CamBoard pico monstar

Getting Started

Version **3.19.0**

PUBLIC

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This document may also be changed without notice.
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1. Introduction

This document is intended for specialists. These specialists are people who are qualified by their appropriate training and their experience to see risks and to avoid possible hazards that may be caused during operation or maintenance of the device. The document contains information about the correct handling of the device.

Read this document before use to familiarize yourself with operating conditions and installation. Keep this document at hand during the entire duration of use of the device.

All references to software package and viewer application are valid for revision 3.19.0. Changes in future revisions will be reflected in an updated corresponding getting started document.

2. Warnings / Recommendations

These instructions are part of the device. They contain texts and figures concerning the correct handling of the device and must be read before installation or use.
Note the safety instructions. Use the device in accordance with its designated use.
The installation and connection must comply with the applicable national and international standards. Responsibility lies with the person installing the device.
The unit may only be opened by the manufacturer or by a person authorized by the manufacturer.

Based on the assessment of IEC 60825-1 2nd Edition (2007) this product does not exceed the AEL of a Class 1 laser product. Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Caution: Class I invisible laser radiation present.
Highly divergent laser radiation - Do not stare into the beam.
Do not attach any optics to the device! Do not open the enclosure.

Attention: warning of hot surfaces.

During operation do not touch the device directly.

Only use the CamBoard pico monstar with the software delivered in this package. Don’t use this module with prior software versions!

Though profound testing we cannot guarantee seamless operation with all USB chipsets on the market. Utilize an active USB hub if problems occur with notebook or tablet operation

3. Items supplied

1.	**CamBoard pico monstar**	
2.	**USB cable**	
3.	**Fixation bar incl Screws**	
4.	**Getting Started manual**	

4. Installation

Please use the **software download portal on the bottom of** www.pmdtec.com/picofamily to **download the software package** including full API documentation for the CamBoard pico family.

Password: Sh!2CBpf

Unpack the ZIP file. You will find several packed files inside that correspond to the supported OS platforms.

Choose the file for your OS and unpack it to a location of your choice e.g. your desktop.

4.1. Windows

- There are installers for installing software and drivers for the CamBoard pico family (libroyale-3.19.0.X-WINDOWS-x86-64Bit.exe and libroyale-3.19.0.X-WINDOWS-x86-32Bit.exe).
- Please follow the instructions of the installation assistant. Choose “Weiter”/”Continue” on the first screen, then accept the license agreement on the second screen (“Annehmen”/”Accept”).
- Make sure that the checkboxes for Desktop icon and install of the drivers on the third screen are checked.
- On the fourth screen you may change the installation path.
- After successful installation you may
    - Connect the CamBoard pico monstar to your PC via USB.
    - Open the device manager (on a console or in the Win8-search type "mmc devmgmt.msc" and hit RETURN)
    - The CamBoard pico monstar should show up in the "PMD Devices" section. For each connected CamBoard pico monstar an entry should exist.

4.2. Linux

Please extract the Linux package (will result in a “libroyale-3.19.0.X-LINUX-x86-64Bit” or “libroyale-3.19.0.X-LINUX-x86-32Bit” folder). Then transfer the complete folder to your computer.

Make sure that you have proper permissions to the USB device. The installation package contains a proper rules file which can be used. It is located in the /driver/udev directory, please refer to the README file in that directory for more details.

4.3. Mac OS X

For Mac OS X please extract the zip package (will result in a “libroyale-3.19.0.X-APPLE-x86-64Bit” folder). Then transfer the complete folder to your computer. You will find the royaleviewer app in the /bin subfolder.

5. API documentation (Royale documentation)

The **Royale** software package provides a light-weight camera framework for time-of-flight (ToF) cameras. While being tailored to pmd cameras, the framework enables partners and customers to evaluate and/or integrate 3D TOF technology on/in their target platform. This reduces time to first demo and time to market.

The full html documentation can be found within the doc subfolder in the installation path (Windows) or in the unpacked folder (Linux and Mac OS X).

- *C:\Program Files\libroyale\3.19.0.X\doc\html\index.html*
- *libroyale-3.19.0.X-[platform]/doc/html/index.html*

6. Royale viewer

Once the CamBoard pico monstar is attached to a free USB port, and the drivers are in place, you may start the **Royale viewer** application which gives you a first indication, if the CamBoard pico device is working on your target system. The Royale viewer displays a 2D and a 3D representation of the captured depth data.

7. Use cases

Please note that these settings are initial proposals. When investigating your specific application do not hesitate to try a different use case, in order to verify whether it provides more beneficial data.

Nr	Use Case	Name	Range(*) [m]	Framerate	max. Exposure Time (us)
1	Indoor room reconstruction	MODE_9_5FPS_1900	0.9 - 6.0	5 fps	1900
2	Room scanning, indoor navigation	MODE_9_10FPS_900	0.7 - 5.2	10 fps	900
3	3D object reconstruction	MODE_9_15FPS_600	0.5 - 4.3	15 fps	600
4	Medium size object recognition, face reconstruction	MODE_9_25FPS_300	0.5 - 3.4	25 fps	300
5	Remote collaboration, step by step instruction, table-top gaming	MODE_5_35FPS_500	0.5 – 2.5	35 fps	500
6	Small object/product recognition, Hand tracking	MODE_5_45FPS_400	0.5 – 2.5	45 fps	400
7	Hand tracking	MODE_5_60FPS_300	0.5 – 2.5	60 fps	300
8	Mixed Mode	MODE_MIXED_30_5		30/5fps	270/970
9	Mixed Mode	MODE_MIXED_50_5		50/5fps	210/850

(*) *Typical values for lambertian reflection of 90% without ambient light, center of image; due to the wide FoV the depth performance may decrease for non-central pixel.*

These are no hard limits. Depending on the reflectivity of the scene also further and closer distances might be visible.

7.1.1. Indoor room reconstruction

pmd sensors are a viable solution to locate objects or people inside large environments, such as buildings. This use case is optimized for long range scanning at a maximum data quality. By making use of multiple frequencies the ambiguity range of the sensor signal can be increased by several magnitudes. At the same time this sampling methods leads to an increase in data confidence and applications with very high demands in data quality can be realized.

7.1.2. Room scanning, indoor navigation

For mapping applications demanding an enhanced situational awareness quick response times are a necessity. These demands are met by increasing the framerate at a minimum cost in data quality.

7.1.3. 3D object reconstruction

Scanning and reproduction of man-sized objects in close proximity demands high data confidence equal to environmental mapping. Since in general the objects of interest are in closer proximity, the range requirements and necessary integration time can be lowered in favor of faster scanning speed.

7.1.4. Medium size object Recognition, face reconstruction

In general, the quality demands of applications in the field of pattern and object recognition are less demanding than metrological applications. On the other hand, a quick system response time is mandatory. Therefore, the integration time and correspondingly the data quality is lowered in favor of faster framerates.

7.1.5. Remote collaboration, step by step instruction, table-top gaming

For modern gaming and collaborative applications a quick system response is even more important. Since the range requirement can be lowered and the noise performance of **pmd** sensors is directly related to the object distance, higher framerates at equal data quality can be realized.

7.1.6. Small object/product recognition

For hand-size objects and products the necessary range requirements can be further limited and only one scanning frequency is sufficient. Therefore the framerate can be almost doubled and vice versa the overall scanning speed.

7.1.7. Hand tracking

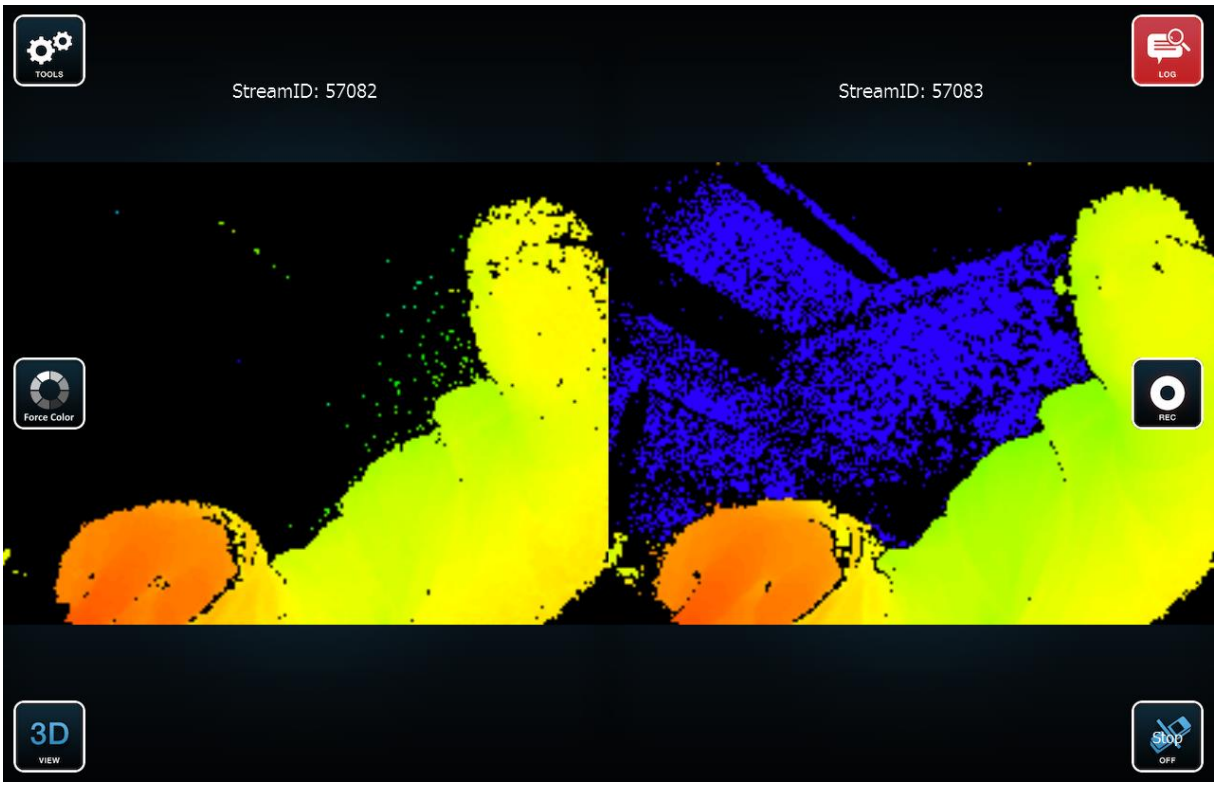
The precise detection and recognition of hand gestures in 3D space is very demanding, both in data quality and processing speed. Hence a special use case has been devised offering optimum setting for this special application.

7.1.8. Mixed Modes

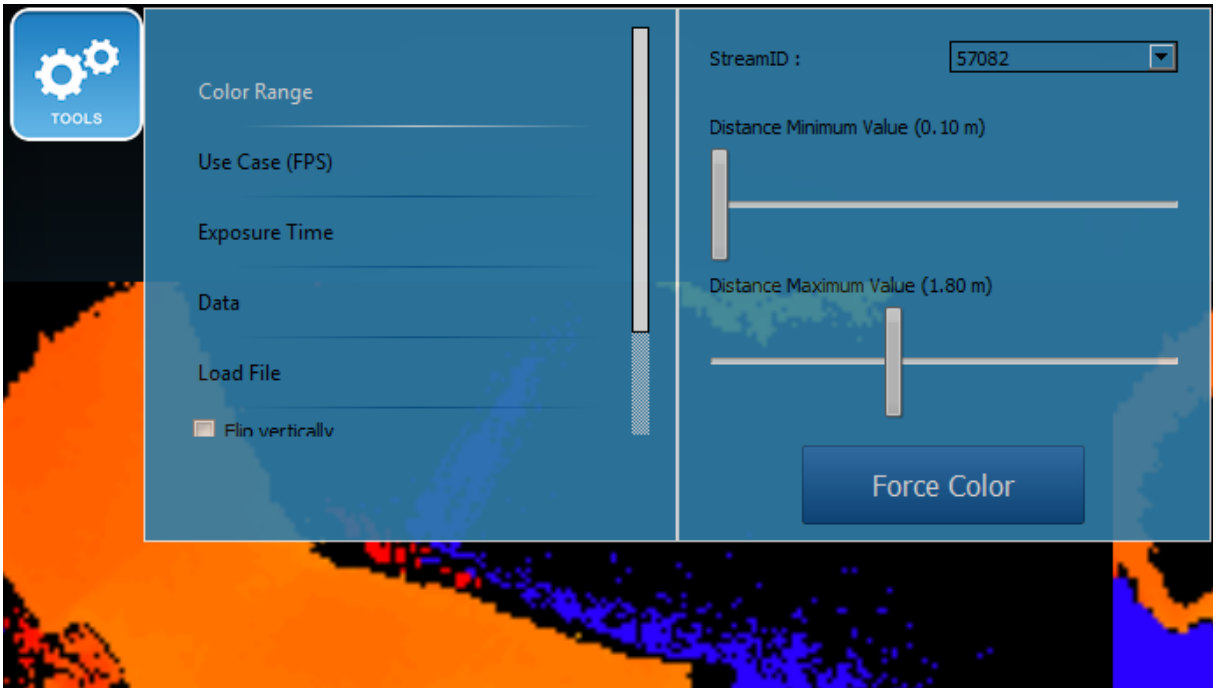
The mixed modes can be used to run two or more different modes at the same time, by capturing frames that fit into separate use cases.

For the pico monstar, Royale offers mixed modes that are a combination of short range/high fps (e.g. for hand tracking) and long range/low fps (environmental scanning). They can be selected like any other use case; to enable the application to distinguish the different use cases the frames will be delivered as separate streams.

In the RoyaleViewer application this is visualized like this:



If you're using one of the mixed modes some settings will require you to select a StreamId:



8. Troubleshooting/ Known Bugs/ Errata

Problem	Possible solution
Camera not recognized ("CX3" in device manager)	Install drivers as described in chapter 4.
Camera not functional on USB3 port	Try using another USB cable. (Recommended: USB-to-microUSB3).
Nothing happens after pressing start in the royale viewer.	Starting the visualization might take a few seconds. Please click the "Info" Button to check if the camera was found. If the camera was not found please install drivers as described in chapter 4.
Far distances are shown as close distances.	a. Switch to a MODE_9 use case to extend the unambiguity range b. Decrease the exposure time Technical Explanation: Due to the periodicity of the frequency modulation the unambiguous range for the distance calculation is limited. Therefore in some use cases (MODE_9_...) two modulation frequencies are combined to extend the unambiguity

	range. The combination of both frequencies yields in an extended unambiguity range of approx. 7,5m. Some use cases only use one modulation frequency (MODE_5_ …) in order to achieve higher framerates. In those Use Cases the unambiguity range is approx. 2,5m. Due to the illumination power of the camera module points in the scene beyond 2,5m may be visible. Those will be mapped into the unambiguity range.

9. Tested configurations

OS	Comment
Windows 7	Tested with Windows 7 Enterprise (SP1), 32 bit
Windows 8	
Windows 8.1	
Windows 10	Tested with Intel USB 3 Controller on Windows 10 (Version 1703)
Linux (Ubuntu 16.04 + Qt5.5)	Tested with Ubuntu 16.04 32/64 bit