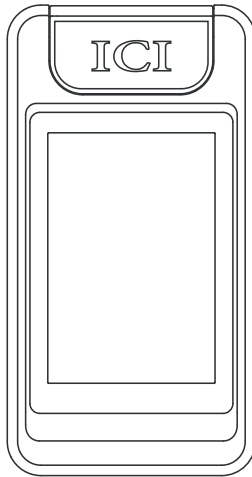**ICI** | **INFRARED CAMERAS** INC

Industry

PIVOT-IR
USER MANUAL

PLEASE READ THIS MANUAL BEFORE SWITCHING THE UNIT ON.
IMPORTANT SAFETY INFORMATION INSIDE.

ICI cameras fall under US Federal Law and Export Control.

Revision History

5.2022-001   Document created

Contents

1.   Disclaimers

1-1   Terms and Conditions

Warranty Terms and Condition of Sale are made available online at:

   https://infraredcameras.com/support/terms-and-conditions-of-sale/

1-2   U.S. Government Regulations

This product may be subject to U.S. Export Regulations. Please send any inquiries to support@infraredcameras.com

1-3   Copyright

© 2021, Infrared Cameras, Inc. All rights reserved worldwide. No parts of the software including source code may be reproduced, transmitted, transcribed or translated into any language or computer language in any form or by any means, electronic, magnetic, optical, manual or otherwise, without the prior written permission of Infrared Cameras, Inc.

The documentation must not, in whole or part, be copied, photocopied, reproduced, translated or transmitted to any electronic medium or machine readable form without prior consent, in writing, from Infrared Cameras, Inc. Names and marks appearing on the products herein are either registered trademarks or trademarks of Infrared Cameras, Inc. and/or its subsidiaries. All other trademarks, trade names or company names referenced herein are used for identification only and are the property of their respective owners.

1-4   Quality Assurance

Infrared Cameras, Inc. is committed to a policy of continuous development; therefore we reserve the right to make changes and improvements on any of the products without prior notice.

1-5   Customer Help

For customer help, visit:

https://infraredcameras.com/support/

E-mail:

support@infraredcameras.com

2. User Notice

2-1 Calibration

Annual calibration to the thermal camera is recommended. Contact customer service to schedule maintenance.

2-2 Accuracy

For very accurate results, we recommend that you wait a minimum of 5 minutes after you have started the camera before measuring a temperature.

2-3 Cybersecurity

After the products are connected to the Internet, they may face risks including but not limited to network attacks, hacker attacks, virus infections, etc. The company will not be responsible for the abnormal operation of the products and any loss or liability caused therefrom shall be at your own risk.

2-4 Disposal of Electronic Waste

Electrical and electronic equipment (EEE) contains materials, components and substances that may be hazardous and present a risk to human health and the environment when waste electrical and electronic equipment (WEEE) is not handled correctly.

Equipment marked with the below crossed-out wheeled bin is electrical and electronic equipment. The crossed-out wheeled bin symbol indicates that waste electrical and electronic equipment should not be discarded together with unseparated household waste, but must be collected separately.

All local authorities have established collection schemes under which residents can dispose of equipment at a recycling center or other collection points, or WEEE will be collected directly from households. More detailed information is available from the administration of the relevant local authority. Always dispose of waste in accordance with local, state, and federal regulations.

2-5 Intended Use

Pivot-IR cameras are used for surface temperature assessment of energy emitted from the first 1/1000th of an inch of a subject.

Environment of use: industrial and petrochemical buildings, electrical plants, security rooms, science labs, animal reserves as well as environmental conservatories, and aerial integrations, among others.

You agree that this product is for civilian use only, and shall not use applications that may infringe the rights of third parties, medical and safety devices or other applications where product failure may lead to life-threatening or personal injury, as well as weapons of mass destruction, chemical and biological weapons, nuclear explosions, unsafe use of nuclear energy, dangerous or humanitarian purposes. Any loss or liability caused therefrom shall be at the your own risk.

2-6 Manual Update

The user manual is updated from time to time. To access the latest manuals, translations of manuals, and notifications, go to:

https://infraredcameras.com/product-resources/

The manufacturer reserves the right to alter the specifications of the product without prior notification. The manufacturer allows himself the right to modify without any preliminary opinion the technical specifications of the product.

2-7 Scope of Application

Infrared Cameras, Inc. issues generic manuals that cover several cameras within a model line.

This means that this manual may contain descriptions and explanations that do not apply to your particular camera model. This manual may contain technical inaccuracies or typographical errors.

2-8 Authoritative Versions

The authoritative version of this publication is English. In the event of divergences due to translation errors, the English text has precedence.

Any late changes are first implemented in English. Other languages may or may not be available.

2-9   Training

To read about infrared training, visit:

https://infraredtraininginstitute.com/

3.   Safety Information

- Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- To prevent eye damage and personal injury, do not look into the laser. Do not point the laser directly at people or animals or indirectly off reflective surfaces.

- Do not exceed the maximum angle of 90° when rotating the lens to avoid damage to the camera.

- Do not disassemble or modify the thermal device.

- Do not point the imager (with or without the lens cover) at intensive energy sources, e.g. devices that emit laser radiation, or the sun. This can affect the accuracy of the camera, and cause damage to the detector.

- Do not use the imager in temperatures higher than 50 °C (122 °F) or lower than -10 °C (14 °F). High/low temperatures can cause damage to the device.

- Always charge the battery in the special temperature range. The temperature range to charge the battery is 0 °C to 40 °C (32 °F to 104 °F). Charging the battery at temperatures outside this range can cause the battery to become hot or to explode. It can also decrease the performance or the life cycle of the battery.

- Do not continue to charge the battery if it does not become charged in the specified charging time. If you continue to charge the battery, it can become hot and cause an explosion or ignition. Injury to persons can occur.

- Do not attach the batteries directly to a car's cigarette lighter socket. Using the incorrect equipment can cause the battery to become hot or cause an explosion.

- Only use the correct equipment to discharge the battery. Using the incorrect equipment can decrease the performance or the life cycle of the battery. Using the incorrect equipment can cause the battery to become hot or cause an explosion.

- Do not connect the positive terminal and the negative terminal of the battery to each other with a metal object (such as wire). Damage to the batteries can occur.

- The battery contains safety and protection devices which, if they become damaged, can cause the battery to become hot, or cause an explosion or an ignition.

- Do not put holes in the battery with objects. Damage to the battery may occur.

- Do not hit the battery with a hammer or apply strong impacts or electric shocks to it. Damage to the battery may occur.

- Do not put the battery in or near a fire, stove or other high-temperature locations. Damage or ignition of the battery may occur.

- Do not put the battery in direct sunlight or other high-temperature locations. Damage or ignition of the battery may occur.

- Do not solder directly onto the battery. Damage to the battery may occur.

- Do not get water or salt water on the battery or device or permit the device or battery to get wet. Damage to the battery may occur.

- Remove any water or moisture on the battery before you install it. Damage to the battery may occur.

- If there is a leak from the battery and the fluid gets into the eyes, do not rub the eyes. Flush well with water and immediately get medical care.

- Always dispose of battery in accordance with local, state and federal regulations.

- Do not use the battery if, when used, charged, or placed in storage, there is an unusual smell from the battery, the battery feels hot, changes color, changes shape, or is in an unusual condition. Speak with a sales office if one or more of these problems occurs.

- Clean the case with a damp cloth and a weak soap solution. Do not use abrasives, isopropyl alcohol, or solvents to clean the case or lens/screen.

- Be careful when cleaning the infrared lens. Do not clean the infrared lens too vigorously. This can damage the anti-reflective coating.

- Avoid condensation. Taking the imager from cold to hot areas causes condensation in thermal imager. To protect the imager, power on the device and wait until it becomes warm enough for the condensation to evaporate.

- Keep device out of reach of children.

- Storage: If you do not use the imager for a long period of time, put the device in a cool and dry environment. Batteries should be stored in an ambient temperature of -20 °C to 20 °C (-4 °F to 67.9 °F). Lithium batteries discharge over time and should be fully charged before storage. It is recommended to fully recharge the batteries every 3 months to prevent damage. Store the device in an ambient temperature of -40 °C to 70 °C (-40 °F to 158 °F).

THE ENCAPSULATION RATING IS ONLY APPLICABLE WHEN ALL THE OPENINGS ON THE CAMERA ARE SEALED WITH THEIR CORRECT COVERS, HATCHES, OR CAPS. THIS INCLUDES THE COMPARTMENTS FOR DATA STORAGE, BATTERIES, AND CONNECTORS.

4.   Technical Specifications

Pixel Resolution	256 x 192
Accuracy	± 2°C (± 3.6 °F) or ± 2%
Temperature Range	-20 °C to 550 °C (-4 °F to 1022 °F)
Operation Range	-10 °C to 50 °C (14°F to 122 °F)
Storage Range	-20 °C to 70°C (-4 °F to 158 °F)
Detector Array	UFPA VOx
Pixel Pitch	12 µm
FOV	56° x 42°
IFOV	3.75 mrad
Focal Length	3.2 mm
Focus	Fixed
Measurement Distance	0.5 m - 4 m, step size 25 cm (1.6' - 13.12', step size 9.84")
Spectral Band	8 µm to 14 µm
Thermal Sensitivity (NETD)	< (40 mK) 0.04 °C at 30 °C (86°F)
Frame Rate	25 Hz
Humidity	95% non-condensing
Pixel Operability	> 99 %
Drop Rating	2 m (6.56')
Dimensions (without lens)	142 mm x 76 mm x 19 mm (L x W x D ± 0.5 mm) (5.56" x 2.99" x 0.75" (L x W x H ± 0.02"))
Weight	210 g (7.41 oz)
Power	DC 5V, 2A
Battery	Internal, rechargeable
Operation Time	6 hours, continuous
Charging Time	3 hours
Power Management	Adjustable
Interface	USB Type-C
Video	UVC streaming, real-time infrared (with data)
Image Format	IR JPG (with data) + visible JPG
Image Polarity	7 options
Image Modes	IR, fusion (ICI Dual Vision), visible, picture-in-picture
Memory	16 GB, internal
Screen	3.5" color touchscreen, 960 x 640

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Brightness	Adjustable
Digital Camera	1920 x 1080, 2 MP
Zoom	2x, 4x
Emissivity Correction	0.1 to 1.0
Measurement Units	°C, °F, and °K
IP Rating	IP54
Language	Multinational
Light	LED, 200 W
Voice Annotation	60 seconds/image
Automatic alarms	
Alarm snapshot (duration and frequency)	
Interval photography (duration and frequency)	
Internal non-uniformity correction (NUC)	
Unlimited voice annotation, text available	
Speaker & Microphone	
1/4"-20 tripod support	
Wi-Fi support	

Specifications subject to change without further notice. Models and accessories subject to regional market considerations. License procedures may apply. Products described herein may be subject to US Export Regulations. Please refer to support@infraredcameras.com with any questions.

5.   Structure

5-1   Appearance and Definitions of Interface
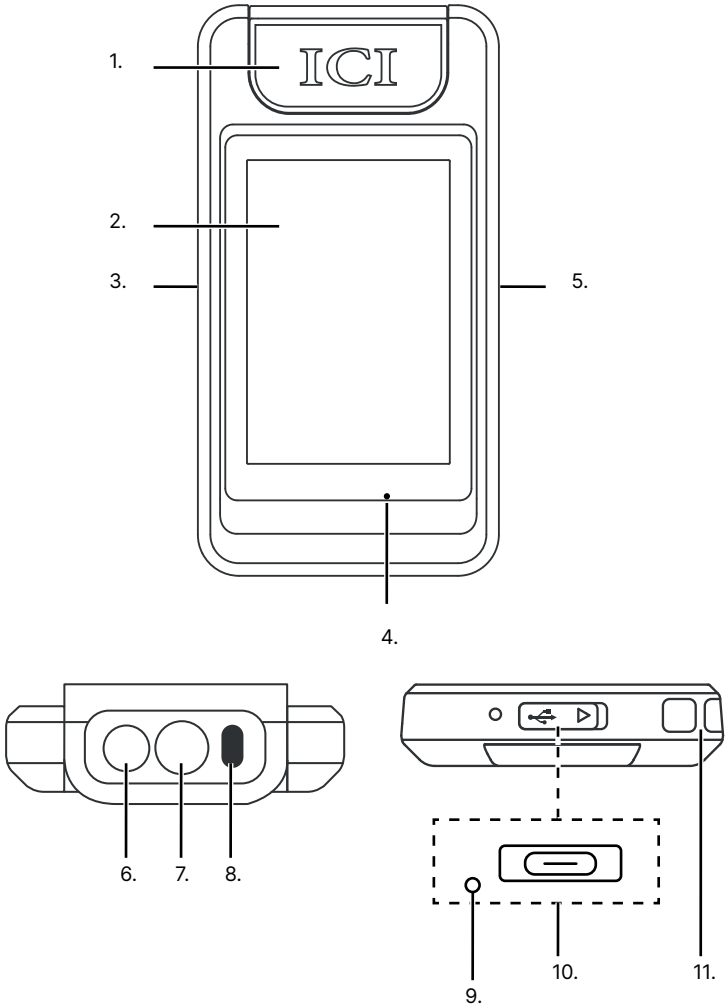
1. Lens Module	7. Germanium Lens
2. Touch Screen	8. LED Flashlight
3. Tripod Mount	9. Power Indicator
4. Microphone	10. Type-C
5. Power	11. Strap Hook
6. Visible Lens	

6.   Package Includes
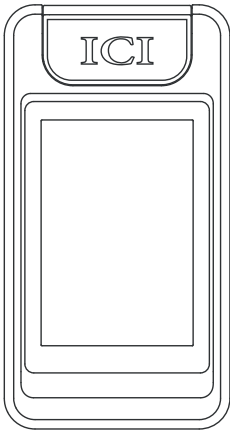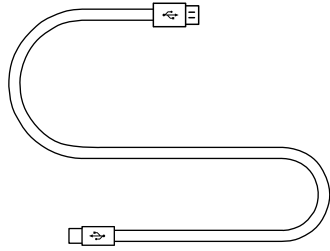
Pivot-IR   USB to Type-C Cable

**ENSURE ALL SYSTEM EQUIPMENT AND COMPONENT ITEMS ARE PRESENT
BEFORE BEGINNING INSTALLATION**

7.   Quick Start Instructions

7-1   Tripod Setup

A.

The Pivot-IR can be used as a handheld device.
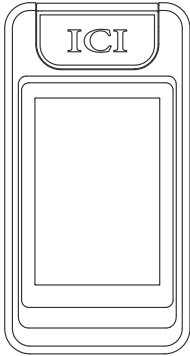
or

Mount the fully charged Pivot-IR to a tripod using the ¼"-20 mount located on the side of the device.
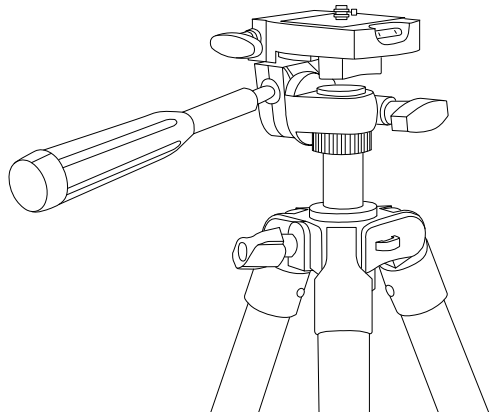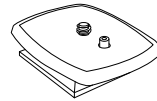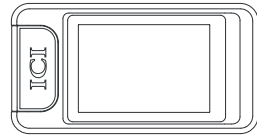
MAKE SURE TRIPODS DO NOT BLOCK THE DIRECT PATH OF THE OBJECT(S) TO BE IMAGED TO ENSURE THE EQUIPMENT WILL NOT BE MOVED OR KNOCKED DOWN. USING A DIVIDING BARRIER HELPS KEEP TRIPODS SEPARATE FROM THE PATH.

TURN ON THE CAMERA BY PRESSING AND HOLDING THE POWER BUTTON FOR AT LEAST 3 SECONDS.

B.

Power on device by pushing
and holding the power button
for three seconds.
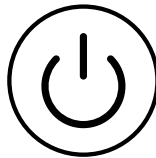
PRESS AND HOLD THE POWER BUTTON FOR MORE THAN 5 SECONDS TO SHUT DOWN THE CAMERA.

THE THERMAL IMAGER NEEDS SUFFICIENT WARM-UP TIME FOR THE MOST ACCURATE TEMPERATURE MEASUREMENTS AND BEST IMAGE QUALITY. THIS TIME CAN OFTEN VARY BY ENVIRONMENTAL CONDITIONS. IT IS BEST TO WAIT A MINIMUM OF 10 MINUTES FOR THE DEVICE TO COMPLETELY WARM-UP.

7-2   Lens Module Rotation

MAKE SURE TO HOLD THE CAMERA FIRMLY IN BOTH HANDS WHEN ROTATING THE LENS MODULE.

A.

Hold device in right hand with the screen facing user. Using the forefinger and thumb of the left hand, pinch the lens module on the LED side.

Back
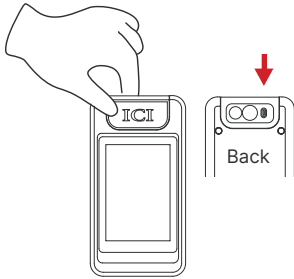
B.

Rotate the lens module by pushing with the thumb and lifting with the forefinger.

Screen

Back
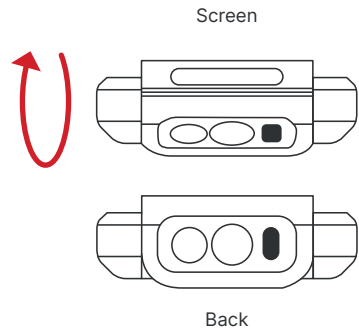
DO NOT GRAB THE LENS MODULE ON THE LENS SIDE. DUST, GREASE, AND FINGERPRINTS PRODUCE HARMFUL SUBSTANCES AND LEAD TO A DECLINE IN PERFORMANCE DUE TO DAMAGE, OR CAUSE SCRATCHES.

THE LENS MODULE CAN BE ROTATED AT ANGLES OF 0°, 30°, 60°, AND 90°. AN AUDIBLE CLICK IS HEARD WHEN A CORRECT ANGLE IS ACHIEVED. DO NOT EXCEED THE MAXIMUM ANGLE OF 90° WHEN ROTATING THE LENS TO AVOID DAMAGE TO THE CAMERA.

DO NOT FORCE THE LENS. IF THERE IS RESISTANCE TRY ROTATING THE LENS IN THE OPPOSITE DIRECTION. THE LENS ROTATES SMOOTHLY AND AN AUDIBLE CLICK IS HEARD WHEN A CORRECT ANGLE IS ACHIEVED.

7-3 Charging Instructions

A.

Plug the USB Type-C end of the USB cable into the bottom of the device.
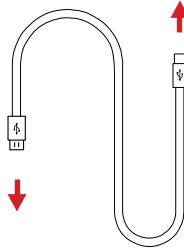
B.

Plug the other end of the USB cable into an available USB port on a computer.
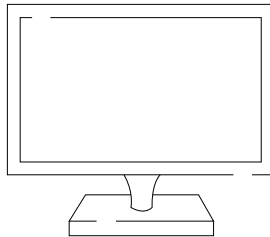
CHARGE THE BATTERY FOR A MINIMUM OF 3 HOURS BEFORE USING. ICI DOES NOT RECOMMEND CHARGING THE DEVICE WHILE IT IS ON A TRIPOD. LAY DEVICE FACE DOWN ON A FLAT AND STABLE DESK OR TABLE WHILE CHARGING.

8.   Operation Instructions

8-1   How to Charge the Battery

Charge the battery for a minimum of 3 hours before using the imager for the first time.

When powered on, the battery status is shown by the indicator in the upper right corner of the screen. A low power warning is displayed on the screen. The instrument is programmed to power off within approximately 10 minutes.

8-1-1   Charging via Computer

The computer USB port should output 5V minimum. If the supply is too low, the device can cause a port surge malfunction; when this occurs, the computer port needs to be restarted before the user can continue.

1.   Plug one end of the USB Type-C cable into the bottom of the device.

2.   Plug the other end of the USB Type-C cable into an available USB port on a computer.

The camera can be charged by USB cable no matter if the device is powered on or off. The light on the bottom of the device lights up during charging. Red indicates not fully charged and green indicates fully charged.

THE CAMERA CAN BE CHARGED BY USB CABLE NO MATTER IF THE DEVICE IS POWERED ON OR OFF. THE LIGHT ON THE BOTTOM OF THE DEVICE LIGHTS UP DURING CHARGING. RED INDICATES NOT FULLY CHARGED AND GREEN INDICATES FULLY CHARGED.

8-1-2   Charging via Power Adapter

1.   Plug one end of the USB Type-C cable into the bottom of the device.

2.   Plug the other end of the USB Type-C cable into a power adapter.

3.   Plug the power adapter into a 110V/120V electrical outlet.

The camera can be charged by USB cable no matter if the device is powered on or off. The light on the bottom of the device lights up during charging. Red indicates not fully charged and green indicates fully charged.

ENSURE THE IMAGER IS NEAR ROOM TEMPERATURE BEFORE CHARGING THE DEVICE. DO NOT CHARGE IN EXTREMELY HOT OR COLD AREAS. THE BATTERY CAPACITY MAY BE DECREASED IF CHARGED IN AN EXTREME TEMPERATURE ENVIRONMENT.

8-2   Power On/Off the Device

To power the device on, push and hold the Power button for 3 seconds. It takes approximately 50 seconds for the head-up display to load and the camera to begin taking measurements.

To power the device off, push and hold the Power button until the screen darkens.

THE THERMAL IMAGER NEEDS SUFFICIENT TIME TO WARM-UP FOR THE MOST ACCURATE TEMPERATURE MEASUREMENTS AND BEST IMAGE QUALITY. THIS TIME CAN OFTEN VARY BY ENVIRONMENTAL CONDITIONS. IT IS BEST TO WAIT A MINIMUM OF 10 MINUTES FOR THE DEVICE TO COMPLETELY WARM-UP.

AFTER POWERING OFF, WAIT TEN SECONDS BEFORE ATTEMPTING TO POWER THE DEVICE ON AGAIN.

THE DEVICE AUTOMATICALLY POWER OFF AFTER A SET AMOUNT OF TIME. ADJUST THE SHUT OFF TIMING BY CHANGING THE POWER MANAGEMENT SETTINGS. TO ADJUST POWER MANAGEMENT SETTINGS SEE SECTION 8-15-4 POWER MANAGEMENT SETTINGS.

8-3   Hibernation Mode

Push and release the Power button to power on/off the screen display. This sends the device into hibernation mode. Placing the device in this standby mode helps to conserve battery power. See Section 8-15-4 Power Management Settings for more information.

THE DEVICE AUTOMATICALLY POWERS OFF AFTER A SET AMOUNT OF TIME. ADJUST THE SHUT OFF TIMING BY CHANGING THE POWER MANAGEMENT SETTINGS. TO ADJUST POWER MANAGEMENT SETTINGS SEE SECTION 8-15-4 POWER MANAGEMENT SETTINGS.

8-4   User Interface

The device interface appearance:

1. Date/Time
2. Analysis Data
3. Display Window
4. Temperature Measurement Point
5. Rotary Menu
6. Main Menu
7. Settings
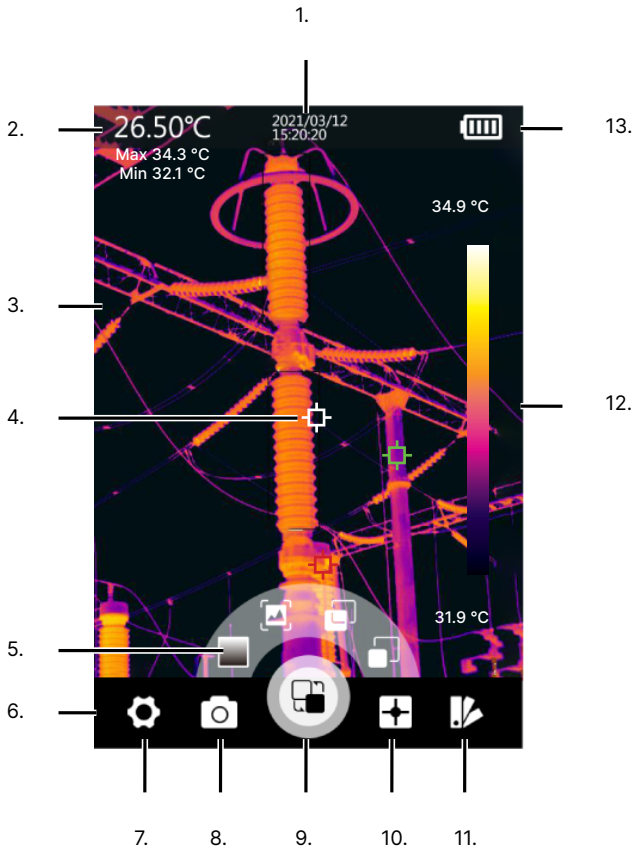
8. Capture/Gallery/Light/NUC
9. Image Mode
10. Zones
11. Polarity
12. Level & Span Bar
13. Battery Life

THE ROTARY MENU AND ORDER OF MAIN MENU OPTIONS CHANGES DEPENDING ON SELECTIONS.

8-4-1   Rotary Menus

8-4-1-1   Open the Rotary Menus

Using the touchscreen, access the rotary menus by tapping on the preferred main menu icon. Each menu icon opens its own rotary menu with its own options; the settings menu is the exception.

8-4-1-2   Using the Rotary Menus

Using the touchscreen, tap on the preferred icon. If the preferred icon is not visible, tap and hold the rotary menu; then, drag the rotary wheel in a circular direction to access the hidden icons.
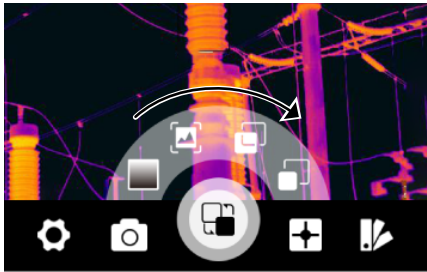
8-4-1-3   Close the Rotary Menus

Close the rotary menu by tapping the display window.

8-4-2   Settings Menu

8-4-2-1   Open the Settings Menu

Using the touchscreen, access the Settings menu by tapping on the gear icon. The Settings menu opens a window containing a list of options. Clicking an option opens a submenu with either more options or device information. Close the submenu by tapping < in the upper left corner.

8-4-2-2   Close the Settings Menu

Close the Settings menu by tapping < in the upper left corner.

DO NOT LOOK INTO THE FLASHLIGHT. LOOKING INTO THE FLASHLIGHT MAY CAUSE EYE DAMAGE AND PERSONAL INJURY. DO NOT POINT THE FLASHLIGHT DIRECTLY AT PEOPLE OR ANIMALS OR INDIRECTLY OFF REFLECTIVE SURFACES.

8-5   Power On/Off the Flashlight

Use the flashlight to assist visibility in dark locations.

1.   Using the touchscreen, tap the Camera icon from the main menu. A rotary menu appears.

2.   Tap the Flashlight icon to power on the light. The line through the icon is removed when enabled. Tap the Flashlight button again to power off the light; a line appears through the icon when disabled.

3.   Tap the display window to exit the rotary menu.

2.
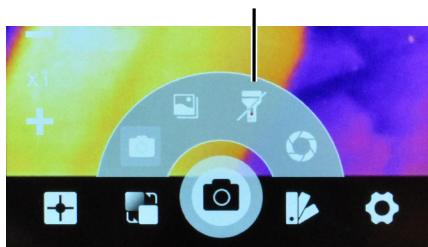
LEAVING THE FLASHLIGHT ON DRAINS THE BATTERY AT AN INCREASED RATE. POWER OFF THE FLASHLIGHT WHEN NOT IN DIRECT USE.

8-6   Focus

The focus of the device is fixed. In order to bring a target into focus, adjust the distance settings and move to the proper distance (see **Section 8-13-4 Distance**). When the target comes into focus, it shows a sharper image. When the target moves out of focus, the thermal image becomes blurry.

Correct focus is important in all imaging applications. Correct focus ensures the infrared energy is directed correctly onto the sensor. This leads to accurate data collection.

8-7   Media Management

8-7-1   Capture an Image

8-7-1-1   Manual Saving

By default, manual saving is enabled. After capturing an image, a small thumbnail is shown on the screen and the user can choose to save, annotate, scan, or cancel the save.

Save images manually as follows:

1.   Find and aim the thermal device at the target.

2.   Using the touchscreen, tap the Camera icon from the main menu. A rotary menu appears.

3.   Tap the Capture icon. A save options box appears.

4.   Name the image using one of the options:

   ◦   Open the keyboard by tapping the input field at the top of the save options box. Use the keyboard by tapping the touchscreen to input the preferred name. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and return to the save options box; or

   ◦   Tap the QRC icon to scan a code to automatically name the image.

5.   Tap the Microphone icon to record voice annotations. Tap the Microphone icon again to stop recording.

6.   Tap the Save icon to save the image. Tap the Back icon to cancel saving.
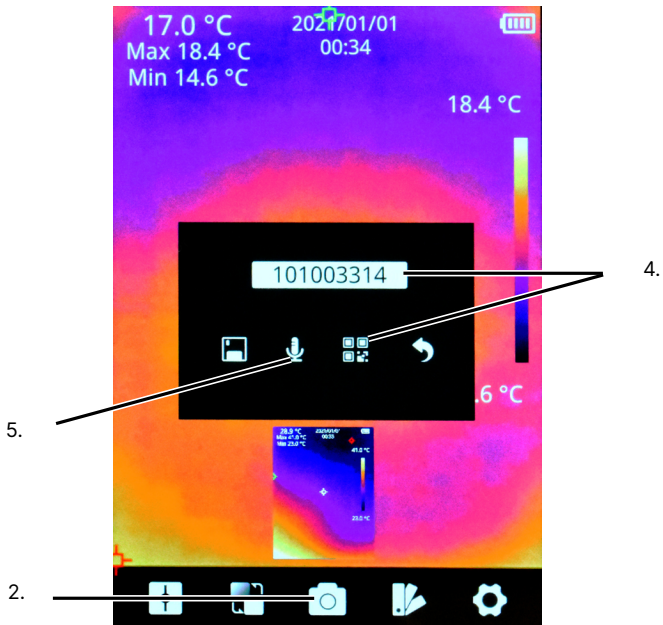
8-7-1-2   Auto Saving

Auto saving is disabled by default. Users can enable automatic saving as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap Image Capture. A submenu opens.

3.   Toggle the Auto Save setting to the On position by tapping the switch. Disable the function by tapping the switch again. Blue means active; gray means inactive.

4.   Tap Save to save settings.

5.   Tap < to exit the submenu.

6.   Tap < to exit the Settings Menu.

8-7-1-3   Interval Photography

By default, interval photography is disabled. Enabling the features allows the device to capture and automatically save a set number of images at a user-defined interval.

Enable interval photography as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap Image Capture. A submenu opens.

3.   Toggle the Timed Image Capture setting to the On position by tapping the switch. Disable the function by tapping the switch again. Blue means active; gray means inactive.

4.   Open the keyboard by tapping the Time Interval input field. Use the keyboard by tapping the touchscreen to input the preferred number of seconds. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

5.   Open the keyboard by tapping the Capture Number input field. Use the keyboard by tapping the touchscreen to input the preferred number of images to capture. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

6.   Tap Save to save settings.

7.   Tap < to exit the submenu.

8.   Tap < to exit the Settings Menu.

USERS CAN ALSO CAPTURE IMAGES WHEN AN THRESHOLD IS MET OR EXCEEDED. SEE SECTION 8-7-1-4 ALARM SNAPSHOT AND SECTION 8-14 TEMPERATURE ALARMS.

8-7-1-4   Alarm Snapshot

By default, alarm snapshot is disabled. Enabling the features allows the device to capture and automatically save a set number of images at a user-defined interval whenever a temperature threshold is exceeded (see **Section 8-14 Temperature Alarms**).

Enable alarm snapshot as follows:

1. Using the touchscreen, tap the Settings icon to open the settings menu.

2. Tap Temperature Alarm. A submenu opens.

3. Enable preferred alarms (see **Section 8-14 Temperature Alarms**).

4. Toggle the Auto Alarm Image Capture setting to the On position by tapping the switch. Disable the function by tapping the switch again. Blue means active; gray means inactive.

5. Open the keyboard by tapping the Time Interval input field. Use the keyboard by tapping the touchscreen to input the preferred number of seconds. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

6. Open the keyboard by tapping the Capture Number input field. Use the keyboard by tapping the touchscreen to input the preferred number of images to capture. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

7. Tap Save to save settings.

8. Tap < to exit the submenu.
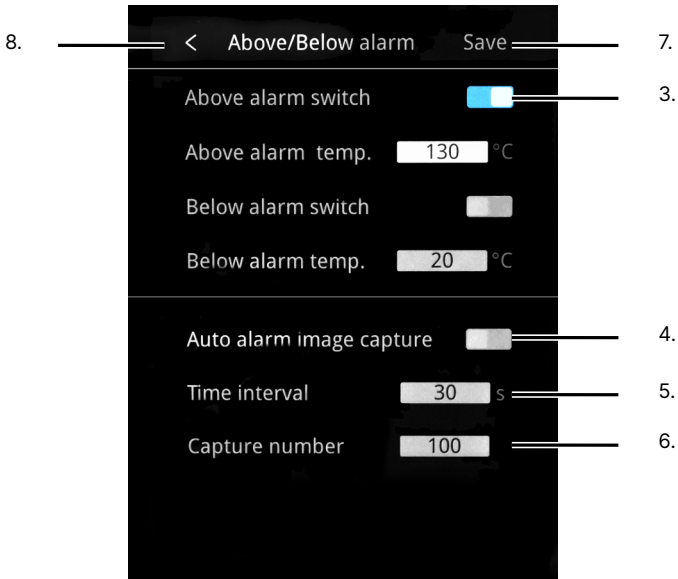
9. Tap < to exit the Settings Menu.

8-7-2   Adding Voice Annotations to an Image

Create voice annotations as follows:

1.   Capture an image. A save options box appears.

2.   Tap the Microphone icon to record voice annotations. Tap the Microphone icon again to stop recording.

3.   Tap the Save icon to save the image. Tap the Back icon to cancel saving.

8-7-3   Name an Image

8-7-3-1   Manual File Naming

1.   Capture an image. A save options box appears.

2.   Name the image using one of the options:

    ◦   Open the keyboard by tapping the input field at the top of the save options box. Use the keyboard by tapping the touchscreen to input the preferred name. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and return to the save options box; or

    ◦   Tap the QRC icon to scan a code to automatically name the image.

3.   Tap the Save icon to save the image. Tap the Back icon to cancel saving.

8-7-3-2   Automatic File Naming

Users can scan QR codes to automatically name files as follows:

1.   Capture an image. A save options box appears.

2.   Tap the QR Code icon to open the scanner.

3.   Scan the QR code. The scanner closes and the file is renamed.

4.   Tap the Save icon to save the image. Tap the Back icon to cancel saving.
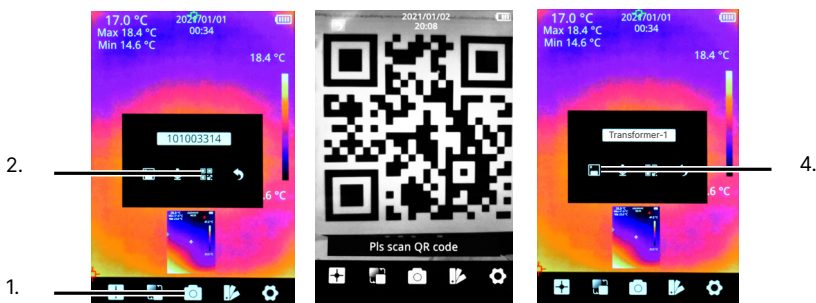
8-7-3-3   Rename Images

Media can be renamed at any time as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap the Gallery icon. Press and hold the screen; then, drag up or down to scroll through the gallery.

3.   Tap the image to rename.

4.   Tap the Edit icon. A keyboard appears.

5.   Use the keyboard by tapping the touchscreen to input the preferred name. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

6.   Tap < to exit the image.

7.   Tap < to exit the Gallery.

8-7-4   Review Images

Media can be viewed at any time as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap the Gallery icon. Press and hold the screen; then, drag up or down to scroll through the gallery.

3.   Tap the image to review. Tap < or > on either side of the image to navigate the images without returning to gallery.

4.   Tap < to return to the gallery.

5.   Tap < to exit the Gallery.

2.
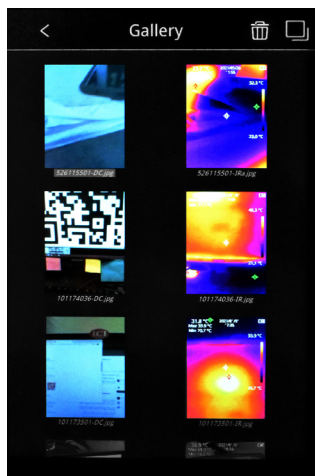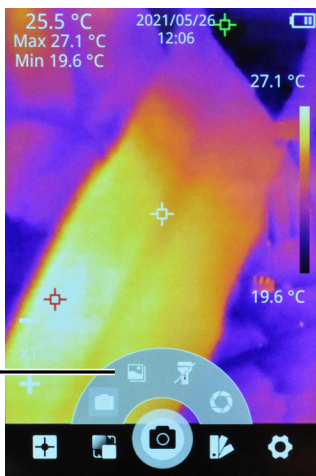
8-7-5　Export Media (USB Storage)

In USB Storage mode, the user can connect the device to a computer to directly access the internal memory of the device. This allows the user to transfer the images to computer for analysis.

Export media as follows:

1.　Using the touchscreen, tap the Settings icon to open the settings menu.

2.　Tap System. A submenu opens.

3.　Tap USB Mode. A submenu opens.

4.　Tap USB Storage. Saving occurs automatically.

5.　Tap < continuously to exit the menus.

6.　Power off the device.

7.　Plug the USB end of the USB Type-C cable into an available USB port on a computer.

8.　Power on the device.

9.　Plug the other end of the USB Type-C cable into the bottom of the device.

10.　Navigate to the DCIM folder of the device.

11.　Export media to preferred location on computer.

12.　Power off the device and unplug the cable when finished.

8-7-6　Live Streaming to a Computer

Users can synchronize the picture in the camera to the PC software for real-time display and analysis. Stream directly to a computer as follows.

1.　Using the touchscreen, tap the Settings icon to open the settings menu.

2.　Tap System. A submenu opens.

3.　Tap USB Mode. A submenu opens.

4.　Tap USB Camera. Saving occurs automatically.

5.　Tap < continuously to exit the menus.

6.　Power off the device.

7.　Plug one end of the USB Type-C cable into the bottom of the device.

8.　Plug the other end of the USB Type-C cable into an available USB port on a computer.

9.　Power on the device. Image feed should now be viewable on the external computer screen.

8-7-7   Delete Images

Media can be deleted at any time as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap the Gallery icon. Press and hold the screen; then, drag up or down to scroll through the gallery.

3.   Tap the image to delete.

4.   Tap the Trash Can icon.

5.   Tap Confirm to delete the image. Tap Cancel to cancel deletion.

6.   Tap < to return to the gallery.

7.   Tap < to exit the Gallery.

DELETED IMAGES CANNOT BE RECOVERED.

8-7-8   Delete Multiple Images

Delete multiple images as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap the Gallery icon.

3.   Tap the Selection icon.

4.   Tap the images to be deleted. A red box appears around selected images. Press and hold the screen; then, drag up or down to scroll through the gallery to find images.

5.   Tap the Trash Can icon.

6.   Tap Confirm to delete the images. Tap Cancel to cancel deletion.

7.   Tap < to exit the Gallery.
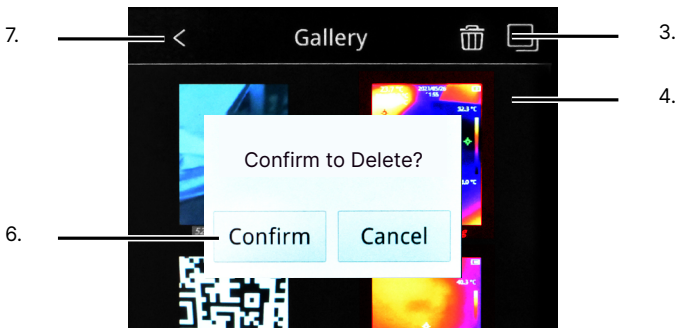
8-8 Non-uniformity Correction

Non-uniformity correction (NUC) is used to compensate for the non-uniformity of detector pixels or other optical interference. The infrared device features a manual NUC operation.

Perform a NUC correction as follows:

1. Using the touchscreen, tap the Camera icon from the main menu. A rotary menu appears.

2. Tap the Aperture icon to perform a NUC. When performing a correction operation, the on screen image freezes temporarily. The image may clear of some noise grain after the device makes its adjustments.

3. Tap the display window to exit the Rotary Menu.

8-9 Image Modes

There are 4 image modes available:

1. ▢ Thermal: infrared image

2. ▢ Fusion (ICI Dual Vision): infrared and visible image

3. ▢ PIP (Picture-in-Picture): thermal image overlay over the visible image

4. ▢ Digital: visible image only

| 1. | 2. | 3. | 4. |
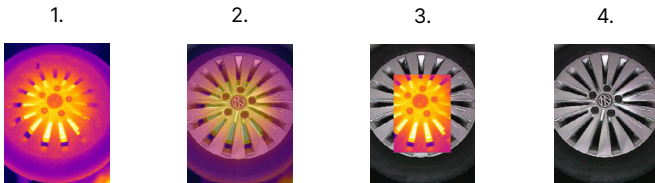
Change the image mode as follows:

1. Using the touchscreen, tap the Image Mode icon from the main menu. A rotary menu appears.

2. Tap the preferred image mode.

3. Tap the display window to exit the rotary menu.

IF THE FUSION OR PICTURE-IN-PICTURE MODE IS SELECTED ENSURE THE IMAGE ALIGNMENT (REGISTRATION) IS SET CORRECTLY.

THE USER SHOULD BE SURE TO SET THE IMAGE OPACITY FOR FUSION MODE.

8-9-1 Image Alignment (Registration)

When using fusion and picture-in-picture mode it is important to ensure the image alignment is set correctly to receive the best image.

Align the images as follows:

1. Using the touchscreen, tap the Image Mode icon from the main menu. A rotary menu appears.

2. Tap the preferred image mode.

3. Adjust the alignment using the + and - to the right of the rotary menu.

4. Tap the display window to exit the rotary menu.
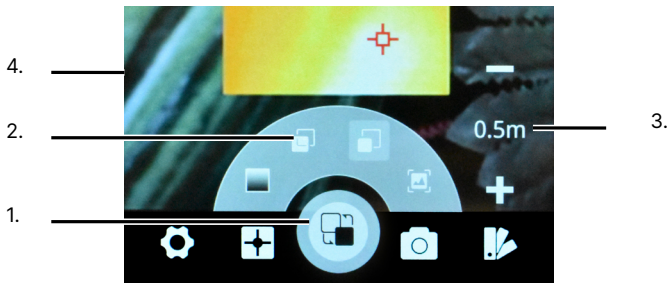
USERS SHOULD STAND AT THE CORRECT DISTANCE FROM THE TARGET WHEN PERFORMING IMAGE ALIGNMENT. THE PROPER DISTANCE IS DETERMINED BY USING THE DISTANCE SETTINGS. MINIMUM DISTANCE IS 1 METER (3' 3.37").

IMAGE MAY REQUIRE REALIGNMENT WHEN CHANGING INSPECTION LOCATIONS.

8-9-2   Image Opacity

When using fusion mode it is important to ensure the image opacity is set correctly to receive the best image.

Adjust the opacity as follows:

1.   Using the touchscreen, tap the Image Mode icon from the main menu. A rotary menu appears.

2.   Tap the Fusion mode icon.

3.   Adjust the opacity using the + and - to the left of the rotary menu.

4.   Tap the display window to exit the rotary menu.
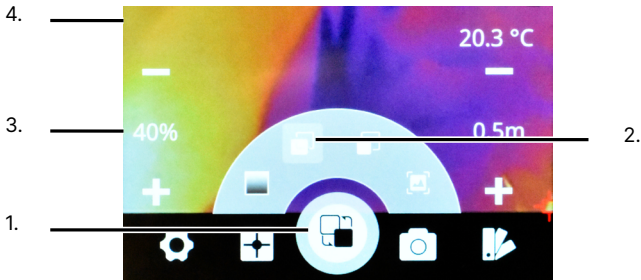
8-10 Zoom

The imager offers digital zoom in the thermal and visible modes.

1.   Using the touchscreen, tap the Camera Mode icon from the main menu. A rotary menu appears.

2.   Tap the preferred image mode.

3.   Adjust the zoom factor using the + and - to the left of the rotary menu. The zoom factor is displayed.

4.   Tap the display window to exit the rotary menu.
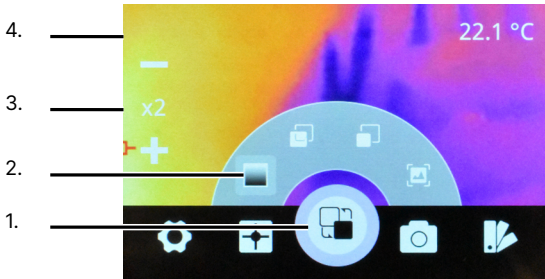
8-11 Polarity

Change the polarity (color palette) to enhance temperature differences on the thermal camera as follows:

1. Using the touchscreen, tap the Polarity icon from the main menu. A rotary menu appears.

2. Using the touchscreen, tap on the preferred color palette. If the preferred palette is not visible, tap and hold the rotary menu; then, drag the rotary wheel in a circular direction to access the hidden palettes.

3. Tap the display window to exit the rotary menu.

8-12 Level & Span

To the right of the imaging interface is the Level & Span bar which plots the surface temperature information detected by the system. The maximum temperature is displayed on the top and the minimum temperature on the bottom. These numbers change depending on the physics of the scene. Preferably, any temperature detected by the thermal device falls between the maximum and minimum temperature detected. If a number falls outside this range the image may "wash out", i.e. the extraneous energy in the viewing environment may reduce the perceived contrast of the image.

The device has automatic level and span adjustment and automatically adjusts the image contrast. Choosing the correct temperature range helps with the adjustment process (see **8-13-1 Temperature Range**).

8-13 Thermal Analysis

8-13-1 Temperature Range

The default temperature scale of the device is -20 °C to 150 °C (-4 °F to 302 °F). Other temperature calibrations may also be available.

Change the temperature range as follows:

1. Using the touchscreen, tap the Settings icon to open the settings menu.

2. Tap Gain Switch. A submenu opens.

3. Select the preferred temperature range. The device may appear to freeze as the device calibrates. It can take up to 1 minute for the calibration to complete initialization. Saving occurs automatically.

4. Tap < to exit the submenu.

5. Tap < to exit the Settings Menu.

SELECT THE APPROPRIATE TEMPERATURE RANGE AND SET EMISSIVITY BEFORE CAPTURING MEDIA OR PERFORMING THERMAL ANALYSIS.

8-13-2 Emissivity

To more accurately measure materials with a low emissivity, an emissivity correction is necessary.

Change the emissivity as follows:

1. Using the touchscreen, tap the Settings icon to open the settings menu.

2. Tap Parameters. A submenu opens.

3. Press and hold the screen; then, drag up or down on the Emissivity rotary dial to set the emissivity.

4. Tap Save to save settings.
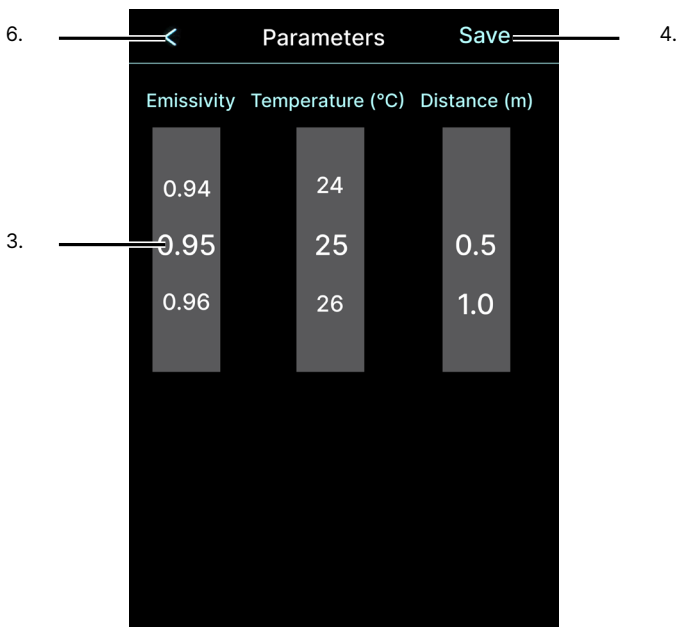
5. Tap < to exit the submenu.

6. Tap < to exit the Settings Menu.

SURFACES WITH AN EMISSIVITY OF < 0.60 MAKE RELIABLE AND CONSISTENT MEASUREMENTS PROBLEMATIC. THE LOWER THE EMISSIVITY, THE GREATER POTENTIAL FOR ERROR WITHIN THE DEVICE'S CALCULATIONS. ERRORS MAY STILL OCCUR EVEN WHEN ADJUSTMENTS ARE PERFORMED PROPERLY.

SEE SECTION 9-2 EMISSIVITY FOR A TABLE OF COMMON EMISSIVITY VALUES.

8-13-3 Ambient Temperature

Reflected energy in the scene caused by atmospheric conditions can alter the temperature readings.

Change the ambient temperature as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap Parameters. A submenu opens.

3.   Press and hold the screen; then, drag up or down on the Temperature rotary dial to set the ambient temperature.

4.   Tap Save to save settings.

5.   Tap < to exit the submenu.

6.   Tap < to exit the Settings Menu.

8-13-4 Distance

Although distance usually does not affect the temperatures measured by the software it can be helpful to know the distance to the target location. The default distance measurement unit is meters.

Change the distance as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap Parameters. A submenu opens.

3.   Press and hold the screen; then, drag up or down on the Distance rotary dial to set the distance.

4.   Tap Save to save settings.

5.   Tap < to exit the submenu.

6.   Tap < to exit the Settings Menu.
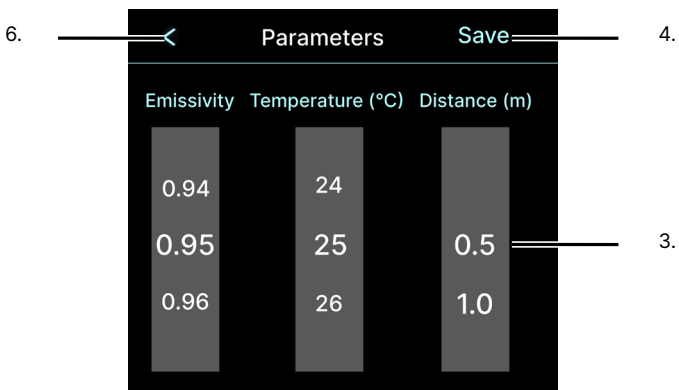
8-13-5   Analysis Objects

Users can have 1 center point analysis object as well as hot spot and cold spot temperature trackers. Radiometric temperature information is displayed in the upper left corner of the screen for each analysis object.

8-13-5-1   Center Point Temperature point

By default, the center point analysis object is enabled. If it becomes disabled, users can enable it as follows:

1.   Using the touchscreen, tap the Analysis Object icon from the main menu. A rotary menu appears.

2.   Tap the center point analysis object. Tap the analysis object again to disable it. A line shows through the analysis object when disabled.

3.   Tap the display window to exit the rotary menu.
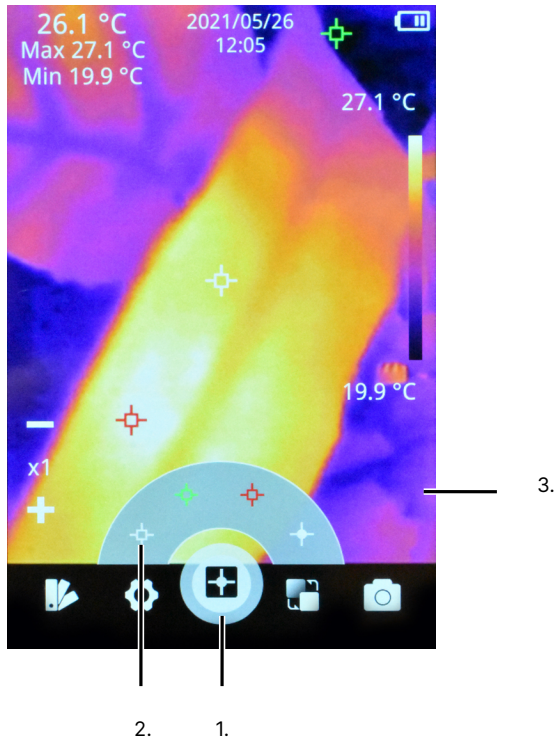
ANALYSIS OBJECTS CAN NOT BE DISPLAYED IN VISIBLE MODE.

8-13-5-2   Hot Spot Temperature Tracking

By default, the hot spot temperature tracker is disabled. Enable the hot spot temperature tracker as follows:

1.   Using the touchscreen, tap the Analysis Object icon from the main menu. A rotary menu appears.

2.   Tap the red analysis object to enable the hot spot tracker. Tap the analysis object again to disable it. A line shows through the analysis object when disabled.

3.   Tap the display window to exit the rotary menu.

8-13-5-2   Cold Spot Temperature Tracking

By default, the hot spot temperature tracker is disabled. Enable the hot spot temperature tracker as follows:

1.   Using the touchscreen, tap the Analysis Object icon from the main menu. A rotary menu appears.

2.   Tap the green analysis object to enable the cold spot tracker. Tap the analysis object again to disable it. A line shows through the analysis object when disabled.

3.   Tap the display window to exit the rotary menu.

THE TEMPERATURE TRACKERS AND CENTER POINT CANNOT BE MANUALLY MOVED AS THEY MONITOR AND TRACK SPECIFIC POINTS.

8-13-5-3   Delete an Analysis Object

Delete an existing analysis object as follows:

1.   Using the touchscreen, tap the Analysis Object icon from the main menu. A rotary menu appears.

2.   Tap an analysis object to disable it. A line shows through the object when disabled.

3.   Tap the display window to exit the rotary menu.

8-13-5-4   Delete ALL Analysis Objects

Delete all existing analysis objects as follows:

1. Using the touchscreen, tap the Analysis Object icon from the main menu. A rotary menu appears.

2. Tap the disable analysis objects icon. The analysis objects disappear and the rotary dial automatically closes.

8-14 Temperature Alarms

8-14-1 Enable an Alarm

By default the temperature alarms are disabled. The user may enable both high and low temperature alarms simultaneously.

Enable an alarm as follows:

1. Using the touchscreen, tap the Settings icon to open the settings menu.

2. Tap Temperature Alarm. A submenu opens.

3. Toggle the preferred temperature alarm setting to the On position by tapping the switch. Disable the function by tapping the switch again. Blue means active; gray means inactive.

4. Tap Save to save settings.

5. Tap < to exit the submenu.

6. Tap < to exit the Settings Menu.
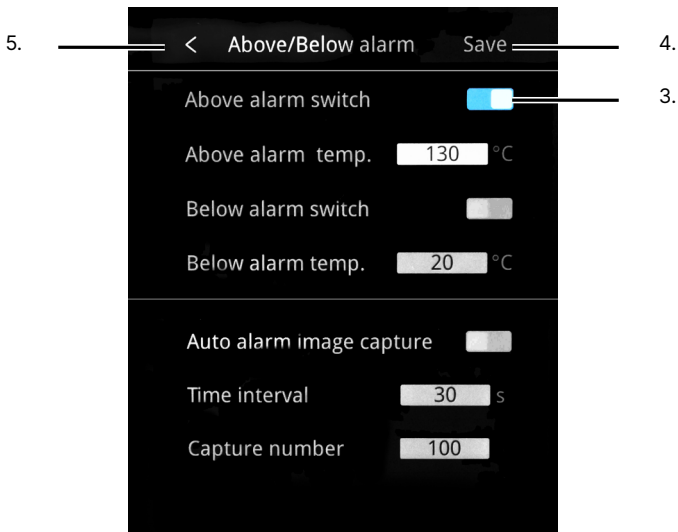
8-14-2 Threshold Settings

Adjust the alarm threshold as follows:

1. Using the touchscreen, tap the Settings icon to open the settings menu.

2. Tap Temperature Alarm. A submenu opens.

3. Toggle the preferred temperature alarm(s) (Above Alarm = High Temperature and Below Alarm = Low Temperature) to the On position by tapping the switch. Disable the function by tapping the switch again. Blue means active; gray means inactive.

4. Open the keyboard by tapping the Above Alarm input field. Use the keyboard by tapping the touchscreen to input the preferred high temperature alarm threshold. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

5. Open the keyboard by tapping the Below Alarm input field. Use the keyboard by tapping the touchscreen to input the preferred low temperature alarm threshold. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

6. Tap Save to save settings.

7. Tap < to exit the submenu.

8. Tap < to exit the Settings Menu.

8-14-3 Visual Alarm

Threshold settings must be enabled for the visual alarms to function. Visual alarms shows automatically on screen when thresholds are either met or exceeded. A red alarm signals a exceeded high temperature threshold. A green alarm signals an exceeded low temperature threshold.

The default high temperature alarm is 130 °C (266 °F). This means a visible alarm triggers at temperatures above 130 °C (266 °F). The default low temperature alarm is 20 °C (68 °F). This means a visible alarm triggers at temperatures below 20 °C (68 °F). Users can adjust the threshold values to change when an alarm shows.

The alarms show whether or not the rotary menus are open.

High   Low

BOTH ALARMS CAN BE ENABLED INDIVIDUALLY OR TOGETHER. THE USER CAN ADJUST THE SETTINGS OF THE TEMPERATURE ALARMS INDIVIDUALLY.

8-15   Settings

8-15-1   Screen Rotation

By default, automatic scree rotation is enabled. If it becomes disabled it can be enabled as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap Screen Rotation. A submenu opens.

3.   Toggle the Auto Rotation feature to the On position by tapping the switch. Disable the function by tapping the switch again. Blue means active; gray means inactive. Saving occurs automatically.

4.   Tap < to exit the submenu.

5.   Tap < to exit the Settings Menu.

8-15-2   Temperature Units

By default the imager is set to measure temperatures in Celsius (°C). Change the temperature scale unit as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap System. A submenu opens.

3.   Tap Unit. A submenu opens.

4.   Select the preferred temperature unit. Saving occurs automatically.

5.   Tap < to exit the submenu.

6.   Tap < to exit the Settings Menu.

ENSURE THE PROPER TEMPERATURE UNIT IS SELECTED FOR YOUR APPLICATION. CELSIUS, FAHRENHEIT, AND KELVIN UNITS ARE AVAILABLE.

8-15-3   Distance Units

The device only measures distance in meters.

1 METER = 3.281 FEET

8-15-4   Power Management Settings

8-15-4-1   Sleep (Hibernation) Mode

Push and release the Power button to send the device into hibernation mode. The device sleeps for a period of time; then, it powers off. Adjust the shut off timing using the automatic shutoff settings in **Section 8-15-4-2 Automatic Shutoff**. Placing the device in hibernation mode can help conserve battery power.

HIBERNATION SETTINGS ARE DETERMINED BY THE AUTOMATIC SHUTOFF SETTINGS AND HELP CONSERVE BATTERY POWER.

8-15-4-2   Automatic Shutoff

By default, automatic shutoff is enabled. The device powers off automatically after 20 minutes.

Adjust the automatic shutoff as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap Auto Power Off. A submenu opens.

3.   Select the preferred timing: 5 minutes, 10 minutes, 20 minutes, or Off. Selecting Off disables automatic shutoff. Saving occurs automatically.

4.   Tap < to exit the submenu.

5.   Tap < to exit the Settings Menu.
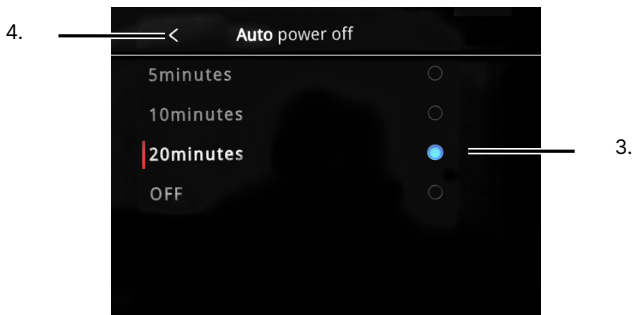
DISABLING AUTOMATIC SHUTOFF DRAINS THE BATTERY AT AN INCREASED RATE. SET THE AUTOMATIC SHUTOFF TIME TO SAVE POWER.

8-15-5   Wi-Fi Settings

Connect to wireless Internet as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap Hotspot. A submenu opens.

3.   Toggle the Hotspot feature to the On position by tapping the switch. Disable the function by tapping the switch again. Blue means active; gray means inactive.

4.   Open the keyboard by tapping the Network Name input field. Use the keyboard by tapping the touchscreen to input the preferred network name. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

5.   Open the keyboard by tapping the Password input field. Use the keyboard by tapping the touchscreen to input the password. Tap Enter to accept changes and close the keyboard. Tap Return to cancel changes and close the keyboard.

6.   Tap Apply.

7.   Tap < to exit the submenu.

8.   Tap < to exit the Settings Menu.
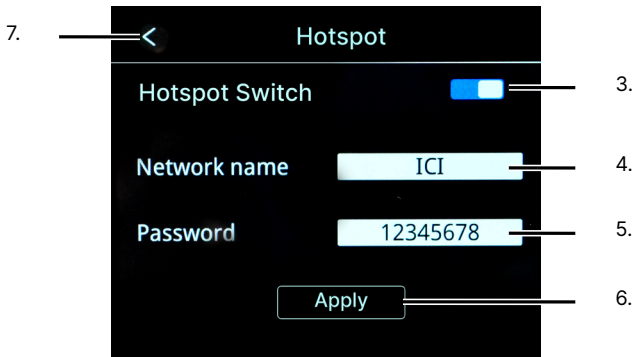
IN ORDER TO ENSURE A RELIABLE WI-FI CONNECTION AND STABLE DATA TRANSMISSION, ENSURE THAT THE CONNECTION DISTANCE IS WITHIN 10 METERS (33 FEET) AND THERE ARE NO OBSTACLES,SUCH AS PARTITIONS, ETC., BETWEEN THE DEVICE AND THE TRANSMITTER.

DON'T CONNECT THE DEVICE TO INSECURE OR PUBLIC NETWORKS.

8-15-6   Display Brightness Settings

Users can change the brightness settings as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap System. A submenu opens.

3.   Tap Brightness. A submenu opens.

4.   Select the preferred brightness: Low, Medium, or High. Saving occurs automatically.

5.   Tap < continuously to exit the menus.

8-15-7   Date and Time Settings

Adjust the date and time as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap System. A submenu opens.

3.   Tap Date & Time. A submenu opens.

4.   Press and hold the screen; then, drag up or down on the rotary dial to set the date and time.

5.   Tap Save to save settings.

6.   Tap < continuously to exit the menus.

8-15-8   Language Settings

English is the default language of the device. Change the device language as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap System. A submenu opens.

3.   Tap Language. A submenu opens.

4.   Select the preferred language. Saving occurs automatically.

5.   Tap < continuously to exit the menus.

THE USER MUST CHOOSE A LANGUAGE AND SET DATE AND TIME SETTINGS AFTER PERFORMING A FACTOR RESET.

8-15-9   Storage Information

Storage information can be viewed as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap System. A submenu opens.

3.   Tap Device Information. Capacity and remaining storage information is shown on screen.

4.   Tap < continuously to exit the menus.

THE DEVICE HAS BUILT-IN STORAGE. REMAINING MEMORY CAN BE SEEN IN THE DEVICE INFORMATION SECTION OF THE SYSTEM SETTINGS.

8-15-10 Device Information

Access information about the device as follows:

1.   Using the touchscreen, tap the Settings icon to open the settings menu.

2.   Tap System. A submenu opens.

3.   Tap Device Information. Information is shown on screen.

4.   Tap < continuously to exit the menus.

8-15-11 Format the Memory Card

Users can format the internal memory card as follows:

1.   Back up images on an external device before formating the internal memory.

2.   Using the touchscreen, tap the Settings icon to open the settings menu.

3.   Tap System. A submenu opens.

4.   Tap Format SD Card.

5.   Tap Confirm to format the internal memory. Tap Cancel to cancel operation.

6.   Tap < continuously to exit the menus.

FORMATTING THE INTERNAL MEMORY ERASES IMAGES SAVED TO THE INTERNAL STORAGE. BE SURE TO BACK UP AS NEEDED BEFORE FORMATTING.

8-15-12 Factory Reset the Device

Users can perform a factory reset as follows:

1. Using the touchscreen, tap the Settings icon to open the settings menu.

2. Tap System. A submenu opens.

3. Tap Factory Defaults.

4. Tap Confirm to perform a factory reset. Tap Cancel to cancel operation.

5. Tap < continuously to exit the menus.

PERFORMING A FACTORY RESET ERASES CUSTOMIZED USER CONFIGURATIONS STORED ON THE DEVICE AND RESTORES THE ORIGINAL DEFAULT SETTINGS PROGRAMMED BY THE MANUFACTURER. THE PROCESS CANNOT BE UNDONE. PERFORMING A FACTORY RESET DOES NOT ERASE IMAGES STORED TO THE INTERNAL STORAGE OF THE DEVICE.

8-15-13 Device Software Upgrade

The device may periodically need a software upgrade or patch. Ensure the device is charged before proceeding with the upgrade. If the device loses power during the process, the upgrade may fail and the device may become unusable.

Update to the latest software version as follows:

1. Contact customer service to receive the latest software upgrade RAR file.

2. Set the Device to USB Storage mode and connect the device to a computer (see Section 8-7-5 Export Media (USB Storage)).

3. Using the computer, unzip the RAR file.

4. Copy the Update folder to the root storage of the thermal device and replace the original Update file.

5. On the thermal device, tap the Settings icon to open the settings menu.

6. Tap System. A submenu opens.

7. Tap Software Update.

8. Tap Update from SD Card. The update can take up to 15 minutes. Do not press buttons. Wait for the install to complete.

9. When the installation is complete, tap < continuously to exit the menus.

10. Restart the device.

THE UPGRADE PROCESS TAKES ABOUT 15 MINUTES. ENSURE THE DEVICE IS CHARGED BEFORE UPGRADING. IF THE DEVICE LOSES POWER DURING THE UPGRADE, THE UPGRADE MAY FAIL AND THE DEVICE MAY BE UNUSABLE.

9   Radiometry

9-1   Introduction to Radiometry

The basic reason for employing image processing programs when analyzing IR images is to have a fast and comprehensive means to determine the information content of an image in numerical terms. Radiometry is considered the base from which to conduct this analysis.

Typically, converting the gray scale values to values of temperatures requires either a calibration of individual cameras or field calibration data. The method for calibrating images provided in this program is field calibration data because temperature data is stored within the media loaded into the software and read by the software program.

IR Tools looks for a data stored within the media. If this software cannot read any calibration data, the user cannot perform temperature analysis on the data. This typically occurs when non-radiometric images are opened using the software. Contact customer service if there is an issue. To adjust parameters see **Section 8-13 Thermal Analysis.**

9-2   Emissivity

All objects radiate infrared energy. The amount of energy radiated varies based on the actual surface temperature and the surface emissivity of the object. The Thermal imager senses the infrared energy from the surface of the object and uses this data to calculate an estimated temperature value.

Many common objects and materials such as painted metal, wood, water, skin, and cloth are particularly good at radiating energy and it is easy to get relatively accurate measurements. For surfaces that are good at radiating energy (high emissivity), the emissivity factor is >=0.90. This simplification does not work on shiny surfaces or unpainted metals as they have an emissivity of <0.6. These materials are not good at radiating energy and are classified as low emissivity.

Adjust the emissivity setting according to **Section 8-13-2 Emissivity.**

SURFACES WITH AN EMISSIVITY OF < 0.60 MAKE RELIABLE AND CONSISTENT MEASUREMENTS PROBLEMATIC. THE LOWER THE EMISSIVITY, THE GREATER POTENTIAL FOR ERROR WITHIN THE DEVICE'S CALCULATIONS. ERRORS MAY STILL OCCUR EVEN WHEN ADJUSTMENTS ARE PERFORMED PROPERLY.

A LIST OF COMMON EMISSIVITY VALUES CAN BE FOUND ON THE NEXT PAGE.

Users are provided the capability to enter any value of surface optical property of the target surface deemed appropriate to the analysis. To set the emissivity enter a value from 0.01 to 1.0 in the input field .

The accompanying table gives the typical emissivity of important materials:

Material	Emissivity
Water	.96
Stainless steel	.14
Aluminum plate	.09
Asphalt	.96
Concrete	.97
Cast iron	.81
Rubber	.95
Wood	.85
Brick	.75
Tape	.96
Brass plate	.06
Human skin	.98
PVC plastic	.93
Polycarbonate	.80
Oxidized copper	.78
Rust	.80
Paint	.90
Soil	.93

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9-3 Temperature Correction

The accuracy of temperature conversion is also dependent on the physics of the scene. These physical properties include emissivity and reflection of the target, the transmission in the intervening atmosphere, and the background/foreground temperature within the scene.

Make sure to select the correct temperature scale to assist with temperature correction (see **8-14-1 Temperature Range).**

9-4 Ambient Temperature

The ambient temperature, which is often referred to as the background, is the temperature of the surfaces surrounding the imaged object. These surfaces are those whose energy hits the face of the imaged object and reflect from it into the camera's field of view. Adjust the ambient temperature setting according to **Section 8-14-3 Ambient Temperature.**

9-5 Distance and Angle of Reflection

Although distance usually does not affect the temperatures measured by the software it can be helpful to know the distance to the target location. Generally, the further away the IR sensor is from the target/background area, the less thermal contrast seen in the image.

Angles of reflection can also affect the contrast. This is significant because when the IR sensor is operated at low angles over water there may be no perceived thermal difference between the horizon and the water, i.e. the horizon can seem to disappear. Users can change their angle by changing where they stand or by attaching a camera to an unmanned aerial system.

While there is an input field for Distance there is not an input for Angle of Reflection. Use the Comments section to create notes concerning positioning and angles; then, adjust the Distance setting according to **Section 8-14-4 Distance.**

9-6 Humidity

Humidity remains in the atmosphere even on bright days. Water of all three states can be found naturally in the atmosphere: liquid (rain, fog, and clouds), solid (snowflakes, ice crystals), and gas (water vapor). Water in any state is an obstacle to accurate temperature measurements. When the wave passes through the water particles, a part of its energy is absorbed and a part is scattered. Therefore the electromagnetic wave is attenuated.

The device does not account for humidity; make a note of any weather conditions on a notepad before beginning the inspection.

10   Cleaning and Maintenance

10-1   Cleaning the Germanium Lens

Do not use corrosive chemicals on the optical glass components. The germanium window surface is coated with anti-reflection coating. Dust, grease, and fingerprints produce harmful substances and leads to a decline in performance, or cause scratches. If dirt is found, please use the following methods:

1.   Use a blown balloon or a soft brush to clean the lens surface to avoid dust particles scratching the anti-reflection film on lens surface during the wiping process.

2.   Use a soft cotton or microfiber cloth or lens wiping paper and dip in distilled water. Gently wipe the lens surface from the middle to the edge, paying attention to not crack the lens, or use too much liquid. If the lens is still not clean, replace the cloth and repeat the wiping process.

10-2   Disinfecting the Camera Surface

Do not use corrosive cleaning solutions on the optical glass components. It is recommended to disinfect the camera surface regularly with a non-corrosive sanitizing product. Follow the directions provided by the manufacturer of the cleaning solution. Adhere to the sanitation protocols and cleaning schedule set forth by the employer.

10-3   Device Calibration

It is recommended to have the device(s) re-calibrated annually. Contact customer service to schedule maintenance.

10-4   Storage

When the equipment is not in use, the device should be placed in a dust-free and moisture-free environment with a stable temperature and humidity.

DO NOT USE CORROSIVE CLEANING SOLUTIONS ON THE OPTICAL GLASS COMPONENTS. DISINFECT THE CAMERA SURFACE REGULARLY WITH A NON-CORROSIVE SANITIZING PRODUCT.

CALIBRATE YOUR DEVICES ANNUALLY. CONTACT CUSTOMER SERVICE TO SCHEDULE MAINTENANCE.

11   Troubleshooting

If the user encounters any problems while using the imager, refer to the following options. If the problem persists, disconnect the power and contact the customer support department.

11-1   Thermal imager does not power on

- Charge battery

11-2   Thermal imager shuts off unexpectedly

- Check power management settings of the device
- Charge battery

11-3   No thermal image

- If lens is foggy, use professional equipment to clean the lens

11-4   Unclear or dark visible images

- Turn on lights in imaging area
- Turn on device light
- If lens is foggy, use professional equipment to clean the lens

11-5   Camera out of focus

- Adjust the distance settings of the device
- Move closer to the target

11-6   Temperature data is missing or has strange readings

- Add a center point or tracker
- If the target's temperature is lower or higher than the limits of the device, temperature data may not show correctly.

11-7 Temperature readings are incorrect

- Turn off the device; then, turn it back on

- To ensure the accuracy of temperature measurement, it is recommended to wait for 5 to 10 minutes after turning on the thermal imager and before attempting to take temperature measurements.

- Ensure the correct temperature range is selected:

   ◦ The default temperature range is -20 °C to 150 °C (-4 °F to 302 °F)

   ◦ When measuring high temperature objects ensure the temperature range is set to the 100 °C to 500 °C (212 °F to 932 °F) range

- Ensure device is at proper height

- Adjust the distance to the target

- Adjust the distance setting

- Adjust the emissivity setting

- Adjust the ambient temperature setting

- Perform a manual NUC operation

- Send the device in for recalibration

11-6 Memory card error

- Format the internal memory

- Perform a factory reset

12   About ICI

ICI manufactures complete systems and software. We can provide complete engineering, software, and OEM solutions. Our Fortune 500 clients rely on us for infrared equipment and thermography training (which we offer through the Infrared Training Institute).

In addition to providing custom germanium, silica, and sapphire optics, we also build windows for enclosures, as well as custom pan and tilt units. We can even provide customizable explosion-proof systems.

Our knowledge and experience stems from years of using infrared imaging and temperature measurement instruments to provide solutions to: managers, engineers, scientists, inspectors and operators in space, power companies, medical, pulp and paper, food industry, research and development, and various process industries. You can see our products and services used in industrial, commercial, and government applications worldwide. Additionally, our ICI 7320 was awarded "Product of the Month" by NASA*. Originally named Texas Infrared (still DBA), Infrared Cameras, Inc. has been in business since March, 1995.

Thank you for your dedicated and continued support.

Infrared Cameras, Inc.
2105 W. Cardinal Dr.
Beaumont, TX 77705

Phone: (409) 861-0788
Toll Free: (866) 861-0788
International: (409) 861-0788

Customer Support: support@infraredcameras.com
Website: www.infraredcameras.com

You may reach a customer care representative by phone or email during regular business hours: Monday – Friday 8:00AM - 5:00PM CST.

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