SEA-BIRD SCIENTIFIC

User manual

ECO puck user manual

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541-929-5650
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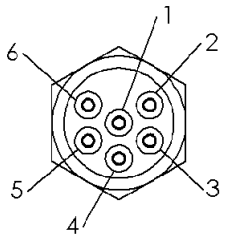
Section 1 Specifications

1.1 Mechanical

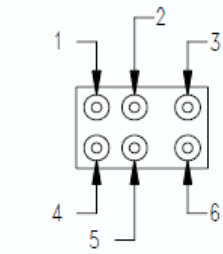
There are many different sizes of *ECO* pucks. The most common are specified below.

Diameter	Length	Depth rating	Temperature range	Weight in air, water
6.30 cm	5.683 cm	600 m	0–30 °C	0.235 kg, 0.235 kg
6.937 cm	5.147 cm			0.261 kg, 0.261 kg
7.62 cm	5.72 cm	600 m 1000 m		0.282 kg, 0.282 kg

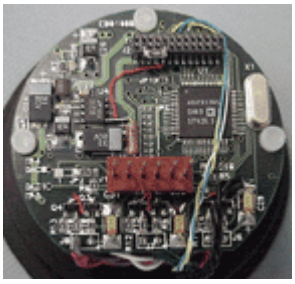
1.1.1 Standard bulkhead connector

Contact	Function	MCBH-6-MP connector
1	Ground	
2	RS232 RX	
3	Reserved	
4	Voltage in	
5	RS232 TX	
6	Reserved	

1.1.1.1 Optional connector

Contact	Function	LPMBH-6-MP connector
1	Ground	
2	RS232 RX	
3	Reserved	
4	Voltage in	
5	RS232 TX	
6	Reserved	

1.1.1.2 Optional Molex

Contact	Function	Internal Molex connector
1	Reserved	
2	Voltage in	
3	RS232 TX	
4	RS232 RX	
5	Reserved	
6	Ground	

1.2 Electrical

Input	Current draw	Linearity
7–15 VDC	60 mA	99%

1.3 Communication

Sample rate	Output rate	Output maximum	Output resolution
to 4 Hz	19200 baud	4130 ±30 counts	12 bit

1.4 Optical

Note: The manufacturer has changed the nomenclature for the output of all dissolved organic matter fluorometers. Fluorescent dissolved organic matter (FDOM) replaces colored dissolved organic matter (CDOM). FDOM aligns the fluorescence measurement with the output description.

1.4.1 Single-parameter fluorometer

Parameter	Wavelength EX/EM	Range, Sensitivity
Chlorophyll (Chl)	470/695 nm	0–125, 0.016 µg/L
Fluorescent Dissolved Organic Matter (FDOM)	370/460 nm	0–500, 0.093 ppb
Uranine (UR)	470/530 nm	0–400, 0.05 ppb
Phycocyanin (PC)	630/680 nm	0–230, 0.029 ppb
Phycoerythrin (PE), Rhodamine (Rh)	520/595 nm	0–230, 0.029 ppb

1.4.2 Single-parameter scattering

Parameter	Wavelength	Range, Sensitivity
Scattering	470 nm, 532 nm, 650 nm	0–5, 0.003 m^{-1}
	700 nm	0–3, 0.002 m^{-1}
		0–5, 0.003 m^{-1}

1.4.3 Two-parameter fluorometer-turbidity

Parameter	Wavelength EX/EM	Range, Sensitivity (chl)	Parameter	Wavelength	Range, Sensitivity (NTU)
Chlorophyll	470/695 nm	0–30, 0.015 µg/L 0–50, 0.025 µg/L 0–75, 0.037 µg/L 0–125, 0.062 µg/L 0–250, 0.123 µg/L	Turbidity	700 nm	0–10, 0.005 NTU 0–25, 0.013 NTU 0–200, 0.098 NTU 0–350, 0.172 NTU 0–1000, 0.123 NTU

1.4.4 Three-parameter fluorometer and scattering

Parameter	Wavelength EX/EM	Range, Sensitivity
Chlorophyll (Chl)	470/695 nm	0–30, 0.015 µg/L
		0–50, 0.025 µg/L
Fluorescent Dissolved Organic Matter (FDOM)	370/460 nm	0–375, 0.184 ppb
Uranine (UR)	470/530 nm	0–300, 0.073 ppb
Phycocyanin (PC)	630/680 nm	0–175, 0.086 ppb
Phycoerythrin (PE), Rhodamine (Rh)	520/595 nm	0–175, 0.086 ppb

Parameter	Wavelength	Range, Sensitivity
Scattering	412 nm, 470 nm, 532 nm, 650 nm, 880 nm	0–5, 0.003 m^{-1}
	700 nm	0–3, 0.002 m^{-1}
		0–5, 0.003 m^{-1}

2.1 Verify sensor operation

⚠WARNING

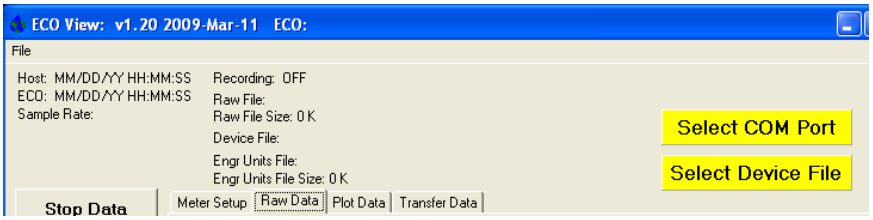
FDOM sensors use an ultraviolet LED light source. Do not look directly at a UV LED when it is on. It can damage the eyes. Keep products that have UV LEDs away from children, pets, and other living organisms. Wear polycarbonate UV-resistant safety glasses to protect the eyes when a UV LED is on.

⚠CAUTION

Do not supply more than 15 VDC to the sensor. More than 15 VDC will damage the wiper.

Make sure that the sensor operates before further setup and deployment.

1. Connect the 6-contact connector on the optional test cable (refer to the section on the test cable for details) to the sensor.
2. Remove the cap that protects the optical face of the sensor.
3. Connect a serial-to-USB adapter to the test cable to connect the test cable to the PC.
4. Connect the sensor to a power supply:
   - Connect sensors with internal batteries to the manufacturer-supplied, three-contact, blue-tipped power connector. The sensor comes on.
   - Connect sensors without internal batteries to the optional test cable and a regulated power supply set at 12 VDC.
5. Start the software from the manufacturer-supplied CD.
   a. Select the COM port on the PC.
   b. Select the device file for the sensor from the CD.
   c. Select the baud rate if necessary. The default is 19200.



6. Turn on the power supply.
   The sensor comes on.
7. Push **Start Data**.
8. Go to the *Raw Data* tab of the software.
   The data collected by the sensor shows in the "Signal" column.

Figure 1 Format of data collected by real-time sensors

99/99/99	99:99:99	695	42	700	264	460	51
99/99/99	99:99:99	695	43	700	260	460	55
99/99/99	99:99:99	695	41	700	257	460	64
99/99/99	99:99:99	695	37	700	255	460	62
99/99/99	99:99:99	695	39	700	258	460	50
99/99/99	99:99:99	695	44	700	262	460	53
99/99/99	99:99:99	695	49	700	259	460	58
			Wave-length	Signal	Wave-length	Signal	Wave-length	Signal

Note that RT and puck sensors show 9's instead of the Date and the Time.

9. Look at the maximum data value for the sensor. Hold a finger, the protective cap, or fluorescent stick if the sensor is a fluorometer, 1–4 cm away from the optical face of the sensor.

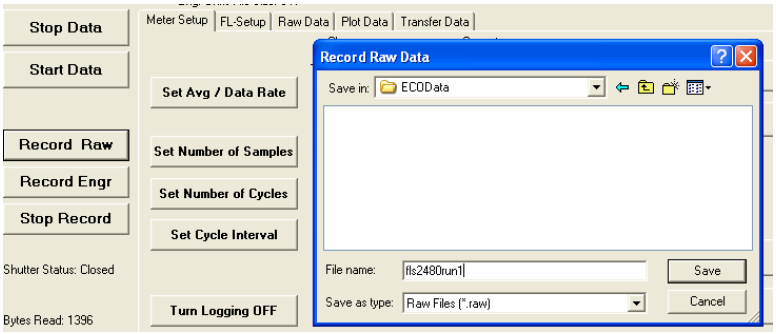
The data value in the "Signal" column in the *Raw Data* tab will increase toward the maximum data value specified for the sensor.

- Scattering and turbidity sensors: use a finger or the protective cap.
- FDOM sensors: use the blue fluorescent stick.
- Chlorophyll or phycoerythrin sensors: use the orange fluorescent stick.
- Uranine or phycocyanin sensors: use the yellow fluorescent stick.
- PAR sensors: point the sensor into the light.

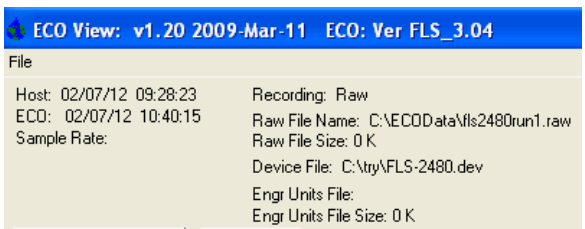
10. Push **Stop Data**.
    The Bio-wiper closes on sensors so-equipped. If the power is turned off in mid-cycle, the Bio-wiper starts at the beginning of the cycle when power is supplied again.

2.2 Save data to PC

To save data to the PC in counts, push **Record Raw**. To save data in engineering units, push **Record Engr**. Data collected by the sensor is saved in real-time to the PC.



1. Push **Record Raw**.
   The *Record Raw Data* window shows in the software.
2. Select a location on the PC to store the data.
3. Type a file name.
4. Push **Save**.
5. Push **Record Engr**.
   The *Record Engineering Data* window shows in the software.
6. Select a location on the PC to store the data.
7. Type a file name.
8. Push **Save**.
9. Make sure the PC is configured to save data.
   - The file names from step 3 and step 7 will show in the software.



10. Push **Start Data**.
    The software will show the PC file sizes.

2.3 Monitor data

Monitor the data from the sensor in counts. The number of "Signal" or columns of data will vary depending on whether the user has a one-, two-, or three-parameter sensor.

1. Make sure the sensor has power supplied and is on.
2. Push **Start Data**.
3. Go to the *Raw Data* tab to see the data that is collected by the sensor.
   Refer to the Verify sensor operation on page 7 illustration to see the format of the data.
   Note: *RT and puck sensors usually show 9's as placeholders in the date and time columns.*

2.4 Set up puck for deployment

1. Refer to the previous section to make sure that the sensor operates correctly.
2. Replace the test cable with a sea cable for deployment.
3. Remove the protective cap from the sensor if necessary.
4. Make sure that the sensor has a power source.

2.5 Sensor maintenance

⚠CAUTION

Do not use acetone or other solvents to clean any part of the sensor.

1. After each cast or exposure to natural water, flush the sensor with clean fresh water.
2. Use soapy water to clean any grease or oil on the optical face of the sensor. It is made of ABS plastic and optical epoxy and can be damaged if an abrasive cleaner is used.
3. Dry the sensor with a clean soft cloth.

2.5.1 Bulkhead connector maintenance

⚠CAUTION

Do not use WD-40® or petroleum-based lubricants on bulkhead connectors. It will cause damage to the rubber.
Damaged connectors can cause a loss of data and additional costs for service.

Damaged connectors can cause damage to the sensor and make it unserviceable.

Examine, clean, and lubricate bulkhead connectors at regular intervals. Connectors that are not lubricated increase the damage to the rubber that seals the connector contacts. The incorrect lubricant will cause the bulkhead connector to fail.

1. Apply isopropyl alcohol (IPA) as a spray or with a nylon brush or lint-free swab or wipes to clean the contacts.
2. Flush with additional IPA.
3. Shake the socket ends and wipe the pins of the connectors to remove the IPA.
4. Blow air into the sockets and on the pins to make sure they are dry.
5. Use a flashlight and a magnifying glass to look for:

Cracks, scratches, or other damage on the rubber pins or in the sockets.	
Any corrosion.	 
Separation of the rubber from the pins.	
Swelled or bulging rubber pins.	

6. Apply a small quantity of 3M™ Spray Silicone Lubricant (3M ID# 62-4678-4930-3) to the pin end of the connector. Make sure to let it dry.
7. Connect the connectors.
8. Use a lint-free wipe to clean any unwanted lubricant from the sides of the connectors.

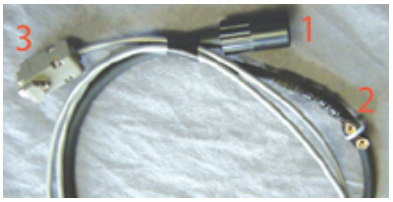
Section 3 Reference

3.1 Delivered items

- the *ECO* sensor
- a dummy connector and lock collar
- blue-tipped power connector and lock collar for sensors with internal batteries
- a plastic protective cover for the optical face
- a model-specific spare parts kit
- **On the CD:**
- this user manual
- the software
- the device file or files for the sensor
- the characterization or calibration page for the sensor.

3.1.1 Test cable

Use a test cable to set up and test the sensor before deployment.



1 six-contact connector	**3** db-9 serial port connector
2 9-volt battery connector	

1. Connect the six-contact connector into the sensor.
2. Connect the 9-volt connector to a 9-volt battery. As an alternative, it can be connected to a regulated power supply.
3. Connect the db-9 connector to the PC. Use a USB-to-RS232 adapter cable if necessary.

3.2 Calibration

The manufacturer calibrates all scattering sensors to make sure that the data that is collected meets the specifications for the sensor. This information is on the sensor-specific calibration page that comes with the sensor.

3.3 Characterization

The manufacturer uses a fluorescent material to characterize all fluorescence sensors to make sure that the data that is collected meets the specifications of the sensor. This information is on the sensor-specific characterization page that comes with the sensor.

3.4 Terminal program operation

Use Windows HyperTerminal®, Tera Term, or other terminal program as an alternative to the manufacturer-supplied software to operate sensors.

baud rate: 19200	stop bits: 1	data bits: 8	flow control: none	parity: none

3.4.1 Common terminal program commands

Command	Parameters	Description
!!!!!	none	Stops the data collected by the sensor. Lets the user to enter setup values. If the sensor is in a low-power mode, turn the power supply off for one minute, then turn the power on and push the "!" key 5 or more times.
$ave	1–255	The number of measurements that make up each row of collected data.
$mnu	—	Prints the menu of setup values to the PC screen.
$pkt	0–65535	Sets the number of rows of data that are collected between the specified time intervals.
$rls	none	Gets the settings from the flash memory.
$run	—	Uses the current setup values to operate.
$sto	—	Saves the desired setup values to the flash memory.

Section 4 General information

Revised editions of this user manual are on the manufacturer's website.

4.1 Warranty

This sensor is warranted against defects in materials and workmanship for one year from the date of purchase. The warranty is void if the manufacturer finds the sensor was abused or neglected beyond the normal wear and tear of deployment.

4.2 Service and support

The manufacturer recommends that sensors be sent back to the manufacturer annually to be cleaned, calibrated, and for standard maintenance.
Refer to the website for FAQs and technical notes, or contact the manufacturer for support at support@seabird.com.

Do the steps below to send a sensor back to the manufacturer.

1. Complete the online Return Merchandise Authorization (RMA) form or contact the manufacturer.
   Note: *The manufacturer is not responsible for damage to the sensor during return shipment.*
2. Remove all batteries from the sensor.
3. Remove all anti-fouling treatments and devices.
   Note: *The manufacturer will not accept sensors that have been treated with anti-fouling compounds for service or repair. This includes AF 24173 devices, tri-butyl tin, marine anti-fouling paint, ablative coatings, etc.*
4. Use the sensor's original ruggedized shipping case to send the sensor back to the manufacturer.
5. Write the RMA number on the outside of the shipping case and on the packing list.
6. Use 3rd-day air to ship the sensor back to the manufacturer. Do not use ground shipping.
7. The manufacturer will supply all replacement parts and labor and pay to send the sensor back to the user via 3rd-day air shipping.

4.3 Waste electrical and electronic equipment

Electrical equipment that is marked with this symbol may not be disposed of in European public disposal systems. In conformity with EU Directive 2002/96/EC, European electrical equipment users must return old or end-of-life equipment to the manufacturer for disposal at no charge to the user. To recycle, please contact the manufacturer for instructions on how to return end-of-life equipment, manufacturer-supplied electrical accessories, and auxiliary items for proper disposal.

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