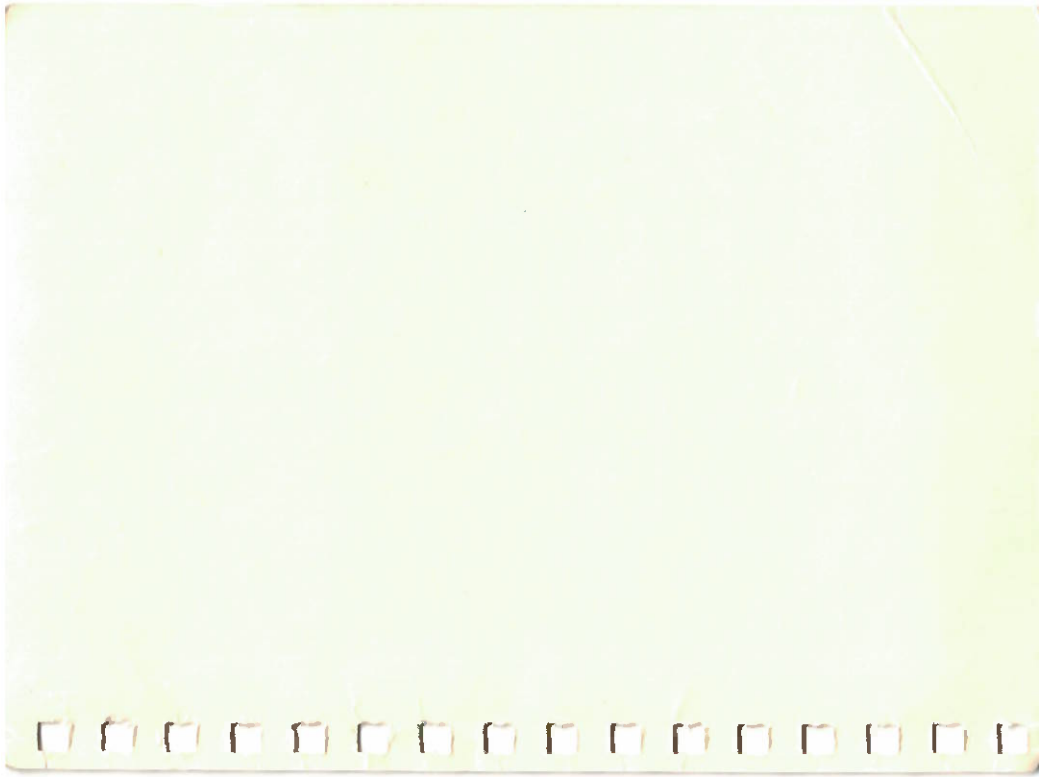
Raytheon

PhantomIR XR

17µm Extended Range Thermal Biocular

Operator Manual



Safety Summary

1. General Safety Instructions

This manual contains operating instructions which may cause injury to personnel or damage to equipment if not properly followed. Prior to performing any task, the WARNINGs, CAUTIONs and NOTEs included in that task shall be reviewed and understood.

2. Warnings, Cautions and Notes

Safety headings used in this manual and their respective definitions are as follows:

WARNING

HIGHLIGHTS AN ESSENTIAL OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION OR STATEMENT, WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN INJURY TO, OR DEATH OF, PERSONNEL OR LONG TERM HEALTH HAZARDS.

CAUTION

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

3. Safety Precautions
The following general safety precautions supplement the specific WARNINGs, CAUTIONs and NOTEs that appear elsewhere in this manual.

3.1 Laser Radiation. The PhantomIR XR thermal bi-ocular emits invisible laser radiation. Nominal Ocular Hazard Distances for safe operation (NOHD) are listed in Table i-1. Exposure to the PhantomIR XR laser beam inside these NOHDs can cause irreversible damage to the human eye.

DEFINITIONS:
Maximum Permissible Exposure (MPE). MPE is the maximum level of Laser radiation to which a person may be exposed without hazardous effects or biological changes in the eye or skin. The MPE is determined by the wavelength of the Laser, the energy involved, and the duration of the exposure.

Nominal Ocular Hazard Distance (NOHD). The NOHD relates to the space within which the level of direct, reflected, or scattered radiation during normal operation exceeds the appropriate MPE.

Nominal Skin Hazard Distance (NSHD). Distance along the axis of the direct Laser beam to the human skin beyond which the MPE of the Laser is not exceeded.

Optical Density (OD). The OD (absorbance) is used in the determination of the appropriate eye protection.

Specular Reflection. Specular Reflection is the mirror-like reflection of light from a surface.

Class 3B Laser. Laser systems that can produce a hazard if viewed directly. This includes intrabeam viewing or specular reflections.

Table i-1 Nominal Ocular Hazard Distances for Safe Operation (NOHD) [1]

	Infrared	
Power Level	Low Power	High Power
Hazard Class	1	3B
NOHD unaided	0	289 m
NOHD 5-cm aided	0	1.63 km
NOHD 8-cm aided	0	2.54 km
NOHD 12-cm aided	0	3.69 km
Diffuse NOHD	0 m	0 m
OD unaided	0	1.7
OD aided	0	1.7
NSHD	0 m	0 m
OD skin	0	0
Laser Eye Protection (LEP) Requirements		
850-870 nm wavelength	Not Required	OD 1.7

[1] Source: Dahlgren Division, Naval Surface Warfare Center Laser Hazard Analysis of March 2009

WARNING

- DO NOT STARE INTO THE LASER BEAM.
- DO NOT LOOK INTO THE LASER BEAM THROUGH BINOCULARS OR TELESCOPES.
- DO NOT POINT THE LASER BEAM AT MIRROR-LIKE SURFACES.
- DO NOT SHINE THE LASER BEAM INTO OTHER INDIVIDUAL'S EYES.

WARNING

PERSONNEL SHOULD BE AWARE OF AREAS THAT MAY CAUSE SPECULAR REFLECTIONS, ESPECIALLY IN ENVIRONMENTS WHERE MIRRORS OR ANY OTHER REFLECTIVE SURFACES ARE PRESENT.

WARNING

TO PREVENT POSSIBLE EYE INJURY, DO NOT RELOCATE THE SAFETY SCREW. ENSURING THAT THE SAFETY SCREW IS IN PLACE WILL KEEP THE LASER IN AN EYESAFE (TRAINING) MODE.

WARNING

THE PHANTOMIR XR IS EQUIPPED WITH A SAFETY SCREW TO PREVENT THE DEVICE FROM BEING ABLE TO OPERATE IN A LASER HIGH-POWERED MODE.

WARNING

ONLY AUTHORIZED PERSONNEL MAY RELOCATE THE SAFETY SCREW THAT ALLOWS THE PHANTOMIR XR TO OPERATE IN A LASER HIGH-POWERED MODE. THE SAFETY SCREW MUST BE RETAINED WITH THE PHANTOMIR XR AT ALL TIMES. THIS WILL BE ACCOMPLISHED BY PHYSICALLY INSERTING THE SAFETY SCREW INTO ONE OF THE TWO THREADED HOLES. THE MISSION AND COMPETENT AUTHORITY WILL DICTATE THE POSITION OF THE SAFETY SCREW FOR LOW POWER TRAINING MODE OR HIGH POWER OPERATING MODE. THE SAFETY SCREW MUST BE INSERTED INTO THE LOW POWER TRAINING MODE POSITION WHEN PHANTOMIR XR IS TURNED IN AT THE UNIT ARMORY, OR IS EVACUATED TO HIGHER ECHELON FOR MAINTENANCE.

WARNING

THE PHANTOMIR XR SHALL NOT BE USED FOR FORCE-ON-FORCE TRAINING.

WARNING

TROUBLESHOOTING SHOULD ONLY BE PERFORMED IN A DESIGNATED LASER SAFE AREA. BEFORE PERFORMING ANY TROUBLESHOOTING, MAKE SURE THE AREA IS SECURE. DO NOT LOOK INTO THE LASER LENS OR INTO THE EMITTED LASER BEAM TO VERIFY FUNCTIONALITY. FAILURE TO FOLLOW INSTRUCTIONS CAN RESULT IN PERMANENT BLINDNESS.

Refer to local standards on Occupational and Environmental Health: Control of Hazards to Health from Laser Radiation.

3.2 Risk of Detection by Enemy.

WARNING

TO REDUCE THE RISK OF DETECTION BY AN ENEMY USING NIGHT VISION DEVICES, AVOID PROLONGED ACTIVATION OF THE LASER.

WARNING

THE PHANTOMIR XR LASER IS MORE DETECTABLE TO AN ENEMY USING NIGHT VISION DEVICES WHEN USED IN SMOKE, FOG, AND RAIN. AVOID PROLONGED ACTIVATION OF THE LASER IN THESE CONDITIONS.

3.3 Batteries. The PhantomIR XR is powered by four AA batteries. The following safety precautions apply when handling AA batteries:

- **Do not short circuit, puncture or disassemble.**
- **Do not attempt to recharge non-rechargeable batteries.**
- **Prior to use, inspect all batteries for cracks, leakage, or bulging. Never install a defective battery.**

CAUTION

Do not use the PhantomIR XR with a mix of old and new batteries, or batteries of different grades, brands or types.

CAUTION

Lithium batteries can explode or cause burns if disassembled, shorted, recharged, exposed to water, fire, or high temperatures (above 100°C or 212°F). Do not place loose batteries in a pocket or other container containing metal objects. Do not store batteries with hazardous or combustible materials. Store in a cool, dry, ventilated area. Follow applicable federal, state, local laws and regulations for disposal and/or recycling of batteries.

CAUTION

Dispose of all depleted batteries in accordance with local regulations. Coordinate with local Installation/ Unit Environmental Office/Officer to ensure conformance with federal, state and local environmental regulations.

CAUTION

Prior to use, inspect all batteries for cracks, leaks, or bulging. Keep batteries in original packaging until ready to use. Once used, transfer batteries to the Hazardous Materials Manager for proper disposal.

CAUTION

Prior to use, inspect battery cover o-ring for nicks, cuts, excessive compression, or wear that would render it unserviceable. When the batteries are installed, and the battery cover is re-attached to the PhantomIR XR, the cover will appear slightly raised from the rear surface of the PhantomIR XR.

CAUTION

Batteries must be removed from the PhantomIR XR prior to storing.

CAUTION

Ensure battery cover is secured prior to cleaning the PhantomIR XR housing.

CAUTION

To prevent damage to plastic components, thoroughly remove insect repellant residue from the PhantomIR XR per paragraph 7.2 prior to non-operational storage.

CAUTION

Do not pull eyepieces apart; use the interpupillary adjustment knob.

CAUTION

- **Failure to utilize the Star Eyecups on the PhantomIR XR in bright, sunlight conditions may result in permanent damage to the eyepieces.**
- **Do not point the eyepieces directly into the sun, especially without the Star Eyecups installed. Pointing the eyepieces into the sun may result in permanent damage to the eyepieces. These conditions include whether the system is powered on or off.**

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How To Use This Manual

1. Overview

This manual provides information necessary for the safe operation of the PhantomIR XR thermal bi-ocular. The Table of Contents sets forth the organizational layout of the manual and allows for rapid identification of subject matter.

2. Abbreviations and Acronyms

For reference purposes, the abbreviations and acronyms used in this manual are listed as follows:

AGC	Automatic Gain Control
C	Celsius
F	Fahrenheit
IPDA	Interpupillary Distance Adjustment
IR	Infrared
jpg	Joint Photographic Experts Group
km	Kilometer
m / mm	Meter / Millimeter
MOLLE	MOdular Lightweight Load-carrying Equipment
mpeg	Moving Picture Experts Group
mW	Milliwatt
NATO	North Atlantic Treaty Organization
NiMH	Nickel-Metal Hydride
nm	Nanometer
NOHD	Nominal Ocular Hazard Distance
NSHD	Nominal Skin Hazard Distance
NSN	National Stock Number
NTSC	National Television System Committee
PALS	Pouch Attachment Ladder System
RMA	Return-to-Manufacturer Authorization
µm	Micrometer
USB	Universal Serial Bus
VDC	Volts Direct Current
VGA	Video Graphics Array

1.0 Introduction

1.1 Principle of Operation of PhantomIR XR

The PhantomIR XR thermal bi-ocular operates in the infrared spectral region and is designed for either daytime or nighttime use. Its detector senses infrared radiation emitted from objects and surfaces. It is entirely passive in operation, requiring no external illumination radiation or low level lighting. Unlike night vision devices that employ image intensifier tube technology, this system produces scene imagery under conditions of total darkness. When operated according to the instructions in Section 2.2 of this manual, the PhantomIR XR will not emit visible radiation and is well suited for use in situations requiring covert operation. The PhantomIR XR contains a magnetic compass and a 2-mode invisible laser pointer with an eyesafe low power mode and a non-eyesafe high power mode.

1.2 Specifications

Detector:	Uncooled infrared (IR), 640x480 staring array
Spectral Response:	8 μm to 12 μm
Objective Lens:	76 mm focal length, f/1.2
FOV:	8.2°(Horizontal) x 6.1°(Vertical)
Magnification:	3x
Eyepiece Correction:	±6 Diopter
Interpupillary Adjustment:	54 – 71 mm
Electronic Zoom:	2x, 3x
Electronic Compass:	Azimuth (±6 degree accuracy)
Inclinometer:	Elevation, Tilt

Display Type:	640 x 480 Color VGA
Focus Range:	5 meters to infinity
Initial Startup Time:	<15 seconds
Polarity Control:	White Hot/Black Hot
Gain/Level Adjustment:	Automatic and Manual
Video Output Signal:	Analog video (NTSC format)
Camera:	Still image (jpg format)/ Video clip (mpeg format)
Internal Power:	4 AA batteries (L91 recommended)
Operating Temperature:	-32°F to 140°F (-36°C to 60°C)
Weight:	3.6 pounds (1600 grams)
Size (inches):	12.7 (L) x 7.0 (W) x 3.5 (H)
Size (millimeters):	324 (L) x 178 (W) x 89 (H)
Laser Power, Class 1:	<= 0.7 mW Low Power Mode
Laser Power, Class 3B:	<= 33 mW High Power Mode
Laser Divergence:	0.5 +/- 0.3 milliradian at $1/e^2$ point
Laser Wavelength:	850 +/- 10 nm
Laser Pulse Length:	CW (Continuous Wave)

1.3 Power Requirements

CAUTION

Lithium batteries can explode or cause burns if disassembled, shorted, recharged, exposed to water, fire, or high temperatures (above 100°C or 212°F). Do not place loose batteries in a pocket or other container containing metal objects. Do not store batteries with hazardous or combustible materials. Store in a cool, dry, ventilated area. Follow applicable federal, state, local laws and regulations for disposal and/or recycling of batteries.

CAUTION

Replace all batteries at the same time. Do not mix different grades or different brands of batteries. Use of battery types other than lithium will significantly reduce operating time and may result in the system failing to turn on. Do not mix rechargeable and non-rechargeable batteries. Do not mix lithium, alkaline or rechargeable (NiMH) type batteries. Failure to observe this precaution may result in some batteries being driven beyond their normal exhaust point and will increase their possibility of leakage.

Internal Battery Operation

Four AA batteries required (lithium battery type L91 or equivalent recommended). L91 batteries will provide continuous operation for >7 hours at 75% full operating mode and 25% power save mode. Any type AA battery can be used, but reduced performance will result from the use of alkaline or rechargeables. To maximize battery life, use lithium L91 AA batteries, lower the brightness level of the eyepiece displays, utilize power saving mode, and in extreme cold conditions, warm the batteries. If the unit is cold enough to need the eyepiece display heaters ((H)), warm the unit to limit the time the heaters are needed.

External Power Operation

The PhantomIR XR can be operated from an external battery or power source through the use of the External Interface Cable. If the unit is running on internal batteries when external power is applied, operation will continue uninterrupted while switching to external power. The internal AA batteries will not be damaged, charged or drained while external power is applied.

- 10-32 volt DC operation: External Interface Cable
- BA5590 battery operation: External Interface Cable
- Vehicle power operation: NATO Slave Adapter Cable
- Vehicle power operation: DC Auto Power Cable

1.4 Parts List

Part numbers for the PhantomIR XR imager and accessories:

NOTE: Some dash numbers are determined by customer specified color.

Item	Part Number
Standard Items	
PhantomIR XR Imager	6621500-2
Objective Lens Cover	6620431-5
Focus Bumper	6620418-5
Focus Grip	6620399-5
Star Eyecup	1669203-5
Neckstrap	520NS
Soft Carrying Case	6620532-1
External Interface Cable	6620492-1
Lens Cleaning Kit	99-TI500
L91 AA Battery 4-Pack	L91-4PACK
Operators Manual	6621938-1
Quick Reference Card	6621937-1
5/64 Ball Allen Wrench	05051057
Optional Accessories	
Transit Case	6621088-1
MOLLE Fork	6620464-1
USB Cable	AK672/2-1-R
Spare Star Eyecup	1669203-5
Spare Laser Safety Screw	6620259-1
Picatinny Rail Mount	1669492-1
7/64 Ball Allen Wrench	05051073
DC Auto Power Cable	6620500-DC2
AC Power Cable (US)	6620500-AC2
AC Power Cable (International)	6620500-AC3
NATO Slave Adapter Cable	SN-00-1003-C
NATO Cable Soft Case	6620387-1
PALS Compatible Harness	SS 429
LensPen MiniPro II	MPII-BLACK

1.5 Adjustment of PhantomIR XR Optics

CAUTION

Do not pull eyepieces apart; use the interpupillary adjustment knob.

1.5.1 Eyepiece

Interpupillary Distance Adjustment (IPDA) –
The separation of the two eyepieces can be adjusted to the user's eye spacing by rotating the knob located on the right side of the housing (Figure 1.5-1).

Diopter Adjustment –
The eyepiece focus can be adjusted by rotating the adjustment ring on each eyepiece housing (Figure 1.5-1).

1.5.2 Objective Lens

Focus Adjustment Ring –
The PhantomIR XR thermal image is focused by rotating the focus ring on the front of the lens housing (Figure 1.5-1).

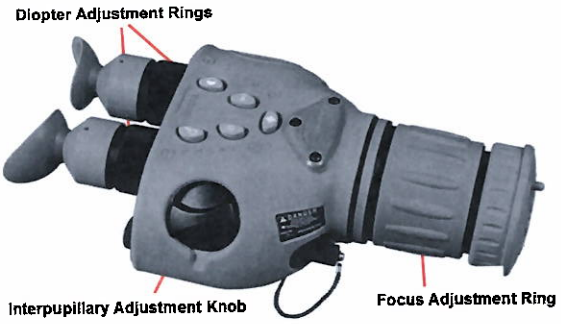


Figure 1.5-1 Optics Adjustments

1.6 PhantomIR XR Controls

Figure 1.6-1 shows the location of the PhantomIR XR keypad controls, power switch, camera (REC) button and laser fire button. The keypad configuration is shown in Figure 1.6-2. Control button symbols are described in Table 1.6-1.

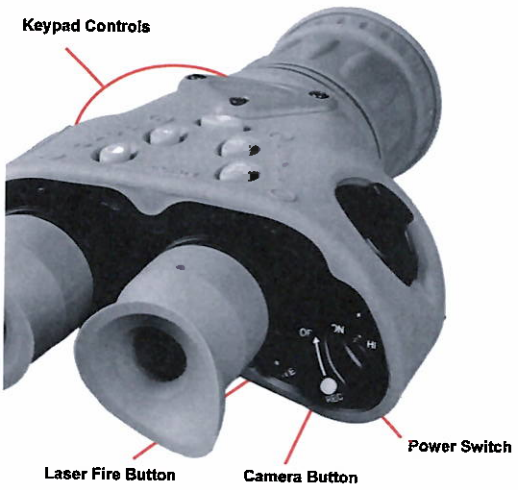


Figure 1.6-1 Location of PhantomIR XR Controls

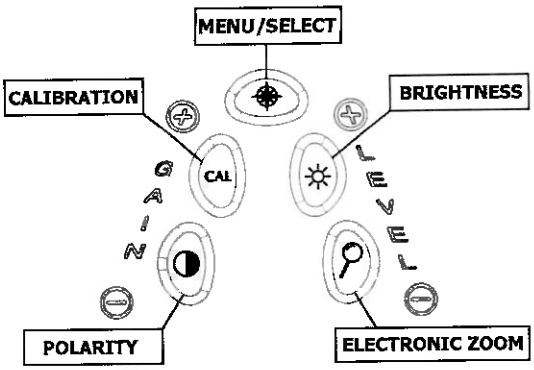


Figure 1.6-2 Keypad Configuration

Table 1.6-1 PhantomIR XR Keypad Symbols

Control	Symbol	Function
Menu Button		Activates the system menu and selects menu functions.
Calibration Button	CAL	Press to calibrate the IR detector.
Display Brightness Button		Cycles display brightness between maximum and minimum levels.
Polarity Button		White-hot/Black-hot scene selection
Electronic Zoom Button		Electronic zoom 1x, 2x, 3x selection

2.0 Operating Instructions

CAUTION

Lithium batteries can explode or cause burns if disassembled, shorted, recharged, exposed to water, fire, or high temperatures (above 100°C or 212°F). Do not place loose batteries in a pocket or other container containing metal objects. Do not store batteries with hazardous or combustible materials. Store in a cool, dry, ventilated area. Follow applicable federal, state, local laws and regulations for disposal and/or recycling of batteries.

CAUTION

Replace all batteries at the same time. Do not mix different grades or different brands of batteries. Use of battery types other than lithium will significantly reduce operating time and may result in the system failing to turn on. Do not mix rechargeable and non-rechargeable batteries. Do not mix lithium, alkaline or rechargeable (NiMH) type batteries. Failure to observe this precaution may result in some batteries being driven beyond their normal exhaust point and will increase their possibility of leakage.

CAUTION

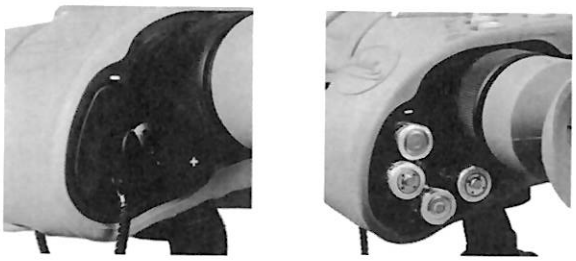
Prior to use, inspect battery cover o-ring for nicks, cuts, excessive compression, or wear that would render it unserviceable. When the batteries are installed, and the battery cover is re-attached to the PhantomIR XR, the cover will appear slightly raised from the rear surface of the PhantomIR XR.

2.1 Battery Installation

Remove battery compartment cover by turning retaining knob counterclockwise until screw thread is disengaged (Figure 2.1-1). Pull cover from PhantomIR XR housing. The cover is attached to the housing by a tether to prevent loss.

Insert four AA batteries into the battery compartment (lithium battery type L91 or equivalent recommended). Two batteries are to be inserted in an "up" orientation (+ end at the top of battery compartment) and two in a "down" orientation (+ end at the bottom of battery compartment) (Figure 2.1-1). Proper orientation of batteries is indicated by +/– polarity symbols located on the battery compartment cover and on the main housing. Figure 2.1-1 shows proper orientation of the batteries. The system is reverse polarity protected, but will not operate until the batteries are installed correctly.

Install battery compartment cover and secure by turning retaining knob clockwise.



Battery Cover Knob Battery Installation

Figure 2.1-1 Battery Installation

2.2 PhantomIR XR Operation

1. Remove lens cover and secure cover to tripod mount if tripod or MOLLE fork not in use.

2. Turn PhantomIR XR on.

   Operation With Batteries
   Rotate power switch clockwise to the ON position.

   Operation Using External Power
   Connect PhantomIR XR to external power source using external interface cable. Rotate power switch clockwise to the ON position. The unit can be operated on external power with or without batteries installed.

3. Position eyecups against eyes and compress.
   The eyecup opens for viewing only when compressed. This provides light security for covert nighttime operation.

   CAUTION

   Do not pull eyepieces apart; use the interpupillary adjustment knob.

4. Adjust interpupillary spacing.
   Rotate the interpupillary adjustment knob to increase or decrease the spacing of the eyepieces as required. Proper spacing of the eyepieces is necessary to prevent eyestrain and eliminate double images of the reticle.

5. Adjust eyepiece diopter setting.
   Rotate diopter adjustment rings clockwise/ counterclockwise until reticles are in focus.

6. Adjust focus.
   Scene focus is adjusted by rotating the focus ring on the objective lens housing. Clockwise rotation adjusts to far-field objects, counterclockwise rotation focuses on near-field objects.

7. Select display functions as desired.
   Keypad control buttons are located on the top of the PhantomIR XR (Figure 2.2-1).

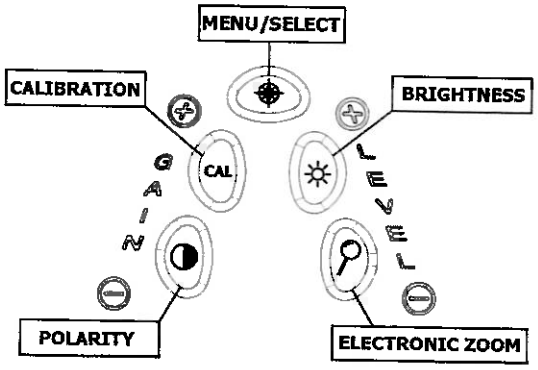


Figure 2.2-1 Keypad Control Buttons

Table 2.2-1 Button Functions in Normal Operating Mode

Pushing these buttons ...	Produces these results ...
 MENU button	Activates the system menu and selects menu functions
CAL CAL button	Manual calibration of the IR detector
 BRT button	Adjusts display brightness
 POL button	Switches polarity between White-hot and Black-hot
 ZOOM button	Switches electronic zoom between 1x, 2x, 3x

2.3 Detector Calibration

The PhantomIR XR detector array must be calibrated periodically to maintain optimum image quality.

Auto Calibration-
Detector calibration occurs automatically at the interval selected by the user in the settings menu. The calibration sequence takes approximately one second, during which time the imagery in the display is momentarily interrupted. The Auto Cal countdown "CAL in x sec" is displayed to inform the user that auto calibration is about to occur, and lets the user cancel this auto calibration event, if desired, by pressing the CAL button. This will reset the timer for the next auto calibration. The automatic calibration function can be disabled by selecting "IR Auto Cal: Off" in the settings menu.

Manual Calibration-
If desired, the operator can perform a manual detector calibration by pressing the CAL button (Figure 2.2-1) located with the keypad control buttons on the top of the PhantomIR XR. This will also reschedule the automatic calibration cycle to begin at the selected number of minutes after the operator- initiated calibration has been performed.

2.4 System Menus

The System Menus allows the user to:

1) Select the gain control mode: Full AGC, Manual or Frame Average
2) Arm the Laser: On or Off
3) Select the camera playback mode to view recorded images and videos, quick format of memory card, or secure format of memory card
4) Select the reticle mode: Mil-Dot, Mil-Dot with Stadiametric, Crosshair, or Reticle Off
6) Select the compass mode: Display units in Degrees, Display units in Mils, Calibrate, or Compass Off
7) Image stabilization: On or Off
8) Settings: provides user setup for Power Save, IR Auto Cal, USB eject, Time and Date, System run time, reset to factory default settings, or show software versions

System setup is performed using a menu that can be accessed by pressing the menu button. When activated, the system menu appears as shown in Figure 2.4-1. The cursor can be moved up and down by pressing the (CAL) and (POL) buttons, and left and right by pressing the (BRT) and (ZOOM) buttons. The unit is returned to normal operating mode by pressing the menu button again. This will select the current settings and exit the menu. If no button is pressed for 60 seconds while the menu is displayed, the current menu settings will be selected and the unit will return to normal operating mode.

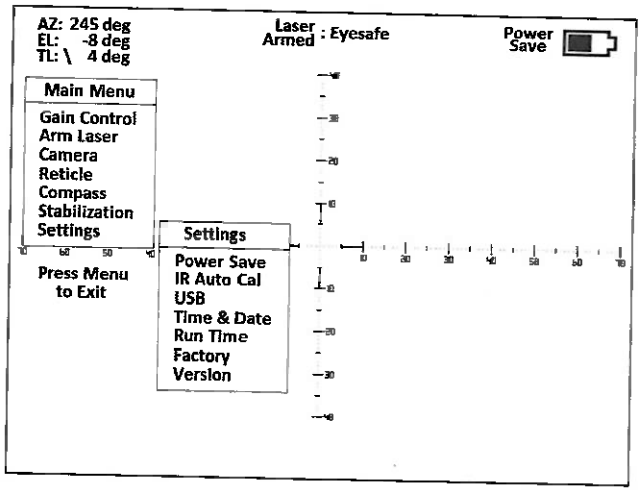


Figure 2.4-1 System Menus

2.5 Operation Modes and Button Functions

Four operation modes are available for selection by the user. These modes are Full AGC (Automatic Gain Control), Manual, Frame Average and Image Stabilization. Use the Main Menu to select the desired mode.

NOTE

Any time the unit is turned off or loses power, the unit will automatically reset to the Full AGC Mode when normal operation is resumed.

2.5.1 Full AGC Mode

In this mode, the system uses AGC software to optimize Gain and Level settings based on inputs from the entire scene and LAP (Local Area Processing) software to provide small area contrast enhancement for improving image detail of each object seen on the display. The PhantomIR XR will always power-up in Full AGC Mode.

2.5.2 Manual Mode

Manual Adjust: Selecting Manual Adjust Mode allows the user to change the Gain and Level to enhance a specific target. The notation "Manual Adjust" is displayed. Symbology showing changes in Gain and Level settings are also displayed. The keypad buttons used to adjust Gain and Level settings are shown in Table 2.5-1.

Table 2.5-1 Button Functions in Manual Adjust Mode

Pushing these buttons ...		Produces these results ...
	MENU button	Accepts the selected gain/level settings and returns the buttons to normal control functions
CAL	CAL button	Increase Gain setting (GAIN +)
	POL button	Reduce Gain setting (GAIN -)
	BRT button	Increase Level setting (LEVEL +)
	ZOOM button	Reduce Level setting (LEVEL -)

Manual Lock: Pressing the menu/select button will lock in the Gain and Level adjustments made in Manual Adjust and returns the button functions to their normal control functions. The notation "Manual" is displayed.

2.5.3 Frame Average

In this mode, the system will average two frames to reduce image noise. In some scene situations, such as viewing long range targets while holding the PhantomIR XR steady, this will provide the user a better image. This does reduce the frame rate, however, so it is not the optimum viewing mode for all scene situations. The notation "Frame Average" is displayed.

2.5.4 Image Stabilization

In this mode, the system will reduce image motion to provide the user a better image. This mode is best used to reduce the effects of hand-held jitter or vibration.

2.6 Display Symbology

All symbology can be removed from the display with the exception of the laser status and the battery status. The following information describes the display symbology:

Battery Life –
A battery symbol located in the upper right portion of the display shows the approximate battery life remaining. The internal battery status symbol [] changes colors from green to yellow to red as the battery charge decreases. The battery symbol will flash when the batteries are approaching a low power condition that will cause the unit to auto-shutdown.

See Appendix B for details regarding the battery symbol with different types of AA batteries.

The external battery symbol [] indicates a greater than 20VDC charge when filled. The icon empties from higher to lower as the battery voltage decreases. A 15VDC input will show approximately half full.

Compass Readings –
Azimuth (mils or degrees), elevation (degrees) and tilt (degrees) angles are displayed in the upper left portion of the display. The tilt symbol [\ ] has a tilt plane that shows the orientation of the PhantomIR XR with respect to the horizon. This tilt plane moves as the system orientation changes. When held at a zero tilt angle, the symbol disappears. Azimuth angle is unavailable when elevation or tilt exceeds 15 degrees.

Laser Status –
The PhantomIR XR will always power-up in **Laser UnArmed** mode. The screen symbology changes to **Laser Armed** when the laser is activated using the system menu. The laser is in training mode when the power switch is in the ON position and **Eyesafe** is displayed. When the power switch is rotated to the HI position, the laser is in high power mode and **NonEyesafe** is displayed as shown in Figure 2.6-1.

Camera Status –
A **Camera Memory** icon is displayed under the battery icon to show the space remaining on the memory card. A red camera icon is displayed under the memory icon during image and video capture to indicate image data is being saved to the memory card. Video recording elapsed time is displayed while video capture is in progress. The red camera icon is displayed momentarily when a still image is captured.

Electronic Zoom Setting –
A 2x or 3x notation will appear at the bottom of the display when the electronic zoom is activated.

Power Save Indicator –
The **Power Save** icon indicates that the Power Save feature (Section 2.7) has been turned on.

Reticle –
A choice of Mil-Dot, Stadiametric or Crosshair reticles are available. The reticle can be turned off if desired.

Operation Mode Information –
Operation mode information is located in the bottom portion of the display. Details are discussed in Section 2.5.

The PhantomIR XR display symbology is shown in Figure 2.6-1. Appendix A explains the symbology meanings.

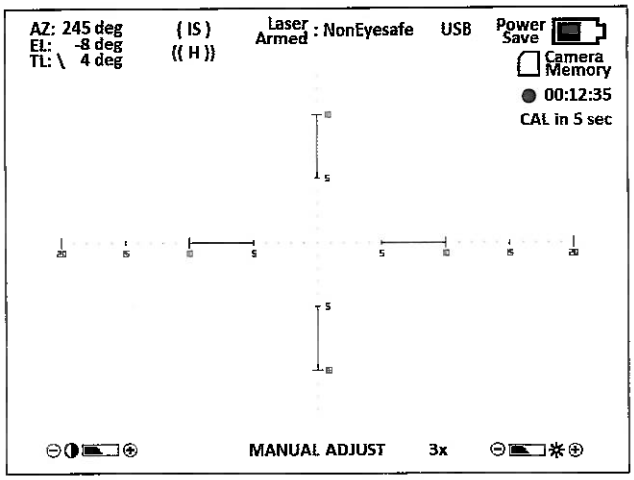


Figure 2.6-1 Display Symbology

2.7 Power Save Feature

The Power Save feature enables the PhantomIR XR to enter a low power mode when it is not being actively used. This shuts down the thermal imaging electronics, significantly increasing battery life. When the Power Save feature is enabled the PhantomIR XR will switch to low power operation in either of the following situations:

1) When the PhantomIR XR is pointed down at an angle greater than 45 degrees below horizontal (EL: -45 degrees) for a period of two minutes or more. Such a situation will occur if the PhantomIR XR is allowed to hang from the neck strap rather than being held to the eyes. The PhantomIR XR will exit the low power mode automatically when it is raised to an angle of -40 degrees or higher.
2) When the PhantomIR XR is not moved more than 3 degrees in any direction for 10 minutes. The system will exit the low power mode automatically when movement is detected.

A 10 second warning countdown appears in the display before the PhantomIR XR enters the low power mode, giving the operator time to move the unit to prevent loss of imagery. If the PhantomIR XR is to be used in a manner that will cause the low power mode to activate when this feature is not wanted, the Power Save mode can be disabled using the Settings menu.

2.8 Tripod / MOLLE Fork Mounting

The PhantomIR XR can be tripod mounted using the 1/4-20 UNC thread located on the bottom of the housing (Figure 2.8-1). A tripod made of non-ferrous metal is recommended to avoid affecting the compass accuracy. This thread can also be used to attach the PhantomIR XR accessory MOLLE Fork which is used to secure the unit to a PALS vest while it hangs from the neckstrap or PALS compatible harness.

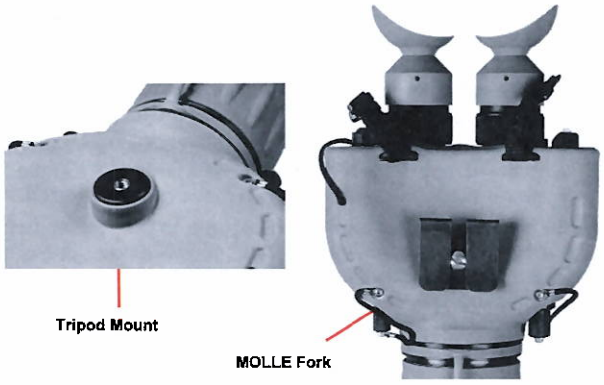


Figure 2.8-1 Tripod / MOLLE Fork Mounting

2.9 External Interface Connector

CAUTION

Check connector interface for debris prior to mating.

The external interface connector is located on the front left side of the PhantomIR XR (Figure 2.9-1). This provides an interface for the external interface cable which provides connections to video output, USB image download, external power sources and RS-232 data port.

External Interface Connector

Figure 2.9-1 External Interface Connector

To connect the external interface cable to the connector, remove the dust cap from the connector by rotating the cap counter-clockwise, orient the cable connector with key at the top of the mating connector and thread into place.

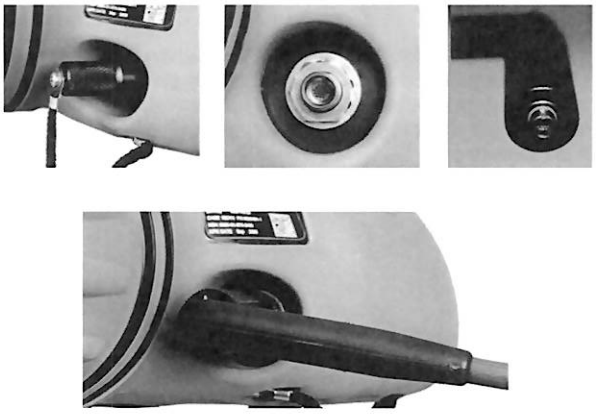


Figure 2.9-2 External Interface Connector

2.10 Accessory Cables

2.10.1 External Interface Cable

A 6-foot External Interface Cable is supplied with PhantomIR XR that adapts the PhantomIR XR 19 pin Data/Video port to standard commercially available interfaces; USB, BNC, RS-232, BA5590. Recorded still and video imagery can be accessed using the USB interface. With the BNC, PhantomIR XR provides analog video output (NTSC format) for remote viewing. RS-232 is used to remotely control the PhantomIR XR button functions.

Figure 2.10-1 External Interface Cable

2.10.2 Vehicle Power Cable

A 12-foot NATO Slave Adapter Cable or DC Auto Power Cable may be supplied with the PhantomIR XR. When connected to the External Interface Cable, the PhantomIR XR can be powered by external vehicle power.

Figure 2.10-2 Vehicle Power Cable

2.11 Remote Control Functions

Many system functions can be controlled remotely using a computer keyboard. Connect the PhantomIR XR unit to a Windows compatible computer using the external interface cable and a DB9 serial cable connected to the RS-232 connector.
Open a HyperTerminal (or HyperTerminal alternative program) session on the computer and enter a name for this connection (Figure 2.11-1), select the COM port (Figure 2.11-2) and configure the COM port settings (Figure 2.11-3). Save the session when exiting HyperTerminal to avoid repeating this setup procedure.

Use keyboard number keys to navigate menu options, or press h to Display Help for a list of additional commands available, such as calibrate, brightness, polarity and zoom.

```
------ Menu ------
1) Gain Control
2) Arm Laser
3) Camera
4) Reticle
5) Compass
6) Stabilization
7) Settings

0  Previous Menu
h  Display Help
s  Save All Selections
```

```
------ Menu ------
1) Power Save
2) USB
3) IR Auto Cal
4) Time & Date
5) Run Time (hrs)
6) Factory
7) Version

0  Previous Menu
h  Display Help
s  Save All Selections
```

2.11.1 Remote Control Save Function

PhantomIRxr camera system has an additional save command in the serial remote console. The save command is listed on the console screen as "s Save All Selections". Pressing 's' on the computer keyboard allows the user to save any user settings that were changed in the serial remote console.

Figure 2.11-1 HyperTerminal Connection

Figure 2.11-2 Select COM Port

Figure 2.11-3 COM Port Properties

3.0 Laser Pointer

WARNING

- **DO NOT STARE INTO THE LASER BEAM.**
- **DO NOT LOOK INTO THE LASER BEAM THROUGH BINOCULARS OR TELESCOPES.**
- **DO NOT POINT THE LASER BEAM AT MIRROR-LIKE SURFACES.**
- **DO NOT SHINE THE LASER BEAM INTO OTHER INDIVIDUAL'S EYES.**

WARNING

PERSONNEL SHOULD BE AWARE OF AREAS THAT MAY CAUSE SPECULAR REFLECTIONS, ESPECIALLY IN ENVIRONMENTS WHERE MIRRORS OR ANY OTHER REFLECTIVE SURFACES ARE PRESENT.

WARNING

TO PREVENT POSSIBLE EYE INJURY, DO NOT RELOCATE THE SAFETY SCREW. ENSURING THAT THE SAFETY SCREW IS IN PLACE WILL KEEP THE LASER IN AN EYESAFE (TRAINING) MODE.

WARNING

THE PHANTOMIR XR IS EQUIPPED WITH A SAFETY SCREW TO PREVENT THE DEVICE FROM BEING ABLE TO OPERATE IN A LASER HIGH-POWERED MODE.

WARNING

ONLY AUTHORIZED PERSONNEL MAY RELOCATE THE SAFETY SCREW THAT ALLOWS THE PHANTOMIR XR TO OPERATE IN A LASER HIGH-POWERED MODE. THE SAFETY SCREW MUST BE RETAINED WITH THE PHANTOMIR XR AT ALL TIMES. THIS WILL BE ACCOMPLISHED BY PHYSICALLY INSERTING THE SAFETY SCREW INTO ONE OF THE TWO THREADED HOLES. THE MISSION AND COMPETENT AUTHORITY WILL DICTATE THE POSITION OF THE SAFETY SCREW FOR LOW POWER TRAINING MODE OR HIGH POWER OPERATING MODE. THE SAFETY SCREW MUST BE INSERTED INTO THE LOW POWER TRAINING MODE POSITION WHEN PHANTOMIR XR IS TURNED IN AT THE UNIT ARMORY, OR IS EVACUATED TO HIGHER ECHELON FOR MAINTENANCE.

WARNING

THE PHANTOMIR XR SHALL NOT BE USED FOR FORCE-ON-FORCE TRAINING.

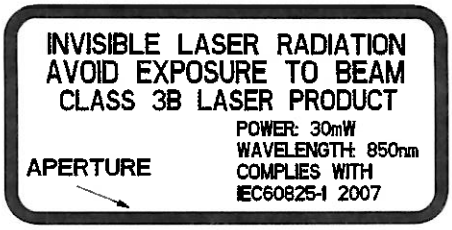


Figure 3.0-1 Laser Warning Label

3.1 Laser Safety Interlocks

The PhantomIR XR uses a 2-mode laser capable of operating in either an eyesafe Class 1 training mode or a non-eyesafe Class 3B high power mode.

Mechanical interlocks – Two mechanical safety features prevent unintentional exposure to the high-energy laser beam:

1) A blue laser safety screw (Figure 3.1-1) prevents the power switch from being rotated to the HI position (high power mode). To operate in the high power mode, the blue laser safety screw must be relocated and the power switch turned to the HI position. During high power laser operation the blue laser safety screw must be stored in the threaded hole above the power switch.

2) A safety cover on the laser pointer (Figure 3.1-2) prevents laser energy from leaving the unit. When preparing the unit for laser firing in either the eyesafe or high power mode, the laser safety cover must be unscrewed from the laser output aperture.

Software interlock – The laser will not fire until it is armed using the System menu. Any time the unit is turned off, loses power or enters Power Save mode, the laser will automatically be unarmed when normal operation is resumed.

Electrical interlock – After arming, the laser will only fire while the laser fire button is pressed and held. When the laser fire button is released, the laser stops firing but is still armed.

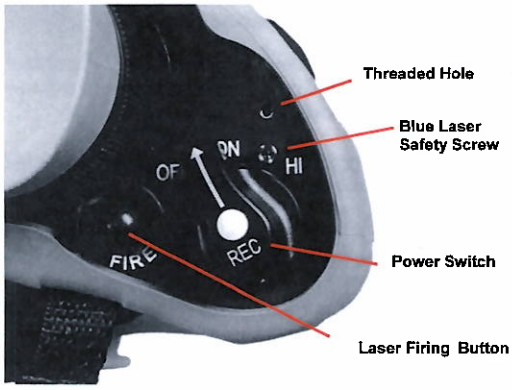


Figure 3.1-1 Laser Controls

Figure 3.1-2 Laser Pointer Safety Cover

The on-screen overlays, shown in Figure 3.1-3 and Figure 3.1-4, show the operator the laser source status (Armed or UnArmed, Eyesafe or NonEyesafe) at the top of the display.

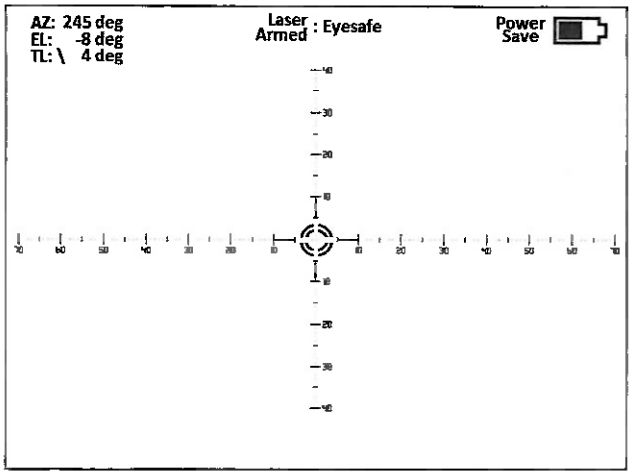


Figure 3.1-3 On-Screen Overlays in Eyesafe Training Mode

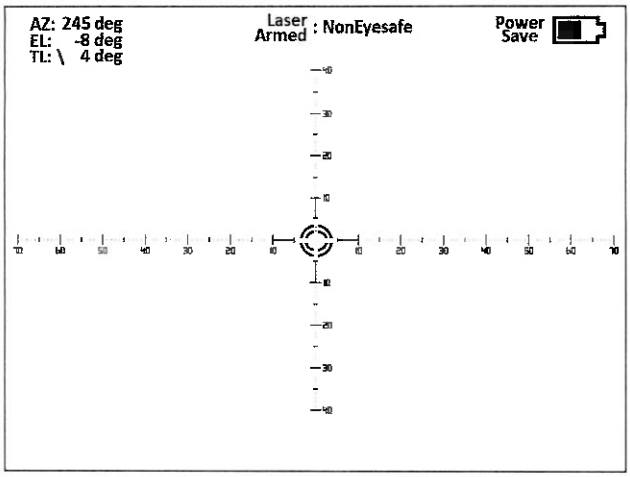


Figure 3.1-4 On-Screen Overlays in NonEyesafe High Power Mode

3.2 Arming the Laser

The PhantomIR XR laser is armed by using the System menu. This is done by moving the menu cursor to the Arm Laser line and selecting ON (Section 2.4). The laser safety cover must be removed before firing by unscrewing it from the PhantomIR XR housing (Figure 3.1-2). The power switch is used to turn the unit on and off and to select the laser pointer's power mode. When this switch is in the ON position, the laser is in eyesafe mode. Rotating the switch from the ON to the HI position allows the laser to operate in the high power (non-eyesafe) mode.

3.3 Firing the Laser

Laser operation is only available when the laser is armed and the user is viewing live imagery. Laser operation is inhibited during system startup, while in the menu, and while the system is in camera playback or USB download. After arming, the laser is fired by pressing the laser fire button. When the laser fire button is released, the laser stops firing but is still armed. To reduce the risk of accidental firing of the laser, there is a half-second delay from button press to laser firing. During this delay, an animated icon appears at the center of the reticle. This icon collapses to a center circle (green icon for eyesafe, red icon for non-eyesafe) indicating that the laser is about to fire. When the icon reaches the center, the laser fires and the icon is fixed around the center of the reticle, indicating that the laser is firing.

3.3.1 Firing in low power eyesafe mode:

a. Ensure that the blue laser safety screw is installed in the position which prevents the power switch from being rotated to the high power position.
b. Ensure that the laser output aperture safety cover is installed on the laser pointer output aperture.
c. Prepare the PhantomIR XR for Operation in accordance with Section 2.0 Paragraphs 2.1, 2.2, 2.3, & 2.4.
d. While viewing into the PhantomIR XR, access the System menu by pressing and releasing the Menu Select button on the Keypad Control.
e. Use the (POL)(down) Keypad Control button to move the menu cursor down to the Arm Laser line. The (CAL)(up) Keypad Control button can be used to move the menu cursor up the menu if necessary.
f. Use the (ZOOM)(right) Keypad Control button then the (POL)(down) button to select Arm Laser: ON
g. Press the Menu Select button on the Keypad control to exit the System menu.
h. Remove the laser output aperture safety cover.
i. Aim the PhantomIR XR at intended target.
j. Pressing the Laser Fire Button will fire the laser. Press Laser Fire Button.
k. Releasing the Laser Fire Button will stop laser firing. Release Laser Fire Button.
l. The laser is still armed and can be fired repeatedly by performing steps j and k.

3.3.2 Firing in non-eyesafe mode:

a. Ensure that the blue laser safety screw is relocated to the position which permits the power switch to be rotated to the high power position. Rotate the power switch to the HI position.
b. Ensure that the laser output aperture safety cover is installed on the laser pointer output aperture.
c. Prepare the PhantomIR XR for Operation in accordance with Section 2.0 Paragraphs 2.1, 2.2, 2.3, & 2.4.
d. While viewing into the PhantomIR XR, access the System menu by pressing and releasing the Menu Select button on the Keypad Control.
e. Use the (POL)(down) Keypad Control button to move the menu cursor down to the Arm Laser line. The (CAL)(up) Keypad Control button can be used to move the menu cursor up the menu if necessary.
f. Use the (ZOOM)(right) Keypad Control button then the (POL)(down) button to select Arm Laser: ON
g. Press the Menu Select button on the Keypad control to exit the System menu.
h. Remove the laser output aperture safety cover.
i. Aim the PhantomIR XR at intended target.
j. Pressing the Laser Fire Button will fire the laser. Press Laser Fire Button.
k. Releasing the Laser Fire Button will stop laser firing. Release Laser Fire Button.
l. The laser is still armed and can be fired repeatedly by performing steps j and k.

3.4 Laser Alignment Verification

Alignment of the laser pointer to the PhantomIR XR reticle is important to prevent inadvertent lasing. To check the laser and reticle co-alignment conduct the following procedures:

CAUTION

The following procedure will be conducted at low light or darkness to prevent damage to the I^2 device and aid in viewing the laser spot.

1. Find an area where the Laser can be fired safely at targets a minimum of 100 meters away yet within the capabilities of the I^2 device which will be used to observe the laser spot.
2. Remove the objective lens cover.
3. Ensure that the safety screw is in place to inhibit high power lasing.
4. Turn the power switch to the ON position.
5. Set Eyepiece, Objective, and Interpupillary adjustments for optimum viewing of target area.
6. While viewing the target area through the PhantomIR XR, search for a target with a right angle feature such as a window or door frame.
7. Stop viewing and remove the laser safety cover.
8. Resume viewing of previously selected target and aim the PhantomIR XR reticle center at the right angle feature.
9. Arm and fire laser using system menu and laser firing button.
10. An assistant using an I^2 device will observe that the laser spot is impacting on the selected right angle feature.
11. If the laser is pointing at the position where the PhantomIR XR reticle is pointed then the laser is aligned.
12. If the laser and reticle are not co-aligned, evacuate the system to Field Level Maintenance.

4.0 Camera Operation

The PhantomIR XR can provide still image capture and motion video capture during system operation. Captured files are stored on an internal memory card and may be viewed both in the eyepiece displays and through the video output port. Files are also accessible using the USB connection on the external interface adapter cable. The internal memory card can hold approximately 80,000 still image files or 10 hours of video.

4.1 Image and Video Capture

1. Ensure the unit is in normal operating mode.

2. For Image Capture - Press and release the REC button on the power switch.

3. For Video Capture - Press and hold the REC button to begin video capture, then release button to continue recording. Video capture continues without user interaction until one of the following events occurs – user presses REC button to stop recording, memory card is full, or batteries are depleted. Any of these three events will result in video capture being stopped and the video file properly saved to memory.

Note: The red camera icon is displayed momentarily when a still image is captured. The red camera icon and video recording elapsed time is displayed during video capture. A camera memory icon is displayed to show the space remaining on the memory card.

Note: The maximum video file size is 2GB, so a new video file will automatically begin when the 2GB limit is reached.

4.2 Image and Video Playback

1. Select "Camera: Playback" mode using the system menu. This will display all image and video files in the order in which they were recorded, while also showing live imagery to maintain situational awareness. Use the (CAL)(up) and (POL)(down) keypad buttons to move up and down through the captured files. The playback button functions are shown in Table 4.2-1.

2. To Display Image Files – Select full screen view by pressing the (ZOOM)(right) button on the keypad, then go back to thumbnail view by pressing the (BRT)(left) button.

NOTE
MPEG is displayed on video files.

3. To Play Video Files – Press the REC button to play a selected video file. When in the video playback mode the video can be paused by pushing the REC button again. While playing a video clip press the up keypad button (CAL) to rewind or the down keypad button (POL) to fast-forward.

4. To Delete Image Capture Files – Use the Playback Menu to delete the currently selected file or delete all files.

5. Secure Format – Select "Camera: Secure Format" to write a blank image file over the entire memory space, ensuring no previous images or videos can be recovered. The unit can be used in normal thermal imaging mode during the secure format process, but the camera functions are disabled. If the unit is turned off, if the batteries die, or if the batteries (or external power) are removed, the secure format process cannot be completed.

Table 4.2-1 Button Functions in Playback Mode

Pushing these buttons ...	Produces these results ...
 MENU button	Activates the playback menu to return to normal operating mode
 CAL button	Move up, or, rewind while playing a video
 BRT button	Move left to return to normal operating mode or thumbnail view
 POL button	Move down, or, fast-forward while playing a video
 ZOOM button	Move right to full screen view

4.3 USB Download

Connect the unit to a Windows compatible computer using the external interface cable and a USB cable to download files to the computer. Select "USB Download" when prompted to select USB Download or USB Streaming.

4.4 USB Streaming Video

Connect the unit to a Windows compatible computer using the external interface cable and a USB cable to stream live video to the computer. Select "USB Streaming" when prompted to select USB Download or USB Streaming. A standard webcam viewer for Windows will display the streaming video. Depending on the Windows operating system, a codec for that operating system may be needed.

4.5 Safeguarding Classified/Sensitive Information

The PhantomIR XR is capable of capturing and storing still and video imagery that may contain classified /sensitive information. Follow local standard operating procedures and Operator Manual instructions for clearing sensitive data when required.

In the event that the PhantomIR XR contains classified/sensitive information and it will not power on, follow local standard operating procedures prior to forwarding the PhantomIR XR to next higher echelon for repair.

5.0 Compass Calibration

The compass in the PhantomIR XR is accurate to within +/- 6 degrees when the unit is held level with respect to the horizon. Magnetic interference due to surrounding objects, including body armor, weapons and vehicles, or organic content in the earth can affect this accuracy. For best results, the compass should be calibrated to the geographic area it will be used in. Because buildings and metal objects can cause errors in the readings, calibration should be done outside, away from vehicles and other objects. When calibrated with 0 declination offset, the compass will display headings with respect to magnetic north.

The PhantomIR XR compass must be recalibrated under the following conditions:

- After an electrical storm.
- Anytime the PhantomIR XR has received a severe shock; for example, if it is dropped from the bed of a truck to the ground.
- Anytime the PhantomIR XR is moved outside a 25km radius from the area in which it was last declinated. Because of local magnetic attractions, any move of the aiming circle may result in an appreciable change in the relationship of grid north and magnetic north as measured by the PhantomIR XR.
- A minimum of once every 30 days to determine if any changes in the declination have occurred because of the annual shift of magnetic north or because of accidents involving the instrument that may not have been reported. If a radical change is observed, the instrument should be declinated again within a few days to determine if the observed change is a real change in the characteristics of the instrument.
- When the instrument is first received.
- Anytime the instrument is returned from ordnance repair.

Calibration should be performed away from these objects:

High-tension power lines	55 meters
Field gun, truck, or tank	18 meters
Telegraph or telephone wires	10 meters
Barbed wire	10 meters
Machine gun	2 meters
Steel helmet or rifle	1/2 meter

Calibration Process:

1) Use the System menu to select Compass: Calibrate. The message "Calibrating Compass" will appear on the display, and prompts will assist in the calibration procedure.

2) Hold the PhantomIR XR level to the horizon to within ±10 degrees and rotate the unit clockwise or counter-clockwise 360 degrees. This is best done by turning in a full circle while holding the PhantomIR XR. An elevation angle greater than 10 degrees will result in calibration failure. Slow rotation (> 10 seconds) produces a more accurate calibration. Failure to rotate the PhantomIR XR at least 360 degrees can cause a calibration failure.

3) After completing the circle, press the MENU button then point the PhantomIR XR down so that the front lens is pointing at the ground a full 90 degrees. Failure to do this can cause a calibration failure. Calibration is now complete. Declination can be performed if desired.

4) Press the MENU button to end calibration and return to the normal operation mode. The compass heading will be displayed beside the "AZ:" symbol where North = 0°, East = 90°, South = 180°, West = 270°.

Application of the Declination Diagram

Declination is the angular difference between any two norths. If you have a map and a compass, the one of most interest will be between magnetic and grid north. The declination diagram shows the angular relationship, represented by prongs, among grid, magnetic, and true norths. While the relative positions of the prongs are correct, they are seldom plotted to scale. Do not use the diagram to measure a numerical value. This value will be written in the map margin (in both degrees and mils) beside the diagram.

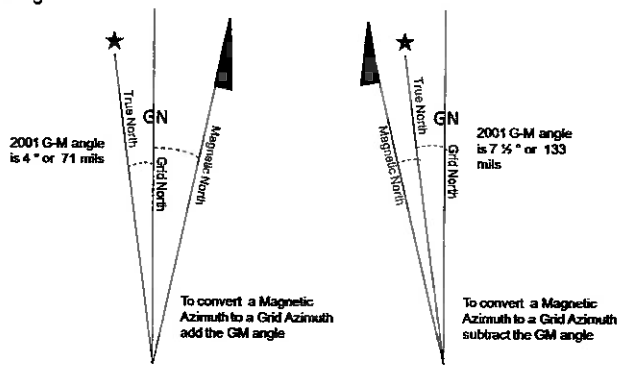


Figure 5.0-1 Example Declination Diagrams

Location. A declination diagram is a part of the information in the lower margin on most larger maps. On medium-scale maps, the declination information is shown by a note in the map margin.

Grid-Magnetic Angle. The G-M angle value is the angular size that exists between grid north and magnetic north. It is an arc, indicated by a dashed line that connects the grid-north and

magnetic-north prongs. This value is expressed to the nearest 1/2 degree, with mil equivalents shown to the nearest 10 mils. The G-M angle is important to the map reader/land navigator because azimuths translated between map and ground will be in error by the size of the declination angle if not adjusted for it.

NOTE

When converting azimuths, exercise extreme care when adding and subtracting the G-M angle. A simple mistake of 1 degree could be significant in the field.

Once the G-M angle is determined, the operator should enter the value (in degrees) using the following process:

Declination Adjustment Process:

1) Perform steps 1 through 3 of the calibration process.
2) A prompt will appear on the display to identify which buttons to push to make declination angle adjustments. The current declination setting will be shown below the prompts.
3) Determine the correct declination angle for the location in which the PhantomIR XR is to be used.
4) Adjust the declination angle by pressing the BRT button to increase the declination and the ZOOM button to decrease it. Adjustments are made in 1-degree increments to a maximum angle of +/- 20 degrees.
5) After the desired declination setting has been made, press the MENU button to save the setting and return to the normal operation mode.

6.0 Care of PhantomIR XR

CAUTION

Remove batteries from the PhantomIR XR prior to storing.

6.1 General Care

Install protective covers over the front lens, the external interface connector, and the laser when the PhantomIR XR is not in use.

CAUTION

To prevent damage to plastic components, thoroughly remove insect repellant residue from the PhantomIR XR per paragraph 6.2 prior to non-operational storage.

CAUTION

Ensure battery cover is secured prior to cleaning the PhantomIR XR housing.

6.2 Cleaning the Housing

The rubber covering, interpupillary adjustment knob and all other metal and plastic exterior surfaces of the PhantomIR XR can be cleaned using water or a water-soap solution.

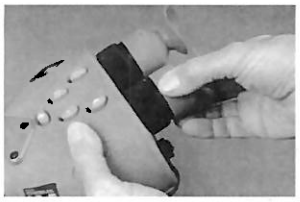
6.3 Lens Care

To clean any PhantomIR XR lens, remove particles and dust by first blowing on the lens. Remove mud by splashing water onto the lens. Complete the cleaning of the lens by using a soft tissue or cloth and water. To use the LensPen, first extend the retractable brush to remove particles and dust, then remove the cap and use the cleaning tip to remove smudges with a smooth circular motion. Install the cap back onto the LensPen and rotate the cap half turn to replenish the non-liquid cleaning compound.

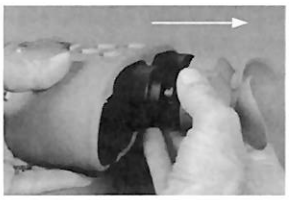
7.0 Operator Maintenance

7.1 Eyecup Replacement

Eyecup Removal



1. Grip the base of the eyecup



2. Pull and rotate the eyecup away from the eyepiece

Eyecup Installation

3. Place the eyecup at a slight angle to the eyepiece. Push it toward the eyepiece and rotate to seat it on the eyecup retainer ring

Figure 7.1-1 Eyecup Replacement

7.2 Focus Bumper Replacement

Bumper Removal

1. Grip the inside of the rubber bumper with your thumb and the outside with your fingers. Pull the bumper away from the housing

2. Continue working around the perimeter of the housing until the bumper is removed

Bumper Installation

Place the bumper over the front of the lens housing Pull the inside lip over the rim of the housing and work around the perimeter until it is engaged

Figure 7.2-1 Focus Bumper Replacement

7.3 Focus Rubber Grip Replacement

Focus Grip Removal

1. First remove the rubber bumper

2. Pull up the Focus Grip at the rear of the grip

3. Continue pulling the grip up until it disengages from the Lens Assembly

Focus Grip Installation

1. Place the focus grip at a slight angle to the Lens Housing and stretch the Grip over the Lens Housing

2. Continue working the Grip down over the front of the Lens Housing until it engages the recess on the Focus Grip Housing

Figure 7.3-1 Focus Rubber Grip Replacement

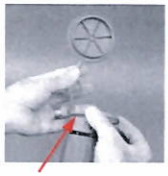
7.4 Lens Cap Replacement

Lens Cap Removal

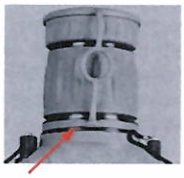
1. Grip Lens at base of Lens Assembly where the lanyard attaches to the ring. Pull the ring out of the groove

2. Work the ring up and over the focus Grip and the Rubber Bumper until it is free from the lens assembly.

Lens Cap Installation



Ring



Properly Seated Ring

1. Correctly orientate the Lens Cap as shown in the picture on the left. 2. Stretch the ring and place it over the front of the Lens Assembly. 3. Pull the ring down until it engages the groove at the base of the lens assembly.

Figure 7.4-1 Lens Cap Replacement

7.5 Battery Replacement

CAUTION

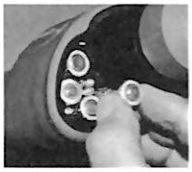
Lithium batteries can explode or cause burns if disassembled, shorted, recharged, exposed to water, fire, or high temperatures (above 100°C or 212°F). Do not place loose batteries in a pocket or other container containing metal objects. Do not store batteries with hazardous or combustible materials. Store in a cool, dry, ventilated area. Follow applicable federal, state, local laws and regulations for disposal and/or recycling of batteries.

CAUTION

Replace all batteries at the same time. Do not mix different grades or different brands of batteries. Use of battery types other than lithium will significantly reduce operating time and may result in the system failing to turn on. Do not mix rechargeable and non-rechargeable batteries. Do not mix lithium, alkaline or rechargeable (NiMH) type batteries. Failure to observe this precaution may result in some batteries being driven beyond their normal exhaust point and will increase their possibility of leakage.

1. Rotate the battery cover knob counterclockwise to remove the battery cover

2. Insert the batteries starting at the upper right position. The negative end of the battery is up as shown

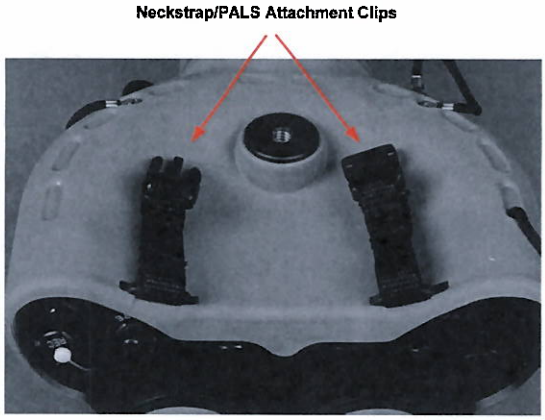


3. Continue inserting batteries counterclockwise. The insertion sequence of the batteries will alternate negative, positive, negative, with the last one being positive as shown above

4. Reinsert the battery cover and rotate the knob clockwise to tighten the cover until its top surface is level with the back surface of the housing

Figure 7.5-1 Battery Replacement

7.6 PALS Harness Replacement



Attach the replacement PALS or neckstrap to the clips shown in the picture

Figure 7.6-1 PALS Harness Replacement

7.7 PALS Harness Pigtail Replacement

REMOVAL

Using pliers, bend the clip on the Pigtail (1) until a gap is created that is large enough for the strap to slip thru. Remove the end of the Pigtail from the clip. Remove the Pigtail from the Housing (2) by pulling it from the slot.

INSTALLATION

Using pliers, bend the clip on the Pigtail (1) until a gap is created that is large enough for the strap to slip thru. Remove the end of the Pigtail from the clip. Push the end of the strap thru the slot in the Housing (2). Push the end of the pigtail onto the clip. Using pliers, bend the clip until the gap is removed.

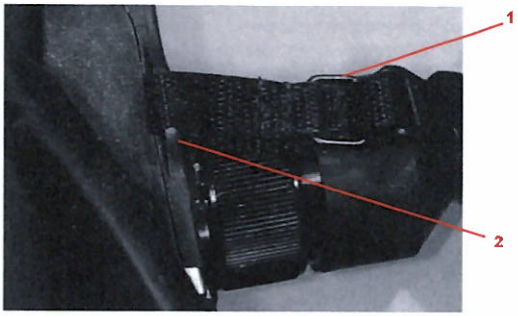


Figure 7.7-1 PALS Harness Pigtail Replacement

8.0 Operator Troubleshooting

NOTE

If these troubleshooting steps do not resolve the issue, the operator should return the unit to the next level of maintenance for proper disposition.

8.0.1 Unit will not turn on

a) Ensure 4 AA batteries are in the battery compartment in the proper orientation per the +/- marking on the battery cover and the housing.
b) If the batteries are dead, replace the batteries. If the battery power is very low, the unit may turn on, but then turn itself off.
c) In very cold conditions, the batteries may need to be warmed before they can power the unit.
d) Inspect the battery cover and battery box for damage.

8.0.2 Power switch is on but unit is off

The batteries may be dead, or the unit may have entered auto-shutdown after 1 hour of no motion. If the unit is in auto-shutdown, rotate the power switch to OFF then back to ON. Auto-Shutdown and Power Save may be disabled by selecting Power Save OFF using the system menu.

8.0.3 Symbology is displayed but no thermal imagery

If no thermal imagery is displayed, ensure the lens cover has been removed from the front objective lens and inspect the lens for contamination or damage.

8.0.4 Unfocused image

a) If the symbology is unfocused in one or both eyepieces, rotate the diopter adjustment on each eyepiece to set the proper focus for your eyes.
b) If the thermal imagery is unfocused, rotate the front objective lens to achieve the best focus.

8.0.5 Grainy image

a) If the thermal imagery looks grainy, pixilated or has fixed pattern noise, press the CAL button to perform a manual calibration.

b) If you prefer to let the unit auto-calibrate, enable auto-cal by selecting the desired calibration time interval in the settings menu.

8.0.6 Thermal image is not the expected scene

If the thermal image is frozen or is not showing the expected scene, the unit may be in camera playback mode. Use the playback menu to switch back to normal operating mode.

8.0.7 No Laser output

The IR wavelength emitted by this laser is not visible to the unaided eye or with the PhantomIR XR unit. The laser will only fire while the laser button is being pressed, and only after the laser has been armed using the system menu. Ensure the laser cap has been removed, and no obstruction is blocking the laser lens.

8.0.8 Reticle or compass data is not displayed

Use the system menu to select the desired reticle or compass settings, or to turn off this symbology.

8.0.9 Compass data is not accurate

Use the system menu to select Compass Calibrate, then follow the on-screen instructions. Rotate slowly to increase the accuracy of the data points used by the compass. Variables that affect compass accuracy are addressed in more detail in section 5.0 of this Operators Manual. Set the declination for your location to display a grid/mag north heading.

Appendix A – Display Symbology

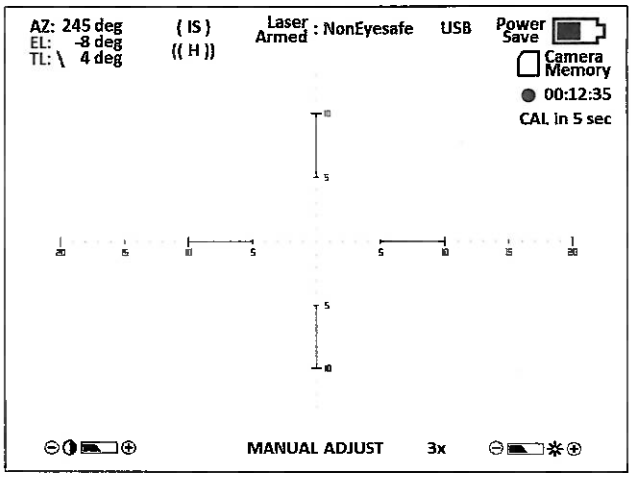
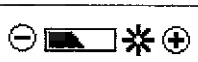


Figure A-1 Display Symbology

Symbol	Meaning
AZ: 245 deg	Shows the azimuth angle from magnetic north. If a declination adjustment has been made, the displayed value will be the true north heading.
EL: -8 deg	Shows the elevation angle from horizontal
TL: \ 4 deg	Shows the tilt angle from horizontal
	Shows the approximate battery life remaining (internal batteries / external battery)
Power Save	Indicates that Power Save mode has been enabled
Laser UnArmed	Indicates that the Laser is UnArmed and will not fire
Laser Armed	Indicates that the Laser is Armed and ready to fire
Eyesafe	Indicates that the Laser is in Eyesafe power mode
NonEyesafe	Indicates that the Laser is in NonEyesafe high power mode
	Shows the approximate space available on the internal memory card
00:12:35	Indicates video recording time elapsed

Symbol	Meaning
(IS)	Indicates that the PhantomIR XR is in the "Image Stabilization" mode.
((H))	Eyepiece display heaters are activated
CAL in _ sec	Auto Cal countdown lets the user cancel automatic calibration if desired
2x or 3x	Indicates 2x or 3x electronic zoom has been selected
MANUAL ADJUST	Indicates that the PhantomIR XR is in the "Manual Adjustment" mode and that the gain and level settings are being controlled by the user
	Gain Indicator - Shows the gain setting that has been selected by the user.
	Level Indicator - Shows that level setting that has been selected by the user.
MANUAL	Replaces MANUAL ADJUST notation when the level and gain settings are in the locked position. Function buttons revert to normal operation in this mode.
FRAME AVERAGE	Indicates that the PhantomIR XR is in the "Frame Averaging" mode. In this mode, the system will average two frames to reduce image noise. In some scene situations, this will provide the user a better image.

Appendix B – Reticle Configuration

Mil-Dot Reticle

The PhantomIR XR display contains a Mil-Dot reticle as shown in Figure B-1 and Figure B-2. Numbers shown in the reticle are mil values (there are 6400 mils in a circle). By measuring the mil width or height of a target of known size, its range can be determined. The reticle automatically changes to the correct Mil-Dot scale for each electronic zoom setting.

Mil-Dot Spacing =	@ Target Range
0.5 meter	500 meters
1 meter	1000 meters
2 meters	2000 meters

For example, a man-sized target 2 meters in height will measure 2 mils high (two reticle divisions) at a range of 1 km, 4 mils high at a range of 500 meters and 8 mils high at range of 250 meters.

Man-size target = 2m	@ Target Range
1 reticle division	2000 meters
2 reticle divisions	1000 meters
4 reticle divisions	500 meters
8 reticle divisions	250 meters

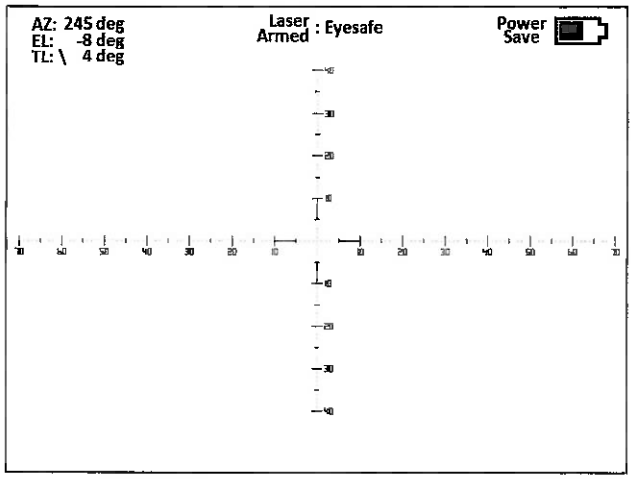


Figure B-1 Mil-Dot Reticle, 1x Electronic Zoom

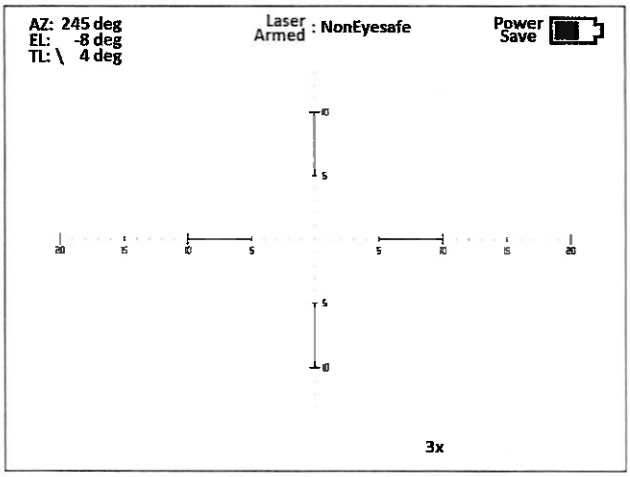


Figure B-2 Mil-Dot Reticle, 3x Electronic Zoom

Stadiametric Scales

Figure B-3 and Figure B-4 shows the stadiametric scales. The scales can be turned on or off in the system menu. The scales magnify with each electronic zoom setting.

At 1x electronic zoom, the lower left scale permits range estimation of human sized targets (1.8 meters tall) out to a maximum range of 1.0 km, and the lower right scale permits range estimation of vehicle sized targets (3.0 meters wide) out to 1.0 km.

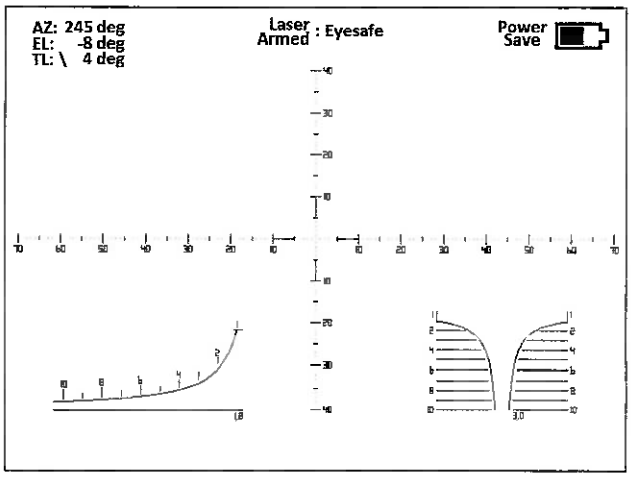


Figure B-3 Stadiametric Scales, 1x E-Zoom

At 3x electronic zoom, the lower left scale permits range estimation of human sized targets (1.8 meters tall) out to a maximum range of 3.0 km, and the lower right scale permits range estimation of vehicle sized targets (3.0 meters wide) out to 3.0 km.

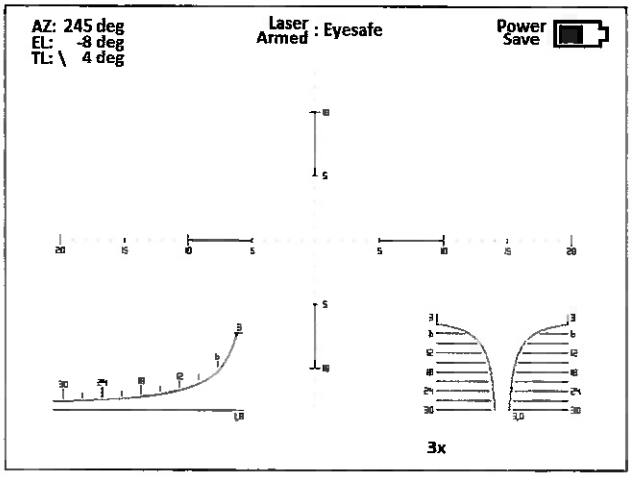


Figure B-4 Stadiametric Scales, 3x E-Zoom

Crosshair Reticle

A crosshair reticle (Figure B-5) can be selected in place of the Mil-Dot reticle by using the system menu that is accessible by pressing the menu button.

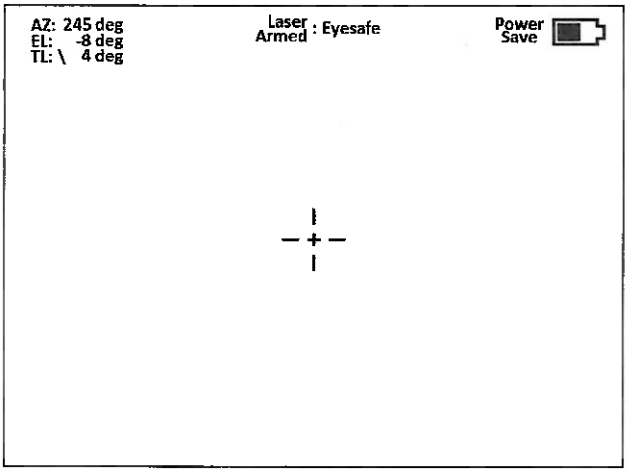


Figure B-5 Crosshair Reticle

Turning Reticle Off

The reticle option can be turned off if desired by using the system menu that is accessible by pressing the menu button.

Appendix C – Battery Symbology

Approximate battery life remaining at 68°F:

Table C-1 Battery Symbology

Symbol	Lithium L91	Alkaline	Rechargeable
	7 hours	3 hours	3.5 hours
	< 7 hours	< 3 hours	< 3.5 hours
	< 2 hours	< 2.5 hours	< 2.5 hours
	< 30 minutes	< 2 hours	< 30 minutes
	< 10 minutes	< 1.5 hours	< 10 minutes
Flashing 	< 1 minute	< 1 hour	< 5 minutes

The battery symbol will flash when the batteries are approaching a low power condition that will cause the unit to auto-shutdown.

The external battery symbol [] indicates greater than 20VDC charge when filled. The icon empties from higher to lower as the battery voltage decreases. A 15VDC input will show approximately half full.