DS4501 IP Carrier Board

RTLib 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

Contents

This RTLib Reference (Real-Time Library) gives detailed descriptions of the C functions needed to program a DS4501 IP Carrier Board. The C functions can be used to program RTI-specific Simulink S-functions, or to implement your real-time models manually using C programs.

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.

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 Features of the DS4501 Board

Introduction

The DS4501 IP Carrier Board enables you to use IP modules in a PHS-bus-based system.

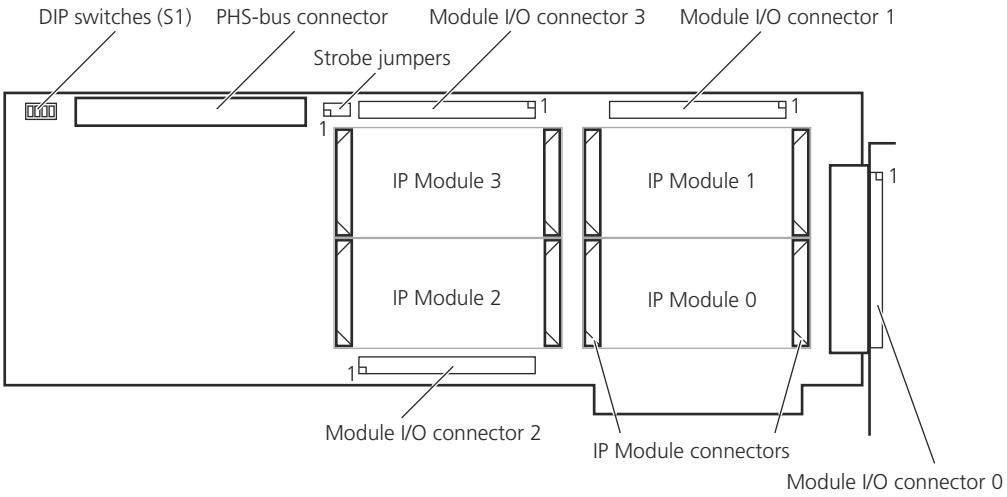
Where to go from here

Information in this section

DS4501 Board Overview

Introduction

The illustration shows the locations of connectors and switches on the board.



The DS4501 contains the following board elements (from left to right):

DIP switches (S1) For setting the PHS-bus base address. Factory default setting: 00H (hex)/0000 (DIP switches).

PHS-bus connector For communication between the processor board and the I/O boards.

Strobe jumpers To connect the logic interface /STROBE of the IP modules to a clock signal.

IP Module x To connect the IP Modules to the carrier board.

Module I/O connector x To connect the IP Modules to the bus system. Pin 1 on the connectors is marked with a square pad, visible from the solder side of the board.

PHS-bus connection

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 🕮).

Memory Types

Introduction

An IP module has usually four memory types:

- ID PROM (identification programmable read-only memory) for the configuration data of the IP module
- I/O space
- Memory space
- Interrupt space

The DS4501RTLib provides you with all the necessary functions to access these memory locations on your IP module.

It is possible that not all functions are really usable, depending on the existing memory types of your IP module.

Memory Access

Accessing memory

Access to the memory locations of an IP module always addresses a 16-bit word, but you can select between an 8-bit and a 16-bit access:

- A word access reads a full 16-bit word.
- A low byte access reads bits 0 to 7 of the specified address.
- A high byte access reads bits 8 to 15 of the specified address.

Note

The DS4501 access functions are not protected against interrupts. An application which uses the functions must ensure that no interrupt disturbs their execution.

Example

This example shows you how to avoid an interrupt during execution of an access function. The `ds4501_mem_read` function is enclosed by function calls which save and disable the interrupt until the memory access is finished or aborted.

```
...
{
   UInt32 base = DS4501_1_BASE;
   UInt32 module = DS4501_MODULE1;
   UInt32 addr = 0x100;
   Int16 data;
   rtlib_int_status_t int_status;
   RTLIB_INT_SAVE_AND_DISABLE(int_status);
   ds4501_mem_read(base, module, DS4501_LOWBYTE_ACCESS, addr, &data);
   RTLIB_INT_RESTORE(int_status);
}
```

```
...
```

Related topics

References

ds4501_mem_read.....41

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

Board Initialization

Introduction

You have to perform the initialization process before you can use the DS4501 board.

Where to go from here

Information in this section

ds4501_init

Syntax

```
void ds4501_init (UInt32 base)
```

Include file

`ds4501.h`

Purpose

To perform the basic initialization of the DS4501 board.

Description

The `ds4501_init` function:

- Resets all connected IP modules
- Sets the clock frequency of the IP modules to 8 MHz
- Sets the I/O error mode to "Reset on IOERR"
- Initializes the Setup Register of the DS4501

Note

This function must be called before any other function can be used.

Parameter

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
230	Error	ds4501_init(0x??): Board not found!	The board DS4501 could not be found at the specified PHS-bus address

Related topics

References

Base Address of the I/O Board 11

ds4501_reset_mode_set

Syntax

```
void ds4501_reset_mode_set(
      UInt32 base,
      UInt32 mode)
```

Include file

`ds4501.h`

Purpose

To select the I/O error mode.

Description

This function can be used to change the I/O error mode setting. The I/O error mode specifies whether the IP modules mounted on the board will be reset automatically if an I/O error occurs or not (i.e., if the I/O error line in the PHS bus is asserted).

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

mode Specifies the I/O error mode. Use the following predefined symbols:

Predefined Symbol	Meaning
`DS4501_IOERROR_RESET`	All connected IP modules are reset after an I/O error has occurred.
`DS4501_IOERROR_NORESET`	No connected IP module is reset after an I/O error has occurred.

Return value

None

Related topics

References

Base Address of the I/O Board..... 11

Module Handling

Introduction

These functions are necessary to initialize an IP module and adapt it to your needs.

Where to go from here

Information in this section

ds4501_module_init

Syntax

```
void ds4501_module_init(
      UInt32 base,
      UInt32 module_nr,
      dsfloat delay)
```

Include file

`ds4501.h`

Purpose

To initialize one IP module.

Note

The default clock frequency is 8 MHz. If a clock frequency of 32 MHz is required, the `ds4501_module_clock_set` function must be called before this function to change the clock frequency.

Description

The IP module which is specified by the module number is started.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

delay Specifies the time delay in seconds which is necessary to initialize the IP module. Choose the length of delay according to the specification of your IP module.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
234	Error	ds4501_module_init: Parameter module_nr out of range(0x??)!	The specified module_nr was greater than DS4501_MODULE4

Related topics

References

Base Address of the I/O Board 11
ds4501_module_clock_set 19

ds4501_module_clock_set

Syntax

```
void ds4501_module_clock_set(
      UInt32 base,
      UInt32 module_nr,
      UInt32 module_clock)
```

Include file

`ds4501.h`

Purpose

To set the clock frequency of an IP module.

Description

The **ds4501_module_clock_set** function performs a reset and the clock frequency is set to the value selected by the **module_clock** parameter. This can be 8 or 32 MHz.

Note

This function must be called before **ds4501_module_init**.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

module_clock Specifies the clock frequency of the IP module. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_CLOCK_8	The clock frequency is set to 8 MHz.
DS4501_CLOCK_32	The clock frequency is set to 32 MHz.

Return value

None

Messages

The following messages are defined:

ID	Type	Message	Description
234	Error	ds4501_module_clock_set: Parameter module_nr out of range (0x??)!	The specified module_nr was greater than DS4501_MODULE4
235	Error	ds4501_module_clock_set: Parameter module_clock at module ? out of range (0x??)!	The specified module_clock was greater than DS4501_CLOCK_32

Example

This example shows how to set the clock frequency of Module 1 to 32 MHz:

```
...
/* Set the clock frequency to 32 MHz*/
ds4501_module_clock_set (
DS4501_1_BASE, DS4501_MODULE1, DS4501_CLOCK_32);
...
```

Related topics

References

Base Address of the I/O Board 11
ds4501_module_init 17

ds4501_module_detect

Syntax

```
UInt32 ds4501_module_detect(
      UInt32 base,
      UInt32 module_nr)
```

Include file

`ds4501.h`

Purpose

To check a module slot.

Description

This function checks if an IP module is available at the module slot specified by the module number.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

Return value

Returns the following error codes:

Error Code	Meaning
DS4501_NO_MODULE	No IP module was found.
DS4501_NO_ERROR	There is an IP module at the specified module number.

Messages

The following message is defined:

ID	Type	Message	Description
234	Error	ds4501_module_detect: Parameter module_nr out of range (0x??)!	The specified module_nr was greater than DS4501_MODULE4

Related topics

References

Base Address of the I/O Board....11

ds4501_module_reset

Syntax

```
void ds4501_module_reset(
      UInt32 base,
      UInt32 module_nr)
```

Include file

ds4501.h

Purpose

To reset the specified IP module.

Description

This function resets the IP module which is specified by the module number.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

Return value

None

Related topics

References

Access to ID Space

Introduction

To access the Identification Programmable Read-Only Memory (ID PROM) of your IP module, you can use the following functions.

Where to go from here

Information in this section

ds4501_id_read

Syntax

```
void ds4501_id_read(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 *data)
```

Include file

`ds4501.h`

Purpose

To read data from the ID space.

Description

The function reads data from the ID space and saves the return value to the location that `*data` points to. The memory access can be performed as a high byte, low byte or word access (see Memory Access on page 9).

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
`DS4501_WORD_ACCESS`	A word access is performed.
`DS4501_UPBYTE_ACCESS`	A high byte access is performed.
`DS4501_LOWBYTE_ACCESS`	A low byte access is performed.

address Specifies the memory location of the ID space.

data Specifies the address to which the data value is saved.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_id_read: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP

ID	Type	Message	Description
			module did not respond within 32 µs. Possible reason: ▪ IP module is not properly connected on the DS4501 ▪ PHS bus cable is not properly installed, see Notes on Installation. ▪ IP module is defect

Example

This example shows how to use the function:

```
...
Int16 data;
...
/*Read 16-bit word from ID space of module 1 with the address
   0x06*/
ds4501_id_read (
      DS4501_1_BASE,
      DS4501_MODULE1,
      DS4501_WORD_ACCESS,
      0x06,
      &data);
...
```

Related topics

Basics

Notes on Installation (DS1006 Hardware Installation and Configuration Guide 🕮)
Notes on Installation (DS1007 Hardware Installation and Configuration Guide 🕮)

References

Base Address of the I/O Board..... 11

ds4501_id_read_timed

Syntax

```
Int32 ds4501_id_read_timed(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 *data,
      Float64 timeout)
```

Include file

`ds4501.h`

Purpose

To read data from the ID space in a specified time.

Description

The function tries to read data from the ID memory in a specified time span and saves the value to the location that `*data` points to. You can use this function to define the time span you require, setting the worst-case execution time of the function to the specified `timeout`. This is necessary for an application with fixed timing, for example. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
`DS4501_WORD_ACCESS`	A word access is performed.
`DS4501_UPBYTE_ACCESS`	A high byte access is performed.
`DS4501_LOWBYTE_ACCESS`	A low byte access is performed.

address Specifies the memory location of the ID space.

data Specifies the address to which the data value is saved.

timeout Specifies the maximum response time in seconds.

Return value

Returns the following error codes:

Error Code	Meaning
`DS4501_ACCESS_OK`	The IP access was successfully finished.
`DS4501_ACCESS_TIMEOUT`	The IP access could not be finished in the specified time span.

Example

This example shows how to perform a read with a specified maximum response time. In this example the response time is set to 20 µs:

```
...
Int16 data;
...
/*Read 16-bit word from ID space with the address 0x06
   of module 1*/
ds4501_id_read_timed (
      DS4501_1_BASE,
      DS4501_MODULE1,
      DS4501_WORD_ACCESS,
      0x06,
      &data,
      20e-6);
...
```

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

ds4501_id_write

Syntax

```
void ds4501_id_write(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 data)
```

Include file

`ds4501.h`

Purpose

To write data to the ID space.

Description

The function writes the specified data to the specified address in the ID space. The memory access can be performed as a high byte, low byte or word access (see Memory Access on page 9).

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location of the ID space.

data Specifies the data value to be written.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_id_write: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs. Possible reason: ▪ IP module is not properly connected on the DS4501 ▪ PHS bus cable is not properly installed, see Notes on Installation. ▪ IP module is defect

Example

This example shows how to write data to the ID space:

```
...
Int16 data = 32;
...
/*Write contents of the variable 'data'
      to high byte address 0x00 of module 3*/
ds4501_id_write (
      DS4501_1_BASE,
      DS4501_MODULE3,
      DS4501_UPBYTE_ACCESS,
      0x00,
      data);
...
```

Related topics

Basics

Notes on Installation (DS1006 Hardware Installation and Configuration Guide 🕮)
Notes on Installation (DS1007 Hardware Installation and Configuration Guide 🕮)

References

Base Address of the I/O Board 11

ds4501_id_write_timed

Syntax

```
Int32 ds4501_id_write_timed(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 data,
      Float64 timeout)
```

Include file

`ds4501.h`

Purpose

To write data to the ID space in a specified time.

Description

The function tries to write the specified data to the ID space in a specified time span. You can use this function to define the time span you require, setting the worst-case execution time of the function to the specified `timeout`. This is necessary for an application with fixed timing, for example. The memory access

can be performed as a high byte, low byte or word access (see Memory Access on page 9).

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location of the ID space.

data Specifies the data value to be written.

timeout Specifies the maximum response time in seconds.

Return value

Returns the following error codes:

Error Code	Meaning
DS4501_ACCESS_OK	The IP access was successfully finished.
DS4501_ACCESS_TIMEOUT	The IP access could not be finished in the specified time span.

Example

This example shows how to write data with a specified maximum response time. In this example the response time is set to 20 µs:

```
...
Int16 data = 32;
...
/*Write contents of the variable 'data' to
      high byte of address 0x00 of module 3*/
ds4501_id_write_timed (
      DS4501_1_BASE,
      DS4501_MODULE3,
      DS4501_UPBYTE_ACCESS,
      0x00,
      data,
      20e-6);
...
```

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

Access to I/O Space

Introduction

To access the I/O space of your IP module, you can use the following functions.

Where to go from here

Information in this section

ds4501_io_read

Syntax

```
void ds4501_io_read(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 *data)
```

Include file

`ds4501.h`

Purpose

To read data from the I/O space.

Description

The function reads data from the I/O space and saves the return value to the location that `*data` points to. The memory access can be performed as a high byte, a low byte or a word access (see Memory Access on page 9).

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
`DS4501_WORD_ACCESS`	A word access is performed.
`DS4501_UPBYTE_ACCESS`	A high byte access is performed.
`DS4501_LOWBYTE_ACCESS`	A low byte access is performed.

address Specifies the memory location of the I/O space.

data Specifies the address to which the data value is saved.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_io_read: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs. Possible reason: ▪ IP module is not properly connected on the DS4501 ▪ PHS bus cable is not properly installed, see Notes on Installation. ▪ IP module is defect

Related topics

Basics

Notes on Installation (DS1006 Hardware Installation and Configuration Guide 🕮)
Notes on Installation (DS1007 Hardware Installation and Configuration Guide 🕮)

References

Base Address of the I/O Board 11

ds4501_io_read_timed

Syntax

```
Int32 ds4501_io_read_timed(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 *data,
      Float64 timeout)
```

Include file

`ds4501.h`

Purpose

To read data from the I/O space in a specified time.

Description

The function tries to read data from the I/O space in a specified time span and saves the value to the location that `*data` points to. You can use this function to define the time span you require, setting the worst-case execution time of the function to the specified `timeout`. This is necessary for an application with fixed timing, for example. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2

Predefined Symbol	Meaning
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location of the I/O space.

data Specifies the address to which the data value is saved.

timeout Specifies the maximum response time in seconds.

Return value

Returns the following error codes:

Error Code	Meaning
DS4501_ACCESS_OK	The IP access was successfully finished.
DS4501_ACCESS_TIMEOUT	The IP access could not be finished in the specified time span.

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

ds4501_io_write

Syntax

```
void ds4501_io_write(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 data)
```

Include file

ds4501.h

Purpose

To write data to the I/O space.

Description

The function writes the specified data to the specified address in the I/O space. The access can be performed as a high byte, low byte or word access (see Memory Access on page 9).

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location of the I/O space.

data Specifies the data value to be written.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_io_write: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP

ID	Type	Message	Description
			module did not respond within 32 µs. Possible reason: ▪ IP module is not properly connected on the DS4501 ▪ PHS bus cable is not properly installed, see Notes on Installation. ▪ IP module is defect

Related topics

Basics

Notes on Installation (DS1006 Hardware Installation and Configuration Guide 🕮)
Notes on Installation (DS1007 Hardware Installation and Configuration Guide 🕮)

References

Base Address of the I/O Board 11

ds4501_io_write_timed

Syntax

```
Int32 ds4501_io_write_timed(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 data,
      Float64 timeout)
```

Include file

`ds4501.h`

Purpose

To write data to the I/O space in a specified time.

Description

The function tries to write the specified data to the I/O space in a specified time span. You can use this function to define the time span you require, setting the worst-case execution time of the function to the specified `timeout`. This is necessary for an application with fixed timing, for example. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location of the I/O space.

data Specifies the data value to be written.

timeout Specifies the maximum response time in seconds.

Return value

Returns the following error codes:

Error Code	Meaning
DS4501_ACCESS_OK	The IP access was successfully finished.
DS4501_ACCESS_TIMEOUT	The access could not be finished in the specified time span.

Related topics

References

Access to Memory Space

Introduction

To access the memory space of your IP module, you can use the following functions.

Where to go from here

Information in this section

ds4501_mem_read

Syntax

```
void ds4501_mem_read(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 *data)
```

Include file

`ds4501.h`

Purpose

To read data from the memory space.

Description

The function reads data from the memory space and saves the return value to the location that `*data` points to. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
`DS4501_WORD_ACCESS`	A word access is performed.
`DS4501_UPBYTE_ACCESS`	A high byte access is performed.
`DS4501_LOWBYTE_ACCESS`	A low byte access is performed.

address Specifies the memory location.

data Specifies the address to which the data value is saved.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_mem_read: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs.

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

ds4501_mem_read_timed

Syntax

```
Int32 ds4501_mem_read_timed(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 *data,
      Float64 timeout)
```

Include file

`ds4501.h`

Purpose

To read data from the memory space in a specified time.

Description

The function tries to read data from the memory space in a specified time span and saves the value to the location that `*data` points to. You can use this function to define the time span you require, setting the worst-case execution time of the function to the specified `timeout`. This is necessary for an application with fixed timing, for example. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location.

data Specifies the address to which the data value is saved.

timeout Specifies the maximum response time in seconds.

Return value

Returns the following error codes:

Error Code	Meaning
DS4501_ACCESS_OK	The IP access was successfully finished.
DS4501_ACCESS_TIMEOUT	The IP access could not be finished in the specified time span.

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

ds4501_mem_block_read

Syntax

```
void ds4501_mem_block_read(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      UInt32 count,
      Int16 *data)
```

Include file

ds4501.h

Purpose

To read a block of data from the memory space.

Description

This function reads a number of bytes or words from the memory space. The number is specified by `count`. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location.

count Specifies the number of data bytes or words to be read.

data Specifies the address to the destination data array.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_mem_block_read: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs.

Example

This example shows how to read eight (low) bytes of data from the memory:

```
...
Int16 data[8];
...
/*Reading eight low bytes starting at address 0x001000*/
ds4501_mem_block_read(
      DS4501_1_BASE,
      DS4501_MODULE1,
      DS4501_LOWBYTE_ACCESS,
      0x001000,
      8,
      data);
...
```

Related topics

References

Base Address of the I/O Board 11
Memory Access 9

ds4501_mem_write

Syntax

```
void ds4501_mem_write(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 data)
```

Include file

`ds4501.h`

Purpose

To write data to the memory space.

Description

The function writes the specified data to the specified address in the memory. The memory access can be performed as a high byte, low byte or word access (see Memory Access on page 9).

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location.

data Specifies the data value to be written.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_mem_write: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs.

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

ds4501_mem_write_timed

Syntax

```
Int32 ds4501_mem_write_timed(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 data,
      Float64 timeout)
```

Include file

`ds4501.h`

Purpose

To write data to the memory space in a specified time.

Description

The function tries to write the specified data to the memory in a specified time span. You can use this function to define the time span you require, setting the worst-case execution time of the function to the specified `timeout`. This is necessary for an application with fixed timing, for example. The memory access can be performed as a high byte, low byte or word access (see Memory Access on page 9).

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location.

data Specifies the data value to be written.

timeout Specifies the maximum response time in seconds.

Return value

Returns the following error codes:

Error Code	Meaning
DS4501_ACCESS_OK	The IP access was successfully finished.
DS4501_ACCESS_TIMEOUT	The IP access could not be finished in the specified time span.

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

ds4501_mem_block_write

Syntax

```
void ds4501_mem_block_write(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      UInt32 count,
      Int16 *data)
```

Include file

ds4501.h

Purpose

To write a block of data to the memory space.

Description

This function writes a number of bytes or words to the specified address in the memory. The number is specified by `count`. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
`DS4501_WORD_ACCESS`	A word access is performed.
`DS4501_UPBYTE_ACCESS`	A high byte access is performed.
`DS4501_LOWBYTE_ACCESS`	A low byte access is performed.

address Specifies the memory location.

count Specifies the number of data bytes or words to be written.

data Specifies the address to the source data block.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_mem_block_write: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs.

Example

This example shows how to write two blocks of data:

```
...
Int16 data[2] = {0,1};
...
/*Writing contents of 'data' to memory location
      starting at address 0x00F000*/
ds4501_mem_block_write(
      DS4501_1_BASE,
      DS4501_MODULE1,
      DS4501_WORD_ACCESS,
      0x00F000,
      2,
      data);
...
```

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

Access to Interrupt Space

Introduction

To access the interrupt space of your IP module, you can use the following functions.

Where to go from here

Information in this section

ds4501_int_read

Syntax

```
void ds4501_int_read(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 *data)
```

Include file

`ds4501.h`

Purpose

To read data from the interrupt space.

Description

The function reads data from the interrupt space and saves the return value to the location that `*data` points to. The memory access can be performed as a high byte, a low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
`DS4501_WORD_ACCESS`	A word access is performed.
`DS4501_UPBYTE_ACCESS`	A high byte access is performed.
`DS4501_LOWBYTE_ACCESS`	A low byte access is performed.

address Specifies the memory location of the interrupt space.

data Specifies the address to which the data value is saved.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_int_read: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs.

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

ds4501_int_read_timed

Syntax

```
Int32 ds4501_int_read_timed(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 *data,
      Float64 timeout)
```

Include file

`ds4501.h`

Purpose

To read data from the interrupt space in a specified time.

Description

The function tries to read data from the interrupt space in a specified time span and saves the value to the location that `*data` points to. You can use this function to define the time span you require, setting the worst-case execution time of the function to the specified `timeout`. This is necessary for an application with fixed timing, for example. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location of the interrupt space.

data Specifies the address to which the data value is saved.

timeout Specifies the maximum response time in seconds.

Return value

Returns the following error codes:

Error Code	Meaning
DS4501_ACCESS_OK	The IP access was successfully finished.
DS4501_ACCESS_TIMEOUT	The IP access could not be finished in the specified time span.

Related topics

References

Base Address of the I/O Board 11
Memory Access 9

ds4501_int_write

Syntax

```
void ds4501_int_write(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 data)
```

Include file

ds4501.h

Purpose

To write data to the interrupt space.

Description

The function writes the specified data to the specified address in the interrupt space. The access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location of the interrupt space.

data Specifies the data value to be written.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Descripition
233	Error	ds4501_int_write: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs.

Related topics

References

ds4501_int_write_timed

Syntax

```
Int32 ds4501_int_write_timed(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_access,
      UInt32 address,
      Int16 data,
      Float64 timeout)
```

Include file

`ds4501.h`

Purpose

To write to the interrupt space in a specified time.

Description

The function tries to write the specified data to the interrupt space in a specified time span. You can use this function to define the time span you require, setting the worst-case execution time of the function to the specified `timeout`. This is necessary for an application with fixed timing, for example. The memory access can be performed as a high byte, low byte or word access. Refer to Memory Access on page 9.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies the memory location of the interrupt space.

data Specifies the data value to be written.

timeout Specifies the maximum response time in seconds.

Return value

Returns the following error codes:

Error Code	Meaning
DS4501_ACCESS_OK	The IP access was successfully finished.
DS4501_ACCESS_TIMEOUT	The IP access could not be finished in the specified time span.

Related topics

References

Base Address of the I/O Board....11
Memory Access....9

General Access via Memory Channels

Introduction

It is possible to perform more general access to the memory locations by using memory channels.

Where to go from here

Information in this section

ds4501_memCh

Syntax

```
typedef struct
{
   UInt 32 base;
   UInt32 *Address;
   UInt32 *Data;
   UInt32 module_nr;
   UInt32 MemSpace;
   UInt32 MemAccess;
   UInt32 AccessNumber;
} ds4501_memCh;
```

Include file `ds4501.h`

Description You must specify one memory channel for each memory location. A memory channel is a data structure which contains all the information needed to perform a read or write access to a specific memory location. That means you have to initialize a specific memory channel only once for several accesses to the same location.

Members

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

Address Specifies an address to read data from or transfer data to.

Data Specifies an address to write data to or to transfer the data value from.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MODULE1`	IP module at slot 1
`DS4501_MODULE2`	IP module at slot 2
`DS4501_MODULE3`	IP module at slot 3
`DS4501_MODULE4`	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

MemSpace Specifies the target memory type. The following symbols are predefined:

Predefined Symbol	Meaning
`DS4501_MEMORY_ID`	The target memory type is the ID PROM.
`DS4501_MEMORY_IO`	The target memory type is the I/O space.
`DS4501_MEMORY_MEM`	The target memory type is the memory space.
`DS4501_MEMORY_INT`	The target memory type is the interrupt space.

MemAccess Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
`DS4501_WORD_ACCESS`	A word access is performed.
`DS4501_UPBYTE_ACCESS`	A high byte access is performed.
`DS4501_LOWBYTE_ACCESS`	A low byte access is performed.

Related topics

References

Base Address of the I/O Board.....11

ds4501_mem_channel_init

Syntax

```
ds4501_memCh *ds4501_mem_channel_init(
      UInt32 base,
      UInt32 module_nr,
      UInt32 mem_type,
      UInt32 mem_access,
      UInt32 *address,
      Int16 *data)
```

Include file

`ds4501.h`

Purpose

To initialize a memory channel.

Description

This function initializes the data structure for a memory channel (`ds4501_memCh`), which contains all the information needed to perform a read or write access to the specified module and the specified memory location.

Parameters

base Specifies the PHS-bus base address. Refer to Base Address of the I/O Board on page 11.

module_nr Specifies the IP module number. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MODULE1	IP module at slot 1
DS4501_MODULE2	IP module at slot 2
DS4501_MODULE3	IP module at slot 3
DS4501_MODULE4	IP module at slot 4

For information on the module slots, refer to DS4501 Board Overview on page 8.

mem_type Specifies the memory type of the target memory. The following symbols are predefined:

Predefined Symbol	Meaning
DS4501_MEMORY_ID	The target memory type is the ID PROM.
DS4501_MEMORY_IO	The target memory type is the I/O space.
DS4501_MEMORY_MEM	The target memory type is the memory space.
DS4501_MEMORY_INT	The target memory type is the interrupt space.

mem_access Specifies the memory access mode. Use the following predefined symbols to choose the appropiate access:

Predefined Symbol	Meaning
DS4501_WORD_ACCESS	A word access is performed.
DS4501_UPBYTE_ACCESS	A high byte access is performed.
DS4501_LOWBYTE_ACCESS	A low byte access is performed.

address Specifies a pointer to a memory location.

data Specifies a pointer to a data value to be read or written.

Return value

channel_descriptor Returns an address to a memory channel.

Messages

The following message is defined:

ID	Type	Message	Description
232	Error	ds4501_mem_channel_init(): Memory allocation failed.	It was not possible to allocate enough memory.

Example

This example shows how to initialize a memory channel:

```
...
UInt32 address = 0x100;
Int16 data;
ds4501_memCh *channel_descriptor;
...
/*Initialization of a data memory access to module 2.
      The access to the memory shall be performed wordwise.*/
channel_descriptor = ds4501_mem_channel_init(
      DS4501_1_BASE,
      DS4501_MODULE2,
      DS4501_MEMORY_MEM,
      DS4501_WORD_ACCESS,
      &address,
      &data);
...
```

Related topics

References

Base Address of the I/O Board....11
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ds4501_mem_channel_read

Syntax

```
void ds4501_mem_channel_read(ds4501_memCh *channel_descriptor)
```

Include file

`ds4501.h`

Purpose

To read data from an IP module memory location.

Description

This function reads data from a memory location which is specified in the channel_descriptor structure. This structure contains the source address and a pointer to the location the returned value must be written to.

Parameters

channel_descriptor Specifies an address to a memory channel.

Return value

None

Messages

The following message is defined.

ID	Type	Message	Description
233	Error	ds4501_mem_channel_read: DS4501 access timeout error at module ? (0x??)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs.

Example

This example shows how to use a memory channel:

```
...
Int16 data;
UInt32 address = 0x100000;
ds4501_memCh *channel_descriptor;
...
/*Initialization of memory channel*/
channel_descriptor = ds4501_mem_channel_init(
      DS4501_1_BASE,
      DS4501_MODULE3,
      DS4501_MEMORY_MEM,
      DS4501_UPBYTE_ACCESS,
      &address,
      &data);
...
/*Read value from IP module memory as specified by
      'channel_descriptor' */
ds4501_mem_channel_read(channel_descriptor);
...
```

ds4501_mem_channel_write

Syntax

```
void ds4501_mem_channel_write(
      ds4501_memCh *channel_descriptor)
```

Include file

`ds4501.h`

Purpose

To write data to an IP module memory location.

Description

This function writes data to a memory location which is specified in the channel_descriptor structure. This structure contains the destination address and a pointer to the location of the data to be written.

Parameters

channel_descriptor Specifies an address to a memory channel.

Return value

None

Messages

The following message is defined:

ID	Type	Message	Description
233	Error	ds4501_mem_channel_write: DS4501 access timeout error at module ? (0x00)!	The built-in timer generated a timeout signal because the IP module did not respond within 32 µs.

Example

This example shows how to use a memory channel:

```
...
Int16 data = 0x56;
UInt32 address = 0x02;
ds4501_memCh *channel_descriptor;
...
/* Initialization of memory channel */
channel_descriptor = ds4501_mem_channel_init (
      DS4501_1_BASE,
      DS4501_MODULE4,
      DS4501_MEMORY_ID,
      DS4501_WORD_ACCESS,
      &address,
      &data);
...
/* Write value to IP module memory as specified
      by 'channel_descriptor' */
ds4501_mem_channel_write (channel_descriptor);
...
```