FACE: FlowWorks Advanced Calculation Engine

Quick Reference Guide

Calculated Channel Setup	New calculated channels can be created from existing raw or calculated channels using any combination of mathematical operators.
Variables	Any channel from any station can be used in any calculation via an assigned single letter variable name (A, B…Z).
Basic Math (FORMULA)	Add (A+B) Subtract (A-B) Multiply (A*B) Divide (A/B) Exponents (A^B)
Conditional Statements and Comparisons (FORMULA)	Conditional Statements (IF A>B THEN 0 ELSE 1) are written as: IF(A>B,0,1) where 0 and 1 may be a variable, constant, or equation. You may substitute the word NULL as in IF(A>B,0,NULL) Valid comparisons include: Equal IF(A==B,0,1) Not equal IF(A!=B,0,1) Greater than (A>B,0,1) Greater than or equal to (A>=B,0,1) Less than (A<B,0,1) Less than or equal to (A<=B,0,1) AND IF(A>B&C>D,0,1) OR IF(A>B|C>D,0,1) NOT IF(A>B!C>D,0,1)
Trigonometric/ Special (FORMULA)	A variety of functions are available, please contact FlowWorks technical support for exact syntax depending on your needs.
Cumulative (Interval Length or Calendar Length)	The Cumulative function builds a running cumulative total that resets to 0 at set intervals. How to Use: Choose the source site and channel, and choose how often you want the total to reset (either a set Interval Length or Calendar Length).
Rolling Average	The Rolling Average function produces a boxcar average of the values in a channel over a set duration, but with the same time-resolution as the source data. Typical uses include calculation of duration-based flow statistics for alarming (for example, calculating the average flow over the previous 24-hours). How to Use: Choose the source site and channel, set the size of the boxcar window (Interval Minutes), set the interval of the source data (Step Size), and set a value to write in the event FlowWorks detects the source data does not match the step size.
Shift	The Shift function takes a segment of data and moves it forwards or backwards in time. Can be used for direct comparisons or calculations between different periods (such as difference in flow year to year). How to Use: Choose the source site and channel, set the interval that you want to shift the source data by (Interval Minutes), and choose the Shift Direction (forward or backward in time).
Sum	The Sum function creates a fixed interval time series by summing the values within the given interval period. Common uses include creating hourly or daily summarized channels for rainfall and flow volume. Can also be used for turning event data into a fixed interval time series (for example, number of pump starts per hour). How to Use: Choose the source site and channel, and set the interval that you want the data summed into.
Median	The Median function produces a median value time series based on a source channel and interval length. Typical use includes filtering noise from a dataset. How to Use: Choose the source site and channel and the desired Interval or Calendar length of the output channel.
Manning Flow	The Manning Flow function creates a time series of Manning Flow (circular pipe). How to Use: Choose the source site and water level channel, measurement system, pipe diameter, pipe slope, and roughness.
Manning Velocity	The Manning Velocity function creates a time series of Manning Velocity (circular pipe). How to Use: Choose the source site and water level channel, measurement system, pipe diameter, pipe slope, and roughness.
Delta Time	The Delta Time function creates a time series by calculating the difference in time between the current and previous values in a source channel. One of its uses is for detecting missing data. How to Use: Choose the source site and channel, and whether or not to ignore null values in the source data.

Delta	The Delta function produces time series data of the difference between the current value and its previous value in the selected channel. It is used to identify potential hardware problems and spikes within the dataset. How to Use: Choose the source site and channel
Discrete	The Discrete function builds a discrete interval dataset using cumulative total input data. Uses include producing discrete interval rainfall data (such as 5-minute or hourly) from a daily rainfall totalizer signal. How to Use: Choose the source site and channel, set the interval of the data you want to create (Interval Minutes) and set the maximum value used in the source data before resetting to 0 (Rollover Value).
Interpolate	The Interpolate function creates a fixed interval time series by linearly interpolating between sparser values of the source channel. Its primary use is for creating a channel with a smaller time interval than the source channel (i.e. creating 5-minute interval data from hourly data). How to Use: Choose the source site and channel, and set the interval of the data points that you want to add (Interval Minutes).
Repeat	The Repeat Function produces a repeating signal of data. This is often used to produce a dry weather repeating pattern. How to Use: Select a source site and channel, and the start & end dates/times of the source data to repeat.
Prev (FORMULA)	Prev function returns the previous time step value from the specified channel. How to Use: Reference in the formula box as PREV(A) where A is the channel that you want the previous value of.
Rolling Sum	The Rolling Sum function produces a boxcar summation of the values in a channel over a set duration, but with the same time-resolution as the source data. Typical uses include calculation of duration-based rainfall statistics for alarming (for example, calculating the amount of rainfall over the previous 24-hours). How to Use: Choose the source site and channel, set the size of the boxcar window (Interval Minutes), set the interval of the source data (Step Size), and set a value to write in the event FlowWorks detects the source data does not match the step size.
Step	The Step function takes event data (such as pump start or stop status) and approximates it into a fixed interval dataset. Useful when doing calculations that combine event data (such as pump status) with fixed interval data (such as wet well level). How to Use: Choose the source site and channel, and set the interval that you want the data approximated to (Interval Length).
Time-Weighted Average	Time-Weighted Average takes an input channel and converts it into fixed-duration data using a time-weighted average. Useful for converting irregularly spaced data from SCADA polling systems or variable-interval flow meters into fixed-duration data. How to Use: Choose the source site and channel, and set the interval that you want the data averaged into.
Lookup (FORMULA)	The Lookup function allows the use of a lookup table in a formula. How to Use: Choose the lookup table from the dropdown list and reference in the formula with an input channel such as LOOKUP (A)
Circle (FORMULA)	The Circle function calculates the cross sectional area of a circle occupied by the flow in a pipe. It is used with depth and velocity data to calculate continuity flow, and can also be used to calculated silt cross sectional area. The output is in squared units of the input. How to Use: Reference in the formula box as CIRCLE (D,12) where D is the depth channel to use and 12 in this case is the pipe diameter in inches.
Pump Time Weighted Average	The pump time weighted average produces a weighted average between zero-valued source data. The function is primarily used to calculate average time of pump runs. How to Use: Choose the source site and channel

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