PH DENIX LIDAR SYSTEMS

Ladybug5 Trigger with LadybugCapPro Technical Bulletin

Revision Date: April 27, 2020

Phoenix LiDAR Systems 10131 National Blvd.

Los Angeles, CA 90034

www.phoenixlidar.com +1.323.577.3366 support@phoenixlidar.com

Disclaimer

Information in this document is provided in connection with Phoenix LiDAR Systems products. No license, expressed or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in the terms and conditions of sale for such products, Phoenix LiDAR Systems assumes no liability whatsoever, disclaims any express or implied warranty, relating to sale and/or use of products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property rights.

Phoenix LiDAR Systems products are not intended for use in medical, life saving, life sustaining, critical control or safety systems, or in nuclear facility applications. In no event shall Phoenix LiDAR Systems liability exceed the price paid for the product from direct, indirect, special, incidental, or consequential damages resulting from the use of the product, its accompanying software, or its documentation. Phoenix LiDAR Systems makes no warranty or representation, expressed, implied, or statutory, with respect to its products or the contents or use of this documentation and all accompanying software, and specifically disclaim its quality, performance, merchantability, or fitness for any particular purpose. Phoenix LiDAR Systems reserves the right to revise or update its products, software, or documentation without obligation to notify any individual or entity. Backup data collected periodically to avoid any potential data loss. Phoenix LiDAR Systems disclaims any responsibility of all sorts of data loss or recovery.

Introduction

The purpose of this document is to demonstrate how to setup and use the Ladybug5 camera in conjunction with Point Grey's LadybugCapPro software and SpatialExplorer to trigger and capture a stream of images.

During this procedure, the Ladybug5 must be connected locally to your workstation via the attached USB 3.0 cable. We highly recommend connecting to rover via an Ethernet connection for this procedure.

This procedure will **ONLY** work with Ladybug5 cameras that have been configured by Phoenix LiDAR Systems beginning in June 2018.

If you have a Ladybug5 camera that was configured prior to June 2018 by Phoenix LiDAR Systems, this procedure will NOT work.

Pre-Procedure

- If using an ethernet cable to connect to rover, make sure that you have configured the ethernet adapter on your workstation to be able to communicate with rover. Any computer with a properly configured ethernet adapter can be used to establish a direct connection to the rover using an ethernet cable. Field computers configured by Phoenix LiDAR Systems will default to an alternative IP configuration of 192.168.200.20 when no IP address is obtained through DHCP on the primary ethernet port within 3 minutes. This will allow a computer to establish a connection to the rover via ethernet after 3 minutes of connection. Refer to the <u>Wired Ethernet Network Card Setup</u> in the Phoenix LiDAR Systems User Manual for more information.
- Download and install the latest version of the Ladybug SDK from <u>Point Grey's website</u>. The Ladybug SDK contains several GUI applications such as LadybugCapPro to ensure full compatibility Make sure to download the corresponding version (Windows 64-bit) of the Ladybug SDK.

Ladybug SDK Download F	ur × +					
€)→ ℃ ŵ	Attps://www.flir.com/support-center/lis/machine-vis	sion/downloads/ladybug-sdk-and-firmware/	⊚ ☆	¥ III\ E	0	Ξ
	EXTECH Raymaning 🔞		8 17	\oplus		í
	\$FLIR	APPLICATIONS PRODUCTS D	DISCOVER SUPPORT NEWS ABOUT	Q		
			f ⊮ in	S* @		
		Ladybug SDK				
[This is the latest version of the Ladybug SDK which support Ladybug5+. The initial Linux version of the Ladybug library s on Ubuntu 16.04 (both x86 and x86_64). The initial Linux SI recording and GPS support via a command line application (DDWNLOAD	s Ladybug2, Ladybug3, Ladybug5, and supports both 1394 and USB3 cameras DK focuses on image acquisition, stream LadybugRecorderConsole}.	URGENT! It's important that you are upda Sign-up for Tech insights evkewsletter receive firmware and software notificat product change notifications and knowled articles. FIRST NAME *	ted! and ions, gebase	0	

Figure 1: Download Ladybug SDK from Point Grey's website

- Download and install <u>Serial Port Redirector</u> from Fabulatech.com.
- Ensure the Ladybug5 camera is connected to the nav box and powered on prior to beginning the procedure.
 - Ladybug5 input voltage range: 12-24 V
- Ensure SpatialExplorer is open and running in the background prior to beginning the procedure.

Procedure

1. Launch Serial Port Redirector. If a virtual serial port is not available, you will need to add a virtual serial port to Serial Port Redirector. A virtual COM port is necessary to establish GNSS communication between the Ladybug5 and rover.

Serial Port Redirector - www.fabulatech.com	*	-	×
			?
Ny Computer			

Figure 2: Serial Port Redirector interface

2. The virtual serial COM port number can be any available port number. What is important is the remote IP address and the TCP port number. The remote IP address must match the IP address of the rover (**192.168.200.10**) or the hostname (*rover-wire*). The TCP port must be **8000**. Click "OK" to create and save the virtual port.

Add Serial Port	Add Client Virtual Port
Dr. 1	COM1 · Advanced
	Remote IP address or computer name: rover-wire
	TCP-port: 8000
	OK Cancel

Figure 3: Virtual Serial Port parameters

3. Ensure the virtual serial port is present and properly configured. Leave Serial Port Redirector open in the background. Do **NOT** close Serial Port Redirector.



Figure 4: Virtual Serial Port present in Serial Port Redirector

4. Launch LadybugCapPro software. Click the "Start Camera" button to launch the camera selection menu.



Figure 5: LadybugCapPro Welcome Interface

5. Before connecting to the Ladybug5 camera, click the "Configure Selected" button to configure a few camera parameters.

💪 LadybugCapPro				• – 0 ×
File View Help Come and the second s	• 💷 💷 Shutter range: • AE ROI:	۰.		
	Ladybug 1.14 Release 9 Camera Selection		• - • ×	
	Camera List (1 cameras detected) Recat # Model 10000742 [Lasgoug61.D5P1.0551555-44	Interface IP Address USB 30 NoA	Serial Number 1800742 Model: Ladyoug5 LDS-U3 51SC-44 Vendor: Point Grey Research Sensor: Herodore Research Resolution: Interface Ibit Speed Usinoun PCIel Bus Speed Usinoun IDC Version: 1.32 Finimaare Build Time: Fin Aug 1121 55 44 2017 Drive: USE Care Driver (PGRUSbCare Syst) - 2 4.3.0	
	F200112 Rotesh		OK Canfigure Selected Cancel	
Ready			GPS not started Display Rate: 0 fos Gr	ab Rate: 0 fos Data Rate: 0.00MB/s

Figure 6: LadybugCapPro Camera Selection Interface

6. Click on the "Trigger/Strobe" tab to view the trigger and strobe options. If you want to trigger the camera through rover (preferred method), you must click the checkbox "Enable/disable trigger" and ensure it is checked. Under Pin Direction Control, verify GPIO 0 is set as "In" and GPIO 1 is set to "Out." Under Strobe Control, verify the checkbox "Enable strobe for this pin" for GPIO 1 is checked, Polarity is set to "Low", with a Duration of "10.00".

Camera Moremation Camera Moremation Camera Registers Trigger Control Enable / disable trigger Trigger Delay Enable / disable delay Pin Direction Control Trigger Source Look Up Table Mode: ✓ Parameler: 0 00000 Data Fisch System Information GPIO 0 GPIO 1 Bus Topology Help / Support GPIO 2 GPIO 3 Strobe Control Fire Software Trigger GPIO 1: Trigger Polarity Polarity Enable strobe for this pin Polarity Fire Software Trigger GPIO 2 GPIO 3 GPIO 1:	ol ed s hem	
Camera Registers Imager / Strobe Imager / Strobe Mode: ○ Mode: ○ Imager / Strobe Might Dynamic Range Parametler: ○ Look Up Table Parametler: ○ Parameter: ○ ○ Mode: ○ ○ Parameter: ○ ○ Date Fish © © System Information © GPIO 0 GPIO 1 But Topology None Software Trigger Fire Software Trigger High Support Lobybug Settings Imable strobe for this pin Price Software Trigger Polarity ● Low High Delay: 000 © GPIO 1 Enable strobe for this pin Polarity Polarity Enable strobe for this pin Polarity Low Duration: 000 © Enable strobe for this pin Polarity Low Duration: 000 © Enable strobe for this pin Polarity Low Duration: 000 © Enable strobe for this pin	ed s hem	
Trigger / Strube Iddamade Carear Settinga High Dynamic Range High Dynamic Range Parameller: Darameller: Dispersive Frame Buffer Der Ur Table Frame Buffer Der Ward Raheh System Information Bus Topology Help / Support Lady bug Settinga Trigger Polarity © Low High Polarity High Delay: Polarity High Delay: Polarity Low Duration: QPIO 2 QPIO 3	ed s hem	
transact Cames Settings Mode: 0 ✓ High Dynamic Range Parameler: 0 0 Lock Up Tidger Source Min trigger delay: 0.0000s min trigger delay: 0.0000s Bus Tapology GPIO 0 GPIO 1 Bus Tapology Mode: Fire Software Trigger Trigger Polarity Imager Source Software Trigger Trigger Polarity Imager Source Fire Software Trigger Bus Tapology High Min trigger delay: 0.0000s Meb / Support One Fire Software Trigger Ladybug Settings Trigger Polarity Fire Software Trigger Ploarity High Delay: 0.00 Polarity High Delay: 0.00 Polarity Low Duration: 0.00 GPIO 2 GPIO 3	ed s hem	
High Dynamic Range Look Up Table Parameller: 0 00000 <	nem	
Lock Up Table Parallinetes. 0 Min trigger delay: 0.00000s as a trigger source Prane Buffer Obt Fish GPIO 0 GPIO 1 Min trigger delay: 0.00000s GPIO 0.0 In Out System Hormation GPIO 2 GPIO 3 Software Trigger Fire Software Trigger Heb/ Stopport None Fire Software Trigger Fire Software Trigger Lobybug Settings Trigger Polarity Fire Software Trigger GPIO 2.0 In Out Strobe Control GPIO 1 Enable strobe for this pin Polarity Polarity High Delay: 0.00 Polarity Ool 0 GPIO 2 GPIO 3 GPIO 3 GPIO 3	_	
Prace Buffer Trigger Source Min fingger delay: 0.000005 Data Flash GPIO 0 GPIO 1 GPIO 2 GPIO 3 GPIO 0 GPIO 1 GPIO 2 GPIO 3 But Tooology GPIO 2 GPIO 3 GPIO 2 GPIO 3 GPIO 2 GPIO 3	_	
Dotes Fleih GPI0 0 GPI0 1 GPI0 2 GPI0 3 GPI0 2 GPI0 3 GPI0 3	_	
System Unformation GPIO 2 GPIO 3 But Topology None Fire Software Trigger Help / Support Ladybug Settings Fire Software Trigger Strobe Control GPIO 1: In ● Out GPIO 2: In ● Out GPIO 3: In ● Out Strobe Control GPIO 1: In ● Out GPIO 1: In ● Out GPIO 3: In ● Out GPIO 2: In ● Out GPIO 3: In ● Out GPIO 1: In ● Out GPIO 3: In ● Out GPIO 1: In ● Out GPIO 3: In ● Out GPIO 1: In ● Out GPIO 3: In ● Out GPIO 1: In ● Out GPIO 3: In ● Out GPIO 1: In ● Out GPIO 1: In ● Out GPIO 1: In ● Out GPIO 3: In ● Out		
Bur Teology Help / Support Ladybug Settings → None Trigger Polarity ● Low → High Strobe Control GPIO 1 → Enable strobe for this pin Polarity → High Delay: → Dout GPIO 1 → Enable strobe for this pin Polarity → Low Duration: → Control GPIO 1 → Control GPIO 1 → Control → Control GPIO 2 → Control → C	-	
Melp / Support	-	
Ladybug Settings Trigger Polarity		
GPIO 3: D In Out Strobe Control GPIO 1 Carlou High GPIO 1 Carlou High Polarity Low Duration: 0.00 \$ GPIO 1 Carlou Polarity High Delay: 0.00 \$ GPIO 2		
Strobe Control GPI0 1 □ Enable strobe for this pin □ Enable strobe for this pin □ Polarity High Delay: □ Low Duration: 0.00 \$ □ GPI0 2 GPI0 3		
Strobe Control GPI0 1 GPI0 1 Control Enable strobe for this pin Control Polarity High Delay: Low Duration: 000 € GPI0 2 GPI0 3		
GPI0 1 GPI0 1 GPI0 1 Polarity High Delay: Polarity Low Duration: GPI0 2 GPI0 3 GPI0 1 Polarity Delay: 0.00 ↓ Polarity Duration: GPI0 1 Polarity Delay: 0.00 ↓ Polarity Duration: GPI0 3		
Enable strobe for this pin Polarity High Delay: Low Duration: 0.00 ♀ GPIO 2 GPIO 3		
Polarity High Delay: 0.00 Polarity High Delay: 0.00 Polarity Polarity Low Duration: 0.00 Environment Environment 10.00 GPIO 2 GPIO 3	191	
Oraniy Low Duration: 0.00 Polany OLow Duration: 10.00 GPIO 2 GPIO 3	=	
GPIO 2 GPIO 3	•	
GPIO 2 GPIO 3		
Eachie shake for this size		
	A	
Polarity Polarity Out Polarity	Ŧ	
Low Duration: 0.00 + Low Duration: 0.00 +	÷	

Figure 7: Trigger/Strobe LadybugCapPro Camera options

7. Alternatively, if you want the Ladybug5 camera to trigger by time on its own you must disable the Trigger control option in the "Trigger/Strobe" section. Once the trigger control has been disabled, you can then manually adjust and set the framerate within the "Camera Settings" section. *This option only applies if you do not want to trigger the camera through SpatialExplorer.*

🕻 Ladybug 1.14 R	elease 9 Camera Control Point Grey Research Ladybug5 LD5P-U3-51S5C-44 (18080742)	*			×
Camera Settings	Camera Settings				
Camera Information	Absolute Mode		Auto	On/O	One Pust
Camera Registers	Brightness	1.465	%		
Trigger / Strobe	Exposure	-0.927	EV V	\checkmark	
Advanced Camera Settings	Sharpness				
High Dynamic Range	Hue				
Look Up Table	Saturation				
Frame Buffer	Gamma	2.200			
Data Flash	Iris				
System Information	Focus				
BusTopology	Zoom				
Help / Support	Pan	0			
Ladybug Settings	Tilt				
	Shutter	0.135	ms 🗸	\checkmark	
	Gain			_	
	FrameRate	14.000	fps		
	W.B.(Red)				
	W.B.(Blue)		-		
	Power 🗸				
	Temperature 02.4K / 29.25°C / 84.65°F			•	

Figure 8: Adjust Framerate in Camera Settings (only if triggering camera by time on its own).

8. Once the camera parameters have been set, close the Camera Control interface and click the "OK" radio button in the Camera Selection menu to establish the connection with the Ladybug5 camera.



Figure 9: Click OK to connect to Ladybug5 camera

9. Upon establishing a connection to the Ladybug5 with LadybugCapPro, you will need to verify the LadybugCapPro GPS COM port parameters to make sure they make the parameters of your Virtual COM Port. Of importance is the Port number; it has to match the port number of your virtual COM port as well as the Baud rate. Additionally, ensure the checkbox labeled "Start GPS when starting LadybugCapPro" is enabled.

LadybugCapPro O	ptions		×
GPS			4
Port number:	COM1		
Baud rate:	9600	•	
Data update ii	nterval (ms):	1000	
Start GPS v	when starting L	adybugCapl	Pro

Figure 10: LadybugCapPro GPS Options

10. Make sure the option "*Start GPS Positioning*" is selected. If it is running, it will display "Stop GPS Positioning." Additionally, make sure the option "*Start GPS Time Sync*" is enabled. These two options will provide software and hardware timestamps for your images. It is possible you may need to restart LadybugCapPro and reconnect to the Ladybug5 to ensure both services are enabled and running.



Figure 11: Start GPS Positioning and Start GPS Time Sync

11. In Serial Port Redirector, you should see the status of the virtual COM port as "Connected" to the Ladybug5 camera via LadybugCapPro.



Figure 12: Virtual COM port status connected to LadybugCapPro

12. Set the "Data Format" to JPEG (12-bit) - GIS.



Figure 13: Setting Data Format in LadybugCapPro

13. Depending on where you will be driving, select the appropriate Shutter range (Drive Highway, Drive City, Indoor, Low noise).



Figure 14: Selecting Shutter Range in LadybugCapPro

Drive Highway	Maximum shutter is set to as short as possible to prevent motion blur. Best used outdoors or images may be too dark. This is the default.
Drive City	Maximum shutter set for city driving speed (40 km/h or 25 m/h) to prevent motion blur.
Indoor	Maximum shutter is slightly longer than the driving modes, for use in indoor or lower light applications.
Low Noise	Maximum shutter range allowed for lowest noise. This may introduce motion blur.

Before triggering the camera with SpatialExplorer, ensure to record a new stream.

14. Click the "Record new stream" radio button and choose a location to save the image stream. Once recording is in progress, you can **ACT**ivate the camera via SpatialExplorer.



Figure 15: Record new stream in LadybugCapPro

15. To verify that the GPS Time Sync is indeed enabled within LadybugCapPro, ensure the values "GPS Time: 1, PPS: 1, Quality: 1" are displayed near the bottom of the interface. These values will not update until a picture is taken.



Figure 16: GPS Time Sync verification

BEFORE CONTINUING, MAKE SURE TO VERIFY GPS TIME SYNC READS: "GPS TIME: 1, PPS: 1, Quality: 1" DO NOT CAPTURE AND RECORD IMAGERY WITHOUT GPS TIME SYNC.

Dimensions

Roof Rack



Clamp







This content is subject to change.

If you have any questions about this document, please contact Phoenix LiDAR Systems by sending a message to support@phoenixlidar.com.

Copyright © 2020 Phoenix LiDAR Systems All Rights Reserved.