

DS5001 Digital Waveform Capture Board

RTI Reference

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About This Reference

Contents

This RTI Reference provides a full description of the Real-Time Interface (RTI) software support for the DS5001 Digital Waveform Capture Board.

Symbols

dSPACE user documentation uses the following symbols:

Symbol	Description
	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
	Indicates a hazard that, if not avoided, could result in property damage.
	Indicates important information that you should take into account to avoid malfunctions.
	Indicates tips that can make your work easier.
	Indicates a link that refers to a definition in the glossary, which you can find at the end of the document unless stated otherwise.
	Precedes the document title in a link that refers to another document.

Naming conventions

dSPACE user documentation uses the following naming conventions:

%name% Names enclosed in percent signs refer to environment variables for file and path names.

< > Angle brackets contain wildcard characters or placeholders for variable file and path names, etc.

Examples:

- Where you find terms such as `rti<XXXX>` replace them by the RTI platform support you are using, for example, `rti1007`.
- Where you find terms such as `<model>` or `<submodel>` in this document, replace them by the actual name of your model or submodel. For example, if the name of your Simulink model is `smd_1007_sl.slx` and you are asked to edit the `<model>_usr.c` file, you actually have to edit the `smd_1007_sl_usr.c` file.

RTI block name conventions All I/O blocks have default names based on dSPACE's board naming conventions:

- Most RTI block names start with the board name.
- A short description of functionality is added.
- Most RTI block names also have a suffix.

Suffix	Meaning
B	Board number (for PHS-bus-based systems)
M	Module number (for MicroAutoBox II)
C	Channel number
G	Group number
CON	Converter number
BL	Block number
P	Port number
I	Interrupt number

A suffix is followed by the appropriate number. For example, DS2201IN_B2_C14 represents a digital input block located on a DS2201 board. The suffix indicates board number 2 and channel number 14 of the block. For more general block naming, the numbers are replaced by variables (for example, DS2201IN_Bx_Cy).

Special folders

Some software products use the following special folders:

Common Program Data folder A standard folder for application-specific configuration data that is used by all users.

`%PROGRAMDATA%\dSPACE\<InstallationGUID>\<ProductName>`

or

`%PROGRAMDATA%\dSPACE\<ProductName>\<VersionNumber>`

Documents folder A standard folder for user-specific documents.

`%USERPROFILE%\Documents\dSPACE\<ProductName>\<VersionNumber>`

Local Program Data folder A standard folder for application-specific configuration data that is used by the current, non-roaming user.

`%USERPROFILE%\AppData\Local\dSPACE\<InstallationGUID>\<ProductName>`

Accessing dSPACE Help and PDF Files


After you install and decrypt dSPACE software, the documentation for the installed products is available in dSPACE Help and as PDF files.

dSPACE Help (local) You can open your local installation of dSPACE Help:

- On its home page via Windows Start Menu
- On specific content using context-sensitive help via **F1**

dSPACE Help (Web) You can access the Web version of dSPACE Help at www.dspace.com.

To access the Web version, you must have a *mydSPACE* account.

PDF files You can access PDF files via the  icon in dSPACE Help. The PDF opens on the first page.

Overview of the DS5001 Blockset

Overview of the DS5001 Blockset

DS5001 board

The DS5001 Digital Waveform Capture Board is used for the analysis of input signals such as square waves, pulse trains, or pulse-width modulated signals. These waveforms can be seen as a series of rising and falling edges and the corresponding times (time stamps).

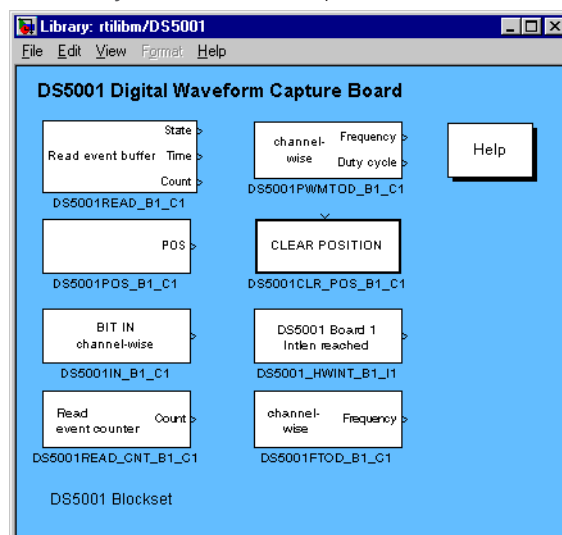
16 input channels allow you to capture digital pulses with a resolution of 25 ns. Up to 511 events per input channel (edge direction and time stamp) are stored for further calculations.

Access

The Real-Time Interface (RTI) board library for the DS5001 Digital Waveform Capture Board provides the RTI blocks that implement the functionality and I/O capabilities of the DS5001 board in Simulink models.

DS5001

After you double-click the corresponding board library icon in the rtlibm library the Library: rtlibm/DS5001 opens:



Library components

The following I/O units can be accessed by the RTI blockset for the DS5001:

- [Event Data Capture](#) on page 11
- [Counting Events](#) on page 17
- [Incremental Encoder Interface](#) on page 21
- Timing I/O Unit
- [Digital I/O Unit](#) on page 35
- [Interrupts](#) on page 39

Demo model

For the Simulink models (`demom_ds5001_1.mdl` and `demom_ds5101_2.mdl`) showing how to use the RTI blocks of the DS5001 board, refer to the RTI demo library of your processor board. You can also find the model files at `<RCP_HIL_InstallationPath>\Demos\Ds100x\RTI`.

Event Data Capture

Introduction

The Library: rtilibm/DS5001 provides access to the event data capture unit of the DS5001.

Where to go from here

Information in this section

[DS5001READ_Bx_Cy.....](#) 12
To provide read access to a sequence of stored event data for special analysis.

Information in other sections

[Overview of the DS5001 Blockset.....](#) 9
The DS5001 blockset provides the RTI blocks that implement the functionality and I/O capabilities of the DS5001 board in Simulink models.

DS5001READ_Bx_Cy

Purpose To provide read access to a sequence of stored event data for special analysis.

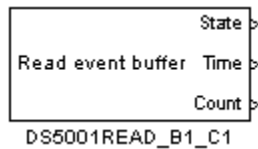
Where to go from here

Information in this section

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To describe the purpose and function of the block.	
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To specify the board number and the channel number for event data capturing.	
Capture Page (DS5001READ_Bx_Cy)	14
To configure the read access to the event buffer and the interrupt generation.	

Block Description (DS5001READ_Bx_Cy)

Illustration



Purpose To provide read access to a sequence of stored event data for special analysis.

I/O mapping

For details on the I/O mapping, refer to [Event Data Capture \(DS5001 Features\)](#).

Note

- Since each channel can be used for only one purpose at a time, this block may not be used channel-wise together with any other block of the DS5001 blockset.
- The frequency detection of the DS5001PWMTOD_Bx_Cy block and the DS5001FTOD_Bx_Cy block uses channel 16. If you do not specify 0 Hz as its lower limit for disabling the frequency detection, channel 16 is not available for the DS5001READ_Bx_Cy block.

I/O characteristics

The block provides 3 output ports:

Output Port	Simulink Output	Data Type		Description
		Without Data Typing	With Data Typing	
State (output 1)	0 ... 1 0: falling edge detected 1: rising edge detected	double	Boolean	Edge direction; if less edges were counted than specified, the remaining vector elements are filled with old data.
Time (output 2)	0 ... 2^{31}	double	unit32	Time stamp of captured events (detected edges) in time base tics; if less edges were counted than specified, the remaining vector elements are filled with old data.
Count (output 3)	0 ... 511	double	unit32	Number of actually detected edges.

RTI supports data typing for this block. As a result, the block output labeled State will be of Boolean type, and can be used with all logical operators without using data type conversion blocks.

Note

- The minimum difference between 2 time stamps is 25 ns.
- If the event buffer contains less than the desired number of events, the available events are read. Unused elements in the block output vectors are filled with the data of the last readout of the event buffer according to the read mode specified on the Capture page.
- If the Time output port reaches the maximum value of 2^{31} tics, the next time value starts counting at 0 again.

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to [Unit Page \(DS5001READ_Bx_Cy\)](#) on page 14)
- Capture Page (refer to [Capture Page \(DS5001READ_Bx_Cy\)](#) on page 14)

Related RTLib functions

ds5001_init, ds5001_read_init, ds5001_read_contig,
ds5001_read_over1

Related topics**References**

DS5001FTOD_Bx_Cy.....	31
DS5001PWMTOD_Bx_Cy.....	28

Unit Page (DS5001READ_Bx_Cy)

Purpose

To specify the board number and the channel number for event data capturing.

Dialog settings

Board number Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.

Channel number Lets you select a single channel within the range 1 ... 16.

Related topics**References**

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Capture Page (DS5001READ_Bx_Cy)

Purpose

To configure the read access to the event buffer and the interrupt generation.

Dialog settings

Read mode Lets you select the method for reading the event buffer:

- **Contiguous mode**

In the contiguous mode, the captured event data is stored in increasing order, i.e. the time stamps increase with increasing index. The first element of the time vector contains the time stamp of the first event since the last call to the related RTLib read function.

- **Overlapped mode**

In the overlapped mode, the captured event data is stored in reverse order, i.e. the time stamps decrease with increasing index. The first element of the time vector contains the time stamp of the most recent event. Unlike the contiguous mode, segments of event data being read may overlap.

Number of events Lets you specify the maximum number of events to be captured. Valid values are within the range 1 ... 511.

Trigger level Lets you specify the input trigger level. Valid values must remain within the range ± 10 V.

Edge direction Lets you select the edges where the trigger for capturing is activated. You can specify the rising edge, the falling edge or both edges.

Interrupt trigger threshold Lets you specify the number of captured events at which a hardware interrupt must be generated. The edge direction parameter specifies which edges should be counted. Valid values are within the range 1 ... 511. If you specify 0 as the interrupt trigger threshold, interrupt generation is disabled.

To make the hardware interrupt available, the DS5001_HWINT_Bx_Iy block must be in the model.

Related topics

References

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Counting Events

Introduction

The Library: rtlibm/DS5001 provides access to the event counters of the DS5001.

Where to go from here

Information in this section

[DS5001READ_CNT_Bx_Cy.....](#) 18

To provide channel-wise read access to one of the 3 event counters and to output the number of read events.

Information in other sections

[Overview of the DS5001 Blockset.....](#) 9

The DS5001 blockset provides the RTI blocks that implement the functionality and I/O capabilities of the DS5001 board in Simulink models.

DS5001READ_CNT_Bx_Cy

Purpose

To provide channel-wise read access to one of the 3 event counters and to output the number of read events.

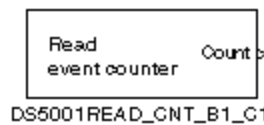
Where to go from here

Information in this section

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To describe the purpose and function of the block.	
Unit Page (DS5001READ_CNT_Bx_Cy).....	19
To specify the board number and the channel number for event data capture.	
Capture Page (DS5001READ_CNT_Bx_Cy).....	20
To configure the read access to the event counter.	

Block Description (DS5001READ_CNT_Bx_Cy)

Illustration



Purpose

To provide channel-wise read access to one of the 3 event counters and to output the number of read events.

Description

For reading the current event counter value there are two modes available. In the continuous mode all edges since start of application are counted. In the reset mode the event counter will be reset after each reading, therefore the number of events of the last sample step will be returned.

Note

- The DS5001 has 3 event counters. Thus up to 3 DS5001READ_CNT_Bx_Cy blocks can be used in a model.
- The frequency detection of the DS5001PWMTOD_Bx_Cy block and the DS5001FTOD_Bx_Cy block uses channel 16. If you do not specify 0 Hz as its lower limit for disabling the frequency detection, channel 16 is not available for the DS5001READ_CNT_Bx_Cy block.

I/O mapping	<p>For details on the I/O mapping, refer to Counting Events (DS5001 Features).</p> <div>Note<p>Since each channel can be used for only one purpose at a time, this block may not be used channel-wise together with any other block of the DS5001 blockset.</p></div>
I/O characteristics	<p>The block output is the number of actually read events within the range 0 ... 232.</p>
Dialog pages	<p>The dialog settings can be specified on the following pages:</p> <ul style="list-style-type: none">Unit Page (refer to Unit Page (DS5001READ_CNT_Bx_Cy) on page 19)Capture Page (refer to Capture Page (DS5001READ_CNT_Bx_Cy) on page 20)
Related RTLib functions	<p>ds5001_init, ds5001_read_init, ds5001_counter_init, ds5001_counter_read</p>
Related topics	<p>References</p> <div>DS5001FTOD_Bx_Cy..... 31</div> <div>DS5001PWMTOD_Bx_Cy..... 28</div>

Unit Page (DS5001READ_CNT_Bx_Cy)

Purpose	<p>To specify the board number and the channel number for event data capture.</p>
Dialog settings	<p>Board number Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.</p> <p>Channel number Lets you select the channel number in the range 1 ... 16.</p>

Capture Page (DS5001READ_CNT_Bx_Cy)

Purpose

To configure the read access to the event counter.

Dialog settings

Read mode Lets you select the method for reading the event counter:

- Continuous mode: Each captured event increments the event counter.
- Reset mode: The event counter will be reset to 0 after reading the counter.

Trigger level Lets you specify the input trigger level. Valid values must remain within the range ± 10 V.

Edge direction Lets you select the edges where the trigger for capturing is activated. You can specify the rising edge, the falling edge or both edges.

Incremental Encoder Interface

Introduction

The Library: rtlibm/DS5001 provides access to the incremental encoder interface unit of the DS5001.

Where to go from here

Information in this section

[DS5001POS_Bx_Cy.....](#) 22

To provide channel-wise read access to the position counter value measured in encoder lines.

[DS5001CLR_POS_Bx_Cy.....](#) 25

To clear the encoder position of the specified channel when the block is triggered.

Information in other sections

[Overview of the DS5001 Blockset.....](#) 9

The DS5001 blockset provides the RTI blocks that implement the functionality and I/O capabilities of the DS5001 board in Simulink models.

DS5001POS_Bx_Cy

Purpose To provide channel-wise read access to the position counter value measured in encoder lines.

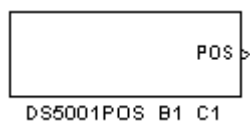
Where to go from here

Information in this section

Block Description (DS5001POS_Bx_Cy).....	22
To describe the purpose and function of the block.	
Unit Page (DS5001POS_Bx_Cy).....	23
To specify the channels reading the position counter values.	
Capture Page (DS5001POS_Bx_Cy).....	24
To specify the trigger level.	

Block Description (DS5001POS_Bx_Cy)

Illustration



Purpose To provide channel-wise read access to the position counter value measured in encoder lines.

I/O mapping

For details on the I/O mapping, refer to [Incremental Encoder Measurement \(DS5001 Features !\[\]\(35dc653d59570f8f891c312eeece91a2_img.jpg\)](#)).

Note

Since each channel can be used for only one purpose at a time, this block may not be used channel-wise together with any other block of the DS5001 blockset.

I/O characteristics

- When an encoder-like signal is measured, the block output contains the position value in encoder lines.
- No scaling of the block output is performed.

Note

- Although the DS5001 board may measure position counter values of encoder-like input signals it cannot be directly connected to an incremental encoder. Furthermore, it does not offer features such as delta position measurement or index search that are common in the field of encoder signal processing.
- The frequency detection of the DS5001PWMTOD_Bx_Cy block and the DS5001FTOD_Bx_Cy block uses channel 16. If you do not specify 0 Hz as its lower limit for disabling the frequency detection, channel 16 is not available for the DS5001POS_Bx_Cy block.

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to [Unit Page \(DS5001POS_Bx_Cy\)](#) on page 23)
- Capture Page (refer to [Capture Page \(DS5001POS_Bx_Cy\)](#) on page 24)

Related RTLib functions

ds5001_init, ds5001_enc_init, ds5001_enc

Related topics**References**

DS5001FTOD_Bx_Cy	31
DS5001PWMTOD_Bx_Cy	28

Unit Page (DS5001POS_Bx_Cy)

Purpose

To specify the channels reading the position counter values.

Dialog settings

Board number Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.

Channel number Lets you select channels 1, 3, 5, 7, 9, 11, 13, or 15. The corresponding channels 2, 4, 6, 8, 10, 12, 14 and 16 will be set automatically.

Related topics**References**

Capture Page (DS5001POS_Bx_Cy)	24
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Capture Page (DS5001POS_Bx_Cy)

Purpose	To specify the trigger level.
Dialog settings	Trigger level Lets you specify the input trigger level. Valid values must remain within the range ± 10 V.
Related topics	References <div>Unit Page (DS5001POS_Bx_Cy)..... 23</div>

DS5001CLR_POS_Bx_Cy

Purpose To clear the encoder position of the specified channel when the block is triggered.

Where to go from here

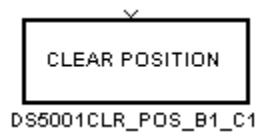
Information in this section

[Block Description \(DS5001CLR_POS_Bx_Cy\)](#)..... 25
To describe the purpose and function of the block.

[Unit Page \(DS5001CLR_POS_Bx_Cy\)](#)..... 26
To specify the channels on which the encoder position is to be cleared.

Block Description (DS5001CLR_POS_Bx_Cy)

Illustration



Purpose To clear the encoder position of the specified channel when the block is triggered.

I/O mapping

For details on the I/O mapping, refer to [Incremental Encoder Measurement \(DS5001 Features !\[\]\(d3102649f02e825ddb76dc3de0190154_img.jpg\)](#)).

Note

Since each channel can be used for only one purpose at a time, this block may not be used channel-wise together with any other block of the DS5001 blockset.

I/O characteristics

- The execution of the DS5001CLR_POS_Bx_Cy block is triggered whenever its input control signal rises from 0 to a positive value.
- When the block is triggered, the position counter value is set to 0.

Note

The frequency detection of the DS5001PWMTOD_Bx_Cy block and the DS5001FTOD_Bx_Cy block uses channel 16. If you do not specify 0 Hz as its lower limit for disabling the frequency detection, channel 16 is not available for the DS5001CLR_POS_Bx_Cy block.

Dialog pages	The dialog settings can be specified on the Unit Page (refer to Unit Page (DS5001CLR_POS_Bx_Cy) on page 26).
Related RTLib functions	ds5001_init, ds5001_enc_clr
Related topics	<div>References<div><div>DS5001FTOD_Bx_Cy.....31</div><div>DS5001PWMTOD_Bx_Cy.....28</div></div></div>

Unit Page (DS5001CLR_POS_Bx_Cy)

Purpose	To specify the channels on which the encoder position is to be cleared.
Dialog settings	<div><div>Board number Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.</div><div>Channel number Lets you select channels 1, 3, 5, 7, 9, 11, 13, or 15. The corresponding channels 2, 4, 6, 8, 10, 12, 14 and 16 will be set automatically.</div></div>

Timing I/O Unit

Introduction

The Library: rtlibm/DS5001 provides access to the timing I/O unit of the DS5001.

Where to go from here

Information in this section

[DS5001PWMTOD_Bx_Cy.....](#)28

To measure the average frequency and duty cycle of a PWM input signal.

[DS5001FTOD_Bx_Cy.....](#)31

To measure the average frequency of a square-wave input signal.

Information in other sections

[Overview of the DS5001 Blockset.....](#)9

The DS5001 blockset provides the RTI blocks that implement the functionality and I/O capabilities of the DS5001 board in Simulink models.

DS5001PWMTOD_Bx_Cy

Purpose To measure the average frequency and duty cycle of a PWM input signal.

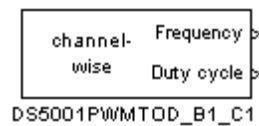
Where to go from here

Information in this section

Block Description (DS5001PWMTOD_Bx_Cy)	28
To describe the purpose and function of the block.	
Unit Page (DS5001PWMTOD_Bx_Cy)	29
To specify the channel for PWM analysis.	
Capture Page (DS5001PWMTOD_Bx_Cy)	29
To configure the PWM measurement.	

Block Description (DS5001PWMTOD_Bx_Cy)

Illustration



Purpose To measure the average frequency and duty cycle of a PWM input signal.

I/O mapping

For details on the I/O mapping, refer to [PWM Signal Measurement \(PWM2D\) \(DS5001 Features\)](#).

Note

Since each channel can be used for only one purpose at a time, this block may not be used channel-wise together with any other block of the DS5001 blockset.

I/O characteristics

- The frequency is measured in Hz.
- Scaling between the duty cycle and the output of the block:

Duty Cycle	Simulink Output
0 ... 100%	0 ... 1

The measurement algorithm used is accurate if the PWM period starts with the falling or rising edge of the corresponding PWM signal (asymmetric signal).

The DS5001 can also be used to measure PWM signals that are centered around the middle of the PWM period (symmetric signals). However, the measurement of the PWM frequency of symmetric PWM signals is faulty if the duty cycle of the PWM signal changes during measurement. For details, refer to [Limitation for the Measurement of Symmetric PWM Signals \(DS5001 Features !\[\]\(2e897e890e69d81eae4503a8342c36b0_img.jpg\)](#)).

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to [Unit Page \(DS5001PWMTOD_Bx_Cy\)](#) on page 29)
- Capture Page (refer to [Capture Page \(DS5001PWMTOD_Bx_Cy\)](#) on page 29)

Related RTLib functions

ds5001_init, ds5001_pwm2d_init, ds5001_pwm2d_overl

Unit Page (DS5001PWMTOD_Bx_Cy)

Purpose

To specify the channel for PWM analysis.

Dialog settings

Board number Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.

Channel number Lets you select a single channel within the range 1 ... 16.

Capture Page (DS5001PWMTOD_Bx_Cy)

Purpose

To configure the PWM measurement.

Dialog settings

Number of periods Lets you specify the number of signal periods the average frequency and duty cycle are computed from. Valid values must remain within the range 1 ... 254.

Trigger level Lets you specify the input trigger level. Valid values must remain within the range ± 10 V.

Lower limit for frequency detection Lets you specify the limit for the lower threshold frequency. Valid values must remain within the range 0 ... ∞ Hz. Frequencies below this limit will be ignored.

Note


The frequency detection uses channel 16. If you specify 0 Hz as the lower limit, the frequency detection feature is disabled and channel 16 can be used for PWM analysis, otherwise channel 16 is not available. This affects the following blocks:

- DS5001FTOD_Bx_Cy
- DS5001READ_Bx_Cy
- DS5001READ_CNT_Bx_Cy
- DS5001POS_Bx_Cy
- DS5001CLR_POS_Bx_Cy
- DS5001IN_Bx_Cy
- DS5001_HWINT_Bx_Iy

DS5001FTOD_Bx_Cy

Purpose	To measure the average frequency of a square-wave input signal.
Where to go from here	<div>Information in this section</div> <div><div>Block Description (DS5001FTOD_Bx_Cy)..... 31</div><div>To describe the purpose and function of the block.</div><div>Unit Page (DS5001FTOD_Bx_Cy)..... 32</div><div>To specify the board number and the channel number for average frequency measurement.</div><div>Capture Page (DS5001FTOD_Bx_Cy)..... 32</div><div>To configure the frequency measurement.</div></div>

Block Description (DS5001FTOD_Bx_Cy)

Illustration	<div><div><div>channel-wise</div><div>Frequency ></div></div><div>DS5001FTOD_B1_C1</div></div>
Purpose	To measure the average frequency of a square-wave input signal.
Description	The average frequency of an input signal is provided channel-wise. The lower limit for frequency detection can additionally be set.
I/O mapping	<div>For details on the I/O mapping, refer to Square-Wave Signal Measurement (F2D) (DS5001 Features ).</div> <div><div>Note</div><div>Since each channel can be used for only one purpose at a time, this block may not be used channel-wise together with any other block of the DS5001 blockset.</div></div>

I/O characteristics	The block output is the average signal frequency measured in Hz within the range 0 ... 20 MHz.
Dialog pages	The dialog settings can be specified on the following pages: <ul style="list-style-type: none">▪ Unit Page (refer to Unit Page (DS5001FTOD_Bx_Cy) on page 32)▪ Capture Page (refer to Capture Page (DS5001FTOD_Bx_Cy) on page 32)
Related RTLib functions	<code>ds5001_init</code> , <code>ds5001_f2d_init</code> , <code>ds5001_f2d_over1</code>

Unit Page (DS5001FTOD_Bx_Cy)

Purpose	To specify the board number and the channel number for average frequency measurement.
Dialog settings	<p>Board number Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.</p> <p>Channel number Lets you select a single channel within the range 1 ... 16.</p>

Capture Page (DS5001FTOD_Bx_Cy)

Purpose	To configure the frequency measurement.
Dialog settings	<p>Number of periods Lets you specify the number of signal periods the average frequency is computed from. Valid values must remain within the range 1 ... 254.</p> <p>Trigger level Lets you specify the input trigger level. Valid values must remain within the range ± 10 V.</p>

Lower limit for frequency detection Lets you specify the limit for the lower threshold frequency. Valid values must be nonnegative.

Note

The frequency detection uses channel 16. If you specify 0 Hz as the lower limit, the frequency detection feature is disabled and channel 16 can be used for frequency analysis, otherwise channel 16 is not available. This affects the following blocks:

- DS5001PWMTOD_Bx_Cy
- DS5001READ_Bx_Cy
- DS5001READ_CNT_Bx_Cy
- DS5001POS_Bx_Cy
- DS5001CLR_POS_Bx_Cy
- DS5001IN_Bx_Cy
- DS5001_HWINT_Bx_Iy

Digital I/O Unit

Introduction

The Library: rtlibm/DS5001 provides access to the digital I/O unit of the DS5001.

Where to go from here

Information in this section

[DS5001IN_Bx_Cy.....](#) 36
To provide binary input by means of one of the 16 input channels.

Information in other sections

[Overview of the DS5001 Blockset.....](#) 9
The DS5001 blockset provides the RTI blocks that implement the functionality and I/O capabilities of the DS5001 board in Simulink models.

DS5001IN_Bx_Cy

Purpose To provide binary input by means of one of the 16 input channels.

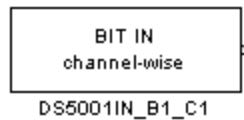
Where to go from here

Information in this section

Block Description (DS5001IN_Bx_Cy)	36
To describe the purpose and function of the block.	
Unit Page (DS5001IN_Bx_Cy)	37
To specify the channel for digital input.	
Capture Page (DS5001IN_Bx_Cy)	38
To specify the trigger level.	

Block Description (DS5001IN_Bx_Cy)

Illustration



Purpose To provide binary input by means of one of the 16 input channels.

I/O mapping

For details on the I/O mapping, refer to [Bit I/O \(DS5001 Features !\[\]\(758ebdf4629c903da74c2e079717ae32_img.jpg\)](#)).

Note

Since each channel can be used for only one purpose at a time, this block may not be used channel-wise together with any other block of the DS5001 blockset.

I/O characteristics

- RTI supports data typing for this block. If the block's output is of Boolean type, the block can be used with all logical operators without using data type conversion blocks.
- As long as the input signal is higher than the trigger level chosen from the Capture page, the resulting block output is 1. If the input signal is lower than the trigger level, the block output is 0.

- The relationship between the digital input and the output of the block is:

Digital Input (TTL)	Simulink Output	
	Without Data Typing	With Data Typing
High	1 (double)	1 (Boolean)
Low	0 (double)	0 (Boolean)

Note

The frequency detection of the DS5001PWMTOD_Bx_Cy block and the DS5001FTOD_Bx_Cy block uses channel 16. If you do not specify 0 Hz as its lower limit for disabling the frequency detection, channel 16 is not available for the DS5001IN_Bx_Cy block.

Dialog pages

The dialog settings can be specified on the following pages:

- Unit page (refer to [Unit Page \(DS5001IN_Bx_Cy\)](#) on page 37)
- Capture page (refer to [Capture Page \(DS5001IN_Bx_Cy\)](#) on page 38)

Related RTLib functions

ds5001_init

Related topics

References

DS5001FTOD_Bx_Cy	31
DS5001PWMTOD_Bx_Cy	28

Unit Page (DS5001IN_Bx_Cy)

Purpose

To specify the channel for digital input.

Dialog settings

Board number Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.

Channel number Lets you select a single channel within the range 1 ... 16.

Related topics

References

Capture Page (DS5001IN_Bx_Cy)	38
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Capture Page (DS5001IN_Bx_Cy)

Purpose	To specify the trigger level.
Dialog settings	Trigger level Lets you specify the input trigger level. Valid values must remain within the range ± 10 V.
Related topics	<div>References<div>Unit Page (DS5001IN_Bx_Cy).....37</div></div>

Interrupts

Introduction	The Library: rtlibm/DS5001 provides access to the hardware interrupts of the DS5001.
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Where to go from here

Information in this section

DS5001_HWINT_Bx_ly.....	40
To make the hardware interrupts of the DS5001 board available as trigger sources in a Simulink model.	

Information in other sections

Overview of the DS5001 Blockset.....	9
The DS5001 blockset provides the RTI blocks that implement the functionality and I/O capabilities of the DS5001 board in Simulink models.	

DS5001_HWINT_Bx_Iy

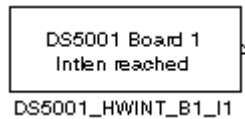
Purpose To make the hardware interrupts of the DS5001 board available as trigger sources in a Simulink model.

Where to go from here **Information in this section**

Block Description (DS5001HWINT_Bx_Iy)	40
To describe the purpose and function of the block.	
Unit Page (DS5001_HWINT_Bx_Iy)	40
To specify the hardware interrupt.	

Block Description (DS5001HWINT_Bx_Iy)

Illustration



Purpose To make the hardware interrupts of the DS5001 board available as trigger sources in a Simulink model.


Dialog pages The dialog settings can be specified on the **Unit Page**.

Unit Page (DS5001_HWINT_Bx_Iy)

Purpose To specify the hardware interrupt.

Dialog settings **Board number** Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.

Type Lets you select the type of the interrupt source. The DS5001 provides the following interrupts:

Interrupt Type	Description	Required RTI Block
Intlen reached		No RTI support
Read event interrupt ch. 1	To trigger an interrupt for the specified channel, which is configured for event data capturing.	DS5001READ_Bx_Cy
Read event interrupt ch. 2		
Read event interrupt ch. 3		
Read event interrupt ch. 4		
Read event interrupt ch. 5		
Read event interrupt ch. 6		
Read event interrupt ch. 7		
Read event interrupt ch. 8		
Read event interrupt ch. 9		
Read event interrupt ch. 10		
Read event interrupt ch. 11		
Read event interrupt ch. 12		
Read event interrupt ch. 13		
Read event interrupt ch. 14		
Read event interrupt ch. 15		
Read event interrupt ch. 16		
Event RAM full	The number of valid entries in the EVENT buffer of at least 1 input channel has reached 511.	
Input FIFO full	The input FIFO is full. Additional edges will be lost.	
Arbitration error	The DSP read an event that has been overwritten by the edge detector before the reading was completed (for further information, refer to Interrupts Provided by the DS5001 (DS5001 Features )).	

Note

- The “Intlen reached” interrupt type cannot be initialized completely by means of RTI blocks, so it is not ready to use. To enable the usage of the DS5001 “Intlen reached” interrupt, application-specific interrupt directives like interrupt acknowledge code have to be set manually. This interrupt is listed only for backwards compatibility. It is strongly recommended to use the Read event interrupt.
- The read event interrupts for channels 1 ... 16 are triggered, if a specified number of captured events is reached. The number of captured events can be specified by the DS5001READ_Bx_Cy block.
- The read event interrupt for channel 16 is not supported if the DS5001PWMTOD_Bx_Cy block or the DS5001FTOD_Bx_Cy block is used with activated frequency detection.

Related topics

References

DS5001FTOD_Bx_Cy.....	31
DS5001PWMTOD_Bx_Cy.....	28
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