DS2202 HIL I/O Board

RTI Reference

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dSPACE

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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

Content

This RTI Reference provides a full description of the Real-Time Interface (RTI) software for the *DS2202 HIL I/O Board*, which can be controlled by a 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_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/go/help.

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 DS2202 Blockset

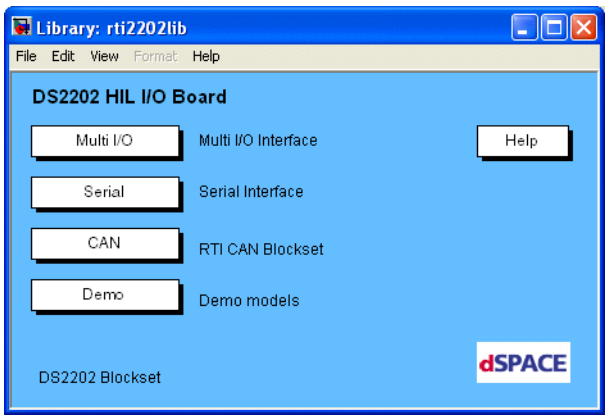
Overview of the DS2202 Blockset

Introduction

The board library for the DS2202 – rti2202lib – provides RTI blocks that implement the functionality and I/O capabilities of the DS2202 HIL I/O Board.

Library access

After you double-click the DS2202 button the rti2202lib window is displayed.



The RTI blocks are designed to specify the hardware setup for real-time applications.

Library components

The following rti2202lib components are available in the Library: rti2202lib window:

Multi I/O sublibrary comprising RTI blocks for the multi I/O interface. This sublibrary provides access to A/D conversion, digital I/O and PWM signal measurement, for example. For detailed information, see Multi I/O Interface on page 13.

SERIAL sublibrary comprising RTI blocks for the serial interface. For detailed information, see Serial Interface on page 57.

CAN sublibrary comprising RTI blocks for CAN access. For detailed information, see Basics on the RTI CAN Blockset (RTI CAN Blockset Reference 🕮).

Demo Shows example models.

Related topics

Basics

Basics on the RTI CAN Blockset (RTI CAN Blockset Reference 🕮)

References

Multi I/O Interface

Where to go from here

Information in this section

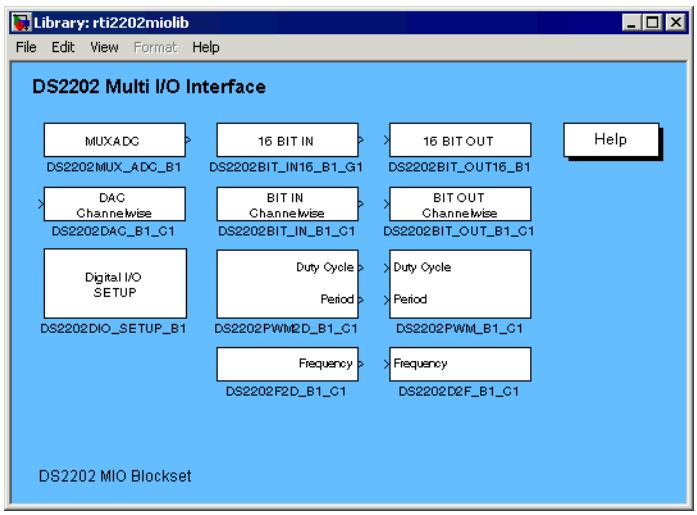
Information in other sections

General Information on the Multi I/O Interface

Overview of the Multi I/O Interface

Overview

After you double-click the **Multi I/O** button in the **Library: rti2202lib**, the **Library: rti2202miolib** window is displayed.



The buttons of this library provide access to the RTI I/O blocks of the multi I/O interface (MIO).

ADC Unit

Where to go from here

Information in this section

DS2202MUX_ADC_Bx..... 15
To read from up to 16 A/D channels.

Information in other sections

ADC Unit (DS2202 Features 🕮)
The ADC unit consists of a successive approximation register (SAR) A/D converter with a 16:1 input multiplexer that provides 16 input channels (ADC1 … ADC16), with 14-bit resolution each, 20 µs conversion time for all channels, and one integrated sample/hold for all channels.

DS2202MUX_ADC_Bx

Purpose

To read from up to 16 A/D channels.

Where to go from here

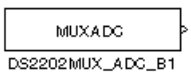
Information in this section

Block Description (DS2202MUX_ADC_Bx)..... 15
To read from up to 16 A/D channels.

Unit Page (DS2202MUX_ADC_Bx)..... 16
To specify the board number and select the channel to be used.

Block Description (DS2202MUX_ADC_Bx)

Illustration



Purpose

To read from up to 16 A/D channels.

I/O mapping

For information on the I/O mapping, refer to ADC Unit (DS2202 Features 🕮).

Note

Depending on your selection, A/D conversion will be started for channels 1 … 4, 1 … 8, 1 … 12, or 1 … 16. To speed up conversion time use low channel numbers.

I/O characteristics

This table shows the scaling between the differential analog input voltage and the output of the block:

Input Voltage Range	Simulink Output
0 V … 60 V	0 … 1

Dialog pages

The dialog settings can be specified on the Unit page (refer to Unit Page (DS2202MUX_ADC_Bx) on page 16).

Related RTLib functions

- `ds2202_adc_block_init`
- `ds2202_adc_start`
- `ds2202_adc_block_in`

Related topics

References

ADC Unit (DS2202 Features 🕮)
ds2202_adc_block_in (DS2202 RTLib Reference 🕮)
ds2202_adc_block_init (DS2202 RTLib Reference 🕮)
ds2202_adc_start (DS2202 RTLib Reference 🕮)
Unit Page (DS2202MUX_ADC_Bx)..... 16

Unit Page (DS2202MUX_ADC_Bx)

Purpose

To specify the board number and select the channel to be used.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Channel selection Lets you choose a set of up to 16 A/D channels. Use the None button to clear an obsolete selection.

Note

You have to select at least one channel.

Related topics

Basics

Block Description (DS2202MUX_ADC_Bx) 15

DAC Unit

Where to go from here

Information in this section

DS2202DAC_Bx_Cy..... 18
To write to a single D/A channel.

Information in other sections

DAC Unit (DS2202 Features 🕮)
The DAC unit provides 20 unipolar D/A output channels (DAC1 … DAC20) with 12-bit resolution (fully monotonic) and 20 µs full-scale settling time to 1 LSB.

DS2202DAC_Bx_Cy

Purpose

To write to a single D/A channel.

Where to go from here

Information in this section

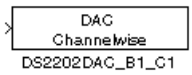
Block Description (DS2202DAC_Bx_Cy)..... 18
To write to a single D/A channel.

Unit Page (DS2202DAC_Bx_Cx)..... 19
To specify the board number and select the channel to be used.

Parameters Page (DS2202DAC_Bx_Cx)..... 20
To specify the initialization and termination.

Block Description (DS2202DAC_Bx_Cy)

Illustration



Purpose

To write to a single D/A channel.

I/O mapping

For information on the I/O mapping, refer to DAC Unit (DS2202 Features 🕮).

I/O characteristics

- This table shows the scaling between the input of the block and the analog output voltage:

Simulink Input	Output Voltage Range
0 … 1	0 … V_{REF}

  For information on V_{REF}, refer to DAC Unit (DS2202 Features 🕮).
- The following table shows the characteristics of the block input:

Characteristic	Value
Data type	Double
Range	0 … 1

- The block provides its outputs in unlatched mode, which means that the channel is converted and output immediately.

Dialog pages

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

- Unit Page (DS2202DAC_Bx_Cx) on page 19
- Parameters Page (DS2202DAC_Bx_Cx) on page 20

Related RTLib functions

`ds2202_dac_out`

Related topics

References

DAC Unit (DS2202 Features 🕮)
ds2202_dac_out (DS2202 RTLib Reference 🕮)
Parameters Page (DS2202DAC_Bx_Cx)..... 20
Unit Page (DS2202DAC_Bx_Cx)..... 19

Unit Page (DS2202DAC_Bx_Cx)

Purpose

To specify the board number and select the channel to be used.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Channel selection Lets you select a single channel in the range 1 … 20.

Related topics

Basics

Block Description (DS2202DAC_Bx_Cy)..... 18

Parameters Page (DS2202DAC_Bx_Cx)

Purpose

To specify the initialization and termination.

Description

Initialization With the initialization value, the D/A channel has a defined output during the initialization phase. This is especially useful if a channel is used in a triggered or enabled subsystem that is not executed right from the start of the simulation.

Termination When the simulation terminates, the D/A channel holds the last output value by default. Using the parameters **Termination mode** and **Termination value**, you can specify a user-defined output value on termination and use this setting 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 enter the initial value for the output voltage at the start of the simulation. The value in the range 0 … 100% corresponds to the DAC output voltage range (0 … V_{REF}).

Termination value Lets you enter the output value at the end of the simulation. The value in the range 0 … 100% corresponds to the DAC output voltage range (0 … V_{REF}).

Related topics

Basics

Block Description (DS2202DAC_Bx_Cy)..... 18

References

simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)

Digital I/O Set Up

DS2202DIO_SETUP_Bx

Purpose

To set up digital I/O.

Where to go from here

Information in this section

Block Description (DS2202DIO_SETUP_Bx)

Illustration

Purpose

To set up digital I/O.

Description

To set the basic parameters of the digital I/O blocks, the multi I/O interface (rti2202miolib) provides a common block that affects the bit I/O unit, PWM generation, and PWM measurement.

You can configure the following parameters of the digital I/O:

- Threshold level for digital inputs
- Termination mode for digital outputs
- Supply voltage for the output drivers (driver behavior configuration)

For information on digital I/O, refer to the *Modular Systems Hardware Installation and Configuration Reference*.

Dialog pages

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

- Unit Page (DS2202DIO_SETUP_Bx) on page 23
- DIG_IN (PWM_IN) Page (DS2202DIO_SETUP_Bx) on page 24
- DIG_OUT Page (DS2202DIO_SETUP_Bx) on page 25
- PWM_OUT Page (DS2202DIO_SETUP_Bx) on page 26

Related RTLib functions

- `ds2202_digout_mode_set`
- `ds2202_digin_threshold_set`
- `ds2202_digout_ls_write`
- `ds2202_digout_hs_vbat1_write`
- `ds2202_digout_hs_vbat2_write`

Related topics

References

Unit Page (DS2202DIO_SETUP_Bx)

Purpose

To configure the threshold level and the termination mode for all digital I/O.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Termination mode Lets you select the termination mode. Possible values are *disable* and *enable*.

Termination Mode	Description
Disable	All digital outputs will be set to high-Z when the simulation terminates.
Enable	The output on termination will be determined by the block-specific settings.

This parameter affects the following blocks:

- DS2202BIT_OUT16_Bx on page 29
- DS2202BIT_OUT_Bx_Cy on page 34
- DS2202PWM_Bx_Cy on page 42

Related topics

Basics

Block Description (DS2202DIO_SETUP_Bx)..... 22

DIG_IN (PWM_IN) Page (DS2202DIO_SETUP_Bx)

Purpose

To set up the parameters for the digital I/O inputs.

Dialog settings

Threshold level digital I/O in Lets you enter the threshold level value for digital inputs for one or more of the 38 channels in the range 1 ... 23.8 V.

Set All Lets you enter the threshold level value for digital inputs for all 38 channels in the range 1 ... 23.8 V.

Note

The PWM input channels and the bit I/O input channels 1 … 24 share the same input pins. For details on conflicting I/O features of the DS2202, refer to Conflicting I/O Features (DS2202 Features 🕮).

Related topics

Basics

Block Description (DS2202DIO_SETUP_Bx)..... 22

DIG_OUT Page (DS2202DIO_SETUP_Bx)

Purpose

To set up the parameters for the digital outputs.

Description

Normally, the low-side switch must be closed to avoid a voltage drift of the digital output. You must connect a pulldown resistor to avoid the voltage drift if the low-side switch is opened. For example, you can use several digital outputs in a wired OR relation using a common pulldown resistor and opening their low-side switches.

Dialog settings

Setup of supply rails Lets you set the supply rails defined by the parameters LOW, VBAT1 and VBAT2.

Parameter	Meaning
LOW	Set the low-side switch for the bit I/O output channel 1 ... 16.
VBAT1	Set the high-side switch to VBAT1 for the bit I/O output channel 1 ... 16.
VBAT2	Set the high-side switch to VBAT2 for the bit I/O output channel 1 ... 16.

Set All Lets you set the supply rails defined by the parameters LOW, VBAT1 and VBAT2 for all 16 bit I/O output channels.

Related topics

Basics

Block Description (DS2202DIO_SETUP_Bx)..... 22

PWM_OUT Page (DS2202DIO_SETUP_Bx)

Purpose

To set up the parameters for the PWM signal outputs.

Dialog settings

Setup of supply rails Lets you set the supply rails defined by the parameters LOW, VBAT1 and VBAT2.

Parameter	Meaning
LOW	Set the low-side switch for the PWM output channel 1 ... 9.
VBAT1	Set the high-side switch to VBAT1 for the PWM output channel 1 ... 9.
VBAT2	Set the high-side switch to VBAT2 for the PWM output channel 1 ... 9.

Set All Lets you set the supply rails defined by the parameters LOW, VBAT1 and VBAT2 for all 9 PWM output channels.

Related topics

Basics

Block Description (DS2202DIO_SETUP_Bx)..... 22

Bit I/O Unit

Where to go from here

Information in this section

Information in other sections

Bit I/O Unit (DS2202 Features 🕮)
The bit I/O unit provides 38 discrete digital input channels, and 16 discrete digital output channels.

DS2202BIT_IN16_Bx_Gy

Purpose

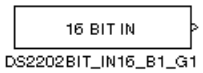
To provide group-wise read access to the digital input.

Where to go from here

Information in this section

Block Description (DS2202BIT_IN16_Bx_Gy)

Illustration



Purpose

To provide group-wise read access to the digital input.

Note

- Use DS2202BIT_IN_Bx_Cy to read from a single bit of the input port.
- Use DS2202DIO_SETUP_Bx to set the threshold level for digital inputs. If you do not include this block in your model the default threshold level of 2.5 V is valid.

I/O mapping

For information on the I/O mapping, refer to Bit I/O Unit (DS2202 Features 🕮).

I/O characteristics

This table shows the relationship between the block input and block output:

Digital Input	Simulink Output
Group 1 and 2:	
0000 0000 0000 0000 … 0000 0000 1111 1101 … 1111 1111 0000 0010 … 1111 1111 1111 1111	0 … 253 … 65282 … 65535
Group 3:	
000000 … 111111	0 … 63

The following table shows the characteristics of the block output:

Characteristic	Value
Data type	Uint16

Dialog pages

The dialog settings can be specified on the Unit page (refer to Unit Page (DS2202BIT_IN16_Bx_Gy) on page 29).

Related RTLib functions `ds2202_bit_io_in`

Related topics

References

Bit I/O Unit (DS2202 Features 🕮)
ds2202_bit_io_in (DS2202 RTLib Reference 🕮)
DS2202BIT_IN_Bx_Cy 32
DS2202DIO_SETUP_Bx 22
Unit Page (DS2202BIT_IN16_Bx_Gy) 29

Unit Page (DS2202BIT_IN16_Bx_Gy)

Purpose To specify the board number and a group for digital input.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Group number Lets you select a group number for digital input in the range 1 … 3. Group 1 and 2 provide 2-byte read access to the 16 bits of the corresponding digital input group. Group 3 provides read access to the 6 bits of the corresponding digital input group.

Related topics

Basics

Block Description (DS2202BIT_IN16_Bx_Gy) 28

DS2202BIT_OUT16_Bx

Purpose To write to the 16 bits of the digital output.

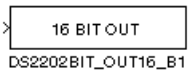
Where to go from here

Information in this section

Block Description (DS2202BIT_OUT16_Bx) 30
To write to the 16 bits of the digital output.

Block Description (DS2202BIT_OUT16_Bx)

Illustration



Purpose

To write to the 16 bits of the digital output.

Note

- Use DS2202BIT_OUT_Bx_Cy to write to a single bit of the output port.
- Use DS2202DIO_SETUP_Bx to configure the digital outputs.
- Before operating the digital output channels, you must connect an external power supply (V_{Bat}) to at least one of the two VBAT supply rails.

I/O mapping

For information on the I/O mapping, refer to Bit I/O Unit (DS2202 Features 🕮).

I/O characteristics

This table shows the relationship between the block input and block output:

Simulink Input	Digital Output
0	0000 0000 0000 0000
…	…
253	0000 0000 1111 1101
…	…
65282	1111 1111 0000 0010
…	…
65535	1111 1111 1111 1111

The following table shows the characteristics of the block input:

Characteristic	Value
Data type	Uint16
Range	0 … 65535

Dialog pages

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

- Unit Page (DS2202BIT_OUT16_Bx) on page 31
- Parameters Page (DS2202BIT_OUT16_Bx) on page 31

Related RTLib functions

`ds2202_bit_io_out`

Related topics

References

Bit I/O Unit (DS2202 Features 🕮)
ds2202_bit_io_out (DS2202 RTLib Reference 🕮)
DS2202BIT_OUT_Bx_Cy 34
DS2202DIO_SETUP_Bx 22
Parameters Page (DS2202BIT_OUT16_Bx) 31
Unit Page (DS2202BIT_OUT16_Bx) 31

Unit Page (DS2202BIT_OUT16_Bx)

Purpose

To specify the board number.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Related topics

Basics

Block Description (DS2202BIT_OUT16_Bx) 30

Parameters Page (DS2202BIT_OUT16_Bx)

Purpose

To set the initial output and termination output.

Description

Initialization During the model initialization phase the initial output specified with **Initialization value** is written to each channel (bit) to ensure a defined output during this simulation phase. This is especially useful if a channel is used

in a triggered or enabled subsystem that is not executed right from the start of the simulation.

Termination When the simulation terminates, all channels hold their last digital output values by default. With **Output on termination** you can specify an output value on termination and use this setting to drive your external hardware into a safe final condition. Use DS2202DIO_SETUP_Bx to enable or disable the termination mode for all digital outputs.

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 enter the initial output value at the start of the simulation. The value must remain in the range 0 … 65535. According to the corresponding binary value, the bits will be set.

Termination output Lets you set the output value specified by **Output on termination** or keep the current output value when the simulation terminates.

Related topics

Basics

Block Description (DS2202BIT_OUT16_Bx)..... 30

References

DS2202DIO_SETUP_Bx..... 22
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)

DS2202BIT_IN_Bx_Cy

Purpose

To read channelwise from a single bit of the digital input.

Where to go from here

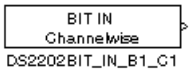
Information in this section

Block Description (DS2202BIT_IN_Bx_Cy)..... 33
To read channelwise from a single bit of the digital input.

Unit Page (DS2202BIT_IN_Bx_Cy)..... 34
To specify the board number and the channel number.

Block Description (DS2202BIT_IN_Bx_Cy)

Illustration



Purpose

To read channelwise from a single bit of the digital input.

Note

- Use DS2202BIT_IN16_Bx_Gy to access a group of bits (16 bits or 6 bits, depending on the corresponding group) of the input port at the same time.
- Use DS2202DIO_SETUP_Bx to set the threshold level for digital inputs. If you do not include this block in your model the default threshold level of 2.5 V is valid.

I/O mapping

For information on the I/O mapping, refer to Bit I/O Unit (DS2202 Features 🕮).

I/O characteristics

This table shows the relationship between the digital input and the output variable (binary representation related to one channel) of the block:

Digital Input	Simulink Output
High	1
Low	0

The following table shows the characteristics of the block output:

Characteristic	Value
Data type	Boolean
Range	0, 1

Dialog pages

The dialog settings can be specified on the Unit page (refer to Unit Page (DS2202BIT_IN_Bx_Cy) on page 34).

Related RTLib functions `ds2202_bit_io_in`

Related topics

References

Bit I/O Unit (DS2202 Features 🕮)
ds2202_bit_io_in (DS2202 RTLib Reference 🕮)
DS2202BIT_IN16_Bx_Gy 27
DS2202DIO_SETUP_Bx 22
Unit Page (DS2202BIT_IN_Bx_Cy) 34

Unit Page (DS2202BIT_IN_Bx_Cy)

Purpose To specify the board number and the channel number.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Channel number Lets you select a channel (bit) in the range 1 … 38.

Related topics

Basics

Block Description (DS2202BIT_IN_Bx_Cy) 33

DS2202BIT_OUT_Bx_Cy

Purpose To write channelwise to a single bit of the digital output.

Where to go from here

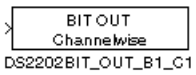
Information in this section

Block Description (DS2202BIT_OUT_Bx_Cy) 35
To write channelwise to a single bit of the digital output.

Unit Page (DS2202BIT_OUT_Bx_Cy) 36
To specify the board number and the channel number.

Block Description (DS2202BIT_OUT_Bx_Cy)

Illustration



Purpose

To write channelwise to a single bit of the digital output.

Note

- Use DS2202BIT_OUT16_Bx to access all 16 bits of the output port at the same time.
- Use DS2202DIO_SETUP_Bx to configure the digital outputs.

I/O mapping

For information on the I/O mapping, refer to Bit I/O Unit (DS2202 Features 🕮).

I/O characteristics

This table shows the relationship between the block input and block output:

Simulink Input	Digital Output
1	High
0	Low

The following table shows the characteristics of the block input:

Characteristic	Value
Data type	Boolean
Range	0, 1

Dialog pages

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

- Unit Page (DS2202BIT_OUT_Bx_Cy) on page 36
- Parameters Page (DS2202BIT_OUT_Bx_Cy) on page 36

Related RTLib functions

- `ds2202_bit_io_set`
- `ds2202_bit_io_clear`

Related topics

References

Bit I/O Unit (DS2202 Features 🕮)
ds2202_bit_io_clear (DS2202 RTLib Reference 🕮)
ds2202_bit_io_set (DS2202 RTLib Reference 🕮)
DS2202BIT_OUT16_Bx 29
DS2202DIO_SETUP_Bx 22
Parameters Page (DS2202BIT_OUT_Bx_Cy) 36
Unit Page (DS2202BIT_OUT_Bx_Cy) 36

Unit Page (DS2202BIT_OUT_Bx_Cy)

Purpose

To specify the board number and the channel number.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Channel number Lets you select a channel (bit) in the range 1 … 16.

Related topics

Basics

Block Description (DS2202BIT_OUT_Bx_Cy) 35

Parameters Page (DS2202BIT_OUT_Bx_Cy)

Purpose

To set the initial output state and the termination output state.

Description

Initialization During the model initialization phase the initial digital output state specified with **Initial output state** is written to each channel (bit) to ensure a defined output during this simulation phase. This is especially useful if a channel is used in a triggered or enabled subsystem that is not executed right from the start of the simulation.

Termination When the simulation terminates, all channels hold their last digital output state by default. With the **Termination output state** you can specify an output state on termination and use this setting to drive your external hardware into a safe final condition. Use DS2202DIO_SETUP_Bx to enable or disable the termination mode for all digital outputs.

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 state Lets you select the output state "Low(0)" or "High(1)" at the start of the simulation.

Termination output state Lets you set the output state "Low(0)" or "High(1)" at the end of the simulation or keep the current output state when the simulation terminates.

Related topics

Basics

Block Description (DS2202BIT_OUT_Bx_Cy)..... 35

References

DS2202DIO_SETUP_Bx..... 22
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)

PWM Signal Measurement

Where to go from here

Information in this section

DS2202PWM2D_Bx_Cy.....38
To measure the period and duty cycle of the specified PWM input signal. For PWM signal measurement, 24 independent channels are available.

Information in other sections

PWM Signal Measurement (DS2202 Features 🕮)
The DS2202 provides 24 independent PWM channels to analyze the duty cycle, frequency, and low and high periods of PWM signals.
You can measure the duty cycle within 0 … 100% for PWM frequencies in the range 0.01 Hz … 100 kHz, at a resolution of 16 bit.

DS2202PWM2D_Bx_Cy

Purpose

To measure the period and duty cycle of the specified PWM input signal. For PWM signal measurement, 24 independent channels are available.

Where to go from here

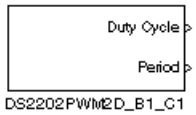
Information in this section

Block Description (DS2202PWM2D_Bx_Cy).....39
To measure the period and duty cycle of the specified PWM input signal. For PWM signal measurement, 24 independent channels are available.

Unit Page (DS2202PWM2D_Bx_Cy).....40
To specify the board number, the channel number, the PWM update mode, and the PWM period range.

Block Description (DS2202PWM2D_Bx_Cy)

Illustration



Purpose

To measure the period and duty cycle of the specified PWM input signal. For PWM signal measurement, 24 independent channels are available.

I/O mapping

For information on the I/O mapping, refer to PWM Signal Measurement (DS2202 Features 🕮).

Note

- Use DS2202DIO_SETUP_Bx to set the threshold level for digital inputs. If you do not include this block in your model, the default threshold level of 2.5 V is valid.
- It is not possible to use the same channels for frequency and PWM signal measurement.

I/O characteristics

- This table shows the scaling between the duty cycle of the measured signal and the output of the block:

Duty Cycle	Simulink Output
0 … 100%	0 … 1

- The following table shows the characteristics of the block output:

Variable	Characteristic	Value
Duty Cycle	Data type	Double
	Range	0 … 1
Period	Data type	Double
	Range	Depends on the selected period

- The period of the measured signal is given in seconds.
- The period of the input signal should remain within the specified range, otherwise the measured values will not be correct.

Dialog pages

The dialog settings can be specified on the Unit page (refer to Unit Page (DS2202PWM2D_Bx_Cy) on page 40).

Related RTLib functions

- `ds2202_timing_in_mode_set`
- `ds2202_pwm_in`

Related topics

References

ds2202_pwm_in (DS2202 RTLib Reference 🕮)
ds2202_timing_in_mode_set (DS2202 RTLib Reference 🕮)
DS2202DIO_SETUP_Bx 22
PWM Signal Measurement (DS2202 Features 🕮)
Unit Page (DS2202PWM2D_Bx_Cy) 40

Unit Page (DS2202PWM2D_Bx_Cy)

Purpose

To specify the board number, the channel number, the PWM update mode, and the PWM period range.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Channel number Lets you select a channel in the range 1 … 24.

Update mode Lets you select the PWM update mode:

Mode	Description
Asynchronous	The measured values are updated at the end of each T_{high} and T_{low} period of the PWM signal.
Synchronous	Update of the block output is performed synchronously to the period (at each rising edge of the input signal).

Range of period Lets you select the period range. Note that the resolution depends on the selected period range (for further information, refer to PWM Signal Measurement (DS2202 Features 🕮)).

Range of frequency States the range of frequency.

Resolution of period States the current resolution of period.

Note

To optimize the resolution of the measurement, you should always choose the period range with the lowest possible range number. For example, if your desired period is 10 ms, you should use period range 3 (10 µs … 13.1 ms) rather than period range 4 (10 µs … 26.2 ms), refer to Quantization Effects (DS2202 Features 🕮).

Related topics

Basics

Block Description (DS2202PWM2D_Bx_Cy)..... 39

PWM Signal Generation

Where to go from here

Information in this section

Information in other sections

DS2202PWM_Bx_Cy

Purpose

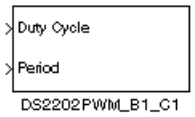
To generate a square-wave signal with the variable period and variable duty cycle adjustable during run time. For PWM signal generation, 9 independent channels are available.

Where to go from here

Information in this section

Block Description (DS2202PWM_Bx_Cy)

Illustration



Purpose

To generate a square-wave signal with the variable period and variable duty cycle adjustable during run time. For PWM signal generation, 9 independent channels are available.

I/O mapping

For information on the I/O mapping, refer to PWM Signal Generation (DS2202 Features 🕮).

Note

- Use DS2202DIO_SETUP_Bx to configure the digital outputs.
- You cannot use the same channels for square-wave signal and PWM signal generation at the same time.
- Before operating the digital output channels, you must connect an external power supply (V_{Bat}) to at least one of the two VBAT supply rails.

I/O characteristics

- The block inputs – Period and Duty Cycle – can be changed during run time. The period input values should remain within the specified range.
- The Period block input is given in seconds.
- This table shows the scaling between the duty cycle and the input of the block:

Simulink Input	Duty Cycle
0 … 1	0 … 100%

The following table shows the characteristics of the block input:

Variable	Characteristic	Value
Duty Cycle	Data type	Double
	Range	0 … 1
Period	Data type	Double
	Range	Depends on the selected period

Dialog pages

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

- Unit Page (DS2202PWM_Bx_Cy) on page 44
- Initialization Page (DS2202PWM_Bx_Cy) on page 46
- Termination Page (DS2202PWM_Bx_Cy) on page 47

Related RTLib functions

- `ds2202_timing_out_mode_set`
- `ds2202_pwm_out`

Related topics

References

ds2202_pwm_out (DS2202 RTLib Reference 🕮)
ds2202_timing_out_mode_set (DS2202 RTLib Reference 🕮)
DS2202DIO_SETUP_Bx 22
Initialization Page (DS2202PWM_Bx_Cy) 46
PWM Signal Generation (DS2202 Features 🕮)
Termination Page (DS2202PWM_Bx_Cy) 47
Unit Page (DS2202PWM_Bx_Cy) 44

Unit Page (DS2202PWM_Bx_Cy)

Purpose

To specify the board number, the channel number, the PWM update mode, and the PWM period range.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Channel number Lets you select the output channel in the range 1 … 9.

Update mode Lets you select the PWM update mode:

Update Mode	Description
Asynchronous	The new values are updated immediately. An update can happen anywhere during the PWM period. **Note** For PWM signal generation with *asynchronous* update, a high or low pulse is cut off when the new T_{high} or T_{low} value: ▪ Is shorter than the current one and ▪ Exceeds the time which has elapsed in the current T_{high} or T_{low} period, respectively. As a result, the PWM period is not constant during update (i.e., actual T_{high} + T_{low}). If this is not desired, select the *synchronous* update mode instead.
Synchronous	Update of the input parameters is performed synchronously to the period. Changes take effect in the next period (at each rising edge). **Note** For PWM signal generation with *synchronous* update, the output period should be constant. It is constant if $T = T_{high} + T_{low}$ is constant. If you change the period during run time, synchronous PWM update cannot be ensured.

Range of period Lets you select the period range for the PWM signal to be generated. Note that the resolution depends on the selected period range (for further information, refer to PWM Signal Generation (DS2202 Features 🕮)).

Range of frequency States the range of frequency.

Resolution of period States the current resolution of period.

Note

To optimize the resolution of the generated square-wave signal, you should always choose the period range with the lowest possible range number. For example, if your desired period is 10 ms, you should use period range 3 (10 µs … 13.1 ms) rather than period range 4 (10 µs … 26.2 ms), refer to Quantization Effects (DS2202 Features 🕮).

Related topics

Basics

Block Description (DS2202PWM_Bx_Cy) 43

Initialization Page (DS2202PWM_Bx_Cy)

Purpose

To specify the initialization values to be set.

Description

Initialization During the model initialization phase, the output signal is either generated with an initial period or is set to zero. This is especially useful if a channel is used in a triggered or enabled subsystem that is not executed at the start of the simulation. With **Initial period** and **Initial duty cycle**, the channel has a defined output during this simulation phase.

Dialog settings

Initial duty cycle Lets you enter the duty cycle at the start of the simulation in the range 0 … 1 (by default: 0)

Initial period Lets you enter the period at the start of the simulation in the range 10 µs … 107.3 s (by default: 50 µs). The value should remain within the selected period range and must be given in seconds.

Related topics

Basics

Block Description (DS2202PWM_Bx_Cy) 43

Termination Page (DS2202PWM_Bx_Cy)

Purpose

To specify the termination values to be set.

Description

Termination When the simulation terminates, the signal generation is continued with the last period and duty cycle by default. If you want to stop signal generation during this simulation phase, set the duty cycle to 0. Otherwise, select one above the lower range limit. Use these settings to drive your external hardware into a safe final condition. Use DS2202DIO_SETUP_Bx to enable or disable the termination mode for all digital outputs.

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 Lets you set the values specified by Duty cycle on termination and Period on termination or keep the current duty cycle and period when the simulation terminates.

Duty cycle on termination Lets you enter the duty cycle at the end of the simulation in the range 0 … 1.

Period on termination Lets you enter the period at the end of the simulation in the range 10 µs … 107.3 s (by default: 50 µs). The values should remain within the selected period range and must be given in seconds.

Related topics

Basics

Block Description (DS2202PWM_Bx_Cy)....43

References

DS2202DIO_SETUP_Bx....22
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)

Frequency Measurement

Where to go from here

Information in this section

DS2202F2D_Bx_Cy.....48
To measure the frequency of a square-wave input signal. For frequency measurement, 24 independent channels are available.

Information in other sections

Frequency Measurement (F2D) (DS2202 Features 🕮)
The DS2202 provides 24 independent input channels for the frequency measurement of square-wave signals.

DS2202F2D_Bx_Cy

Purpose

To measure the frequency of a square-wave input signal. For frequency measurement, 24 independent channels are available.

Where to go from here

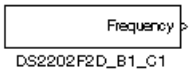
Information in this section

Block Description (DS2202F2D_Bx_Cy).....48
To measure the frequency of a square-wave input signal. For frequency measurement, 24 independent channels are available.

Unit Page (DS2202F2D_Bx_Cy).....49
To specify the board number, the channel number and the range of frequency.

Block Description (DS2202F2D_Bx_Cy)

Illustration



Purpose

To measure the frequency of a square-wave input signal. For frequency measurement, 24 independent channels are available.

I/O mapping

For information on the I/O mapping, refer to Frequency Measurement (F2D) (DS2202 Features 🕮).

Note

You cannot use the same channels for frequency and PWM signal measurement.

I/O characteristics

The frequency of the input signal specified in Hz corresponds to the output of the block.

- If the frequency is less than the lower limit, the measured frequency is detected as a 0 Hz signal.
- If the frequency is higher than the upper limit, the measurement is faulty due to quantization effects.

Dialog pages

The dialog settings can be specified on the Unit page (refer to Unit Page (DS2202F2D_Bx_Cy) on page 49).

Related RTLib functions

- `ds2202_timing_in_mode_set`
- `ds2202_f2d`

Related topics

References

ds2202_f2d (DS2202 RTLib Reference 🕮)
ds2202_timing_in_mode_set (DS2202 RTLib Reference 🕮)
Frequency Measurement (F2D) (DS2202 Features 🕮)
Unit Page (DS2202F2D_Bx_Cy).....49

Unit Page (DS2202F2D_Bx_Cy)

Purpose

To specify the board number, the channel number and the range of frequency.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Channel number Lets you select the input channel in the range 1 … 24.

Range of frequency Lets you select the frequency range.

Note

To optimize the resolution of the measurement, you should always choose the frequency range with the lowest possible range number. For example, if your desired frequency is 100 Hz, you should use frequency range 1 (9.54 Hz … 100 kHz) rather than frequency range 2 (4.77 Hz … 100 kHz).

Resolution of frequency States the resolution of the selected frequency range.

Related topics

Basics

Block Description (DS2202F2D_Bx_Cy)..... 48

Square-Wave Signal Generation

Where to go from here

Information in this section

Information in other sections

Square-Wave Signal Generation (D2F) (DS2202 Features 🕮)
The DS2202 provides 9 independent output channels for the generation of square-wave signals with variable frequencies.

DS2202D2F_Bx_Cy

Purpose

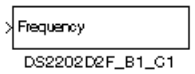
To generate a square-wave signal for the specified output channel. For square-wave signal generation, 9 independent channels are available.

Where to go from here

Information in this section

Block Description (DS2202D2F_Bx_Cy)

Illustration



Purpose

To generate a square-wave signal for the specified output channel. For square-wave signal generation, 9 independent channels are available.

I/O mapping

For information on the I/O mapping, refer to Square-Wave Signal Generation (D2F) (DS2202 Features 🕮).

Note

- You cannot use the same channels for square-wave signal and PWM signal generation at the same time.
- Before operating the digital output channels, you must connect an external power supply (V_{Bat}) to at least one of the two VBAT supply rails.

I/O characteristics

The frequency of the output signal specified in Hz corresponds to the input of the block.

- If the frequency is higher than the upper limit, the frequency saturates to f_{max}.
- If the frequency is less than the lower limit, the frequency is set to 0 Hz, and the output voltage level is set to the value specified by **Set output channel**.

Dialog pages

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

- Unit Page (DS2202D2F_Bx_Cy) on page 53
- Initialization Page (DS2202D2F_Bx_Cy) on page 54
- Termination Page (DS2202D2F_Bx_Cy) on page 54

Related RTLib functions

- `ds2202_digout_mode_set`
- `ds2202_timing_in_mode_set`
- `ds2202_d2f`

Related topics

Basics

ds2202_d2f (DS2202 RTLib Reference 🕮)

References

ds2202_digout_mode_set (DS2202 RTLib Reference 🕮)
ds2202_timing_in_mode_set (DS2202 RTLib Reference 🕮)
Initialization Page (DS2202D2F_Bx_Cy)..... 54
Square-Wave Signal Generation (D2F) (DS2202 Features 🕮)
Termination Page (DS2202D2F_Bx_Cy)..... 54
Unit Page (DS2202D2F_Bx_Cy)..... 53

Unit Page (DS2202D2F_Bx_Cy)

Purpose

To specify the board number, the channel number, the range of frequency and the Zero frequency mode.

Dialog settings

Board number Lets you select the DS2202 board number in the range 1 … 16.

Channel number Lets you select the output channel in the range 1 … 9.

Range of frequency Lets you select the frequency range.

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 Hz, you should use frequency range 1 (9.54 Hz … 100 kHz) rather than frequency range 2 (4.77 Hz … 100 kHz).

Resolution of frequency Displays the resolution of the selected frequency range (read-only).

Set output channel Lets you select the behavior of the output if the output frequency falls below the lower limit of the frequency range. The following settings are available:

Output Level	Meaning
Low	The output is set to low (default).
High	The output is set to high.

Output Level	Meaning
Hold	The output keeps the current signal level (low or high).

Related topics

Basics

Block Description (DS2202D2F_Bx_Cy)..... 52

Initialization Page (DS2202D2F_Bx_Cy)

Purpose

To specify the initialization values to be set.

Description

Initialization During the model initialization phase, the output signal is either generated with an initial frequency or is set to zero. This is especially useful if a channel is used in a triggered or enabled subsystem that is not executed at the start of the simulation. With **Initial frequency**, the channel has a defined output during this simulation phase.

Dialog settings

Initial frequency Lets you enter the initial frequency at the start of the simulation. The values of the initial frequency must remain within the selected range. If a frequency below the lower limit is chosen, the signal generation starts with a frequency of 0 Hz.

Related topics

Basics

Block Description (DS2202D2F_Bx_Cy)..... 52

Termination Page (DS2202D2F_Bx_Cy)

Purpose

To specify the termination values to be set.

Description

Termination When the simulation terminates, the signal generation continues with the last frequency by default. If you want to stop signal generation during this simulation phase, specify a frequency below the lower limit. The frequency is set to 0 Hz, but the signal voltage level may not be 0 V (if

Set output channel is set to High). Otherwise, select a frequency above the lower limit. Use these settings to drive your external hardware into a safe final condition. Use DS2202DIO_SETUP_Bx to enable or disable the termination mode for all digital outputs.

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 Lets you set the value specified by Frequency on termination or keep the current frequency when the simulation terminates. The value must remain within the selected range. If a frequency below the lower limit is chosen, the frequency is set to 0 Hz, but the signal voltage level may not be 0 V (if Set output channel is set to High).

Related topics

Basics

Block Description (DS2202D2F_Bx_Cy)..... 52

References

DS2202DIO_SETUP_Bx..... 22
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)

Serial Interface

Where to go from here

Information in this section

Information in other sections

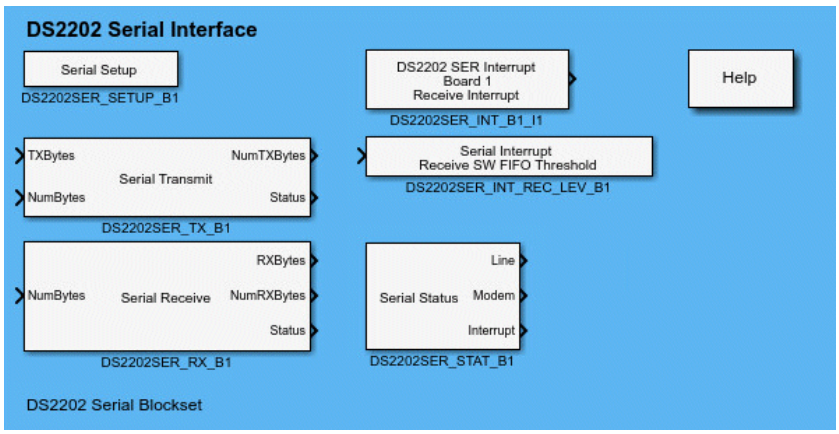
Serial Interface (DS2202 Features 🕮)
The board contains a universal asynchronous receiver and transmitter (UART) to communicate with external devices.

General Information on the Serial Interface

Overview of the Serial Interface

Introduction

After you double-click the SERIAL button in the Library: rti2202lib window, the Library: rti2202serlib is displayed.



The Serial Interface blocks can be used to implement serial communication.

Library components

The library contains the following RTI blocks:

- DS2202SER_SETUP_Bx on page 59
- DS2202SER_STAT_Bx on page 64
- DS2202SER_TX_Bx on page 68
- DS2202SER_RX_Bx on page 72
- DS2202SER_INT_Bx_Iy on page 76
- DS2202SER_INT_REC_LEV_Bx on page 79

Related topics

Basics

Serial Interface (DS2202 Features 🕮)

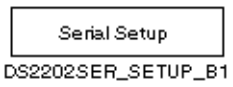
DS2202SER_SETUP_Bx

Where to go from here

Information in this section

Block Description (DS2202SER_SETUP_Bx)

Block



Purpose

To set the global parameters for the serial interface.

Note

- This block has to be placed in the model if any of the other serial blocks is used for the corresponding board.
- This block must not be used more than once per channel.
- If several DS2202 boards are connected to different PHS buses of a multiprocessor system, identical board numbers are assigned to these boards. For the moment, RTI-MP does not allow you to configure a multiprocessor system using identical board numbers on different processors. If you encounter this problem, contact dSPACE support.

I/O mapping

For information on the I/O mapping, refer to Serial Interface (DS2202 Features 🕮).

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS2202SER_SETUP_Bx) on page 60)
- **UART Page** (refer to UART Page (DS2202SER_SETUP_Bx) on page 61)
- **FIFO Page** (refer to FIFO Page (DS2202SER_SETUP_Bx) on page 62)
- **Advanced Page** (refer to Advanced Page (DS2202SER_SETUP_Bx) on page 63)

Related RTLib functions

This RTI block is implemented using the following RTLib functions:

- dsser_init
- dsser_config
- dsser_set

Related topics

References

Unit Page (DS2202SER_SETUP_Bx)

Purpose

To select the board number and channel number.

Dialog settings

Board number Lets you choose the board number in the range 1 … 16.

Related topics

References

UART Page (DS2202SER_SETUP_Bx)

Purpose

To specify the UART parameters.

Dialog settings

Transceiver Lets you select the transceiver mode:

Transceiver Mode	Meaning
RS232	RS232 mode
RS422	RS422 mode

Baud rate Lets you specify the baud rate in bits per second.

Mode	Baud Rate Range
RS232	300 … 115,200 baud
RS422	300 … 1,000,000 baud

For further information, refer to Specifying the Baud Rate of the Serial Interface (DS2202 Features 🕮).

Data bits Lets you choose the number of data bits. The valid values are: 5, 6, 7, 8.

Stop bits Lets you choose the number of stop bits. The valid values are: 1, 1.5 or 2. If you select 1.5 or 2, the number of stop bits depends on the number of specified data bits: For 5 data bits there are 1.5 stop bits; for 6, 7 and 8 data bits there are 2 stop bits.

Parity Lets you choose the parity mode:

Parity Mode	Meaning
No	No parity bits
Odd	Parity bit is set so that there is an odd number of "1" bits in the byte, including the parity bit
Even	Parity bit is set so that there is an even number of "1" bits in the byte, including the parity bit
Forced parity one	Parity bit is forced to a logical 1

Copy data to RX SW FIFO after reception of <value> byte(s) at latest Lets you choose the UART threshold at which data is copied from the UART to the receive buffer. Values are: 1, 4, 8, 14.

Note

Use the highest UART threshold possible to generate fewer interrupts, i.e., to decrease the UART's workload.

Related topics

References

FIFO Page (DS2202SER_SETUP_Bx)

Purpose

To specify the software FIFO buffer.

Dialog settings

SW FIFO size Lets you specify the size of the software buffer. The size must be a power of two (2^n) and at least 64 bytes great. The maximum size depends on the available memory.

Overwrite mode Lets you choose the behavior of the receive buffer when an overrun occurs:

Overwrite Mode	Meaning
Discard new data	If the receive buffer is full, the new data is discarded.
Replace old data with FIFO method	If the receive buffer is full, the new data replaces the oldest data in the buffer. The number of bytes that are replaced is defined by Block size.

Block size Lets you specify the number of bytes that are deleted in RX SW FIFO overrun (see table above). Use this parameter to set up the appropriate data consistency for your model. Value range: 1 … (`SW FIFO size`-1)

Related topics

References

Advanced Page (DS2202SER_SETUP_Bx)

Purpose

To specify the behavior on model termination.

Dialog settings

Disable UART on termination Lets you choose the UART behavior on model termination. If the UART is disabled, data is neither transmitted nor received. No interrupts are generated in this case.

Related topics

References

Block Description (DS2202SER_SETUP_Bx)....59
FIFO Page (DS2202SER_SETUP_Bx)....62
UART Page (DS2202SER_SETUP_Bx)....61
Unit Page (DS2202SER_SETUP_Bx)....60

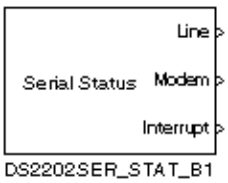
DS2202SER_STAT_Bx

Where to go from here

Information in this section

Block Description (DS2202SER_STAT_Bx)

Block



Purpose

To read the contents of the UART status register.

Note

This block can only be used in interrupt-driven subsystems (see DS2202SER_INT_Bx_Iy on page 76).

- The Line status delivers correct results only if the block resides in a subsystem driven by the Line status interrupt.
- The Modem status delivers correct results only if the block resides in a subsystem driven by the Modem status interrupt.
- The Interrupt status is non-functional at the moment.

Description

The block reads the line, modem and interrupt statuses and writes the values to the outports. If you do not want to evaluate a status register, you can disable its outport with the block dialog.

I/O mapping

For information on the I/O mapping, refer to Serial Interface (DS2202 Features 🕮).

I/O characteristics

The outports show the values of the UART's register.

- The **Line** port outputs the 8 bits of the line status register. The following table shows the meanings of the individual bits:

Index	Meaning
1	Data ready (DR) indicator
2	Overrun error (OE) indicator
3	Parity error (PE) indicator
4	Framing error (FE) indicator
5	Break interrupt (BI) indicator
6	Transmitter holding register empty (THRE) indicator
7	Transmitter empty (TEMT) indicator
8	Error in receiver FIFO

- The **Modem** port outputs the 8 bits of the modem status register. The following table shows the meanings of the individual bits:

Index	Meaning
1	Clear-to-send (CTS) changed state
2	Data-set-ready (DSR) changed state
3	Ring-indicator (RI) changed state
4	Data-carrier-detect (DCD) changed state
5	Complement of CTS
6	Complement of DSR
7	Complement of RI
8	Complement of DCD

- The **Interrupt** port outputs the 8 bits of the interrupt status register. The following table shows the meanings of the individual bits:

Index	Meaning
1	Interrupt status: 0 if interrupt pending
2	Interrupt ID bit 1
3	Interrupt ID bit 2
4	Interrupt ID bit 3
5	Not relevant
6	Not relevant
7	FIFOs enabled (bit 0)
8	FIFOs enabled (bit 1)

- The following table shows the characteristics of the block outputs:

Port	Characteristics	Value
Line	Datatype	Boolean
	Range	0, 1
	Size	8
Modem	Datatype	Boolean
	Range	0, 1
	Size	8
Interrupt	Datatype	Boolean
	Range	0, 1
	Size	8

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS2202SER_STAT_Bx) on page 66)
- Status Page (refer to Status Page (DS2202SER_STAT_Bx) on page 67)

Related RTLib functions

This RTI block is implemented using the following RTLib function:

- dsser_status_read

Related topics

References

dsser_status_read (DS2202 RTLib Reference 🕮)
Status Page (DS2202SER_STAT_Bx)..... 67
Unit Page (DS2202SER_STAT_Bx)..... 66

Unit Page (DS2202SER_STAT_Bx)

Purpose

To specify the board number used for reading the status.

Dialog settings

Board number Lets you select the board number in the range 1 … 16.

Related topics

References

Block Description (DS2202SER_STAT_Bx)..... 64
Status Page (DS2202SER_STAT_Bx)..... 67

Status Page (DS2202SER_STAT_Bx)

Purpose

To enable the status registers to be read.

Dialog settings

Enable Line status port Lets you enable the line status output of the UART.

Enable Modem status port Lets you enable the modem status output of the UART.

Enable Interrupt status port Lets you enable the interrupt status output of the UART.

Related topics

References

Block Description (DS2202SER_STAT_Bx)..... 64
Unit Page (DS2202SER_STAT_Bx)..... 66

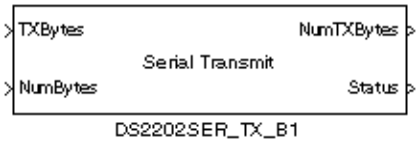
DS2202SER_TX_Bx

Where to go from here

Information in this section

Block Description (DS2202SER_TX_Bx)

Block



Purpose

To send data via the serial interface.

Description

The block sends the bytes of the TXBytes input via the serial interface during one sample step. The number of bytes to be sent can be either fixed or variable. If the number of bytes to be sent is fixed, you have to specify it with a block parameter. If the number of bytes to be sent is variable, you can specify it with either a block parameter or an inport. The status and the number of bytes that were sent are returned via outports.

You can disable the NumBytes input, NumTXBytes output and Status output with the block dialog.

I/O mapping

For information on the I/O mapping, refer to Serial Interface (DS2202 Features 🕮).

I/O characteristics

- The TXBytes input must be the stream of bytes to be written to the software buffer within one sample step.

- The **NumBytes** input must be the number of bytes to be sent within one sample step. The value must be less than or equal to the **Maximum number of bytes** block parameter. If it is less, only the specified number of bytes is sent.
- The **NumTXBytes** port outputs the number of bytes that could be written to the software buffer within the current sample step. You can use this output value and the **NumTXBytes** input to verify whether all the data could be sent.
- The **Status** port outputs the status of writing data to the software buffer within the current sample step. One of the following values is returned:

Return Value	Meaning
0	No error
202	The FIFO is filled or not all data could be copied to the FIFO

- The following table shows the characteristics of the block inputs and outputs:

Port	Characteristics	Value
TXBytes	Datatype	UInt8
	Range	0 … 255
	Size	1 … (SW FIFO size - 1)
NumBytes	Datatype	UInt32
	Range	1 … (SW FIFO size - 1)
NumTXBytes	Datatype	UInt32
	Range	1 … (SW FIFO size - 1)
Status	Datatype	Int32
	Range	int32

SW FIFO size is a block parameter. For further information, refer to DS2202SER_SETUP_Bx on page 59.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS2202SER_TX_Bx) on page 70)
- **Tx Parameters Page** (refer to TX Parameters Page (DS2202SER_TX_Bx) on page 70)
- **Advanced Page** (refer to Advanced Page (DS2202SER_TX_Bx) on page 71)

Related RTLib functions

This RTI block is implemented using the following RTLib function:

- dsser_transmit

Related topics

References

Unit Page (DS2202SER_TX_Bx)

Purpose

To specify the board number used for sending data.

Dialog settings

Board number Lets you select the board number in the range 1 … 16.

Related topics

References

TX Parameters Page (DS2202SER_TX_Bx)

Purpose

To specify the transmitting parameters.

Dialog settings

Transmission SW FIFO mode Lets you specify how to react if there is not enough free space in the transmit buffer:

Data Handling	Meaning
Discard all new data	All data in the sample step is discarded. Data consistency is ensured but you have to repeat the complete data from this sample step.
Write as much data as possible	The transmit buffer is filled until it is full. You only have to repeat bytes which did not fit into the transmit buffer.

Parameter flexibility Lets you specify whether the number of bytes to be sent is fixed (non-tunable) or variable (tunable).

Number of bytes Lets you specify the number of bytes to be sent within one sample step.

Maximum number of bytes Lets you specify the maximum number of bytes that can be sent within one sample step. The valid value range is: 1 … (SW FIFO size-1) (SW FIFO size is a block parameter, see DS2202SER_SETUP_Bx on page 59).

Specify the number of bytes Lets you specify whether to set the number of bytes to be sent within one sample step via the **NumBytes** inport or the block parameter.

Related topics

References

Advanced Page (DS2202SER_TX_Bx)

Purpose

To specify the output.

Dialog settings

Enable TXBytes port Lets you specify whether to output the number of bytes that could be sent or not.

Enable Status port Lets you specify whether to output the transmission status or not.

Related topics

References

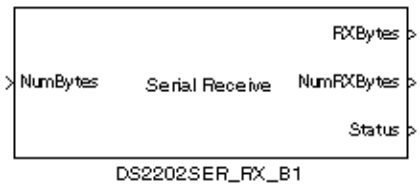
DS2202SER_RX_Bx

Where to go from here

Information in this section

Block Description (DS2202SER_RX_Bx)

Block



Purpose

To read bytes from the serial interface.

Description

The block receives bytes via a serial interface and writes them to the RXBytes output. The number of bytes to be received can be either fixed or variable. If the number of bytes to be received is fixed, you have to specify it with a block parameter. If the number of bytes to be received is variable, you can specify it with either a block parameter or an inport. The status and the number of received bytes are returned via outports.

You can disable the NumBytes input, NumRXBytes output and Status output with the block dialog.

I/O mapping

For information on the I/O mapping, refer to Serial Interface (DS2202 Features 🕮).

I/O characteristics

- The **NumBytes** input must be the number of bytes to be read from the software buffer within one sample step.
- The **RXBytes** port outputs the stream of data that could be read from the software buffer within one sample step. If fewer than the expected number of bytes could be received, the last bytes of the output still contain the data from the previous sample step.
- The **NumRXBytes** port outputs the number of bytes that could be read from the software buffer within one sample step.
- The **Status** port outputs the reception status. One of the following values is returned:

Return Value	Meaning
0	No error
4	The operation failed with no effect on the input or output data. No data is written to or read from the FIFO.
5	No new data is read from the FIFO.
202	The FIFO is filled or not all data could be copied to the FIFO.

- The following table shows the characteristics of the block input and outputs:

Port	Characteristics	Value
NumBytes	Datatype	UInt32
	Range	1 … (SW FIFO size - 1)
RXBytes	Datatype	UInt8
	Range	0 … 255
	Size	1 … (SW FIFO size - 1)
NumRXBytes	Datatype	UInt32
	Range	1 … (SW FIFO size - 1)
Status	Datatype	Int32
	Range	Int32

SW FIFO size is a block parameter. For further information, refer to DS2202SER_SETUP_Bx on page 59.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS2202SER_RX_Bx) on page 74)
- **RX Parameters Page** (refer to RX Parameters Page (DS2202SER_RX_Bx) on page 74)
- **Advanced Page** (refer to Advanced Page (DS2202SER_RX_Bx) on page 75)

Related RTLib functions

This RTI block is implemented using the following RTLib functions:

- dsser_receive
- dsser_receive_term (DS2202 RTLib Reference 🕮)

Related topics

References

Advanced Page (DS2202SER_RX_Bx)....75
DS2202SER_SETUP_Bx....59
dsser_receive (DS2202 RTLib Reference 🕮)
dsser_receive_term (DS2202 RTLib Reference 🕮)
RX Parameters Page (DS2202SER_RX_Bx)....74
Unit Page (DS2202SER_RX_Bx)....74

Unit Page (DS2202SER_RX_Bx)

Purpose

To specify the board number used for reading data.

Dialog settings

Board number Lets you select the board number in the range 1 … 16.

Related topics

References

Advanced Page (DS2202SER_RX_Bx)....75
Block Description (DS2202SER_RX_Bx)....72
RX Parameters Page (DS2202SER_RX_Bx)....74

RX Parameters Page (DS2202SER_RX_Bx)

Purpose

To specify the receiving parameters.

Dialog settings

Reception mode Lets you specify how to react if there are fewer than the expected number of bytes in the receive buffer:

Data Handling	Meaning
Skip read operation	The new data is left in the receive buffer. The received data is collected in the receive buffer until the specified number of bytes is reached. Then it is copied to the RXBytes output.
Read available data anyway	All the available data is copied from the receive buffer to the RXBytes output.

Parameter flexibility Lets you specify whether the number of bytes to be received is fixed (non-tunable) or variable (tunable).

Number of bytes Lets you specify the number of bytes to be received within one sample step.

Maximum number of bytes Lets you specify the maximum number of bytes that can be received within one sample step. Value range: 1 … (SW FIFO size-1) (SW FIFO size is a block parameter, see DS2202SER_SETUP_Bx on page 59).

Specify the number of bytes Lets you specify whether to set the number of bytes to be received within one sample step via the **NumBytes** input or the block parameter.

Related topics

References

Advanced Page (DS2202SER_RX_Bx)

Purpose

To specify the output.

Dialog settings

Enable NumRXBytes port Lets you specify whether to output the number of bytes that could be received or not.

Enable Status port Lets you specify whether to output the transmission status or not.

Related topics

References

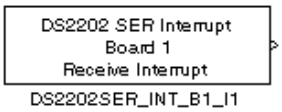
DS2202SER_INT_Bx_Iy

Where to go from here

Information in this section

Block Description (DS2202SER_INT_Bx_Iy)

Block



Purpose

To make the interrupts of the serial interface available as trigger sources in the model.

I/O mapping

For information on the I/O mapping, refer to Serial Interface (DS2202 Features 🕮).

I/O characteristics

The output triggers a function call to a subsystem if it is connected.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS2202SER_INT_Bx_Iy) on page 77)
- **Interrupt Page** (refer to Interrupt Page (DS2202SER_INT_Bx_Iy) on page 77)

Related RTLib functions

This RTI block is implemented using the following RTLib functions:

- dsser_subint_handler_inst
- dsser_subint_disable
- dsser_subint_enable

Related topics

References

dsser_subint_disable (DS2202 RTLib Reference 🕮)
dsser_subint_enable (DS2202 RTLib Reference 🕮)
dsser_subint_handler_inst (DS2202 RTLib Reference 🕮)
Interrupt Page (DS2202SER_INT_Bx_Iy) 77
Unit Page (DS2202SER_INT_Bx_Iy) 77

Unit Page (DS2202SER_INT_Bx_Iy)

Purpose

To specify the board on which an interrupt will be made available.

Dialog settings

Board number Lets you select the board number in the range 1 … 16.

Related topics

References

Block Description (DS2202SER_INT_Bx_Iy) 76
Interrupt Page (DS2202SER_INT_Bx_Iy) 77

Interrupt Page (DS2202SER_INT_Bx_Iy)

Purpose

To specify the interrupt source.

Dialog settings

Interrupt source Lets you choose the interrupt type. The following table shows the available interrupt types:

Interrupt Type	Meaning
RX SW FIFO	Interrupt triggered when the number of bytes in the receive buffer reaches the specified threshold (see Initial RX SW FIFO threshold)
TX SW FIFO	Interrupt triggered when the transmit buffer is empty
Line status	Line status interrupt of the UART
NOT SELECTED	For other platforms, this option represents the modem status interrupt. The DS2202 does not support the modem status interrupt, so specifying this option has no effect on the model.

Initial RX SW FIFO threshold Lets you specify the RX SW FIFO threshold for the receive interrupt in the range 1 … (SW FIFO size -1) . The value should be a multiple of the UART threshold (see DS2202SER_SETUP_Bx on page 59).

The RX SW FIFO threshold can be changed during run time by using the block DS2202SER_INT_REC_LEV_Bx on page 79.

Related topics

References

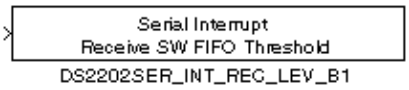
DS2202SER_INT_REC_LEV_Bx

Where to go from here

Information in this section

Block Description (DS2202SER_INT_REC_LEV_Bx)

Block



Purpose

To change the RX SW FIFO threshold during run time.

Description

The block changes the RX SW FIFO threshold that is initially specified by the DS2202SER_INT_Bx_Iy block (see DS2202SER_INT_Bx_Iy on page 76).

I/O mapping

For information on the I/O mapping, refer to Serial Interface (DS2202 Features 🕮).

I/O characteristics

- The Receive SW FIFO Threshold input sets a new RX SW FIFO threshold.
- The following table shows the characteristics of the block input:

Port	Characteristics	Value
Receive SW FIFO Threshold	Datatype	UInt32
	Range	1 … (SW FIFO size - 1)

SW FIFO size is a block parameter. For further information, refer to DS2202SER_SETUP_Bx on page 59.

Dialog pages

The dialog settings can be specified on the following page:

- Unit page (refer to Unit Page (DS2202SER_INT_REC_LEV_Bx) on page 80)

Related RTLib functions

This RTI block is implemented using the following RTLib functions:

- dsser_config
- dsser_fifo_reset
- dsser_transmit_fifo_level
- dsser_receive_fifo_level

Related topics

References

DS2202SER_INT_Bx_Iy 76
DS2202SER_SETUP_Bx 59
dsser_config (DS2202 RTLib Reference 🕮)
dsser_fifo_reset (DS2202 RTLib Reference 🕮)
dsser_receive_fifo_level (DS2202 RTLib Reference 🕮)
dsser_transmit_fifo_level (DS2202 RTLib Reference 🕮)
Unit Page (DS2202SER_INT_REC_LEV_Bx) 80

Unit Page (DS2202SER_INT_REC_LEV_Bx)

Purpose

To specify the board on which the RX SW FIFO threshold will be changed.

Dialog settings

Board number Lets you select the board number in the range 1 … 16.

Related topics

References

Block Description (DS2202SER_INT_REC_LEV_Bx) 79