

NVFFC Calibration and Operation

Application Note



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1.0 Document

1.1 Revision History

Version	Date	Comments
100	10/14/2011	Initial Release

1.2 Scope

Many FLIR cameras support a feature known as Non-Volatile Flat Field Correction (NVFFC). The NVFFC is a stored correction map that is applied to the image automatically at the next power-up. This feature is particularly useful for shutterless configurations. This document describes the process of creating an NVFFC and its operation.

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

The following FLIR cameras support NVFFC:

- Tau 320 (minimum software version 2.78)
- Tau 640
- Tau 2
- Quark

The camera software revision can be verified in the FLIR Camera Controller GUI by clicking Help→About. The software will be described as “Main app” and the last two values are reported above. It is possible to update the software on a Tau 320 to enable the use of this feature. Contact a FLIR Applications Engineer for more details.

The FLIR Camera Controller GUI can be obtained at <http://www.flir.com/cvs/cores/resources/software/tau/>. Refer to the FLIR Camera Controller GUI User’s Guide for information on installing the FLIR Camera Controller GUI or connecting to the camera.

3.0 NVFFC Operation

The Non-Volatile Flat Field Correction is applied when the camera is first powered on.

When there is no correction map stored in the NVFFC memory location, the camera will exhibit the following behavior for the different FFC Modes:

- **Automatic:** FFC is performed automatically at start-up and periodically thereafter as triggered by elapsed time or temperature change. (Both parameters may be modified by the user.) FFC is also performed upon command. For cores with an internal shutter, the shutter is automatically moved in and out of the FOV when FFC takes place. Automatic mode is not recommended for shutterless configurations because there is no assurance that the core will be imaging a uniform source when it initiates an automatic FFC.
- **Manual:** FFC is performed automatically at start-up and only upon command thereafter. For those configurations that include an internal shutter, the shutter is automatically moved in and out of the FOV when FFC takes place. This mode is recommended when it is desirable that an FFC event not take place at any arbitrary time (for example, when tracking a target). Repeated FFC events are necessary to correct for temperature drift in the camera. For this reason, it may be necessary to command FFC more frequently during startup or when the camera temperature changes quickly.
- **External:** FFC is performed only upon command. The shutter control signals are not exercised even if the core includes an internal shutter. That is, offset terms are generated based upon whatever the core is imaging at the time FFC is commanded. (It is recommended to subdivide the entire FOV with a uniform scene prior to commanding external FFC.) For configurations that contain no internal shutter, external FFC mode is the preferred mode.

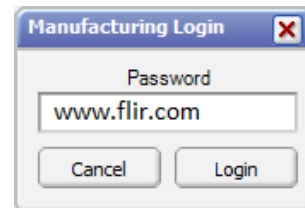
When there is an NVFFC stored in the camera, the behavior will be as follows:

- Automatic: FFC is *not* automatically performed at start-up. Instead the stored NVFFC map is applied for the first 5 seconds after power-up, after which time an automatic FFC event takes place. Normal FFC operation will continue after this time.
- Manual mode: FFC is *not* automatically performed at start-up. Instead the stored NVFFC map is applied and subsequent FFC is only applied upon command.
- External: The stored NVFFC map is applied at start-up. Subsequent FFC is only applied upon command.

4.0 Calibration Procedure

It is possible to save the currently-applied FFC map to non-volatile memory. Whenever possible, this should be performed when the camera is integrated into the final operating system and environmental conditions for typical startup should be replicated. For example, if a large lens will be exposed to the sun and the camera remains powered off most of the time, the lens may have a large temperature gradient.

1. Install the FLIR Camera Controller GUI.
2. Open the FLIR Camera Controller and connect to the camera.
3. The Advanced Tab contains many features that can be considered to be for advanced users. For this reason, a special keystroke and password is required to display the Advanced Tab. The keystroke is **Ctrl+Shift+a** and the password is `www.flir.com`. After the keystroke is performed, the following dialog will appear. Note that the text in the following image is added and a password typed will display as asterisks.



Note: This is only intended for sophisticated users and it is possible to break the camera if the incorrect operation is performed.

4. Navigate to the Gain Calibration Tab:

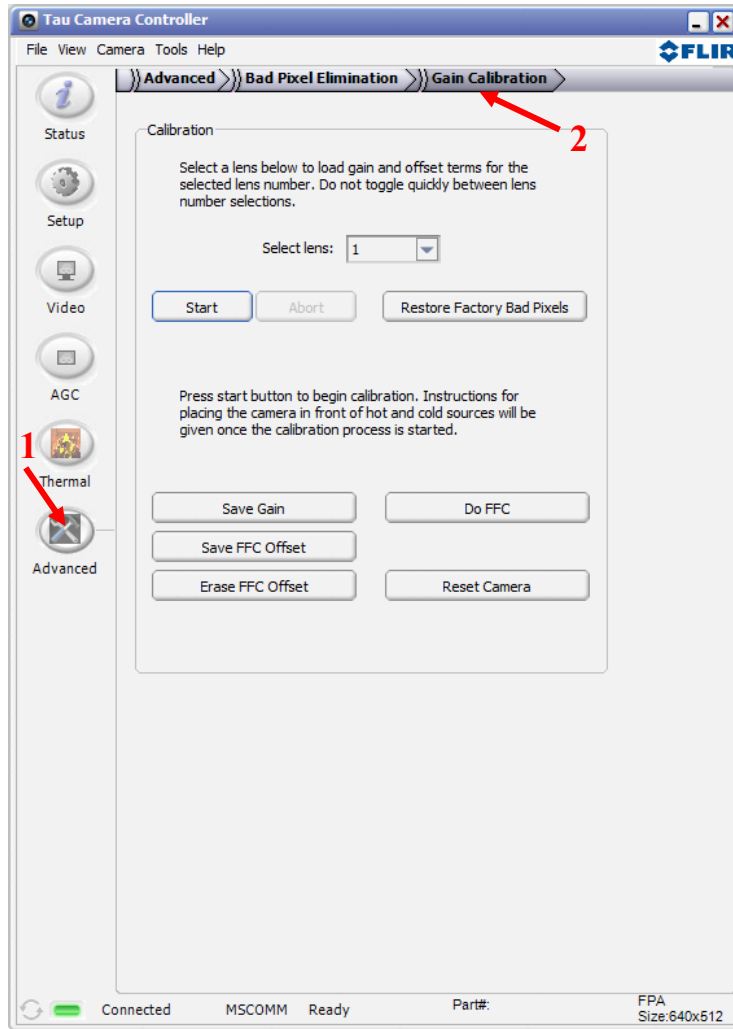


Figure 1: FLIR Camera Controller GUI – Gain Calibration Tab

Save FFC Offset: Store the currently-applied map to non-volatile memory.

Erase FFC Offset: Erase the NVFFC from camera memory.

