

# Guide to Boresighting

## By Fred Bohl

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This guide was originally an interactive presentation given at the January 22, 2004 meeting of the Twin City Rod & Gun Club. The author claims no special expertise and the opinions expressed are based on his own research and experience (over 300) in using these methods and equipment on rifles, shotguns and handguns. With appropriate adaptation, these methods and equipment have worked successfully on firearms for adjustment of open sights, reflex (red dot), and telescopic sights. The original presentation was directed primarily at use with typical internally adjusted telescopic sights on rifles.

### **Goal**

To adjust the sights to compensate for height of sights above the bore and for the expected path of the bullet from the selected cartridge - see middle view 'Optimal Collimator...' page 4 of 9

### **Equipment Preferences**

1. Optical Boresighter (Collimator) - see page 5 of 9
2. Spuds in order of preference
  - a. Expanding Spud - whenever possible - see bottom view page 6 of 9
  - b. Long Spud - see middle view page 6 of 9
  - c. Standard Spud - see top view page 6 of 9
3. Laser Boresighter  
Bore mounted expanding spud laser is particularly useful to align reflex and/or laser beam sights (under 25 yards) on handguns by adjusting to superimpose the two dots at the desired range - see bottom view page 9 of 9
4. Magnetic Boresighter  
This type is a last resort for original boresighting. However, it is highly recommended that once a firearm is sighted in, a magnetic boresighter is used and the crosshair position noted for that firearm and boresighter. This can then be used as a quick check particularly in the field should a problem with sight alignment be suspected - see view page 8 of 9
5. Boresighter Offset Device  
These should only be used when the sight axis and bore axis are too far apart for direct boresighter to spud mounting (angular error potential high with two more mounting interfaces) - see view page 7 of 9

# Scope Adjustments

## Direction

The directions marked on the turrets (Up/Down - Left/Right) usually (*but not always!*) refer to the desired movement of the point of impact (were you want the next bullet hole to be)

## Indicators

Scopes have a graduated scales at the adjustment knobs with increments representing a certain amount of point of impact movement on the target. The most common increment is 1/4 minute of angle per increment (or per "click" when so equipped). Each one increment or "click" adjustment moves the point of impact 1/4" at 100 yards.

### Inches per "click" for popular adjustments by yardage

Per Click	25yd	50yd	100yd	150 yd	200yd	300yd	400yd
1/2 MOA	1/8	1/4	1/2	3/4	1	1 1/2	2
1/4 MOA	1/16	1/8	1/4	3/8	1/2	3/4	1
1/8 MOA	1/32	1/16	1/8	3/16	1/4	3/8	1/2

# Mount Adjustments

## Windage

Some mounts are equiped with windage adjustments in the form of opposed screws in the rear ring position. Always use these to align the scope axis with the bore after making shure that the scope windage adjustment is centered in its range before making this adjustment!

## Elevation

Virtually no scope mounts provide for elevation adjustment other than by putting shims under the mounts. Shim the rear to lower the point of aim and shim the front to raise the point of aim. For typical mount spacing, the point of aim changes 3/4 MOA per each 0.001inch of shim!

### Burriss Signature Rings & Pos-Align Offset Inserts

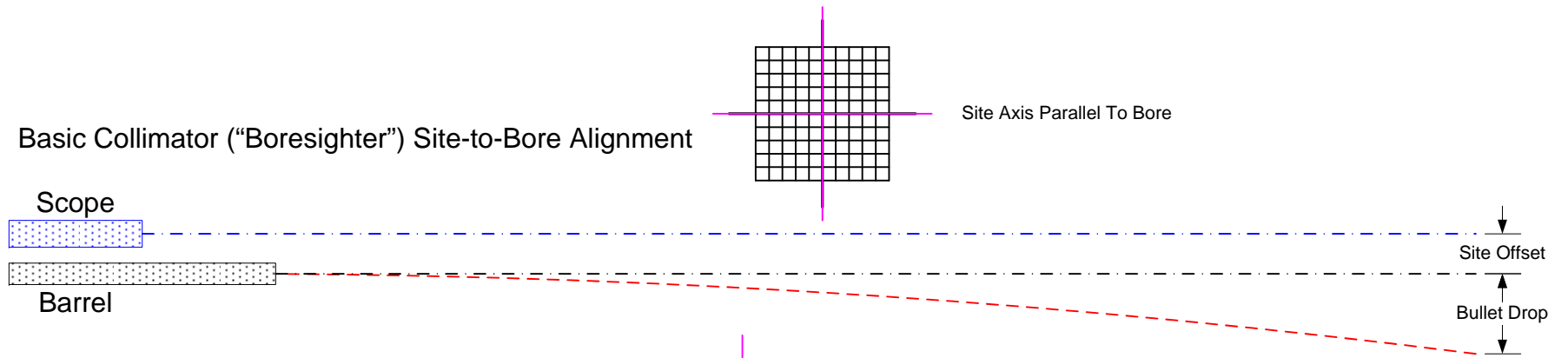
Burriss Signature Rings have a synthetic liner between the scope and the rings. Burriss also offers Pos-Align Offset Inserts (+/- .005", +/- .010", and +/- .020") that can correct for both windage and elevation within the rings themselves without shims or adjustable mounts.

## Optimum Scope Adjustments

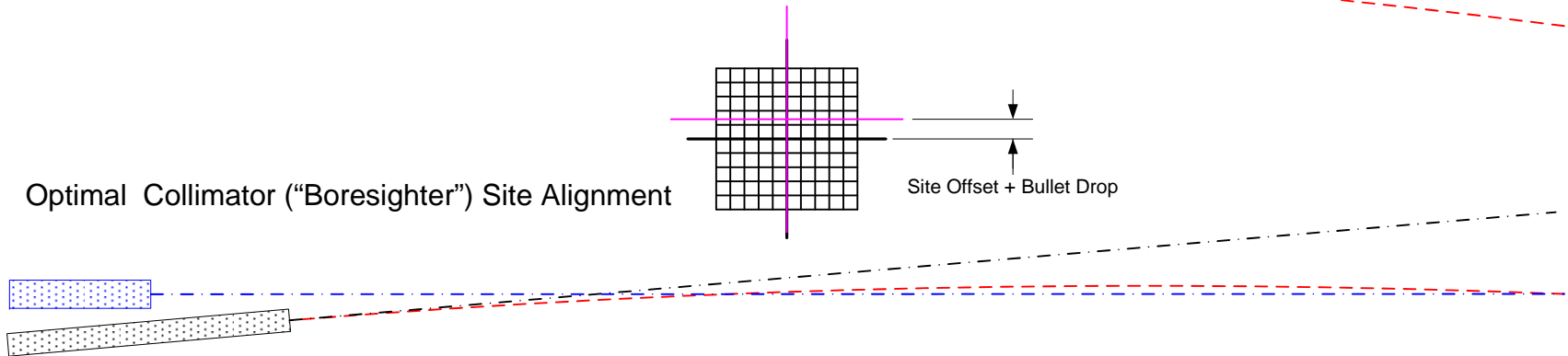
<i>Zero Range</i> Yards	<i>Drop</i>		<i>Scope Height</i>		<i>Scope Adjust</i>
	Inch	MOA	Inch	MOA	MOA
<b>100</b>	2.4	2.29	1.5	1.43	3.72
<b>150</b>	5.5	3.50	1.5	0.96	4.46
<b>200</b>	10.2	4.87	1.5	0.72	5.59

**Cartridge Data: .308 Win, 150gr, 0.315 BC, 2820 fps MV**

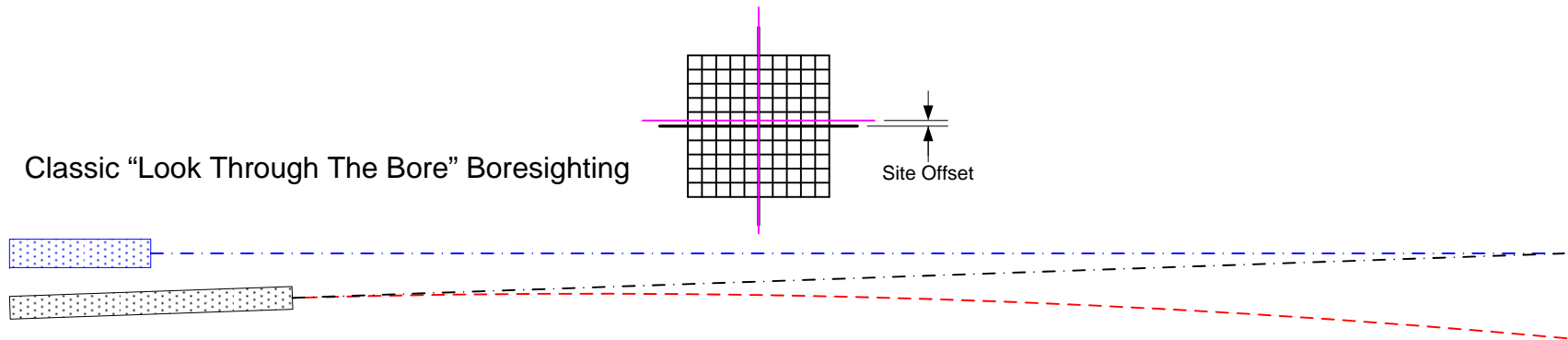
### Basic Collimator ("Boresighter") Site-to-Bore Alignment



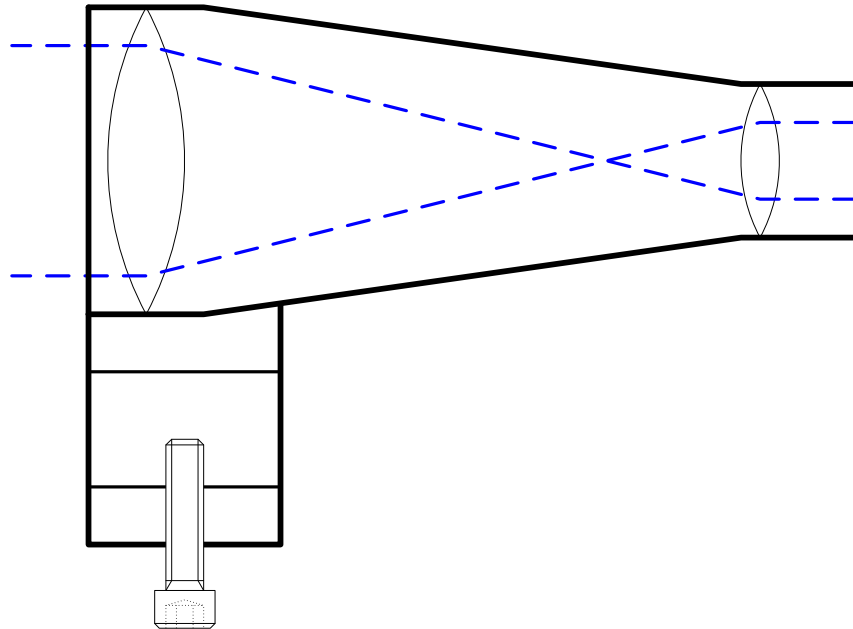
### Optimal Collimator ("Boresighter") Site Alignment



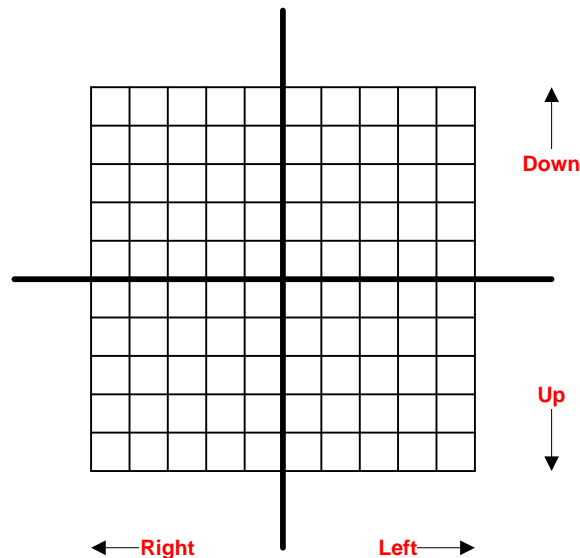
### Classic "Look Through The Bore" Boresighting



# Typical Boresighter (Collimator)

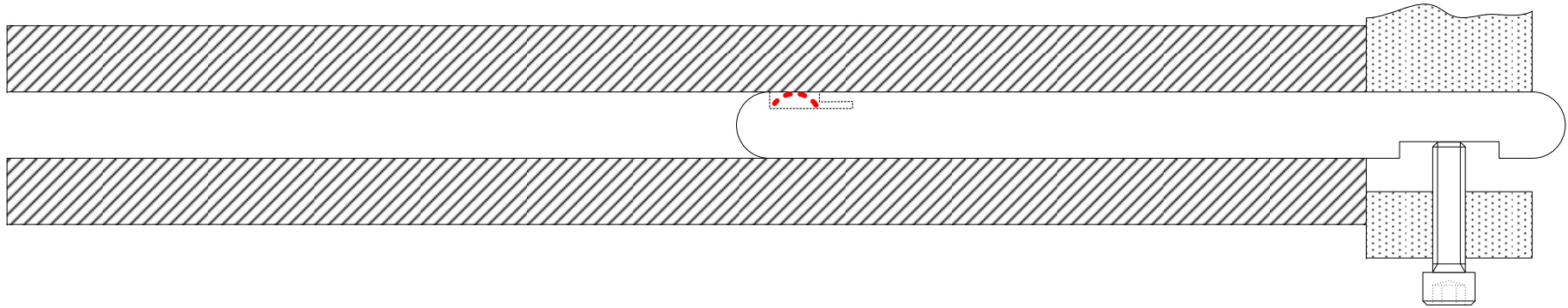


## Typical Grid Line Spacing 4 MOA (4 in at 100 yds)

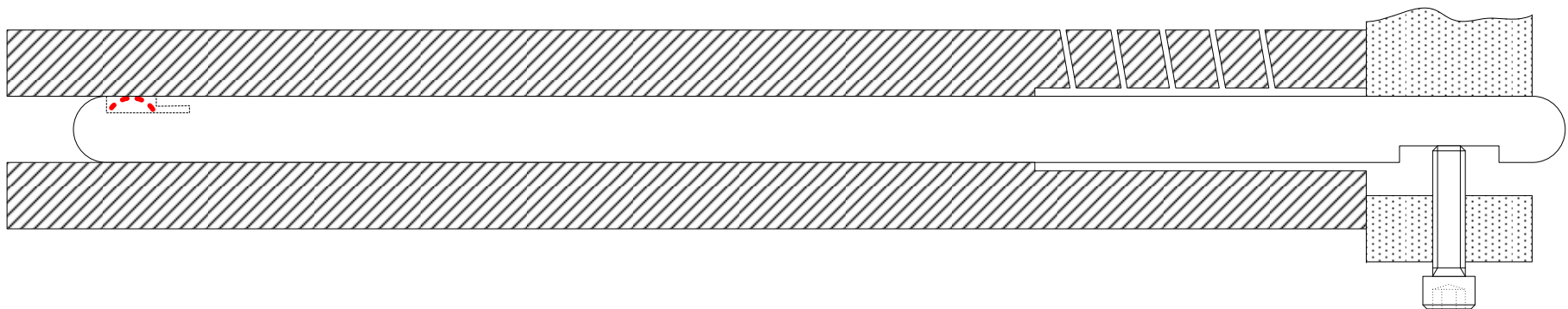


**Note:** Since both the boresighter and the scope tube are fixed in relative position, the position of the crosshair on the grid shows the actual reticle location in the tube. To make the reticle appear centered, modern scopes tilt the optical axis of the erector tube, which lies between the objective and ocular image planes (the reticle is at one or the other), in the opposite direction to compensate for the inverted images. In normal use, your visual system will compensate for this very slight axis tilt.

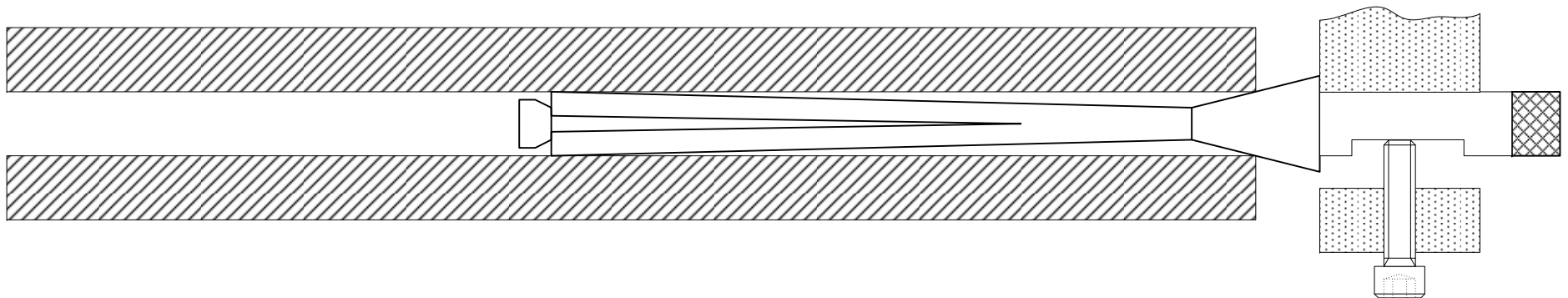
## Standard Spud



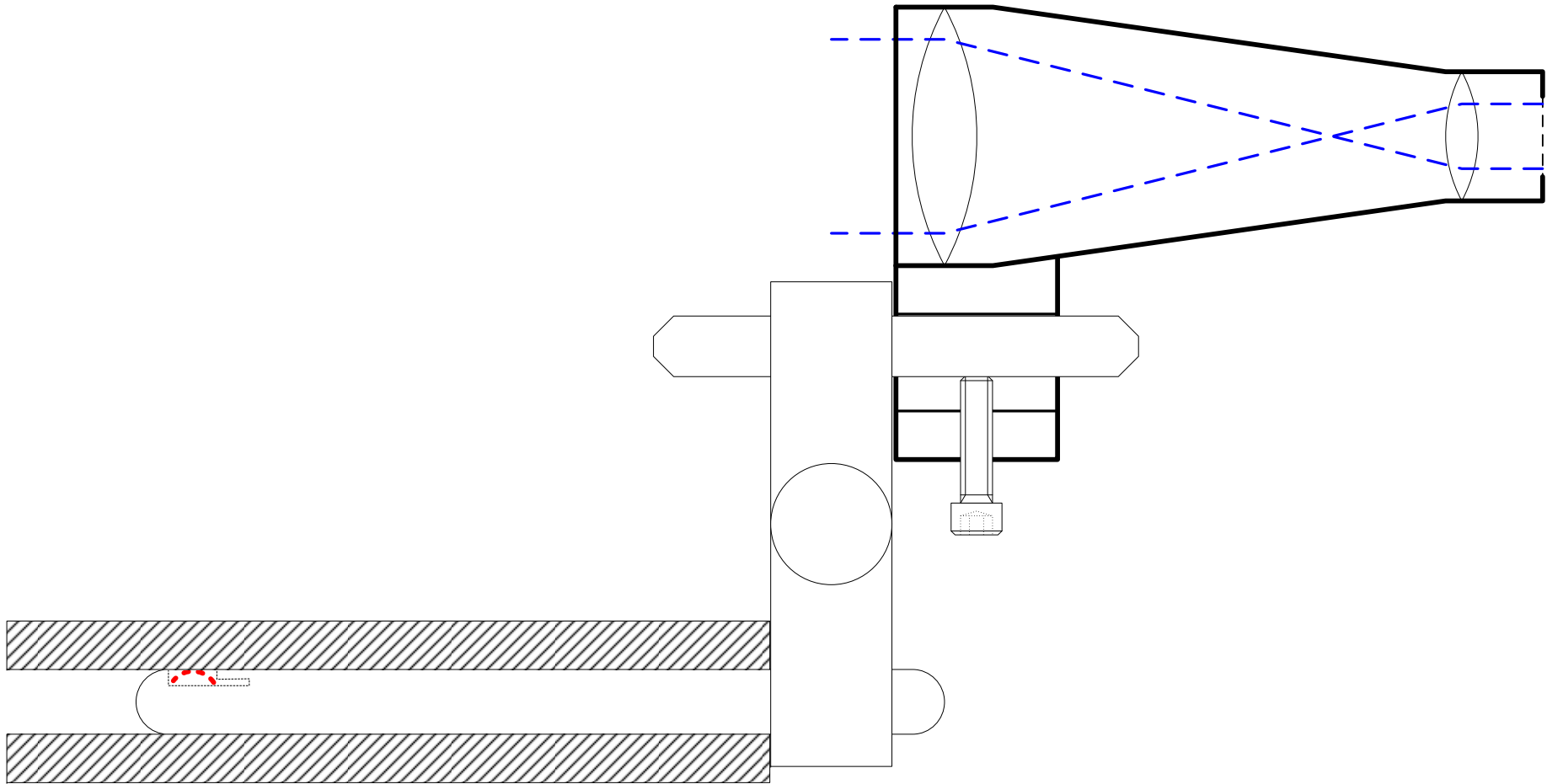
## Long Spud (Used with muzzle brakes & "Boss")



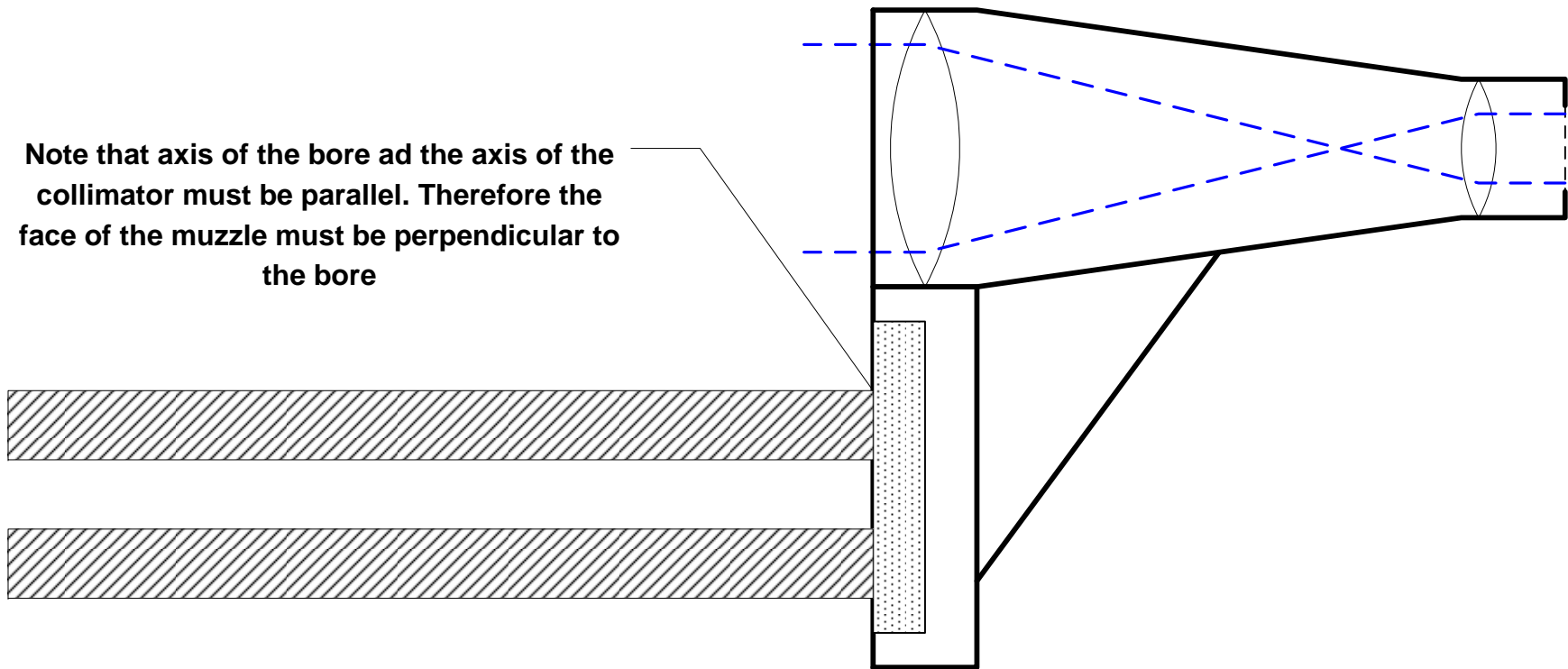
## Expanding Spud - Best Fit



# Boresighter Offset Device Used for High Scope Mounting (Can add to error - 2 more angular fits)



# Magnetic Mount Boresighter (Collimator)

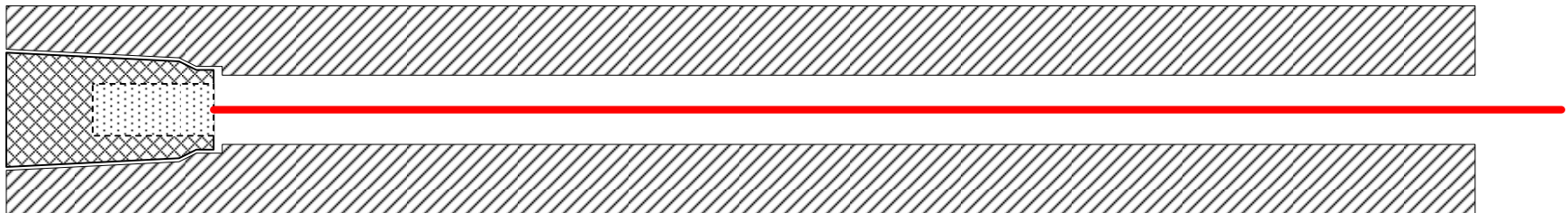




# Laser Boresighters

Better Than Classic “Look Through The Bore” Boresighting

Chamber Mounted Dummy Cartridge - Most Alignment Error Sources



Bore Mounted Expanding Spud - Least Alignment Error Sources

