

A Guide to Transitioning from the Flea[®]2 to the Flea[®]3 FireWire Camera

Technical Application Note TAN2010001

Revised June 24, 2011

1.1 Subject

Technical Application Note (TAN2010001): A Guide to Transitioning from the Flea2 to the Flea3 FireWire Camera

1.2 Applicable Product(s)

- Flea2 FL2-xx
- Flea3 FL3-FW (all models)

1.3 Application Note Description

The *Flea3* was developed as the next generation replacement for the popular *Flea2* camera. It supports all of the features of the *Flea2*, while adding new Sony image sensors and a host of new features, including an on-camera frame buffer, non-volatile user data storage, new trigger modes and improved imaging performance. The *Flea3* is Point Grey's first camera to conform to version 1.32 of the Instrumentation & Industrial Digital Camera (IIDC) specification.

The purpose of this Technical Application Note is to:

1. Outline the primary similarities and differences between the two cameras; and
2. Offer suggestions and pointers to end users for migrating their custom applications from the *Flea2* to the *Flea3*.



For customers upgrading from a Flea2 camera, Point Grey strongly encourages putting the Flea3 through a full requalification process. The [Point Grey Research Evaluation Program](#) offers qualified customers an excellent opportunity to evaluate the Flea3.



A separate Application Note will be prepared to compare Flea3 to existing Flea2G (FL2G-13S2 and FL2G-50S5) models.

1.3.1 General Considerations

1.3.1.1 Other Reference Documentation

Other useful sources of information regarding specific features of the Applicable Product(s) include:

- [Flea2 Getting Started Manual](#)
- [Flea3 Getting Started Manual](#)
- [Flea2 and Flea3 Technical Reference Manuals](#)

1.3.1.2 Testing Tools

To configure and test the information presented in this TAN:

1. **Connect the camera's GPIO pins to an oscilloscope or external trigger source.** By connecting the appropriate GPIO pins to an external trigger source or oscilloscope, you can observe the differences in general purpose input/output capability of the Applicable Product(s). Consult your camera's *Technical Reference* or *Getting Started* manual for:
 - a. GPIO connector pin layouts; and
 - b. GPIO electrical characteristics
2. **Download the FlyCapture SDK.** The SDK includes numerous [example programs](#) that demonstrate various camera features. Specific examples that relate to this TAN include *CustomImageEx*, *AsyncTriggerEx* and *SaveImageToFlashEx*.
3. **Access the camera's register space.** The easiest way to try this is using the FlyCap demo software included with the *FlyCapture SDK*. For register definitions and individual bit descriptions, please refer to the *Point Grey Digital Camera Register Reference* or your camera's *Technical Reference* manual.

1.3.2 Mechanics

The Flea2 and Flea3 share the same form factor and general mechanical properties.

| Description | Flea2 | Flea3 |
|------------------------------------|--|-------|
| <i>IR cut filter properties</i> | The infrared cut-off filter used with color versions of the cameras is the same and has the same transmittance properties. | |
| <i>GPIO connector</i> | Hirose HR25 8 pin connector | |
| <i>CCD sensor placement on PCB</i> | The chip and lens holder mounting holes are centered relative to the four corner mounting holes. | |
| <i>Overall dimensions</i> | Industry standard 29mm x 29mm x 30mm (excluding lens holder and 1394/GPIO connector) | |
| <i>Lens holder</i> | C-mount | |
| <i>Case description</i> | Black zinc (casted) with black aluminum top and Point Grey logo | |
| <i>Mass</i> | 58g (excluding including optics) | |
| <i>Tripod mounting</i> | Secured by four (4) M2x2mm screws | |

| | |
|---|---|
| <i>bracket</i> | Meets ISO and ASA standards |
| <i>Mounting holes</i> | Three (3) M3x2.5mm holes on the bottom face Four (4) M2x2mm holes on the bottom face (for mounting bracket) Two (2) M2 holes on the top face |
| <i>Removable glass / IR filter system</i> | BW models: protective dust glass between sensor and optics COL models: IR filter between sensor and optics Glass / IR filter screwed into place to allow easy removal |

1.3.3 GPIO Properties

| Pin | Flea2 | Flea3 |
|--------------------------------|---|--|
| <i>GPIO0 (Pin 1)</i> | Bi-directional input/output Default direction: input Default function: trigger Drive strength: 10 mA at 30 V | Opto-isolated input (+3.3 V to +30 V) Direction: input Default function: trigger in Input delay time: 4 μ s |
| <i>GPIO1 (Pin 2)</i> | Bi-directional input/output Default direction: output Drive strength: 10 mA at 30 V | Opto-isolated open collector output (+3.3V to +30V) Direction: output Default function: strobe Drive strength: 25 mA at 30 V |
| <i>GPIO2 (Pin 3)</i> | Bi-directional input/output Default direction: output Drive strength: 10 mA at 30 V | Bi-directional input/output Default direction: output Drive strength: 25 mA at 30 V |
| <i>GPIO3 (Pin 4)</i> | Bi-directional input/output Default direction: input Drive strength: 10 mA at 30 V | Bi-directional input/output Default direction: input Drive strength: 25 mA at 30 V |
| <i>GND (Pin 5)</i> | Ground pin for all pins | Ground pin for bi-directional IO, Vext, +3.3 V |
| <i>GND (Pin 6)</i> | Ground pin for all pins | Ground pin for opto-isolated IO pins |
| <i>V_{EXT} (Pin 7)</i> | Power camera externally | Same functionality as Flea2, except on FL3-FW-14S3 and FL3-FW-20S4 models, V _{EXT} is tied to 1394b bus power. This circuit allows bus-powered cameras to supply V _{EXT} with max 300mA. For more information, see the FL3-FW <i>Technical Reference</i> . |
| <i>+3.3V (Pin 8)</i> | Power external circuitry up to a total of 150 mA. | |

1.3.4 Other Hardware and Electronics

| Description | Flea2 | Flea3 |
|---------------------|---|---|
| CCD imaging sensors | 648x488 Sony ICX424 1032x776 Sony ICX204 1392x1032 Sony ICX267 1624x1224 Sony ICX274 | 648x488 Sony ICX618 648x488 Sony ICX424 648x488 Sony ICX414 1032x776 Sony ICX204 1392x1032 Sony ICX267 1624x1224 Sony ICX274 |
| IEEE-1394 interface | 9-pin IEEE-1394b (800Mb/s) Connector flush with case Secure jack screw connector | |
| Power consumption | Less than 2.5 W | |
| A/D converter | Analog Devices, 12-bit resolution | |
| Temperature Sensor | None | On-board; accessible via control and status registers (CSRs) |
| Voltage Sensor | None | |
| Current Sensor | None | |
| LED Behavior | Same | |

1.3.5 Firmware

This section does not address the significant number of firmware enhancements that have been added in the *Flea3*, but focuses on functional differences between the two cameras that could affect integration of the *Flea3* in existing *Flea2*-based applications. Users are encouraged to download the documents listed in Section 1.3.1.1: Other Reference Documentation for assistance with terms, camera specifications, and register definitions.



Many default startup (power-up) parameters, such as resolution, frame rate, gain, and shutter, have changed in the Flea3. The memory channels on the Flea3 can be used for creating new default settings.



Point Grey cannot predict if or how all of the following differences may affect user applications. This section provides recommendations on how to address some of the most obvious differences in functionality.

1.3.5.1 Format_7

| Description | Flea2 | Flea3 |
|----------------------|--|---|
| Pixel Formats | Mono8, Mono16, Raw8, Raw16, YUV411, YUV422, YUV444, RGB8 | Mono8, Mono12, Mono16, Raw8, Raw12, Raw16, YUV411, YUV422, YUV444, RGB8 |
| Modes | | |
| <i>Mode_0</i> | Region of interest only | Region of interest only; yields fastest frame rates |
| <i>Mode_1</i> | 2X vertical binning and 2X horizontal subsampling; values are aggregated and averaged; limited or no increase in intensity | 2X vertical and 2X horizontal subsampling; values are aggregated without averaging; increased intensity |
| <i>Mode_2</i> | 2X vertical binning; values are aggregated and averaged, with limited or no increase in intensity | Not available |
| <i>Mode_3</i> | Region of interest only | Not available |
| <i>Mode_4</i> | Not available | 2X vertical binning and 2X horizontal subsampling; increased frame rate; available on color models only |
| <i>Mode_5</i> | Not available | 4X vertical and 4X horizontal subsampling; values are aggregated without averaging; increased intensity; available on select models |
| <i>Mode_7</i> | Not available | Region of interest only; improved imaging performance |

1.3.5.2 Control and Status Registers (CSRs)

| Description | Flea2 | Flea3 |
|----------------------------|--|--|
| Redefined Registers | | |
| <i>LUT</i> | 1A40h – 1A44h Point Grey implementation | 80000h – 80048h IIDC v1.32 implementation |
| <i>XMIT_FAILURE 12FCh</i> | No presence bit | Presence bit |
| <i>FRAME_INFO 12F8h</i> | No inquiry bits for each embedded information type | Inquiry bits for each information type |
| New Registers | | |
| <i>Y16 Endianness</i> | Controlled using IMAGE_DATA_FORMAT 1048h | DATA_DEPTH 630h IIDC v1.32 implementation |

| | | |
|--|------|-------------------------|
| <i>Mirror Image</i> | | MIRROR_IMAGE_CTRL 1054h |
| <i>Y8 or Y16 Grayscale or Raw Bayer Output</i> | | BAYER_MONO_CTRL 1050h |
| <i>Current Sensor Access</i> | None | CURRENT 1A58h – 1A5Ch |

1.3.5.3 Other Firmware Changes

| Description | Flea2 | Flea3 |
|----------------------------------|---|---|
| <i>IIDC Version</i> | 1.31 | 1.32 |
| <i>Color processing</i> | Color models output greyscale information when run in standard (Format_0 or Format_1) Y8/Y16 modes. The conversion from raw Bayer information to greyscale is done on-board the camera. | |
| <i>Lookup table</i> | 11-bit to 9-bit mapping Three (3) LUT's for RGB | 9-bit to 9-bit mapping Two (2) banks, each containing three (3) channels for RGB |
| <i>Trigger Modes</i> | IIDC modes 0, 1, 3, 14, 15: Supported on all models IIDC modes 4, 5: Supported on 03S2 and 08S2 only | IIDC modes 0, 1, 3, 4, 5, 14, 15: Supported on all models |
| <i>Memory Channels</i> | Two (2) channels for user-defined configuration sets; one (1) channel for restoring to factory default settings | |
| <i>Frame Buffer</i> | None | 32 MB for temporary image storage and re-transmission |
| <i>Non-Volatile Flash Memory</i> | None | 1 MB for data storage |
| <i>Pixel Clocks</i> | Two (2) or more settings; may change with format/mode change | Max two (2) settings; will not change with format/mode change |

1.3.6 Software Support

| Description | Flea2 | Flea3 |
|------------------------------------|-----------|---|
| <i>FlyCapture 2.x Applications</i> | Supported | Supported |
| <i>FlyCapture 1.x Applications</i> | Supported | FlyCap Demo GUI does not support new IIDC 1.32 video formats and other new features. New features are supported in the API. |

Additional Downloads and Support

Access more Technical Application Notes on the web at www.ptgrey.com/support/downloads.

Point Grey Research Inc. endeavors to provide the highest level of technical support possible to our customers. Most support resources can be accessed through the Product Support section of our website: www.ptgrey.com/support.

Creating a Customer Login Account

The first step in accessing our technical support resources is to obtain a Customer Login Account. This requires a valid name, e-mail address, and camera serial number. To apply for a Customer Login Account go to www.ptgrey.com/support/downloads/.

Knowledge Base

Our on-line knowledge base at www.ptgrey.com/support/kb/ contains answers to some of the most common support questions. It is constantly updated, expanded, and refined to ensure that our customers have access to the latest information.

Product Downloads

Customers with a Customer Login Account can access the latest software and firmware for their cameras from our downloads site at www.ptgrey.com/support/downloads. We encourage our customers to keep their software and firmware up-to-date by downloading and installing the latest versions.

Contacting Technical Support

Before contacting Technical Support, have you:

1. *Read the product documentation and user manual?*
2. *Searched the Knowledge Base?*
3. *Downloaded and installed the latest version of software and/or firmware?*

If you have done all the above and still can't find an answer to your question, contact our Technical Support team at www.ptgrey.com/support/contact/.