



SenseiAQ Software

***Real-Time Air Quality Monitoring for Piera Sensors, Canāree Air Quality Monitors
Application User Guide – Version 1.5 Updated June 29, 2021***

Overview

SenseiAQ software for Piera Systems enables real time Air Quality Monitoring using data from Piera's family of Intelligent Particle Sensors (IPS) and Canāree 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 Canāree A1, I1, I5 AQM's. 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.

Alerts for vape/smoke and particle count thresholds and distributions can be seen in the serial data and log files and reported to the cloud. This software is provided with all Piera sensors while the Cloud-reporting functionality is included for all customers under a yearly subscription / maintenance agreement with Piera Systems.



Downloading

SenseiAQ Software is available for download on the Piera GitHub Repository

<https://github.com/PieraSystems/SenseiAQ>

- Windows 10 Installer (Supports both Professional and Home Editions)
- MacOS Installer (Supports MacOS 10.15 "Catalina" or above)

Installation Notes

Windows 10 – Download and run the SenseiAQ-1.0.0 Setup Executable. All necessary components will be installed in Program Files and the SenseiAQ Application will launch. Note: If Microsoft Defender blocks the app, select "More info" and then "Run anyway".

MacOS – Control-click/Right click on the SenseiAQ application icon then choose "Open" from the shortcut menu.

Future versions of SenseiAQ will be signed for validation and will not require these exemptions to run.

SenseiAQ First Time Usage



Figure 1. Initial dashboard view with no Piera sensor connected

Attach the Piera sensor to the USB Port on your computer and SenseiAQ will auto detect your sensor. It

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will immediately begin displaying values for PM measured in the dashboard. After 1 minute the application will begin displaying AQI Information based on averages over the last 60 seconds.

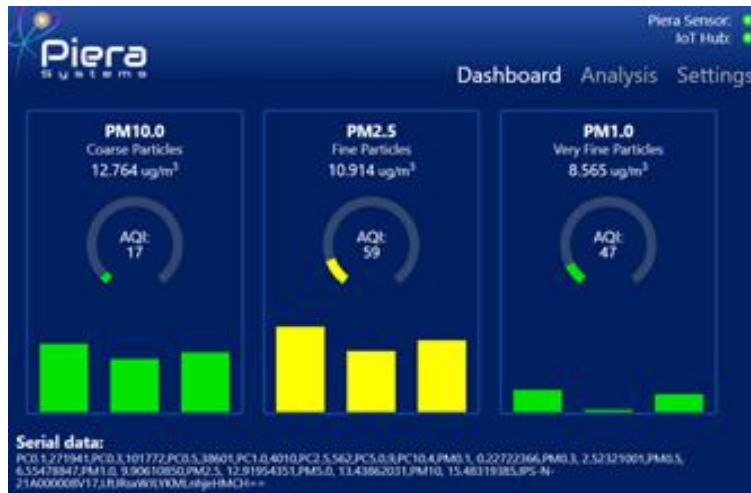


Figure 2. Initial dashboard view with Piera sensor detected

Data can be viewed within SenseiAQ, saved to a local CSV log file, or sent to Piera Systems IoT Hub for remote analysis. This is further explained throughout this document.

The Status Indicators will turn green when a Piera Sensor is detected and sending data. The IoT Hub green light indicates that SenseiAQ is sending data to the Cloud.



Figure 3. Status indicators

Note: If you are having Internet connectivity issues the IoT Hub light may turn RED – indicating data is not actively being sent to the Cloud. This is not a requirement to use the software; however, without the IoT Hub functionality all data will be stored locally and not sent to the Piera Cloud. A Software or Network Firewall may be blocking a web-socket connection to the Azure IoT-Portal. Ensure port 80 and 443 are open and permit websockets and SenseiAQ app is allowed in your software firewall. In this case we recommend you enable Save Log in the Settings tab to record data to a CSV File for offline analysis.

Dashboard View

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. Color-coding corresponds to EPA NAAQS

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standards for AQI values (see the color-coded table below) 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 ug/m3.

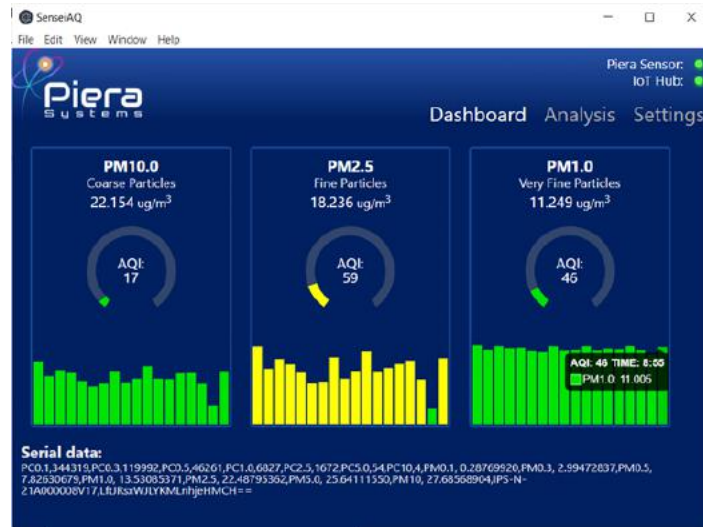


Figure 4. Dashboard view of SenseiAQ operating normally (top) EPA Air Quality Index (bottom)

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.

Analysis View

This view allows for more detailed analysis of the data in real-time and provides the ability to include or exclude certain bin(s) on a historical line chart. The charts can be updated by clicking the “Refresh” button or automatically by enabling the “Auto-Refresh” checkbox. Selecting a PC size value will exclude that data

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from the chart.

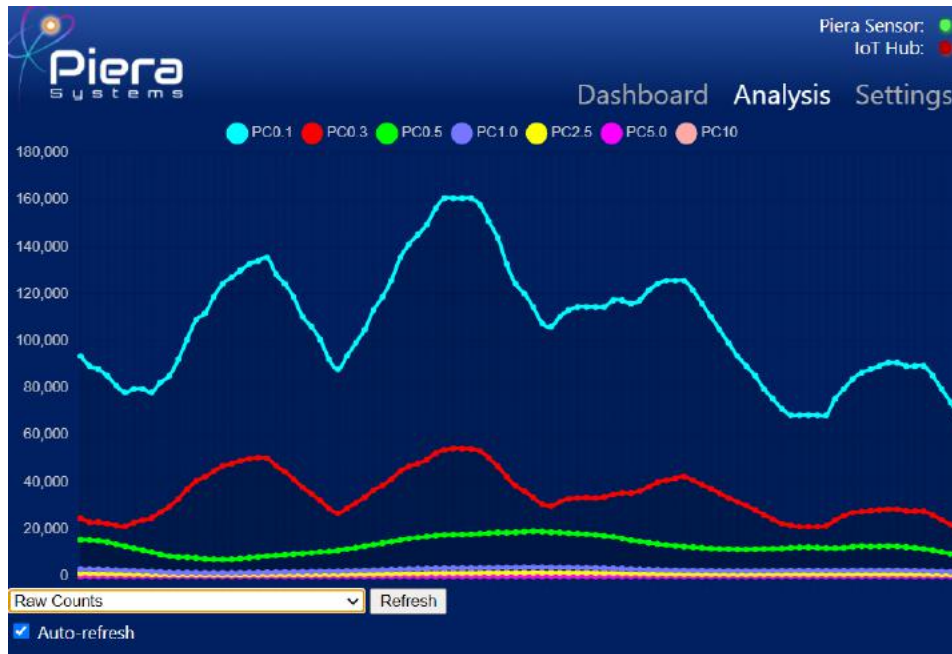


Figure 5. Analysis view of particle counts for all bins

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.

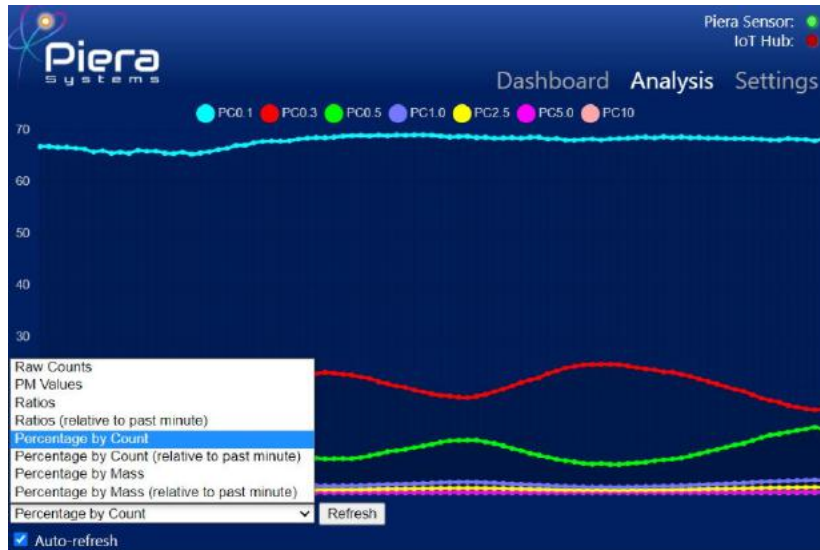


Figure 6. Analysis chart options

All other plots but PM0.5 have been excluded from the chart as an example, shown in Figure 7. The chart updates and scrolls automatically with “Auto-Refresh” enabled.



Figure 7. Displaying specific bin plot

The display window can be set to full screen or scaled using “Zoom in” and “Zoom out” options in the View

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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.

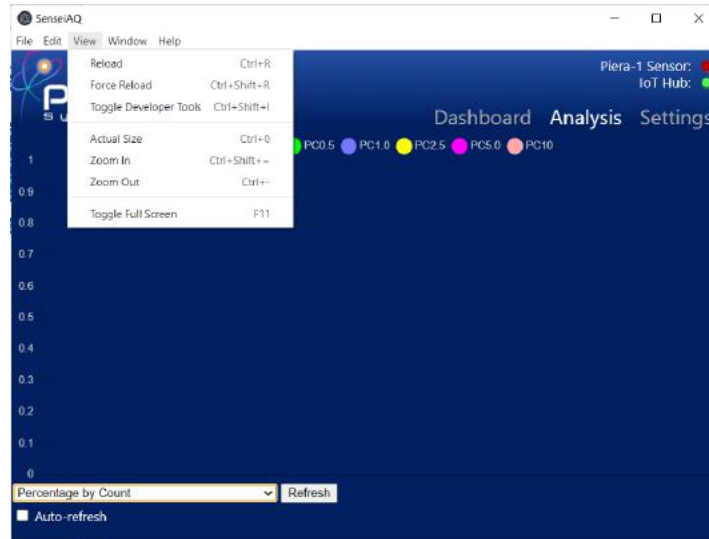


Figure 8. View menu options for larger displays

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



Settings View

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 use 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.

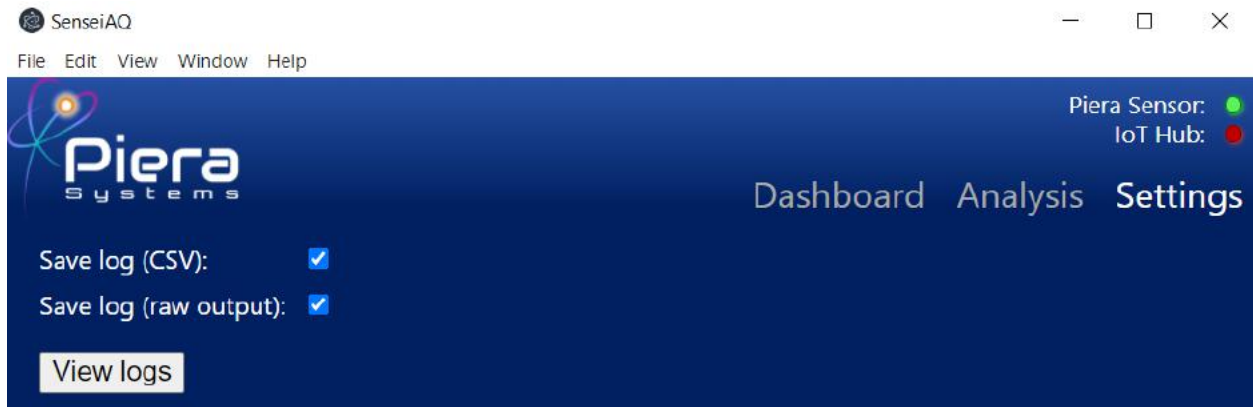


Figure 9. Settings available on SenseiAQ version 1.0.0

Logs are currently stored in your home directory at "My Documents\SenseiAQ\" on Windows 10 and "~/Library/Application Support/SenseiAQ/sensor-logs" on MacOS. Click on the View logs button to open the log directory.

Each time you launch SenseiAQ Application 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.

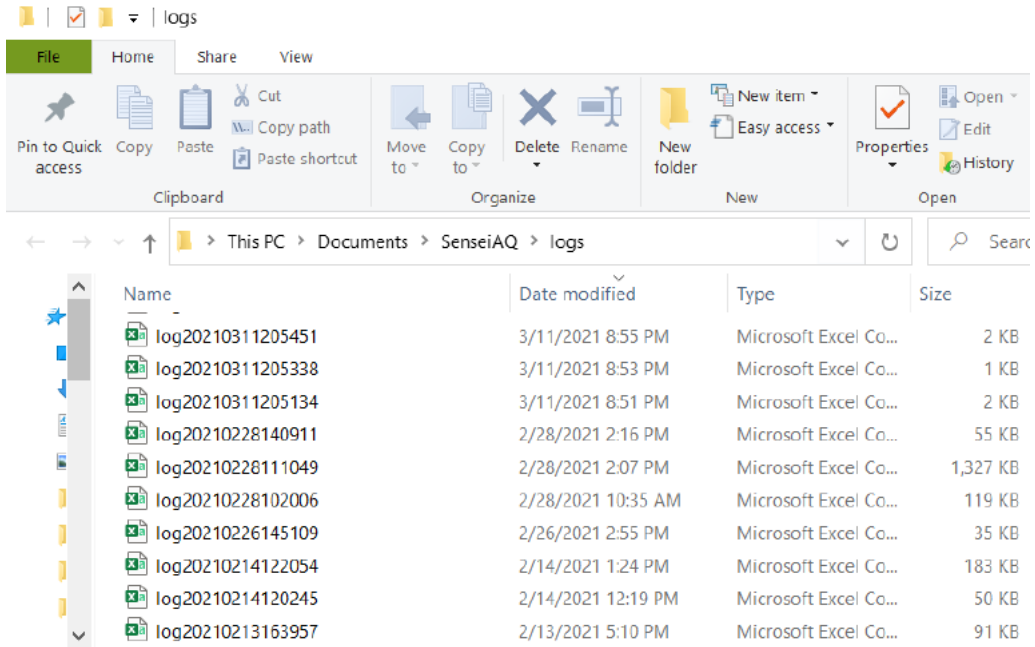


Figure 10. Log file directory on Windows 10



SenseiAQ Specifications

Software Specifications	Rating
OS Support	Windows (7, 10 Pro / Home Edition) MacOS (High Sierra or greater)
Distribution Package	Electron Installer / Cross-Platform React Package, signed by Piera Systems
Languages	Node.js
USB Interfaces support	Type A - USB 2.0, Max Length 10m / 32'
Install Package Size	98Mb
Piera Hardware Supported	Piera-IPS™ Series Intelligent Particle Sensors Canāree™ Series Air Quality Monitors (AQM)
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

*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/Canāree 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/Canāree 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 such as:

```
Serial data:
PC0.1, 43073550,PC0.3, 14062634,PC0.5, 8893584,PC1.0, 997356,PC2.5, 184096,PC5.0, 8974,PC10, 458,PM0.1, 3599053/10000000,PM0.3,
35324355/10000000,PM0.5, 128208946/10000000,PM1.0, 169876484/10000000,PM2.5, 249218178/10000000,PM5.0, 303557542/10000000,PM10,
324605298/10000000,IPS-N-21A000001V16,1ftJRsxWJLYKMLnhjeHMCA= =
```

Appendix A: Troubleshooting (Windows OS)

If Serial Data is not seen and/or the Piera Sensor light stays RED this indicates the software was not able to recognize the USB Device. On Windows platforms open the Device Manager and expand the Ports COM

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& 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.

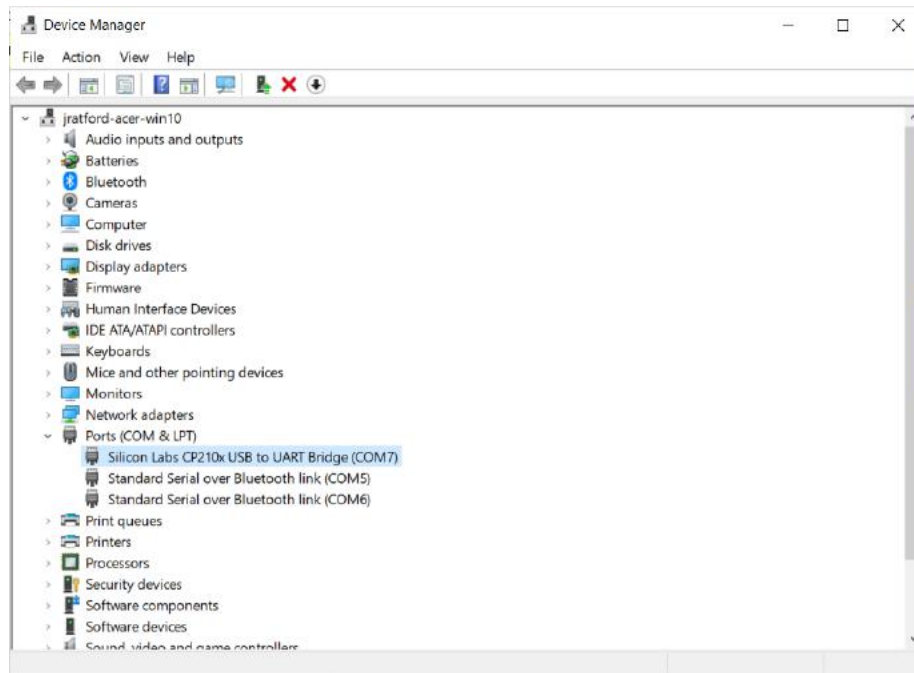


Figure 11. Windows 10 device manager window

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 Serial Data is not seen and/or the Piera Sensor light stays RED this indicates the software was not able to recognize the USB Device or there is 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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