

Section M5: Frequency blocks

These blocks appear at the top of the simulation area

Table of blocks	
Block notation	Description
<i>FFT</i>	Fast Fourier Transform algorithm
<i>IFFT</i>	Inverse Fast Fourier Transform algorithm
<i>Pk Pking</i>	Peak picking routine
<i>Magn.</i>	Calculates the magnitude of the input signal
<i>Phase</i>	Calculates the phase of the input signal



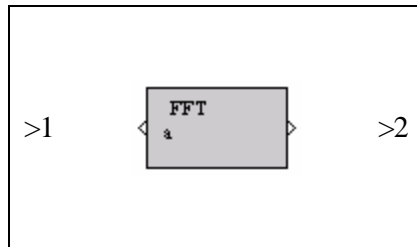
M5.1

Block name : Fast Fourier Transform

Notation: *FFT*

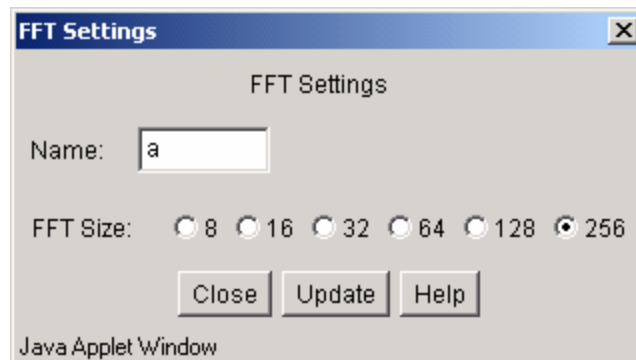
Description: Implements the Fast Fourier Transform algorithm. The user can select a desired FFT size. Possible options are 8, 16, 32, 64, 128, or 256

Pin assignment:



Pin	Description
1	Time-domain signal $x(n)$
2	Frequency-domain signal $X(k)$
3	
4	
5	
6	

Dialog window(s):



(a) FFT dialog window

Script use:

Name: fft

Example code: <param name = "3" value = "B3-fft(3,1)">

Equation(s) Implemented :

$$X(k) = \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0 \dots N-1$$

$x(n)$ = input signal

$X(k)$ = output signal

N = FFT length

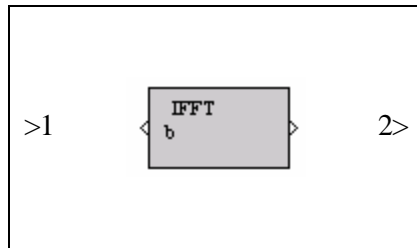
M5.2

Block name : Inverse Fast Fourier Transform

Notation: *IFFT*

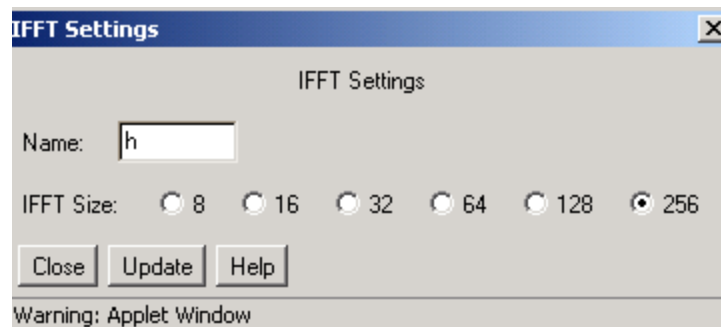
Description: Implements the Inverse Fast Fourier Transform algorithm. The user can select the desired inverse FFT size: 8, 16, 32, 64, 128, or 256.

Pin assignment:



Pin	Description
1	Frequency-domain input signal $X(k)$
2	Time-domain output signal $x(n)$
3	
4	
5	
6	

Dialog window(s):



(a) IFFT dialog window

Script use:

Name: `ifft`

Example code: `<param name = "3" value = "B3-ifft(3,1)">`

Equation(s) Implemented :

$$x(n) = \frac{1}{N} \sum_{k=0}^{N-1} X(k) e^{j2\pi kn/N}, \quad n=0..N-1$$

$X(k)$ = input signal

$x(n)$ = output signal

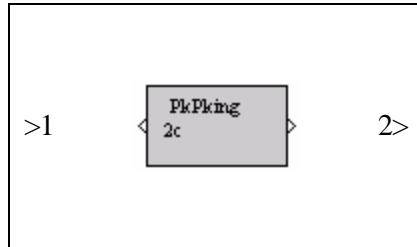
M5.3

Block name : Peak Picking

Notation: *PkPking*

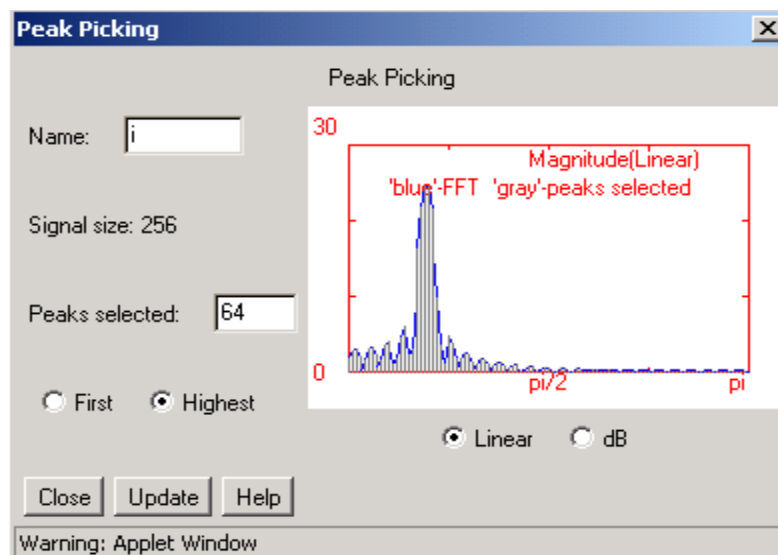
Description: Selects a specific number of peaks from a frequency-domain signal. The first set of peaks or the highest magnitude ones can be selected. Here, the “Peaks selected” option allows users to specify how many peaks to be selected. For example, 64 is chosen in the graph below. In this case, the “First” option selects the first 64 peaks of the input signal and the “Highest” option selects the 64 peaks that are the larger in magnitude.

Pin assignment:



Pin	Description
1	Frequency-domain input signal $X(k)$
2	Selected peaks
3	
4	
5	
6	

Dialog window(s):



(a) *PkPking* dialog window

Script use:

Name: peakpicking

Example code: <param name = “3” value = “B3-peakpicking(3,1)”>

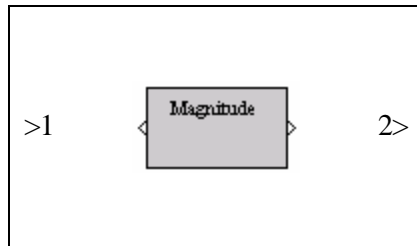
M5.4

Block name : Magnitude

Notation: *Magn*

Description: This block calculates the magnitude of a signal.

Pin assignment:



Pin	Description
1	Input signal $x(n)$
2	Output signal $y(n)$
3	
4	
5	
6	

Dialog window(s):

-None-

Script use:

Name: magn

Example code: <param name = "3" value = "B3-magn(3,1)">

Equation(s) Implemented :

$$y(n) = |x(n)|^2$$

$x(n)$ = input signal

$y(n)$ = Magnitude of the input signal

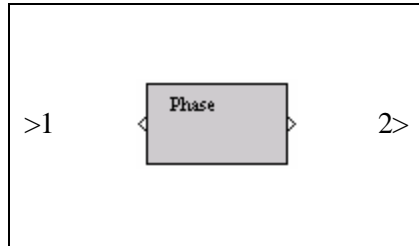
M5.5

Block name : Phase

Notation: *Phase*

Description: This block calculates the phase of the input signal

Pin assignment:



Pin	Description
1	Input signal
2	Phase of input signal
3	
4	
5	
6	

Dialog window(s):

-None-

Script use:

Name: phase

Example code: <param name = "3" value = "B3-phase (3,1)">

Equation(s) Implemented :

$$f(n) = \angle x(n)$$

$x(n)$ = input signal

$f(n)$ = phase of the input signal