Modicon TMC2
Cartridges
Programming Guide

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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, service, 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 a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

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

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could 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 document describes the software configuration of the TMC2 cartridges for logic controllers supported by EcoStruxure Machine Expert – Basic. For further information, refer to the separate documents provided in the EcoStruxure Machine Expert – Basic online help.

Validity Note

This document has been updated for the release of EcoStruxure™ Machine Expert - Basic V1.0.

Related Documents

Title of Documentation	Reference Number
EcoStruxure Machine Expert - Basic - Operating Guide	*EIO0000003281 (ENG)* *EIO0000003282 (FRA)* *EIO0000003283 (GER)* *EIO0000003284 (SPA)* *EIO0000003285 (ITA)* *EIO0000003286 (CHS)* *EIO0000003287 (POR)* *EIO0000003288 (TUR)*
Modicon M221 Logic Controller - Programming Guide	*EIO0000003297 (ENG)* *EIO0000003298 (FRA)* *EIO0000003299 (GER)* *EIO0000003300 (SPA)* *EIO0000003301 (ITA)* *EIO0000003302 (CHS)* *EIO0000003303 (POR)* *EIO0000003304 (TUR)*
Modicon M221 Logic Controller - Hardware Guide	*EIO0000003313 (ENG)* *EIO0000003314 (FRA)* *EIO0000003315 (GER)* *EIO0000003316 (SPA)* *EIO0000003317 (ITA)* *EIO0000003318 (CHS)* *EIO0000003319 (POR)* *EIO0000003320 (TUR)*

Title of Documentation	Reference Number
Modicon TMC2 Cartridges- Hardware Guide	*EIO0000003337 (ENG)* *EIO0000003338 (FRA)* *EIO0000003339 (GER)* *EIO0000003340 (SPA)* *EIO0000003341 (ITA)* *EIO0000003342 (CHS)* *EIO0000003343 (POR)* *EIO0000003344 (TUR)*

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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.

Chapter 1
I/O Configuration General Information

Introduction

This chapter provides general information to help you configure TMC2 cartridges in EcoStruxure Machine Expert – Basic.

What Is in This Chapter?

This chapter contains the following topics:

I/O Configuration General Practices

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 or, depending on the controller reference, to or from the controller (in the form of cartridges), then you must 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 no longer function while the embedded I/O that may be present in your controller continues to operate.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Update the configuration of your program each time you add or delete any type of I/O expansions on your I/O bus, 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.

General Description

Introduction

The TMC2 cartridges connect to Modicon TM221C Logic Controllers to increase the number of I/Os or serial lines available on the controller.

Cartridges can be either:

- Analog cartridges
- Serial line cartridges

Cartridge Features

The following table describes the TMC2 cartridge features:

Reference	Description
TMC2AI2 *(see page 16)*	TMC2 cartridge with 2 analog voltage or current inputs (0...10 V, 0...20 mA, 4...20 mA), 12 bits
TMC2TI2 *(see page 18)*	TMC2 cartridge with 2 analog temperature inputs (thermocouple, RTD), 14 bits
TMC2AQ2V *(see page 21)*	TMC2 cartridge with 2 analog voltage outputs (0...10 V), 12 bits
TMC2AQ2C *(see page 22)*	TMC2 cartridge with 2 analog current outputs (4...20 mA), 12 bits
TMC2SL1 *(see page 23)*	TMC2 cartridge with 1 serial line (RS232 or RS485)
TMC2HOIS01 *(see page 30)*	TMC2 application cartridge with 2 analog voltage or current inputs for hoisting load cells
TMC2PACK01 *(see page 32)*	TMC2 application cartridge with 2 analog voltage or current inputs for packaging
TMC2CONV01 *(see page 34)*	TMC2 application cartridge with 1 serial line for conveying

Using Cartridges in a Configuration

Adding a Cartridge

TMC2 cartridges can be connected to Modicon TM221C Logic Controller with 1 or 2 cartridge slots.

NOTE: It is not possible to add 2 serial line cartridges to the same logic controller. For more information on cartridge compatibility with specific controllers, refer to the Hardware Guide of your logic controller.

The following steps explain how to add a cartridge to a logic controller in an EcoStruxure Machine Expert - Basic configuration:

Step	Description	Result
1	Click the **Configuration** tab in the EcoStruxure Machine Expert - Basic window.	–
2	In the hardware catalog area of the window, select **M221 Cartridges**.	–
3	Select a cartridge reference.	A description of the physical characteristics of the selected cartridge appears in the bottom right-hand corner of the EcoStruxure Machine Expert - Basic window.
4	Drag and drop the cartridge onto an empty cartridge slot of a Modicon TM221C Logic Controller logic controller.	The cartridge is added to the **MyController → IO Bus** area of the device tree. For serial line cartridges, the **SL2 (Serial line)** node appears. For analog cartridges, the **Analog inputs** or **Analog outputs** subnode appears immediately below the cartridge reference. The following information about the selected cartridge is displayed in the lower central area of the EcoStruxure Machine Expert - Basic window: ● Information about the current status of the cartridge. ● For application cartridges, a list of project templates available for the cartridge.

Replacing an Existing Cartridge

To replace an existing cartridge with a difference reference, drag and drop the new cartridge onto the cartridge to be replaced.

A message appears asking you to confirm the operation. Click **Yes** to continue.

Removing a Cartridge

To remove a cartridge from a controller, either click on the cartridge and press the **Delete** key, or right-click on the cartridge and click **Remove** on the contextual menu that appears.

If the cartridge contains at least one address being used in the user logic of the program, a message appears asking you to confirm the operation. Click **Yes** to continue.

Configuring Cartridges

Overview

You can configure cartridges on:

- The **Configuration** tab
- The **Programming** tab

Displaying Configuration Details

The **Configuration** tab allows you to configure cartridge modules.

The steps below describe how to view the configuration of digital inputs on the **Configuration** tab:

Step	Description
1	Select the **Configuration** tab.
2	For analog cartridges, select **Cartridge 1** or **Cartridge 2** in the device tree on the left of the EcoStruxure Machine Expert - Basic window then click on the **Analog inputs** or **Analog outputs** subnode. For serial line cartridges, select **SL2 (Serial line)** in the device tree on the left of the EcoStruxure Machine Expert - Basic window The properties of the selected cartridge are displayed.
3	Refer to TMC2 Standard Cartridges Configuration *(see page 15)* or TMC2 Application Cartridges Configuration *(see page 29)* for configuration details.

Displaying Programming Properties

The **Programming** tab allows you to configure programming-related properties of analog cartridges, such as symbols and comments.

To display analog cartridge properties in the **Programming** tab:

Step	Description
1	Select the **Programming** tab.
2	Click **Tools → I/O objects → Analog inputs** or **Tools → I/O objects → Analog outputs** A list of I/O addresses appears in the lower central area of the EcoStruxure Machine Expert - Basic window.
3	Scroll down to the range of addresses corresponding to the cartridge you are configuring. The following properties are displayed: ● **Used**. Whether the address is being used in your program ● **Address**. The analog input or analog output address. Refer to I/O Addressing *(see EcoStruxure Machine Expert - Basic, Generic Functions Library Guide)* for details. ● **Symbol**. An optional symbol associated with the address. Double-click in the **Symbol** column and type the name of a symbol to associate with this input. If a symbol already exists, right-click in the **Symbol** column and choose **Search and Replace** to find and replace occurrences of this symbol in the application. ● **Comment**. An optional comment associated with the address. Double-click in the **Comment** column and type a comment to associate with this address.

Chapter 2
TMC2 Standard Cartridges Configuration

Introduction

This chapter describes how to configure the TMC2 standard cartridges.

What Is in This Chapter?

This chapter contains the following topics:

TMC2AI2

Introduction

The TMC2AI2 is a standard cartridge featuring 2 analog voltage or current input channels with 12-bit resolution.

The channel input types are:

- 0...10 V
- 0...20 mA
- 4...20 mA

For further hardware information, refer to TMC2AI2 *(see Modicon TMC2, Cartridges, Hardware Guide)*.

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert - Basic, you may damage the analog circuit.

NOTICE
INOPERABLE EQUIPMENT Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel. **Failure to follow these instructions can result in equipment damage.**

Configuring the Module

For each input, you can define:

Parameter		Value	Default Value	Description
Used		True/False	False	Indicates whether the address is being used in a program.
Address		`%IW0.x0y`	-	The address of the input channel, where *x* is the module number and *y* is the channel number
Type		**Not used** **0 - 10 V** **0 - 20 mA** **4 - 20 mA**	**Not used**	Select the mode of the channel.
Scope		**Normal**	**Normal**	The range of values for a channel.
Min.	**0 - 10 V**	-32768...32767	0	Specifies the lower measurement limit.
	0 - 20 mA		0	
	4 - 20 mA		4000	
Max.	**0 - 10 V**	-32768...32767	10000	Specifies the upper measurement limit.
	0 - 20 mA		20000	
	4 - 20 mA		20000	
Filter		0...100	0	Specifies the filtering value. Multiply by the **Filter Unit** value to obtain the filtering time.
Filter Unit		100 ms	100 ms	Specifies the unit of time for the filtering value.
Units		-	-	-

TMC2TI2

Introduction

The TMC2TI2 is a standard cartridge featuring 2 analog input channels with 14-bit resolution.

The channel input types are:

- K Thermocouple
- J Thermocouple
- R Thermocouple
- S Thermocouple
- B Thermocouple
- E Thermocouple
- T Thermocouple
- N Thermocouple
- C Thermocouple
- PT100
- PT1000
- NI100
- NI1000

For further hardware information, refer to TMC2TI2 *(see Modicon TMC2, Cartridges, Hardware Guide)*.

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert - Basic, you may damage the analog circuit.

NOTICE
INOPERABLE EQUIPMENT Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel. **Failure to follow these instructions can result in equipment damage.**

Configuring the Module

For each input, you can define:

Parameter		Value	Default Value	Description
Used		True/False	False	Indicates whether the address is being used in a program.
Address		%IW0.x0y	-	The address of the input channel, where *x* is the module number and *y* is the channel number
Type		**K Thermocouple** **J Thermocouple** **R Thermocouple** **S Thermocouple** **B Thermocouple** **E Thermocouple** **T Thermocouple** **N Thermocouple** **C Thermocouple** **PT100** **PT1000** **NI100** **NI1000**	**K Thermocouple**	Choose the mode of the channel.
Scope		**Normal** **Celsius (0.1°C)** **Fahrenheit (0.1°F)** (except Thermocouple B and C) **Fahrenheit (0.2°F)** (for Thermocouple B and C only)	**Normal**	Choose the temperature units for a channel.
Min.	**Temperature**	See the table below		Specifies the lower measurement limit.
Max.	**Temperature**	See the table below		Specifies the upper measurement limit.
Filter		0...100	0	Specifies the filtering value. Multiply by the **Filter Unit** value to obtain the filtering time.
Filter Unit		100 ms	100 ms	Specifies the unit of time for the filtering value.
Units		See the table below		Displays the temperature unit configured.

Type	Customized		Celsius			Fahrenheit		
	Min.	Max.	Min.	Max.	Units	Min.	Max.	Units
K Thermocouple	-32768	32767	-2000	13000	0.1 °C	-3280	23720	0.1 °F
J Thermocouple	-32768	32767	-2000	10000	0.1 °C	-3280	18320	0.1 °F
R Thermocouple	-32768	32767	0	17600	0.1 °C	320	32000	0.1 °F
S Thermocouple	-32768	32767	0	17600	0.1 °C	320	32000	0.1 °F
B Thermocouple	-32768	32767	0	18200	0.1 °C	160	16540	0.2 °F
E Thermocouple	-32768	32767	-2000	8000	0.1 °C	-3280	14720	0.1 °F
T Thermocouple	-32768	32767	-2000	4000	0.1 °C	-3280	7520	0.1 °F
N Thermocouple	-32768	32767	-2000	13000	0.1 °C	-3280	23720	0.1 °F
C Thermocouple	-32768	32767	0	23150	0.1 °C	160	20995	0.2 °F
PT100	-32768	32767	-2000	8500	0.1 °C	-3280	15620	0.1 °F
PT1000	-32768	32767	-2000	6000	0.1 °C	-3280	11120	0.1 °F
NI100	-32768	32767	-600	1800	0.1 °C	-760	3560	0.1 °F
NI1000	-32768	32767	-600	1800	0.1 °C	-760	3560	0.1 °F

TMC2AQ2V

Introduction

The TMC2AQ2V is a standard cartridge featuring 2 analog voltage output channels with 12-bit resolution.

The channel output types are:

- 0...10 V

For further hardware information, refer to TMC2AQ2V *(see Modicon TMC2, Cartridges, Hardware Guide)*.

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert - Basic, you may damage the analog circuit.

NOTICE
INOPERABLE EQUIPMENT Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel. **Failure to follow these instructions can result in equipment damage.**

Configuring the Cartridge Module

For each output, you can define:

Parameter		Value	Default Value	Description
Used		True/False	False	Indicates whether the address is being used in a program.
Address		`%QW0.x0y`	-	Shows the address of the output channel, where *x* is the cartridge number and *y* is the channel number
Type		**0 - 10 V**	**0 - 10 V**	The mode of the channel.
Scope		**Normal**	**Normal**	The range of values for a channel.
Min.	**0 - 10 V**	-32768...32767	0	Specifies the lower measurement limit.
Max.	**0 - 10 V**	-32768...32767	10000	Specifies the upper measurement limit.
Fallback value		**Min.**...**Max.**	0 (**Min.** if 0 is not in the range)	Specifies the fallback value of the output channel.
Units		-	-	-

TMC2AQ2C

Introduction

The TMC2AQ2C is a standard cartridge featuring 2 analog current output channels with 12-bit resolution.

The channel output types are:

- 4...20 mA

For further hardware information, refer to TMC2AQ2C *(see Modicon TMC2, Cartridges, Hardware Guide)*.

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert - Basic, you may damage the analog circuit.

NOTICE
INOPERABLE EQUIPMENT Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel. **Failure to follow these instructions can result in equipment damage.**

Configuring the Cartridge Module

For each output, you can define:

Parameter		Value	Default Value	Description
Used		True/False	False	Indicates whether the address is being used in a program.
Address		%QW0.x0y	-	Shows the address of the output channel, where *x* is the cartridge number and *y* is the channel number
Type		**4 - 20 mA**	**4 - 20 mA**	The mode of the channel.
Scope		**Normal**	**Normal**	The range of values for a channel.
Min.	**4 - 20 mA**	-32768...32767	4000	Specifies the lower measurement limit.
Max.	**4 - 20 mA**	-32768...32767	20000	Specifies the upper measurement limit.
Fallback value		**Min.**...**Max.**	0 (**Min.** if 0 is not in the range)	Specifies the fallback value of the output channel.
Units			-	-

TMC2SL1

Introduction

The TMC2SL1 is a standard cartridge module featuring 1 serial line.

For further hardware information, refer to TMC2SL1 *(see Modicon TMC2, Cartridges, Hardware Guide)*.

The serial line can be configured for any one of the following protocols:

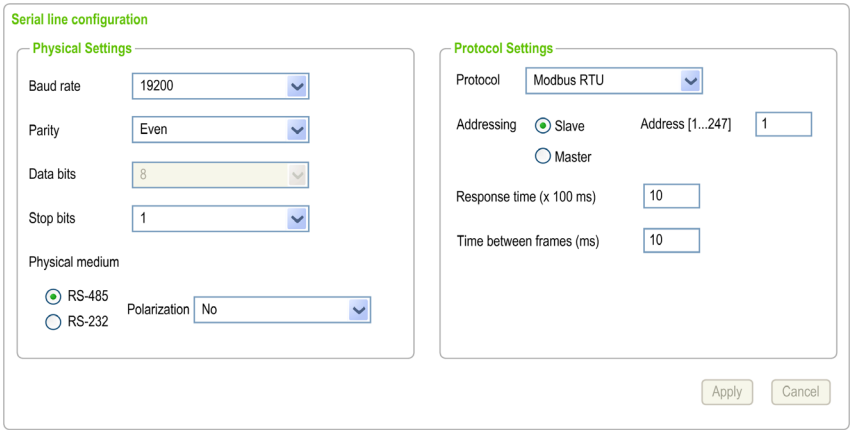
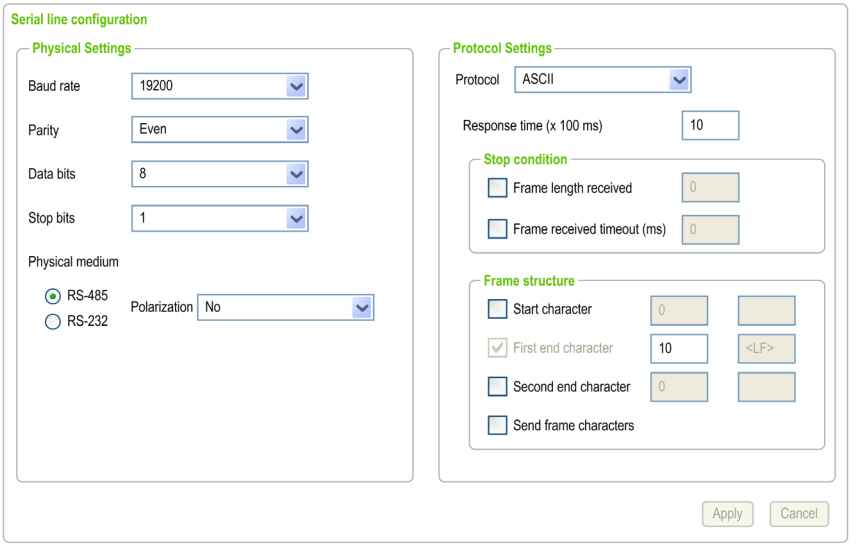
- Modbus RTU
- Modbus ASCII
- ASCII

You can configure both physical and protocol settings for the serial line. Serial lines are configured for the Modbus RTU protocol by default.

NOTE: You can only add one serial line cartridge to the controller.

Serial Line Configuration

This table describes how to configure the serial line:

Step	Action
1	Click the **SL2 (Serial line)** node in the **Hardware Tree** to display the serial line properties. This figure shows the properties of the serial line for **Modbus RTU** and **Modbus ASCII** protocols:  This figure shows the properties of the serial line for **ASCII** protocol: 
2	Edit the properties to configure the serial line. For detailed information on the serial line configuration parameters, refer to the table below.

This table describes each parameter of the serial line:

Parameter	Editable	Value	Default Value	Description
Physical settings				
Baud rate	Yes	**1200** **2400** **4800** **9600** **19200** **38400** **57600** **115200**	**19200**	Allows you to select the data transmission rate (bits per second) for the modem from the drop-down list.
Parity	Yes	**None** **Even** **Odd**	**Even**	Allows you to select the parity of the transmitted data for error detection. Parity is a method of error detection in transmission. When parity is used with a serial port, an extra data bit is sent with each data character, arranged so that the number of 1 bits in each character, including the parity bit, is always odd or always even. If a byte is received with the wrong number of 1 bits, the byte is corrupt. However, an even number of detected errors can pass the parity check.
Data bits	Yes (only for the **ASCII** protocol	**7** **8**	**7** for Modbus ASCII, **8** for Modbus RTU	Allows you to select the number of data bits from the drop-down list. The number of data bits in each character can be 7 (for true ASCII) or 8 (for any kind of data, as this matches the size of a byte). 8 data bits are almost universally used in all applications.
Stop bits	Yes	**1** **2**	**1**	Allows you to select the number of stop bits from the drop-down list. A stop bit is a bit indicating the end of a byte of data. For electronic devices, 1 stop bit is usually used. For slow devices like electromechanical teleprinters, 2 stop bits are used.

Parameter	Editable	Value	Default Value	Description
Physical medium	Yes	**RS485** True/False **RS232** True/False	**RS485** True	Allows you to select the physical medium for communication. You can only select either the **RS485** or **RS232** medium. Enabling one medium disables the other one. A physical medium in data communications is the transmission path over which a signal propagates. It is an interface for interconnection of devices with the logic controller.
Polarization	Yes	**Yes** **No**	**No**	Polarization resistors are integrated in the cartridge module. Specify whether to switch on or off polarization.
Protocol settings				
Protocol	Yes	**Modbus RTU** **Modbus ASCII** **ASCII**	**Modbus RTU**	Allows you to select the protocol transmission mode for communication from the drop-down list. Protocol advanced parameters are displayed based on the selected protocol. Refer to the following figures and tables.
Protocol settings for the **Modbus RTU** and **Modbus ASCII** protocols:				
Addressing	Yes	**Slave** **Master**	**Slave**	Allows you to select the addressing mode. You can only select either of the **Slave** or **Master** addressing. Enabling one addressing mode disables the other one.
Address [1...247]	Yes	1...247	1	Allows you to specify the address ID of the slave. **NOTE:** This field is displayed only for the addressing of the slave. For master, this field does not appear on the screen.
Response time (x 100 ms)	Yes	10...255 ms	10	Allows you to specify the response time of the protocol to the queries.
Time between frames (ms)	Yes	3...255 ms	10	Allows you to specify the time between frames of the protocol.

Parameter	Editable	Value	Default Value	Description
Protocol settings for the **ASCII** protocol:				
Stop condition				
Response time (x 100 ms)	Yes	1...255	10	Allows you to specify the response time of the protocol to the queries.
Frame length received	Yes	0...255	0	Allows you to specify the frame length received.
Frame received timeout (ms)	Yes	0...255	10	Allows you to specify the frame received timeout.
Frame structure				
Start character	Yes	0...255	58 (if check box is selected)	Allows you to specify the start character of the frame.
First end character	Yes	0...255	10 (if check box is selected)	Allows you to specify the first end character of the frame.
Second end character	Yes	0...255	10 (if check box is selected)	Allows you to specify the second end character of the frame.
Send frame characters	Yes	True/False	False	Allows you to enable or disable sending first end character of the frame to the ASCII protocol.

Chapter 3
TMC2 Application Cartridges Configuration

Introduction

This chapter describes how to configure the TMC2 application cartridges.

What Is in This Chapter?

This chapter contains the following topics:

TMC2HOIS01

Introduction

The TMC2HOIS01 is an application cartridge module for hoisting, featuring 2 analog voltage or current input channels with 12-bit resolution.

The channel input types are:

- 0...10 V
- 0...20 mA
- 4...20 mA

For further hardware information, refer to TMC2HOIS01 *(see Modicon TMC2, Cartridges, Hardware Guide)*.

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert - Basic, you may damage the analog circuit.

NOTICE
INOPERABLE EQUIPMENT Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel. **Failure to follow these instructions can result in equipment damage.**

Configuring the Module

For each input, you can define:

Parameter		Value	Default Value	Description
Used		True/False	False	Indicates whether the address is being used in a program.
Address		`%IW0.x0y`	-	The address of the input channel, where *x* is the module number and *y* is the channel number
Type		**Not used** **0 - 10 V** **0 - 20 mA** **4 - 20 mA**	**Not used**	Choose the mode of the channel.
Scope		**Customized**	**Customized**	The range of values for a channel.
Min.	**0 - 10 V**	-32768...32767	0	Specifies the lower measurement limit.
	0 - 20 mA		0	
	4 - 20 mA		4000	
Max.	**0 - 10 V**	-32768...32767	10000	Specifies the upper measurement limit.
	0 - 20 mA		20000	
	4 - 20 mA		20000	
Filter		0...100	0	Specifies the filtering value. Multiply by the **Filter Unit** value to obtain the filtering time.
Filter Unit		100 ms	100 ms	Specifies the unit of time for the filtering value.
Units)		-	-	-

TMC2PACK01

Introduction

The TMC2PACK01 is an application cartridge module for packaging, featuring 2 analog voltage or current input channels with 12-bit resolution.

The channel input types are:

- 0...10 V
- 0...20 mA
- 4...20 mA

For further hardware information, refer to TMC2PACK01 *(see Modicon TMC2, Cartridges, Hardware Guide)*.

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert - Basic, you may damage the analog circuit.

NOTICE
INOPERABLE EQUIPMENT Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel. **Failure to follow these instructions can result in equipment damage.**

Configuring the Module

For each input, you can define:

Parameter		Value	Default Value	Description
Used		True/False	False	Indicates whether the address is being used in a program.
Address		`%IW0.x0y`	-	The address of the input channel, where *x* is the module number and *y* is the channel number
Type		**Not used** **0 - 10 V** **0 - 20 mA** **4 - 20 mA**	**Not used**	Choose the mode of the channel.
Scope		**Customized**	**Customized**	The range of values for a channel.
Min.	**0 - 10 V**	-32768...32767	0	Specifies the lower measurement limit.
	0 - 20 mA		0	
	4 - 20 mA		4000	
Max.	**0 - 10 V**	-32768...32767	10000	Specifies the upper measurement limit.
	0 - 20 mA		20000	
	4 - 20 mA		20000	
Filter (x 100ms)		0...100	0	Specifies the filtering time (0...10 s).
Units)		-	-	-

TMC2CONV01

Introduction

The TMC2CONV01 is an application cartridge module featuring 1 serial line for conveying.

For further hardware information, refer to TMC2CONV01 *(see Modicon TMC2, Cartridges, Hardware Guide)*.

The serial line can be configured for any one of the following protocols:

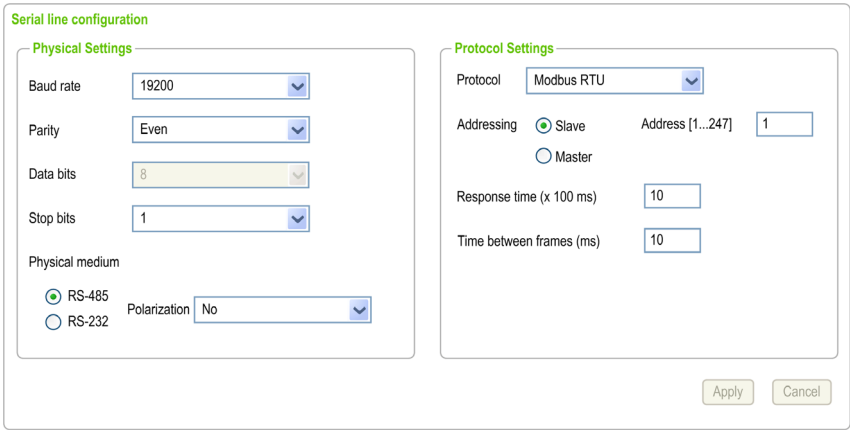
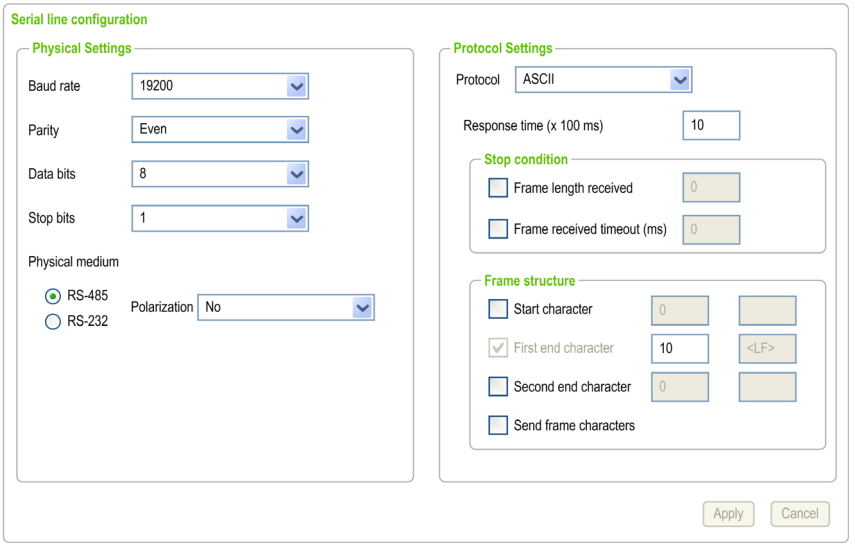
- Modbus RTU
- Modbus ASCII
- ASCII

You can configure both physical and protocol settings for the serial line. Serial lines are configured for the Modbus RTU protocol by default.

NOTE: You can only add one serial line cartridge to the controller.

Serial Line Configuration

This table describes how to configure the serial line:

Step	Action
1	Click the **SL2 (Serial line)** node in the **Hardware Tree** to display the serial line properties. This figure shows the properties of the serial line for **Modbus RTU** and **Modbus ASCII** protocols:  This figure shows the properties of the serial line for **ASCII** protocol: 
2	Edit the properties to configure the serial line. For detailed information on the serial line configuration parameters, refer to the table below.

This table describes each parameter of the serial line:

Parameter	Editable	Value	Default Value	Description
Physical settings				
Baud rate	Yes	**1200** **2400** **4800** **9600** **19200** **38400** **57600** **115200**	**19200**	Allows you to select the data transmission rate (bits per second) for the modem from the drop-down list.
Parity	Yes	**None** **Even** **Odd**	**Even**	Allows you to select the parity of the transmitted data for error detection. Parity is a method of error detection in transmission. When parity is used with a serial port, an extra data bit is sent with each data character, arranged so that the number of 1 bits in each character, including the parity bit, is always odd or always even. If a byte is received with the wrong number of 1 bits, the byte is corrupt. However, an even number of detected errors can pass the parity check.
Data bits	Yes (only for the **ASCII** protocol	**7** **8**	**7** for Modbus ASCII, **8** for Modbus RTU	Allows you to select the number of data bits from the drop-down list. The number of data bits in each character can be 7 (for true ASCII) or 8 (for any kind of data, as this matches the size of a byte). 8 data bits are almost universally used in all applications.
Stop bits	Yes	**1** **2**	**1**	Allows you to select the number of stop bits from the drop-down list. A stop bit is a bit indicating the end of a byte of data. For electronic devices, 1 stop bit is usually used. For slow devices like electromechanical teleprinters, 2 stop bits are used.

Parameter	Editable	Value	Default Value	Description
Physical medium	Yes	**RS485** True/False **RS232** True/False	**RS485** True	Allows you to select the physical medium for communication. You can only select either the **RS485** or **RS232** medium. Enabling one medium disables the other one. A physical medium in data communications is the transmission path over which a signal propagates. It is an interface for interconnection of devices with the logic controller.
Polarization	Yes	**Yes** **No**	**No**	Polarization resistors are integrated in the cartridge module. Specify whether to switch on or off polarization.
Protocol settings				
Protocol	Yes	**Modbus RTU** **Modbus ASCII** **ASCII**	**Modbus RTU**	Allows you to select the protocol transmission mode for communication from the drop-down list. Protocol advanced parameters are displayed based on the selected protocol. Refer to the following figures and tables.
Protocol settings for the **Modbus RTU** and **Modbus ASCII** protocols:				
Addressing	Yes	**Slave** **Master**	**Slave**	Allows you to select the addressing mode. You can only select either of the **Slave** or **Master** addressing. Enabling one addressing mode disables the other one.
Address [1...247]	Yes	1...247	1	Allows you to specify the address ID of the slave. **NOTE:** This field is displayed only for the addressing of the slave. For master, this field does not appear on the screen.
Response time (x 100 ms)	Yes	10...255 ms	10	Allows you to specify the response time of the protocol to the queries.
Time between frames (ms)	Yes	3...255 ms	10	Allows you to specify the time between frames of the protocol.

Parameter	Editable	Value	Default Value	Description
Protocol settings for the **ASCII** protocol:				
Stop condition				
Response time (x 100 ms)	Yes	1...255	10	Allows you to specify the response time of the protocol to the queries.
Frame length received	Yes	0...255	0	Allows you to specify the frame length received.
Frame received timeout (ms)	Yes	0...255	10	Allows you to specify the frame received timeout.
Frame structure				
Start character	Yes	0...255	58 (if check box is selected)	Allows you to specify the start character of the frame.
First end character	Yes	0...255	10 (if check box is selected)	Allows you to specify the first end character of the frame.
Second end character	Yes	0...255	10 (if check box is selected)	Allows you to specify the second end character of the frame.
Send frame characters	Yes	True/False	False	Allows you to enable or disable sending first end character of the frame to the ASCII protocol.

Chapter 4
TMC2 Analog Cartridge Diagnostics

TMC2 Analog Cartridge Diagnostics

Introduction

For analog cartridges, the operating status of each I/O channel is given by the objects:

- %IWS0.x0y for input channel y of cartridge x
- %QWS0.x0y for output channel y of cartridge x

The real-time values of these objects can be read when in online mode, using either an animation table *(see EcoStruxure Machine Expert - Basic, Operating Guide)* or the application.

Input Channel Status Description

This table describes the possible values of the %IWS input channel status word:

Byte value	Description
0	Normal
1	Data conversion in progress
2	Initialization
3	Input operation setting error or cartridge with no input
4	Undefined
5	Wiring error detected (input voltage/current high limit exceeded).
6	Wiring error detected (input voltage/current low limit exceeded).
7	Non-volatile memory error
8...255	Undefined

Output Channel Status Description

This table describes the possible values of the %QWS output channel status word:

Byte value	Description
0	Normal
1	Undefined
2	Initialization
3	Output operation setting error or cartridge with no output
4	Undefined
5	Undefined
6	Undefined
7	Non-volatile memory error
8...255	Undefined

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