

VORTEX® VIPER® PST

PRECISION
SHOOTING
TACTICAL

SECOND FOCAL PLANE

EBR-1 MOA Manual 4—16x50 Riflescope



Designed to maximize long distance shooting and

ranging abilities,

the EBR-1 MOA

reticle can be

used to effectively

determine ranges,

holdovers, windage

corrections and

moving target leads.

Ultra precision

laser etching on

the glass reticle ensures that minute of angle (MOA)

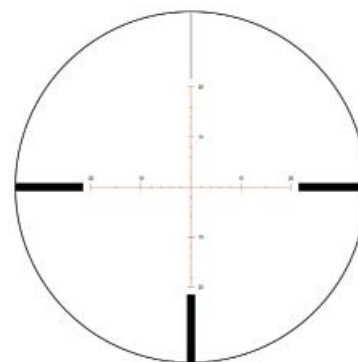
specifications can be kept to the tightest tolerances

possible. The fine center crosshair subtensions on the

EBR-1 MOA reticle were carefully chosen to provide

the optimum balance between precision aiming and low

light visibility.



MOA Subtensions

The EBR-1 reticle is based on minute-of-angle (MOA) subtensions. Many shooters are very familiar with the MOA system used in hunting riflescopes. MOA measurements are based on degrees and minutes: 360 degrees in a circle, 60 minutes in a degree for a total of 21,600 minutes. These angular measurements are used to estimate range and correct for bullet trajectory drop in riflescopes. 1 MOA will correspond to 1.05 inches at a 100 yard distance, 2.1 inches at 200 yards, 3.15 inches at 300 yards, and so on.

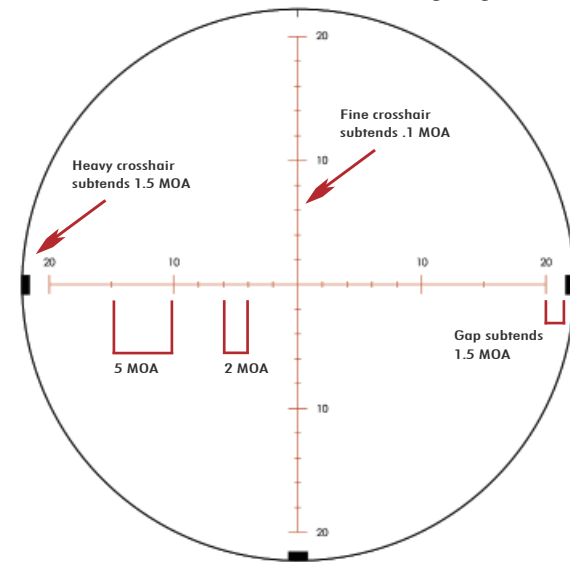
Estimating MOA

Although 1 MOA is very commonly corresponded to 1 inch at 100 yards, this is not quite correct 1 MOA at 100 yards equals 1.05 inches. Calling 1 MOA an inch per 100 yards may be acceptable at shorter distances, but it will cause a five percent error in ranging and holdover adjustments. This will result in missed shots at longer distances.

In this second focal plane riflescope, the listed MOA subtensions are only valid at the highest magnification of the scope. However, by understanding the relationship of magnification and subtensions, ranging, holdovers and wind drift can still be calculated at partial magnifications. If magnification is set at 1/2 of full magnification, subtension values will be two times the manual listed spec. If magnification is set at 1/3 full magnification, subtension values will be three times the manual listed spec. If magnification is set at 1/4 of full magnification, subtension values will be four times the manual listed spec.

EBR-1 Reticle Subtensions

To help calculate ranges, holdovers and wind drifts at magnifications other than full power, the Viper PST 4–16x50 riflescope uses a dual number marking system on the magnification dial. The 1x, 2x, 3x, and 4x subtension multiplier markings on the back side of the magnification numbers can be used in conjunction with the reticle to help calculate distances and holdovers at varying magnifications.



Subtension Changes with Magnification

Model	Riflescope Magnification	Reticle Multiplier	Actual Subtension of 2 MOA Reticle Space
4–16x50 Reticle subtensions valid at 16x	16x	1x	2 MOA
	8x	2x	4 MOAs
	5.3x	3x	6 MOAs
	4x	4x	8 MOAs

Ranging

MOA measurements are very effective for ranging using a simple formula. To use this formula, the shooter needs to know the size of the target or nearby object in inches.

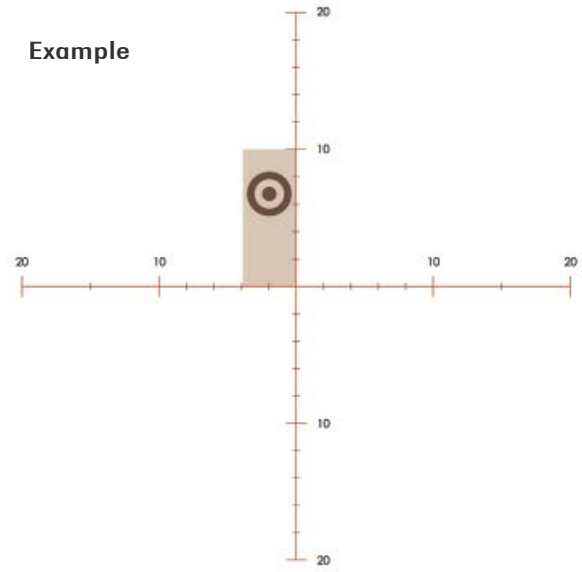
MOA Ranging Formula

$$\frac{\text{Target Size (Inches)} \times 95.5}{\text{Measured MOAs}} = \text{Range (Yards)}$$

Using either the vertical or horizontal MOA scale, place the reticle on a target of known dimensions and read the number of MOAs spanned. You will obtain maximum accuracy in ranging by calculating exact MOA measurements. MOAs should be estimated in 1/4s if possible.

Accurate measuring will depend on a very steady hold. The rifle should be solidly braced using a rest, bipod or sling when measuring. Once you have an accurate MOA reading, use the formula to calculate the distance.

Example



Ranging a 6-foot target (72 inches) at 10 MOAs yields 688 yards.

$$\frac{72 \times 95.5}{10 \text{ MOA}} = 688 \text{ Yards}$$

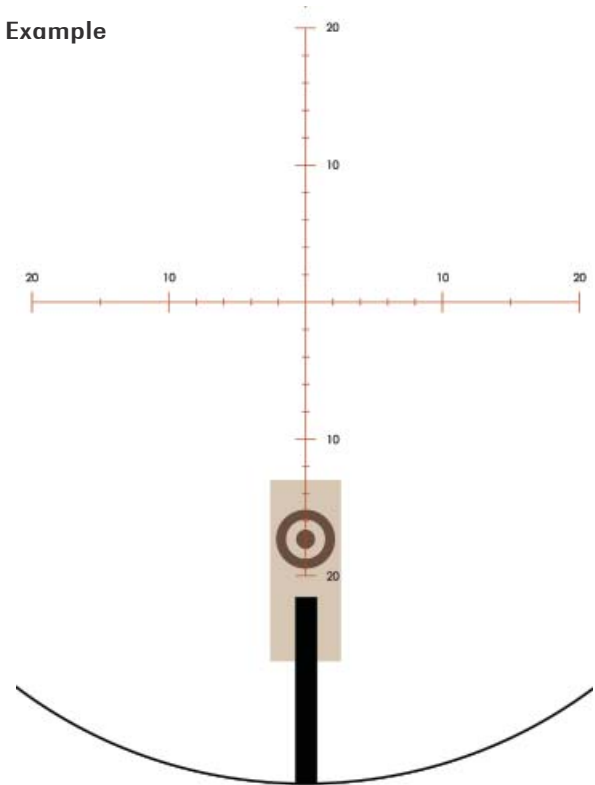
Note: In the MOA ranging formula, a shooter may substitute **100** for **95.5** in the interest of speedier calculations. Be aware that this will produce a five percent **over-estimation error** of the yardage distance obtained.

Elevation Holdovers

Once the distance has been calculated using the EBR-1 MOA reticle or a laser rangefinder, the EBR-1 can be used for rapid holdover correction for bullet drop of the cartridge being used. To get the most benefit out of the EBR-1 equipped riflescope, Vortex Optics highly recommends shooters learn their bullet drop numbers in MOAs rather than inches.

Since the EBR-1 reticle is scaled in 2 MOA increments, it is an easy job to quickly select the correct drop reference line once the shooter knows the bullet drops in MOAs. If the shooter prefers to dial *come ups* for bullet drop using the elevation knob, knowing bullet drops in MOAs rather than inches will allow for much faster adjustments as the MOAs can be quickly read on the elevation knob.

Example



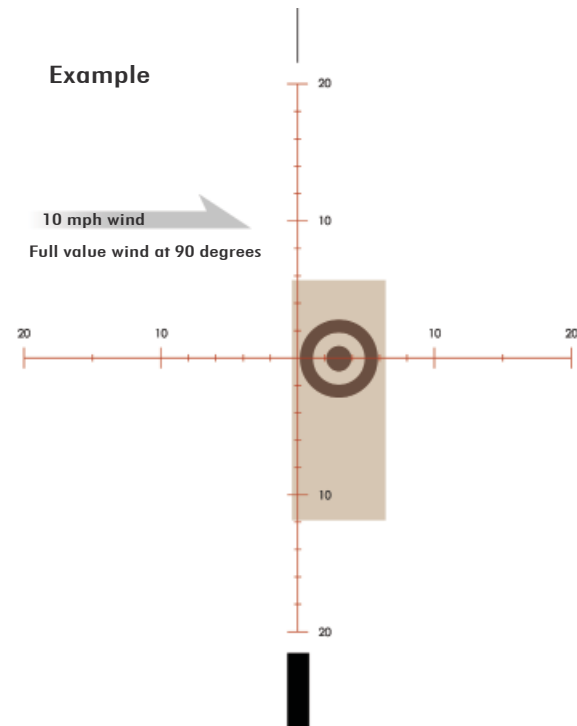
17.5 MOA reticle holdover for 625-yard shot. No wind.

Windage and Moving Targets

The EBR-1 MOA reticle is highly effective when used for wind and moving target leads. Using the reticle for effective windage and moving target leads will require thorough knowledge of your weapons system's ballistic performance under varying conditions and experience in reading wind strengths and target speeds. As in bullet drops, it is important for the shooter to learn a particular weapon's windage/moving target corrections in MOAs rather than inches. Always hold the reticle into the wind.

Basic windage correction on center crosshair

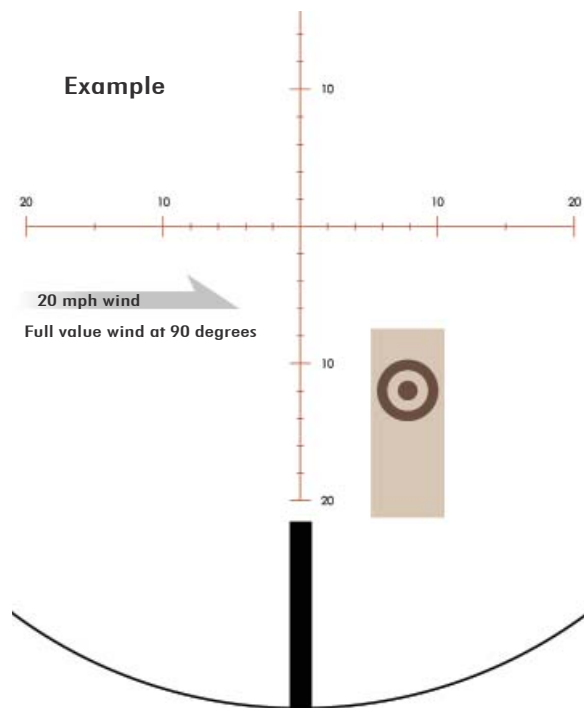
When dialing elevation *come ups*, the center horizontal crosshair will be used for windage or moving lead corrections.



3 MOA reticle windage correction for 400-yard shot in 10 mph crosswind using center crosshair. Elevation adjustment already dialed into riflescope.

Basic windage correction using drop line on reticle

When using the reticle for elevation correction rather than dialing, the MOA marks on the center horizontal crosshair can still be used to help visually reference windage corrections. Remember to hold the reticle into the wind.

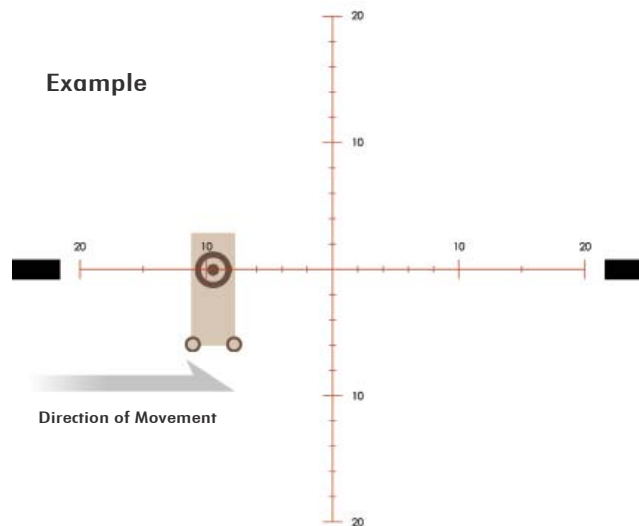


8 MOA reticle windage correction for 500-yard shot in 20 mph crosswind using 12 MOA reticle drop line.

Basic moving lead correction

When estimating moving target leads, the MOA marks on the center horizontal crosshair can be used. Estimating moving target leads will require knowing yardage distance, wind speed, moving target speed, and total bullet flight time (including rifle lock time). Bullet flight times can be roughly calculated based on fps velocities or a ballistic calculator.

***Note:** Correctly estimating moving leads is very difficult and requires considerable practice and knowledge beyond the scope of this manual.*



9.4 MOA reticle correction for a target moving 3 mph at a distance of 800 yards. No wind. Total bullet time of flight from trigger pull 1.5 seconds during which target travels 6.6 feet. Elevation already dialed into turret.



Vortex Service and Repair Policy

Unconditional Lifetime Warranty

Vortex Optics wants you to shoot and use your Viper PST riflescope under any conditions with complete confidence—that's why our warranty is straightforward and simple:

- Fully transferable
- No warranty card needed
- No receipt needed



Unconditional Lifetime Warranty

Rest assured, if this riflescope should ever require repair, all you need to do is contact Vortex for absolutely free service. Call 800-426-0048 or e-mail service@vortexoptics.com.

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Patent Pending
Dual Use: Shooting Tactical / Hunting



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