# Weather Station Technician Guide

Manitoba Métis Federation and the Centre for Earth Observation Science

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# Document Control

## Version History

| Version | Author(s) | Type | Date Modified | Comments |
|---------|-----------|------|---------------|----------|
| 1.0 | Hammett, D., Friesen, K. L. | Previous edition | 2021/12/14 | First draft |
| 1.1 | Friesen, K. L. | Working copy | 2022/02/28 | Updated workflow |

## Document Location

A digital copy of the document can be found in the MMF repository on the UM's Gitlab site. This repository is accessible by the Manitoba Métis Federation (MMF) and its designees

**Link:** https://cwincloud.cc.umanitoba.ca/manitoba-metis-federation/weather-keeper-program/-/tree/main/Guides (English only)

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# Summary

The Weather Keeper Program is a collaboration between the Manitoba Métis Federation and the Centre for Earth Observation Science at the University of Manitoba, to support the collection of atmospheric data in the Manitoba Great Lakes region. This program is a co-developed, and jointly managed, monitoring network that will provide information on how the Manitoba Great Lakes respond to land-use changes and variability in weather. The program will also give insight into the local and regional effects of climate change.

## Weather Keeper Program Overview

The weather station is built on a base of a three-meter tripod mast. The sensors you are expected to install are a wind monitor, rain gauge, PAR sensor, and temperature and relative humidity sensor. The data is logged via a HOBOware Energy Logger and transmitted hourly via an Iridium Satellite Chip. These sensors are connected with cables to the Logger housing box. Please refer to **Section 2.1** of the **Weather Station Instrument Guide** for a detailed explanation of each sensor.

## <u>Choosing a Site</u>

Once you arrive at the selected location, you need to choose a site to build the Weather Station. The best build site will be the area with the most amount of open space around it. Careful consideration should be made to avoid sites near buildings (garage, cabin, shed) and tree cover, as these factors could influence data collection by creating shade or blocking wind. The Weather Keeper should know the amount of area the Weather Station will take up (footprint). The tower is 3 meters high. The guy wires are attached below the wind sensor and anchored into the ground with rebar placed at an angle. There are 3 guy wires, which extend 2-3 meters from the base of the station (Figure 1). The final station location and additional notes such as any obstructions (e.g. trees on the SW side 3 m from station) should be recorded in the setup notes.

**CAUTION:** The station site should not be close to high traffic areas (e.g. footpaths, lounge areas) or areas where children frequently play. Figure 1. shows the completed weather station with flagging tape attached to the guy wires. The guy wires should be marked for high visibility since they are a tripping hazard.

*Figure 1. Complete weather station with (1) Anemometer, (2) PAR sensor, (3) Temperature and relative humidity, (4) solar panel, (5) logger housing box, (6) battery housing box, (7) Rain gauge or bucket, and guy wires identified with orange flagging tape.*

# Setup

## Creating an Instrument Template

An Instrument Template should be filled out by the technician before installing the Weather Station (Appendix B.1 and B.2). You can also find this template in [CanWIN's public repository](). This document will contain detailed information about each sensor, including serial number, range, sensitivity, units, and last calibration date. This information can also be found in the sensor manuals which should have been provided to you through the manufacturer. Manuals for the current HOBO weather stations are available on [CanWIN's DataHub site]() as well as in the [Weather Keeper Program]() repository on GitLab.

## Sensors and Equipment

Before departure, ensure that you have every sensor needed (Tables 1.1, 1.3, and 1.5 in Weather Station Instrument Guide). Speak to your MMF supervisor to ensure you have the correct list of sensors purchased.

## Software

Before leaving for the field, check that you have the HOBOware Logger software installed on your computer. You can check this by typing in HOBOware in the search menu beside the windows start button. If the software does not show up on your computer, please refer to **Section 3.**1 of the **Instrument Guide** for step-by-step installation instructions.

## Activating Satellite Account

At least a week before departure, the satellite account needs to be set up, and sensors need to be tested. The current weather stations were set up using DataGarrison as the provider through Hoskins Scientific. To activate the account, first, contact your Hoskins representative. The technician will need to provide the Iridium serial number of the box they wish to set up. This is found on the Iridium Satellite Chip (Figure 2).
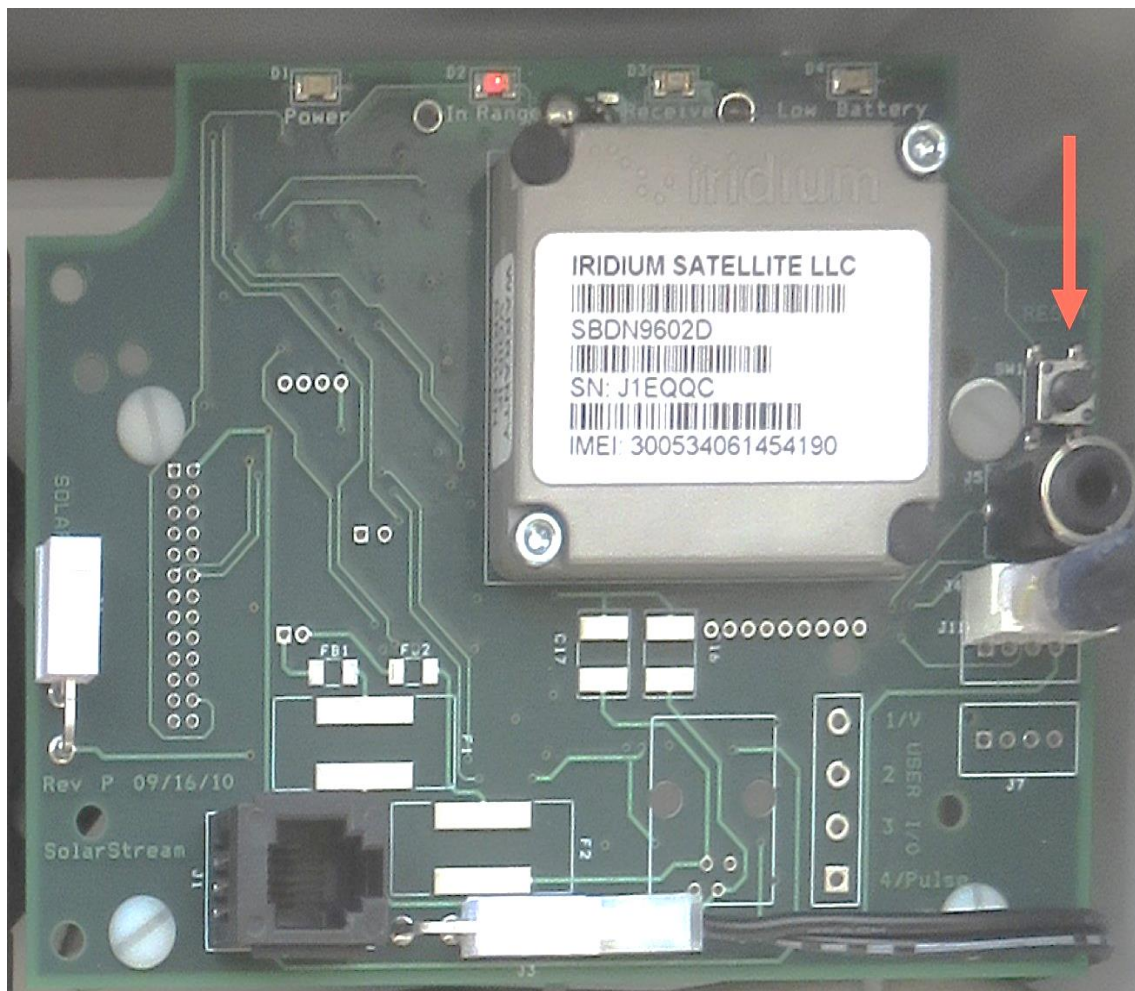
*Figure 2. Iridium satellite chip displaying sticker with a serial number (SN) and restart button indicated by the red arrow.*

The user will be able to log into the DataGarrison site with the username and password that was provided by Hoskins.

Link to account login: https://datagarrison.com/ (English only)

## Assembly Equipment

Refer to **Table 1.5** of the **Instrument Guide** for a detailed checklist of the equipment needed to assemble a weather station. Ensure you have all equipment before departure. For detailed instructions on how to set up the weather station check the **Weather Station Instrument Guide**.

## Sensor Testing

Testing each sensor is an important step before departure to the setup location. This is done to ensure that the logger, Iridium Satellite Chip, and each sensor are working correctly. This also allows the technician to troubleshoot any issues that might occur in a controlled environment. Please refer to the **Weather Station Instrument Guide** in **Section 2.1** for a detailed explanation of each sensor and **Section 3** of the guide for software, sensor, logger, and tripod setup instructions.

# Review

## <u>Weather Keeper Maintenance</u>

Regular maintenance and inspection of the weather station should be reviewed with the weather keeper before leaving the site. Routine checks are important to ensure that the equipment isn't damaged and is delivering "good" data.

A quick checklist for maintenance should include:

• Inspection of cables to and from the logger and battery box.

• Cleaning of logger box, sensor, and solar panel.

Refer to **chapter 4** in the **Weather Station Instrument Guide** for a detailed list of what maintenance should be done as well as a maintenance schedule. The **Regular Checks** section in the **User Guide** provides the weather keeper with detailed instructions for routine maintenance.

## <u>Final Checks</u>

Below is a list of final checks to conduct before leaving the weather keeper with their new station.

1. With the Weather Keeper, go through the **Regular check** and Emergency check section from **Table 1** of the **User Guide**.
2. Check to see if sensor or logger box lights are flashing or on. Refer to **Table 1** for troubleshooting.
3. Provide Weather Keeper with a physical copy of the **Weather Keeper User Guide**.
4. Provide Weather Keeper with a laminated **Decision Tree** card (Appendix A.2).
5. Highlight where contact information is provided, in case of complex issues or emergencies.
6. Provide link locations to dashboard and real-time websites.
7. Walk the Weather Keeper around the site and ensure no debris or garbage is on-site that could potentially damage the station.
8. Take pictures of the final setup, in each cardinal direction.

# Data Management

Data Curators in CEOS have created a workflow for archiving weather station data downloaded from the DataGarrison site. The workflow takes a raw (original) downloaded weather data file, or files, applies a script (using R computational language), which standardizes the variable names, adds metadata and compiles the archived file(s) into a single weather data file.

## Workflow

The workflow for managing the archived weather keeper data is documented in the **Weather Station Cookbook**. A detailed description of the data curation process can be found in the **Weather Station Codebook**, which details the R script applied to the weather data. You can find these resources in the MMF [Weather Keeper program](#) repository. The workflow is shown below in Figure 3.

Currently, the workflow is maintained by CEOS Data Curators, with code/cookbooks and archived data publicly available on the Weather Keeper Program page in CanWin's DataHub site. Additionally, the raw and curated files are uploaded to the MMF's Gitlab repository. This process will be transferred to MMF technicians in the future.
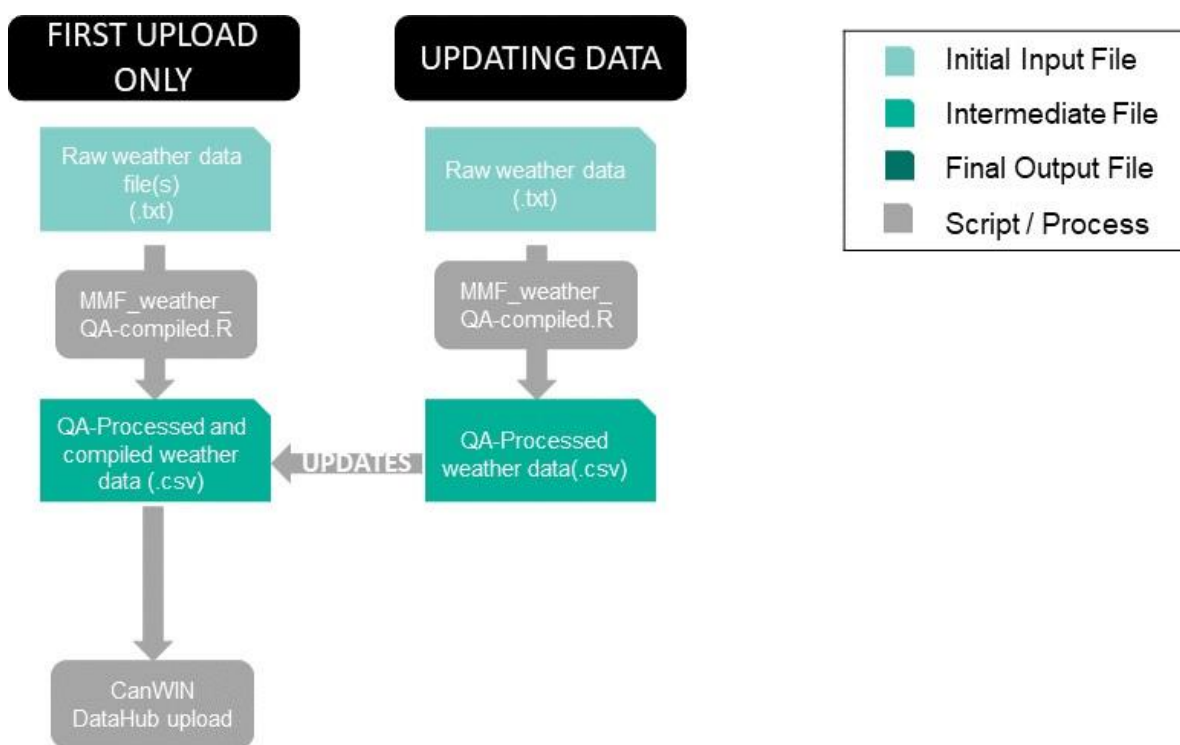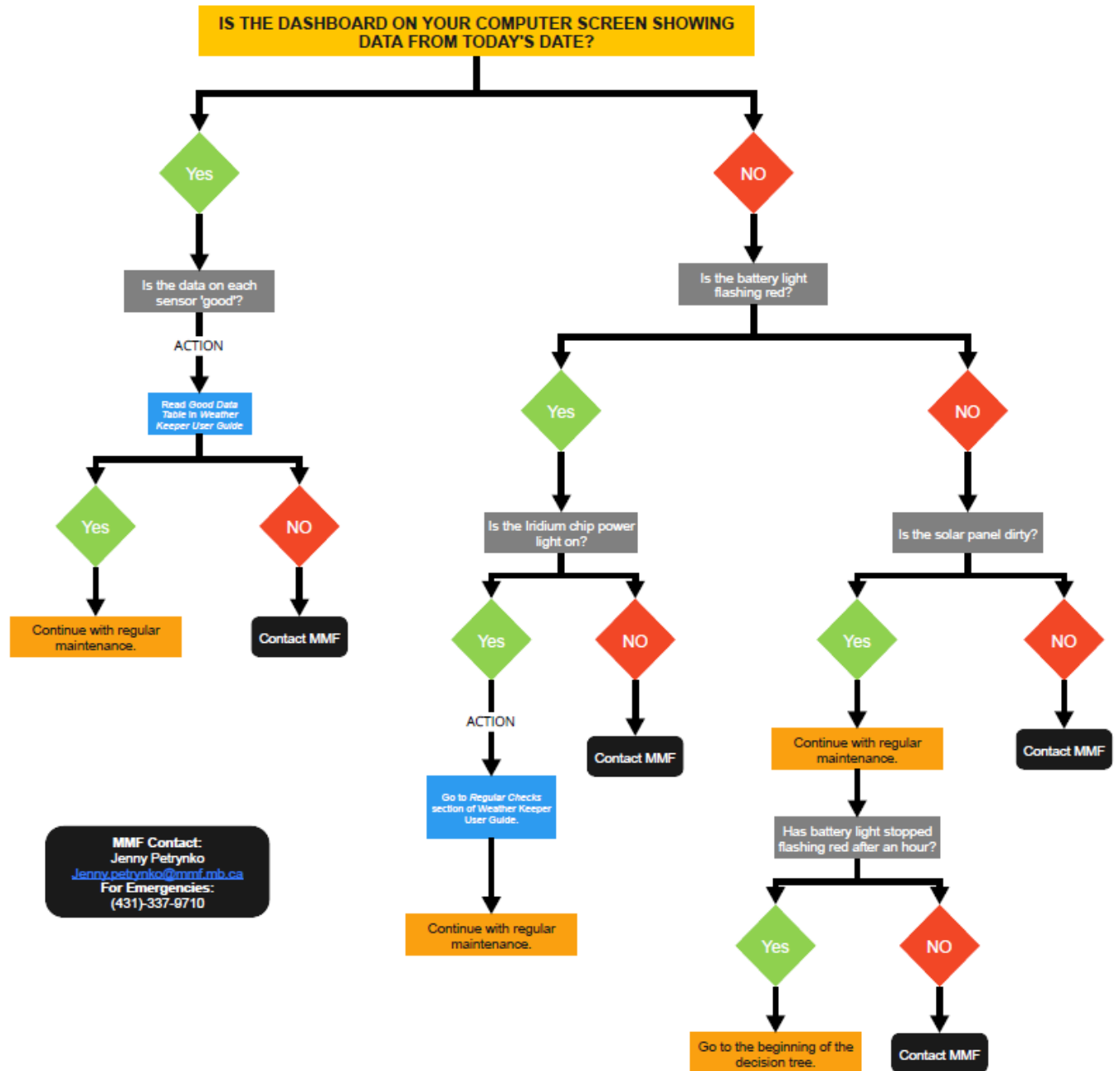


*Figure 3. Weather Station Data Workflow.*

# A Trouble Shooting

## A.1 Troubleshooting Guide

| Problem | Solution | Contact for Help |
|---|---|---|
| **No status indicators are blinking** | This may be due to several issues:<br>- Ensure batteries are not dead. Each battery should have at least 1 volt per cell.<br>- The memory may be full. Relaunch the logger.<br>- The logger may not have been launched correctly or at all. | Claire.herbert@umanitoba.ca |
| **Individual modules or sensors are not found by the HOBOware Launcher software** | If a SmartSensor is removed and then immediately reconnected it may not be detected. This can be fixed with the **Refresh** button in the HOBOware Launch software. | Claire.herbert@umanitoba.ca |
| **Batteries die prematurely** | This can be caused by an excess of moisture or condensation in the logger enclosure. It is important to keep up general maintenance by checking the logger box regularly.<br><br>Check for damaged wiring and malfunctioning sensors. This can result in short circuits that can rapidly drain batteries. | Claire.herbert@umanitoba.ca |
| **Logger is not found** | Check and replace the batteries and reconnect the logger.<br><br>Check cable connection, computer COM port, and USB settings | Claire.herbert@umanitoba.ca |

## A.2 Weather Keeper Decision Tree

**IS THE DASHBOARD ON YOUR COMPUTER SCREEN SHOWING DATA FROM TODAY'S DATE?**

**Yes**

Is the data on each sensor 'good'?

ACTION

Read *Good Data Table* in *Weather Keeper User Guide*

**Yes** → Continue with regular maintenance.

**NO** → Contact MMF

**MMF Contact:**
Jenny Petrynko
Jenny.petrynko@mmf.mb.ca
**For Emergencies:**
(431)-337-9710

**NO**

Is the battery light flashing red?

**Yes**

Is the Iridium chip power light on?

**Yes** → ACTION → Go to *Regular Checks* section of Weather Keeper User Guide. → Continue with regular maintenance.

**NO** → Contact MMF

**NO**

Is the solar panel dirty?

**Yes** → Continue with regular maintenance. → Has battery light stopped flashing red after an hour?

**Yes** → Go to the beginning of the decision tree.

**NO** → Contact MMF

**NO** → Contact MMF

# B Instrument Template

## B.1 Blank Template

## Document Control*

| Document Version | Author(s) | Date | Comments |
|---|---|---|---|
| 1.0 | Claire Herbert | 7 May 2020 | Initial draft |
| 1.1 | Claire Herbert | 27 May 2021 | Modified categories |
| 1.2 | Claire Herbert | 04 Oct 2021 | added related publications |
| 1.3 | Claire Herbert | 08 Dec 2021 | updated to match online ckan template |

*DO NOT EDIT

# INSTRUMENT DETAILS

| | |
|---|---|
| **User Instrument Name** | *Name of instrument. Could be common name, organization, or project dedicated name.* |
| **Standardized Instrument Name** | *Choose from pre-selected list of controlled vocabularies.*<br>**Ex.** INCUBATOR, shipboard incubators, Beam trawl, etc. |
| **Instrument DOI** | *A unique and permanent identifier. Assigned by CanWIN curator if requested by data provider.* |
| **Instrument Unique ID** | *Unique ID for Instrument. Typically, a serial or inventory number.* |
| **ID Type** | *Name the type of unique ID used.* **Ex.** serial number, inventory number. |
| **Model No** | *Manufacturer descriptor of instrument.* |
| **Instrument Type***  | *Choose from:* Baseline, Guest, External, or Retired |
| **Description** | *Description written by data provider.* |
| **Manufacturer***  | *The instrument's manufacturer(s) or developer. This may also be the owner of the custom built instrument.* |
| **Manufacturer Type** | *Choose from:* Organizational or Personal |
| **Notes** | *If additional information is needed in ordering the instrument described above, provide it here.*<br>**Ex.** Sensors were requested to be assembled in logger housing box. |

* Required fields

## SENSOR DETAILS

| Instrument Sensor Name | Instrument Sensor Serial No. | Sensor Range | Sensor Sensitivity | Sensor units | Last Calibration Date |
|---|---|---|---|---|---|
| *Ex. Temperature and Relative Humidity (RH)* | 21188234 | *Temperature: -40°C to 75°C (-40°F to 167°F); RH: 0-100% RH at -40° to 75°C (-40° to 167°F); exposure to conditions below -20°C (-4°F) or above 95% RH may temporarily increase the maximum RH sensor error by an additional 1%* | *Temperature: ±0.21°C from 0° to 50°C (±0.38°F from 32° to 122°F); RH: ±2.5% from 10% to 90% RH typical to a maximum of ±3.5% including hysteresis at 25°C (77°F); below 10% and above 90% ±5% typical* | °C and % | 2021-04-18 |
| | | | | | |
| | | | | | |

Add more sensor fields if necessary.

## REQUIRED FIELD

| | |
|---|---|
| **Facility***  | *Organization or research facility associated with this data.* |

* Required fields

## ASSOCIATED PAGES

If you have other information related to your dataset hosted on CanWIN datahub you can link them here. If you are unfamiliar with datahub pages, please contact a Data Curator for assistance.

| | |
|---|---|
| **Related Datasets** | *List any datasets related to the instrument.* |
| **Related Campaigns** | *List any campaigns related to the instrument.* |
| **Related Platform** | *List any platforms related to the instrument.* |

* Required fields

# B.2 Completed Template

**Document Control**

| Document Version | Author(s) | Date | Comments |
|---|---|---|---|
| 1.0 | Claire Herbert | 7 May 2020 | Initial draft |

**A. Instrument Details**


**Instrument Name: HOBO MBGL Weather Station 1**


**Common Name: MMF Met Station 1**


**CanWIN Standardized Name:**


**Instrument Serial No.: 30023406813390**


**Model:**


**Activity Collection Type:** Field Measurement

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**Sensor Details**

| Sensor Name | Serial No. | Sensor Details | Range | Sensitivity | Sensor units | Last Calibration Date |
|---|---|---|---|---|---|---|
| Temp/RH Sensor | 21048243 | 12-bit w/ 2m cable | Temp: -40°C to 75°C (-40°F to 167°F)<br><br>RH: 0-100% RH at -40° to 75°C (-40° to 167°F); exposure to conditions below -20°C (-4°F) or above 95% RH may temporarily increase the maximum RH sensor error by an additional 1% | Temp: ±0.21°C from 0° to 50°C (±0.38°F from 32° to 122°F)<br><br>RH: ±2.5% from 10% to 90% RH typical to a maximum of ±3.5% including hysteresis at 25°C (77°F); below 10% and above 90% ±5% typical | °C or °F | |
| PAR Sensor | 21040570 | w/ 3m cable | 0 to 2500 $\mu mol/m^2/sec$, wavelengths 400 to 700 nm | ±5 $\mu mol/m^2/sec$ or ± 5%, whichever is greater in sunlight; Additional temperature induced error ±0.75 $\mu mol/m^2/sec/°C$ from 25°C (0.42 $\mu mol/m^2/sec/°F$ from 77°F) | $\mu mol/m^2/sec$ | |

| Sensor Name | Serial No. | Sensor Details | Range | Sensitivity | Sensor units | Last Calibration Date |
|---|---|---|---|---|---|---|
| Barometric Pressure Sensor | 20812842 | Rate for -40C to +70C, must be used inside logger case, w/ 10 cm cable | 660 to 1070 mbar (19.47 to 31.55 in. Hg) | ±3.0 mbar (0.088 in. Hg) over full pressure range at 25°C (77°F); maximum error of ±5.0 mbar (0.148 in. Hg) over -40° to 70°C (-40° to 158°F) | mbar or in. Hg | |
| RM Young 05103 Wind Sensor/Monitor | 21055171 | | S-WCB-M003: 0 to 50 m/s (0 to 112 mph)<br><br>S-WCE-M003: 0 to 52 m/s (0 to 116 mph)<br><br>Wind Direction: 0 to 355 degrees, 5 degrees dead band | 0.20 m/s (0.46 mph)<br><br>Wind Direction: 1.4 degrees | m/s or mph<br><br>degrees | Dec 8, 2020 |
| Rain Gauge | 21050257 | 0.2mm w/ 2m cable | 0 to 12.7 cm (0 to 5 in.) per hour, maximum 4000 tips per logging interval | ±1.0% at up to 20 mm/hour (1 in./hour) | cm | |