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Innovative Technology for Earth and Space

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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 Nephelometers: 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

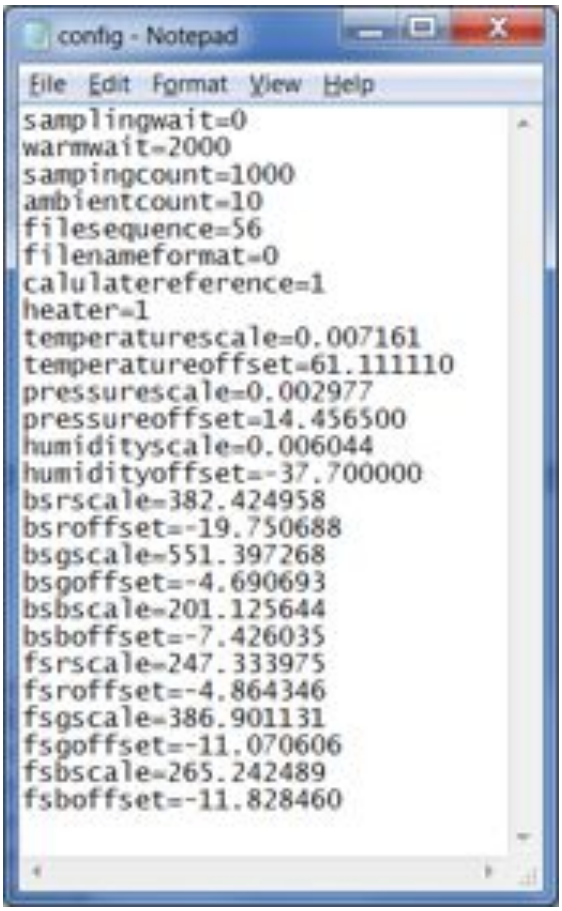
Pressurescale	Slope - Calibration coefficient for pressure
Pressureoffset	Intercept - Calibration coefficient for pressure
Humidityscale	Slope - Calibration coefficient for relative humidity
Humidityoffset	Intercept - Calibration coefficient for relative humidity
Bsrscale	Slope Calibration intercept 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

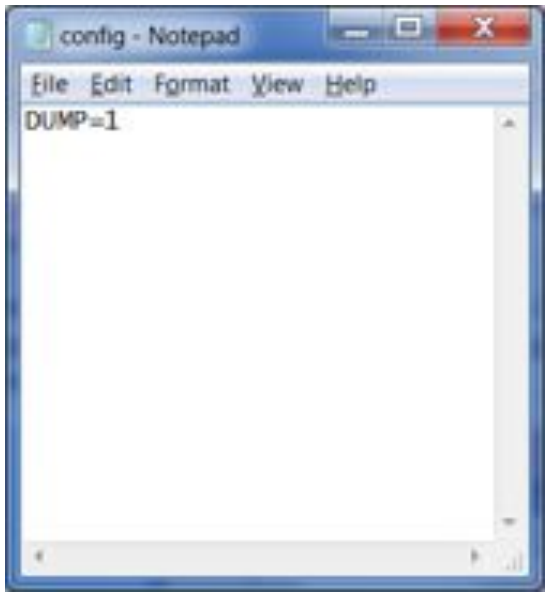


2 - Dumping Current Configuration

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 care. 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:

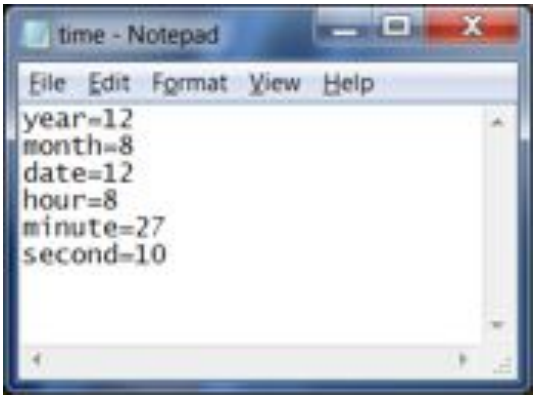
Valid Date and Time Parameters	
year	Year with no padding (ex: 13 instead of 2013) Valid: 0 – 99
month	Month with no padding (ex: 8 instead of 08) Valid: 1 - 12
date	Day of the month with no padding (ex: 8 instead of 08) Valid: 1 – 31
hour	Hour with no padding (ex: 8 instead of 08) Valid: 0 - 23
minute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



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