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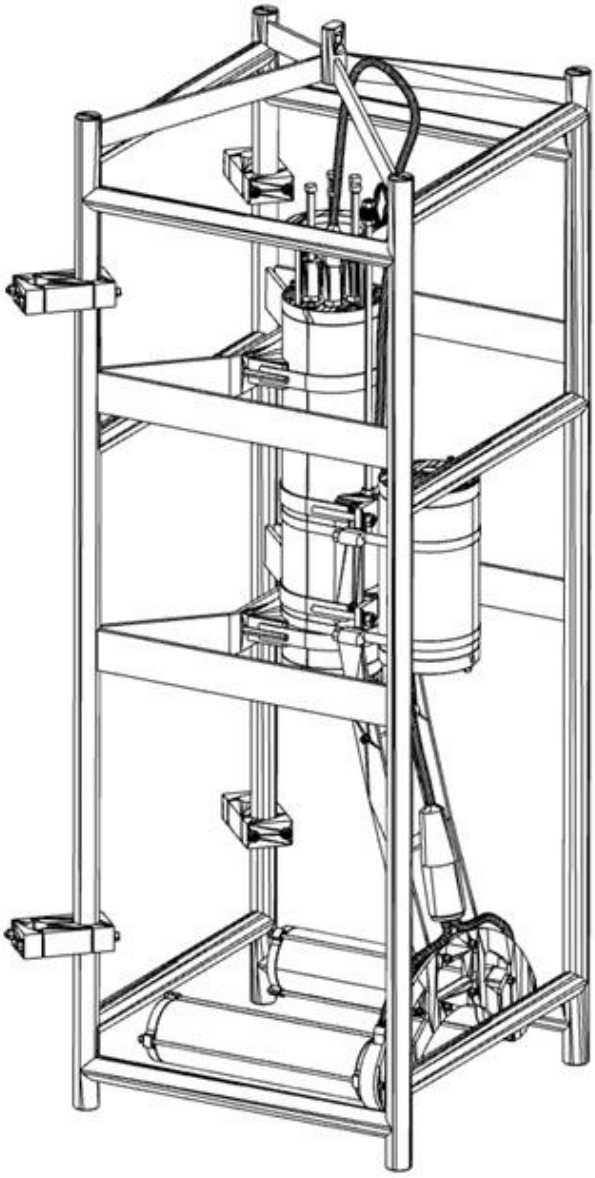
UVP SHALLOW

USER MANUAL

v. 2016/10/04



WARNING!

If you suspect that the UVP Shallow main pressure case or any of the light units has flooded, use EXTREME CAUTION around the instrument. The UVP SHALLOW can operate at depths of up to 600 meters but the maximum depth is given by the PRESSURE SENSOR installed on your instrument (check provided documentation and notice on the main pressure case).

If the light leaked at depth it might remain highly pressurized when recovered and cause the end cap to be launched from the pressure case with extreme force if retaining screws are removed.

The main pressure case is equipped with a relief valve that should prevent any over pressure.
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!
Even if the relief valve should prevent over pressure in the main case, you should try to depressurize the main pressure case slowly backing off one of the valve located in the center of the connector end cap. The valve only has to be loosened so that the face seal O ring is no longer sealed against the end cap. When all of the pressure has been released the instrument can be stored and safely shipped to Hydroptic for repairs.

You can also open the pressure case by the connector end, disconnect the battery and rinse with fresh water under Hydroptic supervision.

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

Instruments
Do not leave instruments in direct sunlight. Direct sunlight can easily increase the internal temperature of the instrument beyond its maximum rating.

LIGHT UNITS
Even if rated and tested for 600 meter use, the glass cylinders of the light unit are fragile. Extreme care must be applied to prevent any scratch or shock on these units. If you suspect any damage, stop using UVP and contact Hydroptic.

Connections
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. Connectors should be free of dirt and lightly lubricated before mating.
Hydroptic recommends using the provided silicone on the male pins prior to connection.

Troubleshooting

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.

CONTENTS:

1. Introduction

The manual enables the user to be directed pertaining to the contents of the crates received from Hydroptic and that can contain variable parts and optional spare parts. The user will be guided through the unpacking and system setup and fine-tuning prior to the system being sea bound. In the same time basic functions and features are explained for a quick understanding and ownership of the UVP. More manuals are available in the package *UVP SHALLOW_snXXX_manuals*, which are explaining thoroughly each function.

Additional useful information on software utilized for the piloting of the UVP (Zooprocess), data processing and Computer assisted Sorting of Zooplankton can be found in the following manuals accessible on the www.zooscan.com website.

- ZooProcess_Manual_v718.pdf
- Computer_assisted_sorting_plankton_2013.pdf

2. Regulations (customs, safety)

2.1 HS code

3.1.1. INTERNATIONAL

901580

3.1.2. FRENCH

9015801900

2.2 US custom ECCN

The UVP5 US 8A992.

2.3 Battery UN

UVP5 Li-Ion batteries are located inside the main pressure case. Their UN number is thus **3481: "Lithium Ion Batteries contained in equipment"**.
Weight: 1.085 Kg
Power: 29.4 Vdc / 6.8 A

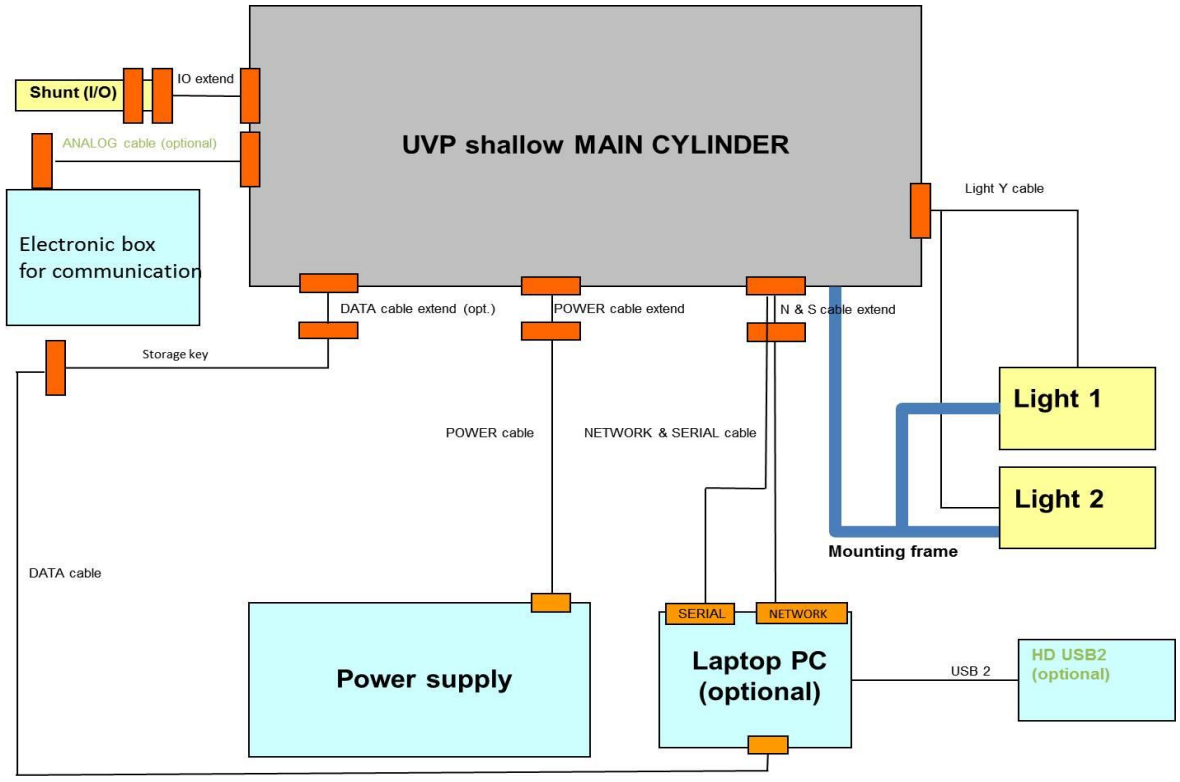
3. Assembly procedure

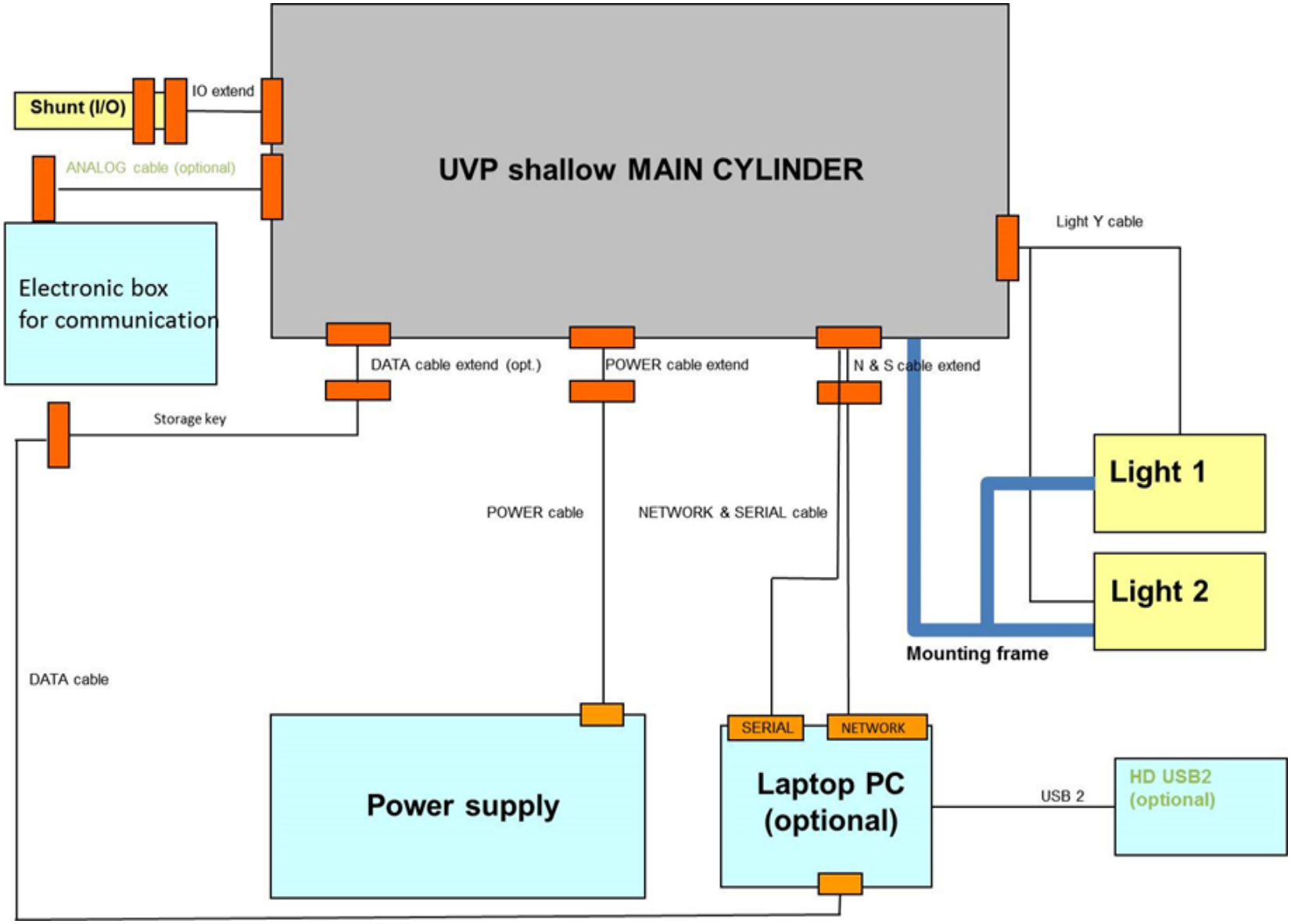
3.1. Description of components

This section of the manual describes the detailed contents of the shipping crates. The location of the parts will allow the system setup to be easily performed through the identification of the different parts shown in the section.

The single crate includes two foam protected levels in order to have all the contents in the same container. Each level can be removed individually in order to access the different parts that are placed on each level. The levels are shown hereunder.

The diagram hereafter presents the different components of the UVP SHALLOW:




Shunt (I/O)
IO extend
ANALOG cable (optional)
UVP shallow MAIN CYLINDER
Light Y cable
Electronic box for communication
DATA cable extend (opt.)
POWER cable extend
N & S cable extend
Storage key
Light 1
Light 2
POWER cable
NETWORK & SERIAL cable
Mounting frame
DATA cable
SERIAL
NETWORK
Power supply
Laptop PC (optional)
USB 2
HD USB2 (optional)

4. Crate Contents and Unpacking:

This section of the manual describes the detailed contents of the shipping crates. The location of the parts will allow the system setup to be easily performed through the identification of the different parts shown in the section.

4.1 System Crate Contents:

The single crate includes three foam protected levels in order to have all the contents in the same container. Each level can be removed individually in order to access the different parts that are placed on each level. The levels are shown hereafter.

4.2 UVP shallow Crate TOP level:

The first level of the crate corresponds to the elements that can be seen upon the opening of the crate. The first level includes three compartments as shown hereafter:

- Compartment ① holds the Frame mounted lighting unit
- Compartment ② contains the battery charger
- Compartment ③ contains documentation, station datasheets, and laptop/backup drive (optional)
- The top cover holds the T Shape light beam adjusting alignment

4.3 UVP SHALLOW INTERMEDIATE CRATE LEVEL:

The second level of the crate corresponds to the elements that can be seen once the top level has been removed from the crate. The level includes the following components:

- ① Clamp collar (2)
- ② IO Shunt (yellow tag)
- ③ Set of cables:
  -Data storage (USB stick) cable from UVP camera to USB storage
  -Data transfer cable from USB storage cable to computer
  -Battery to camera cable
  -RJ45 and serial port cables (coupled with Edgeport converter)
  -Power and IO extension cable
- ④ Additional compartment for spare parts or else

4.4 UVP shallow Crate BOTTOM level:

The third level of the crate corresponds to the elements that can be reached once the intermediate level has been removed from the crate. The level includes the following components:

- ① Camera Unit
- ② Dummies
- ③ Camera Unit support piece
- ④ 2 Camera Unit Attachment brackets
- ⑤ Battery Unit.
- ⑥ Chainplate

4.5. OPTIONAL SPARE PARTS CRATE CONTENTS

The UVP5 can be supplied with an additional set of parts (depending on the configuration and pre-defined sales agreement). The parts are placed in an additional crate and can include (but not limited to) the following components:

- SPARE Lighting Unit
- SPARE Electronic Components
- SPARE Ethernet Switch
- SPARE UVP5 mother board
- SPARE Waterproof Connectors

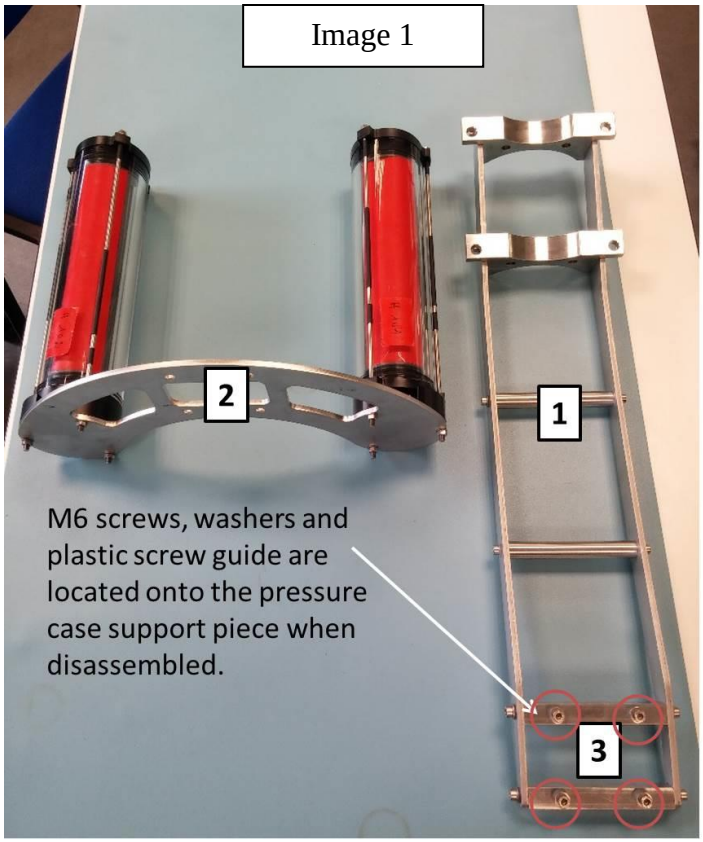
- SPARE Flash Drive containing CAMERA OS
- SPARE pre-configurated UVP5 camera
- OPTIONAL CTD rosette mounting KIT
- OPTIONAL CTD analog cable
- OPTIONAL CTD serial uplink cable
- USB Flash card reader
- OPTIONAL separate frame

5. System Setup:

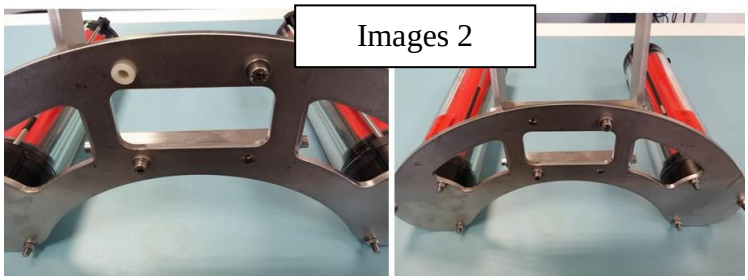
In order to start the system setup, the parts need to be removed from the crate and placed on a safe and clean workplace. The installation kit needs to be available at all times. The setup sequence is detailed in the following step by step procedures.

1 Prepare the camera support piece①, the frame mounted lighting units②, 4 M5 plastic screw guides, 4 M5 washers, 4 M5 screws, 4 M5 nuts ③. Image1
2 Place the screw guides in the lighting unit frame as shown hereunder.
3 Line up the frame and the support piece. Images2
4 Place 2 screws, 2 washers, and maintain in position with 2 nuts.
5 Place the 2 other screws, washers and nuts and tighten all 4 attachment screws.

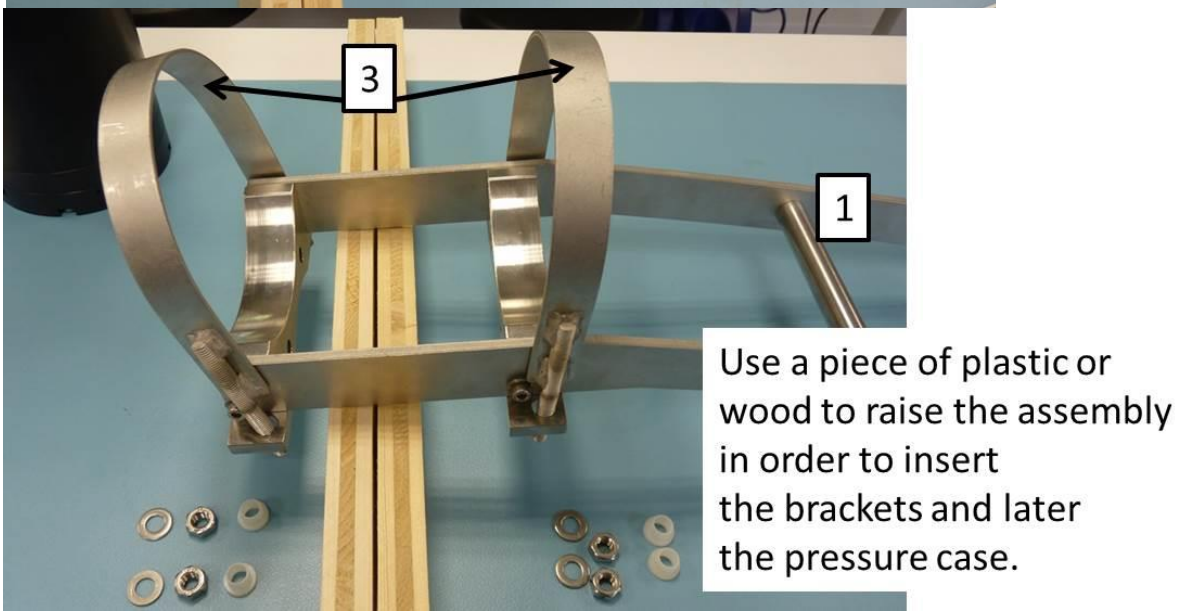
Image 1



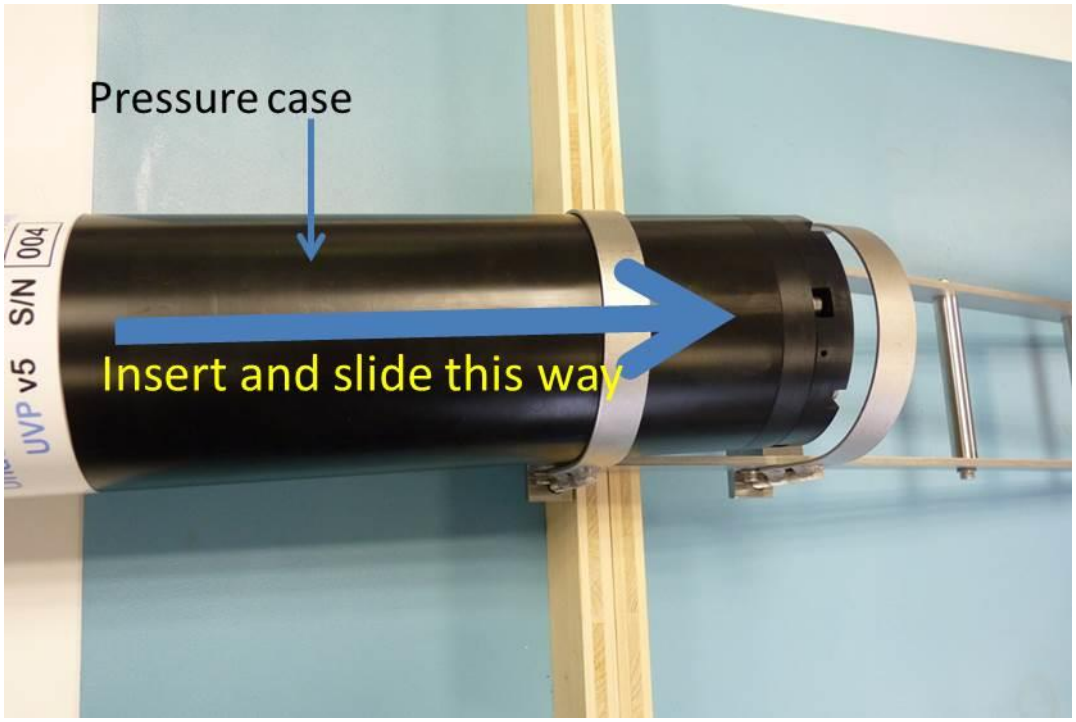
Images 2



6 Once the main pressure case support① is fitted to the frame mounted lighting units②, prepare the 2 camera attachment brackets③ , 4 M6 nuts, 4 M6 washers, 4 M6 plastic screw guides. The screws threads are included in the attachment brackets.
7 Place the 4 plastic screw guides on the main pressure case support piece
8 Place the washers and nuts on the main pressure case attachment bracket screw threads
9 Slightly tighten the nuts in order to leave enough mechanical play to slide the main pressure case through the brackets③.



10 Slide the main pressure case through the attachment brackets and tighten all four screws to ensure the position of the camera unit.



11 The distance between the main pressure case (camera unit) and the lighting unit is pre-set in the factory. The distance is set at 370 millimeters from the black porthole to the centre of the lighting units. Two labelled arrows are used for the alignment and distance adjustment. (Image 3)
Two marks are used to align the tube with the lighting unit in the event the labels peel off. Both marks must match on the pressure case (camera unit) and the main pressure case support cradle.

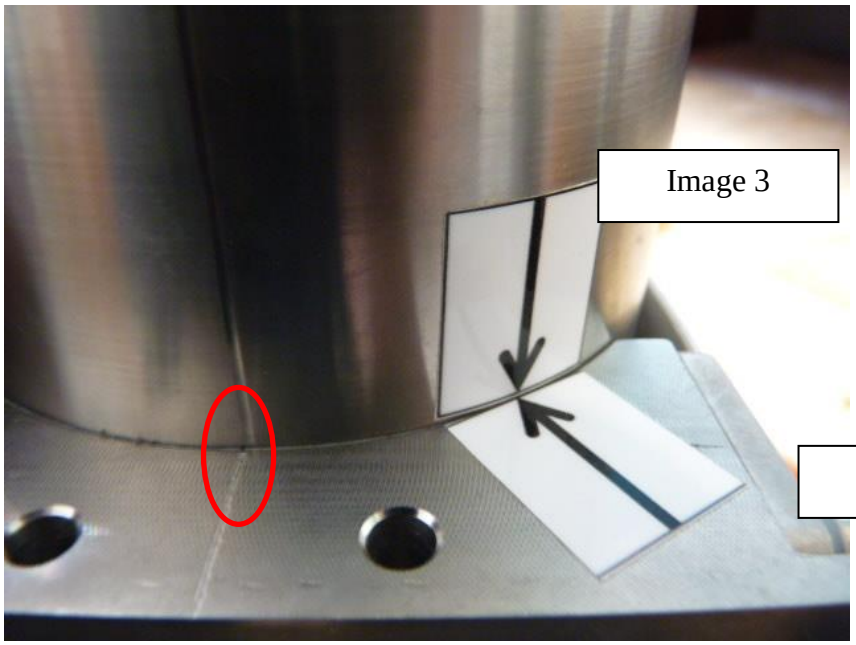
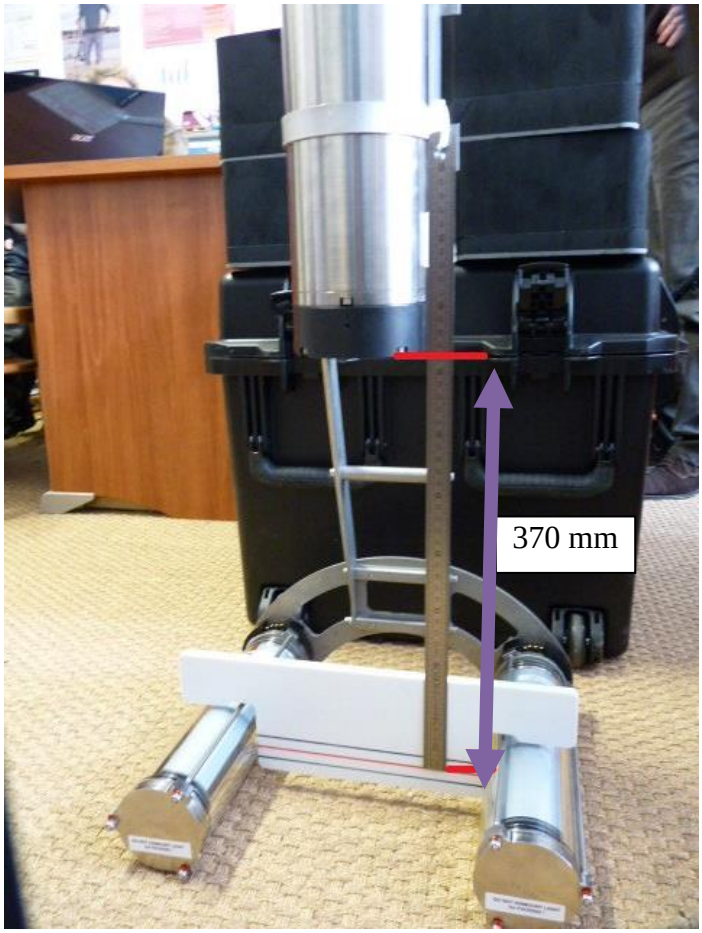
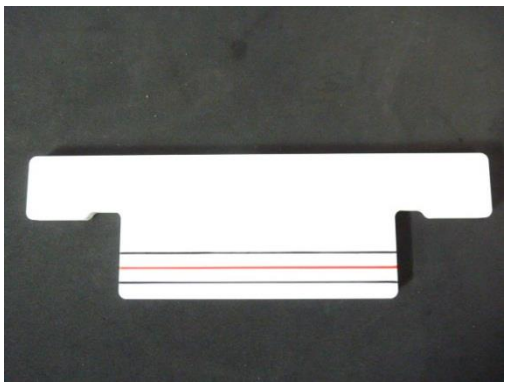


Image 3

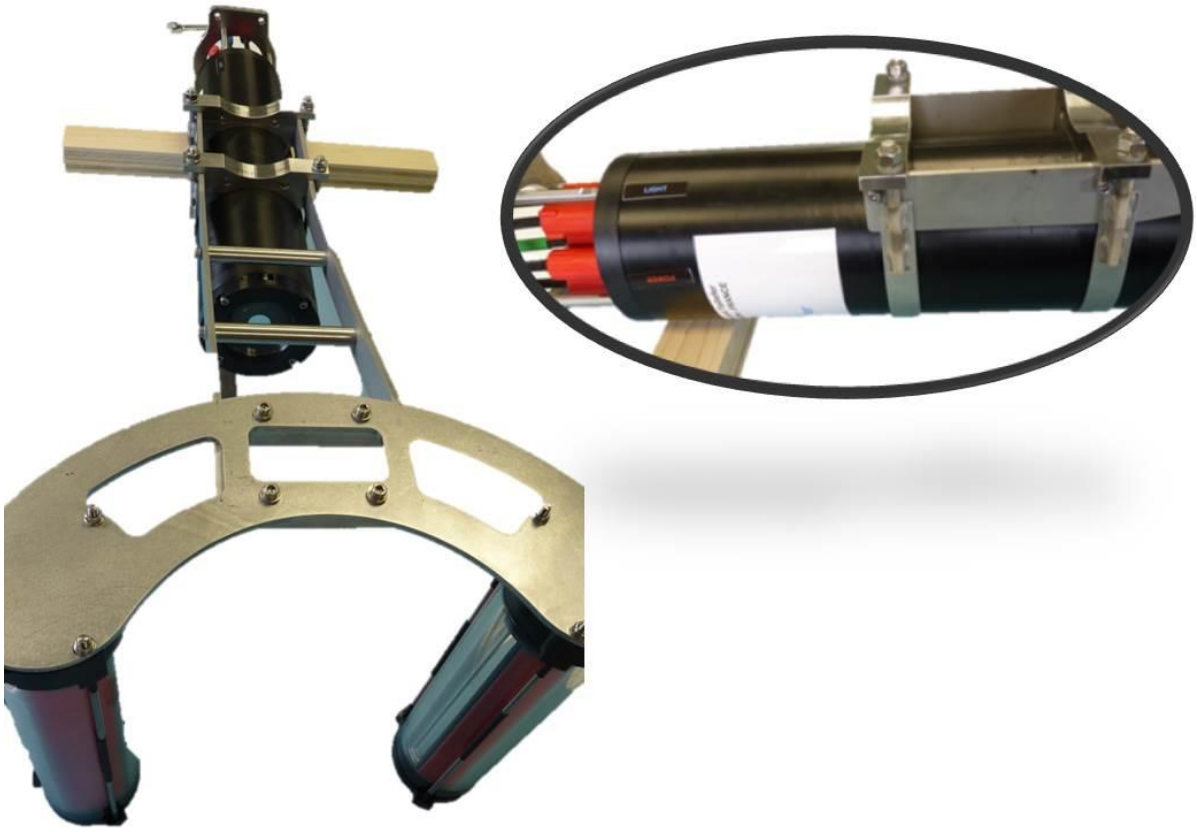
Image 4

12 The distance can be checked and set up with the help of the alignment JIG (image 4) by positioning it on the lighting unit as shown hereunder.

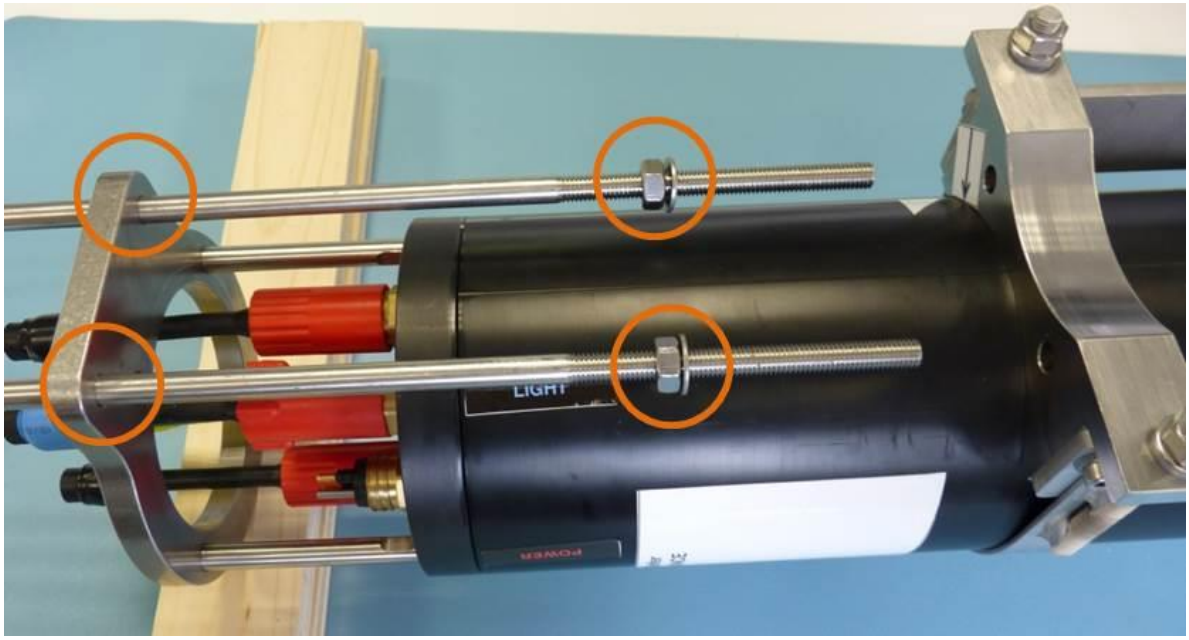




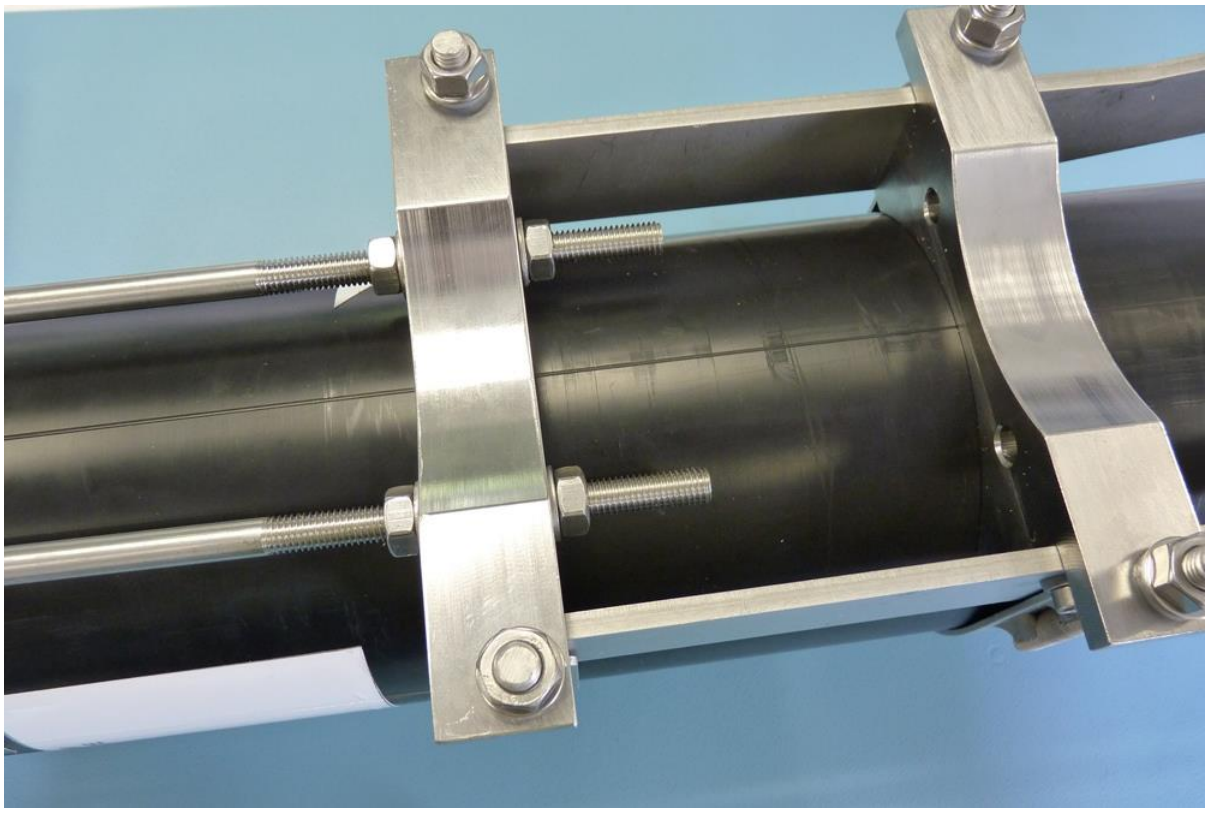
13 Turn the UVP Shallow upside down as shown hereunder:



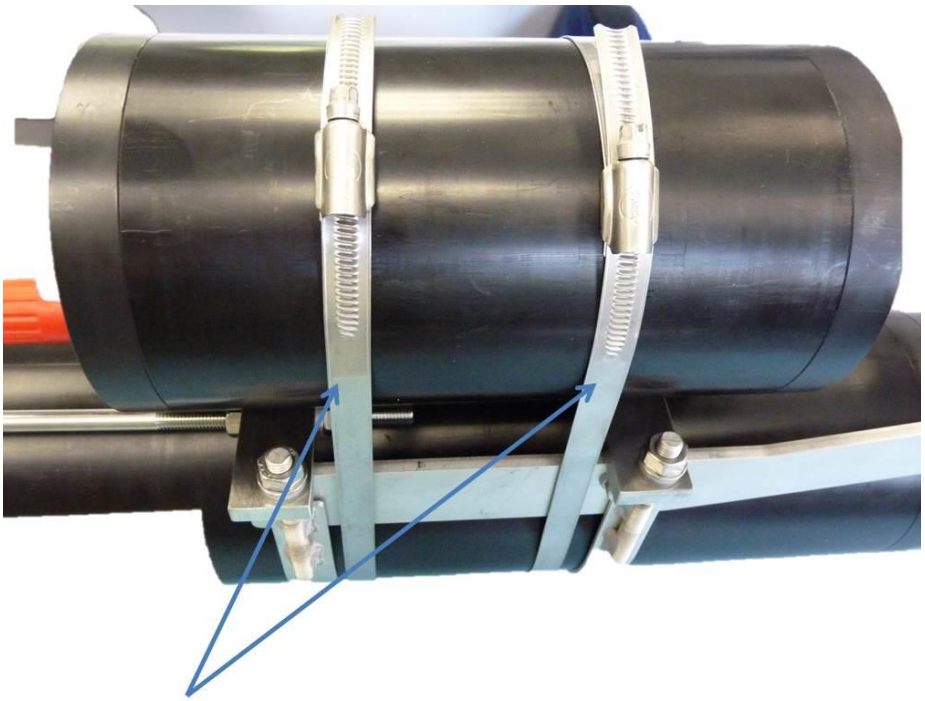
14 Insert the pad eye rods in the flange holes and put both washers and bolts



15 Continue inserting the rods in the first cradle and screw firmly the remaining bolts.

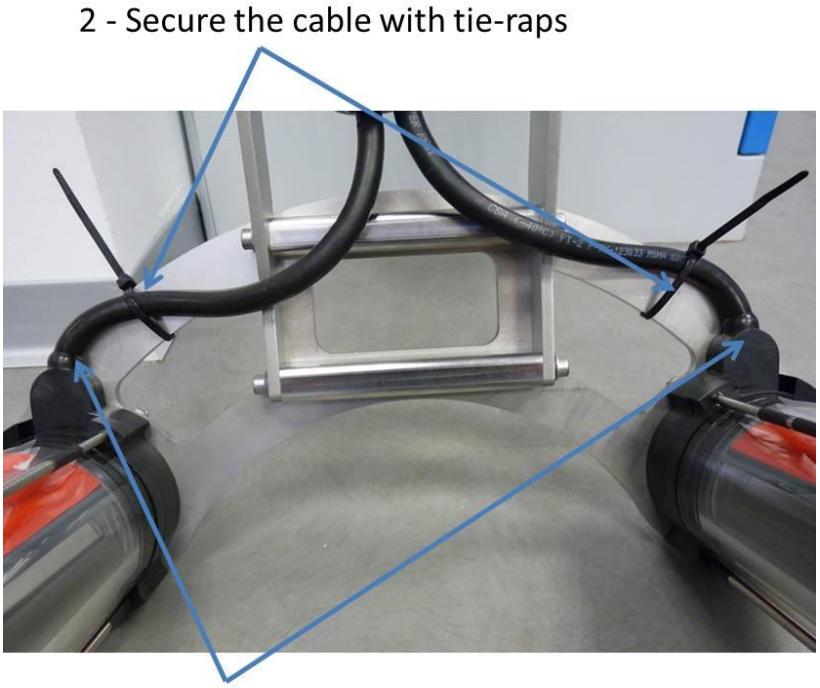


16 Insert both battery clamps and slide the battery.

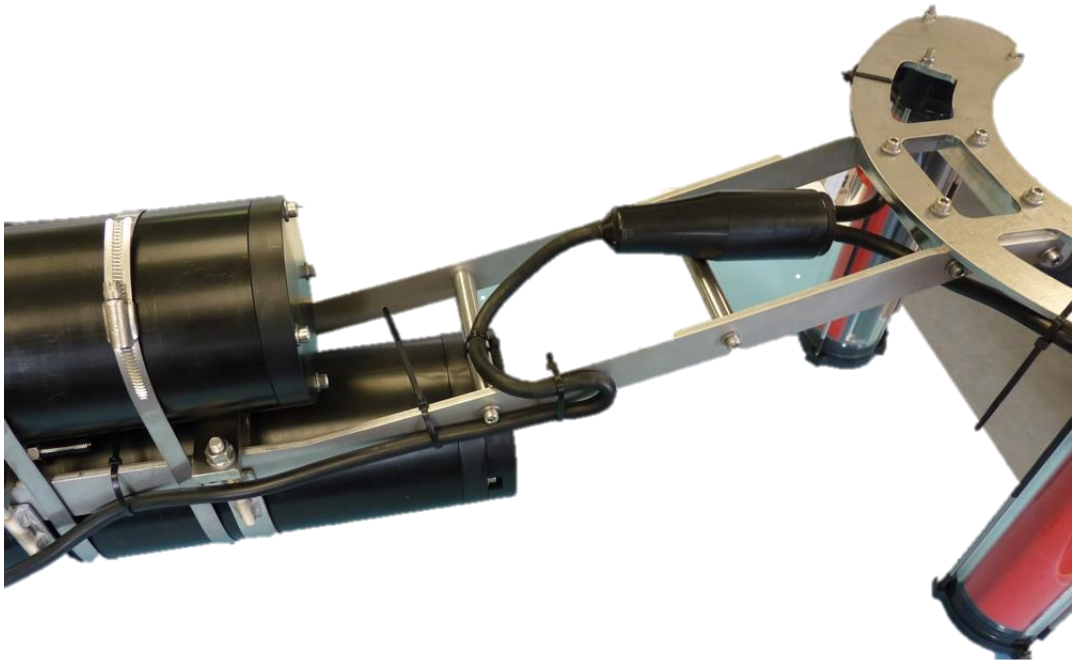


17 The mechanical assembly of the UVP Shallow is now complete. The cable connections now need to be performed.

18 Connect the lighting cable on both lighting units



19 Place the tie-wraps on the lighting unit cable along the main pressure case support piece as shown hereunder.



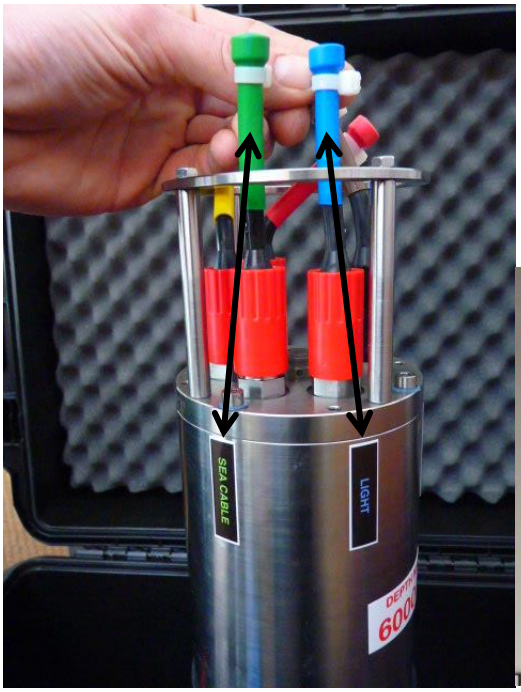
20 Finally connect the link cable between the battery and the main pressure case.
To do so, remove both dummy on each and plug the cable.

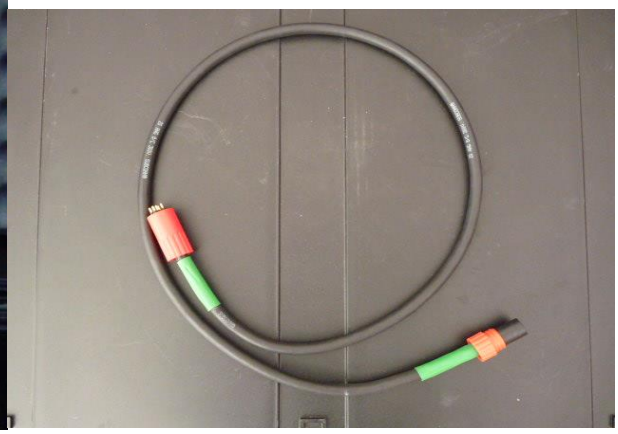
Be really cautious, as the pins from the battery always deliver 28 V, do not shortcut the pins and beware when using metallic tools /

When storing or not using the UVP5 Shallow, put the dummies back on both the battery case and the main pressure case, otherwise the battery will discharge /

21 The system is now fully assembled. It is nevertheless necessary to control the additional cables and dummies onto the main pressure case before the UVP Shallow is sea bound.

17 Each dummy, shunt and cable is colour marked and matches its connector.





5.1. DISTINGUISHING DUMMY FROM SHUNT

SHUNT (active dummies) can be differentiated by their coloured ring of heat shrink (red for POWER, yellow for I/O) or their wider diameter (S/N above 8) added on the locking sleeve.

Colour code

Light	**Blue**
NA	**Brown**
IO	**Yellow**
Sea Cable /Data	**Green**
USB Data Storage	**White**
Power	**Red**

6. Recommendations

6.1 Bronze sockets

Shunt and dummy of Power, Sea cable and IO should be used in addition with their extend cable. It will prevent bad maneuver on the socket and lessen their worn out.

6.2 Lighting units alignment

WARNING: DO NOT REMOVE LIGHT UNITS FROM THE CRESCENT PLATE OTHERWISE THE LED BEAM ALIGNMENT WILL BE LOST!

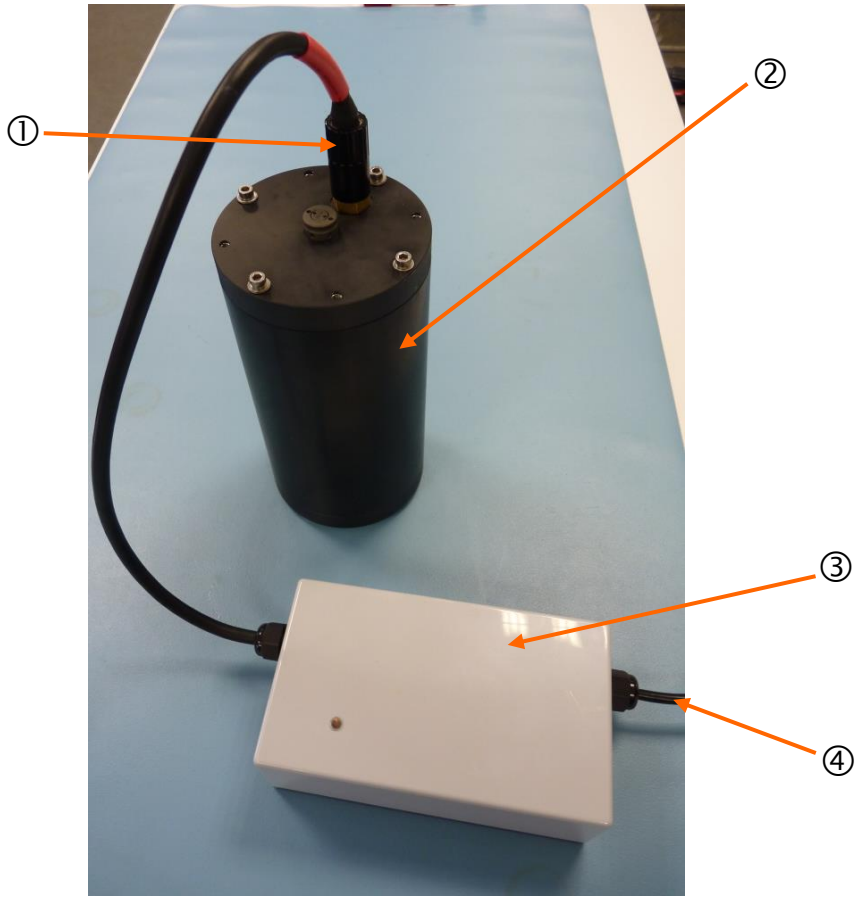
It is recommended to check the light alignment using the "T" JIG on a daily base when at sea.

7. First launch

7.1 Battery voltage

Plug the battery case to the charger in order to check the battery voltage.

7.2 Connecting the battery case to the battery charger



1. Plug the cable① (red marked) of the charger③ to the battery case②
2. Plug the AC cable④ into a power outlet

7.3 Controlling the battery charge

On top of the charger box, a LED indicates which state of charge the battery is in. The document hereunder explains the charge status modes.

GB

INSTRUCTIONS FOR USE

READ THESE INSTRUCTIONS BEFORE USING THE CHARGER

This product is designed for indoor use only and should not come into contact with water or dust. To prevent overheating the product should not be covered whilst in use.

The mains socket should be easily accessible. In the event of operational error, the plug should be immediately removed from the socket.

This charger is designed for use with Lithium-ion batteries. For safety reasons, this charger must be used only for batteries which have the right number of cells in series: Output voltage divided by 4.1V or 4.2V.

The product contains dangerous voltages and the cover should not be removed. All service or maintenance work should be carried out by qualified personnel who can get assistance by contacting the manufacturer's agent.

A fuse protects the product against short circuiting and overloading. In the event that the fuse needs to be replaced, the same type and size of fuse should always be used.

In the event that the charger has this symbol on it, it is double-insulated (in insulation class II).

If the battery charger is mounted in a vehicle it can only be used when the vehicle is not in use.

If the product is labelled "EN60601-1" it complies with the requirements of electro-medical equipment and can be used in hospital environments, etc.
The product should not be used in the vicinity of flammable anaesthesia gases.

If the product is supplied with an exchangeable output plug, refer to the last page for assembly.

If the product has plastic casing, avoid it coming into contact with oils, grease etc., as most types of plastic can be broken down by chemicals and solvents.

Technical specification: See product labelling.

CHARGING INSTRUCTIONS

1. Do not connect the charger to the mains before it is connected to the battery.
2. Observe correct polarity when connecting to the battery terminals.
3. Connect the charger to the mains.
4. When charging is complete, disconnect from the mains before removing battery connections.

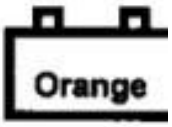
LOOK AFTER THIS MANUAL!

WARNING

The charger has internal fuses which blows if a fault occurs in the charger. Such faults must be repaired by qualified service personnel.

LED's INDICATE FOLLOWING CHARGE STATUS

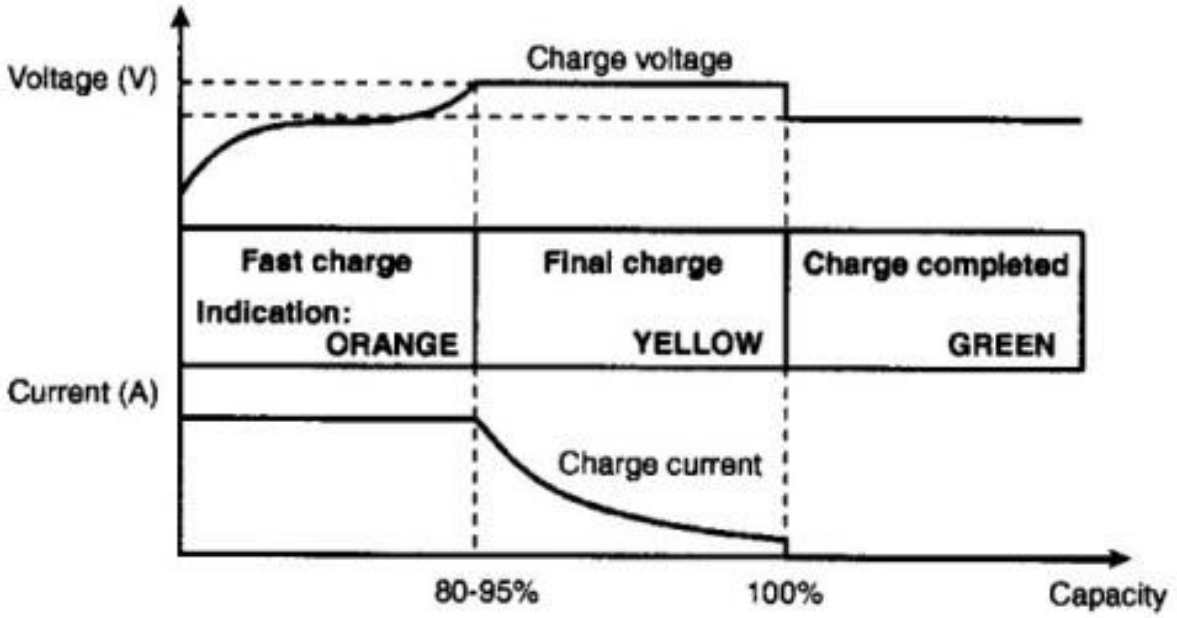
Fast charge
The charger is in constant current mode.
Charge current is maximum.



Final charge
The charger is in timer mode.
Charge current is less than maximum.
The battery is normally 80-95% charged when the LED-indicator changes to yellow.
The charger is in constant voltage mode.
The charger stays in this mode until the timer has run out (eg. 4h).

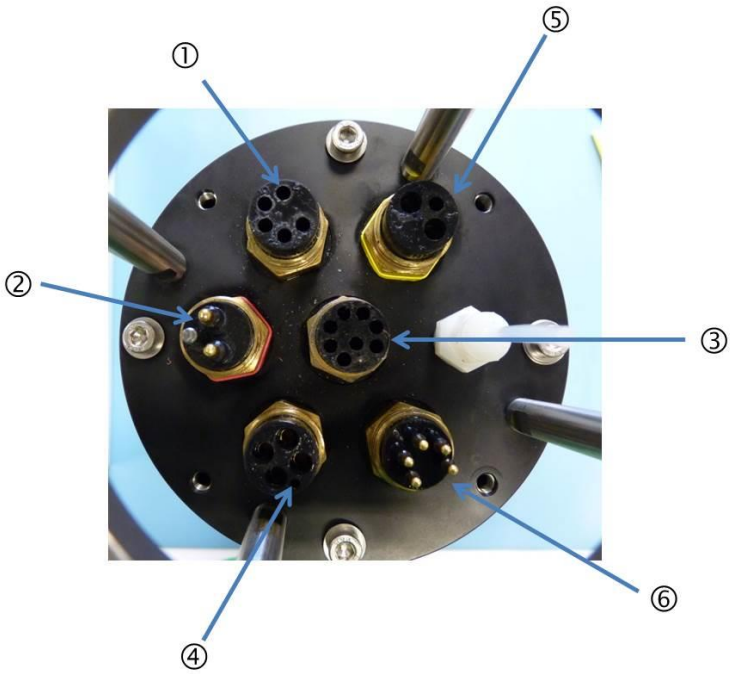
Charge completed
The LED-indicator changes to green.
The charge is stopped.
Charge current is zero.

Charging diagram



7.4 Connecting the cables to the UVP Shallow camera pressure case

No	Socket	Cable in
1	Subconn MCBH 5F	Storage data/ White labeling
2	Subconn MCBH 2M	Power cable from battery case or external power supply/ Red labeling **Warning**: Do not plug the Battery charger
3	Subconn MCBH 8F	Network and serial/ Green labeling
4	Subconn MCBH 4F	Light cable from the lighting unit/ Blue labeling
5	Subconn MCBH 3F	IO Shunt or Dummy/ Yellow labeling
6	Subconn MCBH 5M	NA/ Brown labeling



7.5. Network SETTINGs

7.5.1 COMPUTER SETTINGS

Computer Network configuration must be fixed IP (no DHCP).
193.49.112.XXX
255.255.255.0
193.49.112.1
193.49.112.3

XXX must be different than the UVP SHALLOW address (bellow).

7.5.2 UVP SHALLOW IP ADDRESS

The UVP SHALLOW camera default IP address is 193.49.112.100. The main pressure case can be networked only when powered ON.

8. Power

IMPORTANT NOTE:

In order to secure the operation of the UVP SHALLOW, user should monitor battery voltage to be sure that the remaining power is sufficient for the duration of the image acquisition and process to be done.

8.1 POWER SOURCES

UVP SHALLOW external battery pack contains a Lithium-Ion 29.4/6.8A battery weighting 1085g. This battery is considered as a dangerous good and should be declared when shipping the UVP SHALLOW.

UVP SHALLOW can thus be powered by the mean of its External battery when performing image acquisition and process. It can also be powered by an external unit (additional battery, ROV, Sub…) providing that the voltage ranges from 24 to 30 Vdc and peak accepted current can reach 3A.

User should refer to Hydroptic to get procedure to change settings if voltage under 26 Vdc is provided to UVP SHALLOW.

UVP SHALLOW external power supply should provide about 30 Vdc to power the UVP SHALLOW when downloading data and allows light tests on deck.

8.2. POWER MANAGEMENT

8.2.1. BATTERY CONTROL AND CHARGING

Voltage checking can be done by two means:

1) Connect the Charger's power cable to the battery case and check the led color status onto the charger's top.
2) Power up the UVP on its external battery and read voltage via the status messages sent by UVP SHALLOW on the RS232 link by the mean of Zooprocess

8.2.1.1. VOLTAGE CONTROL VIA A TERMINAL

We use **Motocross.exe** as a terminal but any other terminal will do it.

The application is located in the blue USB key under: \UVP SHALLOW USB KEY\SNXXX\UVP SHALLOWsnXXX_Computer_applications\Motocross
(See below for installation of the tools).

VOLTAGE can be checked via the TERMINAL application or via the ZOOPROCESS checking tool.

1) Serial cable must be plugged into laptop USB and the main pressure case 8pts sockets (Green tagged) ④ (image 8)
2) Start the terminal application. The com port number depends of the laptop used and the USB-RS232 plug. (check under control panel/hardware property)
3) Power UVP SHALLOW
4) The RS232 messages to be received are the following:

```
Running UVP SHALLOW Pilot Application.
You have 5 s to press 'q' if you do not want to launch the program.
                2     4 3 2 1
Testing DAC WAIT !
V092DATA_-0002*00179*00179*00022*02734*02277*02058*02070*01732*01861*01406*01838*0707122726!
V092DATA_-0002*00178*00178*00023*02719*02572*01975*01683*01879*01630*01776*01889*0707122726!
V092DATA_-0002*00178*00178*00023*02726*02635*02154*02209*01823*01907*01408*01880*0707122730!
```

The **« V092…! »** command lines are generated by the UVP SHALLOW controller (mother board), while in supervision mode and enable the system to be monitored continuously. The command line structure is the following:
<V092DATA*ppppp*iiiii*iiiii*ttttt*aaaaa*aaaaa*aaaaa*aaaaa*aaaaa*aaaaa*aaaaa*aaaaa*mmddhhmmss!>

Where:

ppppp:	Corresponds to the pressure in centi-bars (the value is then divided by ten in order to reach a metric value).
iiiiii:	Corresponds to the angle of the system in degrees (the system is by default stabilized in vertical position at 180°).
ttttt:	Corresponds to the Temperature in Celsius
aaaaa:	Corresponds to the values of the 8 CAN. ***The first aaaaa variable represents the voltage (in mV) of the Lithium-Ion battery***
mmddhhmmss:	Corresponds to the current time and date

8.2.1.2. VOLTAGE CONTROL VIA ZOOPROCESS

Refer to Zooprocess piloting tools and utilize the "Monitor com port" menu.
Voltage is displayed in ImageJ status bar.

8.2.2. BATTERY STATUS AND AUTONOMY

The internal cells enable a variable duration of operation for the UVP SHALLOW that may vary depending on the status of the system.

There are 4 statuses with their own consumption as shown in the table hereunder:

Mode	State	Battery life
Transport OFF	Off	full
Suspend Sleep	On	7 Day
Supervision STBY	On	5 Day
Action Sequence	On	4 Hours

1) OFF: store UVP SHALLOW at voltage ranging between 24 and 25 V (preferable).
2) SUSPEND or SLEEP mode is automatically commuted by UVP SHALLOW when
    a. Battery voltage drops below the limit set (23.3V by default) or internal temperature limit overpassed. (50°C by default).
    b. UVP SHALLOW is manually turned to sleep mode
    c. Between TIME programmed sequences of image acquisition and process
3) SUPERVISION mode is started when the UVP SHALLOW is powered and properly configured to run acquisition sequences in other modes than TIME.
4) ACTION mode imply that UVP SHALLOW camera is powered to:
    a. Acquire and process images (LIGHTS are ON too)
    b. Download data
    c. Change settings

8.2.3. BATTERY CHARGE

UVP SHALLOW must be charged when battery drops below 26 Vdc and you will perform a profile at sea.

Battery is fully charged at 29.4Vdc.

UVP SHALLOW will switch to SLEEP mode (not responding to commands, not sending any RS232message) if battery below the limit set (23.0 Vdc).

It requires 4 hours to fully charge a fully discharged battery.

PROCEDURE:

1) CONNECT the CHARGER CABLE to the BATTERY CASE.
2) PLUG the CHARGER into the mains supply.

8.2.4. BATTERY CHARGE IN COLD CONDITIONS

In order to get a longer battery life, battery should not be charged when below 10°C.

Interval UVP SHALLOW temperature can be monitored in Terminal mode (see V092 messages) or using the Zooprocess pilot tools to monitor COM port. Note that temperature measurement is accurate only at the moment UVP SHALLOW is powered ON. The board temperature increases rapidly biasing the measurement.

If you can store the UVP SHALLOW in a warm place and you have lot of time, just wait till the temperature raises 10°C.

If you are in a rush or the UVP SHALLOW stays outside in the cold, you can try to warm up the internal temperature turning ON the camera (as for downloading data) before and during charging. Apply all necessary care for that operation.

9. Operating the UVP SHALLOW

9.1. Useful information

9.1.1 UVP SHALLOW FOUR MAIN STATUS

The UVP SHALLOW has four states of energy consumption which are described below.

9.1.1.1. POWER OFF FOR TRANSPORT OR STORAGE

The Power Dummy is connected on both the battery case and the main pressure case: no power consumption.

9.1.1.2. SUSPEND OR SLEEP MODE

This mode is activated in several cases listed hereunder:

- RS232 command line sent by the user
- Low input voltage detected by the UVP SHALLOW at 30 second intervals
- High temperature detected by the UVP SHALLOW at 30 second intervals
- No sequences or time only related sequences are programmed in the system

The power consumption is limited to a few milli-ampers when the system is in these modes.

9.1.1.3. SUPERVISION OR STANDBY MODE:

This intermediate Mode allows the monitoring of the pressure sensor to be performed by the system since the driver board is supplied and operational. This is the default Mode for the UVP SHALLOW when an I/O, Pressure or Manual sequence is programmed and UVP SHALLOW turned ON (via battery case or external power supply). The V092 are continuously displayed when in this mode.

The Standby mode drains the same energy. It permits to change UVP SHALLOW settings.

9.1.1.4. ACTION MODE:

The camera, is powered for a programmed sequence or a data download RS232 command line. Light are ON if in recording mode.

The recording autonomy is approximately 4 hours depending on temperature and battery charge.

Thermal Issues Warning: The UVP SHALLOW needs to be immersed or cooled down in the event of the outside temperature being above 25°C and sunlight warming the UVP SHALLOW pressure case. Do not let the UVP under direct sunlight.

9.1.2. INSTALLING COMPUTER TOOLS:

The piloting software and drivers are located in the blue round USB key under **/UVP SHALLOWsn1XX_Laptop applications/**

Updates can be found on the www.hydroptic.com and www.zooscan.com websites.

9.1.2.1. USB-RS232 AND COM PORT

Laptops do not have serial port anymore (except industrial ones). We thus provide a RS232-USB cable adaptor with the serial cable. This adaptor comes with a driver. Install the driver first.

Location: **\Serial port to USB adaptor driver**

Note: the USB-RS232 adapter must always be connected to the same USB port of your computer to avoid changing the COM port number in the terminal application or in Zooprocess.

Once the driver is installed and the adaptor connected to the laptop, go under your laptop /hardware device manager/port com and write down the port number. You will use it when configuring motocross and Zooprocess.

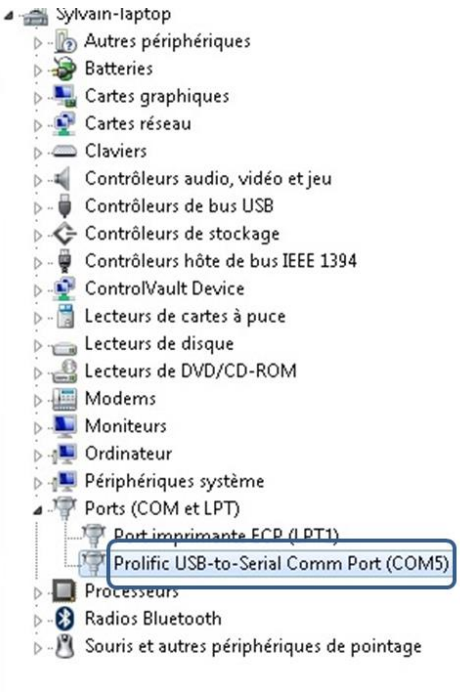


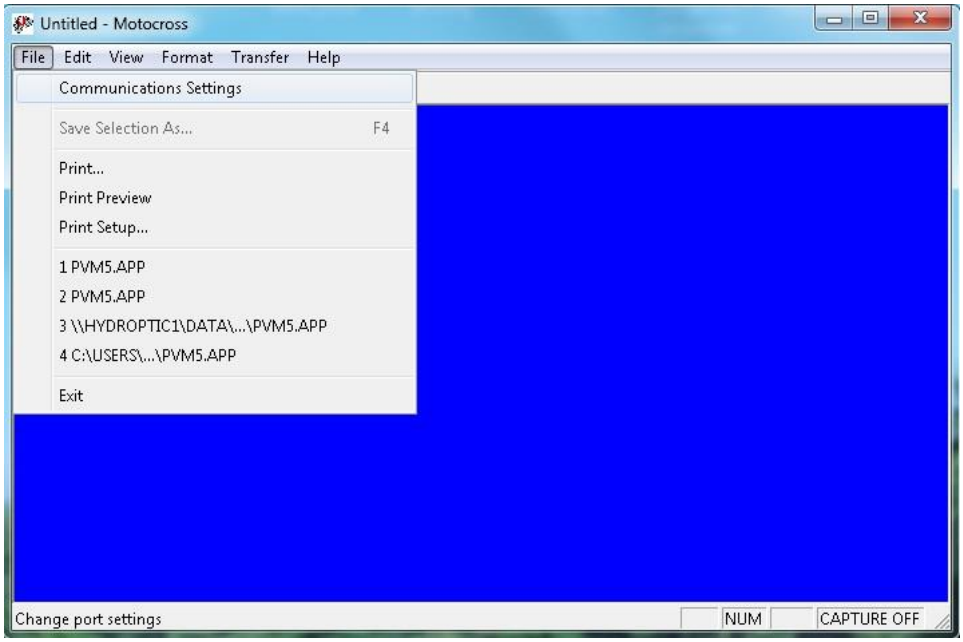
Image 9B

9.1.2.2. TERMINAL PILOTING

Motocross is a terminal application provided with the UVP but any other terminal will work. Teraterm.exe works well on W7 64bit operating system.

1) Motocross application needs to be copied from the USB key onto the desktop of your PC. Location: **Terminal**

2) Enter the correct port under the *communication settings* tab as well as the baud rate which is 9600. Keep all other as default. NOTE that MOTOCROSS accepts COM port numbers below 10 only. Com port number can be changed in the device manager tools.



9.1.2.3. IMAGEJ AND ZOOPROCESS PILOTING

ImageJ is a java-based image processing program and Zooprocess a suite of routines in ImageJ macro language. Both programs installations steps are explained in the *ZooProcess_Manual_vxxx* located under UVP manuals and preferably updated from the www.zooscan.com website.

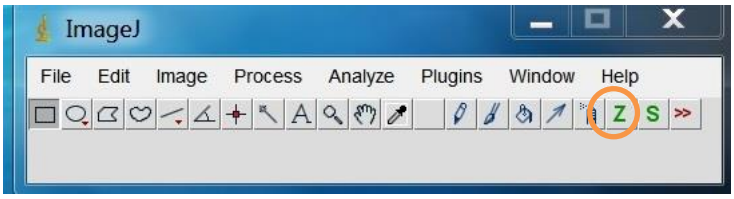
9.1.2.4. DEFFAULT SETTINGS OF ZOOPROCESS

The first time you install Zooprocess and select UVP5 instrument on a computer, you will be asked to fill in many information **issued from the qualification report provided with your instrument**. This initial filling must be done with the highest care as the parameters will then be utilized and checked every time you will create a new project. **The qualification report describes the process**.

❖ CONFIGURING ZOOPROCESS FOR UVP SHALLOW OPERATION

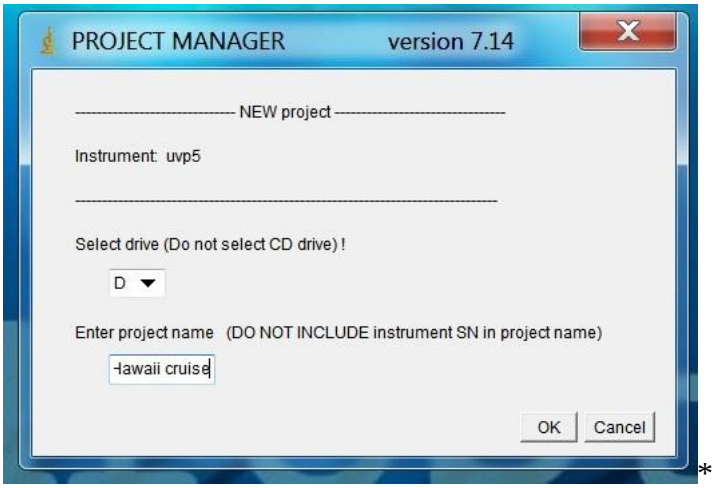
. Note that ALL data to fill are indicated in the calibration document provided on the USB memory stick. The setup parameters should not vary. Have your calibration report ready.

1) First of all, open ImageJ and then click on Zooprocess



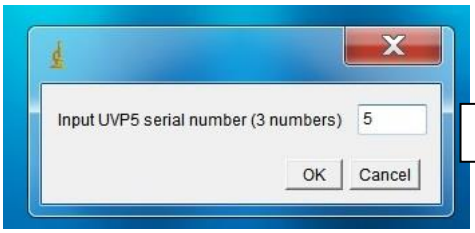
2) In the menu "**select project**" choose "Create project"

3) Name the project



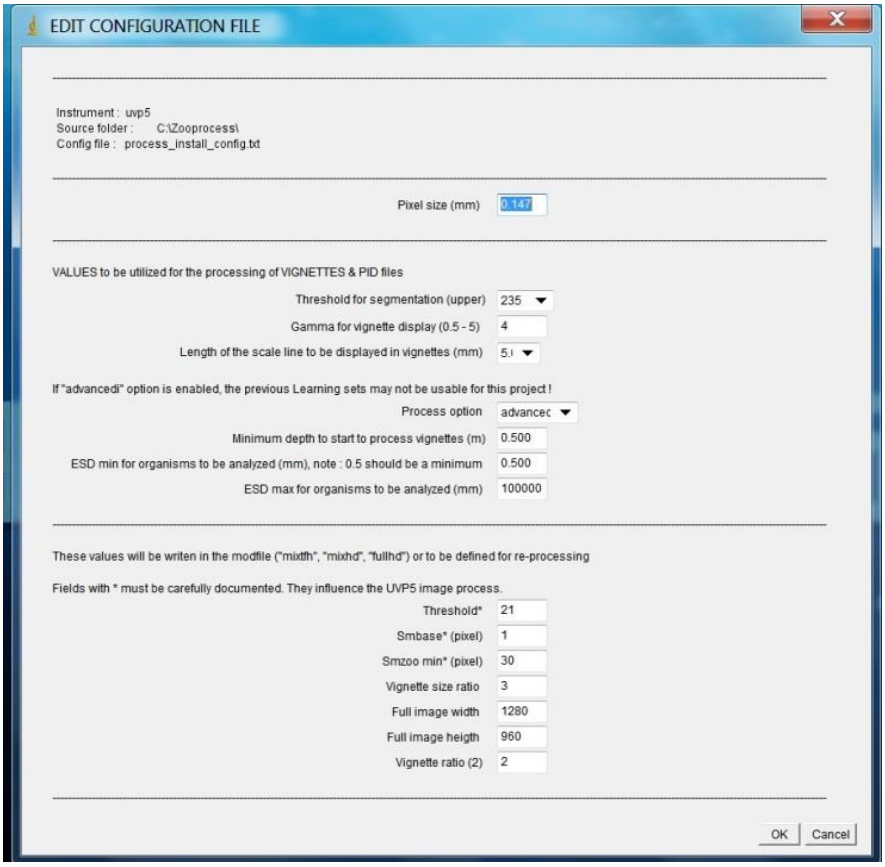
*

4) Enter UVP Serial number:

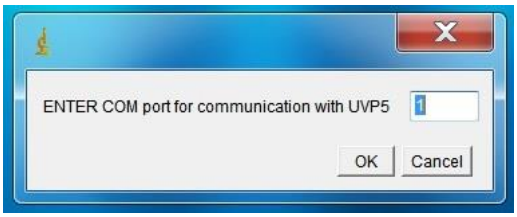


Serial number ► XXX

5) Enter processing parameters



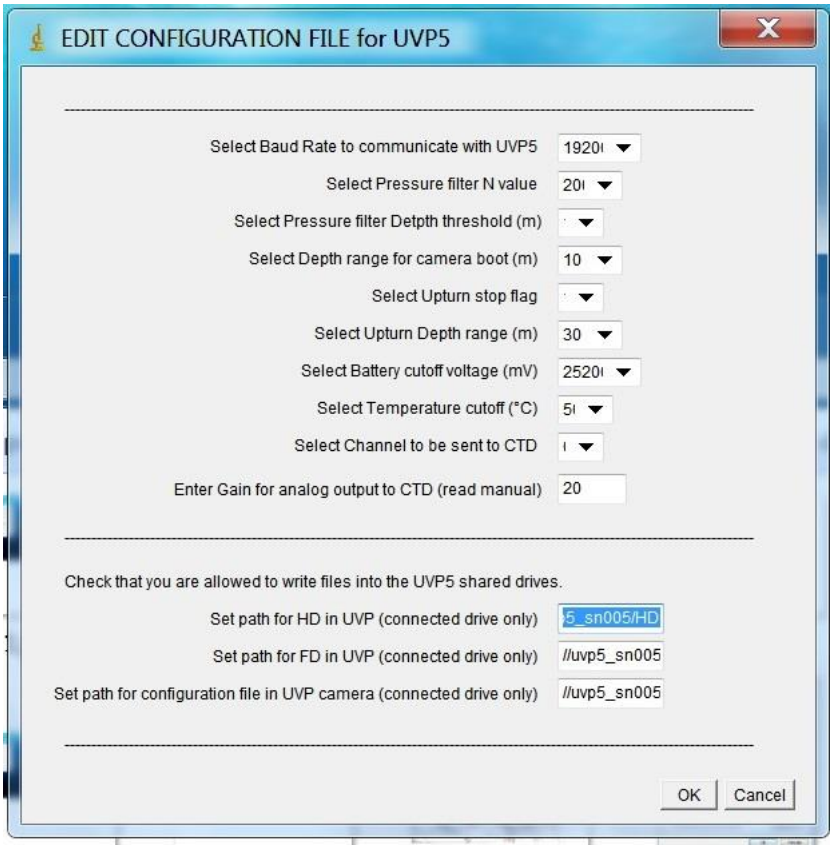
6) Enter the port com used by your computer to communicate with the UVP (RS232)



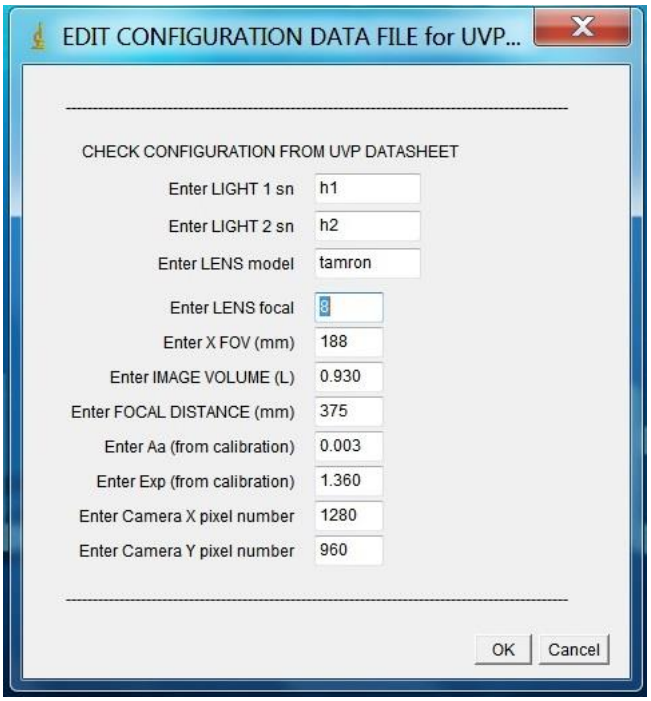
7) Path settings and other settings

Most of the parameters are defaults parameters here. Nevertheless the paths need to be updated with the UVP serial number in order to access the USB key and flash drive data storage.

Eg:
//UVP5_SN005/HD
Where **UVP5_SN005** is the camera name and **HD** is the USB key
//UVP5_SN005/FD ► **FD** is the flash drive.



8) optical parameters



- **CREATE A PROJECT FOR UVP SHALLOW, FILLING SPECIFIC PARAMETERS FOR PILOTING UVP SHALLOW**

Note that ALL data are indicated in the calibration document provided on the USB memory stick. The setup parameters should not vary.

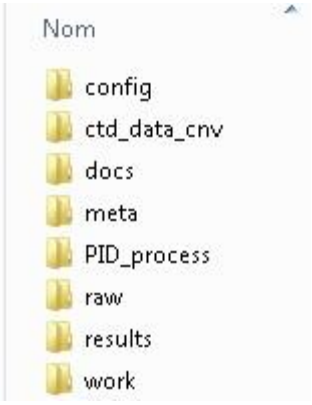
PROVIDED QUALIFICATION FOLDER AND PROJECT ARRANGEMENTS

Your UVP SHALLOW has been qualified and calibrated prior delivery. The results of these operations are provided with your system. Calibration and configuration files for your UVP SHALLOW are located in the folder **UVP SHALLOW_snXXX_source.** XXX is the S/N of your unit.

Zooprocess manual describes well the folder arrangement of the UVP SHALLOW projects. This manual emphasized on the tools related to pilot the UVP SHALLOW. This manual describes the method to create another project.

The project folder is composed of 8 sub-folders as shown hereunder and summarized in the next paragraphs.

Each new created project under Zooprocess will always be organized with the same tree structure. We recommend creating a new project for each cruise you will perform. Run Zooprocess for that purpose!



❖ CONFIG FOLDER

The first folder named **config** folder contains 4 files plus the **UVP SHALLOW_settings** subfolder utilized by Zooprocess to pilot the UVP SHALLOW.

Apart from the "profiler.ini file, the four other files are requested only for the Zooprocess processing of the profiles.

- The **Profiler.ini** file is a backup of the configuration file of the UVP SHALLOW. This file is created in factory and cannot be modified without opening the UVP SHALLOW and our assistance.

```
PilotBR= 9600
comport= 3
databits= 8
stopbits= 1
parity= NO
Pressure_Filter_Nb= 200
Presure_Filter_Thres= 1
Pressure_Pre_Pos= 10
Pmin= 0
DeltaP_Upturn_Flag= 30
Upturn_Flag= 0
Battery_Threshold= 25200
Temperature_Threshold= 50
CNA_Ind= 0
CNA_s= 20
CNA_o= 0
hd_path= //uvp5sn006/HD
fd_path= //uvp5sn006/FD
modfile_path= //uvp5sn006/FD
```

Image 10

- The **Process_install_config.txt** contains originals settings values necessary to post-process images with Zooprocess.

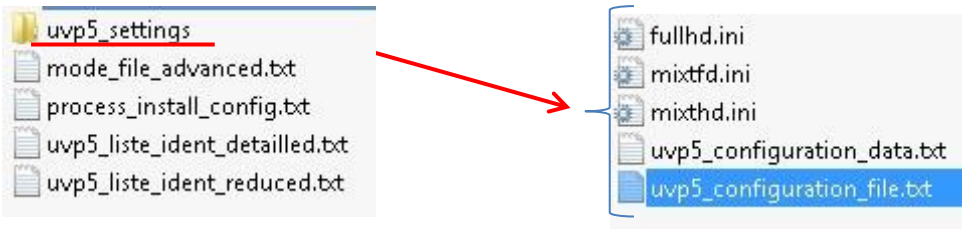
```
calibration= 20130115_0912
pixel= 0.1469
upper= 235
gamma= 4
echelle_mm= 5.0
process_option= advancedi
profmin= 0.5
esdmin= 0.5
esdmax= 100000
threshold= 21
smzoo= 30
ratio= 3
Larg= 1280
Haut= 960
scale= 2
areamini= 1
```

- The **UVP SHALLOW_liste_ident_detailled.txt** and **UVP SHALLOW_liste_ident_reduced.txt** file contain a library of zooplankton which is utilized by Zooprocess. Refer to dedicated manuals.

- The **mode_file_xxxxx.txt** set the Zooprocess running mode to USER or ADVANCED.

❖ UVP SHALLOW SETTINGS SUBFOLDER

The **config** folder contains also the **UVP SHALLOW_settings** folder which has 5 files as shown hereafter. These files are already set in the UVP SHALLOW's camera memory. They are to be kept on your computer for information purpose.



UVP SHALLOW camera files:

- **Fullhd.ini** is chosen for images to be processed and save. In that case profiles should be acquired in open sea. Images will be saved onto the HD disk (USB). Image acquisition rate remains below 3Hz.
- **Mixtfd.ini** is chosen for images to be saved and processed. Images will be saved on the UVP SHALLOW FD (Flash drive). Highest image acquisition rates can reach 11Hz.
- **Mixthd.ini**, same as Mixtfd.ini but images are saved on the HD disk.

GENERAL configuration file (specific to your S/N):

- **UVP SHALLOW_configuration_data.txt** includes parameters for the field of view as well as the lens settings, the image volume and size.
- **UVP SHALLOW_configuration_file.txt** contains the port com and baud rate that should match the computer com port in order to communicate with the UVP controller by the mean either of a terminal (Motocross) or Zooprocess. (ImageJ). Other parameters are included (image 10). For instance: Battery voltage and temperature threshold safety features.

The configuration file can be edited with a text editor or with zooprocess. (See section 3.1.4 Piloting the system)

❖ Docs

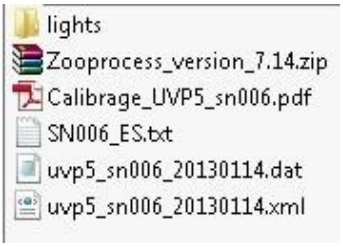
This folder contains all documentation that can be useful for the understanding of the project (documentation, bibliography…).

We provide there the following files:

- **Zooprocess**: You'll find a version of Zooprocess.

Do not forget to check regularly on www.zooscan.com for an updated version.

- **Lights**: contains the characterization of both lighting units.
- **Calibrage_UVP SHALLOW_snXXX.pdf:** Text file containing UVP SHALLOW calibration results and specific settings of the UVP SHALLOW. The values from this file are necessary to install Zooprocess on your computer and create new projects.
- **SNXXX_ES.txt**: raw data equivalence in volt of the analog inputs (calibration of the UVP SHALLOW analog inputs)
- **UVP SHALLOW_snXXX_yyymmdd.dat** and **UVPSHALLOW_sn00X_yyymmdd.xml:** ghost image of the UVP SHALLOW operating system



❖ Raw

The raw folder contains the profiles folder downloaded from UVP SHALLOW after completion of profiles.

Each HDRYYYYMMDDHHMMSS sub folder contains at least

a) *.HDR file: copy of the image acquisition file utilized by the camera (mixtfd, mixthd, fulhd)
b) *.DAT: N°, date, depth, sensor readout, gross image data for each of the image
c) *.BRU: individual measurements for each of the detected object
d) Image files: their number and format depends on the settings.

9.2 Field operation

UVP5 SHALLOW can start and stop acquisition in four modes:

1) Pressure : uses the embedded pressure sensor and a specific logic
2) I/O : uses a switch (I/O shunt) to start and stop sequences
3) Manual : RS232 commands are sent by user (or piloting device)
4) Time : UVP SHALLOW is started and stopped at user preset time

UVP SHALLOW acquisition sequence can always be manually stopped by RS232 command. It must not be stopped by removing power (as for any desktop computer!).

9.2.1. NEW PRESSURE PROTOCOL

User must be careful using this very powerful mode of starting sequences. This mode saves:

1) Battery
2) Memory
3) Download time

It is thus utilized in most cases when UVP SHALLOW is attached with a CTD for vertical profiles.
It simplifies and replaces the pressure mode described below in chapter 7.2.2.

This mode is utilized for SINGLE profile unless user accepts to redo the starting procedure between profiles (no need to have UVP SHALLOW back on deck between casts).

Although the measures are in deci-bars, the depth via the metrical unit will be used in this manual.

User must follow the sketch below which corresponds to the default recommended parameters:

- START criteria : "**D**" for descending
- START depth: 15m
- Prepositioning dP: 8m
- STOP criteria: "**D**" for descending
- STOP depth: 500m (not activated!)
- UPTURN flag: activated to automatically stop UVP acquisition
- UPTURN dP: 30m (more than the CTD rinsing depth)

The above fields will be documented either in TERMINAL mode (see RS232 commands below) or using Zooprocess "READ / PROGRAM sequences" menu which will assist you.

This sequence was based on taking advantage of the CTD "rosette" rinsing 20 meters prior to diving the system into the water so as to automatically start-up the image acquisition.

The start-up will take place at 22 meters under the surface when in Standby. UVP5 camera will enter pre-positioning at 7 meters (ie dP = 8 meters, if descending speed is sufficient) when descending to 22 meters.

• If the UVP5 analog output is connected to the CTD, the 22 meters standby will end when CTD operator detects signal on the UVP5 analog input (Voltage).

• If the UVP5 is not connected to any CTD, you must wait more than 50 seconds after it passes 7 meters to allow rising up the UVP5 under the surface and start the profile.

The end value is never reached since the interrupt is triggered by the return to surface flag whatever the depth once higher than 35 meters.

The descent speed needs to be at least of 0.3 m/s when reaching the 7 meters depth.

Recommendations:

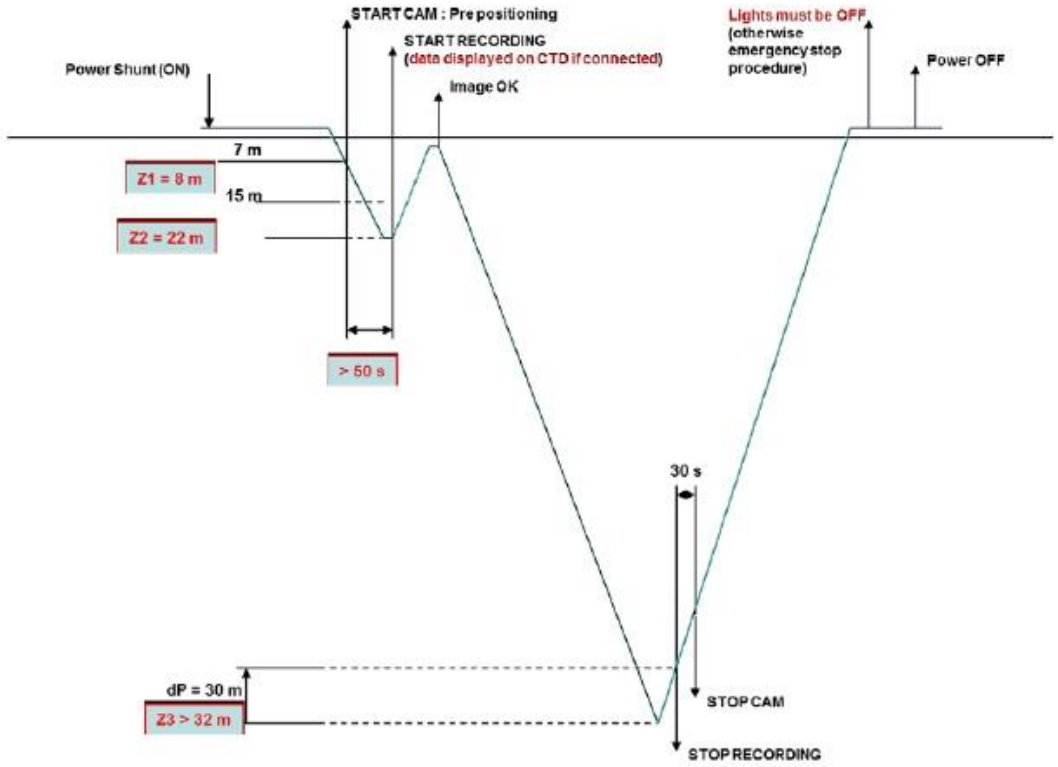
a) If UVP does not start (no data output on CTD screen after UVP5 60 seconds boot delay) at 22 meters, rise up UVP below the surface and redo procedure descending faster if possible.

b) If UVP red flashes not visible (not applicable in daylight) from the surface before the start of the profile (Image OK step), redo the procedure.

c) If profile to be aborted for any reason (CTD failure), descent the system below 35 meters in order to take benefit of the automatic UPTURN stop.

d) If UVP5 still flashing when back on deck, connect DATA cable and stop UVP5 by RS232 command line or by Zooprocess. Do not remove Power shunt till you properly stop acquisition and wait more than 30 seconds afterward.

Userl Manual
UVP5



9.2.2. PRESSURE PROTOCOL (OLD)

User must be careful using this very powerful mode of starting sequences. This mode saves:
4) Battery
5) Memory
6) Download time

It is thus utilized in most cases when UVP5 is attached with a CTD for vertical profiles. This mode is still workable but the new one from chapter 7.2.1 simplifies the procedure.

This mode is utilized for SINGLE profile unless user accepts to redo the starting procedure between profiles (no need to have UVP5 back on deck between casts).
Although the measures are in deci-bars, the depth via the metrical unit will be used in this manual.
User must follow the sketch below which corresponds to the default recommended parameters:
• START criteria : "**D**" for descending
• START depth : 15m
• Prepositionning dP : 10m
• STOP criteria : "**D**" for descending
• STOP depth : 6000m (not activated !)
• UPTURN flag : activated to automatically stop UVP acquisition
• UPTURN dP : 30m (more than the CTD rinsing depth)
The above fields will be documented either in TERMINAL mode (see RS232 commands below) or using Zooprocess "READ / PROGRAM sequences" menu which will assist you.
This sequence was based on taking advantage of the CTD "rosette" rinsing 20 metres prior to diving the system into the water so as to automatically start-up the image acquisition.
The start-up will take place at 15 metres under the surface when in descending mode. This implies a pre-positioning sequence begun at 5 metres, followed by a 90 second wait between 5 and 15 metres depth in order to allow the system to complete the pre-positioning sequence. The end value is never reached since the interrupt is triggered by the return to surface flag and this whatever the depth once higher than 60 metres.
The descent speed needs to be at least of 0.3 m/s when reaching the 5 meters depth.
Recommendations:
e) If UVP does not start (not data output on CTD screen) when passing 15m, rise up UVP below the surface and redo procedure descending faster if possible.
f) If UVP red flashes not visible (not applicable in daylight) from the surface before the start of the profile (Image OK step), redo the procedure.
g) If profile to be aborted for any reason (CTD failure), descent the system below 32m in order to take benefit of the automatic UPTURN stop.
h) If UVP5 still flashing when back on deck, connect DATA cable and stop UVP5 by RS232 command line. Do not remove Power shunt till you properly stop acquisition and wait more than 30s afterward.

9.2.3. I/O protocol

The acquisition sequence can be manually started via the usage of the I/O shunt connector (yellow). In the event of the connector being linked to a driver system (ROV, AUV), the shunt can be replaced by a relay and enable easy sequence starts.

This mode can be selected for classical vertical profiles when it is required to manually start the sequence prior to launching and interrupt it by the same means upon return to surface. **It is very useful for shallow profiles** when 35m depth cannot be reached to allow upturn flag to stop UVP SHALLOW on ascent.

The mode is very easy to manage but nevertheless requires the presence of an operator for each launching.

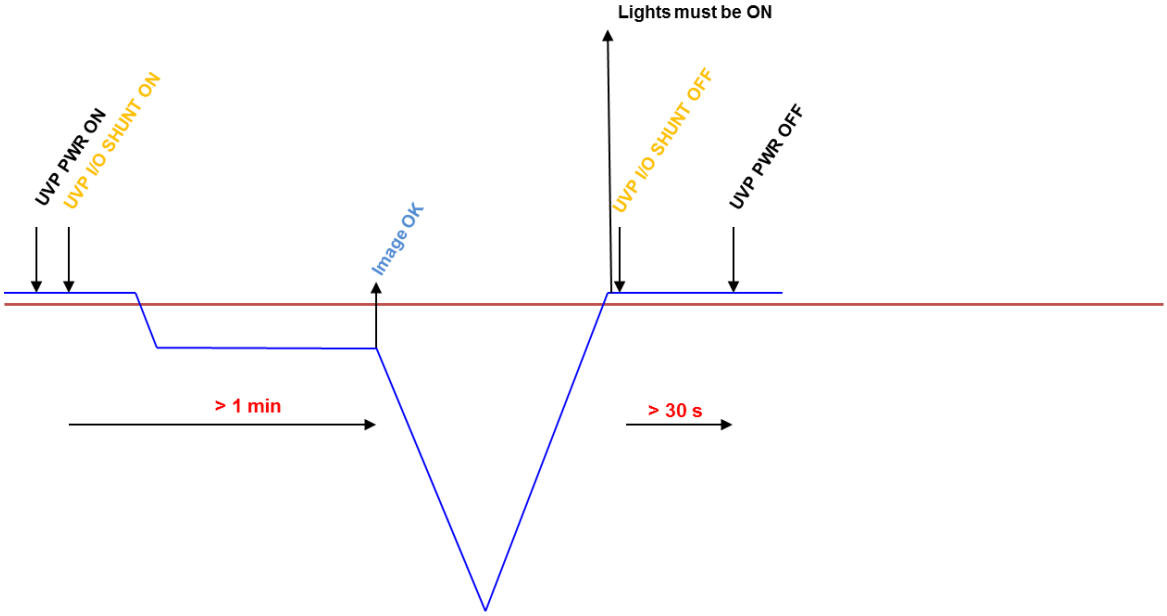
It allows easy YOYO casts as described in the graph but permits also single casts.

This mode:

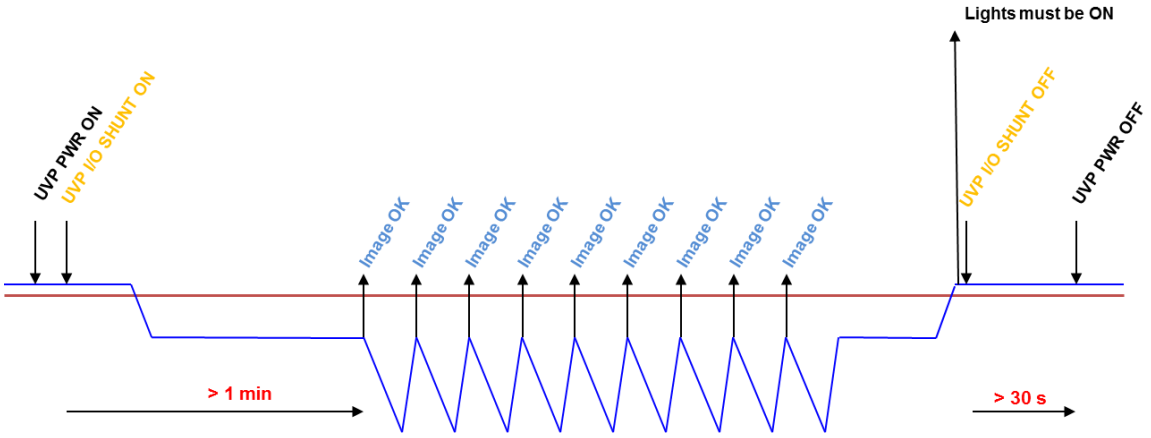
1) Consumes more power as it records descent AND ascent profiles

2) It consumes more memory for the same reason
3) It requires more download time for the same reason

9.2.3.1 EXAMPLE OF SINGLE I/O CAST



9.2.3.2. EXAMPLE OF YOYO I/O CASTS



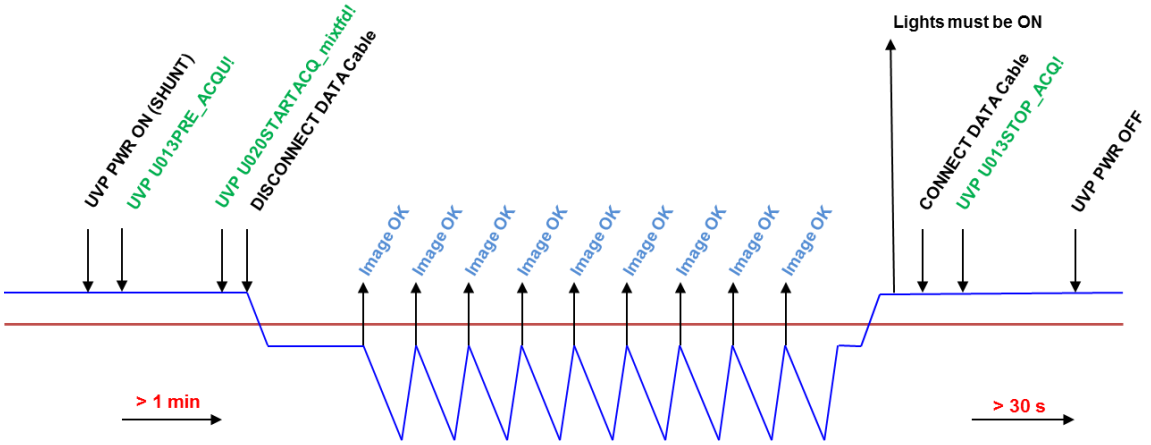
9.2.4. RS232 COMMANDS PROTOCOL

The acquisition sequence can be manually started via the usage of an RS232 command in Terminal or Zooprocess.

This mode requires the action of an operator before and after the launching of the UVP SHALLOW. It is more demanding than the I/O mode as the Data cable will have to be disconnected before launching the UVP SHALLOW.

It is anyhow very similar to the I/O mode.

This mode can be run either in a Terminal or in Zooprocess using the dedicated tool.



9.2.5. TIME PROTOCOL

Starting and ending times are entered in the UVP SHALLOW. UVP SHALLOW goes into SLEEP mode between recording sequences which start and stop at preset times if UVP SHALLOW is powered.

9.2.6. MAIN STEPS FOR PROTOCOLS USING A TERMINAL

This chapter contains the manual terminal's commands to pilot UVP using a Terminal application (MOTOCROSS).

Be careful when powering the camera. Use any applicable method to avoid switching UVP SHALLOW OFF when camera is ON for any purpose. Use stickies or any reminder if you have to move in order to avoid someone else making a mistake.

- RUN sequence using RS232 commands
- Setting time
- Read & Program sequence
- Download data from UVP SHALLOW
- Delete data in UVP SHALLOW
- Emergency STOP
- WAKE Up UVP SHALLOW
- Adjust/test lights (monthly)

The commands are sent to UVP SHALLOW by copying them one by one from a text file (copied below). Start application and Turn ON UVP SHALLOW.

Many others command are located in *"UVP SHALLOW_snXXX_Terminal commands RS232"*

9.2.6.1. CAMERA TEST AND DATA RECOVERY

U013STBY_PRG!

U017START_HD_CAM!

S013WATCHDOG!

=======> Check com with Camera and available space

=======> allow data download and erase in UVP

U016STOP_HD_CAM!

U012RUN_UVP!

9.2.6.2. ON DECK EMERGENCY STOP

=> Connect Sea Cable (green)

=> Start MOTOCROSS.exe

U013STOP_ACQ!

Wait MORE than 1 minute before disconnecting the POWER cable

9.6.2.3. ON DECK ACQUISITION TEST / MANUAL SEQUENCE

U013PRE_ACQU!

U020STARTACQ_mixtfd!

U013STOP_ACQ!

9.6.2.4. LIGHT TEST

U013STBY_PRG!

U024SET_OUTPUT_00000001!

U024SET_OUTPUT_00000101! => light flashing rapidly

U024SET_OUTPUT_00000000!

9.2.6.5. SETTINGS GENERAL (UPDATE CONFIG.INI)

U016BAUD_009600!

U024SET_CNA_0_0010_0000!

U020SET_FLAG_1_0030!

U019SET_PPREP_0010!

U012STT_050!

U014SVA_25200!

U018SET_PMIN_0000!

U024SET_PFILT_0200_0001!

9.6.2.6. TIME READING

U013GET_TIME!

9.6.2.7. TIME SETTING

U033SET_TIME_YYYY_MM_DD_HH_MM_SS!

9.6.2.8. TO WAKE UP SLEEPING SYSTEM

Enter the following messages without delay between sending) till you get a STBY_OK return message.

U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!

U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!

9.6.2.9. PROGRAMMING TIME SEQUENCE

U013STBY_PRG!

U020SET_FLAG_0_0060!

U018SET_PMIN_0000!

U050SET_SEQ_0000_mixthd_H_MMDDHHMMSS_H_ *MMDDHHMMSS*!

U013READ_SEQ!

U012RUN_UVP!

UVP SHALLOW will go into SLEEP mode between casts and wake up automatically about 90 seconds before programmed starting time.

Any configuration file (mixtfd, fullhd, mixthd…) can be utilized in Time mode. Choice will be done according to objectives.

Where MMDDHHMMSS is starting time (time of first image) and *MMDDHHMMSS* is time of last image of the sequence.

9.6.2.10. PROGRAMMING I/O SEQUENCE

U013STBY_PRG!

U020SET_FLAG_0_0060!

U018SET_PMIN_0000!

U050SET_SEQ_0000_fullhd_I_0000000000_I_0000000000!

U013READ_SEQ!

U012RUN_UVP!

Note: this sequence will be run every time you plug the I/O shunt. No need to program it between acquisitions.

9.6.2.11. PROGRAMMING PRESSURE SEQUENCE

U013STBY_PRG!

U020SET_FLAG_1_0030!

U019SET_PPREP_0010!

Choose one of the acquisition methods (mixtfd, mixthd, fullhd).

U050SET_SEQ_0000_mixtfd_D_0000000015_D_0000006000! (Default)

U050SET_SEQ_0000_mixthd_D_0000000015_D_0000006000! (In case no space on FD)

U050SET_SEQ_0000_fullhd_D_0000000015_D_0000006000! (To record all images on HD)

U013READ_SEQ! (To check)

U012RUN_UVP!

Note: this sequence will be run every time you satisfy the starting criteria (depth). No need to program it again between casts.

9.6.3. USING ZOOPROCESS

Zooprocess uses the same set of commands as if they were entered one by one under Motocross terminal. Nevertheless, Zooprocess is user friendly and no mistake can be made. To communicate with the controller by using ZOOPROCESS, enter your project and select "**UVP SHALLOW Pilot tool**".

Information is displayed

1) In the LOG window
2) In the ImageJ status bar
3) In specific windows

Be careful when powering the camera. Use any applicable method to avoid switching UVP SHALLOW OFF when camera is ON for any purpose. Use stickies or any reminder if you have to move in order to avoid someone else making a mistake.

Other efficient precaution is to run Zooprocess only in order to avoid blinding precaution messages.

When not doing profiles, the camera should be powered on for data transfer only, and turned off shortly after.

USER mode provides all necessary tools for daily operation of the UVP SHALLOW and prevents errors.

9.6.3.1. MONITORING TOOL

Zooprocess provides (7.20) a tool to monitor and display UVP5 data in real time when connected to a serial link (SBE option on CTD SBE911). This tool do not allow to send any command to UVP5 which will be started using either I/O shunt, Time or Depth method.

9.6.3.2. PILOT LOGS

The "pilot_logs" folder of your project contains the logs of all operations performed using the Pilot tools. These files can be of great use to diagnose or keep track of the status of the instrument.

9.6.3.3. LIST OF TOOLS AVAILABLE IN USER MODE:

a) TEST & MONITOR COM PORT: displays received messages (V092 type and other) and data into the Status bar of ImageJ.
   a. UVP date and time
   b. UVP voltage
   c. UVP angle
   d. UVP depth
   e. UVP internal temperature
b) Synchronize UVP SHALLOW time with Computer time
   a. DOWNLOAD DATA from UVP SHALLOW: starts camera to download data from UVP SHALLOW
c) DELETE DATA in UVP SHALLOW: uses the RESET terminal command to delete data after powering the camera. Note that Data can also be manually deleted via the network when camera is started (more reliable when many casts stay in UVP drives and need to be deleted).
d) READ / PROGRAM sequences: Check actual UVP SHALLOW programmed sequence and allows changing it to DEPTH, I/O, Manual or Time. This tool is much safer than the Terminal mode as it will also set the additional parameters to secure the mode.
e) START ACQUISITION: starts acquisition in Manual mode. C110 messages will be read and essential parameters displayed in the ImageJ status bar.
f) EMERGENCY STOP : stop acquisition if UVP SHALLOW was not automatically stopped
g) WAKE UP sleeping UVP SHALLOW: helps to wake up not responding UVP SHALLOW
h) TURN ON UVP SHALLOW light (test / alignment): permits to turn ON lights and make them flashing during 30s for check or alignment.
i) SWITCH mode (advanced/user): allow to access all menus

9.6.3.4. ADDITIONAL TOOLS AVAILABLE IN ADVANCED MODE

We consider that these tools permit to change many settings and that some modifications may result in UVP SHALLOW running problems or need for additional

calibration. Great care should be applied and Hydroptic asked for advises if any doubt. A coming version of this manual will complete this section for the benefit of advanced users.

a) GET ACQUISITION and INI files from UVP SHALLOW: starts UVP SHALLOW camera and copy image acquisition files (mixtfd, mixthd, fullhd…) from UVP SHALLOW camera to the "settings" folder of the project.
b) EDIT ACQUISITION files: allows to modify those files and to create others.
c) EDIT ProfileurVideo ini file: allows editing the UVP SHALLOW internal configuration file (Profiler.ini) which has been previously downloaded to your project.
d) SEND ACQUISITION and INI files to UVP SHALLOW: the files you created/modified will be sent to UVP SHALLOW. This action is mandatory if you want to program sequences using these files. Note that the profiler.ini file will be sent but UVP SHALLOW will not take the new parameters (to be solved in the next).
e) TURN ON UVP SHALLOW camera: allows to manually power ON the camera to manually download or erase data via the network.
f) TURN OFF UVP SHALLOW camera: can be helpful.
g) EDIT Pilot board Configuration file: permits to change UVP SHALLOW mother board settings such as Voltage and Temperature limits.
h) SEND configuration to pilot board: permits to send those modified parameters to UVP SHALLOW mother board
i) Set GAIN for ANALOG output: permits to adjust the analog output of the UVP SHALLOW.

9.6.4. SELECT ACQUISITION MODE RELATED WITH OPERATING CONDITIONS

UVP SHALLOW is provided with three defaults acquisition modes: mixtfd, mixthd and fullhd.

The modes differ only in the way images are recorded and the saving location in the UVP. All other image acquisition and processing parameters are the same and coherent with those described in the provided calibration report and project. **Any change may results in a need for additional calibration procedure**.

UVP SHALLOW permits 4 image acquisition and process options

1) Save only: records images only, no process in-situ. Zooprocess post processing still possible
2) Process only: no recording of any image, no zooplankton identification possible. Highest acquisition frequency.
3) Process and save (fullhd.ini): process and save all images on HD. It requires lot of space and drops down acquisition rate to 3 Hz.
4) Save and process (mixtfd.ini & mixthd.ini): process all images and save only images or ROIs of objects to be later identified (above a size limit). Works on FD or HD.

UVP SHALLOW is equipped with two memory drives:

1) FD: flash drive containing also the OS of the UVP SHALLOW camera. It allows the fastest acquisition rates buts its size may limit the number of casts in case you save many images. To retrieve the date UVP needs to be on deck.
2)
3) HD: USB2 drive. Higher capacity but lower speed. The data are retrievable directly by unplugging the USB key.

We recommend using the mixtfd.ini configuration which provides the highest acquisition rates and keep only (default) ROIs of objects above 30p (Area).

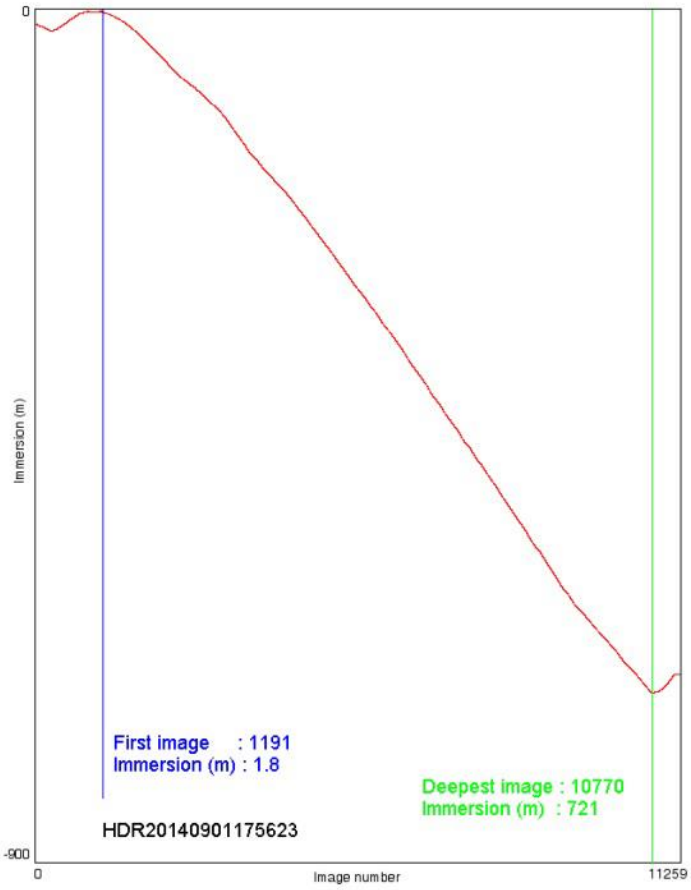
The fullhd mode provides the possibility to later re-process images both for particles and Zooplankton with different settings (threshold, size limit). Useful if you suspect the water to be too turbid for the default settings provided with the calibration.

9.6.5. BASIC PROCESSING AFTER DOWNLOADING DATA FROM UVP SHALLOW

9.6.5.1. FILL IN METADATA

Metadata must be filled first in order to allow processing of downloaded data. **Take care of the data format for Latitude and Longitude.**

FIRST image OK and optional LAST image to process will be read from the DAT files (see chapter 7.2.5.1). Zooprocess try to set automatically the First Image OK and displays a graph indicating the detected values. The detected value is pre-set in the metadata fill-in window. User can also check in DAT files if the values fit.



Graphs in Field Operation Protocol chapter define the position of the First and Last images OK.

9.6.5.2. PROCESS DAT BRU PID & VIGNETTES

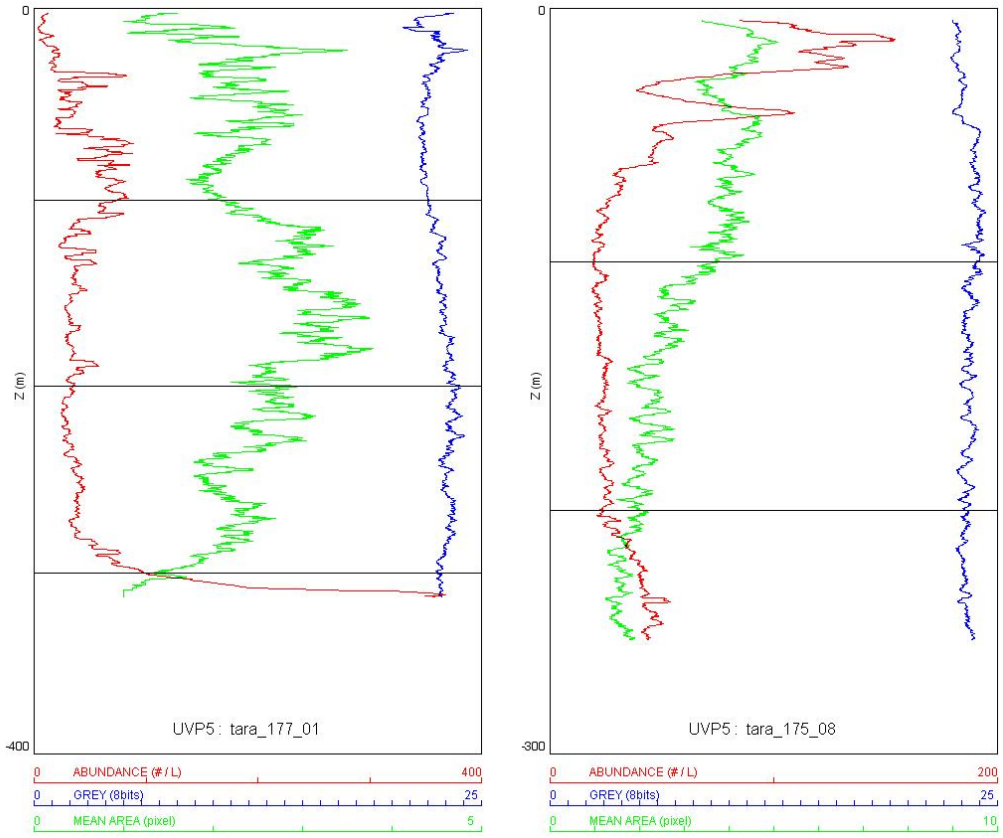
This tool will format the BRU and DAT files for easier use.
It will also process the PID files for computer assisted sorting of Zooplankton using Plankton Identifier.

Note that if you only want to work on particulate matter (LPM), you do not need to process PID and Vignettes immediately as it is a time demanding process.

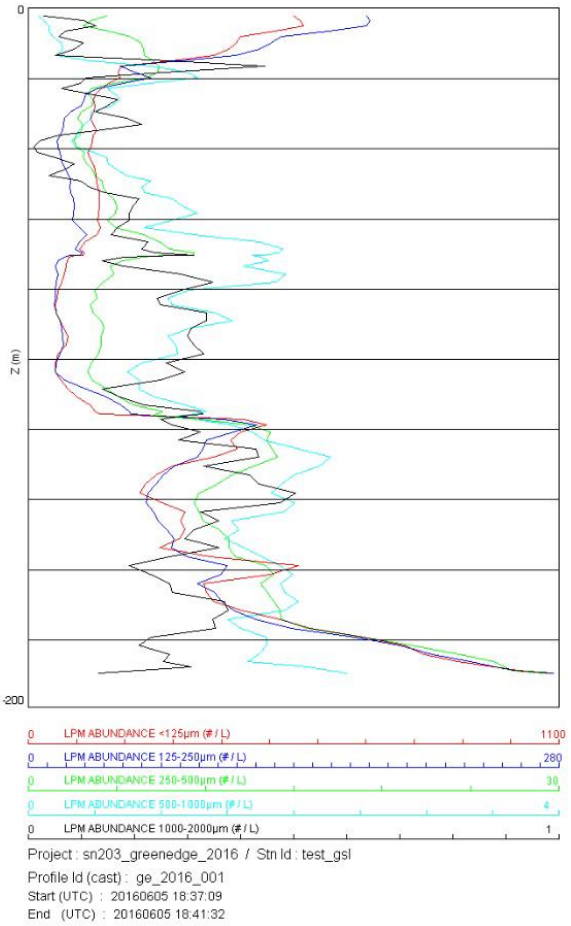
9.6.5.3. PLOT PROFILES

After you processed DAT and BRU, you can plot again figures of the LPM vertical profiles using user-selected depth range.

Vertical plots of Particle concentration, mean size and grey level are created by default and saved in the Result folder.



The UVP5 HD provides *_histo.tsv files that summarize the abundances of particles for 6 different size classes. These files can be directly utilized and Zooprocess will also plot these data.



9.6.5.4. DAT FILES DATA DESCRIPTION

in situ or post processed by Zooprocess. The DAT files are stored in the process RAW folder and later concatenated and cleaned by Zooprocess during the "Process DAT, BRU and vignette" process.
Example of the first two lines: different fields are indicated using different colors corresponding to the different 4 sections of the line

• **index;image;sensor data;nb blobs P-G;mean area P-G;mean grey P-G;nb blobs G;mean grey G;**

•**1**;**20140625160226_000**;**00010*00205*00205*00030*02815*02181*00759*00865*00490*00694*00774*00796!; 2051;2;22;3;43;**

Detailed description:

• **Index: 1** => the image number, starting at 1 in the RAW dat files.
• **Image: 20140625160226_000** => corresponding image acquisition time (YYYYMMDDHHMMSS_ms).
• **sensor data:**
00010*00205*00205*00030*02815*02181*00759*00865*00490*00694*00774*00796! => UVP sensor data (as described in chapter 6.2.1.2) where:
ppppp*iiiii*iiiii*ttttt*aaaaa*aaaaa*aaaaa*aaaaa*aaaaa*aaaaa*aaaaa*aaaaa! ○ ppppp: Image pressure in centi-bars (the value is then divided by ten in order to reach a metric value, here 1.0db).

- iiiiii: Angle of the system in degrees (the system is by default stabilized in vertical position at 180°, here 205°).
- ttttt: Temperature in Celsius, here 30°C
- aaaaa: Values of the 8 CAN. ***The first aaaaa variable represents the voltage (in mV) of the Lithium-Ion battery*** *(here 28.15Volt) or of the* ***Deck Unit*** *depending on whether the power shunt or power cable are connected. Here, no external sensor is connected/recorded and recorded values are floating.*

• **nb blobs P-G;mean area P-G;mean grey P-G;nb blobs G;mean grey G: 2051;2;22;3;43** => summary of measurements recorded for that image in the BRU file. Here we have: ○ **nb blobs P-G: 2051** objects measuring more than SMbase and less than SMzoo (see modfile related chapter)
- **mean area P-G: mean area P-G: 2:** average area in pixels of these "small" objects
- **mean grey P-G: 22:** mean grey level (8 bits scale) of these objects
- **nb blobs G 3:** number of particle measuring more than SMzoo (here 30 pixels)
- **mean grey G: 43:** mean grey level of these "large" particles.

These last data will be utilized to plot the initial profile (see chapter 7.2.5.3). The **nb blobs G** represents the number of vignettes (ie objects) to be later identified.

The **nb blobs P-G** data (default setting) is displayed as an analog voltage onto the CTD application when the UVP is connected to a CTD. The number is converted in voltage according to the gain (see chapter 8.1.6).

This DAT file is later simplified and concatenated in a unique file with no header line and containing the same fields. This final "cleaned" file is saved both into the profile folder (work subfolder) and in the Results folder.

9.6.5.5. BRU FILES DATA DESCRIPTION

The BRU file contains the measurements and position of each particle counted by the UVP. The BRU files are stored in the process RAW folder and later concatenated and cleaned by Zooprocess during the "Process DAT, BRU and vignette" process.

Example of the first two lines: different fields are indicated using different colors corresponding to the different 4 sections of the line

index;image;blob;area;meangrey;xcenter;ycenter;
1;20140625160226_000; 0;84;33;1214; 196;
Detailed description:
• **Index: 1** => the image number, starting at 1 in the RAW dat files.
• **Image: 20140625160226_000** => corresponding image acquisition time (YYYYMMDDHHMMSS_ms).
• **Blob: 0** => N° of the object in the image
• **Area: 84** => Area in pixels
• **Meangrey: 33** => mean grey level of the object (8 bits)
• **Xcenter : 1214** => X position of its center of gravity
• **ycenter: 196** => Y position of its center of gravity

This BRU file is later simplified and concatenated in a unique file without header. The Image field is removed and the images before the "First Image OK" removed too. . This final "cleaned" file is saved both into the profile folder (work subfolder) and in the Results folder.

9.6.5.6. ADDITIONAL IDENTIFICATION TOOLS

Read the "Computer_assisted_sorting_plankton_2013.pdf" manual.
Zooprocess 7.21 and above versions provide direct export tools for the ECOTAXA sorting application:

http://ecotaxa.obs-vlfr.fr
http://ecotaxa.sb-roscoff.fr

10. Additional information and advanced settings

10.1.1. UVP SHALLOW CONFIGURATION FILES

UVP SHALLOW contains two computers. One is hosted on its mother board and run all time the UVP SHALLOW is powered. It creates or requires three files:

a) Config.ini : mother board settings
b) Sequence.ini : programming of the acquisition
c) Event.log: records all commands received and sent by the UVP. Useful for troubleshooting.

The second is the Camera computer. It starts only in ACTION mode when the camera is powered. It creates or requires two types of files:

a) Profiler.ini : contains the general software configuration settings
b) Acquisition files : defines the image acquisition and process methods

10.1.2. COMMAND LIST SYNTAX (S/C/U/V CODE)

Each RS232 command starts with a letter which assigns an internal device. Below is the meaning of the letters:

U: Message emitted by user in the Terminal application or in Zooprocess. The message is addressed to the mother board controller.
V: Answer from the controller emitted to the user
S: Message emitted by user or by the mother board controller and directed to the camera (camera must be turned on)
C: Answer from the camera

See the UVP SHALLOW_Messages_RS232.xls file for more detailed information on all commands. The file is located under *UVP SHALLOW USB KEY SN00X\Commands Motocross RS232.xls.*

Reminder: the mother board controller is switched on, as soon as the battery case is plugged to the main case.

Enter "**app"** to run again UVP5 SHALLOW application or unplug and plug² again.

10.1.3. EVENT.LOG VISUALIZATION

You'll need to run Motocross.exe and then turn ON the UVP external power. Once the UVP is turned on, you'll have 5 seconds to press Q (Quit) to access the controller. (c:/). Then

a couple of commands allow you to perform quick control. Here you'll need to type and not just copy and paste.

If you want to record the content of the event.log file to send information for trouble shouting:

- Configure the Terminal application to capture the text that is displayed.
- Enter "**type event.log**" to load the content of the file into your terminal for diagnose or trouble shooting of the UVP5 SHALLOW.

10.1.4. DELETE EVENT.LOG FILE

The event.log needs to be emptied once in a while or after 200 profiles. Zooprocess pilot tool will automatically tell you when it is recommended to rename (or delete) the event.log file.

You'll need to run Motocross.exe and then turn ON the UVP external power. Once the UVP is turned on, you'll have 5 seconds to press Q (Quit) to access the controller. (c:/). Then a couple of commands allow you to perform quick control. Here you'll need to type and not just copy and paste.

We recommend renaming the event.log to keep it as a backup for later troubleshooting:

- Enter "**ren event.log eventXXX.old**" where XXXX increased every time.

After deleting the event.log file, you may encounter difficulties to start sequences if you do not fill a little bit the new event.log that will be automatically created. We thus recommend you to send 2-3 times the following command line after restarting the application typing "**app**".

U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!

10.1.5. VISUALIZING SETTINGS

To visualize the settings you'll need to open motocross and then turn ON the UVP. Once the UVP is turned on, you'll have 5 seconds to press Q (Quit) to access the controller. (c:/). Then a couple of commands allow you to perform quick control. Here you'll need to type and not just copy and paste.

Enter "**type config.ini**" to display the parameters and settings recorded in the mother board controller. Note that the corresponding information can be edited in Zooprocess ("EDIT PILOT BOARD CONFIGURATION") and sent to the UVP SHALLOW mother board using the Pilot Tools.

Enter "**type sequence.ini**" to display the programming of the UVP SHALLOW sequences.

10.1.6. CONFIGURING THE ANALOG OUTPUT TO CTD

10.1.6.1. CONNECTIONS

UVP SHALLOW can output a voltage on the "ANALOG" connector. This voltage is proportional with the number of particle counted by the camera.

The related PIN OUT of the ANALOG MCBH6M (6 pin male bulkhead) connector is:

PIN	DESIGNATION/MCBH6M	
1	**Analog Output**	**0-5Vdc**
2	**GND**	**0 V**
3	CTD AUX POWER	
4	12V TEMP	From UVP SHALLOW
5	CH1	UVP SHALLOW Analog input #1
6	CH2	UVP SHALLOW Analog input #2

10.1.6.2. CHECKING THE ANALOG OUPUT TO CTD

The ANALOG output can be tested every time you turn ON UVP SHALLOW. A voltage increasing ramp will be applied during 5s, starting 5s after you power the UVP SHALLOW ON. This function is very useful to test the UVP SHALLOW-CTD interfacing.

This voltage can be:

a) Monitored using a voltmeter
b) Visualized on the CTD display if connected properly.

The output range depends on the GAIN set. 0 to 5V ramp is achieved with the default gain of 20. Lower or faster ramp increase range may be displayed if you change this gain.

10.1.6.3. SETTING GAIN FOR THE ANALOG OUTPUT USING ZOOPROCESS

Select the "Set GAIN for ANALOG output" tool in ADVANCED mode and define the maximum particle concentration to be visualized on the analog output. Higher observed concentration will result in saturating the analog output to 5 volt with no damage for the UVP5 or the CTD.
The Zooprocess tool provides also an "uvp5_configuration_file.XML" file to be loaded in the SeaSoft configure inputs tools (after version 7.20).
Note that the analog output should be utilized for the observation of the UVP5 profile and check of the UVP5 status in real time only. Zooprocess tools will produce more reliable data (ie UVP data in CTD files are less accurate than what you get using UVP5 recorded files and contains only the total nb of recorded particles).

10.1.6.4. SEASOFT XML CONFIGURATION FILE FOR THE UVP5

Every time you change the gain in Zooprocess PILOT tool, an updated xml file is created and saved in the "config" folder of the project. This file ease the configuration of the UVP5 data visualization in SEASAVE application.

10.1.6.5. CALCULATING GAIN FOR THE ANALOG OUTPUT TO CTD

Output voltage is linked with the Number of particles via the following equation:

$$\mathbf{OUT_{(mV)} = 0.25 \times Gain \times N/Vol_{(L)} + Offset}$$

OUT: output voltage in mV (limited to 5 Vdc)
N: number of particle counted in the images (averaged and updated every 10 images. 10 is set by default in the provided mixtfd.ini, mixthd.ini and fullhd.ini files)
Vol: Image volume (from calibration document)
Gain: to be set (Factory setting = 20)
Offset: to be set (Factory setting = 0)

Notes:

a) Gain and Offset must be positive integer! As the output is updated every 10 images the CTD display can show step profiles if the image acquisition frequency drops for any reason.
b) Signal can also be saturated at a maximum of 5Vdc if the Gain is too high for the observed particle concentrations.

Example:

Achieving a 0-5vdc (OUT = 5) output range for a maximum concentration of 1000 particle / L and an image volume of 0.93 L.

$$\mathbf{Gain = Vol \times (5000 - Offset) / (0.25 \times N)}$$

$$\mathbf{Gain = 0.93 \times 5000 / (0.25 \times 1000)}$$
$$\mathbf{Gain = 19}$$

10.1.6.6. SETTING GAIN FOR THE ANALOG OUPUT TO CTD USING TERMINAL

Gain can be very easily set using Zooprocess Pilot tools in Advanced mode.

Gain can be also be set in Terminal mode sending the following commands:

U013STBY_PRG!

U024SET_CNA_0_GGGG_OOOO!

U012RUN_UVP!

Where:

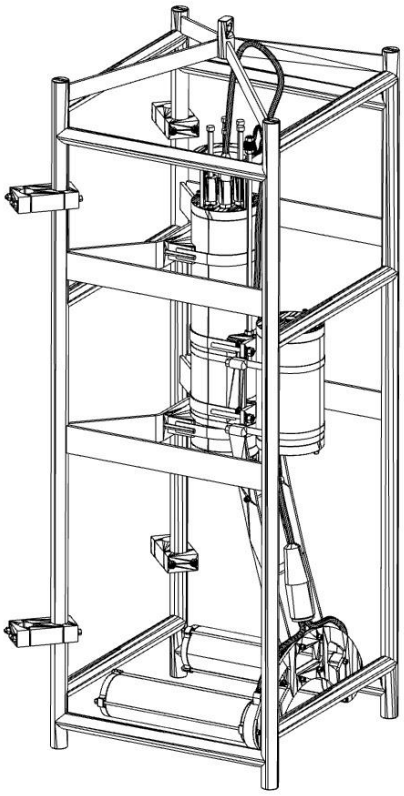
OOOO = Offset (=0)
GGGG = Gain

10.1.7. USING UVP SHALLOW INSIDE UVP FRAME

UVP SHALLOW can be easily installed outside any Carousel frame provided that you have ordered the UVP SHALLOW specific frame. This option is convenient for most 12 bottles rosettes which do not have space inside for the UVP SHALLOW.

There is no need to remove any bottle as the UVP SHALLOW will be placed apart.

An optional frame can be ordered for this purpose. This frame can be attached to SEABIRD 12 bottle carousel using the specific nuts (schematic) or to any CTD frame using cords (photo). This frame can also be utilized alone or with a small autonomous CTD attached inside.



10.1.8. SAFETY FEATURES

Two main safety features allow the UVP SHALLOW to switch to SUSPEND/SLEEP mode (energy saving mode) and thereby interrupt the on-going sequences.

The parameters defining the safety features are monitored and checked at 30 second intervals.

If an abnormal value is reached and that the value remains abnormal for two consecutive checks, the SUSPEND mode is activated and a message is sent via the RS232 port.

UVP SHALLOW will then need to be awake by sending many successive STANDBY commands.

U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!U013STBY_PRG!

10.1.8.1. THERMAL SAFETY FEATURE

A temperature check is performed in the pressure case. The temperature is not precise but guarantees that no components are operating at temperature levels that could damage them especially when the system is on the deck.

The default temperature value is 50°C since the sensor is not thermally linked to the most fragile component.

10.1.8.2. BATTERY CHECK SAFETY FEATURE

The voltage powering the UVP SHALLOW (battery if connected) is checked as for the temperature. If the voltage measured reaches levels lower than the recommended value, the system will switch into SUSPEND mode. The curves supplied in the general document for the UVP SHALLOW indicate the different voltages and cell charge state.

The recommended default value is 23300 when the system power supply is provided by the internal cells. In the event of the power supply being provided by an external 24V battery this value will need to be modified to adapt to the power supply voltage.

10.1.9. UVP SHALLOW CAMERA ACQUISITION AND PROCESS FILES

The UVP SHALLOW camera is provided with defaults acquisition modes defined in the mixtfd.ini, mixthd.ini and fullhd.ini. These files have been utilized for the calibration of the UVP SHALLOW before delivery. A copy of the default files is automatically created in the "UVP SHALLOW_settings" folder of the projects you can create in Zooprocess. They can be edited via the dedicated advanced tool. New ones can also be created from the existing ones. You will have to send these file to the UVP SHALLOW camera and you can do it using the advanced dedicated tool too.

Some parameters should not be modified if you want to keep the calibration parameters for the size measurements. They are indicated in RED. Other ones must not be modified in any case. They are indicated in BLUE.

```
[General]
;mixtfd
; -1 : error, 0 : Save only, 1 : Process only, 2 : Mixt process, 3 : Full process
TaskType= 2
; -1 : error, 0 : FD, 1 : HD
DiskType= 0
; -1: error, 0: BMP, 1: TIFF, 2: AVI, 3: JPEG
Filesavetype= 0
; Size of the AVI sequence (only if Filesavetype=2)
AVIFileSize= 0
; Delay between two images (only if Filesavetype=2)
AVISleep= 1000

; cf SONY documentation for SHUTTER
ShutterSpeed= 12
; cf SONY documentation for SHUTTER
ShutterMode= 1
```

```
; cf SONY documentation for SHUTTER
ShutterPolarity= 0
; cf SONY documentation for GAIN
Gain= 6
; cf SONY documentation for GAMMA
Gamma= 0
; cf SONY documentation for GAMMA
Threshold= 512

[Sequence]
; 0 : No trigger, 1 : Trigger
TriggerMode= 1

[Processing]
Thresh= 21
SMbase= 0
SMzoo= 30
TimeOut= 1000
BRUoption= 1
EraseBorderBlobs= 0

[Picture]
Choice= 1
Ratio= 3

[TRData]
N= 10
DataMoy= 10110

[Font]
FontPath= C:LOVCAMmodfilegrey.bmp
FontSubstract= 0
SaveAfterSub= 0
```

10.1.10. ASCENDING AND DESCENDING MODES FOR SEQUENCES

The ascending and descending modes are the main criteria defining the sequence. The user defines whether the sequence start-up is performed while in ascending mode (A) or descending mode (D)

Two parameters allow the UVP SHALLOW to define whether it is in ascending or descending mode. This validation allows unnecessary start-ups not to be triggered due to pressure variances caused by the roll of the ship.

The system makes an average calculation of the nnnn successive pressure values and compares them to the following nnnn values.

- Should the delta be positive and the absolute value higher than the pre-defined ssss pressure value parameter, the system is considered as is in descending mode

- Should the delta be negative and the absolute value higher than the pre-defined ssss pressure value parameter, the system is considered as is in ascending (back to surface) mode

The parameters are defined via the <**U024SET_PFILT_nnnn_ssss!**> command line where nnnn represents the number of successive pressure values (200 default value) and ssss corresponding to the delta in pressure (measured in meters).

The definition and linked adjustments of the mode currently in place (ascending or descending) depends on the frequency of the pressure measures. The frequency not being clearly defined, adjustments will be made as follows:

- The higher the ssss value the closer the control will be on the system
- The higher the nnnn/ssss ratio, the lower required speed of the system will be.

10.1.10.1. START-UP IN DESCENDING MODE:

Whenever a pressure defined sequence has been validated by the UVP SHALLOW, the pressure is continuously measured and the A/D (Ascending/Descending) test activated by the system.

The pre-positioning will start automatically when the descending mode has been validated and the depth is higher than that pre-defined value minus the pre-positioning interval.

At the end or the pre-positioning, the system automatically starts up if the depth is equal or higher to that defined in the sequence or the system will wait for the pre-defined pressure value to be reached.

10.1.10.2. START-UP IN ASCENDING MODE:

Whenever a pressure defined sequence has been validated by the UVP SHALLOW, the pressure is continuously measured and the A/D (Ascending/Descending) test activated by the system.

The pre-positioning will start automatically when the ascending mode has been validated and the depth is lower than that pre-defined value plus the pre-positioning interval.

At the end or the pre-positioning, the system automatically starts up if the depth is equal or lower to that defined in the sequence or the system will wait for the pre-defined pressure value to be reached.

10.1.10.3. DESCENDING MODE INTERRUPT:

Once the depth is higher than the pre-defined value and that the system is in descending mode the sequence will be immediately stopped.

10.1.10.4. ASCENDING MODE INTERRUPT:

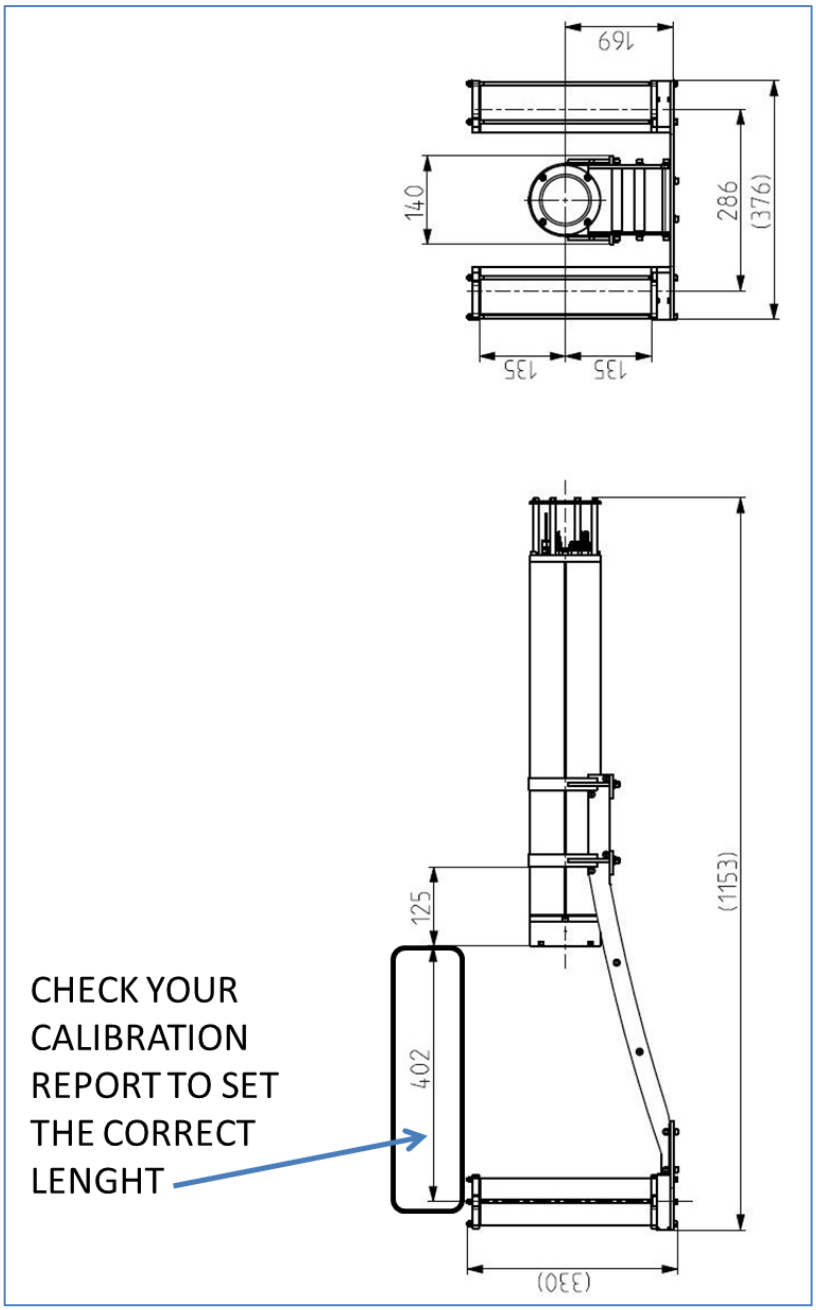
Once the depth is lower than the pre-defined value and that the system is in ascending mode the sequence will be immediately stopped.

10.1.11. PRESSURE VALUE START-UP AND PRE-POSITIONING VALUE:

In order to prepare the acquisition start-up prior to the defined depth value being reached, a pre-defined distance is integrated via the <**U019SET_PPREP_pppp!**> command line where pppp stands for the interval in meters.

11. Appendices

11.1. UVP SHALLOW Overall dimension



11.2. UVP SHALLOW GENERAL MAINTENANCE

11.2.1. INTRODUCTION

This chapter is to give the user basic guideline on how to carry simple maintenance operations on the UVP SHALLOW hardware. Rinsing the UVP SHALLOW and light beam control are very important and should be performed on regular schedule.

11.2.2. CLEANING THE UVP

The UVP must be rinsed with fresh water after each cast.

a) Rinse the UVP entirely
b) Rinse the porthole by inserting water through one of the holes

c) Do not forget to rinse the the IO shunt on the side.

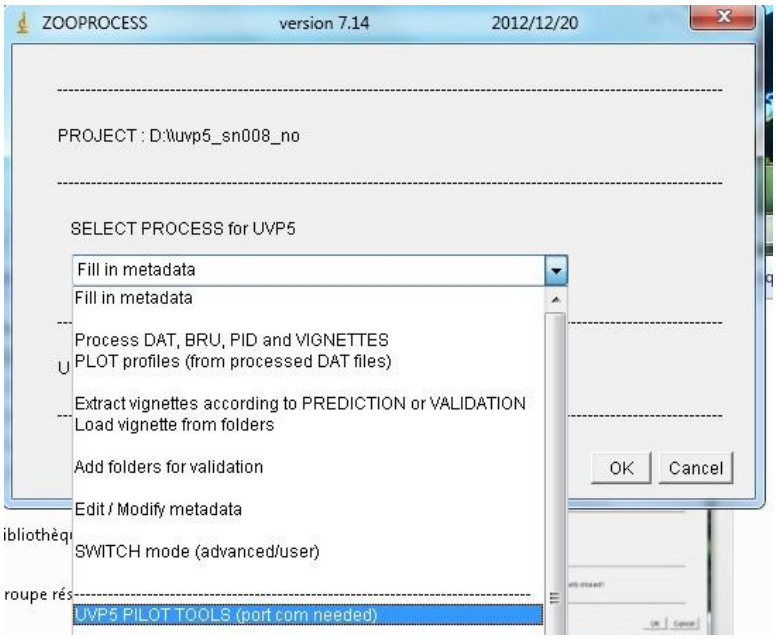
11.2.3. LIGHT BEAM CONTROL

The light beam control is a visual control on the beams alignment. It is to be performed on a monthly preventive maintenance.

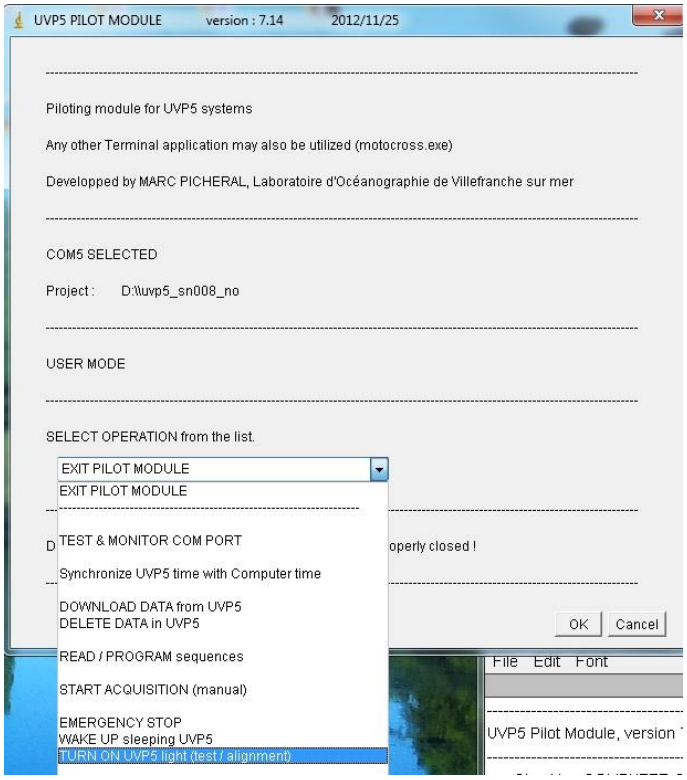
11.2.3.1. TURN LIGHTS ON WITH ZOOPROCESS

Switching the lightings on by using ZOOPROCESS:

1. Open Zooprocess
2. Select UVP Pilot Tools



3. Scroll down the pilot module operation list and select <TURN ON UVP SHALLOW light (test alignment)>.



Light will be ON during 30s.

11.2.3.2. CHECKING BEAM INTEGRITY

Even if you get data that look OK, you cannot be sure that abundances are not biased by the failure of some internal parts of a light or by one of the two lights.

This operation will be done once a day at sea. It permits to check that both lights work well and that data acquired since you performed the last test are OK.

Turn lights ON as described above and check that the beam issued from each light is continuous (no dead section). Pass your hand between the two lights and check the beam is not interrupted. Restart light if necessary!

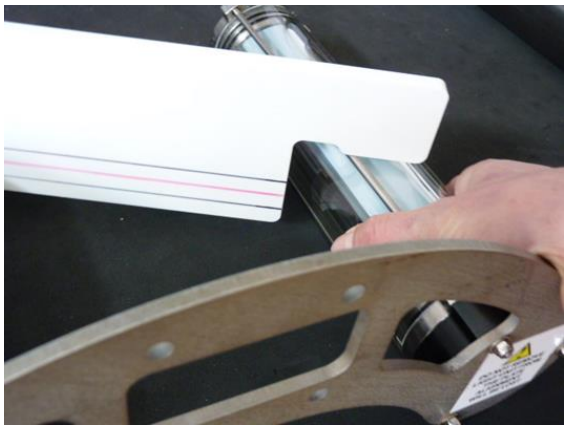
11.2.3.3. CONTROLLING THE BEAMS PARALLELISM

1. Insert the JIG between both lights and make sure the beams are well positioned
    a. If in water, light beams should be parallel and encompassed between the external 2cm separated lines of the JIG.
    b. If in air, the beams should be focused on the central line.
2. If the beams are not well positioned, carry out the next step.

11.2.3.4. ADJUSTING LIGHTS BEAM PARALLELISM

This operation will be done if you observe a misalignment of the beam or if you need to replace a light.

1. Turn ON light in Zooprocess to detect which light needs to be rotated.
2. Unscrew the 3 nuts from the crescent plate only. Unscrew on a few threads until the glass can rotate.
3. Rotate the lighting glass clockwise or anticlockwise in order to meet the alignment in between the two black lines of the JIG. Tighten the nuts (not too strong) Repeat the operation for the second lighting glass if necessary.



11.2.4. SCREWS CONTROL

Please control the 8 screws from the front socket tap and the black port hole. They shouldn't be loose.

11.2.5. PRESSURE SENSOR OIL REFILL

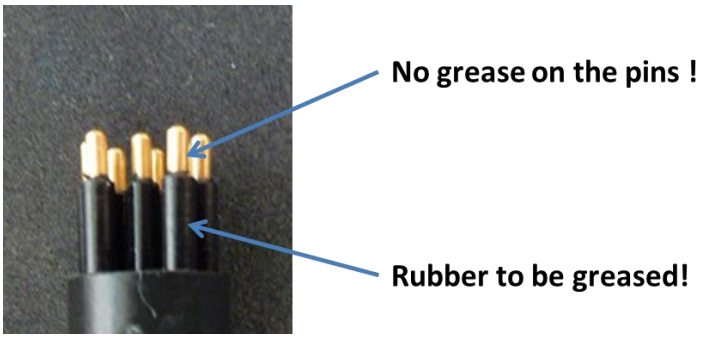
To be performed on a yearly schedule.

Use the syringe and a DC 200 oil bottle from the tool box, follow the steps hereunder:

1. fill the syringe with DC -200 oil from the plastic bottle
2. Screw-lock needle into place
3. Remove pressure capillary nylon fitting and fill cavity with silicon oil (DC200 fluid, with 20 centistokes viscosity)
4. Replace nylon fitting. Oil in cavity should fill capillary as capillary is screwed in

5. The purpose of the nylon fitting and plastic tube is to prevent any salt water from getting into the end cap penetration. The pressure transducer itself is protected from salt water by the oil-filled stainless capillary tube connecting it to the end cap.

11.2.6. CONNECTORS AND SILICON GREASE



Male connectors from both the cap and the cables need to be greased from time to time. So slightly grease the connector black rubber and avoid putting grease on the gold platted pins. This operation will increase the service life of the connectors and sockets.

11.2.7. UVP SHALLOW DETAILED LIST OF RS232 COMMAND

These commands are for the use of highly skilled operators. They permit to utilize the UVP SHALLOW for special purposes: moorings, ROVs, AUVs, SUBs and more. Ask Hydroptic!

Refer to the corresponding file *Commands_UVP SHALLOWsnXXX*

11.2.8. UVP SHALLOW STATION DATASHEET

This example of datasheet is formatted to ease filling metadata in Zooprocess.

Profile DATE (UTC)	
Profile TIME (UTC)	
Profile name (HDRYYYYMMDDHHMMSS) *To be read from RAW folder after download*	HDR20
Cruise	
Ship	
Profile Id *Will provide the folder name in work folder (must start with alphanumeric character)*	
Station Id *Name of the station : no associated file naming*	
Bottom depth *For information*	
CTD-Rosette reference file *Will ease association of UVP SHALLOW data and CTD data*	
Latitude	
Longitude	
First image OK *To be read in the DAT file of the RAW folder*	
Image Volume *To be found in the calibration document*	
Aa *To be found in the calibration document*	
Exp *To be found in the calibration document*	
Day / Night	
Wind direction (°)	
Wind speed (Knots)	
Sea state	
Nebulousness (8e)	
Maximum profile depth	
Operator	