



Environmental Analysis Program

Pomona College
Biogeochemistry Laboratory

SOP-F200

Eureka Manta2 Multiprobe for Water Quality Testing

Standard Operating Procedure

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Table of contents

1 Purpose	2
2 Scope	2
3 Responsibilities	2
3.1 Required Training	2
4 Definitions	2
5 Safety and Hazards	3
5.1 Required PPE	3
6 Equipment and Materials	4
7 Procedure	4
7.1 Startup	4
7.2 Calibration	4
7.2.1 pH	4
7.2.2 Conductivity	4
7.2.3 Dissolved Oxygen (HDO)	5
7.3 Field Measurement	5
7.4 Disconnecting	5
8 Post-Field Procedures	5
8.1 Cleaning the Probe	5
8.2 Downloading Data	5
8.3 Charging	5
9 Quality Control	6
10 Troubleshooting	6
11 References	6
12 Related SOPs	6
13 Training Record	7

1. Purpose

This SOP describes the procedures for calibrating, operating, and maintaining the Eureka Manta2 Sub2 Multiprobe for water quality measurements including temperature, pH, depth, conductivity, and dissolved oxygen (mg/L and % saturation) (APHA et al., 2012; Eureka Environmental Engineering, 2018).

2. Scope

- **Applies to:** Water quality measurements in lakes, streams, rivers, and other surface water bodies
- **Does not apply to:** Groundwater monitoring wells (requires different deployment procedures); laboratory bench-top water analysis
- **Location:** All EA Program field water sampling sites

3. Responsibilities

Role	Responsibility
Lab PI	Approve protocol, ensure training compliance
Field Lead	Verify calibration before deployment, coordinate logistics
Trained Personnel	Calibrate, operate, and clean the probe per this SOP
New Students	Complete training before independent use

3.1. Required Training

Researchers using this SOP should be trained on [SOP-F001 Field Safety](#).

4. Definitions

- **Amphibian 2:** The ruggedized handheld field computer (portable PC) manufactured by Eureka that controls the Manta2 probe, displays real-time readings, stores data snapshots, and connects to the probe via the underwater cable (Eureka Environmental Engineering, 2018).
- **Barometric pressure:** Atmospheric pressure at the measurement location, expressed in mm Hg; required as an input for dissolved oxygen calibration because oxygen solubility decreases with decreasing pressure (increasing altitude) (APHA et al., 2012).
- **Calibration:** The process of adjusting sensor readings to match known reference standards before field use; required before every field outing to ensure data accuracy (Eureka Environmental Engineering, 2018).

- **Conductivity (specific conductance, spCond):** A measure of a water sample's ability to conduct electrical current, expressed in $\mu\text{S}/\text{cm}$ or mS/cm ; proportional to the concentration of dissolved ions; temperature-corrected to 25 °C for comparability across sites and seasons (APHA et al., 2012).
- **Dissolved oxygen (DO):** The concentration of oxygen dissolved in water, expressed as mg/L or percent saturation (%sat); measured by the HDO sensor using luminescent optical technology; decreases with increasing temperature, salinity, and altitude (APHA et al., 2012).
- **HDO (Handheld Dissolved Oxygen):** The luminescent optical dissolved oxygen sensor on the Manta2; measures both %sat and mg/L; calibrated in water-saturated air or with an air-saturated water standard (Eureka Environmental Engineering, 2018).
- **PDOP (Position Dilution of Precision):** A dimensionless measure of GPS accuracy based on satellite geometry; lower values indicate better positional accuracy; values below 3 are acceptable for most field applications.
- **Reference electrode:** The electrochemical half-cell that provides a stable reference potential for pH measurement; requires periodic refilling with reference electrolyte to maintain accurate pH readings (Eureka Environmental Engineering, 2018).
- **Sensor Response Factor (SRF):** A calibration diagnostic value indicating how the sensor responded to the reference standard; acceptable ranges are sensor-specific and indicate whether calibration was successful (Eureka Environmental Engineering, 2018).
- **Snapshot:** A single instantaneous record of all sensor readings captured and stored by the Amphibian at a specific date, time, and GPS location.
- **Sonde (probe):** The cylindrical instrument body of the Manta2 that houses all sensors (temperature, pH, conductivity, dissolved oxygen, and reference electrode) and is submerged during measurements (Eureka Environmental Engineering, 2018).

5. Safety and Hazards

Hazards

- **Biological/Chemical:** Water bodies may be contaminated; avoid ingestion and direct skin contact.
- **Physical:** Slippery surfaces near water; risk of submersion; electrical components near water.
- **Chemical:** pH standards (pH 4, 7, 10) and conductivity standard are mild irritants.

5.1. Required PPE

- ☐ Nitrile or latex gloves
- ☐ Water shoes or wading boots (if entering the water)
- ☐ Safety glasses (during calibration with standards)
- ☐ Sun protection (hat, sunscreen)

Refer to [SOP-F001 Field Safety](#) for general field safety, transportation, and emergency response.

6. Equipment and Materials

Item	Notes
Eureka Manta2 Sub2 Sonde	Inspect sensors before each use
Amphibian 2 field computer	Ensure fully charged (Eureka Environmental Engineering, 2018)
Underwater cable	Inspect for damage before use
pH 4, 7, and 10 standard solutions	For pH calibration; check expiration dates
Conductivity standard	Appropriate concentration for expected range
Deionized water	For rinsing sensors between calibration steps
Storage/calibration cup	Filled with tap water for storage
Field notebook	Per SOP-F003

7. Procedure

7.1. Startup

1. Connect the underwater cable to both the sonde and the Amphibian.
2. Power on the Amphibian.
3. Open the **Amp_2_2_6** app (or press **P1** shortcut).
4. Allow sensors to stabilize for 5–10 minutes before calibration.

7.2. Calibration

Calibrate before every field outing (APHA et al., 2012; Eureka Environmental Engineering, 2018). Record all calibration data (SRF values, standard concentrations, date, operator) in the field notebook.

7.2.1. pH

1. Remove the storage cup. Rinse sensors with DI water.
2. Submerge the sonde in pH 7 standard. Select **Calibrate > pH** and follow the on-screen prompts.
3. Rinse with DI water. Submerge in pH 4 standard. Accept the second calibration point.
4. (Optional) Verify with pH 10 standard. Record the SRF (acceptable range: 95–105).

7.2.2. Conductivity

1. Rinse sensors with DI water.
2. Submerge in the appropriate conductivity standard.
3. Select **Calibrate > Conductivity**. Enter the standard value and accept (Eureka Environmental Engineering, 2018).
4. Record the SRF (acceptable range: 110–120).

7.2.3. Dissolved Oxygen (HDO)

1. Remove the sonde from the calibration cup. Allow the HDO sensor to equilibrate in water-saturated air for 2 minutes (sensor face moist but not submerged).
2. Enter the current barometric pressure in mm Hg.
3. Select **Calibrate > DO** and accept the 100% saturation calibration (Eureka Environmental Engineering, 2018).
4. Record the SRF (should equal 100%).

7.3. Field Measurement

1. Lower the sonde to the desired depth. Allow 1–2 minutes for readings to stabilize before recording.
2. Press **Snapshot** on the Amphibian to save readings. Record the snapshot ID, location, and notes in the field notebook.
3. For depth profiles, lower the sonde in 0.5 or 1 m increments, pausing 30–60 s at each depth (Eureka Environmental Engineering, 2018).

7.4. Disconnecting

1. Remove the probe from the water.
2. Disconnect the underwater cable from the probe.
3. Insert the blue storage plug.
4. Cover the cable end with the plastic protector.

8. Post-Field Procedures

8.1. Cleaning the Probe

1. Clean the probe with warm soapy water (liquid dish soap or mild household cleaner).
2. Clean sensor stems with a soft brush.
3. Rinse thoroughly with tap water.
4. Store sensors with tap water inside the cup.

8.2. Downloading Data

1. Connect the Amphibian to your PC using a USB cable.
2. A green window will appear with four options; select **File Management**.
3. In the next window, navigate to the hard drive, then select **My Documents**.
4. Locate the Excel document with your data.
5. Copy the file to your project data folder.

8.3. Charging

Return the Amphibian to its charging station after each field outing.

9. Quality Control

- Calibrate all sensors before every field outing (APHA et al., 2012; Eureka Environmental Engineering, 2018).
- Verify SRF values are within acceptable ranges; do not proceed if any sensor fails calibration.
- Record a post-deployment calibration check on return to the lab; if any sensor has drifted beyond acceptable limits, flag the data.
- Compare spot readings against an independent DO meter or multiprobe where possible; readings should agree within ± 0.3 mg/L for DO and ± 0.1 units for pH (APHA et al., 2012).

10. Troubleshooting

Problem	Solution
No power	Check the green LED on the Manta2; if off, the voltage is insufficient. Try another cable.
pH SRF out of range	Recalibrate with fresh standards. If still out of range, refill the reference electrolyte and contact the PI.
Conductivity SRF outside 110–120	Recalibrate. If still out of range, contact the PI.
HDO %sat SRF 100	Redo the calibration with freshly aerated water.
GPS not acquiring satellites	Ensure the top cap (antenna) is uncovered; move to an open area.

11. References

- Eureka Environmental Engineering (2018)
- APHA et al. (2012)

APHA, AWWA, & WEF. (2012). *Standard methods for the examination of water and wastewater* (22nd ed., p. 1360). American Public Health Association.

Eureka Environmental Engineering. (2018). *Manta2 water quality multiprobe: User manual*. <https://www.rshydro.co.uk/PDFs/Eureka/Manta2-manual.pdf>

12. Related SOPs

SOP	Title	Relationship
F001	Field Safety	Required prerequisite
F003	Field Notebook Protocols	Data recording
F209	Dissolved Oxygen Meter	Standalone DO companion
F307	Lake Profiling	Depth profile application

13. Training Record

Before using this instrument independently, personnel must:

1. Read this SOP in full
2. Complete [SOP-F001 Field Safety](#) training
3. Observe a trained operator perform calibration and field deployment
4. Perform a supervised calibration of all sensors
5. Perform a supervised field deployment with data collection
6. Be signed off by the field lead or PI