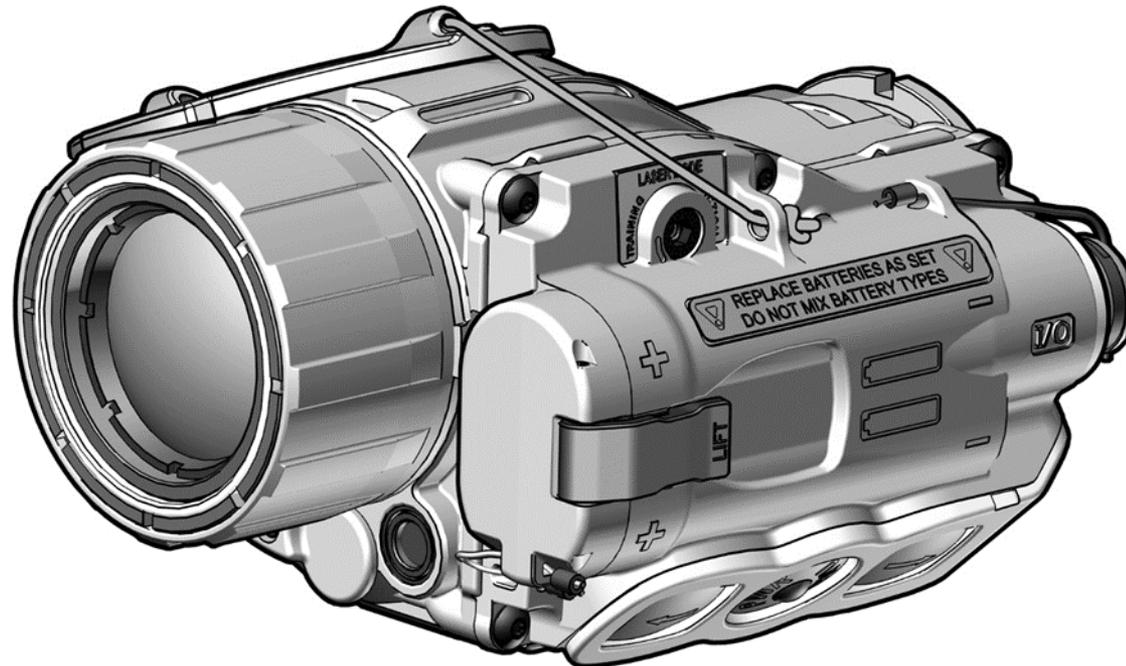




CLIP-ON RUGGEDIZED ADVANCED THERMAL OPTICAL SYSTEM (CRATOS)



General Information



General Information



1. The CRATOS is a battery operated thermal imaging device with an integrated Infrared (IR) Laser Pointer and magnetic compass. It may be used as a handheld unit, mounted to a weapon in a stand-alone configuration, or used in-line with a day optic.
2. The thermal imaging capability of the CRATOS allows for observation, target identification, and target acquisition during the day or in adverse conditions such as light rain, light snow, dry smoke, and low light to total darkness. The unit will not allow the user to see through glass, water, or heavy rain / snow.
- 3.
4. The dual-power IR Laser Pointer provides a means of marking potential targets in low light or complete darkness, for handoff to individuals using night vision devices.
5. The digital magnetic compass is used to provide an azimuth (or bearing) for the direction in which the CRATOS is pointed.
6. The CRATOS can be mounted to weapons equipped with a MIL-STD-1913 rail.
7. It is a ruggedized system designed for operation in battlefield environments.

Safety Precautions



WARNING

The Clip-On Ruggedized Advanced Thermal Optical System (CRATOS) is equipped with an infrared (IR) Laser Pointer that emits invisible laser radiation. Nominal Ocular Hazard Distances (NOHD) for safe operation and required Optical Densities (OD) are listed in Table i-1. Exposure to the IR Laser Pointer inside the NOHDs listed in Table i-1 can cause irreversible damage to the human eye

Nominal Ocular Hazard Distance NOHD Table

Laser	Laser Class ¹	Unaided ²		Aided ³	
		NOHD	OD ⁴	NOHD	OD ⁴
IR Laser Pointer, Low Power (TRAINING)	1	0m	0	0m	0
IR Laser Pointer, High Power (TACTICAL)	3B	97.0m	1.4	680.0m	1.4

¹ Laser Safety Classification per ANSI Z136.1-2007

² Nominal Ocular Hazard Distance without magnifying optics (in meters)

³ Extended Nominal Ocular Hazard Distance with standard 7x50 magnifying optics (in meters)

⁴ Optical Density (OD) expressed to the nearest tenth

Safety Precautions (continued)



WARNING

Use of controls or adjustments or performance of procedures other than those described in this manual may result in hazardous radiation exposure.

WARNING

- Avoid direct exposure to 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 individuals' eyes

WARNING

Laser eye protection should be provided to maintenance personnel, laser operators, and all personnel at risk from laser radiation. Provided protection should be appropriate for the Optical Densities (OD) specified in the NOHD table.

WARNING

IR lasers are detectable by an enemy using night vision devices. Detection is easier in smoky, foggy, or rainy conditions. To reduce the risk of detection, avoid prolonged activation of the IR Laser Pointer in these conditions.

Safety Precautions (continued)



WARNING

Emission of stray light from the eyepiece (even with the eyecup installed) may be detectable by the enemy

WARNING

- Do not short circuit, puncture, disassemble, crush or incinerate batteries
- Do not attempt to recharge batteries.
- Prior to use, inspect all batteries for cracks, dents, leakage, or bulging. Never install a defective battery in the CRATOS.

WARNING

The CRATOS is designed to be used with destructive weapon systems. Improper operation or misuse of the CRATOS with these weapon systems could lead to personal injury or death of either the operator or other persons within weapons range. Safe firearms handling procedures must be practiced at all times.

WARNING

Do not use the CRATOS with a mix of old and new batteries, or batteries of different brands.

Safety Precautions (continued)



WARNING

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 batteries in a cool, dry, ventilated area.

WARNING

Use of off-brand batteries poses a risk of fire or explosion. Ensure that only batteries produced by a well-known battery manufacturer are installed in the CRATOS. These batteries are specifically designed for use in high performance, high-drain devices, and contain built-in fault and heat protection features.

WARNING

Ensure the laser lens cover is closed before attempting to install, remove, or replace batteries.

WARNING

Prior to performing any inspection or maintenance procedure, verify that the batteries are not installed.

Safety Precautions (continued)



WARNING

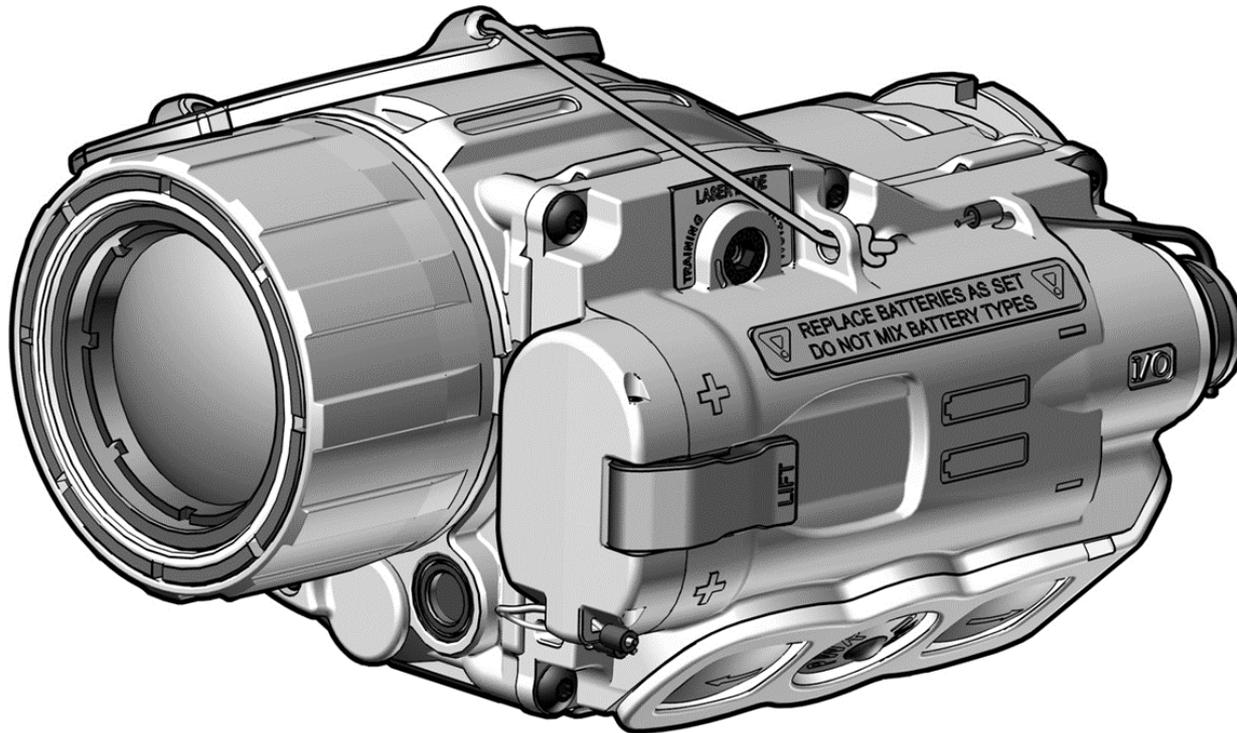
Remove the CRATOS from the weapon before inspecting, cleaning, or performing other maintenance functions.

WARNING

Isopropyl alcohol is flammable and toxic. To avoid injury, keep away from open fire and use in a well ventilated area.



Equipment Description



Equipment Description



WEIGHT AND DIMENSIONS

Weight	< 21.0 ounces (595 g)
Length	< 4.5 inches (11.4 cm)
Width	< 2.9 inches (7.4 cm)
Height	< 2.6 inches (6.6 cm)
Weight	< 21.0 ounces (595 g)

Equipment Description (continued)



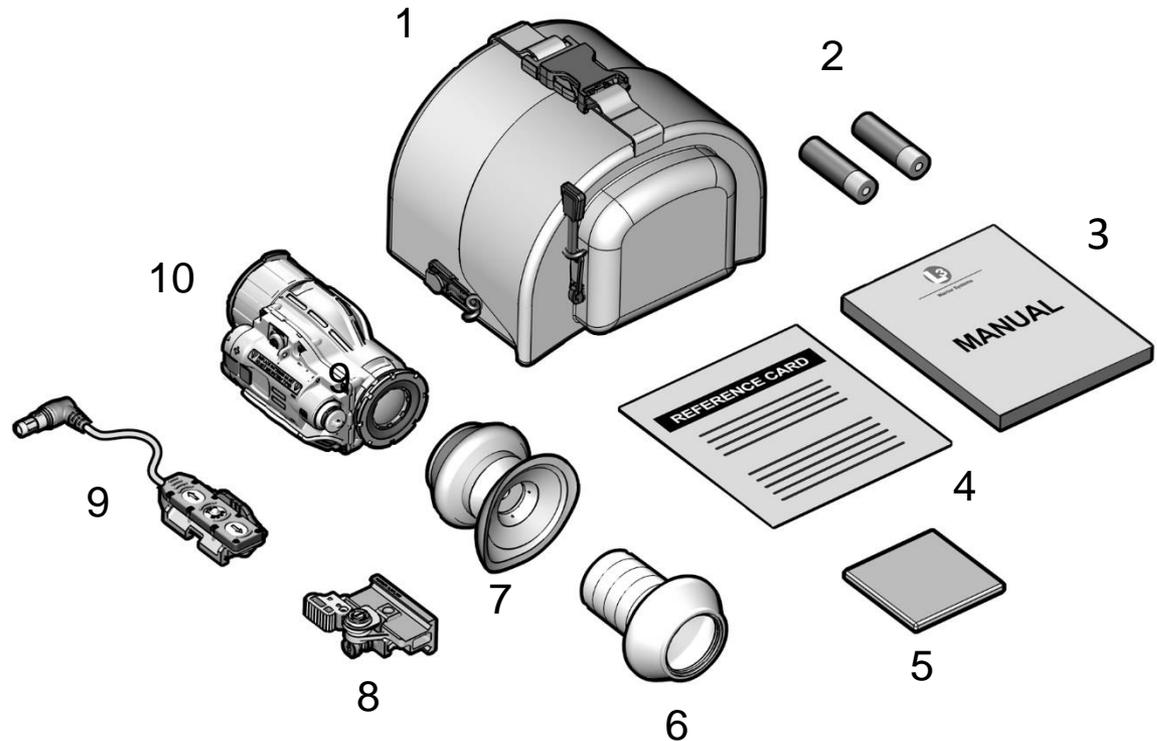
POWER AND PERFORMANCE	
Batteries	Two 1.5V AA lithium batteries
Battery Operating Life ¹	≥ 4 hours continuous operation
Magnification	1x with selectable 2x electronic zoom
Field of View	21° (± 1°) horizontal
Compass Accuracy	± 22.5°
Immersion	20m for 2 hours
Operating Temperature	-26°F (-32°C) to 126°F (52°C)
Storage Temperature	-40°F (-40°C) to 165°F (74°C)
IR LASER POINTER	
Output Power	
Training Mode	0.55 mW (+ 0.1 / - 0.05 mW)
Tactical Mode	15.0 mW (± 2.0 mW)
Beam Divergence	≤ 1.0 mrad
Wavelength	840 nm (+ 10 / - 20 nm)

¹Performance will vary depending on actual environmental and atmospheric conditions.

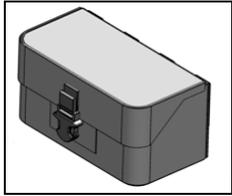
Major Components



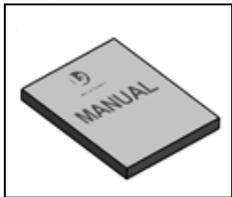
1. Soft Case
2. AA Batteries (2)
3. Operator Manual
4. Quick Reference Guide
5. Lens Cleaning Cloth
6. Interface Hood
7. Eyecup, Shuttered
8. Mount Adapter
9. Remote Cable Switch
10. CRATOS Assembly



Major Components (continued)



1. **Soft Case** - Allows for storage and/or shipping of the CRATOS and accessories.

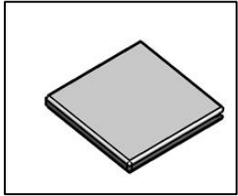


2. **Operator Manual** - Provides detailed operating and maintenance instructions specific to the CRATOS.



3. **Quick Reference Guide** - Provide at-a-glance operating procedures for the CRATOS.

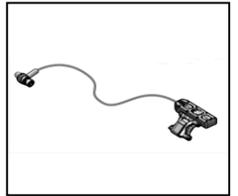
Major Components (continued)



5. **Lens Cleaning Cloth** - Used to clean the optical surfaces of the CRATOS.



6. **Interface Hood** - Used to improve visual security and image quality when the CRATOS is mounted in-line with other optical sights.



7. **Remote Cable** - Allows for fingertip control of the CRATOS without altering the operator's grip on the weapon..

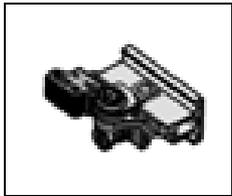


8. **Eyecup, shuttered** - When attached, reduces emission of stray light from the eyepiece.

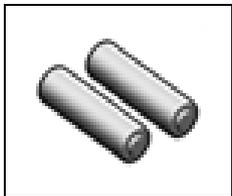
Major Components (continued)



9. **CRATOS Assembly** - A thermal imaging device that allows for observation, target identification, and target acquisition during the day or in adverse conditions such as light rain, light snow, dry smoke, and low light to total darkness



10. **Mount Adapter** - Allows the CRATOS to be mounted to any weapon equipped with a MIL-STD-1913 rail.



11. **AA Lithium Batteries (2)** – Provide power to the CRATOS.

CRATOS System Components



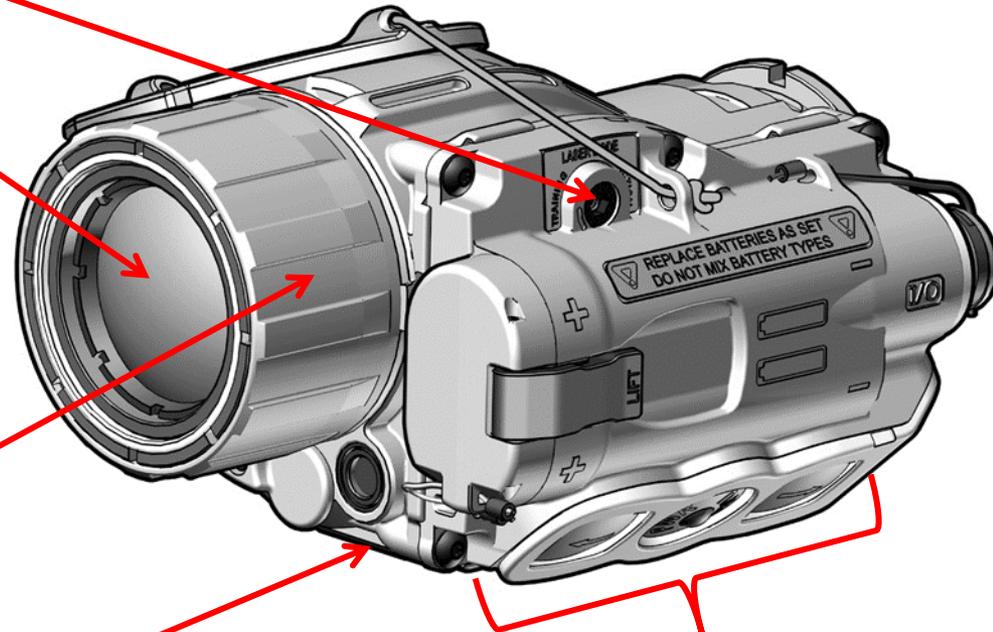
Laser Power Switch - Used to select the desired laser setting (i.e., TRAIN, TACT) and corresponding laser power.

Objective Lens - Collects thermal energy within the viewed scene and focuses it onto a thermal imaging detector.

Objective Focus Ring - Used to focus the CRATOS for the viewing distance being observed.

Mounting Bracket - Attaches to the provided Mount Adapter to allow for weapon-mounted use of the CRATOS.

Key Pad - Contains multifunctional buttons that produce different results depending on system status and how the buttons are pressed.



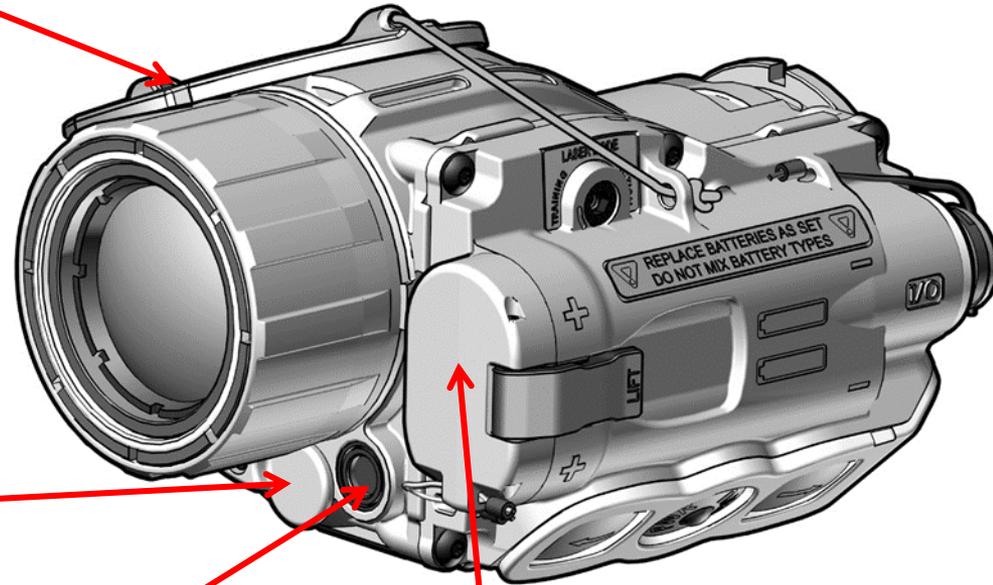
CRATOS System Components



Objective Lens Cover - Used to protect the objective lens and internal imaging components whenever the CRATOS is not in use.

Laser Lens Cover - Used to prevent inadvertent emission of laser energy.

IR Laser Pointer - Provides a means of marking potential targets in low light or complete darkness, for handoff to individuals using night vision devices.



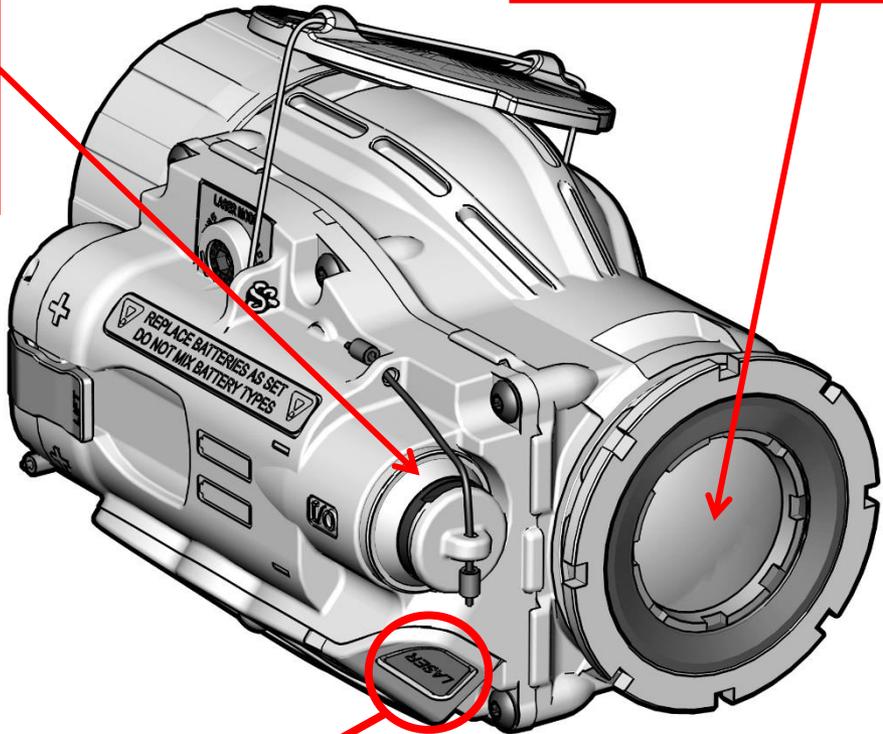
Battery Cap / Compartment- Provides secure housing for the two AA lithium batteries that power the CRATOS.

CRATOS System Components (continued)



Remote Jack / Jack Plug - Provides an interface for the Remote Cable Switch and other RS232 and USB connections. A jack plug is installed to protect the remote jack from debris and moisture.

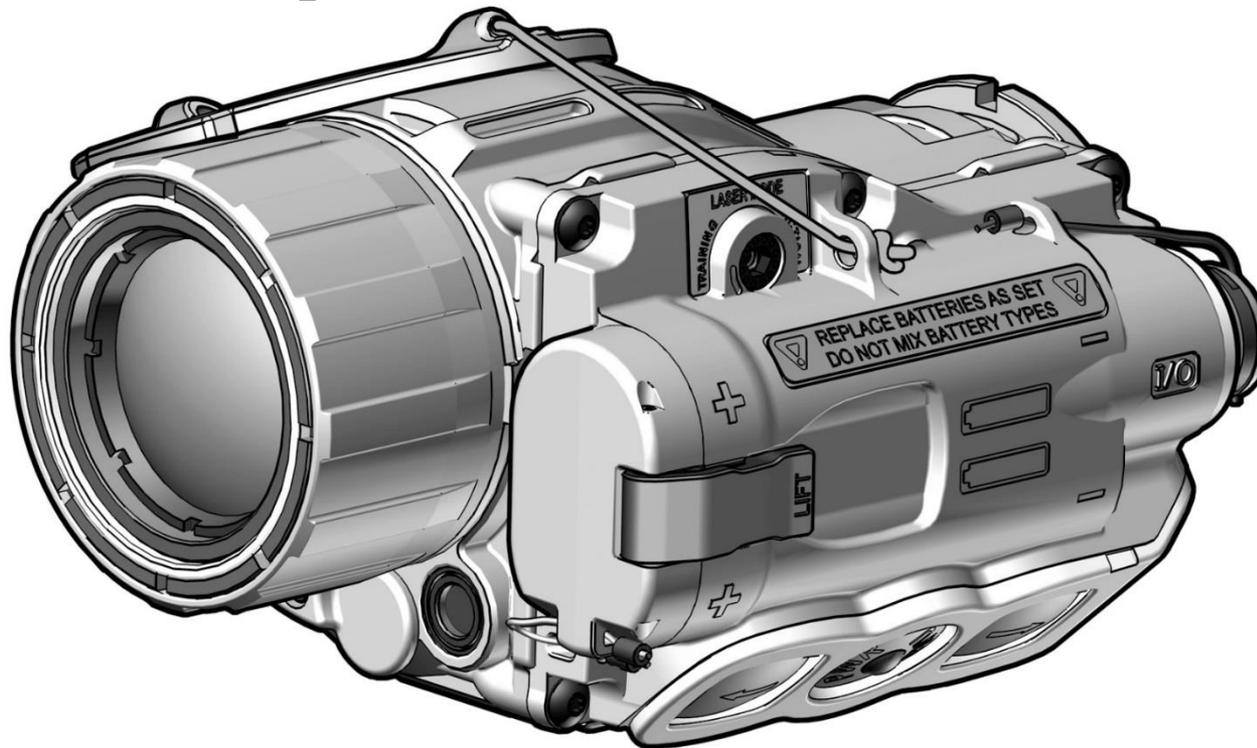
Eyepiece - Allows the operator to view the thermal image, Main Menu, and symbology.



LASER Button - Activates the IR Laser Pointer.



Preparation for Use



Preparation for Use



PREPARATION FOR USE

Unpacking the Equipment

Open the soft carrying case and verify that all major components listed in Table 1-2 are present. Check the CRATOS to ensure the following additional items are included:

- a. Objective Lens Cover
- b. Lens Cover Lanyard
- c. Battery Cap (and lanyard)
- d. Remote Jack Plug (and lanyard)
- e. Laser Lens Cover

If any of the major components or items listed above are missing, seek guidance from the equipment issuing authority.

Inspection of the Equipment

Before use, inspect all pieces of equipment for any damage such as cracks, loose parts, faulty cables, or other visible defects. If any damage or defects are noted, seek guidance from the equipment issuing authority.

Preparation for Use (continued)



BATTERY HANDLING

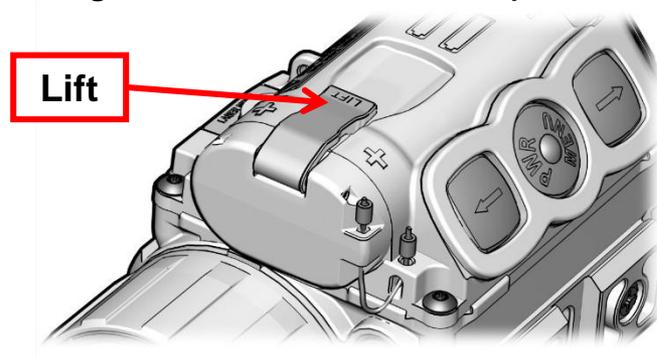
Battery Inspection

Before installation, inspect the batteries for any cracks, dents, leakage, or bulging. Never install a defective battery in the CRATOS.

Battery Installation

WARNING

- Do not use the CRATOS with a mix of old and new batteries, or batteries of different brands.
 - Ensure the laser lens cover is closed before attempting to install, remove, or replace batteries.
1. Hold the CRATOS in one hand with the battery compartment facing up. Pull up on the battery cover latch, along the edge labeled “LIFT”, to open the battery compartment.



Preparation for Use (continued)

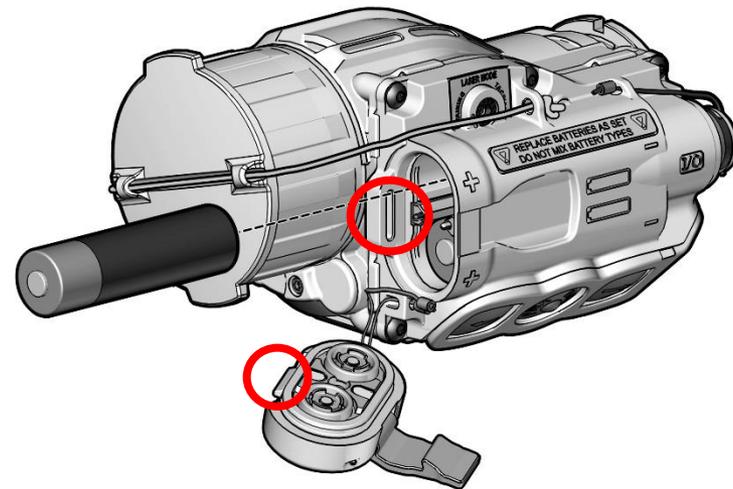


Battery Inspection / Installation

2. Install two fresh 1.5V AA lithium batteries with the positive terminals facing out as shown. Proper battery orientation is clearly marked on the CRATOS housing.

NOTE

Reseating the battery cap requires that the tab on the inside edge of the battery cap first be placed into the corresponding slot on the CRATOS housing.



3. Reseat the battery cap and swing the latch onto the CRATOS housing.
4. While holding the battery cover closed, press down firmly on the latch to lock the battery cover into place.

Preparation for Use (continued)



BATTERY HANDLING (Continued)

Battery Capacity

A graduated battery symbol centered near the top of the eyepiece display will appear whenever the Main Menu is displayed. The battery symbol provides a graphical representation of remaining battery life. As battery life decreases, the number of bars will also decrease.

Low Battery Indicator

When approximately 20 minutes of continuous operation remain, a low battery message (LOW BATT) will appear centered near the top of the eyepiece display, regardless of whether or not the Main Menu is displayed.

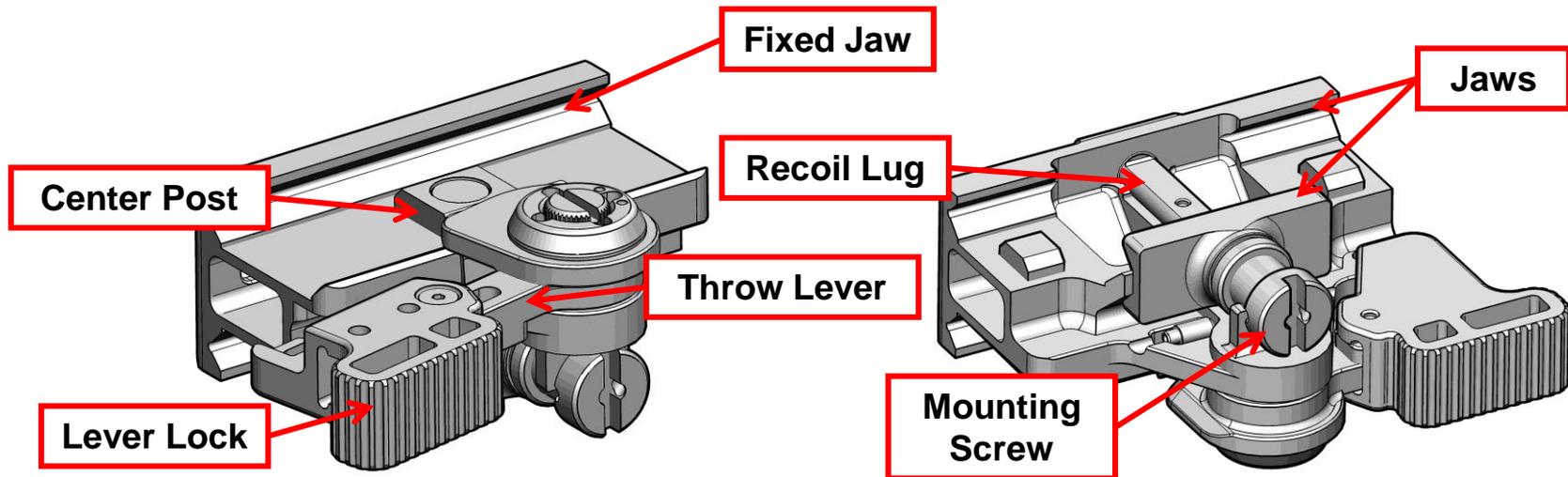
Preparation for Use (continued)



MOUNTING PROCEDURES

Mount Adapter

A double-sided Mount Adapter provided with the system allows the CRATOS to be mounted to any weapon equipped with a MIL-STD-1913 rail. Figures 2-3 and 2-4 show both sides of the Mount Adapter with key features labeled.



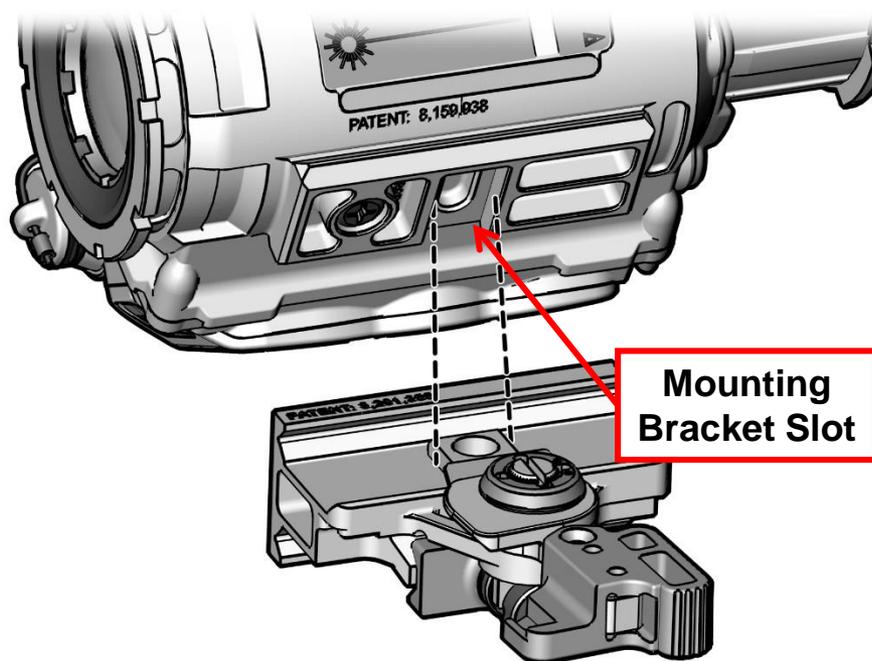
Preparation for Use (continued)



Mounting Procedures

Attaching Mount Adapter to CRATOS

1. Pull the lever lock out to the full open position.
2. Swing the throw-lever so that it is perpendicular to the jaws of the Mount Adapter.



Preparation for Use (continued)



Mounting Procedures (continued)

3. Orient the CRATOS and Mount Adapter as shown. Hook the fixed jaw of the Mount Adapter on the edge of the CRATOS' mounting bracket.
4. Pivot the Mount Adapter toward the CRATOS' mounting bracket. Ensure the center post of the Mount Adapter is properly seated in the slot of the mounting bracket.
5. Swing the throw-lever toward the back (eyepiece) of the CRATOS until it is snug against the mounting bracket.
6. Push the lever lock in to engage the locking mechanism.

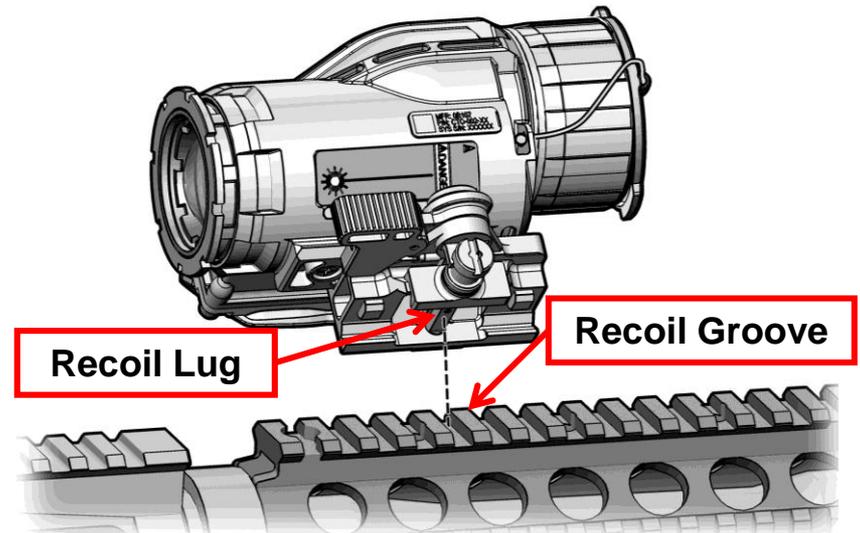
Preparation for Use (continued)



Attaching Mount Adapter to Weapon Rail

WARNING - Be sure the weapon is **CLEAR and SAFE** before proceeding.

1. Loosen the mounting screw on the Mount Adapter until the jaws have sufficient space to fit over the weapon rail.
2. Hold the CRATOS with the objective lens facing in the direction of the muzzle of the weapon.
3. Position the CRATOS on the rail ensuring the recoil lug is seated in the desired recoil groove of the rail.
4. While holding the CRATOS tightly against the rail and toward the muzzle of the weapon, turn the mounting screw clockwise as tightly as fingers allow. Use a screwdriver or similar tool in the slot of the mounting screw to turn it an additional 1/2 turn.



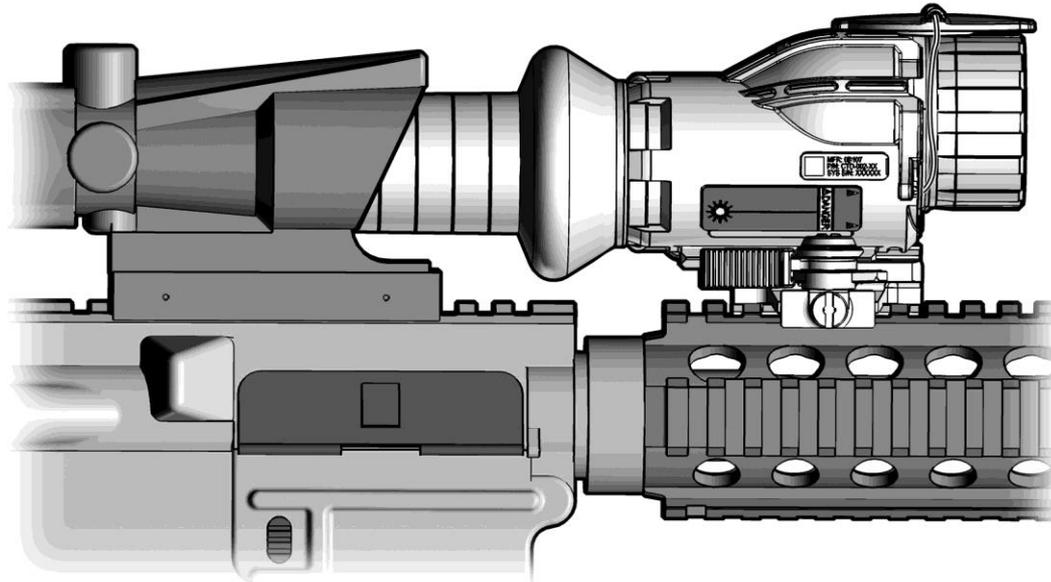
Preparation for Use (continued)



Mounting with Other Optics

When the CRATOS is mounted in-line with a day optic, the provided interface hood is used to improve light security and image quality.

1. Attach the interface hood to the CRATOS by stretching the base over the eyepiece as shown



Preparation for Use (continued)



Mounting with Other Optics (continued)

2. Mount the day optic to the rail in accordance with manufacturer's instructions.
3. Slide the narrow end of the interface hood inside the objective shroud of the day optic to determine the appropriate recoil groove for mounting the CRATOS.
4. Mount the CRATOS (with mount adapter) to the weapon rail in front of the optical sight.

NOTE - The interface hood should fit freely in the day optic objective while still maintaining good light security. The fit should be free of any folds or kinks that may obstruct the day optic field of view.

Preparation for Use (continued)



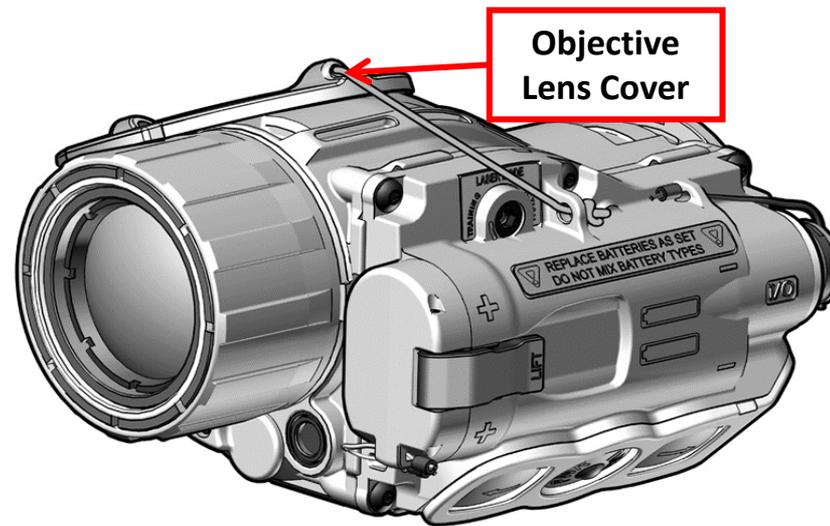
Lens Accessories

Objective Lens Cover

CAUTION

Pointing the CRATOS directly at the sun without the objective lens cover installed may damage internal imaging components.

The CRATOS is equipped with an objective lens cover that provides additional protection to the objective lens. It is held captive to the CRATOS with a retaining lanyard. The lens cover should be fitted over the objective lens whenever the CRATOS is not being used. When the CRATOS is in use, the objective lens cover may be flipped up on top of unit housing as shown.



Preparation for Use (continued)



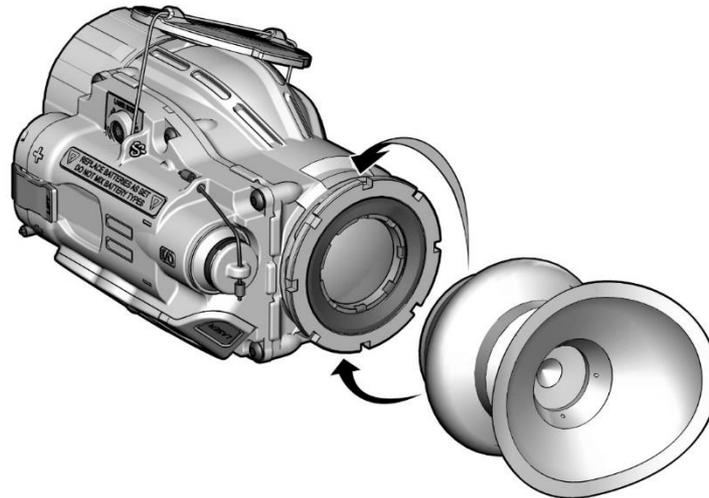
Lens Accessories (continued)

Shuttered Eyecup

WARNING

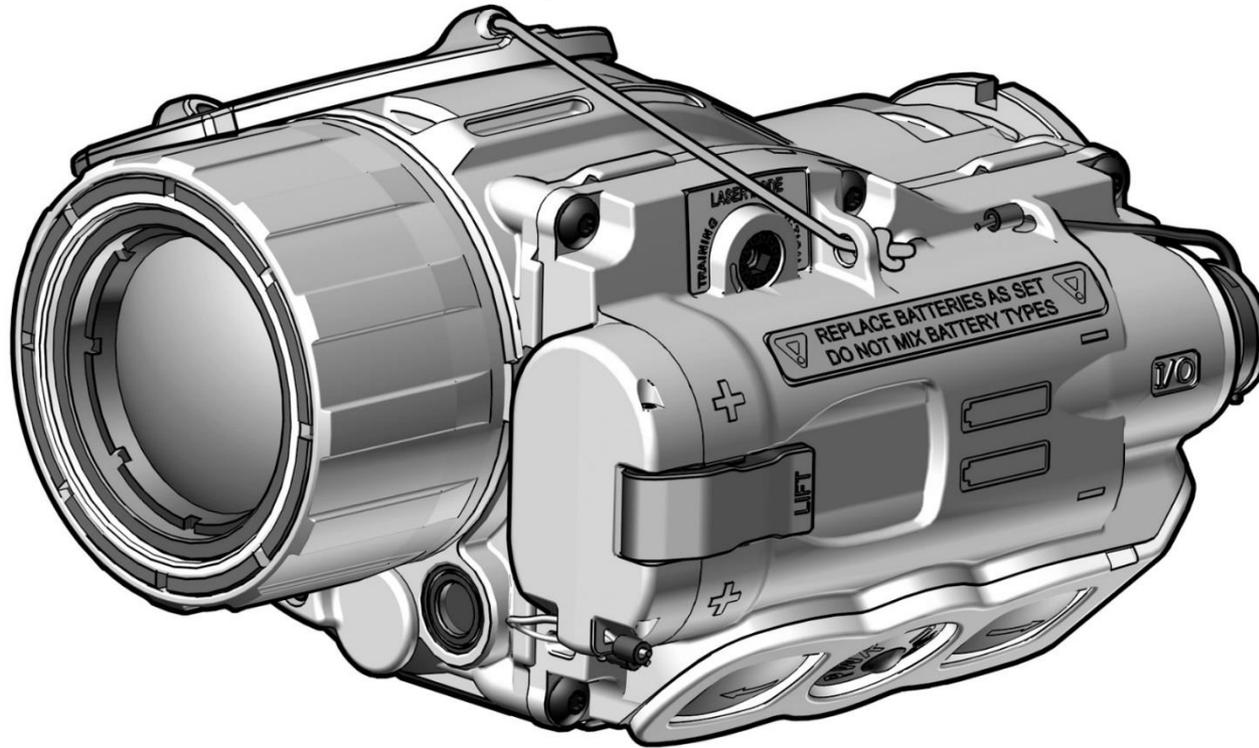
Emission of stray light from the eyepiece (even with the eyecup installed) may be detectable by the enemy.

When attached, the shuttered eyecup assists in positioning the CRATOS relative to the operator's eye and reduces emission of stray light from the eyepiece. To attach, stretch the base of the eyecup into place over the eyepiece as shown in Figure 2-9. Rotate the eyecup to obtain a proper eye / cheek weld.





Operating Procedures



Operating Procedures



POWER

Power On

To turn on the CRATOS, press the PWR / MENU button. With very few exceptions, the CRATOS will power up with the same menu settings selected as when the system was last turned off.

Power Off

To turn off the CRATOS, press and hold the PWR / MENU button for approximately 4 seconds as the following messages appear sequentially in the eyepiece display:

- RELEASE TO CAL; and
- POWER OFF?

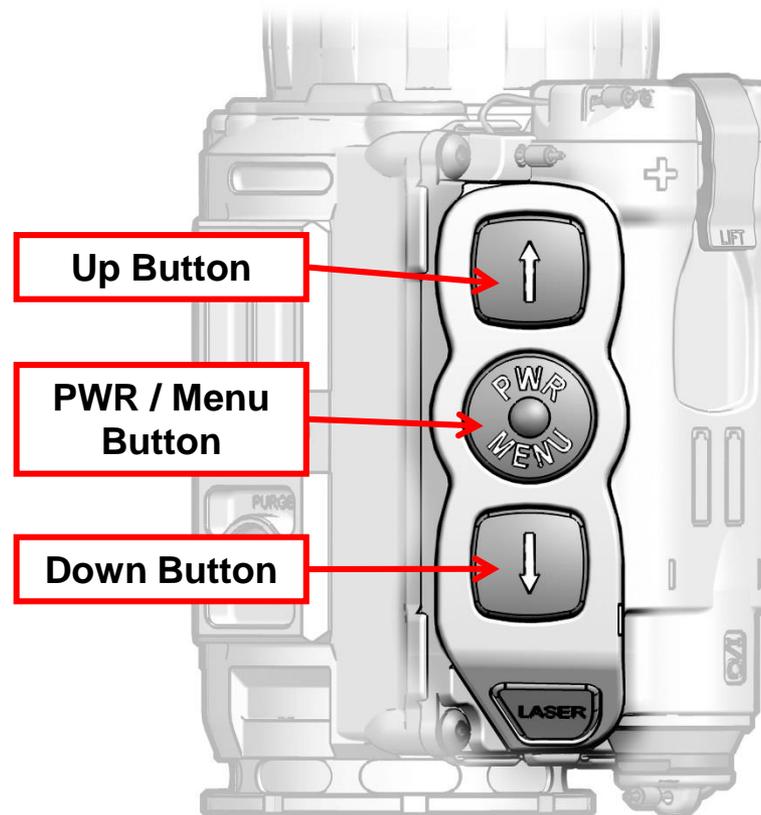
Release the PWR / MENU button when the eyepiece display turns dark.

Operating Procedures (continued)



BUTTON FUNCTIONS

The CRATOS keypad consists of the three buttons. The buttons are multifunctional and produce different results depending on the system status (e.g., ON, OFF, Main Menu displayed) and how they are pressed. The uses and effects of each button are addressed throughout this Section.



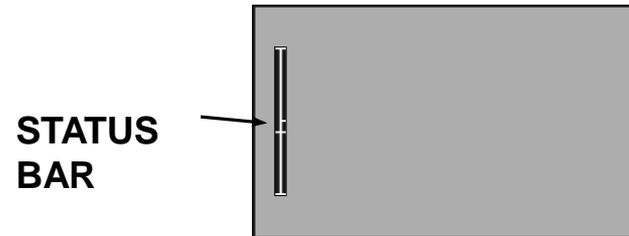
Operating Procedures (continued)



Button Functions (continued)

THERMAL BRIGHTNESS ADJUSTMENT

When the Main Menu is not displayed, pressing the DOWN button causes the thermal brightness scale to appear in the eyepiece display as shown. Adjusting the thermal brightness affects the luminosity of the thermal image.



Thermal brightness is adjusted by pressing the UP / DOWN buttons to move the status bar along the scale. If neither button is pressed within three seconds, the thermal brightness scale will disappear and the CRATOS will revert to normal viewing mode.

- Repeatedly pressing the UP / DOWN buttons will move the status bar in single increments.
- Pressing and holding the UP / DOWN buttons will auto-scroll the status bar in multiple increments.
- Pressing the PWR / MENU button will dismiss the thermal brightness scale and the CRATOS will revert to normal viewing mode.

Once adjusted, thermal brightness will remain at the applied setting (even if the CRATOS is turned off) until readjusted by the operator.

Operating Procedures (continued)

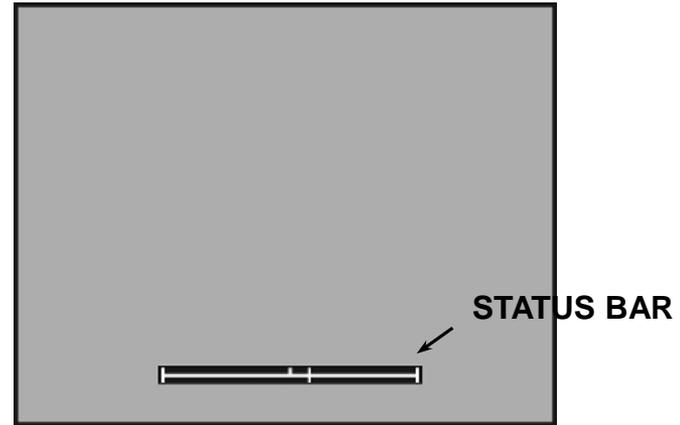


Contrast (Gain) Adjustment

When the Main Menu is not displayed, pressing the UP button causes the gain control scale to appear in the eyepiece display as shown

Adjusting the gain affects the amount of contrast observed in the thermal scene.

Gain is adjusted by pressing the UP / DOWN buttons to move the status bar along the scale. If neither button is pressed within three seconds, the gain control scale will disappear and the CRATOS will revert to normal viewing mode.



- Repeatedly pressing the UP / DOWN buttons will move the status bar in single increments.
- Pressing and holding the UP / DOWN buttons will auto-scroll the status bar in multiple increments.
- Pressing the PWR / MENU button will dismiss the gain control scale and the CRATOS will revert to normal viewing mode.

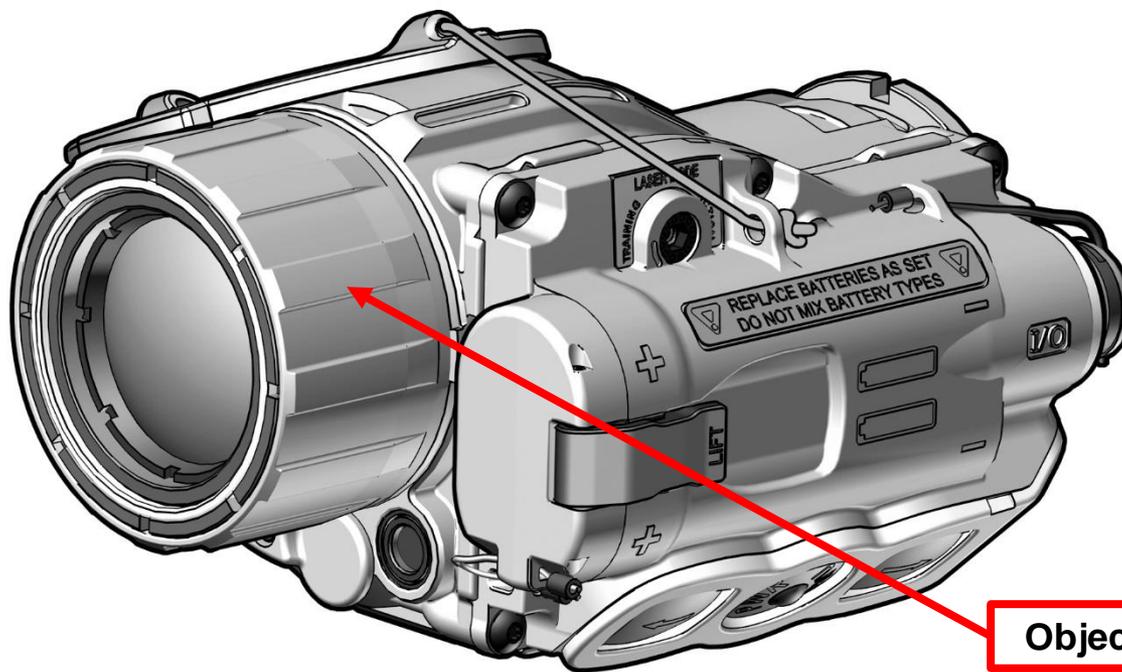
Once adjusted, gain will remain at the applied setting (even if the CRATOS is turned off) until readjusted by the operator.

Operating Procedures (continued)



Focus Adjustment

The objective lens must be focused for the viewing distance being observed. Rotate the objective focus ring for best image clarity. A change in viewing distance requires that the lens be refocused. However, if already focused for a distance of at least 50m, no change in focus is required between this distance and infinity.



Objective Focus Ring

Operating Procedures (continued)



Startup Procedures

To achieve optimal performance and image clarity, the following procedures should be accomplished in the order presented, each time the CRATOS is to be placed into operation:

1. Install batteries as described earlier.
2. Turn on the CRATOS by pressing the PWR / MENU button.
3. Flip the objective lens cover up and over the objective lens to rest on top of the CRATOS housing; adjust the thermal brightness setting as described earlier.
4. Adjust the gain setting to achieve a comfortable contrast level.
5. While looking through the eyepiece at an object at least three meters away, rotate the objective focus ring until the best (sharpest) thermal image is obtained.
6. Press the PWR / MENU button to access the Main Menu, then activate desired settings.

Operating Procedures (continued)



Shutdown Procedures

1. Press and hold the **PWR / MENU** button for approximately 4 seconds as the following messages appear sequentially in the eyepiece display:
 - RELEASE TO CAL; and
 - POWER OFF?

Release the **PWR / MENU** button when the eyepiece display turns dark.

2. Install the objective lens cover over the objective lens and if necessary, close the laser lens cover.
3. Remove batteries; place batteries and the CRATOS in the soft carry case.

Operating Procedures (continued)



SYSTEM MENUS

NOTE

This manual applies to several different models of CRATOS. Your specific configuration may not include all menu items described in this Section.

MENU NAVIGATION

With the CRATOS turned on, the Main Menu is accessed by pressing the PWR / MENU button. Menu items are then selected (highlighted) by scrolling with the UP / DOWN buttons. Pressing the PWR / MENU button again activates the selected menu item. If the UP / DOWN or PWR / MENU buttons are not pressed within approximately 5 seconds, the Main Menu will disappear and the CRATOS will revert to normal viewing mode.

MENU STRUCTURE

The Main Menu is split into two levels and incorporates various sub-menus. The first level of the Main Menu contains frequently used, mission critical items. The second level of the Main Menu is accessed through the USER menu item and includes items that are invoked less often.

NOTE

Not all menu items are displayed when the CRATOS is placed in CLIPON mode. Additionally, some menu items, when activated, serve as a toggle between different settings or modes (e.g., ZOOM 1X / ZOOM 2X). In these cases, menus display the currently selected setting.

Operating Procedures (continued)



MENU STRUCTURE (continued)

First Level

Once accessed, the Main Menu will appear in the eyepiece display as shown.



Second Level

The second level of the Main Menu is accessed by selecting, then activating the USER menu item. Once activated, the second level will appear in the eyepiece display as shown.



Operating Procedures (continued)



Menu Navigation

Upon system power up, Main Menu settings either revert to the last saved setting or a default value as shown below.

Menu Item	Menu Options	Default
POLARITY	WHOT/BHOT/OUTLINE	LAST SAVED
ZOOM	1X/2X	LAST SAVED
AGC MODE	MANUAL/AUTO	LAST SAVED
OPERATIONAL MODE	HANDHELD / STANDALONE / CLIPON	LAST SAVED
CAL MODE	ACAL/MCAL	ACAL
LASER	ENABLED/DISABLED	DISABLED
DIMMER	SLIDING SCALE	LAST SAVED
IMAGE COLOR	MONO IMG / COLOR IMG	LAST SAVED
COMPASS	ENABLED / DISABLED	DISABLED
RETICLE	ON / OFF	LAST SAVED

Operating Procedures (continued)



Menu Navigation (continued)

WHOT / BHOT / OUTLINE (POLARITY)

Activating the WHOT / BHOT / OUTLINE menu item toggles between white hot (WHOT), black hot (BHOT) and OUTLINE polarity settings.

Shortcut	Toggling between polarity settings may also be accomplished when the Main Menu is NOT displayed by pressing the PWR / MENU button twice in rapid succession.
----------	--

NOTE

OUTLINE polarity is most effective when viewing objects at least 3m (about 10 feet) away.

The polarity setting uses colors (or levels of greyscale) to portray temperature differences in the viewed thermal scene. Colors used in the eyepiece display for this purpose will vary depending on whether MONO IMG or COLOR IMG has been selected via the system menu. In WHOT mode, objects with the hottest thermal signature will appear lighter and those with the coolest thermal signature will appear darker. In BHOT mode, the reverse is true. In OUTLINE mode, objects with a thermal signature will appear as wire frame silhouettes (or outlines).

At system startup, and whenever the polarity setting is changed, the current setting (WHOT, BHOT, or OUTL) will appear briefly near the top of the eyepiece display.

Operating Procedures (continued)



Menu Navigation (continued)

ZOOM 1X / ZOOM 2X

NOTE

The ZOOM menu item is not available when the CRATOS is placed in CLIPON mode.

Activating the ZOOM 1X / ZOOM 2X menu item toggles between a 1x and 2x magnified viewed image. Visual confirmation that the CRATOS is placed in ZOOM 2X is provided by a “2X” indicator that appears toward the upper left corner of the eyepiece display.

Operating Procedures (continued)



Menu Navigation (continued)

Calibration (CAL)

The CRATOS may be placed in automatic (ACAL) or manual (MCAL) calibration mode as described later in this class. Regardless of the mode selected, activating the CAL menu item initiates a calibration of the device. A calibration should be initiated whenever a degradation of the thermal image is noticed.

When in ACAL mode, all calibrations initiated through the Main Menu are shuttered. A shuttered calibration causes the CRATOS' internal shutter to close for approximately one second so that a uniform thermal scene is provided to the thermal detector. While calibrating, a frozen thermal image will be briefly visible in the eyepiece display, and the operator may hear the internal shutter closing and opening.

NOTE

When performing a shutterless calibration, failure to cover the objective lens may result in the presence of a ghost image in the eyepiece display.

When in MCAL mode, all calibrations initiated through the Main Menu are shutterless. Shutterless calibrations require the operator to ensure a uniform thermal scene is provided to the thermal detector. This is accomplished by covering the objective lens with the objective lens cover or a hand. Shutterless calibrations are silent since the CRATOS' internal shutter is not being used.

Operating Procedures (continued)



Menu Navigation (continued)

Shortcut A calibration may also be initiated when the Main Menu is NOT displayed by pressing and holding the PWR / MENU button for about 1 second, until the RELEASE TO CAL message appears in the eyepiece display. The calibration is initiated upon release of the PWR / MENU button. Regardless of the calibration mode selected (ACAL / MCAL), all calibrations conducted in this manner are shuttered.

AGC AUTO / AGC MAN (AGC MODE)

Activating the AGC AUTO / AGC MAN menu item allows the operator to toggle the automatic gain control setting on or off.

With AGC AUTO selected, the CRATOS automatically adjusts thermal brightness and gain levels based on the contrast present in the viewed scene. AGC AUTO usually provides the best thermal image. Even with AGC AUTO selected, thermal brightness and gain can be manually fine-tuned by the operator. However, allowable adjustments to these settings are much smaller than when AGC MAN is selected.

With AGC MAN selected, continual adjustments to both thermal brightness and gain must be performed manually as described earlier. Adjusting thermal brightness and gain with AGC MAN selected allows for lower and higher settings than are possible with AGC AUTO.

Operating Procedures (continued)



Menu Navigation (continued)

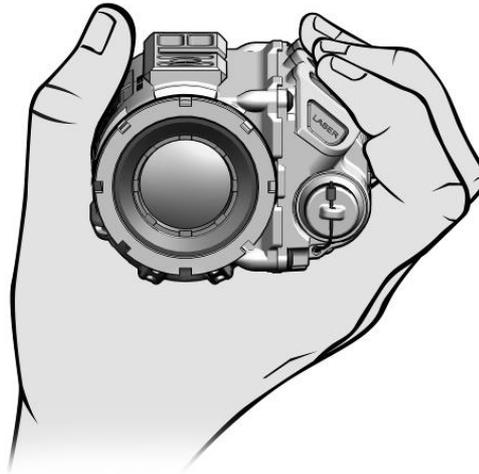
HANDHELD / STANDALONE / CLIPON

Activating the HANDHELD / STANDALONE / CLIPON menu item allows the operator to toggle between these three operational modes.

Handheld Mode

The HANDHELD menu item is appropriate when the CRATOS is not being used in a weapon-mounted configuration.

The CRATOS is shaped to fit the hand comfortably and is designed for use by both right and left-handed users. Holding the device as shown below with the mounting bracket facing up allows for easy fingertip control of the keypad. When the HANDHELD menu item is activated, all display symbology and text is oriented to appear upright when the CRATOS is held in this manner.



Operating Procedures (continued)



Menu Navigation (continued)

HANDHELD / STANDALONE / CLIPON (Continued)

Stand Alone Mode

The STANDALONE menu item is appropriate when the CRATOS is mounted to a weapon in a stand-alone configuration; that is, *not* in-line with a day optic.

When the STANDALONE menu item is activated, all display symbology and text is oriented to appear upright when the CRATOS is mounted to a weapon. Additionally, a weapon reticle may be activated via the system menu as described in to be used as an aiming device. If used as an aiming device, the weapon reticle must be aligned / zeroed to the host weapon using procedures contained in a later section.

Clip-On Mode

The CLIPON menu item is appropriate when the CRATOS is mounted in-line with a day optic. Selecting the CLIPON mode automatically accomplishes the following:

- a. Removes the reticle, if displayed.
- b. Reduces the size of all display symbology and text to accommodate the day optic's narrower field of view.
- c. Orients all display symbology and text to appear upright when the CRATOS is mounted to a weapon.
- d. Brings all display symbology toward the center of the display so that it is visible when viewed through the in-line day optic.

Operating Procedures (continued)



Menu Navigation (continued)

USER

Activating the USER menu item calls up the second level of the Main Menu.

ACAL / MCAL (CALIBRATION MODE)

Activating the MCAL / ACAL menu item toggles between these two calibration modes.

Manual Calibration Mode

With MCAL selected, all calibrations after system start-up must be initiated manually as described earlier. The CRATOS is equipped with an internal sensor that detects significant changes in temperature. When this condition occurs, the message RECAL will appear toward the upper left corner of the eyepiece display, indicating that a manual calibration should be performed.

Automatic Calibration Mode

With ACAL selected, the CRATOS will automatically initiate a calibration at system start-up and as required to maintain an optimal thermal image.

Operating Procedures (continued)



Menu Navigation (continued)

PIC (PICTURE)

Activating the PIC menu item takes (and stores) a digital picture of the image as seen through the eyepiece display. During the image capture process, the message **TAKING PICTURE** appears in the display.

The CRATOS is capable of storing more than 150 pictures. When attempting to take more than the maximum allowable number of pictures, the words “**ERROR: 9**” will appear in the eyepiece display. No more pictures may be taken until one or more stored pictures are deleted.

When one or more pictures have been stored to memory, activating the PIC REV menu item causes a menu bar to appear along the bottom of the display that allows for the review and deletion of saved pictures (see Figure 2-16). If no pictures have been stored to memory, the message **NO PICTURES TO REVIEW** will appear in lieu of the menu bar.



- EXIT closes all menus and returns the display to normal viewing mode.
- PREV displays the picture taken prior to the one currently being viewed. If viewing the first picture, the last picture in the sequence will be displayed.
- NEXT displays the picture taken after the one currently being viewed. If viewing the last picture, the first picture in the sequence will be displayed.

Operating Procedures (continued)



Menu Navigation (continued)

PIC (PICTURE) (continued)

CAUTION

When deleting pictures, files are deleted immediately. There is no prompt for confirmation and no way to retrieve a deleted image. A message will appear in the eyepiece display indicating successful deletion.

- DEL instantly and permanently deletes the currently displayed image from memory and displays the next image in the sequence.
- DEL-ALL instantly and permanently deletes all saved images from memory.

LASER ENABLED / LASER DISABLED

Activating the LASER ENABLED / LASER DISABLED menu item affects the performance of the IR Laser Pointer by toggling between these two settings. Refer to Section IV for more information regarding the IR Laser Pointer.

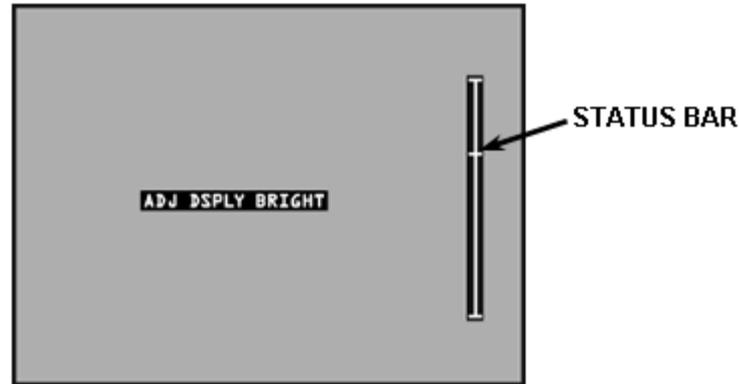
Operating Procedures (continued)



Menu Navigation (continued)

DIMMER

Activating the DIMMER menu item calls up a brightness scale that is presented in the eyepiece display as shown below.



Adjusting the display brightness affects the luminosity of everything in the eyepiece display including menu text, symbology, and the thermal image. Higher brightness settings are appropriate in bright ambient lighting conditions. Lower brightness settings are appropriate for operators with night-adapted vision and to reduce eye fatigue.

Operating Procedures (continued)



Menu Navigation (continued)

DIMMER (continued)

Display brightness is adjusted by pressing the UP / DOWN buttons to move the status bar along the scale.

- Repeatedly pressing the UP / DOWN buttons will move the status bar in single increments.
- Pressing and holding the UP / DOWN buttons will auto-scroll the status bar in multiple increments.
- Pressing the PWR / MENU button will dismiss the brightness scale and return to the system menu.

Once adjusted, display brightness will remain at the applied setting (even if the CRATOS is turned off) until readjusted by the operator.

Operating Procedures (continued)



Menu Navigation (continued)

MONO IMG / COLOR IMG (IMAGE COLOR)

Activating the MONO IMG / COLOR IMG menu item toggles between these two settings.

With MONO IMG (monochromatic image) selected, temperature differences in the viewed thermal scene are presented in various shades of greyscale. With COLOR IMG (color image) selected, temperature differences are presented using a color palette.

The polarity settings described in earlier determine which colors (or levels of greyscale) are used to denote hot and cool objects.

RETICLE

NOTE

The RETICLE menu item is not available when the CRATOS is placed in CLIPON mode.

Activating the RETICLE menu item displays the Reticle sub-menu as shown.



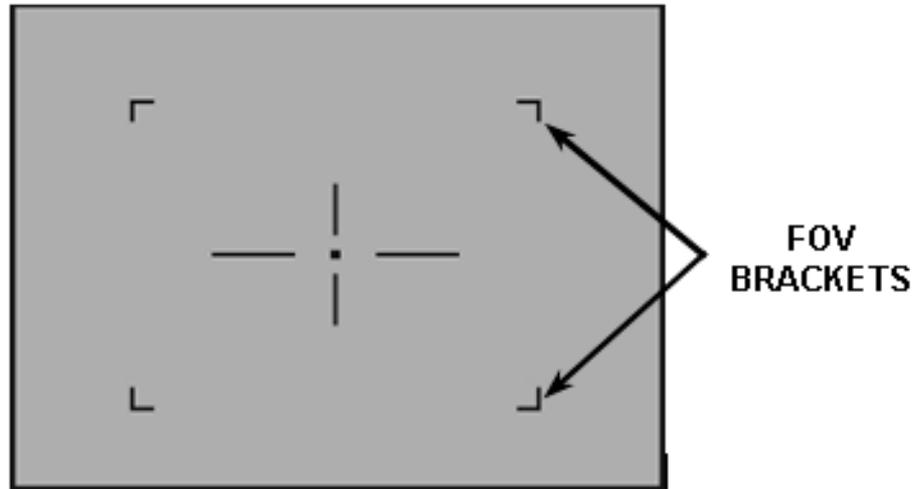
Operating Procedures (continued)



Reticle (continued)

Weapon Reticle

Activating the ON / OFF menu item from the Reticle sub-menu toggles the M4/M16 weapon reticle on or off. When toggled on, the weapon reticle will appear in the eyepiece display as shown. The area bounded by the FOV brackets shows the field of view that will be visible in the eyepiece display when the ZOOM setting is at 2X.



Operating Procedures (continued)



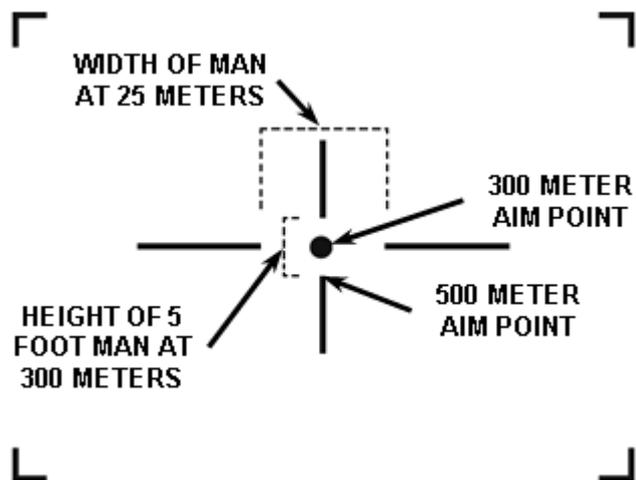
Reticle (continued)

Weapon Reticle (continued)

Aim points and range estimation features of the M4/M16 reticle are shown in Figure 2-20.

CAUTION

If the CRATOS is mounted to a weapon other than an M4/16, the aim points shown below may not be accurate. However, the range estimation features apply to any host weapon.



Operating Procedures (continued)



Reticle (continued)

Adjusting Reticle Position

The ADJ menu item allows for moving the position of the weapon reticle in the eyepiece display as required for the alignment / zeroing procedure described later.

Activating the ADJ menu item from the Reticle sub-menu will cause the Reticle Adjust sub-menu (shown) to appear in the lower left corner of the eyepiece display.



NOTE

Adjustments to the weapon reticle do not affect the laser reticle. The laser reticle always points where the laser is directed and is not adjustable.

With the Reticle Adjust sub-menu displayed, press the UP button to adjust the reticle's elevation, or press the DOWN button to adjust the reticle's azimuth. To switch between azimuth and elevation (or vice versa), press and hold the PWR / MENU button for about one second until the other option is highlighted.

Operating Procedures (continued)



Reticle (continued)

Adjusting Reticle Position (continued)

The minimum adjustment increment is measured in “clicks”. Depending on the ZOOM mode, each press of the UP / DOWN button moves the weapon reticle by a fixed number of clicks.

For example:

- At ZOOM 1X, each button press is 2 clicks (about 0.6 mrad)
- At ZOOM 2X, each button press is 1 click (about 0.3 mrad)

Adjusting the position of the weapon reticle is accomplished as follows:

1. Use the UP / DOWN buttons to adjust the weapon reticle’s position by the desired number of clicks. Holding down either button will auto-scroll in the corresponding direction.
 - The azimuth value can be adjusted up to 160 clicks left or right from its central value of AZ-000. The UP / DOWN buttons move the weapon reticle right / left respectively.
 - The elevation value can be adjusted up to 160 clicks up or down from its central value of EL-000. The UP / DOWN buttons move the weapon reticle downward / upward respectively.
2. After making the desired adjustment, press the PWR / MENU button to return to the Reticle sub-menu, then select EXIT.

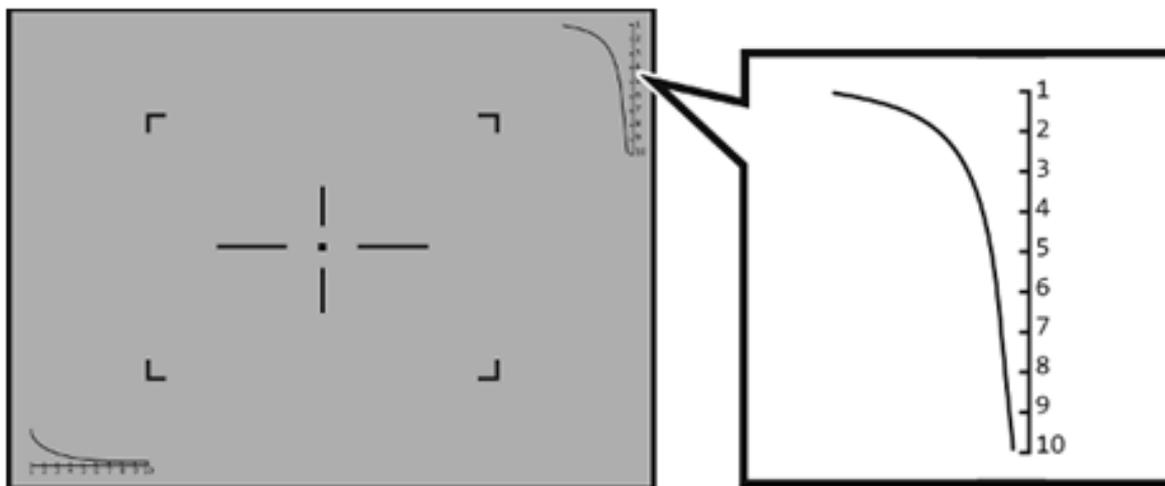
Operating Procedures (continued)



Reticle (continued)

Stadiametric Reticle

Activating the STADIA ON / OFF menu item toggles between these two settings. Activating STADIA ON causes stadiametric scales to appear in the upper right and lower left corners of the eyepiece display as shown. The viewed location and range (1 – 10) of the stadiametric scales will remain the same regardless of ZOOM setting, but the curvature of the scales will change.



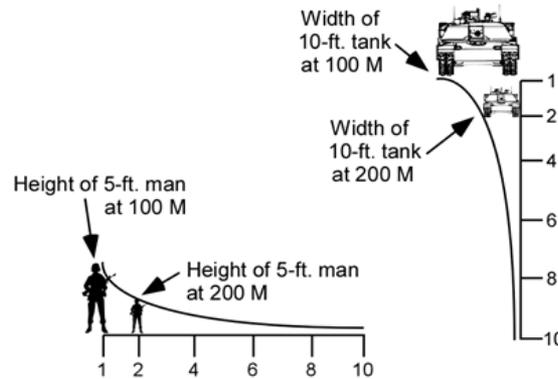
Operating Procedures (continued)



Reticle (continued)

Stadiametric Reticle (continued)

The stadiametric range scale is from 100 to 1,000 meters. The figure below shows the range estimation features of the stadiametric scales.



EXIT

Activating any of the EXIT menu or sub-menu items closes all menus and returns the CRATOS display to normal viewing mode.

Operating Procedures (continued)



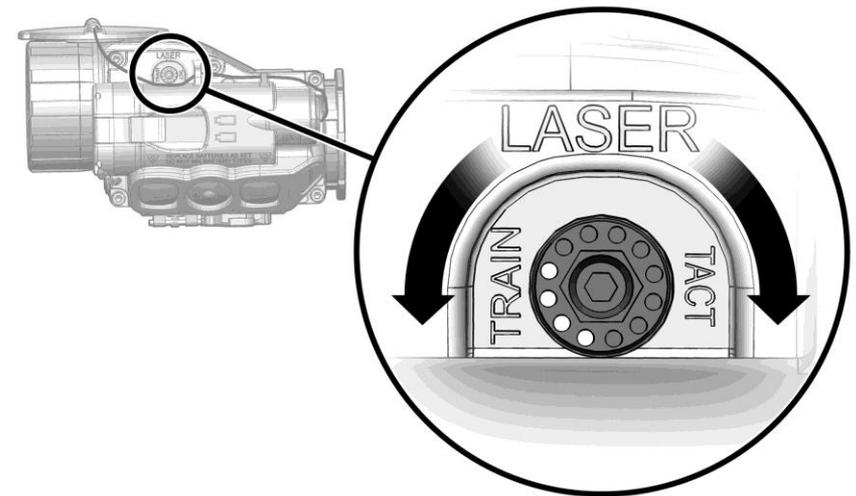
Using the IR Laser Pointer

LASER POWER SETTING

The CRATOS features an IR Laser Pointer that provides a means of marking potential targets in low light or complete darkness for handoff to individuals using night vision devices.

The IR Laser Pointer may be activated in one of two power settings: a low power TRAINING mode or high power TACTICAL mode. White dots around the perimeter of the laser power switch provide a visual indicator of which power setting is selected.

The laser power setting is established by using a 1/8" hex head wrench to turn the laser power switch through its complete range of travel in the desired direction (i.e., TRAINING mode, TACTICAL mode).



Operating Procedures (continued)



Using the IR Laser Pointer (continued)

Laser Activation

WARNING

IR lasers are detectable by an enemy using night vision devices. Detection is easier in smoky, foggy, or rainy conditions. To reduce the risk of detection by an enemy using night vision devices, avoid prolonged activation of the CRATOS' IR Laser Pointer.

Before using the IR Laser Pointer, two steps must first be performed:

- The laser lens cover must be moved (slid) to the open position as shown. When in the closed position, the IR Laser Pointer can still be activated but laser emission will be blocked. The laser lens cover can be opened and closed using fingers or a thumb.



Operating Procedures (continued)



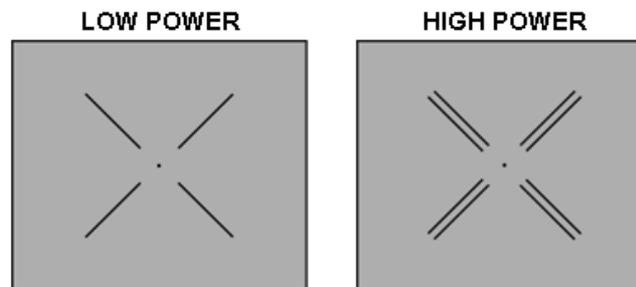
Using the IR Laser Pointer (continued)

Laser Activation(continued)

- The LASER ENABLED menu item must be selected via the Main Menu as described earlier. The IR Laser Pointer cannot be activated with the LASER DISABLED menu item selected.

Once LASER ENABLED is selected via the system menu, one of the following two events will occur, depending on whether the *weapon* reticle described in section 2.26 is displayed:

- If the weapon reticle is OFF, the laser reticle will appear in the eyepiece display. The laser reticle allows the operator to know where the IR Laser Pointer is directed without the need for a night vision device. Note that the laser reticle differs slightly depending on whether the IR Laser Pointer is in the low power (TRAINING) or high power (TACTICAL) setting.
- If the weapon reticle is ON, the laser reticle will NOT immediately appear in the eyepiece display. However, the laser reticle will replace the weapon reticle in the eyepiece display whenever the IR Laser Pointer is activated.



Operating Procedures (continued)

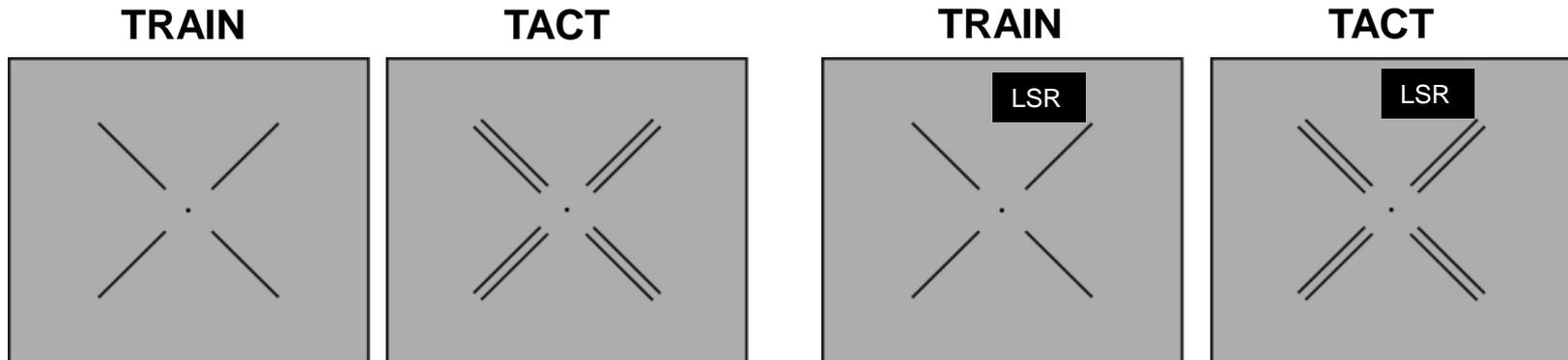


Using the IR Laser Pointer (continued)

Laser Reticle

Once LASER ENABLED is selected via the Main Menu, a co-aligned laser reticle with a dot in the center will appear in the eyepiece display as shown in the first two figures. The laser reticle allows the operator to know where the IR Laser Pointer is directed without the need for a night vision device. Note that the laser reticle differs slightly depending on whether the IR Laser Pointer is in the training (TRAIN) or tactical (TACT) setting.

When the Laser Pointer is activated, the text LSR will appear above the laser reticle as shown in the second two figures.



Operating Procedures (continued)

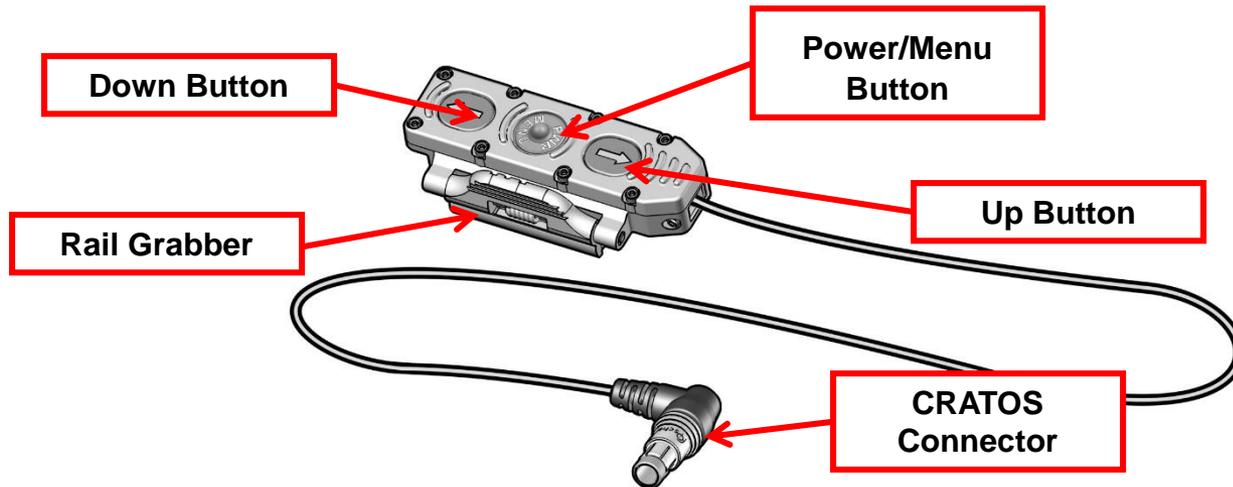


Remote Cable Switch

REMOTE CABLE SWITCH FEATURES

The Remote Cable Switch allows for fingertip control of the CRATOS without altering the operator's grip on the weapon. Buttons on the Remote Cable Switch function identically to those on the CRATOS keypad with the following exceptions:

- The CRATOS cannot be powered on by using the Remote Cable Switch;
- Simultaneously pressing the UP / DOWN buttons activates the IR Laser Pointer (if LASER ENABLED is selected via the Main Menu) until one or both of the buttons are released.



Operating Procedures (continued)



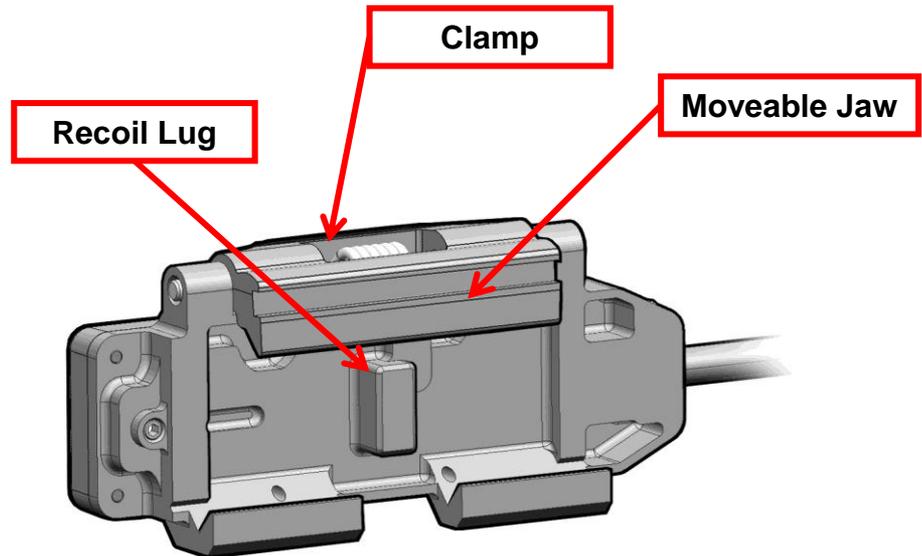
Remote Cable Switch (continued)

REMOTE CABLE SWITCH INSTALLATION

The Remote Cable Switch features an integral rail grabber that is designed for attachment to any weapon with a MIL-STD-1913 rail. Connecting the Remote Cable Switch to the CRATOS and mounting it to the rail are best performed with the CRATOS (and day optic) already mounted to the weapon as described.

Remote Cable Switch Rail Grabber Bracket.

The Remote Cable Switch may be mounted to any of the weapon rails according to the operator's preference. It is designed to accommodate both left and right hand shooters.



Operating Procedures (continued)



Remote Cable Switch (continued)

Mounting the Remote Cable Switch

Regardless of which weapon rail is being used, the Remote Cable Switch should be mounted so that the UP button is closest to the muzzle of the weapon. This ensures that the orientation of the Remote Cable Switch buttons mimic those of the CRATOS keypad.

WARNING

Be sure the weapon is CLEAR and SAFE and the laser lens cover is closed before proceeding.

1. Position the Remote Cable Switch with the recoil lug aligned with the desired recoil groove of the weapon's rail.
2. Hook the moveable jaw of the Remote Cable Switch on the edge of the weapon rail.
3. Squeeze the clamp of the Remote Cable Switch to open the jaws and "roll" the Remote Cable Switch onto the weapon rail until it clicks into place and is firmly secured.

Connecting the Remote Cable Switch

CAUTION

When the Remote Cable Switch is plugged into the remote jack, it automatically locks in place. To prevent damage to the cable connector, do not twist or rotate once inserted. To disconnect it, pull straight back on the cable connector's sleeve. Do not pull on the cable itself.

Operating Procedures (continued)

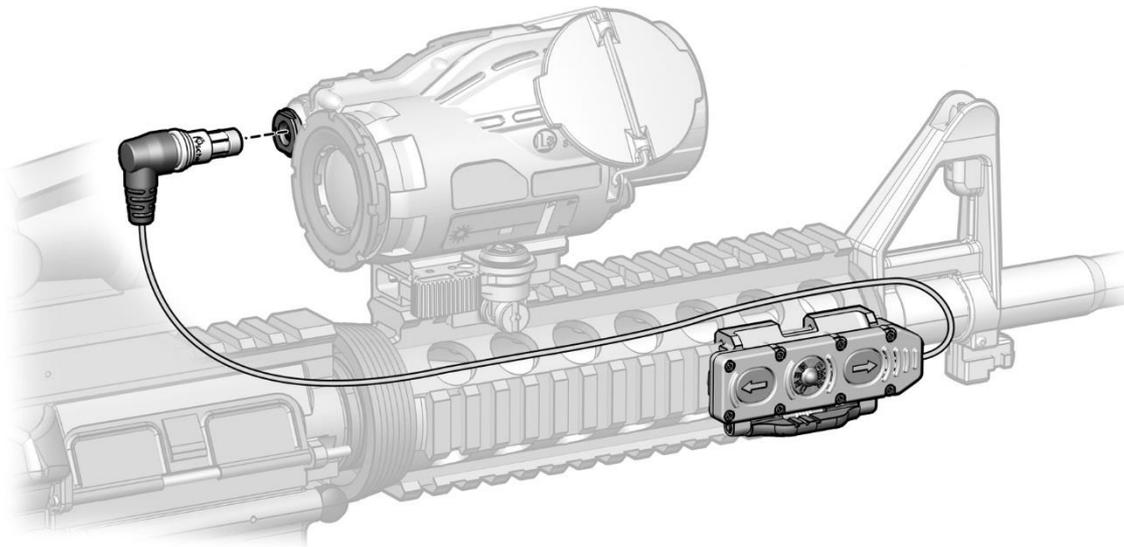


Remote Cable Switch (continued)

NOTE

The CRATOS ships with a jack plug installed in the remote jack that must be removed and stored before installing the Remote Cable Switch.

1. Feed the loose end of the Remote Cable Switch to the CRATOS so that the cable does not obstruct the operator's sight picture, interfere with the proper functioning of the weapon, or create a snag hazard.
2. Align the white dots on the CRATOS connector with the white dots on the CRATOS remote jack. Carefully push the connector into the remote jack.



Operating Procedures (continued)



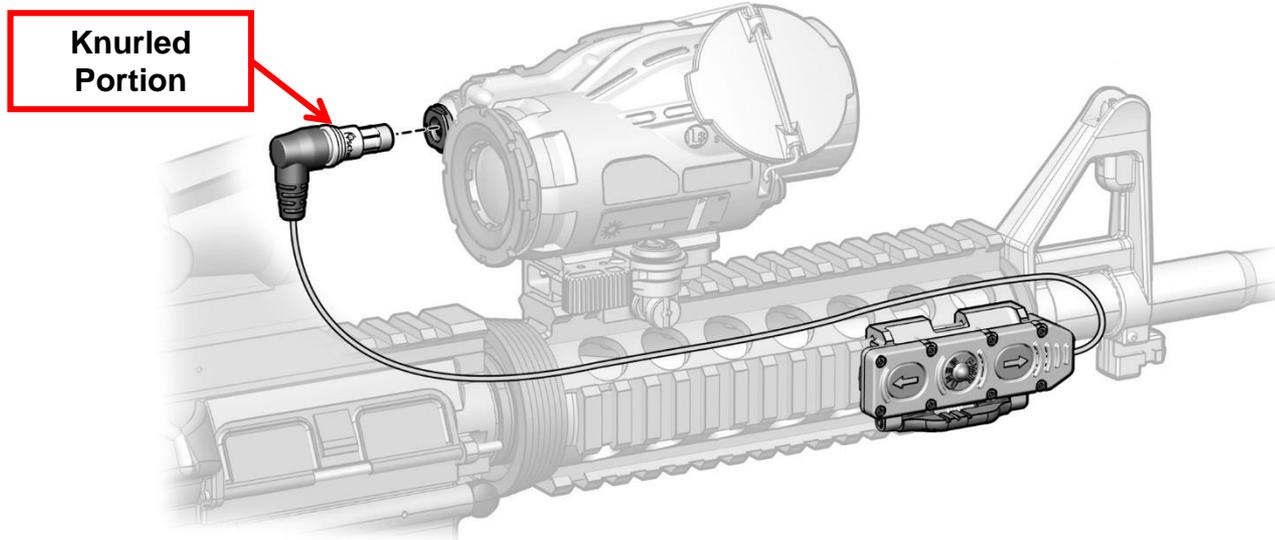
Remote Cable Switch (continued)

Removing the Remote

CAUTION

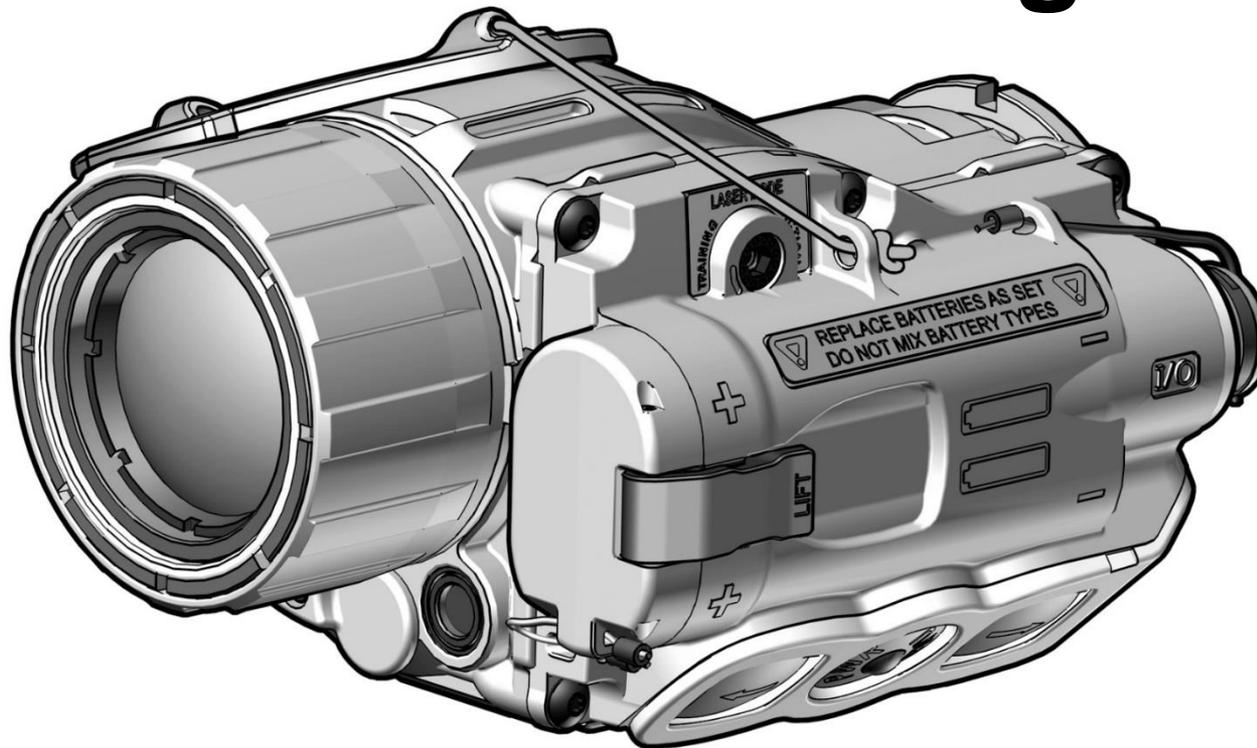
Do not pull on the cable itself when removing the remote jack from the CRATOS connector.

Using two fingers grasp the knurled portion of the remote jack and pull back and it will release it from the CRATOS connector. If you pull on the plastic portion of the remote jack itself it will not release and you could potentially damage the remote or the connector.





Maintenance and Troubleshooting



Maintenance and Troubleshooting



Troubleshooting

Troubleshooting

The procedures below will help correct some of the basic problems that may arise with the CRATOS. If the equipment malfunction is not listed, or the actions listed do not correct the fault, refer to section 3.4 of your Technical Manual (TM) for additional guidance.

Symptom	Malfunction	Corrective Action
1. No display is present upon start-up.	a. Batteries not properly installed.	a. Ensure batteries are properly installed (section 2.2).
	b. Battery capacity is depleted.	b. Replace batteries with fresh batteries (section 2.2).
	c. Battery compartment and/or battery cover contacts corroded.	c. Clean battery compartment and battery cover contacts (section 3.2).

Maintenance and Troubleshooting (continued)



Troubleshooting

Symptom	Malfunction	Corrective Action
2. Display is ON but no thermal image is displayed.	a. Lens cover is installed over the thermal objective lens.	a. Flip objective lens on top of CRATOS housing.
	b. CRATOS requires calibration.	b. Perform a calibration of the CRATOS (section 2.16).
	c. Thermal brightness, gain, and/or objective focus settings are improperly adjusted.	c. Perform startup procedures (section 2.10).
3. Reticle or other display symbology is not visible.	Display brightness setting is too low.	Adjust DIMMER setting via Main Menu (section 2.24).

Maintenance and Troubleshooting (continued)



Troubleshooting

Symptom	Malfunction	Corrective Action
4. Poor or degraded thermal image.	a. Eyepiece and/or thermal objective lens obscured by dirt, dust, or grime.	a. Clean objective lens and eyepiece (section 3.2).
	b. CRATOS requires calibration.	b. Initiate a calibration of the CRATOS (section 2.16).
	c. Thermal brightness, gain, and/or objective focus settings are improperly adjusted.	c. Perform startup procedures (section 2.10).
5. IR Laser Pointer appears weak or is not visible down range.	a. Laser lens cover is closed.	a. Open laser lens cover (section 2.32).
	b. Laser port obscured by dirt, dust, or grime.	b. Clean the laser port (section 3.2).
	c. LASER DISABLED is selected in Main Menu.	c. Select LASER ENABLED via Main Menu (section 2.23).
	d. Viewed scene is outside effective range of IR Laser Pointer.	d. Limit use of IR Laser Pointer to viewed scenes within a few meters of the CRATOS.

Maintenance and Troubleshooting (continued)



Troubleshooting

Symptom	Malfunction	Corrective Action
6. "BIT" appears on the upper left side of the eyepiece display.	System hardware or circuitry error.	Cycle power. If symptom persists, refer to section 3.4.
7. "ERROR: X" appears in the eyepiece display.	a. ERROR: 9 indicates memory storage capacity for pictures is full.	a. Delete stored picture(s) (section 2.22).
	b. System software or circuitry error.	b. Cycle power. If symptom persists, refer to section 3.4.

Maintenance and Troubleshooting (continued)



Preventive Maintenance

WARNING

- Prior to performing any inspection or maintenance procedure, verify that the batteries are not installed.
- Remove the CRATOS from the weapon before inspecting, cleaning, or performing other maintenance functions.
- Isopropyl alcohol is flammable and toxic. To avoid injury, keep away from open fire and use in a well ventilated area.

The operator should inspect the CRATOS before each use and after it has been in extreme conditions, such as prolonged exposure to intense temperatures. The following procedures will extend the life of the CRATOS and help ensure safe operation.

CRATOS Housing

Inspect the CRATOS housing for any signs of damage including cracks, missing parts, and any other visible defects. Rinse the CRATOS housing with water or mild soap and water and then wipe dry with a soft cloth. Clean around buttons and housing details with a cotton swab.

Maintenance and Troubleshooting (continued)



Preventive Maintenance (continued)

Battery Compartment

Inspect the battery compartment for dirt, dust, or corrosion. Dirt or debris that cannot be shaken loose from the battery compartment may be removed using a cotton swab. If necessary, clean battery contacts with a cotton swab and isopropyl alcohol.

Battery Cover

Inspect the battery cover for dirt, sand, and grime. Thoroughly clean the battery cover and o-ring by rinsing with water and wiping with a cotton swab. Periodically lubricate the o-ring with fluorinated grease. If necessary, clean battery contacts with a cotton swab and isopropyl alcohol.

Optical Surfaces

Inspect optical surfaces for dirt, dust, and grime. Remove any large particles or loose dirt using air or a soft cloth. Fine cleaning of the optical surfaces should be performed using the provided lens cleaning cloth. Clean water, isopropyl alcohol, or lens cleaner may be used to remove stubborn stains. Avoid using excessive force as this may scratch the lenses.

Maintenance and Troubleshooting (continued)

Preventive Maintenance (continued)

Remote Jack

Inspect the remote jack for corrosion, dirt and damage. Gently remove any large particles of foreign matter and clean the contacts with a cotton swab and isopropyl alcohol.



Maintenance and Troubleshooting (continued)



Corrective Maintenance

The SRF has no internal parts or assemblies replaceable by the operator or organizational level personnel. See section 3.4 for guidance regarding maintenance and/or repair actions beyond those described in this manual.

WARNING

- Prior to performing any inspection or maintenance procedure, verify that the batteries are not installed.
- Remove the CRATOS from the weapon before inspecting, cleaning, or performing other maintenance functions.

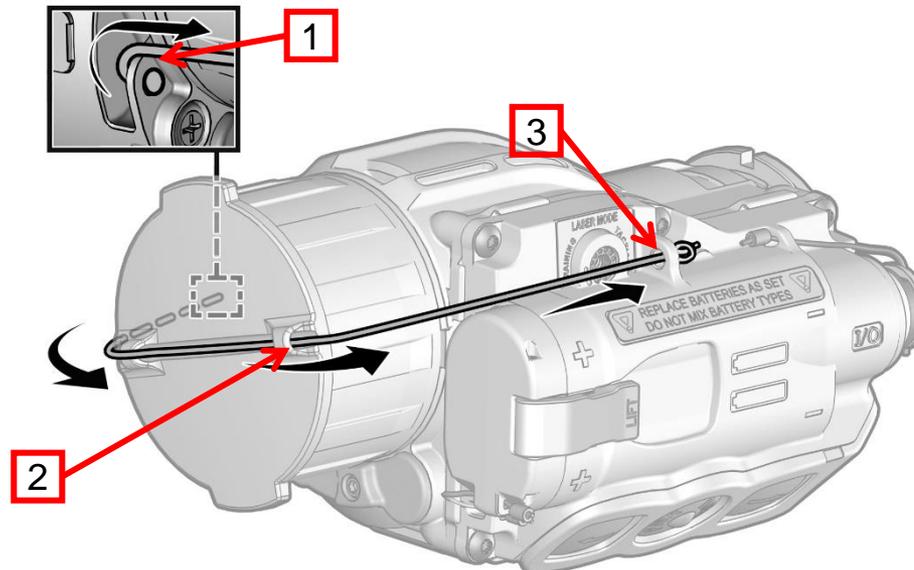
Maintenance and Troubleshooting (continued)



Corrective Maintenance

Replacing Retaining Lanyard

1. Feed the retaining lanyard through the eyelet on the CRATOS housing (1). Pull the lanyard all the way through the eyelet so that the stopper on the end of the lanyard rests against the eyelet.
2. Feed the lanyard through the eyelets on the lens cover (2).

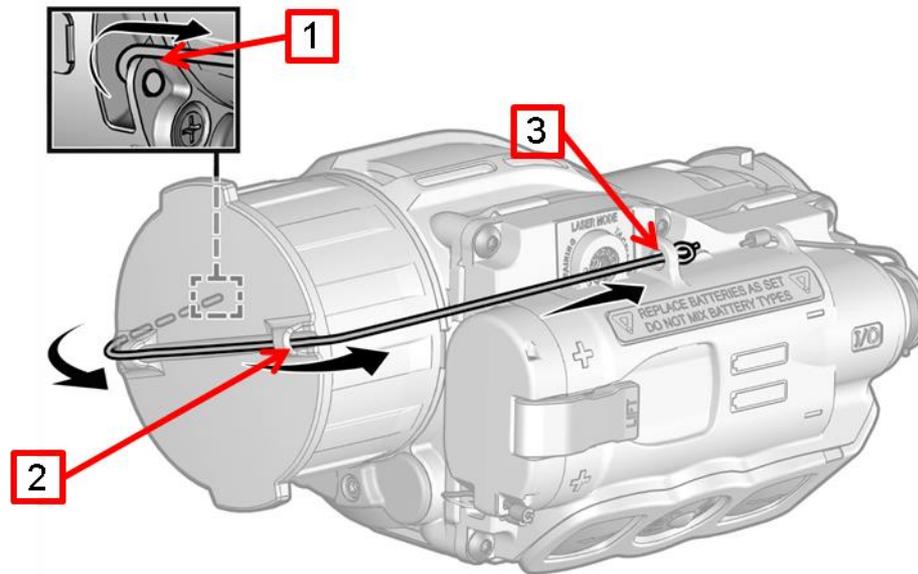


Maintenance and Troubleshooting (continued)



Corrective Maintenance Procedures

3. Feed the lanyard through the eyelet on the other side of the CRATOS housing (3). Secure the lanyard in place with a half knot.
4. Pull back on the lanyard so that the half knot is snug against the CRATOS housing.
5. Use scissors or a similar tool to snip off the excess (unused) length of the lanyard.



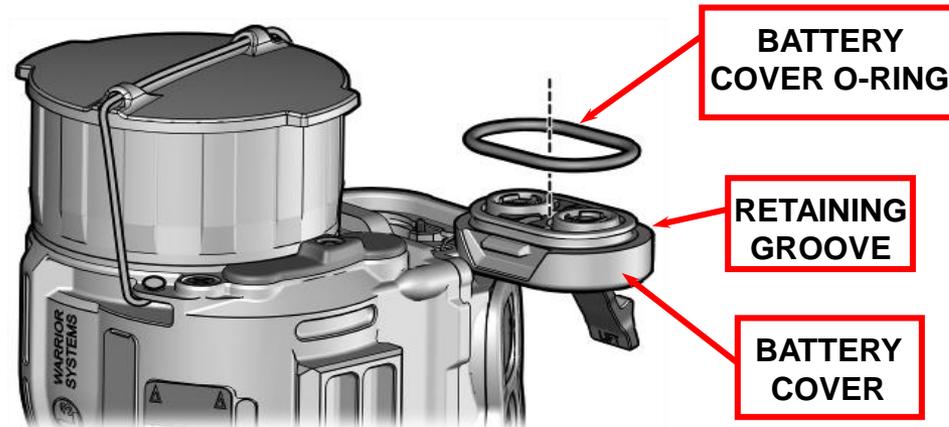
Maintenance and Troubleshooting (continued)

Corrective Maintenance Procedures



Replacing Battery Cover O-Ring

1. Review the figure to gain familiarity with components that are referred to throughout this procedure.



2. Open the battery cover as earlier.
3. Use fingers to pull the battery cover o-ring out of its retaining groove.
4. Use a cotton swab dipped in isopropyl alcohol to clean the retaining groove of any dirt, grease, or debris.
5. Install the replacement battery cover o-ring into the retaining groove.
6. Replace and close the battery cover as described earlier.

Maintenance and Troubleshooting (continued)



Corrective Maintenance Procedures

Replacing Battery Cover Lanyard

1. If present, cut the wire lanyard and remove it from the battery cover and CRATOS housing.
2. Slide a metal sleeve about 1/16" over one end of the replacement wire lanyard and use pliers to crimp in place.
3. Feed the wire lanyard through the holes in the battery cover and CRATOS housing as shown.
4. Slide a second metal sleeve about 1/16" over the free end of the wire lanyard and use pliers to crimp in place.



Maintenance and Troubleshooting (continued)



Corrective Maintenance Procedures

Replacing Battery Cover

1. If present, cut the wire lanyard and remove it from the battery cover and CRATOS housing.
2. Open the battery cover as described earlier and remove it from the CRATOS housing.
3. Install a new o-ring in the retaining groove of the replacement battery cover as shown.
4. Replace and close the battery cover as described earlier.
5. Install a new battery cover lanyard as described previously (see Replacing Battery Cover Lanyard).

Replacing Remote Jack Plug Lanyard

1. If present, cut the wire lanyard and remove it from the remote jack plug and CRATOS housing.
2. Slide a metal sleeve about 1/16" over one end of the replacement wire lanyard and use pliers to crimp in place.
3. Feed the wire lanyard through the holes in the remote jack plug and CRATOS housing as shown in the next slide.

Maintenance and Troubleshooting (continued)



Corrective Maintenance Procedures

Replacing Remote Jack Plug Lanyard (continued)



4. Slide a second metal sleeve about 1/16” over the free end of the wire lanyard and use pliers to crimp in place.

Replacing Remote Jack Plug

1. If present, cut the wire lanyard and remove it from the remote jack plug and CRATOS housing.
2. If present, pull the remote jack plug free from the remote jack.
3. Insert a new remote jack plug into the remote jack.
4. Install a new remote jack plug lanyard as described previously (see Replacing Remote Jack Plug Lanyard).

Service / Packing and Unpacking



Return Instructions

For service, repair, or replacement information refer to Section 3.4 of your Technical Manual (TM) under Service / Packing and Unpacking. Here you will find warranty / non-warranty information, an email address, and a phone number that will put you in contact with customer service to answer any question that you may have.