

DS3001 Incremental Encoder Interface Board

RTI Reference

Release 2021-A – May 2021

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About This Reference

Content

This RTI Reference provides a full description of the Real-Time Interface (RTI) software support for the DS3001 Incremental Encoder Interface Board, which can be controlled by the DS1006 Processor Board and the DS1007 PPC Processor Board.

Symbols

dSPACE user documentation uses the following symbols:

Symbol	Description
 DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
 WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a hazard that, if not avoided, could result in property damage.
Note	Indicates important information that you should take into account to avoid malfunctions.
Tip	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_s1.slx` and you are asked to edit the `<model>_usr.c` file, you actually have to edit the `smd_1007_s1_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.

General Information on the DS3001 Blockset

Overview of the DS3001 Blockset

About this board

The DS3001 Incremental Encoder Interface Board provides 5 independent incremental encoder interface channels.

Partitioning the PHS bus with the DS802 With the DS802 PHS Link Board you can spatially partition the PHS bus by arranging the I/O boards in several expansion boxes.

The DS802 can be used in combination with many types of available dSPACE I/O boards. However, some I/O boards and some functionalities of specific I/O boards are not supported.

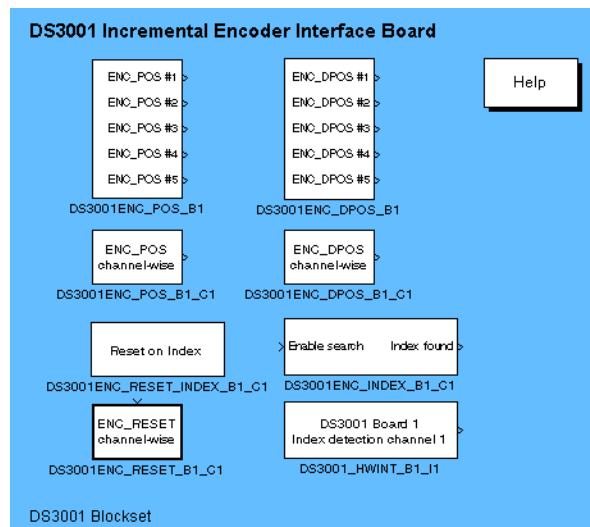
The I/O board support depends on the dSPACE software release which you use. For a list of supported I/O boards, refer to [DS802 Data Sheet \(PHS Bus System Hardware Reference\)](#).

RTI blockset

The Real-Time Interface (RTI) board library for the DS3001 Incremental Encoder Interface Board provides the RTI blocks that implement the functionality and I/O capabilities of the DS3001 board in Simulink models.

DS3001

After you double-click the corresponding board library icon in the library rtilibm the Library: rtilibm/DS3001 opens:



The following I/O units can be accessed by the RTI blockset for the DS3001:

- [Incremental Encoder Interface](#) on page 11
- [Interrupts](#) on page 33

NOTICE

For use with RTI, do not change the original jumper settings of the Setup register.

Supported signal types

The DS3001 supports the following encoder signal types:

- **Differential line mode (RS422)**
This mode should be used in noisy environments or when long cables are used between the sensor and the DS3001. In addition to the improved noise rejection the differential line mode features a cable break detector which activates the I/O-Error line on the PHS-bus if both differential lines of a signal are carrying the same voltage level.
- **Single-ended line mode (TTL)**
In this mode the inverting lines of an encoder input must be grounded. The cable break circuit is disabled in single-ended line mode. If an encoder input of the DS3001 is not used, the encoder signal type should be set to single-ended mode to avoid generation of I/O errors due to floating inputs.

Demo model

For Simulink models, that shows how to use the RTI blocks of the DS3001 board, refer to the RTI demo library of your processor board. You can find the model files also at <RCP_HIL_InstallationPath>\Demos\<ProcessorBoard>\RTI.

Incremental Encoder Interface

Introduction The Library: `rtilibm/DS3001` provides access to the incremental encoder interface of the DS3001.

Demo model For demo models using the incremental encoder interface, refer to `<RCP_HIL_InstallationPath>\Demos\<ProcessorBoard>\RTI\demom_ds3001_1.slx` or `<RCP_HIL_InstallationPath>\Demos\<ProcessorBoard>\RTI\demom_ds3001_2.slx`. These are the models DS3001_1 and DS3001_2, which you can find in the processor board's RTI demo library.

Where to go from here

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To read the position of one of the five encoder channels.	
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To read the delta position of one of the five encoder channels.	
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DS3001ENC_POS_Bx

Introduction	To read the positions of the five encoder channels.
Where to go from here	<div><div>Information in this section</div><div><div>Block Description (DS3001ENC_POS_Bx)..... 12</div><div>Gives you information on the appearance and purpose of the block.</div><div>Unit Page (DS3001ENC_POS_Bx)..... 14</div><div>To specify the board number.</div><div>Signal Type Page (DS3001ENC_POS_Bx)..... 14</div><div>To specify the encoder signal type.</div></div><div><div>Information in other sections</div><div><div>DS3001ENC_POS_Bx_Cy..... 15</div><div>To read the position of one of the five encoder channels.</div><div>DS3001ENC_DPOS_Bx..... 18</div><div>To read the delta positions of the five encoder channels.</div></div></div></div>

Block Description (DS3001ENC_POS_Bx)

Block	<div><div>Gives you information on the appearance and purpose of the block.</div><div><div><div>ENC_POS #1 ></div><div>ENC_POS #2 ></div><div>ENC_POS #3 ></div><div>ENC_POS #4 ></div><div>ENC_POS #5 ></div></div><div>DS3001ENC_POS_B1</div></div></div>
Purpose	To read the positions of the five encoder channels.
Description	Each DS3001 encoder interface channel contains a 24-bit counter to provide the absolute position for the connected transducer, corresponding to an encoder line range of $-2^{21} \dots + 2^{21}-0.25$. This range is automatically scaled to $-1 \dots +1$. To

receive the number of lines as an integer value, the output value must be multiplied by 2^{21} .

Each encoder interface channel uses 4-fold pulse multiplication for enhanced resolution. This means that each encoder line produces 4 counts in the position counter.

Note

- The signal type settings of the channels used must correspond to the settings of the DS3001ENC_DPOS_Bx and the DS3001ENC_INDEX_Bx_Cy blocks.
- When an application is loaded to the processor board, the position values of the employed channels are cleared automatically, which means that they are set to zero before the real-time simulation is started.

I/O mapping

For information on the I/O mapping, refer to [Signal Mapping to I/O Pins \(PHS Bus System Hardware Reference \[1\]\)](#).

I/O characteristics

The scaling between the physical encoder lines and the output of the block is:

Encoder Lines	Simulink Output
$-2^{21} \dots +2^{21}-0.25$	± 1.0 (double)

Dialog pages

The dialog settings can be specified on the following pages:

- [Unit Page \(DS3001ENC_POS_Bx\)](#) on page 14
- [Signal Type Page \(DS3001ENC_POS_Bx\)](#) on page 14

Example

To receive the radian angle φ from the scaled output value of the DS3001ENC_POS_Bx block, the following calculation must be applied:

$$\varphi = 2^{21} \cdot \left(2 \cdot \frac{\pi}{\text{encoder_lines}} \right) \cdot \text{scaled_output}$$

If an encoder with 1024 lines per revolution is used, the output value has to be rescaled by the factor:

$$2^{21} \cdot \left(2 \cdot \frac{\pi}{1024} \right)$$

This scaling factor can be introduced in the Simulink diagram with a Gain block.

Related RTLib functions

This RTI block is implemented by using the RTLib functions, which are described in the *DS3001 RTLib Reference*.

- ds3001_init
- ds3001_set_line_type
- ds3001_read_position

Unit Page (DS3001ENC_POS_Bx)

Purpose	To specify the board number.
----------------	------------------------------

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.
------------------------	---

Related topics

References

Block Description (DS3001ENC_POS_Bx).....	12
Signal Type Page (DS3001ENC_POS_Bx).....	14

Signal Type Page (DS3001ENC_POS_Bx)

Purpose	To specify the encoder signal type.
----------------	-------------------------------------

Dialog settings	Encoder signal type Lets you select differential (RS422) or single-ended (TTL) for the encoder signal type.
------------------------	--

Related topics

References

Block Description (DS3001ENC_POS_Bx).....	12
Unit Page (DS3001ENC_POS_Bx).....	14

DS3001ENC_POS_Bx_Cy

Introduction	To read the position of one of the five encoder channels.
Where to go from here	<div><div>Information in this section</div><div><div><div>Block Description (DS3001ENC_POS_Bx_Cy)..... 15</div><div>Gives you information on the appearance and purpose of the block.</div></div><div><div>Unit Page (DS3001ENC_POS_Bx_Cy)..... 17</div><div>To specify the board number, the channel number and the encoder signal type of the encoder block.</div></div></div></div> <div><div>Information in other sections</div><div><div><div>DS3001ENC_POS_Bx..... 12</div><div>To read the positions of the five encoder channels.</div></div><div><div>DS3001ENC_DPOS_Bx_Cy..... 21</div><div>To read the delta position of one of the five encoder channels.</div></div></div></div>

Block Description (DS3001ENC_POS_Bx_Cy)

Block	<div><div>Gives you information on the appearance and purpose of the block.</div><div><div><div>ENC_POS channel-wise</div><div></div></div><div>DS3001ENC_POS_B1_C1</div></div></div>
Purpose	To read the position of one of the five encoder channels.
Description	<div><div>Each DS3001 encoder interface channel contains a 24-bit counter to provide the absolute position for the connected transducer, corresponding to an integer range of $-2^{21} \dots +2^{21}-0.25$. This range is automatically scaled to $-1 \dots +1$. To receive the number of counts as an integer value, the output value must be multiplied by 2^{21}.</div><div>Each encoder interface channel uses 4-fold pulse multiplication for enhanced resolution. This means that each encoder line produces four counts in the position counter.</div></div>

Note

- The signal type setting of the channel used must correspond to the settings of the DS3001ENC_DPOS_Bx_Cy and the DS3001ENC_INDEX_Bx_Cy blocks.
- When an application is loaded to the processor board, the position value of the employed channel is cleared automatically, which means that they are set to zero before the real-time simulation is started.

I/O mapping

For information on the I/O mapping, refer to [Signal Mapping to I/O Pins \(PHS Bus System Hardware Reference !\[\]\(6605b201d6f14d9b3bcb8ab5f274d107_img.jpg\)](#)).

I/O characteristics

The scaling between the physical encoder lines and the output of the block is:

Encoder Lines	Simulink Output
$-2^{21} \dots +2^{21}-0.25$	± 1.0 (double)

Dialog pages

The dialog settings can be specified on the following pages:

- [Unit Page \(DS3001ENC_POS_Bx_Cy\)](#) on page 17

Example

To receive the radian angle φ from the scaled output value of the DS3001ENC_POS_Bx_Cy block, the following calculation must be applied:

$$\varphi = 2^{21} \cdot \left(2 \cdot \frac{\pi}{\text{encoder_lines}} \right) \cdot \text{scaled_output}$$

If an encoder with 1024 lines per revolution is used, the output value has to be rescaled by the factor:

$$2^{21} \cdot \left(2 \cdot \frac{\pi}{1024} \right)$$

This scaling factor can be introduced in the Simulink diagram with a Gain block.

Related RTLib functions

This RTI block is implemented by using the RTLib functions, which are described in the *DS3001 RTLib Reference*.

- ds3001_init
- ds3001_set_line_type

Unit Page (DS3001ENC_POS_Bx_Cy)

Purpose To specify the board number, the channel number and the encoder signal type of the encoder block.

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 in the range 1 ... 5.

Encoder signal type Lets you select differential (RS422) or single-ended (TTL) for the encoder signal type.

Related topics

References

Block Description (DS3001ENC_POS_Bx_Cy).....	15
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DS3001ENC_DPOS_Bx

Introduction

To read the delta positions of the five encoder channels.

Where to go from here

Information in this section

Block Description (DS3001ENC_DPOS_Bx)	18
Gives you information on the appearance and purpose of the block.	
Unit Page (DS3001ENC_DPOS_Bx)	20
To specify the board number.	
Signal Type Page (DS3001ENC_DPOS_Bx)	20
To specify the encoder signal type.	

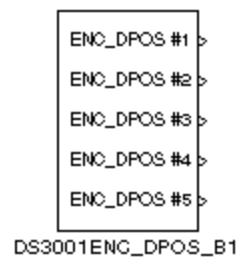
Information in other sections

DS3001ENC_POS_Bx	12
To read the positions of the five encoder channels.	
DS3001ENC_DPOS_Bx_Cy	21
To read the delta position of one of the five encoder channels.	

Block Description (DS3001ENC_DPOS_Bx)

Block

Gives you information on the appearance and purpose of the block.



Purpose

To read the delta positions of the five encoder channels.

Description

The delta position represents the scaled difference of 2 successive position values of a channel.

Each DS3001 encoder interface channel contains a 24-bit counter to provide the absolute position for the connected transducer, corresponding to an integer range of $-2^{21} \dots +2^{21}-0.25$. This range is automatically scaled to $-1 \dots +1$. To receive the number of counts as an integer value, the output value must be multiplied by 2^{21} .

Each encoder interface channel uses 4-fold pulse multiplication for enhanced resolution. This means that each encoder line produces four counts in the position counter.

The signal type settings of the channels used must correspond to the settings of the DS3001ENC_POS and the DS3001ENC_INDEX blocks.

Note

- When an application is loaded to the processor board, the position values of the employed channels are cleared automatically, which means that they are set to zero before the real-time simulation is started.
- If reset-on-index is set for the specified encoder channel, you have to regard the following situation: When an index has occurred between the actual and the last evaluation of the delta position, the previously read position is set either to 0 or to the specified position value. This causes a deviation between the real and the calculated delta position.

I/O mapping

For information on the I/O mapping, refer to [Signal Mapping to I/O Pins \(PHS Bus System Hardware Reference !\[\]\(e474458956c9a37fbf9586ddb60a7fa1_img.jpg\)](#)).

I/O characteristics

The scaling between the physical encoder lines and the output of the block is:

Encoder Lines	Simulink Output
$-2^{21} \dots +2^{21}-0.25$	± 1.0 (double)

Dialog pages

The dialog settings can be specified on the following pages:

- [Unit Page \(DS3001ENC_DPOS_Bx\)](#) on page 20
- [Signal Type Page \(DS3001ENC_DPOS_Bx\)](#) on page 20

Example

To receive the radian angle φ from the scaled output value of the DS3001ENC_DPOS_Bx block, the following calculation must be applied:

$$\varphi = 2^{21} \cdot \left(2 \cdot \frac{\pi}{\text{encoder_lines}} \right) \cdot \text{scaled_output}$$

If an encoder with 1024 lines per revolution is used, the output value has to be rescaled by the factor:

$$2^{21} \cdot \left(2 \cdot \frac{\pi}{1024} \right)$$

This scaling factor can be introduced in the Simulink diagram with a Gain block.

Related RTLib functions	<p>This RTI block is implemented by using the RTLib functions, which are described in the <i>DS3001 RTLib Reference</i>.</p> <ul style="list-style-type: none">▪ ds3001_init▪ ds3001_set_line_type▪ ds3001_read_line_count
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Unit Page (DS3001ENC_DPOS_Bx)

Purpose	To specify the board number.
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.
Related topics	<div>References<div><div>Block Description (DS3001ENC_DPOS_Bx)..... 18</div><div>Signal Type Page (DS3001ENC_DPOS_Bx)..... 20</div></div></div>


Signal Type Page (DS3001ENC_DPOS_Bx)

Purpose	To specify the encoder signal type.
Dialog settings	Encoder signal type Lets you select differential (RS422) or single-ended (TTL) for the encoder signal type.
Related topics	<div>References<div><div>Block Description (DS3001ENC_DPOS_Bx)..... 18</div><div>Unit Page (DS3001ENC_DPOS_Bx)..... 20</div></div></div>

DS3001ENC_DPOS_Bx_Cy

Introduction	To read the delta position of one of the five encoder channels.
Where to go from here	Information in this section <div><div>Block Description (DS3001ENC_DPOS_Bx_Cy)..... 21 Gives you information on the appearance and purpose of the block.</div><div>Unit Page (DS3001ENC_DPOS_Bx_Cy)..... 23 To specify the board number, the channel number and the encoder signal type.</div></div> Information in other sections <div><div>DS3001ENC_POS_Bx_Cy..... 15 To read the position of one of the five encoder channels.</div><div>DS3001ENC_DPOS_Bx..... 18 To read the delta positions of the five encoder channels.</div></div>

Block Description (DS3001ENC_DPOS_Bx_Cy)

Block	<div>Gives you information on the appearance and purpose of the block.</div> <div><p>DS3001ENC_DPOS_B1_C1</p></div>
Purpose	To read the delta position of one of the five encoder channels.
Description	<p>The delta position represents the scaled difference of 2 successive position values of a channel.</p> <p>Each DS3001 encoder interface channel contains a 24-bit counter to provide the absolute position for the connected transducer, corresponding to an integer range of $-2^{21} \dots + 2^{21}-0.25$. This range is automatically scaled to $-1 \dots +1$. To receive the number of counts as an integer value, the output value must be multiplied by 2^{21}.</p>

Each encoder interface channel uses 4-fold pulse multiplication for enhanced resolution. This means that each encoder line produces four counts in the position counter.

Note

- The signal type setting of the channel used must correspond to the settings of the DS3001ENC_POS_Bx_Cy and the DS3001ENC_INDEX_Bx_Cy blocks.
- When an application is loaded to the processor board, the position value of the employed channel is cleared automatically, which means that they are set to zero before the real-time simulation is started.
- If reset-on-index is set for the specified encoder channel, you have to regard the following situation: When an index has occurred between the actual and the last evaluation of the delta position, the previously read position is set either to 0 or to the specified position value. This causes a deviation between the real and the calculated delta position.

I/O mapping

For information on the I/O mapping, refer to [Signal Mapping to I/O Pins \(PHS Bus System Hardware Reference !\[\]\(950a62bbddad88d64435fd35607dfc42_img.jpg\)](#)).

I/O characteristics

The scaling between the physical encoder lines and the output of the block is:

Encoder Counts	Simulink Output
$-2^{21} \dots +2^{21}-0.25$	± 1.0 (double)

Dialog pages

The dialog settings can be specified on the following pages:

- [Unit Page \(DS3001ENC_DPOS_Bx_Cy\)](#) on page 23

Example

To receive the radian angle φ from the scaled output value of the DS3001ENC_DPOS_Bx_Cy block, the following calculation must be applied:

$$\varphi = 2^{21} \cdot \left(2 \cdot \frac{\pi}{\text{encoder}_{lines}} \right) \cdot \text{scaled}_{output}$$

If an encoder with 1024 lines per revolution is used, the output value has to be rescaled by the factor:

$$2^{21} \cdot \left(2 \cdot \frac{\pi}{1024} \right)$$

This scaling factor can be introduced in the Simulink diagram with a Gain block.

Related RTLib functions

This RTI block is implemented by using the RTLib functions, which are described in the *DS3001 RTLib Reference*.

- ds3001_init
- ds3001_set_line_type

Unit Page (DS3001ENC_DPOS_Bx_Cy)

Purpose	To specify the board number, the channel number and the encoder signal type.
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 in the range 1 ... 5.</p> <p>Encoder signal type Lets you select differential (RS422) or single-ended (TTL) for the encoder signal type.</p>
Related topics	<div>References</div> <div>Block Description (DS3001ENC_DPOS_Bx_Cy)..... 21</div>

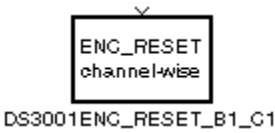
DS3001ENC_RESET_Bx_Cy

Introduction To reset the position counter of one of the encoder input channels.

Where to go from here	Information in this section
	Block Description (DS3001ENC_RESET_Bx_Cy) 24 Gives you information on the appearance and purpose of the block.
	Unit Page (DS3001ENC_RESET_Bx_Cy) 25 To specify the board number and the channel number.
	Information in other sections
	DS3001ENC_INDEX_Bx_Cy 26 To poll the encoder index of the selected channel.
	DS3001ENC_RESET_INDEX_Bx_Cy 30 To reset the position counter if the encoder index was detected by the hardware.

Block Description (DS3001ENC_RESET_Bx_Cy)

Block Gives you information on the appearance and purpose of the block.



Purpose To reset the position counter of one of the encoder input channels.

Description

If the block is triggered the corresponding counter is cleared, which means that its position value is set to zero.

Note

- When an application is loaded to the processor board, the position values of the employed channels are cleared automatically, which means that they are set to zero before the real-time simulation is started.
- The DS3001ENC_RESET_Bx_Cy block and the DS3001ENC_RESET_INDEX_Bx_Cy block cannot be used simultaneously.

Dialog pages

The dialog settings can be specified on the following pages:

- [Unit Page \(DS3001ENC_RESET_Bx_Cy\)](#) on page 25

Related RTLib functions

This RTI block is implemented by using the RTLib functions, which are described in the *DS3001 RTLib Reference*.

- ds3001_init
- ds3001_clear_counter

Unit Page (DS3001ENC_RESET_Bx_Cy)

Purpose

To specify the board number and the channel number.

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 in the range 1 ... 5.

Related topics**References**

[Block Description \(DS3001ENC_RESET_Bx_Cy\)](#)..... 24

DS3001ENC_INDEX_Bx_Cy

Introduction To poll the encoder index of the selected channel.

Where to go from here

Information in this section

Block Description (DS3001ENC_INDEX_Bx_Cy)	26
Gives you information on the appearance and purpose of the block.	
Unit Page (DS3001ENC_INDEX_Bx_Cy)	28
To specify the board number, the channel number and the encoder signal type.	
Options Page (DS3001ENC_INDEX_Bx_Cy)	28
To specify a sample time and the behaviour of model variables on a found index.	
S-Function Page (DS3001ENC_INDEX_Bx_Cy)	29
To specify the underlying S-function for the encoder index search.	

Information in other sections

DS3001ENC_RESET_INDEX_Bx_Cy	30
To reset the position counter if the encoder index was detected by the hardware.	
DS3001ENC_RESET_Bx_Cy	24
To reset the position counter of one of the encoder input channels.	

Block Description (DS3001ENC_INDEX_Bx_Cy)

Block

Gives you information on the appearance and purpose of the block.



Purpose

To poll the encoder index of the selected channel.

Description

When the index is found, the corresponding counter is cleared, which means that its position value is set to zero.

For a sequential index search of the different encoder channels the inputs of up to 5 DS3001ENC_INDEX blocks can be cascaded. To do so, the output of the first block can be used as the input for the second one.

Note

- You should not use any DS3001ENC_INDEX block and any DS3001_HWINT_Bx_Iy block at the same time because this leads to an incorrect encoder index search.
- The signal type settings of the channels that are used must correspond to the settings of the DS3001ENC_POS and the DS3001ENC_DPOS blocks.
- When an application is loaded to the processor board, the position values of the employed channels are cleared automatically, which means that they are set to zero before the real-time simulation is started.
- The DS3001ENC_INDEX_Bx_Cy block and the DS3001ENC_RESET_INDEX_Bx_Cy block cannot be used simultaneously.

I/O mapping

For information on the I/O mapping, refer to [Signal Mapping to I/O Pins \(PHS Bus System Hardware Reference !\[\]\(a03a7eb2f4046e1d3c76772003e549ea_img.jpg\)](#)).

I/O characteristics

- RTI supports data typing for this block. The block's input has to be of boolean type, and the block can be used with all logical operators without using data type conversion blocks.
- If data typing is enabled, an input value equal to 1 (boolean) enables the index search for the respective interface channel. The output will be of the boolean type.
- If data typing is disabled, an input value > 0 enables the index search for the respective interface channel. The output will be of the type double.
- The block outputs 1 if the index was found, otherwise 0:

State	Simulink Output	
	Without Data Typing	With Data Typing
Index has not been found once	0 (double)	0 (boolean)
Index has been found	1 (double)	1 (boolean)

- The block output is related to one of the 2 independent encoder position counters.

Dialog pages

The dialog settings can be specified on the following pages:

- [Unit Page \(DS3001ENC_INDEX_Bx_Cy\)](#) on page 28
- [Options Page \(DS3001ENC_INDEX_Bx_Cy\)](#) on page 28
- [S-Function Page \(DS3001ENC_INDEX_Bx_Cy\)](#) on page 29

Related RTLib functions

This RTI block is implemented by using the RTLib functions, which are described in the *DS3001 RTLib Reference*.

- ds3001_init
- ds3001_set_line_type
- ds3001_clear_counter
- ds3001_read_index

Unit Page (DS3001ENC_INDEX_Bx_Cy)

Purpose	To specify the board number, the channel number and the encoder signal type.
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 in the range 1 ... 5.</p> <p>Encoder signal type Lets you select differential (RS422) or single-ended (TTL) for the encoder signal type.</p>
Related topics	<p>References</p> <ul style="list-style-type: none"> Block Description (DS3001ENC_INDEX_Bx_Cy)..... 26 Options Page (DS3001ENC_INDEX_Bx_Cy)..... 28 S-Function Page (DS3001ENC_INDEX_Bx_Cy)..... 29

Options Page (DS3001ENC_INDEX_Bx_Cy)

Purpose	To specify a sample time and the behavior of model variables on a found index.
Dialog settings	<p>Sample time Lets you specify the sample time of the task the encoder index search should be executed in. Valid values are -1 (inherited) or any multiple of the Fixed step size chosen in the Simulation Parameters dialog of the current model. You can also state a valid MATLAB expression, meaning a mathematical expression containing numbers and variables that you defined in MATLAB's Workspace beforehand.</p> <p>Model variables If Re-initialize on index found is selected, all model variables, like states and user variables, are set to their initial values.</p>

Related topics**References**

Block Description (DS3001ENC_INDEX_Bx_Cy).....	26
S-Function Page (DS3001ENC_INDEX_Bx_Cy).....	29
Unit Page (DS3001ENC_INDEX_Bx_Cy).....	28

S-Function Page (DS3001ENC_INDEX_Bx_Cy)

Purpose

To specify the underlying S-function for the encoder index search.

Dialog settings

Solving S-function Lets you specify the underlying C-code S-function for the encoder index search.

Note

The DS3001ENC_INDEX_Bx_Cy block refers to the S-function file `ds3001enc_index_s.c` available from `<RCP_HIL_InstallationPath>\MATLAB\RTI\RTI<ProcessorBoard>\S Fcn`. By default, the S-function code searches for the index signal of the specified channel. If the index is found, the position counter is set to zero and the block output is set to 1. If a different functionality is required for your application, the source code of the S-function can be customized accordingly.

Related topics**References**

Block Description (DS3001ENC_INDEX_Bx_Cy).....	26
Options Page (DS3001ENC_INDEX_Bx_Cy).....	28
Unit Page (DS3001ENC_INDEX_Bx_Cy).....	28

DS3001ENC_RESET_INDEX_Bx_Cy

Introduction

To reset the position counter if the encoder index was detected by the hardware.

Where to go from here

Information in this section

Block Description (DS3001ENC_RESET_INDEX_Bx_Cy)	30
Gives you information on the appearance and purpose of the block.	
Unit Page (DS3001ENC_RESET_INDEX_Bx_Cy)	31
To specify board and channel on which the index detection should be performed.	
Parameter Page (DS3001ENC_RESET_INDEX_Bx_Cy)	32
To specify the reset mode on index detection.	

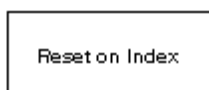
Information in other sections

DS3001ENC_RESET_Bx_Cy	24
To reset the position counter of one of the encoder input channels.	
DS3001ENC_INDEX_Bx_Cy	26
To poll the encoder index of the selected channel.	

Block Description (DS3001ENC_RESET_INDEX_Bx_Cy)

Block

Gives you information on the appearance and purpose of the block.



DS3001ENC_RESET_INDEX_B1_C1

Purpose

To reset the position counter if the encoder index was detected by the hardware.

Description

The reset will be done immediately after the index detection. It can be performed once or always on detection on each of the 5 encoder channels independently.

Note

- This block cannot be used simultaneously with the DS3001ENC_INDEX_Bx_Cy block.
- This block cannot be used simultaneously with the DS3001ENC_RESET_Bx_Cy block.

The index reset is generated on the rising edge of the index pulse. This means that an index reset is generated when moving into the index position. An index reset is not generated if the index line is already active while an index reset is requested. An index reset interrupt, however, is generated on the falling edge of the index pulse.

I/O mapping

For information on the I/O mapping, refer to [Signal Mapping to I/O Pins \(PHS Bus System Hardware Reference !\[\]\(83f22ed94ec5517769dd76d702c6bfd8_img.jpg\)](#)).

Dialog pages

The dialog settings can be specified on the following pages:

- [Unit Page \(DS3001ENC_RESET_INDEX_Bx_Cy\)](#) on page 31
- [Parameter Page \(DS3001ENC_RESET_INDEX_Bx_Cy\)](#) on page 32

Related RTLib functions

This RTI block is implemented by using the RTLib functions, which are described in the *DS3001 RTLib Reference*.

- ds3001_init
- ds3001_set_counter_reset_mode
- ds3001_prepare_index_reset

Unit Page (DS3001ENC_RESET_INDEX_Bx_Cy)

Purpose

To specify board and channel on which the index detection should be performed.

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 specify a channel within the range 1 ... 5.

Related topics**References**

Block Description (DS3001ENC_RESET_INDEX_Bx_Cy)	30
Parameter Page (DS3001ENC_RESET_INDEX_Bx_Cy)	32

Parameter Page (DS3001ENC_RESET_INDEX_Bx_Cy)

Purpose

To specify the reset mode on index detection.

Dialog settings

Reset position count Lets you specify the reset mode on index detection:

Reset Mode	Meaning
Once	The position counter will be reset to zero only the first time if an encoder index was detected.
Always	The position counter will be reset to zero each time if an encoder index was detected.

Related topics**References**

Block Description (DS3001ENC_RESET_INDEX_Bx_Cy)	30
Unit Page (DS3001ENC_RESET_INDEX_Bx_Cy)	31

Interrupts

Introduction

The Library: `rtilibm/DS3001` provides access to the hardware interrupts of the DS3001.

Demo model

For demo models showing how to use interrupts, refer to the TaskLib demo models.

DS3001_HWINT_Bx_Iy

Introduction To make the hardware interrupts available.

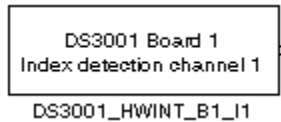
Where to go from here

Information in this section

Block Description (DS3001_HWINT_Bx_Iy)	34
Gives you information on the appearance and purpose of the block.	
Unit Page (DS3001_HWINT_Bx_Iy)	35
To specify the board number and the type of the interrupt source.	

Block Description (DS3001_HWINT_Bx_Iy)

Block Gives you information on the appearance and purpose of the block.



Purpose To make the hardware interrupts of the DS3001 board available as trigger sources in a block diagram.

Note

You should not use any DS3001ENC_INDEX_Bx_Cy block and any DS3001_HWINT_Bx_Iy block at the same time because this leads to an incorrect encoder index search.

I/O mapping For information on the I/O mapping, refer to [Signal Mapping to I/O Pins \(PHS Bus System Hardware Reference !\[\]\(9c2e8d1b5bd77cb5c9f83b7a9cff79fd_img.jpg\)](#)).

Dialog pages The dialog settings can be specified on the following pages:

- [Unit Page \(DS3001_HWINT_Bx_Iy\)](#) on page 35

Unit Page (DS3001_HWINT_Bx_Iy)

Purpose To specify the board number and the type of the interrupt source.

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.

Interrupt Lets you select the type of the interrupt source. For each of the 5 incremental encoder index lines an interrupt on detecting an index pulse is available:

Interrupt No.	Interrupt Type
1	Index detection channel 1
2	Index detection channel 2
3	Index detection channel 3
4	Index detection channel 4
5	Index detection channel 5

Related topics	References
	Block Description (DS3001ENC_DPOS_Bx_Cy)..... 21

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block description 18

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DS3001ENC_DPOS_Bx_Cy 21

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DS3001ENC_INDEX_Bx_Cy 26

block description 26

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block description 12

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block description 15

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DS3001ENC_RESET_Bx_Cy 24

block description 24

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block description 30

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