

Keysight U5850 Series TrueIR Thermal Imager



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Safety Information

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Safety Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.



Caution, risk of danger
(refer to this manual for specific Warning or Caution information)



Laser radiation

Safety Considerations

Read the information below before using this instrument.

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards for design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

WARNING

- Do not use the U5850 Series if it is damaged. Before you use the U5850 Series, inspect the casing. Look for cracks or missing plastic. Do not operate the U5850 Series around explosive gas, vapor, or dust.
 - Always use the U5850 Series with the cables provided.
 - Observe all markings on the U5850 Series before establishing any connection.
 - Turn off the U5850 Series before removing the battery cover.
 - When servicing the U5850 Series, use only the specified replacement parts.
 - Do not operate the U5850 Series with the battery cover or portions of the cover removed or loosened.
 - Use only the designated AC/DC power adapter or charger provided by the manufacturer to avoid any unexpected hazards.
 - Use only the battery pack supplied with the U5850 Series. Do not disassemble/modify the battery pack or leave it under direct heat/sunlight.
 - Keep the battery pack away from water, fire, or heat.
 - Avoid any contact with battery leakage to prevent personal injuries. If there is leakage or strange smell, remove the battery pack immediately from the U5850 Series or the external battery charger.
-

WARNING

- Do not connect the positive terminal and the negative terminal of the battery pack (metallic part) to each other with any metal objects, such as wires.
 - Do not continue to charge the battery pack if it does not become charged within the specified charging time.
 - Do not apply impact to or insert foreign objects into the battery pack.
 - Do not use the camera on a tripod in an area with large vibration or shock.
 - Do not use the U5850 Series under water or with conductive gloves or cloths worn or in a strong electromagnetic field.
 - Do not stare into the torch light.
-

CAUTION

- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
 - The U5850 Series uses a highly-sensitive infrared detector. Ensure to comply with the requirements in “**Environmental Conditions**” on page 8 when using the U5850 Series.
 - Do not apply excessive stress to the LCD screen, the focus adjustment ring, or the camera lens to avoid damages.
 - Avoid direct rays or shock to the visible or infrared camera lens of the U5850 Series.
 - Do not perform image acquisition directly at the sun or objects with extremely high temperature over a long period of time to avoid damage to the infrared detector.
-

CAUTION

- The following condition may be observed when the U5850 Series acquires or saves a visible image. This condition is not a device failure.
 - The color of the visible image changes periodically or may be different from the real target object when the image is replayed in the freeze mode.

To avoid this condition, perform image acquisitions by changing the camera angle. In this case, it is recommended to acquire visible images by observing the image on the screen.

- The following condition may be observed in outdoor data acquisitions. This condition is not a device failure.
 - If the contrast is great (e.g., due to backlight), the object may appear darker on the camera display as compared to the brightness of the background.

To avoid this condition, control the frame so that it covers only the target object.

- If bright sunlight enters the visible camera, the entire picture may become reddish. To avoid this, shield the camera from bright sunlight.
 - When the U5850 Series is moved from objects with large temperature differences, “ghost” image may be present on the display. This condition is not a device failure. It may take several minutes to dissipate the “ghost” image. You can automatically dissipate the “ghost” image by switching to the freeze mode and back to the run mode (refer to “**Image Playback**” on page 56).
 - **Do not input laser beam (CO₂ laser, etc.) to avoid damage to the infrared detector.**
 - If the U5850 Series is used in a manner not specified by the manufacturer, the U5850 Series protection may be impaired.
 - Always use a dry cloth to clean the U5850 Series. Do not use ethyl alcohol or any other volatile liquid to clean the U5850 Series.
-

WARNING

Laser pointer precautions:

- This laser pointer is a Class 2 laser product.
- Laser beam contact with the eyes may cause visual impairment.
- Do not point the laser beam towards people.
- Do not stare into the laser beam.
- The U5850 Series is intended for professional use and is not suitable for general use.



Environmental Conditions

The U5850 Series True/R Thermal Imager is designed for indoor use and in an area with low condensation. The table below shows the general environmental requirements for this instrument.

Environmental condition	Requirement
Temperature	Operating condition – -15 °C to 50 °C
	Storage condition – -40 °C to 70 °C
Humidity	Operating condition – 50% RH to 95% RH at 40 °C
	Storage condition – 95% RH at 40 °C
Altitude	Up to 2000 m
Pollution degree	2

Regulatory Information

The U5850 Series True/R Thermal Imager complies with the following safety and Electromagnetic Compatibility (EMC) compliances:

Safety compliance

- Laser safety: IEC 60825-1 (Laser Class 2)
- IEC 61010-1

EMC compliance

- IEC 61326-1
- CISPR11, Group 1 Class A
- Canada: ICES/NMB-001: Issue 4, June 2006
- Australia/New Zealand: AS/NZS CISPR 11

Regulatory Markings

<p>CAN ICES NMB-001(A) ISM GRP 1-A</p>	<p>CAN ICES/NMB-001(A) indicates that this ISM device complies with the Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.</p>	 <p>The RCM mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australia EMC Framework regulations under the terms of the Radio Communication Act of 1992.</p>
	<p>This symbol is a South Korean Class A EMC Declaration. This is a Class A instrument suitable for professional use and in electromagnetic environment outside of the home.</p>	 <p>This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.</p>
	<p>This symbol indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.</p>	<p style="background-color: #cccccc;"> </p>

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit <http://about.keysight.com/en/companyinfo/environment/takeback.shtml> for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/trueIRimager
(product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
(worldwide contact information for repair and service)

Table of Contents

Safety Symbols	3
Safety Considerations	4
Environmental Conditions	8
Regulatory Information	8
Safety compliance	8
EMC compliance	8
Regulatory Markings	9
Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/ EC	10
Product category:	10
Sales and Technical Support	10
1 Introduction	
About This Manual	20
Documentation map	20
Safety notes	20
Preparing the U5850 Series	21
Check the shipment	21
Standard shipped items	22
Install the hand strap	23
Install and charge the battery	24
Insert the SD memory card	26
Turn on the U5850 Series	26
Set up the U5850 Series	27
The U5850 Series in Brief	32
LED status indication	34
Camera mode switching flow	35
Display screen	36
2 Image Capture, Processing, and Measurement Functions	
Camera Controls	40

Capture images	40
Image Saving	44
Preview and save an image	44
Add tags	47
Edit tags	51
Delete tags	52
Save an image directly	53
Edit an image	53
Image Playback	56
Full screen/Thumbnail playback mode operation	56
Full screen playback mode overview	57
Thumbnail playback mode operation	58
Thumbnail playback mode overview	59
Delete an image (full screen playback mode)	60
Delete multiple images (thumbnail playback mode)	61
Measurement Controls	63
Set the temperature range	63
Set the center spot	66
Set the max/min tracking	67
Set the moveable spots and boxes	68
Set the delta temperature	72
Turn off all measurements	74
Imaging Controls	75
Set the color palette	75
Load a custom color palette	77
Set the color alarm	78
Digital Zoom	83
Set the zoom ratio	83
Pan (move) the zoom area	84
Disable zoom	84
Parameter Controls	85
Set the emissivity (ϵ)	86
Set the reflected temperature (RT)	89
Set the object distance (OD), ambient temperature (AT), and	

humidity (Hum)	92
Set the transmissivity (τ)	94

3 Data Management and System-Related Functions

Data Management Controls	96
Perform image logging	96
View the memory status of the SD memory card	101
Manage image folders	102
Format the SD memory card	106
System-Related Settings	107
Configure the Quick Start Tutorial	107
Save/recall instrument setups	110
Turn on/off visible image auto-save	111
Configure the display items	112
Configure the main key press functions	114
Set the USB mode	115
Set the power saving mode	117
Set the LCD brightness	119
Set the temperature unit (°C or °F)	119
Set the date and time	119
Set the video out format	120
Set the language	120
Display the system and owner information	121
Reset the U5850 Series to factory default settings	124

4 Characteristics and Specifications

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List of Figures

Figure 1-1	The front and side panels at a glance32
Figure 1-2	The rear panel at a glance33
Figure 1-3	The display at a glance36

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List of Tables

Table 1-1	Rear panel descriptions	33
Table 1-2	LED status indication (power adapter connected)	34
Table 1-3	Display descriptions	36
Table 1-4	Battery status indication	37
Table 2-1	Emissivity table	88

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1 Introduction

About This Manual	20
Preparing the U5850 Series	21
The U5850 Series in Brief	32

This chapter guides you to set up the U5850 Series True/IR Thermal Imager for the first time. A summary of all the U5850 Series True/IR Thermal Imager features is also given.

About This Manual

The descriptions and instructions in this manual apply to the Keysight U5855A, U5856A, and U5857A True/R Thermal Imager (hereafter referred to as the U5850 Series or the instrument).

The model U5857A appears in all illustrations.

Documentation map

The following manuals and software are available for your instrument. For the latest version, visit our website at: www.keysight.com/find/truelRimager

Check the manual revision on the first page of each manual.

- **User's Guide**
This manual.
- **Quick Start Guide**
Printed copy, included with shipment.
- **Service Guide**
Free download at the Keysight website.
- **Keysight True/R Analysis and Reporting Tool software**
Free download at the Keysight website: www.keysight.com/find/truelR_ART

Safety notes

Safety notes are used throughout this manual (refer to the [Safety Symbols](#) section for format examples). Familiarize yourself with each of the notes and its meaning before operating your instrument.

More pertinent safety notes for using this instrument are located under the [Safety Considerations](#) section.

Do not proceed beyond a safety notice until the indicated conditions are fully understood and met.

Preparing the U5850 Series

Check the shipment

When you receive your instrument, check the shipment according to the following procedure.

- 1** Inspect the shipping container for damage. Signs of damage may include a dented or torn shipping container or cushioning material that indicates signs of unusual stress or compacting. Save the packaging material in case the instrument needs to be returned.
- 2** Carefully remove the contents from the shipping container, and verify that the standard items are included in the shipment according to the standard shipped items list shown in “**Standard shipped items**” on page 22.
- 3** For any enquiries, refer to the Keysight contact numbers on the back of this manual.

If any item is found missing or damaged, contact your nearest Keysight Sales Office.

Keep the original packaging in case the U5850 Series has to be returned to Keysight in the future. If you return the U5850 Series for service, attach a tag identifying the owner and model number. Include also a brief description of the problem.

Standard shipped items



KeySight U5850 Series True/R Thermal Imager



Hard carrying case



Power adapter



Power cord



Li-Ion rechargeable battery



SD memory card



USB Standard-A to Mini Type-B interface cable, 2 m



Video RCA to RCA interface cable, 2 m

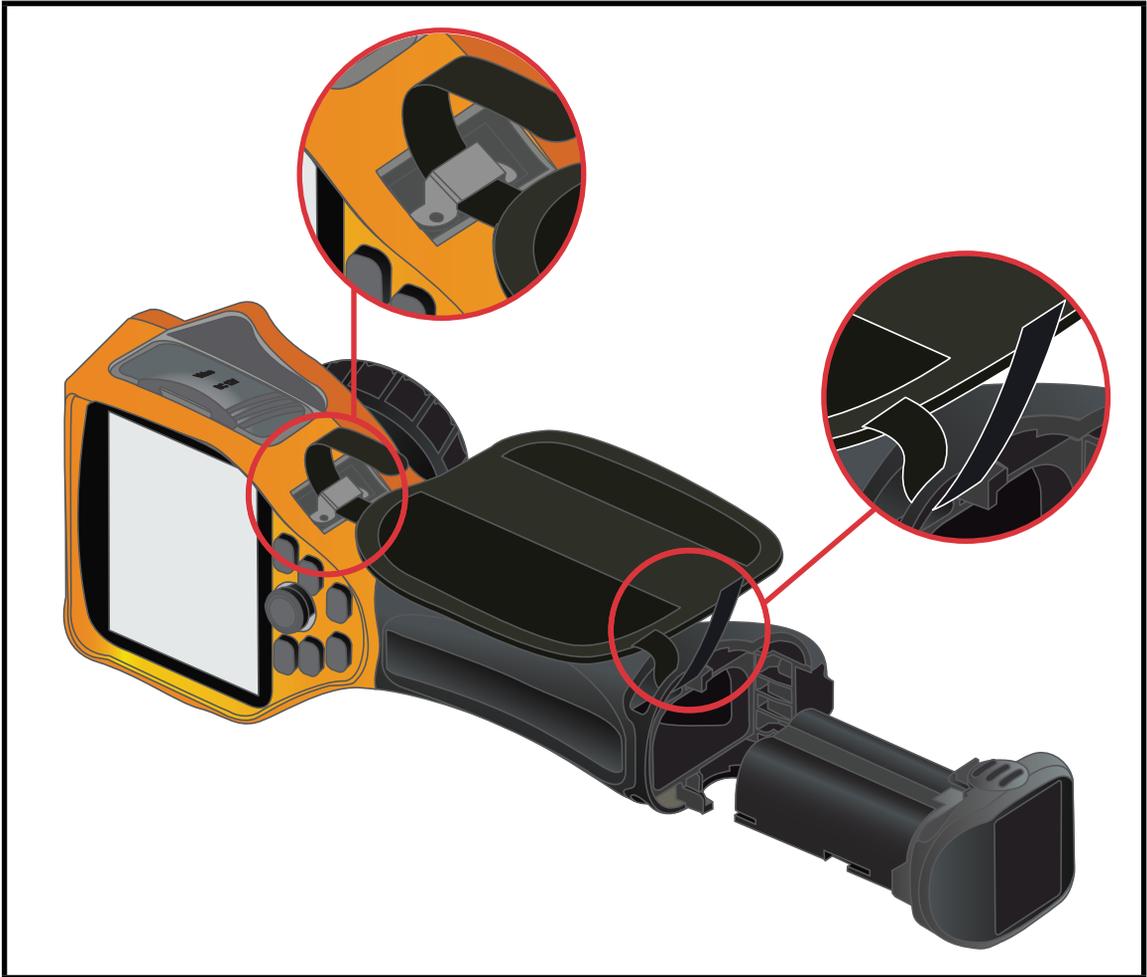


KeySight U5850 Series Quick Start Guide



Certificate of Calibration

Install the hand strap

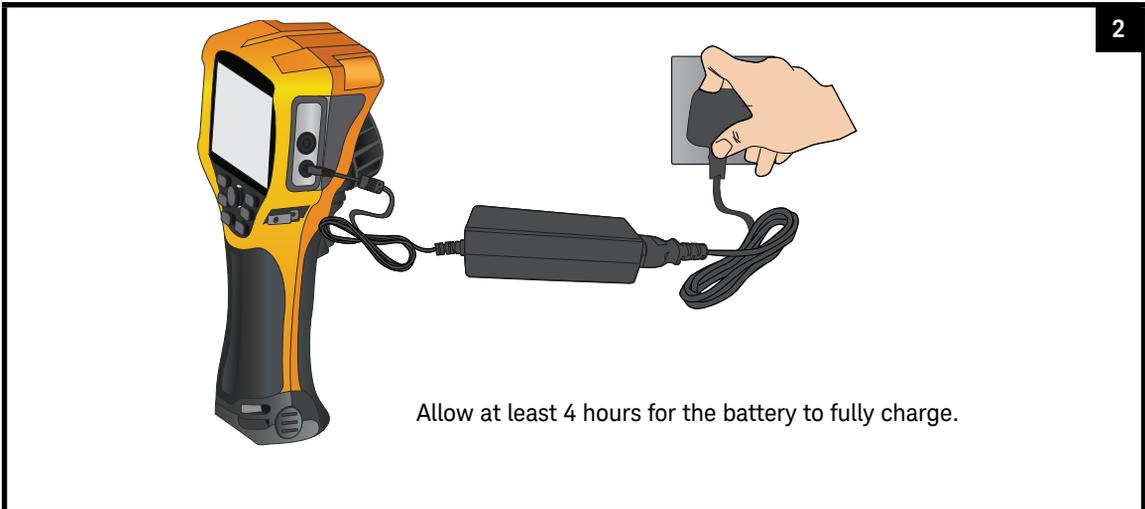


Install and charge the battery

NOTE

It is recommended to store the battery in a cool, dry place at normal room temperature. Remove the battery from the device if the device is stored for extended periods.





Allow at least 4 hours for the battery to fully charge.



NOTE

Refer to “LED status indication” on page 34 and “Battery status indication” on page 37 for more details.

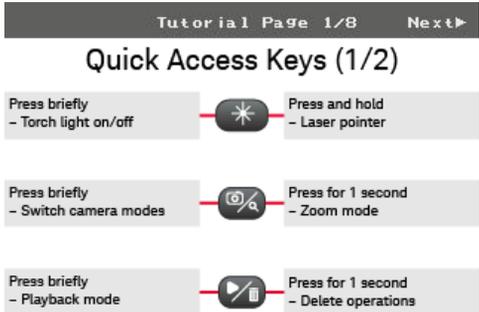
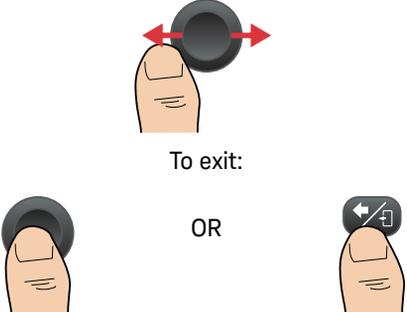
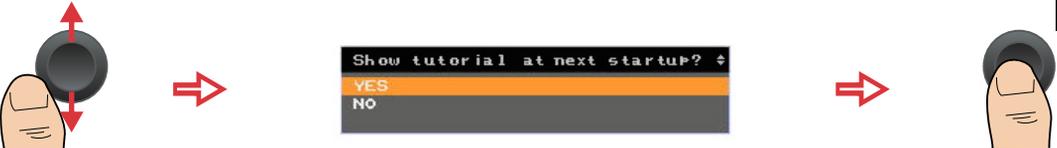
Insert the SD memory card



Turn on the U5850 Series

CAUTION

DO NOT REMOVE the battery or the SD memory card before power is turned off and the LED light goes off entirely. Otherwise it may damage the U5850 Series or destroy files saved in the SD memory card.

 <p>Press for 1 seconds to turn on/off.</p>	<p>1</p> <p>2</p> <p>When you turn on the U5850 Series for the first time or after a factory reset, you will be prompted to perform initial setups. Refer to “Set up the U5850 Series” on page 27.</p>
<p>Quick start tutorial:</p>  <p>3</p>	<p>To navigate the tutorial pages:</p>  <p>4</p>
 <p>5</p>	
<p>6</p> <p>Ready to take measurements with specified accuracy after warm-up.</p>	

NOTE

- If Auto Off is enabled, the U5850 Series will automatically turns off if idle for 20 minutes (default). Pressing the power key will turn it back on.
- If Auto Sleep is enabled, the U5850 Series will automatically goes to sleep if idle for 10 minutes (default). Pressing any key will turn it back on.
- Refer to **“Set the USB mode”** on page 115 for more details.

Set up the U5850 Series

NOTE

This is only applicable when you turn on the U5850 Series for the first time, or after restoring the factory settings.

Set the language



Set the date, time, and temperature unit

1

Settings	
Date Format	YY/MM/DD
Date	14/02/27
Time	17:15:43
Unit	°C
OK	

Settings: (left arrow) To select
Enter to change/confirm

2

Settings	
Date Format	Y YY/MM/DD
Date	1 MM/DD/YY
Time	1 MM/DD/YY
Unit	°C DD/MM/YY
OK	

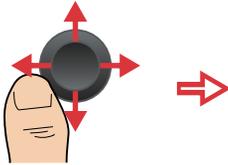
Settings: (left arrow) To select
Enter to change/confirm

3

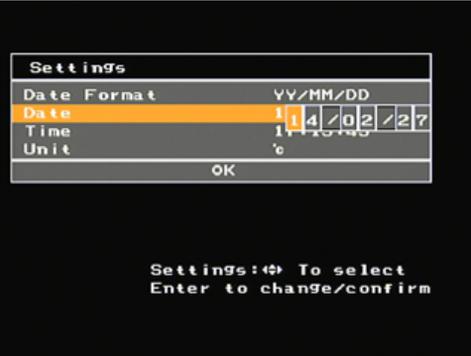
Settings	
Date Format	YY/MM/DD
Date	14/02/27
Time	17:15:43
Unit	°C
OK	

Settings: (left arrow) To select
Enter to change/confirm

- Year: 00 to 99 (00: year 2000) - Month: 01 to 12 - Date: 01 to 31
4



Push left/right to move the indicator.
Push up/down to increase/decrease the digits.

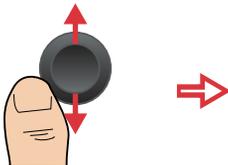


Settings	
Date Format	YY/MM/DD
Date	14/02/27
Time	17:15:43
Unit	'c
OK	

Settings: ⌘ To select
Enter to change/confirm



- Hour: 00 to 23 - Minute: 00 to 59 - Second: 00 to 59
5



Push left/right to move the indicator.
Push up/down to increase/decrease the digits.

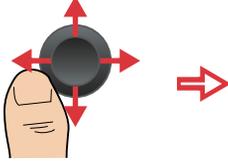


Settings	
Date Format	YY/MM/DD
Date	14/02/27
Time	17:15:43
Unit	'c
OK	

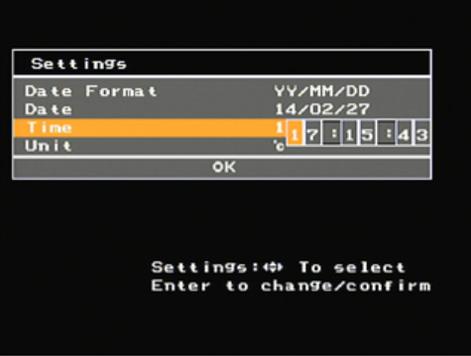
Settings: ⌘ To select
Enter to change/confirm



- Hour: 00 to 23 - Minute: 00 to 59 - Second: 00 to 59
6



Push left/right to move the indicator.
Push up/down to increase/decrease the digits.



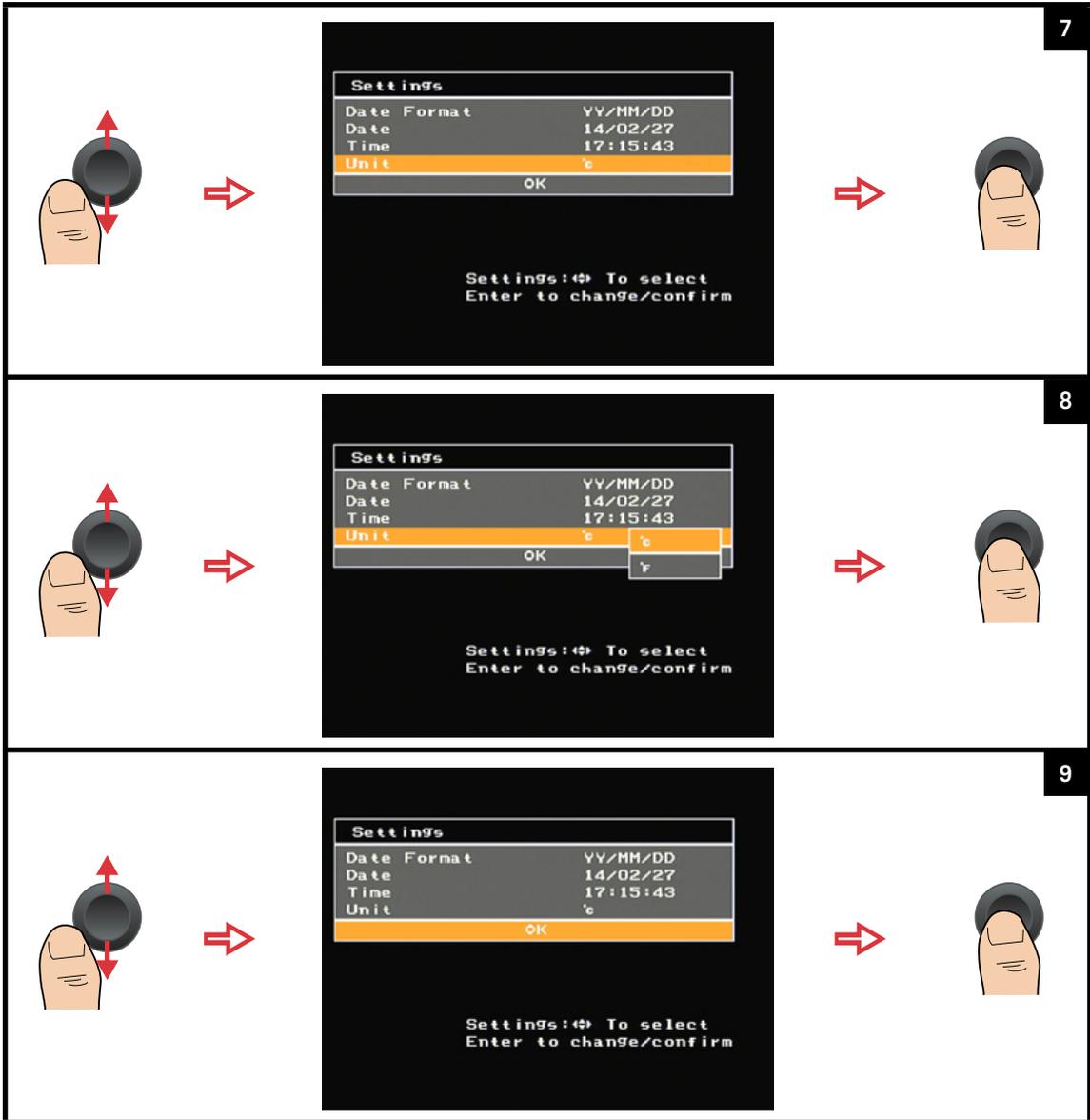
Settings	
Date Format	YY/MM/DD
Date	14/02/27
Time	17:15:43
Unit	'c
OK	

Settings: ⌘ To select
Enter to change/confirm



30

Keysight U5850 Series User's Guide



The U5850 Series in Brief



Figure 1-1 The front and side panels at a glance

[1] Press briefly to toggle between the image freeze (capture) or run operation.
Press for 1 second to perform a quick-save.

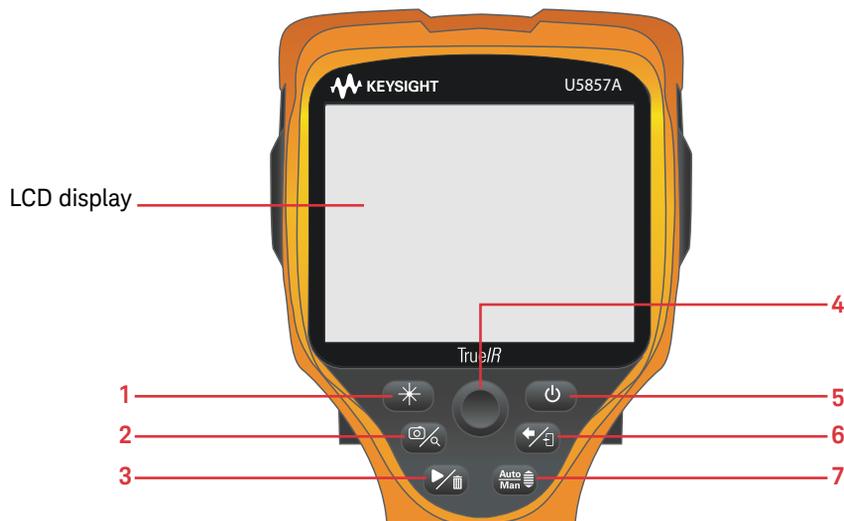
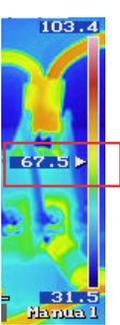
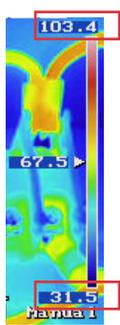


Figure 1-2 The rear panel at a glance

Table 1-1 Rear panel descriptions

Legend	Description
1 Light/Laser control key ^[a]	<ul style="list-style-type: none"> – Press briefly to toggle the torch light on or off. – Press and hold to turn on the laser pointer, and release to turn it off.
2 Camera/Zoom key	<ul style="list-style-type: none"> – Press briefly to select the camera mode (refer to “Camera mode switching flow” on page 35 for more details). – Press for 1 second to access the zoom mode.
3 Play/Delete key	<ul style="list-style-type: none"> – Press briefly to play back saved images. – Press for 1 second for delete operations.
4 Navigation/Enter key	<ul style="list-style-type: none"> – Press the center of the key briefly to use as an Enter key or to access the Main Menu. – Push the sides of the key for up/down/left/right navigation. The left/right sides can be pushed to open or close sub-menus.
5 Power on/off key (with LED status indicator)	<ul style="list-style-type: none"> – Press for 1 seconds to turn the U5850 Series on or off.
6 Back/Exit key	<ul style="list-style-type: none"> – Press briefly to return to the previous menu. – Press for 1 second to exit any menu.

Table 1-1 Rear panel descriptions (continued)

Legend	Description
<p>7 Auto/Manual scale key</p>	<p>Press briefly to switch from auto to manual scaling.</p> <ul style="list-style-type: none"> - In the manual scaling mode, press briefly to perform auto scaling once. - Manual scaling allows you to set the temperature level or the temperature span (upper/lower temperature limits) of the temperature scale. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Adjust temperature level:</p>  </div> <div style="text-align: center;">  <p>Adjust temperature span:</p>  </div> </div> <p>Press for 1 second to switch from manual to auto scaling.</p>

[a] Torch light and laser pointer are not functional when the U5850 Series is in the power-saving mode.

LED status indication

Table 1-2 LED status indication (power adapter connected)

Unit turned on/off	LED	Status
Off	Red (flashing)	Charging
	Off	Full charge
	Red	Charge error
On	Green	Charging
	Green	Full charge
	Red	Charge error
	Red (flashing)	Laser on
	Green (flashing)	Power saving (Auto-Sleep) mode

Camera mode switching flow

IR image
(with Fine Resolution enabled)



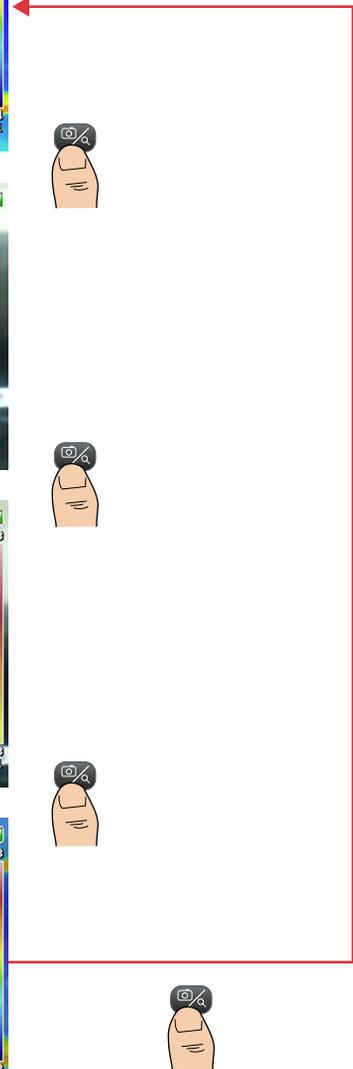
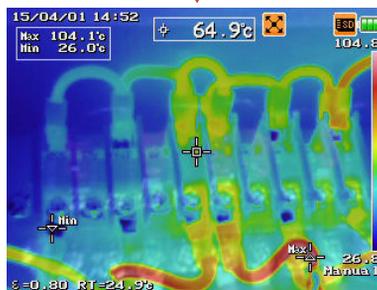
Visible image



Picture-in-picture
(fusion) image



Blend (fusion) image



Display screen

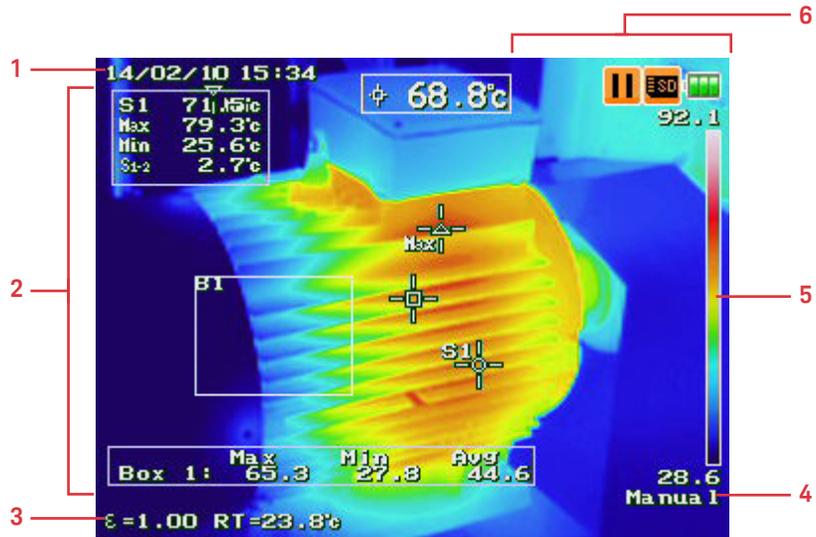


Figure 1-3 The display at a glance

Table 1-3 Display descriptions

Description
1 Date/time
2 Measurement results and tools
3 Info bar (selectable up to four items to display)
4 Auto/manual scaling

Table 1-3 Display descriptions (continued)

Description								
5	Temperature scale/color bar with upper and lower temperature limits							
Icons as status indicators:								
	Freeze mode		Laser on		SD memory card inserted		Edit mode	
6		Battery status		Fine Resolution Mode		Image logging operation		USB connectivity for mass storage
							USB connectivity for data streaming	

Battery status indication

Table 1-4 Battery status indication^[a]

(~2.5 to 4 hours remaining)	1 to 2.5 hours remaining	15 to 60 minutes remaining	Empty (flashing)
			
Charging	Fully charged (with adapter connected)	No battery (with adapter connected)	Charge error (flashing) (with adapter connected)
			

[a] Typical operating time of a new battery.

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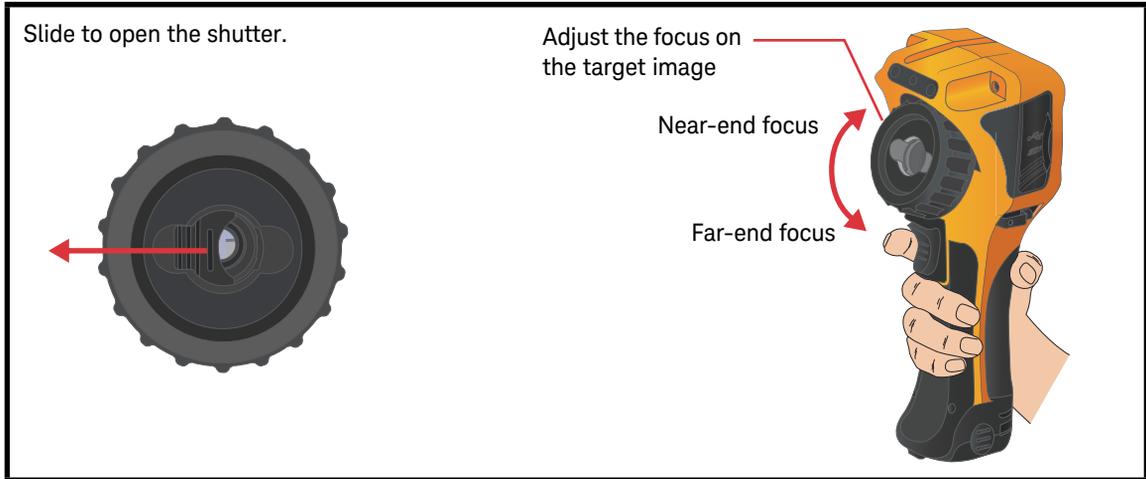
2 Image Capture, Processing, and Measurement Functions

Camera Controls	40
Image Saving	44
Image Playback	56
Measurement Controls	63
Imaging Controls	75
Digital Zoom	83
Parameter Controls	85

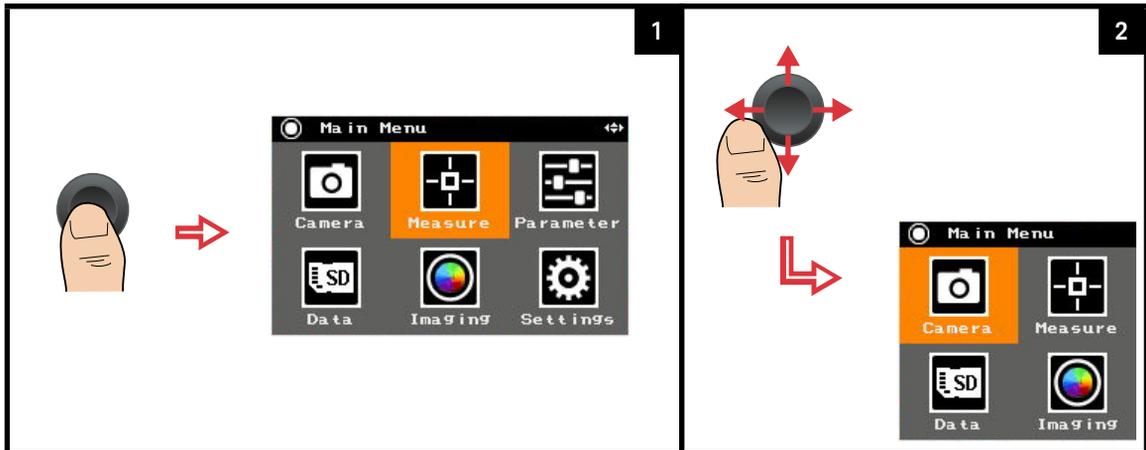
This chapter guides you on how to operate the main functions of the U5850 Series True/R Thermal Imager.

Camera Controls

Capture images



Select a camera mode



3



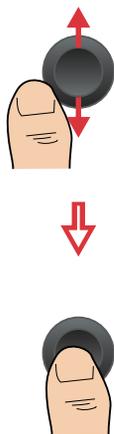
The U5850 Series provides two fusion camera modes:

- Picture in Picture
- Blend

These modes enable you to identify abnormalities easily with a fusion of both IR and visible images.

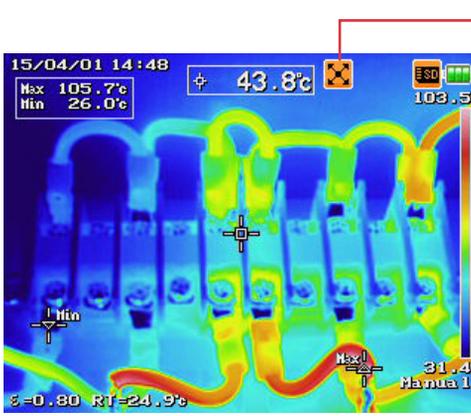
4

Select a camera mode:



Fine resolution (FR)

Fine resolution thermal imaging produces high quality in-camera IR images by capturing images with 4× more effective IR resolution and approximately 1.5× finer Instantaneous Field of View (IFOV) using multi-frames capturing and sophisticated image processing techniques.



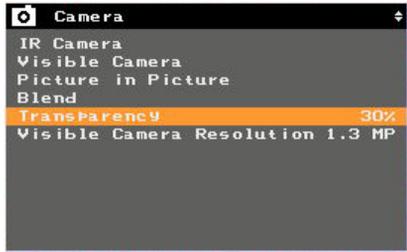
Set the transparency of fusion images

1

Transparency can only be set when the Picture in Picture or Blend mode is selected.



↓



⇒



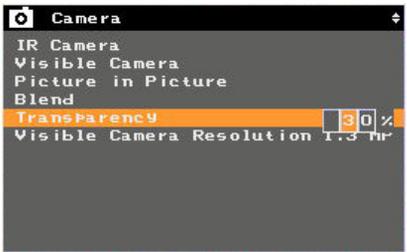
2

Set a value (with a 10% step):

Push up/down to increase/decrease the digits.



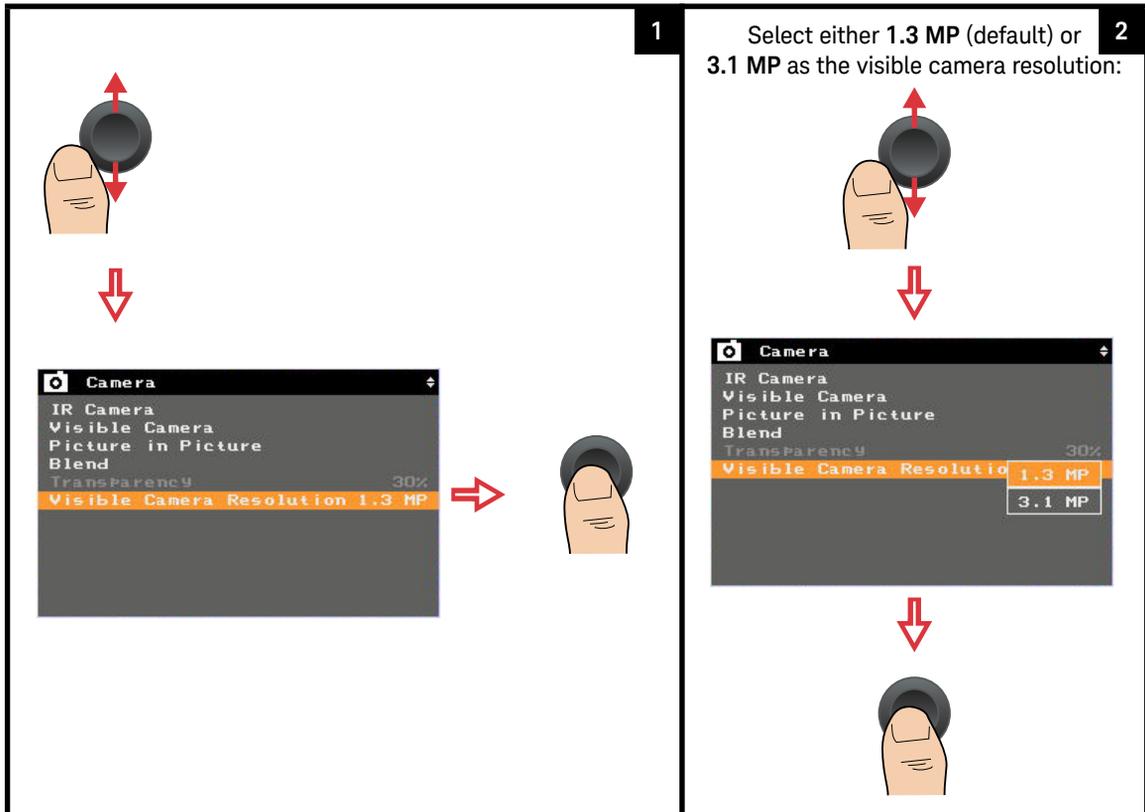
↓



↓



Set the visible camera resolution

**NOTE**

For better clarity and higher resolution, select **3.1 MP** as the visible camera resolution.

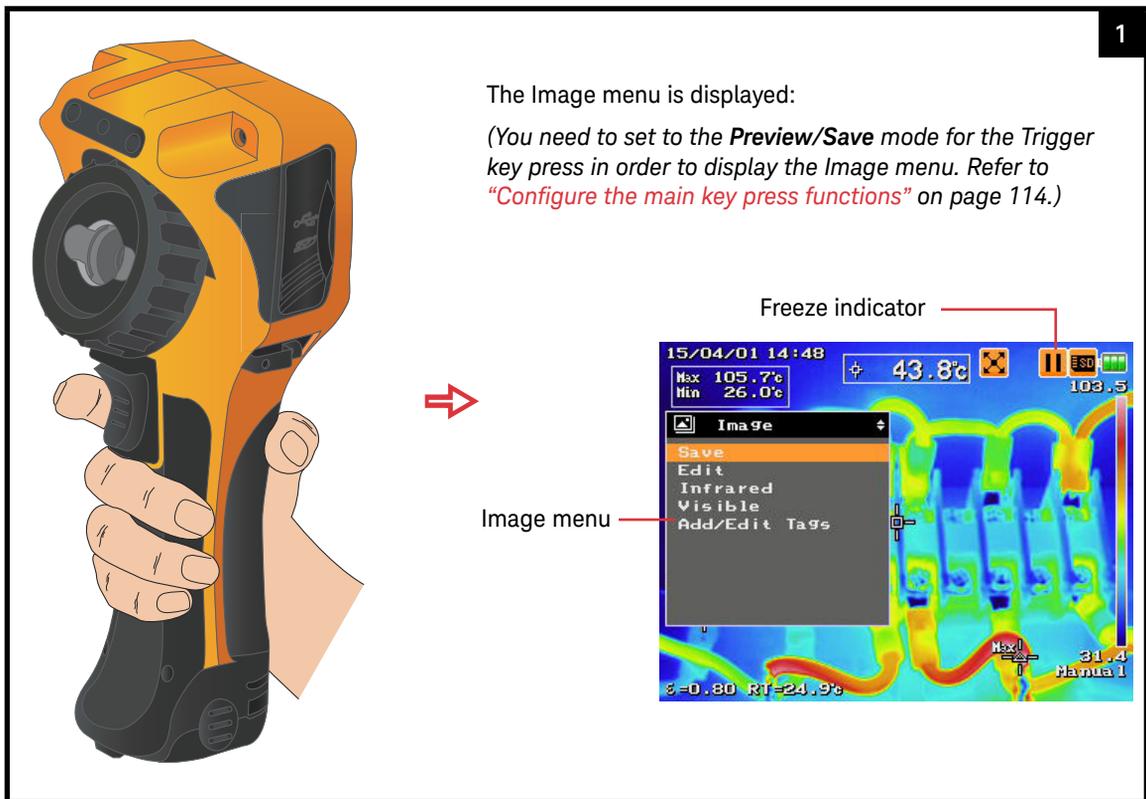
Image Saving

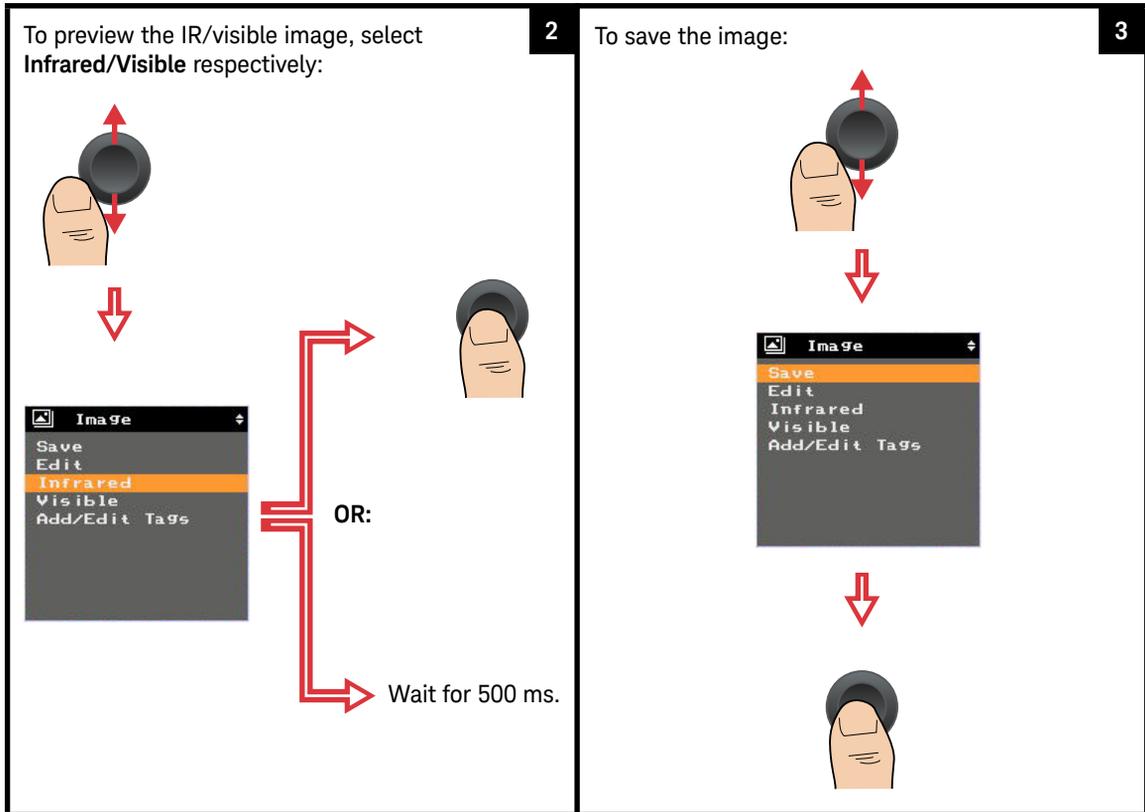
NOTE

- Allow a short warm up before performing image acquisition for accurate measurement.
- It is recommended to power on the U5850 Series before connecting the USB cable to the PC.

After capturing the images, you can save them into the SD memory card inserted in the U5850 Series. You can also add tags and edit the images.

Preview and save an image





Once the image has been saved, it will return to the run mode.

4



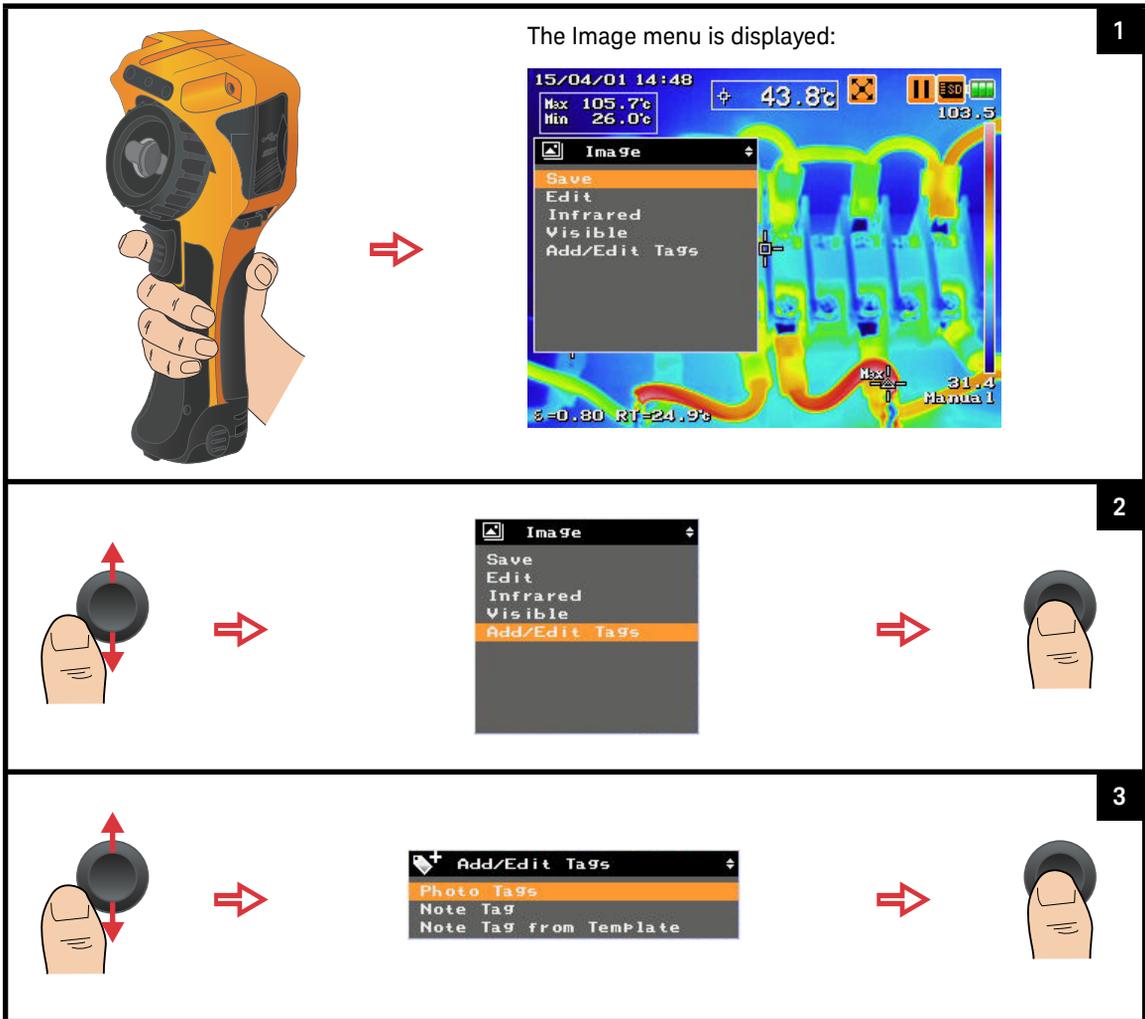
- If the auto save visible image setting is enabled, both the IR and visible images will be saved.
- If the auto save visible image setting is disabled, only the IR image will be saved.

Refer to “Turn on/off visible image auto-save” on page 111 for more details.

Add tags

You can include photo tags (up to three visible images) and note tag that correspond to your IR image analysis.

Add photo tags



2 Image Capture, Processing, and Measurement Functions

Visible image is displayed:

4



To capture the photo tag:

5



Repeat the same to add more photo tags (up to three).

Photo tag indicators will be added:

6



Save the photo tags with the IR and visible images, and return to the run mode:

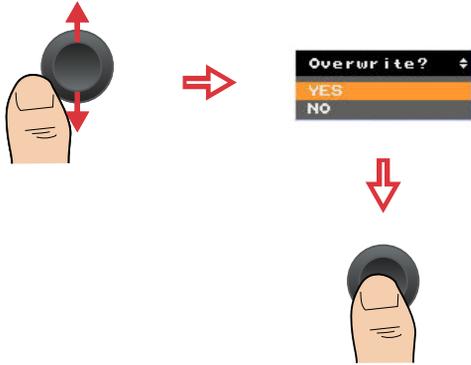
7



8 If there is already an existing photo tag and you want to add a new tag, a message prompts you to overwrite the existing tag:



9 Select **YES** to proceed with adding tags or **NO** to return to the previous screen:



Add a note tag

Repeat steps 1 to 2 from **"Add photo tags"** on page 47. **1**



2



Move the character cursor

Confirm the cursor position

Select and enter the character

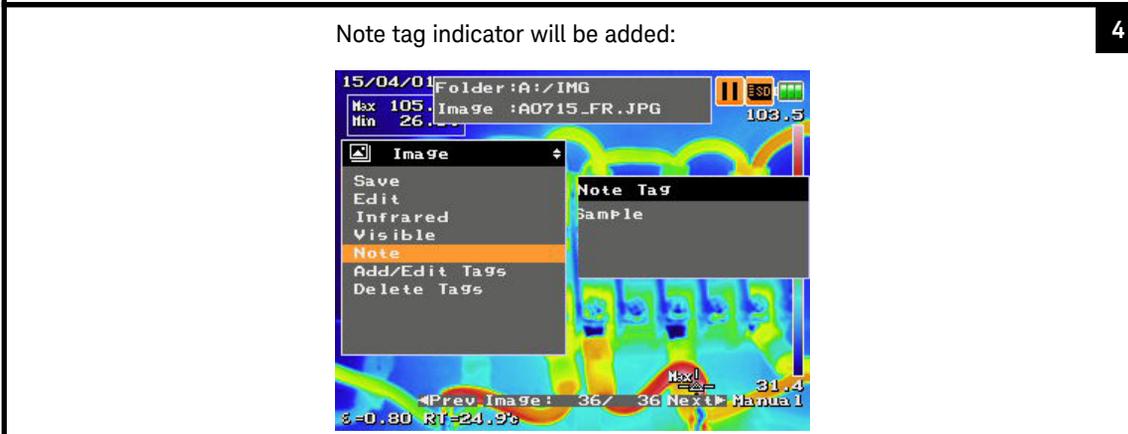
If there is no character input, a blank character is inserted.

2 Image Capture, Processing, and Measurement Functions

Press for 1 second. 3



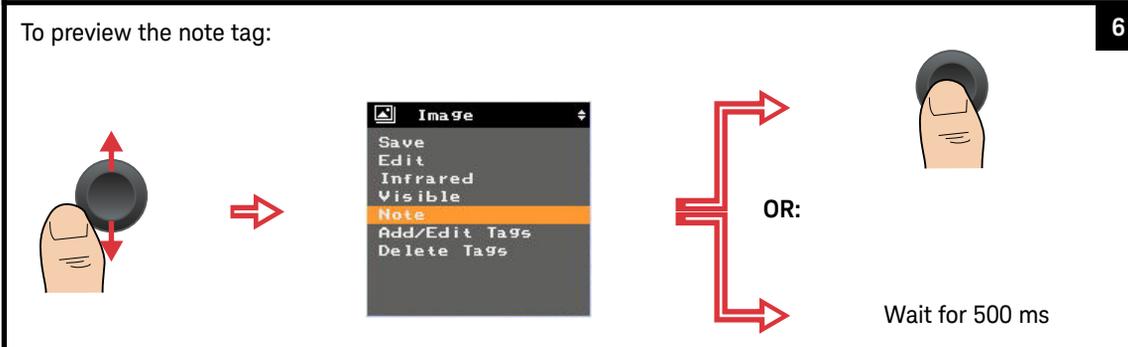
Note tag indicator will be added: 4



Save the note tag with the IR and visible images, and return to the run mode: 5



To preview the note tag: 6



Wait for 500 ms

Add a note tag from a template file

You can download the note tag template file from the Keysight website to the SD memory card.

To ensure proper use of this template file, use the following guidelines:

- File name and extension: NOTE_TMP.TXT
- File format: Text file/Notepad
- File location: Root of the SD memory card
- Character code: ASCII (20h to 7Fh)
- Maximum line: 50 lines
- Maximum characters per line: 64 characters

Follow steps 1 to 2 from **“Add photo tags”** on page 47.



1

The note tag template file that you downloaded will be displayed. Select a template and follow the same procedure from **“Add a note tag”** on page 49.

2

Edit tags



1

Follow the same procedure as adding tags. Existing tags will be overwritten by the edited tags.

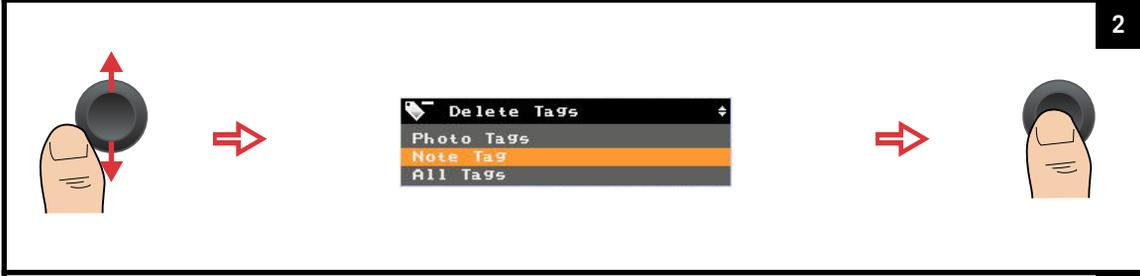
2

Delete tags

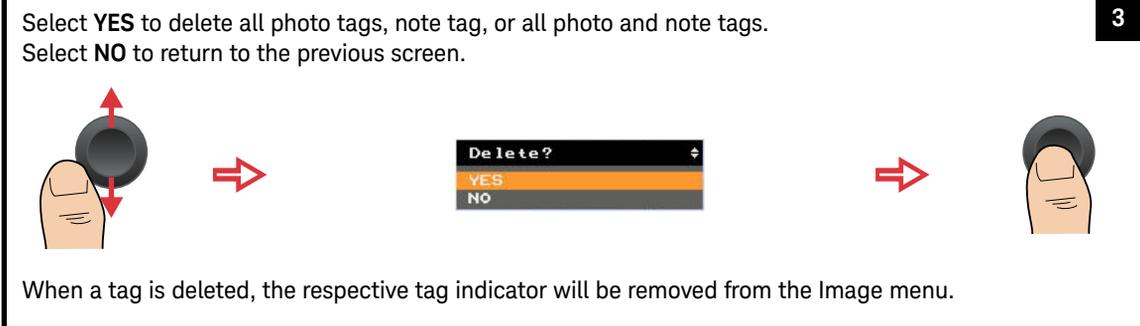
1



2



Select **YES** to delete all photo tags, note tag, or all photo and note tags.
Select **NO** to return to the previous screen.



When a tag is deleted, the respective tag indicator will be removed from the Image menu.

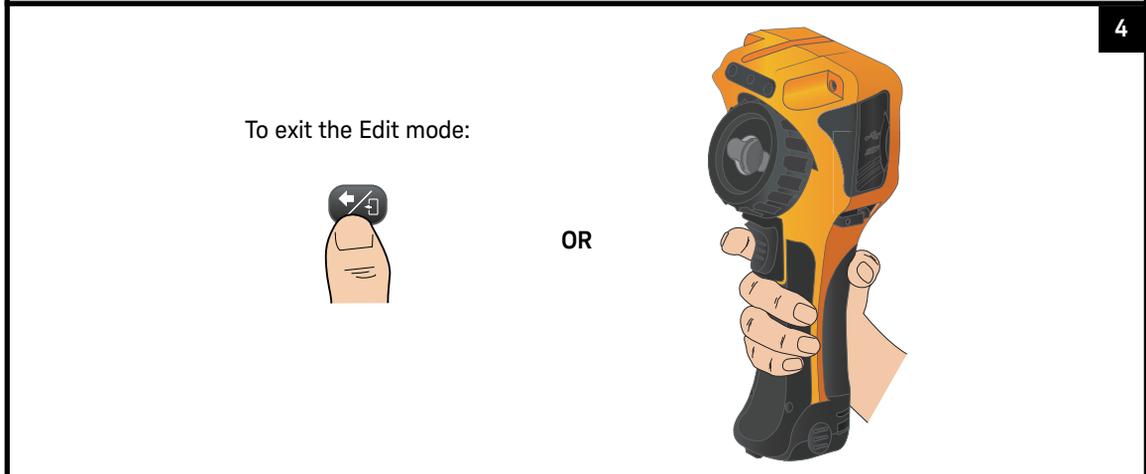
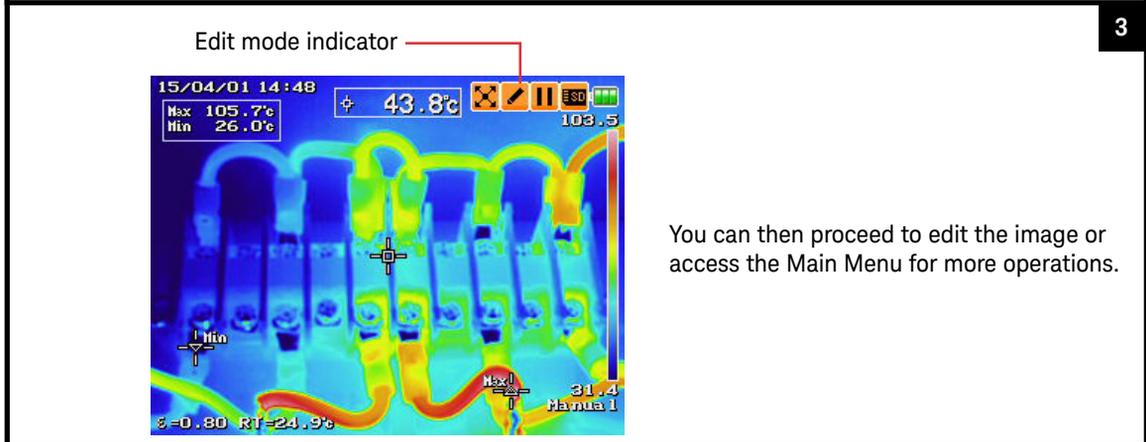
Save an image directly



Edit an image



2 Image Capture, Processing, and Measurement Functions



- Select **Save and exit** to overwrite the existing image and save your new edits, and then exit the Edit mode.
- Select **Exit without saving** to exit the Edit mode without saving your edits.
- Select **CANCEL** to return to the current operation.

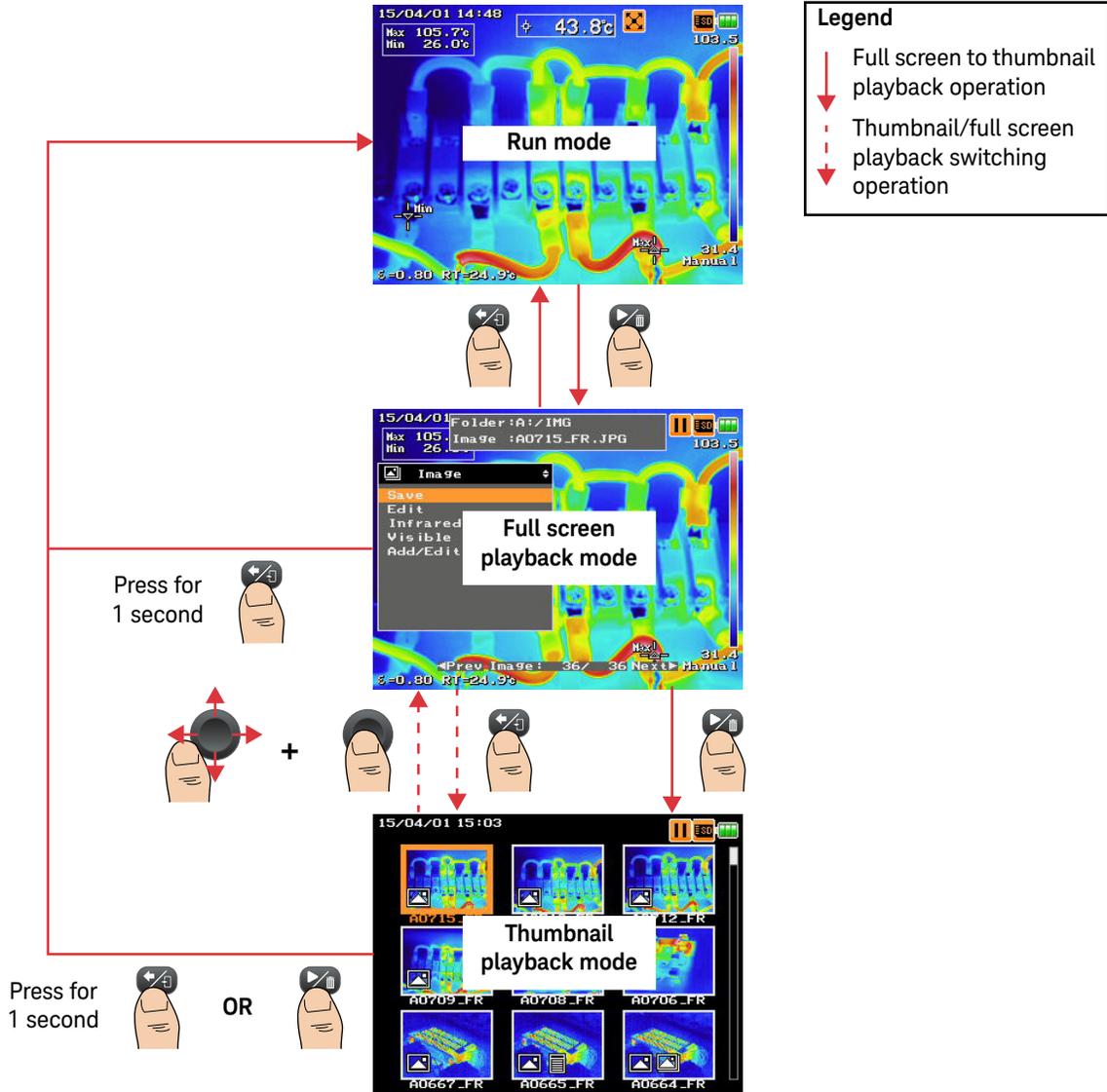
5



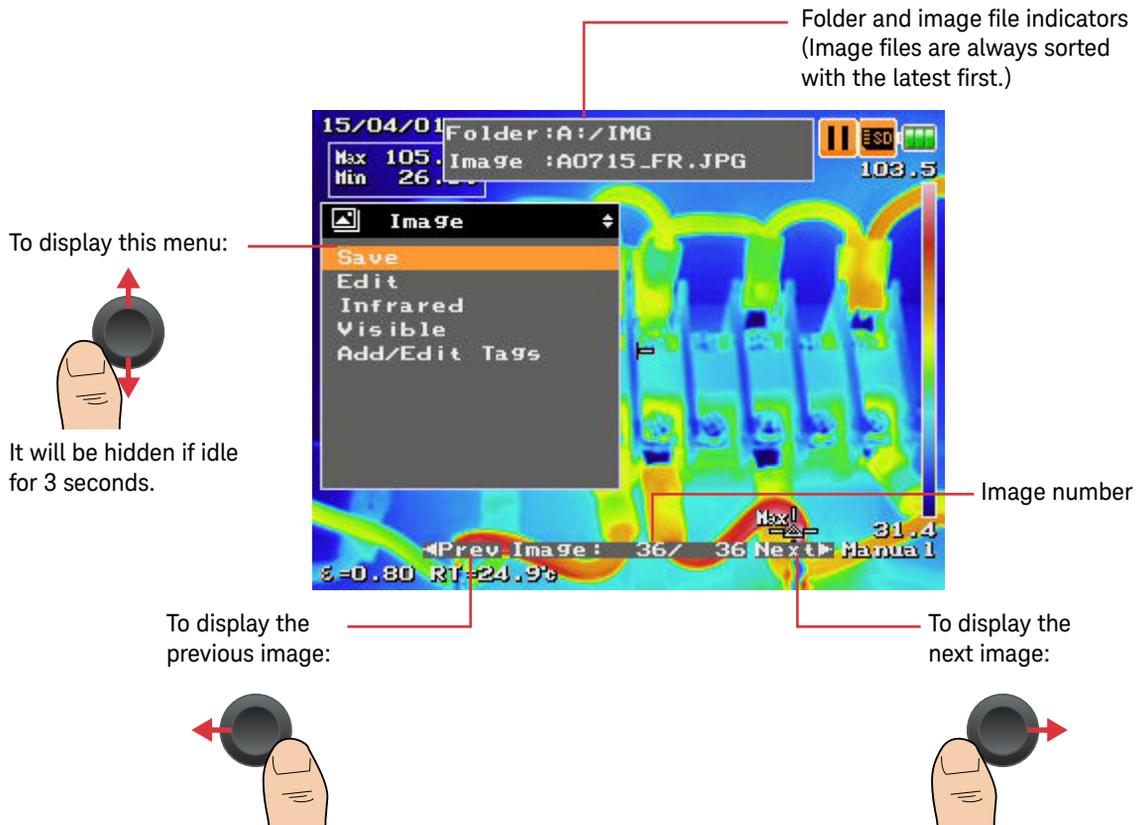
Image Playback

This feature allows you to play back saved images.

Full screen/Thumbnail playback mode operation

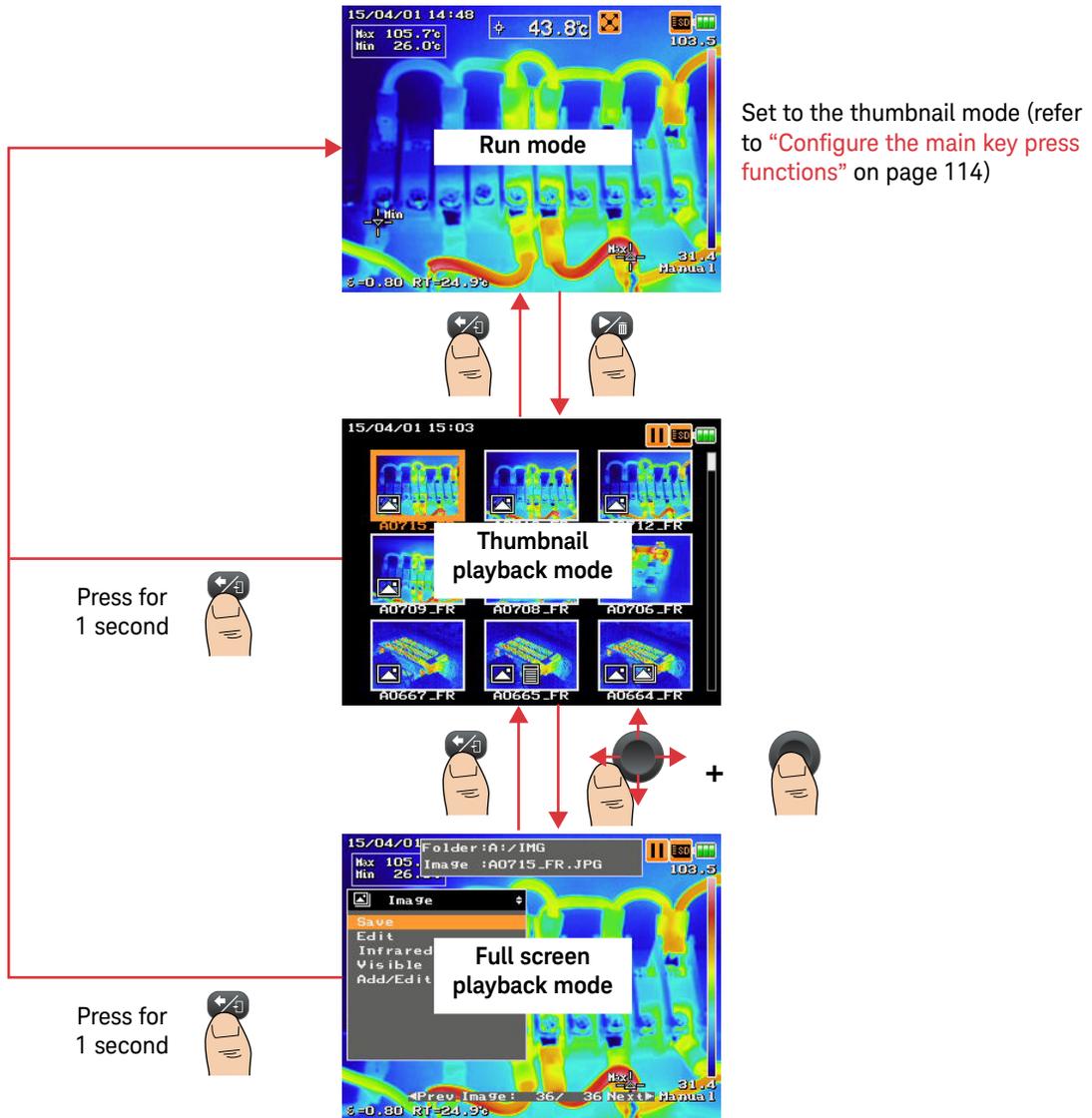


Full screen playback mode overview

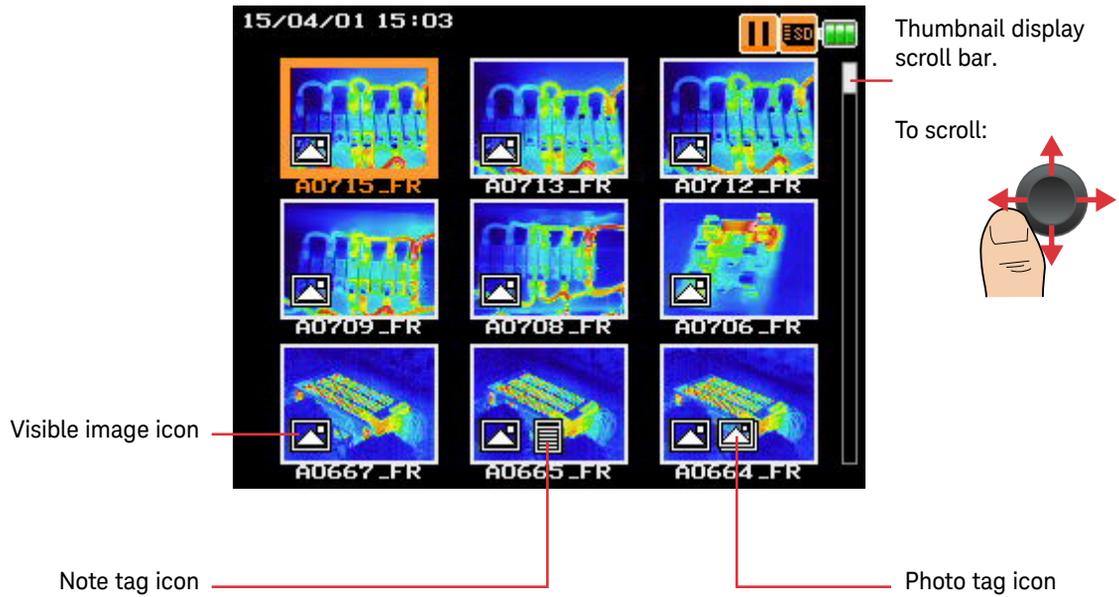
**NOTE**

In the playback mode, you can perform the same Image menu operations as described in the previous sections of this chapter.

Thumbnail playback mode operation



Thumbnail playback mode overview



Delete an image (full screen playback mode)

Press for 1 second



↓

Delete? ▾

YES

NO

3



↓

Delete? ▾

YES

NO

↓



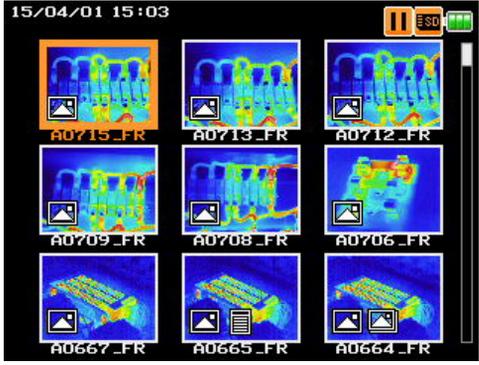
4

If an IR image is deleted, its related visible image, photo tag, and note tag are also deleted.

Delete multiple images (thumbnail playback mode)

1

15/04/01 15:03



Press for 1 second

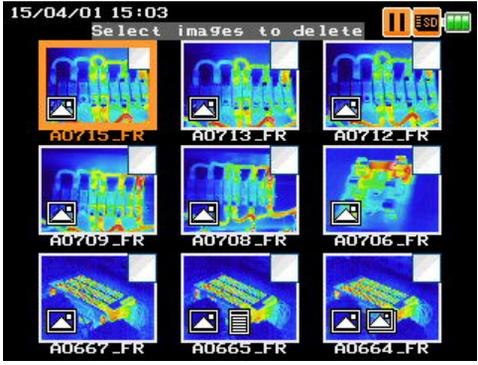


2



15/04/01 15:03

Select images to delete



2a

15/04/01 15:03

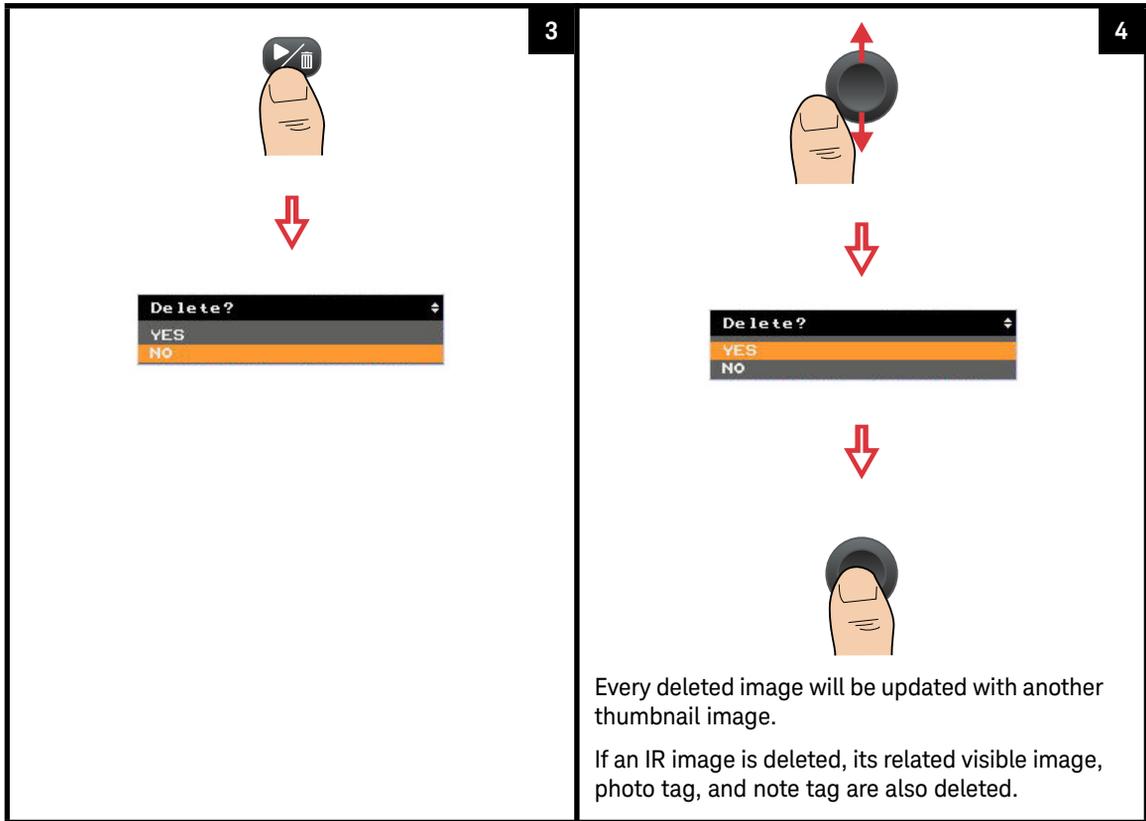
Select images to delete



Indicator for the selected image

Toggle to check/uncheck





Measurement Controls

The U5850 Series True/R Thermal Imager measurement controls enable you to identify hot/cold spots and to perform thermal analysis on the move, directly on the camera.

Set the temperature range

You can set auto range or manual range for temperature measurement.

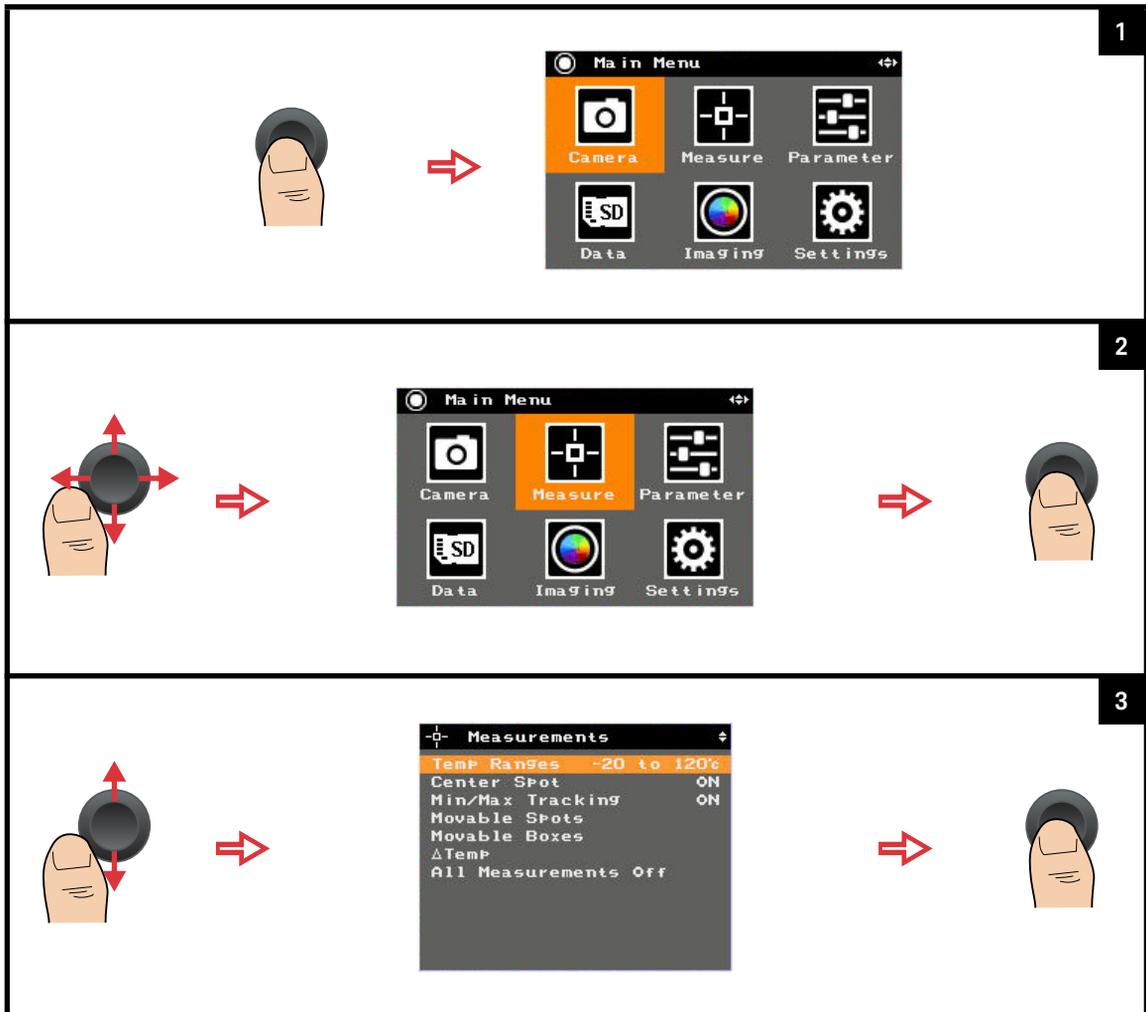
- Range 1: -20 to 120 °C (U5855A/U5856A/U5857A)
- Range 2: 0 to 350 °C (U5855A/U5857A), 0 to 650 °C (U5856A)
- Range 3: 0 to 1200 °C (U5857A)

If the maximum temperature (within 80% of the image center area) meets the following conditions, auto ranging will occur:

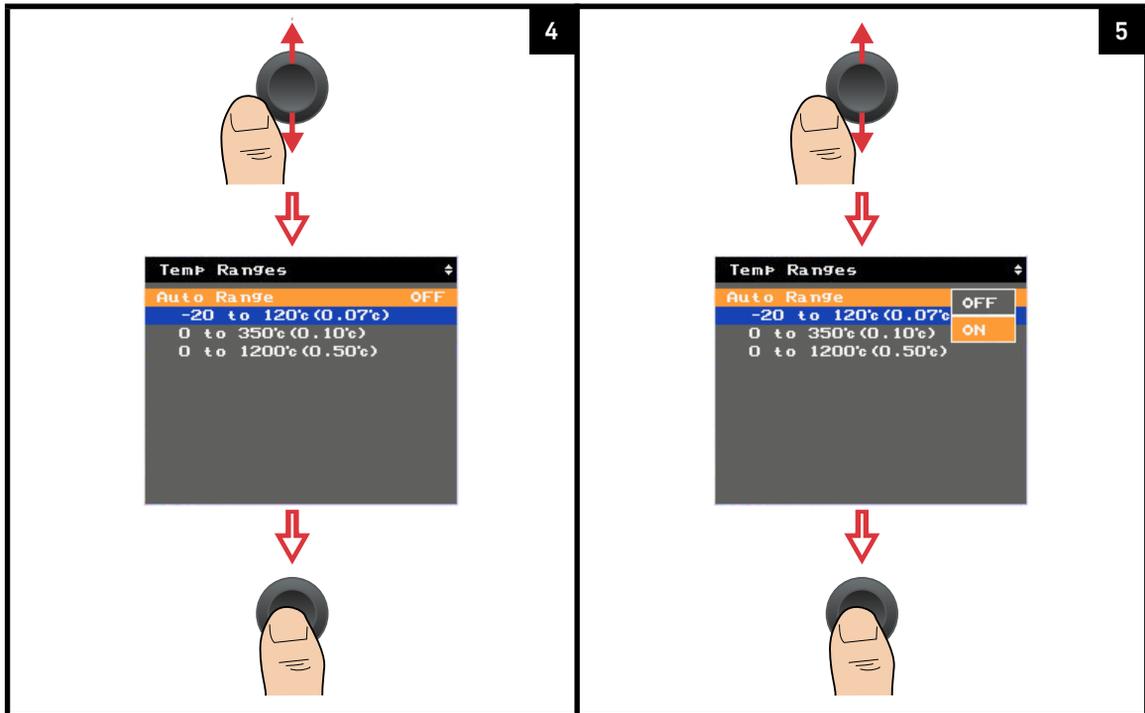
- > 120 °C:
Automatically switches from range 1 to range 2.
- > 350 °C (for U5857A):
Automatically switches from range 2 to range 3.
- < 108 °C:
Automatically switches from range 2 to range 1.
- < 315 °C (for U5857A):
Automatically switches from range 3 to range 2.

Auto ranging for these conditions only applies in the auto scaling mode.

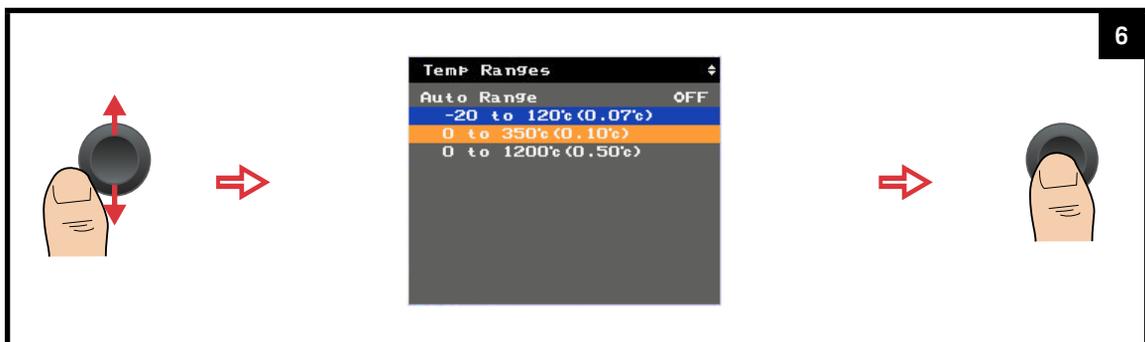
2 Image Capture, Processing, and Measurement Functions



Enable/disable auto range



Select a manual range (auto range disabled)



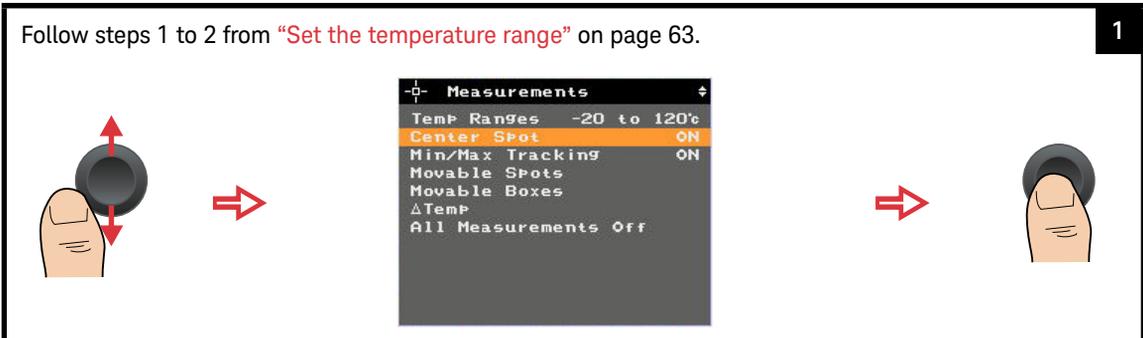
2 Image Capture, Processing, and Measurement Functions

Set the center spot

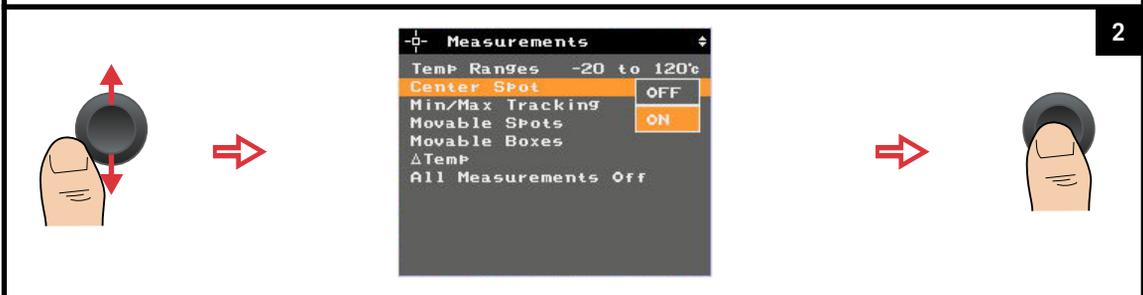
You can enable or disable the center spot cursor which measures the temperature at the center of the IR image.

Follow steps 1 to 2 from “Set the temperature range” on page 63.

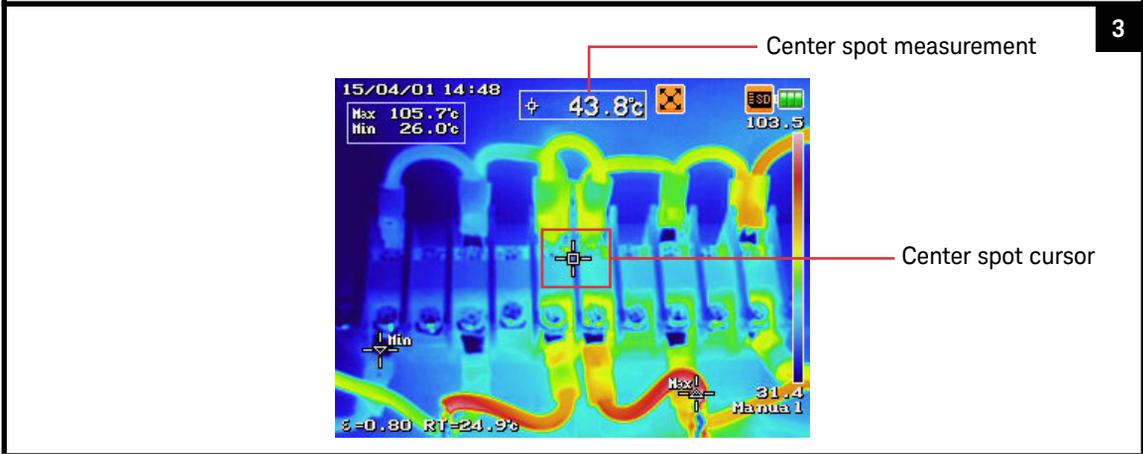
1



2



3



Center spot measurement

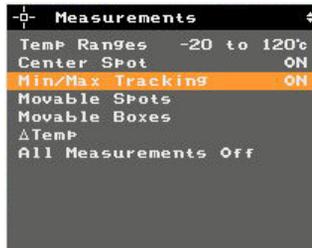
Center spot cursor

Set the max/min tracking

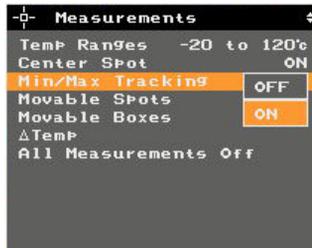
This function tracks the maximum and minimum temperature within the full IR image.

Follow steps 1 to 2 from “Set the temperature range” on page 63.

1



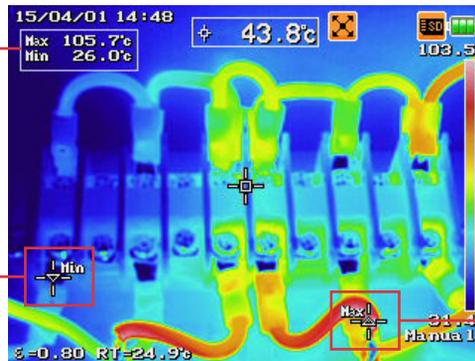
2



3

Max/Min measurements

Min point cursor



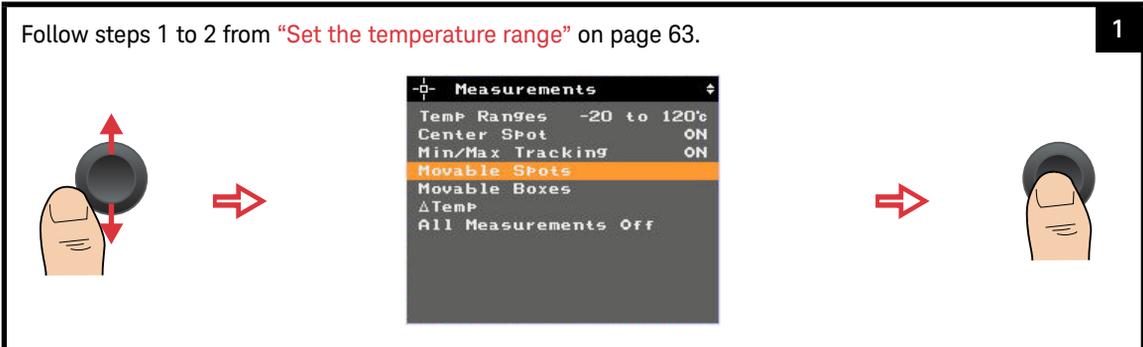
Max point cursor

Set the moveable spots and boxes

You can enable measurement spots and boxes to browse and detect the hot/cold areas of the IR image. You can allocate boxes at specific areas of the IR image to perform max, min, and average temperature measurements within the areas. The box size can be adjusted.

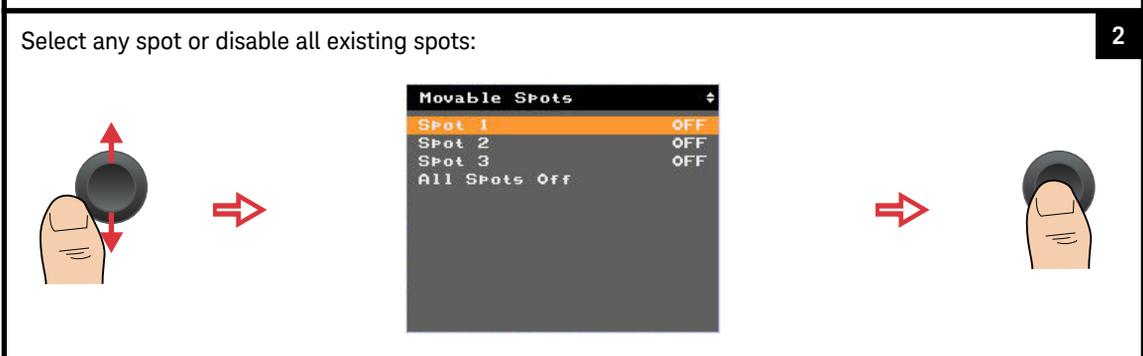
Set a measurement spot

Follow steps 1 to 2 from “Set the temperature range” on page 63. 1



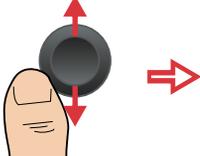
```
Measurements
Temp Ranges -20 to 120%
Center Spot ON
Min/Max Tracking ON
Movable Spots
Movable Boxes
ΔTemp
All Measurements Off
```

Select any spot or disable all existing spots: 2



```
Movable Spots
Spot 1 OFF
Spot 2 OFF
Spot 3 OFF
All Spots Off
```

For example, to enable or move spot 1:



Movable Spots

Spot 1 OFF

Spot 2 ON/Edit

Spot 3 ON/Edit

All Spots Off



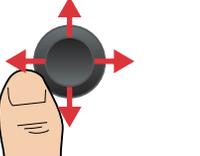
Spot 1 measurement



Spot 1 point cursor

3

To move spot 1:



To confirm spot 1 location:



4

To exit spot 1 moving mode:

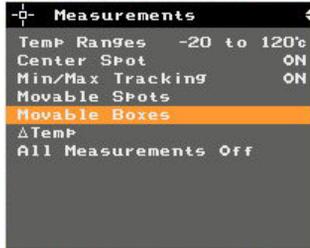


4a

Set a measurement box

Follow steps 1 to 2 from “Set the temperature range” on page 63.

1



Select any box or disable all existing boxes:

2



For example, to enable or move/adjust box 1:

3

Box 1:	Max	Min	Avg	Max1	Min1
	89.7	29.6	36.1	31.4	26.0

To move box 1:

4

To adjust the size of box 1:

5

To confirm box 1:

6

To exit box 1 moving mode or size adjustment:

6a

Set the delta temperature

You can measure the difference between two temperature readings – you can select from the spot readings or specify your own reference value.

Follow steps 1 to 2 from “Set the temperature range” on page 63. 1

Step 1: The **Measurements** menu is shown with **ΔTemp** highlighted.

```

Measurements
Temp Ranges -20 to 120°C
Center Spot ON
Min/Max Tracking ON
Movable Spots
Movable Boxes
ΔTemp
All Measurements Off
    
```

Step 2: The **ΔTemp** menu is shown with **Show ΔTemp** set to **OFF**.

```

ΔTemp
Show ΔTemp OFF
Temp 1 Spot 3
Temp 1 Ref 30.0°C
Temp 2 Ref
Temp 2 Ref 20.0°C
    
```

Step 3: The **ΔTemp** menu is shown with **Show ΔTemp** set to **ON**. The thermal image displays the **ΔTemp indicator** showing a difference of **43.8°C**.

15/04/01 14:48 **43.8°C** 103.5

S1 86.2%
 Max 105.7%
 Min 26.0%
 S1-2 66.2%

Box 1: Max 88.7 Min 28.5 Avg 58.1 Max 31.4 Manual 1
 % = 0.80 RT = 24.9%

4

ΔTemp		
Show	ΔTemp	ON
Temp 1	Spot 3	
Temp 1	Ref	30.0%
Temp 2	Ref	
Temp 2	Ref	20.0%

5

Select the center spot, spot 1, 2, or 3, or a reference value for Temp 1:

ΔTemp		
Show	ΔTemp	ON
Temp 1	Center	
Temp 1	Ref	
Temp 2	Spot 1	
Temp 2	Spot 2	
Temp 2	Spot 3	
Temp 2	Ref	

6

If you want to enter a reference value:

ΔTemp		
Show	ΔTemp	ON
Temp 1	Ref	
Temp 1	Ref	30.0%
Temp 2	Ref	
Temp 2	Ref	20.0%

Push left/right to move the indicator.

Push up/down to increase/decrease the digits.

7

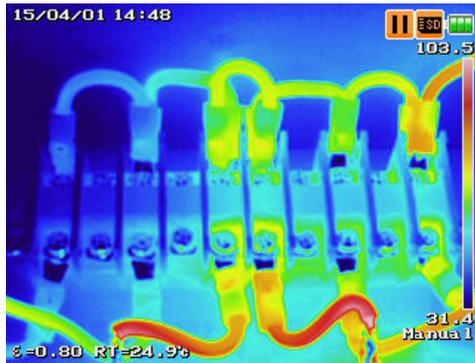
Repeat the same procedure for **Temp 2**.

Turn off all measurements

Follow steps 1 to 2 from “Set the temperature range” on page 63.



All measurement indicators are removed:

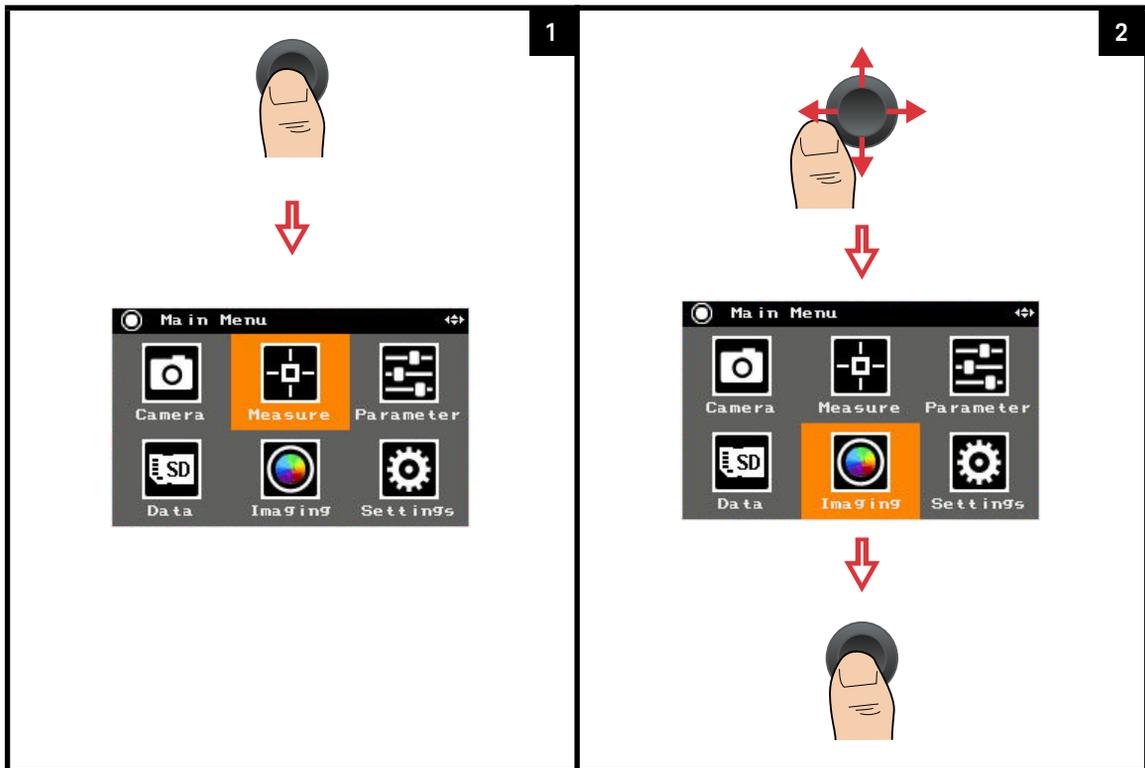


Imaging Controls

The imaging feature allows you to perform a more comprehensive thermal analysis by configuring the IR image display for different environments.

Set the color palette

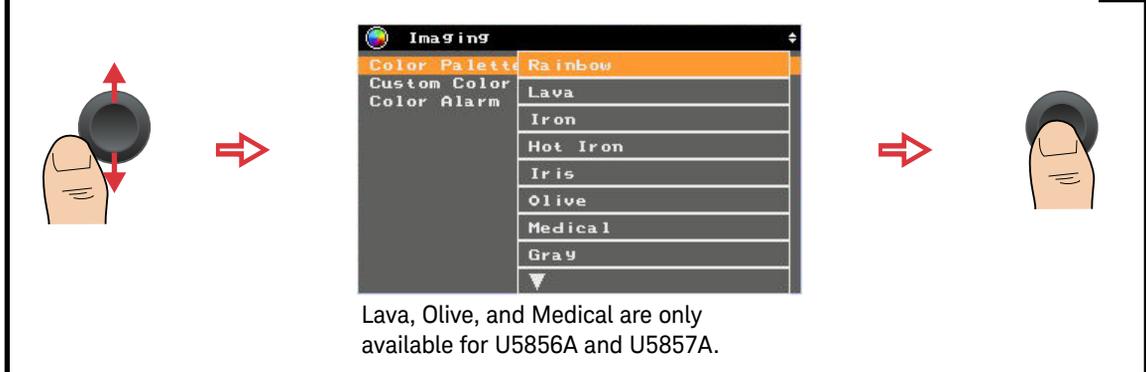
You can apply a specific color palette for your IR image to improve contrast and clarity when identifying hot/cold areas.



2 Image Capture, Processing, and Measurement Functions



Select a color palette:



For example, the Medical color palette is applied:



Load a custom color palette

You can create custom color palette from the Keysight TrueIR Analysis and Reporting Tool. Visit www.keysight.com/find/trueIR_ART to download the software for free.



⇒

Imaging

Color Palette Rainbow

Custom Color Palette

Color Alarm

⇒



1

- Select **Read from SD Card** to select a custom color palette from the SD memory card to be loaded into the U5850 Series.
- Select **Erase from Camera** to remove the custom color palette from the U5850 Series.



⇒

Custom Color Palette

Read from SD Card

Erase from Camera

⇒



2

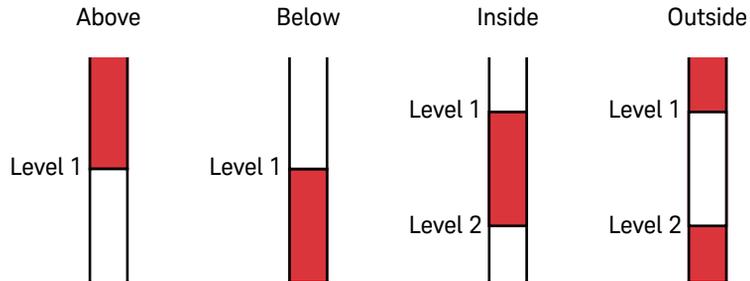
NOTE

- The custom color palettes must be saved into the root directory of the SD memory card.
- The maximum characters for the custom color palette file name is 8 characters.
- The U5850 Series allows up to 30 custom color palettes (sorted by time) to be displayed from the SD memory card.

Set the color alarm

The color alarm allows you to set an alarm threshold which only displays IR components on image zones above, below, inside, or outside the alarm threshold.

Alarm thresholds



-  Alarm zone (based on selected color palette)
-  Image background zone (based on selected background)

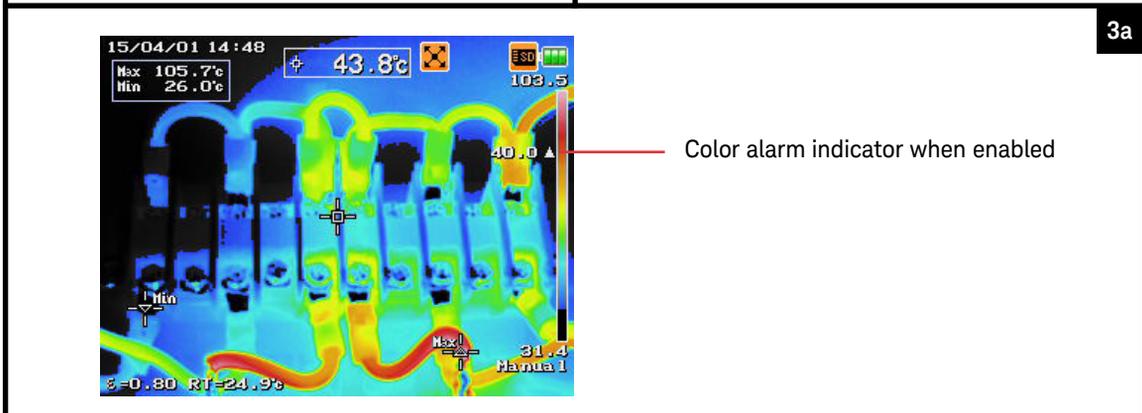
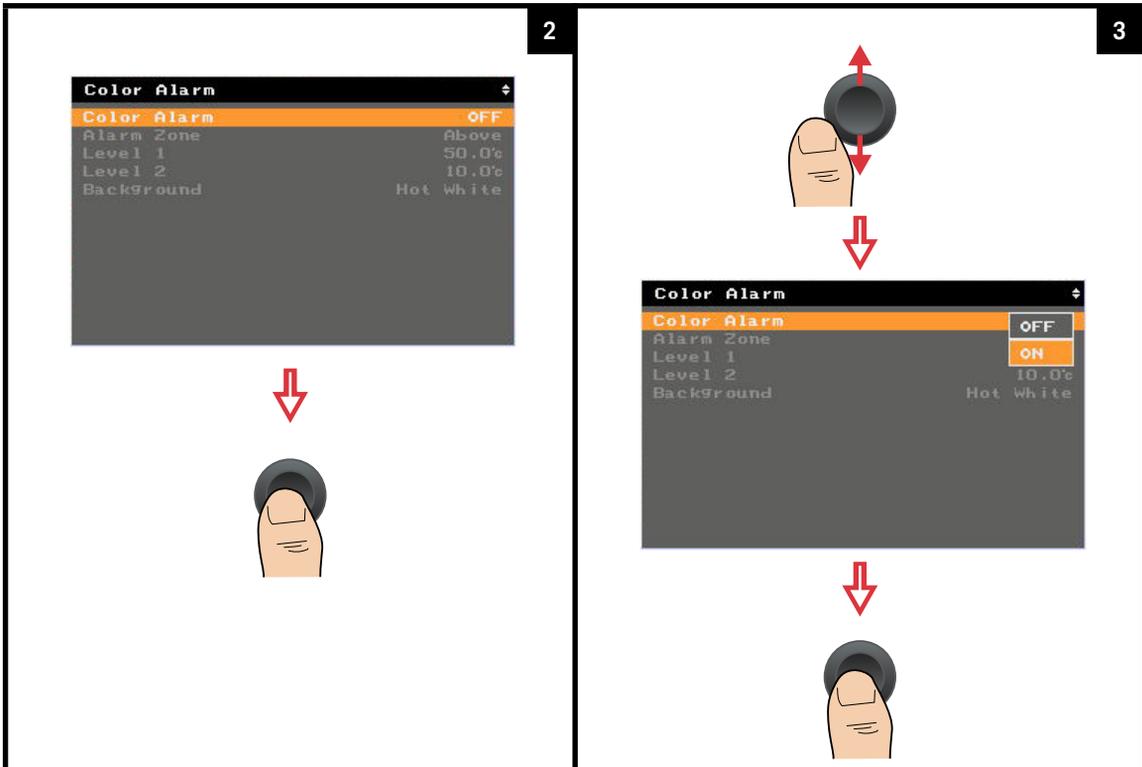
Turn on/off the color alarm

Follow steps 1 to 2 from “Set the temperature range” on page 63.



The screenshot shows the Imaging menu with the following options: Color Palette (Rainbow), Custom Color Palette, and Color Alarm (highlighted in orange). A hand is shown interacting with the menu.

1



Set the alarm threshold

1

Color Alarm

Color Alarm	ON
Alarm Zone	Above
Level 1	50.0%
Level 2	10.0%
Background	Hot white

2

Select the threshold type:

Color Alarm

Color Alarm	ON
Alarm Zone	Above
Level 1	
Level 2	
Background	

Above
Below
Inside
Outside

Set the alarm threshold level

1



2

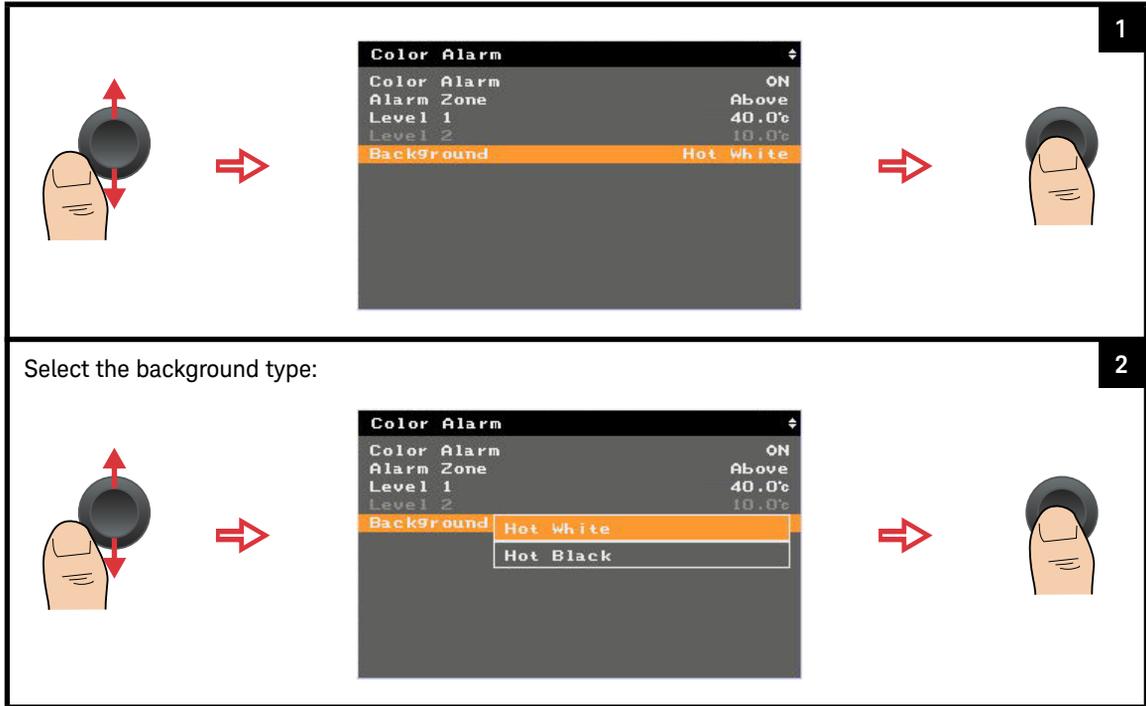


Push left/right to move the indicator.

Push up/down to increase/decrease the digits.

If you have selected the **Inside** or **Outside** threshold, repeat the same procedure to enter the value for **Level 2**.

Set the image background



Digital Zoom

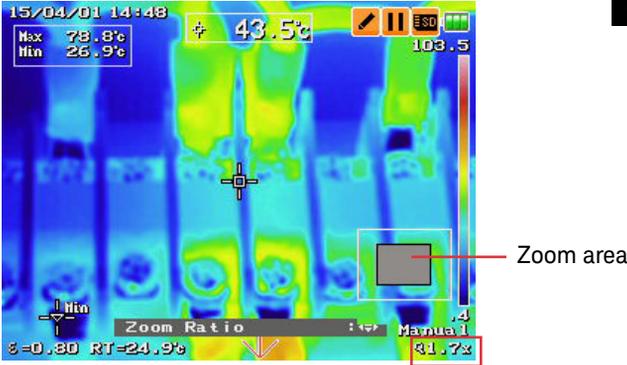
You can zoom in to expand the view of certain areas of the image at a 1× to 4× ratio.

Set the zoom ratio

Press for 1 second.



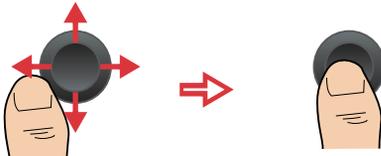
1



In run mode, the zoom area is always at the center of the image.

2

To change and confirm the zoom ratio:

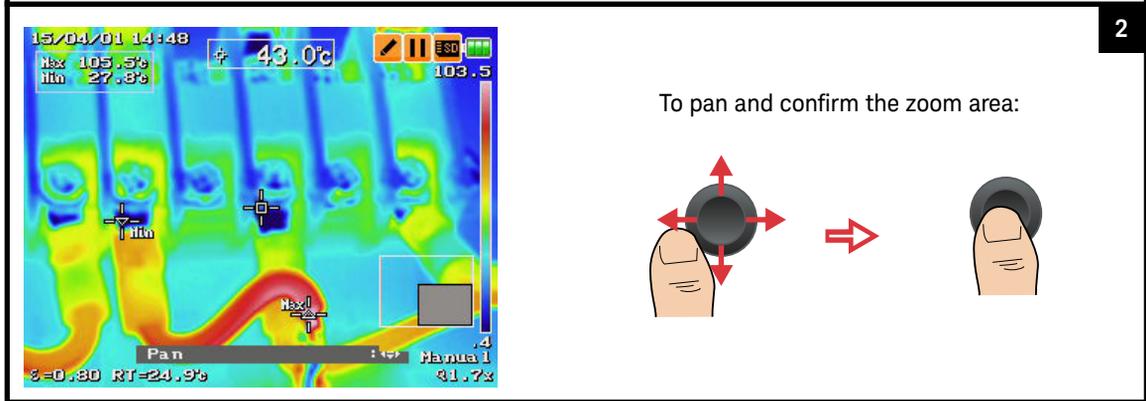
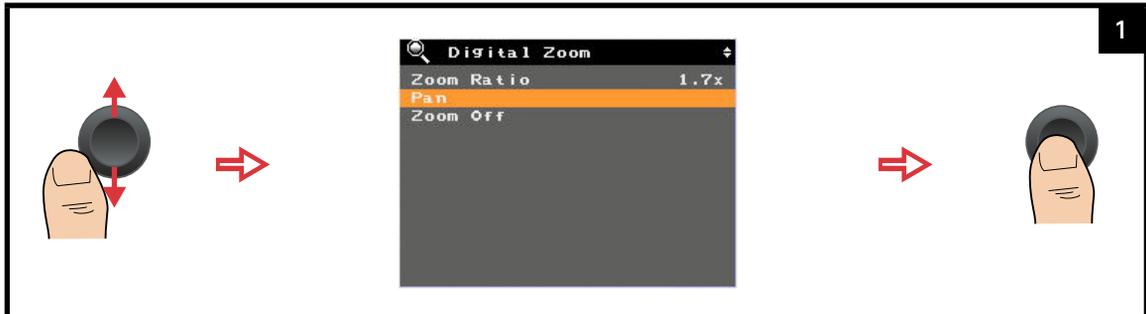


To exit:

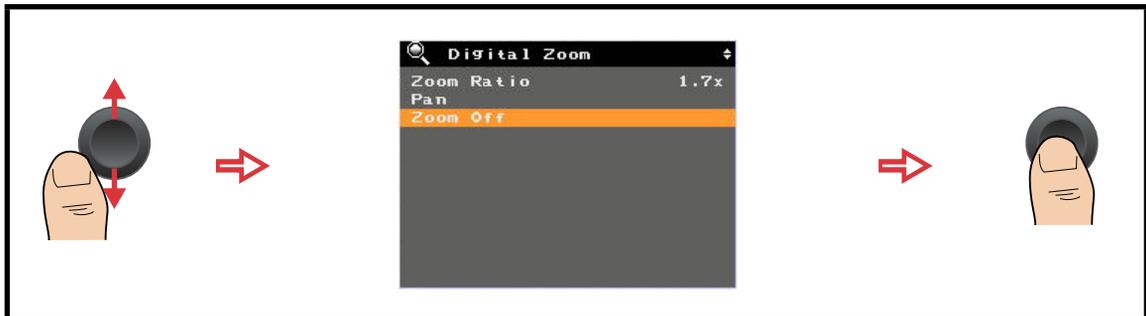


3

Pan (move) the zoom area



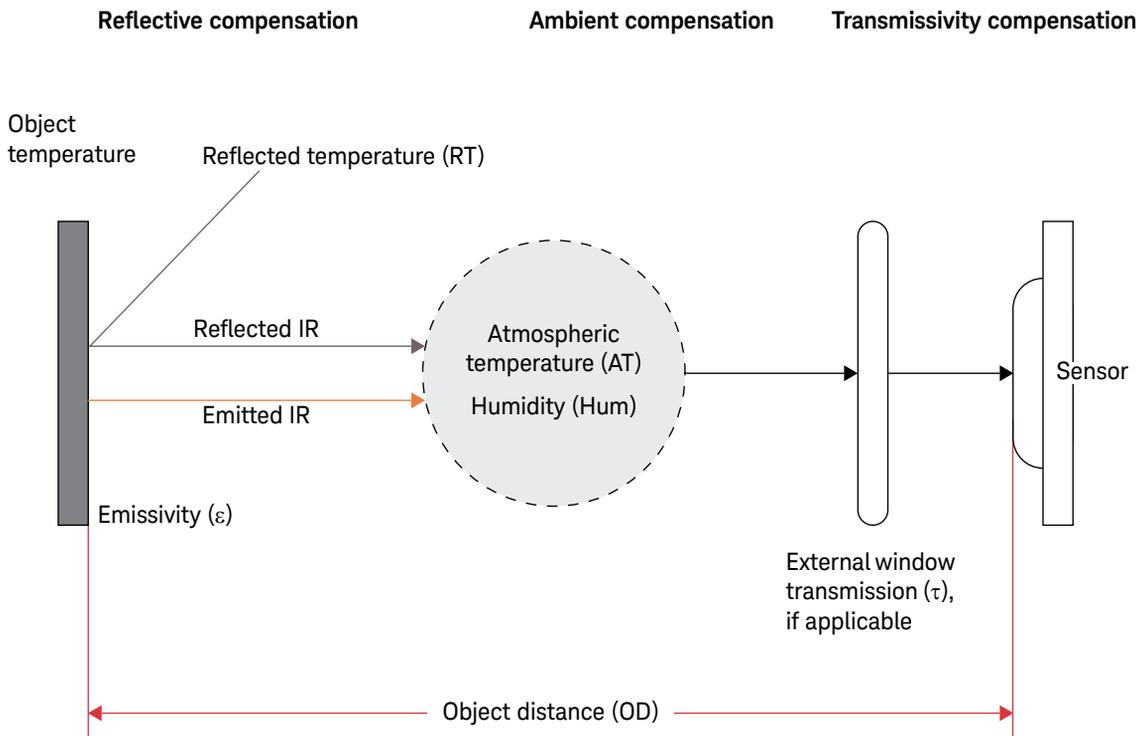
Disable zoom



Parameter Controls

These controls enable you to improve the accuracy of your temperature measurements by making corrections or compensations to the emissivity, reflected temperature, object distance, ambient temperature, humidity, and transmissivity.

Below illustrates a model of the IR emission energy received by the U5850 Series.



Set the emissivity (ϵ)

Emissivity is the ratio of energy radiated from an object and energy radiated from blackbody. The emissivity varies with the surface condition of the object. The emissivity value is expressed between 0.10 to 1.00.

Enter an emissivity value



3

Parameters	
Emissivity (ε)	0.80
Emissivity Table	
Reflected Temp (RT)	23.9%
Object Distance (OD)	1m
Ambient Temp (AT)	25%
Humidity (Hum)	50%
Transmission (τ)	1.00

4

Enter a value from 0.10 to 1.00:

Push left/right to move the indicator.

Push up/down to increase/decrease the digits.

Parameters	
Emissivity (ε)	0.80
Emissivity Table	
Reflected Temp (RT)	23.9%
Object Distance (OD)	1m
Ambient Temp (AT)	25%
Humidity (Hum)	50%
Transmission (τ)	1.00

5

Emissivity parameter indicator

To display the parameter indicator, refer to “Configure the display items” on page 112.

Select a common emissivity value



Table 2-1 Emissivity table

Common item	Emissivity value	Common item	Emissivity value
Iron (polished)	0.10	Paint (typical)	0.94
Iron (oxidized)	0.70	Brick	0.93
Aluminum (oxidized)	0.15	Paper	0.90
Stainless steel (polished)	0.20	Clay	0.92
Stainless steel (oxidized)	0.80	Graphite (carbon)	0.95
Copper (oxidized)	0.40	Glass	0.90
Nickel (oxidized)	0.37	Rubber	0.90
Brass (oxidized)	0.64	Concrete	0.92
Snow	0.85	Skin	0.98
Cloth	0.90	Water	0.96

Set the reflected temperature (RT)

RT can be corrected to obtain a more accurate temperature measurement especially for low-emissivity objects.

You can manually enter an RT value or run the RT calibration (RT Cal) for reflection source correction. When the source of reflection exists around an object and the temperature of the source of reflection is known, you can enter the RT value manually. If the temperature of the source of reflection is not known, perform RT Cal to obtain the RT value automatically.

NOTE

RT Cal cannot be executed during freeze mode and image logging.

Enter an RT value

Follow steps 1 to 2 from “Enter an emissivity value” on page 86.

1

Parameters	
Emissivity (ε)	0.80
Emissivity Table	
Reflected Temp (RT)	24.9%
Object Distance (OD)	1m
Ambient Temp (AT)	25%
Humidity (Hum)	50%
Transmission (τ)	1.00

2

Reflected Temp (RT)	
Reflected Temp	24.9%
RT Cal (Source)	

3

Reflected Temp (RT)	
Reflected Temp	24.9%
RT Cal (Source)	

Push left/right to move the indicator.

Push up/down to increase/decrease the digits.

4

RT parameter indicator

To display the parameter indicator, refer to “Configure the display items” on page 112.

Run RT Cal for reflection source correction



⇒

Reflected Temp (RT) ▾

Reflected Temp 24.9%

RT Cal (Source)

⇒


1

If you know the temperature of the reflection source, you may enter the value.
If not, point the U5850 Series at the reflection source and select **YES** to run the calibration to obtain the temperature.



⇒

Background Compensation ▾

YES

NO

23.8%

⇒


2



⇒

Background Compensation ▾

YES

NO

23.6%

⇒



Push left/right to move the indicator.
Push up/down to increase/decrease the digits.

OR



⇒

Background Compensation ▾

YES

NO

23.6%

⇒



When completed, it will return to the Reflected Temp (RT) menu.

Value updated

3

RT indicator updated

Set the object distance (OD), ambient temperature (AT), and humidity (Hum)

You can perform compensation for ambient parameters (OD, AT, Hum) to correct atmospheric errors in your temperature measurements.

NOTE

Ambient parameter settings are not supported in the freeze, playback, and image logging modes.

Follow steps 1 to 2 from “Enter an emissivity value” on page 86.
 Select Object Distance (OD)/Ambient Temp (AT)/Humidity (Hum):

⇒

Parameters

Emissivity (ε) 0.80

Emissivity Table

Reflected Temp (RT) 24.9%

Object Distance (OD) 1m

Ambient Temp (AT) 25%

Humidity (Hum) 50%

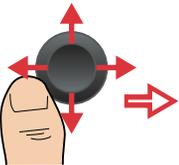
Transmission (τ) 1.00

⇒

1

2

- OD: 1 to 1000 m
- AT: -15 to 50 °C
- Hum: 0 to 100%



Parameters

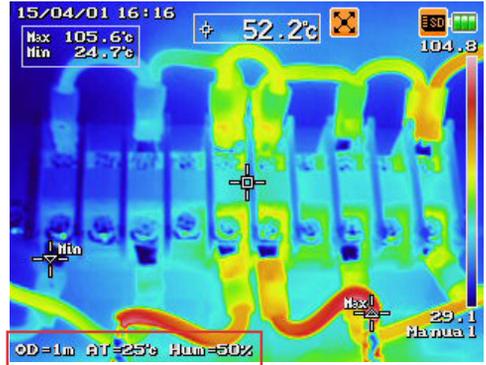
Emissivity (ε)	0.80
Emissivity Table	
Reflected Temp (RT)	24.9%
Object Distance (OD)	1 m
Ambient Temp (AT)	25%
Humidity (Hum)	50%
Transmission (τ)	1.00

Push left/right to move the indicator.

Push up/down to increase/decrease the digits.



3



Ambient parameter indicators

To display the parameter indicator, refer to “Configure the display items” on page 112.

Set the transmissivity (τ)

Some IR energy may be lost when transmitted through an external window; this transmissivity error must be corrected to improve the accuracy of your temperature measurements.

NOTE

Transmissivity setting is not supported in the freeze, playback, and image logging modes.

Follow steps 1 to 2 from “Enter an emissivity value” on page 86.



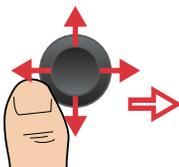
Parameters	
Emissivity (E)	0.80
Emissivity Table	
Reflected Temp (RT)	24.9%
Object Distance (OD)	1m
Ambient Temp (AT)	25%
Humidity (Hum)	50%
Transmission (T)	1.00



1

Enter a value from 0.10 to 1.00:

2



Parameters	
Emissivity (E)	0.80
Emissivity Table	
Reflected Temp (RT)	24.9%
Object Distance (OD)	1m
Ambient Temp (AT)	25%
Humidity (Hum)	50%
Transmission (T)	0.80

Push left/right to move the indicator.

Push up/down to increase/decrease the digits.



Transmissivity parameter indicator

To display the parameter indicator, refer to “Configure the display items” on page 112.

3

3 Data Management and System-Related Functions

Data Management Controls	96
System-Related Settings	107

This chapter guides you on how to configure data and system settings for the U5850 Series True/R Thermal Imager.

Data Management Controls

These controls allow you to log images, check the memory status, manage your image folders, and format the SD memory card.

Perform image logging

You can log IR, visible, or fusion images at defined intervals. During logging, folders are automatically created in the SD memory card to store the images. The folder created at the first logging interval will be named LOG_0001, then LOG_0002 at the next interval, and will increase subsequently.

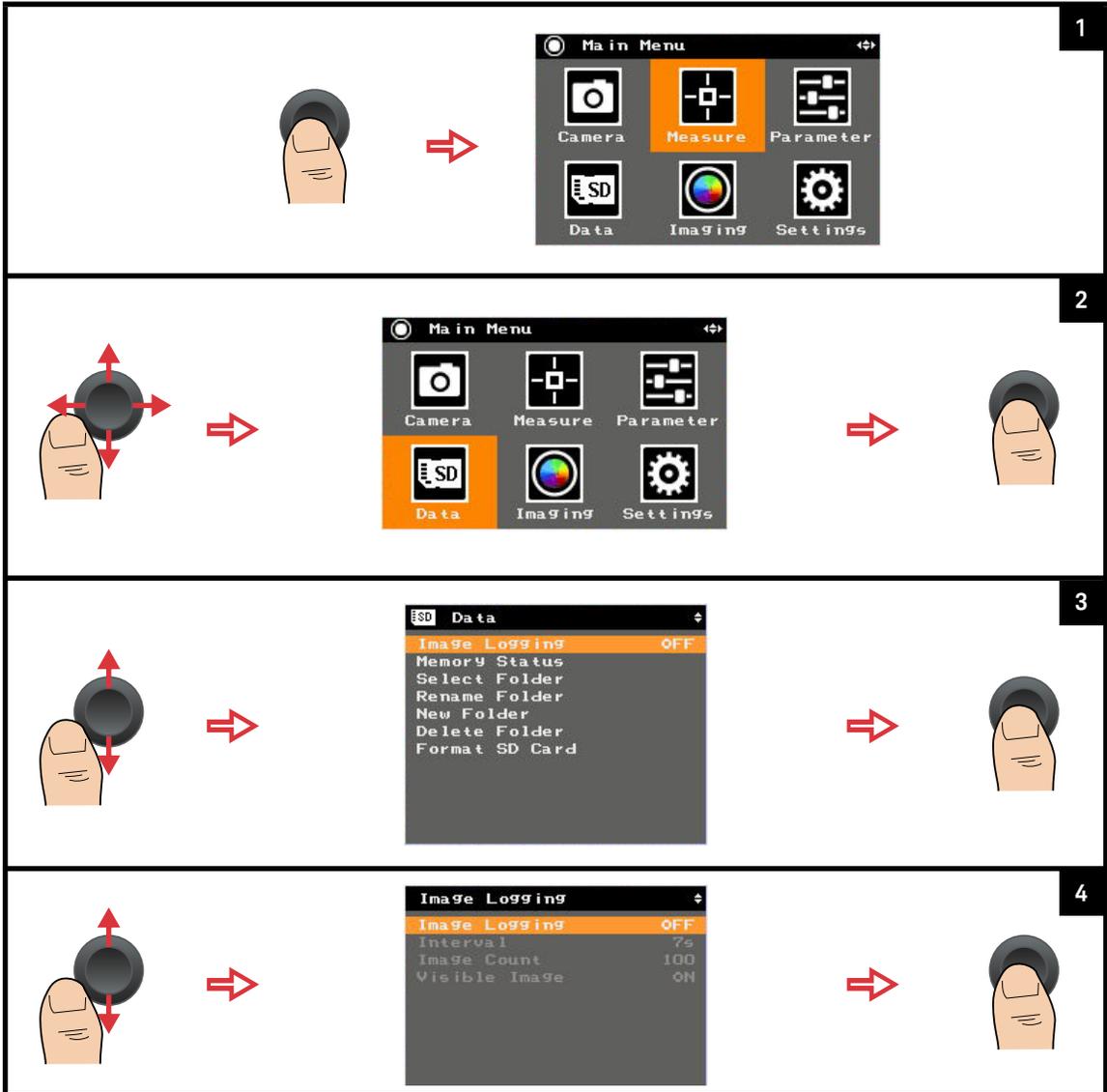
NOTE

All functions are not accessible during image logging.

CAUTION

Do not perform image logging on objects with extremely high temperature over a long period of time to avoid damage to the infrared detector.

Enable/Disable image logging



3 Data Management and System-Related Functions

5

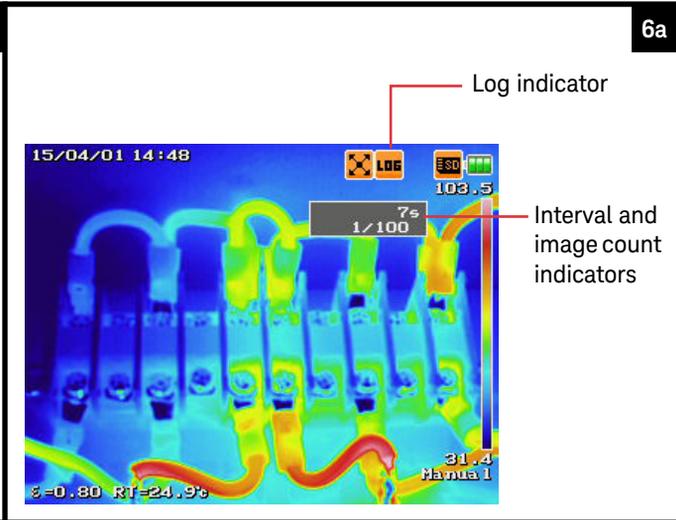


6

Press for 1 second to start logging.



6a

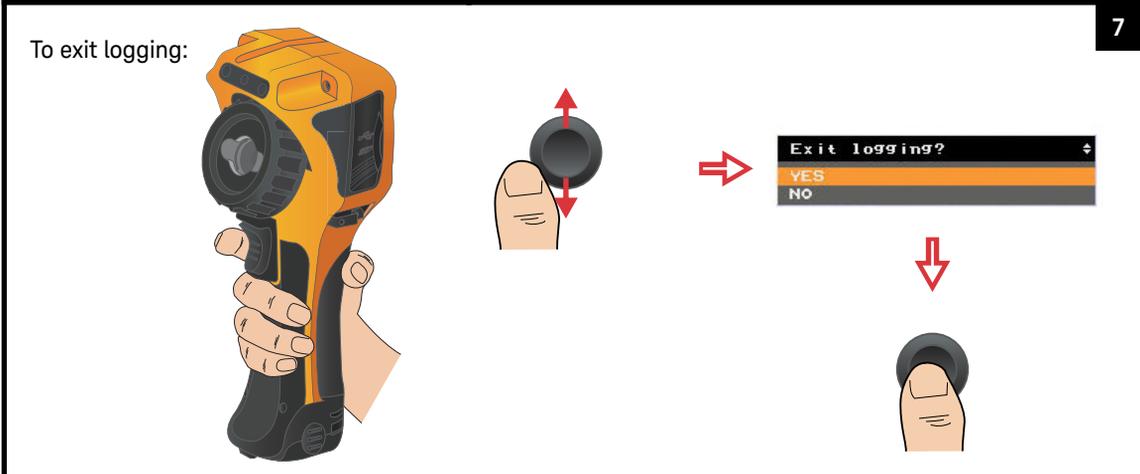


Log indicator

Interval and image count indicators

7

To exit logging:



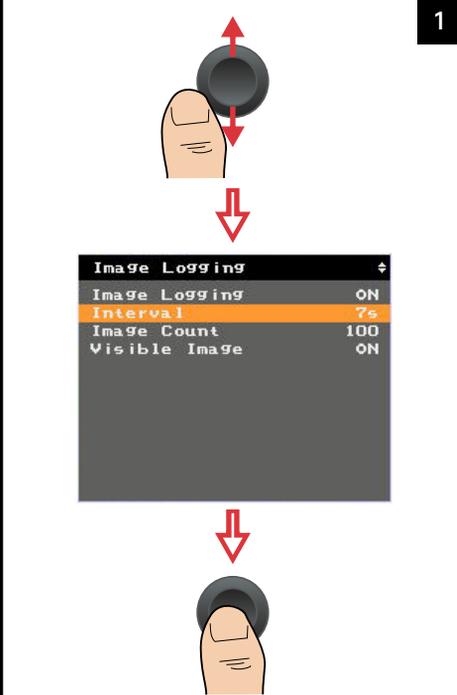
Exit logging?

YES

NO

Set the logging interval

1



2

Enter a value from 7 to 3600 seconds:

Push left/right to move the indicator.
Push up/down to increase/decrease the digits.

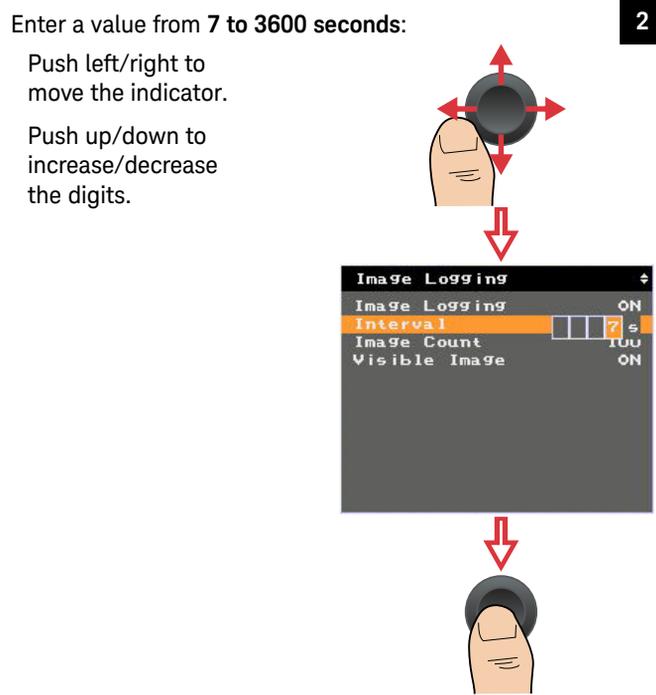


Image Logging	
Image Logging	ON
Interval	7s
Image Count	100
Visible Image	ON

Image Logging	
Image Logging	ON
Interval	7s
Image Count	100
Visible Image	ON

Set the image count

1 Enter a value from 1 to 1000:

Push left/right to move the indicator.
Push up/down to increase/decrease the digits.

2

The diagram illustrates the process of setting the image count in two steps. In step 1, a hand uses a rotary knob to navigate through the 'Image Logging' menu. The menu items are: Image Logging (ON), Interval (7s), Image Count (100), and Visible Image (ON). The 'Image Count' item is highlighted. In step 2, the hand uses the knob to enter a value of 1000 into the 'Image Count' field. The menu items are: Image Logging (ON), Interval (7s), Image Count (1000), and Visible Image (ON). The 'Image Count' field is highlighted and shows the value 1000.

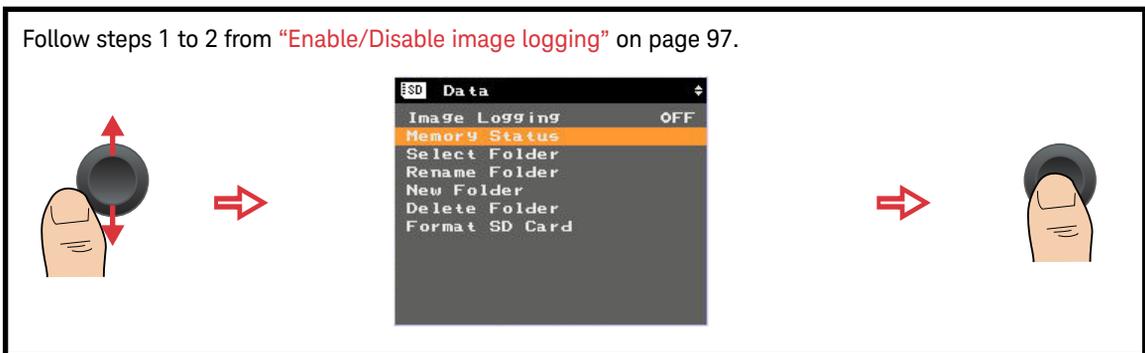
Image Logging	
Image Logging	ON
Interval	7s
Image Count	100
Visible Image	ON

Image Logging	
Image Logging	ON
Interval	7s
Image Count	1000
Visible Image	ON

Enable/Disable logging of visible images



View the memory status of the SD memory card

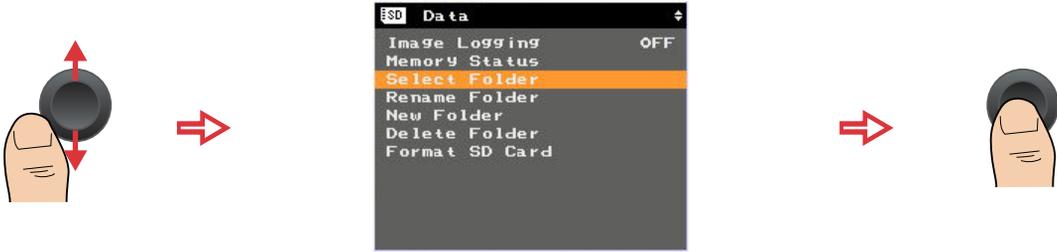


Manage image folders

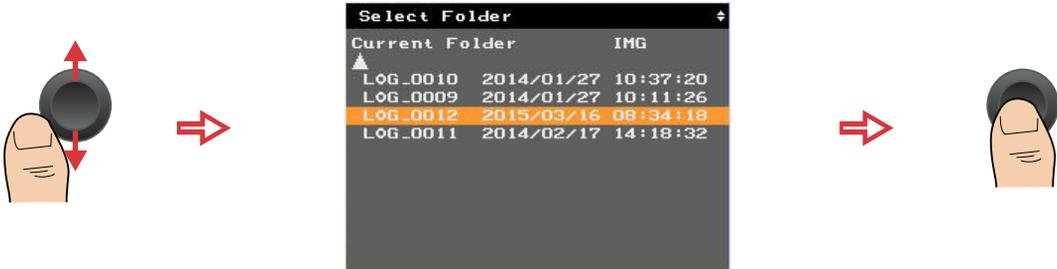
You can create a new image folder or select, rename, or delete an existing folder for your image saving purposes.

Select a folder

Follow steps 1 to 2 from “Enable/Disable image logging” on page 97. 1



Select an existing folder to use: 2

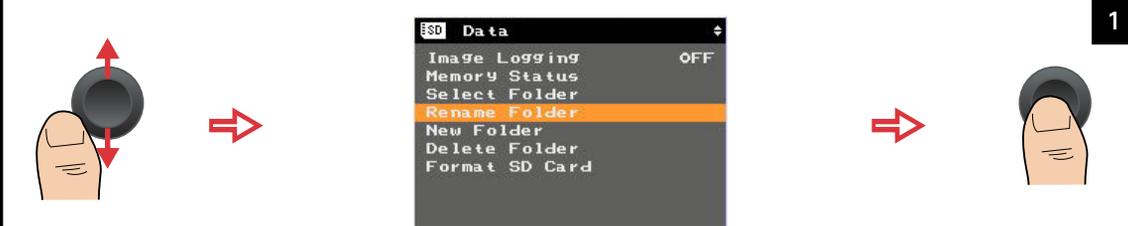


To return to the previous folder list display: To return to the Data menu:



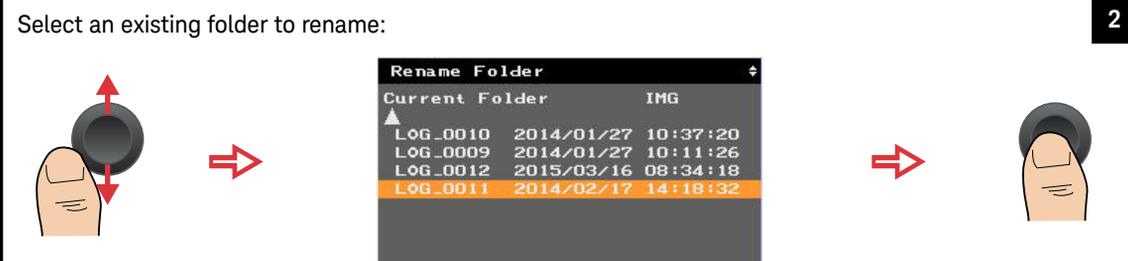
Rename a folder

1



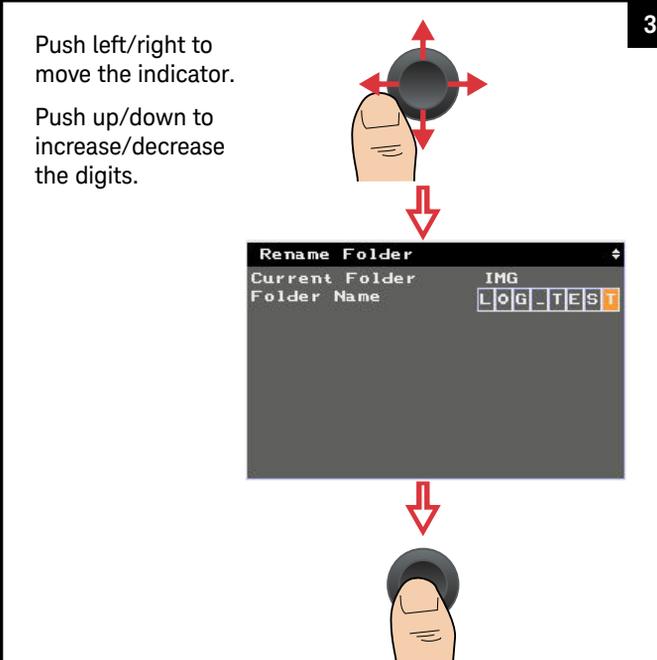
2

Select an existing folder to rename:



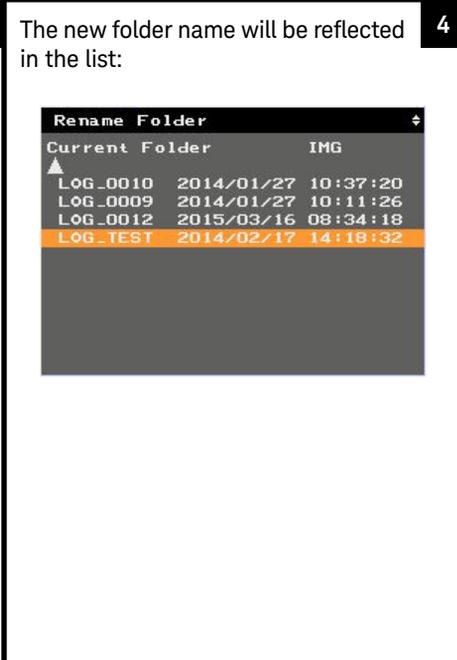
3

Push left/right to move the indicator.
Push up/down to increase/decrease the digits.



4

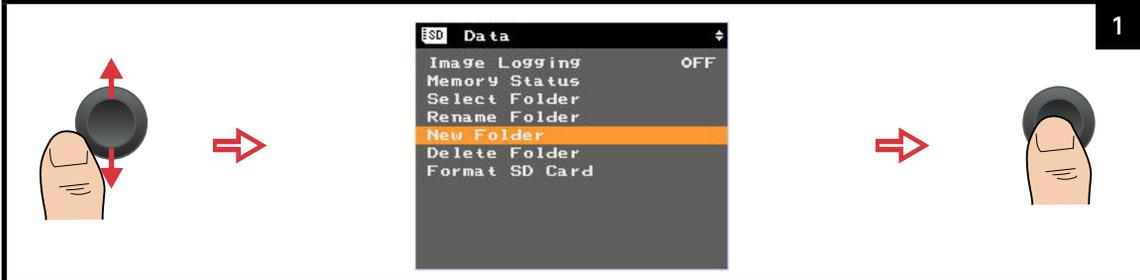
The new folder name will be reflected in the list:



Rename Folder			
Current Folder		IMG	
LOG_0010	2014/01/27	10:37:20	
LOG_0009	2014/01/27	10:11:26	
LOG_0012	2015/03/16	08:34:18	
LOG_0011	2014/02/17	14:18:32	
LOG_TEST	2014/02/17	14:18:32	

Create a new folder

1



2



Push left/right to move the indicator.
Push up/down to increase/decrease the digits.

This will lead you to add another new folder.
To exit,



You can view the new folders under the Select Folder menu.

Delete a folder

1



⇒

```
SD Data
Image Logging OFF
Memory Status
Select Folder
Rename Folder
New Folder
Delete Folder
Format SD Card
```

⇒



2

Select an existing folder to delete:



⇒

```
Delete Folder
Current Folder IMG
LOG_0010 2014/01/27 10:37:20
LOG_0009 2014/01/27 10:11:26
LOG_0012 2015/03/16 08:34:18
LOG_TEST 2014/02/17 14:18:32
100IMAGE 2015/03/16 09:41:14
```

⇒



3



⇒

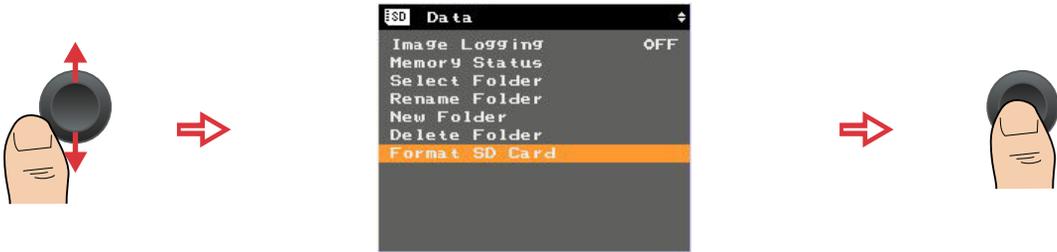
```
Delete selected folder?
YES
NO
```

⇒



Format the SD memory card

Follow steps 1 to 2 from **“Enable/Disable image logging”** on page 97. 1



Select **YES** to proceed and return to the Data menu once completed. 2

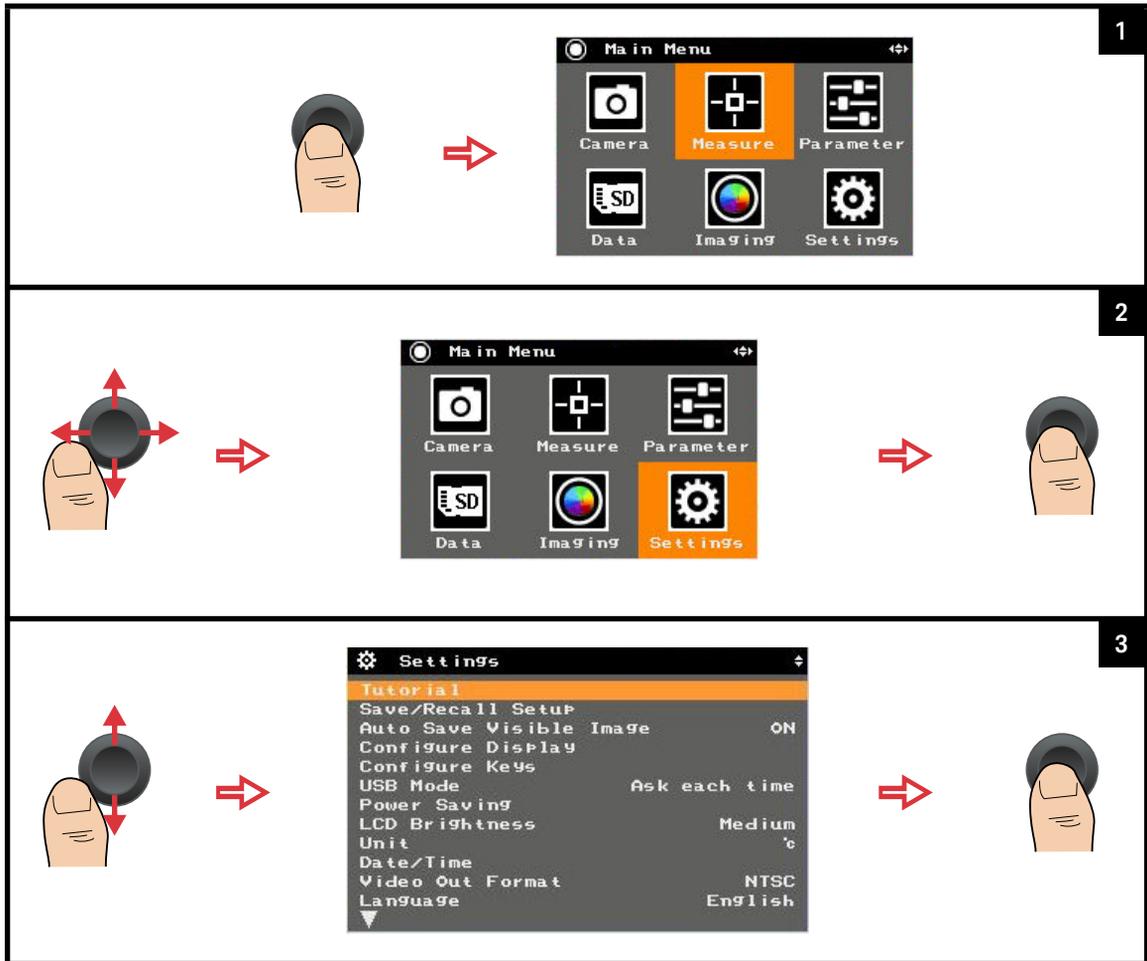


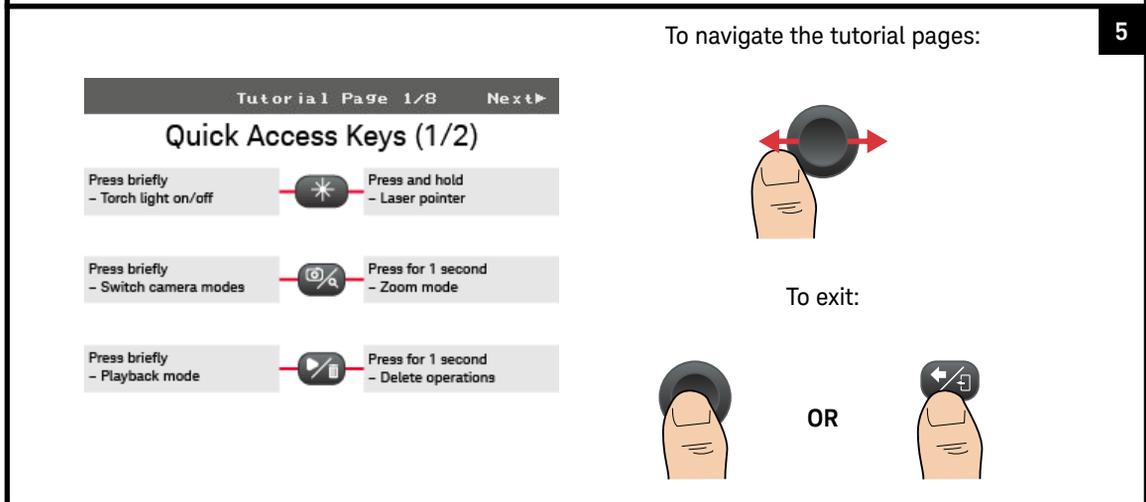
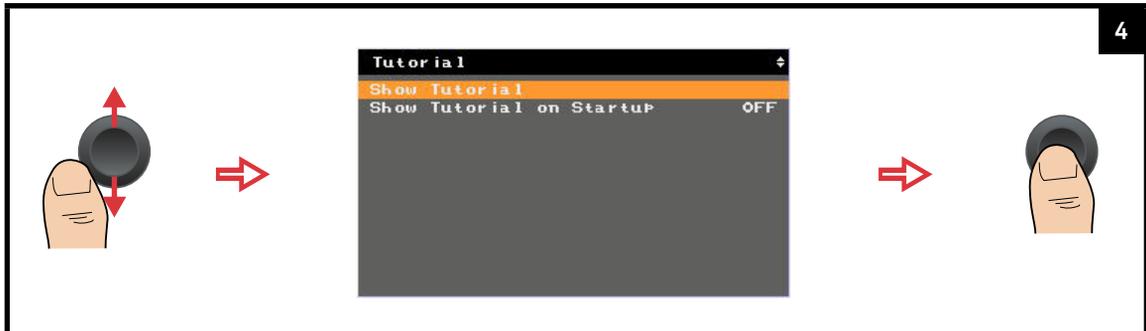
System-Related Settings

These settings allow you to make general system configurations for the U5850 Series.

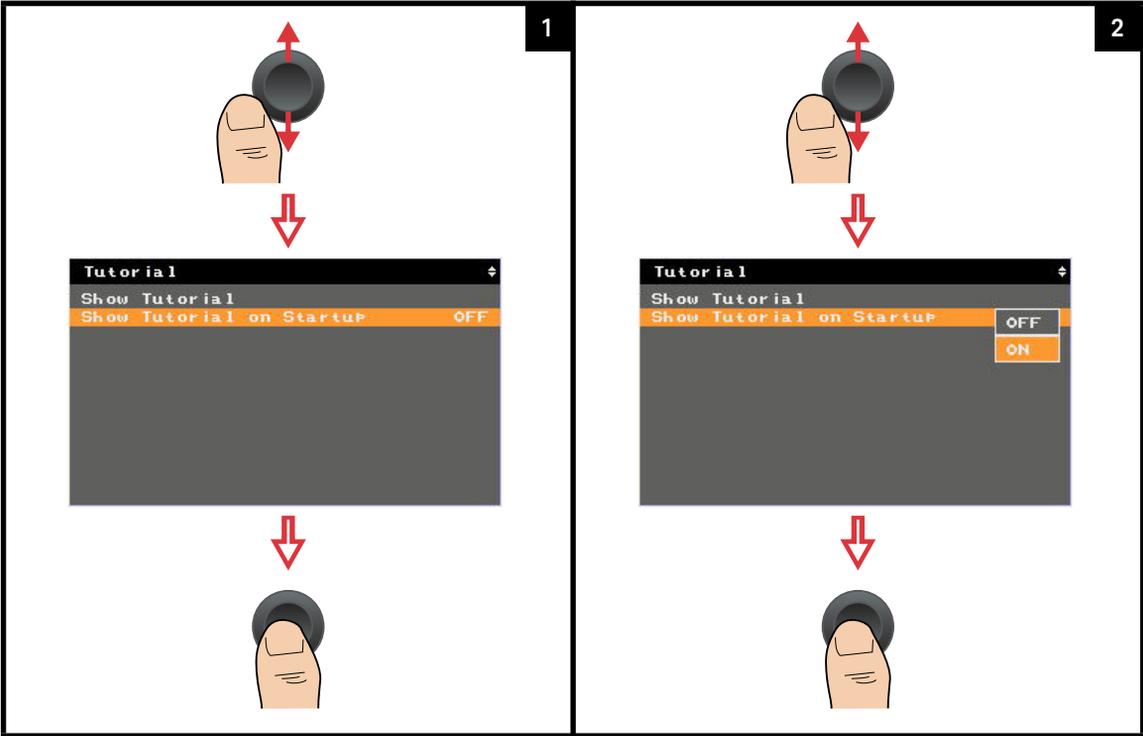
Configure the Quick Start Tutorial

Display the tutorial





Enable/Disable the tutorial at power-on



Save/recall instrument setups

You can save up to three instrument setups at a time into the SD memory card, and recall a setup to use. If there is an existing saved setup and you perform a save for the current setup, the existing setup will be overwritten.

Follow steps 1 to 2 from “Display the tutorial” on page 107. 1

Select **Save Setup** or **Recall Setup**: 2

Select a setup storage to save/recall: 3

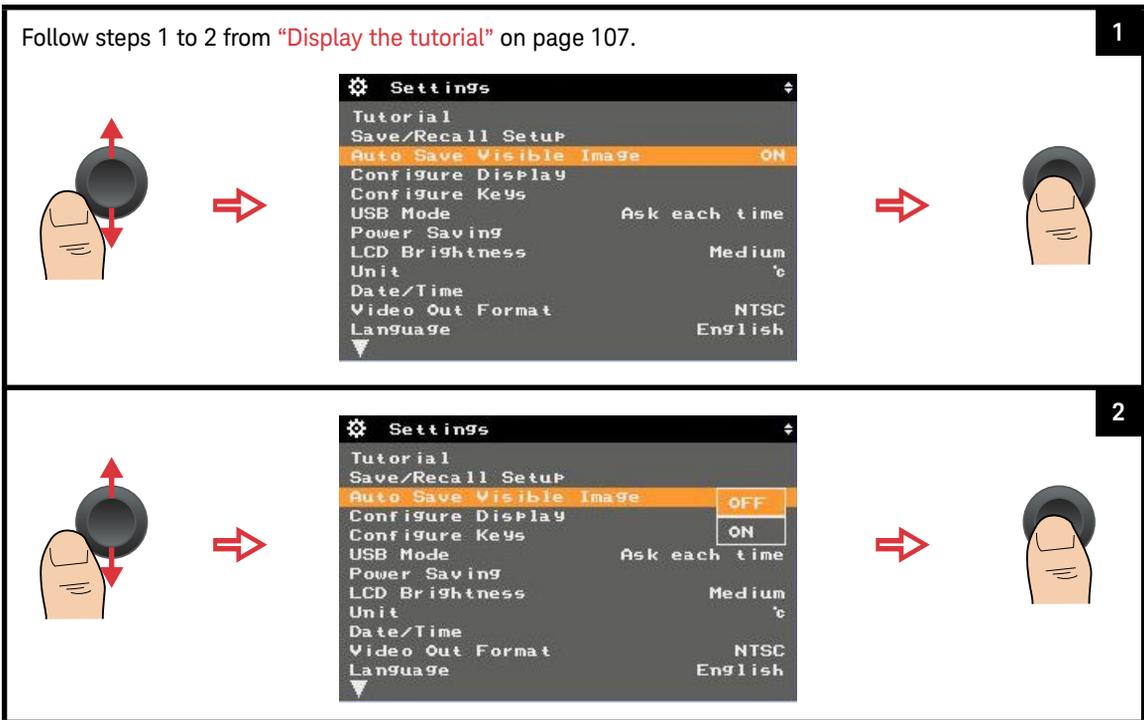
Turn on/off visible image auto-save

If you enable auto-save for visible images, both the IR and visible images will be saved. If disabled, only the IR image will be saved.

NOTE

This is only applicable for the IR camera mode. Visible images will always be auto saved in the Visible Camera, Picture in Picture, and Blend modes.

Follow steps 1 to 2 from “Display the tutorial” on page 107.



Configure the display items

You can set the items that you want to display on the screen.

Follow steps 1 to 2 from **“Display the tutorial”** on page 107.

1



⚙️ Settings
↕

- Tutorial
- Save/Recall Setup
- Auto Save Visible Image ON
- Configure Display
- Configure Keys
- USB Mode Ask each time
- Power Saving
- LCD Brightness Medium
- Unit 'e
- Date/Time
- Video Out Format NTSC
- Language English

⇒



Select **Date/Time**, **Color Bar**, or **Info Bar**:

2



Configure Display
↕

- Date/Time ON
- Color Bar ON
- Info Bar ON
- Info Bar Items

⇒



Select **Date/Time**, **Color Bar**, or **Info Bar**:

3



Configure Display
↕

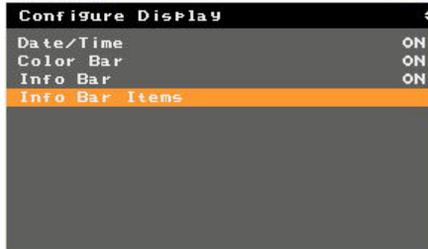
- Date/Time OFF
- Color Bar ON
- Info Bar ON
- Info Bar Items

⇒



To select the info bar items to display:

4



Select the items (only the first four items selected will be displayed):

5



Toggle to check/uncheck

To confirm and exit:



Configure the main key press functions

You can set the default functions for the Camera Trigger, Camera/Zoom, and Play/Delete key presses.

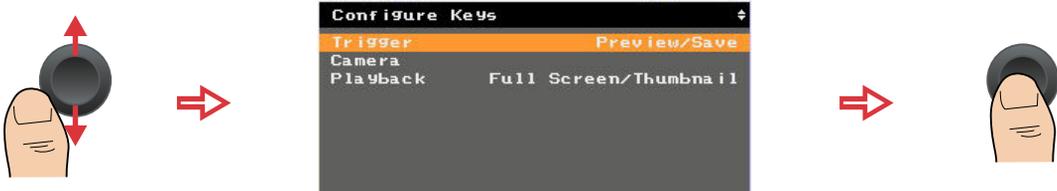
Follow steps 1 to 2 from “Display the tutorial” on page 107. 1



Settings

- Tutorial
- Save/Recall Setup
- Auto Save Visible Image ON
- Configure Display
- Configure Keys**
- USB Mode Ask each time
- Power Saving
- LCD Brightness Medium
- Unit °C
- Date/Time
- Video Out Format NTSC
- Language English

Select **Trigger/Camera/Playback**: 2



Configure Keys

- Trigger** Preview/Save
- Camera
- Playback Full Screen/Thumbnail

For example, if you select **Trigger**, you can set to preview and save the image, preview the image only, or save an image directly when you press the key: 3



Configure Keys

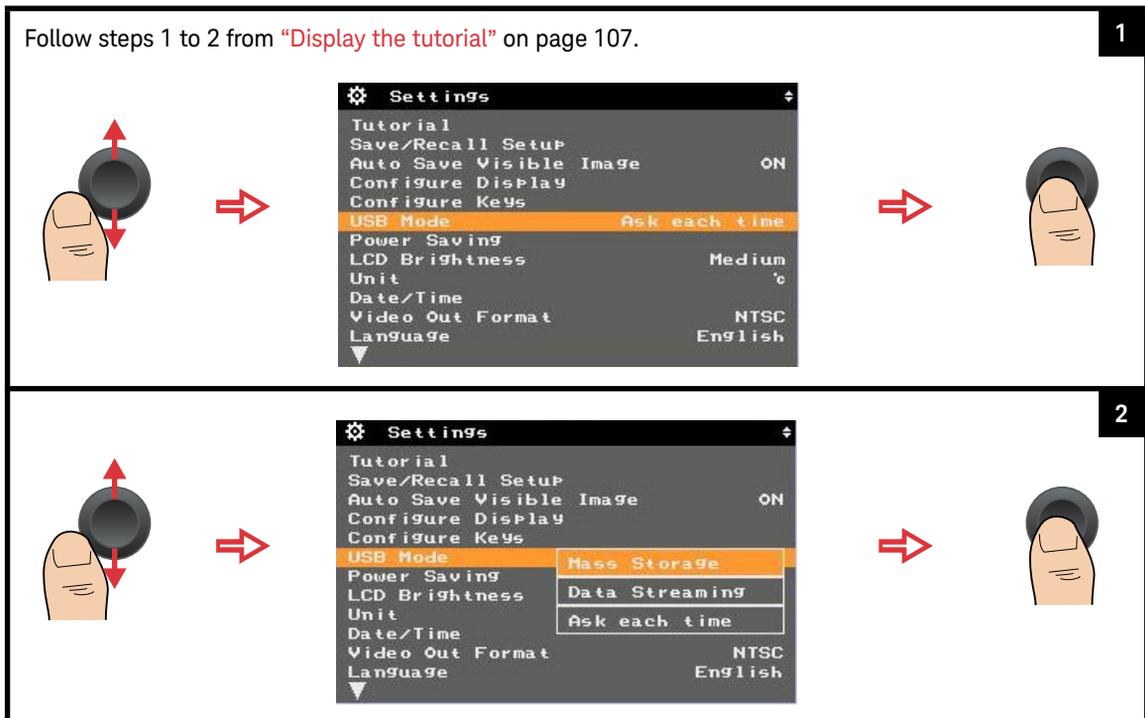
- Trigger**
 - Preview/Save
 - Preview Only
 - Direct Save
- Camera
- Playback Full

Set the USB mode

You can set the USB mode to allow mass storage or data streaming when you connect the U5850 Series to the PC using the USB cable. The default selection is Ask each time. If Ask each time is selected, you will be prompted to select between mass storage or data streaming upon the start-up of the U5850 Series. This prompt occurs when you connect the U5850 Series to the PC using the USB cable.

NOTE

Do not press any keys on the U5850 Series TrueIR Thermal Imager when you are connecting its USB cable to the PC and launching the Keysight TrueIR Analysis and Reporting Tool software.



Data streaming mode

Data streaming mode allows you to stream, capture, and record live IR images using the Keysight TrueIR Analysis and Reporting Tool software from your PC.



Data streaming indicator

Set the power saving mode

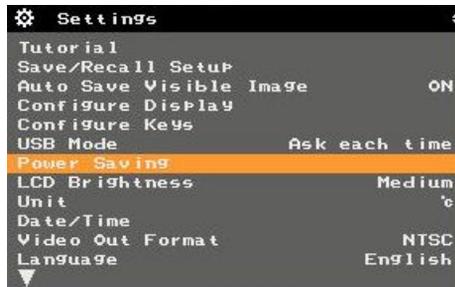
You can enable/disable auto sleep or auto power-off, and change the timer period of these functions.

NOTE

- It is recommended to remove the battery from the U5850 Series when not in use.
- Auto sleep and auto power-off functions are disabled during image logging.

Follow steps 1 to 2 from “Display the tutorial” on page 107.

1



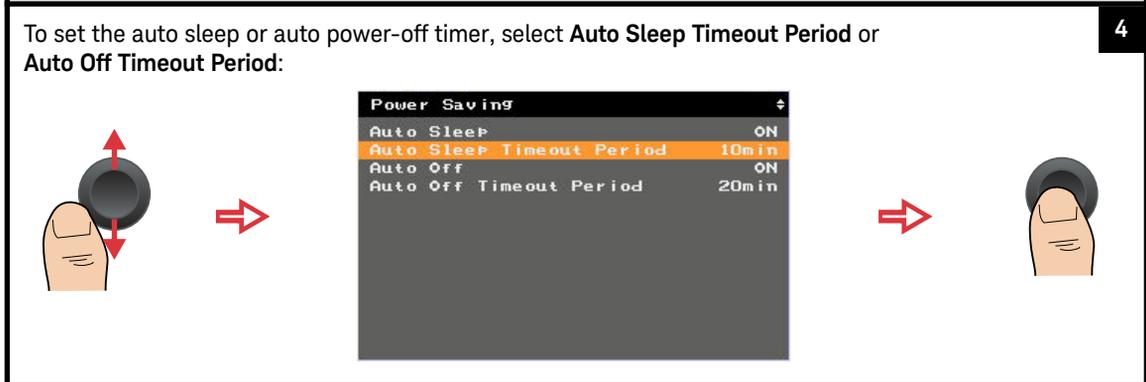
Select Auto Sleep or Auto Off:

2

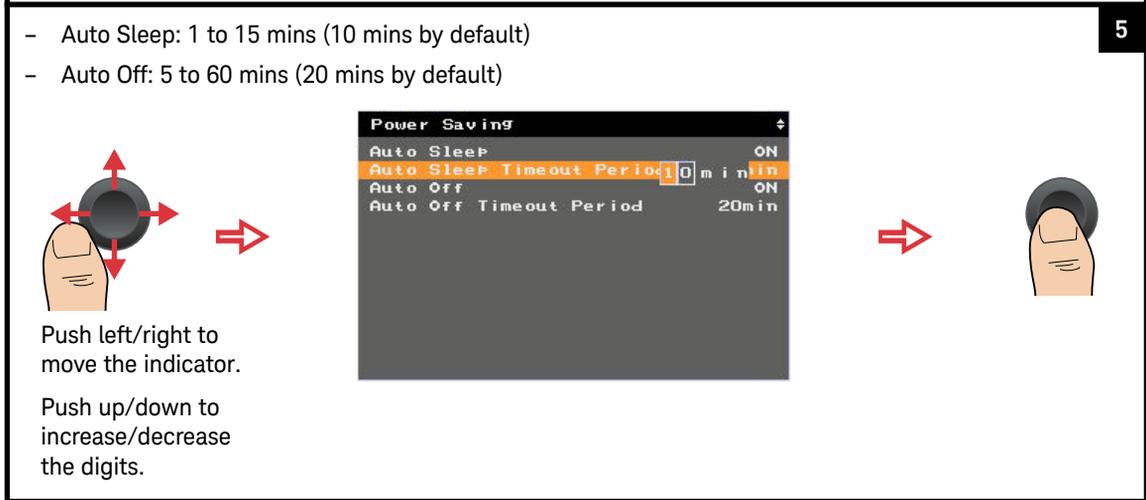




To set the auto sleep or auto power-off timer, select **Auto Sleep Timeout Period** or **Auto Off Timeout Period**:

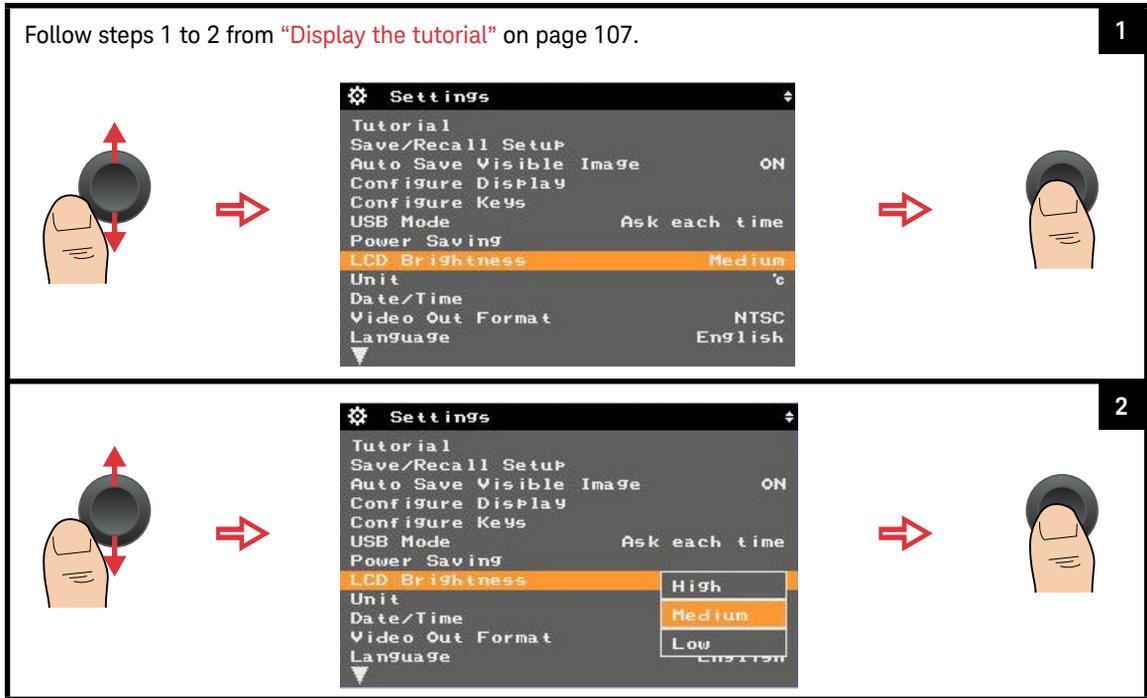


- Auto Sleep: 1 to 15 mins (10 mins by default)
- Auto Off: 5 to 60 mins (20 mins by default)



Set the LCD brightness

If viewing the display becomes difficult in certain conditions, you can adjust the LCD brightness to high, medium, or low.



Set the temperature unit (°C or °F)

Refer to “Set up the U5850 Series” on page 27.

Set the date and time

Refer to “Set up the U5850 Series” on page 27.

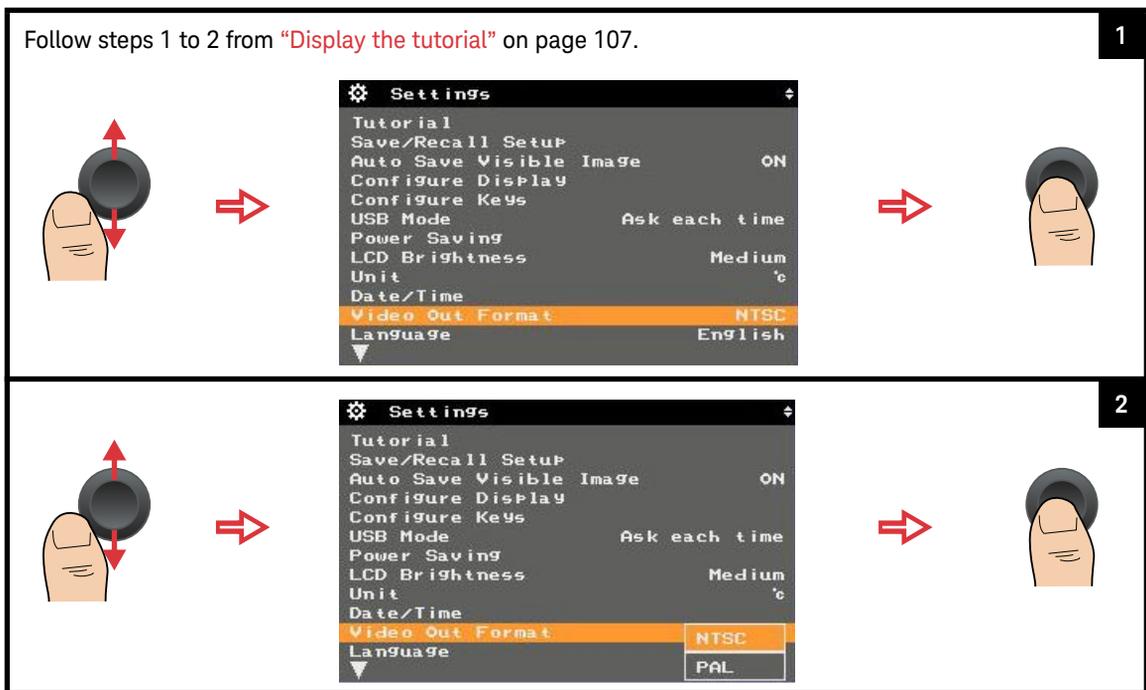
Set the video out format

You can set the video out format to NTSC or PAL when you connect the U5850 Series to an external monitor.

NOTE

- The PAL and NTSC formats are full resolution screen videos. Hence, if a TV/projector/monitor screen is truncated, switch its OVERSCAN function to OFF.
- Video out is disabled in the power-saving mode.

Follow steps 1 to 2 from “Display the tutorial” on page 107.



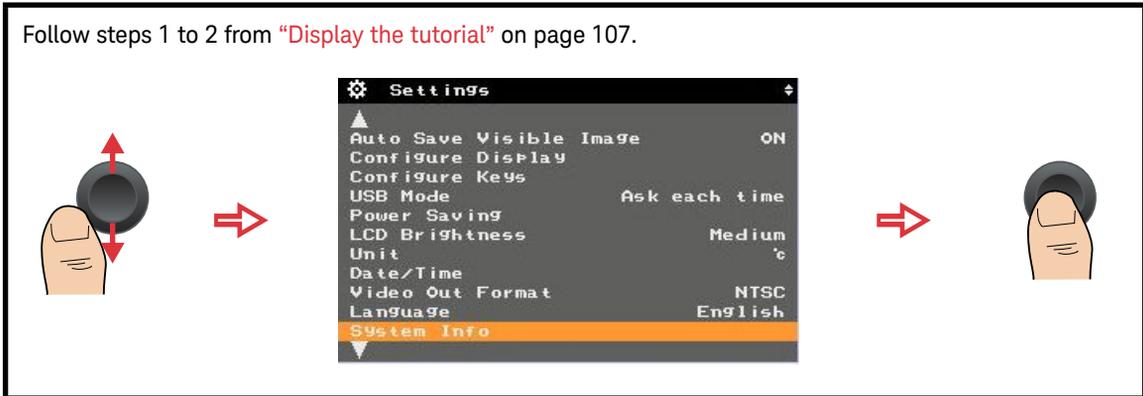
Set the language

Refer to “Set up the U5850 Series” on page 27.

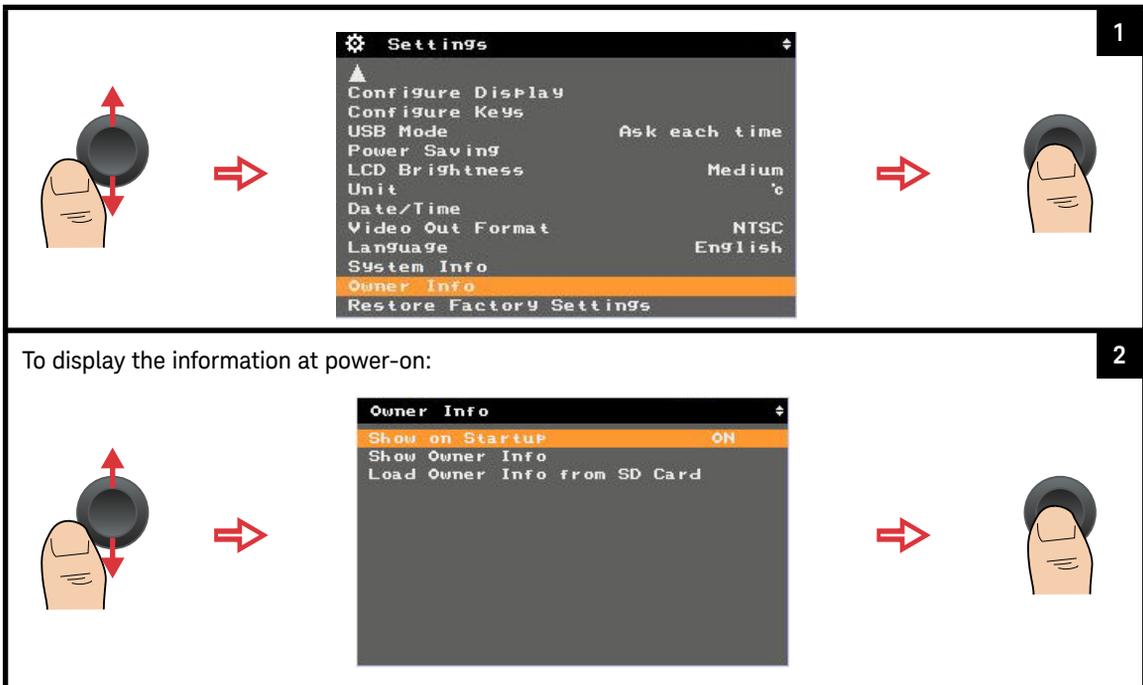
Display the system and owner information

Display the system information

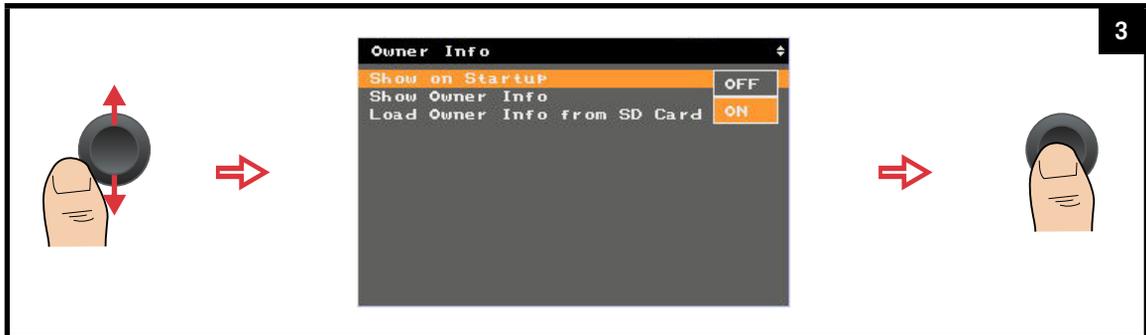
Follow steps 1 to 2 from “Display the tutorial” on page 107.



Display the owner information



3 Data Management and System-Related Functions



Add the owner information from a template file

You can download the owner information template file from the Keysight website to the SD memory card.

To ensure proper use of this template file, use the following guidelines:

- File name and extension: OWNERINF.TXT
- File format: Text file/Notepad
- File location: Root of the SD memory card
- Character code: ASCII (20h to 7Fh)
- Maximum line: 8 lines
- Maximum characters per line: 18 characters

When you load the owner information from the template file, the contents of the file are read and registered with the U5850 Series memory.

To view the owner information:

➡

➡

1

Select **YES** to load the info file and return to the Owner Info menu:

➡

➡

2

If the info file does not exist on the SD memory card, an error message is

Reset the U5850 Series to factory default settings

Follow steps 1 to 2 from “Display the tutorial” on page 107.

1



2



4 Characteristics and Specifications

For the characteristics and specifications of the U5850 Series True/R Thermal Imager, refer to the data sheet at <http://literature.cdn.keysight.com/litweb/pdf/5991-4297EN.pdf>.

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This information is subject to change without notice. Always refer to the Keysight website for the latest revision.

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