

# User manual for ThermalCapture 2.0



by



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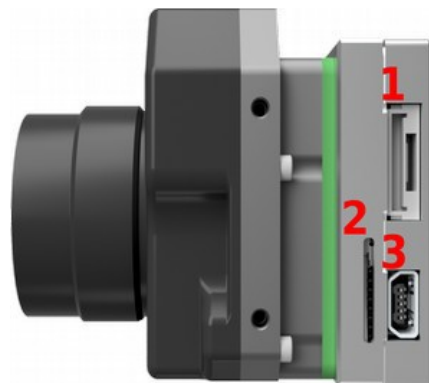
# 1 Initial Operation

Before you can use ThermalCapture 2.0 the first time, take some time to learn more about the product and needed steps to a setup tailored to your needs. This guide assumes that ThermalCapture 2.0 is already mounted to a TAU core. If this is not the case please follow the *ThermalCapture 2.0 Mounting Guide* first.

## 1.1 Wiring and Connectors

ThermalCapture 2.0 has the following connectors:

1	8-pin connector
2	Micro sd card slot
3	Mini-USB for configuration and 5V power supply



### 1.1.1 Mini-USB Connector

ThermalCapture 2.0 and the connected TAU core can be powered from the Mini-USB interface for configuration. This interface also allows the configuration of the TAU core via the FLIR TAU GUI.

To do TAU core configuration disconnect any memory devices, connect ThermalCapture 2.0 to your PC and execute steps described in chapter Configuration of the TAU Core of this guide.

Thermal Capture is intended to be used with small UAVs. You need an adapter cable from your 5V power supply to either Mini-USB or 8-pin connector. ThermalCapture 2.0 can work with a DC voltage from 4,5 to 5,5V. The source must be able to deliver at least 600mA continuous and peaks up to 1A. Our standard cable includes a power converter to allow higher input voltages (see 1.1.4).

### 1.1.2 Micro SD card slot

This is a slot for a micro sd card. ThermalCapture 2.0 stores the captured images on the memory connected to this interface. The sd card must be formatted with a FAT32 filesystem and support a minimum serial data writing speed of 10MB/s. We recommend a SDHC Class 10 with 32GB capacity for use with the ThermalCapture 2.0.

It is strongly recommended to use the [SD Formatter 4.0 for SD/SDHAC/SDXC](#) instead of formatting utilities provided with operating systems that format various types of storage media. Using generic formatting utilities may result in less than optimal performance for your memory cards.

### 1.1.3 8-pin connector

The 8-pin connector has the following pin definition:

1	EXP1
2	EXP0
3	5V DC input
4	GND
5	TRIGGER_IN
6	SERIAL_IN
7	VIDEO GND
8	VIDEO OUT

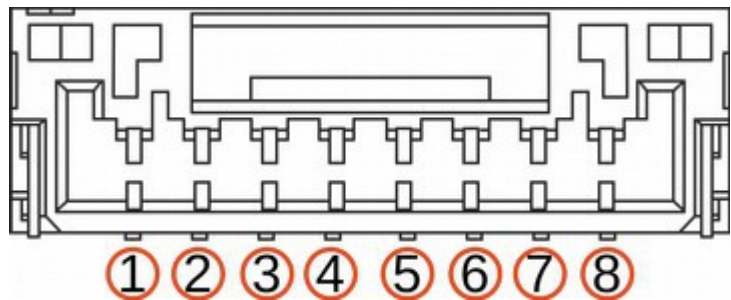


Image capture is triggered when the TRIGGER\_IN pin is pulled to ground. It is connected to 3.3V internally via resistor. You can apply a switch or a transistor between TRIGGER\_IN and GND. It is also possible to connect a digital signal (0-5V) to the trigger input.

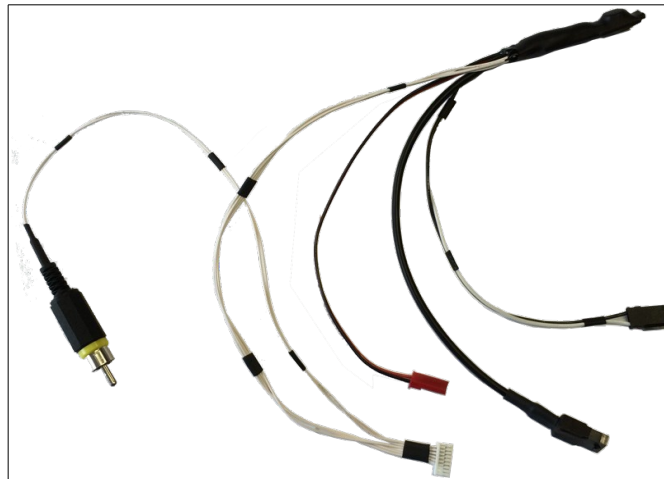
Images are captured as long as TRIGGER\_IN is at ground level. It is not possible to connect the trigger input permanently to GND, because in this case there would be no way to switch ThermalCapture 2.0 off or release the sd card, without potentially damaging its file-system.

SERIAL\_IN is a UART interface. It supports inverted and not inverted signals (0-5V). The data received at this pin is continuously stored in an internal buffer. This buffer is added to any stored image. So it is possible to connect a GPS receiver or an IMU to ThermalCapture 2.0. Since the data is only stored but not processed at ThermalCapture 2.0, any UART based protocol can be used as long the sensor begins with data output on its own. Interface settings (baud rate etc.) can be done with the serial configuration tool (see chapter 2.2).

VIDEO\_OUT provides NTSC or PAL composite video out from the TAU core. The video standard and other video related settings can be configured with FLIR TAU GUI, see chapter 2.1.

### 1.1.4 TeAx Standard Cable Set for ThermalCapture 2.0

With each ThermalCapture 2.0 unit comes a standard cable that splits the 8-pin connector functions into easy-to-use connectors. It also includes a voltage converter which allows the system to be connected to a power source with voltages between 8V and 32V DC.



*Illustration 1: ThermalCapture 2.0 Standard Cable*

More detailed information can be found in the separate Standard cable set description:

<http://thermalcapture.com/thermalcapture-2-0-standard-cable-set>

ThermalCapture hardware itself must be powered with **5V DC**. If your power source is between 8V and 32V use our standard cable with included voltage converter. Make sure that your power source delivers at least 8V in this case.

## 2 Configuration

Before ThermalCapture 2.0 can be used in a specific setup, it is necessary to configure the TAU core correctly. Configuration of ThermalCapture 2.0 is only needed if the serial input (see chapter 1.1.3) is used to connect to a GPS receiver or a similar device.

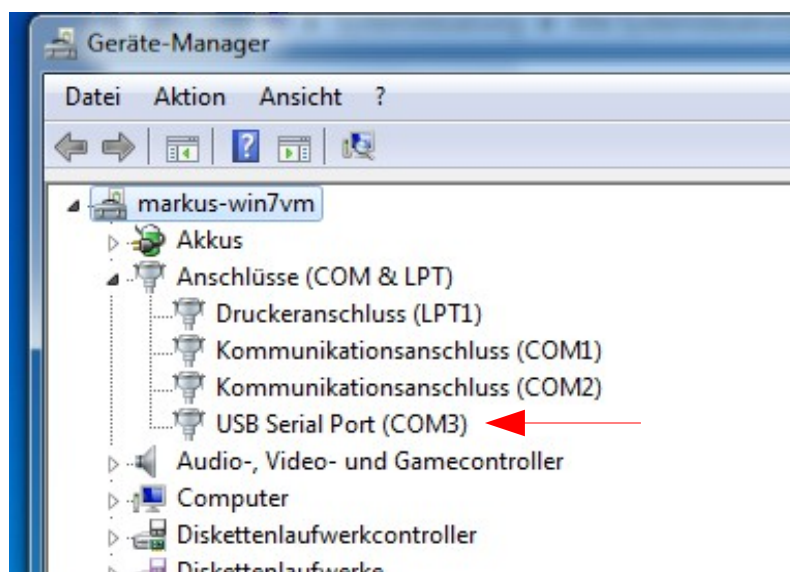
### 2.1 Configuration of the TAU Core

TAU core configuration is only necessary if you have mounted ThermalCapture 2.0 to a TAU core on your own, or if you want to change some core related settings. If this is not the case, please proceed with chapter 3.

#### 2.1.1 Driver Install

ThermalCapture 2.0 uses a virtual COM port to connect the TAU core to the Mini-USB interface. To get access to the TAU core with your PC, you may need to download and install the STM32 virtual COM port driver from [STM32 Virtual COM Port Driver](#)

After installation the TAU core is connected to a virtual serial interface (COMX). Please open the device manager and look which COM – interface it has got.



## 2.1.2 Flir Software Installation

The configuration of the Tau core is done by software from FLIR.

You need the FLIR Camera Controller GUI for Tau and Quark:  
<http://www.flir.com/cvs/cores/view/?id=51880>

and the FLIR GUI User Guide:

[http://www.flir.com/uploadedFiles/OEM/Products/LWIR-Cameras/Vue/flir\\_gui\\_user\\_guide.pdf](http://www.flir.com/uploadedFiles/OEM/Products/LWIR-Cameras/Vue/flir_gui_user_guide.pdf)

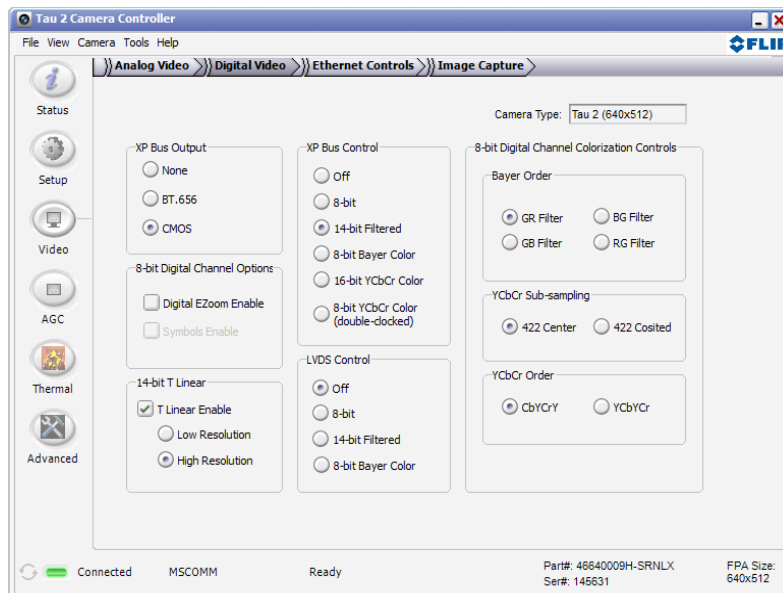
Connect the Mini-USB interface of ThermalCapture 2.0 to your PC and follow Chapter 4 of the FLIR GUI User Guide to connect to the camera.

## 2.1.3 TAU Configuration

ThermalCapture 2.0 gets the images from the digital output of the TAU core. This output is switched off by default. If the output is not enabled, ThermalCapture 2.0 cannot record images.

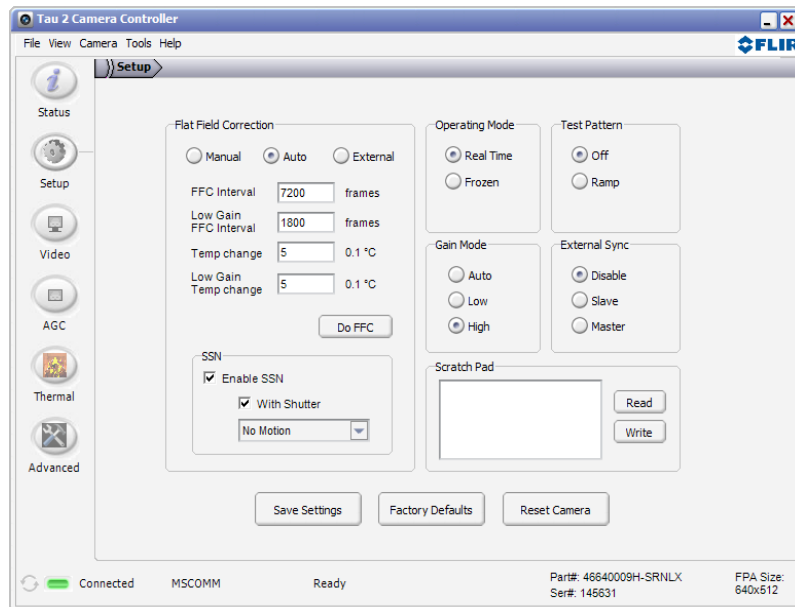
The digital output must be enabled with the Flir "Camera Controller GUI".

After the FLIR GUI has connected to the TAU core, go to the Digital Video Tab and select CMOS for XP Bus Output and 14-bit filtered output.



If your TAU core has the “advanced radiometry option”, TLinear should be enabled to have per pixel temperature measurement in ThermoViewer.

These settings must be saved permanently. To achieve this, go to the Setup tab and click to Save Settings.



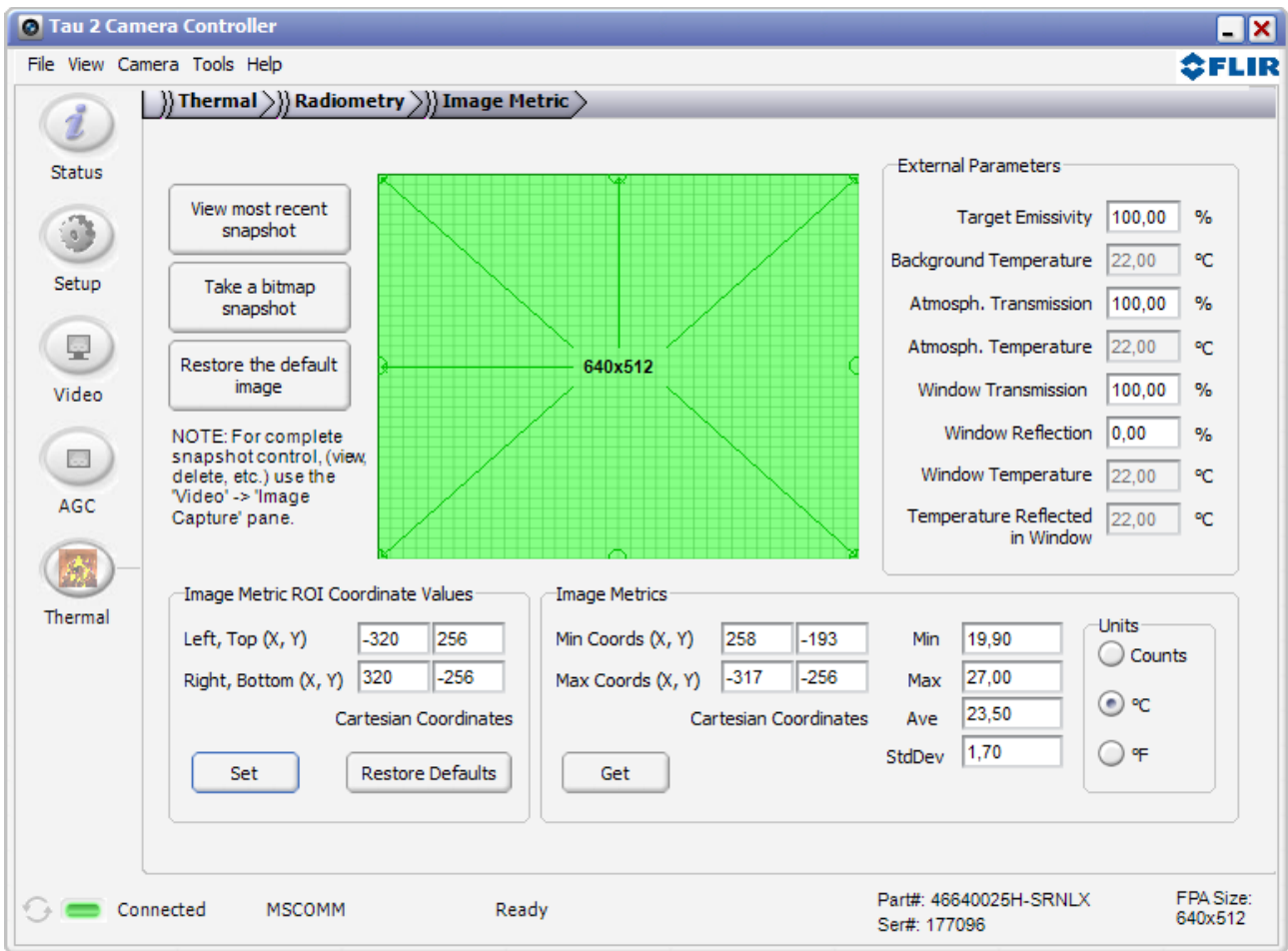
Without saving, settings will be lost with the next power cycle and recording cannot work.

Now the TAU core is ready to be used with ThermalCapture 2.0.



### 2.1.4 Tau Configuration for Overlay Feature

To use the overlay feature the region of interest must be configured to use all available pixels. To do this open Flir "Camera Controller GUI" and go to the **Thermal** → **Radiometry** → **Image** tab. In the Image Metric setup make sure that the "Image Metric ROI Coordinate Values" fit your FLIR Tau core:



For a FLIR Tau core with a resolution of 640x512 pixels use:

Left, Top (X, Y)	-320	256
Right, Bottom (X, Y)	320	-256

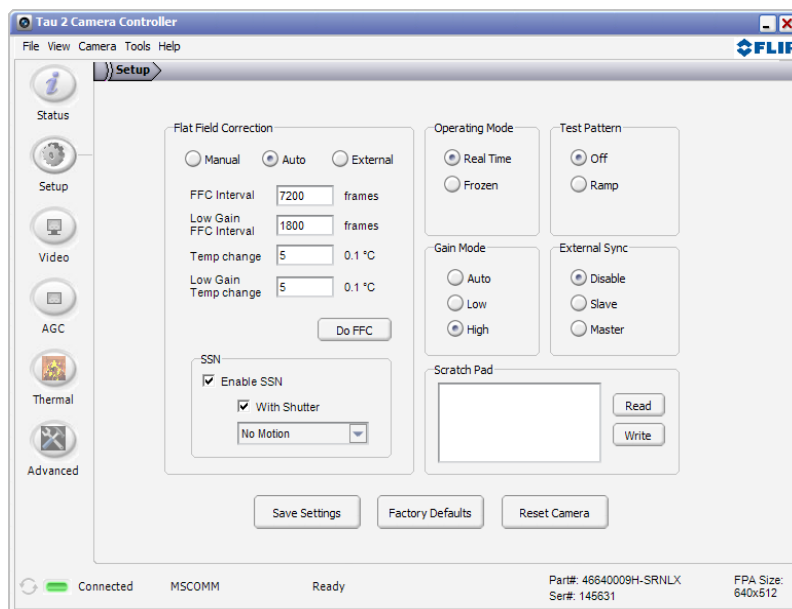
For a FLIR Tau core with a resolution of 336x256 pixels use:

Left, Top (X, Y)	-168	128
Right, Bottom (X, Y)	168	-128

For a FLIR Tau core with a resolution of 324x256 pixels use:

Left, Top (X, Y)	-162	128
Right, Bottom (X, Y)	162	-128

After entering the correct values click on “Set”. Additionally these settings must be saved permanently. To achieve this, go to the Setup tab and click to Save Settings.



Without “Set” and “Save Settings”, settings will be lost with the next power cycle and overlay cannot work.

## **2.2 Configuration of ThermalCapture 2.0**

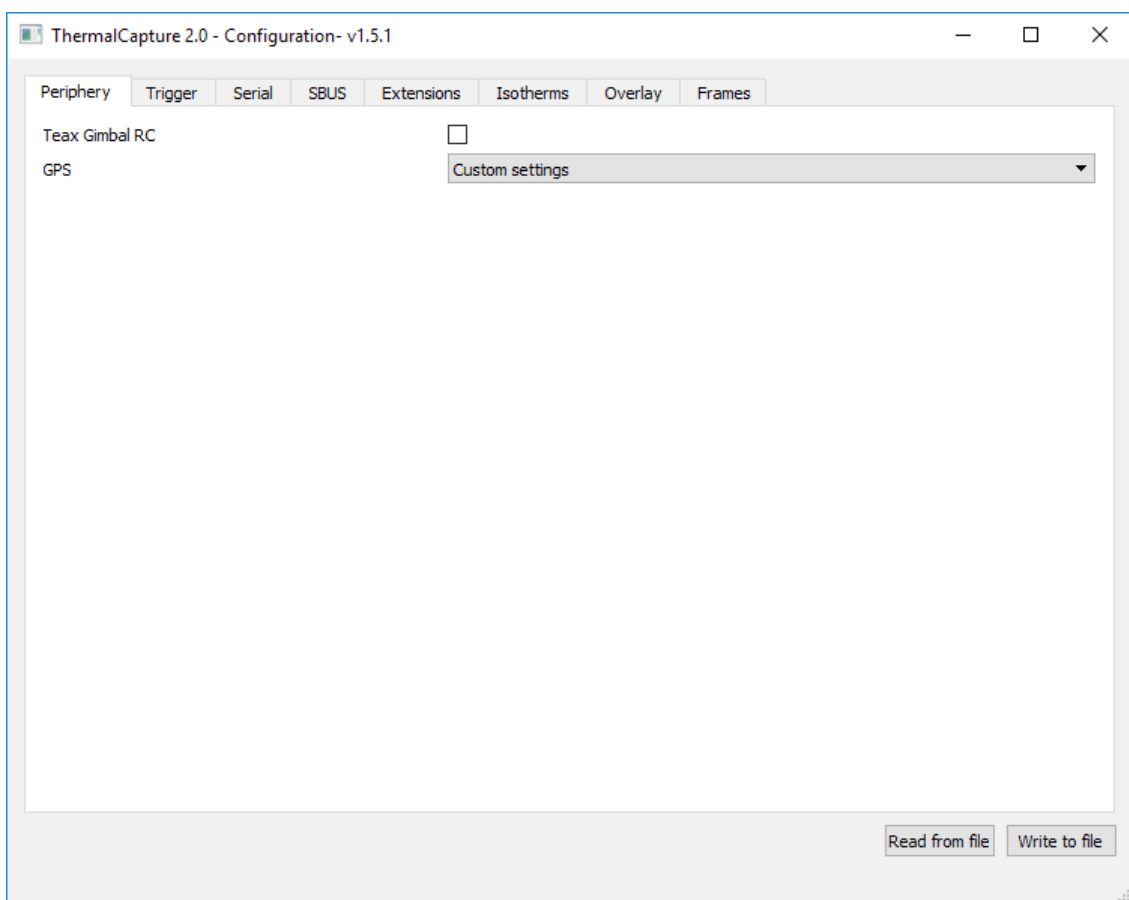
ThermalCapture is configured by placing a TCCONFIG.BIN file in the root directory of the SD card onto which data is recorded. During boot-up ThermalCapture parses this file and stores the included parameters as new default. If no configuration file is found, the default configuration is written to the sd card. Creation of this files is done by using ThermalCapture configuration tool, which is available here: <http://thermalcapture.com/thermalcapture-configurator>

The button “Write to file” opens a file dialog in which the root directory of the sd card should be selected as target. The supposed filename “TCCONFIG.BIN” must be used to allow ThermalCapture 2.0 to read it. The file can also be saved to a different destination and copied to the sd card manually later on.

## 2.2.1 Periphery

The *Periphery* tab allows easy access to preconfigured settings for various devices:

- TeAx Gimbal RC
- ThermalCapture GPS Receiver - based on u-blox 6 SuperSense® chipset
- ThermalCapture GPS Receiver - based on u-blox 8 Multi GNSS UBX-M8030-KT chipset



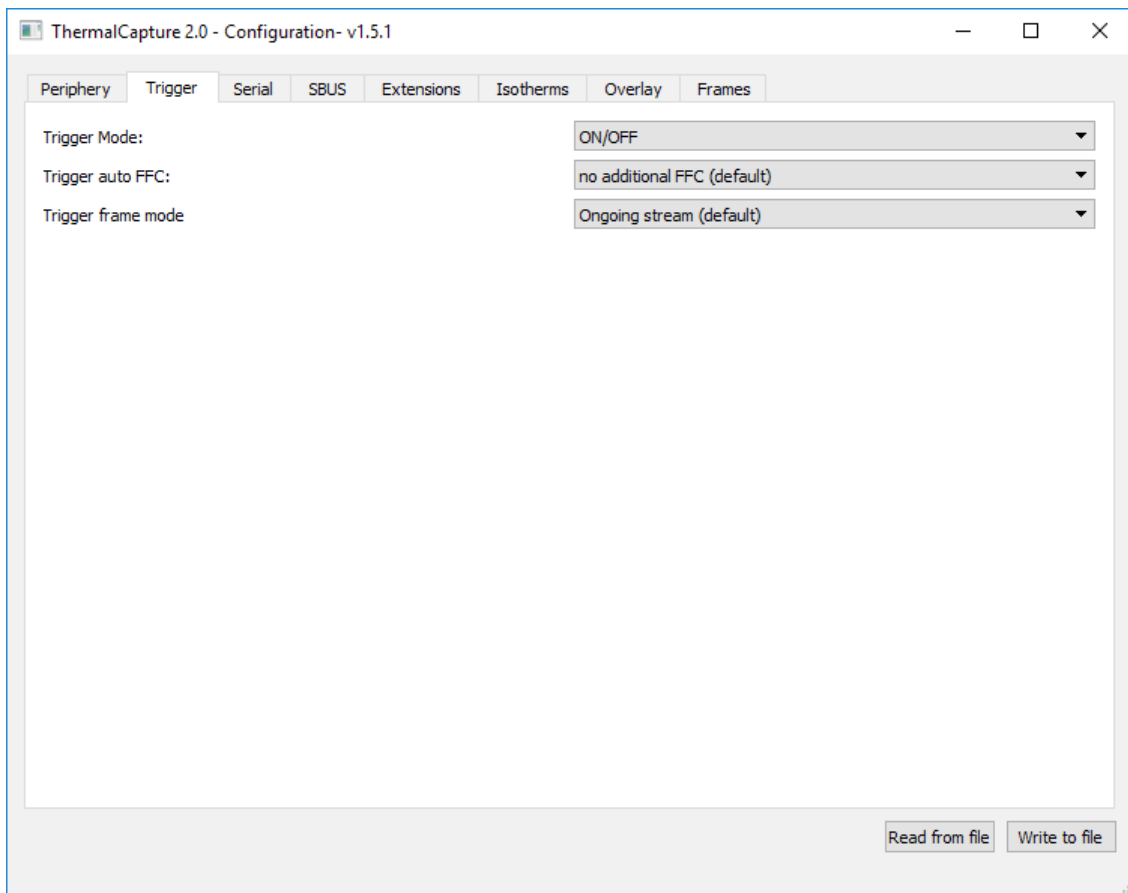
## 2.2.2 Trigger detection

**Trigger Mode** ThermalCapture can be configured to different types of trigger signals. These choices are possible:

- Standard trigger detection ON/OFF
- SBUS
- Serial input
- PWM
- PWM (inverted signal)
- PPM

**Trigger auto FFC** ThermalCapture can be configured to enforce a flat field correction every time a recording is started.

**Trigger frame mode** ThermalCapture can be configured to record an ongoing stream of images or just one single frame when recording is started.



### Trigger Mode Serial Input protocol

The serial interface is a pass through for commands specified in the Tau2 Quark Software IDD. The serial input must be active and is then accessible via USB and the trigger pin. Additional commands are implemented as follows:

Additional commands:

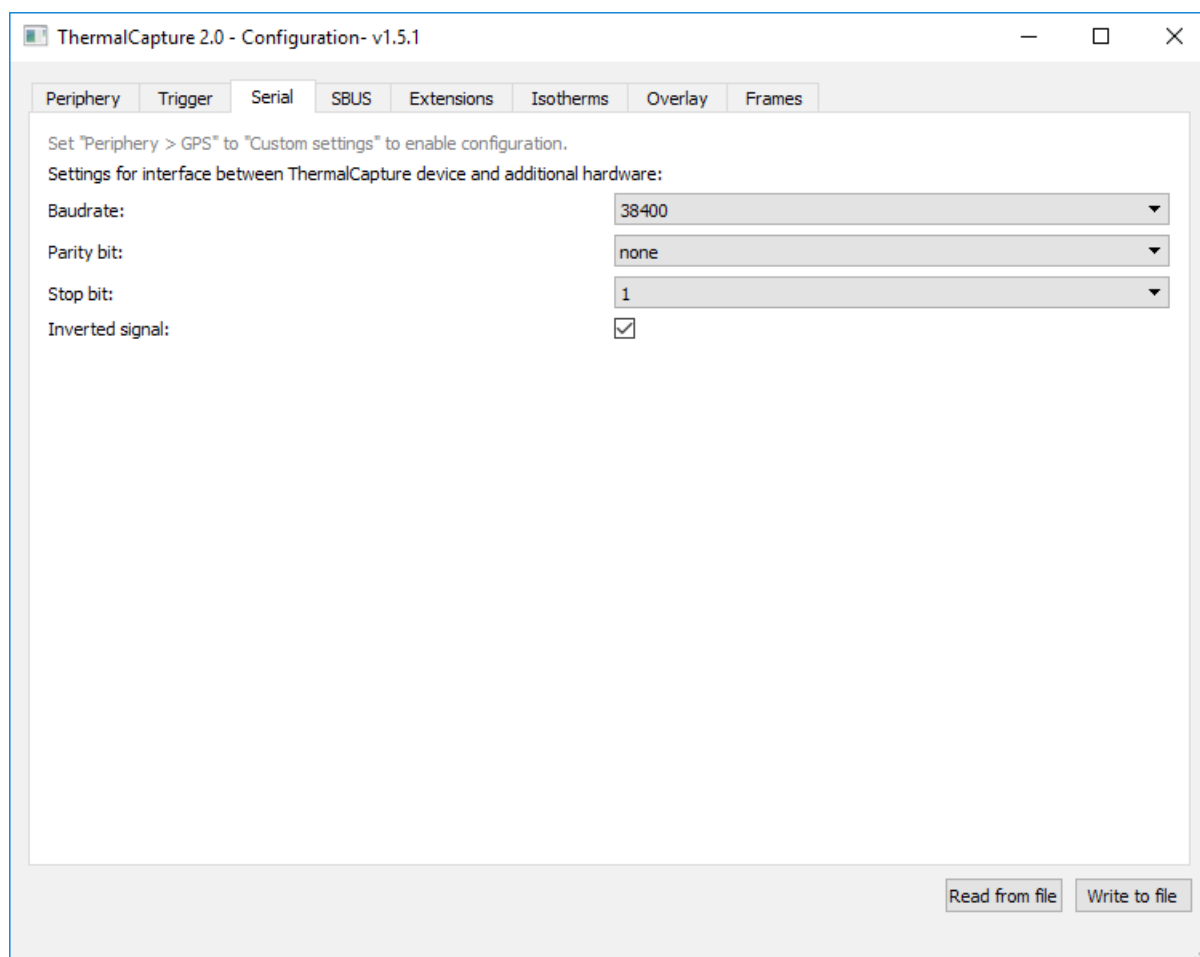
ID	Fuction Code (hex)	Command	Description
240	0xF0	TEAX_IMPLEMENTATIONS	Sets various commands for TeAx products

Byte Count	Argument (I.e, Data Bytes) (hex)	Notes
Set Cmd: 2 & Reply: 2	Bytes 0-1: 0x0000 = TRIGGER_FRAME_MODE_ONGOING_STREAM 0x0001 = TRIGGER_FRAME_MODE_SINGLE_FRAMES 0x0100 = OVERLAY OFF 0x0101 = OVERLAY ON	

### 2.2.3 Serial interface

If the serial input (see chapter 1.1.3) is used, it needs to be configured for a specific data source. ThermalCapture 2.0 is delivered together with a configuration software to set up this serial interface. This chapter describes how to use the TC-Configurator software.

If ThermalCapture 2.0 is used together with the official TeAx GPS receiver no configuration file is needed. ThermalCapture 2.0 comes pre-configured for this add-on.



Settings for the serial interface are communicated to ThermalCapture 2.0 by generating a configuration file and saving it onto the sd card, which is used for picture storage. This file contains information about the Baudrate, Parity Bit-, Stop Bit- and Inversion-settings. These settings must match with the settings of the connected hardware.

- Supported Baudrates range from 1200 to 115200
- Parity can be set to “none”, “odd”, or “even”
- 1 or 2 Stop bits
- Inverted signal check box determines, if inversion is active or not

Required settings for TeAx GPS receiver are the following ones:

Baudrate: 38400  
Parity bit: none  
Stop bit: 1  
Inverted signal: yes

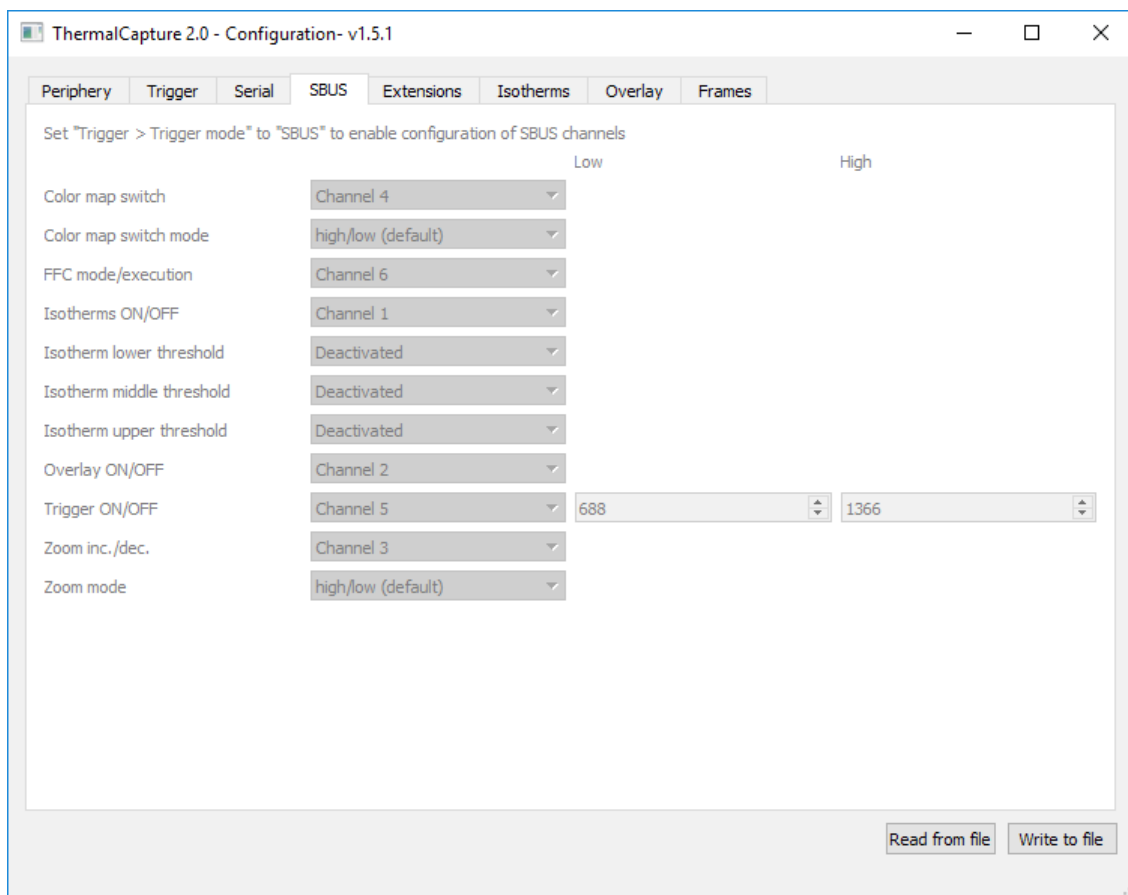
ThermalCapture comes preconfigured with this settings. They only have to be re-applied if changed before.



## 2.2.4 SBUS configuration

ThermalCapture can be controlled via SBUS. Adjustable features are the following:

- Color-palette for live video
- FFC mode/execution: Switch between Auto/manual and enforced execution of a FFC.
- Isotherms activated/deactivated the isotherms in live video
- Isotherms thresholds changes the lower/middle/upper thresholds of the isotherms.
- Activate/Deactivate overlay of hotspot marker in live video
- Trigger Start/Stop/Single recording. Switch between ongoing stream, stop recording and single frame capture. In stream mode the trigger starts/stops recording. In single frame mode a single frame is recorded when the trigger is started.
- Digital zoom level in live video



For each feature a single SBUS channel can be assigned.

### **2.2.5 Extensions**

The two extension lines of ThermalCapture can be configured for specific tasks. Currently its possible to synchronize several ThermalCaptures via expansion line 1 and enforce a FFC event via line 0. Please contact us before using this feature.

### **2.2.6 Isotherms**

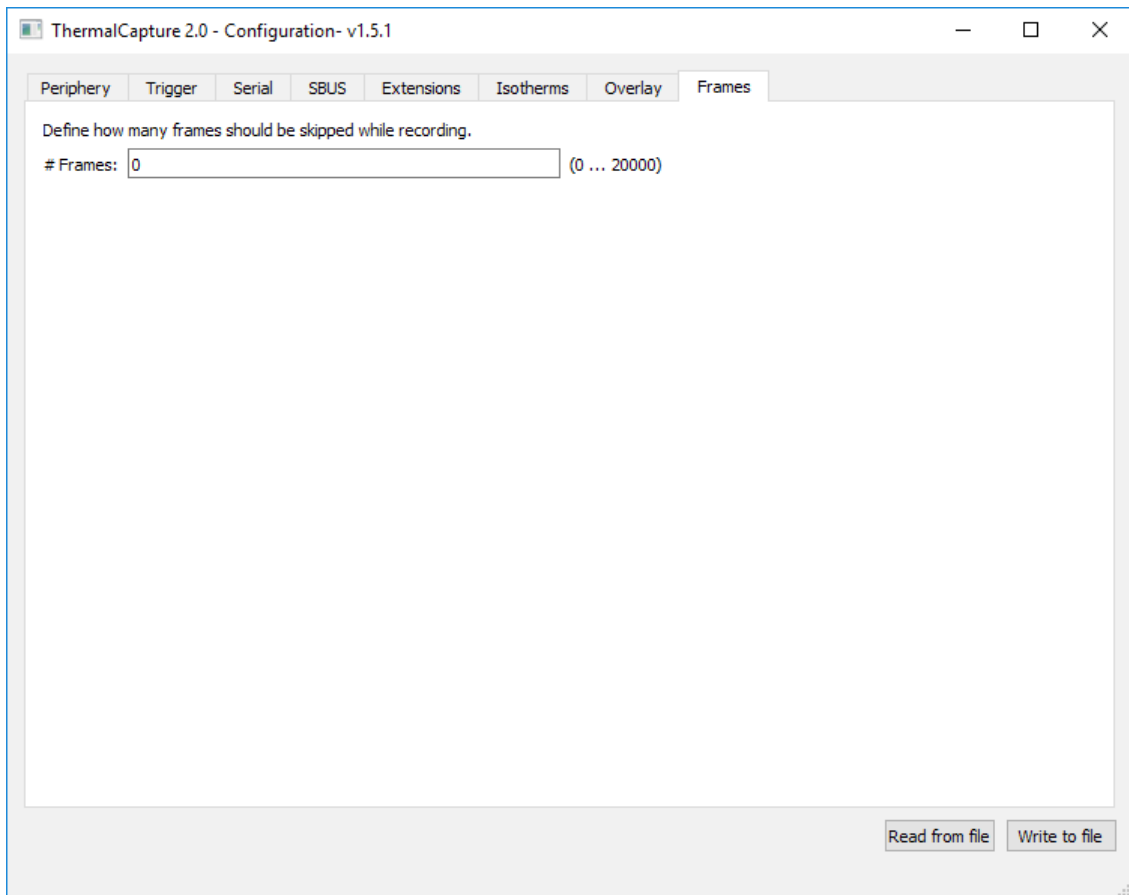
The isotherms mode for live view can be configured in this screen. In can be activated/deactivated and the default lower/middle/upper thresholds can be configured.

### **2.2.7 Overlay**

The overlay function can be configured to be automatically on upon startup.

## 2.2.8 Frame skip

For some applications it may not be necessary to record all frames coming from the Tau Core in order to reduce the amount of data in post-processing steps. Therefore it is possible to chose the amount of frames that should be skipped between each recording.



The Tau Core delivers frames with 8.33Hz in the not export restricted versions. If a recording frame rate of approximately 1Hz is desired a value of 7 skipped frames does exactly this. The result is 1 frame gets recorded; the next 7 frames are discarded; 1 frame is recorded; and so on.

This parameter is also useful if only one frame should be recorded with each trigger event. If for example the trigger is activated automatically by the waypoint functionality of the UAV, this parameter should be set to a number  $> 10$ . That ensures that even, if the UAV activates the trigger for 1 second, only one frame is stored. The number can be set even higher, because the counter is reset with every new trigger event.

## 3 ThermalCapture 2.0 Usage

ThermalCapture 2.0 was designed to be used with UAVs. Its task is to store thermal image data from the TAU core, when the trigger signal occurs. So there is only limited human intervention necessary to operate ThermalCapture 2.0. In the following the complete process from power up through data recording to power down is described.

### 3.1 Power On

You can power on with or without a connected sd card. ThermalCapture 2.0 begins to boot immediately when 5V is supplied to the MINI-USB connector or to the 8-pin connector. During boot up the LED on the back side glows red. This will take one or two seconds. After boot up ThermalCapture 2.0 waits for the sd card and the LED glows green. When the sd card was found and ThermalCapture 2.0 is ready to work, this LED will start blinking green.

### 3.2 Data Recording

When the trigger input is pulled to ground images from the TAU core are captured and stored to the sd card. The LED on the back side will flicker red and the letters "REC" are shown in the analog video output. Do not power off ThermalCapture 2.0 or release the sd card when the red LED is flickering. The file-system of the sd card may get damaged. If an error occurred while writing the data to the sd card the LED will blink green and red alternately. This will also happen if the sd card is full.

### 3.3 Power Off

Every time the LED does not flicker red, it is safe to remove the sd card or to power off ThermalCapture 2.0. Power off can only be done by turning off the power supply which is connected to the MINI-USB connector or 8-pin connector.

## 4 Post Processing with ThermoViewer Software

ThermoViewer is the post-processing software provided by TeAx Technology to process RAW data captured with ThermalCapture 2.0. It allows the user to quickly browse through recorded data and tune every single frame into the perfect result. For further usage of the data it can be exported into images like JPG and PNG, videos and CSV data. CSV is especially useful, if further automatic data processing follows. There is also the option to export data into radiometric JPGs. Those files can be opened with powerful FLIR tools for deeper analysis, or automatic report generation.

ThermoViewer user manual is available here:

<http://thermalcapture.com/thermoviewer-users-manual>

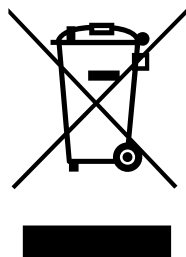
ThermoViewer is available for download here:

<http://thermalcapture.com/thermoviewer>

## 5 Disposal and recycling information

You must dispose of this device properly according to local laws and regulations. Because this device contains electronic components, the device must be disposed of separately from household waste. When this device reaches its end of life, contact local authorities to learn about disposal and recycling options.

### 5.1 European Union — Disposal Information



The symbol above means that according to local laws and regulations your product and/or its battery shall be disposed of separately from household waste. When this product reaches its end of life, take it to a collection point designated by local authorities. The separate collection and recycling of your product and/or its battery at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

## 6 Contact

TeAx Technology UG (haftungsbeschränkt) Hofstädtr. 8 57234 Wilnsdorf Germany

Internet: <http://www.thermal-capture.com/>

E-mail: [support@teax-tec.de](mailto:support@teax-tec.de)

WEEE: DE47944405

Please provide the following information about the device when you make an inquiry:

- Name and manufacturer of your system
- Item and serial no. of the product

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