TRIPLETT
Test Equipment & Tools

USER MANUAL

IRTC650

Thermal Imager

CE

Content **Page**

Content **Page**

1.Introduction

- The Thermal Imager is handheld imaging camera used for predictive maintenance, equipment troubleshooting and verification.
- Focus the len to the object, then the thermal and visual images are displayed on the LCD and can be saved to a Micro SD Memory card.
- Transferring images to a PC is accomplished by removing the SD memory card and connecting it to a PC through the included card reader, or transfer the images and video stream to the smart device with "**InfraRead**" apps installed.
- In addition to the features mentioned above, the Thermal Imager provide video recording and play back.

2.Safety Information

- Do not disassemble or do a modification to the Thermal Imager.
- Do not point the Thermal Imager (with or without the lens cover) at intensive energy sources, for example devices that emit laser radiation, or the sun, this can have an unwanted effect on the accuracy of the camera, it can also cause damage to the detector in the Thermal Imager.
- Do not use the Thermal Imager in a temperature higher than 50°C (122°F), lower than -20°C (-4°F), high temperature or low temperature can cause damage to the Thermal Imager.
- Only use the correct equipment to discharge the battery, if you do not use the correct equipment, you can decrease the performance or the life cycle of the battery.
- If you do not use the correct equipment, an incorrect flow of current to the battery can occur, this can cause the battery to become hot, or cause an explosion and injury to persons.
- Do not pull out the battery when the thermal imager is working, if you pull out the battery when the thermal imager is working, it may cause the thermal imager work unnormal.
- Do not disassemble or do a modification to the battery, 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.
- If there is a leak from the battery and the fluid gets into your eyes, do not rub your eyes, flush well with water and immediately get medical care.
- Do not make holes in the battery with objects, Do not hit the battery with a hammer, Do not step on the battery, or apply strong impacts or shocks to it.
- Do not put the battery in or near a fire, or in direct sunlight, or other high-temperature locations, Do not solder directly onto the battery.
- Always charge the battery in the special temperature rang, the temperature range through which you can charge the battery is 0 to 50°C (32 to 122°F), if you charge the battery at temperatures out of this range, it can cause the battery to become hot or to break, it can also decrease the performance or the life cycle of the battery.
- Do not get water or salt water on the battery, or permit the battery to get wet.
- 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 you clean the infrared lens, Do not clean the infrared lens too vigorously, this can damage the anti-reflective coating.

- Take the Thermal Imager from from cold to hot, it will appear condensation in thermal Imager, to protect the Thermal Imager, you should power of the Thermal Imager, wait until the Thermal Imager has become war enough for the condensation to evaporate.
- If you do not use the Thermal Imager, put the Thermal Imager in cool and dry environment, if you store Thermal Imager equipped with the battery, the power of the battery will be exhausted.

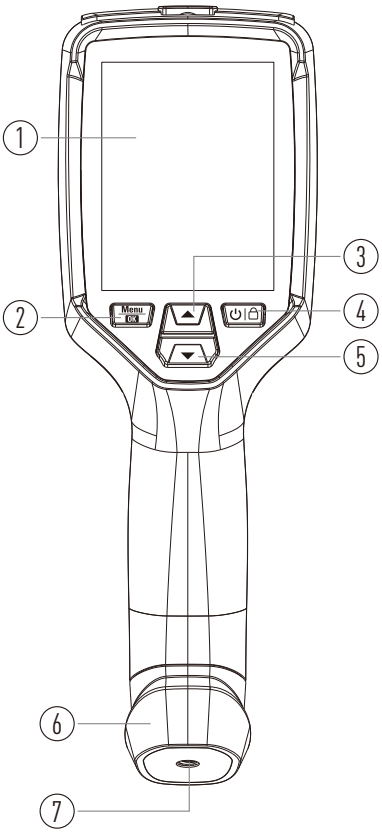
3.Specifications

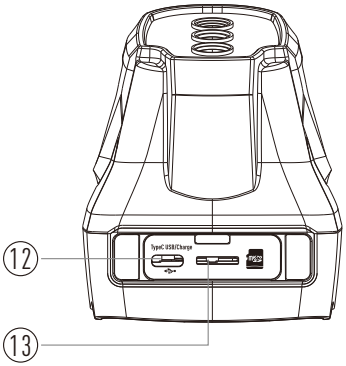
Imaging and Optical Data	
Field of View (FOV)/Minimum Focus Distance	56°x 42°/0.5m
Spatial Resolution (IFOV)	3.75mrad
Thermal Sensitivity/NETD	<0.04°C at 30°C (86°F)/40mK
Image Frequency	9Hz
Focus Mode	Focus free
Focal Length	2.6mm
Focal Plane Array (FPA)/Spectral Range	Uncooled microbolometer/7.5-14μm
IR Resolution	256x192 pixels
Image Presentation	
Display	3.2 in. LCD, 320x240 pixels
Image Modes	IR image, Visual image, Picture in Picture, Auto fusion
Color Palettes	IRON, Rainbow, Grey, Grey Inverted, Brown, 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 (Environment 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, Reflected temperature
Storage of Videos	
Storage Media	8Gbytes Micro SD card and 3.4GB internal EMMC
Video Storage Format	Standard MPEG-4 encode, 240x320 at 30fps, on memory card >30minutes
Video Storage Mode	IR/visual images; simultaneous storage of IR and visual images

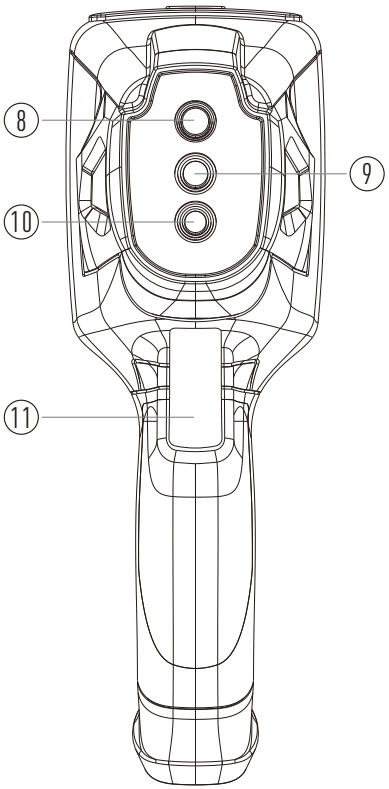
Storage of Images	
Image Storage Format	Standard JPEG or HIR files including measurement data, on memory card >6000 pictures
Image Storage Mode	IR/visual images; simultaneous storage of IR and visual images
Image Analyse	Internal image analyse tools, Complete function
Set-Up	
Set-Up Commands	Local adaptation of units, language, date and time formats, information of camera
Languages	Multinational
Digital Camera	
Built-in Digital Camera	2 Megapixels
Built-in Digital Lens Data	FOV 65°
Data Communication Interfaces	
Interfaces	USB-Type C
USB	Data transform 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	Automatic shutdown
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	<500g
Camera Size (LxWxH)	224x77x96mm

4.Structure Description

1-LCD Display and Screen
2-MENU/OK Button
3-Up Arrow Button
4-Power/Lock Button
5-Down Arrow Button
6-Battery
7-Hole for Tripod Insertion
8-Flashlight
9-Infrared Camera Lens
10-Visual Camera
11-The Trigger
12-TypeC USB/Charge
13-Micro SD Card Slot







5. Before You Start

5-1. How to Charge the Battery

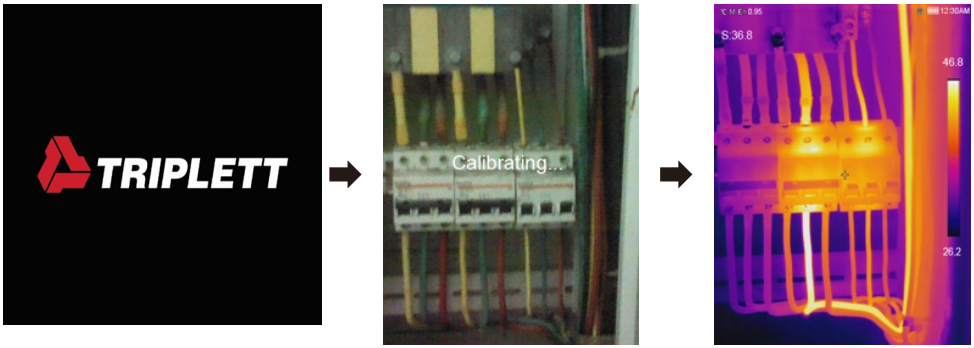
- Before you use the thermal imaging camera for the first time, charge the battery for about three and a half hours. The battery status is shown on the six-segment charge indicator.
- Charge the battery as follows:
  1. Connect the ac power adapter into an ac wall outlet and connect the dc output to the camera's ac power socket, the charge light is on, the battery indicator displays "  ", while the battery charges.
  2. Charge until the charge indicator changes to "  ".
  3. Disconnect the ac power adapter 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 Thermal Imager on, push the **Power** "⏻" Button.

Note: After power on the device, the thermal Imager needs sufficient warm-up time for the most accurate temperature measurements and best image quality. So the visible image will first appear, and the thermal sensor will calibrate internal for sevearal seconds. After that the thermal image will be displayed on the screen.



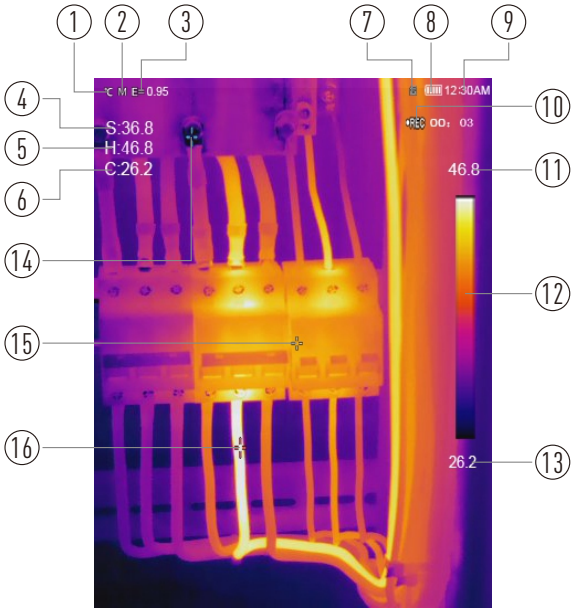
5-3.Power Off

When Thermal Imagers power on, push and hold the Power " "button for two seconds, the device will be power off directly.

5-4.Desktop

The Desktop is as follow:

1-Temperature unit
2-Distance unit
3-Emissivity
4-Centre point temperature readings
5-MAX temperature point readings
6-MIN temperature point readings
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 point cross
15-Centre point cross
16-MAX temperature point cross



5-5.Shutter

- The thermal image of the Thermal Imager becomes blurry, when the Thermal Imager no correcting after some minutes or the Thermal Imager changes target, to get fine thermal image, the Thermal Imager need to correct.
- The Thermal Imager has two mode for correcting, Manual and Auto Mode.
- In Manual Mode, long press the down arrow button, the Thermal Imager will correct.
- In Auto Mode, the Thermal Imager can correct automatically while The thermal image of the Thermal Imager becomes blurry.

5-6.Temperature Measurement

- All objects radiate infrared energy, the quantity of energy radiated is base 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 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 a low emissivity, an emissivity correction is necessary, adjustment to the emissivity setting will usually allow the Thermal Imager to calculate a more accurate estimate of the actual temperature.
- More information please see Emissivity Adjustment to get the most accurate temperature measurements.

5-7.Emissivity Adjustment

- The correct emissivity value is important to make the most accurate temperature measurement, emissivity of a surface can have a large effect on the apparent temperatures that the Thermal Imager observes.
- Understanding the emissivity of the surface, but may not always, allow you to obtain more accurate temperature measurements.

Note: Surfaces with an emissivity of <0.60 make reliable and consistent determination of actual temperature problematic, the lower the emissivity, the more potential error is associated with the Imager's temperature measurement calculations, this is also true even when adjustments to the emissivity and reflected background adjustments are performed properly.

- Emissivity is set directly as a value or from a list of emissivity values for some common materials, the global emissivity displays in 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 with infrared instruments is improved.
- In most cases, the reflected temperature is identical to the ambient air temperature, only when objects with strong emissions with much higher temperature are in the proximity of the object being measured should be determined and used, the reflected temperature has only little effect on objects with high emissivity.
- 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 reflected temperature.

5-9.Thermal Imager Reporter Software

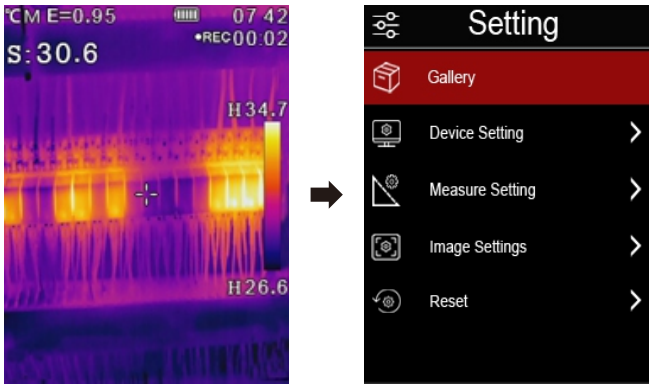
- Thermal Imager Reporter software is supplied with the Thermal Imager, this Software is intended for Thermal Imager and contains feature to analyze images, organize data and information, and make professional reports.
- Thermal Imager Reporter software allows audio annotations and commentary to be reviewed on a PC.

6.Menus

The menus, together with buttons, are access for image, measurement, Emiss, Palette, temperature measurement range, take photo and video, review, and settings.

6-1.Setting Menu

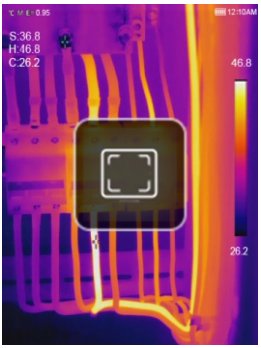
- Press the **MENU/OK** Button, the setting menu will be poped up, Setting Menu is the main interface of the Thermal Imager's menus.
- It contains five items such as Gallery, Device setting, Measure setting, Image setting, Reset.



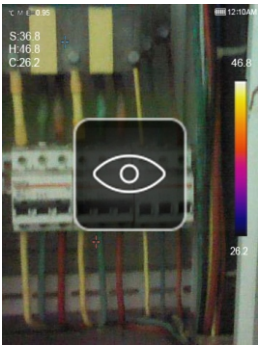
	Gallery	Enter gallery.
	Device Setting	Some settings for devices and systems, including time and date, language, flashlights and automatic shutdown and so on.
	Measure Setting	Contains settings for maximum temperature, minimum temperature, reflection temperature, emissivity, alarm mode, range, and temperature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

6-2.Image Mode

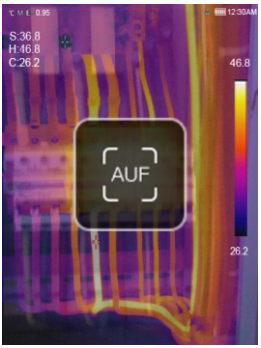
- In main menu, press the **Up** or **Down** Button, then you can loop switching image mode.
- We offer four image modes to choose from, which are: Thermal image, Camera, Picture in picture and Auto fusion.



Thermal image



Camera



Auto fusion

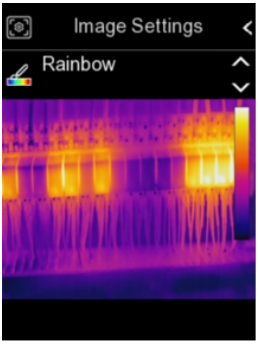
Picture in picture

6-3.Image Palette

- The Image Palette lets you change the false-color presentation of the infrared images on display or captured.
- 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 main menu, press the **Up** or **Down** Button, highlight "**Palette**".
2.Press the **MENU/OK** Button, popup Image submenu which contains 8 kinds of color palettes.
3.Press the **Up** or **Down** Button, highlight the palette which you want to choose.
4.The palette mode will be changed after you choose it.



	Iron
	Rainbow
	Grey
	Grey Invert

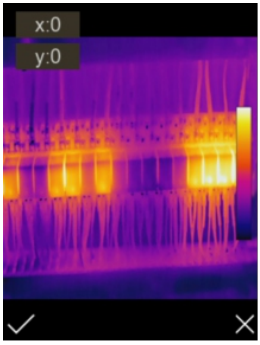
	Brown Hot
	Blue Red
	Hot Cold
	Feather

6-4.Histgram Mode and Auto Mode

- **Auto Mode:** Level and span are decided by the thermal image of minimum temperature and maximum temperature, the relationship between temperature and color is linear.
- **Histgram Mode:** The thermal image is enhanced by histogram algorithm, 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.

6-5.Image Align

- Press the "﹀,﹀" and Trigger button to adjust the vision's position to align the vision and infrared.
- Press the **Power/Lock** Button to cancel the setting, press the **MENU/OK** Button to save the aligment setting.

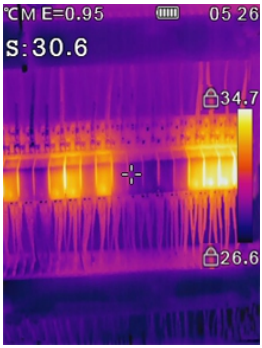


6-6.Image Adjustment

There are three kinds of mode for image adjustment, Histgramm and Auto.

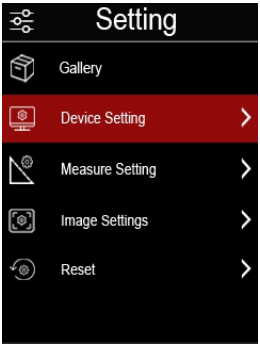
6-7.Lock Operation

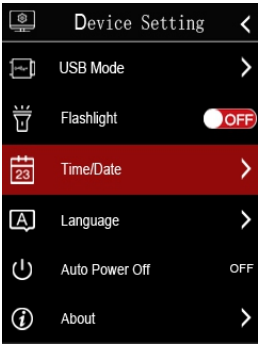
- Press the **Power/Lock** Button to lock the current scene temperature ran ge.
- After locked the current scene temperature range, press the a, you can adjust the High/Low temperature level to see what temperature your interested range image.



6-8.Device Setting

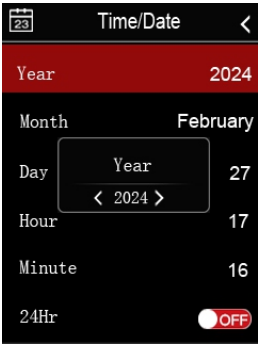
There are multipages in Device setting, use the ﹀ Button to go to next item, or use the ﹀ Button to go to previous item.





6-9.Time/Date

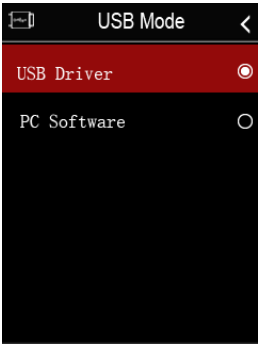
Press the **Up** or **Down** Button to select year, month and so on, then press the **MENU/OK** or **Right** Button to change Time/Date.

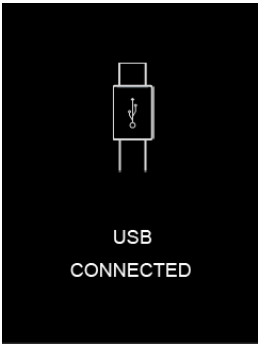


6-10.USB Mode

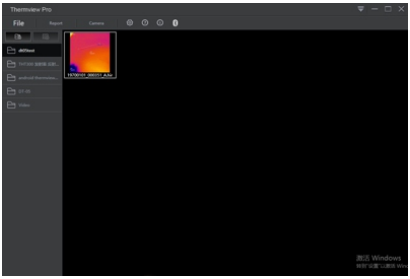
- Connect USB cable to device, popup the menu as follow:

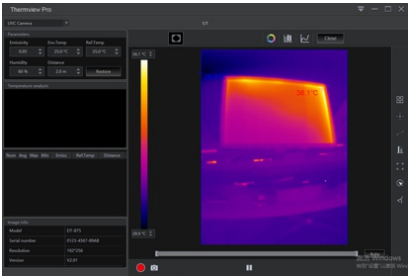
- There are two modes for USB, Storage and PC Camera, press the **Up** or **Down** Button to switch mode.
- **USB Driver:** Browse files stored on the SD card on your computer, if select Storage mode, will display a picture as follow:





- **PC Software:** The device is a USB camera for your computer, if select this mode, open PC software "**Thermalview Pro**" and select "**Camera**" menu, will display a picture as follow:

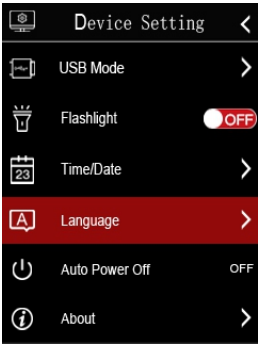




- In PC software, you can realtime analyse the thermal image or you can record the thermal video and analyse the thermal video.

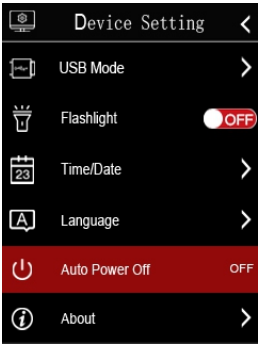
6-11.Language

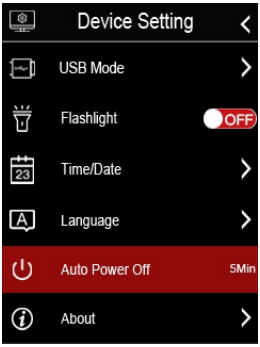
Press the **Up** or **Down** Button to select language and use **MENU/OK** Button to set selected language to be valid.



6-12.Auto Power Off

- Thera are four options in auto power off menu, as follows: "OFF", "5Min", "10Min", "15Min" and "30Min".
- When press the **MENU/OK** Button, the timer of Auto Power Off will be cleared and re-timed.



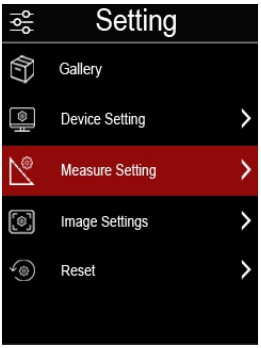


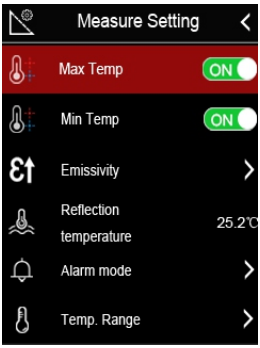
6-13.About

The info menu contains all of the product information, such as: Software version, Serial number and so on.

6-14.Measure Setting

- Select the "**Measure Setting**" menu, the Measure Setting menu will be displayed.
- Thera are several options in Measure setting menu, as follow picture.





6-14-1.Max Temp

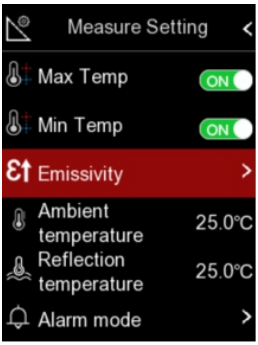
Press the **MENU/OK** Button to turn on or turn off maximum temperature measurement.

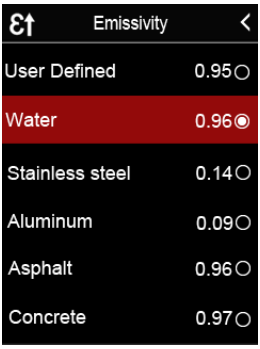
6-14-2.Min Temp

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

6-14-3.Emissivity

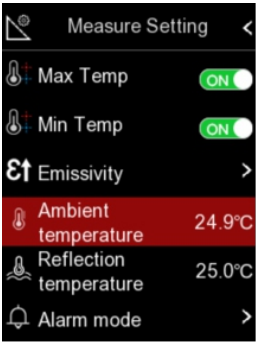
- In emissivity submenu, press the "**Up**" and "**Down**" arrow to change the emissivity values.
- "Emiss" sets object emissivity, the value range is 0.01 to 1.00.





6-14-4.Ambient Temperature Composation

Ambient temperature will affect the measurement of the thermal imager, it can be composite from 0 degree to 50 degree.



6-14-5.Reflective Temperature

- In reflective temperature submenu, press the "**Up**" and "**Down**" arrow to change the temperature values.
- The reflective temperature is important for radiometric temperature measurement, Thermal Imager has temperature compensation for reflective temperature, to get more accurate temperature measurement, accurately set the reflective temperature.
- 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 set.

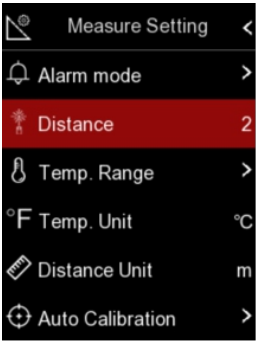
6-14-6.Alarm Mode

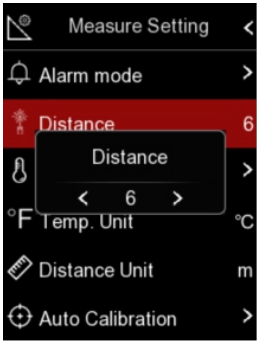
- **OFF:** Turn off the alarm display and sound.

- **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.

6-14-7.Distance

There are many substances in the air that can absorb infrared rays, so the infrared ray of the object will decaied as the distance increase.



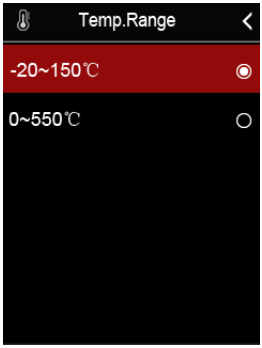


6-14-8.Distance Unit

- Change the distance unit between "m" (meter) and "ft" (Foot).
- 1ft=0.3048m; 1m=3.2808399ft

6-14-9.Temperature Range

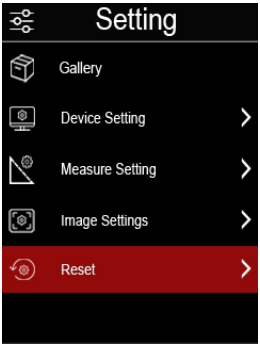
- The temperature measurement ranges have "-20 to 150°C" and "0 to 550°C" to choose.
- The overlap temperature of the two ranges is more accurate to choose "-20 to 150°C".

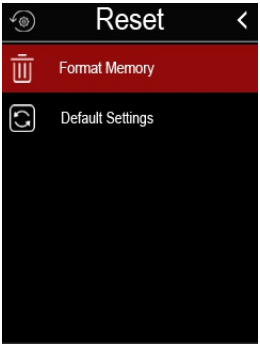


6-14-10.Temperature Unit

- Temperature Unit have three types to choose: °C, °F and K.
- Conversion relationship: °F=1.8x°C+32, K=273.15+°C.

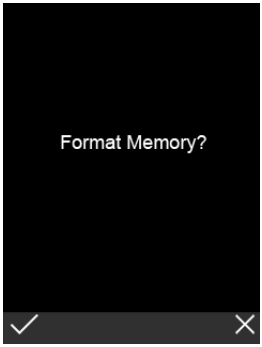
6-14-11.Reset





6-14-12.Format Memory

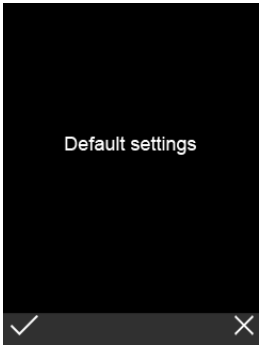
Format Memory operation will format all the Picture Gallery, the device setting is not affected.



6-14-13.Factory Settings

Factory Settings of the Thermal Imager is as follow:

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



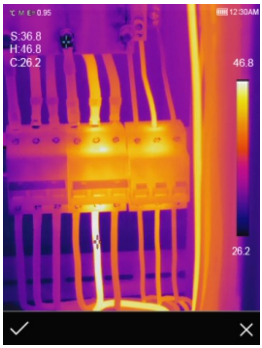
6-15.Camera Menu

- Thermal Imager has photo and video functions.
- In photo function, the Imager can save thousands of images, every image resolution is 1280x960, format is ".jpg" and stores infrared data and visible data in an image.
- In video function, the Imager has ".mp4" video capture for hours and save infrared data in .mp4 format.

Note: Images and video files are stored in SD Memory Card, images can easily be read and second analyzed within Thermal Imager PC software.

6-15-1.Save Image

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



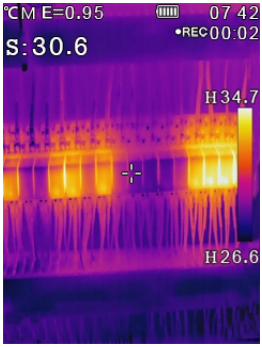
2.Press the **MENU/OK** Button to save image and the image will flash for a second, after the image is saved, the image will be unfreezed.

6-15-2.Video Menu

The Thermal Imager has ".mp4" video capture.

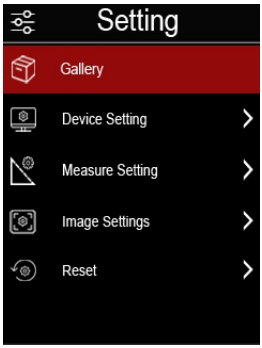
1.In desktop, press the Trigger button and hold for about 2 seconds, start video capture.

2.To stop video capture, press the Trigger button again, the video saved in the video file.



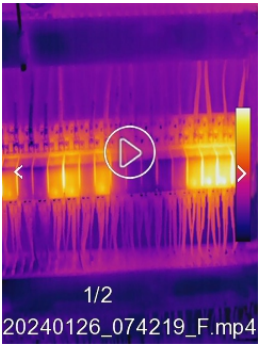
6-15-3.Files Browser

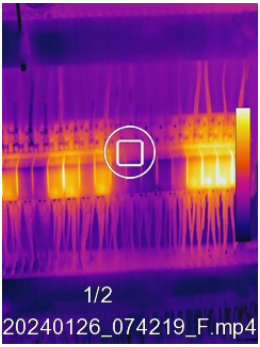
Press the **MENU/OK** Button, highlight "**Gallery**", then press the **MENU/OK** Button to popup files browser, which displays pictures and videos saved in SD Memory Card.



6-15-4.Play a Video

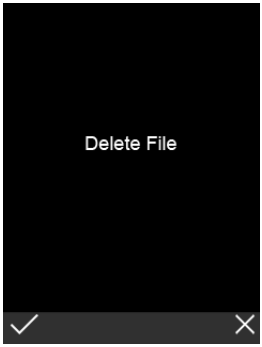
When current file type is video, press the Trigger button to play video or stop play video.





6-15-5.Delete a File

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



7.Android/iOS APP InfraRead

7-1.Software Install and Uninstall

7-1-1.System Required

Android mobile phone: Android 4.0 above, with USB OTG Support
iOS: iPhone4 above

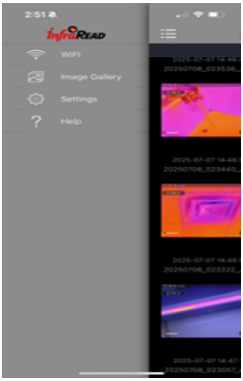
7-1-2.InfraRead App Install

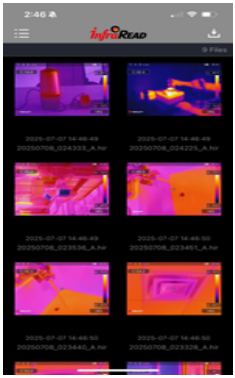
Android: Search "**InfraRead**" on Google Play and install it.
iOS: Search "**Thermview**" on Apple Store and install it.

7-2.InfraRead Function

7-2-1.Import Pictures

- Use the USB OTG cable download the IR pictures from the thermal imager directly.
- Copy the IR pictures from PC or SD card.





7-2-2.Analyze

Select a IR Picture and click "✎" icon to analyse it.

1.Image Mode

Click " icon to select image mode, there are four mode for you to select.

(1) IR Mode: only infrared picture displayed.

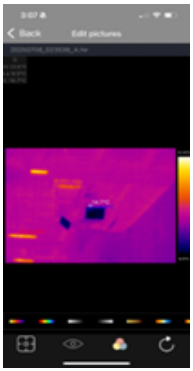
(2) Visible Mode: only visible picture displayed.

(3) IR Fusion Mode: The infrared picture is fusioned with visible picture.

(4) Visible Fusion Mode: full screen fusion, the visible picture is fusioned with infrared picture.

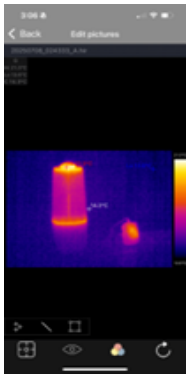
2.Colorbar Select

Click "" icon to select colorbar, there are eight colorbar for you choice.



3.Analyze

Click "" icon to analyze the IR pictures, there are three analyze tools.



(1) Point Analyze: Add a point to the picture, it will display the temperature of the point.

(2) Line Analyze: Add a line to the picture, it will display the highest, lowest and average temperature of the line.

(3) Area Analyze: Add a rectangle to the picture, it will display the highest, lowest and average temperature of the rectangle.

4.Save and Exit

Click "↻" to save and return to the main page of the APP.

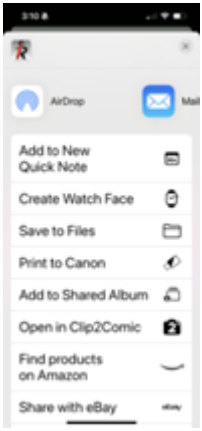
7-2-3.Report and Share

1.Report

Click "📄" icon to report as a ".pdf" file.

2.Share

Click "⋔" icon to share the Infrared picture with Email, Cloud or Message and so on.



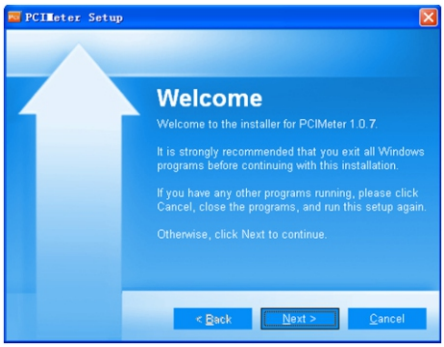
8.PC Software

8-1.System Required

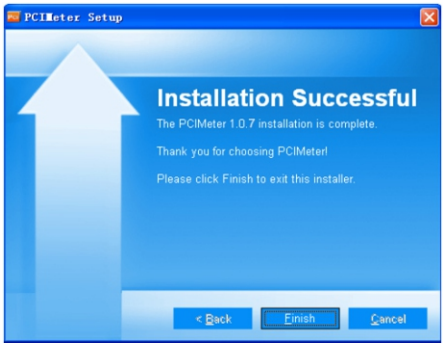
- Window XP or higher version of Windows system, please make sure you have installed Net Framework 2.0 or Net Framework 3.5(include 2.0)when you install PCIMeter software. If not, please find and install our Microsoft. NET_Framework_v2.0.exe that provided to you.
- Open the net framework 2.0,Follow all tips to install Net Framework 2.0 till it finishes.
- If your system already have installed Net Framework 2.0, then no need to install again.

8-2.PCIMeter Install

1.You can insert your installation CD to install directly if you have one, or you can run "setup.exe" to install it as follow.



2.Click "Next" to install, till finish installation.



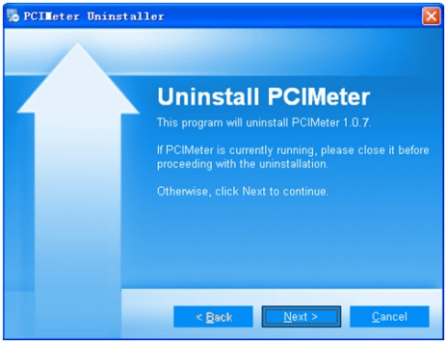
3.Installation Successful after click "Finish" like above.

8-3.Running

After ensuring PCIMeter software has been installed, click shortcuts on the desktop or start menu to run the software.

8-4.Uninstall

Uninstall PCIMeter in the start menu as follow, then click "Next" to finish uninstall.



9.Fault diagnosis and Exclusion

- If you encounter any problems while using the thermal imager, overhaul according to the following table.
- If the problem persists, disconnect the power and contact with the company's technical support department.

Phenomenon of the Fault	Cause of the Fault	Solution
Thermal imager cannot start	No battery	Inserting the battery
	No power	Replace the battery or charge it
Thermal imager shut down	No power	Replace the battery or charge it
No Thermal image	The lens cap cover	Opened the lens cap

Warranty Statement

Triplett Test Equipment offers a one-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.

Triplett www.triplett.com