DS5101 Digital Waveform Output Board

RTI Reference

Release 2021-A – May 2021

dSPACE

How to Contact dSPACE

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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.
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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

Contents

About This Reference

Contents

This reference provides a full description of the Real-Time Interface (RTI) software support for the DS5101 Digital Waveform Output 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 DS5101 Blockset

Introduction

Here you get basic information on the DS5101 blockset.

Overview of the DS5101 Blockset

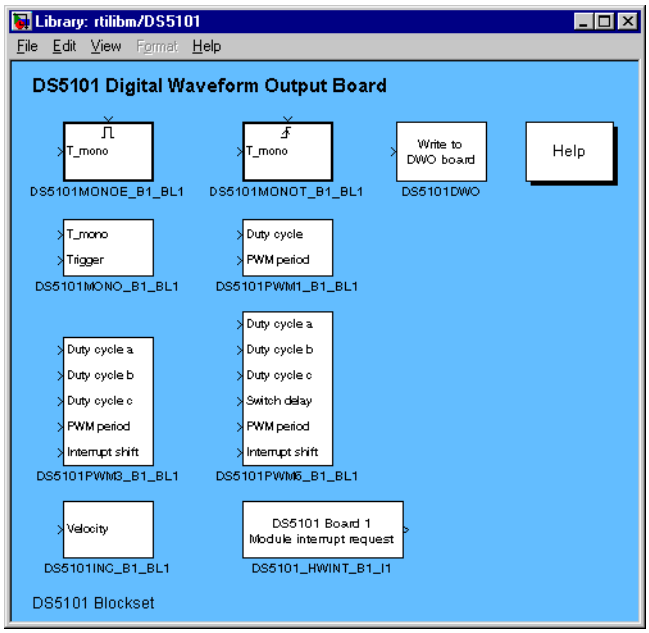
About this board

The DS5101 Digital Waveform Output Board autonomously generates various TTL pulse patterns on up to 16 channels with a time resolution of 25 ns. You can also program your own pulse patterns in an intuitive high-level language.

Access

The Real-Time Interface (RTI) board library for the DS5101 Digital Waveform Output Board provides the RTI blocks that implement the functionality and I/O capabilities of the DS5101 board in Simulink models.

After you double-click the corresponding board library icon in the **rtilibm** library the **Library: rtilibm/DS5101** opens:



Library components

The following I/O units can be accessed by the RTI blockset for the DS5101:

- Timing I/O Unit on page 11
- DWO Unit on page 33
- Interrupts on page 37

Demo model

For Simulink models (`demom_ds5101_1.mdl` and `demom_ds5101_2.mdl`) showing how to use the RTI blocks of the DS5101 board, refer to the RTI demo library of your processor board. You can also find the model files at `<RCP_HIL_InstallationPath>\Demos\ds100x`.

Timing I/O Unit

Introduction

The Library: rtilibm/DS5101 provides access to the timing I/O unit of the DS5101.

Where to go from here

Information in this section

DS5101PWM1_Bx_BLy

Purpose

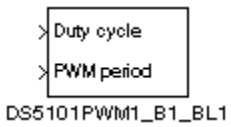
To generate 1-phase PWM signals with variable duty cycle and period length.

Where to go from here

Information in this section

Block Description (DS5101PWM1_Bx_BLy)

Illustration



Purpose

To generate 1-phase PWM signals with variable duty cycle and period length.

I/O mapping

For details on the I/O mapping, refer to Mapping of I/O Signals (PHS Bus System Hardware Reference 🕮).

I/O characteristics

- Scaling between the duty cycle and the input of the block:

Duty Cycle	Simulink Input
0 … 100%	0 … 1 (double)

- The PWM period inport determines the PWM period length in seconds. Valid values must remain within the range 500 ns … 26 s.
- Only a single channel of the DS5101 board is occupied by a 1-channel PWM application.Thus, up to sixteen 1-channel PWM applications are available.

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS5101PWM1_Bx_BLy) on page 13)
- Initialization Page (refer to Initialization Page (DS5101PWM1_Bx_BLy) on page 13)
- Termination Page (refer to Termination Page (DS5101PWM1_BX_BLy) on page 14)

Related RTLib functions

`ds5101_init`, `ds5101_pwm_load`, `ds5101_pwm_update`, `ds5101_start`, `ds5101_stop`

Unit Page (DS5101PWM1_Bx_BLy)

Purpose

To specify the output channel for the 1-phase PWM signal generation.

Dialog settings

Board number 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.

Channel-block number Lets you select the block number in the range 1 … 16. Each channel block occupies 1 output channel of the DS5101 board.

Related topics

References

Initialization Page (DS5101PWM1_Bx_BLy)

Purpose

To specify the initial values at simulation start.

Description

During the model initialization phase, an initial duty cycle and an initial period length are set for PWM generation. This is especially useful if a PWM signal is generated from within a triggered or enabled subsystem which 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

Initial duty cycle Lets you specify the initial duty cycle at the start of the simulation. The duty cycle must remain within the range 0 … 1. The default value is 0.5.

Initial period Lets you specify the PWM period (clock signal) at the start of the simulation. The period must remain within the range 500 ns … 26 s. The default value for the channel specified is 0.01 s.

Related topics

References

Termination Page (DS5101PWM1_BX_BLy)..... 14
Unit Page (DS5101PWM1_Bx_BLy)..... 13

Termination Page (DS5101PWM1_BX_BLy)

Purpose

To specify the output values at termination.

Description

When the simulation terminates, all channels hold their signal shape by default. You can set a user-defined duty cycle and period length on termination to drive your external hardware into a safe final condition.

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.

Dialog settings

Termination values Lets you keep the current output for the duty cycle and the period length or specify their termination values.

Duty cycle on termination If the Termination values checkbox is selected, the Duty cycle on termination can be specified. Its value must remain within the range 0 … 1.

Period on termination If the Termination values checkbox is selected, the Period on termination can be specified. The period must remain within the range 500 ns … 26 s.

Related topics

References

Initialization Page (DS5101PWM1_Bx_BLy)..... 13
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)
Unit Page (DS5101PWM1_Bx_BLy)..... 13

DS5101PWM3_Bx_BLy

Purpose

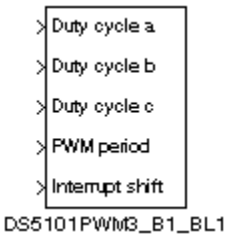
To generate 3-phase PWM signals with variable duty cycles and period length.

Where to go from here

Information in this section

Block Description (DS5101PWM3_Bx_BLy)

Illustration



Purpose

To generate 3-phase PWM signals with variable duty cycles and period length.

I/O mapping

For details on the I/O mapping, refer to Mapping of I/O Signals (PHS Bus System Hardware Reference 🕮).

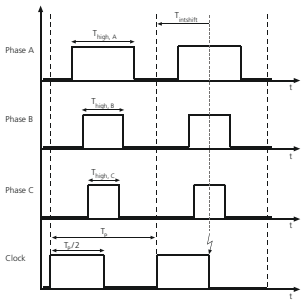
I/O characteristics

- Scaling between the duty cycles and the input of the block:

Duty Cycle	Simulink Input
0 … 100%	0 … 1 (double)

- The PWM period inport determines the PWM period length in seconds. Valid values must remain within the range 500 ns … 26 s.

- The 3-phase PWM application generates 3 signals which are symmetrical to the middle of their high-level pulses. To synchronize the 3 output signals, a master clock signal is generated additionally. Thus, 4 channels of the DS5101 board are occupied by a 3-phase PWM application.
- The clock output generates an interrupt request at **`0.5 · t`**$_p$ **`- intshift`**, where **`intshift`** is specified by the **Interrupt shift** inport. The interrupt shift depends on the PWM period. It must be in the range 0.25e-6 … 0.5 · t_p – 0.25e-6.



- Up to four 3-phase PWM applications are available.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS5101PWM3_Bx_BLy) on page 17)
- **Initialization Page** (refer to Initialization Page (DS5101PWM3_Bx_BLy) on page 18)
- **Termination Page** (refer to Termination Page (DS5101PWM3_Bx_BLy) on page 18)

Related RTLib functions

`ds5101_init`, `ds5101_pwm3_intshift_load`, `ds5101_pwm3_intshift_update`, `ds5101_start`, `ds5101_stop`

Unit Page (DS5101PWM3_Bx_BLy)

Purpose

To specify the output channels for the 3-phase PWM signal generation.

Dialog settings

Board number 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.

Channel-block number Lets you select the block number in the range 1 … 4. Each channel block occupies 4 output channels of the DS5101 board.

Related topics

References

Initialization Page (DS5101PWM3_Bx_BLy)..... 18
Termination Page (DS5101PWM3_Bx_BLy)..... 18

Initialization Page (DS5101PWM3_Bx_BLy)

Purpose

To specify the initial values at simulation start.

Description

During the model initialization phase, initial duty cycles and an initial period length are set for PWM generation. This is especially useful if the PWM signals are generated from within a triggered or enabled subsystem which 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

Initial duty cycle Lets you specify the initial duty cycle at the start of the simulation. The duty cycle must remain within the range 0 … 1. The default value is 0.5. It is selectable for the first 3 channels of the specified channel block.

Initial period Lets you specify the PWM period at the start of the simulation. The period must remain within the range 500 ns … 26 s. The default value is 0.01 s. It is selectable for the fourth channel of the specified channel block.

Related topics

References

Termination Page (DS5101PWM3_Bx_BLy)..... 18
Unit Page (DS5101PWM3_Bx_BLy)..... 17

Termination Page (DS5101PWM3_Bx_BLy)

Purpose

To specify the output values at termination.

Description

When the simulation terminates, all channels hold their signal shape by default. You can set user-defined duty cycles and period length on termination to drive your external hardware into a safe final condition.

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.

Dialog settings

Termination values Lets you keep the current output for the duty cycles and the period length when the simulation terminates or specify their termination values.

Duty cycle on termination If the Termination values checkbox is selected, the Duty cycle on termination can be specified for the selected channels. Its value must remain within the range 0 … 1.

Period on termination If the Termination values checkbox is selected, the Period on termination can be specified. The period must remain within the range 500 ns … 26 s.

Related topics

References

Initialization Page (DS5101PWM3_Bx_BLy)..... 18
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)
Unit Page (DS5101PWM3_Bx_BLy)..... 17

DS5101PWM6_Bx_BLy

Purpose

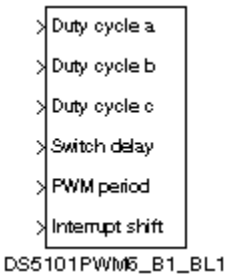
To generate 3-phase PWM signals with inverted and non-inverted PWM outputs. The duty cycles, a switch delay, the period length and the interrupt shift are variable.

Where to go from here

Information in this section

Block Description (DS5101PWM6_Bx_BLy)

Illustration



Purpose

To generate 3-phase PWM signals with inverted and non-inverted PWM outputs. The duty cycles, a switch delay, the period length and the interrupt shift are variable.

I/O mapping

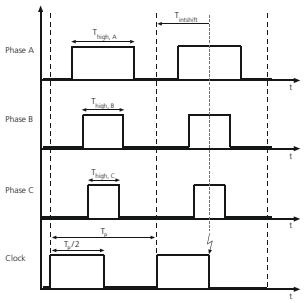
For details on the I/O mapping, refer to Mapping of I/O Signals (PHS Bus System Hardware Reference 🕮).

I/O characteristics

- Scaling between the duty cycles and the input of the block:

Duty Cycle	Simulink Input
0 … 100%	0 … 1 (double)

- The **PWM period** inport determines the PWM period length in seconds. Valid values must remain within the range 500 ns … 26 s.
- The **Switch delay** is measured in seconds and must not lead to signals longer than one half of the PWM period.
- The 3-phase/6-channel PWM application generates 3 non-inverted and 3 inverted signals symmetrical to the middle of their high-level and low-level pulses respectively. To synchronize the 6 output signals, a master clock signal is generated additionally. Thus, 7 channels of the DS5101 board are occupied by a 3-phase/6-channel PWM application.
- The **Switch delay** affects the inverted outputs only. With delay, the falling edge of the inverted signal appears earlier than the rising edge at the non-inverted signal. The rising edge of the inverted signal is additionally delayed with respect to the falling edge of the non-inverted signal.
- The clock output generates an interrupt request at `0.5 · tp - intshift`, where `intshift` is specified by the **Interrupt shift** inport. The interrupt shift depends on the PWM period. It must be in the range 0.25e-6 … 0.5 · t_p - 0.25e-6.



- Two 3-phase/6-channel PWM applications are available. Channels 8 and 16 of the DS5101 board are not used with the **3-Phase/6-Channel PWM** block.

Dialog pages

The dialog settings can be specified on the following pages:

- **Unit Page** (refer to Unit Page (DS5101PWM6_Bx_BLy) on page 22)
- **Initialization Page** (refer to Initialization Page (DS5101PWM6_Bx_BLy) on page 22)
- **Termination Page** (refer to Termination Page (DS5101PWM6_Bx_BLy) on page 23)

Related RTLib functions

`ds5101_init`, `ds5101_pwm6_intshift_load`, `ds5101_pwm6_intshift_update`, `ds5101_start`, `ds5101_stop`

Unit Page (DS5101PWM6_Bx_BLy)

Purpose

To specify the output channels for the 3-phase/6-channel PWM signal generation.

Dialog settings

Board number 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.

Channel-block number Lets you select the block number in the range 1 … 2. Each channel block occupies 7 output channels of the DS5101 board.

Related topics

References

Initialization Page (DS5101PWM6_Bx_BLy)....22
Termination Page (DS5101PWM6_Bx_BLy)....23

Initialization Page (DS5101PWM6_Bx_BLy)

Purpose

To specify the initial values at simulation start.

Description

During the model initialization phase initial duty cycles, the switch delay and an initial period length are set for PWM generation. This is especially useful if the PWM signals are generated from within a triggered or enabled subsystem which 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

Initial duty cycle Lets you specifiy the initial duty cycle at the start of the simulation. The duty cycle must remain within the range 0 … 1. The default value is 0.5.

Initial switch delay Lets you specify the switch delay at the start of the simulation. The switch delay is measured in seconds and must not lead to signals that are held longer than one half of the PWM period.

Initial period Lets you specify the PWM period at the start of the simulation. The period must remain within the range 500 ns … 26 s. The default value is 0.01 s.

Related topics

References

Termination Page (DS5101PWM6_Bx_BLy)....23
Unit Page (DS5101PWM6_Bx_BLy)....22

Termination Page (DS5101PWM6_Bx_BLy)

Purpose

To specify the output values at termination.

Description

When the simulation terminates, all channels hold their signal shape by default. You can set user-defined duty cycles, switch delay and period length on termination to drive your external hardware into a safe final condition.

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.

Dialog settings

Termination values Lets you either keep the current output for the duty cycles, the switch delay and the period length when the simulation terminates or select the checkbox to specify their termination values.

Duty cycle on termination If the Termination values checkbox is selected, the duty cycle on termination can be specified for the selected channels. Its value must remain within the range 0 … 1.

Switch delay on termination If the Termination values checkbox is selected, the switch delay can be specified. The delay is measured in seconds and must not lead to signals that are held longer than one half of the PWM period.

Period on termination If the Termination values checkbox is selected, the period on termination can be specified. Its value must remain within the range 500 ns … 26 s.

Related topics

References

Initialization Page (DS5101PWM6_Bx_BLy)....22
simState (RTI and RTI-MP Implementation Reference 🕮)
Stop RTP (ControlDesk Platform Management 🕮)
Unit Page (DS5101PWM6_Bx_BLy)....22

DS5101MONO_Bx_BLy

Purpose

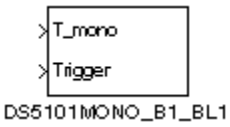
To provide a monoflop behavior on a DS5101 output channel. The trigger level is variable.

Where to go from here

Information in this section

Block Description (DS5101MONO_Bx_BLy)

Illustration



Purpose

To provide a monoflop behavior on a DS5101 output channel. The trigger level is variable.

I/O mapping

For details on the I/O mapping, refer to Mapping of I/O Signals (PHS Bus System Hardware Reference 🕮).

I/O characteristics

- Each DS5101MONO_Bx_BLy block generates a high-active and a low-active output signal on subsequent channels. Therefore, 2 channels of the DS5101 board are occupied by a monoflop application.
- The monoflop outputs toggle their logical state when the Trigger inport is higher than the trigger level selected from the Parameters page.
- The T_mono inport determines the period of time until the monoflop output signals fall back into their default states. The value of T_mono is measured in seconds.
- Up to 8 monoflops are available.

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS5101MONO_Bx_BLy) on page 25)
- Parameters Page (refer to Parameters Page (DS5101MONO_Bx_BLy) on page 25)

Related RTLib functions

`ds5101_init`, `ds5101_mono_load`, `ds5101_mono_update`, `ds5101_start`, `ds5101_stop`, `ds5101_trigger`

Unit Page (DS5101MONO_Bx_BLy)

Purpose

To specify the monoflop output channels.

Dialog settings

Board number 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.

Channel-block number Lets you select the block number in the range 1 … 8. Each channel block occupies 2 output channels of the DS5101 board. The assigned channels are stated in the dialog field below.

Related topics

References

Parameters Page (DS5101MONO_Bx_BLy)..... 25

Parameters Page (DS5101MONO_Bx_BLy)

Purpose

To specify the start trigger for the monoflop signal generation.

Dialog settings

Trigger level (0 - 1) The trigger level that must be reached to start the monoflop signal generation. Valid values must remain within the range 0 … 1.

Related topics

References

Unit Page (DS5101MONO_Bx_BLy)..... 25

DS5101MONOE_Bx_BLy

Purpose

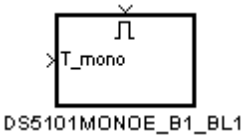
To provide a monoflop behavior on a DS5101 output channel. The monoflop is triggered if the subsystem is in an enable state.

Where to go from here

Information in this section

Block Description (DS5101MONOE_Bx_BLy)

Illustration



Purpose

To provide a monoflop behavior on a DS5101 output channel. The monoflop is triggered if the subsystem is in an enable state.

I/O mapping

For details on the I/O mapping, refer to Mapping of I/O Signals (PHS Bus System Hardware Reference 🕮).

I/O characteristics

- Each DS5101MONOE_Bx_BLy block generates a high-active and a low-active output signal on subsequent channels. This means that 2 channels of the DS5101 board are occupied by a monoflop application.
- The monoflop outputs toggle their logical state when the enabled subsystem is executed.
- The T_mono inport determines the period of time until the monoflop output signals fall back into their default states. The value of T_mono is measured in seconds.
- Up to 8 monoflops are available.

Dialog pages

The dialog settings can be specified on the **Unit Page** (refer to Unit Page (DS5101MONOE_BX_BLy) on page 27).

Related RTLib functions

`ds5101_init`, `ds5101_mono_load`, `ds5101_mono_update`, `ds5101_start`, `ds5101_stop`, `ds5101_trigger`

Unit Page (DS5101MONOE_BX_BLy)

Purpose

To specify the monoflop output channels, triggered by an enabled subsystem.

Dialog settings

Board number 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.

Channel-block number Lets you select the block number in the range 1 … 8. Each channel block occupies 2 output channels of the DS5101 board. The assigned channels are stated in the dialog field below.

DS5101MONOT_Bx_BLy

Purpose

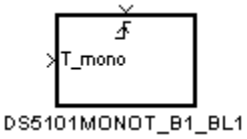
To provide a monoflop behavior on a DS5101 output channel. The monoflop is triggered if the subsystem is triggered.

Where to go from here

Information in this section

Block Description (DS5101MONOT_Bx_BLy)

Illustration



Purpose

To provide a monoflop behavior on a DS5101 output channel. The monoflop is triggered if the subsystem is triggered.

I/O mapping

For details on the I/O mapping, refer to Mapping of I/O Signals (PHS Bus System Hardware Reference 🕮).

I/O characteristics

- Each DS5101MONOT_Bx_BLy block generates a high-active and a low-active output signal on subsequent channels. This means that 2 channels of the DS5101 board are occupied by a monoflop application.
- The monoflop outputs toggle their logical state if the subsystem is triggered by a rising Simulink signal.
- The T_mono inport determines the period of time until the monoflop output signals fall back into their default states. The value of T_mono is measured in seconds.
- Up to 8 monoflops are available.

Dialog pages

The dialog settings can be specified on the **Unit Page** (refer to Unit Page (DS5101MONOT_Bx_BLy) on page 29).

Related RTLib functions

`ds5101_init`, `ds5101_mono_load`, `ds5101_mono_update`, `ds5101_start`, `ds5101_stop`, `ds5101_trigger`

Unit Page (DS5101MONOT_Bx_BLy)

Purpose

To specify the monoflop output channels, triggered by a triggered subsystem.

Dialog settings

Board number 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.

Channel-block number Lets you select the block number in the range 1 … 8. Each channel block occupies 2 output channels of the DS5101 board. The assigned channels are stated in the dialog field below.

DS5101INC_Bx_BLy

Purpose

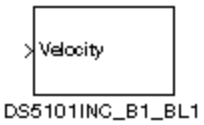
To provide access to an incremental sensor simulation unit.

Where to go from here

Information in this section

Block Description (DS5101INC_Bx_BLy)

Illustration



Purpose

To provide access to an incremental sensor simulation unit.

I/O mapping

For details on the I/O mapping, refer to Mapping of I/O Signals (PHS Bus System Hardware Reference 🕮).

I/O characteristics

- The Velocity inport is measured in encoder lines per second and must remain within the range -1e6 … +1e6 s^{-1}.
- The incremental sensor simulation application generates the leading and the lagging phase outputs. Thus, 2 channels of the DS5101 board are occupied by this application.
- 7 incremental sensor simulation applications are available. The channels 15 and 16 of the DS5101 board are not used with the incremental sensor simulator.

Dialog pages

The dialog settings can be specified on the following pages:

- Unit Page (refer to Unit Page (DS5101INC_Bx_BLy) on page 31)
- Parameters Page (refer to Parameters Page (DS5101INC_Bx_BLy) on page 31)

Related RTLib functions

`ds5101_init`, `ds5101_inc_load`, `ds5101_inc_update`, `ds5101_start`, `ds5101_stop`

Unit Page (DS5101INC_Bx_BLy)

Purpose

To specify the output channels of the incremental sensor simulation unit.

Dialog settings

Board number 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.

Channel-block number Lets you select the block number in the range 1 … 7. Each channel block occupies 2 output channels of the DS5101 board.

Related topics

References

Parameters Page (DS5101INC_Bx_BLy) 31

Parameters Page (DS5101INC_Bx_BLy)

Purpose

To specify the initial values at simulation start.

Description

- During the model initialization phase the velocity is set for the encoder simulator. This is especially useful if the encoder signals are generated from within a triggered or enabled subsystem which is not executed right from the start of the simulation. With the initialization value all channels have defined outputs during this simulation phase.
- When the simulation terminates, the encoder simulator holds its velocity by default. You can set a user-defined velocity on termination to drive your external hardware into a safe final condition.

Dialog settings

Initial velocity Lets you specify the initial velocity (encoder lines per second) at the start of the simulation. The default value is 100 s^{-1}.

Termination velocity Lets you either keep the current velocity when the simulation terminates or select the checkbox to specify a termination value. The velocity is measured in encoder lines per second and must remain within the range –1e6 … +1e6 s^{-1}.

Related topics

References

Unit Page (DS5101INC_Bx_BLy)..... 31

DWO Unit

Introduction

The Library: rtilibm/DS5101 provides access to the DWO unit of the DS5101.

DS5101DWO

Purpose

To enable parameter updating of a user-written DS5101 DWO Board application.

Where to go from here

Information in this section

Block Description (DS5101DWO)

Illustration

Purpose

To enable parameter updating of a user-written DS5101 DWO Board application.

Description

You must edit the public part of the S-function template `rti5101dwo.c`, which you can find in `<RCP_HIL_InstallationPath>\MATLAB\RTI\RTI<ProcessorBoard>\SFcn`. Copy the S-function template `rti5101dwo.c` to your working directory together with the header file and the C file of your DS5101 application.

If you want to use more than one **DS5101 DWO** block you have to rename the template according to your requirements. Afterwards you have to compile the S-function using the MATLAB command **`mex <name_of_renamed_template>.c`**.

Note

No error checking is performed.
The scaling depends on the user-defined DWO application.

I/O mapping	For details on the I/O mapping, refer to Mapping of I/O Signals (PHS Bus System Hardware Reference 🕮).
I/O characteristics	▪ The number of inputs has to correspond to the number of variables you want to update. Use a multiplexed input for updating more than one variable. ▪ The block's input depends on the specific DWO application.
Dialog settings	The dialog settings can be specified on the **Parameters Page** (refer to Parameters Page (DS5101DWO) on page 35).
Related RTLib functions	`ds5101_init`, `ds5101_start`, `ds5101_stop`

Parameters Page (DS5101DWO)

Purpose	To configure the parameter updating of a user-written DWO board application.
Dialog settings	**Board number** 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. **Number of inputs** Lets you specify the number of variables you want to update. Use a multiplexed input for updating more than one variable. **Sample Time** Lets you specify the sample time of the task. Valid values are "–1" (inherited), "0" (continuous), or any multiple of the **Fixed step size** chosen on the **Simulation parameters** page of the current model. **S-Function name** After you have created an S-function using the template `rti5101dwo.c` you have to specify its name in this dialog.

Interrupts

Introduction

The Library: rtilibm/DS5101 provides access to the hardware interrupts of the DS5101.

DS5101_HWINT_Bx_Iy

Purpose

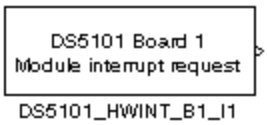
To make the hardware interrupts of the DS5101 board available as trigger sources in a block diagram.

Where to go from here

Information in this section

Block Description (DS5101HWINT_Bx_Iy)

Illustration



Purpose

To make the hardware interrupts of the DS5101 board available as trigger sources in a block diagram.

I/O mapping

For details on the I/O connector pinouts of the DS5101, refer to Interrupts Provided by the DS5101 (DS5101 Features 🕮).

Dialog pages

The dialog settings can be specified on the **Unit Page** (refer to Unit Page (DS5101_HWINT_Bx_Iy) on page 39).

Related RTLib functions

`ds5101_init`, `ds5101_int_clear`

Unit Page (DS5101_HWINT_Bx_Iy)

Purpose

To specify the trigger source used as a hardware interrupt.

Dialog settings

Board number 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.

Type Lets you select the type of the interrupt source. The DS5101 hardware interrupt block provides access to interrupt requests coming from at least 1 of the 16 modules, the PWM3 or the PWM6 block interrupts, and from the external reset input. On the I/O connector of the DS5101, the pins 1 … 19 are connected to GND.

Interrupt Type	Description	Required Block
Module request interrupt	The interrupt is triggered if a PHSINT command is called by a DWO application on one of the 16 output channels.	–
PWM3 block 1 interrupt PWM3 block 2 interrupt PWM3 block 3 interrupt PWM3 block 4 interrupt	The interrupt is generated at the middle of the PWM3 high signal. An interrupt shift can be specified for the DS5101PWM3 block.	DS5101PWM3_Bx_BLy
PWM6 block 1 interrupt PWM6 block 2 interrupt	The interrupt is generated at the middle of the PWM6 high signal. An interrupt shift can be specified for the DS5101PWM6 block.	DS5101PWM6_Bx_BLy
External RESET	The interrupt is generated if a high-level TTL signal feeds at pin 37 of the I/O connector (P35). All 16 I/O channels are set to input and all pending interrupts are cleared.	–

Note

As the module request interrupt cannot be initialized completely by means of RTI blocks, it is not ready to use. To enable the usage of the DS5101 hardware interrupt, application-specific interrupt directives have to be set manually (see example below). For further information on these topics, refer to Interrupts Provided by the DS5101 (DS5101 Features 🕮).

To trigger the interrupt, the DWO code has to execute the **phsint** command at an adequate location for example:

```
(...)
 ch1
 (...)
 begin:
  syncen,                 # use new data from DSP
   phsint, set, t_imp;    # generate interrupt, set output high,
                          # wait t_imp
 (...)
```

In this specific example channel 1 will trigger the interrupt.

Related topics

References

DS5101PWM3_Bx_BLy 16
DS5101PWM6_Bx_BLy 20

C

D

L