



Environmental Analysis Program

Pomona College
Biogeochemistry Laboratory

SOP-F204

HOBO Weather Station Deployment

Standard Operating Procedure

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1. Purpose

This SOP describes the deployment, programming, data retrieval, and maintenance of Onset HOBO pendant and MX-series data loggers used for unattended monitoring of air temperature, relative humidity, and light intensity at EA Program field sites. These compact loggers provide continuous microclimatic data for characterizing site conditions, supporting ecological studies, and supplementing manual weather observations (Onset Computer Corporation, 2023; World Meteorological Organization, 2018).

2. Scope

- **Applies to:** HOBO Pendant MX2201, MX2202 (temperature/light), HOBO MX2301 (temperature/RH), HOBO Pendant UA-002 (temperature/ light, legacy), and similar Onset loggers deployed at EA Program field sites
- **Does not apply to:** HOBO water level loggers (see [SOP-F203](#)); fixed, permanently installed weather stations managed by other departments; air quality sensors (see [SOP-F502](#))
- **Location:** All EA Program field sites

3. Responsibilities

Role	Responsibility
PI / Field Lead	Approve deployment plan and logging interval
Trained Personnel	Deploy, retrieve, and download loggers per this SOP
New Students	Complete training before independent use

4. Definitions

- **Bluetooth logging:** A wireless communication protocol used by MX-series HOBO loggers; enables programming and data download via the HOBObconnect smartphone app without cables; requires proximity (typically within 15 m of the logger) (Onset Computer Corporation, 2023).
- **Data gap:** A period within a logger deployment during which no data were recorded; caused by battery failure, logger reset, or memory overflow; must be documented in the project data log.
- **HOBObconnect:** The Onset smartphone app (iOS and Android) used to program, launch, and download data from Bluetooth-enabled MX-series HOBO loggers; requires the logger to be within Bluetooth range (Onset Computer Corporation, 2021).
- **HOBOWare:** The Onset desktop software used to program and download data from legacy UA-series HOBO loggers via optical USB coupler; also supports barometric compensation for water level loggers (Onset Computer Corporation, 2021).
- **Logging interval:** The time between successive measurements stored to the logger memory; typical intervals for EA Program deployments are 5 minutes (microclimatic studies) or 15 minutes (long-term monitoring); shorter intervals fill memory faster and require more frequent downloads (Onset Computer Corporation, 2023).
- **MX2301:** The Onset HOBO MX temperature and relative humidity logger; Bluetooth-enabled; ± 0.2 °C temperature accuracy and $\pm 2.5\%$ RH accuracy; internal memory stores 500,000 readings (Onset Computer Corporation, 2023).
- **Radiation shield:** A ventilated, white polypropylene housing that surrounds a temperature or RH logger and prevents direct solar radiation from inflating the measured air temperature; a radiation shield is mandatory for any logger exposed to sunlight (World Meteorological Organization, 2018).
- **Relative humidity (RH):** The ratio of the partial pressure of water vapor in air to the saturation vapor pressure at the same temperature, expressed as a percentage; values above

approximately 70% promote sensor drift in some sensor types (World Meteorological Organization, 2018).

- **Sensor drift:** A gradual, systematic change in sensor readings over time not attributable to true environmental change; detected by co-deployment with a reference sensor or comparison with a nearby weather station.

5. Safety and Hazards

Hazards

- **Physical:** Deployment may involve climbing, ladder use, or working on uneven terrain. Use a spotter when mounting loggers at height.
- **Environmental:** Heat exposure during summer deployments in Southern California. Carry adequate water and sun protection.
- **Wildlife:** Insects (bees, wasps), ticks, and snakes may be present at deployment sites.

5.1. Required PPE

- ☐ Closed-toed shoes or field boots
- ☐ Sun protection (hat, sunscreen)
- ☐ Nitrile gloves (when handling loggers at contaminated sites)

5.2. Emergency Procedures

Refer to [SOP-F001 Field Safety](#).

6. Instrument Specifications

Model	Parameters	Range	Accuracy	Memory	Communication
MX2201	Temp, light	-20 to 70 °C; 0–320,000 lux	±0.5 °C	96,000 readings	Bluetooth
MX2202	Temp, light (waterproof)	-20 to 70 °C	±0.5 °C	96,000 readings	Bluetooth
MX2301	Temp, RH	-40 to 70 °C; 0–100% RH	±0.2 °C; ±2.5% RH	500,000 readings	Bluetooth
UA- 002-64	Temp, light (legacy)	-20 to 70 °C	±0.53 °C	64,000 readings	Optical USB

(Onset Computer Corporation, 2023)

7. Equipment and Materials

Item	Notes
HOBO logger(s)	Confirm model and battery status
Radiation shield (RS3 or similar)	Required for temperature loggers exposed to direct sunlight (World Meteorological Organization, 2018)
Mounting hardware (cable ties, U-bolts, brackets)	For securing shield/logger to posts, trees, or tripods
Tripod or mounting post	If no suitable tree or structure available
Smartphone with HOBOnnect app	For Bluetooth-enabled MX loggers (Onset Computer Corporation, 2021)
Laptop with HOBOWare software	For legacy UA-series loggers (Onset Computer Corporation, 2021)
Optical USB coupler (for UA loggers)	For launching and downloading
Field notebook	For recording deployment metadata
GPS unit or smartphone	Per SOP-F006
Spare batteries	CR2032 (MX pendant) or 3V lithium (varies by model)

8. Procedure

8.1. Pre-Deployment Programming

MX-series (Bluetooth):

1. Open the HOBOnnect app and connect to the logger via Bluetooth (Onset Computer Corporation, 2021).
2. Configure:
 - Logging interval: 5 or 15 minutes
 - Start mode: delayed start (set to a round time, e.g., top of the next hour)
 - Logger name: use the convention `SiteID_Parameter_LoggerSN` (e.g., `BFS_TempRH_20456789`)
3. Verify the battery level. Replace if below 20%.

UA-series (legacy):

1. Connect the logger via the optical USB coupler and open HOBOWare.
2. Select **Launch** and configure the logging interval and start time (Onset Computer Corporation, 2021).
3. Click **Start** to begin logging.

8.2. Deployment

1. Mount the radiation shield at 1.5 m above ground on a post, tree, or tripod in a location representative of the site. Avoid positions within 3 m of heat-absorbing surfaces (pavement, metal walls) (World Meteorological Organization, 2018).
2. Insert the logger into the shield. Ensure the sensor faces are unobstructed and the shield ventilation holes are unblocked.
3. Secure the shield to the mounting structure with cable ties.
4. Record in the field notebook:
 - Logger serial number
 - Deployment coordinates per [SOP-F006](#)
 - Date and time of deployment
 - Logging interval and start time
 - Sensor height above ground
5. Photograph the deployed logger with surrounding context visible.

8.3. Downloading Data at Regular Intervals

MX-series (Bluetooth):

1. Open HOBObconnect app and connect to the logger.
2. Select **Download** to transfer all stored data to the smartphone (Onset Computer Corporation, 2021).
3. Export the data as a CSV file.
4. Save using the naming convention: YYYY-MM-DD_SiteID_Parameter_LoggerSN.csv
5. Upload to the project GitHub repository under `data/microclimate/` within 48 hours.

UA-series (legacy):

Connect via optical USB coupler and use HOBOWare to read out data.

8.4. Logger Retrieval (End of Deployment)

1. Download all remaining data.
2. Remove the logger and mounting hardware.
3. Clean the logger housing with a damp cloth. For waterproof models, rinse with fresh water.
4. Inspect the radiation shield for damage; replace desiccant packs if applicable.
5. Store loggers in a dry, room-temperature location.

9. Quality Control

- At each download visit, compare the logger temperature reading against a handheld thermometer. Discrepancies greater than 1 °C should be investigated (World Meteorological Organization, 2018).

- At least once per year, co-deploy two loggers of the same model at the same location for a minimum of 48 hours to check inter-unit agreement. Temperature should agree within 0.5 °C; RH within 5%.
- Inspect data for signs of sensor failure: constant readings, sudden offsets, or readings pegged at the sensor limit.
- Check battery level at every download. Replace batteries proactively if below 20%.
- For light loggers, verify that the sensor face has not shifted orientation by comparing the deployment photograph to current position.

10. References

- Onset Computer Corporation (2023)
- Onset Computer Corporation (2021)
- World Meteorological Organization (2018)

Onset Computer Corporation. (2021). *HOBOWare user's guide*. https://www.onsetcomp.com/files/manual_pdfs/10246-K-MAN-HOBOWare.pdf

Onset Computer Corporation. (2023). *HOBO U23 Pro v2 external temperature data logger: User manual*. <https://www.onsetcomp.com/products/data-loggers/u23-004>

World Meteorological Organization. (2018). *Guide to meteorological instruments and methods of observation (WMO-no. 8)* (2018th ed.). World Meteorological Organization. <https://library.wmo.int/idurl/4/41650>

11. Related SOPs

SOP	Title	Relationship
F001	Field Safety	Required prerequisite
F006	GPS and Site Navigation	Deployment coordinates
F203	HOBO Water Level Loggers	Companion instrument SOP
F510	Weather Monitoring	Full meteorological context
L801	RStudio and GitHub	Data version control

12. Training Record

Before deploying HOBO loggers independently, personnel must:

1. Read this SOP in full
2. Demonstrate logger programming via HOBObconnect or HOBOWare
3. Participate in a supervised deployment including shield mounting and metadata recording
4. Demonstrate data download, export, and upload to the repository
5. Be signed off by the PI or field lead