

# THERMAL LASER



## User Manual



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### IMPORTANT:





Before operating or maintaining this unit, please read this manual carefully paying extra attention to the safety warnings and precautions.

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The information in this manual is periodically revised to ensure the latest information is included. Download the latest version of this manual and other related product support documentation from the Snap-on Diagnostics website.

## Product Compliance and Certification

This product is certified and/or in compliance with the guidelines and regulations set forth by the following:

United States and Canada		Europe	Australia
(California Only) California Energy Commission (CEC)	(U.S. and Canada) Underwriters Laboratories (UL)	Conformité Européene (European Conformity)	Regulatory Compliance Mark (RCM)
			

## Customer Support Information

North America	
Website	<a href="http://diagnostics.snapon.com">http://diagnostics.snapon.com</a>
Phone	1-800-424-7226
E-mail	diagnostics_support@snapon.com
Online Contact Form	<a href="https://www1.snapon.com/diagnostics/us/Contact">https://www1.snapon.com/diagnostics/us/Contact</a>

United Kingdom	
Website	<a href="https://www.snapon.com/diagnostics/uk">https://www.snapon.com/diagnostics/uk</a>
Phone	+44 (0) 845 6066512
E-mail	<a href="https://www.snapon.com/diagnostics/uk">https://www.snapon.com/diagnostics/uk</a>

Australia and New Zealand	
Website	<a href="http://www.snapontools.com.au">http://www.snapontools.com.au</a>
Phone	(Australia) 1800-810-581
	(New Zealand) 0800-762-766
E-mail	sota.diagnostics@snapon.com

The Netherlands and Belgium	
Website	<a href="http://www.eurotechcenter.nl">http://www.eurotechcenter.nl</a>
Phone	NL +31 (0) 356-242322
	BE +32 (0) 380 80537
E-mail	helpdesk@eurotechcenter.nl

Deutschland	
Website	<a href="http://www.snapon.de">http://www.snapon.de</a>
Phone	+49 (0) 3723-66820-13
E-mail	decustomerservices@snapon.com

For technical assistance in all other markets, contact your selling agent.

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# Safety Information

## READ ALL INSTRUCTIONS

For your own safety, the safety of others, and to prevent damage to the product and vehicles upon which it is used, it is important that all instructions and safety messages in this manual and in the *Important Safety Instructions* (included with the Thermal Laser) be read and understood by all persons operating, or coming into contact with the product, before operating. We suggest you store a copy of each, near the product in sight of the operator.

For your safety, read all instructions. Use your diagnostic tools only as described in the tool user's manual. Use only manufacturer recommended parts and accessories with your diagnostic tools.

This product is intended for use by properly trained and skilled professional automotive technicians. The safety messages presented throughout this manual and in the supplied *Important Safety Instructions* are reminders to the operator to exercise extreme care when using this product.

There are many variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. Because of the vast number of test applications and variations in the products that can be tested with this instrument, we cannot possibly anticipate or provide advice or safety messages to cover every situation. It is the responsibility of the automotive technician to be knowledgeable of the system being tested. It is essential to use proper service methods and test procedures. It is important to perform tests in an appropriate and acceptable manner that does not endanger your safety, the safety of others in the work area, the equipment being used, or the vehicle being tested.

It is assumed that the operator has a thorough understanding of vehicle systems before using this product. Understanding of these system principles and operating theories is necessary for competent, safe and accurate use of this instrument.

Before using the equipment, always refer to and follow the safety messages and applicable test procedures provided by the manufacturer of the vehicle or equipment being tested. Use the product only as described in its user manual. Use only manufacturer recommended parts and accessories with your product.

Read, understand and follow all safety messages and instructions in this manual, the supplied *Important Safety Instructions*, and on the test equipment.

### **Environmental Conditions:**

- This product is intended for indoor use only
- This product is rated for Pollution Degree 2 (normal conditions)

## Safety Signal Words

All safety messages contain a safety signal word that indicates the level of the hazard. An icon, when present, gives a graphical description of the hazard. Safety Signal words are:

### **DANGER**

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or to bystanders.

### **WARNING**

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to the operator or to bystanders.

### **CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury to the operator or to bystanders.

## Safety Message Conventions

Safety messages are provided to help prevent personal injury and equipment damage. Safety messages communicate the hazard, hazard avoidance and possible consequences using three different type styles:

- Normal type states the hazard.
- **Bold type states how to avoid the hazard.**
- *Italic type states the possible consequences of not avoiding the hazard.*

An icon, when present, gives a graphical description of the potential hazard.

## Safety Message Example

### **WARNING**



Risk of unexpected vehicle movement.

- **Block drive wheels before performing a test with engine running.**

*A moving vehicle can cause injury.*

## Important Safety Instructions

For a complete list of safety messages, refer to the accompanying *Important Safety Instructions manual*.

**SAVE THESE INSTRUCTIONS**



This manual contains basic operating instructions and is structured in a manner to help you become familiar with the tool features and perform basic operations.

The illustrations in this manual are intended as reference only and may not depict actual screen results, information, functions or standard equipment.

The following information is intended as reference, using general content to describe the use of conventions in this manual. Not all examples, conventions or content may be used, or applicable within this manual.

## 1.1 Conventions

### 1.1.1 Bold Text

Bold emphasis is used in procedures to highlight selectable items such as buttons and menu options.

Example:

- Select **LEFT ◀ / RIGHT ▶** control buttons.

### 1.1.2 Symbols

The “greater than” arrow (>) indicates an abbreviated set of selection instructions.

Example:

- Select **Settings > Advanced > Emissivity**.

The above statement abbreviates the following procedure:

1. Select the **Settings** icon.
2. Select the **Advanced** submenu.
3. Select the **Emissivity** option from the submenu.

### 1.1.3 Terminology

The term “select” describes tapping/touching an icon on the touch screen, or highlighting an icon or menu choice and then selecting the confirmation menu choice such as **Continue, Accept, OK, Yes**, or other similar choice.

Example:

- Select the **Gallery** icon.

## 1.1.4 Notes and Important Messages

The following messages are used.

### Note

A note provides helpful information such as additional explanations, tips, and comments.

Example:



---

**NOTE:**

For additional information refer to...

---

### Important

Important indicates a situation which, if not avoided, may result in damage to the test equipment or vehicle.

Example:

---

**IMPORTANT:**

Do not use any abrasive cleansers or automotive chemicals on the tool.

---

## 1.1.5 Hyperlinks

Hyperlinks, or links, that take you to other related articles, procedures, and illustrations are available in electronic documents. Blue colored text indicates a selectable hyperlink.

Example:

---

**IMPORTANT:**

Read all applicable [Safety Information](#) before using this tool!

---

Item	Description / Specification
Display (LCD)	Size (diagonal): 71mm (2.8 in.)
	Resolution: 240 x 320 pixels
Digital Camera	Focus: Fixed
Laser	Class II Output power < 1 mW Wavelength 655 nm
Thermal Laser	Temperature Measurement Range: <b>Thermal Mode</b> -20 to 538 °C (-4 to 1000 °F), <b>Laser Mode</b> -20 to 982 °C (-4 to 1800 °F)
	Color Palettes: 5 options: Iron, Rainbow, Plasma, Grey-Iron, Cool-Hot
	Thermal Sensitivity (NETD): < 50mK (millidegrees Kelvin)
	IR Image Refresh Rate: < 8 times per second
	Accuracy at room temperature (20°C/68°F): < 0°C (32°F): ±3°C (±6°F) 0°C (32°F) to 982°C (1800°F): ±2°C (±4°F) or ±3% whichever is greater. <i>Accuracy specifications listed are under battery power. Accuracy will vary if the unit is being charged.</i>
	Spectral Range: is 7.7µm to 20µm
	IR Image Detector Type: Thermopile
	Effective Distance: 1 to 2.5 ft. (30.48 to 76.2 cm)
	Spot Size Ratio: 10:1
LED Spotlight	Low: 7 lumens
	Med.: 12 lumens
	High: 22 lumens
Image Storage Memory Capacity	> 300 image files
Image File Format	.jpg
USB Interface	2.0 USB, micro USB
Battery	Rechargeable Lithium Ion Battery Pack (+3.7V, 2150mAh (nominal))
	Approximate eight hour continuous operation, with brightness level at 50%
	Approximate 80% charge in three hours. 100% charge in less than five hours.
USB Power Supply Rating	5 VDC, 2A
Operating Voltage (USB input)	4.75 to 5.25 VDC
Operating Altitude	Maximum 2000 m
Width	2.9 in. (72.9 mm)
Height	8.9 in. (228.3 mm)
Depth	2.3 in. (58.3 mm)
Weight	8.8 oz. (0.275 kg)
Operating Temperature Range (ambient)	At 0 to 90% relative humidity (non-condensing) 32 to 113°F (0 to 45°C)
Storage Temperature (ambient)	At 0 to 70% relative humidity (non-condensing) -4 to 140°F (-20 to 60°C)
Environmental Conditions	This product is intended for indoor use only. It is not rated for damp or wet locations.
	This product is rated for Pollution Degree 2 (normal conditions)

This chapter introduces the general features and controls of the Thermal Laser.

The Thermal Laser is a specialized tool used to make non-contact thermal measurements. It features blended thermal and visual light viewing modes, allowing you to see heat sources at different opacity levels. A laser spot temperature feature is included, giving you the ability to make accurate spot temperature measurements.

The Thermal Laser also has the capability to capture screenshots in all viewing modes.



1. UP▲ / DOWN▼ Buttons - change thermal / laser views
2. LEFT◀ / RIGHT▶ Buttons - navigate the toolbar
3. N (X) Button - cancel selection
4. Power Button - on / off
5. micro USB Jack - charge the battery and connect to PC
6. Laser (pointer)
7. Thermal Lens (sensor)
8. Camera Lens
9. LED Spotlight
10. Trigger - capture images
11. Battery Charge Indicator - red = charging, green = charged
12. Y (Yes) Button - accept selection

Figure 3-1

## 4.1 Main Topic Links

The following topics are described in this section:

- [Power \(On/Off\)](#)
- [Using the Toolbar](#)
- [Changing Viewing Modes](#)
- [Using Laser Spot Temperature Mode](#)
- [Taking Thermal / Temperature Readings](#)
- [Saving and Managing Screenshots](#)
- [Using the LED Spotlight](#)

## 4.2 Power (On/Off)

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**IMPORTANT:**

If needed, fully charge the battery pack before operation. See [Battery Charging](#) on page 22 for battery pack charging instructions.

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- **Power On** - To turn the Thermal Laser **ON**, press and hold the **Power** button until the screen displays, then release. The Thermal Laser is ready for use, however to ensure optimal measurement accuracy, it is recommended to allow the Thermal Laser to “warm-up” a minimum of five minutes before operation.  
After the Power button is pressed, an audible tone is sounded upon startup.
- **Power Off** - To turn the Thermal Laser **OFF**, press and hold the **Power** button for a minimum of two seconds until the Thermal Laser turns off.

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**NOTE:**

The active viewing mode is saved when the Thermal Laser is turned off, allowing you to resume operation with the same view you last used.

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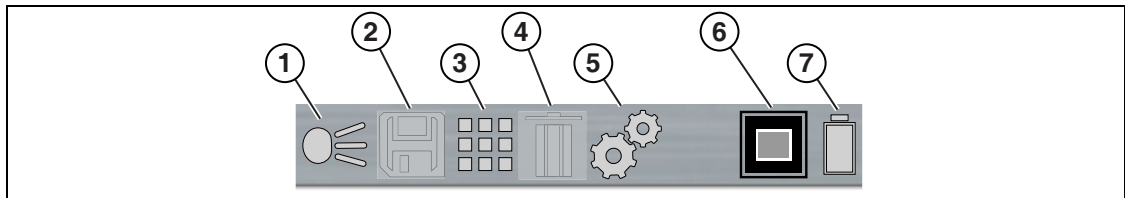
- **Emergency Shutdown** - In the event the control buttons have no response, or the unit cannot be turned off using the normal shutdown method, press and hold the **Power** button (approximately seven seconds) until the Thermal Laser turns off.

### 4.3 Using the Toolbar

The toolbar located at the top of the screen includes menu icons and status indicators.

Use the **LEFT ◀ / RIGHT ▶** control buttons to highlight an active icon from the toolbar, then press the **Y** button to select it.

Icons are feature dependent and are only active when applicable. As example in [Figure 4-1](#) the Save and Delete icons are inactive (grayed out).



1. LED Spotlight Indicator (on / off)
2. Save Icon (saves screen image)
3. Gallery Icon (opens image gallery)
4. Delete Icon (deletes image)
5. Settings Icon (opens Setting menu)
6. View Indicator
7. Battery Charging Level Indicator

Figure 4-1



**NOTE:**

**LEFT ◀, RIGHT ▶, UP ▲, and DOWN ▼** control button functionally is the same for all menus. Highlight the item, then press **Y** to select it. Press the **N** button to return to the last screen or press it repeatedly to return to the Thermal View.

### 4.4 Changing Viewing Modes

There are seven viewing modes:

- Blended thermal opacity at 20, 40, 60, 80, 100%, and diffused beam
- Laser Spot Temperature

When using any of the blended thermal opacity modes, the Opacity Level icon in the toolbar indicates the current opacity level ([Figure 4-2](#)).

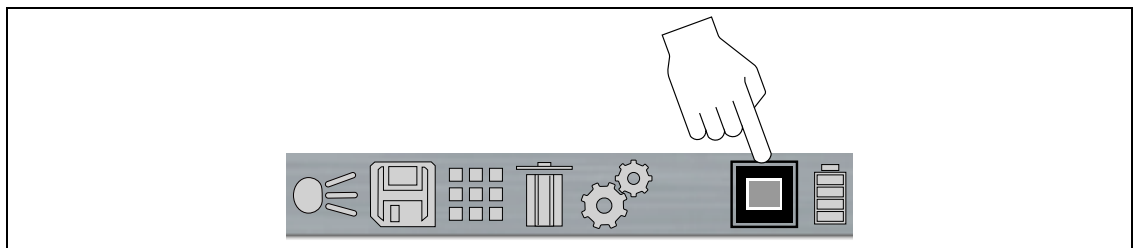


Figure 4-2



**NOTE:**

When the Thermal Laser is turned on, the viewing mode that was active when the unit was turned off is resumed.

Pressing the UP ▲ or DOWN ▼ control buttons allows you to change the viewing mode.

Press the UP ▲ control button repeatedly to increase thermal opacity, full UP = 100% (Figure 4-3).

Press the DOWN ▼ control button repeatedly to decrease thermal opacity (Figure 4-3).

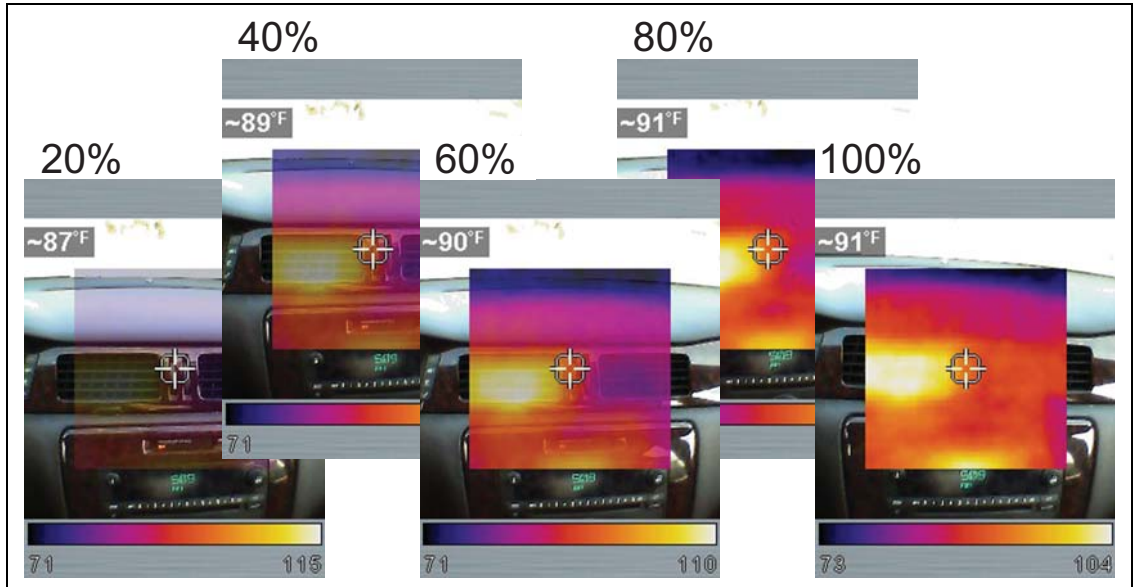


Figure 4-3

At the 20% level (Figure 4-3), pressing DOWN ▼ once displays the Diffused Beam view. This view displays at 100% opacity at center and gradually decreases radially to 0% (Figure 4-4).



Figure 4-4

From the Diffused Beam view, pressing DOWN ▼ once displays laser spot temperature mode, see [Using Laser Spot Temperature Mode](#) on page 8.

## 4.5 Using Laser Spot Temperature Mode



**WARNING**

Risk of eye injury or impaired vision.

- Never look or stare into a laser light when it is on.
- Do not point the laser into the face of someone else.
- Do not allow children to be in the area of a laser that is in use, or use the laser.
- Do not point the laser into mirrors, doors, windows, or at reflective surfaces.

*Laser light can impair vision and cause eye injury.*

1. To use Laser Spot Temperature mode, press the **Down ▼** control button repeatedly until **“Press TRIG to start measurement”** is displayed on the screen and the Laser icon displays in the toolbar (Figure 4-2).



**NOTE:**

The “X” in the laser icon (Figure 4-2) indicates the laser pointer is off. When the trigger is pulled, the laser pointer turns on and the “X” is not displayed in the icon.

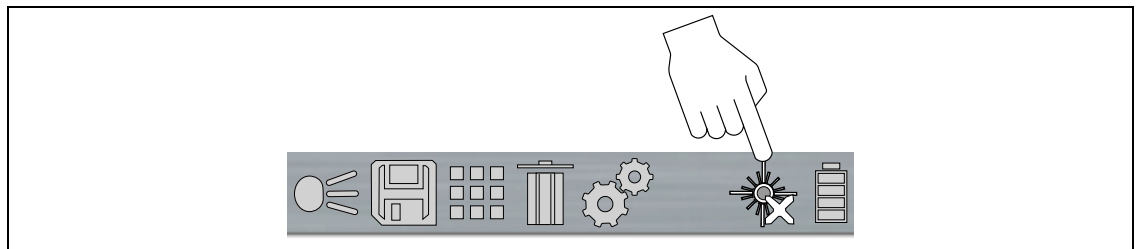


Figure 4-5

2. To take a measurement, pull and hold the trigger to activate the laser pointer.
3. Point the laser at the desired object(s), and read the measurement on the screen (Figure 4-6).



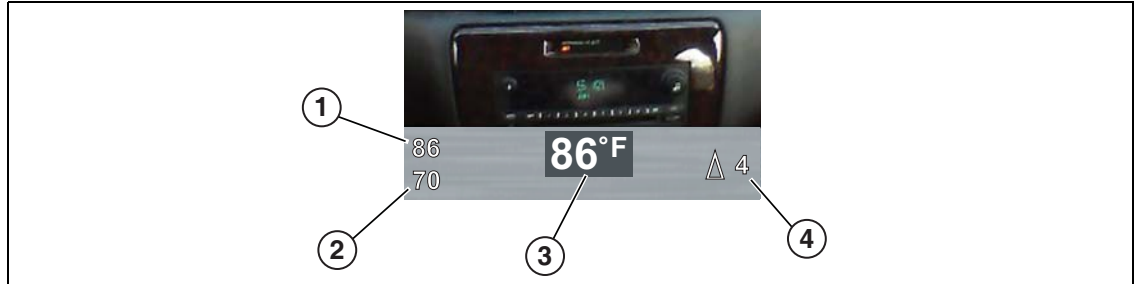
Figure 4-6

4. When the trigger is released, **“Press Y to capture screen”** is displayed onscreen. To save the screenshot, press the **Y** button.
5. To take another measurement, press and hold the trigger and repeat the process.



When the trigger is pulled and held, the highest and lowest temperatures measured (Figure 4-7 (1 and 2)) are displayed on the left side of the screen. The difference between the high and low temperatures is displayed on the right side (Figure 4-7 (4)).

The values displayed onscreen are described in Figure 4-7.



1. Highest Measured Temperature
2. Lowest Measured Temperature
3. Current Temperature at Laser Spot
4. Temperature Difference Between High and Low (▲Delta)

Figure 4-7

## 4.6 Taking Thermal / Temperature Readings

To take a thermal / temperature measurement in any of the blended thermal modes, just point the Thermal Laser at the desired object(s) to be measured and view the reading onscreen.

To take temperature measurements using laser spot mode, see [Using Laser Spot Temperature Mode](#) on page 8.

### 4.6.1 More About Temperature Readings

The Thermal Laser measures the emitted infrared radiation from an object(s), and then uses a known emissivity value to effectively calculate the temperature value displayed on the screen.

To accurately calculate temperature from infrared radiation, the emissivity value of the object being measured must be entered, see [Emissivity](#) on page 19.

**⚠ WARNING** - Risk of personal injury or harm.

- Use caution if making physical contact with the surface being measured, as the displayed temperature may be different than the actual temperature.

#### ***Out of Range Symbols***

Symbols are used to indicate when temperatures are out of operating range.

The ">" and "<" symbols are used to indicate when the temperature measured is above or below the operating range of the unit.

## Center Region Temperature (Average) and Palette Range Indicator

The target indicator in the center of the screen (Figure 4-2) measures the Center Region Temperature (Average). The Center Region Temperature (Average) is dynamically indicated within the color palette range indicator (Figure 4-2).



Figure 4-8

The color palette range indicator shows the complete temperature range of the active measured scene with the minimum and maximum temperature values (arrows Figure 4-2) of the scene. It is normal for the min/max temperature values to constantly change.

## 4.7 Saving and Managing Screenshots

### 4.7.1 Saving Screenshots

1. Point the Thermal Laser at the object to be measured.
2. Pull and release the trigger.
3. Press the **Y** button to save the screenshot image. Press the **N** button to continue without saving the screenshot.

### 4.7.2 Viewing Screenshots

1. To view screenshot images, select the Gallery icon from the toolbar (Figure 4-9), then press the **Y** button.

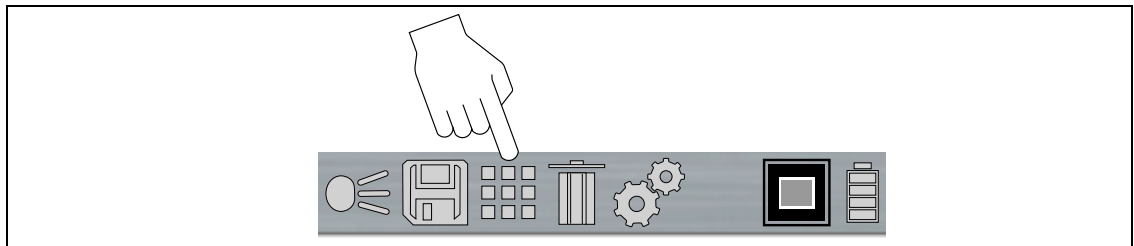


Figure 4-9

2. Select the image from the Gallery list, then press the **Y** button.
3. To select and view other images, scroll through the list using the **UP ▲** / **DOWN ▼** control buttons.

### 4.7.3 Deleting Screenshots

1. Open the Gallery, see [Viewing Screenshots](#).
2. Select the image to be deleted.
3. Select the **Delete** icon from the toolbar ([Figure 4-12](#)), then press the **Y** button to delete the image.

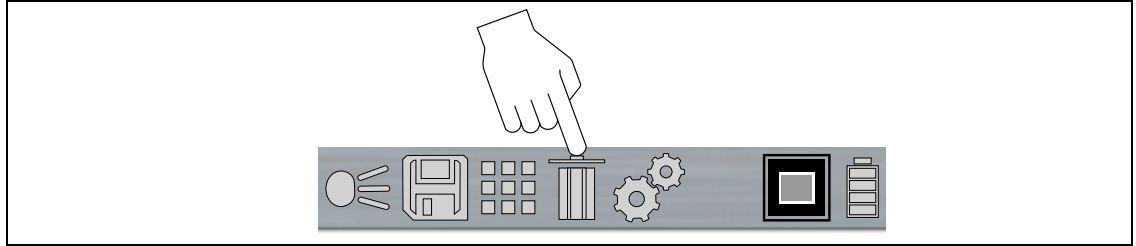


Figure 4-10

### 4.7.4 Transferring Screenshots to a PC



**NOTE:**

When the Thermal Laser is connected by USB cable to a PC, saving and viewing screenshots is disabled. If the screen capture trigger is pulled, or the gallery icon is selected while the USB cable is connected to a PC, an error message is displayed. To resume saving screenshots, disconnect the USB cable from the PC.

The Thermal Laser can be connected to a PC using the supplied USB cable. This allows you to transfer saved screenshots to the PC.

1. Open the protective cover on top of the Thermal Laser, and connect the USB cable to the USB jack.
2. Turn the Thermal Laser on.
3. With your PC turned on, connect the USB cable to your PC.
4. Your PC will recognize the Thermal Laser as an external storage device (e.g. **THERMALASER Drive (E:)**) ([Figure 4-11](#)).

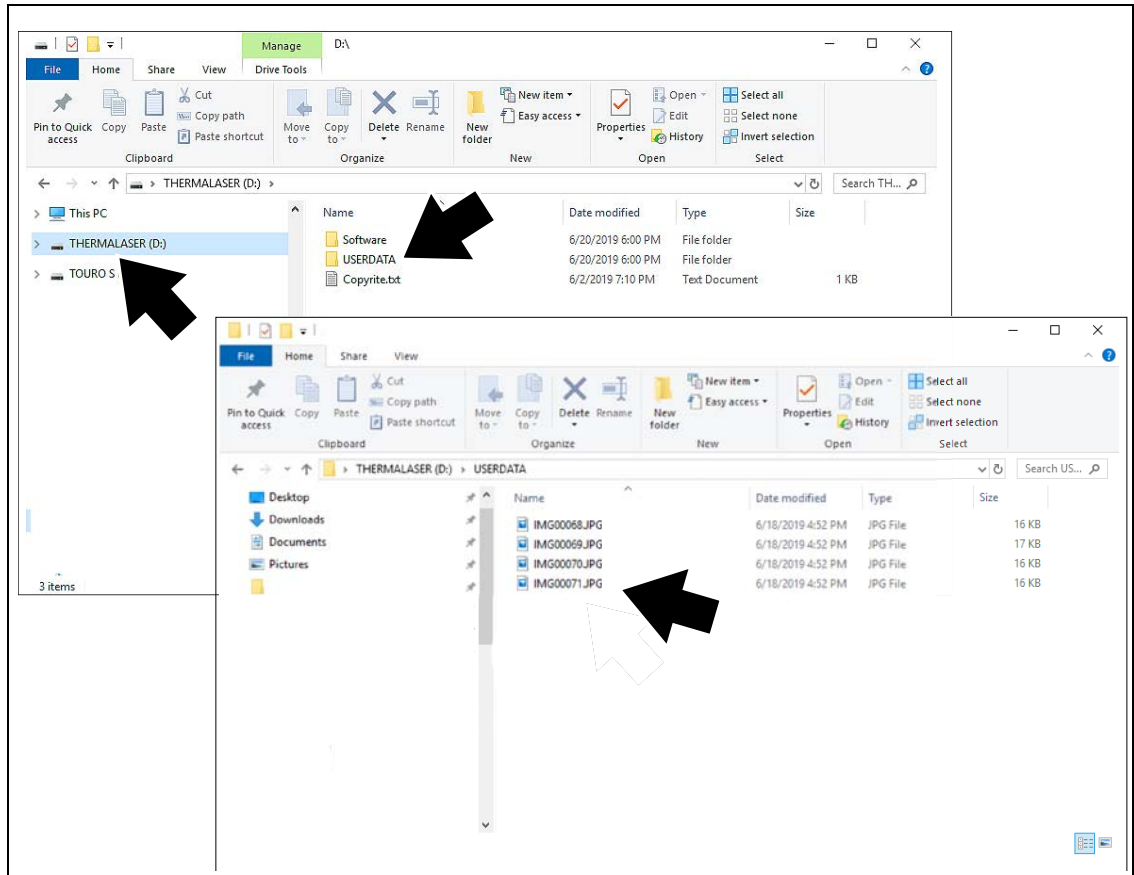


Figure 4-11

5. Using the standard Windows applications on your PC (e.g. Windows Explorer or Computer), select your saved screenshots from the “USERDATA” folder (Figure 4-11).
6. Select the files to copy / move from the Thermal Laser to your PC.
7. When finished, (if required) perform any Windows procedures to “Safely Remove Hardware or Eject Media” to stop communication with the Thermal Laser.
8. Disconnect the USB cable from the PC, and the Thermal Laser.
9. Close the protective cover.

## 4.8 Using the LED Spotlight

An LED spotlight is provided to illuminate areas of low light.

Select the spotlight icon in the toolbar (Figure 4-12), then press the **Y** button to turn the LED spotlight ON/OFF.

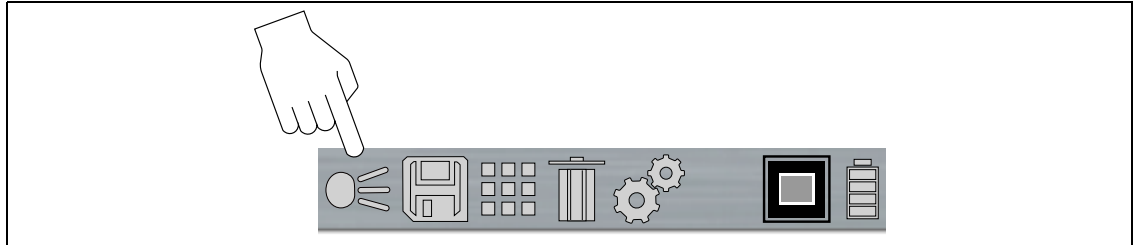


Figure 4-12

The spotlight has three intensity levels, to change the light level, see [Spotlight Intensity](#) on page 18.



**NOTE:**

When the battery reaches a low charge level (approximately one bar indication on icon), the LED spotlight is disabled. The spotlight will be functional again when the battery has been charged to approximately 30%. Always turn the spotlight off before and when charging the battery.



**NOTE:**

The battery discharge rate will vary depending on overall use and settings. To optimize battery life when using the spotlight, use the spotlight at brief intervals at a low intensity level.

## 5.1 Main Topic Links

The following topics are described in this section:

- [Color Palette](#)
- [Brightness](#)
- [Language](#)
- [Automatic Shutdown](#)
- [Navigation Tips](#)
- [Spotlight Intensity](#)
- [Advanced](#)
  - [Temperature](#)
  - [Emissivity](#)
  - [Object Distance](#)
  - [About \(Factory Reset\)](#)

## 5.2 Settings Menu

1. Use the **LEFT** ◀ / **RIGHT** ▶ control buttons to highlight the **Settings** icon from the toolbar ([Figure 5-1](#)). Press the **Y** button to select it.

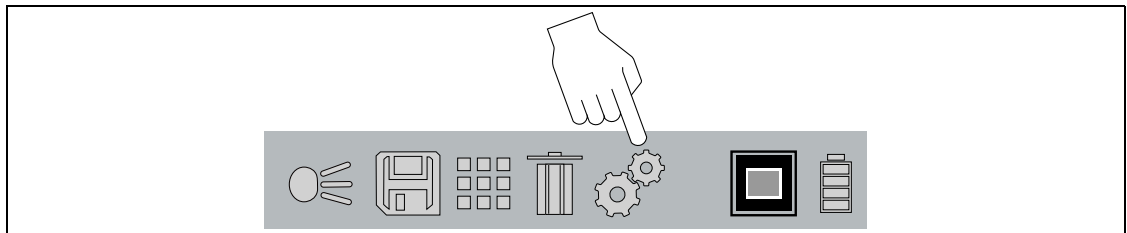


Figure 5-1

2. Use the **UP** ▲ / **DOWN** ▼ control buttons to select an option from the menu ([Figure 5-2](#)). Press the **Y** button to select it.



**NOTE:**

**LEFT** ◀, **RIGHT** ▶, **UP** ▲, and **DOWN** ▼ control button functionally is the same for all menus. Highlight the item, then press **Y** to select it. Press the **N** button to return to the last screen or press it repeatedly to return to Thermal Mode.

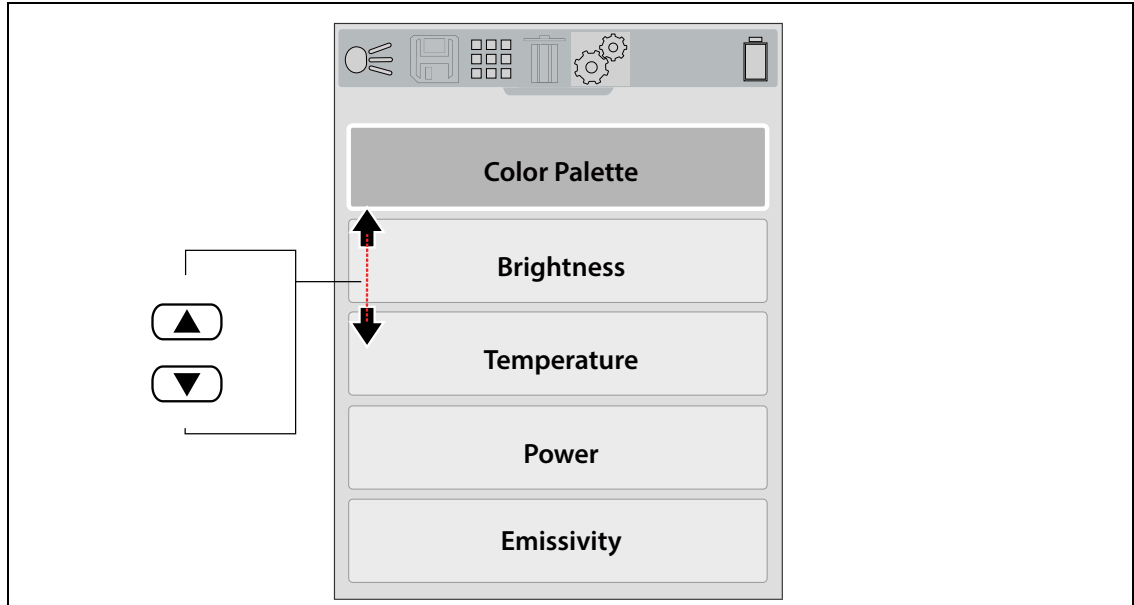


Figure 5-2

### 5.2.1 Color Palette

Different color palette themes can be used to help define (enhance) object temperatures onscreen by varying color ranges, contrast and brightness. The **Color Palette** setting allows you to choose one of five color palette presets (Figure 5-3).



Figure 5-3

### 5.2.2 Brightness

The **Brightness** setting allows you to set the lighting level of the display (Figure 5-4).

Use the **UP ▲ / DOWN ▼** control buttons to change the brightness setting. Each press incrementally changes the lighting level by 10%.

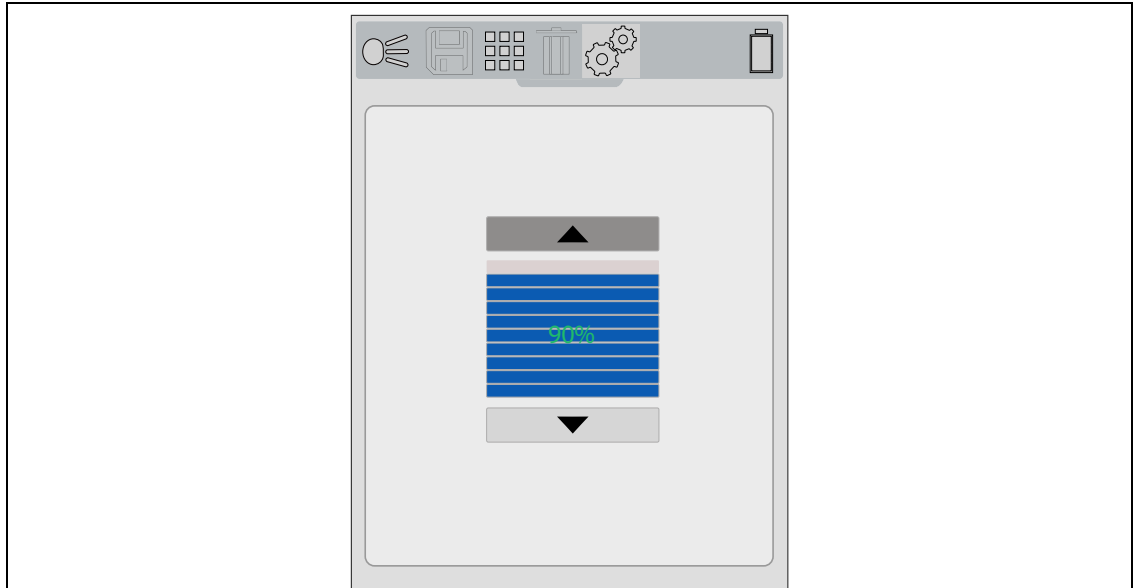


Figure 5-4

### 5.2.3 Language

The **Language** setting allows you to select your preferred language (Figure 5-5).

Menu Options: **English, French, Spanish, Italian, Polish, Dutch, German, Portuguese.**



Figure 5-5



### 5.2.4 Automatic Shutdown

The **Power** setting allows you to set the automated power off time. Four preset options are provided (Figure 5-6).

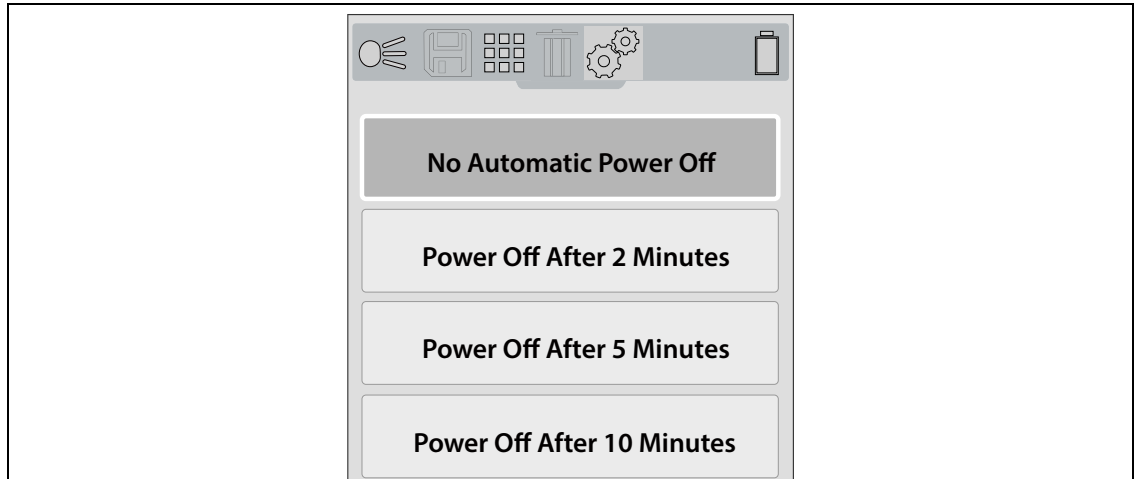


Figure 5-6

### 5.2.5 Navigation Tips

Onscreen navigational tips are provided for select menu navigation procedures to help you become familiar with the Thermal Laser menus. Each Tip will appear only once after turning on the Thermal Laser.

The **Navigation Tips** setting allows you to turn on (enable), or turn off (disable) the automated navigational tips (Figure 5-7).

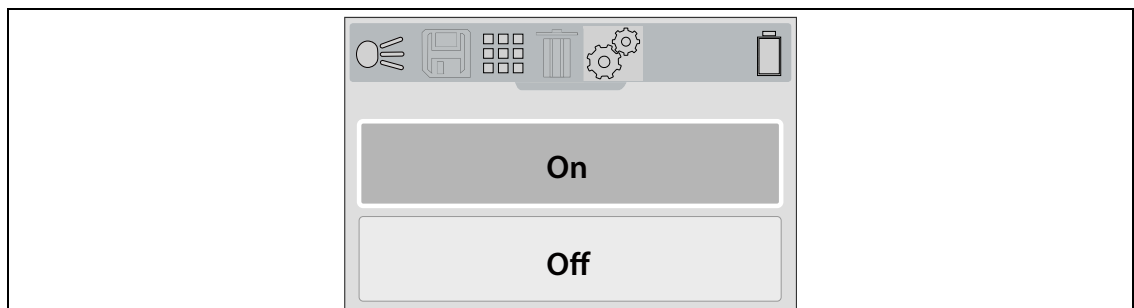


Figure 5-7

## 5.2.6 Spotlight Intensity

The **Spotlight Intensity** setting allows you to adjust the brightness of the LED spotlight (Figure 5-8).

Three settings are provided:

- Low (Eco) - 7 lumens
- Medium - 12 lumens
- High - 22 lumens (default setting)

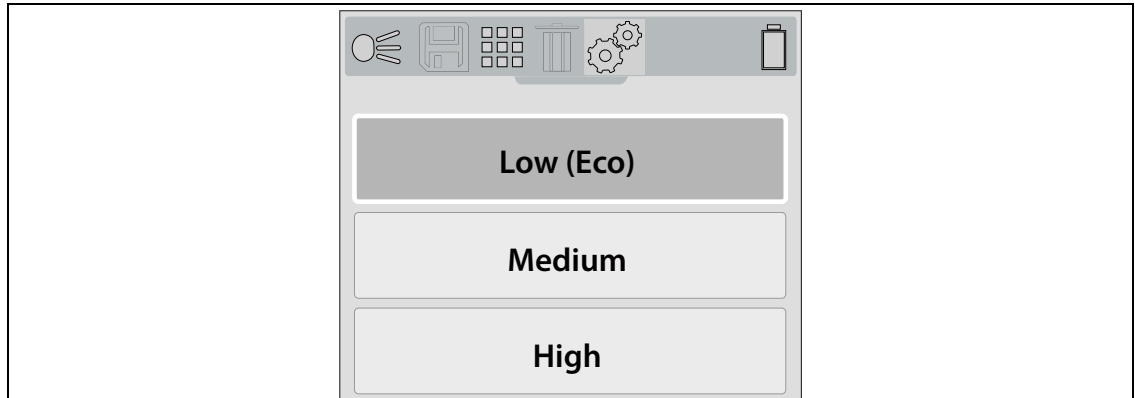


Figure 5-8

## 5.2.7 Advanced

The following selections (Temperature, Emissivity, Object Distance and About) are available within the Advanced menu.

### Temperature

The **Temperature** setting allows you to set the temperature unit of measure (**°F** or **°C**) (Figure 5-9).

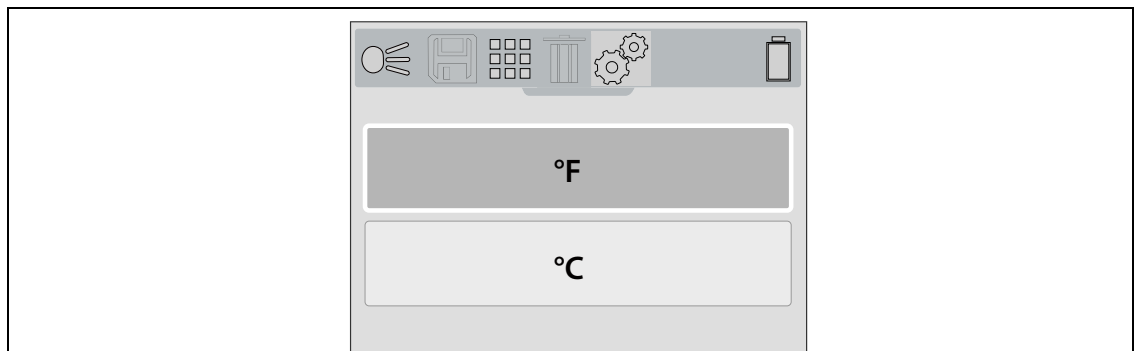


Figure 5-9

## Emissivity

The **Emissivity** setting allows you to set the emissivity level (Figure 5-10). The Thermal Laser is equipped with five common emissivity value presets. Choose the most applicable setting for your application. The default setting is (0.95) (Standard).

The Thermal Laser measures and displays the emitted infrared radiation from an object(s).

To accurately calculate temperature (from infrared radiation), the emissivity value of the object being measured must be entered. The emissivity value is used to effectively calculate the displayed temperature value.

Emissivity is the amount of radiation emitted from an object, compared to that of a perfect blackbody (standard of radiation) of the same temperature.

Emissivity can be effected by other factors (listed below), which is beyond the scope of this manual.

- Core material makeup
- Surface condition
- Temperature
- Angle of view
- Wavelength

As a general rule, objects and surfaces normally exhibit emissivity ranging from approximately 0.1 to 0.95. Materials with smooth (non oxidized) surfaces, usually range from 0.05 to 0.50, however these values may change if the surface is rough or oxidized.

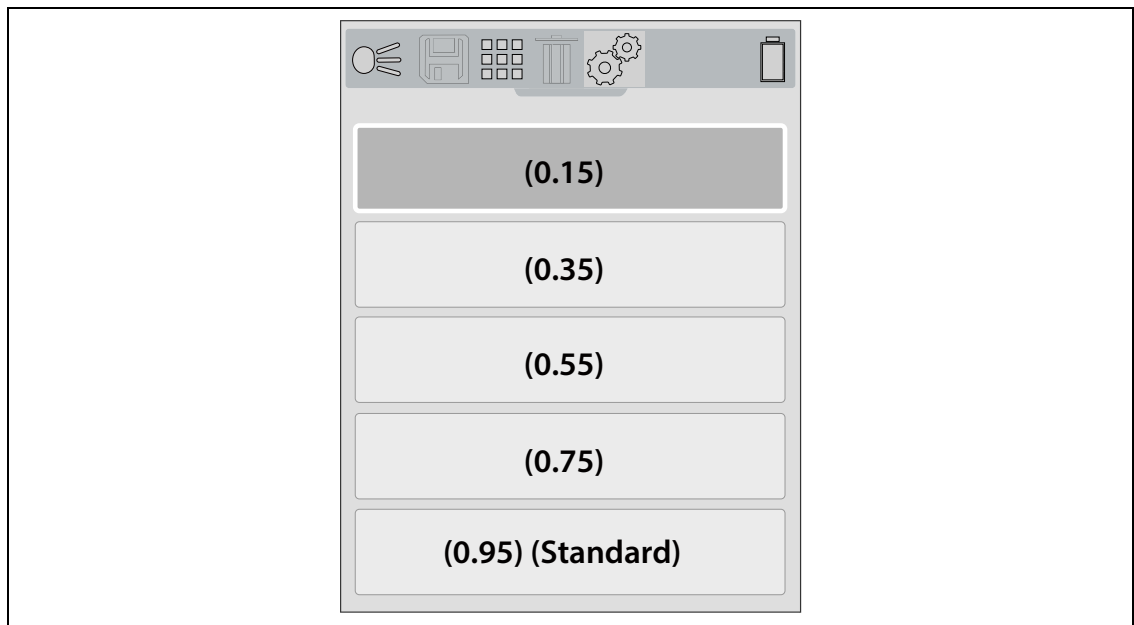


Figure 5-10

## Object Distance

The **Object Distance** setting allows you to optimize the accuracy of the Thermal Laser, by setting the approximate distance to the object you are measuring.

Options:

- **Near** - 1 to 3 feet (30.48 to 91.44 cm)
- **Far** - 3 to 10 feet (91.44 to 304.8 cm)



### NOTE:

The Thermal Laser uses two cameras to provide the blended (overlay) effect of the thermal image over the visual light image. As the two cameras view slightly different images due to their alignment with an object, when viewing objects that are close to the camera the image may appear mis-aligned. This visual effect of the position of an object that appears to differ when viewed from different positions is known as parallax.

When objects are viewed closer than 1 foot (30.48 cm) they will always display slightly mis-aligned, however as the imager is moved farther away from the object the misalignment decreases. Therefore, to optimize the accuracy of the Thermal Laser when used in close proximity of an object 1 to 3 feet (30.48 to 91.44 cm), the Object Distance setting should be set to **Near**.

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## About (Factory Reset)

Selecting **About** displays hardware and software version information, and provides the option to reset the device to factory settings.

Select **Ok** to exit the screen.

Select **Factory Reset** to reset the following to their factory default settings (as shown):

- -Color Palette - Iron
- -Brightness - Level 50%
- -Language - English
- -Temperature Unit - Fahrenheit
- -Automatic Shutdown - Disabled
- -Emissivity - 0.95
- -Navigation Tips - Disabled
- -Spotlight Intensity - High
- -Object Distance - Near
- -Opacity Overlay Level - 60%

When Factory Reset is selected a confirmation screen is displayed, select the **Y** button to proceed with the reset or the **N** button to cancel.

If **Y** is selected a confirmation screen displays to indicate the reset was completed, and then the option to delete all images is provided, select the **Y** button to delete all images or the **N** button to cancel.

## 6.1 Main Topic Links

The following topics are described in this section:

- [Storage](#)
- [Cleaning](#)
- [Battery Pack](#)
  - [Safety Guidelines](#)
  - [Battery Information](#)
  - [Battery Charging](#)
- [Disposal](#)

## 6.2 Storage

To protect your Thermal Laser, store it in safe area free from dust, moisture and excessive temperatures.

## 6.3 Cleaning

Periodically perform the following tasks to keep your Thermal Laser in proper working order:

- Check the housing, display, and controls for dirt and damage before and after each use.
- Clean the Thermal Laser housing and display screen with a damp soft cloth and a weak detergent cleaner.

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**IMPORTANT:**

Do not use paper towel or other paper type materials to clean the display screen.  
Do not use any abrasive cleansers or automotive chemicals.

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**IMPORTANT:**

Only use cleaning solution specified for cleaning commercial digital camera lenses to clean the Thermal Laser and visible light lenses. Use extreme care when cleaning the lenses. Only use a cotton wool applicator and avoid touching the lens with your fingers. Oil or debris from your fingers may damage the lenses.

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## 6.4 Battery Pack

### 6.4.1 Safety Guidelines

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**IMPORTANT:**

The battery pack is not accessible or replaceable. Do not attempt to remove the battery pack as this will void the product warranty.

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### 6.4.2 Battery Information

The Thermal Laser is powered by an internal rechargeable battery pack, and has a built in charger that recharges the battery when connected to a power source. A fully charged battery pack can provide up to 8 hours of continuous operation (@ 80% brightness and spotlight off). The battery discharge rate will vary depending on overall use and settings. For example, using the LED spotlight or a high level display brightness setting will accelerate battery discharge.

To prolong the life of your battery, turn off the Thermal Laser when not in use.

The Thermal Laser should be used within a short period of time (about 30 days) after charging to prevent loss of capacity due to self-discharging.

If the battery pack no longer holds a charge, contact your sales representative.

### 6.4.3 Battery Charging

There are three modes of charging:

- Low Rate (approximate charge rate 100mA)
  - Thermal Laser turned on
  - USB cable connected to a powered PC USB jack
- Medium Rate (approximate charge rate 500mA)
  - Thermal Laser turned off
  - USB cable connected to a powered PC USB jack
- High Rate (approximate charge rate 960mA)
  - Thermal Laser turned off
  - Using supplied or compatible USB power supply adapter connected to AC power source

A protective cover is used over the USB jack, located on top of the Imager. Always keep the protective cover closed during operation. Only open the protective cover during battery charging. Opening the protective cover during operation could result in an electrostatic discharge event that may cause the Thermal Laser to reset. If this occurs, the Thermal Laser will reset and return to normal operation without being damaged.

**WARNING** Risk of electric shock.

- There are no serviceable parts inside the unit. Do not disassemble the unit or try to remove the cover. Removal of the cover could result in an electrical shock, and will void the product warranty.

Electric shock can cause personal injury.

**NOTE:**

When the battery reaches a low charge level (approximately one bar indication on icon), the LED spotlight is disabled.

1. Turn the LED spotlight off.
2. Open the protective cover on top of the Thermal Laser (Figure 6-1).
3. Connect the USB cable to the micro USB jack.



Figure 6-1

**IMPORTANT:**

It is highly recommended to use the supplied USB power supply adapter to charge the battery. Using a non-approved power supply adapter (max. 500mA charge rate output) may result in insufficient charging.

4. Connect the USB cable to the USB power supply adapter.
5. Connect the USB power supply adapter, to a live AC power source.

**NOTE:**

The battery pack will also charge when the USB cable is connected to a PC (using the power supplied from the PC's USB connection).



The battery charge indicator LED is located on the front of the Thermal Laser below the **DOWN ▼** control button (Figure 6-2).

- A red LED indicates the battery is being charged.
- A green LED indicates the battery is fully charged.



- 1. Battery Charging Level Indicator
- 2. Battery Charge Indicator - red = charging, green = charged

Figure 6-2

Icon	Function
	<p>Indicates power is being supplied by the internal battery pack. Horizontal bars diminish as the battery discharges.</p> <p>When the battery charge level drops to approximately 10 minutes of power left, the icon will flash on/off as a reminder to connect the USB power supply adapter. If the charger is not connected, the unit will continue operate until it automatically turns off, due to low power. A warning message will be displayed before shutdown, "Low Battery - The unit will power down in 30 seconds, please connect to a charger."</p>
	<p>Indicates power is being supplied by the USB power supply adapter to charge the battery pack.</p>

- 6. Close the protective cover, when finished.



## 6.4.4 Disposal

This unit contains a lithium-ion battery. Always dispose of batteries according to your local regulations. As disposal regulations vary across different countries and regions, always contact your local or regional recycling center for battery disposal and recycling information. The battery pack, while non-hazardous waste, does contain recyclable materials.

**NOTE:**

Always dispose of materials according to local regulations.

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For additional information in the following markets contact:

- **North America**—Rechargeable Battery Recycling Corporation (RBRC) at <http://www.rbrc.org> or <http://www.call2recycle.org>, or call 1(800) 822-8837 (USA)
- **United Kingdom**—Electrical Waste Recycling Company at <http://www.electricalwaste.com>
- **Australia**—Australian Battery Recycling Initiative <http://www.batteryrecycling.org.au>
- **New Zealand**—Ministry for the Environment <https://www.mfe.govt.nz/issues/waste/streams/batteries.html>

For all other countries and regions not listed above contact your local or regional recycling center or sales representative for battery disposal and recycling information.

Products bearing the WEEE logo (Figure 6-3) are subject to European Union regulations.

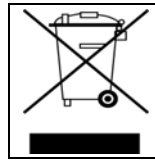


Figure 6-3 sample WEEE logo

## 7.1 General Troubleshooting Chart

Problem	Checks / Remedy
Will not turn on	a.) Battery is discharged or is defective. Recharge battery.
	b.) Device or software may be damaged. Contact Customer Support.
Battery performance is poor	Using incorrect or defective USB power supply adapter or cable to charger battery. Use the supplied USB cable and adapter
Poor or no image	a.) Color palette setting is incorrect. Change the color palette setting.
	b.) Emissivity setting is incorrect. Change the emissivity setting.
	c.) Condensation or debris on thermal and/or camera lenses. Clean lenses or place imager in a dry area at room temperature until condensation clears.
Temperature measurement is inaccurate	a.) Emissivity setting is incorrect. Change the emissivity setting.
	b.) Condensation or debris on thermal and/or camera lenses. Clean lenses or place imager in a dry area at room temperature until condensation clears.
Temperature measurement display is non-responsive	a.) If the ">" symbol displays in front of the Center Region Temperature (Average) value, this indicates the maximum measurable temperature has been reached (e.g. >1000°F (>538 °C)).
	b.) The Thermal Laser may be performing an automatic calibration. Wait a few seconds and retry, if still no response turn the unit off then back on.
Error message displayed - <b>"Disconnect the USB cable from the PC and retry"</b> or <b>"Unable to save image"</b>	When the Thermal Laser is connected by USB cable to a PC, saving and viewing images is disabled. If the screen capture trigger is pulled, or the gallery icon is selected while the USB cable is connected to a PC, an error message is displayed. To resume operation, disconnect the USB cable from the PC.