G-Class

Outdoor Wood Furnace

Owner's Manual for G2, G2 Plus & G3

Wood Moisture Requirements
See Section 8.2 of this Manual

The G-Class indoor/outdoor hydronic heater by Polar Furnace is listed by Intertek to the applicable portions of the following standard: ASTM E 2618-10 and/or EPA Method 28 WHH or EPA Method 28 WHH-15 and ASTM E2515-2011. The G-Class G2-Plus indoor/outdoor hydronic heater by Polar Furnace is also listed by Intertek to the applicable portions of the following standard: CSA B415.1-10. The G-Class indoor/outdoor hydronic heater by Polar Furnace is listed by CSA group to the applicable portions of the following standards: UL 2523 Standard for Solid Fuel-Fired Hydronic Heating Appliances, Water Heaters and Boilers and CAN/CSA-B366.1-11 Solid-Fuel-Fired Central Heating Appliance. The G-Class is CSA and UL certified for indoor or outdoor installation. Indoor installations must satisfy CSA CAN/CSA-B365 installation code for solid fuel burning appliances as well as any other applicable standards or regulations. The G-Class includes one 2-foot stainless steel insulated chimney section. Use only stainless steel solid fuel chimneys specified by Polar Furnace to extend the chimney.

To obtain a French translation of this manual, please contact your dealer or visit www.polarfurnace.com.
(Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez www.polarfurnace.com.)

Specifications[1]	U of M	G2*	G2-Plus**	G3*
8-Hour Output Rating	Btu/hr	66 897	108 982	142 533
8-Hour Average Efficiency	lower/higher heating value (%)	76.5/71.2	87.2/81	80.5/74.8
Manufacturer's Rated Heat Output Capacity	Btu/hr	160 000	180 000	200 000
Output Range	Btu/hr	0 to 160 000	0 to 180 000	0 to 200 000
Annual Efficiency Rating	lower/higher heating value (%)	71.6/66.5	78.7/73.1	77.9/72.3

[1]***Specifications subject to change without notice***
*This heater is U.S. ENVIRONMENTAL PROTECTION AGENCY certified to comply with 2015 particulate emission standards. Not approved for sale after May 15, 2020. Under specific test conditions, this heater has been shown to deliver heat at rates shown for the respective model above.
**This heater is U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord fuel. Under specific test conditions, this heater has been shown to deliver heat at rates shown for the respective model above.

Performance is a product of the combustion rate, combustion efficiency and heat exchange efficiency of a single fuel load. Results may vary because of many additional factors including wood species, wood quality, wood quantity and moisture content of the wood used. Efficiencies are determined under the same test conditions using higher heating value, lower heating value and annual fuel utilization efficiency (AFUE). This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.

DO NOT OVERFIRE THIS HEATER. Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater. Any person(s) operating a hydronic heater must comply with all applicable laws, including but not limited to local ordinances. Improper use or failure to maintain the hydronic heater may cause nuisance conditions. The person(s) operating a hydronic heater is/are responsible for operation in a manner that does not create a nuisance condition. Meeting the setback distance and stack height recommendations from the manufacturer and requirements in applicable State and local regulations may not always be adequate to prevent nuisance conditions in some areas due to terrain or other factors. Operating and maintaining an outdoor furnace may not be suitable to every individuals' abilities or lifestyles. Be sure to review the Owner's Manual for the appliance with your dealer prior to purchasing or operating this heater.

IMPORTANT: Read and fully understand this manual prior to installing and/or operating a Polar Furnace heater. This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.

POLAR FURNACE G-CLASS HEATER WARRANTY (v. 15-1)

The longevity of your G-Class heater will depend on how well the heater is maintained and if the wood burned in the unit meets the wood moisture requirements specified in the owner's manual. With proper operation, proper maintenance and proper wood quality your new furnace will last a long time. Be sure to understand and follow the operational and maintenance instructions included in the owner's manual.

Polar Furnace Mfg. Inc. (The Company) warrants the water jacket and fire chamber of the heater identified herein to be free from leaks during normal use for a period of 4 (four) years from the date of original purchase to the original purchaser of this heater. From year 1 (one) through year 4 (four) The Company will cover the cost of repairing any leaks in the fire chamber and water jacket onsite or at our factories including materials, parts, travel, shipping and labor.

Electric and electronic components as well as high temperature refractory and the heater housing are limited to a 12 month 100% replacement warranty including parts, shipping, travel and labor. Only the manufacturer at the address on this certificate will determine, in its sole and absolute discretion, all warranty issues. Any repair work claimed under warranty must be approved in writing by The Company prior to any repairs being started.

If repair is not feasible for any reason as judged by The Company, our obligations under this warranty are limited to providing a replacement heater per the following schedule. For the 15 year warranty period the following pro-rated replacement charge will apply.

Schedule of Charges for Replacement of the Complete Heater.

From 1 through 2 years	Company's then current list price less 100%
From 3 through 4 years	Company's then current list price less 100%
From 5 through 6 years	Company's then current list price less 60%
From 7 through 10 years	Company's then current list price less 25%
From 11 through to 15 years	Company's then current list price less 10%

All replacement heaters are FOB our factory unless otherwise specified in this warranty.
The warranty period on any replacement heater is from the date of the sale of the original heater.

General Conditions of this Warranty.

The warranty registration form, delivery checklist, and customer acceptance must be completely filled in and signed by the customer and dealer and submitted to The Company for this warranty to be valid. The warranty contained herein shall be voided if the heater is not installed, operated and maintained as instructed in the owner manual. **Using wood that does not meet the wood moisture requirements detailed in the owner's manual voids this warranty.** The heater must never be pressurized; pressurizing the heater voids this warranty. The boiler protection valve must be maintained as described in the owner's manual and failure to properly maintain the boiler protection valve voids this warranty. A properly qualified tradesperson/s should supervise or perform all installations. If the chimney needs be extended an appropriately certified and approved insulated chimney system must be used. The insulated chimney is not covered under this warranty. This warranty is void if the chimney

installation does not meet all of the installation requirements detailed in the owner's manual. Your dealer may charge you for a service call to do warranty work. Parts will be replaced on an even exchange basis. Polar Furnace heaters are not intended to be the only source of heat. A backup system should be in place to prevent resultant damage due to a lack of heat. This warranty is limited to defective parts repair and/or replacement only and excludes any incidental and consequential damages. Door seals, door insulation, light bulbs, fire tending tools, heat shields, Strong Wall liner, hearth plates and any other wear items are not covered under this warranty. High temperature refractory materials are warranted for 1 year under this warranty. In use, small cracks can occur in high temperature refractory and will not affect the performance of the heater. Damage caused by abuse, accidents, improper use, improper installation, excess creosote buildup, overheating, freezing, corrosion, negligence, accidents in transit, and pressurization are not covered under this warranty. Damage resulting from modifications or alterations will not be covered under this warranty. If the serial number on the equipment is defaced, altered or removed this warranty is void. Damage caused by burning flammable materials (such as petroleum products) or any other material besides properly prepared wood will void this warranty. Only nontoxic antifreeze that meets and/or is approved per all applicable regulations and standards may be used. The Company will not be responsible for any environmental damages or charges resulting from use of toxic and or unapproved types of antifreeze. Antifreeze will breakdown over a period of time and therefore should be tested annually to ensure adequate freeze protection. Always dispose of antifreeze per federal, state, provincial, local or any applicable laws and regulations. Loss of antifreeze under any situation and condition is not covered under this warranty. The Company is not responsible for replacement of water, water treatment, antifreeze, removal, disposal, costs of transportation, or shipping charges unless otherwise specified in this warranty. Warranty does not cover any plumbing components, boiler piping, valves, controls or any other component or system external to the boiler package. WARNING, The Company will not warranty the inside of the fire box due to ash corrosion. Rotation of ashes and/or removal of ashes from the fire chamber must be performed as per the operator manual instructions. WARNING, The Company will not warranty the water jacket due to corrosion from corrosive or improperly treated water. An appropriate water treatment must be added and maintained and receipt retained for proof of use to establish any warranty claims. We will not be liable to any contingency beyond our control including war, strikes, floods, government restrictions or short supply of material. We will not be liable for any labor cost, except above schedule. This warranty replaces and supersedes any and all other warranties, expressed or implied, directly and or indirectly whether at law, common law, equity and/or statute and constitutes the only warranty of The Company and the only liability of The Company. This warranty constitutes the entire agreement between the parties with respect to the subject matter and supersedes all prior agreements, negotiations, discussions, undertakings, representations, warranties and understandings, whether written or verbal. This Warranty is governed by, and is to be construed and interpreted in accordance with the laws of Manitoba and the federal laws of Canada applicable in Manitoba. The purchaser and The Company each irrevocably agree to submit to the jurisdiction of the courts of Manitoba. The Company's limitation of liability pursuant to any warranty shall be equivalent in all respects to the sum of $1.00.

Polar Furnace Mfg. Inc.

Box 159. Sperling, Manitoba. R0G 2M0

PH: 1-204-626-3485 FAX: 1-204-626-3326

NOTICE: To activate this warranty, the white copy of the warranty activation form (page 5) as well as a copy of the original bill of sale (invoice) must be mailed to the Polar Furnace address above within thirty (30) days of furnace delivery to end user.

POLAR FURNACE MFG. INC.
WARRANTY (v.15-1) ACTIVATION[1] FORM—DOWN DRAFT HEATER

WARRANTY REGISTRATION FORM

Customer's Name:_____

Address:_____

City, State/Prov. Code:_____

Phone: (____)_____

Serial No._____

Dealership Name: _____

Address: _____

City, State/Prov. Code:_____

Date of Purchase: _____/_____/_____

DELIVERY CHECKLIST

_____ Review owner's manual.

_____ Review warranty and service requirements.

_____ Explain required maintenance schedule.

_____ Review and explain Boiler Protection Valve Maintenance (Manual Section 14.4)

_____ Identify safety hazards & demonstrate proper operation.

_____ Explain requirement that properly seasoned wood must be used. (review manual section 8.2)

_____ No warranties are validated unless this form and registration are completed and returned.

CUSTOMER ACCEPTANCE

I have inspected the Polar Furnace heater with the customer and reviewed all items on the delivery checklist. I have thoroughly instructed the customer on the equipment identified herein and thoroughly reviewed the operator's manual. The customer has accepted responsibility for the operation and maintenance of the product identified herein.

Date: _____ Dealer's Rep. Signature: _____

The dealer rep. and I have inspected my new Polar Furnace heater and reviewed all items on the delivery checklist. The dealer rep. has reviewed the operator's manual with me and has thoroughly instructed me on the equipment herein. I assume full responsibility for the operation and maintenance of the product identified herein.

Date: _____ Owner's Signature: _____

A nominal fee may be charged for service calls. All sales are final. Heater approved for use with well-seasoned wood only. Suitability of use is the customer's decision. The customer is responsible for ensuring conformance to local bylaws and regulations. A backup heating system is strongly recommended.

White—Polar Furnace copy	Yellow—Dealer copy	Pink—Customer copy

[1] To activate this warranty, the white copy of this warranty registration form as well as a copy of the original bill of sale (invoice) must be mailed to Polar Furnace Mfg. Inc., Box 159, Sperling MB, R0G 2M0 within 30 days of delivery of furnace to end user.

Table of Contents

1 Introduction

The Polar Furnace G-Class Heaters are wood-fired, downdraft, hydronic heaters. The downdraft burning design allows for controlled combustion of wood which results in far lower smoke and particulate emissions and higher efficiency when compared to other designs.

1.1 !! NOTICE !!

The Warranty Activation form is located on page 5. This form must be thoroughly completed and the white copy returned to Polar Furnace Mfg. Inc. to ensure product support and warranty activation.

1.2 Product Feature Variation

Our commitment is to provide you with the best possible wood burning technology. As part of this commitment, we make improvements to our products on a regular basis as we strive to make them even better. Although a concerted effort is made to keep this manual as up-to-date regarding any changes to our products, there may be noticeable differences. If clarification of any part of this manual is needed, don't hesitate to contact your local Polar Furnace dealer or contact Polar Furnace directly.

1.3 Save These Instructions!

Keep this manual for as long as you own the Polar Furnace heater. Read and understand these instructions before installing or operating this heater.

Warnings & Cautions 2

2.1 !!WARNING!!
A person operating a hydronic heater must comply with all applicable laws or other requirements such as state or provincial laws or regulations and local ordinances.

2.2 !!WARNING!!
All installations and operations must follow the applicable federal, provincial, state, and local codes for wiring, plumbing, chimney installation, chimney extension (if required) and firing of this unit. When the relevant local codes differ from this manual, the local codes take precedence.

2.3 !!WARNING!!
Strictly maintain the following clearances around the heater to any combustibles including fuel storage. Front—24", Right—6", Left—1", Rear—6", Top—2", Flue—6".

2.4 !!WARNING!!
This heater is designed to burn natural wood only. Higher efficiencies and lower emissions generally result when burning air-dried seasoned hardwoods as compared to softwoods or to green or freshly cut hardwoods. DO NOT BURN: unclean wood, unseasoned wood, garbage, tires, lawn clippings, leaves, brush trimmings or general yard waste, materials containing asbestos, materials containing lead, mercury or other heavy toxic metals, materials containing plastic, waste petroleum products, paints and paint thinners, asphalt products, chemicals, coal, glossy or colored paper, construction and demolition debris, plywood, particleboard, salt water driftwood and other salt water saturated materials, manure, or animal carcasses. Burning these materials may lead to the release of toxic fumes or render the heater ineffective and cause smoke. Burning these materials can cause irreparable damage to your heater which is not covered under warranty.

2.5 !!WARNING!!
Burn wood only! Dry seasoned wood is preferable. The manufacturer does not recommend burning treated or contaminated wood (i.e. railroad ties or pressure treated lumber).

2.6 !!WARNING!!
All Polar Furnace heaters operate at atmospheric pressure. DO NOT, in any way, obstruct, block or plug the overflow/fill pipe located on top of the heater. DO NOT install a pressure relief valve. This boiler should not be connected to an existing heating system unless a water to water or water to air heat exchanger is used.

2.7 !!WARNING!!
Use of a rain cap with an approved spark arrestor is required.

2.8 !!WARNING!!
Most Polar Furnace heaters are installed outdoors. All fire clearances on page 15 should be observed. Always keep area around and in front of fire door cleared from combustible materials. DO NOT store fuel within clearances listed on label.

2.9 !!WARNING!!
Polar Furnace heaters are CSA certified for outdoors and indoors. When used indoors, special care must be taken to ensure the installation conforms to local installation requirements. Plan for makeup air, ventilation of smoke when opening door, chimney clearances and heights, and clearances from combustibles. Consult local professionals. Field installations must satisfy CSA CAN/CSA-B365 installation code for solid fuel burning appliances as well as any other applicable standards or regulations. If extended chimney height is needed, use an insulated chimney system.

2.10 !!WARNING!!
Installation should be completed by appropriately qualified personnel.

2.11 !!WARNING!!
Never let small children play near or tamper with the heater. Only responsible adults should operate the heater. Outer surfaces may be hot during operation. Ensure children do not touch heater.

2.12 !!WARNING!!
Always open the load door slowly while standing well back and behind the door. Open the outer door and wait one minute before opening inner doors. Do not look directly into the fire chamber until at least 60 seconds after opening the load door. Failure to do so may result in serious injury from flashbacks.

2.13 !!WARNING!!
Keep fuel door tightly closed during operation.

2.14 !!WARNING!!
In case of a runaway fire, disconnect the heater from the electrical supply and ensure all doors are closed. Check to ensure the air supply gates are not stuck open. Check aquastat settings. Add water to ensure that the heater is not low on water.

2.15 !!WARNING!!
DO NOT operate heater unless the water level gauge shows that the water jacket is in the “Full” range.

2.16 !!WARNING!!
Be concerned about ground water and insulate the distribution pipes to avoid excessive wood consumption.

2.17 !!WARNING!!
The secondary combustion chamber, heat exchanger and areas above and below the heat exchanger should be cleaned regularly to remove accumulated creosote and ash.

2.18 !!WARNING!!
Cleaning the firebox, flue pipes, chimney, heat exchanger and fan is especially important at the end of the heating season to minimize corrosion. All accumulated ash MUST be removed.

2.19 !!WARNING!!
Care should be taken to avoid potential smoke problems. Downdraft heaters can smoke if not operated as per recommendations or without properly prepared wood. Be a responsible neighbor and use properly seasoned firewood. Use a chimney extension if required.

2.20 !!Alert: Monitoring Smoke and Carbon Monoxide!!

During the combustion process, the presence of smoke is a strong indicator that the fuel is not being consumed efficiently. Smoke is created when the combustion air supply to the fuel load is inadequate to burn all the gases and particulate being released as the wood is consumed. This is why it is important to establish the correct draft with the furnace/chimney system. One of the byproducts of poor combustion is carbon monoxide, a colourless, odourless, and tasteless gas that is toxic when inhaled and which can be fatal depending on concentration levels and exposure time. Note that although carbon monoxide is produced during poor combustion that might also create smoke (as described above), high levels of carbon monoxide may be produced in the absence of smoke. For example, this could take place when a wood fire has been reduced to the coal state and the draft starts to reduce as less heat is available to keep the chimney warm. Some level of carbon monoxide is being generated in all stages of the combustion process regardless of the fuel.

Continued on next page....

Several precautions must be taken to minimize the risk of carbon monoxide poisoning especially when the G-Class is installed in a building:

• First, run the furnace in the most efficient manner possible to reduce the production of carbon monoxide. Use well seasoned, dry wood and establish the correct operating draft as laid out in these operating instructions to help limit CO emissions.

• Second, Building Pressure—if the combustion air for an appliance (i.e., the wood furnace) comes from within the same building in which the appliance is located, there will be a tendency for the internal building pressure to become negative. Adequate mechanical ventilation must be supplied to the building to neutralize the building pressure, otherwise there is a risk of reversing the flow of exhaust flue products back into the building. These flue products may not only come from the wood furnace but also from other combustion appliances in the building.

• Thirdly, Smoke Alarms and Carbon Monoxide Detectors—Smoke alarms and carbon monoxide detectors are not only important tools for protecting the inhabitants of a building, but they are mandated in many jurisdictions. Although these items should be located on every level of a building there are two locations that are of prime importance. The first is in the sleeping areas of the building, and the second is in the location where the combustion process is taking place. Check with local codes for details on alarm/detector requirements. Carefully follow installation instructions included with the purchase of your Smoke Alarm and Carbon Monoxide Detector(s).

Responsible Ownership 3

3.1 Safety First!

- Be safety conscious.
- Clear ground around heater.
- Use non-combustible cement blocks, patio blocks or cement base under heater.
- Install the rain cap on the chimney. Use an approved spark arrestor.
- Use a good quality pipe for hot water distribution.
- **ALWAYS HIRE APPROPRIATELY QUALIFIED INSTALLERS!**

3.2 Minimize Smoke Emissions. Burn Wisely.

- Be considerate of your neighbours when operating your furnace. If you use your furnace in the summer months, ensure that your chimney exhaust is not adversely affecting any neighbours with open windows.
- Consider prevailing wind direction when choosing a site location for the heater.
- Water can be piped a long distance with minimal heat loss. This is a good option to avoid smoke related problems.
- Don't burn garbage. Burn only well-seasoned firewood.

4 Heater Components

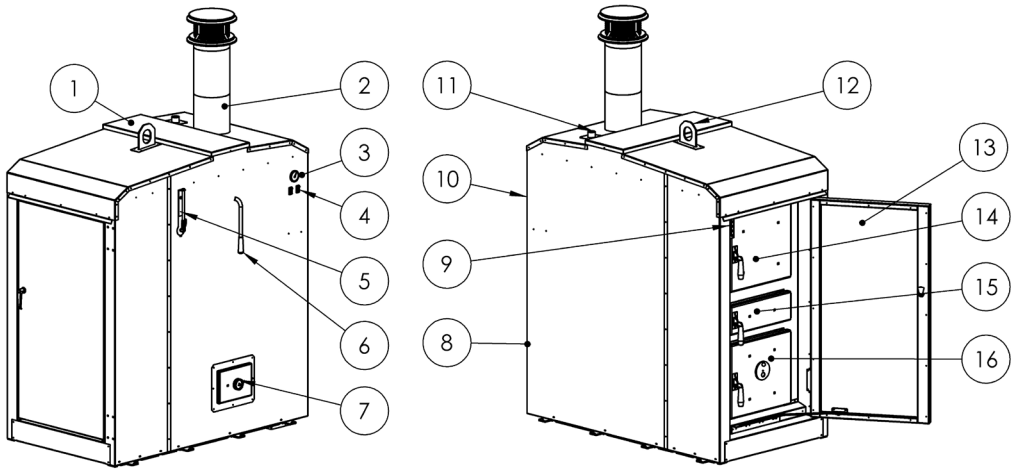


Diagram 4.1–Heater Components

Item #	Description
1	Heat Exchanger Access Cover
2	Chimney Hookup
3	Waterjacket Temperature Gauge (On some models, check inside Main Outer Door)
4	Furnace ON/OFF Switch, Work Light ON/OFF Switch
5	Water Level Sight Gauge
6	Heat Exchanger Cleaning Actuator Lever (Easy Sweep)
7	Heat Exchanger Bottom Cleanout
8	Rear Bottom Access Panel—Plumbing Hookup, Air Damper Setting
9	Work Light (inside outer door)
10	Rear Top Access Panel—Suction Fan Access, Electrical Access
11	Overflow/Fill Pipe
12	Lifting Hook
13	Main Outer Door
14	Loading Door
15	Ignition Door
16	Front Bottom Cleanout Door

Safety 5

5.1 !! WARNING !!
Maintain minimum distances between heater and combustibles. (Refer to section 6.6)

5.2 !! WARNING!!
Develop and implement a clearly formulated plan of what to do in the event of a chimney fire.

5.3 !! WARNING!!
Keep area around heater clear of combustibles.

5.4 Flashbacks

5.4.1 !! CAUTION !!
ALWAYS KEEP BODY AND FACE WELL AWAY FROM LOAD DOOR, ACCESS DOORS AND CLEANOUT DOORS WHILE OPENING THEM. FAILURE TO DO SO CAN RESULT IN SERIOUS BODILY INJURY FROM FLASHBACKS.

When opening any access panels on the heater there is danger of flashbacks. It is important to understand what causes flashbacks before operating the heater. Read the following explanations carefully and be sure to understand what flashbacks are before attempting to operate the heater.

5.4.2 Cause of Flashbacks
The root cause of flashbacks is the accumulation of oxygen-starved hot gases inside the fire chamber. These gases cannot combust without oxygen. Opening the load door allows fresh air and oxygen to mix with the hot gases causing them to ignite and explode.

5.4.3 Conditions Causing Flashbacks
There are some combustion conditions that greatly increase the risk of flashbacks. It is important to understand these conditions. **It is important to note that flashbacks can occur whenever any of the front heater doors are opened and are not limited to the conditions described below.**

5.5 The Combustion Fans Have Just Shut Off
Once the heater reaches the point where the water temperature is high enough, the controller shuts off the combustion fans. When the fans stop blowing, actuators also close off the air supply openings. This stops any new air and oxygen from getting into the fire chamber. At this point the fire chamber is still extremely hot. The heat in the fire chamber continues to bake the wood which continues to break down into combustible smoke and gases. Without oxygen, these combustible, hot gases do not burn off but accumulate in the fire chamber. When a door is opened, fresh air and oxygen mix with the hot combustible gases which then ignite and explode. **Always keep face and body well away when opening the load door, ignition door, bottom and side cleanout doors.**

5.6 Hot Surfaces
Some surfaces on the boiler get hot. Always wear protective leather gloves when working on or around the heater, when loading the heater or when performing maintenance on the heater.

5.7 Smoke Inhalation / Eye Irritation
Burning wood produces smoke. Avoid inhaling smoke. Whenever there is smoke, wait until it has cleared before proceeding to load the heater or performing maintenance work.

5.8 !! DANGER !!
NEVER PRESSURIZE THIS HEATER! NEVER block or obstruct the overflow/vent pipe located on the roof of the heater (item #11 on page 12). Pressurizing this heater could result in very serious injury and damage to the heater and property!!

6 Heater Setup

6.1 !! NOTICE !!

All installation work must be completed by appropriately qualified personnel and must conform to all applicable standards, regulations and local codes (e.g. CAN/CSA-B365 Installation Code for Solid Fuel Burning Appliances).

6.2 Heater Delivery

Wash the heater immediately following delivery to remove salt and dirt from shipping. Inspect the heater for shipping damage. If damaged, make note of it on carrier shipping paperwork.

6.3 Unpacking

Several items are shipped with each furnace. These components are located inside the main fire chamber and the rear bottom access panel. They include:

- Owner's Manual.
- Ash shovel (diagram 8.1 of manual).
- Small ash tool (diagram 8.1 of manual).
- Large ash tool (diagram 8.1 of manual).
- Flue brush (handle and brush may ship separated from each other and may need to be assembled) (diagram 8.1 of manual).
- Initial boiler treatment kit.
- Anti-evaporation cap (diagram 6.2 of manual).
- Insulated chimney pipe extension (total of at least 2' of extension. Either 1pc x 2' or 2pcs x 1').
- Chimney rain cap.
- Distribution pipe finishing duct (diagram 14.2 of manual).
- Anti-Condensation Valve (diagram 14.5 of the manual).
- Stack Temperature Gauge (diagram 6.1 of the manual).

6.4 Indoor Installation

Polar Furnaces are CSA & UL certified for both indoor and outdoor installation. However, care must be taken whenever a heater is near or inside a building. When installed indoors, proper air supply is required for combustion and ventilation. Continuous air supply is mandatory. Installation must conform to all applicable codes and standards. Consult a heating professional.

6.5 Electrical Requirements

Electrical Rating: 120V AC, 6 amps, 60Hz. Installation must meet federal, provincial and local codes and must be completed by qualified personnel only. Wire must be rated and approved for direct burial if is to be included in the same trench as the water lines. Heater power connection box is located inside the rear access panel. Minimum supply conductor ampacity is 15 amps. Maximum over current device is 15 amps. Use copper conductors only.

6.6 Heater Fire Clearances

All G-Class Heaters are CSA and UL approved to the following fire clearances. No combustibles should be stored within these measurements.

Front	24"
Back	6"
Left Side	1"
Right Side	6"
Top	2"
Chimney	6"

Consult with your insurance company to ensure that the boiler to building clearances are acceptable. Failure to do so may void insurance. The manufacturer assumes no liability in the event of damages to personnel or buildings.

6.7 Chimney Requirements

The chimney is a very important component in the successful operation of the G-Class heater. A good chimney provides a continuous, dependable draft to ensure proper operation of the heater. If your furnace is installed indoors, a continuous draft is especially important to pull the exhaust gases out of the building. The entire chimney exhaust system must be designed to prevent possible soot build up, insufficient draft, and condensation. Chimneys are very prone to draft and creosote related problems when they have diameters that are too large, are insufficiently insulated, or when they have dents and bends. Incorrect chimney installation will void the warranty.

The heater must be connected to a factory-built chimney that must be designed for solid fuel appliances, must be 6" in diameter, and must be UL-103 or ULC-S629 listed. Chimneys that do not meet these requirements MUST NOT be used for any part of the chimney system. Never use black stove pipe or uninsulated double wall chimney pipe for any part of the chimney system. The chimney connection on the G-Class heater will work best with the Security Chimney ASHT+ 6" chimney system. Other chimney systems can be used, but strictly follow the chimney installation instructions for making a connection. If a short piece of stove pipe is used to make the connection, the stove pipe must be as short as possible and must be insulated using suitable blanket insulation. A dripless adaptor must be used at the connection between the boiler and the factory-built chimney. The top of the chimney must be at least 3 feet above the top of the roof penetration level and at least 2 feet above any portion of the roof within a 10 foot diameter measured horizontally.

Always follow the chimney manufacturer's installation instructions when installing and supporting a chimney. All chimneys and connections must conform to all applicable standards and local codes. No other appliance should be connected to the chimney unless allowed by the local code authority. Consult your local inspector for chimney requirements and install the heater in accordance with all applicable codes.

6.7.1 Chimney Draft

When measuring draft, ensure that there is a fire in the fire chamber, the fan has been on for at least 10 minutes and the water temperature in the boiler is above 160°F. This ensures the chimney is at proper operating temperature. Breech draft is the draft near the connection point to the furnace and should be measured within 6" from the top roof panel of the heater. Minimum breech draft is .02" water column. Maximum breech draft is .14" water column. Strong winds blowing across the top of a chimney (especially a chimney which has a strong natural draft) can cause the G-Class heater to continue firing when the fan has switched off. This can cause the furnace to overheat. If there is excessively high draft or an irregular draft, a draft regulator must be used.

6.7.2 Draft Regulator

Whenever the breech draft exceeds .12" water column, a draft regulator must be installed. The diameter of the draft regulator used must be equal to or larger than that of the chimney connector and should be installed as close as possible to the boiler. If one draft regulator is not sufficient to bring the draft below .10" water column, a second draft regulator may be required. After installing a draft regulator, the draft must always be measured on the boiler side of the draft regulator. The draft regulator adjustment should be made with a vacuum gauge if possible. If the damper is adjusted during warm weather, an adjustment may be required during cold weather.

6.7.3 Off Cycle Draft

A slight but measurable draft during the off cycle is required. The draft must persist for at least 30 minutes after the fan has switched off. A draft during the off cycle moves a very small amount of fresh air through the heater which evacuates moisture laden air from

the primary fire chamber. In some conditions a reverse draft or back draft may occur during the off cycle. This may be the case if the boiler is installed near a very tall building or near a high hill or if the chimney is improperly installed and/or terminates on the side of a building. A back draft must be remedied and stopped. If a back draft is suspected or detected, consult with your dealer or local HVAC professional to determine a possible solution. Lack of a draft and/or back drafting during the off cycle is one possible cause of water condensating and accumulating inside the primary air delivery channels during the off cycle.

6.8 Stack Temperature

Stack temperature is an important factor in the proper functioning of a chimney. The chimney's maximum stack temperature must never exceed 400˚F. If the chimney temperature exceeds 400˚F, consult with your local dealer or with the factory on how to decrease the maximum stack temperature. The stack temperature must always increase to over 275˚F during every burn cycle. If the stack temperature fails to exceed 275˚F during each burn cycle, consult with your local dealer or with the factory to increase the stack temperature.

6.8.1 Stack Temperature Gauge

A stack temperature gauge is shipped with each G-Class furnace. This gauge must be installed in the chimney within 4" from the point at which the chimney penetrates the rear roof panel. The gauge is installed by sliding it into a small hole drilled through the chimney wall. The stack temperature gauge has a red temperature indicator which shows the maximum temperature measured since the last time the max temperature dial was turned counterclockwise until it contacted the black current temperature indicator.

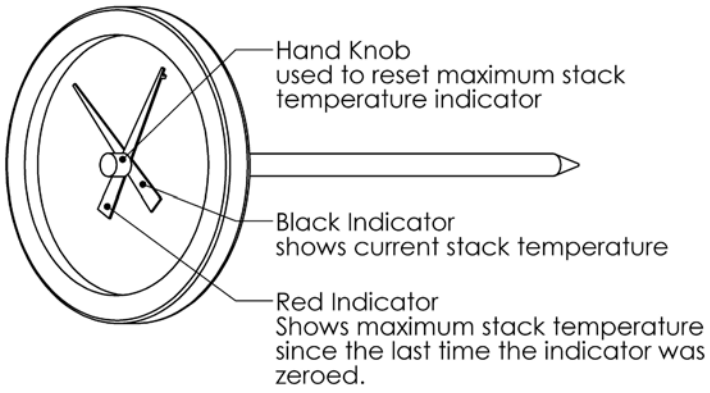


Diagram 6.1–Stack Temperature Gauge

Notice: Always turn the hand knob very carefully. Only turn the hand knob counterclockwise until the red maximum temperature indicator gently touches the black current temperature indicator.

6.9 Water Quality & Treatment

Ensure that the water used to fill the water jacket conforms to the following requirements before filling the water jacket or adding any treatment:

- pH must be within the allowable range of 7.0 - 9.9. (See section 10.5 for instructions on how to determine pH)
- The water must not have an odour.
- The water to be used must have no turbidity. To check for turbidity, fill a white 5 gallon pail or clear 2L bottle. Any visible discoloration is turbidity.

If the water to be used does not meet the above requirements, a sample must be sent to a water treatment lab to determine what treatment is needed to make the water suitable for use. If it is determined that treatments are needed, the Polar Furnace Initial Treatment chemicals may not be compatible with the new treatment requirements. In this case, use either source water that conforms to the requirements outlined above or work with the lab and water treatment company for a complete treatment solution and do not use Polar Furnace supplied chemicals if incompatible. If the water to be used to fill the water jacket meets the above requirements, refer to section 10 and the information included with the water treatment kit that shipped with the heater to treat the water for corrosion prevention. **Polar Furnace suggests using softened water.**

6.10 Filling the Water Jacket

6.10.1 !! WARNING !!

Do NOT start a fire in the heater before filling the heater water jacket with water. Starting a fire in the heater without first filling the water jacket can damage or destroy the heater.

6.10.2 !! DANGER!!

Do NOT pressurize this heater since it is designed with an open system type water jacket. Pressurizing the heater could result in damage to the heater, damage to property, and could cause severe bodily injury and even death.

6.10.3 !! WARNING !!

Before filling the water jacket, test the water to ensure the pH level is within the acceptable range of 7-9.9. Water that is NOT within this allowable range must NOT be used to fill the water jacket. Please review the "Water Testing and Treatment" section in this manual for instructions on how to test the pH of the water you intend to use.

This heater is a hydronic heater. This means that it operates by heating water that is inside its water jacket. This water jacket must be filled with water or a water/glycol mixture before operating the heater. Filling the water jacket can be achieved by adding water through the overflow pipe on top of the heater or by hooking the water supply hose to the drain/fill valve located inside the rear access panel. Alternately, the water jacket can be filled by adding water into any part of the hot water distribution piping. Fill the heater until the water level is in the green "FULL" zone (See Section 6.11).
Note: Check the water level daily during the first few weeks after the heater is installed and used.

6.11 Using the Water Level Sight Tube

The water level sight tube is located on the side of the heater. To check the water level in the heater turn the valve handle into the vertical position. The sight tube will fill with water showing the level of the water in the water jacket. If the level is in the red, "ADD" zone, add water until the level reaches the green, "FULL" zone. After using the water level sight tube, always turn the handle back into the horizontal position to drain water from the sight tube. Output Settings (V.2)

6.12 Anti-Evaporation Fill Pipe Cap

An anti-evaporation cap ships with each heater (diagram 6.2-Anti-Evaporation Cap). This cap reduces the amount of evaporant escaping the water jacket and helps maintain the water level over long periods of time. The cap is installed into the overflow/fill pipe. To install, slide the stem into the overflow pipe. To locate the overflow/fill pipe, refer to diagram 4.1, item #11.

6.13 Antifreeze

6.13.1 !! WARNING !!

Use only approved environmentally friendly antifreeze. Many types of antifreeze are banned in specific areas; propylene glycol is legal in most areas. Check with local authorities to ensure that propylene glycol use is legal in your area.

Diagram 6.2–Anti-Evaporation Cap

6.14 Setting Your Heater

The G-Class heater has a very stable combustion system. Its settings are factory set for optimal combustion across all normal operating conditions. Before making any setting changes on your heater, contact your Polar Dealer or Polar Furnace factory support to discuss the setting change you are planning to make. The G-Class fan speed switch (on the control board) should always be set to HIGH. The LOW setting should only be used when directed to do so by factory support. Factory Primary and Secondary Damper settings are covered in Section 8.12.2.

6.15 Stack Temperature and Condensation

The G-Class is a high efficiency wood burning appliance. This means that stack temperatures are low compared to low efficiency wood burning appliances. In certain conditions, condensation can build up inside the fan housing. This condensation will appear as a black liquid at the base of the fan housing. If not stopped, this condensation can cause corrosion and permanent damage to the G-Class.

6.15.1 !! IMPORTANT !!

Stack temperatures higher than 400˚F can cause damage to the heater.

6.15.2 Stopping Chimney Condensation

When you notice condensation inside the fan housing, the following steps can be taken to stop the condensation. Follow these steps in numerical order and be sure to rectify item 1 before continuing to the next item:

1. Ensure the chimney meets ALL requirements (section 6.7 of this manual). Use only an insulated, prefabricated chimney. If any single wall or double wall uninsulated chimney/ stove pipe is used, remove and replace with prefabricated, insulated chimney.

2. Ensure moisture content of wood is 24% or lower. Lower moisture content will reduce condensation.

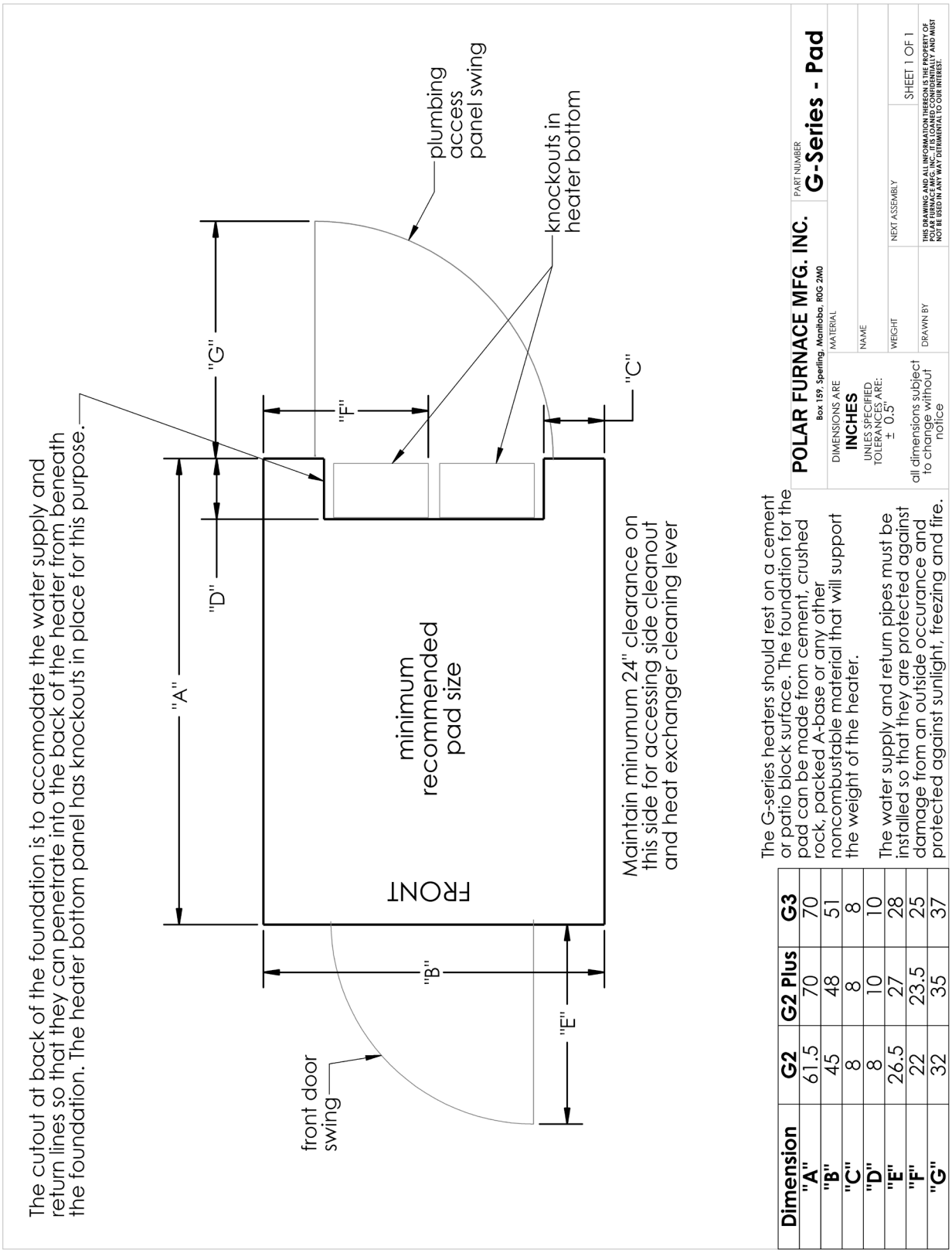
3. If requirements 1 and 2 are satisfied, remove one Easy Sweep turbulator from the heat exchanger. This will increase stack temperature by 40-90˚F. Removing two turbulators will increase the stack temperature by approximately 90-180˚F. The stack temperature must never exceed 400˚F. Tubes with the turbulators removed will need to be cleaned manually on a regular basis. Frequency of cleaning will depend on many factors including type of wood burned and the furnace firing rate.

4. If after making all of the above adjustments condensation still occurs, contact your dealer or the factory. Do not continue operating the furnace if condensation is still taking place. Furnace corrosion resulting from condensation is not covered under the heater warranty.

6.16 Installations in Massachusetts

Operators of this hydronic heater are responsible for ensuring that the air pollution condition, defined in 310 CMR 7.01(1), is avoided.

G-Class Foundation Drawing



Dimension	G2	G2 Plus	G3
"A"	61.5	70	70
"B"	45	48	51
"C"	8	8	8
"D"	8	10	10
"E"	26.5	27	28
"F"	22	23.5	25
"G"	32	35	37

Diagram 6.12–Foundation Pad Recommendations

Heater Controls 7

7.1 Controls Overview

The heater's controls include: 2 aquastats located inside the rear top access panel, 2 switches and a temperature gauge located on the right side towards the rear of the heater. One aquastat controls the combustion process while the second aquastat is the high temperature shutdown. This prevents overheating of the system if the control aquastat fails for any reason. One switch turns the combustion cycle on and off. The second switch is used to turn the heater's front-access work light ON or OFF. The temperature gauge shows the temperature of the water inside the water jacket.

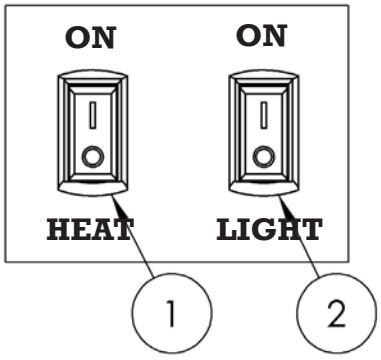


Diagram 7.1–Switches

Item #	Name	Function Description
1	HEAT Switch	For switching the combustion cycle ON or OFF. In the ON position, the combustion cycle will only start if the controller is calling for heat.
2	Work Light Switch	For switching the work light ON or OFF.
3	High Temp. Aquastat	(Not SHOWN—located inside rear top access panel). Switches fans off if controller fails and boiler overheats.
4	Control Aquastat	(Not SHOWN—located inside rear top access panel). Controls when combustion starts and stops.

7.2 Controls Functionality

7.2.1 HEAT Switch

This ON/OFF switch switches the combustion cycle on or off. When the switch is in the "OFF" position the combustion cycle will not start even when the controller is signaling for the combustion cycle to start. When the combustion switch is at the "ON" position the combustion cycle will start but only if the temperature control aquastat is also signaling the combustion cycle to begin.

7.2.2 !! WARNING!!

Switching the HEAT Switch to OFF does not cut off all power to the fan and actuators. Disconnect the main power supply before servicing the fan and/or actuators.

7.2.3 Light Switch

Used to switch the work light at front of unit ON or OFF.

7.2.4 Control Aquastat

The control aquastat is used to set the water temperature at which the heater switches the combustion fan off and at which water temperature the combustion fan switches on during normal operation. The control aquastat should not be set lower than 180˚F.

7.2.5 High Temperature Aquastat

The high temperature aquastat is used to protect the heater against over heating if the control aquastat should fail. If the high temperature set point is reached the fans are switched off and the air dampers close. The high temperature shutdown aquastat is set at the factory. Always talk to Polar Furnace Factory Support before changing the high temperature aquastat set point.

7.2.6 Temperature Gauge

Provides a reading of the water temperature inside the water jacket.

7.3 Controls Circuit Fuse

The control circuits are protected by a 3 amp slow blow fuse. In the event of an electrical problem this fuse may burn out and need to be replaced. The fuse should be replaced with another one of identical specifications. Failure to use the proper fuse can result in electrical damage to components making up the heater controls. The fuse holder is located on the control board (diagram 12.1: G-Class Wiring Schematic - Item F1) which is located inside the rear top access panel (diagram 4.1 - heater components - item #10). To replace a blown fuse pull the tab to swing the fuse holder outwards to expose the defective fuse. Place the new fuse in position and push the tab back into position.

7.4 Primary Air & Secondary Air Controls

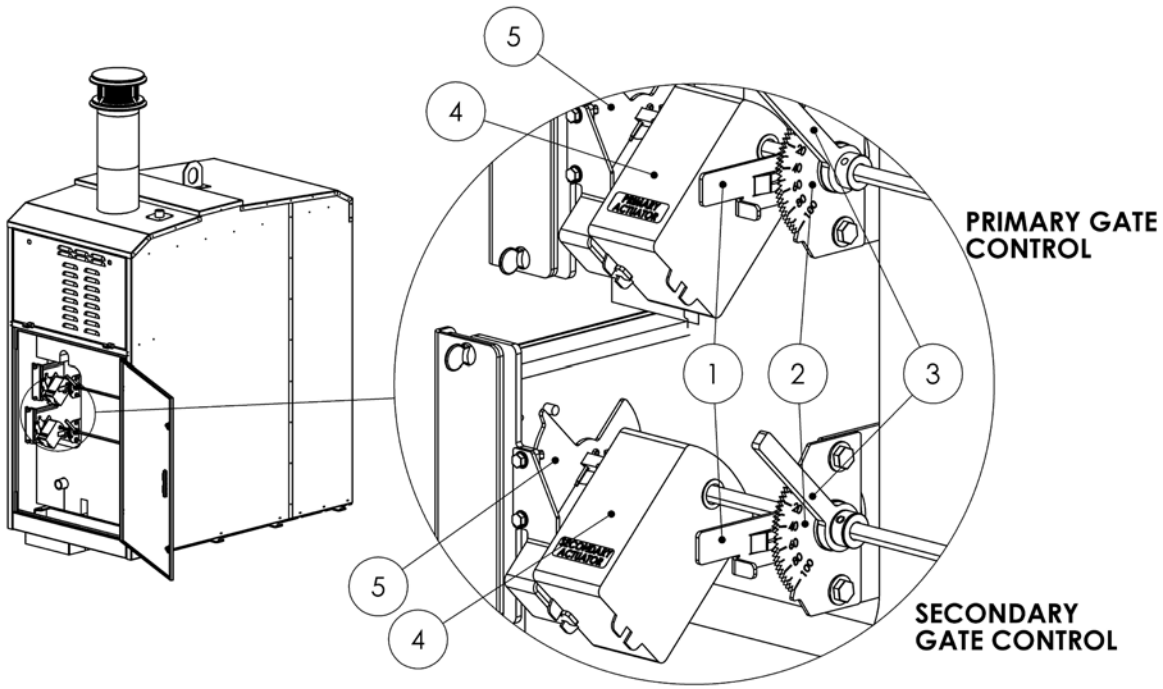


Diagram 7.2–Air Controls

Note: Refer to pages 32 and 33 for General Air Gate Adjustment Guidelines

Item #	Feature	Function Description
1	Gate Adjustment Lever	Spring loaded lever can be pulled slightly sideways and moved upwards or downwards to set how far the air gate opens.
2	Indicator Dial	Used as a reference to show how much the air gate will open when adjustment lever is set to different positions.
3	Rotation Stop	Rotates when actuator turns and stops rotation when it hits the Gate Adjustment Lever.
4	Spring Return Actuator	Opens the air gate when the combustion fans turn on. Gates will open to the position set by the Gate Adjustment Lever.
5	Air Gate	Air Gates open to the amount set on the Gate Adjustment Lever when the actuator rotates.

8 Operating the Heater

8.1 Before You Begin

Do not use any flammable liquid (gasoline, lighter fluid, diesel, etc) to help start or maintain a fire in the heater as this can result in serious bodily injury and can cause damage to the heater and property.

Do not burn anything other than properly prepared wood in the heater. **Do not burn garbage, trash, unseasoned wood, treated wood, plastic, oil, coal, coloured paper, solvents or anything other than properly prepared firewood.**

Be sure to keep all combustibles outside of the fire clearances as specified. See Section 6.6 for minimum fire clearances. The heater is designed to have an open or unpressurized water jacket. Pressurizing the heater can cause damage the heater, property and/or cause bodily harm.

Reference Section:
Wood Moisture Requirements

8.2 Wood Fuel Requirements and Guidelines

The only allowed fuel for the G-Class heaters is properly seasoned firewood. Logs or split pieces of wood with a diameter of less than 6" are best. Larger pieces can be burned but the flame will not be as intense and heat output will be reduced. **The moisture content of the wood used must be less than 24%.** Wood with a moisture content under 20% is even better and will provide the most efficient wood burning. The manufacturer cannot and will not be responsible for problems related to using wood that is not adequately dry. Using wood that is freshly cut or improperly seasoned may result in unpredictable operation, poor efficiency and a shortened heater life.

As a general rule wood that is cut to length, split and stacked under a roof without side walls for one year will usually season to within the acceptable moisture range. Wood that has been properly stored and seasoned for two years is better. The best way to determine wood moisture content is with a moisture meter.

Checking is a good indicator if a piece of wood has been seasoned or not. Checking is cracks that appear on the end of a log as it seasons or dries. Green freshly cut wood will have no checking or cracks. Seasoned wood will have checking on the ends. The longer the wood seasons the more checking or cracks will show. Review diagrams 8.1 to 8.4 showing green and seasoned wood:

Diagram 8.1–Green, Split Wood: no checking visible, indicates green, freshly cut wood.

Diagram 8.2–Seasoned, Split Wood: checking visible, indicates wood has been seasoned.

Diagram 8.3–Green Wood Logs: no checking visible, indicates green, freshly cut wood.

Diagram 8.4–Seasoned Wood Logs: checking visible, indicates wood has been seasoned.

Generally you will be more satisfied with the heater when burning drier wood. With drier wood the heater will:

- burn less wood,
- burn the wood more efficiently,
- emit less emissions from the stack,
- be much easier to light,
- have less creosote buildup and
- last many years longer.

Seasoned wood burning is better wood burning!

For more information, visit the following links on the web:

- EPA's Burnwise Program Website (lots of good wood burning information): http://www.epa.gov/burnwise
- Video about how to properly Split, Stack, Cover and Store Wood: http://www.youtube.com/watch?v=yo1--Zrh11s
- EPA Wet Wood is a Waste brochure: http://www.epa.gov/burnwise/pdfs/wetwoodwastebrochure.pdf
- Video about how to Use a Moisture Meter: http://www.youtube.com/watch?v=jM2WGgRcnm0

8.3 Starting and Operating the Heater the First Time

Before starting heater for the first time, the installation should be inspected and approved by an individual with appropriate qualifications (electrician, plumbing and/or heating contractor etc.) The heater and all system piping must be properly filled with water.

When starting the heater for the first time after purchasing or when starting for the first time at the beginning of a heating season, follow the following steps:

1. Flick the HEAT switch, located on the side of the heater, to the ON position. This will engage the fan.

2. Place a layer of small pieces of wood kindling and newspaper onto the fire chamber floor. Do not plug the slot at the bottom of the fire chamber.

3. Add at least 12 inches of smaller firewood no larger than 2" across on top of the kindling.

4. Fill the primary fire chamber half full with regular pieces of firewood. Stack the wood lengthwise into the fire chamber.

5. Close the top loading door and open the front middle ignition door.

6. Light the newspaper/kindling on the fire chamber floor.

7. Leave the middle door open a crack until the kindling has caught well.

8. After kindling has caught well close the front middle ignition door.

9. Ensure all 3 front doors are closed tightly and close outer door.

Note: During the first start up, large quantities of condensation form in the fire chamber. In some conditions there is so much condensation during startup that it will leak out of the secondary and side cleanout door. To minimize condensation during startup or until the water temperature is above 160˚F, only load the fire chamber half full with wood.

8.4 Tools Needed for Operation and Maintenance

To operate and maintain the heater properly the tools in Diagram 8.5 are necessary and are shipped with each heater:

8.5 Stoking the Heater

See Section 8.2-"Wood Fuel Requirements and Guidelines" for information on which wood is suitable as fuel for the heater.

Place wood lengthwise inside the fire chamber so that the firewood ends face the door opening. Lay the first few pieces into the bottom of the fire chamber carefully since dropping them can damage the ceramics. Be careful not to cover the nozzle opening when loading the first few pieces. Stack the wood inside the chamber as neatly as possible. Never place wood into the secondary fire chamber (front bottom door).

Tip: Before adding wood to the fire chamber use the small ash tool to push aside any ash and coals covering or plugging the nozzle opening. This will insure maximum heat output in the shortest time possible.

Tip: When you want to get maximum heat output fastest use smaller diameter wood towards the bottom of the fire chamber.

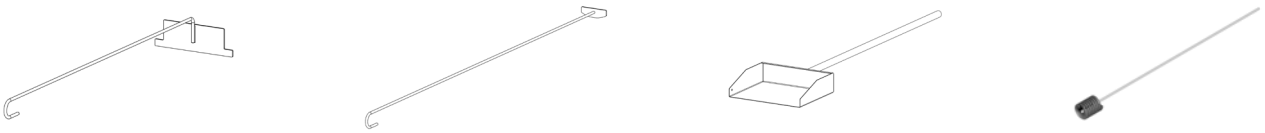
8.5.1 Reduced Season Stoking (Shoulder Season)

During the shoulder seasons (fall, spring) when the heat load is less, only load as much wood into the furnace as is needed for the next 10-12 hours. Further information in Section 8.10.

8.5.2 Burning Slab Wood

When loading slab wood into the fire chamber be careful not to cover the nozzle opening at the bottom of the fire chamber. Insure there is are openings around the slab wood so air can flow freely into the nozzle.

While filling the fire chamber stack the slab wood in such a way that there are gaps and spaces between the slab flats. If slabs are stacked one on top of the other without spaces it is like loading large diameter logs into the fire chamber. The fire will be less intense and heat output will be reduced.



Large ash tool | Small ash tool | Ash Shovel | Flue Brush

Diagram 8.5–Cleaning Tools

8.6 Managing the Ash/Coal Bed

After using the heater for several days you will notice a buildup of ash and coals at the bottom of the fire chamber. When left undisturbed for several more days, this layer can become a hard insulating layer which will negatively impact the performance of the heater. This layer must be stirred on a regular basis. The ash building up in the corners at the bottom of the fire chamber must be stirred daily using the small ash tool. If the ash buildup becomes excessive (covers all the primary air delivery holes) part of it can be removed. Always leave an inch or two of stirred ash and coals in place to protect the bricks during loading.

8.7 Keep the Primary Air Holes Clear From Obstruction.

The primary air holes are located towards the bottom and along both sides of the fire chamber. Before loading the heater open the middle ignition door and use the small ash tool to clear coals and ash that may be covering the primary air holes. This will make the heater burn cleaner and more efficiently.

8.8 Disposal of Ashes

Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground well away from all combustible materials.

8.9 Shutting Down the Heater

The heater combustion cycle can be turned off manually by switching the HEAT switch to the OFF position. This will not stop the fan from turning on when the loading door is opened. To completely shut down the heater, the main disconnect switch powering the heater must be turned off.

8.10 Fractional Load/Summer Use

A fractional (or partial) load is a smaller heating load that is placed on the heater during the shoulder seasons (spring and fall) and summer.

In a fractional load-type situation, fill the chamber only with as much wood as needed to provide heat for the next 10-12 hours. For example, if a half chamber load of wood is needed to provide heat for the next 10-12 hours, fill the chamber only half way. Regularly filling the fire chamber completely when there is only a small heat load can lead to fire chamber wall corrosion and shortened heater service life.

Whenever possible, do not use the heater during summer months when the heat load is very small. Never use the heater just for a very small load like domestic hot water generation. Use an alternate supply of heat for this purpose (e.g electric hot water heater). A small fractional load like domestic hot water heating during summer is harder on the heater and will shorten its service life.

If the heater has to be used in the summer for small loads like domestic hot water add as little wood as possible when filling the heater. **Never fill the fire chamber completely with wood in these situations and insure the wood is well seasoned. See section 8.2.** If you notice ash at the bottom of the fire chamber is wet or moist, immediately stop using the heater for the fractional load. Thoroughly clean out the moist ashes and ensure the fire chamber dries completely.

8.11 Operating Temperature

The water temperature in the water jacket should always be above 160°F. Maintaining proper water temperature in the heater is important for two reasons:

1. Proper combustion—cool water cools the combustion process which reduces the combustion efficiency.

2. Heater longevity—cool water causes condensation to form on the fire-side surfaces. This condensation results in creosote buildup throughout the heater. Moisture or water mixed with ashes is corrosive and will shorten the life of the heater.

8.12 Setting the Primary and Secondary Air Gates

The G-Class furnace has a very stable combustion system by design and the factory settings work for burning any type of properly seasoned cord wood and rarely need to be changed. For factory damper settings see Section 8.12.2. For information on what properly seasoned cord wood is refer to Section 8.2.

The primary air gate regulates the amount of air delivered to the primary fire chamber. The secondary air gate regulates the amount of air delivered to the secondary chamber.
(See Section 7.4-Primary & Secondary Air Controls)

By changing the primary air gate settings the heater BTU output rate can be increased or reduced. Also, different amounts of primary and secondary air may be needed depending on the type and moisture content of the wood being burned.

8.12.1 Air Gates Location

The primary and secondary air gates are located inside the rear bottom access panel (Diagram 4.1, Item 8).

8.12.2 Factory Settings

At the factory, the fan switch is set to HIGH, the primary gate is set to 50% open and the secondary gate to 40% open. These settings will work well in most situations provided properly prepared and well-seasoned wood is used. See Section 8.2-"Wood Fuel Consideration" for information on which wood is suitable as fuel for the heater.

8.13 General Air Gate Adjustment Guidelines

8.13.1 Wood Moisture Content Rule

Wetter wood generally will need more primary air and less secondary air. Drier wood generally will need less primary air and the same or more secondary air.

8.13.2 Wood Size Rule

Larger diameter logs will reduce the output rate of the heater. Smaller diameter or pieces that have been split smaller will increase the output rate of the heater. Larger logs will generally require less secondary air while smaller logs will generally require more secondary air.

8.13.3 Soft Wood vs. Hard Wood Rule

Softer woods generally will burn faster and need more secondary. Harder woods will generally burn slower and require less secondary air.

8.14 Is My Heater Burning Wood Properly?

8.14.1 Chimney Smoke

Good combustion is characterized by no visible smoke coming from the chimney. If the heater is smoking when the air gates are set to the factory settings it is highly likely that wet wood is being burned. Get dry wood.

8.14.2 Is it Smoke or Water Vapour?

During normal combustion the heater will emit condensation or water vapor which can look very much like smoke. There are a number of indicators which can be used to determine if the what is observed is water vapor or smoke:

1. With the chimney cap removed check to see if there is a "clear" gap (or a space without the visible cloud) between the chimney end and the cloud. A clear gap indicates water vapor. If the cloud begins right at the chimney end and there is no gap this may indicate smoke.

2. If the furnace smokes for the amount of time it takes for an entire fire chamber full of wood to burn, the fan housing and heat exchanger will be lined with creosote and/or carbon which is dark black. If the heat exchanger and fan blade and fan housing are not coated in black the

heater is not smoking and the visible cloud is condensation.

8.14.3 Secondary Flame Characteristics

How well the heater is burning can be gauged by viewing the orangey-yellow secondary flame through the peep hole in the front bottom door. During optimal combustion this flame will have at least some blue flame in it. If you see blue the heater is well set. Depending on which part of the combustion cycle the heater is in, there will be more or less blue flame. When there is a heavy bed of coals in the fire chamber the flame should have more blue than orange and yellow. When the heater has just started burning on a fresh load of wood there will be very little blue flame and mostly orange and yellow flame.

8.14.4 Ceramics Glow

If the combustion cycle is long enough the ceramics will begin to glow bright orange from the high temperatures in the secondary chamber. The glow from the bricks may make the blue flame hard to see during the day time and it may seem that there is no flame at all in the secondary chamber.

9 Maintaining the Heater

Proper maintenance of the heater is important to insure reliable, efficient and safe operation of the heater. Proper maintenance will also help insure longer service life of the heater. There are weekly, monthly and end of season maintenance procedures which need to be understood and followed.

9.1 Weekly Maintenance

9.1.1 Fire Chamber Ash Bed.

During normal use ash will accumulate along the bottom sides of the fire chamber. If left untouched this ash will pile up high enough to plug the primary air delivery holes. This ash needs to be stirred and moved away from the walls and primary air holes regularly using the Large Ash Tool (Section 8.1). If the ash at the bottom of the fire chamber builds up more than 3-4 inches the access ash should be removed with the ash shovel. When removing ash always leave at least 2 inches of ash at the bottom of the fire chamber. This helps protect the fire brick from damage during the wood loading process. (Review diagram 9.1-Primary Fire Chamber Ash Removal)

9.1.2 Secondary Chamber Ash Removal

During normal use ash will build up in and around the secondary burn chamber and needs to be removed periodically.

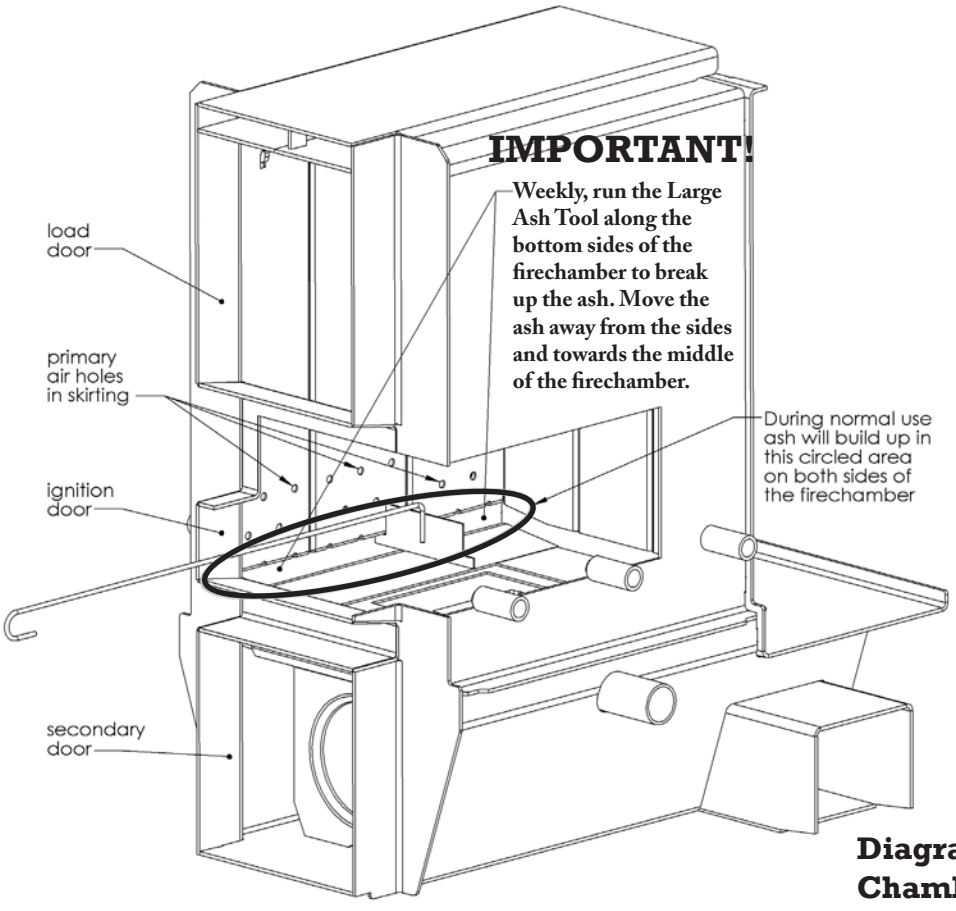


Diagram 9.1–Primary Fire Chamber Ash Removal

!! DANGER !! - EXTREMELY HIGH TEMPERATURES OCCUR INSIDE FRONT BOTTOM CLEAN-OUT DOOR. ALLOW HEATER TO COOL BEFORE COMPLETING MAINTENANCE DESCRIBED BELOW. WEARING EYE AND/OR FACE AND HAND PROTECTION IS STRONGLY RECOMMENDED. FINE WHITE POWDERY ASH BECOMES AIR BORNE EASILY. RESPIRATORY PROTECTION IS STRONGLY RECOMMENDED.

Every 1-2 weeks open the Front Bottom Clean-out Door (Diagram 4.1, Item #16) and use the Small Scraper Tool (Diagram 8.1), which has one edge that matches the roundness of the secondary chamber, to remove the ash from inside the secondary burn chamber. Keeping the secondary chamber clean will improve the combustion efficiency of the heater and keep the heater working properly.

The ash accumulating in front of and along the outside of the secondary burn chamber needs to be removed when 3-4" has built up. For best efficiency remove this ash weekly. Use the Small Ash Tool to scrape the fire chamber walls around the secondary burn chamber to remove the accumulating fine grey/ white insulating ash.

9.1.3 Easy Sweep Heat Exchanger Cleaning

Each day when loading the furnace with wood rapidly work the Easy Sweep lever on the side of the unit back and forth several times to clean the heat exchanger tubes. Working the Easy Sweep daily will keep the tubes as clean as possible and ensures maximum heat exchanger efficiency. Some types of wood have much lower ash content than others and daily cleaning may not be needed to maintain maximum efficiency. Some types of wood have high clay content and this may stick to the heat exchanger surface and build up slowly over time causing the Easy Sweep to seize. In this situation it is necessary to clean the tubes at regular intervals using the wire brush shipped with the furnace. To clean the tubes with the wire brush remove the heat exchanger top access panel (Diagram 4.1, Item #1), remove the piece of insulation covering the inner access cover, remove the inner access cover, remove the quick pins to remove the turbulators. Brush until clean.

Caution:
Always reinstall turbulators after cleaning the heat exchanger and never operate the furnace without the turbulators in place. Operating the heater without the turbulators in place will cause the stack temperature to increase dramatically and will damage the fan motor.

9.1.4 Water Jacket Water Level

Once every 1- 2 weeks check that the water jacket is filled to the proper level. This is done with the Water Level Sight Gauge. (Diagram 4.1, Item #5) To check the water level, simply turn the valve on the Water Level Sight Gauge 90°. Water will fill the sight tube above the valve and indicate the water level inside the water jacket. If the water level is below the green "Full" zone water MUST be added before continuing to operate the heater. After checking the water level, turn the lever back to the original position and the water will drain from the sight tube.

IMPORTANT - Operating the heater with low water will destroy your heater and voids all warranty.

9.2 Monthly Maintenance

Once a month, open the Heat Exchanger Bottom Cleanout Door (Diagram 4.1, Item #7) and use the Small Ash Tool to remove all the accumulated ash from the walls and bottom of the fire chamber. Depending on the firing rate this cleaning may need to be performed more or less frequently then once a month. Ash should not build up more than 3" and removing the ash more frequently will keep the furnace operating more efficiently.

Also remove the nozzle inserts (fire grates) (see Item 5, Diagram 13.5) from the bottom of the fire chamber and remove any accumulated fine ash from the channels underneath. These ashes can be removed through various means but a hot ash vacuum works best.

9.3 End of Season Maintenance

9.3.1 Fire chamber Walls and Primary Air Delivery Ports

Remove the STRONGWALL liner pieces by lifting the individual pieces up and off the retaining pins/ hangers. Before attempting to remove the liner remove any ash and creosote between the very top of the liner pieces and the top of the fire chamber. This will make it possible to slide the pieces upward for removal. Then using a flat screwdriver break the pieces free from each other by inserting the screwdriver between the panels and prying the pieces away from each other.

Remove the STRONGWALL panels in the following order. Reinstall in the reverse order.

- First, remove front side corner pieces
- Then, the side middle pieces
- Then, the 2 or 3 rear pieces.
- And, then the remaining side rear-most pieces.

Inspect the STRONGWALL liner and replace any pieces that are worn thin. The liner will warp over time. This warping is normal, however, the panels should be replaced if the bottom of the liner warps more than 1" outward from its original position. The STRONGWALL liner will last anywhere from 3-6 years depending on use.

With the STRONGWALL panels removed, the fire chamber surface will have a dark glassy smooth look towards the top and charred ash towards the bottom. The dark smooth areas are covered with a thin layer of creosote. This thin layer of creosote does not need to be removed. Remove any heavy buildups of creosote and ash. Inspect the 6 (3 ports per side) primary air supply ports located towards the bottom of the fire chamber and remove any creosote which may be plugging them. **Tip:** Hard creosote can be removed from the Primary Air Supply Ports using a cordless drill and drill bit. The drill bit can range in size from 1/2" to 1.125". A larger bit works better and faster than a smaller bit. The Primary Air Supply Ports are about 4 inches deep.

9.3.2 End of Season Ash Removal

Creosote and/or ash mixed with water produces a corrosive acid. This acid can form inside the fire chamber during the off season. It is important that the heater be properly prepared for the off season period when the heater will be idle to avoid formation of this acid. All the ash and coals need to be removed from the heater. Clean all areas including the fire chamber, underneath the nozzle insert (fire grates) secondary chamber, underneath the heat exchanger, above the heat exchanger, the fan and inside the fan housing to remove all the ash and coals. The chimney should be sealed off with a plastic cap or wrap to ensure that no water gets into the heater. Ensure all the doors are tightly closed.

9.3.3 ASH + MOISTURE = CORROSIVE ACID.

CORROSIVE ACID WILL CORRODE AND DAMAGE THE HEATER. REMOVE ALL THE ASH AND COALS AND CREOSOTE FROM THE FIRE CHAMBER WHENEVER THE HEATER IS SHUT DOWN FOR MORE THAN 3 WEEKS.

9.4 Fan Maintenance

At least every 3 months or as often as is required to ensure trouble-free operation, remove and clean the main suction fan as well as the fan housing at the rear of the furnace.

9.4.1 CAUTION:

Before removing/servicing the fan, disconnect power to the heater. Ensure that there is no wood burning in the primary fire chamber and that the fan blade has cooled adequately.

9.4.2 Removing the Fan Assembly

Carefully unplug the rear power connector first (see Diagram 9.2). Next unplug the front control connector from the side of the motor.
Note: Both Connectors have catches (see Diagram 9.2) which must be released before the plug can be unplugged. The rear power connector has a release on both ends of the connector. The release on the front control connector is on the back side of the connector and hidden from view.

Once unplugged, thread both cables back into the electrical controls area. Next, remove the thumb screw(s) (see diagram 9.3 –item #5) securing the cooling shroud in place and remove the fan cooling shroud (see diagram 9.3–item #4).

Next, remove the 4 wing nuts (see diagram 9.3–item #2) mounting the fan assembly to the heater. Finally, pull the fan assembly straight back to remove from the heater.

IMPORTANT: DO NOT DISASSEMBLE THE FAN ASSEMBLY FURTHER. LEAVE THE BLADE ATTACHED TO THE MOTOR DURING CLEANING.

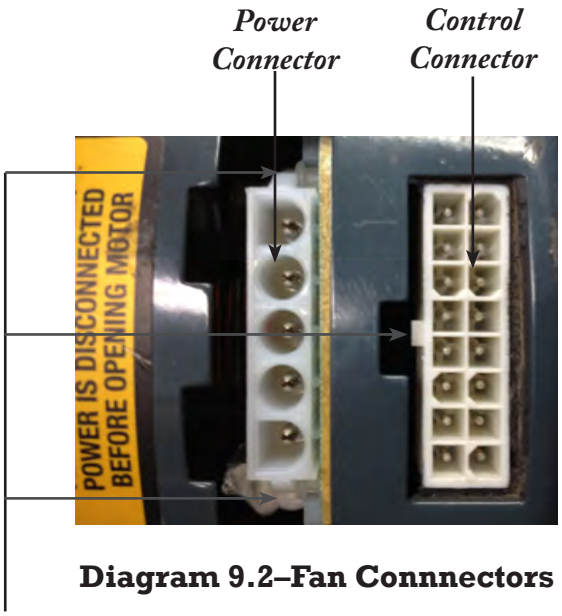


Diagram 9.2–Fan Connnectors

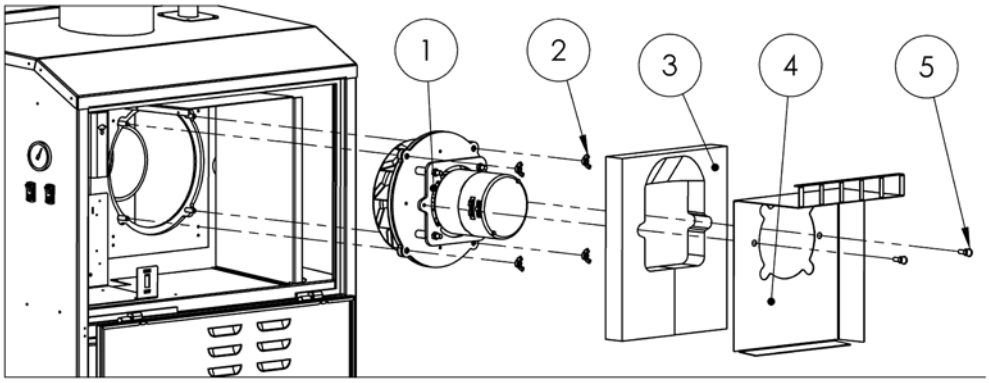
9.4.3 Cleaning the Fan Assembly

Gently clean the fan blade using a stiff brush. A wire brush works well. NEVER USE WATER WHEN CLEANING THE FAN BLADE. NEVER USE A CHISEL OR HAMMER OR ANY OTHER TOOL THAT COULD GOUGE BEND OR DAMAGE THE FAN BLADE. Remove as much of the ash from the fan blade as possible. Using a thin screwdriver or similar tool, remove any buildup between the fan blade and the mounting plate. All fan blade surfaces must be cleaned thoroughly to ensure the blade is well balanced when placed back into the heater. Clean the walls and bottom of the fan housing and remove all ash and dust before reinstalling the fan assembly.

After cleaning the fan carefully, reinstall the fan assembly. When plugging the power and control electrical cables back into the motor be careful and ensure that the connectors are oriented correctly. The plugs can only be oriented in one way. Round pins fit into the round holes and square pins into square hole. (See picture below) If the plug doesn't seem to fit, try turning the connector 180 degrees.

9.5 Maintaining Tight Door Seals

Maintaining tight door seals will help keep the heater performing properly. The fiberglass rope used to seal the fire chamber doors should be inspected regularly.



ITEM	DESCRIPTION
1	Fan Assembly
2	3/8" wing nut (x4)
3	fan insulation
4	cooling shroud
5	thumb screw(x2)

Diagram 9.3–Fan Removal

If a glass rope becomes too flattened and/or worn it should be replaced.

A leaky poor door seal results in slow but steady combustion of wood during the off cycle. This results in more wood being used which reduces the overall efficiency of the heater.

9.6 Water Jacket Treatment Levels

Check water using test kit to insure proper nitrite and pH levels. Adjust levels if necessary. See "Water Testing and Treatment" section for water testing and treating information. Water test and treatment kits are available for purchase.

9.7 Anode Rod

The heater is protected by a sacrificial anode rod. A sacrificial anode rod works by "sacrificing" itself and corroding first before the heater steel corrodes. Over time corrosion will wear the anode rod down until it is completely sacrificed (or used up). In order to keep protecting the heater from corrosion the anode rod need to be replaced from time to time. The length of time the anode rod will help protect the heater will vary depending on the chemistry of the water. It is recommended that the anode rod is checked once a year and replaced if it has worn down to less than 3/8 inch diameter. The anode rod can be accessed by removing the top heat exchanger cover (Diagram 4.1, Item # 1). The rod can be loosened and removed with a wrench or socket ratchet set.

9.8 Creosote

If creosote builds up inside the front bottom cleanout door, on the heat exchanger tubes, on the fan or in the chimney, the heater is likely not working properly. Stop using the furnace and consult with the local dealer to get the heater working properly.

9.9 Wear Items

The G-Class includes parts classified as wear items. These items wear down over time and will need to be replaced from time to time during the life of the heater. The life expectancy of these items varies greatly depending on my factors including maintenance level, firing rate and the type and moisture content of wood burned. Wear items are not covered under warranty. The operator must monitor and insure wear items are replaced when the conditions detailed in this section below become evident or when it becomes obvious that any part is breaking down and not retaining its normal shape and function. Damage to the G-Class resulting from failing to replace wear items in time is not covered under warranty. Refer to the warranty for a full list of wear items not covered under warranty.

9.9.1 Description: Bottom Door Insulation

Location: Bolted to Front Bottom Clean Out Door (Item # 16, Diagram 4.1)
Replace when any area deteriorates more than 0.5" from original shape.
Part #: 100089

9.9.2 Description: Nozzle Insert (fire grate)

Location: At Bottom of Primary Firechamber (Item #5, Diagram # 13.5)
Replace when nozzle opening has increased to 2" or if the insert is warped more than 3/8"
Part #: 100529

9.9.3 Description: Strong Wall Liner

Location: Inside Primary Fire Chamber (see Diagram 13.1)
Replace when bottom of panels are warped more than 1" away from the fire chamber wall or when parts of the panel have completed deteriorated.
Part #: Various (see diagram 13.1)

9.9.4 Description: Easy Sweep Turbulators

Location: Inside Heat Exchanger Access Cover (Item 1, Diagram 4.1)
Over time the bottom end of the turbulators will deteriorate from the intense heat. When the bottom of the turbulator has lost it's stiffness so that it is no longer effective at removing dust from the heat exchanger surface when Easy Sweep is activated the turbulator should be replaced
G2 Part # 100048
G2-Plus Part # 101085
G3 Part # 100047

9.10 Maintaining the Fan

#	Fan Problem	Cause of Problem	Troubleshooting/Corrective Measures
1	Fan is making a loud noise	Fan is contacting inside surface of furnace	-remove and adjust fan blade on shaft to give more clearance to surface being contacted.
2	Fan/furnace is vibrating/shaking	-fan has buildup of dust on one side of the fan making it unbalanced. -condensation from chimney is dripping from chimney onto fan in the off cycle causing the fan to become unbalanced.	-remove and clean fan assembly and fan housing. -see corrective measures listed under problem #4.
3	Fan fails to start turning when controller calls for heat	-fan or fan housing has a lot of ash/dust buildup keeping fan from rotating. -motor has failed. -motor control has failed. -other electrical control component has failed.	-remove fan and clean fan assembly and fan housing. -ask licensed electrician to check cables and connectors. -ask dealer or factory for assistance in locating failed electrical component. -check fuse F1 (Section 7.3).
4	There is water or wet sludge at the bottom of the fan housing	-condensation is occurring inside the fan housing and/or chimney extension.	-use only prefabricated insulated chimney extension. -ensure fan insulation is installed behind the fan air cooling shroud. -ensure chimney base insulation underneath the rear roof panel is in place. -ensure proper combustion. -burn well seasoned dry wood only.
5	Ash/dust building up on fan and in fan housing very quickly and needs to cleaned much more frequently than every 3 months to run without problems	-uninsulated chimney causing condensation to drip from chimney down onto fan and into fan housing. -temperature in chimney too low. -wet wood is burned causing poor combustion, low stack temperatures, and condensation in stack.	-ensure only prefabricated insulated chimney is used to extent chimney. -see corrective measures listed under problem #4. -adjust damper/fan settings to increase stack temperature above 280˚F. -burn well seasoned wood only.
6	There is a heavy buildup of creosote on fan that is very difficult to remove	-creosote indicates improper combustion.	-modify air damper settings to achieve proper combustion. -burn well seasoned wood only. Note: creosote (dark black hard substance that is difficult to remove) should never occur on the heat exchanger tubes or on the fan or in the fan housing. A creosote buildup in these areas indicates the furnace is not working properly and it must be adjusted to burn properly. Consult with your dealer or the factory to correct this as soon as possible.

10 Water Testing & Treatment

10.1 Overview

Properly testing and treating the water in the heater water jacket is important to control waterside corrosion. Untreated or improperly treated water can reduce the life of the heater. The water in the heater should be tested and if necessary treated to maintain proper Nitrite and pH levels. A Startup Water Treatment Kit is included with each heater. Further treatment supplies are available for purchase.

10.2 Drawing Water for Testing

10.2.1 !!CAUTION!!:

Water in water jacket could be very hot. Draw water with Caution!!

10.2.2 IMPORTANT!!

All water samples drawn for testing should be allowed to cool to room temp. before testing with test strips.

10.2.3 Collecting Water

Water can be drawn from the water jacket at the water level sight gauge. Open the valve and unclip the clear plastic tube from the holder and bend the clear tube downwards. Let water run from the tube for 10 seconds. Don't collect the first water draining from the tube; after 10 seconds direct the water into a clean container. Collect about 10 ounces of water.

10.3 Purchasing Additional Water Testing and Treatment Kits

Water testing and treatment supplies are available for purchase from your local dealer.

10.4 Nitrite Treatment

10.4.1 Initial Nitrite Treatment

Follow the instructions in with the Initial Treatment Kit included with the heater to initially treat the water.

10.4.2 Adjusting the Nitrite Level Up

If the nitrite level is lower than 600 ppm, dissolve another half puck of nitrite treatment in a 1 gallon container or pail and pour into the overflow/vent pipe. Circulate the water for at least 24 hours before testing for the new nitrite level.

10.4.3 Adjusting the Nitrite level Down

If the nitrite level is too high drain 20 gallons of water from the water jacket and refill with fresh untreated water. Circulate the water for at least 24 hours before testing for the new nitrite level.

10.5 Water pH Levels

10.5.1 Determining the pH level of the water

NOTE: Before filling the water jacket check the pH of the water to be used to fill the water jacket to insure it is within the allowable range. Use only water that has a pH level within the allowable range.

Follow the instructions included with the Initial Treatment Kit included with the heater to determine the pH of the water.

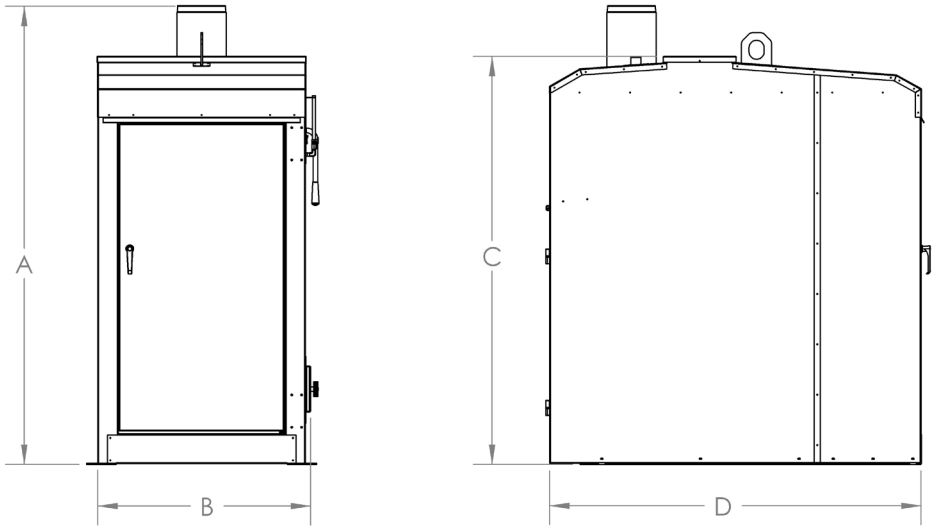
10.5.2 Adjusting the pH level Up or Down

If the pH level is not within the allowable range after filling the water jacket, treatments kits for adjusting the pH level up or Down are available for purchase.

10.6 Determining the Propylene Glycol Level (if used)

Kits to determine the glycol level and freeze protection level are available for purchase.

Heater Model Specifications 11

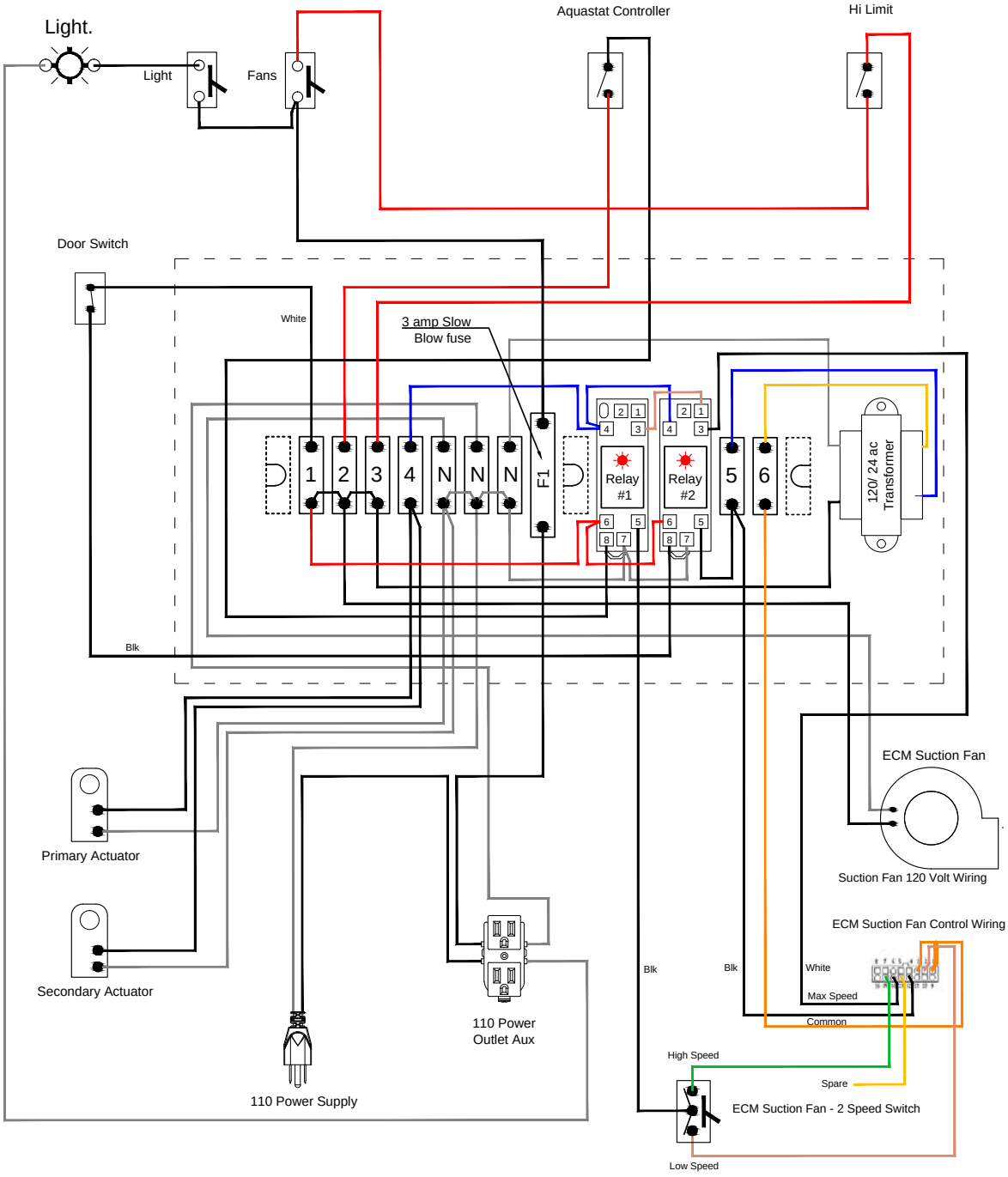


Heater Specifications

Specifications*	U of M	G2	G2-Plua	G3
Overall Height x Width x Length	A x B x C-inch	72 x 36.5 x 63.5	76 x 40 x 69.5	80 x 42.5 x 69.5
Weight	lbs	2200	2650	2750
Wood Load Door Opening (W x H)	inch	15 x 14	15 x 18	15 x 18
Max. Wood Length	inch	21	27	27
Supply Ports	Qty. x thread	2 / 1" NPT Female	2 / 1" NPT Female	3 / 1" NPT Female
Return Ports	Qty. x thread	2 / 1" NPT Female	2 / 1" NPT Female	3 / 1" NPT Female
Chimney Diameter	inch	6	6	6
Water Capacity	US gal.	160	200	250
Fire Chamber Volume	ft^3	5.6	9.2	12.7
Max continuous output	BTUH	160 000	180 000	200 000
8 hr. output rating	BTUH	66 897	108 982	142 533
Min. to Max. Ambient Operating Temp.	°C/°F	-35/-31 to 32/90	-35/-31 to 32/90	-35/-31 to 32/90
Voltage/Amps	V/A	120/1.86	120/1.86	120/2.74
Watts (Min./Max.)	W	88/214	88/214	189/316

Specifications subject to change without notice

12 Electrical Diagram



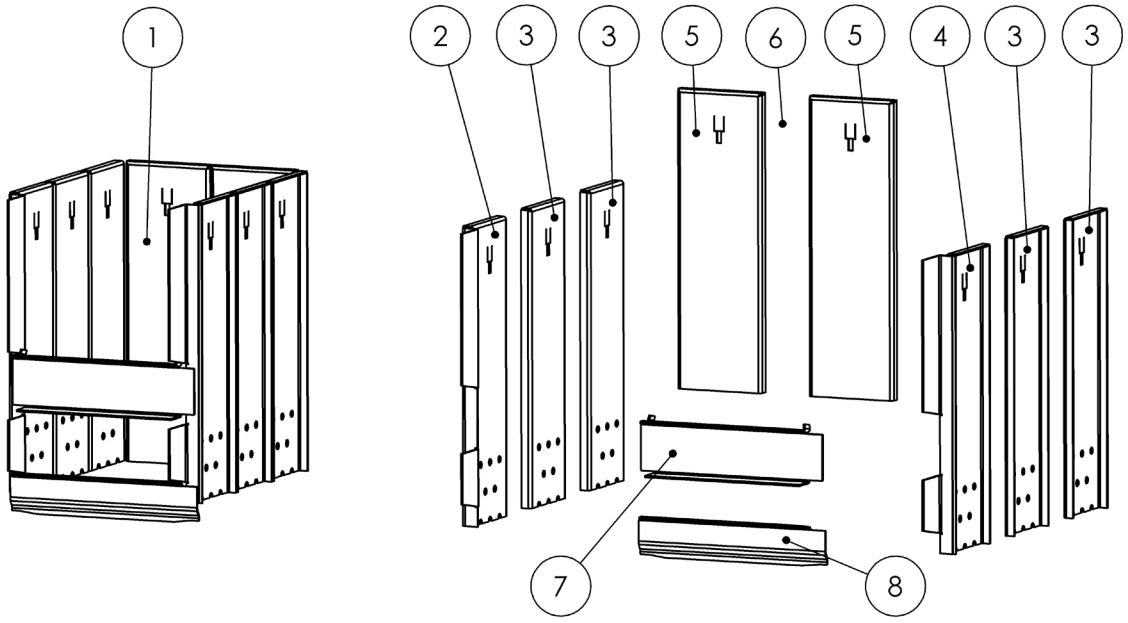
Rev 1.6

Diagram 12.1—G-Class Wiring Schematic

G-Class Replacement Parts 13

NOTE:
Only replace parts and components with original Polar replacement parts. With Polar original replacement parts in your furnace, you are using parts designed to work with and fit perfectly with each other. Installing non-original parts voids the warranty. Parts shown may be different from actual furnace. Always include your furnace serial# when ordering replacement parts. The serial # can be found on the silver CSA label located inside the rear top access panel.

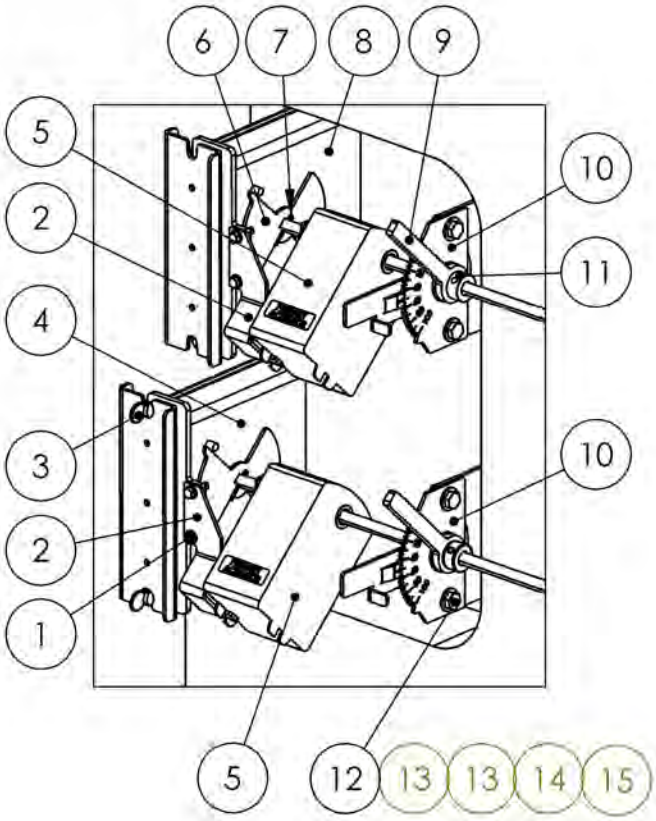
Diagram 13.1—StrongWall Liner



Item#	Description	Part# G2	Part# G2-Plus	Part# G3
1	complete STRONGWALL liner	100563	100530	100596
2	left side front liner	100556	100531	100590
3	sides liner	100559	100533	100589
4	right side front liner	100562	100534	100595
5	rear liner	100560	100535	100592
6	rear middle liner (not shown)	NA	NA	100592
7	middle jamb liner	100558	100536	100591
8	bottom jamb liner	100561	100537	100594

Diagram 13.2—Air Gate Assembly

ITEM	DESCRIPTION	G2 PART #	G2 Plus Part #	G3 PART #
1	3/16 hex head self drilling screw	000091	000091	000091
2	actuator stop	100604	100604	100604
3	thumb screw	000534	000534	000534
4	secondary tube left	100599	100539	100621
5	actuator	000187	000187	000187
6	air gate	100610	100610	100610
7	cutter pin	000511	000511	000511
8	primary tube left	100598	100540	100622
9	rotation stop	100607	100607	100607
10	air adjustment assembly	100602	100602	100602
11	collar	000461	000461	000461
12	5/16 x .75 bolt	000099	000099	000099
13	1/4 washer	000520	000520	000520
14	5/16 lock washer	000521	000521	000521
15	5/16 nut	000100	000100	000100
16	primary tube right	100601	100541	100623
17	tension spring(not visible)	000434	000434	000434
18	primary rod	100605	100546	100619
19	3/8 washer	000247	000247	000247
20	secondary rod	100617	100547	100603
21	gasket	000590	000590	000590
22	secondary tube right	100600	100548	100620
23	cover	100624	100624	100624



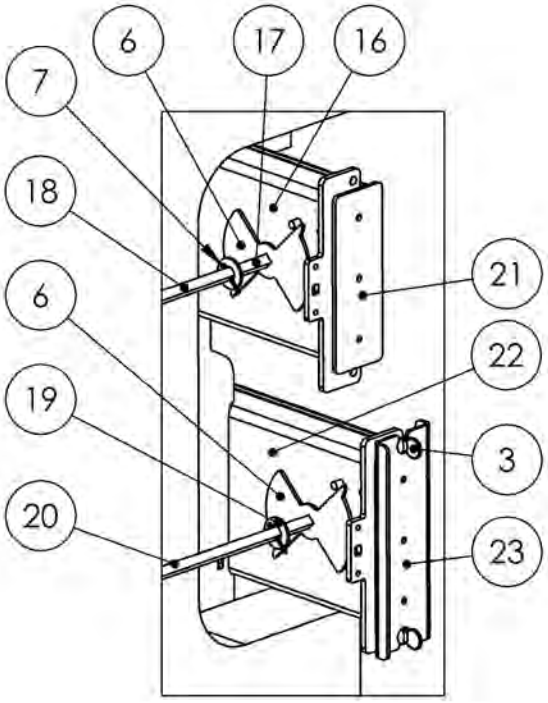
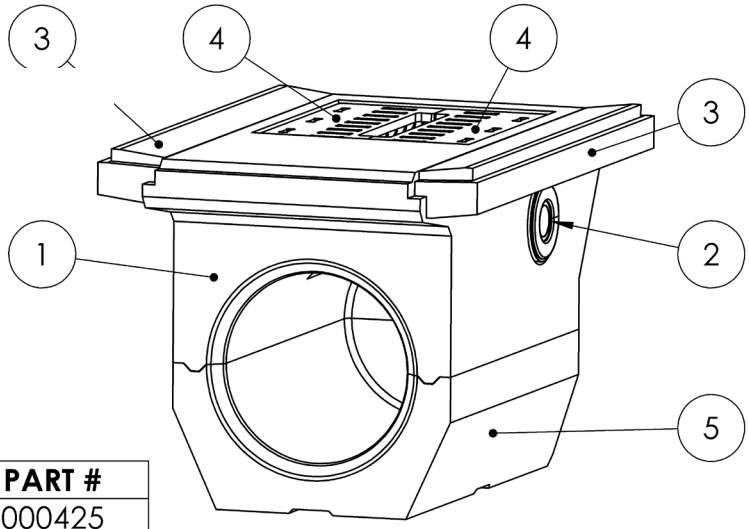
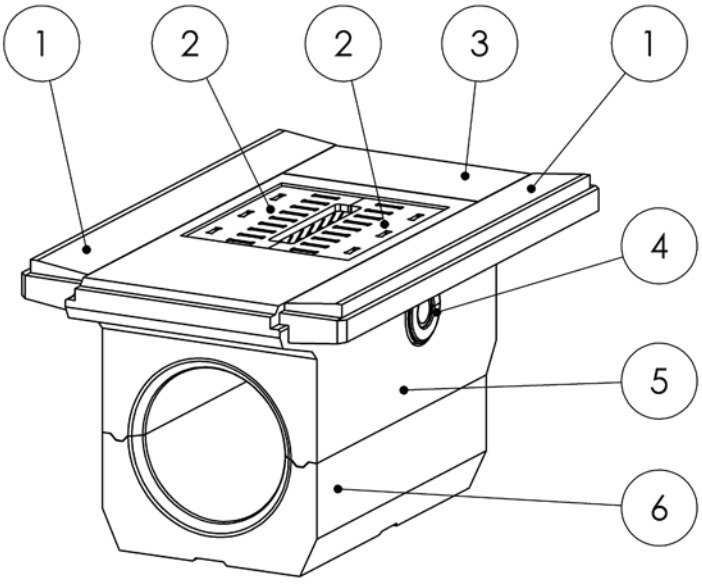


Diagram 13.3—G2 Ceremics Assembly



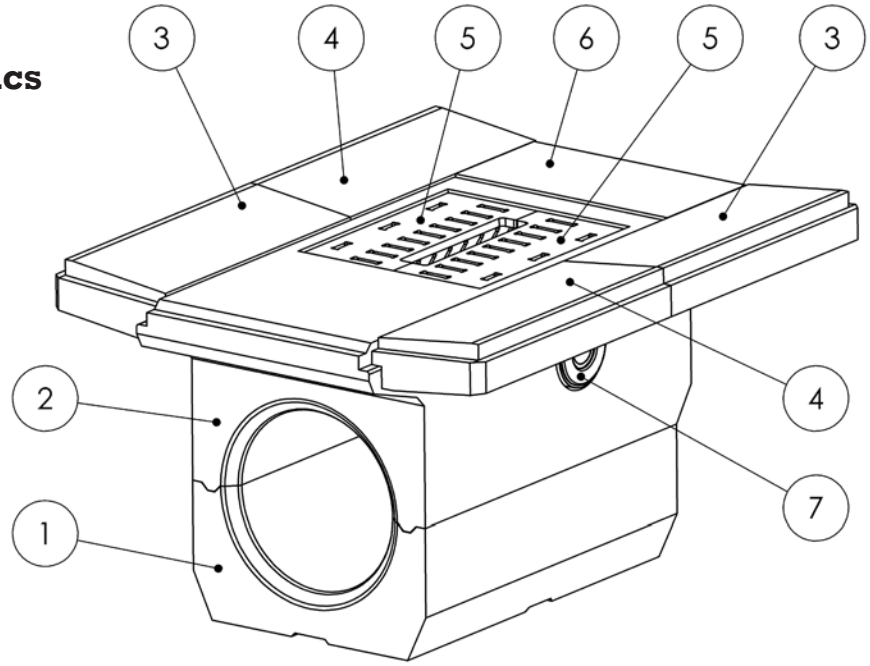
ITEM	DESCRIPTION	PART #
1	VORTECH TOP	000425
2	SECONDARY SEAL ASSEMBLY	100532
3	SIDE BRICK	000426
4	NOZZLE INSERT	100529
5	VORTECH BOTTOM	000627
6	SEALING ROPE (NOT SHOWN)	100528

Diagram 13.4—G2-Plus Ceremics Assembly



ITEM	DESCRIPTION	PART #
1	side brick	000493
2	nozzle insert	100532
3	rear brick	001083
4	secondary seal assembly	100529
5	vortech top	000494
6	vortech bottom	100551
7	fire box sealing rope (not shown)	000497

Diagram 13.5—G3 Ceremics Assembly



ITEM	DESCRIPTION	PART #
1	vortech bottom	000494
2	vortech top	000493
3	side brick type 1	000495
4	side brick type 2	000496
5	nozzle insert	100529
6	rear brick	000497
7	secondary seal assembly	100532
8	sealing rope (not shown)	100538

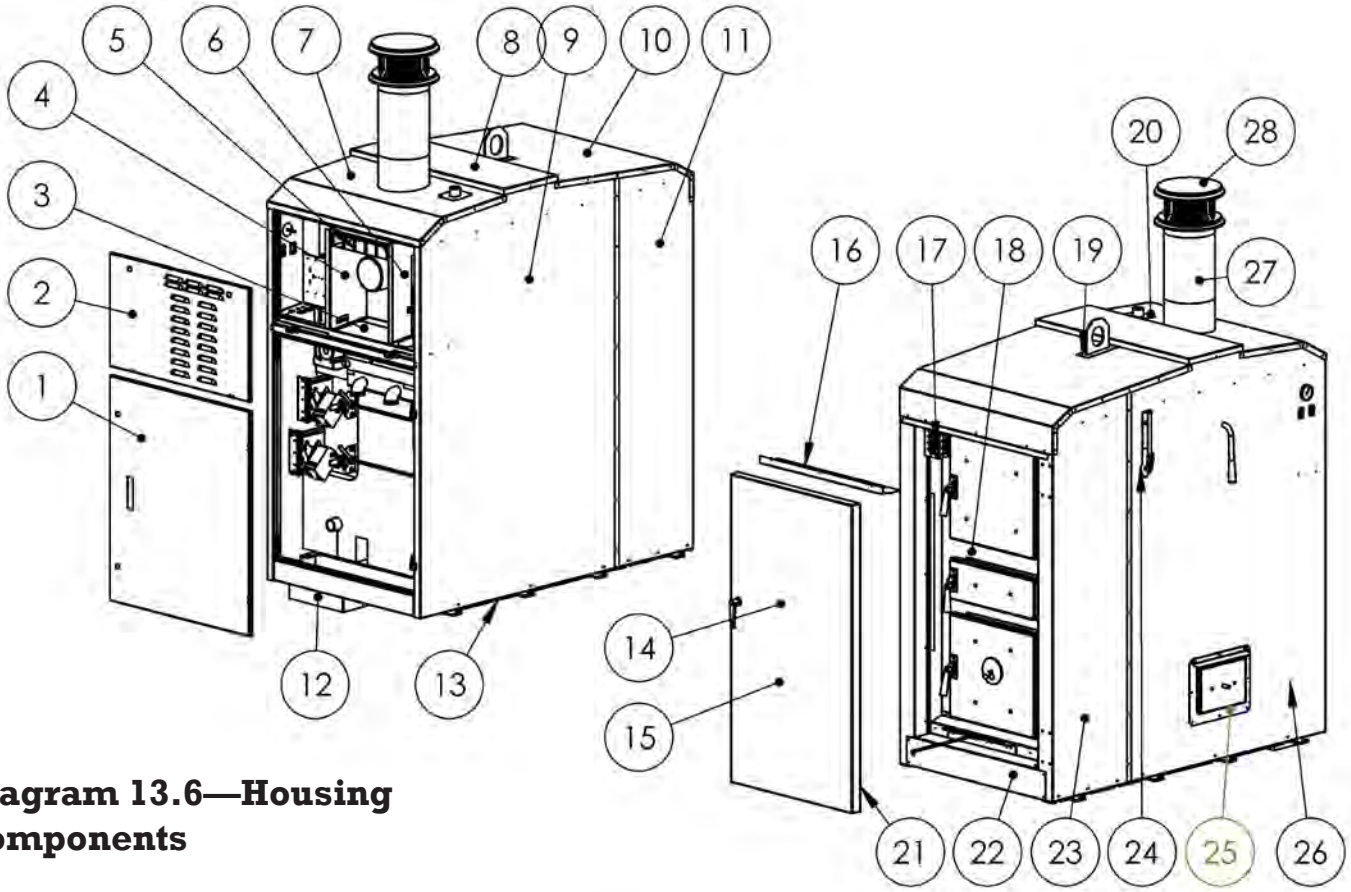
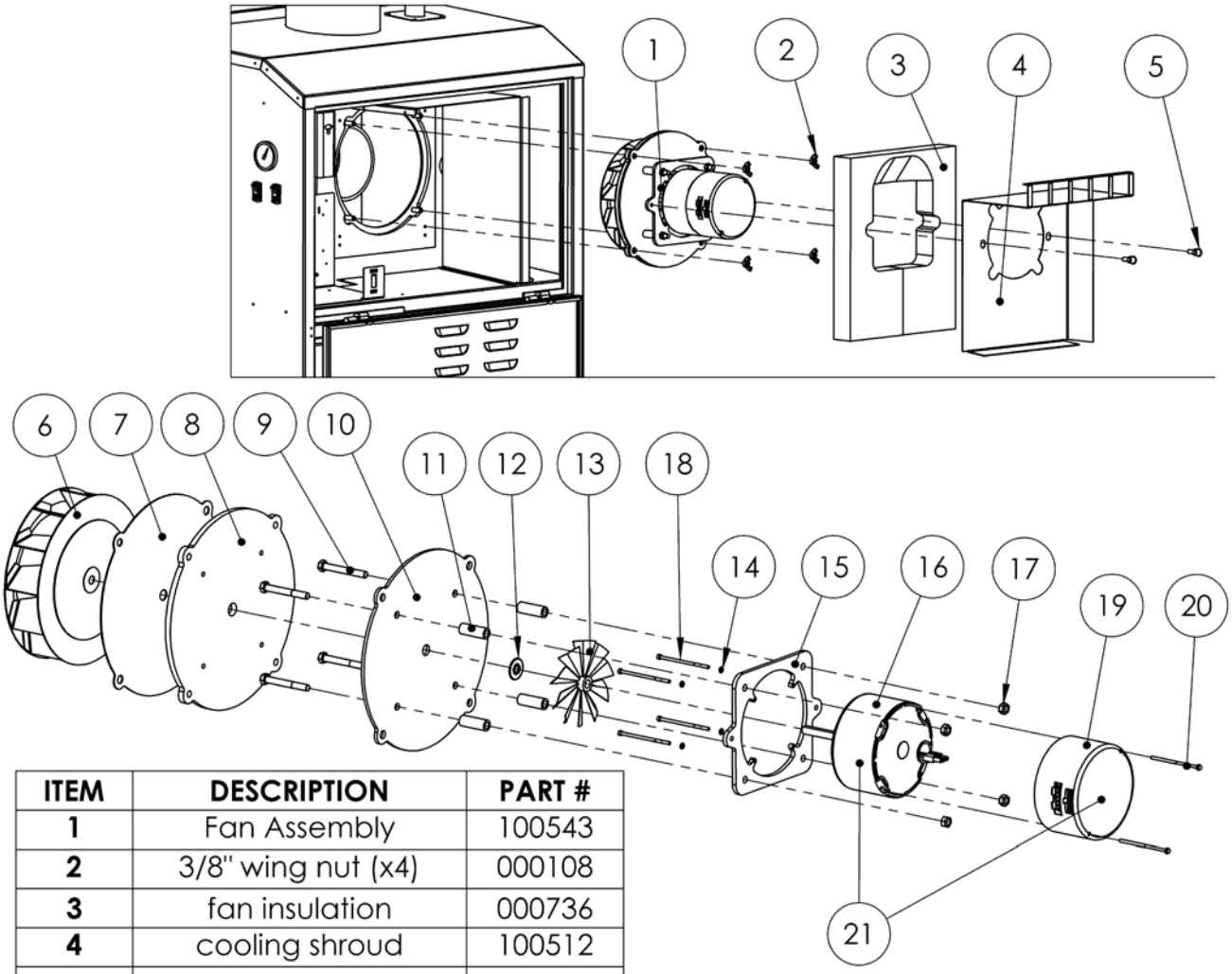


Diagram 13.6—Housing Components

ITEM	DESCRIPTION	G2 PART #	G2-PLUS PART #	G3 PART #		ITEM	DESCRIPTION	G2 PART #	G2-PLUS PART #	G3 PART #
1	rear bottom panel	100508	100553	100564		15	door outer panel	100513	100629	100584
2	rear top panel	100503	100609	100571		16	door eave	100525	100630	100575
3	rear mid partition	100501	100611	100572		17	light shroud	100521	100631	100582
4	fan left wall	100515	100612	100579		18	front panel	100523	100632	100565
5	cooling shroud	100512	100512	100512		19	lift hook trim	100509	100633	100569
6	fan right wall	100507	100613	100567		20	overflow trim	100516	100634	100578
7	roof rear	100504	100614	100566		21	door inner panel	100517	100635	100583
8	top access	100526	100615	100587		22	front bottom panel	100506	100636	100573
9	left rear panel	100502	100616	100576		23	right front panel	100524	100637	100586
10	roof front	100519	100618	100585		24	sight tube trim	100510	100638	100581
11	left front panel	100505	100625	100568		25	cleanout trim	100520	100639	100570
12	hookup connector	100522	100626	100577		26	right rear panel	100511	100640	100588
13	bottom panel	100514	100627	100580		27	Chimney 6" x 12"	000337	000337	000337
14	door full assembly	100518	100628	100574		28	Chimney raincap	000338	000338	000338



ITEM	DESCRIPTION	PART #
1	Fan Assembly	100543
2	3/8" wing nut (x4)	000108
3	fan insulation	000736
4	cooling shroud	100512
5	thumb screw(x2)	000534
6	main fan blade	000430
7	Inner SS Shield	100527
8	insulation	000431
9	3/8' x 3" bolt (x4)	000246
10	fan base plate	100550
11	spacer bushing	100552
12	shaft seal	000733
13	cooling blade	000436
14	3/16" lock washer (x4)	100542
15	motor mount	100549
16	motor part 1	100554
17	3/8" lock nut (x4)	000096
18	motor mount bolt (x4)	000542
19	motor part 2	100544
20	motor assembly bolt	100545
21	fan motor (part 1&2)	000384

Diagram 13.7—Fan Assembly

Plumbing 14

The hydronic system is used to distribute heat from an outdoor wood furnace to where it is needed and can range in complexity from very simple to quite extensive. The most common install is very simple and includes a water to air radiator placed into a central air furnace plenum, a pump, and insulated underground pipe (Diagram 14.8). More complex systems can also include several other heat emitters, a heat exchanger to separate the inside and outside open system, and may also include a backup boiler (Diagram 14.10)

14.1 Optional Connect-EZ Manifold

The G-Class heater can be quickly and easily installed with the optional Connect-EZ manifold assembly (diagram 14.1) from Polar Furnace. This assembly is installed at top rear of the furnace plumbing compartment and greatly simplifies and reduces the cost of the installation. The Connect-EZ manifold includes 1" ports for connecting one or more distribution loops going to one or more buildings, a circulation pump and a boiler protection valve. If Connect-EZ is not installed, consult with your dealer or factory support regarding other means of protecting the G-Class against cold return and maintaining minimum required flow. Failing to install an adequate form of cold return protection voids the G-Class warranty.

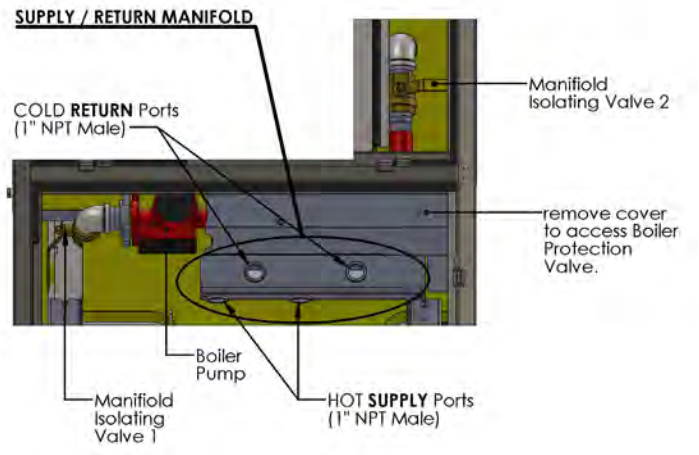


Diagram 14.1–Connect-EZ Manifold Assembly

14.1.1 Supply and Return Ports

The pipes delivering hot water from the boiler are connected to the ports labeled "SUPPLY" and the pipes delivering cooled water back to the boiler are connected to the ports labeled "RETURN".

14.1.2 Boiler Pump

The boiler pump (in Diagram 14.1) is used to circulate hot water through the manifold, anti condensation valve and boiler. The boiler pump is NOT used to circulate water through the distribution loop(s). Each distribution loop connected to the manifold requires a separate pump. The boiler pump is powered by plugging it into the power receptacle located next to and above the boiler pump. The boiler pump must always remain set to HIGH.

14.1.3 !!CAUTION!!

Only power the boiler pump after the water jacket has been filled with water AND BOTH manifold isolation valves have been opened otherwise damage to the boiler pump will occur.

14.1.4 Aquastat Settings with Connect-EZ

When the Connect-EZ assembly is installed the control aquastat should be set to 190°F with a 5 degree differential.

14.2 Distribution Loop(s)

A distribution loop is the portion of the system which delivers heat from the furnace to the application (See Diagram 14.2). A distribution loop consists of a water supply line, water return line and a circulating pump. A system may include one distribution loop or multiple distribution loops (Diagram 14.8). If the heater is located outdoors portions of the distribution loop will consist of insulated underground pipe.

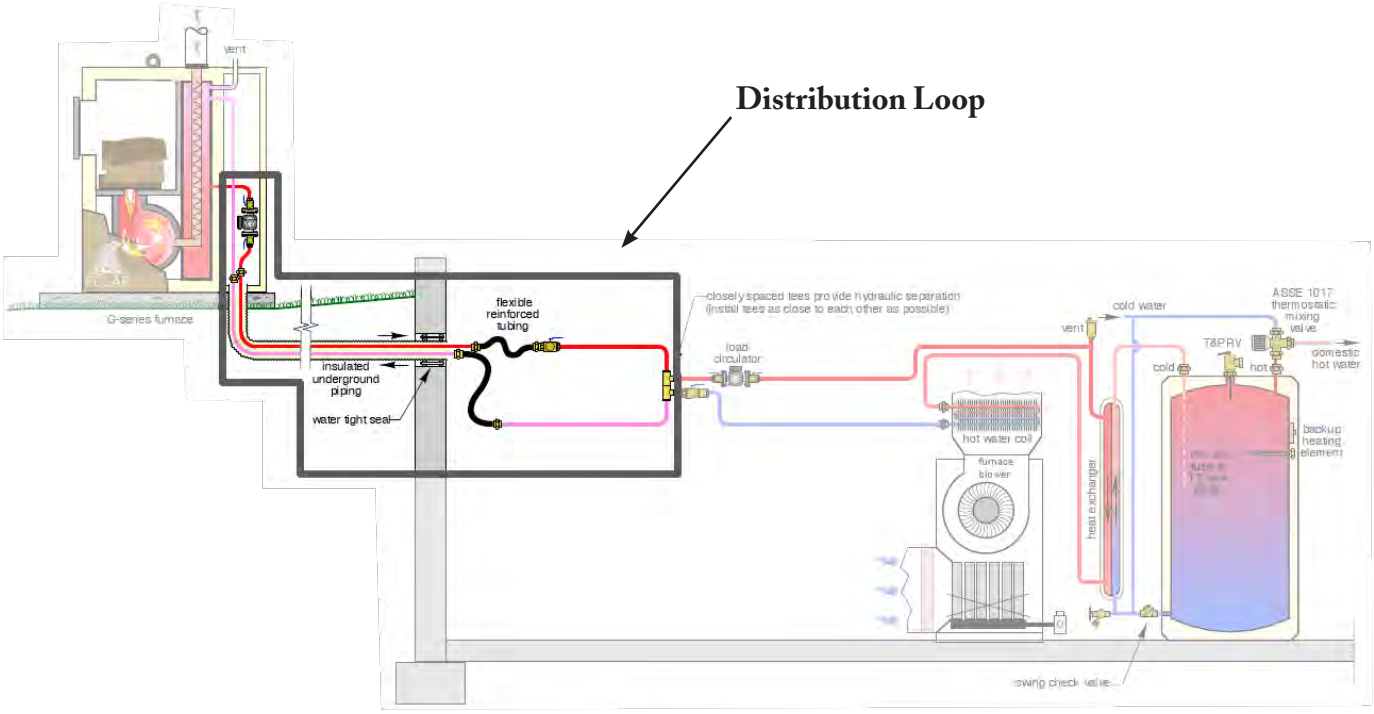


Diagram 14.2

14.2.1 Distribution Loop Pipe Diameter

Never use piping smaller than 1" for a distribution loop. For most applications 1" PEX piping will work. 1.25" piping may be needed to supply a high demand load located more than 150' from the boiler. Consult with your dealer, or the factory before selecting a pipe diameter for your distribution loop(s).

14.2.2 Distribution Loop Pump

The pump size needed for a given loop will depend on many factors including the length of the distribution loop, pipe size and type used, and the heat load that needs to be delivered. Differentials as high as 40 F are acceptable on G-Class furnaces equipped with the Supply/Return Manifold. Consult with your dealer or the factory before selecting a pump for your distribution loop(s).

14.2.3 Underground Distribution Pipe

It is recommended the underground pipe is buried in a ditch at least 18" deep. Manufactures of insulated pipe, suggest that 6" of sand be added around their insulated pipe for a cushion were clay and stony soil is present. When passing under a driveway or traffic area a 36" to 48" ditch is preferable. Prevent the underground pipe from lying in water. Use a high quality insulated and waterproof piping system for underground water distribution.

14.2.4 Distribution Pipe Finishing Duct

4 flat pieces are shipped inside each furnace (See "as shipped" in Diagram 14.3). The pieces are bent by hand into a u-shape as shown in the diagram above. 2 pcs combine to form a rectangle. There are 4 flat pieces which can be used to form 2 rectangles. These pipe duct rectangles fit into the 2 cutouts at the rear of the furnace and can be used as a form for pouring grouting and/or insulation around the distribution pipes to finish the connection from the furnace bottom to the furnace pad. Use is optional, different installers use different techniques for finishing the connection. Finished connection must be mouse- and rodent-proof.

14.3 Heat Exchanger Sizing

Polar Furnace recommends that a heat exchanger is used to separate the outdoor "open" system from the indoor "closed" system (See Diagram 14.9). A heat exchanger is strongly recommended in larger systems (see Diagram 14.10) and when a back up boiler is installed on one of the distribution loops (see Diagram 14.10 & 14.11). Consult your dealer, or the factory before selecting a heat exchanger for the distribution loop(s).

14.4 Boiler Protection Valve Maintenance

The Connect-EZ assembly includes a boiler protection valve which is an important component in ensuring normal service life for the heater and needs to be inspected and cleaned annually to ensure that the valve is functioning normally.

14.4.1 Safety Instructions

!! CAUTION!! Water temperatures higher than 100°F can be dangerous. During maintenance of the boiler protection valve take the necessary precautions to insure that such temperature do not endanger people.

!! CAUTION!! Assembly and disassembly of the boiler protection valve should always be conducted when the system is COLD.

!! CAUTION!! If the boiler protection valve is not maintained properly, according to the instructions contained in this manual, it may not operate properly resulting in damage to the boiler and other equipment. To access the boiler protection valve for maintenance remove the cover from the supply/return manifold assembly (Diagram 14.1).

Inspect the valve internal components before each heating season or at least once a year. Every 2 years replace

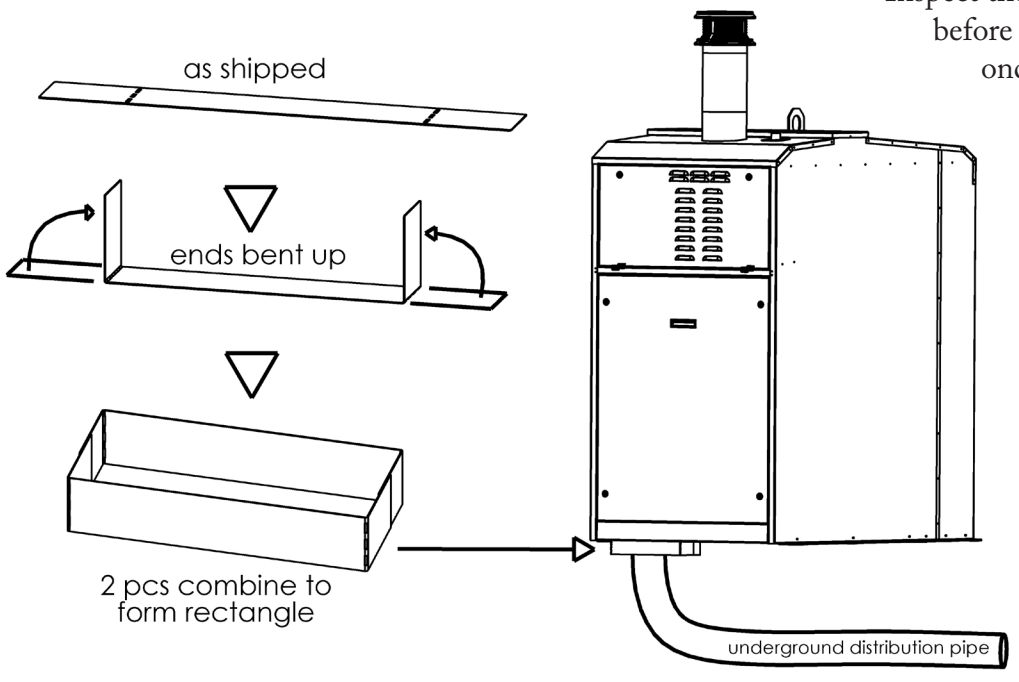


Diagram 14.3–Distribution Pipe Finishing Duct

the thermostatic sensor cartridge. Every 5 years remove the valve body from the manifold assembly and inspect the internal walls of the valve. Gently remove any buildups and deposits.

To inspect, clean and/or replace internal components of the boiler protection valve remove the plug at the base of the assembly using the supplied valve wrench (Diagram 14.7) and remove the thermostatic cartridge, shutter, and stainless steel spring from the valve body (Diagrams 14.5 & 14.6). Replace any defective components. Carefully remove any buildups or deposits. If you suspect the valve may not be working properly or has buildups that can not be removed replace the entire valve assembly.

14.5 Boiler Wrench

A wrench (diagram 14.7) is supplied with each Connect-EZ assembly for removing the plug at the base of the boiler protection valve (Diagrams 14.5 & 14.6).

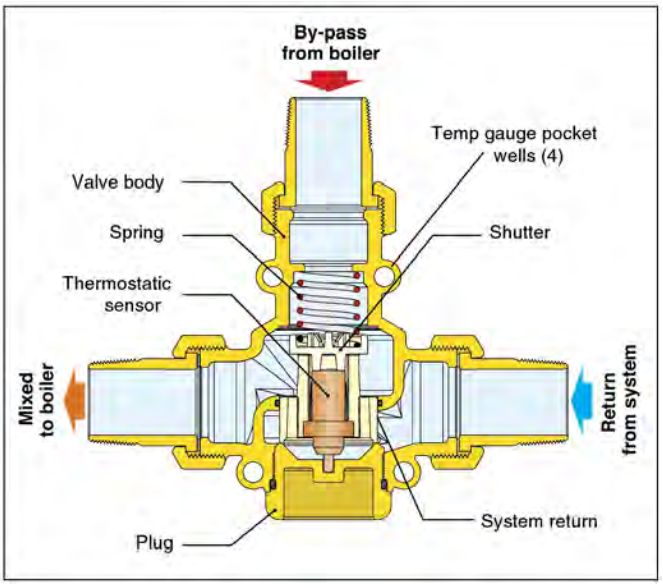


Diagram 14.5–Boiler Protection Valve Cut-Away

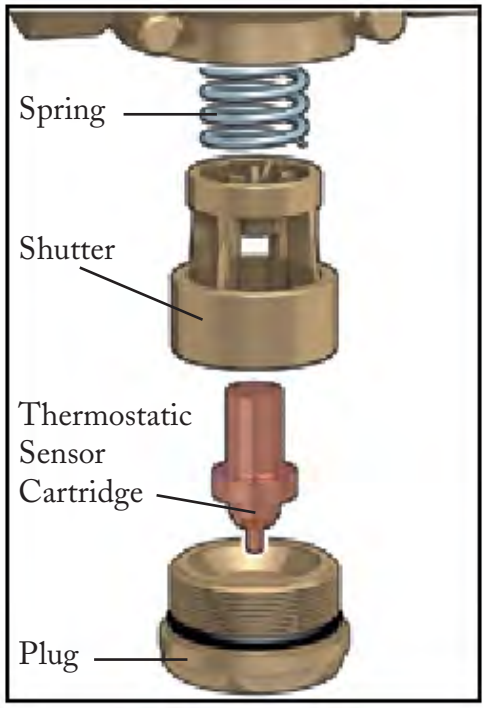


Diagram 14.6–Boiler Protection Valve Internal Components

14.6 Installation Concept Drawings

More installation concept drawings are available at www.polarfurnace.com. All drawings are provided as examples only. Actual installation details will vary depending on the specific install requirements. Consult with your dealer and/or local heating professionals to create a hydronic heat distribution system best suited to your requirements.

Diagram 14.7–Valve Wrench

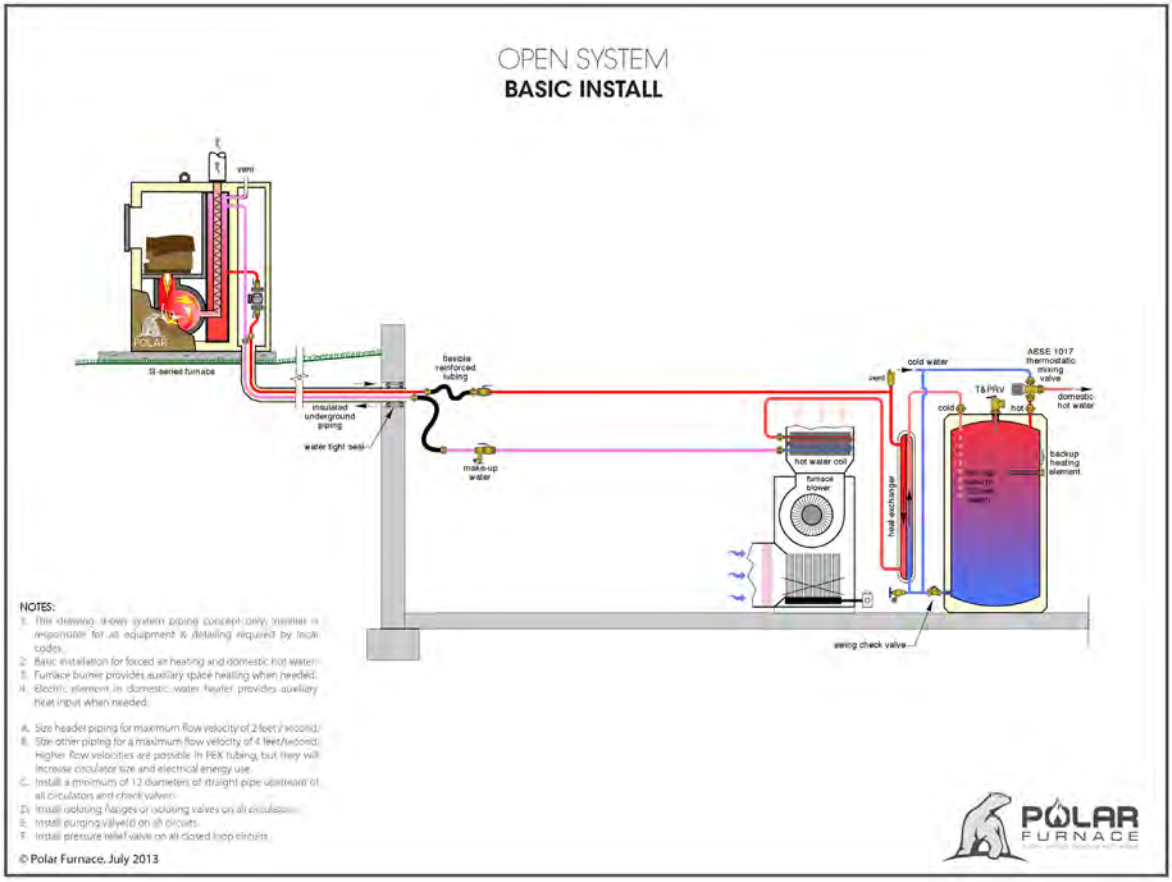


Diagram 14.8– Open System Basic Install

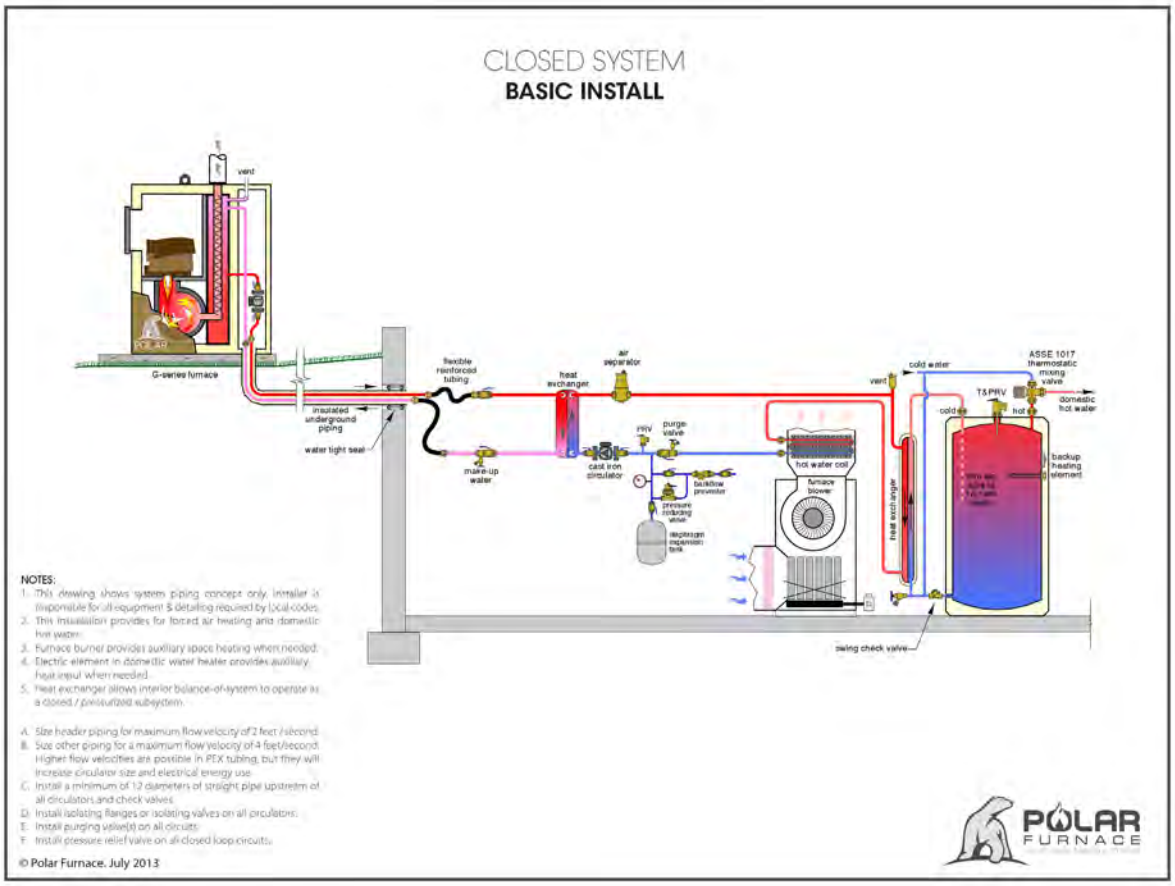


Diagram 14.9– Closed System Basic Install

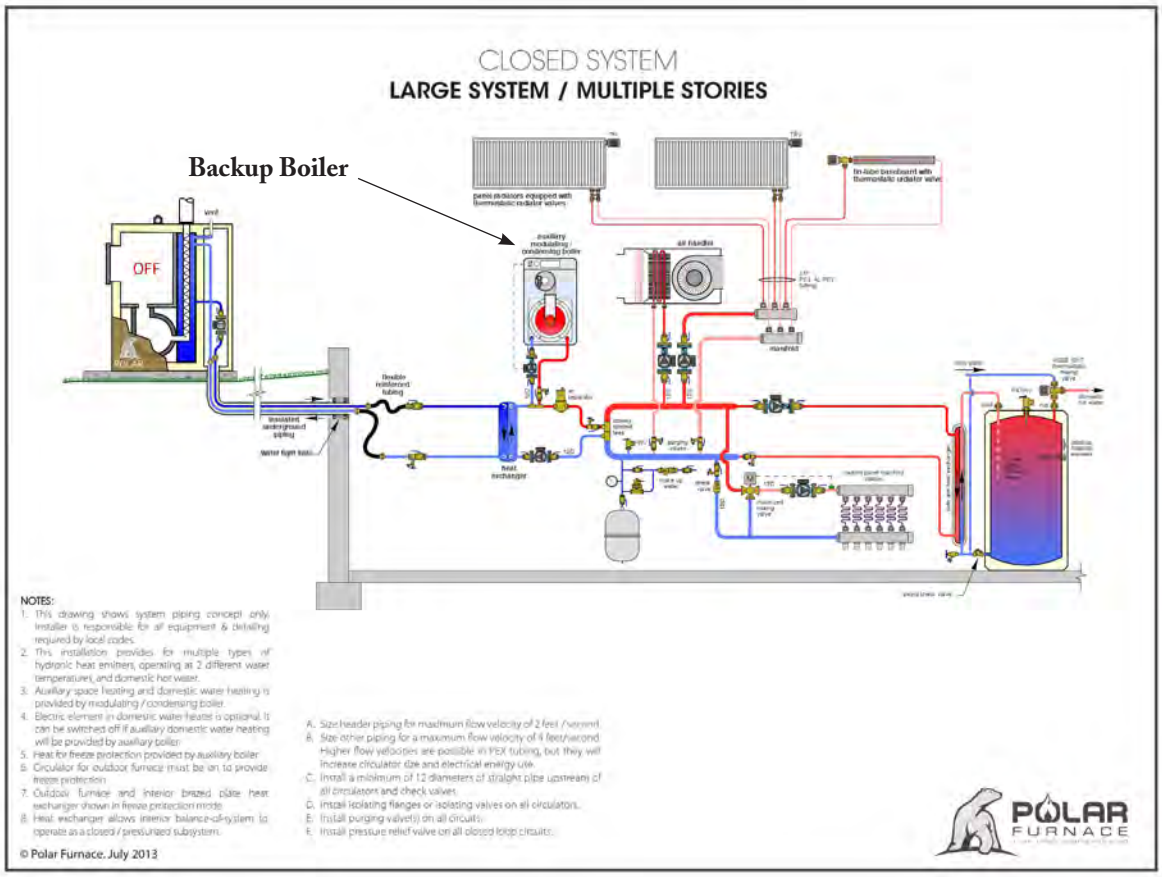


Diagram 14.10– Closed System Large System/ Multiple Stories Install

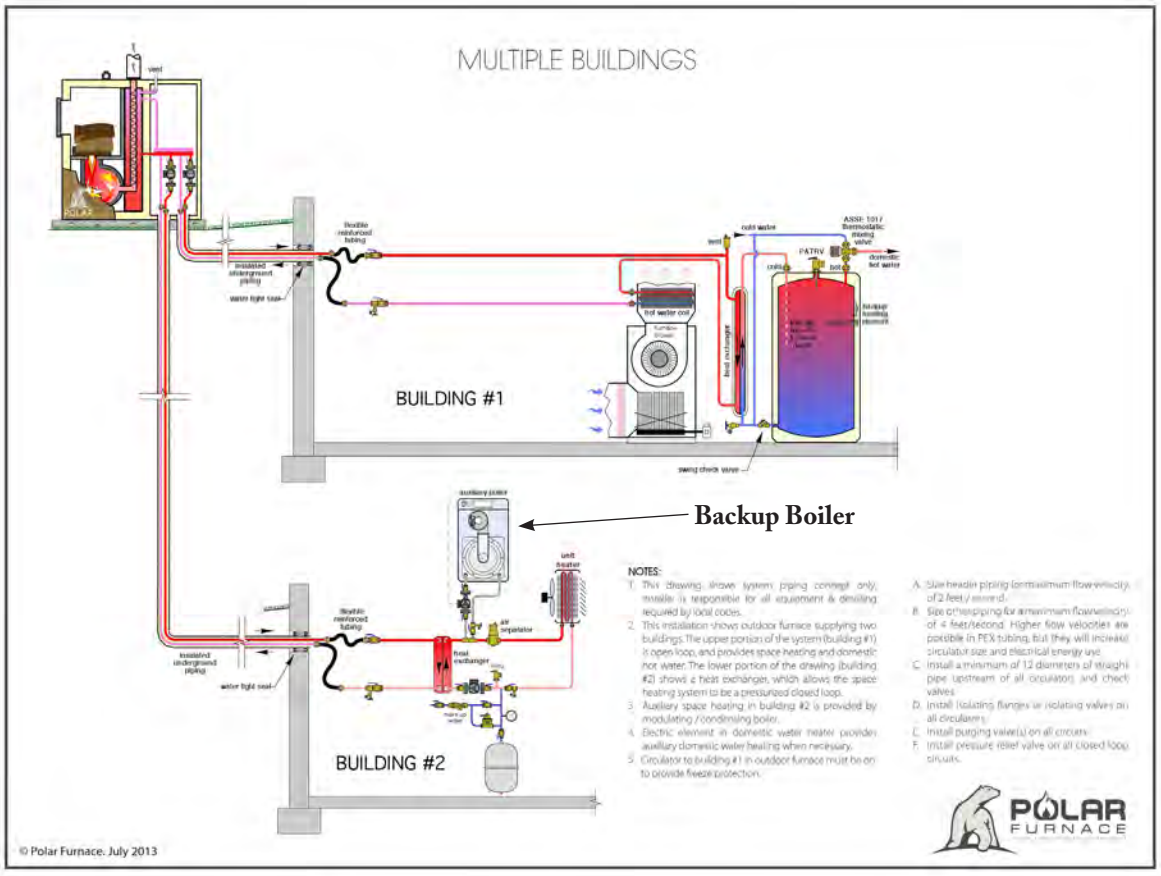


Diagram 14.11– Multiple Buildings Install

Your Notes

Your Notes

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For service and support on the Polar Furnace heater contact your local dealer.

POLAR FURNACE
clean, simple heating with wood

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