Modicon TM7

Expansion Blocks DTM Configuration Programming Guide

04/2012

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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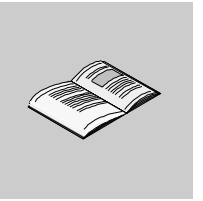
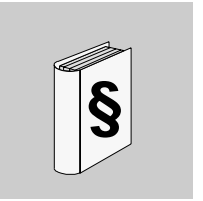


Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

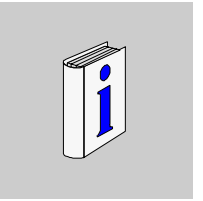
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This manual describes the DTM configuration of the Modicon TM7 field bus interface embedded I/O and the Modicon TM7 Input/Output expansion blocks.

Validity Note

This document has been updated with the release of the Performance Distributed I/O Configuration Software V1.0.

Related Documents

Title of Documentation	Reference Number
Modicon TM5 / TM7 CANopen Interface Programming Guide	EIO0000000697 (Eng), EIO0000000698 (Fre), EIO0000000699 (Ger), EIO0000000700 (Spa), EIO0000000701 (Ita), EIO0000000702 (Chs)
Modicon TM7 CANopen I/O Blocks Hardware Guide	EIO0000000685 (Eng), EIO0000000686 (Fre), EIO0000000687 (Ger), EIO0000000688 (Spa), EIO0000000689 (Ita), EIO0000000690 (Chs)

Modicon TM7 Digital I/O Blocks Hardware Guide	EIO0000000703 (Eng), EIO0000000704 (Fre), EIO0000000705 (Ger), EIO0000000706 (Spa), EIO0000000707 (Ita), EIO0000000708 (Chs)
Modicon TM7 Analog I/O Blocks Hardware Guide	EIO0000000709 (Eng), EIO0000000710 (Fre), EIO0000000711 (Ger), EIO0000000712 (Spa), EIO0000000713 (Ita), EIO0000000714 (Chs)

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

I/O Configuration General Information

1

Introduction

This chapter provides the general considerations to configure field bus interface embedded I/O and I/O expansion blocks.

What's in this Chapter?

This chapter contains the following topics:

General Description

Introduction

The range of TM7 blocks includes:
- Field bus interface blocks with embedded digital I/O
- TM7 Digital blocks
- TM7 Analog blocks
- TM7 Power Distribution Blocks

Digital or analog input blocks convert measured values (voltages, currents) into numerical values which can be processed by the controller.

Digital or analog output blocks convert controller internal numerical values into voltages or currents.

Analog temperature blocks convert the temperature measurement values into number values which can be processed by the controller. For temperature measurements, the temperature block returns the measured value using 0.1° C *(0.18° F)* steps.

The Power Distribution Blocks PDB are used to manage the power supply for the various I/O blocks. The PDB feeds the TM7 power bus.

NOTE: The TM7 I/O blocks are associated with power cables, TM7 bus cables and I/O cables.

Embedded Digital I/O Features

Reference	Number of channels	Voltage/current
TM7BDM8BE *(see page 17)*	8 inputs	24 Vdc / 7 mA
TM7BDM16BE *(see page 17)*	16 inputs	24 Vdc / 7 mA
TM7BDM16AE *(see page 17)*	16 inputs	24 Vdc / 7 mA

Digital I/O Expansion Features

Reference	Number of channels	Voltage/current
TM7BDI8B *(see page 22)*	8 inputs	24 Vdc / 7 mA
TM7BDI16B *(see page 22)*	16 inputs	24 Vdc / 7 mA
TM7BDI16A *(see page 22)*	16 inputs	24 Vdc / 7 mA

Reference	Number of channels	Voltage/current
TM7BDO8TAB *(see page 23)*	8 outputs	24 Vdc / 2 A
TM7BDM8B *(see page 24)*	8 inputs 8 outputs	24 Vdc / 4.4 mA 24 Vdc / 0.5 A
TM7BDM16A *(see page 24)*	16 inputs 16 outputs	24 Vdc / 4.4 mA 24 Vdc / 0.5 A
TM7BDM16B *(see page 24)*	16 inputs 16 outputs	24 Vdc / 4.4 mA 24 Vdc / 0.5 A

Analog I/O Expansion Features

Reference	Number of channels	Voltage/Current
TM7BAI4VLA *(see page 28)*	4 inputs	-10...+10 Vdc
TM7BAI4CLA *(see page 34)*	4 inputs	0...20 mA
TM7BAO4VLA *(see page 48)*	4 outputs	-10...+10 Vdc
TM7BAO4CLA *(see page 50)*	4 outputs	0...20 mA
TM7BAM4VLA *(see page 51)*	2 inputs 2 outputs	-10...+10 Vdc -10...+10 Vdc
TM7BAM4CLA *(see page 57)*	2 inputs 2 outputs	0...20 mA 0...20 mA

Temperature Analog Input Expansion Features

Reference	Number of channels	Sensor Type
TM7BAI4TLA *(see page 40)*	4 inputs	PT100/1000 KTY10-6/84-130
TM7BAI4PLA *(see page 44)*	4 inputs	Thermocouple J, K, S

Power Distribution Expansion Features

Reference	Description
TM7SPS1A *(see page 63)*	TM7 Power Distribution Block

Match Software and Hardware Configuration

The I/O that may be embedded in your controller is independent of the I/O that you may have added in the form of I/O expansion. It is important that the logical I/O configuration within your program matches the physical I/O configuration of your installation. If you add or remove any physical I/O to or from the I/O expansion bus, it is imperative that you update your application configuration (this is also true for any field bus devices you may have in your installation). Otherwise, there is the potential that the expansion bus or field bus will no longer function while the embedded I/O that may be present in your controller will continue to operate.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Update the configuration of your program each time you add or delete an I/O expansion, or you add or delete any devices on your field bus.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Adding TM7 Expansion Blocks

Overview

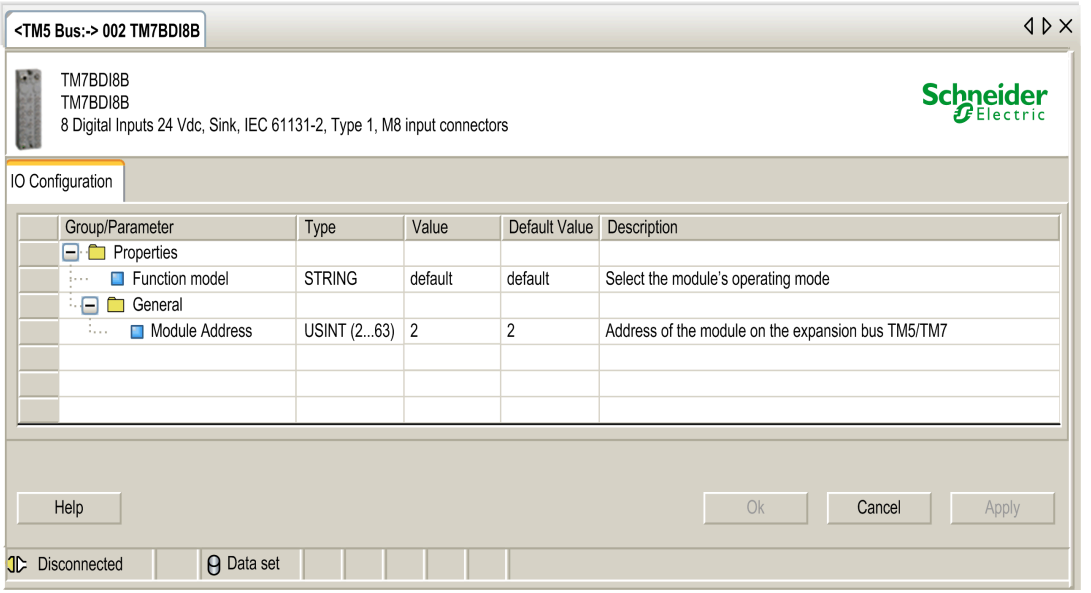
In order to configure your TM5/TM7 distributed I/O configuration, you must create your configuration with your frame application (for example: SoMachine).

In your frame application, select the device to open the DTM configuration for that device.

Each frame application has its own way of creating a configuration; refer to your frame application online help for more details.

I/O Configuration Tab Description

The expansion blocks are set up from the **I/O Configuration** tab:



The **I/O Configuration** tab contains the following columns:

Column	Description	Editable
Group/Parameter	Parameter name	No
Type	Parameter data type	No
Value	Parameter value	If the parameter is editable, an edit frame can be opened by double-clicking.
Default Value	Default parameter value	No
Description	Parameter short description	No

General Control Buttons

The **OK Button** confirms the latest settings. All changed values are applied on the frame application database. The DTM Graphic User Interface (GUI) closes.

The **Cancel Button** cancels the latest changes. Confirm your decision in the **Cancel** dialog box that no changes are stored. The DTM GUI closes.

The **Apply Button** confirms the latest settings. All changed values are applied on the frame application database. The DTM GUI remains opened.

The **Help Button** opens the DTM online help.

Field bus Interface Embedded Digital I/O Blocks

2

TM7BDM8BE, TM7BDM16AE and TM7BDM16BE

Introduction

The TM7BDM8BE, TM7BDM16AE and TM7BDM16BE blocks are embedded in the CANopen interface I/O. These embedded designations are 24 Vdc digital configurable input or output with either 8 or 16 channels. These embedded designations are automatically added when a TM7 CANopen interface I/O block is added.

For further information, refer to the Hardware Guide:

Designation	Refer to
TM7BDM8BE	TM7NCOM08B CANopen Interface Block *(see Modicon TM7, CANopen Interface I/O Blocks, Hardware Guide)*
TM7BDM16AE	TM7NCOM16A CANopen Interface Block *(see Modicon TM7, CANopen Interface I/O Blocks, Hardware Guide)*
TM7BDM16BE	TM7NCOM16B CANopen Interface Block *(see Modicon TM7, CANopen Interface I/O Blocks, Hardware Guide)*

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the module. TM7BDM... supports only one mode.
General	**Module address**	1	1	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
	Output status	On Off	Off	Enables (On) / Disables (Off) the reading of the output status.
	Input filter	0...250	10	Specifies the filter time of all digital inputs in the range 0...250 (0...25 ms).
Channel 00...15*	**Channel type**	Input Output	Input	Select the channel type: digital input or digital output.
	Fall back mode (for Output channel type)	Set to 0 Set to 1 Last current state	Set to 0	Sets the fall back mode in case of communication loss on the field bus. The fall back mode indicates the fall back value adopted by outputs in the event of an internal error detection or a communication loss. Fall backs are not activated in case of communication loss on the TM5/TM7 bus. In this case the outputs assume the value of 0.

* The number of **channel** is equal to the block channel number

Output Status Register

The output status register describes the status of each output channel:

Bit	Description	Bits value
0[1]	Channel 00 status	0: No error detected 1: Short-circuit or overcurrent
...	...	
15[1]	Channel 15 status	
[1] The bit number is the same as the block channel number		

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristics	Value (µs)	
	Without filter	With filter
Minimum cycle time	150	200
Minimum I/O update time	150	200

TM7 Digital I/O Blocks

3

Introduction

This chapter provides information to configure digital I/O expansion blocks.

To add expansion blocks and to access the configuration screens, refer to Adding a TM7 Expansion Block *(see page 15)*.

What's in this Chapter?

This chapter contains the following topics:

TM7BDI8B, TM7BDI16A and TM7BDI16B

Introduction

TheTM7BDI8B, TM7BDI16A and TM7BDI16B expansion blocks are 24 Vdc digital input blocks with either 8 or 16 inputs.

For further information, refer to the Hardware Guide:

Reference	Refer to
TM7BDI8B	TM7BDI8B Block 8DI 24 Vdc Sink *(see Modicon TM7, Digital I/O Blocks, Hardware Guide)*
TM7BDI16A	TM7BDI16A Block 16DI 24 Vdc Sink *(see Modicon TM7, Digital I/O Blocks, Hardware Guide)*
TM7BDI16B	TM7BDI16B Block 16DI 24 Vdc Sink *(see Modicon TM7, Digital I/O Blocks, Hardware Guide)*

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the module. TM7BDI... supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.

TM7BDO8TAB

Introduction

TheTM7BDO8TAB expansion block is a 24 Vdc digital output block with 8 outputs.

For further information, refer to TM7BDO8TAB Block 8DO 24 Vdc Source *(see Modicon TM7, Digital I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the module. TM7BDO8TAB supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
	Output status	On Off	Off	Enables (On) /Disables (Off) the reading of the output status (overload or short circuit).
Channel 00... 07	**Fall back mode**	Set to 0 Set to 1 Last current state	Set to 0	Sets the fall back mode in case of communication loss on the field bus. The fall back mode indicates the fall back value adopted by outputs in the event of an internal error detection or a communication loss. Fall backs are not activated in case of communication loss on the TM5/TM7 bus. In this case the outputs assume the value of 0.

TM7BDM8B, TM7BDM16A and TM7BDM16B

Introduction

The TM7BDM8B, TM7BDM16A and TM7BDM16B expansion blocks are 24 Vdc digital configurable input or output blocks with either 8 or 16 channels.

For further information, refer to the Hardware Guide:

Reference	Refer to
TM7BDM8B	TM7BDM8B Block 8 Configurable DI/DO 24 Vdc *(see Modicon TM7, Digital I/O Blocks, Hardware Guide)*
TM7BDM16A	TM7BDM16A Block 16 Configurable DI/DO 24 Vdc *(see Modicon TM7, Digital I/O Blocks, Hardware Guide)*
TM7BDM16B	TM7BDM16B Block 16 Configurable DI/DO 24 Vdc *(see Modicon TM7, Digital I/O Blocks, Hardware Guide)*

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the module. TM7BDM... supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
	Output status	On Off	Off	Enables (On) /Disables (Off) the reading of the output status.
	Input filter	0...250	10	Specifies the filter time of all digital inputs in the range 0...250 (0...25 ms).
Channel 00...15*	**Channel type**	Input Output	Input	Select the channel type: digital input or digital output.
	Fall back mode (for Output channel type)	Set to 0 Set to 1 Last current state	Set to 0	Sets the fall back mode in case of communication loss on the field bus. The fall back mode indicates the fall back value adopted by outputs in the event of an internal error detection or a communication loss. Fall backs are not activated in case of communication loss on the TM5/TM7 bus. In this case the outputs assume the value of 0.

* The number of **channel** is equal to the block channel number.

Output Status Register

The output status register describes the status of each output channel:

Bit	Description	Bits value
0[1]	Channel 00 status	0: No error detected 1: Short-circuit or overcurrent
...	...	
15[1]	Channel 15 status	
[1] The bit number is the same as the block channel number		

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristics	Value (µs)	
	Without filter	With filter
Minimum cycle time	150	200
Minimum I/O update time	150	200

TM7 Analog I/O Blocks

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Introduction

This chapter provides information to configure analog I/O expansion blocks.

To add expansion blocks and access to the configuration screens, refer to Adding a TM7 Expansion Block *(see page 15)*.

What's in this Chapter?

This chapter contains the following topics:

TM7BAI4VLA

Introduction

The TM7BAI4VLA expansion block is a 4 channel analog input block with 10 Vdc inputs.

For further information, refer to TM7BAI4VLA Block 4AI ±10V *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the block. TM7BAI4VLA supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
	Input filter	Off level 2 level 4 level 8 level 16 level 32 level 64 level 128	Off	Definition of the filter level *(see page 29)*.
	Input limitation	Off I16383 I8191 I4095 I2047 I1023 I511 I255	Off	Definition of the input limitation *(see page 31)*. **NOTE:** Parameter only available if an input filter is selected.
	Input status	On Off	Off	Enables (On) / Disables (Off) the reading of the input status *(see page 32)*.

Group/Parameter		Value	Default Value	Description
Channel 00*	**Channel on/off**	On/Off	On[1]	Enables (On) / Disables (Off) the channel. Off: The other parameters assume their default value and the channel is deactivated. **NOTE:** Disable any unused channels to avoid unnecessary communication on the bus.
	Configuration			
	Channel type	-10...+10 V	-10...+10 V	
	Delta interrupt mode	Checked Unchecked	Checked	Activates the delta interrupt mode. Delta interrupt mode defines the delta value which may trigger a PDO send.
	Delta interrupt value	0...10000	100	Sets the delta interrupt value. **NOTE:** Sets the highest value compatible with your application to avoid unnecessary communication on the bus.
	Lower limit mode	Checked Unchecked	Unchecked	Activates the lower limit interrupt mode. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Lower limit value	0	0	Sets the lower limit value. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Upper limit mode	Checked Unchecked	Unchecked	Activates the upper limit interrupt mode. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.
	Upper limit value	32767	32767	Sets the upper limit value.

[1] Channel 00 default value is ON. Channel 01 to 03 default value is OFF.

[*] The same channel 00 parameters are also available for channel 01...03.

Filter Level

The input value is evaluated according to the filter level. An input limitation can then be applied using this evaluation.

Formula for the evaluation of the input value:

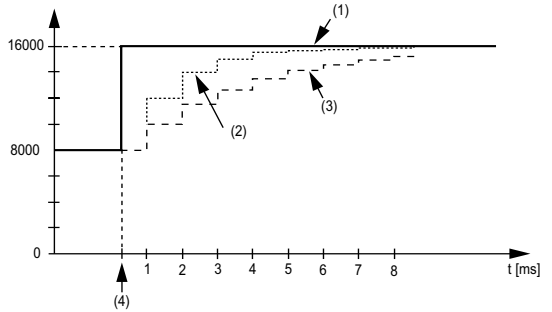
$$Value_{new} = Value_{old} - \frac{Value_{old}}{Filterlevel} + \frac{Inputvalue}{Filterlevel}$$

The following examples show the function of the input limitation based on an input jump and a disturbance.

Example 1: The input value makes a jump from 8000 to 16000. The diagram displays the evaluated value with the following settings:

Input limitation = 0

Filter level = 2 or 4

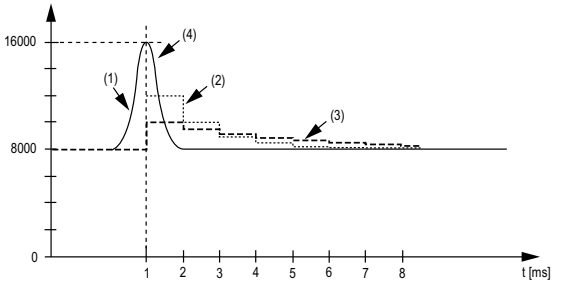


1 Input value
2 Evaluated value: Filter level 2
3 Evaluated value: Filter level 4
4 Input jump

Example 2: A disturbance is imposed on the input value. The diagram shows the evaluated value with the following settings:

Input limitation = 0

Filter level = 2 or 4



1 Input value
2 Evaluated value: Filter level 2
3 Evaluated value: Filter level 4
4 Disturbance (Spike)

Input Limitation

Input limitation can only take place when a filter is used. Input limitation is executed before filtering takes place.

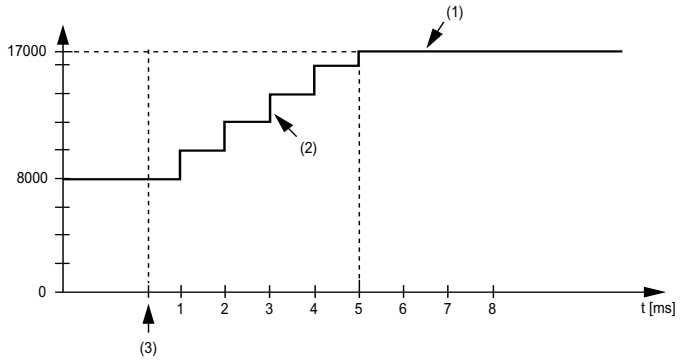
The amount of the change in the input value is checked to make sure the specified limits are not exceeded. If the values are exceeded, the adjusted input value is equal to the old value ± the limit value.

The input limitation is well suited for suppressing disturbances (spikes). The following examples show the function of the input limitation based on an input jump and a disturbance.

Example 1: The input value makes a jump from 8000 to 17000. The diagram displays the adjusted input value for the following settings:

Input limitation = 2047

Filter level = 2

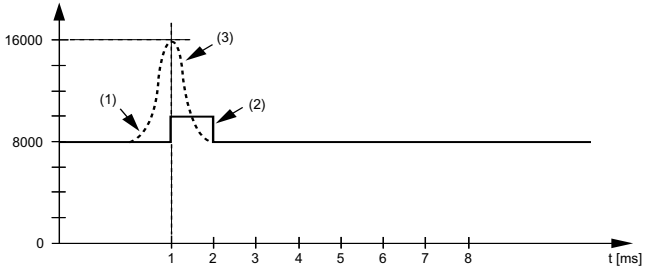


1 Input value
2 Internal adjusted input value before filter
3 Input jump

Example 2: A disturbance is imposed on the input value. The diagram shows the adjusted input value with the following settings:

Input limitation = 2047

Filter level = 2



1 Input value
2 Internal adjusted input value before filter
3 Disturbance (Spike)

Input Status Register

The input status register describes the status of each input channel:

Bit	Description	Bits value
0-1	Channel 00 status	00: No error detected 01: Below lower limit value 10: Above upper limit value 11: Broken wire detected
2-3	Channel 01 status	
4-5	Channel 02 status	
6-7	Channel 03 status	

Out of Range Values

Out of Range Values	
Below lower limit	-32768
Above upper limit	32767

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristics	Value (µs)	
	Without filter	With filter
Minimum cycle time	250	500
Minimum input update time	300	1000

TM7BAI4CLA

Introduction

The TM7BAI4CLA expansion block is a 4 channel analog input block with 20 mA inputs.

For further information, refer to TM7BAI4CLA Block 4AI 0-20mA *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the block. TM7BAI4CLA supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block in the Performance Distributed I/O Configuration. TM7 Blocks do not support the ability to change the address.
	Input filter	Off level 2 level 4 level 8 level 16 level 32 level 64 level 128	Off	Definition of the filter level *(see page 35)*.
	Input limitation	Off l16383 l8191 l4095 l2047 l1023 l511 l255	Off	Definition of the input limitation *(see page 37)*. **NOTE:** Parameter only available if an input filter is selected.
	Input status	On/Off	Off	Enables (On) / Disables (Off) the reading of the input status *(see page 38)*.

Group/Parameter		Value	Default Value	Description
Channel 00*	**Channel on/off**	On/Off	On[1]	Enables (On) / Disables (Off) the channel. Off: The other parameters assume their default value and the channel is deactivated. **NOTE:** Disable any unused channels to avoid unnecessary communication on the bus.
	Configuration			
	Channel type	0...20 mA	0...20 mA	Select channel type.
	Delta interrupt mode	Checked Unchecked	Checked	Activates the delta interrupt mode. Delta interrupt mode defines the delta value which may trigger a PDO send.
	Delta interrupt value	0...10000	100	Sets the delta interrupt value. **NOTE:** Sets the highest value compatible with your application to avoid unnecessary communication on the bus.
	Lower limit mode	Checked Unchecked	Unchecked	Activates the lower limit interrupt mode. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Lower limit value	0	0	Sets the lower limit value. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Upper limit mode	Checked Unchecked	Unchecked	Activates the upper limit interrupt mode. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.
	Upper limit value	32767	32767	Sets the upper limit value. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.

[1] Channel 00 default value is ON. Channel 01 to 03 default value is OFF.

[*] The same channel 00 parameters are also available for channel 01...03.

Filter Level

The input value is evaluated according to the filter level. An input limitation can then be applied using this evaluation.

Formula for the evaluation of the input value:

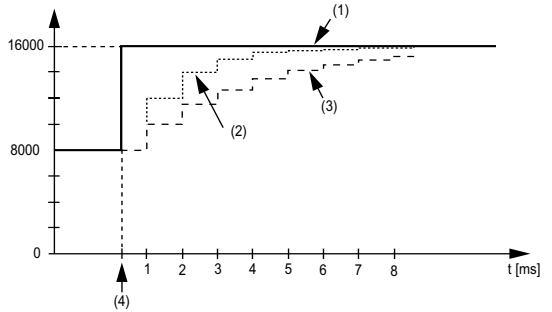
$$Value_{new} = Value_{old} - \frac{Value_{old}}{Filterlevel} + \frac{Inputvalue}{Filterlevel}$$

The following examples show the function of the input limitation based on an input jump and a disturbance.

Example 1: The input value makes a jump from 8000 to 16000. The diagram displays the evaluated value with the following settings:

Input limitation = 0

Filter level = 2 or 4

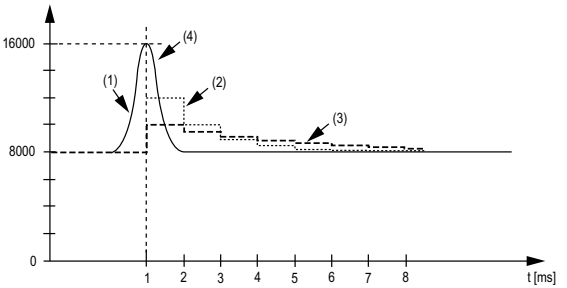


1 Input value
2 Evaluated value: Filter level 2
3 Evaluated value: Filter level 4
4 Input jump

Example 2: A disturbance is imposed on the input value. The diagram shows the evaluated value with the following settings:

Input limitation = 0

Filter level = 2 or 4



1 Input value
2 Evaluated value: Filter level 2
3 Evaluated value: Filter level 4
4 Disturbance (Spike)

Input Limitation

Input limitation can only take place when a filter is used. Input limitation is executed before filtering takes place.

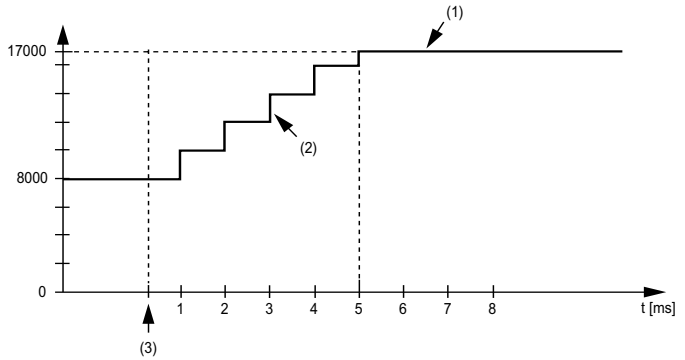
The amount of the change in the input value is checked to make sure the specified limits are not exceeded. If the values are exceeded, the adjusted input value is equal to the old value ± the limit value.

The input limitation is well suited for suppressing disturbances (spikes). The following examples show the function of the input limitation based on an input jump and a disturbance.

Example 1: The input value makes a jump from 8000 to 17000. The diagram displays the adjusted input value for the following settings:

Input limitation = 2047

Filter level = 2

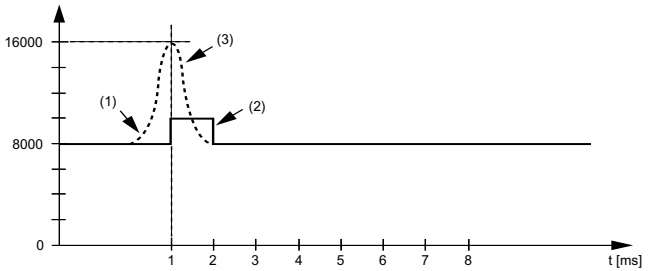


1 Input value
2 Internal adjusted input value before filter
3 Input jump

Example 2: A disturbance is imposed on the input value. The diagram shows the adjusted input value with the following settings:

Input limitation = 2047

Filter level = 2



1 Input value
2 Internal adjusted input value before filter
3 Disturbance (Spike)

Input Status Register

The input status register describes the status of each input channel:

Bit	Description	Bits value
0-1	Channel 00 status	00: No error detected 10: Above upper limit value
2-3	Channel 01 status	
4-5	Channel 02 status	
6-7	Channel 03 status	

Out of Range Values

Out of Range Values	
Below lower limit	0
Above upper limit	32767

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristic	Value (µs)	
	Without filter	With filter
Minimum cycle time	250	500
Minimum input update time	300	1000

TM7BAI4TLA

Introduction

The TM7BAI4TLA expansion block is a 4 channel Analog Resistance Temperature input block with input sensor type PT and KTY or resistor.

For further information, refer to TM7BAI4TLA Block 4AI PT100/PT1000 *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter	Parameter	Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the block. TM7BAI4TLA supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
	Input filter	2 ms 4 ms 16.67 ms 20 ms	20 ms	Definition of the filter level *(see page 35)*.
	Input status	On/Off	Off	Enables (On) / Disables (Off) the reading of the input status *(see page 42)*.

Group/Parameter	Parameter	Value	Default Value	Description
Channel00 *	**Sensor type**	PT100 PT1000 KTY10-6 KTY84-130 0.1...4500 Ohm (0.1 Ohm/bit) 0.05...2250 Ohm (0.05 Ohm/bit) off	PT100	Sets the sensor type *(see page 41)*.
	Delta interrupt mode	Checked Unchecked	Checked	Activates the delta interrupt mode. Delta interrupt mode defines the delta value which may trigger a PDO send.
	Delta interrupt value	0...1000	50	Sets the delta interrupt value. **NOTE:** Sets the highest value compatible with your application to avoid unnecessary communication on the bus.
	Lower limit mode	Checked Unchecked	Unchecked	Activates the lower limit interrupt mode. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Lower limit value	Depend of the sensor type	Depend of the sensor type	Sets the lower limit value. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Upper limit mode	Checked Unchecked	Unchecked	Activates the upper limit interrupt mode. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.
	Upper limit value	Depend of the sensor type	Depend of the sensor type	Sets the upper limit value. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.

Analog Inputs

Different resistance or temperature measurements result in different value ranges and data types.

Sensor Type

The block is designed for temperature and resistance measurement. The sensor type must be specified because of the different adjustment values for temperature and resistance. To save time, individual channels can be switched off.

The table below shows the sensor types:

Sensor Types	Digital value	Temperature °C (°F)	Resolution
Sensor type PT100	-2000...8500	-200...850 (-328...1562)	0.1°C (0.18°F)
Sensor type PT1000	-2000...8500	-200...850 (-328...1562)	0.1°C (0.18°F)
Sensor type KYY10-6	500...1450	-50...145 (48...293)	0.1°C (0.18°F)
Sensor type KTY84-130	400...3000	-40...300 (40...572)	0.1°C (0.18°F)
Resistance measurement 0.1...4500 Ohm	1...45000	-	0.1 Ohm
Resistance measurement 0.05...2250 Ohm	1...45000	-	0.05 Ohm

Limit Analog Value

In addition to the status information, the analog value is set to the values listed below, by default, when an error is detected. The analog value is limited to the new values if the limit values were changed.

Detected error type	Temperature measurement Digital value for detected error	Resistance measurement Digital value for detected error
Broken wire detected	+32767 (7FFF hex)	65535 (FFFF hex)
Above upper limit value	+32767 (7FFF hex)	65535 (FFFF hex)
Below lower limit value	-32767 (8001 hex)	0 (0000 hex)
Invalid value	-32768 (8000 hex)	65535 (FFFF hex)

Input Status Register

The input status register describes the status of each input channel:

Bit	Description	Bits value
0-1	Channel 00 status	00: No error detected 01: Below lower limit value 10: Above upper limit value 11: Broken wire detected
2-3	Channel 01 status	
4-5	Channel 02 status	
6-7	Channel 03 status	

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristic	**Value (µs)**	
	1 input	**n inputs**
Minimum cycle time	200	
Minimum input update time	Equal to the filter time	n x (3 x filter time + 15 ms)

TM7BAI4PLA

Introduction

The TM7BAI4PLA expansion block is a 4 channel Analog Temperature Sensor block with input sensor type J, K and S thermocouple sensors.

For further information, refer to TM7BAI4PLA Block 4AI thermocouple J/K/S *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the block. TM7BAI4PLA supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
	Input filter	2 ms 4 ms 16.67 ms 20 ms	20 ms	Definition of the filter level *(see page 35)*.
	Input status	On/Off	Off	Enables (On) / Disables (Off) the reading of the input status *(see page 47)*.
	Sensor type	J K S ±32767 µV (1 µV/bit) ±65534 µV (2 µV/bit)	J	Set the sensor type *(see page 47)*. The sensor type is applied for all the channels

Group/Parameter		Value	Default Value	Description
Channel 00*	**Channel On/Off**	On/Off	On	Enables (On) / Disables (Off) the channel. Off: The other parameters assume their default value and the channel is deactivated. **NOTE:** Disable any unused channels to avoid unnecessary communication on the bus.
	Temperature of connector	On/Off	On	Activates the measurement of the temperature of the M12 connector for compensation *(see page 46)*.
	Delta interrupt mode	Checked Unchecked	Checked	Activates the delta interrupt mode. Delta interrupt mode defines the delta value which may trigger a PDO send.
	Delta interrupt value	0...1000	50	Sets the delta interrupt value. **NOTE:** Sets the highest value compatible with your application to avoid unnecessary communication on the bus.
	Lower limit mode	Checked Unchecked	Unchecked	Activates the lower limit interrupt mode. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Lower limit value	Depend of the sensor type	Depend of the sensor type	Sets the lower limit value. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Upper limit mode	Checked Unchecked	Unchecked	Activates the upper limit interrupt mode. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.
	Upper limit value	Depend of the sensor type	Depend of the sensor type	Sets the upper limit value. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.

* The same channel 00 parameters are also available for channel 01...03.

Analog Inputs

The converted analog values are output by the block in the registers. The sensor type configured affects the value ranges.

Raw Value Measurement

If a sensor type other than J, K or S is used, the terminal temperature must be measured on at least one input. Based on this value, the user must perform a terminal temperature compensation.

Terminal Temperature (Cold Junction) Compensation

When using thermocouples, it is necessary to measure the temperature at the terminal connections of the TM7BAI4PLA in order to calculate an accurate absolute temperature at the measuring point of the thermocouple. The sensor used to measure the terminal temperature is integrated in the TM7ACTHA thermocouple connector.

NOTE: At least one terminal temperature sensor TM7ACTHA *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)* is required to determine the temperature measured by the connected thermocouples. Otherwise, a value of 7FFF hex is calculated for all the connected thermocouples.

The accuracy of the temperature measurement of the connected thermocouples is a function of the number of terminal temperature sensors connected to the block.

NOTE: If the J, K and S types are used, you must select the terminal temperature compensation.

The temperature measured at the external reference junction is stored in the I/O area of the TM7BAI4PLA block. The TM7BAI4PLA block calculates the thermocouple temperature internally from the measured voltage and the reference junction temperature value (per channel).

The table below provides examples for the possible configurations:

TM7ACTHA connected on the input connector	**Description**
1	The terminal temperature compensation for all 4 channels is performed using the temperature measured on connector 1.
1 and 3	The terminal temperature compensation for channels I0 and I1 is performed using the temperature measured on connector 1. The terminal temperature compensation for channels I2 and I3 is performed using the temperature measured on connector 3.
1, 2, 3 and 4	The terminal temperature compensation is performed using the temperature measured on the respective connector.
NOTE: For the correspondence between the connectors and channels, refer to Connector and Channel Assignments *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.	

Sensor Type and Channel Deactivation

The block is designed for various sensor types. The sensor type must be specified because of the different adjustment values. To save time, individual channels can be switched off.

The table below shows the code corresponding sensor types:

Sensor Types	Digital value	Temperature °C (°F)	Resolution
Sensor type J	-2200...12000	-220...1200 (-364...2192)	0.1°C (0.18°F)
Sensor type K	-2700...13720	-270...1372 (-454...2501)	0.1°C (0.18°F)
Sensor type S	-500...17680	-50...1768 (-58...3214)	0.1°C (0.18°F)
Measurement range of ±32.767 mV	-32768...32767	-	1 µV
Measurement range of ±65.534 mV	-32768...32767	-	2 µV

Input Status Register

The input status register describes the status of each input channel:

Bit	Description	Bits value
0-1	Channel 00 status	00: No error detected 01: Below lower limit value 10: Above upper limit value 11: Broken wire detected
2-3	Channel 01 status	
4-5	Channel 02 status	
6-7	Channel 03 status	

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristics	Value (µs)	
	1 input	n inputs
Minimum cycle time	200	
Minimum input update time	Equal to the filter time	(n+1) x (3 x filter time + 2 ms)

TM7BAO4VLA

Introduction

The TM7BAO4VLA expansion block is a 4 channel analog output block with 10 Vdc outputs.

For further information, refer to TM7BAO4VLA Block 4AO ±10V *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter	Parameter	Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the module. TM7BAO4VLA supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
Channel 00*	**Fall back Mode**	Min. value Max. value Set to 0 Last current state Predefined value	Min. value	Sets the fall back mode in case of communication loss on the field bus. The fall back mode indicates the fall back value adopted by outputs in the event of an internal error detection or a communication loss. Fall backs are not activated in case of communication loss on the TM5/TM7 bus. In this case the outputs assume the value of 0.
	Fall back value	-32768...32767	Depend of the fall back mode	Display or set the fall back value.

* The same channel 00 parameters are also available for channel 01...03.

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristics	Value (µs)
Minimum cycle time	250
Minimum input update time	400

TM7BAO4CLA

Introduction

The TM7BAO4CLA expansion block is a 4 channel analog output block with 20 mA inputs.

For further information, refer to TM7BAO4CLA Block 4AO 0-20 mA *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter	Parameter	Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the module. TM7BAO4CLA supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
Channel 00*	**Fall back Mode**	Max. value Set to 0 Last current state Predefined value	Set to 0	Sets the fall back mode in case of communication loss on the field bus. The fall back mode indicates the fall back value adopted by outputs in the event of an internal error detection or a communication loss. Fall backs are not activated in case of communication loss on the TM5/TM7 bus. In this case the outputs assume the value of 0.
	Fall back value	0...32767	Depend of the fall back mode	Display or set the fall back value.

* The same channel 00 parameters are also available for channel 01...03.

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristics	Value (µs)
Minimum cycle time	250
Minimum input update time	400

TM7BAM4VLA

Introduction

The TM7BAM4VLA expansion block is a 2 analog input block with 10 Vdc inputs and 2 analog output block with 10 Vdc outputs.

For further information, refer to TM7BAM4VLA Block 2AI/2AO ±10V *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the module. TM7BAM4VLA supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
	Input filter	Off level 2 level 4 level 8 level 16 level 32 level 64 level 128	Off	Definition of the filter level *(see page 53)*.
	Input limitation	Off I16383 I8191 I4095 I2047 I1023 I511 I255	Off	Definition of the input limitation *(see page 54)*. **NOTE:** Parameter only available if an input filter is selected.
	Input status	On/Off	Off	Enables (On) / Disables (Off) the reading of the input status *(see page 56)*.

Group/Parameter		Value	Default Value	Description
Input 00*	**Channel on/off**	On/Off	On[1]	Enables (On) / Disables (Off) the channel. **Off**: The other parameters assume their default value and the channel is deactivated. **NOTE:** Disable any unused channels to avoid unnecessary communication on the bus.
	Configuration			
	Channel type	-10...+10 V	-10...+10 V	Only one channel type.
	Delta interrupt mode	Checked Unchecked	Checked	Activates the delta interrupt mode. Delta interrupt mode defines the delta value which may trigger a PDO send.
	Delta interrupt value	0...10000	100	Sets the delta interrupt value. **NOTE:** Sets the highest value compatible with your application to avoid unnecessary communication on the bus.
	Lower limit mode	Checked Unchecked	Unchecked	Activates the lower limit interrupt mode. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Lower limit value	-32768...32767	-32768	Sets the lower limit value. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Upper limit mode	Checked Unchecked	Unchecked	Activates the upper limit interrupt mode. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.
	Upper limit value	-32768...32767	32767	Sets the upper limit value. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.
Output 00*	**Fall back Mode**	Min. value Max. value Set to 0 Last current state Predefined value	Min. value	Sets the fall back mode in case of communication loss on the field bus. The fall back mode indicates the fall back value adopted by outputs in the event of an internal error detection or a communication loss. Fall backs are not activated in case of communication loss on the TM5/TM7 bus. In this case the outputs assume the value of 0.
	Fall back value	-32768...32767	Depend of the fall back mode	Display or set the fall back value.

[1] Channel 00 default value is ON. Channel 01 to 03 default value is OFF.

* The same channel 00 parameters are also available for channel 01.

Filter Level

The input value is evaluated according to the filter level. An input limitation can then be applied using this evaluation.

Formula for the evaluation of the input value:

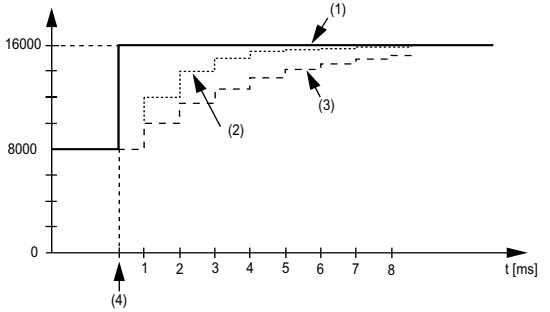
$$Value_{new} = Value_{old} - \frac{Value_{old}}{Filterlevel} + \frac{Inputvalue}{Filterlevel}$$

The following examples show the function of the input limitation based on an input jump and a disturbance.

Example 1: The input value makes a jump from 8000 to 16000. The diagram displays the evaluated value with the following settings:

Input limitation = 0

Filter level = 2 or 4

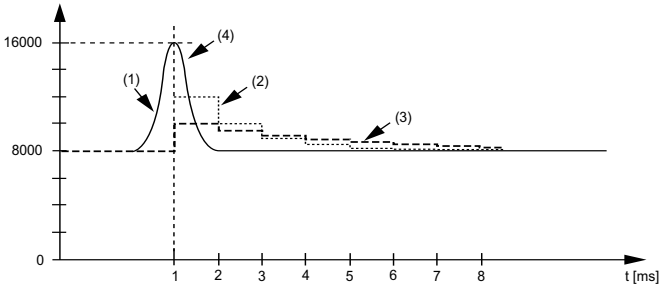


1 Input value
2 Evaluated value: Filter level 2
3 Evaluated value: Filter level 4
4 Input jump

Example 2: A disturbance is imposed on the input value. The diagram shows the evaluated value with the following settings:

Input limitation = 0

Filter level = 2 or 4



1 Input value
2 Evaluated value: Filter level 2
3 Evaluated value: Filter level 4
4 Disturbance (Spike)

Input Limitation

Input limitation can only take place when a filter is used. Input limitation is executed before filtering takes place.

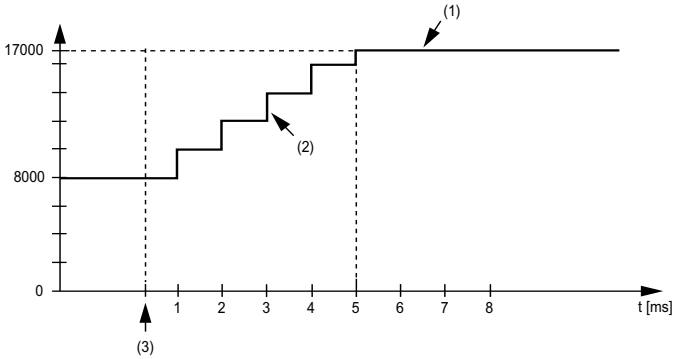
The amount of the change in the input value is checked to make sure the specified limits are not exceeded. If the values are exceeded, the adjusted input value is equal to the old value ± the limit value.

The input limitation is well suited for suppressing disturbances (spikes). The following examples show the function of the input limitation based on an input jump and a disturbance.

Example 1: The input value makes a jump from 8000 to 17000. The diagram displays the adjusted input value for the following settings:

Input limitation = 2047

Filter level = 2

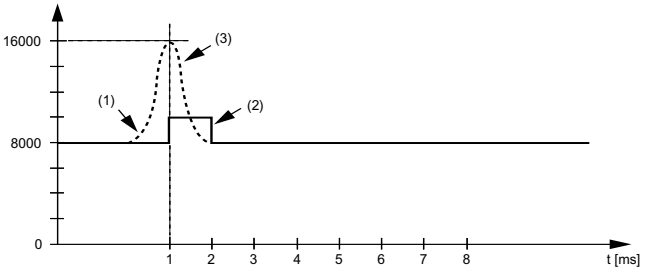


1 Input value
2 Internal adjusted input value before filter
3 Input jump

Example 2: A disturbance is imposed on the input value. The diagram shows the adjusted input value with the following settings:

Input limitation = 2047

Filter level = 2



1 Input value
2 Internal adjusted input value before filter
3 Disturbance (Spike)

Input Status Register

The input status register describes the status of each input channel:

Bit	Description	Bits value
0-1	Channel 00 status	00: No error detected 01: Below lower limit value 10: Above upper limit value 11: Broken wire detected
2-3	Channel 01 status	
4-5	Not used	
6-7	Not used	

Out of Range Values

Out of Range Values	
Below lower limit	-32768
Above upper limit	32767

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristics	Value (µs)	
	Without filter	With filter
Minimum cycle time	250	500
Minimum input update time	400	1000
Minimum output update time	400	-

TM7BAM4CLA

Introduction

The TM7BAM4CLA expansion block is a 2 analog input block with 20 mA inputs and 2 analog output block with 20 mA outputs.

For further information, refer to TM7BAM4CLA Block 2AI/2AO 20 mA *(see Modicon TM7, Analog I/O Blocks, Hardware Guide)*.

I/O Configuration Tab

The table below describes the blocks parameters configuration:

Group/Parameter		Value	Default Value	Description
Properties	**Function model**	Default	Default	Sets the operating mode supported by the module. TM7BAM4CLA supports only one mode.
General	**Module address**	2...63	2	The address is automatically set when adding the blocks. The address value depends on the order of adding the block. TM7 Blocks do not support the ability to change the address.
	Input filter	Off level 2 level 4 level 8 level 16 level 32 level 64 level 128	Off	Definition of the filter level *(see page 59)*.
	Input limitation	Off I16383 I8191 I4095 I2047 I1023 I511 I255	Off	Definition of the input limitation *(see page 60)*. **NOTE:** Parameter only available if an input filter is selected.
	Input status	On/Off	Off	Enables (On) / Disables (Off) the reading of the input status *(see page 62)*

Group/Parameter		Value	Default Value	Description
Input 00*	**Channel on/off**	On/Off	On[1]	Enables (On) / Disables (Off) the channel. **Off**: The other parameters assume their default value and the channel is deactivated. **NOTE:** Disable any unused channels to avoid unnecessary communication on the bus.
	Configuration			
	Channel type	0...20 mA	0...20 mA	Select the channel type.
	Delta interrupt mode	Checked Unchecked	Checked	Activates the delta interrupt mode. Delta interrupt mode defines the delta value which may trigger a PDO send.
	Delta interrupt value	0...10000	100	Sets the delta interrupt value. **NOTE:** Sets the highest value compatible with your application to avoid unnecessary communication on the bus.
	Lower limit mode	Checked Unchecked	Unchecked	Activates the lower limit interrupt mode. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Lower limit value	0...32767	0	Sets the lower limit value. Lower limit interrupt mode defines the lower limit which will trigger communication on the bus.
	Upper limit mode	Checked Unchecked	Unchecked	Activates the upper limit interrupt mode. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.
	Upper limit value	0...32767	32767	Sets the upper limit value. Upper limit interrupt mode defines the upper limit which will trigger communication on the bus.
Output 00*	**Fall back Mode**	Set to 0 Max. value Last current state Predefined value	Set to 0	Set the fall back mode in case of communication loss on the field bus. The fall back mode indicates the fall back value adopted by outputs in the event of an internal error detection or a communication loss. Fall backs are not activated in case of communication loss on the TM5/TM7 bus. In this case the outputs assume the value of 0.
	Fall back value	0...32767	Depend of the fall back mode	Display or set the fall back value.

[1] Channel 00 default value is ON. Channel 01 to 03 default value is OFF.

* The same channel 00 parameters are also available for channel 01.

Filter Level

The input value is evaluated according to the filter level. An input limitation can then be applied using this evaluation.

Formula for the evaluation of the input value:

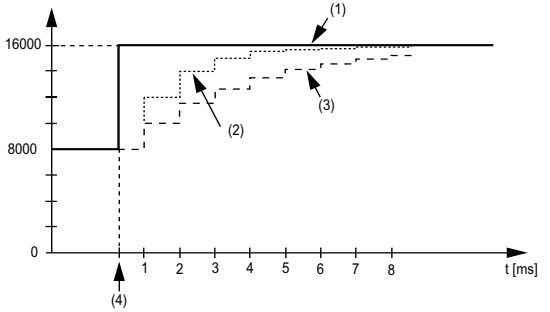
$$Value_{new} = Value_{old} - \frac{Value_{old}}{Filterlevel} + \frac{Inputvalue}{Filterlevel}$$

The following examples show the function of the input limitation based on an input jump and a disturbance.

Example 1: The input value makes a jump from 8000 to 16000. The diagram displays the evaluated value with the following settings:

Input limitation = 0

Filter level = 2 or 4

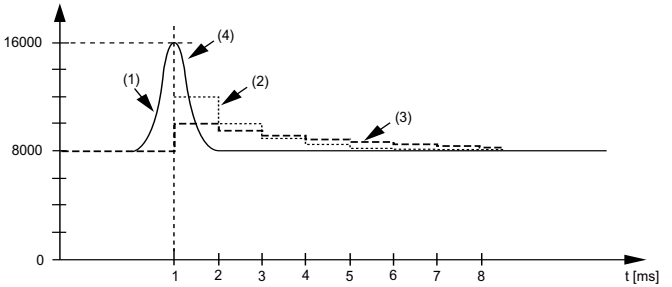


1 Input value
2 Evaluated value: Filter level 2
3 Evaluated value: Filter level 4
4 Input jump

Example 2: A disturbance is imposed on the input value. The diagram shows the evaluated value with the following settings:

Input limitation = 0

Filter level = 2 or 4



1 Input value
2 Evaluated value: Filter level 2
3 Evaluated value: Filter level 4
4 Disturbance (Spike)

Input Limitation

Input limitation can only take place when a filter is used. Input limitation is executed before filtering takes place.

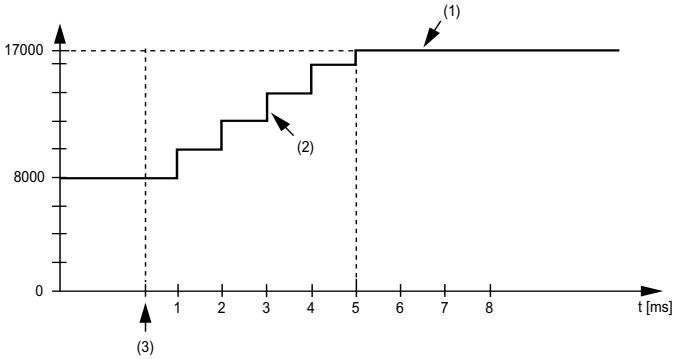
The amount of the change in the input value is checked to make sure the specified limits are not exceeded. If the values are exceeded, the adjusted input value is equal to the old value ± the limit value.

The input limitation is well suited for suppressing disturbances (spikes). The following examples show the function of the input limitation based on an input jump and a disturbance.

Example 1: The input value makes a jump from 8000 to 17000. The diagram displays the adjusted input value for the following settings:

Input limitation = 2047

Filter level = 2

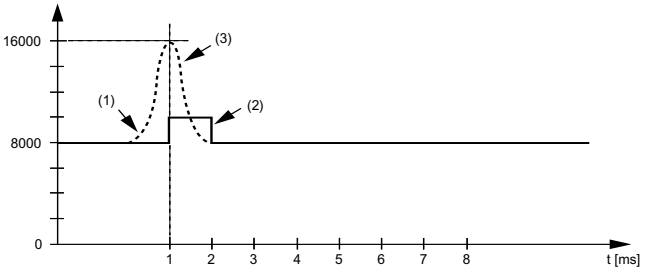


1 Input value
2 Internal adjusted input value before filter
3 Input jump

Example 2: A disturbance is imposed on the input value. The diagram shows the adjusted input value with the following settings:

Input limitation = 2047

Filter level = 2



1 Input value
2 Internal adjusted input value before filter
3 Disturbance (Spike)

Input Status Register

The input status register describes the status of each input channel:

Bit	Description	Bits value
0-1	Channel 00 status	00: No error detected 10: Above upper limit value
2-3	Channel 01 status	
4-5	Not used	
6-7	Not used	

Out of Range Values

Out of Range Values	
Below lower limit	0
Above upper limit	32767

Cycle Time and I/O Update Time

The table below gives the block characteristics allowing the Bus Cycle Time configuration:

Characteristics	Value (µs)	
	Without filter	With filter
Minimum cycle time	250	500
Minimum input update time	400	1000
Minimum output update time	400	-

TM7 Power Distribution Block (PDB)

5

TM7SPS1A

Introduction

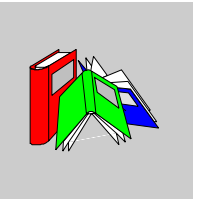
The TM7SPS1A expansion block is a 24 Vdc power distribution block for internal I/O supply.

For further information, refer to TM7SPS1A TM7 Power Distribution Block *(see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide)*.

I/O Configuration

There is no parameter configuration for this block.

Glossary



0-9

%I

According to the IEC standard, %I represents an input bit (for example a language object of type digital IN).

%IW

According to the IEC standard, %IW represents an input word register (for example a language object of type analog IN).

%MW

According to the IEC standard, %MW represents a memory word register (for example a language object of type memory word).

%Q

According to the IEC standard, %Q represents an output bit (for example a language object of type digital OUT).

%QW

According to the IEC standard, %QW represents an output word register (for example a language object of type analog OUT).

1-phase counter

A *1-phase counter* uses 1 hardware input as counter input. It usually counts up or counts down when there is pulse signal in the input.

2-phase counter

A *2-phase counter* uses the phase difference between 2 input counter signals to count up or count down.

A

ADC

analog/digital converter

AFB

application function block

AMOA

An *address of modbus of option application board* installed on the drive.

analog input

An *analog input* module contains circuits that convert an analog DC input signal to a digital value that can be manipulated by the processor. By implication, the analog input is usually direct. That means a data table value directly reflects the analog signal value.

analog output

An *analog output* module contains circuits that transmit an analog DC signal proportional to a digital value input to the module from the processor. By implication, these analog outputs are usually direct. That means a data table value directly controls the analog signal value.

application source

The *application source* file can be uploaded to the PC to reopen a SoMachine project. This source file can support a full SoMachine project (for example, one that includes HMI application).

ARP

The *address resolution protocol* is the IP network layer protocol for Ethernet that maps an IP address to a MAC (hardware) address.

ARRAY

An `ARRAY` is a table containing elements of a single type. The syntax is as follows: `ARRAY [<limits>] OF <Type>`

Example 1: `ARRAY [1..2] OF BOOL` is a 1-dimensional table with 2 elements of type `BOOL`.

Example 2: `ARRAY [1..10, 1..20] OF INT` is a 2-dimensional table with 10x20 elements of type `INT`.

ARW

anti-reset windup

ASCII

The *american standard code for information interchange* is a communication protocol for representing alphanumeric characters (letters, numbers, and certain graphic and control characters).

assigned variable

A variable is "assigned" if its location in controller memory can be known. For example, the `Water_pressure` variable is said to be assigned through its association with memory location `%MW102.Water_pressure`.

ATC

analog tension control

ATV

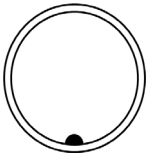
ATV is the model prefix for Altivar drives. (For example, “ATV312” refers to the Altivar 312 variable speed drive.)

AWG

The *american wire gauge* standard specifies wire gauges in North America.

A coded

These connectors have one raised key on the male connector and one mating slot on the female connector. This is the standard coding used for sensors and distribution box applications:



B

BCD

The *binary coded decimal format* represents decimal numbers between 0 and 9 with a set of 4 bits (a nybble/nibble, also titled as Halfbyte). In this format, the 4 bits used to encode decimal numbers have an unused range of combinations. For example, the number 2,450 is encoded as `0010 0100 0101 0000`

BOOL

A *Boolean* type is the basic data type in computing. A `BOOL` variable can have one of these values: 0 (`FALSE`), 1 (`TRUE`). A bit that is extracted from a word is of type `BOOL`, for example: `%MW10.4` is a fifth bit a memory word number 10.

Boot application

Files that contain machine dependent parameters:
- machine name
- device name or IP address
- Modbus Serial Line address
- Routing table

BOOTP

The *bootstrap protocol* is a UDP network protocol that can be used by a network client to automatically obtain an IP address (and possibly other data) from a server. The client identifies itself to the server using the client MAC address. The server—which maintains a pre-configured table of client device MAC addresses and associated IP addresses—sends the client its pre-configured IP address. BOOTP was originally used as a method that enabled diskless hosts to be remotely booted over a network. The BOOTP process assigns an infinite lease of an IP address. The BOOTP service utilizes UDP ports 67 and 68.

bps

bit per second as a definition of transmission rate, also given in conjunction with multiplicator kilo (kbps) and mega (mbps).

BSH

BSH is a Lexium servo motor from Schneider Electric.

bus base

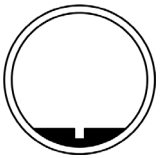
A *bus base* is a mounting device that is designed to seat an electronic module on a DIN rail and connect it to the TM5 bus for M258 and LMC058 controllers. Each base bus extends the TM5 data and to the power buses and the 24 Vdc I/O power segment. The electronic modules are added to the TM5 system through their insertion on the base bus. The base bus also supplies the articulation point for the terminal blocks.

BYTE

When 8 bits are grouped together, they are called a `BYTE`. You can enter a `BYTE` either in binary mode or in base 8. The `BYTE` type is encoded in an 8-bit format that ranges from `16#00` to `16#FF` (in hexadecimal format).

B coded

These connectors have one raised key on the female connector and one mating slot on the male connector. These connectors (also called reverse keyed) are used for field bus applications:



C

calibration

Graduates a piece of measuring apparatus.

CAN

The *controller area network* protocol (ISO 11898) for serial bus networks is designed for the interconnection of smart devices (from multiple manufacturers) in smart systems for real-time industrial applications. Originally developed for use in automobiles, CAN is now used in a variety of industrial automation control environments.

CANmotion

CANmotion is a CANopen-based motion bus with an additional mechanism that provides synchronization between the motion controller and the drives.

CANopen

CANopen is an open industry-standard communication protocol and device profile specification.

CFC

The *continuous function chart* (an extension of the IEC61131-3 standard) is a graphical programming language that works like a flowchart. By adding simple logic blocks (AND, OR, etc.), each function or function block in the program is represented in this graphical format. For each block, the inputs are on the left and the outputs on the right. Block outputs can be linked to inputs of other blocks in order to create complex expressions.

CiA

CAN in automation is a non-profit group of manufacturers and users dedicated to developing and supporting CAN-based higher layer protocols.

CIP

When the *common industrial protocol* is implemented in a network application layer, it can communicate seamlessly with other CIP-based networks without regard to the protocol. For example, the implementation of CIP in the application layer of an Ethernet TCP/IP network creates an EtherNet/IP environment. Similarly, CIP in the application layer of a CAN network creates a DeviceNet environment. In that case, devices on the EtherNet/IP network can communicate with devices on the DeviceNet network through CIP bridges or routers.

CMU

The *current measurement unit* is used to convert the relative current value (%) provided by TeSys into a real ISO value (A).

configuration

The *configuration* includes the arrangement and interconnection of hardware components within a system and the hardware and software selections that determine the operating characteristics of the system.

controller

A *controller* (or “programmable logic controller,” or “programmable controller”) is used to automate industrial processes.

controller status output

The *controller status output* is a special function used in circuits that are external to the controller that control the power supply to the output devices or the controller power supply.

CPDM

controller power distribution module

CRC

A network message’s *cyclic redundancy check* field contains a small number of bits that produce a checksum. The message is calculated by the transmitter according to the message’s content. Receiving nodes then recalculate the field. Any discrepancy in the two CRC fields indicates that the transmitted message and the received message are different.

crosstalk

The crosstalk is an undesired signal caused by a capacitive, inductive or conductive coupling between two channels.

CSA

The *canadian standards association* defines and maintains standards for industrial electronic equipment in hazardous environments.

CTS

Clear to send is a data transmission signal and acknowledges the RDS signal from the transmitting station.

cyclic task

The cyclic scan time has a fixed duration (interval) specified by the user. If the current scan time is shorter than the cyclic scan time, the controller waits until the cyclic scan time has elapsed before starting a new scan.

D

data log

The controller logs events relative to the user application in a data log.

DCE

Data communications equipment describes devices (often modems) that start, stop, and sustain network sessions.

Derating

Derating describes a reduction in an operating specification. For devices in general it is usually a specified reduction in nominal power to facilitate operation at increased ambient conditions like higher temperatures or higher altitudes.

DHCP

The *dynamic host configuration protocol* is an advanced extension of BOOTP. DHCP is a more advanced, but both DHCP and BOOTP are common. (DHCP can handle BOOTP client requests.)

digital I/O

A *digital input* or *output* has an individual circuit connection at the electronic module that corresponds directly to a data table bit that holds the value of the signal at that I/O circuit. It gives the control logic digital access to I/O values.

DIN

Deutsches Institut für Normung is a German institution that sets engineering and dimensional standards.

DINT

A *double integer* type is encoded in a 32-bit format.

DNS

The *domain name system* is the naming system for computers and devices connected to a LAN or the Internet.

drop cable

A *drop cable* is the unterminated derivation cord used to connect a TAP to a device.

DSR

Data set ready is a data transmission signal.

DTM

With *device type managers* representing the field device in SoMachine, direct communications are possible to every single field device via SoMachine, the controller and the field bus, thus avoiding the need for individual cable connections.

DWORD

A *double word* type is encoded in a 32-bit format.

E

EDS

Electronic data sheet contains for example the properties of a device e.g. parameters and settings of a drive.

EEPROM

Electrically erasable programmable read-only memory is a type of non-volatile memory used to store data that must be saved when power is removed.

EIA

The *electronic industries alliance* is the trade organization for establishing electrical/electronic and data communication standards (including RS-232 and RS-485) in the United States.

EIA rack

An *electronic industries alliance rack* is a standardized (EIA 310-D, IEC 60297 and DIN 41494 SC48D) system for mounting various electronic modules in a stack or rack that is 19 inches (482.6 mm) wide.

electronic module

In a programmable controller system, most electronic modules directly interface to the sensors, actuators, and external devices of the machine/process. This electronic module is the component that mounts in a bus base and provides electrical connections between the controller and the field devices. Electronic modules are offered in a variety of signal levels and capacities. (Some electronic modules are not I/O interfaces, including power distribution modules and transmitter/receiver modules.)

EN

EN identifies one of many European standards maintained by CEN (*European Committee for Standardization*), CENELEC (*European Committee for Electrotechnical Standardization*), or ETSI (*European Telecommunications Standards Institute*).

encoder

An *encoder* is a device for length or angular measurement (linear or rotary encoders).

Equipment

An *Equipment* is a part of the *Machine*.

ERC

eccentric roller conveyor

ESD

electrostatic discharge

Ethernet

Ethernet is a physical and data link layer technology for LANs, also known as IEE 802.3.

EtherNet/IP

The *ethernet industrial protocol* is an open communications protocol for manufacturing automation solutions in industrial systems. EtherNet/IP is in a family of networks that implements Common Industrial Protocol at its upper layers. The supporting organization (ODVA) specifies EtherNet/IP to accomplish global adaptability and media independence.

expansion bus

The *expansion bus* is an electronic communication bus between expansion modules and a CPU.

expansion I/O module

An *expansion input or output module* is either a digital or analog module that adds additional I/O to the base controller.

expert I/O

*Expert I/O*s are dedicated modules or channels for advanced features. These features are generally embedded in the module in order to not use the resources of the PLC Controller and to allow a fast response time, depending of the feature. Regarding the function, it could be considered as a “stand alone” module, because the function is independent of the Controller processing cycle, it just exchanges some information with the Controller CPU.

F

FAST I/O

*FAST I/O*s are specific I/Os with some electrical features (response time, for example) but the treatment of these channels is done by the Controller CPU.

FAST task

The *FAST task* is a periodic, high-priority task of a short duration that is run on a processor through its programming software. The task fast speed keeps it from interfering with the execution of lower priority master (MAST) tasks. A FAST task is useful when fast periodic changes in discrete inputs need to be monitored.

FB

A *function block* performs a specific automation function, such as speed control, interval control, or counting. A function block comprises configuration data and a set of operating parameters.

FBD

A *function block diagram* is a graphically oriented programming language, compliant with IEC 61131-3. It works with a list of networks whereby each network contains a graphical structure of boxes and connection lines which represents either a logical or arithmetic expression, the call of a function block, a jump, or a return instruction.

FDT

Field device tool for standardized communications between field devices and SoMachine.

FE

Functional ground is the point of a system or device that must be grounded to help prevent equipment damage.

FG

frequency generator

firmware

The *firmware* represents the operating system on a controller.

Flash memory

Flash memory is nonvolatile memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

FTP

File transfer protocol is a standard network protocol (built on a client-server architecture), to exchange and manipulate files over TCP/IP based networks.

function

A *function*:
- is a POU that returns 1 immediate result
- is directly called with its name (as opposed to through an instance)
- has no persistent state from one call to the next
- can be used as an operand in expressions

Examples: boolean (AND) operators, calculations, conversions (BYTE_TO_INT)

function block (FB)

See *FB*.

function block diagram (FBD)

See *FBD*.

FWD

forward

G

gross weight

Indication of the load weight on an instrument when no tare or predefining device has been used.

GVL

The *global variable list* manages global variables that are available in every application POU.

H

HE10

Rectangular connector for electrical signals with frequencies below 3MHz, complying with IEC60807-2.

HMI

A *human-machine interface* is an operator interface (usually graphical) for industrial equipment.

hot swapping

Hot swapping is the replacement of a component with a like component while the system remains operational. The replacement component begins to function automatically after it is installed.

HSC

high-speed counter

HVAC

Heating ventilation and air conditioning applications monitor and control indoor environments.

I

I/O

input/output

I/O scan

An *input/output scan* continuously polls I/O modules to collect data bits and status, error, and diagnostics information. This process monitors inputs and controls outputs.

I/O terminal

An *input/output terminal* on the front of an expansion I/O module connects input and output signals.

ICMP

The *internet control message protocol* reports errors and provides information related to datagram processing.

IEC

The *international electrotechnical commission* is a non-profit and non-governmental international standards organization that prepares and publishes international standards for all electrical, electronic, and related technologies.

IEC 61131-3

The IEC 61131-3 is an *international electrotechnical commission* standard for industrial automation equipment (like controllers). IEC 61131-3 deals with controller programming languages and defines 2 graphical and 2 textual programming language standards:

- **graphical:** ladder diagram, function block diagram
- **textual:** structured text, instruction list

IEEE

The *institute of electrical and electronics engineers* is a non-profit international standards and conformity assessment body for advances in all fields of electrotechnology.

IEEE 802.3

IEEE 802.3 is a collection of IEEE standards defining the physical layer, and the media access control (MAC) sublayer of the data link layer, of wired Ethernet.

IL

A program written in the *instruction list* language is composed of a series of instructions executed sequentially by the controller. Each instruction includes a line number, an instruction code, and an operand. (IL is IEC 61131-3 compliant.)

immediate addressing

The direct method of addressing memory objects, including physical inputs and outputs, used in programming instructions as operands and parameters by using their direct address (for example, `%Iwx` or `%QWx`).

The use of immediate addressing in your program may avoid the need to create symbols for these objects, but there are also disadvantages. For example, if you change the program configuration by adding or deleting devices or I/O modules or slices, the immediate addresses used as programming instruction operands and/or parameters are not updated and must be corrected manually, which may cause extensive program modifications and lead to incorrect programming instructions. (See *symbolic addressing*.)

input filter

An *input filter* is a special function that rejects input noises. It is useful for eliminating input noises and chatter in limit switches. All inputs provide a level of input filtering using the hardware. Additional filtering with software is also configurable through the programing or the configuration software.

input terminal

An *input terminal* on the front of an expansion I/O module connects input signals from input devices (such as sensors, push buttons, and limit switches). For some modules, input terminals accept both sink and source DC input signals.

instruction list language (IL)

Refer to IL.

INT

A single *integer* is encoded in 16 bits.

IP

The *internet protocol* is part of the TCP/IP protocol family that tracks the Internet addresses of devices, routes outgoing messages, and recognizes incoming messages.

IP 20

Ingress protection rating according to IEC 60529. IP20 modules are protected against ingress and contact of objects larger than 12.5 mm. The module is not protected against harmful ingress of water.

IP 67

Ingress protection rating according to IEC 60529. IP67 modules are completely protected against ingress of dust and contact. Ingress of water in harmful quantity is not possible when the enclosure is immersed in water up to 1m.

IP 67

Ingress protection rating according to IEC 60529. IP67 modules are completely protected against ingress of dust and contact. Ingress of water in harmful quantity is not possible when the enclosure is immersed in water up to 1 m (3.28 ft.).

K

Kd

derivative gain

Ki

integral gain

Kp

proportional gain

L

Ladder Diagram language

See *LD*.

LAN

A *local area network* local area network is a short-distance communications network that is implemented in a home, office, or institutional environment.

latching input

A *latching input* module interfaces with devices that transmit messages in short pulses. Incoming pulses are captured and recorded for later examination by the application.

LCD

liquid crystal display

LD

A program in the *ladder diagram* language includes a graphical representation of instructions of a controller program with symbols for contacts, coils, and blocks in a series of rungs executed sequentially by a controller. IEC 61131-3 compliant.

LED

A *light emitting diode* is an indicator that lights up when electricity passes through it.

LINT

Long integer is a 64-bit variable (4 times INT or two times DINT).

LMC

lexium motion control

load receiver device

Part of instrument that will receive the load.

located variable

A *located variable* has an address. (See *unlocated variable*.)

LRC

longitudinal redundancy checking

LREAL

Long real is a 64-bit variable.

LSB

The *least significant bit* (or *least significant byte*) is the part of a number, address, or field that is written as the right-most single value in conventional hexadecimal or binary notation.

LWORD

A *long word* type is encoded in a 64-bit format.

M

MAC address

The *media access control address* is a unique 48-bit number associated with a specific piece of hardware. The MAC address is programmed into each network card or device when it is manufactured.

Machine

A *Machine* consists of several *functions* and/or *equipments* which build the machine.

Magelis

Magelis is the commercial name for Schneider Electric's range of HMI terminals.

MAST

A master (MAST) task is a processor task that is run through its programming software. The MAST task has two sections:

- **IN:** Inputs are copied to the IN section before execution of the MAST task.
- **OUT:** Outputs are copied to the OUT section after execution of the MAST task.

master/slave

The single direction of control in a network that implements the master/slave model is always from a master device or process to one or more slave devices.

maximum weight

Maximum measuring capacity, not taking account of the additive capacity of the tare.

MIB

The *management information base* is an object database that is monitored by a network management system like SNMP. SNMP monitors devices that are defined by their MIBs. Schneider has obtained a private MIB, groupeschneider (3833).

minimum I/O update time

The *minimum I/O update time* is the minimum time it takes for the bus cycle to shut down to force an I/O update at each cycle.

minimum weight

Load value under which measuring results can be marred by a relative detected error that is too large.

Modbus

The Modbus communication protocol allows communications between many devices connected to the same network.

Modbus SL

Modbus serial line

MSB

The *most significant bit* (or *most significant byte*) is the part of a number, address, or field that is written as the left-most single value in conventional hexadecimal or binary notation.

N

NAK

negative acknowledge

NC

A *normally closed* contact is a contact pair that is closed when the actuator is de-energized (no power is applied) and open when the actuator is energized (power is applied).

NEC

The *national electric code* dictates the safe installation of electrical wiring and equipment.

NEMA

The *national electrical manufacturers association* publishes standards for the performance of various classes of electrical enclosures. The NEMA standards cover corrosion resistance, ability to protect from rain and submersion, etc. For IEC member countries, the IEC 60529 standard classifies the ingress protection rating for enclosures.

net weight (net)

Weight indication of a load placed on an instrument after a tare device has been used.

Net weight = Gross weight - Tare weight

network

A network includes interconnected devices that share a common data path and protocol for communications.

Nibble

A *Nibble* is a half-byte (representing 4 bits of a byte).

NMT

Network management protocols provide services for network initialization, error control, and device status control.

NMT state machine

A *network management state machine* defines the communication behavior of any CANopen device. The CANopen NMT state machine consists of an initialization state, a pre-operational state, an Operational state, and a stopped state. After power-on or reset, the device enters the initialization state. After the device initialization is finished, the device automatically enters the pre-operational state and announces the state transition by sending the boot-up message. In this manner, the device indicates that it is ready to work. A device that stays in pre-operational state may start to transmit SYNC-, Time Stamp-, or Heartbeat message. In this state, the device can not communicate through a PDO; it must do so with an SDO. In the operational state, the device can use all supported communication objects.

NO

A *normally open* contact is a contact pair that is open when the actuator is de-energized (no power is applied) and closed when the actuator is energized (power is applied).

node

A *node* is an addressable device on a communication network.

O

ODVA

The *open deviceNet vendors association* supports the family of network technologies that are built on CIP (EtherNet/IP, DeviceNet, and CompoNet).

OS

Operating system. Can be used for Firmware that can be uploaded/downloaded by the user.

OSI

The *open system interconnection* reference model is a 7-layer model that describes network protocol communications. Each abstract layer receives services from the layer below it and provides services to the layer above.

OTB

Optimized terminal block, used in the context of Advantys I/O distributed module

output terminal

An *output terminal* connects output signals to output devices (such as electromechanical relays and solenoid valves).

P

pallet

A *pallet* is a portable platform, which is used for storing or moving goods.

PCI

A *peripheral component interconnect* is an industry-standard bus for attaching peripherals.

PDM

A *power distribution module* distributes either AC or DC field power to a cluster of I/O modules.

PDO

A *process data object* is transmitted as an unconfirmed broadcast message or sent from a producer device to a consumer device in a CAN-based network. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

PDU

protocol data unit

PE

Protective ground is a return line across the bus for fault currents generated at a sensor or actuator device in the control system.

periodic execution

The master task is executed either cyclically or periodically. In periodic mode, you determine a specific time (period) in which the master task must be executed. If it is executed under this time, a waiting time is generated before the next cycle. If it is executed over this time, a control system indicates the overrun. If the overrun is too high, the controller is stopped.

persistent data

Value of persistent data that will be used at next application change or cold start. Only get re-initialized at a reboot of the controller or reset origin. Especially they maintain their values after a download.

PI

proportional integral

PID

proportional, integral and derivative control

PLC

The *programmable logic controller* is the “brain” of an industrial manufacturing process. It automates a process, used instead of relay control systems. PLCs are computers suited to survive the harsh conditions of the industrial environment.

PLCopen

The PLCopen standard brings efficiency, flexibility, and manufacturer independence to the automation and control industry through the standardization of tools, libraries, and modular approaches to software programming.

PLI

pulse latch input

post-configuration

Post-configuration files contain machine-independent parameters, including:

- machine name
- device name or IP address
- Modbus serial line address
- routing table

POU

A *program organization unit* includes a variable declaration in source code and the corresponding instruction set. POUs facilitate the modular reuse of software programs, functions, and function blocks. Once declared, POUs are available to one another. SoMachine programming requires the utilization of POUs.

POU FB

Program organization unit function block types are user programs that can be defined by the user in the ST, IL, LD, or FBD languages. You can use POU FB types in an application to:

- simplify the design and entry of the program
- make the program easier to read
- simplify debugging
- reduce the amount of generated code

power supply terminals

The power supply is connected to these terminals to provide power to the controller.

Profibus DP

Profibus Decentralized Peripheral

An open bus system that uses an electrical network based on a shielded 2-wire line or an optical network based on a fiber-optic cable. DP transmission allows for high-speed, cyclic exchange of data between the controller CPU and the distributed I/O devices.

protocol

A *protocol* is a convention or standard that controls or enables the connection, communication, and data transfer between two computing endpoints.

Pt100/Pt1000

Platinum resistance thermometer are characterized by their nominal resistance R0 at a temperature of 0° C.

- Pt100 (R0 = 100 Ohm)
- Pt1000 (R0 = 1 kOhm)

PTO

Pulse train outputs are used to control for instance stepper motors in open loop.

PWM

Pulse width modulation is used for regulation processes (e.g. actuators for temperature control) where a pulse signal is modulated in its length. For these kind of signals, transistor outputs are used.

R

RAM

random access memory

REAL

Real is a numeric data type. The REAL type is encoded in a 32-bit format.

real-time clock (RTC)

See RTC

reflex output

In a counting mode, the high speed counter current value is measured against its configured thresholds to determine the state of these dedicated outputs.

retained data

A *retained data* value is used in the next power-on or warm start. The value is retained even after an uncontrolled shutdown of the controller or a normal switch-off of the controller.

RFID

Radio-frequency identification is an automatic identification method that relies on the storage and remote retrieval of data using RFID tags or transponders.

RJ-45

This *registered jack* is a modular connector that is commonly implemented in communication networks.

RPDO

A *receive PDO* sends data to a device in a CAN-based network.

RPM

revolutions per minute

RPS

revolutions per second

RS-232

RS-232 (also known as EIA RS-232C or V.24) is a standard type of serial communication bus, based on three wires.

RS-485

RS-485 (also known as EIA RS-485) is a standard type of serial communication bus, based on two wires.

RTC

The *real-time clock* option keeps the time for a limited amount of time even when the controller is not powered.

RTS

Request to send is a data transmission signal and will be acknowledged by the CTS signal from the destination node.

RTU

A *remote terminal unit* is a device that interfaces with objects in the physical world to a distributed control system or SCADA system by transmitting telemetry data to the system and/or altering the state of connected objects based on control messages received from the system.

RxD

receiving data (data transmission signal)

S

SCADA

A *supervisory control and data acquisition* system monitors, manages, and controls industrial applications or processes.

scale division

Value in mass units, expressing the difference between two consecutive indications for one numerical indication.

scan

A controller scanning program performs 3 basic functions: [1] It reads inputs and places these values in memory; [2] it executes the application program 1 instruction at a time and stores results in memory; [3] It uses the results to update outputs.

SDO

A *service data object* message is used by the field bus master to access (read/write) the object directories of network nodes in CAN-based networks. SDO types include service SDOs (SSDOs) and client SDOs (CSDOs).

SEL-V

A system that follows IEC 61140 guidelines for *safety extra low voltage* is protected in such a way that voltage between any 2 accessible parts (or between 1 accessible part and the PE terminal for Class 1 equipment) does not exceed a specified value under normal conditions or under single-fault conditions.

Sequential Function Chart

See *SFC*.

SERCOS

The *SErial Realtime COmmunications System* is a digital control bus that interconnects:

- motion controls,
- drives,

- I/Os,
- sensors and actuators, for numerically controlled machines and systems.

It is a standardized and open controller-to-intelligent digital device interface, designed for high-speed serial communication of standardized closed-loop real-time data.

SERCOS III

Industrial Ethernet based on the SERCOS implementation.

SFC

A program written in the *sequential function chart* language can be used for processes that can be split into steps. SFC is composed of steps with associated actions, transitions with associated logic condition, and directed links between steps and transitions. (The SFC standard is defined in IEC 848. It is IEC 61131-3 compliant.)

sink input

A *sink input* is a wiring arrangement in which the device provides current to the input electronic module. A sink input is referenced to 0 Vdc.

SINT

Signed integer is a 16-bit value.

SL

serial line

SMS

The *short message service* is a standard communication service for telephones (or other devices) that send short text messages over the mobile communications system.

SNMP

The *simple network management protocol* can control a network remotely by polling the devices for their status, performing security tests, and viewing information relating to data transmission. It can also be used to manage software and databases remotely. The protocol also permits active management tasks, such as modifying and applying a new configuration

source output

A *source output* is a wiring arrangement in which the output electronic module provides current to the device. A source output is referenced to +24 Vdc.

SSI

Serial synchronous interface is a common interface for relative and absolute measurement systems like encoders.

ST

See *structured text*.

STN

Scan Twisted Nematic (also known as passive matrix)

STRING

A `STRING` variable is a series of ASCII characters.

Structured Text

A program written in the *structured text* (ST) language includes complex statements and nested instructions (such as iteration loops, conditional executions, or functions). ST is compliant with IEC 61131-3.

symbol

A *symbol* is a string of a maximum of 32 alphanumeric characters, of which the first character is alphabetic. It allows you to personalize a controller object to facilitate the maintainability of the application.

symbolic addressing

The indirect method of addressing memory objects, including physical inputs and outputs, used in programming instructions as operands and parameters by first defining symbols for them using these symbols in association with the programming instructions.

In contrast to immediate addressing, this is the recommended method because if the program configuration changes, symbols are automatically updated with their new immediate address associations, whereas any immediate addresses used as operands or parameters are not. (See *immediate addressing*.)

system time

An internal clock provides a device with the system time.

system variable

A system variable structure provides controller data and diagnostic information and allows sending commands to the controller.

T

TAP

A *terminal access point* is a junction box connected to the trunk cable that allows you to plug in drop cables.

tare

Load placed on the load receiver along with the product to be weighed.

tare device

Device allowing the instrument indication to be moved to zero when a load is positioned on the load receiver:

tare predefining device

Device allowing a predefined tare value to be subtracted from a gross weight value and indicating the result of the calculation. The load range is consequently reduced.

Tare Value

Weight value of a load, determined by a tare full-bridge strain gauge electronic module.

taring

Action allowing the instrument indication to be moved to zero when a load is positioned on the load receiver.

task

A group of sections and subroutines, executed cyclically or periodically for the MAST task, or periodically for the FAST task.

A task possesses a level of priority and is linked to inputs and outputs of the controller. These I/O are refreshed in consequence.

A controller can have several tasks.

TCP

A *transmission control protocol* is a connection-based transport layer protocol that provides a reliable simultaneous bi-directional transmission of data. TCP is part of the TCP/IP protocol suite.

terminal block

The *terminal block* is the component that mounts in an electronic module and provides electrical connections between the controller and the field devices.

TFT

thin film transmission (also known as active matrix)

threshold output

Threshold outputs are controlled directly by the HSC according to the settings established during configuration.

TP

A *touch probe* is a position capture that is triggered by a fast input signal (quick sensor). On the rising edge of the touch probe input the position of an encoder is captured. Example: This is used for packaging machines to capture the position of a printmark on a film to cut always on the same position.

TPDO

A *transmit PDO* reads data from a device in a CAN-based system.

trunk cable

A *trunk cable* is the main cable that is terminated at both physical ends with line termination resistors.

TVDA

tested validated documented architectures

TxD

TxD represents a transmit signal.

U

UDINT

An *unsigned double integer* is encoded in 32 bits.

UDP

The *user datagram protocol* is a connectionless mode protocol (defined by IETF RFC 768) in which messages are delivered in a datagram (data telegram) to a destination computer on an IP network. The UDP protocol is typically bundled with the Internet Protocol. UDP/IP messages do not expect a response, and are therefore ideal for applications in which dropped packets do not require retransmission (such as streaming video and networks that demand real-time performance).

UINT

An *unsigned integer* is encoded in 16 bits.

UL

Underwriters Laboratories, US organization for product testing and safety certification.

unlocated variable

An *unlocated variable* does not have an address. (See *located variable*.)

UTC

coordinated universal time

V

VSD

variable speed drive

W

WORD

The *WORD* type is encoded in a 16-bit format.

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