

microAeth®

MA Series MA200, MA300, MA350

Quick Start Guide

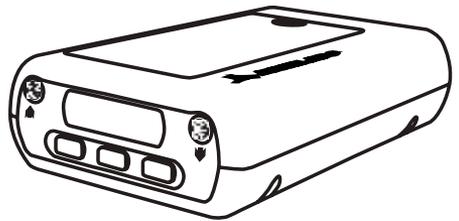
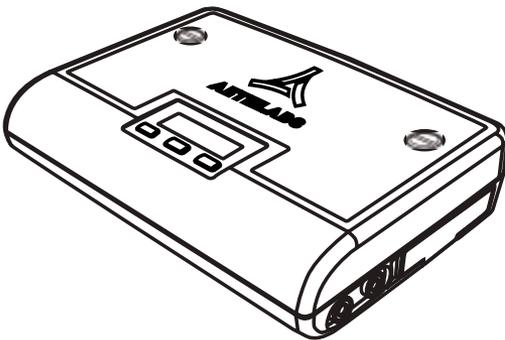
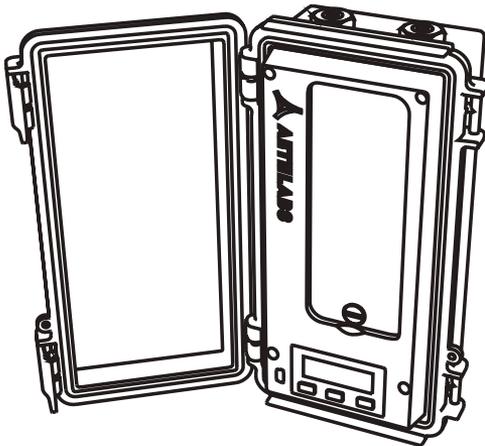


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Introduction

Thank you for your purchase of an AethLabs microAeth® MA Series Black Carbon monitor. This guide is a short introduction to setting up and using your microAeth instrument. Please refer to the [MA Series Manual](#) for more detailed information.

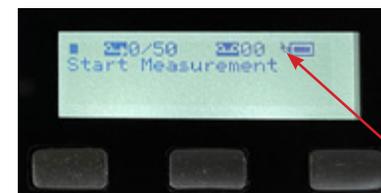
Carefully unpack the instrument and accessories from their packaging. Check to identify that all items are present and that there is no damage. Retain original packaging for safe storage and shipping of the instrument.

The small size and light weight of the microAeth MA series instruments will allow you to gather data in a wide range of mobile or stationary applications. The MA series filter cartridge enables unattended operation from multiple weeks to a year, depending on the model, settings, and environmental factors. Optimization of performance across this breadth of applications requires an understanding of operational settings, precautions, and maintenance procedures. The following recommendations provide general guidelines.

Charging the microAeth

Before using the instrument, the internal battery can be charged by plugging it in to external power using the barrel jack power adapter. Battery runtime varies with settings and age of the pump and battery.

The on-board screen displays a lightning bolt to the left of the battery indicator in the top right corner, when the instrument is turned on, connected to an external power source using the 5V barrel jack port.



lightning bolt
charging symbol

Charging times with instrument turned off:

MA200: DC via barrel jack AC adapter: ~3 hours

MA300: DC via barrel jack AC adapter: ~11.75 hours

MA350: Sealed connector DC via barrel jack AC adapter: ~11.75 hours

Important information Before Getting Started

1) The microAeth Manager application for MacOS and Windows can be used to modify all instrument settings but only some settings can be modified using the on-board user interface on the front panel of the microAeth instrument.

2) Timebase:

The microAeth MA instruments can acquire data on timebase settings of 1, 5, 10, 30, 60, or 300 seconds. The 1, 5 and 10 second timebases 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 the highest flow rate and/or post-processing. For stationary outdoor applications, we recommend longer timebases such as the 300 second setting.

3) Flow Rate:

The MA series pump can operate at flow rate settings of 50, 75, 100, 125, 150 or 170 ml/min. A higher flow rate can contribute to greater measurement sensitivity but will use more filter tape and more power.

4) The lowest wavelength light source enabled will typically trigger the attenuation (ATN) tape advance threshold. For example if 5 wavelengths are enabled, the UV channel should always trigger the tape advance.

5) Measurement Wavelengths: What are you trying to measure? What wavelengths are important for your measurements? **More is not always better. Operating with the IR channel only will increase tape life by at least 2.3x.**

6) Tape advance ATN threshold: If DualSpot® is enabled, a higher ATN threshold can be used as DualSpot will help correct for aerosol composition dependent loading effects.

7) DualSpot® vs SingleSpot™: A flow rate of 100 ml/min or greater is highly recommended when using DualSpot® loading compensation. Using DualSpot® will allow measurements at higher ATN loadings (longer sampling at each filter tape sampling location) as the data are compensated in the BCc data column.

NOTE: Due to the flow split between Spot 1 and Spot 2 the measurement sensitivity in DualSpot® mode will be lower than in SingleSpot™ mode for the same total flow rate that is selected. When the DualSpot calculation and compensation is active (when ATN for BC1 >= 3) the data will have more noise, this is expected behavior. Simple smoothing can be applied to reduce the noise, or the smoothed columns in the data file can be used if helpful.

8) Protect the instrument and the inlet and outlet ports from water and other contaminants. Aethlabs can provide an inlet protection kit with a water/bug trap with rain protection at the inlet.

9) Verify flow rates using on-board test flow menu and external flow calibration kit before calibrating flows. The instruments are initially calibrated at sea level. Only calibrate the flow system if there is an error in the measured flow when using the test flow menu. If sampling is being done at a high elevation compared to sea level then a calibration may be required to compensate for the change in altitude.

10) To get the best data from the microAeth MA Series instruments, we highly recommend that the instrument warm up for approximately 30 minutes so that it can equilibrate.

11) If you change sampling settings or download data (non-streaming data), you must stop the instrument measurement before being allowed to make a change. Every time the measurement starts into the sampling mode, the filter tape cartridge automatically advances to a clean spot. Stopping and starting the instrument will therefore consume more tape than just sampling without stopping the measurement intermittently.

Installation & Environmental Considerations

The microAeth instrument is specifically designed to be used in a wide range of measurement scenarios. Each research deployment will require its own specific considerations for protecting the instrument and ensuring the integrity of your data. The included sample tubing assembly with threaded insert should be installed into the inlet of the instrument. Obstruction of either the inlet or outlet port should be prevented as this will affect the flow of air into the instrument.

IMPORTANT: Be sure that the aerosol inlet to the microAeth is at atmospheric pressure and that there is no differential pressure between the aerosol inlet and the operating environment of the microAeth. For example, if sampling from a plenum or chamber, the plenum or chamber must be at the same pressure as the instrument itself. If other instrumentation is measuring in parallel, we always recommend that microAeth instruments have their own sampling line so there is no impact from other devices that might have large flow rates. Failure to meet this requirement may cause sampling and/or measurement errors

In personal monitoring applications, the included lapel clip can assist in positioning the sampling inlet near to the person's breathing zone, care must be taken to ensure the inlet, or microCyclone inlet, are free from obstruction.

For outdoor deployments, protection of the instrument and the inlet and outlet ports must be considered. An Inlet Protection Kit (WPK-20-25) should be used to help protect the instrument and data from moderate water and bug intrusion and in-line condensation through the sampling train.



Outdoor installation of MA series requires protection from rapid temperature changes and moisture / precipitation. In addition to potentially having signal-to-noise implications on your data, rapidly changing environmental conditions can harm your instrument without proper protection. It is possible that an environmentally controlled enclosure could be helpful and/or necessary. The instrument should be shielded from solar radiation to reduce impact of rapid heating from the sun.

The MA350 features more robust weather protection, though it is not completely weatherproof. While the case itself is rated IP67, necessary penetrations in the enclosure for the inlet and outlet are obviously open to the elements. Our inlet and outlet ports are protected by custom made fittings with dual o-ring seals for backup protection. As long as the inlet and outlet sample lines are installed in a protected way as described earlier, then the device is robust and protected from the elements. For continuous monitoring outdoors we still recommend the instrument be further protected from the sun and precipitation. The MA350 comes with included mounting hardware for wall mounting. AethLabs also offers a pole mounting kit.

Temperature:

microAeth instruments are specified to operate between 5 ~ 40 °C. Furthermore, rapid changes in temperature can impact data. Such effects are inversely proportional to timebase and flow rate settings. It is possible that an environmentally controlled enclosure could be helpful and/or necessary depending on the application.

Humidity:

As with many other types of particle measurement instrumentation, changes in relative humidity can change the size and optical properties of particles. For locations with high RH variability, an external sample dryer or heater may be used to condition the sample. AethLabs offers a portable aerosol dryer for this application. Moving between a dry, air conditioned environment, to a high humidity environment can impact the data while the device equilibrates. Selecting a higher flowrate and longer timebase will help to reduce these effects.

Contamination:

Preventative maintenance for your deployment and sampling apparatus are important for protecting your instrument. Keeping the microAeth and its air passageways, internal components, and optical chambers clean is critical for maintaining the instrument and producing quality measurements. **We recommend, at a minimum, Standard Maintenance Service at AethLabs or an authorized service center on at least an annual basis.**

Typically, Black Carbon particles are smaller than one micron in diameter. In some sampling conditions where the aerosol is primarily composed of light scattering particulate matter, such as dust or smoke from biomass fuels, there can be a prevalent fraction of larger-diameter particles. Contamination of the instrument can cause increased measurement noise, poor sealing of the analytical area and degraded operational lifetime of some components.

For these applications, and to add contamination protection for your microAeth in high concentrations, AethLabs offers a microCyclone™ size selective inlet that will limit the size of the particles entering the microAeth to less than 2.5 microns in diameter when used at the specified flow rate. The microCyclone may not be appropriate for use with the microAeth MA200, MA300, or MA350 in some applications depending on required flow rates for DualSpot® loading compensation or other application specific flow requirements. Contact AethLabs for more information.

Recommendations and Best Use Practices

Instrument Settings: We recommend getting started using the 60 seconds timebase and 100mlpm flow rate settings, with 5 wavelengths enabled. After using the instrument in your application and collecting some data, these settings can be easily changed depending on your requirements.

SingleSpot™ vs DualSpot®: DualSpot® loading compensation method corrects for the optical loading effect and provides additional information about aerosol optical properties. This method simultaneously collects aerosol samples on two analysis spots in parallel and at different face velocities while measuring the rate of change in absorption of transmitted light due to the particles loading on the filter. The use of this method is an optional user selectable feature in the microAeth Manager program. DualSpot is usually recommended, though SingleSpot with a lowered ATN threshold of 50 (with UV enabled) usually has minimal loading effect in the IR channel

The timebase, flow rate, and WiFi settings will have the greatest impact on battery run time. NOTE: Battery life will start to gradually diminish after many cycles (~ 1 year of use). Runtimes can vary based on individual MA series instruments.

Individual Data Point Noise:

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. Data collected on a 1 second timebase should always be smoothed or averaged over longer periods, unless measuring high concentrations where the instrumental noise is negligible.

Effects of Contamination, Vibration, and Impact: Primarily affected by timebase setting. Increased flow rate will also reduce the effect.

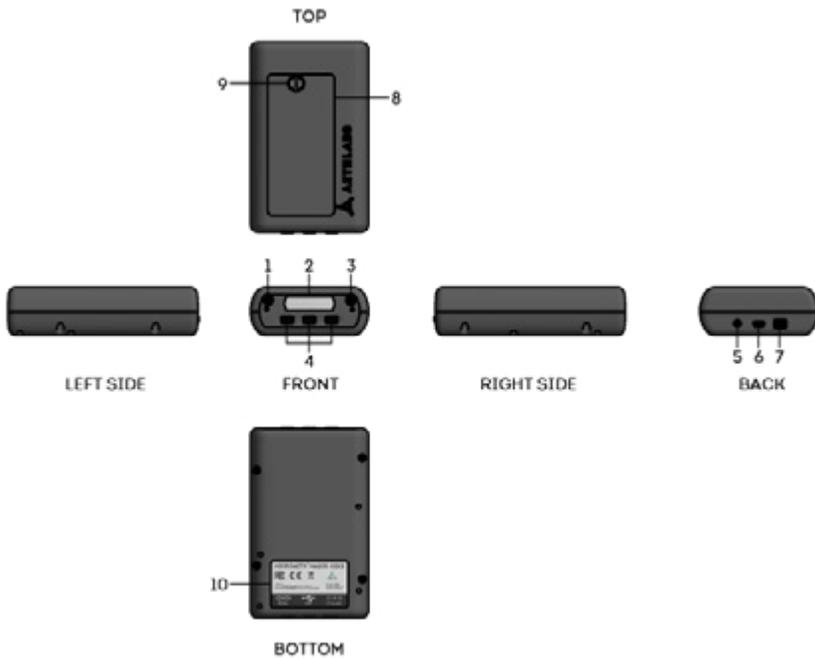
1 second	5 seconds	10 seconds	30 seconds	60 seconds	300 seconds
very large	large	large	moderate	low	least

Choosing the Tape Advance ATN for your application:

Choosing the right tape advance ATN trigger helps ensure the integrity of your measurement by reducing possible loading effects. Loading effects are variable, aerosol dependent, and are not always present. The range of the Tape Advance ATN trigger is 1 to 100. The lower the Tape Advance ATN trigger setting, the lower the impact of loading effects on the data at the expense of more tape consumption. Your settings from SingleSpot™ vs DualSpot®, Flow Rate, and Wavelengths also impact how frequently you reach your ATN setpoint and tape advance frequency.

MA200 Included Items

microAeth MA200 Instrument Diagram

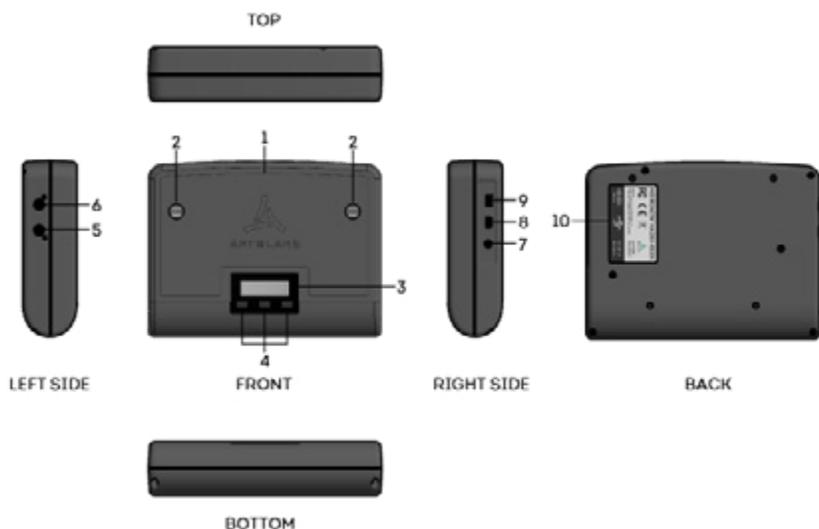


1. Inlet port
2. User interface screen
3. Outlet port
4. User interface buttons (3)
5. DC Barrel jack port
6. USB mini-B port
7. 4-pin 3.3V TTL serial port
8. Filter tape cartridge door
9. Flat head screw in filter tape cartridge door
10. Serial number label

Quantity	Part Number	Description
1	MA200	 microAeth MA200
1	MAFT-L17	 MA200 Filter Tape Cartridge, 17 Sampling locations (installed in instrument)
1	AC-XP12B-5020	 Barrel jack AC adapter with 1 territory-specific plug
1	USB-C-MX-0100	 mini USB communication cable
1	MASH-40	 Sampling Hose with Barb Fitting Swivel Connector, 40 inches (1 meter)
1	MALC	 Lapel clip for sampling hose
Download		Cross-platform microAeth® Manager software (download via AethLabs website)
Download		Quick Start Guide (download via AethLabs website)
Download		Manual (download via AethLabs website)

MA300 Included Items

microAeth MA300 Instrument Diagram

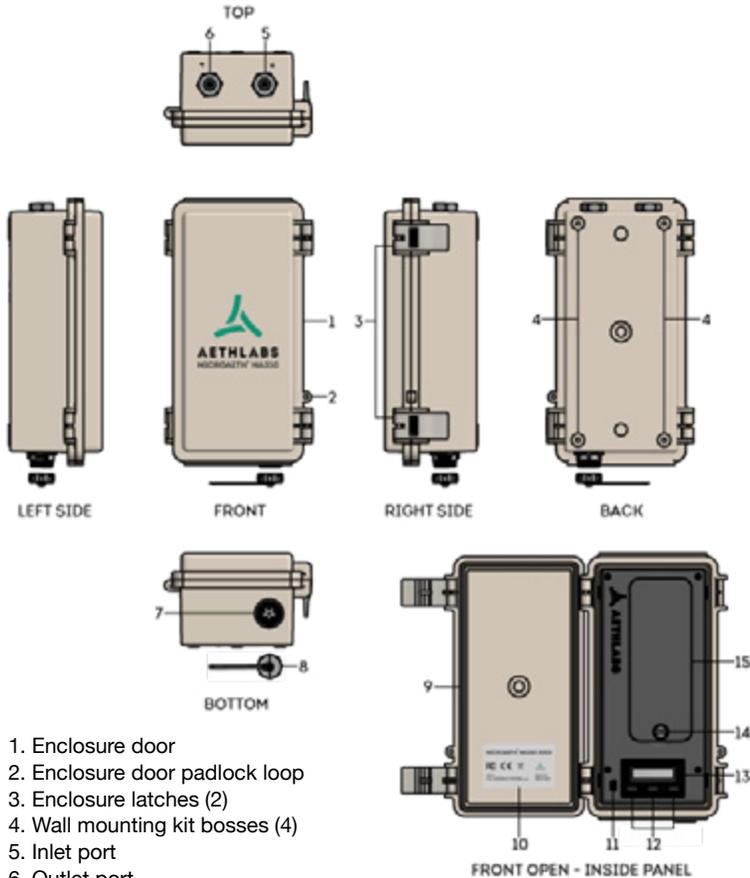


1. Filter tape cartridge door
2. Flat head screws (2) in filter tape cartridge door
3. User interface screen
4. User interface buttons (3)
5. Inlet port
6. Outlet port
7. DC Barrel jack port
8. USB mini-B port
9. 4-pin 3.3V TTL serial port
10. Serial number label

Quantity	Part Number	Description
1	MA300	 microAeth MA300
1	MAFT-L85	 MA300/350 Filter Tape Cartridge, 85 Sampling locations (installed in instrument)
1	AC-XP12B-5020	 Barrel jack AC adapter with 1 territory-specific plug
1	USB-C-MX-0100	 mini USB communication cable
1	MASH-40	 Sampling Hose with Barb Fitting Swivel Connector, 40 inches (1 meter)
1	MALC	 Lapel clip for sampling hose
Download		Cross-platform microAeth® Manager software (download via AethLabs website)
Download		Quick Start Guide (download via AethLabs website)
Download		Manual (download via AethLabs website)

MA350 Included Items

microAeth MA350 Instrument Diagram



1. Enclosure door
2. Enclosure door padlock loop
3. Enclosure latches (2)
4. Wall mounting kit bosses (4)
5. Inlet port
6. Outlet port
7. Sealing circular connector for DC power in, 3.3V TTL serial comms
8. Cap for sealing circular connector
9. Enclosure door gasket
10. Serial number label
11. USB mini-B port
12. User interface buttons (3)
13. User interface screen
14. Flat head screw (1) in filter tape cartridge door
15. Filter tape cartridge door

Quantity	Part Number	Description
1	MA350	 microAeth MA350
1	MAFT-L85	 MA300/350 Filter Tape Cartridge, 85 Sampling locations (installed in instrument)
1	AC-XP12B-5020	 Barrel jack AC adapter with 1 territory-specific plug
1	USB-C-MX-0100	 mini USB communication cable
2	MASH-40	 Sampling Hose with Barb Fitting Swivel Connector, 40 inches (1 meter)
1	SC-003	 MA350 Sealed connector to DC barrel jack and serial port cable
Download		Cross-platform microAeth® Manager software (download via AethLabs website)
Download		Quick Start Guide (download via AethLabs website)
Download		Manual (download via AethLabs website)

Operation

You can use the microAeth on-board user interface to operate and configure the instrument for basic operations.

Turn On:

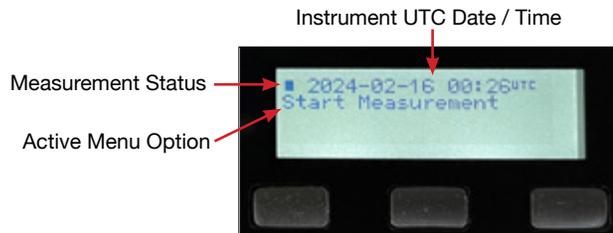
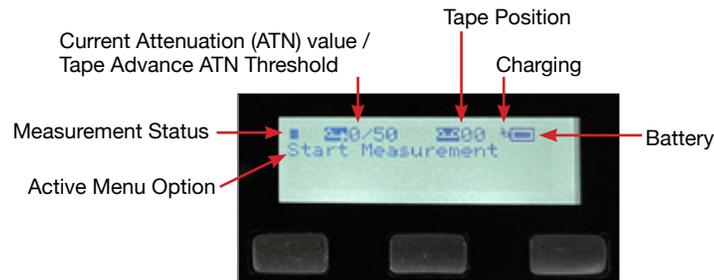
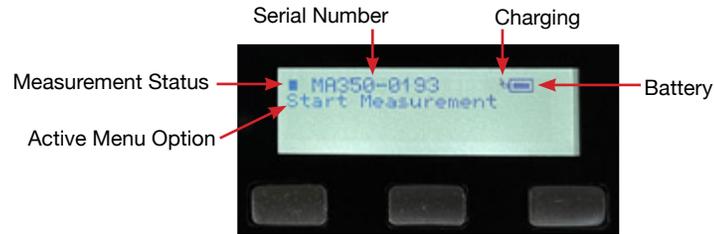
1) Press and hold only one of the three buttons for 2 seconds. The screen and instrument will turn on and the AethLabs logo will be displayed.

Turn Off:

1) Scroll through menu options to 'Turn Off'. Press the center button to select the 'Turn Off' option.

On-board Status Indications:

The on-board screen displays status information on the top line that rotates through three status layouts:



Measurement Status:

A "play" ▶ symbol will be shown if the instrument is sampling and making measurements.

A "stop" ■ symbol will be shown if the instrument is idle.

Serial Number: Displays the instrument serial number.

Battery: Displays the battery remaining symbol.

Charging: Displays "lightning bolt" charging symbol when the instrument is connected to an external power source using the 5V barrel jack port and the battery is charging.

Current Attenuation (ATN) value / Tape Advance ATN Threshold: Displays the current attenuation (ATN) symbol and the current attenuation value out of the tape advance ATN threshold trigger value for the lowest enabled wavelength that will trigger an automatic tape advance.

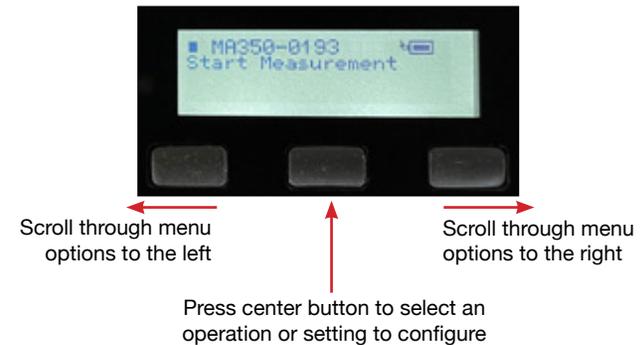
Tape position: Displays the tape position symbol next to the current tape position value in the top middle of the screen.

Instrument UTC Date / Time: Displays the instrument UTC date and time.

Menu Options:

1) The currently active menu option is displayed on the second line below status indicators.

2) Scroll menu options to select an operation or a desired setting to configure. With the desired menu option displayed on the interface, press the center button to manage each setting.



During Startup:

The AethLabs logo is displayed followed by the Firmware Version, Serial Port Baud Rate, and AutoSample setting value.



During Sampling:

When the instrument is sampling and making measurements the standard status indications are displayed on line one. Line two displays 'Press Center to Stop' informing the user to press the center button to stop sampling and measurements. Line three displays <XX> Target <FFF.FF> where <XX> equals DS when sampling in DualSpot mode or SS when sampling in SingleSpot mode and where <FFF.FF> equals the current user selected target flow rate. Line four displays 'SAMPLING'



Operating Parameters:

To change the Timebase, Flow Rate, or Tape Advance (Adv.) ATN (more options available on screen and all settings available in microAeth Manager):

- 1) Scroll through the menu options to the Change <setting>
- 2) Press the center button to select the setting to adjust and enter the sub menu.
- 3) Use the left or right buttons to scroll through value options (value options vary depending on which setting being adjusted).



Decrease value

Increase value

Press 'OK' to select current value and return to the top menu level

- 4) Press the center button, 'OK' to select the current value option. Once selected, the value is saved and the user interface returns to the top menu level.

IMPORTANT: When adjusting Adv. ATN, the lowest wavelength light source enabled will typically trigger the attenuation (ATN) tape advance.

Filter Tape Cartridge Removal and Installation

The MA200 uses the MA200 Filter Tape Cartridge (MAFT-L17) with 17 sampling locations.

The MA300 and MA350 use the MA300/MA350 Filter Tape Cartridge (MAFT-L85) with 85 sampling locations.

Important: When removing a filter tape cartridge, please record the current sampling location of the filter tape cartridge that is displayed on the LCD screen so this can be tracked and entered when the tape cartridge is installed again. **Do not rewind the filter tape cartridge, or use previously sampled filter tape sampling locations.**

To remove filter tape cartridge:

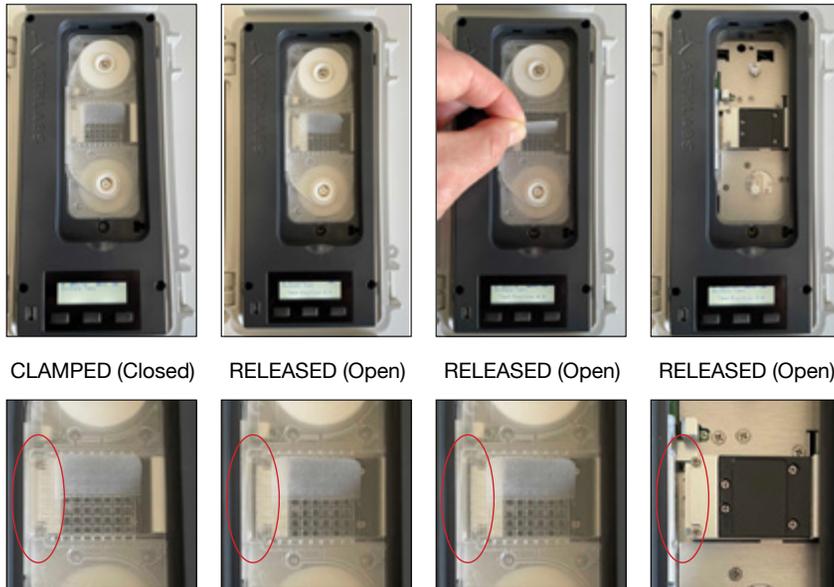
- 1) Make sure that the microAeth is not sampling.
- 2) Unscrew the flat head slotted screw(s) in the filter tape cartridge door until it is completely free of its mating threaded hole and remove the door.



- 3) Scroll through menu options to 'Release Tape'. Press the center button to select the 'Release Tape' option.
- 4) '-Releasing Tape' and 'Tape Position @ <xx>' will be displayed on the screen where <xx> is the current tape position. **Record the tape position number.** The optical head of the instrument will move to its open position and stop in about 6 seconds.



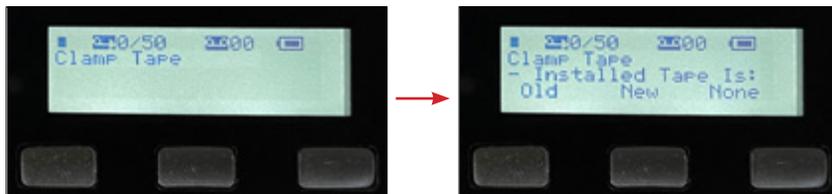
- 5) Once the optical head stops moving, use the pull tab in the center of the filter tape cartridge to remove the cartridge straight out of the instrument.



CLAMPED (Closed) RELEASED (Open) RELEASED (Open) RELEASED (Open)

To install filter tape cartridge:

- 1) When inserting a cartridge into the instrument, make sure the optical head is open and in the released location so that the filter can be installed. Use the release tape menu to open the optical head if not already opened.
- 2) Insert a filter tape cartridge straight into the instrument, aligning the left and right holes in the cartridge with the two white capstans in the instrument.
- 3) Make sure that the filter tape cartridge is fully inserted and sits flat in the instrument.
- 4) Scroll through menu options to 'Clamp Tape'.



- 5) Press the center button to select the 'Clamp Tape' option and enter the sub menu. '- Installed Tape Is:' and 'Old', 'New', 'None' options will be displayed on the screen
 - OLD)** If installing an Old tape cartridge that has been partially used before, press the left button that is under the on-screen 'Old' option.
 - NEW)** If installing a New tape cartridge that has never been used before, press the center button that is under the on-screen 'New' option.
 - NONE)** If reinstalling the same tape cartridge that was previously installed (no change to the tape cartridge was made - the tape cartridge was not removed after the tape clamp

was released), press the right button that is under the on-screen 'None' option



- 6-**OLD)** If 'Old' was selected by pressing the left button, '- Position : <xx>' and '<<->', 'Done', and '+>' options will be displayed on screen where <xx> is the current tape position value of the tape cartridge being installed.
- 7-**OLD)** Use the left button under the on-screen '<<->' option and the right button under the on-screen '+>' option to decrease or increase the current tape position value that is displayed on-screen.
- 8-**OLD)** When the correct tape position value is displayed on-screen, press the center button under the 'DONE' option.
- 9-**OLD)** '-Clamping Tape' and 'Tape Position @ <xx>' will be displayed on the screen where <xx> is the current tape position. The optical head will move to its clamped position and stop in about 6 seconds.
- 10-**NEW)** If 'New' was selected by pressing the center button, '-Clamping Tape' and 'Tape Position @ 0' will be displayed on-screen since the tape cartridge is new and has never been used before. The optical head of the instrument will move to its clamped position and stop in about 6 seconds.
- 11-**NONE)** If 'None' was selected by pressing the right button, '-Clamping Tape' and 'Tape Position @ <xx>' where <xx> is the tape position value of the previously installed tape cartridge will be displayed on-screen since no change to the tape cartridge was made (the tape cartridge was not removed after the tape clamp was released). The optical head of the instrument will move to its clamped position and stop in about 6 seconds.

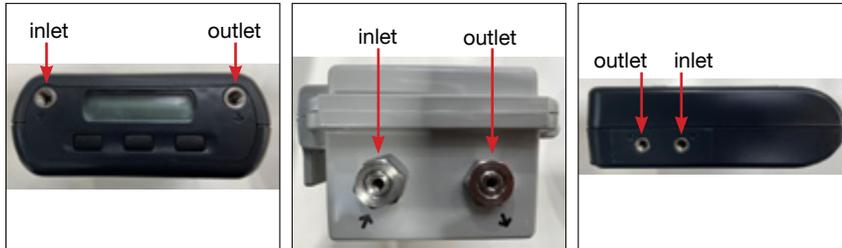


- 12) Confirm that the filter tape cartridge is clamped by the optical head.
- 13) If the filter tape cartridge is correctly installed, replace the filter tape cartridge door to its closed position and completely screw the flat head slotted screw(s) in place. Once the door is in its closed and locked position, the instrument is ready for further use.

Performing Measurements

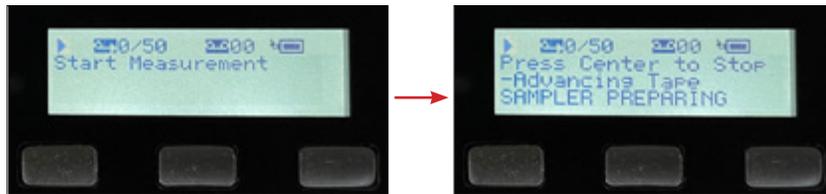
The inlet and outlet ports are 10-32 UNF imperial (inch) threaded ports.

The inlet port, outlet port, and all connections to the inlet port must be properly protected from the environment. There must be limited restriction to flow while protection from water, insects, bugs, and other objects that can block or infiltrate the instrument air pathway through both the inlet and outlet ports of the instrument. Extra precaution must be taken as the internal pump of the instrument is pulling air into the instrument through the inlet port.

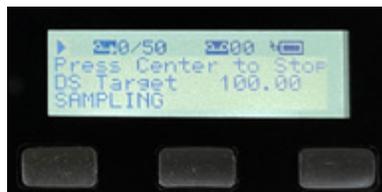


To Start Sampling and Measurements:

- 1) Ensure there is a filter cartridge installed and clamped.
- 2) Confirm that all settings are correct for the sampling campaign.
- 3) To start measurement, scroll through menu options to 'Start Measurement' and press the center button.
- 4) 'SAMPLER PREPARING' will be displayed on screen. The microAeth will automatically advance the filter tape cartridge to a new sampling location and run its start up routine.



- 5) When sampling and measurement begins, the screen will display a "play" symbol in the top left corner, 'Press Center to Stop' on line 2, the DualSpot (DS) or SingleSpot (SS) target total flow rate on line 3, and 'SAMPLING' on line 4.



To Stop Sampling and Measurements:

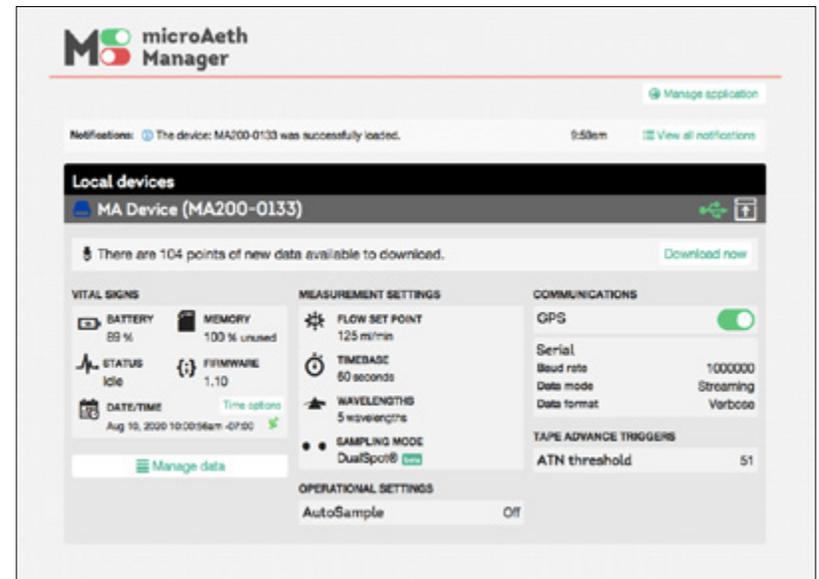
- 1) While the microAeth is sampling, the screen will display a "play" symbol in the top left corner, 'Press Center to Stop' on line 2, the DualSpot (DS) or SingleSpot (SS) target total flow rate on line 3, and 'SAMPLING' on line 4.
- 2) Press and hold the center button for 2 seconds to stop sampling and measurement. The screen will display a "stop" symbol in the top left corner and 'STOPPED' will be displayed on the screen and sampling and measurement will finish.

USB Communication, Configuration, & Data Export

The microAeth instrument has a USB port for communication with the microAeth Manager software for configuring the instrument settings and downloading data using the AethLabs provided mini-B to Type A USB cable.

To connect and configure the microAeth using the microAeth Manager application:

- 1) Connect the microAeth instrument to your computer using the provided mini USB cable.
- 2) Turn on the microAeth instrument.
- 3) Open the microAeth Manager application. The microAeth information will be loaded into the microAeth Manager instrument device pane.



- 4) Use the microAeth Manager to modify all available settings of the microAeth.

To download data to the microAeth Manager local database:

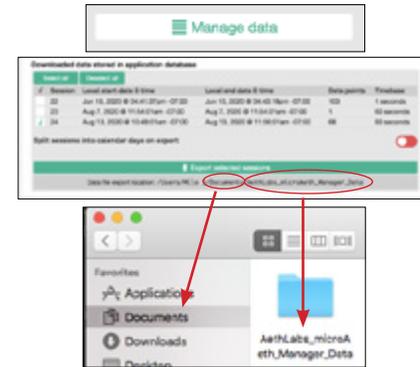
- 1) Connect the microAeth instrument to your computer using the provided mini USB cable.
- 2) Turn on the microAeth instrument.
- 3) Open the microAeth Manager application. The microAeth information will be loaded into the microAeth Manager instrument device pane.



- 4) If there is new data stored on the microAeth that has not been downloaded to the microAeth Manager application local database, then the text 'There are <xxx> points of new data available to download' and a 'Download now' button will appear below the instrument device pane title bar.
- 5) Click the 'Download now' button.
- 6) When the download is completed, the 'Close' button can be clicked to return to the main application window.

To export downloaded data from microAeth Manager to data files on computer:

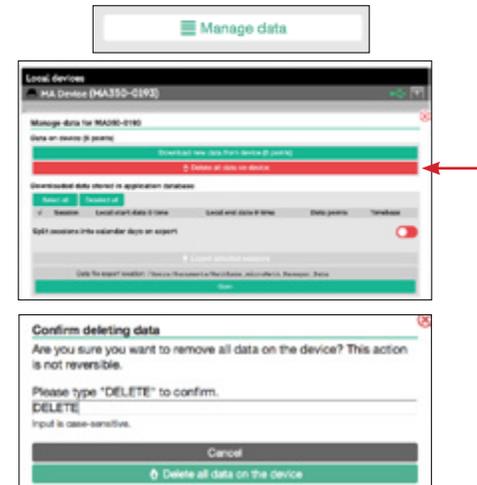
- 1) Connect the microAeth instrument to your computer using the provided mini USB cable.
- 2) Turn on the microAeth instrument.
- 3) Open the microAeth Manager application. The microAeth information will be loaded into the microAeth Manager instrument device pane.
- 4) Click the 'Manage data' button.
- 5) In the new window that opens, there is the 'Data on device' section to manage the data for this microAeth that is stored on the instrument.
- 6) Select the checkboxes of all data sessions to export to .csv files. The 'Split sessions into calendar days on export' toggle switch can be used to split exported data sessions that span multiple calendar days into multiple single- date files.
- 7) Click the 'Export selected sessions' button at the bottom of the window. Data session files are exported to a folder named with the instrument serial number in the directory shown at the bottom of the Manage data window.



To delete all data on the microAeth:

NOTE: ONCE THIS ACTION IS COMPLETED, IT IS NOT REVERSIBLE.

- 1) Connect the microAeth instrument to your computer using the provided mini USB cable.
- 2) Turn on the microAeth instrument.
- 3) Open the microAeth Manager application. The microAeth information will be loaded into the microAeth Manager instrument device pane.
- 4) Click the 'Manage data' button.
- 5) In the new window that opens, all data files that were downloaded from the microAeth and are currently stored in the microAeth Manager application local database on the computer are displayed.
- 6) Click the 'Delete all data on device button'.
- 7) The 'Confirm deleting data' window will open.
- 8) Type 'DELETE' into the text field.
- 9) **ONCE THIS ACTION IS COMPLETED, IT IS NOT REVERSIBLE.** Press the 'Delete all on the device' button to confirm. All data on the microAeth is now erased.



Calibration

All microAeth instruments are flow calibrated at approximately standard atmospheric pressure and room temperature to ensure accurate flow rates at the time of production. Local operating conditions vary around the world. Temperature and pressure at the time of calibration are recorded in the flow calibration table header. Before instrument deployment, we suggest that the flow rates at the inlet of your microAeth instrument are checked.

In general, and especially for sampling at higher elevations, AethLabs suggests calibrating the flow of your microAeth in the location at which you plan to use it. This will ensure that the internal mass flowmeter is calibrated for the in situ atmospheric pressure.

If re-calibration is needed, it is possible to calibrate to within 1-2% on average using the AethLabs MA Series Flow Calibration Kit. Only the external mass flowmeter provided in the AethLabs MA Series Flow Calibration Kit is compatible with the MA200, MA300, and MA350.



Cleaning & Maintenance

If the microAeth is exposed to any liquids or other damaging contaminants, immediately turn off the instrument, disconnect all cables, and remove any foreign substances in contact with the instrument. Do not use liquids or other cleaning products on the instrument. Wait until the microAeth is completely dry before charging or turning on the instrument. Only AethLabs authorized service personnel should clean the air passageways and internal components of the microAeth.

AethLabs recommends sending your instrument for annual service, or more frequent service depending on use and operating conditions. Cleaning intervals will vary based on the sampling environment and concentrations.

In addition to any necessary repairs, AethLabs offers flow calibration service and standard maintenance service (including full diagnostics, cleaning, flow calibration, and instrument testing) at the AethLabs San Francisco office. AethLabs also has authorized repair locations in Europe and South America.

Status Codes

Code Value	Readable status	Status Description
1		No status notifications
2	Start up	Instrument in sampling and measurement startup
4	Tape advance	Tape advance occurring during sampling and measurement period
8		N/A
16	Optical saturation	Optical saturation
32	Sample timing error	Sample timing error
64	DualSpot Enabled	Sampling spot 2 of DualSpot® loading compensation is active
128	Flow unstable	Flow unstable during sampling and measurement period. Flow deviates from target flow setpoint by more than $\pm 5\%$.
256	Pump drive limit	Flow out of range during sampling and measurement period
512	Time source manual	Time synchronization source is manual (synchronized to application/computer time or no GPS time is available)
1024	User skipped tape advance	User skipped tape advance. No tape advance occurred at start of sampling and measurements. NOT RECOMMENDED! SKIPPING THE AUTOMATIC TAPE ADVANCE AT THE BEGINNING OF SAMPLING WILL IMPACT CORRECT OPERATION OF THE DEVICE. DATA MAY NOT BE VALID.
2048	System busy	Device stops sampling after receiving a command via USB or serial that requires the device stop operation.
4096	S.A. disabled	Source apportionment disabled due to measurement configuration. Check Settings to re-enable source apportionment calculations
8192	Tape jam	Tape is jammed. Inspect tape. Release and clamp tape to attempt to clear the jam error.
16384	Tape at end	Tape is at end. Replace tape.

Code Value	Readable status	Status Description
32768	Tape not ready	Tape is not ready. Check that the tape is installed and clamped.
65536	Tape transport not ready	Tape transport is not ready. Check that tape is installed and clamped and there are no other errors.
131072	Ext. power	Device is powered through the barrel jack input or circular connector (MA350) by external 5v source.
262144	Invalid date/time	Date and time are not set or are invalid. Set the clock with proper date/time.
524288	Tape error	Tape Error. A generic error for the tape. Possible reasons are tape is not detected in the instrument.
16777216	WiFi Forced Timebase to 60s	When WiFi is enabled and timebase is set to less than 60 seconds, the timebase will be forced to 60 seconds as this is the minimum timebase for WiFi functionality.
4294967296	WiFi Line Full	WiFi data buffer is full.
274877906944	Remote power down	Power down command received remotely via serial connection.