



The Technical Staff is responsible for performing the measurements and installations outlined in this procedure, documenting all required information described in this SP, and assuring the latest revision of this document is followed.

If the procedure cannot be worked as written, the user has the responsibility to stop work and resolve all concerns with the PI/MTL/FTL, safety, and/or QA, as appropriate, prior to proceeding with the work.

## **2.3 Equipment**

### **2.3.1 ONSET Brand Data Logging Rain Gauges**

Rainfall data will be collected using ONSET brand data logging rain gauges. The data logging rain gauge consists of two major components: a tipping bucket rainfall collector and a HOBO event/temperature data logger. The collector consists of a funnel (covered by a screen) that diverts rainwater to the tipping-bucket mechanism (for model RG-3, one tip is equal to 0.01 inches of rainfall) and an aluminum housing to protect the tipping-bucket mechanism. The data logger is a waterproof event logger that uses a coupler and optical base station for programming and data downloading.

### **2.3.2 HOBO Data Download**

The rain gauge data logger is accessed using the HOBO Waterproof Shuttle (hereafter referred to as the Shuttle) or a laptop computer. These devices perform several functions including: downloading all information (serial number, data, etc.) from loggers in the field for transfer to the host server/computer, re-launching the logger, resetting the logger's time, and synchronizing the logging interval. If the Shuttle is used to download data from the rain gauge, it needs to be synchronized (or launched) with the SNL Hydrology Group's data storage server/PC prior to each test initiation and download cycle.

\*Note: synchronizing the shuttle will delete any files that are stored on it.

#### **2.3.2.1 Retrieving Deleted Files**

As mentioned above, all files on the shuttle will be deleted once the shuttle is synchronized (or launched). To retrieve these files follow the steps below.

- Close HOBOWare and right click on the Start button and left click on explore.
- Scroll down to Program Files and click on the plus sign to make it a minus sign.
- Scroll down to Onset Computer Corporation and click on the plus sign to make it a minus sign.
- Left click on HOBOWare once. On the right-hand side, double click on HOBOWare properties (it should open in WordPad).
- Change the hoboware.dbm to on and close everything.
- Open HOBOWare, you will notice a new menu item called Debug.
- Click on Debug, then Force Offload.
- After offload is complete, relaunch the logger and check the parameters—configure as needed.
- If any problems arise during this process contact ONSET.

## **2.4 Rain Gauge Setup**

Rain gauges will be deployed per manufacturer and industry standards. The rain gauge MUST be mounted in:

- a vertical, level position, clear of overhead obstructions;

- such a way as to minimize vibration, due to high winds;
- a clear and unobstructed location (typically greater than 7 ft above the ground and at a distance of three times the height of the nearest obstruction); and
- a way to avoid splash into the collector (i.e., mounted an appropriate distance above any surface).

The steps in this section apply to the normal removal and installation of a rain gauge for maintenance purposes at an existing site. The construction of a new rain gauge mounting site is not covered by this procedure and would be planned using the Sandia National Laboratories work planning processes.

## 2.5 Logging Setup and Data Download

Initial setup of the data logger must be done using a computer with HOBOWare version 2.2 or later. The logger will be programmed to collect rainfall data on an event basis and, if desired, temperature and battery voltage on an interval basis. The information listed in the Test Setup bullet must be documented in the appropriate SN.

### 2.5.1 Logger Setup

To program the data logger, use the following steps:

- Launch the HOBOWare (version 2.2 or later) software;
- Attach the Shuttle to the laptop using the USB cable;
- Place the data logger pendant into the coupler, which is attached to the Shuttle;
- Press the coupler lever and the green LED should illuminate (if not, follow the troubleshooting steps outlined in HOBOWaterproof Shuttle User's Guide);
- If communication is not established, the coupler is an optical device and it can be affected by sunlight, it may be necessary to shade the shuttle from sunlight.
- Click the *Launch Logger*  icon in the toolbar;
- Set up the test:
  - Description: Rain Gauge\_SNXXXXXXX\_date launch shuttle\_wellpadID (MMDDYY)  
(X's are the logger serial number)
  - Event Channels: Name - Rainfall, Increment - 0.01, Units – inches
  - Launch Options: At interval (set to start at time closest to the top of the nearest hour);  
If Desired
  - Channels to Log: Temperature 10K Thermistor and battery
  - Logging Interval: desired interval (nearest half hour)
- Click the *Launch* button; and
- Detach and secure the logger pendant.

### 2.5.2 Data Download

Data can be downloaded from the data logger either by using the Shuttle or a laptop computer with HOBOWare software (version 2.2 or later) installed. For convenience a Rain Gauge Data Download Form, SP 12-23-1 (Appendix A) was developed to assist in data recording and to ensure consistent record keeping, though it is not required to use it. The form must be inserted into the appropriate SN; however, if the form is not available then the information must be recorded directly into the appropriate SN, containing the same information as the form. This applies whether the data is downloaded on the shuttle or the laptop. If the data is downloaded on the shuttle, some of the

information will not be available until the data is downloaded from the shuttle back in the office. The appropriate information will still be recorded in the SN at this time.

### 2.5.2.1 Data Download Using a Shuttle

To download data using the Shuttle use the following steps:

- Place the data logger pendant into the coupler, which is attached to the Shuttle;
- Press the coupler lever, the amber LED will illuminate indicating data download has begun (**Note:** the amber LED will blink continuously while data is downloading, do not remove logger while the amber LED is blinking);
- When the data download is complete and the logger is reinitialized, the green LED will illuminate, press the coupler lever (any LED that is on should go off);
- Detach and secure the logger pendant.

### 2.5.2.2 Data Download Using a Laptop

To download data using a laptop computer, use the following steps:

- Launch the HOBOWare (version 2.2 or later) software;
- Attach the Shuttle to the laptop using the USB cable;
- Place the data logger pendant into the coupler, which is attached to the Shuttle;
- Press the coupler lever and the green LED should illuminate (if not follow the troubleshooting steps outlined in HOBOWaterproof Shuttle User's Guide);
- Click the *Readout Logger*  icon on the toolbar, a box will pop up with the rain gauge serial number on it- click ok, click the *Don't Stop* button, unless maintenance, calibration, or demobilization is needed/intended, in which case click the *Stop* button;
- Save the data as the HOBOWare software prompts; Make sure you append the download date at the end of the file and document the file name.
- Plot data to ensure that all looks appropriate and check battery
- Detach and secure the logger pendant.

### 2.5.3 Logger Shutdown

To stop the logger a computer must be used. Use the following steps:

- Launch the HOBOWare (version 2.2 or later) software;
- Attach the Shuttle to the laptop using the USB cable;
- Place the data logger pendant into the coupler, which is attached to the Shuttle;
- Press the coupler lever and the green LED should illuminate (if not follow the troubleshooting steps outlined in HOBOWaterproof Shuttle User's Guide);
- If communication is not established, the coupler is an optical device and it can be affected by sunlight, it maybe necessary to shade the shuttle from sunlight.
- Click the *Readout*  icon on the toolbar, click the *Stop* button;
- Save the data as the HOBOWare software prompts-follow steps outlined in Section 2.5.2;
- Detach and secure the logger pendant, unless the tipping bucket and logger are to be redeployed immediately, in which case follow steps outlined in Section 2.5.1.

## 2.6 Rain Gauge Maintenance

During each data download, the rain gauge should be checked for and cleared of any debris. Use a rag or cotton swab soaked with mildly soapy water to clean the screen and funnel ring. **Note:** If during cleaning the tipping bucket is tipped, please note in the notebook the date and time of tip, number of tips, and cause of tip.

## 2.7 Rain Gauge Performance Check

ONSET data logging rain gauges require an annual performance check or as deemed appropriate by MTL/FTL. If the rain gauge performance is considered suspect in the field, the gauge should be replaced and a performance check will be performed in the SNL offices or at the manufacturer's facilities prior to its annual check date. The procedure is as follows:

- Position a container (metal or plastic) with a metering type valve in the bottom over the rain gauge funnel (**Note:** the opening should be positioned so that the water does not drip directly down the throat of the funnel), adjust the metering valve to establish a flow rate where approximately 473 ml is dripped into the rain gauge;
- Launch the logger to record the number of tips;
- Place 473 mL of water into the container and allow it to drip into the rain gauge funnel. 473 mL is equivalent to 1 inch of rain.

The As-Found performance check is considered successful if the result of the above steps is  $100 \pm 10$  tips (equivalent to  $1.00 \pm 0.1$  inches). The ONSET data logging rain gauge User's Manual provides steps to adjust the tipping mechanism, if necessary. Document what adjustments were made and perform an As-Left performance check to ensure the rain gauge is working properly.

The performance check(s) will be documented on the Rain Gauge Performance Check Form, SP 12-23-2 (Appendix B) and submitted to records.

## 2.8 Precipitation Data Storage

All data collected by the ONSET data-logging rain gauge will be uploaded from the Shuttle or host laptop to a directory on the SNL Hydrology Group's data storage server/PC.

## 3.0 Records

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The following QA records, generated through implementation of this procedure, shall be prepared and submitted to the WIPP Records Center in accordance with NP 17-1, "Records":

### QA Record

- Scientific Notebooks
- Rain Gauge Performance Check Form

## 4.0 Appendices

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Appendix A: Form SP 12-23-1, Rain Gauge Data Download

Appendix B: Form SP 12-23-2, Rain Gauge Performance Check Form



### Appendix A

<b>Sandia National Laboratories</b> <b>ACTIVITY/ PROJECT SPECIFIC PROCEDURE</b>	<b>Rain Gauge Data Download</b>	<b>Form Number: SP 12-23-1</b>
<p>Document inserted into Scientific Notebook _____ on page _____</p> <p>Rain Gauge Location: _____ Rain Gauge S/N: _____</p> <p>_____ Download Initiated _____ Download Complete: <input type="checkbox"/> Battery: _____ (time)</p> <p>File Name: _____</p> <p>Last Data Point Collected: Date: _____ Time: _____</p> <p>Rain gauge Logger Security _____ (initials) _____ (date)</p>		

Sample Form

### Appendix B

<b>Sandia National Laboratories</b> <b>ACTIVITY/ PROJECT SPECIFIC PROCEDURE</b>	<b>Rain Gauge Performance Check Form</b>	<b>Form Number: SP 12-23-2</b>
<p><b>Date:</b> _____ <b>Operator(s):</b> _____</p> <p><b>Weather Conditions:</b> _____</p> <p><b>Rain Gauge / Data Logger S/N:</b> _____ <b>As Found</b> <input type="checkbox"/> <b>As Left</b> <input type="checkbox"/></p> <p><b>Start Time:</b> _____ <b>End Time:</b> _____</p> <p><b>Elapsed Time:</b> _____ <b>Air Temp Recorded:</b> _____ (inches)</p> <p><b>Comments:</b> _____ _____ _____</p> <p><b>Field Check Date:</b> _____</p>		

Sample Form

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