DS4001 Timing and Digital I/O Board

RTI Reference

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dSPACE

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How to Contact dSPACE Support

If you encounter a problem when using dSPACE products, contact your local dSPACE representative:

- Local dSPACE companies and distributors: http://www.dspace.com/go/locations
- For countries not listed, contact dSPACE GmbH in Paderborn, Germany.
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You can also use the support request form: http://www.dspace.com/go/supportrequest. If you are logged on to mydSPACE, you are automatically identified and do not need to add your contact details manually.

If possible, always provide the relevant dSPACE License ID or the serial number of the CmContainer in your support request.

Software Updates and Patches

dSPACE strongly recommends that you download and install the most recent patches for your current dSPACE installation. Visit http://www.dspace.com/go/patches for software updates and patches.

Important Notice

Contents

About This Reference

Contents

This reference provides a full description of the Real-Time Interface (RTI) software support for the DS4001 Timing and Digital I/O 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_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.

General Information on the DS4001 Blockset

Introduction

To get basic information on the DS4001 blockset.

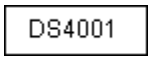
Overview of the DS4001 Blockset

Introduction

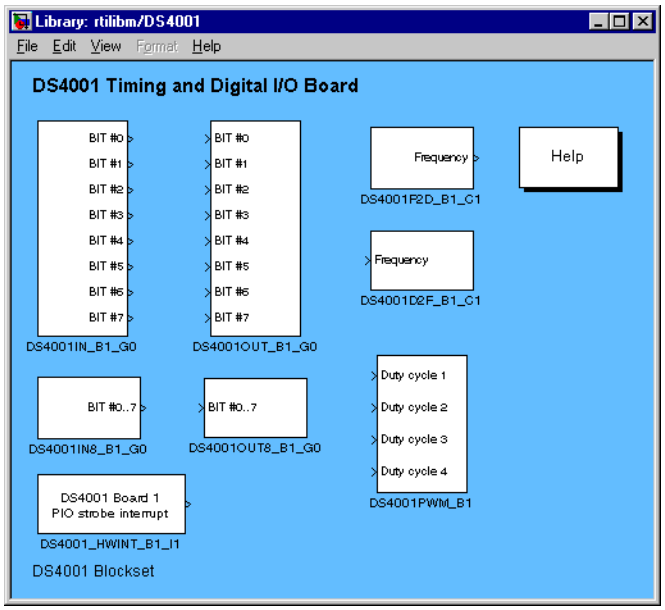
The DS4001 Timing and Digital I/O Board provides 32 bidirectional TTL digital I/O lines.

The Real-Time Interface (RTI) board library for the DS4001 Timing and Digital I/O Board provides the RTI blocks that implement the functionality and I/O capabilities of the DS4001 board in Simulink models.

Access



After you double-click the corresponding board library icon in the library **rtilibm** the **Library: rtilibm/DS4001** opens:



Library components

The following I/O units can be accessed by the RTI blockset for the DS4001:

- Digital I/O Unit on page 11
- Timing I/O Unit on page 25
- Interrupts on page 37

Demo model

For Simulink models that show how to use the RTI blocks of the DS4001 board, refer to the RTI demo library of your processor board. You can also find the model files at `<RCP_HIL_InstallationPath>\Demos\ds100x`.

Related topics

References

Digital I/O Unit

Introduction

The Library: rtilibm/DS4001 provides access to the digital I/O unit of the DS4001.

You can configure each 8-bit group of the DS4001 board freely for input or output. However, all digital channels of one group can be used either for input or for output only.

Where to go from here

Information in this section

DS4001IN_Bx_Gy

Purpose

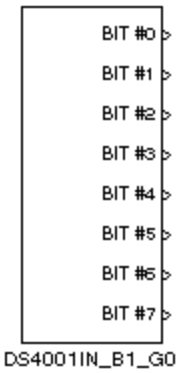
To provide bit-wise read access to the 8 bits of a group.

Where to go from here

Information in this section

Block Description (DS4001IN_Bx_Gy)

Illustration



Purpose

To provide bit-wise read access to the 8 bits of a group.

I/O mapping

For details on the I/O connector pinouts of the DS4001, refer to Digital I/O Unit (DS4001 Features 🕮).

I/O characteristics

- RTI supports data typing for this block. If the block's output is of the boolean type, the block can be used with all logical operators without using data type conversion blocks.

- Relationship between the digital input and the output of the block:

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

Dialog pages

The dialog settings can be specified on the Parameters Page.

Related RTLib functions

`ds4001_pio_init`, `ds4001_pio_initialize`, `ds4001_in32`, `ds4001_bit_in`

Related topics

References

ds4001_bit_in (DS4001 RTLib Reference 🕮)
ds4001_in32 (DS4001 RTLib Reference 🕮)
ds4001_pio_init (DS4001 RTLib Reference 🕮)
ds4001_pio_initialize (DS4001 RTLib Reference 🕮)

Parameters Page (DS4001IN_Bx_Gy)

Purpose

To specify the board number and the bit group 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.

Group number Lets you select a group of 8 bits. Valid group numbers are:

- 0 (bits 0 … 7)
- 1 (bits 8 … 15)
- 2 (bits 16 … 23)
- 3 (bits 24 … 31)

Note

After changing the group number, the block output labels are updated to show the new bit range of the group.

DS4001IN8_Bx_Gy

Purpose

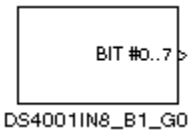
To provide byte-wise read access to 8 bits of a group.

Where to go from here

Information in this section

Block Description (DS4001IN8_Bx_Gy)

Illustration



Purpose

To provide byte-wise read access to 8 bits of a group.

I/O mapping

For details on the I/O connector pinouts of the DS4001, refer to Digital I/O Unit (DS4001 Features 🕮).

I/O characteristics

- The 8 bits of a group are combined to one byte and its decimal equivalent is the Simulink block output within the range 0 … 255.
- The most significant bit (MSB) is the one with the highest bit number in the group.
- RTI supports data typing for this block. If data typing is enabled, the block's output will be of `uint8` type, otherwise it will be of `double` type.
- Data type of the Simulink output without and with data typing:

Data type of Simulink Output	
Without Data Typing	**With Data Typing**
double	uint8

Example

The following table gives an example of a digital input (TTL) and the corresponding Simulink output:

Digital Input (TTL)	Simulink Output
1100 0001 (1 = high, 0 = low)	193.0

Dialog pages

The dialog settings can be specified on the **Parameters Page** (refer to Parameters Page (DS4001IN8_Bx_Gy) on page 15).

Related RTLib functions

`ds4001_pio_init`, `ds4001_pio_initialize`, `ds4001_in32`, `ds4001_bit_in`

Related topics

References

ds4001_bit_in (DS4001 RTLib Reference 🕮)
ds4001_in32 (DS4001 RTLib Reference 🕮)
ds4001_pio_init (DS4001 RTLib Reference 🕮)
ds4001_pio_initialize (DS4001 RTLib Reference 🕮)

Parameters Page (DS4001IN8_Bx_Gy)

Purpose

To specify the board number and the bit group 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.

Group number Lets you select a group of 8 bits (1 byte). Valid group numbers are:

- 0 (bits 0 … 7)
- 1 (bits 8 … 15)
- 2 (bits 16 … 23)
- 3 (bits 24 … 31).

Note

After changing the group number, the block output label is updated to show the new bit range of the group.

DS4001OUT_Bx_Gy

Purpose

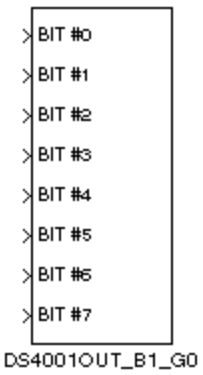
To provide bit-wise write access to the 8 bits of a group.

Where to go from here

Information in this section

Block Description (DS4001OUT_Bx_Gy)

Illustration



Purpose

To provide bit-wise write access to the 8 bits of a group.

I/O mapping

For details on the I/O connector pinouts of the DS4001, refer to Digital I/O Unit (DS4001 Features 🕮).

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.
- Relationship between the digital output and the input of the block:

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

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS4001OUT_Bx_Gy) on page 17)
- Initialization Page (refer to Initialization Page (DS4001OUT_Bx_Gy) on page 18)
- Termination Page (refer to Termination Page (DS4001OUT_Bx_Gy) on page 19)

Related RTLib functions

`ds4001_pio_init`, `ds4001_pio_initialize`, `ds4001_out32`, `ds4001_bit_out`

Related topics

References

ds4001_bit_out (DS4001 RTLib Reference 🕮)
ds4001_out32 (DS4001 RTLib Reference 🕮)
ds4001_pio_init (DS4001 RTLib Reference 🕮)
ds4001_pio_initialize (DS4001 RTLib Reference 🕮)

Unit Page (DS4001OUT_Bx_Gy)

Purpose

To specify the board number and the bit group for digital output.

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.

Group number Lets you select a group of 8 bits. Valid group numbers are:

- 0 (bits 0 … 7)
- 1 (bits 8 … 15)

- 2 (bits 16 … 23)
- 3 (bits 24 … 31).

Note

After changing the group number, the block output labels are updated to show the new bit range of the group.

Related topics

References

Initialization Page (DS4001OUT_Bx_Gy)..... 18
Termination Page (DS4001OUT_Bx_Gy)..... 19

Initialization Page (DS4001OUT_Bx_Gy)

Purpose

To specify the initial state of the I/O channels.

Description

During the model initialization phase, an initial digital output value is written to each channel. This is especially useful if a channel is written from within a triggered or enabled subsystem which is not executed right from the start of the simulation. With the initialization state, specified on the **Initialization** page, all channels have defined outputs during this simulation phase.

Dialog settings

Initialization state Lets you specify the initial digital output at the start of the simulation. It is selectable for each channel. To assign one Initialization state to all of the eight bits, specify the desired value in the lowest row before pushing the **Set all** button.

Related topics

References

Termination Page (DS4001OUT_Bx_Gy)..... 19
Unit Page (DS4001OUT_Bx_Gy)..... 17

Termination Page (DS4001OUT_Bx_Gy)

Purpose

To specify the state of the I/O channels at termination.

Description

When the simulation terminates, all channels hold their last digital output values by default. You can specify a user-defined value to drive your external hardware into a safe final condition.

Dialog settings

Termination state Lets you choose, whether keep the current digital output when the simulation terminates or select the checkbox to specify the desired value of the digital output. It is selectable for each channel. To assign one termination state to all of the bits, select the checkbox in the lowest row and specify the desired value before pushing the **Set all** button.

The specified termination values of I/O channels are set when the simulation executes its termination function by setting the `simState` variable to STOP. If you stop the real-time application by using ControlDesk's **Stop RTP** command, the processor resets immediately without executing termination functions. The current values of the I/O channels are kept and the specified termination values are not set.

Related topics

References

Initialization Page (DS4001OUT_Bx_Gy)..... 18
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)
Unit Page (DS4001OUT_Bx_Gy)..... 17

DS4001OUT8_Bx_Gy

Purpose

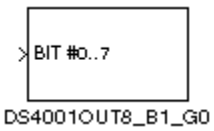
To provide byte-wise write access to the 8 bits of a group.

Where to go from here

Information in this section

Block Description (DS4001OUT8_Bx_Gy)

Illustration



Purpose

To provide byte-wise write access to the 8 bits of a group.

I/O mapping

For details on the I/O connector pinouts of the DS4001, refer to Digital I/O Unit (DS4001 Features 🕮).

I/O characteristics

- The Simulink block input has to be the decimal equivalent of a single byte within the range 0 … 255. Its bit pattern is written to the 8 bits of the selected DS4001 group.
- The most significant bit (MSB) is the one with the highest bit number in the group.
- RTI supports data typing for this block. If data typing is enabled, the block's input has to be of `uint8` type, otherwise it must be of `double` type.

- Data type of the Simulink input without and with Data Typing:

Data type of Simulink Input	
Without Data Typing	**With Data Typing**
double	uint8

Example

The following table gives an example of a digital output (TTL) and the corresponding Simulink input:

Digital Output (TTL)	Simulink Input
1100 0001 (1 = high, 0 = low)	193.0

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS4001OUT8_Bx_Gy) on page 21)
- Parameters Page (refer to Parameters Page (DS4001OUT8_Bx_Gy) on page 22)

Related RTLib functions

`ds4001_pio_init`, `ds4001_pio_initialize`, `ds4001_out32`, `ds4001_bit_out`

Related topics

References

ds4001_bit_out (DS4001 RTLib Reference 🕮)
ds4001_out32 (DS4001 RTLib Reference 🕮)
ds4001_pio_init (DS4001 RTLib Reference 🕮)
ds4001_pio_initialize (DS4001 RTLib Reference 🕮)

Unit Page (DS4001OUT8_Bx_Gy)

Purpose

To specify the board identification and the bit group.

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.

Group number Lets you select a group of 8 bits (1 byte). Valid group numbers are:

- 0 (bits 0 … 7)
- 1 (bits 8 … 15)
- 2 (bits16 … 23)
- 3 (bits 24 … 31).

Note

After changing the group number, the block output label is updated to show the new bit range of the group.

Related topics

References

Parameters Page (DS4001OUT8_Bx_Gy)..... 22

Parameters Page (DS4001OUT8_Bx_Gy)

Purpose

To specify the state of the I/O channels at simulation start and termination.

Description

During the model initialization phase, an initial digital output value is written to each channel. This is especially useful if a channel is written from within a triggered or enabled subsystem which is not executed right from the start of the simulation. With the initial output all channels have defined outputs during this simulation phase.

When the simulation terminates, all channels hold their last digital output values by default. You can specify the termination output values to drive your external hardware into a safe final condition.

The specified termination values of I/O channels are set when the simulation executes its termination function by setting the `simState` variable to STOP. If you stop the real-time application by using ControlDesk's **Stop RTP** command, the processor resets immediately without executing termination functions. The current values of the I/O channels are kept and the specified termination values are not set.

Dialog settings

Initial output Lets you specify the initial digital output at the start of the simulation. Because a complete byte is written at a time, the value must remain within the range 0 … 255. It is selectable for each group.

Termination output Lets you choose whether keep the current digital output when the simulation terminates or select the checkbox to specify the digital output to the desired value. Because a complete byte is written at a time, the value must remain within the range 0 … 255. It is selectable for each group.

Related topics

References

simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)
Unit Page (DS4001OUT8_Bx_Gy)..... 21

Timing I/O Unit

Introduction

The Library: rtilibm/DS4001 provides access to the timing I/O unit of the DS4001.

Where to go from here

Information in this section

DS4001PWM_Bx

Purpose

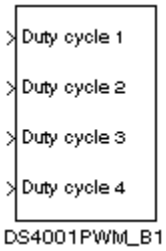
To provide four 1-phase PWM generations with variable duty cycles.

Where to go from here

Information in this section

Block Description (DS4001PWM_Bx)

Illustration



Purpose

To provide four 1-phase PWM generations with variable duty cycles.

Description

Note

Multiple use of the same channel is not allowed for DS4001PWM_Bx, DS4001F2D_Bx_Cy, and DS4001D2F_Bx_Cy. Because every PWM channel needs a timer clock source, the respective timer gate input (TMRGS1 … 4) has to be connected to the timer output pin 5 (TMROUT5). Thus, DS4001D2F_Bx_C5 and DS4001F2D_Bx_C5 must not be selected if DS4001PWM_Bx is used.

I/O mapping

For details on the I/O connector pinouts of the DS4001, refer to PWM Signal Generation (DS4001 Features 🕮).

I/O characteristics

Scaling between the duty cycle and the input of the block:

Duty Cycle	Simulink Input
0 … 100%	0 … 1

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS4001PWM_Bx) on page 27)
- Initialization Page (refer to Initialization Page (DS4001PWM_Bx) on page 28)
- Termination Page (refer to Termination Page (DS4001PWM_Bx) on page 29)

Related RTLib functions

`ds4001_stc_init`, `ds4001_pwm_init`, `ds4001_pwm`, `ds4001_timer_stop`

Related topics

References

ds4001_pwm (DS4001 RTLib Reference 🕮)
ds4001_pwm_init (DS4001 RTLib Reference 🕮)
ds4001_stc_init (DS4001 RTLib Reference 🕮)
ds4001_timer_stop (DS4001 RTLib Reference 🕮)

Unit Page (DS4001PWM_Bx)

Purpose

To specify the board number and the PWM frequency.

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.

Range Lets you select one of the 5 valid frequency ranges:

Range Number	Min. Frequency	Max. Frequency
1	76.3 Hz	833.3 kHz
2	7.63 Hz	83.33 kHz
3	763 mHz	8.333 kHz

Range Number	Min. Frequency	Max. Frequency
4	76.3 mHz	833.3 Hz
5	7.63 mHz	83.33 Hz

Note

To optimize the resolution of the generated PWM signal, you should always choose the frequency range with the lowest possible range number.
For example, if your desired PWM frequency is 81 kHZ, you should use frequency range 1 (76.3 Hz … 833.3 kHz) rather than frequency range 2.

Frequency Lets you specify a frequency value within the selected frequency range. Alternatively, you may also state a valid MATLAB expression, meaning a mathematical expression containing numbers and variables that you defined in MATLAB's Workspace beforehand.

Related topics

References

Initialization Page (DS4001PWM_Bx)

Purpose

To specify the initial duty cycle.

Description

During the model initialization phase, an initial duty cycle is set for PWM generation. This is especially useful if the PWM signal is generated from within a triggered or enabled subsystem which is not executed right from the start of the simulation. With the initialization value all channels have defined outputs during this simulation phase. You can specify them on the Initialization page.

Dialog settings

Initialization value Lets you specify the initial duty cycles at the start of the simulation. The duty cycles must remain within the range 0 … 1. The default value is 0.5 for each channel. To assign one initialization value to all of the four channels, specify the desired value in the lowest row before pushing the Set all button.

Related topics

References

Termination Page (DS4001PWM_Bx)..... 29
Unit Page (DS4001PWM_Bx)..... 27

Termination Page (DS4001PWM_Bx)

Purpose

To specify the duty cycle at termination.

Description

When the simulation terminates, all channels hold their signal shape by default. You can specify a termination value to drive your external hardware into a safe final condition.

The specified termination values of I/O channels are set when the simulation executes its termination function by setting the `simState` variable to STOP. If you stop the real-time application by using ControlDesk's **Stop RTP** command, the processor resets immediately without executing termination functions. The current values of the I/O channels are kept and the specified termination values are not set.

Dialog settings

Termination value Lets you choose, whether keep the current duty cycles when the simulation terminates or select the checkbox to specify a termination value. The duty cycles must remain within the range 0 … 1. To assign one initialization value to all of the 4 channels, specify the desired value in the lowest row before pushing the **Set all** button. A termination duty cycle equal to 0 resets the outputs, that means the PWM generation will be stopped.

Related topics

References

Initialization Page (DS4001PWM_Bx)..... 28
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)
Unit Page (DS4001PWM_Bx)..... 27

DS4001D2F_Bx_Cy

Purpose

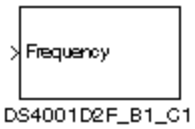
To provide the generation of a non-negative square-wave signal with variable frequency.

Where to go from here

Information in this section

Block Description (DS4001D2F_Bx_Cy)

Illustration



Purpose

To provide the generation of a non-negative square-wave signal with variable frequency.

I/O mapping

For details on the I/O connector pinouts of the DS4001, refer to Square-Wave Signal Generation (D2F) (DS4001 Features 🕮).

Note

Multiple use of the same channel is not allowed for DS4001D2F_Bx_Cy, DS4001F2D_Bx_Cy, and DS4001PWM_Bx. DS4001D2F_Bx_C5 must not be selected if DS4001PWM_Bx is used.

I/O characteristics

- The block input determines the frequency of the square-wave output signal. The lowest possible frequency is 3.815 mHz (range 1). The frequency may reach up to 1.25 MHz (range 5).
- If the block input is not within the limits of the selected frequency range, the output will keep the value of the respective limit.

  For example, if range 1 is selected, an input frequency of 30 Hz will cause the generation of a square-wave with 38.15 Hz.
- A frequency value equal to 0 stops the signal generation.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS4001D2F_Bx_Cy) on page 31)
- **Parameters Page** (refer to Parameters Page (DS4001D2F_Bx_Cy) on page 32)

Related RTLib functions

`ds4001_stc_init`, `ds4001_d2f_init`, `ds4001_d2f`

Related topics

References

ds4001_d2f (DS4001 RTLib Reference 🕮)
ds4001_d2f_init (DS4001 RTLib Reference 🕮)
ds4001_stc_init (DS4001 RTLib Reference 🕮)

Unit Page (DS4001D2F_Bx_Cy)

Purpose

To specify the board and channel number for the generation of a non-negative square-wave signal.

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 the channel number in the range 1 … 5. At signal TMROUTx (with x as channel number) a timer interrupt is generated automatically.

Note

If you use **DS4001PWM_Bx** in your model, you are not allowed to use channel 5 for the signal generation.

Range Lets you select one of the 5 valid frequency ranges:

Range Number	Min. Frequency	Max. Frequency
1	38.15 Hz	1.25 MHz
2	3.815 Hz	125 kHz
3	381.5 mHz	12.5 kHz
4	38.15 mHz	1.25 kHz
5	3.815 mHz	125 Hz

Note

To optimize the resolution of the generated square-wave signal, you should always choose the frequency range with the lowest possible range number. For example, if your desired frequency is 100 kHZ, you should use frequency range 1 (38.15 Hz … 1.25 MHz) rather than frequency range 2.

Related topics

References

Parameters Page (DS4001D2F_Bx_Cy)..... 32

Parameters Page (DS4001D2F_Bx_Cy)

Purpose

To specify the initialization and termination frequency for the generation of a non-negative square-wave signal.

Description

During the model initialization phase, an initial frequency is set for square-wave generation. This is especially useful if the square-wave signal is generated from within a triggered or enabled subsystem which is not executed right from the start of the simulation. With the initialization frequency value all channels have defined outputs during this simulation phase.

When the simulation terminates, all channels hold their last digital output values by default. You can specify a termination frequency to drive your external hardware into a safe final condition.

The specified termination values of I/O channels are set when the simulation executes its termination function by setting the `simState` variable to STOP. If you stop the real-time application by using ControlDesk's Stop RTP command, the processor resets immediately without executing termination functions. The current values of the I/O channels are kept and the specified termination values are not set.

Dialog settings

Initialization frequency Lets you specify the frequency of the output signal at the start of the simulation. An initial value equal to 0 resets the output; i.e., the square wave generation is not started. If the initial frequency is not within the selected frequency range, an error message will be displayed.

Termination frequency Lets you choose whether keep the current frequency when the simulation terminates or select the checkbox to specify the desired value. A termination value equal to 0 resets the output; i.e., the square-wave generation is stopped. If the termination frequency is not within the selected frequency range, an error message will be displayed.

Related topics

References

simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)
Unit Page (DS4001D2F_Bx_Cy)..... 31

DS4001F2D_Bx_Cy

Purpose

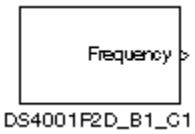
To provide read access to the frequency measurement of a square-wave signal.

Where to go from here

Information in this section

Block Description (DS4001F2D_Bx_Cy)

Illustration



Purpose

To provide read access to the frequency measurement of a square-wave signal.

I/O mapping

For details on the I/O connector pinouts of the DS4001, refer to Square-Wave Signal Measurement (F2D) (DS4001 Features 🕮).

Note

Multiple use of the same channel is not allowed for DS4001F2D_Bx_Cy, DS4001D2F_Bx_Cy, and DS4001PWM_Bx. DS4001F2D_Bx_C5 must not be selected if DS4001PWM_Bx is used.

I/O characteristics

- The block output is the measured frequency value for the selected channel.
- If the block input is not within the limits of the selected frequency range, the output will keep the value of the respective limit. For example, if range 1 is selected, a square-wave with 70 Hz will yield a frequency value of 76.3 Hz.

Note

Due to hardware limitations, there is no possibility to set the output to 0 if the selected frequency range is exceeded.

Dialog pages

The dialog settings can be specified on Parameters Page.

Related RTLib functions

`ds4001_stc_init`, `ds4001_f2d_init`, `ds4001_f2d`

Related topics

References

ds4001_f2d (DS4001 RTLib Reference 🕮)
ds4001_f2d_init (DS4001 RTLib Reference 🕮)
ds4001_stc_init (DS4001 RTLib Reference 🕮)

Parameters Page (DS4001F2D_Bx_Cy)

Purpose

To specify the board number, channel number and range.

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 the channel number in the range 1 … 5.

Note

If you use DS4001PWM_Bx in your model, you are not allowed to use channel 5 for the frequency measurement.

Range Lets you select one of the 5 valid frequency ranges:

Range Number	Min. Frequency	Max. Frequency
1	76.3 Hz	1.67 MHz
2	7.63 Hz	167 kHz
3	763 mHz	16.7 kHz
4	76.3 mHz	1.67 kHz
5	7.63 mHz	167 Hz

Tip

To optimize the resolution of your frequency measurement, you should always choose the frequency range with the lowest possible range number. For example, if the frequency to be measured is 100 kHz, you should use frequency range 1 (76.3 Hz … 1.67 MHz) rather than frequency range 2.

Interrupts

Introduction

The Library: rtilibm/DS4001 provides access to the hardware interrupts of the DS4001.

DS4001_HWINT_Bx_Iy

Purpose

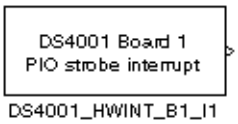
To make the hardware interrupts of the DS4001 available as trigger sources in a block diagram.

Where to go from here

Information in this section

Block Description (DS4001_HWINT_Bx_Iy)

Illustration



Purpose

To make the hardware interrupts of the DS4001 available as trigger sources in a block diagram.

I/O mapping

For details on the I/O connector pinouts of the DS4001, refer to Interrupts Provided by the DS4001 (DS4001 Features 🕮).

Dialog pages

The dialog settings can be specified on the **Parameters Page**.

Related RTLib functions

`ds4001_set_int_input`

Related topics

References

ds4001_set_int_input (DS4001 RTLib Reference 🕮)

Parameters Page (DS4001_HWINT_Bx_Iy)

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.

Type Lets you select the type of the interrupt source. The DS4001 provides 3 interrupts on external events and 5 timer interrupts:

Interrupt No.	Interrupt Type
1	PIO strobe interrupt, connected to the PSTB input
2	User interrupt 1
3	User interrupt 2
4	Timer interrupt 1
5	Timer interrupt 2
6	Timer interrupt 3
7	Timer interrupt 4
8	Timer interrupt 5

The PSTB input can be used as an additional external interrupt source because all DS4001 I/O blocks are configured for non strobed operation.

The user interrupts are triggered by an external signal and can be used freely.

The timer interrupts are triggered by the rising edge of the TMROUTx signals which can be specified for **DS4001PWM_Bx** and **DS4001D2F_Bx_Cy**.

Related topics

References

DS4001D2F_Bx_Cy 30
DS4001PWM_Bx 26

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