

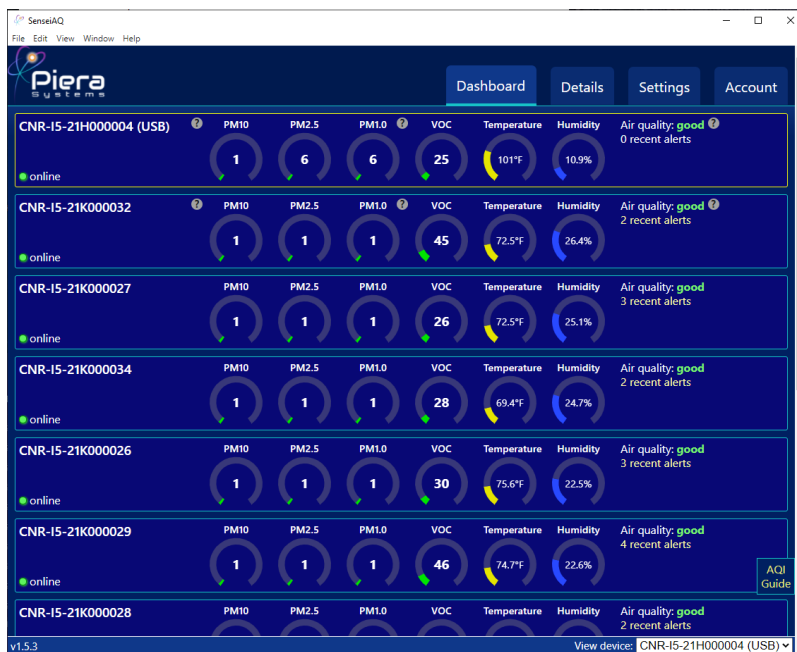
SenseiAQ Software

Real-Time Air Quality Monitoring for Piera Sensors, Canaree Air Quality Monitors
Application User Guide – Version 1.5.3 Updated 1/4/22

Overview

SenseiAQ software for Piera Systems enables real time Air Quality Monitoring using data from Piera's family of Intelligent Particle Sensors (IPS) and Canaree Air Quality Monitors. It collects particle count / mass concentration data via a USB connected Piera sensor, and stores data locally on the connected device for logging and analysis. It is available as a download at no charge and supports the IPS Evaluation Kit and Canaree A-Series, R-Series and I-Series AQM Sensors.

In addition to data analysis, it displays an Air Quality Index (AQI) and events (Vape and Smoke Detection) on a dashboard, the status of the sensor and its connectivity. SenseiAQ can also Cloud-Enable a locally connected device providing a IoT Gateway functionality enabling the collected data to be stored, viewed and analyzed remotely through Piera's Cloud Subscription on the Sensei Website (<https://sensei.pierasystems.com>) - allowing multiple devices to be monitored remotely.



SenseiAQ Software displays real-time data on a dashboard including Particle Counts for PM10, 2.5 and 1.0 sizes which are displayed in ug/m3 (micrograms per cubic meter) The Air-Quality-Index (AQI) Score is updated every minute based on previous minutes averages of particle counts. These standards were developed to monitor outdoor Air Quality and serve as a baseline for measuring Indoor Air Quality.

This software is provided with all Piera sensors and the Cloud-reporting functionality is included for all customers under a maintenance agreement with Piera Systems.

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Downloading

SenseiAQ Software is available for download on the Piera Systems support site at

<https://www.pierasystems.com/support>

- Windows 10 Installer (Supports both Professional and Home Editions x86 and x64 versions)
- MacOS Installer (Supports MacOS 10.15 "Catalina" or above. x64 and ARM M1 Chipsets)

Installation Notes

Windows 10 – Download and run the SenseiAQ Setup Executable. All necessary components will be installed in Program Files and the SenseiAQ Application will launch.

MacOS – Control-click/Right click on the SenseiAQ application icon then choose "Open" from the shortcut menu. You may need to override MacOS Security settings from the Security Control panel to allow the application to open.

SenseiAQ First Time Usage

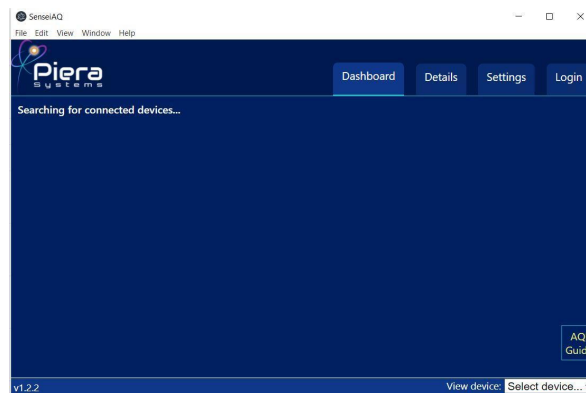


Figure 1. Initial dashboard view with no Piera sensor detected

Attach the Piera sensor to the USB Port on your computer and SenseiAQ will auto detect your sensor. It will immediately begin displaying values for PM measured in the dashboard. After the first minute the application will begin displaying AQI Information based on averages over the last 60 seconds.

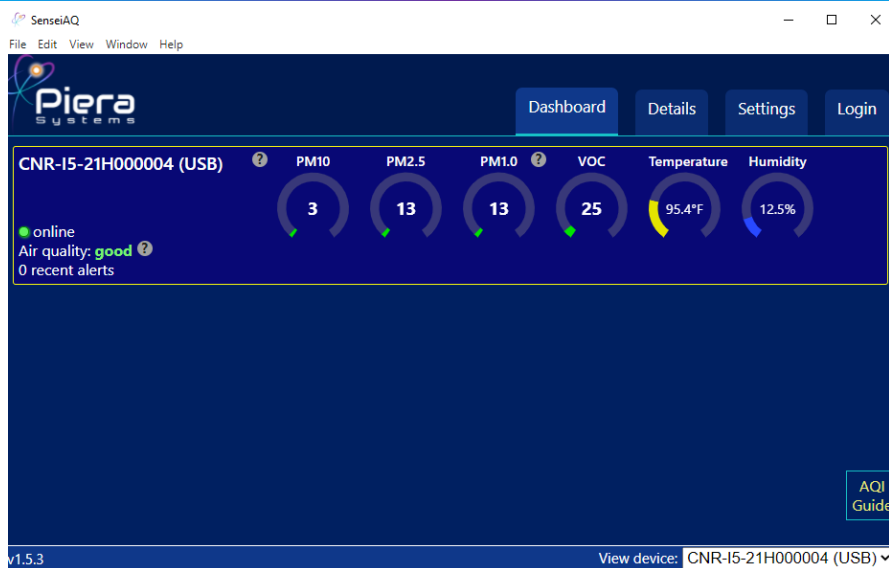


Figure 2. Initial dashboard view with Piera sensor detected

Data can be viewed within SenseiAQ, saved to a local CSV log file, or sent to Piera's SenseiAQ Cloud for remote analysis on <https://sensei.pierasystems.com>. This is further explained throughout this document.

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0-50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51-100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101-150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151-200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201-300	Health alert: everyone may experience more serious health effects.
Hazardous	> 300	Health warnings of emergency conditions. The entire population is more likely to be affected.

Figure 3. AQI Values are calculated based on US EPA Guidelines for PM10, PM2.5 and PM1.0 and VOC are color coded by SenseiAQ for easy interpretation of the health impacts of the current air quality. Click AQI Guide to show this information.

For some users SenseiAQ may suggest installing a driver to support the Canaree devices on your operating system. If this is suggested follow the links to install the COM Port Drivers then reconnect your Piera devices via the PC's USB Port after install. For more information see the Troubleshooting section at the end of this document or contact us at pierasystems.com/support.

Device Settings - Navigate to the *Settings* tab to configure your Device Wifi settings (Canaree R-Series and I-Series only) For Internet-connectivity these devices require a one-time configuration of your Wifi network name and password. Enter this information and click Save to program the device. The Device will reboot and attempt the Wifi connection and may take up to a minute to reappear in SenseiAQ App.

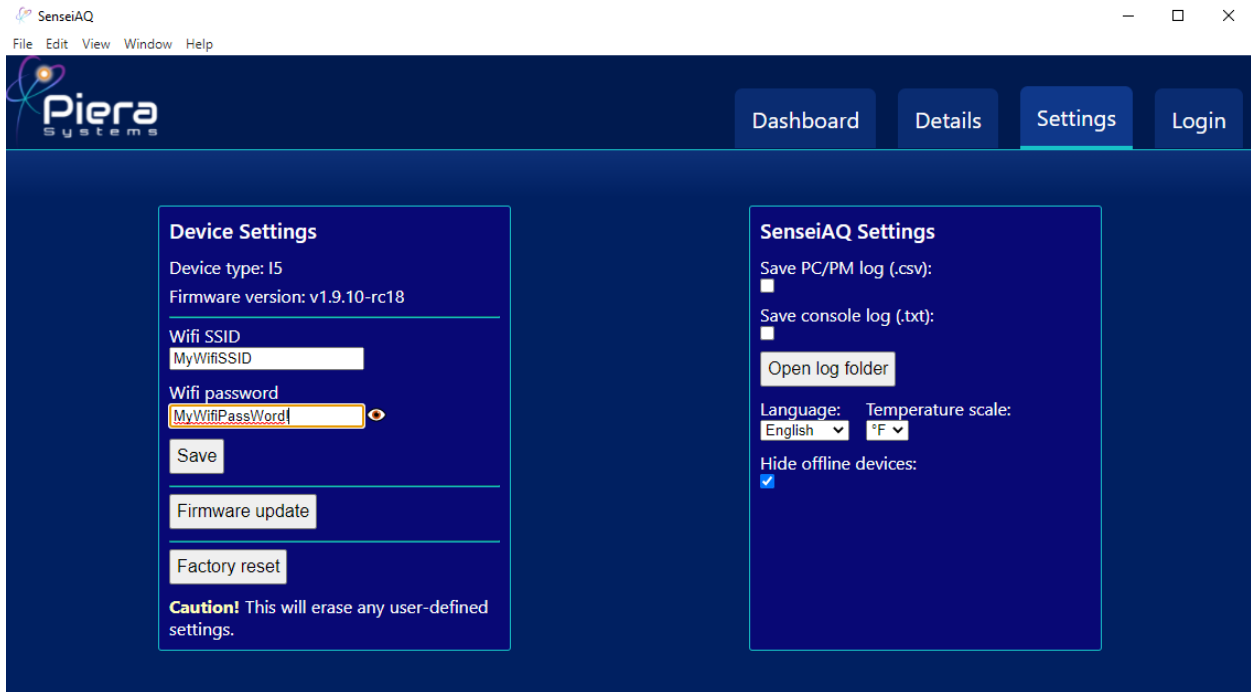


Figure 4. From the Settings tab you can configure your device for Wifi Networks and perform other functions.

Firmware Update - (For Canaree I-Series only) executes a firmware update to the latest version from Piera Systems. Note Wifi must be configured and working before attempting to update the firmware. When updating Firmware the device will reboot and may take 1-2 minutes to reappear in SenseiAQ.

Factory reset - Restores all sensor settings to factory default. Note: This will wipe out the Wifi Network or Password information on I-Series!

SenseiAQ Settings - Application specific settings here include saving data to a CSV File (for manual logging) or saving Console log for full debugging purposes. The Temperature setting in *F or *C applies only to I5/R5 devices which can monitor temp.

Settings View (Canaree R-Series Devices)

Canaree R-Series devices will show the network mode option, which lets you select between Ethernet only and Wifi options for connectivity. Note when set to Ethernet the wifi radio will be disabled completely for security reasons. In this mode - the device will not transmit or receive any RF.

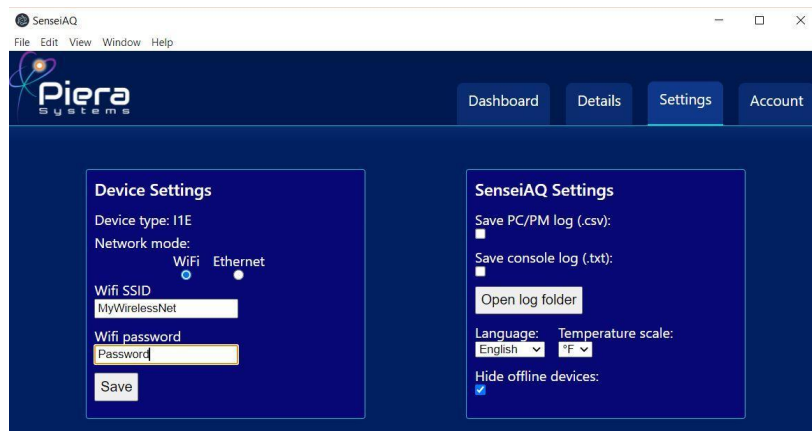


Figure 5. SenseiAQ Settings View with Canaree R-Series connected

Settings View (IPS Sensors and Canaree A-Series)

A-Series do not support network connectivity; however the settings tab will allow you to enable the Save Log (CSV) option for all Particle Count and Mass data. This option is primarily for customers who wish to analyze the data using Excel or other tools. A Save Console Log option can be enabled to log all serial data received for the device, for troubleshooting.

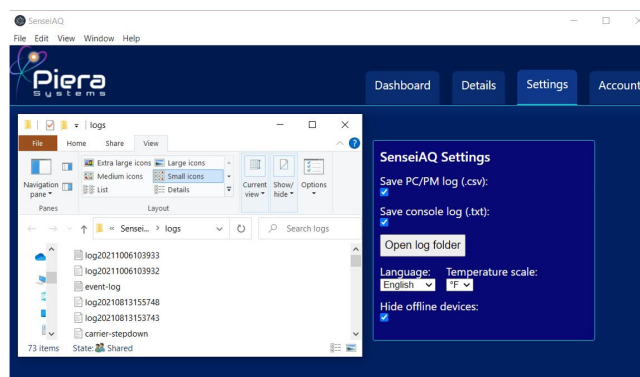


Figure 6. Settings available on SenseiAQ version 1.2.2

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Login Tab - This is where you login to view your sensor(s) cloud data and to register a new device for cloud reporting. If this is a new device and you wish to register it to the SenseiAQ Cloud, click on the Login tab and login. If you do not already have an account, click on **Create Account** and you will be redirected to the account creation page. After you can login using your credentials.

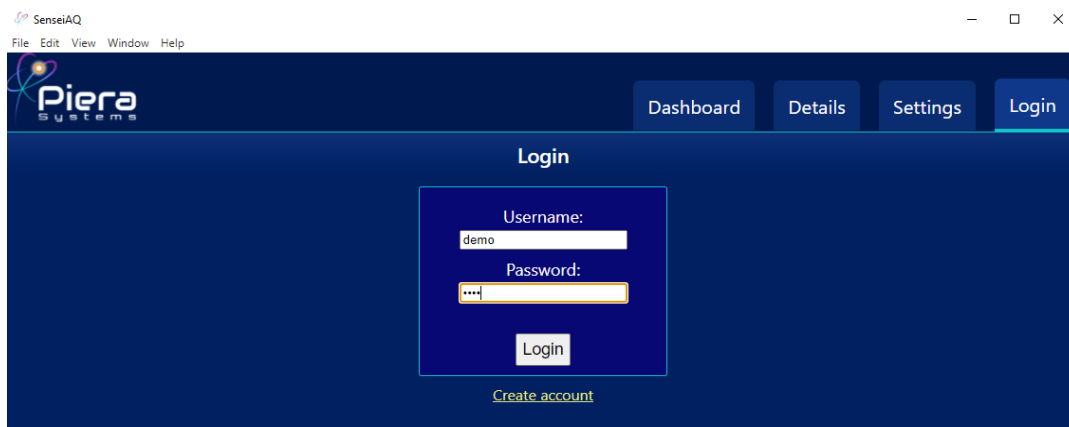


Figure 7. SenseiAQ Login Page

When creating an account for the first time, be sure to input a valid email address in case you later forget your password and need it reset. Note this email address will also be used to send alerts on events and software updates from Piera Systems.

Login with your new account and you will be redirected to the Dashboard where all active and registered devices are shown.

For new devices - Navigate back to the Account tab and click on the *Register Device* button to register and associate this Piera device with your account.

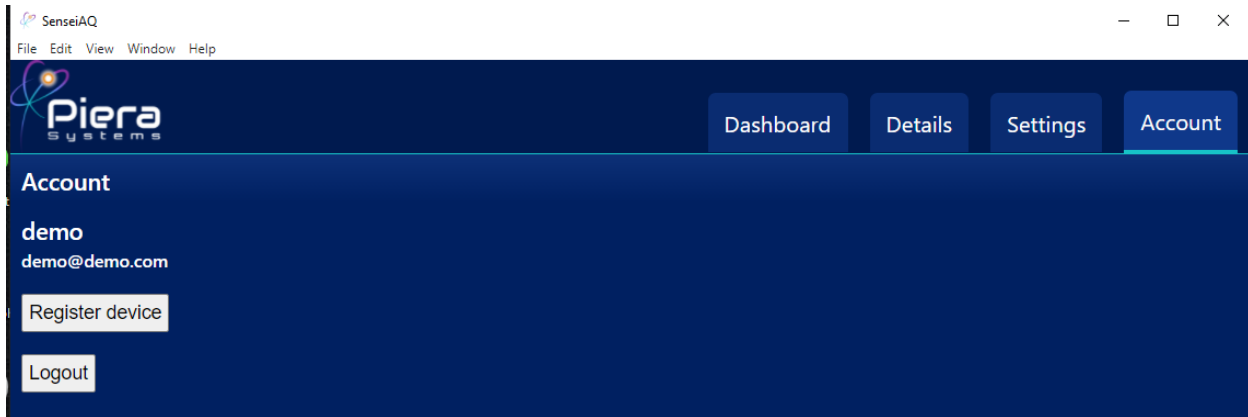


Figure 8. SenseiAQ Account Tab shown logged in successfully.

Once registered your device will be shown on the SenseiAQ Dashboard and can be accessed remotely from anywhere using the website:

<https://sensei.pierasystems.com/login>

If you wish to register or configure additional devices, connect them to SenseiAQ and follow the above process to Register additional devices. All devices associated with your account will be shown in the dashboard when logged in and registered.

- Your Canāree I-Series or R-Series is now ready to be deployed as a standalone Air Quality Monitor. You can safely disconnect the device from your PC and install it in its final location connected to USB Power (I-Series) or PoE Ethernet (R-Series)
- Canāree A-Series devices and IPS Sensors rely on the SenseiAQ app to report data to the Cloud for remote monitoring. This means the SenseiAQ App needs to be always running to report and remotely-access the data. For this purpose the application can be minimized and run in the background and consider placing it in your Startup Items folder to automatically launch.

Details Tab

Once SenseiAQ has run for several minutes, it will begin to calculate AQI Values every 60 seconds. The results for larger particle sizes are displayed on the dashboard with Color-coded graphs that correspond to EPA standards for AQI values. Historical values will be displayed in the bar graph over time and placing your mouse pointer over any bar graph value will show the details about AQI during the selected timeframe. Data updates every 1 second and SenseiAQ displays PM concentrations in $\mu\text{g}/\text{m}^3$.

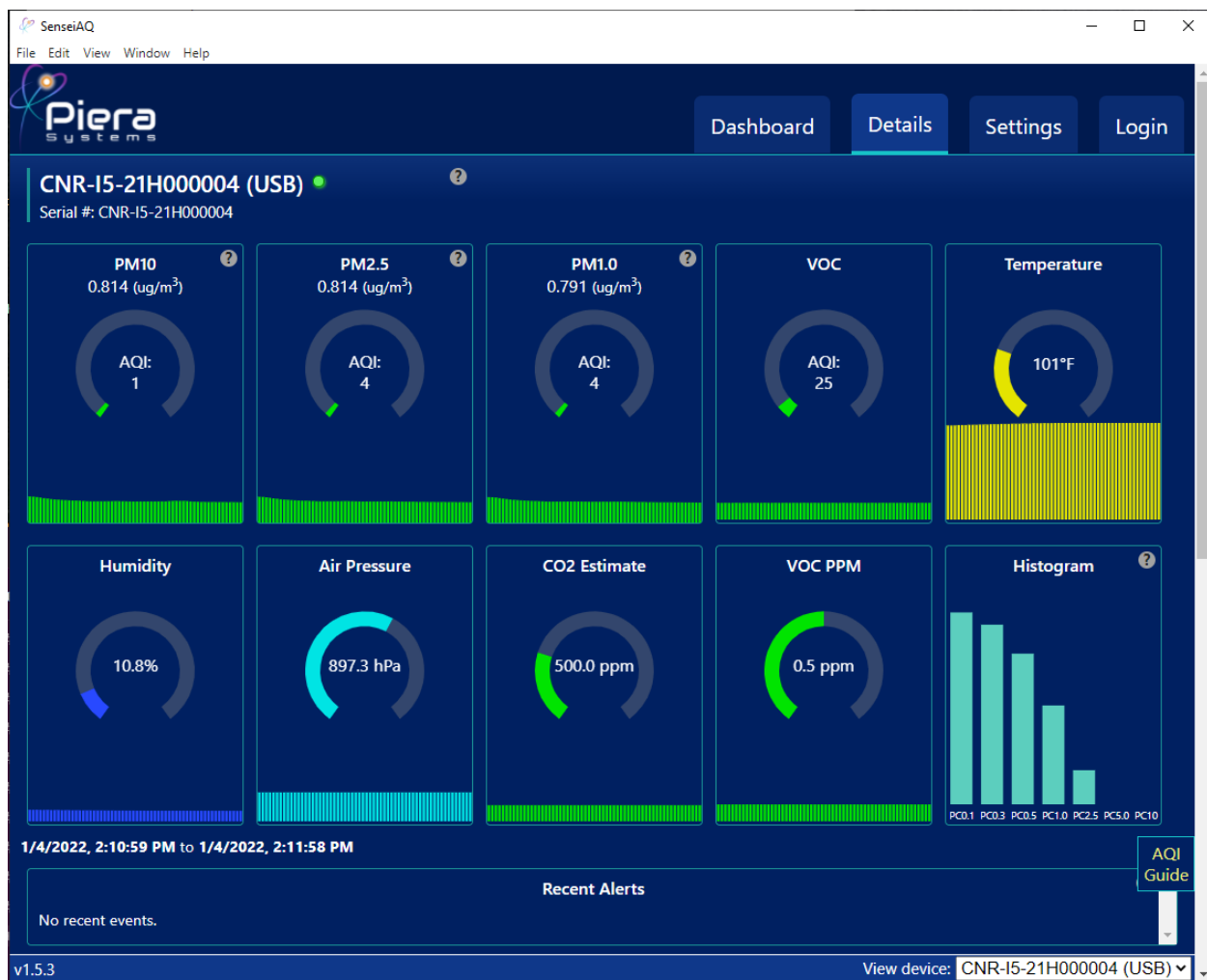


Figure 9. Details view of a locally connected Canaree-I5 operating normally (top)

Note: Alerts for Events detected, such as Vape or Smoke will be seen here as well.

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Details Analysis View

Scrolling further down the detail page - this view allows for more detailed analysis of the data in real-time and provides the ability to include or exclude certain PC (Particle Size) bin(s) on a historical line chart. This functionality is intended for closely monitoring trends in particle counts or other data over time. Designed for the data-scientist / air quality experts.

Note: Selecting a PC size value will exclude that data from the chart.

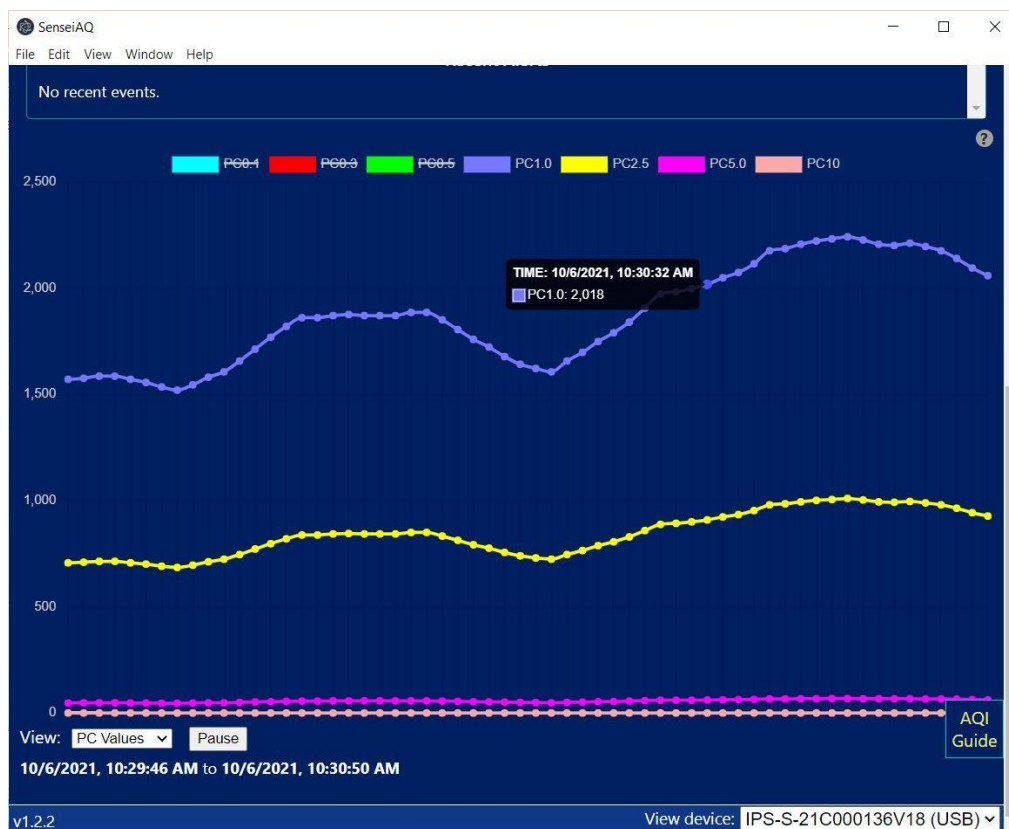


Figure 10. Analysis view of particle counts for all bins

In addition to Raw Counts the Analysis tab can also display PM Values, Ratios between PM Values or Percentage by Particle Count or Mass. A “Relative to last minute” option is to compare minute averages.

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In the chart you can choose to include or exclude specific PM Sizes in the Analysis View.

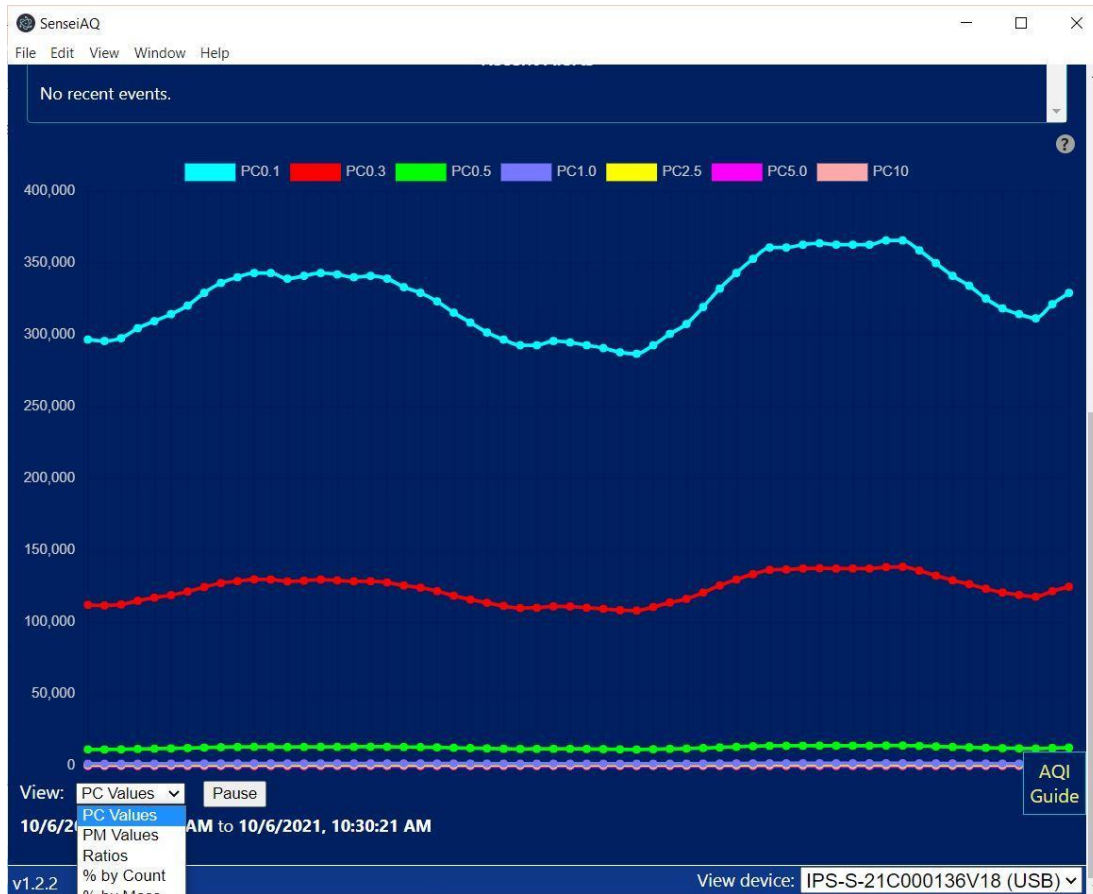


Figure 11. Analysis chart options menu.

View Menu - The display window can be set to full screen or scaled using “Zoom in” and “Zoom out” options in the View menu to increase the timeline or amount of data plotted in the chart. Keyboard shortcuts are available for these options. The reload option will reload the UI. These are useful when operating in full screen mode on large displays.

Changing Display size and resolutions (also available in the View menu)

“F11”: Toggle full screen mode on/off

“Ctrl” + “R”: Reload GUI

“Ctrl” + “-”: Zoom out plots

“Ctrl” + “=”: Zoom in plots

“Ctrl” + “0”: Return to original size

Log Files - Each time you launch the SenseiAQ Application and enable logging - a separate log file will be generated with a timestamp. You can download an Excel template for analyzing these log files from the Piera Systems GitHub page for detailed analysis. These logs provide all sensor data with per-second measurements and timestamps. Look in your Documents folder for logs in the SenseiAQ Director.

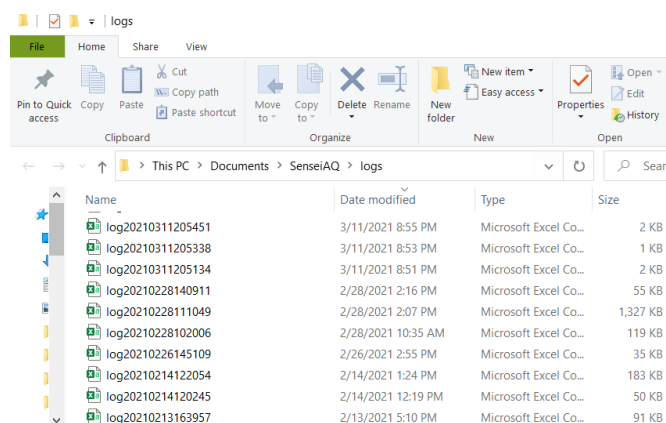
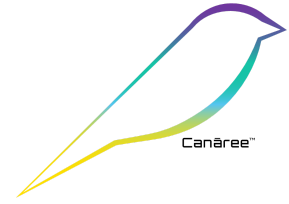


Figure 12. Log file directory on Windows 10



SenseiAQ Specifications

Software Specifications	Rating
OS Support	Windows (7, 10 Pro / Home Edition on x86, x64 or ARM Platforms) MacOS (High Sierra or greater on x64 or ARM Platforms)
Distribution Package	Electron Installer / Cross-Platform React Native Package, signed by Piera Systems
Languages	Node.js / React Native
USB Interfaces support	Type A - USB 2.0, Max Length 10m / 32'
Install Package Size	Signed Electron Package - 82 Mb for Windows 10 (x64 Version) Electron Package - 78Mb for MacOS (x64 and ARM M1 Supported)
Piera Hardware Supported	Piera-IPS™ Series Intelligent Particle Sensors: IPS-7100 IPS-5100 IPS-3100 Canaree™ Series Air Quality Monitors (AQMs): Including A-Series, R-Series and I-Series
Cloud Reporting Support	Native support for Microsoft Azure IoT Hub* Software acts as IoT Gateway Device
API Support	Direct Serial API (CSV format) Azure IoT via REST API in JSON format
Language Support	English, Spanish, French, Deutsche

*1 Year subscription included with purchase of device. Extended subscriptions available with maintenance contract.

Troubleshooting Sensor Connectivity

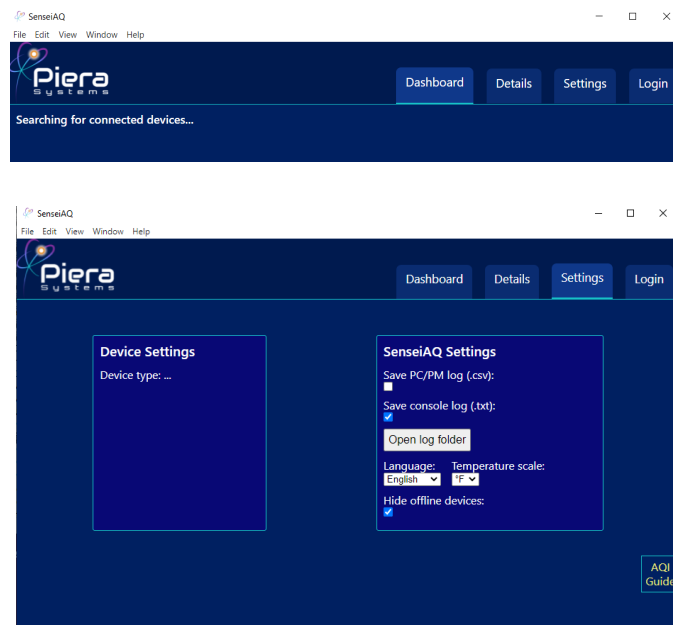
In some cases, the device may be working but fails to communicate with SenseiAQ. If there are other programs running that may be using COM Ports, such as serial monitoring or logging software that can prevent SenseiAQ from communicating with the device. Certain USB devices, such as Serial Adapters or IoT development boards can also interfere with SenseiAQ's detection of the Piera/Canaree device.

If you experience problems try shutting down any programs that may be using COM Ports and unplugging other USB devices that could potentially be interfering, then unplug the Piera/Canaree device and restart SenseiAQ. With SenseiAQ running, plug the device in again and wait up to a minute for it to start communicating. When the sensor is communicating properly you should see serial data in the console log file.

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Appendix A: Troubleshooting (Windows OS)

If SenseiAQ does not detect a device and nothing is seen in the settings tab, as shown below. Try disconnecting all other USB Devices and restart SenseiAQ to see if that resolves the issue. If it does - try reconnecting each USB device again to determine if a device is conflicting with SenseiAQ software. - If the LED illuminates on the Piera device but your sensor cannot be detected, a driver may be required which is discussed below.



On Windows platforms open the Device Manager and expand the Ports COM & LPT) section. With a Piera sensor connected via USB you should see a “Silicon Labs CP210x USB to UART Bridge” as shown below. Also indicated is the COM Port mapping – in this case COM7. The exact COM Port may differ for your system.

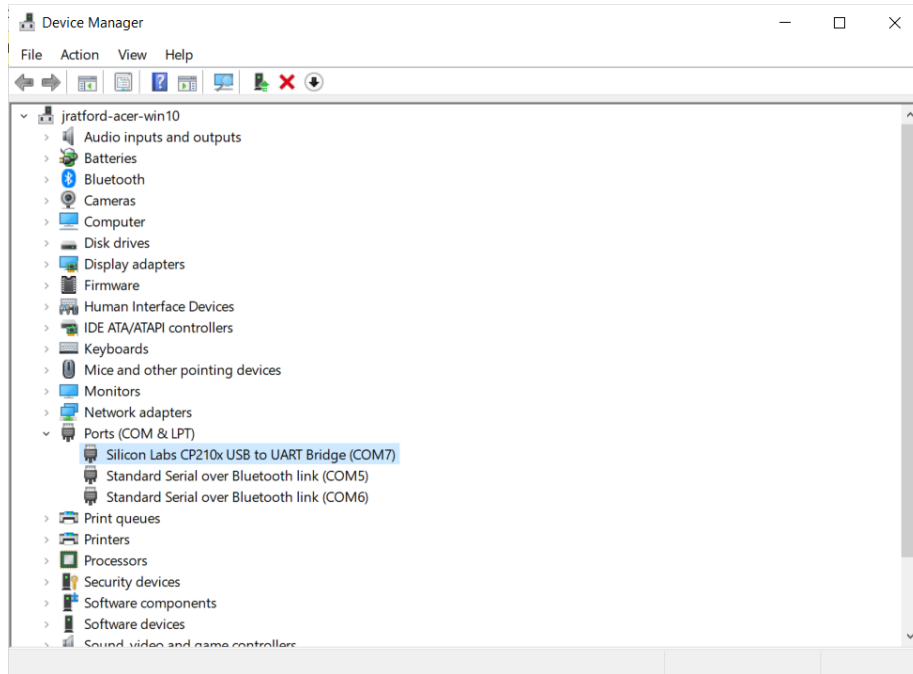


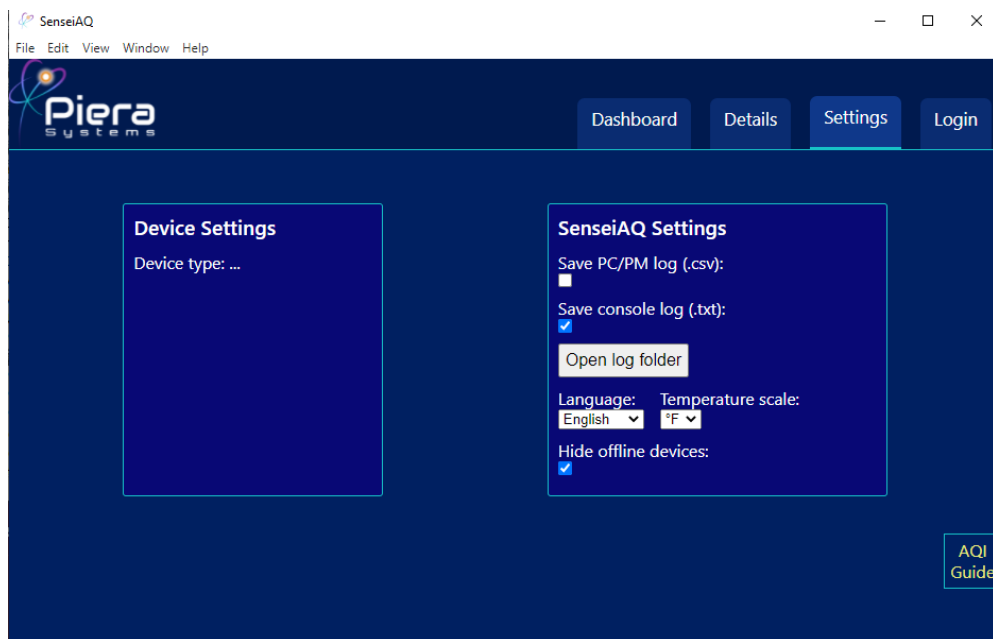
Figure 13. Windows 10 device manager window

If this does **not appear** when you connect your sensor, or an Unknown USB Device message is displayed it may be necessary to install the driver on your Windows system. SenseiAQ may alert you about this. The driver can be downloaded from the following link:

<https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers>

Appendix B: Troubleshooting (MacOS)

If SenseiAQ was not able to recognize the Piera USB Device here could be a conflict or driver issue. Try disconnecting all other USB Devices and restart SenseiAQ to see if that resolves the issue. If it does - try reconnecting each USB device again to determine if a device is conflicting with SenseiAQ software.



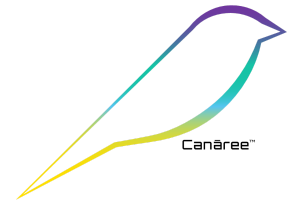
The following commands can be used to troubleshoot USB detection on MacOS from the Terminal App

```
ioreg -p IOUSBsudo
```

Does this display a recognised USB Device with a Piera sensor connected?

```
find /System/Library/Extensions/ /Library/Extensions/ -name osx-cp2102.kext -o
-name osx-pl2303.kext -o -name osx-ch341.kext -o -name usbserial.kext -o -name
usb.kext -o -name ch34xsigned.kext
```

Does your system have one of the valid and supported drivers? If not please contact us for assistance.



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