## 1 Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CONTENT</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>GENERAL CONCEPT</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>SET UP</td>
<td>5</td>
</tr>
<tr>
<td>3.1</td>
<td>Core</td>
<td>5</td>
</tr>
<tr>
<td>3.1.1</td>
<td>Installation</td>
<td>5</td>
</tr>
<tr>
<td>3.1.2</td>
<td>Configuration</td>
<td>5</td>
</tr>
<tr>
<td>3.2</td>
<td>Installation of Touch</td>
<td>6</td>
</tr>
<tr>
<td>3.3</td>
<td>Installation of SDK and Documentation</td>
<td>6</td>
</tr>
<tr>
<td>3.4</td>
<td>Installation of perClass</td>
<td>6</td>
</tr>
<tr>
<td>3.5</td>
<td>Configuration for FireFLeye series</td>
<td>7</td>
</tr>
<tr>
<td>3.5.1</td>
<td>Configuration of network interfaces</td>
<td>7</td>
</tr>
<tr>
<td>3.5.2</td>
<td>Performance settings</td>
<td>7</td>
</tr>
<tr>
<td>3.5.3</td>
<td>Tweaking</td>
<td>7</td>
</tr>
<tr>
<td>3.6</td>
<td>Configuration for ButterFLeye series</td>
<td>8</td>
</tr>
<tr>
<td>3.7</td>
<td>Configuration of Ambient Light Sensor</td>
<td>8</td>
</tr>
<tr>
<td>3.8</td>
<td>Configuration of GPS</td>
<td>9</td>
</tr>
<tr>
<td>3.9</td>
<td>Known Issues</td>
<td>9</td>
</tr>
<tr>
<td>3.9.1</td>
<td>Cubert Utils Touch can’t connect</td>
<td>9</td>
</tr>
<tr>
<td>3.9.2</td>
<td>Camera not getting online</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>SUPPORT</td>
<td>10</td>
</tr>
</tbody>
</table>
PREFACE

Thank you for choosing this Cubert GmbH product!

This software guide points out the operating concept of the Cubert Utils bundle.

Please keep this document at a safe location.

News and current information on this product can be found on our official webpage:

www.cubert-gmbh.com
The Cubert Utils represent a three-tier system. The first tier represents the physical hyperspectral camera with its hardware preprocessing and digitalization.

The second tier, the application layer, is **Cubert Utils Core**. This application abstracts the hardware and provides the unified saving format and communication.

The thirds tier, the presentation layer, is implemented by the UI **Cubert Utils Touch** as well as custom SDK applications.

The connection between camera and Cubert Utils Core is a proprietary protocol, which will differ over the camera models. The connection between Core and any presentation software is a TCP/IP connection with a SOAP protocol.
The setup of a system is somewhat complicated, and strongly dependent on the camera model. Thus, we will separate the general installation from the camera-specific setup.

3.1 Core

3.1.1 Installation

Cubert Utils Core is required to be installed the computer that has physical connection to the hyperspectral camera. One exception is the ButterflyEYE series, where in autonomous more the core is already installed on the camera.

For a flight solution, Cubert Utils Core needs to be installed on the MiniPC. However, depending on your purchase, this has already been done by Cubert. Same applies for pre-installed Laptops by Cubert.

For all other systems, start the shipped installer and during the setup procedure select to install CORE.

For systems with no direct camera connection it is not required to install CORE, however, if you wish to view and post-process pre-recorded measurements on that machine directly, you are required to also install Cubert Utils Core on that PC.

During the setup, all required dependencies will be installed. After installation, the system will reboot.

3.1.2 Configuration

For Cubert Utils Core some options may require tweaking. Cubert Utils Core in general is controlled by environment variables.

- **CUBERTDIR** set the default saving directory. Per default, the documents folder of the user will be used.
- **SLOWFPS** set the frame-rate for processing of live previews (default: 5 fps). This does not affect the recording speed, but will severely influence your system performance. If you encounter performance issues, decrease that number. For the MiniPC in the flight solution, a value of 0.5 is recommended.
- **SOAPPORT** set the port for the network connection between Cubert Utils Core and Cubert Utils Touch (only for high performance mode). This option is overwritten by CubertUtilsTouch.exe.config by DefaultPort (see Cubert Utils Touch manual, chapter 10.1).
- **GPIORAWFPS** sets a maximum frame rate for Raw and Dark Subtract capture mode. This option allows fine tuning a system for the actual performance constraints of a system.
- **GPIOREFFFPS** sets a maximum frame rate for Reflectance capture mode. This option allows fine
tuning a system for the actual performance constraints of a system.

- **AUTOEXPMAXFPS** sets the maximum frame rate for processing the auto exposure. When the actual acquisition exceeds this speed, frames for calculating the exposure metrics will be skipped. The default is 3 fps.

- **CUBERTNOVALIDINIT** forces to ignore validation checks of the factory calibration. Do not use this option.

### 3.2 Installation of Touch

The installation of Cubert Utils Touch can be selected in installation wizard. For configuration details and operation refer to the separate guide Cubert Utils Touch manual.

### 3.3 Installation of SDK and Documentation

The SDK examples and the documentation can be selected for setup in the installation wizard. They will be located in the installation directory selected, by default this is C:\Program Files\CubertFuchsia\perClass\.

### 3.4 Installation of perClass

PR SysDesign’s classification engine perClass is installed automatically with the CORE package, the respective Toolbox for generating classification pipelines with Matlab can be selected for installation during setup.

For activating perClass Runtime, enter the activation key in the log window of Cubert Utils Touch (see Cubert Utils Touch manual, chapter 8.8). This requires an internet connection.

For activation of the toolbox, start Matlab and add perClass to the path (e.g. C:\Program Files\CubertFuchsia\perClass\). In Matlab run the command `sdactivate`. This required internet connection.

The Runtime license file will be located in `%ALLUSERSPROFILE%\CubertUtilsCore\license`

The Toolbox license will be located in the directory where the Matlab files for the toolbox are stored.

If you encounter problems with the internet-based activation, please contact support.

Please also regard the abundant documentation at PS SysDesign’s web page: http://perclass.com/cubert
3.5 Configuration for FireflEYE series

For configuration of a FireflEYE camera, first install Cubert Utils Core on the system the camera will be connected to.

3.5.1 Configuration of network interfaces

First, configure the NICs:

- Open Network and Sharing Center
- Select the NICs utilized for the FireflEYE camera
- Select properties
- Select Configure
- Under advanced options, search for JumboFrames, set the maximum possible value (at least 8k / 8000). Confirm dialogue with OK.
- Open TCP/IPv4 properties
- Configure the IPs according to the **hardware operation guide** of your camera model.

3.5.2 Performance settings

Next, run the factory file installer shipped with your camera.

During setup, select the same path for installation, as during the setup of CORE.

Next, select the performance settings for a computer. For a Cubert Flight solution controller, select MiniPC, for a computer with only one built-in Gig-E Ethernet connection, select Laptop. For a high performance workstation, select High End PC.

If you experience low acquisition frame rate with the hyperspectral camera, you may try to re-install the factory files and select a higher performance setting. However, if you encounter frame drops, you should decrease the performance settings.

3.5.3 Tweaking

The performance settings selected by the factory installer is a rough category at best. For really optimizing the performance to your system you are able to fine-tune the settings on you system.

For this, you can manipulate the environment variables **LCAMPACKSIZE** for the package size of the panchromatic sensor, and **CCAMPACKSIZE** (S185 only) for the packet size of the spectral sensor.

In general, a lower numeric value will increase frame rate. In order to check for stability, observe the frame rate in the log window. If the value for "good" decreases, increase **LCAMPACKSIZE**. If the frame rate decreases, increase **CCAMPACKSIZE**.

We recommend the strategy to really test for you use case. E.g. if you want to record in reflectance mode with NDIV preview enabled at a fixed display rate of 5 FPS (see SLOWFPS option, chapter 3.1.2), set this up (including actual integration times that you intend to use later on!) with a
fixed CCAMPAKSIZE/LCAMPAKSIZE combination and check for the highest frame rate. Run a series of settings changing the values by a factor of 2 each.

The best mode will be the one, that provides the highest FPS and network data bandwidth (see task manager) for both network connections.

3.6 Configuration for ButterfiEYE series

The ButterfiEYE cameras come with a dual IP configuration. The first IP is static at 192.168.200.100/24. To connect with it, set your computer to an ip in the same subnet, e.g. 192.168.200.1, netmask 255.255.255.0.

The secondary ip is configured by a DHCP server that runs in your network. Which IP the camera will obtain depends on your DHCP server.

Next, install the factory files.

Finally, you need to decide whether you want to run the camera in performance mode or autonomous mode. See Hardware Operation Guide ButterfiEYE, chapter 6.

In performance mode, you need to run Cubert Utils Core on your computer. The core will automatically establish connection to the camera.

In autonomous mode, you need to enter the camera IP in Cubert Utils Touch (see Cubert Utils Touch manual, chapter 2.1).

3.7 Configuration of Ambient light sensor

The major part of the ambient light sensor’s configuration is included to the factory calibration of you camera. The required drivers are installed together with the installation of Cubert Utils Core.

When starting Cubert Utils Core, the log window will show the load level of the ambient light sensor, if it is properly connected. Also, you can see the system status in Cubert Utils Touch, see chapter 3.5 in the respective manual. This chapter also explains how to set an integration time factor.

Setting the integration time factor is the most challenging part of a proper set up with the ambient light sensor. We recommend the following strategy.

First, set up your hyperspectral camera’s integration time, as such, you ensure, that you will have as many counts as possible for you actual measurement without over-illuminating it.

Next, point the ambient light sensor with cosine corrector in place to the light source or the sky. The viewing field must not contain any local objects, if you intend to move the whole system.

Next, change the integration time factor of the ambient light sensor to produce a load level that allows enough increase to cover the changes of your light source, e.g. 80% if you expect the light source to brighten by a maximum of 25%.
Finally, point your camera to white target, record a white reference. Cover the camera (and if possible also the ambient light sensor) and record a dark.

The whole procedure requires a lot of experience. We recommend testing the whole procedure indoors with an artificial light source, first.

3.8 Configuration of GPS

The GPS link is automatically established, if a Cubert-specified GPS is connected to the system. As yet, the USB-to-serial converter’s driver is not automatically installed. Please install the driver shipped with the GPS, first.

The GPS will show an online state in Cubert Utils Touch (see chapter 3.5 in the respective manual) if the GPS locked to a sufficient number of satellites, only. For closer information about possible problems, closely observe the log window.

3.9 Known Issues

3.9.1 Cubert Utils Touch can’t connect

A commonly known issue is that Cubert Utils Touch will not connect to Cubert Utils Core.

Please ensure that the network connection is reachable and Core is running.

If so, verify that the Core’s network service is running. Search for command prompt in the start menu of you operating system, right click and run as administrator. In the console box enter “netstat -b -a” and search for CubertUtilsCore.exe

If the application can be found in the list, you probably have an issue with the firewall. Ensure, that the firewall allows CubertUtilsCore.exe to server on the port 8080.

If the CubertUtilsCore.exe is not in the list, you need to change the network port. Create the environment variable SOAPPORT and set a free port number as value, e.g. 18800. Restart Cubert Utils Core. Remember to change the port also in Cubert Utils Touch.

3.9.2 Camera not getting online

For the camera not going online there might be several reasons. Please closely observe the log window, if it complains about faulty network connections. If so, fix the setting according to the hardware operation guide of the camera. This may quite commonly be, that you simply switched the network cables.

If this doesn’t help, please contact you distributor for support (see chapter 4).
4 Support

In general, the technical support for Cubert Hyperspectral cameras is provided by your local distributor.

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