

# **TiS**

## Thermal Imaging Scanner

### Users Manual

June 2010

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## ***Introduction***

The Fluke TiS Thermal Imaging Scanner (hereafter “the Imager”) produces infrared images on a 640 X 480 display. Thermal images are displayed on the Imager LCD and can be saved to an SD Memory card. Transferring images to a PC is accomplished by removing the SD memory card and connecting it to a PC through the included card reader. SmartView<sup>®</sup> software is included for image analysis and report generation from these saved images.

The thermal image temperature range starts at -20 °C, and goes up to +100 °C. The thermal image can be displayed using any one of a number of color palettes.

Imager power is supplied by a rechargeable Nickel Metal-Hydride battery.

A full visual image (640 X 480) can be displayed and stored with each IR image. The Imager operates in full-time thermal image mode only.

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: +81-3-3434-0181
- Singapore: +65-738-5655
- 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/usen/support/manuals>.

## Safety Information

Use the Imager only as specified in this manual. See Table 1 for a list of symbols used on the Imager and in this manual.

A **Warning** identifies hazardous conditions and actions that could cause bodily harm or death.

A **Caution** identifies conditions and actions that could damage the Imager or cause permanent loss of data.










### Warning

**To avoid a burn hazard, remember that highly reflective objects will result in lower than actual temperature measurements. See Emissivity information later in this manual for more information.**

**Do not use in a manner not specified in this manual or the protection provided by the equipment may be impaired.**

**To avoid injury from explosion, chemical burns, or fire, follow all battery care and charging instructions in this manual.**

Table 1. Symbols

Symbol	Description	Symbol	Description
	Battery condition.		Battery charging.
	Conforms to requirements of European Union and European Free Trade Association.		Important information. See manual.
	Imager connected to battery charger.		Audio recording associated with the displayed image.
	On Off Symbol		Imager in sleep mode or audio paused.
	Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.		

## **Unpacking the Imager**

Carefully unpack the following items:

- TiS Thermal Imaging Scanner
- AC Power Adapter/Charger
- Rugged Carrying Case
- SD Memory Card
- SD Card Reader
- Soft Transport Bag
- SmartView<sup>®</sup> Software
- Warranty Registration Card

### *Note*

*Fluke recommends the use of the supplied SD memory card with the Imager. Fluke does not warrant the use or reliability of aftermarket SD memory cards of different brands or capacities.*

## **Charging the Battery**

Before using the Imager for the first time, charge the battery for at least two hours. The Imager's battery condition is displayed in the upper-left corner of the display. When the last segment of the battery icon extinguishes, the Imager will shut down and will require recharging before operating again. To charge the Imager's battery:

### **⚠ Caution**



**To avoid damage to the Imager, remove it from the dc car charger before starting or jump starting the vehicle.**

### *Note*

*Ensure the Imager is near room temperature before connecting it to the charger. See the charging temperature specification. Do not charge the Imager in hot or cold places. Charging in extreme temperatures reduces the battery pack's ability to hold a charge.*

1. Plug the ac input of the battery charger into an ac wall outlet.
2. Plug the battery charger's dc output into the Imager's ac adapter socket.

The optional Car Charger can also be used to recharge the Imager's battery.


While the battery is charging, the battery icon appears as  while the Imager is operating. With the Imager off,  appears in the display while connected to the battery charger.

Keep the Imager attached to the charger until the battery condition icon indicates a full charge. With the Imager off, the battery charge icon will have four full bars. With the Imager on, turn the Imager off to view the battery condition icon. Removing the Imager from the charger before a full charge is indicated will deprive the battery of a full charge and thus shorten the run time.

*Note*

*New batteries are not fully charged. Two to ten normal charging/discharging cycles may be required before the battery charges to its maximum capacity.*

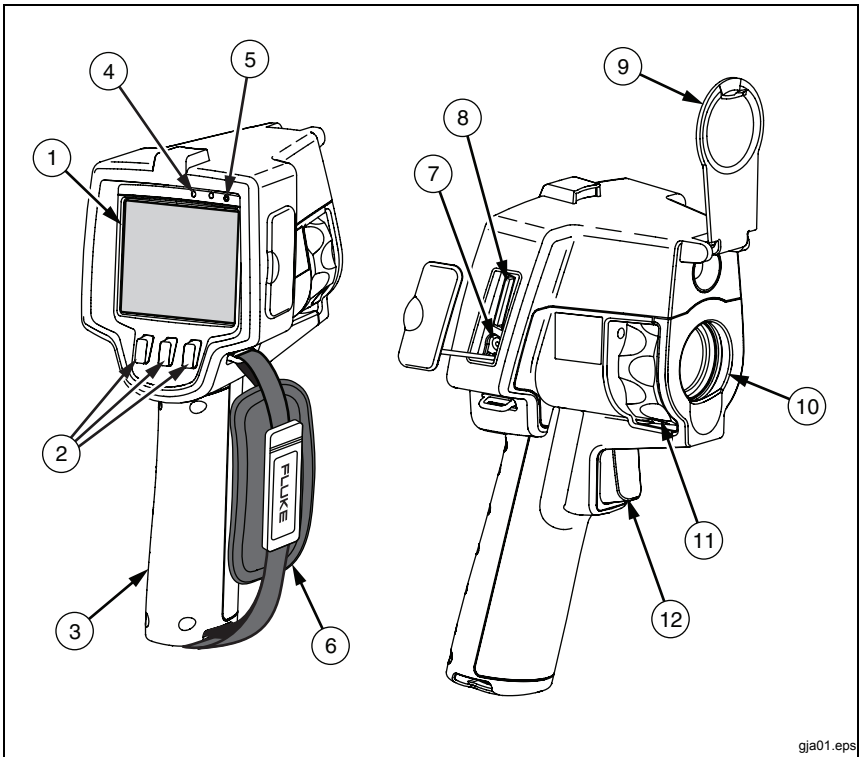
## **Turning the Imager On and Off**

To turn the Imager on or off, press the center softkey () for two seconds.

## **Features and Controls**

Imager features and controls are shown and described in Table 2.

**Table 2. Features and Controls**



gja01.eps

Item	Description
①	LCD Display
②	Function Softkeys (F1, F2, and F3)
③	Battery Cover
④	Speaker
⑤	Auto backlight sensor
⑥	Hand strap
⑦	AC adapter/charger input terminal

**Table 2. Features and Controls (cont.)**

Item	Description
⑧	SD memory card compartment
⑨	Retractable Lens Cover
⑩	Thermal (IR) camera
⑪	Focus control
⑫	Trigger

## **Using the Menu**

The menus, coupled with the three softkeys (F1, F2, and F3), provide access for setting features (date, time, language, units, backlight and spot temperatures), thermal image display, and saving and viewing stored images.

To bring up the menu, press F2. The text above each function softkey (F1, F2, and F3) corresponds to that softkey throughout all menu screens.

Press F2 to open and cycle through the menus.

The menu will disappear several seconds after the last press of a softkey.

## **Changing the Displayed Language**

To change the display to present information in another language:

1. Press F2 until the F1 softkey label reads **Language**.
2. Press the softkey labeled **Language**.
3. Press the softkey labeled **Up** or **Down** to move the cursor to the desired language.
4. Press the softkey labeled **Back/Done** to set the units.

## **Setting the Imager Clock**

The Imager has an internal real-time clock that holds the date and time of day.

### **Setting the Date**

To set the date:

1. Press **F2** until **Date** appears over the F1 softkey.
2. Press the softkey labeled **Date**.

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

3. Press the softkey labeled with the desired date format.
4. Press the softkey labeled **Up** (**F1**) or **Down** (**F3**) to adjust the selected date element.
5. Press the softkey labeled **Next** to move to the next date element.
6. Press the softkey labeled **Done** when finished.

### **Setting the Time**

To set the time:

1. Press **F2** until **Time** appears over the F3 softkey.
2. Press the softkey labeled **Time**.

The Imager will display time in two different formats: 24 hour or 12 hour.

3. Press the softkey labeled with the desired format.
4. Press the softkey labeled **Up** (**F1**) or **Down** (**F3**) to adjust the selected time element.
5. Press the softkey labeled **Next** to move to the next time element.
6. Press softkey labeled **Done** when finished.

The 12 hour format has a selection for setting whether the time is AM or PM.

## Focusing and Capturing an Image

Point the Imager at the object or area of interest, focus by turning the focus control until the image displayed on the LCD is as clear as possible, and then press and release the trigger. The Imager displays the captured image and a menu. To cancel image storage and return to live viewing, press and release the trigger.

### *Note*

*Minimum focus distance for thermal (IR) camera is 15 cm (approx. 6 inches). IR-Fusion® and visible light images are unavailable on the TiS Thermal Imager.*

### *Note*

*The Imager can save the image as a simple picture or as a radiometric image that allows further temperature analysis. To change the saved image format, see the “Setting File Format” section later in this manual.*

Pressing the softkey labeled **Settings** allows modification of image characteristics such as palette, picture-in-picture, and range. Refer to the appropriate setting section for operational details.

## Saving Imager Data

The Imager saves displayed data on an SD card placed into the camera. See the “Changing the SD Card” section for inserting and ejecting an SD card. The file format set on the Imager determines how the measured information is stored on the SD card. To store Imager data:

1. Point camera at the area of interest and pull the trigger to capture an image. This will freeze the image in the display and bring up the Image Capture menu.
2. Press the softkey labeled **Store**. If the SD card is in the Imager and there is enough room left on the card, the information is stored.

## **Adjusting the Thermal Image**

The Imager uses different colors or shades of gray to display the temperature gradient of the area within the Imager's field of view. There are two adjustments for changing how the Imager displays the image: Palette and Range.

### **Selecting a Palette**

The palette menu provides different thermal viewing patterns. Grayscale, Blue-Red, and Ironbow are available. To select a palette:

1. Press **F2** until **Palette** appears over **F1**.
2. Press the softkey labeled **Palette** to display the available palette options.
3. Press the softkey labeled **Up** or **Down** to move between the palette options.
4. Press the softkey labeled **Back/Done** to set the Imager to the selected palette.

### **Auto or Lock Range**

Viewing temperature (level and span) is set either automatically or locked. When Lock is set, ranging is locked to the last range setting. To set the range, do the following:

1. Press **F2** until **Range** appears over **F1**.
2. Press the softkey labeled **Range**.
3. Press the softkey labeled **Lock** to set the Imager to locked ranging and press the softkey labeled **Auto** to select auto ranging.

#### *Note*

*The Imager always powers up in the same Range mode, Auto or Lock, as when it powers down.*

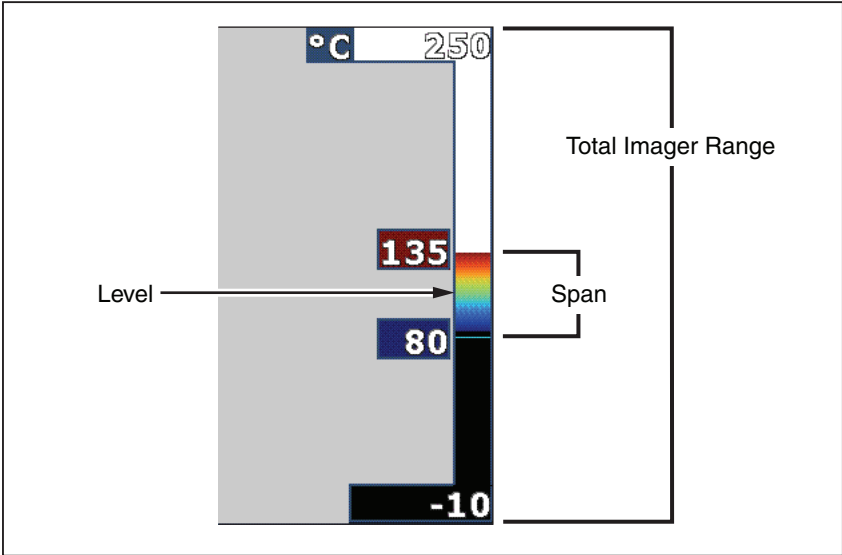


Figure 1. Range and Span Settings

exj02.eps

## Reviewing and Deleting Stored Images

To view stored images on the SD card:

1. Press **[F1]** until **Memory** appears over **[F1]**.
2. Press the softkey labeled **Memory** to reveal the review menu.
3. Press the softkey labeled **Review**.
4. Press the softkey labeled **Up** to display the previous image or **Down** to display the next stored image.

To delete a single Image from the SD card:

1. Perform the steps under viewing stored images above to bring the desired image to the display.
2. Press the softkey labeled **Select**.
3. Press the softkey labeled **Delete**.





To delete all the images from the SD card:

1. Press **[F1]** to activate the menu.
2. Press the softkey labeled **Memory**.

3. Press the softkey labeled **All Images**.

## **Changing the Temperature Units**

The Imager will display temperature in Fahrenheit or Celsius. To change the temperature units:

1. Press  until **Units** is displayed over .
2. Press the softkey labeled **Units**.
3. Press  for Celsius or  for Fahrenheit.
4. Press the softkey labeled **Back/Done** to set the language.

## **Making Accurate Temperature Measurements**

All objects radiate infrared energy. The amount of energy radiated is based on two primary factors: the surface temperature of the object and the emissivity of the object's surface. The Imager detects the infrared energy from an object and uses this information to estimate the temperature of the object. Most of the objects measured such as painted metal, wood, water, skin, and cloth are very efficient at radiating energy and it is easy to get very accurate measurements. For surfaces that are efficient at radiating energy (high emissivity), the emissivity factor is estimated to be 95 % (or 0.95). This estimate works for most purposes. This simplification does not work however, on shiny surfaces or unpainted metals. These materials are not efficient at radiating energy and are classified as having low emissivity. To accurately measure materials with a low emissivity, an emissivity correction is necessary. The easiest correction method is to set the Imager to the proper emissivity value so the Imager automatically calculates the correct surface temperature. If the Imager uses a fixed emissivity value (meaning that it is set to one value and the user cannot adjust it), then the Imager's measurement must be multiplied by a value found in a look up table to get a more accurate estimate of the actual temperature.




The TiS has emissivity that is permanently fixed at 0.95, which works well for most surfaces but can provide very inaccurate reading if used directly on a shiny metal surface.

A significant amount of information is available on emissivity. Further study of this topic is recommended to get the most accurate temperature measurements using the Imager.

## Setting File Format

Data stored on the Imager's SD card can be saved in two different file formats: .bmp and .is2. This setting is saved and remains valid when the Imager is turned off and back on. It can always be changed prior to capturing images.

To change the file format:

1. Press  until **File Format** appears over softkey F3.
2. Press the softkey labeled **File Format**.
3. Press  to set the bitmap (.bmp) file format, or  to set the infrared storage (.is2) file format.

The bitmap format only saves the image shown on the Imager's display. The ".is2" format is a proprietary file format that saves the radiometric data, fusion blend, palette, visual image, screen settings, and voice recording to annotate the stored image.

Bitmap (.bmp) images can be transferred to a PC and used immediately in non-proprietary software and electronic documents. Images in ".is2" format can be transferred to a PC for further analysis and report generation through Fluke SmartView<sup>®</sup> software or non-Fluke software that is available from specially approved software vendors. Visit the Fluke web site or contact Fluke to find out about currently available software options.

## SmartView<sup>®</sup> Software

SmartView<sup>®</sup> software is supplied with the thermal imager. This software is specially designed for Fluke imagers and contains powerful functions to analyze images, organize data storage, and create professional reports. SmartView<sup>®</sup> allows audio annotations to be reviewed on a PC. SmartView<sup>®</sup> can be used to export IR and visible images as JPEG, BMP, GIF, TIFF, WMF, EXIF, or EMF formatted files.

## Changing the SD Card

To eject an SD card from the Imager, press in on the exposed edge of the SD card and then release. The card should pop partially out after releasing it. Carefully pull the card out of the slot.



### *Note*

*The SD Card can be inserted and removed while the Imager is in operation.*

To insert an SD card into the Imager, carefully slip the card into the slot with the card's label facing toward the LCD display. Push the card in until it catches.

## Setting the Backlight

The backlight can be set to Auto-sensing or Full-Bright. To set the backlight:

1. Press  until **Backlight** appears over .
2. Press the softkey labeled **Backlight**.
3. Press the softkey labeled **Auto** or **Full-Bright**.

### *Note*

*To extend battery life, Auto-Sensing automatically adjusts backlight brightness based on ambient light levels.*

## Maintenance

The Imager supplies maintenance-free operation. However, some precautions should be followed to get the best and longest Imager performance.

### Cleaning the Imager

Wipe the case with a damp cloth and a mild detergent. Do not use abrasives, isopropyl alcohol, or solvents to clean the case or lens/window.

### Battery Care

To get the best performance from the Imager's Nickel-Metal Hydride (NiMH) battery, use the guidelines that follow.

#### Caution

**To avoid damage to the Imager, do not leave the camera exposed to a heat source or high-temperature environments, such as an unattended vehicle in the sun.**

- Do not store the Imager on the charger for more than 24 hours as reduced battery life may result.
- Charge the Imager for a 2-hour minimum at least every six months to maximize battery life. Without use, the battery will self-discharge in approximately six months. Batteries stored for long periods may require two to ten charging cycles before it reaches full capacity.
- Always operate the Imager within the temperature range specified in the specifications labeled Temperature – Operating.

#### Caution

**Do not incinerate the Imager 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
Charging .....	0 °C to 40 °C (32 °F to 104 °F)

**Relative Humidity**..... 10 to 90 % non-condensing

**Display**..... 640 x 480 Color LCD, approximately  
2 in x 3 in (Landscape orientation)  
with Backlight (selectable Bright or  
Auto)

### **Controls and Adjustments**

User selectable temperature scale (°C/°F)

Language selection

Time/Date set

**Software**..... SmartView® full analysis and reporting  
software included

### **Power**

Battery ..... Internal rechargeable battery pack  
(included)

Battery Life..... 3 to 4 hours continuous use (assumes  
50 % brightness of LCD)

Battery Charge Time..... 2 hours full charge with ac adapter or  
dc car charger

AC Operation/Charging ..... AC adapter/charger (110 – 220 V ac,  
50/60 Hz). Charges battery while  
imager is operating. Universal ac  
mains adapters included.

Power Saving..... Sleep Mode activated after 5 minutes  
of inactivity  
Automatic Power Off after 30 minutes  
of inactivity

### **Safety Standards**

CE Directive..... IEC/EN 61010-1 2<sup>nd</sup> Edition Pollution  
Degree 2

### **Electromagnetic Compatibility**

EMC Directive..... EN61326-1

C Tick..... IEC/EN 61326

US FCC ..... CFR 47, Part 15 Class A

**Vibration** ..... 2 G, IEC 68-2-29

**Shock**..... 25 G, IEC 68-2-6

**Drop** ..... 2 meter drop, all sides

<b>Size (H x W x L)</b> .....	25.4 cm x 12.7 cm x 15.2 cm (10 in x 5 in x 6 in)
<b>Weight</b> .....	1.1 kg (2.35 lb)
<b>Enclosure Rating</b> .....	IP54
<b>Warranty</b> .....	2 years
<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).....	-20 °C to +100 °C
Accuracy.....	±5 °C or 5 %, whichever is greater (at 25 °C nominal)
Measurement Modes.....	Smooth Auto-Scaling and Manual Scaling

### **Imaging Performance**

Field of View.....	17 ° x 17 °
Spatial Resolution (IFOV).....	2.5 mRad
Minimum Focus Distance	
Thermal Lens.....	15 cm (approx. 6 in)
Focus.....	Manual
Image Frequency.....	9 Hz refresh rate
Detector Type.....	120 X 120 Focal Plane Array, uncooled microbolometer
Infrared Lens Type.....	20 mm EFL, F/0.8 lens
Thermal Sensitivity (NETD).....	≤0.1 °C at 30 °C (100 mK)
Infrared Spectral Band.....	7.5 μm to 14 μm

### **Image Presentation**

Palettes.....	Ironbow, Blue-Red, Grey
Level and Span	
Smooth Auto-Scaling and Lock of level and span	
Minimum span.....	5 °C

**Image and Data Storage**

Storage Medium .....	SD Memory Card (2 GB memory card will store at least 1200 fully radiometric (.is2) IR and linked visual images each with 60 seconds voice annotations or 3000 basic (.bmp) IR images)
File Formats.....	Non-Radiometric (.bmp) or Fully-Radiometric (.is2) No analysis software required for Non-Radiometric (.bmp) files
Export File Formats w/ SmartView® Software ....	JPEG, JPG, JPE, JFIF, BMP, GIF, DIP, PNG, TIF, and TIFF

