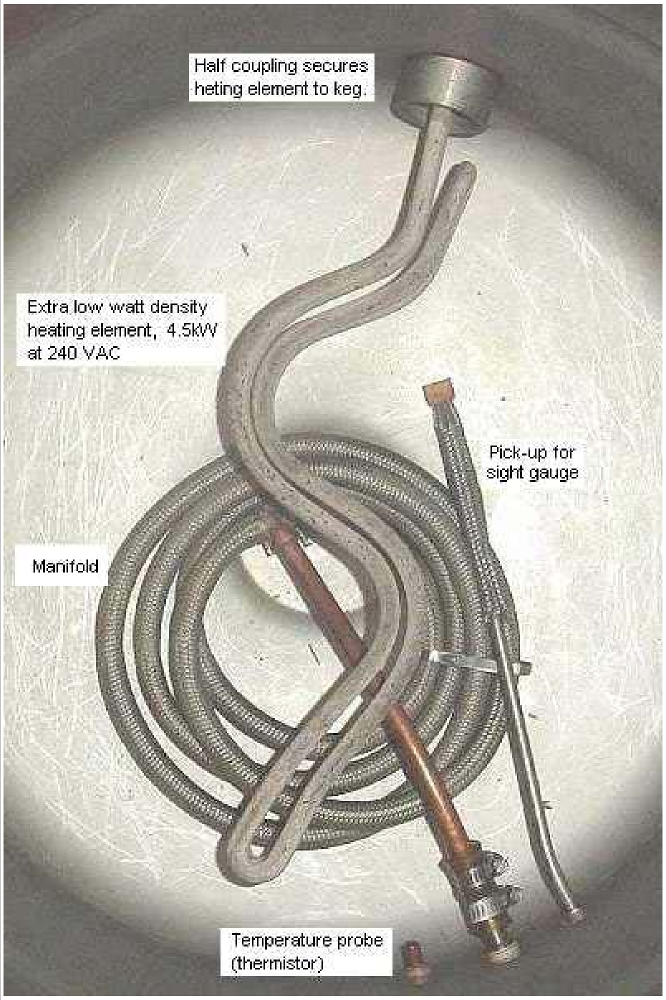
CD's New Electric Wort Boiler rev 6- updated 7/05

This is an electric wort boiler which uses a Sankey keg, a 4500 W @ 240V heating element, a power controller, an immersion chiller and a powered stirrer. Without insulation, 6.5 gals of wort can be raised from 158 degF to boil in 18 minutes and it'll raise 12 gals through that dT in 32 minutes.

Here's an overall photo and a photo of it's innards:

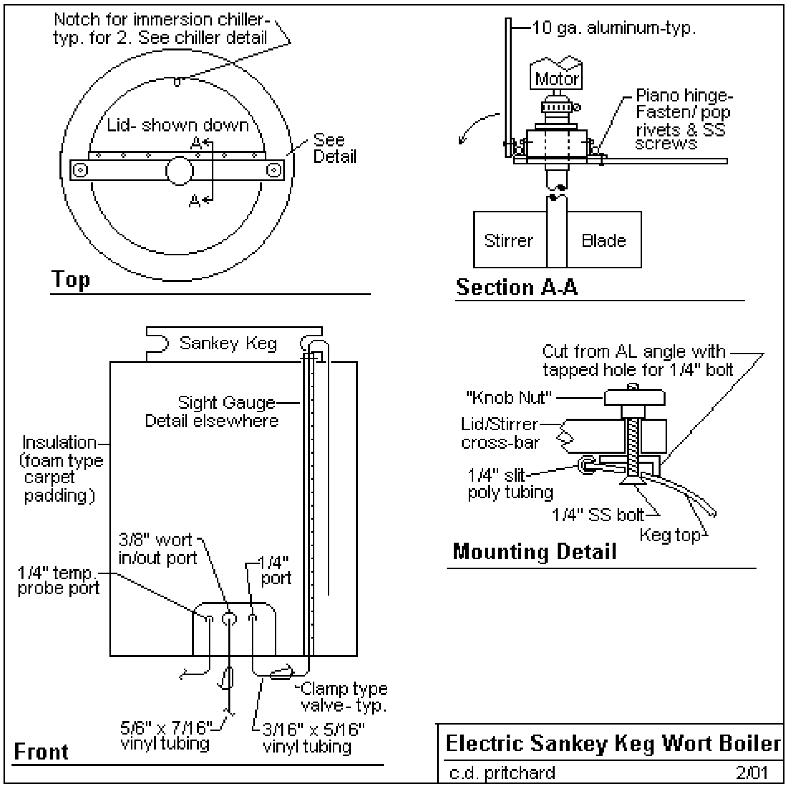
It sure ain't pretty!



Background

I started brewing on top of the kitchen stove but had to switch to outdoor brewing after a very nasty boilover soaked the insulation inside the stove. I also hated lugging propane cylinders to have them refilled and wanted to brew indoors or at least under a roof in a safe manner (more electrical advantages, and some disadvantages, are below). I then built my first electrically "fired" plastic pail boiler after studying Ken Schwartz's excellent web page. Basically, it was two 120 VAC heating elements inserted thru holes in the side of a plastic pail. It was fine as a first stab, but was a bit slow to reach boiling, so I built the boiler shown on this page. The primary downside to it is that a 240 VAC, 20 Amp. circuit is required. I installed a new circuit, but an existing electric dryer receptacle could be an alternative. What's great is the speed it reaches boiling and it's and fast big enough for 10 gal. batches.

Boiler Drawing



Cutting the Hole for the Lid: This seems to be a concern for many folks. I found it much easier than I'd anticipated after reading many HB Digest posts on the subject. After scribing then marking the cut line for the ~12" diameter opening and drilling a starter hole, the opening was cut using a variable speed saber saw with a rotatable blade holder and it's base removed and 32 tpi HSS blades. It took 3 or 4 blades- I broke a couple until I got the hang of cutting on the curved keg top. The cut was very good and required only a little touch-up and burr removal work with a file and then some sandpaper. My guess is that a "Sawsall" would work well.

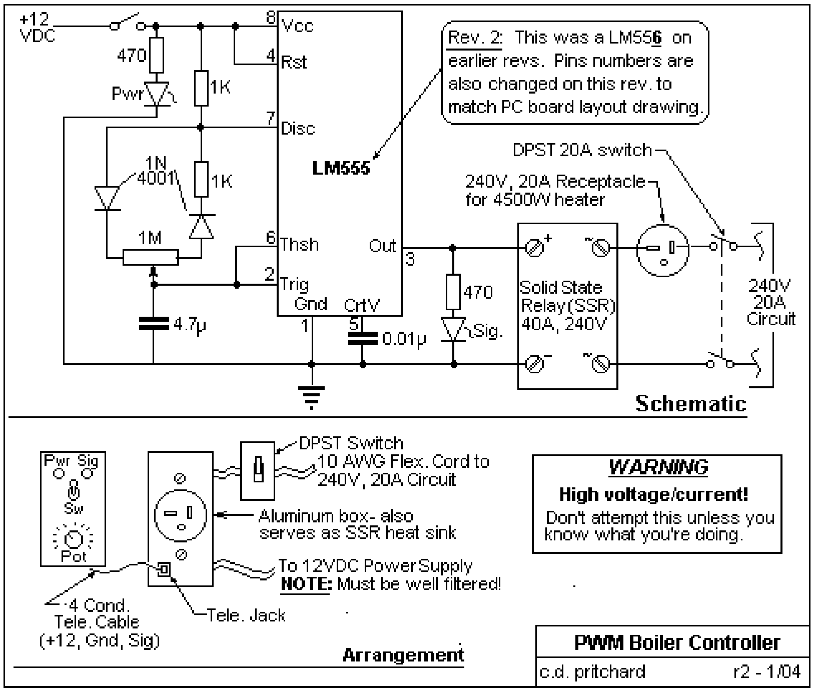
Insulation: The carpet padding works well and is much cheaper than foam sleeping bag pads or the aluminum faced bubble wrap I used on the old boiler. The relative disadvantage is that it'll adsorb spills. I used about three layers of pretty dense1/2" padding around the sides of the keg and as much as I could stuff under the bottom (layers close to the keg were cut like into donut shapes). One day I'll get around to encasing the exterior insulation an outer layer of aluminum faced bubble wrap to reduce the likelihood of spills getting to the foam.

The Controller

The heat input to the boiler is controlled with pulse-width-modulation (PWM). First a ...

> **! ! ! WARNING ! ! !**
>
> **DO NOT BUILD THIS IF YOU DON'T KNOW WHAT YOU ARE DOING!**
>
> Due to the high current at 240 VAC being controlled, this is definitely ***NOT*** a good first electrical project!

Here's the schematic and wiring arrangement:



(The schematic in the above drawing was revised on 1/05 to show a LM555 instead of a LM556 so that it agrees with the PC baord layout below)

The design isn't mine- except for a few part value changes (mainly a LM555 vs. 1/2 of a LM556), it's based entirely on Ron La Borde's controller.   *THANKS Ron!*   His web page has lots of toher very good info.

The controller uses PMW to control the amount of power to the heater.   Basically, twiddling with the potentiometer varies the power to the heating element by shutting off power for variable periods of time over about a fixed 1.5 second overall cycle period- this is also infrequently/incorrectly called "varying the duty cycle". The potentiometer sets the on time of the LM555 which is set up as a free running oscillator. When the output from the LM555 is high, the solid state relay (SSR) conducts thereby completing the 240 VAC circuit and powering the heater. It affords much finer control that the old kitchen range controller I used to use with a much lower wattage 120 VAC heater element in the old plastic pail boiler.

The box with the pot. for controlling the heat has 2 LEDs- a green one that indicates there's 12 VDC control power to the circuit and a red LED that lights when the controller is telling the SSR to turn on. The later gives a visual indication of the amount of power that's being feed to the boiler- i.e., the longer the red LED is on during the 1.5 second cycle period, the more the power being supplied to the heating element. The 1.5 second time period can be easily changed by using something other than a 4.7 uF capacitor (bigger cap. = longer cycle period).

It goes from about 10% to 100% power, so an "off" (*note the quotes!*) switch for the *control* power is included in the box. (A handy upgrade: Omit this switch and use instead a pot with built-in switch, e.g.: www.digikey.com- #CT2233-ND, ~$3.48). The switch does *NOT* actually disconnect the 240 VAC power! That's the function of the ***double pole*** "MAIN" disconnect switch in the 240 VAC power upstream of the receptacle. ***DO NOT WORK ON THE HEATER OR CIRCUIT WITHOUT TURNING THE 240 VAC DISCONNECT!***   I always pull the plug to further ensure safety.

One may be thinking at this point that the switch can be ommitted 240 VAC and the attachment plug can be used instead as the disconnect. That's technically true, but I don't recommend it! Although pretty rare, SSR's can fail "on" due to a failure of the controller that's driving their low voltage side, voltage surges on the 240 VAC supply or inadequate cooling. If it fails "on", a switch is much safer to use to kill the power than pulling an attachment plug which is carrying a lot of current- perhaps a lot more than normal current if something has shorted! FWIW, a 20A circuit breaker will take seconds if not minutes to clear faults drawing much more than 20A. Also, a double pole switch *must* be used for the main switch- a single pole switch in one leg of the 240 VAC supply (like a 120 VAC circuit) will only kill one of the *two* "hot" 240 VAC legs. The one I use looks like a regular light switch and may require some shopping around to find. Make sure it's rated for at least 240VAC at 20A.

Grounding conductors are not shown in the drawing above but they are *MANDATORY!* All of the exposed metal parts of enclosures with 240 VAC in them are grounded as is the keg itself- the later via a ring terminal and a SS sheet metal screw/lock washer in the lower rim of the keg close to the heater element. The lower rim of my keg was very tough to drill- I finally had to use resort to a carbide drill bit. I suspect this may be a design feature of the keg to make the rim tough and able to withstand dropping when full, but it may have been due to my heating the keg over a propane burner when initially cleaning it.

3 conductor, 10 AWG type SO flexible cord was used for all of the 240 VAC wiring although lighter duty SJO cord could be used

instead. I strongly recommend spending the few extra bucks for type SO cord. With 20A, one wants really good connections so I recommend crimp type terminals wherever possible. I made an exception to this for connecting to the attachment plug. However you connect the wiring, make sure the connections are good!

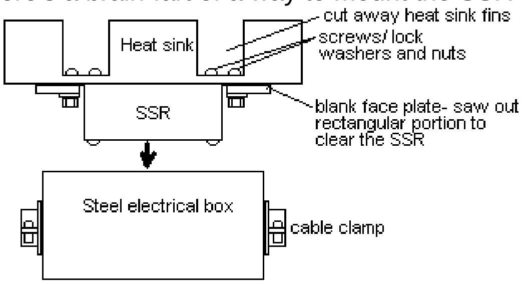
There's no GFCI shown but one could be included. GFCIs rated for the use are expensive (> $100). I consider the electrocution risk vs. cost a decent trade-off; *however*, YMMV! BTW: One handy trick I learned long ago when I had to go in a lot of factories and such was give exposed metal parts of equipment that could be energized a quick slap with the back of my hand before otherwise touching the equipment. It's a good habit to pick up...

A clean/well filtered 12 VDC power supply must be used for powering the controller- otherwise the LM556 (or LM555) may false trigger on the ripple from an inadequately filtered power supply. If the controller acts flaky with the supply you use, adding a large capacitor (something like 100 to 1000 uF rated at the very least 20V) across it's output leads will help.

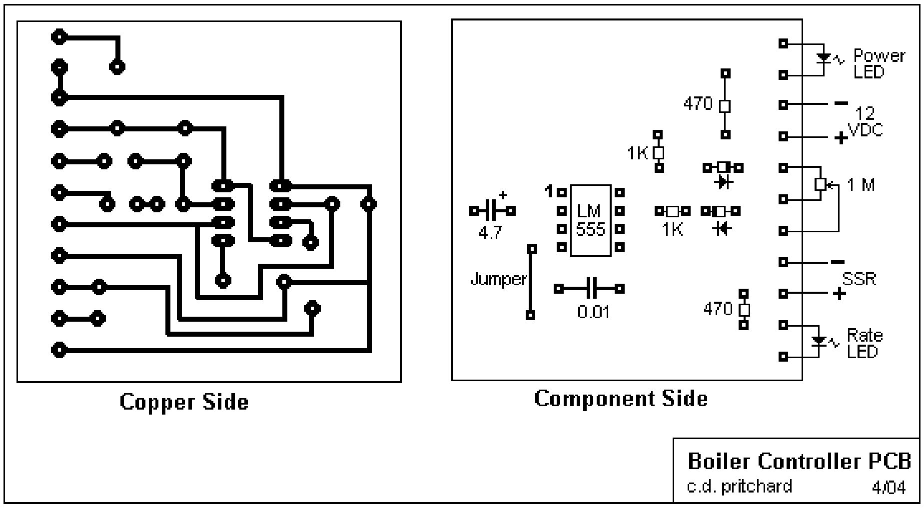
The 4,500 watt heater draws 18.75 A. A SSR rated for 20 Amps. is not adequate IMHO. For triacs and SCRs, a 75% derating usually recommended. I selected a 40 A SSR but a 25 A rated SSR may work. Needless to say, it must be rated at least 240 VAC.

The SSR *MUST* have an adequate heat sink. In mine, the aluminum enclosure which houses the receptacle and SSR also serves as the heat sink for the SSR. I used a beefy "load spreader"/sorta heat heat on the opposite side of the enclosure from the heat sink, heat sink compound between the SRR/enclosure/spreader, and tighten the two fastening screws/nuts/lock washers well. For the load spreader, I used a piece of beefy, 1" x 1/8" aluminum angle (shown in top right of photo above). It also has a hole drilled in it's projecting leg for hanging it up (it's not shown that way in the photo so as to get it in the photo). To ensure the heat sinking is adequate, do a test boil with water and check the temperature of the enclosure and load spreader (remember the "slap it first" tip above....). If either are more than warm to the touch, upgrade to a "real" and beefy heat sink. UPDATE: The foregoing worked for me except during a summer canning session when it was almost 100 degF in the garage. The enclosure never got hot, but was too warm for my taste so I substituded a real heat sink for the aluminum angle.

Here's a brain-fart of a way to mount the SSR inside an ordinary steel electrical box instead of the aluminum handy box I use:



Here is a drawing of a printed circuit board for the controller:



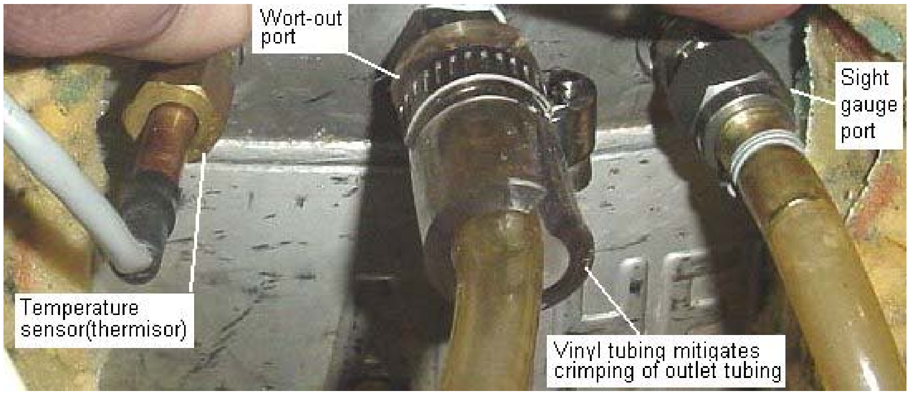
The Heating Element

The element is 4500 W, 240V of an "extra" low watt density design. The element is like a standard, straight low watt density type element but it has a "S" bent into it. It's shown in the photo above. The bending provides more surface area which reduces the power density. It will vigorously boil a 5 gal. batch of 1.080 gravity wort without any noticeable effects of scorching- even with the stirrer off for most of the boil. I used the extra low design as safety factor for boiling higher gravity worts (i.e., in case I get up enough gumption to try brewing an imperial stout or barley wine). Like most elements intended for domestic hot water heaters, it has a 1" male *straight* threaded base. I got it from my local Ace Hardware store. The package is labled "Life Long Heating Element", 4500 watt, 240 Volt, 1" NPS screw-in flange. Model # 9000405. On the back of tha pack, the mfg. is listed as State Industries, Ashland City, TN 37015. If your local Ace Hardware doesn't have them in stock, they can order one for you.

The hole for the element was cut in the keg just above the chime weld and 45 degrees off axis of the ports so the inboard plumbing attached via the ports would not interfere with the element. The element was secured in the hole in the keg with an outboard gasket and an inboard 1" stainless steel half-coupling screwed onto the threaded heater base. (from http://PlumbingSupply.Com/stainles.html#couplings). The half-coupling is cheap ($3.54) and, being SS, should cause less corrosion of the heater based than the copper "nuts" I used on the old boiler. A problem with using "nuts"/half-couplings and other pipe (aka taper or NPT) threaded fittings with straight threaded heating elements is that they may not run up far enough on the heater to compress the gasket(s) enough for a tight seal and secure mounting of the element. Using thick gasket(s) is a solution. They also conform to the curved keg wall without an excessive amount of torqueing of the "nut". I currently have two- one cut from 1/8" thick red rubber gasket material and a rather thinish heater element gasket (they come in differing thickness not much tho- maybe +- 1/16"). Ace Hardware stores sells 6"x6" pieces of 1/16" and 1/8" thick material for a buck or so. Here is some more info from an email exchange on getting a good seal between the keg and the heating element.

The electrical terminals on the outboard end of the element are covered with a PVC 1" female slip x 1/2" female threaded elbow (http://PlumbingSupply.Com/pvc.html#90). 6 or 8 kerfs were sawn in the 1" end and it was clamped to the plastic part of the heating element using a hose clamp over the kerfs. A clamp type electrical fitting screwed into the 1/2" threaded end of the PVC elbow to provide strain relief for the power cord. Whatever you do, INSULATE the terminals of the element and provide strain relief for the power cord.

Stuff at Bottom of Boiler



The photo above shows the three ports on the side and towards the bottom of the keg. All are compression fittings with pipe thread ends which drilled out so tubing would pass completely through and then screwed into drilled and tapped holes in the keg. The keg wall is thick enough to provide plenty of strength. The bushings inside the fittings are nylon (not brass or SS) to allow for easy disassembly. All except the temperature sensor port are SS fittings. The sensor port is brass. It's been installed for 2 years and there is no sign of dielectric corrosion, so, brass could be used for all fittings.

The Sight Gauge

Here's a page that describes how it was made and how it's used. An alternative is to ditch the separate port for this and tee off of the wort in/out port to a sight gauge. Alas, one then looses an easy way of monitoring the progress of filling and draining the boiler of wort since the flow of wort induces a pressure drop which causes the sight gauge to read too low. A work-around is to stop the flow to take a level reading. **An update**: I initially sawed slots in the inboard end of the 1/4" SS pickup tube but they were subject to plugging, so, a piece of SS mesh was put over the end.

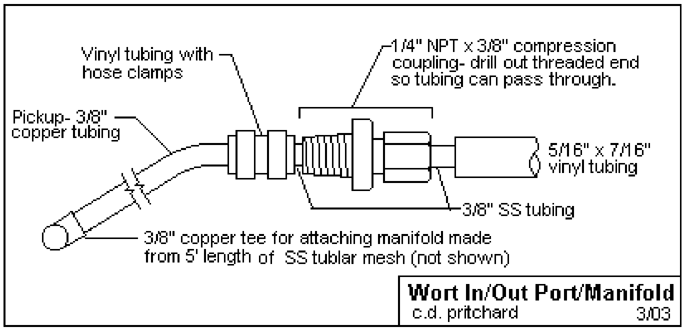
Temperature Probe

This was made in the same manner as as the port for the sight gauge above. The temperature probe is just a short length of 1/4" SS tubing with a thermistor embedded in in it's end with silicone sealant. Details on the probe and how to make one is on the Thermistors for Brewery Temperature Measurement page.

Currently, I connect the cable from the thermistor to a volt-ohm meter, read the resistance of the thermistor then refer to a table of resistance vs. temperature values to determine the temperature of the wort. This will be via computer one of these days. I use it only during the ramp to boil (to tell when to start watching for a boilover) and during chilling after the boil. It serves no purpose during the boil since it always reflects the 212 degF of the boiling wort.

Something which might be worth making is an alarm gizmo which sounds an audible alarm when the boil approaches. Something like the simple fridge controller set for 212 degF or maybe a bit under that.

Wort In/Out Port



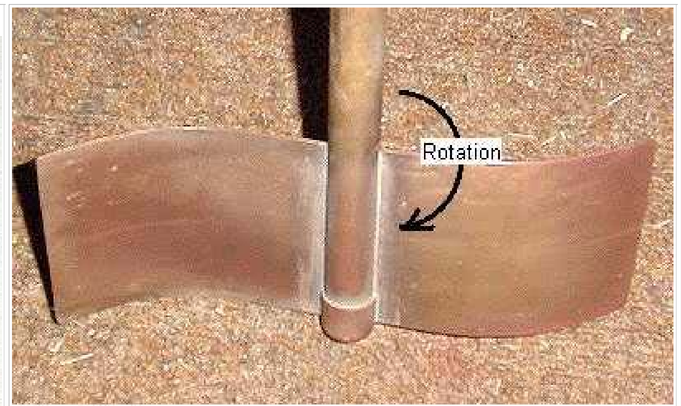
The wort in/out port is via a 1/4" FPT tapped hole. This size allows 3/8" OD tubing to pass thru via a suitable fitting after the fitting is drilled out to 3./8+". I wouldn't try tapping the keg any larger than 1/4" FPT- the decreased thread engagement would make the port too weak IMHO. The 1/4" FPT affords enough strength to withstand the typical knocks and bumps of brewing but I doubt it'd take gross abuse. The tee at the inboard end is soldered to the copper pickup tube and the other end of the tube was swaged so it fits over the 3/8" SS tube in the port. A short length of heavy wall vinyl tubing is secured with two hose clamps over the joint to make it air-tight. This is required since the wort is siphoned out when the level of wort is lower than the port. The vinyl discolors after the first brew but doesn't seem to throw off anything that taints the brew. Hi-temp. flex tubing may work better. One day, I'll try a bent length of SS tubing for the tee and thru the port....

Manifold

A 5' length of tubular SS mesh removed from the exterior of reinforced plumbing connector serves at the strainer for the hops and most of the trub. It was formed into a rough and loose coil of 3 loops and each end of the tubular mesh was secured over the two ends of the tee at the end of the pickup tube by wrapping SS wire. It works very well- especially if one waits for 5 minutes or so for the hops to settle and form a good filter bed. I have recently tried it with pellets for the boiling hops and whole hops (at least an ounce) for late additions. Works fine as long as one doesn't run-off too fast. The rate varies with the brew and, especially, the amounts and types of hops and when they are added. It takes me in the vicinity of 20 minutes for a 5 gal. batch. I start real slow and gradually increase the flow until it first starts to slow then back off a bit- it takes a bit of experience. For clearing a stuck run-off while learning, I use a blast of 30-40 psig CO2 via the end of the wort-out hose although I'd rather use O2 if I had a real cylinder instead of one from a Bernzomatic torch.

The Stirrer and Lid

Some details are on the drawing above. Here are some photos showing the whole stirrer/lid assembly and the stirrer blade:

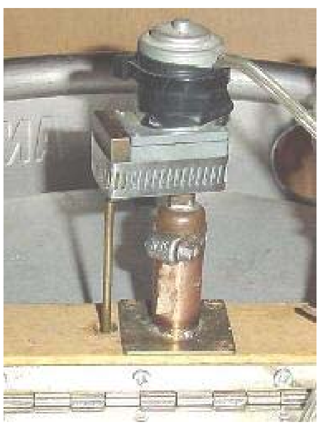


Stirrer Blade

The white stuff along side the shaft of the stirrer blade isn't solder- it's beer stone from about 20 brews and just using blasting with water for cleaning.

A stirrer is *NOT* needed to prevent scorching, but, when used during the boil, it does appreciably increase hop utilization. Where it's of immense benefit is when cooling the wort- it GREATLY shortens the amount of time required since the wort is being moved over the surfaces of the immersion chiller thereby increasing heat transfer.

The boiler drawing and photos above show most of the details. The stirrer is basically constructed like the one used on the old plastic pail boiler. The only significant delta is that the blade has a higher aspect ratio to accommodate the lessor relative wort depth for 5 gallon and the wider relative top opening. It was made from a 9" long piece of, I think, 3/4" copper tubing. Like the old one, the copper tubing was slit, pounded flat then bent into a S shape. Note in the photo above that it rotates "backwards" from the direction most folks think it should rotate when viewing it as a spoon.



The stirrer is powered by a small, cheap 12 VDC, 200 mA gearmotor. A cheap cordless drill may work but you'll likely need additional batteries or need to splice in a power supply. The gearmotor "floats" atop the shaft- i.e. it's fastened to the shaft via a crude/quick-and-dirty/homemade coupling. Its body is restrained from rotating by a brass block/rod, the later of which engages a largish hole in the wood cross piece. Since I was out of bailing wire, I used a hose clamp to fasten the brass rod to the gearmotor body :-) This accommodates the wobble due to the very crude coupling. The 1/2" copper end cap atop the stirrer shaft has kerfs sawn in it an a hose clamp over them to secure it to the stirrer shaft. (A split pin would have been more elegant but that's another trip to the store!) The stirring speed is controlled via a simple variable voltage power supply made using a linear voltage regulator IC powered from the 12 VDC power supply for the heat controller.

Affixing the bolts that secure the wooden cross bar to the keg took me quite a while to "brain-fart". Having the bolts welded on sure would have been less of a pain! I designed the lid to be reasonably tight when closed to keep nasties out of the wort while it's being cooled and racked off. My plan was putting some sort of thin flexible plastic material under the leaves of the piano hinge before it was screwed and pop riveted in place to afford better sealing but I couldn't find any readily available and suitable material.

There are two notches in the lid to allow the vertical feeds of the immersion chiller to pass through (they're somewhat invisible in the photo above...). The chiller is placed in the boiler 5 minutes or so before the end of the boil to sanitize it (the stirrer is already in there). I tried using duct seal to seal the openings in the lid around the chiller feeds but it's really messy and a PITA to boot. There's also a ~3/4" hole in the wood (poplar) cross bar that I planned/brain-farted stuffing a silicone stopper into to allow filtered air into the boiler as the wort is being cooled (i.e., to allow for shrinkage). After 30+ infection-free brews, I don't worry about infections from the gaps.

The Immersion Chiller

Again, it's made much like the one used in the old plastic pail boiler with 20' or so of 3/8" copper tubing but the coils are closer together to accommodate the lessor wort depth. To keep it level and off of the heating element, a chunk of brass was soldered to each of the chillers' two vertical risers. When the chiller is inserted, they brass chunks rest on the edge of the hole in the top of the keg. A tee is at the top of each of the two risers- the extra outlets on the tees are fitted with 1/4" compression fittings for metal stemed electronic thermomters. One day, I'll get around to building a computer-based controller and will use thermistors instead.

When the tap water is too warm to get the wort to yeast pitching temp, I cool with tap water until the wort is within ~10 degF of the tap water temp then switch to recirculation of ice water thru the chiller. I do this by putting ice and water in the HLT and then using it's pump to *recirculate* the ice water- adding more ice when needed. It works very well and requires no additional equipment. A cheap marine bilge pump in a picnic cooler will work also- just keep ice out of the pump.

Usage Tips

If you don't watch the thing as boiling is reached, it will violently boilover even a 5 gal. batch! Alternatively, Foam Control completely eliminates boilovers. I used to use it a lot but now I simply kill the heat as the wort is coming to a boil- when a dense head of foam first starts to form and run the stirrer on high speed for a few minutes while using a long handled brewing spoon to work the foam back into the wort. After the foam has been stirred back into the wort the heat is cranked back to full power then throttled back after a good boil is established.

The manifold is good at ensuring clear wort into the fermenter, but using only pellet hops will *definitely* plug it. Even whole hops that have been boiled more than a couple or three minutes tend to slow run-off. Adding whole aroma hops when the power is killed works the best. They seem to form a more porous bed. At least an ounce is required to form a decent filter bed, but more is better. I let them to settle for at least 10 minutes after stopping the cooling water and killing the stirrer. I typically let them settle for ~5 minutes, shake the immersion chiller to allow hops trapped on it to free themselves and then let settle for ~5 mintes then start run off. I'ts really clear after about the first gallon or so but is still too slow for my taste- around 20 minutes for 5 gallons. I've played around with using around half pellets and half whole hops for bittering but have slower run-offs. This leads to....

Don't run-off wort too fast after the boil or the filter bed of hops over the manifold will plug the manifold! If it plugging occurs, blowing CO_2 thru the wort-out tubing and letting the hop bed reform helps for awhile but results in more trub in the fermenter. Kicking in the stirrer doesn't work since it's so far above the bottom of the boiler. Stirring the bed of hops with a sanitized, long handled brewing spoon should also work similarly but it's a PITA and, since 1/2 of the lid must be raised, it's too infection-prone for my taste. The clamp type valve used on the wort-out tubing functions as both as a shutoff and gross throttling control. In addition, I use a screw clamp lab type pinch gizmo is for finer throttling. Knowing how much is too much is much dicier than setting the recirc. flow on a RIMS. In this regard, teeing a sight gauge into the wort-out line could help see the dP across the filter bed when it's level is compared to that in the other sight tube.

For sanitizing the wort outlet and sight gauge vinyl tubing, I run boiling wort thru them shortly before the end of the boil. I do this by sticking the free end of the tuning into a 2 or 4 cup Pyrex measuring cup and then lowering the cup to allow the boiling wort to flow thru the tubing. When the cup is about full, it is raised which allows the wort to siphon back into the boiler. This is repeated several times. A bit of plastic wrap is put on the end of the wort-out tubing to keep it sanitary. The sight gauge tubing will suck in air as the wort is run off from the boiler, bit, I don't worry about it. If this worries you, try a silicone foam stopper over the free end.

I've never cleaned the boiler with anything but plain water and usually a bit of wiping with a sponge. After 30+ brews, there's some tough residue where the wort level is during boil, but no crud elsewhere. Curiously, the most beer stone visible is on the stirrer. There's now also a mere dusting on inside of the boiler. Wort has never scorched on the element, but after cleaning and air-drying, the element has what looks like a very thin mineral deposit on it- it's shown on the photo above. I don't worry about this since it disappears when even slightly wetted - it's shown in the photo above of the stirrer.

If you use the stirrer during the boil, be consistent using it batch-to-batch since it increases hop utilization significantly!

Going Further

The boiler makes a great boiling water canner! I wired a basket together using 2" x 4" mesh fencing jars. I use 10 to 12 gallons of water in the boiler. This large volume of water and the power available allows the boil to be re-established very quickly after the basket/jars are lowered into the boiler.

A computer based controller is planned (and has been for years....) Features I'd like: elimination of boilovers via automatically killing the heat and stirring the initial foam back into the wort (see bove), sounding an alarm so I can watch for a boilover then restoring heat. Automatic adjustment of the boiling rate to yield the target volume of wort in a given time, alarms for when it's time to add hops and Irish moss or Whirlfloc, display and logging of water temperatures on the input and output on the immersion chiller and wort temperaure and also of wort level via a level transducer .

At the very least, a gizmo that sounds an alarm just before boiling is reached would be nice. It would warn you to keep an eye peeled for a boilover and to throttle the heat back. Something based on the simple fridge controller should work well. Even with a 5 gal. batch in the 15.5 gal. keg, I've had one pretty bad boilover from not paying attention. BTW, to greatly reduce the chance of boilovers, kill the power to the heater when a good boil and 1-2" of foam is attained and stir the foam back into the wort akin to that one uses when folding beaten egg whites to make a souffle (ask your wife or mother :-).

Subcoooling the wort aids in cold break formation and entrapment in the hops filter bed. I've done this a couple of times once to ~50 degF using ice water recirculated with the HLT pump- even got condensation on the outside exposed portion of the boiler! I guessed it reduced the amount of trub in the primary fermenter by about 1/3. Some or most of the reduction may have been due to the increased settling time tho'. The big downside is having to wait until the wort warms in the fermenter to pitching temp although I suspose one could recirc. hot water thru the chiller to warm the .wort up after subcooling. Too much of a hassle for my taste....

Why Electric?

I hated lugging propane cylinders to have them refilled and wanted to brew indoors in a safe manner (I wouldn't even consider using propane indoors). Some other considerations:

1. To me, electricity is much safer than propane. The worst case accidents with electricity are me electrocuting myself or causing a fire if I screw up royally and do something really dumb. With propane, BIG explosions and fast spreading fires which could endanger my family are the primary risks. YMMV....
2. Automating the boil by cutting back the heat when boiling is attained (or excessive foaming is detected...) and killing the power at the end of the boil will be fairly straight-forward if/when I get around to it. Doing that safely with a propane burner is expensive and, more importantly, is fraught with many hazards and problems- some of which are *not* intuitively obvious.
3. The boiler can be insulated much easier and cheaper compared to a propane fired one..
4. The cost of building an electric boiler is more than using propane, but the operating cost is much less It costs only about 30 cents to boil a 5 gallon batch in these parts. Areas with non-public/corporate (and hence greed) power suppliers companies (and especially in "deregulated" areas will be costly due to our systems preversion of Adam Smith's "invisible hand" transferring *your* wealth to greedy corporate execs., inside traders, "Wall Street", corrupt politicians and regulators**...** *ad nausem*. With propane currently being $13 for a 20# cylinder refill, it'd be at least a buck a brew just for the propane and more when you add the truck mileage to take the cylinders to have them refilled.

BTW, one shouldn't haul a propane cylinder in a car or van. I do make an exception for Hummers owners tho'. A tip for them which will increase the cylinder pressure and hence ensure a boil as "macho" as their vehicle**:** On a hot and sunny day, have an old style propane cylinder filled to the max. by telling the filler to ignore the scale he'll want to use- fill 'til the pump starts to make funny noises, drive home, park in sunny spot, leave cylinder in Bummer with windows up and wait awhile (ommission of exiting vehicle is intentional). Oh yes, if one wishes to stop at a store on the way home from cylinder filling, please do *not* park as most Bummer's do- e.g. in fire lanes, in traffic lanes or take up two or four parking spaces close to the store.

Downsides to Electric Wort Boiling

1. Electricity can kill you, although I consider it less risky than propane as per 1 above.
2. Making a electric boiler requires electrical knowledge/experience/skill!
3. Will very likely cost more than a propane fired boiler.
4. Some sort of controller or other method to throttle the heat back after boiling is reached is required.
5. For the rig on this page, a 240 VAC at 20 A supply is required.

If 4 and 5 (and maybe 3) above are impediments, consider something like my old 120 VAC plastic pail boiler.

Credits

Ken Schwartz I never would have built the old (first) boiler without the pioneering work described on his great web page Five Gallon Plastic Electric Brewery and his emails he most graciously provided.

Ron La Borde was of great help with the new boiler. His boiler page, helpful email and especially his boiler controller (upon which the schematic above was stolen!) saved me a ton of time and worry about if what I was designing (more like brain-farting) would work.

THANKS guys!

Comments, Questions, etc...

If you've questions, comments or suggestions, email me at cdp *at* chattanooga.net.

Revisions

- 7/05- r6- Added musings on heat density of heating elements and info on cleaning methods.   Also tweaked other stuff.
- 1/05- r5- Changed the controller schematic drawing to show use of a LM55**5** instead of a 55**6** so it agrees with the PC board since this caused some confusion for at least one dear reader (rev 2 of the drawing is here). Added more info on mounting the heating element and a link to info from an email exchange. Also tweaked other stuff.
- 4/04- r4- Added drawings of controller PCB and SSR mounting method and info on heating element
- 3/04- r3- Added controller info- pot/switch, heat sinking.and safety and tips for running-off, boilover reduction and somewhat of a **tip for Hummer owners**
- 3/03- r2- Added photos and hacked text rather significantly
- 2/02- r1- Hacked the Going Further section, added a Modifications/Updates section and a link to the new Thermistors for Brewery
- 2/01- r0- First posted

Legal Mumbo-Jumbo

This thing works well for me- YMMV. Electricity can kill you, cause a fire, etc.. Sharp/pointly/manly tools are required for construction. Don't even attempt this project if you're not completely comfortable with it and have the needed knowledge and skills.

Return to my Main Page
c.d. pritchard

The biggest miserable failure.