Guide

for

Underwater Vision Profiler 6

And

UVPapp piloting application

Version beta (2022/01/31)

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1. WARNING and MAIN RECOMMENDATIONS

1.1 Optical alignment

The arm connecting the camera to the light unit must never be disconnected from the camera as the optical alignment and the sensor calibration will be lost requiring to return the instrument for inter-calibration.

1.2 Sun light protection

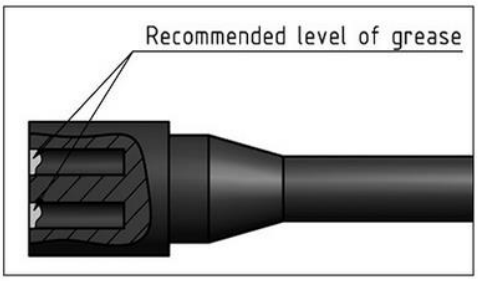
Do not leave instruments in direct sunlight. Direct sunlight can easily increase the internal temperature of the instrument beyond its maximum rating. It may also damage the optics of the light unit.

1.3 Prevention of connector corrosion

It is mandatory to follow the recommendations shown hereafter. A slight corrosion of the connectors might generate UVP6 malfunctions. Small pot of Molykote 44 is provided with the instrument.

See SUBCONN complete recommendations

Greasing and mating above water (dry mate)



- Connectors must be greased with Molykote 44 Medium before every mating
- A layer of grease corresponding to minimum 1/10 of socket depth should be applied to the female connector
- The inner edge of all sockets should be completely covered, and a thin transparent layer of grease left visible on the face of the connector
- After greasing, fully mate the male and female connector in order to secure optimal distribution of grease on pins and in sockets
- To confirm that grease has been sufficiently applied, de-mate and check for grease on every male pin. Then re-mate the connector

1.4 Light unit care

Even if rated and tested for 6000m use, the glass cylinders of the light unit are fragile. Extreme care must be applied to prevent any scratch or shock on these units. The light must be protected with its socket whenever the UVP6 is not in use. The socket prevents scratches on the glass and optics protection against U.V. If you suspect any damage, stop using UVP and contact Hydroptic.

DANGER : RED LASER DIODE

The light unit emits red light via a laser diode rated class IV. Avoid eye exposure to direct or scattered radiation.

1.5 Black cap Porthole protection

The porthole 'cap must be on when the UVP6 is not in use. The cap is attached with the Light socket to not forget to remove both protection before deploying the UVP6.

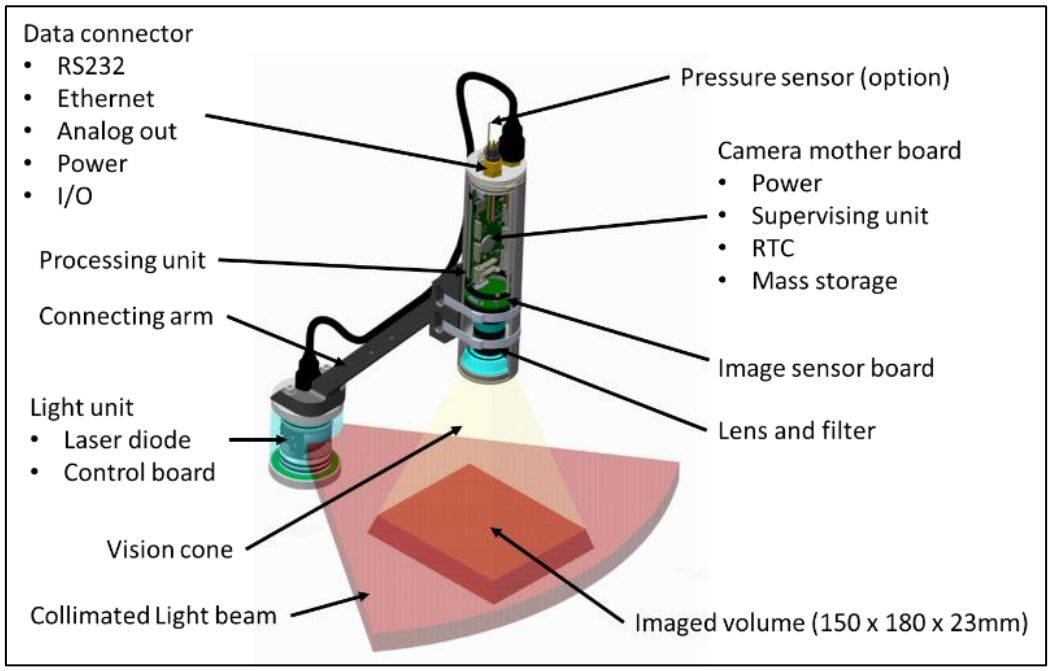
1.6 Efficiency in turbid water

Since the UVP6 is an imaging sensor, turbid water can lead to malfunction and biased results, translated into wrong number or size of objects and/or empty images. This behaviour appears with increasing particle load or turbidity. Two experiments conducted with seabed mud and phytoplankton cultures at Laboratoire d'Océanographie de Villefranche sur mer indicated that the UVP6 results were correct under the values indicated in the table below.

Limit for normal use of UVP6		
Turbidity type	mud	phytoplankton
Transmittance	45%	20%
BBp700 m-1	0.03	0.02
NTU	2.5	2

2. SENSOR DESCRIPTION

2.1 The UVP6



The UVP6 consists of a main camera containing a motherboard with a supervising processor, a mezzanine image processor unit, an image sensor board, a lens and a passband filter centred on 630nm wavelength and an optional pressure sensor necessary when the hosting vector cannot provide the pressure information to the UVP6. The light unit contains a controlling board, a laser diode and lenses. It is attached at a fixed distance of the camera using a connecting arm.

There are two versions of the UVP6:

- The UVP6LP (Low Power) recommended for most application except CTD and fast AUVs
- The UVP6HF (High Frequency), recommended for CTD and fast AUVs

2.2 Operation modes

The UVP6 has four main types of configuration settings: AUTO, TIME, SUPERVISED, and REMOTE CAMERA, the characteristics of which are summarized in Table 2. The four settings correspond to four types of deployments, on different vectors. The settings are based on a main HW configuration table, ten acquisition tables, and an optional time table. The HW table contains mainly the instrument configuration (serial numbers of the camera and light…), the main setup, the parameters issued from the tuning and inter-calibration and some functioning settings related to its configuration. The acquisition tables permit the acquisition parameters including the image rate or the triggering method. The time table permits the selection of the acquisition table for each period of 30 minutes of the deployment when the sensor is utilized in TIME mode.

There are many options to allow all interfacing and usage possibilities from very basic start using the power source up to individual image triggering.

Main setup	Options	Deployment type	Hosting vector
AUTO UVP6 starts when powered ON, use preset acquisition parameters	**CTD (UVP6-HF only)** UVP6 uses pressure to automatically start and stop acquisition	Vertical profiles, analog output available	CTD profilers
	AUTO UVP6 starts after a preset delay, stops when OFF	Any vector only capable to Power UVP ON and OFF	Gliders AUVs ROVs Short term moorings, landers…
TIME UVP6 starts acquisition according to a timetable loaded in the instrument	**TIME** UVP6 starts after a preset delay and check for programming every 30 min to start acquisition using up to 10 sets of parameters	Long term deployments (week-years)	Medium and long term moorings, landers…
SUPERVISED UVP6 waits for the hosting vector to start acquisition sending a RS232 command to select the acquisition parameters	**CONTINUOUS** UVP6 acquires images at its preset frequency	Any vector capable to send/receive RS232 commands	Gliders (SeaExplorer, SeaGlider) Floats AUVs ROVs Cabled observatories
	PILOTED UVP6 acquires images when triggered by the vector	Any vector capable to send/receive RS232 "frequent" commands to trigger images	Floats (NKE CTS5-USEA) Cabled observatories
REMOTE CAMERA	**REMOTE CAMERA**	Remote camera without image analysis through RS232 and ETHERNET (>100MB)	Experimental and connected station

2.3 Computing the mean power consumption of the UVP6

2.3.1 UVP6HF

The UVP6HF drains 6 W when in acquisition and 0.02 W in between. It will drain about 2 W during the 14 s required for booting.

2.3.2 UVP6LP

The UVP6LP drains 0.8 W when acquiring and processing images and 0.02 W in between. The typical duration of an image acquisition and process is 0.75 s. The mean power consumption is then computed according to the image rate of the instrument. Saving full images instead of vignettes will add about 0.6 s to the image acquisition and process.

Examples of computing the mean power in Watt

- typical acquisition at 0.1 Hz saving vignettes : (0.8 x 0.75 + 0.02 x (**10**-0.75))/10 = 0.08 W
- typical acquisition at 0.2 Hz saving vignettes : (0.8 x 0.75 + 0.02 x (**5**-0.75))/**5 =** 0.14 W
- typical acquisition at 0.5 Hz saving vignettes : (0.8 x 0.75 + 0.02 x (**2**-0.75))/**2 =** 0.32 W

2.4 Battery

An optional battery (75Wh/21.6V) can be provided with the UVP6. It permits medium range operations of both UVP6-LP and UVP6-HF instruments. The battery contains a relief valve which permits to charge it without opening the housing.

The housing can anyhow be easily opened for fast replacement of the battery or easier plane transportation. The opening is anyhow made at user risk.

In order to keep the battery autonomy, it is recommended to recharge the battery when less than 50% of its nominal capacity.

The battery provides more than 10 hours (@25°C) recording with UVP6HF while the duration of the operations with UVP6LP depends on its programming (image rate mainly).

2.5 Typical flash sequence

The UVP6 sensor sends a series of 3 flashes of 1 sec approximately when the acquisition starts or when the AUTOCHECK test is successfully completed. The observation of these 3 flashes when the UVP6 is supposed to acquire data means that the instrument is ready and functional.

Note that 3 flashes will be displayed after a maximum delay of 2 seconds for the UVP6-LP and 15 seconds for the UVP6HF sensor. The image flash will then start either immediately or later when a delay is set in AUTO and TIME modes or the start pressure passed in CTD mode.

2.6 Black images

Black images are images acquired at regular intervals without activating the light of the UVP6. They permit measuring the instrument noise and to detect the images which are not influenced by the sunlight at the surface. **The frequency of the black images is automatically set when programming the instrument for most modes.**

2.7 File safe system

The UVP6 has a small storage capacitance which is charged when the instrument is powered. This backup power allows the instrument to complete the image cycle when the power is removed and to safely store the image data. This capacitance is charged when the instrument is powered ON.

2.8 Internal mass storage management

The UVP6 is fitted with a minimum of 400GB of mass storage. 20GB are by default reserved for data storage while 380GB can be used to host images. The data storage is thus never limited in usual utilisation. In case the image storage is full, the instrument will continue acquiring and processing images but only data files will be saved.

The 380GB memory allows to record about 80 000 full images when this option is selected while there is almost no limit for the vignette storage.

3. TYPICAL SEQUENCE OF OPERATIONS

This typical sequence of operation is common to all UVP6 usages. Refer to the dedicated chapter of this guide to learn how to proceed for each step.

3.1 At cruise level

- Instrument mounting in its frame or on its hosting platform
- Instrument connection to Power (AC or battery) and UVPapp
    - Instrument programming
    - Time synchronisation
    - Delete data
    - Autocheck

3.2 At deployment level

- Charge battery (if applicable)
- Time synchronisation
- Porthole and light cleaning
- Deployment (power ON)
- Recovery (power OFF)
- Rinsing with fresh water

3.3 On a daily / regular basis

- Data download
- Merge sequences (if applicable)
- Sample creation (metadata filling)
- Sample process and data QC
- Data backup
- Delete data (if necessary)
- Charge battery (if applicable)

3.4 End of cruise

- Instrument removing from host/frame (never disassemble camera from arm)
- Instrument cleaning and packing

3.5 Data processing steps

The data processing steps are listed below as a reminder. No data can be processed without filling the metadata first.

- Download data
- Merge sequences (if necessary)
- Fill in sample metadata
- Process data
- Process images
- Export to ODV (optional) and import into ODV
- View vignettes (optional)
- Load on the EcoPart FTP and import in EcoPart and EcoTaxa for image classification

4. GUIDE FOR DIFFERENT USAGES OF THE UVP6

Here we describe the specific usage and programming of the UVP6 sensor to perform deployments at sea.

4.1 Using the UVP6HF for vertical profiles (associated with CTD)

The UVP6HF is equipped with a pressure sensor and designed for vertical deployment at high speeds associated with CTD or other optical frames.

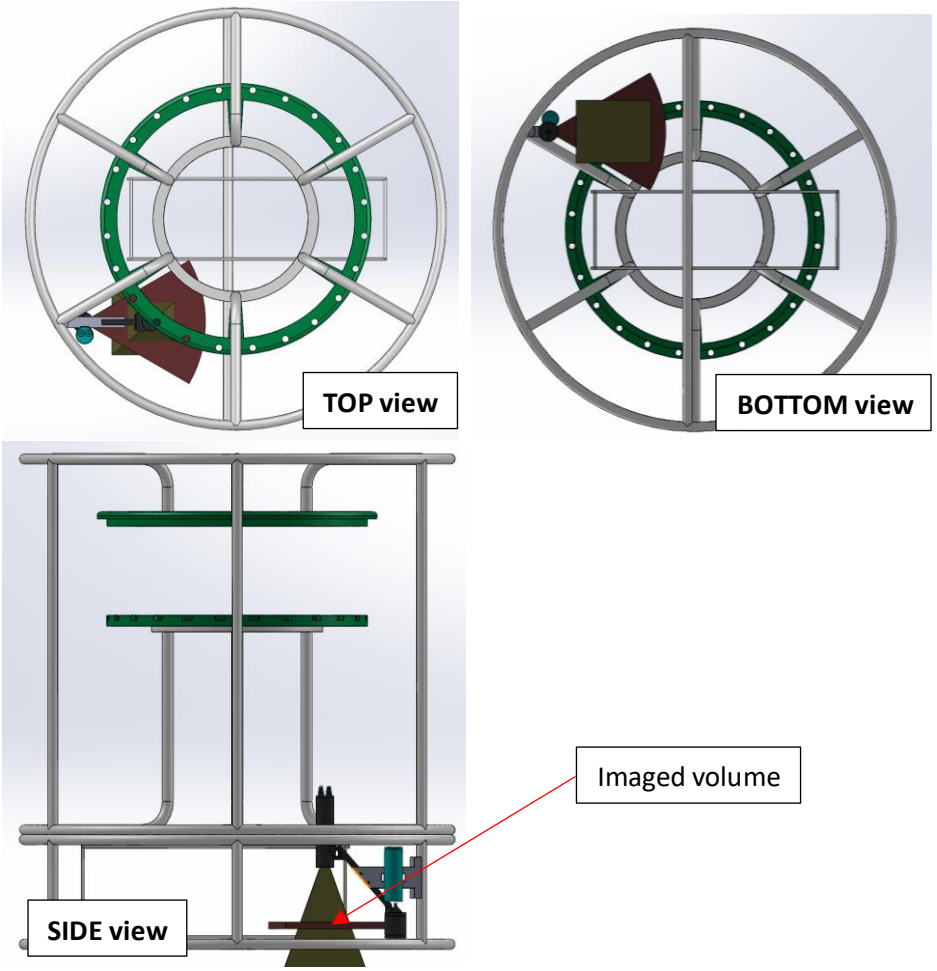
The optional 75 Wh battery permits an easy operation of the system for casts down to 6000M at the highest 25Hz acquisition rate thanks to the provided autonomy.

The UVP6 has a huge data storage capacity which permits it to record tens of profiles without downloading the data.

4.1.1 UVP6 installation

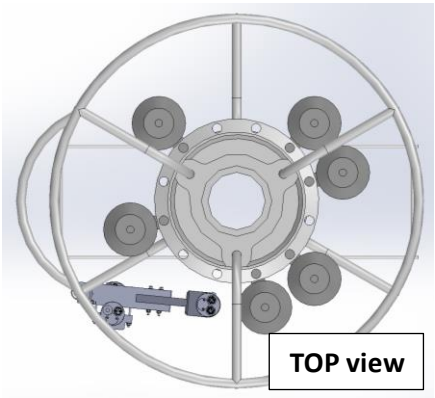
The sensor will be mounted in the CTD frame using the specific mounting kit designed for SBE32 and SBE9+ systems. The positioning will be carefully studied to avoid having any structure in the field of view of the camera and to prevent damaging the UVP6 connectors with the NISKIN bottles. The installation of the UVP6 in a 12 bottles frame requires one bottle above the UVP6 to be shorter than the others.

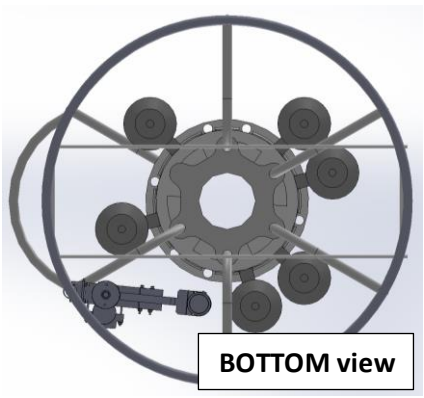
4.1.1.1.1 Mounting in a 24 bottles carousel (SBE32)

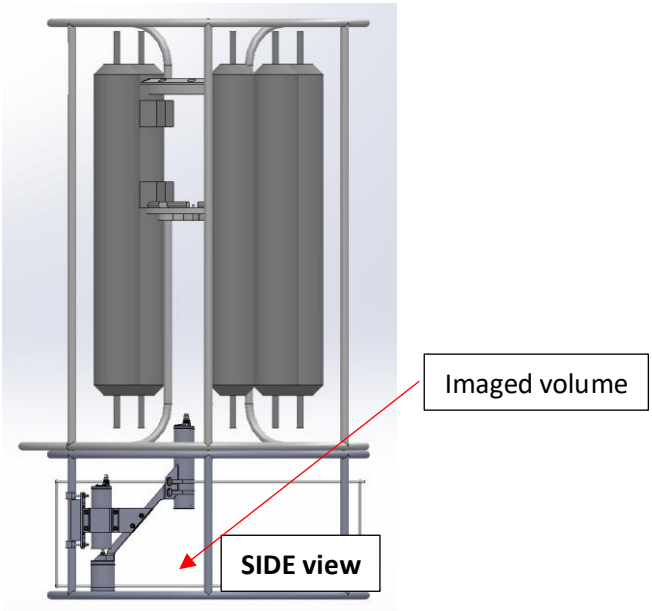


The UVP6 camera will be set behind the bottles. It is recommended to place other optical sensors in the opposite side of the CTD frame to avoid perturbations from the UVP6 red light.

4.1.1.1.2 Mounting in a 12 bottles carousel (SBE32)







The UVP6 camera will be set below one bottle. This bottle must be shorter than the other bottles to give space to the UVP6.

It is recommended to place other optical sensors in the opposite side of the CTD frame to avoid perturbations from the UVP6 red light.

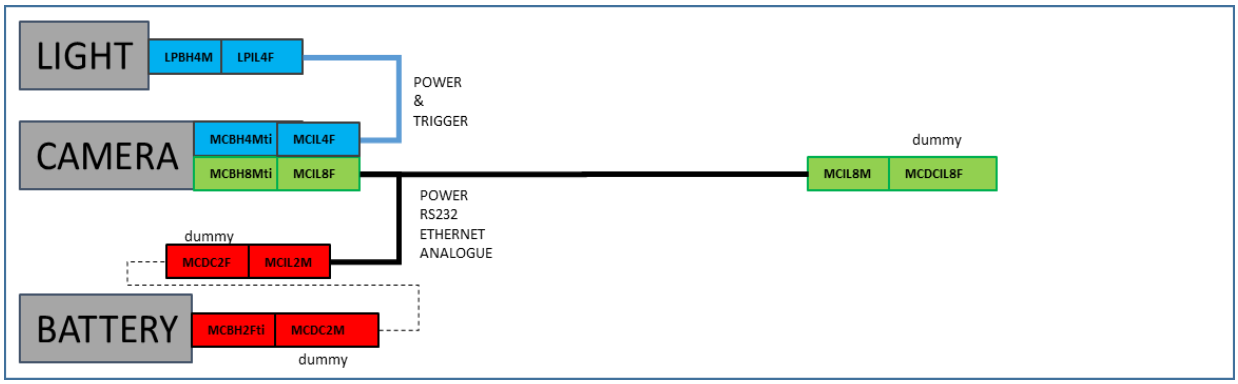
4.1.2 UVP6 cabling

The sensor will be powered via the specific Y cable which connects to the battery.

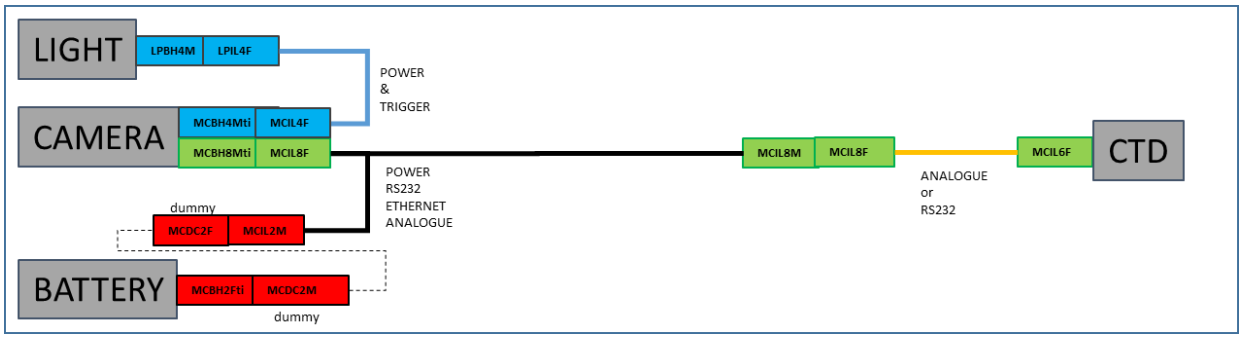
An optional analogue cable allows the UVP6 to transmit the particle abundance converted as a 0-5vdc signal and to visualize it on the CTD graphical interface.

4.1.2.1.1 On deck standby between profiles

In case the analogue output is not connected to the CTD input.

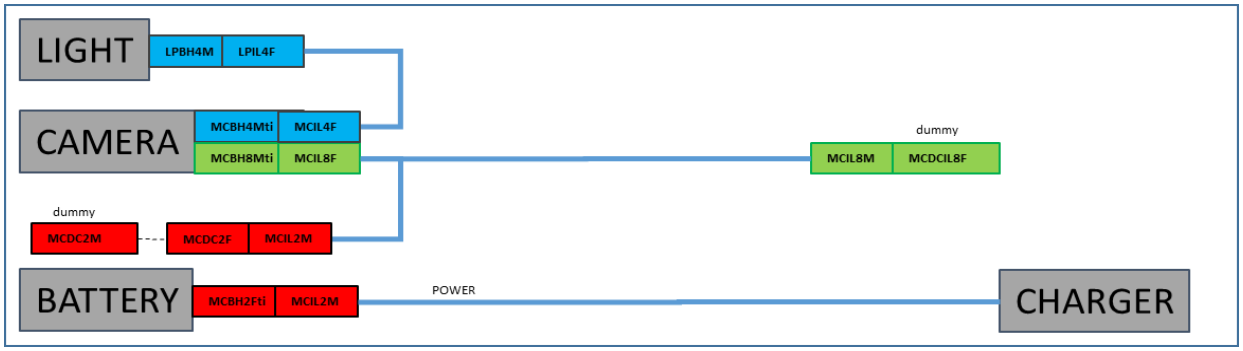


In case the analogue output is connected to the CTD input

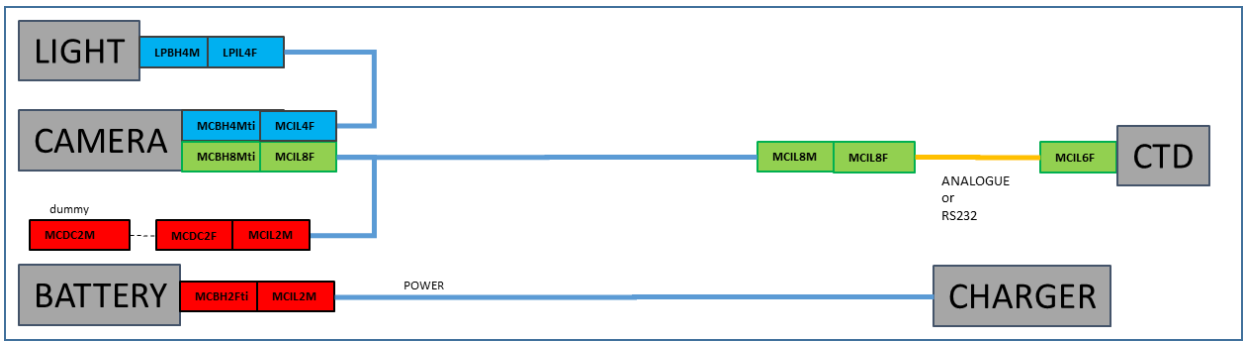


4.1.2.1.2 Battery charge

In case the analogue output is not connected to the CTD input.

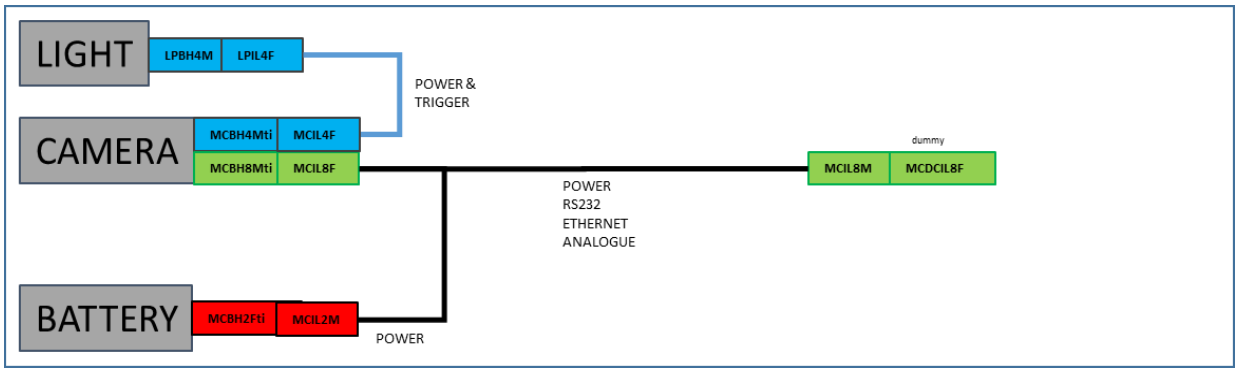


In case the analogue output is connected to the CTD input

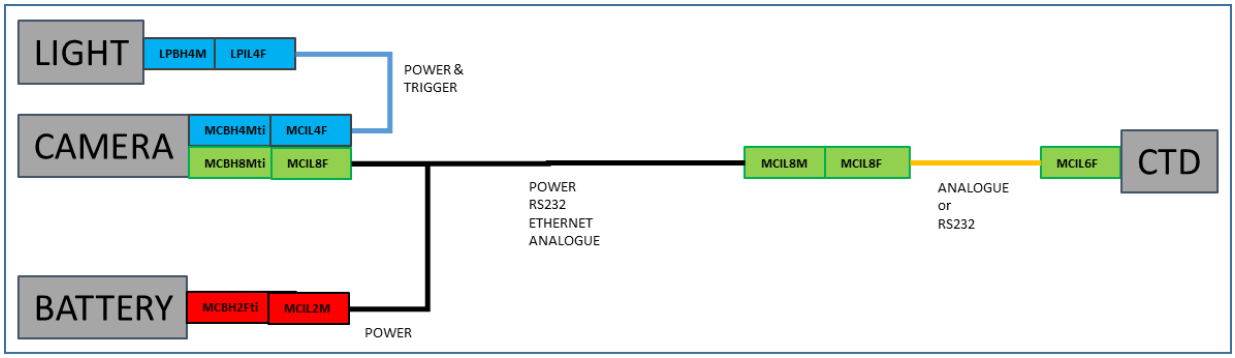


4.1.2.1.3 Deployment

In case the analogue output is not connected to the CTD input.

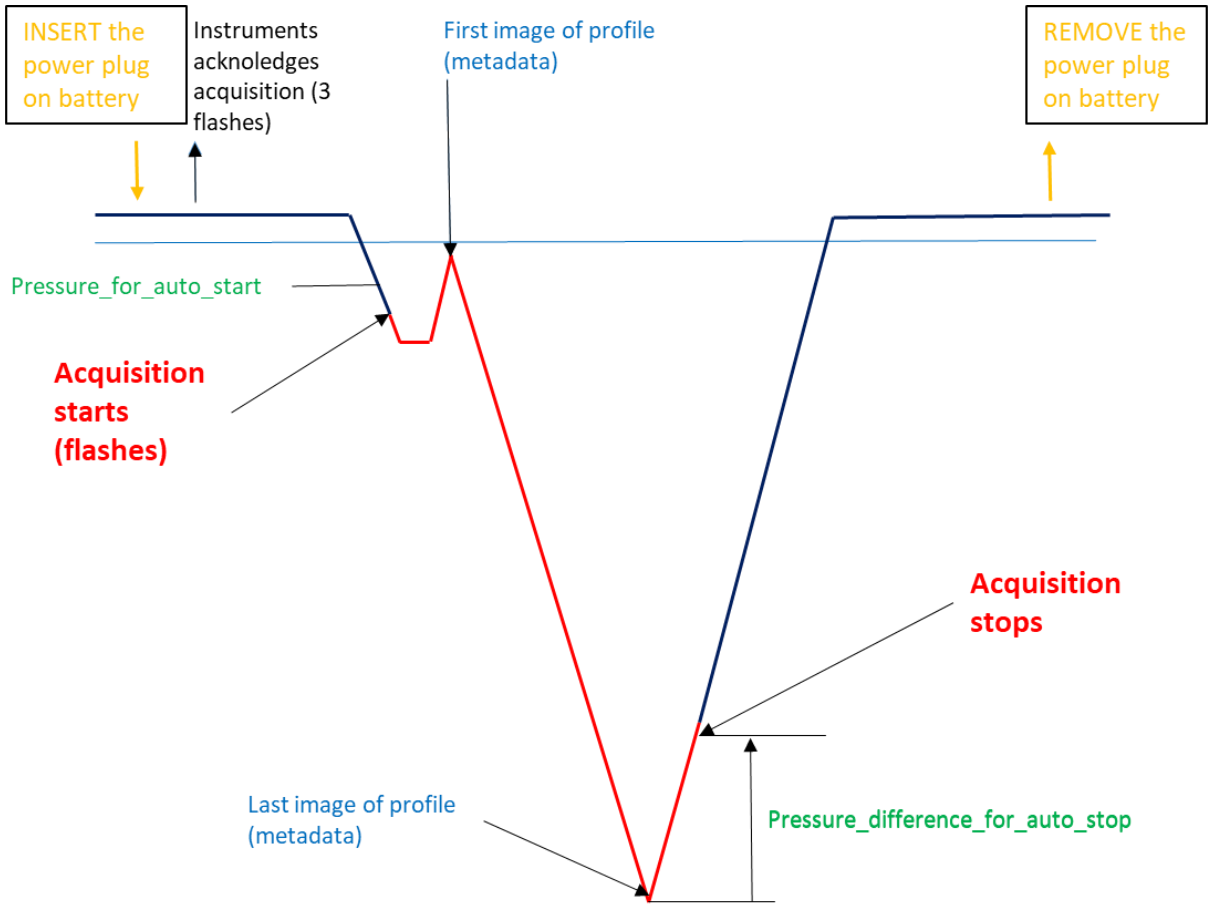


In case the analogue output is connected to the CTD input



4.1.3 UVP6 deployment in CTD mode

The UVP6HF will generally be deployed with the CTD. It will take benefit from the CTD soaking to start acquisition automatically.



Green : settings of the instrument (UPVPapp)

Blue : metadata to be documented when filling the sample metadata (UVPapp)

Red : instrument acquisition

Black : instrument response

4.1.4 UVP6 programming in CTD mode using UVPapp

In case of successive profiles in CTD modes, the battery must be disconnected from the UVP (remove the battery plug) during more than 5 min between deployments in order to allow the instrument to reset.

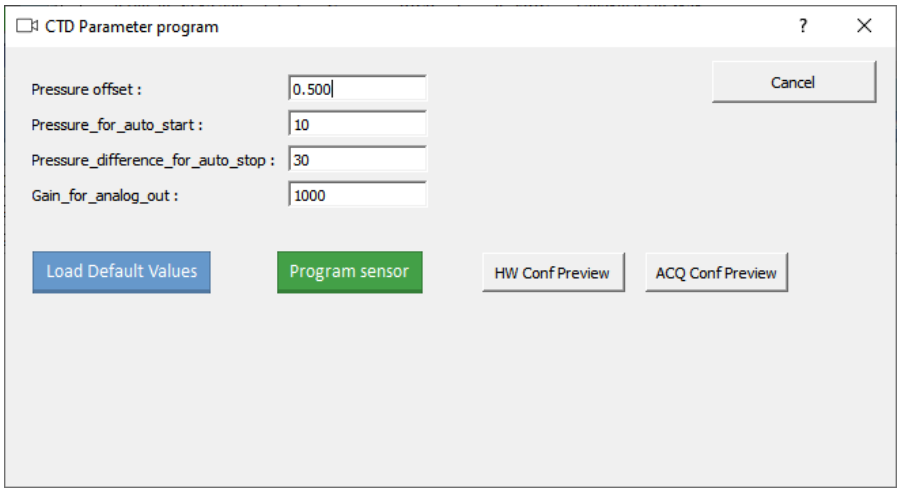
The CTD modes is designed to record data only during the descent of the instrument to image only unperturbed water masses and to minimize the use of the battery.

When programmed in CTD mode, the instrument will flash 3 times 14s after being powered on the battery. It will then automatically start acquisition 14 s after passing the "Pressure_for_autostart" depth and stop automatically when raised up by the "Pressure_difference_for_auto_stop" depth range.

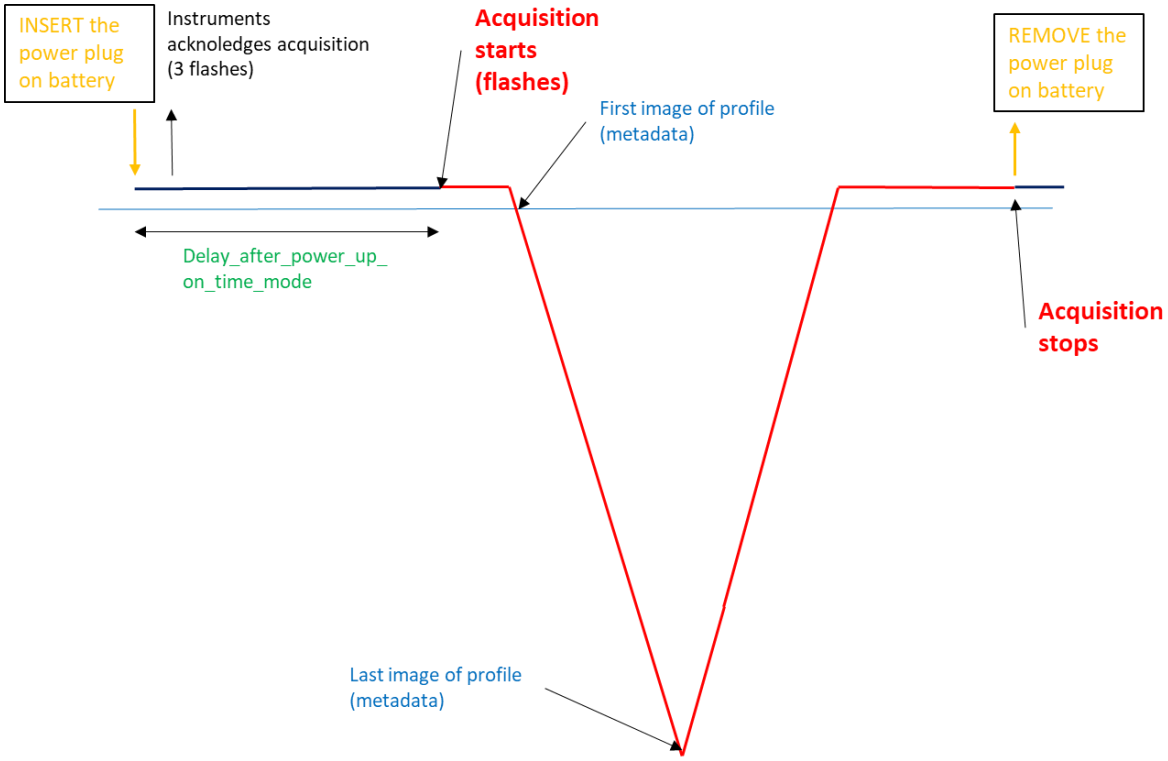
The four parameters that can be changed are :

- Pressure offset : the vertical distance between the pressure sensor (on top of the camera when in vertical position) and the imaged area
- Pressure for auto start : pressure allowing the UVP6 to boot and start acquisition
- Pressure difference for auto stop : the pressure difference to stop the acquisition when the UVP6 is raised up at the end of a profile
- Gain for analog out : the number of particles equivalent to the 5 vdc maximum output of the analogue connexion (a saturation of the output to 5 vdc due to a low gain value will not damage the UVP6 or the CTD input).

The UVP6HF will always acquire data at its maximum image rate.



4.1.5 UVP6 deployment in AUTO mode (vertical profiles)



Green : settings of the instrument (UPVPapp)

Blue : metadata to be documented when filling the sample metadata (UVPapp)

Red : instrument acquisition

Black : instrument response

4.1.6 UVP6 programming in AUTO mode using UVPapp

The AUTO mode can also be utilized for vertical profiles. When programmed in AUTO mode, the instrument will flash 3 times 14s after being powered on the battery. It will then automatically start acquisition either immediately or just after the preset delay. The instrument will stop acquisition when the power is removed by disconnecting the battery.

This mode is really less efficient than the CTD mode as it records data also during the ascent and drains more power thus.

The AUTO mode permits the UVP6 to start using preset parameters just after being powered or after a preset delay. The sensor will then stop acquisition when the power is removed.

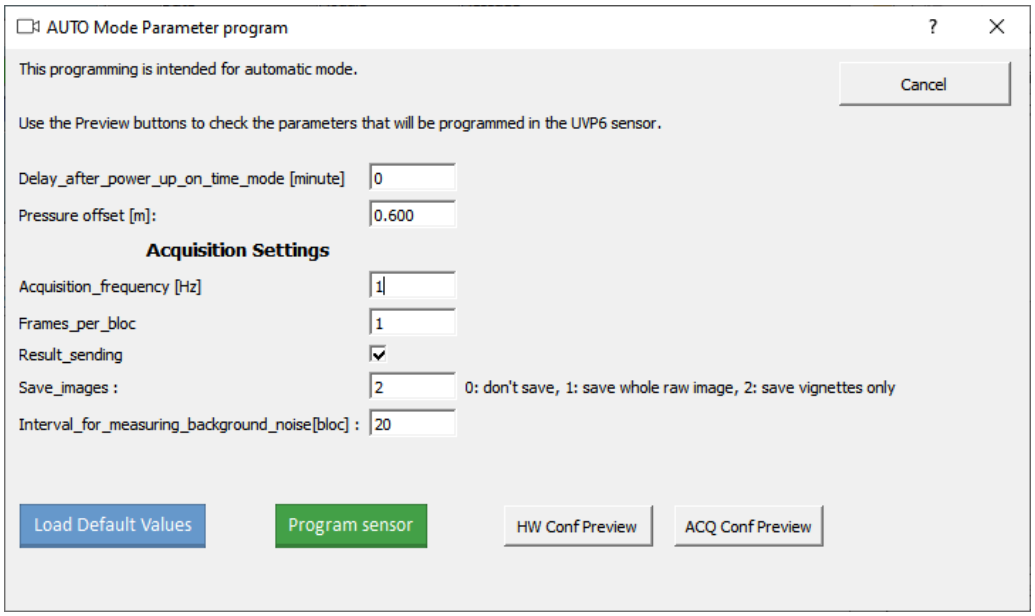
The main parameters that can be changed in AUTO mode are :

- Delay after powering on time mode : delay in minute after the instrument is powered or reboot and before the acquisition of the images starts
- Pressure offset : the vertical distance between the pressure sensor (on top of the camera when in vertical position) and the imaged area

The acquisition settings that can be changed are :

- Acquisition frequency

- Frames per bloc : number of images averaged in a RS232 data frame transmitted by the sensor (if Results sending enabled)
- Results sending : to be enabled if the hosting platform is capable to record or transmit the RS232 data frames from the UVP6
- Save images : type of images to be saved (whole image will rapidly fill the memory and reduce the acquisition rate. It should be utilized only for specific usages of the sensor).
- Interval for measuring background noise (black) : number of bloc (batch) of images between a bloc (batch) is acquired with no light for noise measurement



4.2 Using the UVP6LP on a NKE CTS5 float

All UVP6 delivered with NKE CTS5 float are preset to be piloted via the float. They do not have any pressure sensor as the depth is indicated by the float.

The acquisition will be set via the NKE graphical interface as for all sensors. We thus recommend to refer to NKE instructions for their operation via the float which will trigger each image acquisition and never try to re-program such UVP6.

The data will be transmitted after averaging by depth or time slices and transmitted to the data centres where they will be downloaded by users or automatically by the EcoPart application.

Because these sensors will usually not be recovered and because we want to avoid any possibility of changes in the instrument settings, these sensors are usually provided without any data cable. In case of recovery, the sensors should be sent back for maintenance, inter-calibration and data download before re-configuration for further float deployment.

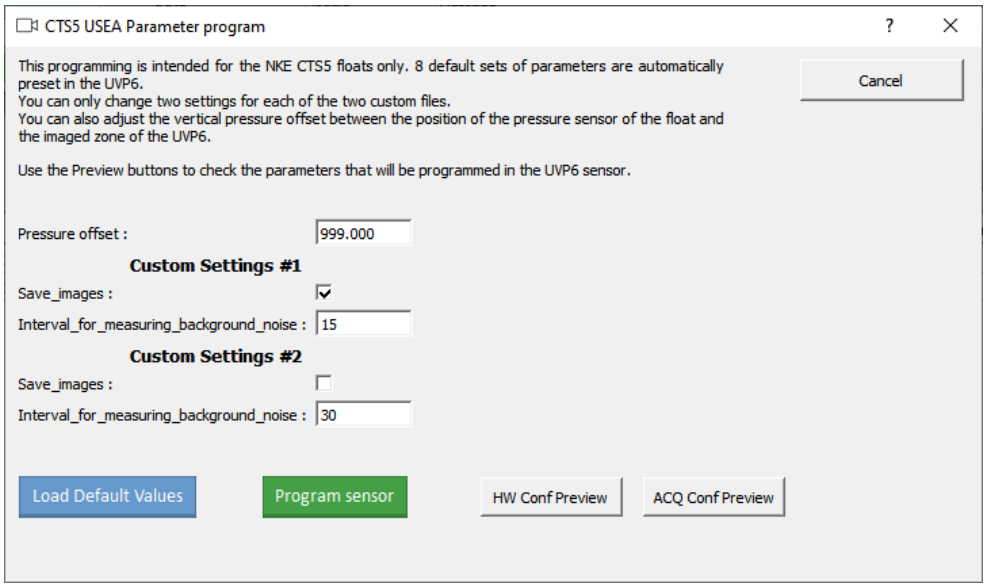
The programming of the UVP6 for CTS5 float is presented below for user information.

The only general parameters that can be changed is the Pressure offset being the vertical distance between the pressure sensor of the float and the imaged volume. It is usually set to 0.6m on a CTS5 float.

In addition, two custom files can be set for specific use of the sensor. Only the type of recorded images and the interval for measuring the background images can be set.

The UVP6 descriptive manuscript provides recommended settings for the acquisition rates, slices width and parking recording intervals.

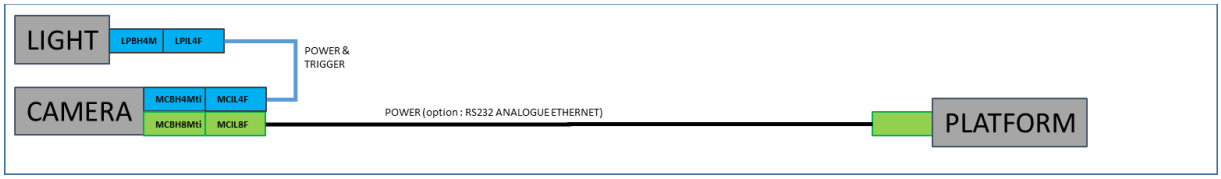
https://aslopubs.onlinelibrary.wiley.com/doi/full/10.1002/lom3.10475



Name	Conf 0	Conf 1	Conf 2	Conf 3	Conf 4	Conf 5	Conf 6	Conf 7	Conf 8	Conf 9
Configuration_name	ACQ_NKE_00H	ACQ_NKE_00L	ACQ_NKE_01H	ACQ_NKE_01L	ACQ_NKE_20H	ACQ_NKE_20L	ACQ_NKE_21H	ACQ_NKE_21L	ACQ_NKE_CUS...	ACQ_NKE_CUS...
PT_mode	0	0	0	0	0	0	0	0	0	0
Acquisition_frequency	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Frames_per_bloc	1	1	1	1	1	1	1	1	1	1
Blocs_per_PT	1	1	1	1	1	1	1	1	1	1
Pressure_for_auto_start	0	0	0	0	0	0	0	0	0	0
Pressure_difference_for_auto_stop	0	0	0	0	0	0	0	0	0	0
Result_sending	true	true	true	true	true	true	true	true	true	true
Save_synthetic_data_for_delayed_r...	false	false	false	false	false	false	false	false	false	false
Limit_lpm_detection_size	10	10	10	10	10	10	10	10	10	10
Save_images	0	0	0	0	2	2	2	2	2	0
Vignetting_lower_limit_size	620	620	620	620	620	620	620	620	620	620
Appendices_ratio	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Interval_for_measuring_backgroun...	10	100	10	100	10	100	10	100	15	30
Image_nb_for_smoothing	10	10	10	10	10	10	10	10	10	10
Analog_output_activation	false	false	false	false	false	false	false	false	false	false
Gain_for_analog_out	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Minimum_object_number	0	0	0	0	0	0	0	0	0	0
Maximal_internal_temperature	40	40	40	40	40	40	40	40	40	40
Operator_email	alice.pierret@i...	alice.pierret@i...	alice.pierret@i...	alice.pierret@i...	alice.pierret@i...	alice.pierret@i...	alice.pierret@i...	alice.pierret@i...	alice.pierret@i...	alice.pierret@i...

4.3 Using the UVP6LP on a SeaExplorer glider

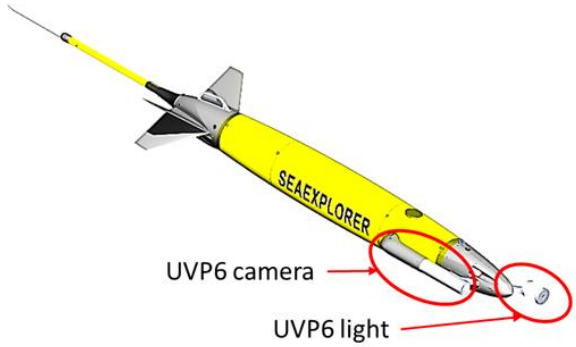
4.3.1 Cabling and mounting



Any UVP6LP sensor **equipped with an optional pressure sensor** can be utilized on a SeaExplorer glider (ALSEAMAR company). The instrument will be mounted in the nose of the glider using the ALSEAMAR provided mounting.

4.3.2 Programming the UVP6

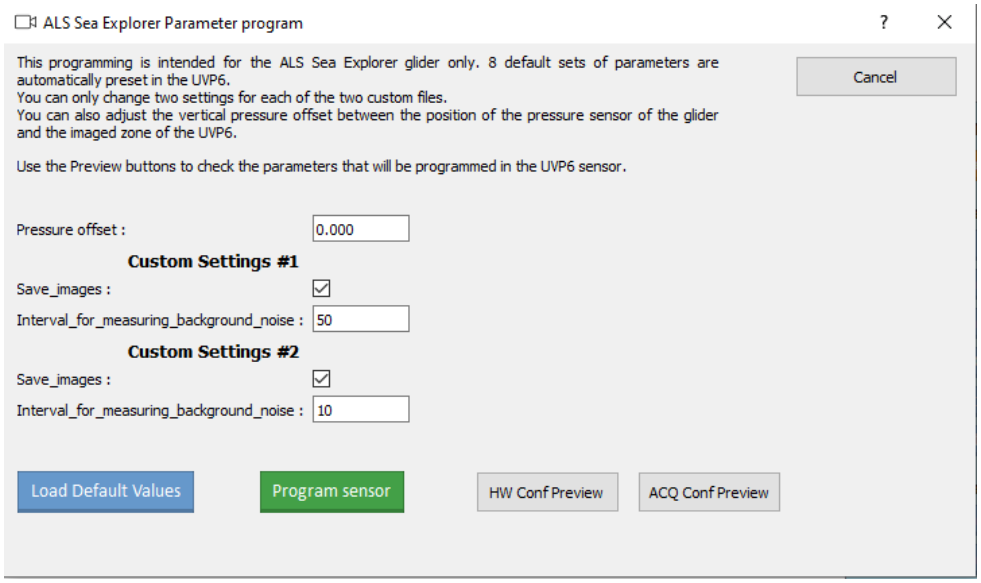
The UVP6 will be preset using the specific ALS programming and then piloted via the glider tools.



The ALS glider mode is a specific SUPERVISED mode (see below).

The only parameters that can be changed is the Pressure offset being the vertical distance between the pressure sensor and the imaged area. It is usually set to 0 on SeaExplorer gliders where the camera and the light are placed horizontally.

In addition, two custom files can be set for specific use of the sensor. Only the type of recorded images and the interval for measuring the background images can be set.



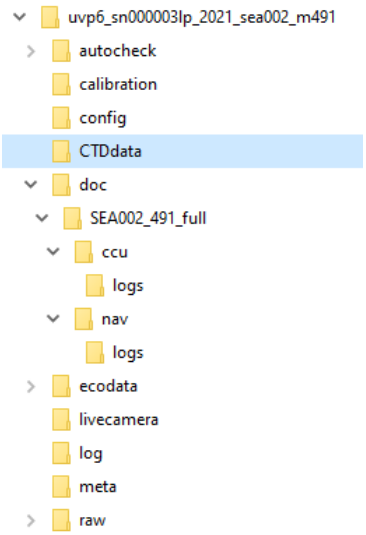
The UVP6 descriptive manuscript provides recommended settings for the acquisition rates.

https://aslopubs.onlinelibrary.wiley.com/doi/full/10.1002/lom3.10475

4.3.3 Project tips for Seaexplorer glider datasets

It is recommended to create the project using the following naming convention: uvp6_snxxxxxxlp-YYYY_seaNNN_mKKK where xxxxxx is the UVP6 serial number, NNN is the SeaExplorer serial number and KKK is the glider deployment reference.

The glider downloaded data will be placed in the doc folder of the project following structure :



4.3.4 Samples metadata standards

For data quality the samples metadata must follow those standards:

- Sample id = Yo_####n_missionID with #### for the number of the yo using 4 digits, n is ‘a’ or ‘d’ for ascent or descent and missionID the unique mission identifier, with the glider id if necessary.
- Station id = empty = “”
- ARGO sample id = name of the corresponding metadata glider file.

4.4 Using the UVP6LP on a Seaglider glider

4.4.1 Programming the UVP6

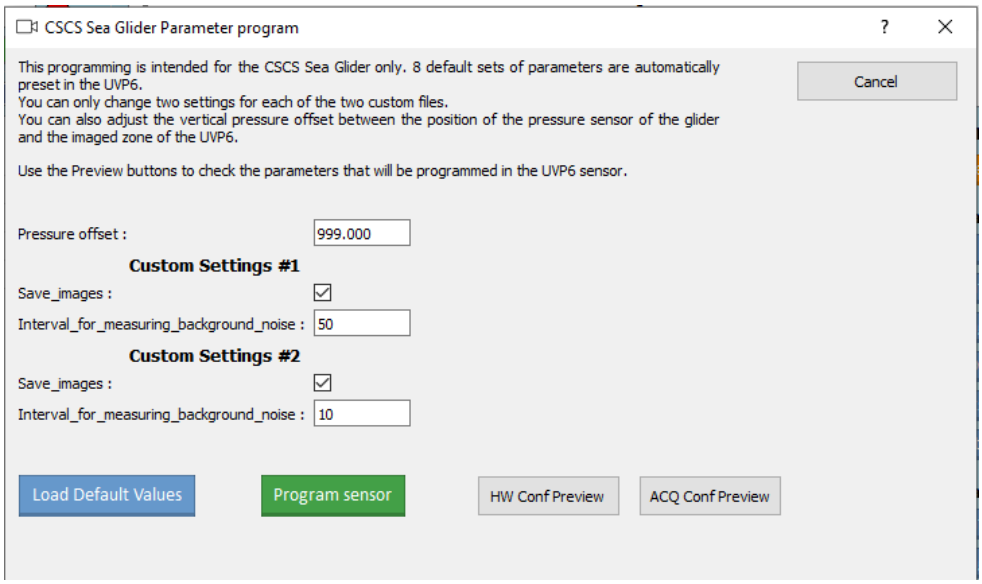
Any UVP6LP sensor **equipped with an optional pressure sensor** can be utilized on a Seaglider glider. The instrument will be mounted in the glider using the CSCS provided mounting.

The UVP6 will be preset using the specific CSCS programming and then piloted via the glider tools.

The CSCS glider mode is a specific SUPERVISED mode (see below).

The only parameters that can be changed is the Pressure offset being the vertical distance between the pressure sensor and the imaged volume. It is usually set to 0 on SeaExplorer gliders where the camera and the light are placed horizontally.

In addition, two custom files can be set for specific use of the sensor. Only the type of recorded images and the interval for measuring the background images can be set.



The UVP6 descriptive manuscript provides recommended settings for the acquisition rates.

https://aslopubs.onlinelibrary.wiley.com/doi/full/10.1002/lom3.10475

4.4.2 Project tips for Seaglider glider datasets

It is recommended to create the project using the following naming convention: uvp6_snxxxxxxlp-YYYY_SGNNN_KKK where xxxxxx is the UVP6 serial number, NNN is the SeaGlider serial number and KKK is the glider deployment name.

The glider downloaded data and nc files will be placed in a folder named SG_NNN_KKK in the doc folder of the project.

4.4.3 Samples metadata standards

For data quality the samples metadata must follow those standards:

- Sample id = Yo_####n_missionID with #### for the number of the yo using 4 digits, n is ‘a’ or ‘d’ for ascent or descent and missionID the unique mission identifier, with the glider id if necessary.
- Station id = empty = “”
- ARGO sample id = name of the corresponding metadata glider file.

4.5 Using the UVP6 on a mooring/lander

The short deployments (up to one month according to the image rate) can be done using the optional 75 Wh battery or a larger battery (Contact Hydroptic for battery recommendations).

The instrument will usually be installed with its camera in horizontal position or facing down to avoid the deposit of particles on its porthole and image blurring. The light must be set on top to also avoid any deposit on its active surface.

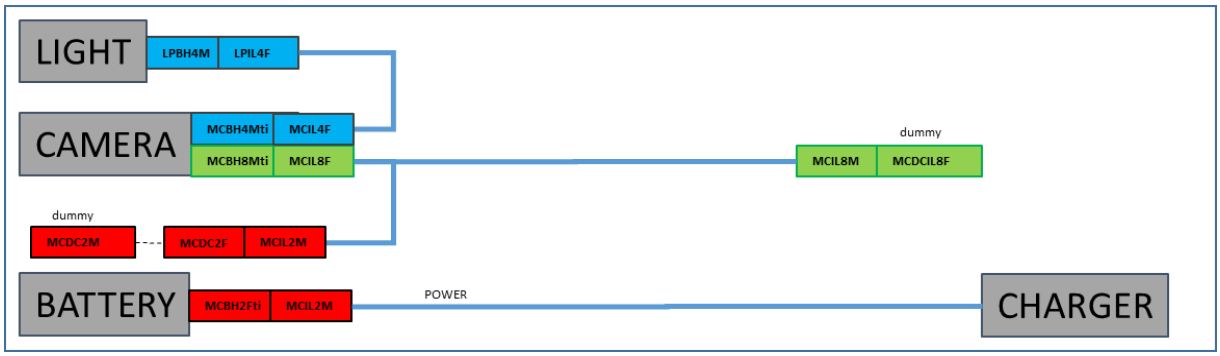
There are so many possibilities of installation of the UVP on so many different platforms that they cannot be described in this guide. Please refer to the UVP6 frame annexe and/or contact Hydroptic.

Two operation modes can be utilized when the UVP6 cannot be piloted by the platform.

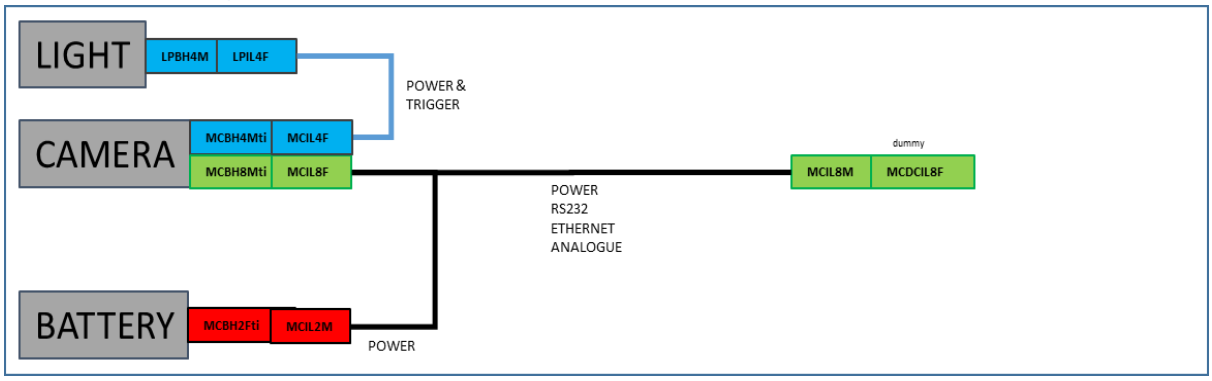
The AUTO mode will permit acquiring data continuously using a unique set of parameters and adjusting the frequency to manage the autonomy of the battery. The TIME mode permits to change the configuration of the image acquisition and process according to time and optimize the use of the battery resources by adjusting the frequency for the period of time.

4.5.1 UVP6 cabling

4.5.1.1.1 Battery charge



4.5.1.1.2 Running the UVP6



4.5.2 Programming the UVP6 in AUTO mode

Check the related chapter in the CTD section of the manual both for the cabling and the programming.

4.5.3 Programming the UVP6 in TIME mode

The Time programming is highly recommended to secure the acquisition reset at given intervals and optimize the battery usage. The acquisition will then start at the first programmed time following the release delay. As for most programming modes, the instrument will flash 3 times when powered and then sleep till it starts acquisition.

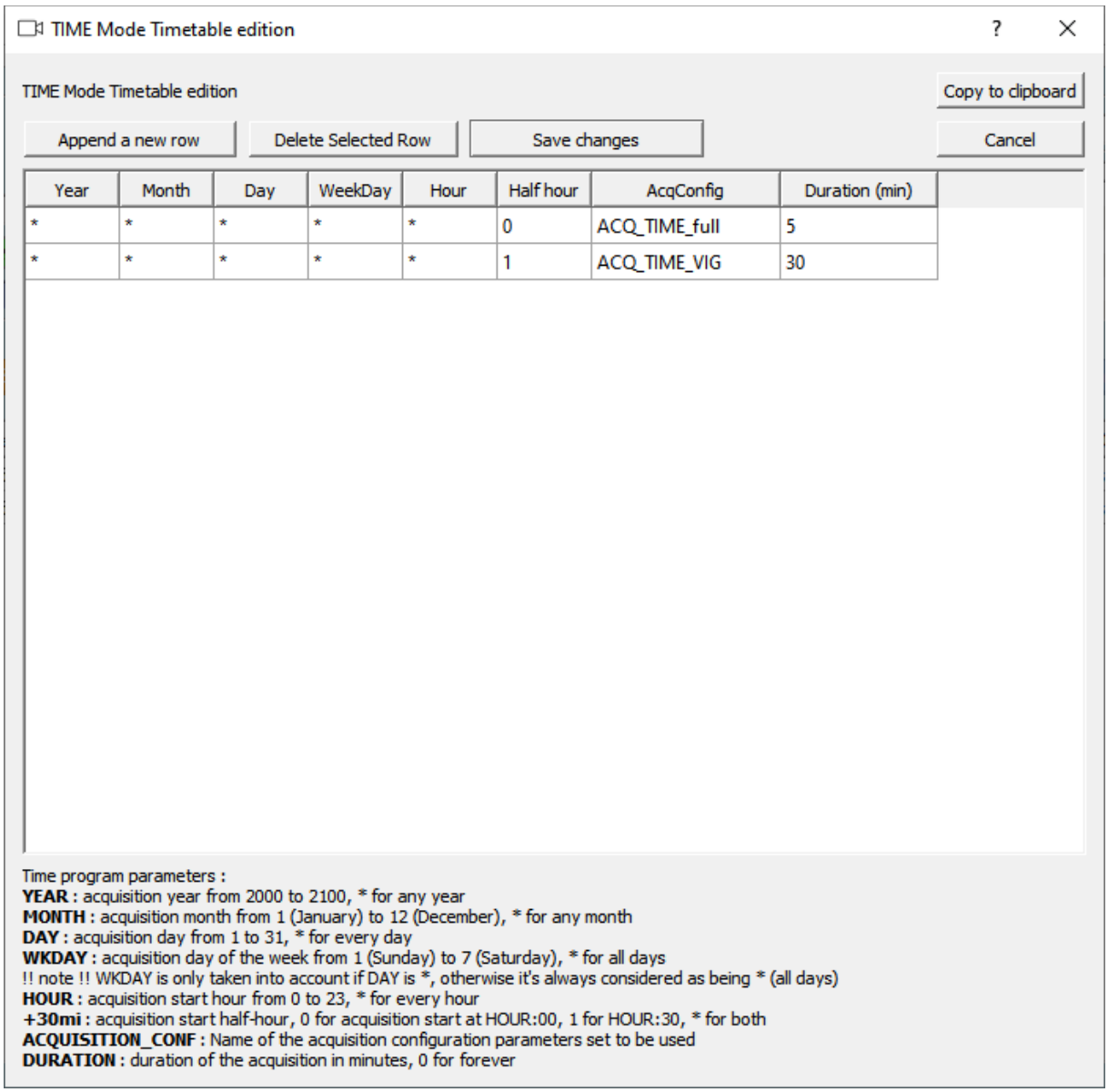
The time mode allows you to program up to 10 acquisition files for an infinite period of time. The minimum interval to change settings is 30 minutes allowing a very high flexibility in the programming.

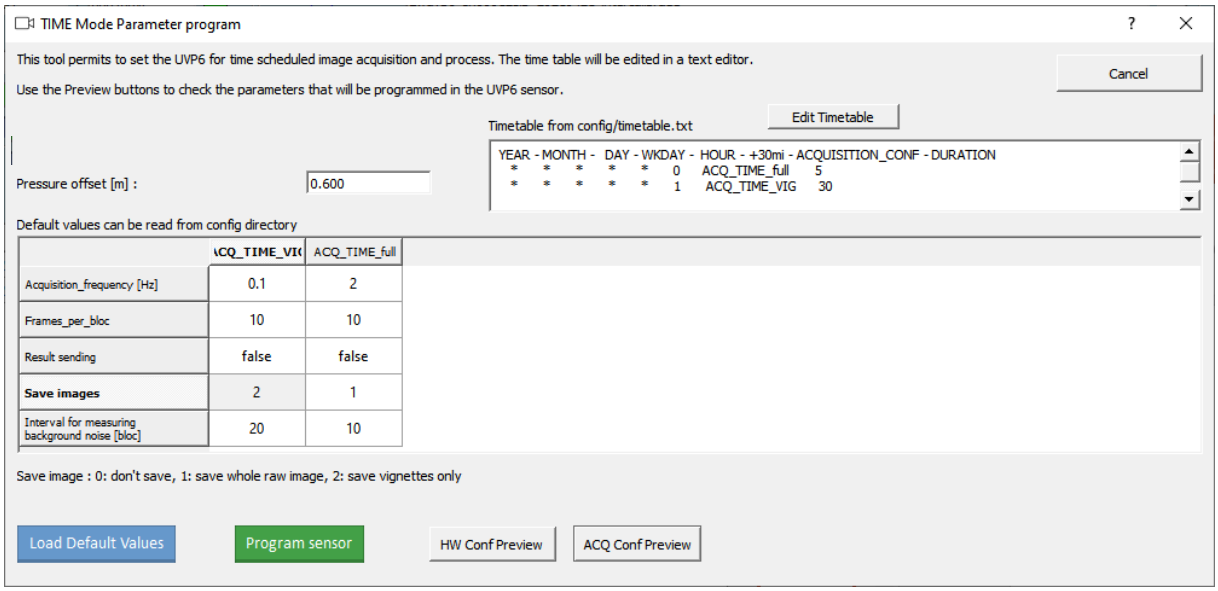
The interface allows you to first set a time table specifying the acquisition methods (AcqConfig) and their duration and then set some essential parameters for each of them.

The instrument checks the time table every 30 minutes to know if there is an acquisition to start, meaning that two acquisition should not overlap. If two acquisitions occur to be at the same time or if the first one is not finished, the second will be ignored.

It is recommended to try the programming on the instrument to be sure that it will work according to your desire by starting acquisition for a period of time covering the time table settings and then downloading the data.

The acquisition will not stop until the specified duration is achieved and thus not run the programmed sequences. Be thus careful when setting this duration parameter.

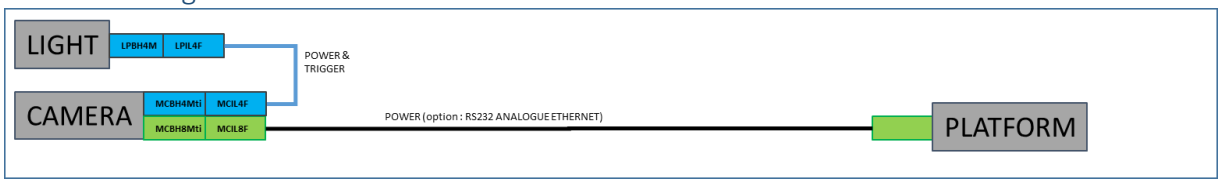


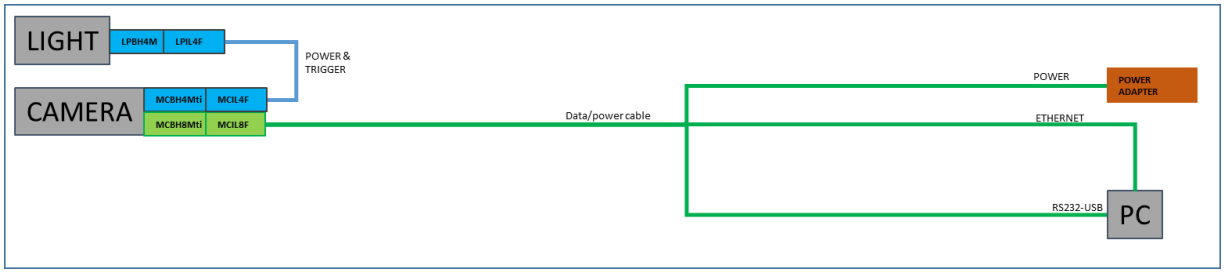


4.6 Using the UVP6 as a remote camera

If connected to shore via an RS232 and Ethernet connexion, the UVP6 can be manually either piloted using the RS232 commands or the UVPapp application, pre-set using the AUTO or the SUPERVISED modes.

4.6.1 Cabling

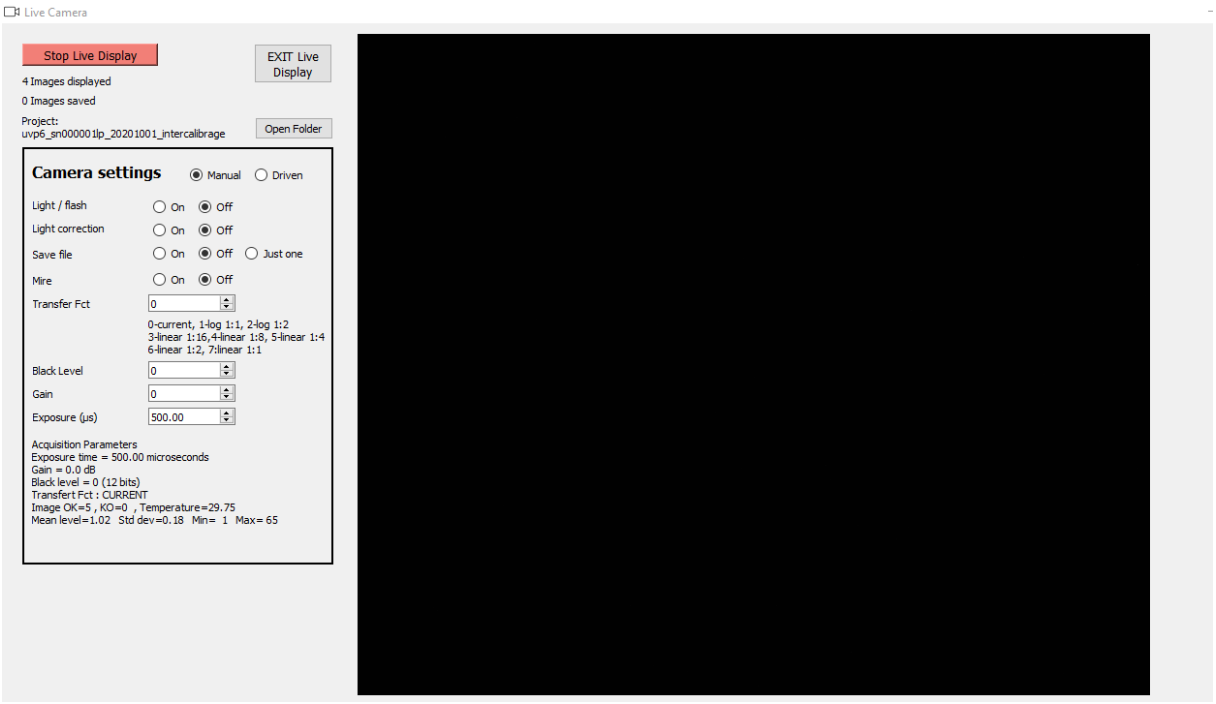




4.6.2 UVP6 running in Livecamera mode

The instrument can also be utilized using the LIVECAMERA mode to record the images on the piloting computer. In that later case, users must be aware that the acquisition settings are not controlled and no tool is provided for the image analysis. We thus recommend to use the remote connexion to control the instrument using one of the programming modes and download the data and images at regular intervals.

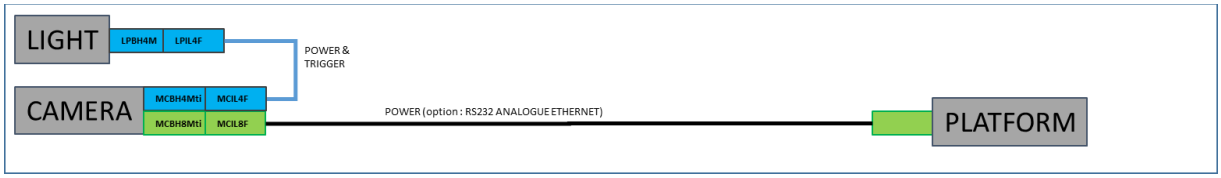
The live camera tool allows the use of the UVP6 sensor as a remote camera and the storage of the images in the project in real time using the Ethernet link.



4.7 Using the UVP6 on smart platforms

A smart platform is capable to communicate with the UVP6 using the RS232 serial interface. There are many possibilities of piloting and users should contact Hydroptic to select the more suitable configurations for their platform. Gliders and profiling floats are examples of smart platforms (see dedicated chapters).

4.7.1 Cabling



4.7.2 Programming the UVP6 in SUPERVISED mode

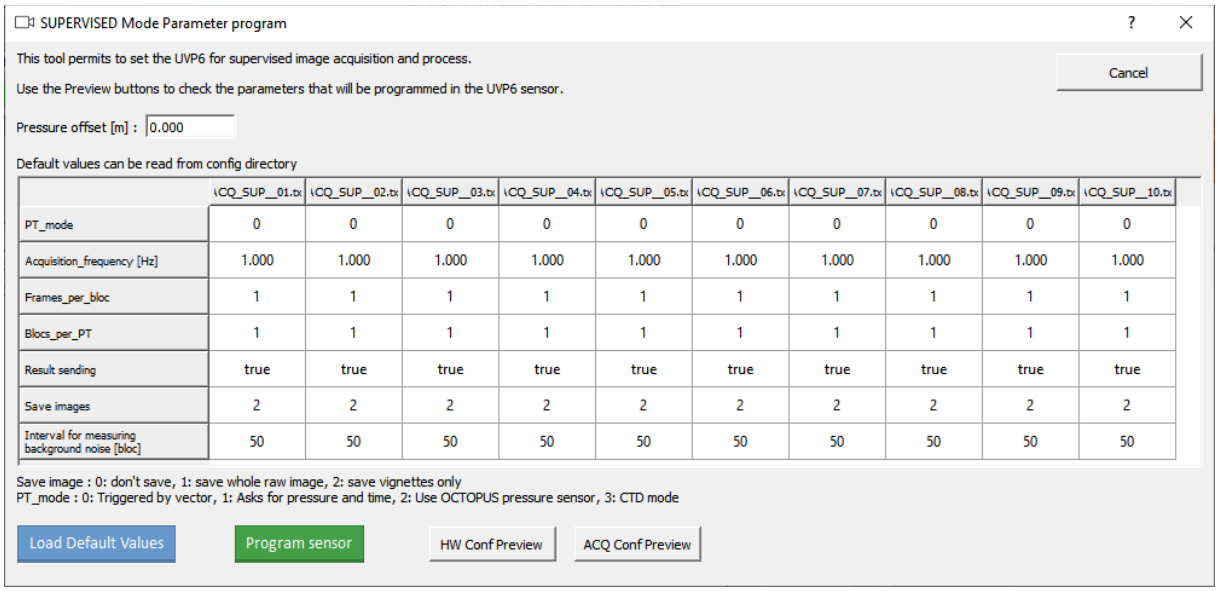
The tool permits to set 10 sets of parameters and save them in the UVP6. The user will then start acquisition, sending a RS232 start message which selects one of the pre-set lists and stop it at the end of the sequence using a stop message (see RS232 messages in the annexe).

This mode opens many possibilities of usages of the UVP6 and is reserved to experts even if we limited the adjustable settings in the 10 sets of parameters. The only general parameters that can be changed is the Pressure offset being the vertical distance between the pressure sensor (when available) and the imaged area. The acquisition settings that can be changed are :

- Acquisition frequency
- Frames per bloc : number of images averaged in a RS232 data frame transmitted by the sensor (if Results sending enabled)
- Results sending : to be enabled if the hosting platform is capable to record or transmit the RS232 data frames from the UVP6
- Save images : type of images to be saved (whole image will rapidly fill the memory and reduce the acquisition rate. It should be utilized only for specific usages of the sensor).

- Interval for measuring background noise (black) : number of bloc (batch) of images between a bloc (batch) is acquired with no light for noise measurement

The useful RS232 commands are described in the RS232 section of this guide.



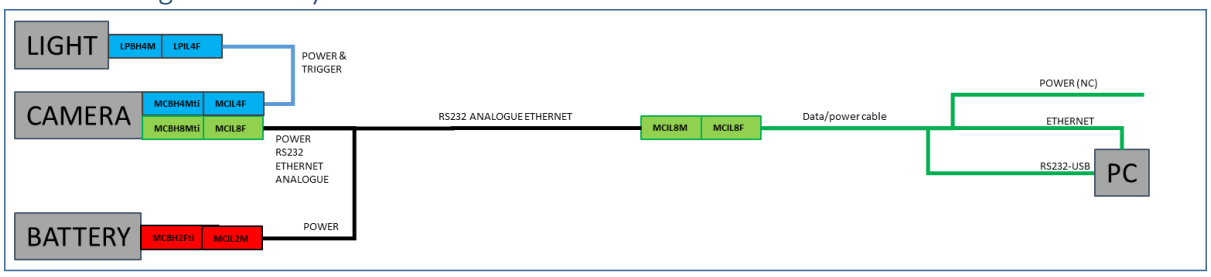
	\CQ_SUP__01.tx	\CQ_SUP__02.tx	\CQ_SUP__03.tx	\CQ_SUP__04.tx	\CQ_SUP__05.tx	\CQ_SUP__06.tx	\CQ_SUP__07.tx	\CQ_SUP__08.tx	\CQ_SUP__09.tx	\CQ_SUP__10.tx
PT_mode	0	0	0	0	0	0	0	0	0	0
Acquisition_frequency [Hz]	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Frames_per_bloc	1	1	1	1	1	1	1	1	1	1
Blocs_per_PT	1	1	1	1	1	1	1	1	1	1
Result sending	true	true	true	true	true	true	true	true	true	true
Save images	2	2	2	2	2	2	2	2	2	2
Interval for measuring background noise [bloc]	50	50	50	50	50	50	50	50	50	50

4.8 UVP6 parametrisation and data download

4.8.1 Cabling

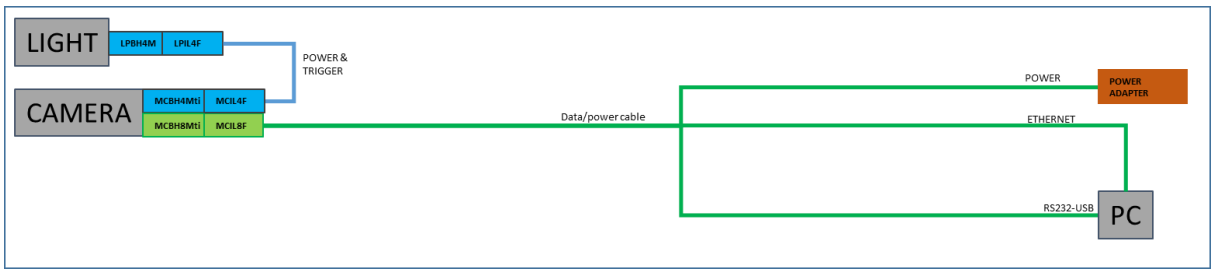
The data download or instrument parametrisation require the connexion to a personal computer via the RS232 serial link and an Ethernet connexion (for data download). The power will be provided either by the UVP6 battery or from the AC adapter provided with the data cable.

4.8.2 Using the battery

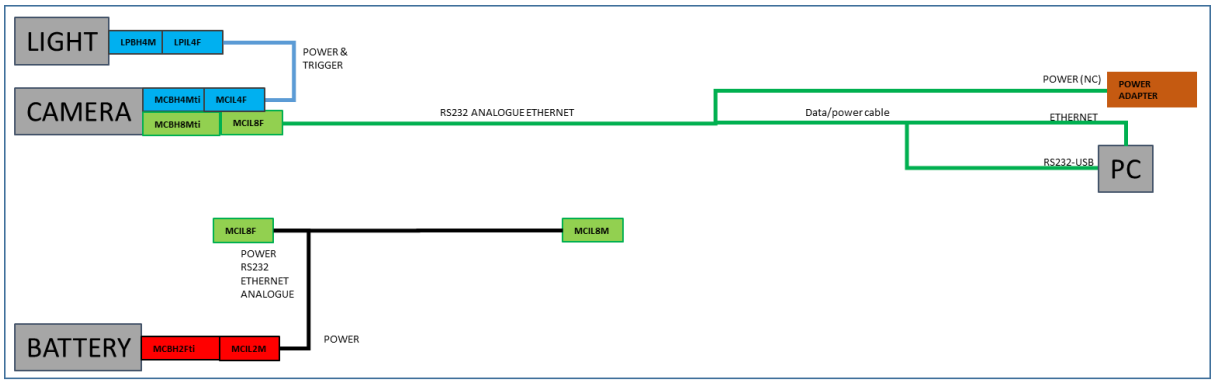


4.8.3 Using the AC power

No battery installed



A battery is installed and not utilized for data download or programming. Do not use the Y battery cable if using the AC power as the battery power will be utilized.



5. UVPapp general information

5.1 Link with EcoPart and EcoTaxa

The UVPapp is designed to pilot the sensor and to prepare and process the data to be later imported in the EcoPart application for Particulate data access and in EcoTaxa for image off-line classification.

https://ecotaxa.obs-vlfr.fr/

https://ecotaxa.obs-vlfr.fr/part/

5.2 Versioning and resources

This section applies to version 0.28 of UVPapp. The application being regularly improved, some changes may occur in the different screens and some new tools may be implemented.

Any comments about the use of the application or ideas for improvement are welcome. Please send them to:

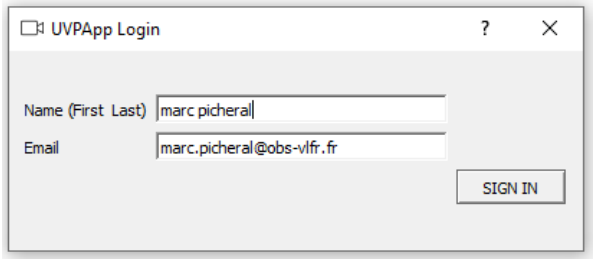
marc.picheral@imev-mer.fr

camille.catalano@imev-mer.fr

UVPapp can run only on Windows 10 operating systems.

5.3 Login

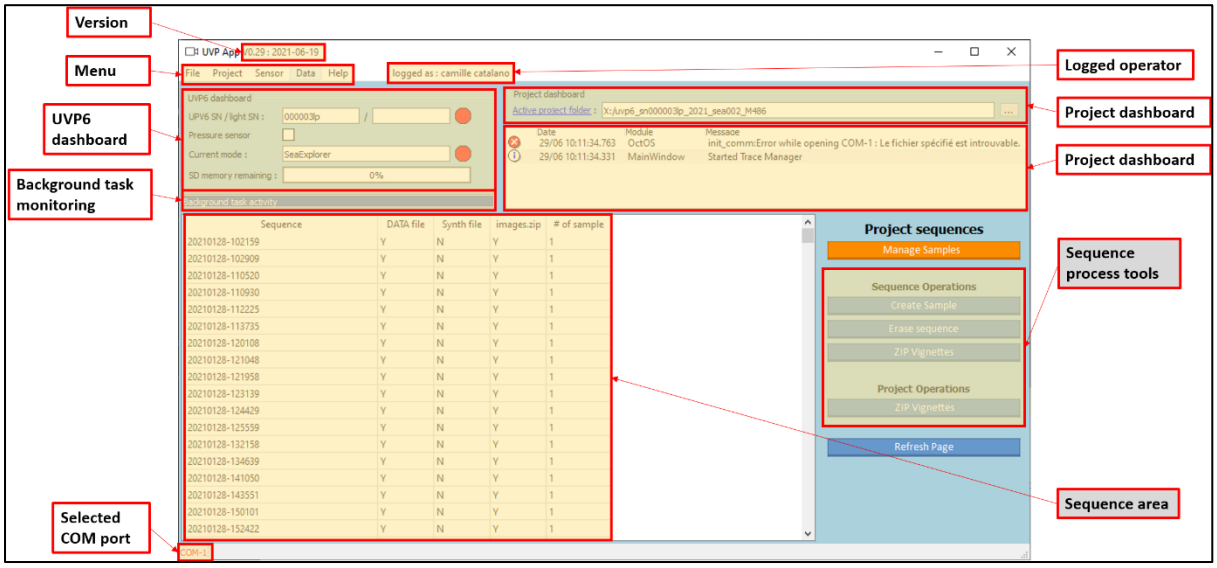
There is no login protection in UVPapp but it is highly recommended to log in using your personal name and email. This information will be stored in the instrument and in the datasets for the traceability of the different operations.



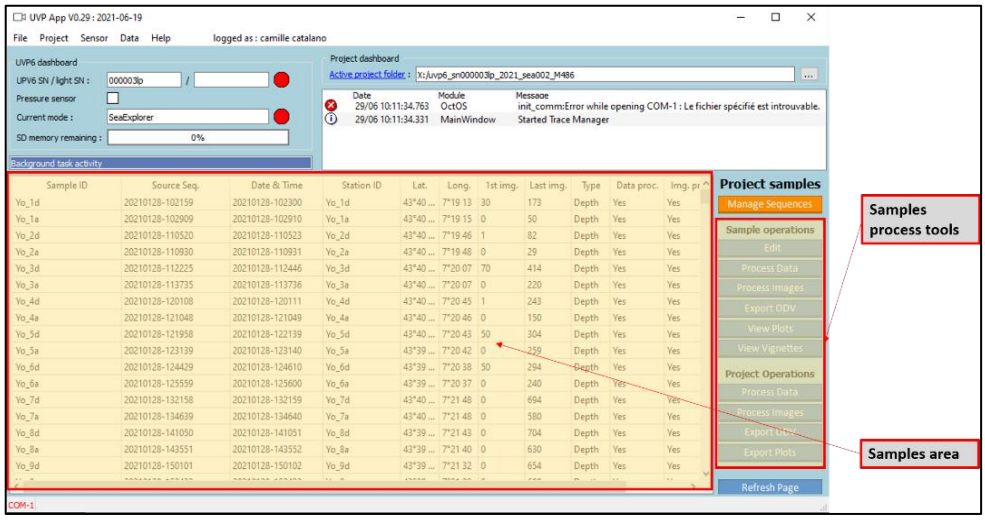
5.4 Main page description

The main page contains different sections plus a main area displaying either Sequence or Sample information and tools.

5.4.1 Sequence area displayed



5.4.2 Sample area displayed



5.4.3 UVP6 dashboard

The sensor dashboard indicates the information of the connected sensor if a sensor is connected or the information of the sensor defined for a project when a project is selected and no sensor connected.

If a sensor is connected and powered and its information not displayed, try the “Connect to sensor” tool in the *Sensor* menu to get the information from the sensor.

5.4.4 Background task monitoring

The bottom window of the *UVP6 dashboard* indicates the background task activity of the application (data download, data processing, image processing…). The application cannot be stopped when tasks are pending. See the File menu to ask to quit at the end of the on-going task without waiting for the completion of a list of tasks.

5.4.5 Project dashboard

The *project dashboard* indicates the path of the active project and enables to open one in Windows Explorer.

5.4.6 Activity dashboard

The time, the date and the description of all on-going actions by the application is described in this board.

5.4.7 Sample/Sequence management

The *Sequences management area* provides information on the downloaded sequences of the selected project and access to dedicated sequence tools.

The *Samples management board* indicates the metadata of all created samples (from project sequences). It allows editing the metadata of the samples and deleting them and gives access to the dedicated sample tools.

Switching between those two boards is made with the *Manage Sequences*/*Manage Samples* button.

5.4.7.1 Sequences processing tools

The *Sequences management board* displays the list of project sequences and a list of buttons: the dedicated sequences tools.

With these tools it is possible to:

- Create samples from the sequences : double click on a sequence to open the create-sample tool
- ZIP vignettes if not done during download (essential for images process)
- Erase sequence (quasi empty sequences are often created when an instrument set in AUTO mode is powered ON before being connected to UVPapp for data download)

5.4.7.2 Samples processing tools

The *Samples management board* displays the list of created samples and a list of buttons: the dedicated samples tools.

With these tools it is possible to:

- Process the data and images of one or all samples, generating the files in the ECODATA folder of the projects. These files will later be imported in EcoPart and Ecotaxa for image classification
- Show the vignettes of the sample
- Export to ODV format

5.4.7.3 Create-sample tool

This tool allows creating one or more samples (profiles or time series) from a sequence of data downloaded from the sensor or merged from the downloaded sequences. A graphical interface separated in different sections permits to:

- Fill in SAMPLE METADATA : the operator will carefully fill in the different fields taking care of the sample naming to allow an easy later management of the resulting files
- Select options for DATA SELECTION : the operator will define the type of dataset between TIME and DEPTH options. In case of Depth profile, the data integration level will be automatically set to 1 decibar while the value can be set for Time samples. In that later case, the mean pressure of the sample can be manually entered in case the sensor was not fitted with a pressure sensor.
- Check INSTRUMENT METADATA
- Select the DATA RANGE : the data range will be manually defined with the help of the graphical interface or trying the available tools (blue buttons). Dash lines indicate the beginning and the end of the data sample for a profile. The first and last images numbers can also be adjusted

by hand. You can zoom on axes and move the cursors to shift the scales. The user must keep data of the chosen depth range and when the black data are constant meaning that they are not influenced by the sun at the surface.

Once saved, the sample will appear in the sample management window of the application.

5.5 UVPapp menus

5.5.1 File drop-down menu

The *File menu* allows to open an existing project but also to ask the application to stop and exit at the end of the task being processed when a list of tasks is pending.

If a sensor is connected, the user can select only projects related to the same serial number.

5.5.2 Project drop-down menu

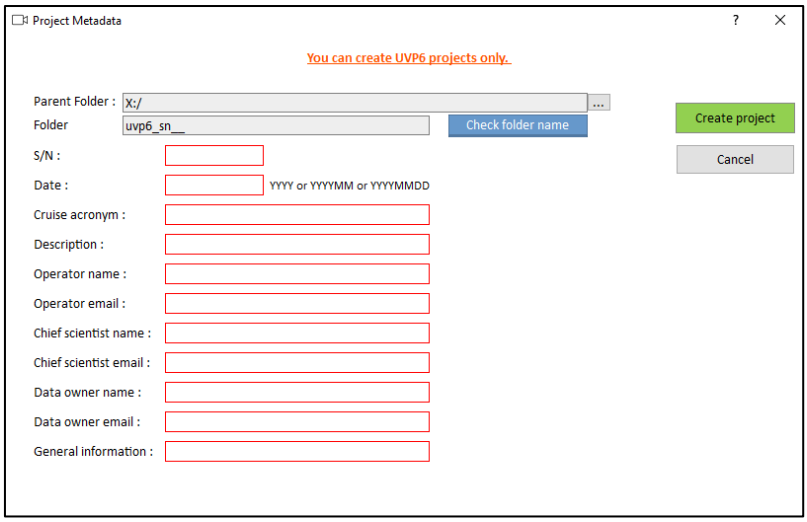
5.5.2.1 Create new project

5.5.2.1.1 Project metadata settings

This page enables the creation of a new project. It is important to carefully fill in all the information which will follow the data in EcoPart and EcoTaxa. The instrument serial number will automatically be filled if a UVP6 is connected to UVPapp.

The project name cannot be modified via the application. The default name is a standard for all UVP projects.

The project name must be unique; therefore, the date and the cruise acronym are used in the name of the project. **A Unique project name AND a unique cruise name are mandatory for quality of the data.**



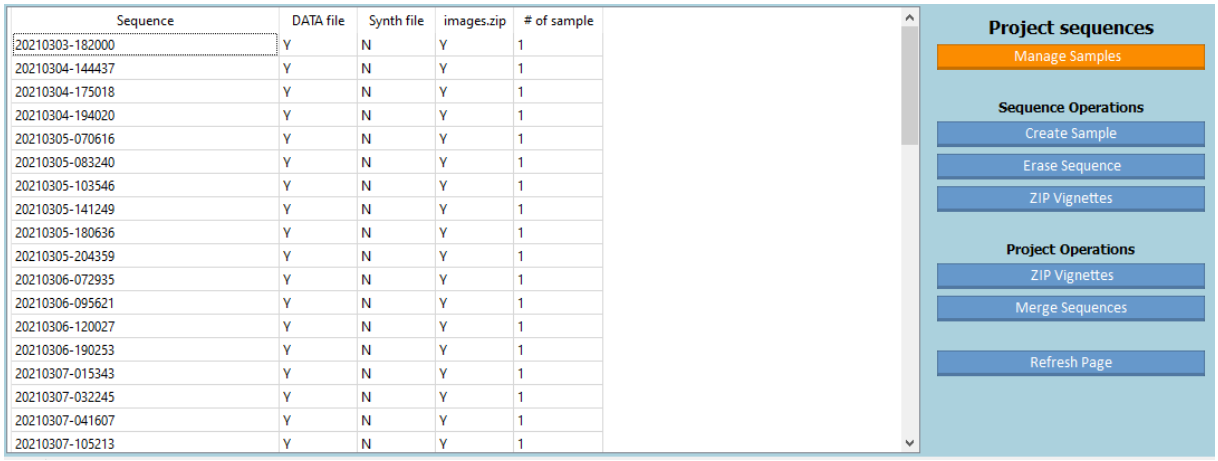
5.5.2.1.2 Project folders

UVPapp will create the project folder which contains the following subfolders as a minimum:

- calibration : users can store here the instrument calibration reports
- config : contains the acquisition and hardware settings downloaded from the sensor and the archives of the previous programming. This folder is checked at every connection to the sensor to check the consistency with the sensor internal settings.
- CTDdata : a folder where users can place the data downloaded from the CTD which may be associated with the UVP6 in the same frame. The filename of the CTD data can be documented in the sample metadata form.
- doc : users can store there any document related to the project (cruise plans, scans…)
- ecodata : the folder will contain the particle and image archives of each sample to be imported in Ecotaxa
- log : the sample may contain logs of the application tasks
- meta : contains the table of metadata of the samples
- raw : the folder contains the sequences downloaded from the instrument or, later, merged.
- results : the folder contains graphs and tables produced by the data processing

5.5.2.2 Manage downloaded sequences

It permits to display the *Sequences management area* with the list of project sequences and the associated tools.



The Data files and images.zip files should be set to Y when the files have successfully been downloaded from the instrument. The Synth file are usually set to N because they are not recorded by the UVP6. The # of sample informs users about the number of samples which have been created from the sequence.

The ZIP vignettes tool is useful only for raw images downloaded apart from UVPapp.

5.5.2.3 Merge sequences

When acquired with different settings a same profile or time series is within multiple sequences. This tool allows an easy merging of these sequences to "merged" sequences from which samples will be easily created.

The merging must be done prior to the creation of the samples.

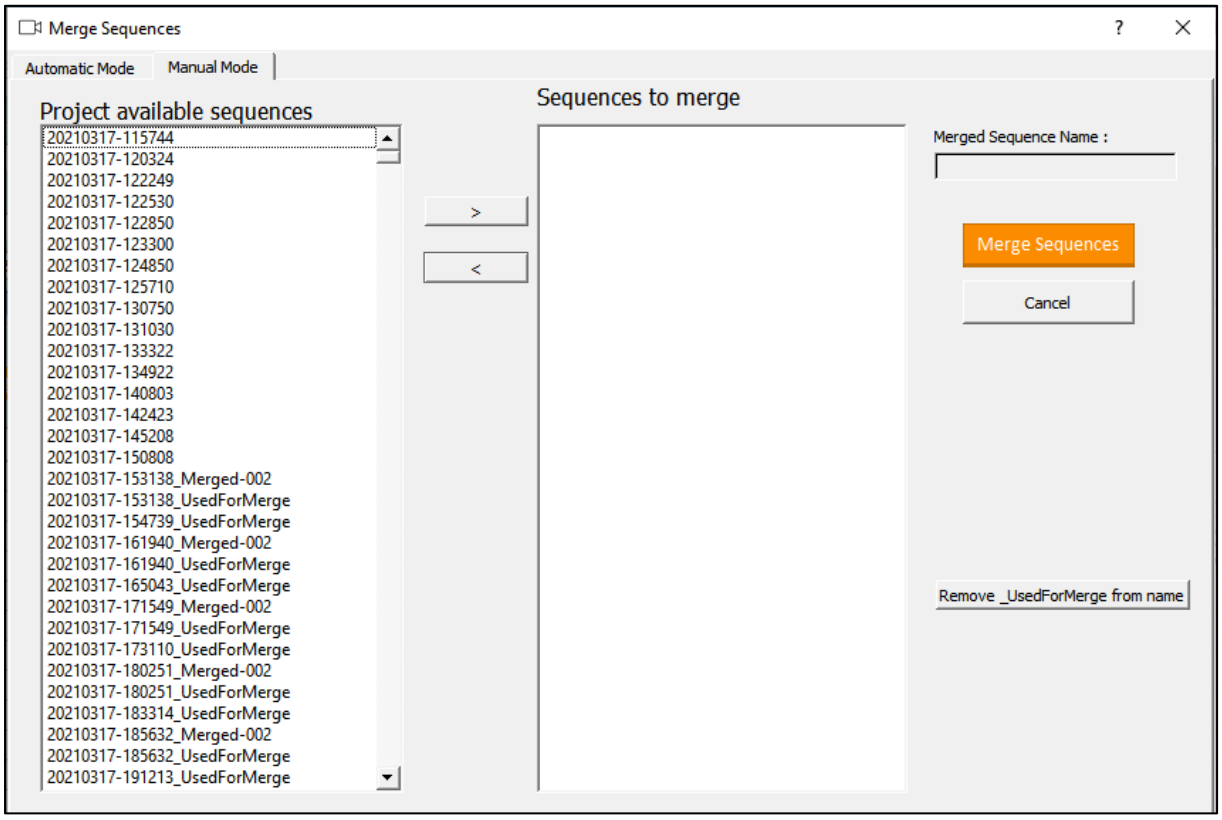
This tool is very efficient to process data recovered from float deployment, time series, glider sections…

It is recommended to back up the data prior merging them as there is no tool to automatically undo the merging of sequences.

The merge can be done manually or with the automatic tool.

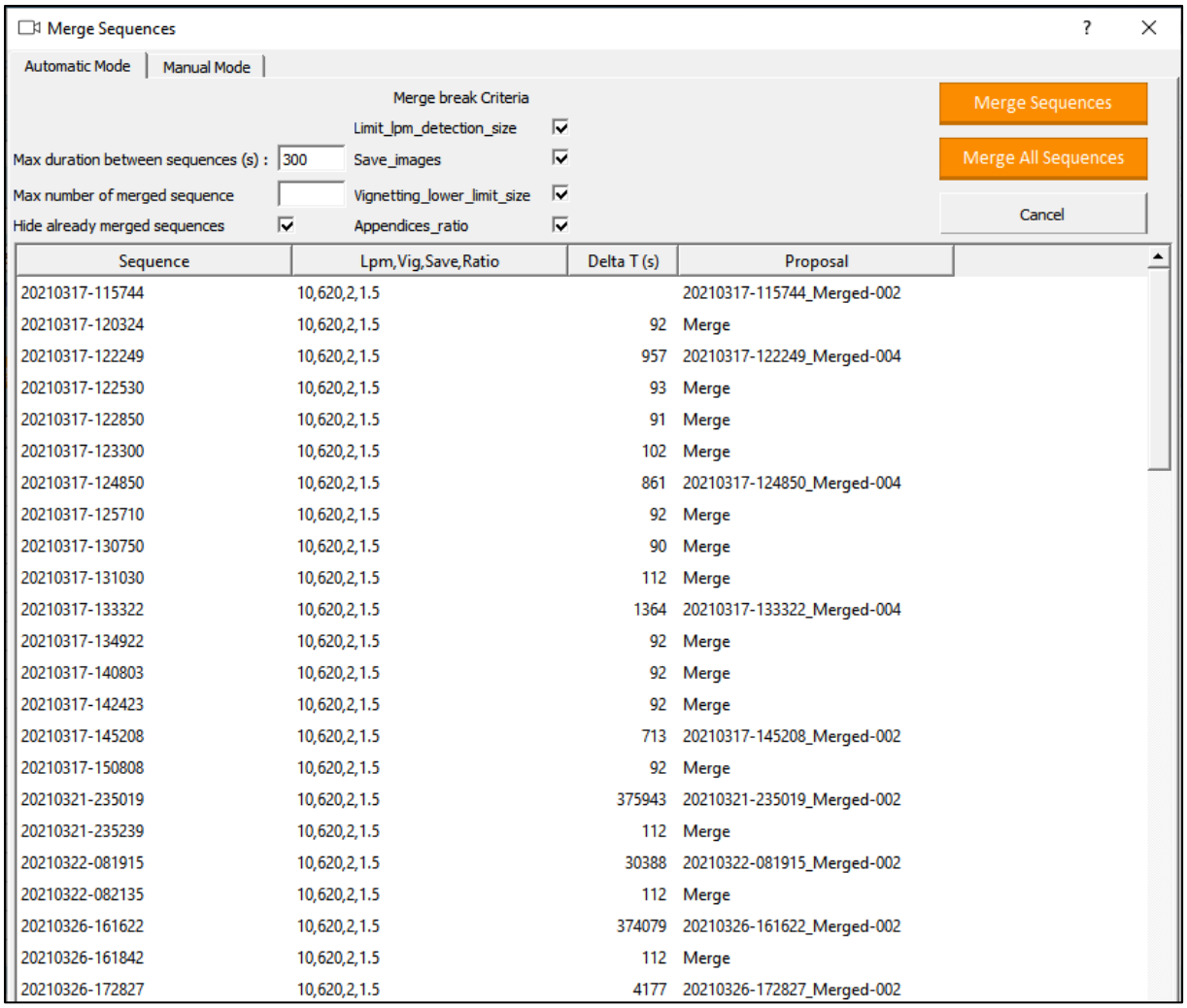
5.5.2.3.1 Manual merge

The manual merge permits to manually select the sequences to be merged.



5.5.2.3.2 Automatic merge

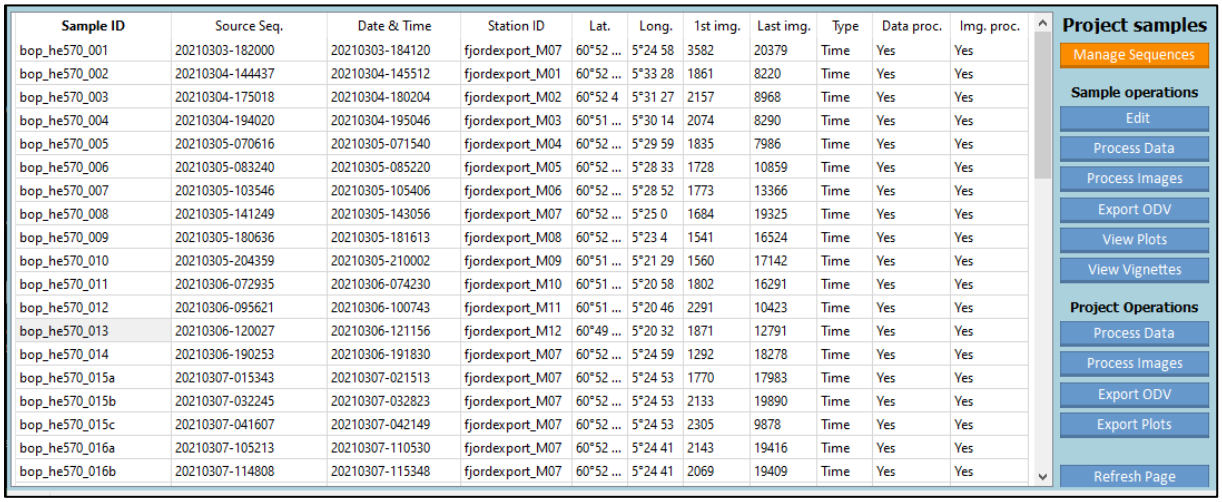
The automatic merging is very efficient to group many sequences into large ones. As there are infinite filtering options for merging, we recommend to 1) backup the data, 2) rename the raw folder to "raw_source", 3) select the sequences to be merged and 4) move them into the raw folder.



5.5.2.4 Manage Sample

It allows displaying the *Sample management board* with the list of samples and the associated tools.

Many tools are available in right panel of the board. They are sorted in Per SAMPLE or per PROJECT operations to facilitate a global processing of the datasets.



The files issued from the Process Data and process Images tools are saved in the Ecodata folder of the project for later importation in EcoPart and Ecotaxa.

The files issued from the Export ODV and Export Plots are saved in the Results folder of the project. The ODV exports allows to easily create text files to be imported in the Ocean Data View (ODV) free application (https://odv.awi.de).

5.5.2.5 Edit project metadata

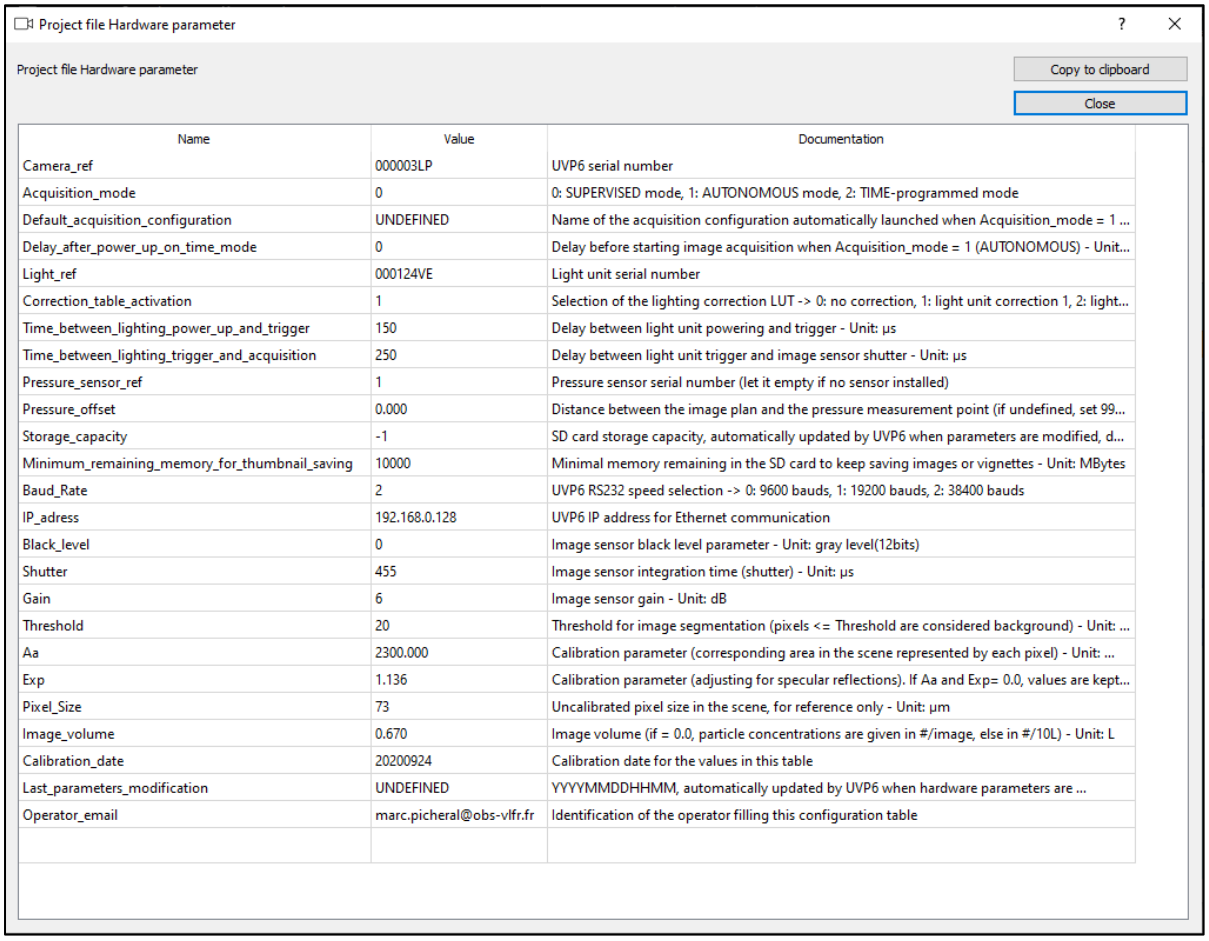
It gives access to the *project metadata window* and allows to fill or correct the missing information about the project.

5.5.2.6 View tools (Project)

The tools permit the visualization of the instrument configuration, i.e. hardware, acquisition and time tables, from the project. It matches the files as they were stored in the instrument at the time of its latest connection.

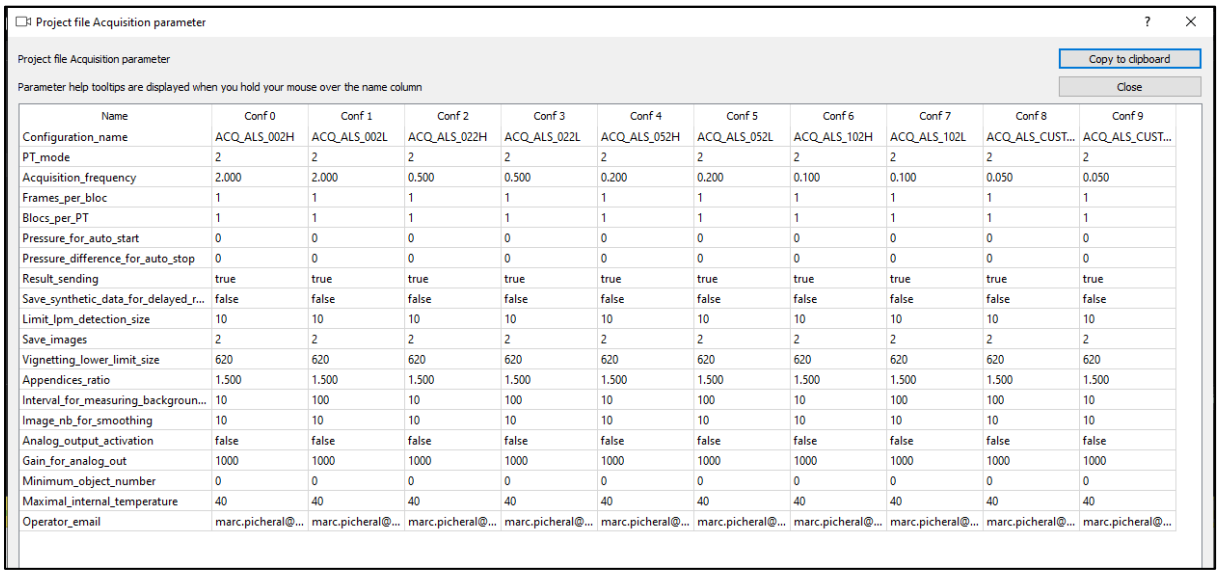
The tables contain the parameters names, its description and its values from the project.

5.5.2.6.1 Hardware table



Name	Value	Documentation
Camera_ref	000003LP	UVP6 serial number
Acquisition_mode	0	0: SUPERVISED mode, 1: AUTONOMOUS mode, 2: TIME-programmed mode
Default_acquisition_configuration	UNDEFINED	Name of the acquisition configuration automatically launched when Acquisition_mode = 1 ...
Delay_after_power_up_on_time_mode	0	Delay before starting image acquisition when Acquisition_mode = 1 (AUTONOMOUS) - Unit...
Light_ref	000124VE	Light unit serial number
Correction_table_activation	1	Selection of the lighting correction LUT -> 0: no correction, 1: light unit correction 1, 2: light...
Time_between_lighting_power_up_and_trigger	150	Delay between light unit powering and trigger - Unit: µs
Time_between_lighting_trigger_and_acquisition	250	Delay between light unit trigger and image sensor shutter - Unit: µs
Pressure_sensor_ref	1	Pressure sensor serial number (let it empty if no sensor installed)
Pressure_offset	0.000	Distance between the image plan and the pressure measurement point (if undefined, set 99...
Storage_capacity	-1	SD card storage capacity, automatically updated by UVP6 when parameters are modified, d...
Minimum_remaining_memory_for_thumbnail_saving	10000	Minimal memory remaining in the SD card to keep saving images or vignettes - Unit: MBytes
Baud_Rate	2	UVP6 RS232 speed selection -> 0: 9600 bauds, 1: 19200 bauds, 2: 38400 bauds
IP_adress	192.168.0.128	UVP6 IP address for Ethernet communication
Black_level	0	Image sensor black level parameter - Unit: gray level(12bits)
Shutter	455	Image sensor integration time (shutter) - Unit: µs
Gain	6	Image sensor gain - Unit: dB
Threshold	20	Threshold for image segmentation (pixels <= Threshold are considered background) - Unit: ...
Aa	2300.000	Calibration parameter (corresponding area in the scene represented by each pixel) - Unit: ...
Exp	1.136	Calibration parameter (adjusting for specular reflections). If Aa and Exp= 0.0, values are kept...
Pixel_Size	73	Uncalibrated pixel size in the scene, for reference only - Unit: µm
Image_volume	0.670	Image volume (if = 0.0, particle concentrations are given in #/image, else in #/10L) - Unit: L
Calibration_date	20200924	Calibration date for the values in this table
Last_parameters_modification	UNDEFINED	YYYYMMDDHHMM, automatically updated by UVP6 when hardware parameters are ...
Operator_email	marc.picheral@obs-vlfr.fr	Identification of the operator filling this configuration table

5.5.2.6.2 Acquisition tables



Project file Acquisition parameter

Project file Acquisition parameter

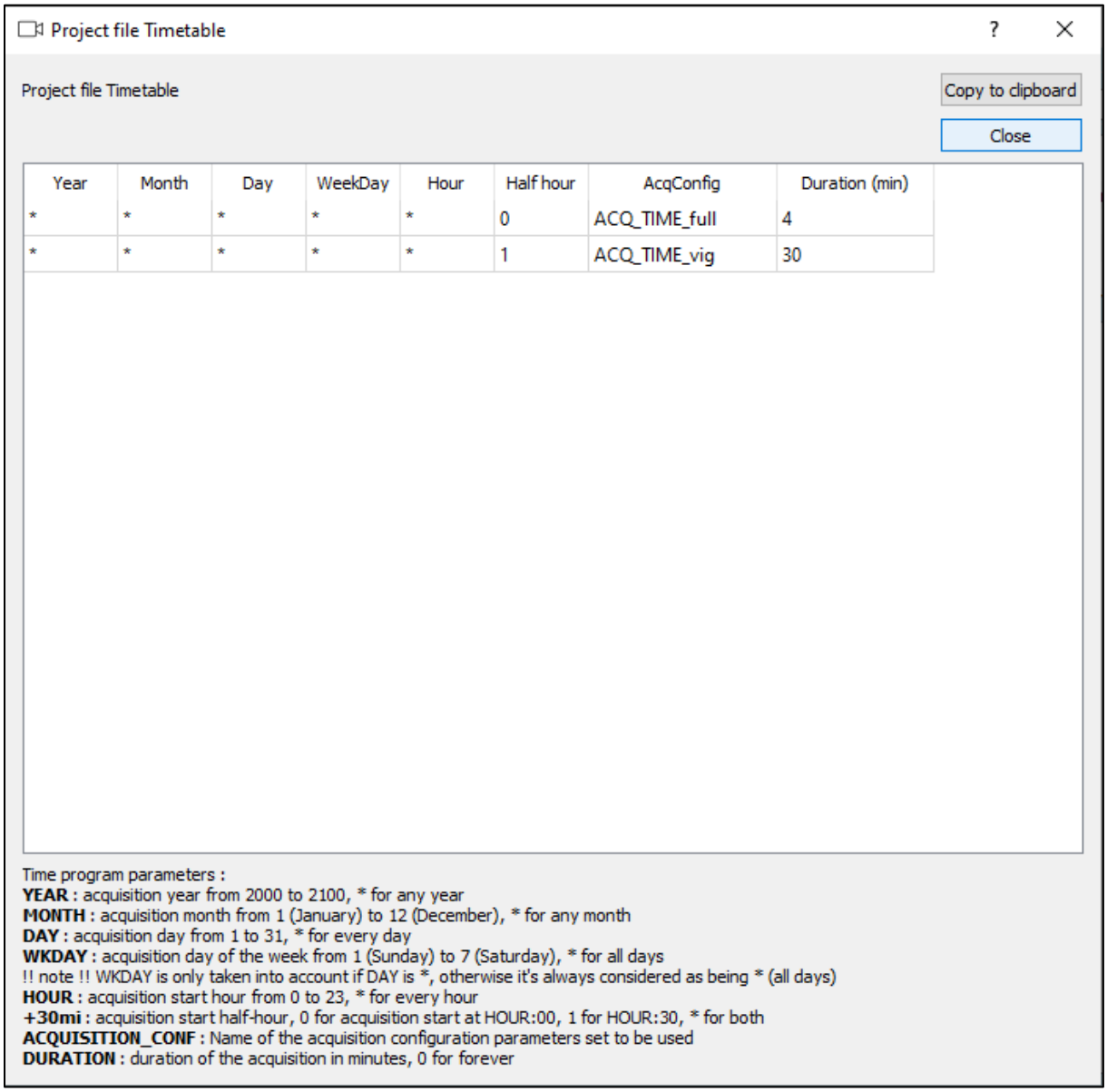
Copy to clipboard

Parameter help tooltips are displayed when you hold your mouse over the name column

Close

Name	Conf 0	Conf 1	Conf 2	Conf 3	Conf 4	Conf 5	Conf 6	Conf 7	Conf 8	Conf 9
Configuration_name	ACQ_ALS_002H	ACQ_ALS_002L	ACQ_ALS_022H	ACQ_ALS_022L	ACQ_ALS_052H	ACQ_ALS_052L	ACQ_ALS_102H	ACQ_ALS_102L	ACQ_ALS_CUST...	ACQ_ALS_CUST...
PT_mode	2	2	2	2	2	2	2	2	2	2
Acquisition_frequency	2.000	2.000	0.500	0.500	0.200	0.200	0.100	0.100	0.050	0.050
Frames_per_bloc	1	1	1	1	1	1	1	1	1	1
Blocs_per_PT	1	1	1	1	1	1	1	1	1	1
Pressure_for_auto_start	0	0	0	0	0	0	0	0	0	0
Pressure_difference_for_auto_stop	0	0	0	0	0	0	0	0	0	0
Result_sending	true	true	true	true	true	true	true	true	true	true
Save_synthetic_data_for_delayed_r...	false	false	false	false	false	false	false	false	false	false
Limit_lpm_detection_size	10	10	10	10	10	10	10	10	10	10
Save_images	2	2	2	2	2	2	2	2	2	2
Vignetting_lower_limit_size	620	620	620	620	620	620	620	620	620	620
Appendices_ratio	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Interval_for_measuring_backgroun...	10	100	10	100	10	100	10	100	100	10
Image_nb_for_smoothing	10	10	10	10	10	10	10	10	10	10
Analog_output_activation	false	false	false	false	false	false	false	false	false	false
Gain_for_analog_out	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Minimum_object_number	0	0	0	0	0	0	0	0	0	0
Maximal_internal_temperature	40	40	40	40	40	40	40	40	40	40
Operator_email	marc.picheral@...	marc.picheral@...	marc.picheral@...	marc.picheral@...	marc.picheral@...	marc.picheral@...	marc.picheral@...	marc.picheral@...	marc.picheral@...	marc.picheral@...

5.5.2.6.3 Time table



Project file Timetable

Project file Timetable

Copy to clipboard

Close

Year	Month	Day	WeekDay	Hour	Half hour	AcqConfig	Duration (min)
*	*	*	*	*	0	ACQ_TIME_full	4
*	*	*	*	*	1	ACQ_TIME_vig	30

Time program parameters :
YEAR : acquisition year from 2000 to 2100, * for any year
MONTH : acquisition month from 1 (January) to 12 (December), * for any month
DAY : acquisition day from 1 to 31, * for every day
WKDAY : acquisition day of the week from 1 (Sunday) to 7 (Saturday), * for all days
!! note !! WKDAY is only taken into account if DAY is *, otherwise it's always considered as being * (all days)
HOUR : acquisition start hour from 0 to 23, * for every hour
+30mi : acquisition start half-hour, 0 for acquisition start at HOUR:00, 1 for HOUR:30, * for both
ACQUISITION_CONF : Name of the acquisition configuration parameters set to be used
DURATION : duration of the acquisition in minutes, 0 for forever

5.5.3 Sensor control drop-down menu

5.5.3.1 Connect to sensor

This is the tool to connect the application to a sensor. This connection stops the acquisition when the sensor is recording data at the same time. A successful connection allows to visualize the sensor status in the UVP6 dashboard.

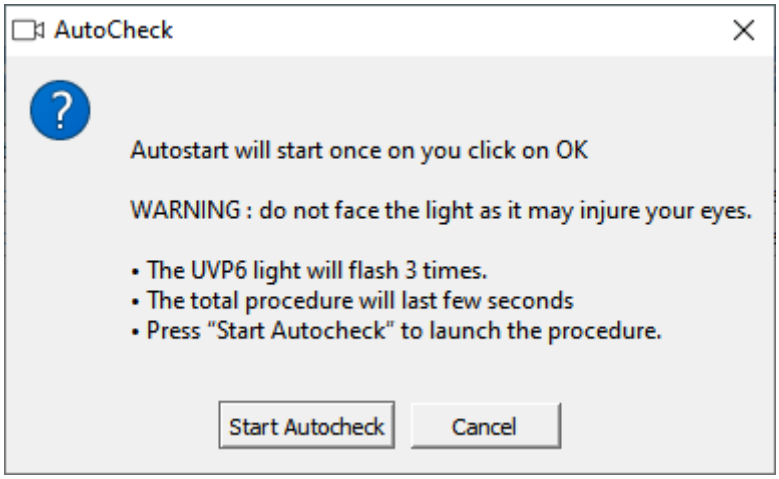
When starting, the application automatically tries to set a connection.

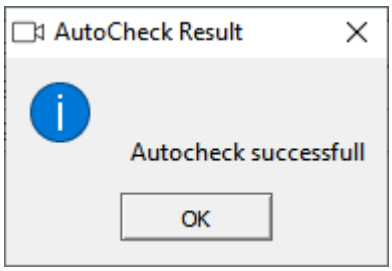
5.5.3.2 Reboot and disconnect

The tool allows to reset the sensor in a perfect state immediately after stopping UVPapp or shutting OFF the sensor power.

5.5.3.3 Autocheck

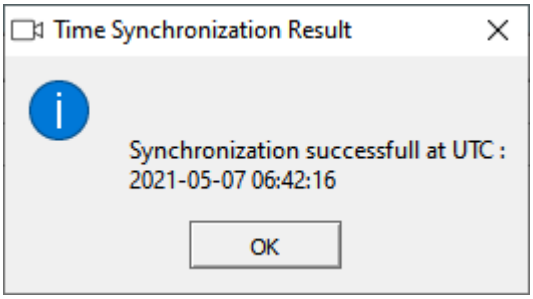
The autocheck tool will start a good health test sequence. It will check all components of the sensor and store a short sequence on its memory. The autocheck can be run as often as necessary prior to instrument deployment.





5.5.3.4 Time tools

The time tools make it possible to check the sensor time and to synchronize it to the computer time in UTC.



It is essential to synchronize the sensor time with the computer time prior to any deployment, mainly when the UVP6 is not equipped with a pressure sensor for depth interfacing with other sensors during vertical profiles. The UVPapp application will manage to set the sensor in UTC no matter the current time of the piloting computer.

It is important that the computer time is automatically synchronized using the Internet time.

5.5.3.5 View tools (Sensor)

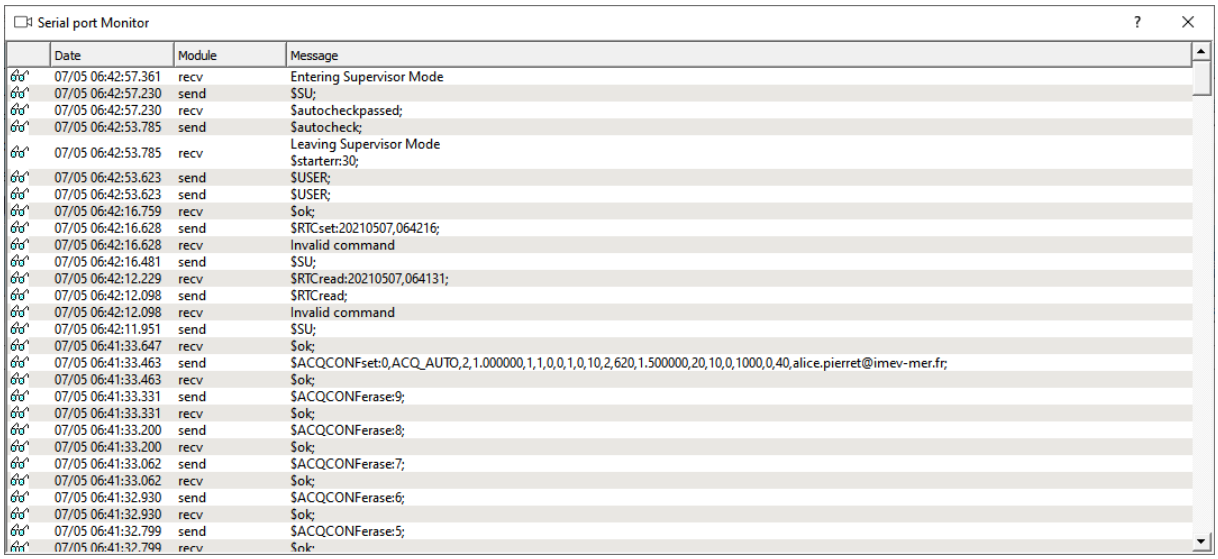
The tools permit the visualization of the instrument hardware, acquisition and time parameters tables of the connected sensor.

5.5.3.6 Program sensor

The programming tools can be run only if a sensor is connected. The programming tools allow you to modify only the relevant settings of the UVP6. See the relevant usage chapters above.

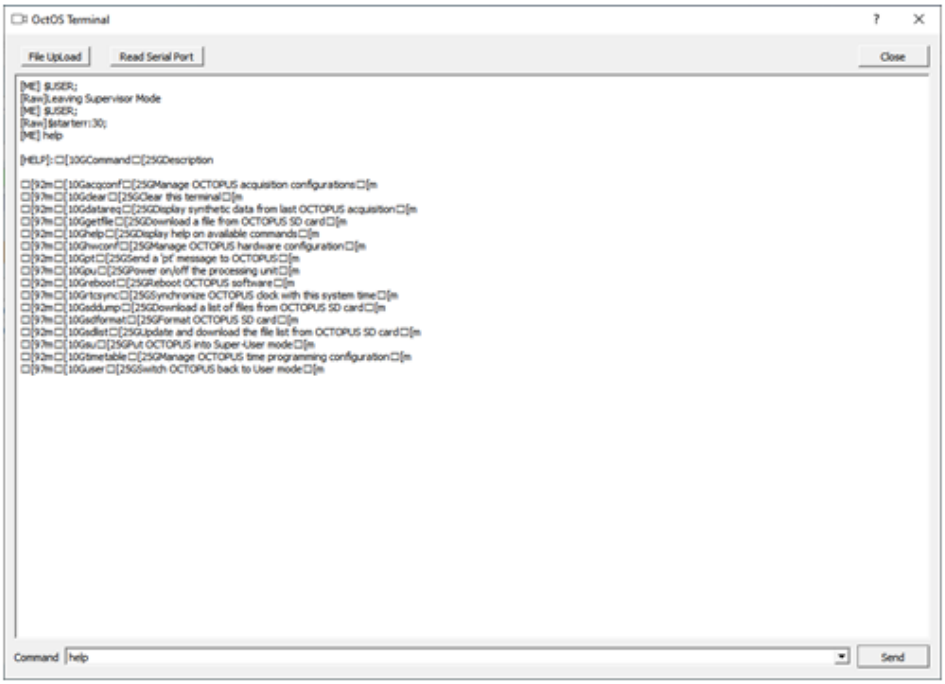
5.5.3.7 Monitor serial port

It opens the *serial port window* which will display all received and sent messages between the UVP6 and the computer. It is usually used for troubleshooting.



5.5.3.8 Open OctOs terminal

The *OctOs terminal* allows to communicate to the UVP6 sensor using a specific terminal and low-level commands.



This terminal is dedicated for experts who will act under Hydroptic supervision, mainly for **specific troubleshooting.**

The File Upload tool permits you to manually change any setting of the instrument without any control. **It must not be utilized by users.**

5.5.3.9 LiveCamera

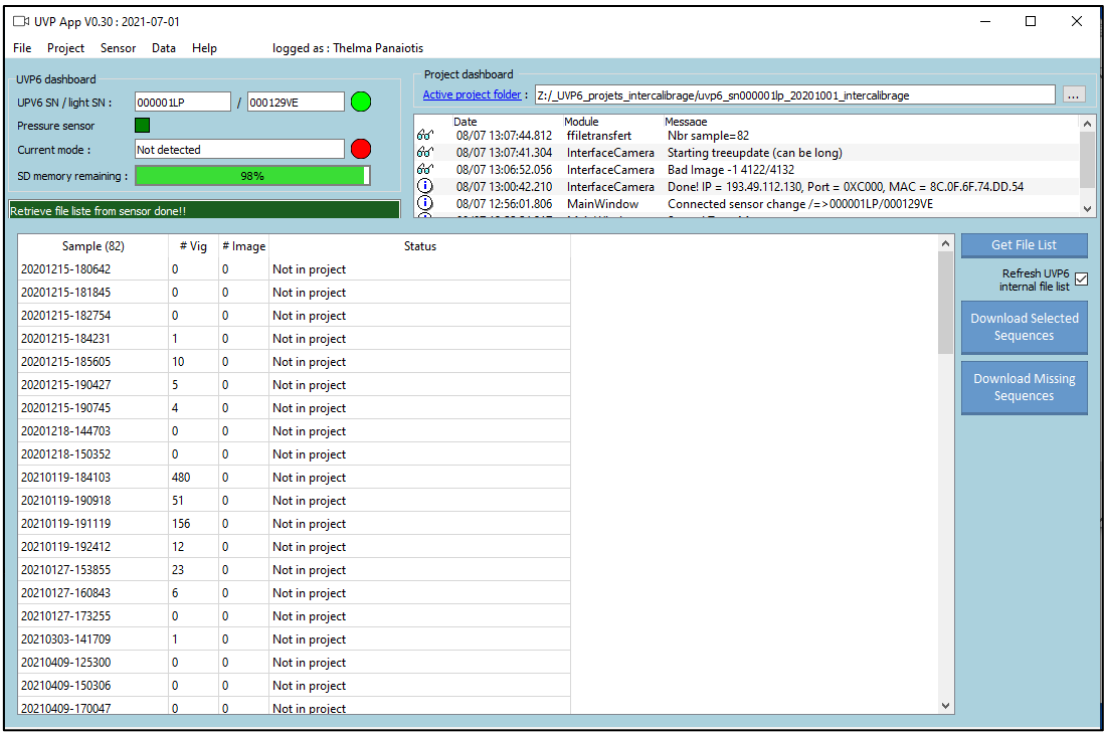
The livecamera tool allows the use of the UVP6 sensor as a remote camera. **See the relevant usage chapters above.**

5.5.4 Data drop-down menu

The Data tools can be run only if a sensor is connected.

5.5.4.1 Download data

It opens the *download data board* to download the data from the sensor to the project on the computer via the Ethernet connexion.



The first step is to use the *Get File List button* to ask the sensor to inventory the data stored in its mass storage SD card. This inventory may take a very long time depending on the quantity of data as the SD card can be either 400 GB or 1TB (in option).

The *Refresh UVP6 internal file list* must be enabled to make an up-to-date inventory (longer).

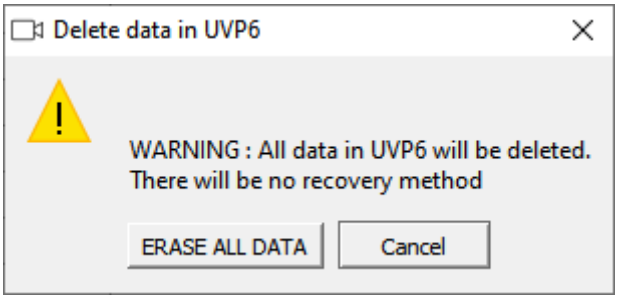
After getting the files list, the user has the possibility to download the data sequence by sequence or let the application download all missing sequences (i.e. sequences that are not yet recovered in the project).

It is very important to consider that downloading 400GB via the 100MB Ethernet link may take 48hours. The instrument will have to stay connected and powered preferably using an AC adapter for long downloads.

The data will be downloaded in the RAW folder of the project. Each sequence sub folder is named according to the UTC date and time of the first image of the sequence. It will contain a data.txt file with all raw particle counting and sensor metadata plus a ZIP archive of all raw image/vignette files.

5.5.4.2 Delete data

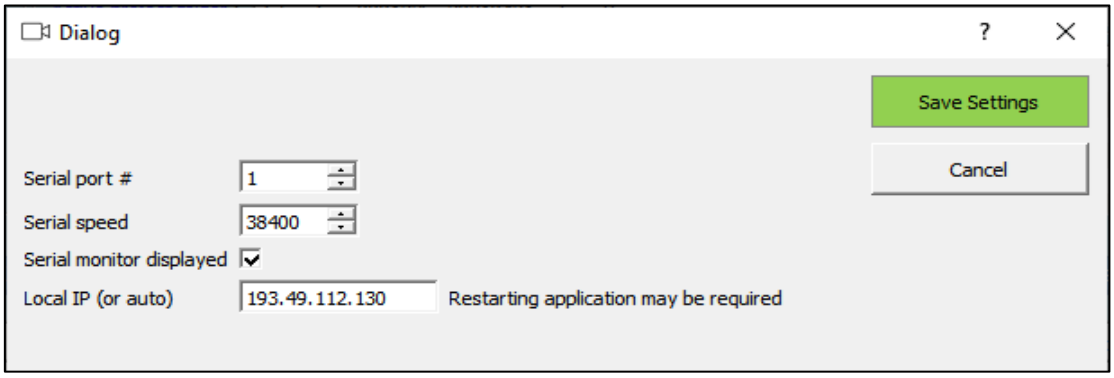
It is impossible to select the data to download in the instrument. The tool will re-format the entire mass storage erasing all previous data.



In case very important data have been erased by mistake, you can ask Hydroptic to recover them by sending the instrument back. This operation can only be done if no data has been recorded since the formatting of the SD card.

5.5.5 Help and application settings

The Help menu opens the *application settings window*.



5.5.5.1 Serial port

The COM port is defined. Be sure that your UVP6 is connected to the referenced COM port and that no other terminal application is using it.

5.5.5.2 Serial speed

The serial speed must be set to 38400. In case of communication over a longer data cable, it may be necessary to lower this serial speed. Contact Hydroptic to get the specific procedure for changing the serial speed in the sensor prior changing it in UVPapp.

5.5.5.3 Serial monitor displayed

Allows to display all incoming and sent messages between the UVP6 and the computer.

5.5.5.4 Local IP

It may be useful to set your computer with a fixed IP and indicate it in this field to facilitate the Ethernet connection with the instrument.

6. MAINTENANCE

6.1 In case of flooding suspicion

If you suspect that the UVP6 main pressure case or the light units have flooded, use EXTREME CAUTION around the instrument.

An indication for flooding is that the instrument stops operating or that there is a short-circuit condition in the instrument. An instrument flooded with salt water will short all of the connector pins together. An electric continuity test between random pins on any of the bulkheads may confirm this suspicion.

In case you suspect any flooding, place the instrument in a safe location and contact HYDROPTIC for further instructions.

Never stay in front of the end caps!

CONTINUE AT YOUR ON RISK!

You should try to depressurize the main pressure case slowly backing off one of the two connectors of the connector end cap. When all of the pressure has been released the instrument can be stored and safely shipped to Hydroptic for repairs.

There is nothing you can do if you suspect light flooded. Just prevent over accident.

6.2 Inter calibration

The UVP6 is an imaging sensor. It is so carefully calibrated before delivery. As for any sensor, we recommend a regular check and intercalibration to ensure the data consistency. The PIQv which performs the initial tuning and inter-calibration of the instrument is providing the subsequent routine inter calibration for all sensors after performing optical tests of the sensor. The PIQv inter-calibrates its instruments between each cruise.

Contact the PIQv (piqv@imev-mer.fr) to request an inter-calibration service.

6.3 Connector maintenance

The UVP6 connectors must be dried each time they are disconnected. They must be greased on a regular basis using the provided Molykote 44 transparent and soft grease.

The connectors are provided with dummies. They must never be left without protection.

Handle electrical terminations carefully, as they are not designed to withstand strain. Disconnect the cables from the components by pulling on the connector heads and not the cables. Do not twist the connector while pulling, as this will damage the connector pins.

Do not use petroleum-based lubricants on Subconn® connectors.

6.4 75Wh Battery (optional)

It is recommended to limit the discharge of the Li-Ion batteries in order to improve their life expectancy. **We thus recommend using only 50% of the provided battery before charging.**

The battery charger is plugged directly to the battery for charging. A relief valve secures the charging without requesting to open the battery.

The Y cable provided with the battery permits to power the UVP6 on the battery. It does not allow you to power the UVP6 using the power from the data cable. If necessary, connect directly the data cable to the UVP6 without using the Y cable.

The charger LED indicates the status of the charge :

- Red : rapid charge
- Yello : intermediate charge
- Green : charge finishing

The charge will be automatically stopped after 4 hours and the LED will stay green.

6.5 Battery voltage measurements

While checking voltages with a multimeter, use extreme care to avoid shorting the probe leads. A shorted power supply or battery can output many amperes of current, potentially harming the user, starting fires, or damaging equipment.

PIN (MCBH2F, battery bulkhead)	Signal

1	0 vdc
2	Vcc (21.6 volts nominal)

6.6 Battery charge

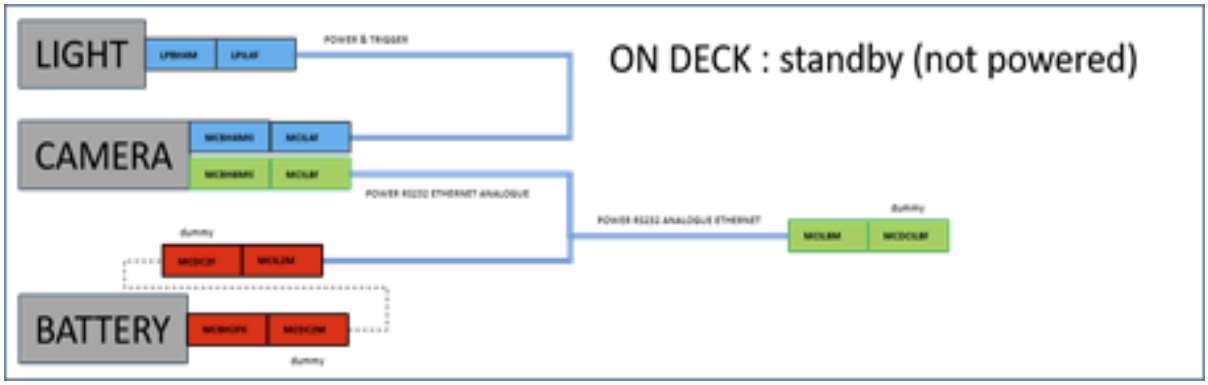
Use the provided charger to charge the battery. **The charger should be disconnected from the AC power when connecting or disconnecting the battery.**

The charge will last a maximum of 4 hours.

6.7 Instrument storage and transport

The camera protection should always be set.

The marine connectors must be kept in good condition by rinsing them with freshwater after each profile, by drying them and by applying some provided Molykote 44 grease on them when needed.



7. SPECIFICATIONS

7.1 UVP6-LP

- Operational depth: 0 to 6000 meters
- Weight in air: 3.2 Kg
- Weight in water: 1.5 Kg
- Materials: titanium, glass and POM
- Input voltage: 8-28 Vdc (0.1Watt@0.1Hz – 0.35Watt@0.5Hz – 1Watt@1.3Hz)
- Interface: RS232, Ethernet, analog output, I/O
- Lighting: 635nm, 80-400µS flashs
- Resolution: 5Mpixels / 0.73µM
- Field of view: 180 x 151mm x 23mm (0.6 L)
- Max image frequency: 1.3Hz
- Real time processing of images
- Memory: 400Go (1 TB option)
- Pressure sensor : 0.1% accuracy (option)

7.2 UVP6-HF

- Operational depth: 0 to 6000 meters
- Weight in air: 3.2 Kg
- Weight in water: 1.5 Kg
- Materials: titanium, glass, POM and Aluminium (arm)
- Input voltage: 10-28 Vdc (6 W / 0.02 W, acquisition / standby)
- Interface: RS232, Ethernet, analog output, I/O

- Lighting: 635nm, 80-400µS flashs
- Resolution: 5Mpixels / 0.73µM
- Field of view: 180 x 151mm x 23mm (0.6 L)
- Max image frequency: 25Hz
- Real time processing of images
- Memory: 400Go (1 TB option)
- Pressure sensor: 0.1% accuracy

7.3 Battery

- Operational depth: 0 to 6000 meters
- Weight in air: 1.4 Kg
- Weight in water: 0.6 Kg
- Materials: titanium
- Power: 66 Wh
- Voltage: 21.6 Vdc

8. ANNEXE

8.1 REGULATIONS

8.1.1 HS code

8.1.1.1.1 International

901580

8.1.1.1.2 French

9015801900

8.1.1.1.3 US custom ECCN

8A992

8.1.1.1.4 Battery

There is no battery contained in the UVP6 sensor. The optional battery housing contains a 6 x 3.3A / 3.6V Li-ion battery of 75Wh / 0.27 Kg. It can easily be transported with you in planes. Ask your company before.

The UN number of such battery is **3481**: **"Lithium Ion Batteries contained in equipment".**

8.2 Configuration

8.3 Data files

The data file is named according to the date and time (UTC) of the first image of sequence. Its header is made of two metadata lines, one for the instrument hardware configuration and one for the acquisition settings utilized for the sequence.

***HW_CONF**,000003LP,0,UNDEFINED,0,000124VE,1,150,250,1,0.000,393819,10000,2,192.168.0.128,0,455,6,20,2342.000,1.136,73,0.670,20200924,202010130814,marc.picheral@obs-vlfr.fr,40.3,50.8,64,80.6,102,128,161,203,256,323,406,512,645,813,1020,1290,1630,2050;*

***ACQ_CONF**,ACQ_ALS_022H,2,0.500,1,1,0,0,1,0,10,2,620,1.5,10,10,0,1000,0,40,marc.picheral@obs-vlfr.fr,0,393788;*

*20210428-143248,94.65,16.06,**0**:1,5056,30.9,11.6;2,145,31.4,10.5;3,2,28.3,7.2; (black line with light flag to **0**)*

*20210428_3250,94.18,16.00,**1**:1,5809,30.5,11.2;2,369,36.0,16.7;3,87,40.6,21.1;4,46,52.4,29.1;5,11,54.8,31.4;6,11,58.4,37.5;7,5,49.5,31.9;8,5,72.2,44.9;9,2,85.0,45.3;10,3,87.1,53.1;11,1,57.7,20.5;12,2,80.2,51.5;25,1,79.7,45.9; (data line with linght flag to **1**)*

These two lines are then followed by image datalines. These lines contain two sections.

The first one indicates the image time, depth (when available, otherwise 'nan'), internal temperature a flag indicating the status of the light (ON/OFF) for the image.

The second section (after the ':') contains the data per pixel size (1), the number of objets for that size (5056 or 5809), the mean grey of these objects (30.9 or 30.5) and the stddev of the mean grey (11.6 or 11.2).... and then the same data for the 2, 3 and.... pixel sizes.

8.4 SeaGlider data files

The SeaGlider data files respect the GOOS JCOMMOPS OceanGliders naming standard:

- "trajectory_id" : "<platform_code>_<start_date>" (ex : "sp065-20210616T1430")
- "id" : "<trajectory_id>_<data_mode>" (ex : "sp065-20210616T1430_R")
    - data_mode is a control_vocab but not agreed yet. In ARGO this is R: real time data / D: delayed mode data / A : real time data with adjusted values
- "file_name" : "<id>.nc" (ex : "sp065-20210616T1430_R.nc")
- examples for our case would be:
    - SG150_20210601T1606_A.nc
    - SG150_20210527T0805_A.nc

These files include metadata from the glider like time, depth, latitude and longitude.

8.5 Basic error messages

8.6 RS232 frames and commands

8.6.1 Selection of useful commands for the SUPERVISED mode

We present here a very limited selection of useful commands to manually start and stop acquisition in SUPERVISED mode. The command must be immediately repeated if the instruments responds ***$starterr:33;*** which indicates that the instrument was in sleep mode and could not understand the command.

$autocheck; (Starts the autocheck of the instrument.)

$start:NNNNNNNN; (Starts acquisition using the NNNNNNNN set of parameters.)

$start:NNNNNNNN,YYYYMMDD,HHMMSS; (Starts acquisition using the NNNNNNNN set of parameters. Adjusts the date and time.)

$stop; (Stops the acquisition.)

8.6.2 HWconf metadata frame

The HWconf frames are sent by the instrument after being powered (delay : 1 second for UVP6LP, 14 second for UVP6HF). The last 18 parameters are the lower value of the size intervals. These values may be modified in a future version of the sensor firmware. They will always correspond to standard data classes in EcoPart (https://ecotaxa.obs-vlfr.fr/part/).

HW_CONF,000002LP,0,UNDEFINED,0,000002VE,2,150,250,169559,20.000,393819,2000,2,192.168.0.128,0,356,6,23,1130.000,1.310,73,0.630,20190207,201907241218,marc.picheral@obs-vlfr.fr,40.3,50.8,64,80.6,102,128,161,203,256,323,406,512,645,813,1020,1290,1630,2050;

HW_CONF
Camera_ref
Acquisition_mode
Default_acquisition_configuration
Delay_after_power_up_on_time_mode
Light_ref
Correction_table_activation
Time_between_lighting_power_up_and_trigger
Time_between_lighting_trigger_and_acquisition
Pressure_sensor_ref
Pressure offset
Storage_capacity
Minimum_remaining_memory_for_thumbnail_saving
Baud_Rate
IP_adress
Black_level
Shutter
Gain
Threshold
Aa
Exp
Pixel_Size
Image_volume
Calibration_date
Last_parameters_modification

Operator_email
40.3
50.8
64
80.6
102
128
161
203
256
323
406
512
645
813
1020
1290
1630
2050

8.6.3 ACQconf metadata frame

The ACQconf frames are sent when the acquisition of a sequence starts even if a delay is then applied (CTD or AUTO modes)

ACQ_CONF,ACQ_CSCS_002L,3,2.000,1,1,10,30,1,1,10,1,50,1.0,10,10,0,1000,0,40,marc.picheral@obs-vlfr.fr,0,381774;

rame
Configuration_name

PT_mode
Acquisition_frequency
Frames_per_bloc
Blocs_per_PT
Pressure_for_auto_start
Pressure_difference_for_auto_stop
Result_sending
Save_synthetic_data_for_delayed_request
Limit_lpm_detection_size
Save_images
Vignetting_lower_limit_size
Appendices_ratio
Interval_for_mesuring_background_noise
Image_nb_for_smoothing
Analog_output_activation
Gain_for_analog_out
Minimum_object_number
Maximal_internal_temperature
Operator_email
0
SD card remaining memory (Mbytes)

8.6.4 Data frames

8.6.4.1.1 Particle frames

The data frame is sent after the acquisition and process of a bloc (batch) of images. The numbers are per bloc of images. The concentrations will be calculated using the indicated number of images and the image volume from the HWconf frame.

LPM_DATA,27.31,20200110,120542,2,14.25,2051,800,123,50,10,1,0,0,0,0,0,0,0,1,0,0,0,0,
25,30,27,50,26,100,0,0,0,0,0,0,0,201,0,0,0,0;

	Unit	Min	Max
LPM_DATA	characters	na	na
Depth	mH2O		
Date	YYYYMMDD		
Time	HHMMSS		
Number of analyzed images	images	1	2^8
Internal temperature	°C		
Cumulated number of objects for class 1	integer	0	2^{16}
Cumulated number of objects for class 2	integer	0	2^{16}
Cumulated number of objects for class 3	integer	0	2^{16}
Cumulated number of objects for class 4	integer	0	2^8
Cumulated number of objects for class 5	integer	0	2^8
Cumulated number of objects for class 6	integer	0	2^8
Cumulated number of objects for class 7	integer	0	2^8
Cumulated number of objects for class 8	integer	0	
Cumulated number of objects for class 9	integer	0	
Cumulated number of objects for class 10	integer	0	
Cumulated number of objects for class 11	integer	0	
Cumulated number of objects for class 12	integer	0	
Cumulated number of objects for class 13	integer	0	
Cumulated number of objects for class 14	integer	0	
Cumulated number of objects for class 15	integer	0	
Cumulated number of objects for class 16	integer	0	

Cumulated number of objects for class 17	integer	0	
Cumulated number of objects for class 18	integer	0	
Mean grey level of objects from class 1	integer	0	255
Mean grey level of objects from class 2	integer	0	255
Mean grey level of objects from class 3	integer	0	255
Mean grey level of objects from class 4	integer	0	255
Mean grey level of objects from class 5	integer	0	255
Mean grey level of objects from class 6	integer	0	255
Mean grey level of objects from class 7	integer	0	255
Mean grey level of objects from class 8	integer	0	255
Mean grey level of objects from class 9	integer	0	255
Mean grey level of objects from class 10	integer	0	255
Mean grey level of objects from class 11	integer	0	255
Mean grey level of objects from class 12	integer	0	255
Mean grey level of objects from class 13	integer	0	255
Mean grey level of objects from class 14	integer	0	255
Mean grey level of objects from class 15	integer	0	255
Mean grey level of objects from class 16	integer	0	255
Mean grey level of objects from class 17	integer	0	255
Mean grey level of objects from class 18	integer	0	255

In case the sensor is over exposed (at the surface) by sunlight, it will replace the LPM frame by an over exposed frame in which all values for the 18 classes of abundances and grey levels are set to 0.

LPM_DATA,0.25,20200110,120112,0,14.25,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0;

8.6.4.1.2 Black frames

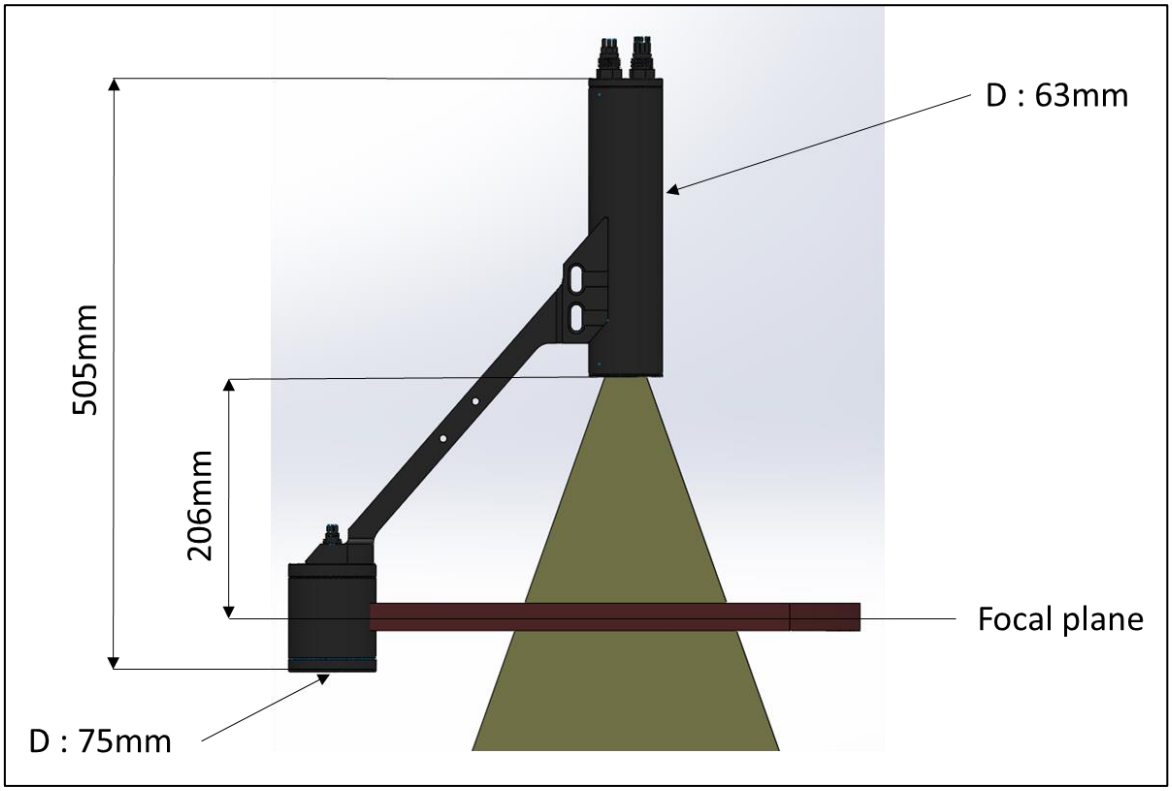
A black frame is sent at preset intervals between particle frames. It contains the number of objects from the images acquired without activating the light.

BLACK_DATA,1.23,20200110,120132,2,14.25,1275,251,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0;

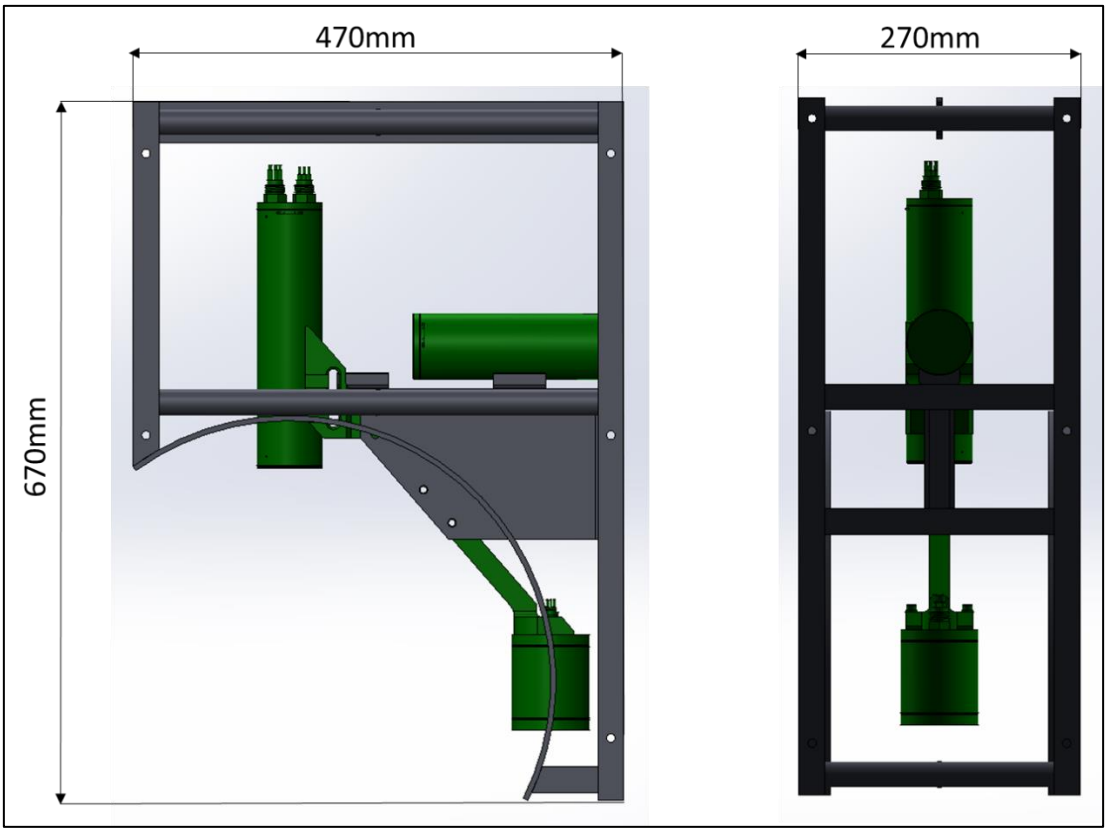
	Unit	Min	Max
BLACK_DATA	*characters*	*na*	*na*
Depth	*mH2O*		
Date	*YYYYMMDD*		
Time	*HHMMSS*		
Number of analyzed images	*images*	*1*	*255*
Internal temperature	*°C*		
Cumulated number of objects for class 1	*integer*	*0*	
Cumulated number of objects for class 2	*integer*	*0*	
Cumulated number of objects for class 3	*integer*	*0*	
Cumulated number of objects for class 4	*integer*	*0*	
Cumulated number of objects for class 5	*integer*	*0*	
Cumulated number of objects for class 6	*integer*	*0*	
Cumulated number of objects for class 7	*integer*	*0*	
Cumulated number of objects for class 8	*integer*	*0*	
Cumulated number of objects for class 9	*integer*	*0*	
Cumulated number of objects for class 10	*integer*	*0*	
Cumulated number of objects for class 11	*integer*	*0*	
Cumulated number of objects for class 12	*integer*	*0*	
Cumulated number of objects for class 13	*integer*	*0*	
Cumulated number of objects for class 14	*integer*	*0*	
Cumulated number of objects for class 15	*integer*	*0*	
Cumulated number of objects for class 16	*integer*	*0*	
Cumulated number of objects for class 17	*integer*	*0*	
Cumulated number of objects for class 18	*integer*	*0*	

8.7 Instrument dimensions

8.7.1 UVP6 Dimensions



8.7.2 UVP6 Frame



8.8 Connector pin configuration on camera

8.8.1 DATA, ANALOGUE and POWER (MCBH8M)

PIN (MCBH8M, bulkhead)	Signal
1	0 volt
2	Vin vdc (10 - 28)
3	UVP6 **Tx** (RS232)
4	UVP6 **Rx** (RS232)
5	Ethernet (or ANALOGUE gnd)*
6	Ethernet
7	Ethernet (or ANALOGUE +) *
8	Ethernet

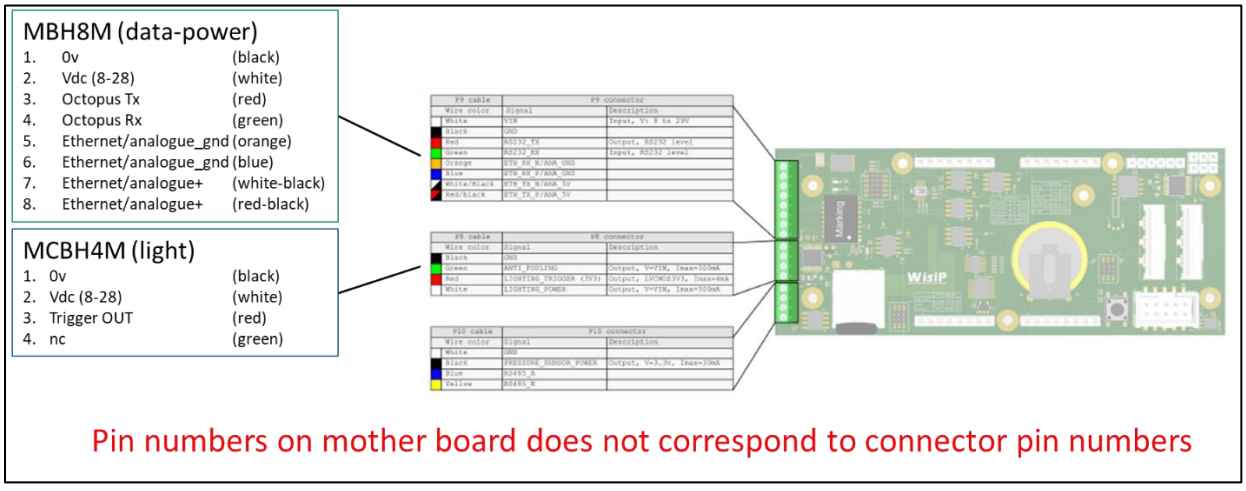
*the analogue output is always activated on UVP6HF instruments. It has to be activated on UVP6LP instrument (on request before delivery)

8.8.2 LIGHT and I/O (MCBH4M)

PIN (MCBH4M, bulkhead)	Signal
1	0 volt
2	Vout vdc (10-28)
3	Trigger out
4	I/O*

* the I/O permits to pilot any device such as a wiper or a closing opercula (ask Hydroptic about this function)

8.8.3 Internal camera cabling



Pin numbers on mother board does not correspond to connector pin numbers

8.9 Battery for long deployments

The Develogic company is providing battery systems which can be utilized for long deployments : http://www.develogic.de/products/power-supply-systems/refillable-battery-container/

8.10 Instrument delivery contents

8.10.1 Shipping carton:

- UVP6LP with light cable and optics covers

8.10.2 Hardcase

- UVP6HF with light cables and optics covers
- Octopus cable for serial, ethernet, power in

Serial to usb converter

- Battery
- Battery charger
- Y cable for battery
- Analog cable
- CTD mounting kit
- Grease pot
- USB key