

## **INSTRUCTION MANUAL**

## MTi10

## 96 X 96 PIXEL THERMAL IMAGER





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#### 1. OVERVIEW

The MTi10 96 x 96 Pixel Thermal Imager is a handheld camera designed for predictive maintenance, troubleshooting, and equipment verification. Simply focus the lens on the target, and thermal and visual images appear on the LCD screen, ready to be saved to a Micro SD card. To transfer images to a PC, just remove the SD card and use the included card reader, or use the "Thermal X" app to send images and video to a smart device. Additionally, the Thermal Imager supports video recording and playback.

#### 2. SAFETY INFORMATION

- Laser Warning: To avoid eye injury, do not look directly into the laser or aim it at people, animals, or reflective surfaces.
- Device Modifications: Do not disassemble or modify the Thermal Imager.
- Exposure to High Energy Sources: Do not point the Thermal Imager, with or without the lens cover, at high-energy sources (e.g., devices emitting laser radiation or the sun). This may affect accuracy and damage the detector.
- **Temperature Limits:** Use the Thermal Imager only within the temperature range of -20°C to +50°C (-4°F to +122°F). Exposure outside this range can damage the device.
- **Battery Handling:** Use the correct equipment to charge and discharge the battery to avoid performance issues, reduced battery life, overheating, or explosions. Do not remove the battery while the Thermal Imager is on, as this can cause malfunction.
- Battery Modifications and Care: Do not disassemble or modify the battery. Damaged protection devices in the battery can cause overheating, explosions, or ignition. If battery fluid contacts eyes, rinse immediately with water and seek medical attention.
- Battery Impact Avoidance: Do not pierce, strike, or apply pressure to the battery, and keep it away from fire or direct sunlight. Do not solder directly onto the battery.
- Charging Temperature: Only charge the battery between 0°C to +50°C (+32°F to +122°F) to avoid overheating or performance issues.
- Water Exposure: Keep the battery away from water and salt water.
- Cleaning Instructions: Clean the Thermal Imager case with a damp cloth and mild soap. Avoid abrasives, isopropyl alcohol, and solvents on the case, lens, or screen. Clean the infrared lens gently to protect its anti-reflective coating.
- Avoiding Condensation: If moving the Thermal Imager from a cold to warm environment, power it off and wait for condensation to evaporate before use.
- **Storage:** Store the Thermal Imager in a cool, dry place when not in use. Remove the battery when stored for long periods of time to avoid damage to the battery.

#### 3. DESCRIPTION

- 1 Interface and Cover Battery
- 2 LCD display
- 3 Button

- 4 Trigger
- 5 Flash light
- 6 Infrared Camera Lens

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#### 4. BEFORE YOU START

#### 4.1. How to Charge the Battery

Before using the Thermal Imager for the first time, fully charge the battery for about three and a half hours. The battery's status will display on a six-segment charge indicator. Here's how to charge it:

- 2. Charge until the charge indicator shows a steady 🗎 icon, indicating that charging is complete.
- 3. Disconnect the AC power adapter once the battery is fully charged.

**Note:** Ensure the Thermal Imager is close to room temperature before charging. Avoid charging in very hot or cold areas, as extreme temperatures can decrease battery capacity.

#### 4.2. Power On

To turn on the Thermal Imager, press the Power Button "也".





**Note:** After powering on, allow the Thermal Imager a brief warm-up period for accurate temperature readings and optimal image quality. First, the visible image will appear, followed by a brief calibration of the thermal sensor. Once calibrated, the thermal image will display on the screen.



#### 4.3. Power OFF

To turn off the Thermal Imager, press and hold the Power Button " $\bigcirc$ " for five seconds to perform a forced shutdown.





#### 4.4. Desktop

The desktop interface appears as follows:



- 1 Temperature unit
- 2 Distance unit
- 3 Emissivity
- 4 Centre point temperature readings
- 5 Max temperature point readings
- 6 Min temperature point readings
- 7 Time
- 8 Battery capacity status

- 9 SD card
- 10 Max temperature of current scene
- 11 Colour bar
- 12 Min temperature of current scene
- 13 Min temperature point Cross
- 14 Centre point Cross
- 15 Max temperature point cross
- 16 Video recording indicator

#### 4.5. Shutter

The thermal image on the Thermal Imager may become blurry after a few minutes or when switching targets. To maintain a clear image, the device needs periodic correction.

The Thermal Imager offers two correction modes: Manual and Auto.

- In **Manual** Mode, press and hold the down arrow button to perform a correction.
- In **Auto Mode**, the device corrects itself automatically whenever the thermal image becomes blurry.

#### 4.6. Temperature Measurement

All objects emit infrared energy, with the amount based on their actual surface temperature and emissivity. The Thermal Imager detects this infrared energy to estimate the object's temperature. Many common

materials, like painted metal, wood, water, skin, and cloth, emit energy effectively, making it easier to capture accurate temperature readings. High-emissivity surfaces (≥0.90) are good radiators of energy and yield reliable measurements. However, shiny surfaces or unpainted metals, which have an emissivity below 0.6, do not radiate energy as well. For these low-emissivity materials, adjusting the emissivity setting helps improve temperature accuracy. See the **Emissivity Adjustment** section for details on optimizing settings for accurate readings.

#### 4.7. Emissivity Adjustment

Selecting the correct emissivity value is essential for accurate temperature measurement, as surface emissivity significantly impacts the temperature readings the Thermal Imager detects. By understanding and adjusting emissivity values, you can improve measurement accuracy.

**Note:** For surfaces with emissivity below 0.60, accurate temperature readings become more challenging. Lower emissivity surfaces introduce more potential error in the Imager's calculations, even with proper emissivity and background adjustments.

You can set emissivity directly as a numerical value or choose from a list of common materials. The LCD screen displays global emissivity as **E=x.xx**.

Material	Emissivity	Material	Emissivity
Water	0.96	Таре	0.96
Stainless Steel	0.14	Brass Plate	0.06
Aluminum Plate	0.09	Human Skin	0.98
Asphalt	0.96	PVC Plastic	0.93
Concrete	0.97	Polycarbonate	0.80
Cast Iron	0.81	Oxidized Copper	0.78
Rubber	0.95	Rust	0.80
Wood	0.85	Paint	0.90
Brick	0.75	Soil	0.93

The following table gives typical emissivity of important materials:

#### 4.8. Reflected Temperature

To improve the accuracy of temperature measurements with infrared instruments, reflection is accounted for using an offset factor, especially important for low-emissivity objects. Typically, reflected temperature matches ambient air temperature. However, if there are nearby objects with high emissions and much higher temperatures, this should be considered. Reflected temperature has minimal impact on high-emissivity objects and can be set individually.



#### Steps to Set Reflected Temperature:

- 1. Set the emissivity to 1.0
- 2. Adjust the lens for a close focus.
- 3. Look away from the object and take a measurement, then freeze the image.
- Find the average value of the image and use it as the reflected temperature input.

#### 4.9. Thermal Imager Reporter Software

The Thermal Imager comes with Thermal Imager Reporter software, which enables image analysis, data organisation, and professional report creation. The software also allows you to add audio annotations and commentary that can be reviewed on a PC.

#### 5. Menus

Menus, along with buttons, provide access to image, measurement, emissivity, color palette, temperature range, photo and video capture, review, and settings.

#### 5.1. Settings Menu

Press the "**Menu/OK**" button to open the Settings Menu, the main interface for the Thermal Imager's options. The menu contains five items: Gallery, Device Settings, Measure Settings, Image Settings, and Reset.



Gallery: Access saved images and videos.

Device setting: Adjust device and system settings, including time, date, language, flashlight, and automatic shutdown, among others.

Measure setting: Configure measurement options, such as maximum and minimum temperature, reflected temperature, emissivity, alarm mode, range, and temperature units.

**Image settings:** Customise image settings, including colour palettes, super-resolution, and image orientation.

**Reset:** Restore factory settings or format storage.

#### 5.2. Image Palette

The Image Palette feature allows you to adjust the false-colour display of infrared images, helping to highlight specific details for various applications. Standard palettes use an equal, linear colour presentation that enhances detail visibility.





#### 5.3. Standard Palette

- 1. In the main menu, press the "∧" or "∨" button to highlight **Palette**.
- 2. Press the "Menu/ OK" button to open the Image submenu, where you'll find eight colour palette options.
- 3. Use the " $\wedge$ " or " $\vee$ " button to select your desired palette.
- 4. The palette will update immediately after selection.

Iron	Rainbow	Grey	Grey	Brown	Blue	Hot	Feather
			invert	hot	red	cold	

#### 5.4. Image Super Resolution

Image super-resolution technology enhances the quality of low-resolution images by using advanced algorithms to increase their resolution. This process makes images appear clearer and more detailed, effectively compensating for limitations caused by lower initial resolution.



#### 5.5. Histogram Mode and Auto Mode

- **Auto Mode:** In this mode, the level and span are automatically determined by the minimum and maximum temperatures of the thermal image. The temperature-to-colour relationship is linear.
- Histogram Mode: This mode uses a histogram algorithm to enhance the thermal image, resulting in a non-linear relationship between temperature and colour. This mode enhances certain parts of the image for greater detail.





Press the " button to toggle between the modes.

#### 5.6. Image Adjustment

There are three modes available for image adjustment: **Histogram Mode**, **Auto Mode**, and another adjustment mode.

#### 5.7. Lock Operation

Press the " $\bigcirc$  " button to lock the current temperature range of the scene. Once locked, press the " $\land$ " or " $\lor$ " buttons to adjust the high/low temperature levels, allowing you to focus on and view the specific temperature range of interest in the image.



#### 5.8. Device Settings

The Device Settings menu has multiple pages. Use the " $\vee$ " button to navigate to the next item, or the " $\wedge$ " button to go back to the previous item.





#### 5.9. Time and Date

To set the time and date, press the " $\land$ " or " $\lor$ " button to select the year, month, day, and other settings. Then, press the **Menu/OK** or **Right** button to confirm and adjust the selected time or date.



#### 5.10. USB Mode

When you connect the USB cable to the device, a menu will pop up with the following options:



#### USB Mode

There are two modes for USB connection: **Storage** and **PC Camera**. Use the " $\land$ " or " $\lor$ " button to switch between the modes.

#### 1. USB Driver

In **Storage Mode**, you can browse files stored on the SD card from your computer. When in Storage mode, the following image will be displayed:





#### PC Software

In **PC Camera Mode**, the device acts as a USB camera for your computer. When this mode is selected, the image on the right will be displayed:



#### **5.11. Language** Press the " $\land$ " or " $\lor$ " button to select your desired language. Then,

Device Setting A Language USB Mode 1 简体中文 Ť Flashlight English Time/Date Deutsch C Language Español Auto Power Off (1) OF Français  $\widehat{\mathbf{i}}$ About Italiano

press the **MENU/OK** button to confirm and set the selected language.

#### 5.12. Auto Power Off

There are four options in the Auto Power Off menu: "OFF", "5 Min", "10 Min", "15 Min", and "30 Min". When you press the MENU/OK button, the timer for Auto Power Off will reset and start counting again from the selected time.





(i)	About <
Producer	CEM
Product Date	2019.07.01
Serial Numb	er 0123-4567- 89AB
Software	V2.94
Storage	3.5G

#### 5.13. About

The **Info** menu provides details about the product, including the software version, serial number, and other relevant information.

#### 6. Measure Settings

Select the **Measure Settings** menu to display the Measure Settings options. The menu includes several settings, as shown in the following picture:



**Max Temp:** Press the **MENU/OK** button to turn the maximum temperature measurement on or off.

**Min Temp**: Press the **MENU/OK** button to turn the minimum temperature measurement on or off.

#### 6.1. Emissivity

In the **Emissivity** submenu, press the "  $\wedge$ " and " $\vee$  " arrows to adjust the emissivity value.

The **Emiss** setting determines the object's emissivity, with a value range from **0.01** to **1.00**.





#### 6.2. Reflective Temperature

In the **Reflective Temperature** submenu, press the " $\land$ " and " $\lor$ " arrows to adjust the reflective temperature values.

Reflective temperature is crucial for accurate radiometric temperature measurement. The Thermal Imager compensates for reflective temperature to improve measurement accuracy. Typically, the reflected temperature matches the ambient temperature. However, if there are nearby objects with significantly higher emissions, the reflective temperature must be set to ensure precise readings.



#### 6.3. Alarm Mode

• OFF: Disables both the alarm display and sound.



**Below Alarm:** If the temperature of the object falls below the set low alarm value, an alarm sound will be triggered, and the display will show an alert.

**Above Alarm:** If the temperature of the object exceeds the set high alarm value, an alarm sound will be triggered, and the display will show an alert.





#### 6.4. Temperature Range

You can choose between two temperature measurement ranges: -20~150°C and 0~550°C. The overlap range between these two options provides more accurate measurements, so it is recommended to select -20~150°C for better precision.



#### 6.5. Temperature Unit

There are three temperature units to choose from: °C (Celsius), °F (Fahrenheit), and K (Kelvin).

#### Conversion formulas:

- °F = 1.8 × °C + 32
- K = °C + 273.15





#### 6.6. Reset



#### 6.7. Format Memory

The **Format Memory** operation will erase all files in the Picture Gallery, but it will not affect the device settings.



#### 6.8. Factory Settings

The **Factory Settings** of the Thermal Imager will restore the device to its original configuration. This will reset all settings to their default values, but it does not affect the device's hardware or firmware. Specific settings that are reset is as follows:



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

#### 7. Camera Menu

The Thermal Imager has both photo and video functions.

- Photo Function: The Imager can save thousands of images with a resolution of 1280×960. Images are saved in .jpg format and include both infrared and visible data.
- Video Function: The Imager supports .mp4 video capture for hours, saving infrared data in .mp4 format.

**Note:** Images and video files are stored on the **SD Memory Card**. These files can be easily read and further analyzed using the Thermal Imager PC software.

#### 7.1. Save Image

- In the **Desktop** mode, press the **Trigger** button to freeze an image. The **Save Menu** will then appear, allowing you to save the image.
- Press the "Menu/OK" button to save the image. The image will flash briefly to indicate it has been saved. After saving, the image will unfreeze, allowing you to continue capturing.

#### 7.2. Video Menu

The Thermal Imager supports **.mp4** video capture.

- 1. In the **Desktop** mode, press and hold the **Trigger** button for about 2 seconds to start video capture, including voice recording.
- 2. To stop video capture, press the Trigger button again. The video will be saved in the video file.

#### 7.3. Files Browser

- 1. Press the "Menu/OK" button, then select "Gallery".
- Press the "Menu/OK" button again to open the Files Browser, which will display the pictures and videos saved on the SD Memory Card.







#### 7.4. Play a Video

When the current file is a video, press the Trigger button to start or stop video playback.



#### 7.5. Delete a File

Press the "**Menu/OK**" button, then press the "**Menu/OK**" button again to delete the current file.



#### 7.6. Fault Diagnosis and Exclusion

If you encounter any issues with the thermal imager, refer to the table below for troubleshooting. If the problem persists, disconnect the power and contact the Major Tech's technical support department.

Phenomenon of the fault	Cause of the fault	Solution
Thermal imager cannot start	No battery	Insert the battery
	No power	Replace the battery or charge it
Thermal imager shut down	No power	Replace the battery or charge it
No Thermal image	The lens cap cover	Open the lens cap



### 8. ANDROID/IOS APP: THERMAL-X

Software Installation and Uninstallation System Requirements

- Android: Android 4.0 or higher, with USB OTG support.
- iOS: iPhone 4 or above.

#### **Thermal-X App Installation**

- Android: Search for "Thermal-X" on Google Play and install it.
- iOS: Search for "Thermal-X" on the Apple App Store and install it.

#### **Thermal-X Function**

#### **Import Pictures**

- Use the USB OTG cable to download the infrared pictures directly from the thermal imager.
- 2. Copy the infrared pictures from a PC or SD card.



#### Analyse

Click the """ icon to apply one of three analysis tools: **Image Mode** To change the image display mode, click the "**Image mode**" icon,

"Image mode" icon, and you will have four modes to choose from:

1. **IR Mode:** Only the infrared (IR) picture is displayed.

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- 2. **Visible Mode:** Only the visible image is displayed.
- 3. **IR Fusion Mode:** Combines the infrared image with the visible image to create a fusion.
- 4. **■Visible Fusion Mode:** Displays a full-screen fusion, with the visible image blended with the infrared image.

#### **Colourbar Select**

Click the """ ' icon to choose from eight different colourbars. The colourbar allows you to modify how temperature gradients are visually represented in the thermal image, offering various colour schemes to best highlight specific temperature differences.

Click the """ icon to access the analysis tools for infrared (IR) pictures. The three analysis tools available are:

#### 1. Point Analyse:

o Add a point to the image.

o It will display the temperature of that specific point.

#### 2. Line Analyse:

o Add a line to the image.

o This will display the highest, lowest, and average temperature along that line.

#### 3. D Area Analyse:

o Add a rectangular area to the image.

o This will display the highest, lowest, and average temperature within that selected area.

These tools help in precisely analysing the temperature data in different sections of the thermal image.







#### Save and Exit

To save your progress and exit the analysis, click the "dd" icon. This will save any changes or analyses made on the IR picture and return you to the main page of the app.

#### **Report and Share**

#### 1. Report

To generate a report, click the " $\blacksquare$ " icon. This will allow you to save the analysis as a PDF file, which can then be



#### 2. Share

To share the infrared image, click the """ icon. This will allow you to send the image via email, upload it to the cloud, or share it through messaging apps, depending on your device and settings.

## PC Software Installation and Uninstallation System Requirements

- Windows XP or a higher version of Windows
- .NET Framework 2.0 or .NET Framework 3.5 (includes 2.0)



#### Installing .NET Framework 2.0

- 1. If your system does not already have .NET Framework 2.0 installed. download and run the Microsoft .NET Framework 2.0 installer from the provided link.
- 2. Follow the on-screen instructions to install the framework.
- 3. If .NET Framework 2.0 is already installed, you do not need to reinstall it.

#### Installing IRMeter Software

1. Using Installation CD:

Insert the installation CD and follow the instructions for installation.

2. Using Setup.exe:

If you don't have the installation CD, you can run the "setup.exe" file to install the software:

o Double-click on setup.exe.

o Follow the on-screen instructions to complete the installation.

#### Installing PC Software

- 1. To install the PC software:
- 2. After launching the **setup.exe** file, click "**Next**" to proceed with the installation.
- 3. Follow the on-screen instructions and prompts to complete the installation process.
- 4. Continue clicking "Next" until the installation is finished.
- 5. Once the installation is complete, click "Finish" to finalize the process and close the installer.
- 6. After installation, you can open the software via the desktop shortcut or the start menu to begin using it.







#### **Run Software**

To run the **PCIMeter** software after installation:

- Ensure that the **PCIMeter** software has been successfully installed on your computer.
- 2. Find the **PCIMeter** shortcut either on your desktop or in the Start menu.
- 3. Double-click the shortcut to open and launch the software.

Once the software is running, you can begin using it to analyze infrared images and perform other functions as required.

#### Uninstalling PC Software

To uninstall the **PCIMeter** software:

- 1. Open the **Start menu** on your computer.
- Search for "PCIMeter" in the list of installed programs.
- 3. Right-click on **PCIMeter** and select "**Uninstall**".
- Follow the on-screen prompts, and when asked, click "Next" to proceed with the uninstallation process.
- 5. Wait for the uninstallation to complete, then confirm by clicking "**Finish**".

Once the process is finished, **PCIMeter** will be removed from your system.







### 9. SPECIFICATIONS

#### 9.1. Imaging and Optical Data

Function	Range
Field of view (FOV) / Minimum focus distance	50°x 50°/ 0.5m
Spatial resolution (IFOV)	8.89mrad
Thermal sensitivity/NETD	<0.05°C @ +30°C/50mk
Image frequency	25Hz
Focus mode	Focus free
Focal length	1.35mm
Focal Plane Array (FPA) / Spectral range	Uncooled microbolometer / 7.5-14 µm
IR resolution	96 x 96 pixels

#### 9.2. Image Presentation

Function	Range
Display	2.0 in. LCD, 240 x 320 pixels
Image modes	IR image, Visual image, Auto fusion
Colour palettes	IRON, Rainbow, Grey, Grey Inverted, Brown, Blue-red, Hot-cold, Feather

#### 9.3. Measurement

Function	Range
Object Temperature Range	-20°C to +550°C
Accuracy	±2°C or ±2% of reading (Environment temperature 10 to 35°C, Object temperature >0°C).

#### 9.4. Measurement Analysis

Function	Range
Spot	Center Spot
Automatic Hot /Cold Detection	Auto hot or cold markers
Measurement Corrections	Emissivity, Reflected temperature

#### 9.5. Storage of Videos

Function	Range
Storage Media	8Gbytes Micro SD card and 3.5GB internal EMMC
Video Storage Format	Standard MPEG-4 encode, 240 x 320 @30fps, on memory card >30 minutes
Video Storage Mode	IR Images



#### 9.6. Storage of Images

Function	Range
Image Storage Format	Standard JPEG or HIR files including measurement data, on memory card >6000 pictures
Image Storage Mode	IR Images
Image analyse	Internal image analyse tools, Complete function.

#### 9.7. Set-Up

Function	Range
Set-Up Commands	Local adaptation of units, language, date and time formats, information of camera
Languages	Multinational

#### 9.8. Data Communication Interfaces

Function	Range
Interfaces	USB-Type C
USB	Data transfer between camera and PC Live video between camera and PC

#### 9.9. Power System

Function	Range
Battery	Li-ion battery, 4 hours operating time
Input Voltage	DC 5V
Charging System	In camera (AC adapter)
Power Management	Automatic shutdown

#### 9.10. Environmental Data

Function	Range
Operating Temperature Range	-15°C to +50°C
Storage Temperature Range	-40°C to +70°C
Humidity (Operating & Storage)	10%~90%
Drop Test	2m
Bump	25g (IEC60068-2-29)
Vibration	2g (IEC60068-2-6)

#### 9.11. Physical Data

Function	Range
Camera Weight, Incl. Battery	<500g
Camera Size (L x W x H)	234.8 x 75.49 x 100.7mm





## MAJOR TECH (PTY) LTD

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Australia

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