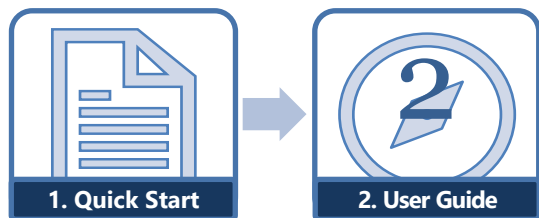




Sensometer™ CP Test Station Monitor User Guide



Guide 2 in the 2-part Sensometer™ CP documentation series

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1 Introduction

The Sensometer™ CP Test Station Monitor (TSM) is the perfect product to keep your pipelines compliant. It is part of the Sensometer family of products to monitor and control cathodic protection systems. This low-cost device offers a 10-year battery life, cellular data, and features GPS. Flexible measurement and transmission intervals provide data when you need it and how you want it. The CP TSM utilizes non-proprietary batteries that can be replaced in the field and accesses multiple cellular networks with one SIM card. CP TSM is designed to be the industry's most cost-effective device to outfit entire pipelines, paying for itself immediately.

The CP TSM is intended to be mounted under the cap of a standard, 3" BigFink® test station. It is a self-contained device with built-in wireless communications. Standard, off-the-shelf batteries are easily replaced, with no tools required. The CP TSM can measure both AC and DC structure potential against two reference cells. It can also be configured to detect the presence of On/Off interruption cycles, and has the unique ability to capture the interruption cycle waveform.

Once captured, the measurements are transmitted to the Sensometer™ Cloud, where a standard web browser will allow you to visualize your data and create compliance reports.

Free The Data™! It's your data; why are you paying someone else for it? Sensometer frees you from expensive data acquisition subscriptions and provides you the ability to remotely monitor your entire system for half the cost of traditional remote monitoring models, without all the headaches.

Figure 1: The Sensometer™ CP Test Station Monitor, mounted on BigFink® Terminal Board with Spacer

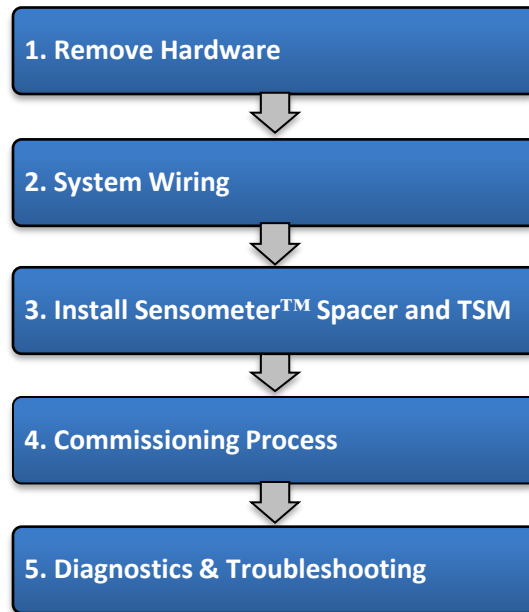


1.1 Key Terms and Concepts

- **Cathodic Protection (CP):** A technique to control the corrosion of a metal surface by making it the cathode of an electrochemical cell.
- **Holiday:** A discontinuity in a protective coating that exposes unprotected surface to the environment.
- **Instant-Off Potential:** The polarized half-cell potential of an electrode taken immediately after the CP current is stopped, which closely approximates the potential without IR drop (i.e., the polarized potential) when the current was on.
- **Interrupted Waveform:** A recorded plot of potential versus time from just prior to disconnecting the CP current from the structure, to some time thereafter ... typically a few seconds. This waveform may be used to determine the instant-off and instant-disconnect potentials.
- **Structure-to-Electrolyte (Pipe-to-Soil) Potential:** The potential difference between the surface of a buried or submerged metallic structure and the electrolyte that is measured with reference to an electrode in contact with the electrolyte.

2 Getting Started and Installation

This section describes how to install the Sensometer™ CP TSM.



2.1 Remove Hardware

WARNING: Follow standard Lockout/Tagout procedures. Do not attempt installation until all equipment is disconnected, and hazardous voltages are removed.

WARNING: Electrostatic Discharge (ESD) can damage electronic devices. Be certain to always wear an anti-static wrist band, attached to an unpainted, grounded metal object.

1. Remove BigFink® cap
2. Using a 7/16" socket and/or 5/16" slotted screwdriver, remove all existing nuts and bolts from the Terminal Board



2.2 System Wiring

1. Cut any existing terminal connections from the wires
2. Strip about 0.275" (7 mm) of insulation from each wire (wire gauge can be 12-24 AWG)
3. Insert and secure the wires per the connection table below, using the precision screwdriver

Table 1: Plug Connections from Left to Right	
Connector Pin:	Description:
4 (left-most)	Structure 1
3	Reference Cell 1
2	Structure 2
1 (right-most)	Reference Cell 2



IMPORTANT! Potential measurements are taken differentially from Structure 1 to Reference Cell 1, and Structure 2 to Reference Cell 2. Therefore, when measuring only one Structure with two Reference Cells, jumper pins 2 and 4 together and connect to the Structure.

IMPORTANT! The maximum wire gauge for this plug is 12 AWG

2.3 Install Sensometer™ Spacer and TSM

1. Place Spacer onto test station post
2. Rotate clockwise until it is secured
3. Place Sensometer™ onto the BigFink® Terminal Board as shown (you should hear a “click” when it is securely mounted)
4. Insert the green plug into Sensometer™

IMPORTANT! The notch in the Spacer must align with the larger opening of the BigFink®



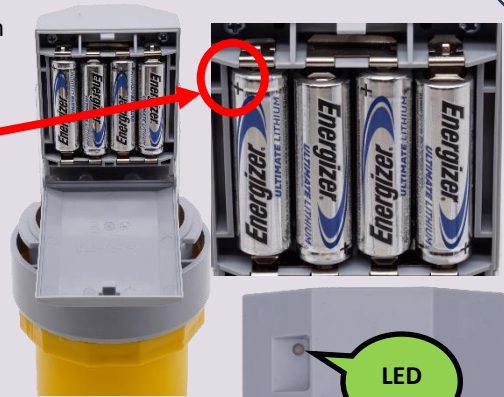
2.4 Commissioning Process

1. Install the included Energizer L91 Ultimate Lithium AA batteries as shown

WARNING! Only Energizer L91 Ultimate Lithium batteries are approved for use.
WARNING! Note the battery polarity when installing.

IMPORTANT! Geo-location, via GPS, is not part of the installation process. Location will be obtained during the first Pipe-to-Soil measurement **AFTER** successful commissioning.

IMPORTANT! Once the batteries are installed, various LED flash patterns will be shown on the bi-color LED. These patterns will indicate the current step of the commissioning process and will repeat after an approximate 1 second pause.



2. The table below indicates the typical commissioning sequence and flash patterns on the LED:

LED Flash(es)	Action	Duration
1	Time and Date Being Acquired	10 seconds
2	Signal Strength Being Measured	5-10 seconds
3	Pipe-to-Soil Measured	5 seconds
4	Cloud Measurement Transmission	15 seconds
On Solid	Commissioning Successful	10 seconds



2.5 Diagnostics & Troubleshooting

1. The table below indicates various scenarios where the commissioning process cannot be completed:

LED Flash(es)	Issue	Recommended Action
1	Insufficient battery Voltage, commissioning cannot begin	Check battery polarity, use ONLY Energizer L91 Ultimate Lithium batteries
2	Temperature Out of Range	Remove batteries and try at different time of day
3	Insufficient battery voltage, commissioning cannot complete	Replace batteries, use ONLY Energizer L91 Ultimate Lithium batteries
4 or 7	Hardware Fault	Remove batteries, return to manufacturer
5	Cannot Connect to Cellular Network	Re-position Sensometer, then re-install batteries
6	Cannot Complete Transmission to Cloud	Remove batteries and try at different time of day

IMPORTANT! If batteries need to be removed or replaced, please wait 10 minutes before installing new batteries to allow Sensometer™ to restart the Commissioning Process.

3 Web Interface & Configuration

This section defines how to configure the CP TSM and navigate the website interface.

3.1 Website Overview

The Sensometer™ website provides users with a simple interface to view device data, configure devices, manage device groups, and manage users. The remainder of this section will guide you through the various options.

3.2 Login


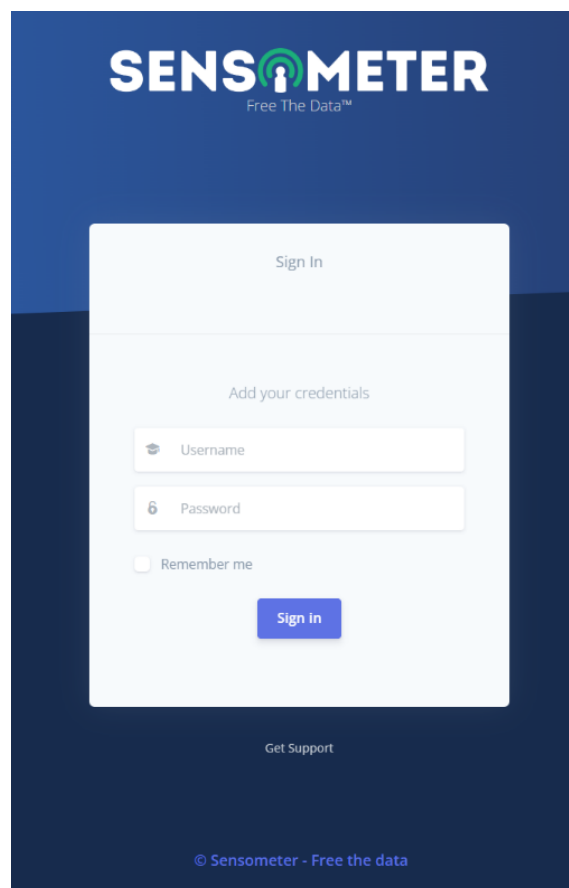
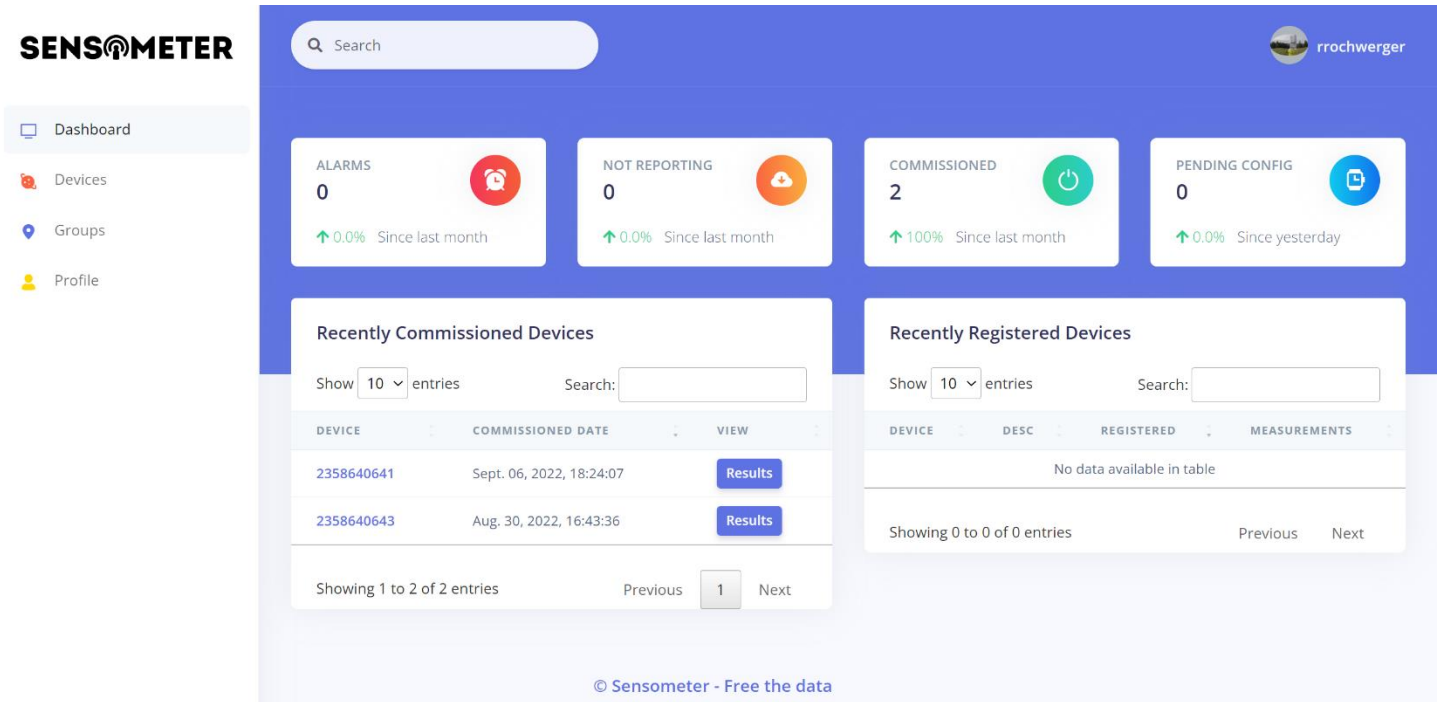
1. Enter the URL you received, typically <https://YOURCOMPANY.sensometerdevices.com/>
2. Enter your Username and Password, then click 

Figure 2: Sensometer™ Login



3. The Dashboard will be displayed.

Figure 3: Sensometer™ Dashboard



3.3 Website Features

The Sensometer™ website has the following features, that can be accessed via the navigator on the left-hand side.

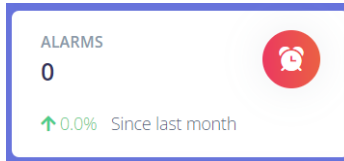
4. **Dashboard:** On this view you can see the overall, site-wide device status.
5. **Devices:** This is used to configure individual devices, view measurements, and export data.
6. **Groups:** Here you can create device groups that contain devices which belong together and are somehow related ... such as on a section of pipe or geographically related. You can also export the data from a Group, and set the configuration for the Group.
7. **Profile:** This section has options to configure your personal profile.

3.3.1 Dashboard

The Dashboard will show you the following:

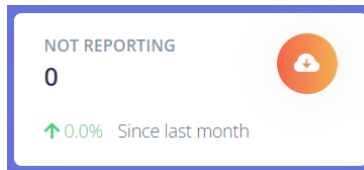
- **Alarms:** Indicates the number of Alarms that are currently active, based on the configured measurement range.

Figure 4: Sensometer™ Dashboard Alarms Indicator



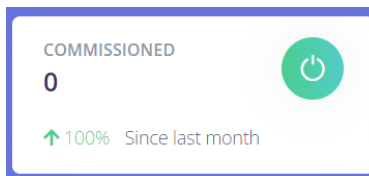
- **Not Reporting:** Indicates the number of devices that have not reported measurements at their configured time interval.

Figure 5: Sensometer™ Dashboard Not Reporting Indicator



- **Commissioned:** Indicates the number of devices that have been commissioned in the last month. These are devices that have been installed on site, have batteries installed, and have successfully communicated to the cloud.

Figure 6: Sensometer™ Dashboard Commissioned Indicator



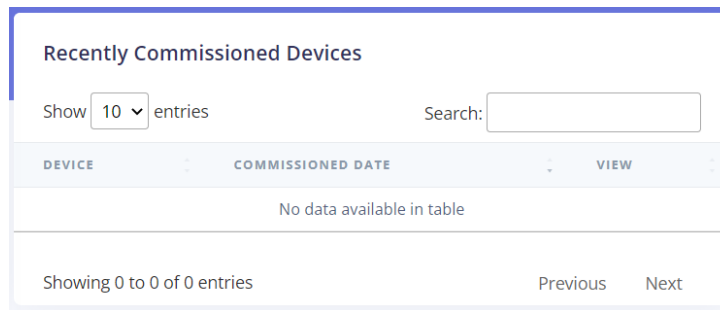
- Pending Config: Indicates that a new configuration is pending.

Figure 7: Sensometer™ Dashboard Config Indicator



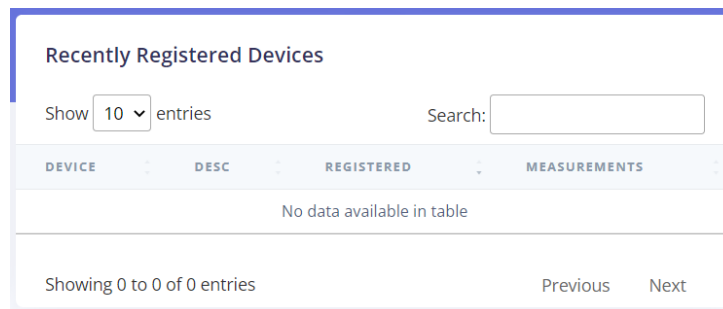
- Recently Commissioned Devices: Indicates devices that have been commissioned within the last month.

Figure 8: Sensometer™ Dashboard Commissioned Devices Indicator



- Recently Registered Devices: Indicates devices that have been registered within the last month. Registered devices are those that have been purchased by a customer but have not yet been Commissioned.

Figure 9: Sensometer™ Dashboard Registered Devices Indicator



3.4 Managing Devices

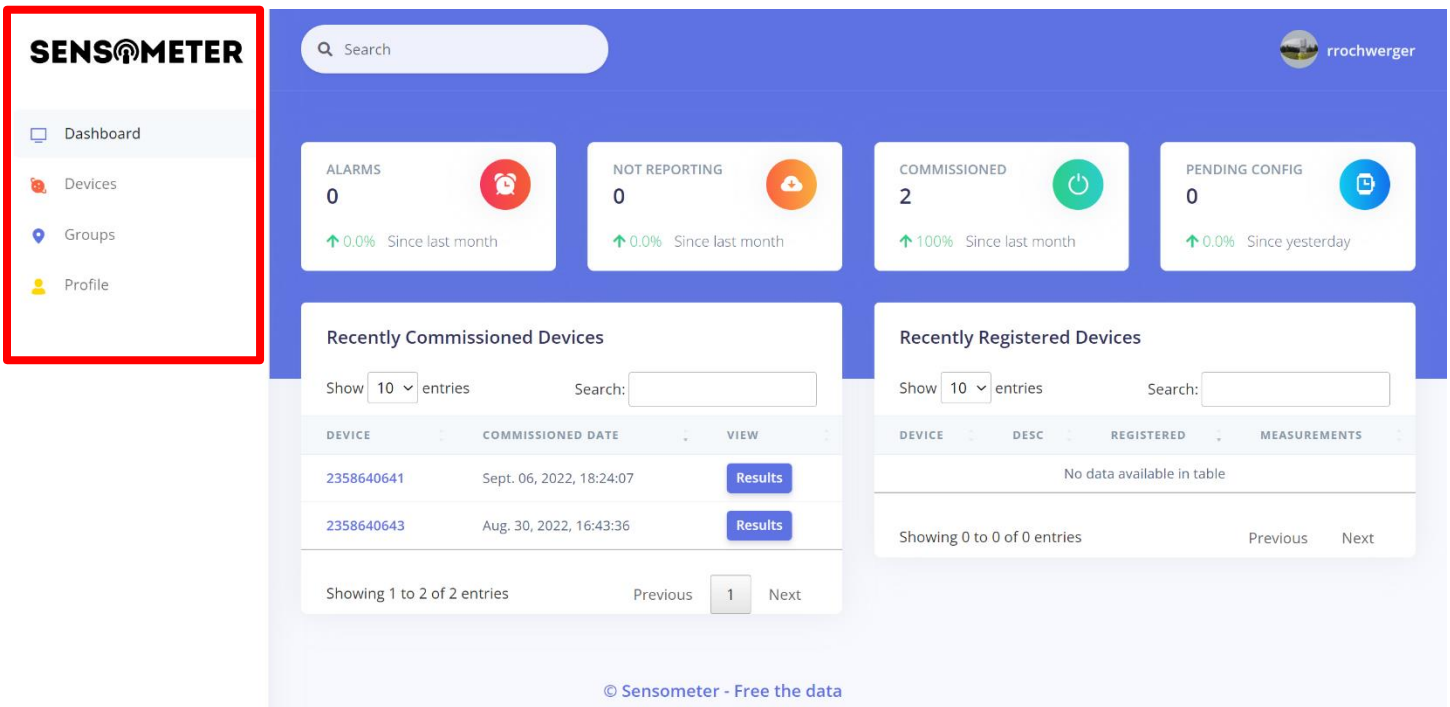
This section shows you how to manage your devices.

3.4.1 Devices

Use the following steps to navigate through “Devices”:

1. Click “Devices” from the navigator

Figure 10: Sensometer™ Navigator



The Devices section gives you access to individual devices. You will see the Device ID, a user-defined Device description, when the device was registered, when the latest measurement was recorded, the Group it belongs to, and the number of times the device has reported in.

Figure 11: Sensometer™ Devices

DEVICE	DESC	REGISTERED	LATEST MEASUREMENT	GROUP	REPORTS
2358640641	Trial unit #2	Sept. 22, 2022, 00:46:57	Nov. 14, 2022, 18:34:26	Trial Group	1334
2358640643	Trial unit #4	Sept. 01, 2022, 14:51:28	Nov. 14, 2022, 19:16:45	Trial Group	1830

Showing 1 to 2 of 2 entries

1. Click on the device number to view the measurement data. At the top of the page, you will see the Measurement Chart. Choose which two measurements are of interest from the drop-down channel selections, and then choose a date range. Based on the selected date range and measurements, you will see a graph of the data.

Figure 12: Sensometer™ Device Measurement Chart

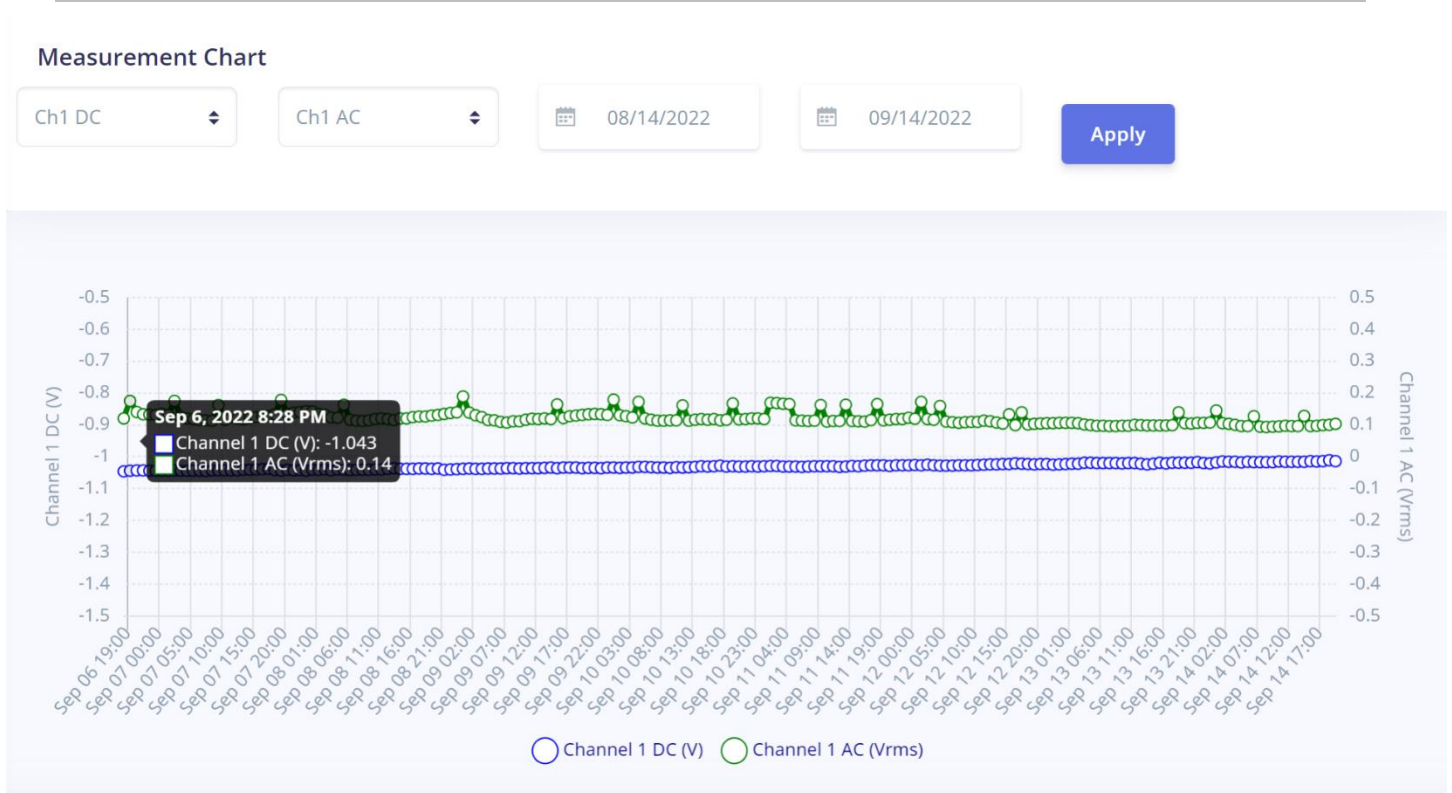
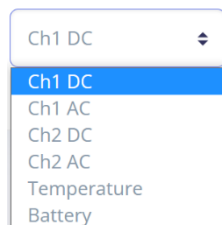


Figure 13: Sensometer™ Device Measurement Drop Down Options



- Below the Measurement Chart is where you will find the Measurements table for the selected device. Both AC and DC voltages are recorded with every measurement cycle.

Figure 14: Sensometer™ Device Measurements

Measurements							Export
CH #1 DC	CH #1 AC	CH #2 DC	CH #2 AC	BATTERY	TAKEN	RECIEVED	
-0.905	0.085	-0.909	0.096	6.678	Sept. 30, 2022, 23:34:15	Oct. 01, 2022, 00:36:37	
-0.904	0.084	-0.907	0.095	6.715	Sept. 30, 2022, 22:34:15	Sept. 30, 2022, 22:36:31	
-0.904	0.084	-0.907	0.095	6.702	Sept. 30, 2022, 21:34:15	Sept. 30, 2022, 22:36:31	
-0.904	0.084	-0.907	0.095	6.706	Sept. 30, 2022, 20:34:15	Sept. 30, 2022, 20:36:25	
-0.904	0.084	-0.908	0.094	6.681	Sept. 30, 2022, 19:34:15	Sept. 30, 2022, 20:36:24	
-0.905	0.116	-0.908	0.134	6.676	Sept. 30, 2022, 18:34:15	Sept. 30, 2022, 18:36:20	
-0.904	0.084	-0.907	0.096	6.644	Sept. 30, 2022, 17:34:15	Sept. 30, 2022, 18:36:19	
-0.902	0.085	-0.905	0.097	6.628	Sept. 30, 2022, 16:34:15	Sept. 30, 2022, 16:36:12	
-0.906	0.086	-0.909	0.097	6.558	Sept. 30, 2022, 15:34:15	Sept. 30, 2022, 16:36:12	
-0.904	0.086	-0.908	0.098	6.471	Sept. 30, 2022, 14:34:15	Sept. 30, 2022, 14:36:06	

Showing 1 to 10 of 1,358 entries

Previous 1 2 3 4 5 ... 136 Next

- Below the Measurements table, are the measurements recorded at commissioning.

Figure 15: Sensometer™ Measurements Recorded at Commissioning

Commissioning							
CH #1 DC	CH #1 AC	CH #2 DC	CH #2 AC	BATTERY	RADIO SIGNAL	TAKEN	RECIEVED
-1.046	0.120	-1.057	0.144	6.616	-69.0	Sept. 06, 2022, 18:23:54	Sept. 06, 2022, 18:24:07

- Below the Commissioning information is the Configuration information, which shows the name of the Group Configuration connected to this device, and also the interval settings.

Figure 16: Sensometer™ Device Configuration

Configuration
Using group configuration: [Trial Group Config](#)

Name*

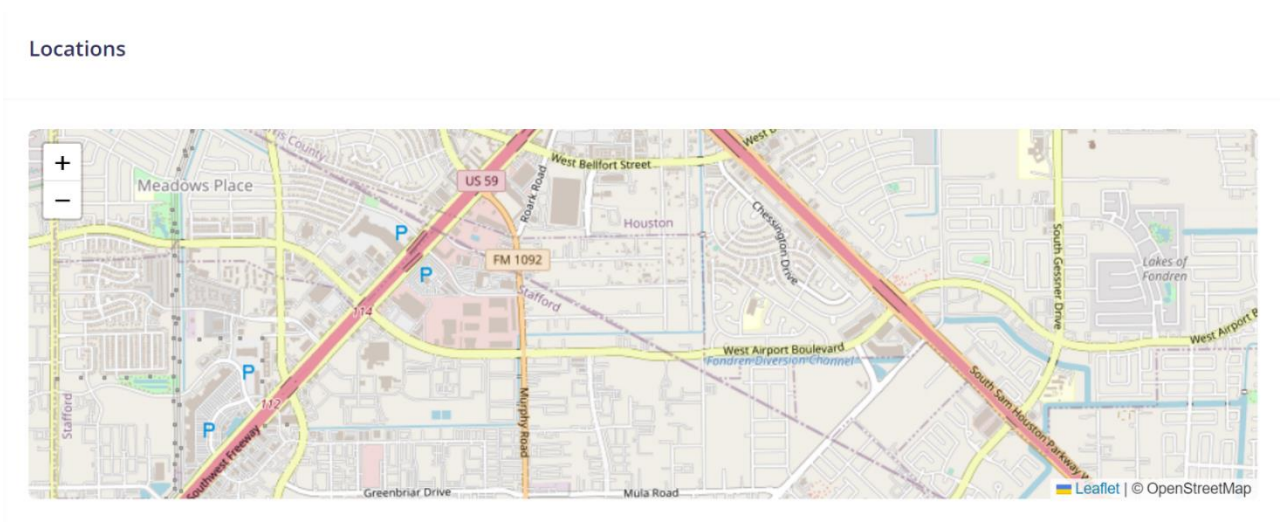
Report interval (hours)*

Measurement interval (hours)*

[Override configuration](#)

- Below the Configuration information is the device location, placed on a map of the nearby surroundings.

Figure 17: Sensometer™ Location



3.5 Managing Groups

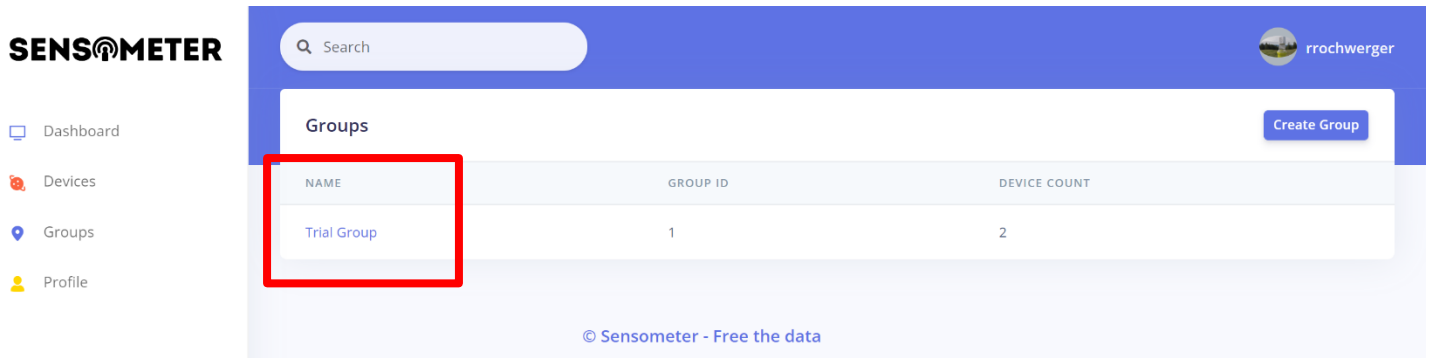
This section shows you how to manage Groups.

3.5.1 Groups

Use the following steps to navigate through “Groups”:

1. Click “Groups” from the navigator
2. You will see a list of the Groups that are currently available

Figure 18: Sensometer™ Group List



3.5.2 Create Device Group

Use the following steps to create a new device Group:

1. To create a new Group, simply click **Create Group** and you will see this dialog below.
2. Enter the information required, and click **Create**
3. From here you can then assign devices to this new group (see 3.5.3)

Figure 19: Sensometer™ Create New Group

Create New Device Group x

Group Name*

Group Configuration Name*

Report Interval* Hours

Measurement Interval* Hours

Create

- Click on the Name of the Group to see additional information. The list of devices that belong to that group will be shown, along with a Measurements table showing all measurements from each device of the group. Click on a specific Device to see only information related to that Device.

Figure 20: Sensometer™ Device List of a Group

Group devices - Trial Group
[Remove a device](#) [Add a device](#)

Show entries

DEVICE	DESCRIPTION	REGISTERED	LATEST MEASUREMENT	USES GROUP CONFIG	MEASUREMENTS
2358640641	Trial unit #2	Aug. 29, 2022, 15:39:55	Sept. 14, 2022, 19:33:46	True	194
2358640643	Trial unit #4	Sept. 01, 2022, 14:51:28	Sept. 14, 2022, 20:01:52	True	364

Showing 1 to 2 of 2 entries
[Previous](#) [Next](#)

Figure 21: Sensometer™ Measurements Table of a Group

Measurements [Export](#)

Show entries

DEVICE	CH #1 DC	CH #1 AC	CH #2 DC	CH #2 AC	BATTERY	TAKEN	RECIEVED
2358640643	-1.123	0.206	0.033	0.225	6.817	Sept. 14, 2022, 20:01:52	Sept. 14, 2022, 21:02:02
2358640641	-1.014	0.103	-1.021	0.119	6.734	Sept. 14, 2022, 19:33:46	Sept. 14, 2022, 20:33:54
2358640643	-1.126	0.185	0.037	0.202	6.824	Sept. 14, 2022, 19:01:36	Sept. 14, 2022, 21:02:02
2358640641	-1.011	0.100	-1.020	0.116	6.738	Sept. 14, 2022, 18:33:28	Sept. 14, 2022, 20:33:54
2358640643	-1.158	0.184	-0.043	0.199	6.803	Sept. 14, 2022, 18:01:47	Sept. 14, 2022, 19:01:56
2358640641	-1.014	0.099	-1.022	0.115	6.711	Sept. 14, 2022, 17:33:40	Sept. 14, 2022, 18:33:48
2358640643	-1.149	0.172	-0.039	0.187	6.801	Sept. 14, 2022, 17:01:30	Sept. 14, 2022, 19:01:55
2358640641	-1.015	0.097	-1.023	0.111	6.697	Sept. 14, 2022, 16:33:22	Sept. 14, 2022, 18:33:48
2358640643	-1.125	0.159	0.039	0.171	6.768	Sept. 14, 2022, 16:01:42	Sept. 14, 2022, 17:01:50
2358640641	-1.014	0.096	-1.022	0.111	6.637	Sept. 14, 2022, 15:33:34	Sept. 14, 2022, 16:33:42

Showing 1 to 10 of 558 entries
[Previous](#) [2](#) [3](#) [4](#) [5](#) ... [56](#) [Next](#)

3.5.3 Add or Remove Devices in a Group

Use the following steps to add or remove devices in a Group:

1. To add a device to this group, simply click **Add a device** and select the device you want to add from the drop down selector box.
2. To remove a device from this group, simply click **Remove a device** and select the device you want to remove from the drop down selector box.

3.5.4 Export Group Data

Use the following steps to export data from a Group:

1. To export this group to a CSV file, click **Export** and the following will be displayed:

Figure 22: Sensometer™ Export Measurements



The screenshot shows a modal dialog box titled "Export Measurements" with a close button (x) in the top right corner. Inside the dialog, there are two text input fields. The first is labeled "Start date*" and the second is labeled "End date*". Below these fields is a green button labeled "Submit".

2. Choose the desired date range, then click **Submit** and the CSV file will be downloaded to your computer.

3.5.5 Modify Group Configuration

Use the following steps to modify the Group configuration:

1. In this section you can configure the Group Name, the time between reporting (data transmission), and the time between measurements. Change the details as needed, then click [Update configuration](#)

Figure 23: Sensometer™ Group Configuration

Group Configuration

Name*

Report interval (hours)*

Measurement interval (hours)*

[Update configuration](#)

3.6 Managing Profiles

This section shows you how to manage your personal profile.

3.6.1 Profile

Use the following steps to navigate through “Profile”:


1. Click “Profile” from the navigator
2. The following will be displayed. From here you can update any information, and then click 

Figure 24: Sensometer™ User Profile

Profile

Username*

First Name

Last Name

Email*

Timezone*



4 Device Troubleshooting

4.1 Device Troubleshooting

See 2.5 for more information.

5 Additional Assistance

5.1 Contact Info

For updated revisions to our user manuals, visit our website: www.sensometersolutions.com

For additional assistance, please contact:

Sales / Customer Service

(833) 743-1897 or Info@SensometerSolutions.com

6 Document Revision History

The following changes have been made to this document:

Rev:	Date:	Summary:
0.2	April 2022	Original Release.
0.6	November 2022	Updates with product photos and website
1.0	December 2022	Clarifications