Using PurpleAir data

PurpleAir sensors employ a dual laser counter to provide some level of data integrity. This is intended to provide a way of determining sensor health and fault detection. Some examples of what can go wrong with a laser counter are a fan failure, insects or other debris inside the device or just a layer of dust from long term exposure.

If both laser counters (channels) are in agreement, the data can be seen as excellent quality. If there are different readings from the two channels, there may be a fault with one or both.

In the case of a fault, the channel may be marked as flagged or downgraded (suspect or known faulty).

PurpleAir provides ways to get direct access to the data and there are a few different ways to do this.

The simplest way to download the data is using the download page available at https://www.purpleair.com/sensorlist. This page provides an easy to use interface to download data based on a date range.

- Find and mark the sensor/s in the list you want to download - use CTRL + F to quickly search by sensor name.
- Return to the top of the page and enter the desired date range, then click Download Selected.

JSON data available from PurpleAir

NOTE: Please limit multiple threaded applications to a few threads at any time to reduce load on purpleair.com or thingspeak.com servers. If you do not limit the amount of threads, you may be blocked on the firewall.

PurpleAir provides access to our real time data in a JSON format. This format allows developers to access current data for all sensors or a subset of sensors.

There are two ways to access the JSON data:
All sensors: https://www.purpleair.com/json
One entry: https://www.purpleair.com/json?show=<ID> where ID is the "ID" of the sensor you want (in the case of dual laser where ParentID is "null").

PurpleAir JSON fields description and example values:

The following is a list of the fields and a description of their values contained in the JSON data:
"ID":1234, // PurpleAir sensor ID
"ParentID":null, // The PurpleAir sensor ID of the "parent" entry in the case of Channel B
"THINGSPEAK_PRIMARY_ID":"1234", // The Thingspeak channel ID for primary data of this sensor
"THINGSPEAK_PRIMARY_ID_READ_KEY":"XXXX", // The Thingspeak read key for primary data of this sensor
"Label":"name", // The "name" that appears on the map for this sensor
"Lat":null, // Latitude position info
"Lon":null, // Longitude position info
"PM2_5Value":"1.07", // Current PM2.5 value (based on the
"State":null, // Unused variable
"Type":"TYPE", // Sensor type (PMS5003, PMS1003, BME280 etc)
"Hidden":"true", // Hide from public view on map: true/false
"Flag":null, // Data flagged for unusually high readings
"DEVICE_BRIGHTNESS":"1", // LED brightness (if hardware is present)
"isOwner":1, // Currently logged in user is the sensor owner
"A_H":null, // true if the sensor output has been downgraded or marked for attention due to suspected hardware issues
"temp_f":"xx", // Current temperature in F
"humidity":"xx", // Current humidity in %
"pressure":"xx", // Current pressure in Millibars
"AGE":29831, // Sensor data age (when data was last received) in minutes
"THINGSPEAK_SECONDARY_ID":"1234", // The Thingspeak channel ID for secondary data of this sensor
"THINGSPEAK_SECONDARY_ID_READ_KEY":"XXXX", // The Thingspeak read key for secondary data of this sensor
"LastSeen":1490309930, // Last seen data time stamp in UTC
"Version":"2.47c", // Current version of sensor firmware
"LastUpdateCheck":1490308331, // Last update checked at time stamp in UTC
"Uptime":"5210", // Sensor uptime in seconds
"RSSI":"-68", // Sensor's WiFi signal strength in dBm

"Stats": // Statistics for PM2.5
"{
\"v\":1.07, // Real time or current PM2.5 Value
\"v1\":1.3988595758168765, // Short term (10 minute average)
\"v2\":10.938131480857114, // 30 minute average
\"v3\":15.028685608345926, // 1 hour average
\"v4\":6.290537580116773, // 6 hour average
\"v5\":1.8393146177050788, // 24 hour average
\"v6\":0.27522764912064507, // One week average
\"pm\":1.07, // Real time or current PM2.5 Value
\"lastModified\":1490309930933, // Last modified time stamp for calculated average statistics
\"timeSinceModified\":69290 // Time between last two readings in milliseconds
}"
}

Accessing data directly from Thingspeak:

Another way to get the data is to use ThingSpeak.com and to do this, you will need the API Key and channelID. These two pieces of data are available from PurpleAir's JSON.

More info on using ThingSpeak's API is here:
https://www.mathworks.com/help/thingspeak/rest-api.html

Field descriptions:

Channel A and B, primary and secondary ThingSpeak channels together provide 32 fields for each sensor.
There are six ug/m3 values and six particle counts for each channel (laser) as well as temperature, humidity, WiFi signal (RSSI), sensor uptime, free memory and analog input.

Channel A

PrimaryData
field1: PM1.0 (CF=ATM) ug/m3
field2: PM2.5 (CF=ATM) ug/m3
field3: PM10.0 (CF=ATM) ug/m3
field4: Uptime (Minutes)
field5: RSSI (WiFi Signal Strength)
field6: Temperature (F)
field7: Humidity (%)
field8: PM2.5 (CF=1) ug/m3 This is the field to use for PM2.5

SecondaryData
field1: 0.3um particles/deciliter
field2: 0.5um particles/deciliter
field3: 1.0um particles/deciliter
field4: 2.5um particles/deciliter
field5: 5.0um particles/deciliter
field6: 10.0um particles/deciliter
field7: PM1.0 (CF=1) ug/m3 This is the field to use for PM1.0
field8: PM10 (CF=1) ug/m3 This is the field to use for PM10

Channel B

PrimaryData
field1: PM1.0 (CF=ATM) ug/m3
field2: PM2.5 (CF=ATM) ug/m3

field3: PM10.0 (CF=ATM) ug/m3
field4: Free HEAP memory
field5: ADC0 (analog input) voltage
field6: SENSOR FIRMWARE 2.5 and up: Atmospheric Pressure
field7: (NOT USED)
field8: PM2.5 (CF=1) ug/m3 This is the field to use for PM2.5

SecondaryData
field1: 0.3um particles/deciliter
field2: 0.5um particles/deciliter
field3: 1.0um particles/deciliter
field4: 2.5um particles/deciliter
field5: 5.0um particles/deciliter
field6: 10.0um particles/deciliter
field7: PM1.0 (CF=1) ug/m3 This is the field to use for PM1.0
field8: PM10 (CF=1) ug/m3 This is the field to use for PM10

* All time stamps are UTC.
PurpleAir sensors attempt to send both primary and secondary data every 40 seconds or so.

PA-II-SD data format

The SD Card version of the PA-II (PA-II-SD) has a built in real time clock and OPENLOG serial logger. The SD card contains data in CSV format with the following headers:

UTCDateTime,mac_address,firmware_ver,hardware,current_temp_f,current_humidity,current_dewpoint_f ,pressure,adc,mem,rssi,uptime,pm1_0_atm,pm2_5_atm,pm10_0_atm,pm1_0_cf_1,pm2_5_cf_1,pm10_0 _cf_1,p_0_3_um,p_0_5_um,p_1_0_um,p_2_5_um,p_5_0_um,p_10_0_um,pm1_0_atm_b,pm2_5_atm_b, pm10_0_atm_b,pm1_0_cf_1_b,pm2_5_cf_1_b,pm10_0_cf_1_b,p_0_3_um_b,p_0_5_um_b,p_1_0_um_b, p_2_5_um_b,p_5_0_um_b,p_10_0_um_b

Header Descriptions

UTCDateTime: The Date and time derived from the Real Time Clock and synced with NTP where possible (in UTC).
Mac_address: The MAC address of the WiFi module on the sensor (used as an ID for the unit).
Firmware_ver: Firmware version of the control board.
Hardware: Hardware the control board has detected.
current_temp_f: Current temperature in F.
Current_humidity: Current Humidity in %.
Current_dewpoint_f: Calculated dew point in F.

Pressure: Current pressure in millibars.
Adc: The voltage reading on the analog input of the control board.
Mem: Free HEAP memory on the control board.
Rssi: WiFi signal strength in dBm
Uptime: Firmware uptime in seconds.

Pm1_0_atm: Channel A ATM PM1.0 particulate mass in ug/m3
Pm2_5_atm: Channel A ATM PM2.5 particulate mass in ug/m3
Pm10_0_atm: Channel A ATM PM10.0 particulate mass in ug/m3
Pm1_0_cf_1: Channel A CF=1 PM1.0 particulate mass in ug/m3
Pm2_5_cf_1: Channel A CF=1 PM2.5 particulate mass in ug/m3
Pm10_0_cf_1: Channel A CF=1 PM10.0 particulate mass in ug/m3
P_0_3_um: Channel A 0.3 micrometer particle counts per deciliter of air
P_0_5_um: Channel A 0.5 micrometer particle counts per deciliter of air
P_1_0_um: Channel A 1.0 micrometer particle counts per deciliter of air
P_2_5_um: Channel A 2.5 micrometer particle counts per deciliter of air
P_5_0_um: Channel A 5.0 micrometer particle counts per deciliter of air
P_10_0_um: Channel A 10.0 micrometer particle counts per deciliter of air

Pm1_0_atm_b: Channel B ATM PM1.0 particulate mass in ug/m3.
Pm2_5_atm_b: Channel B ATM PM2.5 particulate mass in ug/m3
Pm10_0_atm_b: Channel B ATM PM10.0 particulate mass in ug/m3
Pm1_0_cf_1_b: Channel B CF=1 PM1.0 particulate mass in ug/m3
Pm2_5_cf_1_b: Channel B CF=1 PM2.5 particulate mass in ug/m3
Pm10_0_cf_1_b: Channel B CF=1 PM10.0 particulate mass in ug/m3
P_0_3_um_b: Channel B 0.3 micrometer particle counts per deciliter of air
P_0_5_um_b: Channel B 0.5 micrometer particle counts per deciliter of air
P_1_0_um_b: Channel B 1.0 micrometer particle counts per deciliter of air
P_2_5_um_b: Channel B 2.5 micrometer particle counts per deciliter of air
P_5_0_um_b: Channel B 5.0 micrometer particle counts per deciliter of air
P_10_0_um_b: Channel B 10.0 micrometer particle counts per deciliter of air

PA-II NOTES:
Each sensor contains two identical laser counters, hence channel A and B. If these two
channels do not agree to some extent then there is something wrong with one or both channels.

Plantower PMS sensor notes:
ATM is "**atmospheric**", meant to be used for outdoor applications
CF=1 is meant to be used for indoor or controlled environment applications
However, PurpleAir uses CF=1 values on the map. This value is lower than the ATM value in
higher measured concentrations.