

BLACK GUN[®] MACHINE REST



*Guns, Scopes, Ammunition, Benches, etc. are not included.

Always Use Appropriate Eye & Ear Protection When Using This Device!

The Hyskore® Black Gun Machine Rest progressively absorbs the recoil pulse by employing two long (110mm) stroke nitrogen filled compression dampers assisted by adjustable coil springs. This gives it the unique ability to handle everything from .22 LR to .375 H&H. In addition, the dual rail design accommodates pistol grips and high capacity magazines. The gun can be fired from the shoulder, using the strap, directly off the shoulder without the strap, or with the strap and secured in the vise for repeatability testing. The entire vise assembly can be removed to expose a platform for rest bags and a remote hydraulic trigger release is Included with the set.

In the course of shipping and packing, parts may end up missing or damaged- call us at 631.673.5975. 8:30 a.m - 5:00 p.m. Eastern Time. We will promptly send replacements.

HYSKORE® BLACK GUN® MACHINE REST

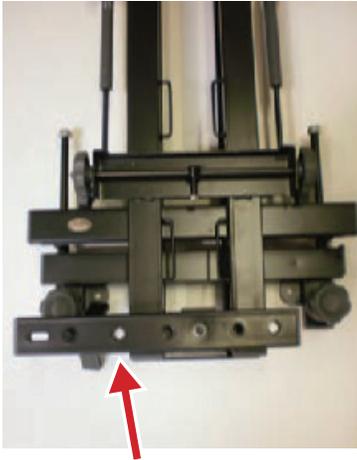
The Black Gun® Machine Rest will work well with any long gun however, the dual rail design makes it perfect for accommodating guns with pistol grips and high capacity magazines. The rest will function well with anything from a .22 long rifle up to a .375 H&H Magnum. This includes turkey loads and 12 gauge slugs. Rather than using high resistance and a shorter 1" to 1½" stroke, the Black Gun® Machine Rest uses light resistance and along (110mm) stroke that bleeds off recoil energy as it travels. The result is that even a gun with high recoil energy, such as the .375 H&H, will have all of its energy dissipated by the time the stroke is completed. The rest uses 2 nitrogen filled compression dampers, which are manufactured to the exact same resistance and tolerance to assure uniform application of pressure. As the piston is pushed back into the damper body it compresses the inert nitrogen gas and converts the kinetic energy to heat energy. When the stroke is completed the gas pressure pushes against the piston and returns the gun to battery. However, because the dampers are light resistance and the pressure generated by the gas may not be able to overcome the internal friction in the damper, it may be necessary to either push the gun carrier forward to full battery or to adjust the spring tension to accomplish the same. If you feel it is necessary, you can use acid-free machine oil on the shaft of the damper. Sewing machine oil or 3M oil works well in this capacity. One of the other key features of this rest is by tightening or loosening the spring retainer knobs on the underside rear of the rest, you can adjust the recoil resistance to fit your personal preference.

The Black Gun® Machine Rest is manufactured to as close a tolerance as workable with available raw material and technology. However, slight variations in raw material and slight variations in the thickness of the finish can, on occasion, cause binding. (Like many mechanical things it is not unreasonable to expect a break in period of from 100-200 cycles. This can be accomplished by shooting or manually. Anchoring the rest to a bench and working the gun carrier back and forth will accomplish the same result.) If further binding should develop, the solution is to use sand paper or Plumber's emery cloth to remove some of the finish build up on the four rods on which the four sleeves ride back and forth. In almost every case, this will solve the problem. For the same reasons the other situation that can develop is that there is a slight amount of play, and this is easily adjusted with the four slack adjusting screws located on each one of the above mentioned sleeves. Simply lighten the adjusting screw until it makes contact with the rod, back it off an ⅛" to ¼" of a turn and then tighten the lock nut. The other area that can be adjusted to remove play is the windage control. Simply back off the hex nut at one knob, then tighten the knob to remove the play, and then re-tighten the hex nut to lock the knob in place. There is a fine elevation adjustment located underneath the rear platform. By turning the thumb knob you can raise or lower the rear of the rest. As this is a fine adjustment, it does not have extensive travel. Your primary elevation should be adjusted by either using the forward gun support V-notch, and/or the two leveling jacks. To set the fine elevation so it is most effective, turn the thumb knob in one direction until it stops, then counting the turns, turn it the other direction until it runs out of travel. Then divide the number of turns by half, and turn the knob until it is in the middle of the adjustment range.

You will also note that there are five threaded holes in the arm to which the forward gun support attaches. These are there so the rest can accommodate guns of varying length. The direction that the windage adjustment will move the gun will be opposite depending on what side of the pivot bolt you place your gun support. There are 3 pair of cleats for using the web Velcro straps to anchor the gun in place. Only two pair are used at any one time, therefore, two straps are supplied for this purpose. If you are going to use the rest as a machine rest to test repeatability, evaluate loads, etc. put the gun in the rest, position it so it makes full contact with the butt retainer strap, clamp it firmly in the vise with the two thumb screws on the vise, and then firmly fix the rear strap in place. The cleats for this strap are on the underside. Fire 2 or 3 shots to seat the gun, then re-tighten the vise and straps. Take a look at the photos suggesting the best way to engage this pair of cleats. Depending on the action and style of the gun select one of the forward pair of cleats and attach the forward strap. If your gun has a free-floating barrel, you will want to leave 1/8" to 1/4" clearance between the gun and the strap. In order to achieve the best repeatability, the rest should be set on a rock solid bench and anchored firmly to it as indicated in the instructions. If your range has a concrete bench or one where screwing it to the bench would be frowned upon, you will probably need to build the bench platform mentioned further on in this manual. Please note, the instructions for the platform are generic and cover various rests that HYSKORE® manufactures, and therefore, the rest sitting on the bench is not the same as the Black Gun® Machine Rest. The set also includes a remote hydraulic trigger release, and, as above, the instructions enclosed in this booklet are generic and should be viewed as such.

ASSEMBLY

1



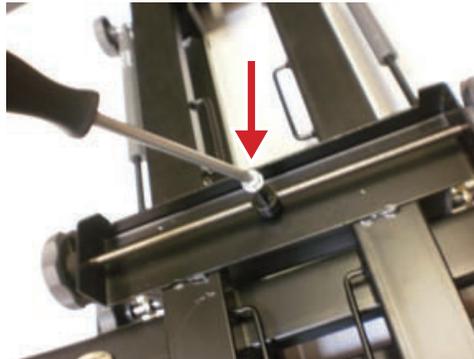
In order to prevent damage in shipping the windage arm (#30185-6) at A 1 is attached to the rest as shown and must be re-attached.

2



Unscrew the nut. Remove it and the washer.

3



Use a #2 Phillips screwdriver to remove this screw.

4



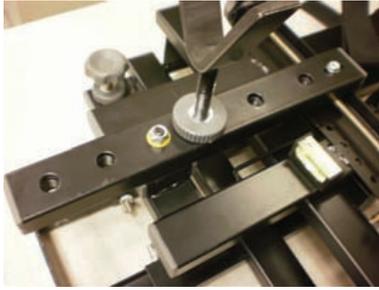
Fit the small round hole in the arm over the threaded post (see 81 Step 2) and fit the slotted hole over the fitting at (C1 in Step 3).

Replace the screw in this fitting and tighten until snug (2-3 lbs. ft. of torque).

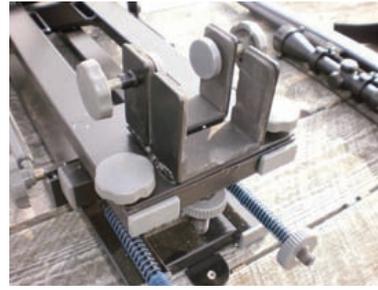
5



Place the washer over the threaded post and tighten the lock nut (flat side down). Operate the windage knobs. Adjust the nut so that the arm moves freely.



Thread the front gun support into one of the holes that is suitable for your gun. Use the lock knob to secure it. This also is the primary elevation adjustment. Note that if you select a hole behind the pivot point the windage adjustment will move the gun in the opposite direction from a hole forward of it.



Install the rear gun support & vise assembly as shown. The two small knobs are used to prevent twisting. By using the 2 large (M-16) lock knobs the rear gun support can be used as a secondary elevation adjustment.



Removing the rear gun support & vise assembly exposes a platform that can be used with rest bags.



There are 3 pair of cleats for anchoring the Velcro web straps. Only 2 straps are necessary but different gun designs require different locations for the straps. When firing off the shoulder the straps are not necessary.



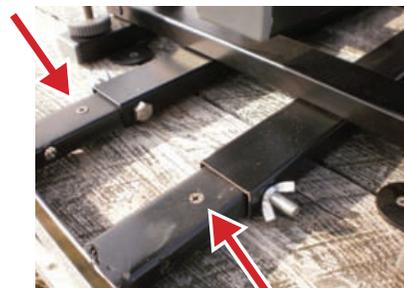
Generally you would use the straps only when testing accuracy and repeatability. This is how the rear strap fits.



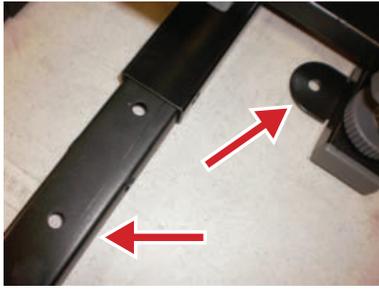
The cleats for the rear strap are on the underside (to avoid making contact with the gun). This is a detail of the easiest way to fit the strap.



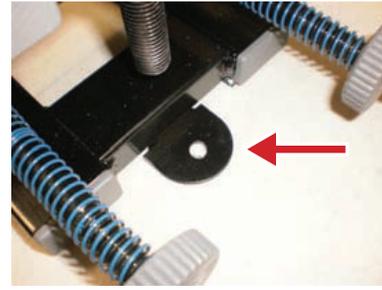
Detail of how a forward strap fits. Note that the rear strap should be tight but the forward straps should allow about 1/4" clearance to allow the barrel to float.



The bench grip arm secures to the bench and rest as shown.



Both the bench grip arm and the base of the rest should be screwed to the bench top as even the slightest movement will influence repeatability. Use two #12 or #14 x 1¼ - 2" sheet metal screws in the grip arm and three more at the tabs just inboard of the elevation jacks.



The rear of the rest must also be secured in the same manner. If your bench is concrete or using screws is frowned upon, you will need to build a mounting platform and use clamps. Instructions are further on in this book.



This set includes a remote hydraulic trigger release so that the gun can be fired without human induced motion contamination. Instructions are further on in this book.



This is the thumb wheel for operating the fine elevation. The best way to use this feature is to put it in its lowest position then count the turns to raise it to maximum height then lower it half the number of turns. This way you will have adjustment in both directions.



The rest features two forward elevation and leveling jacks that can be locked in place using the lock knobs.



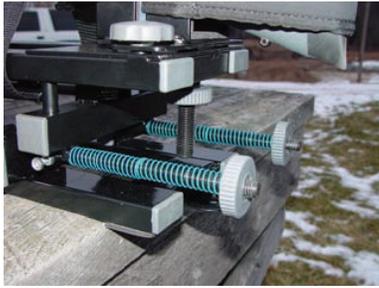
The gun retaining strap installs as shown. Its purpose is to allow the shooter to shoot off the shoulder and use the recoil reduction feature. It also insures that the gun retains its same position in the rest after each shot.



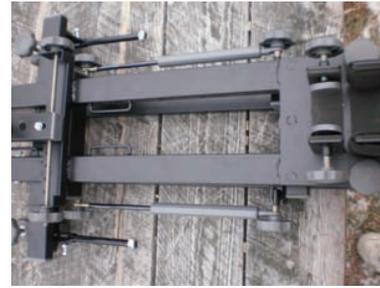
If there is side to side play in the windage adjustment back of the hex nut on one end then tighten the knob to eliminate the play and re-tighten the nut. You may have to do this more than once to eliminate the play but not create binding.



There are two slack adjusters forward and two rear. If there is slack or play between the rails and collars install the adjusters as shown. Back off the hex nut and tighten the screw until it contacts the rail. Now back off the screw ⅛" to ¼" turn and lock in place with the hex nut.

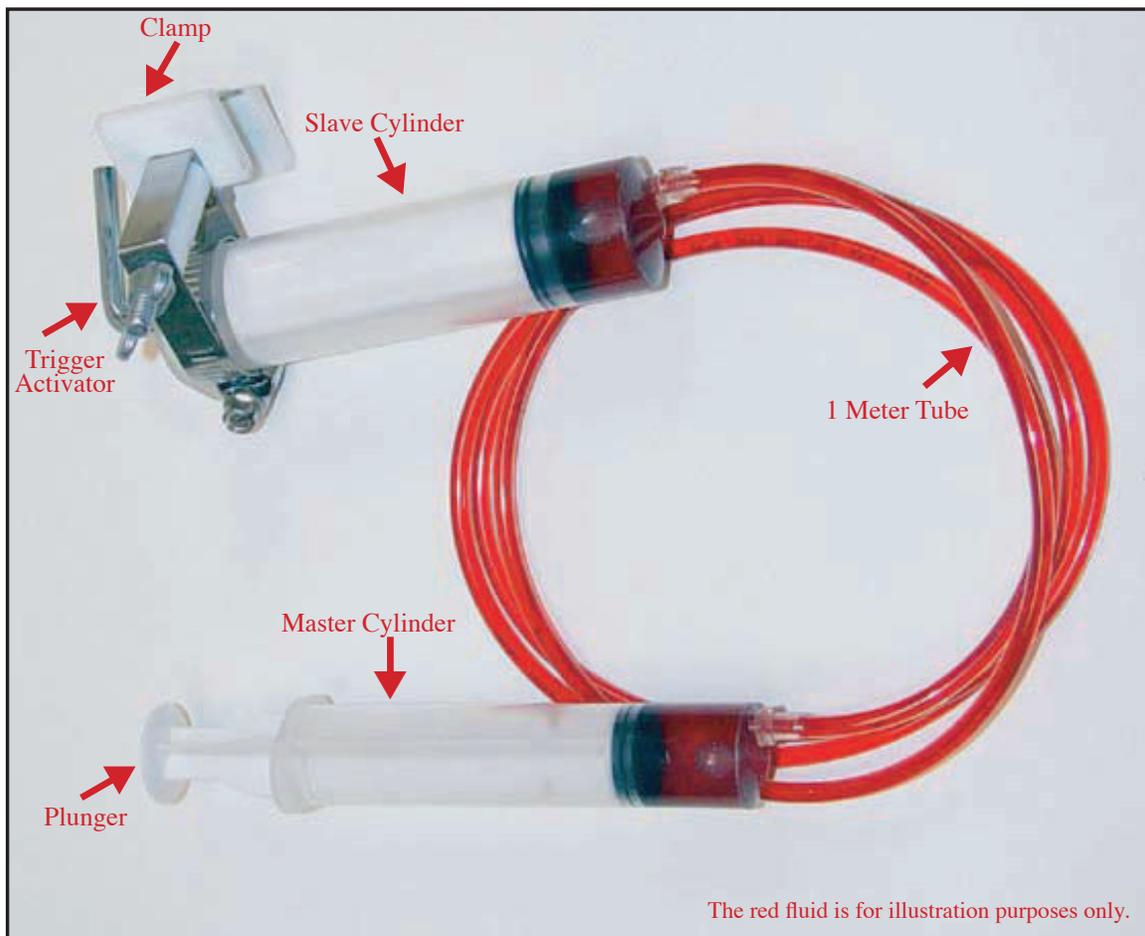


The springs work with the dampers to absorb recoil and then return the gun to battery. Each spring's resistance increases by 4 lbs. per inch of compression. By tightening the knobs the recoil resistance will be increased. Both springs must be kept at the same tension.



Right out of the box, the rest will handle .223 to .375 H&H. To handle guns with less recoil than a .223, remove springs and/or both dampers - (never remove only one spring or damper.) You want to get 2-3 inches of travel without bottoming out. For rim fire guns, remove both springs and dampers. After each shot push the rest forward to battery so that each shot is released from the same point.

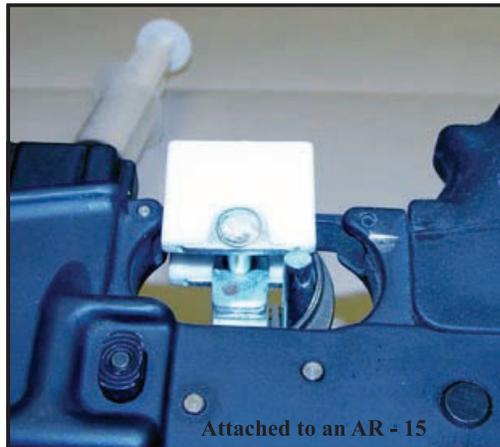
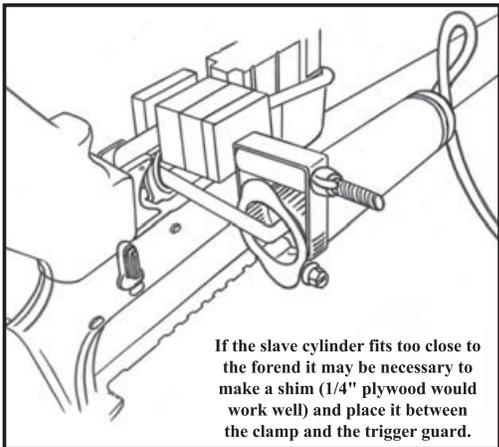
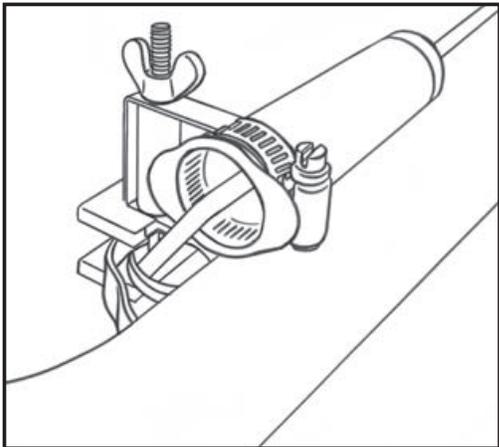
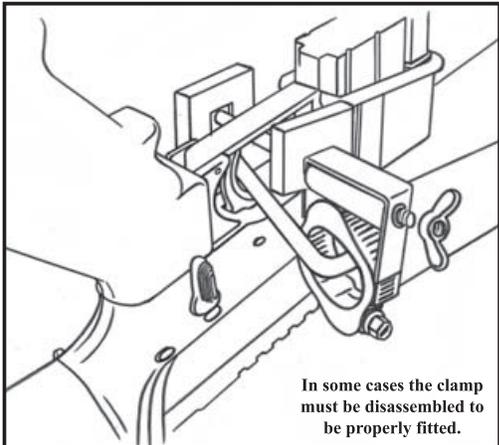
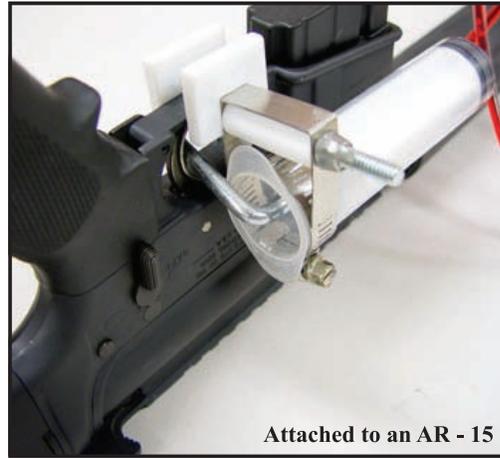
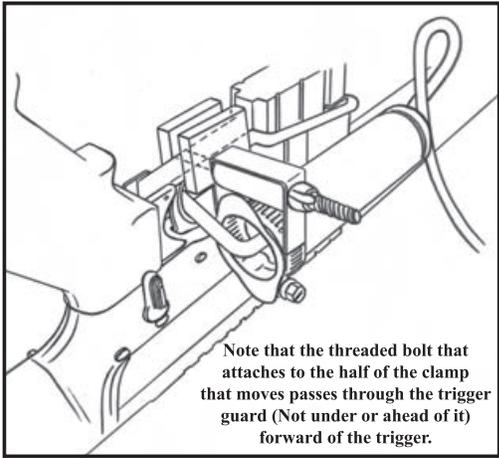
Hydraulic Trigger Release



Instructions for Attachment Follow

Visit our website for more information:

www.hyskore.com



Hyskore®
Suggestions For Building A Shooting Platform Bench
For the 30013 Dangerous Game® Rest 30088 DLX Precision DLX Rifle Rest
30080 Ten Ring® Recoil Assist Shooting Rest 30185 Black Gun® Machine Rest



All of the above captioned rifle rests must be secured to a bench. When there is a concrete bench or a range that doesn't allow shooters to screw anything to their benches it is necessary to mount your rest to a platform that can be fixed to the bench using "C" Clamps.

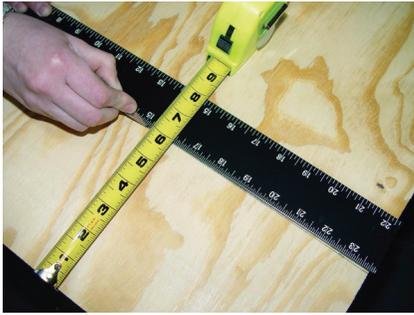
30013 is illustrated. Different models may require a larger notch.

Suggested Bill of Materials:
For Constructing a Bench Platform

These components can be purchased at any big box home improvement retailer.

Qty.	Description
1 -	24" x 48" x 3/4" Plywood
2 -	2" x 4" x 8" wood block
2 -	6" or 8" stair angles (These are heavy duty 90° angle braces. At Lowes or Home Depot they can be found in the lumber area with the joist hangers.)
1 -	Wood Glue (The exterior type is the best)
2 -	5/16" x 3/4" Sheet Metal Screws
1 -	5/16" x 1 1/2" (or 2) Sheet Metal Screw
16-20 -	2" Drywall Screws
2 or 4 -	"C" Clamps (size will depend on the thickness of the bench)

1



Using a 24" x 48" x 3/4" piece of plywood cut a 6" x 24" section of the plywood for the front edge brace.

5



Before cutting the notch examine your rest. Different models require different size notch(es). Notch the front so that the edge of the notch is flush with the surface of the plywood base. This can be done either before or after it is fixed in place.

2



Cut 2 - 10 pieces of 2" x 4".
Glue and screw them to the plywood base.

6



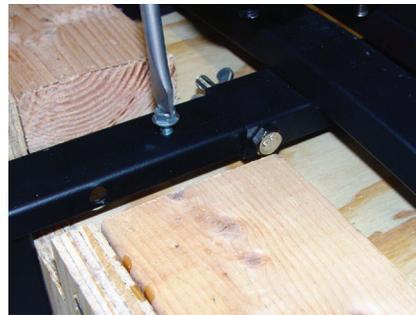
Use 2 - 5/16" x 3/4" sheet metal screws to anchor the left & right sides of the rest. You may find it necessary to stack several flat washers between the flange on the rest and the plywood.

3



Use 2" screws to secure the 2" x 4" x 10" blocks from the underside.

7



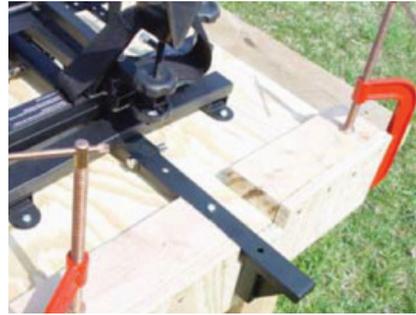
Use 1 - 5/16" x 1 1/2" (or 2") sheet metal screw to anchor the bench grip arm.

4



Glue & screw (with 2 screws) the 6" x 24" piece of plywood across the front as shown.
Use 2" x 6" (or 8") stair angles for reinforcement. Secure with screws.

8



Use 2 or 4 - "C" clamps to anchor the completed set-up to the bench.

A WORD ABOUT ACCURACY

When it comes to shooting, the word “accuracy” really refers to group size. Once the group is established, adjusting the sights to move the point of impact to the point of aim is a simple task. A gun/ammunition combination that shoots to 1, 3, or 5 MOA is just that. No matter what device you use to support the gun that group size will not change, not to mention extraneous factors such as sighting device, wind, stability of the shooting platform, trigger pull, parallax and/or the shooter. There is a long list of factors that can affect group size. Below we have attempted to briefly address a few of the more common ones. All comments are made with the “all things being equal” and “under perfect conditions” provisos. Please consider this a general guide that might point out a few things that might not have come to mind. Our #30013 Dangerous Game®, #30003 Precision Rifle Rest and #30088 DLX Precision Rifle Rest are designed to produce repeatable results. If the rests are properly assembled, securely anchored to a bench that is rock solid and does not shift under the stress of recoil, you will be able to maximize repeatability. Each rest will consistently repeat well under 3 MOA. What this means is that if the gun/ammunition combination is capable of shooting groups of less than 3 inches at 100 yards (nominal 3 MOA), you will be able to realize this degree of repeatability with either rest. The big word in the previous sentence is “IF”. Neither rest will make a 3 MOA gun place all of the bullets in one hole. The group will still be 3 MOA. If your bullets are not all forming a tight group, there is a high probability that the problem is a result of the gun, ammunition and/or the sight.

* MOA-Minute of arc - A circle has 360°, each degree has 60 minutes, i.e. 1/60th degree. 1.0 MOA is exactly 1.047 inches at 100 yards

CENTER FIRE ACCURACY

A large percentage of the rifles, old and new, in the hands of American sportsmen will not shoot much better than 2.5 MOA with exceptional guns shooting 1.0- 1.5 MOA, (assuming the ammunition is correctly matched to the gun). The average deer rifle, using popular brand, off the shelf ammunition is probably capable of 2.5-3.0 MOA because the gun and ammunition manufacturers know that a typical white tail is statistically harvested at a range of less than 100 yards, and a gun that places the bullets within 3 MOA will easily place all of them within a heart sized circle. Manufacturing guns and ammunition that will shoot under 1 MOA is, of course, done every day. There are only a few manufacturers that guarantee that result, and then only with ammunition that they specify. The costs associated with the manufacturing, quality control, and attention to detail, price these guns out of reach of a large part of the market. With that being said, a gun/ammunition combination with 3 MOA accuracy, properly sighted in, will usually get the job done and nobody will know the difference. The target is dead - end of story. The point here is that if your gun is shooting at or beyond 3 MOA, the issue is, in all probability, a combination, of factors that can affect accuracy. We have prepared a short list of issues you may want to consider in examining the group size of your rifle.

A. Bolt action sporting rifles are by nature and design typically more accurate than pump, lever, or semiautomatic rifles. The reason for this is the bolt action tends to be much more rigid, and therefore flexes less. In addition, a bolt action usually has a larger and stronger extraction mechanism, which means the chamber can be made to closer tolerances than other types of actions. Believe it or not, not all ammunition in the same caliber is made to the exact same dimensions by all manufacturers. For example, SAAMI (Sporting Arms and Ammunition Manufacturers Institute, www.saami.org publication ANSI/SAAMI Z299-1992) allows a variance of up to -.008 under the standard for diameter, and up to -.007 under for the standard distance from the base to the shoulder (this determines headspacing) for center fire 30-06 ammunition. (Variances across most calibers are similar.) The extraction mechanism in pump, lever, and especially in semi-automatic weapons must be able to consistently and effectively extract cartridge cases at a rate equal to the cyclic rate of the weapon using the entire range of commercially available ammunition. This can be problematic if the cartridge fits too tight in the chamber. As a result manufacturers tend to make these chambers more tolerant of ammunition that may tend towards the larger end of the size range. Conversely, if ammunition manufacturers want their product to function in guns typically in the hands of sportsmen, they must also consider how easily the cartridge seats and extracts. Needless to say, there are exceptions to this, but as a rule as you move away from a precise cartridge chamber fit accuracy suffers. This is especially apparent in military weapons because they must chamber ammunition from various sources (therefore with various tolerances) and must function even if the ammunition is corroded or dirty. Reliability, not pinpoint accuracy is the primary criteria.

B. Match the correct bullet weight to the twist of the rifling. This is one of the most commonly overlooked factors that determines group size. If the bullet length and twist rate of the barrel are not synchronized, accuracy will suffer. A 110 grain .308 bullet is, of necessity, shorter than a 220 grain .308 bullet. For proper stabilization the heavier, and hence longer bullet, requires a faster rate of rifling twist than a short, light bullet. Further to this point, different guns respond differently to ammunition from different manufacturers. The point here is that you should test fire ammunition from several manufacturers and select bullet weights that are compatible with the rate of twist of the gun's rifling. Generally speaking, twist rate is stamped on the barrel or the information is available from the manufacturer. You need to test different bullet weights to optimize results.) The following websites will give you more information regarding this issue:

www.snipercountry.com/hotlipstwistrate.html

www.uslink.net

kwk.us/twist.html

en.wikipedia.org/wiki/rifling

www.gsgroup.co.za/cip.html

Calculating Twist Rate

Legend:

BL = Bullet Length

BD = Bullet Diameter

C = 150 constant for muzzle velocity 1500-2800 FPS

C = 180 constant for muzzle velocity over 2800 FPS

(choose the correct constant for the ammunition you are using)

Formula:

$$\frac{C}{\frac{BL}{BD}} \times BD$$

First divide the bullet diameter (BD) (for example .224) into the bullet length (BL) (for example .712). Divide the result into the correct constant (150 or 180) and multiply the result by the BD (for example .224). The result is the **approximate minimum** twist rate necessary to stabilize the bullet - Remember a 1:9 rate is faster than a 1:14 rate.

Example A: .223 (5.56 x 45) @ 3200 FPS, 52 Grain, BL= .712 BD=.224

$$\frac{180}{\frac{BL}{BD}} = \frac{180}{\frac{.712}{.224}} = \frac{180}{3.178} = 56.64 \times BD = 56.64 \times .224 = 12.7$$

12.7 is the optimum rate of twist

Example B: .223 (5.56 x 45) @ 2500 FPS, 75 Grain, BL= 1.095 BD=.224

$$\frac{150}{\frac{BL}{BD}} = \frac{150}{\frac{1.095}{.224}} = \frac{150}{4.9} = 30.6 \times BD = 30.6 \times .224 = 6.86$$

6.9 is the optimum rate of twist

If you use the 52 grain bullets in a 7.0 twist barrel the result will be fairly accurate. If you use the 75 grain bullet in a 12.0 or 13.0 twist barrel your group will probably be all over the target.

Diameters of Popular Bullets

.204 - .204 7mm - .284.

.223 - .224 .308 - .308

.243 - .243 .338 - .338

.270 - .277 .375 - .375

Bullet length varies by manufacturer and style. For this information check with the manufacturer or take an actual measurement.

C. A perfectly formed muzzle crown allows the gas to escape in a uniform pattern around the base of the bullet as it exits. Through improper cleaning and handling the crown of the muzzle can be easily damaged. Even a small ding, which may not necessarily be visible to the naked eye, can cause an uneven release of gas, which can heel the bullet over slightly, producing a yaw attitude. This will affect the bullet's stability and accuracy, as the long axis of the bullet will no longer be coincidental with the path of travel.

D. The quality of the ammunition you use can have a direct result on repeatable group size; the more consistent the ammunition, and the components from which it is manufactured, the more consistent the results. Several manufacturers make match grade ammunition where the components are carefully selected and screened for consistency and conformance to specification. (One of the manufacturers that are best known for achieving the most consistent results is Black Hills www.black-hills.com). There are several other manufacturers that make acceptable match grade ammunition, and there are other options. If you are a re-loader, you are already aware of the range of quality components available and in all probability you are able to produce consistent, high quality ammunition.

E. Vertical Grouping – See Rim Fire section point D.

F. Check Your Scope and Mounting – With older and especially inexpensive scopes it is not uncommon for the reticle to stick or shift, especially under heavy recoil and/or temperature extremes. If this happens your muzzle could end up pointing in a slightly different direction after each shot. To check for this condition, lock the gun in a vise that doesn't move and sight the reticle on a set point/target then use a piece of wood or other object (that will not do damage), to tap the scope tube to imitate recoil. If the reticle moves from the original point of aim, you have a problem with the scope. Also check the scope mounting using the same procedure. Mounts and rings frequently become loose due to recoil and heat. In addition to properly mounting a scope the rings must be lapped and centered otherwise there may not be sufficient contact to secure the scope. Even Loctite doesn't insure that mounts and rings will not shift.

- G. Parallax is the apparent shift of the target relative to the reticle due to the horizontal movement of the observer. Scopes with parallax adjustments must be correctly adjusted. Scopes without a parallax adjustment are generally range specific for parallax free sighting. If you have made the adjustments to eliminate parallax you are good to go. If not, it is important to make sure that the longitudinal optical axis of the scope that runs through the center of the cross-hairs is directly aligned with the pupil of your eye. If you have an inconsistent cheek weld to your stock or fail in any other way to address parallax your groups will suffer from horizontal dispersion, i.e.:open up left to right. This will happen because your view of the target in the horizontal plane will vary with each shot.
- H. Barrel temperature plays a major role in maintaining group size. As a barrel heats up torsional stress will cause the barrel to twist. Bench rest shooters wait several minutes between each shot to keep the barrel from overheating. If you fire 10 or 12 shots in rapid succession from a sporter weight barrel your groups will expand.
- I. Other factors, which we will not explore here include: Free floating barrels, bedding, barrel harmonics, etc. - Not to mention the shooter!

RIM FIRE ACCURACY

(Some of this applies to center fire rifles also.)

Accuracy in a rim fire rifle is to a large degree more dependent upon the ammunition as opposed to the equipment. Center fire ammunition can be loaded and/or reloaded to precise and consistent specifications. Rim fire ammunition can only be loaded at the factory level. Since rim fire ammunition is not re-loadable, it's necessary to use whatever is commercially available. Factors affecting rim fire accuracy are:

- A. As with a center fire cartridge there is a SAAMI specification (ANSI/SAAMI Z 299.1-1992) and variance for the dimensional aspects of rim fire ammunition that allows up to $-.004$ under the standard diameter for $.22$ long rifle match or sporting ammunition. Consequently, manufacturers make ammunition within the entire range of this variance. As a direct result a gun that is expected to perform reliably must be able to accept the full range of available ammunition. What this has led to are guns that are match chambered which are invariably bolt action. (The chambers in these guns have a tight precise cartridge fit and the guns perform best with match grade ammunition that is made to close tolerance), and then we have most other guns that have sporting chambers, many of which are auto loaders. The chambers in these guns must be made large enough so that the gun will cycle correctly with any off the shelf brand of ammunition which could be manufactured to any size within the allowable range of tolerance. i.e., this means the cartridge may fit loosely in the chamber. Due to gravity the cartridge settles into the lowest portion of the chamber. The result is that the center axis of the chamber, and hence the center axis of the barrel is not aligned with the center axis of the bullet. This means that the bullet will engage the rifling off center and will travel down the barrel and exit the muzzle at an angle resulting in a loss of stability and accuracy.
- B. Concentrically – If the long axis of the bullet is not concentric with the long axis of the case it will also not be concentric with the long axis of the bore, as above the bullet will travel down the barrel and exit the muzzle at an angle with similar results. As little as $.002''$ – $.003''$ off center will cause a noticeable enlargement of the grouping.
- C. Head Spacing is the distance the bullet must move from the casing until it engages the rifling. In a rim fire this is controlled by thickness of the rim. According to SAAMI standard rim thicknesses may vary from as little as $.036''$ to as much as $.043''$. A gun may perform much better with one rim thickness as opposed to others. It is therefore important to test your gun with a wide range of ammunition. Typically in a box of inexpensive ammunition you will find a considerable variance in rim thicknesses. This will usually result in expanding the group size; consistency of rim thickness will result in smaller, consistent group sizes. Both concentrically and rim thickness can be measured by using the HYSKORE® #30075 Ammo Analyzer.
- D. If the group spread is more vertical than horizontal it is usually the fault of the ammunition. At a known distance, a faster bullet reaches the target quicker and drops less, i.e. gravity has less time to act. As you may appreciate, the small quantities of primer and propellant used in a rim fire cartridge must be precisely and accurately measured in order to produce consistent velocity. Only a small variance in absolute terms translates to a significant percentage variation and by extension, variation in velocity. Maintaining this type of consistency across large production runs is incompatible with maintaining low cost. Primer compound has an explosive force in the magnitude of 25 to 50 times that of the propellant. As little as 1/10 grain (1/70,000 lb.) deviation will cause a velocity differential. With these thoughts in mind, the culprit in groups that open top to bottom is almost always inconsistent velocity. The faster bullets strike higher and the slower ones lower.
- E. Scope Problems -See “F” and “G” under Center Fire.

The aforementioned issues represent a brief synopsis of various conditions that may affect accuracy. There are numerous in depth studies that can provide detailed analysis of each situation. We are not experts and do not intend to be. Our comments and suggestions are the result of studying and compiling data from a wide range of sources. Furthermore, we have only touched on the more significant factors that affect accuracy. If you elect to make adjustments to your gun/ammunition combination to increase accuracy, we suggest that you address each issue one at a time. Do not try to make multiple corrections at the same time as you may contaminate the results, and possibly obscure important issues that need further attention.

CALCULATING RECOIL

There are two ways to do this.

- A. The easy way - go to one of the websites listed in this pamphlet or go to one of the links listed on our website: www.hyskore.com
- B. If you like playing with numbers, use the following formula. While Isaac Newton or Albert Einstein might take us to task for being off by 2 or 3 %, this will get you into the ballpark. We have divided the process into 2 steps. First, calculate the recoil velocity then use this information to calculate the recoil energy in ft/lbs.

Legend:

- PW - Weight of powder charge
- BW - Weight of bullet (grains)
- MV - Muzzle Velocity
- GW - Weight of loaded gun/w scope
- RV - Recoil Velocity
- RE - Recoil Energy

$$1. RV = \frac{[(1.75 \times PW) + BW] \times MV}{7,000 \times GW}$$

Run the calculation like this:

- A. Multiply the weight of the powder charge PW x 1.75
- B. Add the bullet weight (BW) to this number (result from A)
- C. Multiply this number (result from B) by the bullet velocity (MV) - Hold this number aside
- D. Multiply the weight of the gun (GW) x 7000
- E. Take the calculation from D (GW x 7000) and divide it into the number you held aside in C (above) - This is the velocity of the recoil.

$$2. RE = \frac{RV^2 \times GW}{64.4}$$

Run the calculation like this:

- F. Square the recoil velocity and multiply it by the weight of the gun
- G. Divide this number (result from F) by 64.4. This is the recoil energy in ft./lbs.

Example: Actual data for .308 Winchester model 70 with 24" barrel & scope.

- PW = 40 Grains
- BW = 180 Grain (sierra match king)
- BV = 2,500 Fps
- GW = 8.2 lbs.

$$RV = \frac{[(1.75 \times 40) + 180] \times 2,500}{7,000 \times 8.2} = \frac{625,000}{57,400} = 10.89 \text{ fps}$$

$$RE = \frac{10.89 \times 10.89 \times 8.2}{64.4} = \frac{972}{64.4} = 15.10 \text{ ft./lbs.}$$

The Recoil Velocity (RV) is 10.89 fps.
The Recoil Energy (RE) is 15.10 ft./lbs.

A few pointers:

- A. The weight of the gun (GW) should always be in pounds. eg. 7.3, 8.2, etc.
- B. The weight of the powder charge has a very small influence on the recoil velocity (RV) or recoil energy (RE). If you do not know the exact number, use the following guidelines:

.219- .223	- 25 grains
.22 - 25 - .257	- 38 grains
.264 - .28	- 55 grains
.308 - 30'06	- 45 grains
.300 & 7mm mag	- 62 grains
.338	- 70 grains
.375	- 85 grains
.416 - .458	-110 grains

Do your calculations with 2 or 3 different powder weights and you will see that the recoil energy (RE) only varies slightly. The 64.4 number is a constant and the 7000 number is the number of grains in one pound.

Repeat: if you do something dumb, bad things can happen.

The chart is only a general guideline.

For more detailed recoil data (as of this writing) there are several good websites that you can reference:

1. www.real-guns.com
2. www.zvis.com
3. www.chuckhawks.com/recoil
4. www.handleads.com
5. www.rfgc.org/reload
6. www.siskguns.com

The recoil that you feel is a function of the action-reaction created as the bullet moves forward in the barrel and, shortly thereafter, gas exiting the muzzle (Rocket Effect). Therefore, *the quantity of propellant in addition* to gun weight, bullet weight and muzzle velocity is an important factor in determining recoil. Make certain that this is part of your calculation. Calculate your recoil carefully and **DO NOT EXCEED THE LIMITS OF THE COMPRESSION DAMPER/SPRING COMBINATION!**

• REPLACEMENT PARTS •

These are replacement parts for purchase. Pictures do not represent contents of set.



Parts List & Pricing:

30185 - N10	328mm N10 Compression Damper (1 pc.).....	\$37.50
30185 - 1	Slack Adjuster Screws & Nuts (4 sets).....	\$ 5.00
30185 - 2	Rear Gun Support & Vise Set.....	\$37.50
30185 - 3	Damper Retainer Knobs (2 pcs.)	\$ 7.50
30185 - 4	175mm 4 lbs./inch Coil Springs (2 pcs.)	\$10.00
30185 - 5	Foam Pad Set for Vise & Feet	\$10.00
30185 - 6	Windage Arm.....	\$15.00
30185 - 7	M-12 Spring Retainer Nuts & Washers (2 pcs.)	\$10.00
30185 - 8	Fine Elevation Bearing Set (1 set).....	\$ 7.50
30033 - 2	Front Gun Support.....	\$12.50
30105 - 9	Butt Retainer Strap	\$10.00
30088 - 6	Magnetic Spirit Level	\$ 7.50
30105 - 3	Rear Gun Support Retainers (2 pcs.).....	\$ 7.50
30080 - 3	Elevation Jacks (2 sets)	\$ 7.50
30088 - 14	Trigger Release	\$22.50
30088 - 14	Velcro Web Straps (2 pcs.).....	\$12.50

Visit our website for more information or to check our other great shooting accessories: www.hyskore.com

Send Check or Money Order with Phone Number to:

Hyskore® / Power Aisle, Inc.

P.O. Box 983

Middleburgh, NY 12122

NYS Resident add 8.75% Sales Tax (or prevailing rate)

** \$10.00 Shipping & Handling to
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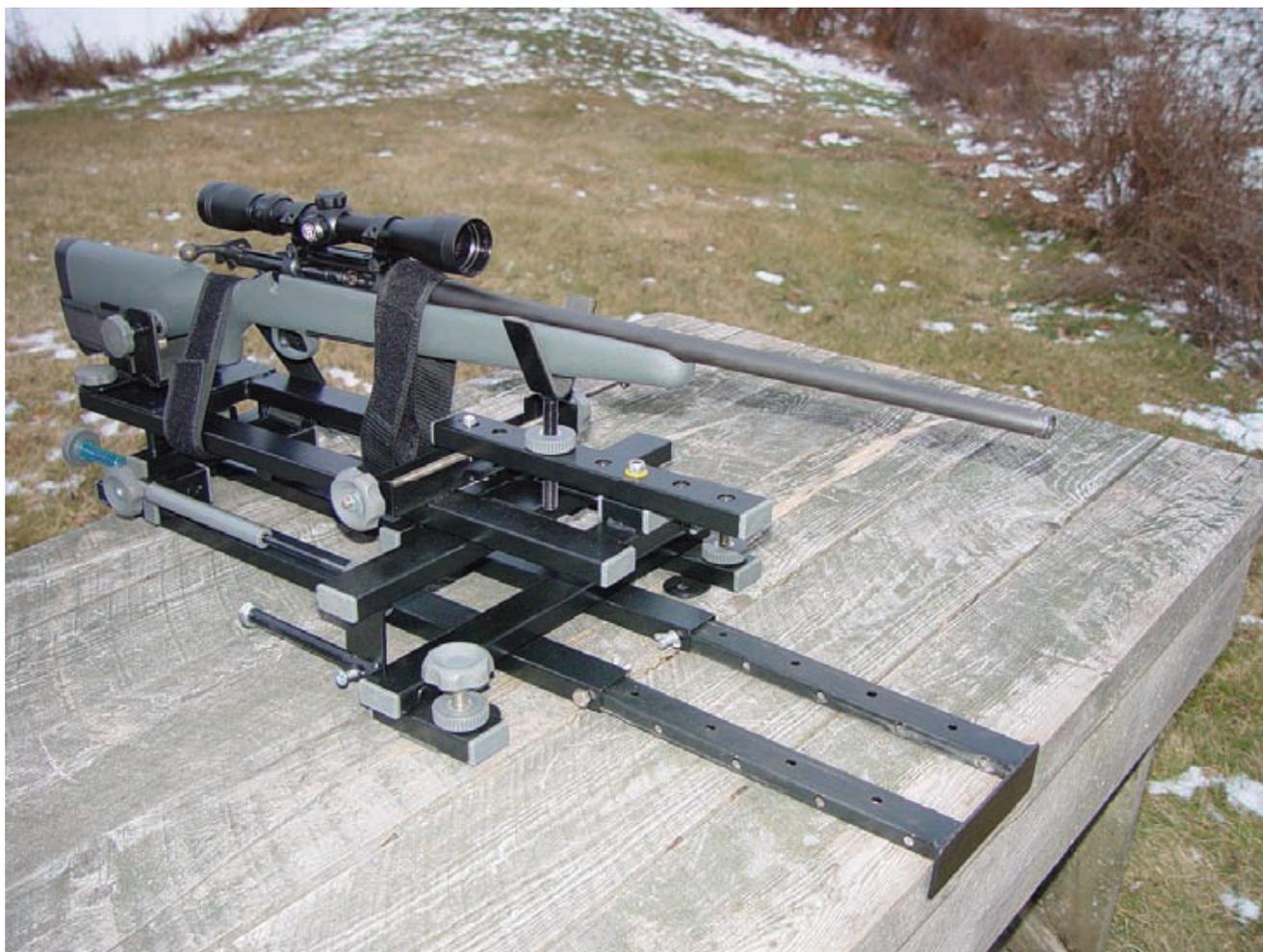
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