Operating Manual for Samplig Station and Nephelometer

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Aerosol Sampling and Measurement Systems

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AirPhoton

Table of Contents

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AirPhoton Automated Filter Sampling Station

Control box SS4e:
Dimensions: 15" x 12.5" x 9"
Weight: 11.4 pounds (5.17 kg)

Inlet/Filter unit SS4i:
Dimensions: 15" x 14.5" x 9"
Weight: 12.2 pounds (5.53 kg)

The Airphoton Automated Filter Sampling Station is a fully programmable system that collects particulate matter on filters for subsequent analysis. Consisting of a Inlet/Filter unit and a Control box, the station is designed for compatibility with the Airphoton 8-slot filter cartridge model FC10. The programmable capability allows flexibility when designing sampling cycles, moving collection from filter slot to filter slot or turning collection on and off at specified times. A total of 8-slots are available before the filter cartridge must be changed. Filter cartridges are portable and can be prepared in the lab and mailed to the sampling station site.

The Inlet/Filter unit employs a PM10 inlet designed to run at 4lpm. The flow rate can be adjusted by a manual valve in the front panel of the instrument. The option exists to separate PM2.5 and coarse mode ($2.5 < d < 10\mu m$) using

Nuclepore filter separation. Other size selection combinations are possible upon request.
The Control box offers 4 analog inputs for external devices and 1 digital port for communication with other Airphoton devices, such as the 3-wavelength nephelometer. Thus, filter measurements and forward/back scattering of the particles can be automatically linked in the same data base. Data is stored in removable memory cards, and automatically backed-up internally.

The Inlet/Filter unit and the Control box are both enclosed in environmentally isolated cases, ready for outdoor deployment in rugged conditions. Power input options include: 110/220 VAC 50/60Hz and nominal 12VDC. The design is also compatible with power supplied by solar panels.

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IMPORTANT WARNING:

The station or the nephelometer should only be turned on if the SD card is inside the slot. If the card is removed during operation, the system must be turned off and re-started.

Initial programming of the Airphoton Sampling Station SS4e

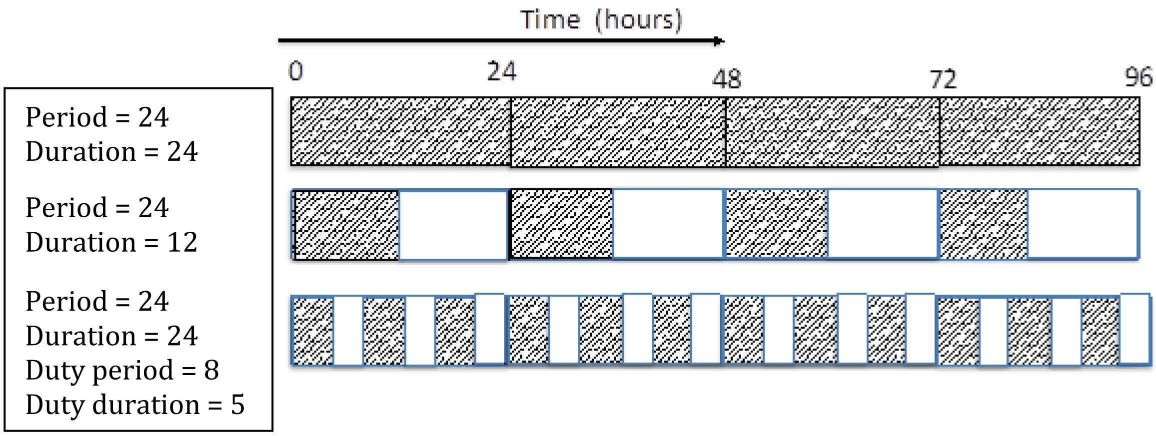
1. Concepts of 'period' , 'duration' and 'duty cycle'.

Before introduction to the mechanics of programming the station, become familiar with the terminology that will appear in the command window.

Period, similar to the period of a wave, is the time between the start of sampling events. **Duration** is the length of time of that event. For example, if you desire to continuously sample each filter, but advance to a new filter every day, then the period of the sampling is 1 day (24 hours) and the duration is also 1 day (24 hours). However, if you only want to sample that filter for half a day (12 hours), then the period is still 24 hours, because you advance filters every 24 hours, but the duration is 12 hours.

Duty cycle allows for shorter periods of sampling within the period assigned to each filter. For example, if the period is 24 hours between filters, but you want to sample 5 hours on followed by 3 hours off, the period would be 24 hours, the duration would be 24 hours, but the duty period would be 8 hours and the duty duration would be 5 hours. The sampling station would still advance to a new filter every 24 hours, and there would be a total of 15 hours of sampling on each filter, but that sampling would be spread out over the 24 hour period at 3 different times of the day.

These examples of various options for the first 4 filters are shown graphically below, with shaded portions of the time line indicating when the pump was on and the station was sampling.



There is also the option of a **short duty cycle**, 'a duty cycle within a duty cycle'. The concept is not shown graphically, but it creates opportunity to further divide the duty cycle into smaller units with a short duty period and a short duty duration. The short duty cycle was implemented for use in highly polluted environments and long periods between advancing filters, so as not to clog the filters prematurely. In this way a user might statistically sample the aerosol particles in a highly polluted environment on one filter, over the course of several days to even weeks, before advancing to the next filter.

In programming the sampling station, **the duty cycle and short duty cycle periods and durations should never be = 0**. If you want to ignore the duty cycles and simply sample continuously, advancing filters every 24 hours, then period, duration, duty period, duty duration, short duty period and short duty duration should all be set = 24. The 24 hour period is used here as illustration. Periods can be as lengthy as 255 days between filters.

Also, you will be able to set the start time and date and will not be restricted to beginning the sampling at the beginning of the period, as shown in the illustrations.

Experimenting with duty cycle programming is recommended before the sampling station is deployed in the field. Several examples of programming will be given below.

2. Command buttons and window

The interface between the program that controls the sampling station and the user consists of the 3 buttons and display window.

The buttons correspond to options displayed directly above the button in the window. Pressing a specific button activates the specific option above. Sometimes buttons enable a scroll through a set of days or times and act to advance these numbers. Holding the button down will cause the speed of the scrolling through the numbers to increase.

In the following we will refer to the buttons as Left (L), Center (C) or Right (R).

3. Start up screen

When the sampling station power is turned on, an initial set of information appears in the window consisting of the Airphoton logo and serial number of the particular instrument. To go into the main menu press (R).

4. Main menu

The main menu consists of 4 options:
- Sampling settings
- Functional tests
- System settings
- Utilities

The options are displayed one at a time in the window, not all at once. To advance through the 4 options, press (C). To choose a particular option when it is displayed in the window press (R).

5. Third option in the main menu – System settings

Even though this is the 3rd option in the menu, it should be the first settings input into the new sampling station. Once input, change will be infrequent. Here is where you input date and time, and can alternate between AC ad 12V power inputs.

There are 4 options under System settings.
- System date
- System time
- Datalink set up
- Aux 12V set up

The options are displayed one at a time in the window, not all at once. To advance through the 4 options, press (C). To choose a particular option when it is displayed in the window press (R).

5.1 System date

After choosing System date, the date will be displayed in the window as

MM/DD/YYYY

The choices appearing in the window above the three control buttons are

(L)	(C)	(R)
exit	save	edit

Pressing exit (L) leaves the date as is, exits without saving. Pressing save (C) saves any changes made to the date. Pressing edit (R) allows you to change the date. Once you save the date, you then can exit (L) and the date will not be lost.

If you choose to edit the date, the date continues in the window but the cursor will indicate its position in the MM portion of the date, and choices appearing in the window above the three control buttons become

(L)	(C)	(R)
-	+	next

To move forward in terms of calendar month, let's say from MM=01 to MM=02, press (C). To move backward in terms of calendar month, let's say from MM=01 to MM=12, press (L). Holding the button down increases scroll speed.

To adjust the day, press next (R) and the cursor should now indicate the DD portion of the date. The control options continue to be

(L)	(C)	(R)
-	+	next

Scroll forward (C) and backward (L) to obtain the correct day. To change the year, press next (R). When month, day and year are set correctly press (R) to return to the screen with

(L)	(C)	(R)
exit	save	edit

Press save (C), if the date is correct, otherwise press (R) to edit again, or (L) to exit and leave the date as it was first encountered. Once the date is saved once, you can safely exit (L) and not lose your changes.

5.2 System time

If you choose this option from the System settings menu, the time will be displayed as

HH:MM:SS

With the options of

(L)	(C)	(R)
exit	save	edit

Again, pressing exit (L) leaves the time as is, exits without saving. Pressing save (C) saves any changes made to the time. Pressing edit (R) allows you to change the time. Editing the time is similar to editing the date. The screen will show

(L)	(C)	(R)
-	+	next

with the cursor indicating its position at either the hour, minute or second position. Advance from hour to minute to second to back to the saving screen by pressing next (R). To change hour, minute or second, advance the cursor position, then use the + (C) and – (L) buttons to scroll through the numbers until the correct time is shown. Then next (R) till back at the saving screen

(L)	(C)	(R)
exit	save	edit

Press (C) to save, (R) to edit again or (L) to exit without saving. Once the changes were saved once, it is safe to exit (L) and your changes will be saved.

6. First option from main menu – Sampling Settings

Here is where you choose the period, duration and starting times for your sampling strategy. There are 8 options under Sampling settings.

Start time
Period
Duration

Duty period
Duty duration
Short cycle period (SP)
Short cycle duration (SD)
ADC sampling

The options are displayed one at a time in the window, not all at once. To advance through the 8 options, press (C). To choose a particular option when it is displayed in the window press (R).

6.1 Start time

Choosing this option allows you to set the starting time that filter sampling will begin. The process for making these changes is the same as for setting the system time, as described in Section 5.2.

6.2 Period

Section 1 describes the concept of a sampling period. Choosing this option allows you to set the sampling period. The period is defined as

DDD/HH:MM:SS

With DDD = to days from 0 to 255, and HH indicating hours, MM indicating minutes and SS indicating seconds. If you want to set a period of 24 hours, as described in Section 1, then you would set

001/00:00:00

If you wanted to stretch out the sampling period so that each filter would accumulate sampling over a 2-day period then,

002/00:00:00

If you wanted to advance filters every 12 hours, then
000/12:00:00

If you wanted to test your ability to program the station, you might try a very short period to see if it works, like 10 minutes.

000/00:10:00

The process of scrolling through the different positions in the display by pressing next (R) on the scrolling window

(L)	(C)	(R)
--	+	next

and then scrolling through the numbers in each position by pressing (L) to decrease numbers or (C) to increase numbers is the same as described in Sections 5.1 and 5.2. Pressing (R) beyond the seconds place in the display brings you back to the saving window

(L)	(C)	(R)
exit	save	edit

where you save, exit or re-edit, as before.

6.3 Duration

Here is where you choose the total time in the period that the pump can be running. If you want the pump running continuously during the entire period, then set the duration to exactly the same numbers as you set in the period. If you want the pump to run less than the full period, then set a shorter duration than the period.

If you will also be setting duty cycles, then note that the duty cycles will not turn on the pump if the time of the duration has been exceeded. For example, you set a period of 1 day and a duration of 12 hours, with a start time of 7:00 am to sample only during daylight hours. The pump will turn on at 7:00 am and turn off at 7:00 pm. Now, if you impose a duty cycle with a 8 hour duty period and an 8 hour duty duration, the pump will be on from 7:00 am to 3:00 pm. It will not go on again at 11:00 pm, because you have exceed the over all duration for that filter. The next time the pump goes on, it will be 7:00 am the next day, and it will have advanced to the next filter.

Setting the duration is the same process as described for Period in Section 6.3.

6.4 Duty period

Here is where you set the duty cycle period. The process is the same as described in Section 6.3. To illustrate from the example of Section 1, where the overall period was 1 day, the duration 1 day, the duty period 8 hours and the duty duration 5 hours, the setting for the duty period would be

000/08:00:00

6.5 Duty duration

Here is where you set the duty cycle duration. The process is the same as described above many times. To illustrate from the example of Section 1 where the overall period was 1 day, the duration 1 day, the duty period 8 hours and the duty duration 5 hours, the setting for duty duration would be

000/05:00:00

6.6 Short cycle period

Here is the opportunity to create a duty cycle within a duty cycle for very heavy aerosol loading and a long period of sampling each filter. The process for programming is the same as above. Remember never set duty or short cycle periods or durations to all zeroes. **To not use the short cycle, set short cycle period and duration to be equal to or greater than the period and duration of the duty cycle.** Thus for the example of Section 1 with the 8 hour duty cycle, the short cycle period should be

000/08:00:00

6.7 Short cycle duration

Here is where you set the duration for the short cycle within the duty cycle. Remember never set duty or short cycle periods or durations to all zeroes. **To not use the short cycle, set short cycle period and duration to be equal to or greater than the period and duration of the duty cycle.** Thus for the example of Section 1 with the 8 hour duty cycle with the 5 hour duty duration, the short cycle duration should be

000/05:00:00

6.8 ADC sampling

These setting refer to data save rates onto the storage card. ADC Sum is how often the summation is made in milliseconds. ADC average is how many seconds till the data is averaged and stored in seconds. If this option is chosen from the Sampling settings menu, the display window will show the default values of

100/15

that is 100 msecs (10 Hz) and 15 seconds. It may be reasonable to adjust these numbers to save less often, for example every 60 seconds instead of every 15 seconds.

The process of changing these numbers is the same as changing dates and times. Choose to edit the numbers from the saving screen

(L)	(C)	(R)
exit	save	edit

Then scroll through the positions on the screen by pushing next (R)

(L)	(C)	(R)
--	+	next

until the cursor indicates the number you want to change, then scroll forward and backward to advance through the numbers using (C) and (L). Holding down the button causes the scroll to advance faster.

Pressing next will return you to the saving screen, then choose to save (C), re-edit (R) or exit (L).

7. Instructions for Automatic Sampling and Flow Adjustments

7.1 How to start automatic sampling:

After initializing the system and going the main menu:
- Hit <Start>
- <Manual> will start sampling right away in a fully manual mode, without following the programmed settings. You will need to hit stop in order to stop the sampling.
- <Auto> will follow the programmed settings (this is probably the option you want)
- "Use programmed start times":
    - <No> starts the sampling right away
    - <Yes> "Start Now/Wait"
        - <Now> starts sampling right away
        - <Wait> will start in the next full sampling cycle

<Stop> will stop sampling for this filter and will move to the next Sample

<F.Start> gives you one more time the option to force the start of

sampling at that moment. The screen should show the Time left to Start (TtS) sampling.

7.2 Instructions to adjust the flow rate:

The flow rate is adjusted manually by turning the valve in the front panel. Notice that the valve has a counter nut that is used to lock the flow in a given setting. You may have to release the counter nut to perform the desired adjustment.

- Turn on the system
- Go to the <Menu> option in the panel
- <Next> to Functional Tests and hit <Go>
- <Go> to enter Valve Test
- The display should toggle between flow rate, vacuum pressure, and valve number. See note 1 below for the frequency of the flow rate update on the screen.
- Hit <Vac> to test the system and verify the flow rate.
- Adjust the valve in the front panel till you have the desired flow rate.
- Hit next to test the flow in other valves.
- After you are done, hit <Exit>. Let the system purge for about 30 seconds or so in order to relief the pressure in the filter.
- Hit <Exit> and <Back> to return to the main menu.

Notes:
1- the flow rate shown in the display is only updated with 2X the period programmed in the ADC settings. See “Frequency of the screen update for flow rate” instructions below to set the appropriate refresh rate of the display for flow adjustments.

2- the flow rate and vacuum pressure should be similar in all filters. Significant differences may indicate leaks or clogging in the cartridge of somewhere else in the system.

3- the vacuum testing should be as brief as possible in order to avoid unnecessary contamination in the filter but be aware that there may be some inertia in the system. You want to make sure the flow rate has stabilized during the flow adjustment.

7.3 Frequency of the screen update for flow rate adjustments

During sampling or during the valve test the screen toggles with a period of about 10 seconds but the update of the flow rate in the screen does not happen with this frequency. The update of the values displayed in the screen follows the ADC sampling settings. The value on the screen will only be updated with 2x the period of the ADC sampling given by the variable ADCAverage. We recommend for the user to set a fast ADCaverage (10 secs or so) for initial adjustments of the flow rate. After the desired flow rate is achieve, the use can change the ADC settings to the desired saving frequency. Data will be saved into the memory card with the same period as set into the ADCAverage variable.

Here are the instructions to set the ADC sampling settings:

- Go to the <Menu> option in the panel
- <go> to enter “Sampling Setting”
- <Next> few times till “ADC Samplling”

- <Set> to enter “ADC Sampling”

- set “ADCSum” to desired time in miliseconds (1-10,000 ms). This value determines the internal period of sampling before the average is performed. In most cases this value should be set to 100 ms.

- set “ADCAverage” to desired time in seconds. This time determines how often the average data is saved in to the memory card. The flow data in the display is updated with a period that is 2X ADCAverage. For flow rate adjustments we recommend this variable to be set at 10 seconds. For regular sampling this variable can be set back to whatever value is convenient for the user sampling settings.

Note: After each change of settings we recommend the power of the system to be cycled in order to make sure all the electronic registers to be updated with the current values.

8. Second option from the main menu – Functional tests

This option from the main menu allows viewing of a variety of different diagnostics of the sampling station, as it is working. There are 6 options under functional tests. Each of these provides a display with no user interaction possible. You can scroll through these different options by pressing the center button next (C), and then choose one to view in the display by pressing the right button (R). Return to the functional test menu by pushing the left button (L) to exit.

The 6 operating diagnostics are:

Valve test: checks the flow/pressure across the valves
Sensor test: displays instantaneous readings of analog inputs
Flow test: displays flow sensor independently
Pressure: displays instantaneous temperature
Temperature: displays instantaneous temperature
12V status: indicates if input port is on or off

9. Fourth option from the main menu – Utilities

9.1 System identity

This option displays the serial number, firmware model number, date of initial installation and date of latest update.

9.2 Factory reset

If all else fails, you can always go back to start by resetting the entire programmed scenario and go back to the settings that the sampling station had when it was shipped from Airphoton LLC.

10. Examples of programmed scenarios

We strongly recommend that a new user plays with the programming aspect of the sampling station using short temporal scales in order to test the different functionality of the station. Using hours to substitute for days during the test speeds up the learning curve.

Below we have presented 4 possible scenarios and the settings that would be programmed for each one.

A. Advancing filters every 24 hours, continuous sampling.
B. Advancing filters every 24 hours, sampling only during daylight hours
C. Advancing filters every 7 days, sampling only during morning traffic periods, 4 hours from 5:00 am to 9:00 am.
D. Advancing filters every 24 hours, dividing the day into 3 periods and sampling 5 out of every 8 hours.

	A	B	C	D
Start day	09/10/2013	09/10/2013	09/10/2013	09/10/2013
Start time	00:00:01	07:00:00	05:00:00	07:00:00
Period	001/00:00:00	001/00:00:00	007/00:00:00	001/00:00:00
Duration	001/00:00:00	000/12:00:00	007/00:00:00	001/00:00:00
Duty period	001/00:00:00	001/00:00:00	001/00:00:00	000/08:00:00
Duty duration	001/00:00:00	001/00:00:00	000/04:00:00	000/05:00:00
Short period	001/00:00:00	001/00:00:00	001/00:00:00	000/08:00:00
Short duration	001/00:00:00	001/00:00:00	001/00:00:00	000/08:00:00

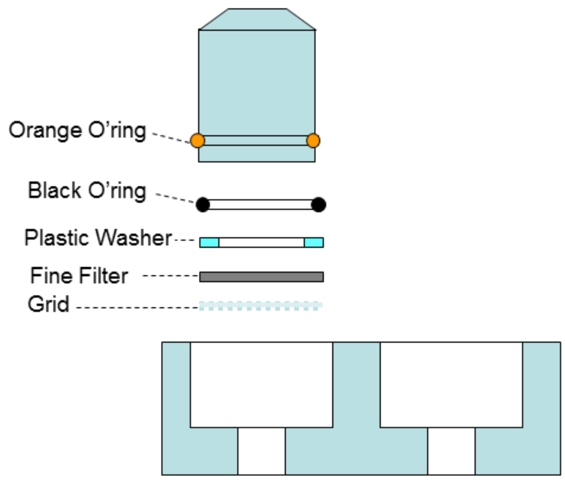
Note none of the above invoke short cycle sampling. If short cycle is desired, we recommend contacting Airphoton directly for guidance.

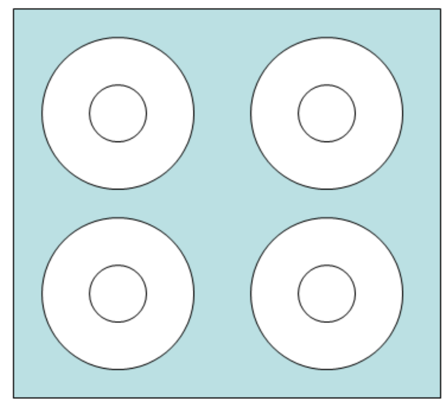
AirPhoton 8-slot filter cartridge model FC10

Dimensions: 3" x 6" x 1.25"
Weight: ~ 0.6 kg

The Airphoton 8-slot filter cartridge is a unique design that holds and protects 8 particle sampling filters. This design minimizes the handling of the filters in the field and reduces the frequency of site visits by technicians. Used in conjunction with the Airphoton Automated Filter Sampling Station, the cartridge can be deployed through 7 sampling cycles and a blank filter (8 sampling cycles are possible upon request) before exchange with a fresh cartridge is necessary. Each of the 8 slots can hold either 1 filter for straightforward measurements of particles of one size, or 2 sequential filters of different pore sizes for separation of particles by size. Filter cartridges can be easily mailed to sampling sites in individual or collective boxes.

Assembly of the filter Cartridge





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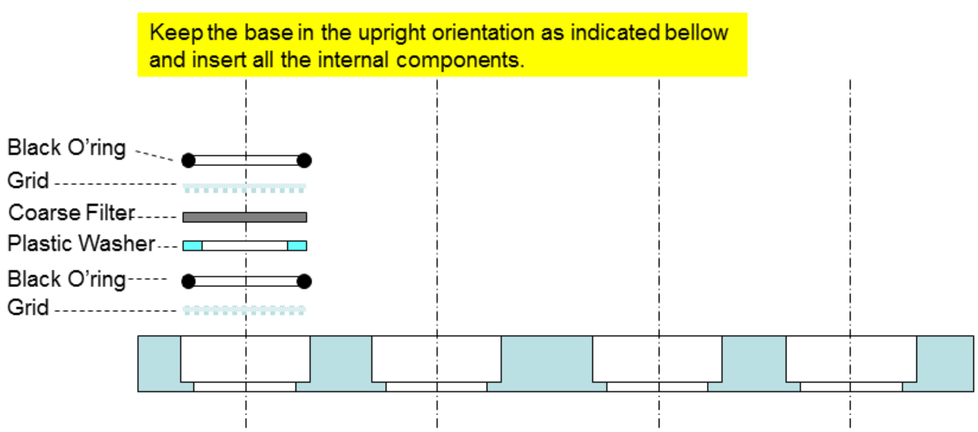
Assembly of the cartridge base:



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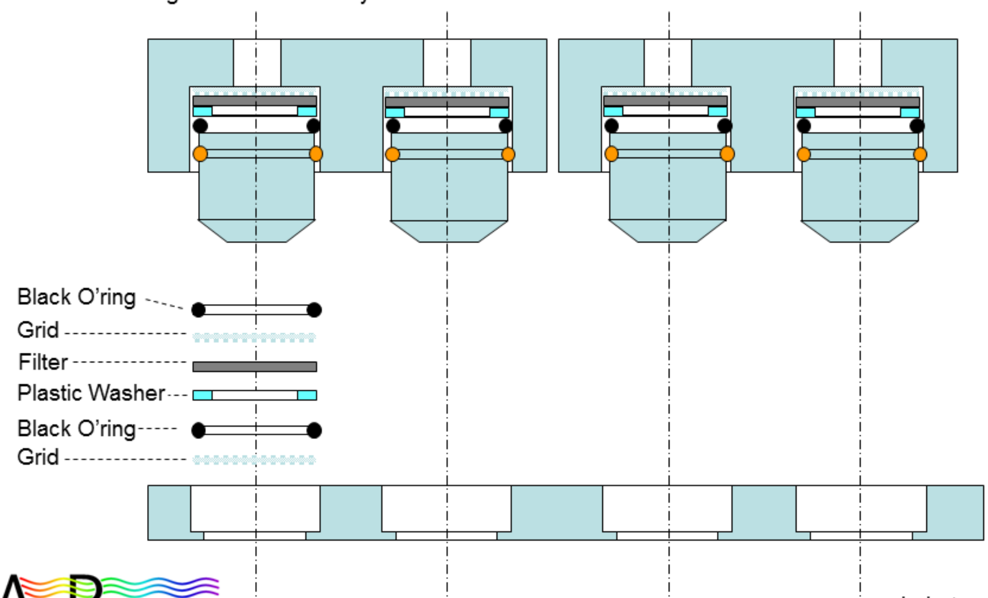
Connecting the top and base:

Insert all the components to the small cap of the cartridge and bring it upside down to the longer base of the cartridge for final assembly



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Final Assembly

- After the top and bottom of the cartridges are connected the screws should be hand tighten without applying excessive force.
- For fine and coarse Nuclepore filters the top and bottom of the cartridge should touch each other without the need of any spacers.
- Thicker filters may require a small spacer (thin washer) between the top and bottom parts of the cartridges but that must be evaluated in a case by case basis.

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Innovative Technology for Earth and Space

AirPhoton 3-wavelength Integrating Nephelometer IN100

Dimensions: 9" x 10" x 24" Mass: 6.7 Kg Power requirements: 15W @120VAC Wavelengths: 450, 532, and 632 nm Angular range: 7 to 90^{o}, and 90 to170^{o}

The Airphoton 3-wavelength Integrating Nephelometer measures the light scattered by particulate matter, over the angular range 7 to 170^{o}. Employing an innovative design, the forward and backward scattering measurements are made completely independently. LED technology allows the nephelometer to make these measurements at 450 nm, 532 nm and 632 nm, and to a sensitivity better than $10^{-6}m^{-1}$. Internal sensors measure and log temperature, relative humidity and pressure.

Small and compact, the 3-wavelength Integrating Nephelometer is enclosed in an environmentally protected case, ready for outdoor deployment in rugged conditions. Power requirements are 15W @ 120 VAC and input power options include: 110/220 VAC, 50/60Hz with provided power supply, and regulated 12VDC from sampling station with provided power connector. Optional heaters are available at the expense of additional power consumption. We strongly recommend the use of the provided power supply, power connector to sampling station or to contact AirPhoton for properly power connection, such as when operating on batteries or solar power.

Data from the AirPhoton IN100 Integrating Nephelometer is saved in a removable memory card.

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IN100 Nephelometer: Configuration System

The AirPhoton Nephelometer IN100 series has a configuration file system that allows for setting up internal variables and configuration parameters. The configuration data is transferred through the Nephelometer SD card and allows for three basic functions:

1. Set configuration and calibration parameters.
2. Dump/download the current configuration and calibration
3. Set date and time

1 - Setting General Configuration and Calibration Parameters

An ASCII text file named **config.txt** must be created in the root directory of the SD card. The configuration file may contain any combination of the following variables:

Valid Configuration and Calibration Parameters	
Samplingwait	The number of seconds between sampling periods. The default value is zero (“0”) which forces the system to run as quick as possible (~14 second of sampling). This variable is secondary to the actual sampling, so only values greater than ~14 seconds to take a sample will take effect and determine the actual sampling period.
Warmwait	Reserved.
Sampingcount	Reserved.
Ambientcount	Reserved.
Filesequence	The last used file sequence number. Replacing with zero “0” will cause the system to start on one “1” at bootup.
Filenameformat	Reserved.
Calulatereference	Reserved.
Heater	The state of internal sensor heaters. The default value of one “1” implies heater are operable if cold conditions develop.

Temperaturescale	Slope - Calibration coefficient for temperature
temperatureoffset	Intercept - Calibration coefficient for temperature
pressurescale	Slope - Calibration coefficient for pressure
pressureoffset	Intercept - Calibration coefficient for pressure
humidityscale	Slope - Calibration coefficient for relative humidity
humidityoffset	Intercept - Calibration coefficient for relative humidity
bsrscale	Slope Calibration intercept for Red Back Scattering
bsroffset	Intercept Calibration intercept for Red Back Scattering
bsgscale	Slope Calibration intercept for Green Back Scattering
bsgoffset	Intercept Calibration intercept for Green Back Scattering
bsbscale	Slope Calibration intercept for Blue Back Scattering
bsboffset	Intercept Calibration intercept for Blue Back Scattering
fsrscale	Slope Calibration intercept for Red Forward Scattering
fsroffset	Intercept Calibration intercept for Red Forward Scattering
fsgscale	Slope Calibration intercept for Green Forward Scattering
fsgoffset	Intercept Calibration intercept for Green Forward Scattering
fsbscale	Slope Calibration intercept for Blue Forward Scattering
fsboffset	Intercept Calibration intercept for Blue Forward Scattering

Notice: All variables are presented in lower case letters only. Only the variables listed in the table above will be accepted in the config.txt file.
Additionally, not all variables need to be present for each configuration change. It is perfectly acceptable to change on a few or even one setting at any given time.
Important: "Reserved" variables should not be changed from its default values without further instructions.

Example config.txt for configuration setting

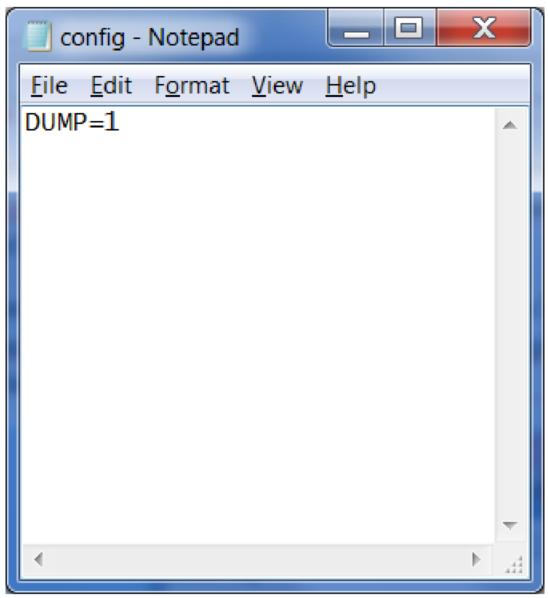
```
samplingwait=0
warmwait=2000
sampingcount=1000
ambientcount=10
filesequence=56
filenameformat=0
calulatereference=1
heater=1
temperaturescale=0.007161
temperatureoffset=61.111110
pressurescale=0.002977
pressureoffset=14.456500
humidityscale=0.006044
humidityoffset=-37.700000
bsrscale=382.424958
bsroffset=-19.750688
bsgscale=551.397268
bsgoffset=-4.690693
bsbscale=201.125644
bsboffset=-7.426035
fsrscale=247.333975
fsroffset=-4.864346
fsgscale=386.901131
fsgoffset=-11.070606
fsbscale=265.242489
fsboffset=-11.828460
```

2 - Dumping Current Configuration

The current configuration of the Nephelometer can be verified but creating a **config.txt** file in the root of the SD card as used in Function 1 above with the command "**DUMP=1**". Notice that the command must be defined in capital letters.

The DUMP command will create a file in the SD card with a listing of the current configuration of the Nephelometer including a header that contains the Nephelometer serial number, firmware number, date, time, and some additional information.

Example config.txt for DUMP Command



> **Notice:** Use of DUMP=1 command during configuration parameter changes is valid, but the output will reflect the previously stored configuration values. If the newly stored values need to be checked, a second config.txt file needs to be processed with the DUMP=1 command.

3 - Setting Date and Time

The proper date and time for the Nephelometer IN100 is set through the SD card. In order to adjust the date and time a file named "time.txt" must be created in the root directory of the SD card with any combination of the following variables:

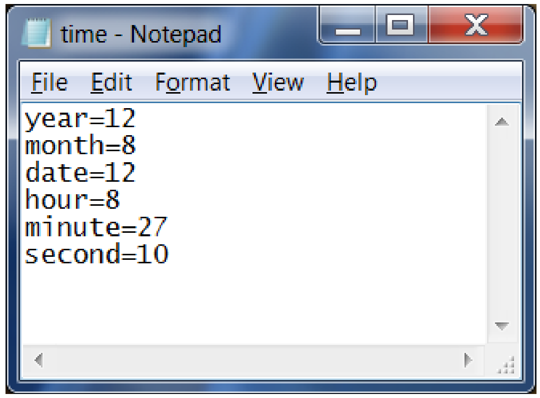
Valid Date and Time Parameters	
year	Year with no padding (ex: 13 instead of 2013) Valid: 0 – 99
month	Month with no padding (ex: 8 instead of 08) Valid: 1 – 12
date	Day of the month with no padding (ex: 8 instead of 08) Valid: 1 – 31
hour	Hour with no padding (ex: 8 instead of 08) Valid: 0 – 23
minute	Minute with no padding (ex: 8 instead of 08) Valid: 0 – 59
second	Second with no padding (ex: 8 instead of 08) Valid: 0 – 59

The SD card must be inserted in the Nephelometer with the system turned off. On boot up, the nephelometer searches for a valid **time.txt** file. If time.txt is found, the front panel indicators will blink in sync at a fast pace. While the Nephelometer is still blinking, the new date and time settings will take effect at the exact moment that the SD card is removed from its slot. We recommend the time in the file **time.txt** to be set about one minute ahead of the actual time in order for the operator to have enough time to prepare to synchronize the nephelometer with a real time clock.

After the SD card is removed, the indicators will turn off except **POWER** will continue to blink indicating that the time was set and that the nephelometer power must be turned off. The SD card must be re-inserted while the power is off and the power must be turned on again for the system to start acquiring data properly.

> **Notice:** Prior to turning on the power to the nephelometer, the SD card must be properly inserted into the Memory Card slot. In the case where the SD card is inserted after startup, no data will be saved to the SD Card.

Example time.txt for Date Time Setting



year=12
month=8
date=12
hour=8
minute=27
second=10

Appendix – Example Files

Example config.txt contents for calibration or configuration
samplingwait=0 sampingcount=1000 ambientcount=10 filesequence=56 heater=1 temperaturescale=0.007161 temperatureoffset=61.111110 pressurescale=0.002977 pressureoffset=14.456500 humidityscale=0.006044 humidityoffset=-37.700000 bsrscale=382.424958 bsroffset=-19.750688 bsgscale=551.397268 bsgoffset=-4.690693 bsbscale=201.125644 bsboffset=-7.426035 fsrscale=247.333975 fsroffset=-4.864346 fsgscale=386.901131 fsgoffset=-11.070606 fsbscale=265.242489 fsboffset=-11.828460

Example config.txt contents configuration dump
DUMP=1

Example time.txt contents to set time
year=12 month=8 date=12 hour=8 minute=27 second=10