RAPID DATA ACQUISITION USING THE MODEL 3787 AND 3788 WATER-BASED CONDENSATION PARTICLE COUNTERS

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The Model 3787/8 WCPCs are generally restricted to one-second data reporting as set from the front panel or up to 10 per second (100 ms) using firmware commands or external software such as TSI's Aerosol Instrument Manager® software. It is possible however to collect concentration data with resolutions down to 20 ms to take full use of the fast response time of these instruments with a few limitations.

Collection of high time resolution data requires the use of a terminal emulation program or custom software that uses a previously undocumented WCPC firmware command. Terminal Emulation programs such as HyperTerminal or Teraterm (http://ttssh2.sourceforge.jp/) allow saving capturing (logging) of data received from a device to a file. Data reported by the WCPC is in a comma-separated-value (CSV) format and if this data is saved with a .csv extension, the file format will be recognized by many software packages such as Microsoft® Excel® spreadsheet software. Communications over the USB or Serial Port are at 115200,N,1. Connections over the Ethernet are on the Telnet port (port 23) and require new line (LF) characters as the command terminations.

The standard command for acquiring data from the WCPC, is the "SM" (Set Mode) command which has the following format:

SM,m,t
where m is the mode:
      0 = idle -- no records reported
      1 = Data Record Reported
      2 = Status Record Reported
      3 = Appended Data and Status Record Reported

And t is the reporting time in tenth of a second (1 to 12000)

Sending the command SM, 1,10 sets the WCPC to provide a new Data record once each second. The undocumented command "SS" (Set Speed) will change the reporting interval from the value (t) that was set with the SM command to a value in increments of 20 ms.

SS,T
Where T is the reporting time in 1/50 of a second (t = T/5)

Examples:

SM,0	Turns off data reporting
SM,1,1	Starts reporting of D records at a 1/10 of a second rate
SS,2	Changes reporting rate to 0.04 second (25 per second)
SM,0	Turns off data reporting
SS,1	Sets reporting rate to 0.02 second (50 per seconds), but record reporting is turned off
SM,1	Turns on record reporting which are sent at the rate of 50 per second
SM,0	Turns off data reporting

Reported D Record format fields:

D	Record identifier
Date	Date in yyyy/mm/dd format
Time	Time in hh:mm:ss format
Flags	Status Flags
Conc	Aggregated concentration
AT	Elapsed sample time 0.1 sec resolution (0.1 to 1200).
LT	Live time 0.001 sec resolution (0.001 to 1200).
CNT	Accumulated particle counts.
Photo	Average photo-detector value in mV.
Reserved	Always 0
PH	Average pulse height in mV
PSTD	Pulse height standard deviation.
Flow	Capillary flow cm^3/min (Model 3788 only)

Example D Record:
D,2010/11/2,08:01:21,0,1.04e4,6.0,4.4,769424,140,0,2100,813,299

Record Type	Date	Time	Flags	Conc	AT	LT	CNT	Photo	Res	PH	PSTD	Flow
D	2010/11/2	08:01:21	0	1.04e4	6.0	4.4	769424	140	0	2100	813	299

Considerations when taking high time resolution WCPC data.

- The number of particle counts acquired is reduced which will cause a reduction in particle counting statistics which in turn will increase the record to record variability (noise).

- The fill and water ejection functions of the WCPC cause a slight disruption in the sample flow of the instrument. This disruption moves particle counts from one reporting record to another and is typically averaged over the record at lower reporting rates. At the higher time resolution rates the disruption may be observable.

- Jitter, which is the time variation from record to record, is a higher percentage of the sample rate that at lower reporting rates. This also increases slightly the observed noise in the reported concentration. Also for this reason, it is recommend to only use the SM,1 mode which reports only the Data record.

- High resolution data reporting cannot be used with the USB Flash drive.

- The higher resolution reporting rate does not improve the physical time response of the WCPC.