

Image Capture Procedure

Application Note



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1.0 Document

1.1 Revision History

Version	Date	Comments
010	06/26/2012	Initial Draft
100	08/08/2012	Updated Draft
110	05/20/2013	Section 2.0: Updated “later releases” and to exclude the decimated configs in 14-bit snapshot Section 3.0: 14-bit snapshots only supported in the GUI Section 3.1: Capturing Snapshots to specify approximate number of snapshots for 640 and 160 Section 3.3: Added a new command and updated example of reading snapshots

1.2 Scope

This document describes the software commands and Camera Controller GUI usage for 8-bit snapshot capture, download, and playback using a Tau 2 camera. Both 8-bit and 14-bit snapshot captures are addressed in the GUI procedures. The snapshot feature and command structure described herein is only applicable for the Tau 2.1 release and later releases.

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-PS242-43	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, Bad Pixel Killing, detailed use of Camera Link, Camera Link Accessory Modifications, 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/faqs/tau/all/>. Additionally, a FLIR Applications Engineer can be contacted at 888.747.FLIR (888.747.3547).

2.0 Requirements

The 8-bit capture feature is supported on the following cameras with the snapshot camera option enabled:

- Tau 2.1 and later releases (640, 324, 336, 160, and all decimated configurations)

The 14-bit capture feature is supported on the following cameras with the snapshot camera option enabled:

- Tau 2.1 and later releases (640, 324, 336, 160)

The Tau 2.1 camera can be distinguished from a Tau 2.0 by the software and firmware revisions. The software must be version 132 or higher, and the firmware version must be 15.X.11.2 or higher. The FLIR

Camera Controller GUI can be used to confirm the minimum versions, as shown in Figure 1 below; the fifth line indicates the software version beginning with “MAIN APP: 15.0.2.XXX”, and the sixth line indicates the firmware version beginning with “FIRMWARE: 15.X.XX.X”. For later releases, the software versions follow a new convention similar to firmware: 15.0.XX.X; for example, the Tau 2.1.1 release has 15.0.11.1 software which does include the snapshot feature.

The FLIR Camera Controller GUI is not required to use the feature, but can be a useful tool to demonstrate and facilitate the full functionality of the feature. 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.

The GUI must be version 100 or higher, and the SDK must be version 91 or higher.. The GUI and SDK versions can be verified in the FLIR Camera Controller GUI by clicking Help→About. The GUI revision is reported on the second line beginning with “GUI Tau 2 v1.0.0.XXX” and the SDK revision is reported on the third line beginning with “Photon SDK v2.XX.0.0, shown below in Figure 1.



Figure 1 - GUI and Camera versions

3.0 Image Capture with Software Commands

This section describes the commands and procedures necessary to access the 8-bit image capture feature introduced in the Tau 2.1 release. Note that the legacy 14-bit snapshot feature is available through the GUI as described in section 4.0, but is not supported with software commands due to the complexity of the compression algorithm. See Appendix A for a summary of all of the software commands.

3.1 Capturing Snapshots

To take a snapshot, issue the 0x82 TRANSFER_FRAME command (#130) with the following arguments:

	Value (hex)	Comment
Function Code	0x82	TRANSFER_FRAME
Bytes 0-1	0x1600	Specifies snapshot capture

This command will write a 8-bit BMP snapshot into the next available slot in the flash buffer. The size of snapshots varies depending on content, but approximately 100 8-bit snapshots can be stored for Tau 2 320 and 336, approximately 20 8-bit snapshots for Tau 2 640, and a maximum of 255 8-bit snapshots can be stored for Tau 2 160. Note that the 14-bit and 8-bit snapshots occupy the same memory location, and the above values for approximate number of 8-bit snapshots assume there are no 14-bit snapshots also stored. If the user commands a snapshot while simultaneously recording the first, the second capture command will be ignored and only the initial snapshot will be saved. If the user commands a snapshot when the Flash memory blocks allotted for snapshots is full the snapshot will not be stored and an error message will be received; the snapshot will not overwrite those previously stored in this event.

3.2 Playback of Snapshots

To playback a snapshot, issue the 0x82 TRANSFER_FRAME command (#130) with the following arguments:

	Value (hex)	Comment
Function Code	0x82	TRANSFER_FRAME
Byte 0	0x17	Specifies snapshot playback
Byte 1	0x##	Specifies snapshot number
Bytes 2-3	0x0001	Specifies do not return to live video

The stored snapshot numbers begin with zero. Sending the command with a snapshot number that is invalid or not stored (e.g. 0x82 1701 0001, when only one snapshot is stored, which is snapshot #0), will cause the analog video to return to live video.

To return to live analog video, issue the 0x82 TRANSFER_FRAME command (#130) with the following arguments:

	Value (hex)	Comment
Function Code	0x82	TRANSFER_FRAME
Byte 0	0x17	Specifies snapshot playback
Byte 1	0x00	Any value
Bytes 2-3	0x0000	Specifies return to live video

3.3 Reading Snapshots

To find the location and total bytes in the entire snapshot memory, send the GET_NUC_ADDRESS command (#214) with the following arguments:

	Value (hex)	Comment
Function Code	0xD6	GET_NUC_ADDRESS
Byte 0-1	0xFFFF	Specifies general information (base address and size in bytes)
Bytes 2-3	0x0013	Specifies snapshot memory

The response will provide the base address of the snapshot area (Bytes0-3) and the total bytes in the snapshot area (Bytes 4-7).

To retrieve the total number of snapshots and bytes currently stored in memory, send the GET_NUC_ADDRESS command (#214) with the following arguments:

	Value (hex)	Comment
Function Code	0xD6	GET_NUC_ADDRESS
Byte 0-1	0xFFFFE	Specifies information (base address and size in bytes) about current memory status
Bytes 2-3	0x0013	Specifies snapshot memory

The response will provide the total bytes used in the snapshot area (Bytes0-3) and the total snapshots stored (Bytes 4-7). Note that the response for total bytes in the snapshot area will include the header (i.e. with no snapshots stored, the response for total bytes currently stored in memory will still be 0x1000, which is the amount of bytes utilized in the header).

To retrieve the header of a specific snapshot, issue the GET_NUC_ADDRESS command (#214) with the following arguments:

	Value (hex)	Comment
Function Code	0xD6	GET_NUC_ADDRESS
Byte 0-3	0x80XX 0013	Specifies 4-byte header stored with snapshot XX

The response to the above command will be the 4-byte ASCII header of the specified snapshot (Bytes 0 – 3) and Bytes 4-7 will be null. The header reports the snapshot type – either 14-bit or 8-bit. An 8-bit snapshot header request will read “BMP8” in ASCII (0x424D 5038). A 14-bit snapshot header request will read “SNAP” in ASCII (0x534E 4150).

To find the address and size of a specific snapshot, issue the GET_NUC_ADDRESS command (#214) with the following arguments:

	Value (hex)	Comment
Function Code	0xD6	GET_NUC_ADDRESS
Byte 0-1	0x00##	Specifies specific snapshot number
Bytes 2-3	0x0013	Specifies snapshot memory

The response will provide the address of the specified snapshot (Bytes0-3) and the size in bytes of the specified snapshot (Bytes 4-7). An error will be returned if the snapshot slot is empty.

To read the snapshot, issue the READ_MEMORY command (#210), using the address and size information received from the step above.

	Value (hex)	Comment
Function Code	0xD2	READ_MEMORY
Byte 0-3	0x#### #	Address in bytes received from 0xD6 cmd

Bytes 4-5	0x####	Snapshot size received from 0xD6 cmd
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An example of reading a snapshot:

1. Find the location and size of the first snapshot: 0xD6 0000 0013
2. Record the response: Address = 0x02001000 and Size in Bytes= 0x00014436
3. Read the first 256 bytes of the first snapshot using the information in step 1:
0xD2 0200 1000 0100
4. To read the next 256 bytes, the starting address must be incremented accordingly:
0xD2 0200 1100 0100
5. Continue with this process until all bytes have been read

3.4 Erasing Snapshots

To erase a snapshot, first find the address and size of a snapshot, by issuing the GET_NUC_ADDRESS command (#214) with the desired snapshot number. Issue the ERASE_FLASH_BLOCK command (#212) with the flash block calculated from the address and size information received from the step above. Note that snapshots are not necessarily stored evenly in a single flash block. The user will need to keep track of the relationship between the starting address and the flash block boundaries.

	Value (hex)	Comment
Function Code	0xD6	GET_NUC_ADDRESS
Byte 0-1	0x00##	Specifies specific snapshot number
Bytes 2-3	0x0013	Specifies snapshot memory

	Value (hex)	Comment
Function Code	0xD4	ERASE_FLASH_BLOCK
Byte 0-1	0x####	Specifies flash block number

To erase the entire snapshot memory including the header, issue the GET_NUC_ADDRESS command (#214) with the 0xFFFF argument to find the location and size of the entire snapshot memory. The response will be the base address of the snapshot area (Bytes 0-3) and the total number of bytes in the snapshot area (Bytes 4-7). To erase only the snapshot memory that has been used in order to save time, issue the GET_NUC_ADDRESS command (#214) with the 0xFFFE argument to find the size of the used snapshot memory and the number of snapshots stored. The response will be the total number of bytes used in the snapshot area (Bytes 0-3) and the total number snapshots (Bytes 4-7). Issue the ERASE_FLASH_BLOCK (#212) command multiple times until the desired section (or the entirety) of the snapshot memory flash blocks calculated from the first two commands are erased.

	Value (hex)	Comment
Function Code	0xD6	GET_NUC_ADDRESS
Byte 0-1	0xFFFF	Specifies general information (base address and size in bytes)
Bytes 2-3	0x0013	Specifies snapshot memory

	Value (hex)	Comment
Function Code	0xD6	GET_NUC_ADDRESS
Byte 0-1	0xFFFE	Specifies general information (base

		address and size in bytes)
Bytes 2-3	0x0013	Specifies snapshot memory

	Value (hex)	Comment
Function Code	0xD4	ERASE_FLASH_BLOCK
Byte 0-1	0x####	Specifies flash block number, send one command for each flash block

An example of erasing the entire snapshot memory:

1. Find the entire snapshot memory size and location for a Tau2, 336 camera: 0xD6 FFFF 0013.
2. Record the response: 0x2000000 800000.
3. The starting address of 0x2000000 indicates the beginning flash block is #128. The size of 0x800000 indicates the total flash blocks in the snapshot memory is 64.
4. Erase the first flash block: 0xD4 0080
5. Repeat step 4 until all snapshot flash blocks have been erased, i.e. #128 - #191 for the Tau2, 336.

4.0 Image Capture with the Tau GUI

After connecting the Tau 2.1, select the “Image Capture” tab (Figure 2, #2) on the “Video” page (Figure 2, #1) to access the image capture features.

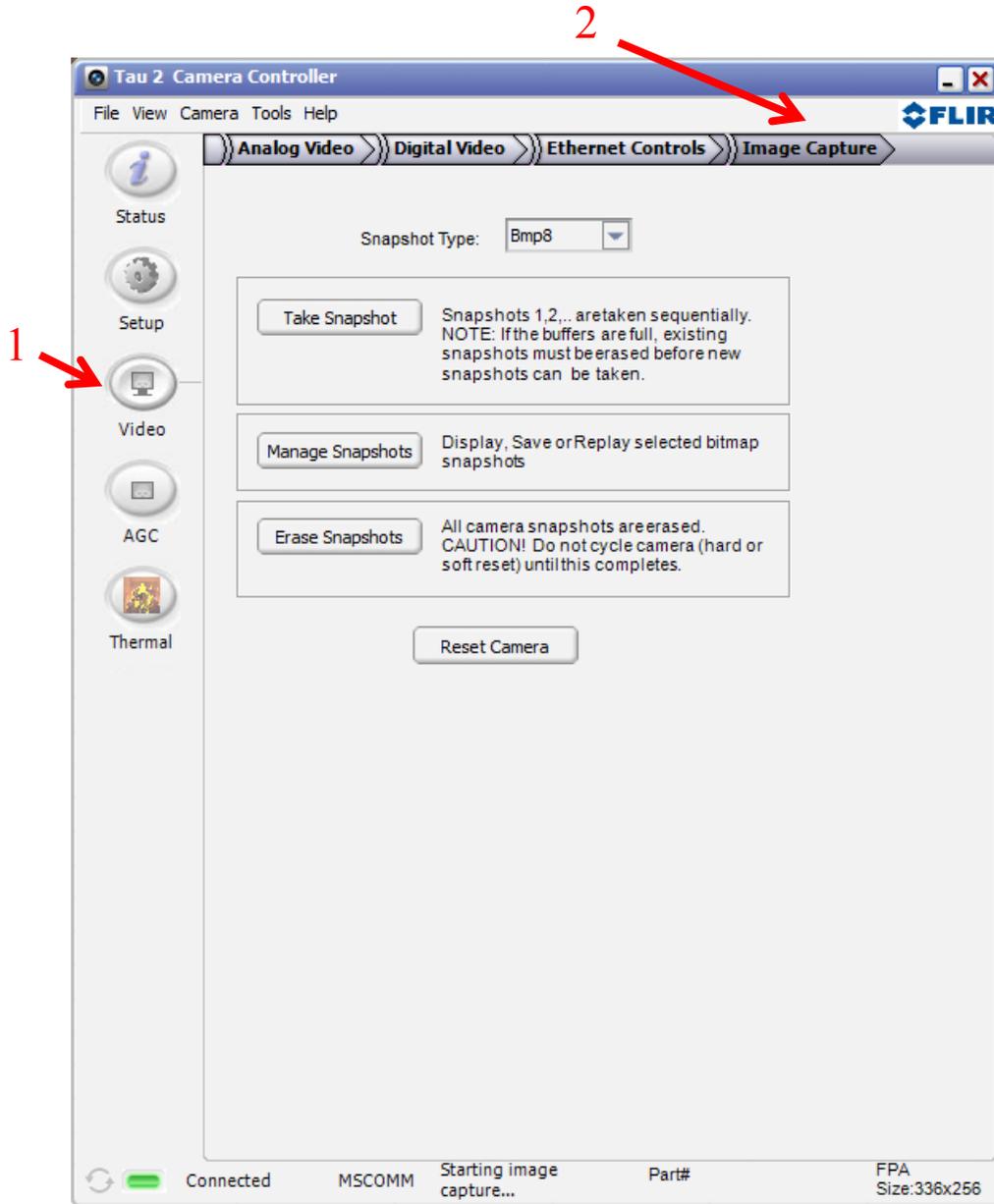


Figure 2 – Image Capture tab

4.1 Capturing Snapshots

Select the “Bmp8” or the “Comp14” option from the *Snapshot Type* dropdown menu to specify whether a 8-bit snapshot or 14-bit snapshot is desired. To capture a snapshot select the “Take Snapshot” button:

. This button captures a snapshot of the specified type and saves it in the next available slot in memory. When memory is full and the “Take Snapshot” button is selected, an error will be reported to indicate that the memory must be erased before it is possible to continue capturing snapshots. Note that the playback feature and number of possible snapshots to be stored reported previously in this document refers only to 8-bit snapshots.

4.2 Playback, Viewing, and Saving Snapshots

4.2.0 8-bit Snapshots

On the “Image Capture” tab, specify the Snapshot Type specified as “Bmp8” in the drop-down menu (Figure 3, #1). The “Manage Snapshots” button (Figure 3, #2) appears to display the snapshots previously captured in memory and offer options for playback, viewing, and saving.

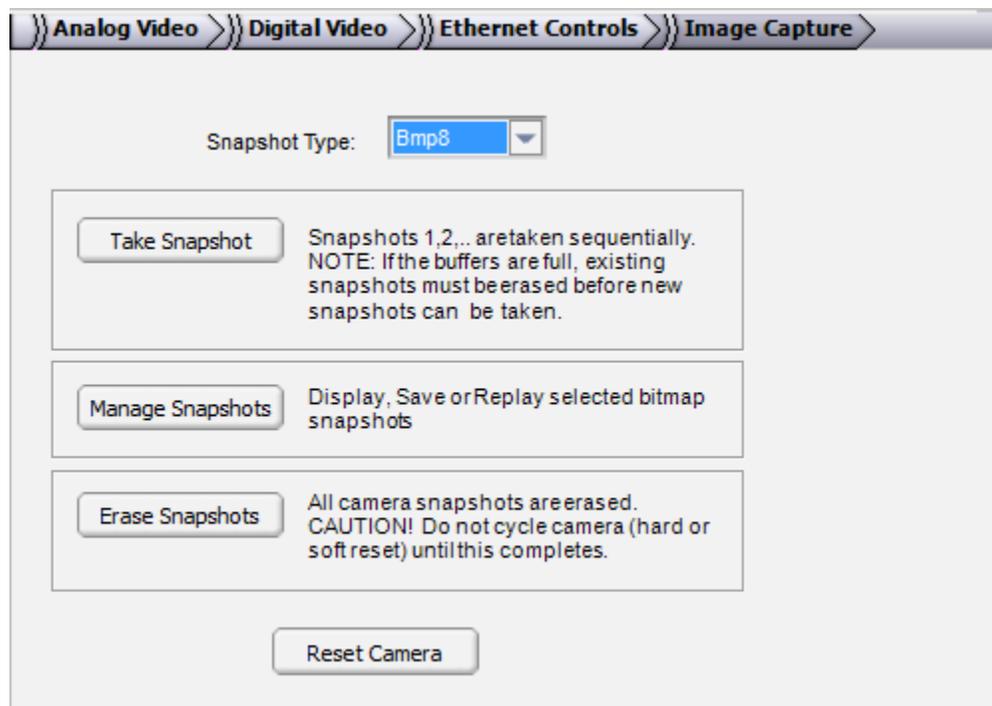


Figure 3 – 8-bit Snapshots

Once selecting the “Manage Snapshots” button, the Image Selector window will appear displaying the snapshots sequentially, as shown in Figure 4. Note that a snapshot must be selected (highlighted) to enable the buttons at the bottom of the pop-up window which allow saving, viewing, and playing back the stored snapshots. For convenience, once in the Image Selector window, the snapshots can be selected with either a mouse-click or the user’s arrow keys.

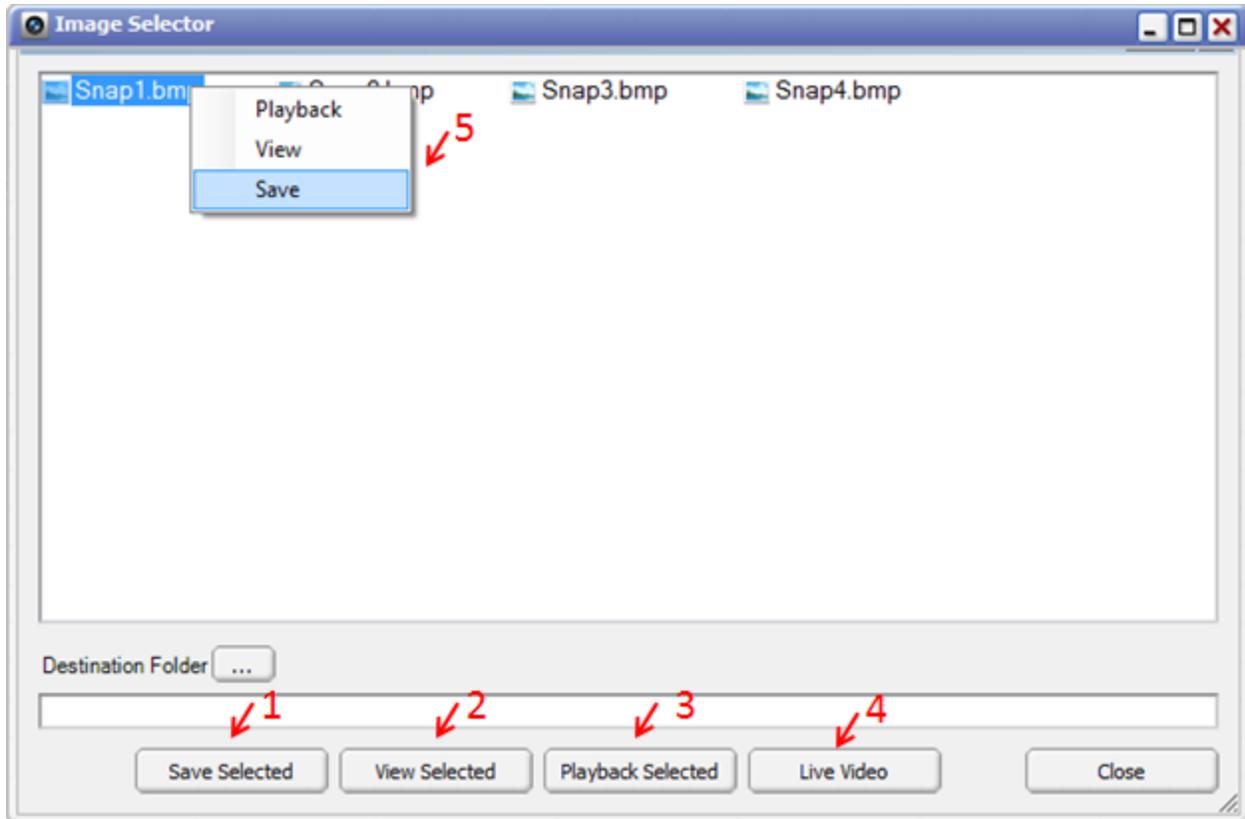


Figure 4 – 8-bit Snapshot Management

The snapshots can be uploaded and saved from the camera to the user’s PC or network from the Image Selector window in multiple user-convenient manners. From the Image Selector window, select the desired snapshot. Type in the destination folder or browse to the desired location using the following

button: . Once the destination has been selected and the desired snapshot has been highlighted the snapshot can be saved using the following methods:

- Select the snapshot and use the “Save Selected” button from the Image Selector window (Figure 4, #1)
- Right-click on the snapshot in the Image Selector window and a select “Save” from the drop-down list (Figure 4, #5)
- Drag and drop the selected snapshot from the Image Selector window into the desired location

A pop-up window with a progress bar will indicate the download status, and the window will disappear when the download is complete.

Similar to saving snapshots, there are multiple ways to view a snapshot from the Image Selector window. To view a snapshot, select the desired snapshot and use one of the following intuitive methods:

- Select the “View Selected” button (Figure 4, #2) in the Image Selector window
- Right-click on the snapshot and select “View” from the drop-down list (Figure 4, #5)
- Simply double-click on the snapshot

A progress bar will appear briefly while the image is being retrieved, and then a separate Bitmap Viewer window will open displaying the selected snapshot, as shown in Figure 5. Note that the snapshot can be saved from the Bitmap Viewer window also, in addition to the ways previously mentioned.



Figure 5 – Bitmap Viewer window

Note that multiple snapshots can be viewed simultaneously; each snapshot will appear in its own separate viewer window as shown below in Figure 6.



Figure 6 – Multiple Bitmap Viewer windows

It is also possible to playback a specific snapshot on the analog video output of the camera. From the Image Selector window, select the desired snapshot and select the “Playback Selected” button (Figure 4, #3). Right-clicking on the desired snapshot and selecting “Playback” from the drop-down list (Figure 4, #5) will also result in snapshot playback.

The desired snapshot will be displayed on the analog video for an unlimited amount of time. To return the analog video to live imaging, select the “Live Video” button (Figure 4, #4) from the Image Selector window.

4.2.1 14-bit Snapshots

For Snapshot Type specified as “Comp14” in the drop-down menu (Figure 7, #1), the “Retrieve Snapshot” button appears to provide viewing and saving capabilities (Figure 7, #2). The Snapshot Number will begin with one regardless of the number of 8-bit snapshots stored in memory before it – the numbering scheme only refers to the 14-bit snapshots stored in memory.

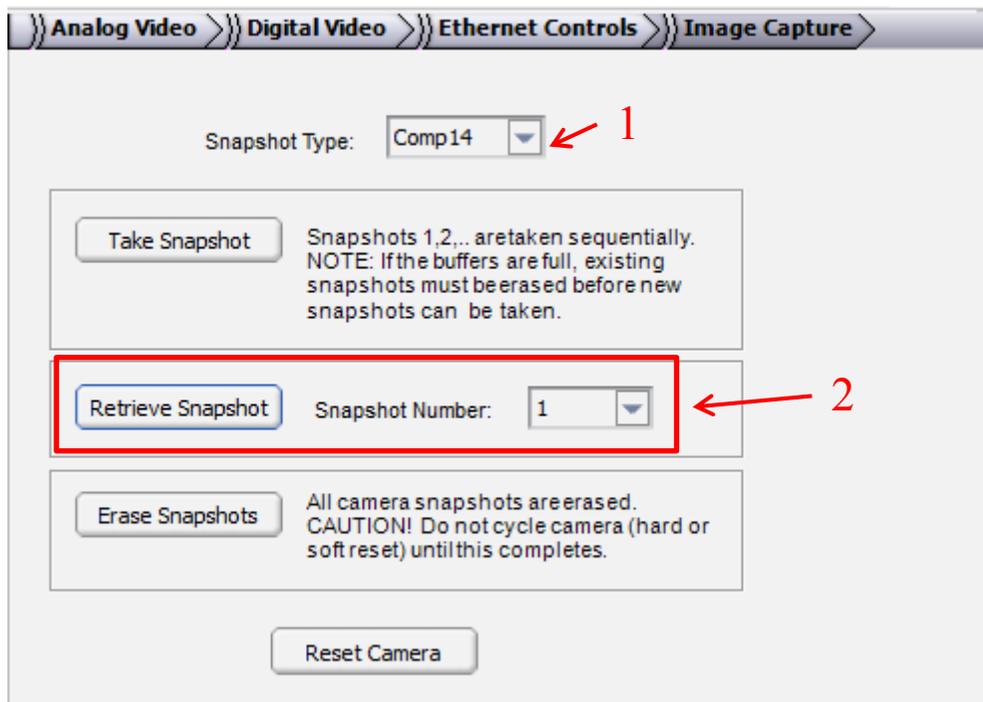


Figure 7 – 14-bit Snapshots

After selecting the “Retrieve Snapshot” button for the desired Snapshot Number, a progress bar will appear during loading, and finally the Snapshot Viewer window will appear, as shown in Figure 8. A cross-hair symbol is applied for the user’s mouse location in the viewer window; the information bar at the bottom of the window displays the coordinates and digital value of the pixel currently pointed at (Figure 8, #1). The minimum, maximum, and average pixel value with respect to the entire array are also displayed in the information bar.

The options at the top of the window will allow the user to save the images via the “Save As” button (Figure 8, #2) and view the per pixel 14-bit data via the “Data” button (Figure 8, #3). Figure 9 shows per pixel data versus x and y coordinates displayed in the Snapshot Viewer; the data may be copied and exported for external use.

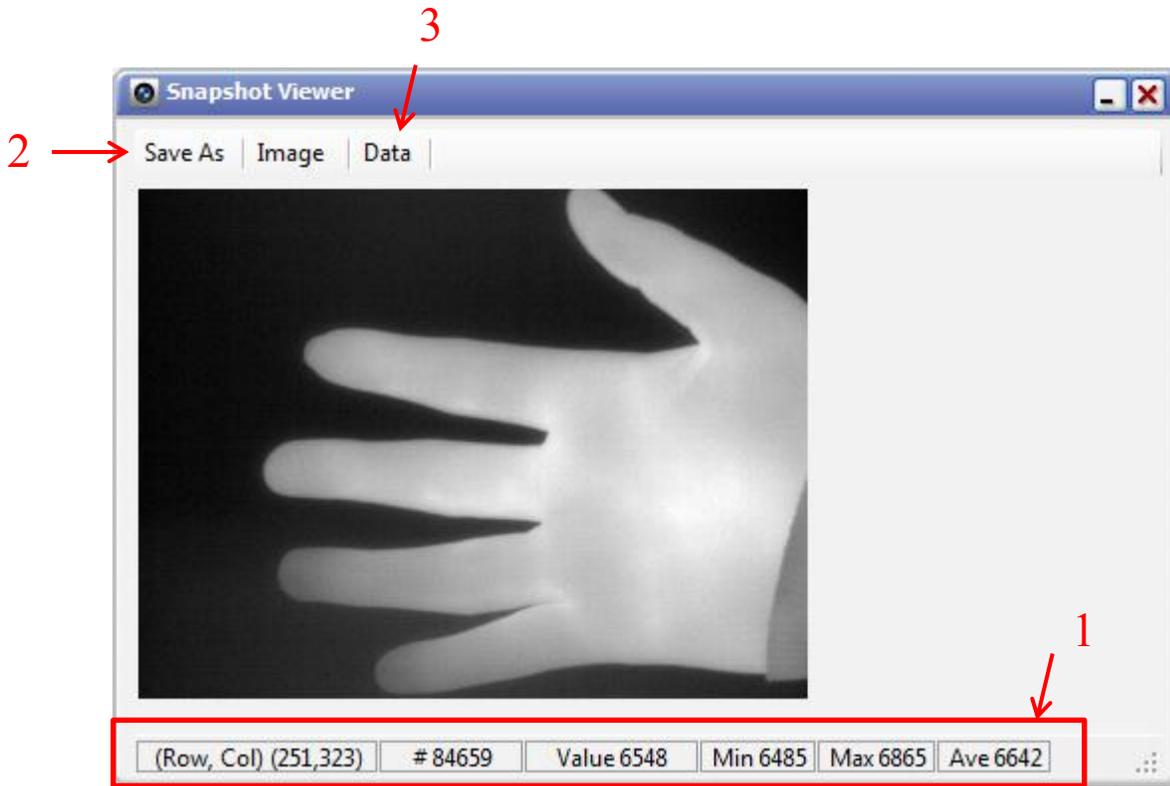


Figure 8 – Snapshot Viewer

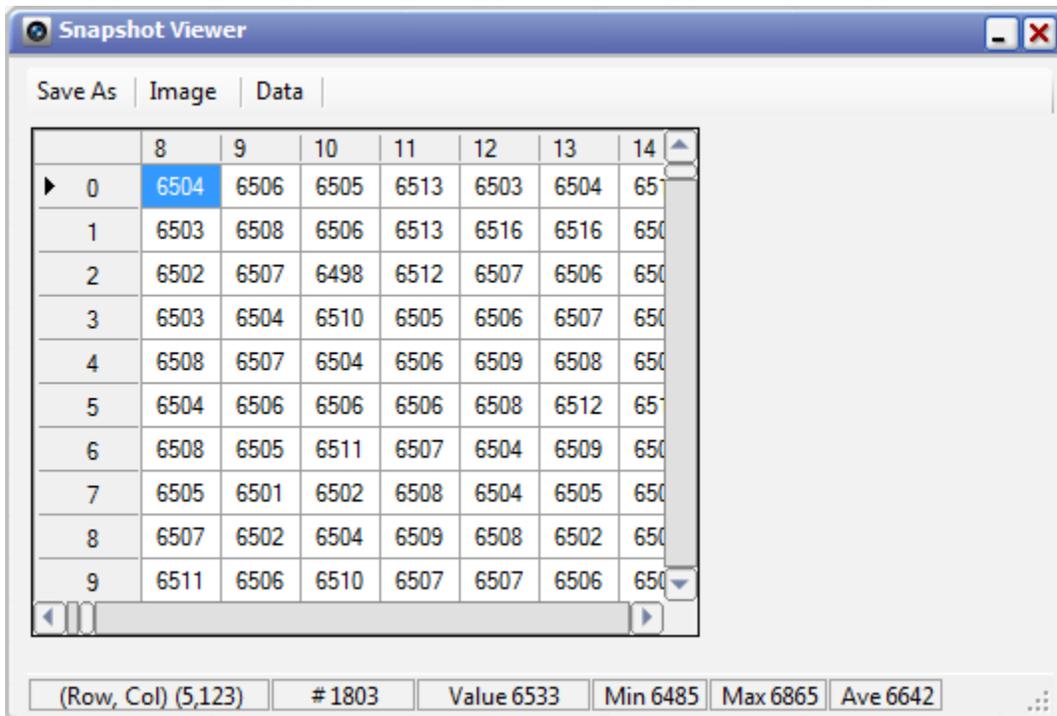


Figure 9 – Snapshot Viewer with digital data

4.3 Erasing Snapshots

The entire snapshot memory can be erased using the “Erase Snapshots” button on the main “Image Capture” tab. The erase is agnostic to the type of snapshot stored (14-bit or 8-bit) and will erase all snapshots. Once the erase is complete, the bottom of the Camera Controller GUI will display a “Snapshot erase complete” message, as shown below in Figure 10. To erase specific flash blocks, use the software commands described in Section 3.4 of this document.

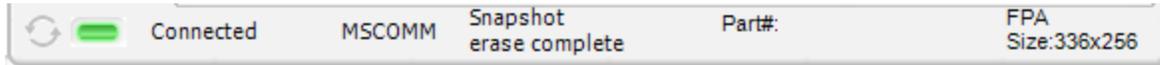


Figure 10 – Snapshot Erase Complete

Appendix A – Snapshot Related Software Commands

ID	Function Code (hex)	Command	Description	Byte Count	Argument (i.e., Data Bytes) (hex)	Notes
130	0x82	TRANSFER_FRAME	<p>Function varies depending upon byte 0 of the argument:</p> <ul style="list-style-type: none"> BMP8 Snapshot Capture: Captures an 8-bit BMP snapshot to Flash memory. Note, for capture, buffer number is a don't care <p>This command is non-blocking (see 2.2.2 in the SW IDD). There is no associated status command.</p>	Cmd: 2 Resp: 2	Byte 0: type 0x16 = BMP8 snapshot capture 0x17 = BMP8 snapshot playback Byte 1: buffer number Bytes 2-3: Only for 0x17 playback 0x0000 = return to live video 0x0001 = snapshot playback	
210	0xD2	READ_MEMORY	Reads specified number of bytes beginning at the specified address	Cmd: 6	Bytes 0-3: Address Bytes 4-5: Number of bytes to read (maximum of 256)	Used for snapshot read. See the note associated with command ID 130 (0x82).
				Resp: Specified #bytes	Bytes 0 – n: Data read	
212	0xD4	ERASE_FLASH_BLOCK	Erases a Flash block or a range of Flash	Cmd/Resp: 2	Flash block	Snapshots are in blocks #128-#191 for Tau2,336
214	0xD6	GET_NUC_ADDRESS	Gets the Flash or DRAM address and size of the specified data type For capture and snapshot, bytes 0-1 specify buffer #.	Cmd: 4	Bytes 0-1: Buffer# Bytes 2-3: Data type 0x0013 = snapshot (Flash)	Snapshot Bytes 0-1: <ul style="list-style-type: none"> 0xFFFF gets entire snapshot area including header. 0xFFFE gets bytes used/stored 0x00XX gets specific snapshot XX 0x80XX gets ASCII header of snapshot XX
				Resp: 8	Bytes 0-3: Address Bytes 4-7: Size (in bytes)	