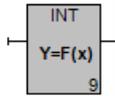


Function Block 169 Function Generator

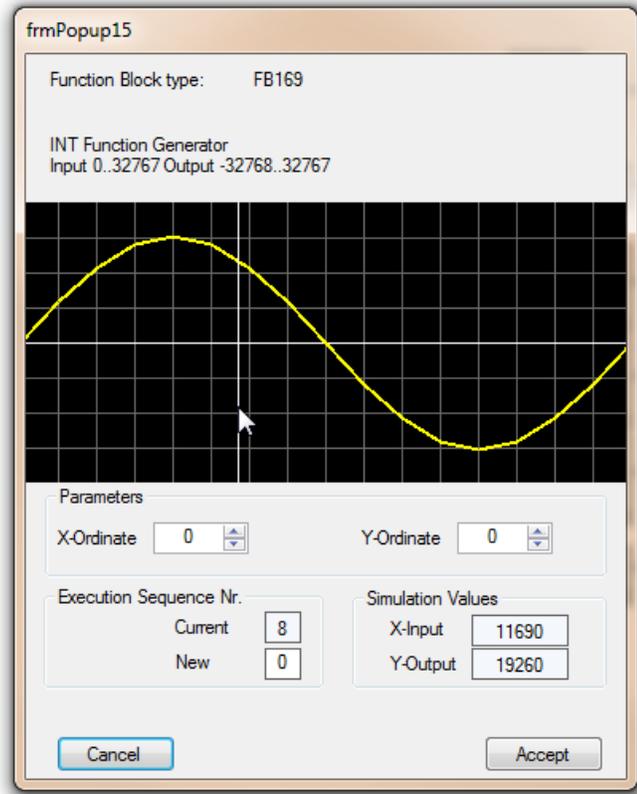
Function Description

This function enables the user to define the output to input relationship of the function block by specifying a set of 17 X/Y ordinate pairs.



Popup Parameters

The user must enter a corresponding Y-ordinate value for each of the 17 X-ordinates. The current X-Ordinate is selected using the up-down scroll buttons. The Y-Ordinate value is entered using your keyboard (and Enter key) or the up-down scroll buttons. The actual values that will be produced by the function can be observed in the Simulation Values frame by placing the cursor inside the graph window.

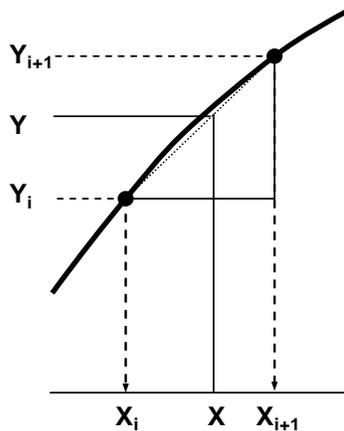


Algorithm Description

An output/input relationship can be approximated by a number of straight-line segments, and visualizes by the well-known format of an X-Y graph, where the input values are represented on the X-axis and the output values on the Y-axis. The X input range (0...32767) is divided into 16 equal-size segments of length 2048, giving X-ordinates X_0 to X_{16} . A corresponding Y_i -ordinate exists for every X_i -ordinate.

The graph is approximated by 16 straight line segments. The complete graph is defined using a table containing 17 pairs of X_i , Y_i values. In fact we only need to define the 17 Y_i values because the corresponding X_i value can be calculated as $X_i = 2048 * (i-1)$.

The next figure indicates how an output value Y is obtained for a particular input value X, making use of linear interpolation.



From the figure: $\frac{(Y_{i+1} - Y_i)}{(X_{i+1} - X_i)} = \frac{(Y - Y_i)}{(X - X_i)}$

Extracting Y gives: $Y = Y_i + \frac{(Y_{i+1} - Y_i) * (X - X_i)}{(X_{i+1} - X_i)}$

This calculation is easily implemented in software if we keep the following in mind:

$$X_{i+1} - X_i = 2048 \quad \dots 2048 = 2^{11}$$

$X - X_i$ is the remainder value of $X/2048$

The index i is the integer value of $X/2048$

The index value is then used to obtain Y_i and Y_{i+1} from a lookup table.

Inputs and Output

Type	Description	Data Type	Range
Input	Input signal (X-value)	INT	0.....32767
Output	Output signal (Y-value)	INT	-32768.....+32767

Application

Function Block 169 can be used to approximate non-linear relations and is very useful when linearizing signals.

