

**INSTALLATION AND
OPERATING INSTRUCTIONS
FOR**

**THE HYPROTHERM
FRONT LOADING,
RESIDENTIAL, HYDRONIC,
COAL FURNACE**

Manufactured by
Hypotherm LLC

05/31/2021

INTRODUCTION

Thank-You and congratulations on the purchase of your new HyProTherm Outdoor Coal Burning Furnace! With the purchase of this HyProTherm Furnace, you can now appreciate the high degree of craftsmanship and reliability that are a result of every furnace being carefully hand-built.

Your choice shows the recognition you have for high quality products.

You are now a member of the large international family of HyProTherm customers, who have enjoyed the elegance, efficiency and reliability of our furnaces for many years.

The HyProTherm Furnace was the first and is the leader in the Outside Wood Burning Furnace field. We sell furnaces as far away as Canada, the UK, Ireland, the Ukraine and Spain!

We deem it important to provide you with this user's and maintenance manual: to allow you to use your equipment under the best possible conditions and in the most optimal manner, and furthermore to increase its operating life.

We strongly advise you to read it twice, carefully and keep it handy.

Again, **Thank-You** for purchasing the original HyProTherm Outdoor Wood Burning Furnace

THIS MANUAL INCLUDES IMPORTANT SAFETY INFORMATION.

Your new furnace should have a large specially designed poker FREE - as a bonus! (Often shipped above the boiler in the back of the furnace.)

We are always here to help!

“When in Doubt – Make it Stout”

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Specifications

Type of fuel – Coal only
For outdoor use only
Electrical Rating 115 VAC/ 60 HZ / 1PH
15 AMP Breaker unless you add pumps

Clearance to Combustibles
5 feet (UL Tested specs) Further is recommended.
Flooring: Non-Combustible

HyProTherm FLRH – Eco 85
Water Capacity; 85 gallons
Firebox Capacity; 15 cubic feet
Shipping Weight: 1,685 lbs. Approx.
BTUs; 95,243 @ 180 degree
Heatable Area; 2,300 sq ft Approx.

HyProTherm FLRH - 85
Water Capacity; 85 gallons
Firebox Capacity; 15 cubic feet
Shipping Weight: 1,996 lbs. approx.
BTUs; 95,243 @ 180 degree
Heatable Area; 2,300 sq ft approx.

HyProTherm FLRH – 100
Water Capacity; 100 gallons
Firebox Capacity; 16.5 cubic feet
Shipping Weight: 2, 000 lbs. approx.
BTUs; 112,050 @ 180 degree
Heatable Area; 2,800 sq ft approx.

HyProTherm FLRH – 185
Water Capacity; 185 gallons
Firebox Capacity; 19.77 cubic feet
Shipping Weight: 2,040 lbs. approx.
BTUs; 207,293 @ 180 degree
Heatable Area; 5,182 sq ft approx.

HyProTherm FLRH – 265

Water Capacity; 265 gallons
Firebox Capacity; 29 cubic feet
Shipping Weight: 2,500 lbs. approx.
BTUs; 296,933 @ 180 degree
Heatable Area; 7,400 sq ft approx.

HyProTherm FLRH – 300

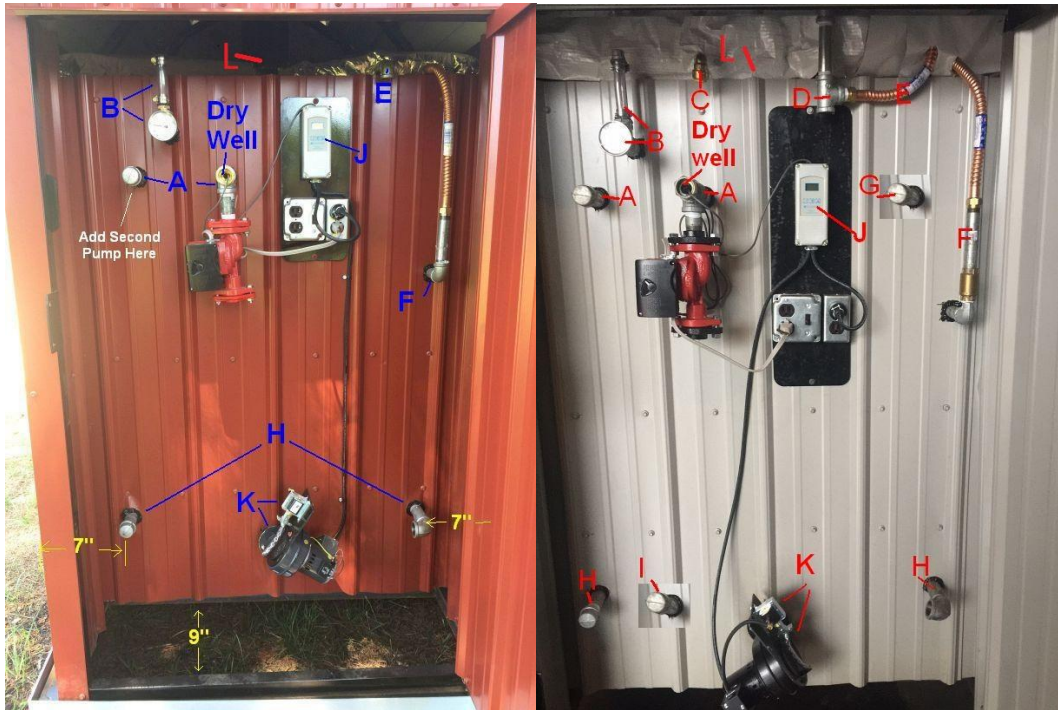
Water Capacity; 301 gallons
Firebox Capacity; 34 cubic feet
Shipping Weight: 2,920 lbs. approx.
BTUs; 336,150 @ 180 degree
Heatable Area; 8,400 sq ft approx.

HyProTherm FLRH – 350

Water Capacity; 350 gallons
Firebox Capacity; 41 cubic feet
Shipping Weight: 3,580 lbs. approx.
BTUs; 392,175 @ 180 degree
Heatable Area; 9,800 sq ft approx.

HyProTherm FLRH – 400

Water Capacity; 403 gallons
Firebox Capacity; 41 cubic feet
Shipping Weight: 3,680 lbs. approx.
BTUs; 451,562 @ 180 degree
Heatable Area; 11,288 sq ft approx.



FLRH Component Locations

- A. Two 1" standard supply ports, one of these ports will have a dry well for the sensor bulb of the Ranco thermostat. The pump on this port needs to run continuously so as to provide water flow past thermostat.
- B. One $\frac{3}{4}$ " port for water level site tube and analog thermometer.
- C. Brass shark bite fitting is return line to domestic water supply.
- D. $\frac{3}{4}$ " T is supply from domestic water heater and,
- E. also supply for filling the furnace. This line runs to the front of the furnace to fill valve makes a loop comes back on F.
- F. Water from fill vale on front enters water jacket here.
- G. This is the extra supply port will be located if applicable.
- H. Two standard 1" return ports.
- I. This is the extra 1" return port if applicable.
- J. Ranco ETC digital thermostat
- K. Combustion blower with auto damper (controlled by Ranco)
- L. This location will house the potable water copper coil with lid or a vertical nipple with cap. Can be used to add water, and chemicals to the furnace.

SAFETY PRECAUTIONS - WARNINGS

Do not operate this equipment for other than its intended purpose nor other than in accordance with the instructions contained in this manual and all other instructions accompanying the furnace.

For furnaces covered by this instruction book, it is important to observe safety precautions to protect yourself from possible injury. Among the many considerations, you are advised to:

- Observe all safety stickers on the furnace.
- **This furnace must be wired by a qualified electrician in accordance with the National Electrical Code.**
- **Never use any type of petroleum product, petroleum-based product, charcoal started, lighter fluid, lantern fuel, kerosene or any other flammable accelerant to start your furnace.**
- **KEEP ALL SUCH LIQUIDS WELL AWAY FROM FIREPLACE WHEN IT IS IN USE**
Keep antifreeze, which is flammable, well away from the furnace.
Only use non-toxic antifreeze. Test antifreeze and other chemicals annually.
- The use of treated wood (painted, treated, etc.) driftwood, and any other salvaged material that can emit noxious gases for the environment and is corrosive towards the components of the appliance is NOT ALLOWED and eliminates the rights of guarantee. **Damage caused from burning unprocessed coal or overloading it, is not covered under the warranty.**
- DO NOT BURN GARBAGE, HOUSEHOLD WASTE, STRAW, HAY OR YARD WASTE. In most areas this is illegal. The furnace is designed to burn seasoned cordwood and coal. Burning other materials can reduce the life of the furnace and will void your warranty.
- Open Loading door slowly– pausing momentarily between the first latch and the safety latch to allow any combustion gases to burn off.
- DO NOT OPERATE THE FURNACE WITH THE DOOR OR ASH PAN OPEN. Always latch the doors securely.
- Always use proper care when installing, operating and maintaining the furnace.
- **Always wear protective gloves and glasses** and be aware that hanging and loose clothing can catch fire! The fire's heat can burn your eyes.
- Do not modify the furnace.
- Do not substitute repairs that can be provided by your dealer, distributor, or Manufacturing Company (Hyprotherm Manufacturing LLC)
- Do not burn with the ash pan door open for any extended period of time, other than for cleaning - it will cause over firing of the fireplace and may cause your water to boil!
- Failure to heed this warning or any additional warnings on the furnace may result in an accident-causing personal injury as well as void your warranty.
- **CALL BEFORE YOU DIG!**

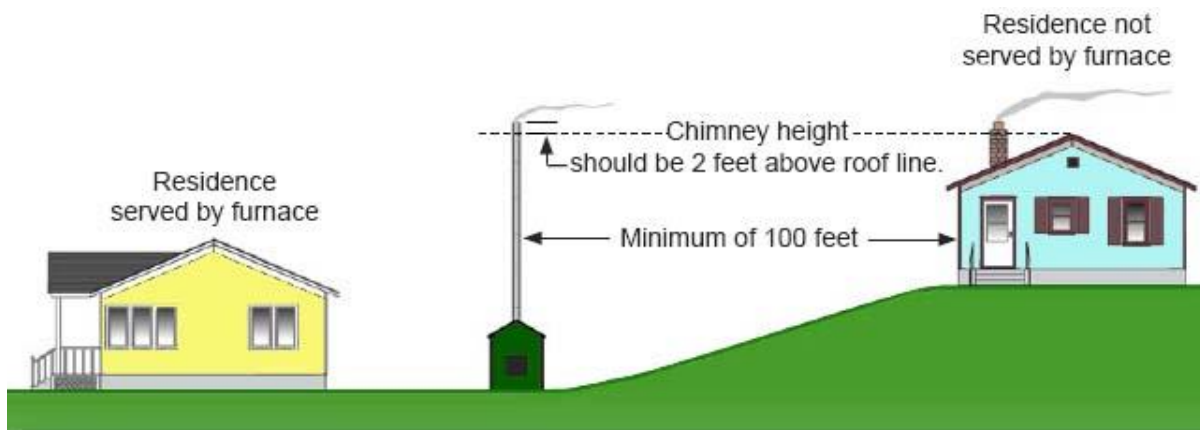
Disposal of ashes

OPEN THE ASHPAN DOOR FOR THE DISPOSAL OF ASHES. **ASHES SHOULD BE PLACED IN A METAL CONTAINER with TIGHT FITTING LID.** THE CLOSED CONTAINER OF ASHS SHOULD BE ON A NONCOMBUSTIBLE FLOOR OR ON THE GROUND, ALL COMBUSTIBLE MATERIALS, PENDING FINAL DISPOSAL. ARE DISPOSED OF BY BURIAL IN SOIL OR OTHERWISE DISPERSED, THEY SHOULD BE RETAINED CLOSED UNTIL ALL CINDERS HAVE THOROUGHLY COOLED.

All installation and operation must follow Federal, Provincial, State and local codes

OUTDOOR FURNACE BEST BURN PRACTICES

1. Read and follow all operating instructions supplied by the manufacturer.
2. FUEL USED: It is important to burn only good quality coal. Burning inferior coal may lead to issues that may not be covered under warranty. Be sure to read your warranty statement (separate document) for exclusions.
3. LOADING FUEL: For a more efficient burn, always add fuel before previous load has burned out. Commonly your furnace will have to be loaded in the morning and at night.
4. STARTERS: NEVER use lighter fluids, gasoline, or chemicals. Good kiln dried scrap lumber is better!
5. LOCATION: It is recommended that the furnace be located with due consideration to the prevailing wind direction. Chimney height can be easily extended with 6" Stovepipe.
 - We recommend a distance of at least 100 feet if prevailing winds blow towards any other residence not served by the furnace, it is recommended that the stack be at least 2 feet higher than the eave line of that residence.
 - If located more than 100 feet but no more than 150 feet to any residence, it is recommended that the stack be at least 50% of the eave line of that residence, plus an additional 2 feet.
 - If located more than 150 feet but no more than 200 feet to any residence, it is recommended that the stack be at least 25% of the height of the eave line of that residence, plus an additional 2 feet.



Chimney height relative to nearest downwind neighbor

The chimney can easily be extended with a flue adapter and standard double wall stove pipe, to any height necessary, with zero adverse affect on performance. In fact it may even draft better. Always use a double wall pipe when going through any kind of roof or extending the flue pipe.

6. **Always remember to comply with all applicable state and local codes.**

THE OUTSIDE Coal FURNACE

How does an outside furnace heat my home?

The HyProTherm outside coal furnace is designed to save the most energy and provide the most comfortable heating available. It heats your home by heating a firebox surrounded by a steel tank filled with water. The water furnace (boiler) is basically a non-pressurized boiler with an atmospheric vent. This hot water is then circulated through underground hot water pipes (Pex Pipe) to a water coil (heat exchanger) installed inside your existing central duct system. You may also need to use a plate exchanger with a boiler or radiant heat.

A typical water-to-air heat exchanger - much like a small radiator or heater core in a car, is installed in your ductwork. When air blows through it, heat is extracted, and hot air blows out of your vents.



The HyProTherm furnace can also be connected to any existing Hydronic heating system that operates at 180 degrees or less. Not for steam systems.

The HyProTherm can also heat water for household use if the optional internal water to water coil exchanger is ordered.

Water is circulated directly between the outdoor furnace and your water heater, via the built-in **water to water coil exchanger** in our furnace. The water going to your water heater is reheated. The only energy required is maintaining the hot water temperature in the outdoor furnace and a 100 watt pump mounted on the hot water heater vs a typical 4500 Watts for a water heater.

When you shut down the wood burner for the season, simply unplug the pump or turn off the circuit breaker to it. Your existing water heater will take over. Please remember to adjust your thermostat, if you had it turned down during the winter.

Heating a **POOL**

A stainless-steel shell and tube heat exchanger should be used for heating pools and spas. The chlorine will ruin a brazed plate heat exchanger in short order.

How do the Thermostat Controls work?

The only visible addition to the heating system inside your home is the thermostat which is located near the existing thermostat. The 2nd thermostat is installed so that it turns the blower on inside your existing furnace to force air across the hot water coil (heat exchanger). This forces hot air into your central duct system. The wall thermostat which regulates the heat from the outside furnace performs a second function as well; when the furnace fan powers up it sends power to the circulating pump in the outdoor furnace to circulate the hot water through the heat exchanger (running only on demand, not 24/7 like most others).

The outside furnace has a hot water thermostat which senses the water temperature of the unit. If the water is not as hot as the thermostat setting then the combustion air blower is automatically turned on (building a hotter fire) and remains on until such temperature is attained.

Location of Furnace

The HyProTherm furnace is designed to be set outside the building to be heated. The furnace must be located a minimum of 5 feet from and facing away from the building. Further is recommended and distances up to 40 feet are within the capabilities of the included pump. For distances greater than 40 feet an upgrade pump will be required. The furnace should be installed upon a 4" thick concrete pad (see pad information beginning on page 12). Remember, your furnace will weigh about 3000 lb. or more, when filled with water.

- A) It is recommended that the appliance be located with due consideration to any neighboring residences. Do not locate an Outdoor Wood Burning Appliance within 100 ft of a residence not served by the appliance. Be considerate of neighboring residences, properties, parks, etc.
- B) Review the recommended stack heights on page 8.
- C) Do not locate near any combustible materials, gasoline or other flammable liquids or gases.
- D) Locate away from *dry* grassy areas.
- E) Place far enough away from any building to minimize fire danger.
- F) Check with your insurance company and local codes or ordinances.
- G) Do not install in an area where nearby structures or trees might cause down drafts.
- H) Typically, Outdoor Wood Burning Appliances are located 40 to 100 ft downwind from the served structure
- I) Transfer lines in excess of 40 ft will require a larger size pump than the one provided with the appliance.
- J) Locate to allow easy access to wood supply.
- K) To aid in smoke dispersal, extra chimney lengths may be required depending on the distance to surrounding structures. See page 8 for guidance.
- L) It is recommended that the appliance be located with due consideration to the prevailing wind direction.
- M) The furnace requires 115 V 10 Amp electrical service to operate.

Failure to keep the HyProTherm Furnace area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death, or substantial property damage.

Burning Coal

Any type of processed coal is fine. You can let us know what kind/size of coal you will be burning, and we will supply the appropriate grate when you order it. We recommend that you burn a coal and wood mixture. A nice bed of coal (about 8-10 shovels) up to the bottom edge of the door, heaping it in the middle with wood on top, *burns best according to our customers.*

Keep the ash receptacle and firebox clean, as **coal is very corrosive. Damage from burning unapproved coal (run of the mine) or burning excessive amounts, is not covered under the warranty. You may want to add firebrick, placing it on the floor of the furnace or/and elsewhere.**

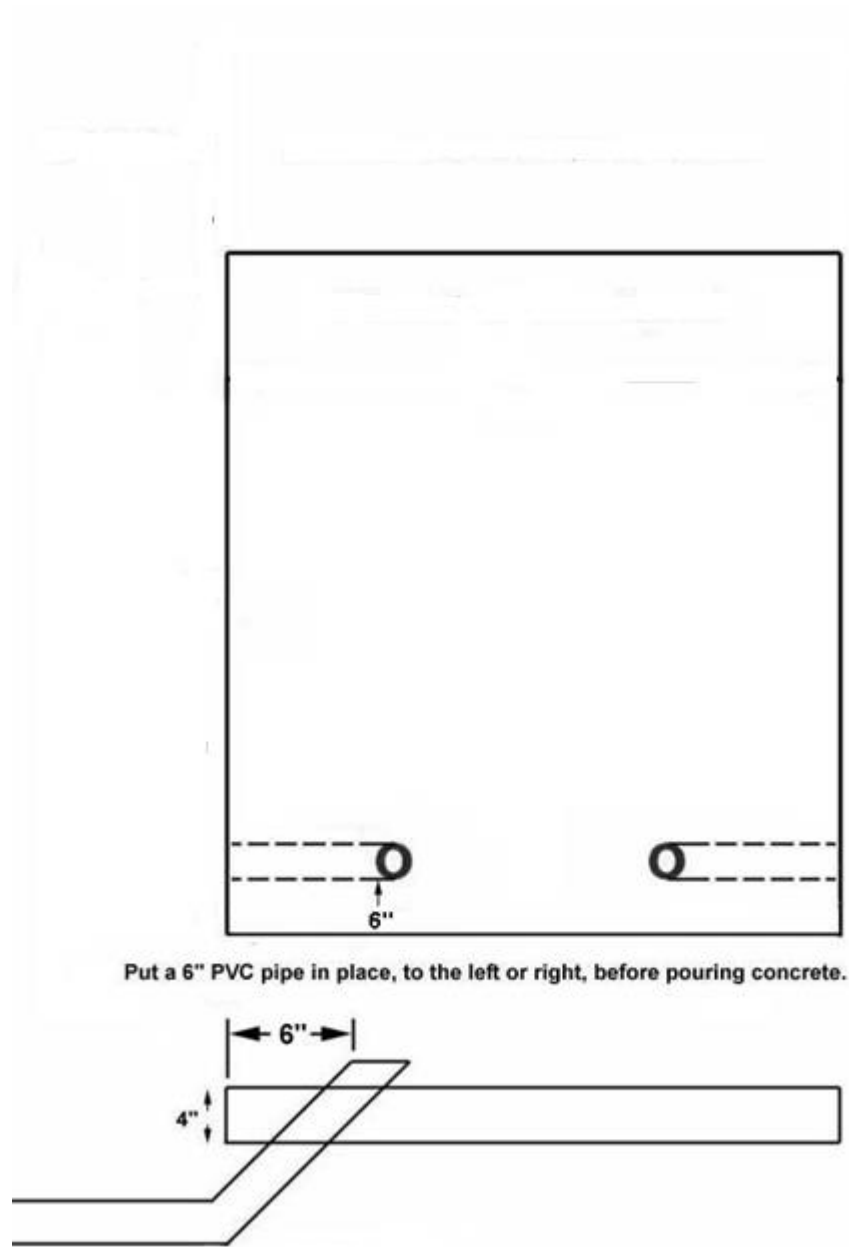
This furnace is now available now with an optional adjustable CAST IRON shaker grate.



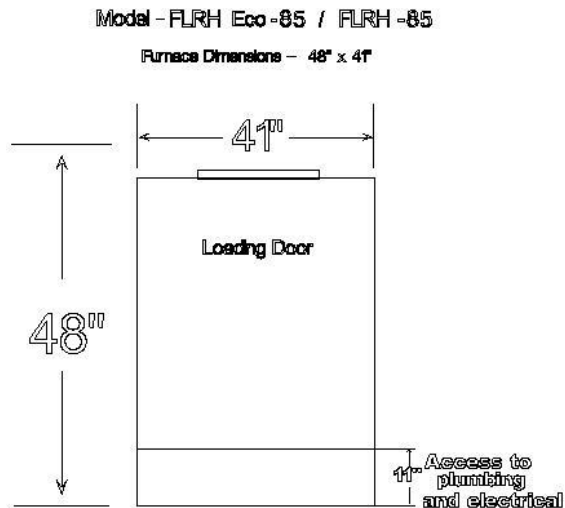
Shaker

Running the plumbing and electrical

The space between the inside rear of the furnace and the door will allow a 4 inch water tile type pipe (4") with the plumbing and electrical lines to run directly into the ground. We put a large full-size door on the back that will allow you easy access for the connection of the plumbing and electrical lines. The image below shows correct placement for this 4" pipe.



The piping can go in *any* direction. It just needs to be in the proper spot above the concrete pad. **Install a ground rod, 4-6 feet deep and attach a 12 or 14 gauge wire, with a clamp and attach it to the frame of the furnace.**

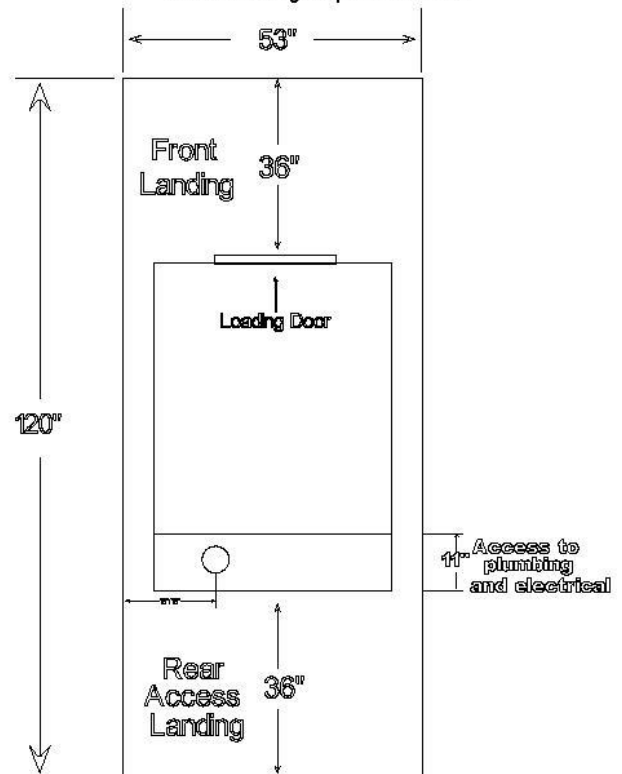


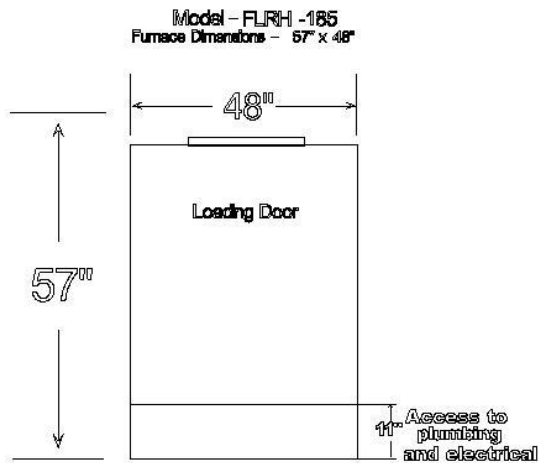
Model - FLRH Eco -85 / FLRH -85

Minimum Pad Dimensions - 60" x 53" Concrete Pad has 6" shoulder on all four sides

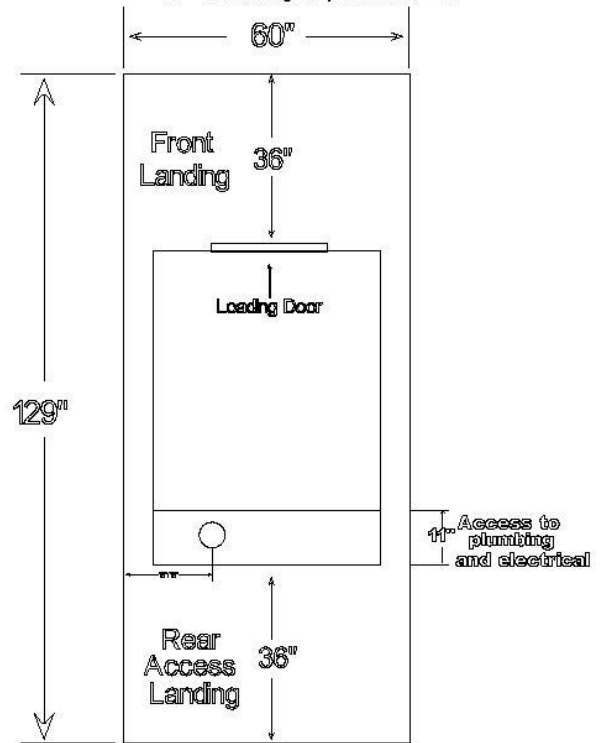
Preferred Pad Dimensions - 120" x 53" Concrete Pad has 6" shoulder on sides and a 36" work landing on front and rear

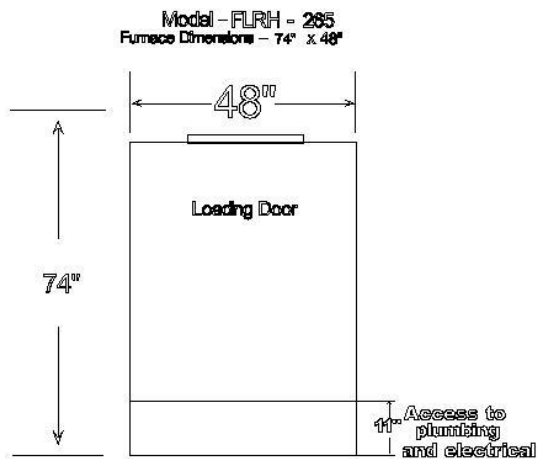
Plumbing and Electrical - bring plumbing and electric thru concrete approx 16" - 16" from edge of pad on either side





Model - FLRH 185
Minimum Pad Dimensions - 69" x 60" Concrete Pad has 6" shoulder on all four sides
Preferred Pad Dimensions - 129" x 60" Concrete Pad has 6" shoulder on sides and a 36" work landing on front and rear
Plumbing and Electrical - bring plumbing and electric thru concrete approx 16" - 18" from edge of pad on either side



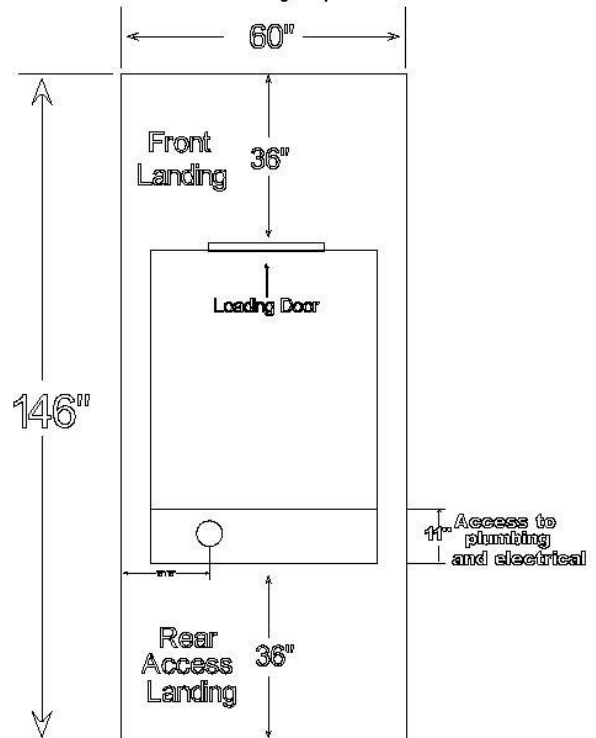


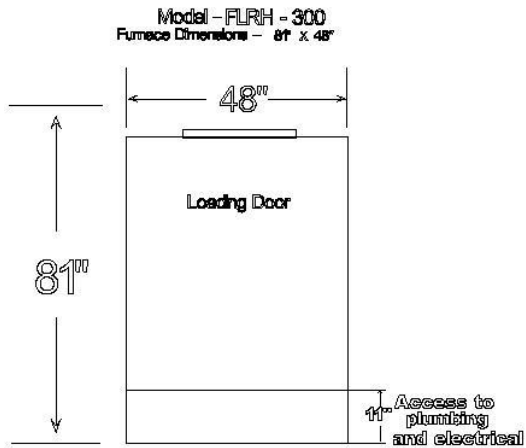
Model - FLRH 265

Minimum Pad Dimensions - 88" x 60" Concrete Pad has 6" shoulder on all four sides

Preferred Pad Dimensions - 146" x 60" Concrete Pad has 6" shoulder on sides and a 36" work landing on front and rear

Plumbing and Electrical - bring plumbing and electric thru concrete approx 16" - 18" from edge of pad on either side



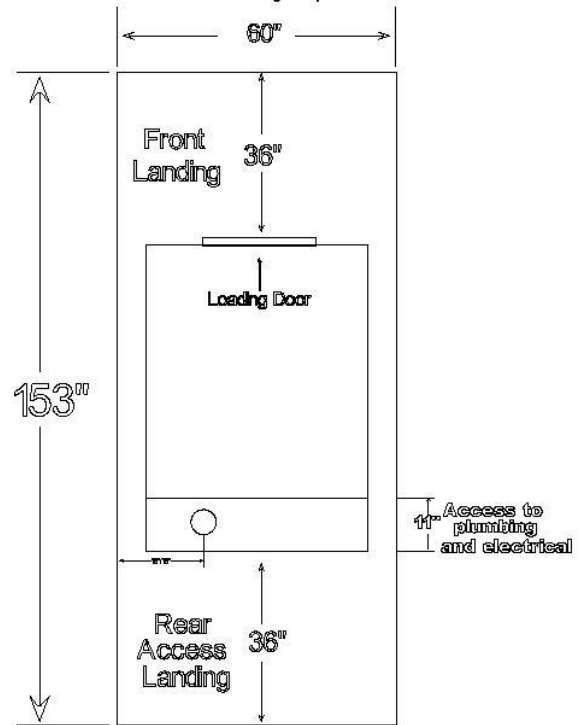


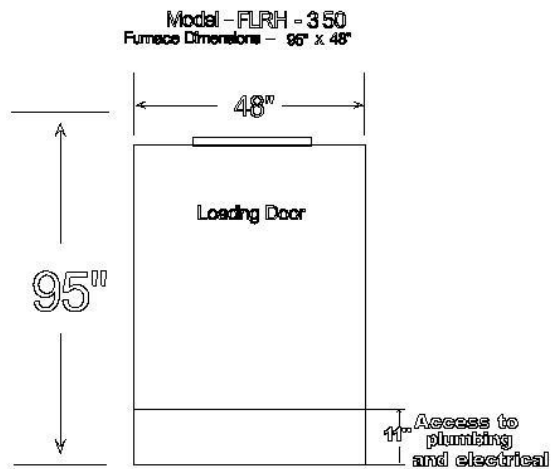
Model - FLRH - 300

Minimum Pad Dimensions - 93" x 60" Concrete Pad has 6" shoulder on all four sides

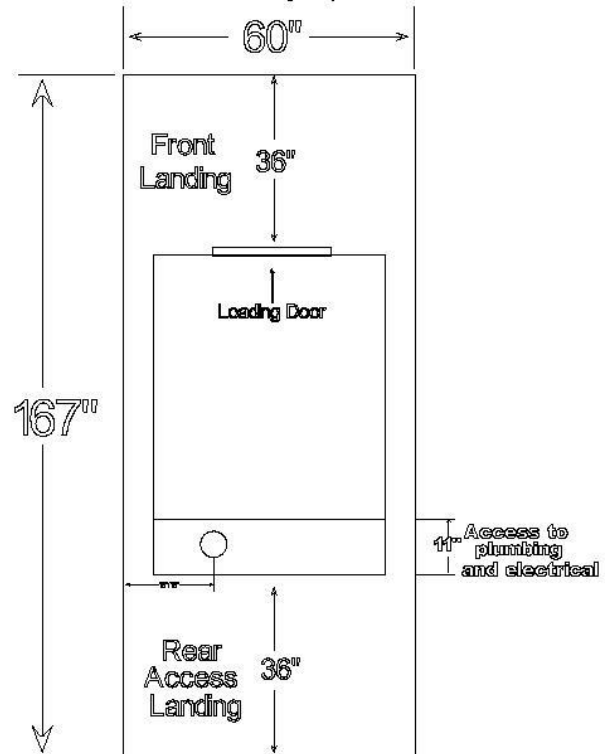
Preferred Pad Dimensions - 153" x 60" Concrete Pad has 6" shoulder on sides and a 36" work landing on front and rear

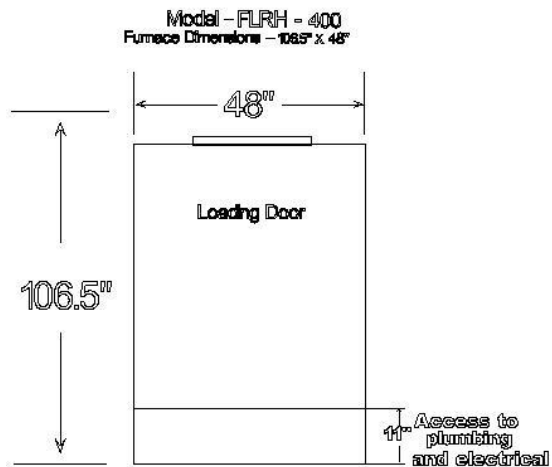
Plumbing and Electrical - bring plumbing and electric thru concrete approx 16" - 18" from edge of pad on either side





- Model - FLRH 350
- Minimum Pad Dimensions - 107" x 80" Concrete Pad has 6" shoulder on all four sides
 - Preferred Pad Dimensions - 137" x 80" Concrete Pad has 6" shoulder on sides and a 36" work landing on front and rear
 - Plumbing and Electrical - bring plumbing and electric thru concrete approx 18" - 18" from edge of pad on either side





Model - FLRH - 400

Minimum Pad Dimensions - 118.5" x 60" Concrete Pad has 6" shoulder on all four sides

Preferred Pad Dimensions - 178.5" x 60" Concrete Pad has 6" shoulder on sides and a 36" work landing on front and rear

Plumbing and Electrical - bring plumbing and electric thru concrete approx 16" - 18" from edge of pad on either side

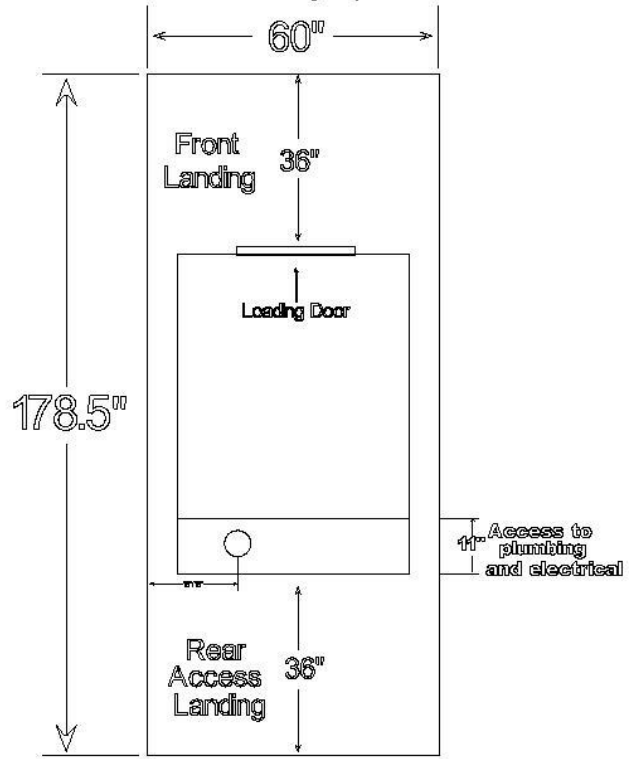


Photo of Pouring Cement Pad with corner framed off for Pex Pipe.



It IS better to have your piping in place and pour the concrete around it, as shown:



PREPARING YOUR FURNACE

1. Simply open the large rear door to gain access to the rear of the furnace, to make plumbing and electrical connections.
2. The plumbing and electrical lines for your furnace must be installed underground in a watertight, preferably pre-insulated pipe.

The water lines should be buried below the frost line to prevent heat loss. The depth of the trench varies in different regions of the country. Be completely sure about the correct depth before the Pex Pipes are installed underground. Always bury any underground cable at least 18" deep, but 24" is preferable. Pipes buried at least 24" deep are less likely to be bothered by spading forks and other tools commonly used around the yard.

3. *Call your local building inspector's office for that information.*
4. A trench must be dug wide enough to accommodate a 4" black corrugated pipe, 4.75" diameter. All electrical lines should be run inside a watertight pipe unless you are using UF rated, direct bury wire and your county allows the wire to be in the same trench as the piping.

5. **Install a ground rod, several feet deep and attach a 12 or 14 gauge wire, with a clamp and attach it to the frame of the furnace.**

HINT: Remember to run a twine or small rope through the 4" black corrugated pipet as well to facilitate pulling wire or anything else through that may be added or changed in future!

6. If more than one location is to be heated, then an additional pipe (set of Pex pipes) must be installed underground to that location.
7. This pipe will run from the rear of the furnace to the location to be heated.

The listing below describes each line and their function.

1. One water supply line to heat exchanger placed into existing heating system. This one is attached at the circulating pump.
2. One water return line from heat exchanger. (All of these must be at least 1" pipe) This line is attached at one of the nipples at the bottom of the furnace. Using the installation kit, with the two valves.
3. One #12/3 W/Ground UF underground Romex wire. The extra insulated wire supplies power to your pump, from your fan in your existing furnace, instead of running a thermostat wire and installing a relay (more to go wrong). **This allows the pump to only run on demand.** Otherwise, you can use 12/2 wire.

4. One water supply line to indoor plumbing for filling the furnace.

OR

If you are heating your hot water, simply run 2 x 3/4" water lines to your water heater. One of those will supply the water to fill the furnace, so a separate pipe isn't needed. You will have a total of 4 Pex lines running to your house in this scenario.

If more than one location is to be heated, a second set of (2) Pex pipes will need to be installed underground for the water lines and line voltage thermostat wire and power wire of the second location. If the 2nd location has a furnace, you wire it as the first and no thermostat wire is needed. Locate this pipe at the opposite side of the outdoor furnace per diagram on page 12 (unless it's running in the same direction. In that case both pipes can be on the left. Do not put any pipes in the center because the fan is there,

HINT: Label the water lines or install them before burying the pipe and lines

Insulation of Pex Pipe

Insulate the Pex pipe with the thickest foam insulation available, where it is exposed in the back of the furnace, however it does stay warm there, if there is a fire, from heat radiating from the pump and galvanized fittings and shut-off valve..

Try to keep the Pex pipe underground (warmer) as it enters the house. A 5" hole in concrete block or the wood band above a basement or foundation is easily made for the pipe. If it has to come above-ground to come through the sill plate or attic it MUST be well insulated, as shown below, using a pre-insulated assembly of Pex, insulated inside a 4.75 OD pipe.



Filling furnace with water

Once your Pex Pipe is hooked up to your water heater, you have a source of water already plumbed, into the back of your boiler.

Simply turn on the manual fill valve at the front of the furnace and allow it to fill until water runs out the overflow.

Be sure to open the valve at least once a week (ON THE SAME DAY, SO THAT YOU WILL REMEMBER) during heating season to keep the furnace topped off. Failure to do so may result in circulating pump failure.

If you aren't hooking up your water heater, you need to find another way to get water to your furnace, **so you don't have to pull out a hose in the middle of the winter!**

This can be achieved by connecting the Pex pipe that return to the boiler to a water supply using a shut-off valve.

Adding treatment to your furnace

Fill the furnace about halfway with water so that the treatment doesn't sit on the bottom of the tank and does not get mixed into the water because it is heavier than water. The treatment will come in a 1-gallon jugs and you need to get it into a very small area in the back of the furnace and obviously you cannot do that. The easiest way to do this is to use a smaller container to scoop the treatment out and pour it into the opening where the hot water coil is. There may be alternative ways of doing this such as getting the pail higher than the lid like on a ladder and using a hose to siphon the treatment into the boiler.

IMPORTANT: The hot water cover **MUST** be sealed as shown on Page 53.

Wiring up your house thermostat

These instructions are for a forced air furnace, with a single-speed fan. **If you have other than a single-speed fan, a boiler or are unsure about anything, you will need to consult an HVAC technician.**

Most existing thermostats have a fan switch that you can set to ON or AUTO. Set to ON. Simply remove the thermostat cover and you will see a wire running to that switch, usually marked as terminal G.



Disconnect the wire that runs to the G terminal, on your existing thermostat.

Purchase a simple, 2-wire thermostat (like a simple ON/OFF switch) Heating only - no A/C. Usually less than \$15.

With a simple 2-wire thermostat, just use those 2 wires. **Connect one wire to Terminal G and connect the other wire to the wire you just removed.**

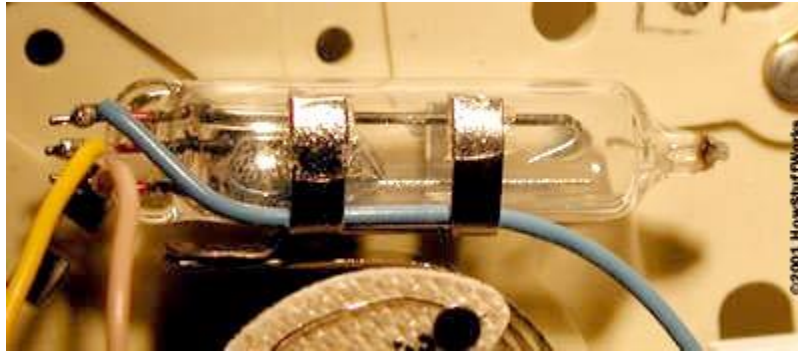
If you are using a thermostat with more than 2 wires, find the two wires that run to the mercury switch shown below (or bi-metal switch or thermistor on a digital thermostat) that make a connection when you turn the thermostat up. Those 2 wires are wired into the fan switch wire(s) above at to Terminal G and the wire you just removed on the existing thermostat.

(The two wires are shown below (next page), as tan and blue on a 3 terminal mercury switch)

Never assume that a wire color (or letter code) is correct for the function it should perform; check it out first

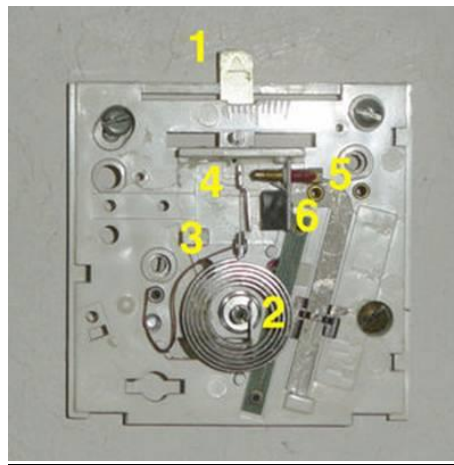
Assemble the new thermostat on the wall **and turn the fan switch on the existing thermostat to ON**, if you haven't done so. That's it!

If you have air conditioning currently and want to use it - turn the original thermostat back to automatic and turn the new thermostat as high as it will go. This will ensure that the new thermostat is always supplying power to the fan.



Mercury Switch

Top and Bottom wires in the switch are typically used.



Examples of Mechanical Non-Programmable Thermostats at Lowe's

Be sure that the one you choose one that will work with just 2 wires, like a light switch.



Plumbing Parts Needed

A. The pump needs a 1" SharkBite™ style-fitting adapter screwed into a flange that is supplied and already mounted to the pump. The flange is a female 1" NPT. See the picture below to help visualize this. It's the brass fitting on the bottom of the pump. SharkBite™ fittings are best!

B. SharkBite™ style-fittings (Do not buy the copy-cats!) can be purchased from any good plumbing store or Lowe's or Home Depot.

The Pex Pipe connected to the bottom of the pump runs to the house and normally runs to your heat exchanger - unless you have a boiler or are installing a hydronic system. In that case, you will need a brazed-plate heat exchanger, which is normally used between the two systems to keep the water separate AND to keep the indoor system pressurized and the auto-fill valve working exactly as it is now. See end of this section for more information on hooking up a brazed-plate heat exchanger.



C. The pump comes already mounted directly to the furnace *without* a shut-off valve. However it is a good idea to install a shut-off valve above the pump (as pictured on page 24, so that if the pump ever has to be changed, the water supply can be shut off so water doesn't flow out of the furnace. This will come in your kit.

Simply add a valve and a 1" pipe nipple, threaded on both ends, as shown below.

Install a shut-off valve above the pump



Start by unbolting the pump, using a socket and ratchet and a wrench.



Do not loose the seal! Unscrew the flange with a pipe wrench.



Wrap the threads on the elbow with pipe thread tape.
Wrap the threads on the small pipe with pipe thread tape.



Screw the short piece of pipe tightly onto the shut-off valve.

SharkBite fittings, etc.



Screw the flange onto the pipe, tightening all. Make sure that the shut-off valve handle will clear the pump.



Reattach the pump and bolt on the bottom flange. Screw the fitting shown above (with the Teflon tape on it), onto the flange.



Make sure the pipe is cut absolutely square and insert the sleeve, if using SharkBite fittings. ProBite fittings do not use this sleeve.



Pump and shut-off valve installed. New models come pre-wired.
D. It is also a good idea to but TWO shut-off valves on the return lines. This helps bleed the system of air and is a big help when troubleshooting.

See the picture below. Note that two different types of shutoff valves are used; a regular faucet valve and a 90-degree shut-off valve.



Adding two shut-off valves (a shut-off valve and faucet drain) on the return lines is done so that if there is a potential problem with a stopped-up heat exchanger or bad pump, it can be diagnosed easily by the owner, without the need for a service call.

See **TESTING** for more information. Pg. 51

Adding two shut-off valves with our installation kit is easy!

All of the parts shown below are included PLUS you get a shut-off valve for your pump and SharkBite™ style Pex fittings.

Screw the fittings on tightly, in the order shown.



1. Remove the existing cap on one of the return/drain ports on the bottom - left or right (if there is one) with a pipe wrench. Leave the elbow in place (not shown here)



2. Put Teflon tape on a small pipe (with pipe thread fittings) as shown. Make sure you wrap the tape the correct way, as shown. Wrap the opposite way from the way it screws on.



3. Screw the shut-off valve onto that pipe.



4. Screw another pipe (wrapped with Teflon tape too) onto the shut-off valve, followed by the 'T' and the Pex fitting. Be sure to orient the 'T' and shut-off valve so that the shut-off valve handle clears the drain. You can also turn the shut-off valve on the opposite way (direction) because the valve works either way.



5. Here is the finished result. Now connect the Pex pipe.



5. Be sure to use the plastic insert if using genuine SharkBite™ fittings. The Pex pipe MUST be cut square! ProBite™ fittings do not use this insert.



6. Sharkbite™ fitting below. Simply push the pipe all the way in until it seats.



6. The Pex pipe is shown attached here.



Installation pictures shown of the wiring on Legacy (original) models OR if you have to replace a pump and add a pigtail (plug)

All new models are nicely pre-wired for you!



Replacing Pump or Pigtail: Wiring

Remove cover

Insert wires through grommet; leaving it loose for now.



Strip wires 1/4"

Connect Black to the L (live) terminal (bottom) of the pump

White to common (center) of the pump

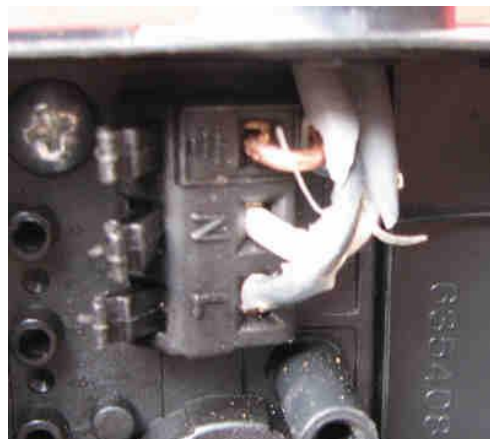
Ground (bare copper) wire, goes to the top ground terminal, as shown below.

Tighten grommet at the top, finger tight.

Reinstall cover.

TACO Brand Pumps

Taco pumps have a cover that you remove. Inside you will find two wires. The white is the neutral wire in the black is hot, as normal. Be sure to attach the ground wires to the green ground screw.



Wiring a replacement fan/blower

Remove fan from the flange by removing the three bolts and three nuts and the gasket. Be careful not to loose the gasket.



Be sure to use a clamp (shown below) to prevent fraying of the wires. I also used a piece of wire insulation to protect the two single wires running to the solenoid.



Use wire nuts to tie both wires together (power and common) - all three wires together (shown here) if using a solenoid activated damper.

Tighten the nut and screws on the wire clamp.



Push the wire nuts down (shown above) so that you can put on the cover. Be sure to ground the fan as shown (copper wire to screw in box).



The solenoid is shown activated above, with the door all of the way open.

Run the wire from the fan connections to the solenoid in parallel, so that when the fan comes on, the solenoid is activated.

Use the type of fully insulated terminals shown below.



The solenoid activated damper was started by customers 2-3 years ago, making home-made ones for their furnace. They reported back to us about how well they worked and how much wood they saved and asked us to offer it as an option - which we happily did.

Bolt the fan back on, using the three bolts and three nuts and the gasket.

Completed installation shown below.



Be sure to use fully insulated wire terminals shown on the previous page (NOT the ones shown here).

Installing the Heat Exchanger in the Plenum or Ductwork

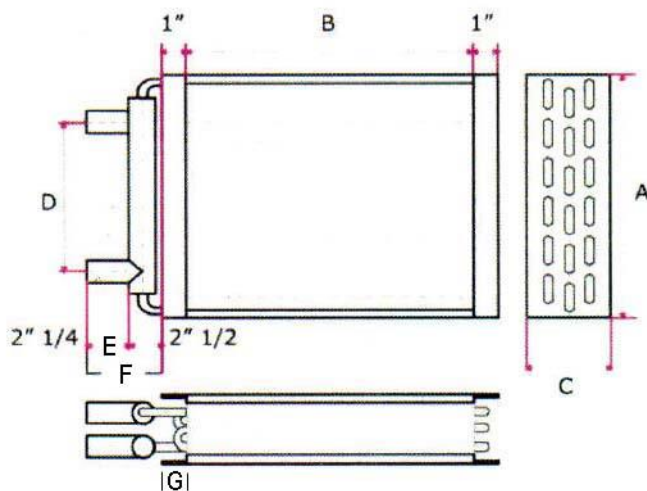
If you have Air Conditioning, the heat exchanger must be installed between the furnace and the evaporator coil. Failure to do so *may* result in freezing of the heat exchanger. If you can't place the heat exchanger between the furnace and the evaporator coil, you must drain the heat exchanger before using the A/C every summer.

The heat exchanger must be installed so that it is airtight. No air must be able to flow around it or out of the ductwork. Use adhesive backed foam tape (used for insulating doors and windows) around the water coil. Use foil tape to seal off the heat exchanger and the hole(s) you make.

Make sure the fittings are easy to get to once it's installed. Remember, there should be no splices in any water lines!

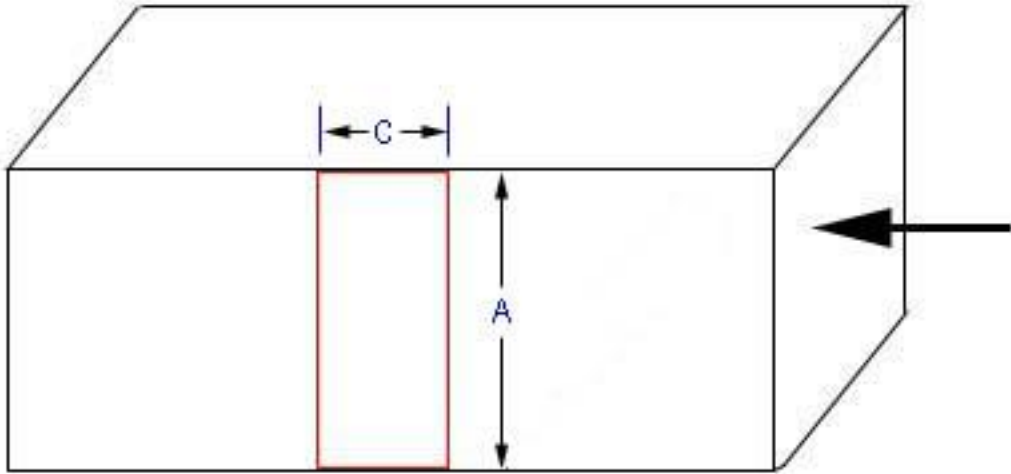
You should be able to find a heat exchanger to fit most popular sizes of plenums. If you can't find one, then you must have your ductwork modified to accept the heat exchanger. This is best left to a professional unless your ductwork is made up of fiber board. In all cases **wear protective gear, gloves and glasses and a mask.**

Measure the width of the heat exchanger (Dimension A in next diagram). Measure the thickness of the heat exchanger (Dimension C).



Start by cutting a hole in the side of your ductwork ON BOTH SIDES is best; the thickness of the heat exchanger (Dimension C) and the height (Dimension A). This allows the heat exchanger to slide all the way through, so that supports are not necessary and you have more of the core inside the plenum, with air-flow over it!

WARNING! Metal edges are very sharp! Wear protective gloves and use caution!



Cross section of plenum showing air blowing in it from right

Cut hole where red lines are

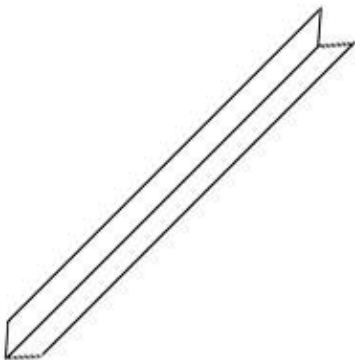
Slide the heat exchanger into the whole for a test fit. Ideally the tubes (D and E) should stick out of the plenum. The header and tubes (F) can stick out of the plenum as well, if necessary. **Having the heat exchanger supported by both sides of the plenum, is best. Cut a whole in BOTH sides, if possible.**

As long as the whole coil surface (B) is in the plenum, you should be good even if a little more of the header (F and even G) sticks out.

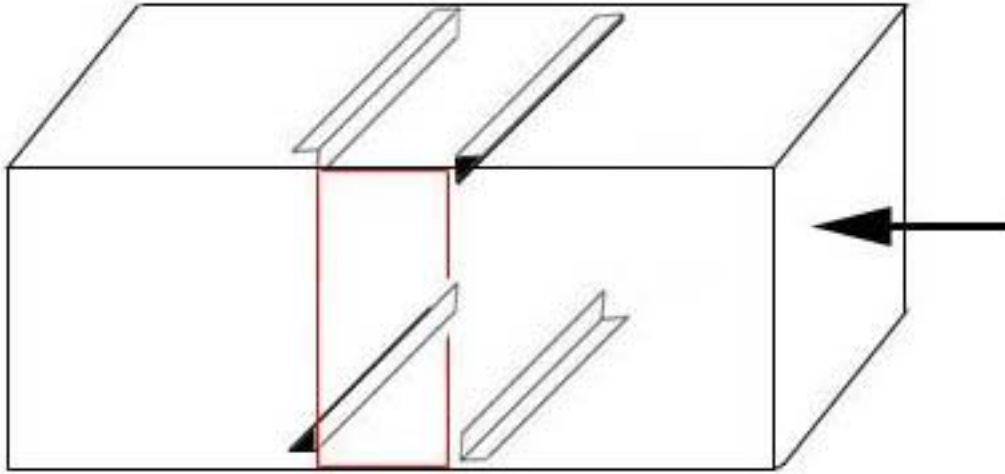
While test fitting it, try to determine how much tape is needed around it. A different amount (thickness) may be needed on different sides. You can purchase different thicknesses of tape so that it will fit and seal properly.

Place foam tape around the outside of the heat exchanger to seal it off so that it fits tight and air can't blow by it.

The heat exchanger needs to be installed so it won't move around, **if you aren't cutting holes in both sides - THE BEST WAY**. The easiest way is to fabricate some pieces of metal into an 'L' shape, approx. the length of the heat exchanger like shown below.



This is what the braces will look like. Very simple.



Install the braces as shown above. Simply put them in place, the proper width apart (Dimension C). Drill through the duct work and your newly made 'L' pieces and pop rivet or screw them into place. You will need four pieces, two each on the top and bottom.

Slide the heat exchanger carefully into the plenum to check the fit again. If all looks good you can seal off the ends of the heat exchanger and the hole you made in the plenum with foil tape made for ductwork.

Bleeding a Heat Exchanger

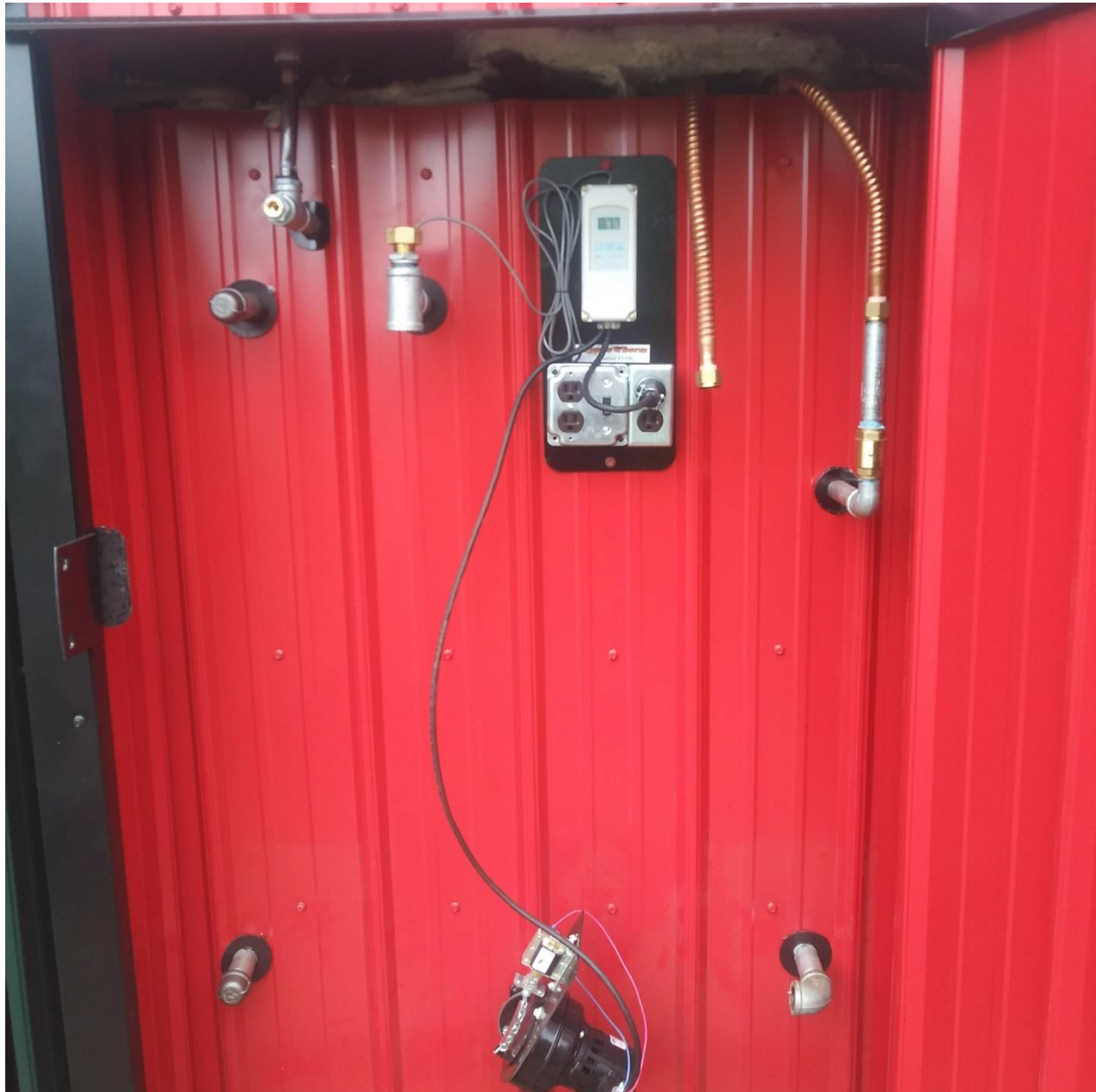
With the pump running (turn the thermostat up to 90 F so that the pump comes on), simply close the brass shut-off valve (yellow handle) on the return line quickly, holding it for 3-4 seconds. Then open the valve. Repeat the procedure 4 times.

If you're unsure if all the air is getting out, you can attach a hose to the faucet style valve and insert it in a 5-gallon bucket. Open the valve. Then simply close the plastic valve on the return line quickly, holding it for 3-4 seconds. Then open the valve. Repeat the procedure 4 times. That way you can see if bubbles are coming out of the line.

Air Flow through Plenum

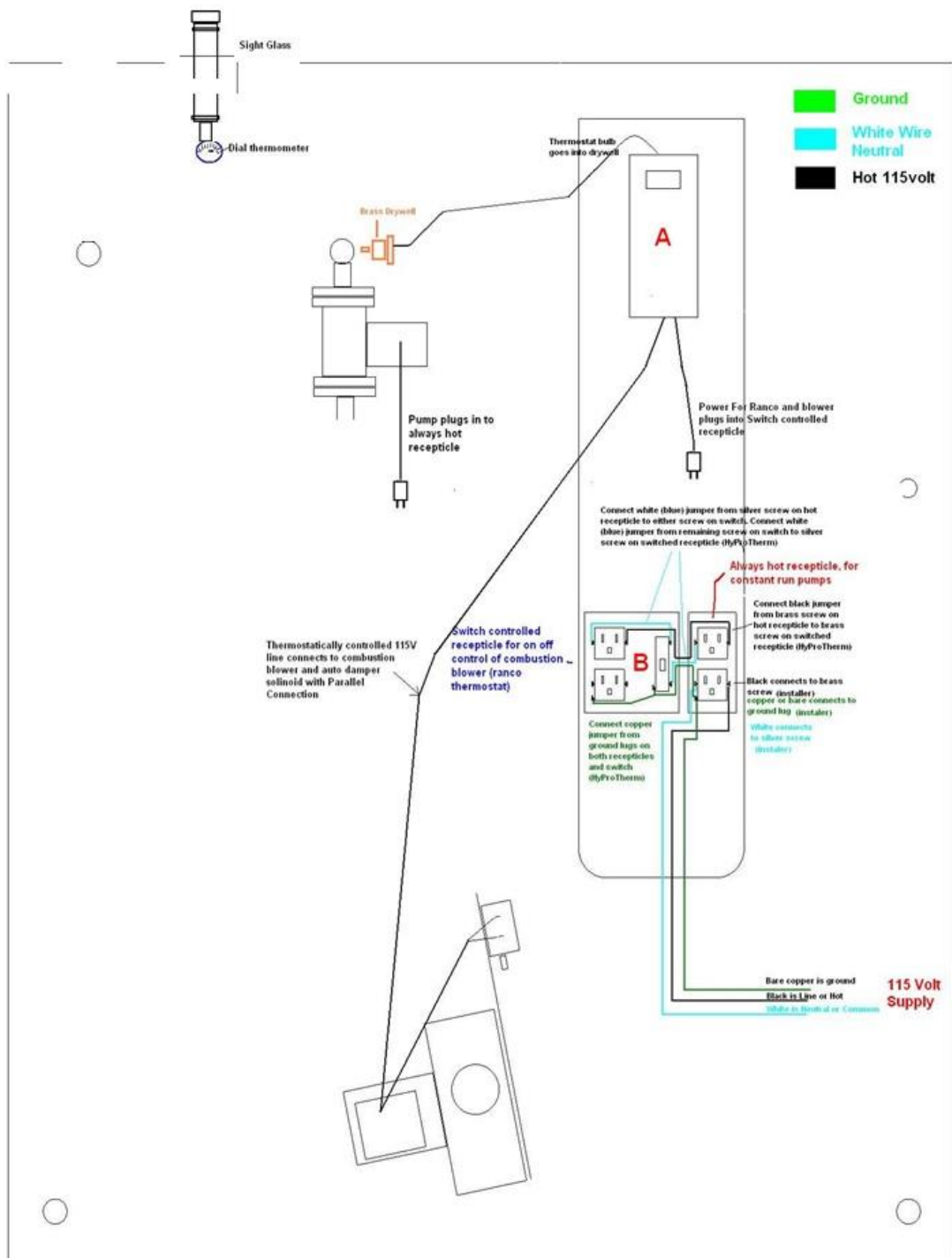
If you need more airflow, the pulleys can usually be changed on the fan or/and motor to give a higher fan speed. Or if is a multi speed fan, the wiring can be changed/moved. Please consult a specialist about this.

Connection of Power to Furnace (ALL NEW MODELS ARE NICELY PRE-WIRED)



Simply run your 3 wires to the box with the two outlets on the right.

The switch in the left box is for turning off the power to the outlets on the far left. That way, when you are loading the boiler, the thermostat, and therefore the fan can be turned off BUT REMEMBER TO TURN IT BACK ON! (Leaving the rear door open will help you remember)



Hooking up the Water Heater

With an electric hot water heater, we recommend that you drain the water and unscrew the pop-up valve (it could be on the side or on the top) and replace it with a 'T' fitting (using Teflon or plumbers tape). See the photos on the next page. Screw the pop-up valve back on one side of the T and mount the circulating pump on the other side of the T. Attach the Pex pipe to the pump with a SharkBite or ProBite 3/4" fitting (outgoing cool water).

Remove the drain and do the same, putting in a T with the drain screwing back in on one side and the Pex Pipe connector (incoming heated water) on the other.

PREFERABLY use the existing Water Heater Thermostat!

TURN POWER OFF and then remove existing wires on thermostat and move them out of the way. Connect power wire to one terminal and use another wire to the 2nd terminal to power up the pump. Reverse procedure the next year when using your H/W heater again.

OR if you want to add another thermostat:

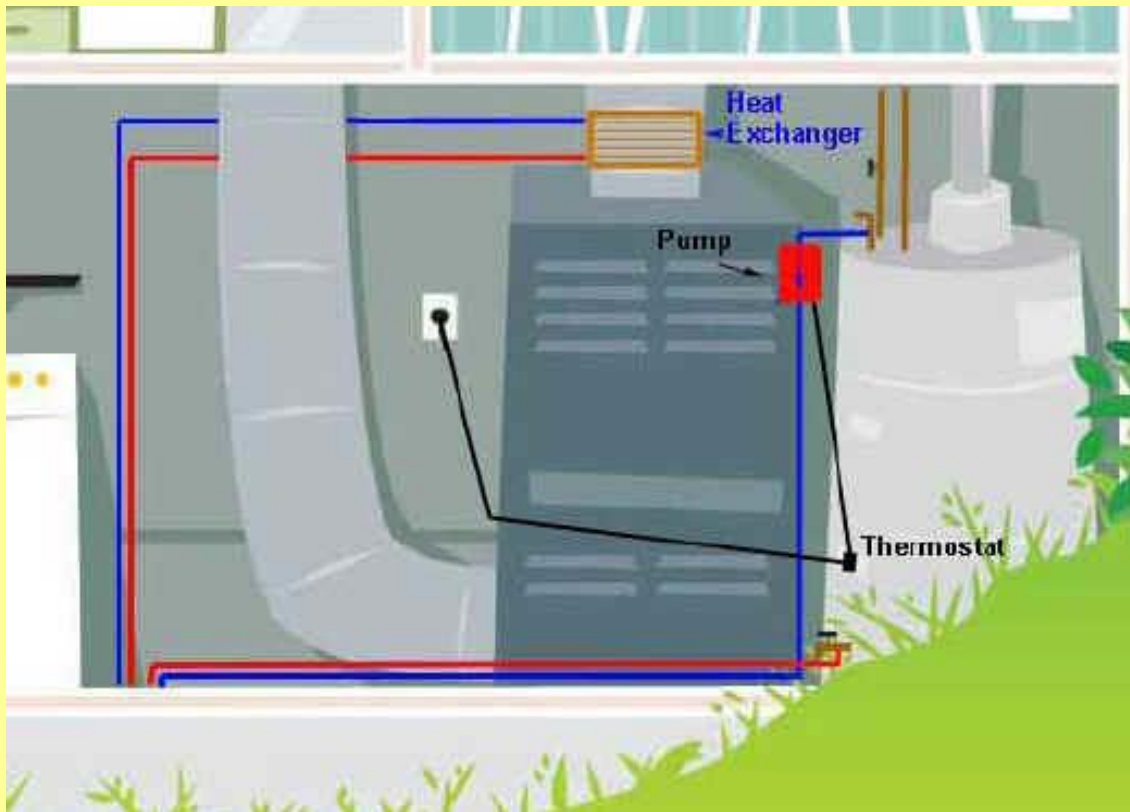
Remove the lower access plate on the hot water heater Or cut a hole if there is not one (as with a gas hot water heater). Mount a surface-mount hot water heater thermostat on the tank with silicone around the outside edge **ONLY**, to hold it in place - above, below or beside the existing thermostat, at the bottom element.

Temporarily hold the thermostat in place with strong tape, first and while the silicone is drying (24 hrs). A tube is about \$8 or less at your local hardware store. Smear the bottom of the thermostat with dielectric grease (available at auto parts stores) before installing it. This facilitates better heat transfer to the thermostat.

Wire it so that 110V is on one terminal and the pump on the other, just like a light switch. Common and ground wires go to the pump.

Alternatively, you can use the existing thermostat by totally remove the existing wires **AFTER TURNING OFF THE CIRCUIT BREAKER** and use wire nuts to protect them and you. Wire the thermostat up as shown but remember that you will have to move the wires back and forth every year. Remember to mark the wires so that you remember where they go!

You just saved \$200 for a side-arm heat exchanger **PLUS** you would have to buy a tempering valve or anti-scald valve! You can still use the heater as normal in the summer and it also serves as a backup in the winter, *automatically*. Just turn your thermostat down lower, than the one you just installed. **OR** if you don't want a backup, turn your Hot Water heater circuit breaker off during the winter. Turn the breaker back on in the summer and remember to turn up thermostat for normal use.

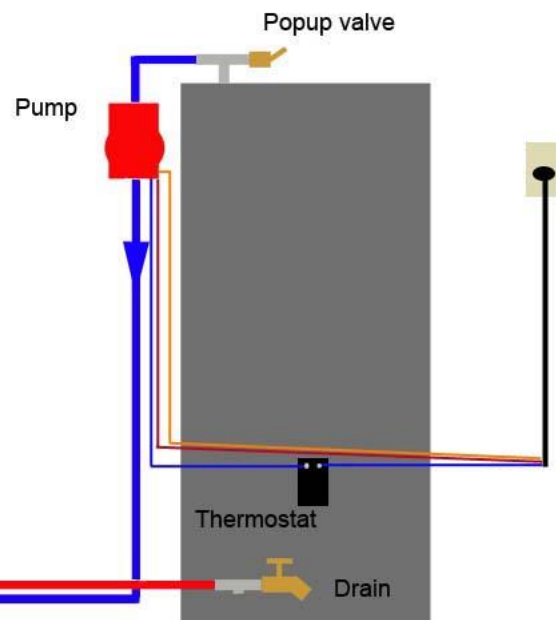


NOTE: The Hot Water coil is submerged in the big tank of water in the outdoor furnace.

Alternatively, you can run the incoming (hot) Pex pipe to a brazed plate heat exchanger for your hot water heater – *before* running to your heat exchanger for your furnace. It is usually about \$175. In this case, you would only need 3 Pex lines running to your house, which may save a little, if the furnace is going to be a long distance away. The downside is that your pump on the furnace would have to run continuously (24/7), instead of cycling on and off as needed. They don't use a lot of electricity (about 100 watts) but it is increased wear and tear. Eliminating the built-in water coil reduces the cost of the furnace by \$100. Our system is a LOT better because you have accurate temperature control. You don't end up with scalding water as is possible with the external plate HE or side-arm.

Gas Hot Water Heater

For a gas heater, there is usually a plate than can be removed to gain access to the tank itself (or cut an access hole). Simply mount the thermostat on the tank and follow the other instructions for water hookup above.





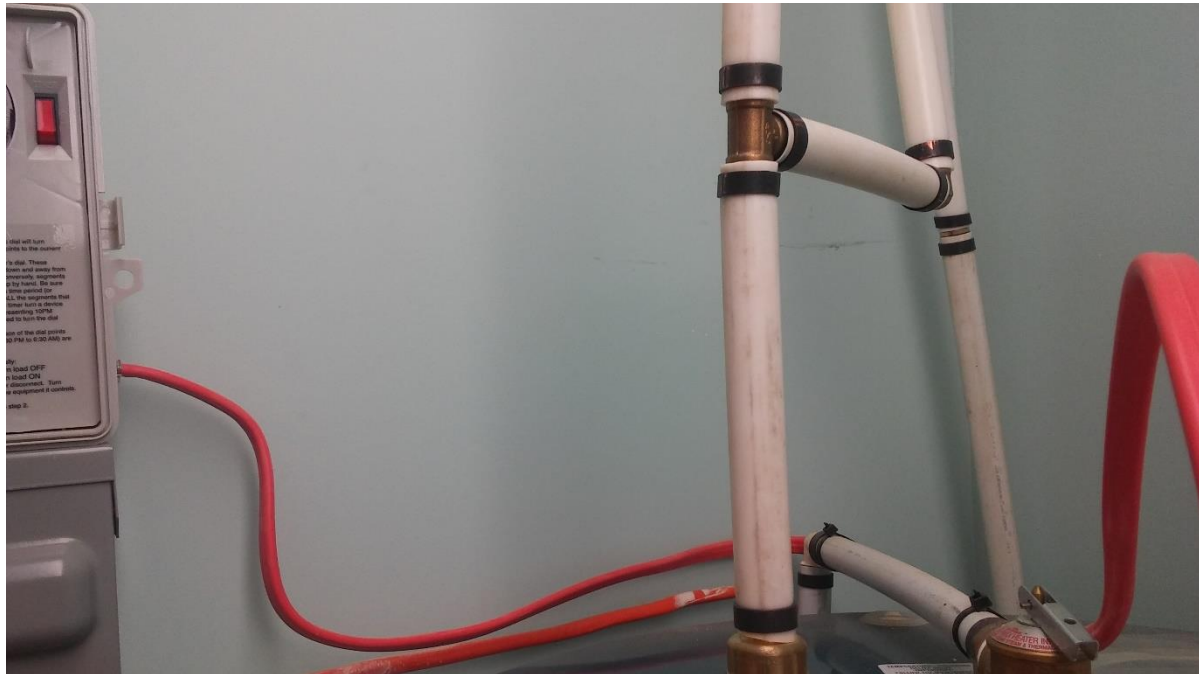
Customer supplied photograph: *Make sure using a single unprotected wire is safe and to code in your area.*



When you shut down the furnace for the season, simply disconnect the wiring to the hot water heater thermostat and reconnect the heating elements or/and unplug the pump or turn off the circuit breaker to it. Your existing hot water heater will take over. Please remember to adjust your thermostat, if you had it turned down during the winter.



Connect return line from the outdoor boiler to the cold-water inlet on the hot water heater, as shown below.



Unscrew drain and screw 'T' into its place. Remount drain on one side and attach flange with pump on the other side.

Use TEFLON tape, as shown, on all threaded fittings.

TURN OFF POWER TO WATER HEATER!

Power wire (I used an extension cord as shown in the 2nd photo above) and it goes to thermostat (after disconnecting wires to the heating elements). (BLACK wires)

The other terminal on thermostat is wired to pump. (BLACK wires)

Neutral (white) and ground (green) wires connect to the pump.

Hooking up a Pool or Spa

A heat exchanger should be used to transfer heat from the outdoor wood furnace to the pool or spa. You don't want nice clean pool water circulating through the furnace.

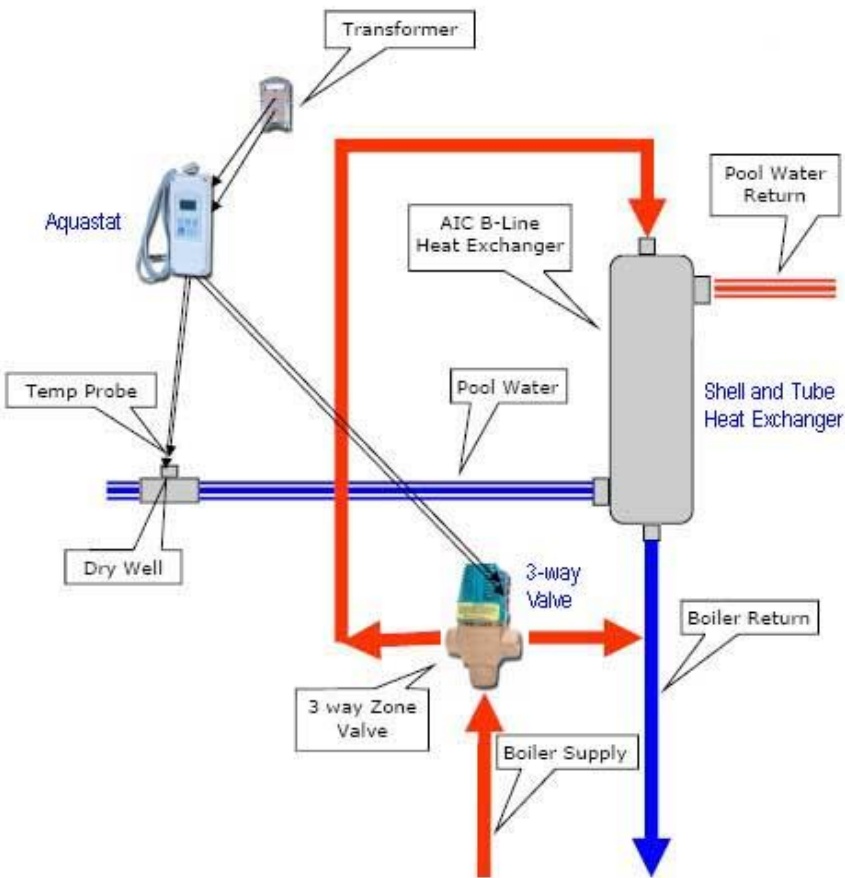
Never use a brazed plate heat exchanger for a pool as the chlorine will destroy it in short order.

ALWAYS use a Stainless Steel shell and tube heat exchanger for this purpose.

If the spa isn't too big and you are NEVER going to use the built-in domestic hot water heat exchanger to heat your hot water, then may be able to utilize that for your spa or hot tub. It is too small to heat a pool.

We have tried many different ways of hooking up pools with different systems, thermostats, etc where the pump goes off an on to control the water temperature. The main problem is that when no heat is being extracted out of the furnace, the water can boil. It is best to utilize a system whereby the pump runs all of the time so that the water can't just sit stagnant in the furnace, overheat and boil.

Instead of the thermostat controlling the fan, connect it so that it controls a 3-way valve. When the water needs to be heated up, the circulating water id routed to the heat exchanger. When the water reaches a preset temperature, the 3-way valve bypassed the heat exchanger and sends the water back to the outdoor furnace. This system works the best. A kit is available to make the installation super easy!



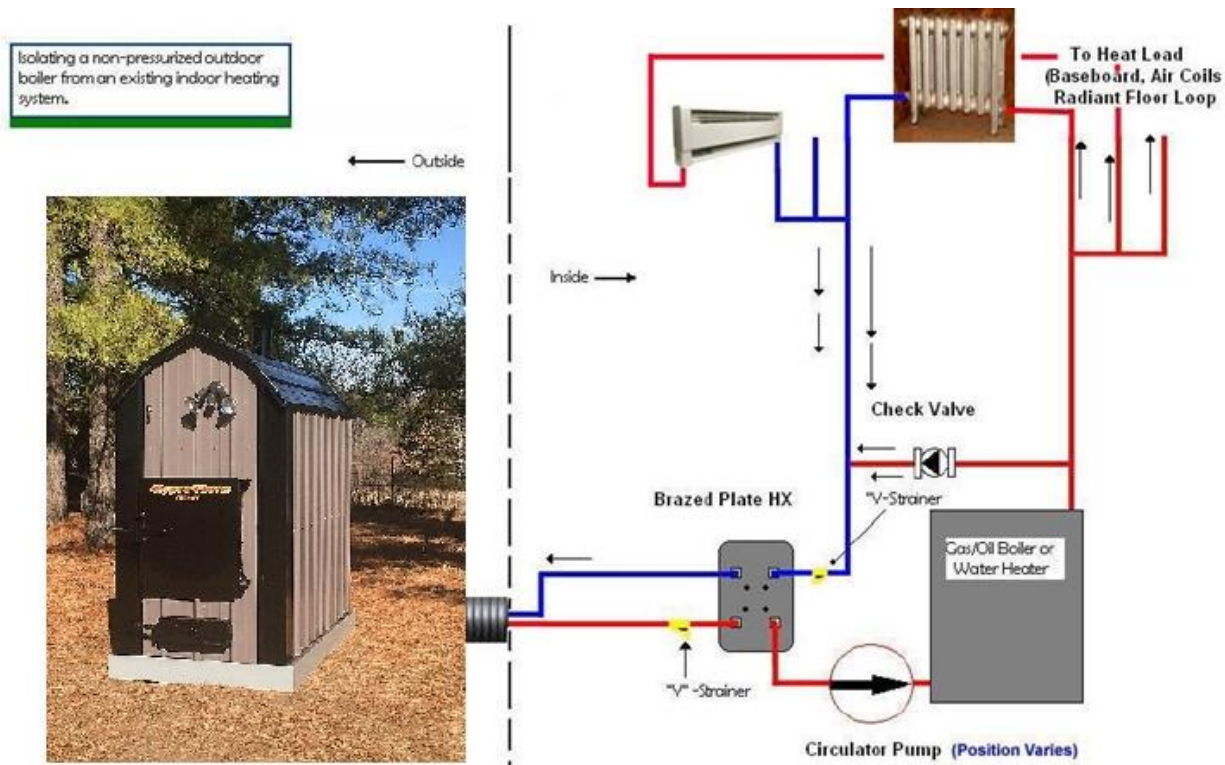
Pool / Spa Kit		
Part	SKU	Qty
	BRS01	1
	AQ002	1
	PR01	8
	PT01	1
	PMS01	3
	TR11024	1
	ZV103	1
	PM0101	2
	DW001	1
	B-Line	Not Included with Kit

Hooking up the Outdoor Furnace to an Existing Boiler

Again, we need to use a heat exchanger to transfer heat from the outdoor furnace to the boiler or hydronic system so that the two systems remain isolated from each other. The hookup is very similar to that shown below.

The 2 systems are totally isolated from each other so that the existing Hydronic system remains undisturbed and functions exactly as it did before. This is just an example. Your system *will* be different but it shows where the brazed plate heat exchanger ALWAYS goes. Always in the return line to your current boiler.

All pumps and controls remain essentially the same as you have them now but *remember to order a digital thermostat*, as explained on page 36.



Water that circulates through the outdoor furnace is never circulated through the home's Hydronic system – or visa versa.

When you stop using the outdoor furnace, the heat exchanger (brazed plate) will continue to heat the hot water in the line, and by convection, that water will circulate to the outdoor furnace. This will cause your existing boiler to come on, even if your house or domestic hot water system (if do equipped) is not calling for heat. The simple solution is to shut off both shut-off valves at the outdoor furnace. This will stop the water from circulating - saving you energy.

If your system does not have the circulator pump in the position above but has it between your boiler and radiators or baseboard heaters, etc., you may not have enough heat accumulated in the boiler to heat your domestic hot water, for those systems so equipped because your main pumps are not running enough to circulate the water through the heat exchanger.

You can either accept this or add a circulator as shown but it **MUST** include a return line as shown (the red line above the boiler). Some residual water (heat) may find itself flowing to your heating system, depending on how it is set up but hopefully you will have thermistor valves that open and close the circuits as needed.

Starting a Fire

Use small pieces of split kindling together with crumbled newspaper or cardboard, and add larger pieces. Kiln dried lumber (as shown) works great!! Remember: The smaller the better; the drier the better.

Using a blow torch is NOT recommended! It does not properly start a log on fire. Use kindling! Dry lumber (kiln dried 2x4's for example, are great!)





You have a great fire!!

If you have poor draft, make sure the chimney is not clogged!

Heat up the chimney by twisting some newspaper into a torch and hold it up into the stove until the draft is reversed.

Testing and recording water flow across each heat loop

This should be done when the furnace and heat exchanger are first installed so that you will know that the water flow is like in *your* system, for future reference.

IMPORTANT! Perform these Steps on a new furnace:

1. After the furnace has been filled and running, close the left (yellow handle) valve, at the return, so that water will not drain out.

Connect a garden hose or washing machine hose and put it in a 5-gallon bucket. Open the faucet style valve. Turn on the pump. If it runs on demand, you may have to turn on the furnace (raising the thermostat if necessary).

2. **Record the amount of time it takes to fill the 5-gallon bucket.** Ideal is 20 - 30 seconds or less. Write that figure down on the inside of the furnace with a permanent magic marker, near the valve for future reference. Turn off the valve.
3. Next, disconnect the Pex line at the pump output. Install a short piece of Pex Pipe or washing machine hose about 4-6 feet long and insert the pipe/hose into a bucket. Turn on the pump by turning on the furnace (raising the thermostat if necessary).
4. Record the amount of time it takes to fill the 5-gallon bucket. If it is 10 seconds, for example, write that figure down on the inside of the furnace, next to the pump for future reference. Turn the pump off.

These figures can be used to check for proper pump sizing AND for futures diagnostics (comparing current figures with future figures), if things should change (heat output diminishes) down the road.

(You may be able to use the circuit breaker to turn the pump off and on if you have already raised the thermostat high enough to make the pump come on.)

Maintenance

Clean out ash!! Moisture combined with ash will eat through a furnace in short order and is NOT covered under warranty. With our grate and ash pan, you can remove the ashes while the fire is still burning.

Creosote – Formation and Need for Removal:

When you burn pine and other soft woods, or the wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue (exposed to the outside air). As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire.

The chimney should be inspected at least twice a year during the heating season to determine when a creosote buildup has occurred. Sometimes, you need to check it weekly!

When creosote has accumulated it needs to be removed to reduce the risk of a chimney fire. **Your fire may not even burn if the chimney gets clogged up!** 5" chimney brushes are available on Amazon or search Google.com

Door Seals

Periodically, during the heating season, check the sealing of the silicone seal. The silicone seal withstands high heat and molds itself to the shape of the door, providing an excellent seal that won't deteriorate like a rope seal.

END OF SEASON:

- Power: Turn off power supply at the appropriate circuit breaker
- Chimney: Clean and inspect chimney! 5" chimney brushes are available on Amazon or search Google.com. Use the chimney cap to keep rain water out.
- Firebox & Ash trough: **Remove ashes**, soot, and hardened deposits from the fire chamber by using putty knife or wire brush. Coat inside of firebox with a light coat of motor oil to protect steel during the off-season.
- Doors: Oil door hinges and latch.
- Plumbing: Ensure fittings on both ends of tubing are tight AND at all locations.

DO NOT DRAIN WATER FROM FURNACE!

Moisture from rain or condensation must not be allowed to accumulate in the firebox or ash pan during the off-season. Failure to perform preventive maintenance may result in corrosion damaging the boiler resulting in possible severe property damage. This is NOT covered under warranty!

Replacing the hot water coil in the furnace

In areas where this a lot of lime or other minerals (hard water) it may be necessary to clean out or replace the hot water coil in the furnace. Thankfully, this is an easy job. On some other models it can take 2 hours or more to do this – if they even have a built-in coil!

Our new design cover is smaller, flat and easier to seal! It is not L-shaped now.



This allows you to fill the furnace to the very top of the water jacket, allowing the rust protection to reach the top plate of steel and to completely envelope the chimney (which also heats up the water!



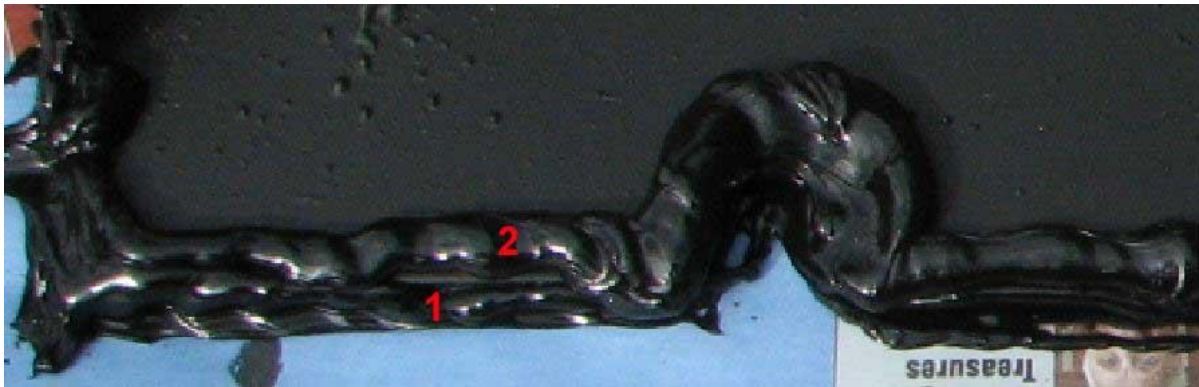
This cover **MUST** be sealed with silicone as shown below.

SEALING THE HOT WATER COIL COVER

Place the hot water coil cover on newspaper and run a bead of silicone all around the edge (1) and then run a thick bead on top, right near the edge (2)



Close-up view of how much silicone is on the edge (1), top (2) and around the holes cut for the piping. USE PLASTIC or LATEX GLOVES because this is VERY messy!



Once the lid is in place, press the silicone into the corners with your finger and around the copper pipes, for a very good seal. Use a mirror and flashlight to check your work!

This will stop steaming, resulting in water loss and damaged insulation.

Optional installation of Hot Water Coil



You can see the water coil now (A different opening and fittings with this old design).

Simply loosen and remove the compression fittings (now metal) and slide the coil out the top.

A 50 foot copper coil is readily available at most hardware and home improvement stores, already coiled up! Simply straighten the ends and reattach the Pex pipe.

Alternatively you could take the coil to a radiator shop to have it cleaned out. With current copper prices this may be cheaper!

Reinstall the steel plate (WELL SEALED with SILICONE as shown on previous pages) and pull the insulation back down.

Trouble-shooting poor water flow or little or no heat

1. Check to make sure that the furnace is full of water. Simply open the valve on the front until water flows out of the overflow tube.
2. Make sure you have a good fire!
3. Be sure that the chimney is not clogged up and the grates are clear! 5" chimney brushes are available on Amazon or search Google.com
4. A. Check to be sure the pump is running when the thermostat is raised.
B. Your inside furnace fan should come on at the same time.
C. See if air is blowing out of the vents.
5. Make sure that the water is hot. You can check this at the drain on the stove, or at the pump by removing the Pex Pipe and turning on the pump.
6. Watch the fan to see if it comes on when the water temperature drops in the furnace. You can test the fan by carefully connecting the two wires at the thermostat together **AFTER TURNING OFF THE POWER!**

If the fan comes on when you connect the two wires but won't come on by itself when the water temperature drops, you need to replace the thermostat. These are standard COMMERCIAL hot water heater thermostats available for about \$10-15 at any good hardware store. You can substitute a residential thermostat (goes up to 150F) in most cases or as a temporary measure

7. Close the left (yellow handle) valve so that water won't drain out. Open the faucet style valve.
8. If water flows out freely, then you know that there isn't a blockage there. Close the valve.
9. Connect a hose and put it in a 5-gallon bucket. Open the valve. Turn on the pump. If it runs on demand, you may have to turn on the furnace (raising the thermostat if necessary).
10. Record the amount of time it takes to fill the 5-gallon bucket. Turn off the faucet type valve. Compare that figure to the one you wrote down on the inside of the furnace, near the valve, when it was installed (Page 47). If the figures are the same or very close to it, you can assume that the pump is working properly and that there aren't any blockages. However, you may have a heat exchanger with a coating of minerals on it such as lime. This will need to be cleaned as it will inhibit heat transfer.. (See heat exchanger cleaning procedure at end of this section)

11. If the figures are lower than original proceed to 12 to find out why the flow is so low.
12. Remove the pump and open the valve above it. If water flows freely, you know that there is no blockage there. If good, proceed with next step.
13. Next, disconnect the Pex line at the pump output. Install a short piece of hose or Pex pipe, about 4-6 feet long and insert the pipe into a bucket. Turn on the pump by turning on the furnace (raising the thermostat if necessary).
14. Record the amount of time it takes to fill the 5-gallon bucket. Turn the pump off. Ideal is 20 seconds or less BUT compare that figure to the one you wrote down on the inside of the furnace, near the valve, when it was installed. If the figures are the same or lower, there is likely a problem with the pump.
15. At this point you should have been able to determine if the flow rate is good at all points and where the problem might be or if there is a blockage.
16. If you have a fire and the water is hot and circulating without restriction and the furnace fan is on, you should have heat! In some case air might be trapped in the heat exchanger and so the bleeding procedure below may need to be performed.

NOTE: It is rare since we use a powerful forced-air induction fan but if you have poor draft or a downdraft, heat up the chimney by twisting some newspaper into a torch and hold it up into the stove until the draft is reversed. A chimney cap also helps in this regard.

If it is difficult to start the fire (RARE) the reasons could be:

Not enough air: Make sure that fan is on or open the ash pan door (approx. 1 cm gap).

CLOGGED Chimney or Grates! Be sure the chimney is not clogged with creosote! 5" chimney brushes are available on Amazon (5" Round Poly Chimney Brush by **WoodEze**) or search Google.com

Bad or no kindling: Use small pieces of split kindling together with cardboard and add larger pieces. Remember: The smaller the better, the dryer the better.

[Dry lumber \(kiln dried 2x4's for example, are great! Cut them up for cheap firestarters\)](#)

Down draft or cold chimney (rare): Heat up the chimney by twisting some newspaper into a torch and hold it up into the stove until the draft is reversed.

Heat Exchanger Cleaning Procedure

If you use the proper chemical additives from **Wood Boiler Solutions LLC** you should never have to clean your heat exchanger. This is a wise idea and keeps your warranty valid.

A specialist experienced in chemical cleaning should perform this procedure.

The easy way out – if you didn't use the proper chemicals for protection:

(1) Remove Heat Exchanger, takes about 10 minutes. (2) Drop off at local radiator shop. (3) Pick up serviced and repainted heat exchanger, cost \$20. (4) Re-Install unit, another 10 - 15 minutes. (5) Job done, have a glass of wine..... What could be easier?

CLR works fine to clean exchangers. Even the label suggests cleaning heating coils, coffee makers, etc.

Some people recommend using Phosphoric acid or Ph-Oshop-Ric. Muriatic acid causes hydrogen embrittlement of metals over time, which Phosphoric acid (mostly) avoids.

Muriatic acid is a MAJOR hazard if it spills - especially on you!

You can also try Marsolve (203-834-8278) or <http://www.marsolve.com/marsdis.htm>

Also recommended and much safer, is Safe-React Formula E is designed as a direct replacement for Muriatic acid. It is effective for pH adjustment, industrial descaling, cleaning heat exchangers and many other jobs that normally require hazardous acids. Safe-React Formula E is a concentrated formula, to be used the same way Muriatic acid is normally used. http://www.safe-react.com/formula_e.htm

Fill a 5-gallon bucket with Safe-React or CLR per the instructions for dilution - or riskier - a 10-12% solution of Hydrochloric acid (sometimes called Muriatic Acid) or Phosphoric acid to water. It can be purchased at your local swimming pool supply store. MURIATIC ACID is a liquid cleaner that dissolves rust, lime and other minerals on hard surfaces.

See http://www.athea.com/label_PDFs/140muriaticlabel.pdf

Place both the supply lines and return lines in bucket with a submersible pump on the supply side. You may have to run the pump for three to eight hours. You should be able to see the process working as water flows into the bucket.

Sometimes reversing the flow can free up deposits encrusted in the heat exchanger in stubborn cases.

Disclaimer

All installation and operation must follow Federal, Provincial, State and local codes.
Do Not consider outdoor wood furnaces for built up urban areas.
Do Not Operate under Pressure.

All electrical and plumbing should be done by qualified personnel and conform to national and local building, electrical and plumbing codes.

Manufacturer is not liable for damages to personnel or property for misuse, improper installation of equipment or for knowing local installation codes. Owner assumes all responsibility for this.

Hyprotherm Home & Commercial Wood and Coal Furnace Warranty

20 Year Limited Warranty

Hyprotherm, LLC of Salem Arkansas, 72576, herein known as Hyprotherm, warrants material and labor on any defects in workmanship on the fire box for a period of 20 years from the purchase date to the original owner only (see proration below) and on the water jacket for a period of 10 years from the purchase date to the original owner only (see proration below). If there is a leak in your properly delivered, installed and maintained commercial boiler, we will cover repair costs for the first 5 years and prorated after that (see below). Repair can be denied if the unit's water jacket has exceeded 220 degrees. The thermostat must be set so the water jacket temperature never falls below 150F otherwise condensation will be created on the inside of the firebox and will cause corrosion that is not covered under warranty.

This warranty is limited to defective parts and excludes any incidental and consequential damages connected therewith. Hyprotherm does not warranty damage or malfunction to any interior portion of the boiler caused by ash corrosion or allowing the unit to overheat. All interior portions (especially corners) must have the ash stirred daily to prevent caking and be completely cleaned out of all ashes and creosote a minimum of 2 times per year, half way through the heating season and at the end of heating season. The chimney must be covered or have a rain cap when the boiler is not in use. Caulk around chimney and potable lid must be inspected frequently and re-sealed if necessary. Caulk sealant and rope gaskets are not covered under this warranty. Damage caused by abuse, neglect, accidents, improper installation, customer or dealer modification, overheating and/or freezing will not be covered under warranty. Damage caused by burning flammable materials (i.e. petroleum products), wet (green) wood or anything other than dry coal or dry, seasoned cordwood will not be covered under warranty. Hyprotherm does not warranty boilers against environmental conditions out of its control. Hyprotherm does not warranty or guarantee against your area's governing laws or changes in your area's governing laws that will affect the use or non-use of the unit.

Hyprotherm is not responsible for replacement of water, water treatment, antifreeze and glycol, costs of transportation or shipping charges. On sight non-warranty parts and labor will be provided at the discretion of your dealer. Please contact your dealer for their current non-warranty rates. Labor is not covered for repairing or replacing electrical or other components not a part of the welded assembly that is under warranty.

Hyprotherm home and commercial coal and wood furnaces are not meant to be your sole source of heat. It is the responsibility of the owner to have a backup system in place. If you do not have a backup source of heat you are at risk of damage due to lack of heat. Hyprotherm will not warranty or be responsible for any damage caused by lack of heat at your premises or for any cost incurred from using a backup heat system in the event of a boiler failure.

There is no written or implied performance warranty on the boiler as Hyprotherm has no control over the installation, structure insulation, maintenance, daily operation and heating demand on a unit or what is burned in the boiler. Hyprotherm will not cover or be held responsible for any cost of wood or coal burned in excess of what is expected or considered normal as installation, fuel being used, structure size and insulation conditions are out of its control.

Treatment & Testing

Your furnace must have an approved by Hyprotherm “water treatment” added during initial filling with water, antifreeze or glycol and a water sample must be submitted for nitrite testing when first filled and then annually at the end of a heating season to ensure proper nitrite concentration (1,000-1,500ppm) for your warranty to remain valid. The water jacket must remain full of properly treated water at all times after installation save for draining, flushing and re-treating. Minimum recommended initial mix ratios are dependent upon the size commercial boiler and the different properties of the water to be used in filling it. An official approved nitrite test must still be performed after treating by sending in a sample. Water in all areas is different and initial treatment may not be sufficient. Contact **image supply, inc.** to obtain water treatment kit. You must have your water tested for nitrite levels, conductivity and pH acidity by **image supply, inc.** Always request results to be sent to you and you must keep them on file to show proof of treatment and testing if warranty work is ever needed. Testing done by anyone other than **image supply, inc.** will not be accepted for warranty claims. Monitoring treatment levels by **image supply, inc.** has **proven to increase the life of the furnace/boiler if their treatment program is followed.** Water levels must be monitored to get the maximum life out of a Hyprotherm home and commercial coal and wood furnace particularly if water is being added throughout a heating season (this is a result of improper operation or installation). Treatment and nitrite test kits are available from **image supply, inc.** Drain, flush, re-fill and re-treat if water is ever not crystal clear.

image supply, inc. Is the only recognized and approved Water Testing Facility and distributor of Water Treatment Chemicals for Hyprotherm Hydronic Furnaces. Please contact them for directions on how to proceed with your water tests. Their contact info is below: **(910) 738-**

1166 Office (800) 672-8251

**5081 Dawn Dr, Lumberton
Carolina 28360**

North

Hyprotherm Warranty Pro-ration:

Hyprotherm will pay costs of warranty work based on the following pro-ration:

Fire Box: Years 1 – 5: 100%, Year 6 – 90%, Year 7 – 80%, Year 8 – 70%, Year 9 – 60%, Year 10 – 50%, Year 11 – 40%, Year's 12 – 14: 30%, Years 15-20: 20%

Water Jacket: Years 1 – 5: 100% Year 6 – 80%, Year 7- 60%, Year 8 – 40%, Year 9 – 20%, Year 10 – 10%

1 Year Warranty on Other Components

Hyprotherm warranties, to the original owner only, any component or part of the boiler that is defective during normal usage for a period of 1 year from customer's date of delivery. Shipping for returning defective parts is not included. Replacement/repaired parts are obtained from the dealer purchase was made through. Labor is not covered for repairing or replacing components that is under warranty. After one year, your dealer may charge you for any parts provided. **No warranty parts will be provided without first returning the defective part.**

Replacement/repaired parts carry a 90 day warranty or the fulfillment of the 1 year warranty period, whichever comes later. Pump failure due to water quality issues or not bleeding the air out from the bearings before startup are not covered under warranty. Proof of treatment and testing is required for pump warranty.

Warranty Procedure

All claims under this warranty must be made through Hyprotherm regardless of where it was purchased. If by inspection or photo observations Hyprotherm indicates that a warranty claim is justified and that all conditions of this warranty have been met, Hypro Therm will repair or replace the problem part according to the above proration. Proof of purchase, treatment and testing records and return of the defective part (if applicable) must be provided by the owner of the boiler before any warranty is given. All costs of removal, shipment to and from the dealer or Hyprotherm and losses during shipment and reinstallation and any other losses due to the stove being removed shall be covered by the owner of the boiler. Please contact Hyprotherm via email to proceed: office@hillbillytrailers.com

Hyprotherm Water Treatment Program New Furnace Purchase

MANDATORY INSTRUCTION SHEET

- Contents:**
1. **Instruction Sheet**
 2. **2, 4, 8 or 12 Gallons Control Water Treatment depending on kit and Furnace size**
 3. **5 Shipping Boxes**
 4. **5 Sample Bottles with lids**
 5. **Shipping Labels**

Program by image supply, inc. for Hyprotherm Mfg, LLC.

Getting Started

You are the Care Taker of your Furnace. It is YOUR responsibility to keep Chemicals at an acceptable range maintaining a Nitrite level of at least 1000ppm and a maximum of 4000ppm, a PH no less than 8 and Conductivity of less than 10 micromhos AT ALL TIMES to prevent loss of your Warranty coverage

Instructions

- 1 Flush your system with fresh water to remove any debris from shipping or storage. Adding a degreaser to aid the process is highly recommended. Debris that remains following a flush (ex. weld slag, etc.) will be a corrosion hotspot and must be removed. All interior water jacket surfaces must be uniformly smooth and clean of any and all “gunk” which will block the necessary interaction of the chemical with the direct metal surface. A dirty or irregular interior water jacket surface will promote failures.
- 2 Following complete flush and rinse of system in step #1 fill the system with clean water. Simple filtering of the water as it is filling is highly recommended. As you are filling your furnaces with water add **Control Water Treatment** per instructions in (3) below as it reaches about 1/3 full. When possible to run your circulator pump turn it on.
- 3 Add Control per chart below immediately with the system fill in step #2.

1 gallon: FLRH – 85, FLRH – 100, FLRH – 185, TL-633-WT6/6, TL-633-WTC6/6
TL-734-WT6/6

2 gallon: FLRH – 265, FLRH – 300 FLRH – 350, FLRH – 400, TL-433-WT12/12, TL-446-WT6/6, TL-454-WT6/6, TL-454-WTC6/6, TL-534-WT6/6, TL-534-WTC6/6, TL-553-WT6/6, TL-634-WTC6/6, TL-634-WT6/6 TL-744-WT6/6, TL-844-WT 6/6, TL-854-WT6/6 TL-1044-WT6/6, TL-1054-WT6/6

3 gallon: TL-454-WT12/12, TL-534-WT12/12, TL-553-WTC6/6, TL-553-WT 12/12, TL-553-WTC 12/12, TL-555-WT6/6, TL-555-WTC6/6, TL-556-WT6/6, TL-556-WTC6/6, TL-633-WT12/12 TL-633-WTC12/12, TL-634-WT12/12, TL-644-WT6/6, TL-644-WTC6/6, TL-1350WT6/6, TL-844-WTC 6/6, TL-854-WTC6/6, TL-934-WT6/6, TL-934-WTC6/6, TL-944-WT6/6, TL-944-WTC6/6, TL-955-WT6/6, TL-1044-WTC6/6, TL-1056-WT6/6, TL-433-WTC12/12, TL-446-WT10/10, TL-446-WTC6/6

4 gallon: TL-446-WTC10/10, TL-454-WTC12/12, TL-534-WTC12/12, TL-634-WTC12/12, TL-644-WT12/12, TL-644-WTC12/12, TL-1350-WTC6/6, TL-844-WT12/12, TL-854-WT12/12, TL-934-WT12/12 TL-1046-WTC6/6, TL-1054-WTC6/6 TL-1055-WTC6/6, TL-1256-WT6/6, TL-1456-WT6/6,

5 gallon: TL-555-WT12/12, TL-555-WTC12/12, TL-556-WT12/12, TL-1350-WT12/6 TL-844-WTC12/12, TL-854-WTC12/12, TL-934-WTC12/12, TL-944-WT12/12, TL-944-WTC12/12, TL-955-WTC6/6, TL-1044-WT12/12, TL-1054-WT12/12, TL-1056-WTC6/6, TL-1065-WTC6/6, TL-1256-WTC6/6

6 gallon: TL-556-WTC12/12, TL-1350-WTC12/6 TL-955-WT12/12, TL-1044-WTC12/12, TL-1054-WTC12/12, TL-1055-WT12/12, TL-1456-WTC6/6

7 gallon: TL-955-WTC12/12, TL-1046-WTC12/12, TL-1055-WTC12/12, TL-1056-WT12/12

8 gallon: TL-955-WTC14/12, TL-955-WT14/12, TL-1056-WTC12/12, TL-1256-WT12/12,

9 gallon: TL-1456-WT12/12

10 gallon: TL-1256-WTC12/12, TL-1456-WTC12/12

4 Take a **sample bottle** and fill it with treated water from your furnaces. Take the **sample bottle and shipping label** out and cut along the dotted line. Fill out the furnace information label completely and attach to the **sample bottle**.

5 Make a shipping box from the **flat cardboard shipping box** and insert the **sample bottle**. Attach the **Self Addressed shipping label** over the fold to seal the box.

6 Mail by your favorite source UPS, USPS or FedEx.

NOTE: THE AMOUNT OF TREATMENT NEEDED WILL BE DEPENDENT ON HOW MUCH WATER YOU NEED TO ADD TO YOUR SYSTEM DURING THE COURSE OF OPERATION. *FREQUENT AND EXCESSIVE WATER ADDITIONS require FREQUENT CHEMICAL ADDITIONS!! THE LEAST EVAPORATION THE BETTER, THIS CANNOT BE STRESSED ENOUGH!!!**

Keep system filled with treated water per above specifications always even in seasons when your stove is shut down and not being used for heating.

Retention of all records and copies of analysis reports is the sole responsibility of the stove owner alone.

For testing help or to reorder chemicals call your parts dealer or image supply, inc. at 800-672-8251

Please fill in the following information and mail this copy by mail to:

Hillbilly Manufacturing LLC, POB 156, Salem, AR 72576

Your name and address:

Phone number(s): _____

HyProTherm Model:

Date of Purchase:

Serial Number: (Only applicable only if financed)

Date of Installation and who installed (Proper self-installation, following the instructions. will not void the warranty):

Dealer Purchased from (if purchased from the factory, put Hillbilly Manufacturing LLC):

Dealer Address:

Dealer Phone Number: _____

Please keep this manual with all other important papers. The information in this manual is necessary for the installation, operation and proper use of this furnace. If you should ever have a problem or question please refer to this manual or have it available when you call your HyProTherm dealer or Hillbilly Manufacturing LLC