

DS2103 Multi-Channel D/A Board

# RTI Reference

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## How to Contact dSPACE

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

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Tel.: +49 5251 1638-941 or e-mail: [support@dspace.de](mailto:support@dspace.de)

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dSPACE GmbH  
Rathenaustraße 26  
33102 Paderborn  
Germany

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# Contents

About This Reference 5

General Information on the DS2103 Blockset 9

    Overview of the DS2103 Blockset..... 9

DAC Unit 11

DS2103\_Bx..... 12

    Block Description (DS2103\_Bx)..... 12

    Unit Page (DS2103\_Bx)..... 13

    Range Page (DS2103\_Bx)..... 14

    Initialization Page (DS2103\_Bx)..... 14

    Termination Page (DS2103\_Bx)..... 15

    Advanced Page (DS2103\_Bx)..... 16

Index 17



# About This Reference

## Content

This RTI Reference provides a full description of the Real-Time Interface (RTI) software support for the DS2103 Multi-Channel D/A 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
 <b>DANGER</b>	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
<b>NOTICE</b>	Indicates a hazard that, if not avoided, could result in property damage.
<b>Note</b>	Indicates important information that you should take into account to avoid malfunctions.
<b>Tip</b>	Indicates tips that can make your work easier.
	Indicates a link that refers to a definition in the glossary, which you can find at the end of the document unless stated otherwise.
	Precedes the document title in a link that refers to another document.

## Naming conventions

dSPACE user documentation uses the following naming conventions:

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

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

Examples:

- Where you find terms such as `rti<XXXX>` replace them by the RTI platform support you are using, for example, `rti1007`.
- Where you find terms such as `<model>` or `<submodel>` in this document, replace them by the actual name of your model or submodel. For example, if the name of your Simulink model is `smd_1007_s1.slx` and you are asked to edit the `<model>_usr.c` file, you actually have to edit the `smd_1007_s1_usr.c` file.

**RTI block name conventions** All I/O blocks have default names based on dSPACE's board naming conventions:

- Most RTI block names start with the board name.
- A short description of functionality is added.
- Most RTI block names also have a suffix.

Suffix	Meaning
B	Board number (for PHS-bus-based systems)
M	Module number (for MicroAutoBox II)
C	Channel number
G	Group number
CON	Converter number
BL	Block number
P	Port number
I	Interrupt number

A suffix is followed by the appropriate number. For example, `DS2201IN_B2_C14` represents a digital input block located on a DS2201 board. The suffix indicates board number 2 and channel number 14 of the block. For more general block naming, the numbers are replaced by variables (for example, `DS2201IN_Bx_Cy`).

## Special folders

Some software products use the following special folders:

**Common Program Data folder** A standard folder for application-specific configuration data that is used by all users.

`%PROGRAMDATA%\dSPACE\<InstallationGUID>\<ProductName>`

or

%PROGRAMDATA%\dSPACE\<ProductName>\<VersionNumber>

**Documents folder** A standard folder for user-specific documents.

%USERPROFILE%\Documents\dSPACE\<ProductName>\  
<VersionNumber>

**Local Program Data folder** A standard folder for application-specific configuration data that is used by the current, non-roaming user.

%USERPROFILE%\AppData\Local\dSPACE\<InstallationGUID>\  
<ProductName>

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## 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](http://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 DS2103 Blockset

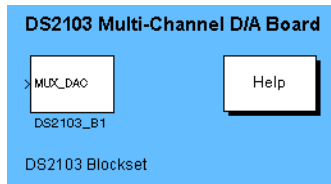
## Overview of the DS2103 Blockset

### RTI blockset

The Real-Time Interface (RTI) board library for the DS2103 Multi-Channel D/A Board provides the RTI blocks that implement the functionality and I/O capabilities of the DS2103 board in Simulink models.

DS2103

After you double-click the corresponding board library icon in the library `rtilibm` the Library: `rtilibm/DS2103` opens:



The following I/O units can be accessed by the RTI blockset for the DS2103:

- [DAC Unit](#) on page 11

### Demo model

For Simulink models, that shows how to use the RTI blocks of the DS2103 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`.



# DAC Unit

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**Objective**

The Library: `rtlibm/DS2103` provides access to the DAC unit of the DS2103.

## DS2103\_Bx

### Where to go from here

### Information in this section

Block Description (DS2103_Bx).....	12
Unit Page (DS2103_Bx).....	13
Range Page (DS2103_Bx).....	14
Initialization Page (DS2103_Bx).....	14
Termination Page (DS2103_Bx).....	15
Advanced Page (DS2103_Bx).....	16

## Block Description (DS2103\_Bx)

### Block



### Purpose

To get write access to up to 32 multiplexed channels of a D/A converter.

### I/O mapping

For details on the I/O connector pinouts of the DS2103, refer to [DAC Unit \(DS2103 Features !\[\]\(758ebdf4629c903da74c2e079717ae32\_img.jpg\)](#)).

### I/O characteristics

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

Output Voltage Range	Simulink Input
$\pm 5$ V	$\pm 1$
$\pm 10$ V	$\pm 1$

- The width of the block input vector must match the number of selected channels.
- The resolution of all channels is 14 bits.
- The DS2103 board is able to convert channel pairs of the following combinations in parallel: 1/17, 2/18, ..., 16/32. Therefore, it is advantageous to use such combinations of channel numbers to speed up data conversion.
- The board provides its outputs in unlatched mode, which means that each channel pair is converted and output immediately.

Dialog pages	<p>The dialog settings can be specified on the following pages:</p> <ul style="list-style-type: none"><li>▪ <a href="#">Unit Page (DS2103_Bx)</a> on page 13</li><li>▪ <a href="#">Range Page (DS2103_Bx)</a> on page 14</li><li>▪ <a href="#">Initialization Page (DS2103_Bx)</a> on page 14</li><li>▪ <a href="#">Termination Page (DS2103_Bx)</a> on page 15</li><li>▪ <a href="#">Advanced Page (DS2103_Bx)</a> on page 16</li></ul>
Related RTLib functions	<p>This RTI block is implemented by using the RTLib functions, which are described in the <i>DS2103 RTLib Reference</i>.</p> <ul style="list-style-type: none"><li>▪ <code>ds2103_init</code></li><li>▪ <code>ds2103_init_scantbl</code></li><li>▪ <code>ds2103_set_errmode</code></li><li>▪ <code>ds2103_set_outmode</code></li><li>▪ <code>ds2103_set_range</code></li><li>▪ <code>ds2103_out</code></li></ul>

## Unit Page (DS2103\_Bx)

Purpose	To specify the board number, and to select a set of channels.
Dialog settings	<p><b>Board number</b> Lets you select the board number in the range 1 ... 16. If your system contains several boards of the same type, RTI uses the board number to distinguish between them.</p> <p><b>Channel selection</b> Lets you select a set of up to 32 channels. To select all or none of the 32 channels, push the All or the None button, respectively.</p>
Related topics	<div>References<div><div><div><div>Advanced Page (DS2103_Bx).....</div><div>16</div></div><div><div>Block Description (DS2103_Bx).....</div><div>12</div></div><div><div>Initialization Page (DS2103_Bx).....</div><div>14</div></div><div><div>Range Page (DS2103_Bx).....</div><div>14</div></div><div><div>Termination Page (DS2103_Bx).....</div><div>15</div></div></div></div></div>

## Range Page (DS2103\_Bx)

**Purpose** To specify the output voltage range.

### Dialog settings

**Configure channels** Lets you switch between the channel sets (1 ... 8, 9 ... 16, ...), for which you want to specify the output voltage range.

**Range** Lets you select the output voltage ranges of  $\pm 5$  V or  $\pm 10$  V for each channel of the specified channel set. To assign one output voltage range to all of the channels displayed, specify the desired value in the second to last row before pushing the Set all button.

#### Note

The range setting is only possible for the channels, that are specified on the Unit page.

### Related topics

#### References

Advanced Page (DS2103_Bx).....	16
Block Description (DS2103_Bx).....	12
Initialization Page (DS2103_Bx).....	14
Termination Page (DS2103_Bx).....	15
Unit Page (DS2103_Bx).....	13

## Initialization Page (DS2103\_Bx)

**Purpose** To specify the initialization value.

### Description

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

### Dialog settings

**Configure channels** Lets you switch between the channel sets (1 ... 8, 9 ... 16, ...), for which you want to specify the initialization value.

**Initialization value** The initial output voltage at the start of the simulation. Valid values must remain within the displayed output voltage range. Selectable

for each channel. To assign one initialization value to all channels displayed, specify the desired value in the second to last row before pushing the Set all button.

Related topics

References

Advanced Page (DS2103_Bx).....	16
Block Description (DS2103_Bx).....	12
Range Page (DS2103_Bx).....	14
Termination Page (DS2103_Bx).....	15
Unit Page (DS2103_Bx).....	13

# Termination Page (DS2103\_Bx)

**Purpose** To specify the termination voltage value.

**Description** When the simulation terminates, all channels hold their last output values by default. If you want to set user-defined output values on termination, this can be done on the Termination page. Use these settings to drive your external hardware into a safe final condition.

**Dialog settings**

**Configure channels** Lets you switch between the channel sets (1 ... 8, 9 ... 16, ...), for which you want to specify the termination voltage value.

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

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



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

**Note**

Valid values must remain within the displayed output voltage range.

## Related topics

## References

Advanced Page (DS2103_Bx).....	16
Block Description (DS2103_Bx).....	12
Initialization Page (DS2103_Bx).....	14
Range Page (DS2103_Bx).....	14
simState (RTI and RTI-MP Implementation Reference  )	
Stop RTP (ControlDesk Platform Management  )	
Unit Page (DS2103_Bx).....	13

## Advanced Page (DS2103\_Bx)

## Purpose

To specify the I/O error handling.

## Description

Via the I/O error line, malfunctions on the processor board are reported to the peripherals and a peripheral failure is signaled to the processor board. Malfunctions may occur from watchdog time-outs, reset of the processor, power failures and hardware error conditions, for example.

## Dialog settings

**Reaction on I/O error** Lets you specify to a set of channels (1 ... 4, 5 ... 8, ...) that the block's output voltage will be set to zero if an I/O error signal is generated by the hardware.

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

The default setting for the Reaction on I/O error is *none*.

**Note**

The termination values set on the Termination page have no effect if an I/O error occurs.

## Related topics

## References

Block Description (DS2103_Bx).....	12
Initialization Page (DS2103_Bx).....	14
Range Page (DS2103_Bx).....	14
Termination Page (DS2103_Bx).....	15
Unit Page (DS2103_Bx).....	13



**C**

Common Program Data folder 6

**D**

Documents folder 7

DS2103\_Bx 12

    Advanced page 16

    block description 12

    Initialization page 14

    Range page 14

    Termination page 15

    Unit page 13

**L**

Local Program Data folder 7

