

# Gain Calibration Procedure

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## Application Note



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## 1.0 Document

### 1.1 Revision History

Version	Date	Comments
100	10/26/2011	Initial Release

### 1.2 Scope

This document describes the procedure to perform a Gain Calibration. This may be necessary if the lens of the camera is changed.

The FLIR website will have the newest version of this document as well as offer access to many other supplemental resources: <http://www.flir.com/cvs/cores/resources/>

Here is a sample of some of the resources that can be found:

Document Title	Document Number	Description
Tau Quick Start Guide	102-PS242-01	Quick Start Guide for first-time use
FLIR Camera Controller GUI User's Guide	102-PS242-02	Detailed Descriptions for functions and adjustments for FLIR cameras using the FLIR Camera Controller GUI
Tau 2 Product Specification	102-PS242-40	Product specification and feature description
Tau 2 Electrical IDD	102-PS242-41	Written for Electrical Engineers to have all necessary information to interface to a Tau 2 camera
Tau 2/Quark Software IDD	102-PS242-42	Written for Software Engineers to have all necessary information for serial control of Tau 2 and Quark
Assorted Mechanical Drawings and Models	Various	There are drawings and 3D models for various camera configurations for mechanical integration
Application Notes	Various	Written for Systems Engineers and general users of advanced features such as Gain Calibration, Supplemental FFC Calibration, NVFFC Calibration, Camera Link, On-Screen Symbology, AGC/DDE explanation, Camera Mounting, Spectral Response, Optical Interface for lens design, and others.

There is also a large amount of information in the Frequently Asked Questions (FAQ) section on the FLIR website: <http://www.flir.com/cvs/cores/knowledgebase/>. Additionally, a FLIR Applications Engineer can be contacted at 888.747.FLIR (888.747.3547).

## 2.0 Requirements

This procedure applies to FLIR's Tau 320, Tau 640, Tau 2, and Quark cameras and requires access to the following:

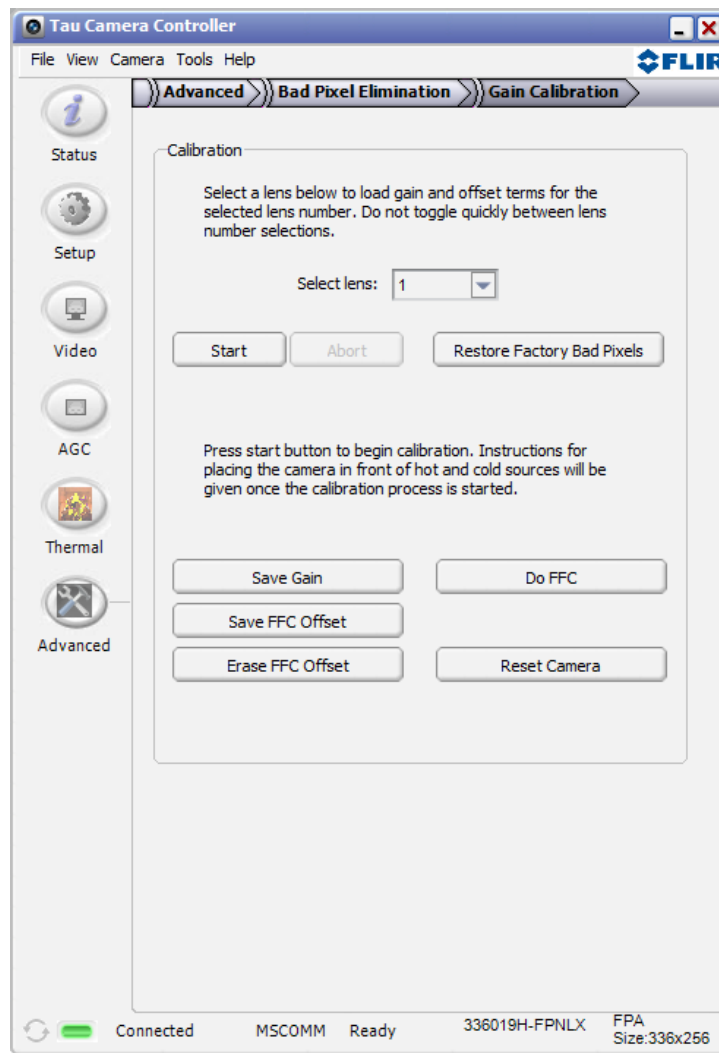
- FLIR Camera Controller GUI version 1.0.0.92 or higher (available at <http://www.flir.com/cvs/cores/resources/software/tau/>)
- Two blackbodies
- FLIR camera with serial communications (often over USB) to a computer
- Analog video monitor

## 3.0 Setup

1. Install the FLIR Camera Controller GUI on your Windows computer. If you have a previous version of the GUI installed, you must first uninstall it using Windows Add/Remove Programs. It is a good idea to also delete the "Camera Controller GUI" folder in the Program Files directory. For Windows XP 32-Bit, this is typically "C:\Program Files\FLIR Systems\Camera Controller GUI". For a 64-Bit computer, this is typically "C:\Program Files (x86)\Flir Systems\Camera Controller GUI". Refer to the FLIR Camera Controller User's Guide available on the web for more details on installation and connection to a camera.
2. Before opening the software, copy "GainCalibrationCameraControls.dll" to the installation directory. This will be the same directory mentioned in the previous step.
3. Connect the camera to the computer. If you are using a VPC Module, the camera will receive power and communication over the USB cable. Open the FLIR Camera Controller GUI software. Click on Tools => Connection and connect with a baud rate of 921600. If a successful connection is made, a green LED will activate in the lower left corner of the GUI window. If you are having trouble connecting, open the Device Manager and verify the COM# for the Silicon Labs serial port.
4. Turn on one of the blackbodies. The goal is to have two uniform scenes that are approximately 20 degrees C apart from each other. Typically, it is sufficient to set one blackbody to 45 C and let the other remain at room temperature. This will likely take some time to reach equilibrium, so please be patient. We recommend allowing about 30 minutes for a blackbody source to reach operating temperature and stabilize. If no blackbodies are available, it is possible to perform a rough calibration on a relatively uniform, warm surface like a hand and a cold surface like a notebook.

## 4.0 Procedure

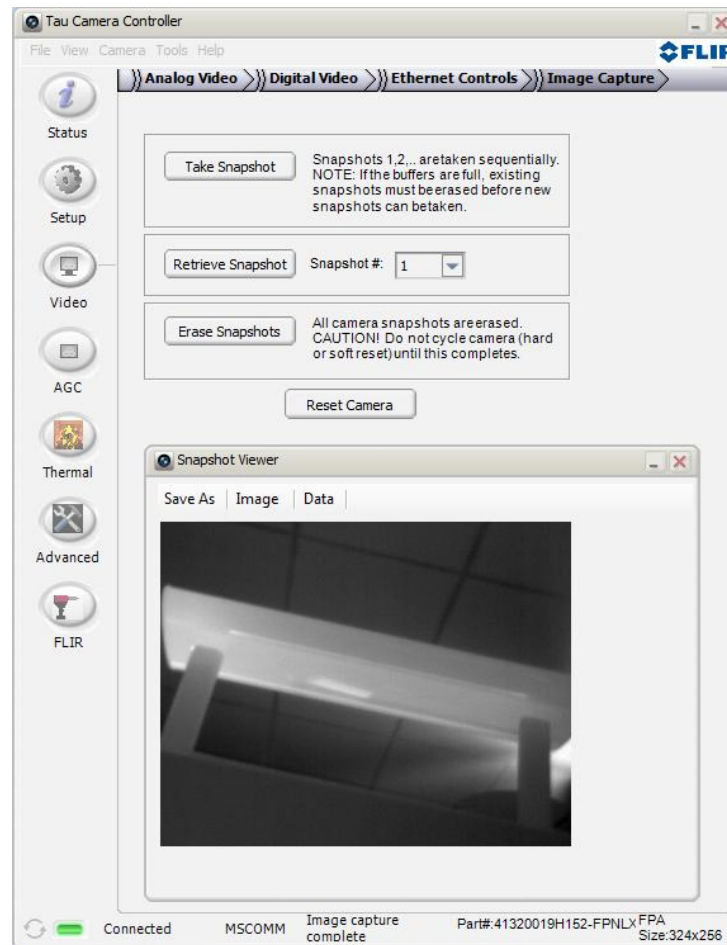
1. Navigate to the Gain Calibration Tab in the GUI, it will be found under the Advanced Tab. If you have a Tau 2 or Tau 640, you can select lens 2 for the calibration. This will preserve the factory calibration in lens 1, allowing you to save a second calibration for lens 2. It is also possible to save separate lens maps for lens 1 and lens 2 for use with a dual FOV optic. Keep the "Backup Current Gain Map" box checked. This will copy the existing gain map from the camera so that it can be recovered at a later time. If you have a Quark or Tau 320, the only option is to overwrite the calibration data for Lens 1, so it is a good idea to keep the "Backup Current Gain Map" box checked. Click Start to begin the process. **Do not navigate away from this pane once you click start because it could change camera settings required for calibration.**



**Figure 1: FLIR Camera Controller GUI – Gain Calibration Tab**

2. The camera will monitor its internal temperature and verify stability. If the camera has not been running long enough, it will tell you that the temperature difference is too great. If it is within tolerance, the start button will change to “Capture1”, the camera will disable all correction terms, and it will prompt you to place the hot blackbody in front of the camera. The optimal blackbodies will have a temperature difference of 20 C and be in the range that the camera will typically be imaging. It is best to flood the aperture of the lens so that the blackbody is all the camera can see. Click “Capture1” and keep the hot source in front of the camera until prompted to remove it.
3. It will now prompt for a cold blackbody to be placed in front of the camera. Flood the aperture with a cold blackbody and click “Capture2”. It will take some time to capture and then it will calculate the new gain and perform an FFC. The correction terms will then be enabled and the quality of the image must be assessed. Keep the camera pointed at the blackbody until this step is complete so that it can use the blackbody for an External FFC if the camera is not equipped with an internal shutter.

4. At this point, the gain is stored in the camera's DRAM and has not been saved to FLASH. Assess the image using an analog monitor to ensure that the calibration was performed correctly. If you do not have an analog monitor, you could also go to the Video => Image Capture tab to take and retrieve a snapshot. It is a good idea to first Erase Snapshots to ensure that the new capture is saved in buffer 1. If the calibration is not satisfactory, reset the camera and start again.



**Figure 2: FLIR Camera Controller GUI – Image Capture**

5. If the calibration was successful, click “Save Gain”. The camera will take about 30 seconds to copy the calibration to the camera's FLASH memory, overwriting the previous calibration. Do not remove power to the camera during this time.
6. Verify that the calibration was saved successfully by resetting the camera and evaluating the image for the applied gain. Resetting the camera will also restore previously saved power on default settings.
7. If you performed this calibration on Lens 2, remember to make sure to select Lens 2 and then Save Settings on the Setup Tab to ensure that this calibration map is loaded when the camera starts up.

8. If you need to restore, a previous gain calibration, you can click the “Restore Gain” button. You will be prompted to select the gain map. The GUI saves the gain map with the SN of the camera and the date that the map was copied from the camera. Select the correct file and click Open.

**Note:** Tau 2 / Quark cameras also have the ability to restore factory bad pixels. This will remove all user-defined bad pixels and restore the factory bad pixel map. This can be useful if the Bad Pixel Elimination Tab was used to erroneously mark pixels that are not actually bad.