

DS2102 High-Resolution D/A Board

# Features

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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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# About This Document

**Content** This document provides feature-oriented access to the information you need to implement the functions of the DS2102 board.

## Symbols

dSPACE user documentation uses the following symbols:

Symbol	Description
	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
	Indicates a hazard that, if not avoided, could result in property damage.
	Indicates important information that you should take into account to avoid malfunctions.
	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.

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## 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.

# Introduction to the Features of the DS2102

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## Introduction

D/A conversion is required by many control applications to provide the control signals for actuators. In hardware-in-the-loop applications, sensors that provide analog signals have to be simulated.

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## Where to go from here

### Information in this section

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### Information in other sections

[DAC Unit \(DS2101 Features !\[\]\(2b376d1a92330ab09dad2665d2f89bf5\_img.jpg\)\)](#)

[Data Sheets \(PHS Bus System Hardware Reference !\[\]\(3cb60d42b10e53f9522bb0b392c1c4cd\_img.jpg\)\)](#)

Summarizes the technical specifications of the hardware components.

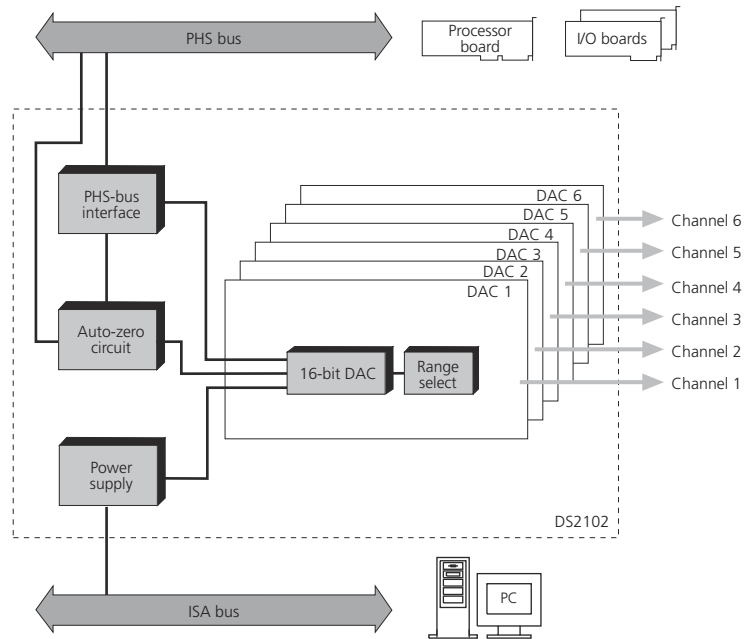
## Board Architecture

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## Introduction

The DS2102 High-Resolution D/A Board provides 6 D/A channels that you can use for D/A conversion.

The following illustration gives an overview of the functional units and architecture of the DS2102:



## Integration Into a PHS-Bus-Based System

### Basics

To be used, the DS2102 must be integrated into a PHS-bus-based system. While the DS2102 performs the required output tasks, the processor board takes over the calculation of the real-time model. That is, applications using DS2102 I/O features are implemented on the processor board.

Communication between processor board and I/O board is performed via the peripheral high speed bus: That is the PHS bus for connection to a dSPACE processor board.

**Partitioning the PHS bus with the DS802** With the DS802 PHS Link Board you can spatially partition the PHS bus by arranging the I/O boards in several expansion boxes.

The DS802 can be used in combination with many types of available dSPACE I/O boards. However, some I/O boards and some functionalities of specific I/O boards are not supported.

The I/O board support depends on the dSPACE software release which you use. For a list of supported I/O boards, refer to [DS802 Data Sheet \(PHS Bus System Hardware Reference\)](#).



## Connection to External Devices

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### Basics

There are two different ways to connect external devices to the DS2102. To access the I/O units of the DS2102, connect external devices:

- to the 37-pin DAC connector P1 of the DS2102
- to the optional connector panel CP2102, equipped with BNC connectors CP1 ... CP6
- to the optional Sub-D/BNC adapter cable DAC-BNC6



# DAC Unit

## DAC Unit

### Introduction

The DS2102 provides a DAC unit featuring 6 parallel D/A converters. They have the following characteristics:

- 16-bit resolution
- $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$  or  $0 \dots 10\text{ V}$  output voltage range (selectable for each of the 6 D/A converters individually)
- Reduction of spikes on the D/A converter outputs (see [Reduction of output spikes](#) on page 12)

#### Note

The deglitcher is available only for versions 01 ... 04 of the DS2102. Version 05 uses different D/A converters with highly reduced output spikes.

### Transparent and latched mode

The DAC unit can be driven in two operating modes:

- In the *transparent mode* the converted value is output immediately.
- In the *latched mode* the converted value is output after a strobe command by the application from the processor board. This allows you to write output values to more than one channel, and output the values simultaneously. To generate the strobe command, use the `ds2102_strobe` function. This mode is not supported by RTI.

### Reacting to I/O errors

If another I/O board activates the I/O error signal of the PHS bus, the DS2102 provides two different modes:

- If the *I/O error mode* is enabled, the output is reset to zero and remains zero until a new output value is written to the channel.
- If the *I/O error mode* is disabled, an I/O error has no influence on the output value.

You can set the *I/O error mode* of the D/A converters with RTI and RTLib.

**Power-up state** On power-up of the DS2102, each output channel of the DAC unit is set to 0 V.

**Reduction of output spikes** When DAC registers are updated, spikes (glitches) may occur in the analog output signal. While typical actuators in control systems are not affected by glitches, they may have a disruptive effect on high-precision applications.

**Note**

Version 05 of the DS2102 uses D/A converters with reduced output spikes. With versions 01 ... 04, deglitchers are available that you can switch on/off with RTI or RTLib.


**RTI/RTLib support** You can access the DAC unit via DS2102 Blockset and RTLib. For details, see:

- [DAC Unit \(DS2102 RTI Reference !\[\]\(13dd0e1ab3baa23f7c1ed52b3eec2756\_img.jpg\)](#))
- [DAC Unit \(DS2102 RTLib Reference !\[\]\(5ed985c65f50e5350eeeb77f03c2e095\_img.jpg\)](#))

**Execution times** For details on the execution times and the corresponding measurement setup, refer to [Function Execution Times \(DS2102 RTLib Reference !\[\]\(05be7c7a8995decd503647c99211f7c2\_img.jpg\)](#)).

**Connecting external devices** For an excerpt from the circuit diagram that shows the I/O circuit and for information on the electrical characteristics and signal conditioning of the DAC unit, refer to [Signal Connection to External Devices \(PHS Bus System Hardware Reference !\[\]\(aa53ad6fea213b8b2226d3077e30533a\_img.jpg\)](#)).

**I/O mapping** The following table shows the mapping between the RTI block and RTLib functions and the corresponding pins used by the DAC unit:

Related RTI Block	Ch (RTI)	Related RTLib Functions	Ch (RTLib)	Conn. Pin	Pin on CP	Signal
DS2102_Bx	Ch 1	See <a href="#">DAC Unit (DS2102 RTLib Reference </a> )	Ch 1	P1 21	P1	DAC1
	Ch 2		Ch 2	P1 24	P2	DAC2
	Ch 3		Ch 3	P1 27	P3	DAC3
	Ch 4		Ch 4	P1 30	P4	DAC4
	Ch 5		Ch 5	P1 33	P5	DAC5
	Ch 6		Ch 6	P1 36	P6	DAC6

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