

VORTEX  
THE FORCE OF OPTICS®

# VIPER<sup>®</sup> VMR-1<sup>™</sup> RETICLE



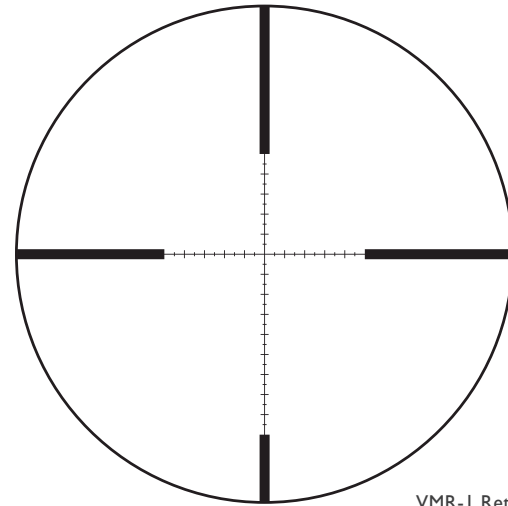
Second Focal Plane Reticle Manual

## VMR-1 RETICLE (MRAD)



## THE VORTEX® VMR-1™ RETICLE

You have purchased a Vortex® riflescope equipped with the VMR-1™ reticle. Designed to maximize long distance shooting and ranging abilities, the VMR-1 mrad reticle can be used to effectively determine ranges, holdovers, windage corrections and moving target leads.



VMR-1 Reticle

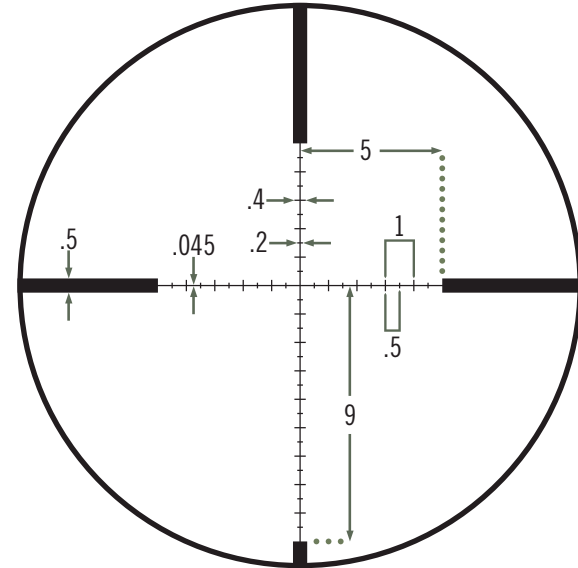
## MRAD Subtensions

The VMR-1 MRAD reticle is based on the milliradian, or mrad for short. Mrad unit of arc measurements are based on the radian. A radian is the angle subtended at the center of a circle by an arc that is equal in length to the radius of the circle. There are 6.283 radians in a circle and 1000 milliradians in a radian for a total of 6,283 milliradians (mrads) in a circle. An mrad will subtend 3.6 inches at a distance of 100 yards. This rifle scope with mrad adjustments uses .1 mrad clicks which subtend .36 inches at 100 yards.

## SECOND FOCAL PLANE RETICLES

Second focal plane (SFP) reticles are located near the scope's eyepiece behind the image erecting and magnifying lenses. This style of reticle does not visually change in size when you change the magnification. The advantage of an SFP reticle is that it always maintains the same ideally-sized appearance. When shooting with this SFP scope, be aware that the listed reticle subtensions used for estimating range, holdover, and wind drift correction are accurate at the highest magnification for all models except the 6-24x50. For 6-24x50 models, the reticle subtensions are accurate at 18x.

## VMR-1 Subtensions



Subtensions measured in mrads. Reticle image shown for representation only.

## Ranging

The VMR-1 mrad reticle is very effective for ranging using simple formulas.

### MRAD RANGING FORMULAS

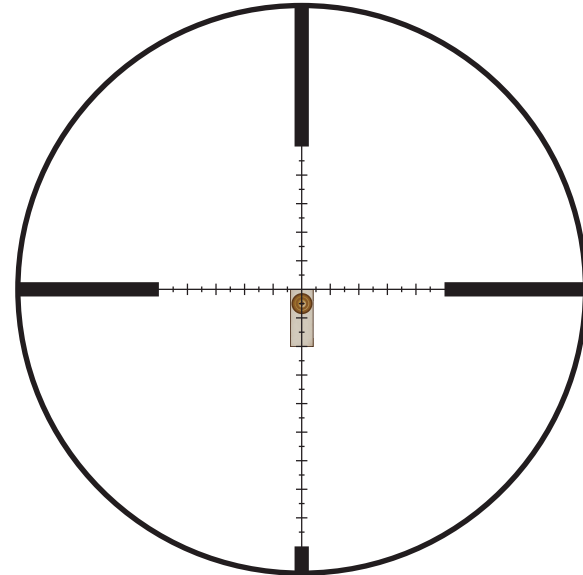
$$\frac{\text{Target Size (Yards)} \times 1000}{\text{MRADs Read}} = \text{Range (Yards)}$$

$$\frac{\text{Target Size (Meters)} \times 1000}{\text{MRADs Read}} = \text{Range (Meters)}$$

$$\frac{\text{Target Size (Inches)} \times 27.8}{\text{MRADs Read}} = \text{Range (yards)}$$

To use these formulas, it will be necessary to know the measured size of the target or a nearby object. Using either the vertical or horizontal mrad scale, place the reticle on the target of known measurement and read the number of mrad spanned. Maximum accuracy in ranging will be obtained by calculating exact mrad measurements—mrad should be estimated in 1/10s if possible.

### Example



Ranging a target stand that is one yard tall at 2 mrad to get 500 yards.

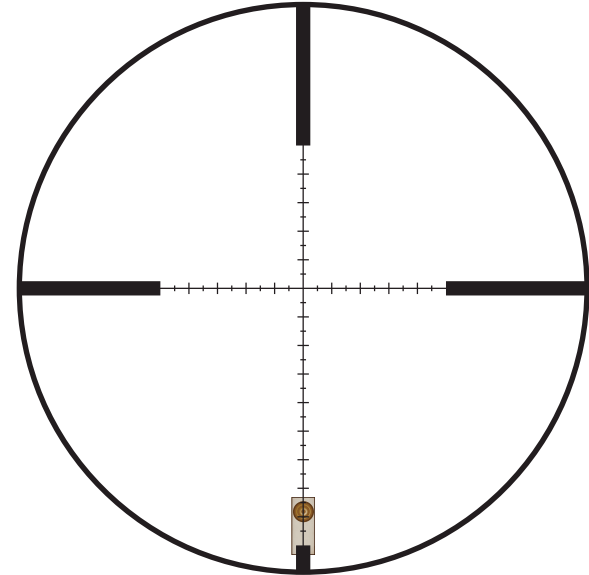
$$\frac{1 \times 1000}{2 \text{ mrad}} = 500 \text{ Yards}$$

## Elevation Holdovers

Once the distance has been calculated using the VMR-1 or a laser rangefinder, the VMR-1 can be used for rapid holdover correction for the bullet drop of the weapon system being used. To get the most benefit out of the riflescope equipped with the VMR-1 reticle, Vortex Optics **highly** recommends shooters learn their bullet drop numbers and windage/lead corrections in mrads rather than inches or MOAs. Remember that 1 mrad equals 3.44 MOA or 3.6 inches per 100 yards.

Since the VMR-1 reticle is marked in mrads, it is an easy job to quickly select the correct drop reference line once the shooter knows the bullet drops and windage/lead corrections in mrads. If the shooter prefers to dial the **come ups** for bullet drop using the elevation knob, knowing bullet drops in mrads will allow for much faster adjustments because the mrads can be quickly read on the elevation knob.

## Example



7.7 mrad reticle holdover correction for 800-yard shot. No wind.

## Windage and Moving Targets

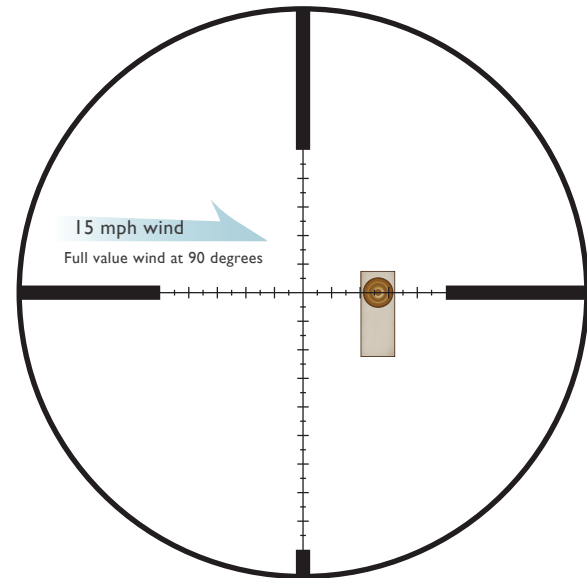
The VMR-1 reticle is highly effective when used for wind and moving target leads. Using the reticle for effective windage and moving leads will require a thorough knowledge of your weapon system's ballistic performance under varying conditions and experience in reading wind strengths and target speeds.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

When dialing elevation *come ups*, the center horizontal crosshair will be used for windage or moving target leads. Mrad marks on the horizontal crosshair are graduated in .5 mrad increments.

## Basic windage correction on center crosshair

When dialing elevation *come ups*, the center horizontal crosshair will be used for windage or moving target leads. Mrad marks on the horizontal crosshair are graduated in .5 mrad increments.

### Example



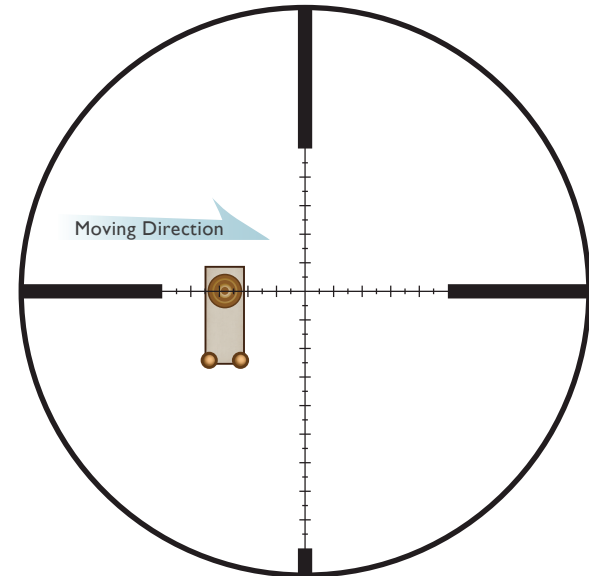
2.6 mrad reticle correction for 15 mph wind at 700 yards. Elevation is already dialed into turret.

## Basic moving lead correction

When estimating moving target leads, the mrad marks on the center horizontal crosshair can be used. Estimating moving leads will require knowing yardage distance, wind speed, moving target speed and total bullet flight times 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.

## Example



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



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