CQT

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Operations Manual

CQT

Close Quarters Thermal Sight

OPERATIONS MANUAL
CQT | Close Quarters Thermal Sight

Part # 9510

Close Quarters Thermal Sight Operations Manual P/N 9510-OG

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SAFETY SUMMARY

How to Use the Operations Manual

The CQT Operations Manual provides information on the use and care of the system. To prevent damage to the unit or injury to personnel, all users should follow the operating instructions. Prior to performing tasks with the CQT, all users should review and understand the Warnings, Cautions, and Notes throughout the document. Keep this manual for future reference.

WARNINGS, CAUTIONS, AND NOTES

Safety headings are used throughout the manual to alert users to important operations information.

WARNINGS

Identifies a critical procedure or practice that, if not followed properly, could result in the death, injury, or long-term health problems of operators.

CAUTIONS

Identifies a critical procedure or practice that, if not followed properly, could result in the damage or destruction of equipment or loss of mission effectiveness.

NOTES

Identifies a critical procedure or practice.

SAFETY PRECAUTIONS

There are several safety precautions that should be taken when using the CQT, including:

WARNING
Use only CR123A lithium batteries.

BATTERY SAFETY

- Turn off equipment if the battery compartment becomes hot. Wait until batteries have cooled before removing them.

- Risk of Fire: DO NOT carry batteries in pockets containing metal objects like coins or keys. Metal objects can cause the batteries to short circuit and become hot.

- Always remove discharged batteries from the device to prevent corrosion damage.

- Batteries should be removed from equipment when not in use, during transportation or before it is sent back for repair.

- DO NOT heat, puncture, disassemble, short circuit, attempt to recharge or otherwise tamper with Lithium batteries.

- DO NOT use a defective battery or batteries with different states of charge. The stronger battery may try to charge the weaker battery resulting in thermal issues.

NOTE : If the CQT shuts off due to low battery power, replace the batteries.

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CHAPTER 1: INTRODUCTION
SECTION I: GENERAL INFORMATION

1.1 Scope
This Operations Manual is intended for use by operators of the CQT. The manual provides system information, operational procedures and maintenance responsibilities. Users are urged to read the Operations Manual prior to using the CQT to ensure safe operation and maximum effectiveness of the product.

1.2 Equipment Name
Close Quarters Thermal Sight

1.3 Manufacturer
Steiner Optics, Inc.
331 East 8th St.
Greeley, CO 80631
www.steiner-optics.com
Tel: (888) 550-6255

1.4 Technical Specifications

TABLE 1-1. TECHNICAL SPECIFICATIONS

DETECTOR	
Detector Type	320 x 256 resolution, 12 um pixels, uncooled VOx microbolometer
Spectral Band	Long wave infrared 8-14 um
NETD	60 mK

OPTICAL CHARACTERISTICS	
Objective Lens	18 mm focal length, 1X optical magnification
Focus	Factory focused: effective at ranges from 5 m to infinity
Eye Relief	80 mm @ 12° thermal HFOV, fixed diopter
Thermal Field of View	12.2° (H) x 9.8° (V)
Beam Combiner	32 mm x 23 mm

DISPLAY	
Microdisplay	High brightness green OLED, SVGA (800 x 600)

PHYSICAL CHARACTERISTICS	
Weight (with batteries)	595 g
Size	133 mm x 76.2 mm x 76.2 mm

POWER SUPPLY	
Battery Type	(2) CR123A batteries
Battery Operating Time	Thermal run time: 8 hours Red dot run time: >1000 hours

ENVIRONMENTAL	
Operating Temperature	-40°C to +70°C
Shock	1000 G's
Immersion	20 m for 2 hours

IMAGING	
Frame Rate	60 Hz
Digital Zoom	1X, 2X, 3X, and 4X
Thermal Modes	Off, Outline, Full, Gradient

ADVANCED FEATURES	
Digital Reticle	Crosshair, Crosshair+Dot, Crosshair+Circle, Dot, Box Dot, None

RED DOT	
Aiming Point	2.5 MOA red dot, separately zeroed
Red dot adjustment click value	0.44 mrad / 1.5 MOA
Red dot horizontal adjustment range	+/-23 clicks, +/-10.0 mrad, +/-34.5 MOA
Red dot vertical adjustment range	+/-15 clicks, +/-6.5 mrad, +/-22.5 MOA
Red dot adjustment type	flat head screw click adjuster

DETECTION RANGE: MAN	
Detection	400 m
Recognition	222 m
Identification	145 m

DETECTION RANGE: VEHICLE	
Detection	1080 m
Recognition	600 m
Identification	475 m

1.5 System Description

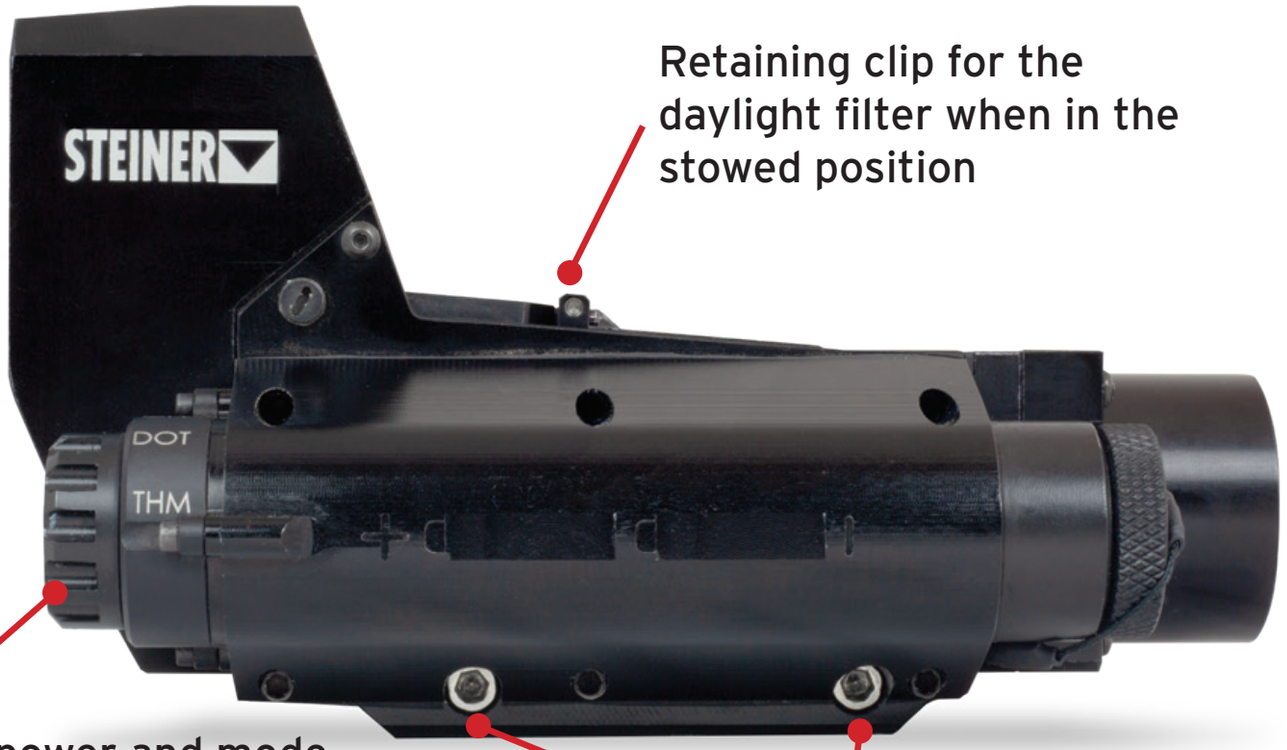

FIGURE 1-1. CONTROLS & FEATURES

FIGURE 1-1. CONTROLS & FEATURES (CONT'D)

1.5 System Description (continued)

The Close Quarters Thermal (CQT) sight is a 1X magnification combination red dot and fused thermal imaging device intended for rifle mounting.

It combines the functionality of a precision 2.5 MOA red aiming dot with a heads-up display thermal imager. Afocal optics with a large eye box and long eye relief ensure the red dot is always on target regardless of eye position behind the sight. The same afocal optics and large viewing window overlay thermal imagery on top of the operator's direct view of the target area.

The operator can rapidly toggle between three thermal modes and no thermal: off, outline, full, and gradient. **Outline** is especially good at highlighting warm objects in the scene without obstructing the operator's direct view of them. **Full mode** enhances warm objects in the scene improving the operator's ability to quickly detect targets hidden by camouflage, brush or the tree line, or obscured by smoke or fog without cluttering the sight with thermal imagery of the terrain and background. **Gradient** mode enables target detection and engagement and situational awareness in low light and dark conditions.

The thermal can also be turned off making the CQT a high performance red dot sight with long battery life. To extend battery life significantly, the rotary switch must be in the "DOT" position.

CHAPTER 2: OPERATING INSTRUCTIONS

2.1 Battery Handling and Installation

The CQT uses two CR123A lithium ion batteries. Insert the batteries positive terminals first.

Push the cap against the battery stack to compress the spring then turn clockwise to tighten it down.

2.2 Mounting to Rail

Align as far back on the top rail as possible with the two bolts passing through slots. Tighten each bolt to 12 in-lbs.

2.3 Unit Activation

To turn the unit on, rotate the switch on the back of the unit from "OFF" to either "DOT" or "THM". "DOT" powers the red aiming dot only. "THM" powers the red dot, thermal imager, and head up display.

In "DOT" mode, the red dot will turn on immediately. In "THM" mode, the red dot flickers at the beginning. After about 6 seconds, the display will turn on and the red dot will become steady.

NOTE: If the red dot is not visible when the CQT is turned to "DOT" mode, the dot brightness may just be set low. Press and release the

up button several times to increase red dot brightness. If the display or electronic reticle is not visible when the CQT is turned to "THM", either the reticle may be turned off or the display brightness may be set very low. Press and release the up button several times to increase display brightness.

NOTE: It takes about 4 seconds for the display to turn on when the switch is rotated to "THM".

2.4 Adjusting Red Dot Brightness

When the rotary switch is in the "DOT" position, the up button increases red dot brightness and the down button decreases it. There are 12 brightness levels. When the lowest brightness level is reached (level 1), subsequent presses of the down button have no effect. When the highest brightness level is reached (level 12), subsequent presses of the up button have no effect. The red dot brightness returns to the set level even if the power is turned off or the batteries are changed. Pressing the center, forward, or rear buttons in "DOT" mode has no effect.

Turning the rotary switch to "THM" turns on the thermal camera and head up display. Text and graphics are only present in "THM" mode, not "DOT" mode. Before entering the menu system, the keypad functions as shown in Figure 2-1.

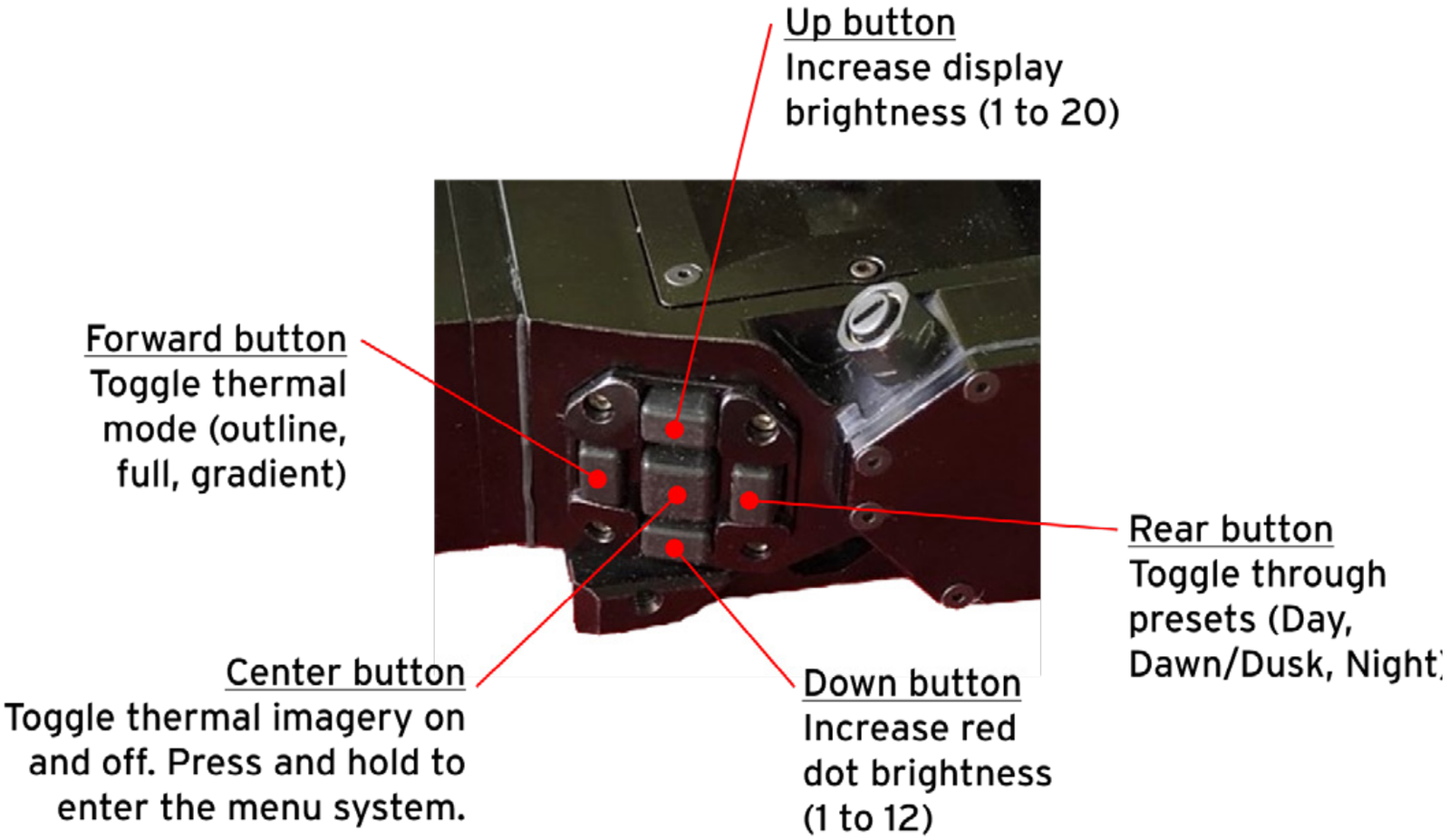

FIGURE 2-1. OPERATIONAL MODE KEYPAD FUNCTIONS

2.5 Operational Mode

When the CQT is first turned to "THM" mode, it is in "operational" mode and the keypad has the functions shown in Figure 2-1.

The forward button toggles through the three thermal modes. The up button increases display brightness. After reaching maximum brightness (level 20), it restarts at minimum brightness (level 1).

The down button increases red dot brightness. After reaching maximum brightness (level 12), it restarts at minimum brightness (level 1).

The center button toggles the thermal imagery on and off.

The rear button toggles through three setups (day, dawn/dusk, and night). Each setup has four customizable settings for brightness, thermal mode, and reticle.

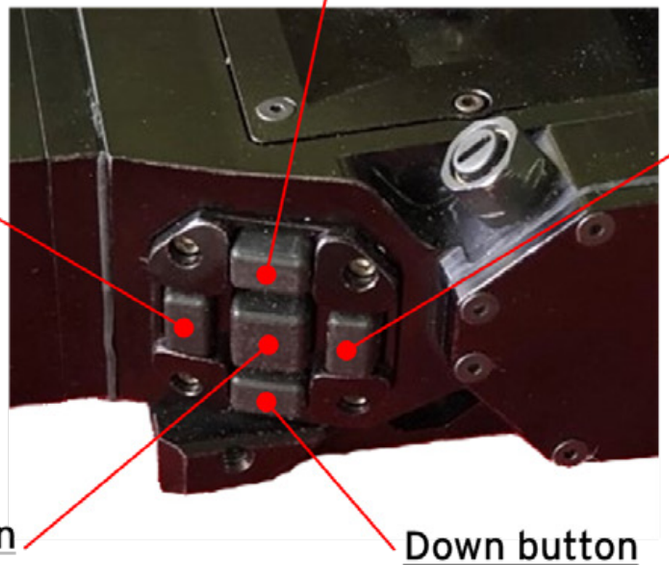

FIGURE 2-2. MENU MODE KEYPAD FUNCTIONS

2.6 Menu System

When the rotary switch is turned to "THM", press and hold the center button for 2 or more seconds to enter the menu system. (To exit the menu system, press and hold the center button for 2 or more seconds at any time.) When the menu system is on, the keypad has the functions shown in Figure 2-2. The forward button toggles up through menu headings and the rear button toggles down through menu headings.

The first five menus are "quick" menus. The rest are "full." "Quick" menus have a single variable. In "quick" menus, the up and down buttons change the single variable's setting or value. "Full" menus contain more than one action or editable variable. In "full" menus, the menu name is displayed with the current variable or action below it. For example:

<Zero/Align Config Menu>
Image Pos (15,-4)

In a "full" menu, pressing the up or down buttons cycles through variables/actions within a menu. Pressing the center button either performs the listed action or enters edit mode for the displayed variable. In edit mode, the variable to be edited is underlined. Pressing up or down changes the value. For some variables, press left or right to move the underline to another digit. Note that "Image Pos" and "Reticle Pos" operate a little differently. See

Section 2.13 for details. To exit edit mode, press the center button; the underline will disappear.

Exit the menu system from anywhere by pressing and holding the center button for more than 2 seconds.

Table 2-1 lists all menus.

NOTE: Not all menus listed in Table 2-1 may be visible at first. To see the full list of menus, navigate to the System Info Menu then to "Advanced Mode Enable". Press and release the center button to make the additional advanced menus visible. See Section 2.9 for more information

TABLE 2-1. MENU LIST

MENUS	
NAME	**FUNCTION**
Reticle[1]	Toggle through reticle styles
Suppressor[1]	Turn suppressor mode on and off
Zoom[1]	Toggle through 1X, 2X, 3X, and 4X thermal magnification
Brightness[1]	Adjust display brightness up or down
Red Dot[1]	Adjust red dot brightness up or down
Preset	Customizes the settings for each preset
Zero/Align Config Menu	Aligns thermal image and electronic reticle
System Info Menu	Displays revision info, reset factory default settings, enable/disable advanced menus
Red Dot Config Menu[2]	Fine tunes red dot brightness levels
Brightness Config Menu[2]	Fine tunes display brightness levels
Thermal Mode Menu[2]	Adjusts thermal image parameters
Debug Menu[2]	Troubleshooting

NOTE[1]: Quick Menu
NOTE[2]: This menu is only visible if advanced menus are enabled from the System Info menu.

2.7 Reticle Menu

The up and down buttons toggle through electronic reticles:

- "XHair" (cross hairs)
- "XHair 3D" (cross hairs that are more visible when overlain on thermal images)
- "XHair 3D Wide" (fatter version of XHair 3D)
- "Dot 3D" (small circle that is visible when overlain on top of a thermal image)
- "XHair+Dot" (partial cross hairs and a center dot)
- "XHair+Circle" (partial cross hairs and center aiming circle)
- "Box Dot" (square and center dot)
- "Dot" (center dot)
- "None" (no reticle)

2.8 Suppressor Menu

Enable suppressor mode when a hot barrel or suppressor is within the field of view. It stops the heat from affecting the automatic gain control (AGC) and potentially degrading the quality of the thermal image.

2.9 Zoom Menu

When "Zoom" is displayed, pressing the up button increases electronic zoom of the thermal image. Pressing the down button decreases electronic zoom. There are 4 zoom levels: 1X, 2X, 3X, and 4X.

2.10 Brightness Menu

When "Brightness" is displayed, pressing the up button increases display brightness and pressing the down button decreases it. There are 20 levels from 1 to 20. The brightness level is retained if the unit is powered off or if the batteries are changed.

2.11 Red Dot Menu

When "Red Dot" is displayed, pressing the up button increases red dot brightness and pressing the down button decreases it. There are 12 levels from 1 to 12. The brightness level is retained if the unit is powered off or if the batteries are changed.

2.12 Preset Menu

For all the "full" menus, the menu title is displayed at the top in the form "<Menu Title>."

The first variable in the preset menu is displayed on the second line. This menu enables the user to customize the settings within each of the three presets: Day, Dawn/Dusk, and Night. Display brightness, red dot brightness, thermal mode, and reticle type can be modified.

2.13 Zero/Align Config Menu

There are two variables in the Zero/Align Config Menu: "Image Position" and "Reticle Position." Press the up or down buttons to toggle between the two variables. Press the center button to select a variable. When selected, the (x, y) coordinates will be underlined. Now pressing the up button moves the image or reticle up; pressing the down button moves things down; pressing the forward button moves things left; pressing the rear button moves things right. A single press and release moves one pixel. Press and hold to move continuously. Press the center button again to exit edit mode. Adjust the image first then the reticle. .

2.14 System Info Menu

This menu has three entries. "FW Version" displays the revision number of the current loaded firmware. "Reset All Defaults" restores the CQT to its original factory state. Clicking the center button initiates this action. The screen will go dark for a second or two, "Done" will be briefly displayed to the right indicating that the reset is complete, and the unit will automatically exit the menu system, putting the unit in operational mode. "Advanced Mode" displays either "ENABLE" or "DISABLE". If it says "ENABLE", then clicking the center button and then clicking the center button again to confirm causes the advanced menus to be accessible. If it says "DISABLE", clicking the center button hides those menus.

2.15 Red Dot Config Menu (Advanced)

This menu has 3 entries: “Index”, “Gain” and “PWM”.

“Index” is the red dot brightness level from 1 to 12. “Gain” sets the current supplied to the red dot source LED for the current index value. There are two values; 1 sets the current low for dim red levels; 0 sets the current high for brighter red dot levels.

“PWM” defines the duty cycle of the pulse width modulation of the red dot LED current supply for the current index value. PWM can be set to any integer between 0 and 65535. Low values make the red dot dimmer. High values increase red dot brightness.

See Red Dot Config Menu, Table 2-2.

TABLE 2-2. RED DOT CONFIG MENU

RED DOT CONFIG MENU	
VARIABLE	**DESCRIPTION**
Index	User adjustable brightness level from 1 to 12
Gain	0 for high brightness levels; 1 for low brightness levels
PWM	0 to 65535. Lower values dim the red dot. Higher values increase brightness.
Reset Defaults	Restore the factory defaults for each of the 12 index levels.

2.16 Brightness Config Menu (Advanced)

The variables in this menu are listed below in Table 2.3. Index is the user configurable brightness level from 1 to 12. The other variables adjust each of those 12 brightness levels.

TABLE 2-3. BRIGHTNESS CONFIG MENU

BRIGHTNESS CONFIG MENU	
VARIABLE	**DESCRIPTION**
Index	User adjustable brightness level from 1 to 12
Brightness	Increases or decreases the 8 bit greyscale value for text and graphics from 0 to 255. This is best left at the factory default of 127 for all conditions.
Max Illuminance	Sets the maximum power that can be supplied to the OLED display. The value range is 0 to 223. This is best left at the factory default of 223 for all conditions.
Dimming Control	Modulates the power supplied to the OLED display. The value range is 0 to 127. Higher values are brighter.
Row Reset	Sets the pulse width modulation duty cycle to dim the display. Used for NVG settings. The value range is 1 to 255. 1 is the dim-mest possi-ble setting; 255 is 100% duty cycle (no modulation) and therefore the brightest. There is a bug where a value of 0 has the same effect as 255.
Reset Defaults	Restores factory default values for each of the 20 index levels.

2.17 Thermal Mode Menu (Advanced)

This menu contains the parameters that configure each of the thermal modes: outline, full, and gradient. Outline mode is especially good at highlighting warm objects in the scene without obstructing the operator's direct view of them. Full mode improves the operator's ability to quickly detect warm targets in camouflage, hidden in brush or the tree line, or obscured by smoke or fog without cluttering the sight with thermal imagery of the terrain and background. Gradient mode enables target detection and engagement and situational awareness in low light and dark conditions. The thermal can also be turned off, making the CQT a high performance red dot sight with long battery life. Table 2-4 below gives a brief explanation of each of the parameters.

TABLE 2-4. THERMAL MODE MENU

THERMAL MODE MENU	
VARIABLE	**DESCRIPTION**
Thermal Mode	OFF, Outline, Full, Gradient
Contrast	Difference in grayscale brightness between the coldest and warm-est objects in the scene—values from 0 to 255
Gamma	A parameter that essentially redis-tributes available grayscale values to improve contrast and reproduction of detail—values from 0.50 to 4.00

Table continues on next page

THERMAL MODE MENU CONTINUED	
VARIABLE	**DESCRIPTION**
Linear Percent	Higher values temper the automatic gain by allocating the 255 gray levels more evenly between the coldest and warmest objects in the scene.—values from 1 to 100
Outliers Cut	Reduces random noise, sometimes at the expense of detail representation—values from 0 to 49
Max AGC Gain	Maximum amount by which the al-gorithm tries to increase contrast in the image—values from 0.25 to 8.00
Damping Factor	Slows gain changes due to changes in the scene. Smooths out video over time.—values from 0 to 100
Detail Head	Higher values reserve more gray-scale values for the warmest objects in the scene.—values from 0 to 127
DDE	Digital Detail Enhancement - higher values enhance the display of small details - values from 0.00 to 6.00
Plateau Value	Limits the number of grayscale lev-els assigned to large uniform areas in the image thereby saving more grayscale values for small-er details—values from 1 to 100
Smoothing Factor	Higher values allocate more gray scale shades to warmer areas of the scene - values from 1 to 8191.

Factory default values for each of the Thermal Mode parameters are given in Table 2-5.

TABLE 2-5. THERMAL MODE DEFAULT VALUES

THERMAL MODE MENU DEFAULTS				
VARIABLE	OFF	Outline	Patrol	Thermal
Contrast	223	223	83	127
Gamma	0.5	0.5	0.5	0.97
Linear Percent	0	0	90	20
Outliers Cut	0	0	0	0
Max AGC Gain	1.00	1.00	8.00	1.38
Damping Factor	50	50	50	85
Detail Head	0	0	30	12
DDE	1.20	1.20	1.50	0.95
Plateau Value	100	100	0	7
Smoothing Factor	2000	2000	2000	5000

2.18 Debug Menu (Advanced)

This menu displays the current battery voltage, enables saving all current variables to memory, and enables resetting all variables to factory defaults.

2.19 Red Dot / Point of Aim Bore Sighting

Windage and elevation adjusters on the left side of the CQT adjust red dot position by 0.44 mrad (1.5 MOA) per click over a range of +/- 10.0 mrad in the horizontal direction and +/- 6.5 mrad in the vertical direction. A flathead screwdriver, coin, or other flat object is required.

For elevation point of aim adjustment, turn the rear adjuster clockwise to lower the red dot or counterclockwise to raise the red dot.

The windage point of aim adjustment, turn the forward adjuster clockwise to move the red dot to the right or counterclockwise to move the red dot to the left.

TABLE 2-6. RED DOT ADJUSTMENT

RED DOT BORE SIGHT ADJUSTMENT	
Windage Adjuster	CW: Red Dot Left CCW: Red Dot Right
Elevation Adjuster	CW: Red Dot Down CCW: Red Dot Up

CHAPTER 3: MAINTENANCE AND SERVICE

3.1 Maintenance

Keep the CQT components clean and free of debris to maintain proper operation. Gently brush off dirt using a soft brush or lint-free cloth. Use fresh water and a clean cloth to clean the exterior surface of the CQT.

3.2 Service and Repair

Please contact the manufacturer for all service and repair needs.

3.3 Warranty Information

Please refer to the contract for warranty information.

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