



The World's **Sixth Sense**[®]

Best Practices for the Ladybug5

Technical Application Note TAN2015008

Revised 7/28/2017

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Applicable products

- Ladybug5
- Ladybug SDK 1.14 or later

Application note description

The purpose of this application note is to describe a series of settings and hardware configurations to optimize Ladybug5 image quality.

Preparing for use

Before you use your camera, we recommend that you are aware of the following resources available from our [downloads page](#):

- **Getting Started Manual for the camera**—provides information on installing components and software needed to run the camera.
- **Technical Reference for the camera**—provides information on the camera's specifications, features and operations, as well as imaging and acquisition controls.
- **Firmware updates**—ensure you are using the most up-to-date firmware for the camera to take advantage of improvements and fixes.
- **Tech Insights**—[Subscribe](#) to our monthly email updates containing information on new knowledge base articles, new firmware and software releases, and Product Change Notices (PCN).

Note: Visit the downloads site regularly to update your Ladybug SDK and take advantage of the latest improvements to achieve the best performance from your Ladybug5.

Other resources

[TAN2008007 Using the Ladybug in a Mobile Setting](#)

[TAN2014013 Diagnosing and Fixing Connectivity Errors with Ladybug5](#)

System requirements

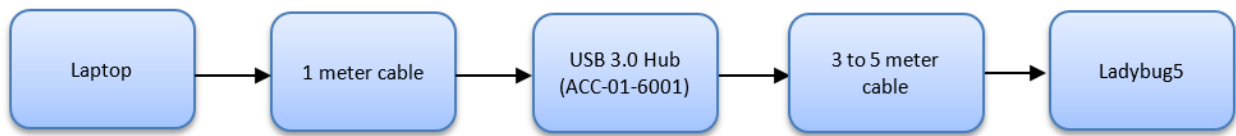
System configuration

Component	Capture	Processing
CPU	Intel Core i3 or equivalent processor	Intel Core i7 or equivalent processor
OS	Windows 7 64-bit Ubuntu 12.04 LTS 64-bit	Windows 7 64-bit
RAM	4 GB	8 GB
Storage	RAID array or SSD capable of sequential data write speed of up to 240 MB/s. Depends on actual streaming bandwidth of the camera.	
Video card	Intel HD4000 Graphics or newer	NVIDIA GTX 560 or newer
Host adaptor	USB3 host adaptor	
Cables Included	1 meter USB3 cable (ACC 01-2303) 3 meter USB3 cable with locking screws (ACC-01-2300) 5 meter USB3 cable with locking screws (ACC-01-2301)	
Power Included	6 meter 12-pin GPIO power cable and wiring harness The Ladybug5 requires 12 – 24 volts of power which must be provided by an external power supply connected to the GPIO cable.	
Driver	PGRxHCI 2.7.3.18 or later for dedicated host adaptors PGRUSBCam 2.7.3.18 or later for onboard USB3 port	
Software	Ladybug SDK 1.14 or later	Ladybug SDK 1.14 or later Microsoft Visual Studio 2010 (needed to compile and run example code using Ladybug SDK).
Firmware	Use the latest firmware available from the downloads page.	

Ladybug5 comes with the following accessories:

- 1 meter USB3 cable
- 3 meter USB3 locking cable
- 5 meter USB3 locking cable
- USB3 hub, VIA VL812 with screw locks
- 6 meter 12-pin GPIO power cable and wiring harness
- Renesas μ PD720202 USB3 PCIe Card
- 24 V 2.5 A (60 W) power supply
- 4-legged desktop mount
- Tripod adapter with 3/8-16 mounting hole

Although a shorter cable (5 meters or less) is recommended, a hub may be used to extend the cable length beyond 5 meters and to improve connectivity. We recommend using a hub when using a laptop or when using cables longer than 3 meters.



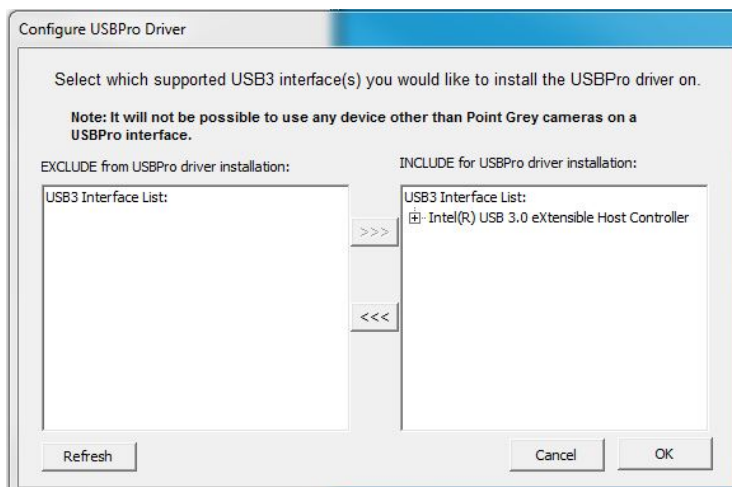
The Ladybug5 has worked successfully with the following systems:

- Dell Precision M3800 (2014 model)—tested by FLIR
- Intel NUC D34010WYK
- Gigabyte Brix GB BXi7-4500
- MacBook Pro (running Bootcamp)

Software requirements

The Ladybug SDK is required to capture and process images from the Ladybug5.

1. Download and install the Ladybug SDK from the [Downloads](#) page.
2. In the Driver Selection window, select I will be using the Ladybug5 camera.
3. Select the driver:
 - PGRUSBCam. Select this option if using an onboard USB3 port or if your host adaptor is used to support other USB3 devices.
 - USBPro. Select this option only when you have a dedicated host adaptor for Ladybug5 because non-FLIR USB3 devices are not recognized by this driver. If this driver is selected, click Configure USBPro driver to identify the dedicated host adaptor.



After installation, to manage and update drivers, use the DriverControlGUI utility in the SDK.

1. To open the DriverControlGUI:
 - Start Menu → All Programs → Point Grey Ladybug SDK → Utilities → DriverControlGUI.
2. Select the interface from the tabs in the top left.
3. Select your interface card to see the current setup.
4. From the Driver Selection drop-down, select the new driver and click the Install Driver button.

Tools for optimizing Ladybug5 capture settings

There are a number of options to optimize the results when capturing images. Some settings must be established before capture and are not available at the processing stage.

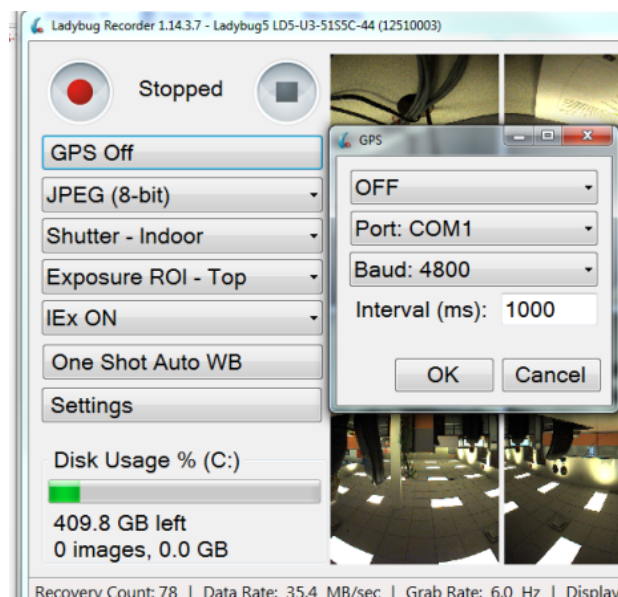
There are two windows which provide access to the camera controls:

- **Ladybug Recorder** provides direct access to the main settings used during capture. We recommend using this tool during capture.
- **LadybugCapPro** Camera Control dialog has a more comprehensive selection of options but a more complicated interface.

Using Ladybug Recorder

To open the Ladybug Recorder:

Start Menu → All Programs → Point Grey Ladybug SDK → Ladybug Recorder.



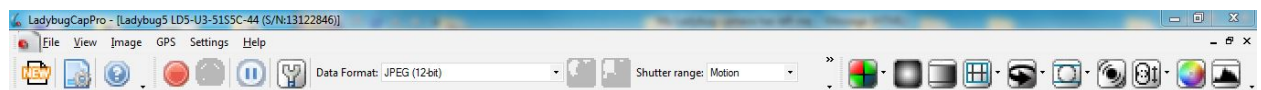
The Ladybug Recorder provides access to these options:

- Record: Stop/Start and Pause
- GPS On/Off. Click to open GPS window.
- Pixel format (includes 8-bit, 12-bit, uncompressed JPEG)
- Shutter Range Mode (includes Motion, Indoor, Low Noise)
- Exposure ROI (Region of Interest)
- IEx (Independent Exposure)
- One Shot Auto White Balance (WB)
- Settings (includes Compression Quality, Frame Rate, and Gamma)

Using LadybugCapPro

To open LadybugCapPro:

Start Menu → All Programs → Point Grey Ladybug SDK → LadybugCapPro → Start Camera.



LadybugCapPro main toolbar provides access to the following options discussed in Optimizing Post Processing:

- Color Processing
- Image Quality
- Dynamic Stitching

For information on all of the features of LadybugCapPro, see [Ladybug5 Technical Reference](#).

Recommended optimization capture settings

Use Ladybug Recorder to set the following options prior to starting image capture.

Pixel format

There are two options that relate to pixel depth and post processing controls:

- 12-bit JPEG setting is a new feature available only with Ladybug5. It provides the highest quality of images and offers a range of post processing options not available with the 8-bit setting. The 12-bit JPEG setting is the recommended setting.
- The 8-bit JPEG setting may be suitable when file size is a concern or certain software compatibility issues apply. If you select 8-bit setting, some post processing options are not available.

	8-bit Pixel Formats	12-bit Pixel Formats
On-camera processing	Gain Black Level Pixel Correction White Balance Gamma	Pixel Correction
Post processing on PC	Stitching Fall off Correction Sharpening Tone Mapping	Stitching Fall off Correction Sharpening Tone Mapping Bayer Decoding Gain Black Level White Balance Gamma EV Compensation

Shutter range mode

There are four preset shutter range modes. Choose the shutter range according to the conditions of use, as defined below:

- Drive Highway—maximum shutter is set to as short as possible to prevent motion blur. Best used outdoors at high speeds or images may be too dark. This is the default.
- Drive City—maximum shutter is slightly longer than highway mode, suitable for slower speeds (~45 km/hour or 25 mph).
- Indoor—maximum shutter is slightly longer than the drive modes, for use in indoor applications.
- Low Noise—maximum shutter is not restricted.

Gamma

When using 12-bit mode, gamma correction is done at the post processing stage.

When using 8-bit mode, the gamma option must be turned on before you start the capture process. It cannot be changed once this process has begun.

1. In Ladybug Recorder, click Settings to access gamma.
2. Set gamma to a value between 1.8 and 2.2.

Automatic White Balance (AWB)

AWB is a system of color correction used for different lighting conditions. It is adjusted by modifying the relative gain of R, G, and B to keep white areas looking white under changing lighting conditions. If you write your own collect software, make the API call for AWB every 20 frames.

When using 12-bit mode, AWB is adjusted during post processing.

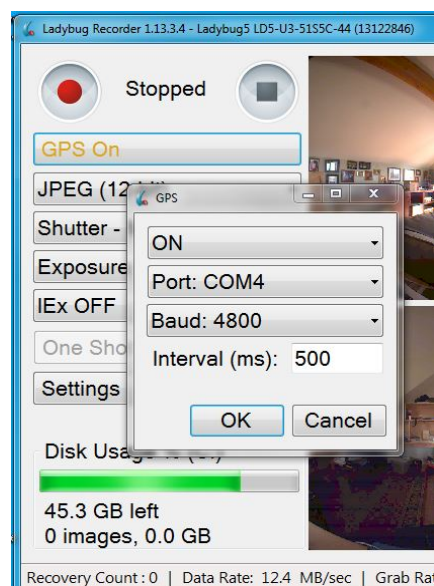
When using 8-bit mode, the AWB can only be set during the capture stage. In Ladybug Recorder, click the AWB button occasionally while capturing to adjust for changes in lighting conditions.

GPS

Turn on GPS and set the data update interval time before capture. Set the interval for double the output rate of the GPS. For example, if GPS sends out data every 1 second, set the interval to 500 ms.

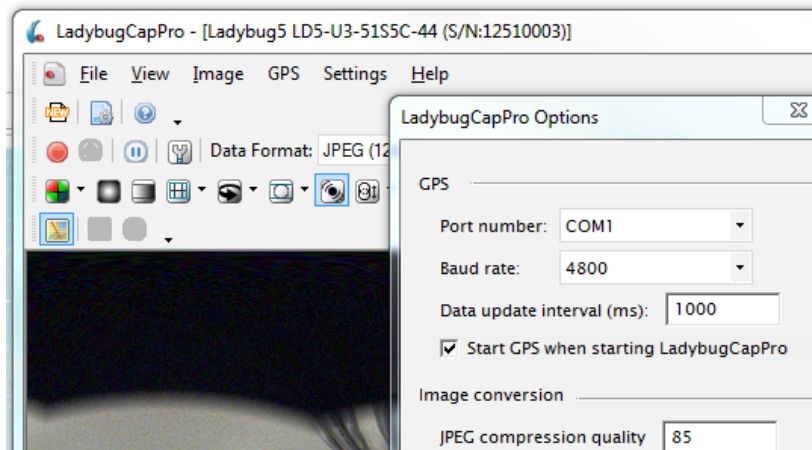
To turn on the GPS option for one use, use Ladybug Recorder:

1. In Ladybug Recorder, click GPS.
2. Set the ON/OFF drop-down to ON.
3. Set the Update Interval in ms.



To turn on the GPS option every time LadybugCapPro is started:

1. In LadybugCapPro, from the Settings menu, select Option.
2. In the Options dialog, select Start GPS when starting LadybugCapPro.
3. Set the Update Interval in ms.



Optimizing post processing

There are a number of options to set during post processing to improve image results. Access the following controls using LadybugCapPro main toolbar.

Color processing

To improve the color processing results:

1. From the LadybugCapPro main toolbar, click the color processing button.
2. Select High Quality Linear. If using an NVIDIA graphics card, select High Quality Linear GPU.

This selection must be made every time LadybugCapPro is started.

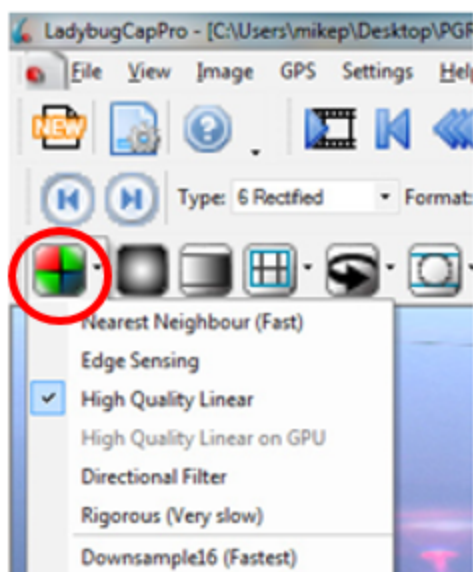
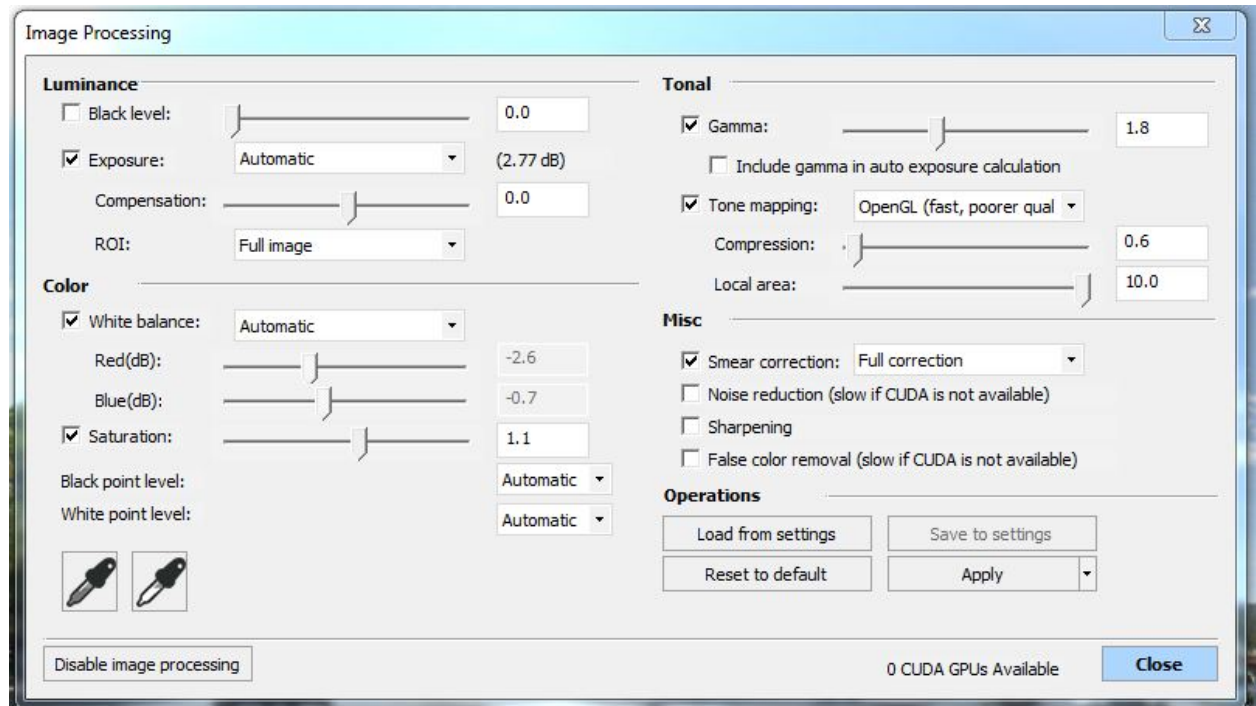



Image quality

The Image Processing window shows the default settings, which are the recommended settings for best image quality. To access these controls, from the Settings menu, select Image Processing.



Dynamic stitching

The captured images are “stitched” together using an algorithm that examines the image overlap along each seam and determines various ranges values along it. There are three settings to control stitching, including two options for dynamic stitching. Click the  button for the drop-down menu of settings as follows:

- Manual—sets the sphere size to a fixed range.
- Dynamic (one-shot)—makes adjustments based on information from a single image and uses these results on all following frames.
- Auto Dynamic stitch—runs the pattern-matching algorithm on every frame. The processing speed is slower, but fewer image artifacts appear when the scenery changes. The default setting for the minimum and maximum distance is 2 meters – 100 meters.

To improve the speed for this option:

1. From the Settings menu, select Options.
2. Adjust the values in in the Options dialog.

To improve the processing time of the pattern-matching algorithm, narrow the range, for example, to 4 meters – 20 meters.

Camera care

Follow these guidelines to help protect Ladybug5 from damage:

- Avoid:
 - excessive shaking, dropping, or mishandling of the camera;
 - extended exposure to bright sunlight, rain, or dust;
 - electrostatic charge; and
 - touching the lenses when handling the camera.
- To clean the lenses, use a standard camera lens cleaning kit or a dry cotton cloth. Avoid heavy pressure.
- If the Ladybug5 is mounted to a vehicle and stored outside, cover the camera when not in use to prevent the accumulation of dust and pooling of precipitation on the lenses.

Warning! Do not open the camera housing. This voids the warranty.

Downloads and support

FLIR endeavors to provide the highest level of technical support possible to our customers. Most support resources can be accessed through the [Support](#) section of our website.

The first step in accessing our technical support resources is to obtain a customer login account. This requires a valid name and email address. To apply for a customer login account go to our [downloads](#) page.

Customers with a customer login account can access the latest **software** and **firmware** for their cameras from our website. We encourage our customers to keep their software and firmware up-to-date by downloading and installing the latest versions.

Finding information

Ladybug® SDK—The Ladybug SDK provides API examples and the LadybugCapPro camera evaluation application. Available from our [downloads](#) page.

Product Documentation—The camera's *Getting Started Manual* provides information on installing components and software needed to run the camera. The *Technical Reference* provides information on the camera's specifications, features and operations, as well as imaging and acquisition controls. They are available from the [downloads](#) page.

Knowledge Base—A database of articles and application notes with answers to common questions as well as articles and tutorials about hardware and software systems. Available from our [knowledge base](#).

Learning Center—Our [Learning Center](#) contains links to many resources including videos, case studies, popular topics, other application notes, and information on sensor technology.

Contacting technical support

Before contacting technical support, have you:

1. Read the product documentation?
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.