



HOME KEGERATOR

here are two major steps that both beginner and journeymen homebrewers spend a lot of time thinking about and planning for: brewing exclusively with malted barley (i.e. going all-grain) and kegging their homebrew. In this project, I'll outline the latter as we'll build a basic, two-tap kegerator. It's not a cheap project, but the benefits are tremendous and well worth the money, in my opinion. (The other two projects in this collection of DIY stories are kegerators built for other uses.)

Refrigerator or Freezer?

Before you can get started buying all of the needed hardware, you need to decide if your kegerator is going to be housed in a refrigerator or chest freezer. Using a refrigerator is generally less expensive overall and requires less equipment, but a decent-sized chest freezer can usually accommodate more kegs (and thus taps). Also, used refrigerators can be had for very little money — and in some cases are free if you can pick them up yourself. Check www.craigslist.org for appliance classified ads in your local area. Be aware, however, that old refrigerators consume a lot of power. Although the upfront cost may be right, a newer refrigerator may end up saving you money after a year or so of operation.

I opted to go with a refrigerator because it fit my brewing needs (and available space), required minimal hardware and was less expensive overall than going with a chest freezer. I ended up buying a new unit because I lucked into a modelclearance sale and got it really cheap. It's an "apartmentsized" refrigerator/freezer combo, which looks just like a normal fridge, but it's about 12 cubic feet (0.34 cubic meters) inside instead of the normal 18 cubic feet (0.51 cubic meter) or larger. It's perfect for a two-, three- or even four-tap setup. And the freezer section can be used for long-term storage of hops, spices, yeast slants and various other brewing ingredients and supplies. A traditional-sized refrigerator can typically hold four or five kegs (and sometimes more). If you plan to have (now or eventually) more than five or six taps, a chest freezer is most likely your best choice. It'll allow you plenty of room to expand over the long haul. I've seen chest freezer kegerators with 10 or more taps.

To figure out how many kegs a given fridge or freezer will hold, trace around the bottom of a Cornelius keg on a piece of cardboard, cut it out and take that with you when you go to look at your options. If you don't have a keg yet, you can just draw an 8-inch (20-cm) diameter circle instead of tracing the bottom. Also be sure to measure for vertical clearance. A typical ball-lock keg with the disconnects attached is about 26" (66 cm) high. Vertical clearance isn't usually an issue with full-size refrigerators or chest freezers, but it's good to know the height of the kegs when trying to squeeze just one more into a tight space in the back of the fridge.

Kegs, Shanks and Faucets

Now that you've got your refrigerator (and a thumbs-up from your significant other), it's time to pick out kegs, shanks and faucets.



Used kegs are the cheapest way to go, and are generally very reliable. You can typically find used, pressure-tested 5.0-gallon (19-L) Cornelius kegs for about \$30–40, whereas new kegs run about \$100. If you buy used, it is imperative to replace all of the rubber seals before using it for homebrew. It'll only cost about \$10 total and will guarantee that your beer doesn't end up tasting like whatever was in the keg before you bought it (usually soda of some sort). Some homebrew shops sell their kegs "reconditioned." This usually means that all the rubber O-rings have been replaced. They also may have been cleaned and it pays to ask what is involved in the reconditioning. Kegs are usually stored under pressure and a quick pull at the pressure release valve on the lid should reveal if the keg is holding pressure.

A good rule of thumb is to have at least one more keg than you have taps. This allows you to have at least one beer conditioning in the keg and ready to go when you finish off one of your other beers and a tap becomes available. I recommend having two more kegs than taps for maximum flexibility.

ROJECT

For a refrigerator-based kegerator, you'll need a shank and a faucet head to make each tap (as shown in photo 1). The shank fits through a hole drilled in the refrigerator door (we'll get to that in a bit), and via beverage tubing connects the keg to the dispensing faucet. Some shanks have a permanently attached hose barb, while others use a tail piece and wing nut to attach the barb. Either type will work just fine. The other end of the shank has a threaded collar that mates with the faucet. This is a great system, as it allows any faucet to be used with any shank. This comes in handy if you want to upgrade your faucets at a later date.

There are many faucets available on the market right now, ranging from cheap brass units to high-end stainless with a brushed nickel finish. If you have the money, I highly recommend the forward-sealing style faucets. In a forward-sealing faucet, the flow of beer is stopped near the front of the faucet, not the back as in most faucets. This means that, when you pour a beer, it does not flow through a tap that has beer residue in it that has been exposed to oxygen. They're easier to keep clean (and they look really cool). But any faucet will work, so there's no need to spend a lot on faucets right away.

CO_2 — Hit the Gas

The heart of any kegerator is the gas that pushes the beer. In the vast majority of cases, this will be carbon dioxide (CO_2) , but could also be a nitrogen/CO₂ mix. Gas cylinders most commonly come in 5-lb, 10-lb, and 20-lb sizes, but both smaller and larger sizes are available.

PARTS LIST

- 1 refrigerator
- 2 Cornelius kegs
- 2 shanks
- 2 forward-sealing faucets
- 2 tap handles
- 2 10' (3-m) lengths of beer line (3/16 ID)
- 2 beer "out" disconnects
- 4 hose clamps (for beer line)
- 1 CO₂ tank
- 1 dual-gauge regulator
- 3' (1 m) air line hose (¼" ID)
- 1 "Y" splitter (for air line hose)
- 6 hose clamps (for air line)
- 2 gas "IN" disconnects
- caulk
- keg lube

TOOLS

elelctric drill %" hole saw screwdriver

Balancing Your Draft System

In order for kegged beer to have the correct level of carbonation, it must be stored at the correct temperature and pressure. Most homebrew texts contain a table relating temperature and pressure to carbonation (or see the May 2000 issue of *BYO*).

Most refrigerators keep their temperature around 40 °F (4.4 °C). If you put between 7 and 12 PSI of CO₂ pressure on your beer, it will equilibrate to contain 2.0 to 2.5 volumes of dissolved CO₂ — and this range covers most "normal" beer styles. (See the article concerning priming sugar on page 62 for typical carbonation levels in the most commonly brewed beer styles.)

When you dispense your beer, it moves through your beer lines and, in the case of a tower system, your tap may also be several feet above the keg. The pressure in the keg will push the beer through these resisting factors. If your beer line is too short, beer will be propelled from the tap at a high rate, causing excess foaming in the glass. If your beer line is too long (or your beer needs to be pushed a long vertical distance), the beer will pour very slowly. It will also likely be foamy because the low pressure at the tap will cause CO_2 to break out of solution. Ideally, you want your kegging lines and taps to "absorb" most of the pressure on the beer, but still leave enough force behind the beer so you can pour at a reasonable rate. In the kegerator system we describe here, the relevant resistances are: vertical height: 0.5 PSI per foot

³/₆" beer line: 2–3 PSI per foot

So, if our keg pressure is set at 10 PSI, we want our dispensing path to "soak up" most of this. In our system, the taps are roughly at the same height as the top of the keg, so they won't require any pressure to push beer uphill when the kegs are full. (When almost empty, it would take about 1 PSI.) At 2 to 3 PSI per foot, we would need 3 to 5 feet (1–1.5 m) of beer to supply the proper resistance.

Of course, these calculations are only as valid as the estimates of resistance. In practice, it pays to make the calculation, but begin with a longer-than-calculated beer line and then shorten it, as your experience dictates.



A gas regulator is required as well. It attaches to the cylinder and allows you to set the pressure of the gas imposed on the keg, which is how you set and adjust the carbonation level in the beer. Dual-gauge regulators also show how much pressure is remaining in the cylinder. (This is shown in photo 2.) You should know, however, that the gauge reading tank pressure doesn't start to drop until the tank is almost empty. This is because the cylinder is under pressure and the carbon dioxide inside exists as a mix of liquid and vapor. As long as there is still liquid in the tank, the vapor pressure will be constant. In a refrigerator (at 40 °F/4.4 °C), the pressure will be about 600 PSI. At room temperature, the pressure will be around 850 PSI.

If you plan on having several beers on tap, you'll also need some way to push the gas to each keg. This is typically done with a manifold that splits the line from a single gas cylinder into many output connections. For splitting off to just two kegs, you can use an inexpensive "Y" adapter that screws into the regulator.

If you plan on serving beers that require different carbonation levels, this will require either a separate CO_2 cylinder and regulator or a double regulator attached to just one cylinder.

For starting out, however, a simple dual-gauge regulator is more than adequate.

Other Equipment

For each keg in your kegerator, you'll need: a liquid and gas disconnect, a length of gas and beverage tubing, and a pair of hose clamps. Be sure to match your disconnects to the type of kegs you have: either ball lock or pin lock. They are not interchangeable. One other critical piece of equipment for your kegerator is a drip tray. These are usually made of stainless steel and start at around \$40, going up for longer trays. For attaching to a refrigerator door, you'll need one that has a mounting bracket (as opposed to drip trays that just lay flat under vertically mounted taps). Instead of screwing mine into the door, I glued some felt-backed magnets to the tray (as shown in photo 3). This makes it easier to remove the tray for cleaning, moving the kegerator, etc.

While not required, you'll also certainly want some swanky tap handles for your faucets. There are many styles available, and they run the gamut on pricing. You can even make your own cast tap handles, as shown in the March-April 2006 issue of BYO.





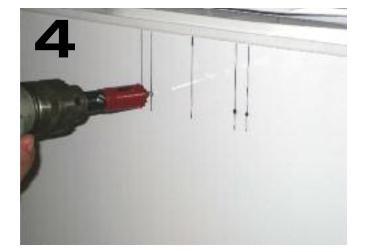
Where Do I Get All This Stuff?

Most homebrew suppliers that stock kegging equipment offer refrigerator conversion kits, and they're usually a little cheaper than buying the parts individually. They also stock beverage and gas tubing and other consumables. There are also vendors that specialize in kegging equipment only, including full kits.

Finding a local supplier for CO_2 can seem like a daunting task. Look for welding supply shops and local businesses that refill or recharge fire extinguishers. These are usually the best places to get your cylinder refilled. You cannot mail order filled CO_2 cylinders, so you will have to find a local or relatively local source for filling.

Before you buy a brand-new shiny cylinder, be aware that most shops will not fill your tank while you wait. Instead, they will exchange your empty tank for a different full tank, much like how a propane exchange program works. Be sure to ask your local supplier if they will fill your personal tank or if they do exchanges only. It may be cheaper for you to just "buy" one of their tanks and keep exchanging. It's also possible that a shop's cylinder prices will be much higher than can be found online, so you'll need to do some comparison shopping first.

There has been a lot of discussion about the "grades" of $\rm CO_2$ that are available. Almost any place where an individual can pur-







chase CO_2 in small amounts will be selling food-grade gas. There is also industrial-grade CO_2 , which has more impurities than foodgrade gas. If in doubt, ask your supplier which grade they sell. My local supplier (County Welding Supply in Wharton, New Jersey) sells both grades and will not sell you industrial grade if you say it's going to be used in a kegerator. A good supplier knows the difference and will inquire about the end use of the gas.

Most paintball supply shops also will fill CO_2 cylinders. However, you must be absolutely sure that they are using food-grade CO_2 . Ask before you get your tank filled.

Convert the Fridge

This is actually the easiest part of the whole project. All you need is a drill and a %-inch hole saw. Just drill a hole through the refrigerator door for each tap you intend to have. That's about all there is to it. For my kegerator, I opted for two taps to start off with, but there is plenty of room to add at least one





more.

Before you drill, you'll want to measure and mark the door. First take a look at the inside of the refrigerator door to verify the locations of shelving supports. It is best not to drill through these supports, as you may want to keep the shelves for holding bottled homebrew or odds and ends related to brewing. Now you can mark off your center points for drilling (as shown in photo 4).

The resulting holes should be a tight fit for the shanks. Work them through the hole and tighten the nuts on the inside of the kegerator (which is what your fridge now is, officially). This can be seen in photo 5. For a little extra thermal security, you can seal the edges of the holes with a little silicone caulk before you tighten down the nut. I have not found this to be necessary, but if your shank holes aren't quite clean and neat, it might not be a bad idea. It can't hurt either way.

Once the retaining nuts are tightened down on the shanks, screw the faucets into the shank collars and you're ready to hook up the kegs and gas (as seen in photo 6). You're almost there.

Some homebrewers like to keep the CO_2 cylinder outside of the kegerator to make room for an additional keg. This requires drilling and insulating an extra hole in the side or back of the fridge to run the gas tubing into the kegerator. This can be a very tricky operation, because the sides, top, and back of a refrigerator are generally the places where the coolant lines are run. Drilling through one of these coolant lines will permanently ruin your kegerator. Determining the location of coolant lines on various makes and models of refrigerators is beyond the scope of this article. Proceed with caution if you plan to go this route.

Testing, Testing

Attach the regulator to the cylinder, and make sure the connection is tight (but do not over-tighten). Slip one end of a



length of gas tubing over the hose barb on the regulator's shut-off valve and secure it tightly with a hose clamp (as seen in photo 7). The other end of the gas tubing goes on the gas quick disconnect fitting (which is usually grey and plastic) and should also be secured with a hose clamp. (This is shown in photo 8.)

Attach the grey gas disconnect to the "IN" post (also called a plug) on a keg filled with tap water (or sanitizer if you prefer). Set the regulator to about 8 to 10 PSI and open the valve on the cylinder. You'll hear the gas enter the keg. Now take a spray bottle filled with either soapy water or a standard strength solution of Star San sanitizer and spray the connections on the regulator and the disconnect. Watch closely for bubbles, as this is a sign that CO_2 is leaking. If you see bubbles, turn off the gas and retighten the connection nearest to where the bubbles occurred. Keep doing this procedure until you don't see any bubbles. Even a very tiny leak will leave



you with an empty cylinder in a very short time.

Now attach the beverage tubing to the hose barb on the liquid disconnect (usually black plastic) and the hose barb on the shank and secure both connections with a hose clamp (as shown in photo 9). As a staring point, use about 10 feet (3.0 m) of beverage tubing. Attach the liquid disconnect to the "OUT" post on the keg, turn the gas back on, put some kind of container under the tap, and pull the handle toward you to open it. The water in the keg will now flow out through the faucet. Watch the beverage "out" side for liquid leaks. Tighten and reseat connections that show any leakage at all.

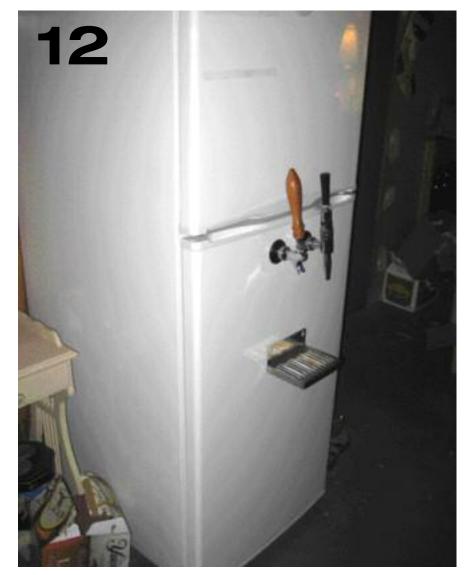
If you think you're having trouble with the keg seals, apply a thin coat of food-grade lubricant to all rubber parts (seals and gaskets). This is commonly available at homebrew suppliers and is often simply called "keg lube."

Kegging Time

When your first batch of beer destined to be kegged is ready, rack it over to a sanitized Corny keg. (As an option, you may want to connect the gas to the empty, sealed keg before racking. Dial your regulator down to 3 PSI or so and fill the keg with CO₂ gas. Pull the pressure release valve a couple times to vent it (and get rid of some of the residual air) and let the keg fill again with CO₂. You will hear the CO2 cylinder creak when you do this. Then, right before you are ready to rack the beer, release the pressure on the keg fully and open it. A "blanket" of CO₂ will hang there in the keg long enough for you rack the beer under it.) Once the beer has been racked, attach the gas and dial the pressure up to serving pressure (typically, around 10 PSI). Vent the keg a few times by pulling on the pressure release valve. This will let gas - a mix of CO_2 and air — out of the headspace and replace it with CO_2 . Now go ahead and take a full keg of your homebrew and put it in the kegerator (and giggle with glee about all the time and effort you







saved by not bottling this batch). Let it chill overnight and you can decide how to carbonate it the next day. Cold beer carbonates faster than room-temp beer because CO_2 dissolves more readily as the temperature decreases, so you can't carbonate the beer while it's still warm.

There are a few ways to go about force carbonating the beer. The first way is to set the regulator to 8 to 12 PSI (a common serving pressure range) and let it sit for about a week or so. The gas will gradually dissolve into the beer at the correct serving pressure and once it is, you're ready to go. A faster way to carbonate your beer is to set the regulator to 25 to 30 PSI for a few days and let the beer sit. Then, dial the pressure back down to about 10 PSI when you are ready to serve it.

A "quick and dirty" method (which you might use if you had just chilled the

beer and you had guests arriving that same day) is to crank the gas to about 35 PSI then shake the keg vigorously for a minute or so. You will hear the gas cylinder creak as CO_2 is released. Repeat several times, until the creaking diminishes greatly, then dial the gas down to your serving pressure. You can start pouring immediately, but it would be better to wait a few hours to let the gas "sink in." This method isn't ideal, but it will work in a pinch. Expect to have bigger bubbles.

Getting your system in balance takes some trial and error and some patience. Just as a baseline, I recommend starting off with 10 feet (3.0 m) of beverage line and use 10 PSI for the serving pressure. Temperature also plays a role in carbonation: lower temps generally mean more fully dissolved CO_2 (usually less head and foam when poured). The general consensus is that a good serving temperature is between 36 and 40 °F (2.2–4.4 °C), although some styles may warrant a slightly higher temp. And of course, personal taste will be the final deciding factor.

The parameters listed above will get you in the general ballpark and should result in an excellent first kegging experience. For some handy formulas to help get your system fully tuned to your liking, see the side bar on page 32 or check out http://kegman.net/balance.html.

The setup may be intimidating at first, but in no time you'll be enjoying your brew on tap with friends and family. It's a beautiful thing. (The last three photos show the completed project.)

Chest Freezer Option

If you decide to make your kegerator from a chest freezer, the overall project is very similar, but there are two differences.

If you have a chest freezer that opens on top, you can't drill through the front wall of the freezer as there are coolant lines there. So, you have two choices for installing taps — add a collar or a tower.

To make space for the shanks to be inserted, you can install a collar above the lip of your chest freezer. To do this, remove the screws that hold the lid on and remove it. (It will likely have wires running to a light; so be careful not to rip those out.) Then, build a "collar" out of 2 x 6s that rests on the walls of the chest freezer. (Essentially, you make four wooden sides that makes the chest freezer 6 inches deeper.) Screw the chest freezer lid into the collar and drill your shank holes in the wooden collar. Don't drill any holes in the freezer part if you install an drip tray.

Your second tapping option is to install a tower in the lid of the freezers. Towers are fairly pricey (usually starting at over \$100) and come in single or multi-tap configurations. Installing a tower involves drilling a hole in the freezer lid and running the beer lines up through it, into the tower, which is bolted to the lid. A drip tray can simply sit under the taps.

Of course, you don't want to serve

beer at 0 °F (-20 °C), the temperature of most freezers. As such, you need to install a thermostat. For about \$70, you can get a thermostat that plugs into the wall outlet. the freezer is then plugged into the thermostat. A probe monitors the temperature inside the freezer and turns the power on and off to the freezer.

Nitrogen Stout Tap Option

If you are a fan of dry stouts or other styles of beer that can be served from a nitrogen tap, you can also install a stout tap in your kegerator. I'll outline this project (and explain the mechanics of "nitro pours") in an upcoming issue of *Brew Your Own*. Until then, happy kegging.

Forrest Whitesides' first kegged beer was a milk stout brewed with coffee malt and fermented with a Belgian yeast strain. He has a wanton disregard for style guidelines. In addition to writing the "Projects" column for each issue of Brew Your Own, Forrest also wrote about building a stir plate in the July-August 2007 issue.

