

obvious reasons I don't particularly care."

Now cleaning in the middle of an event does have problems, and this is because of a concern that on the next relay, cleaning their barrel will have changed the accuracy and initial point of impact of the rifle enough to ruin their score with a single shot, and running 10 or 20 rounds down the barrel to re-foul may not be possible or allowed by rules.

This is where knowing just how large your accuracy window is plays a critical role. From testing and practice, you should have nailed this accuracy range down pretty well, and if your event does not span that range in terms of round count, then my best advice is to not clean the barrel during the event. The risk of landing a poor shot on a target or completely missing a Silhouette animal is not worth the slight gain in accuracy. A one-inch error in shot placement at 50 yards is not worth the risk.

If there is a chance to clean and re-foul the barrel at one of these events, then follow the process described in the Benchrest section of the essay. Do not completely clean the bore down to bare metal. I have shot in some prone events which allowed for shots on a sighter target at the start of each relay, and these make cleaning the barrel and re-fouling possible.

Same goes for 3-Position shooters. If there is an opportunity to clean your barrel between positions, if you expect your round count to push past your accuracy window, and if you have a chance to take a few fouling shots on a sighter target, then you should do so. The top prone shooters are skilled enough to shoot the difference in accuracy between clean and dirty barrels, and it seems that first place is decided by a very slim margin. Don't leave things like accuracy to chance if you have the opportunity to maintain it.

As for the shooters who never clean their position rifles, unless you are nailing down the Olympic quota slots along with World Cup wins, you may want to reconsider that.



Smallbore Silhouette

For my silhouette rifles, I tend to not clean until the end of the day, regardless of how many rounds are fired in an event. Consider that you only have 40 to 80 rounds for score during a match (well within most accuracy windows), and there is no opportunity to establish a new layer of fouling down the bore, why bother with it? Again, there are no sighters once the match begins.

With the size of the targets in silhouette, a slight gain in accuracy of a clean barrel when compared to a dirty barrel with 80 rounds down the bore will more than likely never be difference as to if I miss a target or don't. Pointing the gun in the wrong spot when I pull the trigger is what causes me to miss a target in silhouette.

If you follow the same process as I do, where you don't put dirty guns away at the end of the day and you don't let a black ring to develop the chamber, you'll more than likely be able to shoot a few hundred rounds before you start to suffer from accuracy problems in a position rifle.

Semi-Automatic .22lr Rifles

Unlike bolt-action rifles, the semi-automatic rifle requires attention to both the barrel and the action for proper function and accuracy.

As a quick review, the functioning process semi-auto rimfire rifles use a cycling system known as: "blow-back." This is where a small amount of energy from

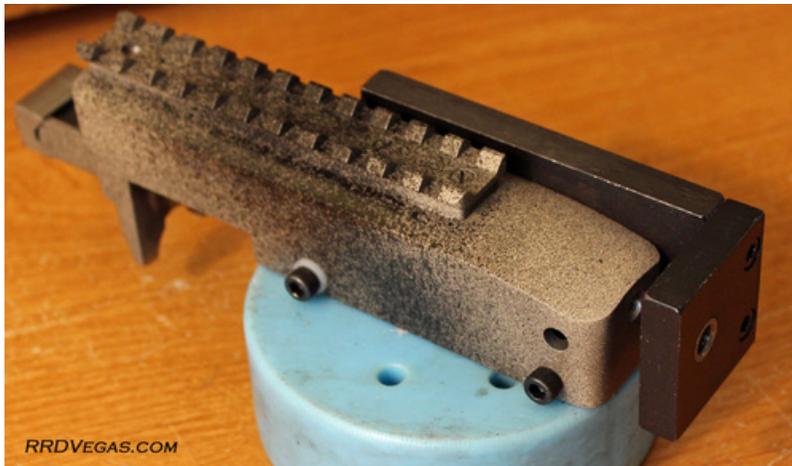
the combustion process of burning powder, which launches the bullet, to push the bolt rearwards and eject the spent casing and then load a new one.

There is a balance between the weight of the bolt, the strength of the recoil spring, and the energy of the expanding gases in the chamber and barrel. When everything is nice and clean, the system works great. Once fouling begins to build up in the barrel and action, problems surface.

These accuracy problems can be buildup of fouling in the chamber and barrel, as we have already discussed, as well as fouling building up in the action and bolt. We will first start by addressing the barrel and receiver cleaning process and then turn our attention to the bolt assembly.



Tactical Solutions X-Ring



Receiver Drilling Jig

What I find frustrating with many semi-auto platforms is that there is no easy way to access the barrel from the rear of the action. Rifles like the Ruger 10/22 and others use a large bolt that requires the rifle to be taken apart to remove.

Further, the rear of the receiver is solid without any way to access the barrel even when the bolt and trigger group is removed. This is why the bore snake is so popular for these rifles.

For those of you who want to use a cleaning rod on your semi-auto, you have to drill a hole into the rear of the receiver to gain access.

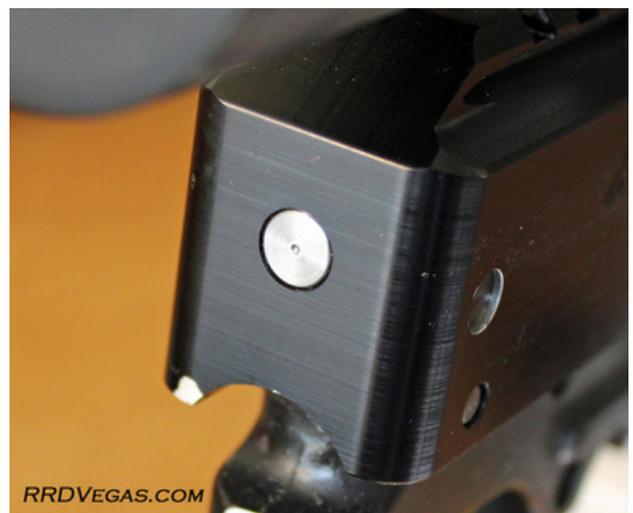
There are a few ways to do this, but the best is to use the receiver drilling jig from Brownells. It's a simple tool to use, and screws into the action through the existing trigger group holes and lines up your drill in the right spot to create an access hole.

Once the access hole is drilled, you can now leave the barrel attached to the receiver and clean the action from the rear as you would a traditional rifle.

Some custom actions like the Tactical Solutions X-Ring actually come with this hole already machined as a standard feature. They use a decorative plug to keep dirt and dust from getting into the receiver, and to give the action a more finished look.

Like the original Ruger design, these custom actions still incorporate a recoil buffer pin of some kind which prevents the bolt from impacting the rear of the action. Most modern buffers are made from a softer polymer rather than the steel pin that Ruger uses.

This not only protects the receiver from the pointing forced of the bolt striking the steel cross buffer pin, but also makes the rifle noticeably quieter.



X-Ring Rear Access Port



X-Ring Receiver After 2000 Rounds

The cleaning procedure for the semi-auto barrel is actually similar to the sporting rifle, with a bit more work needed to clean the action. Actually, it takes a lot more work to clean the action.

Rimfire ammunitions foul terribly in semi-autos, and this is due to the hot combustion gasses following the empty cases out of the chamber when the rifle cycles.

These hot gases are loaded with carbon, wax lubrication, and small bits of lead, and do an excellent job of coating the inside of the action with a sticky, gritty kind of fouling which builds up surprisingly fast.

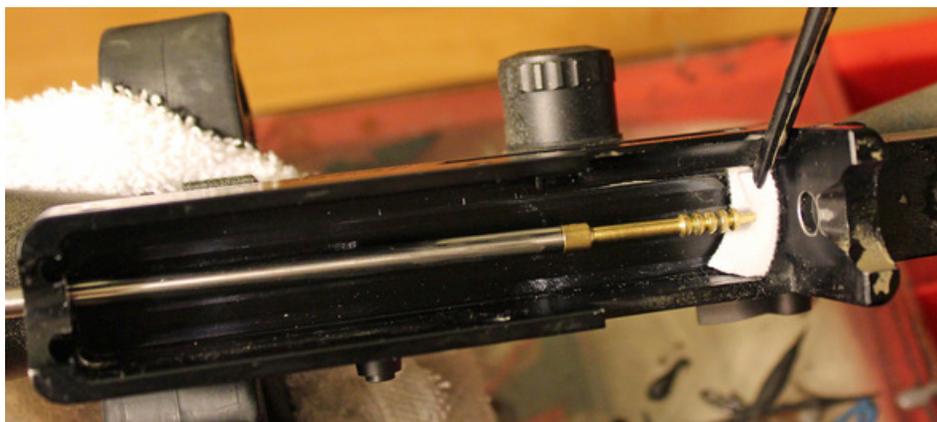
Once you have the bolt removed, the first thing you need to do is clean all of this receiver fouling away, or you will just end up dragging it into the barrel when you run patches down the bore.

I use a large set of tweezers with some soaked patches in solvent and mop out the bottom and sides of the receiver. This take a number of patches and some scrubbing from a tooth brush.

Don't forget to completely clean off the breech face as well. The bolt has pounded the fouling against the face and it will take some time to remove this. I also use a small flat-head screws driver to dig out any heavy fouling from the extractor groove. The fouling get packed in there and it may take a bit of prying to loosen all the debris.

Because you're running a rod from the rear of the receiver through a small hole, and then spanning the gap between the end of the receiver and breech face, it would be nice to have a rod guide to help keep things running straight.

Unfortunately, since there really is no rod guide available at this point, you have to be careful and not press the cleaning rod hard against the rear access hole in the receiver. This can scratch the coating on the rod.



The access hole does a fair job in keeping the cleaning rod in alignment with the bore, it not to the same effect as a proper rod guide.

Unlike the bolt-action rifle where you place the patch on the jag and then soak the patch with solvent, you actually want to run the cleaning rod through the access port and then apply the patch and solvent. The reason why is that when you jam the soaked patch through the small access hole in the rear receiver, you squeeze off most of the solvent or cleaning paste as you pass through that hole.

I use a set of self-closing tweezers to hold the patch in place near the breech face and I guide the rod through the hole, pierce the patch, and remove the tweezers. Then I carefully run the rod for the length of the barrel. It's a bit of a chore, but it keeps the work bench from becoming a complete mess.

I also follow the same process when using a nylon brush. I apply the solvent to the brush once the brush is inside the receiver past the access hole. If you apply solvent to your brush first and then run it through the access hole, most of your solvent will end up splattered across the rear receiver and not much will be left of the brush.

To deal with the pool of solvent that will begin to grow inside the receiver, I keep a small piece of cloth or a few patches tucked up underneath the breech face where it pokes into the receiver. If you don't keep this pool of solvent from sitting in the receiver, it can creep in the screw holes for your scope base or even work around the barrel shank loosening the fit to the action.

Because semi-autos tend to consume more ammo per range session than a manually operated rifle, it also grows the black ring in the chamber at a much quicker rate. Without question I short stroke all the chambers on my semi-auto rifles with JB bore paste. As described in the Sporting Rifle section, JB bore paste is a great way to clean the chamber and remove any buildup in the chamber or leade angle.

Once the chamber is cleaned, I finish the rifle with more wet and dry patches. With the receiver and barrel ready to go, I take some time and clean out the bolt of the rifle, including the firing pin and channel, as well as the bolt face and extractor slot. The rifle can then be reassembled with a few drops of light weight oil where needed, depending on the action design.



The 17's

Bolt-Action .17 Caliber Rifles

If there is a rimfire that requires a delicate touch when cleaning, it would be the 0.17" caliber rifles. More people have bent cleaning rods and gotten jags stuck in a barrel with this caliber than any other caliber I know of.

The smaller bore diameter can be a trick for some shooters to deal with, but with a little more attention to detail, it should be no more difficult to clean and maintain than any other rimfire caliber.

When it comes to 0.17" caliber barrels, I have spent quite a bit of time shooting them in the field over the past few years. Currently I have five rifles and maybe an additional three barrels chambered between the 17 HMR and 17 Mach 2, and when I head out into the field on a varmint hunting trip, I always have at least one with me.

This past year I shot a little more than 3,000 rounds of 17 HMR and nearly 7,000 rounds of 17 Mach 2, and after every trip to the range or out in the rifle, I cleaned the rifle.

The following discussion is based upon my experience cleaning these barrels, not only from a precision and accuracy point of view, but from a high-volume shooter's point of view as well.

While I'm not an advocate of pull-through bore cleaners, this may be one application where a heavy-handed shooter would better off using a pull-through system versus a rod.

Since we have already discussed the different types of pull-through cleaning systems and how they work, I won't go into the detail about the pro's and con's, so if you're more comfortable with one of those in this situation, then by all means use it.

Just know there are shooters who have broken off various pull-through cleaners inside the barrel of a 0.17" caliber rifle and ended up with a real serious problem on their hands. Even with a bore snake or cable system, you still need to use a bit more care with the 0.17" caliber bores.



17 HMR Casings

Patch size is a critical detail with these guns, and generally speaking, oversized patches are the most common cause of



Proper patch size (Left) for cleaning the 0.17" bore.

bent rods and patches becoming stuck in the bore.

It's important to not use the same patches to clean your 0.22" caliber rifle with; these are too large. You should use the 0.75" to 1.0" patches and nothing larger. I find the 0.75" patches to be the best.

A patch any larger will cause the cleaning rod to bow and rub against the lands as you push it down the bore. This will happen even with a rod guide in place, so the correct patch size is a must.

Because of the thinner cross section of the rod, it is much more prone to flexing than a thicker rod of the same length.

Like before, I start by cleaning the receiver and making sure that I'm not dragging more grit from the receiver into the barrel. Once that's done, I install the bore guide and take my

properly sized 0.17" caliber rod and matched jag, completely soak a $\frac{3}{4}$ " inch cleaning patch and carefully run it through the bore.

You may even want to slightly stab this patch off center if your barrel is extremely dirty. This will help ease it down the bore. For guns that I've been hunting with all day, I actually run a little bit of solvent down the barrel itself. I do this by holding the rifle pointed down with the muzzle sitting on a soft cotton cloth and with a little oil dripper I drop a bit of Kroil into the chamber, letting it run down the inside of the barrel. This will help lubricate the wet patch as it passes through the barrel.

With that first wet patch, it will tend to grab a lot as it passes through the barrel. There is not much room for the patch to squeak by. If you find the patch grabbing to the point where it feels as if it will get stuck, or if you have to use more force to push the rod through than you are used to, stop what you're doing leave everything in place.

Carefully tip the rifle muzzle-up towards the roof and drop a bit of solvent down from the muzzle into the barrel. This may help loosen up any fouling around the patch and add additional lubrication. Be liberal with the amount of solvent that you put in the bore because some of it will be absorbed from the fouling in the barrel. The goal is to help loosen the fouling around the patch and let you continue on.

No matter what, do not pound on the cleaning rod to get it down the barrel. I have seen this done at the range and it makes me crazy. Take your time and really soak the patch; it will come loose at some point. Taking time to do that is both cheaper and faster than replacing the barrel.

At this point you should be able to continue pushing the patch out the barrel. Once the first patch is through, the rest are much easier; it's the first patch that tends give you the most trouble. I follow that first patch with about ten more soaked patches, working at getting the barrel completely coated with solvent and removing as much loose fouling out of the bore as possible.

Once I feel the barrel is well soaked in solvent and the patches are starting come out clean, I switch to a different rod fitted with a 0.17" caliber nylon brush.

I dip the brush into a jar solvent, soaking all of the bristles, and I gently run it through the rod guide and into the bore. I feel that most nylon brushes for rifles are a bit too long; I prefer the shorter pistol-length brushes. That said, I still use the longer rifle brushes from time to time. It just seems that the rifles brushes are more prone to bending.

With the brush loaded with solvent, I work it back and forth a number of times, adding more solvent on each pass. The bristles are short and there's not much area to hold solvent, so to keep the cleaning process going I keep reapplying solvent.

After ten passes, I switch back to the first rod and run a number of soaked patches down the bore. Once those patches start coming out clean, I carefully run a few dry patches down the bore. If they start to stick on any remaining fouling in the bore, I switch back to the nylon brush and give it an additional ten passes. You should build a run a dry patch down a clean 0.17" caliber barrel without it getting stuck or grabbing on the sides of the bore.

From time to time I hear a question about whether 0.17" caliber rimfire loadings foul the barrel with copper like a centerfire. I have checked this on a few different barrels, and every now and then I have a little blue coloration on a patch when patching the bore with a strong copper solvent. It is nothing like the amount of coloring when cleaning a centerfire, so don't expect to

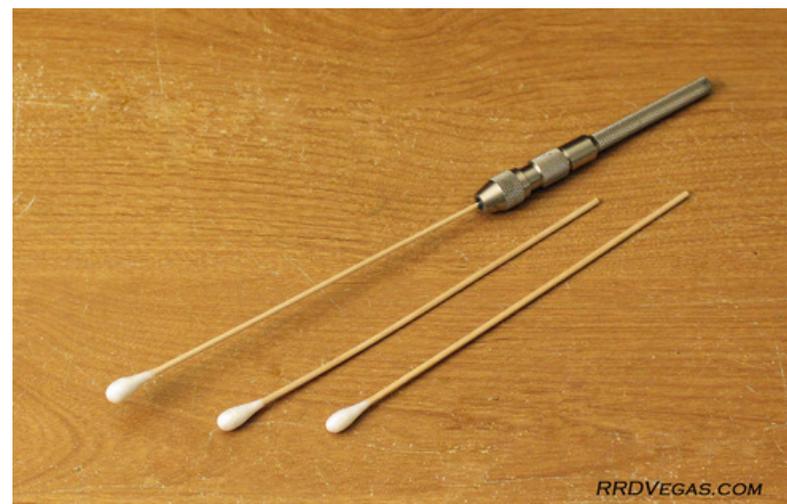
I test out all new 0.17" caliber barrels when I first get them, and about one out of five will have this characteristic. If I do find one that has a bit of copper fouling, I follow a basic process to remove the copper.

To do this, I take a few patches and I soak them in a strong copper solvent and I run those down the bore and let it sit for about 10 minutes. I follow that with a few more wet patches of the same copper solvent, looking to see if I get any traces on the patch (these are blue stains on the patch).

If I do find copper, it tends to be very light and a few more solvent patches seem to get rid of most of it. If I'm still getting blue coloring on the patch after a number of passes, I switch over to nylon brush soaked in copper solvent and make about ten passes. Then I repeat the process with more wet patches of the copper solvent followed by the dry patches looking to see where you're at by now you should have no blue streaks on your patches. As the barrel ages and breaks in, these traces of copper should no longer accumulate.



0.17" Caliber Nylon Brush



6" Cotton Swabs

Now what to do about the chamber..?

Because the 0.17" caliber rimfire rounds all use copper-jacketed bullets, you don't get a lead ring around the chamber, but you still get a carbon ring built up in the throat.

The upside is that it's not a sticky mess like the Black Ring is, and it's much easier to remove.

Because we are still dealing with the small 0.17" caliber bore, it's not really easy to short stroke lead angle and there are no VFG pellets that small.

You can try to wrap a patch around a worn-out brush or an undersized jag, but the problem is that unless you

wrap the patch very tight, you won't be able to fit it into past the shoulder in the chamber.

I have given this problem a lot of thought and found a very simple and low-tech solution to get this knocked out perfectly. I found

these cotton swabs amongst the pages of Brownell's in the cleaning section, and they are fitted with a six-inch long wooden handle.

They sort of a pain to hold onto with the end of your fingertips, so I insert the end of the wooden handle into a Starrett 240-C pin vice. This provides a good grip on the little wooden handle and gives me the reach to go through the receiver and all into the chamber. You could use any kind of small pin or needle holding device, but I'm a tool-nut so I use a Starrett pin vice.

With the cotton swab held firmly in the pin vice, I roll the soft cotton head in JB bore paste and use these to clean my chamber, throat, and lead angle of the barrel.

You can easily reach into the receiver and have plenty of room to short-stroke the chamber and lead angle with the JB bore paste. This does a great job of removing the carbon fouling in the throat and first inch of the barrel. It takes about two or three of these long cotton swabs to remove the carbon fouling, and then I follow that up with a final cotton swab soaked in solvent. At this point I install the rod guide and run a couple of wet patches followed by couple of dry patches down the bore. I keep working until the patches come out clean.

There's a lot involved in cleaning the 0.17" caliber, well at least if you want to do it the right way, and it takes a bit more patience, but I don't consider it worthwhile to shortcut this process considering all the time spent driving out to our hunting spots and the cost of ammunition.

Once I feel the barrel is clean, I finish cleaning up by running a few lightly oiled patches down the bore followed by a few dry patches. It's very important to not leave anything but a very, very light coating of oil in the bore. Error on the side of too little oil versus too much.



Copper Jacket (l), Copper Plated (r)

Bolt-Action .22 WMR and 5mm Remington

When it comes to cleaning these two rifle calibers, you can use nearly the same approach as you do with the 0.17" caliber rimfires.

There are some subtle differences, most of them being in the shooter's favor in that the bore is larger in diameter and you're much less prone to bending a cleaning rod.

You do not need any equipment different for these two calibers than you already have for the .22lr, but you still need to use a rod guide and it doesn't hurt to check the barrel for copper fouling on occasion.

Typically it is uncommon with these rounds but from time to time you'll find a barrel that just seems to develop a little bit of copper fouling. I think in all my time with these two calibers, I've seen two barrels chambered in .22 WMR that develop any kind of copper fouling.

One thing that is important to consider is that unlike the 0.17" caliber rimfires, not all .22 WMR bullets are copper jacketed. Some of the lower priced .22 WMR ammunition is actually copper-plated lead bullets like the .22lr. To clean for this type of ammunition, you can follow the identical process that you would use for the .22lr, discussed in the Sporting Rifle section.

The 5 mm is just the same but you need use a slightly smaller jag and cleaning rod. I suggest using 0.17" caliber equipment to clean a 5 mm, especially if you already have a 0.17" caliber rifle in your collection.

Sight Extension Tubes & Tuners

Sight extension tubes and tuners need to be cleaned on occasion as well. While they do collect a lot of carbon fouling, there is very little if any lead present on the inside of these devices.



That does not mean they are any easier to clean, but rather they take a strong carbon solvent to dissolve the baked-on layers of fouling.

For obvious reasons, if you wipe down the inside of the tube after every range session, they're pretty easy to keep clean. But most of us, including myself, rarely take the time to clean them on a regular basis.

Since the bullet (ideally) never makes contact with the tube, there really is no change in accuracy of the rifle between a dirty and clean tube.

Now if the inside diameter of the tube is narrow, the fouling can actually collect to the point where the bullet will strike the fouling in the tube as it passes through. I have actually seen this years ago on an old Time Precision tuner. The owner had never cleaned the inside of the tuner since he purchased the rifle, and all of a sudden the accuracy really dropped off. Upon inspection I found the

tuner almost completely full of fouling. I had never seen anything like that before or since.

There is also the possibility that if enough fouling builds in the tuner, it can begin to add weight to the unit and change the harmonic tune of the barrel. It would take a long time for this to happen, but I guess it could.

One of the challenges in cleaning some of these devices is that they are surprisingly long, with a few measuring 14" in total length. For longer tuners and tubes, you need some kind of device to help you reach down inside with some solvent and a patch.

You can use a short cleaning rod with a large pistol brush and a small cloth wrapped around it, or a specialized device like this aluminum rod in the photo. The knurled ends hold the patch surprisingly well.



Whichever tool you choose to use, the key is to get enough solvent on the patch to really soak into the carbon fouling in the tube. The fouling will absorb quite a bit of solvent before it can penetrate down to the bottom and loosen it from the tube walls. My advice it is clean these tubes as often as you can remember, and it will save you time in the long run.

As a side note to this, Eric Uptagrafft uses a 12 gauge shotgun boresnake to clean his sight extension / tuner. He uses after every event and it keeps the tuner from building up and debris. I am going to give this a try myself this season.

Closing Thoughts...

At this point, I think I have pretty well beaten this topic to death. There are a few small items that may get added from time to time, but at this point I'm not sure there is much more to say about cleaning.

I appreciate everyone who took the time to read through all the information. Many thanks. Now I'm off to go clean a barrel.

s.



10 months of rimfire casings saved...

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