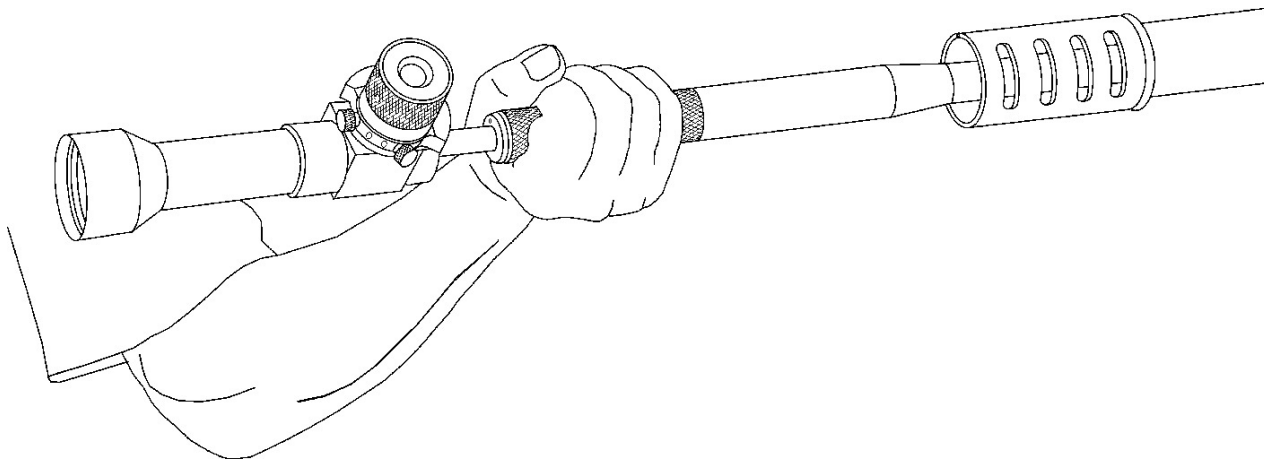


Graflex Muzzle Boresight Devices

Graflex Incorporated Muzzle Boresight Devices will greatly improve first round strike capability thus increasing the lethality of any gun system equipped with a fire control computer.



Graflex Incorporated is proud to have designed and manufacture the newest generation of small and large caliber precision muzzle boresight devices for use on MBT's, AFV's, LAV's, IVF's, and special applications such as missile, radar, and antenna systems. These unique boresights feature a field adjustable reticle, 8X, 10X and 12X magnifications, superior resolution in most all lighting conditions, collimation accuracy to $\pm .02$ angular mils, nighttime boresighting, interchangeable adapters, and are available, but not limited to, sizes from 7.62mm through 155mm.

Graflex Boresights - Sight it Right.....Before the Fight

GRAFLEX Incorporated



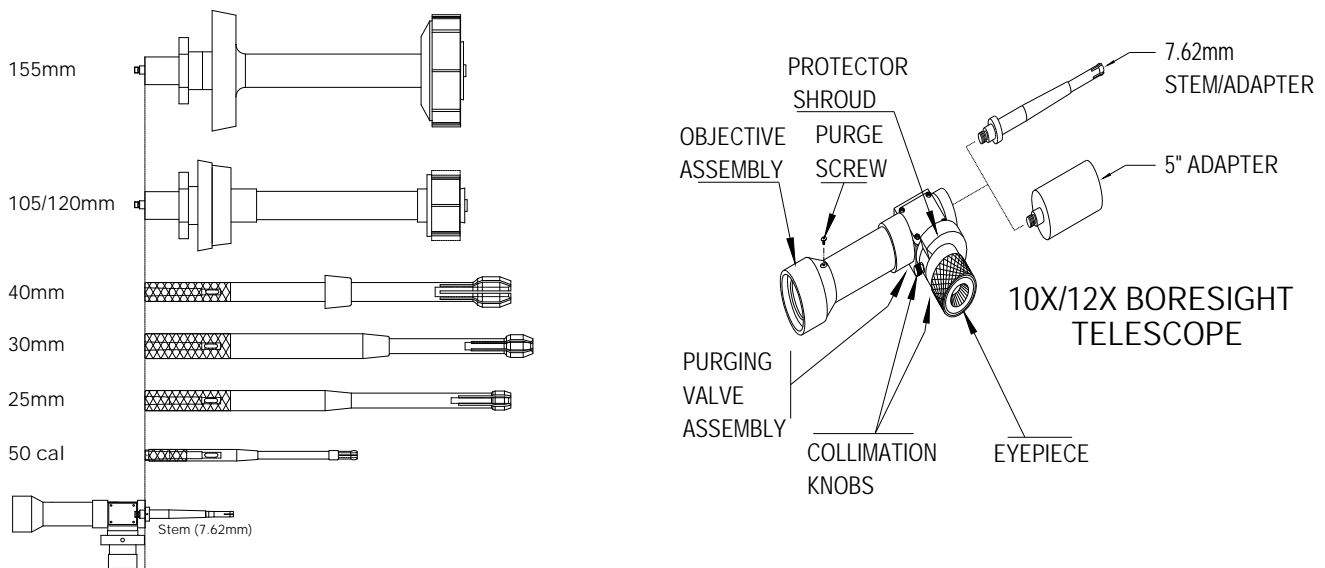
Always on Target

15855 Assembly Loop - Suite 100 - Jupiter, FL 33478 - USA

Telephone: (561)691-5959 Fax: (561)691-5983 E-mail: Sales@Graflex.com

Graflex Muzzle Boresight Device Features

- Built, designed, tested, and proven to meet performance and environmental standards per full MIL specifications (In production and used by US and foreign armies); numerous NSN's.
- Field Adjustable Reticle – azimuth and elevation.
- All adapters inherently and positively (*no wobble*) locate centerline of worn gun tubes.
- Nitrogen purged and sealed.
- Nighttime boresighting via (flashlight) illuminated reticle.
- No loose tools.
- **8X telescope collimation capable of .0625 MIL (+/- .0325 MIL) equal to 6.25 cm @ 1000 meters.**
- 10X telescope collimation capable of .05 MIL (+/- .025 MIL) equal to 5 cm @ 1000 meters.
- 12X telescope collimation capable of .04 MIL (+/- .02 MIL) equal to 4 cm @ 1000 meters.
- Superior resolution-optical performance with suitable aperture for overcast conditions.
- Rugged high-density polyethylene carrying cases with MIL qualified hardware (impervious to DS2, super tropical bleach, and many other chemicals).
- Eperan foam case inserts (excellent resistance to environmental conditions and oils).
- Anti-Parallax below 200 meters via black aperture stop lens cap.
- Common telescopes for large & small caliber units.
- Large Caliber: Single piece telescope/adaptor, 10X & 12X telescopes, torque indication plate, non-rotating collet on large cal sizes including 90mm, 105mm, 120mm, and 155mm.
- Small Caliber: Integral 7.62mm with telescope, instant and positive interchangeability of 12.7mm (50 cal)-20mm-25mm-30mm-40mm adapters to 7.62 tapered stem.
- Options include adjustable objective for close focusing (down to 1.5 meters) and custom adapters for most applications.



Boresighting Facts

WHAT IS BORESIGHTING?

Boresighting is an alignment process whereby an optical sighting system is referenced to the centerline axis of its associated gun tube.

WHY BORESIGHTING?

The sighting system and weapons as found on tanks, armored vehicles, etc., must be in proper alignment to insure an accurate overall system. Deviations from the proper alignment must be corrected by periodic re-boresighting. When a tank or armored vehicle is placed in combat or used in range firing conditions initial and periodic boresighting substantially increases first round hit probability. The crew and equipment will be placed at a major disadvantage during combat engagement provided the enemy boresights and you don't.

Muzzle boresighting substantially increases first round hit probability by correcting misalignment errors between the centerline axis of the gun tube and the sighting system. Misalignment is caused by many factors including temperature changes, vibration, shock, gun tube wear and crew changes. While some vehicles will include boresight retention equipment such as thermal shrouds and muzzle reference devices, the US Army has concluded that such systems *will not* ensure boresight retention and the *only* reliable means is to re-boresight. Boresighting should be performed before every table firing or potential combat engagement; this will include all direct fire weapons. US Army doctrine states that all main battle tanks be boresighted a minimum of once per day provided potential combat engagement.

At one time, tank operators utilized an outdated method of boresighting termed zeroing. This process followed a progression of steps in which the tank stretched a string at the muzzle and the breech in a cross-hair configuration. The target was viewed across these "cross-hairs" through binoculars. The inaccuracy and crudeness of this method then required the firing of three zeroing rounds at the target, resighting to the averaging to the central point impacts, and then firing a confirming fourth round. This process has been deemed inefficient, but also very costly. The Graflex boresight is very cost effective and it would not be unusual for the kit to pay for itself very quickly due to ammunition savings. There is not competitive boresight available today that can match the collimation accuracy capability of the Graflex boresight and none that inherently locate the center line axis of a worn gun tube.

It is generally accepted that the final flight path of a large caliber projectile is determined by the centerline path of the last three diameters of the gun tube at the muzzle end. Repeated firings will cause the muzzle end of a large caliber gun tube to wear erratically and unevenly, predominately to the cross section shape of an oblong circle; this process is commonly referred to as "end belling". The centerline axis of this oblong shaped hole tends to move up and to the left of the original center. Graflex boresights, inherently by design, find the centerline axis of a worn gun tube thereby permit accurate prediction of projectile trajectory.

Boresighting is always performed with the fire control computer disengaged. Proper boresighting assures that an accurate straight baseline relationship exists between the centerline axis of the gun tube and the target, and additionally that the gunners sights are parallel to this line. The fire control computer then inputs corrective offsets to this baseline. It is obviously foolish to invest in an expensive fire control computer and not have an accurate baseline to work from as determined by precision boresighting.

Not having a full solution fire control computer does not negate the need for accurate boresighting. Most ammunition has a tight "round-to-round" dispersion angle which can be taken advantage of to achieve first round hit capability - but only with accurate boresighting.

SCHOOLS OF THOUGHT

- One Shot – One Kill: Proponents are acutely sensitive to maximizing fighting readiness, crew survivability, and first round hit probability all at the lowest possible cost. These proponents demand the most accurate boresighting device available (.1 MIL or better).
- Spray and Pray: Proponents will describe this outdated approach as "walking the weapon in". This approach ignores the fact that survivability is highly determined by who *fires and strikes first*. Some disadvantages to this approach would include the increased probability of the loss of life, minimal crew confidence during combat and increased ammunition costs.

Graflex Muzzle Boresight Device General

<u>Description</u>	<u>Graflex Part #</u>	<u>Items Included In Kit</u>	<u>NSN</u>
7.62mm Sight Alignment Tool Kit	1-1012BR		NA
	1-1001BR	12X Telescope	1240-01-442-2670
	2-1003	Carry Case w/Inserts	1240-66-143-4009
50 Cal Sight Alignment Tool Kit	2-1000		
	1-1001BR	12X Telescope	1240-01-442-2670
	1-1006	50 Cal Adapter	4933-21-257-8503
	2-1003	Carry Case w/Inserts	1240-66-143-4009
50 Cal Sight Alignment Tool Kit (Packed in 50 Cal Ammo Case)	2-1050BR		1240-01-499-7958
	1-1001BRS	12X Telescope	NA
	1-S006	50 Cal Adapter (Short)	NA
	CC-1050	Carry Case w/Inserts	NA
20mm Sight Alignment Tool Kit	1-1210		
	1-1001BR	12X Telescope	1240-01-442-2670
	1-1020	20mm Adapter	NA
	1-1003	Carry Case w/Inserts	1240-01-441-5411
25mm Sight Alignment Tool Kit	1-1000		6680-01-449-0887
	1-1001BR	12X Telescope	1240-01-442-2670
	1-1002	25mm Adapter	1244-01-441-5410
	1-1003	Carry Case w/Inserts	1240-01-441-5411
30mm Sight Alignment Tool Kit	3-1000		NA
	1-1001BR	12X Telescope	1240-01-442-2670
	1-1007	30mm Adapter	1005-01-534-2669
	1-1003	Carry Case w/Inserts	1240-01-441-5411
40mm Sight Alignment Tool Kit	4-1000		
	1-1001BR	12X Telescope	1240-01-442-2670
	1-1009	40mm Adapter	NA
	1-1003	Carry Case w/Inserts	1240-01-441-5411
40mm/50 Cal Sight Alignment Tool Kit	4-1250BR		1240-01-512-4531
	1-1001BR	12X Telescope	1240-01-442-2670
	1-1006	50 Cal Adapter	4933-21-257-8503
	1-1009	40mm Adapter	NA
	1-1003	Carry Case w/Inserts	1240-01-441-5411
40mm/50 Cal/5.56mm Sight Alignment Tool Kit	8-4556		6650-01-563-6732
	8-1001	8X Telescope	1240-01-563-7476
	1-1006	50 Cal Adapter	4933-21-257-8503
	1-1556	5.56mm Adapter	NA
	1-1009	40mm Adapter	NA
	3-4556	Carry Case w/Inserts	NA
90mm Muzzle Boresight Kit	1-1090		NA
	50D1490FH1	90mm MBD	NA
	129568803	Carry Case w/Inserts	1265-01-439-8621
105mm M26A3 Muzzle Boresight Kit	M26A3		4933-01-504-6262
	50D1438FH1	105mm MBD	NA
	129568803	Carry Case w/Inserts	1265-01-439-8621
120mm M27A3 Muzzle Boresight Kit	M27A3		4933-010504-6263
	50D1438FH2	120mm MBD	NA
	129568803	Carry Case w/Inserts	1265-01-439-8621
125mm Muzzle Boresight Kit	1-1125		NA
	50D1485FH1	125mm MBD	NA
	129568803	Carry Case w/Inserts	1265-01-439-8621
155mm Muzzle Boresight Kit	1-1155		NA
	50D1155FH1	155mm MBD	NA
	12956810	Carry Case w/Inserts	NA

NOTES

1. All Medium & Small Cal Kits Include 1-1004 Warning Flag (8345-01-441-6459) & 1-1005 Drift Key (1240-01-441-5412).
2. All Large Cal Kits Include 1-1004 Warning Flag (8345-01-441-6459).
3. Graflex will Upgrade all A1 & A2 Large Cal MBDs to A3 Configuration.
4. 50 Cal Adapter (1-1006) Also Assigned NSN 1005-66-142-8569

OPTIONS

1. Graduated Reticles.
2. Close Focus Mechanism's.
3. Many Optional Stems and Adapters Available Outside of Those Listed Above.

