

ThermoPro™ TP8 IR Thermal Camera

User Manual

Wuhan Guide Infrared Co., Ltd.

No. 26 Shucheng Rd, Hongshan District, Wuhan 430070 P. R. China

Telephone: +86-27-8767 1991

Facsimile: +86-27-8767 1927

Email: overseas@guide-infrared.com

Internet: www.guide-infrared.com

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ThermoPro™ TP8 IR Thermal Camera complies with current European directives relating to electromagnetic compatibility and safety. (EMC directive 89/336/EEC; Low voltage directive 73/23/EEC)

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Introduction

This publication provides the necessary information required to safely operate the **ThermoPro™ TP8** IR Thermal Camera

It is important to fully check all equipment with which you have been supplied

The equipment should be used, maintained and serviced by suitably trained personnel, capable of carefully following the procedures and guidelines given in this User Manual

All User Manuals and leaflets should be read thoroughly before proceeding with operation of the equipment

It is also advisable that all User Manuals and Instruction Leaflets supplied are kept readily available, for reference when the equipment is in general use

Precautions

The following precautions must be adhered to at all times and must be considered in addition to any advised precautions issued at the relevant worksite or work area

- Keep the **THERMOPRO™ TP8** IR Thermal Camera steady during operation
- Do not use the **THERMOPRO™ TP8** IR Thermal Camera in temperature exceeding its working and storage temperature ranges
- Do not direct the **THERMOPRO™ TP8** IR Thermal Camera at very high intensity radiation sources such as the sun, carbon dioxide lasers or arc welders etc
- Do not expose the **THERMOPRO™ TP8** IR Thermal Camera to dust and moisture. When operating the unit near water, ensure that the unit is adequately guarded against splashes. Always replace the lens cap when the unit is not in operation
- When the **THERMOPRO™ TP8** IR Thermal Camera is not in use or is to be transported, ensure that the unit and its accessories are stored in the protective carry case

- Do not jam the holes or loudspeaker on the camera body
- Do not re-switch on the camera until 15 seconds later after switching it off
- Do not throw, knock or vibrate intensely the camera and its components in order to keep them from damage
- Do not attempt to open the camera body, as this action will void the warranty
- Keep the SD memory card for the exclusive use of the camera

The **THERMOPRO™ TP8** IR Thermal Camera utilizes a Lithium Ion (Li-Ion) rechargeable battery pack. The following safety precautions must be adhered to at all times to ensure the safe use of this equipment

- Do not disassemble or attempt to open the battery under any circumstances
- Do not expose the battery to fire or high temperatures
- Do not short circuit the battery
- Do keep the battery off moisture or water
- Charging of the battery should only be carried out using the recommended or supplied charging device

Maintenance

To ensure that the **THERMOPRO™ TP8** IR Thermal Camera is kept in good working condition and remains fully operational, the following guidelines should be adhered to at all times

Non-optical surfaces

The non-optical surfaces of the camera can be cleaned when required, with a soft cloth dampened with water and a mild detergent

Optical surfaces

The optical surfaces of the camera lens should only be cleaned when visibly dirty. Care should be taken to avoid touching the exposed lens surface, as skin acid left behind from fingerprints can be damaging to coatings and lens substrates. Use only a proprietary lens cleaning tissue

Calibration and Repair Philosophy

To ensure the accuracy and reliability of the **THERMOPRO™ TP8** IR Thermal Camera, it is highly recommended that the instrument be calibrated at 12 monthly intervals

Calibration or repair for the instrument can be obtained by either contacting the address/ telephone number on the cover of this User Manual, or by email to the following addresses: overseas@guide-infrared.com

Caution

The **THERMOPRO™ TP8** IR Thermal Camera does not incorporate any user serviceable parts. Never attempt to disassemble or modify the camera. Opening the unit invalidates the warranty

Technical Support

Technical support for your **Wuhan Guide** Thermal Imaging System can be obtained by either contacting the address / telephone number on the cover of this User Manual or by email to the following address: overseas@guide-infrared.com

Feedback to Us

We have tested and verified the information in this manual to the best of our abilities. Yet as we are committed to continuous development and progress, you might find features of the product have been changed since the time of printing. You are appreciated to let us know about any error you find, and your suggestions for further editions by either contacting the address/telephone number on the cover of this User Manual or by email to the following address: overseas@guide-infrared.com

System Overview

THERMOPRO™ TP8, the most **intelligent, innovative** and **integrated** IR thermal imaging system in the world

Improved on the most advanced IR package available now, integrating multiple technologies never used in the industry, **THERMOPRO™ TP8** is another ingenious solution Wuhan Guide provides for professional IR thermographers around the world.

In a rugged, compact and durable magnalium casing, **THERMOPRO™ TP8** offers a wide assortment of unexpected features that enable thermographers to work with unprecedented efficiency and productivity.

Exceeding all the existing IR radiometric cameras, it sets another new standard of the first-class products for the whole industry.

System Configuration

Please ensure that the following items have been correctly supplied:

- IR Camera with visual camera, laser locator
- 35mm IR lens
- 3.5" VGA LCD Screen, 0.6" OLED viewfinder, touch pen
- 2GB SD card & card reader
- Bluetooth wireless headset
- Two rechargeable Li-ion batteries
- Battery charger
- AC Adapter & cable
- VGA cable
- USB extension cable
- RS232 communication & TV video cable

- RS232 communication protocol
- USB driver
- Guide IrAnalyser® Software
- User manual
- Carry case & strap

Options

- Remote control handle
- Tele lens
- Wide angle lens
- Extended temperature range

Technical Specification

Imaging Performance	
THERMAL	
Detector type:	Uncooled FPA microbolometer (384× 288 pixels, 25µm)
Spectral Range:	8-14µm
Thermal Sensitivity:	0.08°C at 30°C (Frame averaging algorithm)
Field of View/ Focus:	16°× 12°/ 35mm
Focus:	Automatic or motorized
Electronic Zoom:	×1 to ×10 continuous zoom
VISUAL	
Built-in Digital Video:	CMOS Sensor, 1280× 1024 pixels, 2 ¹⁵ colors

Image Presentation	
External Display:	3.5" high resolution color VGA LCD, 640× 480 pixels
Viewfinder	0.6" built-in high resolution color OLED, 640× 480 pixels
Video Output:	60Hz VGA/ 50Hz PAL/ 60Hz NTSC switchable
Man-Machine Communication	
Touch Screen:	Present and receive operator's commands given by touch
Auto Speech Recognition System:	Automatically recognize and react to operators' voice commands
Remote Control Handle (optional)	Respond as per operators' operation
Joystick & Buttons:	Respond as per operators' operation
Menu:	Microsoft® Windows style
Measurement	
Temperature Range:	Filter 1: -20 °C- +250°C; (Down to -40°C optional) Filter 2: 200°C- +800°C (up to +2000°C optional)
Accuracy:	Filter 1: ±1°C or ±1% of reading; Filter 2: ±2°C or ±2% of reading
Measurement Modes:	Auto hot spot & auto alarm in live/ zoomed image & video; 10 movable spots, 10 movable & changeable areas displaying either max, min, or average, vertical & horizontal line profile, histogram & isotherm in live/zoomed/frozen/saved image & video
Emissivity Correction:	Variable from 0.01 to 1.00 (in 0.01 increment)
Measurement Features:	Automatic correction based on distance, relative humidity, atmospheric transmission and external

	optics
Optics Transmission Correction:	Auto, based on signals from sensors
Image Storage	
Type:	Removable 2GB SD card or built-in flash memory
File Format:	JPEG (An individual file consists of infrared image, visual image, voice annotation and text annotation if any)
Voice Annotation:	Up to 60 seconds per file Recorded by the built-in microphone or the Bluetooth wireless headset
Text Annotation:	Selected from preset texts
Live Video Recording & Measurement & Storage	
Recording:	Thermal video recording to PC via USB2.0
Measurement:	The same as image
Storage:	In PC, capacity dependent on PC hard disk capacity
Optional Lenses	
Field of View/ Focus:	5.5°× 4.1°/ 100mm 33°× 25°/ 16mm
Laser Locator	
Classification Type:	Class 2 semiconductor laser
Power System	
Battery Type:	Rechargeable Li-ion Camcorder battery, field-replaceable
Charging System:	In camera or in battery charger
Battery Operating Time:	Over 2.5 hours continuous operation

External Power Operation:	AC adapter 110/ 220 VAC, 50/ 60Hz
Environmental Specification	
Operating Temperature:	-20°C- +60°C
Storage Temperature:	-20°C- +60°C
Humidity:	Operating and storing 10% to 95%, non- condensing
Encapsulation:	IP54 IEC 529 housing
Shock:	Operational: 25G, IEC 68-2-29
Vibration:	Operational: 2G, IEC 68-2-6
Interfaces	
USB 2.0:	Real-time data transfer to PC & real-time control of the camera on PC
RS232 communication:	Control of camera on PC
Physical Characteristics	
Housing:	Magnalium
Weight:	0.85kg (excluding battery & LCD); 1.1kg(including battery & LCD)
Size:	186mm×106mm× 83mm (Standard Model)
Tripod interface:	1/4"- 20

System Features

Unique Features

- The highest-performance uncooled IR detector (384*288 pixels, 25 microns) offers performance 45% higher than traditional detectors of 320*240 pixels, 45 microns
- 640*480 VGA LCD screen and 640*480 OLED viewfinder enable flexible high-resolution image presentation
- Easily switchable VGA/ PAL/ NTSC video output simplifies video viewing; simultaneous video output on VGA LCD screen, OLED viewfinder, a VGA display and a TV display is available
- Camera can be controlled by touch screen, voice, remote control handle or joystick & buttons, enabling the camera use in any demanded application
- Intelligent auto speech recognition system and intuitive touch screen free hands or at least reduce hand operation
- Bluetooth voice recording enhances operators' safety
- Real-time radiometric thermal video recording and JPEG image storage facilitate further analysis and report generation
- Ultra large capacity SD memory card and built-in flash memory offer easy in-field storage
- High-speed USB2.0 interface enables real-time data transfer, live video recording and camera control
- Windows-style man-machine interface & status display screen showing component status reinforce the user-friendly feature
- Compact & durable magnesium camera casing raises reliability and operation easiness
- Robust on board analysis enhances operators' efficiency & productivity
- Hot shoe technology enables hot swap of the VGA LCD screen and non-cable-connection of the VGA LCD screen with camera body

Imaging performance

- Picture in picture function: Display both thermal image & visual image at the same time on the same screen, enabling you to find out the problems more quickly and easily.
- IR Fusion technology: IR Fusion technology allows you overlay the thermal image directly to the corresponding visual image, helps you pinpoint the problems.
- Display 256-level gray and color thermal image on both VGA LCD screen and viewfinder
- Display true color visual image on both VGA LCD screen and OLED viewfinder
- Output both thermal and visual video to other display devices (e.g. VGA display or TV set)
- Transfer live thermal video into PC via USB cable
- Continuously zoom in or out thermal image from x1 to x10
- Auto or motorized focusing of IR lens

Temperature measurement

- Auto calibration ensures high accuracy
- Auto hot-spot tracing and center-cursor temperature measurement pinpoint the problem
- Up to 10 spots can be analyzed simultaneously in live or zoomed or frozen or saved images
- Up to 10 areas can be analyzed simultaneously in live or zoomed or frozen or saved images, showing respective Max, Min or Average temperature within each area
- Line analysis can be done in live or zoomed or frozen or saved images; line profile can be switched into horizontal or vertical coordinates system
- Histogram analysis can be done in live or zoomed or frozen or saved images
- Isotherm analysis can be done in live or zoomed or frozen or saved images
- Delta-T analysis can be done in live or zoomed or frozen or saved images

Image Storage

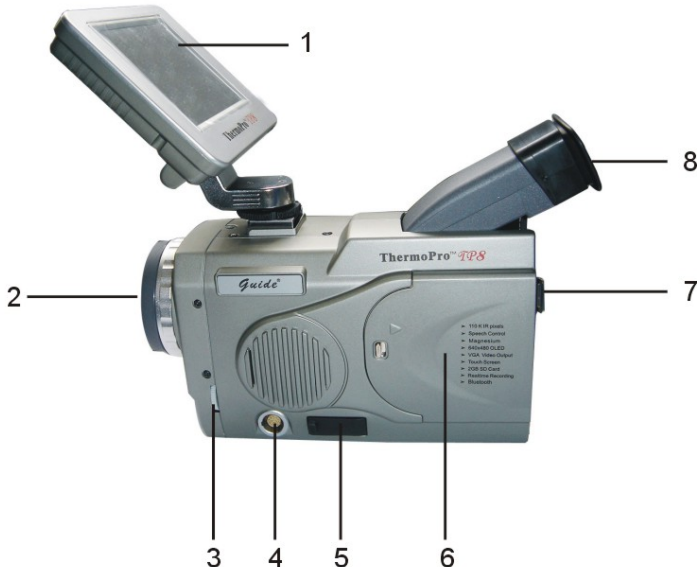
- Image capture: the camera can automatically capture images at a regular frequency.
- Live images can be frozen to be static images to do multiple-spot analysis, multiple-area analysis, line analysis and isotherm analysis
- Frozen images, comprising radiometric data, infrared image, visual image, voice annotation and text annotation, can be saved into 2GB SD card or the built-in flash memory in standard JPEG format
- Up to 60-second digital clip of voice can be recorded and saved for each image
- SD card can accommodate 1000 images and the built-in flash memory can store 450 images
- Live thermal video can be recorded onto PC via USB cable. Temperature measurement and different kinds of analysis can be done on recorded video

Image Playback

- Images saved into SD card or the built-in flash memory can be replayed on the camera
- Temperature measurement and different kinds of analysis can be done on replayed images
- Voice annotation, text annotation and visual images saved together with thermal images can be replayed as well
- Recorded thermal video can be replayed on PC
- Images saved in SD card and the built-in flash memory can be downloaded to PC for further analysis and report generation with software Guide IrAnalyser®

Parts Described

- | | |
|--------------------------|------------------------|
| 1. VGA LCD touch screen | 2. IR lens |
| 3. Visual focusing gear | 4. VGA video interface |
| 5. USB2.0 interface | 6. Battery door |
| 7. Buckle for neck strap | 8. Viewfinder |



- 1. Dioptre adjuster
- 2. Microphone to record voice annotation
- 3. F1-F4 function buttons and power button
- 4. Status display screen for power status, USB, Bluetooth & SD card memory status
- 5. Joystick
- 6. Button S, Button C and Button A
- 7. Bluetooth window



- 1. RS232/ TV video interface
- 2. Power interface



- 1. Laser locator
- 2. Visual camera



1. LCD mount



1. Tightening gear

2. Touch pen

3. Contact pins at the LCD screen foot



RS232 and TV Video cable: Interfaces from the top down are respectively: RS232 interface to PC, TV Video interface to a TV Video display device, TV Video/RS232 interface to the TV Video /RS232 interface on camera



VGA cable: Interfaces from the top down are respectively: VGA video interface to the VGA interface on camera, VGA interface to a VGA display device



USB extension cable: Interfaces from the top down are respectively: Interface to the camera USB2.0 interface, interface to a USB interface on PC



AC adapter and cable: Interfaces from the top down are respectively: Interface to be inserted to the power interface on camera, plug to be connected to a socket or wall outlet



Camera with cables: from the top down and from left to right, the camera is connected with VGA cable, USB extension cable, AC adapter cable and RS232/ TV video cable.

- If connecting the VGA cable and the video interface of RS232/ TV video cable to corresponding devices, such as a VGA display device and a TV video display device, you can view the live video taken by the camera simultaneously on VGA LCD touch screen, OLED viewfinder, the VGA display device and the TV video display device.
- If connecting the RS232 interface of RS232/ TV video cable to a PC with RS232 communication port, you can view the live video on the video display device and meanwhile control the camera on PC via RS232 communication protocol.

- If only connecting the USB extension cable to a PC with USB2.0 interface and running the corresponding menu commands of Guide IrAnalyser® software (e.g. sub-command Device Video of command Video under menu File), you can view the live thermal video on PC, control the camera on PC and also record live thermal video into PC.
- If connecting all the cables above to corresponding devices and execute the corresponding commands in the Guide IrAnalyser® software (i.e. sub-command Device Video of command Video under menu File), the camera will switch to USB mode immediately. Now you can view the live video on PC, control the camera on PC and also record live thermal video into PC with the help of Guide IrAnalyser® software, but at the meantime, the VGA LCD touch screen, OLED viewfinder, VGA display device and TV video display device will display prompt “USB Mode” only.



Rechargeable lithium battery



Battery charger



Bluetooth wireless headset

Attaching and Detaching the LCD Screen

Attaching the LCD screen:

- Mount the LCD screen to the camera by sliding the LCD screen foot into the mount on top of the camera. Then rotate the tightening gear clockwise to make the LCD screen locked in place

- Tilt the LCD screen backward till you view the image comfortably

Detaching the LCD screen:

- Rotate the tightening gear anticlockwise to loose the LCD screen foot
- Keep the LCD screen depressed and slide the LCD screen foot from the mount



Notes for the LCD screen:

- Although the LCD screen utilizes hot shoe technology, it is still advisable to switch off the camera before attaching or detaching the LCD screen
- Do not force the LCD screen into or out of the mount to avoid damage of the contact pins under the LCD screen foot
- When sliding the LCD screen out of the mount, do keep it depressed to avoid damage of the contact pins
- The tightening gear must be rotated into place after the LCD screen has been slid into the mount

Inserting / Removing the SD Memory Card

- To insert or remove a SD memory card, open the SD memory card door
- To insert a SD memory card, slide the card with the terminals pointing downwards and the obverse outwards till you hear a slight sound, as shown in the figure below



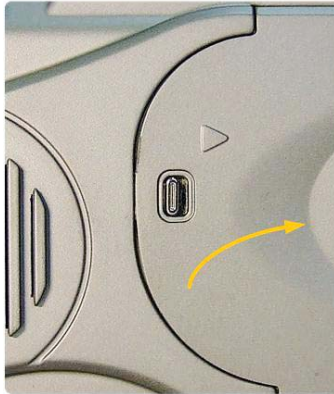
- To remove a SD memory card, press the card downwards and then release it. It will bounce to be pulled it from the camera

**Notes for the SD memory cards:**

- Ensure that saving or opening of images is complete before removing the SD memory card
- Do not use the SD memory card as a common removable disk for storing other information than images or video taken by the camera

Inserting/ Replacing the Battery

- Open the battery door by sliding the release button right, as shown below.



- Insert a fully charged battery with the charge terminals pointing inwards and slide in the battery until you hear a clear sound given by the release button to ensure the battery has been locked into place.
- The battery level is displayed in the status display screen at the back of the camera. When it is to be used up (i.e. the camera will automatically switch off in 15 minutes), an audible sound alarm will activate and the battery level symbol in the status display screen will flicker. At this point the battery needs to be replaced by a fully charged one
- Before replacing the battery, ensure that the camera is powered off

- To remove the battery, open the battery door, keep the battery depressed and then press the pop-up button. Keep the pop-up button depressed, release the battery, then the battery will bounce and you can pull it from the camera. When pulling the battery, please still keep the pop-up button depressed
- Replace a fully charged battery as above instructed

**Notes for the battery:**

- Do slide the battery into the battery chamber until you hear a clear sound given by the release button. Otherwise, the battery is not locked into place and the camera cannot work well because of unstable power supply.
- When pulling the battery out of the camera, please ensure the pop-up button is depressed till the battery finally offs the camera
- In the interim of replacing the battery, AC adapter can be connected to the camera without powering off the camera. Then the AC adapter starts supplying power for the camera and you can replace the battery with a fully charged one without powering off the camera. After replacement, you can disconnect the AC adapter from the camera.

Battery Charging

Two methods are available to charge batteries:

- Charging in the camera
- Charging in an external battery charger

Charging in camera

- Properly insert the battery into the battery door and close the door; connect the camera to AC adapter through the AC adapter cable, and then connect the AC adapter to a socket or wall outlet

- Now charging starts. While charging, the battery level symbol will be rolling in the status display screen. Once the battery is fully charged, the symbol will become steady.

Charging in an external battery charger

- Insert the battery into the battery charger. This is done by aligning the end surface of the battery pack to the edge of the terminal shutter of this unit, then fitting and sliding the battery packing in the direction of the arrow.
- Connect the charger to a wall outlet or socket



- The battery charger will utter an audible sound to indicate charging start and the battery level symbol will flash in its LCD screen. Besides the battery level symbol, its LCD screen also shows the battery capacity by ** Hr ** Min. The capacity will increase as charging goes on. While charging, the charge lamps on the top of the battery pack will light in turn, indicating charging is going on.
- When normal charge is completed, the charger will give an audible sound, display a prompt Full & the battery capacity in its LCD screen and stop the battery level symbol from flashing. The charge lamps on the top of the battery pack also go out.
- Remove the battery pack when required. It can be used even if the charging is not completed

- Once the battery is fully charged it can be used with the camera

Additional Information

- All rechargeable batteries gradually lose their charge over time when they are left in storage. If the battery is to be left in storage or for a period of non-use, a 'top-off' charge should be carried out prior to use
- Always remove the battery from the equipment or charger when not in use. Store the battery in a cool and dry place
- Periodically wipe the metal battery terminals with a soft, dry cloth
- Do not attempt to open or disassemble the battery
- Do not short circuit the battery by directly connecting the metal terminals
- Ensure that no metal objects touch the terminals

Introduction to Buttons & Joystick

Button On/Off: Power supply control

Keep button On/Off depressed for 3 seconds to switch on or off the camera.

Joystick: Multiple functions

When there is no menu displayed in live thermal image, move the joystick up or down to adjust focus and left or right to zoom in or out the image continuously. When there is no menu displayed in frozen or saved thermal image, move the joystick in all directions to move the centre cursor to measure temperature of any spot in the image.

Press the joystick to enter all the menus; move it up, down, left and right to toggle between different sub-menus or menu options or to alter values of different parameters.

When there is a dialog box displayed in thermal image, press the joystick to confirm selection

and close the box.

When an option in the toolbar is highlighted, press the joystick to select this option and execute the command corresponding to it.

Button S: Freeze & save control, option switch

Press button S to freeze a live/zoomed thermal image and press it again to save it into the built-in flash memory or SD memory card.

Press button S to toggle between the 10 spots and 10 areas while doing spot and area analysis on live or frozen or saved thermal images

Press button S to switch between horizontal and vertical coordinate systems when doing line analysis on live or frozen or saved thermal images

Press button S to switch between options or buttons in menus or dialog boxes

Button C: Cancel

Press button C to cancel a dialog box or menu and return to the live/zoomed thermal image

When there is no menu or dialog box in live/zoomed thermal image, keep it depressed and then press button S to perform a non-uniformity calibration.

Button A: Temperature range, filter & emissivity control

When there is no menu displayed in live/zoomed thermal image, keep button A depressed for 2 seconds and then release it to switch between its three modes Auto1, Auto2 and Manual, with the corresponding prompt "Auto1" or "Auto2" or "Manual" shown in the status bar at the left bottom of the image. Brightness and contrast of the image are controlled automatically in the two auto modes and can be adjusted manually in manual mode.

- When there is no menu displayed in live/zoomed thermal image, press button A for an instant to select the temperature setup menu at the right side of the image. Move the joystick up or down to toggle between its options Tmax, Tmin, filter range and emissivity,

move it left or right to change their respective values. But palette change is unavailable in this mode, it can only be changed in the menu system.

Button F1: Sleep mode

Pressing button F1 in the normal working mode can switch to sleep mode, in which all the video outputs are turned off and the red indicator light at the back of the camera flickers.

Pressing it in sleep mode can switch into the normal working mode, in which the red indicator light at the back of the camera shine steady.



Note: Sleep mode is unavailable in thumbnail image status

Button F2: Thermal & visual & PIP & IR fusion image switch

If the PIP value is set as off, pressing button F2 in live, zoomed, frozen or saved thermal images can switch to visual image. Vice versa.

If the PIP value is set as 1, pressing button F2 in live, zoomed, frozen or saved thermal images can switch among thermal, PIP images

If the PIP value is set as 2, pressing button F2 in live, zoomed, frozen or saved thermal images can switch among thermal, visual and IR fusion images.

Button F3: Laser locator/ Histogram control

When option Laser in sub-menu Function of menu Parameter is set as On, press button F3 in live/zoomed thermal image to turn on the laser locator and press it again to turn off the laser locator.

When option Histogram in sub-menu Function of menu Parameter is set as On, press button F3 in frozen or saved thermal image to display or close histogram

Button F4: Auto focusing control

When there is no menu or dialog box in live/zoomed thermal image, keep button F4 depressed till a frame appears in the image, aim the frame at the target to be focused and

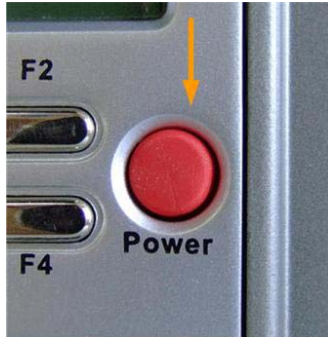
then release button F4, then the camera will automatically focus till getting a clear image of the target.

Quick Start Guide

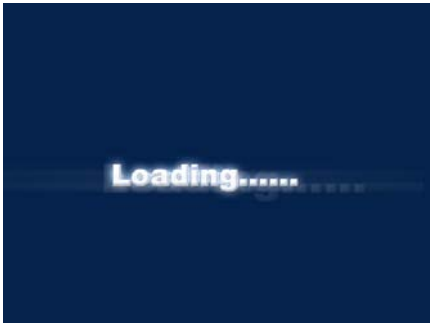
- Ensure that the battery is fully charged and the SD memory card is inserted in the camera
- Insert the VGA LCD screen into the mounting foot and ensure it has locked into place
- Keep button On/ Off depressed for 3 seconds to switch on the camera
- Wait till the boot screen image disappears and uncover lens cap. Non Uniformity Calibration (NUC) is performed automatically
- Aim the camera at the target
- Press button F4 to automatically focus or move the joystick up or down to manually focus
- Move the dioptre adjuster to get a clear image in the viewfinder
- Press button A for 2 seconds to switch between Auto1, Auto2 and Manual modes
- Press button A and release it instantly and then adjust Tmax, palette, Tmin and filter if necessary
- Press button F2 to switch to live visual image
- In visual image, rotate the visual focusing gear at the left front of the camera body to manually focus
- Press button F2 to switch to live thermal image
- Press button S to freeze the live image
- Press button S to store the frozen image into SD memory card or built-in flash memory of the camera
- Press button C to return to the live thermal image

Using the Camera**Powering on the camera**

Keep button On/ Off depressed for 3 seconds to power on the camera.


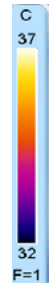






Then the loading image and boot screen flash as shown below appear in the screen successively with music.



After the boot screen flash disappears, live image as shown below is displayed, with Guide logo and temperature setup menu lying at the right side, status bar, zoom bar, speech control bar, memory media bar, temperature display bar and time bar lying at the bottom.



Icon	Significance	Function
	Guide logo	Bring up the main menu upon click of the touch pen
	Temperature setup menu	Display the temperature unit and adjust Tmax, palette, Tmin and filter range for the current image
	Status bar	Show the status of the current image: live, frozen, saved, auto mode, manual mode, etc.
	Zoom bar	Indicate the magnification of the current image
	Speech control bar	Indicate on or off status of the auto speech control function
	Memory media bar	Indicate the memory media that

		the camera currently uses
C= 33.6 M= 37.9	Temperature display bar	Display the center temperature and the maximum temperature of the current image
0.98	Emissivity bar	Show the current set value of emissivity

Non Uniformity Calibration (NUC)

- After powering on the camera and the boot screen flash disappears, the camera will automatically perform a Non Uniformity Calibration (NUC). From now on, 5 seconds later, 25 seconds later, and 45 seconds later, the camera will automatically perform 3 NUC.
- While it is working, the camera will automatically perform NUC at a regular frequency, even if it is under analysis status. Under analysis status, after calibration, it still returns to the analysis status. NUC allows the camera detector to automatically clean up the live image of noise, ensuring normalisation and sharpness of the live image
- If necessary, manual NUC can be performed. To perform a NUC manually, keep button C depressed and then press button S when there is no menu or dialog box in live thermal image.
- During the NUC the live image pauses temporarily, whilst a shutter is placed in front of the detector
- This process takes only a couple of seconds, however for best results, please ensure that camera is pointed at a low temperature uniform surface or the lens cap

Focusing

Thermal camera focusing

There are two methods to adjust focus in live image: manual and automatic

Before focusing, ensure the lens cap is uncovered and there is no menu or dialog box

displayed in live thermal image.

- To manually focus, aim the lens at the target and then move the joystick up or down
- To automatically focus, keep button F4 depressed till a frame appears in the image, aim the frame at the target and then release button F4, then the camera will automatically focus till getting a clear image of the target.
- Focusing is also available while doing spot, area or line analysis in live image. Pressing the joystick will activate Focusing function. Now moving the joystick up or down can adjust focus of the live image. Pressing the joystick again will trigger off the function.

Visual camera focusing

Visual camera needs to be manually focused.

- Press button F2 to switch from thermal image to visual image.
- Rotate the visual focusing gear under the left side of lens at the front of the camera till getting a clear image of the target.



Note: When the temperature difference between the target and its surroundings is not great, it is advisable to focus manually to get a clear image of the target

Setting the temperature range

There are 3 methods available to set the temperature range: **Auto1**, **Auto2** and **Manual**

- To switch between the three modes, when there is no menu displayed in live thermal image, keep button A depressed for 2 seconds and then release it to switch between the 3 modes. The prompt "Auto1" or "Auto2" or "Manual" will appear in the status bar at the bottom of the screen
- In both Auto1 and Auto2 modes, contrast and brightness of the image are controlled automatically by the camera itself through Tmax and Tmin. In manual mode, you can adjust the contrast and brightness manually by altering the values of Tmax and Tmin.
- The only difference between Auto1 and Auto2 modes is that Auto1 makes you to view

both the target and its surroundings clearly enough, but Auto2 enables you to view clearly the target only.

- In each mode, when there is no menu displayed in live thermal image, press button A for an instant to select the temperature setup menu at the right side of the image. Then the menu flickers, indicating you change its option values now. Move the joystick up or down to toggle between its options Tmax, Tmin, filter and emissivity, and move the joystick left or right to change the respective values of the options.
- If changing values of Tmax and Tmin in Auto1 mode or Auto2 mode, the camera will immediately switch to manual mode
- Altering values of Tmax and Tmin actually changes the display effect of a certain palette.
- The standard temperature range of the camera is -20 to 800°C, which is divided into two filter ranges. The range for filter position 1 is -20 to 250°C; the range for filter position 2 is 200 to 800°C
- If the target temperature is beyond the current filter range, the symbol “+++” or “---” will appear in the temperature display bar under the live image. It indicates that the filter range should be changed manually
- To change the filter range manually, go to the live thermal image, and press button A for an instant to select the temperature setup menu at the right side of the image. Move the joystick up or down to select option filter and then right or down to change its value.
- Please refer to page 100 to see the temperature range datasheet.

**Note:**

- While doing spot, area or line analysis in live image, pressing button F4 will highlight the temperature setup menu. Then you can change Tmax, Tmin, filter range and emissivity value.
- In auto modes, when the target temperature is higher than 250°C and the Center cursor aims at the target, the camera will automatically switch to filter range 2. In manual mode,

filter range shall be changed manually.

- After changing the option values, press button C to save the change and exit the menu
- Using the touch pen can also do the above operation. Click the temperature setup menu with the pen first, move the joystick left or right to change option values, and then click the menu again with the pen. Now you have saved the changes and returned to the live image.

Basic Temperature Measurement

For basic temperature measurement, first ensure that a suitable temperature range is set and that the image is in focus. Two methods are then available, **dynamic real-time temperature measurement** and **static temperature measurement**

Dynamic real-time temperature measurement

- With this method, the camera can automatically trace the hottest spot or the coldest spot in the live thermal image.
- In the default mode, there are two cursors on the live thermal image. One is always fixed in the centre of image; the other is always tracing the hottest spot of the image. Under the live thermal image, two temperature values are present in the temperature display bar. The value of C indicates the center temperature; the value of M indicates the maximum scene temperature.



- To trace the coldest spot in the live thermal image, set the value of sub-option M Option in option System under submenu Parameter to be Min and then choose button OK to confirm the setup.

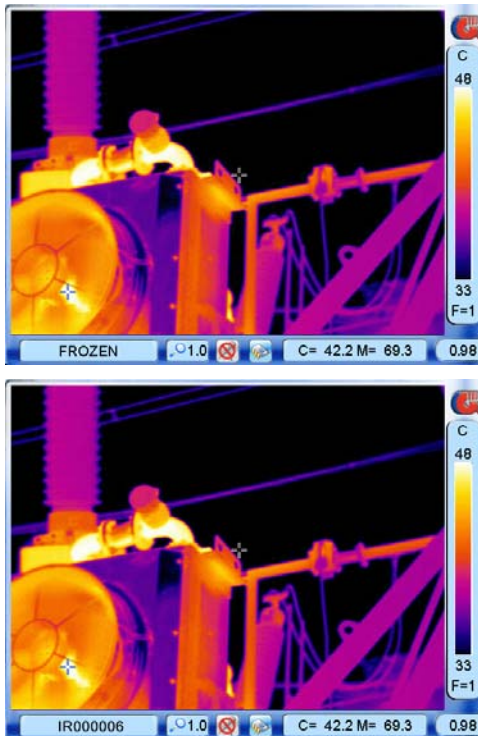


- Then the moving cursor in the live image will always trace the coldest spot of the image. Parameters in the temperature display bar under the image screen will change to blue color and M value will indicates the minimum scene temperature.

Static Temperature Measurement

- This method is available when there is no menu displayed in frozen or saved thermal images

- Keep the camera steady when you have the image in focus, press Button S to freeze the live image; Or choose and open a saved image
- Move the center cursor by moving the joystick up, down, left or right or clicking the touch pen on the center cursor and then moving it within the screen



- The first value is the temperature of the moving cursor; it changes at the same time when the cursor moves in the screen. The second is the maximum scene temperature; it never changes.

Adjusting temperature range of frozen/ saved image

Temperature range of a frozen or saved image can be changed as well to adjust the image

quality.

When there is no menu displayed in the frozen or saved thermal image, press button A for an instant to select the temperature setup menu at the right side of the image. Move the joystick up or down to toggle between its options Tmax, Tmin and filter, and move the joystick left or right to change the respective values of the options.

Image zoom

When there is no menu displayed in live thermal image, move the joystick up or down to adjust focus and left or right to zoom in or out the image continuously from x1 to x10, with the current magnification shown in the zoom bar under the image.



Operation on the x1 image is also available for the zoomed image.

Pausing live images and save images

- Keep the camera steady when you have the image in focus, then press Button S to freeze the live image. Now the image status changes to be frozen. Prompt Frozen is shown in the status bar under the image screen.



- Pressing button S again can save the frozen image directly into the memory media (built-in flash memory or SD memory card). Then name of the saved image “IR*****” will be displayed in the status bar under image screen for 2 seconds.



- Or you can do multiple kinds of operation on the frozen image before saving it into the memory media, such as static temperature measurement, temperature range adjustment, spot analysis, line analysis, area analysis, isotherm analysis, visual image display, recording and playback of voice annotation, adding text annotation, histogram analysis, etc.
- When there is no menu displayed on the frozen image, you can do static temperature measurement and temperature range adjustment as per instruction aforesaid.











- To do the left operation listed above, press the joystick or use the touch pen to click the Guide logo at the right top corner of the screen to bring up the frozen toolbar as shown below.



- Functions of the icons in the toolbar are listed below. Moving the joystick up, down, left or right can toggle between each icons, pressing the joystick can select an icon and execute its command. Or you can simply use the touch pen to click each icon to select a certain one.



Icon	Significance	Function
	Spot analysis	Do spot analysis on the frozen image
	Line analysis	Do line analysis on the frozen image

	Area analysis	Do area analysis on the frozen image
	Isotherm analysis	Do isotherm analysis on the frozen image
	Visual image display	Switch to and display visual image of the frozen image
	Time of voice annotation	Show time of voice annotation recorded for the frozen image
	Start recording	Start recording the voice annotation
	Play recording	Play the recorded voice annotation
	Stop recording	Stop recording of the voice annotation
	Save command	Save recorded voice annotation or text annotation into the frozen image; save the frozen image with voice annotation & text annotation (if any) into memory media
	Text Annotation	Add text annotation to the frozen image
	Exit command	Exit the frozen toolbar

- Spot analysis, line analysis, area analysis, isotherm analysis, visual image display and histogram analysis will be introduced in separate sections later. Here let's focus on voice annotation and text annotation.
- If voice annotation is required with the image, select the icon Start recording with the touch pen. Or move the joystick up, down, left or right to toggle between the icons, highlight the icon Start recording and then press the joystick to select it. Now you can start recording annotation and view the time of recording in the timing box. Meanwhile the icon Stop

recording is highlighted.



- Up to 60 seconds of voice clip can be saved for each image. To stop recording at any time, press the icon Stop recording. Once it reaches 60 seconds, recording will stop automatically. At the meantime, icon Play recording is highlighted.
- To replay the recording, select the icon Play recording by clicking it with the touch pen or pressing the joystick directly. When replaying, the icon Stop recording is highlighted. You can stop replaying at any time.
- If dissatisfied with the recording, the above operation can be repeated until a satisfactory recording has been made.
- If you are satisfied with the recording and do not want to insert text annotation to the image, you can select the icon Save command to save it with the image. Then both it and the image will be saved into the memory media, with file name "IR*****" displayed in the status bar under image screen.
- Text annotation can be inserted to a frozen image as well. Select the icon Text Annotation with the touch pen. Or move the joystick up, down, left or right to toggle between the icons, highlight the icon Text annotation and then press the joystick to select it. Then the annotation dialog box appears in the image screen. To select one out of the preset annotations, click it with the touch pen or move the joystick up or down to highlight it. Then select icon OK to save the annotation with the image.



- Select the icon Save command, then the frozen image with voice annotation and text annotation (if any) will be saved into the memory media, with file name "IR*****" displayed in the status bar under image screen.
- Frozen images (with or without annotation) are saved as JPEG files in the memory media. After saving an image, the camera will switch to live thermal image status.
- To exit the frozen toolbar at any time, select the icon Exit command or press button C. Then the toolbar will disappear. Press button C to exit the frozen image and return to the live thermal image status.
- If the SD memory card or the built-in flash memory is fully filled with images, the respective prompt "SD full" or "Storage full" will appear in the status bar under the image screen when you try to store a new image. If failing to save an image, the prompt "Save error" will appear in the status bar under the image screen.

Replaying saved images

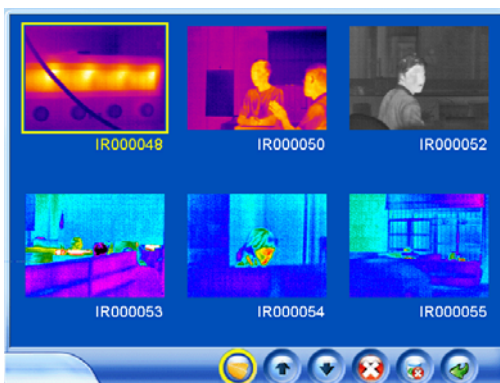
Saved images can be replayed on or deleted from the camera.

- Bring up the main menu and select option File list under submenu File with the touch pen. Or press the joystick when there is no menu displayed in live image to bring up the

main menu, with option File list highlighted. Press the joystick again to select the option File list.









- Now the thumbnail images are displayed in the screen (6 per screen) and the file toolbar is displayed under the image screen. At this moment, the first image and icon Play file are highlighted.
- To toggle between the 6 images within one screen, click them with the touch pen or move the joystick up, down, left or right. To select a certain image, choose the icon Play file by clicking it with the touch pen. Or you can press button S to highlight the icon first and then press the joystick to select the icon.



- To toggle between each icons of the file toolbar, click them with the touch pen or press

button S. After highlighting a certain icon, pressing the joystick will choose the icon and execute the corresponding function.

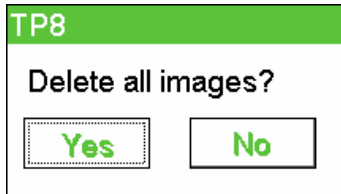
- Functions of the icons are listed below:

Icon	Significance	Function
	Open file	Open a selected image
	Up direction	Press it to turn to the previous screen
	Down direction	Press it to turn to the next screen
	Delete file	Delete a selected image
	Delete all	Delete all the saved images from the current memory media
	Exit command	Exit the replay status and back to live thermal image

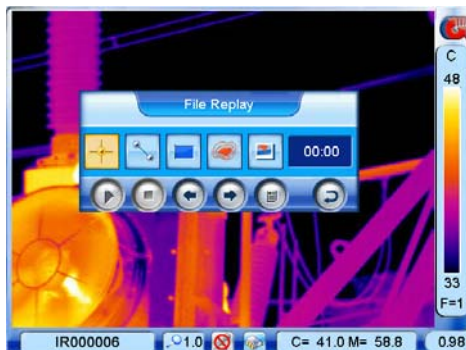
- If more than 6 images are saved, the images will be displayed by more than 1 screen. To toggle between the screens, select icon Up direction or icon Down direction.
- To delete a selected image, choose the icon Delete file. Then a dialog box “Delete this image?” will appear in the screen. Choose button Yes to delete it or button No to cancel deletion. The two buttons can be chosen either by clicking with the touch pen or by pressing button S to highlight first and then pressing the joystick to select, or by moving the joystick left or right to highlight first and then pressing the joystick to select.













- To delete all the saved images, choose the icon Delete all. Then a dialog box “Delete all images?” will appear in the screen. Choose button Yes to confirm or button No to cancel deletion. The two buttons can be chosen either by clicking with the touch pen or by pressing button S to highlight first and then pressing the joystick to select, or by moving the joystick left or right to highlight first and then pressing the joystick to select.





- To open a selected image, choose the icon Open file.
- Multiple kinds of analysis can be performed on it, such as static temperature measurement, spot analysis, area analysis, line analysis, isotherm analysis, visual image replay, voice annotation replay, text annotation replay, histogram analysis, etc.
- To do static temperature measurement and histogram analysis, please refer to the sections Static temperature measurement and Histogram analysis respectively.
- To do the left analysis listed above, bring up the replay toolbar by clicking icon Guide at the right top corner of the screen with the touch pen or pressing the joystick. The toolbar offers similar options to the frozen toolbar, whose functions are introduced below. Clicking each icon with the touch pen can select them respectively. Or move the joystick up, down, left or right to highlight one option first and press the joystick to select the highlighted option.

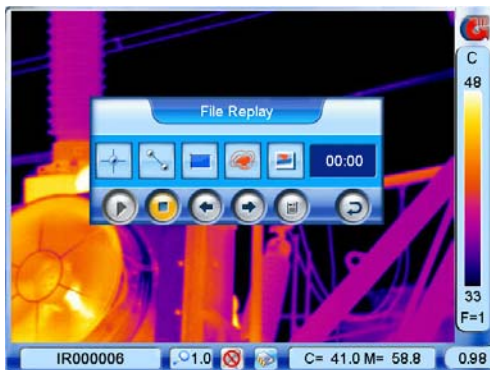




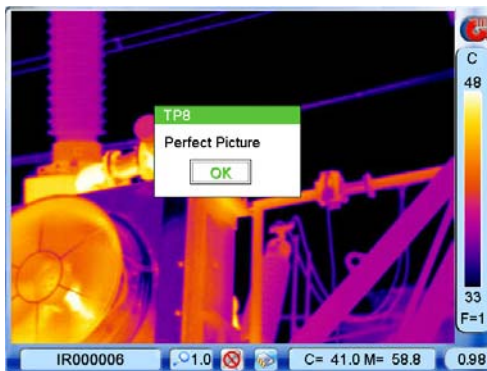
Icon	Significance	Function
	Spot analysis	Do spot analysis on the replayed image
	Line analysis	Do line analysis on the replayed image
	Area analysis	Do area analysis on the replayed image
	Isotherm analysis	Do isotherm analysis on the replayed image
	Visual image display	Replay visual image of the replayed image
	Time of voice annotation	Replay voice annotation recorded for the replayed image
	Start voice replaying	Start replaying the voice annotation
	Stop voice replaying	Stop replaying the voice annotation
	Right direction	Choose it to open next image
	Left direction	Choose it to open the previous image

	Replay text annotation	Replay the text annotation added to the replayed image
	Exit command	Exit the replay toolbar

- Spot, line, area and isotherm analysis is the same as that in live thermal image. For detailed operation, please refer to the corresponding section below.
- To replay the visual image, choose icon Visual image display. Then the visual image taken together with the replayed thermal image will be displayed.
- To replay the recorded voice annotation, choose icon Start voice replaying. Then you can hear the voice and view the time in the icon Time of voice annotation. You can also stop replaying before it automatically ends. This can be done by choose icon Stop voice recording.



- To view the recorded text annotation, choose icon Replay text annotation. Then the recorded text will be displayed in a dialog box on the image screen. To close the dialog box, choose the button OK by clicking it with the touch pen or pressing the joystick.



- To exit the replay status, choose icon Exit command or press button C. Then the live thermal image will be resumed.

**Note:**

- The icon Start voice replaying is not available when the replayed image does not include voice annotation
- The icon Replay text annotation is not available when the replayed image does not include text annotation

Visual image

The camera offers visual imaging function. Visual image can be switched from its corresponding thermal image either in dynamic live status or static zoomed/frozen/ replay status, vice versa. Another mode is also available: both visual image and thermal image being displayed at the same time in the image screen.



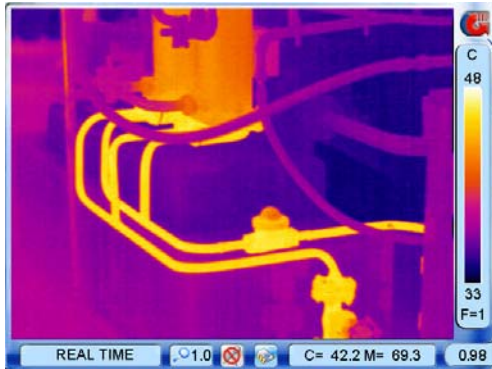
- Bring up the main menu, select option Pic in Pic under submenu Function either by the touch pen or by pressing the joystick, and then set its value to be 1 or 2. Save the setup and exit the menu. Now this function is activated.



- If the value is set as 1, in live thermal image, press function button F2 and release it instantly to switch among the three display modes: thermal image alone, thermal image with visual image on the upper left corner, visual image with thermal image on the upper left corner. The images below show the mode Picture in picture.



- If the value is set as 2, in live thermal image, press function button F2 and release it instantly to switch among the three display modes: thermal image alone, visual image alone, IR fusion image.



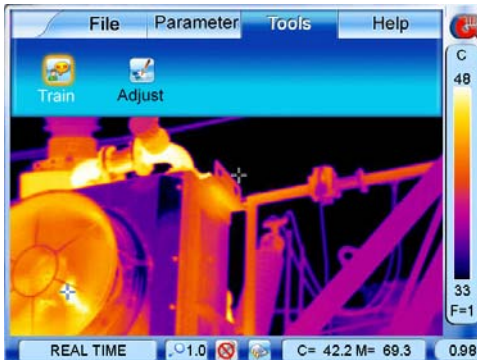
- In the mode Picture in picture, if trying to do on-board analysis on the live image, such as zooming, spot analysis, area analysis, etc, the camera will automatically switch to the mode Thermal image alone. Pressing function button F2 again will switch to either the mode Picture in picture again or the mode Visual image alone.
- In frozen or replay status, you can choose the icon Visual image display in the frozen or replay toolbar.

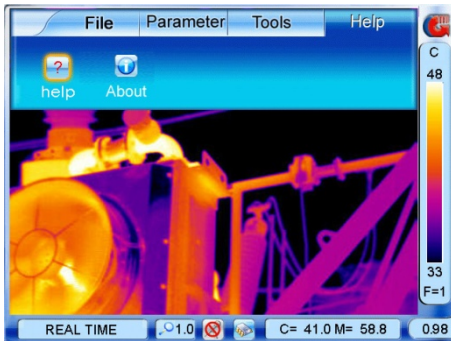


- Then press button F2 and release it instantly to switch between the 3 modes.
- To turn off this function, bring up the main menu, select option Pic in Pic under submenu Function either by the touch pen or by pressing the joystick, and then set its value to be 1 or 2. Save the setup and exit the menu. Now this function is inactive.
- When this function is inactive, pressing function button F2 will switch between the two modes Thermal image alone and Visual image alone
- Focus of the visual camera can be adjusted as well. To adjust it, rotate the visual focusing gear under the lens at the front of the camera.

Main Menu Introduction

- The camera offers a user-friendly Windows-style main menu. The main menu is brought up on the screen by either clicking the icon Guide at the right top corner of the screen or pressing the joystick when there is no menu displayed in the screen

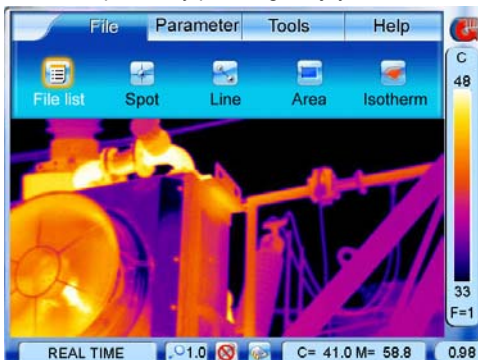




- The submenus can be navigated by either clicking with the touch pen or moving the joystick up or down.
- In each submenu, options are navigated by either clicking with the touch pen or moving the joystick left or right. The highlighted option is confirmed by clicking with the pen or pressing the joystick
- To exit the menu system at any time and return to a live thermal image, press button C or click the icon Guide at the right top corner of the screen

Spot Analysis

- Spot Analysis can be performed on live or zoomed or frozen or saved images.
- In live or zoomed images, bring up the main menu, select option Spot under submenu File either by the touch pen or by pressing the joystick.



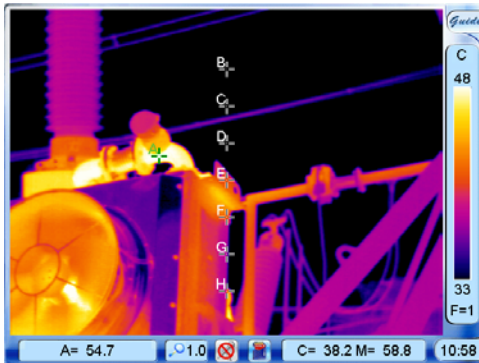
- In frozen images, bring up the frozen toolbar with the touch pen or joystick. Click the icon Spot analysis with the touch pen to select it. Or move the joystick to highlight the icon Spot analysis first and then press the joystick to select it.



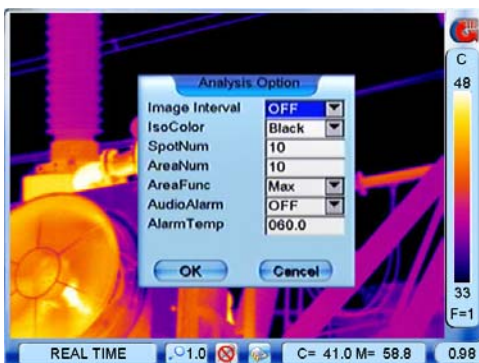
- In saved images, spot analysis can be done when the images are replayed. Bring up the replay toolbar with the touch pen or joystick. Click the icon Spot analysis with the touch pen to select it; or move the joystick to highlight the icon Spot analysis first and then press the joystick to select it.



- Up to 10 spots can be shown on the screen and marked from A to J. Clicking with the touch pen or pressing button S can toggle between them. Temperature of the selected spot is displayed in the status bar under the image screen



- To move each spot after selecting it, click it with the touch pen, drag it to a desired position and then release it; or move the joystick up, down, left or right to a desired position and then release it. The spot temperature shown in the status bar will change accordingly as the spot moves.
- It is possible to change the spot number from 1 to 10. This is done by setting the value of sub-option SpotNum in option Analysis under submenu Parameter and then choosing button OK to confirm the setup. After this, a corresponding number of spots will be available in the spot analysis.



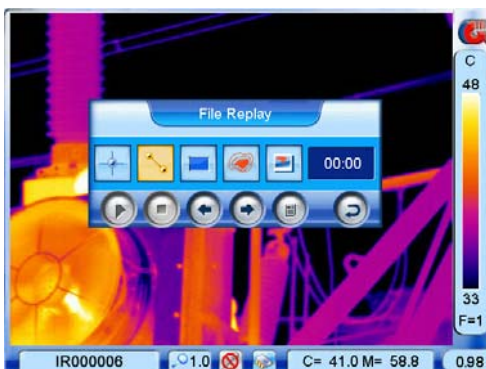
- Press button C to exit and return to the live or zoomed or frozen or save image.

Line Analysis

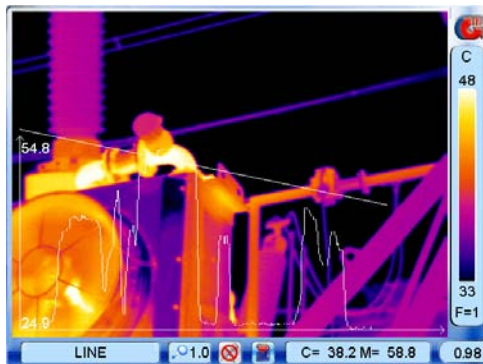
- Line Analysis can be performed on live or zoomed or frozen or saved images.
- In live or zoomed images, bring up the main menu, select option Line under submenu File either by the touch pen or by pressing the joystick
- In frozen images, bring up the frozen toolbar with the touch pen or joystick. Click the icon Line analysis with the touch pen to select it. Or move the joystick to highlight the icon Line analysis first and then press the joystick to select it.



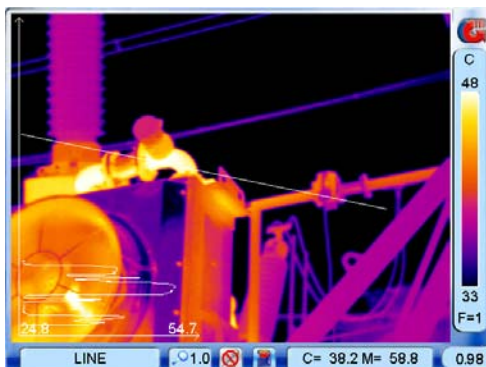
- In saved images, line analysis can be done when the images are replayed. Bring up the replay toolbar with the touch pen or joystick. Click the icon Line analysis with the touch pen to select it; or move the joystick to highlight the icon Line analysis first and then press the joystick to select it.



- Then the cursor representing the starting point of the line is displayed in the image.
- At this moment, two methods are available to draw a line. Method 1: Click and drag the cursor to a correct position with the touch pen, then release the cursor. A line is drawn. Method 2: Move the joystick up, down, left or right to move the cursor to a desired position, press the joystick to confirm the position (i.e. the starting point of the line); move the joystick again to another position and then press it to confirm the new position (i.e. the ending point of the line). Then the line is drawn.
- Press the joystick to confirm the line. At the meantime, the line profile is displayed in the image as well, with the Max and Min temperature of the line displayed in the coordinate system.



- The default coordinate system is a horizontal style. Pressing button S can switch it into vertical. Vice versa.



- In live or zoomed images, the line profile and temperatures will change in real time as the image changes.
- Press button C to exit and return to the live or frozen or save image.



Note: For a horizontal line, the coordinate system for its profile will always be horizontal. For a vertical line, the coordinate system for its profile will always be vertical. In other words, switching between horizontal and vertical coordinate systems is not available for horizontal or vertical lines.

Delta-two Analysis

- Delta-two Analysis can be performed on live or zoomed or frozen or saved images.
- Under the mode of Spot Analysis, press function button F2, then it will switch to Delta-two Analysis mode. Now you can see two spots A and B in thermal image and option A-B: *** in the status bar under the image screen. A-B: *** records the temperature difference of spots A and B.



- Clicking with the touch pen or pressing button S can toggle between the two spots. To move each spot after selecting it, click it with the touch pen, drag it to a desired position

and then release it; or move the joystick up, down, left or right to a desired position and then release it. The temperature difference shown in the status bar will change accordingly as either spot moves.

Area Analysis

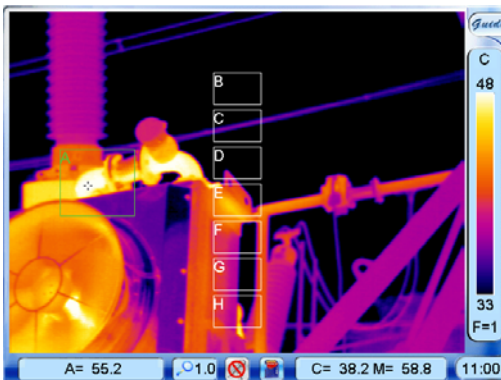
- Area Analysis can be performed on live or zoomed or frozen or saved images.
- In live or zoomed images, bring up the main menu, select option Area under submenu File either by the touch pen or by pressing the joystick
- In frozen images, bring up the frozen toolbar with the touch pen or joystick. Click the icon Area analysis with the touch pen to select it. Or move the joystick to highlight the icon Area analysis first and then press the joystick to select it.



- In saved images, area analysis can be done when the images are replayed. Bring up the replay toolbar with the touch pen or joystick. Click the icon Area analysis with the touch pen to select it; or move the joystick to highlight the icon Area analysis first and then press the joystick to select it.



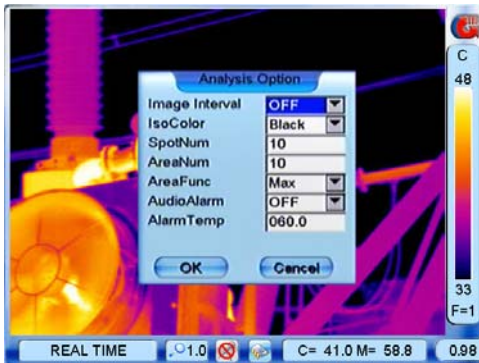
- Up to 10 areas marked from A to J can be shown on the screen. Clicking with the touch pen or pressing button S can toggle between them. Temperature of the selected area as well as the temperature measurement type, Minimum, Average or Maximum will be displayed in the status bar under the image screen.



- To move each area after selecting it, click at its center with the touch pen, move it to a desired position and then release it; or move the joystick up, down, left or right to a desired position and then release it. The temperature displayed in the status bar will accordingly change.
- To change the size of an area after selecting it, click at one of its four corners with the

touch pen, drag the corner to a desired position and then release it. Or firstly press button A for an instant, move the joystick up, down, left or right to desired positions and then release it.

- Areas can be set to display the Maximum, Average or Minimum temperature. This is done by setting the value of sub-option AreaFunc in option Analysis under submenu Parameter and then choosing button OK to confirm the setup.



- It is possible to change the area number from 1 to 10. This is done by setting the value of sub-option AreaNum in option Analysis under submenu Parameter and then choosing button OK to confirm the setup. After this, a corresponding number of areas will be available in the area analysis.
- Press button C to exit and return to the live or frozen or save image.
- When there is only one area in live image, two hot-spot tracing cursors will show up and traces respectively the hot spot of the area and the hot spot of the whole image screen. To freeze the image, you can simply press button S. Then the area and the hot spot tracing cursors will be frozen as well.
- To save the image directly, press button S again. Otherwise, press button C firstly and then press the joystick will bring up the frozen toolbar. Then you can do further analysis or record voice annotation. Then press button S can save the image.

- After the image is saved, the camera will return to the live image again. The area and two cursors are still in the live image.
- To cancel freezing or saving at any time, press button C. Then the camera will return to the live image again. The area and two cursors are still in the live image.

Isotherm Analysis

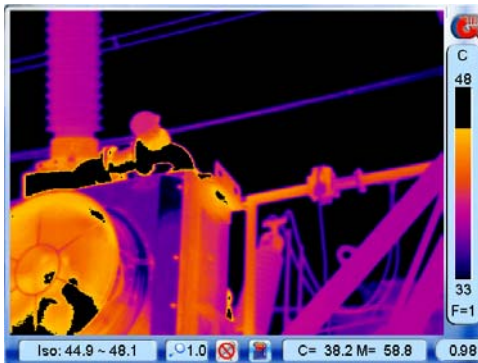
- Isotherm Analysis can be performed on live or zoomed or frozen or saved images.
- In live or zoomed images, bring up the main menu, select option Isotherm under submenu File either by the touch pen or by pressing the joystick
- In frozen images, bring up the frozen toolbar with the touch pen or joystick. Click the icon Isotherm analysis with the touch pen to select it. Or move the joystick to highlight the icon Isotherm analysis first and then press the joystick to select it.



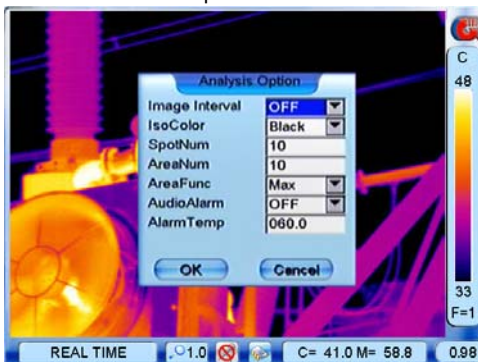
- In saved images, isotherm analysis can be done when the images are replayed. Bring up the replay toolbar with the touch pen or joystick. Click the icon Isotherm analysis with the touch pen to select it; or move the joystick to highlight the icon Isotherm analysis first and then press the joystick to select it.



- Move the joystick up or down to set the maximum temperature of the isotherm band, left or right to set the minimum temperature of the isotherm band.



- There are three isotherm colors to choose from. This is done by setting the value of sub-option IsoColor in option Analysis under submenu Parameter and then choosing button OK to confirm the setup.



- Press button C to exit and return to the live or frozen or save image.

Histogram Analysis

- Histogram Analysis can be performed on live or zoomed or frozen or saved images.
- In live or zoomed images, bring up the main menu, select option Histogram under submenu Function either by the touch pen or by pressing the joystick, and then set its value to be ON. Save the setup and back to the live or zoomed image, then histogram of the image will be displayed at the right bottom corner of the image. To close the histogram, back to the menu and set the option Histogram to be Off.



- In frozen or saved images, press function button F3. Then histogram of the image will be displayed at the right bottom corner of the image. Pressing button F3 again will close the histogram.

Parameter Setup

- Camera setup parameters can be set for the camera. Click the icon Guide at the right top corner of the screen with the touch pen to bring up the main menu and then click the submenu Parameter. Or press the joystick to bring up the main menu and move the joystick up or down to select the submenu Parameter.
- Five options Analysis, Target, System, Function and Default are present in the screen. Clicking them respectively with the touch pen or moving the joystick left or right can toggle between them.

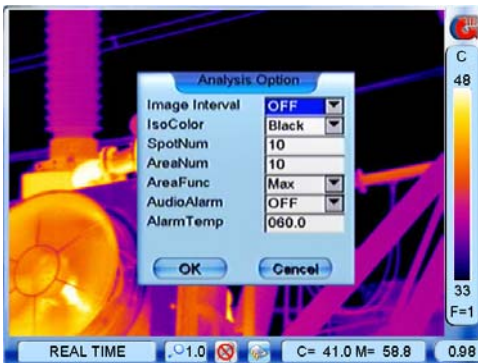


- **Analysis:** Allows for temperature analysis parameters for live and zoomed images to be set up
- **Target:** Allows for temperature measurement parameters of the target to be set up
- **System:** Allows for parameters of the camera functions to be set up
- **Function:** Allows for some camera functions to be set up

- **Default:** Resumes the factory configured values of all the parameters

Option Analysis

- Click option Analysis with the touch pen or press the joystick to select it. Then the Analysis dialog box appears on the screen.
- Clicking each option box with the touch pen or pressing button S can toggle between the options. Moving the joystick up or down can alter values of the option. Moving the joystick left or right can toggle between each digit of the option values if the values contain several digits. If there are several values to choose from for an option (e.g. IsoColor: Black, Green, White), clicking the values respectively with the touch pen can also change the option values.



- To save the change, choose button OK or press the joystick directly; to cancel the change, choose button Cancel or press button C directly. Then the dialog box will be closed and the original image status will be resumed.
- Button OK and button Cancel can be selected by the touch pen directly or by pressing button S first and then pressing the joystick.
- **Image Interval:** The value can be 10sec, 30sec, 1min, 5min, 10min, 20min, 30min, 45min,

and 60min. Save the change and return to the live status. Then the camera will start capturing image every 10 seconds or 5 minutes as per the value you set.

- **IsoColor:** To choose a certain color for isotherm, black, white or green
- **SpotNum:** To set the number of spots for spot analysis, up to 10 spots are available
- **AreaNum:** To set the number of areas for area analysis, up to 10 areas can be set
- **AreaFunc:** To set the temperature type of areas in area analysis, maximum, minimum or average
- **AudioAlarm:** To activate or inactivate the audio alarm for live thermal images
- **AlarmTemp:** To set the scene temperature threshold above which the audio alarm will sound

Option Target

- Click option Target with the touch pen or press the joystick to select it. Then the Target dialog box appears on the screen



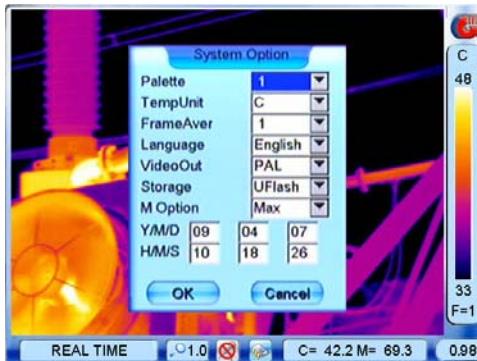
- Clicking each option box with the touch pen or pressing button S can toggle between the options. Moving the joystick up or down can alter values of the option. Moving the joystick

left or right can toggle between each digit of the option values.

- **Emiss:** To set emissivity value between 0.01 and 1.00
- **RelHum:** To set relative humidity percentage value between 0 and 100
- **Distance:** To set distance for target (meters)
- **Tamb:** To display the real-time ambient temperature
- Choose button OK or press the joystick directly to save the change; choose button Cancel or press button C directly to cancel change. Then the dialog box will be closed and the original image status will be resumed.

Option System

- Click option System with the touch pen or press the joystick to select it. Then the System dialog box appears on the screen



- Clicking each option box with the touch pen or pressing button S can toggle between the options. Clicking each value respectively with the touch pen or moving the joystick up or down can alter values of the option. Moving the joystick left or right can toggle between each digit of the option values if the values contain several digits.
- **TempUnit:** To set the temperature unit for measurement, degrees Celsius or Fahrenheit

- **FrameAver:** To set the number of frames for frame averaging algorithm to freeze image
- **Language:** To select the language for man-machine communication
- **VideoOut:** To turn on or off the video output function. PAL and NTSC can be selected as per requirements and be outputted together with VGA to respective devices. Off means only the VGA output is available.
- **Storage:** To choose the memory medium where to save files. If SD card is inserted in the camera, the default medium is SD card. But you can switch to the built-in flash memory as per need. To switch between the two memory media, you can either set UFlash for Storage here or click the icon shown in the memory media bar under the image screen.
- **M Option:** To order the camera to trace the hot spot or cold spot.
- **Y/M/D:** To set date for the camera. After setup, date of the camera will automatically update.
- **H/M/S:** To set time for the camera. After setup, time of the camera will automatically update.
- Choose button OK or press the joystick directly to save the change; choose button Cancel or press button C directly to cancel change. Then the dialog box will be closed and the original image status will be resumed.

Option Function

- Click option Function with the touch pen or press the joystick to select it. Then the Function dialog box appears on the screen



- Clicking each option box with the touch pen or pressing button S can toggle between the options. Clicking each value respectively with the touch pen or moving the joystick up or down can alter values of the option.
- **Speech:** To activate or inactivate the auto speech recognition function. Or you can directly click the icon shown in the speech control bar under the image screen to activate or inactivate this function.
- **UserID:** To choose one from 4 users for speech template. When setting its value to be 1, the user is No. 1 user and the speech template is that of No.1 user's. Then after activating the auto speech recognition function, speech commands must match the speech template of No.1 user's to successfully execute speech control of the camera. So does No. 2 or No. 3 or No. 4 user.
- **Laser:** To turn on or off the laser locator. After setting On, keep button F3 depressed to turn on the laser locator. Once the button F3 is released, the laser locator will turn off. To thoroughly turn it off, set sub-option Laser in option Function under submenu Parameter to be Off.
- **Auto Off:** To turn on or off the auto turnoff function. Never means the camera will never turn off automatically during working; 10Min, 30Min or 60Min means the camera will

automatically turn off if there is no operation on it in successive 10 minutes, 30 minutes or 60 minutes. No operation indicates in live or zoomed images there is no click on the VGA LCD screen, no operation of joystick or buttons, and no menu or dialog box displayed in the screen.

- **PowerAlarm:** To turn on or off the power alarm function. If setting On, the power alarm will sound every one minute when the battery is to use up.
- **BlueTooth:** To turn on or off the Bluetooth function.
- **Histogram:** To display or close histogram of frozen or saved images
- **Pic in Pic:** To display thermal image alone or visual image alone or both simultaneously on the screen or the IR fusion image
- Choose button OK or press the joystick directly to save the change; choose button Cancel or press button C directly to cancel change. Then the dialog box will be closed and the original image status will be resumed.



Note for Bluetooth function:

- Before setting option BlueTooth to be On, ensure the Bluetooth headset has been powered on and paired with the camera.
- Then set option BlueTooth to be On, the camera will search for the headset.
- Once it finds the headset, headset will work as the voice input/ output device of the camera, which means voice recording and replay will be performed through the headset.
- After setting option BlueTooth to be Off, the headset will not act as the voice input/ output device.

Option Default

- Click option Default with the touch pen or press the joystick to select it. Then the Default

dialog box appears on the screen

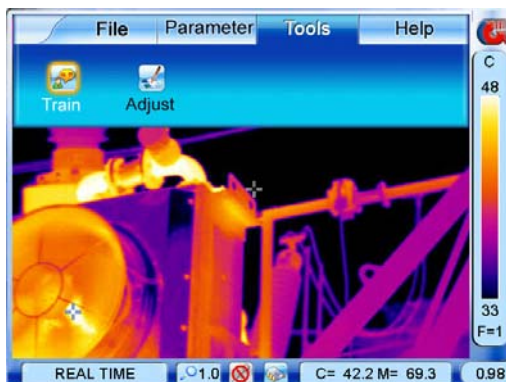
- Camera setup parameters and filter range remain the same after re-powering on the camera. But they can be resumed to the factory configured ones when needed.



- Clicking button Yes or pressing the joystick will execute the command. Then a NUC is performed automatically. After NUC, all the parameters and the filter range become the factory configured ones.
- Clicking button No or pressing button C can give up the command.
- To toggle between the buttons Yes and No, press button S or move the joystick left or right. To select them respectively, click them with the touch pen or press the joystick.

Menu Tools

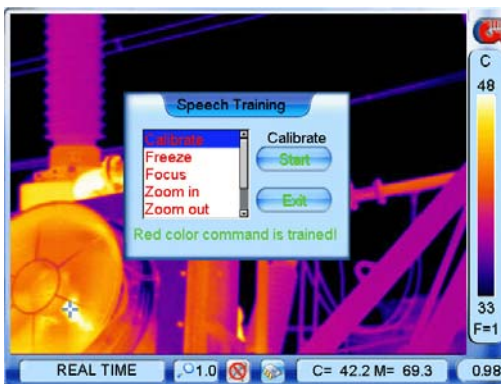
- Click the icon Guide at the right top corner of the screen with the touch pen to bring up the main menu and then click the submenu Tools. Or press the joystick to bring up the main menu and move the joystick up or down to select the submenu Tools.



- Two options Train and Adjust are present in the screen. Clicking them respectively with the touch pen or moving the joystick left or right can toggle between them.
- **Train:** To perform speech training and create speech templates
- **Adjust:** To adjust the touch pen with the cursor to improve the operation accuracy of the pen

Option Train

- Speech training is only available in the camera TP8.
- Speech training is only available in live/zoomed thermal image
- Click option Train with the touch pen or press the joystick to select it. Then the Speech Training dialog box appears on the screen
- Phrases in the form at the left side of the dialog box are commands that can be executed by speech. After training a phrase, the phrase becomes red, indicating a speech template corresponding to it has been created.



- To select a certain phrase, click it with the touch pen or move the joystick onto it.

- When highlighting a phrase, you can start training its template by clicking button Start with the touch pen directly or by pressing button S or moving the joystick right firstly and then pressing the joystick.
- Immediately pronounce the phrase in front of the microphone, then the recorded phrase will be replayed and a Message dialog box will appear on the screen to show whether the training succeeds or fails.



- If the training has failed, press the joystick to close the dialog box and then repeat the above procedures till training succeeds.
- If the training has succeeded, press the joystick to close the dialog box. Now button Start will change to be Again and highlighted. Click it with the touch pen or press the joystick to select it to start the second training. Pronounce the phrase again. If the second pronunciation is similar to the first one, the camera will regard the second training succeeds, freeze the pronunciation and bring up a Success dialog box to prompt saving the template. Press button Save to save the template and Cancel to cancel the training.



- If the second pronunciation differs greatly from the first one, the camera will regard the second training fails and bring up an Error dialog box to prompt the training has failed.



- Press the joystick to close the dialog box. Repeat the above operation to try it till training succeeds.
- The same operation to the left phrases. After successful training, the respective templates will be saved in the camera. Then after the auto speech recognition function is turned on and the corresponding user ID is properly selected, you can control the camera by your voice.

**Note:**

- To successfully train a phrase, do pronounce the phrase within 2 seconds after choosing button Start or Again. Otherwise, the training will fail.
- Training and auto speech control are also available when using Bluetooth wireless headset

Option Adjust

- Click option Adjust with the touch pen or press the joystick to select it. Then the Pen Adjust interface appears on the screen
- 4 buttons Start, Exit, Save and Test are available in the interface. Pressing button S or moving the joystick left or right can toggle between them. Clicking with the touch pen or pressing the joystick can select them respectively.
- Select button Start to start adjustment. Then a cursor appears at the left top corner of the screen, click its center with the touch pen; then a cursor appears in the center of the screen, click its center with the touch pen as well; finally a cursor appears at the right bottom of the screen, click its center with the touch pen, too. Now the adjustment succeeds and a dialog box appears to prompt the success. Press the joystick or click button OK with the touch pen to save the adjustment.



- If adjustment fails, mainly under the case that the touch pen did not click on the cursor centers, a dialog box will appear to indicate failure. Then repeat the operation above till adjustment succeeds.



- To save the ultimate coordinates of the pen after adjustment, select button Save. To test the adjustment result, select button Test, draw anything with the touch pen on the screen and observe whether the cursor moves accordingly with the pen. If so, adjustment has done well. Now select button Save to save the ultimate coordinates of the pen after adjustment. Then the pen and cursor will respond each other accurately.
- Select button Exit or press button C to exit the interface and return to the live thermal image.

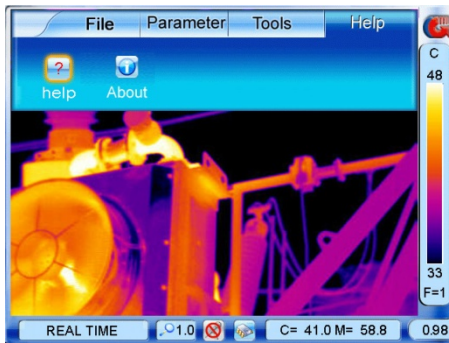


Note: In the adjustment process, improper adjustment may cause the touch pen not to work well. Thus it is strongly recommended to use joystick and buttons in this process.

Menu Help

- Click the icon Guide at the right top corner of the screen with the touch pen to bring up the

main menu and then click the submenu Help. Or press the joystick to bring up the main menu and move the joystick up or down to select the submenu Help.

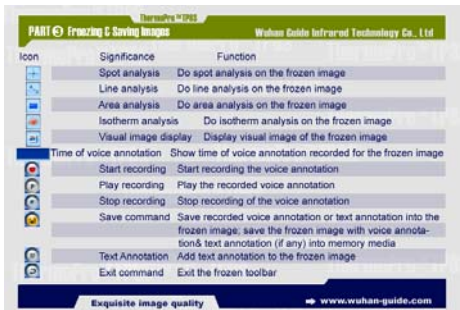
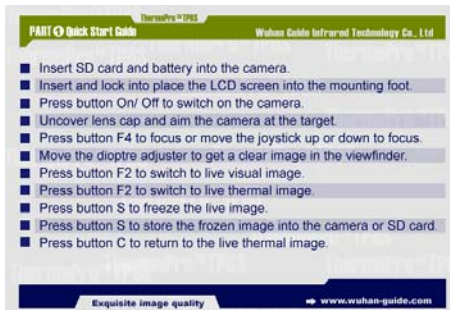


Option help is highlighted. Click it with the touch pen or press the joystick to select it. Then the help menu box appears on the screen.

For example this picture shows the contents.



Click each part then jump to the corresponding help instructions.



- When option About is highlighted. Click it with the touch pen or press the joystick to select it. After choosing it, the camera will display an image as shown below in the live thermal image.



- Press button C or press the joystick to close the dialog box and return to the live thermal image.

Powering off the camera

- To power off the camera after use, keep button Power depressed till the progress bar “Power off” moves and disappear in 3 seconds.
- Under the case that no progress bar is displayed in the screen, keep button Power depressed for 5 seconds. Then the camera will switch off.

Using the Bluetooth Wireless Headset

Bluetooth wireless video recording technology is only utilized in the camera TP8.

- Power on the headset and camera.

- Pair the headset with the camera firstly in order to enable communication
- Fit the headset on your ear.
- After setting sub-option BlueTooth in option Function under submenu Parameter to be On, the camera will search the headset. Once the camera finds it, you will hear a sound in it, indicating it formally start working right now.

- Increase or decrease the headset volume by adjusting corresponding volume buttons.



Note: After the headset and camera start communication with each other, the headset works as the voice input/ output device of the camera. You can use it to record voice annotation for images or control the camera via voice.

- To stop the headset service as the voice input/ output device of the camera, bring up the main menu, choose option Function under submenu Parameter and then set sub-option BlueTooth to be Off.
- Power off the headset after use.



Note: When using the headset to work with the camera, please ensure the plastic Bluetooth window at the bottom of the camera back faces you directly. Also please do not keep the headset far away from the camera.

Video Output

- The camera offers 3 modes of video output: VGA, PAL and NTSC. VGA always existing after powering on the camera (video on the LCD screen and OLED viewfinder is VGA). PAL and NTSC are available upon setup.

VGA output:

- When the camera and the VGA display device to be used are powered off, properly connect them with the VGA cable
- Power on the camera and the VGA display device
- Set sub-option VideoOut in option System under submenu Parameters to be Off, save the setup and return to live image
- Now you can view the live VGA video on LCD screen, OLED viewfinder and the VGA display device

VGA & PAL output or VGA & NTSC output:

- When the camera and the TV video display device to be used are powered off, properly connect them with the RS232/ TV video cable
- Power on the camera and the TV video display device
- Set sub-option VideoOut in option System under submenu Parameters to be PAL or NTSC, save the setup and return to live image
- Adjust the TV video display device to receive PAL or NTSC video as per the above setup
- Now you can view live VGA video on LCD screen & OLED viewfinder and live PAL or NTSC video on the TV video display device simultaneously

**Note:**

- It is also feasible to connect the camera to a VGA display device and a TV video display device simultaneously, through the corresponding VGA cable and RS232/ TV video cable
- Set sub-option VideoOut in option System under submenu Parameters to be PAL or NTSC, save the setup and return to live image
- Now you can view synchronous video output on the LCD screen & OLED viewfinder of the camera, the VGA display device and the TV video display device. The TV video display device displays PAL or NTSC video, and the left display VGA video.

- **Before transferring data from the ThermoPro™ TP8 camera to PC, ensure that the PC offers USB2.0 interface and the USB driver for the camera has been successfully installed in the PC.**
- To transfer data saved in the SD card to PC, get the SD card out of the camera, insert it into the card reader and then insert the reader to a USB2.0 interface of the PC. Then PC will identify the card as a removable hard disk. With the help of corresponding menu commands in Guide IrAnalyser® software, you can copy the saved data to PC or delete them from the card and etc.
- You can also format the SD card when connecting it to PC through the card reader but not running the corresponding menu commands in Guide IrAnalyser® software.



Note: To format the SD card, choose FAT32 as the file system.

- To transfer data saved in the built-in flash memory of the camera to PC, connect the camera to PC through the USB extension cable. Then run the software Guide IrAnalyser® to download data into PC.
- Live video recording and real-time control over the camera are also available with the help of Guide IrAnalyser® software.



Note: It is recommended to create a new folder in your PC to save the transferred data.

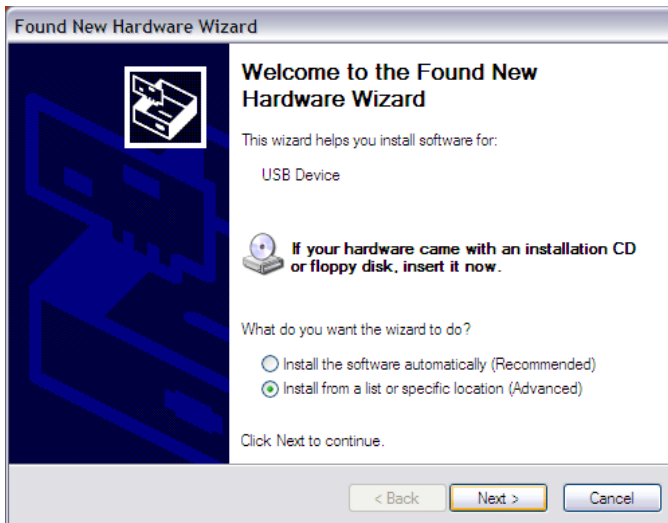
- For more information, pls refer to the user manual of Guide IrAnalyser® software.

Installing the Camera USB Driver to PC

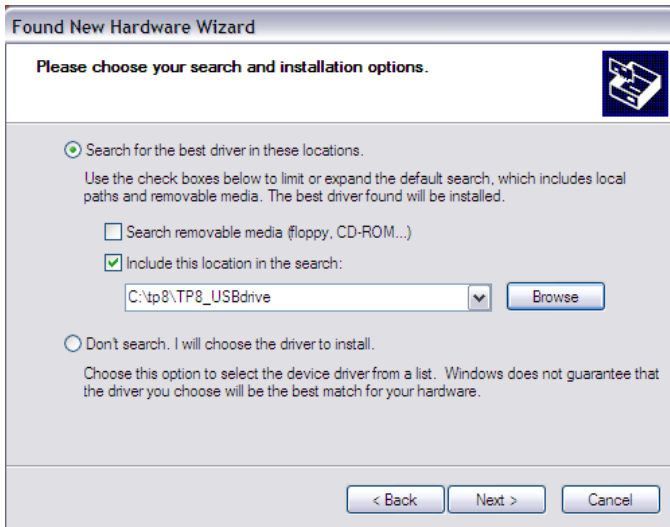
Before installing the USB driver, ensure the camera and your PC are working and your PC

offers at least one USB2.0 port

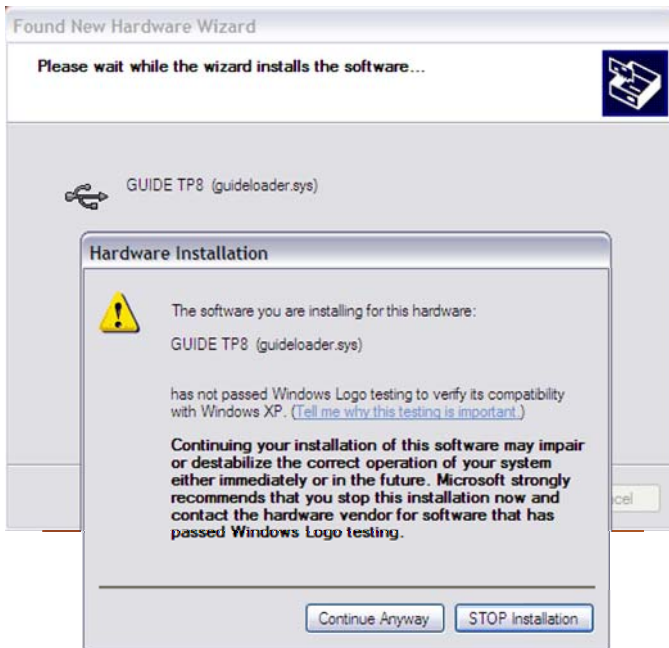
- When there is no menu in the live thermal image, properly connect the USB interfaces of the camera to a USB2.0 port of your PC with the USB extension cable
- Microsoft® Windows launches a Found New Device Wizard to guide you to install the driver as follows:



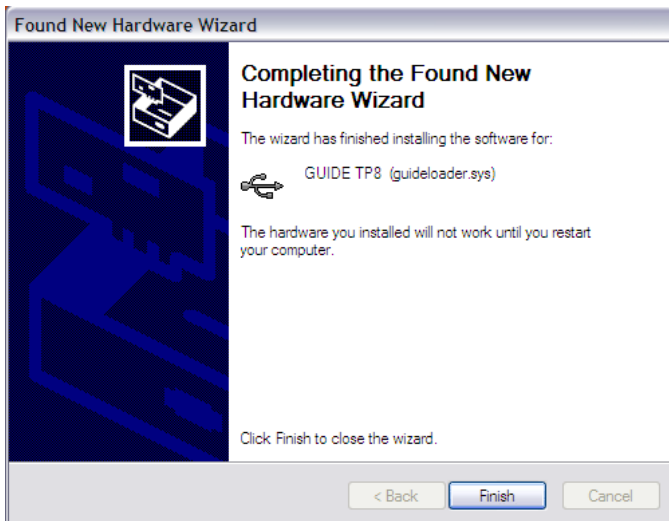
- Choose “Install from a list or specific location (advanced)” and include the folder where you save the driver program. Then Click button Next to go further.



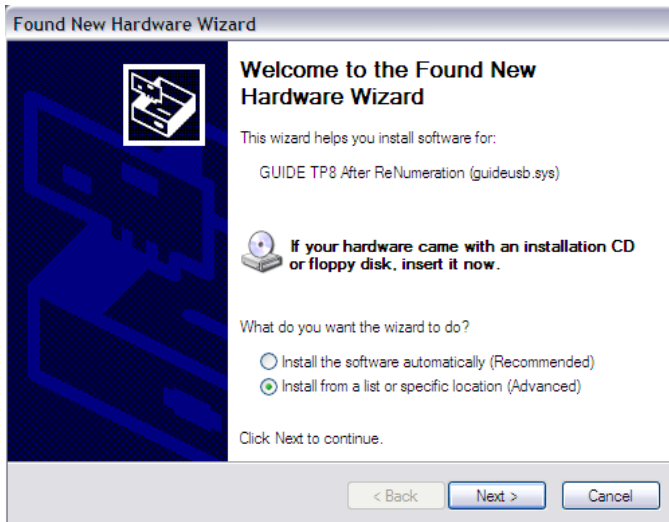
- Installation starts. When getting to the step as shown below, choose "Continue anyway" to proceed further



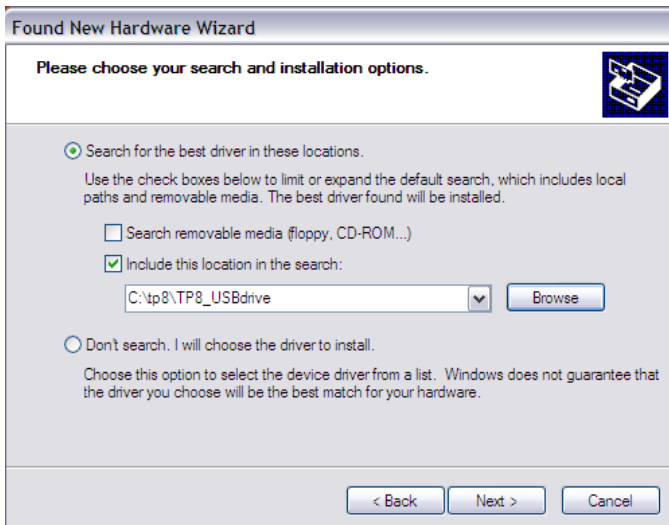
- Installation continues and finishes quickly. Click button Finish.



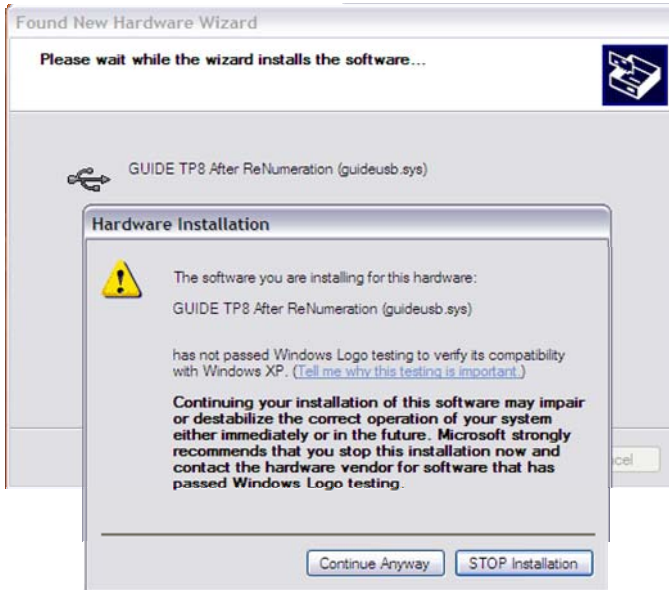
- Microsoft® Windows automatically launches a further installation.



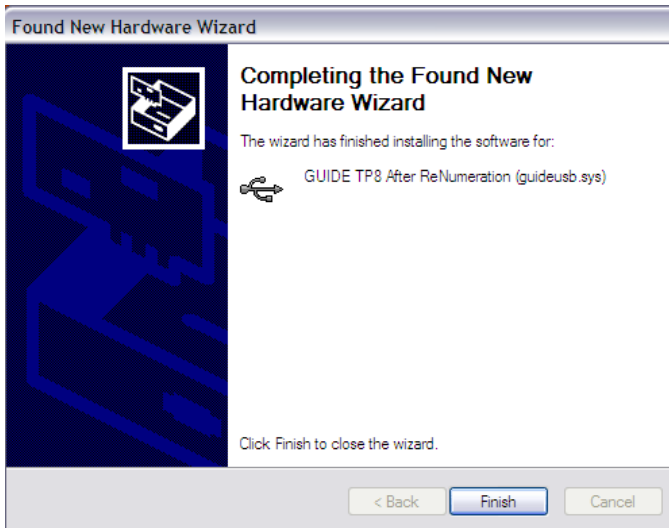
- Choose “Install from a list or specific location (advanced)” and include the same folder you chose in the first installation. Then Click button Next to go further.



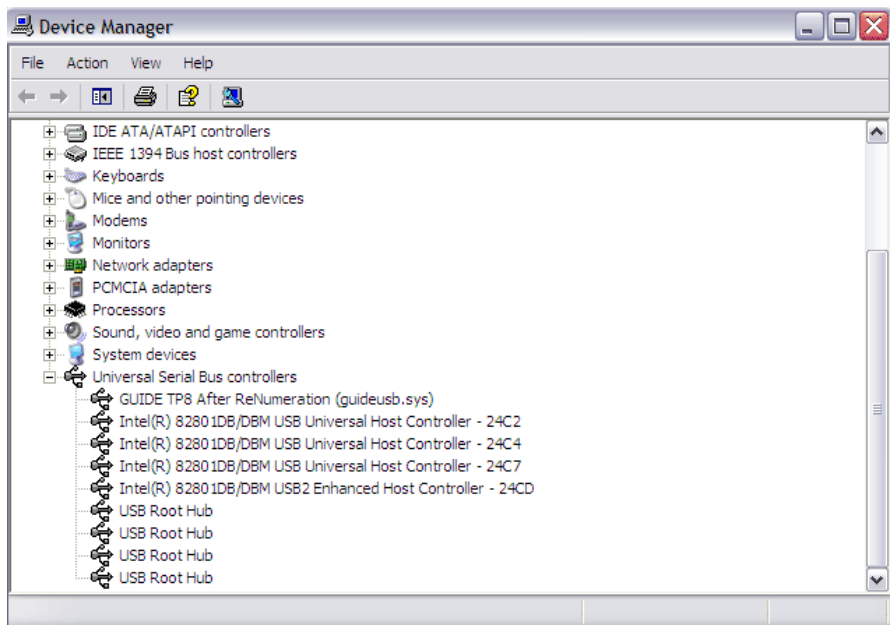
- Installation starts. When getting to the step as shown below, choose “Continue anyway” to proceed further



- Installation continues and finishes quickly. Click button Finish.



- Installation continues and finishes quickly. Click button Finish.
- Go to Device Manager to check and confirm whether the driver has been successfully installed. If there is "GUIDE TP8 After Renumeration (guideusb.sys)" listed under Universal Serial Bus Controller, it indicates the driver has been properly installed and you can transfer data from the camera to PC now.
- The procedures to go to Device Manager is as follows: Clicking My Computer-> Clicking the right mouse and choosing Property-> Choosing menu Hardware in the System Property dialog box-> Choosing option Device Manager under the menu Hardware

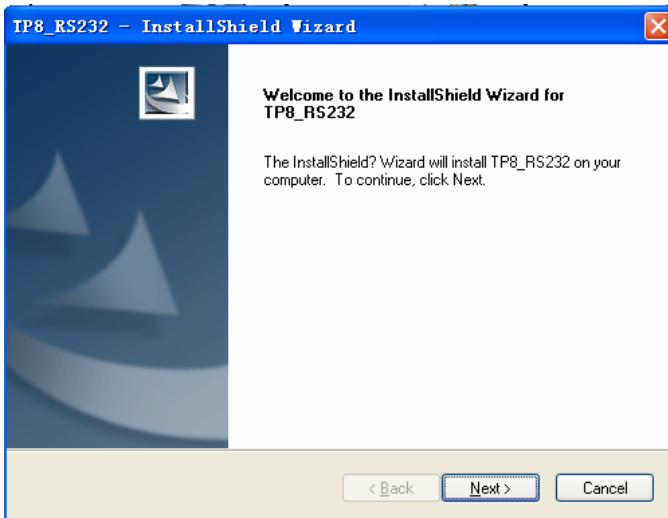


Controlling the Camera through RS232 Communication Protocol

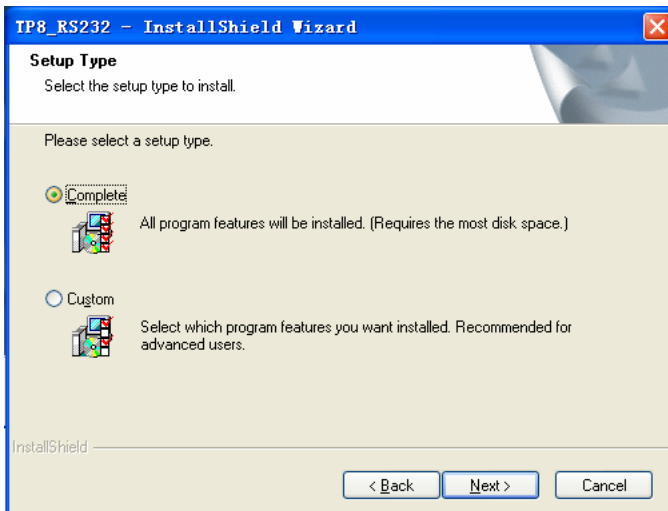
RS232 communication protocol is offered with the **ThermoPro™ TP8** camera. Through the protocol the camera can be conveniently controlled on PC at a remote monitoring place.

Installing the protocol

- Click the file "Setup.exe" in the folder "TP8_RS232_Setup" to start installation.

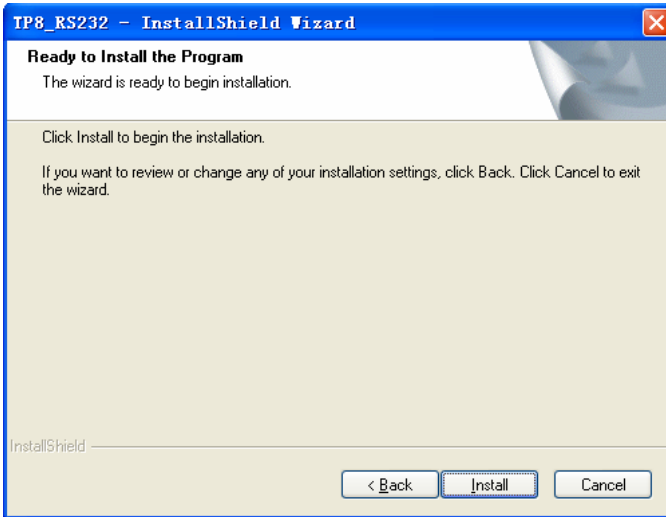


- The operating system launches an installation wizard. Click button Next to go further.

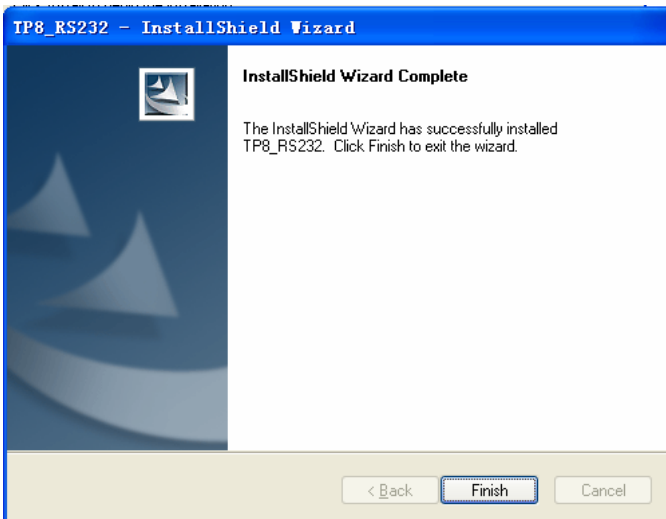


- Choose Complete or Custom to install it in a certain manner. If you choose Complete, the installation directory will be C:\Program Files\Guide IR\TP8_RS232. Click button

Next to go further.



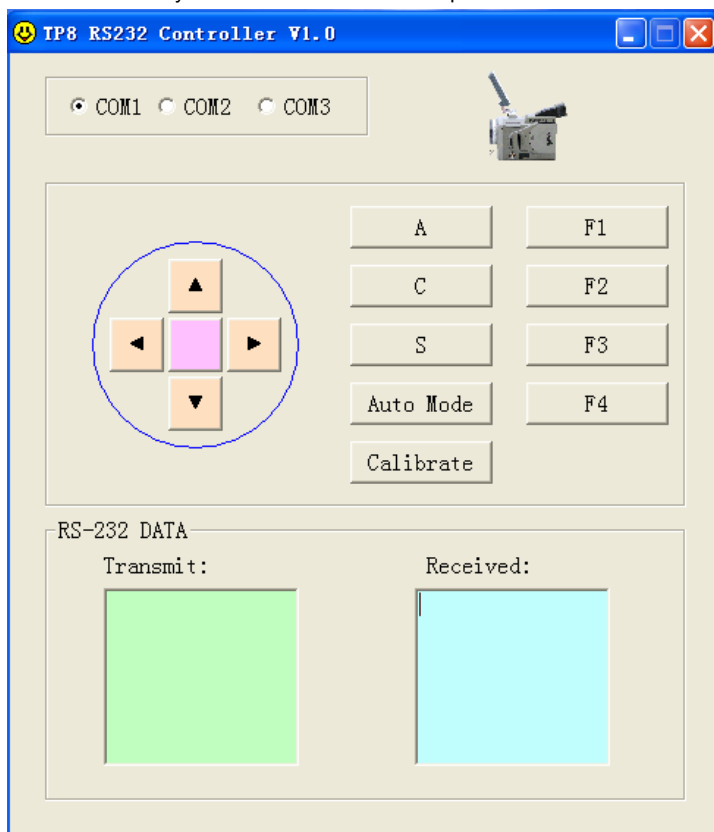
- The operating system is ready to install the protocol. Click button Install to continue. Then the installation will automatically progress.

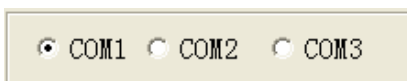


- The installation has succeeded. Click button Finish to end it. Now the protocol is ready to be used.

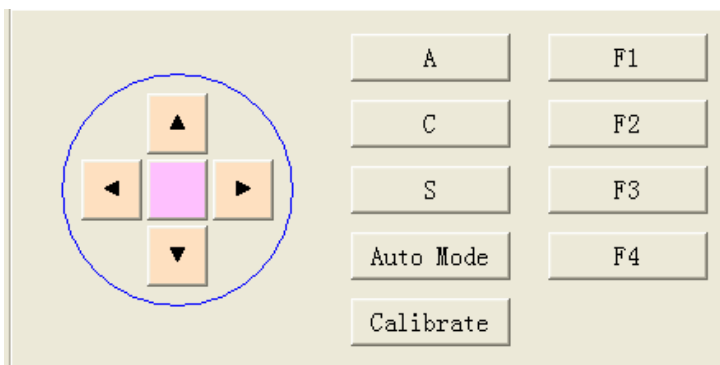
Using the protocol

- Before using the protocol, please ensure the camera and your PC have been properly connected by the RS232/ video cable offered together with the camera. Then click on the shortcut icon TP8_RS232 to run the protocol.
- There is only one control interface of the protocol as shown below:

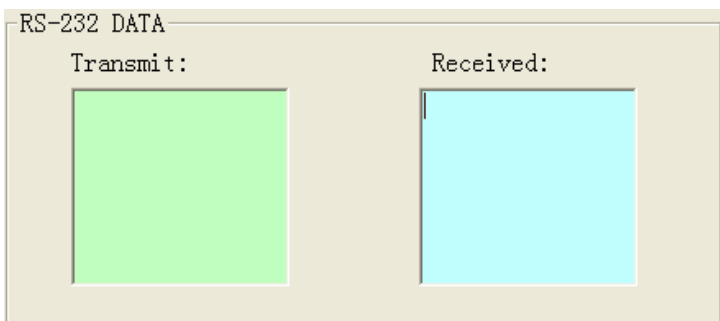


Parts Described:

- Three ports in PC for RS232 communication

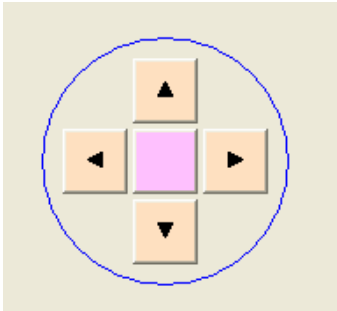


- Buttons for operating the camera



- Display data that is corresponding to each operation and is exactly transmitted in PC

Using the Buttons:

**Pink Button in the center:**

- Functions are the same as pressing joystick on the camera
- While focusing, press it to stop focusing when the image is clear.
- Press it to bring up the main menu of camera, press the four buttons around to navigate through the options, press it again to select a highlighted option
- When there is a dialog box displayed in thermal image, press the joystick to confirm selection and close the box.
- When an option in the toolbar is highlighted, press the joystick to select this option and execute the command corresponding to it.
- While doing spot analysis, pressing it will navigate through the spots
- While doing area analysis, pressing it will navigate through the areas
- While doing line analysis, pressing it will confirm the location of the starting point and ending point of the line, pressing it again will confirm the drawn line and display the line profile on the image

Up and Down Buttons:

- Functions are the same as moving the joystick left and right
- When there is no menu displayed in live thermal image, press them to adjust focus of the IR lens.
- When there is no menu displayed in frozen or saved thermal image, press them to move

the centre cursor up or down to measure temperature.

- While the main menu is displayed, press them to toggle between different sub-menus.
- In the temperature setup menu, press them to toggle between Tmax, palette, Tmin and filter range.
- When there is a dialog box displayed in thermal image, press them to alter values of different parameters.
- While doing spot, area and line analysis, press them to move the spots or areas or starting/ending point of the line up or down and also change the size of areas.
- While doing isotherm analysis, press them to set the maximum temperature of the isotherm band

Left and Right Buttons:

- Functions are the same as moving the joystick up and down
- When there is no menu displayed in live thermal image, pressing them to zoom in or out the image continuously.
- While the main menu is displayed, press them to toggle between different options under sub-menus.
- When there is no menu displayed in frozen or saved thermal image, press them to move the centre cursor left or right to measure temperature.
- In the temperature setup menu, press them to change the values of Tmax, palette, Tmin or filter range.
- When there is a dialog box displayed in thermal image, press them to toggle between digits of parameter values.
- While doing spot, area and line analysis, press them to move the spots or areas or starting/ending point of the line to left or right and also change the size of areas.
- While doing isotherm analysis, press them to set the minimum temperature of the isotherm band

A**Button A:**

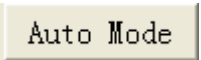
- When there is no menu displayed in live thermal image, press it to select the temperature setup menu at the right side of the image.

C**Button C:**

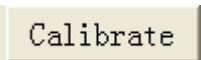
- Press it to cancel a dialog box or menu and return to the live thermal image

S**Button S:**

- Functions are the same as button S on the camera:
- Press it to freeze a live thermal image and press it again to save it into the built-in flash memory or SD memory card.
- Press it to toggle between spots and areas while doing spot and area analysis on live or frozen or saved thermal images
- Press it to switch between horizontal and vertical coordinate systems when doing line analysis on live or frozen or saved thermal images
- Press its to switch between options or buttons in menus or dialog boxes

Auto Mode**Button Auto Mode:**

- When there is no menu displayed in live thermal image, press it to switch between three modes Auto1, Auto2 and Manual, with the corresponding prompt “Auto1” or “Auto2” or “Manual” shown in the status bar at the left bottom of the image.

Calibrate**Button Calibrate:**

- Press it to perform Non Uniformity Calibration when necessary.

A rectangular button with a light beige background and a thin black border, containing the text "F1" in a black serif font.**Button F1:**

- Functions are the same as button F1 on the camera:
- Press it in the normal working mode to switch to sleep mode, in which LCD screen is turned off and the red indicator light at the back of the camera flickers.
- Press it in sleep mode to switch into the normal working mode, in which LCD screen is turned on and the red indicator light at the back of the camera shine steady.

A rectangular button with a light beige background and a thin black border, containing the text "F2" in a black serif font.**Button F2:**

- Function is the same as button F2 on the camera:
- Press it in live, frozen or saved thermal images to switch to visual image.

A rectangular button with a light beige background and a thin black border, containing the text "F3" in a black serif font.**Button F3:**

- Functions are the same as button F3 on the camera:
- When option Laser in sub-menu Function of menu Parameter is set as On, press it in live/ zoomed thermal images to turn on the laser locator and press it again to turn off the laser locator.
- When option Histogram in sub-menu Function of menu Parameter is set as On, press it in frozen or saved thermal images to display the histogram of the image and press it again to close the histogram.

A rectangular button with a light beige background and a thin black border, containing the text "F4" in a black serif font.**Button F4:**

- Function is the same as button F4 on the camera:

- When there is no menu or dialog box in live thermal image, press it to enable the auto focusing of visual camera.

Optional Lens & Handler

TP8 has 3 kinds of optional lens. Telescope lens, wide angle lens and high-temperature filter. Their photos after right installation are as below.

- Telescope lens:



- Wide angle lens



- High-temperature filter



The remote control handler allows convenient operation to the camera.



Temperature-range Combination

TP8 Temperature-ranges combination table

ITEM	F	Range	Temperature range (°C)
1	F=1	Range 1	-20~250
	F=2	Range 2	200~800
2	F=1	Range 1	-20~250
	F=2	Range 2	200~800
	F=3	High-temp range	500~2000
3	F=1	Range 1	-20~250
	F=2	Range 2	200~800
	F=3	Tele-lens range 1	-20~250
	F=4	Tele-lens range 2	200~800
4	F=1	Range 1	-20~250
	F=2	Range 2	200~800
	F=3	Wide-angle lens range 1	-20~250
	F=4	Wide-angle lens range 2	200~800
5	F=1	Range 1	-20~250
	F=2	Range 2	200~800
	F=3	Tele-lens range 1	-20~250
	F=4	Wide-angle lens range 1	-20~250
6	F=1	Range 1	-20~250
	F=2	Range 2	200~800
	F=3	Tele-lens range 1	-20~250
	F=4	High-temp range	500~2000
7	F=1	Range 1	-20~250
	F=2	Range 2	200~800
	F=3	Wide-angle lens range 1	-20~250

	F=4	High-temp range	500~2000
8	F=1	Range 1	-20~250
	F=2	Range 2	200~800
	F=3	Tele-lens range 1	-20~250
	F=4	Wide-angle lens range 1	-20~250
	F=5	High-temp range	500~2000
9	F=1	Range 1	-40~250
	F=2	Range 2	200~800
	F=3	Tele-lens range 1	-40~250
	F=4	Wide-angle lens range 1	-40~250
	F=5	High-temp range	500~2000

Troubleshooting

The camera does not turn on	<p>Battery improperly installed (i.e. battery is not locked in place). Remove battery and install correctly.</p> <p>Battery contacts are dirty. Clean battery contacts.</p> <p>Battery charge is low. Recharge battery or replace with fully charged item.</p>
Battery performance is poor	Battery may be defective. Replace battery.
Image is blurry	<p>The target is not in focus. Adjust focus.</p> <p>Brightness and contrast are inappropriate. Adjust Tmin and Tmax</p>
Visual image is blurry	The target is not in focus. Adjust focus of the visual camera.

<p>Image contrast is low or there is no image</p>	<p>Temperature set points T_{min} and T_{max} are inappropriate. Change the lower set point and upper set point to values that are more consistent with target temperatures.</p> <p>Emissivity setting is incorrect. This affects the temperature range set points. Check and amend the emissivity setting.</p> <p>The lens cap is on. Remove lens cap.</p> <p>Condensation on camera lens. Place camera in a dry area at room temperature until condensation evaporates.</p> <p>Non-uniformity appears in the image. Perform a non-uniformity calibration</p>
<p>Temperature measurement is inaccurate</p>	<p>Emissivity setting is incorrect. Check and amend the emissivity setting.</p> <p>Filter range is inappropriate. Select a filter range that is suitable for the target temperature being measured.</p> <p>The target is not in focus. Adjust focus.</p> <p>Condensation on camera lens. Place camera in a dry area at room temperature until condensation evaporates.</p> <p>Non-uniformity is severe. Press non-uniformity calibration.</p>

Emissivity

What Is Emissivity?

The standard of radiation is "blackbody" radiation which exists in any enclosure whose walls are at a uniform temperature. The shape of the enclosure and the wall material have no effect on this radiation, it being a function of temperature alone.

A small hole in such an enclosure only affects this radiation level very slightly. The area of the hole should not exceed 5% of the area of the walls of the enclosure, when the radiation passing through the hole is within about one part in a thousand of the blackbody radiation level defined by the wall temperature. Such a device is fairly easy to build and forms the source on which all thermometers are calibrated.

A surface always emits less radiation than would a black body at the same temperature by a factor called the "emissivity" of the surface.

$$\text{Emissivity} = \frac{\text{Radiation emitted by surface}}{\text{Radiation emitted by black body}}$$

How Do We Deal With Emissivity?

If we ignore the emissivity altogether and infer a temperature from the thermometer output, we shall get a temperature lower than the true temperature by an amount depending on the value of emissivity and the characteristics of the thermometer. This temperature is known as the "apparent" or "brightness" temperature of the surface. If the emissivity is constant, this temperature rises and falls in exactly the same way as the true temperature and this may be sufficient for some purposes.

More often the true surface temperature is required. We have:

$$\text{Actual output} = E \times \text{output when viewing blackbody}$$

To obtain the true surface temperature we must divide the actual output by the emissivity value E before we convert to temperature.

This is done by setting the emissivity control to the appropriate value.

It is therefore necessary to know the value of the emissivity. There is a vast amount of data available, unfortunately much of it is confusing because substantially different values are quoted. This is because emissivity depends upon:

- a) The basic material
- b) Surface condition - roughness and oxidation
- c) Temperature
- d) Angle of view
- e) Wavelength

For materials with smooth, clean (unoxidised) surfaces, emissivities are usually in the range 0.05 to 0.50 and are usually very wavelength dependent, being higher at shorter wavelengths. The appropriate settings for the *ThermoPro™ TP8* IR Thermal Cameras are given in the following tables. It must be remembered that these are only guideline figures. They can be substantially increased if the surface is rough or even slightly oxidised.

The values quoted for oxidised metals assume that the metal is heavily oxidised. Thin oxide layers will give an emissivity value between this and the value for an unoxidised surface.

If a more precise emissivity value is needed or more information is required on how to obtain the emissivity value of a specific material, please contact: us.

Typical Emissivity Values

Refractories		Miscellaneous	
Alumina	0.40	Asphalt	0.90
Red Brick	0.93	Carbon	>0.90
		<i>Graphite</i>	0.85
Alloys		<i>Soot</i>	0.95
Brass	0.10	Cement & Concrete	0.90
<i>Oxidized</i>	0.61	Cloth	0.85

Metals

Aluminium	0.05
<i>Oxidized</i>	0.30
Chromium	0.15
Cobalt	0.18
Gold	0.02
Iron & Steel	0.18
<i>Oxidized</i>	0.85
Lead	0.16
<i>Oxidized</i>	0.63
Magnesium	0.12
Nickel	0.15
Platinum	0.10
Silver	0.03
Tin	0.09
Titanium	0.30
Tungsten	0.13
Zinc	0.05
<i>Oxidized</i>	0.11