

Keysight U5850 Series True/R 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 54).
 - **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/EN 60825-1 (Laser Class 2)
- IEC 61010-1/EN 61010-1

EMC compliance

- IEC 61326-1/EN61326-1
- CISPR11/EN55011, Group 1 Class A
- Canada: ICES/NMB-001: Issue 4, June 2006
- Australia/New Zealand: AS/NZS CISPR 11

Regulatory Markings

 <p>The CE marking is a legal compliance marking of the European Community. This CE marking shows that the product complies with all the relevant European Legal Directives.</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>ICES/NMB-001</p> <p>ICES/NMB-001 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>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 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 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>

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)

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4 Characteristics and Specifications

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1 Introduction

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This chapter guides you to set up the U5850 Series True/R Thermal Imager for the first time. A summary of all the U5850 Series True/R 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/trueIRimager

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/trueIR_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 dapter



Power cord



Li-Ion rechargeable
battery



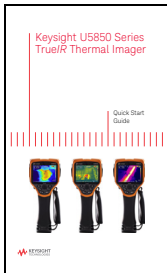
SD memory card



USB Standard-A to Mini
Type-B interface cable, 1 m



Video RCA to RCA
interface cable, 2 m

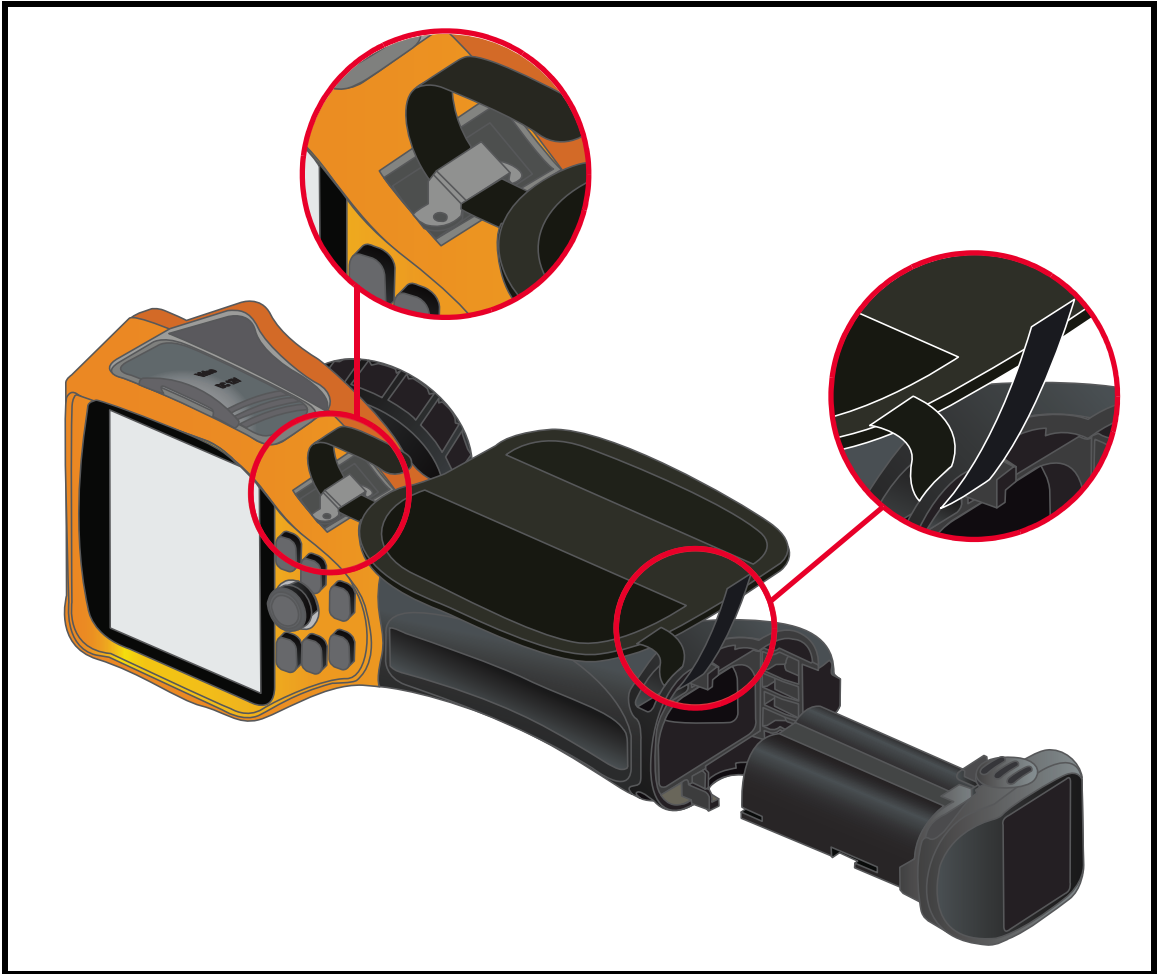


Keysight U5850 Series
Quick Start Guide

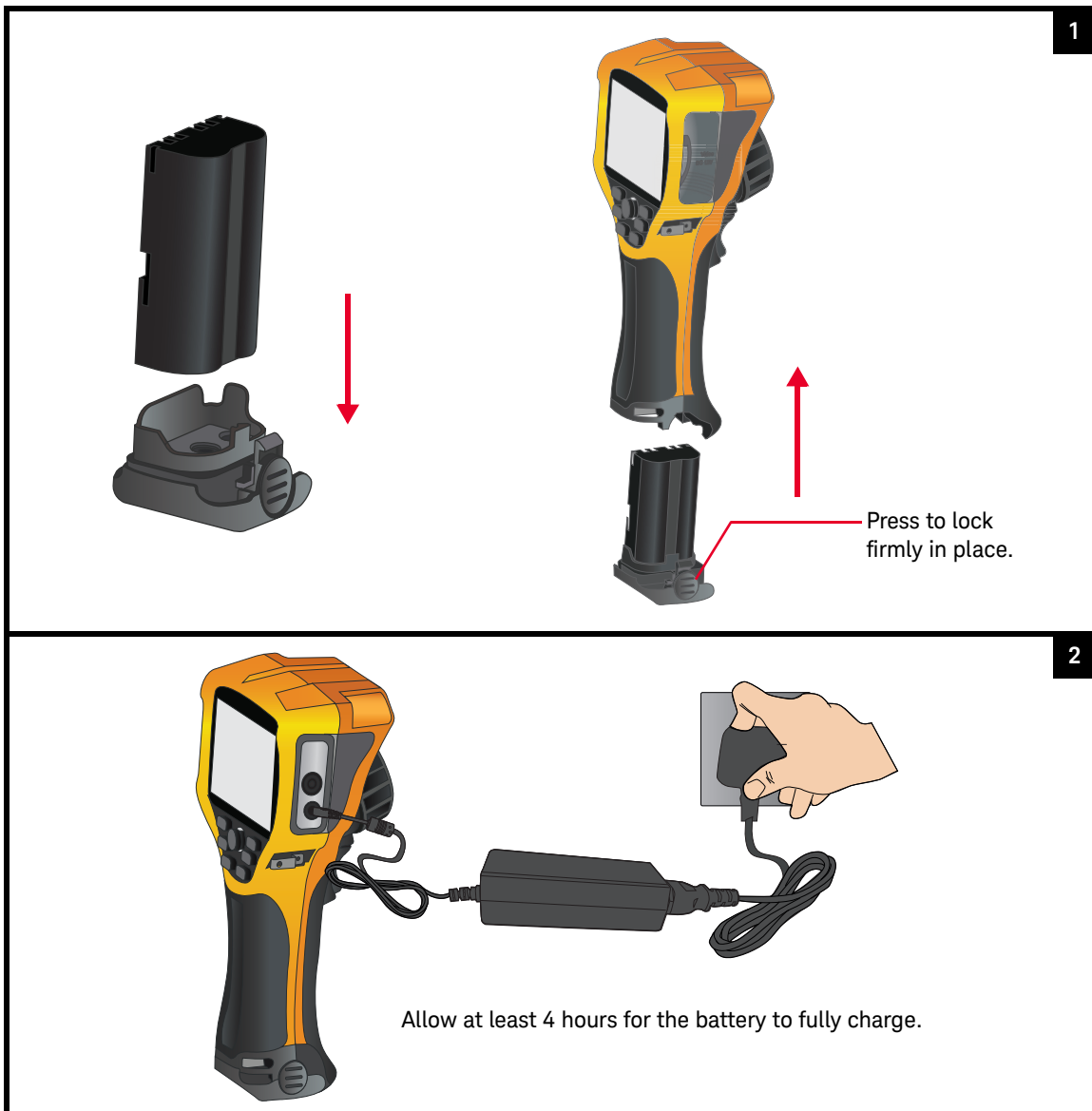


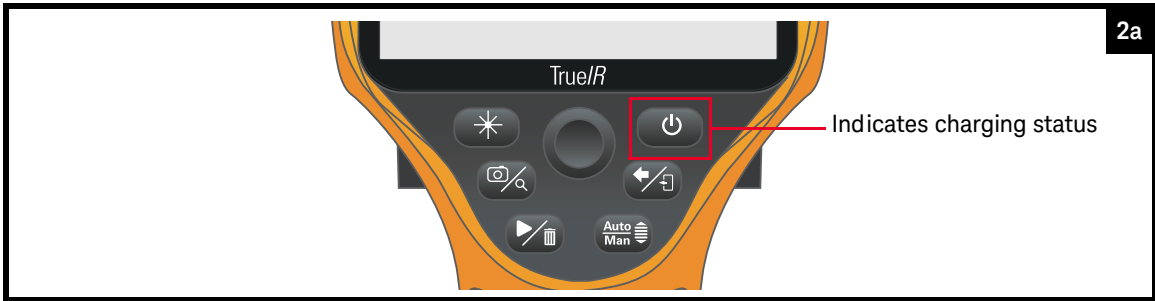
Certificate of
Calibration

Install the hand strap



Install and charge the battery



**NOTE**

Refer to “LED status indication” on page 33 and “Battery status indication” on page 36 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.

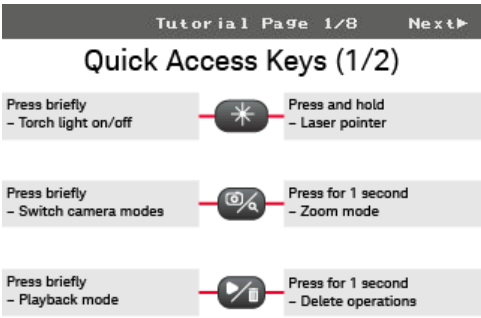


Press for 1 seconds to turn on/off.

1

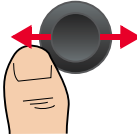
When you turn on the U5850 Series for the first time or after a factory reset, you will be prompted to perform initial setups. Refer to **“Set up the U5850 Series”** on page 27.

Quick start tutorial:




3


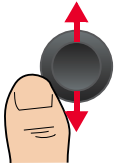
To navigate the tutorial pages:






To exit:

OR









5

Ready to take measurements with specified accuracy after warm-up.

6

NOTE

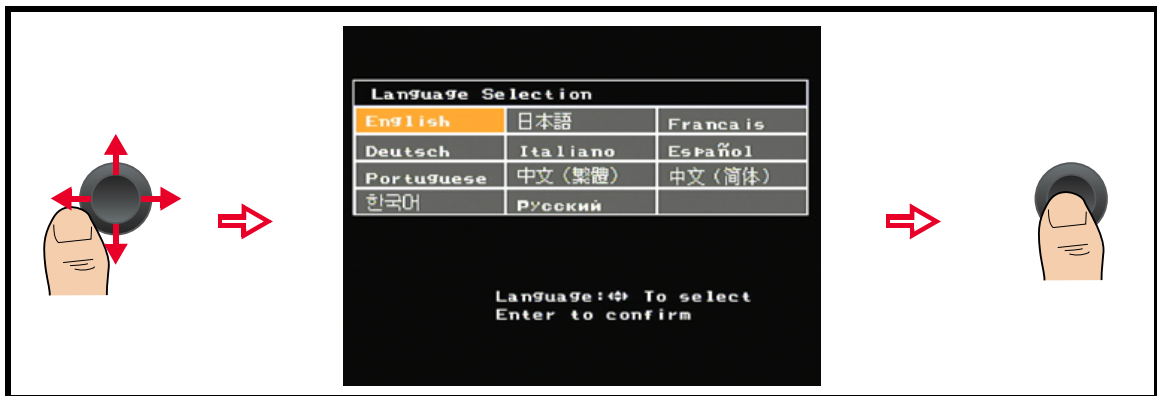
- If Auto Off is enabled, the U5850 Series will automatically turns off if idle for 20 minutes (default). Pressing the power key will turn it back on.
- If Auto Sleep is enabled, the U5850 Series will automatically goes to sleep if idle for 10 minutes (default). Pressing any key will turn it back on.
- Refer to “Set the power saving mode” on page 113 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








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


Settings: To select
Enter to change/confirm






1








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


Settings: To select
Enter to change/confirm






2






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

Settings: To select
Enter to change/confirm

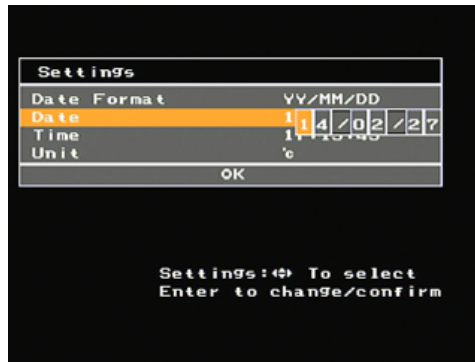
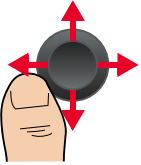




3

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

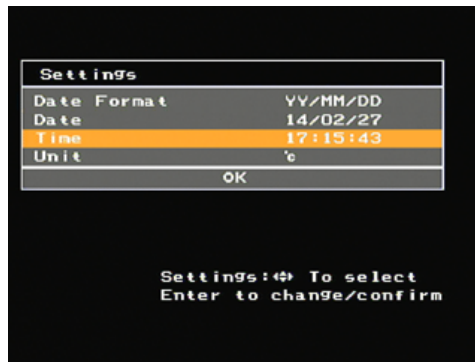
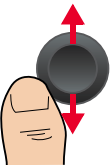
4



Push left/right to move the indicator.

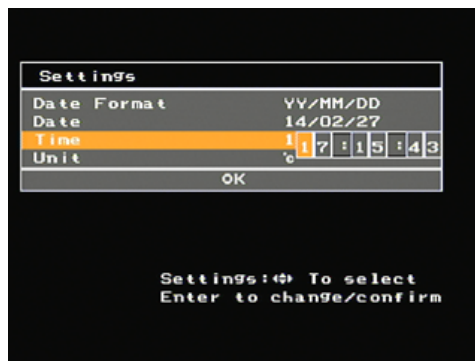
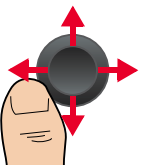
Push up/down to increase/decrease the digits.

5



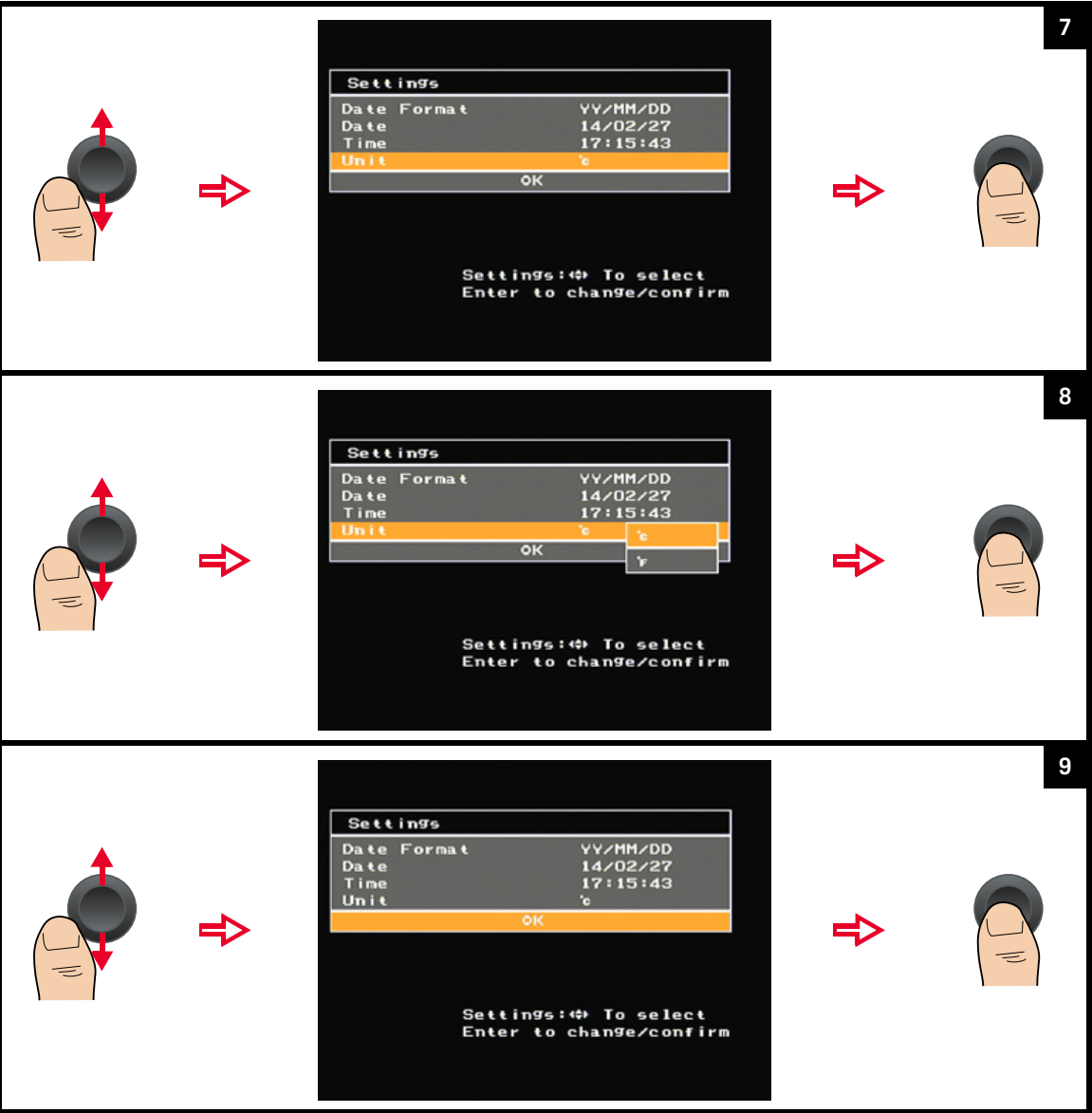
- Hour: 00 to 23
- Minute: 00 to 59
- Second: 00 to 59

6



Push left/right to move the indicator.

Push up/down to increase/decrease the digits.



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.

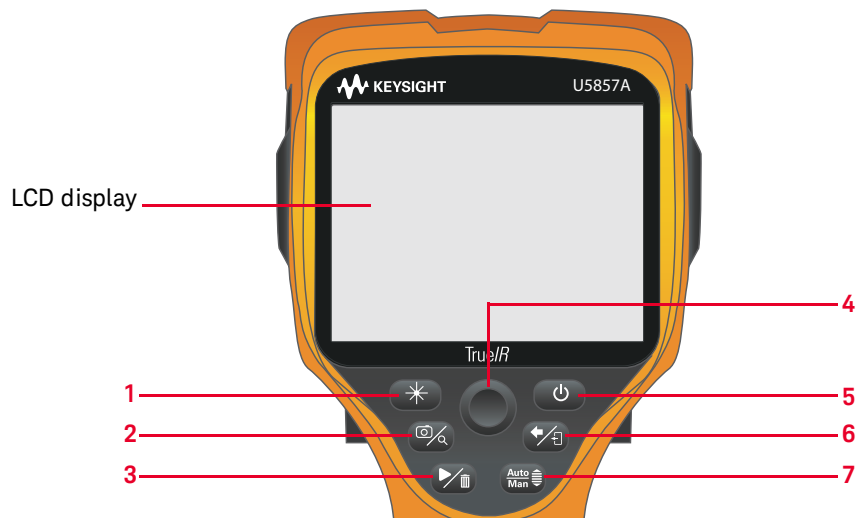
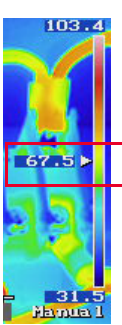
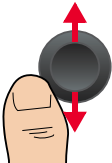
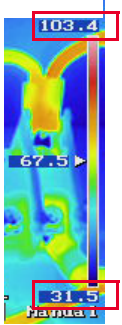
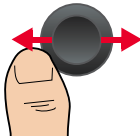


Figure 1-2 The rear panel at a glance

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 34 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)	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

Legend	Description
	Press briefly to switch from auto to manual scaling. – 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.
7 Auto/Manual scale key	<div><div></div><div><p>Adjust temperature level:</p></div><div></div><div><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
		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)



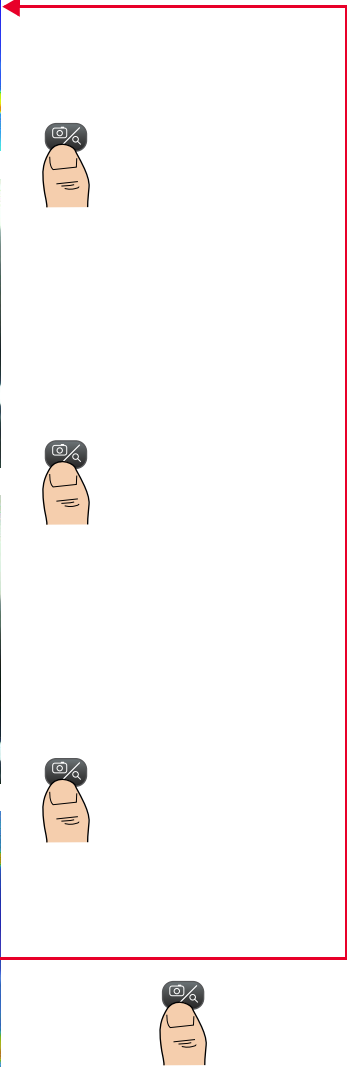
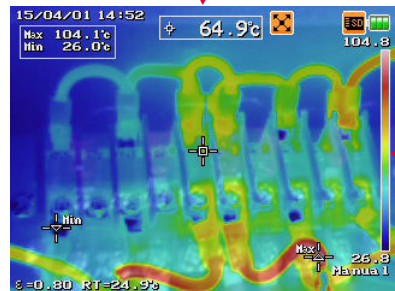
Visible image



Picture-in-picture
(fusion) image



Blend (fusion) image



Display screen

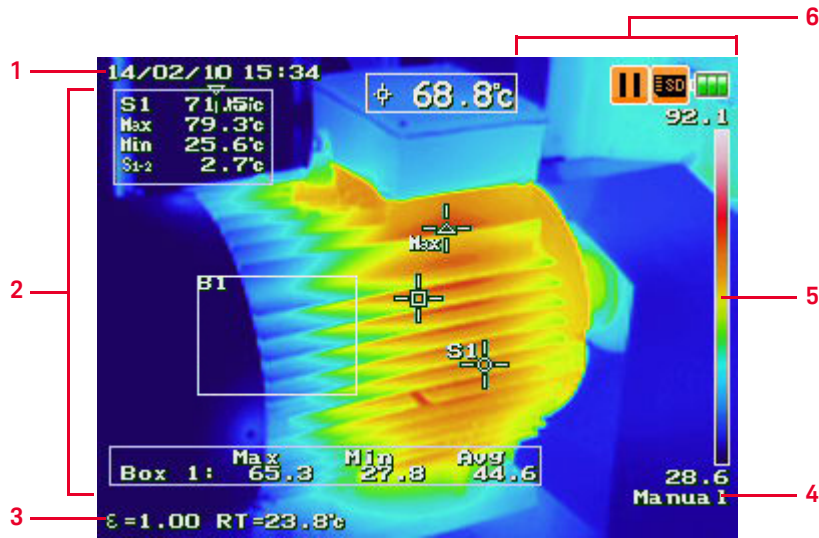


















Figure 1-3 The display at a glance

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

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.

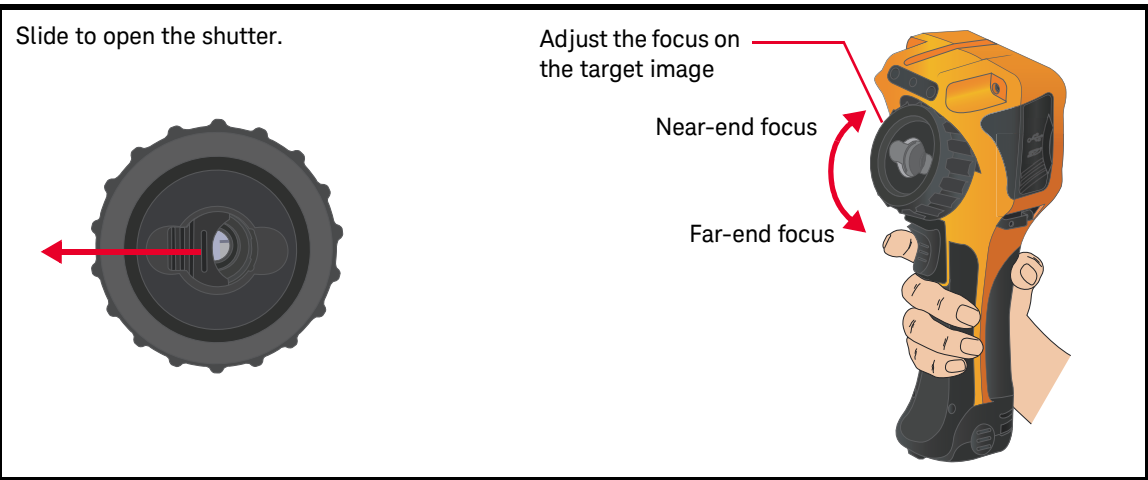
2 Image Capture, Processing, and Measurement Functions

Camera Controls	38
Image Saving	42
Image Playback	54
Measurement Controls	61
Imaging Controls	73
Digital Zoom	81
Parameter Controls	83

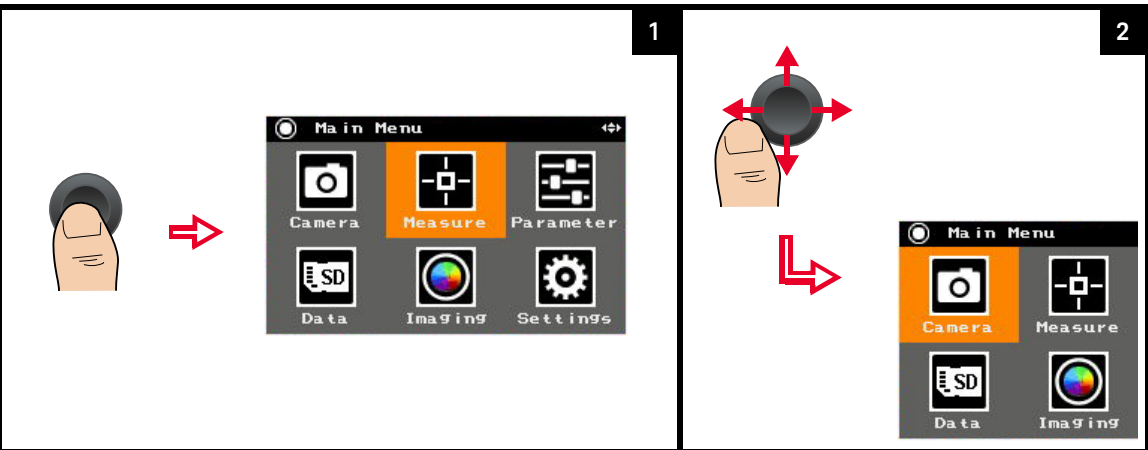
This chapter guides you on how to operate the main functions of the U5850 Series True/R Thermal Imager.

Camera Controls


Capture images



Select a camera mode



3



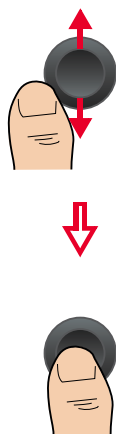
The U5850 Series provides two fusion camera modes:

- 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)

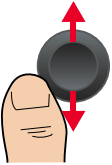
Fine resolution thermal imaging produces high quality in-camera IR images by capturing images with 4× more effective IR resolution and approximately 1.5× finer Instantaneous Field of View (IFOV) using multi-frames capturing and sophisticated image processing techniques.




FR indicator



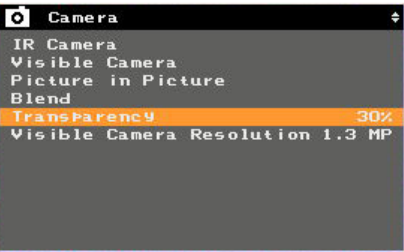
Set the transparency of fusion images

1



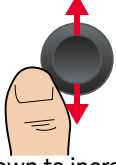
Transparency can only be set when the Picture in Picture or Blend mode is selected.








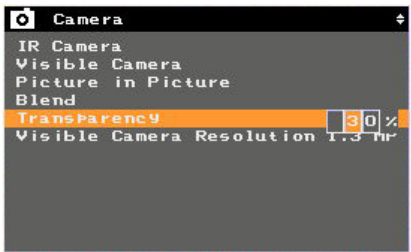
2

Set a value (with a 10% step):

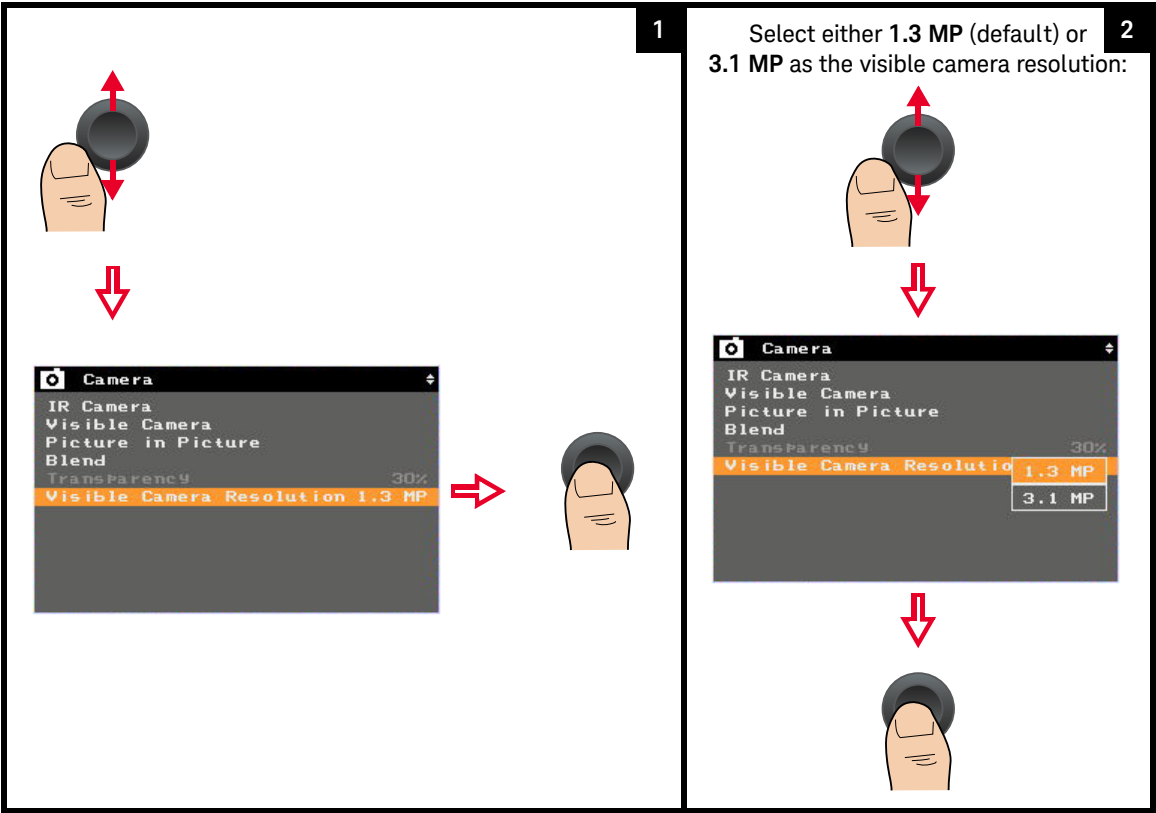


Push up/down to increase/decrease the digits.





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.

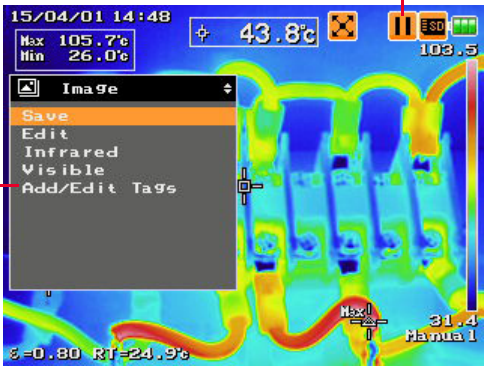
After capturing the images, you can save them into the SD memory card inserted in the U5850 Series. You can also add tags and edit the images.

Preview and save an image

1



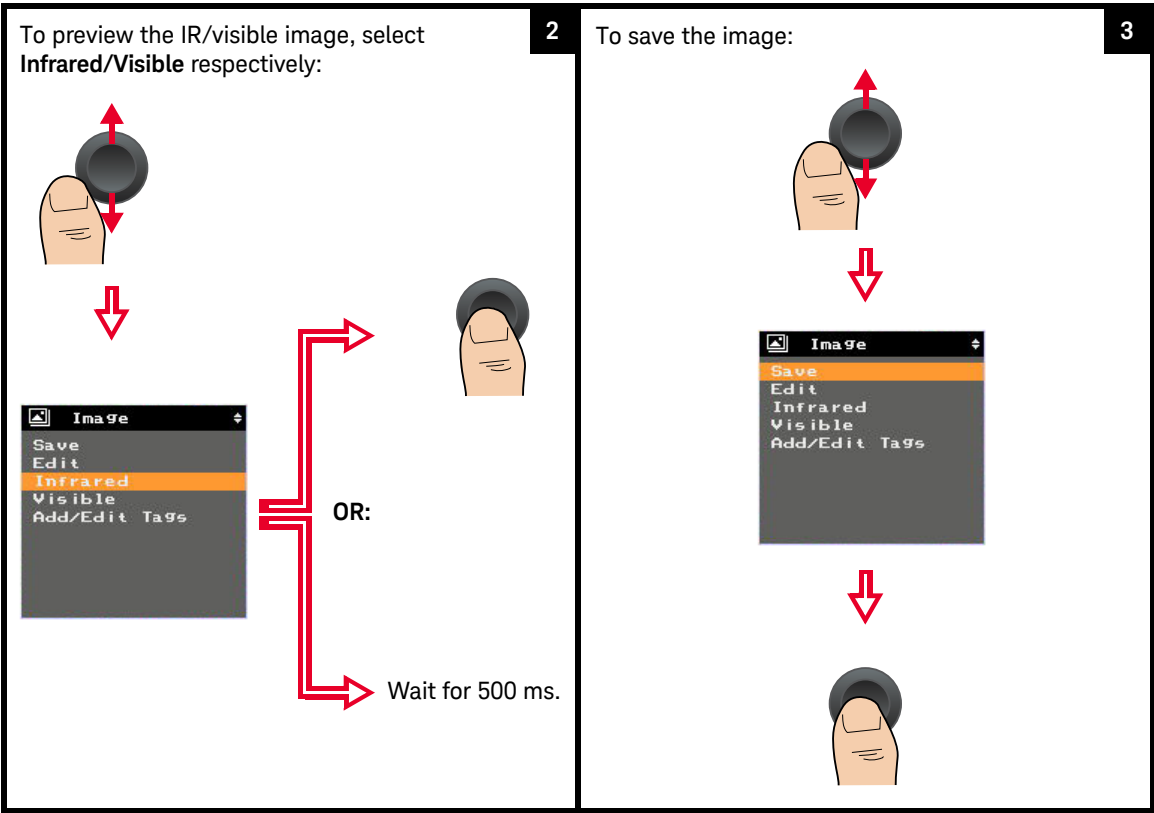




The Image menu is displayed:
*(You need to set to the **Preview/Save** mode for the Trigger key press in order to display the Image menu. Refer to “Configure the main key press functions” on page 112.)*

Freeze indicator

Image menu



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 109 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.

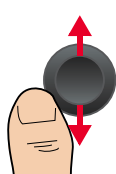
Add photo tags





The Image menu is displayed:



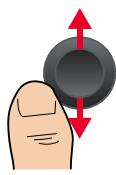
1

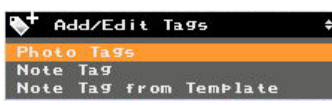







2







3

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).

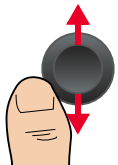
Photo tag indicators will be added:

6




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

7



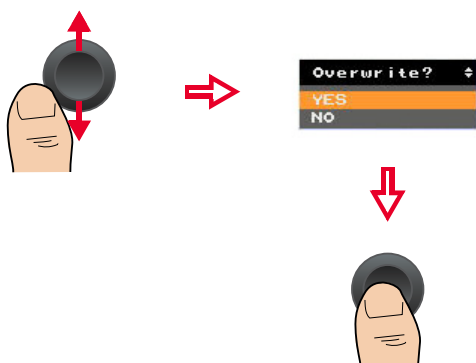
8

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:



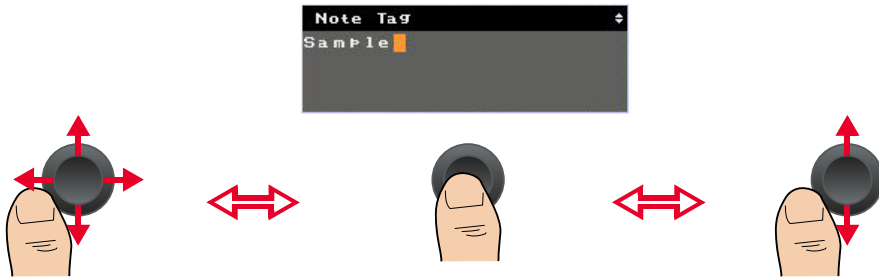
Add a note tag

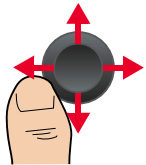
Repeat steps 1 to 2 from “Add photo tags” on page 45.




1

2

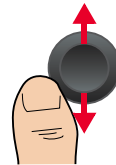




Move the character cursor



Confirm the cursor position

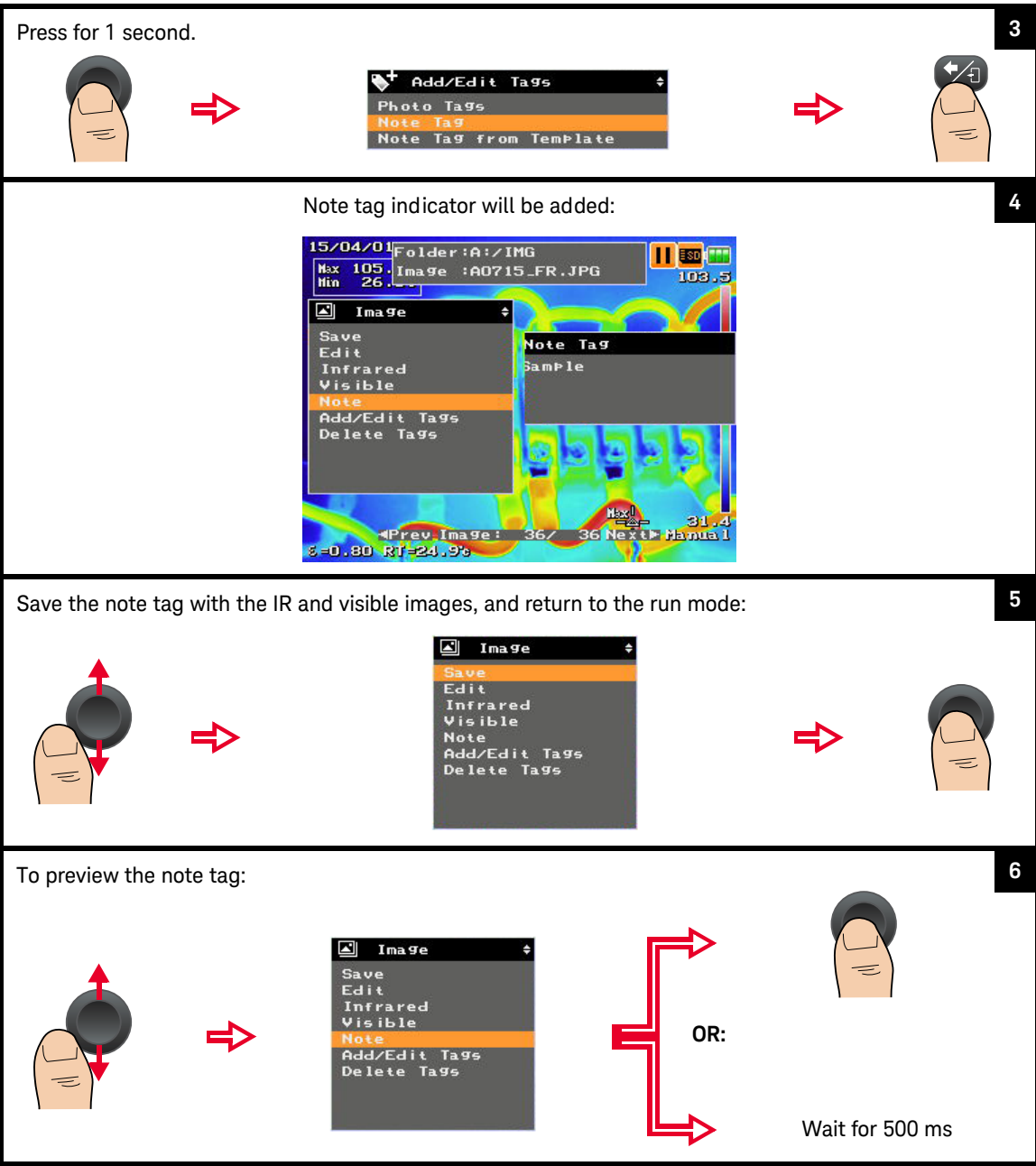


Select and enter the character

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

2

2 Image Capture, Processing, and Measurement Functions



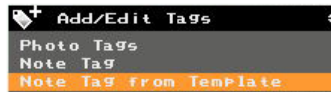
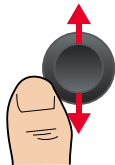
Add a note tag from a template file

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 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 45.

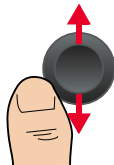


1

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 47.

2

Edit tags


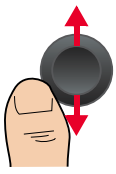



1


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


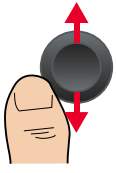
2

Delete tags








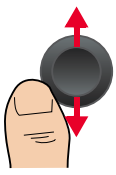











Select **YES** to delete all photo tags, note tag, or all photo and note tags.
Select **NO** to return to the previous screen.





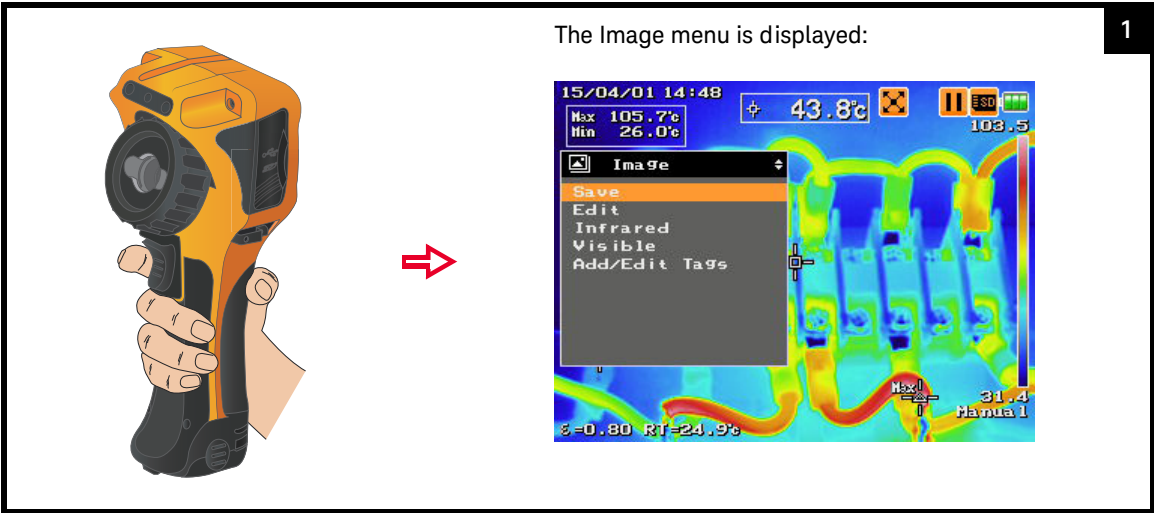


When a tag is deleted, the respective tag indicator will be removed from the Image menu.

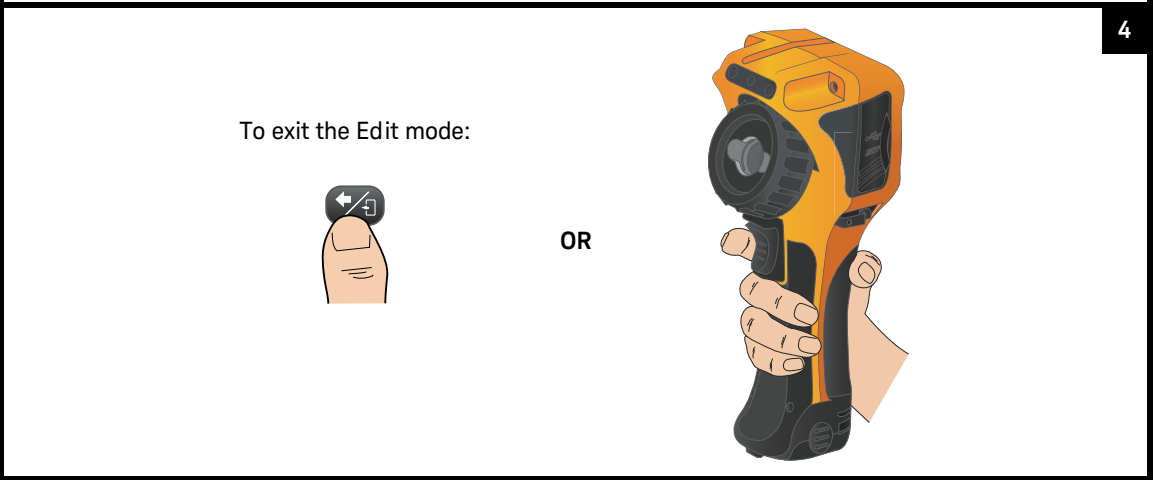
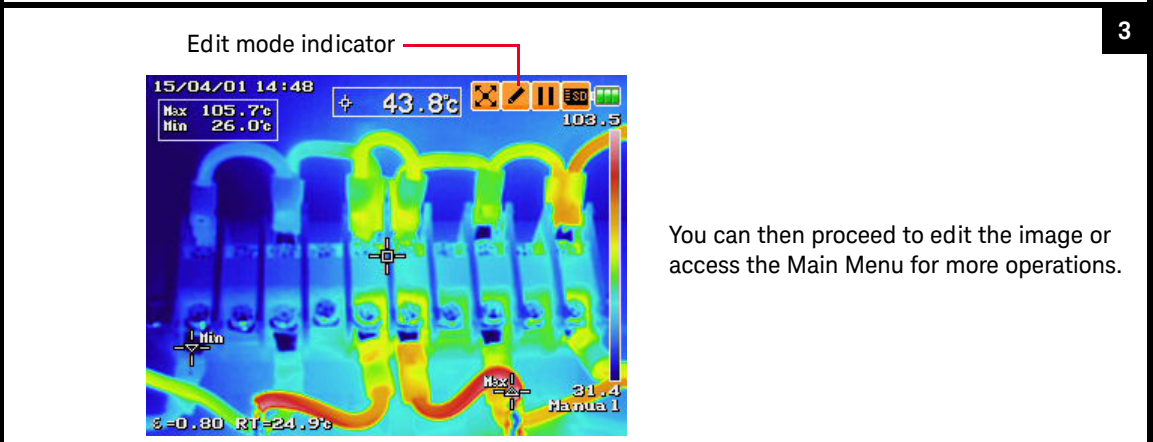
Save an image directly



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.

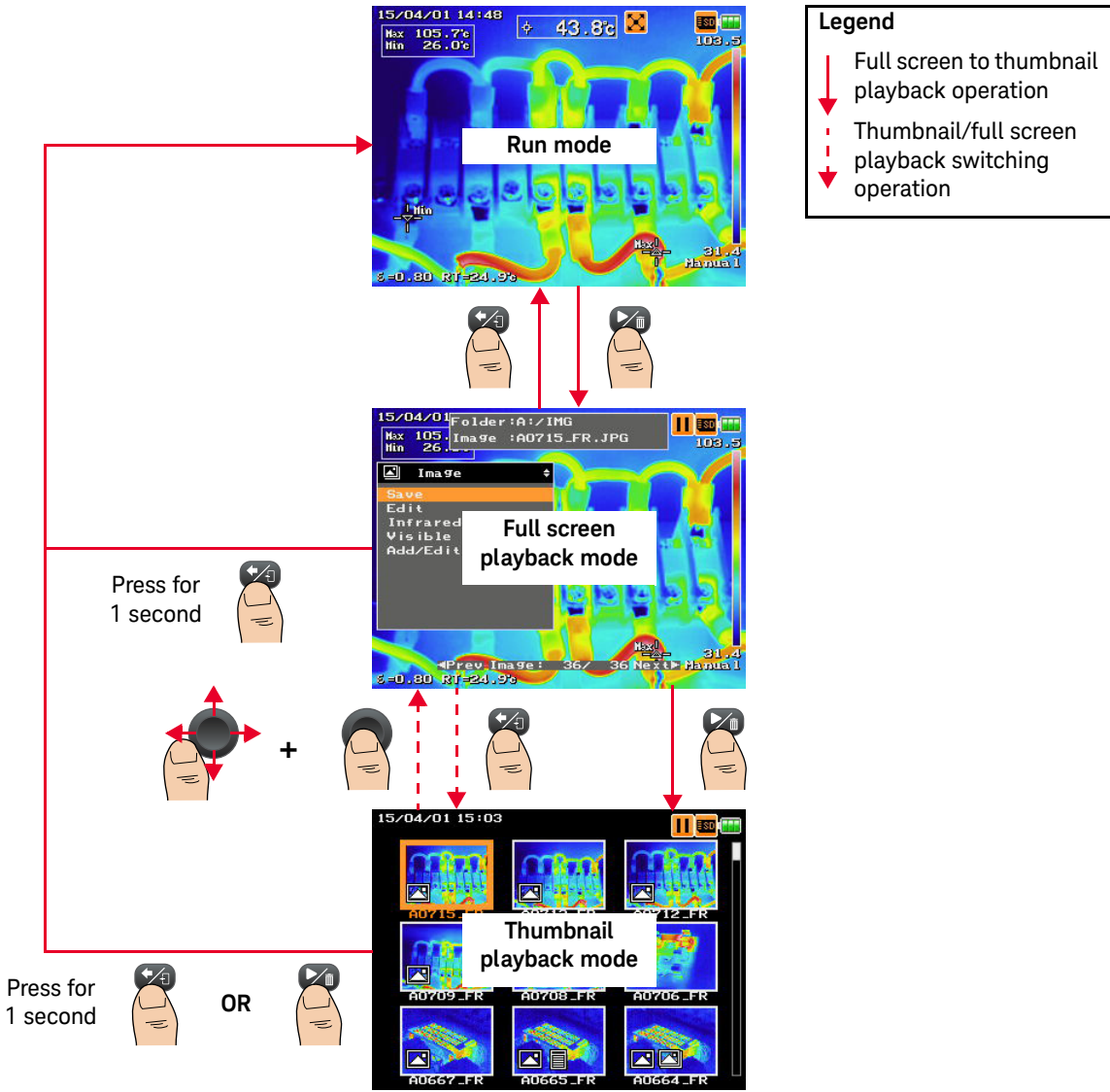
5



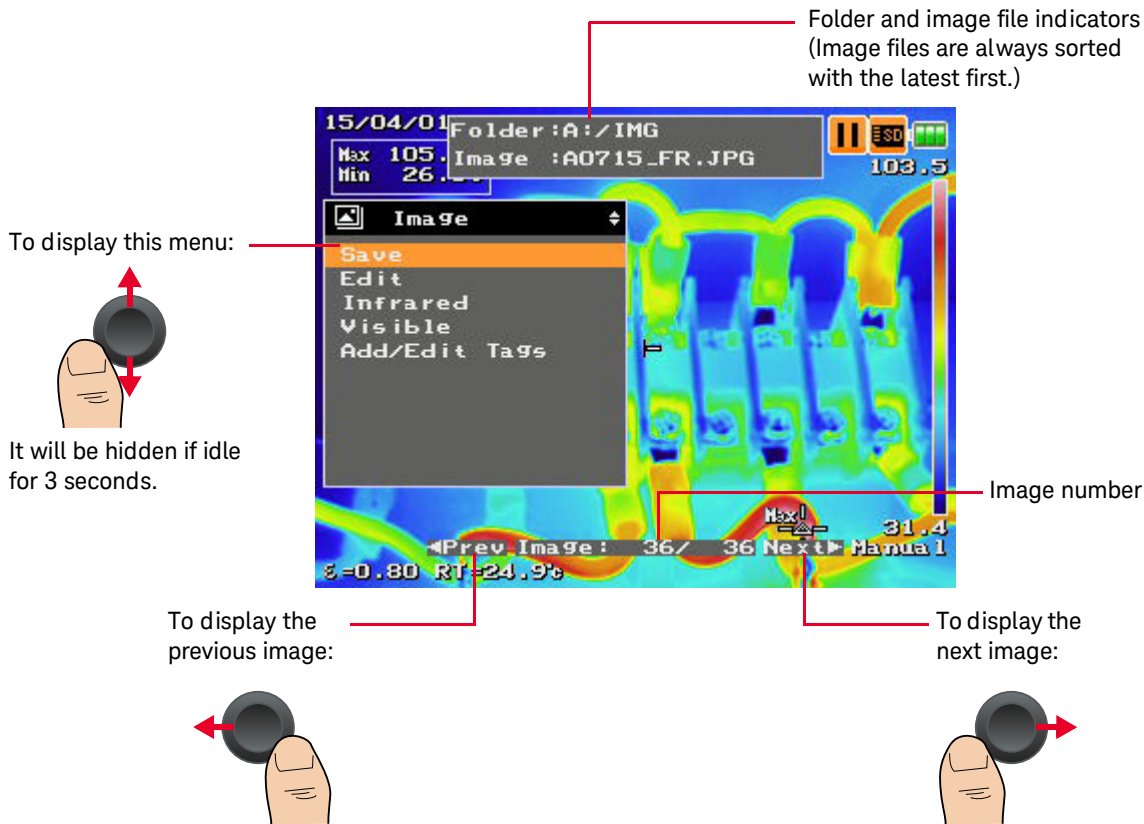
Image Playback

This feature allows you to play back saved images.

Full screen/Thumbnail playback mode operation



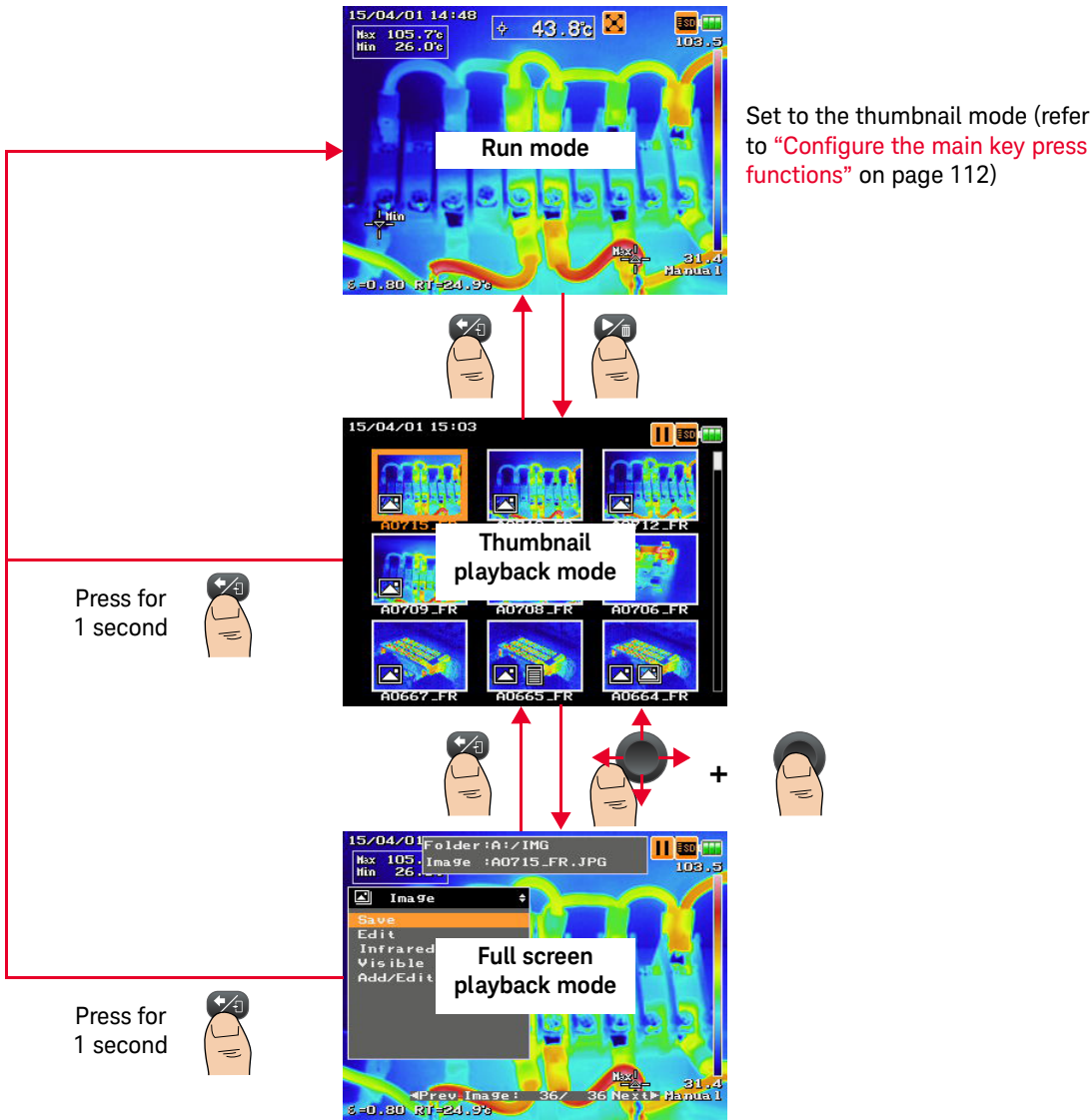
Full screen playback mode overview



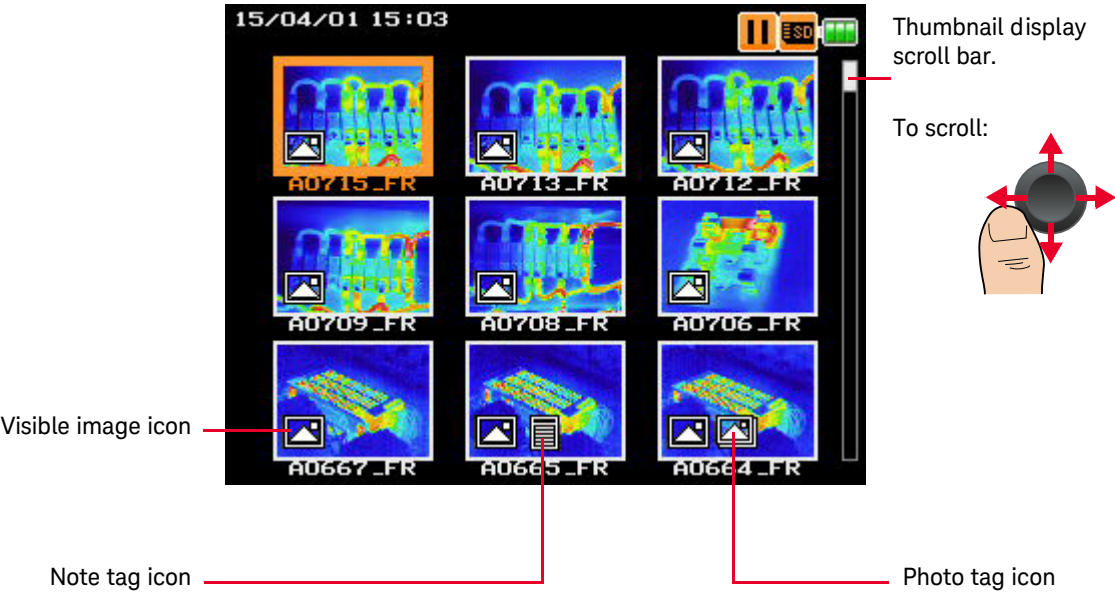
NOTE

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

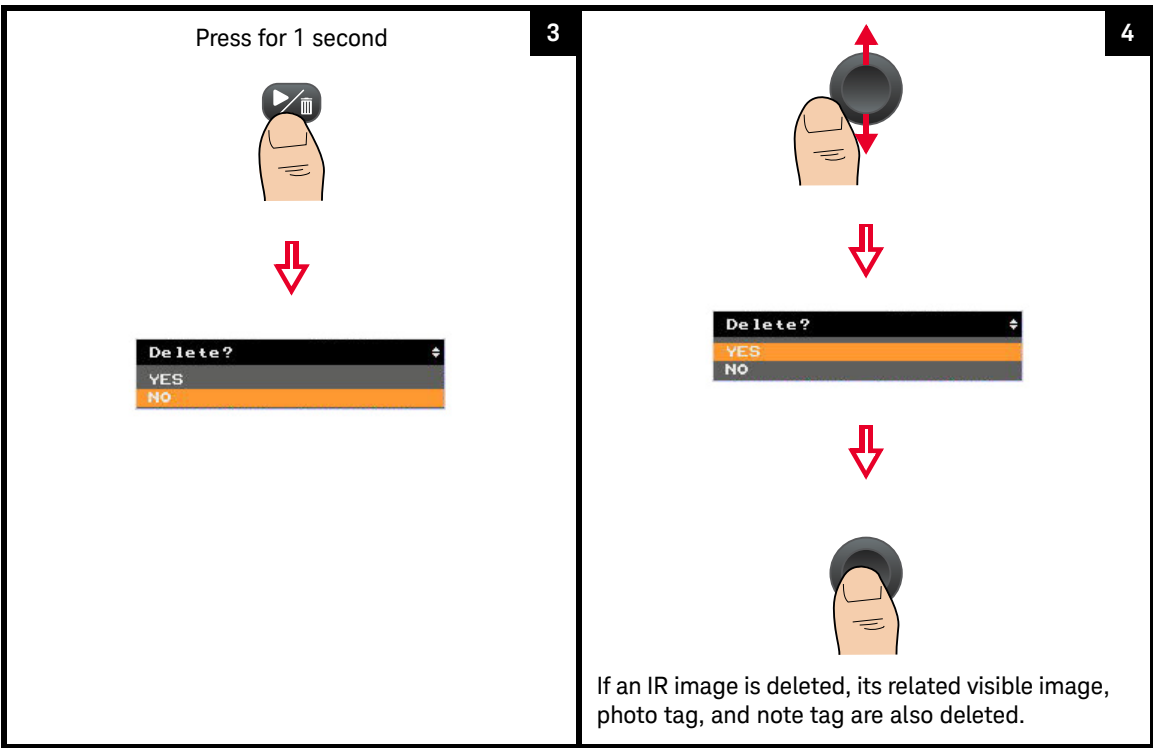
Thumbnail playback mode operation

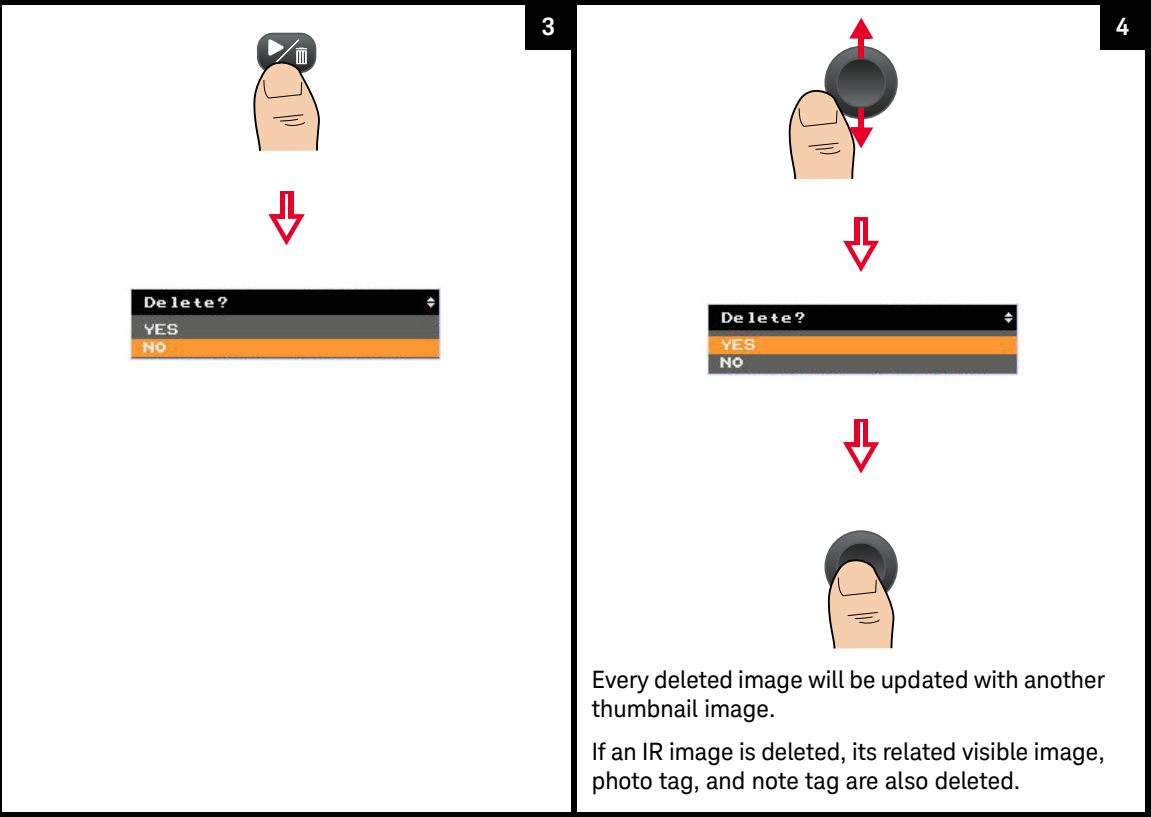


Thumbnail playback mode overview



Delete an image (full screen playback mode)





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

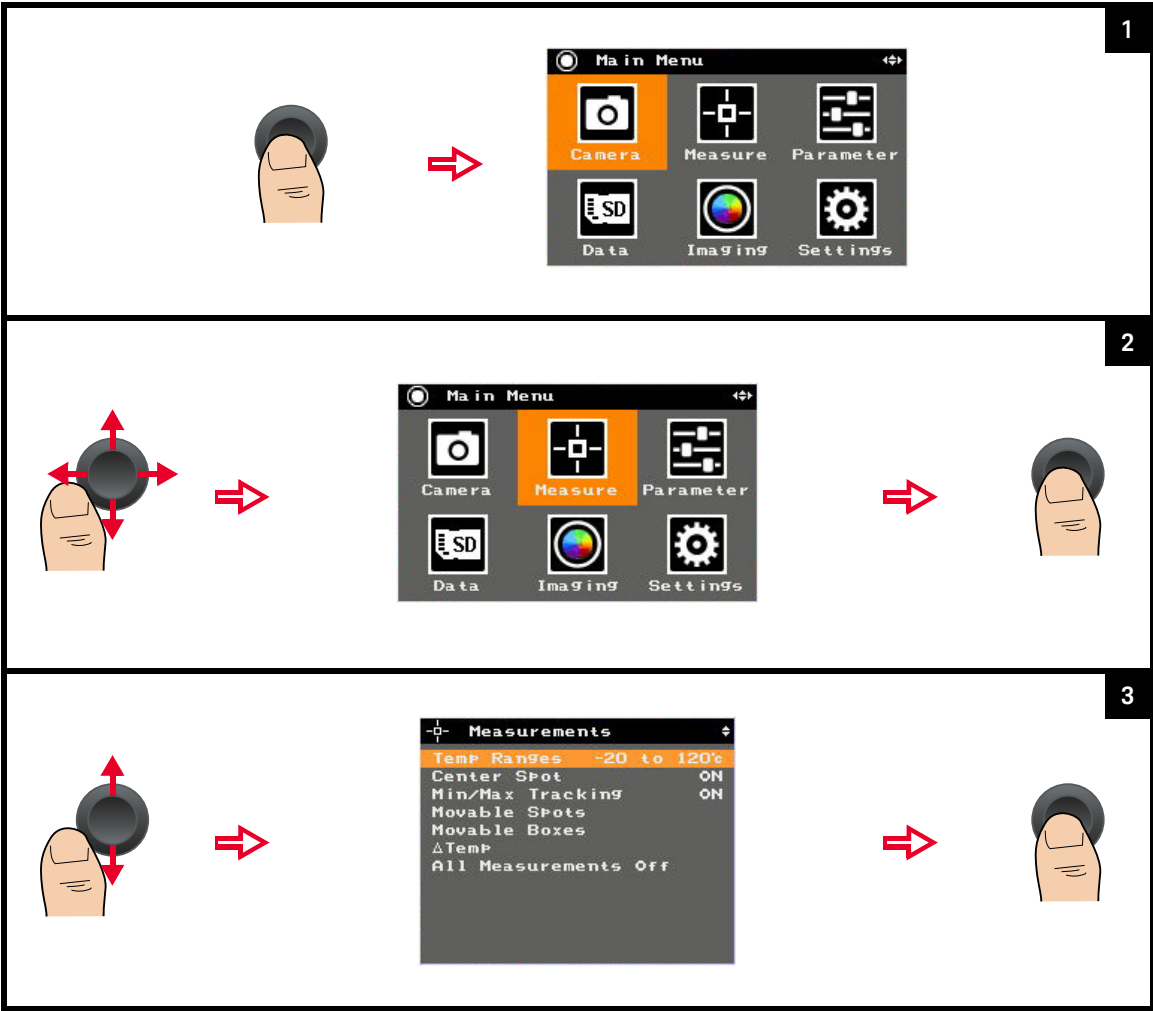
You can set auto range or manual range for temperature measurement.

- 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)

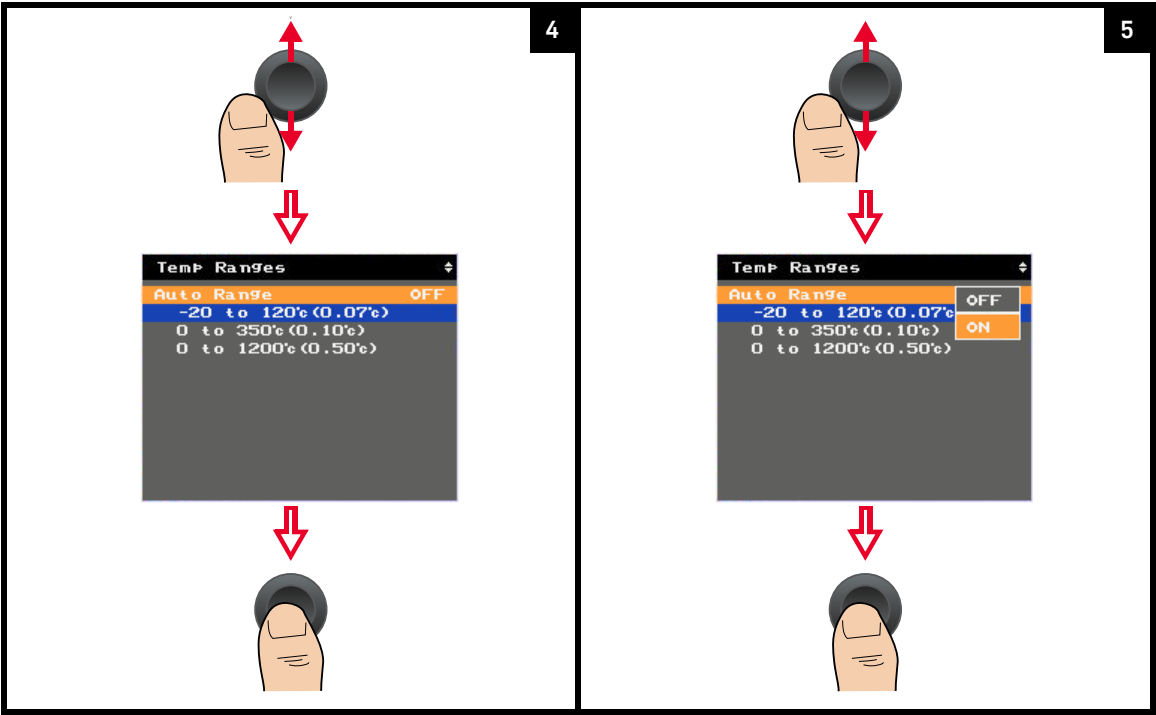
If the maximum temperature (within 80% of the image center area) meets the following conditions, auto ranging will occur:

- > 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.

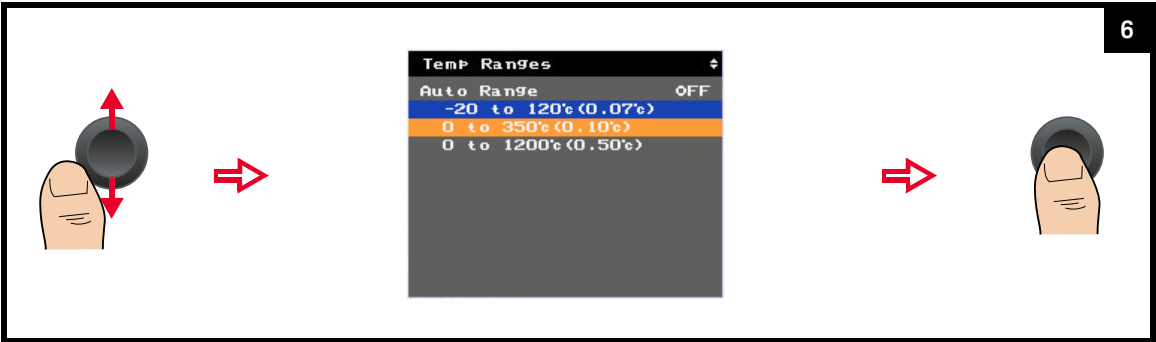
Auto ranging for these conditions only applies in the auto scaling mode.



Enable/disable auto range



Select a manual range (auto range disabled)

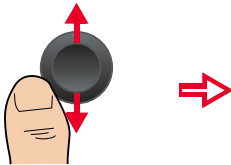


Set the center spot

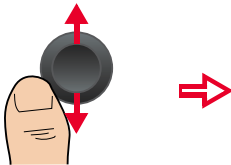
You can enable or disable the center spot cursor which measures the temperature at the center of the IR image.

Follow steps 1 to 2 from “Set the temperature range” on page 61.

1




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



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

3



Center spot measurement

Center spot cursor

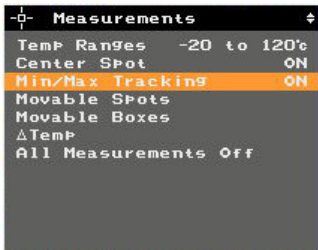
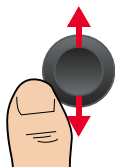
15/04/01 14:48
Max 105.7°C
Min 26.0°C
43.8°C
ESD 103.5
31.4 Manual
Σ=0.80 RT=24.9%

Set the max/min tracking

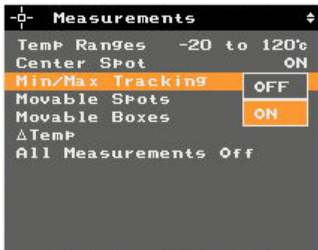
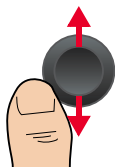
This function tracks the maximum and minimum temperature within the full IR image.

Follow steps 1 to 2 from “Set the temperature range” on page 61.

1



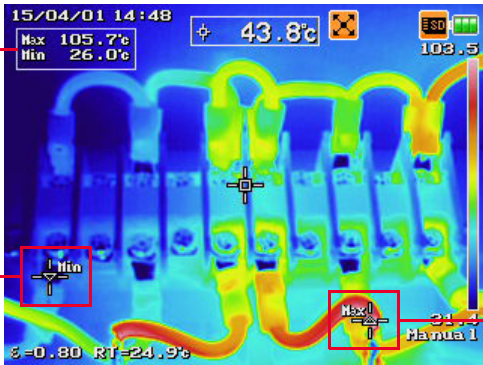
2



3

Max/Min measurements

Min point cursor



Max point cursor

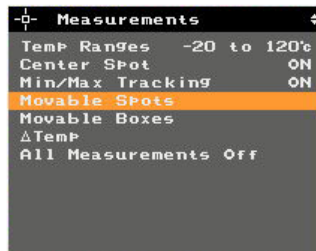
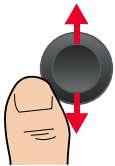
Set the moveable spots and boxes

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

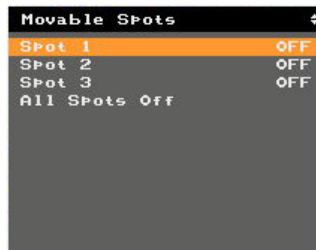
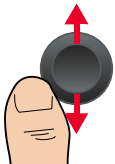
Follow steps 1 to 2 from “Set the temperature range” on page 61.

1



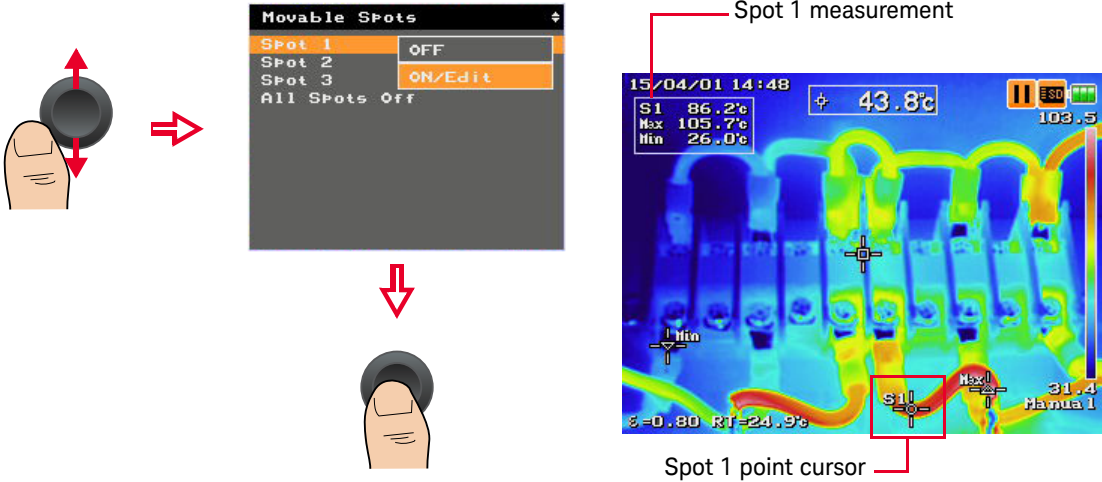
Select any spot or disable all existing spots:

2



For example, to enable or move spot 1:

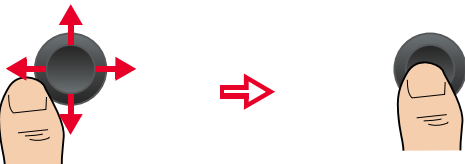
3



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 61.

1



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

Select any box or disable all existing boxes:

2



Movable Boxes	
Box 1	OFF
Box 2	OFF
Box 3	OFF
All Boxes	Off

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

Box 1

OFF

Box 2

Box 3

ON/Edit

All Boxes Off

Box 1 cursor

Box 1 max, min, and average readings

15/04/01 14:48

43.8°C

S1 86.2°C

Max 105.7°C

Min 26.0°C

Box 1: Max 83.7 Min 28.6 Avg 36.1

31.4 Manual 1

%=0.80 RT=24.9%

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:

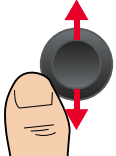
6a

Set the delta temperature

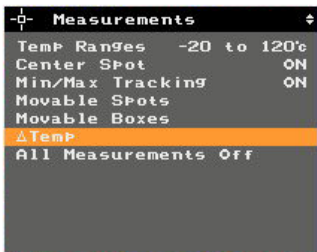
You can measure the difference between two temperature readings – you can select from the spot readings or specify your own reference value.

Follow steps 1 to 2 from “Set the temperature range” on page 61.


1



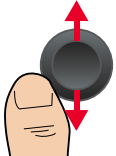
⇒



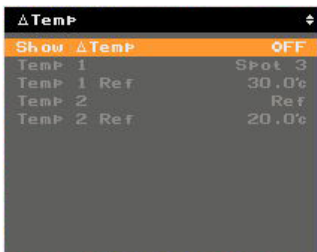
⇒




2



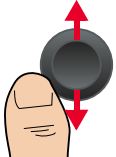
⇒



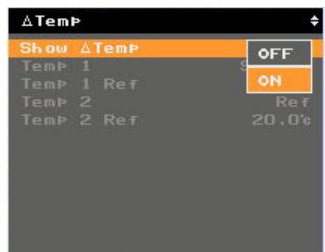
⇒




3



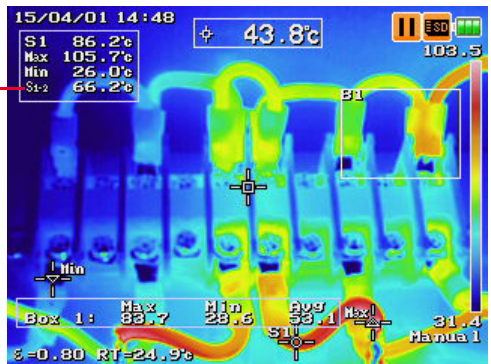
⇒



↓



Δ Temp indicator



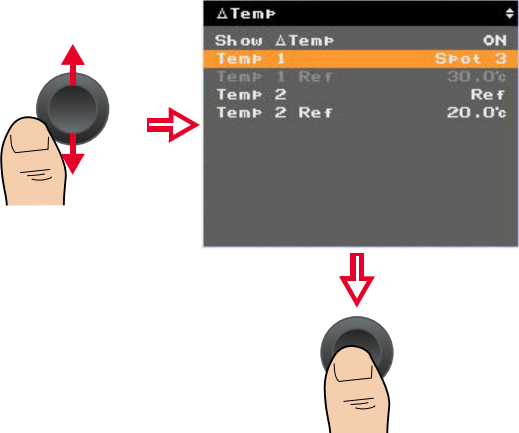
15/04/01 14:48 43.8°C 103.5

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

Box 1: Max 88.7 Min 28.6 Avg 53.1 Max 31.4 Manual 1

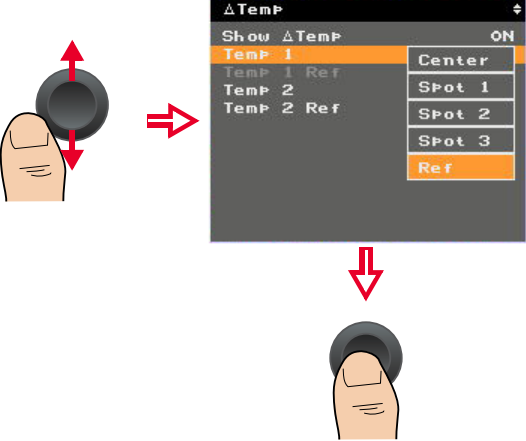
Σ=0.80 RT=24.9%

4




5

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



6

If you want to enter a reference value:



Push left/right to move the indicator.

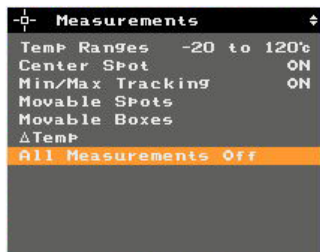
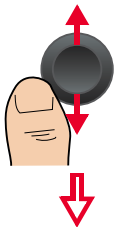
Push up/down to increase/decrease the digits.

7

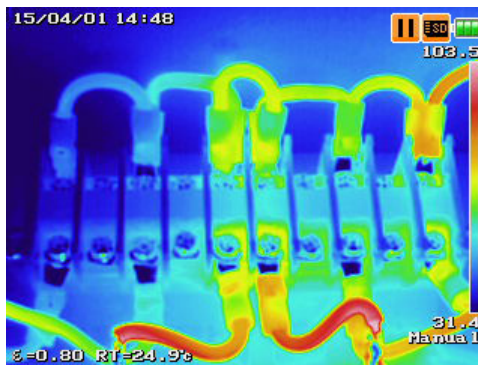
Repeat the same procedure for Temp 2.

Turn off all measurements

Follow steps 1 to 2 from “Set the temperature range” on page 61.



All measurement indicators are removed:

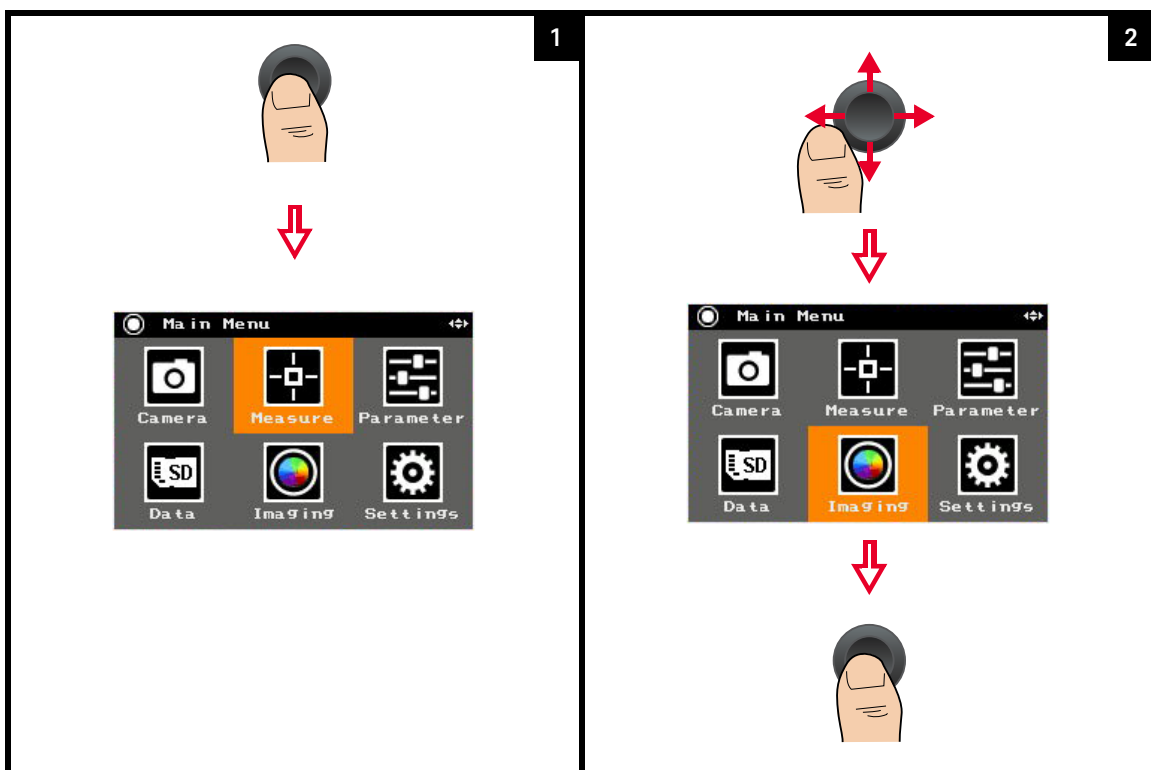


Imaging Controls

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

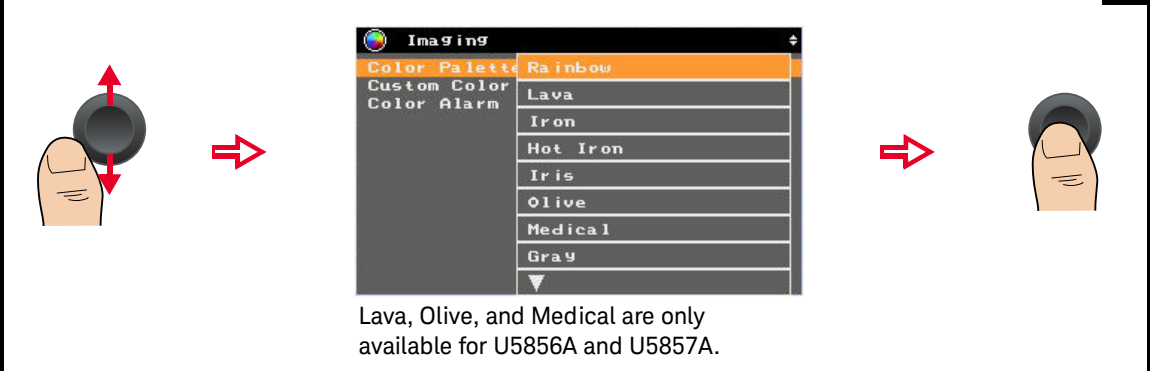
You can apply a specific color palette for your IR image to improve contrast and clarity when identifying hot/cold areas.



2 Image Capture, Processing, and Measurement Functions



Select a color palette:

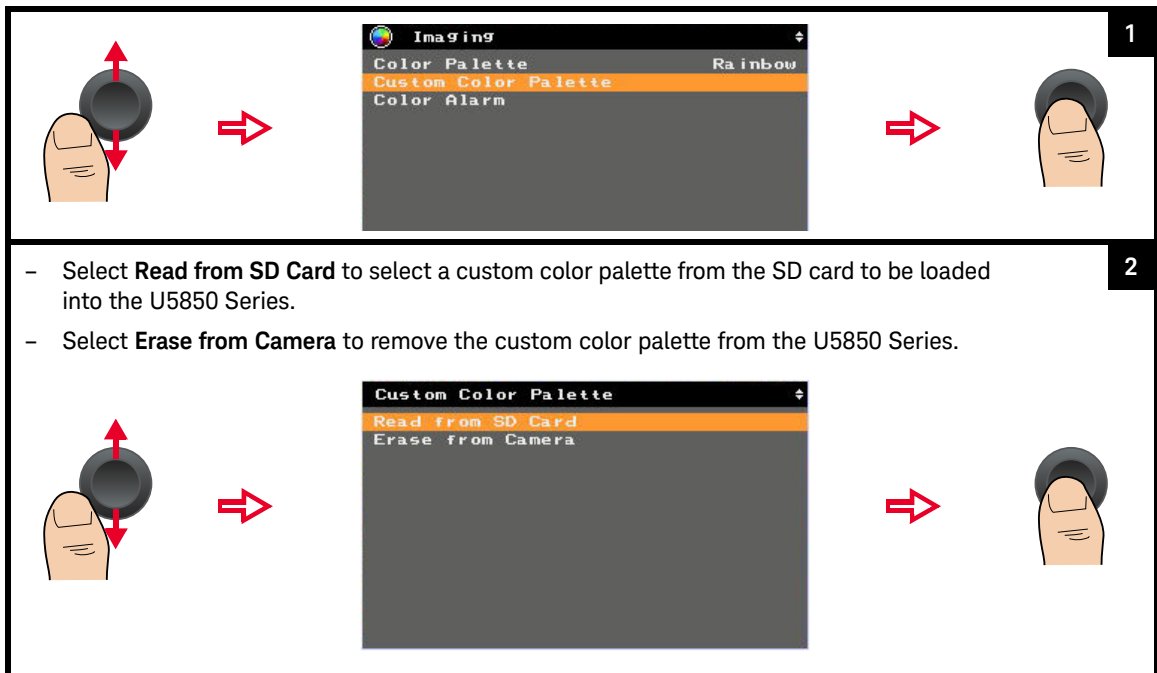


For example, the Medical color palette is applied:



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.

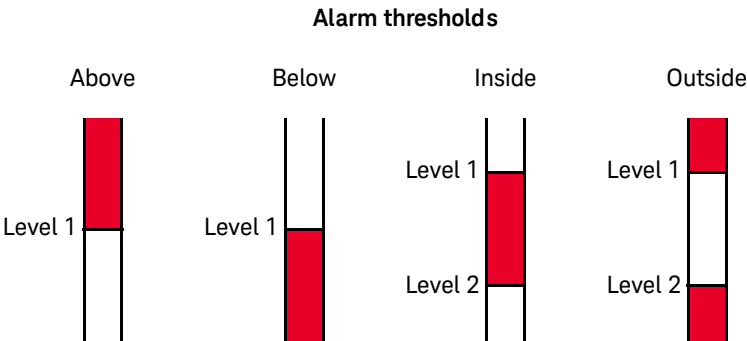




NOTE

- The custom color palettes must be saved into the root directory of the SD 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 card.

Set the color alarm

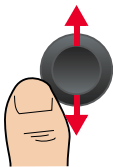
The color alarm allows you to set an alarm threshold which only displays IR components on image zones above, below, inside, or outside the alarm threshold.



-  Alarm 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 61.



1

2



Color Alarm

Color Alarm OFF



Alarm Zone Above

Level 1 50.0%

Level 2 10.0%

Background Hot White

3



Color Alarm

Color Alarm ON


Alarm Zone Above

Level 1 50.0%

Level 2 10.0%

Background Hot White

3a



15/04/01 14:48

Max 105.7°C

Min 26.0°C

43.8°C

103.5

40.0

31.4

Manual

RT=24.9°C

Color alarm indicator when enabled

Set the alarm threshold





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





1

Select the threshold type:







Color Alarm		⬆
Color Alarm		ON
Alarm Zone		Above
Level 1		Below
Level 2		Inside
Background		Outside





2

Set the alarm threshold level



Color Alarm



Color Alarm ON

Alarm Zone Above


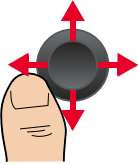
Level 1 50.0%

Level 2 10.0%

Back9round Hot White



1



Color Alarm



Color Alarm ON

Alarm Zone Above

Level 1 40.0%

Level 2 10.0%

Back9round Hot White



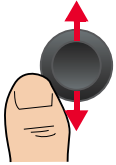
2


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





Color Alarm


Color Alarm ON


Alarm Zone Above

Level 1 40.0°C

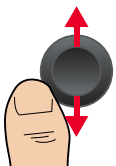
Level 2 10.0°C


Background Hot White





Select the background type:





Color Alarm

Color Alarm ON

Alarm Zone Above


Level 1 40.0°C


Level 2 10.0°C

Background

Hot White

Hot Black



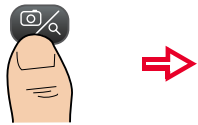


Digital Zoom

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.

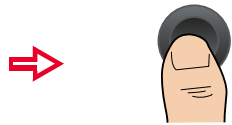


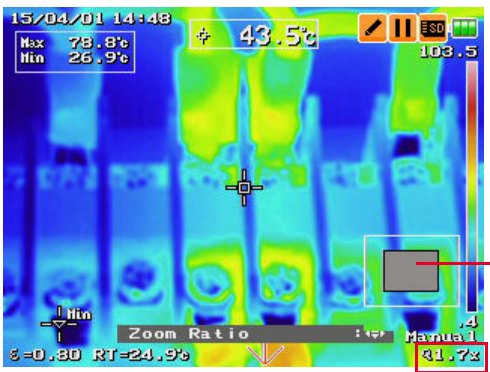
Digital Zoom

Zoom Ratio OFF

Pan

Zoom Off



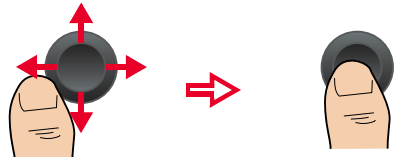


Zoom area


Zoom ratio value

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

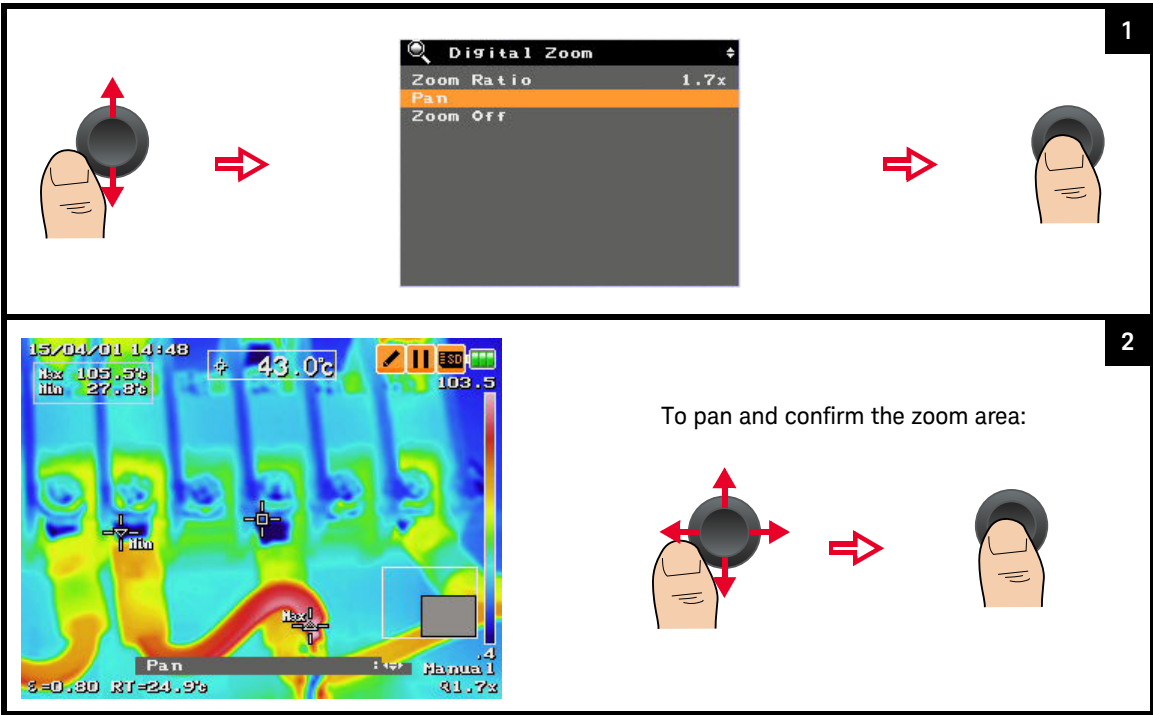
To change and confirm the zoom ratio:



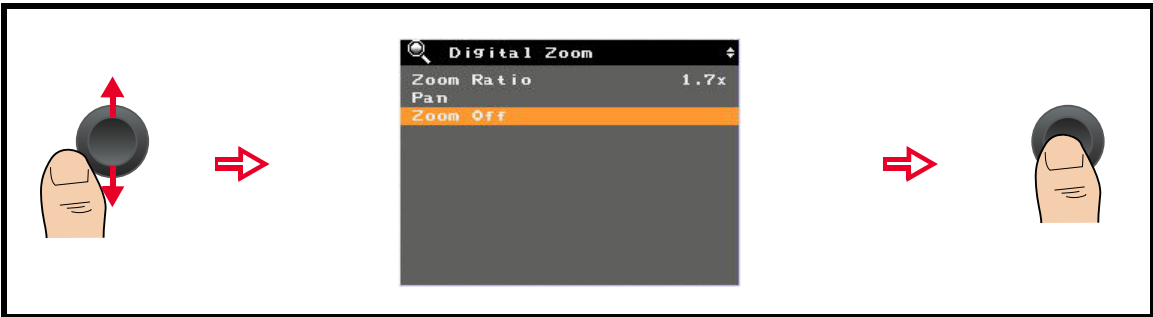
To exit:



Pan (move) the zoom area



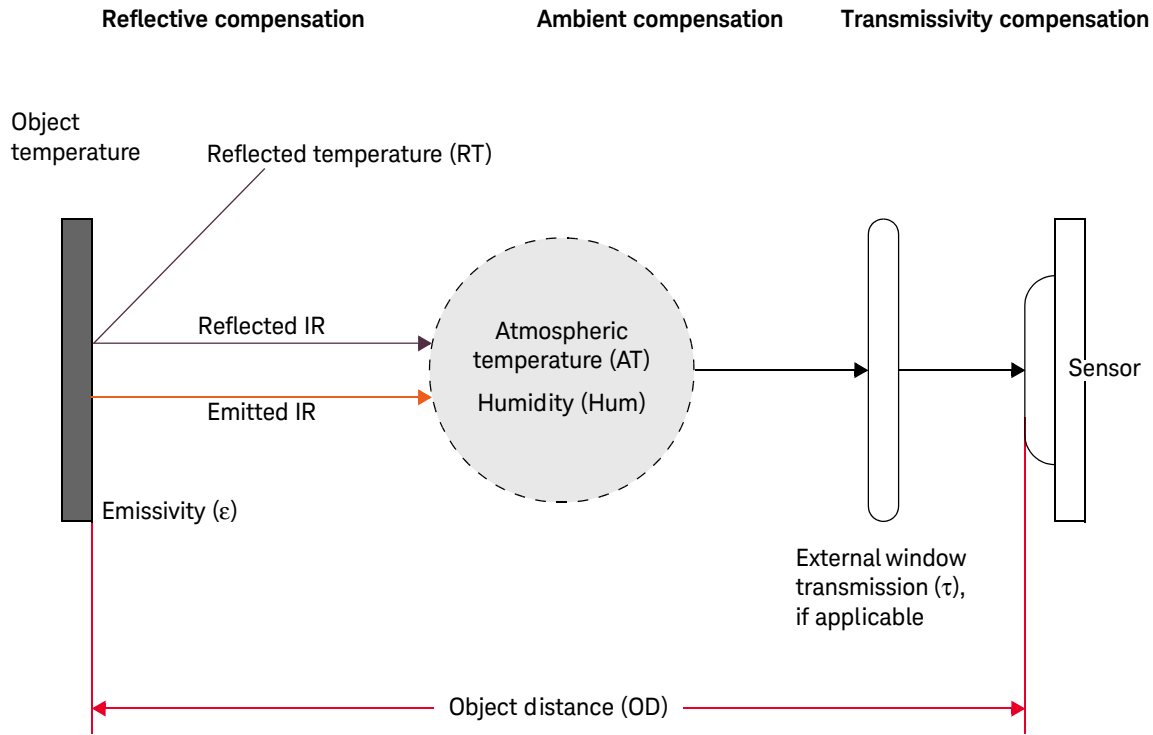
Disable zoom



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.

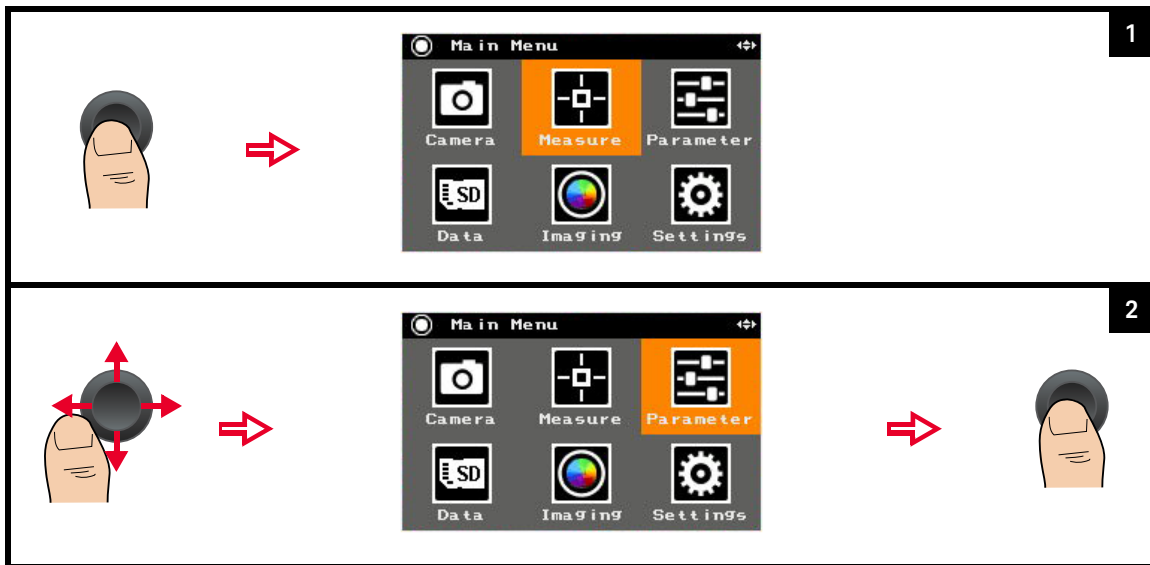
Below illustrates a model of the IR emission energy received by the U5850 Series.




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





Parameters

Emissivity (ε) 0.80

Emissivity Table

Reflected Temp (RT) 23.9%

Object Distance (OD) 1m

Ambient Temp (AT) 25%

Humidity (Hum) 50%

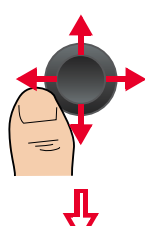
Transmission (τ) 1.00

3

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%

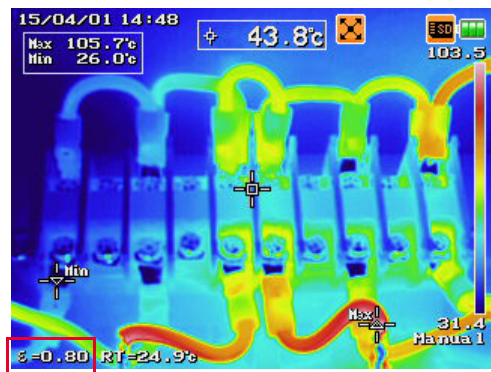
Object Distance (OD) 1m

Ambient Temp (AT) 25%

Humidity (Hum) 50%

Transmission (τ) 1.00

4



15/04/01 14:48

43.8°C

Max 105.7°C

Min 26.0°C

ESD 103.5

RT=24.9%

ε=0.80

31.4 Manual 1

Emissivity parameter indicator

To display the parameter indicator, refer to "Configure the display items" on page 110.

5

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.

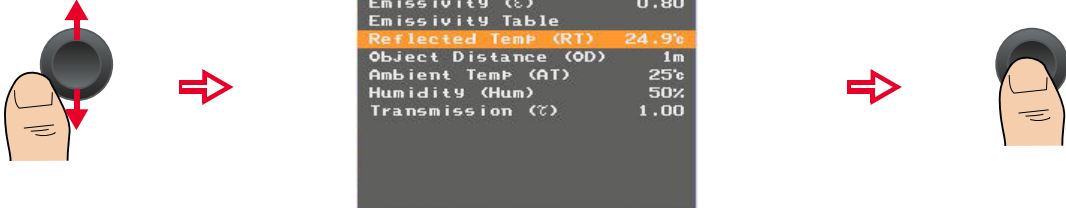
You can manually enter an RT value or run the RT calibration (RT Cal) for reflection source correction. When the source of reflection exists around an object and the temperature of the source of reflection is known, you can enter the RT value manually. If the temperature of the source of reflection is 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

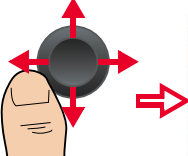
Follow steps 1 to 2 from “Enter an emissivity value” on page 84.



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




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




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.









RT parameter indicator

To display the parameter indicator, refer to “Configure the display items” on page 110.


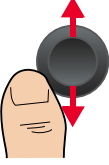
Run RT Cal for reflection source correction





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


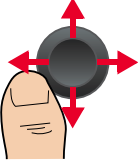


If you know the temperature of the reflection source, you may enter the value.
If not, point the U5850 Series at the reflection source and select **YES** to run the calibration to obtain the temperature.





Background Compensation ↕
YES
NO
23.8%







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



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.

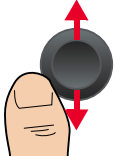
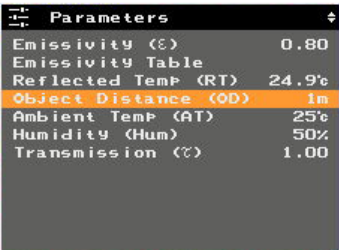

NOTE

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

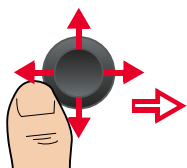
Follow steps 1 to 2 from “Enter an emissivity value” on page 84.

Select **Object Distance (OD)**/Ambient Temp (AT)/Humidity (Hum):

1


⇒

⇒


- 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.



2



Ambient parameter indicators

To display the parameter indicator, refer to “Configure the display items” on page 110.

3

Set the transmissivity (τ)

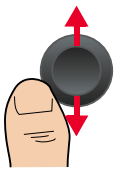
Some IR energy may be lost when transmitted through an external window; this transmissivity error must be corrected to improve the accuracy of your temperature measurements.

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 84.

1

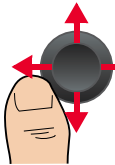


Parameters	
Emissivity (E)	0.80
Emissivity Table	
Reflected Temp (RT)	24.9%
Object Distance (OD)	1m
Ambient Temp (AT)	25%
Humidity (Hum)	50%
Transmission (T)	1.00



Enter a value from 0.10 to 1.00:

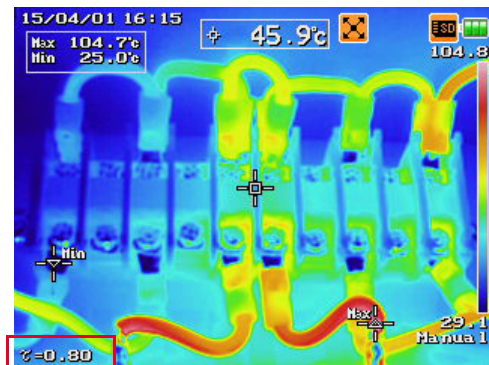
2



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.



3

Transmissivity parameter indicator

To display the parameter indicator, refer to “Configure the display items” on page 110.

3 Data Management and System-Related Functions

Data Management Controls	94
System-Related Settings	105

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.

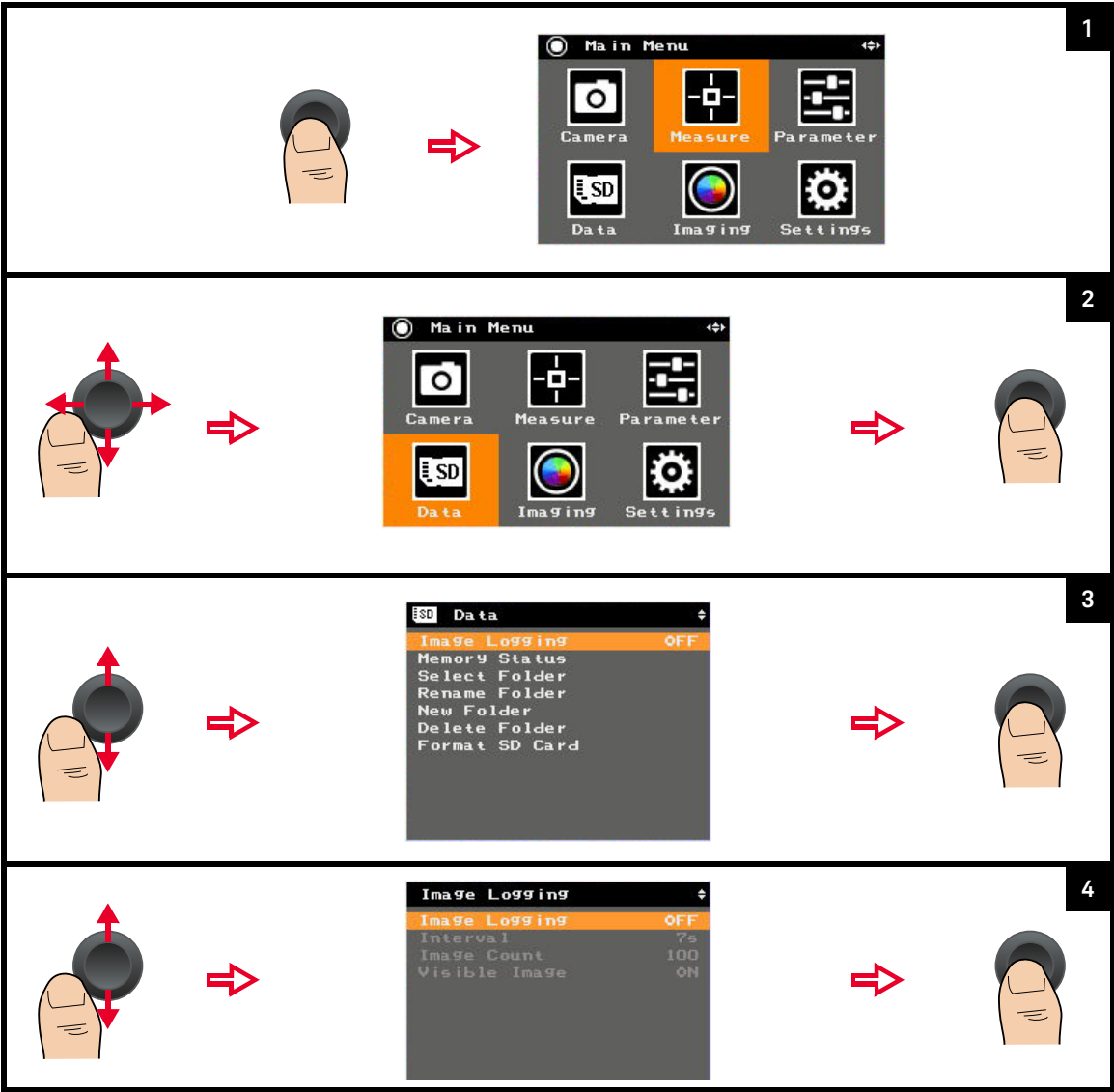
NOTE

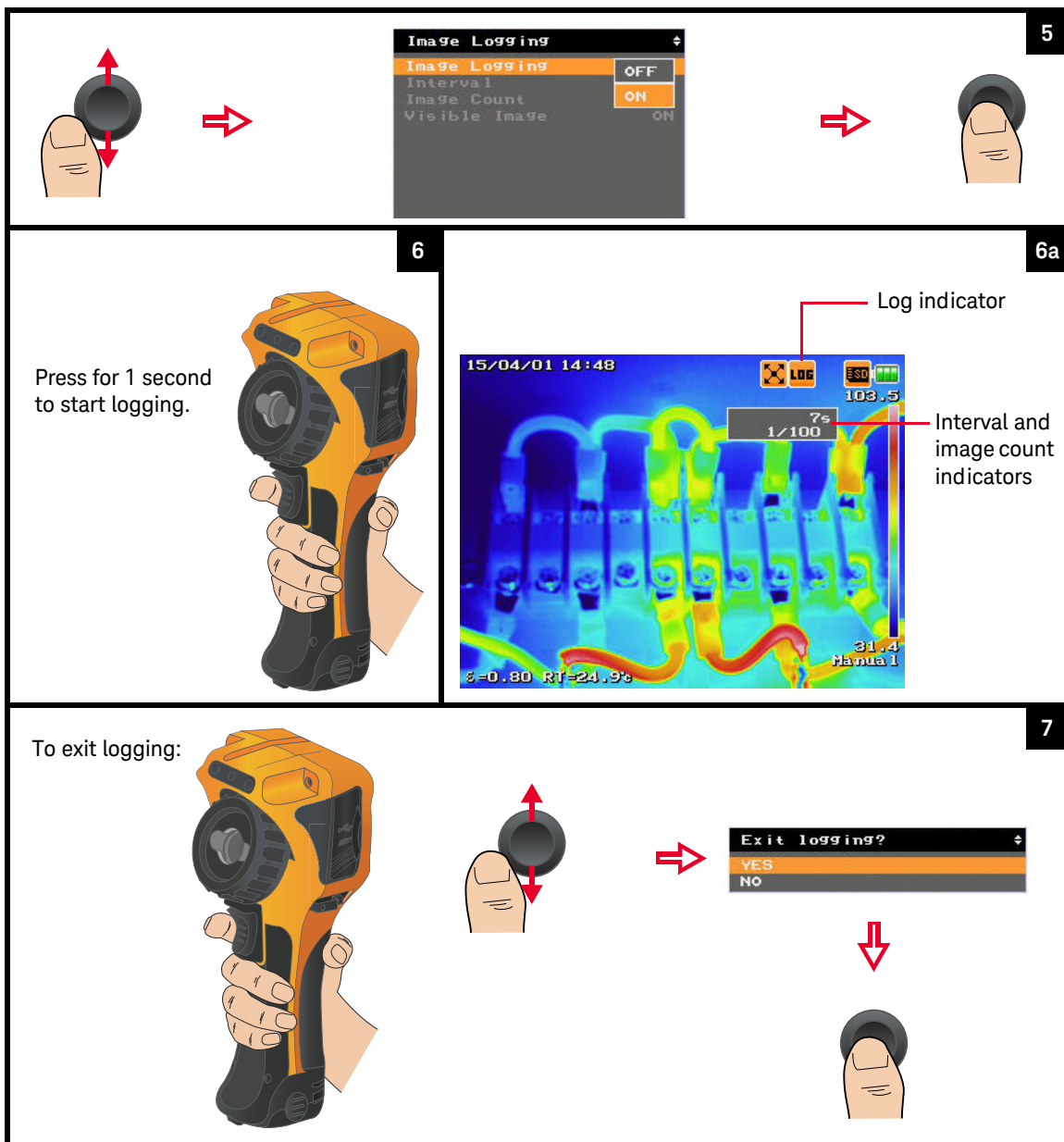
All functions are not accessible during image logging.

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





Set the logging interval

1 Enter a value from 7 to 3600 seconds:

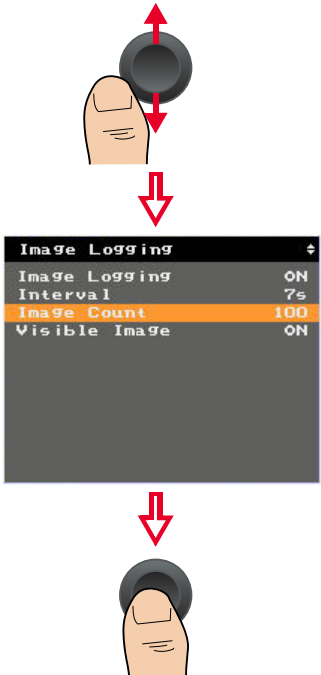
Push left/right to move the indicator.

Push up/down to increase/decrease the digits.

2

Set the image count

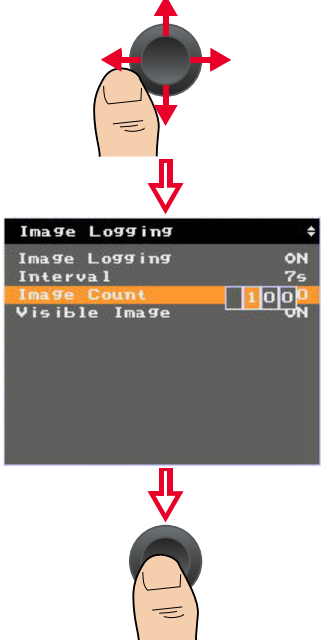
1



2

Enter a value from **1 to 1000**:

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



Enable/Disable logging of visible images



1

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







2



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







View the SD card memory status

Follow steps 1 to 2 from “Enable/Disable image logging” on page 95.



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



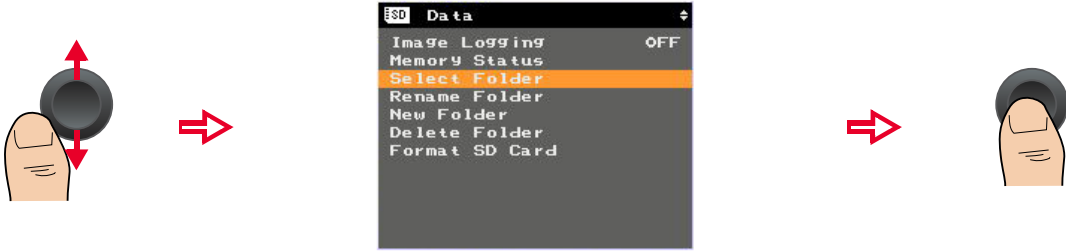


Manage image folders

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

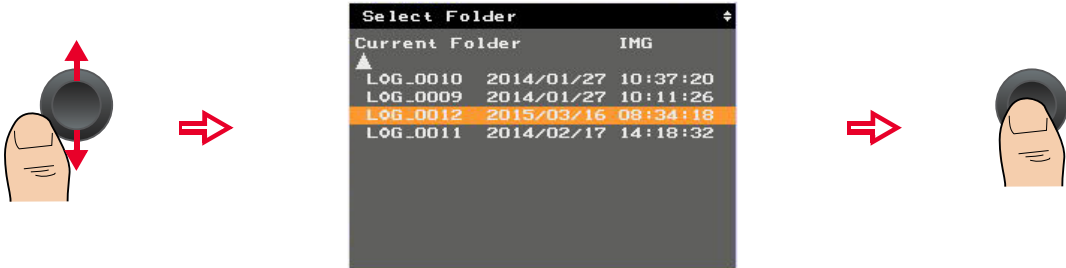
Select a folder

Follow steps 1 to 2 from “Enable/Disable image logging” on page 95.



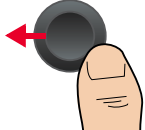
1

Select an existing folder to use:




2


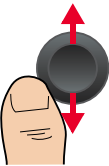
To return to the previous folder list display:

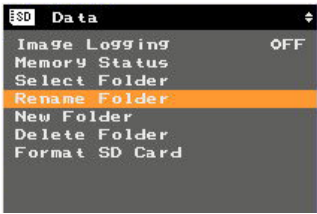


To return to the Data menu:





Rename a folder







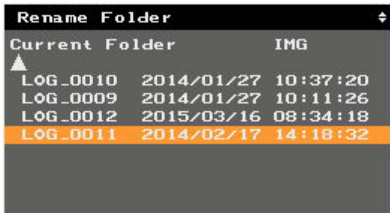
Data	
Image Logging	OFF
Memory Status	
Select Folder	
Rename Folder	
New Folder	
Delete Folder	
Format SD Card	





1



Select an existing folder to rename:


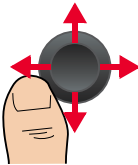



Rename Folder	
Current Folder IMG	
▲	
LOG_0010	2014/01/27 10:37:20
LOG_0009	2014/01/27 10:11:26
LOG_0012	2015/03/16 08:34:18
LOG_0011	2014/02/17 14:18:32





2

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



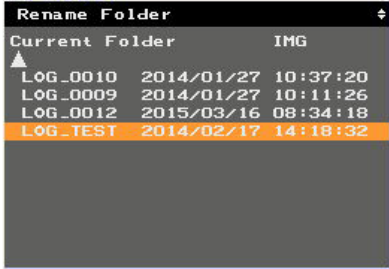


Rename Folder	
Current Folder IMG	
Folder Name LOG TEST	




3

The new folder name will be reflected in the list:



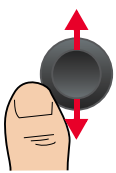
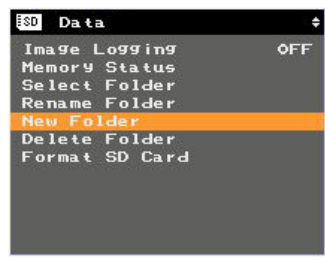

Rename Folder	
Current Folder IMG	
▲	
LOG_0010	2014/01/27 10:37:20
LOG_0009	2014/01/27 10:11:26
LOG_0012	2015/03/16 08:34:18
LOG_TEST	2014/02/17 14:18:32



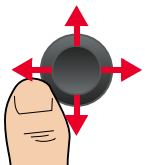


4

Create a new folder

1


⇒

⇒


2

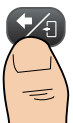

⇒

⇒


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



SD Data

Image Logging OFF

Memory Status


Select Folder

Rename Folder

New Folder

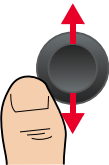
Delete Folder

Format SD Card



1

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

100 IMAGE 2015/03/16 09:41:14



2



Delete selected folder?

YES

NO

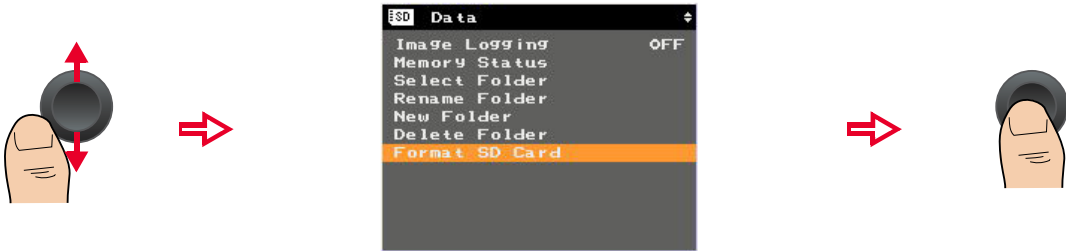


3

Format the SD card

Follow steps 1 to 2 from **“Enable/Disable image logging”** on page 95.


1



The diagram for Step 1 shows a hand on the left with red arrows pointing up and down, indicating navigation. The central screen displays the 'Data' menu with the following options: 'Image Logging' (OFF), 'Memory Status', 'Select Folder', 'Rename Folder', 'New Folder', 'Delete Folder', and 'Format SD Card' (highlighted in orange). A red arrow points from the screen to the right, where a hand is shown pressing the right arrow key.

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

2





The diagram for Step 2 shows a hand on the left with red arrows pointing up and down, indicating navigation. The central screen displays the 'Format SD card?' prompt with the following options: 'YES' (highlighted in orange) and 'NO'. A red arrow points from the screen to the right, where a hand is shown pressing the right arrow key.

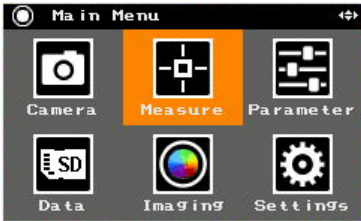
System-Related Settings

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


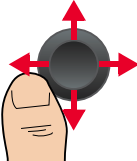
Configure the Quick Start Tutorial


Display the tutorial








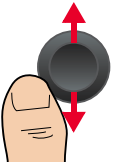
1

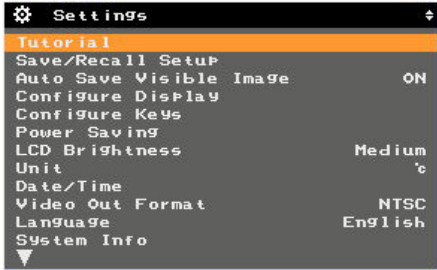








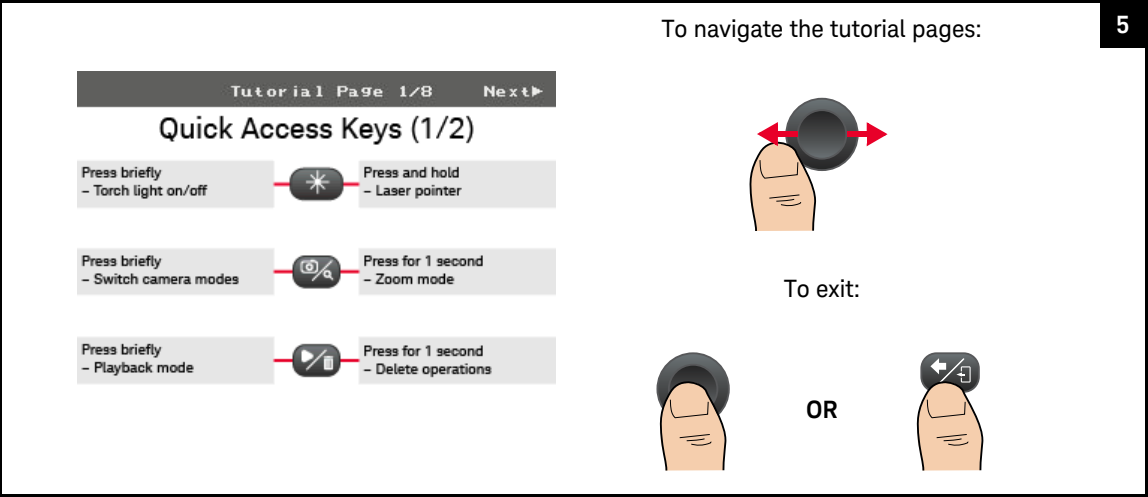
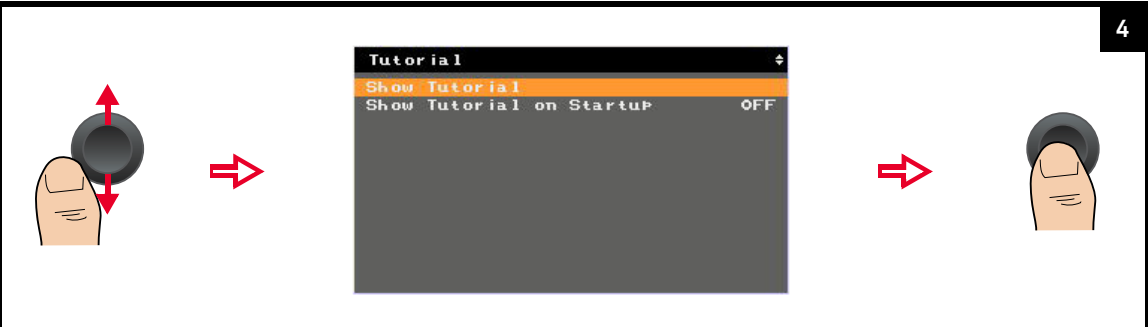
2



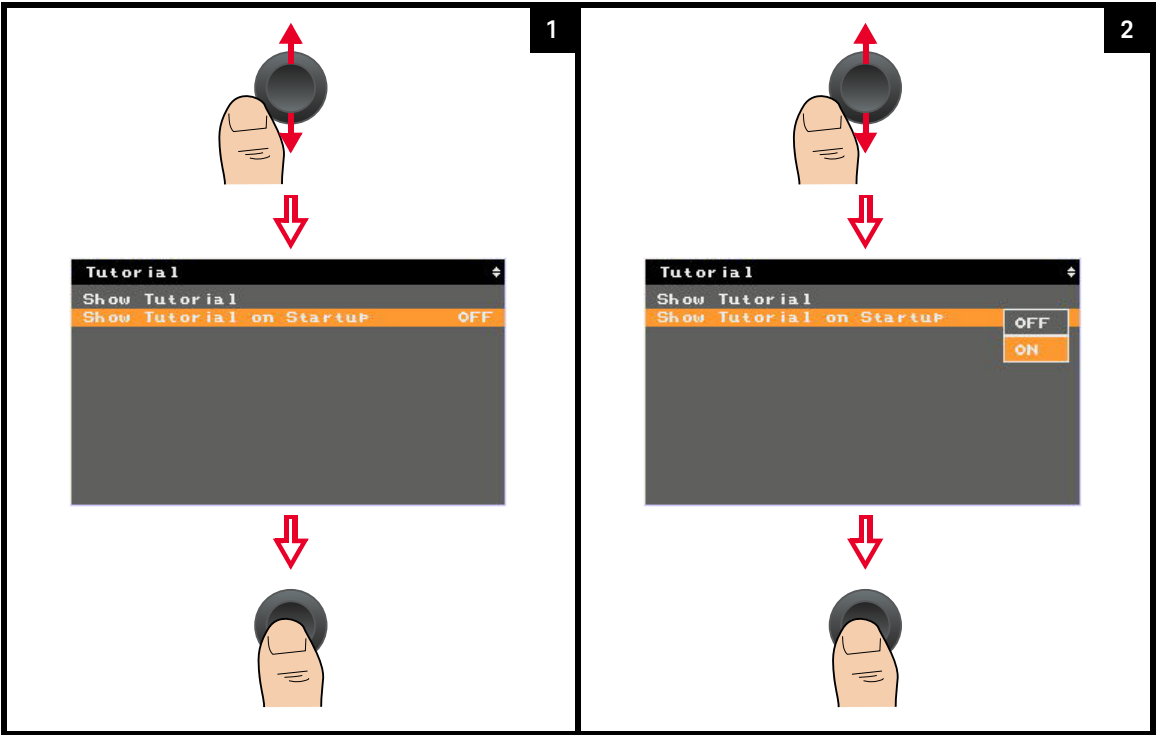




3



Enable/Disable the tutorial at power-on

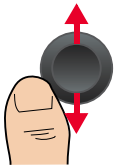
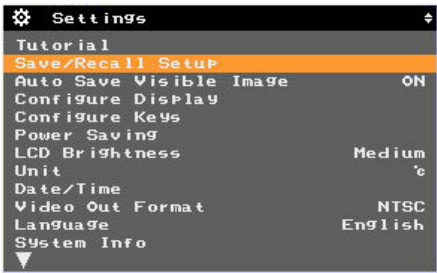



Save/recall instrument setups

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.

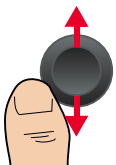
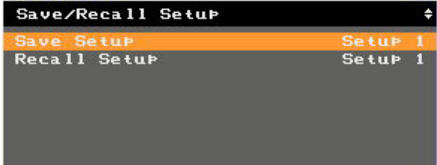

1

Follow steps 1 to 2 from “Display the tutorial” on page 105.

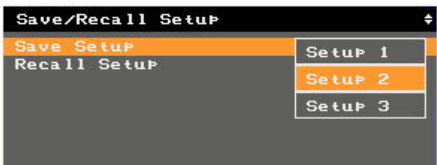

2

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

3

Select a setup storage to save/recall:

Turn on/off visible image auto-save

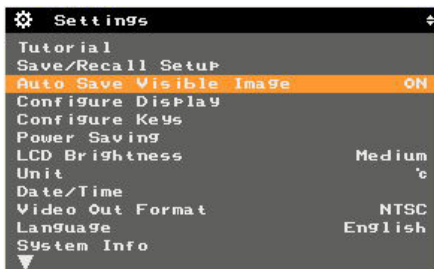
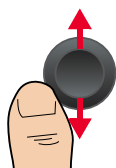
If you enable auto-save for visible images, both the IR and visible images will be saved. If disabled, only the IR image will be saved.

NOTE

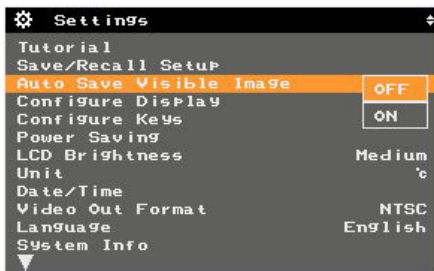
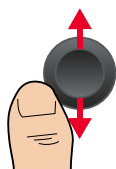
This is only applicable for the IR camera mode. Visible images will always be auto saved in the Visible Camera, Picture in Picture, and Blend modes.

Follow steps 1 to 2 from “Display the tutorial” on page 105.

1




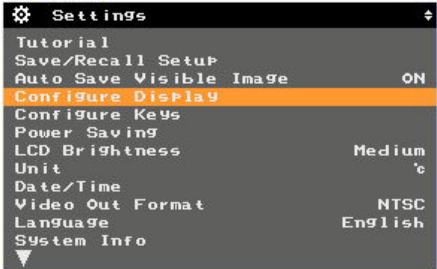
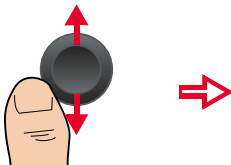
2




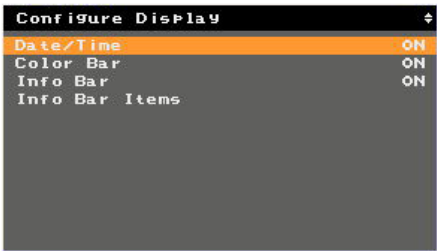
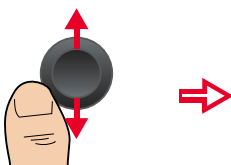
Configure the display items

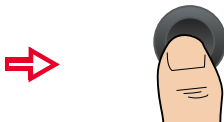
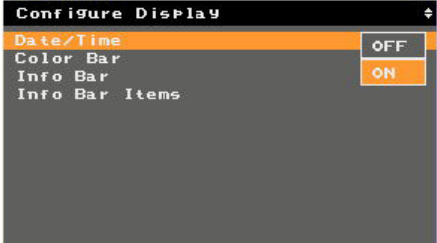
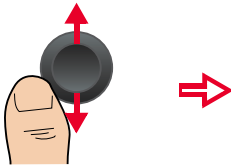
You can set the items that you want to display on the screen.

Follow steps 1 to 2 from “Display the tutorial” on page 105.



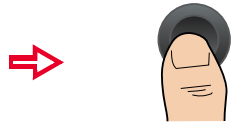
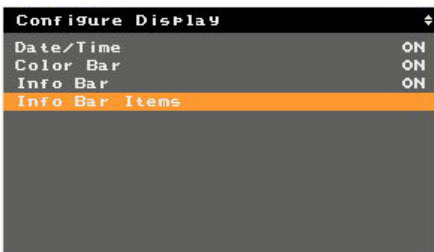
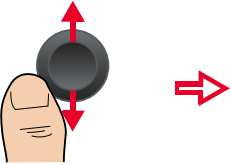
Select **Date/Time**, **Color Bar**, or **Info Bar**:





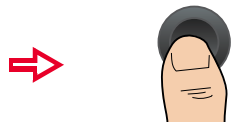
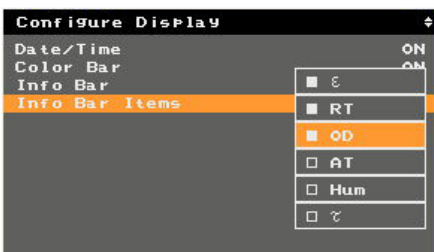
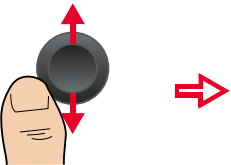
To select the info bar items to display:

4



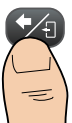
Select the items (only the first four items selected will be displayed):

5



Toggle to check/uncheck


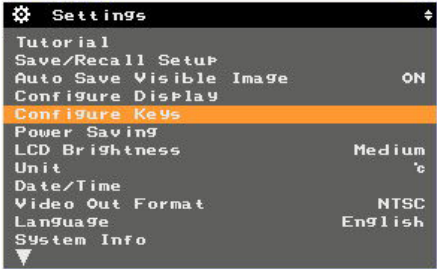
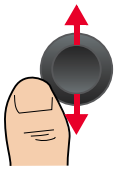
To confirm and exit:




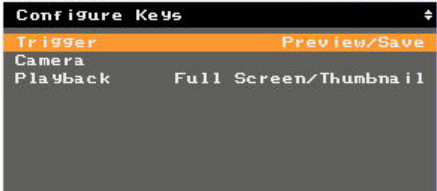
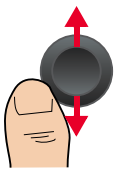
Configure the main key press functions

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


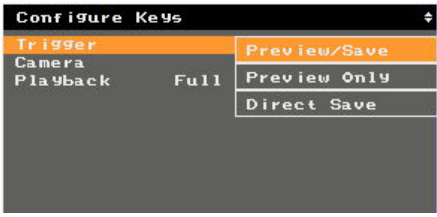
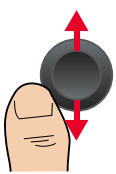
Follow steps 1 to 2 from “Display the tutorial” on page 105.



Select **Trigger/Camera/Playback**:



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:



Set the power saving mode

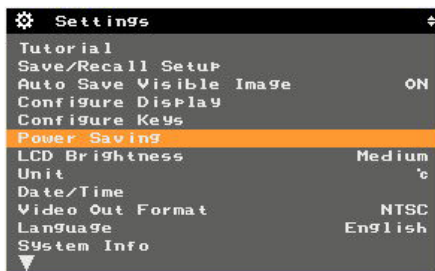
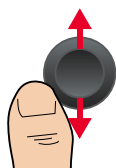
You can enable/disable auto sleep or auto power-off, and change the timer period of these functions.

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.

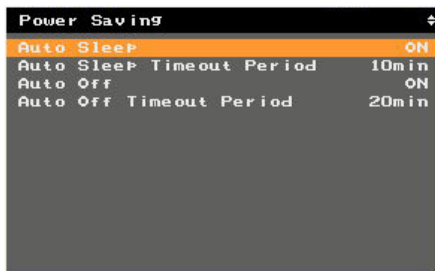
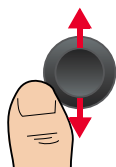
Follow steps 1 to 2 from “Display the tutorial” on page 105.

1



Select **Auto Sleep** or **Auto Off**:

2

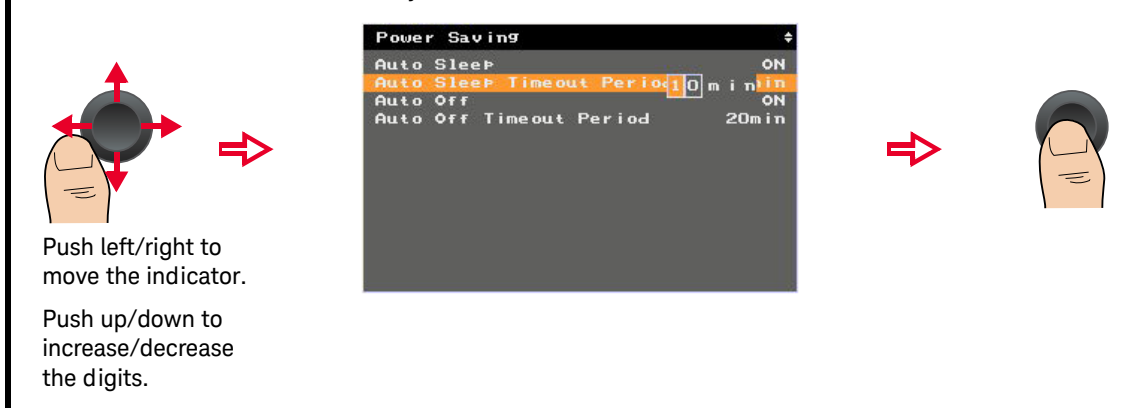




To set the auto sleep or auto power-off timer, select **Auto Sleep Timeout Period** or **Auto Off Timeout Period**:



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

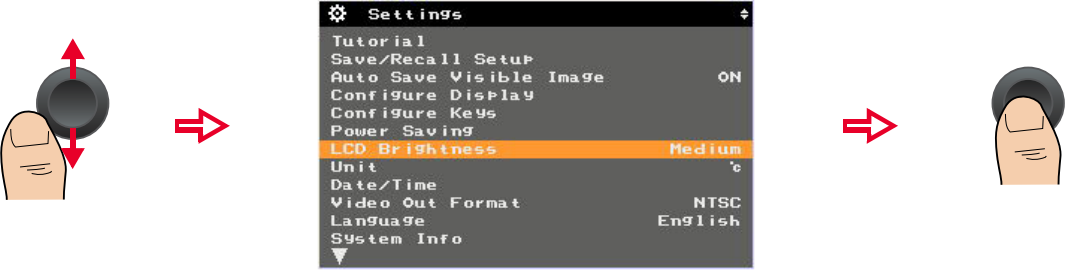


Set the LCD brightness


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

Follow steps 1 to 2 from “Display the tutorial” on page 105.

1



2



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

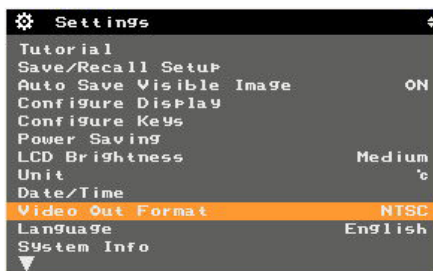
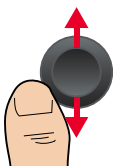
You can set the video out format to NTSC or PAL when you connect the U5850 Series to an external monitor.

NOTE

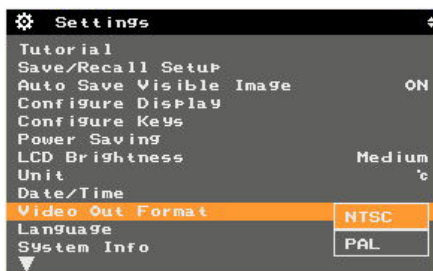
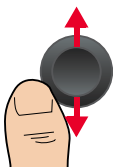
- The PAL and NTSC formats are full resolution screen videos. Hence, if a TV/projector/monitor screen is truncated, switch its OVERSCAN function to OFF.
- Video out is disabled in the power-saving mode.

Follow steps 1 to 2 from “Display the tutorial” on page 105.

1



2



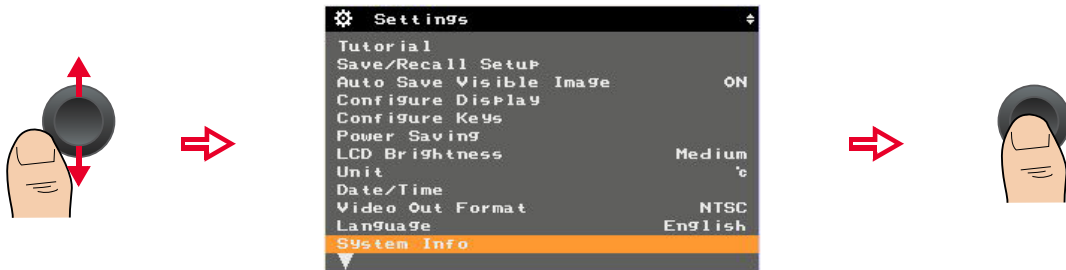
Set the language

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

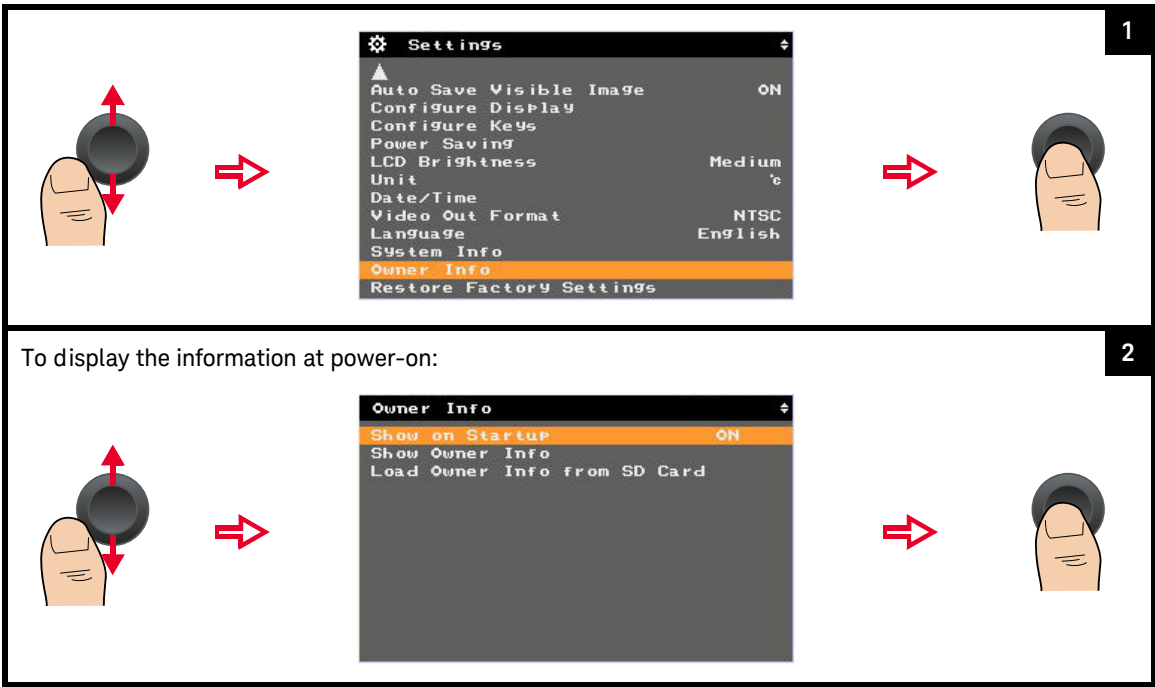
Display the system and owner information

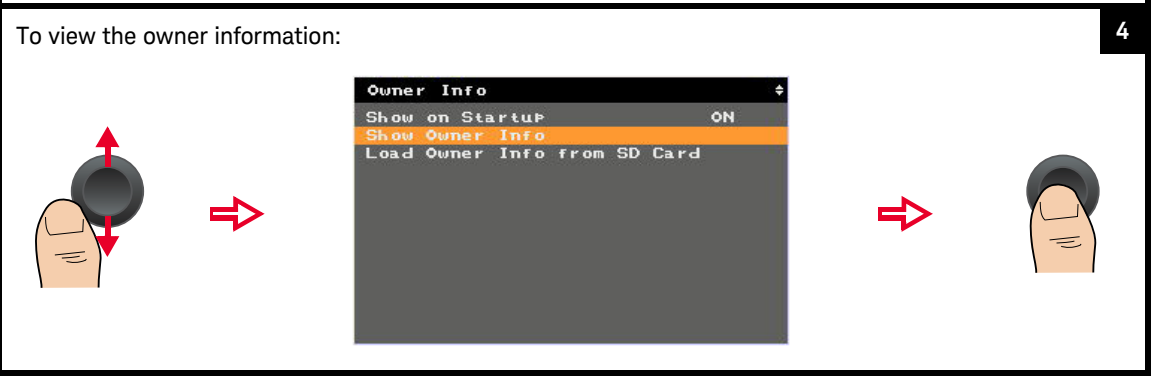
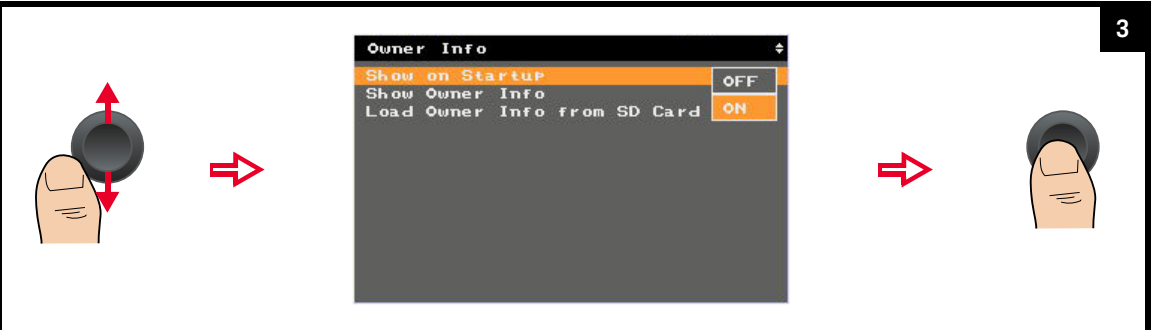
Display the system information

Follow steps 1 to 2 from “Display the tutorial” on page 105.



Display the owner information





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 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:



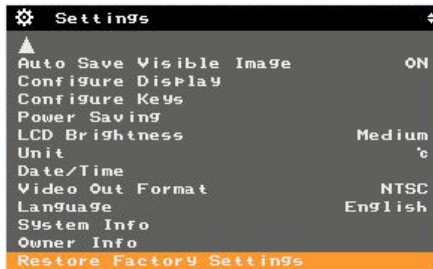
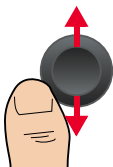
2

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

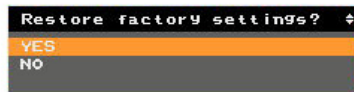
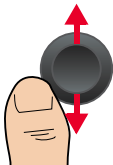
Reset the U5850 Series to factory default settings

Follow steps 1 to 2 from “Display the tutorial” on page 105.

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 English version at the Keysight website for the latest revision.

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