RS232 Communication protocol for AAG_CloudWatcher (part 5, March 3rd 2023)

Relevant hardware changes since the last (1.3) document:

New CloudWatcher units have replaced traditional light sensors (which measured sky brightness) with a new sensor able to measure the quality of the sky in terms of Magnitudes Per Square Arc/Second (MPSAS).

New firmware and underlying communication protocol have been updated to support these new sensors.

Commands added/modified since document Rs232_Comms_v130:

From firmware versions 5.89 onwards:

Command "C!"

"**C!**" previously returned 4 values (see table below). If, and only if, the new light sensor is installed, an extra fifth value is included specifying the raw period (in 1/250000 sec) read by the new light sensor. For convenience, we include all the values (previous and new ones) in the table below:

Sent	**Received**			
Command	# of blocks	Total size	Block Content	Meaning
C!	4 or 5	75 or 90	!6 xxxx	Zener voltage
			!3 xxxx	Ambient Temperature
			!4 xxxx	LDR voltage
			!5 xxxx	Rain sensor temperature
			!8 xxxx	**Only if the new light sensor is installed.** Raw period obtained by the new light sensor
			!¶ 0	Handshaking block

Notes on this command:

- As always, developers should not rely on a fixed size of the response to a command.

Use the handshaking block as an end-of-response marker.

- The order of each response block must not be assumed. Order may change in future versions of the firmware.
- Raw frequency of the new sensor is converted into MPSAS (Magnitudes Per Square Arc/Second) by Windows Software and SOLO using the following formula:

  $$mpsas = SQReference - 2.5 * Log_{10}(250000/period)$$

  Where "**SQReference**" is set to "19.6" by default, but is configurable in both Windows Software and SOLO to better tune the sensor.

  The final "mpsas" value also includes a small correction because of ambient temperature, using this formula:

  $$mpsas\_corrected = (mpsas - 0.042) + (0.00212 * temperature)$$

  Where "temperature" is the ambient temperature in degrees Celsius.

  This correction is also applied in both the Windows Software and the SOLO.
- If the new light sensor is installed, the value of block "**!4**" (LDR voltage) is estimated by the firmware and maintained for backward compatibility. Developers are encouraged to use "**!8**" instead if available, since it is not estimated and represents a more accurate sky quality measurement.