

Single-Angle Scattering Meter

ECO BB

WET Labs manufactures a line of optical tools for determination of bio-optical and physical parameters within natural waters. These instruments are designed as a modular suite of sensors with special features for specific application support. The *Environmental Characterization Optics (ECO)* series incorporates a common set of options with a single basic design to make the sensors ideal for a wide variety of deployments. Features include:

- Compact size
- Optional integrated anti-fouling
- Integrated self-logging
- High precision and stability
- Configurable output

WET Labs, Inc. produces a single-angle sensor for determination of optical backscattering. Based upon recent work by Drs. Emmanuel Boss and Scott Pegau of Oregon State University*, the ECO BB measures scattering at 117 degrees. This angle was determined as a minimum convergence point for variations in the volume scattering function (VSF) induced by suspended materials and water itself. As a result the signal measured by this meter is less determined by the type and size of the materials in the water, and is more directly correlated to the concentration of the materials. Conversely, the meter provides unparalleled accuracy for any single-angle measurement, in determining the optical backscattering coefficient—an important parameter for remote sensing and in many in-water bio-optical applications.



* E. Boss and W. S. Pegau, "Relationship of light scattering at an angle in the backward direction to the backscattering coefficient," *Applied Optics*. **40**(30):5503–5507 (2001).



Model	BB(RT)	BB(RT)D	BB	BBB	BBS	BBSB
Mechanical						
Diameter	2.48 in (6.3 cm)	2.48 in (6.3 cm)	2.48 in (6.3 cm)	2.48 in (6.3 cm)	2.48 in (6.3 cm)	2.48 in (6.3 cm)
Length	5.0 in (12.7 cm)	7.0 in (17.8 cm)	5.0 in (12.7 cm)	10.0 in (25.4 cm)	5.25 in (13.3 cm)	10.25 in (26.0 cm)
Weight in air	0.9 lbs (0.4 kg)	2.86 lbs (1.3 kg)	0.9 lbs (0.4 kg)	2.1 lbs (0.96 kg)	1.1 lbs (0.5 kg)	2.1 lbs (0.96 kg)
Weight in water	0.05 lbs (0.02 kg)	1.66 lbs (0.75 kg)	0.05 lbs (0.02 kg)	0.3 lbs (0.14 kg)	0.19 lbs (0.08 kg)	0.3 lbs (0.14 kg)
Pressure housing	Acetron	Titanium	Acetron	Acetron	Acetron	Acetron
Environmental						
Temperature range	0–30 deg C	0–30 deg C	0–30 deg C	0–30 deg C	0–30 deg C	0–30 deg C
Depth rating	600 m	6000 m	600 m	600 m	300 m	300 m
Temperature/pressure sensor (optional)	Y	Y	Y	Y	Y	Y
Electrical						
Digital output resolution	12 bit	12 bit	12 bit	12 bit	12 bit	12 bit
Analog output signal	0–5 V	0–5 V	0–5 V	0–5 V	0–5 V	0–5 V
Internal data logging	N	Y	Y	Y	Y	Y
Internal batteries	N	N	N	Y	N	Y
Connector	MCBH6M	MCBH6M	MCBH6M	MCBH6M	MCBH6M	MCBH6M
Input	7–15 VDC	7–15 VDC	7–15 VDC	7–15 VDC	7–15 VDC	7–15 VDC
Current, typical	80 mA	80 mA	80 mA	80 mA	80 mA	80 mA
Current, sleep	--	--	85 μ A	85 μ A	85 μ A	85 μ A
Data memory	--	--	1 MB (65,000 samples)	1 MB (65,000 samples)	1 MB (65,000 samples)	1 MB (65,000 samples)
Sample rate	to 10 Hz	to 10 Hz	to 10 Hz	to 10 Hz	to 10 Hz	to 10 Hz
RS-232 output	19200 baud	19200 baud	19200 baud	19200 baud	19200 baud	19200 baud
Anti-fouling bio-wiper™	N	N	N	N	Y	Y
Bio-wiper™ cycle	--	--	--	--	110 mA	110 mA
Optical						
Wavelength	470, 530, or 660 (880 optional) nm	470, 530, or 660 (880 optional) nm	470, 530, or 660 (880 optional) nm	470, 530, or 660 (880 optional) nm	470, 530, or 660 (880 optional) nm	470, 530, or 660 (880 optional) nm
Resolution, blue	$4.1 \times 10^{-5} \text{ m}^{-1} \text{ sr}^{-1}$	$4.1 \times 10^{-5} \text{ m}^{-1} \text{ sr}^{-1}$	$4.1 \times 10^{-5} \text{ m}^{-1} \text{ sr}^{-1}$	$4.1 \times 10^{-5} \text{ m}^{-1} \text{ sr}^{-1}$	$4.1 \times 10^{-5} \text{ m}^{-1} \text{ sr}^{-1}$	$4.1 \times 10^{-5} \text{ m}^{-1} \text{ sr}^{-1}$
Resolution, green	$5.6 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$5.6 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$5.6 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$5.6 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$5.6 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$5.6 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$
Resolution, red	$2.1 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$2.1 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$2.1 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$2.1 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$2.1 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$	$2.1 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$
Sensitivity, (min)	0.005 m^{-1} @ 1Hz	0.005 m^{-1} @ 1Hz	0.005 m^{-1} @ 1Hz	0.005 m^{-1} @ 1Hz	0.005 m^{-1} @ 1Hz	0.005 m^{-1} @ 1Hz
Linearity	99% R^2	99% R^2	99% R^2	99% R^2	99% R^2	99% R^2

ECO BB(RT)—Provides analog or RS-232 serial output with 4,000-count range. This unit provides continuous operation when power is supplied.

ECO BB(RT)D—Provides the capabilities of the BB(RT) with 6,000-meter depth rating.

ECO BB—Provides the capabilities of the BB(RT) with periodic sampling.

ECO BBB—Provides the capabilities of the BB with internal batteries for autonomous operation.

ECO BBS—Provides the capabilities of the BB with an integrated anti-fouling *bio-wiper*™.

ECO BBSB—Provides the capabilities of the BBS with internal batteries for autonomous operation.

Specifications subject to change without notice.

ECO BB

Specifications Sheet

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Revision History

Revision	Date	Revision Description	Originator
A	11/02/01	New Spec Sheet (DCR 158)	C. Moore
B	11/16/01	Correct reference to shuttered unit (DCR 163)	H. Van Zee
C	11/28/01	Add ABB Deep unit (DCR 165)	J. Kitchen
D	03/13/02	Add DMSB unit (DCR 200)	H. Van Zee
E	04/10/02	Correct logging and output specs (DCR208)	J. Kitchen
F	05/01/02	Change references from SM to BB (DCR 219)	H. Van Zee
G	07/08/02	Add internal battery option to spec table (DCR 228)	H. Van Zee
H	10/15/02	Update specifications (DCR 248)	H. Van Zee
I	11/12/02	Add analog capabilities to (RT) model (DCR 254)	I. Walsh
J	02/24/03	Change "shutter" to "bio-wiper™" (DCR 280)	H. Van Zee
K	03/10/03	Correct BBD to BB(RT)D (DCR 287)	A. Derr
K1	9/10/03	Update specifications	H. Van Zee
L	11/24/03	Finalize updated specifications (DCR 338)	H. Van Zee