

OWLIFT User's Guide

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1 Overview

This document describes usage of the compact thermal camera OWLIFT.

1.1 Hardware Requirements

OWLIFT Type-F



* USB cable

USB cables are not supplied with OWLIFT. Please prepare them by yourself.

- For connecting to PC: A micro-USB host cable (A male to micro-B male). Please see the figure “For connecting to PC”.
- For connecting to Android: A micro-USB host cable (Type-C male to micro-B male).



For connecting to PC

* PC with Windows Windows 10 64bit

- One USB2.0 port is required.
- Memory recommendation: 200Mbytes free
- Disk recommendation: 50Mbytes free

1.2 Software Requirements

* For connecting to PC

- OWLIFTCap

A viewer for the thermal camera. Please download from our website.

- * For connecting to Android (OWLIFT Type-F is not supported)
 - Android application “OWLIFT”
A viewer running on Android. Please download from Google Play.

1.3 OWLIFT Specifications

	Type-F
Interface	USB2.0 High Speed USB Video Class 1.0
Supported Platforms	Windows, Linux (includes Raspberry Pi), Android
Resolution	160x120 pixels * A frame data includes 2 lines for Telemetry Data.
Framerate	8.6 fps
Object Temperature Range	-5 ... 430°C (The temperature output on the application has an error of greater one of $\pm 10^{\circ}\text{C}$ or 10%. *1)
Thermal Sensitivity (NETD)	0.05°C against a black body at 25°C
Resolution of obtaining temperature	0.1°C
Sensor Module	500-0771-01
Field of View	54-deg HFOV (57) 67.8-deg DFOV (71) (The values without Undistortion are shown in parentheses *2)
Operating Temperature	0~40°C

*1 The temperature output is not guaranteed accuracy.

Temperature values out of the above range may be displayed on the application

*2 The Undistortion is enabled by default for Type-F. Note that the housing may be reflected in images when the undistortion is disabled. See 2.10.3 for detail.

【Image resolution on screen and sensor's resolution】

The image resolution shown in OWLIFTCap is 3 times each of the height and width of the sensor's original resolution because the frame is magnified and anti-aliased.

	Sensor's original resolution	Image resolution in OWLIFTCap
Type-F, Undistortion:ON	152x114	480x360
Type-F, Undistortion:OFF	160x120	480x360

1.4 OWLIFT Specifications with protection window (GAT-05)

		Type-F
Object Temperature Range		The greater one of 20°C or air temperature ... 430°C (The temperature output on the application has an error of greater one of $\pm 16^{\circ}\text{C}$ or 14%. *1)
Thermal Sensitivity (NETD)		0.07°C against a black body at 25°C

*1 The temperature output is not guaranteed accuracy.

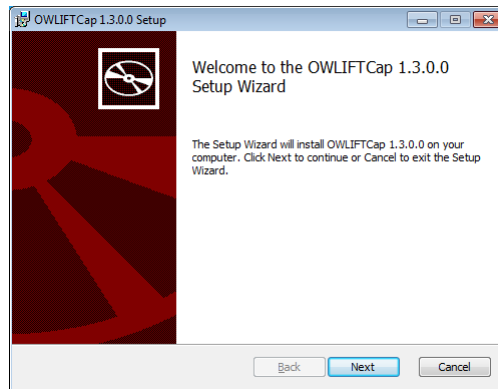
Temperature values out of the above range may be displayed on the application

2 Usage for Windows

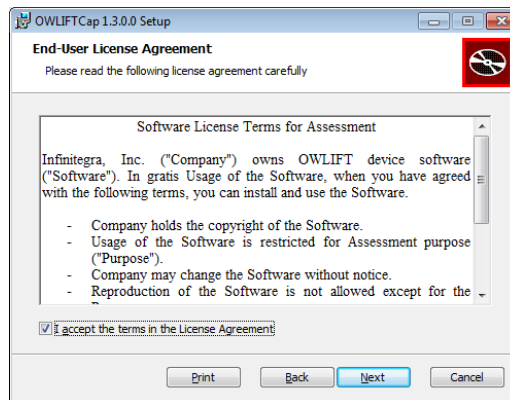
2.1 Installation

2.1.1 Installation

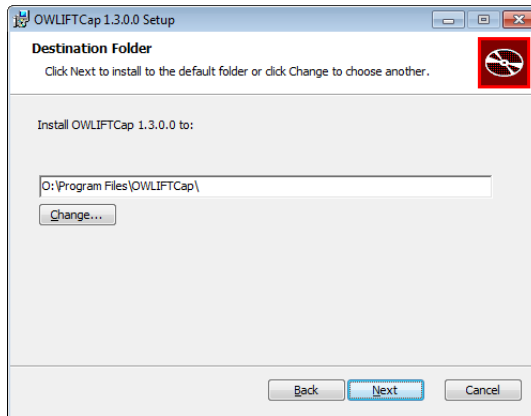
1. Run OWLIFTCap-Installer-#.#.#-x86.msi. “#.#.#” represents a version number.
2. The following dialog is displayed. Push [Next]. Notice that the version number “1.3.0.0” in the following image depends on the installer you downloaded.



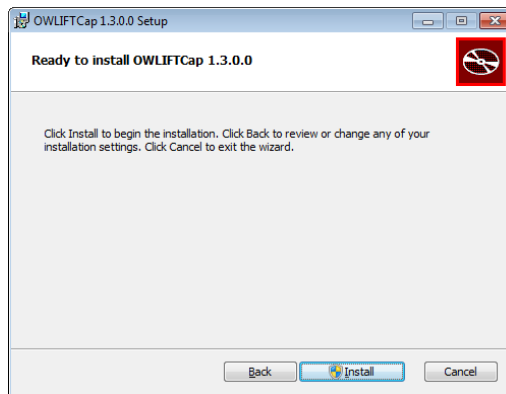
3. The end-user license agreement is displayed. If you agree, check [I accept the terms in the License Agreement] and push [Next].



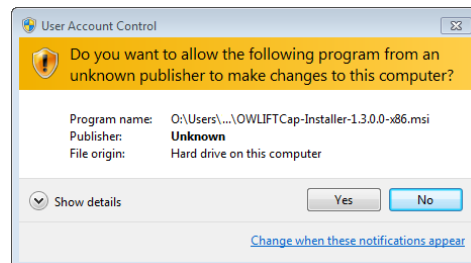
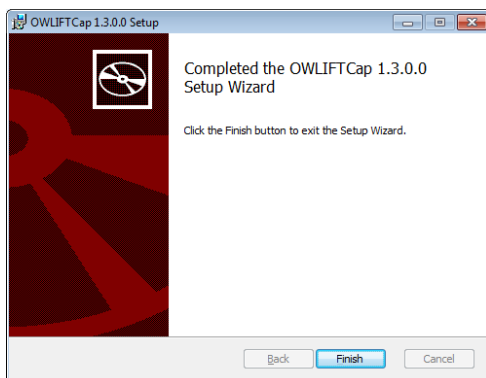
- To change the destination folder from the standard one, push [Change] and select a folder. Push [Next].



- Push [Install].



- If the dialog “User Account Control” is displayed, push [Yes]. After the installation completed, the following dialog is displayed. Push [Finish] to close the dialog.



2.1.2 Execution

To start OWLIFTCap, select [Infinitegra]→[OWLIFTCap] in the Start menu.

Previewing automatically starts when OWLIFT is connected.

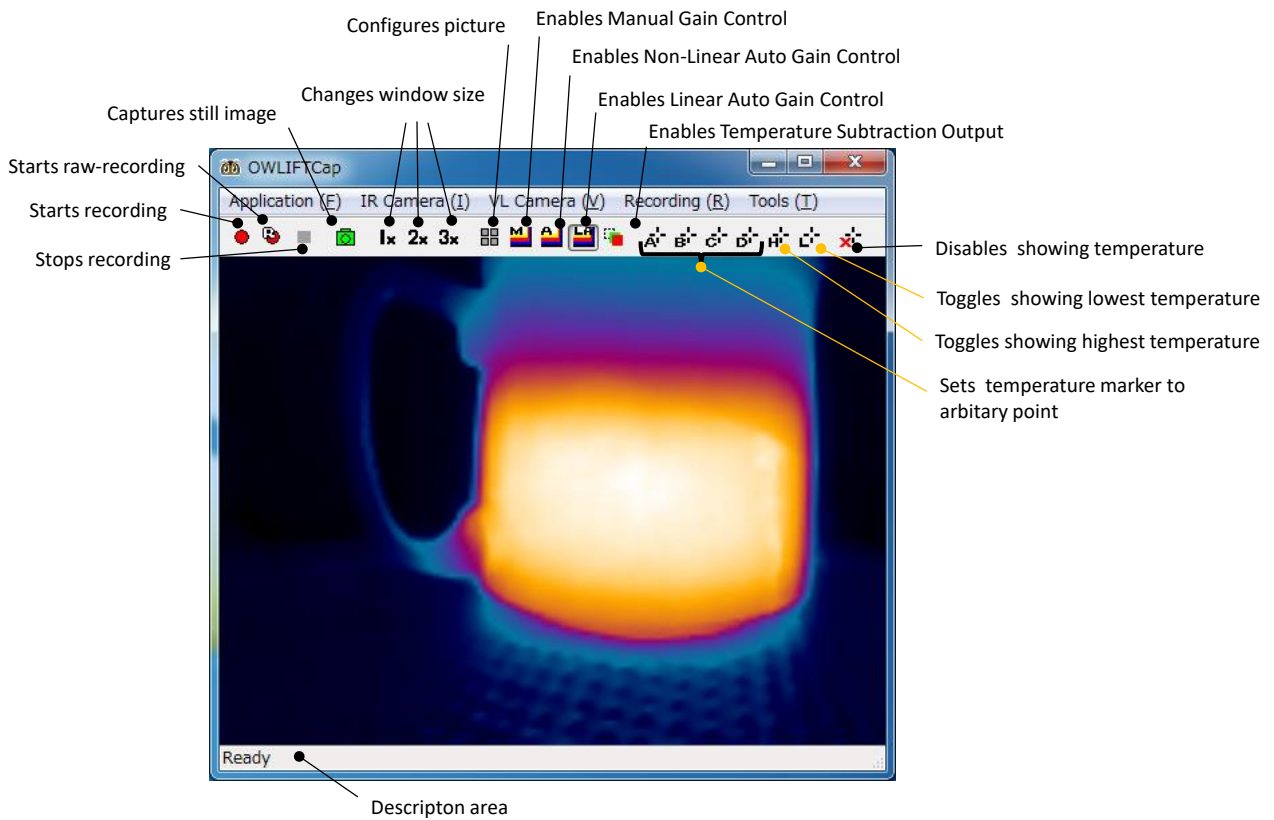
2.2 Overview of OWLIFTCap

2.2.1 Function list

OWLIFTCap has the following functions.

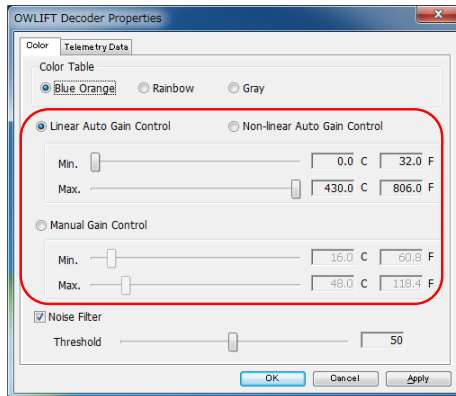
- * Previewing
 - Displays in full color and grayscale
 - Auto Gain Control (AGC) and Manual Gain Control
- * Recording video and capturing still image
 - Video ... Windows Media Video format
 - Still image ... JPEG format
- * Raw-recording
 - Original format (.OWI)
- * Dumping a snapshot of raw-data and temperature data
 - Text format
- * Outputting temperature
 - Arbitrary points
 - Highest and lowest temperature points
 - Unit conversion, emissivity adjustment
- * Fusion of infrared and visible images
 - Superimposition
 - Picture in picture
 - Side by side horizontally and vertically

2.2.2 Description of window



2.3.3 Auto Gain and Manual Gain Control

Select the menu [IR Camera]→[Configure image ...] and the following dialog is displayed. The area enclosed by a red box is the option of Auto Gain and Manual Gain Control.



* Linear Auto Gain Control

Linear Auto Gain Control assigns the color of left end in a color table to the lowest temperature and the color of right end in a color table to the highest temperature. A color of temperatures lower than “Min.” is same as the color of “Min.”. A color of temperatures higher than “Max.” is same as the color of “Max.”

* Non-linear Auto Gain Control

Non-linear Auto Gain Control is similar to Linear Auto Gain Control except that it assigns more colors to the temperature range changing more strongly. “Min.” and “Max.” work in the same way as Linear Auto Gain Control.

* Manual Gain Control

Manual Gain Control assigns the color of left end to the value of “Min.” and the color of right end to the value of “Max.”

Auto Gain Control assigns colors dynamically, so boundaries between different temperatures are displayed in higher contrast. Instead, the correspondence between colors and temperatures changes dynamically. Manual Gain Control assigns colors statically, so the correspondence between colors and temperatures is not changed dynamically. Instead, it must be configured by an interested temperature range in advance.



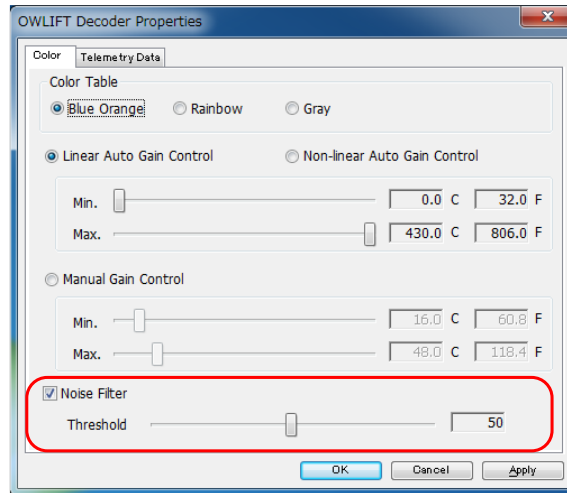
Manual Gain Control



Auto Gain Control

2.3.4 Noise Filter

Select the menu [IR Camera]→[Configure image ...] and the following dialog is displayed. The area enclosed by a red box is the option of Noise Filter.

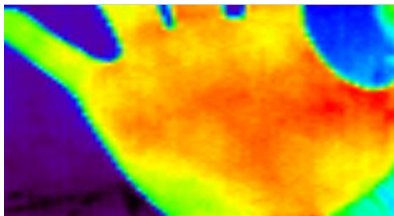


* Noise Filter

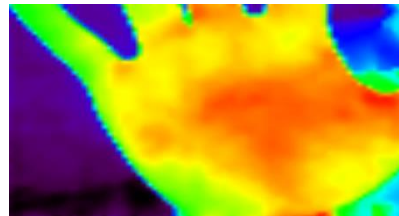
Enables and disables Noise Filter.

* Threshold

Adjusts a threshold that represents the strength of Noise Filter.



Disabled Noise Filter

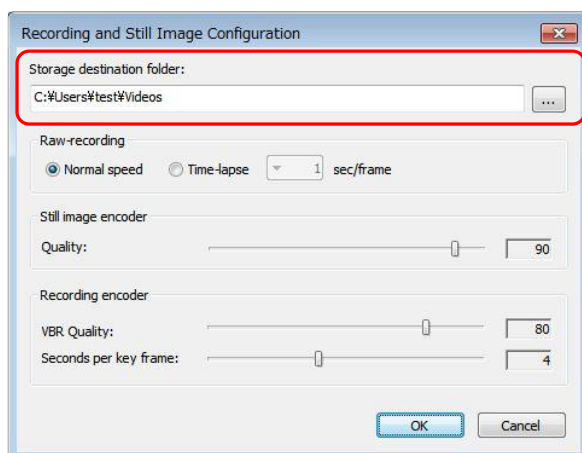


Enabled Noise Filter

2.4 Recording video and capturing still image



2.4.1 Destination folder of recording

Select the menu [Tools]→[Configure recording and still image ...] and the following dialog is displayed. The area enclosed by a red frame is the option of the destination folder. Input a path to the text box directly or push [...] and select a folder.



2.4.2 Recording video

The following are how to start and stop recording.

<p>Start recording</p>	<p>One of the following operations:</p> <ul style="list-style-type: none"> * Push . * Push F5 key. * Select the menu [Tools]→[Start recording].
<p>Stop recording</p>	<p>One of the following operations:</p> <ul style="list-style-type: none"> * Push . * Push F5 key. * Select the menu [Tools]→[Stop recording].


Recorded videos are saved to the folder configured in “2.4.1 Destination folder of recording”.

The file name is “OWLIFTCap_YYMMDD_HHmmSS.wmv”.

“YYMMDD_HHmmSS” represents **Y**ear, **M**onth, **D**ay, **H**our, **M**inute and **S**econd.

2.4.3 Capturing still image

To capture a still image, do one of the following operations.

- * Push  .
- * Push F6 key.
- * Select the menu [Tools]→[Capture still image].

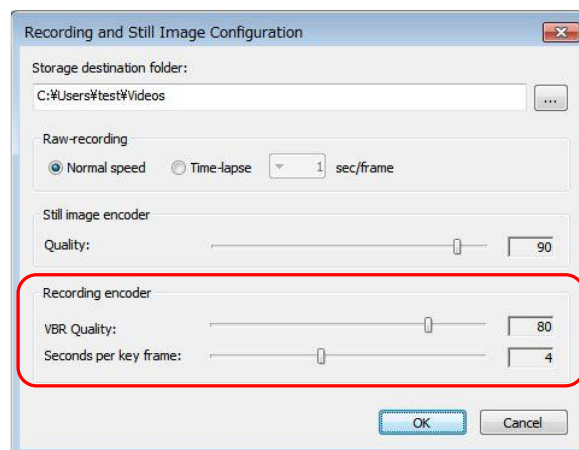
Captured images are saved to the folder configured in “2.4.1 Destination folder of recording”.

The file name is “OWLIFTCap_YYMMDD_HHmmSS.jpg”.

“YYMMDD_HHmmSS” represents **Year, Month, Day, Hour, Minute and Second**.

2.4.4 Configuring video

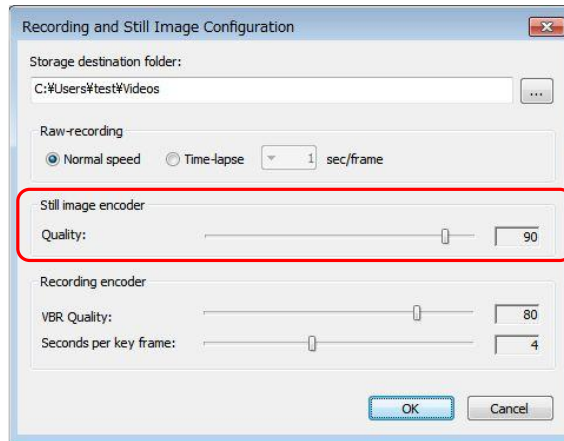
Select the menu [Tools]→[Configure recording and still image ...] and the following dialog is displayed. The area enclosed by a red frame is the option of video.



- * **VBR Quality**
Sets the image quality. 0 means lowest quality. 100 means highest quality. The higher the quality is, the larger the recorded file size is.
- * **Seconds per key frame**
Sets the interval of key frames. The larger the interval is, the smaller the recorded file is. Instead, the possibility of image deterioration for moving objects increases.

2.4.5 Configuring still image

Select the menu [Tools]→[Configure recording and still image ...] and the following dialog is displayed. The area enclosed by a red frame is the option of still image.



* **Quality**

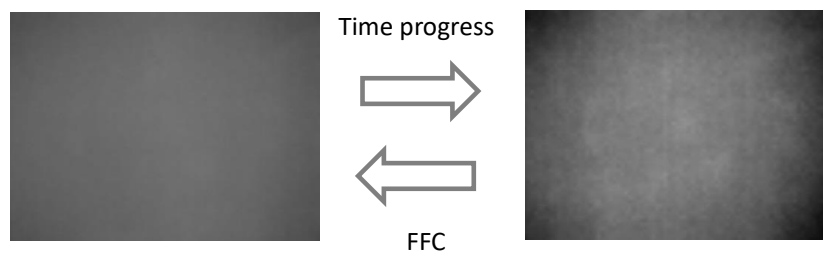
Sets the image quality. 0 means lowest quality. 100 means highest quality. The higher the quality is, the larger the still image file size is.

■ Ambient temperature and sensor's temperature

Sensor's output fluctuates intensely by ambient temperature and sensor's temperature. OWLIFTCap fixes fluctuation of sensor's output and calculates temperature. At that time, the precision and error of the thermometer inside the sensor cause the error of the calculated temperature.


■ Blurring of sensor's output over time

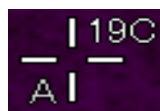
Blurring sensor's output becomes larger in a few minutes. The process called FFC (Flat Field Correction) that fixes blurring is done every 5 minutes.



2.5 Displaying temperature

2.5.1 Temperature output at arbitrary points

OWLIFTCap can display temperatures at up to 4 arbitrary points. Pushing  switches to the selection mode for points to display temperatures and the following cross mark called “marker” is displayed under the mouse cursor.



Left-click at the point you want to display a temperature and finish the selection mode. Right-click to cancel selecting.

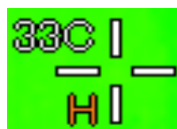
To delete located markers, left-click after pushing . Push  to delete all markers.

2.5.2 Highest and lowest temperature

OWLIFTCap can display markers at point of highest/lowest temperature in a frame.

Pushing  enables or disables the highest/lowest marker.

The left figure (H) is a highest temperature marker. The right figure (L) is a lowest temperature marker.




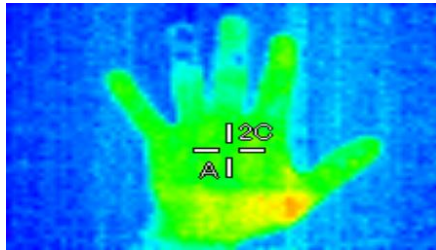
Highest temperature marker



Lowest temperature marker

2.5.3 Temperature Subtraction Output

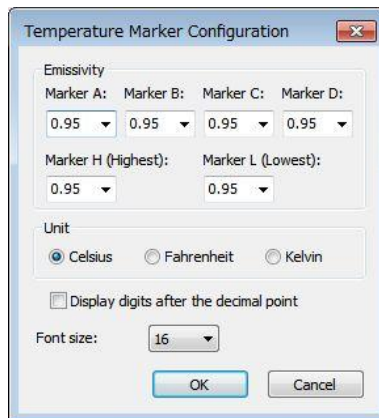
Push  and switch to the temperature subtraction output mode that displays the subtraction between a current frame and the frame of the point in time when you pushed the button. Notice that if Manual Gain Control is selected, the range between “Min.” and “Max.” applies to subtracted temperatures but not original temperatures so you must adjust “Min.” and “Max.” manually.



Temperature Subtraction Output

2.5.4 Configure temperature output

Select the menu [Tools]→[Configure temperature markers ...] and the following dialog is displayed.



- * Emissivity
Sets emissivities to be applied to each temperature markers. The smaller emissivity you set, the higher the temperature output is.
- * Unit
Sets the unit of temperature output.
- * Font size
Sets the font size of temperature output.

2.6 Raw-recording

2.6.1 What is raw-recording ?

The method of recording to save sensor's output data before converting to temperatures to a file. Temperature information is acquired just like playing a real device while playing a raw-recording file. Raw-recording file is the original format of OWLIFT. Its extension is .OWI.

2.6.2 Destination folder or raw-recording

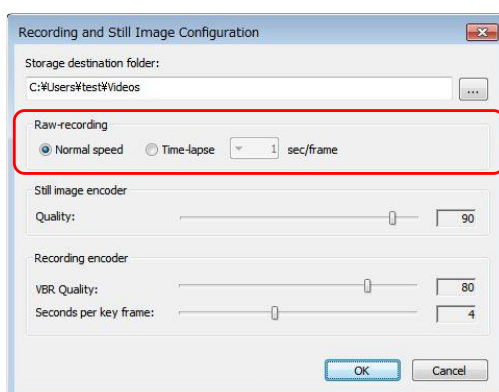
A destination folder of raw-recording is same one for video. Please refer to 2.4.1.

2.6.3 Execute raw-recording

Start recording	One of the following operations: * Push F4 key. * Select the menu [Tools]→[Start raw-recording].
Stop recording	One of the following operations: * Push F4 key. * Select the menu [Tools]→[Stop raw-recording].

2.6.4 Configure raw-recording

Select the menu [Tools]→[Configure recording and still image ...] and the following dialog is displayed. The area enclosed by a red frame is the option of raw-recording.



* Normal speed

Set the speed of raw-recording to normal speed.

* Time-lapse

Set the speed of raw-recording for time-lapse recording. The unit is “seconds per frame” that means interval seconds between frames.

2.7 Playing raw-recording file

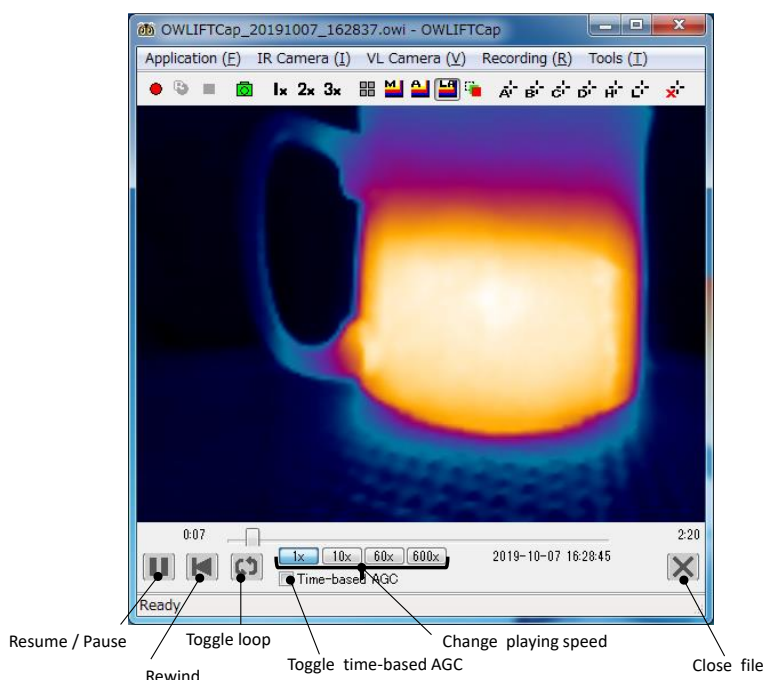
2.7.1 Open raw-recording file

One of the following operations can open raw-recording file.

- * Push F3 key and select a raw-recording file in the file selection dialog.
- * Select the menu [Tools]→[Open raw-recording file...].
- * Double-click a raw-recording file.
- * Drag and drop a raw-recording file to OWLIFTCap.

2.7.2 Operations of playing raw-recording file

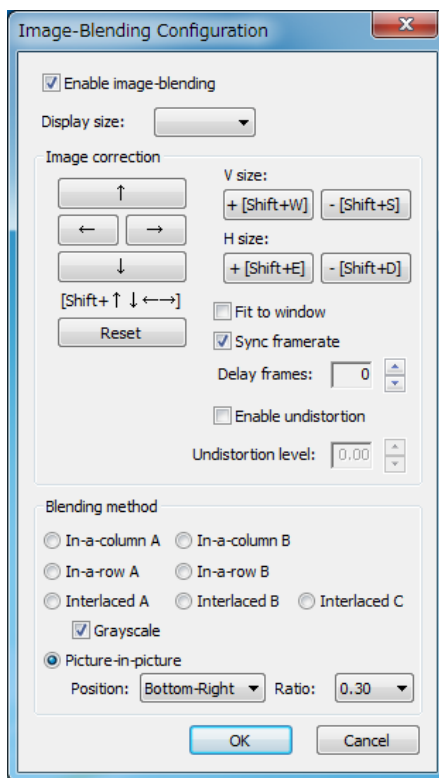
After opening a raw-recording file, the interface of playing a file is shown in the bottom of the window.



- * 1x, 10x, 60x, 600x
Scale factors of playing speed.
- * Toggle time-based AGC
“Time-based AGC” performs to control gain automatically against a time period. Normal AGC performs against a frame. Time-based AGC performs against multiple frames selected at a certain interval in a time period, and shows definitely that colors are changing over time.

2.8 Image-blending of infrared and visible images

Select the menu [Tools]→[Configure image-blending ...] and the following dialog is displayed. If a visible-light camera is connected to the PC, toggle the checkbox [Enable image-blending] and visible-light image and thermal image are blended.



In the menu [VL Camera] you can select visible-light cameras and select resolutions.

This function is implemented experimentally, so we omit the detailed explanation.

2.9 Using protection window

2.9.1 Overview

When you put OWLIFT into a bigger water-proof/dust-proof case, you can GAT-05 (sold separately) as a protection window. GAT-05 is resin material made by Asahi Kasei Engineering and transmits long-wave infrared. Following functions are used to observe temperature via the protection window.

(1) Protection window correction

The function to guess original infrared strength from transformed infrared strength by going through the protection window.

(2) Reflection correction

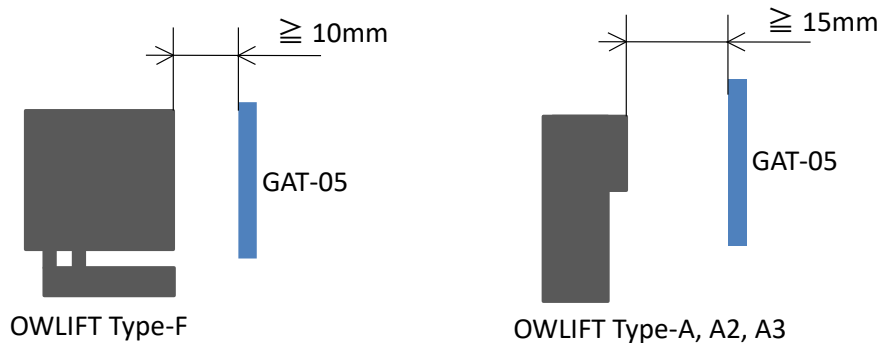
The function to reduce a reflected image of OWLIFT itself in the protection window.

【Note】

- It is impossible to delete the reflected image completely.
- The reflected image appears more clearly with especially OWLIFT Type-A/A2.

2.9.2 Relative position between protection window and OWLIFT

Fix a protection window and OWLIFT at interval of some distance described in the following figures. The nearer they are fixed, the more the thermal image is affected by reflection.

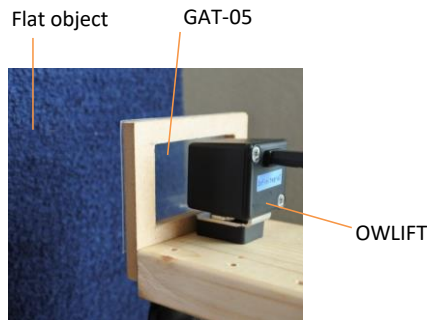


2.9.3 Protection window correction

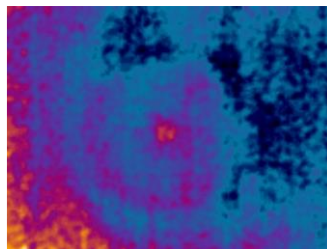
To enable window the protection window correction, select [Tools]→[Window Correction]→[GAT-05].

2.9.4 Reflection Correction

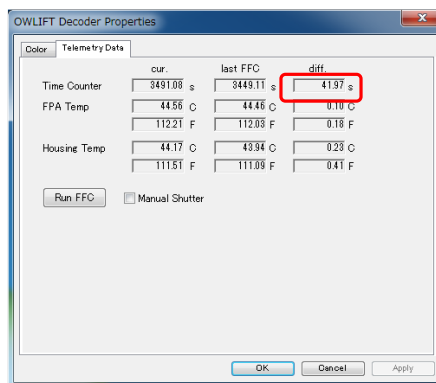
- (1) To enable the reflection correction, you need to generate a correction data. To generate a correction data, place OWLIFT and a protection window in your case and take a thermal video of a flat object. In the following picture, we are taking a thermal video of the towel that are wound around a box. The object must be flat and have a rough surface. It must not be see-through.



- (2) Run OWLIFTCap and start to take a thermal video. Select [IR Camera]→[Configure image] and a dialog opens. In the dialog, select [Linear Auto Gain Control] in [Color] tab. Confirm that you look at a reflected image of OWLIFT like the following image. Wait for 20 minutes with taking a thermal video

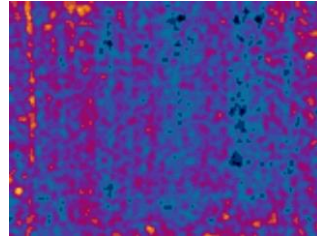
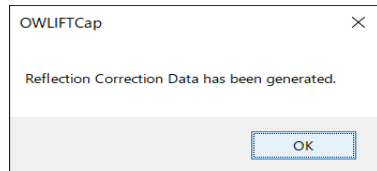


- (3) Select [IR Camera]→[Configure image] and a dialog opens. In the dialog, select [Telemetry Data] tab. The value in the red box of the following image represents elapsed time in seconds since a shutter switched. Wait until the value becomes 60 to 180.



(4) Select [Tools]→[Reflection Correction]→[Generate data]. Wait for 5 seconds and the message like the following dialog will be displayed. Confirm that the reflected image is reduced.

* The reduction of reflected image is not perfect. A small reflected image can remain in the center.



(5) Now a correction data is saved in your PC.

- Correction data are saved against each device type (A#/B/F).
- To save a correction data, select [Export data].
- To load a correction data, select [Import data].
- To delete a correction data, select [Clear data].

2.9.5 Configure protection correction in OWLIFT SDK

(1) Protection window correction

C

```
OwLib_SetWindowCorrection(ow, OW_WINDOW_CORRECTION_TYPE_GAT05_STD_HOUSING, 0);
```

C#

```
ow.SetWindowCorrection(OwWindowCorrectionType.GAT05_STD_HOUSING);
```

Python

```
ow.window_correction = owlift.OwWindowCorrectionType.GAT05_STD_HOUSING
```

(2) Reflection correction

C

```
OwLib_SetReflectCorrFile(ow, filePath);
```

C#

```
ow.SetReflectionCorrectionFile(filePath);
```

Python

```
ow.set_reflection_correction_file(filePath)
```

filePath : The file path of a correction data generated by OWLIFTCap.

2.10 Other functions

2.10.1 Saving and loading configurations

The application configuration is saved to the following file at exiting.

%APPDATA%\OWLIFTCap\OWLIFTCap.ini
 (%APPDATA% is pre-defined environment variable)

OWLIFTCap has a function to save the configuration to another file and load it from arbitrary files.

- * How to save
 Select the menu [Application]→[Save configuration file as ...] and input a file name.
- * How to load
 Select the menu [Application]→[Open configuration file ...] and select a file.

Select [Application]→[Reset configuration to default ...] to reset the application configuration to default state.

2.10.2 Dumping frame data

OWLIFTCap has a function to save frame data as text file. The format is same as OWLIFTDump that is included in OWLIFT SDK.

- * How to dump raw data
 Select the menu [Tools]→[Dump raw data] and output a dump file of raw data to the destination folder of recording. The shortcut key is [F7]. Raw data is an array of values that are retrieved from an IR sensor. The values represent IR energy intensity of each pixels.
- * How to dump temperature data
 Select the menu [Tools]→[Dump temperature data] and output a dump file of temperature data to the destination folder of recording. The shortcut key is [F8]. Temperature data is an array of temperature values of each pixels.

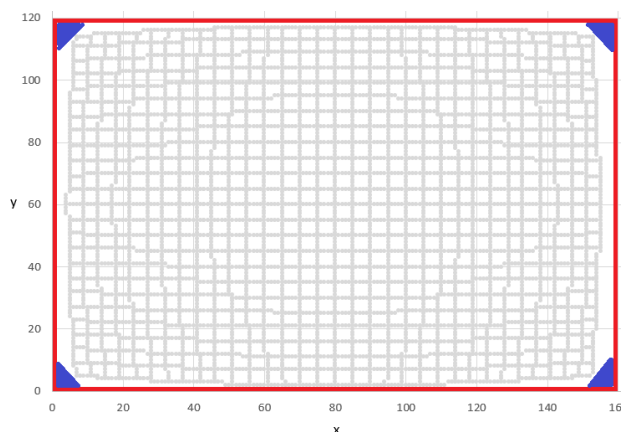
2.10.3 Undistortion

The Undistortion function corrects lens distortion. The Undistortion is enabled by default with OWLIFT Type-F. You can enable/disable it by selecting the menu [Tools]→[Undistortion].

There is a problem about the design of OWLIFT Type-F. The problem is that the housing may be reflected in the corners of images when the Undistortion is disabled. When the Undistortion is enabled, the edges of images are trimmed and the housing is not appeared in images.

The following figure is the relationship between the Undistortion and the housing's shadow.

- Red : The range of the original pixels
- Gray : The range of the pixels displayed through the Undistortion
- Blue : The housing shadow



【Note】

- The lens model used for the Undistortion is different from the real lens of thermal sensors. Therefore the correction is incomplete.

3 Usage for Android

3.1 Installation

3.1.1 Installation

You can install the OWLIFT application via Google Play.



3.1.2 Execution

Connect the OWLIFT then you can run the OWLIFT application by tapping it.

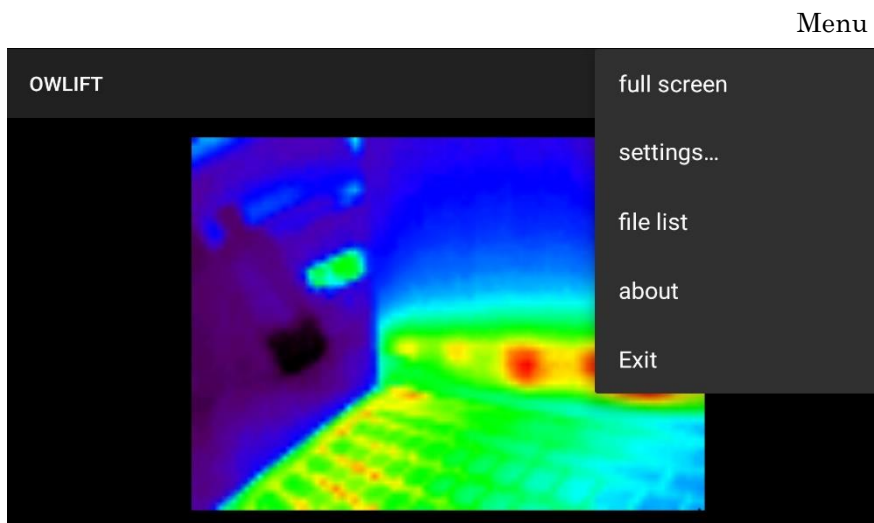
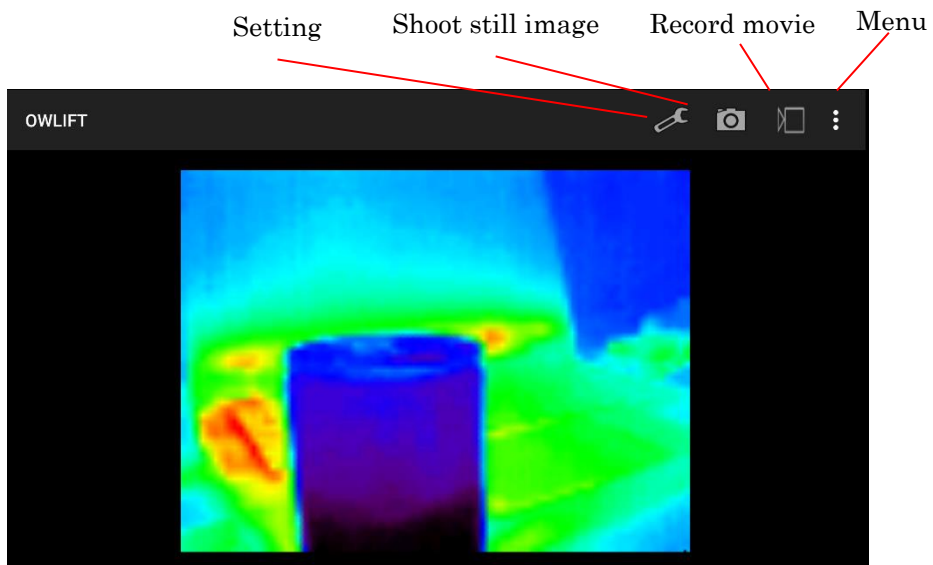
Tap the "OK" button after the dialog box that confirms execution rights is displayed.

3.2 Outline of OWLIFT application

3.2.1 Function list

The OWLIFT application provides the following functions.

- * Previewing
 - Displays in full color and grayscale
 - Auto Gain Control (AGC) and Manual Gain Control
- * Recording video and capturing still image
 - Video ... MP4 format
 - Still image ... JPEG format
- * Outputting temperature
 - Arbitrary points
 - Highest and lowest temperature points
- * Cooperating with the DeviceConnect



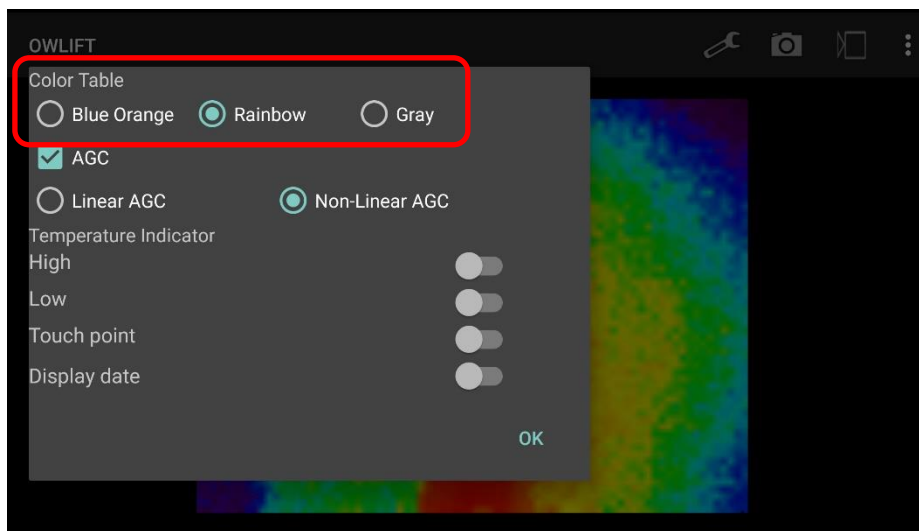
3.3 Previewing

3.3.1 Start previewing

Connect the OWLIFT then start the OWLIFT application.

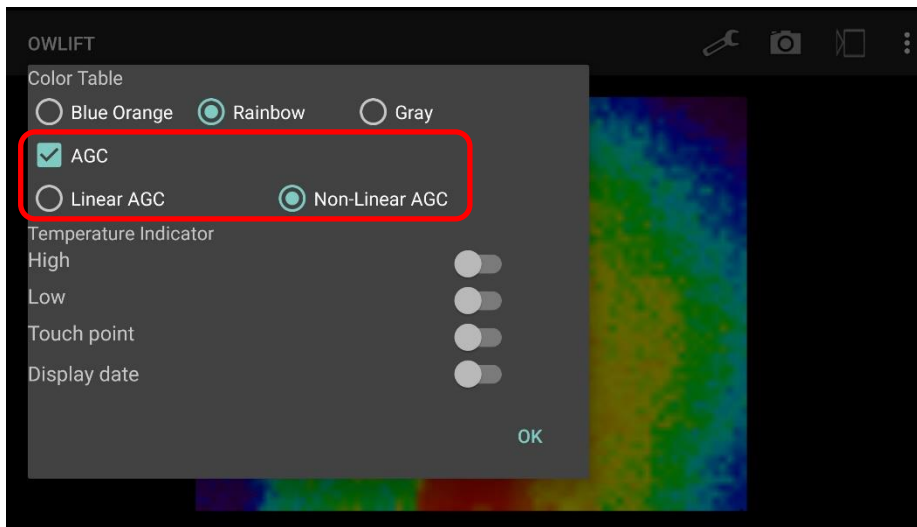
3.3.2 Select Color Table

You can find the following menu by tapping the setting button. The following red area is options for setting color tables. Refer to “2.3.2 Select Color Table” for more information about color tables.

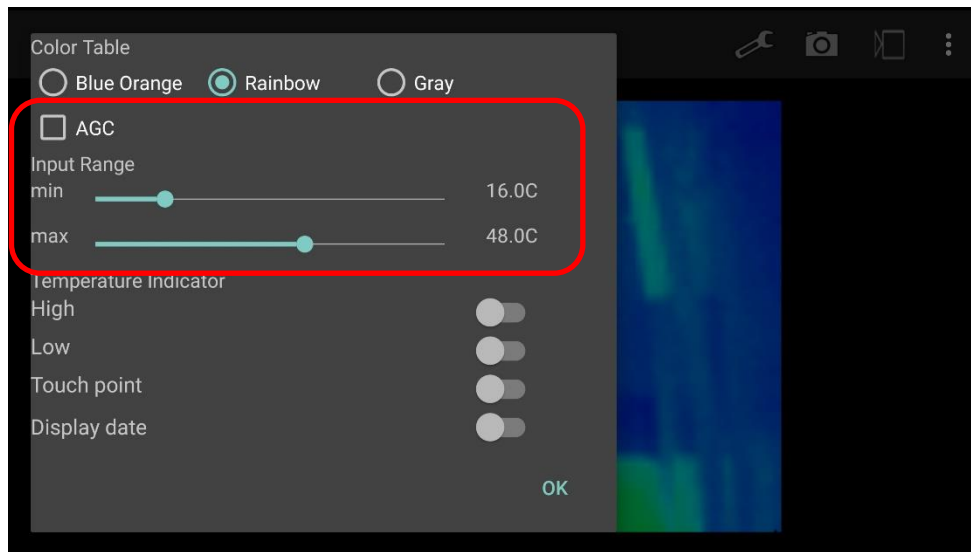


3.3.3 Auto Gain and Manual Gain Control

You can find the following menu by tapping the setting button. Auto gain control options in the following red area will be appeared if AGC check box is turned on.



Manual gain control options in the following red area will be appeared if AGC check box is turned off.

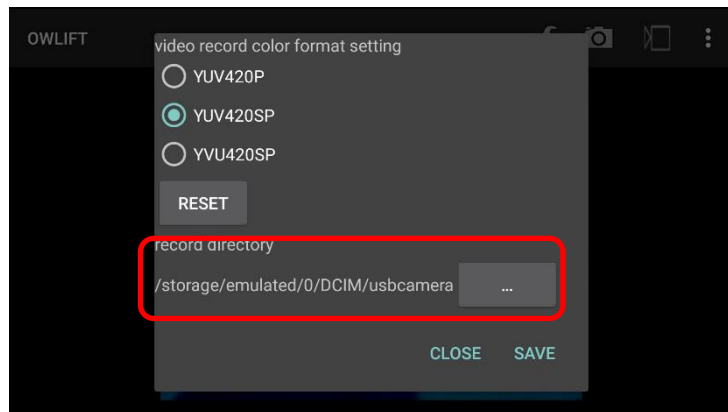


Refer to “2.3.3 Auto Gain and Manual Gain Control” for more information about an AGC and a manual gain control.

3.4 Recording video and capturing still image



3.4.1 Destination folder of recording

Select the menu [settings...]→[record settings...] and the following dialog is displayed. The information enclosed by a red frame means the destination folder of recorded files. You can change the folder by pushing [...] and selecting a folder.



3.4.2 Recording video

The following are how to start and stop recording.

Start recording	Following operation: * Push  .
Stop recording	Following operation: * Push  .

Recorded videos are saved to the folder configured in “3.4.1Destination folder of recording”.

The file name is “usbcameraYYMMDDHHmmSS.mp4”.

YYMMDDHHmmSS represents **Y**ear, **M**onth, **D**ay, **H**our, **M**inute and **S**econd.

3.4.3 Capturing still image

To capture a still image, do the following operation.

- * Push .

Captured images are saved to the folder configured in “3.4.1Destination folder of recording”.

The file name is “usbcameraYYMMDDHHmmSS.jpg”.

YYMMDDHHmmSS represents **Y**ear, **M**onth, **D**ay, **H**our, **M**inute and **S**econd.

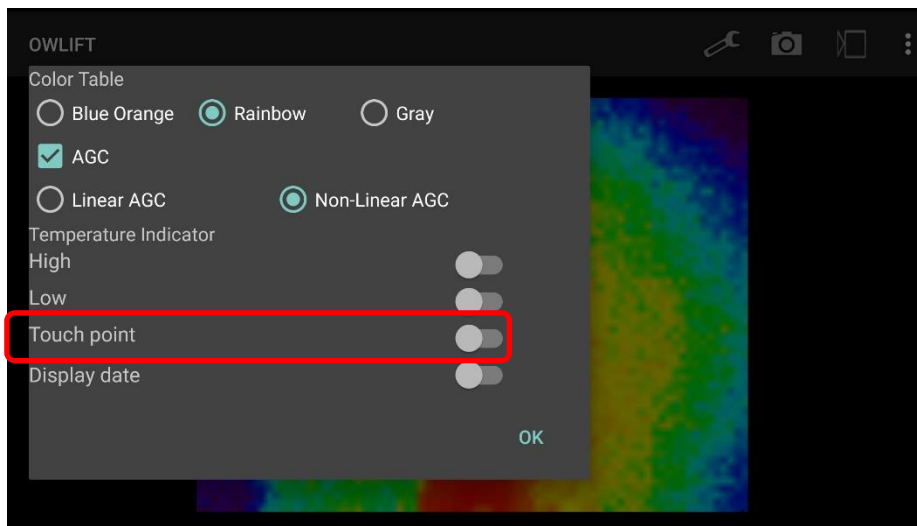
3.5 Display temperature

3.5.1 Temperature output at arbitrary point

The OWLIFT application can display temperature at arbitrary points.

Select the settings button and the following dialog is displayed. The temperature at an arbitrary point is displayed if the button enclosed by a red frame is turned on.

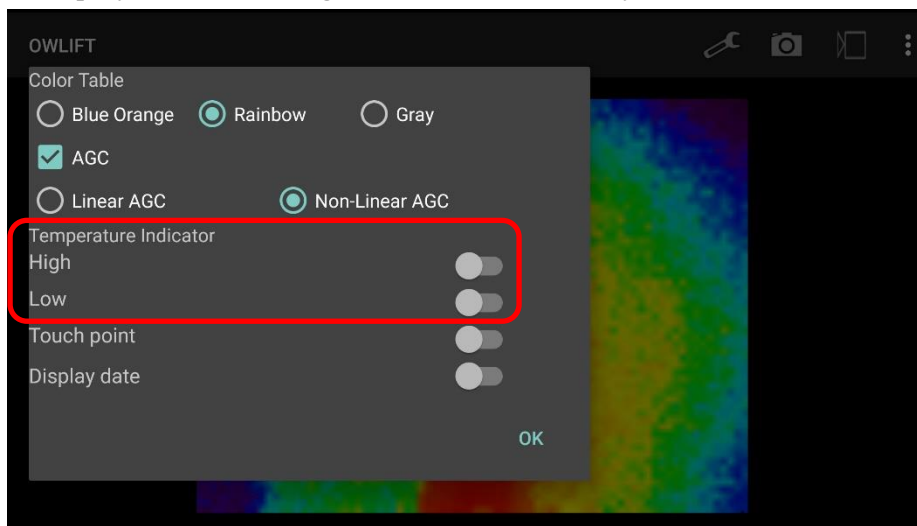
The arbitrary point can be selected by tapping a display.



3.5.2 Highest and lowest temperature

The OWLIFT application can display markers at a point of highest/lowest temperature in a frame.

Select the settings button and the following dialog is displayed. Markers at a point of highest/lowest temperature are displayed if the setting of the area enclosed by a red frame is turned on.



3.5.3 Emissivity

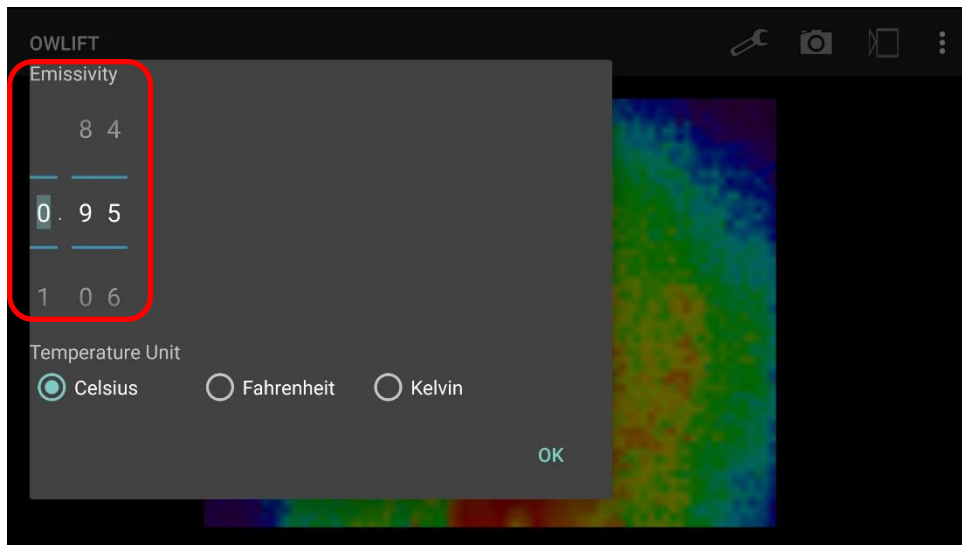
You can select emissivity to be applied to temperature marker.

Refer to “2.5.4 Configure temperature output” for more information about emissivity.

This emissivity is common to all markers.

Refer to “3.5.1 Temperature output at arbitrary point”, “3.5.2 Highest and lowest temperature” about temperature markers.

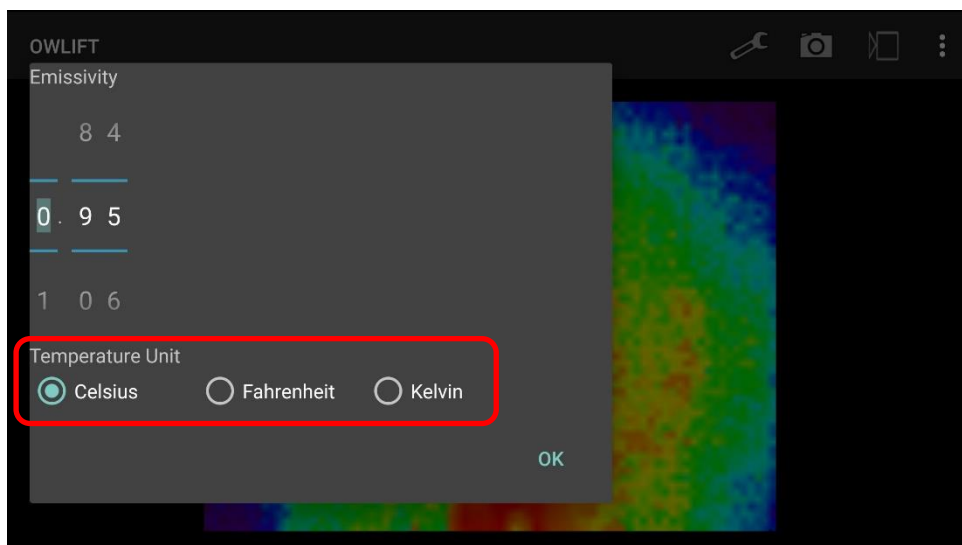
Select the menu [settings...]→[temp markers settings...] and the following dialog is displayed. You can change the emissivity setting at the area enclosed by a red frame.



3.5.4 Temperature units

You can select temperature units.

Select the menu [settings...]→[temp markers settings...] and the following dialog is displayed. You can change the temperature units setting at the area enclosed by a red frame.

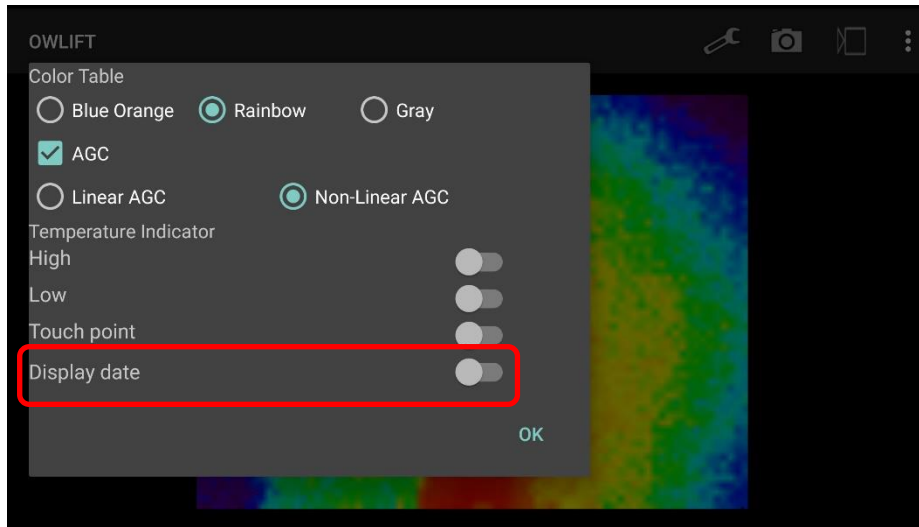


3.6 Other functions

3.6.1 Display date

The OWLIFT application can display the current date.

Select the settings button and the following dialog is displayed. The current date is displayed if the setting of the area enclosed by a red frame is turned on.



4 Correspondence between long-wavelength IR and temperature

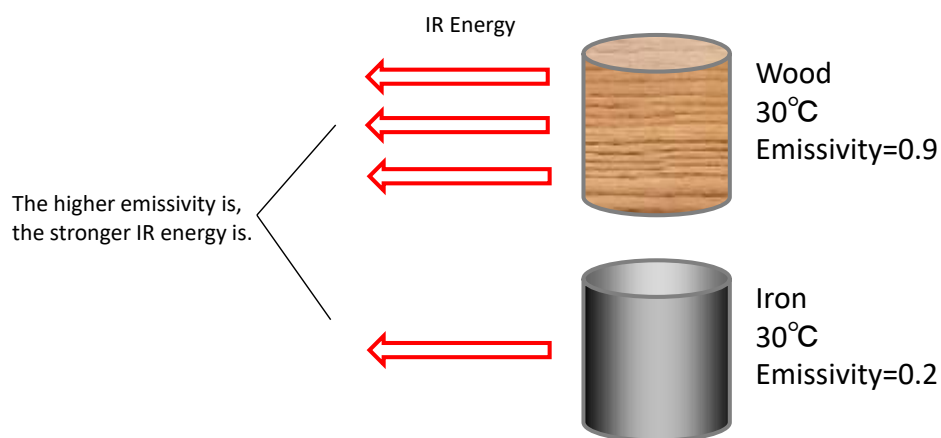
■ Factors concerning temperature output

All objects emit long-wavelength IR. A thermal sensor observes IR energy intensity that objects emit. Temperature is calculated from IR energy intensity and affected by the following factors.

- 1) Emissivity of objects
- 2) Reflected emission from ambient objects
- 3) Ambient temperature
- 4) Sensor's temperature
- 5) Blurring of sensor's output over time

■ Emissivity of objects

The IR energy intensity that a same object emits changes by composition, surface treatment, colors and so on. Emissivity represents radiant intensity that is different in each object. It is used in calculating temperature. OWLIFTCap fixes temperature output by emissivities configured for each observing points. The lower emissivity is, the larger error of the temperature is.



* Note that the emissivities in the above figure are for illustration purpose.

■ Reflected emission from ambient objects

Objects reflect long-wavelength IR. The IR energy intensity that a sensor observes includes reflected energy, so it enlarge the error in the temperature calculation.

5 Third Party Software License

5.1 The Independent JPEG Group

OWLIFTCap includes the software from the Independent JPEG Group.

This software is based in part on the work of the Independent JPEG Group.

6 Release Notes

6.1 Windows / OWLIFTCap

1.9.2.0

Fixed problems

- * Fixed the problem that an access violation occurs at opening the Version Window while playing a OWI file.

1.9.1.0

Misc. changes

- * Changed library version to 1.9.1.

1.9.0.0

New functions

- * Supported the Protection Window Correction for OWLIFT Type-F.
- * Added the Reflection Correction.
- * Added configuration of min./max. temperatures for Auto Gain Control.

Fixed problems

- * Fixed the problem that toolbuttons were blinking.

Misc. changes

- * Changed the algorithm of the Protection Window Correction for OWLIFT Type-A.

1.8.0.0

New functions

- * Added support for OWLIFT Type-F.
- * Added the Undistortion function.

6.2 Android / OWLIFT

1.8.0.0

- * Added support for OWLIFT Type-F.

History of this document

Rev	Context
2024-10-1	<ul style="list-style-type: none"> • Edited OWLIFT Specifications.
2023-06-01	<ul style="list-style-type: none"> • Fixed URL links.
2021-01-14	<ul style="list-style-type: none"> • Updated release notes. • Removed old history and release notes.
2020-05-25	<ul style="list-style-type: none"> • Updated release notes.
2019-10-28	<ul style="list-style-type: none"> • Added “1.4 OWLIFT Specifications with protection window (GAT-05)” . • 2.3.3 Added description about min./max. temperatures for Auto Gain Control. • Added “2.9 Using protection window” . • Updated release notes.
2019-06-27	<ul style="list-style-type: none"> • 1.1, 1.3 Added OWLIFT Type-F. • 1.1 Stopped supporting Windows 7SP1/8.1 and Windows 32bit. • Added “2.9.3 Undistortion” . • Updated release notes.
2018-08-20	<ul style="list-style-type: none"> • Updated release notes.