

# **Ti200, Ti300, Ti400, Ti450**

## Thermal Imagers

## Users Manual

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To obtain warranty service, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that failure was caused by neglect, misuse, contamination, alteration, accident, or abnormal condition of operation or handling, including overvoltage failures caused by use outside the product's specified rating, or normal wear and tear of mechanical components, Fluke will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

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## ***Introduction***

The Fluke Ti200, Ti300, Ti400, and Ti450 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.

All Imagers display thermal images on a high-visibility, industrial-quality 640 x 480 LCD touch screen and 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<sup>®</sup> software. This software is a high-performance, professional software suite that allows for quality analysis and reporting. The Fluke Connect<sup>®</sup> app is available for use on mobile devices.

A rugged, rechargeable lithium-ion smart battery provides power to the Imager. Direct AC power is accessible with the included AC power adapter.

All Imagers have the Fluke LaserSharp<sup>®</sup> Auto Focus System, as well as advanced manual focus capabilities. The Ti450 also includes MultiSharp<sup>™</sup> Focus. The Imagers also include many useful features and functions associated with IR-Fusion<sup>®</sup> technology with Autoblend<sup>™</sup> mode, IR-PhotoNotes<sup>™</sup> photo annotation system, WiFi<sup>™</sup> connectivity, Bluetooth<sup>®</sup> connectivity, and HDMI<sup>®</sup> video connectivity.

## **Productivity Features**

- Voice Annotation
- IR-PhotoNotes photo annotations
- WiFi connectivity
- Streaming video
- Remote control and operation (Ti400 and Ti450 only)

## **How to Contact Fluke**

To contact Fluke, call one of the following telephone numbers:

- USA: 1-800-760-4523
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at [www.fluke.com](http://www.fluke.com).

To register your Product, visit <http://register.fluke.com>.

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

## Safety Information

A **Warning** identifies 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.

### **Warning**

To prevent eye damage and personal injury:

- **Do not look into the laser. Do not point laser directly at persons or animals or indirectly off reflective surfaces.**
- **Do not open the Product. The laser beam is dangerous to eyes. Have the Product repaired only through an approved technical site.**

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



Figure 1. Lens Cover Laser Warning

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## **Warning**













To prevent personal injury:

- **Read all safety information before you use the Product.**
- **Carefully read all instructions.**
- **Use the Product only as specified, or the protection supplied by the Product can be compromised.**
- **Replace the batteries when the low battery indicator shows to prevent incorrect measurements.**
- **Do not use the Product if it operates incorrectly.**
- **Do not use the Product if it is damaged.**
- **See emissivity information for actual temperatures. Reflective objects result in lower than actual temperature measurements. These objects pose a burn hazard.**
- **Do not use the Product around explosive gas, vapor, or in damp or wet environments.**
- **Do not put battery cells and battery packs near heat or fire. Do not put in sunlight.**



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

**Table 1. Symbols**

Symbol	Description
	WARNING - RISK OF DANGER. Consult user documentation.
	WARNING. LASER RADIATION. Risk of eye damage.
	Connected to ac power. Battery removed.
	Battery status. Battery charging when animated.
	On/Off Symbol.
	Conforms to European Union directives.
	Certified by CSA Group to North American safety standards.
	Conforms to relevant Australian Safety and EMC standards.
	Conforms to relevant South Korean EMC standards.
	Japan Quality Association
	This Product contains a lithium-ion battery. Do not mix with the solid waste stream. Spent batteries should be disposed of by a qualified recycler or hazardous materials handler per local regulations. Contact your authorized Fluke Service Center for recycling information.
	This product complies with the WEEE Directive marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste.

## Radio Frequency Data

See *Imager Information* for instructions on how to access digital copies of the radio licenses on the Imager.

To view the Radio Frequency Data Class B Instruction Sheet, visit <http://us.fluke.com/usen/support/manuals> and search for PN 4409209.

## Accessories

Table 2 is a list of the accessories available for the Imager.

**Table 2. 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
FLK-TI-VISOR3	Sun Visor	4335377
FLK-TI-TRIPOD3	Tripod Mounting Accessory	4335389
BOOK-ITP	Introduction to Thermography Principles	3413459
FLK-TI-BLUETOOTH	Bluetooth Headset	4603258
FLK-LENS/TELE2	Infrared Telephoto Lens	4335377
FLK-LENS/WIDE2	Infrared Wide-Angle Lens	4335361
FLK-LENS/4XTELE2	4X Telephoto Lens	4607058

Optional telephoto and wide-angle lenses expand the flexibility and allow more applications for your infrared inspection work. See Figures 2 and 3 for information about how to install a lens.

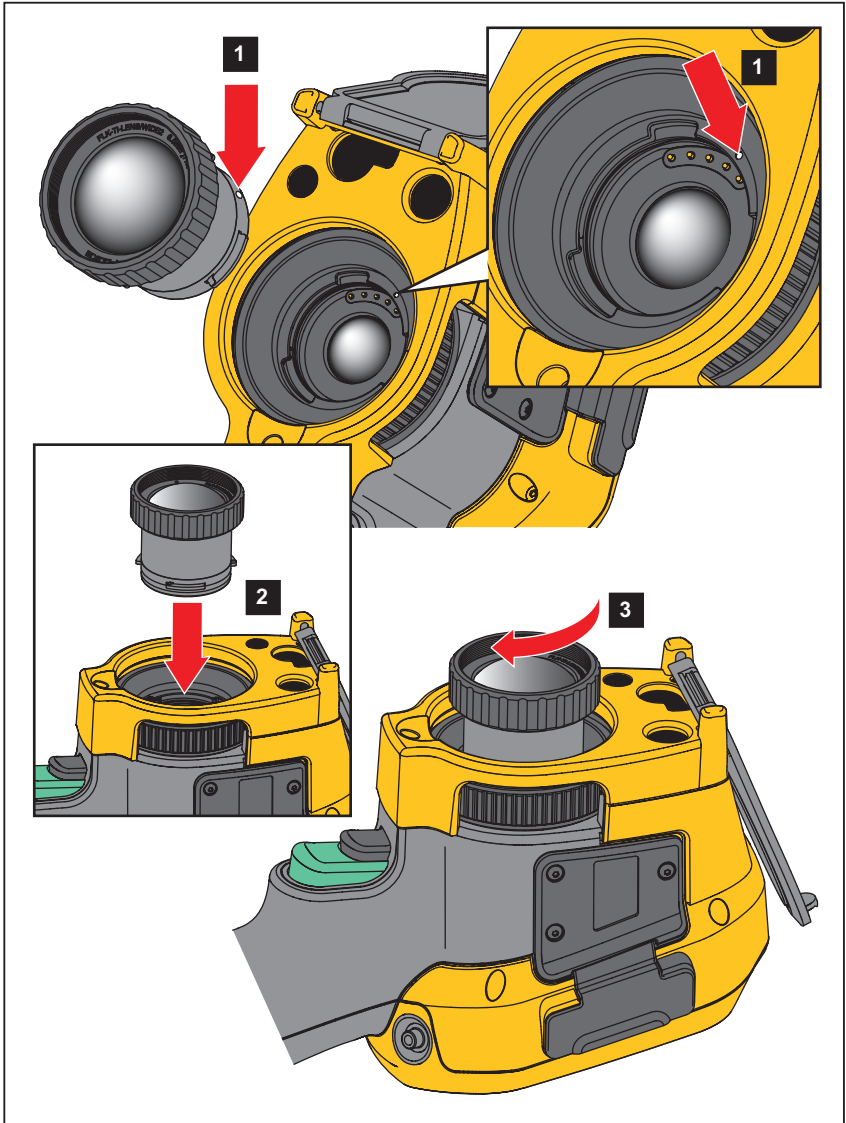
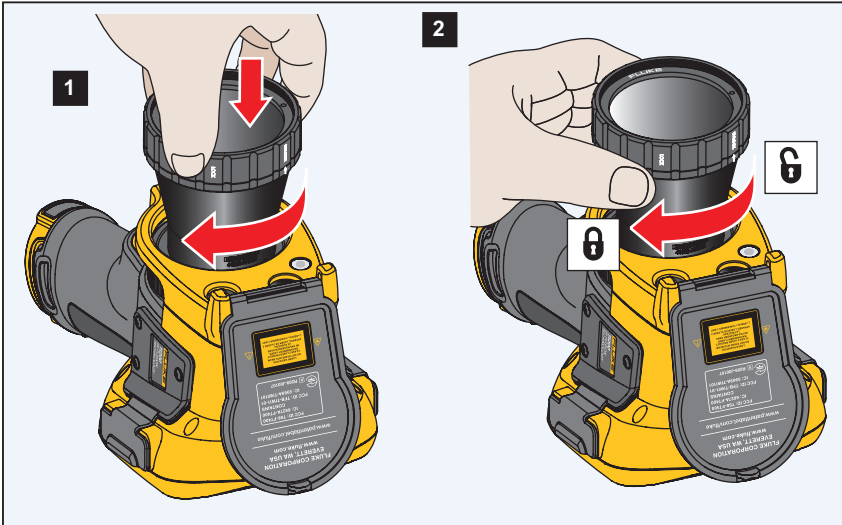


Figure 2. Add-On Lens Installation

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**Figure 3. 4X Telephoto Lens Installation**

hie09.eps

## ***Before You Start***

Carefully unpack the items in the shipment box:

- Thermal Imager
- AC Power Supply with Universal Adapters
- Two-Bay Battery Charge Base
- 2 Lithium-ion Smart Batteries
- Hard Carrying Case
- USB Cable
- HDMI Cable
- Removable Memory Card <sup>[1]</sup>
- Soft Transport Bag
- Adjustable Hand Strap (Left-hand or Right-hand use)
- Info Pack with Safety Information <sup>[2]</sup>

*Note*

[1] *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.*

[2] *To request a printed manual, email Fluke at [TPubs@fluke.com](mailto:TPubs@fluke.com). Specify the product name and language preference in the subject line.*

## **Battery**

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.

### **Warning**

**To prevent personal injury, do not put battery cells and battery packs near heat or fire. Do not put in sunlight.**

*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 indicators show “full”.
4. Remove smart batteries and disconnect the power supply when batteries are fully charged.

## **On-Imager AC Power Socket**

1. Connect the ac power adapter into an AC wall outlet and connect the dc output to the Imager's ac power socket.  flashes on the display while the battery charges with the ac power adapter.
2. Charge until the charge indicator on the display does not flash.
3. Disconnect ac power adapter when the smart battery is fully charged.

### *Note*

*Make sure that the Imager is near room temperature before you connect it to the charger. See the charging temperature specification. Do not charge in hot or cold areas. When you charge in extreme temperatures, battery capacity may be decreased.*

 shows in the lower left-hand corner of the display when the Imager is connected to ac power and the battery is removed. When the Imager's power is off and the ac power adapter is connected,  flashes in the center of the display to show that the battery charge is in process.

Keep the Imager attached to the charger until the battery condition icon shows a full charge. If you remove the Imager from the charger before a full charge shows, it may have a reduced run-time.

### *Note*

*When the battery is connected to ac power or the unit is in video mode, the Sleep Mode/Auto Off feature is disabled automatically.*

## **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.  
Charge until the indicator shows *full* on the screen.
3. Disconnect the 12 V adapter and Imager when battery is fully charged.

### **⚠ Caution**

**To prevent damage to the Imager, remove it from the DC car charger before you start or jump start the vehicle.**

## **SmartView<sup>®</sup> Software**

SmartView software is available at no cost for use with the Imager and contains features to analyze images, organize data and information, and make professional reports. You can use SmartView software to review audio annotations and photos from the IR-PhotoNotes annotation system on a PC. SmartView software is used to export IR and visible images as Bitmap (.bmp), GIF, JPEG, PNG or TIFF formatted files.

Firmware updates for new Imager features are available through SmartView software. You can enable WiFi, Bluetooth, and Fluke Connect functions with SmartView.

## **Download SmartView Software**


1. Go to <http://www.fluke.com/downloads/smartview>.  
The SmartView installer downloads automatically to the PC.
2. Follow the instructions on the PC to install SmartView software.  
(Administrator privileges are required for the installation.)
3. Restart the computer when installation is complete.

## Download Firmware

1. Open SmartView software on your PC.
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. If a new firmware release is available, SmartView software prompts you to download the firmware file. Select **Yes**.
4. Once the firmware is downloaded, SmartView software prompts you to update the firmware in the camera. Select **Update Firmware**.

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. Go to **Fluke Connect** on the Imager.
2. Go to <http://fluke.com/register/ti>.
3. On the website, select a language from the drop down box.



4. Enter your information and the serial number from the display on the Imager
5. 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.*

6. On the Imager, push **F1** or tap **Enter Code**.
7. Type in the authorization code from the website. (The authorization code is not case sensitive.)
8. 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.

9. Tap **Ok**.

## **Turn On and Off the Imager**

To turn on or turn off the Imager, push and hold  for two seconds, see Table 3. The Imager has Power Save and Auto Off features. See *Auto Off* for more information about how to set these features.

### *Note*

*All thermal imagers need sufficient warm-up time for the most accurate temperature measurements and best image quality. This time can often vary by model and by environmental conditions. Although most imagers are fully warmed up in 3-5 minutes, it is always best to wait a minimum of 10 minutes if the most accurate temperature measurement is very important to your application. When you move an Imager between environments with large differences in ambient temperature, more adjustment time can be required.*

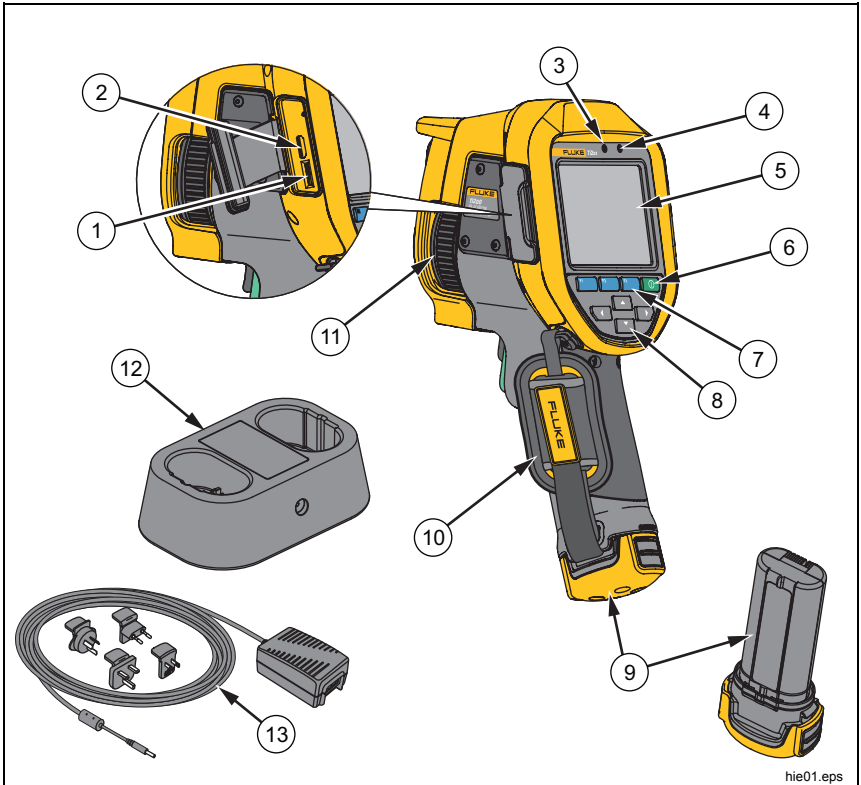
## **Operation in Extreme Conditions**

Storage and/or continual operation of the Imager in extreme ambient temperature conditions can result in temporary interruption of operation. If this occurs, let the Imager stabilize (cool down or warm up) before you resume operation.

## Features and Controls

Table 3 shows the Imager features and controls.

**Table 3. Features and Controls**



hie01.eps

Item	Description
①	Removable Micro SD Memory Card Slot
②	HDMI Connection
③	Microphone
④	Speaker
⑤	LCD Display

**Table 3. Features and Controls (cont.)**

Item	Description
⑥	ⓘ Power On/Off
⑦	Function Buttons (F1, F2, and F3)
⑧	Arrow Buttons
⑨	Lithium-ion Smart Battery
⑩	Hand Strap
⑪	Manual Focus Control
⑫	2-Bay Battery Charging Base
⑬	AC Power Supply with Universal Adapters
<p style="text-align: right; font-size: small;">hie06.eps</p>	
⑭	Connector Cover
⑮	AC Adapter/Charger Input Terminal
⑯	USB Storage Device Connection

**Table 3. Features and Controls (cont.)**

Item	Description
⑰	USB Cable Connection
⑱	LED Torch/Flashlight
⑲	Retractable Lens Cover
⑳	Visual Light Camera Lens
㉑	Laser Pointer/Range Finder
㉒	Infrared Camera Lens
㉓	Secondary Trigger
㉔	Primary Trigger

### ***Primary and Secondary Triggers***

The two-part trigger is located in the standard trigger position for a pistol-grip device. The larger, green trigger is the primary trigger. The smaller, black trigger is the secondary trigger.

In normal operation (video is off), the function of the primary trigger is to capture a thermal image for possible storage to memory by the user. When video is on, the primary trigger is the start/stop for video recording.

The secondary trigger operates the LaserSharp Auto Focus System and laser pointer. See *LaserSharp® Auto Focus System* for information about how to enable and disable the LaserSharp Auto Focus System.

## **Focus**

The Imager uses the LaserSharp Auto Focus System and an advanced manual focus system. The Ti450 also uses MultiSharp Focus. See *MultiSharp™ Focus* for details. Correct focus is important in all imaging applications. Correct focus makes sure that the infrared energy is correctly directed onto the pixels of the detector. Without correct focus, the thermal image can be blurry and the radiometric data may be inaccurate. Out-of-focus infrared images are frequently unusable or of little value.

The LaserSharp Auto Focus System, only from Fluke, uses a precision-adjusted and aligned laser pointer to indicate the area of focus. To focus with the LaserSharp Auto Focus System, depress the secondary (black) trigger on the Imager handle. Aim the laser pointer at the target. When satisfied with the location of the laser pointer, release the trigger. The system automatically, rapidly, and reliably focuses on the precise point where the laser was aimed.

### *Note*

- *The user can enable and disable the LaserSharp Auto Focus System.*
- *The laser pointer is aligned parallel to the infrared lens. If using AutoBlend Mode, the laser pointer dot will always be positioned just above the center point marker on the LCD display. However, it is easier to use your eyes to locate the visible laser pointer on the object under inspection.*

To focus with the advanced manual focus system, place finger on the electronically-driven focus wheel control and rotate the control until the inspection object is in proper focus.

### *Note*

*The user is able to use the advanced manual focus as a manual override of the LaserSharp Auto Focus System.*

## Control Buttons

Three function buttons (F1 F2 F3) and four arrow buttons (◀ ▶ ▲ ▼) are the primary controls. These buttons move the cursor through the menu structure to set the features.

Table 4 is an overview of the buttons and their actions. In live Manual Mode, the arrow buttons are always active to adjust Level and Span.

In general, push:

F1 to set the change and go back to the live view.

F2 to set the change and go back to the previous menu.

F3 to cancel the change and go back to the live view.

**Table 4. Overview of Controls**

Button	Button Label / Action
F3 or Primary Trigger	Cancel
F1 or Primary Trigger	Done (exit from Menu structure)
F1	Select or OK
F2	Back
▲ ▼ ▶ ▶	Move cursor to highlight an option

## Touch Screen

The touch screen enables you to interact directly with what is displayed. To change parameters or select function and options, touch a target on the display with a finger. Touch targets are easy to recognize, such as arrows to indicate a drop-down list for a selection of options.

The touch screen has a backlight for work in dimly lit spaces. To change the backlight intensity, see *Backlight*.

## How to Use the Menus

The menus, coupled with the three function buttons (F1, F2, F3) and arrow buttons, are the access for thermal image display, camera features, measurement, advanced functions, memory review, and settings for date, time, language, units, file format, and Imager information.

To open the primary menu, push F2. The primary menu shows secondary menus for Measurement, Image, Camera, Memory, Fluke Connect, and Settings. The text above each function button (F1, F2, F3) applies to that button throughout all menu screens.

Push F2 to open the primary menu and push ▲ ▼ ▶ ◀ to cycle through the secondary menus. Each secondary menu lists an options menu. Push ▲ ▼ ▶ ◀ to cycle through the options.

The primary, secondary, and option menus close 10 seconds after the last push of a function button. The option selection menu stays open until you make the selection, go up a menu level, or cancel the action.

## Image Capture

Point the imager at the object or area of interest. Focus on the object using the LaserSharp Auto Focus System, MultiSharp Focus, or advanced manual focus. See *Focus* for information on how to focus. Pull and release the primary trigger. This captures and freezes the image.

### Note

*MultiSharp Focus captures and freezes images differently. See MultiSharp™ Focus.*

The image is now in the memory buffer and you can choose to save or edit the image. Push F1 to save the image or pull the primary trigger again or F3 to cancel and return to the live view.






Depending on the selected file format settings, the Imager shows the captured image and a menu bar. The menu bar lets you save the image, edit some image settings, and add voice annotation or IR-PhotoNotes digital photos. To change the file format, see *File Format*.

## **Edit Captured Infrared Image**

Before saving a file, you can edit or modify the image.





To edit:

1. With an image in the buffer, go to the **EDIT** menu.
2. Push / to highlight an option: IR-PhotoNotes, Add Audio, Measurement, Image, or Add Text.
3. Push  to save the changes with the file.

## **IR-PhotoNotes™ System**

The IR-PhotoNotes photo annotation system allows the user to capture and add up to five visible (digital) images of various objects, text, or other information that is related to the analysis and reporting of an infrared image. 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. Up to five images can be captured with the visible image that is stored in addition to the aligned infrared and visible images used in IR-Fusion technology. These visible 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  to open the **EDIT IMAGE** menu.
2. Push / to highlight **IR-PhotoNotes**.
3. Push  to enter the Picture mode.

4. Focus the Imager on the object and pull the primary trigger.
5. Push **F2** when done.
6. Pull the primary trigger to capture additional pictures.
7. Push **F1** to save the pictures with the image.



### **Voice Annotation (Recording)**

To add a voice (audio) recording:

1. With an infrared image in the buffer, push **F2** to open the **EDIT IMAGE** menu.
2. Push **▲**/**▼** to highlight **Add Audio**.
3. Push **F1** to record up to 60 seconds of audio. The display updates to show the recorded time.
4. Push **F1** to pause the recorder.
5. Push **F2** when done.
6. Push **F1** to review the audio file or **F2** to save the audio with the image.

Voice annotation is only available in the .is2 file format and is stored in the file so you do not need to collate multiple files at a later time.

The voice (audio) recording replays through the Bluetooth speaker.

To play back:

1. Do the steps in the *Review Image Files* section to see the image on the display.
2. Push **F1**.
3. Push **F1** to set **Audio**.
4. Push **F1** to listen to the audio.
5. Push **F1** again to pause the audio.



## *Text Annotation*

To add a text annotation:

1. With an infrared image in the buffer, push **F2** to open the **EDIT IMAGE** menu.
2. Push **▲** / **▼** to highlight **Add Text**.
3. Push **F1** to open a keyboard on the display.
4. Use the keyboard on the display 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.

Text annotation is only available in the .is2 file format and is stored in the file so you do not need to collate multiple files at a later time.

To view a text annotation in memory:

1. Do the steps in the *Review Image Files* section to see the image on the display.
2. Push **F1** to go to the **NOTES** menu.
3. Push **F1** to open the text annotation.

## *Save Captured Infrared Image*

To save an image as a data file:

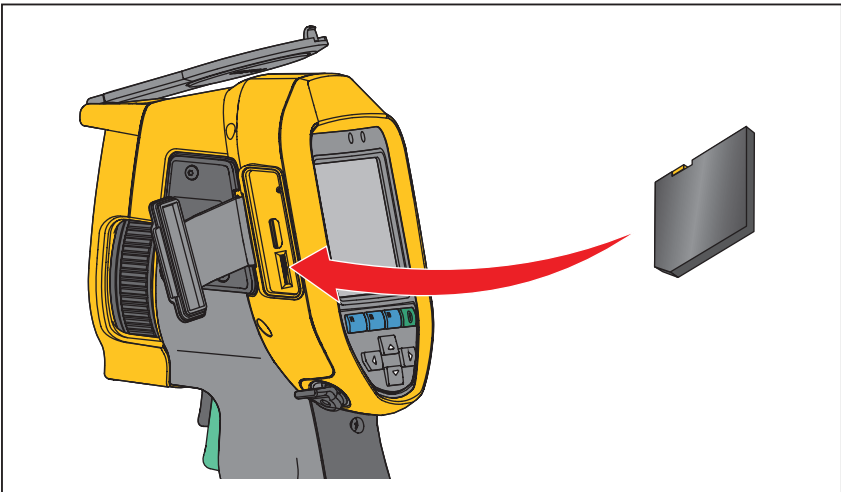
1. Focus on the object of interest or inspection area.
2. Pull the trigger to capture the image. The image is now in the buffer and you can save or edit.
3. Push **F1** to save the image as a file and go back to the live view.

## Micro SD Memory Card

To eject a Micro SD memory card, push in on the exposed edge of the card and then release. The card should pop partially out after you release it. Carefully pull the card out of the slot.

To use a Micro SD memory card, make sure that the write-protect lock is open. See Figure 4. Push the card in until it catches.

The Micro SD memory card comes with an SD adapter for insertion into a PC or multi-function card reader if desired.



**Figure 4. SD Memory Card Insertion and Removal**

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For information about how to save data, see *Save Captured Infrared Image*.  
For information about how to view or erase a stored image, see *Review Image Files* and *Delete Image Files*.

## **Temperature Measurement**

All objects radiate infrared energy. The quantity of energy radiated is based on the actual surface temperature and the surface emissivity of the object. The Imager senses the infrared energy from the surface of the object and uses this data to calculate an estimated temperature value. Many common objects and materials such as painted metal, wood, water, skin, and cloth are very good at radiating energy and it is easy to get relatively accurate measurements. For surfaces that are good at radiating energy (high emissivity), the emissivity factor is  $\geq 90\%$  (or 0.90). This simplification does not work well on shiny surfaces or unpainted metals as they have an emissivity of  $< 0.60$ . These materials are not good at radiating energy and are classified as low emissivity. To more accurately measure materials with a low emissivity, an emissivity correction is necessary. Adjustment to the emissivity setting will usually allow the Imager to calculate a more accurate estimate of the actual temperature.

### **⚠ Warning**

**To prevent personal injury, see emissivity information for actual temperatures. Reflective objects result in lower than actual temperature measurements. These objects pose a burn hazard.**

## **Menus**




The menus, together with the three function buttons (**F1**, **F2**, **F3**) and arrow buttons, are access for thermal image display, camera features, memory setup, and settings for date, time, language, units, file format, and Imager information.

## Measurement Menu

The Measurement Menu has settings for the calculation and display of radiometric temperature measurement data related to the thermal images. These settings include the Temperature Range selection, Level/Span adjustment, Emissivity, Background, Transmission, Spot Temperatures, Markers, and Center Box.




### Range





Preset measurement ranges and a Full Automatic Range are available on the Imager. To select the range:

1. Go to **Measurement > Range**.
2. Push / to select between the preset ranges or the full automatic range.
3. Push  to set the range.

### Level/Span

Level and span are set for automatic or manual adjustment. To choose between automatic or manual level and span:

1. Go to **Measurement > Set Level/Span**.
2. Push / to select between the **Auto** and **Manual** ranging or **Set Level/Span**.
3. Push  to set the new selection.

In manual mode the Set Level/Span control is active. Use / to adjust the level setting. Use / to adjust the span setting. See *Detailed Specifications* for more information about the minimum span.

### **Fast Auto/Manual Range Toggle**

When NOT in a menu mode, push and release **F1** to toggle between Auto Range and Manual Range. The icon in the upper right-hand corner of the LCD screen will indicate the change by saying Auto or Manual.

### **Fast Auto Rescale (in Manual Mode)**

When in Manual Range and NOT in a menu mode, push and release **F3** to automatically rescale the level and span range for objects in the thermal field of view. This feature operates the Imager in a semi-automatic mode if manual fine re-adjustment of level and span with the arrow buttons is not necessary. Rescaling can be done as often, or as little, as needed.

*Note*

*The Imager always powers up in the same Level and Span mode, Auto or Manual, as when it was powered down.*

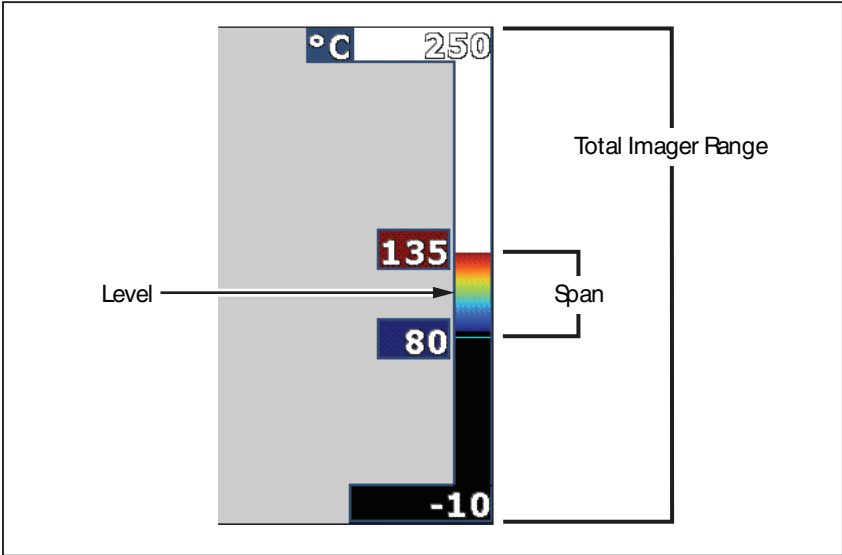
### **Temperature Level for Manual Operation Mode**

When put into manual ranging, the level setting moves the thermal span up or down within the total temperature range. See Figure 5. In the live manual mode, the arrow buttons are always available to adjust the level and span.

To set the level:

1. Push **▲** to move the span to a higher temperature level.
2. Push **▼** to move the span to a lower temperature level.

While you adjust the manual level, the scale along the right side of the display shows the thermal span as it moves to different levels within the total range.





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Figure 5. Level and Span Settings

### Temperature Span for Manual Operation Mode

When in manual mode, the span setting contracts or expands in a selected palette in a temperature range within the total range. See Figure 5. In the live manual mode, the arrow buttons are always available to adjust the level and span.

To adjust the temperature span:


1. Push  to increase or widen the temperature span.
2. Push  to decrease or narrow the temperature span.

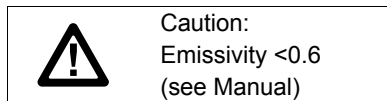
While you adjust the manual span, the scale along the right side of the display shows the thermal span increasing or decreasing in size.



## Emissivity Adjustment

The correct emissivity values are important for the Imager to make the most accurate temperature measurement calculations. Emissivity of a surface can have a large effect on the apparent temperatures that the Imager observes. Understanding the emissivity of the surface being inspected can, but not always, allow you to obtain more accurate temperature measurements.

If you set a value that is  $<0.60$ ,  shows on the Imager display with this caution:



### Note

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



Emissivity is set directly as a value, or from a list of emissivity values for some common materials.

### Note

*If the Display is set to **Display All**, you see the information about current emissivity as  $\epsilon = x.xx$ .*

## Adjust by Number




To set the emissivity value:

1. Go to **Measurement > Emissivity > Adjust Number**.
2. Push  /  to change the value.

A custom emissivity value is indicated when any value not in the standard emissivity table is selected.

## Select by Table





To select from a list of common materials:

1. Go to **Measurement > Emissivity > Select Table**.
2. Push / to highlight the material.
3. Push  to select the material.

## Background (Reflected Background Temperature Compensation)

Compensation for reflected background temperature is set in the Background tab. Very hot objects or very cold objects can affect the apparent temperature and measurement accuracy of the target or object of interest, especially when surface emissivity is low. Adjustment of the reflected background temperature can make the temperature measurement better in many situations. For more information, see *Emissivity Adjustment*.

To adjust the background temperature:

1. Go to **Measurement > Background**.
2. Push / to change the value.
3. Push  or  when done.





### Note

If the Display is set to **Display All**, you see the information about current reflected background temperature as **BG = xx.x**.

## **Transmission/Transmittance Adjustment**

When you do infrared inspections through infrared-transparent windows (IR windows), not all of the infrared energy emitted from the objects of interest is transmitted through the optical material in the window. If the transmission percentage of the window is known, you can adjust this percentage in the Imager or in the SmartView software. Adjustment of the transmission correction can make the accuracy of the temperature measurement better in many situations.

To adjust the transmission percentage:

1. Go to **Measurement > Transmission**.
2. Push / to adjust the percentage between 10 % and 100 %.
3. Push  or  when done.





### *Note*

*If Display Information is set to **Display All**, you see the information about current transmission correction as  $\tau = \text{xxx}\%$ .*

## **Spot Temperatures**

The Spot Temperatures are floating HI and LO temperature indicators that move on the display as the temperature measurements of the image fluctuate.



To turn on/off the hot and cold spot indicators:

1. Go to **Measurement > Spot Temp**.
2. Push / to highlight **On** or **Off**.
3. Push  or  to set the new value.





## Spot Markers

Up to three adjustable, fixed-temperature spot markers are available on the display. You can use these markers to highlight a region before you save the image. The marker selection is set as All Off, One Marker, Two Markers, or Three Markers.

To set a Marker:

1. Go to **Measurement > Markers**.
2. Push the / to highlight the function between **All Off**, **One Marker**, **Two Markers**, and **Three Markers**.
3. Push **F1** to set the marker option and go to the "Move Marker" display. You will see the Move Marker icon and the labels on the function buttons change to **Done**, **Next**, and **Cancel**.

To change the Marker position on the display:

1. Push     to move the Marker location on the image.
2. Push **F2** to highlight the next marker. Do Step 1 again.
3. Do Step 2 for a third marker.
4. Push **F1** when done.




## Center Box

The Center Box feature is an adjustable temperature measurement zone (box) that you can center on the infrared image. This zone (box) expands and contracts to different levels within the infrared image. The zone lets the user see an approximate maximum (MAX), average (AVG), and minimum (MIN) temperature measurement in that area. When in Auto Level and Span mode, the Imager automatically sets the level and span according to the infrared scene within the parameters of the Center Box.









*Note*

*When using the Center Box, the level and span of the Imager is adjusted to the thermal scene within the Center Box.*

To enable or disable the Center Box feature:

1. Go to **Measurement > Center Box**.
2. Push / to highlight **On** or **Off**.
3. Push  to set the new value.

To set the size of the **Center Box** when enabled:

1. Push / to highlight **Set Size**.
2. Push  to go to the adjustment screen.
3. Push  to increase the size of the **Center Box**.
4. Push  to reduce the size of the **Center Box**.
5. When satisfied with the size of the **Center Box**, push:
  -  to set the change and exit the menus.
  -  to set the change and go back to the previous menu.
  -  to cancel the change and go back to the live view.

## **Image Menu**

The Image menu has controls for different features used in the presentation of the infrared image on the Imager's LCD and some saved image and video files.

*Note*

*Data saved as .is2 or .is3 formats can easily be modified within SmartView software. Still images saved in .bmp or .jpg format, as well as video saved in .avi format will retain image settings at the time of capture and save.*

## Palette

The Palette menu lets you change the false-color presentation of the infrared images on display or captured. Some palettes are more suitable for specific applications and can be set as required. Two different palette presentation modes are available, see Table 5. The Standard Palettes offer an equal, linear presentation of colors that allow for best presentation of detail. The Ultra Contrast™ Palettes offer a weighted presentation of colors. These palettes work best in situations with high thermal contrast for extra color contrast between the high temperatures and low temperatures.

**Table 5. Palettes**

<b>Standard Palettes</b>	<b>Ultra Contrast™ Palettes</b>
Grayscale	Grayscale Ultra
Grayscale Inverted	Grayscale Inverted Ultra
Blue-Red	Blue-Red Ultra
High Contrast	High Contrast Ultra
Hot Metal	Hot Metal Ultra
Ironbow	Ironbow Ultra
Amber	Amber Ultra
Amber Inverted	Amber Inverted Ultra

To switch between palettes:

1. Go to **Image > Palette > Standard** or **Ultra Contrast**.
2. Push  /  to highlight a palette.
3. Push  to set the new palette.

To change the palette color:

1. Go to **Image > Palette > Set Palette**.
2. Push / to highlight the palette color.
3. Push  to set the new palette color.

Saturation Colors is an option that you can choose as off, standard, red/blue, or white/black.

### **IR-Fusion<sup>®</sup> Technology**

IR-Fusion technology makes it easier to understand, analyze, and communicate infrared images through the use of an aligned visible image and infrared image. The Imager automatically captures a visible image with every infrared image to show you precisely where a potential problem might be, and then allows you to more effectively communicate it to others.

IR-Fusion technology has different modes:



Picture-in-Picture (PIP) AutoBlend™ (PIP 25%, PIP 50%, PIP 75%, PIP 100%)



Full AutoBlend™ (IR 25%, IR 50%, IR 75%, IR 100%).






Visible



#### *Note*

*The visible image and infrared image can be customized or separated in SmartView and Fluke Connect Software when you use the .is2 file format.*

To set the IR-Fusion technology mode:

1. Go to **Measurement > Image > IR-Fusion**.
2. Push / to highlight an option.
3. Push  to set the new option.

When you are in Auto Level and Span mode, and not in a sub-menu, you can use the up and down arrows to quickly adjust the blending.

Push  /  to change the blending between 100% infrared, 75%, 50%, 25%, and full visible in Full AutoBlend or Picture-in-Picture mode.


## **Color Alarms**

The Imager has various apparent temperature color alarms. 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 alarm level. The low-temperature (or dew point) color alarm shows a full visible image and only shows infrared information on objects or areas that are below the set apparent temperature (or set dew point) color alarm level. The user must manually determine and set these parameters. The imager also displays color isotherms, or infrared information, inside or outside of a set of both high and low limits.

### *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, manual determination and input of surface dew point temperature will yield the best results. Depending on the situation, the colors presented may help identify areas of concern with possible dew point condensation.*

To view the Color Alarm menu:

1. Go to **Image > Color Alarm**.
2. Push  to view the menu.

## **Set High-Temperature Color Alarm**

To set a high-temperature color alarm:

1. Go to **Image > Color Alarm > Set High Alarm**.
2. Push  /  to adjust the temperature setting.
3. Push  or  set the new value.



## Set Low-Temperature (or Dew Point) Color Alarm

To set a low-temperature/dew point color alarm:

1. Go to **Image > Color Alarm > Set Low Alarm**.
2. Push **▲/▼** to adjust the temperature setting.
3. Push **F1** or **F2** set a new value.

## Outside/Inside Alarm

If you set values for the high-temperature color alarm and a low-temperature color alarm, the Imager will have the options for inside or outside isotherm color alarms.

To set an outside/inside isotherm color alarm:

1. Go to **Image > Color Alarm > Outside or Inside**.
2. Push:  
**F1** to set the change and go back to the live view.  
**F2** to set the change and go back to the previous menu.  
**F3** to cancel the change and go back to the live view.

## Display Graphics Presentation

The options for how you view the on-screen graphics are in the Display menu. These options are Display All, Details and Scale, Scale Only, and Image Only.

To set the display:

1. Go to **Image > Display**.
2. Push **▲/▼** to highlight an option.
3. Push **F1** or **F2** set a new option.

### *Note*

*Features that have On/Off controls must be turned on and turned off with those controls.*

## **Image Enhancement (Ti450)**

The Imager has an image enhancement menu used to activate the advanced features of the Imager: Filter Mode, MultiSharp Focus, and SuperResolution.

To use the advanced features:

1. Go to **Image > Image Enhancement**.
2. Push  /  to highlight an option.
3. Push  or  set a new option.

You can only activate MultiSharp Focus or SuperResolution individually. You can use Filter Mode with either MultiSharp Focus or SuperResolution.

To turn off MultiSharp Focus mode or SuperResolution mode, go to **Image > Image Enhancement > Off**.

### **Filter Mode**

Filter mode combines values from successive frames within a small range of temperatures to reduce pixel noise in the image. Use Filter Mode to reduce the thermal sensitivity (NETD) of the Imager as low as 30 mK. You can set the filter level to low, medium, or high. Hold the Imager steady as you do the inspection.

### **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. You can process the images in the camera or in SmartView software.

To use:

1. Point the Imager at your intended target(s) and press the primary trigger.

*Note*

*The minimum focus distance with MultiSharp Focus and a standard lens is 15 cm (6 inches). For optimum performance, position the camera  $\geq 23$  cm (9 inches) from the closest target. MultiSharp Focus also works with all compatible lenses.*

2. Hold the Imager still while it captures the images. **Saving...** shows on the display for ~2 seconds for a 60 Hz model or ~5 seconds for a 9 Hz model. You can move the imager when **Saving...** no longer shows on the display. If necessary, use a tripod.

In MultiSharp Focus mode, the Imager collects the images in the camera and shows the focused image on the display in ~8 seconds for a 60 Hz model or ~15 seconds for a 9 Hz model. Confirm the image on the display is what you need. If possible, process the images on the Imager.

In MultiSharp Focus (In PC only) mode, the Imager collects the images in a single file and shows the image on the display as it appears before you press the trigger (~2 seconds for a 60 Hz model or ~5 seconds for a 9 Hz model). In MultiSharp Focus (In PC only) Mode, you cannot view the focused image on the Imager. If necessary, use a tripod to hold the Imager steady. If possible, download, process, and view the image(s) on your computer while you are at the job site. To view the focused image, open the image with SmartView software. Set the file format to .is2 for the MultiSharp Focus (In PC only) mode to work.

*Note*

*Some targets have abnormal thermal characteristics that can cause the MultiSharp Focus algorithm to fail. If MultiSharp Focus mode does not capture a clear image, use LaserSharp Auto Focus or manual focus.*

## SuperResolution

SuperResolution uses a 320 x 240 sensor to capture micro movements to create a 640 x 480 image.

To use:




1. Press the trigger.
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.

## Logo


A Fluke logo shows on the display and captured images. You can choose to turn on or turn off the logo:

1. Go to **Image > Logo**.
2. Push  /  to highlight **On** or **Off**.
3. Push  to set.

With SmartView software, you can upload a custom logo to the Imager from your PC through the USB connection.

## Distance

The Imager has a laser distance finder that measures, up to 30 meters, the distance from the Imager to a target. You can choose to show the distance on the display in imperial or metric units. The distance is saved to memory as part of the image.




The laser warning symbol () shows in the Header zone of the display when you pull the secondary trigger.

## **Warning**

To prevent eye damage and personal injury:

- **Do not look into the laser. Do not point the laser directly at persons or animals or indirectly off reflective surfaces.**
- **Do not open the Product. The laser beam is dangerous to eyes. Have the Product repaired only through an approved technical site.**

To use the distance measurement feature:




1. Go to **Image > Distance**.
2. Push / to select **On/Off** or **Units**.
3. Push  to set the change and go back to the live view.
4. Point the Imager at the target.
5. Pull the secondary trigger.
6. Locate the red laser dot on the target.
7. Release the Laser Distance Finder button.

The distance measurement shows on the bottom of the display. The measurement shows as “- - -” when the Imager is not able to take a measurement. If this is the case, steady the Imager and retake the measurement. Or, use a tripod. The Imager will show an error message for excessive laser movement due to an out of range distance.

## **Zoom (Ti450)**

The Imager has 1X, 2X, and 4X digital zoom. 1X is the default Zoom setting.

To set:

1. Go to **Image > Zoom**.
2. Push / or touch the target to change the setting.
3. Push  or touch **Done** to select the new setting.

## Camera Menu


The Camera menu has controls and options for secondary camera features such as auto focus, backlight level, and torch.

### LaserSharp® Auto Focus System




The laser pointer on the Imager is both a sighting aid and a part of the LaserSharp® Auto Focus System. In addition, the advanced manual focus of the Imager works both when the auto focus system is enabled or disabled.

#### Warning

**To prevent eye damage and personal injury, do not look into the laser. Do not point laser directly at persons or animals or indirectly off reflective surfaces.**

The laser warning symbol () shows in the Header zone of the display when you pull the secondary trigger.




To turn on or turn off the LaserSharp® Auto Focus System and the laser pointer:

1. Go to **Camera > Auto Focus**.
2. Push  /  to select **On** or **Off**.
3. Push  to set the change and go back to the live view.

When the laser pointer is turned on, the secondary trigger is the control for the LaserSharp® Auto Focus System. Point the Imager in the general direction of the object of interest. Pull and hold the secondary trigger to locate the laser dot on the specific area of interest. Release the trigger. The auto focus system will quickly and accurately focus on the object.

## **Backlight**


The backlight level control is set to low, medium, and high. To set the backlight:

1. Go to **Camera > Backlight**.
2. Push / to highlight high, medium, or low.
3. Push  to set a new value.

## **Torch**

The torch illuminates darker work areas.

To set:




1. Go to **Camera > Torch**.
2. Push  to toggle the torch between on and off.

## **Video**

The Imager has .avi (with mpeg encoding) and .is3 radiometric video capture. The 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 for video recording.

The Video selection options are Video/Audio and Video Only.





To set:

1. Go to **Camera > Video**.
2. Push / to highlight an option.
3. Push  to set the option.

The video capture format is set in the Settings menu. For more information, see *File Format*.










## Record Video

To record:

1. Pull the primary trigger to start recording. The  icon shows in the upper left corner of the display and the recording time graphic at the bottom of the display shows the elapsed recording time.
2. Pull the primary trigger to pause recording. The  icon shows in the upper left corner of the display.
3. Push  to end the recording session.
4. Push  to save the video file.

## Playback Video

To playback:

1. Go to **Memory**.
2. Push / to highlight a file for playback. All video files show the  icon in the upper right corner of the thumbnail.
3. Push  to set a file for playback.
4. Push  to start the playback. During playback, push  or  for fast forward and rewind. Push  to continue normal playback.
5. Push  to exit the playback mode.

## Auto Capture





The Auto Capture feature allows you to set the Imager to capture and save an infrared image, or series of images, automatically. Image capture can be triggered manually or with an “apparent temperature” trigger. The temperature trigger is set to start when a value is above or below a set limit. Regardless of how the capture starts, you can set the interval for when successive images are captured and saved. You also can set the number of images that are captured and saved. The upper limit on how many images is dependent on the amount of storage memory available.



To set and operate the Auto Capture feature:

1. Go to **Camera > Auto Capture**.
2. Push **Start Capture** to start the capture sequence.

In the Auto Capture sub-menu, you will see these options:

- **Start Capture:** Executes the Auto Capture settings in camera memory.
- **Interval:** Push / to select the number of hours, minutes, or seconds as an interval between images.
- **Image Count:** Push / to manually select a number of images. Or, push the **Maximum Memory** button to select the option that will continue capturing and saving images until the chosen storage memory is filled or battery power is depleted.
- **Manual Trigger:** When Manual Trigger is selected, push **Start Capture** to start the automatic capture of a series of images.
- **Temp Trigger:** Select **Temp Trigger** and then select **Set Temp Trigger** to open the adjustment menu.

*Note*

*The minimum interval available can be affected by the file type and visible light camera settings chosen by the user. Some combinations create larger file sizes that take longer to capture and save and create a higher minimum interval compared to others.*




## Wireless





The Imager is equipped with several wireless connectivity options.



## Bluetooth®

Bluetooth is available to connect a device such as a wireless headset. When Bluetooth is on,  shows on the display (upper left corner).

To use Bluetooth:

1. Go to **Camera > Wireless > Bluetooth**.
2. Push / to highlight **On**.
3. Push **Select** to scan for available Bluetooth devices within range of the camera.
4. Push / to select a device.
5. Push **F1** to connect/disconnect.
6. Enter a password if you are prompted.





*Note*

*WiFi for indoor use only in Kuwait, Chile, and United Arab Emirates.*





## **WiFi™ Hotspot**

You can wirelessly download saved pictures or stream live images from the Imager to a PC with SmartView Analysis and Reporting software or to a mobile device with the Fluke Connect App. See *Stream Live to a PC* and *Fluke Connect® Wireless System* for more information.

To create a Hotspot:

1. Go to **Camera > Wireless > WiFi Hotspot**.
2. Push / to highlight **On**.
3. Push **F1** to set the option.

To change the settings:

1. Go to **Camera > Wireless > WiFi Hotspot**.
2. Push / to highlight **Off**.
3. Push / to highlight **Settings**.

4. Push **▲/▼** to highlight an option:
  - **Name (SSID)** to change the SSID
  - **Password** to turn the password on/off or to change the password
  - **Channel** to change the channel
5. Push **F1** to select the option.
6. Push **F2** to go back.
7. Push **F3** again to use the camera.

### WiFi™ Network

When the WiFi Network is active on the Imager, the Imager can connect to a WiFi network. When the Imager is connected to a WiFi network, you can sign into your Fluke Connect account on the Imager. See *Sign In*.

To turn on the WiFi Network feature:








1. Go to **Camera > Wireless > WiFi Network**.
2. Push **▲/▼** to highlight **On**.
3. Push **Select** to scan for available networks within range of the Imager.
4. Push **▲/▼** to select a network.
5. Push **F1** to connect/disconnect.
6. Enter a password if you are prompted.

### CNX

The Imager supports the Fluke CNX™ Wireless System (may not be available in all regions). It can discover up to 10 3000 Series wireless tools up to 20 meters away. From those 10 tools, you can select five tools to view their live measurements on the Imager display.


The system works with Fluke CNX tools that were manufactured between 2012 and 2013. The Fluke CNX system was replaced by Fluke Connect software in current tools.

To discover a supported tool:

1. Turn on the tool.
2. Turn on the wireless feature on the tool.
3. Repeat steps 1 and 2 for each tool.
4. Go to **Camera > Wireless > CNX**.
5. Push / to highlight **On**.
6. Push  to scan for available tools within range of the Imager.
7. Push / to highlight a tool.
8. Push  to select the tool.
9. Repeat steps 8 and 9 for each tool to show their measurements on the display.
10. Push .

The labels change to include an Edit function.

The Imager shows and saves the data for the selected tools.

11. Push  to exit the CNX setup menu.

## Sign In

When the Imager is connected to a WiFi network, you can sign into your Fluke Connect account on the Imager and use Fluke Connect Instant Upload. See *WiFi™ Network*. When you use Fluke Connect Instant Upload, the images you take with the Imager automatically upload to your Fluke Connect account in the Fluke Cloud. You can view the images saved in the Fluke Cloud on the Fluke Connect app or the Fluke Connect website without the mobile device and Imager connected to each other.

### Note

*The Instant Upload feature may not work on all networks or with all devices due to the security profiles on different networks.*

To sign in to your account:

1. Go to **Camera > Wireless > Sign In**.
2. Enter your user name.





3. Push **F1**.
4. Enter your password.
5. Push **F1**.  
 shows on the display.

To sign out:

1. Go to **Camera > Wireless > Sign Out**.
2. Push **F1**.

## **Memory Menu**

The Memory Menu allows you to review captured images and videos. An icon shows with the file name to indicate any additional information that has been saved with the infrared image or IR-Fusion technology image:

-  IR-PhotoNotes photos
-  Voice annotation
-  Video
-  Text annotation

## **Review Image Files**

To view stored images in memory:

1. Go to **Memory**.
2. Push **▲/▼** to highlight the thumbnail of the file for review.
3. Push **F2** to review the file.

## **Delete Image Files**

To erase one image from memory:

1. Go to **Memory**.
2. Push **▲/▼** to highlight the thumbnail of the file to delete.

3. Push **F2** to open the **Delete** menu.
4. Highlight **Selected Image** and push **F1**. The Imager prompts you to continue or cancel.
5. Push **F1** again to delete the file.

To erase all the images from memory:

1. Go to **Memory**.
2. Push **F2**.
3. Highlight **All Images** and push **F1**. The Imager prompts you to continue or cancel.
4. Push **F1** to delete all files in memory.

## **Fluke Connect<sup>®</sup> Wireless System**

The Imager supports the Fluke Connect Wireless System (may not be available in all regions). The Fluke Connect system wirelessly connects your Fluke test tools with an app on your mobile device. It can show images from your infrared camera on your smartphone or tablet screen for you to share with your team.

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. Turn on the Imager.
2. On the Imager, go to **Fluke Connect > Pair to Fluke Connect Mobile App > On**.
3. On your mobile device, go to **Settings > Wi-Fi**.

4. Select the Wi-Fi network that begins with **Fluke...**
5. Go to the Fluke Connect App and select **Thermal Imager** from the list.

You are now able to take images on the Imager. Images 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 Image Storage). Images stored on the SD card or USB storage device may not transfer to the Fluke Connect app.*

6. Push the Image Capture button on the Imager to capture the image.  
The image is now in the buffer and you can save or edit.
7. Push **F1** to save the image and view the image on the phone app.

Go to [www.flukeconnect.com](http://www.flukeconnect.com) for more information about how to use the app.

## **Fluke Connect Tools**

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. On the Imager, go to **Menu > Fluke Connect > Pair to Fluke Connect Tools**.
4. Push **▲/▼** or touch **On** to highlight the selection.
5. Push **F1** to save the 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.

6. Push **▲/▼** or touch the target to select a tool name.
7. Push **F1** or touch **Select** to select the tool.

8. Repeat steps 6 and 7 to select each tool.
9. 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. Push / to highlight the tool name.
2. Push  or touch the **Edit** target. The Edit menu gives you a choice to display the measurement data and save it with the image to the memory location selected in the Settings menu.




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

## **Settings Menu**

The Settings menu has adjustments for user preferences such as units of temperature measurement, file format of stored data, “save to” location choice, auto off settings, WiFi and Bluetooth settings, date, time, and language. This menu also has a section that displays information about the Imager such as model number, serial number, and firmware versions. Certificates and licenses are available from this menu.

### **Units**

To change the temperature units:


1. Go to **Settings > Units**.
2. Push / to highlight an option.
3. Push  to set an option.



## *File Format*

Data can be saved to the internal memory, micro SD memory card, or a USB storage device in different file formats. Image format selections are .bmp, .jpg, and .is2. The video format selections are .avi and .is3. These selections remain valid when you turn the Imager off or on.

To change the file format:

1. Go to **Settings > File Format**.
2. Push / to highlight an option.
3. Push  to set the option.

Images saved in the .is2 file format have the consolidation of all data into a single file and are more flexible for analysis and modification in the included SmartView software. You can also use the Fluke Connect app (where available) to view and edit .is2 images. This file format consolidates the infrared image, radiometric temperature data, visible image, voice annotation, and photos from the IR-PhotoNotes photo annotation system into one location.

For situations where a smaller file size with maximum resolution is needed and modification is not, choose the .bmp file format. For the smallest file size where modification is not needed and image quality and resolution are not as important, choose the .jpg file format.

The .bmp and .jpg files can be emailed and then opened on most PC and MAC systems without special software. These formats do not allow full analysis capabilities or modification.

The .is2 file format can be emailed and then opened with SmartView software. This format has the maximum versatility. Visit the Fluke website or contact Fluke to find out how to download SmartView analysis and reporting software at no charge.




## VLCM (Visual Light Camera) Resolution

The visual light camera can be set to different megapixels (MP): 0.3 MP, 1.2 MP, or 5.0 MP.

### Note

To use the Image Enhancement features on the Ti450, use the 0.3 MP setting.

To set:

1. Go to **Settings > File Format > Image Format > VLCM Resolution**.
2. Push / to highlight an option.
3. Push  to set the option








## Auto Off

The Auto Off timer is user-defined separately for the LCD and power.

### Note

Auto Off is automatically disabled when the battery is connected to AC Power.



To set the Auto Off feature:

1. Go to **Settings > Auto Off**.
2. Push   to highlight **LCD Time Out** or **Power Off**.
3. Push / to set the timer between 1 minute and 120 minutes.
4. Push  to set.

## Date

The date can be displayed in one of two formats: **MM/DD/YY** or **DD/MM/YY**.

To set the date:

1. Go to **Settings > Date**.
2. Push / to highlight the date format.

3. Push **F1** to set a new format.
4. Push **▲**/**▼** to highlight **Set Date**.
5. Push **F1** to open the Set Date menu.
6. Push **▶**/**◀** to select highlight day, month, or year.
7. Push **▲**/**▼** to change the settings.
8. Push **F1** to set the date and exit the menu.

To set the time:

1. Go to **Settings > Time**.

Time displays in two different formats: 24 hour or 12 hour. To set the time format:

2. Push **▲**/**▼** to highlight time format.
3. Push **F1** to select.
4. Highlight **Set Time**.
5. Push **F1** to open the Set Time menu.
6. Push **▶**/**◀** to highlight hours or minutes.

The 12 hour format has a selection to set the time as AM or PM.

7. Push **▲** or **▼** to change the setting.
8. Push **F1** to set the change.

## *Language*

To change the display to a different language:

1. Go to **Settings > Language**.
2. Push **▲** or **▼** to highlight the setting.
3. Push **F1** to set a new language.

## *Image Storage*

The storage setting allows you to choose to save images to the internal memory, a micro SD memory card, or a USB storage device.

1. Go to **Settings > Image Storage**.
2. Push  or  to change the setting.
3. Push  to select the new storage setting.

## *Advanced Settings*

### **Filename Prefix**

The default filename starts with IR\_. You have the option to change this prefix to a different 3-character name with the touch screen keyboard.

### **Reset Filename**

You can reset the file number to 00001.





### **Factory Defaults**

Erases all user-set preferences and restores all of the factory default settings.





### **Imager Information**

You can access information about the version, certifications, and licenses for the Imager from the Settings Menu.







To display the Imager Info:

1. Go to **Settings > Advanced > Imager Info**.
2. Push / to highlight **Version**.
3. Push  to view the information screen with model number, serial numbers, and firmware versions.
4. Push  to close the information screen.

To display the electronic certifications:

1. Go to **Settings > Advanced > Imager Info**.
2. Push / to highlight **Certificates**.
3. Push  to view the information screen with the Image certifications.
4. Push  to close the information screen.

To display the license information:

1. Go to **Settings > Advanced > Imager Info**.
2. Push / to highlight **Licenses**.
3. Push  to view the information screen with a list of Open Source Software Licenses.
4. Push / to scroll to a specific license.
5. Touch the license name on the screen to view the information screen with the specific license agreement.
6. Push  to close the information screen.

## **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. Open the SmartView software on the PC.
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. Choose **Remote Display** from  on the PC.

To stream live to a PC wirelessly:

1. Turn on the WiFi Hotspot on the Imager. See *WiFi™ Hotspot*.
2. From the networks on the PC, 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.*

3. Open the SmartView software on the PC.



appears on the SmartView software toolbar menu.

4. Choose **Remote Display** from  on the PC.

## **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 (Ti400 and Ti450)**

The Imager can be remotely controlled with a PC that has SmartView software installed or with a mobile device that has the Fluke Connect app.

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).

You can control all of the menus on the Imager from the PC. You cannot control the menus on the Imager directly.

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 on the Imager even while the mobile device remotely controls the Imager.

## **Maintenance**

The Imager does not require maintenance.

### **Warning**

**To prevent eye damage and personal injury, do not open the Product. The laser beam is dangerous to eyes. Have the Product repaired only through an approved technical site.**

## **How to Clean the Case**

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**

### **⚠ Warning**

To prevent personal injury and for safe operation of the Product:

- Do not put battery cells and battery packs near heat or fire. Do not put in sunlight.
- Do not disassemble or crush battery cells and battery packs.
- Remove batteries to prevent battery leakage and damage to the Product if it is not used for an extended period.
- Connect the battery charger to the mains power outlet before the charger.
- Use only Fluke approved power adapters to charge the battery.
- Keep cells and battery packs clean and dry. Clean dirty connectors with a dry, clean cloth.

### **⚠ Caution**

To prevent damage, do not expose Product to heat sources or high-temperature environments such as an unattended vehicle in the sun.

To get the best performance from the lithium-ion battery:

- Do not store the Imager on the charger for more than 24 hours as reduced battery life may result.
- Charge the Imager for a two-hour minimum at six-month intervals for maximum battery life. Without use, the battery will self-discharge in approximately six months. Batteries stored for long periods will need two to ten charging cycles for full capacity.



- Always operate in the specified temperature range.
- Do not store the batteries in extreme cold environments.
- Do not attempt to charge the batteries in extreme cold environments.

 **Caution**

**Do not incinerate the Product and/or battery. Go to Fluke's website for recycling information.**

## **General Specifications**

### **Temperature**

Operating .....	-10 °C to 50 °C (14 °F to 122 °F)
Storage .....	-20 °C to 50 °C (-4 °F to 122 °F) without batteries

**Relative Humidity**..... 10 % to 95 % non-condensing

### **Altitude**

Operating .....	2000 m
Storage .....	12 000 m

**Display**..... 8.9 cm (3.5 in) touchscreen diagonal landscape color VGA (640 x 480) LCD with backlight

### **Power**

**Batteries**..... 2 Lithium-ion rechargeable smart battery packs with 5-segment LED display to show charge level.

**Battery Life**..... 3-4 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 V ac to 220 V ac, 50/60 Hz, included), or in-Imager charging. Ac universal adapters included. Optional 12 V automotive charging adapter.

**AC Operation** ..... AC operation with included power supply: 110 – 220 Vac, 50/60 Hz, ac universal adapters included

**Power Save** ..... User-selectable Sleep and Power Off modes

<b>Safety</b> .....	IEC 61010-1: Pollution Degree 2
<b>Wireless Radio</b>	
Frequency .....	.2412 MHz to 2462 MHz
Output Power .....	<100 mW
<b>Electromagnetic Compatibility (EMC)</b>	
International.....	EN61326-1, CISPR 11: Group 1, Class A
<i>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.</i>	
<i>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.</i>	
<i>Emissions that exceed the levels required by CISPR 11 can occur when the equipment is connected to a test object.</i>	
Korea (KCC).....	Class A Equipment (Industrial Broadcasting & Communication Equipment)
<i>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.</i>	
USA (FCC) .....	47 CFR 15 Subpart C Sections 15.207, 15.209, 15.249
<b>Vibration</b> .....	0.03 g <sup>2</sup> /Hz (3.8 gm), 2.5 gm, IEC 68-2-6
<b>Shock</b> .....	25 G, IEC 68-2-29
<b>Drop</b> .....	2 meter (with standard lens)
<b>Size (H x W x L)</b> .....	27.7 cm x 12.2 cm x 16.7 cm (10.9 in x 4.8 in x 6.5 in)
<b>Weight (includes battery)</b> .....	1.04 kg (2.3 lb)
<b>Enclosure Rating</b> .....	IP54
<b>Calibration Cycle</b> .....	2 years (assumes normal operation and normal aging)
<b>Supported Languages</b> .....	Czech, Dutch, English, Finnish, French, German, Hungarian, Italian, Japanese, Korean, Polish, Portuguese, Russian, Simplified Chinese, Spanish, Swedish, Traditional Chinese, and Turkish

## **Detailed Specifications**

### **Temperature Measurements**

Temperature Range (not calibrated below -10 °C)	
Ti200, Ti300.....	-20 °C to +650 °C
Ti400, Ti450.....	-20 °C to +1200 °C
Accuracy.....	±2 °C or 2 % (whichever is greater) at 25 °C ambient
On-screen emissivity correction.....	all models
On-screen reflected background temperature compensation.....	all models
On-screen transmission correction.....	all models

### **Imaging Performance**

Image Capture Frequency.....	9 Hz or 60 Hz refresh rate depending on model variation
Detector Type: Focal Plane Array, uncooled microbolometer	
Ti400, Ti450.....	320 X 240
Ti300.....	240 X 180
Ti200.....	200 X 150
SuperResolution	
Ti450.....	Captures and combines 4X the data to create a 640 x 480 image
Thermal Sensitivity (NETD)	
Ti450.....	≤0.05 °C at 30 °C target temp (50 mK) (30 mK in Filter Mode)
Ti300, Ti400.....	≤0.05 °C at 30 °C target temp (50 mK)
Ti200.....	≤0.075 °C at 30 °C target temp (75 mK)
Total pixels	
Ti400, Ti450.....	76 800
Ti300.....	43 200
Ti200.....	30 000
Infrared spectral band.....	7.5 µm to 14 µm (long wave)

### **Visual (Visible Light) Camera**

Type.....	Industrial performance 5.0 MP
Parallax alignment with standard IR lens.....	From ~60 cm (~24 in) to infinity

**Standard Infrared Lens**

Field of View .....	24 ° x 17 °
Spatial Resolution (IFOV)	
Ti400, Ti450 .....	1.31 mRad
Ti300 .....	1.75 mRad
Ti200 .....	2.09 mRad
Minimum Focus Distance .....	15 cm (6 in)

**Optional 2X telephoto infrared lens**

Field of View .....	12 ° x 9 °
Spatial Resolution (IFOV)	
Ti400, Ti450 .....	0.65 mRad
Ti300 .....	0.87 mRad
Ti200 .....	1.05 mRad
Minimum Focus Distance .....	45 cm (18 in)

**Optional 4X telephoto infrared lens**

Field of View .....	6 ° x 4.5 °
Spatial Resolution (IFOV)	
Ti400, Ti450 .....	0.33 mRad
Ti300 .....	0.44 mRad
Ti200 .....	0.53 mRad
Minimum Focus Distance .....	1.5 m (5 ft)

**Optional wide-angle infrared lens**

Field of View .....	46 ° x 34 °
Spatial Resolution (IFOV)	
Ti400, Ti450 .....	2.62 mRad
Ti300 .....	3.49 mRad
Ti200 .....	4.19 mRad
Minimum Focus Distance .....	15 cm (6 in)

**Digital Zoom**.....2X and 4X

**Focus Mechanism**

LaserSharp® Auto Focus System .....	all models
Advanced Manual Focus .....	all models
MultiSharp™ Focus.....	Ti450

**Image Presentation**

Standard Palettes .....	Blue-Red, Grayscale, Inverted Grayscale, High Contrast, Amber, Inverted Amber, Hot Metal, Ironbow
Ultra Contrast™ Palettes .....	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 On-board Flash Memory..... 4 GB
- Micro SD Memory Card ..... Includes ≥4 GB memory card to store at least 2000 fully radiometric (.is2) IR and linked visual images each with 60 sec voice annotations or 5000 basic (.bmp, .jpg) files
- 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.*

File Formats.....	Non-Radiometric (.bmp, .jpg) or Fully-Radiometric (.is2) No analysis software required for Non-Radiometric (.bmp, .jpg) files
Export File Formats with SmartView Software .....	Bitmap (.bmp), GIF, JPEG, 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.)

Voice Annotation .....≤60 sec recording time per image. Reviewable playback on camera. Optional Bluetooth headset available, but not required.

IR-PhotoNotes Annotations.....5 images

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

(Ti400 and Ti450 only) .....SmartView software or Fluke Connect app.

**Wireless Connectivity** .....PC, Mobile Device (iOS 4s or newer or Android™ 4.3 or newer), and WiFi to LAN (where available)