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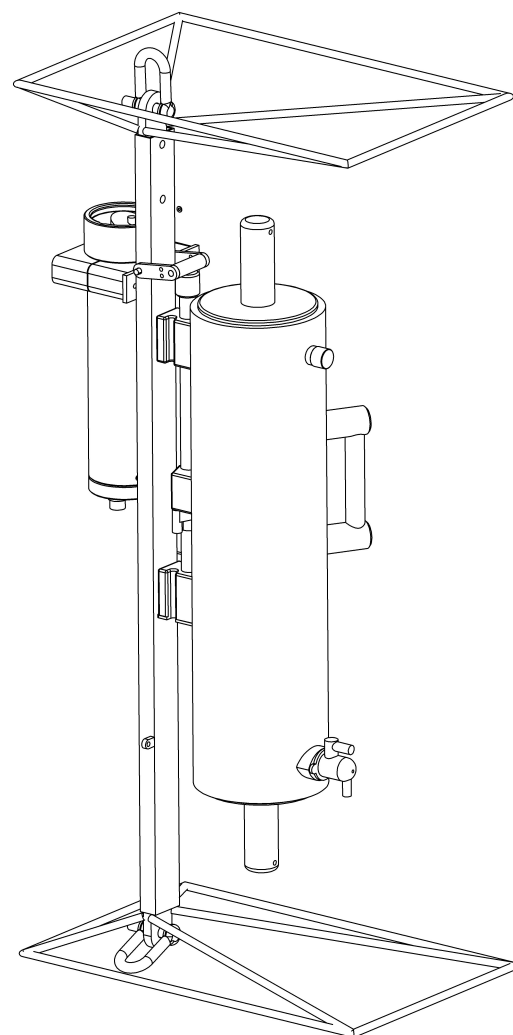
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SINGLE FIRE MODULE - DIGITAL STANDARD MODEL

Multi Water Sampler Technology reduced to the max -
releasing a single water sampler at a precise depth

CATALOGUE NO. 436 990

OPERATION MANUAL



Edition 05/22

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GENERAL DESCRIPTION

The SINGLE FIRE MODULE is a light and handy instrument for obtaining a water sample at a specific depth. The DIGITAL STANDARD MODEL is a stand-alone instrument.

The SINGLE FIRE MODULE consists of a standard water sampler, mounted to a stainless steel rack which is equipped with a motor-driven release device. Impact protection for sampler and release device is made by two dismountable cages on top and bottom side of the instrument. Simply remove the cages when the instrument shall be mounted to an ROV, lander or any other protective structure.

The standard rack can accommodate PLASTIC WATER SAMPLERS (also known as NISKIN SAMPLER) of 1.7, 2.5 and 5 liters capacity and FREE FLOW WATER SAMPLERS of 5 liters capacity. An extended rack for PLASTIC and FREE FLOW WATER SAMPLERS of 10 liters capacity is available upon request.

In online mode, operated in conjunction with standard electro-mechanical cables, the water sampler is actuated via push-button control by the battery powered hand unit. This also handles measuring data of the integrated high-precision pressure sensor.

In offline mode, operated in conjunction with steel or fiber ropes, the water sampler is automatically actuated according to a pre-programmed pressure (depth). Measuring data of the pressure sensor is recorded inside the internal data memory during the operation.

Power supply is made by internal rechargeable lithium-ion batteries, using the state-of-the-art lithium iron phosphate chemistry (LiFePO₄) with capacity sufficient for more than 30 operations. The rechargeable batteries can be charged with a supplied automatic charger. Thanks to most up-to-date technique and primary plug-set the charger is worldwide usable.

STANDARD EQUIPMENT

1. 1 Single Fire Module with motor-driven release device
2. 1 Plastic Water Sampler
3. 1 Dummy connector SUBCONN MC DC 5 M
4. 1 Automatic **LiFePO4** charger with connecting cable
5. 1 Hand Unit with programming cable and connecting cable to PC
6. 1 Battery 9 V (PP3)
7. 1 Can pin lubricant
8. 2 Shackles 10mm
9. 1 Spanner 17mm
10. 1 Hexagon socket screw key 5mm
11. 1 Connecting cable to PC, 5 meters long
12. 1 Adaptor cable Subconn MC IL 5 M --> IL 2 M (for online operations)
13. 1 Counter plug Subconn IL 2 F (to be terminated to the winch cable)
14. 1 Connecting cable from Hand Unit to slip ring box of winch, 3 meters long
15. 2 Dismountable impact protection cages
16. 1 Operation manual
17. 1 USB-Stick Ocean Lab

TECHNICAL DATA

Single Fire Module:

Length:	950 mm
Width:	280 mm
Depth:	440 mm
Empty weight:	12 kg
Material of water sampler:	PVC, NBR
Material of rack:	stainless steel
Material of motor unit:	titanium
Material of release device:	POM
Operational depth:	3000 m
Operating temperature:	-2 ... + 60°C
Connector at Motor Unit:	Subconn MC BH 5 F
Data memory:	4 MByte

Power supply:

Type:	2 LiFePO4 lithium ion batteries
Nominal voltage:	6.6V
Capacity:	2500 mAh, sufficient for approx. 30 operations
Charge conditions:	approx. 2.5 hours at 1500 mA to 80% capacity approx. 5 hours at 1500 mA to 100% capacity
Charge temperature:	+15 ... +35°C
Life expectancy:	up to 2000 charge-discharge-cycles
Self-discharge:	typ. 3% per month

Charger:

System:	automatic charger for double-cell LiFePO4 packs
Type:	FRIWO FW7290
Input voltage:	100 ... 240 V AC
Charge current:	1500 mA

Hand Unit:

Dimensions:	152 x 83 x 33,5 millimeters
Power supply:	internal: Battery 9 V (PP3) external: 7 ... 12 V DC, max. 12 mA
LC-display:	4 x 20 characters
Keyboard:	12 keys
Protection type:	IP 65
Operating temperature:	-5°C ... +50°C

CHARGING THE ACCUMULATORS OF THE UNDERWATER UNIT

SAFETY INSTRUCTIONS

Keep the charger in a dry place (indoor use only)!

The charger should be disconnected from mains supply when not in use.

Do not plug in the charger in case of damaged cabinet or power plug.

Use charger for rechargeable double cell LiFePO₄ packs only!

Do not use the supplied charger for other batteries than rechargeable double cell LiFePO₄ packs!

CHARGING PROCEDURE

1. Bring the SINGLE FIRE MODULE in a dry room.
2. Connect the charger to the SINGLE FIRE MODULE by using the supplied connecting cable.
3. Connect charger to mains supply (100 ... 240 V AC). Select appropriate primary plug for your mains supply. The charging process will start automatically.
4. A **green fast flashing** of the chargers LED indicates the rapid charge process. Depending on state of discharge, the rapid charge process will last up to 2.5 hours.

Note: A **yellow fast flashing** of the chargers LED indicates that the batteries are defective or connected in wrong polarity.

5. Having completed the rapid charge process (leading to approx. 80% state of charge), the charger switches over to maintenance charge (indicated by **green slow flashing** of the chargers LED). The maintenance charge process will last up to additional 2.5 hours.
6. Having completed the maintenance charge process, a **permanent green** LED indicates that the batteries have been completely charged.
7. Disconnect charger from mains supply.
8. Disconnect SINGLE FIRE MODULE from charger.

THE BATTERY

The lithium ion batteries embedded in the SINGLE FIRE MODULE use the lithium iron phosphate (LiFePO₄) chemistry. This type of battery inherently is the **safest** rechargeable battery currently available on the market with highest thermal and chemical stability and highest tolerance to abuse. In contrast to other lithium ion batteries, the LiFePO₄ battery does **NOT** tend to thermal runaway, gassing or explosion.

BATTERY MAINTENANCE

LiFePO₄ batteries do have **no memory effect**, thus a random or partial charge is fine. LiFePO₄ batteries do not need a full charge or discharge for a long battery life.

Charge batteries to approx. 80% state of charge (according to item 5. at this page) and keep them cool for storage - this reduces self discharge and prolongs the battery life.

Avoid total discharge of the batteries to ensure a long battery life. **Charging of batteries is needed at the latest when the battery voltage falls below 5.0V.**

The capacity of completely charged accumulators is sufficient for approx. 30 operations.

BATTERY REPLACEMENT OF THE HAND UNIT

1. The battery case is located at the rear side of the Hand Unit. For battery replacement remove the lid, kept by two screws (tool: screwdriver for recessed-head screws).
2. Remove the exhausted battery.
3. Clip a fresh battery (9 V, PP3) onto the battery contacts.
4. Make sure that packing and sealing surfaces are clean.
5. Remount the lid (tool: screwdriver for recessed-head screws).

EXTERNAL POWER SUPPLY

The Hand Unit can alternatively be powered via two banana sockets by an external mains supply circuit (7 ... 12 V DC, 12 mA).

CONNECTIVITY

The SINGLE FIRE MODULE - DIGITAL STANDARD MODEL provides two different options for connecting the Hand Unit. One of them is also used to connect the SINGLE FIRE MODULE to a PC.

Both communication channels provide identical functionality.

SERIAL COM-PORT

The communication via serial COM-port is used for applications where the SINGLE FIRE MODULE shall be used in pre-programmed mode.

When using the serial COM-port the SINGLE FIRE MODULE is switched on automatically.

Use the supplied programming cable to connect the SINGLE FIRE MODULE to the Hand Unit.

Alternatively use the supplied PC cable to connect the SINGLE FIRE MODULE to the PC.

LONG-DISTANCE TELEMETRY

The long-distance telemetry can only be used for connecting the Hand Unit to the SINGLE FIRE MODULE and is scheduled for applications where manual activation of the water sampler and a supervision of the SINGLE FIRE MODULE during the entire operation is intended. It is not supported by personal computers.

When using the long-distance telemetry the SINGLE FIRE MODULE is switched on automatically.

Use the supplied adaptor cable (Subconn MC IL 5 M --> IL 2 M) to connect the SINGLE FIRE MODULE to the electro-mechanical winch cable. A counter plug Subconn IL 2 F is supplied to be terminated to the electro-mechanical winch cable. Pin 1 (black wire) of the connector SUBCONN IL 2 F is used as electrical ground, pin 2 (white wire) is used for data transmission. When using a single conductor cable the electrical ground must be connected to the steel armor of the electro-mechanical cable, the data wire must be connected to the isolated core of the electro-mechanical cable.

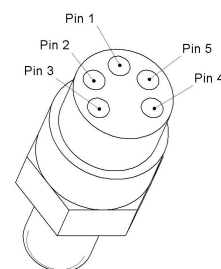
Use the 5 meters long programming cable between Hand Unit and Underwater Unit for checking the principle functioning of the long-distance telemetry by eliminating influences of winch and towing cable.

Use the supplied connecting cable to connect the Hand Unit to the slip ring box of the winch. Electrical ground has to be connected to the brown core of the connecting cable, the data wire has to be connected to the blue core of the connecting cable.

To avoid corrosion at the contacts of the Subconn MC BH 5 F connector of the SINGLE FIRE MODULE the contacts should be slightly greased with pin lubricant and always be protected by the corresponding dummy when not in use.

PIN ASSIGNMENT OF SUBCONN MC BH 5 F

- Pin 1: Electrical ground (GND)
- Pin 2: Long-distance telemetry (FSK)
- Pin 3: + of rechargeable battery (charger)
- Pin 4: Transmitter of serial COM-port (Tx)
- Pin 5: Receiver of serial COM-port (Rx)



HAND UNIT: SWITCHING ON AND OFF

To switch on the Hand Unit press any key once.

To switch off the Hand Unit press any key for 3 seconds until the text at the display disappears. To make sure that the SINGLE FIRE MODULE is in the intended state ("**PROGRAM ACTIVE**" when the SINGLE FIRE MODULE shall be deployed in offline mode, "**SAMPLER CLOSED**" or "**CLOSING = ENTER**" when no operation is planned) it is advised to switch into **MAIN SCREEN** before switching off the Hand Unit. Please note that the accumulators of the Underwater Unit will be discharged within approx. 100 hours whilst the **PROGRAM** is **ACTIVE**.

Additionally an integrated auto-power-off function switches off the Hand Unit after 5 minutes of inactivity (no key pressed, no communication with the Underwater Unit).

After switching on the following text will be temporarily displayed at the LC-display:

HAND UNIT	9.2 V
NO DATA	

- | | | |
|-----------------------------|--------------|---|
| HAND UNIT | 9.2 V | Battery voltage of the Hand Unit. |
| NO DATA | | No instrument connected or connected instrument not ready for communication. |
| alternatively: | | |
| INVALID DATA | | The instrument connected is not supported by the Hand Unit. |
| alternatively: | | |
| CABLE: SHORT CIRCUIT | | Short circuit detected in the long-distance telemetry connection between Hand Unit and SINGLE FIRE MODULE. |

After connecting the SINGLE FIRE MODULE to the Hand Unit (via serial COM-port or long-distance telemetry) the SINGLE FIRE MODULE is switched on automatically.

HAND UNIT: MAIN SCREEN

When a correct communication between Hand Unit and Underwater Unit has been established, the following **MAIN SCREEN** will be displayed:

SFM	3000 m
PRESSURE	0.0 dbar
SAMPLER	6.5 V
CLOSING = ENTER	

This **MAIN SCREEN** will be displayed any time you call function **F1** (by pressing **SHIFT** and **7** successively).

SFM	3000 m	Type of instrument connected: SINGLE FIRE MODULE, maximum operational depth 3000 meters.
PRESSURE	0.0 dbar	Current measuring value of the Underwater Units pressure sensor.
SAMPLER	6.5 V	Accumulator voltage of the Underwater Unit. Charge accumulators at the latest when the voltage falls below 5 V Please note: When the accumulator voltage falls below 4.4 V, the Underwater Unit will be switched off automatically. Before re-starting the accumulators of the Underwater Unit must be charged.
CLOSING = ENTER alternatively:		To close the water sampler press the ENTER key at the keyboard.
MOTOR RUNS alternatively:		The closing process for the water sampler is running.
SAMPLER CLOSED alternatively:		The water sampler has already been closed.
PROGRAM ACTIVE		The SINGLE FIRE MODULE is activated for automatic sampling.

HAND UNIT: PROGRAMMING

To open the **PROGRAMMING** dialog for automatic pressure depending sampling call function **F2** by pressing **SHIFT** and **9** successively.

Two different events have to be programmed:

PROGRAMMING	
UNLOCK	1258.0 dbar
CLOSING	1255.0 dbar
ACTIVATE = ENTER	

The first event to be entered is the **UNLOCK** pressure. The electric motor of the Underwater Unit will be locked until exceeding the **UNLOCK** pressure to avoid closing of the sampler during downcast. Lowering of a closed water sampler could damage the water sampler.

The first digit of the **UNLOCK** pressure is blinking and can be entered via the keyboard. Thereafter the remaining digits of the **UNLOCK** pressure can be entered.

The **CLOSING** event represents the pressure where the water sampler will automatically be closed during upcast. Continue to enter the **CLOSING** pressure digits via the keyboard. The **CLOSING** pressure **must be smaller** than the **UNLOCK** pressure.

The navigation during data input is made via cursor keys ⇐ (by pressing **SHIFT** and **4** successively) and ⇒ (by pressing **SHIFT** and **6** successively). Upon finishing the programming procedure by pressing the **ENTER** key, the entered data are checked and stored inside the Underwater Unit and the SINGLE FIRE MODULE is activated for automatic sampling.

Please note, that programming can only be made when the SINGLE FIRE MODULE is **INACTIVE** and the electric motor of the Underwater Unit is not running.

PROGRAMMING	Name of function
UNLOCK 1258.0 dbar	Unlock pressure for the release device.
CLOSING 1255.0 dbar	Closing pressure for the water sampler.
ACTIVATE = ENTER	To store the entered program and to activate the Underwater Unit for automatic sampling press the ENTER key.

alternatively:

DEACTIVATE = ENTER	The Underwater Unit is active, to switch off the SINGLE FIRE MODULE (when no operation is planned) press the ENTER key.
---------------------------	--

alternatively:

NO END POSITION	The electric motor of the Underwater Unit did not reach its end position (e.g. due to discharged batteries). After re-charging the batteries use MENU function MOTOR CONTROL (page 12) to move the electric motor into the start position.
------------------------	--

HAND UNIT: MENU MOTOR CONTROL

To enter the **MENU**, offering additional dialogs, call function **F5** by pressing **SHIFT** and **3** successively.

```
MENU
> MOTOR CONTROL
  RESET PRESSURE
  IDENT NUMBER
```

The navigation inside the menu is made via the cursor keys \uparrow (by pressing **SHIFT** and **8** successively) and \downarrow (by pressing **SHIFT** and **2** successively).

To enter the menu item selected press the **ENTER** key.

To quit the menu or a menu item call one of the function keys **F1** or **F2**.

The **MENU** incorporates the following menu items:

Menu item **MOTOR CONTROL**:

The menu item **MOTOR CONTROL** is used for synchronization purposes of motor unit and release device. It starts a short motor run (1/2 revolution of the motor axle).

```
MENU
  MOTOR CONTROL
  (SEE MANUAL)
  START = ENTER
```

MENU
MOTOR CONTROL
START = ENTER

Indicator for menu

Motor control for synchronization purposes.

To start a short motor run (1/2 revolution of the motor axle) press the **ENTER** key.

HAND UNIT: MENU RESET PRESSURE

Menu item **RESET PRESSURE**:

Due to the high accuracy of the pressure sensor used inside the SINGLE FIRE MODULE air pressure fluctuations cause variations of the pressure measurements which can be eliminated with assistance by the menu item **RESET PRESSURE**.

The Underwater Unit **must not be immersed into the water** whilst compensating the air pressure influences.

MENU
0.3 dbar
RESET = ENTER

MENU

0.3 dbar

RESET = ENTER

Indicator for menu

Current pressure value of the Underwater Unit.

To eliminate air pressure variations (recalibrate the pressure sensor) press the **ENTER** key.

Use menu item whilst **Underwater Unit stands on deck** at temperatures from +5°C to +35°C and has reached surrounding temperature only.

HAND UNIT: MENU IDENT NUMBER

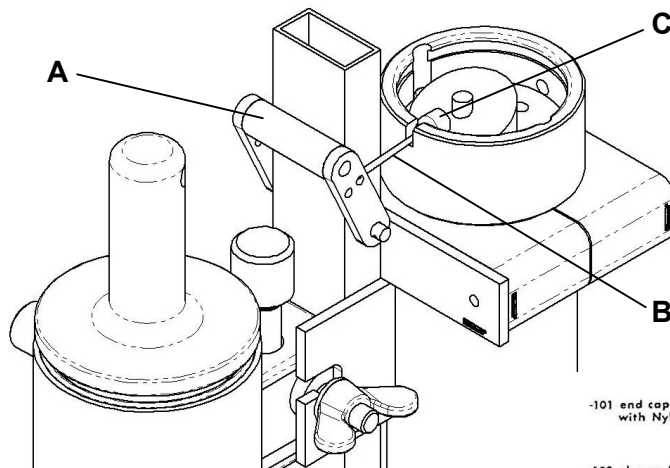
Menu item **IDENT NUMBER**:

The menu item **IDENT NUMBER** gives access to the identification number of the SINGLE FIRE MODULE:

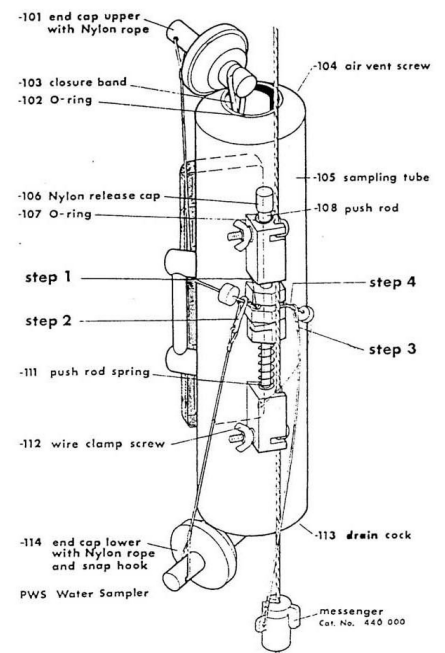
MENU	
IDENT NUMBER	12345

PREPARATION FOR OPERATION

1. Connect the SINGLE FIRE MODULE to the Hand Unit by using the 5 meters long programming cable.
2. When the SINGLE FIRE MODULE has not been operated for a longer period, a TEST RUN should be carried out as follows to control proper functioning of the system.
THE WATER SAMPLERS MUST NOT BE OPENED FOR THE TEST RUN !
 Switch on the Hand Unit by pressing any key once. When a correct communication between Hand Unit and Underwater Unit has been established, the **MAIN SCREEN** will be displayed
 Press the **ENTER** key at the keyboard once to activate the release device. The inclined releaser disc will carry out a full revolution.
3. Check battery voltage of the **SAMPLER** (third line inside the **MAIN SCREEN**). **Charging of batteries is needed at the latest when the battery voltage falls below 5.0V.**
4. Check **PRESSURE** value of the Underwater Unit (second line inside the **MAIN SCREEN**). Use **MENU** function **RESET PRESSURE** to eliminate air pressure variations in case the value considerably differs from zero.
5. Disconnect programming cable from Hand Unit and Underwater Unit.
6. Lift the striking bar **A** of the rack and put rope **B** with the plastic ball **C** into the slit of the release device.



7. The Water Sampler is opened as described on its label. Carry out **step 1** and **step 2**. **Steps 3 and 4** are not applicable.
8. The SINGLE FIRE MODULE is now ready for operation.
9. When no connection of the Underwater Unit is needed, the connector MC BH 5 F at the Underwater Unit should always be protected by the corresponding dummy connector MC DC 5 M to avoid corrosion of the contacts. Regularly grease the pins of the dummy connector with supplied PIN-lubricant.



OPERATION IN ONLINE MODE

1. Connect the Hand Unit to the slip ring box of the winch by using the supplied 3 meters long connecting cable.
2. Connect the SINGLE FIRE MODULE mechanically and electrically (by using the supplied adaptor cable) to the winch cable. Regularly grease the pins of the underwater connectors with supplied PIN-lubricant.
3. Switch on the Hand Unit by pressing any key once. The following text will be temporarily displayed at the LC-display:

HAND UNIT	9.2 V
NO DATA	

4. The **MAIN SCREEN** will be displayed when communication has been established:

SFM	3000 m
PRESSURE	0.0 dbar
SAMPLER	6.5 V
CLOSING = ENTER	

5. Lower the SINGLE FIRE MODULE to the scheduled depth.
6. Press the **ENTER** key at the keyboard of the Hand Unit once to activate the release device. The activating process of the water sampler is indicated by **MOTOR RUNS** in the fourth line of the **MAIN SCREEN**.

SFM	3000 m
PRESSURE	380.3
dbar	
SAMPLER	6.5 V
MOTOR RUNS	

7. Wait until closing of the water sampler has been finished, indicated by **SAMPLER CLOSED** in the fourth line of the **MAIN SCREEN**.

SFM	3000 m
PRESSURE	380.3
dbar	
SAMPLER	6.5 V
SAMPLER CLOSED	

8. Retrieve the SINGLE FIRE MODULE and bottle the sample for storage.
9. Switch off the Hand Unit by pressing any key for 3 seconds until the text at the display disappears.
10. Disconnect Underwater Unit from the winch cable.
11. Protect the connector MC BH 5 F at the Underwater Unit by the corresponding dummy connector MC DC 5 M to avoid corrosion of the contacts. Regularly grease the pins of the dummy connector with supplied PIN-lubricant.

OPERATION IN OFFLINE MODE

1. Connect the Hand Unit to the Underwater Unit by using the supplied 5 meters long programming cable. (Alternatively use the supplied cable to connect the Underwater Unit to a PC in case programming shall be made via the PC software OceanLab.)
2. Switch on the Hand Unit by pressing any key once. The following text will be temporarily displayed at the LC-display:

HAND UNIT	9.2 V
NO DATA	

3. The **MAIN SCREEN** will be displayed when communication has been established:

SFM	3000 m
PRESSURE	0.0 dbar
SAMPLER	6.5 V
CLOSING = ENTER	

4. Open the **PROGRAMMING** dialog by pressing **SHIFT** and **9** successively:

PROGRAMMING	
UNLOCK	1258.0 dbar
CLOSING	1255.0 dbar
ACTIVATE = ENTER	

5. Enter **UNLOCK** and **CLOSING** pressure according to the scheduled sampling scenario. The electric motor of the Underwater Unit will be locked during downcast until exceeding the programmed **UNLOCK** pressure. Afterwards the water sampler will be closed during upcast when passing the **CLOSING** pressure. Thus the **CLOSING** pressure **must be smaller** than the **UNLOCK** pressure.
6. Press the **ENTER** key to store the entered program and to **ACTIVATE** the Underwater Unit for automatic sampling.
7. Switch off the Hand Unit by pressing any key for 3 seconds until the text at the display disappears.
8. Disconnect the programming cable from the Underwater Unit.
9. Protect the connector MC BH 5 F at the Underwater Unit by the corresponding dummy connector MC DC 5 M to avoid corrosion of the contacts. Regularly grease the pins of the dummy connector with supplied PIN-lubricant.
10. Lower the SINGLE FIRE MODULE to the scheduled depth. Make sure that you pass the programmed **UNLOCK** pressure during downcast.
11. Slowly heave the SINGLE FIRE MODULE until passing the **CLOSING** pressure where the water sampler will be automatically closed. Thereafter finalize the upcast with increased winch speed.
12. Retrieve the SINGLE FIRE MODULE and bottle the sample for storage.
13. Connect the Underwater Unit to a PC in case you want to download the pressure profile of the operation into the PC software OceanLab for evaluation.

PC SOFTWARE OCEANLAB

The standard HYDRO-BIOS data acquisition software OceanLab 3 has been extended by a module, particularly to integrate the functionality of the SINGLE FIRE MODULE into the software.

MINIMUM PC REQUIREMENTS

Celeron or Athlon PC 1 GHz, 2GB RAM
10 MB free space on hard-disk drive
Windows 10 / Windows 8.1 / Windows 7 / XP
Display 800 x 600 pix. minimum
1 free USB-port for serial port adaptor
2-Button Wheel-mouse

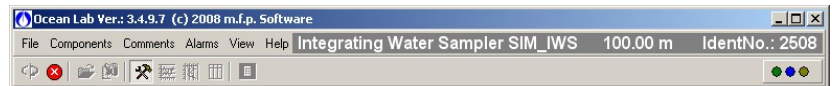
INSTALLATION: (Ensure you have Administrator Rights for the installation)

To install OceanLab 3 at your PC start the PC and insert the supplied OceanLab USB-stick. With AUTORUN function enabled (see Windows manual) the installation will start automatically on Windows XP. If the installation process is not started automatically please select START from the Windows task bar and click on RUN. Enter the installation command "D:\Setup.exe" (where the D is the identification letter for the USB stick drive in your PC) and confirm the command with the OK button. Follow the dialog box instructions to install the software. The installation directory (according to current Microsoft guidelines) is C:\Program Files (x86)\OceanLab3.

APPEARANCE OF OCEANLAB 3

OceanLab 3 consists of different program windows that can be independently modified in size and position at the Windows desktop.

The MAIN window incorporates the toolbar and the main menu. In the upper right of the MAIN



window OceanLab 3 indicates the type of system connected in clear text and the identity number (IdentNo.) of the electronics board inside the instrument connected.

Additionally three LEDs indicate the communication state of OceanLab 3:

Green LED indicates that OceanLab 3 is sending commands to the instrument.

Blue LED indicates that OceanLab 3 receives data from the instrument.

Yellow LED indicates that the electric motor inside the Sampler is active.

Inside the tabulated COMPONENTS window real-time measuring data received from the instrument are displayed in engineering units.

During online operations the GRAPHS window visualizes a currently updated time- or pressure-depending graph with the sets of measuring data received from the instrument. Alternatively the graph can be replaced by a tabulated data list.

A LOGFILE EDITOR is available enabling the user to add individual header information to the active data file and to mark events of special interest inside the active data file.

For system set-up OceanLab 3 offers an individual CONTROLLING dialog window for each implemented device, offering all necessary features of the specific device.

COMMUNICATION / CONNECTING

The communication between the PC and the Underwater Unit is made via a serial COM-port. Feel free to connect the Underwater Unit to any COM-port available at the PC. After starting OceanLab 3 click on button CONNECT inside the toolbar or select menu item CONNECT inside the FILE menu. During the connection process OceanLab 3 uses the first free COM-port to communicate with the Underwater Unit. When OceanLab 3 is unable to establish a connection to the Underwater Unit please select the appropriate COM-port inside the pull-down table COM-PORT of the CONNECT dialog. After having successfully connected OceanLab 3 enters the CONTROLLING MODE to give access to the control of the SINGLE FIRE MODULE.



The CONNECTING process can only be started when no session or simulation is active and no file is opened inside OceanLab 3.

When communication problems occur during a mission OceanLab 3 automatically tries to re-connect.

To stop the data transmission from the Sampler to the PC please use the button STOP SESSION inside the toolbar or inside the FILE menu.

To close the current session and to prepare OceanLab 3 for the next mission use button CLOSE FILE inside the toolbar or inside the FILE menu.

FILE MANAGEMENT

The disk files to store measuring data from the instrument are automatically created by OceanLab 3. According to Microsoft guidelines the sub-directory LOGFILES of OceanLab3 is created inside an application data directory of Windows. The location of the application data directory depends on the Windows version used on your PC. To find the actual path of the LOGFILES directory **at your PC** please use menu item ENTER FILES DIRECTORY inside the FILES menu to start the Windows Explorer inside the LOGFILES directory.

Inside the LOGFILES directory each instrument creates its own sub-directory, named with:

- Type of system connected (e.g. MWS for Multi Water Sampler)

- Identity number (IdentNo.) of the electronics board inside the Probe resp. Motor Unit

Inside the instruments sub-directory OceanLab 3 creates sub-directories to separate ONLINE and OFFLINE sessions.

A file set of one session consists of two files, named with:

- Type of system connected, Identity number (IdentNo.), date and time of session start

- File extensions: .hbl containing the measuring data of the session

- .hbc containing additional user defined information to be stored in connection with the data file

When data or comments files are modified after stopping the session the modified file sets are stored with numerical index:

- name_x.hbl (x = numerical index) containing the modified data of the session

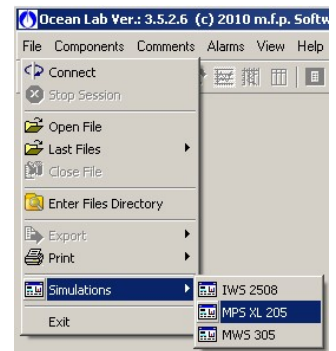
- name_x.hbc (x = numerical index) containing modified user defined information

Please note that OceanLab 3 automatically starts a new session (and thus creates new data and comments file) when modifications are made inside the CONTROLLING dialogs of the CONTROLLING MODE.

SIMULATION

For training purposes OceanLab 3 can be started in SIMULATION MODE with no HYDRO-BIOS system connected. For general training and software evaluation OceanLab 3 offers simulations for some different standard HYDRO-BIOS systems. Additionally OceanLab 3 automatically creates a simulation for each HYDRO-BIOS system during the first connecting process. The simulations are accessible via menu item SIMULATIONS inside the FILE menu, offering all modules and functions necessary to control the specific HYDRO-BIOS system. The simulations can only be started when no session or simulation is active and no file is opened inside OceanLab 3.

Please note that the data file sub-directories and the data files of simulations are marked with SIM as leading expression.



HARDWARE CONSTELLATIONS

Depending on the kind of mission there are two constellations intended for the following applications:

For PREPARING OFFLINE-OPERATIONS, where the PC is directly connected to the Probe resp. Motor Unit via serial port, OceanLab 3 offers a special programming dialog for instruments working in self contained mode where the user can enter a list of action events and programme the instrument electronics to execute this list.

The POST-DEPLOYMENT DATA DOWNLOAD, where the PC is directly connected to the Probe resp. Motor Unit via serial port, is needed to transfer measuring data having been stored inside the instruments data memory during OFFLINE-OPERATIONS after recovery.

OPERATING MODES

To meet the different hardware constellation requirements, OceanLab 3 incorporates three different operating modes:

In MONITORING MODE currently updated real-time data received from the instrument are stored into a disk file (for later analysis) and displayed in engineering units. Additionally the MONITORING MODE offers a user configurable graph to visualize the real-time data of the instrument. All action devices of the instrument can be controlled with an ACTION button.

The CONTROLLING MODE offers a list of all devices implemented into the instrument. It is intended to control all implemented devices in view of pre-deployment system set-up and post-deployment data download.

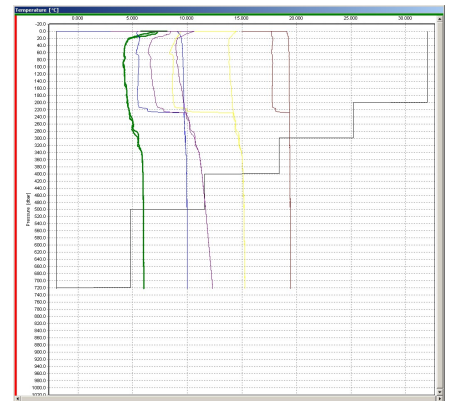
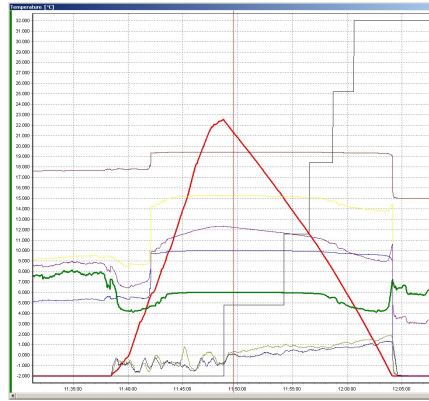
The VIEWER MODULE of OceanLab 3 is used to view and export disk files of previous operations.

MONITORING MODE

To enter the MONITORING MODE click on button MONITORING MODE inside the toolbar. The MONITORING MODE incorporates independent program windows as follows:

GRAPHS WINDOW

Inside the GRAPHS window a currently updated time- or pressure- depending graph visualizes the sets of measuring data received from the instrument. Alternatively the graph can be replaced by a tabulated data list. The appearance of the GRAPHS window can be selected inside the VIEW menu of the MAIN window.



To temporarily enlarge a specific area inside the graphic mark the region of interest with the mouse whilst left button pressed.

To temporarily zoom the graphic please use the wheel of the mouse or + and - keys at the keyboard.

To temporarily navigate inside the GRAPHS window please use the right mouse button or the scroll bars.

To return to the default settings double-click inside the GRAHPS window.

To temporarily display the graph of the complete active mission please use button ZOOM ALL inside the toolbar.

Please note that the GRAPHS window in MONITORING MODE will return to the default settings after 10 seconds automatically.

Time	Sea	Press	Volume	Flow	Flow	Flow	Temperature	Salinity	Sound	Density	Oxygen	Depth	Depth	Depth
hh:mm:ss	ft	cm	l/min	l/min	l/min	l/min	°C	psu	m/s	kg/m ³	mg/l	m	m	m
11:51:41	1	625.6	34.9	0.0	0.0	130.31	5.991	32.994	33121	102.226	10.027	42.28	2.93	4.25
11:51:42	1	626.9	35.0	0.0	0.0	130.32	5.992	32.996	33122	102.229	10.027	42.28	2.93	4.25
11:51:43	1	628.2	35.1	0.0	0.0	130.33	5.991	32.993	33123	102.232	10.027	42.28	2.94	4.26
11:51:44	1	629.5	35.1	0.0	0.0	130.33	5.992	32.994	33119	102.228	10.027	42.28	2.94	4.26
11:51:45	1	630.8	35.2	0.0	0.0	130.32	5.992	32.994	33122	102.234	10.027	42.28	2.93	4.27
11:51:46	1	632.1	35.3	0.0	0.0	130.32	5.991	32.993	33122	102.227	10.027	42.28	2.94	4.27
11:51:47	1	633.4	35.4	0.0	0.0	130.32	5.991	32.992	33123	102.231	10.027	42.30	2.97	4.28
11:51:48	1	634.7	35.5	0.0	0.0	130.32	5.991	32.993	33123	102.233	10.027	42.30	2.97	4.28
11:51:49	1	636.0	35.6	0.0	0.0	130.31	5.992	32.991	33119	102.228	10.027	42.30	2.97	4.30
11:51:50	1	637.3	35.7	0.0	0.0	130.31	5.992	32.992	33123	102.232	10.027	42.34	2.98	4.30
11:51:51	1	638.6	35.8	0.0	0.0	130.31	5.992	32.993	33119	102.226	10.027	42.36	2.98	4.31
11:51:52	1	639.9	35.9	0.0	0.0	130.31	5.991	32.991	33123	102.231	10.027	42.34	2.98	4.31
11:51:53	1	641.2	36.0	0.0	0.0	130.31	5.991	32.991	33117	102.224	10.027	42.34	2.98	4.31
11:51:54	1	642.5	36.1	0.0	0.0	130.30	5.991	32.991	33118	102.232	10.027	42.34	2.98	4.31
11:51:55	1	643.8	36.2	0.0	0.0	130.30	5.991	32.991	33118	102.231	10.027	42.34	2.98	4.31
11:51:56	1	645.1	36.3	0.0	0.0	130.40	5.991	32.990	33117	102.233	10.027	42.34	2.98	4.31
11:51:57	1	646.4	36.4	0.0	0.0	130.40	5.991	32.991	33114	102.231	10.026	42.34	2.98	4.31
11:51:58	1	647.7	36.5	0.0	0.0	130.40	5.992	32.992	33113	102.227	10.026	42.34	2.98	4.31
11:51:59	1	649.0	36.6	0.0	0.0	130.40	5.991	32.991	33114	102.230	10.026	42.36	2.98	4.31
11:52:00	1	650.3	36.7	0.0	0.0	130.40	5.991	32.991	33114	102.228	10.026	42.36	2.98	4.31
11:52:01	1	651.6	36.8	0.0	0.0	130.31	5.990	32.990	33113	102.231	10.026	42.36	2.98	4.31
11:52:02	1	652.9	36.9	0.0	0.0	130.31	5.990	32.990	33113	102.229	10.026	42.36	2.98	4.31
11:52:03	1	654.2	37.0	0.0	0.0	130.29	5.990	32.991	33116	102.231	10.027	42.36	2.97	4.31
11:52:04	1	655.5	37.1	0.0	0.0	130.40	5.990	32.990	33113	102.230	10.027	42.36	2.97	4.31
11:52:05	1	656.8	37.2	0.0	0.0	130.33	5.989	32.992	33107	102.227	10.026	42.40	2.97	4.31
11:52:06	1	658.1	37.3	0.0	0.0	130.40	5.989	32.992	33108	102.231	10.026	42.41	2.97	4.31
11:52:07	1	659.4	37.4	0.0	0.0	130.40	5.989	32.990	33110	102.228	10.026	42.42	2.97	4.31
11:52:08	1	660.7	37.5	0.0	0.0	130.39	5.989	32.991	33108	102.231	10.026	42.42	2.97	4.31
11:52:09	1	662.0	37.6	0.0	0.0	130.40	5.989	32.991	33108	102.230	10.026	42.43	2.97	4.31
11:52:10	1	663.3	37.7	0.0	0.0	130.40	5.989	32.991	33107	102.228	10.026	42.43	2.97	4.31
11:52:11	1	664.6	37.8	0.0	0.0	130.40	5.989	32.991	33107	102.229	10.026	42.43	2.97	4.31
11:52:12	1	665.9	37.9	0.0	0.0	130.31	5.989	32.992	33108	102.231	10.026	42.43	2.97	4.31
11:52:13	1	667.2	38.0	0.0	0.0	130.30	5.989	32.992	33108	102.230	10.026	42.43	2.97	4.31
11:52:14	1	668.5	38.1	0.0	0.0	130.29	5.989	32.993	33108	102.228	10.026	42.54	2.92	4.31
11:52:15	1	669.8	38.2	0.0	0.0	130.29	5.989	32.993	33108	102.229	10.026	42.55	2.92	4.31
11:52:16	1	671.1	38.3	0.0	0.0	130.30	5.989	32.993	33108	102.230	10.026	42.57	2.94	4.31
11:52:17	1	672.4	38.4	0.0	0.0	130.30	5.989	32.993	33108	102.231	10.026	42.58	2.94	4.31
11:52:18	1	673.7	38.5	0.0	0.0	130.30	5.989	32.993	33108	102.230	10.026	42.58	2.94	4.31
11:52:19	1	675.0	38.6	0.0	0.0	130.31	5.989	32.993	33106	102.228	10.026	42.62	2.94	4.31
11:52:20	1	676.3	38.7	0.0	0.0	130.31	5.989	32.993	33106	102.231	10.026	42.62	2.98	4.31

To select a parameter for the vertical axis of the GRAPHS window please click at the parameter inside the COMPONENTS window.

Inside the time-depending GRAPHS window blue boxes mark the positions of header information, yellow boxes mark the positions of LOGFILE EDITOR comments connected to the data file. Red boxes mark the positions of LOGFILE EDITOR comments automatically created by OceanLab 3 when communication problems occur during the mission. To open a LOGFILE EDITOR comment click once at the blue, yellow or red box or select it inside the COMMENTS menu.

COMPONENTS WINDOW

Inside the tabulated COMPONENTS window real-time measuring data received from the instrument and data calculated from the measuring data are displayed in engineering units. An ACTION button enables the user to activate action devices of the instrument.

Components of SIM_SFM

- Battery: 8.6 V
- Bottle: 0 Action
- Pressure: 113.6 dbar
- INACTIVE

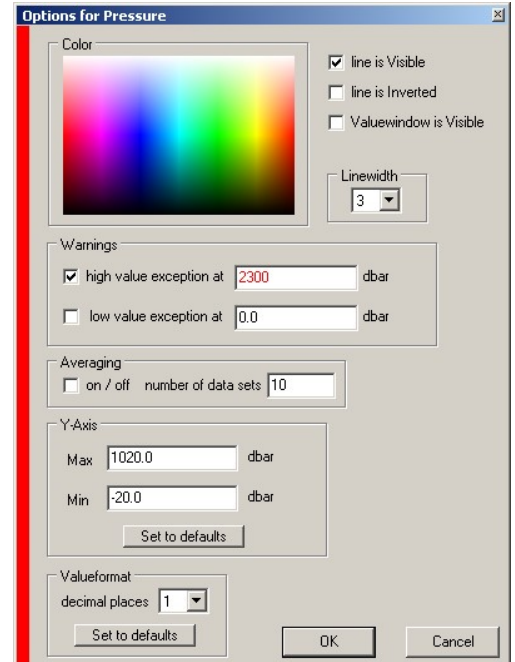
OPTIONS DIALOG

A configuration dialog of a component is accessible by clicking with the right mouse button at the name of the component inside the COMPONENTS window and selecting OPTIONS inside the pop-up menu.

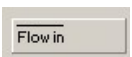
Inside the OPTIONS dialog the component can be configured as follows:

COLOR: Select a color for the component to be used inside the graph.

- **LINE IS VISIBLE:** Use tick box to hide the component inside the graph.
- **LINE IS INVERTED:** Use tick box to mirror the graph of the component (lower limit of Y-axis at the top, upper limit of Y-axis at the bottom).
- **VALUE WINDOW IS VISIBLE:** Use tick box to create an additional value window for the component. This value window can be individually adjusted in size and position at the windows desktop.
- **LINEWIDTH:** Select line width to be used inside the graph from the pull-down box.
- **WARNINGS:** Each component can be associated with high and low value alarms. A pop-up window will indicate the crossing of the selected limit.

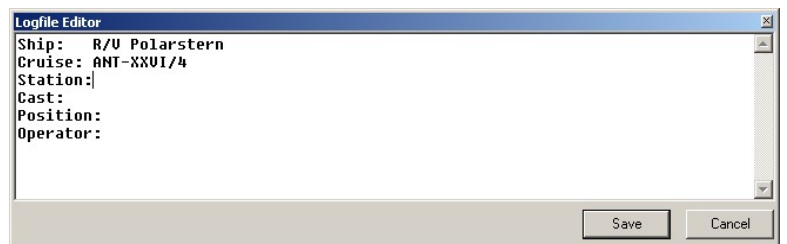


- **AVERAGING:** To smoothen a graph of a component and to average the physical data (in case of unstable or jumping readings) please use tick box to activate averaging and enter the number of data sets to be used for averaging. A component with active averaging is marked with an overline inside the COMPONENTS WINDOW.
- **Y-AXIS:** Enter upper and lower limit of Y-axis at will for a permanent magnification of the graph.
- **VALUEFORMAT:** Select number of decimal places for the component from the pull-down box. Please note that this function does NOT increase the accuracy!



LOGFILE EDITOR

When starting a session OceanLab 3 automatically creates a header information which is intended to enable the user to enter all necessary information to be stored in connection with the data file (e.g. ship, cruise no., station no., ...). As template for this comment



OceanLab 3 uses the file "header.txt" (located inside the OceanLab 3 application data directory) which can be individually configured according to the needs of the user. Inside the GRAPHS window a blue box marks the position of the header information which can be opened for modification with the LOGFILE EDITOR by clicking at the blue box. The header information will be incorporated into the export files that can be created inside the VIEWER module of OceanLab 3.

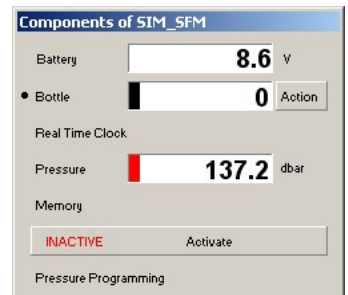
Additional LOGFILE EDITOR comments can be created at any time (e.g. to connect additional information of interest to a specific moment) by simply pressing the space bar at the keyboard of the PC. Inside the time-depending GRAPHS window yellow boxes mark the positions of the LOGFILE EDITOR comments. The LOGFILE EDITOR comments will be incorporated into the export files that can be created inside the VIEWER module of OceanLab 3.

As template for the additional comments OceanLab 3 uses the file "comments.txt" (located inside the OceanLab 3 application data directory) which can be individually configured according to the needs of the user.

Please note that OceanLab 3 automatically starts a new session (and thus creates new data and comments files) when modifications are made inside the CONTROLLING dialogs of the CONTROLLING MODE.

CONTROLLING MODE

The tabulated COMPONENTS window offers a list of all components implemented into the actual instrument.



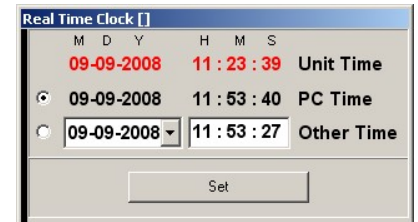
Clicking at one implemented device opens an individual CONTROLLING dialog for the selected device, offering all necessary features of the specific device (e.g. calibration coefficients, clock...).

The following CONTROLLING dialogs for SINGLE FIRE MODULE are available:

REAL TIME CLOCK

The CONTROLLING dialog REAL TIME CLOCK is used to adjust the real time clock of the instrument. The real time clock of the instrument can be synchronized with the PC clock or adjusted at will. The clock data will be used to add time stamps to the offline data files.

The date format is MM-DD-YYYY MM = month, 2 digits
 DD = day, 2 digits
 YYYY = year, 4 digits
 (2000 ... 2099)



The time format is: hh:mm:ss hh = hour, 2 digits (0 ... 24)
 mm = minute, 2 digits
 ss = second, 2 digits

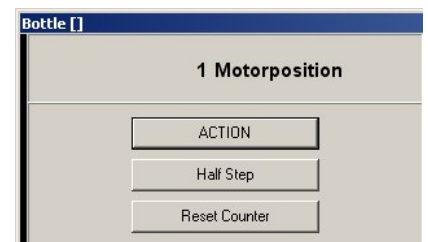
The button SET is used to transfer the new date and time to the instrument after modifications.

BOTTLE

The CONTROLLING dialog BOTTLE offers a dialog to control the motor of the instrument manually:

The button ACTION is used to activate the motor of the instrument to move to the next position.

The button HALF STEP is used for synchronization purposes to synchronize the motor with the release mechanism of the SINGLE FIRE MODULE. The axle of the motor will carry out a half revolution and the motor counter BOTTLE will be set to zero.



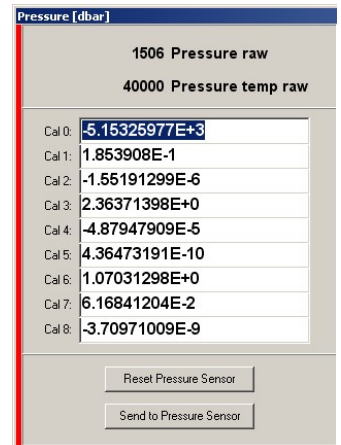
The button RESET COUNTER is used to set the motor counter BOTTLE to zero for synchronization purposes.

PRESSURE

The CONTROLLING dialog PRESSURE incorporates the indication of the sensors raw data and the possibility to read and modify the sensors calibration coefficients (cal 0 ... cal 8).

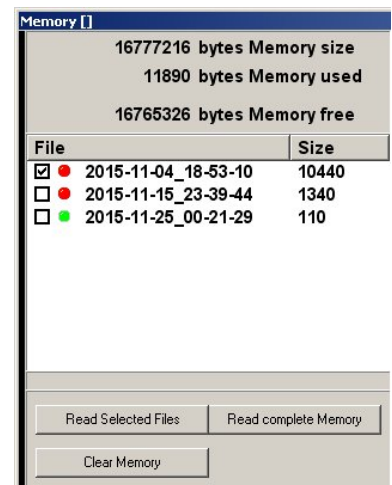
The button SEND TO PRESSURE SENSOR is used to transfer the calibration coefficients to the instrument after modifications.

Due to the high accuracy of the pressure sensor used inside the SINGLE FIRE MODULE air pressure fluctuations cause variations of the immersion depth measurements which can be eliminated with assistance by the button RESET PRESSURE SENSOR. Use function **whilst the Underwater Unit stands on deck** at temperatures from +5°C up to +35°C when the instrument has reached the surrounding temperature only!



MEMORY

The MEMORY dialog informs about the complete size of the data memory, the used size of the data memory and the remaining space inside the data memory. Additionally the MEMORY dialog offers the possibility to select data files for download into a disk file. Please note that, in case of not completely free memory, the instrument will automatically start to create a new data file inside the data memory when started in OFFLINE-MODE. The measuring data of previous OFFLINE-OPERATIONS will not be deleted, but the instrument will stop recording measuring data automatically when the memory is completely used.



All data files stored inside the instruments data memory are available inside the FILE table. Each file is marked with date and time of session start, file size and a green or red dot.

A GREEN DOT indicates that the file has already been transferred to and stored at the PC.

A RED DOT indicates that the file has not yet been stored at the PC.

Tick-boxes are used to select data files for data transfer to the PC.

The button READ SELECTED FILES is used to start the data transfer of the selected data files from the instrument into a disk file.

The button CLEAR MEMORY is utilized to clear the data memory of the instrument. **This function is irreversible! Therefore make sure having successfully transferred the measuring data from the instrument to a disk file!**

The additional button READ COMPLETE MEMORY can be used to save the complete data memory of the instrument into one single disk file, even if the data memory of the instrument has been cleared by mistake. Please note that OceanLab 3 cannot open this special disk file unless it is pre-processed by HYDRO-BIOS Apparatebau GmbH. Therefore the disk file has to be sent to our factory by email, floppy disk or CD-ROM.

Since the SINGLE FIRE MODULE is NOT equipped with a main switch, an additional button ACTIVATE resp. DEACTIVATE inside the COMPONENTS WINDOW is used to switch ON (= ACTIVE) or OFF (= INACTIVE) the Underwater Unit for automatic sampling and data storing inside the data memory of the instrument.



PRESSURE PROGRAMMING

The CONTROLLING dialog PRESURE PROGRAMMING is used to get access to the programmable activating pressures of the SINGLE FIRE MODULE.

Please note that PRESSURE PROGRAMMING can only be done whilst the instruments action device is in STARTPOSITION.

The first event to be entered is the UNLOCK pressure. The electric motor of the Underwater Unit will be locked until exceeding the UNLOCK pressure but measuring data will be continuously recorded.

The CLOSING event represents the pressure where the water sampler will automatically be closed during upcast. Please note that the CLOSING pressure **must be smaller** than the UNLOCK pressure.

The button SEND TO INSTRUMENT is used to transfer the activating events to the instrument after modifications.

The buttons LOAD SCHEDULE and SAVE SCHEDULE give access to a list of operation templates that can be created, arranged and deleted by the end user. The position of the highlighted entry can be changed by means of the buttons ↑ and ↓. The button X is used to delete the highlighted entry. To re-name an entry just select it from the list and enter a new name.

The button PRINT SCHEDULE is used to provide a hard copy of the current list of unlock and activating pressures on your printer.

The button EXPORT SCHEDULE is used to store the current list of unlock and activating pressures in an ASCII-file.

The button ACTIVATE resp. DEACTIVATE is used to switch ON (=ACTIVE) or OFF (=INACTIVE) the Underwater Unit in offline mode.

VIEWER MODULE

To view disk files of previous operations OceanLab 3 offers the VIEWER MODULE. It is accessible via the button OPEN FILE inside the toolbar or menu item OPEN FILE inside the FILE menu. The 6 previous data files are accessible by menu item LAST FILES inside the FILE menu.

The VIEWER MODULE can only be started when no session or simulation is active and no file is opened inside OceanLab 3.

The VIEWER MODULE incorporates program windows identical to the MONITORING MODE.

The following additional feature is implemented into the GRAPHS WINDOW of the VIEWER MODULE: To mark a point of interest the time-depending graph offers a vertical red marking line. This marking line can be moved via drag-and-drop (left mouse button) or ← and → keys of the keyboard (use STRG- resp. CTRL-key of the keyboard to increase the step size).

No.	Pressure	State
Bottle 1	2400.0 dbar	open

EXPORT DATA

The data files created by OceanLab 3 are stored at the PC in binary format. To export physical data of complete binary files in ASCII-format for use with current word-processing, spreadsheet and data base software please use item DATA of the EXPORT menu inside the FILE menu.

The LOGFILE EDITOR comments will be incorporated into the export files.

EXPORT ZOOMED DATA

With active time-depending graph an additional menu item ZOOMED DATA is enabled. It allows to export physical data files in ASCII format of the time interval currently visible inside the GRAPHS window.

PRINT GRAPH

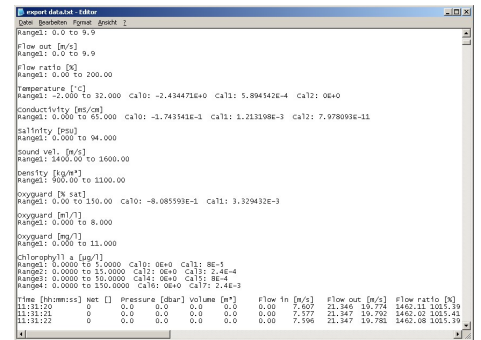
All printers available inside the actual PC configuration can be used to create a hardcopy of the graph as currently visible inside the GRAPHS window. Please use item GRAPH of the PRINT menu inside the FILE menu.

PRINT DATA

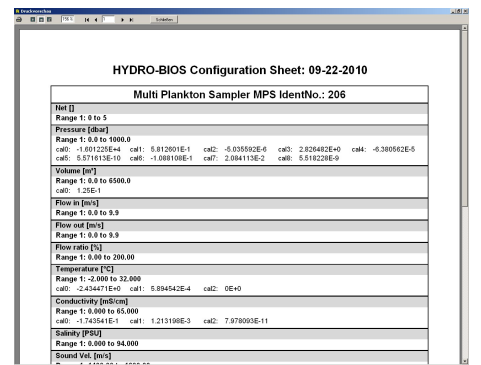
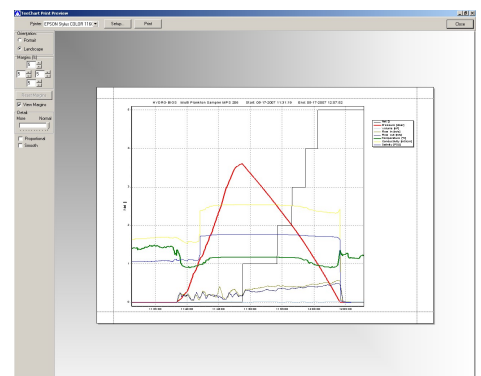
All printers available inside the actual PC configuration can be used to print the complete physical data file as tabulated list. Please use item DATA of the PRINT menu inside the FILE menu.

PRINT CONFIGURATION

All printers available inside the actual PC configuration can be used to print the actual configuration of the HYDRO-BIOS system (including the complete set of calibration coefficients). Please use item CONFIGURATION of the PRINT menu inside the FILE menu.



```
Export Data List Editor
Date: 09/22/2010 10:10:10
Range: 0.0 to 9.9
Flow out [m/s]
Range: 0.0 to 9.9
Flow ratio [%]
Range: 0.00 to 200.00
Temperature [°C]
Range: -2.000 to 32.000 cal0: -2.434471E+0 cal1: 5.894542E-4 cal2: 0E+0
Conductivity [µS/cm]
Range: 0.000 to 65.000 cal0: -1.743541E-1 cal1: 1.213108E-3 cal2: 7.978003E-11
Salinity [PSU]
Range: 0.000 to 94.000
Sound vel. [m/s]
Range: 1400.00 to 1500.00
Density [kg/m³]
Range: 900.00 to 1100.00
Oxygen [mg/l]
Range: 0.00 to 110.00 cal0: -8.085593E-1 cal1: 3.329432E-3
Oxygen [mg/l]
Range: 0.000 to 8.000
Chlorophyll a [µg/l]
Range: 0.000 to 1.000 cal0: 0E+0 cal1: 8E-1
Range: 0.000 to 15.000 cal0: 0E+0 cal1: 2.4E-4
Range: 0.000 to 10.000 cal0: 0E+0 cal1: 8E-4
Range: 0.000 to 150.000 cal0: 0E+0 cal1: 3.4E-3
Time [hh:mm:ss] net [ ] Pressure [dbar] Volume [m³] Flow In [m/s] Flow Out [m/s] Flow Ratio [%]
11:11:11 0 0.0 0.0 0.0 0.0 0.00 0.00 21.246 10.792 5402.11 1015.19
11:11:12 0 0.0 0.0 0.0 0.0 0.00 7.777 21.147 10.792 5402.08 1015.41
11:11:13 0 0.0 0.0 0.0 0.0 0.00 7.596 21.147 10.792 5402.08 1015.19
```



HYDRO-BIOS Configuration Sheet: 09-22-2010			
Multi Plankton Sampler MPS IdentNo.: 206			
Time [s]	Range 1: 0 to 5		
Pressure [dbar]	Range 1: 0.0 to 1000.0		
	cal0: -1.691232E+4	cal1: 6.812601E-1	cal2: -5.035592E-6
	cal3: 2.826482E+0	cal4: -6.380562E-5	cal5: -5.071813E-10
	cal6: -1.080108E-1	cal7: 2.084132E-2	cal8: 5.618228E-9
Volume [m³]	Range 1: 0.0 to 6500.0		
	cal0: 1.25E-1		
Flow In [m/s]	Range 1: 0.0 to 9.9		
Flow out [m/s]	Range 1: 0.0 to 9.9		
Flow ratio [%]	Range 1: 0.00 to 200.00		
Temperature [°C]	Range 1: -2.000 to 32.000		
	cal0: -2.434471E+0	cal1: 5.894542E-4	cal2: 0E+0
Conductivity [µS/cm]	Range 1: 0.000 to 65.000		
	cal0: -1.743541E-1	cal1: 1.213108E-3	cal2: 7.978003E-11
Salinity [PSU]	Range 1: 0.000 to 94.000		
Sound Vel. [m/s]	Range 1: 1400.00 to 1500.00		

IMPACT PROTECTION CAGES

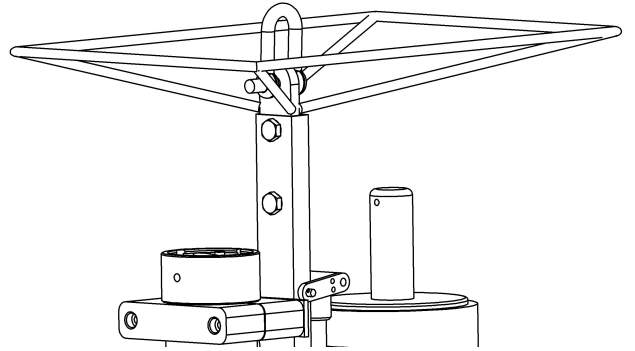
Impact protection for sampler and release device is made by two dismountable cages on top and bottom side of the instrument. Simply remove the cages when the instrument shall be mounted to an ROV, lander or any other protective structure.

REMOVAL

To remove the impact protection cages the following steps have to be carried out:

1. Unscrew the hexagon head screws at top and bottom protection cage. Mind the washers below the screw heads. Tool: Spanner 17mm
2. Extract the flats of the protection cages from the stainless steel rack.

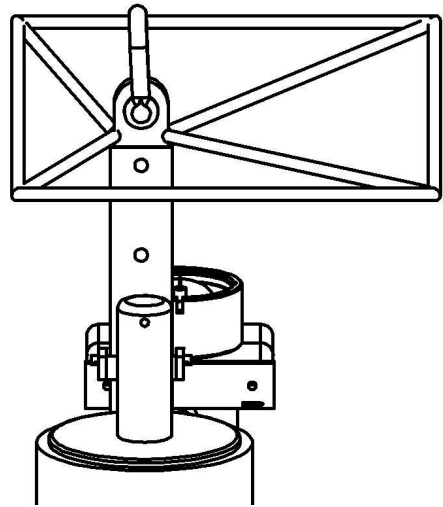
In this condition the SINGLE FIRE MODULE can be mounted to lander arrays, ROVs or any other underwater structure.



MOUNTING

To mount the impact protection cages the following steps have to be carried out:

1. Slide the flats of top and bottom protection cage into the stainless steel rack. Mind the dissymmetric design of the protection cages!
2. Fix top and bottom protection cage by using the hexagon head screws (M10 x 16) and the corresponding washers. Tool: Spanner 17mm
3. Mount a 10mm shackle to the suspension eye of the bottom protection cage in case you want to add an additional bottom weight to the SINGLE FIRE MODULE.



REMOVAL AND MOUNTING INSTRUCTIONS FOR THE MOTOR

When the motor of the SINGLE FIRE MODULE has to be removed for repair resp. maintenance, the following steps have to be carried out:

REMOVAL

1. Remove any cable from connector MC BH 5 F at the Motor Unit.
2. Place dummy MC DC 5 M on connector MC BH 5 F.
3. Loosen both hexagon socket screws M 6 of the black motor clamp.
Tool: Hexagon Socket Screw Key 5 mm
4. Pull complete Motor Unit out of the motor clamp.

MOUNTING

The Underwater Unit does only work properly, when the synchronization between motor and gearing has been established. In order to re-establish the synchronization before mounting, the following steps have to be carried out:

1. Connect the SINGLE FIRE MODULE to the Hand Unit.
2. Activate SINGLE FIRE MODULE by Hand Unit control once.
The motor is synchronized and ready for re-mounting.
3. Remove connecting cable from connector MC BH 5 F at the Motor Unit.
4. Place dummy MC DC 5 M on connector MC BH 5 F.
5. Guide Motor Unit into motor clamp until release device rests against motor clamp.
6. Align slit of the release device in the direction of the rope at the striking bar.
7. Tighten both hexagon socket screws M 6 of the black motor clamp.
Tool: Hexagon Socket Screw Key 5 mm

REPLACEMENT OF ACCUMULATORS

The LiFePO₄ power pack is fully integrated into the Motor Unit of the SINGLE FIRE MODULE. This leads to the fact that a replacement by the end user is not possible.

The Motor Unit of the SINGLE FIRE MODULE has to be returned to our factory for power pack replacement when the accumulators have reached their end of life.

