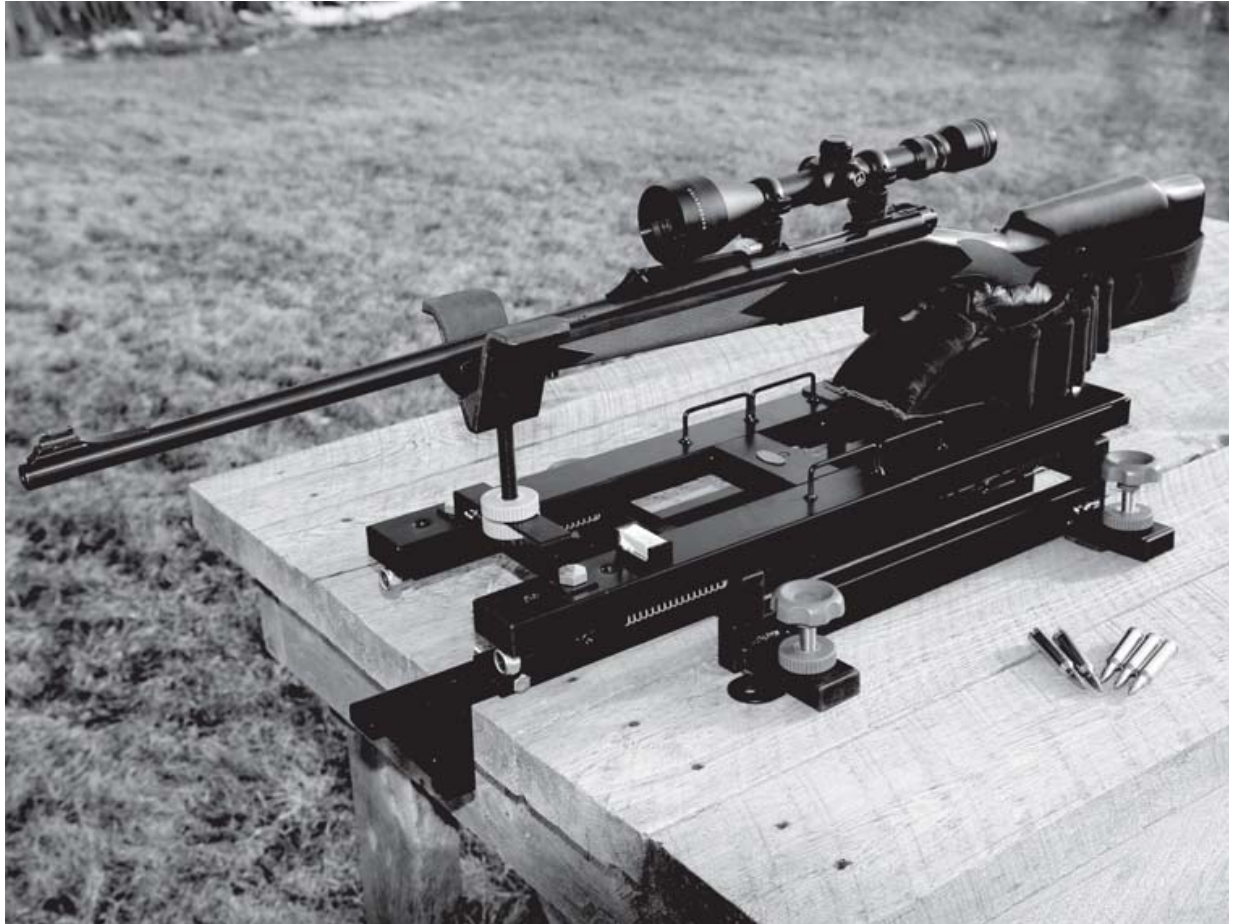


Hyskore®

30080

TEN RING®

RECOIL ASSIST SHOOTING REST



Always use appropriate eye and ear protection when using this device!

The Ten Ring® Recoil Assist Shooting Rest is designed to eliminate all, or most, recoil from light to medium recoiling guns and significantly reduce recoil from heavy recoiling guns. Compression Damper and Spring Technology progressively absorbs the recoil and returns the gun to battery.

For parts or technical support contact:

Hyskore®

Power Aisle, Inc.

P.O. Box 983 • Middleburgh, NY 12122

Phone: 631.673.5975 • Fax: 631.673.5976

visit us @ www.hyskore.com

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.

Introduction

READ THIS ENTIRE MANUAL BEFORE USING THE REST! WARNING !!

- A. The **Ten Ring® Recoil Assist Shooting Rest** will accommodate *most factory* rifle/ammunition combinations that are in the hands of American shooters up to, and including, powerful .375 H&H factory loads.
- B. Vibration and motion caused by shooting may cause knobs and adjustments to loosen. **Check them after every 3rd shot.** Pay special attention to the fittings that hold the gas springs in place.
- C. After every 3rd Shot make sure the velcro strap, if used, is properly secured.

READ THIS CAREFULLY

The **Ten Ring® Recoil Assist Shooting Rest** is designed and constructed to operate consistently and safely within certain limits, i.e., *do not use gun/ammunition combinations that will exceed the recoil range of the compression damper/spring combination.* The chart on page 4 is a *general* guideline for recoil expectations. If you exceed the maximum recoil, you can expect several very bad things to happen as the travel of the damper may be exhausted and the gun carrier may "bottom-out".

First: Expect damage to the gun stock as the inertia of the barrel/action will now be absorbed by those components.

Second: For the same reason you can expect the action/and barrel to separate from the bedding.

Third: You may damage the structural components of the rest. Always calculate the maximum recoil for your gun and Ammunition combination and use the correct damper/spring combination. NEVER exceed the Damper's upper limit. Conversely a damper/spring combination with too much compression for the gun/ammunition combination can result in similar consequences.

If you're not impressed with damage to your weapon and your rest, over loading the device by using a light gun and/or too potent a loading for the damper/spring combination has the potential to result in serious injury. Use common sense and observe, all firearms safety procedures. Never use this rest to fire any weapon that is not in "as new" condition or certified safe by a competent gunsmith.

Never exceed the Gun Manufacturer's maximum recommended loading for any ammunition.

Repeat: if you do something dumb, bad things can happen. The chart on page 4 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 | 4. www.handleads.com |
| 2. www.zvis.com | 5. www.rfgc.org/reload |
| 3. www.chuckhawks.com/recoil | 6. www.siskguns.com |

or go to our website (www.hyskore.com) click on the image of the **Ten Ring®** then click on the link to the recoil calculator.

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 spring combination carefully and *do not use gun/ammunition combinations that will exceed the recoil range of the compression damper/spring combination.*

See pages 14-15 for information on calculating recoil.

HOW THE RECOIL ASSIST FEATURE WORKS

The Ten Ring® Recoil Assist Shooting Rest works by applying progressive resistance against the recoil produced by a gun. Shooting a gun, especially one with a wood stock and serious recoil, from a rest that provides too much resistance, or no give at all, will result in damage to both the gun and stock. Guns have either a two piece stock e.g. AR, AK, Lever, and Pump Actions or a one piece stock, Model 70, 700, etc. With a two piece stock the rear of the receiver transfers the recoil to the butt stock. With a one piece stock the recoil is transferred to the stock by either the recoil lug and/or the cross bolt. If the gun does not move with the recoil in a manner similar to that of your shoulder, too much of the recoil energy will be transferred to the stock and eventually the stock will become damaged and/or break. Either way, accuracy will degrade as the action/stock fit becomes compromised resulting in expanded group sizes. Shooting rests which require various types of weight to offset recoil can easily cause this type of damage. In addition, this type of rest must be completely reset after each shot to get back on target. If the Ten Ring® Recoil Assist Shooting Rest is firmly anchored to a solid bench the compression damper technology and/or coil springs, automatically return it to battery after every shot. We have provided a recoil calculation formula for those who are mathematically inclined. For those of us not so inclined, we have provided various recoil calculation websites which also can also be linked directly from the www.hyskore.com website. These are both to be considered guidelines to assist you in developing the correct amount of resistance for the gun and ammunition combination you are shooting.

There are numerous levels of resistance that can be achieved with this rest. Finding one that is agreeable to your gun and recoil tolerance should not be difficult:

- A. Remove the compression damper and all four springs. The part of the rest that moves (the carrier) is 9.5 lbs., and not surprisingly, will provide a maximum of 9.5 lbs. of resistance. Generally speaking this would be the correct amount of resistance to use when shooting a rim fire or similar light recoiling weapons; as a rim fire produces very little recoil and the 9.5 lbs. presents less resistance than your shoulder.
- B. The two long yellow springs in the front each provide 2.0 lbs. of resistance per inch of travel. Using these two springs only will add 4 lbs. of resistance per inch, of travel e.g. One inch is 4 lbs., two inches is 8 lbs, etc.
- C. The two short red springs each provide 4 lbs. of resistance per inch for a total of 8 lbs. of resistance per inch of travel.
- D. *Without the compression damper in place*, the following outlines the progress of the resistance with all four coil rings in place. The length and positioning of the springs have been set so that after 1.0 inches of travel against the long springs, the carrier makes contact with the short springs thus increasing the resistance from 4 lbs. total to 16 lbs. total per inch of travel. In other words, once all four springs are engaged the total resistance would be 8 lbs. for the two front springs (because they each traveled 2 inches) plus 8 lbs. for the two rear springs, plus 9.5 lbs. for the carrier. In other words a total of 25.5 +/- lbs. of resistance.

A pair of blue springs (same length as the yellow springs), each providing 4.0 lbs of resistance per inch is included. Using these springs will increase the maximum resistance (without using the damper) to 37.5 lbs +/-.

- E. Without the assistance of any springs the compression damper provides 45 lbs. of progressive resistance. Adding or subtracting the compression damper to any combination of springs will increase or decrease the resistance accordingly.
- F. The ends of the rods that support the two forward springs are threaded for a distance of 1.5 inches. At the factory the end of each one is fitted with a nylon lock nut. This allows about .75 inches between the rear of the nut and the long spring. Generally speaking, this distance is sufficient for shooting a rim fire or light recoil gun without the use of the compression damper.
- G. After each shot, (when not using the compression damper) it is a good idea to push the carrier forward until it makes contact with the retaining nuts as this will give you consistent return travel and more consistent groups. The damper automatically pushes the carrier forward to full battery.

Approximate Recoil in FT. LBS.					
Cartridge	Bullet Weight	Muzzle Velocity	7.0 LB Gun	8.0 LB Gun	9.0 LB Gun
6.22 LR	40	1150	0.16	N/A	N/A
6.22 UR	37	1700	0.27	N/A	N/A
223 Rem	52	3417	5	4	3
22-250 Rem	52	3800	6	5	5
243 Winchester	100	2700	7	8	10
7.62mm x 39mm	125	2160	7	6	5
30 - 30 Winchester	150	1950	8	7	6
25 -06 Rem	85	3400	14	13	11
270 Winchester	130	2790	16	14	12
270 WSM	160	2540	18	16	14
308 Win	150	2750	18	16	14
8mm Mauser	150	2695	18	16	14
308 Win	200	2350	20	18	16
7mm Rem Mag	160	2675	21	19	17
30 - 06 SPFLD	150	2850	23	20	18
8mm Mauser	150	2434	24	21	18
30 - 06 SPFLD	200	2600	29	25	22
300 Win Mag	150	3210	33	29	26
338 Win Mag	160	3098	37	33	29
300 Win Mag	200	2850	38	33	29
300 WBY Mag	150	3424	39	34	30
338 Win Mag	270	2930	39	34	30
300 Rem UM	150	3670	45	40	35
300 WBY Mag	200	3014	45	39	35
338 Lapua	275	2478	45	40	35
12 GA	525 (Slug)	1522	46	38	34
300 Rem UM	200	3130	52	45	40
375 H & H	300	2700	55	48	42
338 RUM	275	2700	63	55	49
375 RUM	300	2690	67	58	52
416 Rem Mag	400	2450	83	72	65
378 Weatherby	300	2850	89	78	69
416 Rigby	400	2380	89	78	69
458 Winchester Mag	500	2200	95	83	74
460 Weatherby	400	2570	102	90	80

Warning Choose the Appropriate Resistance:

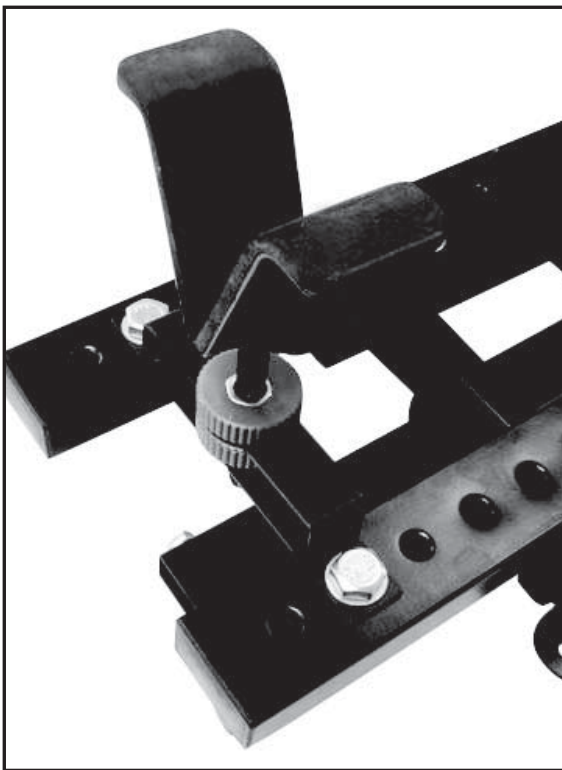
Using too little for a heavy recoil gun may exhaust all of the travel in the damper and cause the **Ten Ring® Recoil Assist Shooting Rest** to "bottom out." This could result in damage to the Rest and/or damage to the weapon, specifically the stock and the bedding. In extreme cases this type of over loading could result in personal injury. Vibration and motion caused by shooting may cause knobs, adjustments and straps to loosen. Check them after every 3rd shot. Also make certain that your bench is secure. If the bench shifts, it will be impossible to hold a tight group. Pay special attention to the fittings that hold the gas springs in place. **Do Not use gun / ammunition combinations indicated in Bold Type.**

The Ten Ring® Recoil Assist Shooting Rest will successfully accommodate a much wider range of cartridges than listed on the chart. But only if (and we repeat - ONLY IF) you have performed the recoil calculations and determined that the recoil is within the range of how the resistance is set. Not to be repetitive but, if you exceed the recommended limits for any gun/ammunition combination, bad things can happen, not only can you damage the rest and/or your weapon but the end result could be personal injury.



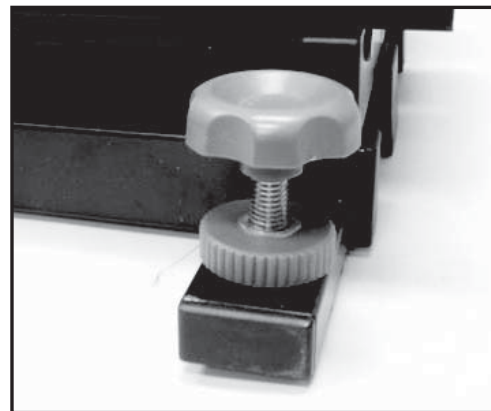
To remove or replace the compression damper use a socket as shown. The bottom rail also has an access opening.

Install Elevation Assembly



The front elevation assembly can be located in any one several locations depending on preference. Install the "V" notch gun support with one locking nut above and one below the top bar of the bracket.

Install Leveling Jacks



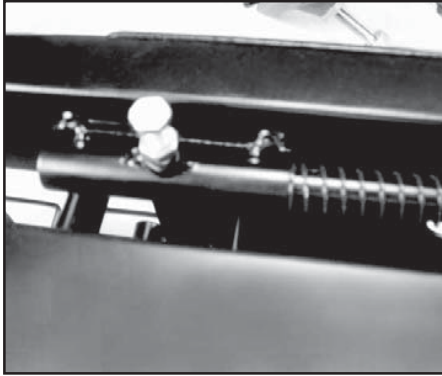
Thread the lock knob onto the shaft then install the jack in the threaded hole.



The butt strap has 6 loops for length adjustment.

Before proceeding make both a visual and mechanical examination to make sure your weapon is unloaded.

Instructions:



To insure smooth function, the Ten Ring® is assembled with a small amount of side play. To reduce the play, hand tighten the adjusting screw until contact is made, then back it off 1/4 turn and tighten the jam nut. It is usually sufficient to only adjust the 2 screws on one side. Before firing cycle the rest to check for binding.

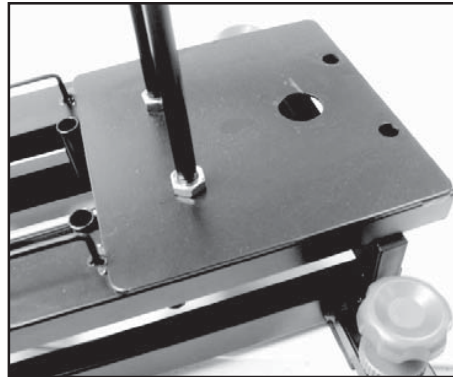


To remove or replace springs an adjustable wrench works well. Remove the 2 lock nuts and slide the carrier forward. Reverse to reinstall, tightening the lock nuts so that the end of the rod is flush with the edge of the nut is sufficient.

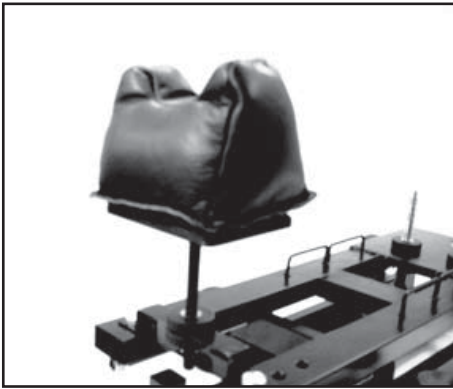
This rest requires a break in period of 100 - 200 cycles. All the metal parts are cut, stamped and welded prior to the finish being applied. Therefore finish build up can cause some drag until it wears in.



There is one socket on each side for anchoring the belt horizontally.



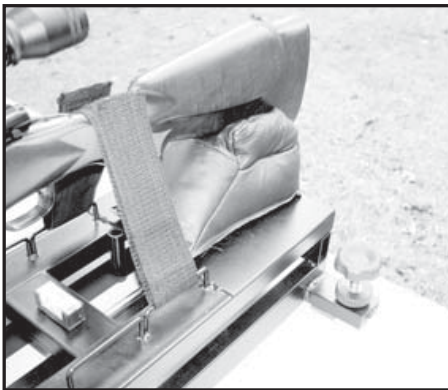
There are also 3 sets of sockets for securing the retaining pins vertically.



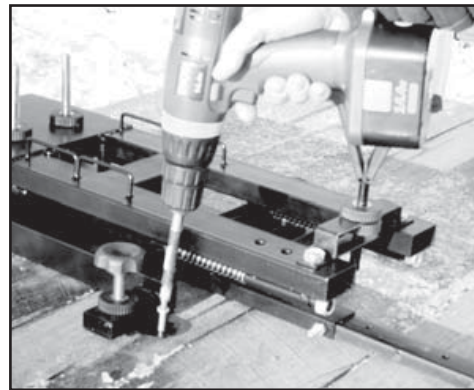
The pedestal support installs the same way as the “V” notch.
(Rest bag not included)



The rear platform has been made large enough to accommodate most “rabbit ear” bags.
(Rest bag not included)



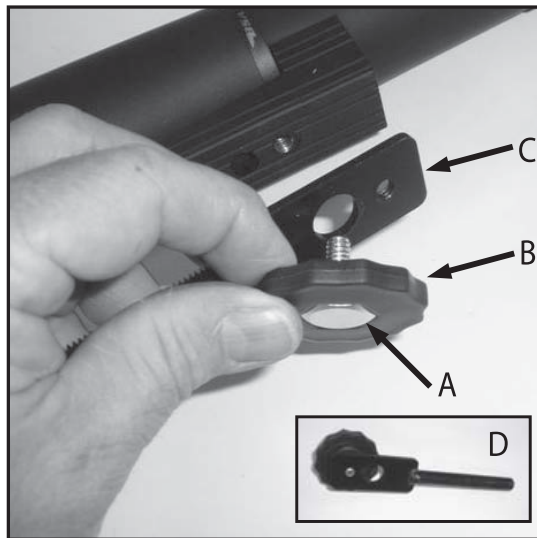
Cleats and a velcro faced web strap have been provided for times when it might be desirable to secure the gun.



The rest should be securely anchored to a stable bench #14 x 1 1/4 - 2” sheetmetal screws or 1/4” lag bolts work well.

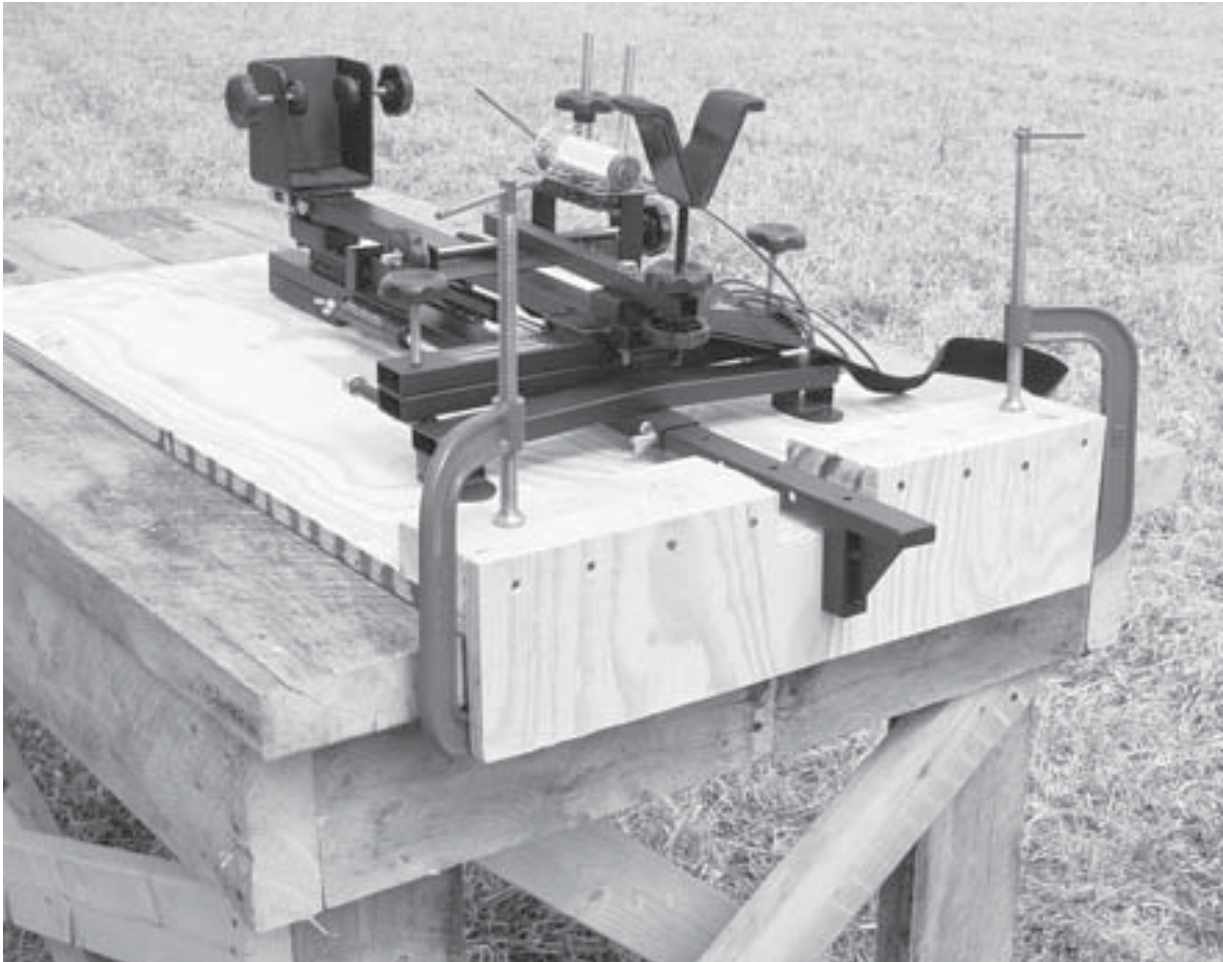


As An Extra Cost Option, A spotting scope mount is available (see replacement parts for details.) It consists of an M12 threaded rod which would fit in place of, and function as, one of the leveling screws, a horizontal support arm, that swivels and a scope mounting and bracket set. There are also 2 - M12 and 2 - M8 lock knobs to hold everything in place.



To mount a spotting scope, insert the 1/4” x #20 shoulder bolt “A” through the spanner knob “B” so that the hex head is fully engaged in the hex socket “A”. Fit the shoulder of the bolt through the mounting bracket “C” and thread into the screw boss (mounting hole) in the scope. Tighten just enough to hold the scope in position. The small threaded hole “D” is for storing the bolt & knob.

Hyskore®
Suggestions For Building A Shooting Bench Platform
For the 30013 Dangerous Game® Rest, 30003 Precision
Rifle Rest, 30088 Precision DLX Rifle Rest, or
30080 Ten Ring® Recoil Assist Shooting Rest



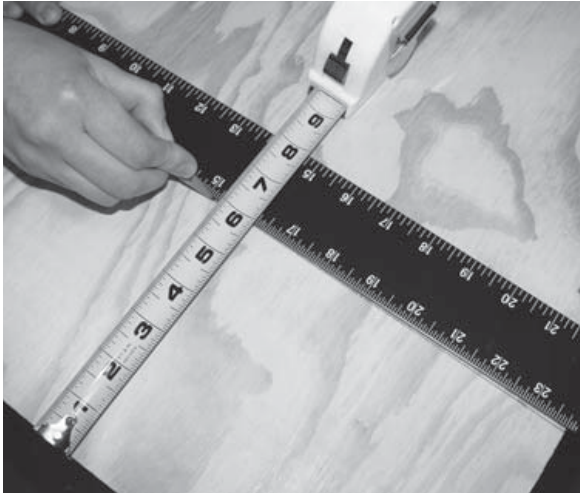
The above captioned rifle rests must be secured to a bench. When there is a concrete bench or a range that doesn't allow shooters to screw anything to their benches it is necessary to mount your rest to a platform that can be fixed to the bench using "C" Clamps.

Suggested Bill of Materials:
For Constructing a Bench Platform

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

	<u>Description</u>
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)

STEP 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.

STEP 2



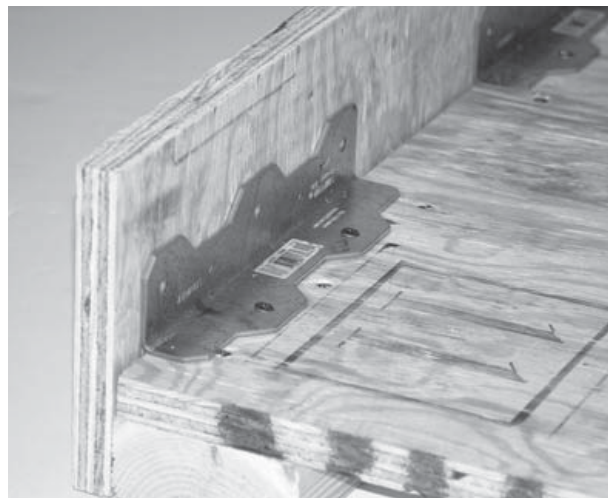
Cut 2 - 10" Pieces of 2" x 4". Glue and screw them to the Plywood base.

STEP 3



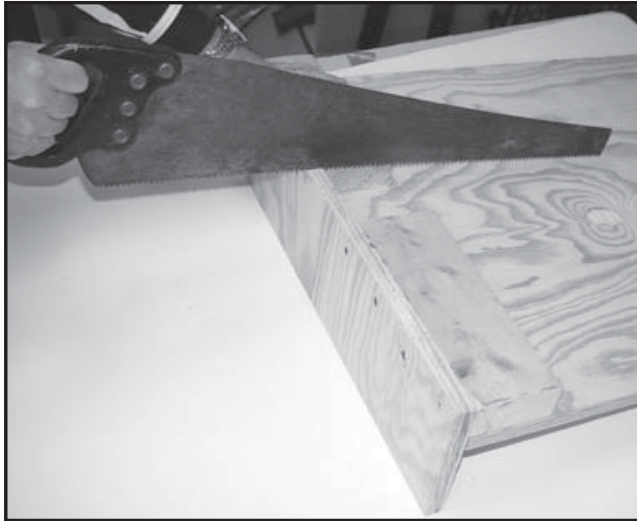
Use 2" screws to secure the 2" x 4" x 10" blocks from the Underside.

STEP 4



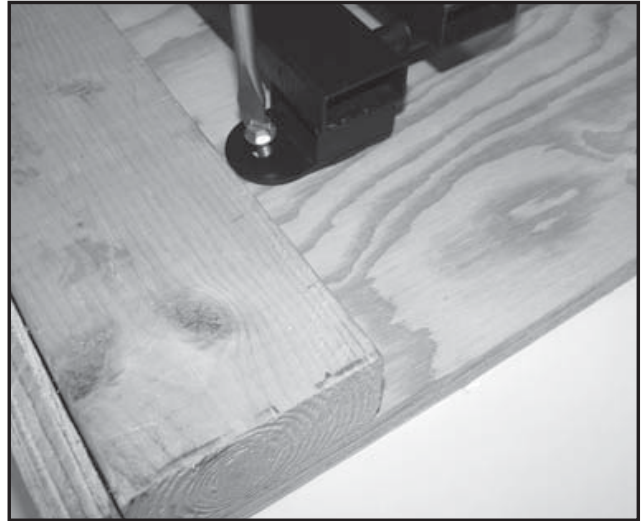
Glue & Screw (w/ 2" screws) the 6" x 24" piece of plywood across the front as shown. Use 2" x 6" (or 8") stair angles for reinforcement. Secure with screws.

STEP 5



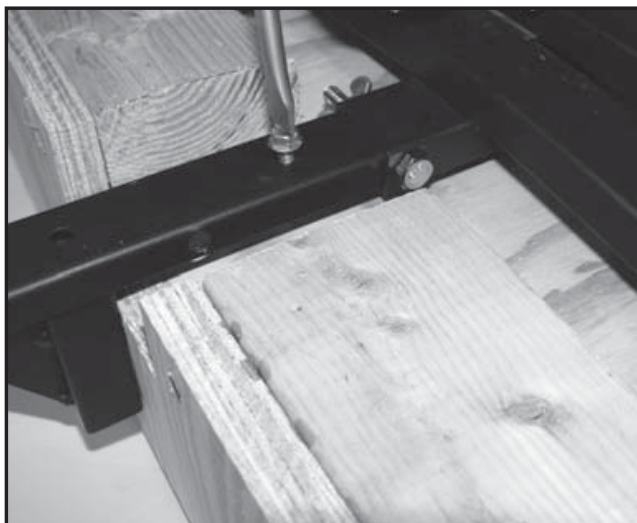
Notch the front brace so that the edge of the notch is flush with the surface of the plywood base. This can be done either before or after it is fixed in place.

STEP 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.

STEP 7



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

STEP 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, but 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 semi-automatic 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/hotlips/twistrate.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 (for example .224) into the bullet length (for example .712). Divide the result into the correct constant (150 or 180) and multiply the result by the BD (for example .224). The results 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 manufactures 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 Locktite 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 crosshairs 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 is 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. Concentricity – 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 the thickness of the rim. According to SAAMI standards 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 concentricity 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.

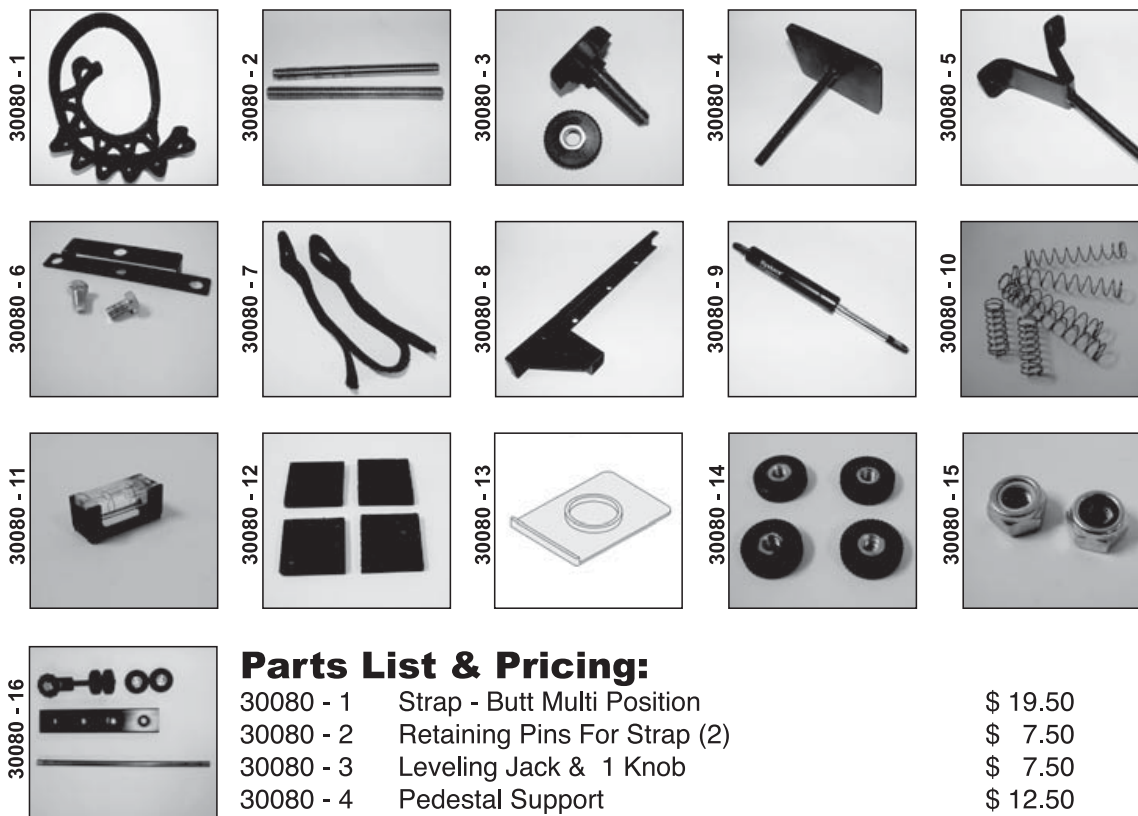
For more detailed recoil data (as of this writing) there are several good websites that you can reference:

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

or go to our website (www.hyskore.com) click on the image of the **Ten Ring®** then click on the link to the recoil calculator.

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 •



Parts List & Pricing:

30080 - 1	Strap - Butt Multi Position	\$ 19.50
30080 - 2	Retaining Pins For Strap (2)	\$ 7.50
30080 - 3	Leveling Jack & 1 Knob	\$ 7.50
30080 - 4	Pedestal Support	\$ 12.50
30080 - 5	V - Notch Support	\$ 12.50
30080 - 6	Elevation Bracket w/ 2 Bolts	\$ 10.00
30080 - 7	Strap - Restraining Velcro	\$ 7.50
30080 - 8	Bench Grip Arm	\$ 27.50
30080 - 9	Compression Damper	\$ 37.50
30080 - 10	Coil Spring Set (6 Springs)	\$ 15.00
30080 - 11	Magnetic Spirit Level	\$ 7.50
30080 - 12	Foam Pad Set - 4 pcs.	\$ 5.00
30080 - 13	Access Cover	\$ 7.50
30080 - 14	12mm Locking Knobs - 4 pcs.	\$ 10.00
30080 - 15	12mm Locking Nuts - 2 pcs.	\$ 5.00
30080 - 16	Spotting Scope Mounting Set	\$ 22.50

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

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Middleburgh, NY 12122

NYS Resident add 8.625% Sales Tax (Or Prevailing Rate)

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**** \$25.00 Shipping & Handling to
Alaska, Hawaii, Puerto Rico****

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