

Simulink® PLC Coder™

Reference



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R2022b



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Simulink® PLC Coder™ Reference

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Revision History

March 2019	Online only	New for Version 3.0 (Release 2019a)
September 2019	Online only	Revised for Version 3.1 (Release 2019b)
March 2020	Online only	Revised for Version 3.2 (Release 2020a)
September 2020	Online only	Revised for Version 3.3 (Release 2020b)
March 2021	Online only	Revised for Version 3.4 (Release 2021a)
September 2021	Online only	Revised for Version 3.5 (Release R2021b)
March 2022	Online only	Revised for Version 3.6 (Release R2022a)
September 2022	Online only	Revised for Version 3.7 (Release R2022b)

1 | _____ **Blocks**

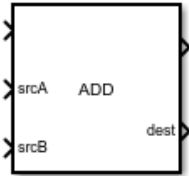
2 | _____ **Functions**

Blocks

ADD

Add inputs

Library:



Description

The ADD block implements the ADD ladder logic instruction. When the rung conditions are true, the block adds source A (srcA) to source B (srcB) and outputs the result to the destination (dest).

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

The first input signal to the addition operation.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

The second input signal to the addition operation.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

Output signal resulting from the addition operation.

Data Types: int8 | int16 | int32 | single

Version History

Introduced in R2019a

See Also

SUB | MUL | DIV | CPT

AFI

Always False

Library:



Description

The AFI block implements the AFI ladder logic instruction. This block sets its **EnableOut** signal to false. Use this block to temporarily disable a rung while you are debugging.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EnableOut — Enable Output

off (default) | on

When the block executes, it automatically sets the **EnableOut** to false. This disables the subsequent blocks on the rung.

Version History

Introduced in R2019a

See Also

AFI | JMP | LBL | MCR | NOP | TND

AND

Bitwise AND

Library:



Description

The AND block implements the AND ladder logic instruction. When the rung conditions are true, the block performs bitwise AND operation on the values at source A with the values at source B. The result of this operation is available at the destination port (**dest**).

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

The first input signal to the bitwise AND operation. If the datatype is `single` (REAL - ladder logic equivalent), the input value is converted to `int32` (DINT - ladder logic equivalent). `int8`, `int16` (SINT, INT - ladder logic equivalent) datatypes are converted to `int32` (DINT - ladder logic equivalent) by filling the upper bits with 0s.

Data Types: `int8` | `int16` | `int32` | `single`

srcB — Second input signal

scalar

The second input signal to the bitwise AND operation. If the datatype is `single` (REAL - ladder logic equivalent), the input value is converted to `int32` (DINT - ladder logic equivalent). `int8`, `int16` (SINT, INT - ladder logic equivalent) datatypes are converted to `int32` (DINT - ladder logic equivalent) by filling the upper bits with 0s.

Data Types: `int8` | `int16` | `int32` | `single`

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

Output signal resulting from the bitwise AND operation. If the datatype is `single` (REAL - ladder logic equivalent), the resultant `int32` (DINT - ladder logic equivalent) is converted to REAL (`single` - ladder logic equivalent).

Data Types: `int8` | `int16` | `int32` | `single`

Version History

Introduced in R2019a

See Also

NOT | OR

AOI Runner

AOI Runner

Library:



Description

AOI Runner is a top organizational unit. It consists of AOI block. The AOI runner acts as an encapsulation around the ladder diagram function block.

Version History

Introduced in R2019a

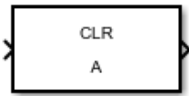
See Also

PLC Controller | Task | Ladder Diagram Program | Ladder Diagram Subroutine | Ladder Diagram Function Block (AOI)

CLR

Clear

Library:



Description

The CLR block implements the CLR ladder logic instruction. When the rung conditions are true, the block clears the bits specified in the Data To Clear tag.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Data To Clear — Operand data

A (default) | boolean

Specify the data bits to be cleared. Data bits are specified in the format of **tags**. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Data To Clear, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Version History

Introduced in R2019a

See Also

MOV

ControllerTags

Syntax

Description

The **Controller Tags** table is used to specify the global variable and I/O symbol attributes.

For example, the controller tag table can be used to specify attributes for global variables (tags) as shown.

Name	Mapping Type	Port	Data Type	Size	Initial Value	Delete
Start	Input Symbol	1	boolean	>>	1	true
Stop	Input Symbol	2	boolean	>>	1	false
Motor	Output Symbol	1	boolean	>>	1	false

Version History

Introduced in R2019a

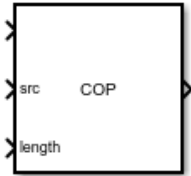
See Also

AOI Runner | Task | Ladder Diagram Program | Ladder Diagram Subroutine | Ladder Diagram Function Block (AOI)

COP

Copy File

Library:



Description

The COP block implements the COP instruction. When the rung conditions are true, the block is used to copy the data of the source and store it at the destination, keeping the source unchanged.

Limitations

- Source and destination elements support only numerical data types.
- Source initial element index and destination element initial index start from zero.

Ports

Input

EnableIn – Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

src – Source

scalar | vector | matrix

It gives the value stored at source. This data is copied into destination.

Data Types: int8 | int16 | int32 | int64 | single | String | Structure

length – Length of elements

scalar

It gives the number or source elements to copy.

Data Types: int8 | int16 | int32

Output

EnableOut – Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Source Initial Element Index — Source Start Index

1 (default) | scalar

Source Start Index is used only when the source is an array. It specifies the index of the first element to be copied into destination. If the source is not an array, then the value of Source Initial Element Index is 1.

Programmatic Use

Block Parameter: PLCSRCArrayIndex

Type: scalar

Value: scalar

Default: 1

Data Types: int8 | int16 | int32 | single

Destination Array Name — Destination

A (default) | boolean

The data copied from source is stored in destination. The destination is specified in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Destination Array Name, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Destination Initial Element Index — Destination Start Index

scalar

Destination Start Index is used only when the source is an array. It specifies the start index of destination where the data is copied. If the source and destination data is not stored in an array, then the value of Destination Initial Element Index is 1.

Programmatic Use

Block Parameter: PLCDestArrayIndex

Type: scalar

Value: scalar

Default: 0

Data Types: int8 | int16 | int32 | single

Version History

Introduced in R2019a

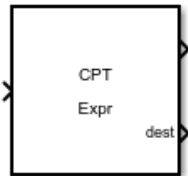
See Also

FLL

CPT

Evaluate expression

Library:



Description

The CPT block implements the CPT ladder logic instruction. When the rung conditions are true, the block evaluates the expression **Expr** and outputs the result to the destination (**dest**).

Limitations

- The CPT ladder diagram instruction does not support direct operand calls. Currently MOD, AND, XOR, FTD, and TOD instructions are unsupported as CPT operands.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output Signal

scalar

The result obtained after computing the expression is placed at the destination.

Data Types: int8 | int16 | int32 | single

Parameters

Expression to Evaluate — Expression to evaluate

'Expr' (default) | character vector

Specify the expression to be evaluated. An expression consisting of tags and/or immediate values separated by operators. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as **Data Type**, **Initial Value**, and **size**. To change the attributes of the Expression to Evaluate, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'Expr'

Version History

Introduced in R2019a

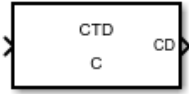
See Also

ADD | SUB | MUL | DIV

CTD

Count Down

Library:



Description

The CTD block implements the CTD ladder logic instruction. When the rung conditions are true, the block counts downwards.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

CD — Count Down Enable Output

off (default) | on

The count down enable output contains the rung-in condition when the instruction was last executed. By default, **CD** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **CD** signal is set to false.

Parameters

Counter Tag — Counter Structure

C (default) | character vector

Specify the counter parameters in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as **Data Type**, **Initial Value**, and **size**. To change the attributes of the **Operand Tag**, open the **Program Variables** table within the Ladder Diagram Program block. The **Data Type** of the timer tag is of the **Bus:COUNTER** type with its initial value specified as a structure containing the following fields:

Field	Description	Default Value
PRE	The preset value specifies the value which the accumulated value must reach before the instruction indicates it is done	0
ACC	The accumulated value specifies the number of transitions the instruction has counted.	0
CU	The count up enable contains rung-condition-in when the instruction was last executed.	1
CD	Count down enabled.	1
DN	The done bit when set indicates the counting operation is complete	0
OV	The overflow bit when set indicates the counter incremented past the upper limit of 2,147,483,647	0
UN	The underflow when set indicates the counter decremented past the lower limit of -2,147,483,648.	0

Programmatic Use**Block Parameter:** PLCOperandTag**Type:** character vector**Value:** character vector**Default:** 'T'**Version History**

Introduced in R2019a

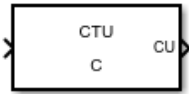
See Also

TON | TOF | RTO | CTD | RES

CTU

Count Up

Library:



Description

The CTU block implements the CTU ladder logic instruction. When the rung conditions are true, the block counts upwards.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

CU — Count Up Enable Output

off (default) | on

The count up enable output contains the rung-in condition when the instruction was last executed. By default, **CU** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **CU** signal is set to false.

Parameters

Counter Tag — Counter Structure

C (default) | character vector

Specify the counter parameters in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as **Data Type**, **Initial Value**, and **size**. To change the attributes of the **Operand Tag**, open the **Program Variables** table within the Ladder Diagram Program block. The **Data Type** of the timer tag is of the **Bus:COUNTER** type with its initial value specified as a structure containing the following fields:

Field	Description	Default Value
PRE	The preset value specifies the value which the accumulated value must reach before the instruction indicates it is done	0
ACC	The accumulated value specifies the number of transitions the instruction has counted.	0
CU	The count up enable contains rung-condition-in when the instruction was last executed.	1
CD	Count down enabled.	1
DN	The done bit when set indicates the counting operation is complete	0
OV	The overflow bit when set indicates the counter incremented past the upper limit of 2,147,483,647	0
UN	The underflow when set indicates the counter decremented past the lower limit of -2,147,483,648.	0

Programmatic Use**Block Parameter:** PLCOperandTag**Type:** character vector**Value:** character vector**Default:** 'T'**Version History**

Introduced in R2019a

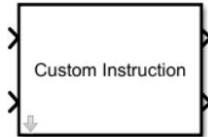
See Also

TON | TOF | RTO | CTU | RES

Custom Instruction

Create custom ladder logic instruction

Library:



Description

The Custom Instruction block implements user-defined instructions for a ladder diagram model. When the rung conditions are true, the block executes the specified custom logic. You can save these instructions in a user-defined library named `plcuserlib.slx`. You can also import, simulate, and export your ladder logic instructions by using your custom blocks saved in `plcuserlib.slx` library.

Ports

Input

EnableIn — Enable Input

off (default) | on

The **EnableIn** port controls the execution of the block and also reflects the rung state preceding the block. If the rung state preceding the block is false, the **EnableIn** signal is set to false, the block does not execute the custom logic, and the outputs are not updated.

src — Input signal

scalar

Input signal to the Custom Instruction block.

Data Types: `int8` | `int16` | `int32` | `single`

Output

EnableOut — Enable Output

off (default) | on

If the **EnableIn** input to the block is false, the custom logic implemented by the block is not executed and **EnableOut** signal is set to false. If **EnableIn** is true and the custom instruction executes, **EnableOut** signal is set to true.

Parameters

Inputs and Outputs

Instruction Name — Name of user-defined ladder logic instruction

`sampleBlock` (default) | character vector

Name of the ladder logic instruction that you want to create. The Rockwell Automation® Studio 5000 IDE must support the ladder logic instruction name.

Number of Inputs — Number of input signals to block

1 (default) | scalar

The number of input signals to the block that are required for your custom ladder logic instruction.

Programmatic Use

Block Parameter: NumInputs

Type: scalar

Value: scalar

Default: 1

Data Types: int8 | int16 | int32 | single

Input Types — Data type of input signal

{{ 'SINT', 'INT', 'DINT', 'REAL' }} (default) | character vector

The data type of the input signal specified as a cell array. For multiple inputs signals, specify the data type as a comma-separated list of cell arrays for each signal. For example, if you have two input signals with the same data type, then specify the **Input Types** as

{{ 'SINT', 'INT', 'DINT', 'REAL' }, { 'SINT', 'INT', 'DINT', 'REAL' }}.

Programmatic Use

Block Parameter: InputTypeList

Type: cell array

Value: cell array

Default: {{ 'SINT', 'INT', 'DINT', 'REAL' }}

Data Types: character vector

Number of Outputs — Number of output signals from block

1 (default) | scalar

The number of output signals from the user-defined Custom Instruction block.

Programmatic Use

Block Parameter: NumOutputs

Type: scalar

Value: scalar

Default: 1

Data Types: int8 | int16 | int32 | single

Output Types — Data type of output signal

{{ 'SINT', 'INT', 'DINT', 'REAL' }} (default) | character vector

The data type of the output signal specified as a cell array. If there is more than one output signal, specify the data type as a comma-separated list of cell arrays for each signal. For example, if you have two output signals with the same data type, then specify the **Output Types** as

{{ 'SINT', 'INT', 'DINT', 'REAL' }, { 'SINT', 'INT', 'DINT', 'REAL' }}.

Programmatic Use

Block Parameter: OutputTypeList

Type: cell array

Value: cell array

Default: {'SINT', 'INT', 'DINT', 'REAL'}

Data Types: character vector

Version History

Introduced in R2020a

See Also

plcimportladder | plcladderinstructions

Topics

“Create Custom Instruction in PLC Ladder Diagram Models”

“Import L5X Ladder Diagram Files into Simulink”

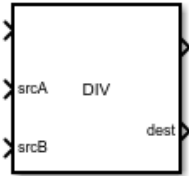
“Model and Simulate Ladder Diagrams in Simulink”

“Generating Ladder Diagram Code from Simulink”

DIV

Divide one input by another

Library:



Description

The DIV block implements the DIV ladder logic instruction. When the rung conditions are true, the block divides the dividend at source A (srcA) by the divisor at source B (srcB) and outputs the result to the destination (dest).

Note If you perform a divide by zero operation a "Divide by zero detected" diagnostic message is generated during code generation.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

The first input signal to the division operation.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

The second input signal to the division operation.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

Output signal resulting from the division operation.

Data Types: int8 | int16 | int32 | single

Version History

Introduced in R2019a

See Also

ADD | SUB | MUL | CPT

EQU

Equal To

Library:



Description

The EQU block implements the EQU instruction. When the rung conditions are true, the block verifies whether the value at source A is equal to the value at source B.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

Value to test against srcB.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

Value to test against srcA.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false. If **EnableIn** is true, **EnableOut** signal is set to true, if srcA is equal to srcb.

Version History

Introduced in R2019a

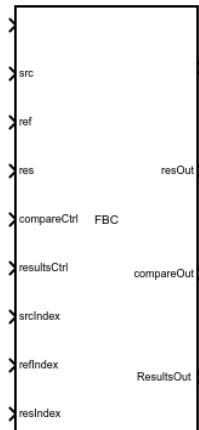
See Also

GEQ | GRT | LEQ | NEQ | LES

FBC

File Bit Comparison

Library:



Description

The FBC block implements the FBC instruction. The block compares the source and reference data bit by bit and stores the outcome in result.

Ports

Input

EnableIn — Enable Input

off (default) | on

This acts as the enabler for the block. The FBC block executes only when EnableIn is true.

src — Source

integer

It gives the value stored at source. This value is compared with reference. Since the block performs a bit comparison, the source is an array variable.

Data Types: int32

ref — Reference

integer

It gives the value stored at reference. This value is compared with source. Since the block performs a bit comparison, the reference is an array variable.

Data Types: int32

res — Result

integer

The result of bit comparison between source and reference is stored at Result. This is an array variable.

Data Types: `int32`

compareCtrl — Compare Control structure

It is a structure consisting of length and position variables. The length variable stores the number of bits to compare. The position variable stores the current position in the source. The initial value of position variable is 0.

resultsCtrl — Results Control structure

It is a structure consisting of length and position variables. The length variable stores the number of storage locations in the result. The position variable stores the current position in the result. The initial value of position variable is 0.

srcIndex — Source Index scalar

Source Start Index specifies the index of the starting element in source for comparison. Typically the value of `srcIndex` is 0.

Data Types: `int8` | `int16` | `int32` | `single`

refIndex — Reference Index scalar

Reference Start Index specifies the index of the starting element in reference for comparison. Typically the value of `refIndex` is 0.

Data Types: `int8` | `int16` | `int32` | `single`

resIndex — Result Index scalar

Result Start Index specifies the index of the starting element in result for storing the result of comparison. Typically the value of `resIndex` is 0.

Data Types: `int8` | `int16` | `int32` | `single`

Output

EnableOut — Enable Output `off` (default) | `on`

When set, `EnableOut` provides the result of the block at the output. Once `EnableIn` is set, it automatically sets the `EnableOut`.

resOut — Result Output integer

The result of comparison stored in `res` is available at the output port. The data can be read by connecting a variable write block at `resOut`.

Data Types: int32

compareOut — Compare Output structure

The comparison operation modifies the values of position and length variable of compareCtrl. The compareCtrl structure is available at the compareOut port. The data can be read by connecting a variable write block to it.

ResultsOut — Results Output structure

The comparison operation modifies the values of position and length variable of resultsCtrl. The resultsCtrl structure is available at the resultsOut port. The data can be read by connecting a variable write block to it.

Parameters

Sample time (-1 for inherited) — Discrete interval between sample time hits -1 (default) | scalar

Enter the discrete interval between sample time hits or specify -1 to inherit the sample time

See also “Specify Sample Time”.

Programmatic Use

Block Parameter: SampleTime

Type: character vector

Value: real scalar

Default: '-1'

Version History

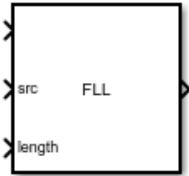
Introduced in R2019a

See Also

FLL

File Fill

Library:



Description

The FLL block implements the FLL instruction. When the rung conditions are true, the block fills a block of memory with the provided source value. The Source remains unchanged.

Limitations

- Source elements should be scalar numeric data types.
- Destination elements should be scalar numeric data types.
- Source and destination elements should be of the same data type.
- Source initial element index and destination element initial index start from zero.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

src — Source

scalar | vector | matrix

It gives the value stored at source. This data is copied into destination.

Data Types: int8 | int16 | int32 | int64 | single | String | Structure

length — Length of elements

scalar

Number of destination elements to fill.

Data Types: int8 | int16 | int32

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Destination Array Name — Destination

A (default) | boolean

The data copied from source is filled to the destination. The destination is specified in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Destination Array Name, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Destination Initial Element Index — Destination Start Index

scalar

Destination Start Index is used only when the source is an array. It specifies the start index of destination where the data is copied. If the source and destination data is not stored in an array, then the value of Destination Initial Element Index is 1.

Programmatic Use

Block Parameter: PLCDestArrayIndex

Type: scalar

Value: scalar

Default: 0

Data Types: int8 | int16 | int32 | single

Version History

Introduced in R2019a

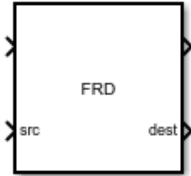
See Also

COP

FRD

Convert to integer

Library:



Description

The FRD block implements the FRD ladder logic instruction. When the rung conditions are true, the block converts the BCD value at source A (*srcA*) to a decimal value and outputs the result to the destination (*dest*).

Note The FRD block is not supported by Simulink® Design Verifier™.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — Input signal

scalar

The input value to the conversion operation.

Data Types: int8 | int16 | int32

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

The decimal equivalent value of input is present at the destination.

Data Types: int8 | int16 | int32

Version History

Introduced in R2019a

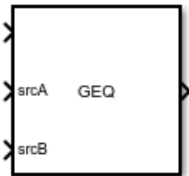
See Also

ADD | SUB | MUL | DIV | CPT

GEQ

Greater Than or Equal To

Library:



Description

The GEQ block implements the GEQ instruction. When the rung conditions are true, the block verifies whether the value at source A is greater than or equal to the value at source B.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

Value to test against srcB.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

Value to test against srcA.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false. If **EnableIn** is true, **EnableOut** signal is set to true, if srcA is greater than or equal to srcb.

Version History

Introduced in R2019a

See Also

EQU | GRT | LEQ | NEQ | LES

GRT

Greater than

Library:



Description

The GRT block implements the GRT instruction. When the rung conditions are true, the block verifies whether the value at source A is greater than the value at source B.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

Value to test against srcB.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

Value to test against srcA.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false. If **EnableIn** is true, **EnableOut** signal is set to true, if srcA is greater than srcB.

Version History

Introduced in R2019a

See Also

EQU | GEQ | LEQ | NEQ | LES

JMP

Jump

Library:



Description

The JMP block implements the JMP ladder logic instruction. When the rung conditions are true, the block skips a part of ladder logic and the rung execution moves to the block referenced by the label block. Jump block can only skip the rungs after it. The block does not support a backward jump.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Jump to Label — Name of the label

L (default) | character vector

Specify the name for associated LBL instruction.

Programmatic Use

Block Parameter: PLCLabelTag

Type: character vector

Value: character vector

Default: 'L'

Version History

Introduced in R2019a

See Also

AFI | LBL | MCR | NOP | TND

Junction

Junction

Library:



Description

The Junction block is used to connect one or more ladder logic branches.

Version History

Introduced in R2019a

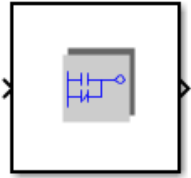
See Also

Power Rail Start | Power Rail Terminal | Rung 1

Function Block (AOI)

Ladder Diagram Function Block (AOI)

Library:



Description

The Ladder Diagram function block is a standalone, organizational unit. Use this block in the absence of a general hierarchy of controller, task, program, and ladder diagram. It is also called an AOI block. The Ladder Diagram function block consists of a ladder diagram and function block variables. The function block variables represent the function variables used in the ladder diagram and provide information about its data types, size, and initial value.

Limitations

- Input and output variable data types must be SINT, DINT, INT, REAL, or BOOL.
- Input and output variable size must be one.
- You must not use global variables in ladder diagrams inside the Logic Routine.

Ports

Input

EnableIn — Enable Input

off (default) | on

The **EnableIn** port controls the execution of the block and reflects the rung state preceding the block. If the rung state preceding the block is false, the **EnableIn** signal is set to false, the block does not execute the custom logic, and the outputs are not updated.

Output

EnableOut — Enable Output

off (default) | on

If the **EnableIn** input to the block is false, the custom logic implemented by the block is not executed and the **EnableOut** signal is set to false. If **EnableIn** is true and the custom instruction executes, the **EnableOut** signal is set to true.

Parameters

Inputs and Outputs

Function Block Name — Name of AOI

FB (default) | character vector

Name of the AOI function block that you want to create. The Rockwell Automation Studio 5000 IDE must support the ladder logic instruction name.

Programmatic Use

Block Parameter: PLCPOUName

Type: character vector

Value: character vector

Default: 'FB'

Block Data Tag — Name of the AOI instance

D (default) | character vector

Name of the AOI instance that you want to generate code for or the instance name for the imported AOI instruction. The Rockwell Automation Studio 5000 IDE must support the ladder logic instruction name.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'D'

Variable Table — Open AOI variable table

Boolean

Button that opens the AOI variable table.

Programmatic Use

Block Parameter: PLCEditVariableSS

Type: button

Logic Routine — Open AOI ladder logic

Boolean

Button that opens the ladder logic routine to implement the AOI ladder logic.

Programmatic Use

Block Parameter: PLCEditPOU

Type: button

Allow EnableInFalse Routine — Enable EnableInFalse routine ladder logic

Boolean

Check box that you select to enable the ladder logic inside the EnableInFalse routine.

Programmatic Use

Block Parameter: PLCAllowEnableInFalse

Type: check-box

EnableInFalse Routine – Open EnableInFalse routine ladder logic

Boolean

Button that opens the ladder logic routine to implement the AOI EnableInFalse ladder logic.

Programmatic Use**Block Parameter:** PLCEditEnableInFalse**Type:** button**Allow Prescan Routine – Enable Prescan routine ladder logic**

Boolean

Check box that you select to enable the ladder logic inside the Prescan routine.

Programmatic Use**Block Parameter:** PLCAllowPrescan**Type:** check-box**Prescan Routine – Open Prescan routine ladder logic**

Boolean

Button that opens the ladder logic routine to implement the AOI Prescan ladder logic.

Programmatic Use**Block Parameter:** PLCEditPrescan**Type:** button

Version History

Introduced in R2019a

See Also

AOI Runner | PLC Controller | Task | Ladder Diagram Program | Ladder Diagram Subroutine | Ladder Diagram Function Block (AOI)

Program

Ladder Diagram Program

Library:



Description

The Ladder Diagram program consists of the Ladder Diagram representation of the logic and program variables. The program executes Ladder Diagram rungs from top to bottom and from left to right. The program variables consists of local and external data types along with its data types, initial values and size. To understand the link between program structure in the Rockwell IDE and Program structure using Simulink PLC Coder refer to

Tips

- When naming Programs choose different names for the Programs even if they are in different Tasks. Rockwell does not allow Programs to have the same names even if they are in different Tasks. For example, if you have an Input Task and Programs named Program and Program 1 these Program names will be unable for use in other Tasks in the same controller.

Version History

Introduced in R2019a

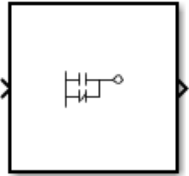
See Also

[AOI Runner](#) | [PLC Controller](#) | [Task](#) | [Ladder Diagram Program](#) | [Ladder Diagram Subroutine](#) | [Ladder Diagram Function Block \(AOI\)](#)

Subroutine

Ladder Diagram Subroutine

Library:



Description

Ladder Diagram Subroutine allows you to create and define a named ladder logic routine. You can edit the logic implemented by the subroutine by clicking on the **Routine Logic** button found under the block parameters menu of this block.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Routine Name — Name of the routine

R (default) | character vector

Specify the name of the ladder logic subroutine.

Programmatic Use

Block Parameter: PLCPOUName

Type: character vector

Value: character vector

Default: 'R'

Routine Logic — Open ladder logic

boolean

Button that opens the ladder logic subroutine.

Programmatic Use

Block Parameter: PLCOpenRoutine

Type: button

Version History

Introduced in R2019a

See Also

AOI Runner | PLC Controller | Task | Ladder Diagram Program | Ladder Diagram Subroutine | Ladder Diagram Function Block (AOI)

LBL

Label

Library:



Description

The LBL block implements the LBL ladder logic instruction. This block is used along with JMP block. The rung execution jumps to the block referenced by LBL block.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Label — Name of the label

L (default) | character vector

Specify the name for the LBL.

Programmatic Use

Block Parameter: PLCLabelTag

Type: character vector

Value: character vector

Default: 'L'

Version History

Introduced in R2019a

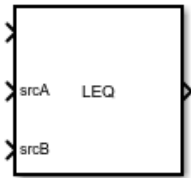
See Also

AFI | JMP | MCR | NOP | TND

LEQ

Less Than or Equal To

Library:



Description

The LEQ block implements the LEQ instruction. When the rung conditions are true, the block verifies whether the value at source A is less than or equal to the value at source B.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

Value to test against srcB.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

Value to test against srcA.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false. If **EnableIn** is true, **EnableOut** signal is set to true, if srcA is less than or equal to srcB.

Version History

Introduced in R2019a

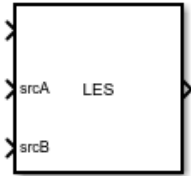
See Also

EQU | GEQ | GRT | NEQ | LES

LES

Less Than

Library:



Description

The LES block implements the LES instruction. When the rung conditions are true, the block verifies whether the value at source A is less than the value at source B.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

Value to test against srcB.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

Value to test against srcA.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false. If **EnableIn** is true, **EnableOut** signal is set to true, if srcA is less than srcB.

Version History

Introduced in R2019a

See Also

EQU | GEQ | GRT | LEQ | NEQ

MCR

Master Control Reset

Library:



Description

The MCR block implements the MCR instruction. The block simulates a master control relay that can selectively disable a section of rungs.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EnableOut — Enable Output

off (default) | on

When the block executes, it automatically sets the **EnableOut** to false. This disables all the subsequent blocks on the rung.

Version History

Introduced in R2019a

See Also

AFI | JMP | LBL | NOP | TND

MOV

Move

Library:



Description

The MOV block implements the MOV instruction. When the rung conditions are true, the block moves a copy of the source to the destination, keeping the source unchanged.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

src — Input signal

scalar

Value to move.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

Tag to store the result.

Data Types: int8 | int16 | int32 | single

Version History

Introduced in R2019a

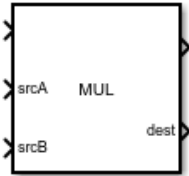
See Also

CLR

MUL

Multiply inputs

Library:



Description

The MUL block implements the MUL ladder logic instruction. When the rung conditions are true, the block multiplies the multiplicand at source A (`srcA`) with the multiplier at source B (`srcB`) and outputs the result to the destination (`dest`).

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

The first input signal to the multiplication operation.

Data Types: `int8` | `int16` | `int32` | `single`

srcB — Second input signal

scalar

The second input signal to the multiplication operation.

Data Types: `int8` | `int16` | `int32` | `single`

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

Output signal resulting from the multiplication operation.

Data Types: `int8` | `int16` | `int32` | `single`

Version History

Introduced in R2019a

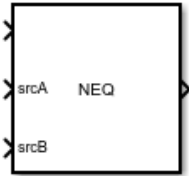
See Also

`ADD` | `SUB` | `DIV` | `CPT`

NEQ

Not Equal To

Library:



Description

The NEQ block implements the NEQ instruction. When the rung conditions are true, the block verifies whether the value at source A is not equal to the value at source B.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

Value to test against srcB.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

Value to test against srcA.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false. If **EnableIn** is true, **EnableOut** signal is set to true, if srcA is not equal to srcB.

Version History

Introduced in R2019a

See Also

EQU | GEQ | GRT | LEQ | LES

NOP

No Operation

Library:



Description

The NOP block implements the NOP function. The block acts as a placeholder. It performs no operation on enable or disable.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EnableOut — Enable Output

off (default) | on

When the block executes, it automatically sets the **EnableOut** to false. This disables all the subsequent blocks on the rung.

Version History

Introduced in R2019a

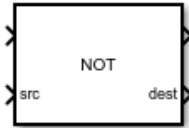
See Also

AFI | JMP | LBL | MCR | TND

NOT

Bitwise NOT

Library:



Description

The NOT block implements the NOT ladder logic instruction. When the rung conditions are true, the block performs bitwise NOT operation on the values at source. The result of this operation is available at the destination port (*dest*).

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

src — Input signal

scalar

The input signal on which to perform the bitwise NOT operation. If the datatype is `single` (REAL - ladder logic equivalent), the input value is converted to `int32` (DINT - ladder logic equivalent). `int8`, `int16` (SINT, INT - ladder logic equivalent) datatypes are converted to `int32` (DINT - ladder logic equivalent) by filling the upper bits with 0s.

Data Types: `int8` | `int16` | `int32` | `single`

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

Output signal resulting from the bitwise NOT operation. If the datatype is `single` (REAL - ladder logic equivalent), the resultant `int32` (DINT - ladder logic equivalent) is converted to REAL (`single` - ladder logic equivalent).

Data Types: int8 | int16 | int32 | single

Version History

Introduced in R2019a

See Also

AND | OR

ONS

One Shot

Library:



Description

The ONS block implements the ONS instruction. The block makes the remainder of the rung true every time the rung-condition-in transitions from false to true.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Storage Bit — Internal storage bit

SB (default) | boolean

Internal storage bit that retains the rung-condition-in from the last time the instruction was executed. Specified in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Operand Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'SB'

Version History

Introduced in R2019a

See Also

OSR | OSF

OR

Bitwise OR

Library:



Description

The OR block implements the OR ladder logic instruction. When the rung conditions are true, the block performs bitwise OR operation on the values at source A with the values at source B. The result of this operation is available at the destination port (**dest**).

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

The first input signal to the bitwise OR operation. If the datatype is `single` (REAL - ladder logic equivalent), the input value is converted to `int32` (DINT - ladder logic equivalent). `int8`, `int16` (SINT, INT - ladder logic equivalent) datatypes are converted to `int32` (DINT - ladder logic equivalent) by filling the upper bits with 0s.

Data Types: `int8` | `int16` | `int32` | `single`

srcB — Second input signal

scalar

The second input signal to the bitwise OR operation. If the datatype is `single` (REAL - ladder logic equivalent), the input value is converted to `int32` (DINT - ladder logic equivalent). `int8`, `int16` (SINT, INT - ladder logic equivalent) datatypes are converted to `int32` (DINT - ladder logic equivalent) by filling the upper bits with 0s.

Data Types: `int8` | `int16` | `int32` | `single`

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

Output signal resulting from the bitwise OR operation. If the datatype is `single` (REAL - ladder logic equivalent), the resultant `int32` (DINT - ladder logic equivalent) is converted to REAL (`single` - ladder logic equivalent).

Data Types: `int8` | `int16` | `int32` | `single`

Version History

Introduced in R2019a

See Also

AND | NOT

OSF

One Shot Falling

Library:



Description

The OSF block implements the OSF instruction. The block sets the output bit for one scan when the rung-condition-in transitions from true to false.

Ports

Input

EnableIn – Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN – Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

OB – Output Bit

boolean

Bit to be modified when the rung-condition-in transitions from false to true.

Data Types: Boolean

Parameters

Storage Bit – Internal storage bit

SB (default) | boolean

Internal storage bit that retains the rung-condition-in from the last time the instruction was executed. Specified in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Operand Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'SB'

Version History

Introduced in R2019a

See Also

ONS | OSR

OSR

One Shot Rising

Library:



Description

The OSR block implements the OSR instruction. The block sets the output bit for one scan when the rung-condition-in transitions from false to true.

Ports

Input

EnableIn – Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN – Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

OB – Output Bit

boolean

Bit to be modified when the rung-condition-in transitions from false to true.

Data Types: Boolean

Parameters

Storage Bit – Internal storage bit

SB (default) | boolean

Internal storage bit that retains the rung-condition-in from the last time the instruction was executed. Specified in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Operand Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'SB'

Version History

Introduced in R2019a

See Also

ONS | OSF

OTE

Output Energize

Library:



Description

OTE is one of the building blocks of a ladder diagram. The OTE block implements the OTE ladder logic instruction. The block examines the state of the `rung-condition-in` and sets or clears the operand tag (data bit). If rung condition is true, the block sets the data bit to true.

Parameters

Operand Tag — Bit to be tested

A (default) | boolean

Specify the data bits to be modified. Data bits are specified in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Operand Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Version History

Introduced in R2019a

See Also

XIC | XIO | OTL | OTU

OTL

Output Latch

Library:



Description

OTL is one of the building blocks of a ladder diagram. The OTL block implements the OTL ladder logic instruction. When the rung condition is true, the block sets the operand tag (data bit) to true. The data bit remains true until it is cleared, typically by an OTU block. When the rung condition is changed to false, the block does not change the status of the data bit.

Parameters

Operand Tag – Bit to be tested

A (default) | boolean

Specify the data bits to be modified. Data bits are specified in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Operand Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Version History

Introduced in R2019a

See Also

XIC | XIO | OTE | OTU

OTU

Output Unlatch

Library:



Description

OTU is one of the building blocks of a ladder diagram. The OTU block implements the OTU ladder logic instruction. When the rung condition is true, the block clears the operand tag (data bit) to false. When the rung condition is changed to false, the block does not change the status of the data bit. It is generally used after the OTL block to unlatch the state and disable the rung.

Parameters

Operand Tag – Bit to be tested

A (default) | boolean

Specify the data bits to be modified. Data bits are specified in the format of tags. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Operand Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Version History

Introduced in R2019a

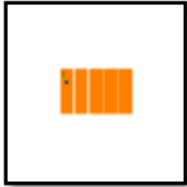
See Also

XIC | XIO | OTE | OTL

PLC Controller

PLC Controller

Library:



Description

In Ladder Diagram, the controller is a top organisational unit that typically consists of task and controller tags. There can be a single task or multiple tasks. Tasks inside a controller are executed in parallel. There are two types of controller blocks available in Simulink PLC Coder™:

- PLC Controller Suite
- PLC Controller

PLC controller suite is a block hierarchy that models a simple complete Ladder Logic Controller structure whereas a PLC controller block consists of ladder logic semantics. The controller tags store the information of global variables such as DataType, Mapping type, Port, Address etc. The global variables defined for a ladder diagram form the input and output ports of the controller.

Version History

Introduced in R2019a

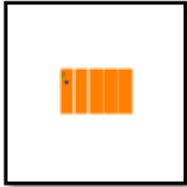
See Also

AOI Runner | Task | Ladder Diagram Program | Ladder Diagram Subroutine | Ladder Diagram Function Block (AOI)

PLC Controller Suite

PLC Controller

Library:



Description

In Ladder Diagram, the controller is a top organisational unit that typically consists of task and controller tags. There can be a single task or multiple tasks. Tasks inside a controller are executed in parallel. There are two types of controller blocks available in Simulink PLC Coder:

- PLC Controller Suite
- PLC Controller

PLC controller suite is a block hierarchy that models a simple complete Ladder Logic Controller structure whereas a PLC controller block consists of ladder logic semantics. The controller tags store the information of global variables such as DataType, Mapping type, Port, Address etc. The global variables defined for a ladder diagram form the input and output ports of the controller.

Version History

See Also

[AOI Runner](#) | [Task](#) | [Ladder Diagram Program](#) | [Ladder Diagram Subroutine](#) | [Ladder Diagram Function Block \(AOI\)](#)

Power Rail Start

Power Rail Start

Library:



Description

The block is for reference purpose only. Do not use this block for ladder diagram modeling.

Version History

Introduced in R2019a

See Also

Power Rail Terminal | Junction | Rung 1

Power Rail Terminal

Power Rail Terminal

Library:



Description

The block is for reference purpose only. Do not use this block for ladder diagram modeling.

Version History

Introduced in R2019a

See Also

Power Rail Start | Junction | Rung 1

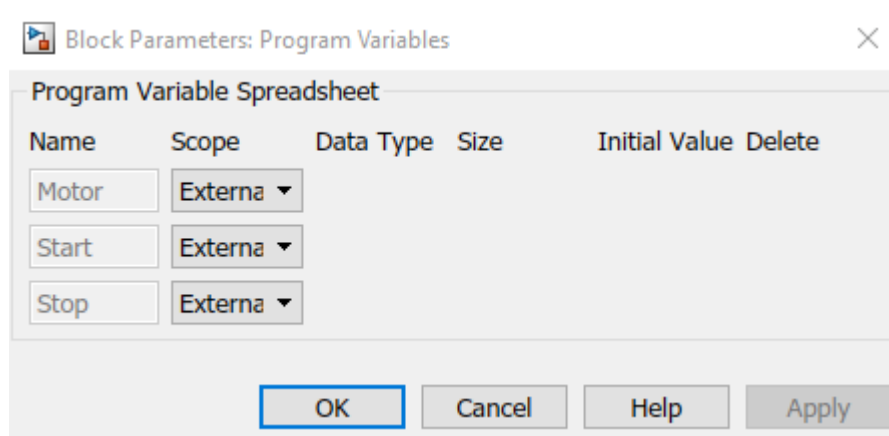
Program Variables

Syntax

Description

The **Program Variables** table within the Ladder Diagram Program block contains attributes associated with tags. The tags can have attributes such as Data Type, Initial Value, and size.

For example, the program variables table can be used to specify attributes for variables (tags) as shown.



Version History

Introduced in R2019a

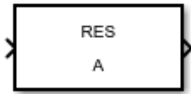
See Also

AOI Runner | Task | Ladder Diagram Program | Ladder Diagram Subroutine | Ladder Diagram Function Block (AOI)

RES

Reset

Library:



Description

The RES block implements the RES ladder logic instruction. When the rung conditions are true, the block resets the value of TIMER, COUNTER, or a CONTROL structure.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Operand Tag To Reset — Structure to Reset

A (default) | character vector

Specify the **tag** to reset. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as **Data Type**, **Initial Value**, and **size**. To change the attributes of the Operand Tag To Reset, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCTagToReset

Type: character vector

Value: character vector

Default: 'A'

Tag Structure — Structure Type

'TIMER or COUNTER' (default) | 'CONTROL'

Specify the structure type to reset.

Type	Description
TIMER or COUNTER	Clears the ACC field of the structure.
CONTROL	Clears the POS field of the structure.

Programmatic Use

Block Parameter: PLCTagDataType

Type: character vector

Value: 'TIMER or COUNTER'|'CONTROL'

Default: 'TIMER or COUNTER'

Version History

Introduced in R2019a

See Also

TON | TOF | RTO | CTU | CTD

RET

Return

Library:



Description

The RET block implements the RET instruction. The blocks is used to return the control of execution from a subroutine. It can be used only inside a subroutine. This block does not support parameters to be passed from the subroutine.

Parameters

Sample time (-1 for inherited) – Discrete interval between sample time hits

-1 (default) | scalar

Enter the discrete interval between sample time hits or specify -1 to inherit the sample time

See also “Specify Sample Time”.

Programmatic Use

Block Parameter: SampleTime

Type: character vector

Value: real scalar

Default: '-1'

Version History

Introduced in R2019a

See Also

RTO

Retentive Timer On

Library:



Description

The RTO block implements the RTO ladder logic instruction. When the rung conditions are true, the block accumulates time until:

- The timer is disabled
- The timer completes

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Timer Tag — Timer Structure

T (default) | character vector

Specify the timer parameters in the format of **tags**. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as **Data Type**, **Initial Value**, and **size**. To change the attributes of the **Operand Tag**, open the **Program Variables** table within the Ladder Diagram Program block. The **Data Type** of the timer tag is of the **Bus : TIMER** type with its initial value specified as a structure containing the following fields:

Field	Description	Default Value
PRE	The preset value specifies the value (1 millisecond units) which the accumulated value must reach before the instruction indicates it is done	0
ACC	The accumulated value specifies the number of milliseconds that have elapsed since the RTO instruction was enabled.	0
EN	The enable bit contains rung-condition-in when the instruction was last executed.	0
TT	The timing bit when set indicates the timing operation is in process.	0
DN	The done bit when set indicates the timing operation is complete (or paused).	0

Programmatic Use**Block Parameter:** PLCOperandTag**Type:** character vector**Value:** character vector**Default:** 'T'**Version History****Introduced in R2019a****See Also**

TON | TOF | CTU | CTD | RES

RungTerminal

Rung Terminal

Library:



Description

The block is for reference purpose only. Do not use this block for ladder diagram modeling.

Version History

Introduced in R2019a

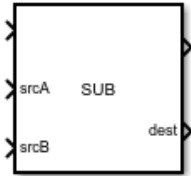
See Also

Power Rail Start | Power Rail Terminal | Junction

SUB

Subtract inputs

Library:



Description

The SUB block implements the SUB ladder logic instruction. When the rung conditions are true, the block subtracts source B (srcB) from source A (srcA) and outputs the result to the destination (dest).

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

srcA — First input signal

scalar

The first input signal to the subtraction operation.

Data Types: int8 | int16 | int32 | single

srcB — Second input signal

scalar

The second input signal to the subtraction operation.

Data Types: int8 | int16 | int32 | single

Output

EnableOut — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

dest — Output signal

scalar

Output signal resulting from the subtraction operation.

Data Types: `int8` | `int16` | `int32` | `single`

Version History

Introduced in R2019a

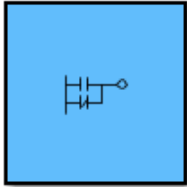
See Also

`ADD` | `MUL` | `DIV` | `CPT`

Task

Task

Library:



Description

The task block is placed inside a PLC controller. There can be multiple tasks inside a controller. Each task consists of a program or multiple programs.

You can use the `get_param` and `set_param` functions to control the settings of the Task block.

Property Name	Description
'Name '	Task name
'SystemSampleTime '	Task rate
'PLCTaskWatchDog '	Watch dog timer value
'Priority '	Task priority
'Description '	Task Description

Version History

Introduced in R2019a

See Also

AOI Runner | PLC Controller | Task | Ladder Diagram Program | Ladder Diagram Subroutine | Ladder Diagram Function Block (AOI)

TND

Temporary End

Library:



Description

The TND block implements the TND ladder logic instruction. When the rung conditions are true, the block acts as the end of ladder diagram execution.

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Version History

Introduced in R2019a

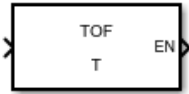
See Also

AFI | JMP | LBL | MCR | NOP

TOF

Timer Off Delay

Library:



Description

The TOF block implements the TOF ladder logic instruction. When the rung conditions are true, the block accumulates time until:

- The timer is disabled
- The timer completes

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Timer Tag — Timer Structure

T (default) | character vector

Specify the timer parameters in the format of **tags**. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as **Data Type**, **Initial Value**, and **size**. To change the attributes of the **Operand Tag**, open the **Program Variables** table within the Ladder Diagram Program block. The **Data Type** of the timer tag is of the **Bus : TIMER** type with its initial value specified as a structure containing the following fields:

Field	Description	Default Value
PRE	The preset value specifies the value (1 millisecond units) which the accumulated value must reach before the instruction indicates it is done	0
ACC	The accumulated value specifies the number of milliseconds that have elapsed since the TOF instruction was enabled.	0
EN	The enable bit contains rung-condition-in when the instruction was last executed.	0
TT	The timing bit when set indicates the timing operation is in process.	0
DN	The done bit when set indicates the timing operation is complete (or paused).	0

Programmatic Use**Block Parameter:** PLCOperandTag**Type:** character vector**Value:** character vector**Default:** 'T'

Version History

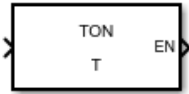
Introduced in R2019a**See Also**

TON | RTO | CTU | CTD | RES

TON

Timer On Delay

Library:



Description

The TON block implements the TON ladder logic instruction. When the rung conditions are true, the block accumulates time until:

- The timer is disabled
- The timer completes

Ports

Input

EnableIn — Enable Input

off (default) | on

Controls the execution of the block. **EnableIn** reflects the rung state preceding the block. If the rung state preceding the block is false, **EnableIn** is false, the block does not execute and the outputs are not updated.

Output

EN — Enable Output

off (default) | on

By default, **EnableOut** follows the state of **EnableIn**. If the **EnableIn** input to the block is false, the logic implemented by the block is not executed and **EnableOut** signal is set to false.

Parameters

Timer Tag — Timer Structure

T (default) | character vector

Specify the timer parameters in the format of **tags**. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as **Data Type**, **Initial Value**, and **size**. To change the attributes of the **Operand Tag**, open the **Program Variables** table within the Ladder Diagram Program block. The **Data Type** of the timer tag is of the **Bus : TIMER** type with its initial value specified as a structure containing the following fields:

Field	Description	Default Value
PRE	The preset value specifies the value (1 millisecond units) which the accumulated value must reach before the instruction indicates it is done	0
ACC	The accumulated value specifies the number of milliseconds that have elapsed since the TON instruction was enabled.	0
EN	The enable bit contains rung-condition-in when the instruction was last executed.	0
TT	The timing bit when set indicates the timing operation is in process.	0
DN	The done bit when set indicates the timing operation is complete (or paused).	0

Programmatic Use**Block Parameter:** PLCOperandTag**Type:** character vector**Value:** character vector**Default:** 'T'

Version History

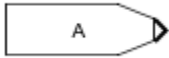
Introduced in R2019a**See Also**

TOF | RTO | CTU | CTD | RES

Variable Read

Variable Read

Library:



Description

The block is used as an input variable assignment.

Parameters

Data Tag — Data to be read

A (default) | boolean

Specify the data to be read, specified in the format of **tags**. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as **Data Type**, **Initial Value**, and **size**. To change the attributes of the **Data Tag**, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Version History

Introduced in R2019a

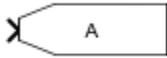
See Also

Variable Write

Variable Write

Variable Write

Library:



Description

The block is used as an output variable assignment.

Parameters

Data Tag — Data to be written

A (default) | boolean

Specify the data bits to be written, specified in the format of **tags**. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Data Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Version History

Introduced in R2019a

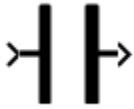
See Also

Variable Read

XIC

Examine If Closed

Library:



Description

XIC is one of the building blocks of a ladder diagram. The XIC block implements the XIC ladder logic instruction. The block examines the operand tag (data bit) for an on condition. If the bit is set, the rung is enabled. If the bit is clear, the rung is disabled.

Parameters

Operand Tag — Bit to be tested

A (default) | boolean

Specify the data bits to be tested. Data bits are specified in the format of **tags**. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Operand Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Version History

Introduced in R2019a

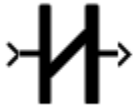
See Also

XIO | OTE | OTL | OTU

XIO

Examine If Open

Library:



Description

XIO is one of the building blocks of a ladder diagram. The XIO block implements the XIO ladder logic instruction. The block examines the operand tag (data bit) for an off condition. If the bit is clear, the rung is enabled. If the bit is set, the rung is disabled.

Parameters

Operand Tag — Bit to be tested

A (default) | boolean

Specify the data bits to be tested. Data bits are specified in the format of **tags**. In Ladder Diagrams, tags (variables) are used to represent inputs, outputs, and internal memory with attributes such as Data Type, Initial Value, and size. To change the attributes of the Operand Tag, open the **Program Variables** table within the Ladder Diagram Program block.

Programmatic Use

Block Parameter: PLCOperandTag

Type: character vector

Value: character vector

Default: 'A'

Version History

Introduced in R2019a

See Also

XIC | OTE | OTL | OTU

Functions

plccoderdemos

Product examples

Syntax

plccoderdemos

Description

plccoderdemos displays the Simulink PLC Coder examples.

Examples

Display List of Simulink PLC Coder Examples

To display a list of examples, at the command prompt enter:

```
plccoderdemos
```

Version History

Introduced in R2010a

See Also

plcopenconfigset

plccoderpref

Manage user preferences

Syntax

```
plccoderpref
```

```
plccoderpref('plctargetide')
```

```
plccoderpref('plctargetide', preference_value )
```

```
plccoderpref('plctargetide', 'default')
```

```
plccoderpref('plctargetidepaths')
```

```
plccoderpref('plctargetidepaths','default')
```

```
plccoderpref('plctargetlist')
```

```
plccoderpref('plctargetlist',targetlist)
```

Description

`plccoderpref` displays the current set of user preferences, including the default target IDE.

`plccoderpref('plctargetide')` returns the current default target IDE. This default can be the target IDE set previously, or the factory default. The factory default is 'codesys23'.

`plccoderpref('plctargetide', preference_value)` sets the default target IDE to the one that you specify in *preference_value* . This command sets the *preference_value* to persist as the default target IDE for future MATLAB® sessions.

`plccoderpref('plctargetide', 'default')` sets the default target IDE to the factory default target IDE ('codesys23').

`plccoderpref('plctargetidepaths')` returns a 1-by-1 structure of the installation paths of supported target IDEs.

`plccoderpref('plctargetidepaths','default')` sets the contents of the 1-by-1 structure of the installation paths to the default values.

`plccoderpref('plctargetlist')` displays the target IDEs that appear in the reduced **Target IDE** list in the Simulink Configuration Parameters dialog box. For more information, see “Target IDE” and “Show Full Target List”.

`plccoderpref('plctargetlist',targetlist)` sets the target IDEs that appear in the reduced **Target IDE** list to the values that you specify in *targetlist*.

Examples

Return Current Default Target IDE

- `plccoderpref('plctargetide')`

```
ans =  
'rslogix5000'
```

Set rslogix5000 as New Default Target IDE

- `plccoderpref('plctargetide', 'rslogix5000')`

```
ans =  
'rslogix5000'
```

See Installation Paths of Supported Target IDEs

- `plccoderpref('plctargetidepaths')`

```
ans = struct with fields:  
    codesys23: 'C:\Program Files (x86)\3S Software'  
    codesys33: 'C:\Program Files\3S CoDeSys'  
    codesys35: 'C:\Program Files\3S CoDeSys'  
    studio5000: ''  
    studio5000_routine: ''  
    rslogix5000: ''  
    rslogix5000_routine: ''  
    brautomation30: 'C:\Program Files\BrAutomation'  
    brautomation40: 'C:\Program Files\BrAutomation'  
    multiprog50: 'C:\Program Files\KW-Software\MULTIPROG 5.0'  
    pcworx60: 'C:\Program Files\Phoenix Contact\Software Suite 150'  
    step7: 'C:\Program Files\Siemens'  
    tiaportal: 'C:\Program Files\Siemens\Automation'  
    tiaportal_double: 'C:\Program Files\Siemens\Automation'  
    plcopen: ''  
    twincat211: 'C:\TwinCAT'  
    twincat3: 'C:\TwinCAT'  
    generic: ''  
    indraworks: ''  
    omron: ''  
    selectron: ''
```

Customize Reduced Target IDE List

- `targetlist = {'codesys23', 'rslogix5000'};`
`plccoderpref('plctargetlist', targetlist)`

```
ans = 1x2 cell  
    {'codesys23'}    {'rslogix5000'}
```


Reset Reduced Target IDE List

- `plccoderpref('plctargetlist','default')`

```
ans = 1x5 cell
      {'codesys23'}   {'studio5000'}   {'step7'}   {'omron'}   {'plcopen'}
```

Append Another IDE to Default Reduced Target IDE List

- `plccoderpref('plctargetlist', [plccoderpref('plctargetlist', 'default') 'codesys35'])`

```
ans = 1x6 cell
      {'codesys23'}   {'studio5000'}   {'step7'}   {'omron'}   {'plcopen'}   {'codesys35'}
```

Append Another IDE to Current Reduced Target IDE List

- `plccoderpref('plctargetlist', [plccoderpref('plctargetlist') 'codesys35'])`

```
ans = 1x8 cell
      {'codesys23'}   {'studio5000'}   {'step7'}   {'omron'}   {'plcopen'}...
      {'codesys35'}   {'codesys35'}   {'codesys35'}
```

Input Arguments

plctargetide — Name of the target IDE

character vector

String directive that specifies the default target IDE.

Value	Description
codesys23	3S-Smart Software Solutions CoDeSys Version 2.3 (default) target IDE
codesys33	3S-Smart Software Solutions CoDeSys Version 3.3 target IDE
codesys35	3S-Smart Software Solutions CoDeSys Version 3.5 target IDE
brautomation30	B&R Automation Studio® 3.0 target IDE
brautomation40	B&R Automation Studio 4.0 target IDE
generic	Generic target IDE
indraworks	Rexroth IndraWorks version 13V12 IDE
multiprog50	PHOENIX CONTACT (previously KW) Software MULTIPROG® 5.0 or 5.50 target IDE
omron	OMRON® Sysmac® Studio
plcopen	PLCopen XML target IDE
pcworx60	Phoenix Contact® PC WORX™ 6.0

Value	Description
rslogix5000	Rockwell Automation RSLogix™ 5000 Series target IDE for AOI format
rslogix5000_routine	Rockwell Automation RSLogix 5000 Series target IDE for routine format
step7	Siemens® SIMATIC® STEP® 7 Version 5 target IDE
studio5000	Rockwell Studio 5000 Logix Designer target IDE for AOI format
studio5000_routine	Rockwell Studio 5000 Logix Designer target IDE for routine format
twincat211	Beckhoff® TwinCAT® 2.11 target IDE
twincat3	Beckhoff TwinCAT 3 target IDE
tiaportal	Siemens TIA Portal
tiaportal_double	Siemens TIA Portal with support for double precision (LREAL type)

plctargetidepaths — Target IDE installation path

character vector

String that specifies the target IDE installation path. Contains a 1-by-1 structure of the installation paths of supported target IDEs.

```
codesys23: 'C:\Program Files\3S Software'
codesys33: 'C:\Program Files\3S CoDeSys'
codesys35: 'C:\Program Files\3S CoDeSys'
studio5000: 'C:\Program Files\Rockwell Software'
studio5000_routine: 'C:\Program Files\Rockwell Software'
rslogix5000: 'C:\Program Files\Rockwell Software'
rslogix5000_routine: 'C:\Program Files\Rockwell Software'
brautomation30: 'C:\Program Files\BrAutomation'
brautomation40: 'C:\Program Files\BrAutomation'
multiprog50: 'C:\Program Files\KW-Software\MULTIPROG 5.0'
pcworx60: 'C:\Program Files\Phoenix Contact\Software Suite 150'
step7: 'C:\Program Files\Siemens'
tiaportal: 'C:\Program Files\Siemens\Automation'
tiaportal_double: 'C:\Program Files\Siemens\Automation'
plcopen: ''
twincat211: 'C:\TwinCAT'
twincat3: 'C:\TwinCAT'
generic: ''
indraworks: ''
omron: ''
```

plctargetlist — List of your target IDEs

cell array of string

Cell array of strings. Each string specifies a target IDE. You can specify any target IDE that is available for the `plctargetide` argument.

Use the string `default` to reset the reduced **Target IDE** list.

Tips

Use the Simulink Configuration Parameters dialog box to change the installation path of a target IDE (**Target IDE Path**).

Version History

Introduced in R2010a

plcgeneratecode

Generate structured text or ladder diagram (L5X) for the atomic subsystem

Syntax

```
generatedfiles= plcgeneratecode(system)
```

Description

`generatedfiles= plcgeneratecode(system)` generates Structure Text or Ladder Diagram for the specified atomic subsystem in a model.

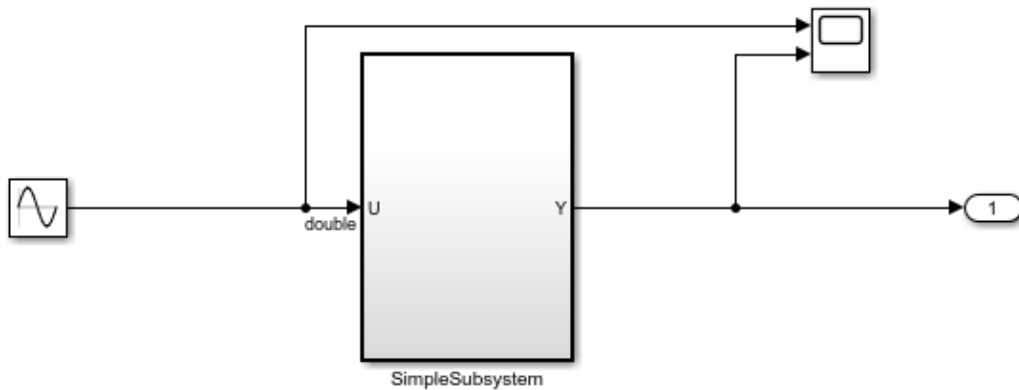
- Structured Text is generated for the specified atomic subsystem in a model. Argument `system` is the fully qualified path name of the atomic subsystem. `generatedfiles` is a cell array of the generated file names. You must first load or start the model.
- Ladder Diagram (L5X) file is generated for the specified system in the model. Argument `system` is the fully qualified path name of the top organizational unit in the Simulink model. The `system` should either be a PLC Controller block, Ladder Diagram Function (AOI) block or an AOI Runner block. `generatedfiles` is a cell array of the generated file names. You must first load or start the Simulink model.

Examples

Generate Structured Text Code for Subsystem

Open or load the model containing the subsystem.

```
plcdemo_simple_subsystem
```



This introductory model shows the code generated for a simple subsystem consisting of a few basic Simulink blocks. To build the subsystem, right-click on the subsystem block and select PLC Code > Generate Code for Subsystem.

The Diagnostic Viewer displays hyperlinks to the generated code files, click the links to view the generated files.

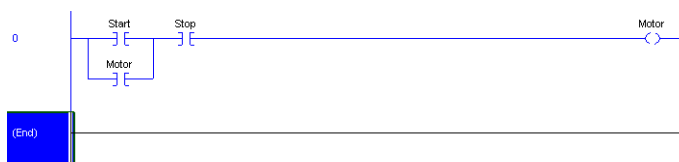
Copyright 2009-2019 The MathWorks, Inc.

Generate code for the subsystem, `plcdemo_simple_subsystem/SimpleSubsystem`.

```
generatedFiles = plcgeneratecode('plcdemo_simple_subsystem/SimpleSubsystem');
```

Generate PLC Code for Ladder diagram model

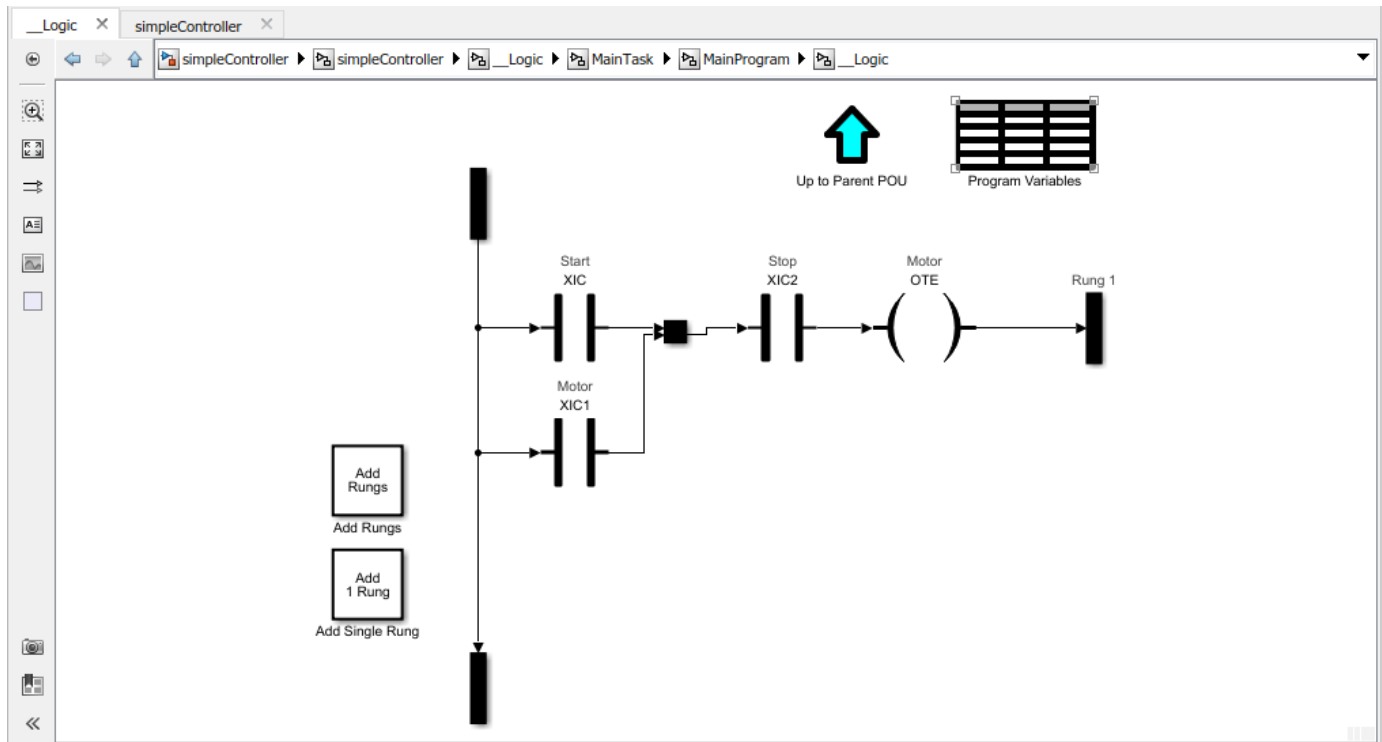
The following example demonstrates how to import a simple ladder diagram from an L5X file (`simpleController.L5X`) into the Simulink environment and then generate Ladder Diagram (L5X) from the imported model. The ladder L5X file was created using RSLogix 5000 IDE and contains contacts and coils representing switches and motor. The following is a snapshot of the ladder structure.



Use the `plcladderimport` function to import the ladder into Simulink.

```
[mdlName,mdlLib,busScript] = plcladderimport('simpleController.L5X','OpenModel','On')
```

The imported model contains a PLC Controller block named `simpleController`, followed by a Task block named `MainTask` and finally a Ladder Diagram Program block named `MainProgram`. The model imported into Simulink has blocks that implement the functionality of the contacts and coils.



Generate code for the subsystem, simpleController/simpleController.

```
generatedFiles = plcgeneratecode('simpleController/simpleController');
```

PLC code generation successful for 'simpleController/simpleController'.

Generated ladder files:
plcsrc\simpleController_gen.L5X

Input Arguments

system — Full file path

character vector

For Structured Text, system specifies the relative or absolute path to the atomic subsystem in the Simulink model.

For Ladder Diagram, system specifies the relative or absolute path to the Simulink model, imported from the Ladder L5X file or a manually created model.

Output Arguments

generatedfiles — Array of generated file names

character array

Specifies the name of the generated code and testbench files.

Version History

Introduced in R2010a

See Also

[plcopenconfigset](#) | [plcimportladder](#) | [plcgeneratecode](#) | [plcgeneraterunnertb](#) | [plcladderoption](#) | [plcladderlib](#)

plcopenconfigset

Open Configuration Parameters dialog box for subsystem

Syntax

```
plcopenconfigset('subsystem')
```

Description

`plcopenconfigset('subsystem')` opens the Configuration Parameters dialog box for the specified atomic subsystem in the model. *subsystem* is the fully qualified path name of the atomic subsystem.

Examples

Open Configuration Parameters for Subsystem

This example shows you how to retrieve the configuration parameters for the subsystem from which you generate structured text code.

Open the model containing the subsystem.

```
open_system('plcdemo_simple_subsystem')
```

Open the Configuration Parameters dialog box for the subsystem, `plcdemo_simple_subsystem/SimpleSubsystem`.

```
plcopenconfigset('plcdemo_simple_subsystem/SimpleSubsystem')
```

Version History

Introduced in R2010a

plcimportladder

Import ladder diagram into a Simulink subsystem

Syntax

```
mdlname = plcimportladder(filename)
```

```
[mdlname,mdllib,genbusscript] = plcimportladder(filename,Name,Value)
```

Description

`mdlname = plcimportladder(filename)` generates a Simulink representation of the ladder diagram in the L5X file created using Rockwell Automation IDEs such as RSLogix 5000 and Studio 5000.

`[mdlname,mdllib,genbusscript] = plcimportladder(filename,Name,Value)` generates a Simulink representation of the ladder diagram in the L5X file with properties specified using one or more `Name,Value` pair arguments.

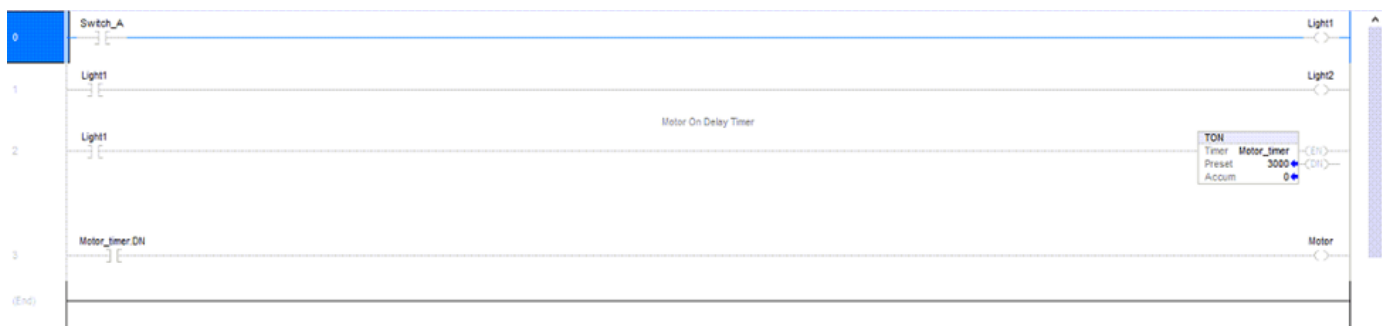
Examples

Import L5X Ladder Diagram Files into Simulink

Simulate, test, and validate your .L5X ladder diagram files by importing your ladder diagram files into Simulink®. Use the `plcimportladder` function to import your ladder diagram files into Simulink. Simulink PLC Coder™ supports only import of ladder diagram files created by using Rockwell Automation® RSLogix 5000® and Studio 5000® integrated development environments (IDEs).

Ladder Diagram Description

The ladder diagram in the `simple_timer.L5X` file controls a motor by using an input switch (Switch_A) and a timer (Motor_timer). This ladder diagram was created using the Studio 5000 IDE.



Light1, Light2, and Motor are the outputs of this ladder diagram.

Import Ladder Diagram

Before using the `plcimportladder` function to import your ladder diagram files into Simulink:

- Verify that your `.L5X` ladder diagram file has no errors by compiling the file in the Rockwell Automation IDE.
- Verify that the `.L5X` ladder diagram file uses blocks that are supported by Simulink PLC Coder. For a list of supported blocks, see Simulink PLC Coder Ladder Diagram Blocks. If your ladder diagram contains custom instructions that are not supported use the Custom Instruction block to create your instructions in Simulink. For more information, see Custom Instruction. To create a custom instruction, see “Create Custom Instruction in PLC Ladder Diagram Models”.

To import the `simple_timer.L5X` ladder diagram file into Simulink, use the `plcimportladder` function.

```
plcimportladder('simple_timer.L5X');
```

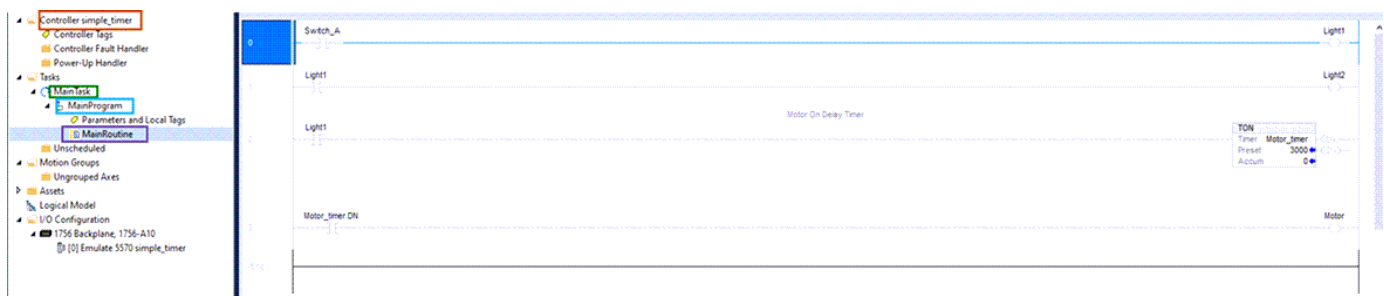
The ladder diagram is imported into Simulink and a `simple_timer.slx` file is created. The current folder also contains a `simple_timer_value.mat` file that loads the initial values for `Motor_timer` into the model data store memory. The data store memory also contains state information of elements of the ladder diagram. This state information is updated by the model during simulation.

During the ladder diagram import, Simulink PLC Coder:

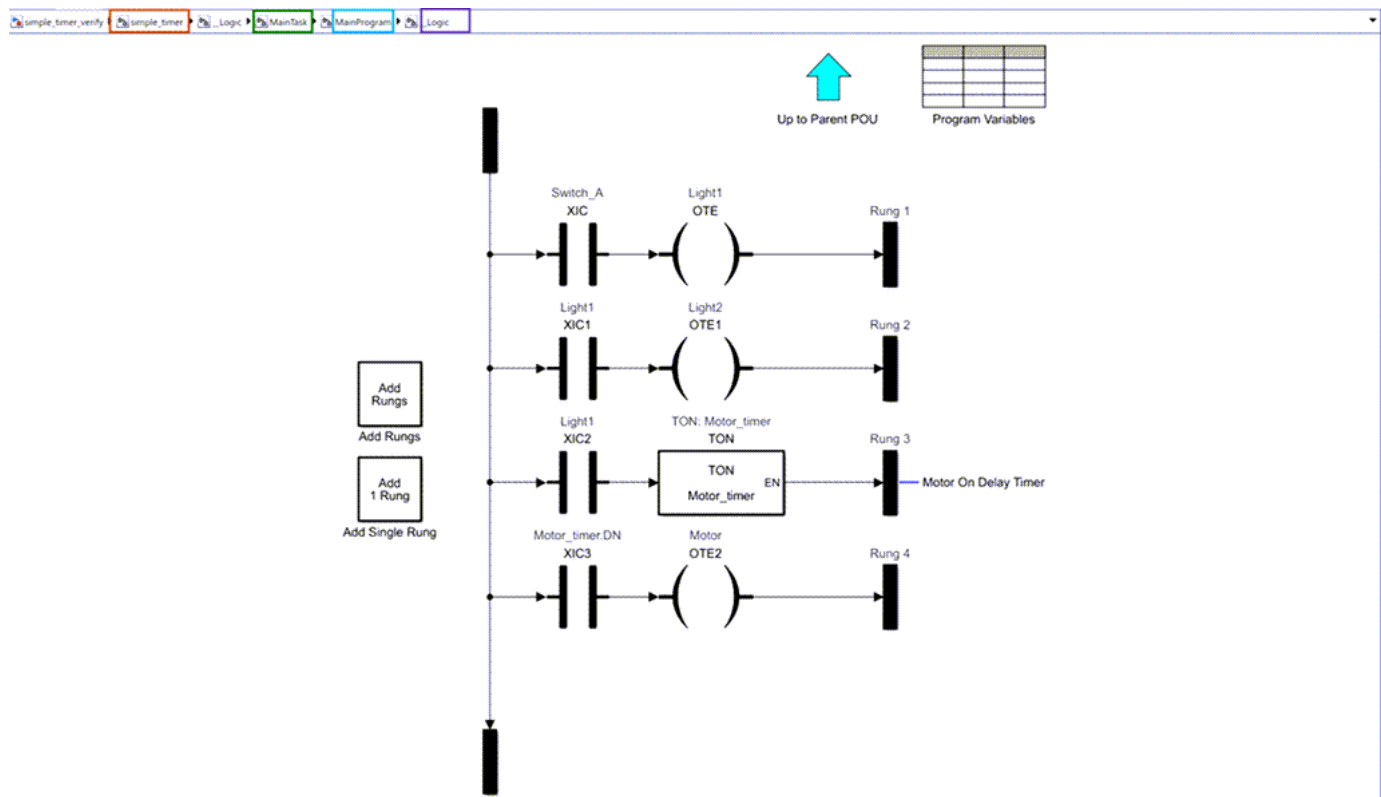
- Imports rung comments. For example, rung two of `simple_timer.L5X` has the comment `Motor On Delay Timer`. This comment also appears in the Simulink model as well.
- Imports Add On Instruction (AOI) with mixed-order arguments, while preserving the order of the arguments. This order argument is preserved during ladder diagram code generation as well.

Imported Ladder Diagram Structure

The `simple_timer.L5X` ladder diagram file is located in Controller `simple_timer` > `MainTask` > `MainProgram` > `MainRoutine`.



The `simple_timer.slx` ladder diagram is located in `simple_timer` > `MainTask` > `MainProgram` > `_Logic`. This structure is similar to the structure in the Rockwell Automation IDE.



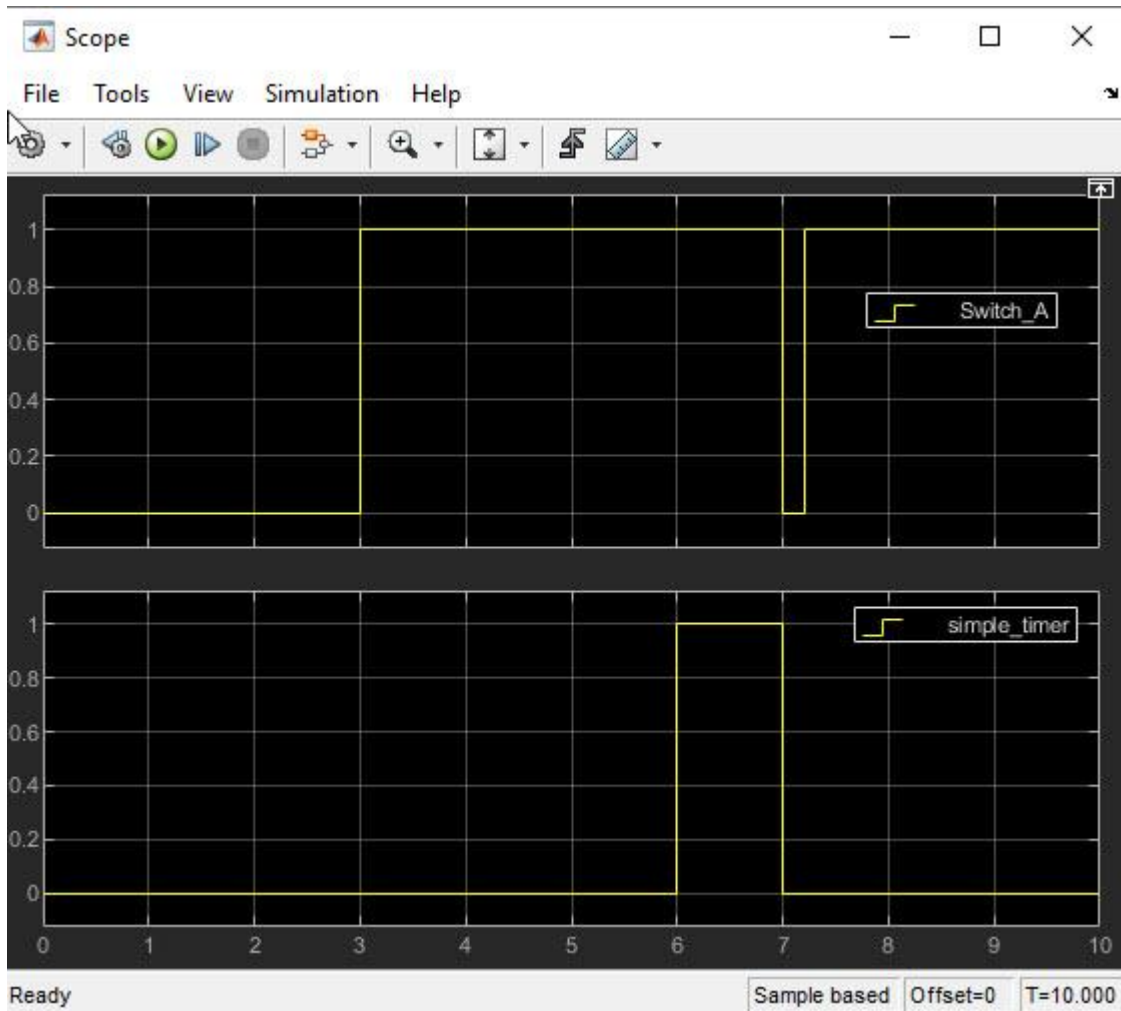
Verify Imported Ladder Diagram

To verify the imported ladder diagram:

- Connect a Signal Builder block to Switch_A.
- Connect a Scope block to the Motor and Switch_A signals.
- Open the simple_timer_verify.slx model.
- Open the Scope block and click the **Run** button.

```
% open_system("simple_timer_verify.slx")
```

This image shows the Scope block output for the model simulation. The Motor (simple_timer) output turns on three seconds after Switch_A is turned on and turns off as soon as Switch_A is turned off. This behavior is the expected behavior of the ladder diagram.



Input Arguments

filename — Name of the ladder file

character vector

Specifies the name of the ladder file to read. Depending on the location of your file, you can either specify the name of the file or provide the full or relative path. name.

Name-Value Pair Arguments

Specify optional pairs of arguments as `Name1=Value1, ..., NameN=ValueN`, where `Name` is the argument name and `Value` is the corresponding value. Name-value arguments must appear after other arguments, but the order of the pairs does not matter.

Before R2021a, use commas to separate each name and value, and enclose Name in quotes.

```
Example: [mdlName,mdlLib,genBusScript] =
plcimportladder('sampleLadder.L5X','OpenModel','on','TopAOI','sampleAOI')
```

OpenModel — Keep the model open

off (default) | on

At the end of import process, the model is hidden by default. To keep the model open at the end of import, set the value of `OpenModel` to `on`.

TopAOI — Top AOI name

character vector

Specify the function blocks that is to be imported. The software imports it into a ladder diagram 'runner' block.

Output Arguments

mdlname — Simulink model name

character array

Specifies the name of the generated Simulink model.

mdllobj — Simulink library name

character array

Specifies the name of the generated Simulink model library.

genbuscript — Name of the bus script

character array

Specifies the name of the generated bus script.

Version History

Introduced in R2018a

See Also

`plcgeneraterunnertb` | `plcgeneratecode` | `plcladderlib` | `plcladderoption` | `plcloadtypes` | `plcclearatypes`

Topics

“Supported Elements in Ladder Diagram”
“Import L5X Ladder Diagram Files into Simulink”
“Model and Simulate Ladder Diagrams in Simulink”
“Generating Ladder Diagram Code from Simulink”
“Verify Generated Ladder Diagram Code”

plcdispextmodedata

Display the external mode logging data

Syntax

```
plcdispextmodedata(filename)
```

Description

`plcdispextmodedata(filename)` displays logging data information contained in the `filename` MAT-file on the MATLAB command window. The OPC Toolbox™ is required to run the external mode visualization.

Examples

Display Logging Data Information

The following example reads the logging data information stored in `plc_log_data.mat` and displays it on the command window.

```
plcdispextmodedata('plc_log_data.mat')  
  
Log data:  
#1: Y1: LREAL  
#2: Y2: LREAL  
#3: Y3: LREAL  
#4: io_Chart.out: DINT  
#5: io_Chart.ChartMode: DINT  
#6: io_Chart.State_A: BOOL  
#7: io_Chart.State_B: BOOL  
#8: io_Chart.State_C: BOOL  
#9: io_Chart.State_D: BOOL  
#10: io_Chart.is_active_c3_Subsystem: USINT  
#11: io_MATLABFunction.y: LREAL  
#12: io_MATLABFunction.i: LREAL  
#13: io_S1.y: LREAL  
#14: io_S1.UnitDelay_DSTATE: LREAL  
#15: i1_S1.y: LREAL  
#16: i1_S1.UnitDelay_DSTATE: LREAL
```

Input Arguments

filename — Name of the MAT-file

character vector

Name of the MAT-file containing the logging information.

Version History

Introduced in R2018a

See Also

`plcrunextmode` | `plcgeneratecode`

Topics

“External Mode Logging”

“Generate Structured Text Code That Has Logging Instrumentation”

“Visualize and Monitor Logging Data by using Simulation Data Inspector”

plcladderinstructions

Lists ladder instructions identified by Simulink PLC Coder

Syntax

```
out = plcladderinstructions
```

Description

`out = plcladderinstructions` returns the ladder instructions identified by Simulink PLC Coder. You can use these instructions to check if a customized, user-defined instruction has been identified by Simulink PLC Coder.

Examples

Verify Simulink PLC Coder Identified Instructions

To verify if Simulink PLC Coder has identified your newly created instruction, at the MATLAB command line, enter:

```
plcladderinstructions
```

This command lists the instructions that Simulink PLC Coder can use. The supported instructions displayed in the output now includes your newly created instructions.

Output Arguments

out — Ladder instructions identified by Simulink PLC Coder

character array

List of ladder instructions identified by Simulink PLC Coder.

Version History

Introduced in R2020a

See Also

Custom Instruction | `plcimportladder` | `plcladderlib`

Topics

“Create Custom Instruction in PLC Ladder Diagram Models”

“Import L5X Ladder Diagram Files into Simulink”

“Model and Simulate Ladder Diagrams in Simulink”

“Generating Ladder Diagram Code from Simulink”

plcrunextmode

Run external mode visualization

Syntax

```
plcrunextmode(opc_host,target_ide,mdl_name,log_file)
plcrunextmode( ____,idx_list)
plcrunextmode( ____,name_list)
```

Description

`plcrunextmode(opc_host,target_ide,mdl_name,log_file)` runs external mode visualization using the settings specified in the arguments. Logged signals are displayed in the Simulation Data Inspector.

`plcrunextmode(____,idx_list)` runs external mode visualization and displays only the logged signals identified by the indices in the `idx_list`.

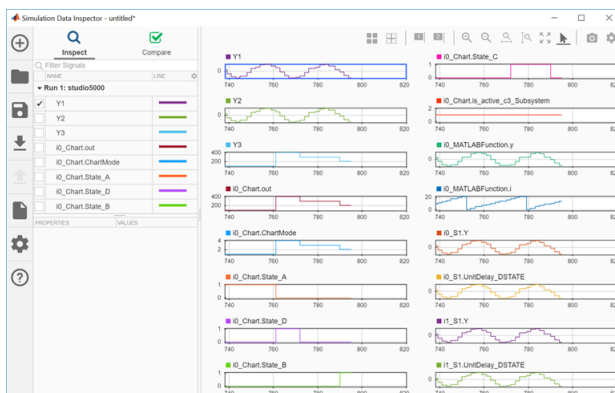
`plcrunextmode(____,name_list)` runs external mode visualization and displays only the logged signals identified by the names in the `name_list`.

Examples

Visualize Logging Data

The following example uses `plcrunextmode` to connect to an OPC server and stream log data in to Simulation Data Inspector.

```
plcrunextmode ('localhost', 'studio5000', 'ext_demo1', 'plc_log_data.mat');
```



Input Arguments

opc_host — Host address
character vector

Host address of the OPC server.

Example: 'localhost'

target_ide – Target IDE string

character vector

Specifies the name of the PLC target IDE.

Example: 'studio5000'

mdl_name – Simulink model name

character vector

Specifies the Simulink model for which the code was generated with logging instrumentation.

Example: 'extmode_demo'

log_file – Logging data MAT-file

character vector

Full file path of the logging data MAT-file.

Example: 'C:\plc_log_data.mat'

idx_list – Index list of logged data

integer vector

The index vector specifying the indices of the logged data signals to display. This argument is optional.

Example: [1 2 3]

name_list – Name list of the logged data

vector

The name vector specifying the names of the logged data signals to display. This argument is optional.

Example: {'Y1', 'Y2', 'i0_S1.Y'}

Version History

Introduced in R2018a

See Also

`plcdispextmodedata` | `plcgeneratecode`

Topics

“External Mode Logging”

“Generate Structured Text Code That Has Logging Instrumentation”

“Visualize and Monitor Logging Data by using Simulation Data Inspector”

plcladderlib

Open the Simulink PLC Coder Ladder Library

Syntax

```
plcladderlib
```

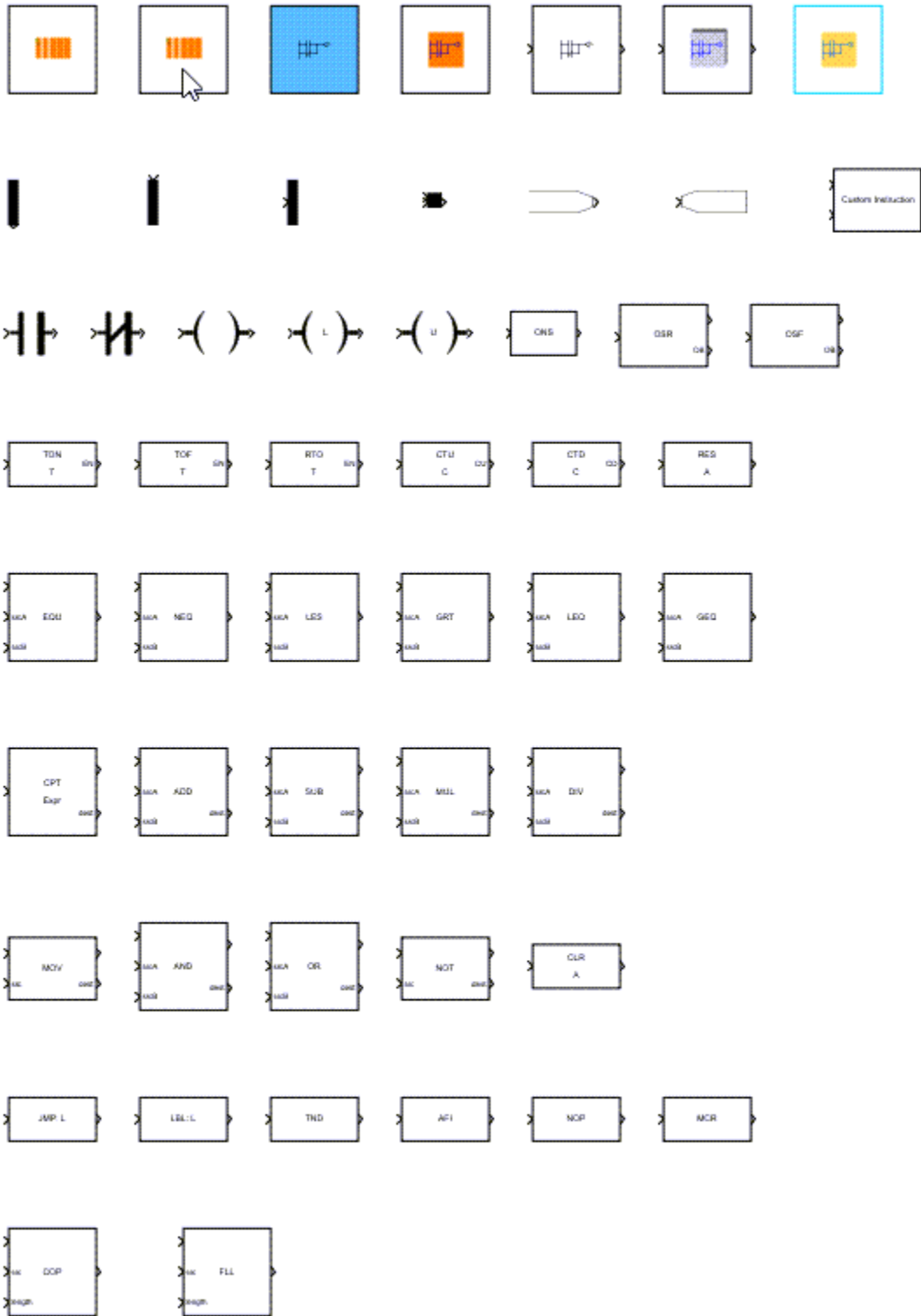
Description

plcladderlib opens the Simulink PLC Coder Ladder Library.

Examples

Open the Ladder Library

```
plcladderlib
```



See Also

[plcimportladder](#) | [plcgeneraterunnertb](#) | [plcgeneratecode](#) | [plcladderoption](#) | [plcloadtypes](#) | [plccleartypes](#)

Topics

[“Supported Elements in Ladder Diagram”](#)
[“Import L5X Ladder Diagram Files into Simulink”](#)
[“Model and Simulate Ladder Diagrams in Simulink”](#)
[“Generating Ladder Diagram Code from Simulink”](#)
[“Verify Generated Ladder Diagram Code”](#)

plcloadtypes

Load the data types for Simulink PLC Coder ladder models

Syntax

```
plcloadtypes
```

Description

`plcloadtypes` loads the data types used by PLC Ladder models into the MATLAB workspace.

Examples

Load Data types for Ladder diagram model

The following example demonstrates how to load the data types associated with a Ladder model in Simulink.

Use the `plcloadtypes` function to load the data types associated with the Simulink Ladder Diagram model.

```
plcloadtypes
```

The data types are loaded into the MATLAB workspace.

Version History

Introduced in R2019a

See Also

`plcimportladder` | `plcgeneraterunnertb` | `plcgeneratecode` | `plcladderlib` | `plcladderoption` | `plccleartypes`

Topics

“Supported Elements in Ladder Diagram”
“Import L5X Ladder Diagram Files into Simulink”
“Model and Simulate Ladder Diagrams in Simulink”
“Generating Ladder Diagram Code from Simulink”
“Verify Generated Ladder Diagram Code”

plcclearatypes

Clear the data types associated with the Simulink PLC Coder ladder models from the workspace

Syntax

```
plcclearatypes
```

Description

`plcclearatypes` clears the ladder data types from the MATLAB workspace.

Examples

Clear data types from a Ladder Diagram model

The following example demonstrates how to clear the data types associated with a Ladder model in Simulink.

Use the `plcclearatypes` function to clear the data types associated with the Simulink Ladder Diagram model.

```
plcclearatypes
```

The data types are cleared from the MATLAB workspace.

Version History

Introduced in R2019a

See Also

`plcimportladder` | `plcgeneraterunnertb` | `plcgeneratecode` | `plcladderlib` | `plcladderoption` | `plcloadtypes`

Topics

“Supported Elements in Ladder Diagram”
“Import L5X Ladder Diagram Files into Simulink”
“Model and Simulate Ladder Diagrams in Simulink”
“Generating Ladder Diagram Code from Simulink”
“Verify Generated Ladder Diagram Code”

plcladderoption

Get or set parameter values associated with Ladder Diagram models

Syntax

```
currentState = plcladderoption(mdlname,Name,Value)
```

Description

`currentState = plcladderoption(mdlname,Name,Value)` sets the parameter to the specified value for the Simulink ladder diagram model. Open or load the Simulink ladder diagram model first. If the `Value` argument is not specified this function returns the value of the specified parameter for the ladder diagram model.

Examples

Set Parameter Values for Ladder Diagram Models

This example shows how to import a ladder diagram from a .L5X file into Simulink® and set options for simulating the imported ladder file by using the `plcladderoption` function.

Import Ladder File

Import the `simpleController.L5X` file by using the `plcimportladder` function.

```
[mdlName,mdlLib,busScript] = plcimportladder('simpleController.L5X','OpenModel','On')

mdlName =
'simpleController'

mdlLib =
'simpleController_lib'

busScript =

    []
```

The imported model contains a PLC Controller block named `simpleController`, a Task block named `MainTask` and a Ladder Diagram Program block named `MainProgram`.

Enable Fast Simulation of Imported Ladder Diagram Model

Enable `FastSim` by using the `plcladderoption` function.

```
currentState = plcladderoption('simpleController','FastSim','on');
```

Input Arguments

mdlname — Simulink model name

character array

Specifies the name of the generated Simulink model.

Name-Value Pair Arguments

Specify optional pairs of arguments as `Name1=Value1, ..., NameN=ValueN`, where `Name` is the argument name and `Value` is the corresponding value. Name-value arguments must appear after other arguments, but the order of the pairs does not matter.

Before R2021a, use commas to separate each name and value, and enclose `Name` in quotes.

Example: `plcladderoption('simpleController','Animation','on')`

FastSim — Enable animation and data display

off (default) | on

When 'on', this option disables animation and data display. If 'FastSim' is set to 'on', then changes made to 'Animation' and 'DataDisplay' parameter do not change simulation behavior.

Animation — Animation of ladder rungs

on (default) | off

This option enables/disables animation of Ladder Diagram rungs, when 'FastSim' is in 'off' state

DataDisplay — Data Display

off (default) | on

This option enables/disables data display of Ladder Diagram rungs, when 'FastSim' is in 'off' state

SLDV — Simulink Design Verifier

off (default) | on

This option enables/disables using Simulink Design Verifier features with Ladder Diagrams. Set 'SLDV' parameter to 'on' before SLDV analysis. SLDV analysis could be still done without using 'SLDV' option, by setting 'FastSim' to 'on' and 'Prescan' to 'off'.

Prescan — Prescan

on (default) | off

This option enables/disables Prescan for instructions and AOI blocks explicitly for Simulink Design Verifier analysis.

Output Arguments

currentState — The value of the specified parameter name for the ladder diagram model

off | on

The value of the specified parameter name for the ladder diagram model.

Version History

Introduced in R2019a

See Also

`plcimportladder` | `plcgeneraterunnertb` | `plcgeneratecode` | `plcladderlib` | `plcloadtypes` | `plccleartypes`

Topics

“Supported Elements in Ladder Diagram”
“Import L5X Ladder Diagram Files into Simulink”
“Model and Simulate Ladder Diagrams in Simulink”
“Generating Ladder Diagram Code from Simulink”
“Verify Generated Ladder Diagram Code”

plcgeneraterunnertb

Generate L5X test bench code for specified AOI Runner block and AOI name

Syntax

```
TbCode = plcgeneraterunnertb (runnerBlk)
```

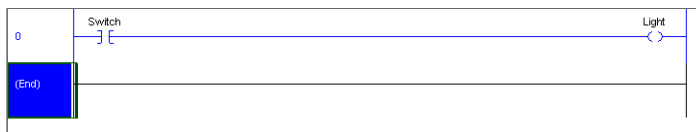
Description

TbCode = plcgeneraterunnertb (runnerBlk) returns the generated test bench code for the AOI runner block of the ladder diagram model. Open or load the Simulink Ladder Diagram model first.

Examples

Generate Test bench for AOI runner block

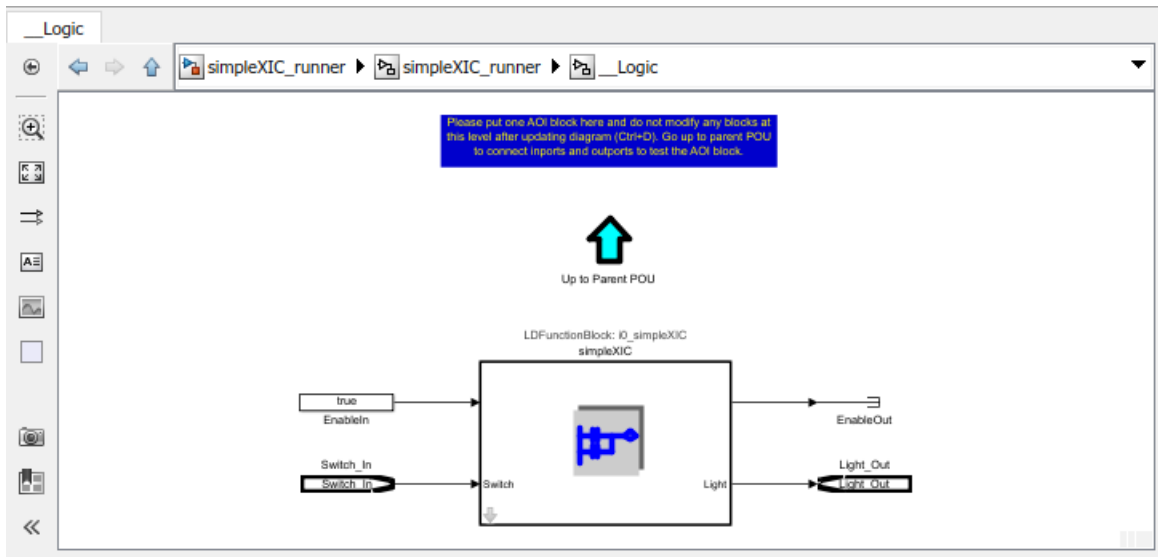
The following example demonstrates how to import a simple ladder diagram from an L5X file (simpleXIC.L5X) into the Simulink environment and generate test bench code for it. The ladder L5X file was created using RSLogix 5000 IDE and contains an AOI named simpleXIC with contact and coil representing a switch and a light. The following is a snapshot of the ladder structure.



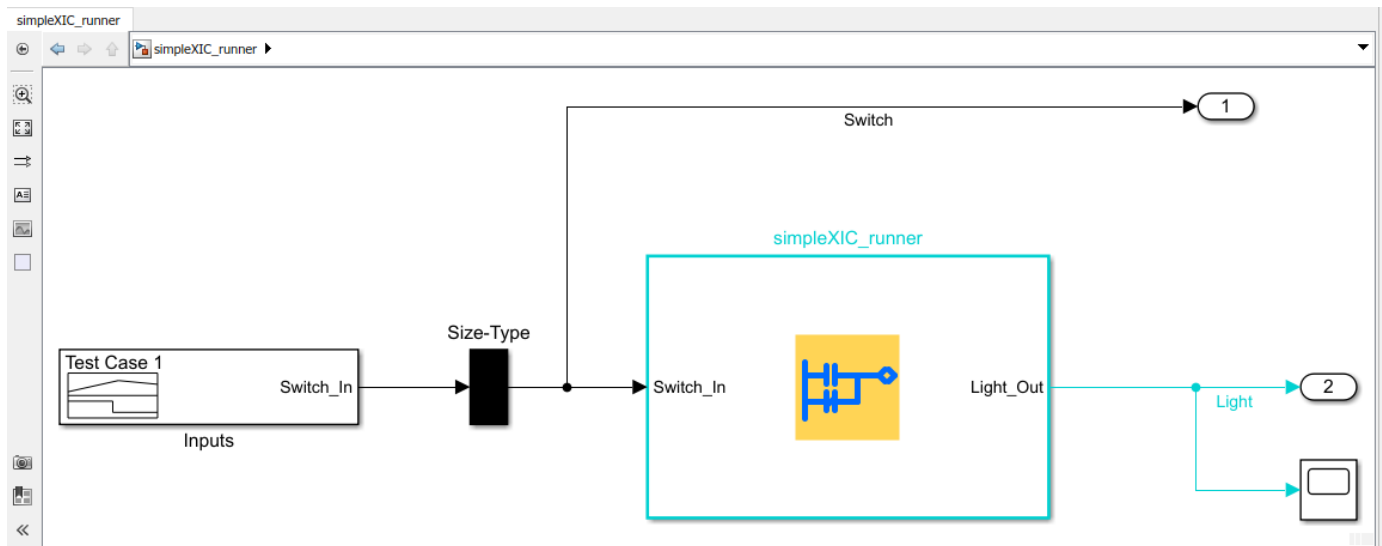
Use the `plcladderimport` function to import the ladder into Simulink.

```
[mdlName,mdlLib,busScript] = plcimportladder('simpleXIC.L5X',...
'OpenModel','0n','TopAOI','simpleXIC')
```

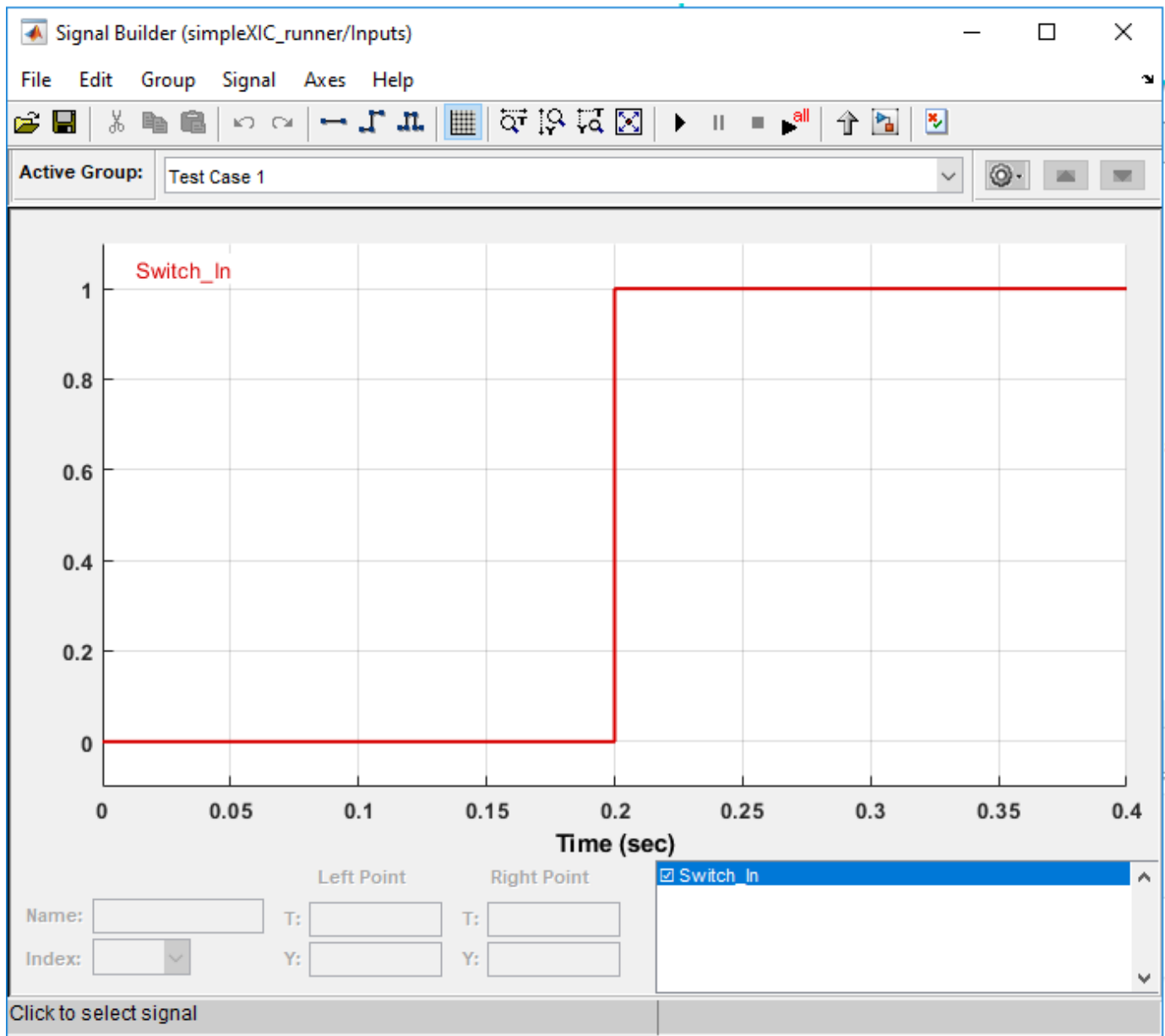
The imported model contains an AOI Runner block named `simpleXIC_runner`, followed by a Ladder Diagram Function (AOI) block named `simpleXIC`.



Add Signal Builder input block, Scope and output ports as shown.



Modify the Signal Builder input to mimic a switch operation as shown.



Generate test-bench for the Ladder Diagram model.

```
Tbcode = plcgeneraterrunrtb('simpleXIC_runner/simpleXIC_runner')
```

```
Tbcode =
```

```
    1x1 cell array
```

```
    {'C:\runnerTB\simpleXIC_runner.L5X'}
```

If the test-bench code generation completes with no errors, a test-bench file `simpleXIC_runner.L5X` is created. The generated AOI test bench file can be verified on Rockwell Automation IDE.

Note Test-bench generation for ladder diagram models containing timer blocks such as TON, TOF and RTO fails. To generate test-bench code for these models, modify the ladder diagram structure while maintaining the logic.

Input Arguments

runnerBlk — AOI runner block name

character vector

AOI runner block name specified as character vector.

Output Arguments

TbCode — Test-bench Code

character vector

Generated test-bench file name specified as character vector.

Version History

Introduced in R2019a

See Also

[plcimportladder](#) | [plcgeneraterunnertb](#) | [plcgeneratecode](#) | [plcladderlib](#) | [plcladderoption](#) | [plcloadtypes](#) | [plccleartypes](#)

Topics

“Supported Elements in Ladder Diagram”
“Import L5X Ladder Diagram Files into Simulink”
“Model and Simulate Ladder Diagrams in Simulink”
“Generating Ladder Diagram Code from Simulink”
“Verify Generated Ladder Diagram Code”