

Rolling Averages

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A rolling average is formed by summing all the valid averages within a given number of periods, then dividing that sum by the number of entries summed. The rolling average uses the most recent valid average and goes backward in time the specified number of periods.

Two Types Of Rolling Averages

The CPP supports two types of rolling averages; continuous (rolling) and discrete (building). With a continuous average, the CPP updates the rolling average constantly as it receives new information. With a building average, The CPP resets the rolling average to zero after it forms the average for the final period.

The CPP supports the following rolling averages; 1, 3, 4, 6, 8, 12 and 24 hours. The CPP makes some assumptions when calculating the building averages. If the interval input is 24, the CPP assumes that this is a daily average, and discrete rolling averages are reset at midnight. An input of twelve resets at midnight and at noon. An input of three resets every 3 hours at 3, 6, 9, 12, 15, 18, 21, and 24 hours. Continuous rolling averages do not reset. The oldest reading is removed and the new reading added in.

Initialization

Entering this routine results in the CPP asking:

```
Rolling Averages
Rolling ( R), Building (B), Clear( C) = R <cr>
Input Chan # = 00 04<cr>
P, I, F = F <cr>
Interval (1,3,4,6,8,12,24,S, Hrs) = 0 24<cr>
% Points In Final Avgs = 45 75<cr>

Chan # =
```

In the example, the user has set up this channel to compute a continuous , rolling average from the final averages of channel #4. The rolling average must have 75% of the hourly averages used in the calculation before the rolling average is considered as valid. The value specifies the percentage of samples that must be present to make a valid rolling average.

Status Indicators

Sometimes this rolling data validation criteria can lead to misconceptions. In the above example, a 75% validation criteria means that 18 of the hourly averages used as inputs to the rolling calculation must be present in forming the rolling average before the rolling average can be considered valid. Data points flagged as bad by the CPP are not used in the rolling average calculation. Data points flagged with other status flags indicators are evaluated by the rolling average routine and the following are not used; if in calibration, if insufficient samples were present to form the average, or a sample delay flag. Other bad status conditions are flagged as bad by the CPP. The calibration aspect has more bearing when the rolling input is from a preliminary data point or an interim data point, as status conditions can span several input samples.

In forming a continuous rolling average, several criteria are at work. Initially, the routine is adding in each new valid data point into a running sum and counting the input. Each invalid data input is stored but not summed into the running sum, nor is the count incremented. This continues until the number of data points required to form the rolling average are input (valid or invalid). This is dependent on the type input and the roll duration. After this time, with each new data input (valid or invalid) the oldest data point is removed. If it is a valid data point, then it is subtracted from the running sum and the counter decremented. If it is an invalid data point, then it is removed but not subtracted from the running sum., as it was never added in, and the counter is not decremented.

The status flagged stored with the rolling averages reflects the condition of the number of valid samples in the running sum. If no counts are present, the data point has a B modified. If there are valid samples present, but not enough to meet the validation criteria, the data point has a < modifier. If sufficient samples are present in the running sum to form a valid average, then the data point is flagged as good.

In discrete or building averages, the status uses the same criteria. If no samples are present in the building average, then the data point has a B status. If some samples are present, but not enough to meet the validation criteria, then the data point has a < status. If enough samples are present to meet the validation criteria, then the data point has a G status.

With the interim or final averages as the inputs, any of the above rolling averages can be formed. With the preliminary averages as the input, only the 1 hour, 3 hour and 4 hour rolling averages (continuous) can be set up. Any of the building averages, with any average as the input, can be set up.

L Keyin Print

The listing print (L keyin) presents the channels set up to calculate rolling averages as presented below. The L key heading providing the instrument manufacturer is used to indicate that this channel has been set up to from a rolling average. The 04 FR indicates that the input is the final averages (F) from channel #04, and that this is a rolling average (R). The roll time is 24 hours.

<u>L Key Heading</u>	<u>Channel</u>
Inst Man	RL AVG
MDL# or ADC#	04 FR
C-Port/Range	24 Hrs

Special Intervals

Above, in the initialization, in the Interval question, if a rolling average is being formed (not a building average), the CPP offers an S, or special option. This allows the user to specify the number of values to use in the rolling average. The correct input is Sxxx, where xxx is either one, two or three digits followed by a carriage return.. This allows the user to set up site specific rolling averages. As an example, using the preliminary averages to form 6 or 20 minute rolling averages to meet some opacity measurement requirements. If it is set up as a special the last line above in the L keyin example will be Sxxx.