

DS4201 Prototyping Board

RTLib Reference

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About This Reference

Content

This RTLib Reference (Real-Time Library) gives detailed descriptions of the C functions needed to program a DS4201 Prototyping Board. The C functions can be used to program RTI-specific Simulink S-functions, or to implement your control models manually using C programs.

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.

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


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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.

Macros

Introduction

The base address of an I/O board in a PHS-bus-based system has to be defined by using the `DSxxxx_n_BASE` macro.

Base Address of the I/O Board

DSxxxx_n_BASE Macros

When using I/O board functions, you always need the board's base address as a parameter. This address can easily be obtained by using the `DSxxxx_n_BASE` macros, where `DSxxxx` is the board name (for example, `DS2001`) and `n` is an index which counts boards of the same type. The board with the lowest base address is given index 1. The other boards of the same type are given consecutive numbers in order of their base addresses.

The macros reference an internal data structure which holds the addresses of all I/O boards in the system. The initialization function of the processor board (named `init`) creates this data structure. Hence, when you change an I/O board base address, it is not necessary to recompile the code of your application. For more information on the processor board's initialization function, refer to [ds1006_init \(DS1006 RTLib Reference\)](#) or [init \(DS1007 RTLib Reference\)](#).

Note

The `DSxxxx_n_BASE` macros can be used only after the processor board's initialization function `init` is called.

Example

This example demonstrates the use of the `DSxxxx_n_BASE` macros. There are two `DS2001` boards, two `DS2101` boards, and one `DS2002` board connected to a PHS bus. Their base addresses have been set to different addresses. The following table shows the I/O boards, their base addresses, and the macros which can be used as base addresses:

Board	Base Address	Macro
DS2001	00H	DS2001_1_BASE
DS2002	20H	DS2002_1_BASE
DS2101	80H	DS2101_1_BASE
DS2001	90H	DS2001_2_BASE
DS2101	A0H	DS2101_2_BASE

Initialization Function

Introduction

Before you can use the DS4201, you have to perform the initialization process.

Note

The initialization function of the processor board must be called before the DS4201 board's initialization function.

ds4201_init

Syntax

```
void ds4201_init(phs_addr_t base)
```

Include file

ds4201.h

Purpose

To initialize the DS4201.

Description

This function only checks for the existing of a DS4201. You can add the initialization for your custom hardware part of the DS4201 to this function.

I/O mapping

For details on the I/O mapping, refer to [DS4201 Prototyping Board \(PHS Bus System Hardware Reference !\[\]\(3342c215b2a8b663596a81468d5dc314_img.jpg\)](#)).

Parameters

base Specifies the PHS-bus base address. Refer to [Base Address of the I/O Board](#) on page 7.

Return value None

Error messages The following messages are defined:

Type	Message	Description
Error	ds4201_init(): Invalid PHS-bus base address 0x???????	The value of the base parameter is not a valid PHS-bus address. This error may be caused if the PHS-bus connection of the I/O board is missing. Check the connection.
Error	ds4201_init(0x??): Board not found!	No DS4201 board could be found at the specified PHS-bus address. Check if the DSxxxx_n_BASE macro corresponds to the I/O board used.

Example

This example shows how to use the function:

```
void main(void)
{
    init();
    ds4201_init(DS4201_1_BASE);
    ...
}
```

The DS4201 at address DS4201_1_BASE is initialized.

Related topics

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Register Access Functions

Introduction	RTLib4201 provides functions to read from and write to the board register. <div>Note The board's initialization function must be called before a register access function.</div>
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Where to go from here	Information in this section <div>ds4201_register_read..... 11 To read a value from the board register. ds4201_register_write..... 12 To write a value to the board register.</div>
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ds4201_register_read

Syntax	<pre>UInt32 ds4201_register_read(phs_addr_t base, UInt32 register_offset)</pre>
Include file	ds4201.h
Purpose	To read a value from the board register.

I/O mapping

For details on the I/O mapping, refer to [DS4201 Prototyping Board \(PHS Bus System Hardware Reference\)](#).

Parameters

base Specifies the PHS-bus base address. Refer to [Base Address of the I/O Board](#) on page 7.

register_offset

Specifies the offset of the register base address (0x0 ... 0xF) where you want to read the value.

Return value

This function returns an UInt32 value.

Example

This example shows how to use the function:

```
UInt32 id;
id = ds4201_register_read(DS4201_1_BASE, 0xF);
```

The DS4201 at address DS4201_1_BASE reads the board's ID register at PHS-bus register offset 0xF.

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ds4201_register_write

Syntax


```
void ds4201_register_write(
    phs_addr_t base,
    UInt32 register_offset,
    UInt32 value)
```

Include file

ds4201.h

Purpose

To write a value to the board register.

I/O mapping	For details on the I/O mapping, refer to DS4201 Prototyping Board (PHS Bus System Hardware Reference ).								
Parameters	base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 7.								
register_offset	Specifies the offset of the register base address (0x0 ... 0xF) where you want to write the value.								
value	Specifies the 32-bit unsigned integer value to write.								
Return value	None								
Example	<p>This example shows how to use the function:</p> <pre>ds4201_register_write(DS4201_1_BASE, 0x0, 0xE0001234);</pre> <p>The DS4201 at address DS4201_1_BASE is writing the value 0xE0001234 to the DS4201 register at the PHS-bus register offset 0x0.</p>								
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