FLUKE®

Ti200, Ti300, Ti400, Ti450, Ti480

Thermal Imagers

Users Manual

September 2013, Rev. 3, 2/17

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Fluke Corporation P.O. Box 9090 Everett, WA 98206-9090 U.S.A.	Fluke Europe B.V. P.O. Box 1186 5602 BD Eindhoven The Netherlands	ООО «Флюк СИАЙЭС» 125167, г. Москва, Ленинградский проспект дом 37, корпус 9, подъезд 4, 1 этаж

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Introduction

The Fluke Ti200, Ti300, Ti400, Ti450, and Ti480 Thermal Imagers (the Product or Imager) are handheld, infrared imaging cameras for use in many applications. These applications include equipment troubleshooting, preventive and predictive maintenance, building diagnostics, and research and development.

The Imager displays thermal images on a high-visibility, industrial-quality LCD touch screen. The Imager can save images to internal memory, to a removable memory card, or to a USB storage device. Saved images and data stored in internal memory or on the memory card can be transferred to a PC through a direct USB connection to the PC or by wireless transfer to a PC or mobile device.

The Imager includes SmartView

To view, print, or download the latest manual supplement, visit http://us.fluke.com/usen/support/manuals.

To request a printed manual, vist www.fluke.com/productinfo.

Safety Information

A **Warning** identifies hazardous conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

- **Batteries contain hazardous chemicals that can cause burns or explode. If exposure to chemicals occurs, clean with water and get medical aid.**
- **Do not disassemble the battery.**
- **Repair the Product before use if the battery leaks.**
- **Use only the external mains power supply included with the Product.**
- **Do not put metal objects into connectors.**
- **Use only specified replacement parts.**
- **Have an approved technician repair the Product.**
- **Remove the batteries if the Product is not used for an extended period of time, or if stored in temperatures above 50 °C. If the batteries are not removed, battery leakage can damage the Product.**
- **Disconnect the battery charger and move the Product or battery to a cool, non-flammable location if the rechargeable battery becomes hot (>50 °C) during the charge period.**
- **Replace the rechargeable battery after 5 years of moderate use or 2 years of heavy use. Moderate use is defined as recharged twice a week. Heavy use is defined as discharged to cutoff and recharged daily.**
- **Do not short the battery terminals together.**
- **Do not keep cells or batteries in a container where the terminals can be shorted.**
- **Do not look into the laser. Do not point the laser directly at persons or animals or indirectly off reflective surfaces.**
- **Do not look directly into the laser with optical tools (for example, binoculars, telescopes, microscopes). Optical tools can focus the laser and be dangerous to the eye.**
- **Do not open the Product. The laser beam is dangerous to eyes. Have the Product repaired only through an approved technical site.**
- **Do not use laser viewing glasses as laser protection glasses. Laser viewing glasses are used only for better visibility of the laser in bright light.**

Additional laser warning information is on the inside of the Product lens cover. See Figure 1.

Figure 1. Laser Warning

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Table 1 is a list of symbols that can be used on the Imager or in this manual.

Table 1. Symbols

Symbol	Description

Product Familiarization

Features

Table 2 lists the features of the Imager.

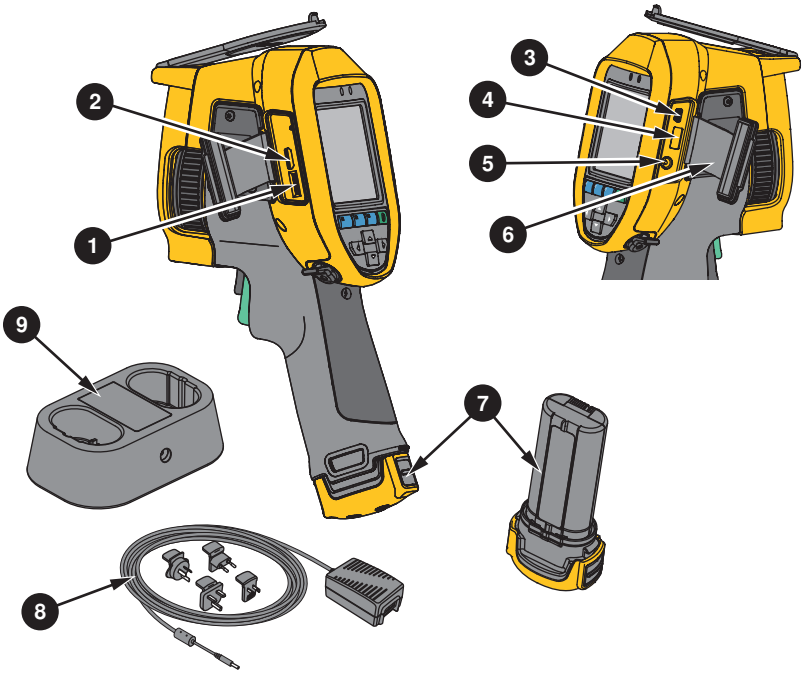
Table 2. Features

Feature	Ti200	Ti300	Ti400	Ti450	Ti480
Focus/Image Enhancement					
Advanced manual focus					
LaserSharp					

Controls

Table 3 shows the connections of the Imager.

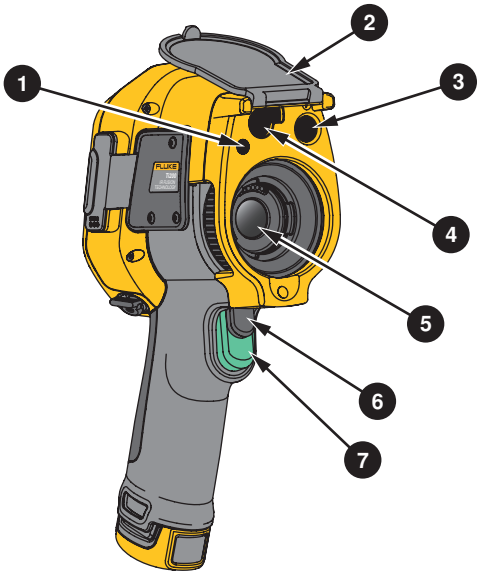
Table 3. Connections



Item	Description	Item	Description
	Micro SD Memory Card Slot		Connector Cover
	HDMI Connection		Lithium-ion Smart Battery
	USB Cable Connection		AC Power Supply with Universal Adapters
	USB Storage Device Connection		2-Bay Battery Charging Base
	AC Adapter/Charger Input Terminal		

Table 4 shows the front of the Product.

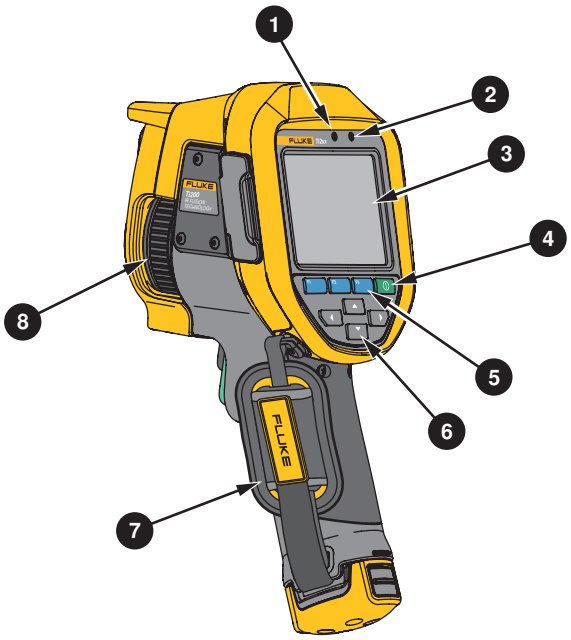
Table 4. Front



Item	Description	Item	Description
	LED Torch/Flashlight		Infrared Camera Lens
	Retractable Lens Cover		Secondary Trigger
	Visual Light Camera Lens		Primary Trigger
	Laser Pointer/Distance Finder		

Table 5 shows the back of the Product.

Table 5. Back



Item	Description	Item	Description
	Microphone		Control Panel
	Speaker		Manual Focus Control
	LCD Touch Screen (display)		

Touch Screen

The touch screen is a shortcut to the most used settings. To change parameters or select functions and options, touch a target on the display.

The touch screen has a backlight for work in dimly lit spaces. When not in a menu, double tap on the display to capture an image.

Control Panel

The control panel is used to change parameters or select functions and options. Table 6 lists the functions of the buttons on the Control Panel.

Table 6. Control Panel

Button	Description

Basic Operation

Turn On and Off the Imager

Before you use the Imager for the first time, charge the battery for a minimum of two and one-half hours. See *Charge Batteries*.

To turn on or turn off the Imager, push and hold

Save Image

To save an image as a data file:

1. Capture an image.

   The image is in the memory buffer for you to save or edit the image.
2. Push **F1** to save the image as a file and go back to the live view.

Menus

Use the menus to change and view settings.

To change settings:

1. Push

Measurement Menu

Table 8 lists the options in the Measurement menu.

Table 8. Measurement Menu

Option Menu	Option	Description
Range	<options>	Select the temperature range from one of the preset measurement ranges or to a fully automatic range.
Set Level/Span	**Auto**	Sets the Level/Span to adjust automatically or manually.
	Manual	
	Set Level/Span	With Level/Span set to **Manual**, changes the Level/Span. See *Level/Span*.
Line Temp	<options>	Turns on/off the Line Temp.
Emissivity	**Adjust Number**	Sets a custom emissivity value when a value from the standard emissivity table is not appropriate for the measurement. See *Emissivity Adjustment*.
	Select Table	Select an emissivity value from a list of common materials. See *Emissivity Adjustment*.
Background	<options>	Changes the background temperature to compensate for reflected background temperature. Very hot objects or very cold objects can affect the apparent temperature and measurement accuracy of the target, especially when surface emissivity is low. Adjust the reflected background temperature to improve the accuracy of the measurement. *Note* *If Display is set to* **Display All**, *the background temperature shows as* **BG = xx.x** *on the display.*

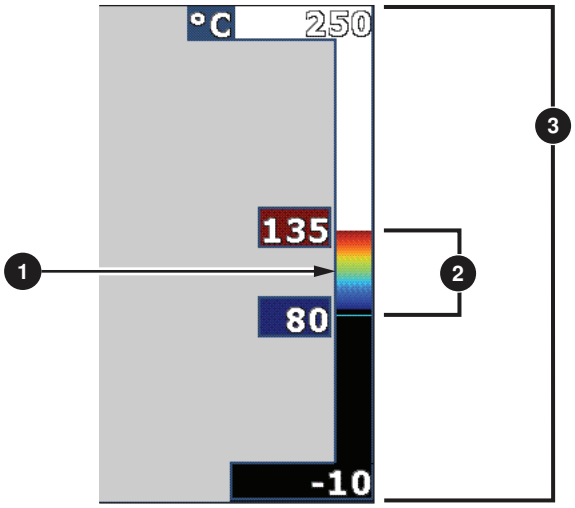
Table 8. Measurement Menu (cont.)

Option Menu	Option	Description
Transmission	<options>	Changes the transmission percentage of the infrared-transparent window (IR window). When you do infrared inspections through IR windows, not all of the infrared energy emitted from the target is transmitted through the optical material in the window. If you know the transmission percentage of the window, adjust the transmission percentage in the Imager or in SmartView software to improve the accuracy of the measurement. *Note* *If Display is set to* **Display All***, the transmission correction shows as* **t = xxx%** *on the display.*
Spot Temp	**Hot**	Select to view and turn on/off either the hot or cold spot indicator on the display. The Spot Temperatures are floating HI and LO temperature indicators that move on the display as the temperature measurements of the image fluctuate.
	Cold	
Spot Markers	**All Off**	Turns off fixed-temperature spot markers.
	<options>	Select the number of fixed-temperature spot markers to use to highlight a region before you take an image. See *Spot Markers*.
Spot Box	**On**	Turns on/off a temperature measurement zone (box) that centers on a target.
	Off	
	Set Size	With Spot Box set to **On**, changes the size of the Spot Box. See *Spot Box*.
	Set Position	With Spot Box set to **On**, changes the position of the Spot Box. See *Spot Box*.

Level/Span

Level and Span are values within the total range of temperature set in **Range**. Level is the temperature level to view within the total range of temperatures. Span is the span of temperatures to view within the total range of temperatures. See Table 9.

Table 9. Level and Span Settings



Item	Description
	Level
	Span
	Total Imager range

In automatic Level/Span mode, the Imager sets **Level**/**Span** based on the temperatures set in **Range**.

When the **Range** of the Imager is set to one the preset measurement ranges and **Level**/**Span** is set to **Manual**, the level setting moves the thermal span up or down within the total temperature range.

To change the Level/Span:

1. Select **Measurement** > **Level/Span** > **Manual**.
2. Select **Set Level/Span**.
3. Push:
    -

Note

Surfaces with an emissivity of <0.60 make it difficult to determine reliable and consistent actual temperatures. The lower the emissivity is the greater the potential of error is when the Imager calculates the temperature measurement because more of the energy reaching the camera is specified as background temperature. This is also true even when adjustments to the emissivity and reflected background adjustments are performed properly.

Spot Markers

Use fixed-temperature spot markers to highlight a region on the display before you save an image.

To set a marker:

1. Select **Measurement** > **Markers**.
2. Select an option.
3. Push **F1** to set the marker option and go to the Move Marker display.

   The Move Marker icon shows on the display and the labels on the function buttons change to **Done**, **Next**, and **Cancel**.

To change the marker position on the display:

1. Push

To set the size of the Spot Box when Spot Box is set to **On**:

1. Select **Measurement** > **Spot Box** > **Set Size**.
2. Push:
   -

Image Menu

Table 10 lists the options in the Image menu.

Table 10. Image Menu

Option Menu	Option	Description
Palette	**Standard**	Select Standard or Ultra-Contrast palette. The Standard Palettes offer an equal, linear presentation of colors that allow for best presentation of detail.
	Ultra Contrast	The Ultra Contrast Palettes offer a weighted presentation of colors. Ultra Contrast palettes work best in situations with high thermal contrast for extra color contrast between the high temperatures and low temperatures. See *Detailed Specifications*.

Table 10. Image Menu (cont.)

Option Menu	Option	Description
Color Alarm	**High Alarm OFF**	Turns on/off the high-temperature color alarm. The high-temperature color alarm shows a full visible image and only shows infrared information on objects or areas that are above the set apparent temperature level.
	Low Alarm OFF	Turns on/off the low-temperature (or dew point) color alarm. The low-temperature color alarm shows a full visible image and only shows infrared information on objects or areas that are below the set apparent temperature level.
	Set High Alarm	Sets the high apparent temperature level. Requires the High Alarm to be on.
	Set Low Alarm	Sets the low apparent temperature level. Requires the Low Alarm to be on. *Note* *The Imager does not sense ambient or surface dew point level automatically. To use the low-temperature color alarm function as a dew point color alarm, determine and input the surface dew point temperature. The colors presented can help identify areas of concern with possible dew point condensation.*
	Outside	Shows color isotherms, or infrared information, outside of a set of both high and low limits. Requires High Alarm and Low Alarm to be on and temperature levels for both alarms to be set.
	Inside	Shows color isotherms, or infrared information, inside of a set of both high and low limits. Requires High Alarm and Low Alarm to be on and temperature levels for both alarms to be set.

Table 10. Image Menu (cont.)

Option Menu	Option	Description
Display	<options>	Sets which graphics to view on the display. *Note* *Features that have On/Off controls must be turned on and turned off with those controls.*
Image Enhancement	<options>	Sets the advanced image enhancement features of the Imager. See *Image Enhancement*.
Logo	**On**	Turns on/off the Fluke logo on the display.
	Off	
	Custom	With SmartView software, upload a custom logo to the Imager from your PC through the USB connection.
Distance	**On**	Turns on/off the distance units on the display. See *Distance*.
	Off	
	<options>	Sets units to feet or meters. See *Distance*.
Zoom	<options>	Sets digital zoom level.

Image Enhancement

Use the Image Enhancement menu to activate the advanced features of the Imager. Activate either MultiSharp Focus or SuperResolution individually. Use Filter Mode with either MultiSharp Focus or SuperResolution. Table 11 lists the options in the Image Enhancement menu.

Table 11. Image Enhancement Menu

Option	Description
Filter Mode	Combine values from successive frames within a small range of temperatures to reduce pixel noise or thermal sensitivity (NETD) to as low as 30 mK.
Off	Turn off MultiSharp Focus mode or SuperResolution mode and not affect Filter mode.
MultiSharp Focus	MultiSharp Focus captures several images focused on multiple targets that are positioned at different distances from the Imager and creates one image that focuses on the multiple targets at the same time. In MultiSharp Focus mode, you can process the image in the camera or in SmartView software. In MultiSharp Focus (In PC only) mode, the image is not processed on the Imager so you cannot view the image on the Imager. Use SmartView software to view the image on your PC. Set the file format to .is2 for MultiSharp Focus (In PC only) mode to work.
MultiSharp Focus (In PC Only)	
SuperResolution	SuperResolution uses a sensor to capture micro movements to create an image with double the resolution. See *Detailed Specifications* the resolution available based on the model of the Imager. In SuperResolution mode, the Imager captures the data and processes the image. In SuperResolution (in PC only) mode, the image is not processed on the Imager so you cannot view the image on the Imager. Use SmartView software to view the image on your PC.
SuperResolution (In PC Only)	

MultiSharp Focus

MultiSharp Focus captures several images focused on multiple targets that are positioned at different distances from the Imager and creates one image that focuses on the multiple targets at the same time.

Note

The minimum focus distance with MultiSharp Focus and a standard lens is 15 cm (6 inches). For optimum performance, position the camera

SuperResolution

SuperResolution uses a sensor to capture micro movements to create an image with double the resolution. See *Detailed Specifications* for the resolution available based on the model of the Imager.

To use:

1. Capture an image.
2. Hold the Imager still for ~1 second.
    - In SuperResolution mode, the Imager captures the data and processes the image. The image shows on the display of the Imager in ~18 seconds.
    - In SuperResolution (in PC only) mode, the image is not processed on the Imager so you cannot view the image on the Imager. Use SmartView software to view the image on your PC.

Distance

Use the **Laser Pointer**/**Distance Finder** to measure the distance, up to 30 meters, from the Imager to a target. You can choose to show the distance on the display in feet or meters. The distance is saved as part of the image.

To use the distance measurement feature:

1. Turn on the distance feature and select the units to show on the display.
2. Point the Imager at the target.
3. Pull and hold the **Secondary Trigger**.

Table 12. Camera Menu (cont.)

Option Menu	Option	Description
Auto Capture	**Start Capture**	Use Auto Capture settings to capture and save an infrared image, or series of images, automatically.
	Interval	Sets the number of hours, minutes, or seconds between image captures. *Note* *The minimum interval available can be affected by the file type and visible light camera settings. Some combinations create larger file sizes that take longer to capture and save and create a higher minimum interval compared to others.*
	Image Count	Sets a number of images to capture. Or, select **Maximum Memory** to capture and save images until the chosen storage memory is full or the battery runs out of power.
	Manual Trigger	Select to automatically capture images when **Start Capture** is selected.
	Temp Trigger	Select to capture images when a value is above or below a set temperature limit when **Start Capture** is selected.
	Set Temp Trigger	With **Temp Trigger** selected, set the temperature and conditions to trigger the auto capture of images.
Wireless	**Bluetooth**	Uses Bluetooth technology to connect the Imager to a device such as a wireless headset. See *Wireless Connectivity*.
	WiFi Hotspot	Uses the Imager to create a wireless Hotspot when no WiFi network exists. See *Wireless Connectivity*.
	WiFi Network	Connects the Imager to a WiFi network so you can sign into your Fluke Connect account on the Imager. See *Wireless Connectivity*.

LaserSharp Auto Focus System

The **Laser Pointer**/**Distance Finder** on the Imager is both a sighting aid and a part of the LaserSharp Auto Focus System.

Video

The video controls include stop, rewind, fast forward, and pause/play functions. The thermal scene and complexity of the recorded data affects the amount of time available to record a video. The video capture format is set in the Settings menu. For more information, see *File Format*.

Record Video

To record:

1. Select **Camera** > **Video**.
2. Select **Video**/**Audio** or **Video ONLY**.
3. Touch **Record Video** to set up the Imager to record a video.

   p shows in the upper left corner of the display.
4. Pull and release the **Secondary Trigger** to start recording.

   r shows in the upper left corner of the display. The elapsed time shows at the bottom of the display.
5. Pull and release the **Secondary Trigger** to stop recording.
6. Push **F2** to end the recording session.
7. Push **F1** to save the video file.

Playback Video

To playback:

1. Open the **Memory** menu.
2. Select a file to playback. All video files show the k icon in the upper right corner of the thumbnail.
3. Push **F1** to set a file for playback.
4. Push **F1** to start the playback. During playback, push

Wireless Connectivity

The Imager has several wireless connectivity options. Before the first use of the wireless feature, enable the radio. See *Enable the Radio*.

Bluetooth

Use Bluetooth to connect the Imager to a device such as a wireless headset. When Bluetooth is on,

6. Push **F2** to go back.
7. Push **F3** to use the Imager.

WiFi Network

Use the WiFi Network setting to connect the Imager to a WiFi network and to sign into your Fluke Connect account on the Imager. When WiFi Network is on,

Fluke Connect Wireless System

The Imager supports the Fluke Connect Wireless System. The Fluke Connect system wirelessly connects your Fluke test tools with an app on a mobile device. It shows images from the Imager on your mobile device.

Note

The Fluke Connect system is not available in all countries.

Fluke Connect App

The Fluke Connect app works with Apple and Android products. The app is available for download from the Apple App Store and Google Play.

How to use the Fluke Connect app with the Imager:

1. On the Imager, select **Fluke Connect** > **Pair to Fluke Connect Mobile App** > **On**.
2. On the mobile device:
   a. Go to **Settings** > **Wi-Fi**.
   b. Select the Wi-Fi network that begins with **Fluke..**.
3. On the Fluke Connect app, select **Thermal Imager** from the list.

You can now take images on the Imager, and they will stream live from the Imager to your mobile device. Live streaming may not be available on all devices. The pictures you take with the Imager are saved on your mobile device and on the Imager.

Note

To save images to the Fluke Connect app, set the file format to .is2 (see File Format) and the image storage to internal memory (see Table 13). Images stored on the SD card or USB storage device may not transfer to the Fluke Connect app.

4. On the Imager, capture an image.

   The image is now in the buffer.

5. Push **F1** to save the image and view the image on the phone app.

Go to www.flukeconnect.com for more information about how to use the app.

Fluke Connect Tools

Use the Imager to wirelessly connect to Fluke-Connect-supported tools to:

- View the live measurement of each tool.
- Capture the measurement of each tool in .is2 and .is3 images.

To discover a Fluke Connect-supported tool:

1. Turn on each wireless tool and make sure the wireless feature is enabled. See the documentation of each tool for more information about how to use the tool.
2. Turn on the Imager.
3. Select **Menu** > **Fluke Connect** > **Pair to Fluke Connect Tools**.
4. Push F1 to set selection.

   The Fluke Connect button on the wireless tool starts to flash. The Imager starts to scan and presents a list with the ID and name of available tools found within 20 m without obstructions (open air) or within 6.5 m with obstructions (sheetrock wall). You can expect a short delay before the scan is complete.
5. Select the tool name.
6. Push F1 or touch **Select** to select the tool.
7. Repeat to select each tool.
8. Select **Done**.

   The labels change to include an Edit function. By default, the Imager shows and saves the data for the selected tools.

To edit the selection:

1. On the Imager, select the tool name.
2. Push F1 or touch the **Edit** target. The Edit menu shows the option to show the measurement data and save it with the image to the memory location selected in the Settings menu.

   The display on the Imager updates to show the wireless icon and the live measurement for each selected wireless tool.

Memory Menu

Use the Memory menu to review or delete captured images and videos. When additional information has been saved with the file, an icon shows with the preview file. The icons are:

Review Image

To review an image:

1. Open the **Memory** menu.
2. Select the preview image of the file for review.
3. Push **F2** to review the file.

Edit Image

Before you save a file, you can use the Imager to edit or modify the image. Once the file is saved, you cannot edit the image.

IR-PhotoNotes System

Use the IR-PhotoNotes photo annotation system to capture visible images of various objects, text, or other information that is related to the analysis and reporting of an infrared image. A visible image is a clear digital photo and does not use infrared technology. Examples of possible annotations include motor name plates, printed information or warning signs, larger views of the environment or room, and related equipment or objects. IR-PhotoNotes images are only available in the .is2 file format and are stored in the file so you do not need to collate multiple files at a later time.

To add photos using the IR-PhotoNotes annotation system:

1. With an infrared image in the buffer, push **F2** to open the Edit Image menu.
2. Select **IR-PhotoNotes**.
3. Push **F1** to enter the Picture mode.
4. Capture an image.
5. Capture additional images as required. See *Detailed Specifications* for the maximum number of images that can be stored with IR-PhotoNotes.
6. Push **F1** to save the pictures with the image.

To view an IR-PhotoNote annotation in memory:

1. Open the **Memory** menu.
2. Select a file to view. All files with IR-PhotoNotes annotations show

Audio

Audio (voice) annotation is only available in the .is2 file format. The audio is stored with the image so you do not need to collate multiple files later.

To add, playback, or edit an audio file:

1. With an image in the buffer, push **F2** to open the Edit Image menu.
2. Select **Add Audio**.
3. Do the corresponding procedure below for the desired action.

Action	Procedure
Add audio file	2. The display updates to show the recorded time. 3. Push **F1** to pause the recorder. 4. Push **F2** to stop the recorder. 5. Push **F1** to review the audio file, or push **F2** to save the audio with the image. The audio file replays through the speaker.
Playback audio file	2. Select a file to view. All files with audio annotations show

Text Notes

Text annotation is only available in the .is2 file format. Text notes are stored with the image so you do not need to collate multiple files later.

To add a text annotation:

1. With an image in the buffer, push **F2** to open the Edit Image menu.
2. Select **Add Text**.
3. Push **F1** to open a keyboard on the display.
4. Use the keyboard to input a message.
5. Push **F1** to save the message.
6. Push **F2** when done.
7. Push **F1** to save the message with the image.

To view a text annotation in memory:

1. Open the **Memory** menu.
2. Select a file to view. All files with text annotations show

Settings Menu

Table 13 lists the options in the Settings menu.

Table 13. Settings Menu

Option Menu	Option	Description
File Format	**Image Format**	Sets the file type to save images and videos to and to set the megapixels to use for the visual light camera. See *File Format*.
	Video Format	
Units	<options>	Sets the temperature units to Celsius or Fahrenheit.
Auto Off	**LCD Time Out**	Sets the time before the display automatically turns off.
	Power Off	Sets the time before the Imager automatically turns off. *Note* *Auto Off is automatically disabled when the battery is connected to ac power.*
Date	<options>	Sets the date format and the date. See *Date*.
Time	<options>	Sets the time format and the time. See *Time*.
Language	<options>	Sets the language to use on the display.
Localization	<options>	Sets the decimal separator to comma or decimal point.
Image Storage	<options>	Sets the location to save images: internal memory, micro SD memory card, or USB storage device.
Advanced	**Filename Prefix**	Changes the default filename that starts with IR_ to a different 3-character prefix with the touch screen keyboard.
	Reset Filename	Resets the file number to 00001.
	Factory Defaults	Erases all user-set preferences and restore the factory default settings.
	Imager Info	View information about the version, certificates, and Open Source Software Licenses of the Imager
	Adjust Parallax	Fine-tunes the parallax adjustment to precisely align the image.

File Format

Select from a list of image and video file formats based on how the end file will be used. Table 14 lists the image file formats. Table 15 lists the video file formats.

Table 14. Image File Formats

File Format	Description
IS2	Saves images as a .is2 file. Choose the .is2 file format when image modification and maximum resolution is needed. The .is2 file format consolidates the infrared image, radiometric temperature data, visible image, voice annotation, and photos from the IR-PhotoNotes photo annotation system into a single file. To customize or separate the visible and infrared images, use SmartView software or the Fluke Connect app.
JPEG	Saves images as a .jpg file. Choose the .jpg file format for images with the smallest file size, where modification is not needed, and image quality and resolution are not as important.
BMP	Saves images as a .bmp file. Choose the .bmp file format when a smaller file size with maximum resolution is needed and image modification is not.
VLCM Resolution	Sets the megapixels (MP) on the visual light camera. *Note* *To use Image Enhancement features, set the VLCM Resolution to 0.3 MP.*

Table 15. Video File Formats

File Format	Description
IS3	Saves videos as an .is3 file with radiometric video capture. Choose the .is3 video format when video modification and maximum resolution is needed. To edit the .is3 video file, use SmartView software or the Fluke Connect app.
AVI	Saves videos as an .avi file with .mpeg encoding. Choose the .avi video format when video modification is not required. The file retains the video settings at the time the video was captured and saved.

Date

The date shows as: **MM**/**DD**/**YY** or **DD**/**MM**/**YY**.

To set the date:

1. Select **Settings** > **Date**.
2. Select **MM**/**DD**/**YY** or **DD**/**MM**/**YY**.
3. Push **F1** to set the new format.
4. Select **Set Date**.
5. Push **F1** to open the Set Date menu.
6. Push

Download SmartView Software

Go to www.fluke.com/smartviewdownload.

1. On the website, follow the instructions to download the software to the PC.
2. On the PC, follow the instructions to install SmartView software. (Administrator privileges are required for the installation.)
3. Restart the PC when installation is complete.

Download Firmware

1. On the PC, open SmartView software.
2. Connect the USB A connector end of the cable into your PC and the USB Micro B connector end into the Imager.

   Note

   Some Imagers have both A and Micro B connector jacks. Make sure to use the Micro B jack on the Imager.

   Windows automatically installs the device driver for use with the Imager. SmartView software recognizes the connection with the Imager and  appears on the SmartView software toolbar menu.
3. On the PC, select **Yes** if prompted to download a firmware update file onto the PC.
4. On the camera, once the firmware is downloaded, select **Update Firmware**, to update the firmware in the camera.

   To complete the firmware update, the Imager turns off.
5. To use the new firmware, turn on the Imager.

Enable the Radio

In countries with laws and regulations that permit wireless communications, wireless communication protocols are available to expand the capabilities of the Imager. All Imagers ship from the factory with the radios disabled.

To enable the radio:

1. On the Imager, select **Camera** > **Fluke Connect**.
2. On the PC, go to http://fluke.com/register/ti.

3. On the website:
   a. Select a language from the drop down box.
   b. Enter your information and the serial number from the display on the Imager. The serial number is case sensitive.
   c. Click on **Submit**.

   If the radio is authorized in your country, an authorization code appears on the web page.

   Note

   If the radio is not yet authorized in your country, Fluke will contact you when the radio is authorized for use in your country.
4. On the Imager,
   a. Push F1 or tap **Enter Code**.
   b. Type in the authorization code from the website. (The authorization code is not case sensitive.)
   c. Push F1 or **Done**.

   A message appears on the Imager display that shows the wireless communication is enabled.

   If a message appears that says the authorization code is invalid:

   - Make sure you entered the correct serial number from the Imager into the website.
   - Make sure you entered the correct authorization code from the website into the Imager.

   d. Tap **Ok**.

Streaming Video (Remote Display)

The Imager can stream live infrared and IR-Fusion technology video to a PC that has SmartView software installed, to the Fluke Connect app (where available), or to an HDMI compatible device.

Stream Live to a PC

To stream live to a PC through a USB connection:

1. Install the latest version of the firmware on the Imager. See *Download Firmware*.
2. On the PC, open the SmartView software.

3. Connect the USB A connector end of the cable into your PC and the USB Micro B connector end into the Imager.

   Note

   Some Imagers have both A and Micro B connector jacks. Make sure to use the Micro B jack on the Imager

    appears on the SmartView software toolbar menu.
4. On the PC, choose **Remote Display** from  .

To stream live to a PC, wirelessly:

1. On the Imager, turn on the WiFi Hotspot. See *WiFi Hotspot*.
2. On the PC:
   a. From the networks screen, select **Fluke-Camera**.

      Note

      Fluke-Camera is the default name of the Imager. If you changed the name of the Imager, select the new name of the Imager from the networks on the PC.

   b. Open the SmartView software.

       appears on the SmartView software toolbar menu.
   c. Choose **Remote Display** from  .

Stream Live with Fluke Connect Software

To stream live with Fluke Connect software, see *Fluke Connect Wireless System*.

Stream Live to an HDMI Device

HDMI (High-Definition Multimedia Interface) is a compact audio/video interface that transfers uncompressed data and compressed/uncompressed digital audio data from the Imager to a compatible HDMI device.

To stream live to an HDMI device:

1. Attach the included HDMI cable to the HDMI port on the Imager.
2. Connect the other end to an HDMI video device.

Remote Control of Imager

Use SmartView software on a PC or the Fluke Connect app on a mobile device to remotely control the Imager.

To remotely control the Imager with a PC:

1. Turn on Remote Display. See *Stream Live to a PC*.
2. In SmartView software, select **SmartView** (**Camera** is the default selection).

When in remote control mode, use the SmartView software to control all the menus on the Imager. The menus cannot be changed directly on the Imager.

To remotely control the Imager with the Fluke Connect app:

1. Set up the Fluke Connect system. See *Fluke Connect Wireless System*.
2. On the mobile device, tap on the streaming image.

   An option shows to Remote Control the Imager.
3. Select **Yes**.

From the mobile device, you can change the IR-Fusion setting, select Auto Focus to turn on LaserSharp Auto Focus, or tap the green Capture button to take an image. You can change the other menu items on the Imager directly even while the mobile device remotely controls the Imager.

Accessories

Table 16 is a list of the accessories available for the Imager.

Table 16. Accessories

Model	Description	PN
FLK-TI-SBP3	Smart Battery Pack	3440365
FLK-TI-SBC3B	Charging Base/Power Supply with Adapters	4354922
TI-CAR CHARGER	12 V Vehicle Charger Adapter	3039779
FLUKE-TI-VISOR3	Sun Visor	4335377
FLUKE-TI-TRIPOD3	Tripod Mounting Accessory	4335389
FLK-Bluetooth	Bluetooth Headset	4603258
BOOK-ITP	Introduction to Thermography Principles	3413459
FLK-LENS/TELE2	2X Telephoto Infrared Lens	4335377
FLK-LENS/WIDE2	Wide-Angle Infrared Lens	4335361
FLK-LENS/4XTELE2	4X Telephoto Infrared Lens	4607058
FLK-LENS/25MAC2	25-Micron Macro Infrared Lens	4607064

Optional Lenses

Use optional telephoto and wide-angle lenses for more applications of infrared inspection work. Figure 2 shows how to install a lens.

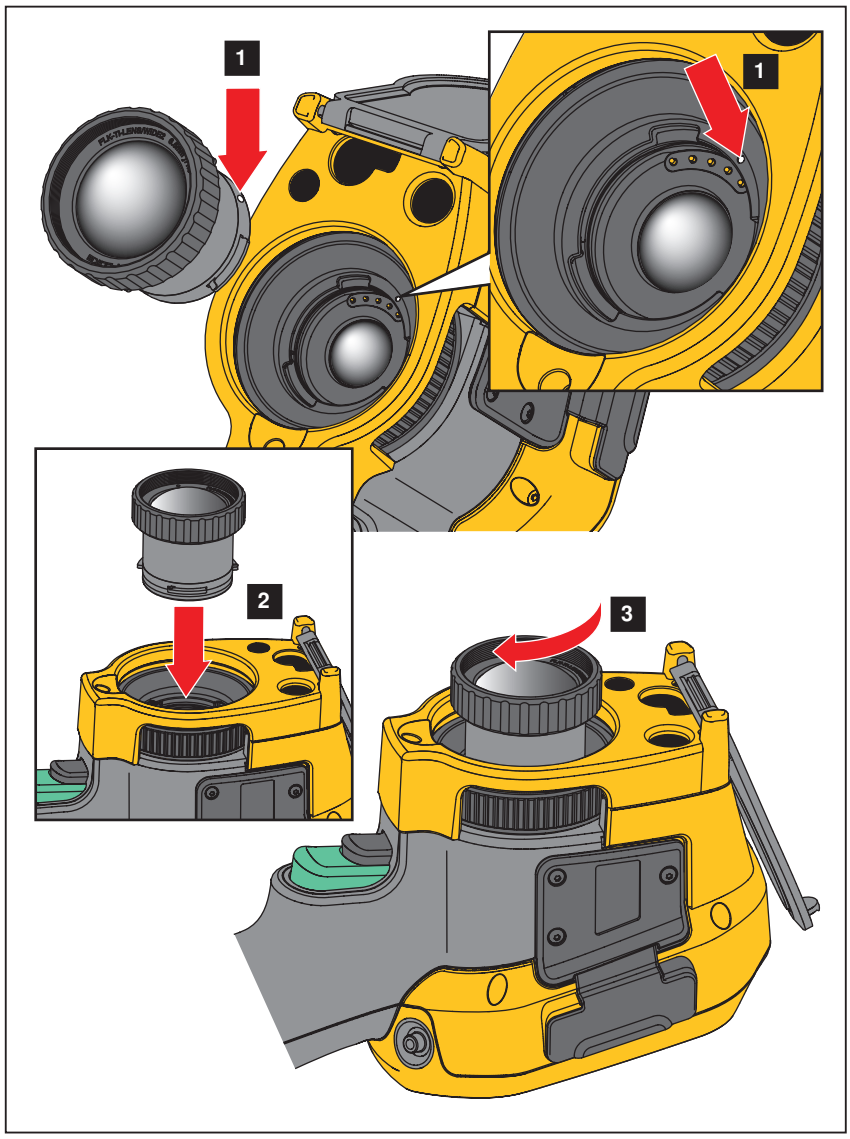


Figure 2. Optional Lens Installation

Maintenance

The Imager does not require maintenance.

Clean the Product

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

Battery Care

Charge Batteries

Before you use the Imager for the first time, charge the battery for a minimum of two and one-half hours. The battery status shows on the five-segment charge indicator.

Note

New batteries are not fully charged. Two to ten charge/discharge cycles are necessary before the battery charges to its maximum capacity.

To charge the battery, use one of the options that follow.

Two-Bay Battery Charger Base

1. Connect the ac power supply to the ac wall outlet and connect the dc output to the charger base.
2. Put one or two smart batteries into bays of charger base.
3. Charge batteries until charge LEDs on charger base are a solid green.
4. Remove smart batteries and disconnect the power supply when batteries are fully charged.

AC Power Socket on Imager

1. Connect the ac power adapter into an AC wall outlet and connect the dc output to the Imager’s ac power socket.

Optional 12 V Vehicle Charger

1. Connect the 12 V adapter into the 12 V accessory socket of the vehicle.
2. Connect the output to the ac power socket of the Imager.
3. Charge until the indicator shows *full* on the screen.
4. Disconnect the 12 V adapter and Imager when battery is fully charged.

	Ti200	Ti300	Ti400	Ti450	Ti480
Power					
Batteries	2 Lithium-ion rechargeable smart battery packs with 5-segment LED display to show charge level.				
Battery Life	3 hours to 4 hours continuous use for each battery pack (Actual life depends on settings and usage.)				2 hours to 3 hours continuous use for each battery pack (Actual life depends on settings and usage.)
Battery Charge Time	2.5 hours to full charge				
AC Battery Charge	Ti SBC3B Two Bay Battery Charger (110 Vac to 220 Vac, 50/60 Hz, included), or in-Imager charging. Ac univeral adapters included. Optional 12 V automotive charging adapter.				
AC Operation	AC operation with included power supply: 110 Vac to 220 Vac, 50/60 Hz ac universal adapters included				
Power Save	User-selectable Sleep and Power Off modes				
Safety	IEC 61010-1: Pollution Degree 2				
Wireless Radio					
Frequency	2412 MHz to 2462 MHz				
Output Power	<100 mW				
Electromagnetic Compatibility (EMC)					
International	EN61326-1, CISPR 11: Group 1, Class A *Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.* *Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.* *Caution: This equipment is not intended for use in residential environments and maynot provide adequate protection to radio reception in such environments.*				
Korea (KCC)	Class A Equipment (Industrial Broadcasting & Communication Equipment) *Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.*				
USA (FCC)	47 CFR 15 Subpart C Sections 15.207, 15.209, 15.249				
Vibration	0.03 g2/Hz (3.8 gm), 2.5 g, IEC 68-2-6				
Shock	25 G, IEC 68-2-29				
Drop	1 meter (with standard lens)				
Size (H x W x L)	27.7 cm x 12.2 cm x 16.7 cm (10.9 in x 4.8 in x 6.5 in)				
Weight (includes battery)	1.04 kg (2.3 lb)				
Enclosure Rating	IP54				
Calibration Cycle	2 years (assumes normal operation and normal aging)				
Supported Languages	Czech, Dutch, English, Finnish, French, German, Hungarian, Italian, Japanese, Korean, Polish, Portuguese, Russian, Simplified Chinese, Spanish, Swedish, Traditional Chinese, and Turkish				

Detailed Specifications

	Ti200	Ti300	Ti400	Ti450	Ti480
Temperature Measurements					
Temperature Range (not calibrated below -10 °C)	-20 °C to +650 °C		-20 °C to +1200 °C		-20 °C to +800 °C
Accuracy	±2 °C or 2 % (whichever is greater) at 25 °C ambient				
Imagining Performance					
Image Capture Frequency	9 Hz or 60 Hz refresh rate depending on model variation				
Detector Resolution	200 X 150	240 X 180	320 X 240		640 X 480
SuperResolution		NA		640 X 480	1280 X 960
Thermal Sensitivity (NETD)	≤0.075 °C at 30 °C target temp (75 mK)	≤0.05 °C at 30 °C target temp (50 mK)		≤0.03 °C at 30 °C target temp (30 mK)	≤0.05 °C at 30 °C target temp (50 mK)
Total pixels	30 000	43 200	76 800		307 200
Infrared spectral band	7.5				

	Ti200	Ti300	Ti400	Ti450	Ti480
Optional wide-angle smart lens					
Field of View (H X V)	46 ° x 34 °				48 ° x 34 °
Spatial Resolution (IFOV)	4.19 mRad	3.49 mRad	2.62 mRad		1.31 mRad
Minimum Focus Distance	15 cm (~6 in)				
IR-Fusion blending	Full screen				
Optional macro smart lens					
Minimum Spot Size	25 µ				NA
Field of View (H X V)	36.1 ° x 27.1 °				
Working Distance	~8 mm (0.3 in) to ~14 mm (0.6 in) with optimal at 10 mm (0.4 in)				
Image Presentation					
Palettes					
Standard	Blue-Red, Grayscale, Inverted Grayscale, High Contrast, Amber, Inverted Amber, Hot Metal, Ironbow				
Ultra Contrast	Blue-Red Ultra, Grayscale Ultra, Inverted Grayscale Ultra, High Contrast Ultra, Amber Ultra, Inverted Amber Ultra, Hot Metal Ultra, Ironbow Ultra				
Level and Span					
Smooth Auto-Scaling and Manual scaling of level and span					
Fast auto toggle between manual and auto modes					
Fast auto-rescale in manual mode					
Minimum Span (in manual mode)	2.0 °C (3.6 °F)				
Minimum Span (in auto mode)	3.0 °C (5.4 °F)				
Image Capture and Data Storage					
Image Capture, Review, Save Mechanism	One-handed image capture, review, and save capability				
Storage Medium					
Internal Flash Memory	4 GB				
Micro SD Memory Card	Includes ≥4 GB memory card to store at least 2000 fully radiometric (.is2) IR and linked IR-PhotoNotes images each with 60 sec voice annotations or 5000 basic (.bmp, .jpg) files. *Note* *Fluke recommends the memory card that is supplied with the Imager or available from Fluke. Fluke does not warrant the use or reliability of aftermarket memory cards of different brands or capacities.*				
USB Storage Device	USB port available (USB storage device not included) *Note* *The addition of IR-PhotoNotes or other saved items can vary the total number of images that can be stored in internal memory or on the SD memory card.*				
Fluke Cloud Permanent Storage	Yes				

	Ti200	Ti300	Ti400	Ti450	Ti480
File Formats	Non-Radiometric (.bmp, .jpg) or Fully-Radiometric (.is2). No analysis software is required for Non-Radiometric (.bmp, .jpg) files.				
Export File Formats with SmartView Software	.bmp, .gif, .jpg, .png, .tiff				
Memory Review	Thumbnail and full screen review				
Video Recording					
Standard, Non-Radiometric	Viewable through Smart View software, Windows Media Player, Quicktime, and on Imager. H.264 MPEG encoding AVI will also allow voice recording in addition to captured video.				
Recording Speed	24 fps (9 fps for imagers with 9 Hz refresh rate.)				
Radiometric	Viewable on Imager and with SmartView software in proprietary .is3 format. Supports voice recording in addition to captured video.				
Recording Speed	20 fps (9 fps for imagers with 9 Hz refresh rate.)				
IR-PhotoNotes Annotation	5 images				
Audio (Voice) Annotation	Up to 60 sec recording time per image. Reviewable playback on camera. Optional Bluetooth headset available, but not required.				
Text Annotation	Yes				
Streaming Video (Remote Display)					
SmartView Software on PC	USB, WiFi Hotspot, or WiFi Network				
Mobile Device	Fluke Connect app with WiFi Hotspot				
TV Monitor	HDMI				
Remote Control Operation	NA			SmartView software or Fluke Connect app	
Wireless Connectivity	PC, mobile device (iOS 4s or newer or Androidä 4.3 or newer), and WiFi to LAN (where available)				