

I've wanted to adapt the vacuum press system for vacuum clamping for quite some time. Of course it's not too difficult to hook the vacuum line from the system directly to a clamping board but I wanted something easier to use. The biggest restriction from making this adaptation a reality was the on/off control of the vacuum pressure to the clamping jig. I wanted to build something that could shut off the vacuum pressure without depleting the vacuum reservoirs and at the same time allow the work piece to release quickly from the clamping jig when the pressure was released.

Luckily, I stumbled upon an excellent source for an affordable 3-way pneumatic latching valve. They offered me a very good discount if I bought a decent amount of units so I agreed and this updated version of the clamping system is now available. It does not require any wiring or electricity and it goes together very easily.



Understanding the Idea

As mentioned previously, it wouldn't be too difficult to directly connect the vacuum press to a vacuum clamping jig. But there are two issues with taking that approach. The first is that the pressure in the vacuum reservoirs would be depleted when switching between the clamping boards. The other issue is the amount of strength it would take to remove the work piece from the jig while vacuum pressure was applied.

By using a 3-way latching (tap on, tap off) foot valve, pressure can be applied to the clamping template and be instantly released as needed. This kit doesn't force the pump to run continuously. Instead, the pump only runs when the vacuum reservoirs need to be recharged.

Whether it's a simple hold down jig or a production run of vacuum template projects, you're going to get a kick out of using the power of vacuum to hold projects in place!

Parts List:

(A complete kit is available at VeneerSupplies.com)

- 3-Way latching pneumatic foot valve
- Street elbow (short) - 1/4" NPT
- 2" Brass pipe - 1/4" NPT
- Vacuum filter - 1/4" NPT
- Brass barbed elbow - 1/4" NPT to 1/4" barb
- Tank adapter ("Vacuum Clamp Fitting") - 1/4" NPT
- Long street elbow - 1/4" NPT x 1.5"L
- Brass barbed tee
- Brass hex plug
- Vacuum sealing tape
- Vacuum jig tube - 10'
- Brass barb fitting - 1/8" NPT to 1/4" barb
- HDPE panels

Pneumatics Assembly

1. Place two passes of thread-sealing tape on each of the male threads from the parts list shown above. Wrap the tape clockwise around the fitting.
2. Remove the plastic plugs from the three ports on the foot valve.

- Using an Allen wrench, attach the brass hex plug to the B port on the foot valve.
Note: This is a new step. If you purchased a clamping kit from us between 11/06 and 1/07, please contact us for this new part.
- Attach the brass street elbow to port "A" on the foot valve. When it is tight, it should be facing toward the "B" port.
- Attach the 2" brass pipe to the street elbow from the previous step. Don't worry about tightening it much yet.
- Attach the filter to the brass pipe. The arrow on the top of the filter shows the correct direction of the vacuum flow. It should be pointing towards the street elbow. When the filter just becomes snug, continue tightening until the filter is parallel to the body of the foot valve as shown below.
- Attach the brass barbed elbow to the remaining port on the filter. When tight, it should be facing upwards.
- Attach the "tank adapter" fitting to the long brass street elbow.
- Attach the long brass street elbow to port "P" on the foot valve. When tight, the tank adapter should be facing upward.

The final assembly should appear as shown in the picture below.

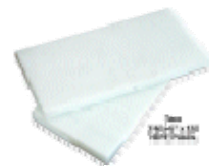
Place your cursor over the picture to label each part.



The Vacuum Jig

A jig/template can be made from any $\frac{3}{4}$ " thick non-porous material. I've found that HDPE (high density polyethylene) works incredibly well. Here's why:

- It can be machined with woodworking tools easily
- It's non-porous
- It's flat
- It's professional looking
- It holds vacuum sealing tape quite well, yet it also allows it to be removed without much fuss



I've tried cherry and maple lumber for the jigs but was unable to get it to hold a vacuum unless it's given a thick coat of polyurethane. Plywood doesn't work well either (unless it is Baltic birch).

For vacuum clamping (vacuum hold-down) the jigs can be made in any size needed. A clamping jig that is 6" x 12" is very useful. In fact, two of these jigs will clamp almost anything you can think of. I'll explain how in a moment.

To make the hold-down jig operational, you have to create a simple air channeling system to direct the vacuum pressure to the work-piece and optionally, to your workbench. For $\frac{3}{4}$ " thick jig material, a $\frac{1}{8}$ " NPT brass barb fitting works perfectly because it's small enough to prevent the edges of the jig from cracking. A $\frac{11}{32}$ " drill bit will give you just about the right opening to thread in the brass barb. Select which side of the jig is most convenient for the vacuum tube connection and drill a hole $\frac{1}{2}$ " deep. Then use a $\frac{3}{16}$ " diameter drill bit to make the same hole 2" deeper. Be sure to plunge the bit in straight (this is critical). We'll call this the air channel.



Now carefully measure to the end of the air channel and drill from the face side of the jig into the air channel. Do not drill all the way through the jig yet! Here's why... If your workbench is porous, you'll need to use a hand clamp to attach the jig to your workbench. A hole on the back side of the jig will waste vacuum pressure.

However, if your work bench is smooth, flat and nonporous, you can drill the hole all the way through the face of the jig. This way the jig will pull down onto your bench and hold the work piece at the same time.

Attach the $\frac{1}{8}$ " NPT brass barbed fitting to the hole on the side of the clamping jig. Be sure to use adequate downward pressure. Remember that you are threading the fitting into unthreaded material. Be certain that you do not over-tighten the fittings and strip the plastic threads.

Apply the Vacuum Sealing Tape

Now that your jig is formed, you only need to add the vacuum tape to complete the unit. On the face side of the jig, start applying the tape within a quarter inch of the edge. Butt up the next piece as tight as possible and continue adding vacuum tape around the perimeter of the jig. Cut the last piece $\frac{1}{16}$ " longer than needed and press it tightly into the edge of the first piece of vacuum tape so you have a nice, tight seal all the way around.



The jig is complete if you are manually clamping it to a porous workbench. If you are letting the jig clamp itself to the bench, you need to apply the vacuum tape to both sides of the jig. Duh!



One thing to remember about the vacuum tape... for vacuum clamping, ordinary closed-cell insulation tape will work fine. Look for tape that is $\frac{3}{8}$ " wide and not more than $\frac{1}{4}$ " thick. However, for vacuum templating you need a vacuum tape that will hold the work piece solid against the template. Ordinary insulation tape will not work for this application. A specialized vacuum tape is needed (one that will not allow shifting or "creeping"). If the tape allows any shifting, the router will grab the work-piece and gouge it.

I tried 3 dozen different vacuum tapes and finally came across one from a specialty manufacturer that works flawlessly. It's strong, durable, and a bit expensive. So I bought 12 cases to get a good deal and I'm offering it at VeneerSupplies.com much cheaper than anyone else on the Internet. In fact, this same tape is sold elsewhere for \$40 per roll. I have no overhead or employees to support so I can offer the tape nearly at cost.

Attach the Tubing

Attach one end of the blue vacuum tube to the barbed fitting on the HDPE jig. Then attach

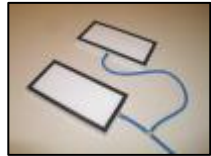
the other side to the barbed fitting on the vacuum filter. The tubing is soft so it will pull off the barbs without much fuss.

Why did I opt for the high flex tubing instead of the braided tubing on the main vacuum press system?

I used it because its less expensive, more flexible, and the bright color has kept me from cutting through it with my router when I doing vacuum template routing. I can't tell you how many times I accidentally ran the router over clear vacuum line and ruined a work piece. I found that when there is a ton of saw dust on my bench, that the blue tube shows through better than the braided stuff and I haven't cut it through since I made the switch.

Adapting the Jig

As previously mentioned, an extra 6"x 12" jig will come in handy for larger work pieces. You can make an additional jig and connect it with vacuum tube to the main jig using a brass barbed "T" fitting as shown.



If your clamping project is smaller than the jig, simply move the vacuum tape and make a smaller area of vacuum surface as shown.



Operation

To use the clamping system, attach the lock-on connector from the vacuum press to the tank adapter fitting on the foot valve assembly and turn on the vacuum press system. The system will put vacuum pressure in the reservoirs and cycle off. It won't cycle on again until the reservoirs need to be recharged.

When the foot pedal is first depressed, it will lock in the "open" position and vacuum pressure will flow from the reservoirs to the clamping jig. To instantly release the pressure from the jig, press the foot pedal again. You may hear a slight rush of air from the breather fitting (inside the foot valve) as the pressure from the jig is unloaded and the work piece is released. It's just that simple.