

ASP M98 Pump Kit



Air Soldier Products developed the M98 pump kit at the request of an overseas customer that needed to work around laws prohibiting the importation of semiauto paintguns (though use of semiauto paintguns was entirely legal). Thus, the kit was designed to be removable – a kit could be applied to a gun to make it pump action, the gun legally imported, then legally converted to semiauto. Several dozen conversion kits were made, but before they could be used, the laws were changed to allow importation, and the kits were sold off at a loss. Still, there has been an enduring interest in the conversion details, which this document will cover. Manufacture of the custom parts required a mill and a lathe, though a skilled person could do everything on just a lathe, and by modifying the design a bit, a person could probably do the conversion with just a drill, Dremel, files, and a bit of patience.

The kit included these items:

- Stock valve with blowback restrictor plate installed
- Cocking knob (manufactured by ASP)

- Pump rod and attached cocking plate (manufactured by ASP)
- CMI Pro/Carbine barrel with pump stop collar attached
- A Lapco Pro/Carbine barrel adapter
- CCI Phantom black Delrin pump
- 3 cut down Maddmann mainsprings (soft, medium, hard)

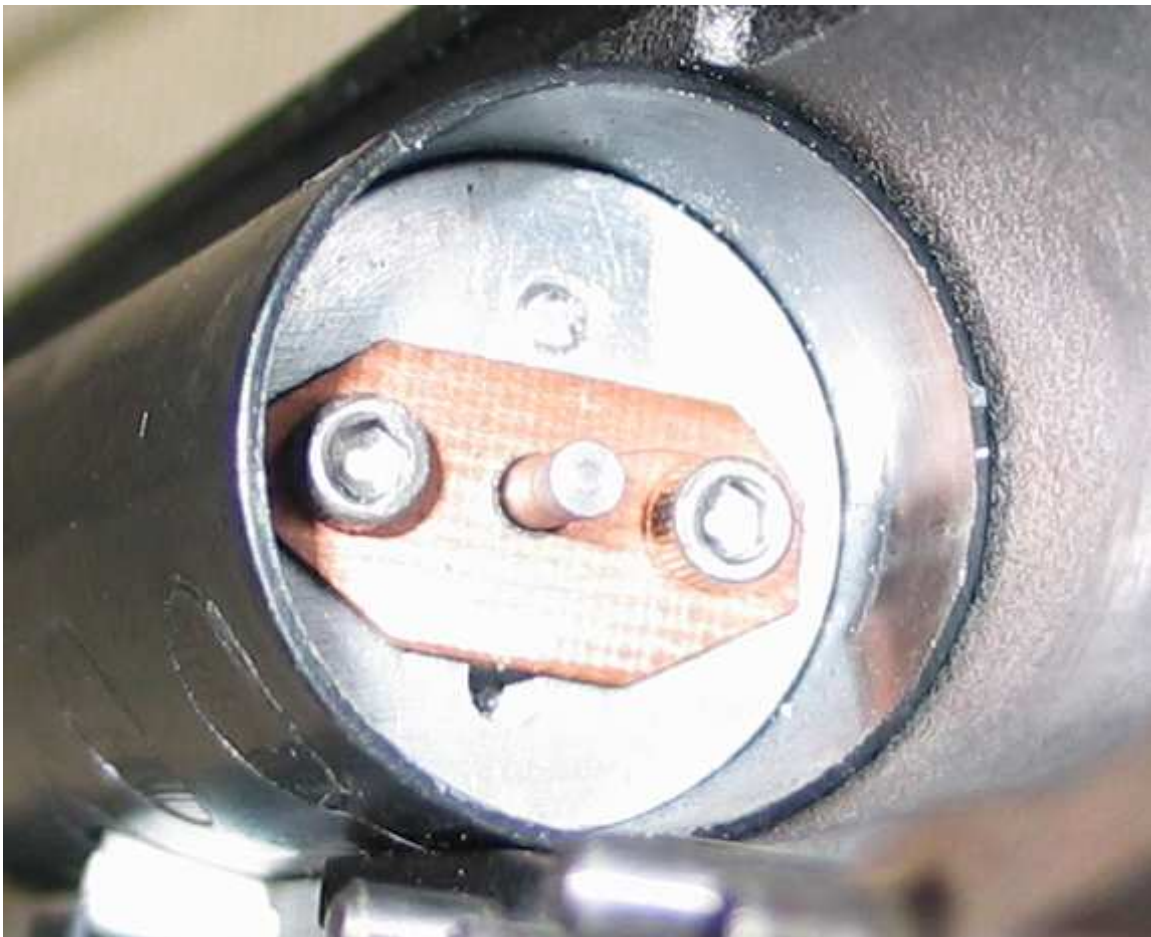
Since the Tippmann Model 98 is a blowback operated gun (a small burst of gas at the valve is used to propel the hammer rearward and recock), killing the burst of blowback gas will keep the gun from recocking, and the gun will have to be manually recocked with each shot. For those familiar with old school guns, a converted M98 operates just like a Brass Eagle Nightmare – a pump arm with a slotted plate engages the cocking knob on the hammer to cock the hammer.



Killing the blowback gas is done by two things: modifying the valve with a restrictor plate, and removing the o-ring from the bolt. I recommend doing both of these – removing just the o-ring may keep the gun from recocking reliably, but the gas usage will be high due to hammer bounce (more on this later). The restrictor plate is extremely simple – on a blowback gun's valve, there is extra room between the valve body and the valve stem (unlike, say, an Autococker, which has no room between the valve body and valve stem – just enough space to slide freely, and no more). When the hammer strikes

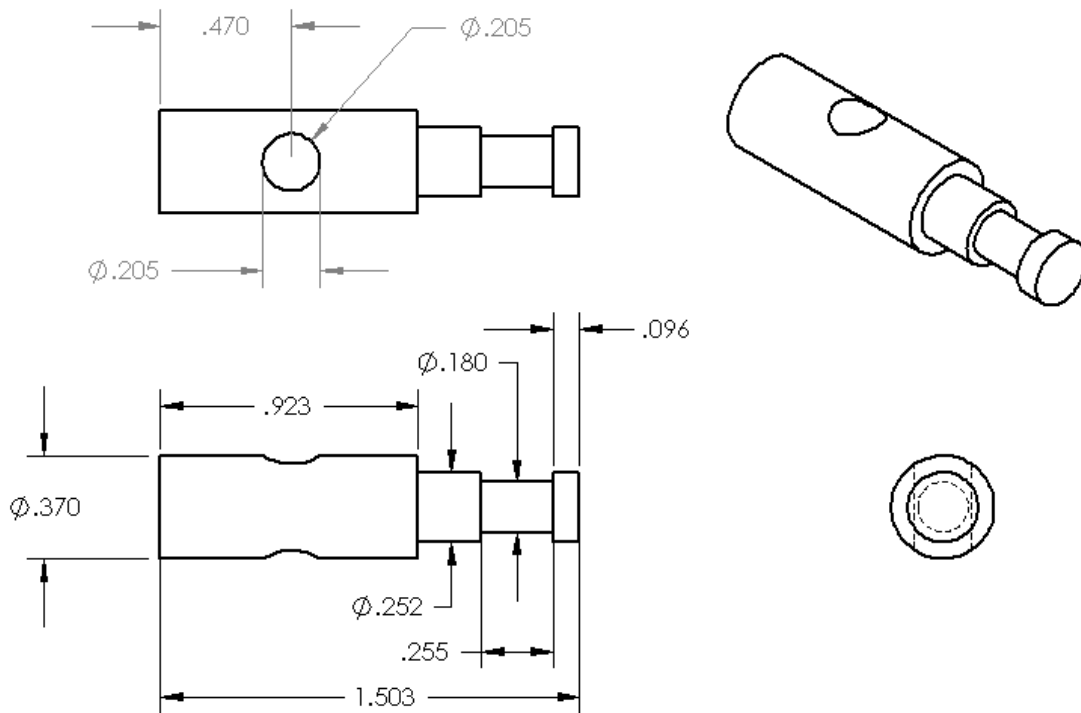
the valve stem, air is directed to fire the ball, but a small amount of air 'leaks' around the valve stem to push on the hammer (sealed in the body by the o-ring), which blows it rearward (hence the term blowback) to recock the gun. The restrictor plate simply blocks this burst of air by having a hole just large enough to allow the valve pin to pass through.

I made the restrictor plates out of 1/32" copper clad PCB board (what circuit boards are made out of) – while other materials might be more appropriate, I used PCB board because it is very stiff (having a fiberglass core), won't gall against the valve pin, and because I had some handy. I drilled and tapped a pair of holes on either side of the valve pin to secure the plate against the rear of the valve body by way of two 4-40 socket head cap screws. Here's what the plate looks like installed (ignore the holes drilled just above and below the plate in the photo – this was a prototype after all, and mistakes were made):

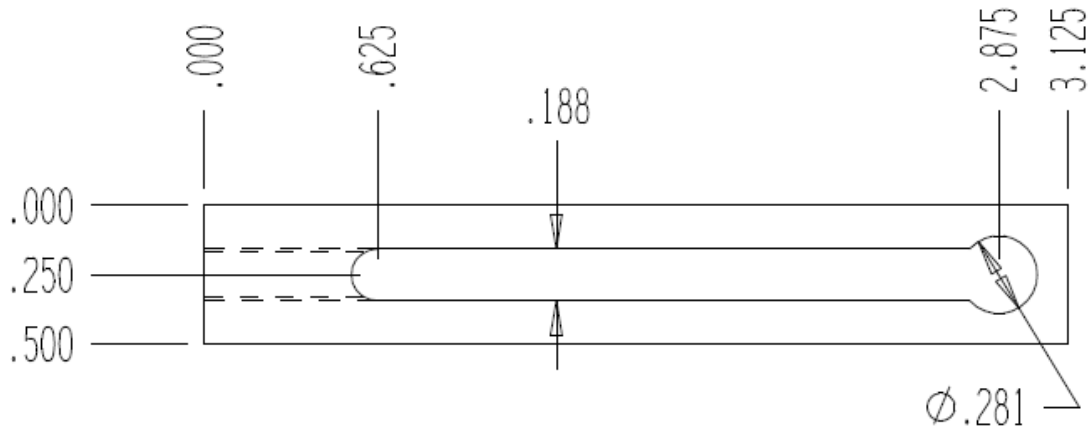


The cocking knob and cocking plate were the next part of the conversion. Since the pump rod would have to be quite long, I machined a replacement cocking knob with a groove that would engage the slot in the cocking plate. This would keep the plate from popping off the cocking knob accidentally. I used stainless steel for corrosion resistance, but plain carbon steel will work just fine as long as you protect it from rust. Double check your own hammer to make sure that the cocking knob will fit – I designed the knob

to fit my own personal gun, but later Tippmanns were manufactured to different tolerances and the main diameter of the knob had to be turned down slightly, or the hole in the hammer had to be enlarged.



A hole in the rear of the plate allows the cocking knob to slip through for assembly/disassembly. I used 6061-T6 aluminum for the cocking plate with a plain black anodized finish.



The plate is 1/4" thick, and is drilled and tapped on the end for 10-32 threads (indicated by the dashed lines). Note that it is a good bit longer than needed, and the length can be shortened by about 3/4".

The cocking rod is a piece of 3/16" diameter stainless rod, 11" long, with 10-32 threaded ends (I ran a 10-32 die 1/2" down each end). Just like on an autococker, the pump rod has to be bent slightly to account for the hole in the pump being off-axis with the hole in the cocking plate. I made two bends on one end of the rod – one 3/4" from the end, and one 1-3/4" from the end so that one end of the pump rod is jogged out about 3/32". Precision isn't important here – while I do have a bending jig, I simply marked the rod at the two bend points, stuck it in a bench vise (using aluminum blocks so as not to mar the rod surface) and eyeballed the bends until they looked about right. The end with the bends is the end that will be threaded into the pump – use a bit of threadlocker on the other end and thread it into the cocking plate.

Now, for the front end of the gun. I used the Delrin pump from a Phantom, as it was readily available from CCI. The main trick was in finding a suitable barrel - the Phantom uses a straight 7/8" OD barrel, and I looked around for a 7/8" OD barrel in M98 threads, but without luck (I was later told that J&J Ceramic M98 barrels are suitable, but I never verified this for myself). So I opted to use a Pro-Lite barrel (from CMI) that has a 7/8" OD with a Lapco thread adapter to mount it to the M98. The only remaining part was the addition of a 7/8" clamping collar (available from various industrial suppliers) to the barrel to act as a forward pump stop.

More recently, CCI has offered a pump with a 1" ID for use with certain aftermarket Phantom barrels that have a larger diameter. This is an ideal way to use a much wider variety of M98 barrels (though one with a straight shank would still be needed, and a stop collar still has to be added). A disadvantage is that the 1" ID pump has a slot on the top, which would then be on the side when used for a M98 pump kit due to the pump rod location – the user would have to keep their fingers clear.

The last part to worry about is the mainspring. When I first made the prototype kit, I found that if I used the stock mainspring, I'd have to turn the velocity adjuster all the way in to bring the velocity down to a safe level. So I tried cutting down some Maddmann springs to see if that would help any, and it did, but I still had hammer bounce (also known as 'valve honk' or even 'farting', which is caused by the hammer rebounding a few times between the valve spring and the mainspring – this hammer bounce releases a bit of gas every time it whacks the valve stem, which is bad for efficiency). I've found that you can eliminate the valve honk by stretching a few rubber bands between the cocking knob and the back of the barrel, but this is obviously a solution with minimal aesthetic appeal! But it does show that perhaps more spring tension and not less is what's needed. This is where the experimentation comes in – you'll have to tinker with the springing to see what work best for your particular M98. If you don't mind the valve honk, then by all means, run with the system 'as is'.

The one final tweak that I had considered but never implemented on the kits was a guide rod for the pump – the pump has the ability to twist around on the barrel somewhat, though this turned out to be far less of an issue than I had first worried. By attaching a guide rod to the stop collar (about 2" long, 1/4" diameter) and drilling a matching hole in the front of the pump, twisting of the pump on the barrel would be eliminated. Of course,

this would also mean that the stop collar would have to be removed to remove the barrel from the gun!

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