

Tool Tip...

Page 1



## Adding a Gauge to Your Bottle Jack

by Patrick ( Doc ) Ferguson



Figure 1: Remove the oil plug and drain all fluid.



Figure 2: Removal of the piston.



Figure 3: Removing the outer case.

### Introduction:

Inexpensive bottle jacks have long been popular among rocket and fireworks builders for pressing operations that require several tons of force. However, there is no way to tell how much pressure is applied with these jacks, which is useful information when trying to get consistent results from items such as rockets, comets, black powder pucks etc.

This article shows how to add a pressure gauge to a typical bottle jack. The jack used here is your run of the mill cheapo from Harbor Freight or other discount supply houses. This one is a 4 ton unit, but the six ton and higher are constructed nearly the same.

### Dismantling the Jack:

Start with removal of hardware for the handle to get it out of the way. Set the parts in a safe place so you don't lose them.

Next remove the oil fill plug and drain the fluid into a container. You will need to pour this fluid back into the hole when you are finished. Figure 1 shows the typical location for the oil plug plug.

The large nut at the top of the jack must now be removed. Secure the jack base in a large vice and use a pipe wrench to fit around this nut. The use of a cheater bar is recommended, which is a short length of pipe that can be used to extend the wrench handle for more leverage. Once the nut is loose, you can unscrew it by hand and remove the piston, as seen in Figure 2.

The outer casing is now removed from the reservoir unit. Now comes the real bear! The removal of the inner sleeve that is screwed into the reservoir by two men and a boy from China. This will take a good vise to hold the unit. Using a pipe wrench again with the cheater bar, turn it counter clockwise to loosen.

### Tapping the Reservoir:

Figure 4 shows where you will need to drill holes into the reservoir base. You will need to drill small pilot holes first using a 1/16" bit, then drill again using a 1/8" bit. The hole in the side will need to be tapped for a 1/8" NPT fitting.

I have opted to put the gauge on the side opposite where the pump handle is so that it can be easily read while pumping the jack.

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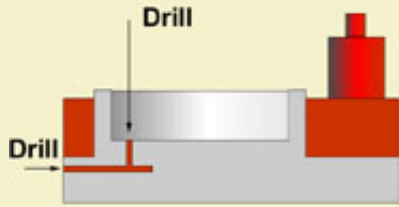


Figure 4: Cutaway view showing where to drill your access holes.



## Adding a Gauge to Your Bottle Jack...

Page 2



Figure 5: Using gauge assembly to mark center of side hole.



Figure 6: Checking the depth of the side hole.



Figure 7: Test fitting the 1/4" fitting.

Before drilling any holes, first set your gauge just to see where center should be located, as seen in Figure 5. Use a center punch to make a dimple where the hole will be drilled. This will keep your drill bit from "walking" off the spot where you want the hole.

Drill the side hole first. I would suggest using a drill press machinist vice if you have one or you will have to rely on a friend to hold this good and tight while you drill. The metal is very soft so it has a tendency to grab. Take your time.

Now you need to find the center of the hole you drilled into the side. Make a small pilot hole first again, stopping once you intersect the hole you put in the side.

Once you have drilled through the top and struck the cross drilled hole you can insert a bit to see that your channel is deep enough, as seen in Figure 6.

Now that you have a good pilot hole you can drill and tap for 1/8" NPT thread. Try your fitting out to see that you have enough threads, as in Figure 7. Note that hydraulic fittings are used between the jack and the gauge, due to the low pressure ratings of standard plumbing fittings. Most small bottle jacks will generate between 5000 and 7000 psi, which far exceeds the pressure ratings of plumbing fittings.

### Reassemble and Test:

Disassemble the fittings and clean the unit thoroughly with cleaning solvent prior to final assembly. Blow out all debris with an air hose. You don't want any filings to be floating around in your fluid!

After a through cleaning, reassemble the jack in the reverse order that you disassembled it. Make sure you get all the fittings tight. This is where you need a big vice and pipe wrench again. Assemble the piping system for the gauge using sealing compound or Teflon tape around the threads of each joint.

Replace the fluids and replace the fill cap if you have not lost it. Remove the gauge from the fittings and pump the handle until the fittings fill with oil. You do not want any air bubbles in the system or your gauge will be inaccurate.

Finally, reconnect the gauge and apply pressure to the jack in order to test for leaks.

There were many predecessors in this project. The [Tap A Jack](#) site has a good amount of information-- thank you very much Nick. Lloyd Sponenberg also provided valuable advice on the types of fittings to use. Northern Tool Equipment is recommended as a source for some fine gauges. I need to fine





tune my jack now, possibly go to a liquid filled gauge that Northern Tool has.



Figure 8: Reassembled jack with new gauge.

