TRIPLETT
Test Equipment & Tools

USER MANUAL

IRTC450

Thermal Imaging Camera

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Welcome, and congratulations on your purchase of the Triplett IRTC450 Thermal Imaging Camera designed to deliver fast, accurate, and reliable thermal images for a wide range of applications. Whether you are inspecting electrical systems, diagnosing HVAC issues, conducting building inspections or preventive maintenance, the IRTC450 is built to help you work smarter, faster, and safer.

1. **Introduction**

- This handheld thermal imaging camera is used for electrical inspections, mechanical diagnostics, and building inspections, and more.
- Focus the lens on the object and the thermal and visual images are displayed on the LCD and can be saved to the microSD card.
- Transferring images to a PC is accomplished by removing the microSD card and connecting it to a PC.
- In addition to the features mentioned above, the thermal imaging camera provides video recording and play back.

2. **Safety Information**

- Do not disassemble or modify the thermal imaging camera as this would void the warranty.
- Do not point the thermal imaging camera at intensive energy sources, for example devices that emit laser radiation or the sun as this can have unwanted effects on the accuracy of the camera, it can also cause damage to the detector.
- Do not use the thermal imaging camera in temperatures higher than 50°C (122°F) or lower than -20°C (-4°F). Operating in too high or too low temperatures can cause damage to your thermal imaging camera.
- Only use the correct equipment to charge the battery. If you do not use the correct battery charger, you can decrease the performance or the life cycle of your battery. It can also cause the battery to heat up or cause an explosion resulting in personal injury.
- Do not disassemble or modify the battery, the battery contains safety and protection devices which, if they become damaged, can cause the battery to overheat, or cause an ignition or explosion.
- If there is a leak from the battery and fluid gets into your eyes, do not rub your eyes, flush well with water and immediately seek medical attention.
- Do not drill holes in the battery, hit the battery with a hammer, step on it, or subject it to strong impacts or shocks.
- Do not put the battery in or near fire, into direct sunlight, or other high-temperature locations.
- Always charge the battery in the temperature range of 0 to 50°C (32 to 122°F). If you charge the battery outside of this temperature range, it can cause the battery to become hot or to malfunction and it can also decrease the performance or life cycle of the battery.
- Do not permit the battery to get wet.
- Clean the case with a damp cloth and a mild soap solution. Do not use abrasives, isopropyl alcohol, or solvents to clean the case, lens, or screen.
- Be careful when you clean the infrared lens. Do not clean the lens too vigorously as this can damage the anti-reflective coating.

- Do not expose the thermal imaging camera to sudden temperature changes (e.g., from cold to hot), as this can lead to internal condensation. To protect your camera, you should power it off and wait long enough until the camera has become warm enough for the condensation to evaporate.
- If you do not use the thermal imaging camera, store it in a cool and dry environment. Remove the battery from the camera and store it separately to prevent unintended battery discharge.

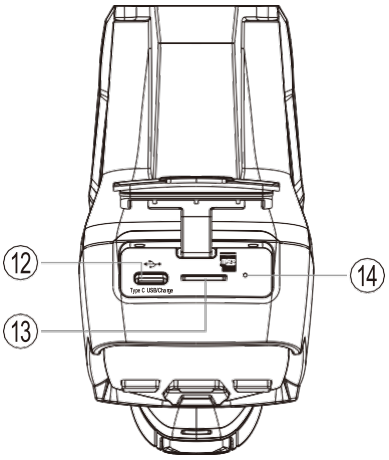
3. **Specifications**

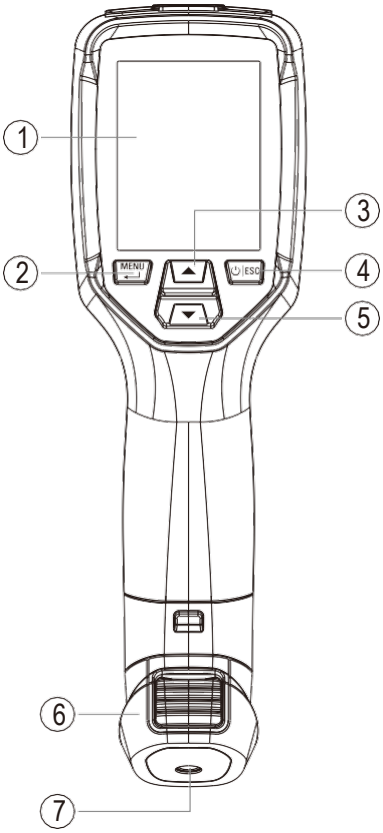
Imaging and Optical Data	
Field of View (FOV)/Minimum Focus Distance	62°x 48°/0.5m
Spatial Resolution (IFOV)	3.75mrad
Thermal Sensitivity/NETD	<0.05°C at 30°C (86°F)/50mK
Image Frequency	9Hz
Focus Mode	Focus free
Zoom	1-16x continuous, digital zoom
Focal Length	2.6mm
Focal Plane Array (FPA)/Spectral Response	Uncooled microbolometer/8-14μm
IR Resolution	256 x 192 pixels (49,152 pixels)
Image Presentation	
Display	2.4 in. LCD, 320 x 240 pixels
Image Modes	IR image, Visual image, Auto fusion
Color Palettes	Iron, Rainbow, White hot, Black hot, Brown hot, Blue red, Hot cold, Feather
Measurement	
Object Temperature Range	-20 to 550°C (-4 to 1022°F)
Accuracy	±2°C (3.6°F) or ±2% of reading (Environmental temperature 10 to 35°C, object temperature > 0°C)
Measurement Analysis	
Spot	Center Spot
Automatic Hot/Cold detection	Auto hot or cold markers
Measurement Corrections	Emissivity (adjustable 0.01-1.0)
Storage of Videos	
Storage Media	8GB microSD card and 3.4GB internal EMMC
Video Storage Format	Standard MPG, 320 x 240 at 30fps, on microSD card >30minutes
Video Storage Mode	IR/visual images; simultaneous storage of IR and visual images

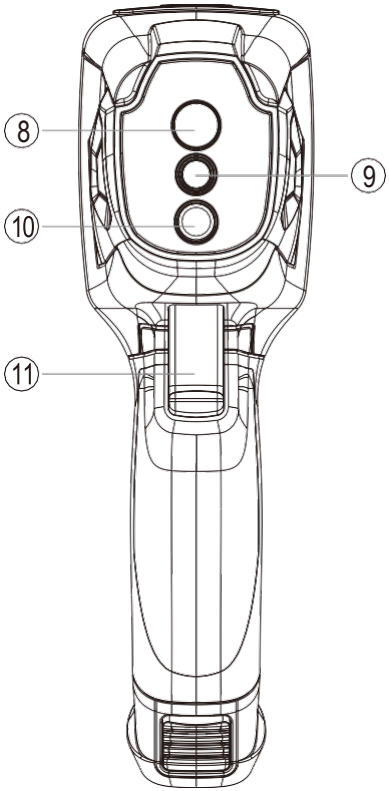
Storage of Images	
Image Storage Format	Standard JPEG or HIR files including measurement data, on the microSD card >6000 pictures
Image Storage Mode	IR/visual images; simultaneous storage of IR and visual images
Image Analysis	Internal image analysis tools, Complete function
Set-Up	
Set-Up Commands	Local adaptation of units, language, date and time formats, information of camera
Languages	12 language options
Digital Camera	
Built-in Digital Camera	2 Megapixels
Built-in Digital Lens Data	FOV 65°
Data Communication Interfaces	
Interfaces	USB-Type C
USB	Data transfer between camera and PC
	Live video between camera and PC
Power System	
Battery	Li-ion battery, 4 hours operating time
Input Voltage	DC 5V
Charging System	In camera (AC adapter)
Power Management	Auto Power Off with options 5, 10, 15, 30 min or OFF
Environmental Data	
Operating Temperature Range	-15 to 50°C (5 to 122°F)
Storage Temperature Range	-40 to 70°C (-40 to 158°F)
Humidity (Operating and Storage)	10% to 90%
Drop Test	2m
Bump	25g (IEC60068-2-29)
Vibration	2g (IEC60068-2-6)
Physical Data	
Camera Weight, Incl. Battery	1.1lbs (500g
Camera Size (L x W x H)	9.2 x 3 x 4" (235 x 76 x 100mm)

4. **Description**

1. LCD Display and Screen	8. Infrared Camera Lens
2. MENU Button	9. Laser Ranging Lens
3. Up Arrow Button	10. Flashlight
4. Power/ESC Button	11. The Trigger
5. Down Arrow Button	12. USB-C Interface
6. Battery	13. microSD Card Slot
7. Hole for Tripod Insertion	14. Battery Charging LED Indicator







5. Before You Start

5-1. How to Charge the Battery

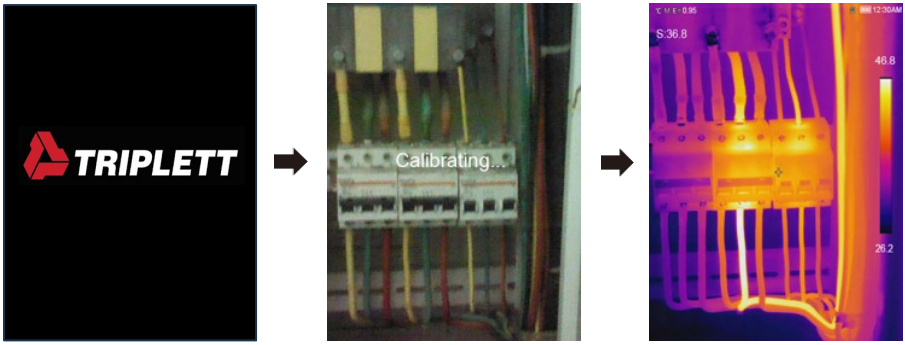
- Before you use the thermal imaging camera for the first time, charge the battery for about three and a half hours. The battery status is shown on the six-segment charge indicator.
- Charge the battery as follows:
  1. Connect the cable to USB-C input on the camera and USB-A end to a power adaptor. The charging indicator will be visible on the display while the battery charges. 
  2. Charge until the charge indicator changes to "  ".
  3. Disconnect from ac power when the battery is fully charged.

Note: Make sure that the camera is near room temperature before you connect it to the charger. Do not charge in unusually hot or cold areas. When you charge in extreme temperatures, battery capacity may be decreased.

5-2. Power On

To turn the camera on, push the **Power** " ⏻/ESC" button.

Note: After you power on your thermal imaging camera, it needs sufficient warm-up time for the most accurate temperature measurements and best image quality. The visible image will appear first, and the thermal sensor will calibrate internally for several seconds. After that the thermal image will also be displayed on the screen.

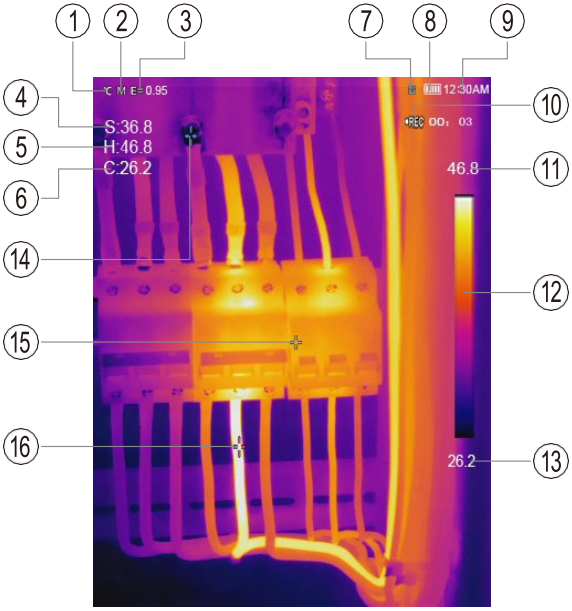


5-3. Powering Off

When the thermal imaging camera is turned on, push and hold the Power " ⏻/ESC " button for two seconds and it will turn off.

5-4. Display Elements

1- Temperature units
2- Distance units
3- Emissivity
4- Center spot temperature reading
5- Hot temperature reading
6- Cold temperature reading
7- SD card
8- Battery capacity status
9- Time
10- Video recording indicator
11- MAX temperature of current scene
12- Color bar
13- MIN temperature of current scene
14- MIN temperature cross point
15- Center cross point
16- MAX temperature cross point



5-5. Shutter

- The thermal image becomes blurry when the thermal imaging camera is not properly correcting after some minutes or if you change to a different target. An automatic correction will take place to improve the image quality.

5-6. Temperature Measurement

- All objects radiate infrared energy, the quantity of energy radiated is based on the actual surface temperature and the surface emissivity of the object. The thermal imaging camera 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 very 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.

- To more accurately measure materials with low emissivity, an emissivity correction is necessary, adjustment to the emissivity setting will usually allow the thermal imaging camera to calculate a more accurate estimate of the actual temperature.
- For more information, please see Emissivity Adjustment to get the most accurate temperature measurements.

5-7. Emissivity Adjustment

- Emissivity of a surface can significantly influence the apparent temperatures that the thermal imaging camera observes. Using the correct emissivity value is important to make the most accurate temperature measurements.
- Understanding the emissivity of a surface can help you obtain more accurate temperature measurements, although this may not always be the case.

  Note: Surfaces with an emissivity of <0.60 make reliable and consistent determination of actual temperature problematic, the lower the emissivity, the more potential errors are associated with the thermal imaging camera's temperature measurement calculations. This is also true even when adjustments to the emissivity are performed properly.
- Emissivity is set directly as a value or from a list of the emissivity values for some common materials, the emissivity displays on the LCD Screen as E=x.xx.
- The following table gives typical emissivity of important materials.

Material	Emissivity
Water	0.96
Stainless steel	0.14
Aluminum plate	0.09
Asphalt	0.96
Concrete	0.97
Cast iron	0.81
Rubber	0.95
Wood	0.85
Brick	0.75

Material	Emissivity
Tape	0.96
Brass plate	0.06
Human skin	0.98
PVC plastic	0.93
Polycarbonate	0.80
Oxidized copper	0.78
Rust	0.80
Paint	0.90
Soil	0.93

5-8. Reflected Temperature

- Using the offset factor, the reflection is calculated out due to the low emissivity and the accuracy of the temperature measurement is enhanced.

  In most cases, the reflected temperature is the same as the ambient air temperature. Only when high emission objects with significantly higher temperatures are near the measured object should the reflected temperature be determined and applied. For objects with high emissivity, the reflected temperature has minimal impact.
- The reflected temperature can be set individually. Follow these steps to get the right value for the reflected temperature.

  1. Set the emissivity to 1.0.
  2. Adjust the optical lens to near focus.

3. Looking in the opposite direction away from the object, take a measurement and freeze the image.
4. Determine the average value of the image and use that value for your input of the reflected temperature.

5-9. InfraRead Software

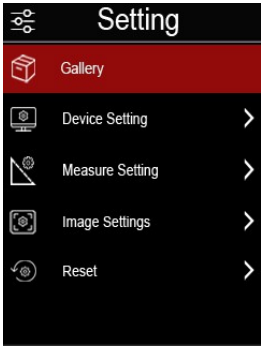
- The thermal imaging camera is supplied with free InfraRead software. This Software contains features to analyze images, organize data and information, and make professional reports.
- You can customize the reports and add your company logo and information.
- You can save the reports as .pdf or .xlsx and export it.

6. Menus

The menus allow you to access images, measurements, emissivity, color palettes, temperature measurement range, review images and video, and access settings.

6-1. Setting Menu

- Press the **Menu** button, the **Setting** menu will pop up. The **Setting** menu is the main interface of the thermal imaging camera's menus.
- It contains the **Gallery**, **Device Setting**, **Measure Setting**, **Image Setting**, and **Reset**.

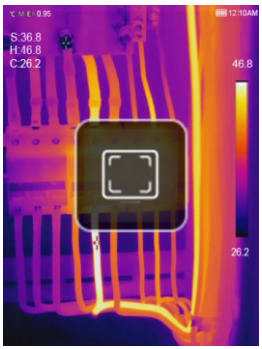


	Gallery	Enter gallery.
	Device Setting	System Settings, including time and date, language, flashlight, and automatic shutdown
	Measure Setting	Contains settings for maximum temperature, minimum temperature, reflection temperature, emissivity, alarm mode, range, and temperature units
	Image Setting	Contains settings such as color palette, super-resolution, image translation.
	Reset	Includes restoring factory settings and formatting storage settings.

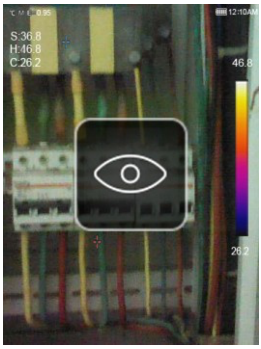
6-2. Image Mode

- In the main menu, press the **Up** or **Down** Button to switch between image modes.
- We offer three image modes to choose from:

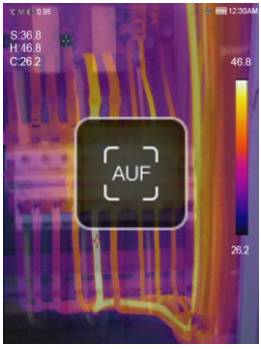
IR: Displays only infrared image.



Visible: Displays only visible image



AUF: Auto Fusion mode, compare the center area temperature with full screen, the thermal imaging camera will calculate the mix ratio of infrared and visual images automatically.



Picture-in-Picture: The thermal image is overlayed in the center of the screen on top of a normal visible light image.

6-3. Image Palette

- A variety of palettes are available for specific applications, the standard palettes offer an equal, linear presentation of colors that allow for best presentation of detail.

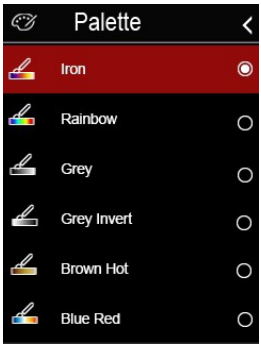
Standard Palette

1. In the main menu, press the **Up** or **Down** Button, highlight "**Palette**".

2. Press the **MENU** Button and the Image submenu will pop up which contains 8 color palettes.

3. Press the **Up** or **Down** Button, highlight the palette you want, and press enter.

4. The palette will change according to your selection.



	Iron
	Rainbow
	White hot
	Black hot

	Brown hot
	Blue red
	Hot cold
	Feather

6-4. Image Super Resolution

- Image super-resolution technology is a technique that upgrades low resolution images captured by the thermal imaging camera to higher resolution through embedded algorithms.
- It can make the image clearer and compensate for the shortcomings brought on by low resolution.

6-5. Histogram Mode and Auto Mode

- **Auto Mode:** Level and span are decided by the thermal image of minimum and maximum temperature, the relationship between temperature and color is linear.
- **Histogram Mode:** The thermal image is enhanced by histogram algorithms, the relationship between temperature and color is not linear, some part of the image is enhanced.
- Press the **Power/Lock** Button to change the mode.

6-6. Image Alignment

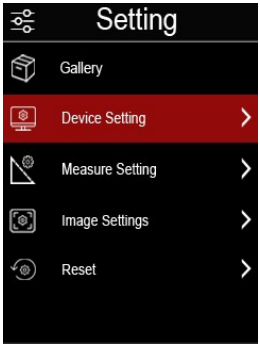
- Press the "﹀, ﹀" buttons to align the visible and infrared images.
- Press the **Power/Lock** button to cancel the setting, press the **Menu/OK** button to save the alignment setting.

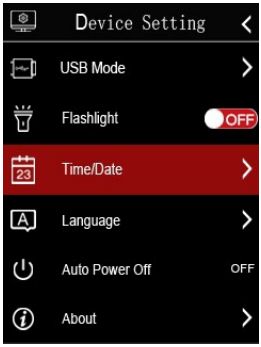
6-7. Image Adjustment

There are two modes for image adjustment: Histogram Auto.

6-8. Device Setting

There are multiple pages in Device setting, use the ﹀Down button to go to next setting, or use the ﹀Up button to go to previous setting.





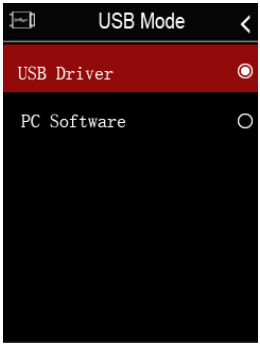
6-9. Time/Date

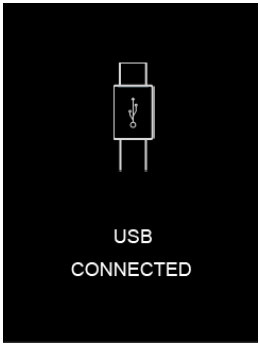
Press the ∧**Up** or ∨**Down** button to select year, month, and day, then press the **MENU/OK** or the **Right** button to change the Time/Date.

6-10. USB Mode

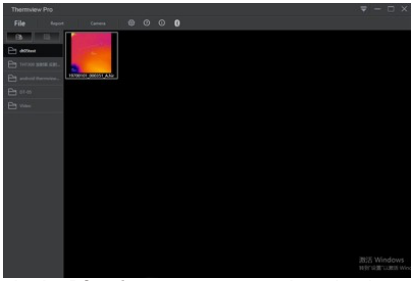
- Connect the USB cable to the thermal imaging camera, the following message will pop up:

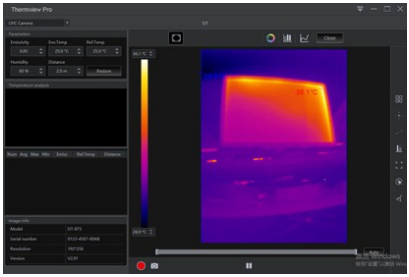
- There are two modes for USB: USB Driver or PC Software, press the **Up** or **Down** button to switch mode.
- **USB Driver:** Browse files stored on the SD card on your computer, if you select Storage mode, the following picture will be displayed:





- **PC Software:** The device is a USB camera for your computer, if you select this mode, open "**InfraRead**" and select "**Camera**" menu to display the following pictures:

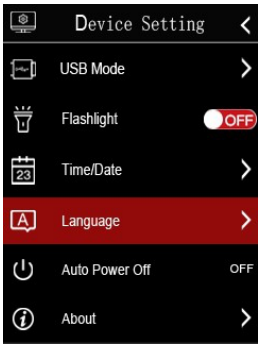




- In the PC software, you can analyze the thermal image in real time, or you can record and analyze the thermal video in real time.

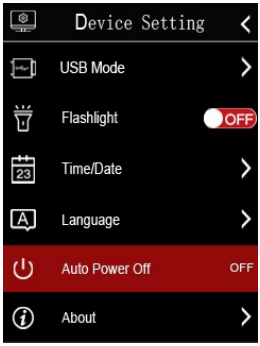
6-11. Language

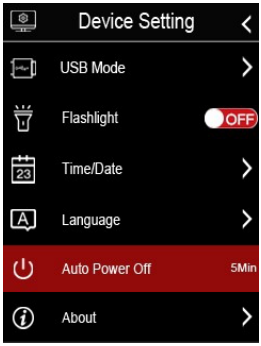
Press the **Up** or **Down** Button to select the desired language and use **MENU/OK** button to set the selected language.



6-12. Auto Power Off

- There are five options in the Auto Power Off menu: "OFF", "5Min", "10Min", "15Min" and "30Min".
- When you press the **MENU/OK** button, the timer of Auto Power Off will be cleared and re-timed.



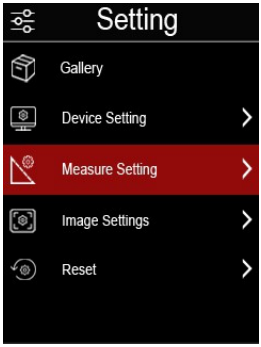


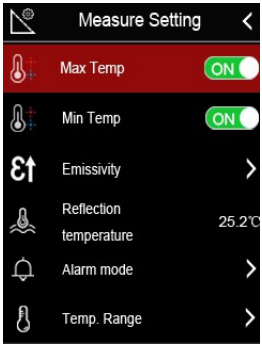
6-13. About

The info menu contains all camera information: Producer, Product Date, Serial Number, Software Version, and storage.

6-14. Measure Setting

- Select the "**Measure Setting**" menu, the Measure Setting menu will be displayed.
- The options in Measure setting menu are shown below.





6-14-1. Max Temp

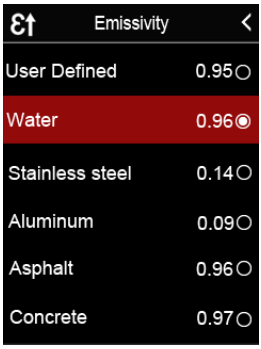
Press the **MENU/OK** Button to turn maximum temperature measurement on or off.

6-14-2. Min Temp

Press the **MENU/OK** Button to turn the minimum temperature measurement on or off.

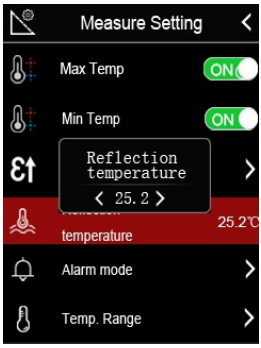
6-14-3. Emissivity

- In emissivity submenu, press the "**Up**" and "**Down**" arrow to change the emissivity values.
- "Emiss" sets object emissivity, the value range is 0.01 to 1.00.



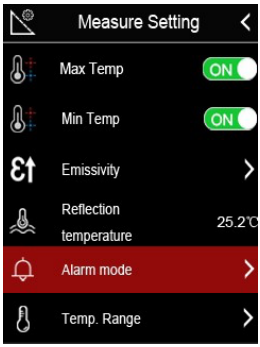
6-14-4. Reflective Temperature

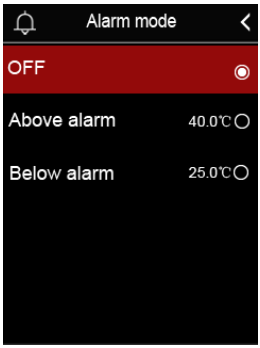
- In reflective temperature submenu, press the "**Up**" and "**Down**" arrow to change the temperature values.
- Reflective temperature is important for radiometric temperature measurements. This thermal imaging camera has temperature compensation for reflective temperatures. To obtain a more accurate temperature measurement, ensure the reflective temperature is set correctly.
- In most cases, the reflected temperature is identical to the ambient temperature, only when objects with strong emissions with much higher temperature are in the proximity of the object being measured, the reflected temperature must be set.



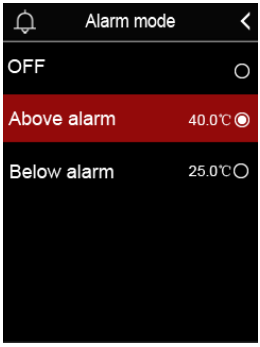
6-14-5. Alarm Mode

- **OFF:** Turn off the alarm display and sound.



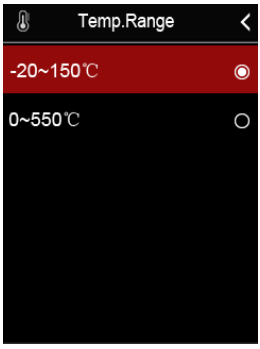


- **Below Alarm:** If the temperature of the object below the low alarm value, there will be alarm sound and display.
- **Above Alarm:** If the temperature of the object exceeds the above alarm value, there will be alarm sound and display.



6-14-6. Temperature Range

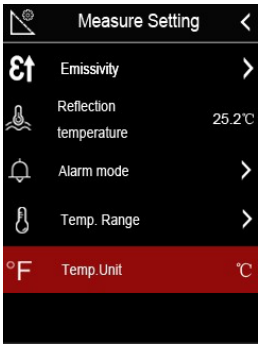
- You can select from two temperature ranges: “-20 to 150°C” and “0 to 550°C”
- If you are not sure, select “-20 to 150°C”.

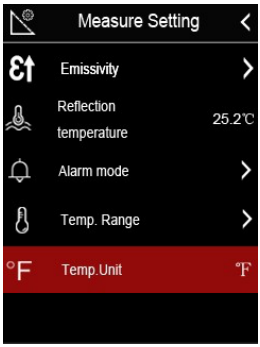


6-14-7. Temperature Unit

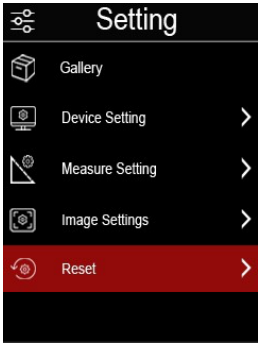
- Temperature Unit: Choose from three types: °C, °F and K.

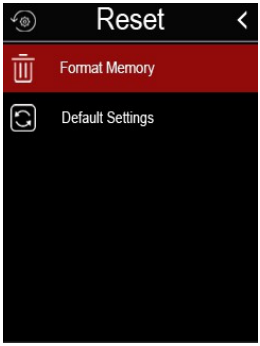
• Conversion relationship: °F=1.8x°C+32, K=273.15+°C.





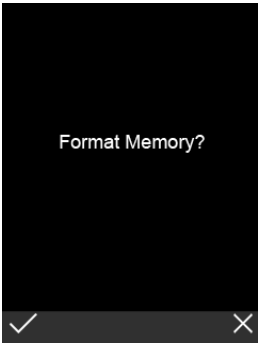
6-14-8. Reset





6-14-9. Format Memory

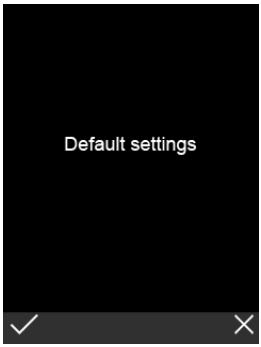
Format Memory operation will format the complete Picture Gallery, the device setting is not affected.



6-14-10. Factory Settings

The Factory Settings of the thermal imaging camera are as follows:

Item	Parameter	Value
Measurement	Center Spot Measurement	On
	Hot Spot Measurement	Off
	Cold Spot Measurement	Off
Measurement Parameters	Emissivity	0.95
	Reflective Temperature	25°C
Image	Mode	Infrared
	Palette	Iron
	Adjustment	Auto
System Setting	Language	English
	USB mode	USB Driver
	Lamp	Off



6-15. Image and Video Menus

- The thermal imaging camera has photo and video functions.
- In photo function, the thermal imaging camera can save thousands of images. Image resolution is 1280 x 960. The image format is ".jpg" and infrared and visible data are stored in one image.
- In video function, the thermal imaging camera has ".mp4" video capability and saves data in .mp4 format.

Note: Images and video files are stored on the microSD card. Images can easily be read and analyzed within the InfraRead app and InfraRead software.

6-15-1. Save Images

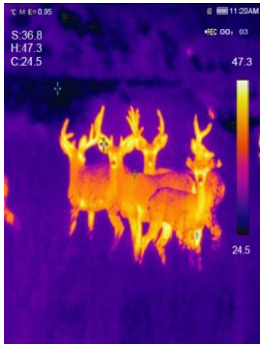
1. In desktop, press the Trigger button, freeze an image, the save menu will display.

2. Press the **MENU** Button to save the image. It will flash for a second, after the image is saved, the display will return to live image mode.

6-15-2. Video Menu

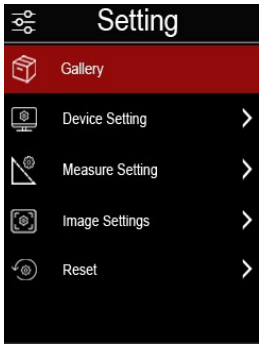
The thermal imaging camera features ".mp4" video capture.

1. In desktop, press the Trigger button and hold for about 2 seconds to start video capture.
2. To stop video capture, press the Trigger button again, the video is saved on the microSD card.



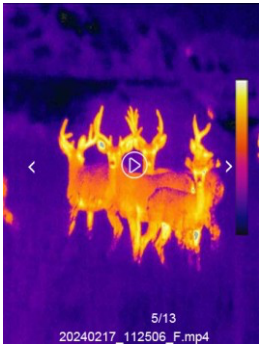
6-15-3. File Browser

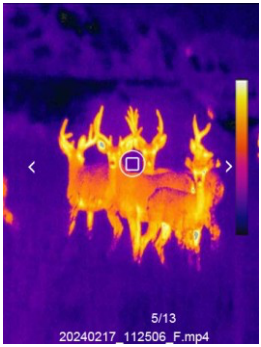
Press the **MENU** Button, highlight "**Gallery**", then press the **MENU** Button and the file browser will pop up, which displays pictures and videos saved on the microSD Card.



6-15-4. Play a Video

When the selected file type is video, press the Trigger button to play video or stop to play the video.





6-15-5. Delete a File

Press the **MENU** Button, then press the **MENU** Button again to delete the current file.

7. Fault Diagnosis and Exclusion

- If you encounter any problems while using the thermal imaging camera, overhaul according to the following table.

Encountered Issue	Cause of the Issue	Solution
Thermal imaging camera cannot start	No battery	Insert the battery
	No power	Charge the battery and if that doesn't help, replace the battery
Thermal imaging camera is shutting down	No power	Charge the battery and if that doesn't help, replace the battery

8. PC Software – InfraRead

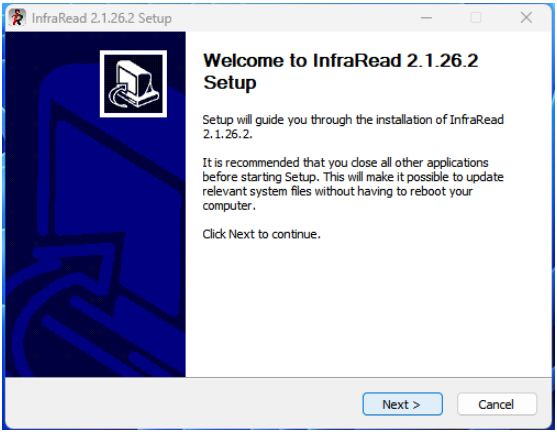
8-1. System Requirements

- Windows X or higher with .NET Framework 4.5 installed.

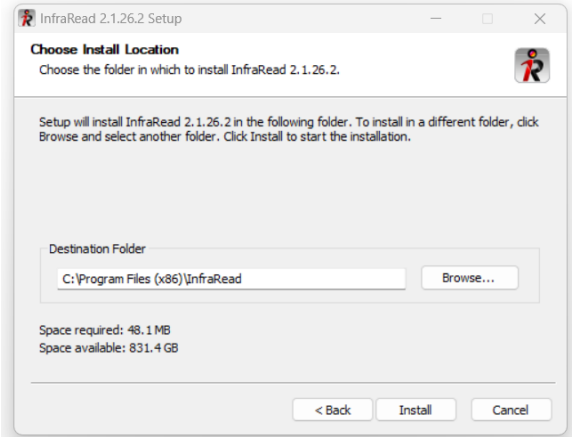
8-2. InfraRead Install

****NOTE:** Please download the latest InfraRead Software from
www.triplett.com/software

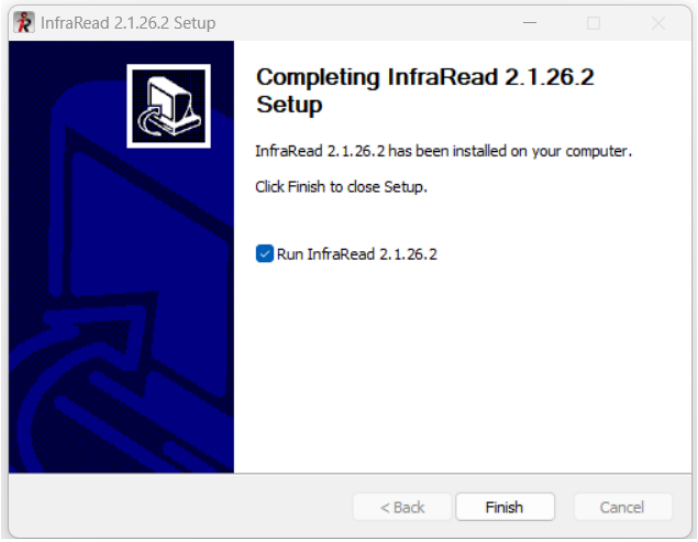
1. Click to run “setup.exe” and follow the prompts to install.



2. Click “Next” to install, until the installation is finished.



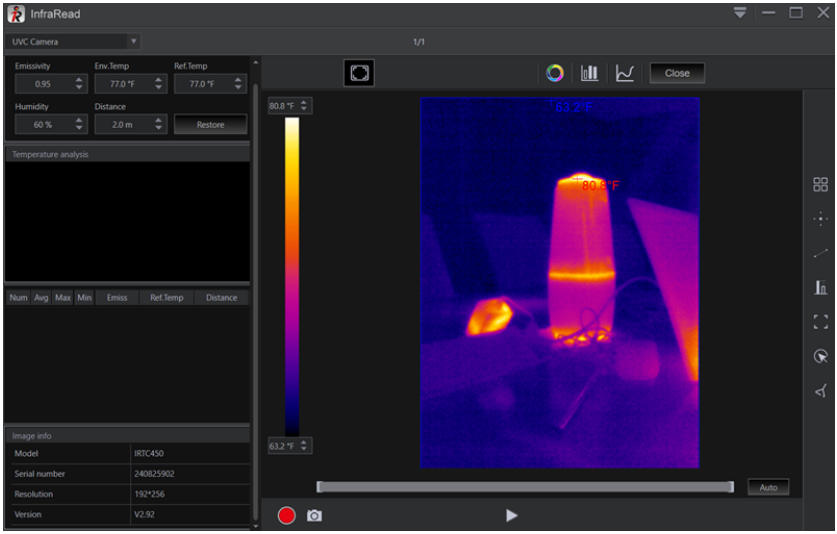
3. The Installation was Successful after you click “Finish” as seen below.



8-3. Running

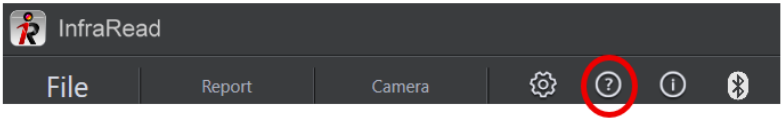
After ensuring the InfraRead software has been installed, click shortcuts 

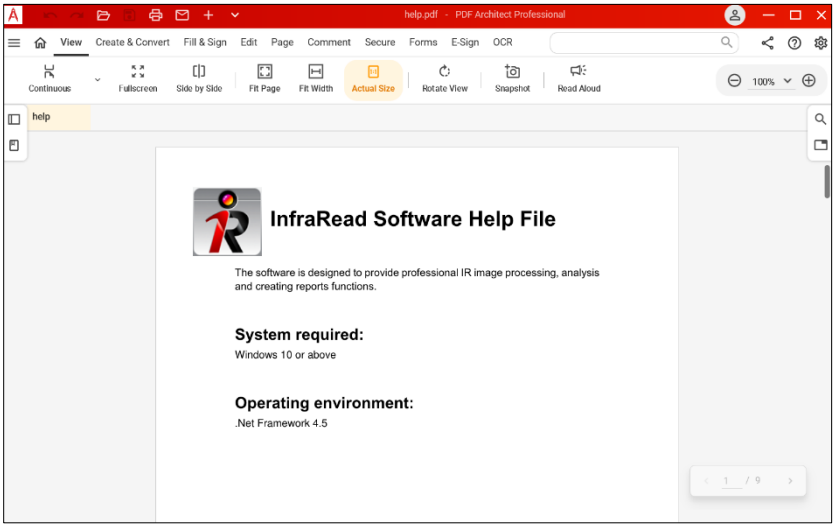
on the desktop or start menu to run the software.



8-4. Software Help File

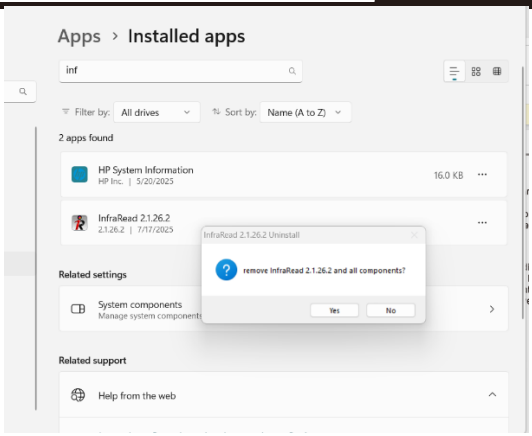
Locate the Software Help Icon in the menu bar. Click on the  icon to Open the Software Help File.





8-4. Uninstall

Uninstall InfraRead by locating it in the Installed apps menu, click “Uninstall” then click “Yes” to finish the uninstall.



9. Warranty Statement

Triplett Test Equipment offers a three-year warranty to the original purchaser of its products. We guarantee that our products will be free from defects in workmanship and materials for three (3) years from the purchase date.

This warranty does not cover:

- Products purchased from unauthorized distributors.
- Items that have been repaired or altered by unauthorized individuals.
- Damage from misuse, abuse, misapplication, negligence, or accidents.
- Products with altered, defaced, or removed serial numbers.
- Accessories, including batteries.