

microAeth® AE51

Quick Start Guide



Recommendations for Best Use Practices

The small size and light weight of the microAeth® AE51 allow it to be used to gather data in a wide range of operational scenarios, not always possible using larger instruments. Optimization of performance across this breadth of applications requires an understanding of operational settings, precautions, and maintenance procedures. The following recommendations provide general guidelines.

Instrument Settings: Measurement Timebase and Flow Rate

In order to get the best data from the microAeth AE51 for the sampling campaign, we highly recommend that the **instrument warm up for approximately 10-15 minutes** so that it can equilibrate to its environment. The microAeth can acquire data on five timebase settings: 1, 10, 30, 60, and 300 seconds. The 1 second timebase should only be used under special circumstances where a decreased signal-to-noise ratio is acceptable. At this setting, instrumental noise is larger and typically requires post-processing. The AE51 pump can operate at four sampling flow rate settings: 50, 100, 150, and 200 ml/min. The choice of these parameters affects the operation and data as follows.

Battery Run Time on Single Charge: Affected by flow rate and timebase.

NOTE: Battery life will gradually diminish after many cycles (~ 1 year of use). The following are approximate runtimes which can vary based on individual AE51 instruments and specific environments.

	50 ml/min	100 ml/min	150 ml/min	200 ml/min
1 second	> 21 hours	> 18 hours	> 14 hours	> 12 hours
10 seconds	> 21 hours	> 19 hours	> 15 hours	> 12 hours
30 seconds	> 23 hours	> 19 hours	> 15 hours	> 13 hours
60 seconds	> 28 hours	> 24 hours	> 20 hours	> 15 hours
300 seconds	> 30 hours	> 24 hours	> 21 hours	> 15 hours

Individual Data Point Noise: At 150 ml/min, primarily affected by timebase setting.

1 second	60 seconds	300 seconds
< 5 ug/m³	< 0.1 ug/m³	< 0.05 ug/m³

Effects of Contamination, Vibration, and Impact: Primarily affected by timebase setting.

1 second	10 seconds	30 seconds	60 seconds	300 seconds
very large	large	moderate	moderate	least effect

Recommended Settings of microAeth® AE51 for Different Scenarios

Different Black Carbon measurement scenarios require different operational settings for optimum performance. The 1 second timebase setting is a ‘Data Acquisition Mode’ intended for subsequent processing, and should NOT be used for routine monitoring. Data collected on a 1 second timebase should always be smoothed or averaged over longer periods, in order to optimize the signal-to-noise ratio at the desired time resolution.

	Longest ←		Filter Life	→ Shortest
	50 ml/min	100 ml/min	150 ml/min	200 ml/min
1 s	‘Data Acquisition Mode’ for immediate emissions and impacts at high concentrations.	‘Data Acquisition Mode’ for emissions and impacts in typical urban and traffic environments.	‘Data Acquisition Mode’ for higher time resolution at lower BC concentrations.	‘Data Acquisition Mode’ for higher time resolution at lower BC concentrations or shorter sampling durations.
10 s	Traffic and transporation impacts in high BC concentrations.	Traffic and transporation impacts.	Traffic and transporation impacts at lower BC concentrations.	Traffic and transporation impacts at lower BC concentrations.
30 s	Personal Exposure Monitoring in high BC concentrations. Occupational Exposure.	Recommended Setting for General Applications. Personal Exposure Monitoring. Traffic impact. High time resolution ambient monitoring.	Personal Exposure Monitoring. Traffic impact. High time resolution ambient monitoring.	Personal Exposure Monitoring. Traffic impact. Ambient monitoring. Higher sensitivity for low BC concentrations.
60 s	Personal Exposure Monitoring. Occupational Exposure. High BC concentrations.	Personal Exposure Monitoring. Indoor Air Quality.	Personal Exposure Monitoring. Indoor Air Quality. Low BC concentration.	Personal Exposure Monitoring. Higher sensitivity for low BC concentrations.
300 s	Epidemiology. Area monitoring. Indoor air quality. High BC concentration.	Epidemiology. Area monitoring. Indoor air quality.	Epidemiology. Area monitoring. Indoor air quality. Low BC concentration.	Epidemiology. Area monitoring. Indoor air quality. Lowest BC concentration. Lowest data noise.

Install/Exchange Filter Strip

1. Always make sure that a filter strip is installed in the microAeth AE51 when it is operating.
2. When exchanging a filter strip in the microAeth AE51, make sure that it is turned off.
3. The sample deposit side of the filter strip is the white side. When the filter strip is installed in the sample chamber, the white side of the filter strip should be facing the same direction as indicated by the white arrow on the faceplate of the AE51.



Top of microAeth AE51

Bottom of microAeth AE51



White sample deposit side of filter strip faces the top.



Metal side of filter strip faces the bottom.

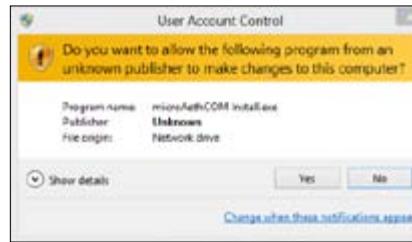
4. Hold the AE51 in one hand, with the release button on the bottom.
5. Loosen the rubber cover on the front of the AE51 by pulling the tab away from the instrument. This will expose the filter strip slot.
6. If there is a filter strip already installed, depress the release button with your thumb and pull the filter strip out of the sampling head.



7. Install a new filter strip by pressing and holding the release button and then inserting the new filter strip into the sample chamber opening.
8. Make sure to push the new filter strip all the way into the slot, and that the locating pinhole on the filter strip is not visible.
9. Release the button.
10. Replace the rubber cover. A tight fit is essential to prevent the entry of contamination and stray light into the sample chamber.

PC Software Installation

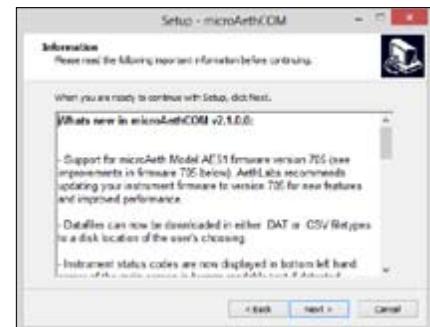
1. Do not connect the microAeth AE51 to the computer until the software installation is complete.
2. Make sure that you have the necessary user privileges on your computer to install software.
3. Locate and double click microAethCOM Install.exe to start the install. The installer will prompt you through the setup.



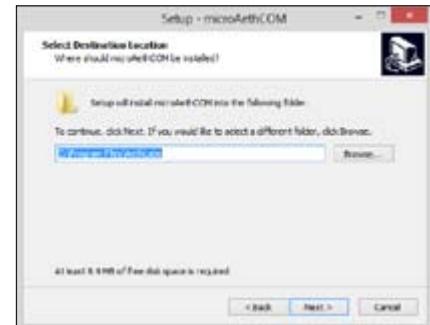
4. In order to install the microAethCOM software, please read and accept the license agreement.



5. Please review changes to microAethCOM and firmware.



6. Select the directory location where microAethCOM and the firmware file should be installed on the computer.



- The communication drivers will need to be installed next. The installer will prompt you through this section of the setup.



- Once all the correct drivers are installed, the setup will be complete.



Operation & Communication

- Make sure that a filter strip is installed in the microAeth AE51. Turn on the AE51 by depressing the power button for 4 seconds until the instrument beeps for the second time and the red and green LEDs illuminate together.
- Release the power button and wait for a few seconds. The pump will turn on and the LEDs will then begin to blink on and off in unison about every second until the beginning of the next minute. When the LEDs stop blinking, the instrument will chirp indicating the start of data collection.
- While the unit is operating, the green LED will blink periodically. If the unit is set to store data to its internal memory, the green LED will emit single blinks every few seconds. If it has been set to store data internally and stream data, the green LED will blink twice every few seconds.
- Start the microAethCOM software.



- Connect the USB cable to the AE51 and your computer.



- After the AE51 establishes communication with the microAethCOM software, the connection status in the bottom left corner of the main screen will change to Connected and the microAeth AE51 serial number, status, and settings will be displayed.

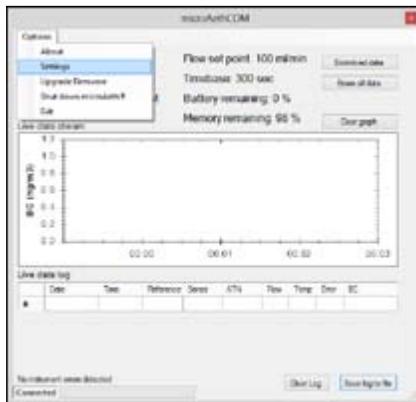


- If the serial number, status, and settings are not displayed, disconnect the USB cable and reinsert it.
- To download the data stored on the internal memory of the AE51, click the Download data button.
- Select .DAT or .CSV data file type to download.
- Select the directory to save the data.
- Wait until the download has completed.



Settings Configuration

1. Turn on the microAeth AE51.
2. Start the microAethCOM software.
3. Connect the USB cable to the microAeth AE51 and your computer.
4. Click Options then Settings



5. On the Settings screen, the AE51 can be configured.



• Time & time sync

The time on the AE51 is displayed. In order to sync the time on the AE51 with the PC time, click the Sync with PC time check box.

• Flow set point

Select a 50, 100, 150, or 200 ml/min flow rate.

• Timebase

Select a 1, 10, 30, 60, or 300 second timebase.

• Operating mode

Select the data output function.

- **Store to flash** saves data to the internal memory only.

- **Flash and streaming** saves data to the internal memory and outputs a continuous data stream through the USB port.

• Shutdown mode

Select the shutdown mode.

- **Simple** mode will allow the AE51 to be shutdown by depressing the power button for 3 seconds.

- **USB only** mode will only allow the AE51 to be shutdown using the microAethCOM software.

- **Secure** mode will allow the AE51 to be shutdown by pressing and releasing the power button three times in succession. The smoothly-timed sequence is coordinated by a simultaneous beep and blink of the red and green LED indicator lights.

Each cycle of the Secure mode takes about 1 second as follows:

1. Press and hold the power button.
2. When you hear/see the first 'beep/blink' release the button quickly.
3. When you hear/see the next 'beep/blink' quickly press and hold the power button.
4. When you hear/see the next 'beep/blink' release the button quickly.
5. When you hear/see the next 'beep/blink' quickly press and hold the power button.
6. When you hear/see the next 'beep/blink' release the button quickly.
7. The microAeth will then shut down.

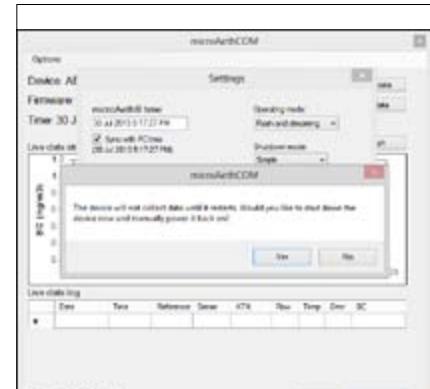
• Sound notifications

Select if sound notifications are On or Off.

6. When all settings are selected as desired, click the Save settings button.



7. Once the settings have been saved, you will be prompted to shut down the AE51. **The AE51 will not collect data with the new saved settings until it has been restarted.**



Contamination, Maintenance & Cleaning of Sample Chamber

If a loose particle of contamination enters the microAeth AE51's sample chamber or the instrument experiences vibration or impact, the data will be degraded. Shaking or tapping a "dirty" instrument will create data excursions that are far larger than those of a "clean" unit. These effects are amplified greatly at the shorter timebase settings. Cleaning intervals will vary based on the sampling environment and concentrations.

Contamination Probability for Various Use Scenarios

Sampling Scenario	Contamination Probability
Dry, dusty environment	High
Occupational settings with combustion exhaust	High
Exposure to "oily" smokes such as biomass-burning plumes, 2-cycle engine exhaust	High
Presence of suspended fluff, fibers, pollen	High
Immediate vicinity of traffic and roadways	Medium
Outdoor urban environments	Medium
Outdoor rural environments (without dust, fluff, pollen)	Low
Residential indoor environments	Low

Recommended Hours of Operation Between Cleaning & Maintenance

Sampling Scenario	Contamination Probability		
	High	Medium	Low
Mobile sampling with impacts: on person or in vehicle	100	200	400
Mobile sampling on cushioned support	150	300	500
Stationary sampling, relocated during operation	500	800	1200
Stationary sampling, not moved during operation	800	1200	2000

NOTE: If a microCyclone™ is being used with your microAeth AE51, please clean it on a frequent basis, depending on sampling environment and concentrations.

Operational Summary

- Always use a new filter strip for each measurement period.
- In order to get the best data from the microAeth AE51 for the sampling campaign, we highly recommend that the instrument warm up for approximately 10-15 minutes so that it can equilibrate to its environment.
- Leave the microAeth AE51 connected to the wall charger when not in use, to be sure the battery is always fully charged and ready for use.
- Instrumental noise contributes a random perturbation to the 'ideal' BC data. Its magnitude is inversely proportional to the operational parameters of timebase and flow rate. These parameters should be set to values appropriate to the measurement requirements and scenario.
- If the data exhibits noise that is unacceptable relative to the BC level being measured, the noise may be reduced proportionally by taking the arithmetic average of successive data values.
- Data collected on a rapid timebase is useful for identifying transient events of rapidly changing BC concentration. Data collected on a 1 second timebase will almost always require some subsequent smoothing and averaging. The 1 second timebase should be considered as a 'Data Acquisition Mode'.
- Vibration and impact may contribute transient changes to the light signal measurements. These changes will appear as noise on the data, which may be amplified if the instrument is operating at the shortest timebase setting.
- The instrument's sample chamber should be kept clean and free of contamination in order to minimize electronic noise and the possible effects of vibration and impact.
- Minimize transitions between environments of substantially different humidity. Avoid placement near the vents of cycling air conditioning systems.

LED Indicator Status

Run Modes		
Green	1 long blink & beep sound	Start of data storing to internal memory.
Green	1 blink every 3 sec	Acquiring data to internal memory.
Green	2 blinks every 3 sec	Acquiring data to internal memory and streaming.
Green	1 long blink every 1 or 5 min	Data write to internal memory (1, 5 min timebase).
Status Warnings during Run Modes (see above)		
Green indicates Run Mode (see above), Red indicates Warning (see below)		
Red	1 blinks every 1 sec	Warning - Change filter strip
Red	2 blinks every 1 sec	Warning - Battery low
Red	3 blinks every 1 sec	Warning - Flow error
Stop Modes		
Red & Green	synchronous 1 blink every 1 sec	Startup - Beeping, Not collecting data until ready. Idle - No Beeping, Not collecting data, Restart Req'd
Red Only	Repeat blink on/off sequence; on time is same as off time. Emits one series of 3 triple beeps.	Critical hardware error: <ul style="list-style-type: none">• Main supply voltage too high or too low• Light source current too high or too low• Light source feedback circuit error.



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