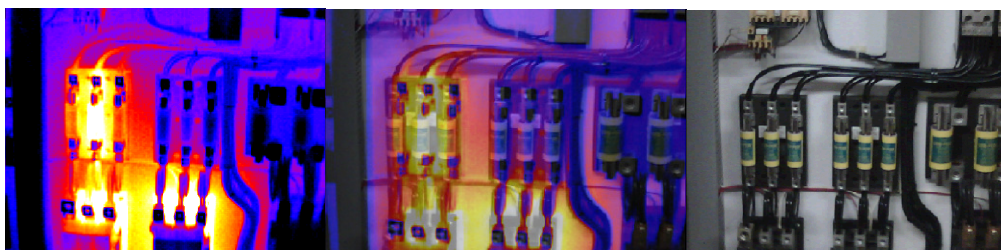


IR16 DS

Dual View Thermal Imaging Camera

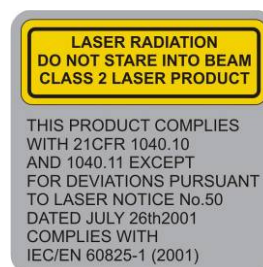
User Manual



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 execution of procedures other than those specified in this document may result in hazardous laser radiation exposure.



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1. Contents of the case.



- ◆ The case.
- ◆ Camera.
- ◆ USB PSU and International adaptors.
- ◆ CD – User manual and software.
- ◆ USB cable (camera to PC).
- ◆ Quick start guide.

2. Main controls.

2.1. Back



2.2. Front



2.3. 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.

3. Getting started.

3.1. Switching the camera on/off



Press the on/off button and hold it for two seconds to switch the camera on.

Press and hold for three seconds to switch the camera off.

After switching on, it will take up to 30 seconds for the infrared image to appear. The image will periodically freeze for one or two seconds while the camera re-calibrates itself. This is normal operation, and the time between these calibrations will increase as the operating temperature of the camera stabilizes.

3.2. Charging the battery



The camera's battery is charged via the USB port. A fully charged battery will last approximately 5 hours. A green LED indicates charging which turns to red when the battery is charged.

Note: When the camera is connected to a PC via the USB cable it switches off and the PC sees the SD card as an external memory.

3.3. Changing the battery



Open the lock on the battery cover and remove the cover



Remove battery.

Insert new battery, ensuring the terminal pads are towards the front of the camera.

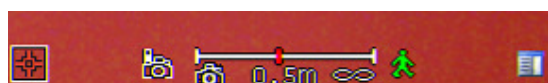
Replace and lock the cover

3.4. Focussing

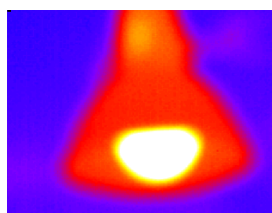


Gently rotate the lens clockwise and anti-clockwise to focus the image.

♦ 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.

3.5. Saving an image



Save image button

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).

3.6. Temperature measurement

One of the key functions of a thermal imager is obtaining temperature information about the scene. The IR16 DS has a variety of measurement options to provide maximum flexibility.

The display of temperature values and related items depends on the combination of the measurement and display options selected. Temperature readings are displayed at the top of the display. In the default mode, a single reading in °C indicates the temperature at the centre point of the cursor. The other reading at the top of the display is the reflected temperature setting(see section 5.1.). The temperature range within the scene is indicated by a scale on the right hand side of the display.

4. Hotkey buttons



Hotkey1 Hotkey2 Hotkey3 Hotkey4

Pressing any of the hotkey buttons reveals the icons which indicate the functions of these buttons. A 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. With the default settings, the key functions are as follows:

Hotkey 1 toggles between Align Image and Cursor.

Hotkey 2 cycles through Visible on/off, Auto/Manual, and Light on/off.

Hotkey 3 toggles between Live and Freeze.

Hotkey 4 opens the menu.

See appendix A2 for a full list of Hotkey button functions.

4.1. Moving the cursor

- 4.1.1. Press Hotkey 1  to toggle to the Cursor icon . The emissivity value will be displayed at the top of the screen.
- 4.1.2. Use the left/right and up/down navigation buttons to move the cursor to the desired position.

4.2. Image alignment

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

4.2.1. Press Hotkey 1  to toggle to the alignment icon .

4.2.2. Use the up/down and left/right navigation buttons  to align the thermal and visible images.

Note *The visible image is moved during alignment.*

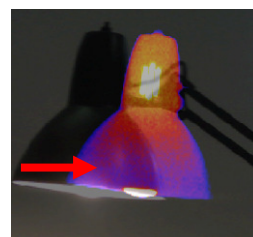
Examples of alignment.



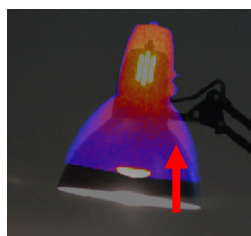
Fully Aligned



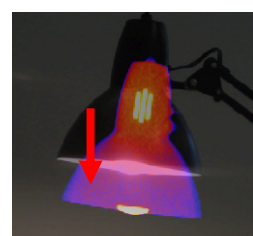
Align left



Align right



Align up



Align down

Four pre-programmed alignment distances are included. These are at 0.5m, 1m, 2m and 4m ranges. With the alignment option selected by Hotkey1, pressing the toggle button once aligns at 2 metres. Pressing the toggle button repeatedly cycles through to 4m, 0.5m, 1m, and 2m.

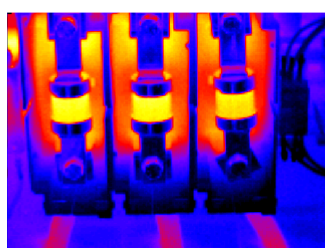
Note: *These values appear in feet if °F is selected.*

4.3. Turning the visible image off and on

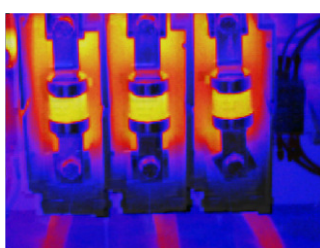
- 4.3.1. Press Hotkey 2  to toggle to the Visible On icon .
- 4.3.2. Press the centre toggle button  to toggle to Visible Off .
- 4.3.3. Press the centre toggle button  again to toggle to Visible On .

4.4. Thermal and visible image blending

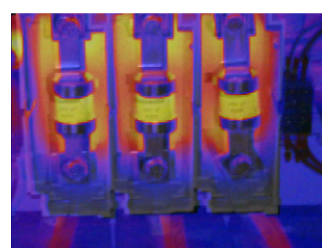
The camera can show a thermal image, a visible image of the scene, a mixed blend of both visible and thermal, a thermal picture in the visible picture (PiP) and a blended version of the thermal image in the PiP.



100% thermal



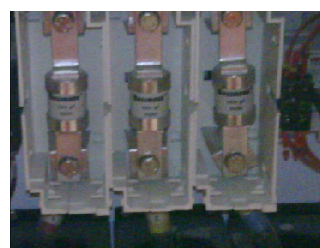
25% visible 75% thermal



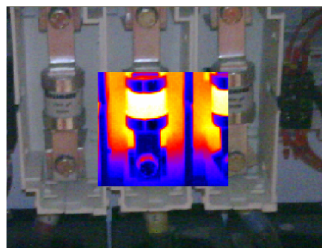
50% visible 50% thermal



75% visible 25% thermal



100% visible



Picture in Picture

- 4.4.1. Press Hotkey 2  until the Visible On/Off icon appears  .
- 4.4.2. If off  press the centre toggle button  to toggle to Visible On .
- 4.4.3. Use the up/down navigation buttons to merge (blend) the visible and thermal images. Repeatedly pressing the up button cycles through the options 0%, 25%, 50%, 75%, 100%, PiP.
- 4.4.4. In the PiP mode the thermal image can also be blended using the left/right navigation buttons.

4.5. Manual control

The thermal image gain and offset are normally controlled automatically in order to give a meaningful display on the screen. However, Hotkey 2 offers the option of switching to manual control if desired:

- 4.5.1. Press Hotkey 2  to toggle to the Auto icon .
- 4.5.2. Press the centre toggle button  to toggle to Manual  or Persistent manual.  If Persistent manual is selected, then the manual settings are stored. When the camera is switched on again, and Manual selected, the stored span and level settings are used.
- 4.5.3. Use the left/right navigation buttons to change the span of the displayed temperature range.
- 4.5.4. Use the up/down navigation buttons to change the level of the displayed temperature range.
- 4.5.5. Press the centre toggle button again to revert to Auto.

4.6. Light

There is a visible illuminator for use in poor ambient lighting:

- 4.6.1. Press Hotkey 2  to toggle to the Light Off icon .
- 4.6.2. Press the centre toggle button  to toggle to Light On .
- 4.6.3. Press the centre toggle button again to turn the light off.

It is advisable to turn the light on only when necessary in order to conserve battery power.

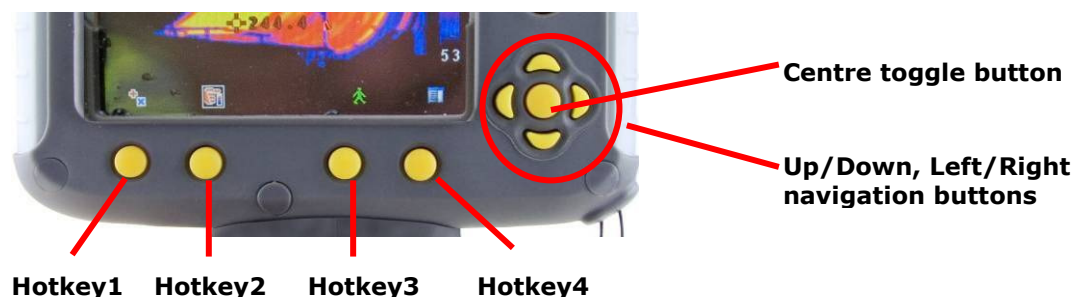
4.7. Image freeze

Pressing Hotkey 3 freezes the both the infrared and the visible image. Pressing again reverts to a live image. The image save facility works with either a live or a frozen image, but once a frozen image has been saved the camera will revert to a live image.

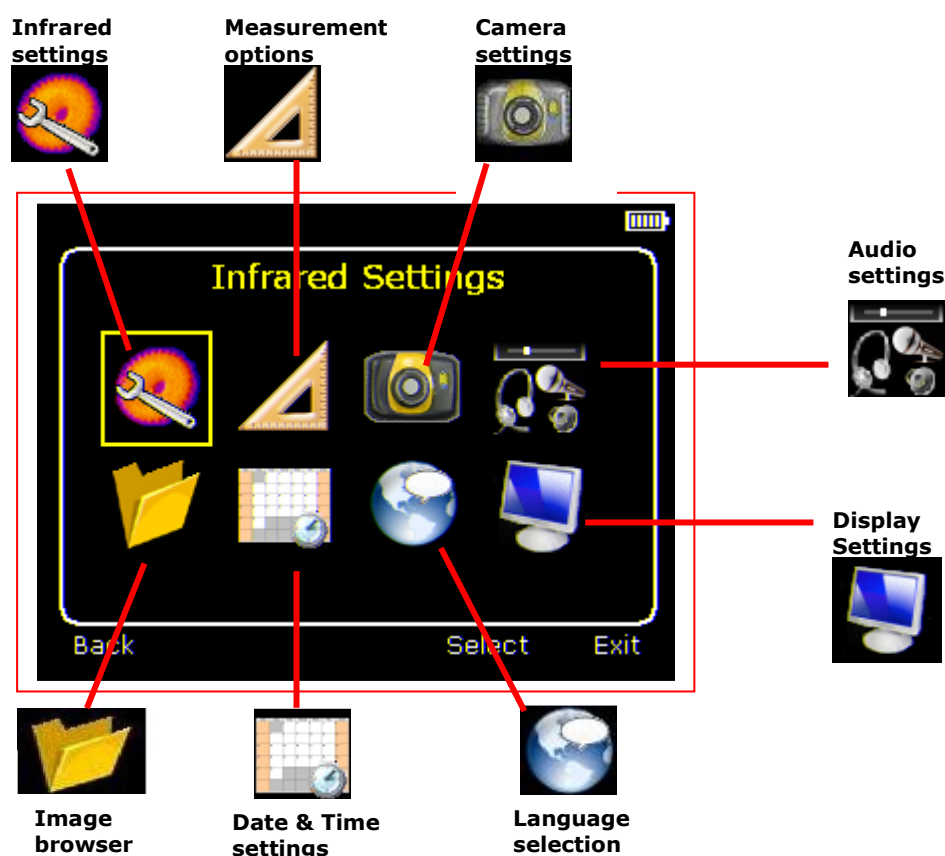
4.8. Menu

Hotkey 4 opens the menus. See section 5 for details of the menu structure.

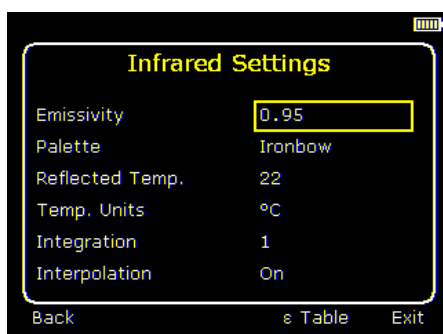
5. Menu structure.



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



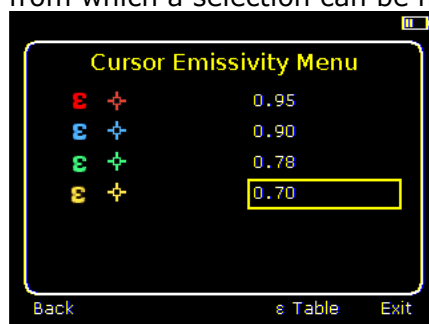
5.1. Infrared settings



◆ Emissivity

Set the emissivity value between 0.10 and 1.00 using the left/right navigation buttons.

Pressing Hotkey 3 (ε Table) gives a table of emissivity values of common materials from which a selection can be made.



Note that if more than one cursor is selected, individual emissivity's can be assigned to each cursor.

◆ Palette

Display the 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

Set this to the ambient temperature to correct for reflected radiation when an emissivity of less than 1 is selected.

◆ Temp units

Choose between °C and °F.

◆ Integration

Choose an integration period from 1 (fast) to 4 (slow).

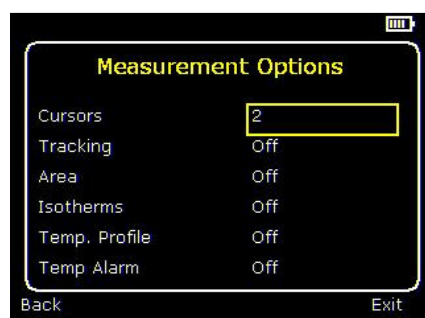
A longer integration time will reduce the noise in the image, but will slow down the response to moving images.

◆ 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.

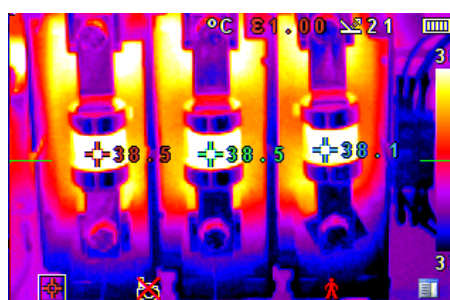
◆ Cursors

. Choose from one to four cursors. When more than one cursor is selected, the temperatures of all the cursors are displayed in a table or are tagged next to the cursors (see section 5.8). When two cursors are chosen, the temperature difference between them is also displayed. When one of the cursors is selected by Hotkey 1, it can be moved around on the display by the navigation buttons.

If two or more cursors are selected then individual emissivity values can be assigned to each cursor. When an emissivity less than 1.00 is selected for a cursor, then that cursor flashes on the screen.



Tabular temperature values



Tagged temperature values

◆ 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.

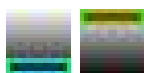
◆ Area



If this option is turned on, three different rectangular areas can be selected via Hotkey 1. The maximum, minimum, and average temperatures within the designated area will be displayed in the top left hand corner of the display.

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

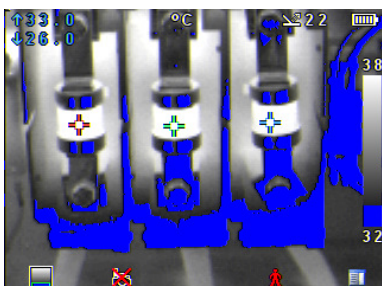
◆ Isotherms



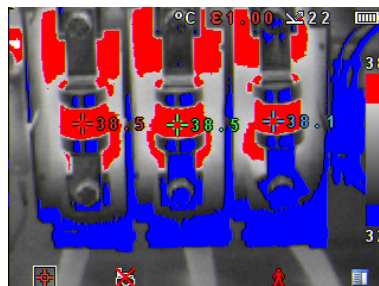
Select "High", "Low", or "High & Low" in order to highlight areas of the scene with temperatures within a high (red) or low (blue) temperature band. The temperature bands are adjustable by means of Hotkey 1 and the navigation keys.



Red isotherm

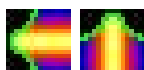


Blue isotherm

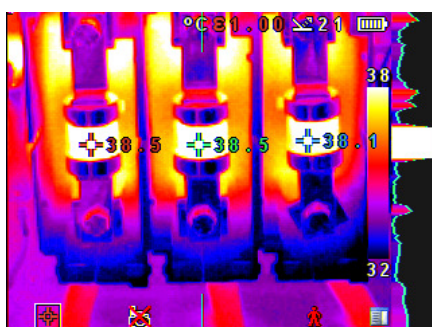


Combined isotherms

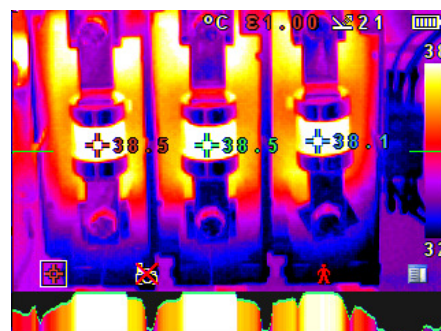
◆ Temp. profile



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 or the bottom 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.



Vertical Profile



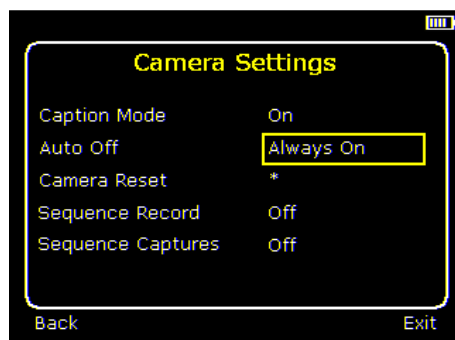
Horizontal profile

◆ 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



- ◆ 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.
- ◆ Sequence Record
Select this to save a set of images of the scene. The images are saved to the micro SD card and can be saved at intervals of 5 Sec, 10 Sec, 20 Sec, 30 Sec, 1 Min, 2 Min, 5 Min, 10 Min, 20 Min, 30 Min, 1 Hour and on Alarm. The alarm setting works in conjunction with the high low alarm function. When the temperature in the scene exceeds the user defined high alarm threshold temperature an image is saved. Equally when the temperature in the scene goes below the user defined low alarm threshold temperature an image is saved.
- ◆ Sequence Capture
If sequence record is selected, then this option is switched on and allows the user to define the number of images to be saved. Choices available are 10, 50, 100, 500 and 1000 images.

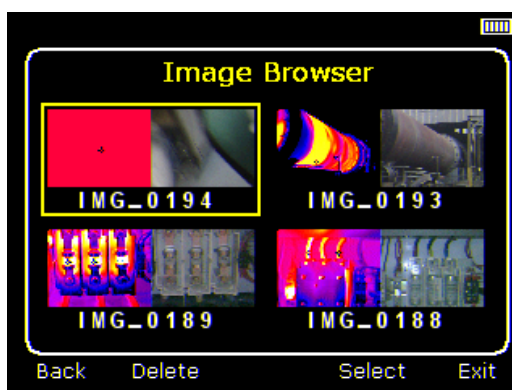
5.4. Audio settings



- ◆ Imager sounds
Select "Off" to mute all audible outputs.
- ◆ Voice annotation
Select "Individual" to add a voice message to each saved image.
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 "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" or "Combined" is selected the voice message is recorded before exiting the audio settings menu 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.

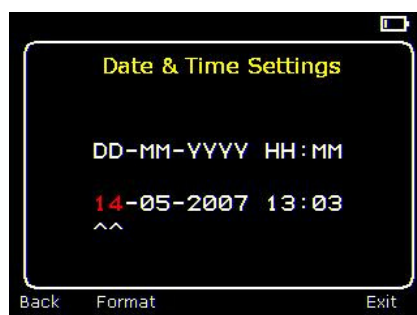
Select the desired image by means of the navigation keys.

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



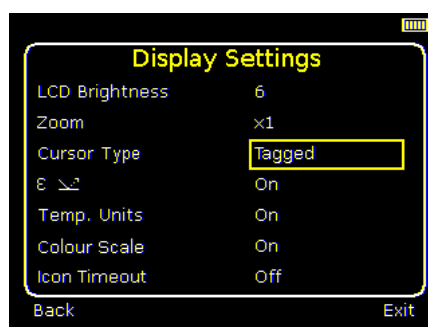
- Use the left/right buttons  to navigate in this menu, the item that can be changed is highlighted in red. In the picture above the day (DD) 14 is highlighted.
- Use the up/down buttons  to change the value.
- The date formats can be changed by pressing Hotkey 2 to cycle through DD-MM-YYYY, MM-DD-YYYY and YYYY-MM-DD options. Pressing Hotkey 4 will select the option on the display.

5.7. Language selection



To select a language move to the relevant flag. When the language is highlighted press Hotkey 3 to select.

5.8. Display Settings

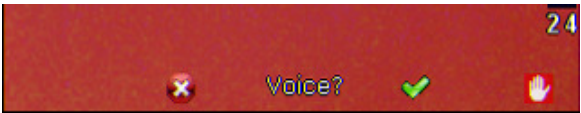
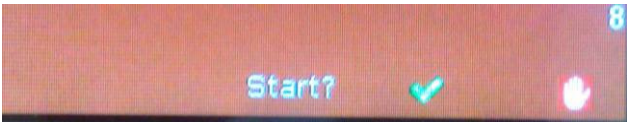
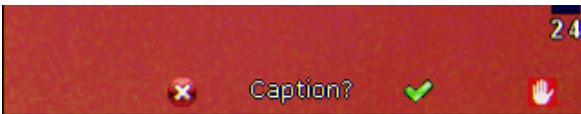


- ◆ LCD brightness
Select from 1 (low) to 9 (high) to control the screen brightness to save battery power.
- ◆ Zoom
Allows the user to digitally zoom into the image. Options are X2 and X4 zoom.
- ◆ Cursor Type
Select how the cursor temperature values are to be displayed on the screen. The choice is between a tabular display or a tag next to the cursor.
- ◆ ϵ 
Choose whether or not to display the reflected temperature. Only applicable when emissivity is selected to be less than 1.
- ◆ Temp. Units.
Choose whether or not the temperature units ($^{\circ}\text{C}$ or $^{\circ}\text{F}$) are displayed on the screen.
- ◆ Colour Scale
Chose whether or not the colour scale is to be displayed.
- ◆ Icon Timeout
The Icons above the 4 hotkeys can be displayed either continuously or for 10 seconds after a hotkey is pressed.

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:

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

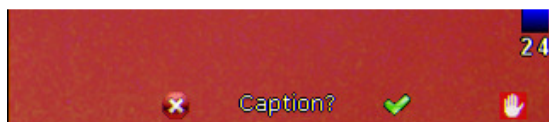
Playback

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

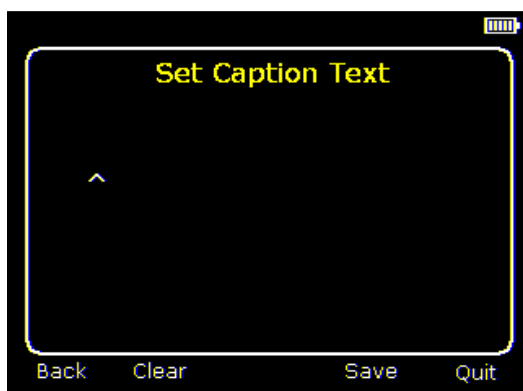
Note: **The abort Icon  on Hotkey4.**
Pressing Hotkey 4 at any stage aborts the saving process.

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 3 to 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 = Red brick	
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	

General Emissivity Look up tables

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

A2. Full icon list.

Hotkey one	
 Cursor one.	 Isotherm high
 Cursor two.	 Isotherm low.
 Cursor three	 Profile horizontal.
 Cursor Four	 Profile vertical.
 Alignment.	 Alarm high.
 Tracking.	 Alarm low.
 Area.	.
Hotkey two	
 Camera off.	 Playback
 Camera on.	 Light off.
 Auto temperature range.	 Light on.
 Manual temperature range.	 No.
 Manual persistent	 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

Field of View:	20° X 15°
Focus:	Manual
Minimum Focus:	30cm
Spectral response:	8µm to 14µm
Thermal Sensitivity:	NETD ≤80mK (0.08°C) @ 23°C ambient and 30°C scene temperature.
Detector:	160×120 element uncooled microbolometer

Measurement

Temperature range: -10°C to +250°C

Radiometry: Four moveable temperature measurement cursors giving automatic temperature difference measurement and auto locking onto hottest and coldest points

Emissivity Correction: User selectable 0.1 to 1.0 in steps of 0.01 with reflected ambient temperature compensation. The four measurement cursors can have individual emissivity values assigned to them.

Accuracy: The greater of ±2°C or ±2% of reading in °C for the operating temperature range of -15°C to +45°C.

Display

3 ½" colour LCD with LED backlight with 8 colour palettes

Thermal images or visible images or mixed thermal and visible images including picture in picture.

Electronic zoom (IR and visible) x2; x4; Image integration. Up to x4

Image Storage

Over 1000 images on supplied micro SD card

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

Imager power Supply

Battery: Rechargeable Lithium-Ion field replaceable battery with up to 5 hours continuous operation; charge through the USB port

AC Operation: USB AC power adaptor supplied

Mechanical

Housing: Impact resistant plastic with over moulded soft plastic.

Dimensions: 130mm X 95mm X 220mm

Weight: 0.8Kg

Mounting: Handheld & tripod mounting 1/4" BSW.

Settings and Controls

Auto/user selectable span and level control.

- Readout in °C or °F
- Four moveable temperature measurement cursors with individual emissivity values and temperature difference between two points.
- User selectable emissivity setting for each measurement cursor.
- Auto hot and cold seeking or hot only or cold only.

- User selectable reflected temperature compensation.
- Area analysis – 3 options.
- X-Y thermal profiles.
- Isotherms with temperature difference.
- Voice and or text annotation.
- Image capture; time and date.
- Visual/audio alarm for above/below set temperature values.
- Palette selection.
- User selectable integration.
- Image fusion control: 0 to 100% adjustment on whole image and on picture in picture.
- Electronic zoom, x2 , x4.
- Multi-language options.
- Battery power indicator.
- Image browser showing thumbnails and voice annotation playback.
- Time or Alarm sequence recording.

Interfaces

Data transfer direct from micro SD card or over USB.

Jack socket for headphones

Built in microphone for voice annotation.

Sequencing of images (IR only) to the SD card

Optional Accessories

Light shade, battery, desk top charger, car charger, hard carry case

Computer Requirements (for PC software)

IBM Compatible PC with one of the following operating systems.

Windows XP, VISTA, or Windows 7.

See Irisys website for currently supported operating systems.

Environment

Temperature

Operating range -15°C to +50°C;

Storage range: -20°C to +70°C

Humidity: 10% to 90% non condensing

IP rating: IP54

CE mark (Europe)

Vibration: MIL-PRF-288000F
Class 2 section 4.5.5.3.1

Shock: MIL-PRF-288000F
Class 2 section 4.5.5.4.1

Drop test: MIL-PRF-288000F
Class 2 section 4.5.5.4.2;
2 metres drop test.

IR 16DS Includes

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

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