Owner's Manual

for **Polar Furnace® Updraft Heater**

POLAR
FURNACE
clean, simple heating with wood

IMPORTANT: Read and fully understand this manual prior to installing and/or operating a Polar Furnace Heater.

POLAR FURNACE UPDRAFT HEATER WARRANTY (v. 15-1)

The longevity of your updraft 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 and the heater housing are limited to a 12 month 100% replacement warranty including parts, shipping, travel and labor. Only the manufacturer at address on this certificate will determine in its sole and absolute discretion all warranty issues and 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 contained herein shall be voided if the heater is not installed and operated as instructed in the owner manual. The hand over checklist must be signed by the customer and dealer and submitted along with the warranty registration for this warranty to be valid. Heater must never be pressurized and pressurizing the heater voids this warranty. A properly qualified tradesperson/s should perform all installations. If the chimney needs be extended an appropriately certified and approved insulated chimney must be used. 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, light bulbs, fire tending tools, heat shields and any other wear items are not covered under this warranty. The insulated chimney is not covered under this warranty. Damaged 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 insure 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. 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 drum due to ash corrosion. Rotation of ashes and/or stirring of firebox corners 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 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 157. 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.

WARRANTY VOID IF NOT REGISTERED

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

_____ Describe installation methods and recommendations.

_____ Review warranty and service requirements.

_____ Identify safety hazards and demonstrate proper operation.

_____ Explain required maintenance schedule.

_____ Describe possible problems with using different types of wood.

_____ 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 insuring 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.

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This Polar Furnace Updraft Heater is an upwards-firing, forced draft, wood-fired, hydronic heater. Polar Furnace heaters combine simplicity with exceptionally rugged construction into a product which will provide heat for many years.

!! NOTICE !!

The warranty registration and delivery acceptance 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.

This Model has been tested and approved by CSA INTERNATIONAL to CSA/CSA-366.1-11 and UL2523

SAVE THESE INSTRUCTIONS

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

WARNINGS & CAUTIONS

!!WARNING!! Read the manual carefully and follow instructions. Retain this manual for as long as you own your Polar Furnace heater.

!!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.

!!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.

!!WARNING!! Strictly maintain the following clearances around the heater to any combustibles including fuel storage. Front - 48", Rear - 6", Sides - 6", Top - 12", Flue - 6".

!!WARNING!! DO NOT burn trash, plastics, rubber, naphtha, household garbage, leaves, cardboard, paper products, material treated with petroleum products (particle board, railroad tiles and pressure treated lumber), gasoline, engine oil, coal, tires or anything other than wood in the heater. Do not use chemicals or fluids to start the fire.

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

!!WARNING!! All Polar Furnaces operate at atmospheric pressure. DO NOT, in any way, obstruct, block or plug the overflow vent located on top of the heater. DO NOT install a pressure relief valve. Remove rear access cover before filling with water. This boiler should not be connected to an existing heating system unless a water to water or water to air heat exchanger is used.

!!WARNING!! Use of approved spark arrestor is strongly recommended.

!!WARNING!! Most Polar Furnace heaters are installed outdoors. All clearances on door panel 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.

!!WARNING!! Polar Furnace heaters are CSA certified for outdoors and indoors. When used indoors special care must be taken to insure the installation conforms to local installation requirements. Plan for make up 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.

!!WARNING!! Installation should be completed by appropriately qualified individuals.

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

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

!!WARNING!! Always turn fan switch off before opening door. Wait several minutes before opening door slowly while standing well back and to the right of the door. Do not look into the fire chamber until 60 seconds have passed. Failure to do so may result in serious injury from flashbacks.

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

!!WARNING!! DO NOT operate heater unless it is full of water. Water should be added until it runs out the top of the fill pipe located on top of the heater.

!!WARNING!! Insulate the distribution pipes to avoid excessive wood consumption. Use appropriate piping to avoid heat loss to ground water.

!!WARNING!! The air inlet, chimney, and chimney extension should be cleaned regularly to remove accumulated creosote and ash.

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

!!WARNING!! Care should be taken to avoid potential smoke problems in the neighbourhood. Use a chimney extension if required.

!!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 and or evacuated 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. The Updraft product is a basic wood burning appliance and the fuel to air mixture is not always correct for complete combustion. 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.

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

- First, Polar does not recommend installing the Updraft furnaces in a tightly sealed building. From time to time significant amounts of smoke will escape from the loading door during the loading process and will spill into the building. These smoke and gases need to be able to easily escape the building through air that is flowing through the building via openings in the walls or at the rafters. Polar also recommends installation of a smoke collection hood and mechanical ventilating fan above the loading door that will adequately capture and evacuate smoke and gases from the building as they spill out of the loading door.

- 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. Polar Furnace does not recommend installation of an Updraft furnace inside a tightly sealed building due to the large amounts of smoke and gases that can exit the loading door from time to time.

- 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).

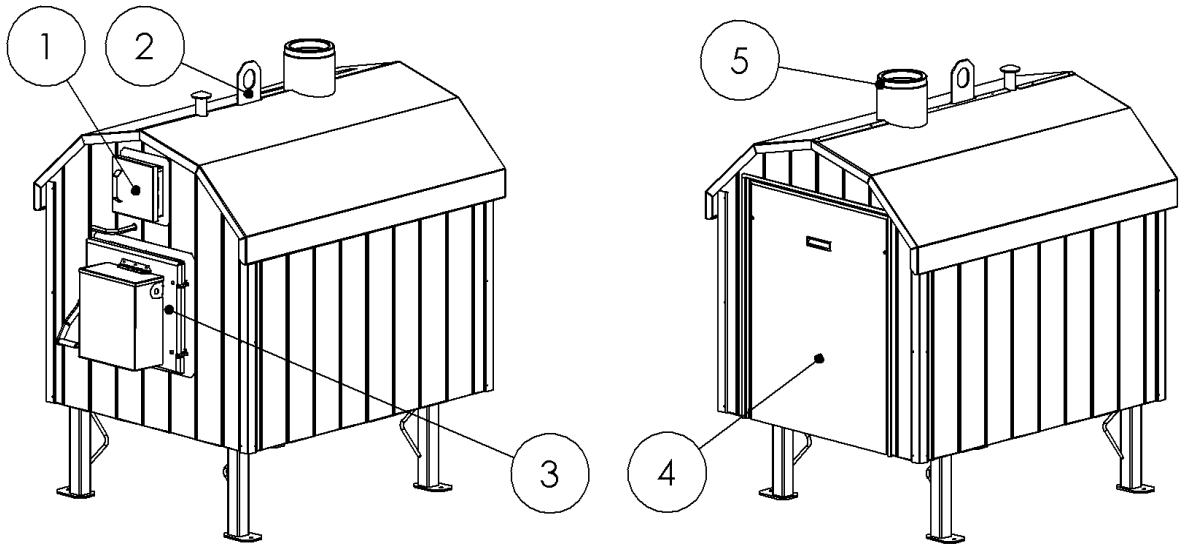
Minimize Smoke Emissions. Burn Wisely.

- Consider prevailing wind direction when choosing a site location for your heater.
- Water can be piped a long distance with minimal heat loss. This is a good option to avoid smoke related problems.
- Don't use updraft heater in urban built up area. For urban areas consider a smoke free downdraft unit.
- Don't overload heater. Small amounts of wood are better to control smoke. Load twice daily instead of filling only once completely with wood.
- Don't burn garbage. Burn only well-seasoned firewood.

Safety First!

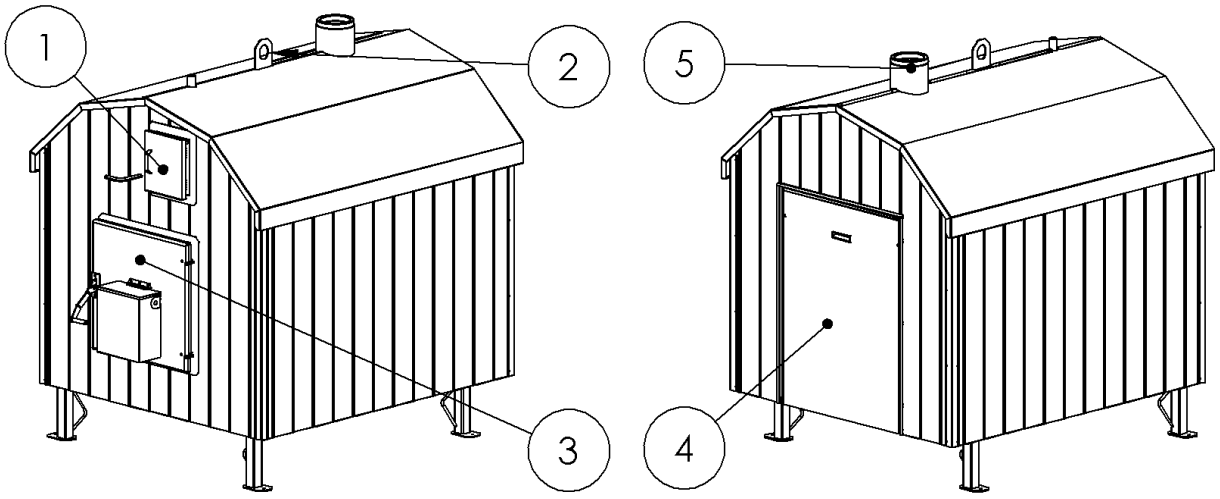
- Keep ground around heater clear.
- Use non-combustible cement blocks, patio blocks or cement base under heater.
- Install the rain cap on the chimney. Use an approved spark arrestor.
- Use a good quality pipe for hot water distribution.
- Only use environmentally friendly glycol solution. Ethylene glycol is not environmentally friendly and is not recommended. Do not use antifreeze or recycled glycol. If using glycol, do NOT use boiler treatment. Use a glycol mixture with a rust inhibitor included. Mix the propylene glycol with water according to the manufacturer's instructions. Check with manufacturer to insure glycol is intended for heating purposes and is compatible with all your system components including all distribution piping.
- **ALWAYS HIRE APPROPRIATELY QUALIFIED INSTALLERS.**

RG-5 – Main Components



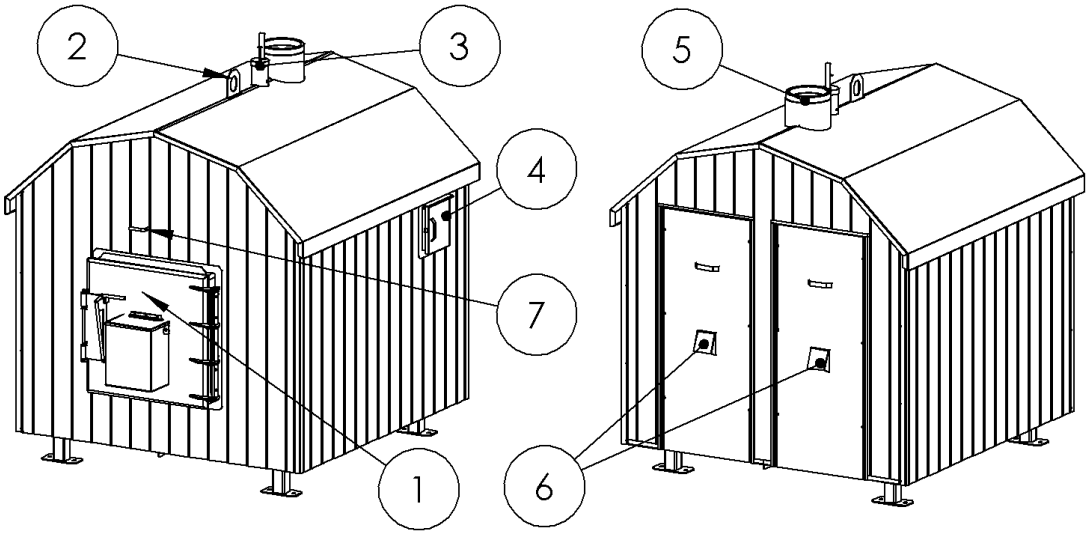
Item #	Description
1	Controls enclosure. Includes light and fan on/off switch, temperature gauge and sight glass.
2	Lifting/handling hook.
3	Fire chamber loading door.
4	Rear access panel for water and electrical hookup as well as access to combustion control aquastat and high limit shutdown aquastat.
5	Chimney connector.

MD-9 & LG-15 – Main Components



Item #	Description
1	Controls enclosure. Includes light and fan on/off switch, temperature gauge, sight glass, control aquastat, high temperature shutdown aquastat.
2	Lifting/handling hook.
3	Fire chamber loading door.
4	Rear access panel for water and electrical hookup.
5	Chimney connector.

COM-32 – Main Components



Item #	Description
1	Fire chamber loading door.
2	Lifting/handling hook.
3	Water level indicator
4	Controls enclosure.
5	Chimney connector.
6	Rear access panels to rear fan assemblies and plumbing and electrical hookup.
7	Bypass damper pullrod.

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).

Heater Fire Clearances

All Polar Furnaces are CSA approved to the following fire clearances. No combustibles should be stored within these measurements.

Front	48”
Back	6”
Left Side	6”
Right Side	6”
Top	12”
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.

Indoor Installation

Polar Furnaces are CSA 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.

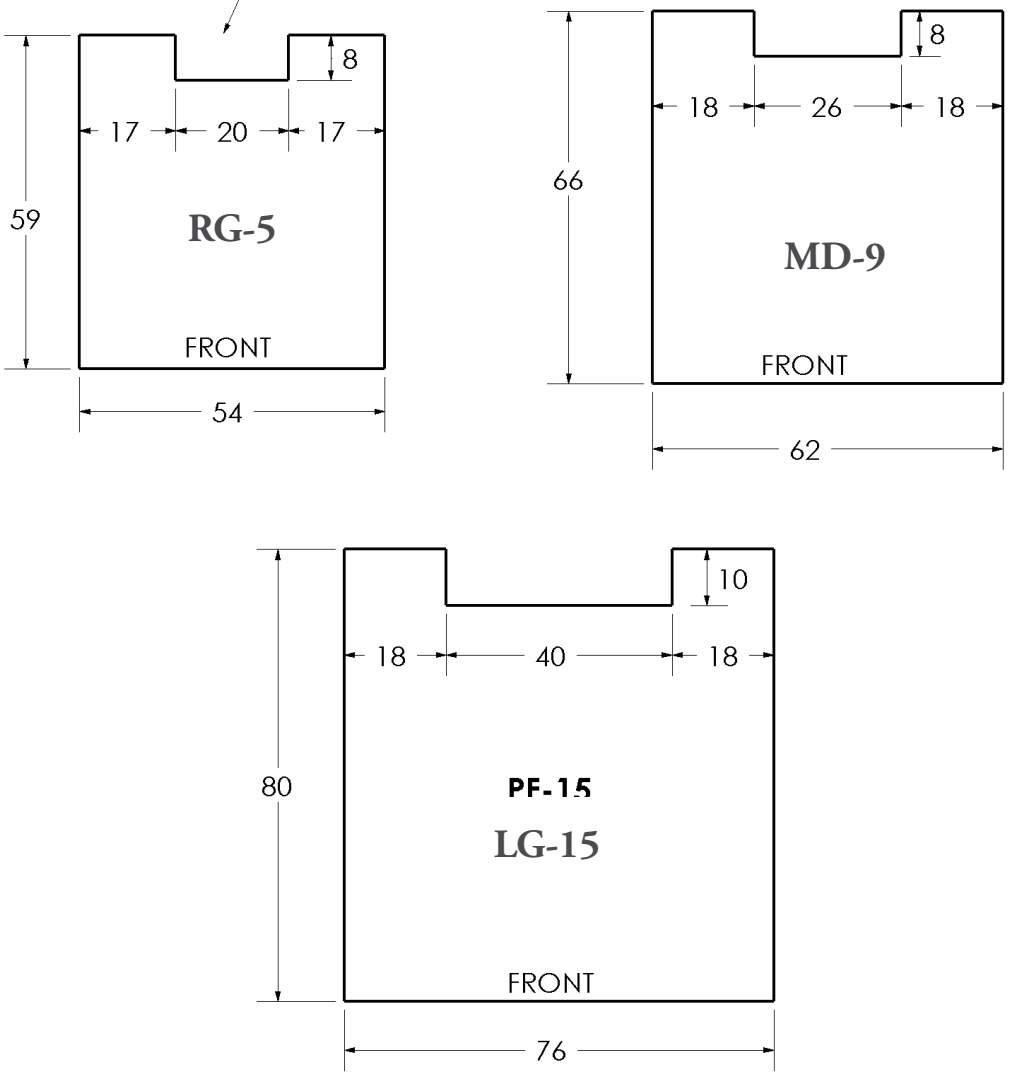
Chimney

Chimney installations must conform to all applicable regulations and standards. All chimney extensions must be completed with approved prefabricated chimney pipe. The rain cap with spark arrestor must be installed at all times. Chimney extensions may require periodic cleaning.

Foundation—Base Dimensions

Note: The foundation can be made from cement, crushed rock, packed A-base or patio bricks. The water supply and return lines must be installed so that they are protected against damage from an outside occurance and protected against sunlight, freezing and fire.

the cutout at back of the foundation is to accomodate the water supply and return lines so that they can penetrate into the back of the heater from beneath the foundation. The heater bottom panel has knockouts in place for this purpose.



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 at rear of heater inside rear access panel. Minimum supply conductor ampacity is 15 amps. Maximum over current device is 15 amps. Use copper conductors only.

Minimum Return Water Temperature and Minimum Flow

The water returning to the heater needs to be higher than 165F. Rate of water flow into the unit must be 10 gpm or higher. Failure to meet this criteria can result in excessive condensation inside the firechamber. Condensation combines with ash to form a corrosive acid which over time will slowly but surely destroy the fire chamber. This type of corrosion is not covered under the Polar Furnace Warranty. Review your plumbing plan with your dealer or contact factory support by sending an email to support@polarfurnace.com to insure that your piping installation will meet the minimum return temperature and minimum flow rate.

Distribution Trench

An 18" deep ditch is recommended. When passing under a driveway or traffic area a 36" to 48" ditch is preferable. Prevent the underground pipe from lying in water.

Waterline Hookups In Buildings

Do **NOT** connect to an existing system unless a water to water or water to air heat exchanger is used. We recommend a qualified installer complete the installation.

Water Quality

Ensure the water that will be used to fill the water jacket meets at least the following minimum criteria:

- does not have an odor
- is not discolored
- does not discolor after sitting in a container for a number of days.

Additionally, if there are any known issues with the water supply we strongly recommend testing the water to verify that the boiler treatment we supply will provide adequate treatment. Such known issues include:

- high chloride levels (salty taste).
- high iron levels (metallic taste, looks reddish).
- a lot of scaling in the toilet, on shower head, or in your teapot.
- needing to replace your domestic hot water heater every 2 or 3 years.
- have corrosion on your water taps.

Wood Boiler Solutions (phone: 920-324-2007) are water treatment professionals who offer water testing service for a reasonable fee. Simply browse to their website (woodboilersolutions.com) and order a water testing service kit to initiate this service. Wood Boiler Solutions will test your water and make a determination if your water supply is suitable for use or not.

Filling the Water Jacket and Adding Treatment

!! 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 your heater.

!! DANGER!!
Do not pressurize your heater. All Polar Furnaces are 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 death.

The Updraft heater heats water in the water jacket part of the heater. The water jacket must be filled with water or a water/glycol mixture before operating the heater. Filling the waterjacket can be achieved in a number of ways:

1. Through the overflow/vent pipe on the peak of the roof towards the front of the heater.

2. By hooking the supply to the drain/fill valve located inside the rear access panel, or

3. by adding water into any part of the hot water distribution piping.

After adding water for approximately 5 minutes add the water treatment by pouring it into the overflow/fill pipe located on the peak of the roof towards the front of the heater. After adding 1 gallon of 101G2 treatment supplied with the unit continue filling the water jacket. Fill the heater until water starts showing up in the sight tube or until water starts coming out of the overflow pipe on top of the heater. The sight tube is located inside the controls enclosure except for the COM-32. The COM-32 model has a sight gauge on top of the heater.

Using the Water Level Sight Tube

The sight tube is located at the top of the water jacket. Before firing the heater for the first time, fill the water jacket until the water level starts showing up in the sight glass. When the heater is up to operating temperature add water until it comes out of the overflow pipe on top of the heater. During operation check the water level in the sight gauge daily and keep the heater as full of water as possible. Add water as needed.

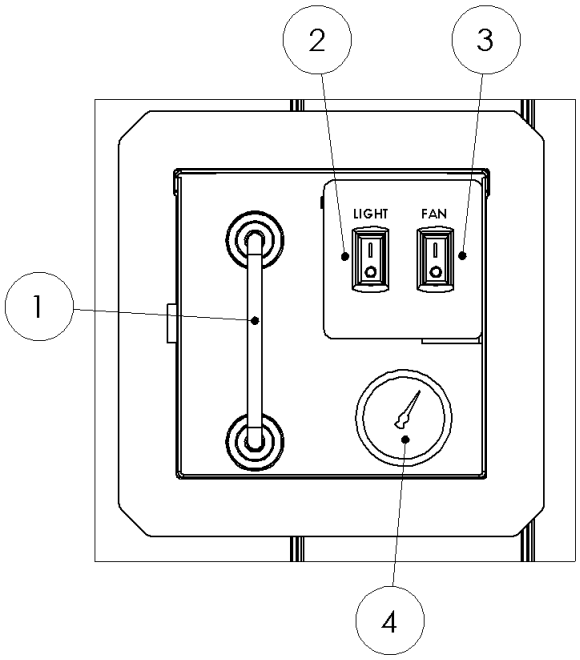
Heater Delivery

Wash heater thoroughly immediately following delivery to remove salt and dirt from shipping. Inspect the furnace for shipping damage. If damaged, make note of it on carrier shipping paperwork. Check to insure all of the following items were shipped with your furnace: outdoor light globe, 12” insulated chimney extension, rain cap, water treatment kit, owners manual. If any items missing make note on carrier’s paperwork of missing items.

RG-5 – Controls Overview

(See page 15 for location for this model's controls.)

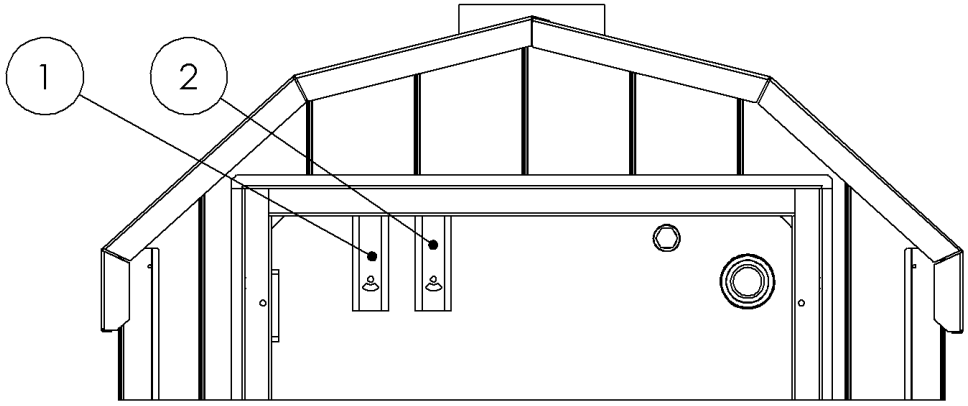
Inside Front Enclosure:



Item #	Name	Function Description
1	Sight Gauge	Shows the water level in water jacket.
2	Light Switch	Used to switch work light ON or OFF.
3	Fan Switch	Used to switch fan ON or OFF.
4	Temperature Gauge	Shows temperature of water in water jacket.

Inside Rear Access Panel:

The Control Aquastat and High Temperature Aquastat are located inside the rear plumbing enclosure at the rear of the heater.



Item #	Name	Function Description
1	Control Aquastat	Controls heater combustion fans.
2	High Temperature Aquastat	High temperature shutdown protects heater against over-heating.

Fan ON/OFF Switch

This switch turns the combustion fans on or off. When the switch is in the “OFF” position, the fans remain off even when the controller is signaling the fans to switch on. When the switch is in the “ON” position, the fans switch on but only if the temperature control aquastat is also signaling the fans to switch on.

Light Switch

Used to switch the outdoor work light ON or OFF.

Control Aquastat

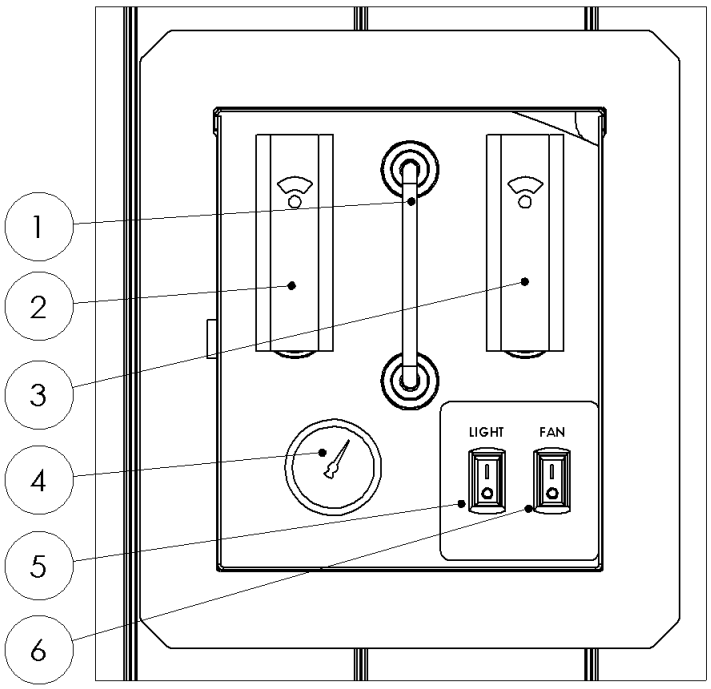
The Control Aquastat is used to set the water temperature at which the heater switches the combustion fan off and at which water temperature the combustion fan switches on during normal operation. The Control Aquastat is set to 185°F with a 10°F differential at the factory. In most installations this setting will work well. The Control Aquastat should never be set higher than 190°F or lower than 180°F.

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. The High Temperature Shutdown Aquastat is factory set to 195°F. It should never be set higher than 195°F and should be at least 8°F degrees higher than the Control Aquastat set point.

MD-9 & LG-15 – Controls Overview

(See page 16 for location for these models' controls.)



Item #	Name	Function Description
1	Sight Gauge	Shows the water level in water jacket.
2	Control Aquastat	Controls heater combustion fan.
3	High Temperature Aquastat	Protects heater from overheating if Control Aquastat fails.
4	Temperature Gauge	Shows temperature of water in the water jacket.
5	Light Switch	Used to switch light ON or OFF.
6	Fan Switch	Used to switch fan ON or OFF.

Fan ON/OFF Switch

This switch turns the combustion fans on or off. When the switch is in the “OFF” position, the fans remain off even when the controller is signaling the fans to switch on. When the switch is in the “ON” position, the fans switch on but only if the temperature control aquastat is also signaling the fans to switch on.

Light Switch

Used to switch the outdoor work light ON or OFF.

Control Aquastat

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High Temperature Aquastat

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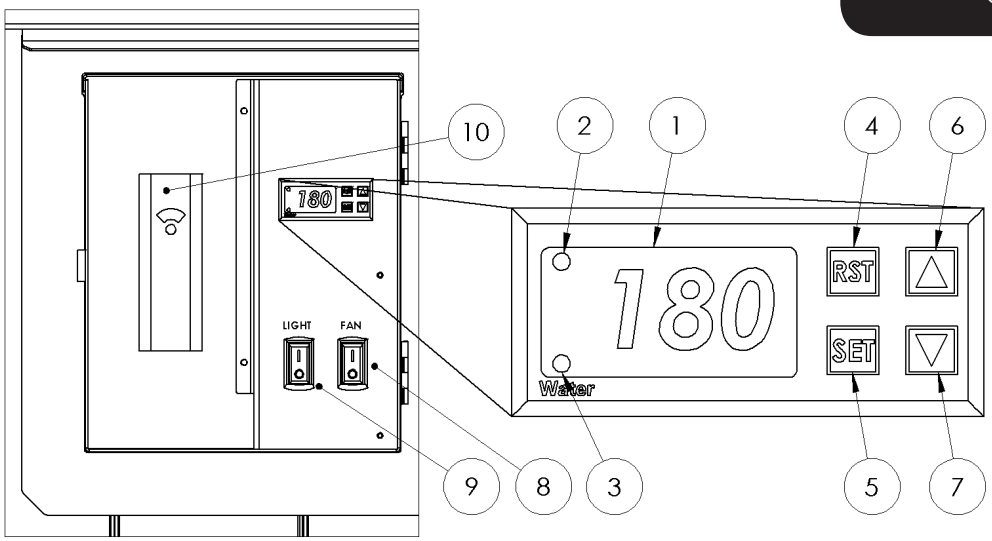
COM-32 – Controls Overview

(See page 17 for location for this model's controls.)

HEATER CONTROLS (COM-32)



Item #	Name	Function Description
1	Display	During normal operation this shows the temperature of the water in the water jacket. During programming this shows the various parameters that can be modified.
2	Low Temperature Indicator	Light off—indicates normal operating temperature. Light blinking on/off—indicates a low temperature shutdown condition.
3	Low Water Indicator (optional)	Light off—indicates normal water level. Light on—indicates a low water level.
4	RESET	Used to Start and Restart the Furnace. Also used to temporarily bypass a low temperature shutdown condition.
5	SET	Used to store settings after making a change when programming the controller.
6	UP	Used to navigate up in a menu when programming the controller.
7	DOWN	Used to navigate down in a menu when programming the controller.
8	Fan Switch	For switching fan ON or OFF. In the ON position the fans will only turn on when the controller is also calling for heat.
9	Light Switch	For switching light ON or OFF.
10	High Temperature Aquastat	Switches fans off if controller fails and boiler overheats.

COM-32 – Controls Functionality

Fan switch

This ON/OFF switch switches the combustion fans on or off. When the switch is in the "OFF" position the fans remain off even when the controller is signaling the fans to switch on. When the switch is at the "ON" position the fans switch on but only if the Temperature Control Aquastat is also signaling the fans to switch on.

Light Switch

Used to switch the outdoor work light ON or OFF.

Digital Controller

The COM-32 heater is equipped with a Digital Controller that provides the following functionality:

- **Combustion Control**

The controller will switch the primary and secondary combustion fans on and off as is required to start and stop combustion in the heater.

- **Low Temperature Shutdown**

The digital controller has a built in Low Temperature Shutdown feature. This feature shuts down the combustion fans when the unit has run out of wood. The controller senses this condition by monitoring the water jacket temperature. When the wood in the fire chamber is used up, the temperature in the water jacket continues to fall even though the controller switches on the fans to try and start combustion. When the temperature of the water drops below a programmed temperature set point, the controller switches the fans off and switches on a blinking low temperature indicator light on the digital controller.

- **Low Water Level Indicator**

The controller will indicate a low water condition by switching on an indicator light on the controller. This warning helps protect your heater from being damaged by overheating as well as your water circulation pumps from running dry.

COM-32 – Operating the Controller

Once the controller is programmed at the factory there isn't much you need to do on the controller to run your heater through the heating season. The controller is intelligent enough that it will manage the combustion process automatically while there is wood and fire in the fire chamber. The only time you need to press a button on the digital controller during normal daily operation is when the digital controller signals a low temperature condition and shuts off the combustion fans. When a low temperature condition occurs, the RST or RESET button on the controller needs to be pressed once and held for several seconds. When the RESET button is pressed and held, the controller will ignore the low temperature condition for 90 minutes or until the temperature of the water has climbed 5 degrees over the Low Temperature Set Point which is factory set to 150°F. If, after 90 minutes the temperature of the water in the water jacket has not climbed to 150°F + 5°F or 155°F, the low temperature condition will again become active and the fans will shut off again.

COM-32 - Controller Programming Parameters and Descriptions

	Description	Factory Settings
HSP	Set point at which the fans shut down on a satisfied water temp.	185
LSP	Set point at which the fans shut off due to low water temperature (Low Fuel/Cold Water).	150
r0H	**Differential between HSP and the lower temperature at which fans come on during normal combustion.**	**10**
r0L	Differential between LSP and the higher temperature at which fans will remain on after resetting a low temperature condition.	5
r1	Lowest possible temperature setting for HSP.	160
r2	Highest possible temperature setting for HSP.	190
r3	Lowest possible temperature setting for LSP.	130
r4	Highest possible temperature setting for LSP.	155
t1	Time (minutes) Low Set Point (LSP) is inactive after reset (RST) is pressed.	90
H5	Access code to parameters.	00

COM-32 - Adjustments to the Digital Controller Settings

NOTE:

The digital controller is preset at the factory to a cut-out temperature of 180°F and a differential of 15°F. With these settings the combustion fans will cut-in (start) at 165 °F and cut-out (stop) at 180°F.

To change the temperature cut-out setting (fan STOPS during normal combustion)

- *Press **SET**. HSP text will appear on the display.*
- *Press **SET** again. The set value is shown on the display.*
- *The value can be modified with the **UP** and **DOWN** arrow keys.*
- *Press **SET** to enter any new values.*
- *Press **SET** and **DOWN** at the same time to quit programming or wait one minute and the display will automatically exit programming mode.*

To change the temperature differential (fan STARTS during normal combustion)

- *Press **SET** for 8 seconds.*
- *The access code value 00 is shown on the display. (Unit comes from factory with access code set to 00).*
- *Press **SET** to enter the code. If the code is correct, the first parameter label is shown on the display (**SP**).*
- *Press the **UP** or **DOWN** arrow keys until (**r0H**) is displayed on the screen.*
- *Press **SET** to view the currently set differential.*
- *The value can be modified with the **UP** and **Down** arrows.*
- *Press **SET** to enter the value and exit to text parameter.*
- *Press **SET** and **DOWN** at the same time to quit programming or wait one minute and the display will automatically exit programming mode.*

The LSP and r0H Parameters

!! IMPORTANT !!

The LSP Parameter is NOT used to set the lower temperature at which the combustion fans turn on. The lower temperature at which the fans turn on during normal combustion is defined by the r0H parameter. Please review parameters and descriptions on page 31.

!! IMPORTANT !!

The r0H parameter is used to set the temperature at which the combustion fan/s turns on. If the r0H setpoint is modified to increase the differential or temperature spread over which the heater operates, the Low Water Temperature Setpoint (LSP) needs to be lowered an equal amount or more.

COM-32 – The High Temperature Shutdown Aquastat

The High Temperature Shutdown Aquastat is factory set to 195°F and should never be set higher than this setting.

COM-32 – The Controls Circuits Protection Fuse

The control circuits are protected by a slow blow 8 amp 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 inside the controls enclosure on the side of the digital controller mount plate. To replace a blown fuse, twist the top part of the fuse holder counter clockwise. Place the new fuse in position and recap the holder.

COM-32 - Water level indicator

The COM-32 model is equipped with a highly visible water level indicator assembly mounted on the roof of the heater (see pg. 17 item #3). Check water level daily. Add water as needed to keep the indicator near the FULL position.

!! WARNING !! Maintain minimum distances between heater and combustibles.

!! WARNING!! Have a clearly understood plan of how to handle a chimney fire.

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

Flashbacks

!! 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 a 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.

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, burn suddenly or explode.

Conditions Causing Flashbacks

There are some combustion conditions that greatly increase the risk of flashbacks. It is important to understand these conditions. They are explained below. However, it is important to note that flashbacks can happen at any time the load door is opened and are not only limited to the combustion conditions described below!

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 and it continues to break down into combustible smoke and gases. Without oxygen these combustible hot gases do not burn off and 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 from door when opening the load door.**

Hot Surfaces

There are surfaces on the boiler that get very hot. These surfaces are labeled with hot surface labels. Always wear protective leather gloves when working on or around the heater. This includes when loading the heater and when performing maintenance on the heater.

Smoke Inhalation / Eye Irritation

Burning wood produces smoke. Avoid inhaling smoke. Whenever there is smoke, wait until smoke has cleared before proceeding to load your heater or perform maintenance work.

Before You Begin

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

Do not burn anything other than properly prepared wood in your heater. Do not burn garbage, treated wood, plastic, oil, coal or anything other than properly prepared fire wood.

Be sure to keep all combustibles outside of the fire clearances as specified. See page 19 of this manual for fire clearances.

The heater is designed to have an open or unpressurized water jacket. Pressurizing the heater can cause damage your heater, property and/or cause bodily harm.

Wood Fuel Considerations

The only recommended fuel for the G-Class heaters is properly seasoned firewood. Logs or split pieces of wood with a diameter of less than 8" 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 should be less than 28%. Wood with a moisture content under 24% is even better and will provide the most efficient wood burning. Using wood that is freshly cut or improperly seasoned may result in unpredictable operation, poor efficiency and a shortened heater life. The manufacturer cannot and will not be responsible for problems related to using wood that is not adequately dry.

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.

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

Starting and Operating the Heater the First Time

Before starting your 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 heating 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:

4. Place the fan switch to the OFF position.
5. Pull the bypass damper out approximately 10".
6. Place a layer of small pieces of wood, kindling and newspaper into the fire chamber.
7. Light the newspaper.
8. Leave the door open until the kindling has caught fire well.
9. Turn the fan(s) on and close the load door.
10. After 15 minutes, add more pieces of wood.
11. Add wood as needed.

Note: During the initial startup keep circulator turned off until heater reaches 180°F.

Stoking the Heater

When stoking the heater, don't fill the fire chamber completely with wood. Fill the fire chamber approximately ¾ of the way to the pipes on the top of the heater. Filling the fire chamber completely with wood will often cause the heater to smoke excessively for a long period of time. If filled only ½ or ¾ full the heater will smoke much less. Also, avoid placing wood in the fire chamber immediately in front of the loading door. Leave approximately a 10" space between the wood in the fire chamber and the inner edge of the door jam. This allows for better and less restricted air flow and improved combustion.

Managing the Ash/Coal Bed

After using your heater for a few days you will notice a buildup of ash and coals at the bottom of the fire chamber. This layer should not be removed and creates an insulating layer between the fire and water jacket surface. This allows the fire to burn hotter and cleaner. This ash/coals layer can be several inches thick. If the buildup becomes excessive, part of it can be removed. Leave an inch or two in place to insulate the next fire.

Shutting Down the Heater

The heater can be turned off manually by switching the fans switch to the OFF position. Or, the heater will switch off when the water temperature in the water jacket gets too low (COM-32 only).

Operating Temperature

The water temperature in the water jacket should always be above 165°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 cause 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 your heater.

Air Gate Setting

Beneath the fan(s) is a slider or damper which can be pushed upwards to choke off the air supply to the heater. This will reduce the fire size and rate of burn in the chamber and will reduce the amount of BTUs the unit generates. To adjust the slider, loosen the two bottom screws holding the fan in place and tap the slider upwards or downwards. Once the desired adjustments are made, retighten the screws holding the fan in place.

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.

Creosote

Excessive creosote should be removed from the fire chamber, horizontal tubes and the chimney. Excessive creosote in the chimney can lead to a chimney fire. The chimney should be inspected at least monthly and any excessive creosote should be removed.

General Maintenance

Proper maintenance of your heater is important for reliable, efficient and safe operation. Proper maintenance will also result in a longer service life of your heater. There are daily maintenance guidelines, monthly guidelines and end of season guidelines that should be understood and followed.

Tools Needed for Operation and Cleaning

To effectively operate and maintain the heater the following tools are needed.

- A poker or rod.
- A shovel.

Weekly Maintenance

Check Water level. Keep heater as full of water as possible. Pull the bypass pull rod out the whole way to remove fly ash from upper chamber. Remove the ashes and coals from the front of the fire chamber and pull ashes/coals from the rear of the fire chamber towards the front of the fire chamber.

Monthly Maintenance

Remove accumulated ash as required. Maintain an ash bed depth of no more than 8-10 inches. Ashes should be stored in a steel container with a tight fitting lid.

End of Heating Season / Yearly Maintenance

After all heating seasons, **ALL** ashes must be removed from fire chamber. Inspect and clean the firebox, horizontal tubes, air bypass and chimney to ensure there is no accumulated creosote or ash. After cleaning, rub new, unused motor oil on the inside surfaces of the heater to protect against moisture. Ensure water, rain, or moisture cannot enter firebox through chimney as ashes and moisture can create a very corrosive environment. Inspect fan to ensure blower is turning freely. Check fresh air solenoid to ensure free movement. Check door gasket and replace as needed. Test and maintain water with water treatment kit. Turn off electrical power at end of season.

Maintaining Tight Door Seals

Maintaining tight door seals will help keep the front of your heater looking good. The fiberglass rope used to seal the fire chamber door should be inspected regularly. If a glass rope becomes too flattened and/or worn it should be replaced.

A leaking 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 your heater.

Off Season Preparation

Creosote and/or ash mixed with water produces a corrosive acid. This acid can form inside the fire chamber of the heater during the off season. It is important that the boiler be properly prepared for the off season period (when the heater is idle) to avoid formation of this acid. All the ash and coals at the bottom of the chamber should be removed. Any excessive buildup of creosote on the heater walls and tubes should be scraped off. (It is not necessary to clean the creosote off down to the bare metal. Hard baked creosote will actually protect the steel against corrosion). If possible the chimney should be sealed off with a plastic cap or wrap to insure no water gets into the heater. Check the fire chamber regularly to insure there is no water building up in the fire chamber.

!!REMEMBER!!

ASH + MOISTURE = CORROSIVE ACIDS.

ACID WILL CORRODE AND DAMAGE YOUR HEATER. REMOVE ALL THE ASH AND CREOSOTE FROM THE FIRE CHAMBER WHENEVER THE HEATER IS SHUT DOWN FOR MORE THAN 2 WEEKS. SEAL THE CHIMNEY.

Water Testing & Treatment

Water Quality and Water Treatment

Treating and maintaining the proper treatment level is important to stop water side corrosion. Failing to properly treat the water will reduce the life of the heater and void the warranty. Enough 101G2 treatment is supplied with your heater to protect your heater for at least 1 year. 101G2 is a product developed by Wood Boiler Solutions LLC and is designed specifically for outdoor wood furnaces.

Forward all questions regarding this treatment solution or any water related issues directly to Wood Boiler Solutions LLC by email: info@woodboilersolutions.com or phone: (920) 324-2007.

See the *Water Quality and Treatment Section* on page 23 for information on how to choose a good water supply and what signs to look for that may indicate your water supply may not be suitable for use.

After adding water to the waterjacket for about 5 minutes, stop filling and add the 101G2 water treatment by pouring into the overflow/fill pipe located on the peak of the roof towards the front of the heater. After adding 1 gallon of treatment supplied with the unit, continue filling the heater until the water level is above the halfway point in the sight tube located inside the control box (Item 1, page 17)

Drawing Water for Testing

Water in the water jacket could be very hot. Draw water with Caution!! Water can be draw from the drain valve located at the bottom center of the water jacket inside the rear plumbing compartment. Use a clean jug or bottle with a mouth or opening big enough to fit over the entire drain outlet. Then carefully open the drain valve a small amount to collect a water sample. Don't use the first water coming from the drain valve for testing. Fill the bottle twice and use the the second bottle of water for testing.

Purchasing Additional Water Testing and Treatment Kits

Water testing and treatment supplies are available for purchase from your local dealer or can be ordered directly from www.woodboilersolutions.com.

When to Add More Treatment

It is very important to maintain proper nitrite levels in the waterjacket to protect the heater against fireside corrosion.

After adding the 1010G2 treatment to the water jacket the boiler water will have very visible pinkish or watermelon colored hue to it. If you notice the pinkish hue is fading add another bottle of treatment.

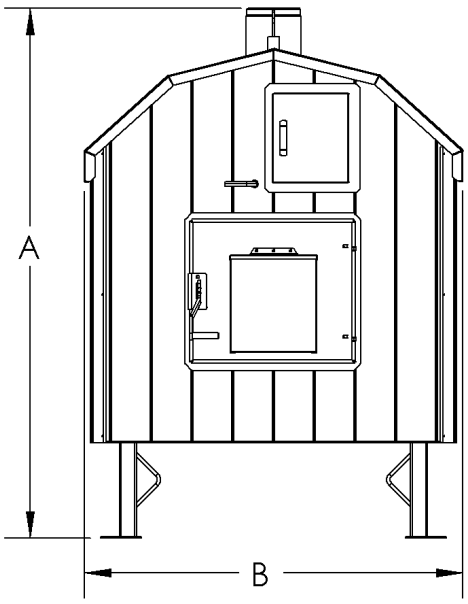
If you want to have a more accurate measure of the nitrite level in your system in ppm use the Nitrite Test Kit. Follow the simple instructions included with the packaging. 500-750 ppm is adequate for most fill waters while a treatment level of 750-1500 ppm provides optimal protection against corrosion.

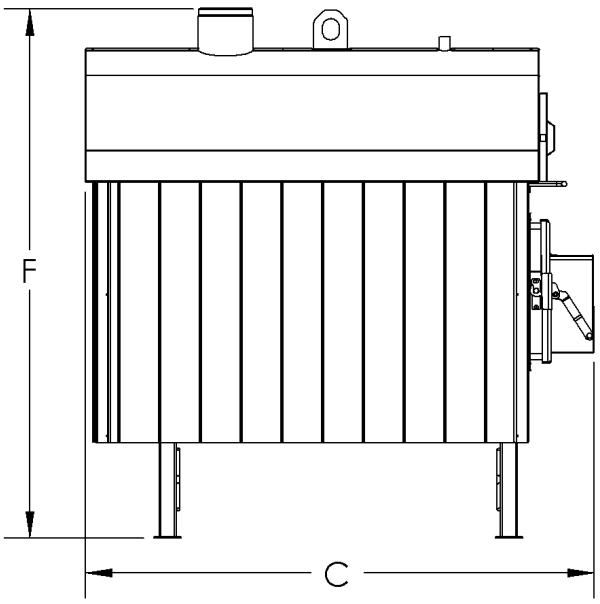
Use the Nitrite Test Kit supplied with your heater to check treatment levels at least annually as well as any time you have added large volumes of water. Follow the instructions included with the test kit to determine the nitrite level. Do not use a test kit that has expired as it will provide incorrect results.

Heater Specifications

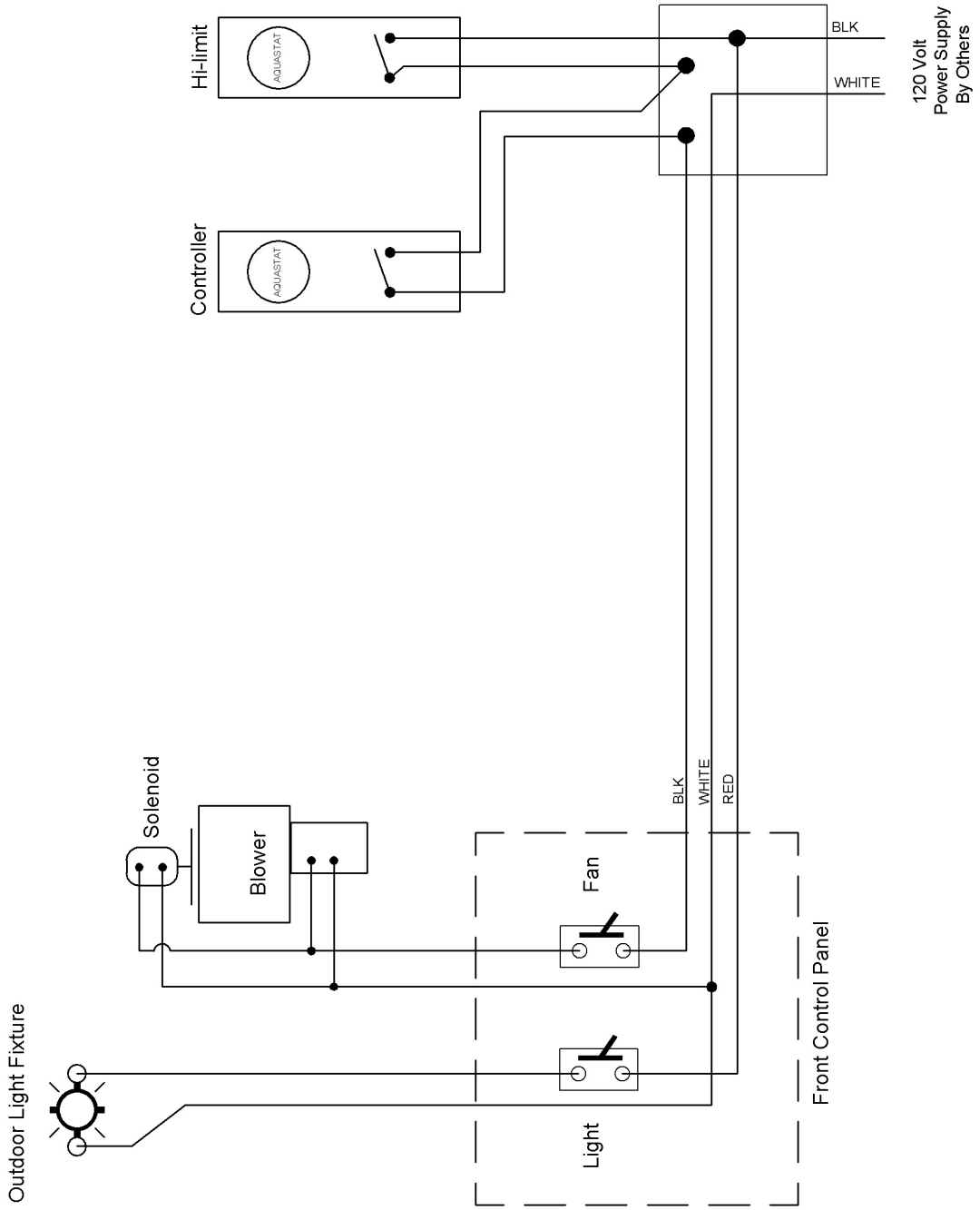
Specifications*	U of M	RG-5	MD-9	LG-15	COM-32
Overall Height	A-inch	70	78	87	111
Overall Width	B-inch	48	56	69	94
Overall Length	C-inch	67	75	87	109
Wood Load Door Opening (W x H)	inch	16.5 x 16.5	19.5 x 19.5	23.5 x 26.5	35 x 35
Max. Wood Length	inch	37	44	55	72
Diameter of Supply and Return Fittings	inch	1.5	1.5	1.5	1.5 (2)
Chimney Connection (Approx. Height)	F-inch	70	78	87	106
Max Output	BTUH	150 000	260 000	525 000	1 000 000

**Specifications subject to change without notice*

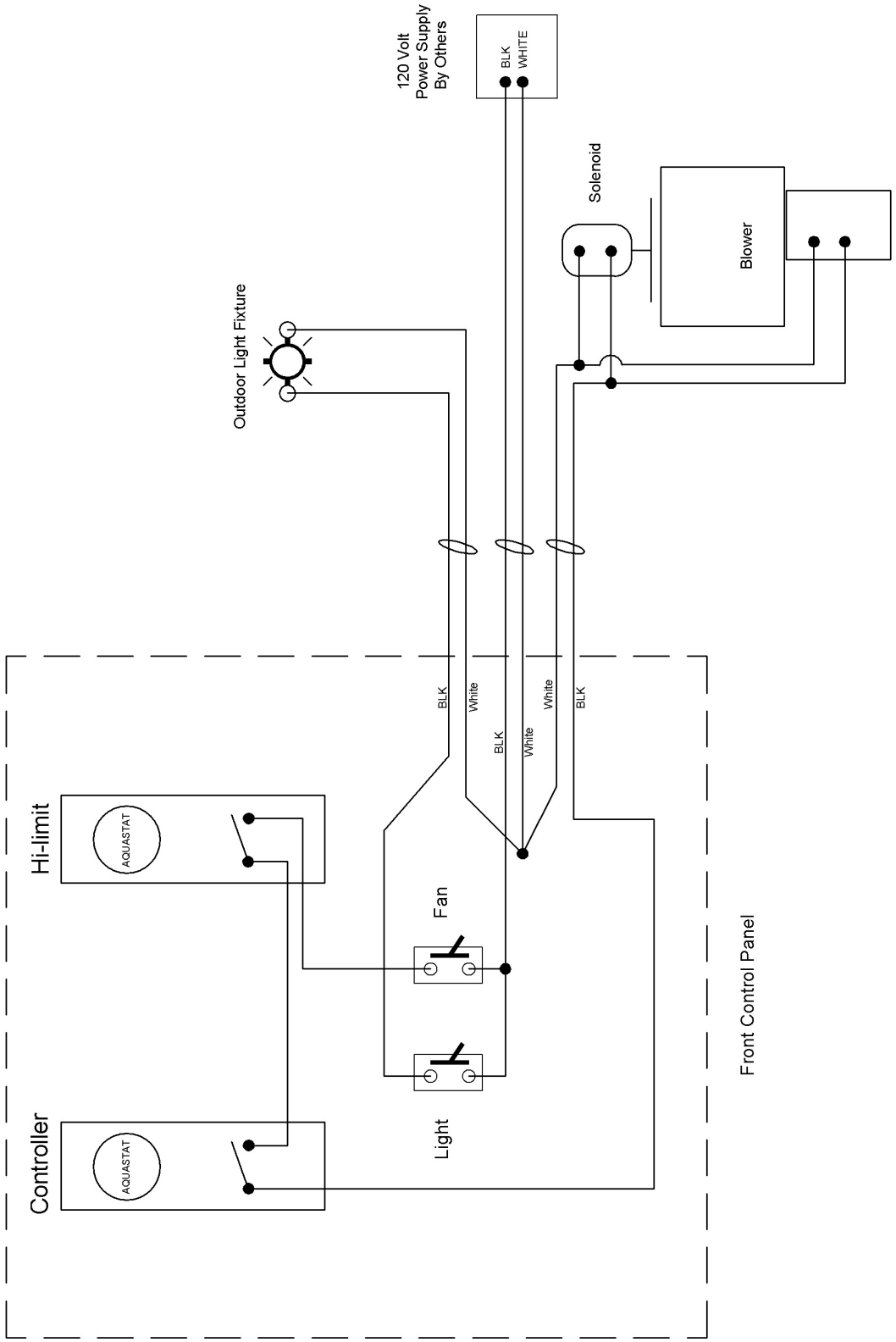




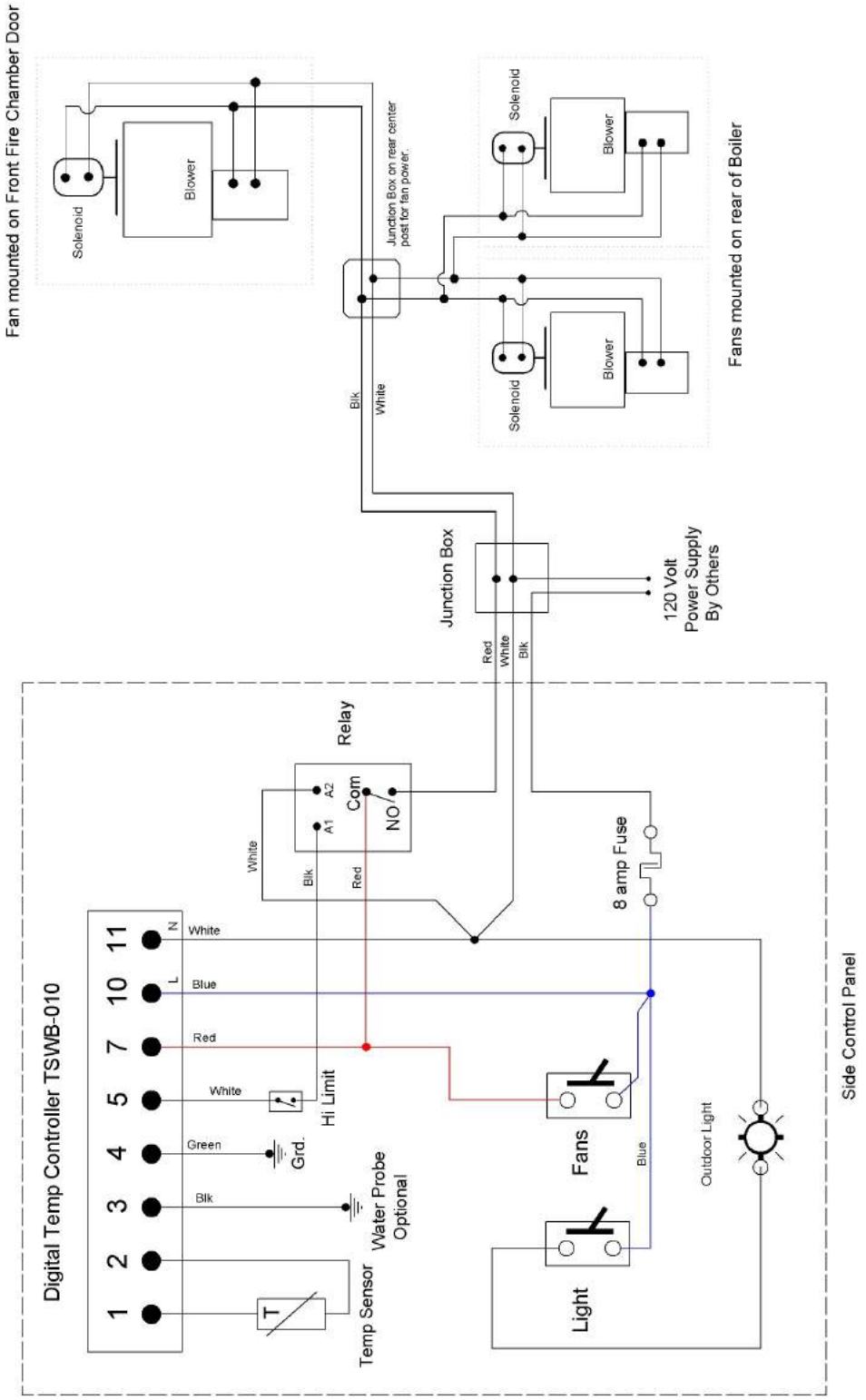
RG-5 Electrical Diagram

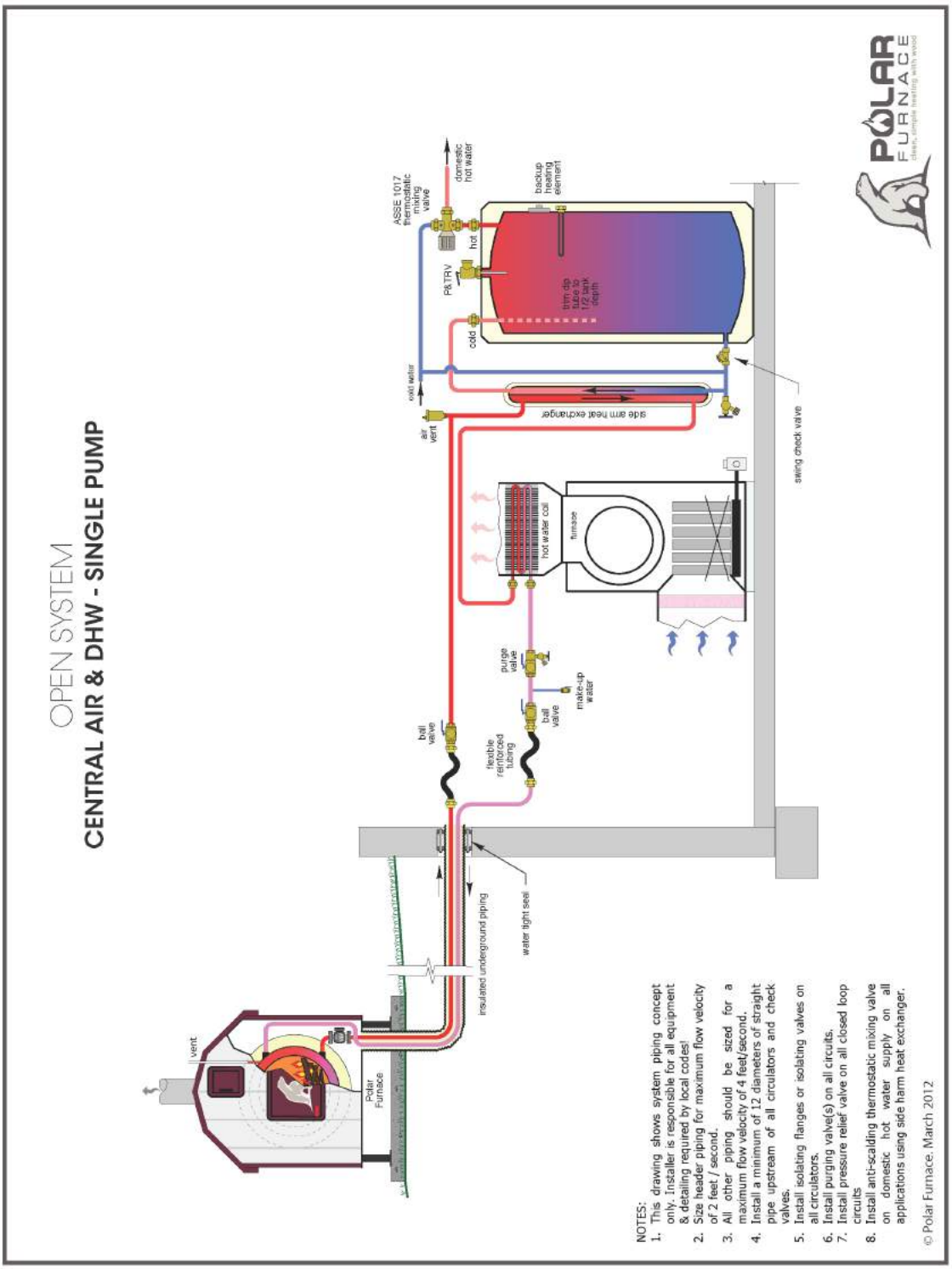


MD-9 & LG-15 Electrical Diagram



COM-32 Electrical Diagram




OPEN SYSTEM
CENTRAL AIR & DHW - SINGLE PUMP
POLAR FURNACE
vent
Polar Furnace
insulated underground piping
water tight seal
ball valve
flexible reinforced tubing
ball valve
purge valve
make-up water
hot water coil
furnace
swing check valve
air vent
cold water
side arm heat exchanger
cold
R&TPV
trim dip tube to 1/2 tank depth
hot
ASSE 1017 thermostatic mixing valve
domestic hot water
backup heating element
NOTES:
1. This drawing shows system piping concept only. Installer is responsible for all equipment & detailing required by local codes!
2. Size header piping for maximum flow velocity of 2 feet / second.
3. All other piping should be sized for a maximum flow velocity of 4 feet/second.
4. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
5. Install isolating flanges or isolating valves on all circulators.
6. Install purging valve(s) on all circuits.
7. Install pressure relief valve on all closed loop circuits
8. Install anti-scalding thermostatic mixing valve on domestic hot water supply on all applications using side harm heat exchanger.
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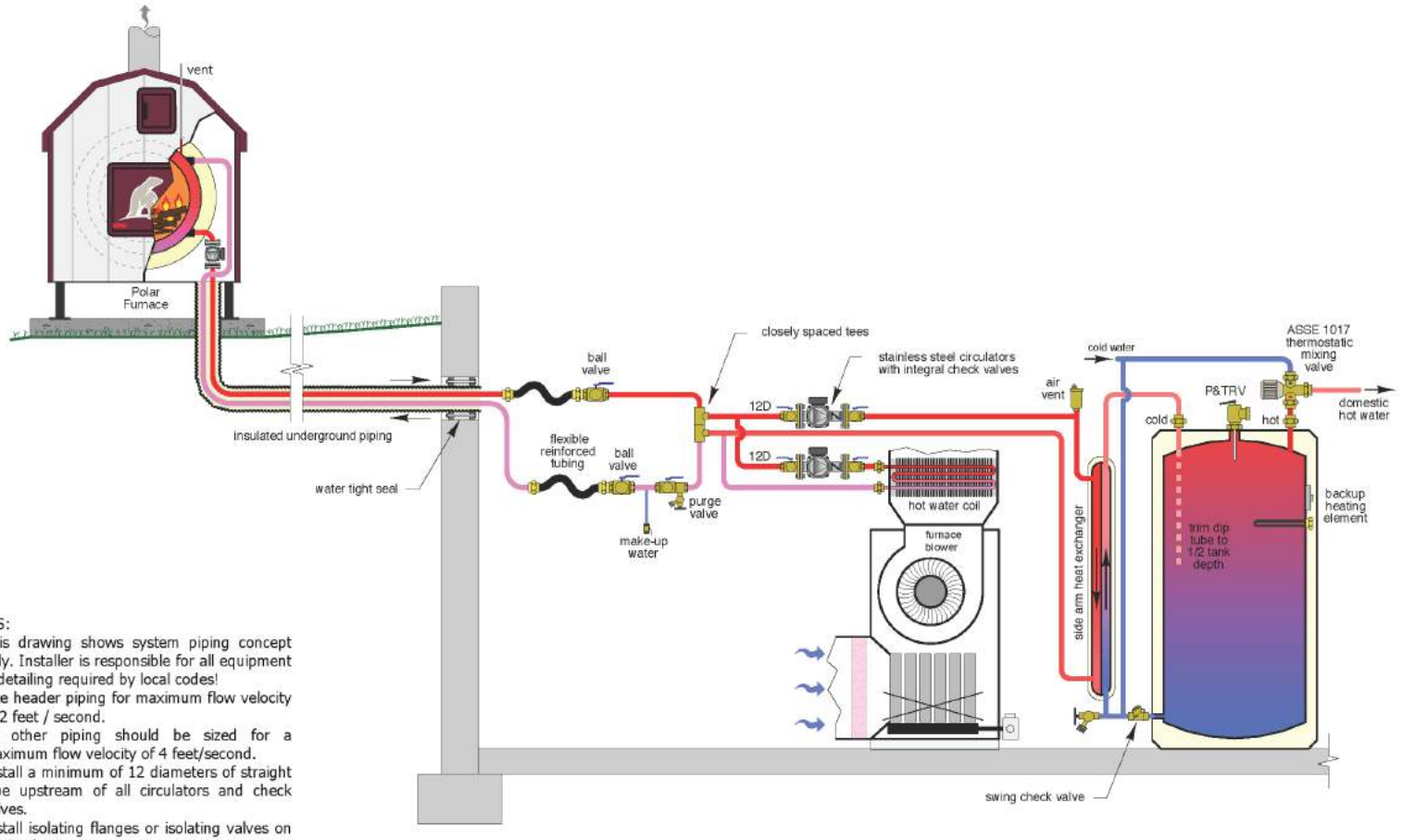
OPEN SYSTEM

CENTRAL AIR & DOMESTIC HOT WATER - DUAL PUMPS



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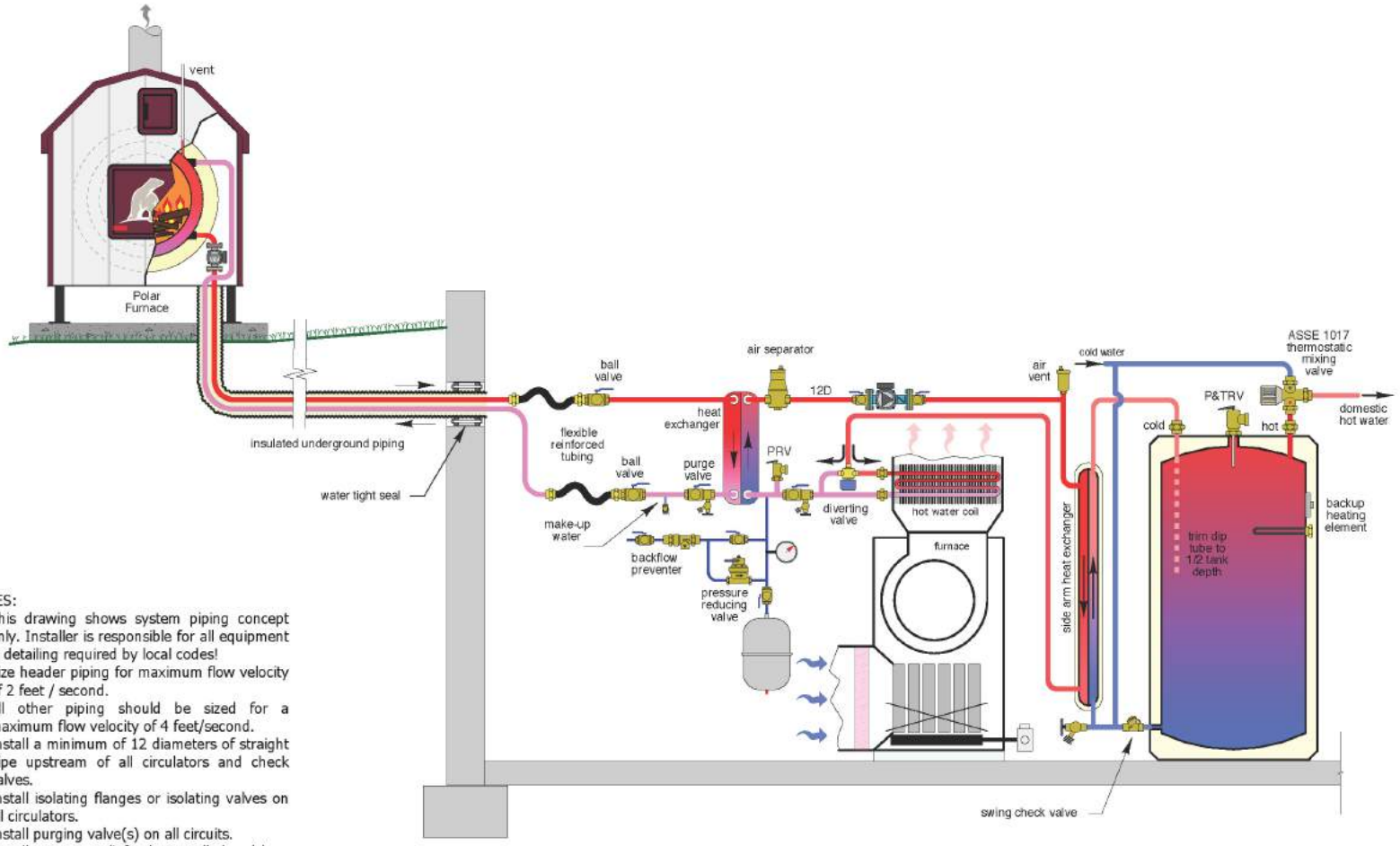
CLOSED SYSTEM
CENTRAL AIR & DOMESTIC HOT WATER - DIVERTER VALVE



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7. Install pressure relief valve on all closed loop circuits
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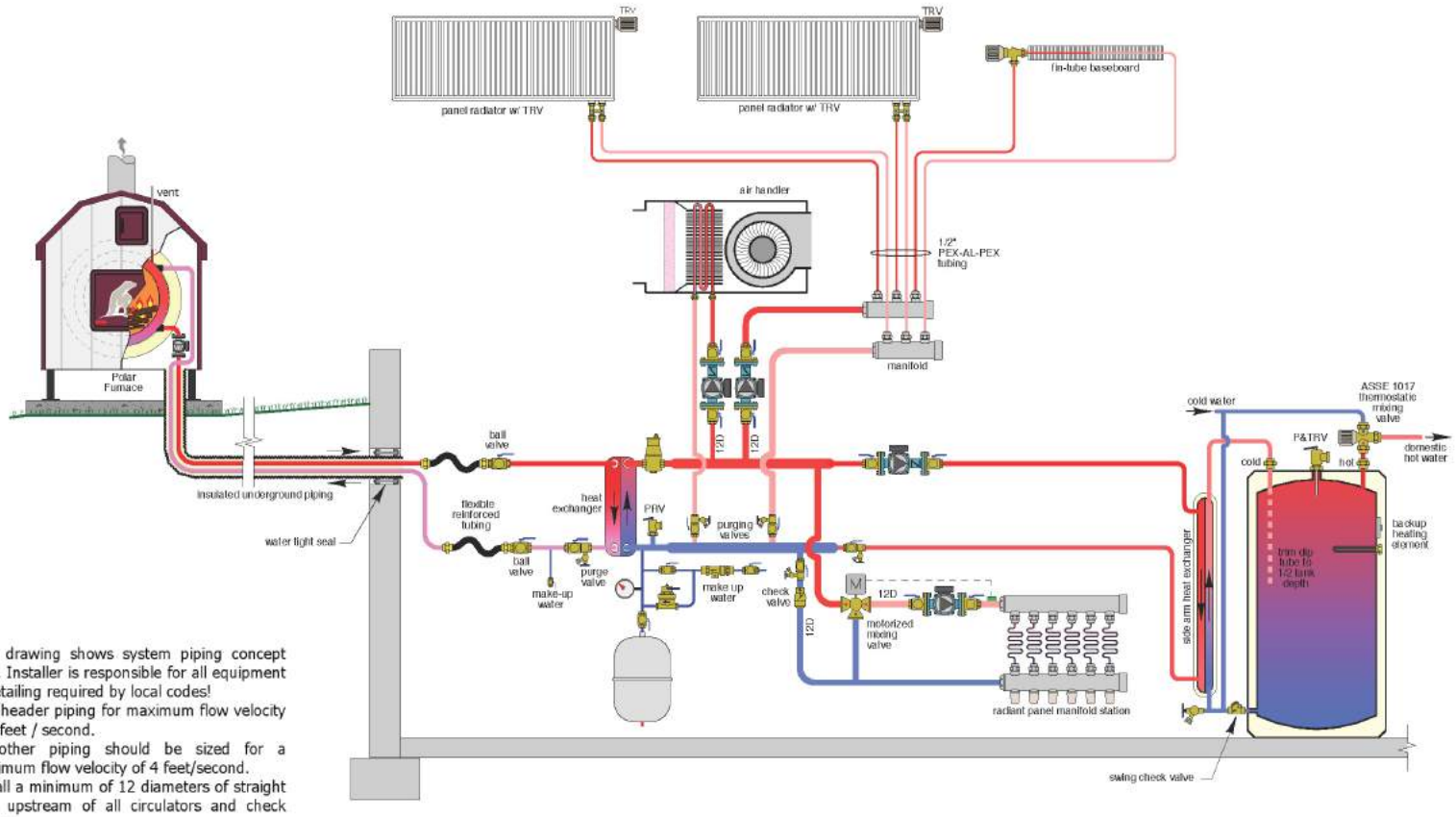
CLOSED SYSTEM
MULTIPLE TYPES OF HEAT EMITTERS



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Notes:

Polar Furnace Mfg. Inc.

Box 159. Sperling, Manitoba. R0G 2M0

For service and support on your Polar Furnace
contact your local dealer
OR
Contact factory support by sending an email to:
support@polarfurnace.com

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