

Modicon TM3 Bus Coupler 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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Table of Contents



	Safety Information	5
	About the Book	7
Chapter 1	TM3 Bus Coupler Configuration General Information ..	13
1.1	I/O Configuration General Practices	14
	I/O Configuration General Practices	14
1.2	TM3 Module General Information	16
	TM3 I/O Configuration General Description	17
	TM3 General Description	19
1.3	TM2 Module General Information	29
	TM2 General Description	29
1.4	Adding a TM3 Bus Coupler and Expansion Modules	32
	Adding a Bus Coupler	33
	Adding an Expansion Module	34
	Optional I/O Expansion Modules	38
Chapter 2	TM3 Ethernet Bus Coupler	41
2.1	Presentation	42
	TM3 Ethernet Bus Coupler Presentation	42
2.2	Ethernet Configuration	43
	Ethernet Services	44
	Ethernet Configuration Operating Modes	45
	Ethernet/IP Adapter	47
	Modbus TCP Server	66
	Web Server	70
	Ring Topology (RSTP)	83
	SNMP	84
2.3	USB Configuration	85
	USB Configuration	85
2.4	Dagnostic	86
	Dagnostic	86
Chapter 3	Updating the Firmware	87
	Updating the Firmware of the Bus Coupler	87
Glossary	89
Index	93

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 configuration of the TM3 bus coupler for EcoStruxure Machine Expert. For further information, refer to the separate documents provided in the EcoStruxure Machine Expert online help.

Validity Note

This document has been updated for the release of EcoStruxure™ Machine Expert V1.1.

Related Documents

Title of Documentation	Reference Number
TM3 Bus Coupler - Hardware Guide	EIO0000003635 (ENG) EIO0000003636 (FRE) EIO0000003637 (GER) EIO0000003638 (SPA) EIO0000003639 (ITA) EIO0000003640 (CHS) EIO0000003641 (POR) EIO0000003642 (TUR)
TM3 Digital I/O Modules - Hardware Guide	EIO0000003125 (ENG) EIO0000003126 (FRE) EIO0000003127 (GER) EIO0000003128 (SPA) EIO0000003129 (ITA) EIO0000003130 (CHS) EIO0000003424 (POR) EIO0000003425 (TUR)
TM3 Analog I/O Modules - Hardware Guide	EIO0000003131 (ENG) EIO0000003132 (FRE) EIO0000003133 (GER) EIO0000003134 (SPA) EIO0000003135 (ITA) EIO0000003136 (CHS) EIO0000003426 (POR) EIO0000003427 (TUR)

Title of Documentation	Reference Number
TM3 Expert Modules - Hardware Guide	<u>EIO0000003137 (ENG)</u> <u>EIO0000003138 (FRE)</u> <u>EIO0000003139 (GER)</u> <u>EIO0000003140 (SPA)</u> <u>EIO0000003141 (ITA)</u> <u>EIO0000003142 (CHS)</u> <u>EIO0000003428 (POR)</u> <u>EIO0000003429 (TUR)</u>
TM3 Safety Modules - Hardware Guide	<u>EIO0000003353 (ENG)</u> <u>EIO0000003354 (FRE)</u> <u>EIO0000003355 (GER)</u> <u>EIO0000003356 (SPA)</u> <u>EIO0000003357 (ITA)</u> <u>EIO0000003358 (CHS)</u> <u>EIO0000003359 (POR)</u> <u>EIO0000003360 (TUR)</u>
TM3 Transmitter and Receiver Modules - Hardware Guide	<u>EIO0000003143 (ENG)</u> <u>EIO0000003144 (FRE)</u> <u>EIO0000003145 (GER)</u> <u>EIO0000003146 (SPA)</u> <u>EIO0000003147 (ITA)</u> <u>EIO0000003148 (CHS)</u> <u>EIO0000003430 (POR)</u> <u>EIO0000003431 (TUR)</u>
Modicon M251 Logic Controller - Programming Guide	<u>EIO0000003089 (ENG)</u> <u>EIO0000003090 (FRE)</u> <u>EIO0000003091 (GER)</u> <u>EIO0000003092 (SPA)</u> <u>EIO0000003093 (ITA)</u> <u>EIO0000003094 (CHS)</u>
Modicon M241 Logic Controller - Programming Guide	<u>EIO0000003059 (ENG)</u> <u>EIO0000003060 (FRE)</u> <u>EIO0000003061 (GER)</u> <u>EIO0000003062 (SPA)</u> <u>EIO0000003063 (ITA)</u> <u>EIO0000003064 (CHS)</u>

Title of Documentation	Reference Number
Modicon M262 Logic/Motion Controller Programming Guide	<i>EIO0000003651 (ENG)</i> <i>EIO0000003652 (FRE)</i> <i>EIO0000003653 (GER)</i> <i>EIO0000003654 (SPA)</i> <i>EIO0000003655 (ITA)</i> <i>EIO0000003656 (CHS)</i> <i>EIO0000003657 (POR)</i> <i>EIO0000003658 (TUR)</i>
EcoStruxure Machine Expert Programming Guide	<i>EIO0000002854 (ENG)</i> <i>EIO0000002855 (FRE)</i> <i>EIO0000002856 (GER)</i> <i>EIO0000002858 (SPA)</i> <i>EIO0000002857 (ITA)</i> <i>EIO0000002859 (CHS)</i>
EcoStruxure Machine Expert Industrial Ethernet User Guide	<i>EIO0000003053 (ENG)</i> <i>EIO0000003054 (FRE)</i> <i>EIO0000003055 (GER)</i> <i>EIO0000003056 (SPA)</i> <i>EIO0000003057 (ITA)</i> <i>EIO0000003058 (CHS)</i>

You can download these technical publications and other technical information from our website at <https://www.schneider-electric.com/en/download>

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.

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2015	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2016	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive (2006/42/EC)* and *ISO 12100:2010*.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

Chapter 1

TM3 Bus Coupler Configuration General Information

Introduction

This chapter provides general information to help you configure TM3 bus coupler in EcoStruxure Machine Expert.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
1.1	I/O Configuration General Practices	14
1.2	TM3 Module General Information	16
1.3	TM2 Module General Information	29
1.4	Adding a TM3 Bus Coupler and Expansion Modules	32

Section 1.1

I/O Configuration General Practices

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.

The Optional Feature for I/O Expansion Modules

I/O expansion modules can be marked as optional in the configuration. The **Optional module** feature provides a more flexible configuration by the acceptance of the definition of modules that are not physically attached to the controller. Therefore, a single application can support multiple physical configurations of I/O expansion modules, allowing a greater degree of scalability without the necessity of maintaining multiple application files for the same application.

You must be fully aware of the implications and impacts of marking I/O modules as optional in your application, both when those modules are physically absent and present when running your machine or process. Be sure to include this feature in your risk analysis.

WARNING

UNINTENDED EQUIPMENT OPERATION

Include in your risk analysis each of the variations of I/O configurations that can be realized marking I/O expansion modules as optional, and in particular the establishment of TM3 Safety modules (TM3S...) as optional I/O modules, and make a determination whether it is acceptable as it relates to your application.

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

NOTE: For more details about this feature, refer to Optional I/O Expansion Modules ([see page 38](#)).

Section 1.2

TM3 Module General Information

What Is in This Section?

This section contains the following topics:

Topic	Page
TM3 I/O Configuration General Description	17
TM3 General Description	19

TM3 I/O Configuration General Description

Introduction

The I/O expansion bus of the bus coupler is formed when you assemble the TM3 I/O expansion modules to the bus coupler.

I/O Expansion Bus Error Handling

When the bus coupler detects a TM3 module in bus communication error it sets the bus to a "bus off" condition whereby the TM3 expansion module outputs, the input image value and the output image value are set to 0. A TM3 expansion module is considered to be in bus communication error when an I/O exchange with the expansion module has been unsuccessful for at least 10 consecutive bus task cycles.

Normal I/O expansion bus operation can only be restored after eliminating the source of the error and performing one of the following:

- Power cycle
- New application download
- Issuing a controller **Reset Warm** or **Reset Cold** command with EcoStruxure Machine Expert.

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.

The Optional Feature for I/O Expansion Modules

I/O expansion modules can be marked as optional in the configuration. The **Optional module** feature provides a more flexible configuration by the acceptance of the definition of modules that are not physically attached to the logic controller. Therefore, a single application can support multiple physical configurations of I/O expansion modules, allowing a greater degree of scalability without the necessity of maintaining multiple application files for the same application.

You must be fully aware of the implications and impacts of marking I/O modules as optional in your application, both when those modules are physically absent and present when running your machine or process. Be sure to include this feature in your risk analysis.

 WARNING
UNINTENDED EQUIPMENT OPERATION
Include in your risk analysis each of the variations of I/O configurations that can be realized marking I/O expansion modules as optional, and in particular the establishment of TM3 Safety modules (TM3S...) as optional I/O modules, and make a determination whether it is acceptable as it relates to your application.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: For more details about this feature, refer to Optional I/O Expansion Modules (*see page 38*).

TM3 General Description

Introduction

The range of TM3 expansion modules includes:

- Digital modules, classified as follows:
 - Input modules (*see page 20*)
 - Output modules (*see page 21*)
 - Mixed input/output modules (*see page 23*)
- Analog modules, classified as follows:
 - Input modules (*see page 24*)
 - Output modules (*see page 25*)
 - Mixed input/output modules (*see page 26*)
- Expert modules (*see page 27*)
- Transmitter and receiver modules (*see page 27*)
- Safety modules (*see page 27*)

The range of TM3 bus couplers includes:

- TM3 Ethernet bus coupler

Modicon TM3 Bus Coupler

The following table shows the TM3 bus coupler, with port, communication and terminal types:

Reference	Port	Communication type	Terminal Type
TM3BCEIP	2 Isolated switched Ethernet ports 1 USB mini-B port	EtherNet/IP Modbus TCP	RJ45 USB mini-B

TM3 Digital Input Modules

The following table shows the TM3 digital input expansion modules, with corresponding channel type, nominal voltage/current, and terminal type. For information on configuration of these modules, refer to the TM3 Digital I/O Modules Configuration section.

Reference	Channels	Channel Type	Voltage Current	Terminal Type / Pitch
TM3DI8A	8	Regular inputs	120 Vac 7.5 mA	Removable screw terminal block / 5.08 mm
TM3DI8	8	Regular inputs	24 Vdc 7 mA	Removable screw terminal block / 5.08 mm
TM3DI8G	8	Regular inputs	24 Vdc 7 mA	Removable spring terminal block / 5.08 mm
TM3DI16	16	Regular inputs	24 Vdc 7 mA	Removable screw terminal block / 3.81 mm
TM3DI16G	16	Regular inputs	24 Vdc 7 mA	Removable spring terminal block / 3.81 mm
TM3DI16K	16	Regular inputs	24 Vdc 5 mA	HE10 (MIL 20) connector
TM3DI32K	32	Regular inputs	24 Vdc 5 mA	HE10 (MIL 20) connector

TM3 Digital Output Modules

The following table shows the TM3 digital output modules, with corresponding channel type, nominal voltage/current, and terminal type. For information on configuration of these modules, refer to the TM3 Digital I/O Modules Configuration section.

Reference	Channels	Channel Type	Voltage Current	Terminal Type / Pitch
TM3DQ8R	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	Removable screw terminal block / 5.08 mm
TM3DQ8RG	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	Removable spring terminal block / 5.08 mm
TM3DQ8T	8	Regular transistor outputs (source)	24 Vdc 4 A maximum per common line/0.5 A maximum per output	Removable screw terminal block / 5.08 mm
TM3DQ8TG	8	Regular transistor outputs (source)	24 Vdc 4 A maximum per common line/0.5 A maximum per output	Removable spring terminal block / 5.08 mm
TM3DQ8U	8	Regular transistor outputs (sink)	24 Vdc 4 A maximum per common line/0.5 A maximum per output	Removable screw terminal block / 5.08 mm
TM3DQ8UG	8	Regular transistor outputs (sink)	24 Vdc 4 A maximum per common line/0.5 A maximum per output	Removable spring terminal block / 5.08 mm
TM3DQ16R	16	Relay outputs	24 Vdc / 240 Vac 8 A maximum per common line / 2 A maximum per output	Removable screw terminal block / 3.81 mm
TM3DQ16RG	16	Relay outputs	24 Vdc / 240 Vac 8 A maximum per common line / 2 A maximum per output	Removable spring terminal block / 3.81 mm
TM3DQ16T	16	Regular transistor outputs (source)	24 Vdc 4 A maximum per common line / 0.5 A maximum per output	Removable screw terminal block / 3.81 mm

Reference	Channels	Channel Type	Voltage Current	Terminal Type / Pitch
TM3DQ16TG	16	Regular transistor outputs (source)	24 Vdc 4 A maximum per common line / 0.5 A maximum per output	Removable spring terminal block / 3.81 mm
TM3DQ16U	16	Regular transistor outputs (sink)	24 Vdc 2 A maximum per common line / 0.3 A maximum per output	Removable screw terminal block / 3.81 mm
TM3DQ16UG	16	Regular transistor outputs (sink)	24 Vdc 2 A maximum per common line / 0.3 A maximum per output	Removable spring terminal block / 3.81 mm
TM3DQ16TK	16	Regular transistor outputs (source)	24 Vdc 2 A maximum per common line / 0.1 A maximum per output	HE10 (MIL 20) connector
TM3DQ16UK	16	Regular transistor outputs (sink)	24 Vdc 2 A maximum per common line / 0.1 A maximum per output	HE10 (MIL 20) connector
TM3DQ32TK	32	Regular transistor outputs (source)	24 Vdc 2 A maximum per common line / 0.1 A maximum per output	HE10 (MIL 20) connector
TM3DQ32UK	32	Regular transistor outputs (sink)	24 Vdc 2 A maximum per common line / 0.1 A maximum per output	HE10 (MIL 20) connector

TM3 Digital Mixed Input/Output Modules

This following table shows the TM3 mixed I/O modules, with corresponding channel type, nominal voltage/current, and terminal type. For information on configuration of these modules, refer to the TM3 Digital I/O Modules Configuration section.

Reference	Channels	Channel Type	Voltage Current	Terminal Type / Pitch
TM3DM8R	4	Regular inputs	24 Vdc 7 mA	Removable screw terminal block / 5.08 mm
	4	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	
TM3DM8RG	4	Regular inputs	24 Vdc 7 mA	Removable spring terminal block / 5.08 mm
	4	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	
TM3DM24R	16	Regular inputs	24 Vdc 7 mA	Removable screw terminal block / 3.81 mm
	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	
TM3DM24RG	16	Regular inputs	24 Vdc 7 mA	Removable spring terminal block / 3.81 mm
	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	

TM3 Analog Input Modules

The following table shows the TM3 analog input expansion modules, with corresponding channel type, nominal voltage/current, and terminal type. For information on configuration of these modules, refer to the TM3 Analog Input Modules Configuration section.

Reference	Resolution	Channels	Channel Type	Mode	Terminal Type / Pitch
TM3AI2H	16 bit, or 15 bit + sign	2	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 5.08 mm
TM3AI2HG	16 bit, or 15 bit + sign	2	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal block / 5.08 mm
TM3AI4	12 bit, or 11 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 3.81 mm
TM3AI4G	12 bit, or 11 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal blocks / 3.81 mm
TM3AI8	12 bit, or 11 bit + sign	8	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA 0...20 mA extended 4...20 mA extended	Removable screw terminal block / 3.81 mm
TM3AI8G	12 bit, or 11 bit + sign	8	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA 0...20 mA extended 4...20 mA extended	Removable spring terminal blocks / 3.81 mm
TM3TI4	16 bit, or 15 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA Thermocouple PT100/1000 NI100/1000	Removable screw terminal block / 3.81 mm

Reference	Resolution	Channels	Channel Type	Mode	Terminal Type / Pitch
TM3TI4G	16 bit, or 15 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA Thermocouple PT100/1000 NI100/1000	Removable spring terminal blocks / 3.81 mm
TM3TI4D	16 bit, or 15 bit + sign	4	inputs	Thermocouple	Removable screw terminal block / 3.81 mm
TM3TI4DG	16 bit, or 15 bit + sign	4	inputs	Thermocouple	Removable spring terminal blocks / 3.81 mm
TM3TI8T	16 bit, or 15 bit + sign	8	inputs	Thermocouple NTC/PTC	Removable screw terminal block / 3.81 mm
TM3TI8TG	16 bit, or 15 bit + sign	8	inputs	Thermocouple NTC/PTC	Removable spring terminal blocks / 3.81 mm

TM3 Analog Output Modules

The following table shows the TM3 analog output modules, with corresponding channel type, nominal voltage/current, and terminal type. For information on configuration of these modules, refer to the TM3 Analog Output Modules Configuration section.

Reference	Resolution	Channels	Channel Type	Mode	Terminal Type / Pitch
TM3AQ2	12 bit, or 11 bit + sign	2	outputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 5.08 mm
TM3AQ2G	12 bit, or 11 bit + sign	2	outputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal block / 5.08 mm
TM3AQ4	12 bit, or 11 bit + sign	4	outputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 5.08 mm
TM3AQ4G	12 bit, or 11 bit + sign	4	outputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal block / 5.08 mm

TM3 Analog Mixed Input/Output Modules

This following table shows the TM3 analog mixed I/O modules, with corresponding channel type, nominal voltage/current, and terminal type. For information on configuration of these modules, refer to the TM3 Analog Mixed I/O Modules Configuration section.

Reference	Resolution	Channels	Channel Type	Mode	Terminal Type / Pitch
TM3AM6	12 bit, or 11 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 3.81 mm
		2	outputs		
TM3AM6G	12 bit, or 11 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal block / 3.81 mm
		2	outputs		
TM3TM3	16 bit, or 15 bit + sign	2	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA Thermocouple PT100/1000 NI100/1000	Removable screw terminal block / 5.08 mm
	12 bit, or 11 bit + sign	1	output	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	
TM3TM3G	16 bit, or 15 bit + sign	2	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA Thermocouple PT100/1000 NI100/1000	Removable spring terminal block / 5.08 mm
	12 bit, or 11 bit + sign	1	output	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	

TM3 Expert Modules

The following table shows the TM3 expert expansion modules, with corresponding terminal type. For information on configuration of these modules, refer to the TM3 Expert I/O Modules Configuration section.

Reference	Description	Terminal Type / Pitch
TM3XTYS4	TeSys module	4 front connectors RJ-45 1 removable power supply connector / 5.08 mm

TM3 Transmitter and Receiver Modules

The following table shows the TM3 transmitter and receiver expansion modules, with corresponding terminal type. For information on configuration of these modules, refer to the TM3 Transmitter and Receiver I/O Modules Configuration section.

Reference	Description	Terminal Type / Pitch
TM3XTRA1	Data transmitter module for remote I/O	1 front connector RJ-45 1 screw for functional ground connection
TM3XREC1	Data receiver module for remote I/O	1 front connector RJ-45 1 removable power supply connector / 5.08 mm

TM3 Safety Modules

This table contains the TM3 safety modules (*see Modicon TM3, Safety Modules, Hardware Guide*), with the corresponding channel type, nominal voltage/current, and terminal type:

Reference	Function Category	Channels	Channel type	Voltage Current	Terminal type
TM3SAC5R	1 function, up to category 3	1 or 2 ⁽¹⁾	Safety input	24 Vdc 100 mA maximum	3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable screw terminal block
		Start ⁽²⁾	Input		
		3 in parallel	Relay outputs Normally open	24 Vdc / 230 Vac 6 A maximum per output	
TM3SAC5RG	1 function, up to category 3	1 or 2 ⁽¹⁾	Safety input	24 Vdc 100 mA maximum	3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable spring terminal block
		Start ⁽²⁾	Input		
		3 in parallel	Relay outputs Normally open	24 Vdc / 230 Vac 6 A maximum per output	
⁽¹⁾ Depending on external wiring ⁽²⁾ Non-monitored start					

TM3 Bus Coupler Configuration General Information

Reference	Function Category	Channels	Channel type	Voltage Current	Terminal type
TM3SAF5R	1 function, up to category 4	2 ⁽¹⁾	Safety inputs	24 Vdc 100 mA maximum	3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable screw terminal block
		Start	Input		
		3 in parallel	Relay outputs Normally open	24 Vdc / 230 Vac 6 A maximum per output	
TM3SAF5RG	1 function, up to category 4	2 ⁽¹⁾	Safety inputs	24 Vdc 100 mA maximum	3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable spring terminal block
		Start	Input		
		3 in parallel	Relay outputs Normally open	24 Vdc / 230 Vac 6 A maximum per output	
TM3SAFL5R	2 functions, up to category 3	2 ⁽¹⁾	Safety inputs	24 Vdc 100 mA maximum	3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable screw terminal block
		Start	Input		
		3 in parallel	Relay outputs Normally open	24 Vdc / 230 Vac 6 A maximum per output	
TM3SAFL5RG	2 functions, up to category 3	2 ⁽¹⁾	Safety inputs	24 Vdc 100 mA maximum	3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable spring terminal block
		Start	Input		
		3 in parallel	Relay outputs Normally open	24 Vdc / 230 Vac 6 A maximum per output	
TM3SAK6R	3 functions, up to category 4	1 or 2 ⁽¹⁾	Safety inputs	24 Vdc 100 mA maximum	3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable screw terminal block
		Start	Input		
		3 in parallel	Relay outputs Normally open	24 Vdc / 230 Vac 6 A maximum per output	
TM3SAK6RG	3 functions, up to category 4	1 or 2 ⁽¹⁾	Safety inputs	24 Vdc 100 mA maximum	3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable spring terminal block
		Start	Input		
		3 in parallel	Relay outputs Normally open	24 Vdc / 230 Vac 6 A maximum per output	
⁽¹⁾ Depending on external wiring ⁽²⁾ Non-monitored start					

Section 1.3

TM2 Module General Information

TM2 General Description

Introduction

The range of TM2 expansion modules includes:

- Digital expansion modules
- Analog 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
TM2DDI8DT	8	Inputs	24 Vdc 7 mA	TM2DDI8DT
TM2DDI16DT	16	Inputs	24 Vdc 7 mA	TM2DDI16DT
TM2DDI16DK	16	Inputs	24 Vdc 5 mA	TM2DDI16DK
TM2DDI32DK	32	Inputs	24 Vdc 5 mA	TM2DDI32DK
Output Modules				
TM2DRA8RT	8	Outputs Relay	30 Vdc/230 Vac 2 A max	TM2DRA8RT
TM2DRA16RT	16	Outputs Relay	30 Vdc/230 Vac 2 A max	TM2DRA16RT
TM2DDO8UT	8	Outputs Transistor sink	24 Vdc 0.3 A max per output	TM2DDO8UT
TM2DDO8TT	8	Outputs Transistor source	24 Vdc 0.5 A max per output	TM2DDO8TT
TM2DDO16UK	16	Outputs Transistor sink	24 Vdc 0.1 A max per output	TM2DDO16UK
TM2DDO16TK	16	Outputs Transistor source	24 Vdc 0.4 A max per output	TM2DDO16TK

Module reference	Channels	Channel type	Voltage/current	Reference page
TM2DDO32UK	32	Outputs Transistor sink	24 Vdc 0.1 A max per output	TM2DDO32UK
TM2DDO32TK	32	Outputs Transistor source	24 Vdc 0.4 A max per output	TM2DDO32TK
Mixed Modules				
TM2DMM8DRT	4 4	Inputs Outputs Relay	24 Vdc/7 mA 30 Vdc/230VAC 2 A max	TM2DMM8DRT
TM2DMM24DRF	16 8	Inputs Outputs Relay	24 Vdc/7 mA 30 Vdc/230VAC 2 A max	TM2DMM24DRF

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
TM2AMI2LT	2	Low-level inputs	Thermocouple type J,K,T	TM2AMI2LT
TM2AMI4LT	4	Inputs	0...10 Vdc 0...20 mA PT100/1000 Ni100/1000	TM2AMI4LT
TM2AMI8HT	8	Inputs	0...20 mA 0...10 Vdc	TM2AMI8HT
TM2ARI8HT	8	Inputs	NTC / PTC	TM2ARI8HT
TM2ARI8LRJ	8	Inputs	PT100/1000	TM2ARI8LRJ
TM2ARI8LT	8	Inputs	PT100/1000	TM2ARI8LT
Output Modules				
TM2AMO1HT	1	Outputs	0...10 Vdc 4...20 mA	TM2AMO1HT
TM2AVO2HT	2	Outputs	+/- 10 Vdc	TM2AVO2HT

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

Section 1.4

Adding a TM3 Bus Coupler and Expansion Modules

What Is in This Section?

This section contains the following topics:

Topic	Page
Adding a Bus Coupler	33
Adding an Expansion Module	34
Optional I/O Expansion Modules	38

Adding a Bus Coupler

Adding a TM3 Bus Coupler

To add a TM3 bus coupler to your project, select the TM3 bus coupler in the **Hardware Catalog**, drag it to the **Devices tree**, and drop it on one of the highlighted nodes.

Select **EtherNet/IP Scanner** or **Modbus TCP IO Scanner**.

For more information on adding a device to your project, refer to:

- Using the Drag-and-drop Method (*see EcoStruxure Machine Expert, Programming Guide*)
- Using the Contextual Menu or Plus Button (*see EcoStruxure Machine Expert, Programming Guide*)

Adding an Expansion Module

Adding a Module

To add an expansion module to your controller or bus coupler, select the expansion module in the **Hardware Catalog**, drag it to the **Devices tree**, and drop it on one of the highlighted nodes.

For more information on adding a device to your project, refer to:

- Using the Drag-and-drop Method (see *EcoStruxure Machine Expert, Programming Guide*)
- Using the Contextual Menu or Plus Button (see *EcoStruxure Machine Expert, Programming Guide*)

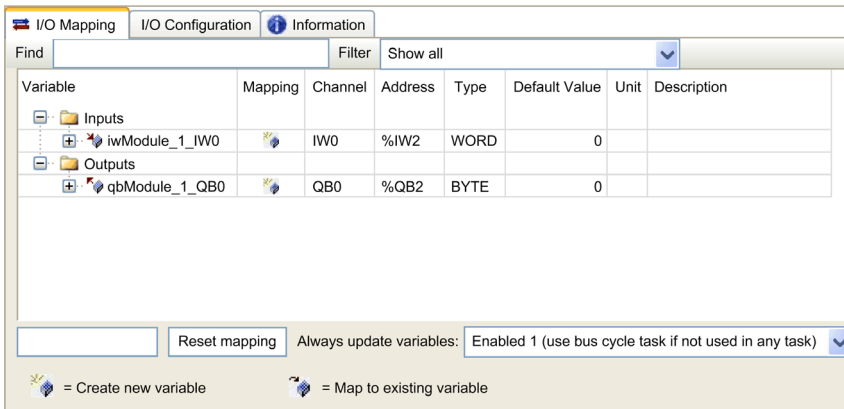
I/O Mapping Tab

The I/O mapping of an expansion module is carried out through the **I/O Mapping** tab of the expansion module configuration.

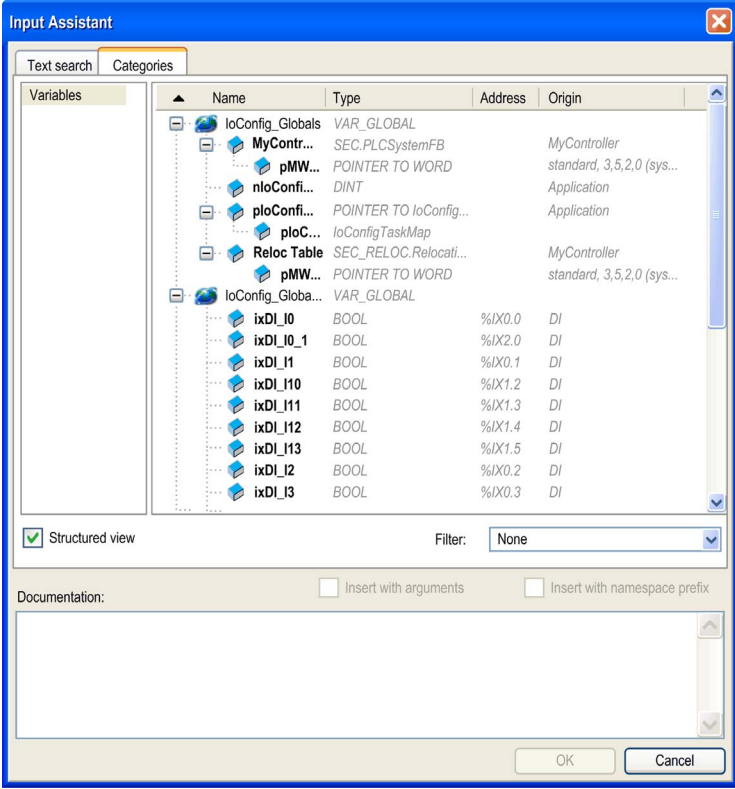
This table describes how to configure an expansion module:

Step	Action
1	Double-click the expansion module node in the Devices tree to display the I/O Mapping tab.
2	Edit the parameters of the I/O Mapping tab to configure the expansion module

This figure shows the **I/O Mapping** tab:



This table describes each parameter of the **I/O Mapping** tab:

Parameter	Description
<p>Variable</p>	<p>Allows you to map the channel on a variable.</p> <p>NOTE: Expand the list of variables from the category Inputs or Outputs.</p> <p>You can map a channel by either creating a new variable or mapping to an existing variable.</p> <p>Create new variable: Double-click the variable to enter the new variable name. A new variable is created if the variable does not already exist.</p> <p>Map to existing variable: Double-click the variable and click [...] to open the Input Assistant window. Select the variable from the list and press OK.</p> <p>This figure shows the Input Assistant window:</p> 
<p>Mapping</p>	<p>Indicates whether the channel is mapped on a new variable or an existing variable.</p>
<p>Channel</p>	<p>Displays the channel name of the device.</p>

Parameter	Description
Address	Displays the address of the channel. NOTE: If the channel is mapped to an existing variable, corresponding address appears as strikethrough text in the table.
Type	Displays the data type of the channel.
Default Value	Indicates the value taken by the output when the controller is in a STOPPED or HALT state. Double-click the cell to change the default value. You can toggle between the following values: <ul style="list-style-type: none"> ● No value (<i>empty cell</i>) ● TRUE ● FALSE
Unit	Displays the unit of the channel value.
Description	Allows you to enter a short description of the channel.

I/O Configuration Tab

This tab allows you to configure the I/Os and the module as an optional module. The following illustration is an example showing the **I/O Configuration** tab of the TM3TM3 mixed analog module:

I/O Mapping		I/O Configuration		Information	
Parameter	Type	Value	Default Value	Unit	Description
Optional module	Enumeration of BYTE	No	No		
Inputs					
IW0					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT(-32768...32766)	-32768	-32768		Minimum value
Maximum	INT(-32767...32767)	32767	32767		Maximum value
InputFilter	INT(0...1000)	0	0	x 10 ms	Input filter
Sampling	Enumeration of BYTE	100	100	ms/Channel	Input sampling selection
IW1					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Scope	Enumeration of BYTE	Not used	Not used		Unit
Minimum	INT(-32768...32766)	-32768	-32768		Minimum value
Maximum	INT(-32767...32767)	32767	32767		Maximum value
InputFilter	INT(0...1000)	0	0	x 10 ms	Input filter
Sampling	Enumeration of BYTE	100	100	ms/Channel	Input sampling selection
Outputs					
QW0					
Type	Enumeration of BYTE	Not used	Not used		Range mode
Minimum	INT(-32768...32766)	-32768	-32768		Minimum value
Maximum	INT(-32767...32767)	32767	32767		Maximum value
Diagnostic					
Status Enabled	Enumeration of BYTE	No	Yes		

Optional I/O Expansion Modules

Presentation

I/O expansion modules can be marked as optional in the configuration. The **Optional module** feature provides a more flexible configuration by the acceptance of the definition of modules that are not physically attached to the controller. Therefore, a single application can support multiple physical configurations of I/O expansion modules, allowing a greater degree of scalability without the necessity of maintaining multiple application files for the same application.

Without the **Optional module** feature, when the controller starts up the I/O expansion bus (following a power cycle, application download or initialization command), it compares the configuration defined in the application with the physical I/O modules attached to the I/O bus. Among other diagnostics made, if the controller determines that there are I/O modules defined in the configuration that are not physically present on the I/O bus, an error is detected and the I/O bus does not start.

With the **Optional module** feature, the controller ignores the absent I/O expansion modules that you have marked as optional, which then allows the controller to start the I/O expansion bus.

The controller starts the I/O expansion bus at configuration time (following a power cycle, application download, or initialization command) even if optional expansion modules are not physically connected to the controller.

You must be fully aware of the implications and impacts of marking I/O modules as optional in your application, both when those modules are physically absent and present when running your machine or process. Be sure to include this feature in your risk analysis.

WARNING

UNINTENDED EQUIPMENT OPERATION

Include in your risk analysis each of the variations of I/O configurations that can be realized marking I/O expansion modules as optional, and in particular the establishment of TM3 Safety modules (TM3S...) as optional I/O modules, and make a determination whether it is acceptable as it relates to your application.

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

Marking an I/O Expansion Module as Optional

To add an expansion module and mark it as optional in the configuration:

Step	Action
1	Add the expansion module to your controller or bus coupler.
2	In the Devices tree , double-click the expansion module.
3	Select the I/O Configuration tab.
4	In the Optional module line, select Yes in the Value column:

Shared Internal ID Codes

Controllers and bus couplers identify expansion modules by a simple internal ID code. This ID code is not specific to each reference, but identifies the logical structure of the expansion module. Therefore, different references can share the same ID code.

You cannot have two modules with the same internal ID code declared as optional without at least one mandatory module placed between them.

This table groups the module references sharing the same internal ID code:

Modules sharing the same internal ID code
TM3DI16K, TM3DI16, TM3DI16G
TM3DQ16R, TM3DQ16RG, TM3DQ16T, TM3DQ16TG, TM3DQ16TK, TM3DQ16U, TM3DQ16UG, TM3DQ16UK
TM3DQ32TK, TM3DQ32UK
TM3DI8, TM3DI8G, TM3DI8A
TM3DQ8R, TM3DQ8RG, TM3DQ8T, TM3DQ8TG, TM3DQ8U, TM3DQ8UG
TM3DM8R, TM3DM8RG
TM3DM24R, TM3DM24RG
TM3SAK6R, TM3SAK6RG
TM3SAF5R, TM3SAF5RG
TM3SAC5R, TM3SAC5RG
TM3SAFL5R, TM3SAFL5RG
TM3AI2H, TM3AI2HG
TM3AI4, TM3AI4G
TM3AI8, TM3AI8G
TM3AQ2, TM3AQ2G
TM3AQ4, TM3AQ4G
TM3AM6, TM3AM6G
TM3TM3, TM3TM3G
TM3TI4, TM3TI4G
TM3TI4D, TM3TI4DG
TM3TI8T, TM3TI8TG

Chapter 2

TM3 Ethernet Bus Coupler

Introduction

This chapter describes how to configure the TM3 Ethernet bus coupler and provides information about Ethernet configuration, Ethernet services and diagnostic.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
2.1	Presentation	42
2.2	Ethernet Configuration	43
2.3	USB Configuration	85
2.4	Diagnostic	86

Section 2.1

Presentation

TM3 Ethernet Bus Coupler Presentation

Introduction

The TM3 Ethernet bus coupler is a device designed to manage Ethernet/IP and Modbus TCP communication when using expansion modules with a controller in a distributed architecture.

The TM3 Ethernet bus coupler supports the TM2 and TM3 expansion modules.

Section 2.2

Ethernet Configuration

This section describes how to configure the Ethernet services of the TM3 Ethernet bus coupler.

What Is in This Section?

This section contains the following topics:

Topic	Page
Ethernet Services	44
Ethernet Configuration Operating Modes	45
Ethernet/IP Adapter	47
Modbus TCP Server	66
Web Server	70
Ring Topology (RSTP)	83
SNMP	84

Ethernet Services

Overview

The TM3 Ethernet bus coupler supports the following services:

- IPV4
- Ethernet/IP Adapter (*see page 47*)
- Modbus TCP/IP server
- Web server (*see page 70*)
- Ring topology (*see page 83*)

Ethernet Protocols

The TM3 Ethernet bus coupler supports the following :

- IP (Internet Protocol)
- UDP (User Datagram Protocol)
- TCP (Transmission Control Protocol)
- ARP (Address Resolution Protocol)
- RSTP (Rapid Spanning Tree Protocol)

Connections

This table shows the maximum number of connections:

Connection Type	Number of Connections
Modbus TCP/IP Server	8
Ethernet/IP adapter Ethernet/IP Adapter	3 (Class 1): <ul style="list-style-type: none"> ● 1 Exclusive Owner ● 2 Listen Only 6 (Class 3)
Web Server	10

Each connection based on TCP manages its own set of connections as follows:

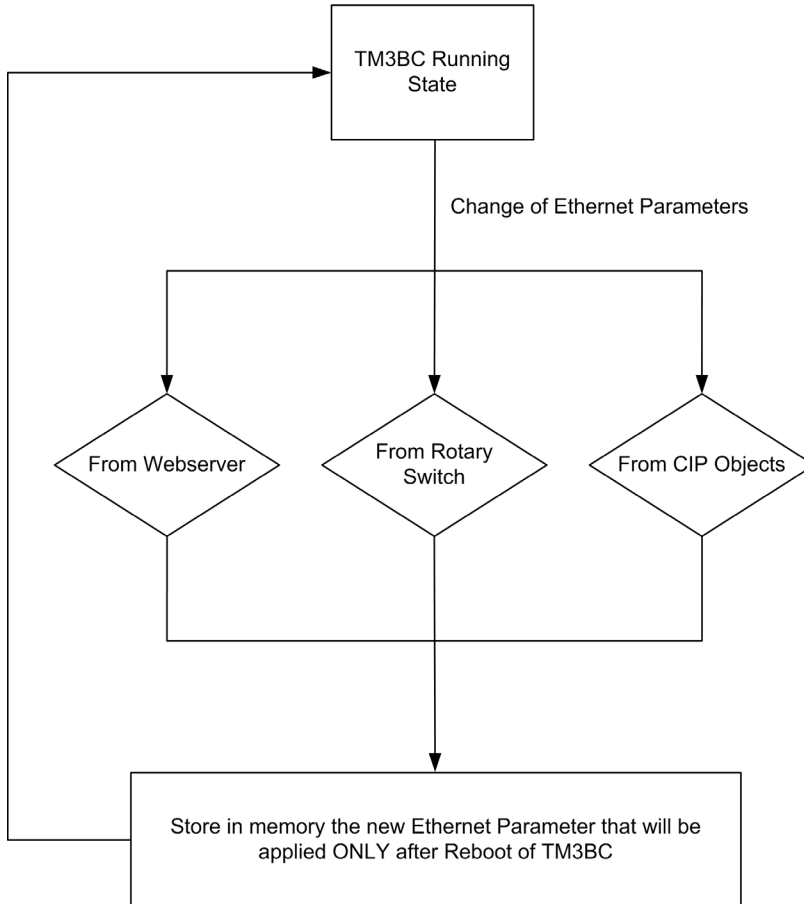
1. When a client tries to open a TCP connection that exceeds the poll size, the TM3 Ethernet bus coupler closes the oldest connection. For Class 1 and Class 3 connections, when a client tries to open a connection that exceeds the poll size, the TM3 Ethernet bus coupler denies the new connection with the message: no resource available.
2. If all connections are busy (exchange in progress) when a client tries to open a new one, the new connection is denied.

Connections can be closed when the originator of the connection requests to close the connection it had previously opened.

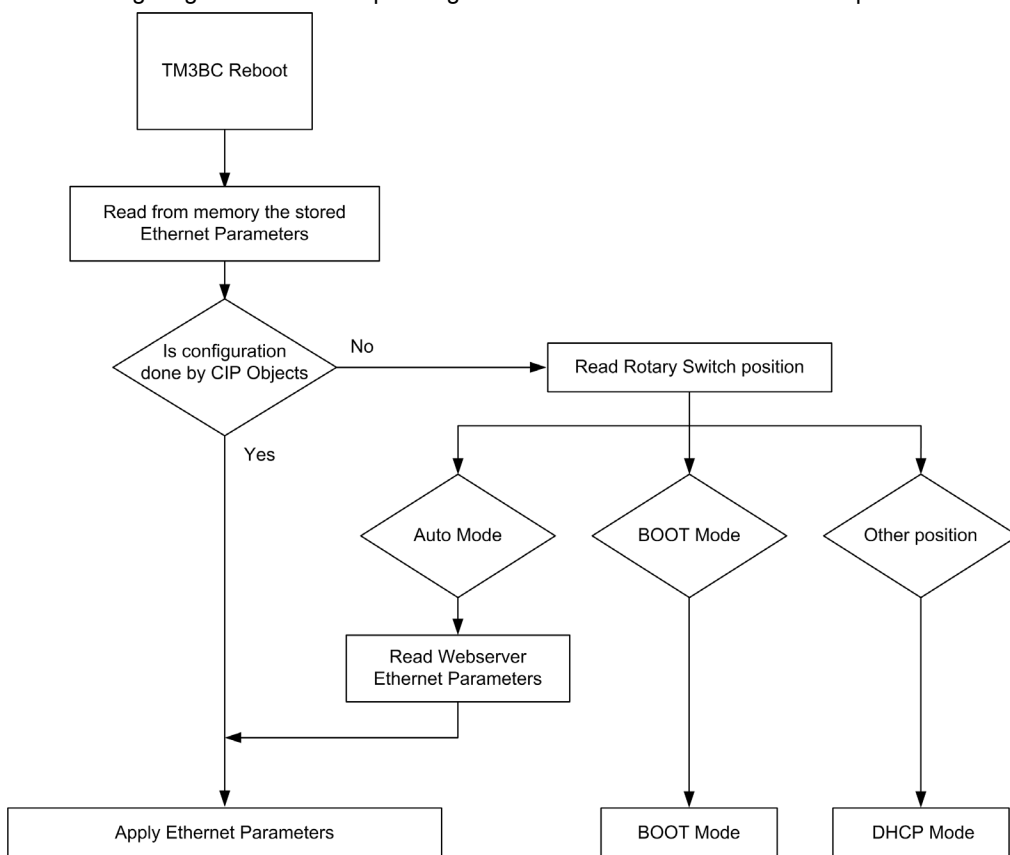
Ethernet Configuration Operating Modes

Operating Modes

The following diagram shows the operating modes of the TM3 Ethernet Bus Coupler:



The following diagram shows the operating modes of the TM3 Ethernet Bus Coupler:



NOTE: If multiple changes have been made, only the last one is taken into account after reboot of the TM3 Ethernet Bus Coupler.

Any change in rotary switch position during the running state of TM3 Ethernet Bus Coupler replaces the Ethernet configuration done via CIP object only after reboot.

Any change in the Ethernet parameters via Web server during the running state of TM3 Ethernet Bus Coupler replaces the Ethernet configuration done via CIP object only after reboot.

Any change in the Ethernet parameters via CIP objects during the running state of TM3 Ethernet Bus Coupler are applied after reboot, no matter the position of the rotary switches.

Ethernet/IP Adapter

Introduction

This section describes the configuration of the TM3 Ethernet bus coupler as an Ethernet/IP adapter.

For further information about Ethernet/IP, refer to the www.odva.org website.

Ethernet/IP Adapter Configuration

To configure your TM3 Ethernet bus coupler as an EtherNet/IP adapter, add the bus coupler to your project (*see page 33*) and select **EtherNet IP Scanner** → **TM3BCEIP**.

EtherNet/IP Parameters Configuration

To configure the Ethernet/IP parameters, double-click the bus coupler node in the **Devices tree**. In the **Target Settings** tab, you can configure the following parameters:

Element	Description
Address Settings	
IP Address by DHCP	IP address is obtained via DHCP.
	Device name used to retrieve IP address through DHCP, maximum 15 characters.
IP Address by BOOTP	MAC address of the bus coupler.
Fixed IP Address	IP address of the bus coupler.
Electronic Keying	
Check Device Type	Type of the bus coupler.
Check Vendor Type	Vendor code of the bus coupler.
Check Product Type	Product code of the bus coupler.
Check Major Revision	Firmware major version.
Check Minor Revision	Firmware minor version.
Protocol on the fieldbus	
Protocol used by the device	Protocol used. You cannot edit this field.

Electronic Keying signatures are used to identify the bus coupler.

Electronic Keying is information contained in the firmware of the bus coupler (Vendor Code, Product Code, ...).

When the controller scanner starts, it compares each selected electronic keying value with the corresponding information in the TM3 Ethernet bus coupler.

If the TM3 Ethernet bus coupler values are not the same as the application values, the controller no longer communicates with the TM3 Ethernet bus coupler.

Connections on Ethernet/IP Adapter

To access a target device, an Originator opens a connection which can include several sessions that send requests.

One explicit connection uses one session (a session is a TCP or UDP connection).

One I/O connection uses one session.

The following table shows the Ethernet/IP connections limitations:

Characteristic	Maximum
Explicit connections	16 (Class 3)
I/O connections	1 (Class 1) Exclusive Owner 15 (Class 1) Listen Only
Sessions	16

NOTE: The TM3 bus coupler supports cyclic connections. If an Originator opens a connection using a change of state as a trigger, packets are sent at the RPI rate.

EtherNet/IP I/O Mapping Tab

When the data exchanges are configured, you can map variables to be used by the program.

Defined variables are listed in the **EtherNet/IP I/O Mapping** tab.

For more information on this tab, refer to I/O Mapping Dialog (*see EcoStruxure Machine Expert, Programming Guide*).

Bus Cycle Options

Select the **Bus cycle task** to synchronize the EtherNet/IP adapter data:

- **Use parent bus cycle setting** (the default),
- **MAST**
- Any task of the application

NOTE: This parameter defines the task responsible for copying the %IW and %QW registers from/to the bus coupler.

EtherNet/IP Objects

The TM3 bus coupler supports the following objects:

Object class	Class ID (hex)	Effect on Interface Behavior
TM3 bus coupler configuration object	65	Stores TM2/TM3 module configurations.
TM3 bus coupler feature configuration object	64	Used to prepare/apply configuration.

Profile

The controller supports the following objects:

Object class	Class ID (hex)	Cat.	Number of Instances	Effect on Interface Behavior
Identity Object (<i>see page 49</i>)	01	1	1	Supports the reset service
Message Router Object (<i>see page 52</i>)	02	1	1	Explicit message connection
Assembly Object (<i>see page 53</i>)	04	2	2	Defines I/O data format
Connection Manager Object (<i>see page 55</i>)	06		1	–
TCP/IP Interface Object (<i>see page 57</i>)	F5	1	1	TCP/IP configuration
Ethernet Link Object (<i>see page 59</i>)	F6	1	1	Counter and status information
Interface Diagnostic Object (<i>see page 60</i>)	350	1	1	–
Connection Diagnostic Object (<i>see page 61</i>)	352	1	1	–
Explicit Connection Diagnostic Object (<i>see page 64</i>)	353	1	1	–
TM3 Bus Coupler Feature Configuration Object	64	1	2	–

Identity Object (Class ID = 01 hex)

The following table describes the class attributes of the Identity Object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	01	Implementation revision of the Identity Object
2	Get	Max Instances	UINT	01	The largest instance number
3	Get	Number of Instances	UINT	01	The number of object instances
6	Get	Max Class Attribute	UINT	07	The largest class attributes value
7	Get	Max Instance Attribute	UINT	07	The largest instance attributes value

The following table describes the Class Services:

Service Code (hex)	Name	Description
01	Get Attribute All	Returns the value of all class attributes
0E	Get Attribute Single	Returns the value of the specified attribute

The following table describes the Instance Services:

Service Code (hex)	Name	Description
01	Get Attribute All	Returns the value of all class attributes
05	Reset ⁽¹⁾	Initializes EtherNet/IP component (controller reboot)
0E	Get Attribute Single	Returns the value of the specified attribute

⁽¹⁾ Reset Service description:

When the Identity Object receives a Reset request, it:

- determines whether it can provide the type of reset requested
- responds to the request
- attempts to perform the type of reset requested

The Reset common service has one specific parameter, Type of Reset (USINT), with the following values:

Value	Type of Reset
0	Reboots the controller NOTE: This is the default value if this parameter is omitted.
1	Not supported
2	Not supported
3...99	Reserved
100...199	Vendor specific
200...255	Reserved

The following table describes the Instance attributes:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Vendor ID	UINT	F3	Schneider Automation ID
2	Get	Device type	UINT	0C	EIP Adapter
3	Get	Product code	UINT	1009	Bus coupler product code

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
4	Get	Revision	Struct of USINT, USINT	–	Product revision number of the bus coupler ⁽¹⁾ . Equivalent to the 2 low bytes of the bus coupler version
5	Get	Status	WORD	–	Status word ⁽²⁾
6	Get	Serial number	UDINT	–	Serial number of the bus coupler
7	Get	Product name	Struct of USINT, STRING	TM3BCEIP	–

⁽¹⁾ Mapped in a WORD:

- MSB: minor revision (second USINT)
- LSB: major revision (first USINT)

Example: 0205 hex means revision V5.2.

⁽²⁾ Status word (Attribute 5):

Bit	Name	Description
0	Owned	TRUE indicates that the device is a owner.
1	Reserved	–
2	Configured	TRUE indicates that the device application has been configured.
3	Reserved	–
4...7	Extended Device Status	<ul style="list-style-type: none"> • 0: Self-testing or undetermined • 1: Firmware update in progress
8	Minor Recoverable Fault	TRUE indicates that the device detected an error, which, under most circumstances, is recoverable. This type of event does not lead to a change in the device state.
9	Minor Unrecoverable Fault	TRUE indicates that the device detected an error, which, under most circumstances, is unrecoverable. This type of event does not lead to a change in the device state.
10	Major Recoverable Fault	TRUE indicates the device detected an error, which requires the device to report an exception and enter into the HALT state. This type of event leads to a change in the device state, but, under most circumstances, is recoverable.
11	Major Unrecoverable Fault	TRUE indicates the device detected an error, which requires the device to report an exception and enter into the HALT state. This type of event leads to a change in the device state, but, under most circumstances, is not recoverable.
12...15	Reserved	–

Message Router Object (Class ID = 02 hex)

The following table describes the class attributes of the Message Router object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	01	Implementation revision number of the Message Router Object
2	Get	Max Instances	UINT	01	The largest instance number
3	Get	Number of Instance	UINT	01	The number of object instances
4	Get	Optional Instance Attribute List	Struct of UINT, UINT []	-	The first 2 bytes contain the number of the optional instance attributes. Each following pair of bytes represents the number of other optional instance attributes (from 100 to 119).
5	Get	Optional Service List	UINT	0A	The number and list of any implemented optional services attribute (0: no optional services implemented)
6	Get	Max Class Attribute	UINT	07	The largest class attributes value
7	Get	Max Instance Attribute	UINT	02	The largest instance attributes value

The following table describes the Class Services:

Service Code (hex)	Name	Description
01	Get_Attribute_All	Returns the value of all class attributes
0E	Get_Attribute_Single	Returns the value of the specified attribute

The following table describes the Instance Services:

Service Code (hex)	Name	Description
01	Get_Attribute_All	Returns the value of all class attributes
0E	Get_Attribute_Single	Returns the value of the specified attribute

The following table describes the Instance attributes:

Attribute ID (hex)	Access	Name	Data Type	Value	Description
1	Get	Implemented Object List	Struct of UINT, UINT []	–	Implemented Object list. The first 2 bytes contain the number of implemented objects. Each 2 bytes that follow represents another implemented class number. This list contains the following objects: <ul style="list-style-type: none"> ● Identity ● Message Router ● Assembly ● Connection Manager ● QoS ● Port ● TCP/IP Interface ● Ethernet Link
2	Get	Number available	UINT	16	Maximum number of concurrent CIP (Class 1 or Class 3) connections supported

Assembly Object (Class ID = 04 hex)

The following table describes the class attributes of the Assembly object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	02	Implementation revision of the Assembly Object
2	Get	Max Instances	UINT	65	The largest instance number
3	Get	Number of Instances	UINT	03	The number of object instances
4	Get	Optional Instance Attribute List	Struct of: UINT UINT []	01 04	The first 2 bytes contain the number of optional instance attributes. Each following pair of bytes represents the number of other optional instance attributes.
5	Get	Optional Service List	UINT	Not supported	The number and list of any implemented optional services attribute (0: no optional services implemented)

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
6	Get	Max Class Attribute	UINT	07	The largest class attributes value
7	Get	Max Instance Attribute	UINT	04	The largest instance attributes value

The following table describes the Class Services:

Service Code (hex)	Name	Description
0E	Get Attribute Single	Returns the value of the specified attribute

The following table describes the Instance Services:

Service Code (hex)	Name	Description
0E	Get Attribute Single	Returns the value of the specified attribute
10	Set Attribute Single	Modifies the value of the specified attribute

Instances Supported

The bus coupler supports 2 Assemblies:

Name	Instance	Data Size
TM3BC IO Modules Output Data	100	2...64 words
TM3BC IO Modules Input Data	101	2...64 words

Assembly assignment

The following table describes the Instance attributes:

Attribute ID (hex)	Access	Name	Data Type	Value	Description
3	Get/Set	Instance Data	ARRAY of Byte	–	Data Set service only available for the controller output
4	Get	Instance Data Size	UINT	128	Size of data in byte

Connection Manager Object (Class ID = 06 hex)

The following table describes the class attributes of the Assembly Object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	01	Implementation revision of the Connection Manager Object
2	Get	Max Instances	UINT	01	The largest instance number
3	Get	Number of Instances	UINT	01	The number of object instances
4	Get	Optional Instance Attribute List	Struct of: UINT UINT []	–	The number and list of the optional attributes. The first word contains the number of attributes to follow and each following word contains another attribute code. Following optional attributes include: <ul style="list-style-type: none"> ● total number of incoming connection open requests ● the number of requests rejected due to non-conforming format of the Forward Open ● the number of requests rejected because of insufficient resources ● the number of requests rejected due to parameter value sent with the Forward Open ● the number of Forward Close requests received ● the number of Forward Close requests with an invalid format ● the number of Forward Close requests that could not be matched to an active connection ● the number of connections that have timed out because the other side has stopped producing, or a network was disconnected
6	Get	Max Class Attribute	UINT	07	The largest class attributes value
7	Get	Max Instance Attribute	UINT	08	The largest instance attributes value

The following table describes the Class Services:

Service Code (hex)	Name	Description
01	Get Attribute All	Returns the value of all class attributes
0E	Get Attribute Single	Returns the value of the specified attribute

The following table describes the Instance Services:

Service Code (hex)	Name	Description
01	Get Attribute All	Returns the value of all instance attributes
0E	Get Attribute Single	Returns the value of the specified attribute
4E	Forward Close	Closes an existing connection
52	Unconnected Send	Sends a multi-hop unconnected request
54	Forward Open	Opens a new connection

The following table describes the Instance attributes:

Attribute ID (hex)	Access	Name	Data Type	Value	Description
1	Get	Open Requests	UINT	–	Number of Forward Open service requests received
2	Get	Open Format Rejects	UINT	–	Number of Forward Open service requests which were rejected due to invalid format
3	Get	Open Resource Rejects	ARRAY of Byte	–	Number of Forward Open service requests which were rejected due to lack of resources
4	Get	Open Other Rejects	UINT	–	Number of Forward Open service requests which were rejected for reasons other than invalid format or lack of resources
5	Get	Close Requests	UINT	–	Number of Forward Close service requests received
6	Get	Close Format Requests	UINT	–	Number of Forward Close service requests which were rejected due to invalid format
7	Get	Close Other Requests	UINT	–	Number of Forward Close service requests which were rejected for reasons other than invalid format
8	Get	Connection Timeouts	UINT	–	Total number of connection timeouts that have occurred in connections controlled by this Connection Manager

TCP/IP Interface Object (Class ID = F5 hex)

This object maintains link specific counters and status information for an Ethernet 802.3 communication interface.

The following table describes the class attributes of the TCP/IP Interface Object:

Attribute ID (hex)	Access	Name	Data Type	Value	Details
1	Get	Revision	UINT	4	Implementation revision of the TCP/IP Interface Object
2	Get	Max Instances	UINT	1	The largest instance number
3	Get	Number of Instances	UINT	1	The number of object instances
4	Get	Optional	Struct of: UINT UINT []	-	The first 2 bytes contain the number of optional instance attributes. Each following pair of bytes represents the number of other optional instance attributes.

The following table describes the Class Services:

Service Code (hex)	Name	Description
01	Get Attribute All	Returns the value of all class attributes
0E	Get Attribute Single	Returns the value of the specified attribute

Instance Codes

Only instance 1 is supported.

The following table describes the Instance Services:

Service Code (hex)	Name	Description
01	Get Attribute All	Returns the value of all instance attributes
0E	Get Attribute Single	Returns the value of the specified instance attribute

The following table describes the Instance Attributes:

Attribute ID (hex)	Access	Name	Data Type	Value	Description
1	Get	Status	DWORD	Bit level	<ul style="list-style-type: none"> ● 0: The interface configuration attribute has not been configured. ● 1: The interface configuration contains a valid configuration. ● 2...15: Reserved.
2	Get	Configuration Capability	DWORD	Bit level	<ul style="list-style-type: none"> ● 0: BOOTP Client ● 2: DHCP Client ● 4: Configuration Settable ● 6: Interface Configuration change requires reset ● 7: Acd Capable <p>All other bits are reserved and set to 0.</p>
3	Get	Configuration	DWORD	Bit level	<ul style="list-style-type: none"> ● 0: The interface configuration is valid. ● 1: The interface configuration is obtained with BOOTP. ● 2: The interface configuration is obtained with DHCP. ● 3: Reserved <p>All other bits are reserved and set to 0.</p>
4	Get	Physical Link	UINT	Path size	Number of 16 bits word in the element path
5	Get	Interface configuration	UDINT	IP Address	–
			UDINT	Network Mask	–
			UDINT	Gateway Address	–
			UDINT	Primary Name	–
			UDINT	Secondary Name	0: No secondary name server address has been configured.
			STRING	Default Domain Name	0: No Domain Name is configured
6	Get	Host Name	STRING	–	ASCII characters. 0: No host name is configured

Ethernet Link Object (Class ID = F6 hex)

This object provides the mechanism to configure a TCP/IP network interface device.

The following table describes the class attributes of the Ethernet Link object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	4	Implementation revision of the Ethernet Link Object
2	Get	Max Instances	UINT	3	The largest instance number
3	Get	Number of Instances	UINT	3	The number of object instances

The following table describes the Class Services:

Service Code (hex)	Name	Description
01	Get Attribute All	Returns the value of all class attributes
0E	Get Attribute Single	Returns the value of the specified attribute

Instance Codes

Only instance 1 is supported.

The following table describes the Instance Services:

Service Code (hex)	Name	Description
01	Get Attribute All	Returns the value of all instance attributes
0E	Get Attribute Single	Returns the value of the specified instance attribute

The following table describes the Instance attributes:

Attribute ID (hex)	Access	Name	Data Type	Value	Description
1	Get	Interface Speed	UDINT	–	Speed in Mbit/s (10 or 100)
2	Get	Interface Flags	DWORD	Bit level	<ul style="list-style-type: none"> ● 0: Link status ● 1: Half/full duplex ● 2...4: Negotiation status ● 5: Manual setting / requires reset ● 6: Local hardware error detected All other bits are reserved and set to 0.
3	Get	Physical Address	ARRAY of 6 USINT	–	This array contains the MAC address of the product. Format: XX-XX-XX-XX-XX-XX

EtherNet/IP Interface Diagnostic Object (Class ID = 350 hex)

The following table describes the class attributes of the EtherNet/IP Interface Diagnostic object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	01	Increased by 1 on each new update of the object
2	Get	Max Instance	UINT	01	Maximum instance number of the object

The following table describes the instance attributes of the EtherNet/IP Interface Diagnostic object:

Attribute ID (hex)	Access	Name	Data Type	Details
1	Get	Protocols supported	UINT	Protocol(s) supported (0=not supported, 1=supported): <ul style="list-style-type: none"> ● Bit 0: EtherNet/IP ● Bit 1: Modbus TCP ● Bit 2: Modbus Serial ● Bits 3...15: Reserved, 0
2	Get	Connection Diag	STRUCT OF	
		Max CIP IO Connections opened	UINT	Maximum number of CIP I/O connections opened.
		Current CIP IO Connections	UINT	Number of CIP I/O connections currently opened.
		Max CIP Explicit Connections opened	UINT	Maximum number of CIP explicit connections opened.
		Current CIP Explicit Connections	UINT	Number of CIP explicit connections currently opened
		CIP Connections Opening Errors	UINT	Incremented on each unsuccessful attempt to open a CIP connection.
		CIP Connections Timeout Errors	UINT	Incremented when a CIP connection is timed out.
		Max EIP TCP Connections opened	UINT	Maximum number of TCP connections opened and used for EtherNet/IP communication.
		Current EIP TCP Connections	UINT	Number of TCP connections currently open and being used for EtherNet/IP communication.

Attribute ID (hex)	Access	Name	Data Type	Details
3	Get Clear	IO Messaging Diag	STRUCT of	
		IO Production Counter	UDINT	Incremented each time a Class 0/1 CIP message is sent.
		IO Consumption Counter	UDINT	Incremented each time a Class 0/1 CIP message is received.
		IO Production Send Errors Counter	UINT	Incremented each Time a Class 0/1 message is not sent.
		IO Consumption Receive Errors Counter	UINT	Incremented each time a consumption is received that contains an error.
4	Get Clear	Explicit Messaging Diag	STRUCT of	
		Class3 Msg Send Counter	UDINT	Incremented each time a Class 3 CIP message is sent.
		Class3 Msg Receive Counter	UDINT	Incremented each time a Class 3 CIP message is received.
		UCMM Msg Send Counter	UDINT	Incremented each time a UCMM message is sent.
		UCMM Msg Receive Counter	UDINT	Incremented each time a UCMM message is received.

IO Connection Diagnostic Object (Class ID = 352 hex)

The following table describes the class attributes of the IO Connection Diagnostic object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	01	Increased by 1 on each new update of the object.
2	Get	Max Instance	UINT	01	Maximum instance number of the object 0...n where n is the maximum number of CIP I/O connections. NOTE: There is an IO Connection Diagnostic object instance for both O->T and T->O paths.

The following table describes the instance attributes of the I/O Connection Diagnostic object:

Attribute ID (hex)	Access	Name	Data Type	Details
1	Get Clear	IO Com Diag	STRUCT of	
		IO Production Counter	UDINT	Incremented each time a production is sent.
		IO Consumption Counter	UDINT	Incremented each time a consumption is received.
		IO Production Send Errors Counter	UINT	Incremented each time a production is not sent due to an error.
		IO Consumption Receive Errors Counter	UINT	Incremented each time a consumption is received that contains an error.
		CIP Connection TimeOut Errors	UINT	Incremented each time a connection is timed out.
		CIP Connection Opening Errors	UINT	Incremented on each unsuccessful attempt to open a connection.
		CIP Connection State	UINT	State of the CIP IO connection.
		CIP Last Error General Status	UINT	General status of the last error detected on the connection.
		CIP Last Error Extended Status	UINT	Extended status of the last error detected on the connection.
		Input Com Status	UINT	Communication status of the inputs.
		Output Com Status	UINT	Communication status of the outputs.

Attribute ID (hex)	Access	Name	Data Type	Details
2	Get	Connection Diag	STRUCT of	
		Production Connection ID	UDINT	Connection ID for production.
		Consumption Connection ID	UDINT	Connection ID for consumption.
		Production RPI	UDINT	Requested Packet Interval (RPI) for productions, in μ s.
		Production API	UDINT	Actual Packet Interval (API) for productions.
		Consumption RPI	UDINT	RPI for consumptions.
		Consumption API	UDINT	API for consumptions.
		Production Connection Parameters	UDINT	Connection parameters for productions.
		Consumption Connection Parameters	UDINT	Connection parameters for consumptions.
		Local IP	UDINT	Local IP address for I/O communication.
		Local UDP Port	UINT	Local UDP port number for I/O communication.
		Remote IP	UDINT	Remote IP address for I/O communication.
		Remote UDP Port	UINT	Remote UDP port number for I/O communication.
		Production Multicast IP	UDINT	Multicast IP address for productions, or 0 if multicast is not used.
Consumption Multicast IP	UDINT	Multicast IP address for consumptions, or 0 if multicast is not used.		
Protocols supported	UINT	Protocol(s) supported (0 = not supported, 1=supported): <ul style="list-style-type: none"> ● Bit 0: EtherNet/IP ● Bit 1: Modbus TCP ● Bit 2: Modbus Serial ● Bits 3...15: Reserved, 0 		

Instance Attributes

The following table describes the Class Services:

Service Code (hex)	Name	Description
01	Get_Attributes_All	Returns the value of all class attributes.
0E	Get_Attribute_Single	Returns the value of a specified attribute.
4C	Get_and_Clear	Gets and clears a specified attribute.

Explicit Connection Diagnostic Object (Class ID = 353 hex)

The following table describes the class attributes of the Explicit Connection Diagnostic object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	01	Increased by 1 at each new update of the object.
2	Get	Max Instance	UINT	0..n (maximum number of CIP IO connections)	Maximum instance number of the object.

The following table describes the instance attributes of the Explicit Connection Diagnostic object:

Attribute ID (hex)	Access	Name	Data Type	Details
1	Get	Originator Connection ID	UDINT	O to T Connection ID
2	Get	Originator IP	UDINT	–
3	Get	Originator TCP Port	UINT	–
4	Get	Target Connection ID	UDINT	T to O Connection ID
5	Get	Target IP	UDINT	–
6	Get	Target TCP Port	UINT	–
7	Get	Msg Send Counter	UDINT	Incremented each time a Class 3 CIP Message is sent on the connection
8	Get	Msg ReceiveCounter	UDINT	Incremented each time a Class 3 CIP Message is received on the connection

Explicit Connections Diagnostic List Object (Class ID = 354 hex)

The following table describes the class attributes of the Explicit Connections Diagnostic List object:

Attribute ID (hex)	Access	Name	Data Type	Value (hex)	Details
1	Get	Revision	UINT	01	Increased by 1 at each new update of the object.
2	Get	Max Instance	UINT	02	Maximum number of concurrent list accesses supported.

The following table describes the instance attributes of the Explicit Connections Diagnostic List object:

Attribute ID (hex)	Access	Name	Data Type	Details
1	Get	Number of Connections	UINT	Total number of open Explicit connections
2	Get	Explicit Messaging Connections Diagnostic List	ARRAY of STRUCT	Contents of instantiated Explicit Connection Diagnostic objects
		Originator Connection ID	UDINT	Originator to Target connection ID
		Originator IP	UDINT	Originator to Target IP address
		Originator TCP Port	UINT	Originator to Target port number
		Target Connection ID	UDINT	Target to Originator connection ID
		Target IP	UDINT	Target to Originator IP address
		Target TCP Port	UINT	Target to Originator port number
		Msg Send Counter	UDINT	Incremented each time a Class 3 CIP message is sent on the connection
Msg Receive Counter	UDINT	Incremented each time a Class 3 CIP message is sent on the connection		

The following table describes the Class Services:

Service Code (hex)	Name	Description
08	Create	Creates an instance of the Explicit Connections Diagnostic List object.
09	Delete	Deletes an instance of the Explicit Connections Diagnostic List object.

Modbus TCP Server

Introduction

Modbus TCP is not based on a hierarchical structure, but on a client/server model.

Without any configuration, the embedded Ethernet port of the bus coupler supports Modbus server.

Modbus TCP Server

The Modbus server supports the Modbus requests:

Function Code Dec (Hex)	Subfunction Dec (Hex)	Function
3 (3)	–	Read holding register (%MW)
6 (6)	–	Write single register (%MW)
16 (10)	–	Write multiple registers (%MW)
22 (16)	-	Mask write register
23 (17)	–	Read/write multiple registers (%MW)
43 (2B)	14 (E)	Read device identification

Modbus TCP Configuration

To configure your TM3 Ethernet bus coupler as a Modbus TCP slave device, add the bus coupler (*see page 33*) and select **Modbus TCP IO Scanner → TM3BCEIP**.

Diagnostic Request

This table contains the data selection code list:

Data Selection Code (hex)	Description
00	Reserved
01	Basic Network Diagnostics
02	Ethernet Port Diagnostic
03	Modbus TCP/Port 502 Diagnostics
04	Modbus TCP/Port 502 Connection Table
05 - 7E	Reserved for other public codes
7F	Data Structure Offsets

TM3 Bus Coupler Modbus TCP Registers

Zone	Access	Registers	Function
Diagnostic Zone	RO	900 - 901	Bus coupler diagnostics
	RO	930 - 931	TM2/TM3 bus status
	RO	932	System state
	RO	991 - 992	Communication diagnostics
	RO	1058...1066	Ethernet communication parameters
	RO	1100...1115	TM3 bus coupler product information
	RO	2512 - 2513	TM3 bus coupler product serial number
IO Scanner Zone	RO	1...99	Subset of bus coupler module input values (first 7 modules) ⁽¹⁾
	RW	101...199	Subset of bus coupler module output values (first 7 modules) ⁽¹⁾
	RO	3001...3499	Bus coupler module input values (all modules) ⁽¹⁾
	RW	3501...3999	Bus coupler module output values (all modules) ⁽¹⁾
	RO	13001...13499	Bus coupler module input values (all modules) for use with HMI devices.
	RO	13501...13999	Bus coupler module output values (all modules) for use with HMI devices.
(1) Access to those registers return an error when System State (register 932) is not 5 (TM3 bus controlled by modbus TCP).			

Bus Coupler Diagnostics

Registers	Function	Description
900	Island status	Bits (0...8}): Not used
		Bit (9): I/O bus runtime error
		Bits (10-11): Not used
		Bit (13): I/O bus not configured or bus configuration error
		Bits (14-15): Not used
901	I/O modules status	Bit (0...13): Status of first expansion module to status of 14 th expansion module
		Bits (14-15): Not used
		0: No error detected
		1: Error detected

TM2/TM3 Bus Status

Registers	Function	Description
930-931	TM2/TM3 bus status	<p>Bits (0...27) module status (2 bits by module):</p> <ul style="list-style-type: none"> ● 0x0: Module OK ● 0x1: Module configuration error detected ● 0x2: Module runtime error detected ● 0x3: Module not present but it is optional module <p>Bits (30-31) bus status:</p> <ul style="list-style-type: none"> ● 0x0: Bus OK ● 0x1: Bus configuration error detected ● 0x2: Bus runtime error detected ● 0x3: Bus not configured

System State

Registers	Function	Description
932	State of the system	<ul style="list-style-type: none"> ● 0x0: System is booting. ● 0x1: TM3 bus is not configured. ● 0x2: A TM3 configuration is being transferred. ● 0x3: A valid TM3 configuration has been applied successfully. The outputs are set to 0. ● 0x4: TM3 bus is controlled by EIP. ● 0x5: TM3 bus is controlled by ModbusTCP IO scanner. ● 0x6: TM3 bus is controlled by Web server. ● 0x7: Timeout on fieldbus refresh ● 0x8: Firmware update in progress ● 0xA: System state transition in progress.

Communication Diagnostic

Registers	Function	Description
991	Number of received messages	Number of messages received.
992	Number of sent messages	Number of messages sent.

Ethernet Communication Parameters

Registers	Function
1058	MAC address
1059	
1060	
1061	IP address currently used
1062	
1063	Subnet mask currently used
1064	
1065	Gateway currently used
1066	

TM3 Bus Coupler Bus Coupler Product Information

Registers	Function
1100	TM3 bus coupler product code
2507-2508	TM3 bus coupler product firmware version
2512-2513	TM3 bus coupler product serial number
2601	Rotary switch ONEs position
2602	Rotary switch TENS position

Web Server

Introduction

The Web server integrated in the TM3 bus coupler offers an easy access using a web browser to the information such as configuration of the most common settings, status, I/O data, Network statistic, and diagnostic info.

The Web server is accessible through the bus coupler USB port (*see page 85*) and Ethernet port by specifying the IP address or hostname in the address bar. You can use the pages of the website for setup and control as well as application diagnostics and monitoring. These pages are ready to use with a Web browser. No configuration or programming is required.

Any PC providing a USB (host) port and/or an Ethernet interface can connect to the Web server by using a Web browser.

The Web server can be accessed by the web browsers listed below:

- Microsoft Internet Explorer (version \geq 11)
- Google Chrome (version \geq 71)
- Mozilla Firefox (version \geq 64)
- Microsoft Edge (version \geq 42)

The Web server allows you to monitor a bus coupler and its application remotely, to perform various maintenance activities including modifications to data and configuration parameters. Care must be taken to ensure that the immediate physical environment of the machine and process is in a state that will not present safety risks to people or property before exercising control remotely.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Define a secure password for the Web server, and do not allow unauthorized or otherwise unqualified personnel to use this feature.
- Ensure that there is a local, competent, and qualified observer present when operating on the controller from a remote location.
- You must have a complete understanding of the application and the machine/process it is controlling before attempting to adjust data, stopping an application that is operating, or starting the controller remotely.
- Take the precautions necessary to assure that you are operating on the intended controller by having clear, identifying documentation within the controller application and its remote connection.

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

NOTE: The Web server must only be used by authorized and qualified personnel. A qualified person is one who has the skills and knowledge related to the construction and operation of the machine and the process controlled by the application and its installation, and has received safety training to recognize and avoid the hazards involved. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this feature.

Web Server Access

You can manage the user accounts on the Web server on MAINTENANCE / User Accounts (*see page 78*).

By default, the user name is Administrator, and the password is Administrator. You must change the password at the first login.

WARNING

UNAUTHORIZED DATA ACCESS

- Secure access to the Web server using User Rights.
- If you do not enable User Rights, disable the Web server to prevent any unwanted or unauthorized access to data in your application.

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

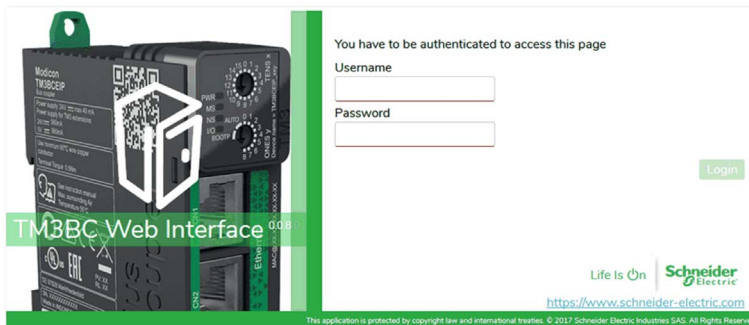
Resetting the Password

To reset the password:

Step	Action
1	Connect to the bus coupler using the USB port.
2	Open the browser.
3	Enter the IP address 90.0.0.1.
4	Click Reset .

Login Page

The login page is the entry point to get authenticated by the Web server. To access the website login page shown in the following illustration, type in your navigator the IP address of the TM3 bus coupler or IP address 90.0.0.1 if you are connected by USB. To login to the Web server, enter the user name and password and click **Login**.



The Web server contains the following pages:


- HOME
- DIAGNOSTICS
- MONITORING (*see page 75*)
- MAINTENANCE (*see page 77*)

NOTE: The timeout session for each login is five minutes. When you do not perform any action after you logged in, it redirects you to the login page if you click any button. You need to log in again with user name and password to access the web pages.

HOME Page

The **HOME** page shows the product details of TM3 bus coupler.

The **identification** section of **HOME** page consists of:

Element	Description
Identification	
Vendor ID	Vendor ID of the bus coupler
Vendor Name	Vendor name of the bus coupler
Product ID	Product ID of the bus coupler
Product Name	Product name of the bus coupler
Product Reference	Product reference of the bus coupler
Serial Number	Serial number of the bus coupler
Locate Device 	Click the button to locate the bus coupler. The LEDs of the bus coupler flash red for few seconds.

DIAGNOSTICS Page

The **DIAGNOSTICS** page shows the status of the bus coupler.

The **DIAGNOSTICS** page contains the following sub-pages:

- Device
- Ethernet (*see page 74*)
- EtherNet/IP (*see page 74*)


DIAGNOSTICS / Device

The **Device** sub-page shows the details about identification (*see page 73*) and status of the bus coupler:

Element	Description
Status	
Last Stop Cause	Displays the cause of the last stop of the bus coupler.
USB Port	Displays whether a USB cable is connected to the bus coupler.
Operating Mode	Displays one of the following operating modes of the bus coupler: <ul style="list-style-type: none"> ● Idle ● Run
Configuration Status	Displays one of the following configuration status of the bus coupler: <ul style="list-style-type: none"> ● Not Configured ● Configured

DIAGNOSTICS / Ethernet

The **Ethernet** sub-page shows the configuration and status of Ethernet connection:

Element	Description
Configuration	
MAC Address	MAC address of the bus coupler.
Mode	Displays the IP mode of the bus coupler: <ul style="list-style-type: none"> ● DHCP ● BOOTP ● Manual
IP Address	IP address of the bus coupler
Subnet Mask	Subnet mask of the bus coupler
Gateway Address	Gateway address of the bus coupler
Statistics	
TX Bytes	Displays the number of the bytes transmitted.
ErroneousTXFrames	Displays the number of the frames transmitted in error.
Rx Bytes	Displays the number of the bytes received.
ErroneousRXFrames	Displays the number of the frames received in error.
Refresh	Refreshes the values.
Connections	Displays the number of the configured connections of the bus coupler.
TX Frames	Displays the number of frames transmitted.
RX Frames	Displays the number of frames received.
Reset  Reset	Resets the values to zero.

DIAGNOSTICS / Ethernet/IP

The **Ethernet/IP** sub-page shows the status information of Ethernet/IP:

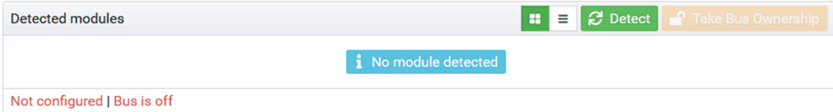
Element	Description
Refresh	Refreshes the values.
Statistics	
TX I/O Messages	Displays the number of I/O messages transmitted through Ethernet/IP.
RX I/O Messages	Displays the number of I/O messages received through Ethernet/IP.
Failed TX I/O Messages	Displays the number of erroneous I/O messages that were not transmitted through Ethernet/IP.
Failed RX I/O Messages	Displays the number of erroneous I/O messages that were not received through Ethernet/IP.

Element	Description
UCMM Requests	Displays the number of UCMM requests.
Reset <input type="button" value="Reset"/>	Resets all the values to zero.

MONITORING Page

The **MONITORING** page displays the TM2 and TM3 expansion modules that are connected to the TM3 bus coupler.

The following illustration shows **MONITORING** page:



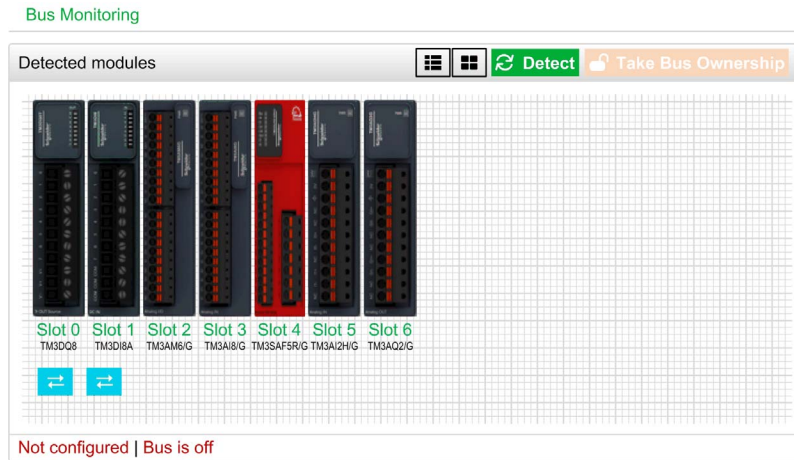
The following illustration shows **MONITORING** page with values:

The screenshot shows a grid of expansion modules in slots 0 through 6. Slot 0 is highlighted in green. Below the grid, the status is 'Configured | Controlled by Web interface'. To the right, a table shows the 'Details of slot 0 (TM3DQ16T/G)' with a 'Reconcile' and 'Force' button. The table has columns for Name, Value, and Prepared Value. The 'Outputs' section is expanded, showing QB0 with a value of 65535 and a prepared value of 123. Below the table, a note describes the module: 'TM3DQ16T (screw), TM3DQ16TG (spring) 16-channel, 0.5A source transistor outputs expansion module with 1 common line and removable terminal block.'

Name	Value	Prepared Value
<div style="display: flex; justify-content: space-between; align-items: center;"> ▼ Outputs FILTER <input type="button" value="⊕"/> <input type="button" value="⊖"/> <input type="button" value="↺"/> DISPLAY 123 0x1 001 </div>		
▼ QB0	65535	123 65535 [0;65535]
Q0	True	True False
Q1	True	True False
Q2	True	True False
Q3	True	True False
Q4	True	True False
Q5	True	True False
Q6	True	True False
Q7	True	True False
Q8	True	True False
Q9	True	True False
Q10	True	True False
Q11	True	True False
Q12	True	True False
Q13	True	True False
Q14	True	True False
Q15	True	True False

TM3DQ16T (screw), TM3DQ16TG (spring) 16-channel, 0.5A source transistor outputs expansion module with 1 common line and removable terminal block.

The following illustration shows **MONITORING** page without values:



This page shows and describes all the modules detected by the bus coupler and allows you to:

- See the state of a module (running or not running) and the protocol used.
- Read the value of an input or output.
- Force a value to an output.

Element	Description
List view	Shows the detected modules in a list. Click the module to select it. Click the up and down arrows to sort the modules.
Graphic view	Shows the detected modules in respect of their physical order. Click the module to select it.
Detect	Allows you to detect the modules connected to the bus coupler.
Take Bus Ownership Release Bus Ownership	Reserves the bus to allow you to force the module outputs. You can click the button when the bus coupler is configured and not controlled by a controller (EtherNet/IP or Modbus TCP) ⁽¹⁾ . Result: You are notified that the bus coupler is configured using the Web server. You can edit the output values. Click Release Bus Ownership when the configuration is done.
(1) When connected on EtherNet/IP, the TM3 bus coupler is controlled, no matter the controller state. When connected on Modbus TCP, the TM3 bus coupler is not controlled when the controller is in <i>STOPPED</i> state.	

Module Details

When you select a module from the graphic view or the list view, a detailed view is shown in the top-right part of the content area. The view provides summary information about the selected module.

In this view, you can access the following data:

- Module name, description and the current firmware version
- Module state
- A list of its I/Os

This list of I/Os allows you to view a real-time value of an input and to write the value of an output.

The view has **DISPLAY** buttons to modify the format of the displayed values.

Output Configuration

1. When **Take Bus Ownership** is enabled, click a module to force its outputs.
2. Click the **Force** button.

Result: A warning message is displayed.

3. Click **I agree** to validate the modifications and send them to the bus coupler.
Click **I disagree** to cancel the modifications.

As the modules are not identified automatically, click the **Reconcile** button to identify the modules.

MAINTENANCE Page

The **MAINTENANCE** page allows you to view and edit the configuration of the bus coupler.

The **MAINTENANCE** page contains the following sub-pages:

- User Accounts (*see page 78*)
- Setup (*see page 79*)
- Ethernet (*see page 80*)
- Firmware (*see page 81*)
- System Log Files (*see page 82*)

MAINTENANCE / User Accounts

The sub-page allows you to enter your login password to access the Web server:

Element	Description
Account Management Select an account to edit it	
User Name	<p>List of the following user accounts:</p> <ul style="list-style-type: none"> ● Administrator The Administrator account is configured with a predefined password (Administrator / Administrator). Modify the predefined password after the first connection. ● Operator This account is disabled by default. ● Viewer This account is disabled by default. <p>NOTE: Depending on your account, you can access to some web pages. See the table below to know the accessible web pages.</p>
Enabled	Checked if the account is enabled.
Account Management Provide a new password for account	
Password	<p>Enter a password for the user account.</p> <p>NOTE: Minimum eight characters and use a...z, A...Z, 0...9 alphanumeric characters. To reset the password, refer to Resetting the Password (<i>see page 72</i>).</p>
Confirmation	Enter the password again of the selected account.
Apply	Saves your new password.

NOTE: When the modifications are applied, the login page is displayed.

This table describes the accessible pages depending on the user account:

Web pages	Sub pages	Administrator	Operator	Viewer
HOME	–	✓	✓	✓
MONITORING	–	✓	✓	–
DIAGNOSTICS	Device	✓	✓	✓
	Ethernet	✓	✓	✓
	Ethernet/IP	✓	✓	✓
MAINTENANCE	Setup	✓	–	–
	Ethernet	✓	–	–
	User Accounts	✓	✓ ⁽¹⁾	✓ ⁽¹⁾
	Firmware	✓	–	–
	System Log Files	✓	✓	–

(1) You can only modify your user account.

MAINTENANCE / Setup

The following illustration shows the **Setup** sub-page:

Device Configuration

Device Name

Enabled Fieldbuses EtherNet/IP Modbus TCP

Access Control List

Enabled

IP Address Range		
<input type="text" value="10.10.0.0"/> / <input type="text" value="1"/>	Mask 128.0.0.0 End Address 127.255.255.255	<input type="button" value="X"/>
<input type="text" value="192.168.0.0"/> / <input type="text" value="1"/>	Mask 128.0.0.0 End Address 255.255.255.255	<input type="button" value="X"/>

The **Setup** sub-page allows you to change the configuration settings of the bus coupler:

Page	Description
Device Configuration	
Device Name	Name of the bus coupler used in DHCP mode. If you modified the Device Name , do a power cycle of the bus coupler to take it into account.
Enabled Fieldbuses	Allows you to select the communication types: <ul style="list-style-type: none"> ● EtherNet/IP ● Modbus TCP
Reset	Resets the configuration settings.
Apply	Saves the configuration settings.

MAINTENANCE / Ethernet

The **Ethernet** sub-page allows you to change the network settings:

Element	Description
Network Configuration	
Mode	Allows you to select the following operating modes of the bus coupler: <ul style="list-style-type: none"> ● Manual ● DHCP ● BOOTP
IP Address	IP address of the bus coupler. For more information, refer to TM3 Bus Coupler - Hardware Guide.
Subnet Mask	Subnet mask of the bus coupler
Gateway Address	Gateway address of the bus coupler
Apply⁽¹⁾	Saves the configuration settings.
Reset	Resets the configuration settings.
Ping Test	
Target IP Address	Allows you to enter the target IP address to check if the bus coupler can reach the device on the network.
Ping	Sends a message to the IP address.
RSTP Configuration	
Enabled	Enables or disables the RSTP configuration.
Bridge Priority	Configure the switch priority to be chosen as the root switch. A low number represents a high priority.
Hello Time (seconds)	Interval between the generation of spanning-tree configuration messages by the root switch. These messages mean that the switch is operational.
(1) Modifying the Ethernet configuration requires to do a power cycle of the bus coupler to apply the configuration settings.	

Element	Description
Maximum Age (seconds)	The number of seconds a switch waits without receiving spanning-tree configuration messages before attempting a configuration.
Forward Delay (seconds)	The number of seconds the port waits before changing from its spanning-tree learning and listening states to the forwarding state.
Access Control List (ACL)	
Enabled	Enables or disables the ACL management. Enable it to configure the IP address ranges allowed to communicate with the bus coupler.
IP Address Range	Shows the ranges of IP addresses. Each line corresponds to an IP address range allowed to communicate with the bus coupler. The first field represents the starting IP address. The second one is the number of free bits. The maximum number of ranges is 10.
Reset	Resets the configuration settings.
Apply	Saves the configuration settings.
Add	Adds a line of IP address range.
(1) Modifying the Ethernet configuration requires to do a power cycle of the bus coupler to apply the configuration settings.	

MAINTENANCE / Firmware

The **Firmware** sub-page shows the firmware version of the TM3 bus coupler and allows you to update its firmware:

Element	Description
Current Firmware	
Firmware	Firmware version
Web interface	Web server version
Firmware Update	
Select a new firmware version	
Select	Allows you to select the new firmware file of the bus coupler.
Apply	Allows you to apply the new firmware.

NOTE: You cannot update the firmware when the TM3 bus coupler cyclically exchanges data with the logic/motion controller. To make sure the bus coupler is not exchanging data, see **MONITORING** (*see page 75*).

To update the firmware:

Step	Action
1	Apply power to the bus coupler.
2	Connect the Ethernet cable.
3	Set the rotary switch ONES to AUTO .
4	Log into the Web server.
5	Click MAINTENANCE / Firmware .
6	Click Select then select the firmware file. Result: A confirmation window is displayed.
7	Click I agree . Result: At the end of the download and verification of the file, a confirmation window is displayed.
8	Click Yes to close the confirmation window then click Apply . Result: At the end of the firmware update, a message is displayed to inform you whether the firmware update is completed successfully.

MAINTENANCE / System Log Files

The **System Log Files** sub-page lists the log files to be used by Schneider Electric Technical Support:

Element	Description
Log Files	
Name	Shows the list of the log files.
Size	Displays the size of the log files.
Download	Allows you to download the log files.

Ring Topology (RSTP)

The TM3 bus coupler supports RSTP ring topology.

For more information, refer to **MAINTENANCE / Ethernet** (*see page 80*).

SNMP

Introduction

The Simple Network Management Protocol (SNMP) is used to provide the data and services required for managing a network.

The data is stored in a Management Information Base (MIB). The SNMP protocol is used to read or write MIB data. Implementation of the Ethernet SNMP services is minimal, as only the compulsory objects are handled.

SNMP Server

This table presents the supported standard MIB-2 server objects:

Object	Description	Access	Value
sysDescr	Text description of the device	Read	SCHNEIDER Ethernet TM3 Bus Coupler
sysName	Node administrative name	Read/Write	TM3BCEIP

The size of these character strings is limited to 50 characters.

The values written are saved to the controller via SNMP client tool software. The Schneider Electric software for this is ConneXview. ConneXview is not supplied with the controller or bus coupler. For more details, refer to www.schneider-electric.com.

Section 2.3

USB Configuration

USB Configuration

Introduction

You can configure the Ethernet interface using the USB port.

Configuring the Virtual Ethernet Link

Step	Action
1	Connect the USB cable to the PC then to the bus coupler.
2	Open Network and sharing center on your PC.
3	Click Change adapter settings → Remote NDIS Compatible Device → Properties .
4	Select Internet Protocol version 4 (TCP/IPv4) .
5	Click Properties .
6	Select Use the following IP address : <ul style="list-style-type: none"> ● IP address: 90.0.0.2 ● Subnet mask: 255.0.0.0
7	Click OK .
8	Close the Properties .
9	In the web browser, enter the IP address 90.0.0.1. Result : The web server is displayed.

Section 2.4

Diagnostic

Diagnostic

Overview

In online mode, the **Status** tab of the bus coupler provides monitoring and diagnostics information for the bus coupler and connected modules.

Displaying Diagnostic Information

Step	Action
1	In the Devices Tree , double-click the bus coupler node.
2	Select the Status tab: <ul style="list-style-type: none"> ● Running: The bus coupler is running. ● Configuration error: At least one configured expansion module is not in the physical configuration. ● ?: At least one expansion module did not respond to the bus coupler three times successively.

Chapter 3

Updating the Firmware

Updating the Firmware of the Bus Coupler

Overview

To update the firmware of the bus coupler, connect to the Web server (*see page 81*).

Glossary



A

application

A program including configuration data, symbols, and documentation.

ARP

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

B

BOOTP

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

C

configuration

The arrangement and interconnection of hardware components within a system and the hardware and software parameters that determine the operating characteristics of the system.

controller

Automates industrial processes (also known as programmable logic controller or programmable controller).

D

DHCP

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

E

Ethernet

A physical and data link layer technology for LANs, also known as IEEE 802.3.

EtherNet/IP Adapter

An EtherNet/IP Adapter, sometimes also called a server, is an end-device in an EtherNet/IP network. I/O blocks and drives can be EtherNet/IP Adapter devices.

F

firmware

Represents the BIOS, data parameters, and programming instructions that constitute the operating system on a controller. The firmware is stored in non-volatile memory within the controller.

H

HE10

Rectangular connector for electrical signals with frequencies below 3 MHz, complying with IEC 60807-2.

I

I/O

(input/output)

IP

(Internet protocol) Part of the TCP/IP protocol family that tracks the Internet addresses of devices, routes outgoing messages, and recognizes incoming messages.

M

MAC address

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

MIB

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

MSB

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

O**originator**

In EtherNet/IP explicit messaging, the device, usually the logic controller, that initiates data exchanges with target network devices.

See also *target*

R**RJ45**

A standard type of 8-pin connector for network cables defined for Ethernet.

RPI

(requested packet interval) The time period between cyclic data exchanges requested by the scanner. EtherNet/IP devices publish data at the rate specified by the RPI assigned to them by the scanner, and they receive message requests from the scanner with a period equal to RPI.

RSTP

(rapid spanning tree protocol) A high-speed network protocol that builds a loop-free logical topology for Ethernet networks.

S**SNMP**

(simple network management protocol) A protocol that can control a network remotely by polling the devices for their status and viewing information related to data transmission. You can also use it to manage software and databases remotely. The protocol also permits active management tasks, such as modifying and applying a new configuration.

T**Target**

In EtherNet/IP, a device is considered to be the target when it is the recipient of a connection request for implicit or explicit messaging communications.

See also *Originator*

TCP

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

terminal block

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

U

UDP

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



A

- Adding a Bus Coupler, *33*
- adding a TM3 bus coupler, *33*
- analog I/O modules, *29*
- analog input modules
 - specifications, *24*
- analog mixed I/O modules
 - specifications, *26*
- analog output modules
 - specifications, *25*

D

- Diagnostic, *86*
- digital I/O modules
 - specifications, *20, 21, 23, 27, 27*

E

- EtherNet
 - EtherNet/IP device, *47*
- Ethernet
 - Modbus TCP Server, *66*
 - SNMP, *84*
 - Web Server, *70*
- EtherNet/IP Adapter, *47*
- expansion modules
 - adding, *34*
 - properties, *34*

I

- I/O configuration general information, *19*
- general practices, *17*

M

- Modbus
 - Protocols, *66*

- Modbus TCP Server
 - Ethernet, *66*

P

- Protocols
 - Modbus, *66*
- protocols
 - SNMP, *84*

R

- regular inputs, *20, 21, 23, 27, 27*
- regular transistor outputs, *20, 21, 23, 27, 27*
- relay outputs, *20, 21, 23, 27, 27*
- Ring Topology (RSTP), *83*

S

- SNMP
 - Ethernet, *84*
 - protocols, *84*
- specifications
 - analog input modules, *24*
 - analog mixed I/O modules, *26*
 - analog output modules, *25*
 - digital I/O modules, *20, 21, 23, 27, 27*

T

- TM3, *13*
- TM3 Ethernet Bus Coupler Presentation, *42*

W

- Web Server
 - Ethernet, *70*

