Modicon M340
Processors
Setup Manual

(Original Document)

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www.schneider-electric.com

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

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

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

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

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 installation of the Modicon M340 PLCs and installation of their main accessories.

This document is also valid for the Modicon M340H PLCs and their accessories.

Validity Note

This documentation is valid for EcoStruxure™ Control Expert 14.0 or later.

You need Modicon M340 firmware 2.4 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 data sheet.
6	To save or print a data sheet 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)
Modicon X80 Racks and Power Supplies, Hardware, Reference Manual	EIO0000002626 (English), EIO0000002627 (French), EIO0000002628 (German), EIO0000002630 (Italian), EIO0000002629 (Spanish), EIO0000002631 (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)

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
Modicon M340 PLCs

Subject of this Part

This part provides a general overview of the Modicon M340 PLC configurations and the various sub-assemblies, as well as the networks and field buses used.

What Is in This Part?

This part contains the following chapters:

Chapter 1
Introduction to Modicon M340 PLC Stations

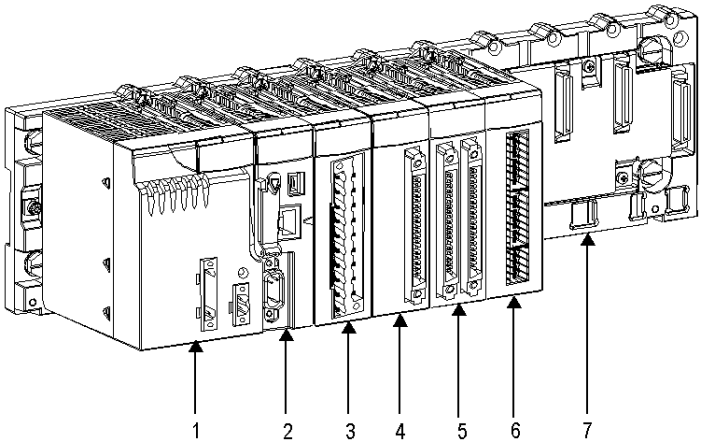
Modicon M340 PLC Station

General

Modicon M340 automated platform processors manage the entire PLC station, which is made up of discrete I/O modules, analog I/O modules, counting modules, discrete I/O modules, analog I/O modules, other expert modules, and communication modules. These are distributed across one or more racks connected on the local bus. Each rack must include a power supply module; the main rack supports the CPU.

Illustration

The following diagram shows a configuration example for the Modicon M340 PLC with one rack:



Number Table

The following table describes the numbered components of the PLC station above.

Number	Description
1	Power supply module
2	Processor
3	20-pin terminal block I/O module
4	40-pin single connector I/O module
5	40-pin 2-connector I/O module
6	Counting module
7	8-slot rack

Chapter 2
General Introduction to PLC Station Components

Subject of this Section

This section provides a general overview of the various components of which a PLC station may consist.

What Is in This Chapter?

This chapter contains the following topics:

General Introduction to Processors

General

Each PLC station is equipped with a processor, chosen according to the following characteristics:

- processing power (number of inputs/outputs managed)
- memory capacity
- communication ports

For further information, please refer to *Introduction to BMX P34 xxxx Processors, page 37*).

General Introduction to Racks

General

There are various sizes of racks. The following list presents the quantity of slots available for the CPU and modules for each rack reference:

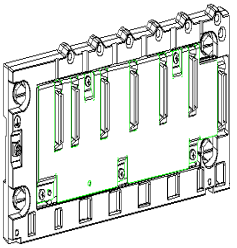
- 4 slots: BMXXBP0400(H) or BMEXBP0400(H)
- 6 slots: BMXXBP0600(H)
- 8 slots: BMXXBP0800(H) or BMEXBP0800(H)
- 12 slots: BMXXBP1200(H) or BMEXBP1200(H)
- racks with redundant power supplies:
  - 6 slots: BMEXBP0602(H)
  - 10 slots: BMEXBP1002(H)

Each rack includes one extra slot that is reserved for the power supply module, and one slot on the right is reserved for the BMXXBE1000 rack extender module.

For further information, refer to the chapter *Modicon X80 Racks Description (see Modicon X80, Racks and Power Supplies, Hardware Reference Manual)*.

Representation of the Racks

The following diagram shows the BMXXPB0400 rack:



General Introduction to Power Supply Modules

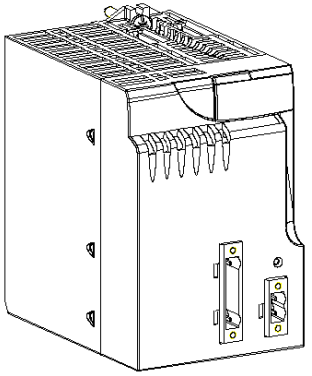
General

Each rack requires one power supply module defined according to the distributed network (alternating or direct current) and the power necessary at rack level.

For further information, refer to the chapter *Modicon X80 Power Supply Modules Description (see Modicon X80, Racks and Power Supplies, Hardware Reference Manual)*.

Illustration

The following illustration shows a BMXCPS•••• power supply module:



General Introduction to Rack Extender Module

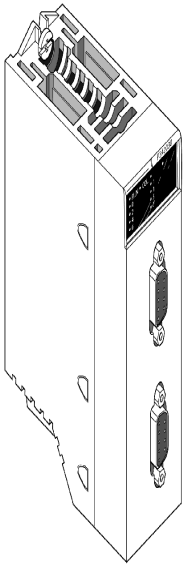
General

This module allows connecting a maximum of 4 chained racks, depending on the CPU, distributed along a maximum length of 30 meters.

For further information, refer to chapter *BMXXBE1000 Rack Extender Module (see Modicon X80, Racks and Power Supplies, Hardware Reference Manual)*.

Illustration

Illustration of the BMXXBE1000 rack extender module:



General Introduction to Input/Output Modules

General

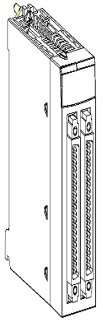
The Modicon M340 range includes discrete and analog input/output modules.

Discrete Input/Output

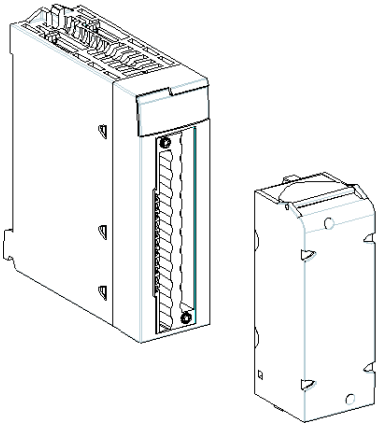
A wide range of discrete input/output modules enables you to select the module best suited to your needs. The characteristics of these modules differ as follows:

Characteristics	Description
Modularity	• 8 channels • 16 channels • 32 channels • 64 channels
Type of Inputs	• Modules with direct current inputs (24 VCC and 48 VCC) • Modules with alternating current inputs (24 VCA, 48 VCA and 120 VCA)
Type of Outputs	• Modules with relay outputs • Modules with direct current static outputs (24 VCC / 0.1 A - 0.5 A - 3 A) • Modules with alternating current static outputs (24 VCC / 240 VAC / 3 A)
Type of Connector	• 20-pin terminal blocks • 40-pin connectors allowing connection to sensors and pre-actuators by means of the TELEFAST 2 prewiring system

The following illustration shows a discrete input/output modules with 40-pin connectors:



The following illustration shows a discrete input/output module with a 20-pin terminal block:

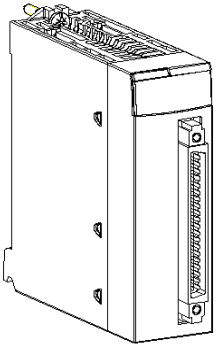


Analog Inputs/Outputs

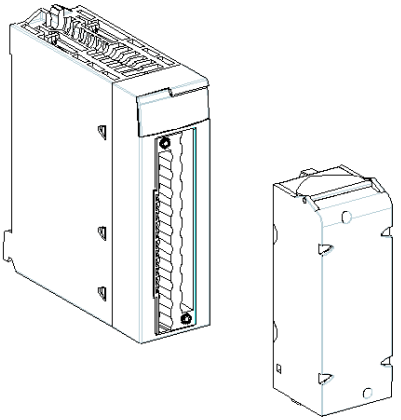
A wide range of analog input/output modules enables you to select the module best suited to your needs. The characteristics of these modules differ as follows:

Characteristics	Description
Modularity	• 2 channels • 4 channels
Performance and Range of Signals Offered	• Voltage/current • Thermocouple • Thermowell
Type of Connector	• 20-pin terminal blocks • 40-pin connectors allowing connection to sensors and pre-actuators by means of the TELEFAST 2 prewiring system

The following illustration shows an analog input/output module with one 40-pin connector:



The following illustration shows an analog input/output module with 20-pin terminal block:



General Introduction to Counting Modules

General

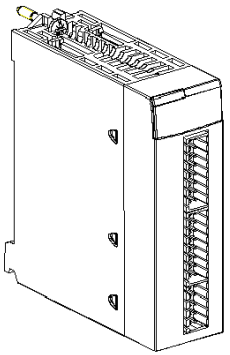
The PLCs in the Modicon M340 range offer counting functions (downcounting, counting, counting/downcounting) by utilizing the application-specific counting modules.

Two counting modules are offered:

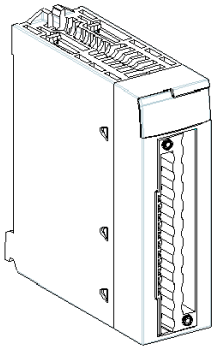
- BMX EHC 0200 module with two counting channels and a maximum acquisition frequency of 60 kHz
- BMX EHC 0800 module with eight counting channels and a maximum acquisition frequency of 10 kHz

Illustration

The following illustration shows a BMX EHC 0200 counting module:



The following illustration shows a BMX EHC 0800 counting module:



General Introduction to Communication

General

PLCs from the Modicon M340 range can be used in different communication modes:

- USB
- Serial
- Ethernet
- CANopen
- AS-Interface

Grounding of Installed Modules

General

The grounding of Modicon M340 modules is crucial to avoid electric shock.

Grounding Processors and Power Supplies

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Ensure ground connection contacts are present and not bent out of shape. If they are, do not use the module and contact your Schneider Electric representative.

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

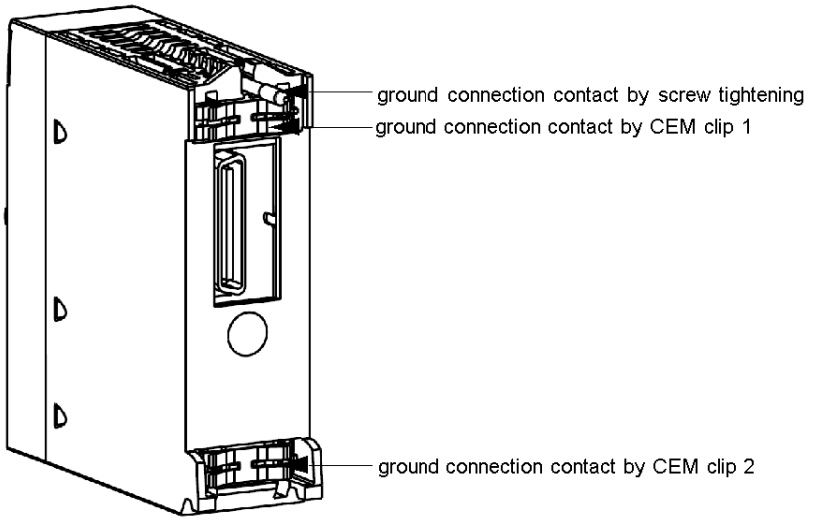
⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Tighten the clamping screws of the modules. A break in the circuit could lead to an unexpected behavior of the system.

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

All Modicon M340 modules are equipped with ground connection contacts at the rear for grounding purposes:



These contacts connect the grounding bus of the modules to the grounding bus of the rack.

Modicon M340H (Hardened) Processors, Modules and Equipment

At a Glance

Hardened equipment can operate in extended temperature ranges and harsher environments compared to standard M340 equipment.

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

"H" Equipment

The follow equipment are available in Hardened versions:

- CPUs:
  - BMX P34 2020H
  - BMX P34 2030 2H
- Power Supplies:
  - BMX CPS 3020H
  - BMX CPS 3500H
  - BMX CPS 4002H
- Backplanes:
  - BMX XBP 0400H
  - BMX XBP 0600H
  - BMX XBP 0800H
  - BMX XBP 1200H
  - BME XBP 0400H
  - BME XBP 0800H
  - BME XBP 1200H
  - BME XBP 0602H
  - BME XBP 1002H
- Backplane Extension:
  - BMX XBE 1000H
- Counting Modules:
  - BMX ECH 0200H
  - BMX ECH 0800H
- Analog Input Modules:
  - BMX ART 0414H
  - BMX ART 0814H
  - BMX AMI 0810H
- Analog Output Modules:
  - BMX AMO 0210H
  - BMX AMO 0410H

- Analog Input/Output Module:
  - BMX AMM 0600H
- TELEFAST Wiring Accessories
  - ABE7 CPA 0410H
  - ABE7 CPA 0412H
- Digital Input modules:
  - BMX DDI 1602H
  - BMX DDI 1603H
- Digital Input/Output modules:
  - BMX DAI 1602H
  - BMX DAI 1603H
  - BMX DAI 1604H
  - BMX DAI 1614H
  - BMX DAI 1615H
  - BMX DDM 16022H
  - BMX DDM 16025H
- Digital Output modules:
  - BMX DAO 1605H
  - BMX DAO 1615H
  - BMX DDO 1602H
  - BMX DDO 1612H
  - BMX DRA 0805H
  - BMX DRA 0815H
  - BMX DRA 1605H
  - BMX DRC 0805H
- Synchronous Serial Interface (SSI) Modules:
  - BMX EAE 0300H

Chapter 3
General Introduction to PLC Networks

Subject of this Section

This section provides a general overview of PLC networks.

What Is in This Chapter?

This chapter contains the following topics:

General Introduction to the Modbus Protocol

General

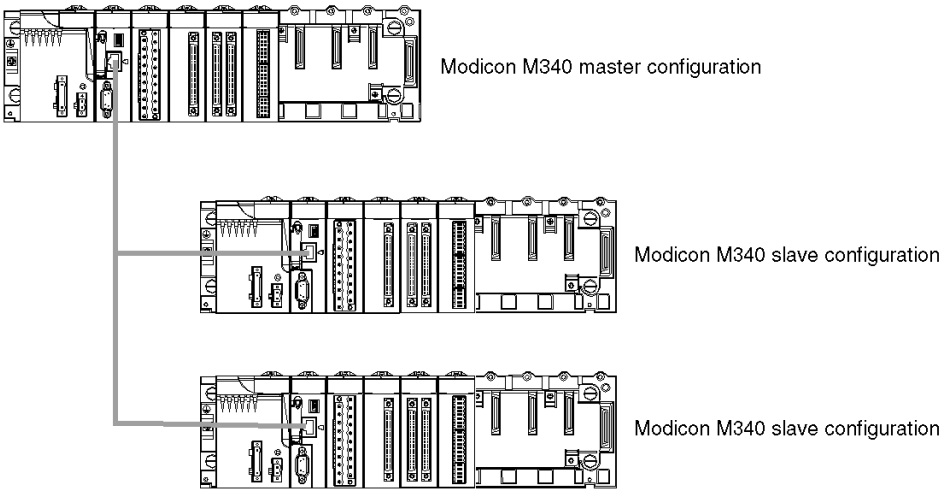
The Modbus protocol creates a hierarchical structure (one master and several slaves).

The master manages all exchanges according to two types of dialog:

- the master exchanges with a slave and awaits the response
- the master exchanges with all slaves without awaiting a response (broadcast queries).

Illustration

The following illustration shows a Modbus network:



General Introduction to an Ethernet Network

General

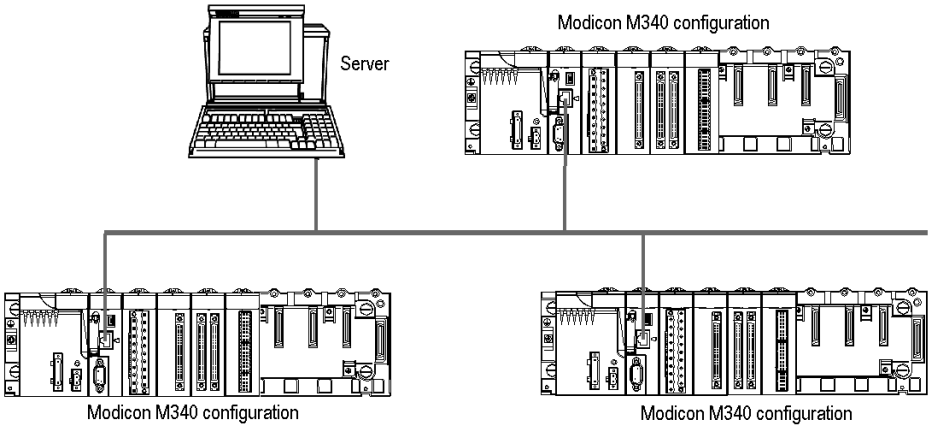
Ethernet communication essentially targets applications of:

- coordination between PLCs
- local or centralized monitoring
- communication with the production management information system
- communication with remote inputs/outputs

Acting as an agent, Ethernet communication also supports management of the network monitoring standard SNMP.

Illustration

The following illustration shows an Ethernet network:



General Introduction to the CANopen Field Bus

General

The CANopen structure consists of:

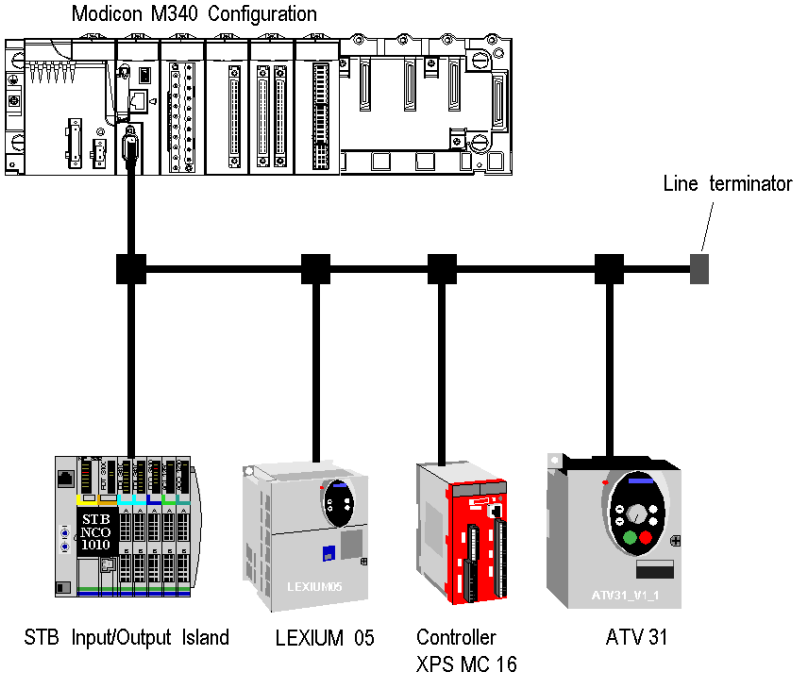
- a bus master
- slave devices, also called nodes

Bus operation is point to point. At any time, each device can send a request on the bus and the affected devices answer.

Bus request priority is calculated by an identifier in each message.

Illustration

The following example illustrates a CANopen field bus architecture:



Chapter 4
Operating Standards and Conditions

Standards and Certifications

Online Help

From the Control Expert online help, you can access the standards and certifications that apply to the modules in this product line by referring to the *Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications* guide.

Download

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

Language	
English	*Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications*
French	*Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications*
German	*Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications*
Italian	*Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications*
Spanish	*Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications*
Chinese	*Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications*

Part II
BMX P34 xxxx Processors

Subject of this Part

This part describes the BMX P34 •••• processors and their installation.

What Is in This Part?

This part contains the following chapters:

Chapter 5
Introduction to BMX P34 xxxx Processors

Subject of this Section

This section describes the BMX P34 •••• processors.

What Is in This Chapter?

This chapter contains the following topics:

General Introduction

Introduction

A wide range of BMX P34 ••••• processors, with increasing performance and capability, are available to respond to various needs.

General

BMX P34 ••••• processors can be installed onto Modicon X80 racks.

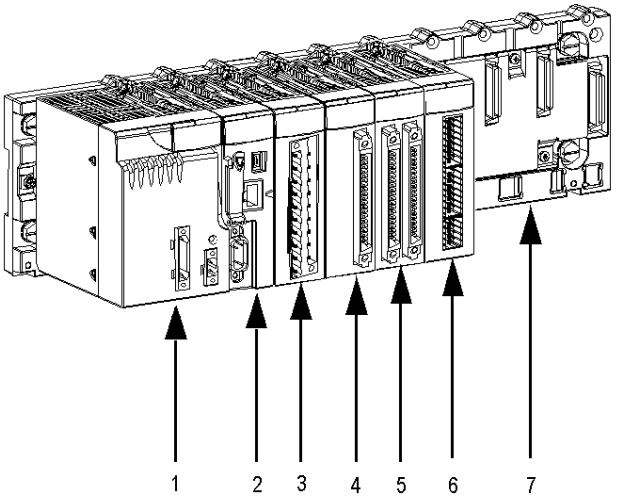
Functions

BMX P34 ••••• processors manage the entire PLC station, which includes the following elements:

- discrete input/output modules
- analog input/output modules
- other expert modules
- communication modules.

Illustration

The figure below shows a processor-managed architecture:

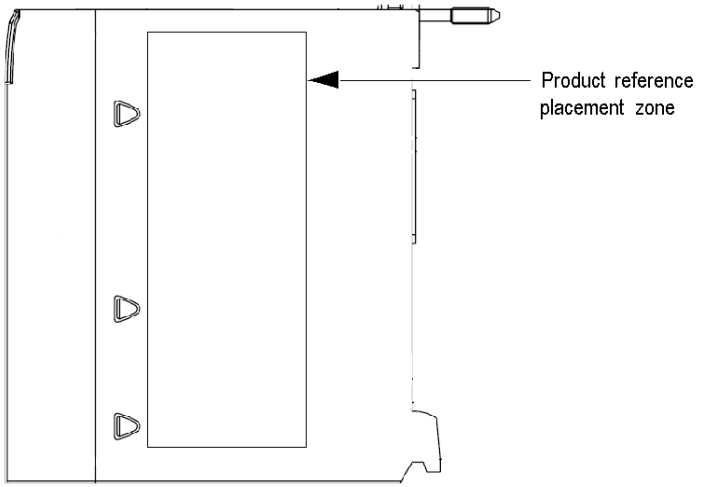


The following table gives the numbered components of the configuration above.

Number	Designation
1	Power supply module
2	Processor
3	20-pin terminal block module
4	40-pin single connector module
5	40-pin twin connector module
6	Counting module
7	Rack

Processor product references

The following diagram shows the location of the product references on the side of the processor:



Main Characteristics of the BMX P34 ••••• Processors

The following table shows the main characteristics of the BMX P34 ••••• processors.

Processor	Global maximum number of discrete inputs/outputs	Global maximum number of analog inputs/outputs	Maximum memory size	Modbus Connection	Integrated CANopen Master Connection	Integrated Ethernet Connection
BMX P34 1000	512	128	2048 Kb	X	-	-
BMX P34 2000	1024	256	4096 Kb	X	-	-
BMX P34 2010/20102	1024	256	4096 Kb	X	X	-
BMX P34 2020	1024	256	4096 Kb	X	-	X
BMX P34 2030/20302	1024	256	4096 Kb	-	X	X
Key						
X Available						
- Not available						

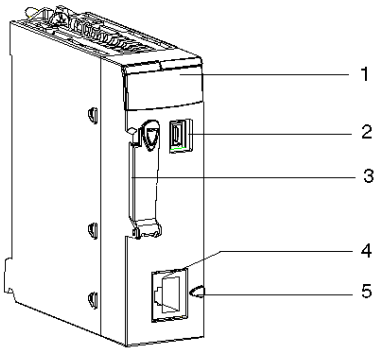
Physical Description of BMX P34 xxxx Processors

General

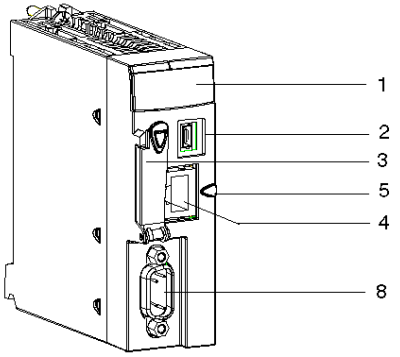
The BMX P34 •••• processors differ according to the various components they include.

Illustration

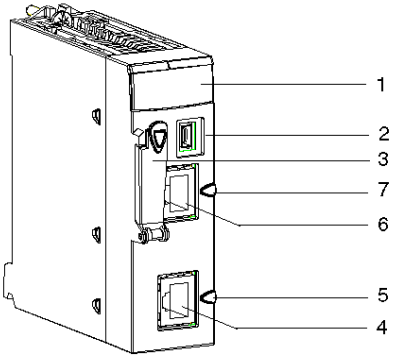
The following diagrams identify the various components of a BMX P34 •••• processor:



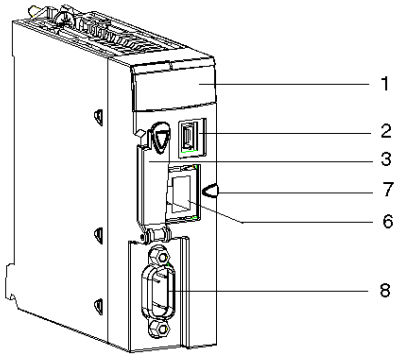
BMX P34 1000/2000 Processors



BMX P34 2010 Processor



BMX P34 2020 Processor



BMX P34 2030 Processor

Description

The following table shows the components of a BMX P34 •••• processor.

Number	Function
1	Display panel
2	USB port
3	Memory card protection port
4	Serial port
5	Serial port identification ring (black)
6	Ethernet port
7	Ethernet port identification ring (green)
8	CANopen port

USB Link

General

All processors have a USB link.

Description

Two connection cables are available to connect a human-machine interface to the processor USB port:

- BMX XCA USB 018, 1.8 m (5.91 ft) in length
- BMX XCA USB 045, 4.5 m (14.76 ft) in length

Both of these cables are fitted with a connector at each end:

- Type A USB: connects to the console
- Type mini B USB: connects to the processor

In fixed assembly with an XBT type console connected to the processor via the USB port, you are advised to connect the USB cable to the shielding connection kit *(see Modicon X80, Racks and Power Supplies, Hardware Reference Manual)*.

NOTE: When using the M340, it is strongly recommended to use a USB 2.0 shielded cable following the USB international standard. The cables BMX XCA USB 018 and BMX XCA USB 045 are designed for this type of use and avoid unexpected behavior of the PLC. Those cables are shielded and tested against electrical noises.

Modbus Link

General

The following processors have a built-in communication channel dedicated to serial communication, and support communication via a Modbus link:

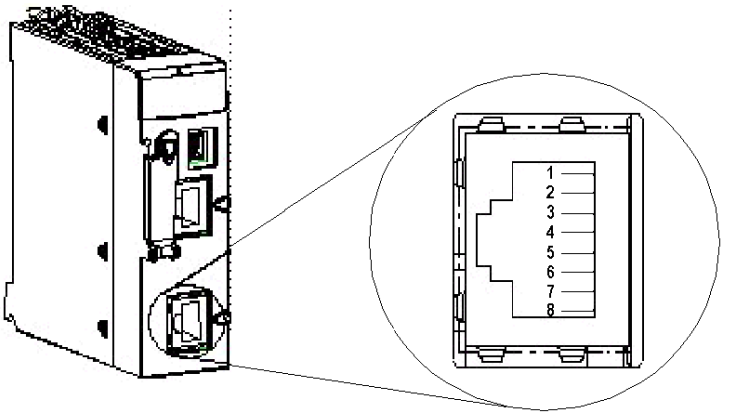
- BMX P34 1000,
- BMX P34 2000,
- BMX P34 2010/20102,
- BMX P34 2020.

Introduction to the Serial Port

The following table describes the characteristics of the serial communication channels:.

Characteristic	Description
Channel number	Channel 0
Protocols supported	• Modbus protocol (ASCII and RTU) • Character Mode protocol
Connection	RJ45 female connector
Physical link	• RS 485 non-insulated serial link • RS 232 non-insulated serial link

The following illustration shows the RJ45 serial port:



The following table shows the pin assignment of the serial port for the BMX P34 xxxxx processors:

1	RXD
2	TXD
3	RTS
4	D1
5	D0
6	CTS
7	Power supply
8	Common
Shielding	

The RJ45 connector has eight pins. The pins used differ according to the physical link used.

The pins used by the RS 232 serial link are as follows:
- Pin 1: RXD signal
- Pin 2: TXD signal
- Pin 3: RTS signal
- Pin 6: CTS signal

The pins used by the RS 485 serial link are as follows:
- Pin 4: D1 signal
- Pin 5: D0 signal

Pins 7 and 8 are dedicated to the power supply of the man-machine interface via the serial link:
- Pin 7: 5 VDC/190 mA network power supply
- Pin 8: common of the network power supply (0 V)

NOTE: The RS 232 4-wire, RS 485 2-wire, and RS 485 2-wire and power supply cables all use the same RJ45 male connector.

CANopen Link

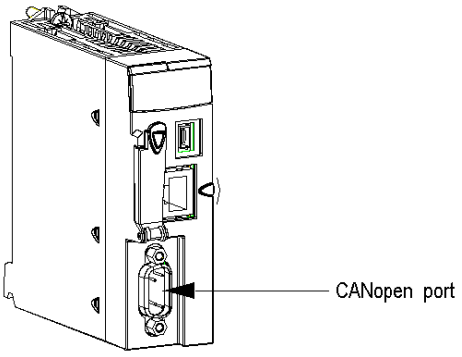
Introduction

The following processors have a built-in communication channel dedicated to CANopen communication,and support communication via CANopen link:

- BMX P34 2010/20102,
- BMX P34 2030/20302.

Introduction to the CANopen Port

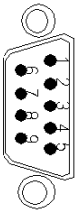
The following illustration shows the position of the BMX P34 2030 processor's CANopen port:



CANopen Connectors

The CANopen port of the processor module is fitted with a SUB-D9 connection.

The following illustration shows the processor CANopen port and the pins labels:



The following table shows the pin assignment of the CANopen link.

Pin	Signal	Description
1	-	Reserved
2	CAN_L	CAN_L bus line (low dominant)
3	CAN_GND	CAN ground
4	-	Reserved
5	Reserved	Optional CAN protection
6	(GND)	Optional ground
7	CAN_H	CAN_H bus line (high dominant)
8	-	Reserved
9	Reserved	Positive external CAN power supply (dedicated to the power supply of optocouplers and transmitters/receivers) Optional

NOTE: CAN_SHLD and CAN_V+ are not installed on the Modicon M340 range processors. These are reserved connections.

Ethernet Link

General

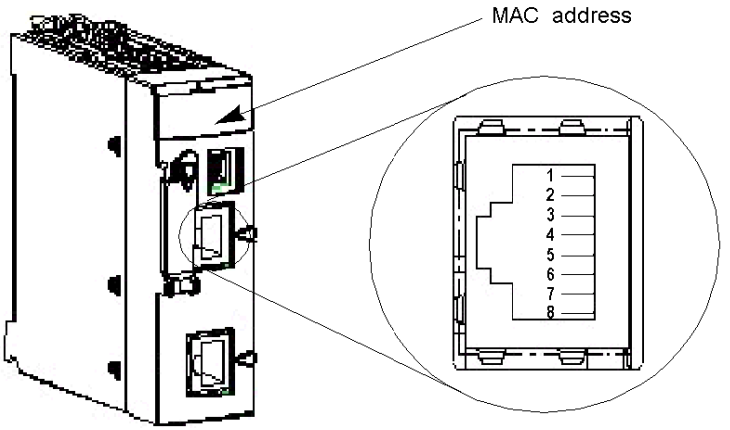
The following processors have a built-in communication channel dedicated to Ethernet communication, with 2 rotary switches which enable easy selection of the IP address processor.

- BMX P34 2020,
- BMX P34 2030/20302.

NOTE: These processors have only one IP address.

Introduction to the Ethernet Port

The following illustration shows the processor of the RJ45 Ethernet port:



The following illustration shows the pin assignment of the Ethernet port:

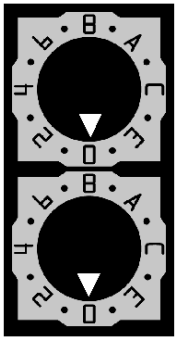
1	TD+
2	TD-
3	RD+
4	Not connected
5	Not connected
6	RD-
7	Not connected
8	Not connected

Introduction to the MAC address

The MAC address is located on the front panel of the processor below the processor display panel.

Introduction to the Rotary Switches

This processor operates as a single node on an Ethernet and possibly other networks. The module must have a unique IP address. The 2 rotary switches on the back of the module provide a simple way to select an IP address:



NOTE: Set the arrow firmly into the desired position. If you do not feel the switch click into place, the value of the switch may be incorrect or undetermined.

Each rotary switch position that you can use to set a valid IP address is marked on the module.

The following information summarizes the valid address settings:

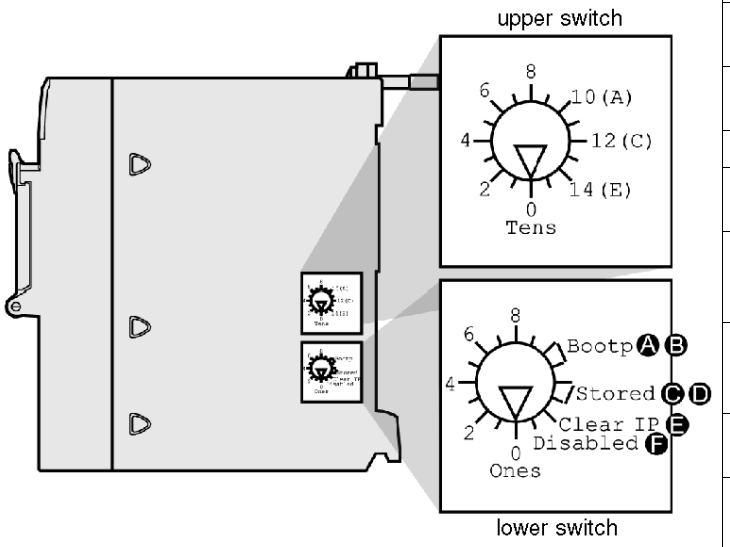
- device name: for a switch-set device name, select a numeric value from 00 to 159. You can use both switches:
  - On the upper switch (TENS digit), the available settings are 0 to 15
  - On the lower switch (ONES digit), the available settings are 0 to 9.

  For example, a BMX P34 2020 processor with the switch setting in the above figure is assigned the DHCP device name BMX_2020_123.
  The selection on the lower switch of any non-numeric parameter (BOOTP, STORED, CLEAR IP, DISABLED) makes the setting on the upper switch inconsequential.
- BOOTP: To get an IP address from a BOOTP server, select either of the two BOOTP positions on the bottom switch.
- STORED: The device uses the application's configured (stored) parameters.
- CLEAR IP: The device uses the default IP parameters.
- DISABLED: The device does not respond to communications.

The functionality of the rotary switch when used in conjunction with the IP Configuration tab *(see Modicon M340 for Ethernet, Communications Modules and Processors, User Manual)* is discussed throughout the IP Address chapter *(see Modicon M340 for Ethernet, Communications Modules and Processors, User Manual)*.

Switch Labels

To assist you in setting the rotary switches to their proper positions, a label is affixed to the right side of the module. The switch settings are described in this table:



Upper Switch
0 to 9: Tens value for the device name (0, 10, 20 . . . 90)
10(A) to 15(F): Tens value for the device name (100, 110, 120 . . . 150)
Lower Switch
0 to 9: Ones value for the device name (0, 1, 2 . . . 9)
Bootp: Set the switch to A or B to receive an IP address from a BOOTP server.
Stored: Set the switch to C or D to use the application's configured (stored) parameters.
Clear IP: Set the switch to E to use the default IP parameters.
Disabled: Set the switch to F to disable communications.

BMX P34 xxxxx Processors Catalog

Introduction

The choice of BMX P34 xxxxx processor is made, primarily, according to its characteristics and possibilities.

BMX P34 xxxxx Processors Catalog

The following table describes the important maximum characteristics of the BMX P34 xxxxx processors.

Characteristic		BMX P34 1000	BMX P34 2000	BMX P34 2010/ 20102	BMX P34 2020	BMX P34 2030/ 20302
Maximum Number of channels	Discrete rack inputs/outputs	512	1024	1024	1024	1024
	Analog inputs/outputs	128	256	256	256	256
	Expert channels (counting, PTO, MPS, NOM, etc.)	20	36	36	36	36
Maximum Number of modules	Embedded Serial port	1	1	1	1	-
	Embedded Ethernet port	-	-	-	1	1
	Embedded CANopen port	-	-	1	-	1
	Network communication (TCP/IP)	2	3	3	3	3
	AS-i fieldbus[1] communication	2	4	4	4	4
Memory size	User application	2048 Kb	4096 Kb	4096 Kb	4096 Kb	4096 Kb
Legend	**1** The AS-i field bus requires at least PLC Operating System V2.10.					

Real-Time Clock

Introduction

Each BMX P34 xxxxx processor has a real-time clock which manages:

- The current date and time
- The date and time of the last application shut-down

When power of the processor is turned off, the real-time clock continues counting during four weeks. This duration is guarantied for a temperature below 45°C (113°F). At a higher temperature this duration is reduced. No maintenance is requested for a real-time clock back up.

Current Date and Time

The processor updates the current date and time in the system words %SW49...%SW53 and %SW70. This data is in BCD (Binary Coded Decimal).

System Word	Most Significant Byte	Least Significant Byte
%SW49	00	Days of the week in the range of values 1 - 7 (1 for Monday and 7 for Sunday)
%SW50	Seconds (0 - 59)	00
%SW51	Hours (0 - 23)	Minutes (0 - 59)
%SW52	Month (1 - 12)	Days of the month (1 - 31)
%SW53	Century (0 - 99)	Year (0 - 99)
%SW70		Week (1 - 52)

Accessing the Date and Time

You can access the date and time as follows:

- through the processor debug screen.
- with the program:
  - Reading system words: %SW49 - %SW53 if the system bit %S50 is at 0,
  - immediate update: writing system words %SW50 to %SW53 if the system bit %S50 is at 1,
  - incremental update: writing the system word %SW59. With this word the date and time can be set field by field from the current value (if the system bit %S59 is at 1), or an overall increment/decrement can be done.

The following table shows the function performed by each bit in the word %SW59.

Bit Range	Function
0	Increments the day of the week
1	Increments the seconds
2	Increments the minutes
3	Increments the hours

Bit Range	Function
4	Increments the days
5	Increments the months
6	Increments the years
7	Increments the centuries
8	Decrements the day of the week
9	Decrements the seconds
10	Decrements the minutes
11	Decrements the hours
12	Decrements the days
13	Decrements the months
14	Decrements the years
15	Decrements the centuries

NOTE: The function is performed when the corresponding bit %S59 is at 1.

NOTE: The processor does not automatically manage Daylight Savings Time.

Date and Time of the Last Application Shutdown

The date and time of the last application shutdown are in BCD in the system words %SW54 - %SW58.

System Word	Most Significant Byte	Least Significant Byte
%SW54	Seconds (0 to 59)	00
%SW55	Hours (0 to 23)	Minutes (0 to 59)
%SW56	Month (1 to 12)	Days of the month (1 to 31)
%SW57	Century (0 to 99)	Year (0 to 99)
%SW58	Day of the week (1 to 7)	Reason for the last application shutdown

The reason for the last application shutdown can be accessed by reading the least significant byte of the system word %SW58 (value in BCD) which can have the following values.

Word value %SW58	Meaning
1	Application switched to STOP mode.
2	Application stopped by watchdog.
4	Power loss or memory card lock operation.
5	Stop on hardware fault.
6	Stop on software fault (HALT instruction, SFC errors, application CRC check fail, undefined system function call, etc). Details on the software fault type are stored in %SW125.

Chapter 6
General Characteristics of the BMX P34 xxxx Processors

Subject of this Section

This section describes the general characteristics of the BMX P34 •••• processors used during installation.

What Is in This Chapter?

This chapter contains the following topics:

Electrical Characteristics of the BMX P34 xxxxx Processors

General

The processors can support certain devices which do not have their own power supply. It is, therefore, necessary to take the power consumption of these devices into account when establishing the overall power consumption breakdown.

Processor Power Consumption

The following table shows the power consumption for all the BMX P34 xxxxx processors with no connected devices.

Processor	Average Consumption
BMX P34 1000	72 mA
BMX P34 2000	72 mA
BMX P34 2010/20102	90 mA
BMX P34 2020	95 mA
BMX P34 2030/20302	135 mA

NOTE: The processor power consumption values are measured at the 24 V_BAC output of the power supply module, which is the only power supply output used by the processors.

NOTE: When a device consumes power on the processor serial port connection, its power needs to be added to the power consumed by the processor. The power supplied by the serial port is 5 VCC/190 mA.

NOTICE
IMPROPER POWER SUPPLY Only use network power-supplied devices tested by Schneider Electric. **Failure to follow these instructions can result in equipment damage.**

NOTE: It is possible to use network power-supplied devices not tested by Schneider Electric. However, their operation is not guaranteed. For further information, please contact your Schneider sales office.

Processor Dissipated Power

The following table shows the average dissipated power for all the BMX P34 xxxxx processors with no connected devices.

Processor	Average Dissipated Power
BMX P34 1000	1.7 W
BMX P34 2000	1.7 W
BMX P34 2010/20102	2.2 W
BMX P34 2020	2.3 W
BMX P34 2030/20302	3.2 W

General Characteristics of the BMX P34 1000 Processor

General

The characteristics of the BMX P34 1000 processor are presented below.

BMX P34 1000 Processor Characteristics

The following table shows the general characteristics of the BMX P34 1000 processor.

Characteristic			Available
Functions	Maximum number of	Discrete rack inputs/outputs	512
		Analog rack inputs/outputs	128
		Expert channels	20
		Ethernet channels	2
		AS-I Field Bus	2
		Simultaneous communication EF	8
	Maximum number of modules	USB	1
		Embedded Serial Modbus link port	1
		Embedded CANopen master port	-
		Embedded Ethernet port	-
	Savable real-time clock		Yes
Savable Application Data Memory Capacity			128 Kb
Application Structure	MAST task		1
	FAST task		1
	Event processing		32
Application Code Execution Speed	Internal RAM	100% Boolean	5.4 Kins/ms (1)
		65% Boolean + 35% digital	4.2 Kins/ms (1)
Execution Time	One basic Boolean instruction		0.18 µs (theoretical)
	One basic digital instruction		0.25 µs (theoretical)
	One floating point instruction		1.74 µs (theoretical)

(1) Kins: 1024 instructions (list), theoretical

General Characteristics of the BMX P34 2000 Processor

General

The characteristics of the BMX P34 2000 processor are presented below.

BMX P34 2000 Processor Characteristics

The following table shows the general characteristics of the BMX P34 2000 processor.

Characteristic			Available
Functions	Maximum number of	Discrete rack inputs/outputs	1024
		Analog rack inputs/outputs	256
		Counting channels	36
		Ethernet channels	2
		AS-i Field Bus	4
		Simultaneous communication EF	16
	Maximum number of modules	USB	1
		Embedded Serial Modbus link port	1
		Embedded CANopen master port	-
		Embedded Ethernet port	-
	Savable real-time clock		Yes
Savable Application Data Memory Capacity			256 Kb
Application Structure	MAST task		1
	FAST task		1
	Event processing		64
Application Code Execution Speed	Internal RAM	100% Boolean	8.1 Kins/ms (1)
		65% Boolean + 35% digital	6.4 Kins/ms (1)
Execution Time	One basic Boolean instruction		0.12 µs
	One basic digital instruction		0.17 µs
	One floating point instruction		1.16 µs

(1) Kins: 1024 instructions (list)

General Characteristics of the BMX P34 2010/20102 Processors

BMX P34 2010/20102 Processors Characteristics

The following table shows the general characteristics of the BMX P34 2010/20102 processors.

Characteristic			Available
Functions	Maximum number of	Discrete rack inputs/outputs	1024
		Analog rack inputs/outputs	256
		Expert channels	36
		Ethernet channels	2
		AS-i field Bus	BMX P34 2010: 0
			BMX P34 20102: 4
		Simultaneous communication EF	16
	Maximum number of modules	USB	1
		Embedded Serial Modbus link port	1
		Embedded CANopen master port	1
		Embedded Ethernet port	-
	Savable real-time clock		Yes
Savable Application Data Memory Capacity			256 Kb
Application Structure	MAST task		1
	FAST task		1
	Event processing		64
Application Code Execution Speed	Internal RAM	100% Boolean	8.1 Kins/ms (1)
		65% Boolean + 35% digital	6.4 Kins/ms (1)
Execution Time	One basic Boolean instruction		0.12 µs
	One basic digital instruction		0.17 µs
	One floating point instruction		1.16 µs

(1) Kins: 1024 instructions (list)

NOTE: Expert mode function is available for BMX P34 20102 processors.

General Characteristics of the BMX P34 2020 Processor

General

The characteristics of the BMX P34 2020 processor are presented below.

BMX P34 2020 Processor Characteristics

The following table shows the general characteristics of the BMX P34 2020 processor.

Characteristic			Available
Functions	Maximum number of	Discrete rack inputs/outputs	1024
		Analog rack inputs/outputs	256
		Expert channels	36
		Ethernet channels	3
		AS-i Field Bus	4
		Simultaneous communication EF	16
	Maximum number of modules	USB	1
		Embedded Serial Modbus link port	1
		Embedded CANopen master port	-
		Embedded Ethernet port	1
	Savable real-time clock		Yes
Savable Application Data Memory Capacity			256 Kb
Application Structure	MAST task		1
	FAST task		1
	Event processing		64
Application Code Execution Speed	Internal RAM	100% Boolean	8.1 Kins/ms (1)
		65% Boolean + 35% digital	6.4 Kins/ms (1)
Execution Time	One basic Boolean instruction		0.12 µs
	One basic digital instruction		0.17 µs
	One floating point instruction		1.16 µs

(1) Kins: 1024 instructions (list)

General Characteristics of the BMX P34 2030/20302 Processor

BMX P34 2030/20302 Processor Characteristics

The following table shows the general characteristics of the BMX P34 2030/20302 processor.

Characteristic			Available
Functions	Maximum number of	Discrete rack inputs/outputs	1024
		Analog rack inputs/outputs	256
		Expert channels	36
		Ethernet channels	3
		AS-i Field Bus	BMX P34 2030: 0
			BMX P34 20302: 4
		Simultaneous communication EF	16
	Maximum number of modules	USB	1
		Embedded Serial Modbus link port	-
		Embedded CANopen master port	1
		Embedded Ethernet port	1
	Savable real-time clock		Yes
Savable Application Data Memory Capacity			256 Kb
Application Structure	MAST task		1
	FAST task		1
	Event processing		64
Application Code Execution Speed	Internal RAM	100% Boolean	8.1 Kins/ms (1)
		65% Boolean + 35% digital	6.4 Kins/ms (1)
Execution Time	One basic Boolean instruction		0.12 µs
	One basic digital instruction		0.17 µs
	One floating point instruction		1.16 µs

(1) Kins: 1024 instructions (list)

NOTE: Expert mode function is available for BMX P34 20302 processors.

Characteristics of the BMX P34 xxxxx Processor Memory

Introduction

The following pages present the main characteristics of the BMX P34 ••••• processor memory.

Size of Located Data

The following table shows maximum size of located data according to the type of processor:

Type of Objects	Address	Maximum Size for the BMX P34 1000 Processor	Default Size for the BMX P34 1000 Processor	Maximum Size for the BMX P34 20x0x Processors	Default Size for the BMX P34 20x0x Processors
Internal bits	%Mi	16250	256	32634	512
Input/Output bits	%Ir.m.c %Qr.m.c	(1)	(1)	(1)	(1)
System bits	%Si	128	128	128	128
Internal words	%MWi	32464	512	32464	1024
Constant words	%KWi	32760	128	32760	256
System words	%SWi	168	168	168	168

(1) Depends on the equipment configuration declared (input/output modules).

Size of Non-Located Data

Non-located data is as follows:

- Elementary Data Types (EDT)
- Derived Data Types (DDT)
- DFB and EFB function block data.

Size of Located and Non-Located Data

The total size of located and non-located data is limited to:

- 128 kilobytes for the BMX P34 1000 processor.
- 256 kilobytes for the BMX P34 20x0x processors

Size of Located Data in Case of State RAM

The following table shows maximum and default size of located data in case of State RAM configuration according to the type of processor.

Type of Objects	Address	BMX P34 1000 V2.40 Processor		BMX P34 2000, 20102, 2020, 20302 Processors (all V2.40)	
		Maximum Size	Default Size	Maximum Size	Default Size
output bits and internal bits	%M (0x)	32765	752	65530	1504
input bits and internal bits	%I (1x)	32765	752	65530	1504
input words and internal words	%IW (3x)	32765	256	65530	512
output words and internal words	%MW (4x)	32765	256	65530	512

NOTE: To use State RAM configuration you need Modicon M340 firmware 2.4 or later.

NOTE: When changing the processor type from a BMX P34 2xxx to a BMX P34 1000, remove the unavailble features (DFBs, EFBs...) in the sections and in the data editor too (Purge Unused FB Instances, Purge Unused Types, Purge Unused Private Data Instance if needed). Otherwise the application can't be built.

Chapter 7
Installation of BMX P34 xxxx Processors

Subject of this Section

This section deals with the installation of BMX P34 •••• processors and memory extension cards.

What Is in This Chapter?

This chapter contains the following topics:

Fitting of Processors

At a Glance

BMX P34 xxxxx processors are powered by the rack bus.

Fitting operations (installation, assembly, and disassembly) are described below.

Installation Precautions

A BMX P34 xxxxx processor is always installed on the rack in slot marked **00**.

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

⚠ DANGER

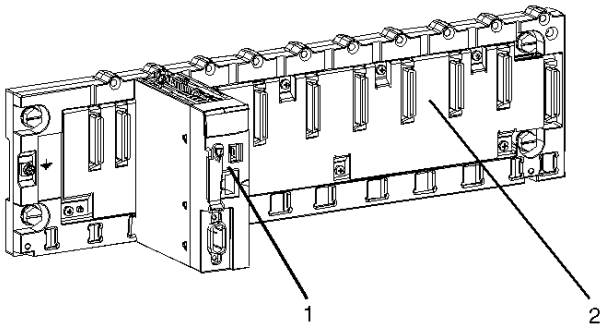
HAZARD OF ELECTRIC SHOCK

Disconnect all power sources before installing the processor.

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

Installation

The following illustration shows a BMX P34 2010 processor mounted on a BMX XBP 0800 rack:

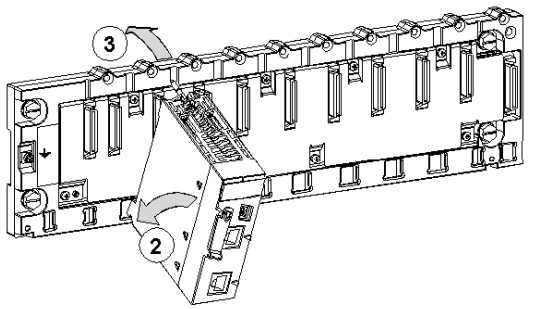
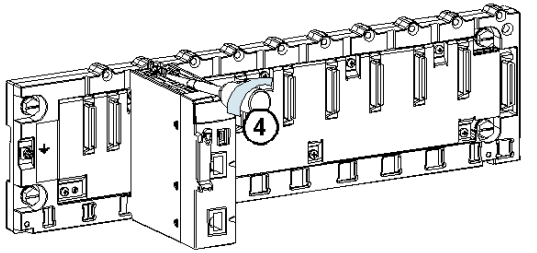


The following table describes the different elements which make up the assembly below.

Number	Description
1	Processor
2	Standard rack

Installing the Processor on the Rack

The following table presents the procedure for installing a processor on a rack.

Step	Action	Illustration
⚠ WARNING **UNEXPECTED EQUIPMENT OPERATION** Ensure that the correct memory card is installed before plugging a new processor on the rack. An incorrect card could lead to unexpected system behavior. Refer to %SW97 to check the status of the card. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**		
1	Verify that power is OFF and make sure that the memory card is correct.	The following illustration describes steps 1 and 2: 
2	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 that you have removed the protective cover.	
3	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.	
4	Tighten the safety screw to ensure that the module is held in place on the rack. Tightening torque: Max. 1.5 N.m	The following illustration describes step 3: 

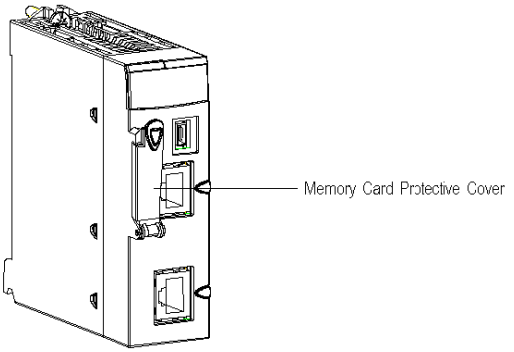
Memory Cards for BMX P34 xxxxx Processors

General

All BMX P34 •••• processors require a memory card.

Memory Card Slot

The following illustration shows the memory card slot on a BMX P34 •••• processor with a protective cover in place:



⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Ensure that the protective cover is closed when the processor is running to maintain enclosure environmental ratings.

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

Memory Card Description

Only Schneider memory cards are compatible with BMX P34 •••• processors.

Schneider memory cards use Flash technology and do not require a battery. These cards can support about 100,000 write/delete cycles (typical).

Three models of memory card are available:

- The BMX RMS 008MP card, used to save application and Web pages.
- The BMX RMS 008MPF card, used to save applications and Web pages as well as to store user files created by the application with the file management function blocks (or files transferred through FTP). The available size for user files in the file system partition is 8 MB (Data Storage area).
- The BMX RMS 128MPF card, used to save applications and Web pages as well as to store user files created by the application with the file management function blocks (or files transferred through FTP). The available size for user files in the file system partition is 128 MB (Data Storage area).

NOTE: The web pages are Schneider Electric pages and cannot be modified.

NOTE: The BMX RMS 008MP card is supplied with each processor, the other ones must be ordered separately.

Memory Card Characteristics

The following table shows the main characteristics of the memory cards.

Memory Card Reference	Application Storage	Data Storage
BMX RMS 008MP	Yes	No
BMX RMS 008MPF	Yes	8 MB
BMX RMS 128MPF	Yes	128 MB

NOTE: The size shown above for the Data Storage area is the maximum recommended size for user files, although file storage is still possible until the global file system partition is full. The risk of going over this recommended maximum is that sufficient free space may not be available for a firmware upgrade, in this case it would be necessary to delete some user files.

The compatibility of the two memory cards is as follows:

- BMX RMS 008MP card compatible with all processors.
- BMX RMS 008MPF and BMX RMS 128MPF cards compatible with the following processors:
  - BMX P34 2000,
  - BMX P34 2010,
  - BMX P34 20102,
  - BMX P34 2020,
  - BMX P34 2030,
  - BMX P34 20302.

NOTE: The memory card is formatted for use with Schneider Electric products. Do not attempt to use or format the card in any other tool. Doing so will prevent program and data transfer usage in a Modicon M340 PLC.

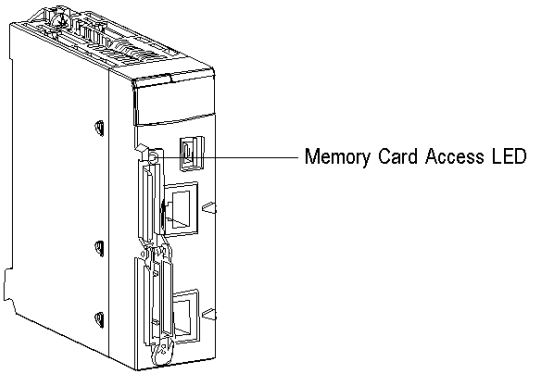
NOTE: For further information about the memory structure of the memory cards, see the Memory Structure of Modicon M340 PLCs *(see EcoStruxure™ Control Expert, Program Languages and Structure, Reference Manual)* page.

NOTE: For further information about Ethernet services provided by memory cards, see the Modicon M340 Memory cards *(see Modicon M340 for Ethernet, Communications Modules and Processors, User Manual)* page in the Ethernet Communication part.

Memory Card Access LED

A memory card access LED is included on all Modicon M340 processors. This LED informs the user of the memory card's status for its removal.

The following illustration shows the physical location of the memory card access LED:



This LED is green and has several different states:

- On: the card is recognized and the processor has access to it,
- Flashing: the LED goes off each time the processor accesses it and comes on again at the end of access,
- Off: the card may be removed as the processor has no access to it.

NOTE: A rising edge on the bit `%S65` finishes the current actions, disables access to the card, then switches off the CARDAC LED. As soon as this LED is off, the card can be removed.

NOTE: The memory card access LED is only visible if the cover is open.

NOTE: The red CARDERR LED shows that either the memory card is in error or the memorized application is different from the one processed by the processor. It is located near the top of the processor front panel.

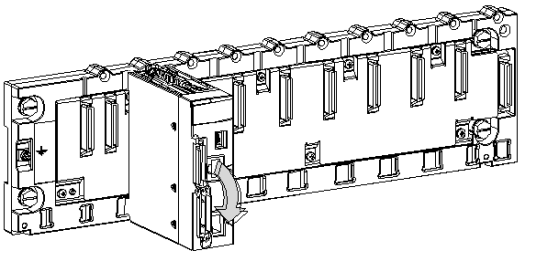
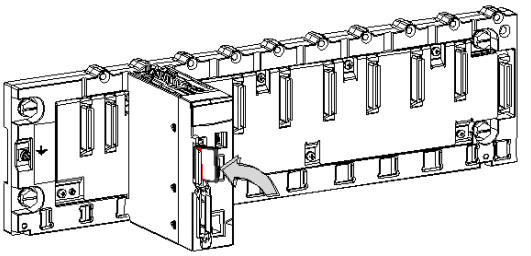
LED States on Power Cycle

The following table presents the different states of the PLC, memory card access LED and CARDERR LED on a power cycle or a PLC reset.

	PLC/memory card behavior	PLC state	Memory card access LED	CARDERR LED
No memory card	-	No configuration	OFF	ON
Memory card not OK	-	No configuration	OFF	ON
Memory card without project	-	No configuration	ON	ON
Memory card with a non-compatible project	-	No configuration	ON	ON
Memory card with a compatible project	Error detected when the restore project from memory card to the PLC RAM	No configuration	Flashing during transfer Finally ON	ON
Memory card with a compatible project	No Error when the restore project from memory card to the PLC RAM		Flashing during transfer Finally ON	ON durring transfer Finally OFF

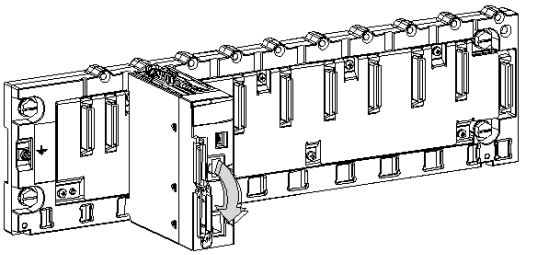
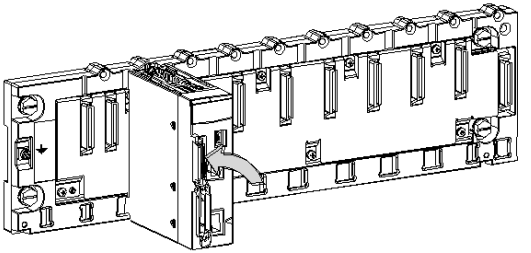
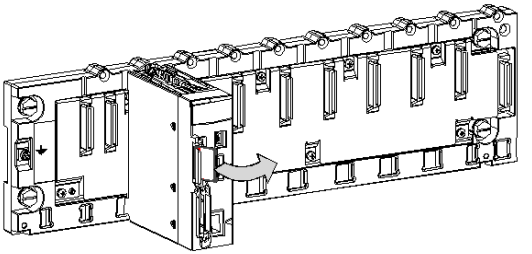
Memory Card Insertion Procedure

The following illustration shows the procedure for inserting a memory card into a BMX P34 •••• processor.

Step	Description	Illustration
⚠ WARNING **UNEXPECTED EQUIPMENT OPERATION** Ensure that the correct memory card is installed before plugging a new processor on the rack. An incorrect card could lead to unexpected system behavior. Refer to %SW97 to check the status of the card. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**		
1	Open the processor's protective cover by pulling the cover towards you.	Opening the cover: 
2	Insert the memory card into its slot by pushing it right in. **Result:** The card should now be clipped into its slot. **Note:** Insertion of the memory card does not force an application restore.	Inserting the memory card: 
3	Close the memory card protective cover.	

Memory Card Removal Procedure

Before removing a memory card, a rising edge on bit %S65 has to be generated to ensure the information consistency. When the CARDAC LED is off, then it is possible to extract the card. There is a risk of inconsistency or loss of data if the extraction is done without the management of the bit %S65. The following illustration shows the procedure for removing a memory card from a BMX P34 •••• processor.

Step	Description	Illustration
1	Open the processor's protective cover by pulling the cover towards you.	Opening the cover: 
2	Push the memory card in its slot. **Result:** The card should unclip from its slot.	Pushing the memory card in its slot: 
3	Remove the card from its slot. **Note:** The CARDERR LED is on when the memory card is removed from the processor.	Removing the memory card: 
4	Close the protective cover.	

Update an Application

Before removing a memory card, a rising edge on bit %S65 has to be generated to ensure the information consistency. When the CARDAC LED is off, then it is possible to extract the card. There is a risk of inconsistency or loss of data if the extraction is done without the management of the bit %S65.The following table shows the procedure for updating an application in a processor using a master memory card.

Step	Description
1	Put the PLC in STOP.
2	Set bit %S65 to 1 and check that the CARDAC LED is off.
3	Remove the currently used memory card, which includes the old application.
4	Insert the master memory card in the the processor.
5	Press the RESET button on the power supply. Result: the new application is transferd to internal RAM.
6	Remove the master memory card.
7	Insert the memory card with the old application in the the processor.
8	Do a backup command.
9	Put the PLC in RUN mode.

Protect an Application

%SW146-147: those 2 system words contain the unique SD card serial number (32bits). If there is not an SD card or an unrecognized SD card, the 2 system words are set to 0. This information can be used to protect an application against duplication: the application is able to check the value of serial number and can go to halt (or other convenient action) if it is different from the initial one. Thus, this application cannot run on a different SD card.

With Control Expert, the application must be read-protected. To do that, uncheck the Upload information in the Project settings.

NOTE: to enforce the protection, you can encrypt the value of the serial number used in the comparison.

NOTE: the complete SD card identification comprises several parameters including the product serial number (32bits).

Precautions

To keep the memory card in normal working order, the following precautions should be taken:

- Avoid removing the memory card from its slot when the processor is accessing it (green access LED on or flashing).
- Avoid touching the memory card connectors.
- Keep the memory card away from electrostatic and electromagnetic sources as well as heat, sunlight, water, and moisture.
- Avoid impacts to the memory card.
- Before sending a memory card by post, check the postal service's security policy. In some countries the postal service exposes mail to high levels of radiation, as a security measure. These high levels of radiation may erase the contents of the memory card and render it unusable.
- If a card is extracted without generating a rising edge of the bit `%S65` and without checking that the CARDAC LED is off, there is a risk of loss of data (file, application).

Chapter 8
BMX P34 xxxx Processors Diagnostics

Subject of this Section

This section deals with BMX P34 •••• processors' diagnostics.

What Is in This Chapter?

This chapter contains the following topics:

Display

Introduction

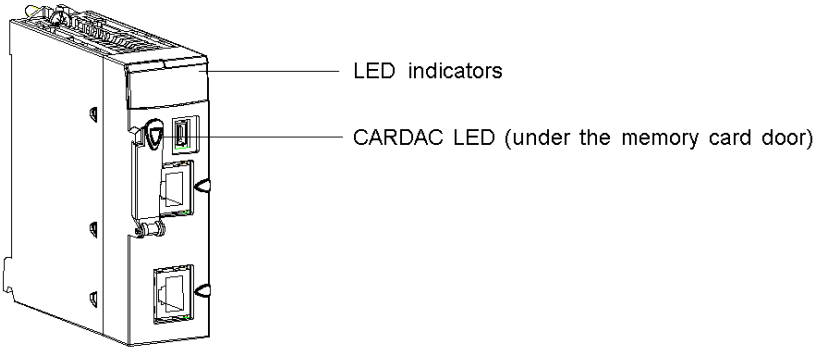
There are several LEDs available on the front panel of each processor, enabling rapid diagnosis of the PLC status.

These LEDs provide information on:

- PLC functioning
- the memory card
- communication with the modules
- serial communication
- communication on the CANopen network
- communication on the Ethernet network

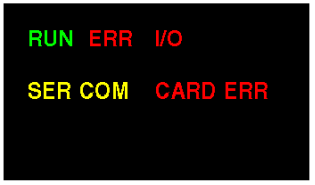
Illustration

The following diagram shows the physical location of the LEDs on the front panel of a BMX P34 ••••• processor:



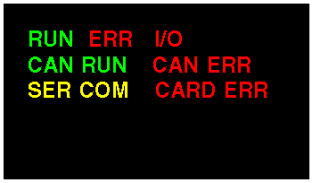
BMX P34 1000/2000 Processors LEDs

The following diagram shows the diagnostic LEDs on the BMX P34 1000/2000 processors:



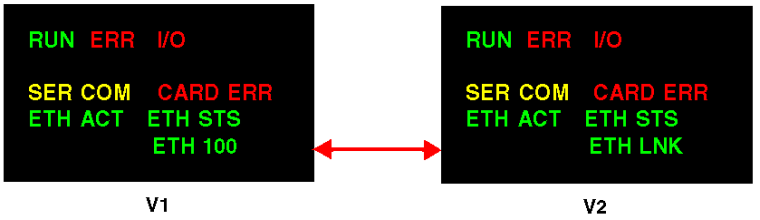
BMX P34 2010 Processor LEDs

The following diagram shows the diagnostic LEDs on the BMX P34 2010 processor:



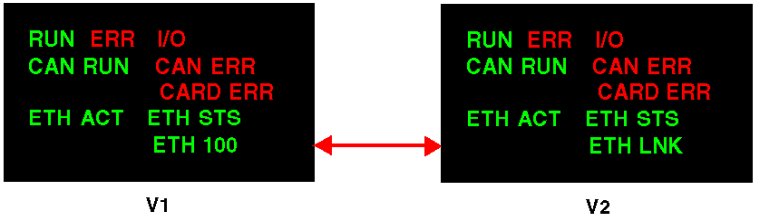
BMX P34 2020 Processor LEDs

The following diagram shows the diagnostic LEDs on the BMX P34 2020 processor. Note that two displays exist, depending on whether you are using V1 or V2 (or greater) of the processor.



BMX P34 2030 Processor LEDs

The following diagram shows the diagnostic LEDs on the BMX P34 2030 processor. Note that two displays exist, depending on whether you are using V1 or V2 (or greater) of the processor.



Memory Card Access LED

There is also a memory card access LED *(see page 70)* on each BMX P34 ••••• processor.

Description

The following table describes the meaning of RUN, ERR, I/O, SER COM, CARDERR, CAN RUN, CAN ERR, ETH STS and CARDAC LED on the front panel.

Label	Pattern	Indication
RUN (green): operational state	on	PLC functioning normally, program running
	flashing	PLC in STOP mode or blocked by a software detected error
	off	PLC not configured (absent, invalid, or incompatible application)
ERR (red): detected error	on	Processor or system detected error
	flashing	• PLC not configured (absent, invalid or incompatible application) • PLC blocked by a software detected error
	off	Normal status (no internal detected errors)
I/O (red): input/output status	on	• Input/output detected error originating from a module or channel • Configuration detected error
	off	Normal status (no internal detected errors)
SER COM (yellow): serial data status	flashing	Data exchange on the serial connection in progress (receiving or sending)
	off	No data exchange on the serial connection
CARDERR (red): memory card detected error For further information, see project backup management for Modicon M340 PLCs *(see EcoStruxure™ Control Expert, Operating Modes)*	on	• Memory card absent • Memory card not recognized • Memory card content differs from the application saved in the processor
	off	• Memory card recognized • Memory card content identical to the application saved in the processor
CAN RUN (green): CANopen operations	on	CANopen network operational
	rapid flashing (on for 50 ms, off for 50 ms, repeating)	Automatic detection of data flow or LSS services in progress (alternates with CAN ERR)
	slow flashing (on for 200 ms, off for 200 ms, repeating)	CANopen network pre-operational
	1 flash	CANopen network stopped
	3 flashes	downloading CANopen firmware

Label	Pattern	Indication
CAN ERR (red): CANopen detected errors	on	CANopen bus stopped
	rapid flashing (on for 50 ms, off for 50 ms, repeating)	Automatic detection of data flow or LSS services in progress (alternates with CAN RUN)
	slow flashing (on for 200 ms, off for 200 ms, repeating)	CANopen configuration not valid
	1 flash	At least one of the detected error counters has reached or exceeded the alert level
	2 flashes	A guard event (NMT-slave or NMT-master) or a heartbeat event has taken place
	3 flashes	The SYNC message was not received before the end of the communication cycle period
	off	No CANopen detected error
	off	No communication activity
ETH STS (green): Ethernet communication status	on	Communication OK
	2 flashes	Invalid MAC address
	3 flashes	Ethernet link not connected
	4 flashes	Duplicate IP address
	5 flashes	Waiting for a server IP address
	6 flashes	Secure and safe mode (with default IP address)
	7 flashes	Configuration conflict between rotary switches and internal configuration
CARDAC (green): memory card access **Note:** This LED is located under the memory card door.	on	Access to the card is enabled
	flashing	Activity on the card; during each access, the card LED is set to OFF, then back to ON
	off	Access to the card is disabled. It is possible to extract the card after the access to the card has been disabled by generating a rising edge on the bit %S65.

The following table describes the meaning of the ETH ACT and ETH 100 LED on the front panel for V1.

Label	Pattern	Indication
ETH ACT (green): Ethernet communication (transmission/reception) activity	on	Ethernet link detected: no communications activity.
	off	No Ethernet link detected.

Label	Pattern	Indication
	flashing	Ethernet link and communications activity detected.
ETH 100 (green): Ethernet transmission speed	on	Ethernet transmission at 100 Mbit/s (Fast Ethernet).
	off	Ethernet transmission at 10 Mbit/s (Ethernet) or no link detected.

The following table describes the meaning of the ETH ACT and ETH LNK LED on the front panel for V2.

Label	Pattern	Indication
ETH ACT (green): Ethernet communication (transmission/reception) activity	on	Communication activity detected.
	off	No communication activity detected.
ETH LNK (green): Ethernet link status	on	Ethernet link detected.
	off	No Ethernet link detected.
	off	No communication activity

NOTE: Rapid flashing is defined as ON for 50 ms and OFF for 50 ms.

NOTE: Slow flashing is defined as ON for 200 ms and OFF for 200 ms.

Searching for Errors Using the Processor Status LEDs

General

The status LEDs located on the processor inform the user of the PLC's operating mode and any possible errors.

The errors detected by the PLC concern:

- circuits which constitute the PLC and/or its modules: internal errors
- the process driven by the PLC or the process wiring: external errors
- functioning of the application executed by the PLC: internal or external errors

Error Detection

Error detection is performed at startup (autotest) or during operation (which is the case for most equipment errors), during exchanges with the modules, or during execution of a program instruction.

Certain "serious" errors require the PLC to be restarted while others are left to the user to decide how to proceed depending on the level of application required.

There are three types of error:

- non-blocking
- blocking
- processor or system

Blocking Errors

General

Blocking errors, caused by the application program, do not cause system errors but prohibit execution of the program. When such an error occurs, the PLC stops immediately and goes into HALT mode (all tasks are stopped on the current instruction). The ERR LED flashes.

Restarting of the Application After a Blocking Error

To end this status it is necessary to init the PLC or to set the %S0 bit to 1.

The application is then in an initial state:

- The data resumes its initial value.
- Tasks are stopped at end of cycle.
- The input image is refreshed.
- Outputs are controlled in fallback position.

The RUN command then allows the application to be restarted.

Blocking Error Diagnosis

Indication of a blocking error is signaled by the ERR and RUN LEDs flashing on the processor front panel.

The system words %SW126 and %SW127 indicate the address of the instruction which caused the blocking error.

The nature of the error is indicated by the system word %SW125.

The following table presents the errors signaled by the values of the system word %SW125.

Hexadecimal Value of %SW125	Corresponding Error
23•••	Execution of a CALL function towards an undefined subroutine
0•••	Execution of an unknown function
2258	Execution of the HALT instruction
9690	Failure of the application CRC check (checksum)
DEB0	Watchdog overrun
DE87	Calculation error on numbers with decimal points
DEF0	Division by 0
DEF1	Character string transfer error
DEF2	Capacity exceeded
DEF3	Index overrun
DEF7	SFC execution error

Hexadecimal Value of %SW125	Corresponding Error
DEFE	SFC steps undefined
81F4	SFC node incorrect
82F4	SFC code inaccessible
83F4	SFC work space inaccessible
84F4	Too many initial SFC steps
85F4	Too many active SFC steps
86F4	SFC sequence code incorrect
87F4	SFC code description incorrect
88F4	SFC reference table incorrect
89F4	SFC internal index calculation error
8AF4	SFC step status not available
8BF4	SFC memory too small after a change due to a download
8CF4	Transition/action section inaccessible
8DF4	SFC work space too small
8EF4	Version of the SFC code older than the interpreter
8FF4	Version of the SFC code more recent than the interpreter
90F4	Poor description of a SFC object: NULL pointer
91F4	Illegal action identifier
92F4	Poor definition of the time for an action identifier
93F4	Macro step cannot be found in the list of active steps for deactivation
94F4	Overflow in the action table
95F4	Overflow in the step activation/deactivation table

Non-Blocking Errors

General

A non-blocking error is caused by an input/output error on the bus or through execution of an instruction. It can be processed by the user program and does not modify the PLC status.

Non-Blocking Errors Linked to Inputs/Outputs

Indication of a non-blocking error linked to the inputs/outputs is signaled by:

- the processor's I/O status LED on
- the modules' I/O status LEDs on
- the error bits and words combined with the channel:
  - bit %Ir.m.c.ERR at 1 indicates the channel at error (implicit exchanges)
  - words %MWr.m.c.2 indicates the channel's type of error (implicit exchanges)
- system bits:
  - %S10: input/output error on one of the modules on the rack bus
  - %S16: input/output error in the task in progress
  - %S118: input/output error on the CANopen bus
  - %S40 - %S47: input/output error on address racks 0-7

The following table shows the diagnosis of non-blocking errors from the status LEDs and the system bits.

RUN Status LED	ERR Status LED	I/O Status LED	System Bit	Error
-	-	ON	%S10 at 0	Input/Output error: channel power supply error, broken channel, module not compliant with the configuration, inoperative or module power supply error.
-	-	ON	%S16 at 0	Input/output error in a task.
-	-	ON	%S118 at 0	Input/output error on the CANopen bus (the errors are the same as those of the bit %S10).
-	-	ON	%S40 - %S47 at 0	Input/output error in at rack level. (%S40: rack 0 - %S47: rack 7).
Key:				

RUN Status LED	ERR Status LED	I/O Status LED	System Bit	Error
ON: LED on				
-: Status undetermined				

Non-Blocking Errors Linked to Execution of the Program

Indication of a non-blocking error linked to execution of the program is signaled by one or more system bits %S15, %S18, and %S20 being set to 1. The nature of the error is indicated in the system word %SW125 (always updated).

The following table shows the diagnosis of non-blocking errors linked to the execution of the program.

System Bit	Error
%S15 at 1	Character string manipulation error
%S18 at 1	Capacity overrun, error on a floating point or division by 0
%S20 at 1	Index overrun

NOTE: There are two ways to change non-blocking errors linked to the execution of the program to blocking errors:

- Diagnostic program function, accessible through the Control Expert programming software
- Bit %S78 (HALTIFERROR) when it is set to 1.

The processor's HALT status is determined via the flashing ERR and I/O LEDs.
Testing and setting these system bits to 0 is the user's responsibility.

Processor or System Errors

General

Processor or system errors are serious errors related either to the processor (equipment or software) or to the rack bus wiring. The system can no longer operate correctly when these errors occur. They cause the PLC to stop in ERROR status, which requires a cold restart. The next cold restart will be forced in STOP status to prevent the PLC from returning to error.

Diagnosis of Processor and System Errors

The following table presents the diagnosis of processor and system errors.

RUN Status LED	ERR Status LED	I/O Status LED	Hexadecimal Value of the System Word %SW124	Error
-	ON	ON	80	System watchdog error or rack bus wiring error
-	ON	ON	81	Rack bus wiring error
-	ON	ON	90	Unforeseen interruption. System task pile overrun.
Legend:				
ON: On				
-: Undetermined				

Chapter 9
Processor Performance

Subject of this Section

This section presents BMX P34 20•0 processor performance. The BMX P34 20•0 processors have 150% of the BMX P34 1000 performance.

What Is in This Chapter?

This chapter contains the following topics:

Execution of Tasks

General

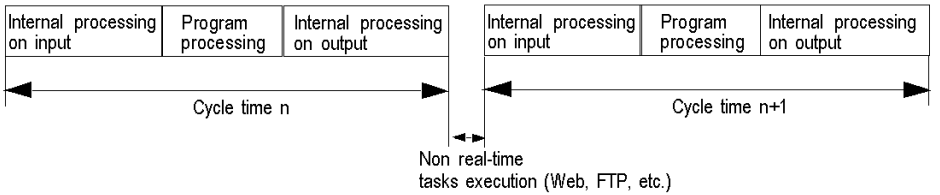
BMX P34 •••• processors can execute single-task and multi-task applications. Unlike a single-task application, which only executes master tasks, a multi-task application .defines the task execution priorities.

Master Task

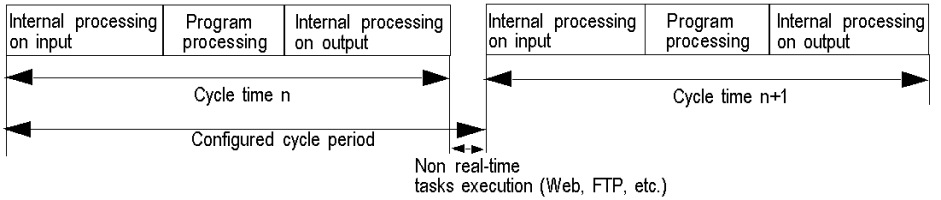
The master task represents the application program's main task. You can choose from the following MAST task execution modes:

- Cyclical (default setup): execution cycles are performed in sequence, one after the other.
- Periodical: a new cycle is started periodically, according to a user-defined time period (1 - 255 ms).
  If the execution time is longer than the period configured by the user, the bit `%S19` is set to 1 and a new cycle is launched.

The following illustration shows the cyclical execution of the MAST task:



The following illustration shows the periodical execution of the MAST task:



Both MAST task cycle modes are controlled by a watchdog.

The watchdog is triggered if the MAST task execution time is longer than the maximum period defined in the configuration, and causes a software error. The application then goes into HALT status, and the bit `%S11` is set to 1 (the user must reset it to 0).

The watchdog value (%SW11) may be configured between 10 ms and 1,500 ms (default value: 250 ms).

NOTE: Configuring the watchdog to a value that is less than the period is not allowed.

In periodical operating mode, an additional check detects when a period has been exceeded. The PLC will not switch off if the period overrun remains less than the watchdog value.

Bit %S19 signals a period overrun. It is set to 1 by the system when the cycle time becomes longer than the task period. Cyclical execution then replaces periodical execution.

The MAST task can be checked with the following system bits and system words:

System Object	Description
%SW0	MAST task period
%S30	Activation of the master task
%S11	Watchdog default
%S19	Period exceeded
%SW27	Last cycle overhead time (in ms)
%SW28	Longest overhead time (in ms)
%SW29	Shortest overhead time (in ms)
%SW30	Last cycle execution time (in ms)
%SW31	Longest cycle execution time (in ms)
%SW32	Shortest cycle execution time (in ms)

Fast Task

The FAST task is for periodical processing and processing over short durations.

FAST task execution is periodical and must be quick so that no lower priority tasks overrun. The FAST task period can be configured (1 - 255 ms). The FAST task execution principle is the same as for periodical execution of the master task.

The FAST task can be checked with the following system bits and system words:

System Object	Description
%SW1	FAST task period
%S31	Activation of the fast task
%S11	Watchdog default
%S19	Period exceeded
%SW33	Last cycle execution time (in ms)
%SW34	Longest cycle execution time (in ms)
%SW35	Shortest cycle execution time (in ms)

Event Tasks

With event processing, the application program's reaction time can be reduced for events originating from:

- input/output modules (EVTi blocks),
- events timers (TIMERi blocks).

Event processing execution is asynchronous. The occurrence of an event reroutes the application program towards the process associated with the input/output channel, or to the event timer that caused the event.

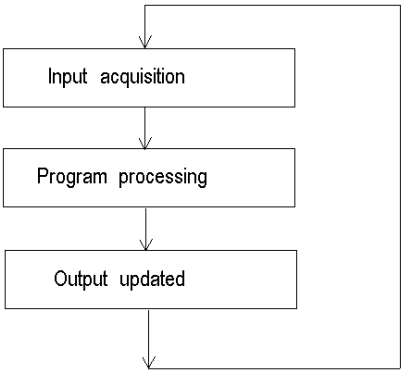
Event tasks can be checked with the following system bits and system words:

System Object	Description
%S38	Activation of events processing
%S39	Saturation of the event signal management stack.
%SW48	Number of IO events and telegram processes executed **NOTE:** TELEGRAM is available only for PREMIUM (not on Quantum neither M340)

Single Task Execution

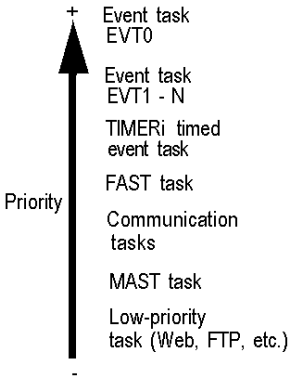
A single-task application program is associated with one task; the MAST task.

The following diagram shows a single-task application's execution cycle:

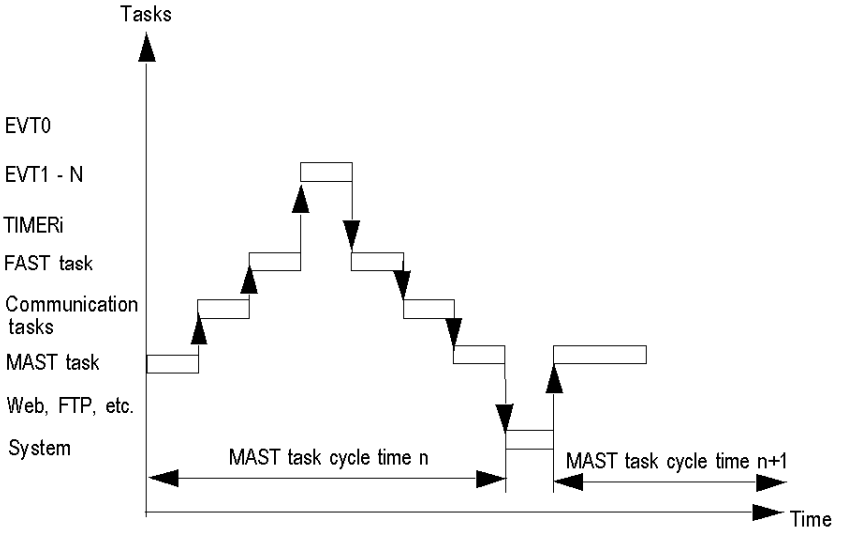


Multi-Task Execution

The following diagram shows the level of priority of the tasks in a multi-task structure:



The following diagram shows the execution of tasks in a multi-task structure:



MAST Task Cycle Time: Introduction

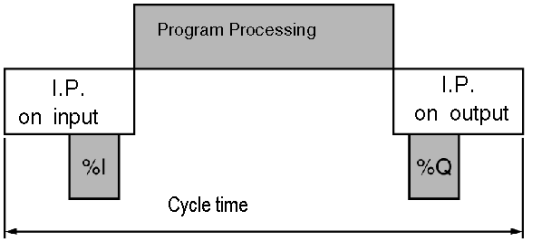
General

The MAST task cycle time is the sum of the following:

- internal processing time on input,
- master task program processing time,
- internal processing time on output.

Illustration

The following diagram defines the MAST task cycle time:



I.P. Internal Processing.

MAST Task Cycle Time: Program Processing

Definition of Program Processing Time

Program processing time is equivalent to the time needed to execute application code.

Application Code Execution Time

The application code execution time is the sum of the times needed for the application program to execute each instruction, at each PLC cycle.

The table below gives the execution time for 1 K of instructions (i.e. 1024 instructions).

Processors	Application Code Execution Time (1)	
	100 % Boolean Program	65 % Boolean + 35 % Digital Program
BMX P34 2000 BMX P34 2010 BMX P34 20102 BMX P34 2020 BMX P34 2030 BMX P34 20302	0.12 milliseconds	0.15 milliseconds

(1) All instructions are executed at each PLC cycle.

MAST Task Cycle Time: Internal Processing on Input and Output

General

The internal processing time for inputs and outputs is the sum of the following:

- MAST task system overhead time
- maximum communication system reception time and input management time for implicit inputs/outputs
- maximum communication system transmission time and output management time for implicit inputs/outputs

MAST Task System Overhead Time

For BMX P34 2000/2010/20102/2020/2030/20302 processors, the MAST task system overhead time is 700 µs.

NOTE:
Three system words give information on the MAST task system overhead times:

- `%SW27`: last cycle overhead time,
- `%SW28`: longest overhead time,
- `%SW29`: shortest overhead time.

Implicit Input/Output Management Time

The implicit input management time is the sum of the following:

- Fixed base of 25 µs,
- Sum of the input management times for each module (in the following table, IN).

The implicit output management time is the sum of the following:

- Fixed base of 25 µs (FAST), 73 µs (MAST),
- Sum of the output management times for each module (in the following table, OUT).

The table below shows the input (IN) and output (OUT) management times for each module.

Type of Module	Input Management Time (IN)	Output Management Time (OUT)	Total Management Time (IN+OUT)
BMX DDI 1602, 16 discrete inputs module	60 µs	40 µs	100 µs
BMX DDI 1603, 16 discrete inputs module	60 µs	40 µs	100 µs
BMX DDI 1604, 16 discrete inputs module	60 µs	40 µs	100 µs
BMX DDI 3202 K, 32 discrete inputs module	67 µs	44 µs	111 µs
BMX DDI 6402 K, 64 discrete inputs module	87 µs	63 µs	150 µs
BMX DDO 1602, 16 discrete outputs module	60 µs	45 µs	105 µs
BMX DDO 1612, 16 discrete outputs module	60 µs	45 µs	105 µs
BMX DDO 3202 K, 32 discrete outputs module	67 µs	51 µs	118 µs
BMX DDO 6402 K, 64 discrete outputs module	87 µs	75 µs	162 µs

Type of Module	Input Management Time (IN)	Output Management Time (OUT)	Total Management Time (IN+OUT)
BMX DDM 16022, 8 discrete inputs and 8 discrete outputs module	68 µs	59 µs	127 µs
BMX DDM 3202 K, 16 discrete inputs and 16 discrete outputs module	75 µs	63 µs	138 µs
BMX DDM 16025, 8 discrete inputs and 8 discrete outputs module	68 µs	59 µs	127 µs
BMX DAI 0805, 8 discrete inputs module	60 µs	40 µs	100 µs
BMX DAI 0814, 8 discrete inputs module	TBC	TBC	TBC
BMX DAI 1602, 16 discrete inputs module	60 µs	40 µs	100 µs
BMX DAI 1603, 16 discrete inputs module	60 µs	40 µs	100 µs
BMX DAI 1604, 16 discrete inputs module	60 µs	40 µs	100 µs
BMX DAI 1614, 16 discrete inputs module	TBC	TBC	TBC
BMX DAI 1615, 16 discrete inputs module	TBC	TBC	TBC
BMX DAO 1605, 16 discrete outputs module	60 µs	45 µs	105 µs
BMX DAO 1615, 16 discrete outputs module	TBC	TBC	TBC
BMX AMI 0410 analog module	103 µs	69 µs	172 µs
BMX AMI 0800 analog module	103 µs	69 µs	172 µs
BMX AMI 0810 analog module	103 µs	69 µs	172 µs
BMX AMO 0210 analog module	65 µs	47 µs	112 µs
BMX AMO 0410 analog module	65 µs	47 µs	112 µs
BMX AMO 0802 analog module	110 µs	110 µs	220 µs
BMX AMM 0600 analog module	115 µs	88 µs	203 µs
BMX ART 0414 analog module	103 µs	69 µs	172 µs
BMX ART 0814 analog module	138 µs	104 µs	242 µs
BMX DRA 1605, 16 discrete outputs module	60 µs	45 µs	105 µs
BMX DRA 0804, 8 discrete outputs module	56 µs	43 µs	99 µs
BMX DRA 0805, 8 discrete outputs module	56 µs	43 µs	99 µs
BMX DRA 0815, 8 discrete outputs module	TBC	TBC	TBC
BMX DRC 0805, 8 discrete outputs module	TBC	TBC	TBC
BMX EHC 0200 dual-channel counting module	102 µs	93 µs	195 µs
BMX EHC 0800 eight-channel counting module	228 µs	282 µs	510 µs

Communication System Time

Communication (excluding telegrams) is managed during the MAST task internal processing phases:

- on input for receiving messages
- on output for sending messages

The MAST task cycle time is, therefore, affected by the communication traffic. The communication time spent per cycle varies considerably, based on the following elements:

- traffic generated by the processor: number of communication EFs active simultaneously
- traffic generated by other devices to the processor, or for which the processor ensures the routing function as master

This time is only spent in the cycles where there is a new message to be managed.

NOTE: These times may not all occur in the same cycle. Messages are sent in the same PLC cycle as instruction execution when communication traffic is low. However, responses are never received in the same cycle as instruction execution.

MAST Task Cycle Time Calculation

General

The MAST task cycle time can be calculated before the implementation phase, if the desired PLC configuration is already known. The cycle time may also be determined during the implementation phase, using the system words %SW30 - %SW32.

Calculation Method

The following table shows how to calculate the MAST task cycle time.

Step	Action
1	Calculate the input and output internal processing time by adding the following times: ● MAST task system overhead time *(see page 96)* ● maximum communication system reception time and input management time for implicit inputs/outputs *(see page 96)* ● maximum communication system transmission time and output management time for implicit inputs/outputs *(see page 96)*
2	Calculate the program processing time *(see page 95)* according to the number of instructions and the type (Boolean, digital) of program.
3	Add together the program processing time, and the input and output internal processing time.

FAST Task Cycle Time

Definition

The FAST task cycle time is the sum of the following:

- program processing time
- internal processing time on input and output

Definition of Internal Processing Time on Input and Output

The internal processing time on input and output is the sum of the following:

- FAST task system overhead time
- implicit input/output management time on input/output *(see page 96)*

For the BMX P34 20x0x processors, the FAST task system overhead time is 130 µs.

Event Response Time

General

The response time is the time between an edge on an event input and the corresponding edge on an output positioned by the program in an event task.

Response Time

The following table gives the response time for the BMX P34 20x0x processors with an application program of 100 Boolean instructions and the module.

Processors	Minimum	Typical	Maximum
BMX P34 20x0x	1625 µs	2575 µs	3675 µs

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