Modicon X80

BMXEHC0800 Counting Module User Manual

Original instructions

10/2019

EIO0000000318.12

Schneider Electric

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

You agree not to reproduce, other than for your own personal, noncommercial use, all or part of this document on any medium whatsoever without permission of Schneider Electric, given in writing. You also agree not to establish any hypertext links to this document or its content. Schneider Electric does not grant any right or license for the personal and noncommercial use of the document or its content, except for a non-exclusive license to consult it on an "as is" basis, at your own risk. All other rights are reserved.

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.

Table of Contents

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.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

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

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

START-UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

⚠ WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

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

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer’s instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer’s instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

At a Glance

Document Scope

This manual describes the hardware and software implementation of the BMXEHC0800 counting module.

Validity Note

This document is valid for EcoStruxure™ Control Expert 14.1 or later.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the reference or product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the datasheet.
6	To save or print a datasheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Related Documents

Title of documentation	Reference number
Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications	EIO0000002726 (English), EIO0000002727 (French), EIO0000002728 (German), EIO0000002730 (Italian), EIO0000002729 (Spanish), EIO0000002731 (Chinese)
EcoStruxure™ Control Expert, Program Languages and Structure, Reference Manual	35006144 (English), 35006145 (French), 35006146 (German), 35013361 (Italian), 35006147 (Spanish), 35013362 (Chinese)
EcoStruxure™ Control Expert, Operating Modes	33003101 (English), 33003102 (French), 33003103 (German), 33003104 (Spanish), 33003696 (Italian), 33003697 (Chinese)
EcoStruxure™ Control Expert, I/O Management, Block Library	33002531 (English), 33002532 (French), 33002533 (German), 33003684 (Italian), 33002534 (Spanish), 33003685 (Chinese)
EcoStruxure™ Control Expert, Communication, Block Library	33002527 (English), 33002528 (French), 33002529 (German), 33003682 (Italian), 33002530 (Spanish), 33003683 (Chinese)

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

Product Related Information

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter, and apply this product.

Follow all local and national safety codes and standards.

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

Part I
Introduction to the BMX EHC 0800 Counting Function

Subject of this Part

This part provides a general introduction to the counting function and the operating principles of the module.

What Is in This Part?

This part contains the following chapters:

Chapter 1
General Information on the BMX EHC 0800 Counting Function

General Information on Counting Functions

At a Glance

The counting function enables fast counting using couplers, Control Expert screens and specialized language objects. The general operation of expert modules also known as couplers is described in the section Presentation of the Counting Module Operation BMX EHC 0800.

In order to implement the counting, it is necessary to define the physical context in which it is to be executed (rack, supply, processor, modules etc.) and to ensure the software implementation *(see page 95)*.

This second aspect is performed from the different Control Expert editors:

- in offline mode
- in online mode

Chapter 2
Presentation of BMX EHC 0800 Counting Module

Subject of this Chapter

This chapter deals with the BMX EHC 0800 counting module of the Modicon X80 range.

What Is in This Chapter?

This chapter contains the following topics:

General Information about Counting Module

Introduction

The BMX EHC 0800 counting module is a standard format module that enable pulses from a sensor to be counted at a maximum frequency of 10 KHz.

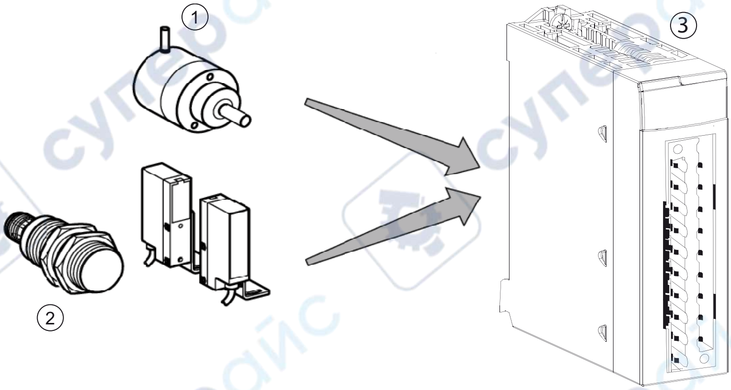
This module has 8 channels.

Sensors Used

The sensors used on each channel may be:

- 24 VDC two-wire proximity sensors
- 24 VDC three-wire proximity sensors
- Incremental signal encoders with 10/30 VDC output and push-pull outputs.

Illustration



1 Incremental encoder
2 Proximity sensors
3 BMX EHC 0800 counting module

General Information about the Counting Module Operation

Introduction

The BMX EHC 0800 module has:

- Counting-related functions (comparison, capture, homing, reset to 0)
- Event generation functions designed for the application program
- Outputs for actuator use (contacts, alarms, relays)

Characteristics

The main characteristics of this module are as follows:

Type	Application	Number of channels per module	Number of physical inputs per channel	Number of physical outputs per channel	Maximum frequency
BMX EHC 0800	● Counting ● Downcounting ● Frequency meter ● Encoder interface	8	2 in single mode 3 in special dual phase mode	0	10 KHz

Presentation of the BMX EHC 0800 Counting Module

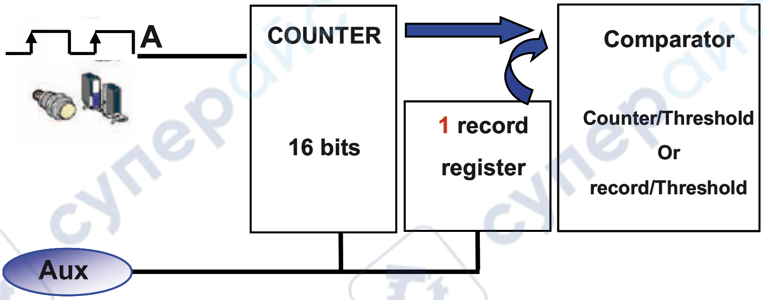
At a Glance

The BMX EHC 0800 counting module enables the counting or downcounting of pulses to be performed. It has the following functions:

- Enable
- Capture
- Comparison
- Load to preset value or reset to 0

16 bits structure

The following illustration shows the 16 bits structure of a counter channel:

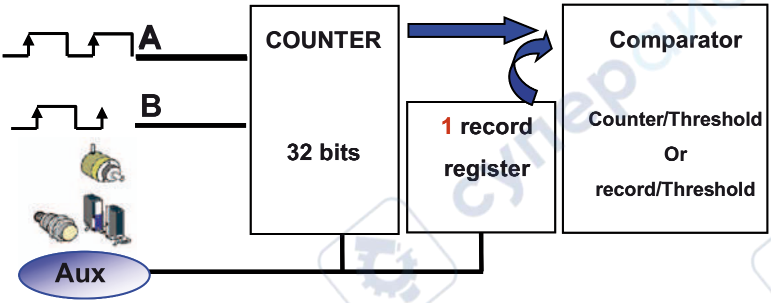


The diagram above is applicable for the following 5 counting modes:

- Frequency mode
- Event counting mode
- One shot counter mode
- Modulo loop counter mode
- Up and down counter mode

32 bits structure

The following illustration shows the 32 bits structure using 2 channels:



The illustration shown above is only applicable for the dual-phase counter mode.

In this mode, with the counting module it is possible to merge 2 single channels into 1 dual-phase channel. As such, it is possible to build up to 4 encoder interfaces.

Standards and Certifications

Download

Click the link that corresponds to your preferred language to download standards and certifications (PDF format) that apply to the modules in this product line:

Title	Languages
Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications	● English: *EIO0000002726* ● French: *EIO0000002727* ● German: *EIO0000002728* ● Italian: *EIO0000002730* ● Spanish: *EIO0000002729* ● Chinese: *EIO0000002731*

Chapter 3

Presentation of the BMX EHC 0800 Counting Module Operation

Overview of BMX EHC 0800 Module Functionalities

At a Glance

This part presents the different types of user applications for the BMX EHC 0800 module.

Measurement

The following table presents the measurement functionality for the BMX EHC 0800 module:

User application type	Mode
Speed measurement/stream measurement	Frequency
Random events monitoring	Event counting

Counting

The following table presents the counting functionality for the BMX EHC 0800 module:

User application type	Mode
Grouping	One shot counter
Level 1 packaging/labeling	Modulo loop counter
Accumulator	Up and down counting
Encoder interface	Dual phase counting[(1)]
1 Dual phase counting mode requires a BMXEHC0800 module if the selected I/O Data Type is Topological and a BMXEHC0800.2 module if the selected I/O Data Type is Device DDT. In this second case the event feature is not available. Select the I/O Data Type, if needed, when adding the module in the rack.	

NOTE: In case of a user application such as level 1 packaging/labeling, the machine makes constant spacing between parts.

Interface

The BMX EHC 0800 module may be interfaced with the following components:

- mechanical switch
- 24 VDC two-wire proximity sensor
- 24 VDC three-wire proximity sensor
- 10/30 VDC encoder with push-pull outputs

Part II
BMX EHC 0800 Counting Module Hardware Implementation

Subject of this Part

This part presents the hardware implementation of the BMX EHC 0800 counting module.

What Is in This Part?

This part contains the following chapters:

Chapter 4
General Rules for Installing BMX EHC 0800 Counting Module

Subject of this Chapter

This chapter presents the general rules for installing the BMX EHC 0800 counting module.

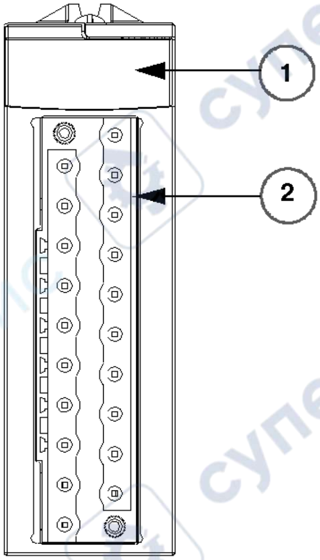
What Is in This Chapter?

This chapter contains the following topics:

Physical Description of the Counting Module

Illustration

The figure below present the counting module BMX EHC 0800:



BMX EHC 0800

Physical Elements of the Module

The table below presents the elements of the counting module:

Module	Number	Description
BMX EHC 0800	1	Module state LEDs: ● State LEDs at module level ● State LEDs at channel level
	2	20-pin connector compatible with BMX FTB 20•0 terminal block

Accessories

The BMX EHC 0800 module requires the use of a BMX FTB 20•0 terminal block and a BMXXSP•••• shielding connection kit *(see page 54)*.

Fitting of Counting Module

At a Glance

The counting module is powered by the rack bus. The module may be handled without turning off power supply to the rack, without causing any danger or disturbance to the PLC if you follow recommendations described in this manual for fitting operations (installation, assembly, and disassembly).

Installation Precautions

The counting module may be installed in any of the positions in the rack except:

- the positions reserved for the rack power supply modules (marked PS, PS1 and PS2),
- the position reserved for the extended module (marked XBE)
- the positions reserved for the CPU in the main local rack (marked 00 or marked 00 and 01 depending on the CPU),
- the position reserved for the (e)X80 adapter module in the main remote drop (marked 00).

Power is supplied by the bus at the bottom of the rack (3.3 V and 24 V).

Before installing a module, you must take off the protective cap from the module connector located on the rack.

⚠ ⚠ DANGER

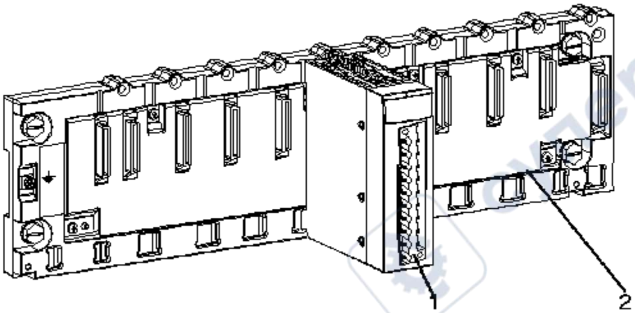
HAZARD OF ELECTRIC SHOCK

- Turn off all power to sensor and pre-actuator devices before connection of disconnection of the terminal block.
- Remove the terminal block before plugging / unplugging the module on the rack.

Failure to follow these instructions will result in death or serious injury.

Installation

The diagram below shows counting module mounted on the rack:

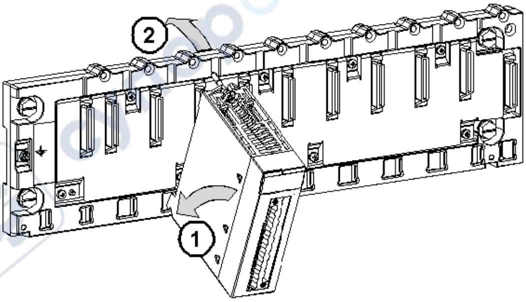


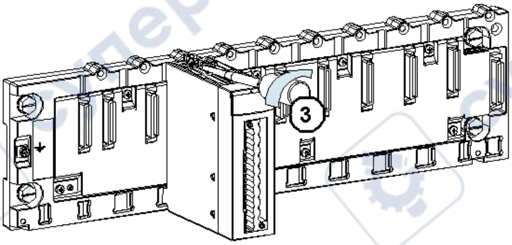
The following table describes the different elements which make up the assembly below:

Number	Description
1	BMX EHC 0800 counting module
2	Standard rack

Installing the Module on the Rack

The following table shows the procedure for mounting the counting module in the rack:

Step	Action	Illustration
1	Position the locating pins situated at the rear of the module (on the bottom part) in the corresponding slots in the rack. **NOTE:** Before positioning the pins, make sure you have removed the protective cover.	Steps 1 and 2 
2	Swivel the module towards the top of the rack so that the module sits flush with the back of the rack. It is now set in position.	

Step	Action	Illustration
3	Tighten the mounting screw to ensure that the module is held in place on the rack. Tightening torque: 0.4...1.5 N•m (0.30...1.10 lbf-ft).	Step 3 

Fitting a 20-Pin Terminal Block to a BMX EHC 0800 Counting Module

At a Glance

The BMX EHC 0800 counting module with 20-pin terminal block connections require the latter to be connected to the module. These fitting operations (assembly and disassembly) are described below.

Installing the 20-Pin Terminal Block

⚠ ⚠ DANGER

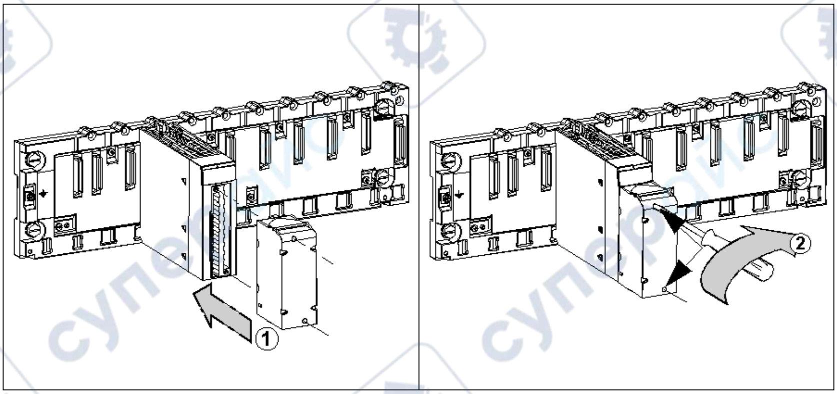
HAZARD OF ELECTRIC SHOCK

Turn off all power to sensor and pre-actuator devices before connection or disconnection of the terminal block.

Failure to follow these instructions will result in death or serious injury.

NOTE: The module connector have indicators which show the proper direction to use for terminal block installation.

The following table shows the procedure for assembling the 20-pin terminal block onto a BMX EHC 0800 counting module:



Step	Action
1	Once the module is in place on the rack, install the terminal block by inserting the terminal block encoder (the rear lower part of the terminal) into the module encoder (the front lower part of the module), as shown above.
2	Fix the terminal block to the module by tightening the 2 mounting screws located on the lower and upper parts of the terminal block. Tightening torque: 0.4 N.m.

NOTE: If the screws are not tightened, there is a risk that the terminal block will not be properly fixed to the module.

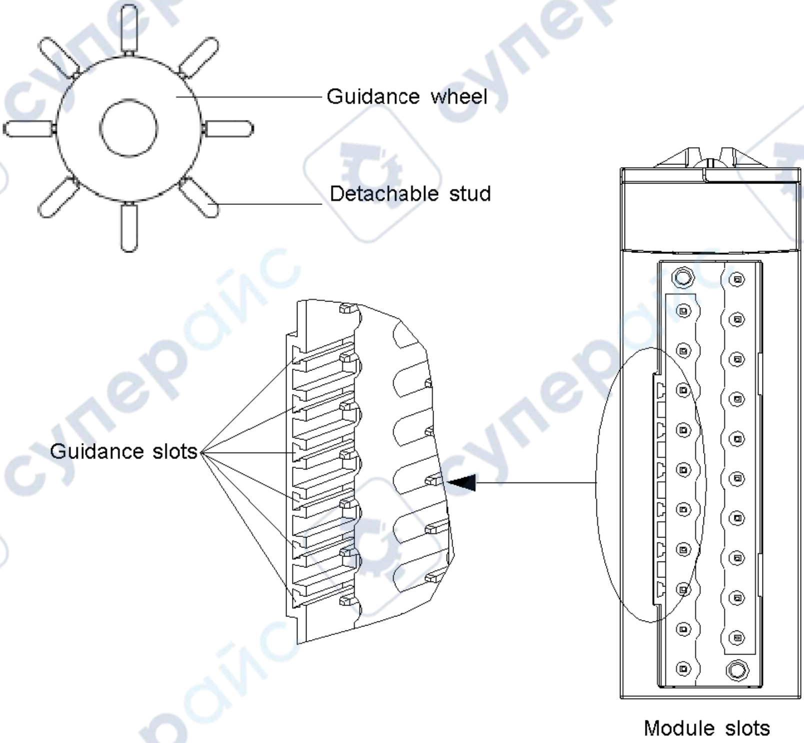
Coding the 20-Pin Terminal Block

When a 20-pin terminal block is installed on a module dedicated to this type of terminal block, you can code the terminal block and the module using studs. The purpose of the studs is to prevent the terminal block from being mounted on another module. Handling errors can then be avoided when replacing a module.

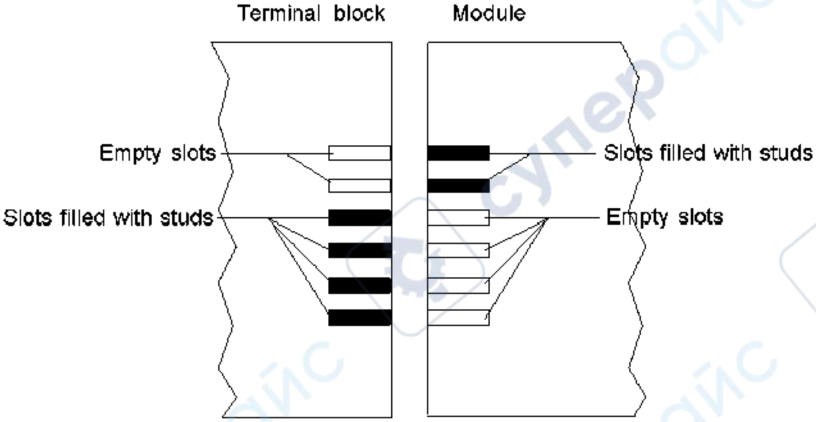
Coding is done by the user with the STB XMP 7800 guidance wheel studs. You can only fill the 6 slots in the middle of the left side (as seen from the wiring side) of the terminal block, and can fill the module 6 guidance slots on the left side.

To fit the terminal block to the module, a module slot with a stud must correspond to an empty slot in the terminal block, or a terminal block with a stud must correspond to an empty slot in the module. You can fill up to and including either of the 6 available slots as desired.

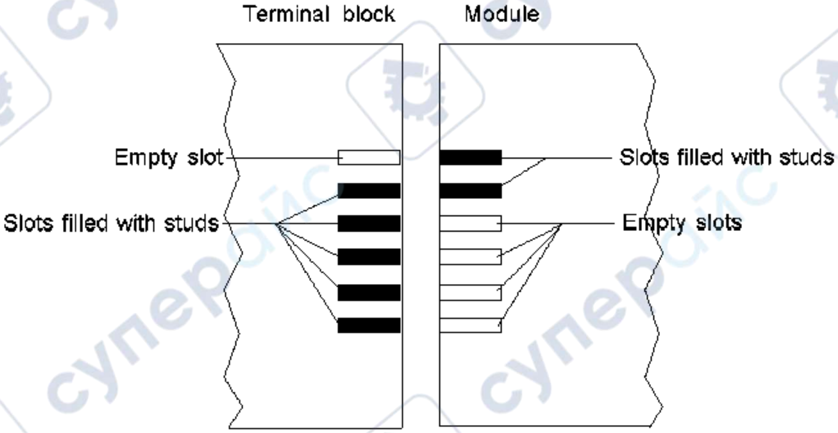
The diagram below shows a guidance wheel as well as the slots on the module used for coding the 20-pin terminal blocks:



The diagram below shows an example of a coding configuration that makes it possible to fit the terminal block to the module:



The diagram below shows an example of coding configuration with which it is not possible to fit the terminal block to the module:



⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK

Turn off all power to sensor and pre-actuator devices before connection or disconnection of the terminal block.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

UNEXPECTED BEHAVIOR OF APPLICATION

Code the terminal block as described above to prevent the terminal block from being mounted on another module.

Plugging the wrong connector could cause unexpected behavior of the application.

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

NOTICE

MODULE DAMAGE

Code the terminal block as described above to prevent the terminal block from being mounted on another module.

Plugging the wrong connector could cause the module to be damaged.

Failure to follow these instructions can result in equipment damage.

How to Connect the BMX EHC 0800 Counting Module: Connecting a 20-Pin Terminal Block

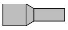
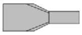
At a Glance

There are 3 types of 20-pin terminal blocks:

- BMX FTB 2010 screw clamp terminal blocks
- BMX FTB 2000 caged terminal blocks
- BMX FTB 2020 spring terminal blocks

Cable Ends and Contacts

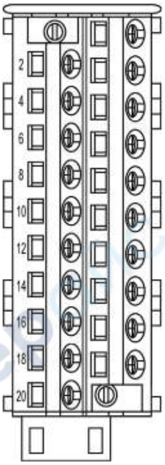
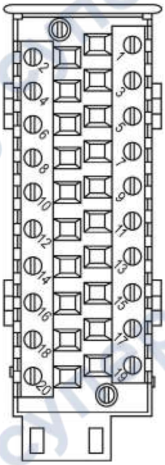
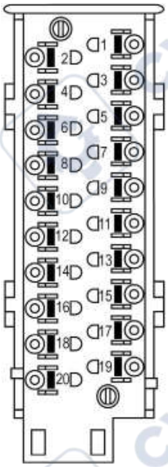
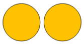
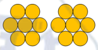
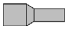
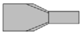
Each terminal block can accommodate:

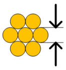
- Bare wires
- Wires with:
  - DZ5-CE (ferrule) type cable ends: 
  - AZ5-DE (twin ferrule) type cable ends: 

NOTE: When using stranded cable, Schneider Electric strongly recommends the use of wire ferrules which are fitted with an appropriate crimping tool.

Description of the 20-Pin Terminal Blocks

The following table describes the type of wires that fit each terminal block and the associated gauge range, wiring constraints, and tightening torque:

	Screw Clamp Terminal Blocks BMX FTB 2010	Caged Terminal Blocks BMX FTB 2000	Spring Terminal Blocks BMX FTB 2020
Illustration			
1 solid conductor	• AWG: 22...16 • mm^2: 0.34...1.5	• AWG: 22...18 • mm^2: 0.34...1	• AWG: 22...18 • mm^2: 0.34...1
2 solid conductors 	2 conductors of the same size: • AWG: 2 x 22...16 • mm^2: 2 x 0.34...1.5	Only possible with twin ferrule: • AWG: 2 x 24...20 • mm^2: 2 x 0.24...0.75	Only possible with twin ferrule: • AWG: 2 x 24...20 • mm^2: 2 x 0.24...0.75
1 stranded cable	• AWG: 22...16 • mm^2: 0.34...1.5	• AWG: 22...18 • mm^2: 0.34...1	• AWG: 22...18 • mm^2: 0.34...1
2 stranded cables 	2 conductors of the same size: • AWG: 2 x 22...16 • mm^2: 2 x 0.34...1.5	Only possible with twin ferrule: • AWG: 2 x 24...20 • mm^2: 2 x 0.24...0.75	Only possible with twin ferrule: • AWG: 2 x 24...20 • mm^2: 2 x 0.24...0.75
1 stranded cable with ferrule 	• AWG: 22...16 • mm^2: 0.34...1.5	• AWG: 22...18 • mm^2: 0.34...1	• AWG: 22...18 • mm^2: 0.34...1
2 stranded cables with twin ferrule 	• AWG: 2 x 24...18 • mm^2: 2 x 0.24...1	• AWG: 2 x 24...20 • mm^2: 2 x 0.24...0.75	• AWG: 2 x 24...20 • mm^2: 2 x 0.24...0.75

	Screw Clamp Terminal Blocks BMX FTB 2010	Caged Terminal Blocks BMX FTB 2000	Spring Terminal Blocks BMX FTB 2020
Minimum individual wire size in stranded cables when a ferrule is not used 	● AWG: 30 ● mm^2: 0.0507	● AWG: 30 ● mm^2: 0.0507	● AWG: 30 ● mm^2: 0.0507
Wiring constraints	Screw clamps have slots that accept: ● Flat-tipped screwdrivers with a diameter of 5 mm. ● Pozidriv PZ1 or Philips PH1 cross-tipped screwdrivers. Screw clamp terminal blocks have captive screws. On the supplied blocks, these screws are not tightened.	Caged terminal blocks have slots that accept: ● Flat-tipped screwdrivers with a diameter of 3 mm. Caged terminal blocks have captive screws. On the supplied blocks, these screws are not tightened.	The wires are connected by pressing the button located next to each pin. To press the button, use a flat-tipped screwdriver with a maximum diameter of 3 mm.
Screw tightening torque	0.5 N•m (0.37 lb-ft)	0.4 N•m (0.30 lb-ft)	Not applicable

⚠ ⚠ DANGER

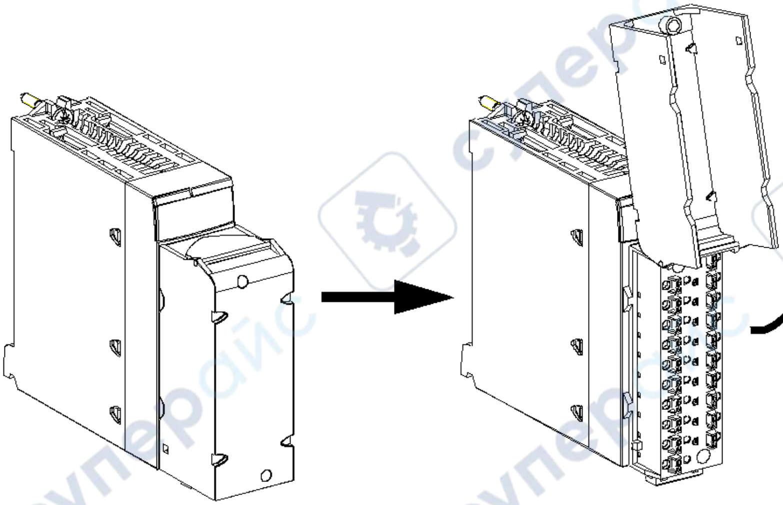
HAZARD OF ELECTRIC SHOCK

Turn off all power to sensor and pre-actuator devices before connection or disconnection of the terminal block.

Failure to follow these instructions will result in death or serious injury.

Connection of 20-Pin Terminal Blocks

The following diagram shows the method for opening the 20-pin terminal block door so that it can be wired:



NOTE: The wires are installed and held in place by a cable clamp positioned below the 20-pin terminal block.

Labeling of 20-Pin Terminal Blocks

The labels for the 20-pin terminal blocks are supplied with the module. They are to be inserted in the terminal block cover by the customer.

Each label has two sides:

- One side that is visible from the outside when the cover is closed. This side features the commercial product references, an abbreviated description of the module as well as a blank section for customer labeling.
- One side that is visible from the inside when the cover is open. This side shows the terminal block connection diagram.

Chapter 5
BMX EHC 0800 Counting Module Hardware implementation

Subject of this Chapter

This chapter deals with the hardware characteristics and diagnostics of the BMX EHC 0800 module.

What Is in This Chapter?

This chapter contains the following topics:

Characteristics of the BMX EHC 0800 Module and its Inputs

Ruggedized Version

The BMX EHC 0800H (hardened) equipment is the ruggedized version of the BMX EHC 0800 (standard) equipment. It can be used at extended temperatures and in harsh chemical environments.

For more information, refer to chapter *Installation in More Severe Environments (see Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications)*.

Altitude Operating Conditions

The characteristics in the table below apply to the modules BMX EHC 0800 and BMX EHC 0800H for use at altitude up to 2000 m (6560 ft). When the modules operate above 2000 m (6560 ft), apply additional derating.

For detailed information, refer to chapter *Operating and Storage Conditions (see Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications)*.

General Characteristics

This table presents the general characteristics for the BMX EHC 0800 and BMX EHC 0800H modules:

Module type		8 counting channels
Operating temperature	BMX EHC 0800	0...60 ºC (32...140 ºF)
	BMX EHC 0800H	-25...70 ºC (-13...158 ºF)
Counter size		16 bits
Maximum frequency at counting inputs		10 kHz
Number of inputs/outputs per counting channel	Inputs	2 inputs in single mode 3 inputs in special dual phase mode
	Outputs	0
Power Supply	Sensor supply voltage	19.2...30 VDC
	Module consumption	Does not take into account sensors or encoder consumption ● All inputs OFF: typical: 15 mA ● All inputs ON: typical: 80 mA
Power distribution to sensors		No
Hot replacement		Yes, under the following conditions: The module may be removed and reinserted into its location while the rack is switched on, but the counter may have to be revalidated when it is reinserted into its base.

Dimensions	Width	Module only	32 mm
		On the rack	32 mm
	Height	Module only	103.76 mm
		On the rack	103.76 mm
	Depth	Module only	92 mm
		On the rack	104.5 mm
Encoder compliance		10...30 VDC incremental encoder model with push-pull at outputs	
Insulation voltage	Of the ground to the bus	1500 V RMS for 1 min	
Rack 24 V supply bus	Current for the 24 V bus	Typical: 40 mA	
Rack 3 V supply bus	Current for the 3 V bus	Typical: 200 mA	
Cycle Time		5 ms	

⚠ WARNING

OVERHEATING MODULE

Do not operate the **BMX EHC 0800H** at 70 °C (158 °F) if the sensor power supply is greater than 26.4 V or less than 21.1 V.

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

Input Characteristics

This table presents the general characteristics of the input channels for the module:

Number of inputs per channel			Two 24 VDC inputs
Inputs: IN_A, IN_AUX	Voltage		30 VDC
	At state 1	Voltage	11 VDC...30 VDC
		Current	4.5 mA (up to 30 VDC)
	At state 0	Voltage	< 5 VDC
		Current	< 1.5 mA
	Current at 11 VDC		> 2 mA

Display and Diagnostics of the BMX EHC 0800 Counting Module

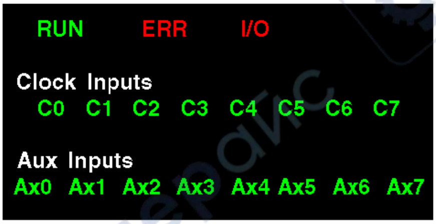
At a Glance

The BMX EHC 0800 counting module has LEDs that enable the following to be viewed:

- the status of the module: RUN, ERR, I/O
- the input status of every channel

Illustration

The following drawing shows the display screen of the BMX EHC 0800 module:



Fault Diagnostics

The following table enables the diagnostics of errors according to the various LEDs.

Module status	LED indicators										
	RUN	ERR	I/O	C0	C1	C2	C3	C4	C5	C6	C7
The module is inoperative or switched off	○										
The module has an error	○	●	○								
The module is not configured	○	⊘	○								
The module has lost communication	●	⊘									
The sensors have a supply error	●	○	●	⊗							
The channels are operational	●	○	○								
The voltage is present at input IN_A of counter 0				●							
The voltage is present at input IN_A of counter 1					●						
The voltage is present at input IN_A of counter 2						●					
The voltage is present at input IN_A of counter 3							●				
The voltage is present at input IN_A of counter 4								●			
The voltage is present at input IN_A of counter 5									●		
The voltage is present at input IN_A of counter 6										●	
The voltage is present at input IN_A of counter 7											●

Module status	LED indicators										
	RUN	ERR	I/O	A0	A1	A2	A3	A4	A5	A6	A7
The channels are operational	●	○	○								
The voltage is present at input IN_AUX of counter 0				●							
The voltage is present at input IN_AUX of counter 1					●						
The voltage is present at input IN_AUX of counter 2						●					
The voltage is present at input IN_AUX of counter 3							●				
The voltage is present at input IN_AUX of counter 4								●			
The voltage is present at input IN_AUX of counter 5									●		
The voltage is present at input IN_AUX of counter 6										●	
The voltage is present at input IN_AUX of counter 7											●
Legend											
● LED on											
○ LED off											
⊗ LED flashing slowly											
⊘ LED flashing fast											
An empty cell indicates that the state of the LED(s) is not taken into account											

BMX EHC 0800 Module Wiring

At a Glance

The BMX EHC 0800 counting module uses a standard BMX FTB 2000/2010/2020 20-pin connector (wiring terminal).

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK

- Turn off all power to sensor and pre-actuator devices before connection or disconnection of the terminal block.
- Remove the terminal block before plugging / unplugging the module on the rack.

Failure to follow these instructions will result in death or serious injury.

Field Sensors

The module has type 3 inputs that support signals from mechanical switching equipment such as contact relays, push-buttons, limit switch sensors and two or three-wire switches that have:

- a voltage drop of less than 8 V,
- current when ON more than or equal to 2 mA,
- current when OFF up to 1.5 mA.

The module complies with all encoders that have a 10...30 Vdc supply and push-pull outputs. Shielding is required if there is no filtering.

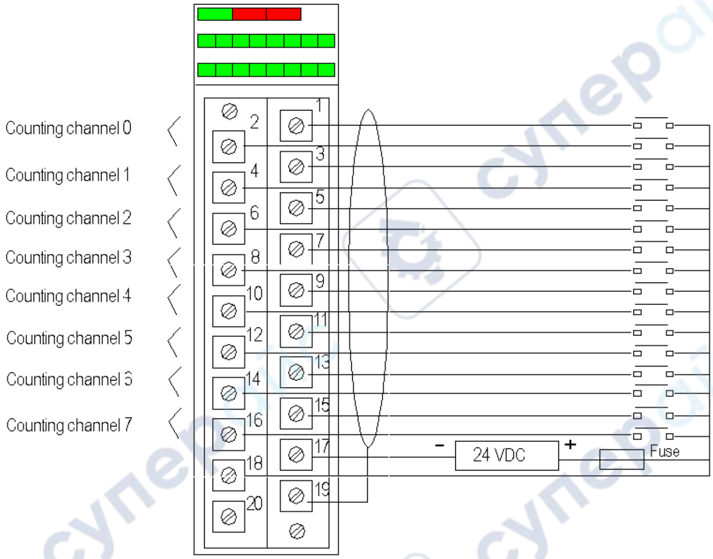
Pin Assignments

The following table describes the assignment of the 20-pin wiring terminal:

IN_A input for channel 0	2	1	IN_AUX input for channel 0
IN_A input for channel 1 or IN_B input for channel 0	4	3	IN_AUX input for channel 1
IN_A input for channel 2	6	5	IN_AUX input for channel 2
IN_A input for channel 3 or IN_B input for channel 2	8	7	IN_AUX input for channel 3
IN_A input for channel 4	10	9	IN_AUX input for channel 4
IN_A input for channel 5 or in_B input for channel 4	12	11	IN_AUX input for channel 5
IN_A input for channel 6	14	13	IN_AUX input for channel 6
IN_A input for channel 7 or IN_B input for channel 6	16	15	IN_AUX input for channel 7
Vdc + power supply for sensors	18	17	Return + 24 V power supply for sensors
Functional earth, for shield continuation	20	19	Functional earth, for shield continuation

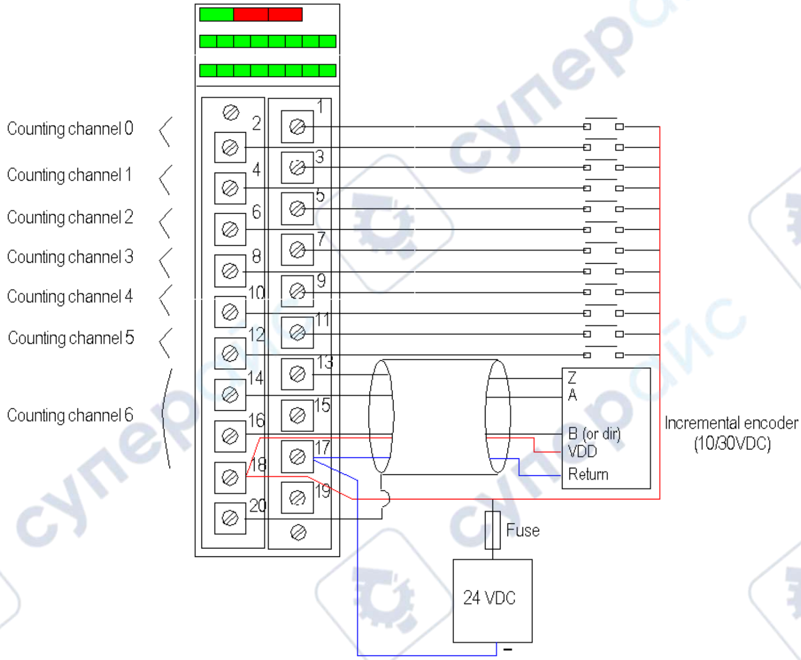
Sensor Connection Example

The example below shows the most complete application using sensors:



Encoder Connection Example

The example below shows an incremental encoder connection used for axis control connected to the counter channel 6 used in dual phase counting mode:



Channels 0 to 5 are still used in single mode.

Channel 7 is no longer available.

Safety Instructions

Electromagnetic perturbations may cause the application to operate in an unexpected manner.

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Follow these instructions to reduce electromagnetic perturbations:

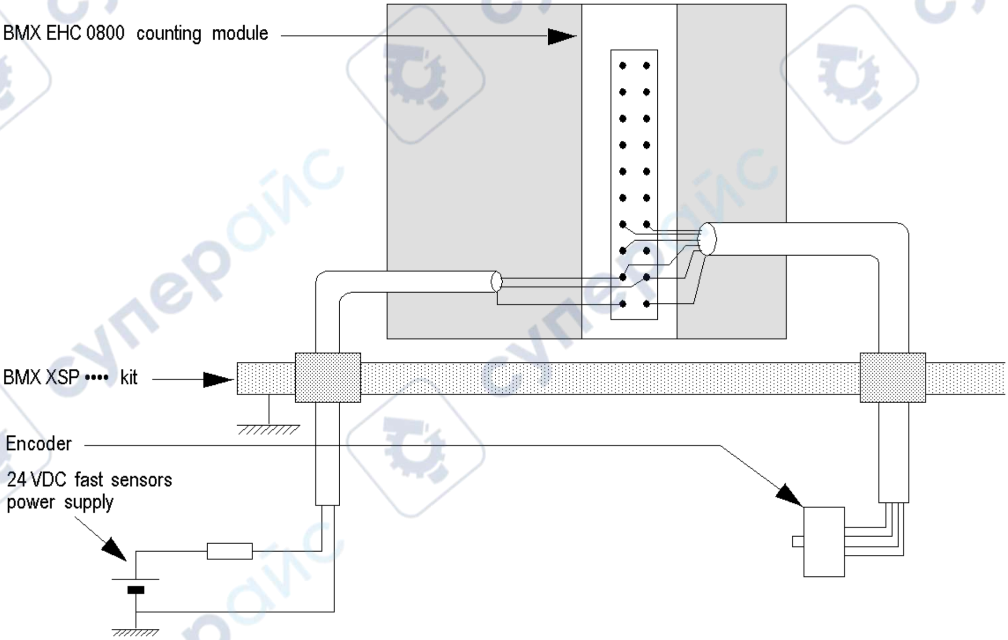
- Adapt the programmable filtering to the frequency applied at the inputs.
- Use a shielded cable (connected to the functional ground) connected to pins 15 and 16 of the connector when using an encoder or a fast detector.

In a highly disturbed environment:

- Use the BMXXSP•••• shielding connection kit *(see page 54)* to connect the shielding without programmable filtering and
- Use a specific 24 Vdc supply for inputs and a shielded cable for connecting the supply to the module.

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

The figure below shows the recommended circuit for a highly disturbed environment using the shielding connection kit:


BMX EHC 0800 counting module
BMX XSP •••• kit
Encoder
24 VDC fast sensors power supply

Improper fuse selection could result in damage to the module.

NOTICE

MODULE DAMAGE

Use fast acting fuses to protect the electronic components of the module from overcurrent and reverse polarity of the input/output supplies.

Failure to follow these instructions can result in equipment damage.

Shielding Connection Kit

Introduction

The BMXXSP•••• shielding connection kit allows to connect the cable shielding directly to the ground and not to the module shielding to help protect the system from electromagnetic perturbations.

Connect the shielding on the cordsets for connecting:

- Analog module,
- Counter module,
- Encoder interface module,
- Motion control module,
- An XBT console to the processor (via shielded USB cable).

Kit References

Each shielding connection kit includes the following components:

- A metal bar
- Two sub-bases

The reference is dependent on the number of slots on the Modicon X80 rack:

Modicon X80 rack	Number of slots	Shielding Connection Kit

BMXXBP0400(H)
BMEXBP0400(H)
	4	BMXXSP0400

BMXXBP0600(H)
BMEXBP0600(H)
	6	BMXXSP0600

BMXXBP0800(H)
BMEXBP0800(H)
BMEXBP0602(H)
	8	BMXXSP0800

BMXXBP1200(H)
BMEXBP1200(H)
BMEXBP1002(H)
	12	BMXXSP1200

Clamping Rings

Use clamping rings to connect the shielding on cordsets to the metal bar of the kit.

NOTE: The clamping rings are not included in the shielding connection kit.

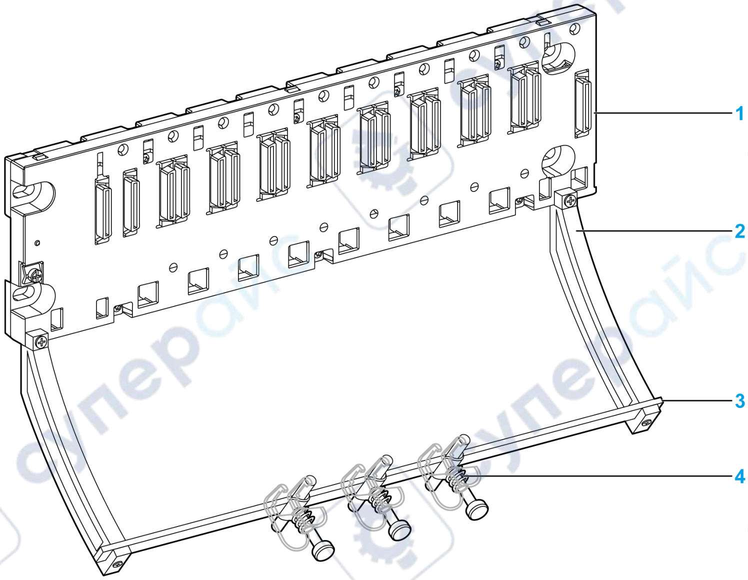
Depending on the cable diameter, the clamping rings are available under the following references:

- STBXSP3010: small rings for cables with cross-section 1.5...6 mm^2 (AWG16...10).
- STBXSP3020: large rings for cables with cross-section 5...11 mm^2 (AWG10...7).

Kit Installation

Installation of the shielding connection kit to the rack can be done with module already installed on the rack except for the BMXXBE0100 rack extender module.

Fasten the sub-bases of the kit at each end of the rack to provide a connection between the cable and the ground screw of the rack:



1 rack
2 sub-base
3 metallic bar
4 clamping ring

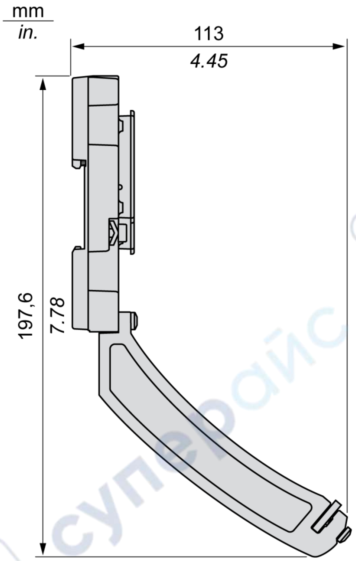
Tightening torques to install the shielding connection kit:

- For the screws fixing the sub-base to the Modicon X80 rack: Max. 0.5 N•m (0.37 lbf-ft)
- For the screws fixing the metallic bar to the sub-bases: Max. 0.75 N•m (0.55 lbf-ft)

NOTE: A shielding connection kit does not modify the volume required when installing and uninstalling modules.

Kit Dimensions

The following figure gives the dimensions (height and depth) of a Modicon X80 rack with its shielding connection kit:



NOTE: The overall width equals to the width of the Modicon X80 rack.

Part III
BMX EHC 0800 Counting Module Functionalities

Chapter 6
BMX EHC 0800 Counting Module Functionalities

Subject of this Chapter

This chapter deals with functionalities and counting modes of the BMX EHC 0800 module.

What Is in This Chapter?

This chapter contains the following sections:

Section 6.1
BMX EHC 0800 Module Configuration

Subject of this Section

This section deals with the configuration of the BMX EHC 0800 module.

What Is in This Section?

This section contains the following topics:

Input Interface Blocks

Description

The BMX EHC 0800 counting module has three fast inputs:

Fast Inputs

The table below presents the module’s fast inputs.

Input	Use with available sensors	Use with an encoder
IN_A input	Clock input for measurement or single upcounting	For signal A
IN_B input From the following channel	Second clock input for differential counting or measurement	For signal B
IN_AUX input	Multi-function input used for: ● synchronization ● preset and start ● reset and record ● capture ● counting direction (upcounting/downcounting mode)	For signal Z Used for preset

Programmable Filtering

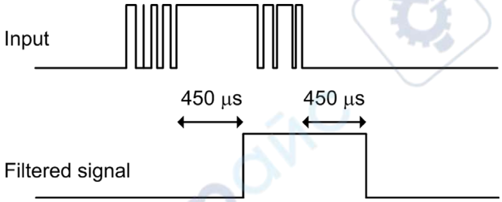
At a Glance

The BMX EHC 0800 counting module’s two (or three) inputs are compatible with the use of mechanical switches.

A programmable debounce filter with 3 levels (low, medium and high) is available at every input.

Debounce Filter Diagram

The figure below shows the debounce filter in low mode:



In this mode, the system delays all transitions until the signal is stable for 450 µs.

Selecting the Filtering Level

The table below specifies the characteristics of each input for the selected level of filtering:

Filtering level	Input	Minimum pulse	Maximum frequency
None	IN_A, IN_B	50 µs	10 KHz
	IN_AUX	50 µs	40 Hz
Low for bounces > 2 KHz	IN_A, (IN_B)	450 µs	1 KHz
	IN_AUX	450 µs	40 Hz
Resource for bounces > 1 KHz	IN_A, IN_B	1.25 ms	350 Hz
	IN_AUX	1.25 µs	40 Hz
High for bounces > 250 Hz	IN_A, IN_B	4.2 ms	100 Hz
	IN_AUX	4.2 ms	40 Hz

Comparison

At a Glance

The comparison block operates automatically when it is enabled. It is available in all the BMX EHC 0800 module’s counting modes.

It compares the current value of the counter together with the capture value at the defined threshold.

Comparison Threshold

The comparison block has one threshold only. Its value is contained in the `lower_th_value` double word (`%QDr.m.c.2`).

The threshold format is identical to the counter value format.

Comparison Status Register

The result of the comparison is stored in the comparison status register.

The value of the capture register and the current value of the counter are compared with the thresholds.

The possible results are:

- Low: The counter value is less than the lower threshold value.
- Equal: The counter value is equal to the threshold.
- High: The counter value is greater than the threshold.

The comparison status register consists of:

Position of the status register bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Compared element											Capture			Counter		
Comparison result											High	Equal	Low	High	Equal	Low

Update

When the `compare_enable_bit` is set to 0, the comparison status register is deleted.

When the `compare_suspend_bit` is set to 1, the comparison status register is frozen at its last value.

The comparison with capture register value is performed every time the registers are loaded.

The comparison with the counter current value is performed as follows:

Counting mode	Comparison register update
Frequency	Period intervals of 10 ms
Event counting	Period intervals defined by the user
Modulo loop counter	One of the following conditions: ● intervals of 5 ms ● counter reloading or resetting to 0 ● counting direction change ● counter stops ● crossing of threshold
One shot counter	
dual phase counting	
Up and down counting	

Diagnostics

Consistency Rules for Inputs Interface

The input interface requires that the sensor power supply remains active for counting operations.

When the sensor power supply interrupts lasts 1 ms or less, the counter remains stable.

In case of power interrupt is greater than 1 ms, all counter values are disabled.

By default, the sensor supply an error makes the `CH_ERROR` (`%Ir.m.c.ERR`) global status bit at the high level and the red led IO lighted.

The configuration screen allows to unlink the sensor supply an error to the `CH_ERROR` bit by configuring the parameter `Input Supply Fault` as `local` instead of `General IO Fault`.

In all cases, after having executed the `READ_STS (IODDT_VAR1)` instruction, the application provides the `%MWr.m.c.2` and `%MWr.m.c.3` standard status words including the supply an error information.

`IODDT_VAR1` is of the type `T_Unsigned_CPT_BMX` or `T_Signed_CPT_BMX`.

Explicit channel status words

The table below presents the composition of the `%MWr.m.c.2` and `%MWr.m.c.3` status words.

Status Word	Bit position	Designation
`%MWr.m.c.2`	0	External error at inputs
	4	Internal error or self-testing.
	5	Configuration Fault
	6	Communication Error
	7	Application error
`%MWr.m.c.3`	2	Sensor supply error

IO Data

All input/output statuses are provided in the channel data bits.

The table below shows the channel data bits:

Input/Output data field	Designation
`%Ir.m.c.4`	Electrical state of IN_A input
`%Ir.m.c.5`	Electrical state of IN_B input
`%Ir.m.c.6`	Electrical state of IN_AUX input

Synchronization, Enable, Reset to 0 and Capture Functions

Introduction

This section presents the functions used by the various counting modes of the BMX EHC 0800 module:

- Synchronization function
- Enable function
- Reset to 0 function
- Capture function

Each function uses at least one of the following two bits:

- valid_(function) bit: Setting this bit to 1 allows you to take into account the occurrence of an external event which activates the function. If this bit is set to 0, the event is not taken into account and does not activate the function. The functions_enabling word (%QWr.m.c.0) contains all the valid_(function) bits.
- force_(function) bit: Setting this bit to 1 allows you to activate the function irrespective of the status of the external event. All the force_(function) bits are %Qr.m.c.4...%Qr.m.c.8 language objects.

Synchronization Function

The synchronization function is used to synchronize the counter operation upon a transition applied to the IN_AUX physical input or the force_sync bit set to 1.

This function is used in the following counting modes:

- Dual phase counting
- Modulo loop counter
- One shot counter
- Event counting
- Up and down counting (using the force_sync bit only)

In all of the counting modes specified above, with the exception of the up and down counting mode, the user may configure the synchro edge parameter in the configuration screen by choosing from the following two possibilities to configure the external event:

- Rising edge of the IN_AUX input
- Falling edge of the IN_AUX input

The following table presents the `force_sync` bit in bold which is an element of the `%Qr.m.c.d` output command word:

Language object	Standard symbol	Meaning
`%Qr.m.c.0`	OUTPUT_0	Forces OUTPUT_0 to level 1
`%Qr.m.c.1`	OUTPUT_1	Forces OUTPUT_1 to level 1
`%Qr.m.c.2`	OUTPUT_BLOCK_0_ENABLE	Implementation of output 0 function block
`%Qr.m.c.3`	OUTPUT_BLOCK_1_ENABLE	Implementation of output 1 function block
`%Qr.m.c.4`	**FORCE_SYNC**	**Counting function synchronization and start**
`%Qr.m.c.5`	FORCE_REF	Set to preset counter value
`%Qr.m.c.6`	FORCE_ENABLE	Implementation of counter
`%Qr.m.c.7`	FORCE_RESET	Reset counter
`%Qr.m.c.8`	SYNC_RESET	Reset SYNC_REF_FLAG
`%Qr.m.c.9`	MODULO_RESET	Reset MODULO_FLAG

The following table presents the `valid_sync` bit in bold which is an element of the `%QWr.m.c.0` function enabling word:

Language object	Standard symbol	Meaning
`%QWr.m.c.0.0`	**VALID_SYNC**	**Synchronization and start authorization for the counting function via the IN_SYNC input**
`%QWr.m.c.0.1`	VALID_REF	Operation authorization for the internal preset function
`%QWr.m.c.0.2`	VALID_ENABLE	Authorization of the counter enable via the IN_EN input
`%QWr.m.c.0.3`	VALID_CAPT_0	Capture authorization in the capture0 register
`%QWr.m.c.0.4`	VALID_CAPT_1	Capture authorization in the capture1 register
`%QWr.m.c.0.5`	COMPARE_ENABLE	Comparators operation authorization
`%QWr.m.c.0.6`	COMPARE_SUSPEND	Comparator frozen at its last value

The following table presents the synchronization principle:

Edge	Status of the **valid_sync** bit	Status of the counter
Rising or falling edge on IN_AUX (depending on the configuration)	Set to 0	Not synchronized
Rising or falling edge on IN_AUX (depending on the configuration)	Set to 1	Synchronized
Rising edge on force_sync bit	Set to 0 or 1	Synchronized

When the synchronization occurs, the application can react using:

- either the SYNC_REF_FLAG input (%IWr.m.c.0.2) *(see page 71)*
- or the EVT_SYNC_PRESET input (%IWr.m.c.10.2) *(see page 73)*.

Enable Function

This function is used to authorize changes to the counter value via software command.

This function is used in the following counting modes:

- Dual phase counting
- Up and down counting
- Modulo loop counter
- One shot counter

The following table presents the force_enable bit in bold which is an element of the %Qr.m.c.d output command word:

Language object	Standard symbol	Meaning
%Qr.m.c.0	OUTPUT_0	Forces OUTPUT_0 to level 1
%Qr.m.c.1	OUTPUT_1	Forces OUTPUT_1 to level 1
%Qr.m.c.2	OUTPUT_BLOCK_0_ENABLE	Implementation of output 0 function block
%Qr.m.c.3	OUTPUT_BLOCK_1_ENABLE	Implementation of output 1 function block
%Qr.m.c.4	FORCE_SYNC	Counting function synchronization and start
%Qr.m.c.5	FORCE_REF	Set to preset counter value
%Qr.m.c.6	FORCE_ENABLE	Implementation of counter
%Qr.m.c.7	FORCE_RESET	Reset counter
%Qr.m.c.8	SYNC_RESET	Reset SYNC_REF_FLAG
%Qr.m.c.9	MODULO_RESET	Reset MODULO_FLAG

The function is activated by setting the force_enable bit to 1. There is no valid_enable bit because the function is not activated by any physical input.

Reset to 0 Function

This function is used to load the value 0 into the counter via software command.

This function is used in the following counting modes:

- Dual phase counting
- Up and down counting
- Modulo loop counter
- One shot counter

The following table presents the `force_reset` bit in bold which is an element of the `%Qr.m.c.d` output command word:

Language object	Standard symbol	Meaning
`%Qr.m.c.0`	OUTPUT_0	Forces OUTPUT_0 to level 1
`%Qr.m.c.1`	OUTPUT_1	Forces OUTPUT_1 to level 1
`%Qr.m.c.2`	OUTPUT_BLOCK_0_ENABLE	Implementation of output 0 function block
`%Qr.m.c.3`	OUTPUT_BLOCK_1_ENABLE	Implementation of output 1 function block
`%Qr.m.c.4`	FORCE_SYNC	Counting function synchronization and start
`%Qr.m.c.5`	FORCE_REF	Set to preset counter value
`%Qr.m.c.6`	FORCE_ENABLE	Implementation of counter
`%Qr.m.c.7`	**FORCE_RESET**	**Reset counter**
`%Qr.m.c.8`	SYNC_RESET	Reset SYNC_REF_FLAG
`%Qr.m.c.9`	MODULO_RESET	Reset MODULO_FLAG

The function is activated by the rising edge of the `force_reset` bit. There is no `valid_reset` bit because the function is not activated by any physical input.

Capture Function

This function is used to load the current counter value into the `capt_0_val` register (`%IDr.m.c.14`) at the same condition defined by the synchro edge parameter configured in the configuration screen *(see page 66)*.

Each BMX EHC 0800 module channel has one capture register.

This function is used in the following counting modes:

- Dual phase counting
- Modulo loop counter

The synchronization and capture functions may be enabled independently:

Status of the **valid_capt_0** bit (**%QWr.m.c.0.3**)	Status of the **valid_sync** bit (**%QWr.m.c.0.0**)	Behavior while the capture condition (condition defined by the **synchro edge** parameter) is true	
		Current counter value	**Capture** register value (**%ID r.m.c.14**)
Set to 0	Set to 0	No change	No change
Set to 0	Set to 1	Reload or clear	No change
Set to 1	Set to 0	No change	Reload with current counter value
Set to 1	Set to 1	Reload or clear	Reload with current counter value The storage will occur just before reseting the counter value.

Modulo Flag and Synchronization Flag

At a Glance

This section presents the operation of the bits relating to the following events:

- Counter synchronization event
- Counter rollovers the modulo or its limits in forward or reverse.

The table below presents the counting modes that may activate synchronization and modulo events:

Flag	Counting mode concerned
`sync_ref_flag` bit (`%IWr.m.c.0.2`)	● Dual phase counting: When the counter presets and (re)starts ● Up and down counting: When the counter presets and (re)starts ● Modulo loop counter: When the counter resets ● One shot counter: When the counter presets and (re)starts ● Event counting: When the internal time base restarts to the beginning.
`modulo_flag` bit (`%IWr.m.c.0.1`	● Dual phase counting: When the counter rollovers its limits ● Up and down counting: When the counter rollovers its limits ● Modulo loop counter: When the counter rollovers the modulo or 0.

You can use these 2 flags without declaring any event task in configuration screen. These 2 flag bits are refreshed by the task declared with the module channel (MAST or FAST task).

Operation of the Flag Bits

The synchronization event’s flag bit is set to 1 when a counter synchronization occurs.

The modulo event’s flag bit can be set to 1 in the following counting modes:

- Dual phase counting: The flag bit is set to 1 when the counter rollovers its limits in forward or reverse
- Up and down counting: The flag bit is set to 1 when the counter rollovers its limits in forward or reverse
- Modulo loop counter: The flag bit is set to 1 when the counter rollovers the modulo.

Location of the Flag Bits

The following table presents the modulo_flag and sync_ref_flag bits which are elements of the %IWr.m.c.d status word:

Language object	Standard symbol	Meaning
%IWr.m.c.0.0	RUN	The counter operates in one shot mode only
%IWr.m.c.0.1	**MODULO_FLAG**	**Flag set to 1 by a modulo switch event**
%IWr.m.c.0.2	**SYNC_REF_FLAG**	**Flag set to 1 by a preset or synchronization event**
%IWr.m.c.0.3	VALIDITY	The current numerical value is valid
%IWr.m.c.0.4	HIGH_LIMIT	The current numerical value is locked at the upper threshold value
%IWr.m.c.0.5	LOW_LIMIT	The current numerical value is locked at the lower threshold value

Resetting the Flag Bits to 0

The user application must reset the flag bit to 0 (if it is active) by using the appropriate command bit from the following two bits:

- sync_reset bit to reset the synchronization event's flag bit to 0
- modulo_reset bit to reset the modulo event's flag bit to 0

Location of Reset to 0 Commands

The following table presents the sync_reset and modulo_reset bits which are elements of the %Qr.m.c.d output command word:

Language object	Standard symbol	Meaning
%Qr.m.c.0	OUTPUT_0	Forces OUTPUT_0 to level 1
%Qr.m.c.1	OUTPUT_1	Forces OUTPUT_1 to level 1
%Qr.m.c.2	OUTPUT_BLOCK_0_ENABLE	Implementation of output 0 function block
%Qr.m.c.3	OUTPUT_BLOCK_1_ENABLE	Implementation of output 1 function block
%Qr.m.c.4	FORCE_SYNC	Counting function synchronization and start
%Qr.m.c.5	FORCE_REF	Set to preset counter value
%Qr.m.c.6	FORCE_ENABLE	Implementation of counter
%Qr.m.c.7	FORCE_RESET	Reset counter
%Qr.m.c.8	**SYNC_RESET**	**Reset SYNC_REF_FLAG**
%Qr.m.c.9	**MODULO_RESET**	**Reset MODULO_FLAG**

Sending Counting Events to the Application

At a Glance

The event task number must be declared in the module configuration screen to enable the events sending.

The BMX EHC 0800 module has 8 event sources contained in the `events_source` word at the address `%IWr.m.c.10`:

Address	Standard Symbol	Description	Counting Mode Concerned
%IWr.m.c.10.0	EVT_RUN	Event due to start of counting.	One Shot Counter mode
%IWr.m.c.10.1	EVT_MODULO	Event due to counter being equal to modulo value - 1 or equal to value 0.	● Modulo Loop Counter mode ● Up and Down Counter mode ● Dual Phase Counter mode
%IWr.m.c.10.2	EVT_SYNC_PRESET	Event due to a synchronization or counter homing.	● Event Counter mode ● Shot Counter mode ● Modulo Loop Counter mode ● Dual Phase Counter mode
%IWr.m.c.10.3	EVT_COUNTER_LOW	Event due to counter being less than threshold.	● Frequency Counter mode ● Event Counter mode ● One Shot Counter mode ● Modulo Loop Counter mode ● Up and Down Counter mode ● Dual Phase Counter mode
%IWr.m.c.10.4	EVT_COUNTER_WINDOW	Event due to counter being equal to threshold.	This event cannot be used with a BMX EHC 0800.
%IWr.m.c.10.5	EVT_COUNTER_HIGH	Event due to counter being greater than threshold.	● Frequency Counter mode ● Event Counter mode ● One Shot Counter mode ● Modulo Loop Counter mode ● Up and Down Counter mode
%IWr.m.c.10.6	EVT_CAPT_0	Event due to capture 0.	● Modulo Loop Counter mode ● Up and Down Counter mode ● Dual Phase Counter mode
%IWr.m.c.10.7	EVT_CAPT_1	Event due to capture 1.	This event cannot be used with a BMX EHC 0800.
%IWr.m.c.10.8	EVT_OVERRUN	Event due to overrun.	● Frequency Counter mode ● Event Counter mode ● One Shot Counter mode ● Modulo Loop Counter mode ● Up and Down Counter mode ● Dual Phase Counter mode

All the events sent by the module, whatever their source, call the same single event task in the PLC.

There is normally only 1 type of event indicated per call.

The `evt_sources` (`%IWr.m.c.10`) is updated at the start of the event task processing.

Enabling Events

In order for a source to produce an event, the validation bit corresponding to the event must be set to 1:

Address	Description
`%QWr.m.c.1.0`	Start of counting event validation bit.
`%QWr.m.c.1.1`	Counter rollover modulo, 0 or its limits event validation bit.
`%QWr.m.c.1.2`	Synchronization or counter homing event validation bit.
`%QWr.m.c.1.3`	Counter less than threshold event validation bit.
`%QWr.m.c.1.4`	Counter equal to threshold event validation bit.
`%QWr.m.c.1.5`	Counter greater than threshold event validation bit.
`%QWr.m.c.1.6`	Capture 0 event validation bit.

Input Interface

The event only has 1 input interface. This interface is only updated at the start of the event task processing. The interface consists of:

- The `evt_sources` word (`%IWr.m.c.10`)
- The current value of the counter during the event (or an approximate value) contained in the `counter_current_value` word (`%IDr.m.c.12`)
- The `capt_0_val` register (`%IDr.m.c.14`) updated if the event is the capture 0.

Operating Limits

Each counter channel can produce a maximum of 1 event per millisecond, but this flow may be slowed down by simultaneously sending events to several modules on the PLC bus.

Each counter channel has a two slot transmission buffer which can be used to store several events while waiting to be sent.

If the counter channel is unable to send all of the internally produced events, the `overrun_evt` bit (address `%IWr.m.c.10.8`) of the `events_source` word is set to 1.

The following 2 points should be taken into account before using the ”Counter equal", "Counter high" and "Counter low" events:

- For frequency mode: due to the accuracy (+/-1 Hz), a frequency near the threshold can cause redundant events.
- For counting function modes: when the counter matches the threshold value, the input frequency must be lower than 200 Hz in order to detect the event.

Section 6.2
BMX EHC 0800 Module Operation Modes

Subject of this Section

This section deals with the different counting modes of the BMX EHC 0800 module.

What Is in This Section?

This section contains the following topics:

BMX EHC 0800 Module Operation in Frequency Mode

At a Glance

Using the frequency counting mode allows you to measure the flow frequency, speed, rate and control.

Basic Principle

In this mode, the module monitors the pulses applied only to the IN_A input and calculates the number of pulses in time intervals of 1s. The current frequency is then shown in number of events per second (Hertz). The counting register is updated at the end of each 10 ms interval.

Counter Status Bits in Frequency Mode

The table below shows the composition of the counter's `%IWr.m.c.0` status word in frequency mode.

Bit	Label	Description
`%IWr.m.c.0.3`	VALIDITY	Validity bit is used to indicate that the counter current value (frequency) and compare status registers contain valid data. If the bit is set to 1, the data is valid. If the bit is set to 0, the data is not valid.
`%IWr.m.c.0.4`	HIGH_LIMIT	The bit is set to 1 when the input frequency signal is out of range.

Type of the IODDT

In this mode, the type of the IODDT must be T_UNSIGNED_CPT_BMX.

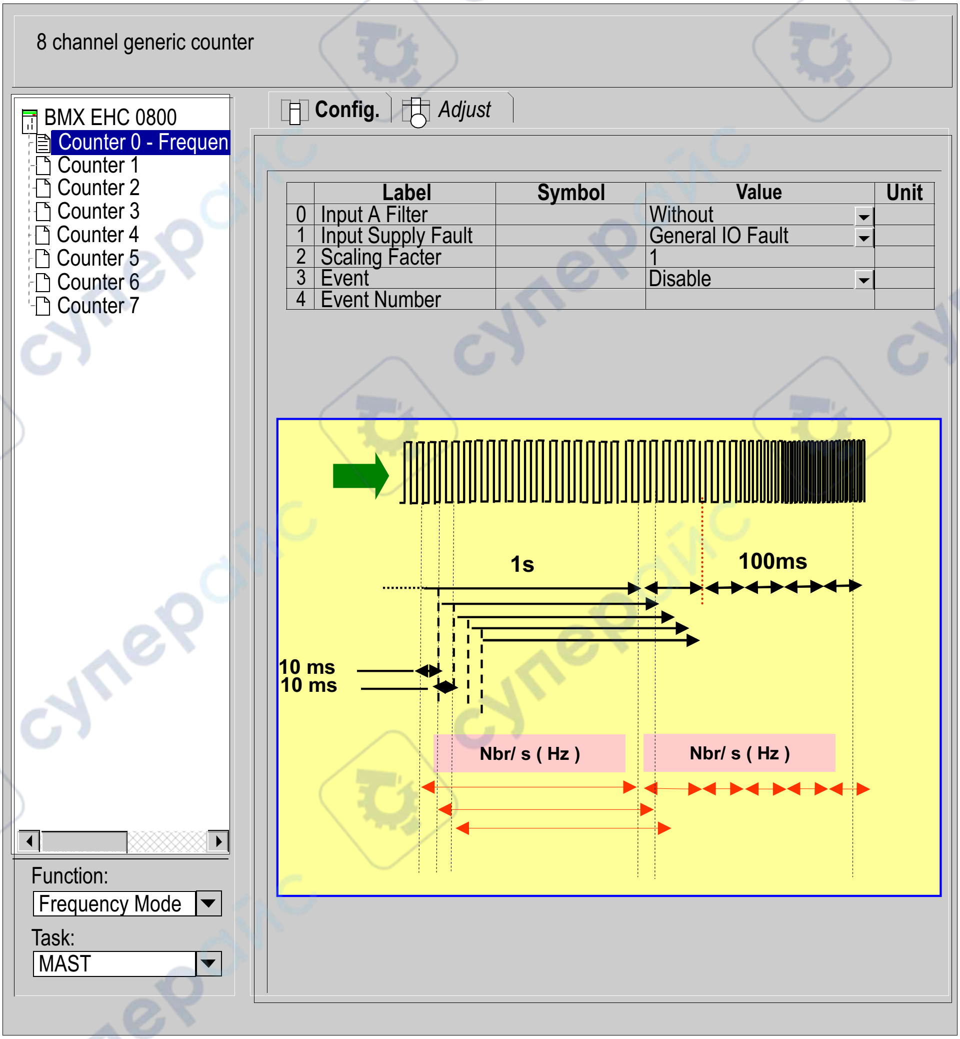
Operating Limits

The maximum frequency that the module can measure on the IN_A input is 10 kHz. Beyond 10 kHz, the counting register value may decrease until it reaches 0.

At 10 KHz, the duty cycle is 40% to 60%.

NOTE: You have to check the `validity` bit (`%IWr.m.c.0.3`) before taking into account the numerical values such as the counter and the capture registers. Only the `validity` bit at the high level (set to 1) guarantees that the mode will operate correctly within the limits.

The following diagram presents the BMX EHC counting module operation in frequency mode.



8 channel generic counter

BMX EHC 0800
- Counter 0 - Frequen
- Counter 1
- Counter 2
- Counter 3
- Counter 4
- Counter 5
- Counter 6
- Counter 7

Config. | Adjust

	Label	Symbol	Value	Unit
0	Input A Filter		Without	
1	Input Supply Fault		General IO Fault	
2	Scaling Facter		1	
3	Event		Disable	
4	Event Number			

Function:
Frequency Mode

Task:
MAST

BMX EHC 0800 Module Operation in Event Counting Mode

At a Glance

Using the event counting mode allows you to determine the number of events received in a scattered manner.

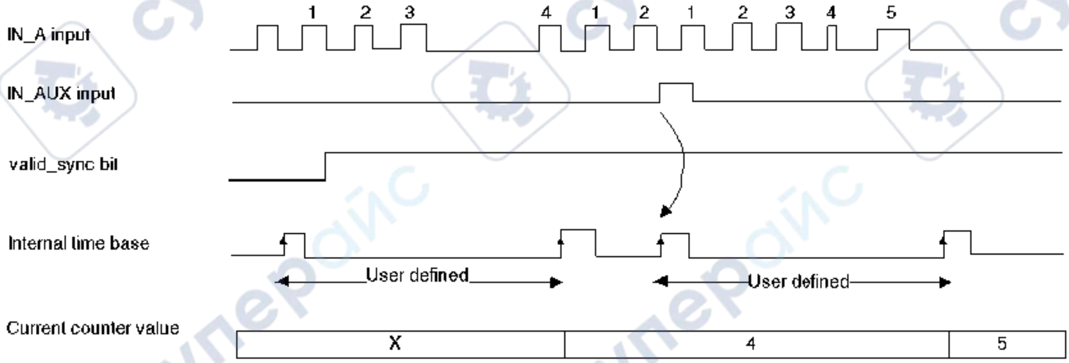
Basic Principle

In this mode, the counter assesses the number of pulses applied at the IN_A input, at time intervals defined by the user. The counting register is updated at the end of each interval with the number of events received.

It is possible to optionally use the IN_AUX input over a time interval, provided that the validation bit is set to 1. This leads to restarting the event counting for a new predefined time interval. Depending on the selection made by the user, the time interval starts at the rising edge or at the falling edge on the IN_AUX input.

Operation

The trend diagram illustrates the counting process in event counting mode



When the synchronization occurs, the application can react using :

- either the SYNC_REF_FLAG input (%IWr.m.c.0.2) *(see page 71)*
- or the EVT_SYNC_PRESET input (%IWr.m.c.10.2) *(see page 73)*.

Counter Status Bits in Event Counting Mode

The table below shows the composition of the counter's `%IWr.m.c.0` status word in event counting mode.

Bit	Label	Description
`%IWr.m.c.0.2`	SYNC_REF_FLAG	The bit is set to 1 when the internal time base has been synchronized. The bit is set to 0 when the `sync_reset` command is received (rising edge of the `%Qr.m.c.8` bit).
`%IWr.m.c.0.3`	VALIDITY	Validity bit is used to indicate that the counter current value (events number) and compare status registers contain valid data. If the bit is set to 1, the data is valid. If the bit is set to 0, the data is not valid.
`%IWr.m.c.0.4`	HIGH_LIMIT	The bit is set to 1 when the number of received events exceeds the counter size. The bit is reset to 0 at the next period if the limit is not reached.
`%IWr.m.c.0.5`	LOW_LIMIT	The bit is set to 1 when more than one synchronization is received within 25 ms period. The bit is reset to 0 at the next period if the limit is not reached.

Type of the IODDT

In this mode, the type of the IODDT is T_UNSIGNED_CPT_BMX.

Operating Limits

The module counts the pulses applied at the IN_A input every time the pulse is at least 50 µs (without debounce filter).

Pulses within 100 ms from synchronization are lost.

The synchronization of the counter must not be done more than one time per 25 ms.

NOTE: You have to check the `validity` bit (`%IWr.m.c.0.3`) before taking into account the numerical values such as the counter and the capture registers. Only the `validity` bit at the high level (set to 1) guarantees that the mode will operate correctly within the limits.

BMX EHC 0800 Module Operation in One Shot Counter Mode

At a Glance

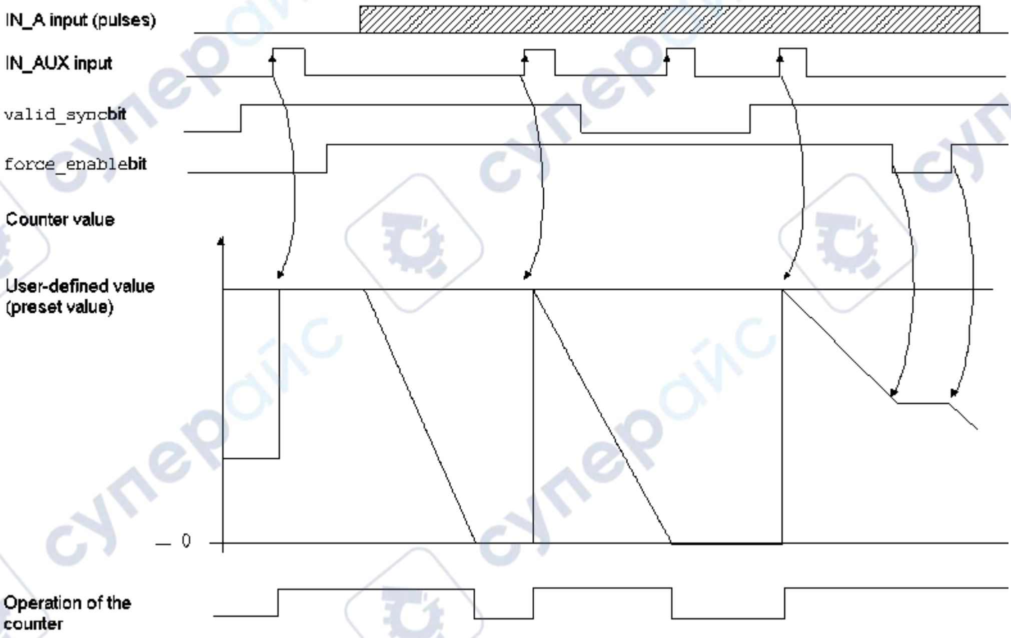
Using the one shot counter mode allows you to quantify a group of parts.

Basic Principle

In this mode, activating the synchronization function starts the counter which, starting from a value defined by the user in the adjust screen (`preset value`), decreases with every pulse applied to the IN_A input until it reaches the value 0. Downcounting is made possible when the enable function is activated. The counting register is thus updated every 5 ms.

Operation

The trend diagram illustrates the one shot counter mode process:



In the trend diagram above, we can see that the counter starts downcounting at the IN_AUX input's rising edge. The counter loads the value defined by the user and decrements the counting register with every pulse applied to the IN_A input. When the register is set to 0, the counter awaits a new signal from the IN_AUX input. The IN_A input pulses have no effect on the register value as long as the counter is set to 0.

The force_enable command must be at the high level during the counting. When this command is at the low level, the last value reported in the counting register is maintained and the counter ignores the pulses applied to the IN_A input. However, it does not ignore the IN_AUX input status. In all cases, the counting resumes when the command reverts to the high level.

Counter Status Bits in One shot Counter Mode

The table below shows the composition of the counter's %IWr.m.c.0 status word in one shot counter mode:

Bit	Label	Description
%IWr.m.c.0.0	RUN	The bit is set to 1 when the counter is running. The bit is set to 0 when the counter is stopped.
%IWr.m.c.0.2	SYNC_REF_FLAG	The bit is set to 1 when the counter has been set to the preset value and (re)started. The bit is reset to 0 when the sync_reset command is received (rising edge of the %Qr.m.c.8 bit).
%IWr.m.c.0.3	VALIDITY	Validity bit is used to indicate that the counter current value and compare status registers contain valid data. If the bit is set to 1, the data is valid. If the bit is set to 0, the data is not valid.

Type of the IODDT

In this mode, the type of the IODDT is T_UNSIGNED_CPT_BMX.

Operating Limits

The maximum frequency that can be applied to the IN_AUX input is 1 pulse every 25 ms.

The maximum preset value is 65,535.

NOTE: You have to check the validity bit (%IWr.m.c.0.3) before taking into account the numerical values such as the counter and the capture registers. Only the validity bit at the high level (set to 1) guarantees that the mode will operate correctly within the limits.

BMX EHC 0800 Module Operation in Modulo Loop Counter Mode

At a Glance

The use of the modulo loop counter mode is recommended for packaging and labeling applications for which actions are repeated for series of moving objects.

Basic Principle

The counter increases with every pulse applied to the IN_A input until it reaches the modulo value -1, the modulo value being defined by the user. At the following pulse, the counter is reset to 0 and the counting resumes.

In the modulo loop counter mode, the counter must be synchronized at least one time to operate. The current counter value is cleared each time the synchronization occurs.

The current counter value can be recorded into the capture0 register *(see page 70)* when the condition of synchronization occurs *(see page 66)*.

The modulo value defined by the user is contained in the `modulo_value` word (`%MDr.m.c.4`). The user may change this value by specifying the value of this word:

- In the adjust screen
- In the application, using the `WRITE_PARAM(IODDT_VAR1)` Function. `IODDT_VAR1` is of the type `T_UNSIGNED_CPT_BMX`.

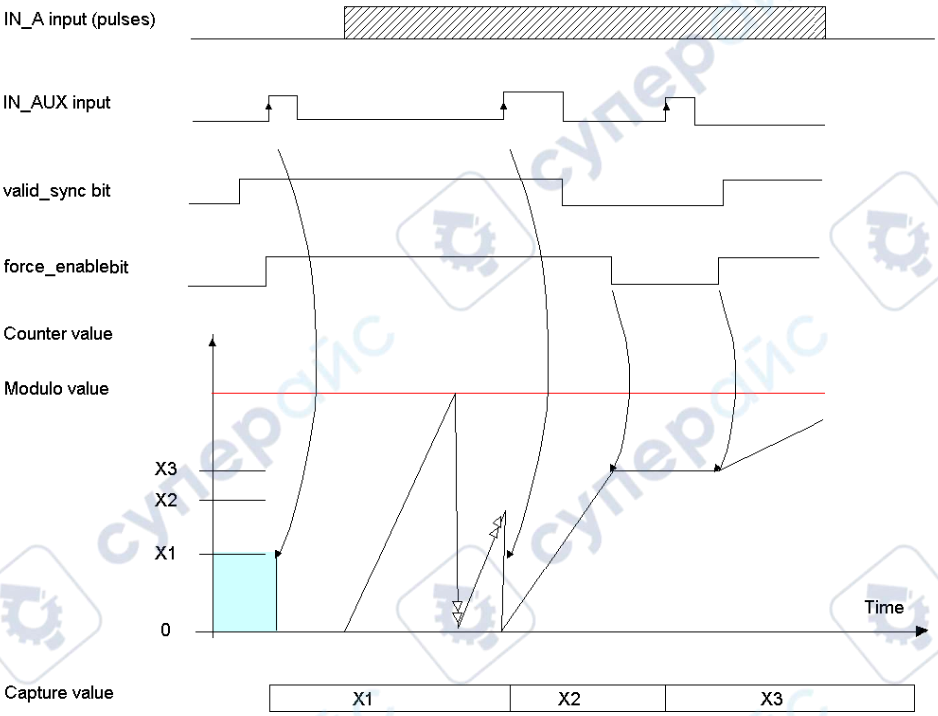
The `force_enable` command must be at the high level during the counting. When this command is at the low level, the last value reported in the counting register is maintained and the counter ignores the pulses applied to the IN_A input. However, it does not ignore the IN_AUX input status. In all cases, the counting resumes when the command reverts to the high level.

In this mode, the counting register is updated at 25 ms intervals.

Unlike for the BMX EHC 0200 module, there is no downcounting.

Operation

The trend diagram below illustrates the modulo counting process:



Counter Status Bits in Modulo Loop Counter Mode

The table below shows the composition of the counter’s %IWr.m.c.0 status word in modulo loop counter mode:

Bit	Label	Description
%IWr.m.c.0.1	MODULO_FLAG	The bit is set to 1 when the counter rollovers the modulo and is . The bit is reset to 0 when the command MODULO_RESET (%Qr.m.c.9) is received (rising edge of the MODULO_RESET bit).
%IWr.m.c.0.2	SYNC_REF_FLAG	The bit is set to 1 when the counter have been set to 0 and (re)started. The bit is reset to 0 when the command SYNC_RESET (%Qr.m.c.8) is received (rising edge of the SYNC_RESET bit).
%IWr.m.c.0.3	VALIDITY	Validity bit is used to indicate that the counter current value and compare status registers contain valid data. If the bit is set to 1, the data is valid. If the bit is set to 0, the data is not valid.

Type of the IODDT

In this mode, the type of the IODDT must be T_UNSIGNED_CPT_BMX.

Operating Limits

The maximum frequency applied to the IN_A input is 10 kHz.

The shortest pulse applied to the IN_AUX input varies according to the level of filtering selected.

The maximum frequency that can be applied to the IN_AUX input is 1 pulse every 25 ms.

The maximum frequency for the modulo event is once every 25 ms.

The minimum acceptable modulo value varies according to the frequency at the IN_A input. E.g.: for a frequency of 10 kHz applied to the IN_A input, the modulo must be greater than 50.

The maximum modulo value is 65,535.

NOTE: When the modulo value is configured to 0, it is possible to count up to 65,536.

NOTE: You have to check the validity bit (%IWr.m.c.0.3) before taking into account the numerical values such as the counter and the capture registers. Only the validity bit at the high level (set to 1) guarantees that the mode will operate correctly within the limits.

BMX EHC 0800 Module Operation in Upcounting and Downcounting Mode

At a Glance

Using the upcounting and downcounting mode allows for an accumulation, upcounting or downcounting operation on a single input.

Basic Principle

In this mode, the counting starts with the `force_sync` software command. On the rising edge, the counting register is updated with the preset value predefined by the user. The preset value is contained in the `preset_value` word (`%MDr.m.c.6`). The user may change this value by specifying the value of this word:

- In the adjust screen
- In the application, using the `WRITE_PARAM(IODDT_VAR1)` Function. `IODDT_VAR1` is of the type `T_SIGNED_CPT_BMX`.

The following processing occurs at each pulse applied to the IN_A input:

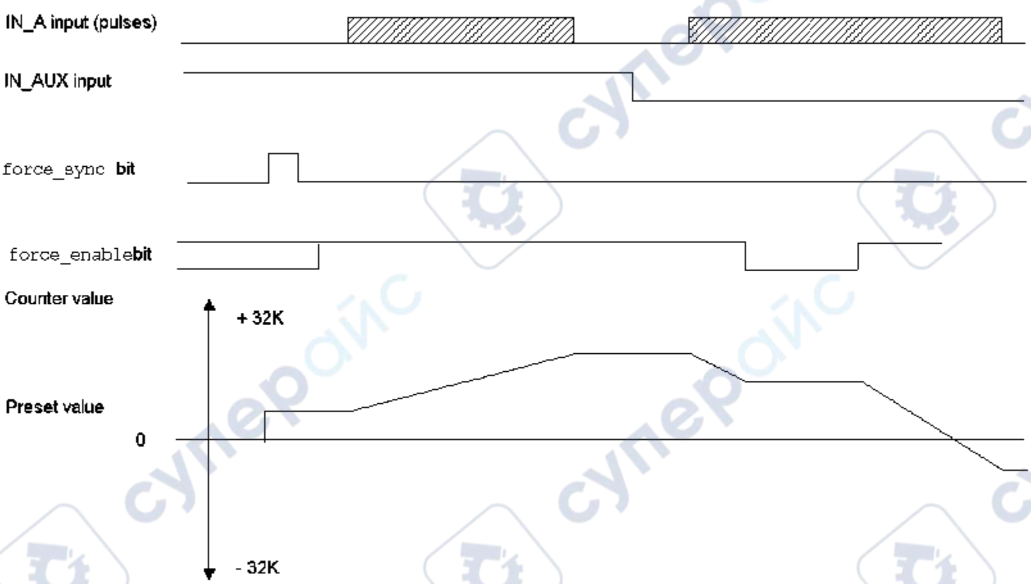
- Pulse counting if the IN_AUX input is high
- Pulse downcounting if the IN_AUX input is low

The `force_enable` software command must be at the high level during the counting. When this command is at the low level, the last value reported in the counting register is maintained and the counter ignores the pulses applied to the IN_A input. The counting resumes when the command reverts to the high level.

Counting values vary between –32,768 and +32,767.

Operation

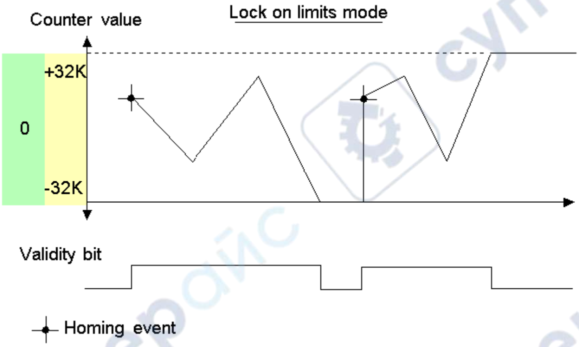
The trend diagram below illustrates the modulo up & down counting mode process:



Behavior at the Counting Limits

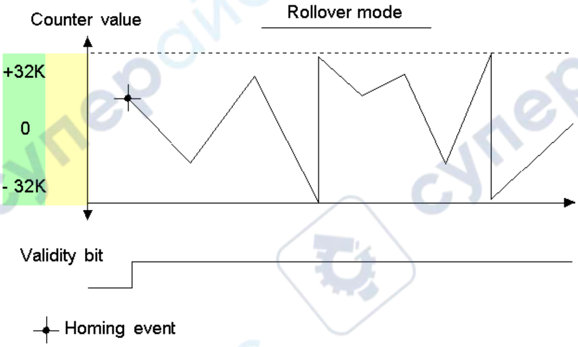
When the upper or lower limit is exceeded, the counter behaves differently according to its configuration.

In the lock on limits sub-mode, the counting register maintains the limit value and the counting validity bit changes to 0:



NOTE: Overflow and underflow are indicated by two bits `LOW_LIMIT` and `HIGH_LIMIT` until the application reloads the counting value predefined by the user (`force_sync` bit set to 1 or preset condition true). The upcounting or downcounting may therefore be resumed.

In the rollover sub-mode, the counting register automatically switches to the limit value opposed to overflow:



Counter Status Bits in Up and Down Counting Mode

The table below shows the composition of the counter's %IWr.m.c.0 status word in up and down counting mode:

Bit	Label	Description
%IWr.m.c.0.1	MODULO_FLAG	The bit status changes in the rollover mode. The bit is set to 1 when the counter rollovers its limits (-32,768 or +32,767). The bit is reset to 0 when the command MODULO_RESET (%Qr.m.c.9) is received (rising edge of the MODULO_RESET bit).
%IWr.m.c.0.2	SYNC_REF_FLAG	The bit is set to 1 when the counter have been set to the preset value and (re)started. The bit is reset to 0 when the command SYNC_RESET (%Qr.m.c.8) is received (rising edge of the SYNC_RESET bit).
%IWr.m.c.0.3	VALIDITY	Validity bit is used to indicate that the counter current value and compare status registers contain valid data. If the bit is set to 1, the data is valid. If the bit is set to 0, the data is not valid.
%IWr.m.c.0.4	HIGH_LIMIT	The bit status changes in the lock on limits mode. The bit is set to 1 when the counter reaches +32,767. The bit is reset to 0 when the counter presets or resets.
%IWr.m.c.0.5	LOW_LIMIT	The bit status changes in the lock on limits mode. The bit is set to 1 when the counter reaches -32,768. The bit is reset to 0 when the counter presets or resets.

Type of the IODDT

In this mode, the type of the IODDT must be T_SIGNED_CPT_BMX.

Operating Limits

The maximum frequency applied to the IN_A input is 10 kHz.

Pulses applied at the IN_A input, after a change of direction, are only upcounted or downcounted after a delay that corresponds to the delay in acknowledging the IN_AUX input status due to the level of filtering programmable on this input.

Preset value must be between –32,768 and +32,767.

NOTE: You have to check the validity bit (%IWr.m.c.0.3) before taking into account the numerical values such as the counter and the capture registers. Only the validity bit at the high level (set to 1) guarantees that the mode will operate correctly within the limits.

BMX EHC 0800 Module Operation in Dual Phase Counting Mode

At a Glance

The dual phase counting mode is available for channels 0, 2, 4, and 6 (channels 1, 3, 5 and 7 become inactive). This mode behaves like the up and down counting mode, and uses up to three physical inputs. It enables simultaneous upcounting and downcounting.

NOTE: Dual phase counting mode is available on BMXEHC0800 modules with topological I/O Data Type only, and on BMXEHC0800.2 in Device DDT I/O Data Type. For BMXEHC0800.2 module the events feature is not available. Select the I/O Data Type, if needed, when adding the module in the rack.

Basic Principle

In the dual phase counting mode, confirm that the counter is synchronized at least one time to operate. The current counter value is preset each time the synchronization occurs. The current counter value can be recorded into the `capture0` register when the condition of synchronization occurs.

For further information, you may see the synchronization function *(see page 66)* and the capture function *(see page 70)*.

Confirm that the `force_enable` software command is at the high level during the counting. When this command is at the low level, the last value reported in the counting register is maintained, and the counter ignores the pulses applied to the IN_A and IN_B inputs. The counting resumes when the command reverts to the high level.

Counting values vary between the limits -2,147,483,648 and +2,147,483,647 (31-bit word and one sign bit).

The preset value is predefined by the user, and is contained in the `preset_value` word (`%MDr.m.c.6`). The user may change this value by specifying the value of this word:

- in the adjust screen
- in the application, using the `WRITE_PARAM(IODDT_VAR1)` function. `IODDT_VAR1` is of the type `T_Signed_CPT_BMX`.

Counting Configurations

In this mode, the user may select one of the following counting configurations:

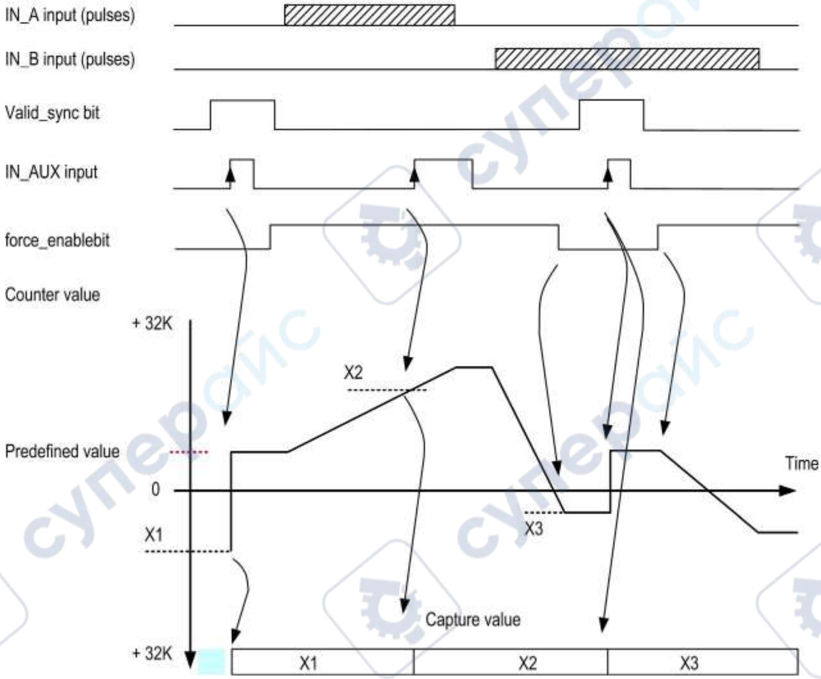
- A = Up, B = Down (default configuration)
- A = Impulse, B = Direction
- Normal Quadrature X1
- Normal Quadrature X2
- Normal Quadrature X4
- Reverse Quadrature X1
- Reverse Quadrature X2
- Reverse Quadrature X4.

The following table shows the upcounting and downcounting principle according to the selected configuration:

Selected Configuration	Upcounting Condition	Downcounting Condition
A = Up, B = Down	Rising edge at the IN_A input.	Rising edge at the IN_B input.
A = Impulse, B = Direction	Rising edge at the IN_A input and low state at the IN_B input.	Rising edge at the IN_A input and high state at the IN_B input.
Normal Quadrature X1	Rising edge at the IN_A input and low state at the IN_B input.	Falling edge at the IN_A input and low state at the IN_B input.
Normal Quadrature X2	Rising edge at the IN_A input and low state at the IN_B input. Falling edge at the IN_A input and high state at the IN_B input.	Falling edge at the IN_A input and low state at the IN_B input. Rising edge at the IN_A input and high level at the IN_B input.
Normal Quadrature X4	Rising edge at the IN_A input and low state at the IN_B input. High state at the IN_A input and rising edge at the IN_B input. Falling edge at the IN_A input and high state at the IN_B input. Low state at the IN_A input and falling edge at the IN_B input.	Falling edge at the IN_A input and low state at the IN_B input. Low state at the IN_A input and rising edge at the IN_B input. Rising edge at the IN_A input and high level at the IN_B input. High state at the IN_A input and falling edge at the IN_B input.
Reverse Quadrature X1	Falling edge at the IN_A input and low state at the IN_B input.	Rising edge at the IN_A input and low state at the IN_B input.
Reverse Quadrature X2	Falling edge at the IN_A input and low state at the IN_B input. Rising edge at the IN_A input and high level at the IN_B input.	Rising edge at the IN_A input and low state at the IN_B input. Falling edge at the IN_A input and high state at the IN_B input.
Reverse Quadrature X4	Falling edge at the IN_A input and low state at the IN_B input. Low state at the IN_A input and rising edge at the IN_B input. Rising edge at the IN_A input and high level at the IN_B input. High state at the IN_A input and falling edge at the IN_B input.	Rising edge at the IN_A input and low state at the IN_B input. High state at the IN_A input and rising edge at the IN_B input. Falling edge at the IN_A input and high state at the IN_B input. Low state at the IN_A input and falling edge at the IN_B input.

Operation

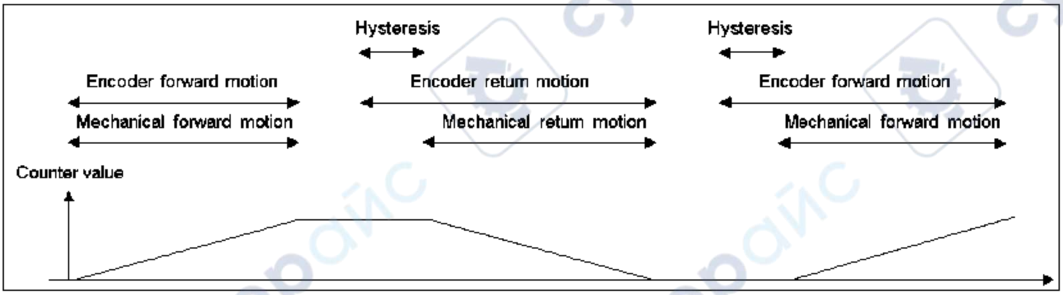
The trend diagram below illustrates the counting process for the dual phase counting mode in default configuration:



Slack Delete

In the free large counter mode, the counter may apply a hysteresis if the rotation is inverted. The `hysteresis` parameter configured with the adjust screen defines the number of points that are not acknowledged by the counter during the rotation inversion, which accounts for the slack between the encoder/motor axis and the mechanical axis (e.g. an encoder measuring the position of a mat).

This behavior is described in the following figure:



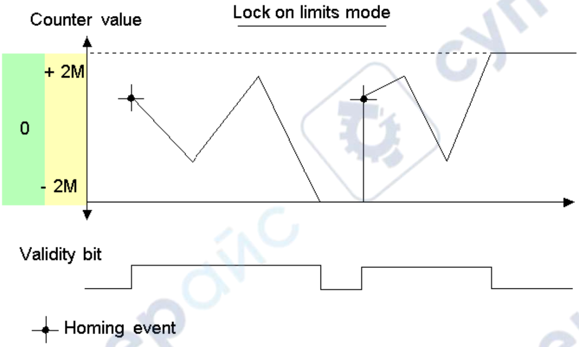
The value defined by the user as the `Hysteresis (slack)` value is contained in the `%MWr.m.c.9` word. The user may change this value by specifying the value of this word (this value is from 0 to 255):

- in the adjust screen
- in the application by using the `WRITE_PARAM(IODDT_VAR1)` Function. `IODDT_VAR1` is of the type `T_Signed_CPT_BMX`.

Behavior at the Counting Limits

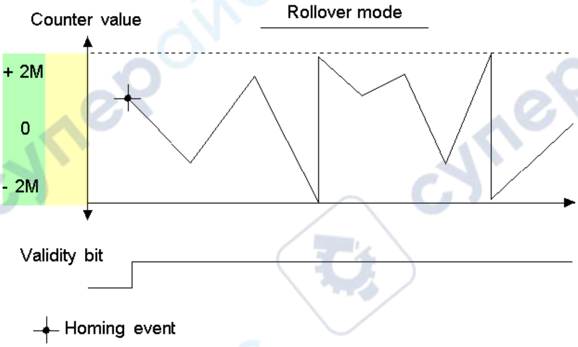
When the upper or lower limit is exceeded, the counter behaves differently according to its configuration.

In the lock on limits default configuration, the counting register maintains the limit value, and the counting validity bit changes to 0 until the next preset condition occurs:



NOTE: Overflow and underflow are indicated by two bits `LOW_LIMIT` and `HIGH_LIMIT` until the application reloads the counting value predefined by the user (`force_ref` bit set to 1 or preset condition true). The upcounting or downcounting may therefore resume.

In the rollover configuration, the counting register automatically switches to the limit value opposed to overflow



Counter Status Bits in Dual Phase Counting Mode

The table below shows the composition of the counter's `%IWr.m.c.0` status word in dual phase counting mode:

Bit	Label	Description
`%IWr.m.c.0.1`	MODULO_FLAG	The bit status changes in the rollover mode. The bit is set to 1 when the counter rolls over its limits (-2,147,483,648 or +2,147,483,647). The bit is reset to 0 when the command `MODULO_RESET` (`%Qr.m.c.9`) is received (rising edge of the `MODULO_RESET` bit).
`%IWr.m.c.0.2`	SYNC_REF_FLAG	The bit is set to 1 when the counter has been set to the preset value and restarted. The bit is reset to 0 when the command `SYNC_RESET` (`%Qr.m.c.8`) is received (rising edge of the `SYNC_RESET` bit).
`%IWr.m.c.0.3`	VALIDITY	The validity bit is used to indicate that the counter current value and compare status registers contain valid data. If the bit is set to 1, the data is valid. If the bit is set to 0, the data is not valid.
`%IWr.m.c.0.4`	HIGH_LIMIT	The bit status changes in the lock on limits mode. The bit is set to 1 when the counter reaches +2,147,483,647. The bit is reset to 0 when the counter presets.
`%IWr.m.c.0.5`	LOW_LIMIT	The bit status changes in the lock on limits mode. The bit is set to 1 when the counter reaches -2,147,483,648. The bit is reset to 0 when the counter presets.

Type of the IODDT

In this mode, the type of the IODDT must be T_SIGNED_CPT_BMX.

Operating Limits

The maximum frequency applied to the IN_A and IN_B inputs is 10 kHz.

The shortest pulse applied to the IN_AUX input is defined according to the level of filtering applied to the input.

The maximum loading frequency for the value predefined by the user is once every 25 ms.

NOTE: Check the `validity` bit (`%IWr.m.c.0.3`) before accounting for the numerical values such as the counter and the capture registers. Only the `validity` bit at the high level (set to 1) guarantees that the mode will operate correctly within the limits.

Part IV
BMX EHC 0800 Counting Module Software Implementation

Subject of this Part

This part describes the software implementation and functions of the BMX EHC 0800 counting module.

What Is in This Part?

This part contains the following chapters:

Chapter 7
Software Implementation Methodology for the BMX EHC 0800 Counting Module

Installation Methodology

At a Glance

The software installation of the BMX EHC **** counting modules is carried out from the various Control Expert editors:

- in offline mode,
- in online mode.

The following order of installation phases is recommended but it is possible to change the order of certain phases (for example, starting with the configuration phase).

Installation Phases

The following table shows the different installation phases:

Phase	Description	Mode
Declaration of variables	Declaration of IODDT-type variables for the application-specific modules and variables of the project.	Offline(1)
Programming	Project programming.	Offline(1)
Configuration	Declaration of modules.	Offline
	Module channel configuration	
	Entering the configuration parameters **Note:** All the parameters are configurable online except the `event` parameter.	Offline(1)
Association	Association of IODDTs with the channels configured (variable editor)	Offline(1)
Build	Project generation (analysis and editing of links)	Offline
Transfer	Transfer project to PLC	Online
Adjustment/ Debugging	Debug project from debug screens, animation tables	Online
	Debugging the program and adjustment parameters	
Documentation	Building documentation file and printing miscellaneous information relating to the project	Online(1)
Operation/ Diagnostic	Displaying miscellaneous information necessary for supervisory control of the project	Online
	Diagnostics of project and modules	
Key:		
(1)	These various phases can also be performed in online mode	

Chapter 8
Accessing the Functional Screens of the BMX EHC xxxx Counting Modules

Subject of this Chapter

This chapter describes the various functional screens of the BMX EHC •••• counting modules to which the user has access.

What Is in This Chapter?

This chapter contains the following topics:

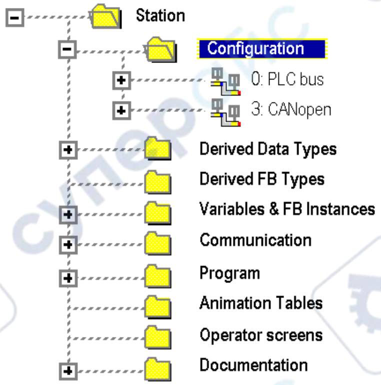
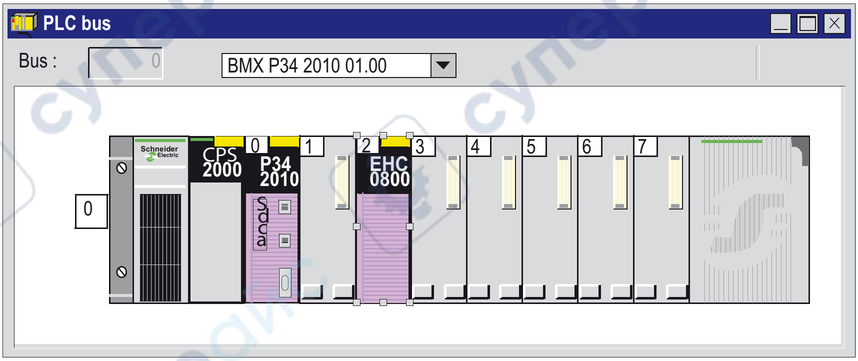
Accessing the Functional Screens of the BMX EHC 0800 Counting Modules

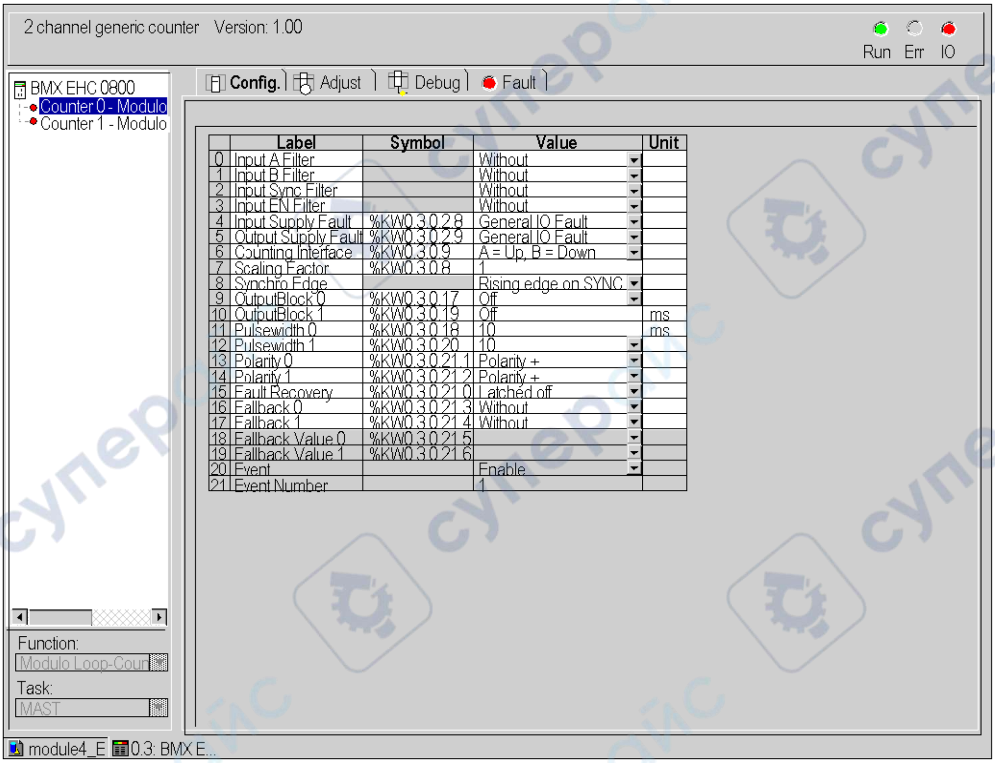
At a Glance

This section describes how to access the functional screens of the BMX EHC 0800 counting module.

Procedure

To access the screens, execute the following actions:

Step	Action
1	Expand the Configuration directory in the project browser. **Result**: the following screen appears:  Station Configuration 0: PLC bus 3: CANopen Derived Data Types Derived FB Types Variables & FB Instances Communication Program Animation Tables Operator screens Documentation
2	Double-click on the PLC Bus directory. **Result**: the following screen appears:  PLC bus Bus : 0 BMX P34 2010 01.00 0 Schneider Electric CPS 2000 0 P34 2010 1 2 EHC 0800 3 4 5 6 7

Step	Action
3	Double-click on the counting module. **Result**: the module screen appears: 

2 channel generic counter Version: 1.00

Function: Modulo Loop-Coun

Task: MAST

	Label	Symbol	Value	Unit
0	Input A Filter		Without	
1	Input B Filter		Without	
2	Input Sync Filter		Without	
3	Input EN Filter		Without	
4	Input Supply Fault	%KW0.3.0.2.8	General IO Fault	
5	Output Supply Fault	%KW0.3.0.2.9	General IO Fault	
6	Counting Interface	%KW0.3.0.9	A = Up, B = Down	
7	Scaling Factor	%KW0.3.0.8	1	
8	Synchro Edge		Rising edge on SYNC	
9	OutputBlock 0	%KW0.3.0.17	Off	
10	OutputBlock 1	%KW0.3.0.19	Off	ms
11	Pulsewidth 0	%KW0.3.0.18	10	ms
12	Pulsewidth 1	%KW0.3.0.20	10	
13	Polarity 0	%KW0.3.0.21.1	Polarity +	
14	Polarity 1	%KW0.3.0.21.2	Polarity +	
15	Fault Recovery	%KW0.3.0.21.0	Latched off	
16	Fallback 0	%KW0.3.0.21.3	Without	
17	Fallback 1	%KW0.3.0.21.4	Without	
18	Fallback Value 0	%KW0.3.0.21.5		
19	Fallback Value 1	%KW0.3.0.21.6		
20	Event		Enable	
21	Event Number		1	

Description of the Counting Module Screens

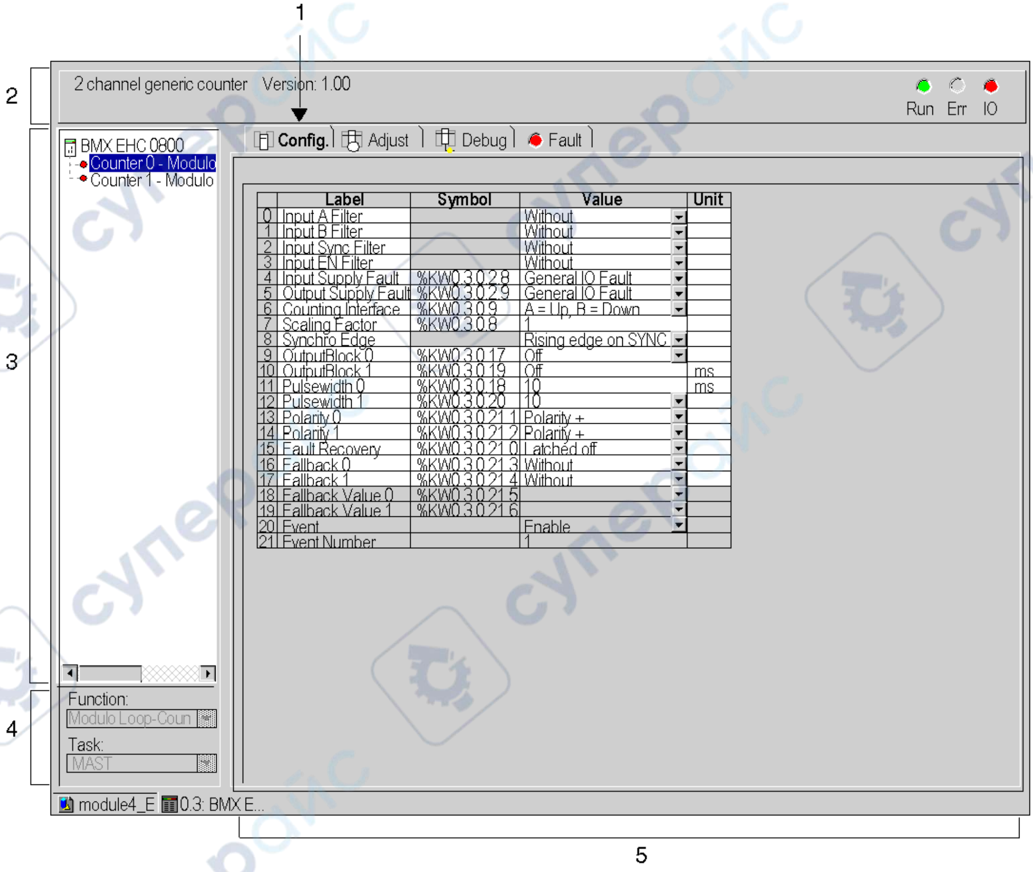
Introduction

The various available screens for the BMX EHC 0800 counting module are:

- Configuration screen
- Adjust screen
- Debug screen (can only be accessed in online mode)
- Faults screen (can only be accessed in online mode)

Description of the Screens

The following diagram presents the counting modules configuration screen.



2 channel generic counter Version: 1.00

BMX EHC 0800
Counter 0 - Modulo
Counter 1 - Modulo

Function: Modulo Loop-Coun

Task: MAST

module4_E 0.3: BMX E...

	Label	Symbol	Value	Unit
0	Input A Filter		Without	
1	Input B Filter		Without	
2	Input Sync Filter		Without	
3	Input EN Filter		Without	
4	Input Supply Fault	%KW0.3.0.2.8	General IO Fault	
5	Output Supply Fault	%KW0.3.0.2.9	General IO Fault	
6	Counting Interface	%KW0.3.0.9	A = Up, B = Down	
7	Scaling Factor	%KW0.3.0.8	1	
8	Synchro Edge		Rising edge on SYNC	
9	OutputBlock 0	%KW0.3.0.17	Off	
10	OutputBlock 1	%KW0.3.0.19	Off	ms
11	Pulsewidth 0	%KW0.3.0.18	10	ms
12	Pulsewidth 1	%KW0.3.0.20	10	
13	Polarity 0	%KW0.3.0.21.1	Polarity +	
14	Polarity 1	%KW0.3.0.21.2	Polarity +	
15	Fault Recovery	%KW0.3.0.21.0	Latched off	
16	Fallback 0	%KW0.3.0.21.3	Without	
17	Fallback 1	%KW0.3.0.21.4	Without	
18	Fallback Value 0	%KW0.3.0.21.5		
19	Fallback Value 1	%KW0.3.0.21.6		
20	Event		Enable	
21	Event Number		1	

The following table presents the parts of the various screens.

Number	Element	Function
1	Tabs	The tab in the foreground indicates the mode in progress (**Configuration** in this example). Every mode can be selected using the respective tab. The available modes are: ● **Configuration** ● **Adjust** ● **Debug** (which can only be accessed in online mode) ● **Faults** (which can only be accessed in online mode)
2	Heading area	Provides an abbreviation as a reminder of the module and module status in online mode (LEDs).
3	**Module** area	Is used: ● By clicking on the reference number, to display the tabs: ❍ **Description** which gives the characteristics of the device. ❍ **I/O Objects** or **Device DDT** depending on the I/O data type selected at module insertion in the Control Expert project.
	Channel area	Is used: ● By clicking on the channel (Counter) number, to display the tabs: ❍ **Configuration** which gives the characteristics of the channel. By default in topological I/O data model, no function is configured. By default in device DDT data model, all channels are **Frequency Mode** configured and a channel can not be set to **None**. ❍ **Adjust**: consists of various sections to be completed (parameter values), displayed according to the choice of counting function. ❍ **Debug**: displays the status of the inputs and outputs, as well as the various parameters of the current counting function (in online mode). ❍ **Fault** which shows the device errors (in online mode).
4	**General parameters** area	Allows you to select the counting function and the task associated with the channel: ● **Function:** counting function among those available for the modules involved. Depending on this choice, the headings of the configuration area may differ. ● **Task:** defines the task through which the channel's implicit exchange objects will be exchanged. These choices are only possible in offline mode.
5	**Parameters in progress** area	This area has various functionalities which depend upon the current mode: ● **Configuration**: is used to configure the channel parameters. ● **Adjust**: consists of various sections to be completed (parameter values), displayed according to the choice of counting function. ● **Debug**: displays the status of the inputs and outputs, as well as the various parameters of the current counting function. ● **Fault**: displays the errors that have occurred on the counting channels.

Chapter 9
Configuration of the BMX EHC 0800 Counting Module

Subject of this Chapter

This chapter deals with the configuration of the BMX EHC 0800 counting module. This configuration can be accessed from the Configuration tab on the functional screens of BMX EHC 0800 *(see page 102)* module.

What Is in This Chapter?

This chapter contains the following sections:

Section 9.1
Configuration Screen for BMX EHC xxxx Counting Modules

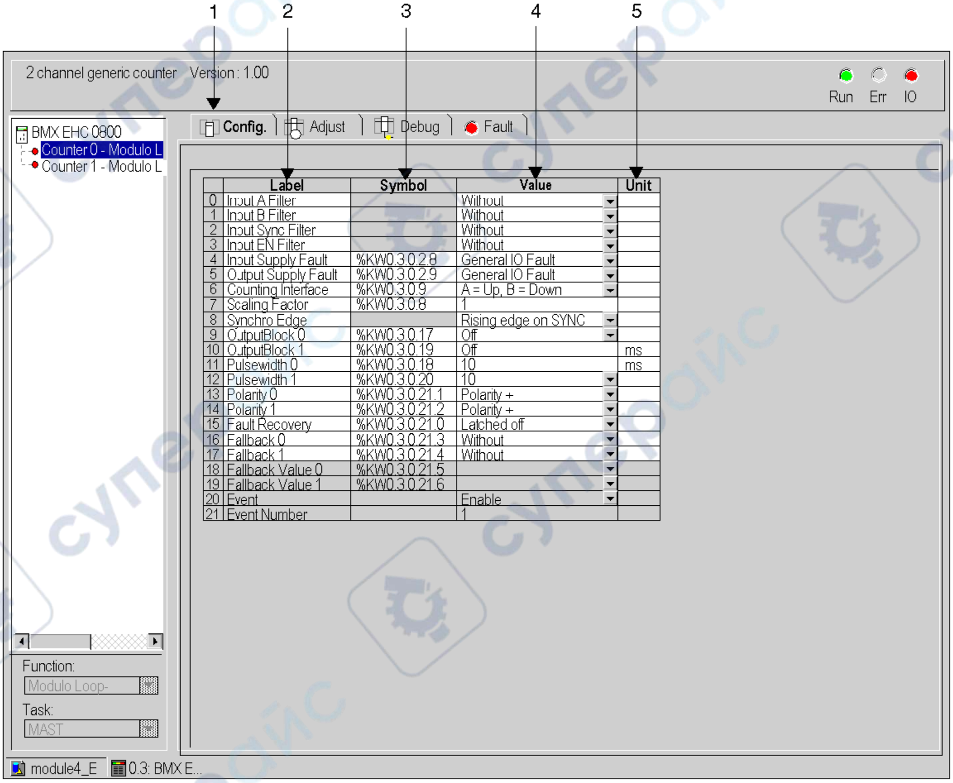
Configuration Screen for the BMX EHC 0800 Counting Module

At a Glance

This section presents the configuration screen for the BMX EHC 0800 counting module.

Illustration

The figure below presents the configuration screen for the BMX EHC 0800 module in modulo loop counter mode:



2 channel generic counter Version : 1.00

Function: Modulo Loop

Task: MAST

	Label	Symbol	Value	Unit
0	Input A Filter		Without	
1	Input B Filter		Without	
2	Input Sync Filter		Without	
3	Input EN Filter		Without	
4	Input Supply Fault	%KW0.3.0.2.8	General IO Fault	
5	Output Supply Fault	%KW0.3.0.2.9	General IO Fault	
6	Counting Interface	%KW0.3.0.9	A = Up, B = Down	
7	Scaling Factor	%KW0.3.0.8	1	
8	Synchro Edge		Rising edge on SYNC	
9	OutputBlock 0	%KW0.3.0.17	Off	
10	OutputBlock 1	%KW0.3.0.19	Off	ms
11	Pulsewidth 0	%KW0.3.0.18	10	ms
12	Pulsewidth 1	%KW0.3.0.20	10	
13	Polarity 0	%KW0.3.0.21.1	Polarity +	
14	Polarity 1	%KW0.3.0.21.2	Polarity +	
15	Fault Recovery	%KW0.3.0.21.0	Latched off	
16	Fallback 0	%KW0.3.0.21.3	Without	
17	Fallback 1	%KW0.3.0.21.4	Without	
18	Fallback Value 0	%KW0.3.0.21.5		
19	Fallback Value 1	%KW0.3.0.21.6		
20	Event		Enable	
21	Event Number		1	

Description of the Screen

The following table presents the various parts of the above screen:

Number	Element	Function
1	Tab	The tab in the foreground indicates the current mode. The current mode is therefore the configuration mode in this example.
2	**Label** field	This field contains the name of each variable that may be configured. This field may not be modified.
3	**Symbol** field	This field contains the address of the variable in the application. This field may not be modified.
4	**Value** field	If this field has a downward pointing arrow, you can select the value of each variable from various possible values in this field. The various values can be accessed by clicking on the arrow. A drop-down menu containing all the possible values is displayed and the user may then select the required value of the variable.
5	**Unit** field	This field contains the unit of each variable that may be configured. This field may not be modified.

Section 9.2
Configuration of Modes for the BMX EHC 0800 Module

Subject of this Section

This section deals with the configuration of the modes for the BMX EHC 0800 counting module.

What Is in This Section?

This section contains the following topics:

Frequency Mode Configuration

At a Glance

The configuration of a counting module is stored in the configuration constants (%KW).

The parameters r,m and c shown in the following tables represent the topologic addressing of the module. Each parameter had the following signification:

- r: represents the rack number,
- m:represents the position of the module on the rack,
- c: represents the channel number.

Configuration Objects

The table below presents the frequency mode configurable elements.

Label	Address in the configuration	Configurable values
Counting mode	%KWr.m.c.2 (least significant byte)	Frequency mode. The value of the least significant byte of this word is 1.
IN_A input filter	%KWr.m.c.3 (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
Input power supply error	%KWr.m.c.2.8	General input/output error (bit set to 0) Local (bit set to 1)
Scale factor	%KWr.m.c.6 (least significant byte)	Edit (value in the range 1...255)
Event Event number	%KWr.m.c.0	Activated (if activated is selected, the entered event number is coded on the most significant byte of this word) Deactivated (all bits of the most significant byte of this word are set to 1)

Event Counting Mode Configuration

At a Glance

The configuration of a counting module is stored in the configuration constants (`%KW`).

The parameters r,m and c shown in the following tables represent the topologic addressing of the module. Each parameter had the following signification:

- r: represents the rack number,
- m:represents the position of the module on the rack,
- c: represents the channel number.

Configuration Objects

The table below presents the event counting mode configurable elements.

Label	Address in the configuration	Configurable values
Counting mode	`%KWr.m.c.2` (least significant byte)	Event counting mode. The value of the least significant byte of this word is 2.
IN_A input filter	`%KWr.m.c.3` (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
IN_AUX input filter	`%KWr.m.c.4` (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
Input power supply error	`%KWr.m.c.2.8`	General input/output error (bit set to 0) Local (bit set to 1)
Synchronization edge	`%KWr.m.c.10.8` (most significant byte)	Rising edge at the IN_SYNC input (bit set to 0) Falling edge at the IN_SYNC input (bit set to 1)
Time base	`%KWr.m.c.7`	This word can take the following values: ● 0: 0.1 s, ● 1: 1 s, ● 2: 10 s, ● 3: 1 min
Event Event number	`%KWr.m.c.0`	Activated (if activated is selected, the entered event number is coded on the most significant byte of this word) Deactivated (all bits of the most significant byte of this word are set to 1)

One Shot Counter Mode Configuration

At a Glance

The configuration of a counting module is stored in the configuration constants (%KW).

The parameters r,m and c shown in the following tables represent the topologic addressing of the module. Each parameter had the following signification:

- r: represents the rack number,
- m:represents the position of the module on the rack,
- c: represents the channel number.

Configuration Objects

The table below presents the one shot counter mode configurable elements.

Label	Address in the configuration	Configurable values
Counting mode	%KWr.m.c.2 (least significant byte)	One shot counter mode. The value of the least significant byte of this word is 3.
IN_A input filter	%KWr.m.c.3 (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
IN_AUX input filter	%KWr.m.c.4 (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
IN_EN input filter	%KWr.m.c.4 (most significant byte)	The most significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
Input power supply error	%KWr.m.c.2.8	General input/output error (bit set to 0) Local (bit set to 1)
Scale factor	%KWr.m.c.6 (least significant byte)	Edit (value in the range 1...255)
Synchronization edge	%KWr.m.c.10.8 (High)	Rising edge (bit set to 0) Falling edge (bit set to 1)
Event Event number	%KWr.m.c.0	Activated (if activated is selected, the entered event number is coded on the most significant byte of this word) Deactivated (all bits of the most significant byte of this word are set to 1)

Modulo Loop Counter Mode Configuration

At a Glance

The configuration of a counting module is stored in the configuration constants (%KW).

The parameters r,m and c shown in the following tables represent the topologic addressing of the module. Each parameter had the following signification:

- r: represents the rack number,
- m:represents the position of the module on the rack,
- c: represents the channel number.

Configuration Objects

The table below presents modulo loop counter mode configurable elements.

Label	Address in the configuration	Configurable values
Counting mode	%KWr.m.c.2 (least significant byte)	Modulo loop counter mode. The value of the least significant byte of this word is 4.
IN_A input filter	%KWr.m.c.3 (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
IN_AUX input filter	%KWr.m.c.4 (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
Input power supply error	%KWr.m.c.2.8	General input/output error (bit set to 0) Local (bit set to 1)
Scale factor	%KWr.m.c.6 (least significant byte)	Edit (value in the range 1...255)
Synchronization edge	%KWr.m.c.10.8	Rising edge (bit set to 0) Falling edge (bit set to 1)
Event Event number	%KWr.m.c.0	Activated (if activated is selected, the entered event number is coded on the most significant byte of this word) Deactivated (all bits of the most significant byte of this word are set to 1)

Up and Down Counting Mode Configuration

At a Glance

The configuration of a counting module is stored in the configuration constants (%KW).

The parameters r,m and c shown in the following tables represent the topologic addressing of the module. Each parameter had the following signification:

- r: represents the rack number,
- m:represents the position of the module on the rack,
- c: represents the channel number.

Configuration Objects

The table below presents the up and down counting mode configurable elements.

Label	Address in the configuration	Configurable values
Counting mode	%KWr.m.c.2 (least significant byte)	Up and down counting mode. The value of the least significant byte of this word is 5.
IN_A input filter	%KWr.m.c.3 (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
IN_AUX input filter	%KWr.m.c.4 (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
Input power supply error	%KWr.m.c.2.8	General input/output error (bit set to 0) Local (bit set to 1)
Counting operation	%KWr.m.c.11.0	Overrun locking (bit set to 0) Reversal (bit set to 1)
Synchronization edge	%KWr.m.c.10.8 (High)	Rising edge (bit set to 0) Falling edge (bit set to 1)
Event Event number	%KWr.m.c.0	Activated (if activated is selected, the entered event number is coded on the most significant byte of this word) Deactivated (all bits of the most significant byte of this word are set to 1)

Dual Phase Counting Mode Configuration

At a Glance

The configuration of a counting module is stored in the configuration constants (`%KW`).

The parameters r,m and c shown in the following tables represent the topologic addressing of the module. Each parameter had the following signification:

- r: represents the rack number,
- m:represents the position of the module on the rack,
- c: represents the channel number.

Configuration Objects

The table below presents the dual phase counting mode configurable elements.

Label	Address in the configuration	Configurable values
Counting mode	`%KWr.m.c.2` (least significant byte)	Dual phase counting mode. The value of the least significant byte of this word is 6.
IN_A input filter	`%KWr.m.c.3` (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
IN_B input filter	`%KWr.m.c.3` (most significant byte)	The most significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
IN_AUX input filter	`%KWr.m.c.4` (least significant byte)	The least significant byte can take the following values: ● 0: none, ● 1: low, ● 2: medium, ● 3: high.
Input power supply error	`%KWr.m.c.2.8`	General input/output error (bit set to 0) Local (bit set to 1)

Label	Address in the configuration	Configurable values
Input mode	`%KWr.m.c.9`	This word can take the following values: ● 0: A = High, B = Low ● 1: A = Pulse, B = Direction ● 2: normal quadrature 1 ● 3: normal quadrature 2 ● 4: normal quadrature 4 ● 5: inverse quadrature 1 ● 6: inverse quadrature 2 ● 7: inverse quadrature 4
Scale factor	`%KWr.m.c.6` (least significant byte)	Edit (value in the range 1...255)
Synchronization edge	`%KWr.m.c.10.8`	Rising edge (bit set to 0) Falling edge (bit set to 1)
Counting operation	`%KWr.m.c.11.0`	Overrun locking (bit set to 0) Reversal (bit set to 1)
Event Event number	`%KWr.m.c.0`	Activated (if activated is selected, the entered event number is coded on the most significant byte of this word) Deactivated (all bits of the most significant byte of this word are set to 1)

Chapter 10
BMX EHC 0800 Counting Module Adjusts

Subject of this Chapter

This chapter deals with the possible adjusts for the counting modes of the BMX EHC 0800 module. These adjusts can be accessed from the Configuration tab on the functional screens of BMX EHC 0800 module *(see page 102)*.

What Is in This Chapter?

This chapter contains the following topics:

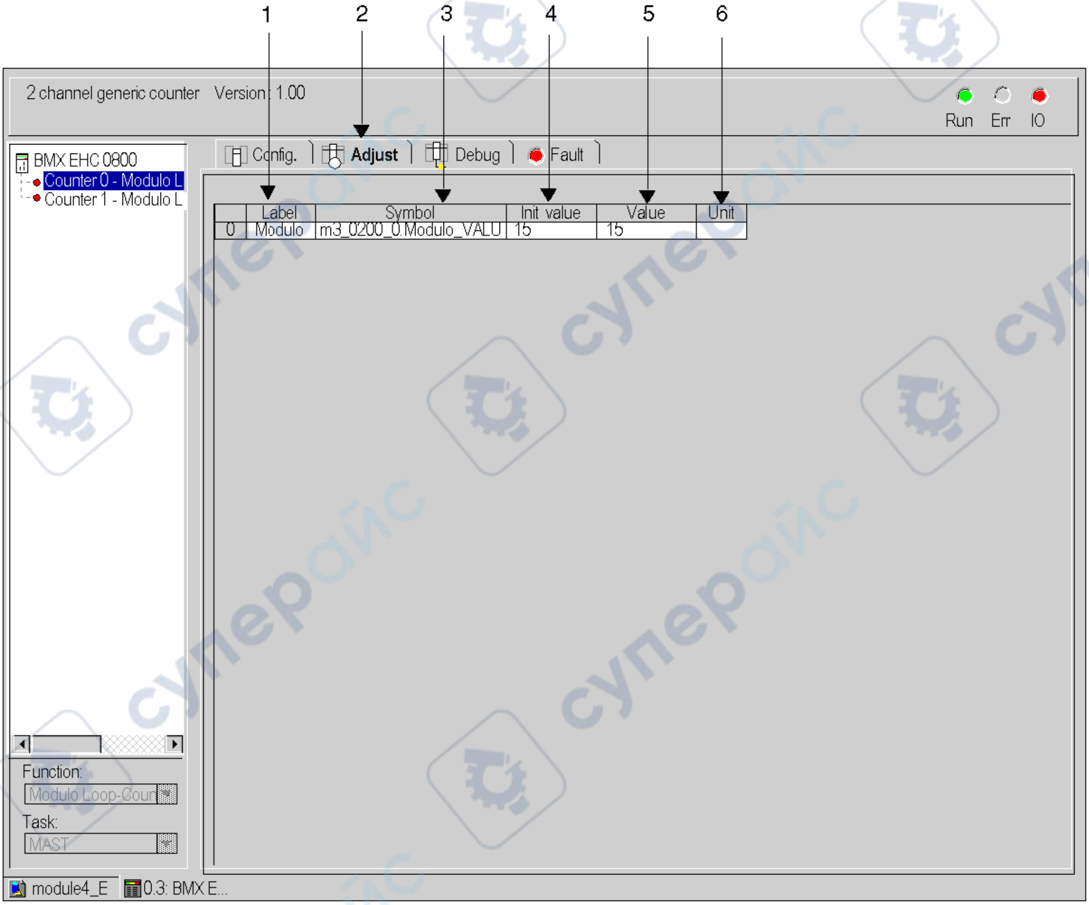
Adjust Screen for BMX EHC 0800 Counting Module

At a Glance

This section presents the adjust screen for BMX EHC 0800 counting module.

Illustration

The figure below presents the adjust screen for the BMX EHC 0800 module in modulo loop counter mode:



	Label	Symbol	Init value	Value	Unit
0	Modulo	m3_0200_0.Modulo_VALU	15	15	

Function: Modulo Loop-Coun

Task: MAST

Description of the Screen

The following table presents the various parts of the above screen:

Number	Element	Function
1	**Label** field	This field contains the name of each variable that may be adjusted. This field may not be modified and can be accessed in both local and online modes.
2	Tab	The tab in the foreground indicates the current mode. The current mode is therefore the adjust mode in this example.
3	**Symbol** field	This field contains the mnemonics of the variable. This field may not be modified and can be accessed in both offline and online modes.
4	**Initial value** field	This field displays the value of the variable that the user has adjusted in offline mode. This field is only accessible in online mode.
5	**Value** field	The function of this field depends on the mode in which the user is working: ● **In offline mode**: this field is used to adjust the variable. ● **In online mode**: this field is used to display the current value of the variable.
6	**Unit** field	This field contains the unit of each variable that may be configured. This field may not be modified and can be accessed in both offline and online modes.

Adjust the Preset Value

Introduction

The preset value concerns the following counting modes:

- for the BMX EHC 0800 module:
  - dual phase counting mode
  - up and down-counting mode.

Description

The following table shows the preset value adjust:

Number	Address in the configuration	Value	Default value
Preset value	`%MDr.m.c.12` (Low)	Edit	0

Adjust the Calibration Factor

Introduction

The calibration factor concerns the frequency mode for the BMX EHC 0800 module.

Description

The following table shows the calibration factor adjust:

Number	Address in the configuration	Value	Default value
Calibration factor	%MWr.m.c.14	Edit	0

Modulo Adjust

Introduction

The modulo concerns the modulo loop counter modes for the counting modules BMX EHC ****.

Description

The following table shows the modulo adjust:

Number	Address in the configuration	Value	Default value
Modulo	`%MDx.y.v.10` (Low)	Edit	0xFFFF

Adjust the Hysteresis Value

Introduction

The hysteresis value concerns dual phase counting mode for BMX EHC 0800 module.

Description

The following table shows the adjust for the hysteresis value:

Number	Address in the configuration	Value	Default value
Hysteresis (release value)	`%MWr.m.c.9`	Edit	0

Chapter 11
Debugging the BMX EHC 0800 Counting Module

Subject of this Chapter

This chapter deals with the debugging settings applicable to the BMX EHC 0800 module. These settings can be accessed from the Debug tab on the functional screens of the BMX EHC 0800 *(see page 100)* module.

What Is in This Chapter?

This chapter contains the following sections:

Section 11.1
Debug Screen for BMX EHC xxxx Counting Modules

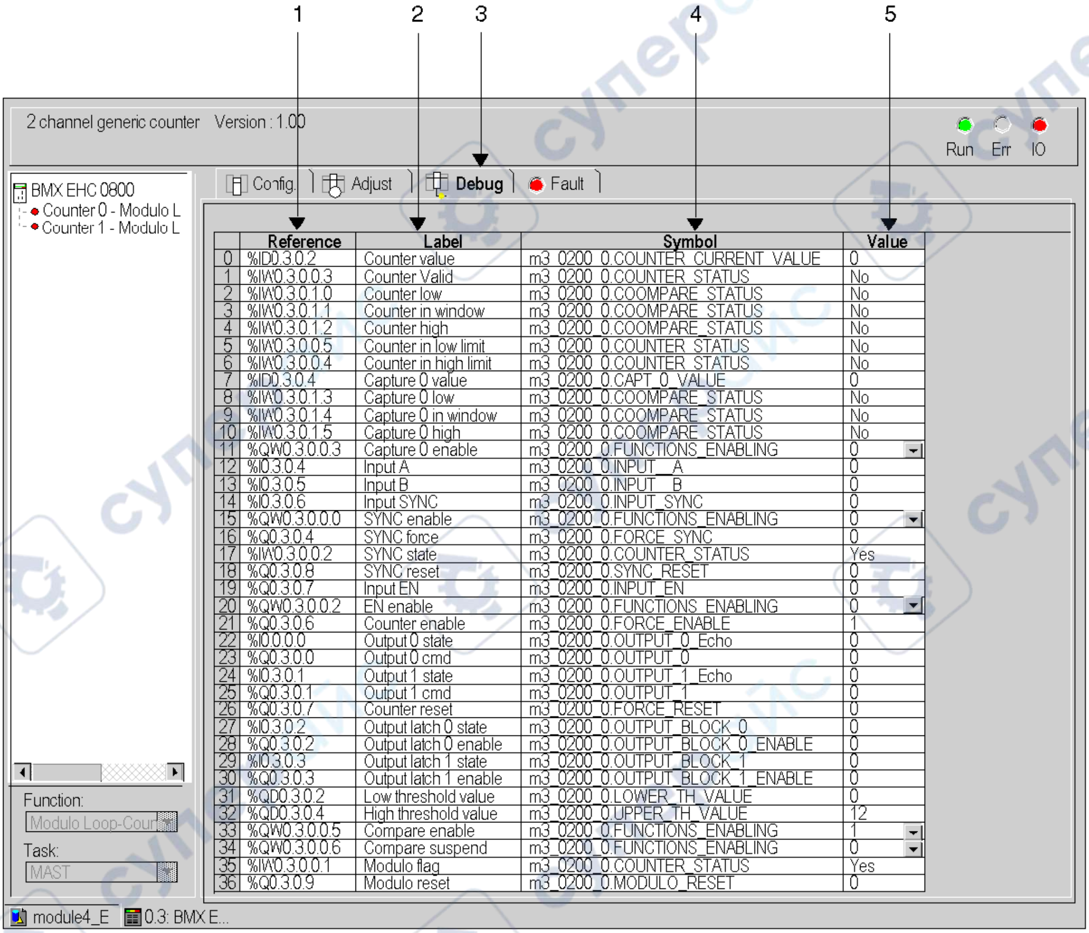
Debug Screen for the BMX EHC 0800 Counting Module

At a Glance

This section presents the debug screen for the BMX EHC 0800 counting module. A module’s debug screen can only be accessed in online mode.

Illustration

The figure below presents the debug screen for the BMX EHC 0800 module in modulo loop counter mode:



Function: Modulo Loop-Coun

Task: MAST

	Reference	Label	Symbol	Value
0	%ID0.3.0.2	Counter value	m3_0200_0.COUNTER_CURRENT_VALUE	0
1	%IW0.3.0.0.3	Counter Valid	m3_0200_0.COUNTER_STATUS	No
2	%IW0.3.0.1.0	Counter low	m3_0200_0.COOMPARE_STATUS	No
3	%IW0.3.0.1.1	Counter in window	m3_0200_0.COOMPARE_STATUS	No
4	%IW0.3.0.1.2	Counter high	m3_0200_0.COOMPARE_STATUS	No
5	%IW0.3.0.0.5	Counter in low limit	m3_0200_0.COUNTER_STATUS	No
6	%IW0.3.0.0.4	Counter in high limit	m3_0200_0.COUNTER_STATUS	No
7	%ID0.3.0.4	Capture 0 value	m3_0200_0.CAPT_0_VALUE	0
8	%IW0.3.0.1.3	Capture 0 low	m3_0200_0.COOMPARE_STATUS	No
9	%IW0.3.0.1.4	Capture 0 in window	m3_0200_0.COOMPARE_STATUS	No
10	%IW0.3.0.1.5	Capture 0 high	m3_0200_0.COOMPARE_STATUS	No
11	%QW0.3.0.0.3	Capture 0 enable	m3_0200_0.FUNCTIONS_ENABLING	0
12	%I0.3.0.4	Input A	m3_0200_0.INPUT__A	0
13	%I0.3.0.5	Input B	m3_0200_0.INPUT__B	0
14	%I0.3.0.6	Input SYNC	m3_0200_0.INPUT_SYNC	0
15	%QW0.3.0.0.0	SYNC enable	m3_0200_0.FUNCTIONS_ENABLING	0
16	%Q0.3.0.4	SYNC force	m3_0200_0.FORCE_SYNC	0
17	%IW0.3.0.0.2	SYNC state	m3_0200_0.COUNTER_STATUS	Yes
18	%Q0.3.0.8	SYNC reset	m3_0200_0.SYNC_RESET	0
19	%Q0.3.0.7	Input EN	m3_0200_0.INPUT_EN	0
20	%QW0.3.0.0.2	EN enable	m3_0200_0.FUNCTIONS_ENABLING	0
21	%Q0.3.0.6	Counter enable	m3_0200_0.FORCE_ENABLE	1
22	%I0.0.0.0	Output 0 state	m3_0200_0.OUTPUT_0_Echo	0
23	%Q0.3.0.0	Output 0 cmd	m3_0200_0.OUTPUT_0	0
24	%I0.3.0.1	Output 1 state	m3_0200_0.OUTPUT_1_Echo	0
25	%Q0.3.0.1	Output 1 cmd	m3_0200_0.OUTPUT_1	0
26	%Q0.3.0.7	Counter reset	m3_0200_0.FORCE_RESET	0
27	%I0.3.0.2	Output latch 0 state	m3_0200_0.OUTPUT_BLOCK_0	0
28	%Q0.3.0.2	Output latch 0 enable	m3_0200_0.OUTPUT_BLOCK_0_ENABLE	0
29	%I0.3.0.3	Output latch 1 state	m3_0200_0.OUTPUT_BLOCK_1	0
30	%Q0.3.0.3	Output latch 1 enable	m3_0200_0.OUTPUT_BLOCK_1_ENABLE	0
31	%QD0.3.0.2	Low threshold value	m3_0200_0.LOWER_TH_VALUE	0
32	%QD0.3.0.4	High threshold value	m3_0200_0.UPPER_TH_VALUE	12
33	%QW0.3.0.0.5	Compare enable	m3_0200_0.FUNCTIONS_ENABLING	1
34	%QW0.3.0.0.6	Compare suspend	m3_0200_0.FUNCTIONS_ENABLING	0
35	%IW0.3.0.0.1	Modulo flag	m3_0200_0.COUNTER_STATUS	Yes
36	%Q0.3.0.9	Modulo reset	m3_0200_0.MODULO_RESET	0

Description of the Screen

The following table presents the various parts of the above screen:

Number	Element	Function
1	**Reference** field	This field contains the address of the variable in the application. This field may not be modified.
2	**Label** field	This field contains the name of each variable that may be configured. This field may not be modified.
3	Tab	The tab in the foreground indicates the current mode. The current mode is therefore the debug mode in this example.
4	**Symbol** field	This field contains the mnemonics of the variable. This field may not be modified.
5	**Value** field	If the field has a downward pointing arrow, you can select the value of each variable from various possible values in this field. The various values can be accessed by clicking on the arrow. A drop-down menu containing all the possible values is displayed and the user may then select the required value of the variable. If there is no downward pointing arrow, this field simply displays the current value of the variable.

Section 11.2
BMX EHC 0800 Module Debugging

Subject of this Section

This section deals with the debugging of the BMX EHC 0800 counting module modes.

What Is in This Section?

This section contains the following topics:

Frequency Mode Debugging

At a Glance

The table below presents the frequency mode debugging elements:

Label	Language object	Type
Frequency value	%IDr.m.c.2	Digital
Frequency valid	%IWr.m.c.0.3	Binary
Frequency low	%IWr.m.c.1.0	Binary
Frequency equal	%IWr.m.c.1.1	Binary
Frequency high	%IWr.m.c.1.2	Binary
Frequency in high limit	%IWr.m.c.0.4	Binary
Input A state	%Ir.m.c.4	Binary
Threshold value	%QDr.m.c.2	Digital
Compare enable	%QWr.m.c.0.5	Binary
Compare suspend	%QWr.m.c.0.6	Binary

For a description of each language object refer to T_UNSIGNED_CPT_BMX IODDT *(see page 154)*.

Event Counting Mode Debugging

At a Glance

The table below presents the event counting mode debugging elements.

Label	Language object	Type
Counter value	%IDr.m.c.2	Digital
Counter valid	%IWr.m.c.0.3	Binary
Counter low	%IWr.m.c.1.0	Binary
Counter equal	%IWr.m.c.1.1	Binary
Counter high	%IWr.m.c.1.2	Binary
Counter in low limit	%IWr.m.c.0.5	Binary
Counter in high limit	%IWr.m.c.0.4	Binary
Input A state	%Ir.m.c.4	Binary
Input AUX state	%Ir.m.c.6	Binary
SYNC enable	%QWr.m.c.0.0	Binary
SYNC force	%Qr.m.c.4	Binary
SYNC state	%IWr.m.c.0.2	Binary
SYNC reset	%QWr.m.c.8	Binary
Threshold value	%QDr.m.c.2	Digital
Compare enable	%QWr.m.c.0.5	Binary
Compare suspend	%QWr.m.c.0.6	Binary

For a description of each language object refer to T_UNSIGNED_CPT_BMX IODDT *(see page 154)*.

One Shot Counter Mode Debugging

At a Glance

The table below presents the one shot counter mode debugging elements:

Label	Language object	Type
Counter value	`%IDr.m.c.2`	Digital
Counter valid	`%IWr.m.c.0.3`	Binary
RUN	`%IWr.m.c.0.0`	Binary
Counter reset	`%Qr.m.c.7`	Binary
Counter enable	`%Qr.m.c.6`	Binary
Counter low	`%IWr.m.c.1.0`	Binary
Counter equal	`%IWr.m.c.1.1`	Binary
Counter high	`%IWr.m.c.1.2`	Binary
Input A state	`%Ir.m.c.4`	Binary
Input AUX state	`%Ir.m.c.6`	Binary
SYNC enable	`%QWr.m.c.0.0`	Binary
SYNC force	`%Qr.m.c.4`	Binary
SYNC state	`%IWr.m.c.0.2`	Binary
SYNC reset	`%QWr.m.c.8`	Binary
Threshold value	`%QDr.m.c.2`	Digital
Compare enable	`%QWr.m.c.0.5`	Binary
Compare suspend	`%QWr.m.c.0.6`	Binary

For a description of each language object refer to T_UNSIGNED_CPT_BMX IODDT *(see page 154)*.

Modulo Loop Counter Mode Debugging

At a Glance

The table below presents the modulo loop counter mode debugging elements:

Label	Language object	Type
Counter value	%IDr.m.c.2	Digital
Counter valid	%IWr.m.c.0.3	Binary
Counter reset	%Qr.m.c.7	Binary
Counter enable	%Qr.m.c.6	Binary
Counter low	%IWr.m.c.1.0	Binary
Counter equal	%IWr.m.c.1.1	Binary
Counter high	%IWr.m.c.1.2	Binary
Capture value	%IDr.m.c.4	Digital
Capture low	%IWr.m.c.1.3	Binary
Capture equal	%IWr.m.c.1.4	Binary
Capture high	%IWr.m.c.1.5	Binary
Capture enable	%QWr.m.c.0.3	Binary
Input A state	%Ir.m.c.4	Binary
Input AUX state	%Ir.m.c.6	Binary
SYNC enable	%QWr.m.c.0.0	Binary
SYNC force	%Qr.m.c.4	Binary
SYNC state	%IWr.m.c.0.2	Binary
SYNC reset	%Qr.m.c.8	Binary
Threshold value	%QDr.m.c.2	Digital
Compare enable	%QWr.m.c.0.5	Binary
Compare suspend	%QWr.m.c.0.6	Binary
Modulo state	%IWr.m.c.0.1	Binary
Modulo reset	%Qr.m.c.9	Binary

For a description of each language object refer to T_UNSIGNED_CPT_BMX IODDT *(see page 154)*.

Up and Down Counting Mode Debugging

At a Glance

The table below presents the up and down counting mode debugging elements:

Label	Language object	Type
Counter value	%IDr.m.c.2	Digital
Counter valid	%IWr.m.c.0.3	Binary
Counter reset	%Qr.m.c.7	Binary
Counter enable	%Qr.m.c.6	Binary
Counter low	%IWr.m.c.1.0	Binary
Counter equal	%IWr.m.c.1.1	Binary
Counter high	%IWr.m.c.1.2	Binary
Counter in low limit	%IWr.m.c.0.5	Binary
Counter in high limit	%IWr.m.c.0.4	Binary
Input A state	%Ir.m.c.4	Binary
Input AUX state	%Ir.m.c.6	Binary
SYNC force	%Qr.m.c.4	Binary
SYNC state	%IWr.m.c.0.2	Binary
SYNC reset	%Qr.m.c.8	Binary
Threshold value	%QDr.m.c.2	Digital
Compare enable	%QWr.m.c.0.5	Binary
Compare suspend	%QWr.m.c.0.6	Binary
Modulo state	%IWr.m.c.0.1	Binary
Modulo reset	%Qr.m.c.9	Binary

For a description of each language object refer to T_SIGNED_CPT_BMX IODDT *(see page 154)*.

Dual Phase Counting Mode Debugging

At a Glance

The table below presents the dual phase counting mode debugging elements:

Label	Language object	Type
Counter value	`%IDr.m.c.2`	Digital
Counter valid	`%IWr.m.c.0.3`	Binary
Counter reset	`%Qr.m.c.7`	Binary
Counter enable	`%Qr.m.c.6`	Binary
Counter low	`%IWr.m.c.1.0`	Binary
Counter equal	`%IWr.m.c.1.1`	Binary
Counter high	`%IWr.m.c.1.2`	Binary
Counter in low limit	`%IWr.m.c.0.5`	Binary
Counter in high limit	`%IWr.m.c.0.4`	Binary
Capture value	`%IDr.m.c.4`	Digital
Capture low	`%IWr.m.c.1.3`	Binary
Capture equal	`%IWr.m.c.1.4`	Binary
Capture high	`%IWr.m.c.1.5`	Binary
Capture enable	`%QWr.m.c.0.3`	Binary
Input A state	`%Ir.m.c.4`	Binary
Input B state	`%Ir.m.c.5`	Binary
Input AUX state	`%Ir.m.c.6`	Binary
SYNC enable	`%QWr.m.c.0.0`	Binary
SYNC force	`%Qr.m.c.4`	Binary
SYNC state	`%IWr.m.c.0.2`	Binary
SYNC reset	`%Qr.m.c.8`	Binary
Threshold value	`%QDr.m.c.2`	Digital
Compare enable	`%QWr.m.c.0.5`	Binary
Compare suspend	`%QWr.m.c.0.6`	Binary
Modulo state	`%IWr.m.c.0.1`	Binary
Modulo reset	`%Qr.m.c.9`	Binary

For a description of each language object refer to T_UNSIGNED_CPT_BMX IODDT *(see page 154)*.

Chapter 12
Display of BMX EHC xxxx Counting Module Error

Subject of this Chapter

This chapter deals with the display of possible errors for the BMX EHC•••• modules.

What Is in This Chapter?

This chapter contains the following topics:

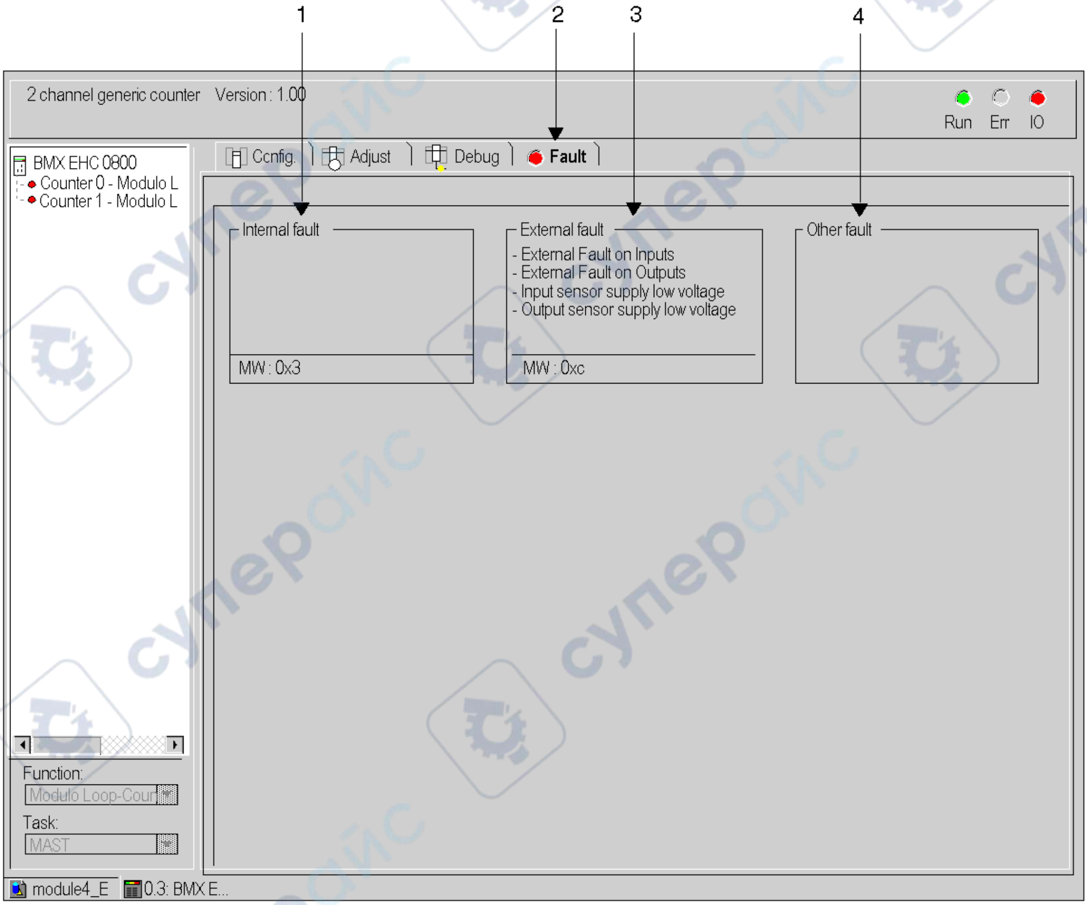
Fault Display Screen for the BMX EHC 0800 Counting Module

At a Glance

This section presents the fault display screen for the BMX EHC 0800 counting module. A module’s fault display screen may only be accessed in online mode.

Illustration

The figure below presents the fault display screen for the BMX EHC 0800 module in modulo loop counter mode.



- External Fault on Inputs
- External Fault on Outputs
- Input sensor supply low voltage
- Output sensor supply low voltage

MW : 0x3

MW : 0xc

Function: Modulo Loop-Coun

Task: MAST

Description of the Screen

The following table presents the various parts of the above screen.

Number	Element	Function
1	Internal faults field	This field displays the module’s active internal faults.
2	Tab	The tab in the foreground indicates the current mode. The current mode is therefore the fault display mode in this example.
3	External faults field	This field displays the module’s active external faults.
4	Other faults field	This field displays the module’s active faults, other than internal and external faults.

Faults Diagnostics Display

At a Glance

The diagnostic screens *(see page 99)* on the module or channel are only accessible in connected mode. When an un-masked error appears, it is reported:

- in the configuration screen of the rack, with the presence of a red square in the position of the inoperative counting module,
- in all screens at module level (**Description** and **Fault** tabs),
  - in the module field with the LED
- in all channel level screens (**Configuration**, **Adjustment**, **Debug** and **Fault** tabs),
  - in the module zone with the LED
  - in the channel zone with the error LED
- in the fault screen that is accessed by the **Fault** where the fault diagnostics are described.

The error is also signaled:

- On the module, on the central display,
- by dedicated language objects: CH_ERROR (`%Ir.m.c.ERR`) and MOD_ERROR (`%Ir.m.MOD.ERR`), `%MWr.m.MOD.2`, etc. and status words.

NOTE: Even if the error is masked, it is reported by the flashing of the **I/O** LED and in the fault screen.

List of Errors

At a Glance

The messages displayed on the diagnostics screens are used to assist with debugging. These messages must be concise and are sometimes ambiguous (as different errors may have the same consequences).

These diagnostics are on two levels: module and channel, the latter being the most explicit.

The lists below show the message headings with suggestions for identifying issues.

List of the Module Error Messages

The table below provides a list of the module error messages.

Error indicated	Possible interpretation and/or action.
Module failure	The module has a error. Check the module mounting. Change the module.
Inoperative channel(s)	One or more channels have a error. Refer to channel diagnostics.
Self-test	The module is running a self-test. Wait until the self-test is complete.
Different hardware and software configurations	There is a lack of compatibility between the module configured and the module in the rack. Make the hardware configuration and the software configuration compatible.
Module is missing or off	Install the module. Fasten the mounting screws.

BMX EHC 0800 Module Errors

The table below provides a list of errors that may appear on the BMX EHC 0800 module.

Language object	Description
`%MWr.m.c.2.0`	External error at inputs
`%MWr.m.c.2.4`	Internal error or self-testing.
`%MWr.m.c.2.5`	Configuration Error
`%MWr.m.c.2.6`	Communication Error
`%MWr.m.c.2.7`	Application error
`%MWr.m.c.3.2`	Sensor power supply error

List of Channel Error Messages

The table below gives the list of error messages at channel level.

Error indicated. Other consequences.	Possible interpretation and/or action.
External error or counting input error: ● encoder or proximity sensor supply error ● line break or short circuit of at least one encoder differential signal (1A, 1B, 1Z) ● specific error on absolute encoder Outputs are set to 0 in automatic mode. **Invalid measurement** message.	Check the sensor connections. Check the sensor power supply. Check the sensor operation. Delete the error and acknowledge if the error storing is configured. Counting pulses or incremental encoder: preset or reset to acknowledge the **Invalid measurement** message.
Counting application error: ● measurement overrun ● overspeed Outputs are set to 0 in automatic mode. **Invalid measurement** message.	Diagnose the error more precisely (external causes). Check the application again, if necessary. Delete the error and acknowledge if the error storing is configured. Counting pulses or incremental encoder: preset or reset to 0 to acknowledge the **Invalid measurement** message.
Auxiliary input/output error: ● power supply ● short circuit of at least one output Outputs are set to 0 in automatic mode	Check the output connections Check the input/output power supply (24V) Diagnose the error more precisely (external causes) Delete the error and acknowledge if the error storing is configured
Internal error or channel self-testing: ● module inoperative ● module missing or off ● module running self-test	Module error has gone down to channel level. Refer to module level diagnostics.
Different hardware and software configurations	Module error has gone down to channel level. Refer to module level diagnostics.
Invalid software configuration: ● incorrect constant ● bit combination not associated with any configuration	Check and modify the configuration constants.
Communication error	Check the connections between the racks.
Application error: refusal to configure or adjust	Diagnose the error more precisely.

Chapter 13
The Language Objects of the Counting Function

Subject of this Chapter

This chapter describes the language objects associated to the counting tasks as well as the different ways of using them.

What Is in This Chapter?

This chapter contains the following sections:

Section 13.1
The Language Objects and IODDT of the Counting Function

Subject of this Section

This section describes the general features of the language objects and IODDT of the counting function.

What Is in This Section?

This section contains the following topics:

Introducing Language Objects for Application-Specific Counting

General

The counting modules have only two associated IODDTs. These IODDTs are predefined by the manufacturer and contains language objects for inputs/outputs belonging to the channel of an application-specific module.

The IODDT associated with the counting modules are of T_ Unsigned_CPT_BMX and T_Signed_CPT_BMX types.

NOTE: IODDT variables can be created in two different ways:

- Using the **I/O objects** *(see EcoStruxure™ Control Expert, Operating Modes)* tab.
- Using the Data Editor *(see EcoStruxure™ Control Expert, Operating Modes)*.

Language Object Types

Each IODDT contains a set of language objects allowing its operation to be controlled and checked.

There are two types of language objects:

- **Implicit Exchange Objects:** these objects are automatically exchanged on each cycle revolution of the task associated with the module.
- **Explicit Exchange Objects:** these objects are exchanged on the application's request, using explicit exchange instructions.

Implicit exchanges concern the inputs/outputs of the module (measurement results, information and commands). These exchanges enable the debugging of the counting modules.

Explicit exchanges enable the module to be set and diagnosed.

Implicit Exchange Language Objects Associated with the Application-Specific Function

At a Glance

An integrated application-specific interface or the addition of a module automatically enhances the language objects application used to program this interface or module.

These objects correspond to the input/output images and software data of the module or integrated application-specific interface.

Reminders

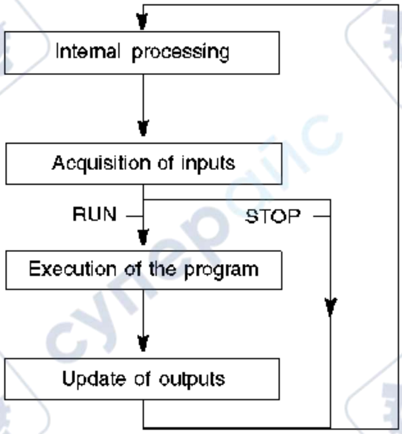
The module inputs (`%I` and `%IW`) are updated in the PLC memory at the start of the task, the PLC being in RUN or STOP mode.

The outputs (`%Q` and `%QW`) are updated at the end of the task, only when the PLC is in RUN mode.

NOTE: When the task occurs in STOP mode, either of the following are possible, depending on the configuration selected:
- outputs are set to fallback position (fallback mode)
- outputs are maintained at their last value (maintain mode)

Figure

The following diagram shows the operating cycle of a PLC task (cyclical execution).



Explicit Exchange Language Objects Associated with the Application-Specific Function

Introduction

Explicit exchanges are performed at the user program's request using these instructions:
- READ_STS (read status words)
- WRITE_CMD (write command words)
- WRITE_PARAM (write adjustment parameters)
- READ_PARAM (read adjustment parameters)
- SAVE_PARAM (save adjustment parameters)
- RESTORE_PARAM (restore adjustment parameters)

For more details about instructions, refer to *EcoStruxure™ Control Expert, I/O Management, Block Library*.

These exchanges apply to a set of %MW objects of the same type (status, commands or parameters) that belong to a channel.

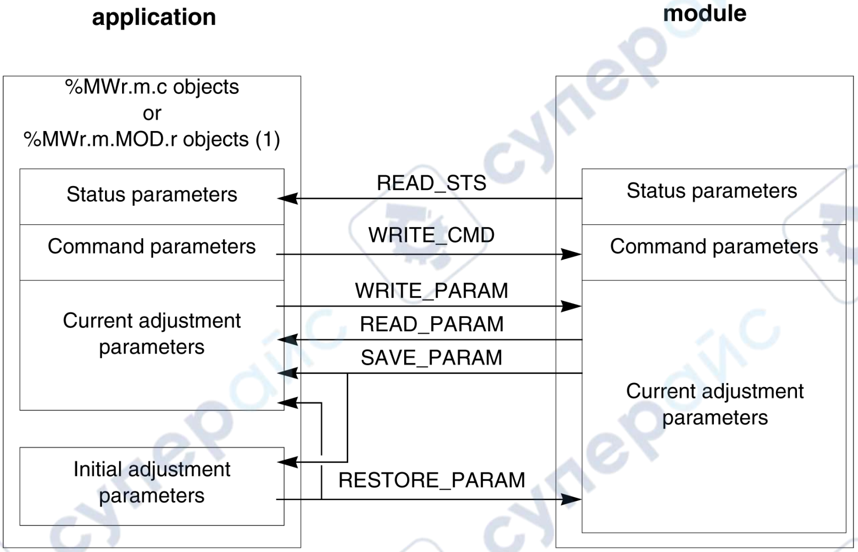
These objects can:
- provide information about the module (for example, type of error detected in a channel)
- have command control of the module (for example, switch command)
- define the module's operating modes (save and restore adjustment parameters in the process of application)

NOTE: To avoid several simultaneous explicit exchanges for the same channel, it is necessary to test the value of the word EXCH_STS (`%MWr.m.c.0`) of the IODDT associated to the channel before calling any EF addressing this channel.

NOTE: Explicit exchanges are not supported when X80 analog and digital I/O modules are configured through an eX80 adapter module (BMECRA31210) in a Quantum EIO configuration. You cannot set up a module's parameters from the PLC application during operation.

General Principle for Using Explicit Instructions

The diagram below shows the different types of explicit exchanges that can be made between the application and module.



(1) Only with READ_STS and WRITE_CMD instructions.

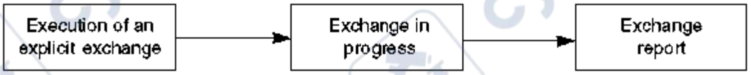
Managing Exchanges

During an explicit exchange, check performance to see that the data is only taken into account when the exchange has been correctly executed.

To do this, two types of information is available:

- information concerning the exchange in progress *(see page 152)*
- the exchange report *(see page 152)*

The following diagram describes the management principle for an exchange.



NOTE: In order to avoid several simultaneous explicit exchanges for the same channel, it is necessary to test the value of the word EXCH_STS (`%MWr.m.c.0`) of the IODDT associated to the channel before calling any EF addressing this channel.

Management of Exchanges and Reports with Explicit Objects

At a Glance

When data is exchanged between the PLC memory and the module, the module may require several task cycles to acknowledge this information. IODDTs use two words to manage exchanges:

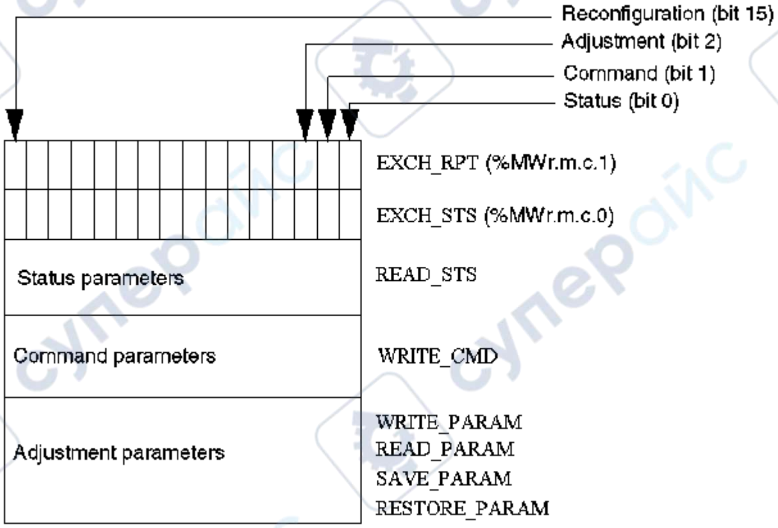
- `EXCH_STS` (`%MWr.m.c.0`): exchange in progress
- `EXCH_RPT` (`%MWr.m.c.1`): report

NOTE:
Depending on the localization of the module, the management of the explicit exchanges (`%MW0.0.MOD.0.0` for example) will not be detected by the application:

- For in-rack modules, explicit exchanges are done immediately on the local PLC Bus and are finished before the end of the execution task. So, the `READ_STS`, for example, is finished when the `%MW0.0.mod.0.0` bit is checked by the application.
- For remote bus (Fipio for example), explicit exchanges are not synchronous with the execution task, so the detection is possible by the application.

Illustration

The illustration below shows the different significant bits for managing exchanges:



Description of Significant Bits

Each bit of the words `EXCH_STS` (`%MWr.m.c.0`) and `EXCH_RPT` (`%MWr.m.c.1`) is associated with a type of parameter:

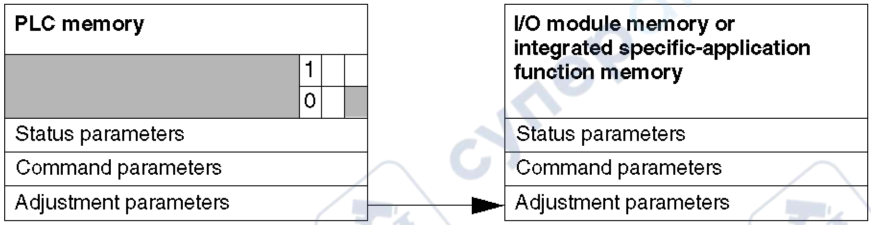
- Rank 0 bits are associated with the status parameters:
  - The `STS_IN_PROGR` bit (`%MWr.m.c.0.0`) indicates whether a read request for the status words is in progress.
  - The `STS_ERR` bit (`%MWr.m.c.1.0`) specifies whether a read request for the status words is accepted by the module channel.
- Rank 1 bits are associated with the command parameters:
  - The `CMD_IN_PROGR` bit (`%MWr.m.c.0.1`) indicates whether command parameters are being sent to the module channel.
  - The `CMD_ERR` bit (`%MWr.m.c.1.1`) specifies whether the command parameters are accepted by the module channel.
- Rank 2 bits are associated with the adjustment parameters:
  - The `ADJ_IN_PROGR` bit (`%MWr.m.c.0.2`) indicates whether the adjustment parameters are being exchanged with the module channel (via `WRITE_PARAM, READ_PARAM, SAVE_PARAM, RESTORE_PARAM`).
  - The `ADJ_ERR` bit (`%MWr.m.c.1.2`) specifies whether the adjustment parameters are accepted by the module. If the exchange is correctly executed, the bit is set to 0.
- Rank 15 bits indicate a reconfiguration on channel **c** of the module from the console (modification of the configuration parameters + cold start-up of the channel).
- The *r*, *m* and *c* bits indicates the following elements:
  - the **r** bit represents the rack number.
  - The **m** bit represents the position of the module in the rack.
  - The **c** bit represents the channel number in the module.

NOTE: **r** represents the rack number, **m** the position of the module in the rack, while **c** represents the channel number in the module.

NOTE: Exchange and report words also exist at module level `EXCH_STS` (`%MWr.m.MOD`) and `EXCH_RPT` (`%MWr.m.MOD.1`) as per IODDT type `T_GEN_MOD`.

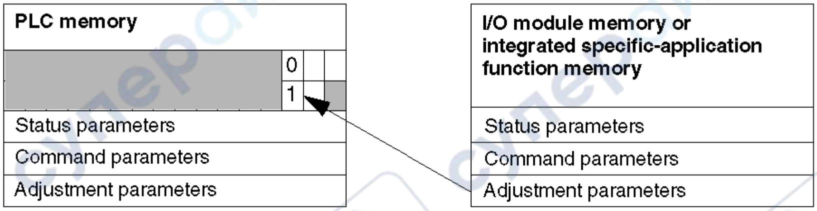
Example

Phase 1: Sending data by using the `WRITE_PARAM` instruction



When the instruction is scanned by the PLC, the **Exchange in progress** bit is set to 1 in `%MWr.m.c`.

Phase 2: Analysis of the data by the I/O module and report.



When the data is exchanged between the PLC memory and the module, acknowledgement by the module is managed by the `ADJ_ERR` bit (`%MWr.m.c.1.2`).

This bit makes the following reports:

- 0: correct exchange
- 1: incorrect exchange)

NOTE: There is no adjustment parameter at module level.

Execution Indicators for an Explicit Exchange: EXCH_STS

The table below shows the control bits of the explicit exchanges: `EXCH_STS` (`%MWr.m.c.0`)

Standard Symbol	Type	Access	Meaning	Address
STS_IN_PROGR	BOOL	R	Reading of channel status words in progress	%MWr.m.c.0.0
CMD_IN_PROGR	BOOL	R	Command parameters exchange in progress	%MWr.m.c.0.1
ADJ_IN_PROGR	BOOL	R	Adjust parameters exchange in progress	%MWr.m.c.0.2
RECONF_IN_PROGR	BOOL	R	Reconfiguration of the module in progress	%MWr.m.c.0.15

NOTE: If the module is not present or is disconnected, explicit exchange objects (`READ_STS` for example) are not sent to the module (`STS_IN_PROG` (%MWr.m.c.0.0) = 0), but the words are refreshed.

Explicit Exchange Report: EXCH_RPT

The table below shows the report bits: `EXCH_RPT` (`%MWr.m.c.1`)

Standard Symbol	Type	Access	Meaning	Address
STS_ERR	BOOL	R	Error detected while reading channel status words (1 = detected error)	%MWr.m.c.1.0
CMD_ERR	BOOL	R	Error detected during a command parameter exchange (1 = detected error)	%MWr.m.c.1.1
ADJ_ERR	BOOL	R	Error dectected during an adjust parameter exchange (1 = detected error)	%MWr.m.c.1.2
RECONF_ERR	BOOL	R	Error detected during reconfiguration of the channel (1 = detected error)	%MWr.m.c.1.15

Counting Module Use

The following table describes the steps realized between a couting module and the system after a power-on.

Step	Action
1	Power on.
2	The system sends the configuration parameters.
3	The system sends the adjust parameters by WRITE_PARAM method. **Note:** When the operation is finished, the bit %MWr.m.c.0.2 switches to 0.

If, in the begining of your application, you use a WRITE_PARAM command, wait until the bit %MWr.m.c.0.2 switches to 0.

Section 13.2
Language Objects and IODDT Associated with the Counting Function of the BMX EHC xxxx Modules.

Subject of this Section

This section presents the language objects and IODDTs associated with the counting function of BMX EHC •••• modules.

What Is in This Section?

This section contains the following topics:

Details of Implicit Exchange Objects for the T_Unsigned_CPT_BMX and T_Signed_CPT_BMX-types IODDTs

At a Glance

The tables below present the T_Unsigned_CPT_BMX and T_Signed_CPT_BMX-types IODDTs implicit exchange objects which are applicable to all BMX EHC •••• counting modules.

Counter Value and Sensor Values

The table below presents the various IODDT implicit exchange objects:

Standard symbol	Type	Access	Meaning	Language object
COUNTER_CURRENT_VALUE	DINT	R	Current counter value	%IDr.m.c.2
CAPT_0_VALUE	DINT	R	Counter value when captured in register 0	%IDr.m.c.4
CAPT_1_VALUE	DINT	R	Counter value when captured in register 1	%IDr.m.c.6
COUNTER_VALUE	DINT	R	Current counter value during event	%IDr.m.c.12
CAPT_0_VAL	DINT	R	Capture value 0	%IDr.m.c.14
CAPT_1_VAL	DINT	R	Capture value 1	%IDr.m.c.16

%Ir.m.c.d Word

The table below presents the meanings of the %Ir.m.c.d words:

Standard symbol	Type	Access	Meaning	Language object
CH_ERROR	BOOL	R	Channel error	%Ir.m.c.ERR
OUTPUT_0_Echo	BOOL	R	Logical state of output 0	%Ir.m.c.0
OUTPUT_1_Echo	BOOL	R	Logical state of output 1	%Ir.m.c.1
OUTPUT_BLOCK_0	BOOL	R	State of output block 0	%Ir.m.c.2
OUTPUT_BLOCK_1	BOOL	R	State of output block 1	%Ir.m.c.3
INPUT_A	BOOL	R	Physical state of IN_A input	%Ir.m.c.4
INPUT_B	BOOL	R	Physical state of IN_B input	%Ir.m.c.5
INPUT_SYNC	BOOL	R	Physical state of the IN_SYNC input (or IN_AUX)	%Ir.m.c.6
INPUT_EN	BOOL	R	Physical state of IN_EN input (enable)	%Ir.m.c.7
INPUT_REF	BOOL	R	Physical state of the IN_REF input (preset)	%Ir.m.c.8
INPUT_CAPT	BOOL	R	Physical state of IN_CAP input (capture)	%Ir.m.c.9

Counter Status, %IWr.m.c.0 Word

The following table presents the meanings of the bits of the `%IWr.m.c.0` status word:

Standard symbol	Type	Access	Meaning	Language object
RUN	BOOL	R	The counter operates in counting mode only	`%IWr.m.c.0.0`
MODULO_FLAG	BOOL	R	Flag set to 1 by a modulo switch event	`%IWr.m.c.0.1`
SYNC_REF_FLAG	BOOL	R	Flag set to 1 by a preset or synchronization event	`%IWr.m.c.0.2`
VALIDITY	BOOL	R	The current numerical value is valid	`%IWr.m.c.0.3`
HIGH_LIMIT	BOOL	R	The current numerical value is locked at the upper threshold value	`%IWr.m.c.0.4`
LOW_LIMIT	BOOL	R	The current numerical value is locked at the lower threshold value	`%IWr.m.c.0.5`

Comparison Status, %IWr.m.c.1 Word

The following table presents the meanings of the bits of the `%IWr.m.c.1` status word:

Standard symbol	Type	Access	Meaning	Language object
COUNTER_LOW	BOOL	R	Current counter value less than lower threshold (`%QDr.m.c.2`)	`%IWr.m.c.1.0`
COUNTER_WIN	BOOL	R	Current counter value is between lower threshold (`%QDr.m.c.2`) and upper threshold (`%QDr.m.c.4`)	`%IWr.m.c.1.1`
COUNTER_HIGH	BOOL	R	Current counter value greater than upper threshold (`%QDr.m.c.4`)	`%IWr.m.c.1.2`
CAPT_0_LOW	BOOL	R	Value captured in register 0 is less than lower threshold (`%QDr.m.c.2`)	`%IWr.m.c.1.3`
CAPT_0_WIN	BOOL	R	Value captured in register 0 is between lower threshold (`%QDr.m.c.2`) and upper threshold (`%QDr.m.c.4`)	`%IWr.m.c.1.4`
CAPT_0_HIGH	BOOL	R	Value captured in register 0 is greater than upper threshold (`%QDr.m.c.4`)	`%IWr.m.c.1.5`
CAPT_1_LOW	BOOL	R	Value captured in register 1 is less than lower threshold (`%QDr.m.c.2`)	`%IWr.m.c.1.6`
CAPT_1_WIN	BOOL	R	Value captured in register 1 is between lower threshold (`%QDr.m.c.2`) and upper threshold (`%QDr.m.c.4`)	`%IWr.m.c.1.7`
CAPT_1_HIGH	BOOL	R	Value captured in register 1 is greater than upper threshold (`%QDr.m.c.4`)	`%IWr.m.c.1.8`

Event Sources, %IWr.m.c.10 Word

The following table presents the meanings of the bits of the %IWr.m.c.10 word:

Standard symbol	Type	Access	Meaning	Language object
EVT_SOURCES	INT	R	Event sources field	%IWr.m.c.10
EVT_RUN	BOOL	R	Event due to start of counter.	%IWr.m.c.10.0
EVT_MODULO	BOOL	R	Event due to modulo switch	%IWr.m.c.10.1
EVT_SYNC_PRESET	BOOL	R	Event due to synchronization or preset	%IWr.m.c.10.2
EVT_COUNTER_LOW	BOOL	R	Event due to counter value being less than lower threshold	%IWr.m.c.10.3
EVT_COUNTER_WINDOW	BOOL	R	Event due to counter value being between the two thresholds	%IWr.m.c.10.4
EVT_COUNTER_HIGH	BOOL	R	Event due to counter value being greater than upper threshold	%IWr.m.c.10.5
EVT_CAPT_0	BOOL	R	Event due to capture function 0	%IWr.m.c.10.6
EVT_CAPT_1	BOOL	R	Event due to capture function 1	%IWr.m.c.10.7
EVT_OVERRUN	BOOL	R	Warning: lost event(s)	%IWr.m.c.10.8

Output Thresholds and Frequency

The table below presents the various IODDT implicit exchange objects:

Standard symbol	Type	Access	Meaning	Language object
LOWER_TH_VALUE	DINT	R/W	Lower threshold value	%QDr.m.c.2
UPPER_TH_VALUE	DINT	R/W	Upper threshold value	%QDr.m.c.4
PWM_FREQUENCY	DINT	R/W	Output frequency value (unit = 0.1 Hz)	%QDr.m.c.6
PWM_DUTY	INT	R/W	Duty cycle value of the output frequency (unit = 5%)	%QDr.m.c.8

%Qr.m.c.d Words

The following table presents the meanings of the bits of the %Qr.m.c.d words:

Standard symbol	Type	Access	Meaning	Language object
OUTPUT_0	BOOL	R/W	Forces OUTPUT_0 to level 1	%Qr.m.c.0
OUTPUT_1	BOOL	R/W	Forces OUTPUT_1 to level 1	%Qr.m.c.1
OUTPUT_BLOCK_0_ENABLE	BOOL	R/W	Implementation of output 0 function block	%Qr.m.c.2
OUTPUT_BLOCK_1_ENABLE	BOOL	R/W	Implementation of output 1 function block	%Qr.m.c.3
FORCE_SYNC	BOOL	R/W	Counting function synchronization and start	%Qr.m.c.4
FORCE_REF	BOOL	R/W	Set to preset counter value	%Qr.m.c.5
FORCE_ENABLE	BOOL	R/W	Implementation of counter	%Qr.m.c.6
FORCE_RESET	BOOL	R/W	Reset counter	%Qr.m.c.7
SYNC_RESET	BOOL	R/W	Reset SYNC_REF_FLAG	%Qr.m.c.8
MODULO_RESET	BOOL	R/W	Reset MODULO_FLAG	%Qr.m.c.9

FUNCTIONS_ENABLING, %QWr.m.c.0 Word

The following table presents the meanings of the bits of the %QWr.m.c.0 words:

Standard symbol	Type	Access	Meaning	Language object
VALID_SYNC	BOOL	R/W	Synchronization and start authorization for the counting function via the IN_SYNC input	%QWr.m.c.0.0
VALID_REF	BOOL	R/W	Operation authorization for the internal preset function	%QWr.m.c.0.1
VALID_ENABLE	BOOL	R/W	Authorization of the counter enable via the IN_EN input	%QWr.m.c.0.2
VALID_CAPT_0	BOOL	R/W	Capture authorization in the capture0 register	%QWr.m.c.0.3
VALID_CAPT_1	BOOL	R/W	Capture authorization in the capture1 register	%QWr.m.c.0.4
COMPARE_ENABLE	BOOL	R/W	Comparators operation authorization	%QWr.m.c.0.5
COMPARE_SUSPEND	BOOL	R/W	Comparator frozen at its last value	%QWr.m.c.0.6

EVENT_SOURCES_ENABLING, %QWr.m.c.1 Word

The following table presents the meanings of the bits of the `%QWr.m.c.1` words:

Standard symbol	Type	Access	Meaning	Language object
EVT_RUN_ENABLE	BOOL	R/W	EVENT task call at start of the counting function	`%QWr.m.c.1.0`
EVT_MODULO_ENABLE	BOOL	R/W	EVENT task call when there is a counter reversal	`%QWr.m.c.1.1`
EVT_REF_ENABLE	BOOL	R/W	EVENT task call during counter synchronization or preset	`%QWr.m.c.1.2`
EVT_COUNTER_LOW_ENABLE	BOOL	R/W	EVENT task call when the counter value is less than lower threshold	`%QWr.m.c.1.3`
EVT_COUNTER_WINDOW_ENABLE	BOOL	R/W	EVENT task call when the counter is between the lower and upper threshold	`%QWr.m.c.1.4`
EVT_COUNTER_HIGH_ENABLE	BOOL	R/W	EVENT task call when the counter value is greater than the upper threshold	`%QWr.m.c.1.5`
EVT_CAPT_0_ENABLE	BOOL	R/W	EVENT task call during capture in register 0	`%QWr.m.c.1.6`
EVT_CAPT_1_ENABLE	BOOL	R/W	EVENT task call during capture in register 1	`%QWr.m.c.1.7`

Details of the Explicit Exchange Objects for the T_CPT_BMX-type IODDT

At a Glance

This section presents the explicit exchange objects for the T_Unsigned_CPT_BMX and T_Signed_CPT_BMX- types IODDTs which are applicable to all BMX EHC •••• counting modules. They includes word type objects whose bits have a specific meaning. These objects are described in detail below.

Sample variable declaration: T_Unsigned_CPT_BMX and T_Signed_CPT_BMX-types IODDT_VAR1.

NOTE:

- in general, the meaning of the bits is given for bit status 1.
- not all bits are used.

Exchange Status: EXCH_STS

The table below shows the meaning of channel exchange status bits from the EXCH_STS channel (%MWr.m.c.0).

Standard symbol	Type	Access	Meaning	Language object
STS_IN_PROG	BOOL	R	Status parameter read in progress	%MWr.m.c.0.0
ADJ_IN_PROG	BOOL	R	Adjust parameter exchange in progress	%Mwr.m.c.0.2
RECONF_IN_PROG	BOOL	R	Reconfiguration in progress	%MWr.m.c.0.15

Channel Report: EXCH_RPT

The following table presents the meanings of the report bits of the EXCH_RPT channel (%MWr.m.c.1).

Standard symbol	Type	Access	Meaning	Language object
STS_ERR	BOOL	R	Error while reading channel status	%MWr.m.c.1.0
ADJ_ERR	BOOL	R	Error while adjusting the channel	%Mwr.m.c.1.2
RECONF_ERR	BOOL	R	Error while reconfiguring the channel	%MWr.m.c.1.15

Channel Error: CH_FLT

The table below presents the meaning of the error bits on the CH_FLT channel (`%MWr.m.c.2`).

Standard symbol	Type	Access	Meaning	Language object
EXTERNAL_FLT_INPUTS	BOOL	R	External error at inputs	`%MWr.m.c.2.0`
EXTERNAL_FLT_OUTPUTS	BOOL	R	External error at outputs	`%MWr.m.c.2.1`
INTERNAL_FLT	BOOL	R	Internal error: channel inoperative	`%MWr.m.c.2.4`
CONF_FLT	BOOL	R	Hardware or software configuration error	`%MWr.m.c.2.5`
COM_FLT	BOOL	R	Bus Communication error	`%MWr.m.c.2.6`
APPLI_FLT	BOOL	R	Application error	`%MWr.m.c.2.7`

Channel Error: `%MWr.m.c.3`

The table below presents the meaning of the error bits on the `%MWr.m.c.3` word.

Standard symbol	Type	Access	Meaning	Language object
SENSOR_SUPPLY	BOOL	R	Low input power supply for the sensors	`%MWr.m.c.3.2`
ACTUATOR_SUPPLY_FLT	BOOL	R	Output power supply failure	`%MWr.m.c.3.3`
SHORT_CIRCUIT_OUT_0	BOOL	R	Short circuit on output 0	`%MWr.m.c.3.4`
SHORT_CIRCUIT_OUT_1	BOOL	R	Short circuit on output 1	`%MWr.m.c.3.5`

Section 13.3
The IODDT Type T_GEN_MOD Applicable to All Modules

Details of the Language Objects of the IODDT of Type T_GEN_MOD

Introduction

The Modicon X80 modules have an associated IODDT of type T_GEN_MOD.

Observations

In general, the meaning of the bits is given for bit status 1. In specific cases an explanation is given for each status of the bit.

Some bits are not used.

List of Objects

The table below presents the objects of the IODDT.

Standard Symbol	Type	Access	Meaning	Address
MOD_ERROR	BOOL	R	Module detected error bit	%Ir.m.MOD.ERR
EXCH_STS	INT	R	Module exchange control word	%MWr.m.MOD.0
STS_IN_PROGR	BOOL	R	Reading of status words of the module in progress	%MWr.m.MOD.0.0
EXCH_RPT	INT	R	Exchange report word	%MWr.m.MOD.1
STS_ERR	BOOL	R	Event when reading module status words	%MWr.m.MOD.1.0
MOD_FLT	INT	R	Internal detected errors word of the module	%MWr.m.MOD.2
MOD_FAIL	BOOL	R	module inoperable	%MWr.m.MOD.2.0
CH_FLT	BOOL	R	Inoperative channel(s)	%MWr.m.MOD.2.1
BLK	BOOL	R	Terminal block incorrectly wired	%MWr.m.MOD.2.2
CONF_FLT	BOOL	R	Hardware or software configuration anomaly	%MWr.m.MOD.2.5
NO_MOD	BOOL	R	Module missing or inoperative	%MWr.m.MOD.2.6
EXT_MOD_FLT	BOOL	R	Internal detected errors word of the module (Fipio extension only)	%MWr.m.MOD.2.7
MOD_FAIL_EXT	BOOL	R	Internal detected error, module unserviceable (Fipio extension only)	%MWr.m.MOD.2.8
CH_FLT_EXT	BOOL	R	Inoperative channel(s) (Fipio extension only)	%MWr.m.MOD.2.9
BLK_EXT	BOOL	R	Terminal block incorrectly wired (Fipio extension only)	%MWr.m.MOD.2.10

Standard Symbol	Type	Access	Meaning	Address
CONF_FLT_EXT	BOOL	R	Hardware or software configuration anomaly (Fipio extension only)	%MWr.m.MOD.2.13
NO_MOD_EXT	BOOL	R	Module missing or inoperative (Fipio extension only)	%MWr.m.MOD.2.14

Section 13.4
Device DDTs Associated with the Counting Function of the BMX EHC xxxx Modules.

Subject of this Section

This section presents the Device DDTs associated with the counting function of BMX EHC •••• modules.

What Is in This Section?

This section contains the following topics:

Counter Device DDT

Introduction

This topic describes the device DDT for the Modicon X80 counter module, the instance default naming is described in Device DDT Instance Naming Rule *(see EcoStruxure™ Control Expert, Program Languages and Structure, Reference Manual)*.

Regarding the device DDT, its name contains the following information:

- platform with:
  - M for Modicon X80 module
- device type (CPT for counter)
- function (STD for standard)
- direction:
  - IN
  - OUT
- max channel (2 or 8)

Example: For a Modicon X80 counter module with 2 standard inputs: T_M_CPT_STD_IN_2

Adjustment Parameter limitation

Adjustment parameters cannot be changed from the PLC application during operation (no support of READ_PARAM, WRITE_PARAM, SAVE_PARAM, RESTORE_PARAM) for:

- counter modules in a Quantum EIO
- counter modules in a M580 RIO

Modifying the adjustment parameters of a channel from Control Expert during a CCOTF operation causes the channel to be re-initialized.

The concerned parameters are:

- PRESET_VALUE
  Preset value
- CALIBRATION_FACTOR
  Calibration Factor
- MODULO_VALUE
  Modulo value
- SLACK_VAL (Hysteresis)
  Offset value

List of Implicit Device DDT

The following table shows the list of device DDT and their **X80** modules:

Device DDT	Modicon X80 modules
T_M_CPT_STD_IN_2	BMX EHC 0200
T_M_CPT_STD_IN_8	BMX EHC 0800

Implicit Device DDT Description

The following table shows the `T_M_CPT_STD_IN_x` status word bits:

Standard Symbol	Type	Meaning	Access
MOD_HEALTH	BOOL	0 = the module has a detected error	read
		1 = the module is operating correctly	
MOD_FLT	BYTE	internal detected errors byte *(see page 171)* of the module	read
CPT_CH_IN	ARRAY [0..x-1] of `T_M_CPT_STD_CH_IN`	Array of structure	

The following table shows the `T_M_CPT_STD_CH_IN_x`[0..x-1] status word bits:

Standard Symbol	Type	Bit	Meaning	Access
FCT_TYPE	WORD	–	1 = Frequency	read
			2 = EvtCounting	
			3 = PeriodMeasuring	
			4 = Ratio1	
			5 = Ratio2	
			6 = OneShotCounter	
			7 = ModuleLoopCounter	
			8 = FreeLargeCounter	
			9 = PulseWidthModulation	
			10 = UpDownCounting	
			11 = DualPhaseCounting	
CH_HEALTH	BOOL	–	0 = the channel has a detected error	read
			1 = the channel is operating correctly	
ST_OUTPUT_0_ECHO	EBOOL	–	logical state of output 0	read
ST_OUTPUT_1_ECHO	EBOOL	–	logical state of output 1	read
ST_OUTPUT_BLOCK_0	EBOOL	–	status of physical counting output block 0	read
ST_OUTPUT_BLOCK_1	EBOOL	–	status of physical counting output block 1	read
ST_INPUT_A	EBOOL	–	status of physical counting input A	read
ST_INPUT_B	EBOOL	–	status of physical counting input B	read
ST_INPUT_SYNC	EBOOL	–	physical state of the IN_SYNC input (or IN_AUX)	read
ST_INPUT_EN	EBOOL	–	physical state of IN_EN input (enable)	read

(1) Signed application specific function (ASF) must be used
(2) Unsigned application specific function (ASF) must be used

Standard Symbol		Type	Bit	Meaning	Access
ST_INPUT_REF		EBOOL	–	physical state of the IN_REF input (preset)	read
ST_INPUT_CAPT		EBOOL	–	physical state of IN_CAP input (capture)	read
COUNTER_STATUS [INT]	RUN	BOOL	0	the counter operates in counting mode only	read
	MODULO_FLAG	BOOL	1	flag set to 1 by a modulo switch event	read
	SYNC_REF_FLAG	BOOL	2	flag set to 1 by a preset or synchronization event	read
	VALIDITY	BOOL	3	the current numerical value is valid	read
	HIGH_LIMIT	BOOL	4	the current numerical value is locked at the upper threshold value	read
	LOW_LIMIT	BOOL	5	the current numerical value is locked at the lower threshold value	read
COMPARE_STATUS [INT]	COUNTER_LOW	BOOL	0	current counter value less than lower threshold (LOWER_TH_VALUE)	read
	COUNTER_WIN	BOOL	1	current counter value is between lower threshold (LOWER_TH_VALUE) and upper threshold (UPPER_TH_VALUE)	read
	COUNTER_HIGH	BOOL	2	current counter value greater than upper threshold (UPPER_TH_VALUE)	read
	CAPT_0_LOW	BOOL	3	Value captured in register 0 is less than lower threshold (LOWER_TH_VALUE)	read
	CAPT_0_WIN	BOOL	4	Value captured in register 0 is between lower threshold (LOWER_TH_VALUE) and upper threshold (UPPER_TH_VALUE)	read
	CAPT_0_HIGH	BOOL	5	Value captured in register 0 is greater than upper threshold (UPPER_TH_VALUE)	read
	CAPT_1_LOW	BOOL	6	Value captured in register 1 is less than lower threshold (LOWER_TH_VALUE)	read
	CAPT_1_WIN	BOOL	7	Value captured in register 1 is between lower threshold (LOWER_TH_VALUE) and upper threshold (UPPER_TH_VALUE)	read
	CAPT_1_HIGH	BOOL	8	Value captured in register 1 is greater than upper threshold (UPPER_TH_VALUE)	read

(1) Signed application specific function (ASF) must be used

(2) Unsigned application specific function (ASF) must be used

Standard Symbol	Type	Bit	Meaning	Access
COUNTER_CURRENT_VALUE_S(1)	DINT	–	Current counter value during event	read
CAPT_0_VALUE_S(1)	DINT	–	Value captured in register 0	read
CAPT_1_VALUE_S(1)	DINT	–	Value captured in register 1	read
COUNTER_CURRENT_VALUE_US(2)	UDINT	–	Current counter value during event	read
CAPT_0_VALUE_US(2)	UDINT	–	Value captured in register 0	read
CAPT_1_VALUE_US(2)	UDINT	–	Value captured in register 1	read
OUTPUT_0	EBOOL	–	forces OUTPUT_0 to level 1	read / write
OUTPUT_1	EBOOL	–	forces OUTPUT_1 to level 1	read / write
OUTPUT_BLOCK_0_ENABLE	EBOOL	–	implementation of output 0 function block	read / write
OUTPUT_BLOCK_1_ENABLE	EBOOL	–	implementation of output 1 function block	read / write
FORCE_SYNC	EBOOL	–	counting function synchronization and start	read / write
FORCE_REF	EBOOL	–	set to preset counter value	read / write
FORCE_ENABLE	EBOOL	–	implementation of counter	read / write
FORCE_RESET	EBOOL	–	reset counter	read / write
SYNC_RESET	EBOOL	–	reset SYNC_REF_FLAG	read / write
MODULO_RESET	EBOOL	–	reset MODULO_FLAG	read / write

(1) Signed application specific function (ASF) must be used
(2) Unsigned application specific function (ASF) must be used

Standard Symbol		Type	Bit	Meaning	Access
FUNCTIONS_ ENABLING [INT]	VALID_SYNC	BOOL	0	synchronization and start authorization for the counting function via the IN_SYNC input	read / write
	VALID_REF	BOOL	1	operation authorization for the internal preset function	read / write
	VALID_ENABLE	BOOL	2	authorization of the counter enable via the IN_EN input	read / write
	VALID_CAPT_0	BOOL	3	capture authorization in the capture 0 register	read / write
	VALID_CAPT_1	BOOL	4	capture authorization in the capture 1 register	read / write
	COMPARE_ENABLE	BOOL	5	comparators operation authorization	read / write
	COMPARE_SUSPEND	BOOL	6	comparator frozen at its last value	read / write
LOWER_TH_VALUE_S[1]		DINT	–	lower threshold value	read / write
UPPER_TH_VALUE_S[1]		DINT	–	upper threshold value	read / write
PWM_FREQUENCY_S[1]		DINT	–	output frequency value (unit = 0.1 Hz)	read / write
LOWER_TH_VALUE_US[2]		UDINT	–	lower threshold value	read / write
UPPER_TH_VALUE_US[2]		UDINT	–	upper threshold value	read / write
PWM_FREQUENCY_US[2]		UDINT	–	output frequency value (unit = 0.1 Hz)	read / write
PWM_DUTY		INT	–	duty cycle value of the output frequency (unit = 5%)	read / write
(1) Signed application specific function (ASF) must be used (2) Unsigned application specific function (ASF) must be used					

Here below is all the signed ASF that must be used with a counter BMX EHC 0200:

- Free Large counter Mode
- Ratio 1
- Ratio 2

Here below is all the unsigned ASF that must be used with a counter BMX EHC 0200:

- Event Counting Mode
- Frequency Mode
- Modulo Loop Counter Mode
- One Shot Counter Mode
- Period Measuring Mode
- Pulse Width Modulation Mode

Here below is all the signed ASF that must be used with a counter BMX EHC 0800:

- Up Down Counting Mode

Here below is all the unsigned ASF that must be used with a counter BMX EHC 0800:

- Event Counting Mode
- Frequency Mode
- Modulo Loop Counter Mode
- One Shot Counter Mode

Use and Description of DDT for Explicit Exchange

The following table shows the Derived Data Type (DDT) used for the variables connected to dedicated EFB parameter to perform an explicit exchange:

DDT	Description	
T_M_CPT_STD_CH_STS	Structure to read the channel status of a counting module.	Depending on the module location, the DDT can be connected to the `STS` output parameter of the EFB: ● READ_STS_QX when the module is located in Quantum EIO. ● READ_STS_MX when the module is located in a M580 local rack or in M580 RIO drops.
T_M_SIGN_CPT_STD_CH_PRM	Structure for adjustment parameters of a channel of a counting module (signed application specific function) in a M580 local rack.	The DDT can be connected to the `PARAM` output parameter of the EFB: ● READ_PARAM_MX to read module parameters. ● WRITE_PARAM_MX to write module parameters. ● SAVE_PARAM_MX to save module parameters. ● RESTORE_PARAM_MX to restore the new parameters of the module.
T_M_UNSIGN_CPT_STD_CH_PRM	Structure for adjustment parameters of a channel of a counting module (unsigned application specific function) in a M580 local rack.	

NOTE: Targeted channel address (`ADDR`) can be managed with ADDMX *(see EcoStruxure ™ Control Expert, Communication, Block Library)* EF (connect the output parameter `OUT` to the input parameter `ADDR` of the communication functions).

The following table shows the structure of the T_M_CPT_STD_CH_STS DDT:

Standard Symbol		Type	Bit	Meaning	Access
CH_FLT [INT]	EXTERNAL_FLT_INPUTS	BOOL	0	external detected error at inputs	read
	EXTERNAL_FLT_OUTPUTS	BOOL	1	external detected error at outputs	read
	INTERNAL_FLT	BOOL	4	internal detected error: channel inoperative	read
	CONF_FLT	BOOL	5	hardware or software configuration detected error	read
	COM_FLT	BOOL	6	bus communication detected error	read
	APPLI_FLT	BOOL	7	application detected error	read
	COM_EVT_FLT	BOOL	8	communication event detected fault	read
	OVR_EVT_CPU	BOOL	9	CPU overflow event	read
	OVR_CPT_CH	BOOL	10	counter channel overflow	read
CH_FLT_2 [INT]	SENSOR_SUPPLY	BOOL	2	low input power supply for the sensors	read
	ACTUATOR_SUPPLY_FLT	BOOL	3	output power supply loss	read
	SHORT_CIRCUIT_OUT_0	BOOL	4	short circuit on output 0	read
	SHORT_CIRCUIT_OUT_1	BOOL	5	short circuit on output 1	read

The following table shows the structure of the T_M_SIGN_CPT_STD_CH_PRM DDT:

Standard Symbol	Type	Bit	Meaning	Access
MODULO_VALUE	DINT	–	Modulo value	read/write
PRESET_VALUE	DINT	–	Preset value	read/write
CALIBRATION_FACTOR	INT	–	Adjust the value from – 10 % to + 10 %, unit = 0.1 %	read/write
SLACK_VAL	INT	–	Hysteresis	read/write

The following table shows the structure of the T_M_UNSIGN_CPT_STD_CH_PRM DDT:

Standard Symbol	Type	Bit	Meaning	Access
MODULO_VALUE	UINT	–	Modulo value	read/write
PRESET_VALUE	UINT	–	Preset value	read/write
CALIBRATION_FACTOR	INT	–	Adjust the value from – 10 % to + 10 %, unit = 0.1 %	read/write
SLACK_VAL	INT	–	Hysteresis	read/write

MOD_FLT Byte Description

MOD_FLT Byte in Device DDT

MOD_FLT byte structure:

Bit	Symbol	Description
0	MOD_FAIL	● 1: Internal detected error or module failure detected. ● 0: No detected error
1	CH_FLT	● 1: Inoperative channels. ● 0: Channels are operative.
2	BLK	● 1: Terminal block detected error. ● 0: No detected error. **NOTE:** This bit may not be managed.
3	–	● 1: Module in self-test. ● 0: Module not in self-test. **NOTE:** This bit may not be managed.
4	–	Not used.
5	CONF_FLT	● 1: Hardware or software configuration detected error. ● 0: No detected error.
6	NO_MOD	● 1: Module is missing or inoperative. ● 0: Module is operating. **NOTE:** This bit is managed only by modules located in a remote rack with a BME CRA 312 10 adapter module. Modules located in the local rack do not manage this bit that remains at 0.
7	–	Not used.

This page left blank intentionally

This page left blank intentionally

Index