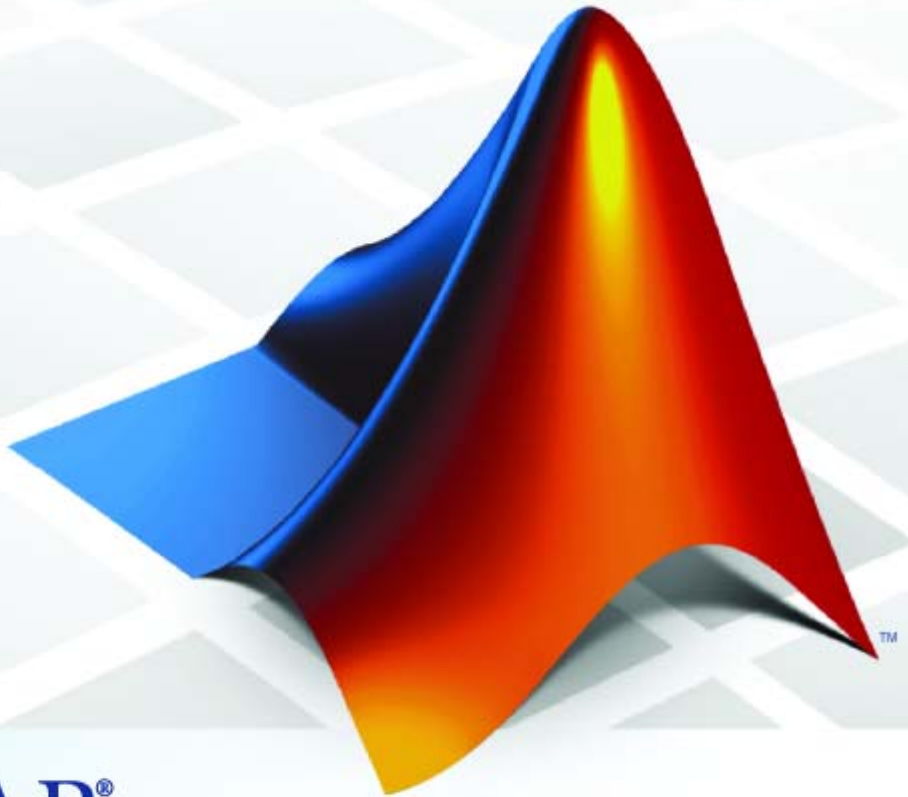


# Real-Time Windows Target™ 3

## Reference



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*Real-Time Windows Target™ Reference*

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### Revision History

March 2008      Online only      New for Version 3.1 (Release 2008a)

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# Function Reference

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Configuration Specification (p. 1-2)    Document generated code

## **Configuration Specification**

`rtwinconfigset`

Attach and activate the default Real-Time Windows Target™ configuration set

# Functions — Alphabetical List

---

# rtwinconfigset

---

<b>Purpose</b>	Attach and activate the default Real-Time Windows Target™ configuration set
<b>Syntax</b>	<pre>rtwinconfigset(<i>model</i>) configset=rtwinconfigset()</pre>
<b>Arguments</b>	<p><i>model</i></p> <p>The model to which the default Real-Time Windows Target configuration set is to be attached.</p>
<b>Returns</b>	<p><i>configset</i></p> <p>The default Real-Time Windows Target configuration set, which can later be attached to a model.</p>
<b>Description</b>	<p>The <code>rtwinconfigset</code> function, when called with argument <i>model</i>, attaches the default Real-Time Windows Target configuration set RTWin to the model, then activates the configuration set. This default configuration set specifies various simulation and code-generation parameter values that are useful when working with a Real-Time Windows Target model. In most cases, using <code>rtwinconfigset</code> provides all the configuration parameter values that the model needs.</p> <p>When called with no argument, <code>rtwinconfigset</code> returns the default Real-Time Windows Target configuration set object. This configuration set can later be attached to a model. See for more information.</p>
<b>See Also</b>	<p>Configuration Sets Referencing Configuration Sets Specifying the Default Configuration Set</p>



# Block Reference

---

Input (p. 3-2)

Input data to a Real-Time Windows  
Target™ application

Output (p. 3-3)

Output data from a Real-Time  
Windows Target application

## **Input**

Analog Input	Select and connect analog input channels
Counter Input	Select and connect counter input channels
Digital Input	Select and connect digital input lines or channels
Encoder Input	Select and connect encoder input channels
Other Input	Connect with input sources that other input blocks cannot
Packet Input	Receive unformatted binary data
Stream Input	Receive formatted ASCII data

## Output

Analog Output	Select and connect analog output channels
Digital Output	Select and connect digital output lines or channels
Frequency Output	Generate and output a pulse-width-modulated square wave
Other Output	Connect with output sources that other output blocks cannot
Packet Output	Transmit unformatted binary data
Stream Output	Transmit formatted ASCII data



# Blocks — Alphabetical List

---

# Analog Input

---

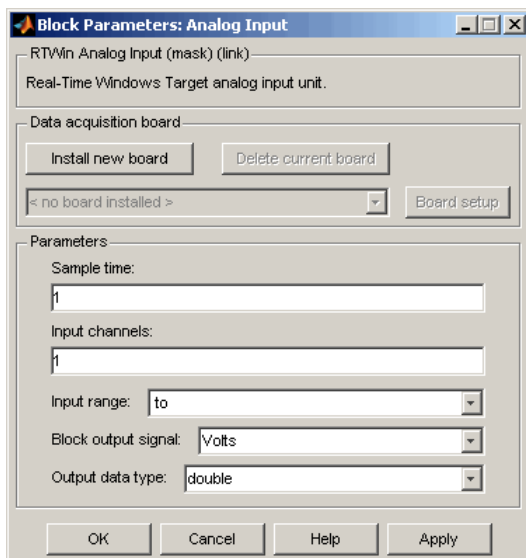
**Purpose** Select and connect analog input channels

**Library** Real-Time Windows Target™

**Description** The Analog Input block allows you to select and connect specific analog input channels to your Simulink® model. After you add an Analog Input block to your model, you can enter the parameters for its I/O driver. The following procedure uses the Humusoft® AD512 I/O board as an example:

- 1 Double-click the Analog Input block.

The Block Parameters: Analog Input dialog box opens:



- 2 In the **Sample time** box, enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

- 3** In the **Input channels** box, enter a channel vector that selects the analog input channels you are using on this board. The vector can be any valid MATLAB® vector form. For example, to select all eight analog input channels on the AD512 board, enter

[1,2,3,4,5,6,7,8] or [1:8]

If you want to use the first three analog input channels, enter

[1,2,3]

- 4** From the **Input range** list, choose the input range for all of the analog input channels you entered in the **Input channels** box. For example, with the AD512 board, choose -5 to 5 V.

If you want the input range to be different for different analog channels, you need to add an I/O block for each different input range.

- 5** From the **Block output signal** list, choose from the following options:

- **Volts** — Returns a value equal to the analog voltage.
- **Normalized unipolar** — Returns a full range value of 0 to +1 regardless of the input voltage range. For example, an analog input range of 0 to +5 volts and -5 to +5 volts would both be converted to 0 to +1.
- **Normalized bipolar** — Returns a full range value of -1 to +1 regardless of the input voltage range.
- **Raw** — Returns a value of 0 to  $2^n - 1$ . For example, a 12-bit A/D converter would return values of 0 to  $2^{12} - 1$  (0 to 4095). The advantage of this method is the returned value is always an integer with no roundoff errors.

- 6** Set **Output data type** to specify the type of data that the block will output to the model.

- 7** Click **OK** or **Apply**.

# Analog Output

---

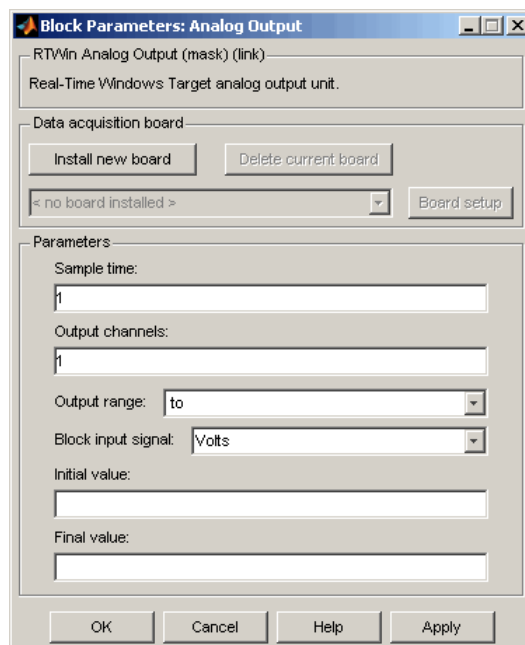
**Purpose** Select and connect analog output channels

**Library** Real-Time Windows Target™

**Description** The Analog Output block allows you to select and connect specific analog output channels to your Simulink® model. After you add an Analog Output block to your model, you can enter the parameters for its I/O driver. The following procedure uses the Humusoft® AD512 I/O board as an example.

- 1 Double-click the Analog Output block.

The Block Parameters: Analog Output dialog box opens:





- 2** In the **Sample time** box, enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

0.001

- 3** In the **Output channels** box, enter a channel vector that selects the analog output channels you are using on this board. The vector can be any valid MATLAB® vector form. For example, to select both analog output channels on the AD512 board, enter

[1,2] or [1:2]

- 4** From the Output range list, choose the input range for all of the analog input channels you entered in the Input channels box. For example, with the AD512 board, choose -5 to 5 V.

If you want the input range to be different for different analog channels, you need to add an I/O block for each different input range.

- 5** From the Block input signal list, choose from the following options:

- **Volts** — Expects a value equal to the analog output voltage.
- **Normalized unipolar** — Expects a value between 0 and +1 that is converted to the full range of the output voltage regardless of the output voltage range. For example, an analog output range of 0 to +5 volts and -5 to +5 volts would both be converted from values between 0 and +1.
- **Normalized bipolar** — Expects a value between -1 and +1 that is converted to the full range of the output voltage regardless of the output voltage range.
- **Raw** — Expects a value of 0 to  $2^n - 1$ . For example, a 12-bit A/D converter would expect a value between 0 and  $2^{12} - 1$  (0 to 4095). The advantage of this method is the expected value is always an integer with no roundoff errors.

# Analog Output

---

- 6** Enter the initial value for each analog output channel you entered in the **Output channels** box. For example, if you entered [1,2] in the **Output channels** box, and you want an initial value of 0 volts, enter [0,0].
- 7** Enter a final value for each analog channel you entered in the **Output channels** box. For example, if you entered [1,2] in the **Output channels** box, and you want final values of 0 volts, enter [0,0].
- 8** Click **OK** or **Apply**.

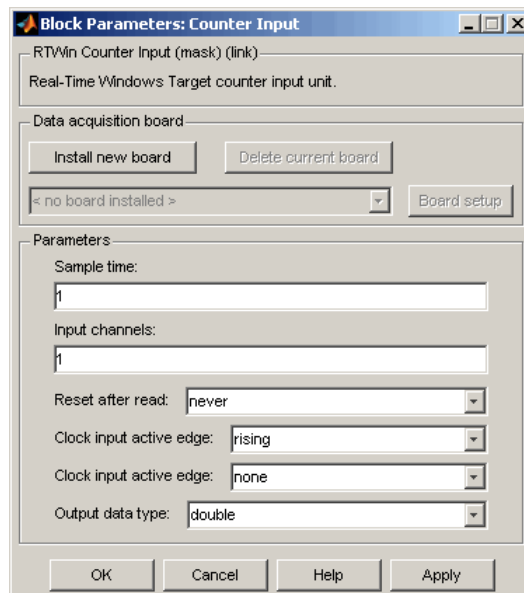
**Purpose** Select and connect counter input channels

**Library** Real-Time Windows Target™

**Description** The Counter Input block allows you to select and connect specific counter input channels to your Simulink® model. After you have added a Counter Input block to your model, you can enter the parameters for its I/O driver. The following procedure uses the Humusoft® MF604 I/O board as an example.

- 1 Double-click the Counter Input block.

The Block Parameters: Counter Input dialog box opens:



- 2 In the **Sample time** box, enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

# Counter Input

---

**3** In the **Input channels** box, enter a channel vector that selects the counter input channels you are using on this board. The vector can be any valid MATLAB® vector form. For example, to select all four counter input channels on the MF604 board, enter

[1,2,3,4] or [1:4]

**4** From **Reset after read**, which determines if the counter should be reset to zero after its value has been read, choose one of the following options:

- **never** — Do not reset after reading.
- **always** — Always reset after reading.
- **level** — Reset after reading if block input is nonzero. This will add an input to the Counter Input block.
- **rising edge** — Reset after reading if block input changes from zero to nonzero between the last two successive readings. This will add an input to the Counter Input block.
- **falling edge** — Reset after reading if the block input changes from nonzero to zero between last two successive readings. This will add an input to the Counter Input block.
- **either edge** — Reset after reading if the block input changes either from zero to nonzero or from nonzero to zero between the last two successive readings. This will add an input to the Counter Input block.

**5** From **Clock input active edge**, which determines which clock edge should increment the counter, select

- **rising** — Low to high transitions
- **falling** — High to low transitions

Not all counter chips support selecting the input edge. In this case, the pull-down menu will reflect the supported option only.

**6** From **Gate input functionality**, which defines the action of the counter's gate pin, select

- none — Gate is disabled.
- enable when high — Counting is disabled when the gate is low and enabled when the gate is high.
- enable when low — Counting is disabled when the gate is high and enabled when the gate is low.
- start on rising edge — Counting is disabled until low to high transition of the gate occurs.
- start on falling edge — Counting is disabled until high to low transition of the gate occurs.
- reset on rising edge — Counter is reset when low to high transition of the gate occurs.
- reset on falling edge — Counter is reset when high to low transition of the gate occurs.
- latch on rising edge — The count of the counter is remembered when low to high transition of the gate occurs.
- latch on falling edge — The count of the counter is remembered when high to low transition of the gate occurs.
- latch & reset on rising edge — The count of the counter is remembered and then the counter is reset when low to high transition of the gate occurs.
- latch & reset on falling edge — The count of the counter is remembered and then the counter is reset when high to low transition of the gate occurs.

Not all counter chips support all gate modes. Only supported gate modes are shown in the pull-down menu.

**7** Set **Output data type** to specify the type of data that the block will output to the model.

# Counter Input

---

**8** Click **OK** or **Apply**.

## **Counter Input Block Demo**

The Real-Time Windows Target software includes a demo that shows the operation of the Counter Input block. To see this demo, type `rtcounter` in the MATLAB Command Window, or launch MATLAB Online Help and choose **Demos > Links and Targets > Real-Time Windows Target > Real-Time Counter**.

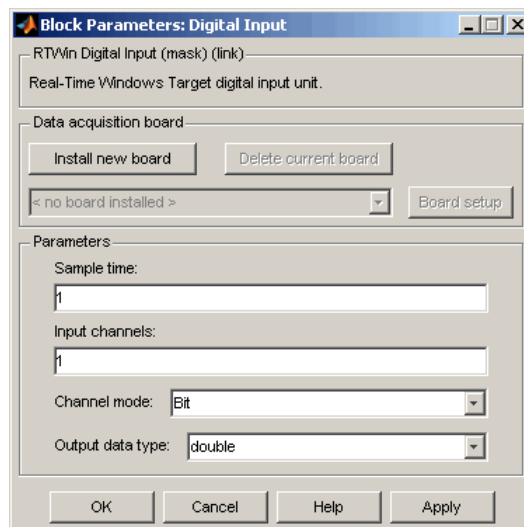
**Purpose** Select and connect digital input lines or channels

**Library** Real-Time Windows Target™

**Description** The Digital Input block allows you to select and connect specific digital lines or channels to your Simulink® model. After you have added a Digital Input block to your model, you can enter the parameters for its I/O driver. The following procedure uses the Humusoft® AD512 I/O board as an example.

- 1 Double-click the Digital Input block.

The Block Parameters: Digital Input dialog box opens:



- 2 In the **Sample time** box, enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

# Digital Input

---

- 3** In the **Input channels** box, enter a channel vector that selects the digital input channels you are using on this board. The vector can be any valid MATLAB® vector form. For example, to select all eight digital input channels on the AD512 board, enter

[1,2,3,4,5,6,7,8] or [1:8]

If you want to use the first four digital input lines, enter

[1,2,3,4]

If you have one 8-bit digital channel, enter [1]. If you have two 8-bit digital channels, enter [1 9], and from the Channel mode list, choose Byte.

- 4** From the Channel mode list, choose one of the following options:

- Bit — Returns a value of 0 or 1.
- Byte — Groups eight digital lines into one digital channel and returns a value of 0 to 255.

- 5** Set **Output data type** to specify the type of data that the block will output to the model.

- 6** Click **OK** or **Apply**.



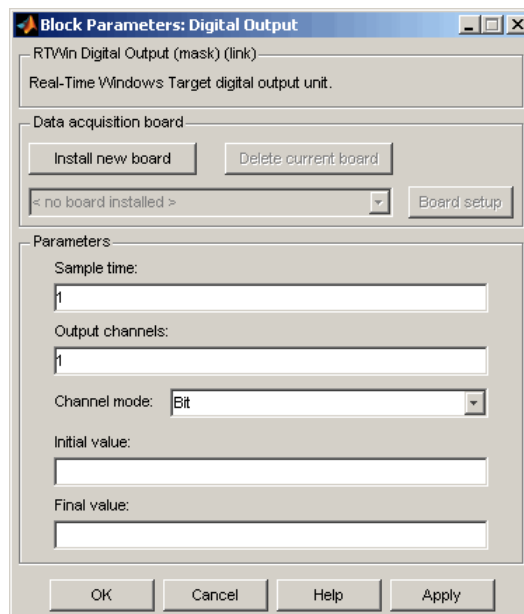
**Purpose** Select and connect digital output lines or channels

**Library** Real-Time Windows Target™

**Description** The Digital Output block allows you to select and connect specific digital lines or channels to your Simulink® model. After you have added a Digital Output block to your model, you can enter the parameters for its I/O driver. The following procedure uses the Humusoft® AD512 I/O board as an example.

- 1 Double-click the Digital Output block.

The Block Parameters: Digital Output dialog box opens:



- 2 In the **Sample time** box, enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

# Digital Output

---

- 3** In the **Output channels** box, enter a channel vector that selects the digital output channels you are using on this board. The vector can be any valid MATLAB® vector form. For example, to select all eight digital output channels on the AD512 board, enter

```
[1,2,3,4,5,6,7,8] or [1:8]
```

If you want to use the first four digital output lines, enter

```
[1,2,3,4]
```

If you have one 8-bit digital channel, enter [1]. If you have two 8-bit digital channels, enter [1 9], and from the Channel mode list, choose Byte.

- 4** From the Channel mode list, choose from one of the following:

- Bit — Expects a value of 0 or 1.
- Byte — Expects a value of 0 to 255 that is converted to one digital channel of eight digital lines.

- 5** Enter the initial values for each digital output line or channel you entered in the **Output channels** box. For example, if you entered [1,2,3,4] in the **Output channels** box, and you want initial values of 0 and 1, enter

```
[0,0,1,1]
```

If you choose Byte from the Channel mode list, enter a value between 0 and 255 for each digital output channel. For example, for one byte (8 digital lines) with an initial value of 25, enter [25]. For two bytes (16 digital lines) with initial values of 25 and 50, enter [25 50].

- 6** Enter a final value for each digital output channel you entered in the **Output channels** box. For example, if you entered [1,2,3,4] in the **Output channels** box, and you want final values of 0, enter

```
[0,0,0,0]
```

If you choose Byte from the Channel mode list, enter a value between 0 and 255 for each digital output channel.

**7** Click **OK** or **Apply**.

# Encoder Input

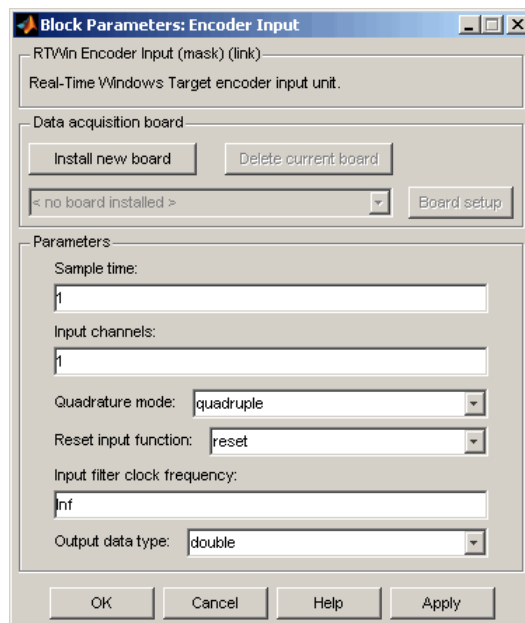
**Purpose** Select and connect encoder input channels

**Library** Real-Time Windows Target™

**Description** The Encoder Input block allows you to select and connect specific encoder input channels to your Simulink® model. After you have added an Encoder Input block to your model, you can enter the parameters for its I/O driver. The following procedure uses the Humusoft® MF604 I/O board as an example.

- 1 Double-click the Encoder Input block.

The Block Parameters: Encoder Input dialog box opens:



- 2** In the **Sample time** box, enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.
- 3** In the **Input channels** box, enter a channel vector that selects the encoder input channels you are using on this board. The vector can be any valid MATLAB® vector form. For example, to select all four encoder input channels on the MF604 board, enter

[1,2,3,4] or [1:4]

- 4** Encoders typically use two sets of stripes, shifted in phase, to optically detect the amplitude and direction of movement. The **Quadrature mode** parameter specifies which encoder stripe edges should be counted.
  - `double` — Counts the rising edges from both stripe sets
  - `single` — Counts the rising edges from one stripe set
  - `quadruple` — Counts rising and falling edges from both stripe sets

Quadruple mode yields four times more pulses per revolution than the single mode. Therefore, quadruple is more precise and is recommended unless other parameters dictate otherwise.

- 5** The encoder interface chip has a reset pin in addition to encoder inputs. This pin is usually connected to the index output of the encoder. However, it can be connected to any signal or not be used at all. The **Reset input function** specifies the function of this pin.
  - `gate` — Enables encoder counting
  - `reset` — Level reset of the encoder count
  - `rising edge index` — Resets the encoder count on the rising edge
  - `falling edge index` — Resets the encoder count on the falling edge

# Encoder Input

---

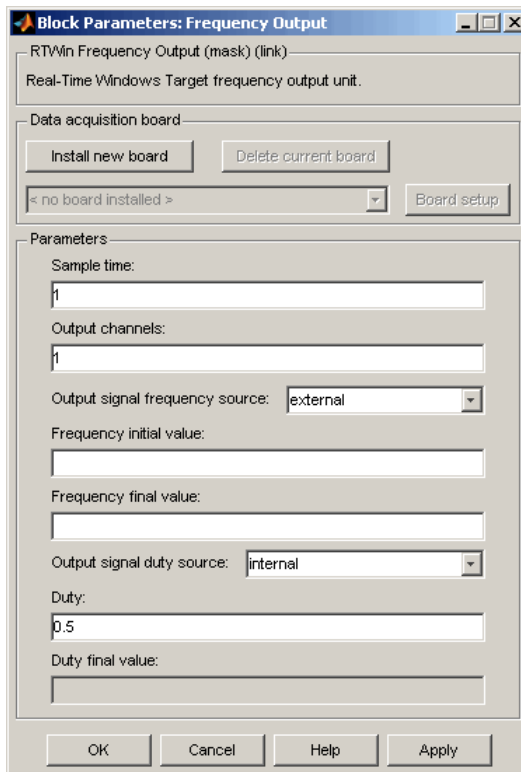
- 6 The encoder interface chip has a built-in lowpass filter that attempts to filter out any high frequencies, which are interpreted as noise. The **Input filter clock frequency** is the cutoff frequency (Hz) of this filter. The cutoff frequency you specify is rounded to the nearest frequency supported by the chip.

If the encoder is moving slowly and high-frequency noise is present, employ the filter to eliminate the noise. This keeps the noise from being counted as encoder pulses. If the encoder is moving quickly, the filter can filter out all of the high-frequency pulses, including those you want to count. In this case, consider leaving the filter disabled by setting the cutoff frequency to Inf.

- 7 Set **Output data type** to specify the type of data that the block will output to the model.
- 8 Click **OK** or **Apply**.

<b>Purpose</b>	Generate and output a pulse-width-modulated square wave
<b>Library</b>	Real-Time Windows Target™
<b>Description</b>	<p>The Frequency Output block generates a pulse-width-modulated square wave that alternates between low (0) and high (1) with a specified frequency and duty cycle. The frequency is specified in Hertz. The duty cycle is specified as a decimal fraction between 0 and 1 inclusive. This fraction specifies the amount of time that the output signal value is high (1). For example, a duty cycle of .7 specifies that the output is high 70% of the time, and low 30% of the time.</p> <p>After you have added a Frequency Output block to your model, double-click the Frequency Output block to open the Block Parameters: Frequency Output dialog box. The default appearance of the dialog box is:</p>

# Frequency Output



Specify parameter values as needed, then click **OK** or **Apply**. If you specify a non-default value for **Output signal frequency source** or **Output signal duty source**, the appearance of the dialog box changes as shown below. The parameters are:

## Sample time

Enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

## Output channels

A vector that selects the output channels you are using on this board. The vector can be any valid MATLAB® vector form.



## Output signal frequency source

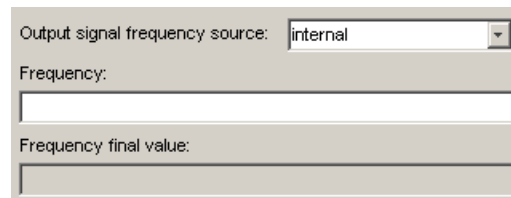
The source that specifies the frequency to output. The frequency is specified in Hertz. The **Output signal frequency source** can be either of the following:

external (Default)

The frequency is specified by an input signal. An input port appears on the block to accept the signal. A **Frequency initial value** and a **Frequency final value** may be needed.

internal

The frequency is specified by a tunable parameter named **Frequency**. If you specify internal, **Frequency** replaces **Frequency initial value**, and **Frequency final value** is disabled:



Output signal frequency source: internal

Frequency:

Frequency final value:

## Frequency

This tunable parameter appears when **Output signal frequency source** is internal. Specify the desired frequency in Hertz.

## Frequency initial value

This parameter appears when **Output signal frequency source** is external. Optionally specify a frequency in Hertz. The specified frequency takes effect when you connect to the target, and persists until simulation starts, at which time the value of the frequency signal takes effect. You can use this parameter to specify initial conditions and give them time to stabilize. If no value appears, connecting to the target has no effect on the frequency.

# Frequency Output

---

## Frequency final value

This parameter appears when **Output signal frequency source** is external. Optionally specify a frequency in Hertz. The specified frequency takes effect when simulation completes and persists indefinitely. Disconnecting from the target does not affect the frequency. You can use this parameter to put a connected device into a safe or neutral state after simulation. If no value appears, the frequency in effect at the end of simulation persists afterwards.

## Output signal duty source

The source that specifies the duty cycle. The specification is a decimal fraction between 0 and 1 inclusive that determines the amount of time that the output signal value is high (1). For example, a duty cycle of .7 specifies that the output is high 70% of the time, and low 30% of the time. Two duty cycle values have special significance:

0

The output signal is continuously low (0) regardless of any frequency specification currently in effect.

1

The output signal is continuously high (1) regardless of any frequency specification currently in effect.

The **Output signal duty source** can be either of the following:

internal (Default)

The duty cycle is specified by a tunable parameter named **Duty**.

external

The duty cycle is specified by an input signal. An input port appears on the block to accept the signal. If you specify external, **Duty initial value** replaces **Duty**, and **Duty final value** is enabled:

Output signal duty source: external

Duty initial value:  
0.5

Duty final value:

## Duty

This tunable parameter appears when **Output signal duty source** is **internal**. Specify the desired duty cycle as a decimal fraction between 0 and 1. Specifying 0 or 1 overrides the currently specified frequency and enforces a continuously low or high output signal for the duration of the specification.

## Duty initial value

This parameter appears when **Output signal duty source** is **external**. Optionally specify a duty cycle. The specified duty cycle takes effect when you connect to the target, and persists until simulation starts. If no value appears, connecting to the target has no effect on the duty cycle. You can specify any duty cycle. Often the **Duty initial value** is 0 or 1, enforcing a continuously low or high initial output signal. Specifying 0 or 1 overrides any **Frequency initial value**.

## Duty final value

This parameter appears when **Output signal duty source** is **external**. Optionally specify a duty cycle. The specified duty cycle takes effect when simulation completes and persists indefinitely. Disconnecting from the target does not change the duty cycle. If no value appears, the duty cycle in effect at the end of simulation persists indefinitely afterwards. You can specify any duty cycle. Often the **Duty final value** is 0 or 1, enforcing a continuously low or high initial output signal. Specifying 0 or 1 overrides any **Frequency final value**.

# Other Input

---

**Purpose** Connect with input sources that other input blocks cannot

**Library** Real-Time Windows Target™

**Description** The Real-Time Windows Target Other Input block can be used for interfacing input signals that other Real-Time Windows Target input blocks do not accommodate. The Other Input block is rarely used, and for only a few drivers. For details, see the documentation for the driver that you intend to use.

If none of the available blocks, including Other Input, provide what you need, you can create your own I/O blocks to work with Real-Time Windows Target applications. See “Custom I/O Driver Blocks” for details.

**Purpose** Connect with output sources that other output blocks cannot

**Library** Real-Time Windows Target™

**Description** The Real-Time Windows Target Other Output block can be used for interfacing input signals that other Real-Time Windows Target output blocks do not accommodate. The Other Output block is rarely used, and for only a few drivers. For details, see the documentation for the driver that you intend to use.

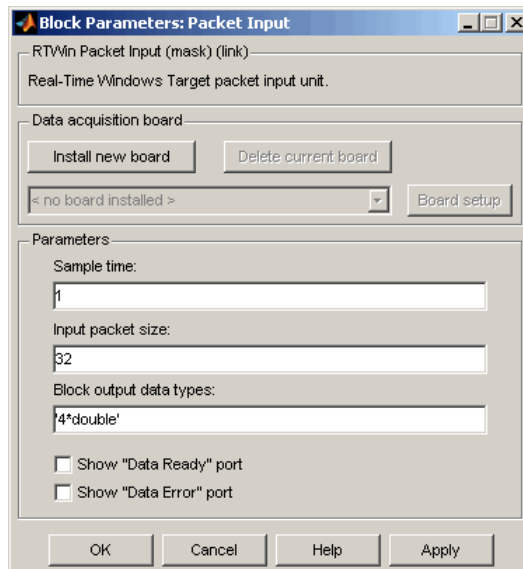
If none of the available blocks, including Other Output, provide what you need, you can create your own I/O blocks to work with Real-Time Windows Target applications. See “Custom I/O Driver Blocks” for details.

# Packet Input

**Purpose** Receive unformatted binary data

**Library** Real-Time Windows Target™

**Description** The Packet Input block receives unformatted binary data. After you have added a Packet Input block to your model, double-click the Packet Input block to open the Block Parameters: Packet Input dialog box.



The driver must be **Standard Devices > Serial Port** or **Standard Devices > UDP Protocol**. Specify parameter values as needed, then click **OK** or **Apply**. The parameters are:

### Sample time

Enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

## **Input packet size**

The number of bytes expected in each input packet. This number must be the same as the number of bytes needed to satisfy the type specifications in **Block output data types**.

## **Block output data types**

A string, or a cell array of strings, that specify how the data in each packet obtained from the device is to be typed and grouped for input to the application. The Packet Input block has an output port corresponding to each string in **Block output data types**. Changing the number of strings automatically changes the number of output ports.

Each string has the format  $[n*]datatype$ . The data described by the string has the type specified by *datatype* and the width specified by *n*; or 1 if *n* is not specified. For example, 'double' means one double value, and '4\*int8' means a vector of four int8 values.

By providing an appropriate cell array of strings, you can convert an input packet into any needed types, packaged into vectors in any needed way. For example, specifying {'int16', 'int16', 'double'} creates three ports. The first and second each output an int16 value, and the third outputs a double. Specifying {'2\*int16', 'double'} creates two ports: a vector of two int16 values, and a scalar double.

## **Show “Data Ready” port**

If enabled, the block has an output port that signals 1 if the block has new data available, and 0 otherwise.

## **Show “Data Error” port**

If enabled, the block has an output port that signals 1 if a data error has occurred, and 0 otherwise.

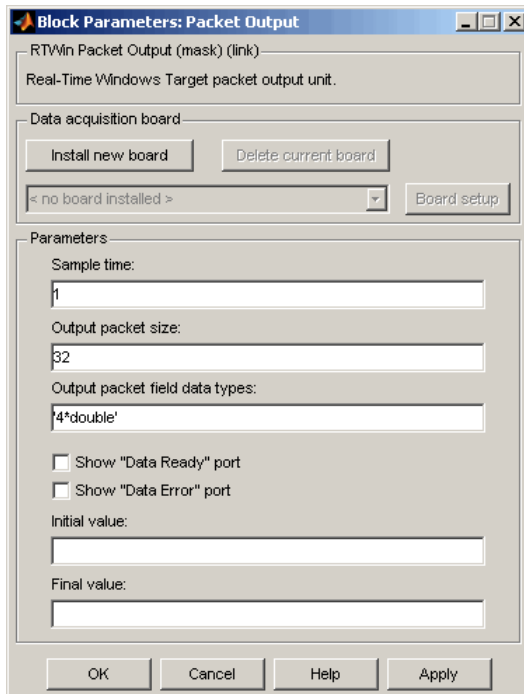
# Packet Output

---

**Purpose** Transmit unformatted binary data

**Library** Real-Time Windows Target™

**Description** The Packet Output block sends unformatted binary data. After you have added a Packet Output block to your model, double-click the Digital Output block to open the Block Parameters: Digital Output dialog box.



The driver must be **Standard Devices > Serial Port** or **Standard Devices > UDP Protocol**. Specify parameter values as needed, then click **OK** or **Apply**. The parameters are:



## Sample time

Enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

## Output packet size

The number of bytes to be transmitted in the output packet. This number must be the same as the number of bytes needed to satisfy the type specifications in **Output packet field data types**.

## Output packet field data types

A string, or a cell array of strings, that specify how data provided by the application will be formatted into a packet for output to the device. The Packet Output block has an input port corresponding to each string in **Output packet field data types**. Changing the number of strings automatically changes the number of ports.

Each string has the format  $[n^*]datatype$ . The data described by the string has the type specified by *datatype* and the width specified by *n*; or 1 if *n* is not specified. For example, 'double' means one double value, and '4\*int8' means a vector of four int8 values.

The signal input to each port of the Packet Output block can be a scalar or vector of any Simulink® data type. The string for each port specifies the type to be used when its signal is output to the device. If the format string for a port matches the type of the signal input to that port, the signal value appears verbatim in the output packet.

You can also perform type conversion on output. For example, if an input signal is a four-element int16 vector, but the corresponding string is '4\*int8', each of the four integers is converted to an int8 before being written to the packet. The resulting data occupies four bytes in the output packet.

# Packet Output

---

## **Show “Data Ready” port**

If enabled, the block has an output port that signals 1 if the block is ready to accept new data, and 0 otherwise.

## **Show “Data Error” port**

If enabled, the block has an output port that signals 1 if a data error has occurred, and 0 otherwise.

## **Initial value**

If specified, a vector that has the same number of elements as the sum of the widths of the input signals across all ports. The specified data is sent when simulation begins, before any other data that is output during simulation.

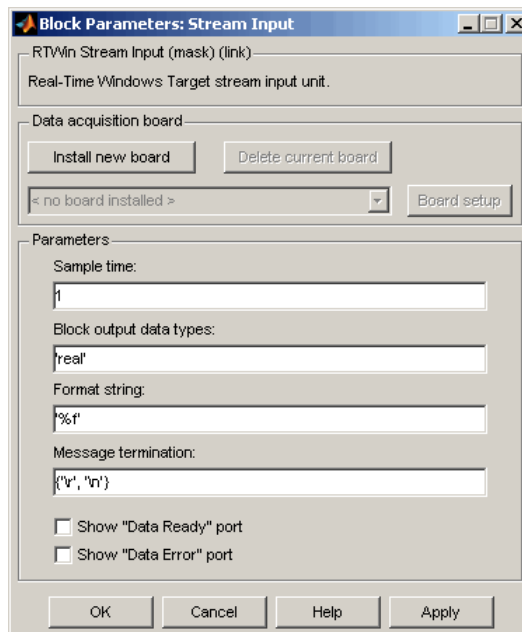
## **Final value**

If specified, a vector that has the same number of elements as the sum of the widths of the input signals across all ports. The specified data is sent when simulation ends, after any other data that is output during simulation.

**Purpose** Receive formatted ASCII data

**Library** Real-Time Windows Target™

**Description** The Stream Input block receives formatted ASCII data. After you have added a Stream Input block to your model, double-click the Stream Input block to open the Block Parameters: Stream Input dialog box.



The driver must be **Standard Devices > Serial Port** or **Standard Devices > UDP Protocol**. Specify parameter values as needed, then click **OK** or **Apply**. The parameters are:

### Sample time

Enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

## **Block output data types**

A string or a cell array of strings. The block has as many output ports as the number of strings. Each string specifies a data type by name, and optionally a number of elements. For example, 'double' means one double value, and '4\*int8' means four int8 values.

The values made available on output ports are grouped and typed according to the **Block output data types** strings. For example, if **Block output data types** is {'2\*int8', '3\*double'}, the block outputs an int8 vector of width 2 on the first output port, and a double vector of width 3 on the second output port.

## **Format string**

A specification in the same format used by C library I/O routines like scanf. The format string describes the data to be received. The number of elements in the string must equal the number of data items specified in **Block output data types**.

For example, if **Block output data types** is {'2\*int8', '3\*double'}, and **Format string** is '%d %d %f %f %f', the block reads an ASCII representation of two integers and three doubles. The block makes the resulting values available to the application in an int8 vector of width 2 on the first output port, and a double vector of width 3 on the second output port.

If the data type specified for a value in **Block output data types** differs from the type of the corresponding element in **Format string**, type conversion occurs automatically. The block reads data as specified by **Format string**, converts the data to match the **Block output data types**, and provides the data to the application on the block output ports.

## **Message termination**

A string, cell array of strings, or a number. If the value is a string, receiving this sequence of characters terminates data input. If the value is a cell array, any of the strings in the cell array terminates

data input. If the value is a number, data input terminates after reading the specified number of characters.

**Show “Data Ready” port**

If enabled, the block has an output port that signals 1 if the block has new data available, and 0 otherwise.

**Show “Data Error” port**

If enabled, the block has an output port that signals 1 if a data error has occurred, and 0 otherwise.

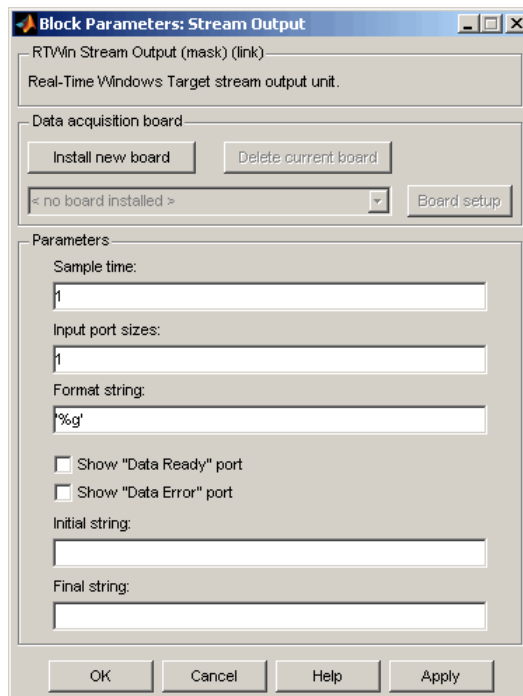
# Stream Output

---

**Purpose** Transmit formatted ASCII data

**Library** Real-Time Windows Target

**Description** The Stream Output block sends formatted ASCII data. After you have added a Stream Output block to your model, double-click the Stream Output block to open the Block Parameters: Stream Output dialog box.



The driver must be **Standard Devices > Serial Port** or **Standard Devices > UDP Protocol**. Specify parameter values as needed, then click **OK** or **Apply**. The parameters are:

## Sample time

Enter the same value you entered in the **Fixed step size** box from the Configuration Parameters dialog box, or an integer multiple of that value.

## Input port sizes

A port width, or vector of port widths. The number of elements determines the number of input ports. Each port has the width specified by the corresponding element. For example, specifying 3, 1, 2 indicates that the block has three input ports. The first is a vector of width 3, the second is a scalar, and the third is a vector of width 2, for a total of six elements. Only the widths need to be specified; any Simulink® data type can be input.

## Format string

A specification in the same format used by C library I/O routines like `printf`. The format string describes the data to be sent. The format string must have the same number of specifiers as the sum of the elements of **Input port sizes**.

For example, assume that **Input port sizes** is 3, 1, 2. Then a **Format string** of '%d %d %d %f %d %d' would output ASCII representing: three integers from the vector on the first input port; a double from the scalar on the input second port; and two integers from the vector on the third input port.

If the data type specified in the **Format string** for a value differs from the type of the actual value, type conversion occurs automatically, and converted data that conforms to the **Format string** is output as ASCII to the device.

## Show “Data Ready” port

If enabled, the block has an output port that signals 1 if the block is ready to accept new data, and 0 otherwise.

## Show “Data Error” port

If enabled, the block has an output port that signals 1 if a data error has occurred, and 0 otherwise.

# Stream Output

---

## **Initial string**

If specified, a string that is sent when simulation begins, before any other data that is output during simulation. The string can contain anything; it could be used to initialize a device. It is sent literally as specified, without translation using the **Format string**.

## **Final string**

If specified, a string that is sent when simulation ends, after any other data that is output during simulation. The string can contain anything; it could be used to shut down a device. It is sent literally as specified, without translation using the **Format string**.

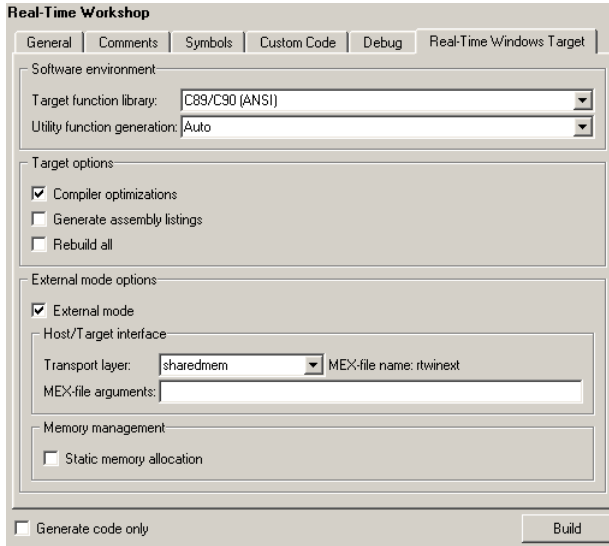


# Configuration Parameters

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---	--

## Real-Time Workshop® Pane: Real-Time Windows Target™



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## **Real-Time Windows Target™ Tab Overview**

Control the code created by Real-Time Workshop® code generation software for a Real-Time Windows Target™ application.

### **Configuration**

This tab appears only if you specify `rtwin.tlc` as the System target file.

### **See Also**

- Real-Time Windows Target User's Guide
- Real-Time Windows Target Reference Manual
- Real-Time Windows Target Release Notes

### Target function library

Specify a floating-point math library extension.

#### Settings

**Default:** C89/C90 (ANSI)

C89/C90 (ANSI)

Generates calls to the ISO/IEC 9899:1990 C standard math library for floating-point functions.

C99 (ISO)

Generates calls to the ISO/IEC 9899:1999 C standard math library.

GNU99 (GNU)

Generates calls to the GNU gcc math library, which provides C99 extensions as defined by compiler option `-std=gnu99`.

#### Tips

- Before setting this parameter, verify that your compiler supports the library you want to use. If you select a parameter value that your compiler does not support, compiler errors can occur.
- **Restriction** — Stateflow® software supports only C89/C90 (ANSI). Selecting a different parameter has no effect on code generated for Stateflow components.

#### Command-Line Information

**Parameter:** GenFloatMathFcnCalls

**Type:** string

**Value:** 'ANSI\_C' | 'C99 (ISO)' | 'GNU99 (GNU)'

**Default:** 'ANSI\_C'

#### Recommended Settings

Application	Setting
Debugging	No impact

<b>Application</b>	<b>Setting</b>
Traceability	No impact
Safety precaution	No impact

## Utility function generation

Specify location for generating utility functions

### Settings

**Default:** Auto

Auto

Operates as follows:

- When the model contains Model blocks, place utilities within the `slprj/target/_sharedutils` directory.
- When the model does not contain Model blocks, place utilities in the build directory (generally, in `model.c` or `model.cpp`).

Shared location

Directs code for utilities to be placed within the `slprj` directory in your working directory.

### Command-Line Information

**Parameter:** UtilityFuncGeneration

**Type:** string

**Value:** 'Auto' | 'Shared location'

**Default:** 'Auto'

### Recommended Settings

Application	Setting
Debugging	Shared location
Traceability	Shared location
Efficiency	Shared location
Safety precaution	No impact

## Compiler optimizations

Instruct the C compiler to generate real-time code fully optimized for speed.

### Settings

**Default:** on

- On  
Optimizes the code for speed.
- Off  
Performs no optimizations.

### Command-Line Information

**Parameter:** CCOptimize

**Type:** Boolean

**Value:** on | off

**Default:** on

### Recommended Settings

Application	Setting
Debugging	Off
Traceability	Off
Efficiency	On
Safety precaution	On

## Generate assembly listings

Instruct the C compiler to generate assembly listings for the generated code.

### Settings

**Default:** off

On  
Generates assembly listings.

Off  
Suppresses assembly listings.

### Command-Line Information

**Parameter:** CCListing

**Type:** Boolean

**Value:** on | off

**Default:** off

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact



## Rebuild all

Force all the object files to always be rebuilt regardless of their time stamps.

### Settings

**Default:** off

On  
Rebuilds all object files at every build.

Off  
Rebuilds only object files whose time stamps show they are outdated.

### Command-Line Information

**Parameter:** RebuildAll

**Type:** Boolean

**Value:** on | off

**Default:** off

### Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	No run-time impact. (Build may take longer.)
Safety precaution	On

### External mode

Enable client/server communication between Simulink® software and an application.

#### Settings

**Default:** on

- On  
Enables external mode.
- Off  
Disables external mode.

#### Dependencies

Selecting **External mode** enables:

- **Transport layer**
- **MEX-file arguments**
- **Static memory allocation**

#### Command-Line Information

**Parameter:** ExtMode

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

#### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

**See Also**

External Mode

### Transport layer

Specify the transport protocol for external mode communication.

#### Settings

**Default:** sharedmem

sharedmem

Uses a shared memory transport mechanism. The MEX-file name is `rtwinext`.

#### Tips

- The MEX-file name displayed next to **Transport layer** cannot be edited in the Configuration Parameters dialog box.
- For targets provided by The MathWorks, like Real-Time Windows Target, the MEX-file name is specified in:

```
matlabroot/toolbox/simulink/simulink/extmode_transports.m
```

#### Dependency

This parameter is enabled by checking **External Mode**.

#### Command-Line Information

**Parameter:** ExtModeTransport

**Type:** integer

**Value:** 0

**Default:** 0

#### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

### **See Also**

- Creating an External Mode Communication Channel
- Target Interfacing

### MEX-file arguments

Specify external mode MEX arguments.

#### Settings

**Default:** ''

For a shared memory transport, `rtwnext` allows two optional arguments. The arguments are positional, so the first argument must appear if the second appears.

- An argument that is currently unused. Specify '' for this argument if necessary.
- An argument that specifies verbosity. Specify 0 for Nonverbose, or 1 for Verbose.

The default is Nonverbose mode (0). To specify Verbose mode, set **MEX-file arguments** to:

```
'' 1
```

where '' is the empty string and 1 specifies Verbose mode.

#### Dependency

This parameter is enabled by checking **External Mode**.

#### Command-Line Information

**Parameter:** ExtModeMexArgs  
**Type:** string followed by integer  
**Value:** '' | '' 0 | '' 1  
**Default:** ''

#### Recommended Settings

Application	Setting
Debugging	No impact

<b>Application</b>	<b>Setting</b>
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### **See Also**

- Target Interfacing
- Client/Server Implementations

### Static memory allocation

Control the memory buffer for external mode communication.

#### Settings

**Default:** off

- On  
Enables the **Static memory buffer size** parameter to allocate dynamic memory.
- Off  
Uses a static memory buffer for external mode instead of allocating dynamic memory (calls to malloc).

#### Tip

To determine how much memory you need to allocate, enable verbose mode on the target to display the amount of memory it tries to allocate and is available.

#### Dependencies

- This parameter is enabled by checking **External Mode**.
- This parameter enables **Static memory buffer size**.

#### Command-Line Information

**Parameter:** ExtModeStaticAlloc

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

#### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact



<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

**See Also**

External Mode Interface Options

### Static memory buffer size

Specify the memory buffer size for external mode communication.

#### Settings

**Default:** 1000000

Enter the number of bytes to preallocate for external mode communications buffers in the target.

#### Tips

- If you enter too small a value for your application, external mode issues an out-of-memory error.
- To determine how much memory you need to allocate, enable verbose mode on the target to display the amount of memory it tries to allocate and is available.

#### Dependency

This parameter is enabled by **Static memory allocation**.

#### Command-Line Information

**Parameter:** ExtModeStaticAllocSize

**Type:** integer

**Value:** Any valid size

**Default:** 1000000

#### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

**See Also**

External Mode Interface Options



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