DIY-Thermocam

An open-source, do-it-yourself thermal imager

REVISION 13

MANUAL

This manual explains the features of the DIY-Thermocam V1 / V2 and helps you to understand the device. Please read it carefully in order to prevent any usage mistakes and also pay attention to the how-to guides.

SAFETY NOTE

- On the DIY-Thermocam V1, do not look directly into the laser! It can damage your eyes! Turn it off before pointing to any living being or using it in a public area.

CHARGING / EXTERNAL USB POWER

- The device can be charged with the enclosed micro-USB cable, when the external power switch is moved to the top position. It should be fully charged before the first usage.
- A LED on the top of the device indicates if the device is charging (red or orange) or if the charging process is finished (green or blue). The bottom position of the external power switch is only used to supply the additional video output module with power, do not select it while charging.

FIRMWARE UPDATE

- The firmware on the DIY-Thermocam can be updated over USB with the standalone firmware updater on Windows or the Teensyduino loader on Linux / Mac OSX. For further information, please refer to the firmware update guide inside the download section. Do not put your device into mass storage mode.

LIVE MODE

- The DIY-Thermocam boots into live mode by default. Depending on the selected mode, you either see the thermal, visual or combined image. That selection can be done in the main menu.
- The device requires 60 seconds after it has been turned on to warmup and calibrate itself. Afterwards, the absolute temperatures can be calculated for every pixel and additional info will be shown.
- Press the push button on top of the device short (<1s) to save an image to the storage. Press it long (>1s) to start capturing a video or to create a series of interval images with an adjustable time in between.
- Touching the screen long in auto mode locks the current temperature range. Whenever manual limits have been set as presets in the main menu, you can toggle between them in manual mode.
- In the middle of the screen, you can see the object temperature from the single-point infrared sensor. On the right side of the screen, the color bar shows the relation between colors and absolute temperatures. More information can be enabled in the live display options in the main menu.
- The device does a quick calibration on every start, which helps to use it under different ambient temperatures. To improve the accuracy of the conversion during usage, run the calibration process inside the main menu and point the device to different hot and cold objects in the surrounding area.
- If you connect the device to a PC with the USB cable, you can also enter the USB serial connection at any time when in live mode. Press the screen again to close the connection and return to live mode.

MAIN MENU

- The main menu can be accessed by touching the screen in live mode. It offers the following options:

Navigation: Use the left and right arrow to navigate through the different main menu screens.

Return: Press this button to exit the main menu and return to live mode.

 Change color: Switch between the different color scales applied to the thermal image. There are eighteen different color schemes stored on the device, such as ‘Rainbow’ or ‘Ironblack’.

 Change mode: There are three different operating modes: Thermal (only), visual (only) and combined. In combined mode, the thermal and visual images are matched together. You can save images in each mode, but only the thermal mode allows to record videos and interval images.

 Change limits: You can choose between two modes: ‘Auto’ automatically finds the hottest and coldest value in every image and distributes the colors from the selected scheme evenly between them. ‘Manual’ lets you choose the minimum and maximum temperature, between which the color scheme is applied.

 Load menu: Here you can view all images and videos stored on the internal storage or SD card. You can navigate through the files by pressing the little arrows on the left and right side. The newest image or video will always load first. You can play / pause a video by touching the screen in the middle. There are also four additional options: Find (search an image or video by its time and date), convert (convert an image or video to bitmap file), delete (remove an image or video from the internal storage) and exit.

 USB file transfer (V1 only): Connect the internal storage to the computer to view, copy or delete the images and videos on the device. The DIY-Thermocam will show up as a mass storage device on your PC.

 Trigger shutter (V2 Only): Manually close and open the shutter on top of the FLIR Lepton sensor, in order to remove noise from the raw data and make the image uniform again.

 Settings menu: It allows you to adjust the following presets: Display (change the temperature format, the display rotation and the screen timeout), Storage (format the internal storage, enable / disable the conversion of bitmap images or enable / disable the capture of a visual image for every saved thermal image) and Other (set time & date, calibrate battery gauge).

 Live display options: You can change what information is shown in live mode: Battery on/off, time on/off, date on/off, spot on/off, bar on/off, hottest/coldest point detection (off, cold, hot or both), storage on/off, filter (Gaussian, box or disabled), text color (white, black, red, green or blue).

 Laser (V1 only): Activate or deactivate the laser. It can be used to mark the middle point when measuring over longer distances, so you can precisely measure the spot temperature.

 HQ resolution (V2 only): Choose between normal (160x120) or HQ resolution (320x240) for rendering.

 Display: Turn the display off in order to save battery, while preserving all settings as well as the calibration data. Touch the screen again to reactivate it.

 Calibration: Improves the accuracy of the color to absolute temperature conversion and should be performed after each start. During the calibration process, point the device to different hot and cold objects to ensure a good calibration. Repeat the calibration for different surrounding areas.

 Adjust combined: Only available in visual or combined mode. Move the visual image on top of the thermal image to get a better alignment. Can store up to three presets and allows the change alpha level.

 Hot / cold mode: Only available in thermal mode. Mark the hottest or coldest temperatures with an adjustable color. You can also select the level, above or under the marking should be done.

 Temperature points: Add or remove live temperature reading points for every position inside the image.