Modicon TM2

Expansion Modules Configuration Programming Guide

06/2011

Schneider Electric
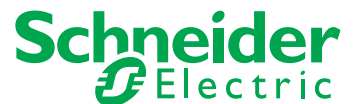
The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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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 or Warning 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.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

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
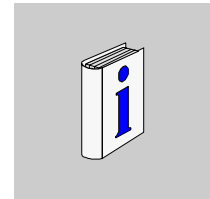
At a Glance

Document Scope

This document describes the configuration of the TM2 Input/Output modules. For further information, refer to the separate documents provided in the SoMachine online help.

Validity Note

This document has been updated with the release of SoMachine V3.0.

Related Documents

Title of Documentation	Reference Number
Modicon M238 Logic Controller Programming Guide	EIO0000000384 (ENG); EIO0000000385 (FRE); EIO0000000386 (GER); EIO0000000388 (SPA); EIO0000000387 (ITA); EIO0000000389 (CHS)
Magelis XBTGC HMI Controller Programming Guide	EIO0000000632 (ENG); EIO0000000633 (FRE); EIO0000000634 (GER); EIO0000000635 (SPA); EIO0000000636 (ITA); EIO0000000637 (CHS)
Modicon TM2 Digital I/O Modules Hardware Guide	EIO0000000028 (ENG); EIO0000000029 (FRE); EIO0000000030 (GER); EIO0000000031 (SPA); EIO0000000032 (ITA); EIO0000000033 (CHS)

Modicon TM2 Analog I/O Modules Hardware Guide	EIO0000000034 (ENG); EIO0000000035 (FRE); EIO0000000036 (GER); EIO0000000037 (ITA); EIO0000000038 (SPA); EIO0000000039 (CHS)
Modicon TM2 High Speed Counter Modules Hardware Guide	EIO0000000022 (ENG); EIO0000000023 (FRE); EIO0000000024 (GER); EIO0000000025 (SPA); EIO0000000026 (ITA); EIO0000000027 (CHS)
Modicon TWDNOI10M3 AS-Interface Master Module Hardware Guide	EIO0000000608 (ENG); EIO0000000609 (FRE); EIO0000000610 (GER); EIO0000000611 (SPA); EIO0000000612 (ITA); EIO0000000613 (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.

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[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

<div style="text-align: right;">**1**</div>

Introduction

This chapter provides the general information to configure I/O expansion modules.

What's in this Chapter?

This chapter contains the following topics:

I/O Configuration General Precautions

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.

Use the GetRightBusStatus *(see Modicon M238 Logic Controller, System Functions and Variables, M238 PLCSystem Library Guide)* function regularly to monitor the expansion bus status.

General Description

Introduction

The range of TM2 expansion modules includes:
- Digital expansion modules
- Analog expansion modules
- Communication expansion module
- Expert expansion modules

Digital Expansion Modules Features

The following table shows the digital expansion modules features:

Module reference	Channels	Channel type	Voltage/current	Reference page
Input Modules				
TM2DAI8DT	8	Inputs	120 Vac 7.5 mA	TM2DAI8DT *(see page 20)*
TM2DDI8DT	8	Inputs	24 Vdc 7 mA	TM2DDI8DT *(see page 21)*
TM2DDI16DT	16	Inputs	24 Vdc 7 mA	TM2DDI16DT *(see page 22)*
TM2DDI16DK	16	Inputs	24 Vdc 5 mA	TM2DDI16DK *(see page 23)*
TM2DDI32DK	32	Inputs	24 Vdc 5 mA	TM2DDI32DK *(see page 24)*
Output Modules				
TM2DRA8RT	8	Outputs Relay	30 Vdc/230 Vac 2 A max	TM2DRA8RT *(see page 25)*
TM2DRA16RT	16	Outputs Relay	30 Vdc/230 Vac 2 A max	TM2DRA16RT *(see page 26)*
TM2DD08UT	8	Outputs Transistor sink	24 Vdc 0.3 A max per output	TM2DDO8UT *(see page 27)*
TM2DD08TT	8	Outputs Transistor source	24 Vdc 0.5 A max per output	TM2DDO8TT *(see page 28)*
TM2DDO16UK	16	Outputs Transistor sink	24 Vdc 0.1 A max per output	TM2DDO16UK *(see page 29)*
TM2DDO16TK	16	Outputs Transistor source	24 Vdc 0.4 A max per output	TM2DDO16TK *(see page 30)*
TM2DDO32UK	32	Outputs Transistor sink	24 Vdc 0.1 A max per output	TM2DDO32UK *(see page 31)*

Module reference	Channels	Channel type	Voltage/current	Reference page
TM2DDO32TK	32	Outputs Transistor source	24 Vdc 0.4 A max per output	TM2DDO32TK *(see page 32)*
Mixed Modules				
TM2DMM8DRT	4 4	Inputs Outputs Relay	24 Vdc/7 mA 30 Vdc/230VAC 2 A max	TM2DMM8DRT *(see page 33)*
TM2DMM24DRF	16 8	Inputs Outputs Relay	24 Vdc/7 mA 30 Vdc/230VAC 2 A max	TM2DMM24DRF *(see page 34)*

Analog Expansion Modules Features

The following table shows the analog expansion modules features:

Module reference	Channels	Channel type	Voltage/current	Reference page
Input Modules				
TM2AMI2HT	2	High-level inputs	0...10 Vdc 4...20 mA	TM2AMI2HT *(see page 38)*
TM2AMI2LT	2	Low-level inputs	Thermocouple type J,K,T	TM2AMI2LT *(see page 40)*
TM2AMI4LT	4	Inputs	0...10 Vdc 0...20 mA PT100/1000 Ni100/1000	TM2AMI4LT *(see page 43)*
TM2AMI8HT	8	Inputs	0...20 mA 0...10 Vdc	TM2AMI8HT *(see page 47)*
TM2ARI8HT	8	Inputs	NTC / PTC	TM2ARI8HT *(see page 50)*
TM2ARI8LRJ	8	Inputs	PT100/1000	TM2ARI8LRJ *(see page 55)*
TM2ARI8LT	8	Inputs	PT100/1000	TM2ARI8LT *(see page 59)*
Output Modules				
TM2AMO1HT	1	Outputs	0...10 Vdc 4...20 mA	TM2AMO1HT *(see page 63)*
TM2AVO2HT	2	Outputs	+/- 10 Vdc	TM2AVO2HT *(see page 65)*

Module reference	Channels	Channel type	Voltage/current	Reference page
Mixed Modules				
TM2AMM3HT	2	Inputs	0...10 Vdc 4...20 mA	TM2AMM3HT *(see page 67)*
	1	Outputs	0...10 Vdc 4...20 mA	
TM2AMM6HT	4	Inputs	0...10 Vdc 4...20 mA	TM2AMM6HT *(see page 70)*
	2	Outputs	0...10 Vdc 4...20 mA	
TM2ALM3LT	2	Low-level inputs	Thermo J,K,T, PT100	TM2ALM3LT *(see page 73)*
	1	Outputs	0...10 Vdc 4...20 mA	

Expert Expansion Modules Features

The following table shows the expert expansion modules features:

Module reference	Channels	Channel type	Refer to
TM200HSC206DF	2	HSC	Expansion Module HSC *(see page 77)*
TM200HSC206DT	2	HSC	

Communication Expansion Module Features
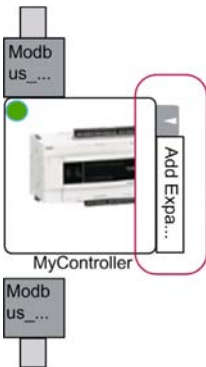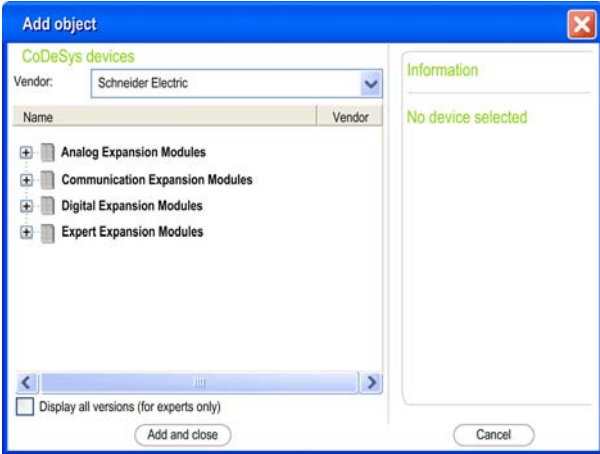
The following table shows the communication expansion module features:

Reference module	Type	Refer to
TWDNOI10M3	AS-Interface Master	AS-Interface Configuration *(see Modicon M238 Logic Controller, Programming Guide)*

Adding an Expansion Module

Procedure

The table below describes how to add an expansion module to the controller:

Step	Action
1	Select the **Configuration** tab:
2	In the **Graphical Configuration Editor**, click **Add Expansion**:
3	In the **Add Object** window, select an expansion module to add:
4	Click **Add and Close**.
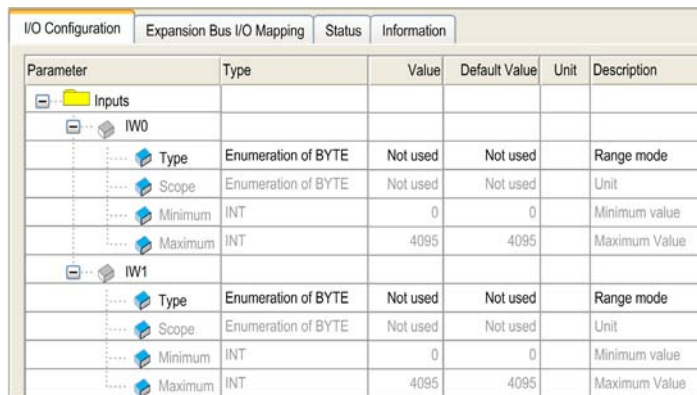
I/O Configuration

To configure the TM2 expansion modules, proceed as follows:

Step	Action
1	Select the **Configuration** tab: es Configuration Pro
2	Double-click the expansion module. **Result:** A window will appear to allow you to configure your I/O module. the tabs that are presented depend on the type of I/O module that you selected for configuration.

I/O Configuration Tab Description

The expansion modules are configurable from the **I/O Configuration** tab (If configuring a digital I/O module, the Expansion bus I/O Mapping is presented without the **I/O Configuration** tab):

Parameter	Type	Value	Default Value	Unit	Description
⊟ 🗀 Inputs					
⊟ 🔧 IW0					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT	0	0		Minimum value
🔹 Maximum	INT	4095	4095		Maximum Value
⊟ 🔧 IW1					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT	0	0		Minimum value
🔹 Maximum	INT	4095	4095		Maximum Value

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

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

NOTE: If a parameter is unavailable, the row is grayed.

Expansion Bus I/O Mapping Tab Description

Variables can be defined and named in the **Expansion Bus I/O Mapping** tab.
Additional information such as topological addressing is also performed in this tab:

Expansion Bus I/O Mapping	Status	Information						
Channels								
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
⊟ ▢ Inputs								
⊟ ◇		IB0	%IB2	BYTE				
◇		I0	%IX2.0	BOOL				
◇		I1	%IX2.1	BOOL				
◇		I2	%IX2.2	BOOL				
◇		I3	%IX2.3	BOOL				
◇		I4	%IX2.4	BOOL				
◇		I5	%IX2.5	BOOL				
◇		I6	%IX2.6	BOOL				
◇		I7	%IX2.7	BOOL				

The **Expansion Bus I/O Mapping** tab contains the following columns:

Column	Description
Variable	Lets you map the channel on a variable. Double-click the icon to enter the variable name, if it is a new variable, the variable is created. It is also possible to map an existing variable with the variables **Input Assistant** by clicking the **...** button.
Mapping	Indicates if the channel is mapped on a new variable or an existing variable
Channel	Name of the channel of the device
Address	Address of the channel
Type	Data type of the channel
Current Value	Current value of the channel, displayed in online mode
Default Value	Double click to change the default value. The default value is applied to the I/O memory variable during certain states assumed by the controller. For more information on when and how the value is applied, see the *Programming Guide* for your controller.
Unit	Unit of the channel value
Description	Description of the channel

NOTE: Expansion I/Os are always physically updated by the MAST task.

TM2 Digital I/O Modules

2

Introduction

This chapter will help you to configure the TM2 digital I/O modules.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
TM2DAI8DT	20
TM2DDI8DT	21
TM2DDI16DT	22
TM2DDI16DK	23
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TM2DRA8RT	25
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TM2DDO16UK	29
TM2DDO16TK	30
TM2DDO32UK	31
TM2DDO32TK	32
TM2DMM8DRT	33
TM2DMM24DRF	34

TM2DAI8DT

Introduction

This expansion module is a 8-point, 120 Vac input module with a terminal block.

For further hardware information, refer to TM2DAI8DT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each input and the channel name.

Expansion Bus I/O Mapping		Status	Information						
Channels									
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
⊟ 📁 Inputs								
⊟ ◇		IB0	%IB2	BYTE				
⋯ 🖊		I0	%IX2.0	BOOL				
⋯ 🖊		I1	%IX2.1	BOOL				
⋯ 🖊		I2	%IX2.2	BOOL				
⋯ 🖊		I3	%IX2.3	BOOL				
⋯ 🖊		I4	%IX2.4	BOOL				
⋯ 🖊		I5	%IX2.5	BOOL				
⋯ 🖊		I6	%IX2.6	BOOL				
⋯ 🖊		I7	%IX2.7	BOOL				

Channel	Type	Description
IB0	BYTE	State of all inputs
I0	BOOL	State of input 0
...		...
I7		State of input 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DDI8DT

Introduction

This expansion module is a 8-point, 24 Vdc input module with a terminal block.

For further hardware information, refer to TM2DDI8DT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each input and the channel name.

Expansion Bus I/O Mapping	Status	Information						
Channels								
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
☐ Inputs								
☐ ◈		IB0	%IB3	BYTE				
◈		I0	%IX3.0	BOOL				
◈		I1	%IX3.1	BOOL				
◈		I2	%IX3.2	BOOL				
◈		I3	%IX3.3	BOOL				
◈		I4	%IX3.4	BOOL				
◈		I5	%IX3.5	BOOL				
◈		I6	%IX3.6	BOOL				
◈		I7	%IX3.7	BOOL				

Channel	Type	Description
IB0	BYTE	State of all inputs
I0	BOOL	State of input 0
...		...
I7		State of input 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DDI16DT

Introduction

This expansion module is a 16-point, 24 Vdc input module with a terminal block.

For further hardware information, refer to TM2DDI16DT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each input and the channel name.

Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
⊟ 📁 Inputs								
⊟ ◇		IW0	%IW2	WORD				
↳ 🔌		I0	%IX4.0	BOOL				
↳ 🔌		I1	%IX4.1	BOOL				
↳ 🔌		I2	%IX4.2	BOOL				
↳ 🔌		I3	%IX4.3	BOOL				
↳ 🔌		I4	%IX4.4	BOOL				
↳ 🔌		I5	%IX4.5	BOOL				
↳ 🔌		I6	%IX4.6	BOOL				
↳ 🔌		I7	%IX4.7	BOOL				
↳ 🔌		I8	%IX5.0	BOOL				
↳ 🔌		I9	%IX5.1	BOOL				
↳ 🔌		I10	%IX5.2	BOOL				
↳ 🔌		I11	%IX5.3	BOOL				
↳ 🔌		I12	%IX5.4	BOOL				
↳ 🔌		I13	%IX5.5	BOOL				
↳ 🔌		I14	%IX5.6	BOOL				
↳ 🔌		I15	%IX5.7	BOOL				

Channel	Type	Description
IW0	WORD	State of all inputs
I0	BOOL	State of input 0
...		...
I15		State of input 15

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DDI16DK

Introduction

This expansion module is a 16-point, 24 Vdc input module with a HE10 connector.

For further hardware information, refer to TM2DDI16DK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each input and the channel name.

Channel	Type	Description
IW0	WORD	State of all inputs
I0	BOOL	State of input 0
...		...
I15		State of input 15

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DDI32DK

Introduction

This expansion module is a 32-point, 24 Vdc input module with a HE10 connector.

For further hardware information, refer to TM2DDI32DK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each input and the channel name.

Channel	Type	Description
ID0	WORD	State of all inputs
I0	BOOL	State of input 0
...		...
I31		State of input 31

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DRA8RT

Introduction

This expansion module is a 8-point relay output module with a terminal block.

For further hardware information, refer to TM2DRA8RT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each output and the channel name.

Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
Outputs								
		QB0	%QB2	BYTE				
		Q0	%QX2.0	BOOL				
		Q1	%QX2.1	BOOL				
		Q2	%QX2.2	BOOL				
		Q3	%QX2.3	BOOL				
		Q4	%QX2.4	BOOL				
		Q5	%QX2.5	BOOL				
		Q6	%QX2.6	BOOL				
		Q7	%QX2.7	BOOL				

Tabs: Expansion Bus/I O Mapping | Status | Information — Channels

Channel	Type	Default value	Description
QB0	BYTE	-	Command byte of all outputs
Q0	BOOL	-	Command bit of output 0
...		TRUE FALSE	...
Q7			Command bit of output 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DRA16RT

Introduction

This expansion module is a 16-point relay output module with a terminal block.

For further hardware information, refer to TM2DRA16RT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each output and the channel name.

Expansion Bus I/O Mapping	Status	Information						
Channels								
Variable	Mapping	Channel	Address	Type	Current V...	Default ...	Unit	Description
⊟ 📁 Outputs								
⊟ 🗇		QW0	%QW2	WORD				
🖘		Q0	%QX4.0	BOOL				
🖘		Q1	%QX4.1	BOOL				
🖘		Q2	%QX4.2	BOOL				
🖘		Q3	%QX4.3	BOOL				
🖘		Q4	%QX4.4	BOOL				
🖘		Q5	%QX4.5	BOOL				
🖘		Q6	%QX4.6	BOOL				
🖘		Q7	%QX4.7	BOOL				
🖘		Q8	%QX5.0	BOOL				
🖘		Q9	%QX5.1	BOOL				
🖘		Q10	%QX5.2	BOOL				
🖘		Q11	%QX5.3	BOOL				
🖘		Q12	%QX5.4	BOOL				
🖘		Q13	%QX5.5	BOOL				
🖘		Q14	%QX5.6	BOOL				
🖘		Q15	%QX5.7	BOOL				

Channel	Type	Default value	Description
QW0	WORD	-	Command byte of all outputs
Q0	BOOL	- TRUE FALSE	Command bit of output 0
...			...
Q15			Command bit of output 15

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DDO8UT

Introduction

This expansion module is a 8-point transistor sink output module with a terminal block.

For further hardware information, refer to TM2DDO8UT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each output and the channel name.

Expansion Bus I/O Mapping	Status	Information							
Channels									
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description	
⊟ 🟨 Outputs									
⊟ 📦		QB0	%QB6	BYTE					
📦		Q0	%QX6.0	BOOL					
📦		Q1	%QX6.1	BOOL					
📦		Q2	%QX6.2	BOOL					
📦		Q3	%QX6.3	BOOL					
📦		Q4	%QX6.4	BOOL					
📦		Q5	%QX6.5	BOOL					
📦		Q6	%QX6.6	BOOL					
📦		Q7	%QX6.7	BOOL					

Channel	Type	Default value	Description
QB0	BYTE	-	Command byte of all outputs
Q0	BOOL	-	Command bit of output 0
...		TRUE FALSE	...
Q7			Command bit of output 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DDO8TT

Introduction

This expansion module is a 8-point transistor source output module with a terminal block.

For further hardware information, refer to TM2DDO8TT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each output and the channel name.

Expansion Bus I/O Mapping	Status	Information							
Channels									
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
⊟ 📁 Outputs								
⊟ 🖉		QB0	%QB7	BYTE				
🖉		Q0	%QX7.0	BOOL				
🖉		Q1	%QX7.1	BOOL				
🖉		Q2	%QX7.2	BOOL				
🖉		Q3	%QX7.3	BOOL				
🖉		Q4	%QX7.4	BOOL				
🖉		Q5	%QX7.5	BOOL				
🖉		Q6	%QX7.6	BOOL				
🖉		Q7	%QX7.7	BOOL				

Channel	Type	Default value	Description
QB0	BYTE	-	Command byte of all outputs
Q0	BOOL	- TRUE FALSE	Command bit of output 0
...			...
Q7			Command bit of output 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DDO16UK

Introduction

This expansion module is a 16-point transistor sink output module with a HE10 connector.

For further hardware information, refer to TM2DDO16UK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each output and the channel name.

Expansion Bus I/O Mapping	Status	Information						
Channels								
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
⊟ 📁 Inputs								
⊟ ◆		IW0	%IW2	WORD				
◆		I0	%IX6.0	BOOL				
◆		I1	%IX6.1	BOOL				
◆		I2	%IX6.2	BOOL				
◆		I3	%IX6.3	BOOL				
◆		I4	%IX6.4	BOOL				
◆		I5	%IX6.5	BOOL				
◆		I6	%IX6.6	BOOL				
◆		I7	%IX6.7	BOOL				
◆		I8	%IX7.0	BOOL				
◆		I9	%IX7.1	BOOL				
◆		I10	%IX7.2	BOOL				
◆		I11	%IX7.3	BOOL				
◆		I12	%IX7.4	BOOL				
◆		I13	%IX7.5	BOOL				
◆		I14	%IX7.6	BOOL				
◆		I15	%IX7.7	BOOL				

Channel	Type	Default value	Description
QW0	WORD	-	Command byte of all outputs
Q0	BOOL	-	Command bit of output 0
...		TRUE FALSE	...
Q15			Command bit of output 15

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18).*

TM2DDO16TK

Introduction

This expansion module is a 16-point transistor source output module with a HE10 connector.

For further hardware information, refer to TM2DDO16TK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each output and the channel name.

Channel	Type	Default value	Description
QW0	WORD	-	Command byte of all outputs
Q0	BOOL	- TRUE FALSE	Command bit of output 0
...			...
Q15			Command bit of output 15

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DDO32UK

Introduction

This expansion module is a 32-point transistor sink output module with a HE10 connector.

For further hardware information, refer to TM2DDO32UK *(see Modicon TM2, Digital I/O Modules, Hardware Guide).*

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each output and the channel name.

Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
⊟ 📁 Outputs								
⊟ ✦		QD0	%QD2	DWO...				
✦		Q0	%QX8.0	BOOL				
✦		Q1	%QX8.1	BOOL				
✦		Q2	%QX8.2	BOOL				
✦		Q3	%QX8.3	BOOL				
✦		Q4	%QX8.4	BOOL				
✦		Q5	%QX8.5	BOOL				
✦		Q6	%QX8.6	BOOL				
✦		Q7	%QX8.7	BOOL				
✦		Q8	%QX9.0	BOOL				
✦		Q9	%QX9.1	BOOL				
✦		Q10	%QX9.2	BOOL				
✦		Q11	%QX9.3	BOOL				
✦		Q12	%QX9.4	BOOL				
✦		Q13	%QX9.5	BOOL				
✦		Q14	%QX9.6	BOOL				
✦		Q15	%QX9.7	BOOL				
✦		Q16	%QX10.0	BOOL				
✦		Q17	%QX10.1	BOOL				
✦		Q18	%QX10.2	BOOL				
✦		Q19	%QX10.3	BOOL				
✦		Q20	%QX10.4	BOOL				
✦		Q21	%QX10.5	BOOL				
✦		Q22	%QX10.6	BOOL				
✦		Q23	%QX10.7	BOOL				
✦		Q24	%QX11.0	BOOL				
✦		Q25	%QX11.1	BOOL				
✦		Q26	%QX11.2	BOOL				
✦		Q27	%QX11.3	BOOL				
✦		Q28	%QX11.4	BOOL				
✦		Q29	%QX11.5	BOOL				
✦		Q30	%QX11.6	BOOL				
✦		Q31	%QX11.7	BOOL				

Channel	Type	Default value	Description
QD0	DWORD	-	Command byte of all outputs
Q0	BOOL	-	Command bit of output 0
...		TRUE FALSE	...
Q31			Command bit of output 31

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18).*

TM2DDO32TK

Introduction

This expansion module is a 32-point transistor source output module with a HE10 connector

For further hardware information, refer to TM2DDO32TK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each output and the channel name.

Channel	Type	Default value	Description
QD0	DWORD	-	Command byte of all outputs
Q0	BOOL	- TRUE FALSE	Command bit of output 0
...			...
Q31			Command bit of output 31

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DMM8DRT

Introduction

This expansion module is a 4-point input /4-point output module with a terminal block.

For further hardware information, refer to TM2DMM8DRT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each input and output with the channel name.

Channel		Type	Default value	Description
Inputs	IB0	BYTE	-	State of all inputs
	I0	BOOL	-	State of input 0
	...			...
	I3			State of input 31
Outputs	QB0	BYTE	-	Command byte of all outputs
	Q0	BOOL	-	Command bit of output 0
	...		TRUE FALSE	...
	Q3			Command bit of output 3

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2DMM24DRF

Introduction

This expansion module is a 16-point input/8-point output module with a wire-clamp terminal block.

For further hardware information, refer to TM2DDMM24DRF *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*.

Expansion Bus I/O Mapping Tab

The table below identifies the addresses of each input and output with the channel name.

Channel		Type	Default value	Description
Inputs	IW0	WORD	-	State of all inputs
	I0	BOOL	-	State of input 0
	...			...
	I15			State of input 15

Channel		Type	Default value	Description
Outputs	QB0	BYTE	-	Command byte of all outputs
	Q0	BOOL	-	Command bit of output 0
	...		TRUE FALSE	...
	Q7			Command bit of output 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18).*

TM2 Analog I/O Modules

3

Introduction

This chapter will help you to configure the TM2 analog I/O modules.

What's in this Chapter?

This chapter contains the following topics:

TM2AMI2HT

Introduction

This expansion module is a 2-point input module with a terminal block.

For further hardware information, refer to TM2AMI2HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION

INOPERABLE EQUIPMENT

Be sure that the physical wiring of the module is compatible with the software configuration for the module.

Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the inputs.

Parameter	Type	Value	Default Value	Unit	Description
⊟ 🗀 Inputs					
⊟ ◈ IW0					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT	0	0		Minimum value
🔹 Maximum	INT	4095	4095		Maximum Value
⊟ ◈ IW1					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT	0	0		Minimum value
🔹 Maximum	INT	4095	4095		Maximum Value

Tabs: I/O Configuration | Expansion Bus I/O Mapping | Status | Information

For each input, you can define:

Parameter		Value	Default value	Description
Type		Not used 0- 10 V 4 - 20 mA	Not used	This identifies the mode of a channel.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper measurement limit.
	Customized	-32768...32767	32767	

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17).*

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

Channel	Type	Description
IW0	INT	Current value of the input 0
IW1	INT	Current value of the input 1

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18).*

TM2AMI2LT

Introduction

This expansion module is a 2-point input thermocouple module with a terminal block.

For further hardware information, refer to TM2AMI2LT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION
INOPERABLE EQUIPMENT
Be sure that the physical wiring of the module is compatible with the software configuration for the module.
Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the inputs.

Parameter	Type	Value	Default Value	Unit	Description
⊟ Inputs					
⊟ IW0					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
Maximum	INT (-32768...32767)	32767	32767		Maximum Value
⊟ IW1					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
Maximum	INT (-32768...32767)	32767	32767		Maximum Value

For each input, you can define:

Parameter		Value	Default value	Description
Type		Not used Thermocouple K Thermocouple J Thermocouple T	Not used	This identifies the mode of a channel.
Scope		Normal Customized Celsius (0.1°C) Fahrenheit (0.1°F)	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Celsius (0.1°C)	See the table below	See the table below	
	Fahrenheit (0.1°F)			
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper measurement limit.
	Celsius (0.1°C)	See the table below	See the table below	
	Fahrenheit (0.1°F)			
	Customized	-32768...32767	32767	

Scope	Normal		Celsius (0.1°C)		Fahrenheit (0.1°F)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Thermocouple K	0	4095	-2700	13700	-4540	24980
Thermocouple J	0	4095	-2000	7600	-3280	14000
Thermocouple T	0	4095	-2700	4000	-4540	7520

For further generic descriptions, refer to I/O Configuration Tab Description (see page 17).

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

Channel	Type	Description
IW0	INT	Current value of the input 0
IW1	INT	Current value of the input 1

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description .

TM2AMI4LT

Introduction

This expansion module is a 4-point input module, current, voltage and temperature, with a terminal block.

NOTE: All inputs used must be of the same type (voltage, current, or temperature).

For further hardware information, refer to TM2AMI4LT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION
INOPERABLE EQUIPMENT
Be sure that the physical wiring of the module is compatible with the software configuration for the module.
Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the inputs.

Parameter	Type	Value	Default Value	Unit	Description
Mode	Enumeration of BYTE	Voltage	Voltage		Mode
Inputs					
IW0					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT (0...4095)	0	0		Minimum value
Maximum	INT (0...4095)	4095	4095		Maximum Value
Lower limit	INT (0...0)	0	0		Lower limit Value
Upper limit	INT (0...0)	0	0		Upper limit Value
IW1					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT (0...4095)	0	0		Minimum value
Maximum	INT (0...4095)	4095	4095		Maximum Value
Lower limit	INT (0...0)	0	0		Lower limit Value
Upper limit	INT (0...0)	0	0		Upper limit Value
IW2					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT (0...4095)	0	0		Minimum value
Maximum	INT (0...4095)	4095	4095		Maximum Value
Lower limit	INT (0...0)	0	0		Lower limit Value
Upper limit	INT (0...0)	0	0		Upper limit Value
IW3					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT (0...4095)	0	0		Minimum value
Maximum	INT (0...4095)	4095	4095		Maximum Value
Lower limit	INT (0...0)	0	0		Lower limit Value
Upper limit	INT (0...0)	0	0		Upper limit Value

For each input, you can define:

Parameter		Value	Default value	Description
Mode		Voltage Current Temperature	Voltage	This identifies the mode of all channels.
Type		Not used 0...10 V 0...20 mA PT100 PT1000 NI100 NI1000	Not used	This identifies the type of a channel. If 'Voltage' mode is enabled then the type 'Not used' and '0...10V' are available. If 'Current' mode is enabled then the type 'Not used' and '0...20mA' are available. If 'Temperature' mode is enabled then the type 'Not used', 'PT100', PT1000', 'NI100' and 'NI1000' are available.
Scope		Not used Normal Customized Resistance (Ohm) Celsius (0.1°C) Fahrenheit (0.1°F)	Not used	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Celsius (0.1°C)	See the table below	See the table below	
	Fahrenheit (0.1°F)			
	Resistance (Ohm)			
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper measurement limit.
	Celsius (0.1°C)	See the table below	See the table below	
	Fahrenheit (0.1°F)			
	Resistance (Ohm)			
	Customized	-32768...32767	32767	

Scope	Normal		Resistance (Ohm)		Celsius (0.1°C)		Fahrenheit (0.1°F)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
PT100	0	4095	18	314	-2000	6000	-3280	11120
PT1000	0	4095	184	3138	-2000	6000	-3280	11120
NI100	0	4095	74	199	-500	1500	-580	3020
NI1000	0	4095	742	1987	-500	1500	-580	3020

For further generic descriptions, refer to I/O Configuration Tab Description

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

Channel	Type	Description
IW0	INT	Current value of the input 0
IW1	INT	Current value of the input 1
IW2	INT	Current value of the input 2
IW3	INT	Current value of the input 3

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description .

TM2AMI8HT

Introduction

This expansion module is a 8-point input module, current and voltage, with a terminal block.

NOTE: All inputs used must be of the same type (voltage or current).

For further hardware information, refer to TM2AMI8HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

<table>
<tr><td colspan="1" align="center"># CAUTION</td></tr>
<tr><td>**INOPERABLE EQUIPMENT**

Be sure that the physical wiring of the module is compatible with the software configuration for the module.

Failure to follow these instructions can result in equipment damage.</td></tr>
</table>

I/O Configuration Tab

The following table allows configuring the inputs.

Parameter	Type	Value	Default Value	Unit	Description
Type	Enumeration of BYTE	0..10V	0..10V		Range mode
Inputs					
IW0					
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT	0	0		Minimum value
Maximum	INT	1023	1023		Maximum value
IW1					
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT	0	0		Minimum value
Maximum	INT	1023	1023		Maximum value
IW2					
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT	0	0		Minimum value
Maximum	INT	1023	1023		Maximum value
IW3					
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT	0	0		Minimum value
Maximum	INT	1023	1023		Maximum value
IW4					
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT	0	0		Minimum value
Maximum	NIT	1023	1023		Maximum value
IW5					
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT	0	0		Minimum value
Maximum	INT	1023	1023		Maximum value
IW6					
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT	0	0		Minimum value
Maximum	INT	1023	1023		Maximum value
IW7					
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT	0	0		Minimum value
Maximum	INT	1023	1023		Maximum value

For each input, you can define:

Parameter		Value	Default value	Description
Type		Not used 0- 10 V 0- 20 mA	Not used	This identifies the mode of all channels.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	1023	1023	Specifies the upper measurement limit.
	Customized	-32768...32767	32767	

For further generic descriptions, refer to I/O Configuration Tab Description

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

Channel	Type	Description
IW0	INT	Current value of the input 0
...	...	...
IW7	INT	Current value of the input 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description

TM2ARI8HT

Introduction

This expansion module is a 8-point input module, temperature, with a terminal block.

For further hardware information, refer to TM2ARI8HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION

INOPERABLE EQUIPMENT

Be sure that the physical wiring of the module is compatible with the software configuration for the module.

Failure to follow these instructions can result in equipment damage.

NTC Probe

The temperature (Tm) varies in relation to the resistance (r) following the equation below:

$$Tm(r) = \frac{1}{\frac{1}{T} + \frac{1}{B}\ln\left[\frac{r}{R}\right]}$$

Where:
- Tm = temperature measured by the probe, in Kelvin
- r = physical value of the resistance in Ohm
- R = reference resistance in Ohm at temperature T
- T = reference temperature in Kelvin
- B = sensitivity of the NTC probe in Kelvin

R,T and B must be greater or equal to 1.

If the resistance is selected as unit, the displayed value is equal to the probe resistance.

NOTE: 25° C = 77° F = 298.15° K

PTC Probe

The following table shows the read value according to the resistance value:

Resistance value	Read value
< Reactivation threshold	1
Reactivation threshold < resistance value < Activation threshold	2
> Activation threshold	4

I/O Configuration Tab

The following table allows configuring the inputs.

Parameter		Type	Value	Default Value	Unit	Description
⊟ 🗀 Inputs						
	⊟ 🗇 IW0					
		Type	Enumeration of BYTE	Not used	Not used		Unit
		Scope	Enumeration of BYTE	Not used	Not used		Unit
		Minimum	INT	- 32768	- 32768		Minimum value
		Maximum	INT	32767	32767		Maximum value
		R	UINT	330	330		Physical value of the res ...
		T	INT	29815	29815		Temperature measured ...
		B	INT	3569	3569		Sensitivity of the probe
		Activation	INT	3100	3100		Activation threshold
		Reactivation	INT	1500	1500		Reactivation threshold
	⊟ 🗇 IW1					
		Type	Enumeration of BYTE	Not used	Not used		Unit
		Scope	Enumeration of BYTE	Not used	Not used		Unit
		Minimum	INT	- 32768	- 32768		Minimum value
		Maximum	INT	32767	32767		Maximum value
		R	UINT	330	330		Physical value of the res ...
		T	INT	29815	29815		Temperature measured ...
		B	INT	3569	3569		Sensitivity of the probe
		Activation	INT	3100	3100		Activation threshold
		Reactivation	INT	1500	1500		Reactivation threshold
	⊟ 🗇 IW 2					
		Type	Enumeration of BYTE	Not used	Not used		Unit
		Scope	Enumeration of BYTE	Not used	Not used		Unit
		Minimum	INT	- 32768	- 32768		Minimum value
		Maximum	INT	32767	32767		Maximum value
		R	UINT	330	330		Physical value of the res ...
		T	INT	29815	29815		Temperature measured ...
		B	INT	3569	3569		Sensitivity of the probe
		Activation	INT	3100	3100		Activation threshold
		Reactivation	INT	1500	1500		Reactivation threshold
	⊟ 🗇 IW 3					
		Type	Enumeration of BYTE	Not used	Not used		Unit
		Scope	Enumeration of BYTE	Not used	Not used		Unit
		Minimum	INT	- 32768	- 32768		Minimum value

For each input, you can define:

Parameter		Value	Default value	Description
Type		Not used NTC PTC	Not used	This identifies the mode of a channel.
Scope		Normal Customized Resistance (Ohm) Kelvin (0.1° K) Celsius (0.1° C) Fahrenheit (0.1° F)	Normal Kelvin (0.1° K)	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	1023	1023	Specifies the upper measurement limit.
	Customized	-32768...32767	32767	
R (used only with NTC probe)		1...65535	330	Reference resistance in Ohm at temperature T
T (used only with NTC probe)		1...32767	29815	Reference temperature value in Kelvin (0.01° K)
B (used only with NTC probe)		1...32767	3569	Sensitivity of NTC probe in Kelvin (0.01° K)
Activation (used only with PTC probe)		100...10000	3100	Activation threshold
Reactivation (used only with PTC probe)		100...10000	1500	Reactivation threshold

Scope	Resistance (Ohm)		Kelvin (0.1° K)		Celsius (0.1° C)		Fahrenheit (0.1° F)	
	Min	Max	Min	Max	Min	Max	Min	Max
NTC	100	10000	10	6500	-789	580	-1101	1364
PTC	100	10000	-	-	-	-	-	-

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17).*

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

I/O Configuration	Expansion Bus I/O Mapping		Status	Information				
Channels								
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
⊟ 📁 Inputs								
⋯◈		IW0	%IW9	INT				
⋯◈		IW1	%IW10	INT				
⋯◈		IW2	%IW11	INT				
⋯◈		IW3	%IW12	INT				
⋯◈		IW4	%IW13	INT				
⋯◈		IW5	%IW14	INT				
⋯◈		IW6	%IW15	INT				
⋯◈		IW7	%IW16	INT				

Channel	Type	Description
IW0	INT	Current value of the input 0
...	...	...
IW7	INT	Current value of the input 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18).*

TM2ARI8LRJ

Introduction

This expansion module is a 8-point output module, temperature, with RJ11 connectors.

For further hardware information, refer to TM2ARI8LRJ *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION
INOPERABLE EQUIPMENT
Be sure that the physical wiring of the module is compatible with the software configuration for the module.
Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the inputs.

Parameter		Type	Value	Default Value	Unit	Description
⊟ Inputs						
	⊟ IW0					
	Type	Enumeration of BYTE	Not used	Not used		Range mode
	Scope	Enumeration of BYTE	Not used	Not used		Unit
	Minimum	INT(-32768...32767)	-32768	-32768		Minimum value
	Maximum	INT(-32768...32767)	32767	32767		Maximum value
	⊟ IW1					
	Type	Enumeration of BYTE	Not used	Not used		Range mode
	Scope	Enumeration of BYTE	Not used	Not used		Unit
	Minimum	INT(-32768...32767)	-32768	-32768		Minimum value
	Maximum	INT(-32768...32767)	32767	32767		Maximum value
	⊟ IW2					
	Type	Enumeration of BYTE	Not used	Not used		Range mode
	Scope	Enumeration of BYTE	Not used	Not used		Unit
	Minimum	INT(-32768...32767)	-32768	-32768		Minimum value
	Maximum	INT(-32768...32767)	32767	32767		Maximum value
	⊟ IW3					
	Type	Enumeration of BYTE	Not used	Not used		Range mode
	Scope	Enumeration of BYTE	Not used	Not used		Unit
	Minimum	INT(-32768...32767)	-32768	-32768		Minimum value
	Maximum	INT(-32768...32767)	32767	32767		Maximum value
	⊟ IW4					
	Type	Enumeration of BYTE	Not used	Not used		Range mode
	Scope	Enumeration of BYTE	Not used	Not used		Unit
	Minimum	INT(-32768...32767)	-32768	-32768		Minimum value
	Maximum	INT(-32768...32767)	32767	32767		Maximum value
	⊟ IW5					
	Type	Enumeration of BYTE	Not used	Not used		Range mode
	Scope	Enumeration of BYTE	Not used	Not used		Unit

For each input, you can define:

Parameter		Value	Default value	Description
Type		Not used PT100 PT1000	Not used	This identifies the mode of a channel.
Scope		Not used Normal Customized Celsius (0.1° C) Fahrenheit (0.1° F)	Not used	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Celsius (0.1° C)	See the table below	See the table below	
	Fahrenheit (0.1° F)			
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper measurement limit.
	Celsius (0.1° C)	See the table below	See the table below	
	Fahrenheit (0.1° F)			
	Customized	-32768...32767	32767	

Scope	Normal		Celsius (0.1° C)		Fahrenheit (0.1° F)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
PT100	0	4095	-2000	6000	-3280	11120
PT1000	0	4095	-500	2000	-580	3920

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17)*.

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

I/O Configuration	Expansion Bus I/O Mapping		Status		Information			
Channels								
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description
⊟ 📁 Inputs								
🔷		IW0	%IW9	INT				
🔷		IW1	%IW10	INT				
🔷		IW2	%IW11	INT				
🔷		IW3	%IW12	INT				
🔷		IW4	%IW13	INT				
🔷		IW5	%IW14	INT				
🔷		IW6	%IW15	INT				
🔷		IW7	%IW16	INT				

Channel	Type	Description
IW0	INT	Current value of the input 0
...	...	...
IW7	INT	Current value of the input 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description .

TM2ARI8LT

Introduction

This expansion module is a 8-point input module, temperature, with 2 terminal blocks.

For further hardware information, refer to TM2ARI8LT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION
INOPERABLE EQUIPMENT
Be sure that the physical wiring of the module is compatible with the software configuration for the module.
Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the inputs.

Parameter	Type	Value	Default Value	Unit	Description
⊟ 📁 Inputs					
⊟ 🔷 IW0					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
🔹 Maximum	INT (-32768...32767)	32767	32767		Maximum value
⊟ 🔷 IW1					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
🔹 Maximum	INT (-32768...32767)	32767	32767		Maximum value
⊟ 🔷 IW2					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
🔹 Maximum	INT (-32768...32767)	32767	32767		Maximum value
⊟ 🔷 IW3					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
🔹 Maximum	INT (-32768...32767)	32767	32767		Maximum value
⊟ 🔷 IW4					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
🔹 Maximum	INT (-32768...32767)	32767	32767		Maximum value
⊟ 🔷 IW5					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
🔹 Maximum	INT (-32768...32767)	32767	32767		Maximum value
⊟ 🔷 IW6					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
🔹 Maximum	INT (-32768...32767)	32767	32767		Maximum value
⊟ 🔷 IW7					
🔹 Type	Enumeration of BYTE	Not used	Not used		Range mode
🔹 Scope	Enumeration of BYTE	Not used	Not used		Unit
🔹 Minimum	INT (-32768...32767)	-32768	-32768		Minimum value
🔹 Maximum	INT (-32768...32767)	32767	32767		Maximum value

For each input, you can define:

Parameter		Value	Default value	Description
Type		Not used PT100 PT1000	Not used	This identifies the mode of a channel.
Scope		Not used Normal Customized Celsius (0.1°C) Fahrenheit (0.1°F)	Not used	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Celsius (0.1°C)	See the table below	See the table below	
	Fahrenheit (0.1°F)			
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper measurement limit.
	Celsius (0.1°C)	See the table below	See the table below	
	Fahrenheit (0.1°F)			
	Customized	-32768...32767	32767	

Scope	Normal		Celsius (0.1°C)		Fahrenheit (0.1°F)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
PT100	0	4095	-2000	6000	-3280	11120
PT1000	0	4095	-500	2000	-580	3920

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17)*.

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

Channel	Type	Description
IW0	INT	Current value of the input 0
...	...	...
IW7	INT	Current value of the input 7

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2AMO1HT

Introduction

This expansion module is a 1-point output module with a terminal block.

For further hardware information, refer to TM2AMO1HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

<table>
<tr><td align="center"><h1>CAUTION</h1></td></tr>
<tr><td>INOPERABLE EQUIPMENT

Be sure that the physical wiring of the module is compatible with the software configuration for the module.

Failure to follow these instructions can result in equipment damage.</td></tr>
</table>

I/O Configuration Tab

The following table allows configuring the output.

For the output, you can define:

Parameter		Value	Default value	Description
Type		Not used 0- 10 V 4 - 20 mA	Not used	This identifies the mode of a channel.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower limit.
	Customized	-32768...32767	-32768	

Parameter		Value	Default value	Description
Maximum	Normal	4095	4095	Specifies the upper limit.
	Customized	-32768...32767	32767	

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17)*.

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:
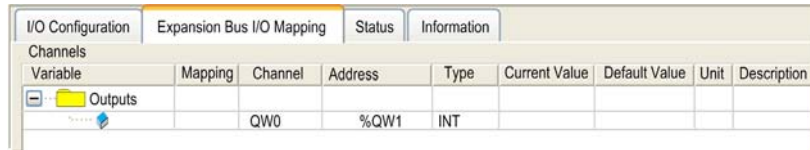
Channel	Type	Default value	Description
QW0	INT	-32768...32767	Command word of the output 0

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2AVO2HT

Introduction

This expansion module is a 2-point output module with a terminal block.

For further hardware information, refer to TM2AVO2HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION
INOPERABLE EQUIPMENT
Be sure that the physical wiring of the module is compatible with the software configuration for the module.
Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the outputs.

For each output, you can define:

Parameter		Value	Default value	Description
Type		Not used -10...10 Vdc	Not used	This identifies the mode of a channel.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	-2048	-2048	Specifies the lower limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	2047	2047	Specifies the upper limit.
	Customized	-32768...32767	32767	

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17)*.

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:
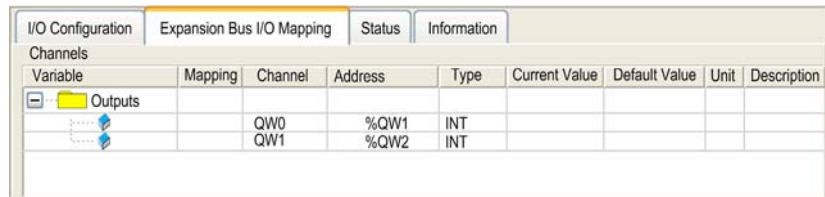
Channel	Type	Default value	Description
QW0	INT	-32768...32767	Command word of the output 0
QW1	INT	-32768...32767	Command word of the output 1

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2AMM3HT

Introduction

This expansion module is a 2-point input/1-point output module with a terminal block.

For further hardware information, refer to TM2AMM3HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION
INOPERABLE EQUIPMENT
Be sure that the physical wiring of the module is compatible with the software configuration for the module.
Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the inputs and the outputs.

For each input, you can define:

Parameter		Value	Default value	Description
Type		Not used 0...10 V 4...20 mA	Not used	This identifies the mode of a channel.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper measurement limit.
	Customized	-32768...32767	32767	

For each output, you can define:

Parameter		Value	Value	Description
Type		Not used 0- 10 V 4 - 20 mA	Not used	This identifies the mode of a channel.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper limit.
	Customized	-32768...32767	32767	

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17).*

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

Channel		Type	Default value	Description
Inputs	IW0	INT	-	Current value of the input 0
	IW1	INT	-	Current value of the input 1
Outputs	QW0	INT	-32768...32767	Command word of the output 0

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18).*

TM2AMM6HT

Introduction

This expansion module is a 4-point input/2-point output module with 2 terminal blocks.

For further hardware information, refer to TM2AMM6HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION
INOPERABLE EQUIPMENT
Be sure that the physical wiring of the module is compatible with the software configuration for the module.
Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the inputs and the outputs.

Parameter	Type	Value	Default Value	Unit	Description
⊟ 📁 Inputs					
⊟ ◈ IW0					
◆ Type	Enumeration of BYTE	Not used	Not used		Range mode
◆ Scope	Enumeration of BYTE	Not used	Not used		Unit
◆ Minimum	INT	0	0		Minimum value
◆ Maximum	INT	4095	4095		Maximum value
⊟ ◈ IW1					
◆ Type	Enumeration of BYTE	Not used	Not used		Range mode
◆ Scope	Enumeration of BYTE	Not used	Not used		Unit
◆ Minimum	INT	0	0		Minimum value
◆ Maximum	INT	4095	4095		Maximum value
⊟ ◈ IW2					
◆ Type	Enumeration of BYTE	Not used	Not used		Range mode
◆ Scope	Enumeration of BYTE	Not used	Not used		Unit
◆ Minimum	INT	0	0		Minimum value
◆ Maximum	INT	4095	4095		Maximum value
⊟ ◈ IW3					
◆ Type	Enumeration of BYTE	Not used	Not used		Range mode
◆ Scope	Enumeration of BYTE	Not used	Not used		Unit
◆ Minimum	INT	0	0		Minimum value
◆ Maximum	INT	4095	4095		Maximum value
⊟ 📁 Outputs					
⊟ ◈ QW0					
◆ Type	Enumeration of BYTE	Not used	Not used		Range mode
◆ Scope	Enumeration of BYTE	Not used	Not used		Unit
◆ Minimum	INT	0	0		Minimum value
◆ Maximum	INT	4095	4095		Maximum value
⊟ ◈ QW1					
◆ Type	Enumeration of BYTE	Not used	Not used		Range mode
◆ Scope	Enumeration of BYTE	Not used	Not used		Unit
◆ Minimum	INT	0	0		Minimum value
◆ Maximum	INT	4095	4095		Maximum value

For each input, you can define:

Parameter		Value	Default value	Description
Type		Not used 0- 10 V 4 - 20 mA	Not used	This identifies the mode of a channel.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper measurement limit.
	Customized	-32768...32767	32767	

For each output, you can define:

Parameter		Value	Value	Description
Type		Not used 0- 10 V 4 - 20 mA	Not used	This identifies the mode of a channel.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper limit.
	Customized	-32768...32767	32767	

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17)*.

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

Channel		Type	Default value	Description
Inputs	IW0	INT	-	Current value of the input 0
	...	...	...	...
	IW3	INT	-	Current value of the input 3
Outputs	QW0	INT	-32768...32767	Command word of the output 0
	QW1	INT	-32768...32767	Command word of the output 1

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab Description *(see page 18)*.

TM2ALM3LT

Introduction

This expansion module is a 2-point input/1-point output module with a terminal block and accepts thermocouple and resistance thermometer signals.

For further hardware information, refer to TM2ALM3LT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog module.

CAUTION
INOPERABLE EQUIPMENT
Be sure that the physical wiring of the module is compatible with the software configuration for the module.
Failure to follow these instructions can result in equipment damage.

I/O Configuration Tab

The following table allows configuring the inputs and the outputs.

I/O Configuration	Expansion Bus I/O Mapping	Status	Information		
Parameter	Type	Value	Default Value	Unit	Description
⊟ 📁 Outputs					
⊟ ◈ QW0					
◆ Type	Enumeration of BYTE	Not used	Not used		Range mode
◆ Scope	Enumeration of BYTE	Not used	Not used		Unit
◆ Minimum	INT	0	0		Minimum value
◆ Maximum	INT	4095	4095		Maximum value

For each input, you can define:

Parameter	Value	Default value	Description
Type	Not used PT100 Thermocouple K Thermocouple J Thermocouple T	Not used	This identifies the mode of a channel.
Scope	Normal Customized Celsius (0.1°C) Fahrenheit (0.1°F)	Normal	This identifies the range of values for a channel.

Parameter		Value	Default value	Description
Minimum	Normal	0	0	Specifies the lower measurement limit.
	Celsius (0.1° C)	See the table below	See the table below	
	Fahrenheit (0.1° F)			
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper measurement limit.
	Celsius (0.1° C)	See the table below	See the table below	
	Fahrenheit (0.1° F)			
	Customized	-32768...32767	.32767	

Scope	Normal		Celsius (0.1° C)		Fahrenheit (0.1° F)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Thermocouple K	0	4095	-2700	13700	-4540	24980
Thermocouple J	0	4095	-2000	7600	-3280	14000
Thermocouple T	0	4095	-2700	4000	-4540	7520
PT100	0	4095	-1000	5000	-1480	9320

For each output, you can define:

Parameter		Value	Default value	Description
Type		Not used 0- 10 V 4 - 20 mA	Not used	This identifies the mode of a channel.
Scope		Normal Customized	Normal	This identifies the range of values for a channel.
Minimum	Normal	0	0	Specifies the lower limit.
	Customized	-32768...32767	-32768	
Maximum	Normal	4095	4095	Specifies the upper limit.
	Customized	-32768...32767	32767	

For further generic descriptions, refer to I/O Configuration Tab Description *(see page 17)*.

Expansion Bus I/O Mapping Tab

This identifies the addresses of each input and the channel name:

I/O Configuration	Expansion Bus I/O Mapping	Status	Information						
Channels									
Variable	Mapping	Channel	Address	Type	Current Value	Default Value	Unit	Description	
⊟ 📁 Inputs									
⋯ 🔷		IW0	%IW3	INT					
⋯ 🔷		IW1	%IW4	INT					
⊟ 📁 Outputs									
⋯ 🔷		QW0	%QW5	INT					

Channel		Type	Default value	Description
Inputs	IW0	INT	-	Current value of the input 0
	IW1	INT	-	Current value of the input 1
Outputs	QW0	INT	-32768...32767	Command word of the output 0

For further generic descriptions, refer to Expansion Bus I/O Mapping Tab
Description *(see page 18).*

TM2 Expert Modules

4

TM200HSC206DF and TM200HSC206DT

Overview

The TM200HSC206DT and TM200HSC206DF HSC accessory modules can be used to add additional HSC functionality to your system, and also provide additional counting modes (period meter and ratio).

Use the `GetRightBusStatus` *(see Modicon M238 Logic Controller, System Functions and Variables, M238 PLCSystem Library Guide)* function regularly to monitor the expansion bus configuration status.
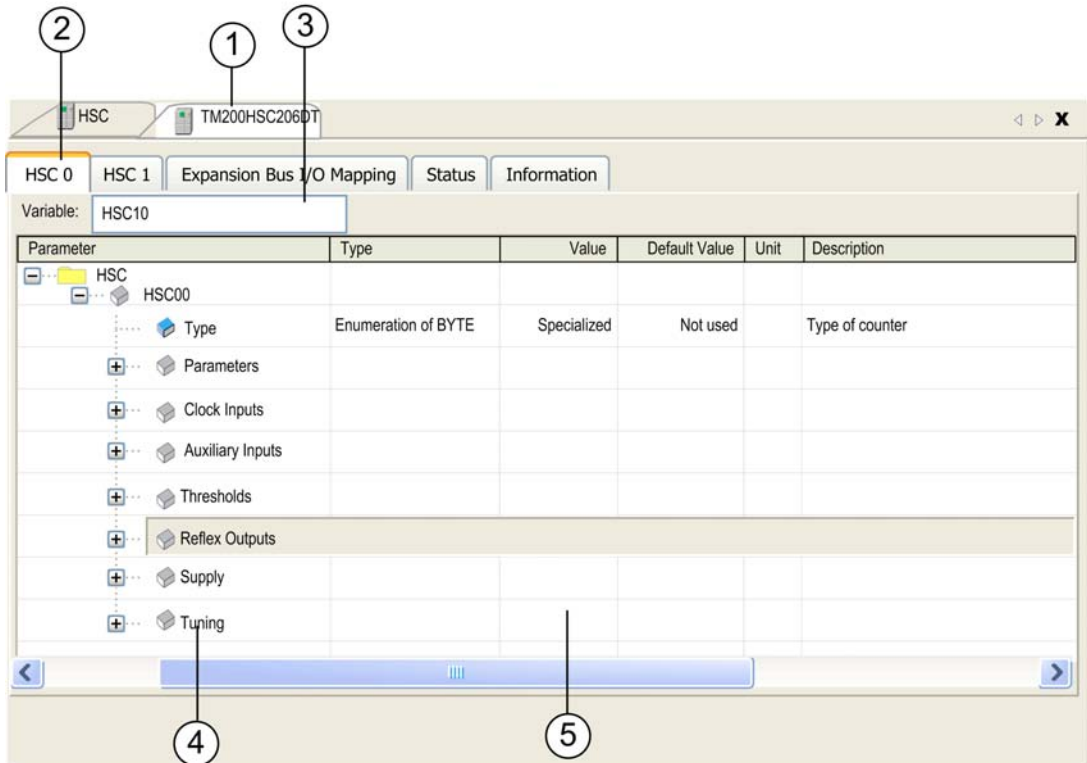
Access the Configuration Menu

Follow these steps to access to the HSC embedded function configuration Window with the **Configuration** menu:

Step	Description
1	Click on the **Configuration** menu: es　　　Configuration　　　Pro
2	Double click on the expansion module to configure. **NOTE:** You can also right-click on the controller you want and select **Edit Parameters**.

HSC Configuration Window

This figure is a sample HSC configuration window used to configure the HSC:

Mark	Action
1	Select this tab to access to the HSC configuration screen for a TM200HSC206DT.
2	Select one of these tabs according to the HSC channel you need to configure.
3	After choosing the type of HSC you want, use the field **Variable** to change the instance name.
4	If the parameters are collapsed, you can expand them by clicking the plus signs. You then have access to the settings of each parameter.
5	Configuration window where the HSC parameters are determined depending on the mode used *(see Modicon M238 Logic Controller, High Speed Counting, M238 HSC Library Guide)*.

TM2 Communication Module

5

TWDNOI10M3

Introduction
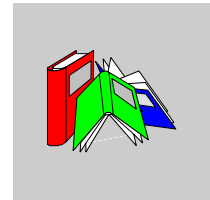
This expansion module is an AS-Interface master module.

To configure the TWDNOI10M3 expansion module, refer to AS-Interface Configuration *(see Modicon M238 Logic Controller, Programming Guide)*.

Glossary

A

ASCII

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

C

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 logicals 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.

controller

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

E

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 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.

expansion bus

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

expansion I/O modules

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

F

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's 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.

firmware

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

H

HSC

high-speed counter

I

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

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.)

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.

L

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.

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.

M

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.

Modbus

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

N

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.

network

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

node

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

P

protocol

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

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

real-time clock (RTC)

See RTC

reflex output

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

RFID

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

RPDO

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

RTC

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

S

scan

A controller's 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.

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.)

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.

T

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.
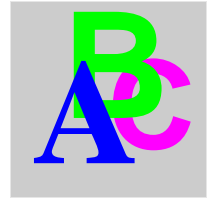
A controller can have sereval tasks.

threshold output

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

TPDO

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

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