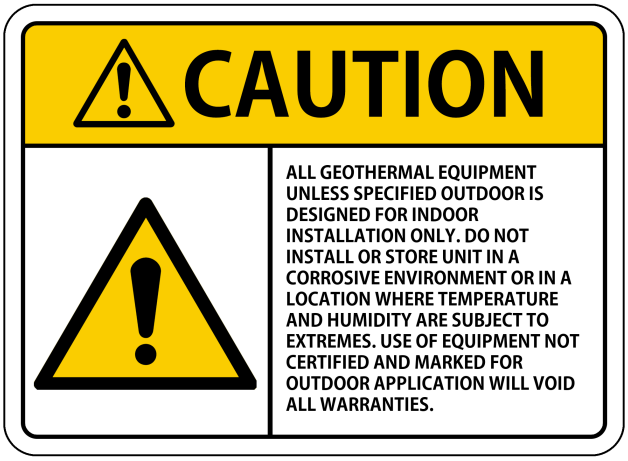
14. Every unit has a unique equipment nameplate with electrical, operational, and unit clearance specifications. Always refer to the unit nameplate for specific ratings unique to the model you have purchased.

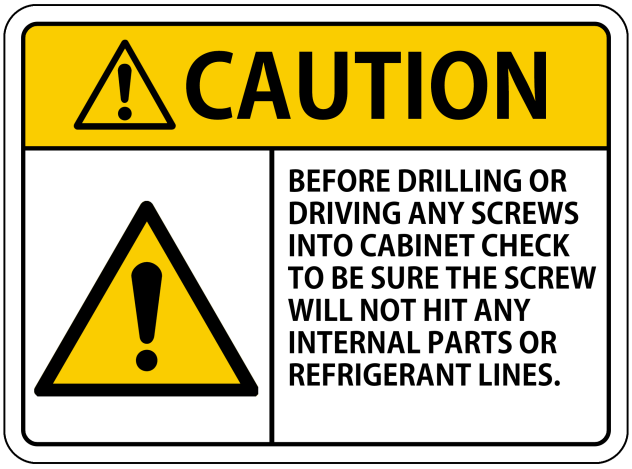
15. Always control the unit from the thermostat or control panel, never at the main power supply, except for emergency or complete shutdown of the unit.

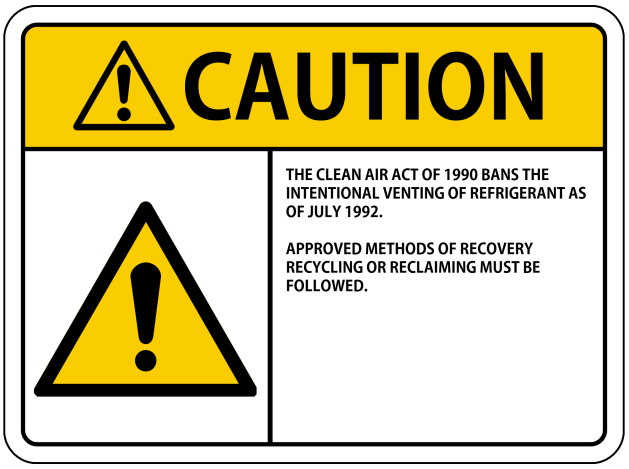


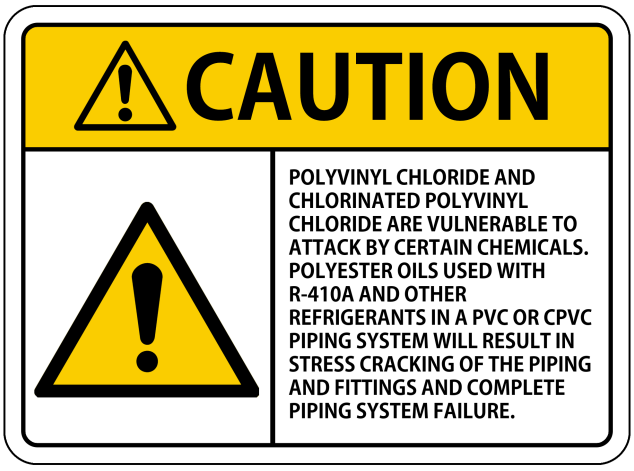
SECTION 10: UNIT WARNING MARKINGS/SAFETY



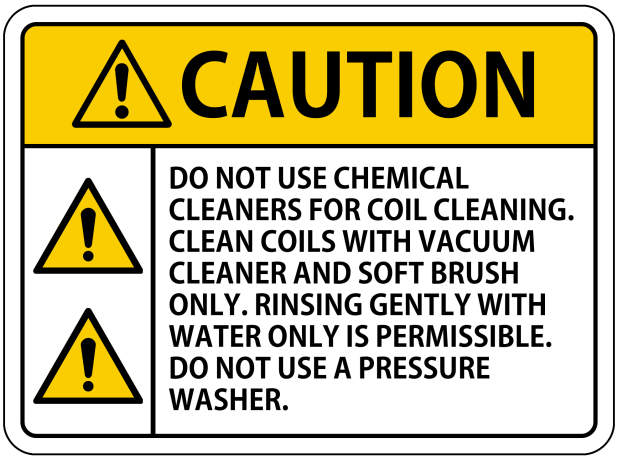


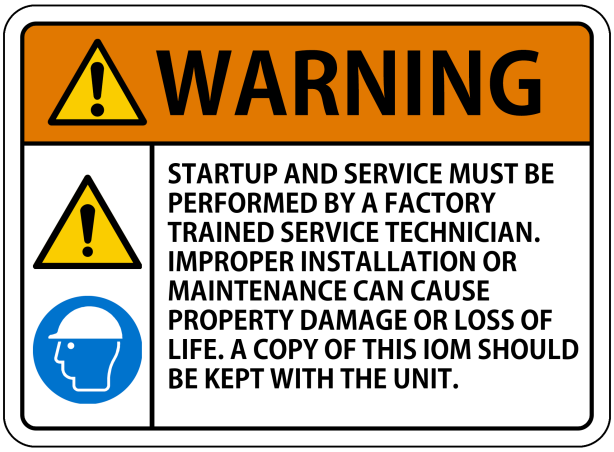


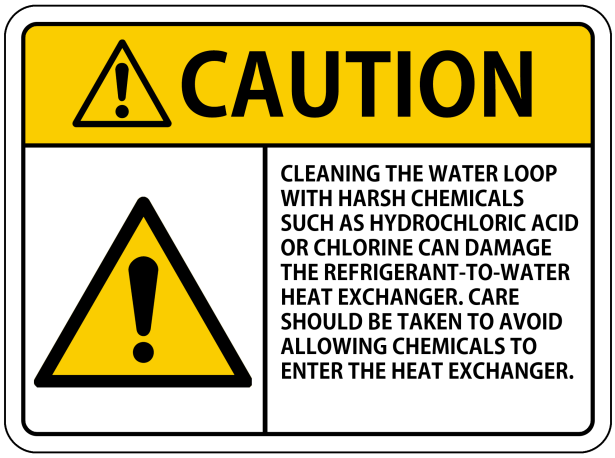




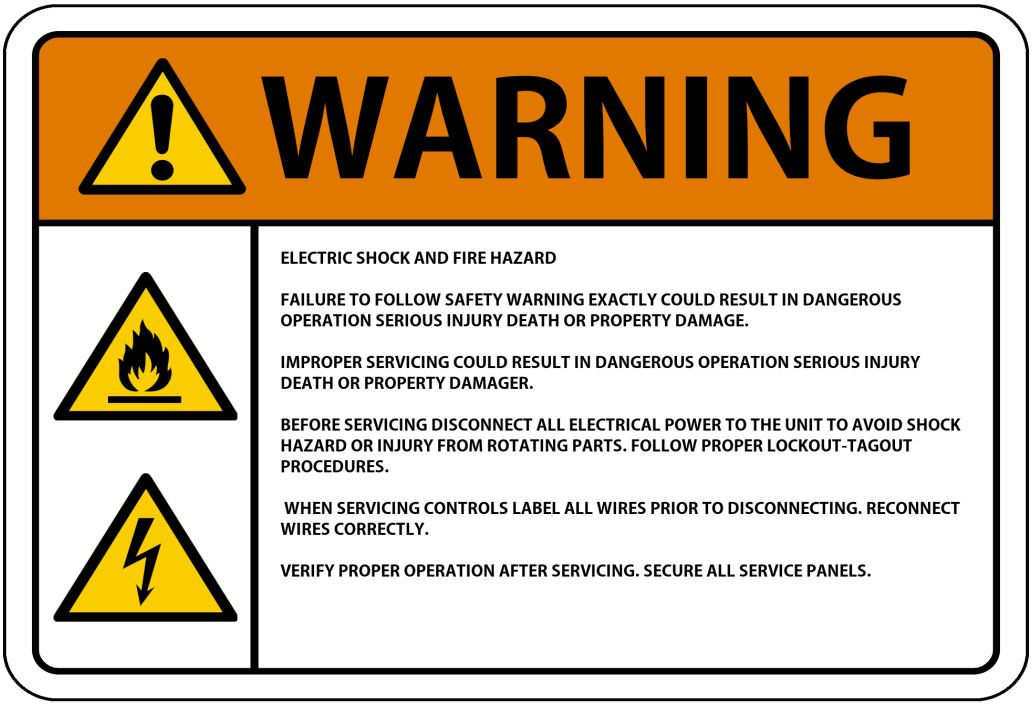
SECTION 10: UNIT WARNING MARKINGS/SAFETY

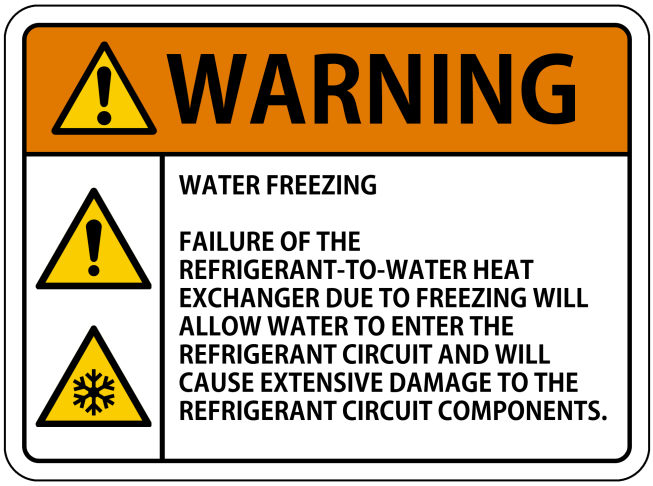






SECTION 10: UNIT WARNING MARKINGS/SAFETY





SECTION 11: UNIT PERFORMANCE DATA

GP1G036 Full Load Performance Data

	HEATING - 70F EAT						
EWT F	FLOW GPM	Dp, max FT*	AIFLOW CFM	HC MBtu/hr	HE MBtu/hr	Power kW	COP
25	7.5	75.3	690	27.81	20.15	2.24	3.64
			1350	28.53	20.75	2.22	3.76
	9	70	690	28.71	20.63	2.16	3.90
			1350	29.35	21.18	2.20	3.90
30	7.5	75.3	690	29.76	22.78	2.28	3.83
			1350	30.46	23.47	2.26	3.96
	9	70	690	30.66	22.37	2.22	4.05
			1350	31.54	23.27	2.26	4.09
40	7.5	75.3	690	34.51	25.78	2.37	4.27
			1350	35.16	26.55	2.34	4.40
	9	70	690	35.55	26.31	2.35	4.44
			1350	36.20	27.09	2.32	4.57
50	7.5	75.3	690	38.77	29.49	2.43	4.67
			1350	39.38	30.38	2.40	4.80
	9	70	690	39.86	30.77	2.43	4.81
			1350	40.27	30.77	2.39	4.94
60	7.5	75.3	690	44.64	35.00	2.59	5.05
			1350	45.19	36.05	2.55	5.20
	9	70	690	45.99	35.72	2.57	5.25
			1350	46.53	36.79	2.52	5.40
70	7.5	75.3	690	50.76	40.54	2.75	5.40
			1350	51.25	41.75	2.70	5.57
	9	70	690	52.31	41.36	2.73	5.62
			1350	52.78	42.61	2.67	5.79
80	Operation in heating above 70F EWT is not recommended						
90							
100							
110							

COOLING - 80/67F EAT						
FLOW GPM	Dp, max FT*	AIFLOW CFM	TC MBtu/hr	HR MBtu/hr	Power kW	EER
Operation in cooling below 60F EWT is not recommended						
7.5	75.3	1210	37.97	45.08	1.92	19.74
		1400	38.98	46.62	2.06	18.94
9	70	1210	39.68	46.71	1.94	20.42
		1400	40.73	48.31	2.08	19.59
7.5	75.3	1210	36.92	44.40	2.01	18.35
		1400	37.89	45.92	2.15	17.61
9	70	1210	38.57	46.01	2.03	18.98
		1400	39.60	47.58	2.17	18.21
7.5	75.3	1210	34.99	43.49	2.20	15.88
		1400	35.90	44.98	2.36	15.24
9	70	1210	36.60	45.08	2.23	16.44
		1400	37.52	46.62	2.38	15.78
7.5	75.3	1210	32.70	41.73	2.34	13.94
		1400	33.54	43.15	2.51	13.38
9	70	1210	34.17	43.24	2.37	14.42
		1400	35.05	44.72	2.53	13.84
7.5	75.3	1210	31.10	41.17	2.59	11.99
		1400	31.89	42.58	2.77	11.51
9	70	1210	32.51	42.67	2.62	12.40
		1400	33.34	44.12	2.80	11.90
7.5	75.3	1210	29.66	40.76	2.79	10.64
		1400	30.41	42.15	2.98	10.21
9	70	1210	31.00	42.24	2.82	11.00
		1400	31.79	43.68	3.01	10.56

*See **Table 20** for variation in max ground loop pressure drop across hardware revisions

Abbreviations:

HC = Heating Capacity
HE = Heat Extracted (from ground loop)
TC = Total Cooling (capacity)
HR = Heat Rejected (to ground loop)

Notes:

Power data includes blower work at 0.6” H2O static and pump work at 10 ft. ground loop pressure drop, at nominal flow rate. COP/EER calculations here include blower and pump power.

SECTION 11: UNIT PERFORMANCE DATA

GP1G036 Partial Load Performance Data

	HEATING - 70F EAT						
EWT F	FLOW GPM	Dp, max FT*	AIFLOW CFM	HC MBtu/hr	HE MBtu/hr	Power kW	COP
25	7.5	75.3	690	20.28	14.01	1.62	3.67
			1130	20.37	14.14	1.72	3.47
	9	70	690	19.93	13.99	1.58	3.69
			1130	20.37	14.28	1.69	3.53
30	7.5	75.3	690	21.78	15.61	1.62	3.94
			1130	21.85	15.75	1.72	3.72
	9	70	690	21.72	15.84	1.58	4.03
			1130	21.80	15.99	1.68	3.80
40	7.5	75.3	690	25.12	19.14	1.57	4.68
			1130	25.14	19.32	1.68	4.40
	9	70	690	25.77	19.63	1.64	4.61
			1130	25.78	19.80	1.74	4.34
50	7.5	75.3	690	28.67	23.13	1.56	5.37
			1130	28.64	22.74	1.71	4.90
	9	70	690	28.85	23.13	1.60	5.30
			1130	28.67	22.74	1.75	4.81
60	7.5	75.3	690	32.38	26.19	1.67	5.70
			1130	32.30	25.75	1.82	5.21
	9	70	690	32.44	26.19	1.70	5.59
			1130	32.36	25.75	1.85	5.12
70	7.5	75.3	690	35.93	29.50	1.78	5.91
			1130	35.80	29.00	1.93	5.43
	9	70	690	36.01	29.50	1.82	5.80
			1130	35.87	29.00	1.97	5.34
80	Operation in heating above 70F EWT is not recommended						
90							
100							
110							

COOLING - 80/67F EAT						
FLOW GPM	Dp, max FT*	AIFLOW CFM	TC MBtu/hr	HR MBtu/hr	Power kW	EER
Operation in cooling below 60F EWT is not recommended						
7.5	75.3	970	27.05	31.37	1.28	21.09
		1130	28.18	32.82	1.37	20.61
9	70	970	28.03	32.28	1.32	21.28
		1130	29.20	33.76	1.40	20.82
7.5	75.3	970	25.99	30.58	1.33	19.60
		1130	27.07	31.98	1.41	19.17
9	70	970	26.93	31.46	1.36	19.78
		1130	28.05	32.91	1.45	19.36
7.5	75.3	970	25.32	30.83	1.50	16.93
		1130	26.36	32.25	1.59	16.61
9	70	970	26.24	31.71	1.49	17.65
		1130	27.33	33.17	1.63	16.78
7.5	75.3	970	25.29	31.41	1.63	15.56
		1130	26.33	32.85	1.72	15.31
9	70	970	26.20	32.31	1.67	15.69
		1130	27.29	33.80	1.77	15.44
7.5	75.3	970	23.72	30.83	1.83	12.96
		1130	24.69	32.24	1.93	12.78
9	70	970	24.59	31.71	1.88	13.06
		1130	25.59	33.17	1.99	12.89
7.5	75.3	970	22.06	29.89	1.98	11.13
		1130	22.95	31.26	2.09	10.99
9	70	970	22.86	30.75	2.04	11.22
		1130	23.79	32.16	2.15	11.08

*See **Table 20** for variation in max ground loop pressure drop across hardware revisions

Abbreviations:

HC = Heating Capacity
HE = Heat Extracted (from ground loop)
TC = Total Cooling (capacity)
HR = Heat Rejected (to ground loop)

Notes:

Power data includes blower work at 0.6” H2O static and pump work at 10 ft. ground loop pressure drop, at nominal flow rate. COP/EER calculations here include blower and pump power.

SECTION 11: UNIT PERFORMANCE DATA

GP1G048 Full Load Performance Data

	HEATING - 70F EAT						
EWT F	FLOW GPM	Dp, max FT*	AIFLOW CFM	HC MBtu/hr	HE MBtu/hr	Power kW	COP
25	10	66.1	920	36.96	26.64	3.12	3.47
			1600	37.64	27.43	3.05	3.62
	12	57.9	920	38.17	27.27	3.00	3.73
			1600	38.75	27.99	3.02	3.76
30	10	66.1	920	39.58	30.11	3.17	3.66
			1600	40.23	31.02	3.09	3.81
	12	57.9	920	40.78	29.57	3.09	3.87
			1600	41.67	30.75	3.10	3.94
40	10	66.1	920	45.93	34.08	3.30	4.08
			1600	46.52	35.10	3.21	4.24
	12	57.9	920	47.33	34.77	3.27	4.24
			1600	47.91	35.81	3.19	4.41
50	10	66.1	920	51.63	38.98	3.39	4.46
			1600	52.16	40.15	3.30	4.63
	12	57.9	920	53.10	40.68	3.38	4.60
			1600	53.36	40.68	3.28	4.76
60	10	66.1	920	59.49	46.27	3.61	4.83
			1600	59.94	47.66	3.50	5.02
	12	57.9	920	61.31	47.21	3.58	5.02
			1600	61.74	48.63	3.47	5.22
70	10	66.1	920	67.69	53.58	3.84	5.17
			1600	68.06	55.19	3.71	5.38
	12	57.9	920	69.76	54.68	3.80	5.38
			1600	70.11	56.32	3.68	5.59
80	Operation in heating above 70F EWT is not recommended						
90							
100							
110							

	COOLING - 80/67F EAT					
FLOW GPM	Dp, max FT*	AIFLOW CFM	TC MBtu/hr	HR MBtu/hr	Power kW	EER
Operation in cooling below 60F EWT is not recommended						
10	66.1	1400	49.95	59.69	2.60	19.18
		1680	51.35	61.72	2.81	18.28
12	57.9	1400	52.19	61.85	2.63	19.83
		1680	53.66	63.96	2.84	18.90
10	66.1	1400	48.56	58.79	2.73	17.82
		1680	49.92	60.79	2.94	16.99
12	57.9	1400	50.74	60.92	2.75	18.42
		1680	52.16	63.00	2.97	17.57
10	66.1	1400	46.04	57.59	2.99	15.39
		1680	47.32	59.55	3.22	14.69
12	57.9	1400	48.15	59.69	3.02	15.92
		1680	49.44	61.73	3.25	15.20
10	66.1	1400	43.02	55.25	3.19	13.50
		1680	44.20	57.14	3.43	12.89
12	57.9	1400	44.95	57.25	3.22	13.95
		1680	46.20	59.21	3.47	13.33
10	66.1	1400	40.93	54.52	3.53	11.59
		1680	42.05	56.38	3.80	11.08
12	57.9	1400	42.77	56.49	3.57	11.98
		1680	43.95	58.42	3.84	11.45
10	66.1	1400	39.03	53.97	3.80	10.27
		1680	40.09	55.81	4.08	9.82
12	57.9	1400	40.79	55.93	3.84	10.61
		1680	41.91	57.83	4.13	10.15

*See **Table 20** for variation in max ground loop pressure drop across hardware revisions

Abbreviations:

HC = Heating Capacity
HE = Heat Extracted (from ground loop)
TC = Total Cooling (capacity)
HR = Heat Rejected (to ground loop)

Notes:

Power data includes blower work at 0.6” H2O static and pump work at 10 ft. ground loop pressure drop, at nominal flow rate. COP/EER calculations here include blower and pump power.

SECTION 11: UNIT PERFORMANCE DATA

GP1G048 Partial Load Performance Data

	HEATING - 70F EAT						
EWT F	FLOW GPM	Dp, max FT*	AIFLOW CFM	HC MBtu/hr	HE MBtu/hr	Power kW	COP
25	10	66.1	920	26.28	18.14	2.20	3.51
			1350	26.27	18.31	2.23	3.46
	12	57.9	920	25.83	18.11	2.15	3.52
			1350	26.27	18.49	2.19	3.52
30	10	66.1	920	28.25	20.21	2.20	3.77
			1350	28.21	20.39	2.23	3.71
	12	57.9	920	28.17	20.52	2.14	3.86
			1350	28.14	20.71	2.17	3.79
40	10	66.1	920	32.61	24.79	2.14	4.48
			1350	32.51	25.01	2.17	4.39
	12	57.9	920	33.46	25.42	2.22	4.41
			1350	33.34	25.65	2.26	4.33
50	10	66.1	920	37.26	29.96	2.12	5.15
			1350	37.09	29.45	2.22	4.90
	12	57.9	920	37.50	29.95	2.17	5.07
			1350	37.13	29.45	2.27	4.80
60	10	66.1	920	42.11	33.92	2.26	5.46
			1350	41.87	33.34	2.36	5.20
	12	57.9	920	42.20	33.92	2.31	5.36
			1350	41.96	33.34	2.41	5.11
70	10	66.1	920	46.76	38.20	2.42	5.67
			1350	46.46	37.55	2.52	5.41
	12	57.9	920	46.85	38.20	2.47	5.56
			1350	46.55	37.55	2.57	5.31
80	Operation in heating above 70F EWT is not recommended						
90							
100							
110							

	COOLING - 80/67F EAT					
FLOW GPM	Dp, max FT*	AIFLOW CFM	TC MBtu/hr	HR MBtu/hr	Power kW	EER
Operation in cooling below 60F EWT is not recommended						
10	66.1	1150	34.60	40.37	1.72	20.14
		1420	36.07	42.23	1.82	19.78
12	57.9	1150	35.85	41.54	1.76	20.32
		1420	37.38	43.45	1.87	19.97
10	66.1	1150	33.24	39.35	1.78	18.72
		1420	34.65	41.16	1.88	18.39
12	57.9	1150	34.44	40.48	1.82	18.88
		1420	35.91	42.35	1.93	18.57
10	66.1	1150	32.38	39.67	2.00	16.15
		1420	33.75	41.50	2.12	15.92
12	57.9	1150	33.56	40.81	1.99	16.84
		1420	34.98	42.69	2.18	16.07
10	66.1	1150	32.34	40.42	2.18	14.84
		1420	33.71	42.28	2.30	14.66
12	57.9	1150	33.51	41.58	2.24	14.96
		1420	34.93	43.50	2.36	14.78
10	66.1	1150	30.34	39.67	2.46	12.35
		1420	31.62	41.50	2.59	12.23
12	57.9	1150	31.44	40.81	2.53	12.45
		1420	32.77	42.69	2.66	12.33
10	66.1	1150	28.21	38.46	2.66	10.61
		1420	29.39	40.23	2.80	10.51
12	57.9	1150	29.24	39.57	2.74	10.69
		1420	30.46	41.39	2.88	10.60

*See **Table 20** for variation in max ground loop pressure drop across hardware revisions

Abbreviations:

HC = Heating Capacity
HE = Heat Extracted (from ground loop)
TC = Total Cooling (capacity)
HR = Heat Rejected (to ground loop)

Notes:

Power data includes blower work at 0.6” H2O static and pump work at 10 ft. ground loop pressure drop, at nominal flow rate. COP/EER calculations here include blower and pump power.

SECTION 11: UNIT PERFORMANCE DATA

GP1G060 Full Load Performance Data

	HEATING - 70F EAT						
EWT F	FLOW GPM	Dp, max FT*	AIFLOW CFM	HC MBtu/hr	HE MBtu/hr	Power kW	COP
25	12.5	56.4	1150	47.46	33.78	4.07	3.42
			1900	47.52	34.80	3.95	3.53
	15	46.5	1150	49.00	34.59	3.92	3.66
			1900	48.94	35.51	3.91	3.66
30	12.5	56.4	1150	50.80	38.19	4.14	3.60
			1900	50.83	39.34	4.01	3.71
	15	46.5	1150	52.33	37.51	4.03	3.80
			1900	52.68	39.01	4.02	3.84
40	12.5	56.4	1150	58.92	43.22	4.31	4.01
			1900	58.87	44.52	4.17	4.14
	15	46.5	1150	60.70	44.10	4.27	4.17
			1900	60.64	45.43	4.13	4.30
50	12.5	56.4	1150	66.19	49.44	4.43	4.38
			1900	66.07	50.93	4.28	4.53
	15	46.5	1150	68.07	51.59	4.42	4.52
			1900	67.61	51.59	4.26	4.66
60	12.5	56.4	1150	76.23	58.68	4.72	4.74
			1900	76.01	60.44	4.54	4.91
	15	46.5	1150	78.55	59.88	4.67	4.93
			1900	78.31	61.68	4.50	5.10
70	12.5	56.4	1150	86.70	67.96	5.01	5.07
			1900	86.38	70.00	4.81	5.26
	15	46.5	1150	89.35	69.35	4.97	5.27
			1900	89.00	71.43	4.77	5.47
80	Operation in heating above 70F EWT is not recommended						
90							
100							
110							

COOLING - 80/67F EAT						
FLOW GPM	Dp, max FT*	AIFLOW CFM	TC MBtu/hr	HR MBtu/hr	Power kW	EER
Operation in cooling below 60F EWT is not recommended						
12.5	56.4	1600	60.18	73.02	3.40	17.72
		2000	61.78	75.52	3.69	16.74
15	46.5	1600	62.88	75.67	3.43	18.31
		2000	64.56	78.26	3.73	17.31
12.5	56.4	1600	58.51	71.93	3.56	16.44
		2000	60.06	74.38	3.86	15.55
15	46.5	1600	61.13	74.53	3.60	16.99
		2000	62.76	77.08	3.90	16.08
12.5	56.4	1600	55.47	70.46	3.91	14.18
		2000	56.93	72.86	4.24	13.43
15	46.5	1600	58.02	73.03	3.96	14.66
		2000	59.49	75.52	4.28	13.90
12.5	56.4	1600	51.84	67.60	4.17	12.42
		2000	53.18	69.90	4.52	11.78
15	46.5	1600	54.17	70.05	4.22	12.84
		2000	55.58	72.44	4.57	12.17
12.5	56.4	1600	49.32	66.70	4.63	10.65
		2000	50.58	68.98	5.00	10.11
15	46.5	1600	51.54	69.12	4.68	11.00
		2000	52.87	71.48	5.06	10.45
12.5	56.4	1600	47.04	66.03	4.99	9.42
		2000	48.23	68.28	5.39	8.95
15	46.5	1600	49.16	68.42	5.05	9.74
		2000	50.42	70.76	5.45	9.26

*See **Table 20** for variation in max ground loop pressure drop across hardware revisions

Abbreviations:

HC = Heating Capacity
HE = Heat Extracted (from ground loop)
TC = Total Cooling (capacity)
HR = Heat Rejected (to ground loop)

Notes:

Power data includes blower work at 0.6” H2O static and pump work at 10 ft. ground loop pressure drop, at nominal flow rate. COP/EER calculations here include blower and pump power.

SECTION 11: UNIT PERFORMANCE DATA

GP1G060 Partial Load Performance Data

	HEATING - 70F EAT						
EWT F	FLOW GPM	Dp, max FT*	AIFLOW CFM	HC MBtu/hr	HE MBtu/hr	Power kW	COP
25	12.5	56.4	1150	33.73	23.05	2.93	3.38
			1500	33.55	23.26	2.92	3.37
	15	46.5	1150	33.14	23.01	2.87	3.39
			1500	33.55	23.49	2.87	3.43
30	12.5	56.4	1150	36.26	25.67	2.93	3.62
			1500	36.04	25.90	2.92	3.62
	15	46.5	1150	36.16	26.06	2.86	3.71
			1500	35.96	26.31	2.85	3.70
40	12.5	56.4	1150	41.86	31.49	2.85	4.31
			1500	41.56	31.78	2.84	4.29
	15	46.5	1150	42.95	32.29	2.97	4.24
			1500	42.64	32.58	2.96	4.23
50	12.5	56.4	1150	47.83	38.05	2.83	4.96
			1500	47.45	37.41	2.91	4.78
	15	46.5	1150	48.13	38.05	2.89	4.88
			1500	47.50	37.41	2.97	4.69
60	12.5	56.4	1150	54.06	43.09	3.01	5.26
			1500	53.60	42.36	3.09	5.08
	15	46.5	1150	54.17	43.09	3.08	5.16
			1500	53.70	42.36	3.16	4.98
70	12.5	56.4	1150	60.03	48.53	3.23	5.45
			1500	59.48	47.71	3.31	5.27
	15	46.5	1150	60.15	48.53	3.30	5.35
			1500	59.60	47.71	3.38	5.18
80	Operation in heating above 70F EWT is not recommended						
90							
100							
110							

	COOLING - 80/67F EAT						
FLOW GPM	Dp, max FT*	AIFLOW CFM	TC MBtu/hr	HR MBtu/hr	Power kW	EER
Operation in cooling below 60F EWT is not recommended						
12.5	56.4	1300	43.87	51.42	2.24	19.54
		1600	45.68	53.79	2.38	19.22
15	46.5	1300	45.45	52.90	2.31	19.70
		1600	47.33	55.33	2.44	19.39
12.5	56.4	1300	42.16	50.12	2.32	18.15
		1600	43.89	52.42	2.46	17.86
15	46.5	1300	43.68	51.56	2.39	18.29
		1600	45.48	53.93	2.52	18.02
12.5	56.4	1300	41.07	50.53	2.63	15.61
		1600	42.75	52.85	2.77	15.41
15	46.5	1300	42.56	51.98	2.61	16.28
		1600	44.31	54.37	2.85	15.54
12.5	56.4	1300	41.02	51.48	2.86	14.32
		1600	42.70	53.85	3.02	14.15
15	46.5	1300	42.50	52.96	2.95	14.42
		1600	44.25	55.40	3.10	14.27
12.5	56.4	1300	38.50	50.52	3.24	11.89
		1600	40.06	52.85	3.40	11.78
15	46.5	1300	39.89	51.98	3.33	11.98
		1600	41.51	54.37	3.50	11.87
12.5	56.4	1300	35.81	48.98	3.51	10.20
		1600	37.24	51.24	3.68	10.11
15	46.5	1300	37.11	50.39	3.61	10.27
		1600	38.60	52.71	3.79	10.19

*See **Table 20** for variation in max ground loop pressure drop across hardware revisions

Abbreviations:

HC = Heating Capacity
HE = Heat Extracted (from ground loop)
TC = Total Cooling (capacity)
HR = Heat Rejected (to ground loop)

Notes:

Power data includes blower work at 0.6” H2O static and pump work at 10 ft. ground loop pressure drop, at nominal flow rate. COP/EER calculations here include blower and pump power.

SECTION 11: UNIT PERFORMANCE DATA

GP1G072 Full Load Performance Data

	HEATING - 70F EAT						
EWT F	FLOW GPM	Dp, max FT*	AIFLOW CFM	HC MBtu/hr	HE MBtu/hr	Power kW	COP
25	15	48.1	1380	54.34	38.88	4.70	3.39
			2300	54.61	40.05	4.57	3.50
	18	36.6	1380	56.11	39.81	4.52	3.63
			2300	56.24	40.87	4.53	3.64
30	15	48.1	1380	58.19	43.96	4.78	3.57
			2300	58.42	45.28	4.64	3.69
	18	36.6	1380	59.95	43.17	4.65	3.78
			2300	60.54	44.90	4.65	3.82
40	15	48.1	1380	67.53	49.74	4.97	3.98
			2300	67.67	51.24	4.82	4.12
	18	36.6	1380	69.58	50.76	4.93	4.14
			2300	69.70	52.28	4.77	4.28
50	15	48.1	1380	75.90	56.91	5.11	4.35
			2300	75.96	58.61	4.95	4.50
	18	36.6	1380	78.06	59.38	5.10	4.49
			2300	77.72	59.38	4.92	4.63
60	15	48.1	1380	87.46	67.54	5.44	4.71
			2300	87.39	69.57	5.25	4.88
	18	36.6	1380	90.13	68.92	5.39	4.90
			2300	90.04	70.99	5.20	5.07
70	15	48.1	1380	99.51	78.22	5.78	5.04
			2300	99.33	80.57	5.56	5.23
	18	36.6	1380	102.55	79.82	5.73	5.25
			2300	102.34	82.21	5.51	5.44
80	Operation in heating above 70F EWT is not recommended						
90							
100							
110							

COOLING - 80/67F EAT						
FLOW GPM	Dp, max FT*	AIFLOW CFM	TC MBtu/hr	HR MBtu/hr	Power kW	EER
Operation in cooling below 60F EWT is not recommended						
15	48.1	1900	67.90	82.05	3.77	18.01
		2300	69.72	84.85	4.07	17.12
18	36.6	1900	70.94	85.03	3.81	18.62
		2300	72.86	87.93	4.12	17.71
15	48.1	1900	66.01	80.82	3.95	16.72
		2300	67.78	83.58	4.26	15.90
18	36.6	1900	68.97	83.75	3.99	17.28
		2300	70.83	86.61	4.31	16.45
15	48.1	1900	62.58	79.17	4.34	14.43
		2300	64.24	81.87	4.67	13.75
18	36.6	1900	65.45	82.06	4.38	14.93
		2300	67.13	84.86	4.72	14.22
15	48.1	1900	58.47	75.95	4.62	12.65
		2300	60.01	78.55	4.98	12.06
18	36.6	1900	61.10	78.71	4.67	13.08
		2300	62.72	81.40	5.03	12.47
15	48.1	1900	55.63	74.95	5.12	10.86
		2300	57.08	77.50	5.51	10.35
18	36.6	1900	58.14	77.66	5.18	11.22
		2300	59.66	80.31	5.57	10.70
15	48.1	1900	53.06	74.19	5.52	9.61
		2300	54.42	76.72	5.93	9.17
18	36.6	1900	55.45	76.88	5.58	9.94
		2300	56.89	79.51	6.00	9.48

*See **Table 20** for variation in max ground loop pressure drop across hardware revisions

Abbreviations:

HC = Heating Capacity
HE = Heat Extracted (from ground loop)
TC = Total Cooling (capacity)
HR = Heat Rejected (to ground loop)

Notes:

Power data includes blower work at 0.6” H2O static and pump work at 10 ft. ground loop pressure drop, at nominal flow rate. COP/EER calculations here include blower and pump power.

SECTION 11: UNIT PERFORMANCE DATA

GP1G072 Partial Load Performance Data

	HEATING - 70F EAT						
EWT F	FLOW GPM	Dp, max FT*	AIFLOW CFM	HC MBtu/hr	HE MBtu/hr	Power kW	COP
25	15	48.1	1380	39.39	26.73	3.49	3.31
			1800	39.18	26.97	3.48	3.30
	18	36.6	1380	38.70	26.68	3.42	3.32
			1800	39.18	27.24	3.42	3.36
30	15	48.1	1380	42.34	29.78	3.50	3.55
			1800	42.09	30.04	3.49	3.54
	18	36.6	1380	42.22	30.23	3.41	3.63
			1800	42.00	30.51	3.40	3.62
40	15	48.1	1380	48.87	36.53	3.40	4.22
			1800	48.53	36.85	3.39	4.20
	18	36.6	1380	50.14	37.45	3.54	4.15
			1800	49.79	37.79	3.53	4.14
50	15	48.1	1380	55.83	44.14	3.37	4.85
			1800	55.40	43.39	3.47	4.68
	18	36.6	1380	56.19	44.13	3.45	4.78
			1800	55.46	43.39	3.54	4.59
60	15	48.1	1380	63.11	49.97	3.59	5.14
			1800	62.57	49.12	3.69	4.97
	18	36.6	1380	63.23	49.97	3.67	5.05
			1800	62.69	49.12	3.77	4.88
70	15	48.1	1380	70.07	56.29	3.85	5.34
			1800	69.44	55.33	3.94	5.16
	18	36.6	1380	70.21	56.29	3.93	5.24
			1800	69.57	55.33	4.03	5.06
80	Operation in heating above 70F EWT is not recommended						
90							
100							
110							

COOLING - 80/67F EAT						
FLOW GPM	Dp, max FT*	AIFLOW CFM	TC MBtu/hr	HR MBtu/hr	Power kW	EER
Operation in cooling below 60F EWT is not recommended						
15	48.1	1500	53.22	61.54	2.48	21.48
		1800	55.51	64.37	2.62	21.23
18	36.6	1500	55.13	63.32	2.55	21.66
		1800	57.52	66.23	2.69	21.42
15	48.1	1500	51.15	59.98	2.56	19.95
		1800	53.34	62.74	2.70	19.73
18	36.6	1500	52.99	61.71	2.63	20.12
		1800	55.27	64.55	2.78	19.90
15	48.1	1500	49.82	60.48	2.90	17.18
		1800	51.95	63.26	3.05	17.03
18	36.6	1500	51.63	62.21	2.88	17.91
		1800	53.85	65.07	3.13	17.18
15	48.1	1500	49.76	61.61	3.16	15.77
		1800	51.90	64.45	3.32	15.65
18	36.6	1500	51.56	63.39	3.25	15.89
		1800	53.77	66.30	3.41	15.78
15	48.1	1500	46.70	60.47	3.56	13.11
		1800	48.69	63.25	3.74	13.04
18	36.6	1500	48.39	62.21	3.67	13.20
		1800	50.46	65.07	3.84	13.13
15	48.1	1500	43.44	58.63	3.86	11.25
		1800	45.28	61.32	4.04	11.19
18	36.6	1500	45.01	60.31	3.97	11.32
		1800	46.92	63.09	4.16	11.28

*See **Table 20** for variation in max ground loop pressure drop across hardware revisions

Abbreviations:

HC = Heating Capacity
HE = Heat Extracted (from ground loop)
TC = Total Cooling (capacity)
HR = Heat Rejected (to ground loop)

Notes:

Power data includes blower work at 0.6” H2O static and pump work at 10 ft. ground loop pressure drop, at nominal flow rate. COP/EER calculations here include blower and pump power.

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Raspberry Pi Pico SDK

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pico-flashloader

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SECTION 13: DOCUMENT REVISION HISTORY

Document Revision Table

Date	Revision	Revision Description	Page #(s)
1/3/25	2.0	Initial release of revision 2. Functionality reflective of firmware version 0.26 or later, unless otherwise noted	-
1/30/25	3.0	Updated capacity tables to be text based rather than images	63-70

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