DS4201-S Serial Interface Board

RTI Reference

Release 2021-A – May 2021

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

This publication contains proprietary information that is protected by copyright. All rights are reserved. The publication may be printed for personal or internal use provided all the proprietary markings are retained on all printed copies. In all other cases, the publication must not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of dSPACE GmbH.

© 1999 - 2021 by:
dSPACE GmbH
Rathenaustraße 26
33102 Paderborn
Germany

This publication and the contents hereof are subject to change without notice.

AUTERA, ConfigurationDesk, ControlDesk, MicroAutoBox, MicroLabBox, SCALEXIO, SIMPHERA, SYNECT, SystemDesk, TargetLink and VEOS are registered trademarks of dSPACE GmbH in the United States or other countries, or both. Other brand names or product names are trademarks or registered trademarks of their respective companies or organizations.

Contents

About This Reference 5

General Information on the DS4201-S Blockset 9

Overview of the DS4201-S Blockset ... 9

Serial Interface 11

General Information on the Serial Interface ... 12
Overview of the Serial Interface ... 12

Basic Principles of Serial Communication with RTI Blocks ... 13
Basics on the Buffer Used for Serial Communication ... 13

DS4201SER_SETUP_Bx_Cy ... 14
Block Description (DS4201SER_SETUP_Bx_Cy) ... 14
Unit Page (DS4201SER_SETUP_Bx_Cy) ... 15
UART Page (DS4201SER_SETUP_Bx_Cy) ... 16
FIFO Page (DS4201SER_SETUP_Bx_Cy) ... 17
Advanced Page (DS4201SER_SETUP_Bx_Cy) ... 18

DS4201SER_STAT_Bx_Cy ... 19
Block Description (DS4201SER_STAT_Bx_Cy) ... 19
Unit Page (DS4201SER_STAT_Bx_Cy) ... 21
Status Page (DS4201SER_STAT_Bx_Cy) ... 22

DS4201SER_TX_Bx_Cy ... 23
Block Description (DS4201SER_TX_Bx_Cy) ... 23
Unit Page (DS4201SER_TX_Bx_Cy) ... 25
TX Parameters Page (DS4201SER_TX_Bx_Cy) ... 25
Advanced Page (DS4201SER_TX_Bx_Cy) ... 26

DS4201SER_RX_Bx_Cy ... 27
Block Description (DS4201SER_RX_Bx_Cy) ... 27
Unit Page (DS4201SER_RX_Bx_Cy) ... 29
RX Parameters Page (DS4201SER_RX_Bx_Cy) ... 30
Advanced Page (DS4201SER_RX_Bx_Cy) ... 30

DS4201SER_INT_Bx_Cy_Iz ... 32
Block Description (DS4201SER_INT_Bx_Cy_Iz) ... 32

Unit Page (DS4201SER_INT_Bx_Cy_Iz)..... 33
Interrupt Page (DS4201SER_INT_Bx_Cy_Iz)..... 34

DS4201SER_INT_REC_LEV_Bx_Cy..... 35
Block Description (DS4201SER_INT_REC_LEV_Bx_Cy)..... 35
Unit Page (DS4201SER_INT_REC_LEV_Bx_Cy)..... 36

Index 37

About This Reference

Content

This RTI Reference provides a full description of the Real-Time Interface (RTI) software support for the DS4201-S Serial Interface Board, which can be controlled by the DS1006 Processor Board and the DS1007 PPC Processor Board.

Symbols

dSPACE user documentation uses the following symbols:

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

Naming conventions

dSPACE user documentation uses the following naming conventions:

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

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

Examples:

- Where you find terms such as `rti<XXXX>` replace them by the RTI platform support you are using, for example, `rti1007`.
- Where you find terms such as `<model>` or `<submodel>` in this document, replace them by the actual name of your model or submodel. For example, if the name of your Simulink model is `smd_1007_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 DS4201-S Blockset

Introduction

Here you get basic information on the DS4201-S blockset.

Overview of the DS4201-S Blockset

About the board

The DS4201-S Serial Interface Board provides 4 serial communication channels with selectable line transceivers (RS232, RS422 or RS485).

Due to the DS4201-S's capability to offer an access for a wide range of custom I/O devices to the dSPACE system, the support for the board provided by the Real-Time Interface (RTI) is restricted to some basic features. Nevertheless, you can have access to the entire range of the board's I/O capabilities by means of custom C code that allows you to implement user-defined functionality.

For more details about using the RTLib for the board, please refer to DS4201-S RTLib Reference 🕮.

For an introduction to the most common configurations of serial data transmission using the DS4201-S board, have a look at the demos provided by the **Library: rtilibm**.

Note

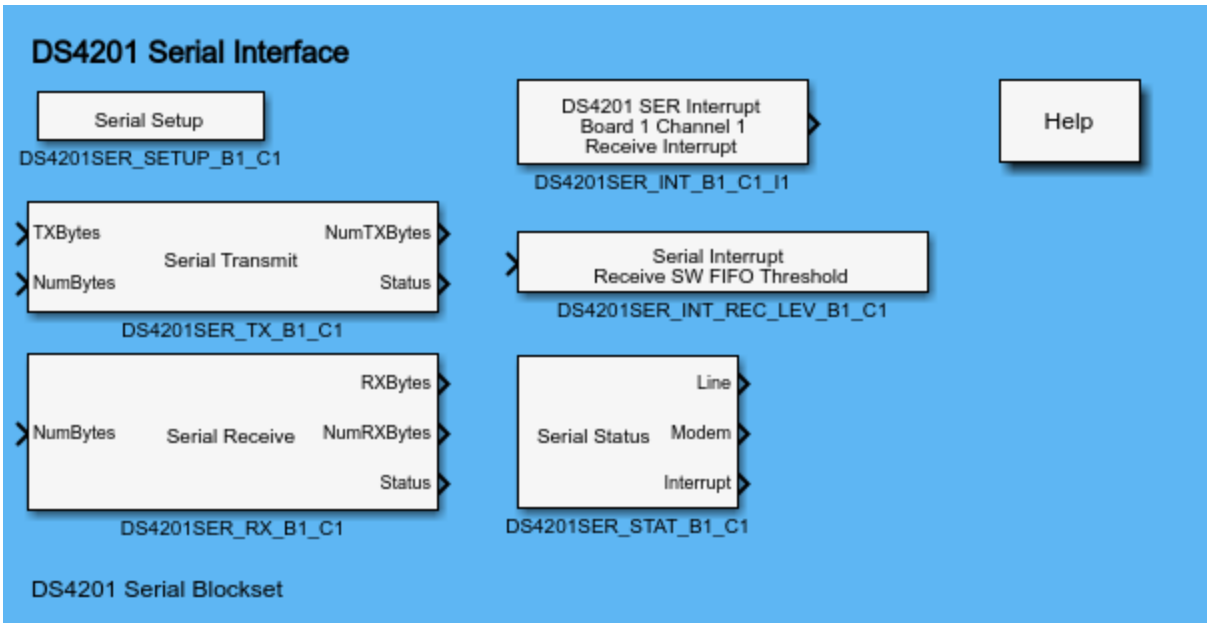
Data losses may occur due to tasks having a higher priority than the one that performs serial communication.
The sample rate of your model should be sufficiently high to allow your model to be executed faster than the data transfer and thus avoid data losses. For the same reason, make sure that the baud rate is not too high.
If you use a DS4201-S hardware interrupt you should assign a high priority to the corresponding task in the **RTI Task Configuration** dialog.

RTI blockset

The Real-Time Interface (RTI) board library for the DS4201-S Serial Interface Board provides the RTI blocks that implement the functionality and I/O capabilities of the DS4201-S board in Simulink models.

DS4201-S

After you double-click the corresponding board library icon in the library rtilibm the Library: rtilibm/rti4201serlib opens:



Demo model

For Simulink models, that shows how to use the RTI blocks of the DS4201-S board, refer to the RTI demo library of your processor board. You can find the model files also at `<RCP_HIL_InstallationPath>\Demos\<ProcessorBoard>\RTI`. For further information, refer to Demo Models (DS4201-S Features 🕮).

Related topics

References

RTI Task Configuration Dialog (RTI and RTI-MP Implementation Reference 🕮)

Serial Interface

Where to go from here

Information in this section

General Information on the Serial Interface....12

Basic Principles of Serial Communication with RTI Blocks....13

DS4201SER_SETUP_Bx_Cy....14
To set the global parameters for the serial interface.

DS4201SER_STAT_Bx_Cy....19
To read the contents of the UART status register.

DS4201SER_TX_Bx_Cy....23
To send data via the serial interface.

DS4201SER_RX_Bx_Cy....27
To read bytes from the serial interface.

DS4201SER_INT_Bx_Cy_Iz....32
To make the interrupts of the serial interface available as trigger sources in the model.

DS4201SER_INT_REC_LEV_Bx_Cy....35
To change the RX SW FIFO threshold during run time.

General Information on the Serial Interface

Overview of the Serial Interface

Introduction

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

Basic principles

Refer to Basic Principles of Serial Communication with RTI Blocks on page 13.

Note

Although the serial blocks of different boards are almost the same, you must always use the board-specific serial blocks.

Library components

The library contains the following RTI blocks:

- DS4201SER_SETUP_Bx_Cy on page 14
- DS4201SER_STAT_Bx_Cy on page 19
- DS4201SER_TX_Bx_Cy on page 23
- DS4201SER_RX_Bx_Cy on page 27
- DS4201SER_INT_Bx_Cy_Iz on page 32
- DS4201SER_INT_REC_LEV_Bx_Cy on page 35

Basic Principles of Serial Communication with RTI Blocks

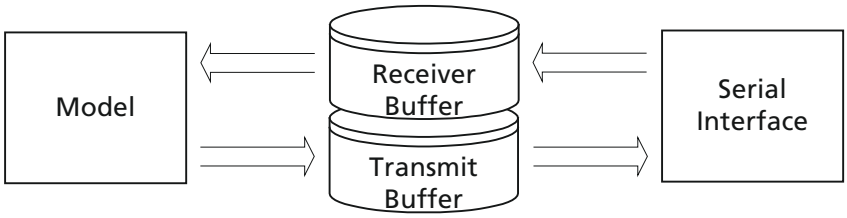
Purpose

This section explains the basic principles of serial communication with RTI blocks.

Basics on the Buffer Used for Serial Communication

Software FIFO buffer

A software FIFO buffer is installed between your model and the UART. The buffer is a memory that provides the UART with additional space for data storage and ensures that the generic blocks are hardware-independent.



The software FIFO buffer stores data that will be written to the UART (transmit buffer) or that was read by it (receive buffer).

Transmit buffer

To transmit data, you only have to write it to the transmit buffer (TX SW FIFO) with the DS4201SER_TX_Bx_Cy block. The data is then transmitted via the UART.

Receive buffer

Data that is received via the serial interface is first copied to the UART buffer. When the number of received bytes exceeds the UART threshold or when the UART timeout is triggered, the bytes are copied to the receive buffer.

UART threshold The UART threshold is defined in the DS4201SER_SETUP_Bx_Cy block.

UART timeout The UART timeout is triggered when no signal is received during an interval of 4 signals after the last signal. The time value depends on the number of bits per signal and the baud rate. The worst case is a signal with 12 bits (1 start bit, 8 data bits, 1 parity bit, and 2 stop bits) and a baud rate of 300 baud. In this case the timeout is 160 ms after the last signal is received.

To get the data into your model, use the DS4201SER_RX_Bx_Cy block. It reads the data from the receive buffer and copies it to an outport. To get a trigger signal when the receive buffer contains data, use the DS4201SER_INT_Bx_Cy_Iz block.

DS4201SER_SETUP_Bx_Cy

Where to go from here

Information in this section

Block Description (DS4201SER_SETUP_Bx_Cy)..... 14
To set the global parameters for the serial interface.

Unit Page (DS4201SER_SETUP_Bx_Cy)..... 15
To select the board number and channel number.

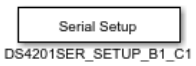
UART Page (DS4201SER_SETUP_Bx_Cy)..... 16
To specify the UART parameters.

FIFO Page (DS4201SER_SETUP_Bx_Cy)..... 17
To specify the software FIFO buffer.

Advanced Page (DS4201SER_SETUP_Bx_Cy)..... 18
To specify the behavior on model termination.

Block Description (DS4201SER_SETUP_Bx_Cy)

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.

I/O mapping

For information on the I/O mapping, refer to Serial Interface (PHS Bus System Hardware Reference 🕮).

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS4201SER_SETUP_Bx_Cy) on page 15)
- UART Page (refer to UART Page (DS4201SER_SETUP_Bx_Cy) on page 16)

- **FIFO Page** (refer to FIFO Page (DS4201SER_SETUP_Bx_Cy) on page 17)
- **Advanced Page** (refer to Advanced Page (DS4201SER_SETUP_Bx_Cy) on page 18)

Related RTLib functions

This RTI block is implemented using the following RTLib functions:

- dsser_init
- dsser_config
- dsser_set

Related topics

References

Advanced Page (DS4201SER_SETUP_Bx_Cy)..... 18
dsser_config (DS4201-S RTLib Reference 🕮)
dsser_init (DS4201-S RTLib Reference 🕮)
dsser_set (DS4201-S RTLib Reference 🕮)
FIFO Page (DS4201SER_SETUP_Bx_Cy)..... 17
UART Page (DS4201SER_SETUP_Bx_Cy)..... 16
Unit Page (DS4201SER_SETUP_Bx_Cy)..... 15

Unit Page (DS4201SER_SETUP_Bx_Cy)

Purpose

To select the board number and channel number.

Dialog settings

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

Channel number Lets you choose the number of the channel in the range 1 … 4.

Related topics

References

Advanced Page (DS4201SER_SETUP_Bx_Cy)..... 18
Block Description (DS4201SER_SETUP_Bx_Cy)..... 14
FIFO Page (DS4201SER_SETUP_Bx_Cy)..... 17
UART Page (DS4201SER_SETUP_Bx_Cy)..... 16

UART Page (DS4201SER_SETUP_Bx_Cy)

Purpose

To specify the UART parameters.

Dialog settings

Transceiver Lets you select the transceiver mode:

Transceiver Mode	Meaning
RS232	RS232 mode
RS422	RS422 mode
RS485	RS485 mode

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

The serial interface of the DS4201-S can be driven by an oscillator with a frequency up to f_{osc} = 24 MHz. The baud rate range depends on the selected transceiver mode and the oscillator frequency.

Note

You have to ensure that the specified transceiver type is installed. For more information, refer to Component Settings for Transceiver Setup (PHS Bus System Hardware Reference 🕮).

The following table shows the baud rate ranges for two different oscillator frequencies:

Mode	Baud Rate Range (f_{osc} = 1.8432 MHz)	Baud Rate Range (f_{osc} = 24 MHz)
RS232	5 … 115,200 baud	5 … 115,200 baud
RS422	5 … 115,200 baud	5 … 1,500,000 baud
RS485	5 … 115,200 baud	5 … 1,500,000 baud

You can specify any baud rate in the range listed above. However, the baud rate actually used by the DS4201-S depends on the oscillator frequency f_{osc} since the baud rate is a fraction of f_{osc}.

The available baud rates can be calculated according to

$f = f_{osc} / (16 \cdot n)$,

where n is a positive integer.

When you specify a baud rate, the closest available baud rate is actually used for serial communication. For example, if you specify 70,000 baud as the baud rate, the baud rate actually used is 57,600 baud (f_{osc} = 1.8432 MHz) or 71,429 baud (f_{osc} = 24 MHz).

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 zero	Parity bit is forced to a logical 0

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

Advanced Page (DS4201SER_SETUP_Bx_Cy)....18
Block Description (DS4201SER_SETUP_Bx_Cy)....14
FIFO Page (DS4201SER_SETUP_Bx_Cy)....17
Unit Page (DS4201SER_SETUP_Bx_Cy)....15

FIFO Page (DS4201SER_SETUP_Bx_Cy)

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.

Overwrite Mode	Meaning
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 (DS4201SER_SETUP_Bx_Cy)....18
Block Description (DS4201SER_SETUP_Bx_Cy)....14
UART Page (DS4201SER_SETUP_Bx_Cy)....16
Unit Page (DS4201SER_SETUP_Bx_Cy)....15

Advanced Page (DS4201SER_SETUP_Bx_Cy)

Purpose

To specify the behavior on model termination.

Dialog settings

Quartz frequency Lets you specify the frequency for triggering the UART.

Note

- You are only allowed to change the frequency, if you have installed a corresponding clock source.
- You have to set the same quartz frequency for each channel specified by a DS4201SER_SETUP_Bx_Cy block in your model.

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 (DS4201SER_SETUP_Bx_Cy)....14
FIFO Page (DS4201SER_SETUP_Bx_Cy)....17
UART Page (DS4201SER_SETUP_Bx_Cy)....16
Unit Page (DS4201SER_SETUP_Bx_Cy)....15

DS4201SER_STAT_Bx_Cy

Where to go from here

Information in this section

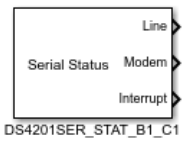
Block Description (DS4201SER_STAT_Bx_Cy)..... 19
To read the contents of the UART status register.

Unit Page (DS4201SER_STAT_Bx_Cy)..... 21
To specify module and channel number used for reading the status.

Status Page (DS4201SER_STAT_Bx_Cy)..... 22
To enable the status registers to be read.

Block Description (DS4201SER_STAT_Bx_Cy)

Block



Purpose

To read the contents of the UART status register.

Note

This block can only be used in interrupt-driven subsystems (see DS4201SER_INT_Bx_Cy_Iz on page 32).

- 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 (PHS Bus System Hardware Reference 🕮).

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 (DS4201SER_STAT_Bx_Cy) on page 21)
- Status Page (refer to Status Page (DS4201SER_STAT_Bx_Cy) on page 22)

Related RTLib functions

This RTI block is implemented using the following RTLib function:

- dsser_status_read

Related topics

References

dsser_status_read (DS4201-S RTLib Reference 🕮)
Status Page (DS4201SER_STAT_Bx_Cy)....22
Unit Page (DS4201SER_STAT_Bx_Cy)....21

Unit Page (DS4201SER_STAT_Bx_Cy)

Purpose

To specify module and channel number used for reading the status.

Dialog settings

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

Channel number Lets you choose the number of the channel within the range 1 … 4.

Related topics

References

Block Description (DS4201SER_STAT_Bx_Cy)..... 19
Status Page (DS4201SER_STAT_Bx_Cy)..... 22

Status Page (DS4201SER_STAT_Bx_Cy)

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 (DS4201SER_STAT_Bx_Cy)..... 19
Unit Page (DS4201SER_STAT_Bx_Cy)..... 21

DS4201SER_TX_Bx_Cy

Where to go from here

Information in this section

Block Description (DS4201SER_TX_Bx_Cy)....23
To send data via the serial interface.

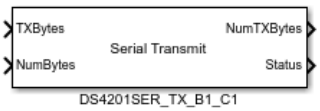
Unit Page (DS4201SER_TX_Bx_Cy)....25
To specify board and channel number used for sending data.

TX Parameters Page (DS4201SER_TX_Bx_Cy)....25
To specify the transmitting parameters.

Advanced Page (DS4201SER_TX_Bx_Cy)....26
To specify the output.

Block Description (DS4201SER_TX_Bx_Cy)

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 (PHS Bus System Hardware Reference 🕮).

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 DS4201SER_SETUP_Bx_Cy on page 14.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS4201SER_TX_Bx_Cy) on page 25)
- **Tx Parameters Page** (refer to TX Parameters Page (DS4201SER_TX_Bx_Cy) on page 25)
- **Advanced Page** (refer to Advanced Page (DS4201SER_TX_Bx_Cy) on page 26)

Related RTLib functions

This RTI block is implemented using the following RTLib function:

- dsser_transmit

Related topics

References

Advanced Page (DS4201SER_TX_Bx_Cy) 26
DS4201SER_SETUP_Bx_Cy 14
dsser_transmit (DS4201-S RTLib Reference 🕮)
TX Parameters Page (DS4201SER_TX_Bx_Cy) 25
Unit Page (DS4201SER_TX_Bx_Cy) 25

Unit Page (DS4201SER_TX_Bx_Cy)

Purpose

To specify board and channel number used for sending data.

Dialog settings

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

Channel number Lets you choose the number of the channel within the range 1 … 4.

Related topics

References

Advanced Page (DS4201SER_TX_Bx_Cy) 26
Block Description (DS4201SER_TX_Bx_Cy) 23
TX Parameters Page (DS4201SER_TX_Bx_Cy) 25

TX Parameters Page (DS4201SER_TX_Bx_Cy)

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 DS4201SER_SETUP_Bx_Cy on page 14).

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 (DS4201SER_TX_Bx_Cy)....26
Block Description (DS4201SER_TX_Bx_Cy)....23
Unit Page (DS4201SER_TX_Bx_Cy)....25

Advanced Page (DS4201SER_TX_Bx_Cy)

Purpose

To specify the output.

Dialog settings

Enable NumTXBytes 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

Block Description (DS4201SER_TX_Bx_Cy)....23
TX Parameters Page (DS4201SER_TX_Bx_Cy)....25
Unit Page (DS4201SER_TX_Bx_Cy)....25

DS4201SER_RX_Bx_Cy

Where to go from here

Information in this section

Block Description (DS4201SER_RX_Bx_Cy)..... 27
To read bytes from the serial interface.

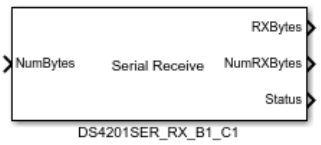
Unit Page (DS4201SER_RX_Bx_Cy)..... 29
To specify board and channel number used for reading data.

RX Parameters Page (DS4201SER_RX_Bx_Cy)..... 30
To specify the receiving parameters.

Advanced Page (DS4201SER_RX_Bx_Cy)..... 30
To specify the output.

Block Description (DS4201SER_RX_Bx_Cy)

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.

Note

The run-time code of the block is not generated in `MdlOutputs()` but in `rti_mdl_sample_input()`. If this block is placed in an enabled subsystem, received data is therefore read from the RX SW FIFO even if the Enable input signal of the subsystem is 0.

I/O mapping

For information on the I/O mapping, refer to Serial Interface (PHS Bus System Hardware Reference 🕮).

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 DS4201SER_SETUP_Bx_Cy on page 14.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS4201SER_RX_Bx_Cy) on page 29)
- **RX Parameters Page** (refer to RX Parameters Page (DS4201SER_RX_Bx_Cy) on page 30)
- **Advanced Page** (refer to Advanced Page (DS4201SER_RX_Bx_Cy) on page 30)

Related RTLib functions

This RTI block is implemented using the following RTLib functions:

- dsser_receive
- dsser_receive_term

Related topics

References

Advanced Page (DS4201SER_RX_Bx_Cy)..... 30
DS4201SER_SETUP_Bx_Cy..... 14
dsser_receive (DS4201-S RTLib Reference 🕮)
dsser_receive_term (DS4201-S RTLib Reference 🕮)
RX Parameters Page (DS4201SER_RX_Bx_Cy)..... 30
Unit Page (DS4201SER_RX_Bx_Cy)..... 29

Unit Page (DS4201SER_RX_Bx_Cy)

Purpose

To specify board and channel number used for reading data.

Dialog settings

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

Channel number Lets you choose the number of the channel within the range 1 … 4.

Related topics

References

Advanced Page (DS4201SER_RX_Bx_Cy)..... 30
Block Description (DS4201SER_RX_Bx_Cy)..... 27
RX Parameters Page (DS4201SER_RX_Bx_Cy)..... 30

RX Parameters Page (DS4201SER_RX_Bx_Cy)

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 DS4201SER_SETUP_Bx_Cy on page 14).

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 (DS4201SER_RX_Bx_Cy) 30
Block Description (DS4201SER_RX_Bx_Cy) 27
Unit Page (DS4201SER_RX_Bx_Cy) 29

Advanced Page (DS4201SER_RX_Bx_Cy)

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

Block Description (DS4201SER_RX_Bx_Cy)..... 27
RX Parameters Page (DS4201SER_RX_Bx_Cy)..... 30
Unit Page (DS4201SER_RX_Bx_Cy)..... 29

DS4201SER_INT_Bx_Cy_Iz

Where to go from here

Information in this section

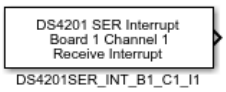
Block Description (DS4201SER_INT_Bx_Cy_Iz)..... 32
To make the interrupts of the serial interface available as trigger sources in the model.

Unit Page (DS4201SER_INT_Bx_Cy_Iz)..... 33
To specify board and channel on which an interrupt will be made available.

Interrupt Page (DS4201SER_INT_Bx_Cy_Iz)..... 34
To specify the interrupt source.

Block Description (DS4201SER_INT_Bx_Cy_Iz)

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 (PHS Bus System Hardware Reference 🕮).

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 (DS4201SER_INT_Bx_Cy_Iz) on page 33)
- **Interrupt Page** (refer to Interrupt Page (DS4201SER_INT_Bx_Cy_Iz) on page 34)

Related RTLib functions

This RTI block is implemented using the following RTLib functions:

- dsser_subint_handler_inst
- dsser_subint_enable
- dsser_subint_disable

Related topics

References

dsser_subint_disable (DS4201-S RTLib Reference 🕮)
dsser_subint_enable (DS4201-S RTLib Reference 🕮)
dsser_subint_handler_inst (DS4201-S RTLib Reference 🕮)
Interrupt Page (DS4201SER_INT_Bx_Cy_Iz) 34
Unit Page (DS4201SER_INT_Bx_Cy_Iz) 33

Unit Page (DS4201SER_INT_Bx_Cy_Iz)

Purpose

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

Dialog settings

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

Channel number Lets you choose the number of the channel within the range 1 … 4.

Related topics

References

Block Description (DS4201SER_INT_Bx_Cy_Iz) 32
Interrupt Page (DS4201SER_INT_Bx_Cy_Iz) 34

Interrupt Page (DS4201SER_INT_Bx_Cy_Iz)

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
Modem status	Modem status interrupt of the UART

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 DS4201SER_SETUP_Bx_Cy on page 14).

The RX SW FIFO threshold can be changed during run time by using the block DS4201SER_INT_REC_LEV_Bx_Cy on page 35.

Related topics

References

Block Description (DS4201SER_INT_Bx_Cy_Iz)..... 32
Unit Page (DS4201SER_INT_Bx_Cy_Iz)..... 33

DS4201SER_INT_REC_LEV_Bx_Cy

Where to go from here

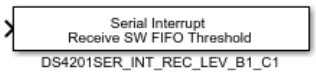
Information in this section

Block Description (DS4201SER_INT_REC_LEV_Bx_Cy)..... 35
To change the RX SW FIFO threshold during run time.

Unit Page (DS4201SER_INT_REC_LEV_Bx_Cy)..... 36
To specify the board and channel on which the RX SW FIFO threshold will be changed.

Block Description (DS4201SER_INT_REC_LEV_Bx_Cy)

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 DS4201SER_INT_Bx_Cy_Iz block (see DS4201SER_INT_Bx_Cy_Iz on page 32).

I/O mapping

For information on the I/O mapping, refer to Serial Interface (PHS Bus System Hardware Reference 🕮).

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 DS4201SER_SETUP_Bx_Cy on page 14.

Dialog pages

The dialog settings can be specified on the following page:

- Unit page (refer to Unit Page (DS4201SER_INT_REC_LEV_Bx_Cy) on page 36)

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

DS4201SER_INT_Bx_Cy_Iz..... 32
DS4201SER_SETUP_Bx_Cy..... 14
dsser_config (DS4201-S RTLib Reference 🕮)
dsser_fifo_reset (DS4201-S RTLib Reference 🕮)
dsser_receive_fifo_level (DS4201-S RTLib Reference 🕮)
dsser_transmit_fifo_level (DS4201-S RTLib Reference 🕮)
Unit Page (DS4201SER_INT_REC_LEV_Bx_Cy)..... 36

Unit Page (DS4201SER_INT_REC_LEV_Bx_Cy)

Purpose

To specify the board and channel 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.

Channel number Lets you choose the number of the channel within the range 1 … 4.

Related topics

References

Block Description (DS4201SER_INT_REC_LEV_Bx_Cy)..... 35

C

Common Program Data folder 6

D

Documents folder 7
DS4201SER_INT_Bx_Cy_Iz 32
DS4201SER_INT_REC_LEV_Bx_Cy 35
DS4201SER_RX_Bx_Cy 27
DS4201SER_SETUP_Bx_Cy 14
DS4201SER_STAT_Bx_Cy 19
DS4201SER_TX_Bx_Cy 23

L

Local Program Data folder 7

R

receive buffer 13
RTI demo model (DS4201-S) 10
RX SW FIFO 13

S

serial interface 11

T

transmit buffer 13
TX SW FIFO 13

U

UART 11
  parameter settings 16