Operator's and Maintainer's Manual
for the WILCOX
Rapid Targeting and Ranging Module
(RAPTAR-S ™)
Line of Products
CAGEC: 004F1

Standalone Configuration

CONTAINS:
FCC ID: A8TBM77SPPSYC2A
IC ID: 12246A-BM77SPPSYC2

Top of Primary Scope Mounting Configuration

WARNING

Wilcox strongly recommends reviewing the operational procedures outlined in this manual prior to operating the device. Customers may obtain a copy of the Operator's and Maintainer's Manual by contacting Wilcox Customer Service at 603-431-1331.

This product contains technical data as defined in the International Traffic in Arms Regulations ITAR 22 CRF 120.10. Export of this material is restricted by the Arms Export Control Act 22 U.S.C. 2751 et seq. and may not be exported to foreign persons without prior written approval from the U.S. Department of State.

SAFETY SUMMARY

S1. GENERAL SAFETY INSTRUCTIONS

WARNING and CAUTION statements have been strategically placed throughout the text to indicate operating or maintenance procedures, practices, or conditions considered essential to the protection of personnel (WARNING) or equipment and property (CAUTION). NOTES emphasize necessary and important data. CAUTIONS and NOTES appear in the text as applicable.

S2. WARNINGS, CAUTIONS AND NOTES

Definitions for WARNINGS, CAUTIONS and NOTES are as follows:

WARNING

Highlights an essential operation or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, could result in injury to or death of personnel.

CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Highlights an essential operating or maintenance procedure, condition or statement.

S3. FCC NOTICE

Contains FCC ID: A8TBM77SPPSYC2A

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

S4. IC NOTICE

Contains Transmitter Module IC: 12246A-BM77SPPSYC2

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

S5. SAFETY PRECAUTIONS

WARNING

Laser Safety

- ***The RAPTAR-S features Class 1, 3b, and 3r laser products which emit visible and infrared laser radiation from the front end of the device when using the visible or infrared flood or laser, or when ranging (refer to Section 1.7 for technical data). Both visible and infrared laser light can be dangerous if misused. Laser light reflected or refracted off mirrored surfaces may be equally harmful.***
  - ***Never stare into a laser.***
  - ***Never point lasers or range finder at someone's eyes.***
  - ***Do not aim lasers at personnel or mirrored surfaces.***
  - ***Do not look at a laser through telescopes, binoculars, scopes, image intensifiers, etc.***
  - ***Direct eye exposure to a laser may cause permanent eye damage, including blindness. Special glasses for filtering laser light must be used if protection from laser radiation is required.***
- ***Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***
- ***Prolonged activation of lasing and ranging equipment may increase the detection probability by hostile forces to the end user.***

WARNING

Laser Safety

- *If the system has been under solar loading conditions, the environmental sensor readings may become less accurate. Confirm the environmental data before finding the ballistic solution.*
- *The illuminating beam of the laser emitting from the RAPTAR-S indicates the area of approximate round impact, provided the co-alignment and optic boresighting (BZO) procedures have been properly followed and attained. Be aware of the direction in which the RAPTAR-S is pointed, as well as the direction of the intended target, prior to ranging or firing the round.*
- *Visible and infrared laser beams and the infrared laser beam of the range finder are enhanced by smoke, fog and rain, making them more easily detectable by onlookers or observers. When used in these environments, prolonged activation of the lasers may need to be avoided.*
- *Lasers are activated during the RAPTAR-S system test. Follow safety precautions for laser eye safety and operational cover.*
- *Due to the high reflectivity of the nVisti target, the infrared (IR) laser should never be used to perform alignments. Such usage could result in eyesight damage. Operate the RAPTAR-S in the visible low power mode when performing this procedure.*

WARNING

Usage Safety

- ***Make sure that the weapon is CLEAR and on SAFE before mounting or dismounting the RAPTAR-S.***
- ***When mounting the RAPTAR-S to a weapon, or to a new rail position, it is necessary to properly co-align the RAPTAR-S to the weapon optic to ensure aiming accuracy.***
- ***When handling a weapon fitted with a RAPTAR-S ALWAYS keep the muzzle pointed down range and clear of all personnel.***
- ***In the event of a detected built-in test failure, contact Wilcox Industries at 603-431-1331.***

Battery Safety

- ***Lithium batteries contain sulphur dioxide gas under pressure and should be handled in the following manner:***
  - ***If the battery compartment becomes hot to touch and you hear a hissing sound (i.e., battery venting) or smell irritating sulfur dioxide gas, IMMEDIATELY turn off the equipment. Wait until battery has cooled before removing it, then replace with a fresh battery.***
  - ***DO NOT heat, puncture, disassemble, test for capacity, short circuit, attempt to recharge, or otherwise tamper with battery.***

WARNING

- *Batteries have a safety vent to prevent explosion. When they are venting gas, you will smell gas, your eyes may become irritated, or you may hear the sound of gas escaping. When safety vents have operated, batteries are fairly safe from bursting, but will be hot and must be handled with care.*
- *DO NOT use batteries, which look bulged or have burst. Turn these batteries in to your Property Disposal Office. Contact your Unit Safety Officer for help with bulged or burst batteries.*
- *DO NOT use water to extinguish lithium battery fire if a shock hazard exists due to high voltage electrical equipment in the immediate vicinity (i.e., greater than 30 volts alternating current (AC) or direct current (DC).*
- *Lithium batteries can explode or cause burns if disassembled, shorted, recharged or exposed to fire or high temperatures. Handle with care.*

CAUTION

Laser Safety

- *Follow proper safety precautions and procedures regarding use of target alignment material and optical devices during laser use. Refer to organizational procedures, instructions and directives.*

CAUTION

Usage Safety

- ***When opening or closing the battery compartment, ensure that moisture is not allowed into the compartment.***
- ***Due to the high reflectivity of the nVisti target, the infrared (IR) laser should never be used to perform alignments. Such usage could result in eyesight damage. Operate the RAPTAR-S in the visible low power mode when performing this procedure.***
- ***Ammo storage temperature may affect round travel. To avoid discrepancies in accuracy, store ammo with the RAPTAR-S.***
- ***When performing a Compass Calibration, ensure that you slowly rotate the device horizontally, vertically and longitudinally. If the procedure is performed in less than 20 seconds, the message "CAL FAILED Rotated too fast. Using defaults." will display.***

Battery Safety

- ***Do not store the RAPTAR-S with batteries installed.***
- ***It is recommended that the batteries be replaced and that the startup procedures for the RAPTAR-S be conducted prior to use to ensure proper operation.***

NOTE

Laser Safety

- ***It is recommended to mount the RAPTAR-S to an integrated high quality specification rail system to optimize the designed performance of the system.***

- ***For best results activating the laser, apply pressure to the center portion of the Fire/Up Button on the Remote Trigger.***

NOTE

- ***If the Activation Buttons on the Remote Trigger fail to operate for any reason, reseat the Remote Trigger in the Remote Trigger Connection Port of the RAPTAR-S and try again.***
- ***It is recommended that the low power Visible Laser be used for co-aligning the laser to the optic.***

Usage Safety

- ***The RAPTAR-S Visible and Infrared (IR) Laser Pointers and Flood AND the Laser Range Finder (LRF) are collimated by design. Adjustments of the Visible laser pointer will adjust the IR laser pointers and LRF simultaneously.***
- ***Do not use harsh abrasives or chemicals such as acetone to clean the RAPTAR-S. Any questions about appropriate chemicals should be directed to Wilcox Customer Service. Periodically inspect the Battery Compartment Cover o-ring. Replace the o-ring if it o-ring becomes cut, nicked or torn.***
- ***This Operator's and Maintainer's Manual should always accompany the product and be transferred with it upon change of ownership.***

NOTE

- ***The RAPTAR-S contains no serviceable internal parts and is programmable only by a Wilcox Factory Technician. Adjustments or attempted repairs to the RAPTAR-S other than those expressly described in this Operator's and Maintainer's Manual will void the warranty and could void the user's authority to operate the equipment.***
- ***Ensure that the Mode Selection Knob is set to the 'OFF' position when not in use to avoid inadvertent battery drain.***
- ***The RAPTAR-S has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. The RAPTAR-S, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If the RAPTAR-S does cause harmful interference to radio or television reception, which can be determined by turning the RAPTAR-S off and on, the user is encouraged to try to correct the interference by one of more of the following measures:***
    - ***Reorient or relocate the receiving antenna.***
    - ***Increase the separation between the equipment and receiver.***
    - ***Consult the dealer or an experienced radio/TV technician for help.***

NOTE

- ***When the RAPTAR-S is powered on, the integrated Bluetooth interface will automatically begin attempting to connect to paired third-party devices. These radio transmissions may be observed by non-paired devices.***
- ***For best performance, Wilcox recommends mounting the RAPTAR-S at the 12:00 position, preferably to the top of the primary scope as depicted on the cover of this manual.***
- ***When ranging in the LRF "Enhanced" configuration setting, responses may be slightly slower. Wait for a response before re-ranging.***
- ***Bluetooth communication is not the most reliable means of data transmission. If an error message display while downloading tables, power cycle the RAPTAR-S and re-download using the previously selected transmission option.***
- ***When using the Kestrel 5700 with the RAPTAR-S, ensure that the Kestrel has been updated to Kestrel software version 1.15 or later.***

Battery Safety

- ***Ensure that the Mode Selection Knob is set to the 'OFF' position prior to changing batteries in the RAPTAR-S.***

S6 Laser Radiation Output Parameters

Table S6-1. *RAPTAR-S* Laser Safety Parameters

Estimated "Worst Case" Nominal Ocular Hazard Distance (NOHD) Based on Worst Case Laser Beam Parameters								
Model	**Parameter**	**NIR Aim Laser**		**NIR Illuminator****		**Visible Aim Laser**		**LRF**
		Low	**High**	**Low**	**High**	**Low**	**High**	
RAPTAR-S PNs 57300G01-XX	**Class**	3R	3B	3R	3B	3R	3B	1
	Laser Color	Infrared				Red		Infrared
	Wavelength (nm)	850		830		635		1550
	Laser Power (mW)	< 0.7	35	< 0.7	45	< 0.7	20	1.2
	NSHD (m)	0	0	0.0	3	0.0	0.0	0.0
	NOHD (m)	0	112	0	95	< 41	88	0
	OD	0	1.7	0	2.0	0	1.4	0
	NOHDe* (m)	0	654	0	557	279	586	
	Ode*	0	1.6	0	1.9	0.7	1.3	
RAPTAR-S ES PN 57300G02-XX	**Class**	3R		3R		3R		1
	Laser Color	Infrared				Red		Infrared
	Wavelength (nm)	850		850		635		1550
	Laser Power (mW)	< 0.7		< 0.7		< 4.999		1.2
	NSHD (m)	0.0		0.0		0.0		0.0
	NOHD (m)	0		0		41		0
	OD	0		0		0.7		0
	NOHDe* (m)	0		0		279		
	Ode*	0		0		0.7		

* Extended nominal ocular hazard distance with standard 7x50 magnifying optics.

** Worst case divergence of 1 mrad.

OPERATOR'S AND MAINTAINER'S MANUAL TO SOFTWARE VERSION CROSS-REFERENCE

When utilizing an older version of the *RAPTAR-S* software, it is critical to reference the correct Operator's and Maintainer's Manual for the Software Version you are using. The following table provides a cross-reference for tracking Operator's and Maintainer's Manual release revision numbers to software revision releases.

Table S6-2. Manual to Software Version Cross-Reference

OPERATOR'S AND MAINTAINER'S MANUAL REVISION	*RAPTAR-S* SOFTWARE REVISION(S)
A-1	1.09
A-2	1.09
A-3	2.00
A-4	2.00, 2.02
A-5	2.05
A-6	3.00
A-7	3.01
A-8	3.03
A-9	3.03

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PREFACE

P1. SCOPE. The purpose of this Operator's and Maintainer's Manual is to assist the Operator in the operation and maintenance of the *Rapid Targeting and Ranging Module (RAPTAR-S™)*.

P2. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATION. Wilcox requests that all errors, omissions, discrepancies be forwarded to the Marketing Department, Wilcox Industries, Corp., One Wilcox Way, Newington, NH 03801-7816. To submit feedback by e-mail, visit *www.wilcoxind.com*.

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SECTION 1

OVERVIEW

1.1 GENERAL SAFETY WARNINGS

The *RAPTAR-S* should not be used by anyone unfamiliar with its operation.

This manual contains specific operating and maintenance instructions which the operator should become familiar with before actual field usage.

The Safety Warnings in this manual are intended to point out the dangers that are common in handling this type of equipment. **Failure to observe any of these warnings may result in serious physical injury, blindness, or death.** You must familiarize yourself with the entire contents of this manual before using the *RAPTAR-S*. All general text, WARNINGS, CAUTIONS, and NOTES, should be strictly followed.

This manual is intended to provide you with information relevant to the operation of the *RAPTAR-S* and is not a substitute for the information contained in the operator's manual issued by the manufacturer of any weapon to which it is attached. It is the responsibility of the operator to read and thoroughly understand the handling and operating procedures for both the *RAPTAR-S* and the weapon to which it is installed.

Laser Radiation Danger

When using the visible or infrared flood or laser, or when ranging, the lasers and range finder built into the *RAPTAR-S* emit visible and/or infrared laser radiation from the front end of the device (see Table S6-1, page "xii" for technical specifications). Both visible and infrared laser light can be dangerous if misused. **Direct eye exposure may cause permanent eye damage, including blindness.** Laser light reflected or refracted off mirrored surfaces may be equally harmful.

- Never stare into a laser beam.
- Never point a laser beam at someone's eyes.
- Do not point a laser beam at personnel or mirrored surfaces.
- Do not look at a laser beam through telescopes, binoculars, scopes, image intensifiers, etc.

The *RAPTAR-S* is provided in two configurations, as noted on its Product Identification Label (see Figure 1.1-1).

Laser Safety Label (International)

RAPTAR-S
Model G01

RAPTAR-S ES
Model G02

Figure 1.1-1 *RAPTAR-S* Identification Labels

First Aid

Administer first aid in accordance with local procedures.

1.2 MODEL NUMBER AND EQUIPMENT NAME

57300G01 *RAPTAR-S*
57300G02 *RAPTAR-S ES*

1.3 MANUFACTURER

Wilcox Industries Corp
One Wilcox Way
Newington, NH 03801 USA

1.4 PURPOSE OF EQUIPMENT

The *RAPTAR-S* is a modular, battery operated Laser Range Finder with integrated infrared, visible red lasers and ballistic computer used for target acquisition and engagement.

1.5 ABBREVIATIONS AND ACRONYMS

Abbreviations and acronyms used in this manual are spelled out on first occurrence within this manual, and are cited here for reference:

BZO	Battlesight Zero
C	Celsius
CAGEC	Commercial and Government Entity Code
CFR	US Code of Federal Regulations
CCW	Counter-Clockwise
CW	Clockwise
F	Fahrenheit
fps	Feet per Second
gr	Grams
HP	High Power
ITAR	International Trafficking in Arms Regulations
inHg	Inches of Mercury - Air Pressure
lb	Pound
LP	Low Power
mbar	Milibars - Air Pressure
mJ	Millijoules
mm	Millimeter
mph	Miles per Hour
mrad	Milliradian
mW	Milliwatt
m/s	Meters per Second
nm	Nanometer
NVD	Night Vision Device
OAT	Outside Air Temperature
oz	Ounce
RAPTAR-S	Rapid Targeting and Ranging Module
RAS	Rail Accessory System
RIS	Rail Integration System

1.6 PRODUCT DESCRIPTION

The Wilcox *RAPTAR-S* is a compact, ruggedized, modular, repairable, expandable and lightweight combined package featuring a day/night Laser Range Finder (LRF), IR and visible designating/aiming/flood lasers. Two versions of the *RAPTAR-S* are available (refer to Section 1.2 for part number specifications). A lock-out screw is available for preventing access to the high powered lasers and is stored in the case when not in use.

The *RAPTAR-S* provides extremely accurate fire control solutions for long range target engagements using the Applied Ballistics Solver. It accounts for all contributing environmental variables including Coriolis, spin drift, and aerodynamic jump, and allows the operator to calibrate the software to match the rifle, based upon observed impacts at long range.

An integrated Bluetooth interface provides connection with third-party devices including Android and iOS devices with compatible apps installed, and the Kestrel 5700 weather meter for live data sharing and gun management. Refer to Section 2.13.4 for further details.

The *RAPTAR-S* accommodates multiple caliber weapon and ballistic profiles, and can be handheld or mounted to a MIL-STD-1913 RIS/RAS Rail and STANAG-494 Rail. In the mounted arrangement, its low profile lies below the Front Sight Stanchion allowing for front sight use. This low profile also allows use with rail-mounted optics and sighting devices, as desired. Optional Wilcox Interface Rail Kits are sold separately (contact Wilcox for more information).

Depending upon weapon configuration, the *RAPTAR-S* may additionally mount to the 0300 and 0900 positions using the standard interface rail included.

Front and rear open sights are built into the *RAPTAR-S* and can be utilized for handheld operation. Refer to Section 2.11 for operating instructions.

NOTE

It is recommended that the low power Visible Laser be used for co-aligning the RAPTAR-S.

1.7 TECHNICAL DATA

Table 1.7-1 *RAPTAR-S* Technical Specifications

For Laser Safety Specifications, refer to Table S6-1, Page xii.

WEIGHT AND DIMENSIONS	
Operational Weight (with Battery and Remote)	< 319 gr (11 oz)
Dimensions (with Battery, Rail, and Remote)	< 4.4" D x < 3.3" W x < 1.9" H
Sight Plane Above the Rail	0.930"

LASER, ILLUMINATOR AND RANGE SPECIFICATIONS *	
RAPTAR-S, HP (G01):	
Visible Aiming Laser	Red (635) <.7 mW, 20 mW Max High * *
IR Aiming Laser	<.7 mW Low, 65 mW Max High
IR Illuminator	<.7 mW Low, 100 mW Max High
Eye Safe Laser Output	< 1 mJ
Actual Range Capability	10 to 1500 Meters (0.5m x 2.0m Target)
Operating Temperature Range	-4° F (-20° C) to 140° F (60° C)
Storage Temperature Range	-40° F (-40° C) to 160° F (71° C)
RAPTAR-S, ES (G02):	
Visible Aiming Laser	Red (635) <5 mW Max * *
IR Aiming Laser	<.7 mW Max
IR Illuminator	<.7 mW Max
Eye Safe Laser Output	< 1 mJ
Actual Range Capability	10 to 1500 Meters (0.5m x 2.0m Target)
Operating Temperature Range	-4° F (-20° C) to 140° F (60° C)
Storage Temperature Range	-40° F (-40° C) to 160° F (71° C)

ADDITIONAL SPECIFICATIONS	
Power Source	One (1) CR123A Battery (not included)
Battery Life	Over 7 Hrs on Dual High IR Laser Only
Ranging Operations at 24°C	> 700 Ranges
Color	Lusterless Brown Matte Finish
Water Resistance	Waterproof to 1 Meter for 60 Minutes

* Laser power specs are based on minimum and maximum diode power specifications. Operator can expect to see reduced output on the maximum end.

1.8 LIST OF *RAPTAR-S* MAJOR COMPONENTS

Table 1.8-1. *RAPTAR-S* Major Components

ITEM	DESCRIPTION
1	*RAPTAR-S*
2	Remote Trigger
3	*RAPTAR-S* Operator's and Maintainer's Manual
4	Carry Pouch
5	Cleaning Brush
6	Lens Cloth
7	Quick Reference Guide
8	Hex Key (HP Model Only)
9	Kestrel 5700 Weather Meter (Sold Separately)

Figure 1.8–1 Major Component Identification

1.9 LIST OF *RAPTAR-S* SUB-COMPONENTS AND FEATURES

Table 1.9-1. *RAPTAR-S* Sub-Components and Features

ITEM	DESCRIPTION
R-1	Mode Selection Knob
R-2	Key Pad
R-3	Fire/Up Button
R-4	Left Button
R-5	Right Button
R-6	Adjust/Down Button
R-7	Enter Button
R-8	Battery Compartment Cover
R-9	Laser Low Power Indicator
R-10	Laser Mode Indicator
R-11	Battery Indicator
R-12	Display
R-13	IR Laser Port
R-14	Visible Red Laser Port
R-15	IR Flood Focus Wheel
R-16	Elevation Adjustment Screw
R-17	Laser Range Finder
R-18	Windage Adjustment Screw
R-19	Remote Trigger Connection Port
R-20	Programming / Purge Port (Not Shown)
R-21	Rail Mounting Interface
R-22	Lens Safety Cover
R-23	Front Sight Post
R-24	Rear Sight
R-25	IR Flood Illuminator Port
R-26	Identification Label with 3D Barcode
R-27	Laser Safety Labels (2)
R-28	Environmental Sensor
R-29	High Power Lockout Screw
R-30	High Power Lockout Screw Storage Port

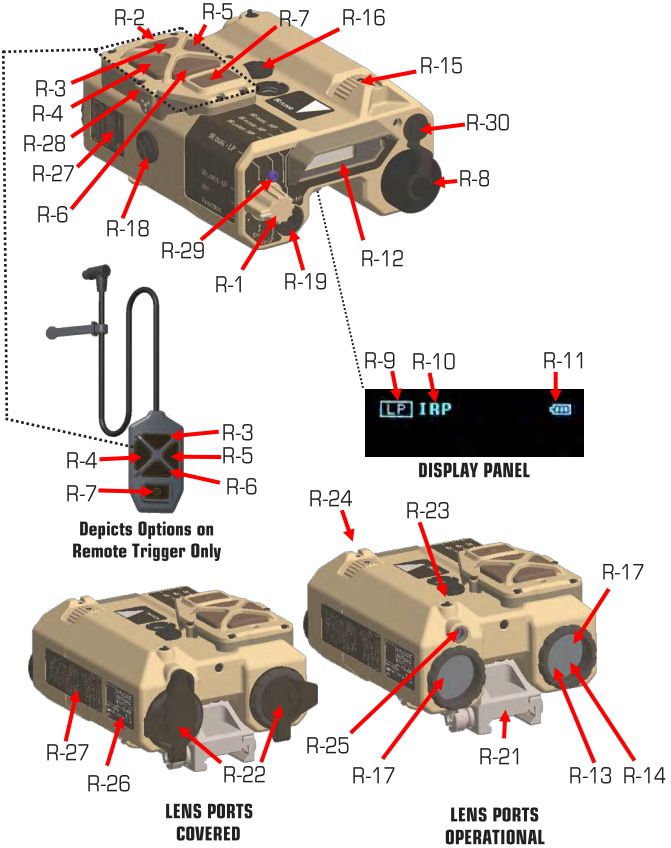


Figure 1.9-1 Sub-Component Identification - *RAPTAR-S*

1.10 DESCRIPTION OF *RAPTAR-S* MAJOR COMPONENTS

1. *RAPTAR-S*. The *RAPTAR-S* features a Laser Range Finder (LRF) with two optics (one to transmit and one to receive). It also features a visible red and an IR laser for sighting targets. An IR illuminator can be changed from a flood to a spot for target illumination at nighttime. The *RAPTAR-S* mounts to the weapon by means of a Securing Screw and/or Throw Lever Mount.

2. Remote Trigger(s). Allows the Operator to remotely control *RAPTAR-S* functions, such as when mounted to a weapon. This assembly is an accessory to the *RAPTAR-S* and is not required for operation. Remote Trigger functions operate the same as *RAPTAR-S* keypad buttons. The G01 features one (1) 20" cable and one (1) 12" cable for varied operational requirements. The G02 model features one (1) 12" Cables. Additional cables can be purchased individually or under separate configurations.

3. *RAPTAR-S* Operator's and Maintainer's Manual. One Operator's and Maintainer's Manual for the *RAPTAR-S* is included with the kit.

4. Carry Pouch. A Carry Pouch stows the *RAPTAR-S* and accessories when not in use. Contact Wilcox Customer Service for further information.

5. Cleaning Brush. Removes loose dirt and debris from the mechanical components of the *RAPTAR-S*. DO NOT use the brush for cleaning the lenses as this may scratch the lens surface. For cleaning instructions, refer to Section 3.1.

6. Lens Cloth. Used for cleaning the lenses and display. Prior to using the Lens Cloth, be certain to gently blow or flush away any debris that exists on the lens as described in Section 3.1.

7. Quick Reference Guide. A handheld reference identifying some of the key operational features and procedures of the *RAPTAR-S*.

8. Hex Key (HP Model Only). One 5/64 Hex Key is provided for installation and removal of the High Power Lockout Screw.

9. Kestrel 5700 Weather Meter (Sold Separately). A Kestrel 5700 Weather Meter (sold separately) provides weather data to the *RAPTAR*-S and receives ranging data from the *RAPTAR-S* to perform its own ballistics calculations all by means of a Bluetooth connection. This connection allows the operator to utilize the ballistics calculations of the *RAPTAR-S*, or those provided by the Kestrel 5700 (see Section 2.13.4).

1.11 DESCRIPTION OF *RAPTAR-S* SUB-COMPONENTS

R-1. Mode Selection Knob. Allows the operator to select from any of the available modes of operation. The Display indicates the selected modes of power and laser operation (see Table 1.11-1). A blue High Power Lockout screw prevents access to high power functions in the HP models. High Power mode functions are not supported in the *RAPTAR-S* ES model.

R-2. Key Pad. The *RAPTAR-S* and Remote Trigger features five buttons for operating the *RAPTAR-S*: Fire/Up, Adjust/Down, Left, Right and Enter.

R-3. Fire/Up Button.
The Fire/Up Button provides laser on/off control in operational modes and scrolling in configuration modes (see Table 2.13-1).

Table 1.11-1. *RAPTAR-S* Mode Selection Knob Options

	KNOB POSITION	DISPLAY	MODE DESCRIPTION
0	VIS - LP	VSP	Visible Laser - Low Power
1	BAL	Ballistics Menu	Ballistics Configuration Menu
2	FUNCTION	Function Menu	Function Menu
3	OFF	n/a	Power Off
4	IR LASER - LP	IRP	IR Pointer Laser - Low Power
5	IR DUAL - LP	IRD	IR Dual - Low Power
6	IR LASER - HP (HP Model Only)	IRP	IR Pointer - High Power
7	IR FLOOD - HP (HP Model Only)	IRF	IR Flood - High Power
8	IR DUAL - HP (HP Model Only)	IRD	IR Dual - High Power
9	VIS - HP (HP Model Only)	VSP	Visible Laser - High Power

R-4. Left Button.
The Left Button is used to exit menu items and to decrease values in the ballistic display.

R-5. Right Button.
The Right Button is used to enter submenus or parameters, exit parameters, or to increase values on the ballistic display.

R-6. Adjust/Down Button.
The Adjust/Down Button is used to enter, select or exit adjust modes or to scroll down in menus.

R-7. Enter Button.
The Enter Button allows the operator to perform range operations and display the ballistic solution. It also allows the operator to perform various operations on menus. Enter Button functionality varies by menu option, see menu option instructional sections in the latter part of this manual for further details.

R-8. Battery Compartment Cover. Allows the Operator to access the Battery Compartment and prevents entry of dirt and dust to the compartment when closed. The internal battery compartment houses one (1) CR123 battery (not included). Refer to Section 2.2 for instructions on replacing the battery in the *RAPTAR-S*.

R-9. Laser Low Power Indicator. Displays the laser power mode when the *RAPTAR-S* is set to a laser output mode. Displays "LP" for Low Power. Does not illuminate when the *RAPTAR-S* is in High Power.

R-10. Laser Mode Indicator. Displays the laser mode of operation when the *RAPTAR-S* is set to a laser output mode (e.g., "IRF" for Infrared Flood Laser). When the device is actively emitting in that mode, the text will reverse against its background (i.e., the text will become black and the background behind the text will become white to inform the operator that it is emitting). Once the laser is deactivated, this reverses back to normal.

R-11. Battery Indicator. Displays a rough approximation of battery strength. To check actual remaining life, use the Battery function (see Section 2.7.1).

R-12. Display. Provides information output display with various brightness levels for day and night operation. Range distances appear in Meter or Yard increments as defined in the Ballistics Mode Setting. Refer to Table 1-11-2 for a list of key indicators.

R-13. IR Laser Port. An Infrared 830 nm Laser that can be used as a co-alignment aid in low power mode and as a target designator in high or low power mode. Refer to Section S6-1 for laser specifications.

R-14. Visible Red Laser Port. A Visible Red 635nm Laser may be used as a co-alignment aid in low power mode and as a target designator in high power mode. Refer to Table S6-1for laser safety specifications.

R-15. IR Flood Focus Wheel. Allows the operator to adjust the size of the Infrared Flood Illuminator from a flood (up to 37^0) to a spot (down to .8 mRad). It widens the aperture of the infrared

beam for maximum illumination within a short distance or lengthens and narrows for spotting targets farther down range when viewed by NVDs. Refer to Table S6-1 for laser safety specifications.

R-16. Elevation Adjustment Screw. Allows for easy alignment of the *RAPTAR-S* to the optic.

R-17. Laser Range Finder. Features two optics ports that provide the ranging capability for the system. The Laser Range Finder houses one (1) 1550nm wavelength transmitter and one (1) receiver.

R-18. Windage Adjustment Screw. Allows for easy alignment of the *RAPTAR-S* to the optic and maintains its setting until reset by the operator.

R-19. Remote Trigger Connection Port. Accepts the connector of the Remote Trigger. The port is conveniently located behind and to the left of the Display.

Table 1.11-2. *RAPTAR-S* Key Display Indicators

INDICATOR	DESCRIPTION
LP	Laser Low Power Indicator: - Low Power Laser (when lit) - High Power Laser (when unlit) *(HP Model Only)*
	Low Battery Indicator (No Bluetooth Connection)
B	Full Battery Indicator; Bluetooth Connected
K	Full Battery Indicator; Kestrel Connected and Streaming

R-20. Programming / Purge Port (Not Shown). Allows the Wilcox Factory Technician to program the system and to purge the system at time of manufacture or maintenance. This port is for access by Wilcox Factory Technicians only. Access by any other individual will void the warranty.

R-21. Rail Mounting Interface. Allows the attachment of the *RAPTAR-S* to the MIL-STD-1913 Rail. Threaded nuts aid in secure mounting.

R-22. Lens Safety Cover. Mounts to the inner diameter of the lens optics when not in use to prevent accidental firing of the lasers and to keep the lenses free of dust and debris.

R-23. / R-24. Front Sight Post / Rear Sight. Allows the operator to visually align the *RAPTAR-S* with the intended target when sighting. A screw slot located on the Front Sight Post allows the post to move left or right by simply turning the post CW or CCW with a small screw driver, as described in Section 2.11.

R-25. IR Flood Illuminator Port. An infrared 830nm flood illuminator that can be used for targeting. The diameter of the illuminator can be adjusted from a flood to a spot by means of the IR Flood Focus Wheel located on the top of the *RAPTAR-S*. Refer to Table S6-1, page "xii" for laser safety specifications.

R-26. Identification Label with 3D Barcode. Identifies the Product Name, Serial Number, Manufacturer Code, Manufacturing Date of the product, the battery orientation, and universal identification code containing all above mentioned items.

A scannable 3-D barcode indicates the Wilcox manufacturer CAGE Code, the Product Part and the Serial Number of the unit when scanned by a 3-D barcode reader. Tampering with this label will void the warranty.

R-27. Laser Safety Labels (2). The Laser Safety Labels located on either side of the *RAPTAR-S* identify the lasers contained in the *RAPTAR-S* and warn operators of the dangers of direct eye exposure.

R-28. Environmental Sensor. An environmental sensor provides measurement of temperature, air pressure and humidity for use in calculating the ballistics solution.

R-29. High Power Lockout Screw. A blue High Power Lockout Screw can be screwed into the Mode Selection Knob to prevent operator access to the High Power laser switch positions (featured only on the HP model of the *RAPTAR-S*). When not in use, it is stored within a screw hole on the upper right-hand corner of the back end of the case to prevent loss of the screw (see Section 2.5 for further information).

R-30. High Power Lockout Screw Storage Port. A storage port is located above the battery compartment for storage of the High Power Lockout Screw when it is not in use.

SECTION 2

OPERATION

2.1 PREPARING THE *RAPTAR-S* FOR USE

2.1.1 Unpacking Equipment

Before unpacking *RAPTAR-S* components, ensure that all components listed in Figure 1.8-1 are present.

2.1.2 Inspection of Equipment

Before using the *RAPTAR-S*, inspect components for damage such as cracked, loose, or defective parts. Check O-Rings in the battery compartment (described in Section 3.2). Replace if damage or defects exist.

2.2 BATTERY REPLACEMENT

A Battery Indicator on the *RAPTAR-S* indicates zero bars when the battery power has been sufficiently depleted to be replaced. Replace the used 'CR123A' size lithium battery when the *RAPTAR-S* displays low power (see Figure 2.2-1). Refer to Section 3.5 for a list of possible conditions that would require battery replacement.

2.2.1 Replacing Batteries in the *RAPTAR-S*

Step 1.) Turn the Mode Selection Knob to the 'OFF' position.

Step 2.) Rotate the Battery Compartment Cover CCW, while ensuring that moisture will not be allowed into the compartment.

Step 3.) Remove the used battery and inspect O-Ring as described in Section 3.2.

Step 4.) Ensure that the Battery Compartment is clean and dry, then install a new battery, positive end first as indicated on the Battery Orientation Indicator on the Identification Label (see Figure 2.2-2).

Step 5.) Resecure the Battery Compartment Cover by turning the cap CW using caution not to damage the O-Ring.

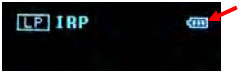


Figure 2.2-1 Battery Level Indicator, Displaying Full Power

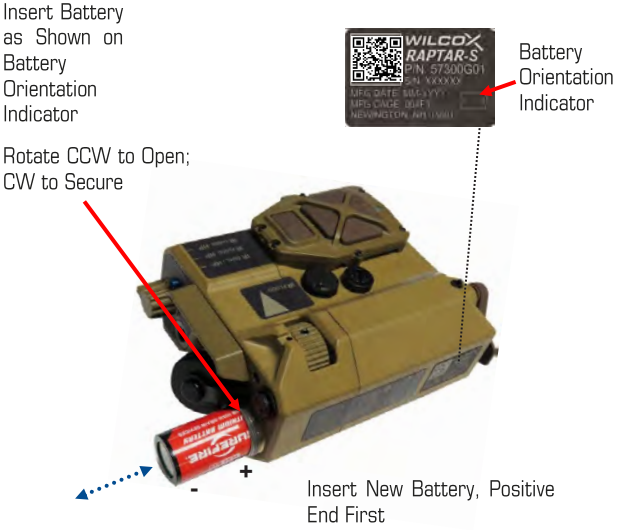


Figure 2.2-2 Replacing the Battery in the *RAPTAR-S*

2.3 MOUNTING AND DISMOUNTING THE *RAPTAR-S*

The *RAPTAR-S* secures to the top (12 O'Clock) and side (3 O'Clock and 9 O'Clock) rail positions of a MIL-STD-1913 RIS/RAS Rail.

NOTE

For best performance, Wilcox recommends mounting the RAPTAR-S at the 12:00 position, preferably to the top of the primary scope as depicted on the cover of this manual.

2.3.1 Mounting the *RAPTAR-S* to the MIL-STD-1913 Rail

Step 1.) Fully unthread the two Lock Nuts to loosen the rail grabbers.

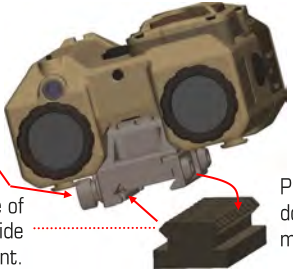
Step 2.) Insert the stationary side of the MIL-STD-1913 rail into the Lock Nut side of the *RAPTAR-S* mount (see Figure 2.3-1).

Step 3.) Pivot the opposite side of the *RAPTAR-S* mount downward so that it sits flat on the weapon rail and the opposite rail grabber is positioned to engage.

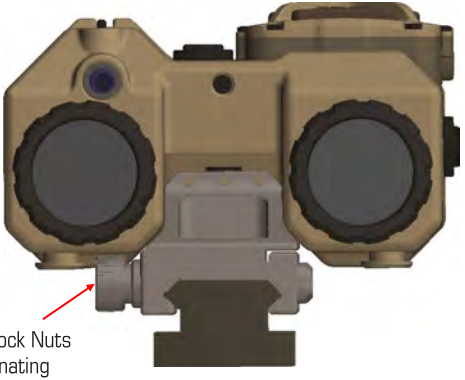
Step 4.) Rotate the locking screws CW, alternating between nuts for even distribution, using a blade screwdriver or coin (30 in/lb is recommended). Attempt to remove the *RAPTAR-S* from the rail by pulling to ensure that it is securely attached. If not properly attached, retighten.

2.3.2 Dismounting the *RAPTAR-S* from the MIL-STD-1913 Rail

Follow steps for mounting the *RAPTAR-S* in reverse.



FRONT VIEW



DEPICTED ON MIL-STD-1913 RAIL

Figure 2.3-1 Mounting the *RAPTAR-S* to the RIS/RAS Rail (12 O'Clock Position Depicted)

2.4 ATTACHING THE REMOTE TRIGGER

The *RAPTAR-S* features a Remote Trigger that allows the operator to control the *RAPTAR-S* remotely during operation of the weapon. Mounting of the Remote Trigger is optional if the *RAPTAR-S* is used standalone.

To Attach the Remote Trigger:

Step 1.) The Remote Trigger End Connector features a "witness notch" and "key" that require proper alignment when mounted. Attach the Remote Trigger by aligning the detent of the *RAPTAR-S* with the detent on the Remote Trigger Connection Port then slide until it clicks (see Figure 2.4-1). The click indicates that the connector is located properly in the port.

To Detach the Remote Trigger:

Step 1.) Grasping the outer portion of the Remote Connector, gently pull outward until the connector unseats. DO NOT PULL ON THE CABLE TO DISCONNECT.

To connect, align the Connector Witness notch to the 2 O'Clock position of the port. Slide Remote connector into the port until is seats/ clicks.

Attach the connector on the remote tether to the *RAPTAR-S.*

To Disconnect, Pull Outward While Grasping Outer Portion of the Remote Connector. DO NOT PULL ON CABLE!

Figure 2.4–1 Attaching the Remote Trigger

2.5 INSTALLING THE HIGH POWER LOCKOUT SCREW (HP MODEL ONLY)

The *RAPTAR-S HP Model* can be configured to allow selectable operation in low power or high power modes, or to lock out all high-power functions. Configuration is performed by installation or removal of a High Power Lockout Screw (see Figure 2.5-1).

To Install the High Power Lockout Screw:

Step 1.) Set the Mode Selection Knob to "OFF".

Step 2.) Using the 5/64 Hex Key provided, remove the High Power Lockout Screw from its storage position and insert into the hole adjacent to the Mode Selection Knob ensuring that it is secure, but not over-tightened.

Step 3.) Activate the *RAPTAR-S* to the desired mode.

To Stow the High Power Lockout Screw:

Step 1.) Set the Mode Selection Knob to "OFF".

Step 2.) Remove the High Power Lockout Screw from the hole adjacent to the Mode Selection Knob and store it in its storage port.

Lockout Screw Installed (HP Model Only)

Lockout Screw Stowed (HP Model Only)

Figure 2.5-1. Installing the High Power Lockout Screw (HP Model Only)

2.6 ACTIVATING THE *RAPTAR-S*

NOTE

When the RAPTAR-S is powered on, the integrated Bluetooth interface will automatically begin attempting to connect to paired third-party devices. These radio transmissions may be observed by non-paired devices.

The default setting for the display brightness is "auto", where the light detector measures ambient light to determine display brightness. In this mode, the display will appear at the correct brightness for ambient conditions. If changed to "Manual 1" through "Manual 8", the display will maintain a consistent brightness based upon the set value.

To Activate the *RAPTAR-S*:

Step 1.) Ensure that the *RAPTAR-S* is securely mounted.

Step 2.) Rotate the Mode Selection Knob to select the desired operational mode. The display illuminates and an icon in the upper right-hand corner shows the current battery level (see Figure 2.6-1). If the display does not illuminate when activated, ensure that the display is not set to a dim setting, and that a fresh battery has been installed in the correct orientation, and that the battery compartment cover is securely fastened.

Step 3.) If desired, set the *RAPTAR-S* display brightness as described in Section 2.7.2.

Step 4.) If desired, set the minimum Range Gate as described in Section 2.7.4.

Figure 2.6-1. Battery Level Indicator

2.7 CONFIGURING USER FUNCTION SETTINGS

The *RAPTAR-S* provides a Function menu that allows the operator to display and/or configure a variety of *RAPTAR-S* functions (see Table 2.7-1).

2.7.1 Displaying the Percentage of Remaining Battery Life

The *RAPTAR-S* displays the percentage of remaining battery life when requested. To do this, follow this simple procedure:

To Display the Percentage of Remaining Battery Life:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**Battery**" option, then press the Right Button to display the estimated percentage of remaining battery.

Table 2.7-1. Function Menu Options

OPTION	DESCRIPTION
Battery	Displays the currently remaining battery percentage
Brightness	Display Brightness **Auto** ***[Default]*** **"Manual 1" (Dimmest) through "Manual 8" (Brightest)**
ID Pattern	Selects the Laser ID (Blink) Pattern **Off** ***[Default]*** **"Pattern 1" through "Pattern 6"**
Range Gate	Selects the Range Gate **"10" [*Default]*** **"0" to "200" Meters in 10 Meter Increments**
LRF Config	Select LRF Maximum Measurement Time **Normal** - Range Events Complete in Less than 1 Second ***[Default]*** **Enhanced** - Range Events Complete in Less than 1.5 Seconds with Increased Accuracy at Longer Distances
Ballistics	Set Ballistic Mode **Full Solution** - Elevation / Windage Holds ***[Default]*** **Range in Meters** - Only Range in Meters **Range in Yards** - Only Range in Yards
Compass Cal	Perform Compass Calibration
Self Test	Perform Unit Self Test Operations
Set Defaults	Set Factory Defaults
About...	Display software version and hardware configuration.

2.7.2 Setting the Display Brightness Control

The Display Brightness Control function allows the operator to select the brightness of the display. The "Auto" mode dims automatically based upon the amount of ambient light. Manual brightness is set by choosing the "Manual 1" (dimmest) through "Manual 8" (brightest) options. The *RAPTAR-S* is shipped, by default, with the Display Brightness Control set to "Auto".

To Set the Display Brightness Control:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**Brightness**" option, then press the Right Button to select.

Step 2.) Using the Fire/Up and Adjust/Down buttons to scroll through the list of options: "Auto" (automatic - dims based upon ambient light) or manual brightness options ranging from "Manual 1" (dimmest) through "Manual 8" (brightest)

2.7.3 Setting the Laser Identification Blink Pattern

The operator can set an identification (blink) pattern on the visible and Near IR laser pointer for operator identification. This pattern is only selectable for the laser pointer. The *RAPTAR-S* is shipped, by default, with the laser identification pattern set to "**OFF**" (no blinking).

To Set the Laser Identification Blink Pattern:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**ID Pattern**" option, then press the Right Button to select the Display option.

Step 2.) Press the Fire/Up and Adjust/Down Buttons to scroll through the available identification patterns from "**OFF**" or "**Pattern 1**" to "**Pattern 6**"

Off	Laser solid, no blinking **(Default)**
Pattern 1	300 blinks per minute – Fast blink
Pattern 2	150 blinks per minute – Medium blink
Pattern 3	100 blinks per minute – Slow blink
Pattern 4	Long on, short off
Pattern 5	Long on, then 2 blinks off, fast
Pattern 6	Long on, then 2 blinks off, slow

Step 3.) Press the Right Button to select the setting.

2.7.4 Setting the Range Gate

The Range Gate sets the minimum distance measured by the Laser Range Finder. For example, if an obstruction appears at 50 meters and the target is at 250 meters, setting the Range

Gate higher than 50 meters will prevent the obstruction from being ranged by the LRF.

To Set the Range Gate:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**Range Gate**" option, then press the Right Button to select the Display option.

Step 2.) Use the Fire/Up and Adjust/Down buttons to adjust the setting between 0 meters and 200 Meters in 10 Meter increments. The default value is 10 meters.

Step 3.) Press the Right Button to select the setting.

2.7.5 Configuring the LRF

The LRF Configuration function allows the operator to set the *RAPTAR-S* measurement time option. The "Normal" mode completes range events in less than one second while the "Enhanced" option completes range events in less than 1.5 seconds with increased accuracy at longer distances. The *RAPTAR-S* is shipped, by default, with LRF Configuration set to "Normal".

To Configure the LRF:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**LRF Config**" option, then press the Right Button to select.

Step 2.) Using the Fire/Up and Adjust/Down buttons to scroll through the list of options: "**Normal"** (Range Events Complete in Less than 1 Second) or "**Enhanced**" (Range Events Complete in Less than 1.5 Seconds - Increased distance).

Step 3.) Press the Right Button to select the option.

2.7.6 Setting the Ballistics Mode

The Ballistics option on the Function Menu allows the operator to choose the range distance display options. Refer to Table 2.7-1 for a list of options and their defaults.

NOTE

When in Full Solution mode, input and output units are selected using the Ballistics Menu options setting.

To Set the Ballistics Mode:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**Ballistics**" option. Depress the Right Button to access the Range Units options.

Step 2.) Press the Fire/Up and Adjust/Down Buttons to select the ballistics mode: "**Full Solutions**", "**Range in Meters**" or "**Range in Yards**".

Step 3.) Press the Right Button to select the option. The *RAPTAR-S* redisplays the Function Menu.

2.7.7 Performing a Compass Calibration

For the most accurate ballistic solutions, compass calibration is required once the *RAPTAR-S* is mounted. This requires the system to be rotated in three planes: horizontal, vertical, and longitudinal. It is more accurately performed while the *RAPTAR-S* is mounted to the weapon in its fully configured form.

NOTE

When performing a Compass Calibration, ensure that you slowly rotate the device horizontally, vertically and longitudinally. If the procedure is performed in less than 20 seconds, the message "CAL FAILED Rotated too fast. Using defaults." will display.

To Perform a Compass Calibration on the *RAPTAR-S*:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**Compass Cal**" option and press the Right Button to Right Button to begin Compass Calibration.

Step 2.) Slowly rotate the weapon 360^0 horizontally, vertically, and longitudinally in no particular order, as illustrated in Figure 2.7-1.

Step 3.) Press the Right Button to stop calibration, then validate calibration to known headings.

Step 4.) If possible, verify the compass calibration settings using an external compass. If the achieved calibration is not accurate, use the "Set Defaults" procedure on the Function Menu to restore factory defaults.

360^0 Horizontal **360^0 Vertical** **360^0 Longitudinal**

Figure 2.7-1. Weapon Rotation for Calibration

2.7.8 Performing a Self Test

The *RAPTAR-S* features a manual system diagnostic test that checks that the display, all lasers and the IR Illuminator are functioning. These tests require a visual check by the operator to ensure that they see the test results. It also checks the internal environmental sensors to ensure that they are properly functioning and returns an error on the display if it does not respond properly.

In the event that there is a test failure, or that you require troubleshooting assistance, contact Wilcox Customer Service between 8am and 5pm EST at 603-431-1331.

WARNING

Lasers are activated during the RAPTAR-S system test. Follow safety precautions for laser eye safety and operational cover.

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**Self Test**" option, then depress the Right Button to choose the Self Test feature. The system then prompts you to confirm that you would like to perform a test by pressing the Enter Button to cycle through the tests, or the Left button to exit.

Step 2.) Press the Enter button to sequence through all tests, verifying the test results as you go along.

Step 3.) If any error appears on *RAPTAR-S* after Self Test, follow battery replacement procedure, and perform a second test. If an error is still present, contact Wilcox Customer Service between 8am and 9pm EST at 603-431-1331.

Step 4.) Press the Left Button to exit the test at any time.

2.7.9 Restoring Factory Default Settings

The Set Defaults option on the Function Menu allows the operator to return all modified settings to the factory default settings as desired.

To Restore the Factory Default Settings:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**Set Defaults**" option, then depress the Right Button to choose the Factory Default feature.

Step 2.) Press the Fire/Up and Adjust/Down Buttons to switch between "**Go Back**" (returns you to the Function Menu) and "**Reset System**" (restores factory defaults), then press the Right Button again to accept. The system will perform the reset. When complete, *RAPTAR-S* will display the word "Done".

Step 3.) Rotate the mode selection knob to the "**OFF**" position.

2.7.10 Displaying the Current *RAPTAR-S* Software Version and Hardware Configuration

The *RAPTAR-S* About screen allows the operator to view the Software Version and hardware configuration, which may be helpful in determining troubleshooting issues when contacting Technical Support for assistance.

To Display the Current *RAPTAR-S* Software Version and Hardware Configuration:

Step 1.) From the Function Menu, press the Adjust/Down Button to highlight the "**About...**" option and press the Right Button to display the current software version and hardware configuration numbers.

2.8 CONFIGURING BALLISTICS SETTINGS

The *RAPTAR-S* provides a Ballistics Configuration Menu that allows the operator to adjust a number of settings for the ballistics engine.

2.8.1 Displaying the Ballistics Configuration Menu

Step 1.) Set Mode Selection Knob to the "BAL" setting. The currently selected gun selection briefly appears on the display followed by the Ballistics Configuration Menu (see Table 2.8-1).

Step 2.) Use the Fire/Up and Adjust/Down Buttons to scroll through the functions on the menu. When the desired menu option is highlighted, press the Right Button to select and enter the option menu. Detailed instructions for each step can be found in the following subsections.

Step 3.) To exit the Ballistics Configuration Menu, rotate the Mode Selection Knob to another option.

Table 2.8-1. Ballistics Menu Options

OPTION	DEFINITION
Gun Selection	Allows the operator to choose from up to five custom user gun profiles and numerous additional preconfigured profiles and to change configuration settings. Alternatively, "Kestrel 5700" may be selected to stream the ballistic solution from the Kestrel. **UserGun01** **UserGun02** **...** **M7-M855** **Kestrel 5700**
Environment	Allows the operator to review and manually adjust environmental variables *. These include: **Temp** (Air Temperature - C or F) **Pres** (Air Pressure - mbar or inHg) **Hum** (Humidity %) **WS** (Wind Speed - m/s or mph) **WD** (Wind Direction)
Target	Allows the operator to adjust determined target values, including: **Rng** (Range to Target) **Inc** (Inclination) **DoF** (Direction of Fire) **Lat** (Latitude)
Options	Allows the operator to set the displayed format for Ballistic parameters. **In Units** - Input Units (English, Mixed ***(Default)*** or Metric) **Out Units -** Output Units (MILS ***(Default)*****,** Inches, ACOG * *, MOA)
Angle Cal	Allows the operator to perform a Cant Angle Calibration. See Section 2.10 for details.
Manage Guns	Allows the operator to send or receive gun configurations between the *RAPTAR-S* and Kestrel. **Send All Guns** - Send all guns from the *RAPTAR-S* to the Kestrel. **Receive All Guns** - (Kestrel to *RAPTAR-S*)

* Select and press up or down to manually adjust the value. Asterisk (*) indicates changed and locked. (-) indicates that the sensor reading is used. Direct sunlight exposure may affect sensor readings.

* * ACOG units are not compatible with Kestrel 5700 gun selection. Choose different Out Units for operation with this gun selection.

2.8.2. Setting Weapon Ballistic Parameters (Gun Settings)

The Gun Settings option allows the operator to change the ballistic parameters for the current weapon system (see Table 2.8-2).

To Set the Weapon Ballistic Parameters:

Step 1.) From the Ballistics Configuration Menu (see Figure 2.8-1), use the Fire/Up and Adjust/Down Buttons to scroll through the functions on the menu and highlight "**Gun Selection**", then press the Right Button to display the Gun Selection list (see Figure 2.8-2). The currently selected gun name will be followed by a "<-" identifier within the list. Highlight the current gun, or to select a different gun highlight that gun, and press Enter.

Step 2.) Press the Right Button to enter the Gun Settings Screen. Only the settings for the currently selected gun can be modified, as outlined in Table 2.8-2.

Step 3.) Use the Fire/Up and Adjust/Down Buttons to scroll through the options.

Step 4.) To change parameter values, press the Right Buttons to access parameter values, then the Fire/Up and Adjust/Down Buttons to change the value. Press the Left Button to return to the menu.

or

When setting Muzzle Velocity "MV" values, use the Left Button to scroll back to "MV #" and press the Enter Button to update the MV-Temp table. This table allows you to enter up to 6 known muzzle velocities for various temperatures. Scroll down the table numbers, using the Adjust/Down Button and press the Right Button to access temperature and velocity data. Once accessed, use the Fire/Up and Adjust/Down Buttons to change temperature or corresponding velocity data. To reset table data, scroll down to the "Reset Table" option and press "Enter". Use the Left Button to exit the adjustment.

Step 5.) When done, press the Left Button to exit the adjustment.

Step 6.) When you are done changing ballistics settings, press the Left Button again to save. Simply rotating the Mode Selection Knob to exit out WILL NOT save your values.

Table 2.8-2. Ballistic Parameters

PARAMETER	DEFINITION	MIN VALUE	MAX VALUE	UNITS
(MV)	**Muzzle Velocity** (Feet per Second)	0	4000	fps
(DC)	**Drag Curve Coefficient** (Select from Table 2.8-2)	G1	Custom	-
(BC)	**Bullet Ballistic Coefficient**	0.005	3	lb/in^2
(BD)	**Bullet Diameter** (inches or millimeters)	0	3	in
(BL)	**Bullet Length** (inches or millimeters)	0	10	in
(BW)	**Bullet Weight** (grains or grams)	0	1500	grains
(ZR)	**Zero Range (BZO)** (yards or meters)	0	5000	meters
(BH)	**Bore Height** (inches or centimeters)	0	10	inches
(ZH)	**Zero Height** (Vertical distance between Point of Aim and Point of Impact) (inches or millimeters)	-30	30	Inches
(ZO)	**Zero Offset** (Horizontal distance between Point of Aim and Point of Impact; Left is negative, Right is positive) (inches or millimeters)	-30	30	inches
(RT)	**Rifling Twist Rate** (Distance in Which Bullet Achieves 360º of Rotation; inches/revolution or centimeters/revolution)	0	36	-
(RTd)	**Rifling Twist Direction** Left = Counter-Clockwise Right = Clockwise Both from the Shooter's Perspective	Left	Right	-
(Cal MV)	**Muzzle Velocity Truing**	-	-	-
(Cal DSF)	**Drop Scale Factor Truing**	-	-	-
(View DSF)	**View the Drop Scale Factor**	-	-	-
(Clear DSF)	**Clear the Drop Scale Factor**	-	-	-
(Reset Gun)	**Reset Parameters for the Selected Gun to Factory Settings**	-	-	-

(*) - Indicates that Gun Profile has been modified. **(<-) -** Indicates selected Gun Profile,

Figure 2.8-1. Ballistics Menu

Figure 2.8-2. Gun Selection Options

2.8.3. Setting Drag Curve Coefficients (DC)

RAPTAR-S allows the operator to use G1 or G7 ballistic coefficients, or a variety of Applied Ballistics' custom drag curves. If a custom drag curve is used, no further adjustment is necessary. The custom drag curves provided offer a new level of accuracy that cannot be matched by conventional G1/G7 ballistic tables (see Table 2.8-3). If using G1 or G7 drag curves, you must adjust the BC by scrolling down and editing to the proper value.

NOTE

When using a custom drag curve, the "BC" will still be visible in the menu items but the value will not affect the ballistics solution.

To Set the Drag Curve Coefficients:

Step 1.) Access the "DC" adjustment option on the Ballistics Menu as described in Section 2.8.2, then use the Fire/Up and Adjust/Down Buttons to adjust the value for the Drag Curve Coefficient.

Step 2.) When done, press the Left Button to exit the adjustment.

Step 3.) When you are done changing ballistics settings, press the Left Button again to save.

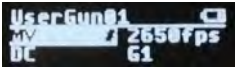


Figure 2.8-3. Drag Coefficient Screen (Sample Data Displayed)

Table 2.8-3. Drag Coefficient Parameters

OPTION	DEFINITION
G1	Industry Standard (Requires BC Adjustment)
G7	Industry Standard (Requires BC Adjustment)
175grSM	.308 175 gr Sierra Matchking
175grBT	.308 175 gr Berger Target Hybrid
190grSM	.308 190 gr Sierra Matchking
230grBH	.308 230 gr Berger Hybrid
250grLP	.338 250 gr Lapua
300grBH	.338 300 gr Berger Hybrid
300grLP	.338 300 gr Lapua
300grSM	.338 300 gr Sierra Matchking

2.8.4. Setting Muzzle Velocity Truing (Cal MV)

The Cal MV Screen allows you to calibrate your muzzle velocity (MV) based on the actual drop of a round at a range where the bullet is supersonic. With the range and the drop entered, the *RAPTAR-S* automatically adjusts muzzle velocity to match.

Within the Cal MV Screen, the recommended truing ranges are presented on the top line (see Figure 2.8-4). The first value is the range at which the bullet is at Mach 1.4. The second value is the range at which the bullet is at Mach 1.2. These are the optimal ranges at which the muzzle velocity should be trued.

To Set the Muzzle Velocity Truing:

Step 1.) Access the "MV" adjustment option on the Ballistics Menu as described in Section 2.8.2. The MV value will initially display unchanged (see Figure 2.8-4).

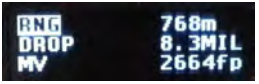


Figure 2.8-4. Muzzle Velocity True Screen

To adjust True Range (RNG) or True Drop (DROP), use the Right Button to access the value, then use the Fire/Up and Adjust/Down Buttons to adjust. As changes are made to RNG and DROP, the Muzzle Velocity (MV) will adjust.

Step 2.) Once the Muzzle Velocity is set to the desired Range and Drop values, press the Left Button to exit the screen. A prompt asks you if you would like to accept the new MV value (see Figure 2.8-5). Use the Fire/Up and Adjust/Down Buttons to highlight the desired response and press the Enter Button to accept.

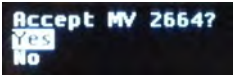


Figure 2.8-5. Muzzle Velocity True Screen (Save Prompt)

Step 3.) When done, the Ballistics Menu redisplays.

2.8.5. Truing the Drop Scale Factor (Cal DSF)

The Drop Scale Factor Menu allows you to enter and maintain a table of drop scale factors (DSF) that utilize observed drop at range to true the elevation computation. DSF Truing is made to calibrate the observed drop with that which is predicted by the ballistics engine and is utilized for transonic and subsonic flight. Some users will be familiar with the concept of adjusting a Ballistic Coefficient as a function of range. The DSF truing operates on a similar principle but is fully compatible with the usage of custom drag curves where the concept of a Ballistic Coefficient is not utilized.

The number shown on the top right of the screen represents the suggested range distance at which to apply a drop scale factor for transonic flight.

NOTE

DSF Truing can occur at any range beyond where the muzzle velocity was trued. Up to 5 ranges can be utilized by incrementally entering a new range and observed drop. If a non-incrementing range is entered, all subsequent ranges that were previously entered are eliminated. Example: Truing was performed at 1200 meters and 1500 meters originally and DSF values computed. Next, a range of 1400 meters was utilized. After acceptance of the new DSF at 1400 meters, the previous 1500 meter truing point is eliminated. If a truing point is desired at 1500 meters, it must be done after the 1400 meter truing point.

NOTE

DSF truing points are stored utilizing the Mach number and DSF value. This ensures that the truing adjusts properly when the environmental or shooting conditions change.

To Set the Drop Scale Factor:

Step 1.) Access the "Cal DSF" adjustment option on the Ballistics Menu as described in Section 2.8.2. The DSF value will initially display unchanged (see Figure 2.8-6).

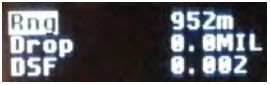


Figure 2.8-6. Drop Scale Factor True Screen

To adjust DSF Range (RNG) or DSF Drop (DROP), use the Right Button to access the value, then use the Fire/Up and Adjust/Down Buttons to adjust. As changes are made to Rng and Drop, the DSF value (DSF) will adjust.

Step 2.) Once the DSF is set to the desired Range and Drop values, press the Left Button to exit the screen. A prompt asks you if you would like to accept the new DSF value (see Figure 2.8-7). Use the Fire/Up and Adjust/Down Buttons to highlight the desired response and press the Enter Button to accept.

Figure 2.8-7. Drop Scale Factor True Screen (Save Prompt)

Step 3.) When done, the Ballistics Menu redisplays.

2.8.6. Maintaining the Drop Scale Factor Table

The Drop Scale Factor Table allows the operator to enter and maintain a table of Drop Scale Factors that utilize observed drop at range to calibrate the elevation computation. This allows the operator to "train" the *RAPTAR-S* based upon noted drop rates at greater distances including subsonic flight.

NOTE

Attempting to enter an additional drop scale factor that is closer in range distance than existing DSF table entries will invalidate and erase existing entries.

To View or Modify the Drop Scale Factor Table:

The *RAPTAR-S* allows you to enter, modify or clear a table of up to six (6) pre-defined Drop Scale Factors that utilize observed drop at range to calibrate the elevation computation.

Step 1.) The *RAPTAR-S* stores up to six (6) pre-defined Drop Scale Factors in a table. To access the table of predefined DSF values, select the "View DSF" option on the Gun List and press the Right Button to select. These values can be modified as required.

Figure 2.8-8. Drop Scale Factor True Screen

Step 2.) To save table values and exit, press the Left Button.

To Clear the Drop Scale Factor Table:

To clear the table of DSF values, access the Clear DSF option on the Gun List, and press the Right Button to select. All values return to 0.000 mach and 1.000 DSF values.

Step 1.) To clear the table of predefined DSF values, select the "Clear DSF" option on the Gun List and press the Right Button to select. The *RAPTAR-S* confirms that it has done this by briefly displaying the word "Done" in the lower right-hand corner of the display.

2.8.7. Setting Environmental Variable Overrides

The Environment screen (see Figure 2.8-9) displays the readings from *RAPTAR-S's* onboard temperature (Temp), pressure (Pres) and humidity (Hum) sensors. A symbol in the middle column indicates whether the reading was measured by a sensor ("**-**" symbol) or manually overridden ("*" symbol). Changes made to these measurements will persist when the *RAPTAR-S* is turned off and back on if the operation is performed as instructed. At any time, the operator can restore the factory default values or those read by the sensor (see Section 2.7.9).

WARNING

Beware of solar loading on the RAPTAR-S. If the housing is hotter than the ambient air, find the actual environmental conditions using an independent source for accuracy, then go into the Environment screen and manual set these values. Erroneous environmental values will cause increasingly incorrect elevation holds as the range increases.

Figure 2.8-9. Environment Screen

To Override a Measured Value:

Step 1.) Using the Fire/Up and Adjust/Down Buttons, scroll to the parameter and press the Right Button to highlight the symbol. Press the Fire/Up and Adjust/Down Buttons to change from "–" to "✻".

Step 2.) Once "✻" is shown, another press of the Right Button highlights the value, which can then be changed using the Fire/Up and Adjust/Down Buttons.

Step 3.) To use the sensor's measurements again, highlight the symbol, and press the Fire/Up and Adjust/Down Buttons until the – is shown again. The value in the right column will update.

Step 4.) When done, press the Left Button to exit the adjustment.

Step 5.) When you are done changing environmental settings, press the Left Button again to save. Simply rotating the Mode Selection Knob to exit out WILL NOT save your values.

2.8.8. Setting Target Reading Overrides

The Target Menu allows the operator to change options for the calculation of range to target. See Table 2.8-4 for a full listing of available parameters.

To Set the Target Option Values:

Step 1.) Access the "**Target**" option on the Ballistics Menu as described in Section 2.8.2, then use the Fire/Up and Adjust/Down Buttons to adjust the value on the Target Menu (see Figure 2.8-10).

Step 2.) Using the Fire/Up and Adjust Down Buttons, scroll to the parameter, and press the Right Button to highlight the symbol. Press the Fire/Up and Adjust/Down Buttons to change from a "**–**" to a "*".

Step 3.) Once a * is shown, another press of the Right Button highlights the value, which can then be changed using the Fire/Up and Adjust/Down Buttons.

Step 4.) To use the sensor's measurements again, highlight the symbol, and press the Fire/Up and Adjust/Down Buttons until the "**–**" symbol redisplays. The value in the right column will update.

Step 5.) When done, press the Left Button to exit the adjustment.

Step 6.) When you are done changing target settings, press the Left Button again to save.

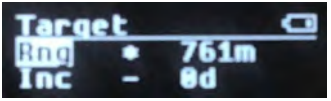


Figure 2.8-10. Target Menu

Table 2.8-4. Target Menu Parameters

OPTION	DEFINITION
(Rng)	Range to Target
(Inc)	Inclination Angle
(DoF)	Direction of Fire
(Lat)	Latitude

2.8.9. Setting Additional Ballistic Options

The Setup Screen allows the user to adjust additional settings on the *RAPTAR-S* for In Units (Input - Mixed, Metric, or English) and Out Units (Output - MILS, Inches, MOA or ACOG). Refer to Section 2.8.10 for more detailed information on using ACOG Output (the ACOG Ballistic Reticle).

To Configure the Setup Options:

Step 1.) Access "**Options**" on the Ballistics Menu as described in Section 2.8.2, then use the Fire/Up and Adjust/Down Buttons to adjust the value on the Setup Menu.

Step 2.) Using the Fire/Up and Adjust Down Buttons, scroll to the parameter you wish to adjust, and press the Right Button to access the value.

Step 3.) Use the Up/Down arrow keys to adjust, then press the Left Button to return to the Setup Menu.

Step 4.) Repeat step 3 for the next parameter or press the Left Button to return to the Ballistics Menu and save your modified values.

Figure 2.8-11. Setup Menu

2.8.10. Using the *RAPTAR-S* with the ACOG Ballistic Reticle

When the *RAPTAR-S* is used in conjunction with an ACOG TA 31F sighting system, the *RAPTAR-S* can provide the proper ballistic solution holds compatible with the ACOG reticle for the selected gun profile. This is accomplished by setting the Ballistic Output Units to "ACOG" within the Ballistics Menu.

When performing a range with the *RAPTAR-S* in ACOG output mode, a chevron reticle icon appears on the *RAPTAR-S* display as shown in Figure 2.8-12, along with the text "BOT CHEV", "TOP CHEV", or a numeric value. These will update automatically as the range value is changed within the *RAPTAR-S*.

- When **"BOT CHEV"** appears on the display, use the bottom of the chevron for aiming within the ACOG sight.

- When **"TOP CHEV"** appears on the display, use the top of the chevron for aiming within the ACOG sight.

- When a **numeric value** appears on the display, use the numeric point on the ACOG reticle within the ACOG sight.

Note that ACOG mode is not compatible with Kestrel 5700 gun selection. Choose a different unit of measurement when using the Kestrel 5700 gun selection.

Figure 2.8-12. ACOG Output Display

2.8.11. Resetting Gun Profiles

The Reset Gun option allows the operator to restore the currently selected gun profile to its factory default settings.

When restoring an uploaded profile, the name is also restored to the original gun name.

To Reset the Gun Profile:

Step 1.) Select the "Reset Gun" option on the Gun List and press the Right Button to select. The *RAPTAR-S* confirms that it has done this by briefly displaying the word "Done" in the lower right-hand corner of the display.

2.9 LASER CO-ALIGNMENT PROCEDURE

The Laser Co-Alignment procedure ensures proper alignment of the *RAPTAR-S* LRF and lasers to the weapon optic. It is preformed after the weapon optic has been bore aligned or BZO obtained, as specified by the weapon and optic manufacturers. This procedure is possible because the LRF of the *RAPTAR-S* is co-aligned at the factory with its built-in lasers.

WARNING

When mounting the RAPTAR-S to a weapon, or to a new rail position, it is necessary to properly co-align the RAPTAR-S LRF to the weapon optic to ensure aiming accuracy.

CAUTION

The illuminating beam of the laser emitting from the RAPTAR-S indicates the area of approximate round impact and range finding, provided the co-alignment and optic boresighting (BZO) procedures have been properly followed and attained. Be aware of the direction in which the primary weapon is pointed, as well as the direction of the intended target, prior to ranging or firing a round.

2.9.1 Co-Aligning the *RAPTAR-S* Laser to BZO of the Optic

A reflective nVisti target enables rapid alignment of the *RAPTAR-S* laser range finder (LRF) to a weapon optic using the *RAPTAR-S*'s built-in visible laser. By performing both the coarse and fine alignment, all parallax is eliminated between the weapon optic and LRF, maximizing LRF performance.

CAUTION

Use proper safety precautions and procedures regarding use of target alignment material and optical devices during laser use. Refer to organizational procedures, instructions and directives.

NOTE

It is recommended to mount the RAPTAR-S to an integrated high quality specification rail system to optimize the designed performance of the system.

NOTE

The RAPTAR-S Visible and Infrared (IR) Laser Pointers and Flood AND the Laser Range Finder (LRF) are collimated by design. Adjustments of the Visible laser pointer will adjust the IR laser pointers and LRF simultaneously.

Setup:

- Ensure that the *RAPTAR-S* is securely mounted to the rifle and that the rifle is properly zeroed.
- Place the target at approximately 100 meters.
- Turn on the low power visible laser.

Coarse Alignment Process:

1. Scan the rifle near the target until the laser spot is visible on the target.
2. Note the offset between the laser spot and the scope's markings.
3. Use the *RAPTAR-S* Windage and Elevation Adjustment Knobs to move the laser until it aligns with the scope's cross hairs.

Fine Alignment Process:

Repeat steps 1-3 of the coarse alignment process at a range of greater than 800 meters.

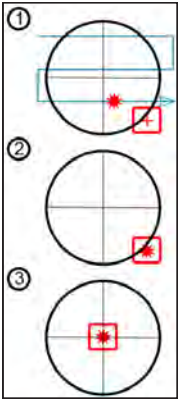


Figure 2.9-1. Co-Aligning the *RAPTAR-S* Laser to BZO of the Optic

2.9.2 Truing the Ballistics Solution

Prior to each use, use the following procedure to fine tune (True) the ballistics solution.

WARNING

If the system has been under solar loading conditions, the environmental sensor readings may become less accurate. Confirm the environmental data before finding the ballistic solution.

CAUTION

Ammo storage temperature may affect round travel. To avoid discrepancies in accuracy, store ammo with the RAPTAR-S.

To True the Ballistics Solution:

Step 1.) **Once the gun is set up, go to the Ballistics Menu to determine your weapons' transonic threshold.** Ensure that environment and wind speed/direction settings are correct, then find a target at the desired range or in the vicinity within 10% of the transonic range. This range can be found by entering the Cal MV screen and denoting the range that is given in the upper right hand corner.

Step 2.) **Once that range is determined, use the rangefinder to range and get the hold for the target.** Shoot at a definitive point of AIM on the target so you can determine the difference from hold to rounds strike within 0.1 mil.

Step 3.) **Once you determine the actual hold to hit correctly, enter the Cal MV setting in the gun settings, adjust drop and calibrate.** Save the muzzle velocity by scrolling to the 4th line and pressing the Enter Button on the calculated muzzle velocity. This will set the muzzle velocity for your gun.

Step 4.) **Your muzzle velocity is now set correctly** and any target lased up to transonic range (and beyond when used in conjunction with a custom drag curve) will give you correct elevation.

Step 5.) **Beware of solar loading on the device.** If the *RAPTAR-S* housing is hotter than the ambient air, find the actual environmental conditions using an independent source for accuracy, then go into the Environment screen and manual set these values. Erroneous environmental values will cause increasingly incorrect elevation holds as the range increases.

2.10 PERFORMING AN ANGLE CALIBRATION

Angle Calibration allows the *RAPTAR-S* to calibrate the proper orientation of the device to the horizon and should be performed each time the *RAPTAR-S* is mounted for operational use.

Figure 2.10-1. Angle Calibration Screen

To Perform an Angle Calibration on the *RAPTAR-S*:

Step 1.) Mount the *RAPTAR-S* to the weapon rail on the 3, 9 or 12 o'clock position.

Step 2.) Place the weapon with mounted *RAPTAR-S* in its level operational position, shooter behind, creating weight or load into gun.

Step 3.) Access the "**Angle Cal**" adjustment option on the Ballistics Menu as described in Section 2.8.1.

Step 4.) Press the Enter Button to calibrate cant and inclination values. This action may be reset and repeated to achieve the closest angle degree values for the following mounted positions:

3 O'Clock	**CNT: -90d**	**INC: 0d**
9 O'Clock	**CNT: +90d**	**INC: 0d**
12 O'Clock	**CNT: 0d**	**INC: 0d**

Step 5.) Press the Left Button to return to the Ballistics Menu.

To Clear the Angle Calibration Value from the *RAPTAR-S*:

Step 1.) To Clear calibration values from the "**Angle Cal**" Screen, use the Right Button to select "CLEAR", then press the Enter Button to Clear Values.

Step 2.) When the angle calibration is set to your operational position, press the Left Button to return to the Ballistics Menu.

2.11 ADJUSTING THE FRONT SIGHT POST

The *RAPTAR-S* features a Front and Rear Sight Post for operator alignment to target when used as a handheld device. The Front Sight Post is adjustable to customize the *RAPTAR-S* for the operator's sight.

To Adjust the Front Sight Post:

Step 1.) Set a diffused laser target at a minimum of 30 to 50 Meters (the further the distance, the better).

Step 2.) Activate the laser at the lowest visible setting for the environmental conditions.

Step 3.) View the laser through the open sight to determine the direction that the post must move.

Step 4.) Using a screwdriver, adjust the Front Sight Post by turning CW to rotate the sight to the right or CCW to rotate it to the left.

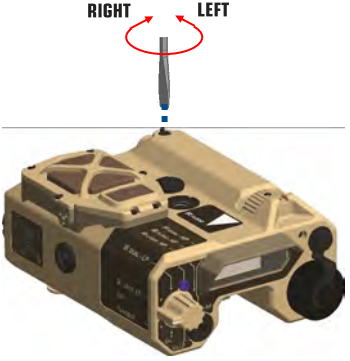


Figure 2.11–1 Adjusting the Front Sight Post

2.12 PRE-OPERATIONAL CHECKLIST

Prior to performing any operation with the *RAPTAR-S*, it is recommended that the operator perform a pre-operational check to ensure the proper operation of the system.

To Perform a Pre-Operational Check:

Step 1.) Check battery life and install fresh batteries if necessary.

Step 2.) Zero weapon to optics if not already zeroed.

Step 3.) Set Latitude for geographical area:
BALLISTICS MENU > TARGET > (LAT)

Step 4.) Select Gun Profile from the pre-loaded menu, or select a User Gun and Input Custom Gun Profile data manually. (<-) indicates this is the profile currently selected.
BALLISTICS MENU > GUN SELECTION >

Step 5.) Select ballistics option:
FUNCTION MENU > BALLISTICS > (FULL SOLUTION / RANGE IN METERS / RANGE IN YARDS)

Step 6.) Attach *RAPTAR-S* to weapons platform and position of choice: Top of Optic, 12, 3 or 9 o'clock.

Step 7.) Perform Compass Calibration (see Section 2.7.7).

Step 8.) Perform Angle Calibration (see Section 2.10).

Step 9.) The *RAPTAR-S* auto senses outside air temperature (OAT), pressure and humidity. These may be verified and manually adjusted and locked using data from other sources such as a weather meter.
BALLISTICS MENU > ENVIRONMENT

Step 10.) Manually enter wind speed and direction. Alternatively, a Kestrel weather meter may be used to stream live wind and other environmental data. If using a Kestrel weather meter, ensure that the Kestrel and *RAPTAR-S* are connected.

BALLISTICS MENU > ENVIRONMENT

Step 11.) Co-Align system to Optic at BZO dialed. Then at 100, 800, 1000m. (Use *RAPTAR-S* nVisti LRF alignment procedure; see Section 2.9.1).

2.13 OPERATING THE *RAPTAR-S*

The *RAPTAR-S* allows the operator to perform lasing and ranging operations independently or simultaneously. Prior to any operation of the *RAPTAR-S*, ensure that the pre-operational steps outlined in Section 2.12 have been performed.

CAUTION

It is recommended that the batteries be replaced and that the startup procedures for the RAPTAR-S be conducted prior to use to ensure proper operation.

2.13.1 Lasing a Target (Visible and Infrared Laser Modes)

Step 1.) Remove the lens/laser covers.

Step 2.) Ensure that the *RAPTAR-S* is in one of the visible or infrared modes.

Step 3.) Activate the laser as described in Table 2.13-1, below.

Step 4.) Rotate the IR Flood Focus Wheel CW or CCW to change the focus of the IR Illuminator when operating in the "**IRF**" or "**IRD**" switch positions.

Table 2.13-1. *RAPTAR-S* Fire/Up Button Functionality

	Fire/Up Button Functionality
Single Tap	Deactivates Selected Laser
Double Tap	Activates Selected Laser
Press and Hold	Momentary On of Selected Laser

Step 5.) Once activated, if desired, the laser intensity can be adjusted from powers of "**0**" through "**3**" for low power switch positions (within eyesafe limit) or "**0**" through "**7**" for high power switch positions (non-eyesafe).

Press the Adjust/Down Button to access the adjust mode. Press the Right Button to increase the laser intensity, or the Left Button to decrease. To save, press the Adjust/Down Button, or wait 5 seconds for the *RAPTAR-S* to time out and save your changes automatically.

Step 6.) In the "**IRD"** switch positions, two lasers are supported. Press the Adjust/Down Button once again to access the second laser and make changes as described in step 5.

Step 7.) Press Adjust/Down again to exit and save your changes. If no change is made within five seconds, the *RAPTAR-S* will automatically exit the adjust mode and save your changes.

Step 8.) The laser timeout will be activated to turn off lasers after 5 minutes of inactivity.

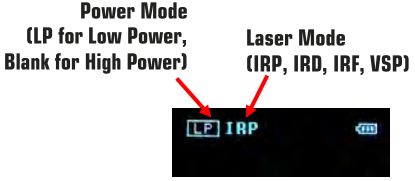


Figure 2.13-1. Mode Indicator

2.13.2 Ranging a Target

The "Ballistics" option on the *RAPTAR-S* Function Menu allows you to choose between the Full Solution and Range Only modes (yards or meters). Performing a range in the Full Solution mode always results in entering the ballistics solution display, regardless of success of the range operation. To change the selected mode, access the "**Ballistics**" option within the Function Menu (see Section 2.7.6).

NOTE

When ranging in the LRF "Enhanced" configuration setting, responses may be slightly slower. Wait for a response before re-ranging.

To Range a Target (Range Only Modes):

Step 1.) Rotate the rotary switch to the desired laser/illuminator position (activation of lasers is not required for range finder operation, but lasers remain functional).

Step 2.) Press the Enter Button. *RAPTAR-S* displays the determined range on the Display. When this display is active, the operator can continue to lase without affecting range values.

If a valid range is found, the value is displayed (Meters or Yards, as configured).

If no range is found, "N/T" is displayed indicating no target.

If the range finder times out and doesn't respond, *RAPTAR-S* may display "RNG T/O". If this occurs repeatedly, check battery level and replace as needed.

If the Range Finder determines multiple targets at different

ranges, the status bar indicates the number of targets (e.g., "R 1 2" (two range results), or "R 1 2 3" (three range results)) in order from the nearest to farthest. In such a case, use the Left and Right buttons to select the target range.

If ranging returns values for obstructions to the range object, set the Range Gate value higher than the distance of the obstruction and re-range.

Step 3.) Verify the cant angle on the Display and correct as necessary.

Table 2.13-2. Cant Values

	Canted LEFT	Canted RIGHT
Level	- - - - -	
1 º of Cant	- - - - \	/ - - - -
2 º of Cant	- - - \ \	/ / - - -
3 º of Cant	- - \ \ \	/ / / - -
4 º of Cant	- \ \ \ \	/ / / / -
5 º of Cant	\ \ \ \ \	/ / / / /

To Range a Target (Full Solution Mode):

Step 1.) Rotate the rotary switch to the desired laser/illuminator position (activation of lasers is not required for range finder operation).

Step 2.) Press the Enter Button. *RAPTAR-S* displays the determined range on the Ballistic Solution. When this display is active, the operator can continue to operate the laser pointer and illuminator using the Fire/Up button. For Elevation (E) Values, valid values are "D" for down and "U" for up. For Windage Hold values, valid values are "L" for left and "R" for right.

If a "0" range repeatedly occurs, check battery level and replace as needed.

Step 3.) If multiple targets are found, the word "MULTI" briefly appears on the display. In such a case, press the Adjust/Down Button until "R 1 2" or "R 1 2 3" displays, then use the Left or Right buttons to select the target.

Step 4.) If at least one valid range is found, the Ballistic Solution Display appears. To exit the Ballistics Solution Display at any time, press and hold the Enter Button.

Step 5.) From within the Ballistic Solution Display, press the Enter button to range another target and acquire another ballistic solution.

If no target is found, N/T is shown briefly and the Ballistic Solution shows a "0" length range solution.

Step 6.) Verify the cant angle on the Ballistic Solution Display and correct as necessary (see Figure 2.13-3).

2.13.3. Setting Range and Wind Variables

In the Ballistics - Full Solution Mode, the Ballistic Solution Display is entered when the rangefinder returns one or more ranges to valid targets. Wind speed and the number of targets are briefly displayed (see Figure 2.13-2). They then clear to display the range and cant indication (see Figure 2.13-3).

From within the Ballistic Solution Display, five parameters may be adjusted: Multi-Range Selection, Range Value, Wind Speed, Wind Direction and Laser Power Step. Note that manually set Wind Speed and Wind Direction are persistent through power cycling while Kestrel Wind Speed and Wind Direction are not. When the *RAPTAR-S* is connected to a Kestrel 5700 (refer to Section 2.13.4) the wind Speed and Wind Direction cannot be adjusted manually.

To Adjust Parameters:

Step 1.) Press the Adjust/Down Button to access the variable.

Step 2.) Press the Left or Right Buttons to adjust the variable's value.

Step 3.) Repeat from Step 1 to perform additional changes.

Figure 2.13-2. Ballistic Solution Display (Briefly Displayed)

Figure 2.13-3. Ballistic Solution Display

2.13.4 Operation with the Kestrel 5700

The *RAPTAR-S* may be paired with a Kestrel 5700 using the Bluetooth interface. When connected over this interface, there are two operational modes that share environmental and other data between the two devices, and one management mode for managing gun profiles. The two operational modes are: *RAPTAR-S* Ballistics and Kestrel 5700 Ballistics.

NOTE

When using the Kestrel 5700 with the RAPTAR-S, ensure that the Kestrel has been updated to Kestrel software version 1.15 or later.

When attached to the Kestrel 5700, the RAPTAR-S will always use environmental data from the Kestrel. If at any point, the operator wishes to manually override Kestrel environmental data, the Kestrel 5700 can be turned off. The operator then can manually adjust values from the RAPTAR-S and the RAPTAR-S will calculate the ballistic solution. In the event that the Kestrel 5700 is not connected when the RAPTAR-S is in Ballistics Mode and the Kestrel 5700 gun is selected, errors will display on the RAPTAR-S.

2.13.4.1 Bluetooth Pairing of the *RAPTAR-S* with the Kestrel 5700

Follow the Kestrel 5700 operator's manual for pairing with the *RAPTAR-S*. During pairing, turn on the *RAPTAR-S*. The Kestrel 5700 will display a list of devices to which it can pair. Select the *RAPTAR-S* with the same serial number as displayed on the *RAPTAR-S* label. Note that the Bluetooth connection may take 10 seconds or longer to attach.

When Bluetooth connects, the message "BT Device +++ Connected +++" appears on the screen and a "K" will appear to the left of the battery icon to indicate that the Kestrel is connected to the *RAPTAR-S* and has begun streaming data. A 'B' will be displayed in front of the battery icon to indicate that Bluetooth is connected. A 'K' will be displayed in front of the battery icon when the Kestrel is streaming data to the *RAPTAR-S*.

2.13.4.2 ***RAPTAR-S* Ballistics**

In the *RAPTAR-S* Ballistics mode, the *RAPTAR-S* performs ballistic calculations the same as when not connected with the Kestrel, except that environmental data, including wind speed and wind direction, are measured by the Kestrel 5700 and streamed to the *RAPTAR-S* for use in the ballistic solution.

2.13.4.3 **Kestrel 5700 Ballistics**

In the Kestrel Ballistics mode, the *RAPTAR-S* performs a range measurement and streams range and target inclination angle to the Kestrel 5700. The Kestrel 5700 performs the ballistics calculation using its gun selection and environmental data. The Kestrel 5700 then streams the ballistic solution and other data to the *RAPTAR-S* for display. This mode is entered by selecting 'Kestrel 5700' using the Gun Selection menu.

In this mode, range values less then 25 yards (22 meters) or greater than 4000 yards (3658 meters) are not supported. The Kestrel will display the message "Unusable Target Data Received" and the ballistic solution displayed on the *RAPTAR-S* will be "- - -". Additionally, hold values in this mode are displayed in the units as configured on the Kestrel 5700.

To Initiate Kestrel 5700 Ballistics Mode:

Step 1). Ensure that Kestrel Bluetooth connectivity is turned on as described in its operator's manual, then go to Ballistics Menu in the *RAPTAR-S*.

Step 2). Use the Fire/Up and Adjust/Down Buttons until the "Gun Menu" option is highlighted, then press the Enter Button.

Step 3). Use the Fire/Up and Adjust/Down Buttons to scroll through the list of gun options until the "Kestrel 5700" option is highlighted, then press the Enter Button.

Step 4). Range the target from the *RAPTAR-S*, and the range data is communicated to the Kestrel. If Kestrel is not connected when a range is attempted on the *RAPTAR-S*, an error will display. Refer to the Kestrel Operator's Manual for information on connecting.

2.13.4.4 Kestrel 5700 Gun Management

This mode supports copying of gun profiles between the *RAPTAR-S* and Kestrel 5700. This exchange is controlled by the *RAPTAR-S*. All gun profiles from one device are copied to the other device, overwriting the gun profiles previously available on it. Therefore, care must be taken to not inadvertently overwrite gun profiles that should be kept.

To Send/Receive Gun Profiles Between the *RAPTAR-S* and Kestrel:

NOTE

Bluetooth communication is not the most reliable means of data transmission. If an error message display while downloading tables, power cycle the RAPTAR-S and re-download using the previously selected transmission option.

Step 1.) Power off both the *RAPTAR-S* and Kestrel.

Step 2.) Power on the *RAPTAR-S* to the Ballistic Menu switch position and wait for the menu to be displayed. Wait for the display of the current gun selection to go away.

Step 3.) Power on the Kestrel and enter the config menu display by pressing the gear button.

Step 4.) Wait for the *RAPTAR-S* to display the BT connection message and the 'K' appears in front of the battery icon.

Step 5.) Enter the Manage Guns menu and select a transmit option to start the download:

OPTION	FROM	TO
Send All Guns	*RAPTAR-S*	Kestrel
Receive All Guns	Kestrel	*RAPTAR-S*

Step 6.) Verify all guns successfully download with the 'Complete' message being displayed.

Step 7.) If transferring from the Kestrel 5700 to the *RAPTAR*-S, enter the Gun Selection menu and verify downloaded gun data.

If a failed transmission occurs, an error message will display. If this occurs, simply repeat this operation until the operation completes.

2.14 SECONDARY MODE OPERATIONS

The *RAPTAR-S* is capable of operating in a diminished capacity in the event of a non-critical subsystem failure (*e.g.*, a broken sensor). In this state, the operator can manually enter parameter values that are not automatically detected.

The operator can perform a manual system test by using the "**Self Test**" option on the Function Menu (see Section 2.7.8).

SECTION 3

MAINTENANCE

3.1 CARE OF THE *RAPTAR-S*

Dismount the *RAPTAR-S* and inspect the unit for dirt, rust, and corrosion. Replace if the lens is broken or cloudy.

Prior to exposing to underwater environment, ensure that the Battery Compartment Cover and o-ring are tightly sealed and that the area is free of sand and dirt particles. Replace the O-ring if a Battery Compartment Cover o–ring becomes cut, nicked or torn.

Ensure that the environmental port is free of sand and dirt particles. Ensure that the display window is free of damage and is properly sealed.

Dirt and other residue, like exposure to salt water, may impede the mechanical operation of the *RAPTAR-S*. Flush exterior with water to remove any debris. Gently blow any residual dirt or dust free from the lenses, then wipe with the clean Lens Cloth, provided. Do not use high pressure air to blow away dirt, dust or debris while cleaning. Do not use the brush provided for cleaning lenses. Using the brush, remove dirt and debris from the mounting interface and controls. This should be done on a regular basis.

NOTE

Do not use harsh abrasives or chemicals such as acetone to clean the RAPTAR-S. Any questions about appropriate chemicals should be directed to Wilcox Customer Service. Periodically inspect the Battery Compartment Cover o-ring. Replace the o-ring if it becomes cut, nicked or torn.

3.2 INSPECTING AND REPLACING O-RINGS

The Battery Compartment Cover of the *RAPTAR-S* contains one (1) double seal Buna O-Ring (Wilcox PN F2655) that prevents dirt and water intrusion to the Battery Compartment.

Age, environment and temperature can wear Buna rubber, so O-Rings should be inspected periodically to maintain proper operation of the system. O-Rings are highly pliable and stretchable, and can be overstretched in the process of inspection. For this reason, it is strongly advised that they be replaced using a non-metallic pick tool whenever they are removed, to ensure safe operation.

O-Ring replacements are available through Wilcox and should be purchased in advance of need to ensure continued service, bearing in mind that they also have a shelf life.

To Inspect O-Rings:

Step 1.) Gently brush any debris away from the o-ring with the cleaning brush provided.

Step 2.) Inspect the O-Ring for cracks, pinches, hardness, dryness, or tackiness of feel. If an O-Ring exhibits any of these characteristics, replace it using a non-metallic pick tool.

If the *RAPTAR-S* O-Ring does not need replacement, but requires lubrication, lubricate the exterior surface of the O-Ring without removing it with a small amount of Silicone Grease.

Step 3.) Gently lubricate the *RAPTAR-S* O-Ring on both sides, with the thumb and index finger, using Silicone Grease.

Step 4.) Using a non-metallic pick tool, gently replace the lubricated O-Ring, using caution not to overstretch.

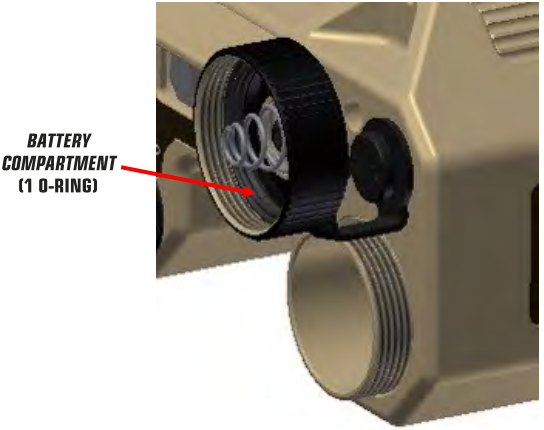


Figure 3.2-1 Inspecting and Replacing O-Rings

3.3 STORAGE

Ensure that cleaning and inspection instructions in Sections 3.1 and 3.2 have been followed. Remove the batteries from the device and retain. Reattach the lens and laser covers to the *RAPTAR-S* to prevent dust and dirt entry. Stow in the pouch provided.

CAUTION

Do not store the RAPTAR-S with batteries installed.

3.4 SHIPPING

Follow all instructions for storage. Package all components securely in a suitable shipping container, maintaining adequate separation between components.

3.5 TROUBLESHOOTING

In the event of a system error, refer to Tables 3.5-1 and 3.5-2 for possible causes and solutions. **If an error should persist after attempting to perform the solutions listed below, contact Wilcox Customer Service for assistance between 8am and 5pm EST at 603-431-1331.**

Table 3.5-1 System Errors

ERROR	CAUSE	SOLUTION
N/T	No target has been detected by the Laser Range Finder.	Ensure that the lens/Laser Covers have been removed and that the lens has not become dirty. Ensure that the Laser Range Finder is aimed at a target and that it is within range specifications. If using weapon sights, verify co-alignment of the *RAPTAR-S* to the optic. Try a closer, more reflective target.
RNG T/O	Laser Range Finder timed out.	Re-range the *RAPTAR-S*. Check batteries.

Table 3.5-2 System Troubleshooting

PROBLEM	CAUSE	SOLUTION
" ▭ " Appears on the Display	Low battery condition.	Replace batteries.
Display too Dim	Dim Brightness Setting for Bright Environment.	Adjust Display Brightness to Auto or brighter setting.

APPENDIX A

WARRANTY

A.1 *RAPTAR-S* WARRANTY STATEMENT

Based on the Magnuson-Moss Warranty Act, Wilcox Industries Corp. offers no express warranty on its product line. However, Wilcox Industries Corp. recognizes its obligation concerning implied warranty.

Warranty for Wilcox products is honored for items purchased directly from a Wilcox or an authorized dealer only. Items purchased via eCommerce such as Ebay, Craigslist and other online marketplaces are not eligible for the Wilcox warranty.

The Wilcox Industries Corp. *RAPTAR-S* will be serviced or replaced for a period of 12 months at no cost to the purchaser for defects in materials or workmanship. Shipment will be made via UPS ground prepaid to any continental United States destination.

Wilcox Industries Corp. must be contacted to assign a **Return Merchandise Authorization (RMA) / Service Call Number** prior to return shipment.

To expedite return, repair, and/or replacement of the *RAPTAR–S* purchased under a military contract Wilcox Industries Corp. will accept any package at the address below, clearly marked:

Wilcox Industries Corp.
RMA # _____
One Wilcox Way
Newington, NH 03801
Phone: 603-431-1331

Be sure to retain your packing list as proof of delivery date when making a warranty claim. If proof of delivery acceptance is not available, the warranty period shall start from the date of manufacture that is laser engraved on the *RAPTAR-S*. Warranty is void if date of manufacture is defaced.

The *RAPTAR-S* should be securely packaged, accompanied by a letter including sender's name, address, daytime phone number, date of purchase, date of manufacture, lot number and a description of the problem or work to be performed.

NOTES:

Manufactured by:

Wilcox Industries, Corp.
One Wilcox Way
Newington, NH 03801-7816

Phone: 888-8WILCOX
603-431-1331
Fax: 603-431-1221

WWW.WILCOXIND.COM

For troubleshooting service questions, contact Wilcox between 8am and 5pm EST.