

**RAZOR<sup>®</sup>HD<sup>GEN</sup>II**

**RIFLESCOPE MANUAL**

First Focal Plane



## THE VORTEX<sup>®</sup> RAZOR HD<sup>®</sup> RIFLESCOPE

Specifically designed for the tactical, law enforcement and committed precision shooting communities, the Razor HD<sup>®</sup> Gen II™ series of riflescopes offer the highest levels of performance and reliability.



## RETICLE

### Reticle Focal Plane

All riflescope reticles can be termed either first focal plane (FFP) or second focal plane (SFP), depending upon their internal location within the riflescope. This Razor HD Gen II riflescope features a first focal plane reticle.

First focal plane (FFP) reticles are located within the riflescope near the windage and elevation turrets in front of the image-erecting and magnifying lenses. This style of reticle will visually grow and shrink as you change the magnification. The advantage of an FFP reticle is that the reticle subtensions used for ranging, holdovers, and wind drift corrections are consistent at all magnifications. Usually, the reticle will appear heavier at higher magnifications and finer at lower magnifications.

### MOA and MRAD Adjustments

Depending on which version you have purchased, your Razor HD riflescope will feature adjustments and reticles scaled in MOAs or mrads. Both minute-of-angle (MOA) and milliradian (mrad) unit of arc scales are equally effective when ranging or adjusting riflescope for bullet trajectory.



### MOA Adjustments

MOA unit of arc measurements are based on degrees and minutes. There are 360 degrees in a circle and 60 minutes in a degree for a total of 21,600 minutes (MOA) in a circle. A minute of angle will subtend 1.05 inches at a distance of 100 yards (29.1 mm at 100 meters). Razor HD riflescopes with MOA adjustments use .25 minute clicks which subtend .26 inches at 100 yards (7.3 mm at a 100 meters), .52 inches at 200 yards (14.6 mm at 200 meters), .78 inches at 300 yards (21.9 at 300 meters), etc.

### MRAD Adjustments

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 all circles and 1000 milliradian in a radian for a total of 6283 milliradians (mrads) in a circle. An mrad will subtend 3.6 inches at a distance of 100 yards (10 cm at 100 meters). Razor HD riflescopes with mrad adjustments use .1 mrad clicks which subtend .36 inches at 100 yards (1 cm at 100 meters), .72 inches at 200 yards (2 cm at 200 meters), 1.08 inches at 300 yards (3 cm at 300 meters), etc.

## RIFLESCOPE ADJUSTMENTS

### Reticle Focus

Vortex Razor HD riflescopes use a *fast focus* eyepiece designed to quickly and easily adjust the focus on the riflescope's reticle.

To adjust the reticle focus:

1. Look through the riflescope at a blank white wall or up at the sky.
2. Turn focus knob fully outward.
3. **Slowly** turn the eyepiece focus knob inward until the reticle image is as crisp as possible. When focusing, look at the reticle with short, interrupted glances rather than an extended stare.



Adjust the reticle focus.

Once this adjustment is complete, it will not be necessary to re-focus every time you use the riflescope. However, because your eyesight may change over time, you should re-check this adjustment periodically.

### Warning

Looking directly at the sun through a riflescope, or any optical instrument, can cause severe and permanent damage to your eyesight.

### Variable Power Adjustments

To change magnifications, turn the magnification ring to the desired level.

Adjust the magnification.



### External Rotation Indicator

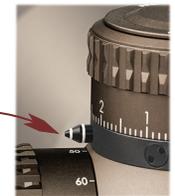
The external indicator on the elevation turret provides quick visual and tactile reference of the elevation turret's rotational position. As the turret enters the second turn of rotation, the indicator will extend outward from the turret. On the third turn of rotation, the indicator will be fully extended.



Turret in first turn of rotation (not visible).



Turret in second turn of rotation (partially extended).



Turret in third turn of rotation (fully extended).

**Note:** Some combinations of rifle, base and rings may not allow a second or third rotation of the elevation turret.

## Locking Side Illumination Control

The Vortex Razor HD riflescopes use a variable intensity reticle illumination system to aid in low light performance. Integrated on the side focus dial for easy access, the illumination can be set and locked at your preferred setting.

To activate the illumination, pull out the dial and adjust by rotating the adjustment dial in either direction. The illumination dial allows for 11 levels of brightness intensity; an *off click* between each level allows the shooter to turn the illumination off and return to a favored intensity level with just one click.



Pull out to unlock and adjust.



Push in to lock.

## Replacing the Battery

1. Unscrew the outer cap with a coin.
2. Remove the battery.
3. Replace with a new CR 2032 battery.
4. Re-install the outer battery cap and be sure to fully tighten it down.



Battery Cap

## Image Focus and Parallax Correction

The Razor HD Gen II riflescopes feature a side focus dial which should be used to fine-tune the image focus. When the image is sharply focused, parallax error will also be eliminated.

### Using the Side Focus

1. Be sure the reticle is correctly focused (see *Reticle Focus* section on page 6).
2. Turn the side focus knob until the target image is as sharp as possible. The yardage numbers referenced on knob should closely match the actual yardage to the target.
3. Check for parallax error by moving your head back and forth while looking through the scope. The focus is correct if there is no apparent shift of the reticle on the target. If you notice any shift, adjust the focus knob slightly until all shift is eliminated.



Rotate Side Focus Dial

*Parallax* is a phenomenon that results when the target image does not quite fall on the same optical plane as the reticle within the scope. This can cause an apparent movement of the reticle in relation to the target if the shooter's eye is off-centered. Correctly focusing the target image will allow it to fall on the same optical plane as the reticle within the rifle scope.

## L-TEC™ Turrets

This Razor HD Gen II riflescope features the fast, accurate, easily-read L-TEC elevation and windage turrets with integrated locking mechanisms preventing accidental adjustments. The turrets feature the L-TEC zero stop which provides a reliable return to the original zero when long distance shots have been dialed. **Note:** The turrets will allow a slight over travel (1/2 mrad or 1.25 MOA) for shooters who occasionally need to dial down below their zero.



To make adjustments:

1. Pull the windage or elevation turret knob outwards to disengage the lock.
2. Turn the knob in the desired direction: up or down for elevation adjustments; left or right for windage adjustments.
3. After the shot, return knobs to the zero position. The elevation turret can simply be spun clockwise until reaching a hard stop against the zero stop. Then, turn the elevation turret just slightly (1/2 mrad or 1.25 MOA) in a counter-clockwise direction until the 0 mark on the cap lines up with the indicator mark on the turret body.
4. Push turret knobs inwards to return to the locked position.

## MOA/MRAD Adjustments

Each click of the Razor HD turret will move the point-of-impact either .25 MOA or .1 mrad depending on the model. (Refer to *MOA and MRAD Adjustments* on page 5 for more details).

## Adjusting the L-TEC Turrets for Bore and Range Sighting

Prior to making any zero adjustments, be sure the L-TEC turret caps are correctly positioned with the 0 mark on the turret cap indexed to the reference line on the turret body.

- Lift the elevation turret cap and rotate turret clockwise until it hits a hard stop. Then, rotate just slightly (1/2 mrad or 1.25 MOA) in a counter-clockwise direction until the 0 mark on the cap lines up with indicator line on the turret body. Once aligned, push the cap back down.
- Lift the windage turret cap and rotate until the 0 mark on the cap lines up with indicator line on turret body. Depending on previous cap orientation, you may have to rotate either clockwise or counter-clockwise to do this. Once aligned, push the cap back down.



## Steps for Bore Sighting and Range Sighting

Be sure the L-TEC turret caps are correctly positioned with the 0 mark on the turret cap indexed to the reference line on the turret body (see page 11).

1. Loosen the turret top cover with a coin or screwdriver to reveal the circular scale on the top of the turret.



2. Use the wrench to loosen three set screws located on cap perimeters.



3. When adjusting, use the reference line and circular scale (MOA or MRAD) in the center of the turret housing to measure the desired adjustments.

4. Using a screwdriver, turn the brass center screw to make the adjustments changing the bullet's point-of-impact. No clicks will be felt when making this adjustment.



5. Once desired zero has been achieved, re-tighten three set screws. For best performance, turn in each of the three set screws until lightly seated. Then, go back and continue to turn each screw a little bit at a time until all three are fully tightened down.

6. Replace the turret top cover.

## RIFLESCOPE MOUNTING

To get the best performance from your Vortex Razor HD rifle scope, proper mounting is essential. Although not difficult, the correct steps must be followed. If you are unsure of your abilities, it would be best to use the services of a qualified gunsmith.

### Rings and Bases

Mount an appropriate base and matching rings to your rifle according to the manufacturer's instructions. The Vortex Razor HD riflescopes require 34 mm rings.

Vortex Optics highly recommends using the Vortex Precision Matched 34 mm ring sets which may be purchased from an authorized Vortex rifle scope dealer. These rings will mount to any Picatinny spec base.

If using an aftermarket base and ring setup, use the lowest ring height that will provide complete clearance of scope and rifle—avoiding any contact with barrel, receiver, bolt handle or any other part of the rifle. A low mounting will help assure proper cheek weld, aid in establishing a solid shooting position, and promote fast target acquisition.



## Eye Relief and Reticle Alignment

After installing the bottom ring halves on the mounting base, place the riflescope on the bottom ring halves and loosely install the upper ring halves. Before tightening the scope ring screws, adjust for maximum eye relief to avoid injury from recoil:

1. Set the riflescope to the middle of its magnification range.
2. Slide the riflescope as far forward as possible in the rings.
3. While viewing through the riflescope in a normal shooting position, slowly slide the riflescope back towards the shooter's face—paying attention to the field of view. *Just as the full view is visible, stop.*
4. Without disturbing the front-back placement, rotate the riflescope until the vertical crosshair exactly matches the vertical axis of the rifle. Use of a reticle leveling tool, a weight hung on a rope, flat feeler gauges, or bubble levels will help with this procedure.
5. After aligning the reticle, tighten and torque the ring screws down per the manufacturer's instructions.



Using bubble levels to square the riflescope to the base.

## Bore Sighting

Initial bore sighting of the riflescope will save time and money at the range. This can be done by using a mechanical or laser bore sighter according to the manufacturer's instructions or by removing the bolt and sighting through the barrel on some rifles.

### To visually bore sight a rifle:

1. Place the rifle solidly on a rest and remove the bolt.
2. Sight through the bore at a target approximately 100 yards away.
3. Move the rifle and rest until the target is visually centered inside the barrel.
4. With the target centered in the bore, make windage and elevation adjustments until the reticle crosshair is also centered over the target.

**Note:** Be sure to read pages 11–12 prior to making adjustments.



Visually bore-sighting a rifle.



## Final Range Sight-In

After the riflescope has been bore-sighted, final sight-in should be done at the range using the exact ammunition expected to be used while shooting. Sight in and zero the riflescope at the preferred distance. 100 yards is the most common zero distance, although a 200 yard zero may be preferred for long range applications.

Be sure the reticle is in focus (see *Reticle Focus* section on page 6) and adjust the side focus knob if present until the target image is sharp and without parallax error (see *Using the Side Focus* section on page 8).

1. Following all safe shooting practices, fire a three-shot group as precisely as possible.
2. Next, adjust the reticle to match the approximate center of the shot group. Be sure to read page 11–12 prior to making adjustments.  
**Note:** If the rifle is very solidly mounted and cannot be moved, simply look through the scope and adjust the reticle until it is centered on the fired group.
3. Carefully fire another three-shot group and see if the bullet group is centered on the bull's eye.

This procedure can be repeated as many times as necessary to achieve a perfect zero.

## MAINTENANCE

### Cleaning

The fully waterproof and fogproof Vortex Razor HD riflescope requires very little routine maintenance other than periodically cleaning the exterior lenses. The exterior of the scope may be cleaned by wiping with a soft, dry cloth.

When cleaning the lenses, be sure to use products, such as the Vortex Fog Free cleaning products or Lens Pen, that are specifically designed for use on coated optical lenses.

- Be sure to blow away any dust or grit on the lenses prior to wiping the surfaces.
- Using your breath, or a very small amount of water or pure alcohol, can help remove stubborn things like dried water spots.

### Lubrication

All components of the Vortex Razor HD riflescopes are permanently lubricated, so no additional lubricant should be applied.

**Note:** Other than to remove the top turret cover for zeroing purposes, do not attempt to disassemble any components of the riflescope. Disassembling of riflescope may void warranty.



## TROUBLESHOOTING

### Sighting-in Problems

Many times, problems thought to be with the scope are actually mount problems. Be sure the mounts are tight to the rifle and the scope is secured so it doesn't twist or move in the rings. An insufficient windage or elevation adjustment range may indicate problems with the base mount, base mount holes drilled in the rifle's receiver, or barrel/receiver alignment.

#### Check for Correct Base and Ring Alignment

1. Center the scope reticle.
2. Attach bore sighter, or remove bolt and visually bore sight rifle.
3. Look through the scope. If the reticle appears way off center on the bore sighter image or when compared to the visually centered target when looking through rifle's bore, there may be a problem with the bases or rings being used. Confirm that correct base and rings are being used—and in the proper orientation.

### Grouping Problems

There are many issues that can cause poor bullet grouping.

- Be sure that rings are correctly torqued per the manufacturer's instructions.
- Be sure that all screws on rifle's action are properly tightened.
- Be sure rifle barrel and action are clean and free of excessive oil or copper fouling.
- Maintain a good shooting technique and use a solid rest.
- Some rifles and ammunition don't work well together—try different ammunition and see if accuracy improves.

## THE VIP WARRANTY

We build optics based on our commitment to your absolute satisfaction. That's why Vortex products are unconditionally guaranteed and we make this Very Important Promise to you—a Very Important Person.

Rest assured that in the event your Razor HD becomes damaged or defective, Vortex Optics will repair or replace the riflescope at no charge to you. Call Vortex Optics at 800-426-0048 for prompt, professional, and friendly service.



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Visit [www.vortexoptics.com](http://www.vortexoptics.com) for more information. Canadian customers may visit [www.vortexcanada.net](http://www.vortexcanada.net) for customer service information.

**Note:** The VIP warranty does not cover theft, loss, or deliberate damage to the product.

**RAZOR<sup>®</sup>HD<sup>GEN II</sup>**

[www.vortexoptics.com](http://www.vortexoptics.com)



**# RFL-RZR-HD-G2-FFP-13A**

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