

Scoping Smallbore Rifles

By David Grantham

1. Choosing the Scope

Choosing a telescopic sight for your smallbore (this article uses the NSRA smallbore definition, i.e., .22LR cal.) rifle is not as simple as you might think. The most common scopes are NOT suitable for smallbore rifles; they are generally designed for centerfire rifles.

Before proceeding further into this discussion we must deal with the term "parallax". Most shooters who use scoped rifles have heard the term, but few really know what it is or more importantly, how it can affect your ability to hit the center of your target.

When sighting through a telescopic sight best results are achieved when the reticle (crosshair) is seen in the same plane as the target, i.e., superimposed on the target. Basically, the optical problem called "parallax" occurs when the reticle is in a different plane, i.e., in front of the target. If you are looking exactly through the center of the field of view you can theoretically eliminate the parallax problem. If your eye is looking even very slightly to one side or the other of dead center of the field of view, the center of the reticle will appear to one side or other of the target center and if you move the rifle slightly to center the reticle on the center of the target, your POI (point of impact) will NOT be in the center of the target.

The above explanation is rather simplistic and it is recommended that you Google "parallax in rifle scopes" for more complete explanations and illustrations of parallax.

What is the impact of all of this parallax talk on choosing a scope for your .22 rimfire rifle? It is this: you must choose a scope which is designed to be parallax free at the distance/range you will be shooting OR you must choose a scope which has an adjustment to "dial out" the parallax at any distance. This is done by either an adjustable objective (AO) or by side focus (SF) adjustment.



SF (side focus) parallax adjustment on Nikon Prostaff 5, 4.5-18 x 40mm

If you will be shooting targets at 50m or less a scope designated “Rimfire”, i.e., for smallbore rifle will do the job. Rimfire scopes are designed to be parallax free at 50 yards and will be OK at 25m or 30m. Scopes intended for centerfire calibres are parallax free at 100 yards and will not work well at 50m or less.

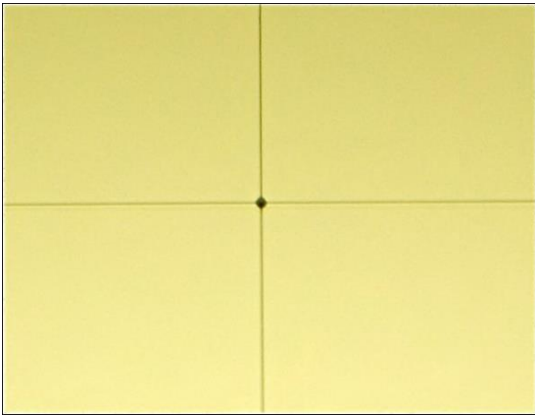
Rimfire scopes are generally in the lower power ranges, most commonly 4x, 2–7x, and 3–9x. Some of which are adequate sell for less than \$100; others of somewhat higher quality are in the \$200 to \$350 range. Because these scopes are relatively compact, light weight and inexpensive they are very suitable for small game hunting and for NSRA Smallbore Practical Rifle class at 50m, metallic silhouette at 30m, and pin shoots at 50m. For F–Class at 50m, a scope with the power and features noted below for 100m will be the best choice for 50m in that class.

Although a few smallbore competitors have had some success at 100m using scopes designed for centerfire and with no AO or SF adjustment, it is recommended that you use a scope with AO or SF for 100m target shooting such as the NSRA 100m F–Class and Benchrest. In addition, you will need more than 9x, usually a minimum of 10x or 12x for Benchrest, some use 20x or more. Very high power will not necessarily make you shoot better; in fact just the opposite may be true because very high power reduces the field of view, eye relief and (in lower quality scopes) the image brightness; scope vibration due to wind appears greater as power increases.

Scopes in the power ranges such as 4-12x, 4-16x and 6-24x with AO or SF for rimfire use can be found for as low as \$180, better quality for about \$300 to \$350, and top end for \$500 on up. Because of virtually no recoil from .22LR, scopes need not have the ruggedness of the higher end scopes needed for centerfire calibres.

In addition to the features noted above there are a few other things to look for in a scope to be used for target type shooting. These are:

- Reticle type - for most purposes a duplex type reticle is suitable, BDC (bullet drop compensator) or mil-dot types are not needed and are confusing to some; useful to others. For F-Class and Benchrest the reticle preferred by many is a fine crosshair with or without a small centre dot.



Fine crosshair with center dot.

- Elevation and windage adjustments - most scopes are 1/4" (¼ MOA) per click at 100 yards; a few Rimfire scopes are 1/4" per click at 50 yards; for precise 100m shooting 1/8" clicks at 100 are best.

- Target turrets - having target or semi-target adjusting turrets facilitates elevation and windage adjustments. It is a real advantage if you can get an elevation turret with lines on the fixed part of the turret which will allow you to keep track of the number of revolutions you have turned; these are not common on low to medium priced scopes.

- Adjustments should have positive, easily felt clicks and be repeatable, i.e. always come back to a previous elevation setting for a specific range.

- Objective lens size – for 50m and less, objective diameter can be relatively small, 20mm to 32mm are common. For F-Class or Benchrest at 100m, objective diameter of 40mm is adequate; 50mm or more requires higher scope mounting to clear the barrel and is not really needed.

- Tube diameter of 1" is fine for all of our NSRA smallbore shooting; 30mm may yield more elevation adjustment, but results in a heavier, more costly scope.

NOTE: Refer to the accompanying photos for illustrations of all of the information presented in this section.



Rimfire scope with semi-target turrets, Nikon P-Rimfire 2-7 x 32mm, Hawke rings mounted in dovetail.



Target turrets: SF on left, windage on right, elevation on top - note the lines below the movable knob which indicate number of revolutions, a great feature to have.

2. Mounting the Scope

2.1 For “Short Range”

Mounting a scope on a .22 rimfire rifle to be used for targets at 50m or less is quite simple provided the scope has been chosen using the guidelines noted above. The rings required depend on whether the receiver is grooved with a dovetail for scope mounting or it uses bases (usually Weaver type) or a rail (Weaver or Picatinny; they are similar, but slightly different in size).

If the receiver is dovetailed you must measure to check its size. American dovetails are designated as 3/8”; European dovetails are designated as 11 mm. To determine which size your rifle has measure across the top of the dovetail. If that dimension is 0.500” it is an American (3/8”) dovetail – yes, this is correct. If that dimension is 0.437” you have a European (11 mm) dovetail. This is important because the clamping plate on the ring bottom must be the correct dimension for the dovetail on your rifle. Some makes of rings come with two clamping plates: one for each size dovetail.

If there are bases or a rail installed on the receiver, any rings designed for use with the particular bases or rail can be used.



Bushnell Rimfire 4 x 32mm scope with coin slot adjustments, Bushnell rings mounted in dovetail, an inexpensive scope which works well at 50m and less.

2.2 For “Long Range”

If the rifle is to be used for engaging targets at 100m or more (as you know even 100m is “long range” for smallbore) things get a bit more complicated due to the ballistics of .22LR. The sight elevation settings for .22 are nearly the same for 25m and 50m. The trajectory is such, however, that there is a drop of about 8” (20cm) between 50m and 100m. This means that you must click up your scope elevation 30 to 35 clicks (for 1/4” clicks).

In many scopes this will nearly max out your elevation adjustment. This is not desirable because you will then not be sighting through the centre of the scope optics. To prevent this situation it is recommended that the scope be installed with a forward declination (slope or tilt). This will enable you to adjust elevation with-out running or nearly running out of adjustment and you will be sighting through the best part of the optics.

The two most common ways of achieving forward declination of the scope are: installing a forward declination rail (15 or 20 MOA are good for smallbore) OR installing Burris scope rings which have plastic inserts to tilt the scope as required. Use of these rings is the less expensive, but use of a rail is simpler. The Burris rings needed are: "Signature .22 Rings" for dovetail mounting or "Signature Zee Rings" for mounting on bases or a horizontal (no declination) rail. For specifics of how these rings are used contact the author. By the way, Burris is the only company making this type of scope ring. Caution: the use of shims to achieve forward declination is NOT recommended – you could bend the scope tube.



Weaver 4-16 x 42mm with semi-target turrets, AO (adjustable objective), mounted in Burris Signature Zee rings on Weaver bases in dovetail - note plastic inserts in rings.



Leupold Rimfire 2-7 x 28mm in Weaver rings on Weaver bases installed in drilled and tapped holes in receiver.

Finally, a few tips on scope installation:

- Center the reticle before installing – click elevation and windage all the way to stop (careful not to force beyond the stop) then click back counting the clicks until the stop is reached; divide by two and click back halfway. The reticle will now be centered.
- Clean scope tube, inside of rings, dovetails/bases, screws and screw holes with rubbing alcohol before you start the installation.
- Tighten rings to dovetail/bases very tight BUT do not over tighten the rings on the scope tube to avoid crushing the tube – hold right angled socket type wrenches by the short arm to help in this.

NOTE: As above, refer to the photos for illustrations of some of these details.