

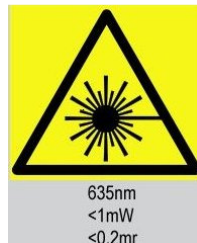
IRI2010 Thermal Imaging Camera User Manual



Safety Warning:








The equipment described in this document uses a Class 2 laser. Under no account should anyone look directly into the laser beam or the laser beam exit aperture, irreversible damage to the eye may occur. The laser should not be operated when there are personnel in the imager's field of view.

Caution – use of controls or adjustments or performance of procedures other than those specified in this document may result in hazardous laser radiation exposure.



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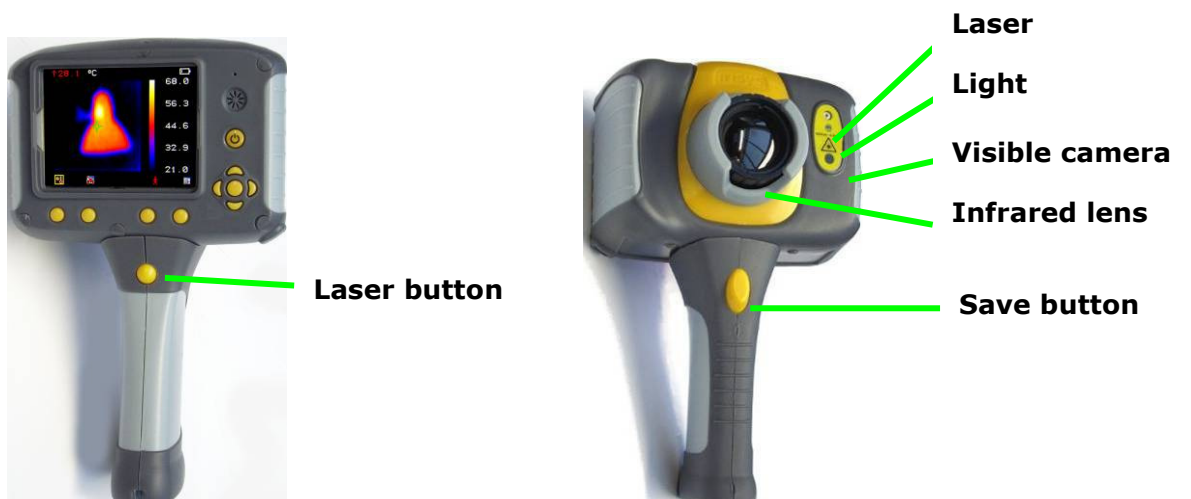
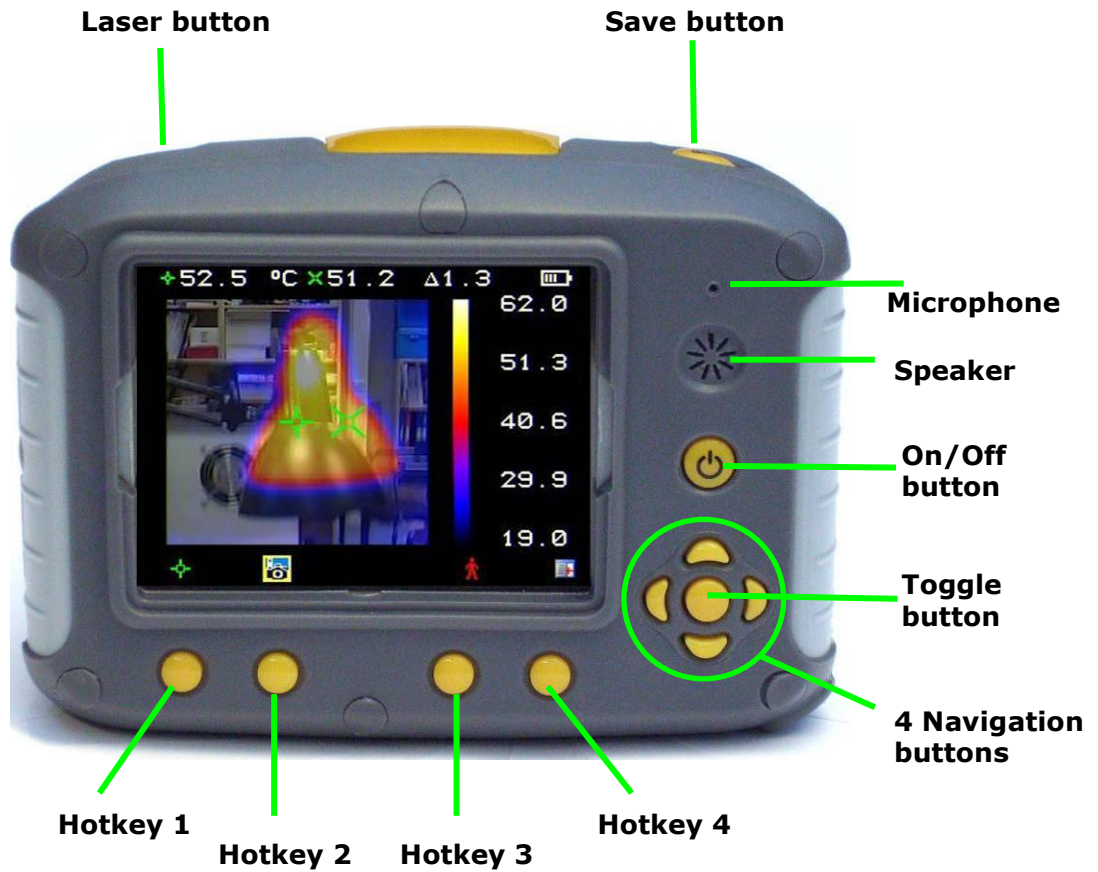
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1. Contents of the case.



1. The case.
2. Camera.
3. PSU and International adaptors.
4. CD – User manual and software.
5. USB cable (camera to PC).
6. Handle.
7. Quick start guide.

2. Main features and controls.



3. Getting started.

a) Switching the camera on/off



Press the on/off button to switch the camera on.

Press and hold for a few seconds to switch the camera off.

b) Charging the internal battery



The camera's built in battery is charged via the charging port. A fully charged battery will last approximately 6 hours. A red LED indicates charging which turns to green when the battery is charged.



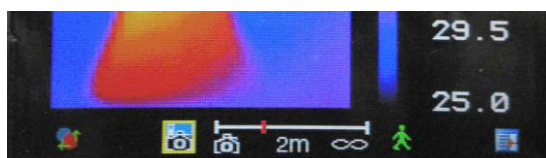
Note: When the camera is connected to a PC via the USB cable the camera will charge but extremely slowly.

c) Focusing

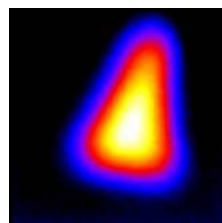


Gently rotate the lens clockwise and anti-clockwise to focus the image.

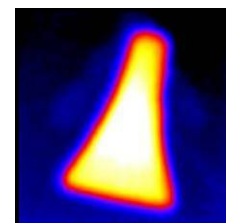
◆ *Remember to remove the lens cap.*



Focus bar



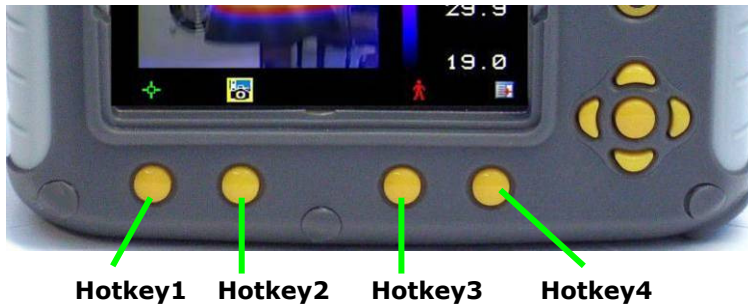
Out of focus




Focused

When focusing a focus bar appears on the screen to assist in focusing the image. It indicates the approximate distance in metres (in feet when °F is selected) of a focussed target from the camera.

Hotkey buttons



The Hotkey functions are indicated by the icons or text displayed on the screen above them.

These functions vary according to the operating options chosen by the user. A yellow box  around the icon for Hotkey1 or Hotkey2 indicates that this option is selected and this defines the operation of the navigation and toggle buttons. In normal imaging mode, Hotkey 3 may be used to freeze the image; pressing it again returns the camera to live operation. Hotkey 4 is used to enter and exit the menu. See appendix A2 for a full icon list.

d) Menu

The Menu is selected by Hotkey 4. Use the Navigation buttons to move around and use Hotkey 3 to select a menu function. Full details of menus in section 5.

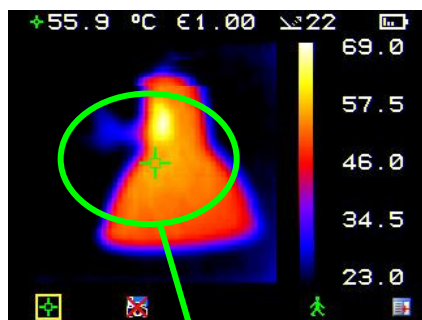
e) Saving an image



To save a live or frozen image, press the Save button once. If Caption Mode or Voice Annotation has been turned on, a text caption or voice annotation can be attached to the image (see section 6). Please note that Hotkey 3 can be used to toggle between a live image and a frozen image.

f) Temperature measurement

Temperature readings are displayed at the top of the display. In the default mode, a single temperature in °C is of the centre point of the cursor. The other readings at the top of the display are emissivity settings and reflected temperature setting. Two cursors or a measurement area can be selected from the measurement options menu (see section 5). The temperature range within the scene is indicated by a scale on the right hand side of the display.



One cursor



Two cursors

Temperature difference between cursors

Temperature range for the scene

4. Thermal and visible image blending

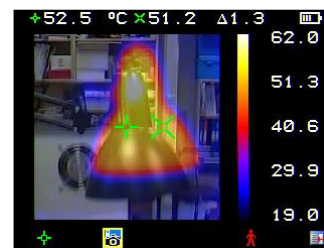
The camera can show a thermal image or a visible image of the scene, or a mixed blend of both.



a) 100% Thermal only



b) 100% Visible only



c) 50% Thermal and 50% visible



Hotkey1 Hotkey2 Hotkey3 Hotkey4

Centre toggle button

Up/Down, Left/Right navigation buttons
















1. Press Hotkey 2  until the Visible On/Off icon appears 
2. If off  press the centre toggle button  to toggle to Visible On .
3. Use either the up/down, or left/right navigation buttons  to merge (blend) the visible and thermal images. Blend options are 0%, 25%, 50% 75% and 100%.

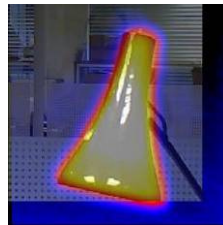
Image alignment

As the visible and thermal camera are not co-axial the visible and thermal image often need to be aligned. This is usually required when moving to view objects at different distances.

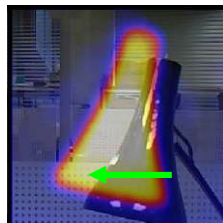
1. Press Hotkey 2  to toggle through to the Visible On/Off icon  . If off  toggle the centre button  to turn the visible option on .
2. Press Hotkey 1  to toggle through to the alignment option .
3. Use the up/down and left/right navigation buttons  to align the thermal and visible images.
4. The alignment facility is only available when the camera is on and in live mode.

♦ **Note the visual image is moved during alignment.**

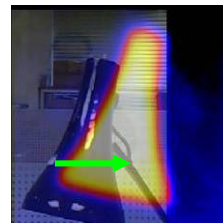
Examples of alignment.



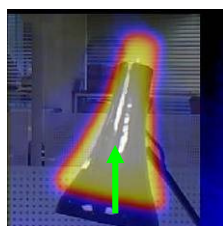
Fully Aligned



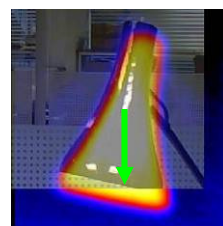
Align left



Align right












Align up

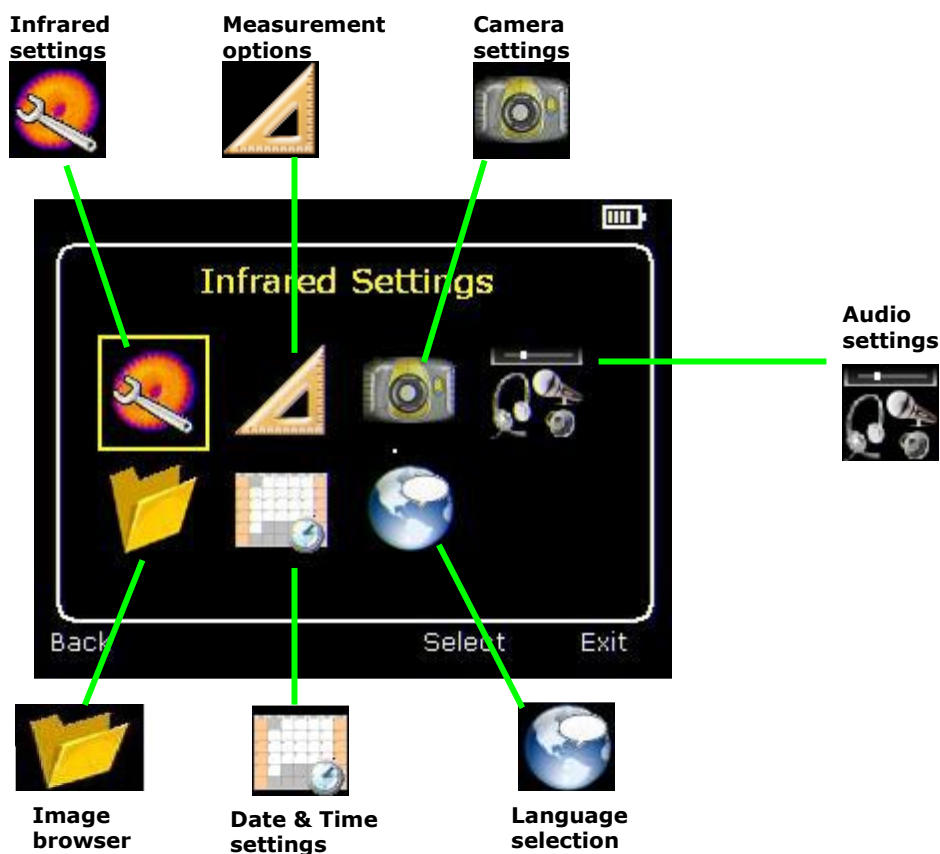
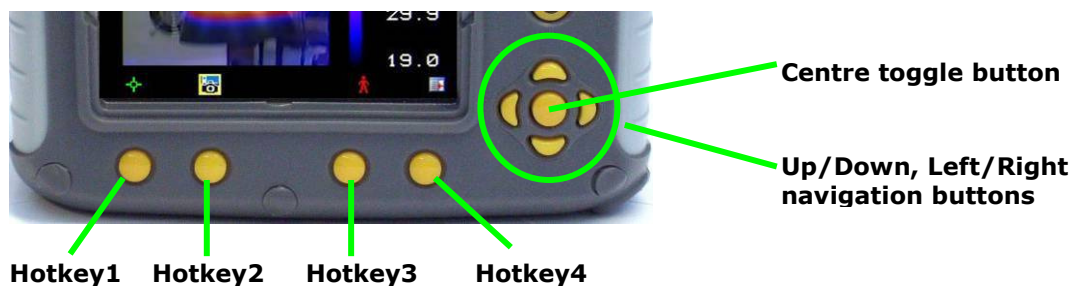


Align down

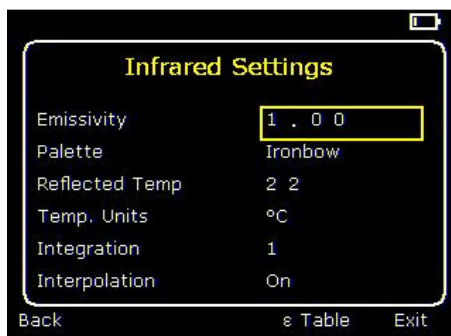
5. Four pre-programmed alignment distances are included. These are at 0.5m, 1m, 2m and 4m ranges. With the alignment option selected by HK1, pressing the toggle button once aligns at 2 metres. Pressing the toggle button again allows you to cycle through to 4m, 0.5m and 1m. These values appear in feet if °F is selected.

5. Menu structure.

- a) Select the menu  by pressing Hotkey 4 .
- b) Navigate through the menu using the navigation buttons  and press Hotkey 3  to select the required option. The highlighted item will have a yellow box  around it.
- c) Use the up/down buttons  to move in the selected list and select the required item.
- d) Use the left/right buttons  to change values and options for the specific item.
- e) Press Hotkey 4  to exit or Hotkey 1  to go back to the previous menu.











5.1. Infrared settings

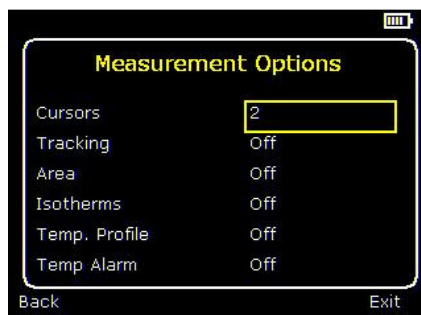


See frequently asked questions for more details of each item.

- ◆ Emissivity
 - Set emissivity value between 0.10 and 1.00 for measuring temperature.
 - Pressing Hotkey 3 (ε Table) gives a table of emissivity values of common materials from which a selection can be made.
- ◆ Palette
 - Display in image using different colour palettes.

1. Ironbow		5. High Contrast	
2. Rainbow		6. Rainbow 16	
3. Isotherm Style		7. Black Hot	
4. Hot Metal		8. White Hot	
- ◆ Reflected Temp
 - Usually set to the ambient temperature.
 - Applies only when emissivity of less than 1 is selected.
- ◆ Temp units
 - Choose between °C and °F.
- ◆ Integration
 - Chose an integration period from 1 (fast) to 9 (slow).
 - This determines the trade off between display speed and noise.
- ◆ Interpolation
 - Choose Off or On.
 - This shows or hides the thermal image pixelation.

5.2. Measurement options



This menu enables the selection of options for temperature measurements. The symbols shown below indicate the icons shown for Hotkey 1 when the various options are selected. See frequently asked questions for more details of each item.

- ◆ Cursors



Choose between one or two cursors. When two cursors are chosen, the temperatures at both cursors and the temperature difference between them will be displayed. When one of the cursors is selected by Hotkey 1, it can be moved around on the display by the navigation buttons.

- ◆ Tracking



Select "High", "Low", or "High & Low" in order to track and measure the hottest point, the coldest point, or both hottest and coldest points in the image.

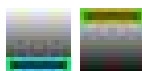
- ◆ Area



If this option is turned on, the highest, lowest, and average temperatures within the designated area will be displayed. Three different area size boxes can be selected via Hotkey 1.

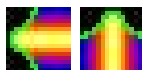
Note that the above three items are mutually exclusive, i.e. when one is turned on the other two are disabled.

- ◆ Isotherms



Select "High", "Low", or "High & Low" in order to highlight areas of the scene with temperatures within one or two temperature bands. The temperature bands are adjustable by means of Hotkey 1 and the navigation keys.

- ◆ Temp. profile



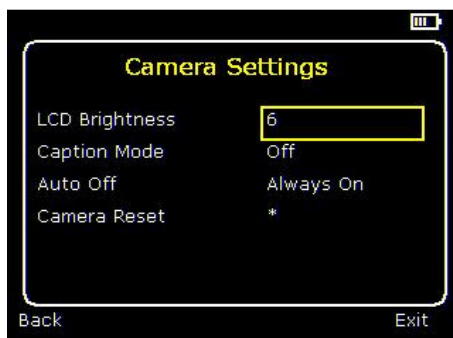
Select "Horizontal" or "Vertical" to enable a histogram of temperature values along a horizontal or vertical cross section to be displayed on the right hand side of the display. The position of the cross section is indicated by small arrows at the left and right or top and bottom of the image and can be adjusted by means of Hotkey 1 and the navigation buttons.

- ◆ Temp alarms




Select "High", "Low", or "High & Low". Visual and audio alarms will be triggered if either cursor or a point within the designated area is higher or lower than a set temperature. The high and low set temperatures may be adjusted by means of Hotkey 1 and the navigation buttons.

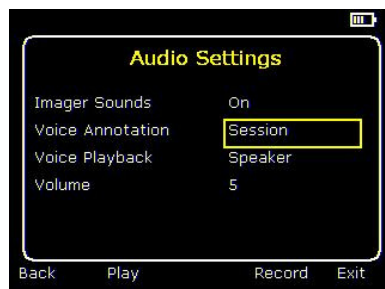
5.3. Camera settings



See frequently asked questions for more details.

- ◆ LCD brightness
Select from 1 (low) to 9 (high) to control the screen brightness to save battery power.
- ◆ Caption mode
Select "On" to enable the addition of a text caption when saving an image. Options will then be displayed when saving an image, to be selected by means of Hotkey 2 and hotkey 3.
- ◆ Auto off
Select "5 Mins", "10 Mins", "20 Mins" to allow the camera to switch itself off after a defined period of inactivity in order to save power. There is also an "Always On" option.
- ◆ Camera reset
Select with Hotkey 3  to restore the factory settings.

5.4. Audio settings

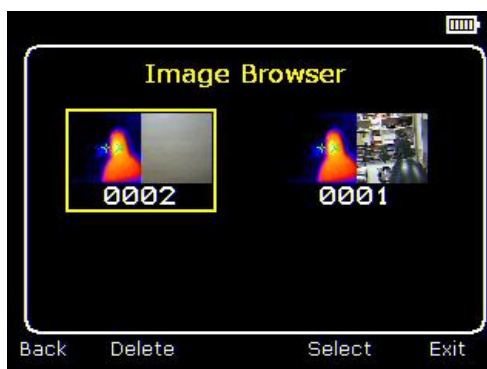


See frequently asked questions for more details of each item.

- ◆ Imager sounds
Select "Off" to mute all audible outputs.
- ◆ Voice annotation
Select "Session" to add a voice message at the start of a set of images (A session ends when the imager is switched off).
Select "Individual" to add a voice message to each saved image.
Select "Combined" to add a common voice message at the start of a set of images and add additional comments for each image.
- ◆ Voice playback
Select "speaker" or "headset" for the desired method of audible outputs.
- ◆ Volume
Select the volume of the audible outputs from 1 to 9.

If session is selected the voice message is recorded in the audio settings by pressing Hotkey 3. Recording is stopped by pressing Hotkey 3 again. Hotkey 2 can be used to play back the recorded message. Hotkey 3 can be used to re-record if necessary.

5.5. Image browser



The saved images are shown on the screen with the most recently saved image first.

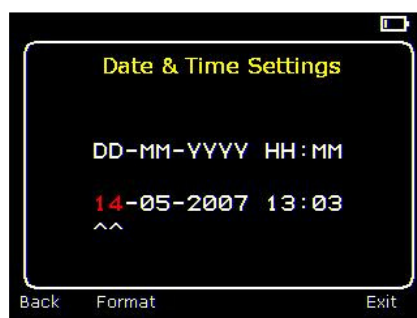
Select the desired image by means of the navigation keys.


To display the selected image press Hotkey 3.

To delete the selected image press Hotkey 2, to confirm deletion press Hotkey 3.

When a stored image is displayed, press Hotkey 3 to return to live imaging.

5.6. Date & Time settings

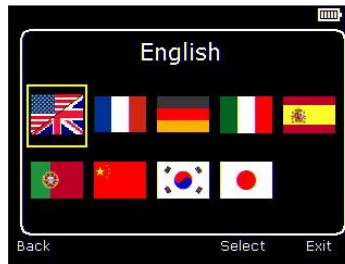



a) Use the left/right buttons  to navigate in this menu, the item that can be changed is highlighted in red. In the picture above the day (DD) 14 is highlighted.

b) Use the up/down buttons  to change the value.

c) The date formats can be changed by pressing Hotkey 2 to cycle through DD-MM-YYYY, MM-DD-YYYY and YYYY-MM-DD options. Pressing Hotkey 4 will select the option on the display.

5.7. Language selection



When the language is highlighted (shown by a yellow box around it) press Hotkey 3  to select.



French



German



Italian



Spanish



Portuguese



Chinese



Korean











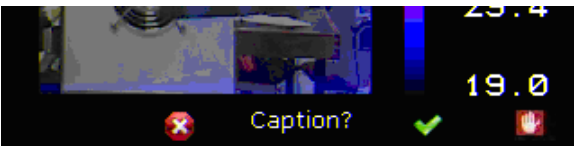



Japanese

6. Adding captions when saving images

6.1. Voice message

When saving an image with Individual Voice Annotation turned on, there is the option of saving a voice message with each image. The screen shots below describe the procedure:

 <p>a) Do you wish to attach a voice message to this saved image? Hotkey 2 for no . Hotkey 3 for yes .</p>	 <p>b) Start voice recording?  Hotkey 3 for yes.</p>
 <p>c) Stop Recording Hotkey 3  to stop.</p>	 <p>d) Option to Re-record the voice message? Hotkey 2 for Yes  Hotkey 3 for No </p>
 <p>e) If caption mode is selected this option will now be offered to save a text caption.(see 6.2)</p>	 <p>f) Image with voice message is being saved.</p>

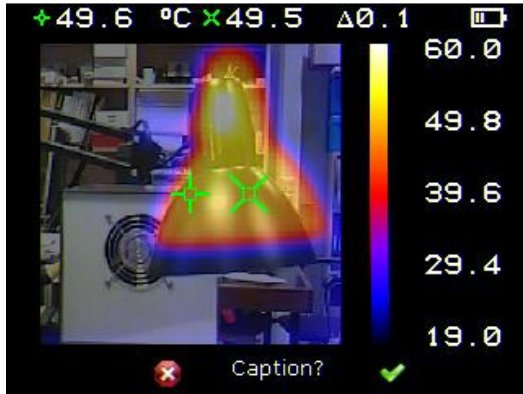
Playback



The voice recording can be played back when viewing saved images in the browser.

Note: *The abort icon  on Hotkey4. Pressing Hotkey 4 at any stage aborts the saving process.*

6.2. Text captions

When saving an image with Caption Mode turned on, there is the option of attaching a text caption to each image. The screen shots below describe the procedure:




a) Do you wish to attach a text caption message to this image?
Hotkey 2 for No  Hotkey 3 for Yes 




b) Start Caption Entry



c) Example of a Caption.

1. Use the up/down arrow buttons  to cycle through letters and numbers until the one required appears. The available symbols are:
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789

2. Use the left/right arrow buttons  to move to the next space and repeat the above step until the caption is completed.

3. Press Hotkey 2  to clear the whole message.

4. Press Hotkey 4  to exit and save the image and caption.

- ◆ **Captions cannot be viewed with the saved images in the browser due to display constraints. The captions can be viewed using the PC software.**

Appendix

A1. Emissivity tables



Emissivity look up tables in Camera

1.00 0.98 = Human skin 0.95 0.94 = Paint, oil 0.93 = Brick red 0.92 = Concrete 0.90 = Planed Oak Wood 0.85 0.80 0.79 = Oxidized steel 0.78 = Oxidized Copper 0.76 = Sand 0.75 0.70 = Red Rust 0.67 = Water 0.65 0.64 = Oxidized Cast Iron	
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General Emissivity Look up tables

0.98 = Carbon filed surface 0.98 = Frost crystals 0.98 = Human skin 0.97 = Slate 0.96 = Water distilled 0.96 = Ice smooth 0.95 = Soil saturated with water 0.95 = Carbon candle soot 0.94 = Glass polished plate 0.94 = Paint, oil 0.93 = Brick red 0.93 = Paper white bond 0.92 = Concrete 0.92 = Soil dry 0.91 = Plaster rough coat 0.90 = Wood planed oak 0.90 = Glazed earthenware 0.89 = Snow, granular 0.88 = Glazed Silica 0.87 = Cuprous Oxide at 38°C 0.86 = Emery Corundum 0.85 = Snow 0.85 = Stainless oxidized at 800°C 0.84 = Oxidised Iron at 500°C 0.83 = Cuprous Oxide at 260°C 0.82 = Snow, fine particles 0.81 = Brass, unoxidised 0.80 = Glass, convex D	0.79 = Steel oxidised 0.78 = Copper heavily oxidised 0.77 = Cotton cloth 0.76 = Sand 0.75 = Unglazed silica 0.74 = Oxidised iron at 100°C 0.73 = Coating No. C20A 0.72 = Basalt 0.71 = Graphitised carbon at 500°C 0.70 = Red Rust 0.69 = Iron sheet heavily rusted 0.67 = Water 0.66 = Black Loam 0.65 = White cement 0.64 = Iron cast oxidised 0.63 = Lead oxidised at 1100°F 0.62 = Zirconia on inconel 0.61 = Cu-Zn, brass oxidised 0.58 = Inconel sheet at 760°C 0.56 = Smooth white marble 0.55 = Al anodised chromic acid 0.21 = Iron cast polished 0.20 = Brass rubbed 80 grit emery 0.16 = Stainless steel 18-8 buffed 0.09 = Aluminium as received 0.07 = Steel polished 0.05 = Aluminium polished sheet 0.05 = Copper polished 0.03 = Brass highly polished
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A2. Full icon list.

Hotkey one	
 Cursor one.	 Isotherm low.
 Cursor two.	 Profile horizontal.
 Alignment.	 Profile vertical.
 Tracking.	 Alarm high.
 Area.	 Alarm low.
 Isotherm high.	 Playback.
Hotkey two	
 Camera off.	 Light off.
 Camera on.	 Light on.
 Auto temperature range.	 No.
 Manual temperature range.	 Yes.
Hotkey three	
 Live.	 No.
 Freeze.	 Yes.
Hotkey Four	
 Menus.	 Abort.
Other Icons	
 Level Down	 Span Out
 Level Up	 Span In
 Level Maximum	 Span Maximum
 Level Minimum	 Span Minimum
 No Memory Card	

A3. Technical specification

Performance

Temperature range:	-10°C to +350°C
Field of view (FOV):	20°x 20°
Spectral Response:	8µm to 12 µm
Sensitivity:	≤0.3°C @ 30°C
Detector:	47 x 47 pixel array
Frame rate:	8Hz
Focus Range:	0.5m to infinity

Image storage

Number:	Up to 1000 images on SD card supplied
Medium:	Micro SD Card

Display

3½" colour LCD with LED Backlight. 8 colour palettes. Mixed thermal and visible images.

Laser pointer

A built in Class 2 laser is supplied to highlight the centre of the thermal image. (Aligned at 2 metres)

Beam Divergence	<0.2mrad
Maximum Output	<1mW

Measurement

Temperature range:	-10°C to +350°C
Radiometry:	Two moveable temperature measurement cursors Temperature difference measurement
Emissivity Correction:	User selectable 0.10 to 1.00 in steps of 0.01 with reflected ambient temperature compensation
Accuracy:	The greater of ±2°C or ±2% of reading in °C

Imager power supply

Battery:	Lithium-ion field rechargeable.
Operation time:	Up to 6 hours continuous operation
AC operation:	AC adaptor supplied

Mechanical

Housing:	Impact Resistant Plastic with over moulded soft plastic and detachable handle
Dimensions:	130mmx95mmx90mm (excluding handle)
Weight:	0.70kg
Mounting:	Handheld & tripod mounting 1/4" BSW

Settings and controls

- On/Off soft power control
- User selectable span control
- User selectable level control
- Auto adjust span and level
- Laser trigger switch
- Readout in °C or °F
- User selectable image integration
- User selectable emissivity setting
- User selectable reflected temperature
- Two moveable temperature measurement cursors
- Area analysis
- X-Y profiles
- Isotherms
- Text annotation
- Voice annotation
- Image capture, time and date
- Visual/audio alarm high and low

Optional accessories

- 12V car charger
- Light shade.

Features

- Real-time image and temperature measurement display
- Visible/thermal/mixed image fusion (100%, 75%, 50%, 25%, 0%)
- Simple operation
- Multiple temperature measurement
- Image browser
- Battery Charge indicator
- Lightweight
- Laser Pointer
- Auto hot/cold seeker
- Languages

IRI 2010 Includes

IR Camera, Handle, Battery, AC Adaptor, Quick start guide, Carrying Case, CD with user manual and software (Analysis and report writer)

Computer requirements (for PC software)

PC: IBM compatible PC with a minimum of: 300MHz processor, MS Windows XP 128MB RAM (see Irisys website for current list of operating systems supported).

16 bit colour

graphics with 1024x768 capability

Environment

Temp. operating range: -5°C to +45°C

Humidity: 10% to 90% non condensing

Temp. storage range: -20°C to +60°C

CE Mark (Europe)

IP rating: IP54

Operating temp for stated accuracy: 23 °C

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