The Partector 2 command interface
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This document is related to partector 2 firmware version 110. Older (and future!) firmware versions may differ slightly.

The partector 2 has a USB port which can be used to receive data in real time from the instrument, and also to send commands to the partector. By default, partector data is streamed from the device at a fixed data rate (1, 10 or 100Hz). Alternatively, the partector can be put in a polling mode, where it only sends data after a given command is sent.

Data format
The partector 2 outputs data in ASCII format, with tabs to delimit values, and new lines (\n\r) to delimit data packets.
There are two output formats (USB and SD-card). The USB output format is standard and contains the following information:

USB format:

Time since instrument start	(%.2f)	[s]
Charger diffusion current	(%.2f)	[nA]
Charger high voltage	(%i)	[V]
Electrometer 1 reading	(%.3f)	[mV]
Electrometer 2 reading	(%.3f)	[mV]
Electrometer 1 amplitude	(%.2f)	[mV]
Electrometer 2 amplitude	(%.2f)	[mV]
Temperature	(%.1f)	[°C]
Relative Humidity	(%.1f)	[%]
Status	(%i)	[-]
Precipitator voltage	(%i)	[V]
Battery voltage	(%.2f)	[V]
Phase angle (disregard)	(%.3f)	
LDSA value	(%.1f)	[$\mu m^2/cm^3$]
Diameter	(%.1f)	[nm]
Number	(%i)	[$1/cm^3$]
Differential Pressure	(%i)	[Pa/240]
Lag (disregard)	(%i)	

The SD card format is identical to the output on the SD card.

The Status value

The status field in the output is 0 if no error has occurred, and nonzero if there is an error condition. Bits 0...12 of the status field correspond to the following errors:

Bit 0: Pulse low error: non-zero Charging current when high voltage is off (contamination in the charger)
Bit 1: Pulse high error: Setpoint diffusion current (normally 2.0nA) is not reached when the charger is on (corona wire contaminated, or grid separating corona and aerosol flow contaminated)
Bit 2: High RH: the humidity sensor reports a value larger than 80%

Bit 3: Electrometer offset high (> 5 or 10mV depending on instrument version), may indicate contamination of electrometer insulators
Bit 4: Corona voltage low (may indicate broken high voltage module)
Bit 5: Buffer overflow: internal data processing too slow to handle data, may happen if writing to the SD-card is excessively slow (e.g. with a nearly full, large SD card)
Bit 6: Generic error (no specific condition), currently used for SD card missing
Bit 7: Deposition voltage low (may indicate broken high voltage module)
Bit 8: Electrometer overflow: At least one of the electrometers has reached its maximal value, measurement is therefore inaccurate and premature aging of the device due to high contamination will occur.
Bit 9: Selftest error on startup
Bit 10: Flow error – may indicate a broken pump
Bit 11: Electrometer 1 gain error
Bit 12: Electrometer 2 gain error

Command interface

This section lists the commands that are recognized by the partector and their effects. Note that you can change settings which influence the LDSA value measured by the partector, and thus inadvertently "decalibrate" the instrument. All settings which influence the calibration are printed in red below, so that you know that you should never change them without good reason!

In general, partector commands are either "set" commands or "get" commands. Set commands are terminated by a "!", get commands by a "?".

List of get commands

a? recall adaptive deposition voltage setting (0 = off, 1 = on)
A? recall antispike setting (0 = off, 1 = on)
b? recall pulsing setting (0 = off, 1 = on)
C? recall LDSA calibration factor multiplied by 100 (e.g. 703 means 7.03)
Cx? where x = 1,2,3: recall further calibration parameters for the 3 deposition voltages
c? recall pulse duty cycle (0...1) (0.5 is the default value)
dx? Where x = 1,2,3: recall deposition voltage setting for the 3 deposition voltages.
D? poll data (partector will send an output string as described in data format section)
E? recall extreme environmental values (T and RH); highest and lowest ever encountered in the entire lifetime of the partector
answer example: "T: 9.3...33.4 RH: 13.5...82.2"
f? recall firmware version (e.g. "345")
F? recall pulse period [s] (2s is the default value)
G? recall electrometer gains
H? recall integration time (x = 0…2, device will integrate over 2^x pulse periods = 2,4 or 8s with standard settings)
h? recall RH shutdown value – if RH larger than this is detected, the corona is turned off. the default value is 90%
L? recall accumulated LDSA-minutes over lifetime of instrument [$\mu m^2/cm^3$ * minutes]
N? recall serial number
O? recall high voltage on (0 = off, 1 = on); should always be on
o? recall accumulated minutes of operation over lifetime of instrument
P? recall pump setpoint (in units of Pa/240, typical values are 1000-2000)
pP? recall P value of the charger diffusion current control (integer, typically 1...10)

pD?	recall D value of the charger diffusion current control (integer, typ. 50)
R?	recall RH correction value
r?	recall value of Real-time-clock correction
T?	recall instrument date/time
t?	recall calibration date
U?	recall diffusion current setpoint [nA]; 2nA is the default value
v?	recall hardware version (e.g. 3.1)
V?	recall power saving setting (0 = off, 1 = on; on is default)
z?	recall zero offset (usually 0)
Z?	recall zero-HV setting – if 1, the HV is turned off completely when the pulse is off, if , 0, it is only regulated to about 2000V.

List of set commands

a000x!	Set adaptive DV on (x=1) or off (x=0)
A000x!	Set antispike on (x=1) or off (x=0)
b000x!	Set pulsing of charger on (x=1) or off (x=0)
Cxxxx!	**Change calibration constants – do not use this!**
c0xxx!	**Set pulse duty cycle to x.xx (0.00 – 1.00)**
dxyyy!	**set deposition voltage x to yyy V**
exxxx!	Turn on EM selftest with amplitude xxxx (0: self-test off; 100: standard test value)
F00xx!	**Set HV pulse period to x.x seconds**
Gx000yyyy!	Changed stored gain (x = 1,2) to yyyy
H000x!	Set integration time to 2^x pulse periods (x = 0,1,2).
h0xxx!	Set shutdown RH to xx%
Nxxxx!	Set instrument serial number to xxxx
O000x!	Set charger HV on (x=1) or off (x = 0) (instrument will measure nothing with charger off!)
Pxxxx!	**Set pump setpoint to xxxx/240 Pa.**
pPxxx!	**Set P value of charger diffusion current control to xx.x (limited to 0.01 .. 10.0)**
pD0xx!	**Set D value of charger diffusion current control to xx**
R0xxx!	Set RH sensor correction to x.xx
r1xxx!	Set lower 3 digits of RTC calibration to xxx
r2xxx!	Set upper 3 digits of RTC calibration to xxx
r4xxx!	Store RTC calibration value in nonvolatile memory The r-commands set the RTC calibration value, which can be +- 0...131071. Important: The r-commands must be used in the sequence r1, r2 and r4!
s!	Stop recording to SD card and store all statistics to EEPROM
Tc0xx!	Sets the internal clock c = Y: set year to 20xx c = M: set month to xx c = D: set day of month to xx c = h: set hour of day to xx c = m: set minute of hour to xx c = s: set second of minute to xx
U0xxx!	**Set charger diffusion current to x.xx nA (default value is 2.00 nA)**
V000x!	Turn power saving on (x=1) or off (x=0)
X000x!	Set USB streaming frequency:

	x = 0: no data is streamed x = 1: 1 Hz data rate x = 2: 10 Hz data rate x = 3: 100 Hz data rate x = 4: 1Hz data rate using the SD card output format Use X0000! to shut down partector data transmission if/when you want to recall settings, and if you want to poll data with D?
x000x!	Set multiplex input to channel x
Y000x!	Turn RH/T heater on (x = 1) or off (x = 0)
Z000x!	Set zero HV pulsing on (x = 1, default) or off (x = 0)
z0xxx!	**Set zero offset to x.xx $\mu m^2/cm^3$**