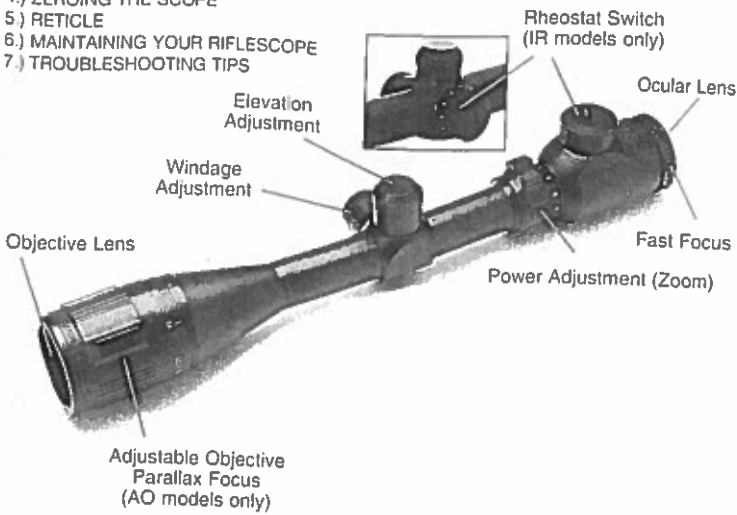


-TABLE OF CONTENTS -

- 1.) FUNDAMENTALS OF A RIFLESCOPE
- 2.) FOCUSING THE SCOPE
- 3.) MOUNTING THE SCOPE
- 4.) ZEROING THE SCOPE
- 5.) RETICLE
- 6.) MAINTAINING YOUR RIFLESCOPE
- 7.) TROUBLESHOOTING TIPS



1.) FUNDAMENTALS OF A RIFLESCOPE

Five basic elements form the system of a rifle scope:

- I. The objective lens performs three important functions:
 - a) It allows the light to get inside the scope.
 - b) It creates an image to be magnified by the other optical elements. This image is always upside down.
 - c) It is responsible for the resolution of the scope. The larger the objective lens is, the better the resolution becomes.

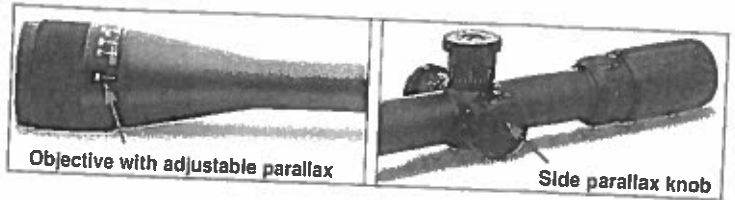
- II. The erector system is a small plastic or metal tube with three or four elements or lenses. Depending if the optical system is a fixed magnification or a variable one and has three functions:
 - a) Primary magnification of the objective image.
 - b) To align the reticle to the image optical axis.
 - c) As its name indicates, it erects or flips the image right-side up.

III. Windage and elevation system:
 Since the erector tube is fixed at one end and free at the other closest to the objective lens, the windage and elevation screws serve as supports for this end while providing movement or correction to the reticle to adjust the aiming point to the real point of impact of the bullet.

IV. Reticle:
 The reticle replaces the iron sight system that usually comes with rifles.

V. Ocular lens:
 This lens does the secondary and final magnification of the image and plays a very important role in the eye relief length.

VI. Parallax.
 The Parallax will manifest itself as apparent movement of the reticle against the target. For a scope to be Parallax-free the target must be located at the same distance for which scope is focused. This means that the target image and the reticle must be focused at the same focal plain. Rifle scopes equipped with variable Parallax adjustment allow focusing at different chosen distances.



NOTE: The location of the parallax adjustment may vary between models. The adjustment may be located on the objective or in the saddle.

2.) FOCUSING THE SCOPE

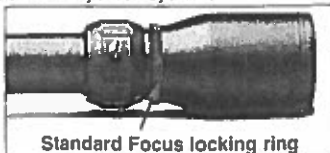
CAUTION DIRECT VIEWING OF THE SUN CAN CAUSE PERMANENT EYE DAMAGE. DO NOT ATTEMPT TO VIEW THE SUN WITH EITHER THIS PRODUCT OR THE NAKED EYE.

Standard Focus:

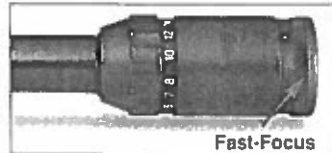
To focus hold the scope three to four inches from your eye in the direction of a flat surface like a wall or the sky. If the reticle does not appear sharp and well defined, loosen the eye bell lock-ring while looking through the scope and rotate the eyepiece in either direction until perfect focus is obtained. (This may require more than one turn). It is possible that when turning in one direction the focus worsens. To correct this, turn the eyepiece in the opposite direction.

Fast-Focus:

On models with a fast focus ocular system, rotate only the end portion of the eyepiece clockwise or counter clockwise to obtain the desired degree of sharpness while looking at a flat, featureless surface. The fast focus works as a macro focus; therefore fewer revolutions are needed to get the desired effect if compared with the standard eye bell system.



Standard Focus locking ring



Fast-Focus

3.) MOUNTING THE SCOPE

CAUTION BE SURE THAT THE FIREARM IS NOT LOADED. PRACTICE SAFE FIREARM HANDLING PROCEDURES AT ALL TIMES.

Separate the top and bottom halves of the rings. Install the bottom halves. Set the scope in the cradles formed by the bottom ring halves, position the scope toward the

objective lens. Rotate the scope to position the elevation turret on top (at 12 o'clock). With the firearm in a steady rest position, while looking through the scope slowly pull it close to the eye until the full field of view becomes visible.

Check the orientation of the reticle. The vertical post of the reticle can be aligned with the corner of a wall, a light post, or the vertical axis of the rifle if an optical collimator is not available. Misalignment of the reticle will not affect accuracy at short distances but can become a problem at long distances.

With the scope properly positioned and the reticle aligned with the axes, tighten the top halves of the rings and secure the rings to the base or receiver.

CAUTION MAKE SURE THAT THE SCOPE IS NOT IN CONTACT WITH THE RIFLE, AND THAT NO SECTION OF IT BLOCKS THE OPERATION OF THE ACTION. AVOID OVER-TIGHTENING THE RINGS. THIS CAN DAMAGE THE SCOPE, AFFECTING PERFORMANCE OR RENDERING IT INOPERABLE. THERE SHOULD BE A SLIGHT EVEN GAP ON THE LEFT AND RIGHT SIDES OF BOTH SETS OF RINGS, BETWEEN THE TOP AND BOTTOM HALVES.

4.) ZEROING THE SCOPE

CAUTION BE SURE THAT THE FIREARM IS NOT LOADED. PRACTICE SAFE FIREARM HANDLING PROCEDURES AT ALL TIMES.

Manually: Open the action of the firearm and remove the bolt. If your rifle scope has an adjustable objective, rotate the parallax ring to the 50 yards position. Set variable-power scopes to mid-power. Looking through the bore of the rifle at the target, make sure that the center of the target is in the center of your view. To pre-zero the scope you will adjust the windage and elevation screws so that the image appearing at the center of your bore is the same centered in the riflescope reticle.

If your firearm is not a bolt action, we recommend the use of an optical collimator. Make sure to follow the collimator instructions and the safety rules.

If a considerable amount of adjustment is required to align the reticle and you have adjustable rings or mounts, make the larger adjustments using these devices and the micro adjustments with the windage and elevation turrets of the scope.

If you do not have the above mentioned mounting systems, make approximately one-half of the required windage correction, then approximately one-half of the required elevation correction. Finish by applying the balance of windage and

elevation correction. Making large adjustments in small increments will prevent damage to the scope's spring.

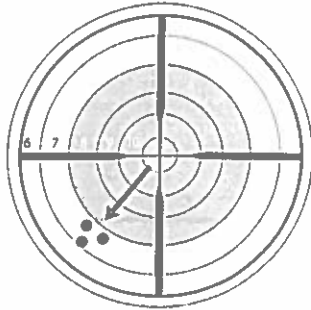
CAUTION ALL DISCHARGING OF FIREARMS SHOULD BE DONE AT AN APPROVED RANGE OR EQUALLY SAFE AREA. THE USE OF EYE AND EAR PROTECTION IS RECOMMENDED.

Danger: If a bore sighting collimator or any other bore obstructing device was used, it must be removed before proceeding. An obstruction can cause serious damage to the gun and possible injury to yourself and others nearby.

Set the scale on the parallax adjustable models to the 100 yard position. Set variable-power scopes to highest power.

From a steady rest position, fire three rounds at a target 100 yards away. Observe point of impact on the target and adjust windage and elevation screws as needed to correct aim. Repeat if necessary.

Note: Each click of adjustment changes bullet strike at a shooting distance of 100 yards by the amount indicated on the windage and elevation turrets. To calculate the click value at distances other than 100 yards, use the following formula: divide the distance (number of yards) by 100. The resulting number, when multiplied by the click value stated on the windage and elevation dial plates, will yield the actual click value of the scope at the shooting distance.

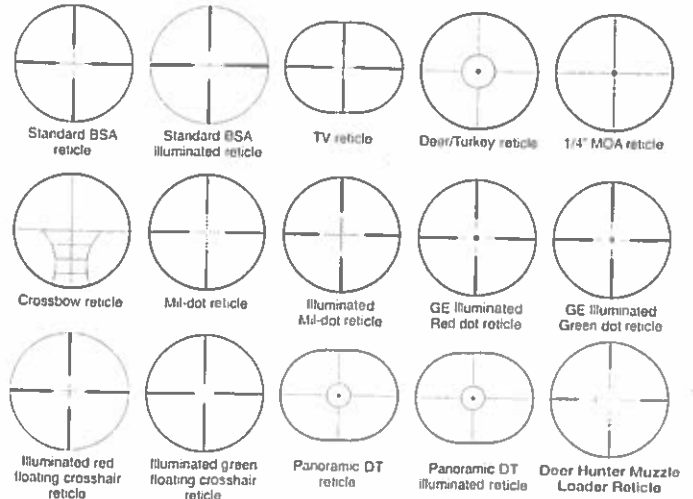


distance / 100 = N
 N x stated click value = actual click value
 Once zeroing of the weapon is complete, replace the windage and elevation caps if necessary.

To place the center of the reticle on the point of impact, turn the elevation turret counterclockwise to raise the point of impact. Then, turn the windage turret counterclockwise to move the point of impact to the left.

5.1 RETICLE

BSA rifle scopes have different reticle designs according to the scope application.



Mil-dot Reticle

The Mil-dot reticle is based on a heavy artillery ranging principle. The main purpose of the reticle was to give a better tool to the Marine snipers to range distances. After almost a quarter of a century, it is the standard reticle in all branches of the military.

What is a Mil-dot?

Mil-dot stands for Mil-radian. A Mil is one of the ways an angle can be measured. It is equal to 1/6400th of a circle, and measures 3.6 inches at 100 yards, or 36 inches at 1000 yards. For long distance shooting, one Mil equals one yard at 1000 yards.

One Mil in the reticle is the distance from the center of one dot to the center of the next. Contrary to popular belief, the Mil-Dots on the reticle measure .75 Mil instead of one Mil. The following table shows width equivalents at different distances between the Mil and the MOA.

To use the Mil-dot range finding capabilities you must know the size of the target. The formula used to calculate range to the target is: (Size of targets in yards X 1000 divided by the numbers of mils the target covers in the reticle). To obtain the size in yards divide the target height in inches by 36 inches.

Distance in Yards	One Mil Width in inches	One MOA width in inches
1000	36	10
900	32.4	9
800	28.8	8
700	25.2	7
600	21.6	6
500	18	5
400	14.4	4
300	10.8	3
200	7.2	2
100	3.6	1

Target Height X 1000
----- = Range in yards
Height of target in Mils

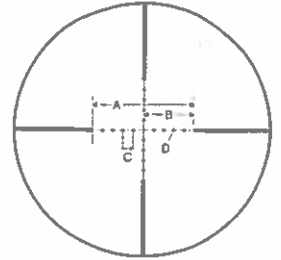
Example:
The known height of a target is 24 inches and covers 1.5 mils in the reticle. Divide 24 into 36" to obtain the correct size in yards.

24/36 = .66 yards .66 X 1000 660
----- = ----- = 440 yards
1.5 mils 1.5

Windage and elevation. The table on the right shows the click values of the Mil-dot reticle and their equivalent in MOA at different distances.

Distance in Yards	One Mil Width in inches	Click Value in Mils	One MOA width in inches	Click Value in MOA
1000	36.00	4.50	10.00	1.25
900	32.40	4.05	9.00	1.13
800	28.80	3.60	8.00	1.00
700	25.20	3.15	7.00	0.88
600	21.60	2.70	6.00	0.75
500	18.00	2.25	5.00	0.63
400	14.40	1.80	4.00	0.50
300	10.80	1.35	3.00	0.38
200	7.20	0.90	2.00	0.25
100	3.60	0.45	1.00	0.13

The Mil-dot was originally designed to be used at 10X power. However, as most marksmen prefer the flexibility and advantage of variable powers, we have incorporated this reticle in some of our zoom scopes. The following Mil-dot Key table shows the angular value at different magnification settings.



MIL-DOT MAGNIFICATION CHART

	2X		3X		4X		5X		7X		8X		8X	
	MILS	MOA	MILS	MOA	MILS	MOA	MILS	MOA	MILS	MOA	MILS	MOA	MILS	MOA
A	45.00	154.71	30.00	103.14	22.50	77.36	15.00	51.57	12.86	44.21	11.25	38.68	10	34.38
B	22.50	77.36	15.00	51.57	11.25	38.68	7.50	25.79	6.43	22.11	5.62	19.34	5	17.19
C	4.50	15.48	3.00	10.32	2.25	7.74	1.50	5.16	1.29	4.42	1.13	3.87	1	3.44
D	0.81	3.38	0.54	2.25	0.04	1.69	0.27	1.13	0.23	0.96	0.20	0.84	0.18	0.75

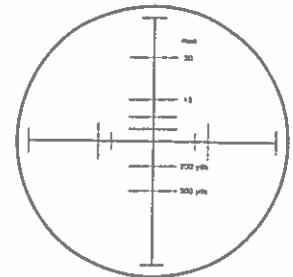
	10X		12X		14X		16X		24X		32X		40X	
	MILS	MOA	MILS	MOA	MILS	MOA	MILS	MOA	MILS	MOA	MILS	MOA	MILS	MOA
A	9.00	30.94	7.50	25.79	6.43	22.11	5.63	19.34	3.75	12.89	2.81	9.67	2.25	7.74
B	4.50	15.47	3.75	12.89	3.22	11.05	2.81	9.67	1.88	6.45	1.41	4.83	1.13	3.87
C	0.90	3.10	0.75	2.58	0.64	2.21	0.56	1.94	0.38	1.29	0.28	0.97	0.23	0.77
D	0.16	0.68	0.14	0.56	0.12	0.48	0.10	0.42	0.07	0.28	0.05	0.21	0.04	0.17

RANGER™ RETICLE

The two fine lines above the main horizontal line of the cross are 3.5 inches at 100 yards or 35.5 inches at 1000 yards.

The two divisions cover the size of target 5'10" tall at 1000 yards and one division covers the size of an equal target at 2000 yards.

The distance between the first two lines above the main horizontal line is 3.5" at 100 yards or 35.5" at 1000 yards. If the height of the target



covers only one of the two divisions, the target is 2000 yards away. These two measurements work for Deer ranging since the body of an average size adult Whitetail buck will fit into the 30 moa/inches section at 100 yards and to the 15 moa/inches at 200 yards.

The two lines below the main horizontal line of the cross, as indicated, are aiming points for two and three hundred yards.

NOTE: This reticle was calibrated for two specific calibers with precise bullet weight and trajectory. Altitude, wind, temperature, and shooting angle will affect the final results.

DEER HUNTER MUZZLE LOADER RETICLE

The DHML has a range finder type reticle that works by bracketing a 30" target at 4X magnification or a 15" target at 8X magnification between two lines to determine distance.

With the scope set at 4X the distance is 100 yards if a 30" target fits between point A and C on the illustration. If a 30" target fits between C and D it is 200 yards. If a 30" target fits between D and E it is 300 yards. If a 30" target fits between E and F it is 400 yards.

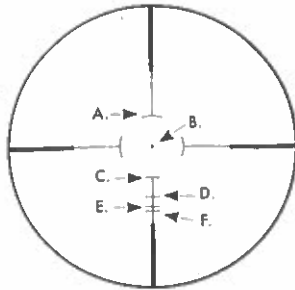
With a scope set at 8X a 15" target will fit between points A and C at 100 yards. A 15" target will fit between C and D at 200 yards. A 15" target will fit between D and E at 300 yards. A 15" target will fit between E and F at 400 yards.

HIGH POWER SCOPES AND TARGET SCOPES

Windage and elevation movement range

The windage and elevation adjustment range is less than that of a lower powered "hunting" scope. However, these units are required to have no less than 15 MOA (Minute Of Angle, or approximately 1" at 100 yards; .5" at 50 yards, etc.) of adjustment in each direction, measured from the mechanical center, and are mechanically centered at the factory prior to shipping.

10



Windage and elevation turret knob settings

Most BSA target scopes have removable windage and elevation turret knobs that can be re-set to zero once the rifle has been sighted in. This feature allows the shooter to calculate how many "clicks" of adjustment are necessary from the zero setting when shooting at different distances or wind conditions, then quickly and accurately return to their original setting. The knobs can be re-set as follows:

Loosen the three small screws (around the top of the knob) holding the knob to the internal post. Then reposition the loosened turret drum to your zero at your desired distance on the "0" indicator line of the turret drum. At 100 yards it takes 4 clicks to move the point of impact approximately 1 inch or 1 moa (they aren't exactly the same thing but close enough). MOA is a minute of angle on a compass. A minute is 1/60th of one degree. A scope that comes equipped with 1/8 MOA adjustments takes 8 clicks to move 1 inch at 100 yards.

They make it that way so that at 1000 yards you still have some useable resolution. At 1000 yards the 1/4 MOA scope changes point of impact from point of aim 2.5 inches for every click, 4 clicks is no longer 1 inch but 10 inches. The 1/8 MOA scope only changes point of impact from point of aim 1.25 inches for every click, 4 clicks would only be 5 inches and it takes eight clicks to move 10 inches.

Precise adjustment helps to dial out windage at these long ranges if you know what the wind velocity is and your rifles ballistics, you simply crank the windage dial enough clicks to be on target.

SCOPES WITH ILLUMINATED RETICLES

The battery switch housing is set on top of the eyepiece in alignment with the elevation turret. BSA offers a standard 11 position rheostat. It uses a lithium CR2032 3V. battery. The battery is protected against accidental discharge during shipping by a plastic bag.

On scopes with settings from 1 to 11 use setting 1 through 3 for lowest light conditions, 4 through 6 for dusk and dawn, 7 through 9 for over cast or cloudy days and 10 through 11 for bright sunny days. Individual scopes may vary and light conditions will change so for best performance always set the dot at the lowest setting that it can clearly be seen. If the dot appears to have a halo or be out of focus the brightness setting should be reduced until it is clear and sharp.

11

With settings from 1 to 3, use setting 1 at lowest light, 2 cloudy or overcast and 3 for brightest conditions. On scopes with Red, Green and Blue dots use the color that shows up the best against the background you are looking at and set the brightness to match the light conditions.

Remove the battery compartment cap by turning it counter-clockwise. Insert the battery with the positive (+) side facing up. Replace the cap by turning it clockwise and tighten to avoid moisture or water from getting inside. The illuminated feature is activated by turning the rheostat switch to number 1. Each click will increase the intensity, 11 being the maximum. To turn off the illuminated reticle turn the knob to the zero position.

6.I MAINTAINING YOUR RIFLESCOPE

Do not attempt to disassemble or clean the scope internally. This will void the warranty. If the scope requires repairs or adjustment, complete instructions can be found in the warranty.

The external optical surfaces should occasionally be wiped clean with the lens cloth provided, a soft lint-free cloth, or an optical quality lens paper. Keep the protective lens covers in place when the scope is not in use. Remove any external dirt or sand with a soft brush to avoid scratching the finish. Wipe the scope with a damp cloth, following with a dry cloth. Store the unit in a moisture-free environment.

7.I TROUBLE SHOOTING TIPS

Inaccuracy Issues

- 1) First check your mount. Using your bare hands only, softly twist the scope in the rings, check for any movement. If there is any movement, re-tighten the mounts. Non-permanent thread lock tight is recommended.
- 2) Use a bench rest or sandbag to support the forearm and butt stock when making windage and elevation adjustments. This will help eliminate movement.
- 3) Always follow through with every shot.
- 4) Always use the ammunition of the same bullet type and weight.
- 5) Check that your rifle is properly bedded in the stock. A loose stock can create changes to the point of impact.

- 6) Check that your barrel and chamber are clean. Damaged rifling or excessive grease can cause inaccuracy.
- 7) Always make adjustments in small increments to avoid moving the erector tube.

For questions on our products and for complete instructions on warranty and repair, contact BSA Optics customer service at (954) 581-2144 or visit bsaoptics.com

*** For returning products**

Return products following the warranty guidelines. A brief description is included below.

1. Remove any accessories and rings
2. Include a note with a brief description of the problem, address, telephone number, and email address
3. A \$10 check for return shipping and processing fees and proof of purchase.
4. We recommend using a shipping method with a tracking number (FedEx, UPS ect.). BSA optics cannot be held liable for lost or damaged items.

*Please note if your product is not registered you must have proof of original purchase, or you will be subject to repair fees.(see warranty)