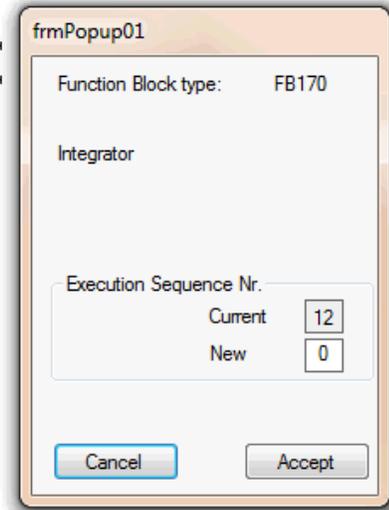
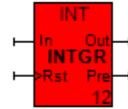


# Function Block 170 INTEGRATOR

## Function Description

The output is the integral of the input value. A 0-to-1 transition at the Rst input will first copy the current output value (Out) to the output Pre and then set the current output to zero. The Rst input can be inverted.



## Popup Parameters

- Execution sequence number.

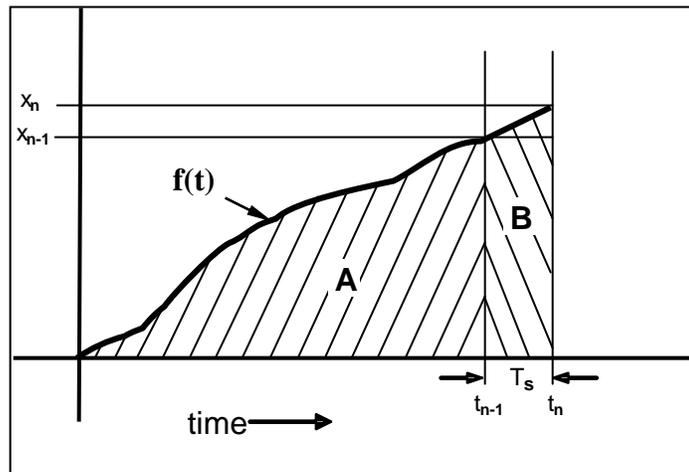
## Input/Output and Parameters

Type	Description	Data Type	Range
Input 1	Input signal	INT	-32768....32767
Input 2	Reset signal	Boolean	0, 1
Output 1	Output signal	INT	-32768....32767
Output 2	Output at Reset	INT	-32768....32767

## Theory

With reference to the figure below, the integral of the function  $f(t)$  for the time interval 0 to  $t_n$  is given by the sum of the areas A and B. The area A represents the integral of all input values up to  $t_{n-1}$ . Thus:

$$\int_0^{t_n} f(x)dt = y_n = A + B$$



If the time between samples,  $T_s$  is made very short then we can approximate  $f(t)$  by a straight line between the ordinates  $t_{n-1}$  and  $t_n$ , and the area B is then given by the sum of the areas of the rectangle and triangle making up the area B:

$$B = \frac{T_s}{2}(x_n + x_{n-1})$$

Area A is simply the sum of all the previously calculated area B's, so that the value of the integral at  $t_n$  is given by:

$$y_n = y_{n-1} + \frac{T_s}{2}(x_n + x_{n-1})$$

### **Application**

Use this function block for everything that changes with time. A measurement of flow rate can be integrated to obtain the quantity passed during the integration time. Another example is a measurement of speed (velocity) can be integrated to give distance travelled. Notice that because  $T_s$  is in units of seconds, so the input must also be in /Second units.

### **Note**

As Function Block 170 must be executed at a fixed cycle time it can only be used in Time Tasks. Although this function block contains no user settable parameters you must nevertheless open its popup and then click the Accept button. This is to update the function blocks parameter for the task scan time. If you neglect to do this the compiler will report an error nr. 131 for the function block.

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