DS2201 Multi-I/O Board

RTI Reference

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dSPACE

How to Contact dSPACE

Mail:	dSPACE GmbH Rathenaustraße 26 33102 Paderborn Germany
Tel.:	+49 5251 1638-0
Fax:	+49 5251 16198-0
E-mail:	info@dspace.de
Web:	http://www.dspace.com

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.
  Tel.: +49 5251 1638-941 or e-mail: support@dspace.de

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 RTI reference provides a full description of the Real-Time Interface (RTI) software support for the DS2201 Multi-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 DS2201 Blockset

Introduction

Here you get basic information on the DS2201 blockset.

Overview of the DS2201 Blockset

About this board

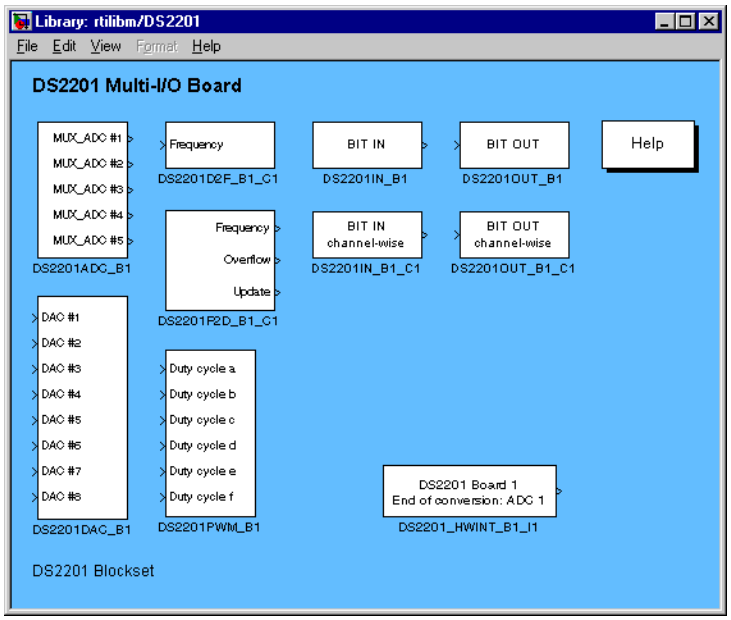
The DS2201 Multi-I/O Board provides I/O units for ADC, DAC, digital I/O, signal generation and frequency measurement.

Library access

The Real-Time Interface (RTI) board library for the DS2201 Multi-I/O Board provides the RTI blocks that implement the functionality and I/O capabilities of the DS2201 board in Simulink models.

DS2201

After you double-click the corresponding board library icon in the **rtilibm** library the **Library: rtilibm/DS2201** opens:



Library components

The following I/O units can be accessed by the RTI blockset for the DS2201:

- ADC Unit on page 11
- DAC Unit on page 15
- Digital I/O Unit on page 21
- Timing I/O Unit on page 33
- Interrupts on page 45

Demo model

For Simulink models that show how to use the RTI blocks of the DS2201 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\`.

Related topics

Basics

DS2201 Architecture (DS2201 Features 🕮)

ADC Unit

Introduction

The Library: rtilibm/DS2201 provides access to the ADC unit of the DS2201.

You can configure the channels of the DS2201 digital unit freely for input or output.

DS2201ADC_Bx

Purpose

To provide read access to 20 channels of 5 parallel A/D converters. The 5 converters are multiplexed to 4 channels each.

Where to go from here

Information in this section

Block Description (DS2201ADC_Bx)

Block

Purpose

To provide read access to 20 channels of 5 parallel A/D converters. The 5 converters are multiplexed to 4 channels each.

Note

Because the A/D conversion works in polling mode, do not specify an *end of conversion* or *user* interrupt using the HWINT block. Otherwise the processor will be blocked. For further information, refer to Limitations (DS2201 Features 🕮).

I/O mapping

For details on the I/O mapping, refer to Analog/Digital Conversion (DS2201 Features 🕮).

I/O characteristics

- The scaling between the analog input voltage and the output of the block is:

Input Voltage Range	Simulink Output
-10 V … +10 V	-1.0 … +1.0

- Each block output is associated with one of 5 independent A/D converters. Therefore, you can access channels 1 … 4 at the first block output, channels 5 … 8 at the second, and so on.
- Each output vector width matches the number of selected channels in the corresponding group.
- The resolution of all channels is 12 bits.
- For optimized data conversion you should reduce the number of converters used. The DS2201 ADC unit always converts the 4 channels of a converter at a time. You should therefore use channels 1, 2, 3 and 4 if your application needs 4 input channels.

Dialog pages

The dialog settings can be specified on the Unit Page.

Related RTLib functions

`ds2201_init`, `ds2201_adc_start`, `ds2201_adc_in`

Related topics

References

ADC Unit (DS2201 RTLib Reference 🕮)
Analog/Digital Conversion (DS2201 Features 🕮)

Unit Page (DS2201ADC_Bx)

Purpose

To specify the board number and select a set of channels of the 5 A/D converter.

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.

ADC1 Lets you select a set of up to 4 channels (channels 1 … 4) of the first A/D converter.

ADC2 Lets you select a set of up to 4 channels (channels 5 … 8) of the second A/D converter.

ADC3 Lets you select a set of up to 4 channels (channels 9 … 12) of the third A/D converter.

ADC4 Lets you select a set of up to 4 channels (channels 13 … 16) of the fourth A/D converter.

ADC5 Lets you select a set of up to 4 channels (channels 17 … 20) of the fifth A/D converter.

To select all or none of the 20 channels of the 5 converters, push the All or the None button respectively.

Related topics

Basics

ADC Unit (DS2201 Features 🕮)

DAC Unit

Introduction

The Library: rtilibm/DS2201 provides access to the DAC unit of the DS2201.

DS2201DAC_Bx

Purpose

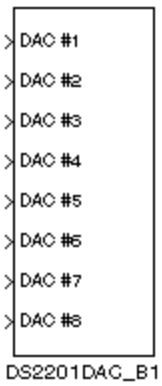
To get write access to 8 channels of 2 A/D converters.

Where to go from here

Information in this section

Block Description (DS2201DAC_Bx)

Block



Purpose

To get write access to 8 channels of 2 A/D converters.

I/O mapping

For details on the I/O mapping, refer to Digital/Analog Conversion (DS2201 Features 🕮).

I/O characteristics

- The scaling between the analog output voltage and the input of the block is:

Output Voltage Range	Simulink Input
-10 V … +10 V	-1.0 … +1.0

- The board provides its outputs in unlatched mode, which means that each channel is converted and output immediately.
- The resolution of all channels is 12 bits.

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS2201DAC_Bx) on page 17)
- Initialization Page (refer to Initialization Page (DS2201DAC_Bx) on page 18)
- Termination Page (refer to Termination Page (DS2201DAC_Bx) on page 18)
- Advanced Page (refer to Advanced Page (DS2201DAC_Bx) on page 19)

Related RTLib functions

`ds2201_init`, `ds2201_set_errmode`, `ds2201_dac_out`

Related topics

References

DAC Unit (DS2201 RTLib Reference 🕮)
Digital/Analog Conversion (DS2201 Features 🕮)

Unit Page (DS2201DAC_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

Initialization Page (DS2201DAC_Bx)

Purpose

To specify the intial voltage value.

Description

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

Dialog settings

Initialization value Lets you assign the initial output voltage at the start of the simulation for each channel. Valid values must remain within the output voltage range of ±10 V.

To assign one initialization value to all channels, specify the desired value before pushing the Set all button.

Related topics

References

Advanced Page (DS2201DAC_Bx)..... 19
Termination Page (DS2201DAC_Bx)..... 18
Unit Page (DS2201DAC_Bx)..... 17

Termination Page (DS2201DAC_Bx)

Purpose

To specify the termination voltage value.

Description

When the simulation terminates, all channels hold their last output values by default. You can set user-defined output values on termination 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

Output on termination Lets you assign the output voltage on termination for each channel. Either keep the current output voltage when the simulation terminates or select the checkbox of the channel to be configured and specify the desired output value.

To assign one termination output value to all of the channels, select the checkbox in the second to last row and specify the desired value before pushing the **Set all** button. Valid values must remain within the output voltage range of ±10 V.

Related topics

References

Advanced Page (DS2201DAC_Bx)..... 19
Initialization Page (DS2201DAC_Bx)..... 18
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)
Unit Page (DS2201DAC_Bx)..... 17

Advanced Page (DS2201DAC_Bx)

Purpose

To specify the I/O error handling.

Description

Via the I/O error line of the PHS bus, malfunctions on the processor board are reported to the peripherals and a peripheral failure is signaled to the processor board. Malfunctions are caused by watchdog timeouts, resetting the processor, power failures and hardware error conditions, for example.

Note

By default, the DS2201 board outputs are set to zero. In this case the termination values set on the Termination page have no effect.

Dialog settings

Reaction on I/O error Lets you select for each channel that the block's output voltage will be set to zero if an I/O error signal is generated by the hardware. Selectable for channels 1 … 4 and 5 … 8 respectively. To assign one value to all channels, specify the desired value in the lowest row before pushing the **Set all** button.

Related topics

References

Initialization Page (DS2201DAC_Bx)..... 18
Termination Page (DS2201DAC_Bx)..... 18
Unit Page (DS2201DAC_Bx)..... 17

Digital I/O Unit

Introduction

The Library: rtilibm/DS2201 provides access to the Digital I/O unit of the DS2201.

Where to go from here

Information in this section

DS2201IN_Bx

Purpose

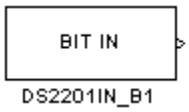
To provide read access to the 16-bit digital input.

Where to go from here

Information in this section

Block Description (DS2201IN_Bx)

Block



Purpose

To provide read access to the 16-bit digital input.

I/O mapping

For details on the I/O mapping, refer to Digital I/O Unit (DS2201 Features 🕮).

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.
- 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)

- The width of the block output vector matches the number of selected channels.

Dialog pages

The dialog settings can be specified on the Unit Page.

Related RTLib functions `ds2201_init`, `ds2201_pin_io_init`, `ds2201_pin_io_in`

Related topics

Basics

Digital I/O Unit (DS2201 Features 🕮)

References

Digital I/O Unit....21
Digital I/O Unit (DS2201 RTLib Reference 🕮)

Unit Page (DS2201IN_Bx)

Purpose To specify the board number and select a set of channels.

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 selection Lets you select a set of up to 16 channels. To select either none of the channels or all of the channels, push the corresponding None or All button.

Related topics

References

DS2201IN_Bx....22

DS2201IN_Bx_Cy

Purpose

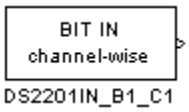
To provide read access to the 16-bit digital input.

Where to go from here

Information in this section

Block Description (DS2201IN_Bx_Cy)

Block



Purpose

To provide read access to the 16-bit digital input.

I/O mapping

For details on the I/O mapping, refer to Digital I/O Unit (DS2201 Features 🕮).

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.
- 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)

Dialog settings

The dialog settings can be specified on the Unit Page.

Related RTLib functions

`ds2201_init`, `ds2201_pin_io_init`, `ds2201_pin_io_in`

Related topics

Basics

Digital I/O Unit (DS2201 Features 🕮)

References

Digital I/O Unit.....21
Digital I/O Unit (DS2201 RTLib Reference 🕮)

Unit Page (DS2201IN_Bx_Cy)

Purpose

To specify the board number and a 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 selection Lets you select a channel number.

Related topics

References

DS2201IN_Bx_Cy.....24

DS2201OUT_Bx

Purpose

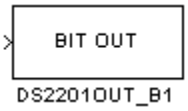
To provide write access to the 16-bit digital output.

Where to go from here

Information in this section

Block Description (DS2201Out_Bx)

Block



Purpose

To provide write access to the 16-bit digital output.

I/O mapping

For details on the I/O mapping, refer to Digital I/O Unit (DS2201 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.
- The relation between the digital output and the input of the block is:

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

- The width of the block input vector must match the number of selected channels.

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS2201OUT_Bx) on page 27)
- Initialization Page (refer to Initialization Page (DS2201OUT_Bx) on page 28)
- Termination Page (refer to Termination Page (DS2201OUT_Bx) on page 28)

Related RTLib functions

`ds2201_init`, `ds2201_pin_io_init`, `ds2201_pin_io_clear`, `ds2201_pin_io_set`

Related topics

Basics

Digital I/O Unit (DS2201 Features 🕮)

References

Digital I/O Unit 21
Digital I/O Unit (DS2201 RTLib Reference 🕮)

Unit Page (DS2201OUT_Bx)

Purpose

To specify the board number and select a set of channels.

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 selection Lets you select a set of up to 16 channels. To select either none of the channels or all of the channels, push the corresponding None or All button.

Related topics

References

Initialization Page (DS2201OUT_Bx) 28
Termination Page (DS2201OUT_Bx) 28

Initialization Page (DS2201OUT_Bx)

Purpose

To specify the intial output state.

Description

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

Dialog settings

Configure channels Lets you select either channels 1 … 8 or channels 9 … 16 to be configured.

Initialization state Lets you select the initial digital output at the start of the simulation for each channel.

To assign one initialization state to all of the channels displayed, specify the desired value before pushing the **Set all** button.

Related topics

References

Termination Page (DS2201OUT_Bx)..... 28
Unit Page (DS2201OUT_Bx)..... 27

Termination Page (DS2201OUT_Bx)

Purpose

To specify the termination output state.

Description

When the simulation terminates, the selected channels holds its last digital output value by default. You can set a user-defined output value on termination to drive your external hardware into a safe final condition.

Dialog settings

Configure channels Lets you select either channels 1 … 8 or channels 9 … 16 to be configured.

Termination state Lets you assign the output stage on termination for each channel. Either keep the current digital output when the simulation terminates or set the digital output to a specified value. Selectable for each channel.

To assign one termination state to all of the channels displayed, select the checkbox in the second to last row and specify the desired value before pushing the **Set all** button.

Related topics

References

Initialization Page (DS2201OUT_Bx)..... 28
Unit Page (DS2201OUT_Bx)..... 27

DS2201OUT_Bx_Cy

Purpose

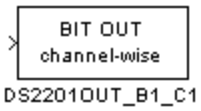
To provide write access to the 16-bit digital output.

Where to go from here

Information in this section

Block Description (DS2201OUT_Bx_Cy)

Block



Purpose

To provide write access to the 16-bit digital output.

I/O mapping

For details on the I/O mapping, refer to Digital I/O Unit (DS2201 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.
- The relation between the digital output and the input of the block is:

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 (DS2201OUT_Bx_Cy) on page 31)
- **Parameters Page** (refer to Parameters Page (DS2201OUT_Bx_Cy) on page 31)

Related RTLib functions

`ds2201_init`, `ds2201_pin_io_init`, `ds2201_pin_io_clear`, `ds2201_pin_io_set`

Related topics

References

Digital I/O Unit....21
Digital I/O Unit (DS2201 RTLib Reference 🕮)
Parameters Page (DS2201OUT_Bx_Cy)....31
Unit Page (DS2201OUT_Bx_Cy)....31

Unit Page (DS2201OUT_Bx_Cy)

Purpose

To specify the board number and select a channel.

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 … 16.

Related topics

References

Parameters Page (DS2201OUT_Bx_Cy)....31

Parameters Page (DS2201OUT_Bx_Cy)

Purpose

To specify the intitial output state and the termination output state.

Description

- During the model initialization phase, an initial digital output value is written to the selected channel. This is especially useful if the channel is written to

from within a triggered or enabled subsystem that is not executed right from the start of the simulation. With the initialization value, the selected channel has a defined output during this simulation phase.

- When the simulation terminates, the selected channel holds its last digital output value by default. You can set a user-defined output value on termination to drive your external hardware into a safe final condition.

Dialog settings

Initial output state Lets you select the initial digital output of the selected channel at the start of the simulation.

Termination output state Lets you assign the output stage on termination. Either keep the current digital output of the selected channel when the simulation terminates or set the digital output to a specified value. Select the checkbox to specify the desired value.

Related topics

References

Unit Page (DS2201OUT_Bx_Cy)..... 31

Timing I/O Unit

Introduction

The Library: rtilibm/DS2201 provides access to the Timing I/O unit of the DS2201.

Where to go from here

Information in this section

DS2201PWM_Bx

Purpose

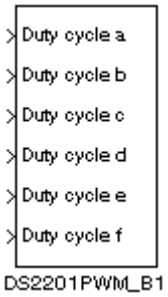
To provide a 4/6-channel PWM generation with a variable duty cycle.

Where to go from here

Information in this section

Block Description (DS2201PWM_Bx)

Block



Purpose

To provide a 4/6-channel PWM generation with a variable duty cycle.

I/O mapping

For details on the I/O mapping, refer to PWM Signal Generation (DS2201 Features 🕮).

I/O characteristics

- The scaling between the duty cycle and the input of the block is:

Duty Cycle	Simulink Input
0 … 100%	0.0 … 1.0 (double)

- If channels 5 and 6, labeled **Duty cycle e** and **Duty cycle f**, are unconnected, the **DS2201PWM** block represents a 4-channel PWM generator. If either channel 5 or 6 is connected, the block represents a 6-channel PWM generator.
- The PWM resolution is 40 ns for PWM frequencies above approximately 385 Hz, and 160 ns otherwise.

Note

- If you use the **DS2201PWM_Bx** block together with a **DS2201F2D_Bx_Cy** block, the generated frequency for the **PWM block** is limited to 23.81 Hz.
- You cannot use a **DS2201D2F_Bx_Cy** block together with a **DS2201PWM_Bx** block.

For further information, refer to Limitations (DS2201 Features 🕮).

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS2201PWM_Bx) on page 35)
- **Initialization Page** (refer to Initialization Page (DS2201PWM_Bx) on page 36)
- **Termination Page** (refer to Termination Page (DS2201PWM_Bx) on page 37)

Related RTLib functions

`ds2201_init`, `ds2201_pwmvar_init`, `ds2201_pwmvar`

Related topics

References

DS2201D2F_Bx_Cy 38
DS2201F2D_Bx_Cy 41
Timing I/O Unit (DS2201 Features 🕮)
Timing I/O Unit (DS2201 RTLib Reference 🕮)

Unit Page (DS2201PWM_Bx)

Purpose

To specify 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.

Frequency Lets you select the frequency in the range of 0.01 Hz … 1 MHz. You can 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 (DS2201PWM_Bx)..... 36
Termination Page (DS2201PWM_Bx)..... 37

Initialization Page (DS2201PWM_Bx)

Purpose

To specify the PWM initialization.

Description

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

Dialog settings

Initialization duty cycle The initial duty cycle at the start of the simulation. Valid values must remain within 0 … 1. It is selectable for each channel. The default value for each channel is 0.5. To assign one initialization value to all of the 6 channels, specify the duty cycle in the lowest row before pushing the Set all button.

Related topics

References

Termination Page (DS2201PWM_Bx)..... 37
Unit Page (DS2201PWM_Bx)..... 35

Termination Page (DS2201PWM_Bx)

Purpose

To specify the PWM termination.

Description

When the simulation terminates, all channels hold their last duty cycle values by default. You can set user-defined duty cycle values on termination to drive your external hardware into a safe final condition.

Dialog settings

Termination duty cycle Either keep the current duty cycle when the simulation terminates or specify a value for the duty cycle. For this purpose, select the checkbox of the appropriate channel and specify the duty cycle on termination. Valid values must remain within 0 … 1. To assign one value on termination to all of the 6 channels, select the checkbox in the lowest row and specify the duty cycle before pushing the **Set all** button.

Related topics

References

Initialization Page (DS2201PWM_Bx) 36
Unit Page (DS2201PWM_Bx) 35

DS2201D2F_Bx_Cy

Purpose

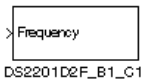
To generate square-wave signals.

Where to go from here

Information in this section

Block Description (DS2201D2F_Bx_Cy)

Block



Purpose

To generate square-wave signals.

Description

This block provides access to generate non-negative square-wave signals with variable frequencies on 2 channels.

Note

- You can use up to 2 DS2201F2D_Bx_Cy blocks in your model together with the DS2201D2F_Bx_Cy block.
- The DS2201D2F_Bx_Cy block cannot be used simultaneously with a DS2201PWM_Bx block.

For further information, refer to Limitations (DS2201 Features 🕮).

I/O mapping

For details on the I/O mapping, refer to Square-Wave Signal Generation (D2F) (DS2201 Features 🕮).

I/O characteristics

The block provides 1 input port:

Input Port	Simulink Output	Data Type	Description
Frequency	0.01 … 10,000 Hz	double	Specifies the square-wave signal frequency that should be generated in Hz.

Frequencies that have been specified outside the given range are modified to the frequency limits:

- Frequency > range: frequency = 10,000 Hz
- Frequency < range: frequency = 0.01 Hz

The resolution is 160 ns.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS2201_D2F_Bx_Cy) on page 39)
- **Parameters Page** (refer to Parameters Page (DS2201_D2F_Bx_Cy) on page 40)

Related RTLib functions

`ds2201_init`, `ds2201_dtof_enable`, `ds2201_dtof`

Related topics

References

DS2201F2D_Bx_Cy....41
DS2201PWM_Bx....34
Timing I/O Unit (DS2201 Features 🕮)
Timing I/O Unit (DS2201 RTLib Reference 🕮)

Unit Page (DS2201_D2F_Bx_Cy)

Purpose

To specify the channels for square-wave signal generation.

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 number of channels to be used for generating square-wave signals. The possible values are 1 or 2.

Related topics

References

Parameters Page (DS2201_D2F_Bx_Cy)..... 40

Parameters Page (DS2201_D2F_Bx_Cy)

Purpose

To specify the frequency on initialization and termination.

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 value, all channels have defined outputs during this simulation phase.

When the simulation terminates, all channels hold their signal shapes by default.You can set a user-defined frequency on termination to drive your external hardware into a safe final condition.

Dialog settings

Initialization frequency Lets you specify the frequency of the output signal at the start of the simulation. The unit of measure is hertz (Hz). The frequency can be specified in the range 0.01 … 10,000 Hz. The default value is 100 Hz.

Termination frequency By default, the current output shape is kept. If **set to:** is selected, the signal frequency on termination can be specified. The unit of measure is Hz. The frequency can be specified in the range 0.01 … 10,000 Hz. The default value is 100 Hz.

Tip

If you want to get a zero signal on termination, you can use the `ds2201_dtof_enable` function with the `value` parameter set to `DS2201_DTOF_DISABLE`. To implement this feature, you have to use custom code blocks. For detailed information, refer to Inserting Custom C/C++ Code (RTI and RTI-MP Implementation Guide 🕮).

Related topics

References

ds2201_dtof_enable (DS2201 RTLib Reference 🕮)
Unit Page (DS2201_D2F_Bx_Cy)..... 39

DS2201F2D_Bx_Cy

Purpose

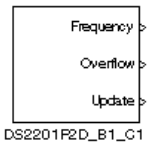
To measure the frequency of square-wave signals on up to 4 channels.

Where to go from here

Information in this section

Block Description (DS2201F2D_Bx_Cy)

Block



Purpose

To measure the frequency of square-wave signals on up to 4 channels.

Note

- If you use the DS2201PWM_Bx block together with a DS2201F2D_Bx_Cy block, the generated frequency for the PWM block is limited to 23.81 Hz.
- If you use the DS2201F2D_Bx_Cy block together with 1 or 2 DS2201D2F_Bx_Cy blocks, the frequency measurement can be done on channels 1 and 2 only.
- If you use one DS2201F2D_Bx_Cy block in your model, the frequency measurement should be done on channel 1. Using 2 DS2201F2D_Bx_Cy blocks in you model, the frequency measurement should be done on channels 1 and 2. In these cases the measurement can reach its maximal frequency range.

For further information, refer to Limitations (DS2201 Features 🕮).

I/O mapping

For details on the I/O mapping, refer to Square-Wave Signal Measurement (F2D) (DS2201 Features 🕮).

I/O characteristics

The block provides 3 output ports:

Output Port	Simulink Output	Data Type	Description
Frequency	0.01 … 60,000 Hz	double	Outputs the average frequency measured in Hz.
Overflow	0: no overflow error 1: overflow error	double	Indicates if an overflow error occurred.
Update	0: no new value 1: new value	double	Indicates if a new frequency value has been measured since the last call.

Note

The values of the maximum frequency depend on the number of channels used. If the ranges are exceeded, the overflow flag is set.
For detailed information on the ranges for frequency measurement, refer to Square-Wave Signal Measurement (F2D) (DS2201 Features 🕮).

Dialog pages

The dialog settings can be specified on the Unit Page.

Related RTLib functions

`ds2201_init`, `ds2201_ftd`

Related topics

References

DS2201D2F_Bx_Cy 38
Timing I/O Unit (DS2201 Features 🕮)
Timing I/O Unit (DS2201 RTLib Reference 🕮)

Unit Page (DS2201F2D_Bx_Cy)

Purpose

To specify the square-wave signal measurement.

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 number of channels to be measured. The possible values are within the range 1 … 4.

Related topics

References

Interrupts

Introduction

The Library: rtilibm/DS2201 provides access to the Interrupts unit of the DS2201.

DS2201_HWINT_Bx_Iy

Purpose

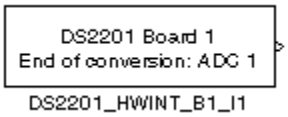
To make the hardware interrupts of the DS2201 board available as trigger sources in a block diagram.

Where to go from here

Information in this section

Block Description (DS2201_HWINT_Bx_Iy)

Block



Purpose

To make the hardware interrupts of the DS2201 board available as trigger sources in a block diagram.

Note

Because the A/D conversion works in polling mode, do not specify an *end of conversion* or *user* interrupt using the HWINT block. Otherwise the processor will be blocked. For further information, refer to Limitations in the *DS2201 Features* document.

Dialog pages

The dialog settings can be specified on the Unit Page.

Related topics

Basics

ADC-End-of-Conversion Interrupt (DS2201 Features 🕮)

Unit Page (DS2201_HWINT_Bx_Iy)

Purpose

To specify 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.

Type Lets you select the type of the interrupt source.

Interrupt No.	Interrupt Type	Required RTI Block
1	End of conversion: ADC 1	DS2201ADC_Bx
2	End of conversion: ADC 2	
3	End of conversion: ADC 3	
4	End of conversion: ADC 4	
5	End of conversion: ADC 5	
6	Slave DSP ready	
8	User interrupt	

An interrupt is available for each of the 5 A/D converters on end of conversion.

The *Slave-DSP ready* interrupt belongs to the slave DSP on the DS2201 board. It is set after the slave DSP has finished command execution and is waiting for a new command.

To feed an external interrupt signal into your system, a *User interrupt* is available. For information on the I/O mapping, refer to User Interrupt (DS2201 Features 🕮).

Related topics

References

DS2201_HWINT_Bx_Iy.....46

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