Modicon M340 Using Unity Pro

Processors, Racks, and Power Supply Modules

Setup Manual

04/2015

35012676.09

www.schneider-electric.com

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.

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, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

At a Glance

Document Scope

This manual describes the hardware installation 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 Unity Pro 10.0 or later.

You need Modicon M340 firmware 2.4 or later.

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

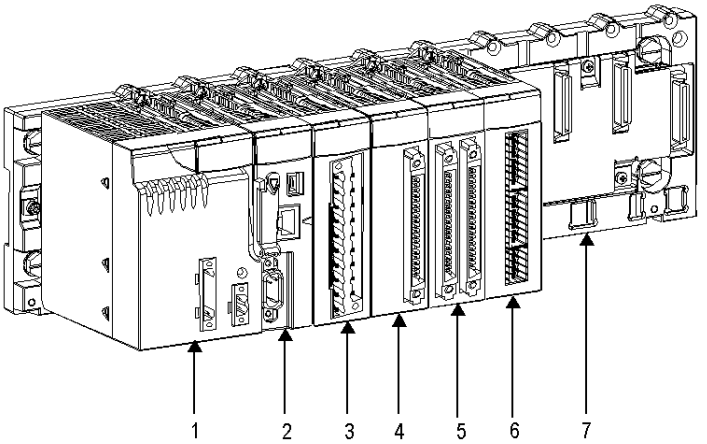
Modicon M340 PLC Station

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 49*).

General Introduction to Racks

General

There are four sizes of racks, chosen according to the number of modules you wish to use:

- BMX XBP 0400 rack (4 slots)
- BMX XBP 0600 rack (6 slots)
- BMX XBP 0800 rack (8 slots)
- BMX XBP 1200 rack (12 slots)

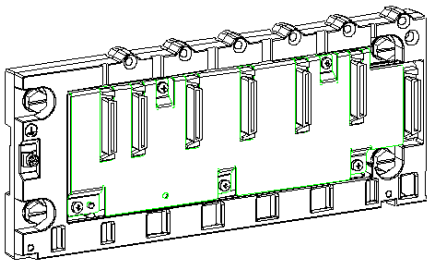
The list above gives the number of usable slots.

Each rack includes one extra slot that is reserved for the power supply module, and one slot on the right is reserved for the BMX XBE 1000 rack extender module.

For further information, please refer to the introduction to racks *(see page 173)*.

Representation of the Racks

The following diagram shows the BMX XPB 0400 rack:



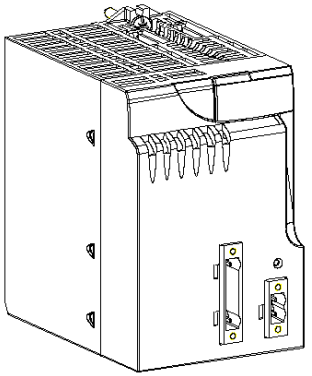
General Introduction to Power Supply Modules

General

Each rack requires one power supply module *(see page 117)* defined according to the distributed network (alternating or direct current) and the power necessary at rack level.

Illustration

The following illustration shows a BMX CPS •••• power supply module:



General Introduction to Rack Extender Module

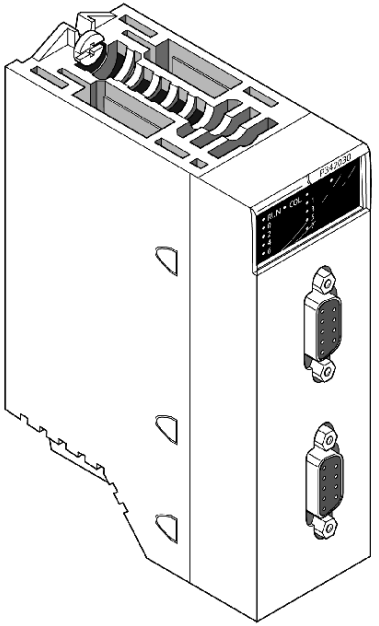
General

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

See Rack extender module *(see page 191)*.

Illustration

Illustration of the BMX XBE 1000 rack extender module:



General Introduction to Input/Output Modules

General

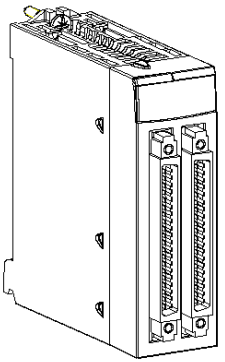
The Modicon M340 range includes discrete and analog input/output modules.

Discrete Input/Output

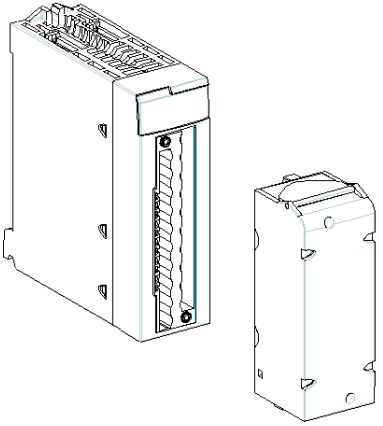
A wide range of discrete input/output modules enables you to select the module best suited to your needs. The characteristics of these modules differ as follows:

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:

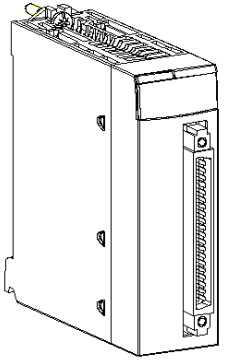


Analog Inputs/Outputs

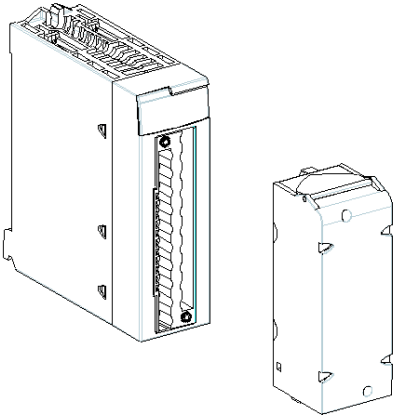
A wide range of analog input/output modules enables you to select the module best suited to your needs. The characteristics of these modules differ as follows:

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

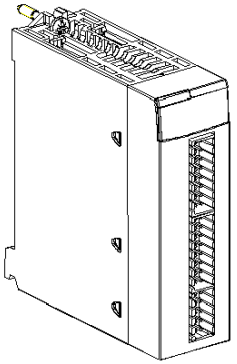
The PLCs in the Modicon M340 range offer counting functions (downcounting, counting, counting/downcounting) by utilizing the application-specific counting modules.

Two counting modules are offered:

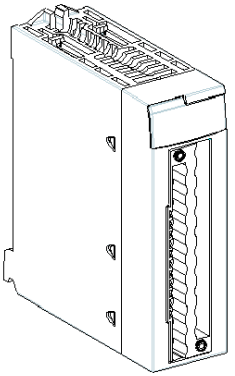
- BMX EHC 0200 module with two counting channels and a maximum acquisition frequency of 60 kHz
- BMX EHC 0800 module with eight counting channels and a maximum acquisition frequency of 10 kHz

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.

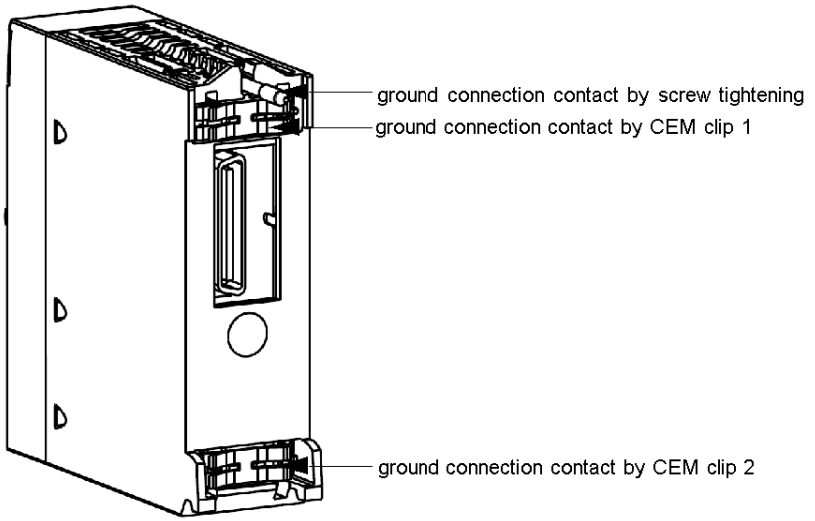
⚠ WARNING

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 *(see Modicon M340 for Ethernet, Communications Modules and Processors, User Manual)* equipment can operate in extended temperature ranges and harsher environments compared to the standard M340 equipment.

“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
- Backplanes:
  - BMX XBP 0400H
  - BMX XBP 0600H
  - BMX XBP 0800H
- 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 DDM 16022H
  - BMX DDM 16025H
- Digital Output modules:
  - BMX DAO 1605H
  - BMX DDO 1602H
  - BMX DDO 1612H
  - BMX DRA 0805H
  - BMX DRA 1605H
- 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

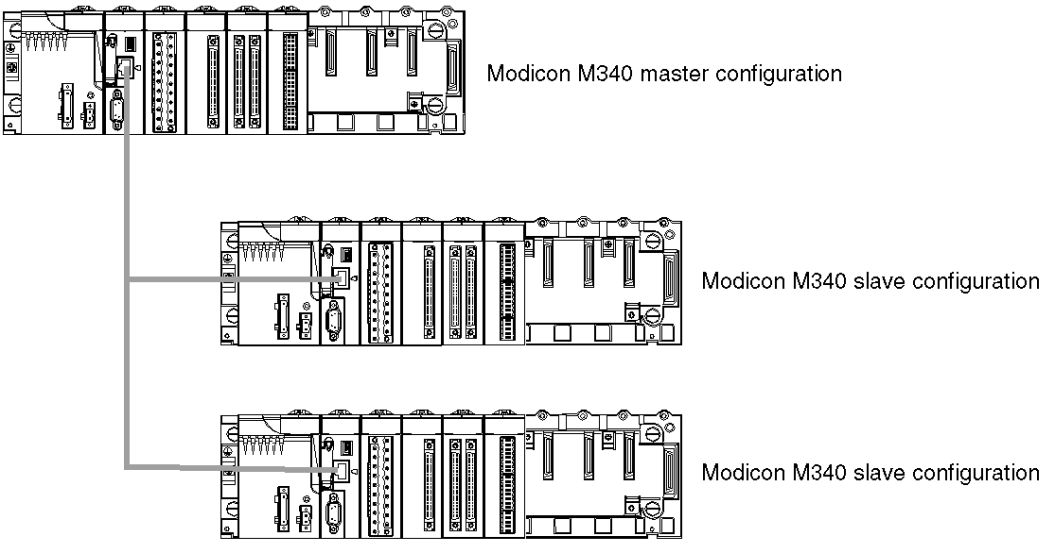
The Modbus protocol creates a hierarchical structure (one master and several slaves).

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

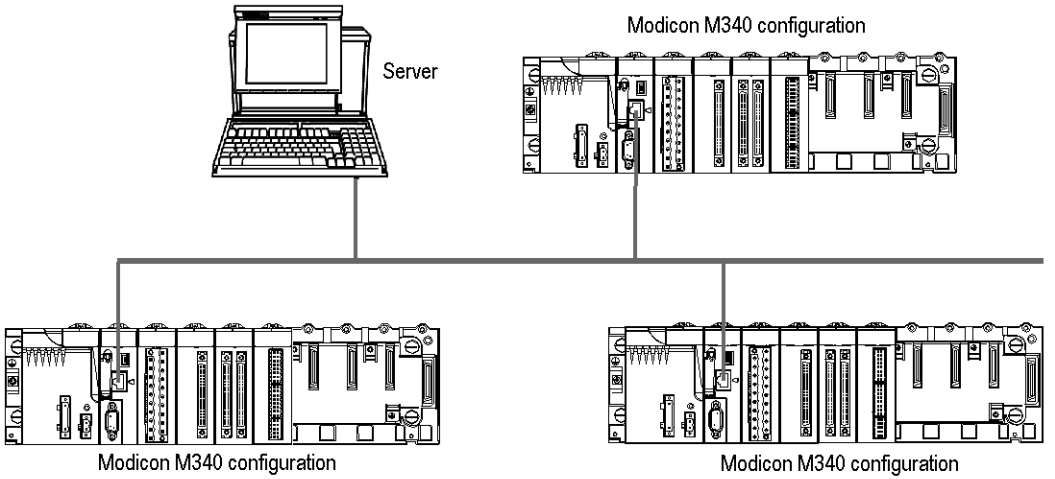
Ethernet communication essentially targets applications of:

- 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:

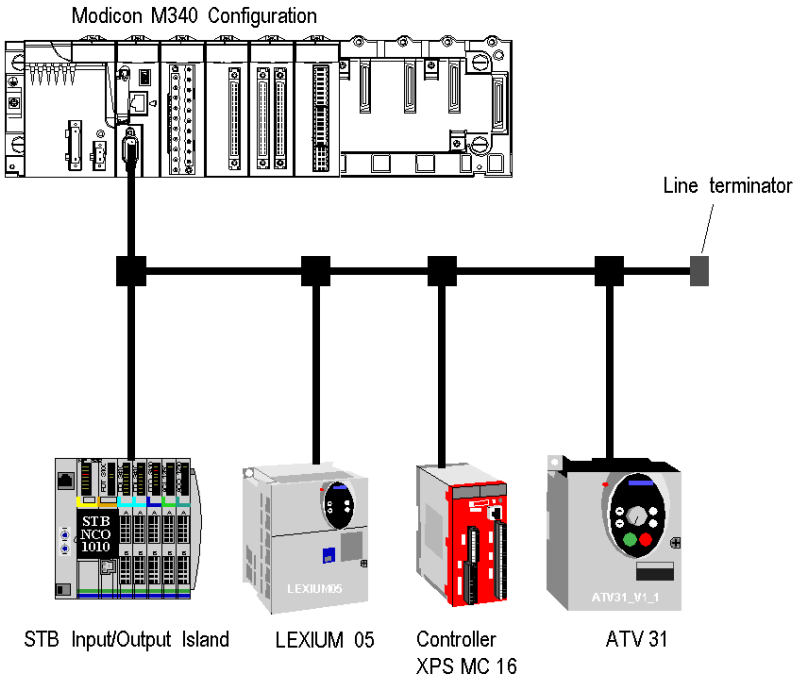
- a bus master
- slave devices, also called nodes

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

Subject of this Section

This sections concerns the operating standards and conditions for Modicon M340 PLCs.

What Is in This Chapter?

This chapter contains the following topics:

Standards and Certifications

General

The Modicon M340 PLCs have been designed to comply with the relevant standards or rules relating to electrical equipment as PLCs for an industrial use.

Standards Compliance and Certifications

Modicon M340 PLCs comply with the following standards and certifications:

- Requirements specific to PLCs relating to functional characteristics, immunity, robustness and security:
  - IEC 61131-2 Ed. 2 (2003)
  - CSA 22.2 No. 142
  - UL 508
- Merchant Navy requirements of the major international organizations:
  NOTE: Compliance with these Merchant Navy requirements does not apply to BMXCPS3540T, DRA0804T or DDI1604T.
  - ABS
  - BV
  - DNV
  - GL
  - LR
  - RINA
  - RMRS
- European directives:
  - Low voltage: 72/23/EEC amendment 93/68/EEC,
  - Electromagnetic compatibility: 89/336/EEC amendments 92/31/EEC and 93/68/EEC
- Recommendations concerning dangerous location:
  - CSA 22.2 No. 213, class 1, division 2, groups A, B, C and D.
    This equipment is only acceptable for use in class 1, division 2, groups A, B, C and D or non classified dangerous areas (see DANGER below)
- ACA rules (for C-Tick working)
- CEI/ECO rules (for GOST working)
- Friendly design environment:
  - European RoHS 2002/95/EC. Does not contain lead, mercury, hexavalent chromium, PBB or PBDE
  - European WEEE 2002/96/EC
  - Schneider Electric directives (no halogen materials, increased rate of recycling, etc.))

  NOTE: Hardened equipment *(see Modicon M340 for Ethernet, Communications Modules and Processors, User Manual)* meets an additional standard for conformal coating.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION

Disconnect all power before removing components, if installed in a hazardous location where flammable gases or combustible dusts may be present. Electrical sparks in a hazardous location will cause an explosion.

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

Operating Conditions and Environment Related Recommendations

Operating Temperature/Hygrometry/Altitude

The following table shows the operating conditions relative to the outside environment.

	M340	M340H/T
Ambient operating temperature	0°C - +60°C (IEC 61131-2 = +5°C to +55°C) 32°F - +140°F (IEC 61131-2 = +41°F to +131°F)	-25°C - +70°C -13°F - +158°F
Relative humidity	5% - 95% (without condensation)	5% - 95% (without condensation)
Altitude	0 - 4,000 meters (13,124 feet)	0 - 4,000 meters (13,124 feet)

NOTE: Above 2,000 meters (6,562 feet), the maximum operating temperature is +55°C (+131°F) and the de-rating for dielectric is applied according IEC 60664-1.

Supply Voltage

The following table shows the operating conditions relative to the supply voltage.

Voltage	Nominal	24 VDC	48 VDC	100 - 240VAC	100 - 120/200 - 240VAC	125 VDC
	Limit	18 - 31.2 VDC	18 - 62.4 VDC	85 - 264 VAC	85 - 115/230 - 264 VAC	100 - 150 VDC
Frequency	Nominal	-	-	50/60 Hz	50/60 Hz	-
	Limit	-	-	47/63 Hz	47/63 Hz	-
Micro-power outages	Duration	≤ 10 ms (1)	≤ 10 ms (1)	≤ 1/2 period	≤ 1/2 period	≤ 50 ms at 125 VDC
	Repetition	≥ 1 s	≥ 1 s	≥ 1 s	≥ 1 s	≥ 1 s
Harmonic rate		-	-	10%	10%	-
Residual ripple included (0 to peak)		5%	5%	-	-	5%

(1) Limited to 1 ms at maximum load with minimum supply (18 VDC).

Human and Material Safety

The following table shows the operating conditions relative to human and material safety.

Test designation	Standards	Levels
Insulation Voltage	EN 61131-2 IEC 60664	1,500 Veff without accounting for the specific characteristics of the various modules.
Dielectric strength and insulation resistance *	EN 61131-2 UL 508 CSA 22-2 No. 142	50 V ≥10 MΩ 250 V > 100 MΩ
Maintaining ground connections *	EN 61131-2 UL 508 CSA 22-2 No. 142	<0.1 Ω / 16 A / 1 hour < 0.1 Ω / 30 A / 2 min.
Leakage current *	UL 508 CSA 22-2 No. 142	Fixed device < 3.5 mA
Protection offered by enclosure *	CSA 22-2 No. 142 IEC 60529 EN 61131-2 UL 508	Protection degree IP 20
Impact withstand	CSA 22-2 No. 142 IEC 950	Fall/500 g (17.635 oz.) sphere/1.3 m (4.2654 ft)
Stored energy injury risk	EN 61131-2	After 1 s Residual voltage < 42.4 V Ground current < 5 mA
Clearance and creepage	EN 61131-2 UL508 CSA 22-2 No. 142	Over voltage category: II (IEC 60664-1) Clearance: 1.5 mm (0.0591 in) at 250 V Minimum insulation distance: 0.18 mm (0.0071 in) at 50 V Creepage: 2.5 mm (0.0985 in) at 250 V / 1.2 mm (0.0473 in) at 50 V Material group: II
Temperature rise	EN 61131-2 UL508 CSA 22-2 No. 142	Ambient temperature: 60°C (140°F) For Hardened equipment, the ambient temperature is 70°C (158°F) with de-rating.
Key		
*: Tests required by EC directives		

NOTE: The equipment must be installed and wired in compliance with the requirements in the TSX DG KBL manual.

Immunity to L.F. Interference

The following table shows the operating conditions relative to L.F. interference caused by low frequencies.

Test designation	Standards	Levels
Voltage and frequency variation a.c. *	EN 61132-2	0.9 / 1.10 Un 30 min. 0.95 / 1.05 Fn 30 min.
Voltage variation d.c. *	EN 61131-2	0.85 Un - 1.2 Un 30 min. + ripple 5% peak (for industrial use) 0.75 Un - 1.3 Un 30 min. (for merchant navy)
Third harmonics *	EN 61131-2	10% Un 0° / 5 min. - 180° / 5 min.
Voltage drop and interruptions *	EN 61131-2	AC 1/2 cycle DC 1 ms
Voltage shut down/start up *	EN 61131-2	Un-0-Un; Un / 60s 3 cycles Un-0-Un; Un / 5s 3 cycles Un-0.9Ud; Un / 60s 3 cycles
Key		
Un: Nominal voltage **Fn:** Nominal frequency **Ud:** Under voltage detection level		
*: Tests required by EU directives		

NOTE: The equipment must be installed and wired in compliance with the requirements in the TSX DG KBL manual.

Immunity to H.F. Interference

The following table shows the operating conditions relative to interference caused by High Frequencies.

Test designation	Standards	Levels
Damped oscillatory wave *	EN 61131-2 IEC 61000-4-12	Main AC / DC power supply Aux. AC power supply AC unshielded I/Os 2.5 kV CM - 1 kV DM Aux. DC power supply Analog/DC unshielded I/Os 1 kV CM - 0.5 kV DM Shielded cables: 0.5 kV CM
Fast transients (bursts) *	IEC 61000-4-4	AC / DC power supply 2 kV WM / CM Discrete I/O > 48 V 2 kV WM / CM
Surge	IEC 61000-4-5	Main/aux. AC / DC power supply AC unshielded I/Os 2 kV CM - 1 kV DM Analog/DC unshielded I/Os 0.5 kV CM - 0.5 kV DM Shielded cables: 1 kV CM
Electrostatic discharge *	IEC 61000-4-2	6 kV contact 8 kV air
Radiated radio frequency electromagnetic field *	EN 61131-2 IEC 61000-4-3	15 V/m (4.572 V/ft); 80 MHz - 2 GHz Sinusoidal modulation amplitude 80% / 1kHz
Conducted disturbance inducted by radio frequency fields *	IEC 61000-4-6	10 Vrms; 0.15 MHz - 80 MHz Sinusoidal modulation amplitude 80% / 1 kHz
Key		
DM: Differential mode **CM :** Common mode **WM :** Wire mode		
*: Tests required by EC directives		

NOTE: The equipment must be installed and wired in compliance with the requirements in the TSX DG KBL manual.

Electromagnetic Emissions

The following table shows the operating conditions relative to electromagnetic emissions.

Test designation	Standards	Levels
Conducted emission *	EN 55022 / 55011	Class A 150kHz - 500kHz quasi peak 79 dB µV 500kHz – 30MHz quasi peak 73 dB µV
Radiated emission *(1)	EN 55022 / 55011	Class A d = 10 m (32.81 ft) 30 MHz - 230 MHz quasi peak 40 dB µV Class A d = 10m (32.81 ft) 230 MHz - 2 GHz quasi peak 47 dB µV
Key		
(1) This test is performed outside the cabinet, with the devices fixed to a metallic grid and wired as shown in the manual.		
*: Tests required by EC directives		

NOTE: The equipment must be installed and wired in compliance with the requirements in the TSX DG KBL manual.

Modicon M340 PLC Protection Processing

General

The Modicon M340 PLCs have a climate-resistant treatment.

Modicon M340 PLC Protection

The Modicon M340 PLCs have an IP20 protection degree and they have been tested with pins. It is an enclosed equipment. It may, therefore, be installed without casing in restricted access rooms not exceeding pollution level 2 (control room with neither machine nor activity producing dust).

NOTE: for a rack to be compliant with the IP20 protection degree, the empty module slots must be protected by a BMX XEM 010 protective cover.

For installation in industrial manufacturing workshops or in an environment corresponding to HP (heat and humidity processing), the Modicon M340 PLCs must be incorporated in the IP54 minimum protection casings recommended in Standards IEC 60664 and NF C 20 040.

Climatic and Mechanical Resistance

Resistance to Climatic Variations (While Operational)

The following table shows the resistance of operational Modicon M340 PLCs to climatic variations.

Test Designation	Standards	Levels
Dry heat	IEC 60068-2-2	from 25°C (77°F) to 60°C (140°F) / 16h[1]
Cold	IEC 60068-2-1 EN 61131-2	from 25°C (77°F) to 0°C (32°F) / 16h[1]
Damp heat, steady state	IEC 60068-2-30	60°C (140°F) / 95% RH / 96h
Damp heat, cyclic	EN 61131-2 IEC 60068-2-3 Db	55°C (131°F) / 25°C (77°F), 93-95% **RH** Two cycles: 12h-12h
Temperature changes	IEC 61131-2 IEC 60068-2-14 Nb	0°C (32°F), 60°C (140°F) / 5 Cycles: 6h-6h

Legend:

RH: Relative Humidity

1 The Modicon M340H PLCs operate over a range of 0°C (32°F) ... 60°C (140°F).

Resistance to Climatic Variations (While Non-Operational)

The following table shows the resistance of non-operational Modicon M340 PLCs to climatic variations.

Test Designation	Standards	Levels
Dry heat, non operating	IEC 60068-2-2	85° C (185° F) / 96 h
Cold, non operating	IEC 60068-2-1 EN 61131-2	-40°C (-40° F) / 96 h
Damp heat cyclic, non operating	IEC 60068-2-3	60°C (140° F) / 96h / 95% RH
Thermal shocks, non operating	IEC 60068-2-14 EN 61131-2	- 40°C (-40° F); 85° C (185° F) Two cycles 6 h-6 h

Resistance to Mechanical Variations

The following table shows the resistance of Modicon M340 PLCs to mechanical variations.

Test Designation	Standards	Levels	Environment
Sinusoidal vibrations	EN 61131-2 Test IEC 60721-4-3 Class 3M7	5 Hz to 8.7 Hz with +/- 10 mm amplitude 8.7 Hz - 150 Hz with 3 g (0.106 oz.) Durability: 10 cycles on each axis (1 octave / min. +/-10 %)	For panel only
	EN 61131-2 Test IEC 60721-4-3 Class 3M4	5 Hz to 8.7 Hz with +/- 10 mm amplitude 8.7 Hz - 150 Hz with 1 g (0.03527 oz.) Durability: 10 cycles on each axis (1 octave / min. +/-10 %)	For Rail DIN
Shocks	EN 61131-2 Test IEC 60068-2-27 Ea	30 g (1.06 oz.) / 11 ms / 3 shocks per axis/all directions	For panel only
	EN 61131-2 Test IEC 60068-2-27 Ea	15 g (0.53 oz.) / 11 ms / 3 shocks per axis/all directions	For Rail DIN
Bumps	EN 61131-2 Test IEC 60721-4-3 Class 3M7	25 g (0.882 oz.)/ 6 ms / 100 bumps per axis/all directions	For panel only
	EN 61131-2 Test IEC 60721-4-3 Class 3M4	15 g (0.53) / 6 ms / 100 bumps per axis/all directions	For Rail DIN

Resistance to Mechanical Stress

The following table shows the resistance of Modicon M340 PLCs to mechanical stress.

Test Designation	Standards	Levels
Flat free fall	EN 61131-2 IEC 60068-2-32	1 m / 5 falls - in packaging 3.281 ft / 5 falls - in packaging 0.1 m / 2 falls - no packaging 0.328 ft / 2 falls - no packaging
Controlled free fall with packaging	EN 61131-2 IEC 60068-2-32	1 m / 45° / 5 falls 3.281 ft / 45° / 5 falls
Random free fall with packaging	EN 61131-2 IEC 60068-2-32	1 m / 5 falls 3.281 ft / 5 falls
Transportation, non operating	EN 61131-2 IEC 60721-4-2 Class 2M3	Stationary vibration random: test method 60068-2-64 Fh on each axis 5 m^2/s^3 from 10 to 100 Hz 53.82 ft^2/s^3 from 10 to 100 Hz -7 dB/octave from 100 to 200 Hz 1 m^2/s^3 from 200 to 2000 Hz 10.765 ft^2/s^3 from 200 to 2000 Hz 30 mn duration each axis

Test Designation	Standards	Levels
Vibrations: fixed frequency/operating	Navy according CTR 61-1/ EN/ IEC 60068-2-6 Fc	3 Hz - 100 Hz / 1mm amplitude 0.7 g Ft 13 Hz Endurance: rf/ 90min/axis (Q limit) <10 Each axis
Sinusoidal vibrations	IEC 60068-2-6	5 - 9 Hz / 15 mm (0.591 ft) 9 - 150 Hz / 5 g (0.176 oz.) Endurance: 10 cycles (1 byte/min.)
Shocks	IEC 60068-2-27	30 g / 11 ms / 3 shocks / direction / axis 1.058 oz. / 11 ms / 3 shocks / direction / axis
Bumps	IEC 60068-2-29	25 g / 6 ms / 500 bumps / direction / axis 0.882 oz. g / 6 ms / 500 bumps / direction / axis

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 best respond to various needs.

General

BMX P34 ••••• processors can be installed onto BMX XBP •••• racks *(see page 173)*.

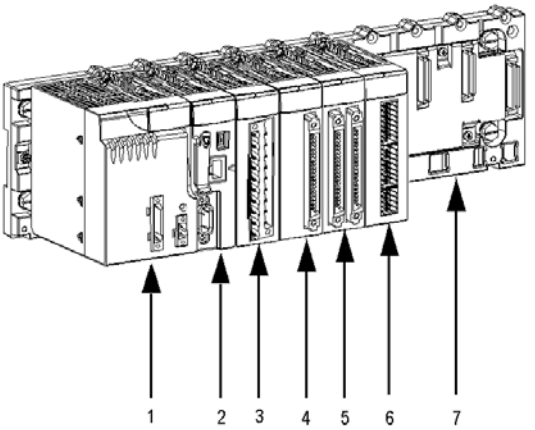
Functions

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:

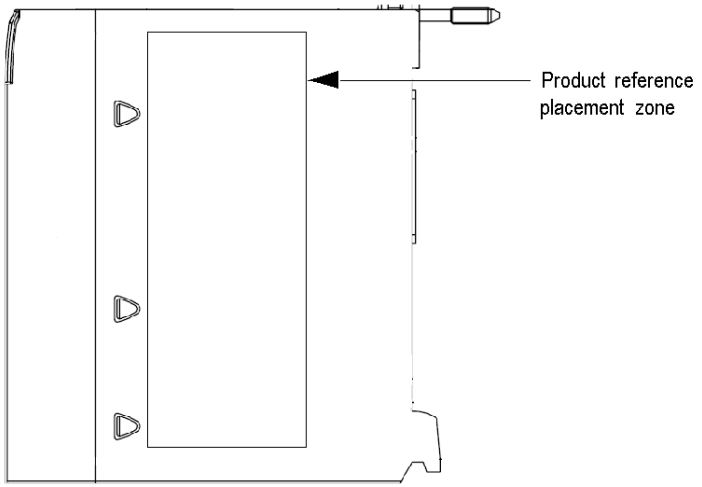


The following table gives the numbered components of the configuration above.

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	2048Kb	X	-	-
BMX P34 2000	1024	256	4096Kb	X	-	-
BMX P34 2010/ 20102	1024	256	4096Kb	X	X	-
BMX P34 2020	1024	256	4096Kb	X	-	X
BMX P34 2030/ 20302	1024	256	4096Kb	-	X	X
Key						
X Available						
- Not available						

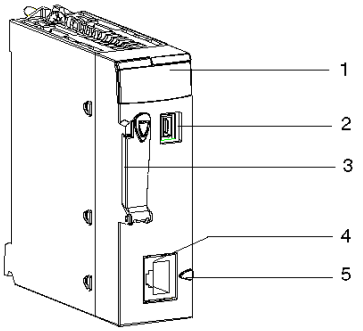
Physical Description of BMX P34 xxxx Processors

General

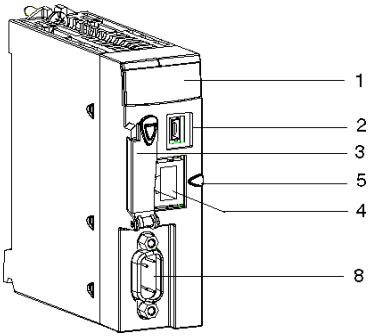
The BMX P34 •••• processors differ according to the various components they include.

Illustration

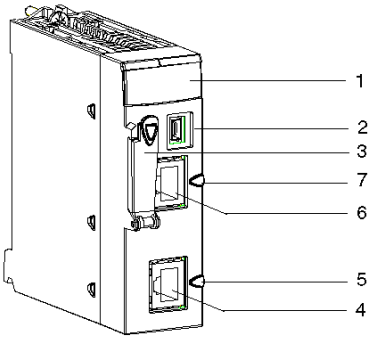
The following diagrams identify the various components of a BMX P34 •••• processor:



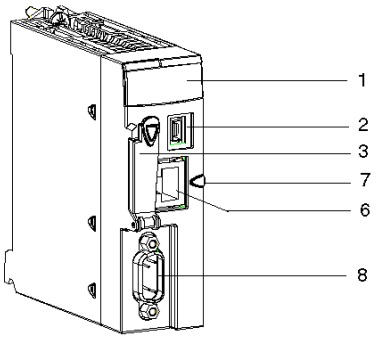
BMX P34 1000/2000 Processors



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 a protection bar *(see page 189)*.

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:

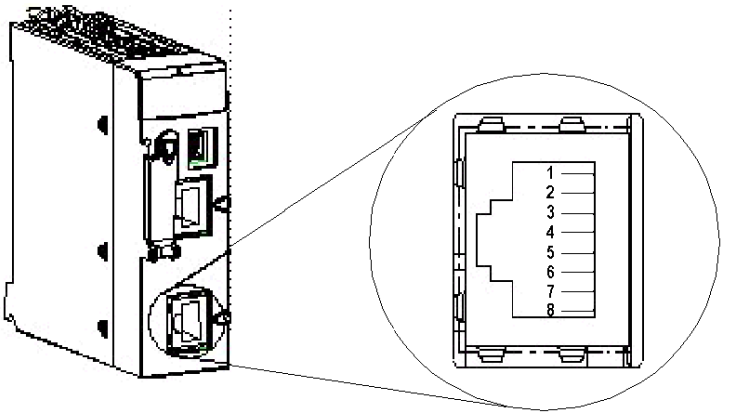
- BMX P34 1000,
- BMX P34 2000,
- BMX P34 2010/20102,
- BMX P34 2020.

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

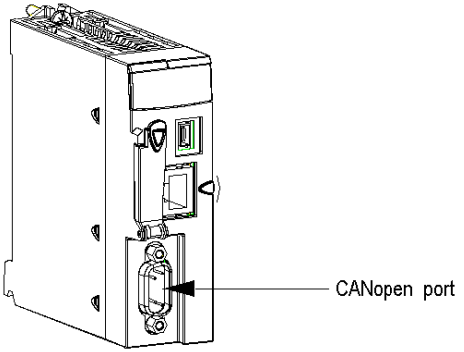
Introduction

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

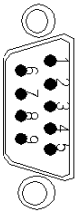
The following illustration shows the position of the BMX P34 2030 processor's CANopen port:



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

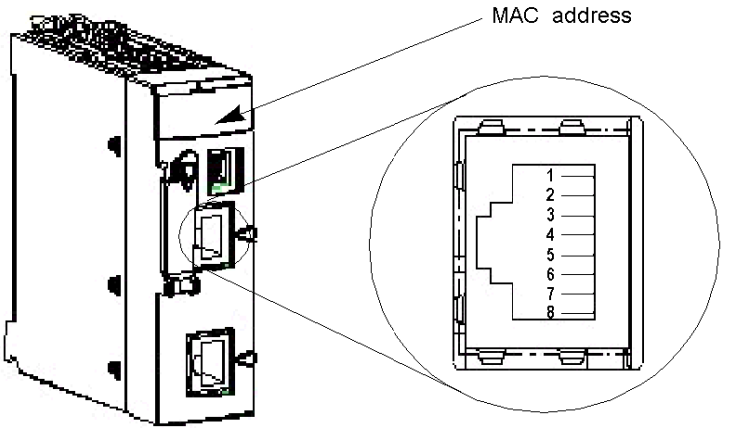
The following processors have a built-in communication channel dedicated to Ethernet communication, with 2 rotary switches which enable easy selection of the IP address processor.

- 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:

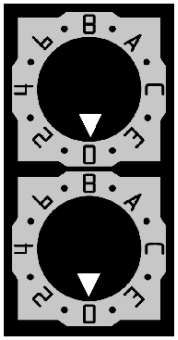
1	TD+
2	TD-
3	RD+
4	Not connected
5	Not connected
6	RD-
7	Not connected
8	Not connected

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:

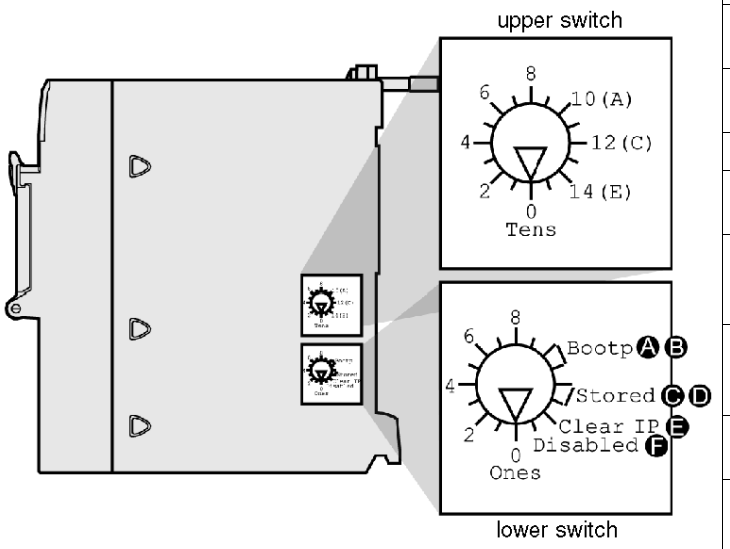
- device name: for a switch-set device name, select a numeric value from 00 to 159. You can use both switches:
  - On the upper switch (TENS digit), the available settings are 0 to 15
  - On the lower switch (ONES digit), the available settings are 0 to 9.

  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 Unity Pro 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 and Unity Pro 4.1.					

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
4	Increments the days

Bit Range	Function
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 Unity Pro 6.1 or later and 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 BMX XBP 0400/0600/0800/1200 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

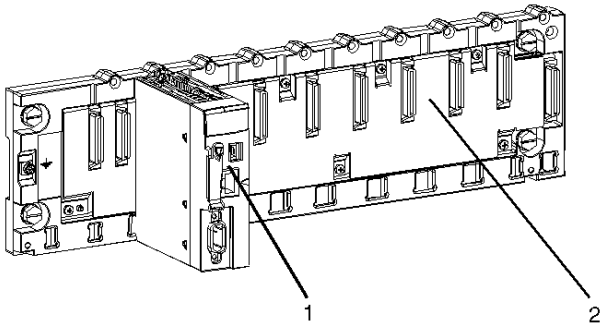
HAZARD OF ELECTRIC SHOCK

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

⚠ WARNING

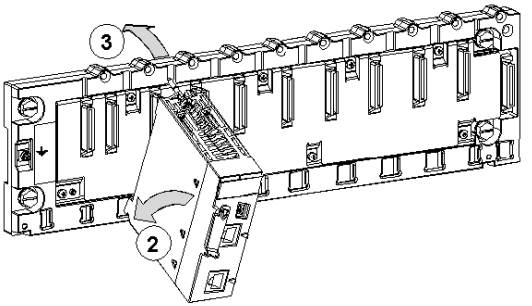
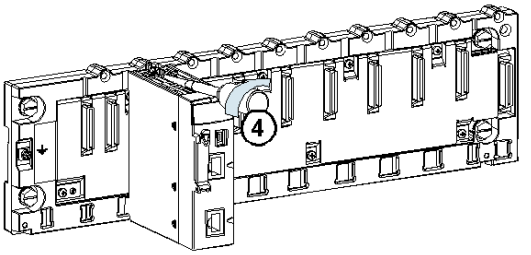
UNEXPECTED EQUIPMENT OPERATION

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.

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

Step	Action	Illustration
1	Verify that power is OFF and make sure 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 you have removed the protective cover *(see page 190)*.	
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: 

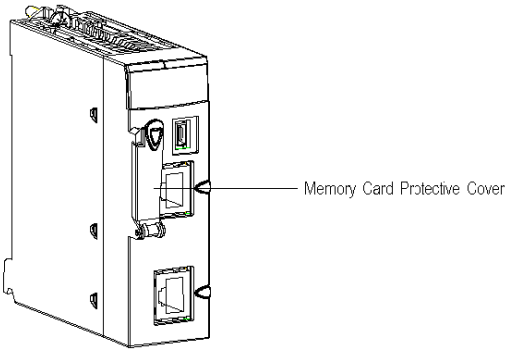
Memory Cards for BMX P34 xxxxx Processors

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.

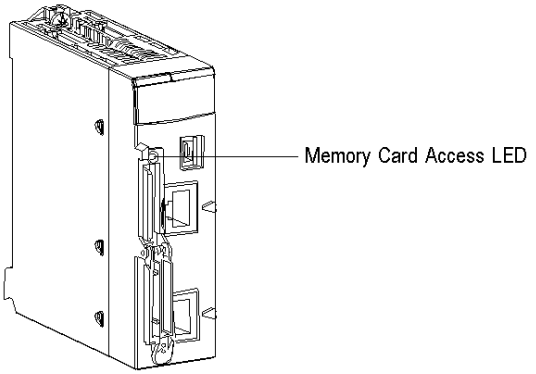
NOTE: For further information about the memory structure of the memory cards, see the Memory Structure of Modicon M340 PLCs *(see Unity Pro, Program Languages and Structure, Reference Manual)* page.

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

⚠ WARNING

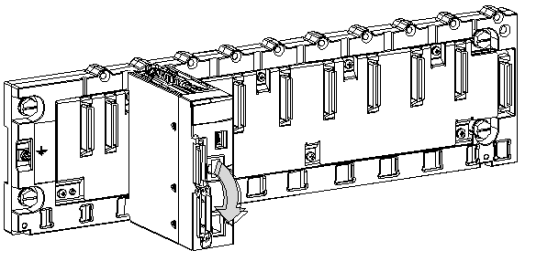
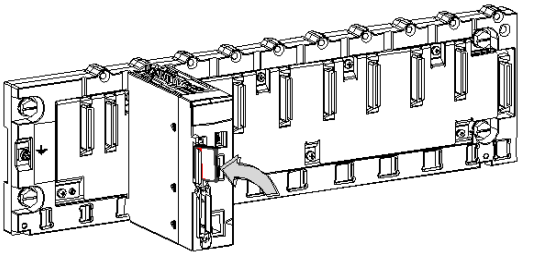
UNEXPECTED EQUIPMENT OPERATION

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.

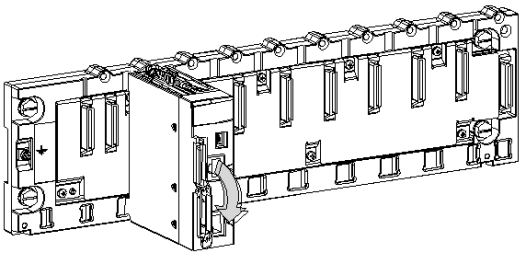
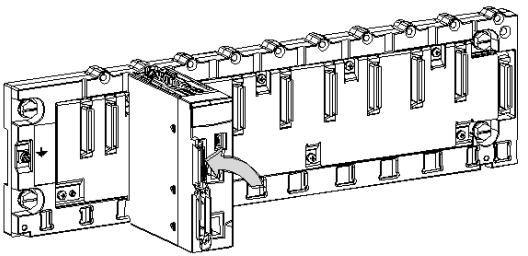
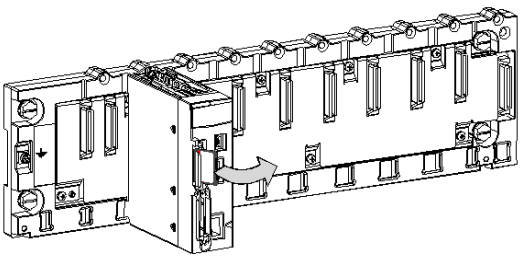
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

Step	Description	Illustration
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 Unity Pro, 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

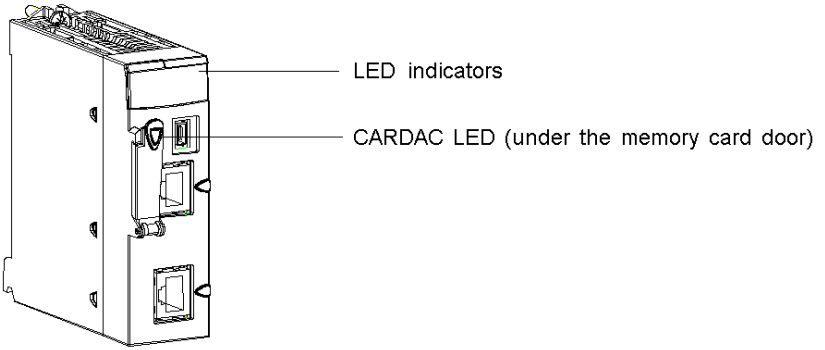
There are several LEDs available on the front panel of each processor, enabling rapid diagnosis of the PLC status.

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:

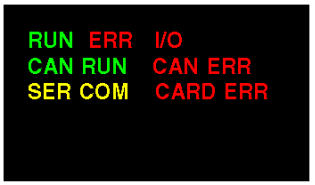


BMX P34 1000/2000 Processors LEDs

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:

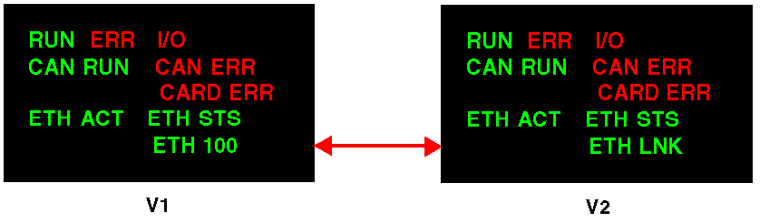


BMX P34 2020 Processor LEDs

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 82)* 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 Unity Pro, 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.
	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
DEFE	SFC steps undefined

Hexadecimal Value of %SW125	Corresponding Error
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).

RUN Status LED	ERR Status LED	I/O Status LED	System Bit	Error
-	-	ON	%S40 - %S47 at 0	Input/output error in at rack level. (%S40: rack 0 - %S47: rack 7).
Key:				
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 Unity Pro 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

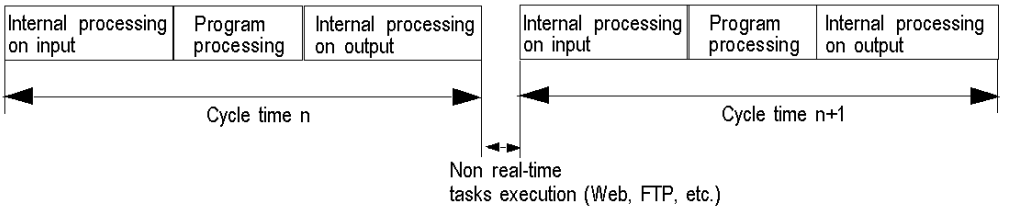
BMX P34 •••• processors can execute single-task and multi-task applications. Unlike a single-task application, which only executes master tasks, a multi-task application .defines the task execution priorities.

Master Task

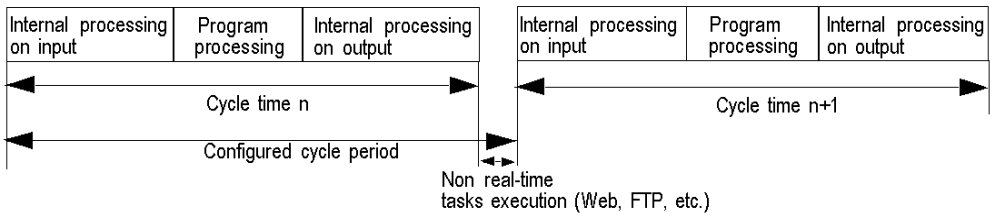
The master task represents the application program's main task. You can choose from the following MAST task execution modes:

- 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.

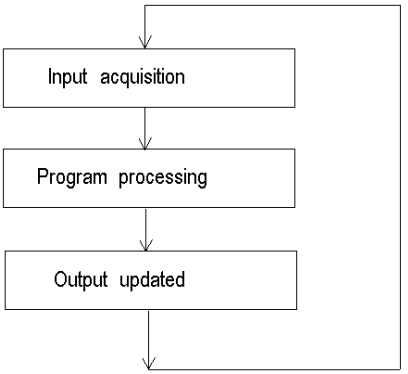
Event tasks can be checked with the following system bits and system words:

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

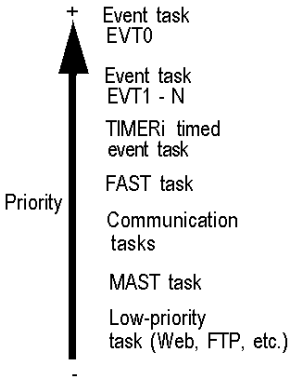
A single-task application program is associated with one task; the MAST task.

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

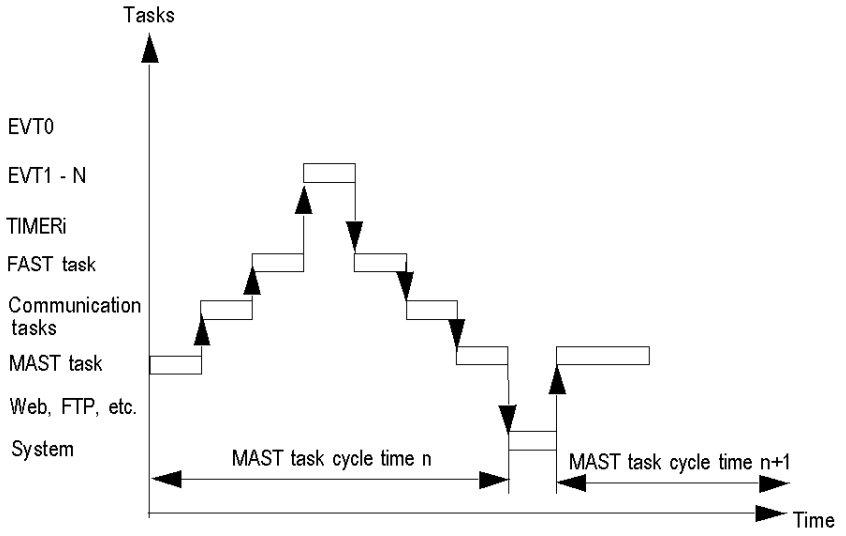


Multi-Task Execution

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

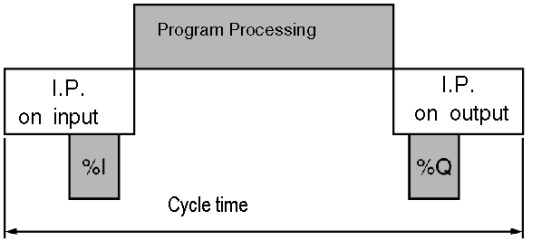
General

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 DRO 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 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 DAO 1605, 16 discrete outputs module	60 µs	45 µs	105 µs
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	65 µs	47 µs	112 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 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 108)* ● maximum communication system reception time and input management time for implicit inputs/outputs *(see page 108)* ● maximum communication system transmission time and output management time for implicit inputs *(see page 108)*
2	Calculate the program processing time *(see page 107)* 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 108)*

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

Part III
BMX CPS xxxx Power Supply Modules

Subject of this Part

This part describes BMX CPS •••• power supply modules and their installation.

What Is in This Part?

This part contains the following chapters:

Chapter 10
Introduction to BMX CPS xxxx Power Supply Modules

Subject of this Section

This section describes the BMX CPS •••• power supply modules.

What Is in This Chapter?

This chapter contains the following topics:

General Introduction

Introduction

BMX CPS •••• power supply modules are used to supply each BMX XBP •••• rack and its modules. The choice of power supply module depends on the distributed network (alternating or direct current) and the power required.

There are two types of power supply modules:

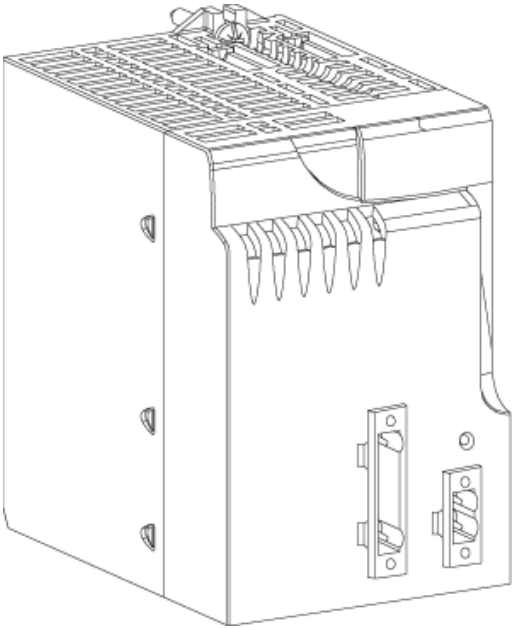
- power supply modules for alternating current networks.
- power supply modules for direct current networks.

Auxiliary Functions of the Power Supply Modules

Each power supply module has the following auxiliary functions:

- display panel
- alarm relay
- pencil tip push button which causes a reset of the rack when pressed.
- 24 VDC sensor supply (only on modules powered by 125 VDC or an alternating current network).

The following diagram shows a BMX CPS •••• power supply module:



Sensor Power Supply

The BMX CPS 2000/3500/3540T power supply modules have a built-in power supply providing a voltage of 24 VDC which is used to supply power to the sensors.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Sensors connected to this rack must be powered from this rack or from an external power supply. Using power from a different rack will cause unintended equipment operation and incorrect activation of outputs, and may damage the power supply.

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

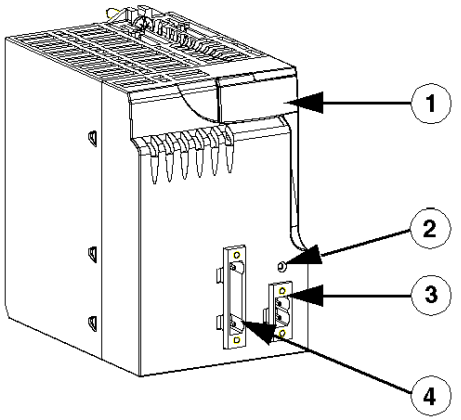
Description of the Power Supply Modules

At a Glance

BMX CPS •••• power supplies come in the form of modules.

Illustration

The following illustration identifies the various components of a BMX CPS •••• power supply module:



Description

The following table describes the components of a power supply module.

Number	Function
1	Display panel consisting of: ● 1 OK LED (green) on if rack power supply module is present and operating correctly ● One 24 V LED (green) on when sensor power supply is present. This LED is only to be found on BMX CPS 2000/3500/3540T power supply modules
2	RESET button
3	Alarm relay connector
4	Connector for the input network (and the 24 VDC sensor power supply for BMX CPS 2000/3500/3540T power supply modules)

Chapter 11
Installation of BMX CPS xxxx Power Supply Modules

Subject of this Section

This section deals with the installation of BMX CPS •••• power supply module.

What Is in This Chapter?

This chapter contains the following topics:

Definition of Protection Devices at the Start of the Line

Introduction

It is recommended that you install a protection device at the start of the line on the power supply network, including the following elements:

- circuit breaker
- fuse

The following information allows definition of the minimum caliber circuit breaker and fuse for a given power supply module.

Choice of Line Circuit Breaker

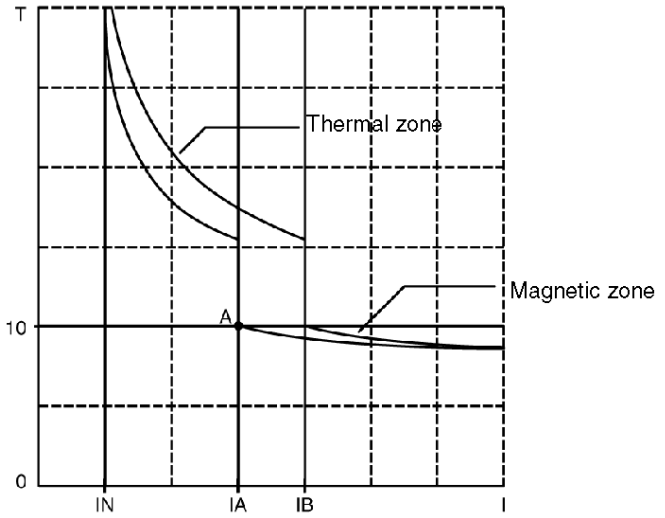
When you choose the caliber of the line circuit breaker, consider:

- nominal input current (Imrs)
- signaling current (I)
- current characteristic (It)

The choice of minimum circuit breaker caliber is made according to the following rules:

- IN circuit breaker caliber greater than the power supply nominal input current (Irms)
- maximum circuit breaker caliber greater than the power supply signaling current (I)
- current characteristic (It) at point A of the curve greater than the power supply characteristic (It)

The following graph shows an example of characteristics provided by a circuit breaker manufacturer:



Choice of Line Fuse

When you choose the caliber of the line fuse, consider:

- current characteristic (I^2t)

The choice of minimum fuse caliber is made according to the following rules:

- IN fuse caliber greater than 3 times the power supply nominal input current Irms
- fuse current characteristic I^2t greater than 3 times the power supply characteristic I^2t

The following table shows the characteristics of each power supply module:

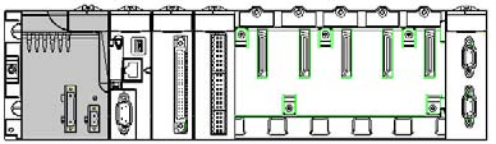
Power Supply Module		BMX CPS 2000	BMX CPS 3500	BMX CPS 3540T	BMX CPS 2010	BMX CPS 3020
nominal input current Irms	at 24 Vdc	-	-	-	1 A	1.65 A
	at 48 Vdc	-	-	-	-	0.83 A
	at 115 Vac	0.61 A	1.04 A	-	-	-
	at 125 Vdc	-	-	0.36 A	-	-
	at 230 Vac	0.31 A	0.52 A	-	-	-
signaling current I (1)	at 24 Vdc	-	-	-	30 A	30 A
	at 48 Vdc	-	-	-	-	60 A
	at 115 Vac	30 A	30 A	-	-	-
	at 125 Vdc	-	-	30 A	-	-
	at 230 Vac	60 A	60 A	-	-	-
current characteristic It	at 24 Vdc	-	-	-	0.15 As	0.2 As
	at 48 Vdc	-	-	-	-	0.3 As
	at 115 Vac	0.03 As	0.05 As	-	-	-
	at 125 Vdc	-	-	0.05 As	-	-
	at 230 Vac	0.06 As	0.07 As	-	-	-
current characteristic I^2t	at 24 Vdc	-	-	-	0.6 A^2s	1 A^2s
	at 48 Vdc	-	-	-	-	3 A^2s
	at 115 Vac	0.5 A^2s	1 A^2s	-	-	-
	at 125 Vdc	-	-	2 A^2s	-	-
	at 230 Vac	2 A^2s	3 A^2s	-	-	-
1 values at initial power-up and at 25 °C (77 °F)						

Installation/Assembly of BMX CPS xxxx Power Supply Modules

Installation

The power supply module is installed in the first two slots of each BMX XBP •••• rack.

The following illustration shows the installed the power supply module.



NOTE: Each power supply module has a guidance device which only allows it to be placed in the correct slot.

Assembly

The assembly of the BMX CPS •••• power supply modules is similar to the assembly of the BMX P34 •••• processors *(see page 79)*, and, generally speaking, similar to the assembly of other modules.

Grounding of the Power Supplies

The power supplies are equipped with ground connection contacts *(see page 26)*.

BMX CPS xxxx Power Supply Connection Rules

General

The BMX CPS •••• power supply modules of each rack must be wired with two removable terminal blocks which allow the following elements to be connected:

- main voltage
- alarm relay
- Protective Earth *(see page 186)*
- 24 VDC sensor power supply for the BMX CPS 2000/3500/3540T power supply modules.

NOTE:
Power supply modules are supplied with one 5-pin screw terminal and one 2-pin screw terminal block, furthermore two kits are on sale:

- BMX XTS CPS 10 kit which contains the following equipment:
  - one 5-pin screw terminal block
  - one 2-pin screw terminal block
  - one guidance system (only for AC and 125 VDC modules)

- BMX XTS CPS 20 kit which contains the following equipment:
  - one 5-pin spring terminal block
  - one 2-pin spring terminal block
  - one guidance system (only for AC and 125 VDC modules)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

Disconnect the power cable of the power supply module before plugging/unplugging its terminal block.

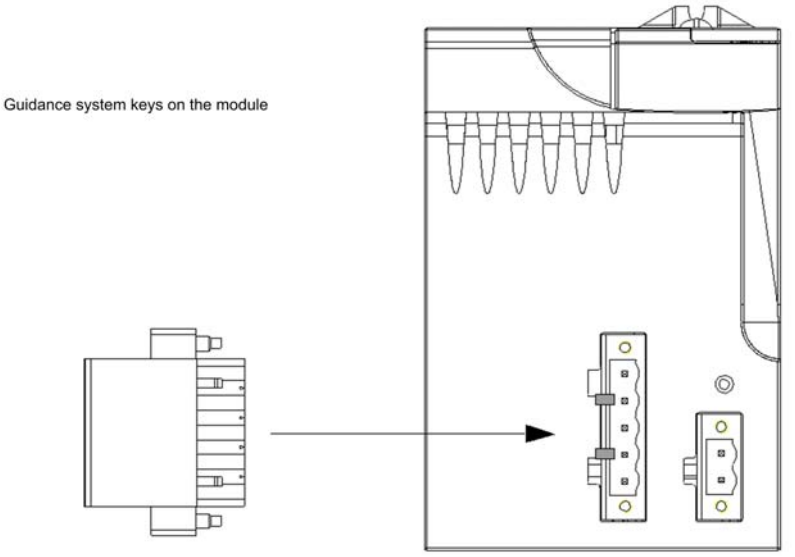
Failure to follow these instructions will result in death or serious injury.

5-pin Terminal Block Description

Guidance system of 5-pin terminal block:

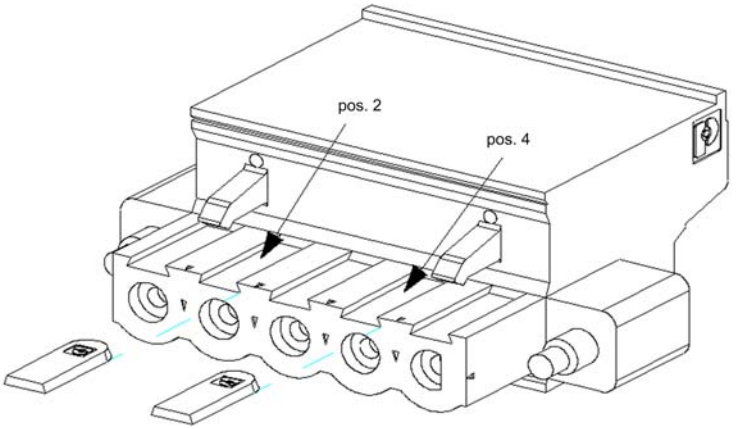
- To prevent the connection of a 5-pin terminal block wired for AC current to a DC entry module, the power supply module is provided with a guidance system, described below.
- The 5-pin terminal block provided with AC entry (BMX CPS 2000 and BMX CPS 3500) is delivered fitted with the 2 guidance system keys.
- The DC power supply module (BMX CPS 2010 and BMX CPS 3020) is delivered fitted with the 2 guidance system keys.
- The BMX XTS CPS 10 and BMX XTS CPS 20 terminal block kits are delivered with the guidance system to be installed by the user following the instruction sheet included in the kit.

The following illustration shows the guidance system for the 5-pin terminal block for DC power supply modules BMX CPS 2010 and BMX CPS 3020.

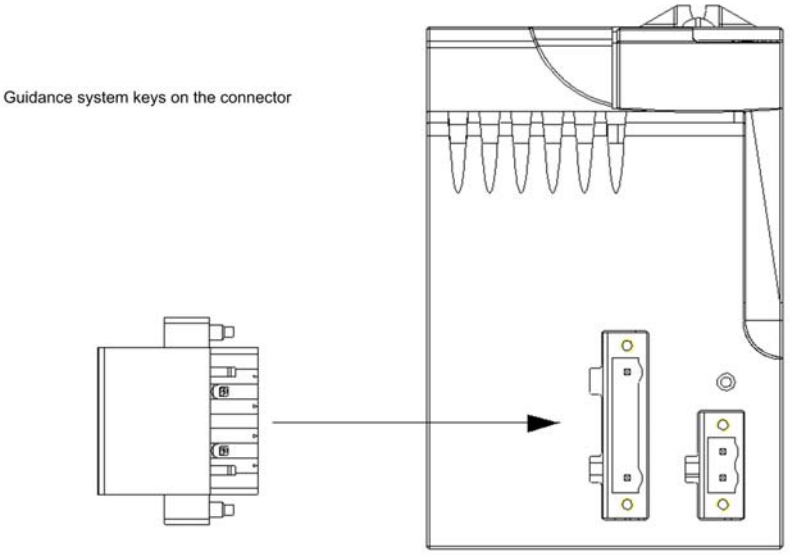


The following illustration shows the guidance system for the 5-pin terminal block for AC power supply modules BMX CPS 2000 and BMX CPS 3500).

Insertion of the guidance keys in the connector
Position 2 and 4

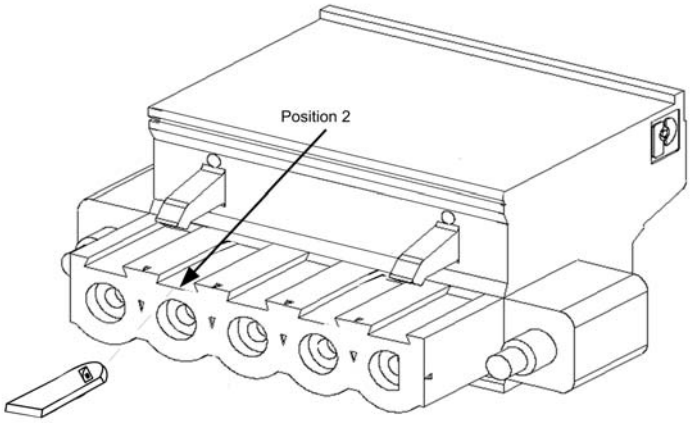


The following illustration shows the insertion of the 5-pin terminal block in AC power supply modules (BMX CPS 2000 and BMX CPS 3500).

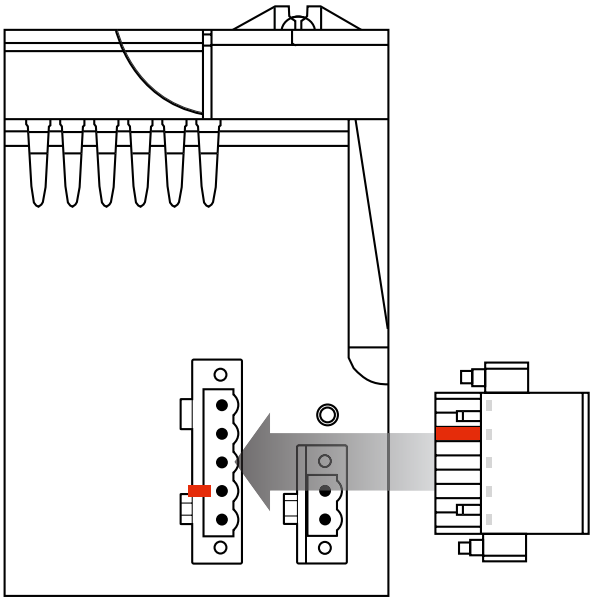


The following illustration shows the guidance system for the 5-pin terminal block for 125 VDC power supply module BMX CPS 3540T.

Insertion of the guidance keys in the connector
Position 2



The following illustration shows the insertion of the 5-pin terminal block in the 125 VDC power supply module BMX CPS 3540T. Note the guidance system key on the connector.



The connectors shipped with the product are keyed at the factory to allow you to make the correct connections. If you use connectors from an accessory kit, you will need to key them yourself.

⚠ DANGER

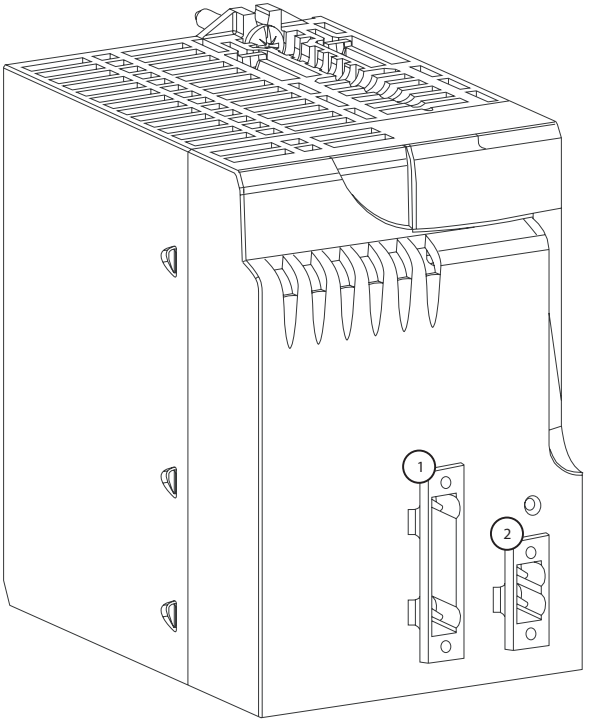
HAZARD OF ELECTRICAL SHOCK

If you are using the connectors from the BMXXTSCPS10 or BMXXTSCPS20 connector accessory kit, you must make sure that they are keyed as shown above. Refer also to the instructions in the kit.

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

Illustration

The following illustration shows the two power supply terminal blocks.



⚠ WARNING
UNEXPECTED EQUIPMENT OPERATION Take care to connect cables properly. Terminal block pinout is different on AC and DC power supplies. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The user must provide a power supply protection and cutoff device upstream to the power supply module.

When choosing the protection devices, the user should take into account the signaling currents defined in the characteristics table of the power supply module.

NOTE: As the BMX CPS 2010/3020 direct current power supply module has a strong signaling current, it is recommended not to use them on direct current networks which have a fold back current limiting protection.
If the power supply module is connected to a direct current network, the length of the power supply cable must be limited in order to avoid transmission losses.
For the BMX CPS 2010 power supply module the maximum length of the power supply cable is:

- 30 m (60 m there and back) with copper wire 2.5mm^2 in width,
- 20 m (40 m there and back) with copper wire 1.5mm^2 in width.

For the BMX CPS 3020 power supply module the maximum length of the power supply cable is:

- 15 m (30 m there and back) with copper wires 2.5mm^2 in width,
- 10 m (20 m there and back) with copper wires 1.5mm^2 in width.

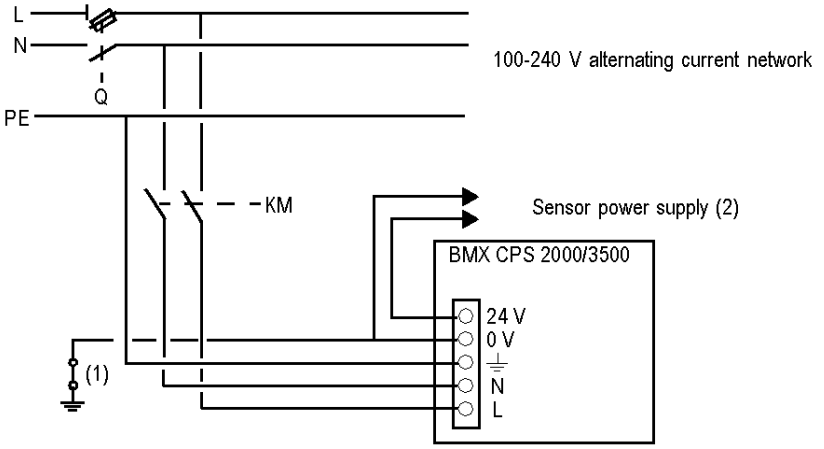
Connection of Alternating Current Power Supply Modules

Introduction

This section presents the connection of BMX CPS 2000/3500 alternating current power supply modules.

Connection of a PLC Station Constituted of a Single Rack

The following diagram shows the connection of a BMX CPS 2000/3500 module to an alternating current network:

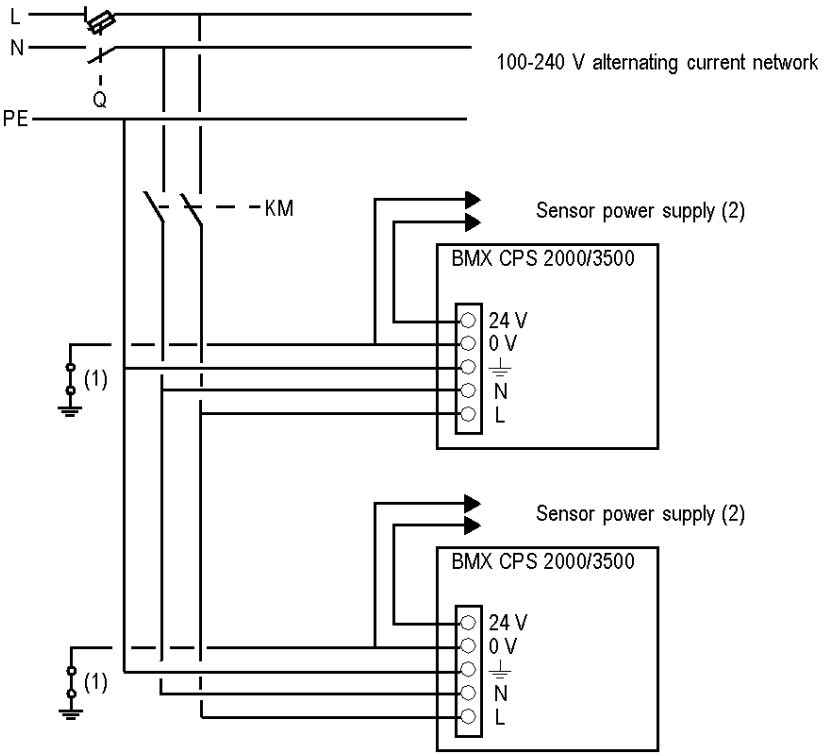


Q General isolator
KM Line contactor or circuit breaker
(1) Insulation connector bar for locating grounding errors
(2) Available current of 0.45 A for the BMX CPS 2000 module or 0.9 A for the BMX CPS 3500 module

NOTE: BMX CPS 2000/3500 alternating current power supply modules are already equipped with a protective fuse. This fuse, connected at the input phase of the alternating current network, is inside the module and is not accessible.

Connection of a PLC Station Constituted of Several Racks

The following diagram shows the connection of several BMX CPS 2000/3500 modules to an alternating current network:



Q General isolator
KM Line contactor or circuit breaker
(1) Insulation connector bar for locating grounding errors
(2) Available current of 0.45 A for the BMX CPS 2000 module or 0.9 A for the BMX CPS 3500 module

NOTE: Where there are several PLC stations supplied by the same network, the connection principle is the same.

Connection of Direct Current Power Supply Modules to a 24 V, 48 V, or 125 VDC Floating Direct Current Network

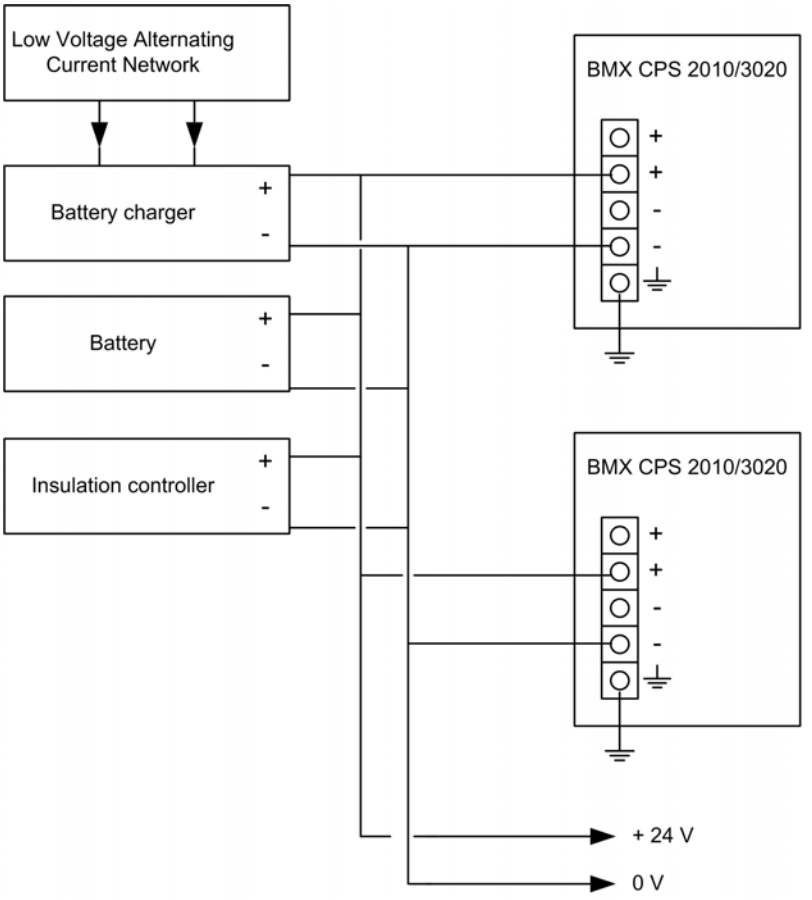
Introduction

For a floating (non-grounded) assembly used in specific applications, marine applications in particular, an insulated BMX CPS 3020 (24 V or 48 V), BMX CPS 2010 (24 V), or BMX CPS 3540T (125 VDC) power supply must be chosen.

Connection of the Power Supply to Floating Direct Current Networks

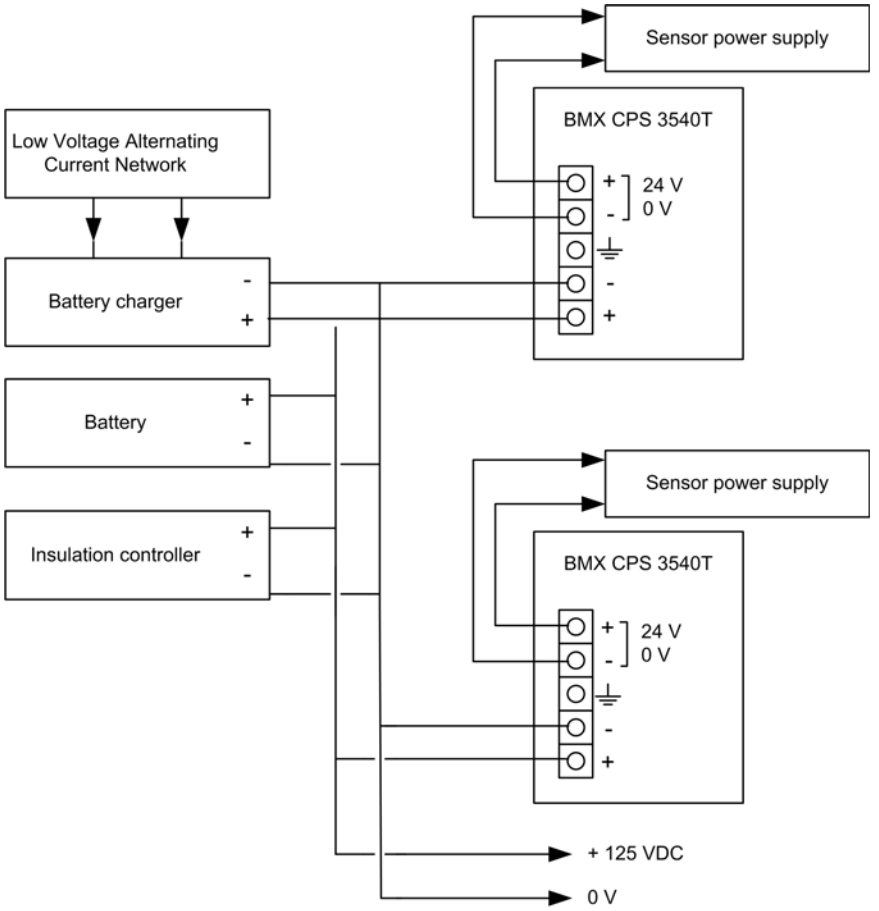
A device can permanently measure the degree of 24 VDC, 48 VDC, or 125 VDC insulation in relation to the ground and give an alert if the degree of insulation is abnormally low. All input/output modules in the Modicon M340 range are insulated.

The following illustration shows the connection of several BMX CPS 2010/3020 modules to the network:



24 VDC floating network for the power supply of sensors, actuators and input/out modules.

The following illustration shows the connection of several BMX CPS 3540T modules to the network:



125 VDC floating network for the power supply of sensors, actuators and input/out modules.

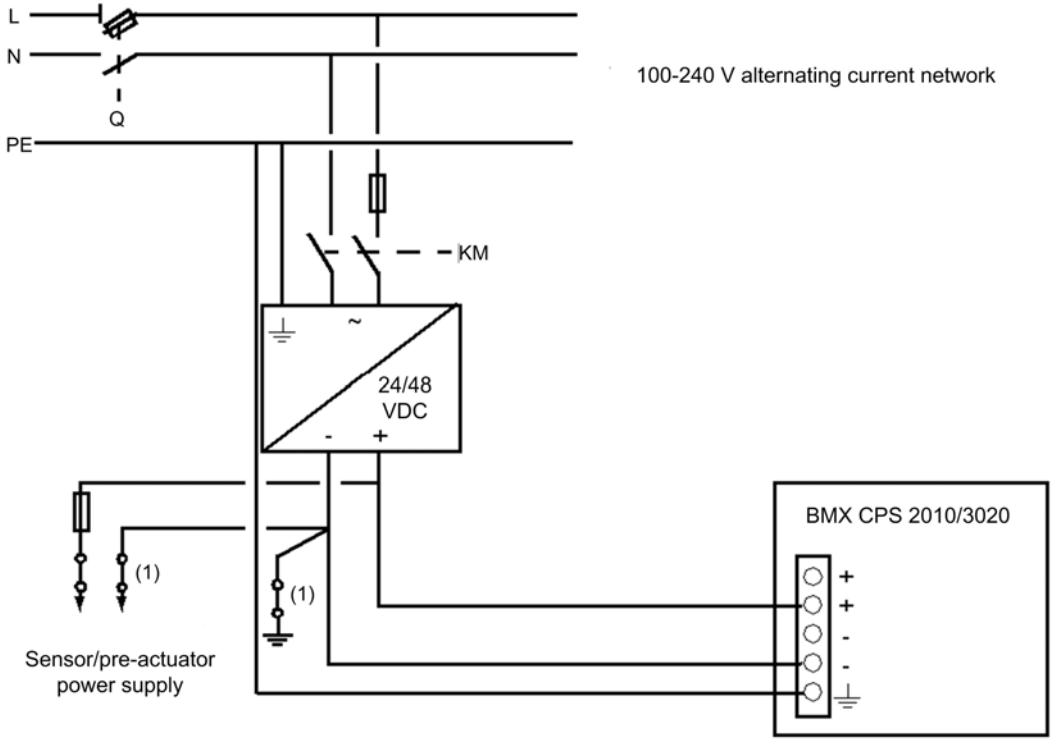
Connection of Direct Current Power Supply Modules to an Alternating Current Network

Introduction

This section presents the connection of BMX CPS 2010/3020/3540T power supply modules to an alternating current network.

Connection of a Single Rack PLC Station

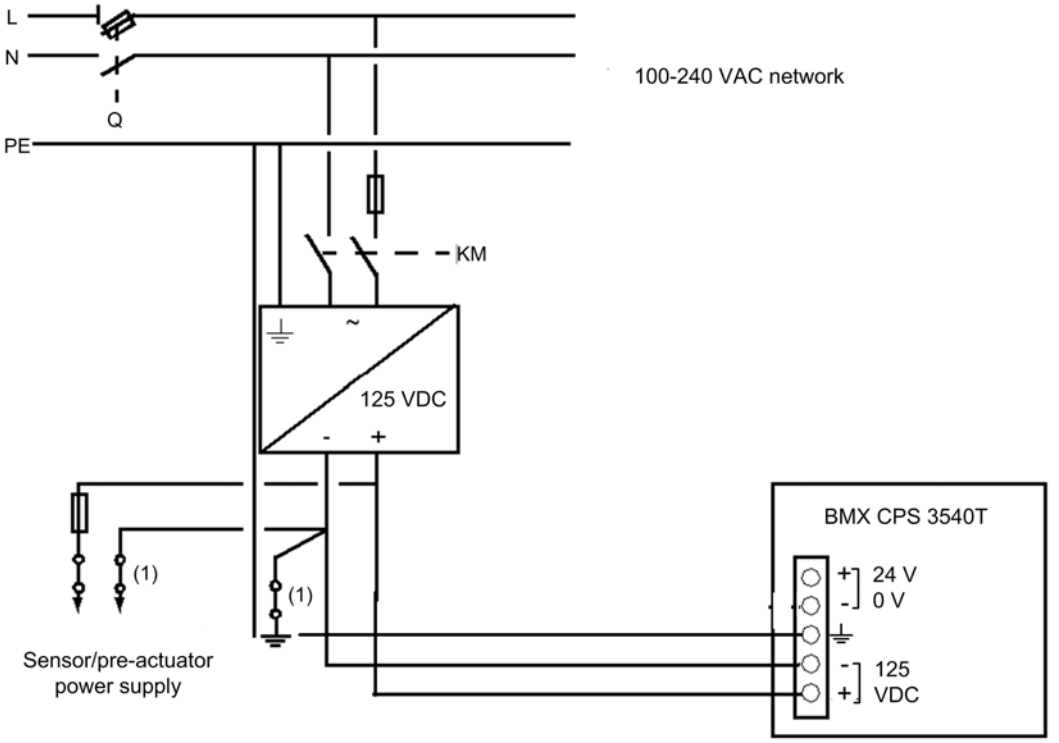
The following diagram shows the connection of a BMX CPS 2010/3020 module to a grounded alternating current network:



Q General isolator
KM Line contactor or circuit breaker
(1) Insulation connector bar for grounding

NOTE: BMX CPS 2010/3020 direct current power supply modules are already equipped with a protective fuse. This fuse, connected at the 24/48 V input, is inside the module and is not accessible.

The following diagram shows the connection of a BMX CPS 3540T module to a grounded alternating current network:

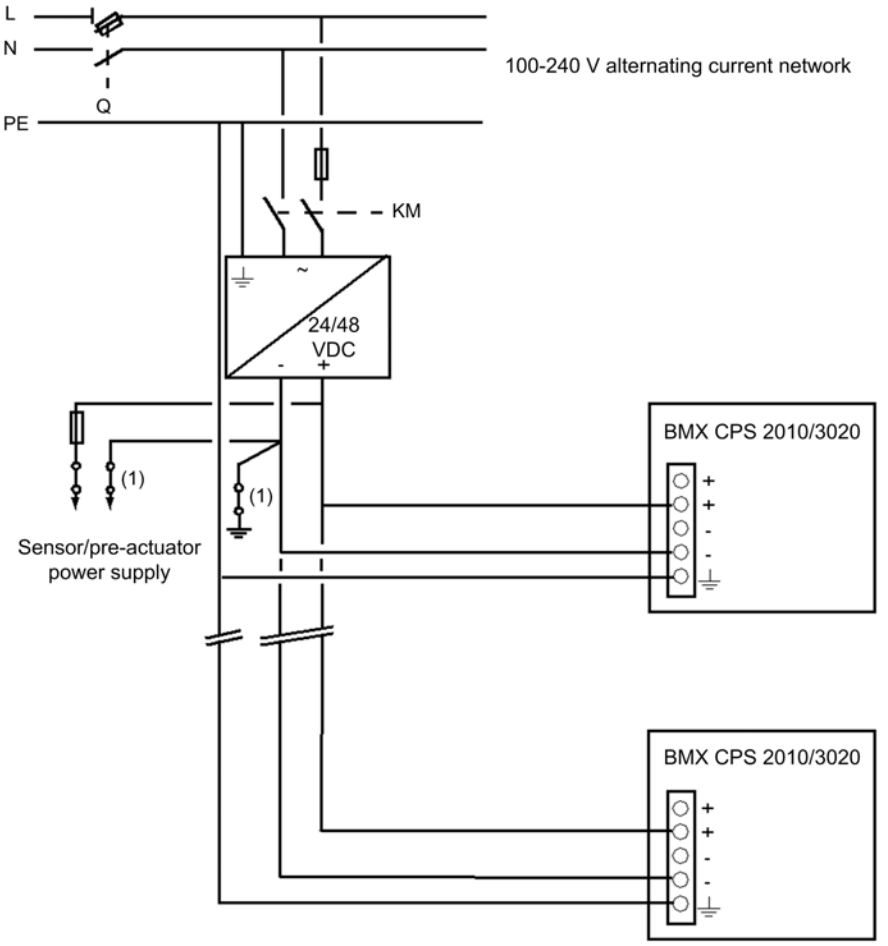


Q General isolator
KM Line contactor or circuit breaker
(1) Insulation connector bar for grounding

NOTE: BMX CPS 3540T direct current power supply modules are already equipped with a protective fuse. This fuse, connected at the 125 VDC input, is inside the module and is not accessible.

Connection of a Multi-Rack PLC Station

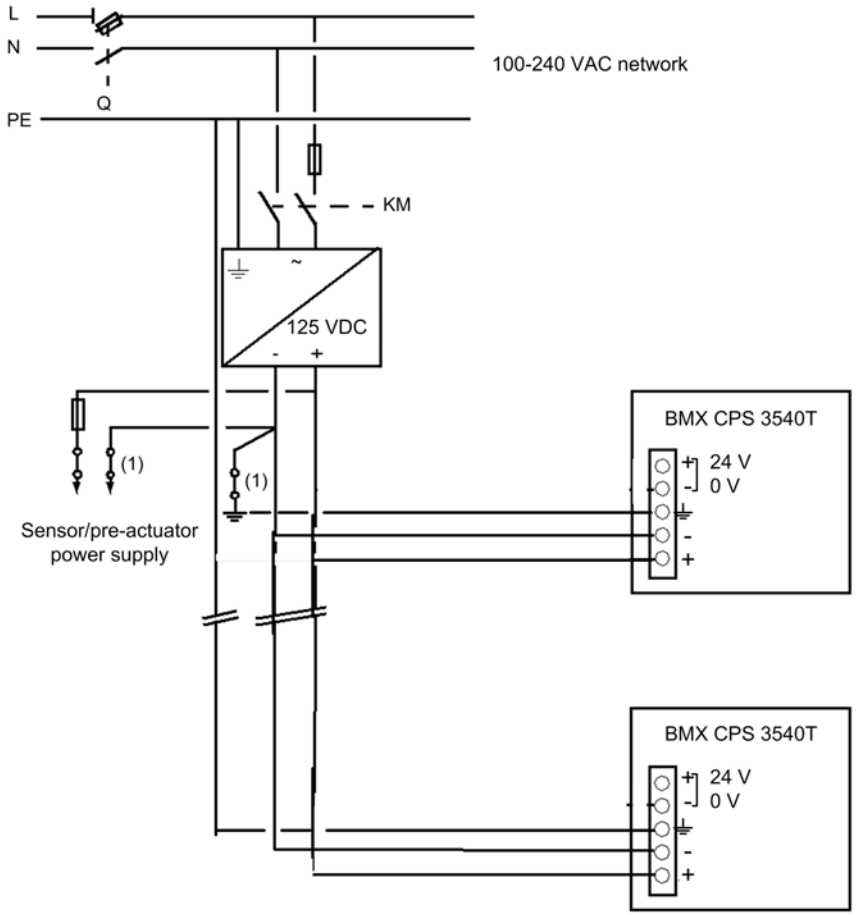
The following diagram shows the connection of several BMX CPS 2010/3020 modules to a grounded alternating current network:



Q General isolator
KM Line contactor or circuit breaker
(1) Insulation connector bar for grounding

NOTE: Where there are several PLC stations supplied by the same network, the connection principle is the same.

The following diagram shows the connection of several BMX CPS 3540T modules to a grounded alternating current network:



Q General isolator
KM Line contactor or circuit breaker
1 Insulation connector bar for grounding

NOTE: Where there are several PLC stations supplied by the same network, the connection principle is the same.

Sensor and Pre-actuator Power Supply Control by Alarm Relay

How to Set Up Sensor and Pre-actuator Power Supply

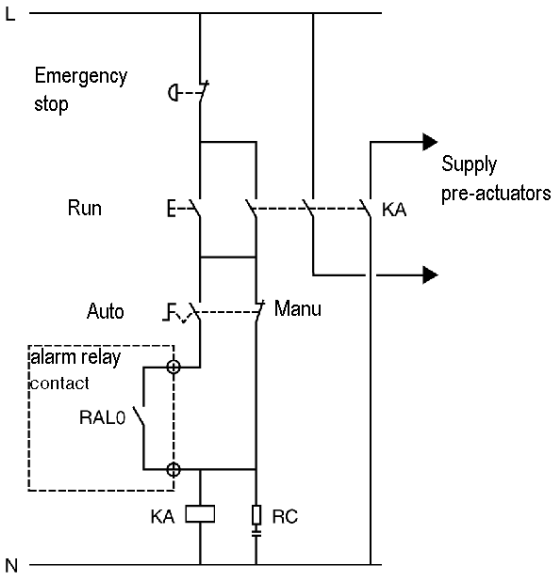
It is recommended that control of the different power supplies is set up in the following sequence.

Step	Action
1	Switch on the power supply to the PLC and the inputs (sensors), using the contactor KM (see diagram *(see page 133)*).
2	When the PLC is in RUN mode and running on MANU/AUTO, switch on the output power supply (pre-actuators), using the contactor KA. Only in AUTO, this is controlled by the alarm relay contact in each power supply. **Note:** In alternating current, the contactor KA controls the supply sensors. In direct current, the contactor KA controls the supply pre-actuators and the supply sensors.

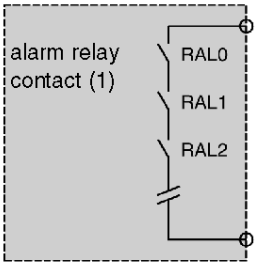
NOTE: Before restarting the installation following a stop (caused by a power outage or an emergency stop), safety standards require authorization to be given by the operator.

Example 1

The following diagram shows a PLC station supplied by alternating current:



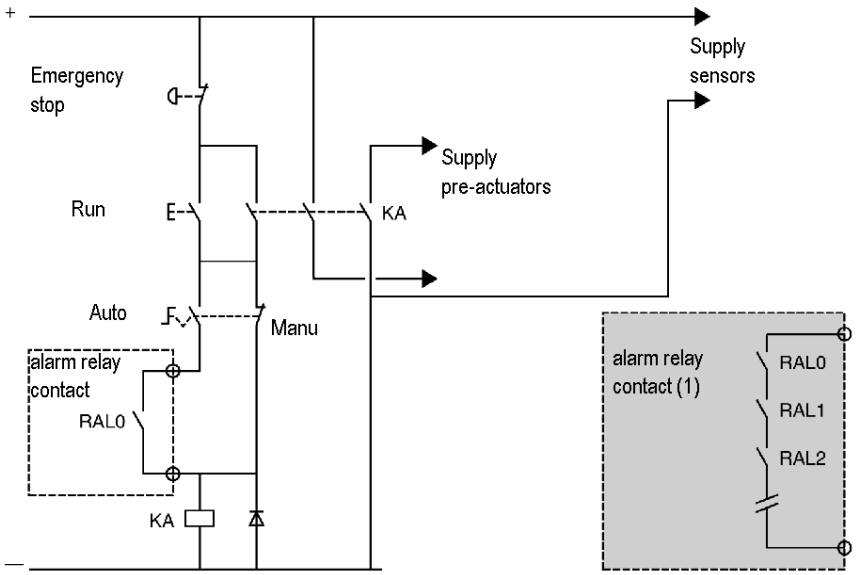
KA: contact controlled by alarm relay from supply module in AUTO run mode.



(1) When the PLC station is composed of several racks: set all the "alarm relay" contacts in series (RAL0, RAL1, RAL2, etc.).

Example 2

The following diagram shows a PLC station supplied by direct current:



KA: contact controlled by alarm relay from supply module in AUTO run mode.

(1) When the PLC station is composed of several racks: set all the "alarm relay" contacts in series (RAL0, RAL1, RAL2, etc.).

Chapter 12
BMX CPS xxxx Power Supply Module Diagnostics

Subject of this Section

This section deals with BMX CPS •••• power supply module diagnostics.

What Is in This Chapter?

This chapter contains the following topics:

LED Display

Introduction

Power supply modules have a display panel with a green **OK** LED.

The BMX CPS 2000 and BMX CPS 3500 power supplies and the BMX CPS 3540T direct current power supply have an additional green **24 V** LED.

Indications

The power supply LEDs indicate the following diagnostic information:

LED	Status Indication
OK	• ON in normal operating mode • OFF when the rack power supply output voltage is below the threshold or when the RESET button is pressed
24 V	• ON in normal operating mode • OFF if the 24 Vdc sensor voltage supplied by the power supply is no longer present

Reset Button

Introduction

The power supply module has a **Reset** button on its front panel which, when pressed, triggers an initialization sequence of the modules on the rack that it supplies.

Pressing the Reset Button

When the **Reset** button is pressed, the following events occur:

- Power is removed from the bus, forcing all modules to a cold start.
- The ALARM relay is forced to open state.
- The power supply **OK** LED is switched off.

Pressing/releasing the **Reset** button triggers a cold start. The connectors around the **Reset** button are energized.

DANGER

HAZARD OF ELECTRIC SHOCK

- Do not touch the **Reset** button directly.
- Use an insulated tool to press the **Reset** button.

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

Chapter 13
Auxiliary Functions of the BMX CPS xxxx Power Supply Modules

Subject of this Section

This section deals with the auxiliary functions of the BMX CPS •••• power supply modules.

What Is in This Chapter?

This chapter contains the following topics:

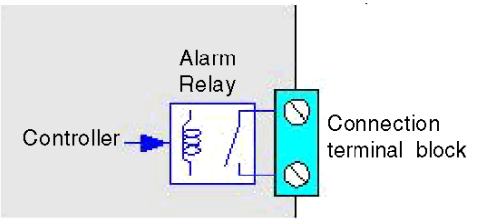
Alarm Relay on BMX CPS xxxx Power Supply Modules

Introduction

The alarm relay located in each power supply module has a potential free contact accessible on the module's connection screw terminal block.

Illustration

The circuit diagram for the power supply module relay alarm is shown below:



Relay Alarm Operation

In normal operating mode, with the PLC in RUN, the alarm relay is activated and its contact is closed (status 1).

The relay falls back and its associated contact opens (status 0) upon any stoppage, even partial, of the application, caused by one of the following factors:

- appearance of a "blocking" error,
- incorrect rack power supply output voltage,
- disappearance of the mains voltage.

⚠ DANGER

LOSS OF ABILITY TO PERFORM SAFETY FUNCTIONS

Always use a redundant device when using the alarm relay in a function safety application.

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

Characteristics of the Alarm Relay Contact

Introduction

This section presents the characteristics of the BMX CPS 2000/2010/3020/3500/3540T power supply modules relay alarm.

Characteristics

The following table shows the characteristics of the contact on the BMX CPS 2000/2010/3020/3500/3540T power supply modules relay alarm.

Voltage limit when in use	Alternating current Direct current		264 V	
			62.4 V	
Thermal Current	2 A			
Service Life	Mechanical	20 million cycles		
	Electrical	Alternating current	200 V/1.5 A 240 V/1 A cos ∅ = 0.7	≥ 100,000 cycles
			200 V/0.4 A 240 V/0.3 A cos ∅ = 0.7	≥ 300,000 cycles
			200 V/1 A 240 V/0.5 A cos ∅ = 0.35	≥ 100,000 cycles
			200 V/0.3 A 240 V/0.15 A cos ∅ = 0.35	≥ 300,000 cycles
		Direct current	24 V/1 A 48 V/0.3 A L/R = 7 ms	≥ 100,000 cycles
			24 V/0.3 A 48 V/0.1 A L/R = 7 ms	≥ 300,000 cycles
Minimum Commutable Load			1 mA/5 V	
Response Time	Opening	< 12 ms		
	Closing	< 10 ms		
Type of Contact	At closing			

Built-in Protections	Against overload and short circuits		None, installation of a quick-blow fuse obligatory
	Against inductive over-voltage in alternating current		None, simultaneous installation of an RC circuit or MOV (ZNO) suppressor appropriate to the voltage in each pre-actuator terminal is obligatory
	Against inductive over-voltage in direct current		None, installation of a discharge diode in each pre-actuator terminal is obligatory
Insulation (Test Voltage)	Contact/Ground	1500 V eff.- 50 Hz-1 mn (altitude 0 - 4,000 m (32 - 7,232 ft))	
	Insulation resistance	> 10 MΩ under 500 VDC	

Chapter 14
BMX CPS xxxx Power Supply Module Power and Power Consumption Breakdown

Subject of this Section

This section provides a breakdown of the power and power consumption for each of the power supply modules.

What Is in This Chapter?

This chapter contains the following topics:

Usable Power

Introduction

When the power necessary for a rack has been calculated, the information in this section is used to select the appropriate power supply module to be installed on the rack.

Usable Power

The following table shows the power supply module usable power in the temperature range 0...60 °C (32...140 °F).

Power	BMX CPS 2000	BMX CPS 2010	BMX CPS 3020	BMX CPS 3500	BMX CPS 3540 T
total usable power (all outputs included)	20 W	17 W	32 W	36 W	36 W
usable power at the 3V3_BAC output	8.3 W (2.5 A)	8.3 W (2.5 A)	15 W (4.5 A)	15 W (4.5 A)	15 W (4.5 A)
usable power at the 24V_BAC output	16.5 W (0.7 A)	16.5 W (0.7 A)	31.2 W (1.3 A)	31.2 W (1.3 A)	31.2 W (1.3 A)
usable power at the 3V3_BAC and 24V_BAC outputs	16.5 W	16.5 W	31.2 W	31.2 W	31.2 W
usable power at the 24V_SENSORS output	10.8 W (0.45 A)	-	-	21.6 W (0.9 A)	21.6 W (0.9 A)

The power supply modules operate in an extended temperature range of -25...0 °C (-13...32 °F) and 60...70 °C (140...158 °F). The following table shows how power is derated when operation is in the extended ranges.

Power	BMX CPS 3020 H	BMX CPS 3500 H	BMX CPS 3540 T
total usable power (all outputs included)	24 W	27 W	27 W
usable power at the 3V3_BAC output	11.25 W (3.375 A)	11.25 W (3.375 A)	11.25 W (3.375 A)
usable power at the 24V_BAC output	23.4 W (0.975 A)	23.4 W (0.975 A)	23.4 W (0.975 A)
usable power at the 3V3_BAC and 24V_BAC outputs	23.4 W	23.4 W	23.4 W
usable power at the 24V_SENSORS output	-	16.2 W (0.5 A)	16.2 W (0.5 A)

NOTE: The 24V_SENSORS output is the 24 Vdc sensor power supply output and is only available on the **BMX CPS 2000/3500/3500 H/3540 T** modules.

Excessive load can cause the power supply to trip off

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION - POWER DEMAND

Do not exceed the **BMX CPS 3500 H** and **BMX CPS 3540 T** 24V_SENSORS output power rating.

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

Power Limits

Excessive load can cause the power supply to trip off.

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION - POWER DEMAND

Do not exceed the total useful power rating of the module. Use the rules below to determine the maximum power supplied to outputs.

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

When establishing the power used by the **BMX CPS 2000/3500/3500 H/3540 T** modules, follow these rules:

- Do not let the sum of the power absorbed on the 3V3_BAC, 24V_BAC, and 24V_SENSORS outputs exceed the maximum usable power of the module.
- Do not let the sum of the power absorbed on the 3V3_BAC and 24V_BAC outputs exceed the sum of their usable power.

When establishing the power used by the **BMX CPS 2010/3020/3020 H** modules:

- Do not let the sum of the power absorbed on the 3V3_BAC and 24V_BAC outputs exceed the maximum usable power of the module.

Module Power Consumption

At a Glance

The power necessary for a rack depends on the type of modules installed on it. It is, therefore, necessary to calculate the power consumption in order to define the power supply module to be installed on the rack.

This section presents the average power consumption by module. This is the average of the maximum consumption and the typical consumption. Using this table, is it possible to calculate the power consumption per rack and, therefore, the power supply module needed on the rack.

Module Power Consumption

The following table gives the average power consumption for each module.

Type of Module	Module		Average Power Consumption in mA		
	Reference	Description	On the 3,3V_BAC output	On the 24VR_BAC output	On the 24V_SENSORS output
Processor	BMX P34 1000	CPU 340-10 Modbus	-	72	-
	BMX P34 2000	CPU 340-20 Modbus	-	72	-
	BMX P34 2010/20102	CPU 340-20 Modbus CANopen	-	90	-
	BMX P34 2020	CPU 340-20 Modbus Ethernet	-	95	-
	BMX P34 2030/20302	CPU 340-20 Ethernet CANopen	-	135	-

Type of Module	Module		Average Power Consumption in mA		
	Reference	Description	On the 3,3V_BAC output	On the 24VR_BAC output	On the 24V_SENSORS output
Analog	BMX AMI 0410	4 isolated high speed analog inputs	150	45	-
	BMX AMI 0800	8 non-isolated high speed analog inputs	150	41	-
	BMX AMI 0810	8 isolated high speed analog inputs	150	54	-
	BMX AMM 0600	4 channel analog inputs	240	-	120
	BMX AMO 0210	2 isolated analog outputs	150	110	-
	BMX AMO 0410	4 isolated high speed analog outputs	150	140	-
	BMX AMO 0802	8 non-isolated high speed analog outputs	150	135	-
	BMX ART 0414	4 isolated analog inputs	150	40	-
	BMX ART 0814	8 isolated analog inputs	220	50	-
Communication	BMX NOE 0100	Ethernet 1 port 10/100 RJ45	-	90	-
	BMX NOE 0110	Ethernet 1 port 10/100 RJ45	-	90	-
Counting	BMX EHC 0200	2 channel high speed counter	200	40	80
	BMX EHC 0800	8 channel high speed counter	200	-	80

Type of Module	Module		Average Power Consumption in mA		
	Reference	Description	On the 3,3V_BAC output	On the 24VR_BAC output	On the 24V_SENSORS output
Discrete inputs	BMX DAI 0805	8 discrete 200 to 240Vac inputs	103	13	-
	BMX DAI 1602	16 discrete 24Vac/24Vdc inputs	90	-	60
	BMX DAI 1603	16 discrete 48Vac inputs	90	-	60
	BMX DAI 1604	16 discrete 100 to 120Vac inputs	90	-	-
	BMX DDI 1602	16 discrete 24Vdc inputs	90	-	60
	BMX DDI 1603	16 discrete 48Vdc inputs	75	-	135
	BMX DDI 1604T	16 discrete 125Vdc inputs	75	-	135
	BMX DDI 3202 K	32 discrete 24Vdc inputs	140	-	110
	BMX DDI 6402 K	64 discrete 24Vdc inputs	200	-	110
Discrete outputs	BMX DAO 1605	16 discrete outputs	100	95	-
	BMX DDO 1602	16 discrete 0,5A outputs	100	-	-
	BMX DDO 1612	16 discrete outputs	100	-	-
	BMX DDO 3202 K	32 discrete 0,1A outputs	150	-	-
	BMX DDO 6402 K	64 discrete 0,1A outputs	240	-	-
	BMX DRA 0804T	8 discrete isolated outputs	100	110	-
	BMX DRA 0805	8 discrete isolated outputs	100	55	-
	BMX DRA 1605	16 discrete outputs	100	95	-

Type of Module	Module		Average Power Consumption in mA		
	Reference	Description	On the 3,3V_BAC output	On the 24VR_BAC output	On the 24V_SENSORS output
Discrete inputs/outputs	BMX DDM 16022	8 discrete 24Vdc inputs and 8 discrete outputs	100	-	30
	BMX DDM 16025	8 discrete 24Vdc inputs and 8 discrete outputs	100	50	30
	BMX DDM 3202 K	16 discrete 24Vdc inputs and 16 discrete outputs	150	-	55
Motion	BMX MSP 0200	2 independent pulse train output channels	200	150	-

Power Calculation Tables

The following table describes the method to establish a power calculation for modules without 24V_Sensor power available.

Power	Calculation	Result:
Power necessary on the 3.3 V rack output (P 3.3 V rack)	Current absorbed on the 3V3_BAC output by all modules *(see page 156)* x 10^{-3} A x 3.3 V	=.....W
Power necessary on the 24 V rack output (P 24 V rack)	Current absorbed on the 24V_BAC output by all modules *(see page 156)* x 10^{-3} A x 24 V	=.....W
Total power necessary	P 3.3 V rack + P 24 V rack	=.....W

The following table describes the method to establish a power calculation for modules with 24V_Sensor power available.

Power	Calculation	Result:
Power necessary on the 3.3 V rack output (P 3.3 V rack)	Current absorbed on the 3V3_BAC output by all modules *(see page 156)* x 10^{-3} A x 3.3 V	=.....W
Power necessary on the 24 V rack output (P 24 V rack)	Current absorbed on the 24V_BAC output by all modules *(see page 156)* x 10^{-3} A x 24 V	=.....W
Power necessary on the 24 V sensor output (P 24 V sensors)	Current absorbed on the 24V_SENSORS output by all modules *(see page 156)* x 10^{-3} A x 24 V	=.....W
Total power necessary	P 3.3 V rack + P 24 V rack + P 24 V sensors	=.....W

Characteristics of the BMX CPS 2000 Power Supply Module

General

The BMX CPS 2000 module is an alternating current power supply module.

Characteristics

The following table shows the characteristics of the BMX CPS 2000 module.

Characteristics of the primary block	Nominal voltage		100 – 120 V/200 – 240 V
	Voltage range		85 - 264 V
	Nominal frequency / frequency range		50-60 Hz/47-63 Hz
	Power		70 VA
	Nominal current consumption		0.61 A at 115 V 0.31 A at 240 V
	Initial power-up at 25° C (1)	InRush current I	≤ 30 A at 120 V ≤ 60 A at 240 V
		I^2t at locking	≤ 0.5 A^2s at 120 V ≤ 2 A^2s at 240 V
		It at locking	≤ 0.03 As at 120 V ≤ 0.06 As at 240 V
	Acceptable duration of power interruptions		≤ 10 ms
	Built-in over-current protection	By internal, inaccessible fuse	
Characteristics of the secondary block	Total usable power		20 W
	Maximum usable power at the two outputs, 3V3_BAC and 24V BAC		16.5 W
	3V3_BAC output	Nominal voltage	3.3 V
		Nominal current	2.5 A
		Power (typical)	8.3 W
	24V BAC output	Nominal voltage	24 VDC
		Nominal current	0.7 A
		Power (typical)	16.5 W
	24V_SENSORS output	Nominal voltage	24 VDC
		Nominal current	0.45 A
		Power (typical)	10.8 W
	3V3_BAC, 24V BAC and 24V_SENSORS output protection	Against overload, short circuits and over-voltage	

Maximum Dissipated Power			8.5 W
Characteristics of the auxiliary functions	Alarm relay	Normally open dry contacts	
	Display	Front panel LED	
	Back-up battery	No	
	Dielectric resistance at 50 Hz-1mn and altitude in the 0 - 4,000 m (32 - 7,232 ft) range	Primary/secondary (24V_BAC/3V3_BAC)	1,500 Vrms
		Primary/secondary (24V_SENSORS)	2,300 Vrms
		Primary/ground	1,500 Vrms
		24V_SENSORS/ground output	500 Vrms
	Insulation resistance	Primary/secondary	≥ 100 MΩ
		Primary/ground	≥ 100 MΩ

(1) These values are to be taken into account for the start-up of several devices simultaneously or for establishing the size of the protection devices.

Characteristics of the BMX CPS 3500 Power Supply Module

General

The BMX CPS 3500 modules are alternating current power supply modules.

Characteristics

The following table shows the characteristics of the BMX CPS 3500 module.

Characteristics of the primary block	Nominal voltage		100 - 120 V/200 - 240 V
	Voltage range		85 - 264 V
	Nominal frequency / frequency range		50-60 Hz/47-63 Hz
	Power		120 VA
	Nominal current consumption		1.04 A at 115 V 0.52 A at 240 V
	Initial power-up at 25° C (1)	InRush current I	≤ 30 A at 120 V ≤ 60 A at 240 V
		I^2t at locking	≤ 1 A^2s at 120 V ≤ 3 A^2s at 240 V
		It at locking	≤ 0.05 As at 120 V ≤ 0.07 As at 240 V
	Acceptable duration of power interruptions		≤ 10 ms
	Built-in over-current protection	By internal, inaccessible fuse	
Characteristics of the secondary block	Total useful power		36 W
	Maximum useful power at the two outputs, 3V3_BAC and 24V BAC		31.2 W
	3V3_BAC output	Nominal voltage	3.3 V
		Nominal current	4.5 A
		Power (typical)	15 W
	24V BAC output	Nominal voltage	24 VDC
		Nominal current	1.3 A
		Power (typical)	31.2 W
	24V_SENSORS output	Nominal voltage	24 VDC
		Nominal current	0.9 A
		Power (typical)	21.6 W
	3V3_BAC, 24V BAC and 24V_SENSORS output protection	Against overload, short circuits and over-voltage	

Maximum Dissipated Power			8.5 W
Characteristics of the auxiliary functions	Alarm relay	Normally open dry contacts	
	Display	Front panel LED	
	Back-up battery	No	
	Dielectric resistance at 50 Hz-1 mn and altitude in the 0 - 4,000 m (32 - 7,232 ft) range	Primary/secondary (24V_BAC/3V3_BAC)	1,500 Vrms
		Primary/secondary (24V_SENSORS)	2,300 Vrms
		Primary/ground	1,500 Vrms
		24V_SENSORS/ground output	500 Vrms
	Insulation resistance	Primary/secondary	≥ 100 MΩ
		Primary/ground	≥ 100 MΩ

(1) These values are to be taken into account for the start-up of several devices simultaneously or for establishing the size of the protection devices.

Characteristics of the BMX CPS 3540T Power Supply Module

General

The BMX CPS 3540T module is a high power 125 VDC power supply module.

Characteristics

The following table shows the characteristics of the BMX CPS 3540T module.

Characteristics of the primary block	Nominal voltage		125 VDC
	Voltage range		100-150 VDC
	Power		45 W
	Nominal current consumption		0.36 A at 125 VDC
	Initial power-up at 25° C (1)	InRush current I	≤ 30 A at 125 V
		I^2t at locking	≤ 2 A^2s at 125 V
		It at locking	≤ 0.05 As at 125 V
	Acceptable duration of power interruptions		≤ 10 ms
	Built-in over-current protection	By internal, inaccessible fuse	
Characteristics of the secondary block	Total useful power		36 W
	Maximum useful power at the two outputs, 3V3_BAC and 24V BAC		31.2 W
	3V3_BAC output	Nominal voltage	3.3 V
		Nominal current	4.5 A
		Power (typical)	15 W
	24V BAC output	Nominal voltage	24 VDC
		Nominal current	1.3 A
		Power (typical)	31.2 W
	24V_SENSORS output	Nominal voltage	24 VDC
		Nominal current	0.9 A
		Power (typical)	21.6 W
	3V3_BAC, 24V BAC and 24V_SENSORS output protection	Against overload, short circuits and over-voltage	

Maximum Dissipated Power			8.5 W
Characteristics of the auxiliary functions	Alarm relay	Normally open dry contacts	
	Display	Front panel LED	
	Back-up battery	No	
	Dielectric resistance at 50 Hz-1mn and altitude in the 0 - 4,000 m (32 - 7,232 ft) range	Primary/secondary (24V_BAC/3V3_BAC)	3,000 Vrms
		Primary/secondary (24V_SENSORS)	3,000 Vrms
		Primary/ground	2,000 Vrms
		24V_SENSORS/ground output	500 Vrms
	Insulation resistance	Primary/secondary	≥ 100 MΩ
		Primary/ground	≥ 100 MΩ

(1) These values are to be taken into account for the start-up of several devices simultaneously or for establishing the size of the protection devices.

NOTE: In order to restart the power supply after a detected output overload, short circuit, or over-voltage condition on the 24V BAC, you must switch the primary power line to the off state, wait 1 minute, and then switch the primary power line back to the on state.

Characteristics of the BMX CPS 2010 Power Supply Module

General

The BMX CPS 2010 module is a direct current power supply module.

Characteristics

The following table shows the characteristics of the BMX CPS 2010 module.

Characteristics of the primary block	Nominal voltage		24 VDC insulated
	Voltage range		18 - 31.2 V
	Nominal current consumption		1 A at 24 V
	Initial power-up at 25°C (1)	InRush current I	30 A at 24 V
		I^2t at locking	≤ 0.6 A^2s at 24 V
		It at locking	≤ 0.15 As at 24 V
	Acceptable duration of power interruptions		≤ 1 ms
	Built-in over-current protection	By internal, inaccessible fuse	
Characteristics of the secondary block	Total usablepower		17 W
	3V3_BAC output	Nominal voltage	3.3 V
		Nominal current	2.5 A
		Power (typical)	8.3 W
	24V BAC output	Nominal voltage	24 VDC
		Nominal current	0.7 A
		Power (typical)	16.5 W
	3V3_BAC and 24V BAC output protection	Against overload, short circuits and over-voltage	
Maximum Dissipated Power			8.5 W
Characteristics of the auxiliary functions	Alarm relay	Normally open dry contacts	
	Display	Front panel LED	
	Back-up battery	No	
	Dielectric resistance at 50 Hz-1mn and at an altitude in the 0 - 4,000 m (32 - 7,232 ft) range	Primary/secondary (24V_BAC/3V3_BAC)	1,500 Vrms
		Primary/ground	1,500 Vrms
	Insulation resistance	Primary/secondary	≥ 10 MΩ
		Primary/ground	≥ 10 MΩ

(1) These values are to be taken into account for the start-up of several devices simultaneously or for establishing the size of the protection devices.

Characteristics of the BMX CPS 3020 Power Supply Module

General

The BMX CPS 3020 module is a direct current power supply module.

Characteristics

The following table shows the characteristics of the BMX CPS 3020 module.

Characteristics of the primary block	Nominal voltage		24 VDC-48 VDC insulated
	Voltage range		18 - 62.4 V
	Nominal current consumption		1.65 A at 24 V 0.83 A at 48 V
	Initial power-up at 25° C (1)	InRush current I	30 A at 24 V 60 A at 48 V
		I^2t at locking	$\leq$ 1 A^2s at 24 V $\leq$ 3 A^2s at 48 V
		It at locking	$\leq$ 0.2 As at 24 V $\leq$ 0.3 As at 48 V
	Acceptable duration of power interruptions		$\leq$ 1 ms
	Built-in over-current protection	By internal, inaccessible fuse	
Characteristics of the secondary block	Total usable power		32 W
	3V3_BAC output	Nominal voltage	3.3 V
		Nominal current	4.5 A
		Power (typical)	15 W
	24V BAC output	Nominal voltage	24 VDC
		Nominal current	1.3 A
		Power (typical)	31.2 W
	3V3_BAC and 24V BAC output protection	Against overload, short circuits and over-voltage	

Maximum Dissipated Power			8.5 W
Characteristics of the auxiliary functions	Alarm relay	Normally open dry contacts	
	Display	Front panel LED	
	Back-up battery	No	
	Dielectric resistance at 50 Hz-1mn and at an altitude in the 0 - 4,000 m (32 - 7,232 ft) range	Primary/secondary (24V_BAC/3V3_BAC)	1,500 Vrms
		Primary/ground	1,500 Vrms
	Insulation resistance	Primary/secondary	≥ 10 MΩ
		Primary/ground	≥ 10 MΩ

(1) These values are to be taken into account for the start-up of several devices simultaneously or for establishing the size of the protection devices.

Part IV
BMX XBP xxxx Racks

Subject of this Part

This part concerns BMX XBP •••• racks used to create Modicon M340 PLC stations.

What Is in This Part?

This part contains the following chapters:

Chapter 15
Introduction to BMX XBP xxxx Racks

Subject of this Section

This section deals with:

- general information about BMX XBP •••• racks
- the physical description of these racks

What Is in This Chapter?

This chapter contains the following topics:

Introduction to the BMX XBP xxxx Racks

General

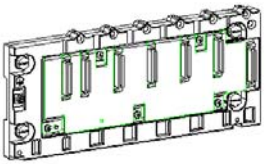
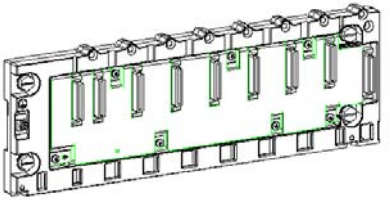
The BMX XBP xxxx racks constitute the basic element of Modicon M340 PLC stations.

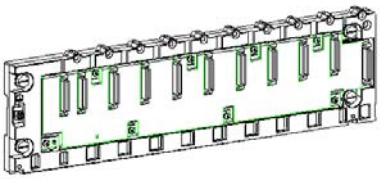
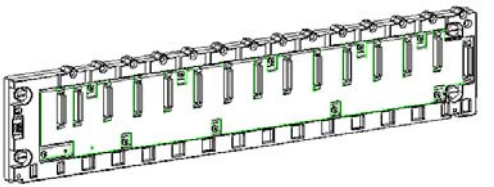
These racks ensure the following functions:

- mechanical function: The racks enable all PLC station modules to be fastened, (power supply module, processor, discrete/analog input/output modules, application-specific modules). These racks may be fastened on various mountings:
  - in cabinets
  - in the machine housings
  - on the panels
- electrical function: the racks provide:
  - the required power supply for each module on a single rack
  - service signals and data for the entire PLC station

Illustration

The following table shows the different BMX XBP xxxx racks.

Designation	Illustration
BMX XBP 0400 rack	The following diagram shows the BMX XPB 0400 rack: 
BMX XBP 0600 rack	The following diagram shows the BMX XPB 0600 rack: 

Designation	Illustration
BMX XBP 0800 rack	The following diagram shows the BMX XPB 0800 rack: 
BMX XBP 1200 rack	The following diagram shows the BMX XPB 1200 rack: 

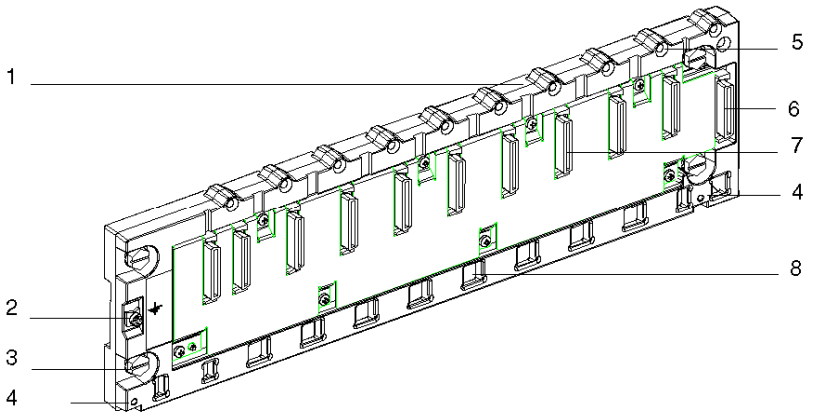
Description of the BMX XBP xxxx Racks

Introduction

The following pages describe the BMX XBP •••• racks.

Illustration

The following illustration shows a typical BMX XPB 0800 rack:



Description

The following table describes the different components of a rack.

Number	Description
1	Metallic mounting which performs the following functions: ● supports the PLC bus electronic card and protects it from EMI and ESD type interference ● supports the modules ● provides mechanical rigidity to the rack
2	Ground terminal for grounding the rack
3	Holes for fastening the rack to a mounting. These holes take M6 screws.
4	Protection bar fastening points
5	Screw holes for the module mounting screws.
6	40-pin female connector for extension module. This connector is marked XBE.

Number	Description
7	40-pin female connectors for connection between the rack and each module. The rack is supplied with covers protecting these connectors. The covers must be removed before installing the modules. The two connectors located the furthest left and marked CPS are always dedicated to the rack's power supply module. The other connectors, marked 00, 01, 02, etc are for all other types of module.
8	Windows for anchoring the module plugs.

Chapter 16
Installation and Assembly of BMX XBP xxxx Racks

Subject of this Section

This section deals with:

- installation of the BMX XBP •••• racks
- assembly of the BMX XBP •••• racks

What Is in This Chapter?

This chapter contains the following topics:

Rack Installation

Introduction

When assembling BMX XBP •••• racks certain installation rules must be complied with.

Module Installation Rules: Description

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Install the racks lengthways and horizontally to facilitate ventilation.

Various module (power supply, processor, input/output, etc.) are cooled by natural convection. Other positions may cause overheating and unexpected equipment operation.

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

If the racks are installed in a cabinet, you are advised to comply with the following measures:

- leave a minimum space of 80 mm (3.15 inch) above and 60 mm (2.36 inch) below the modules to facilitate air circulation
- leave a minimum space of 60 mm (2.36 inch) between the modules and the wiring ducts to facilitate air circulation

The minimum depth of the cabinet should be:

- 150 mm (5.91 inch) if the rack is fastened to a plate
- 160 mm (6.30 inch) if the rack is mounted on a 15 mm (0.59 inch) deep DIN rail
- if XBE rack extender modules are used, the BMX XBC •••K cables with connectors angled at 45° are recommended.

⚠ WARNING

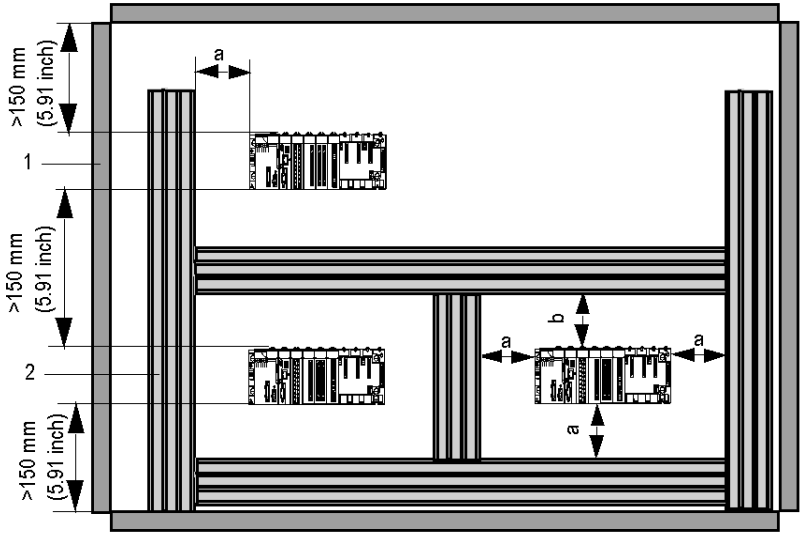
UNEXPECTED EQUIPMENT OPERATION DUE TO OVERHEATING MODULES

Maintain proper thermal distances when installing the racks to prevent overheating and unexpected equipment operation.

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

Illustration

The following illustration shows the rules of installation in a cabinet:



a Greater than or equal to 60 mm (2.36 inch)

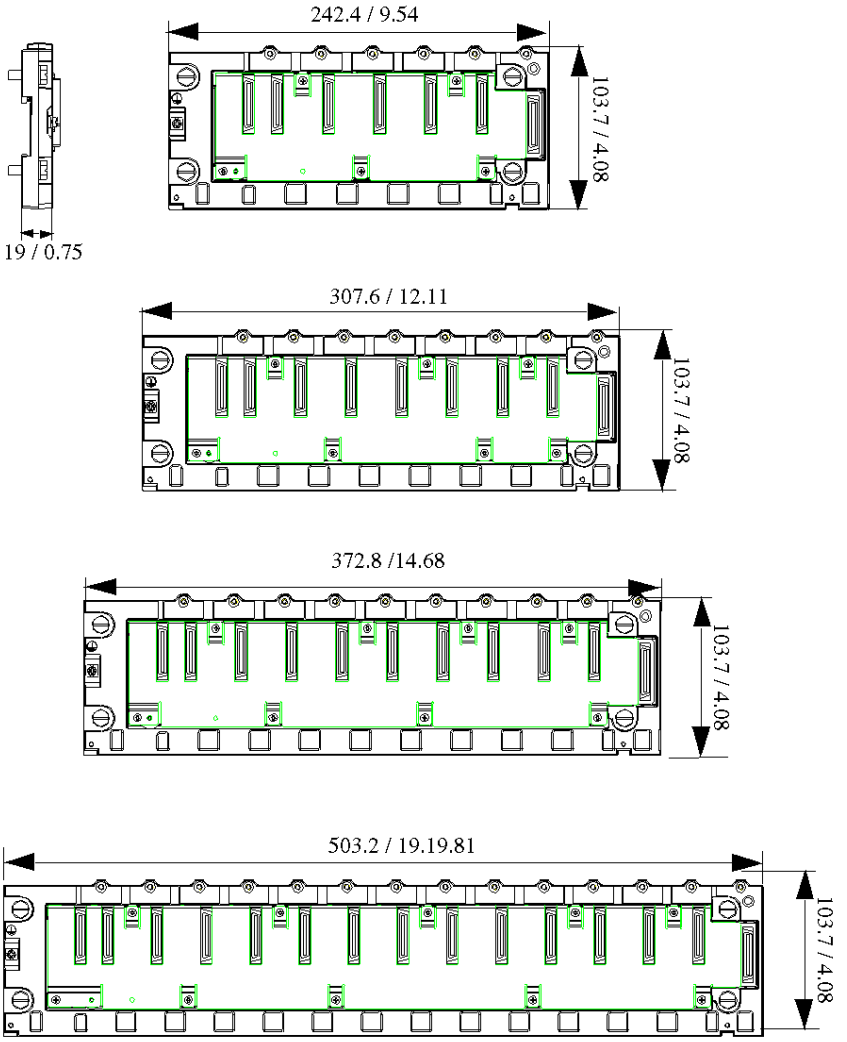
b Greater than or equal to 80 mm (3.15 inch)

1 Installation or casing

2 Wiring duct or tray

Rack Dimensions: Illustrations

The following illustrations show the overall dimensions (mm / inch) of the BMX XBP •••• racks:



Mounting and Fastening the Racks

Introduction

BMX XBP •••• racks may be mounted on:

- 35 mm (1.38 in) wide DIN rails (except for BMX XBP 1200 rack)
- Panels
- Telequick Mounting Grids

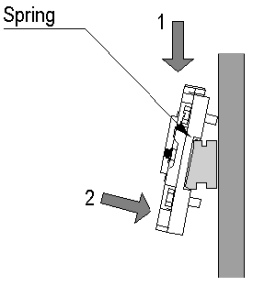
The installation rules must be complied with, irrespective of the mounting used.

Mounting on 35 mm Wide DIN Rails

Racks are fastened to 35 mm (1.38 in) wide and 15 mm (0.59 in) deep DIN rails with four HM6 screws freely spaced along the rail.

Mounting on a 35 mm (1.38 in) wide and 7.5 mm (0.295 in) deep DIN rail is possible, but in this case the product withstands less mechanical stress.

The following table explains the procedure for mounting a rack on a DIN rail.

Step	Description	Illustration
1	Position the PLC on the DIN rail as indicated in the illustration.	The following illustration illustrates mounting on a DIN rail:
2	Press down on the rear section of the rack (1) in order to compress the springs, then tip the rack backwards against the rail (2).	
3	Release the rack to lock it.	

To remove the rack, perform the mounting procedure in reverse.

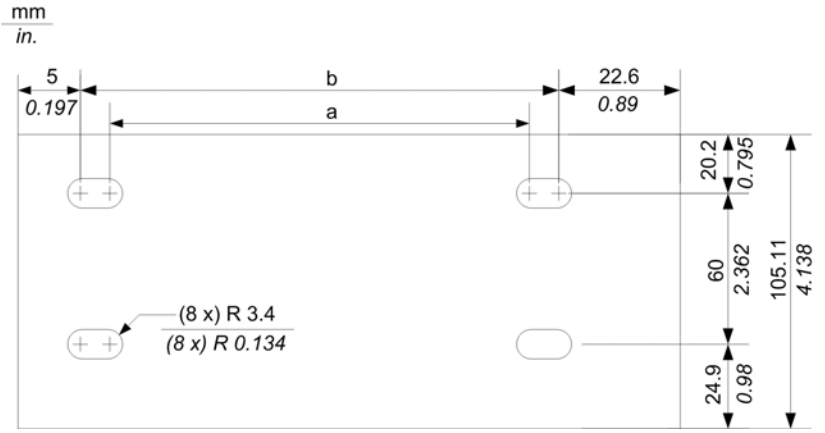
Press down on the rear section of the rack (1) in order to compress the springs, then tip the rack forwards to disengage it from the rail (2).

NOTE: To make sure that the PLCs continue to operate correctly when there is severe electromagnetic interference, you must mount the modules on properly grounded metallic mountings.

NOTE: Racks longer than 400 mm (15.76 in) (more than eight positions) are not compatible with DIN rail mounting.

Mounting on Panels

The illustration below shows the screw-hole layout for mounting a rack on a panel (dimensions in mm / inch):



The diameter of the fastening holes must allow use of M4, M5, M6 and UNC #6 screws (from 4.32 mm to 6.35 mm).

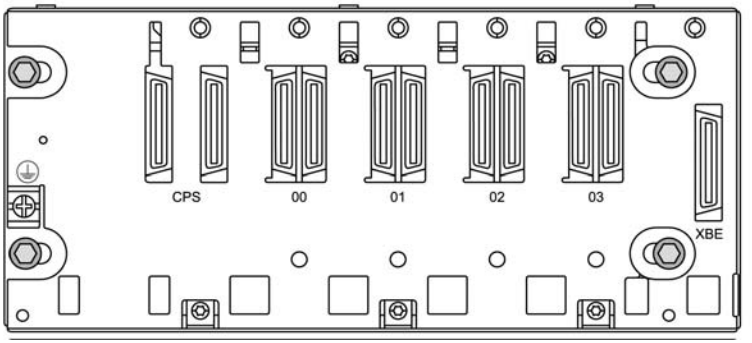
NOTE: Tighten the screw to ensure the contact between the BKP and the Panel.

The following table shows the main characteristics of the different BMX XBP •••• racks.

Rack	a	b	Size of the rack and extension module
BMX XBP 0400	202.1 mm (7.94 in)	214.8 mm (8.44 in)	243.58 mm (9.57 in)
BMX XBP 0600	267.5 mm (10.50 in)	280 mm (10.99 in)	308.78 mm (12.13 in)
BMX XBP 0800	332.5 mm (13.06 in)	345.2 mm (13.56 in)	373.98 mm (14.69 in)
BMX XBP 1200	462.9 mm (18.185 in)	475.6 mm (18.684 in)	504.38 mm (19.81 in)

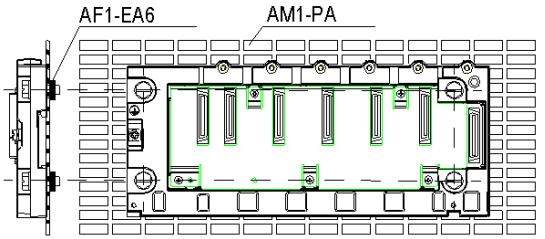
Recommended screw installation

The illustration below shows the recommended screw installation:



Mounting on Telequick AM1-PA and AM3-PA Mounting Grids

The illustration below shows the mounting of a rack on a mounting grid (dimensions in mm):



Fasten the rack with four M4, M5, M6 or UNC #6 screws (4.32 – 6.35).

Grounding the BMX XBP xxxx Rack and the BMX CPS xxxx Power Supply Module

General

Grounding a Modicon M340 PLC configuration involves the racks and the power supply modules.

Grounding the Rack

Protective grounding of the racks must be performed by connecting a ground cable between the protective earth of the installation and the screw located on the left-hand side of the rack, close to the power supply module. This screw is used to connect two cables (1.5 to 2.5 mm^2 or in AWG size, 16 to 13). Every rack in the PLC station must be grounded.

Grounding the Power Supply Module

Just like the rack, the Protective Earth (PE) terminal located on the power supply module must be connected to the protective earth of the installation in one of the following two ways:

- Using a separate cable, independent of the rack ground cable, and directly connected to the protective earth of the installation.
- Using a cable connecting the ground screw of the rack to the Protective Earth (PE) terminal of the module from the power supply (where the rack is already grounded).

⚠ DANGER

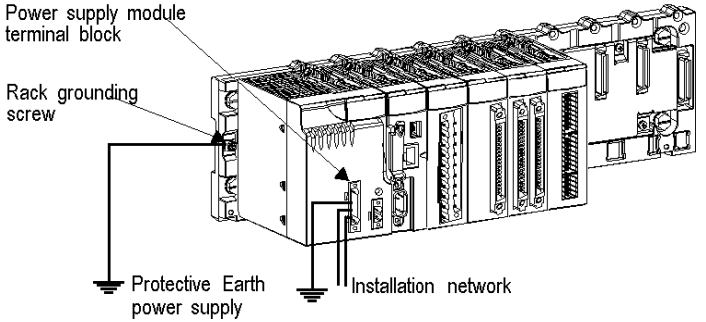
HAZARD OF ELECTRIC SHOCK

Power supply module must be grounded. Do not connect anything else to the power supply ground.

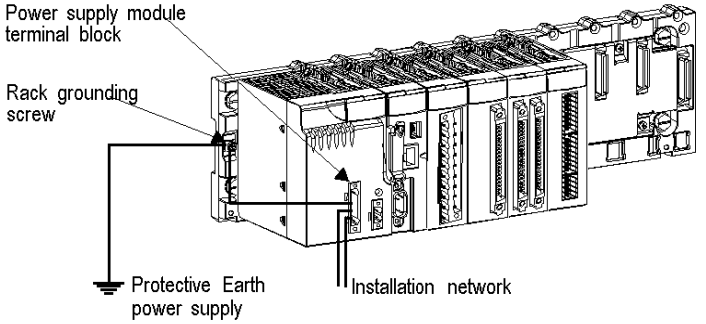
Failure to follow these instructions will result in death or serious injury.

Illustrations

The following illustration shows how the rack and the power supply module are ground connected using two independent ground cables:



The following illustration shows how the rack and the power supply module are ground connected, with the two Protective Earth (PE) terminals connected to each other:



NOTE: The wiring illustration shown above is possible only if the cable extremities (which are screwed to the grounding bus of the rack) are equipped with ring or spade lugs able to insure a permanent fixation even if the screw is slack.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

Use only cables with ring or spade lugs to ensure connection to ground. Ensure grounding hardware is tightened properly.

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

BMX XSP xxxx Protection Bar

General

To guarantee protection against electromagnetic perturbations, the cable shielding is not connected to the module shielding, but directly to the ground.

This connection may be made using any method but a protection bar is provided in order to facilitate the set up.

The protection bar is fastened at each end of the rack and provides a connection between the cable and the grounding screw.

Protection Bar Description

A protection bar is used in three cases:

- counting module with 10-pin, 16-pin and 20-pin terminal blocks
- analog module with 20-pin terminal block and 40-pin connector
- processor connected to an XBT console via the USB port

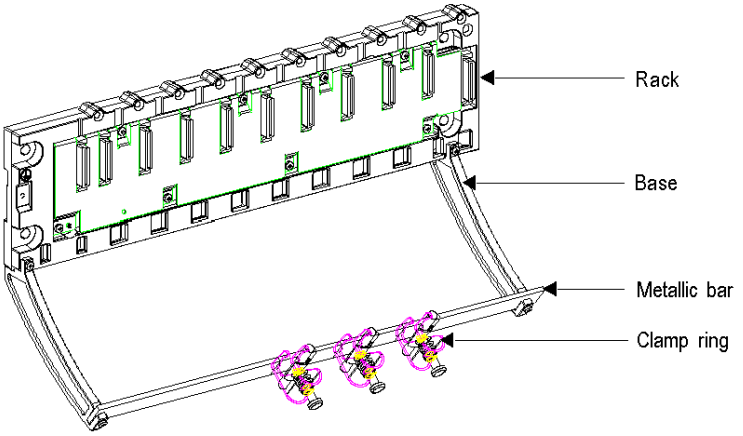
The protection bar kit references are as follows:

- BMX XSP 0400 bar to be fastened to the BMX XBP 0400 rack
- BMX XSP 0600 bar to be fastened to the BMX XBP 0600 rack
- BMX XSP 0800 bar to be fastened to the BMX XBP 0800 rack
- BMX XSP 1200 bar to be fastened to the BMX XBP 1200 rack

Each kit includes the following components:

- one metallic bar
- 2 bases
- one set of spring locking clamp rings to fasten the cables to the protection bar.

The following illustration illustrates a protection bar fastened to a rack:



Clamp rings are sold in sets of 10 and are available under the following references:

- STB XSP 3010: small rings for fastening USB connection cables
- STB XSP 3020: large rings for fastening analog and counting modules connection cables

NOTE: A protection bar does not modify the volume necessary when installing and uninstalling modules.

Connecting a Console to a Processor

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

- BMX XCA USB 018, 1.8 m in length
- BMX XCA USB 045, 4.5 m 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

On the type A USB connector side, these cables are fitted with a metallic ground connection to be screwed to a grounded object.

On the type mini B USB connector side, these cables are fitted with a:

- metallic ground connection to be screwed to a grounded object
- bare section to be fastened to the protection bar with a clamp ring

BMX XEM 010 Protective Cover for an Unoccupied Position

At a Glance

If a position is unoccupied on a rack, you are advised to install a BMX XEM 010 cover in this slot, in order to protect it.

Description

The cover is installed and attached to the rack like a narrower version of a normal module. You are advised to use this cover on each unoccupied position on the rack to comply with the IP20 protection index.

BMX XEM 010 covers are sold in sets of 5.

Chapter 17
BMX XBE 1000 rack extender module

Goal of this Chapter

The goal of this Chapter is to introduce the rack extender module and its installation.

What Is in This Chapter?

This chapter contains the following topics:

Rack Extender Module Introduction

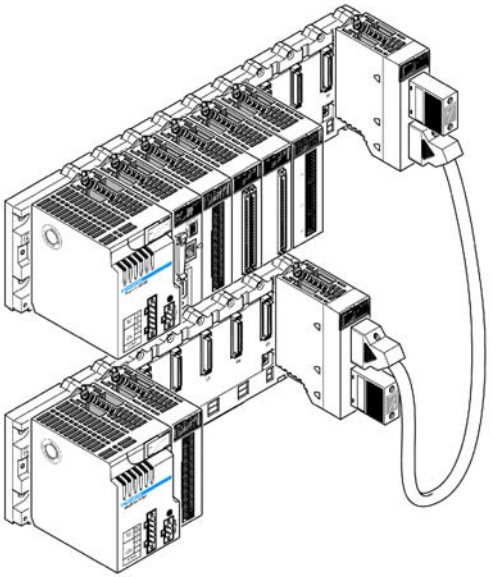
General

The Modicon PLC rack extender module makes it possible to connect a maximum of 4 racks, depending on the CPU, distributed along a maximum length of 30 meters. The racks are daisy chained together via the extension modules.

Example of topology

A typical system consists of:

- A rack extender module (BMX XBE 1000) in each rack,
- A power supply module in each rack,
- One CPU for the complete system,
- 2 line terminators, TSX on the first rack and TLY on the last.



Module consumption

Consumption on 3.3 VDC power supply: 22 mA.

Dissipated power on the 3.3 VDC rack power supply : 73 mW.

Consumption on 24 VDC rack power supply : 160 mA

Dissipated power on the 24 VDC rack power supply : 3.84 W

Rack Extender Module Physical Description

Illustration

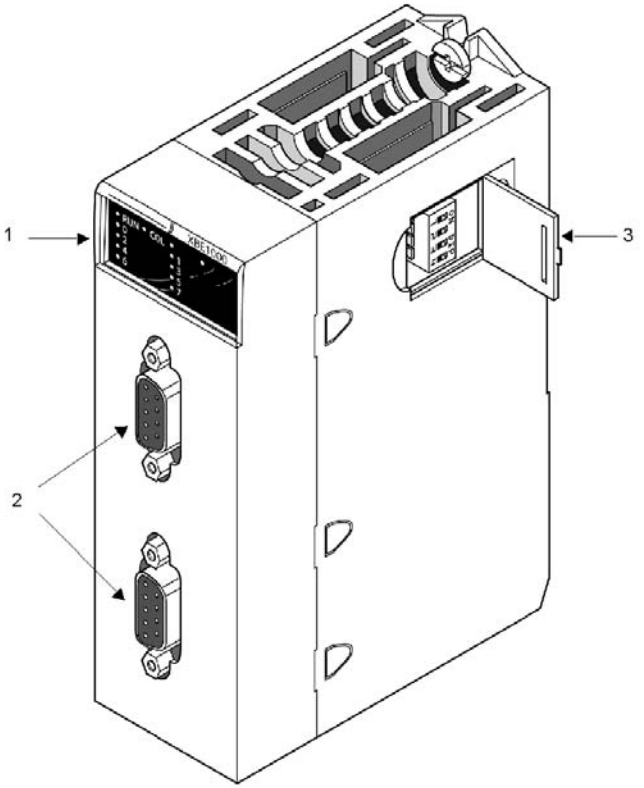


Table of labels

The BMX XBE 1000 module is composed of the following elements:

Label	Description
1	Module status LEDs on the front: ● **RUN** LED: indicates the operating status of the module, ● **COL** LED: indicates a collision error of the module, ● **0** to **3** LEDs: indicates the rack address of the module.
2	Two female SUB.D 9 pin connectors for bus cables or terminators.
3	Coding switches.

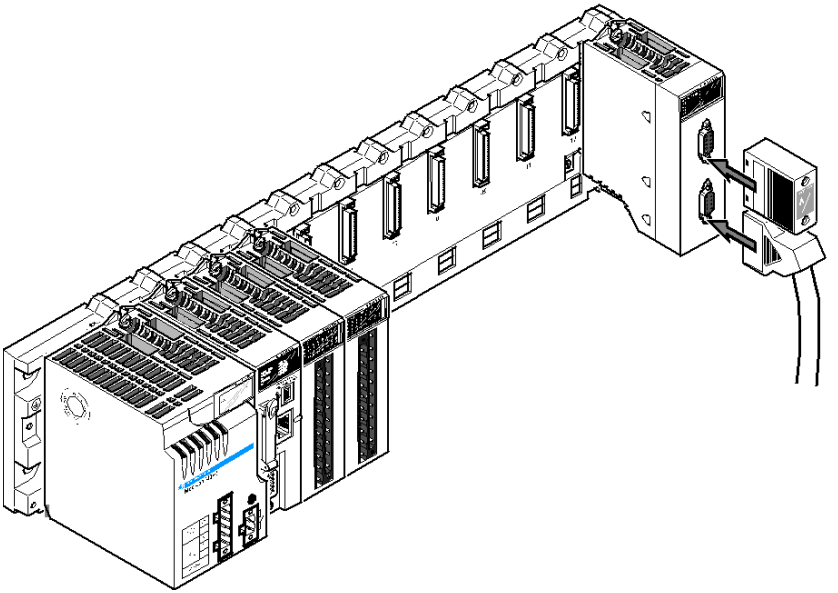
Rack Extender Module Installation

Installation

The following modules must be placed in these slots:

- The BMX XBE 1000 module is installed on each BMX XBP •••• rack in the slot marked XBE.
- Each rack must include a power supply module, in position CPS.
- The processor must be installed in the main rack (rack 0) in position 00.

The following illustration shows the installed the BMX XBE 1000 extender module with power supply, processor and two I/O modules in the main rack (rack 0):



⚠ DANGER

HAZARD OF ELECTRIC SHOCK

Disconnect all power sources before installing the module.

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

Assembly

The assembly of the BMX XBE 1000 module is similar to the assembly of the BMX P34 ••••• processors *(see page 78)*, and generally speaking, similar to the assembly of the other modules.

Leave 12 mm of free space on the right side of the rack to insure a free flow of air for cooling. Leave 35 mm in front of the module for the local bus connector and terminator.

Grounding of the Rack Extender Module

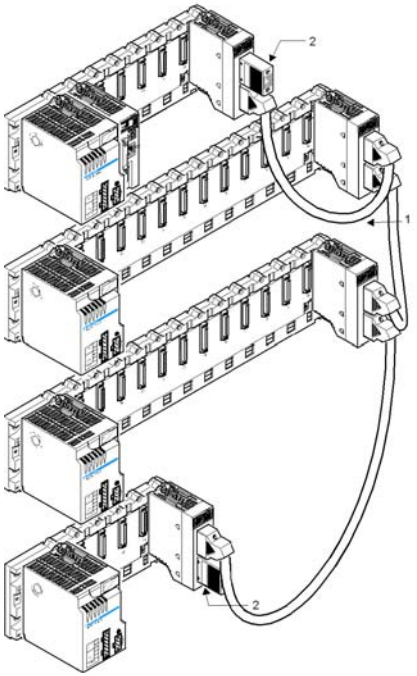
The BMX XBE 1000 module is equipped with ground connection contacts *(see page 26)*.

Building a Modicon M340 Sta tion Using BMX XBP •••• Racks

The BMX XBP •••• racks can be used to build a PLC station that contains a maximum of:

Station		Maximum number of racks
Processor	**OS Version**	
For a BMX P34 1000/2010/20102/2020/2030/20302 station	01.00	1 BMX XBP •••• racks
For a BMX P34 1000 station	>= 02.00	2 BMX XBP •••• racks
For a BMX P34 2000/2010/20102/2020/2030/20302 station	>= 02.00	4 BMX XBP •••• racks

Diagram:



Legend:

- **(1)** The same station can contain 4, 6, 8 and 12 position racks that are interconnected by Extension cables *(see page 201)*.
- **(2)** The local bus must have a Line terminator *(see page 201)* fitted at each end.

NOTE: The cumulative length of all the BMX XBC •••K or TSX CBY •••K cables used in a PLC station must not exceed 30 meters.

Extension Cable

Racks are connected by means of BMX XBC •••K or TSX CBY •••K extension cables which are connected to the 9-pin SUB-D connectors situated on the BMX XBE 1000 module of each main and extension rack.

Line Terminators

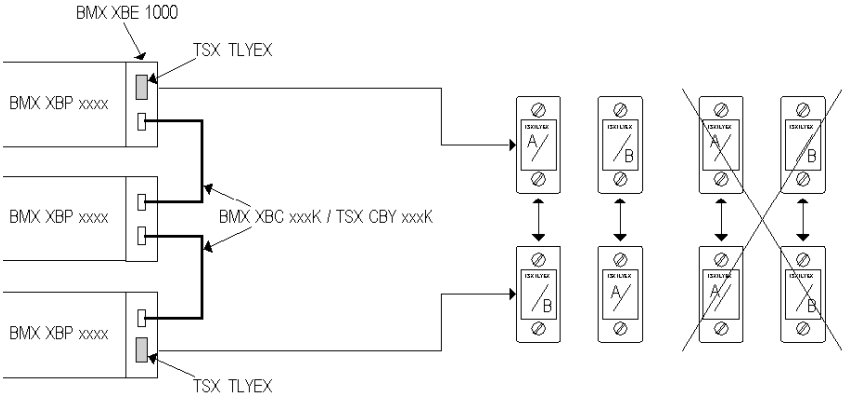
The BMX XBE 1000 modules of the two racks situated at the start and at the end of the chain **must always** be fitted with TSX TLY EX line terminators on the unused 9-pin SUB-D connectors.

Line terminators are labeled **A/** or **/B**. A PLC station that uses extension modules must use one line terminator labeled **A/** and one labeled **/B**.

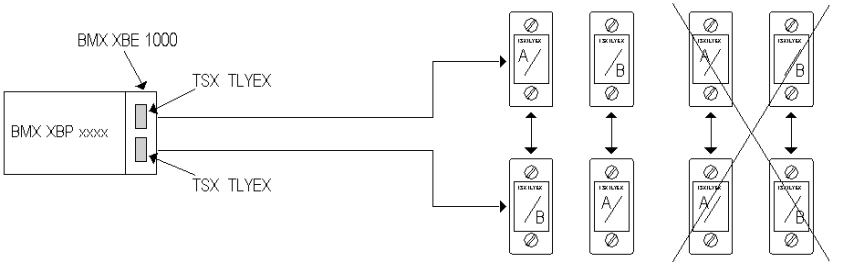
For example, if the extension module in the first rack of the chain contains a terminator labeled **A/**, then the extension module in the last rack must contain a terminator labeled **/B**

Positioning of Line Terminators on a Modicon M340 Station

Positioning on a PLC station containing several BMX XBP •••• extension racks:



Positioning on a PLC station containing a single BMX XBE 1000 extension module:



Rack extender Module Configuration

At a Glance

The rack extender modules are configured using microswitches on the side of the modules. The configuration of the module must be done before mounting the module on the rack.

PLC station rack addressing depends on the number of racks used:

- PLC station built with a single rack,
- PLC station built with extension racks.

Station built with a single rack

If the PLC station is built with a single rack, the rack address is implicit and has a value of 0.

If a rack extender module is installed in this rack, line terminators must be connected to the local bus connectors, and the microswitches on the side of the module must be configured for rack 0 (refer to the table of rack addresses in the next paragraph).

Station built with extension racks

For a PLC station built with extension racks, an address must be assigned for each station rack. This address is coded using 3 microswitches on the side of the module.

Microswitches 1 to 3 are used to code the rack address on the local bus (address 0 to 3).

Diagram showing the microswitches:

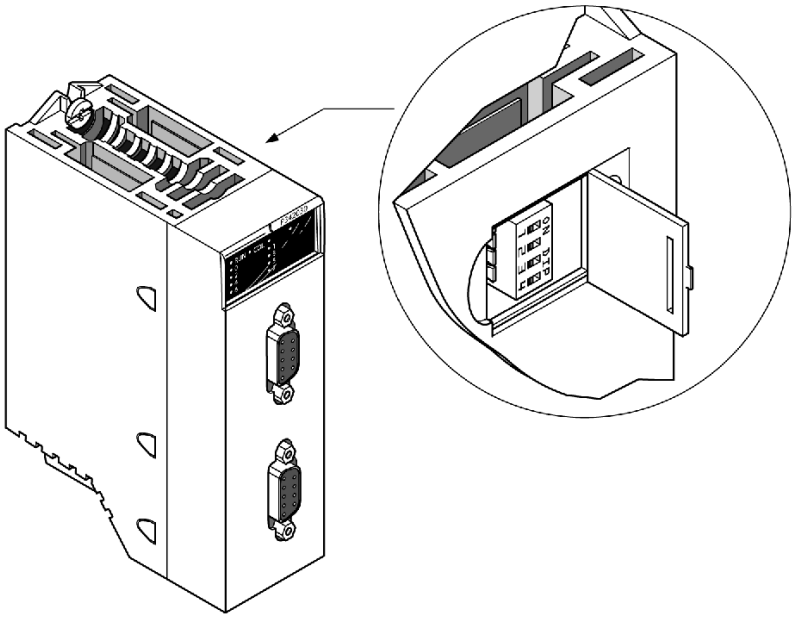


Table of rack addresses:

Switch	Rack Address			
	0	1	2	3
1	OFF	OFF	OFF	OFF
2	OFF	OFF	ON	ON
3	OFF	ON	OFF	ON
4	Not applicable			

NOTE: On delivery, all the microswitches are delivered in the OFF position (address 0).

Assigning addresses to different racks

Address 0: this address is always assigned to the rack which supports the BMX P34 xxxxx processor.

This rack can be located in any position in the chain.

If two or more racks are configured with address 0, only the rack supporting the processor will function correctly.

Addresses 1 to 3: can be assigned in any order to all the other extension racks in the station.

If two or more racks are configured with the same rack address (other than 0), the behavior depends on the position of the modules in those racks:

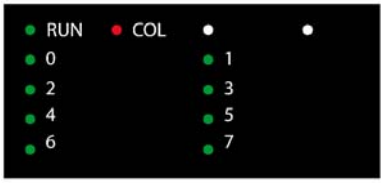
- If each module position is only used once, the modules will function correctly.
- If modules are mounted in the same position on two or more racks, those racks will not function, the access to them will be blocked.

Rack Extender Module Diagnostics

BMX XBE 1000 Module LEDs

The BMX XBE 1000 module display panel, located on the front of the module, is used for diagnostics.

Illustration:display panel *(see page 193)*



Description

The following table describes the different LEDs and their meanings:

LED	Pattern	Indication
RUN (green): operational state	on	Module functioning normally
	off	• The power supply is no longer present, or • Internal module detected error
COL (red): collision error detected	on	Two or more racks are coded with the same rack address, and either: • Rack address is 0: this rack does not contain the processor; modules are mounted in the same rack position on each rack. There will be no communication on the local bus for this rack **or** • Rack address is not 0: modules are mounted in the same rack position on each rack. There will be no communication on the local bus for this rack.
	off	The rack addresses are correct.
0 to 3 (green):	on	Rack address

To resolve a collision error detected, carry out the following actions:

Step	Action
1	Power off the principal supply of the racks in collision.
2	Correct the rack address.
3	Power on the principal supply.

Rack Extender Module Accessories

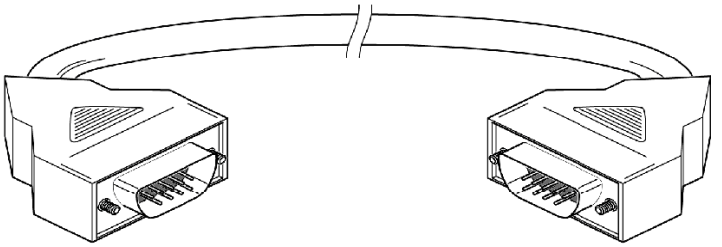
Extension Cable BMX XBC •••K and TSX CBY •••K

These cables of predetermined length are used to chain BMX XBP •••• racks and to transport the different local bus signals.

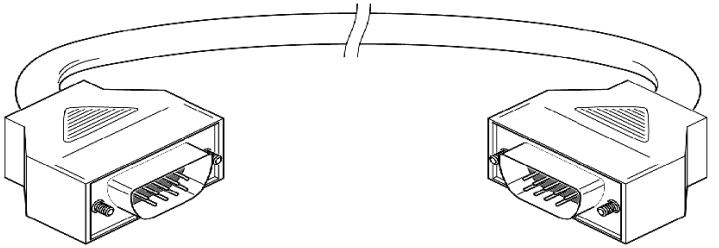
They are equipped at each end with a male 9-pin SUB D connector, which connect to the female 9-pin SUB D connector on the rack extender modules.

The BMX XBC •••K cables use connectors angled at 45°.

BMX XBC •••K



TSX CBY •••K



NOTE: The cumulative length of all the cables used in a PLC station is limited to 30 meters.

⚠ CAUTION
INRUSH CURRENT Insertion and extraction of a BMX XBC •••K or a TSX CBY •••K cable must only be done with all the station's elements switched off (racks, PC, etc.) **Failure to follow these instructions can result in injury or equipment damage.**

Summary table of different cable types available:

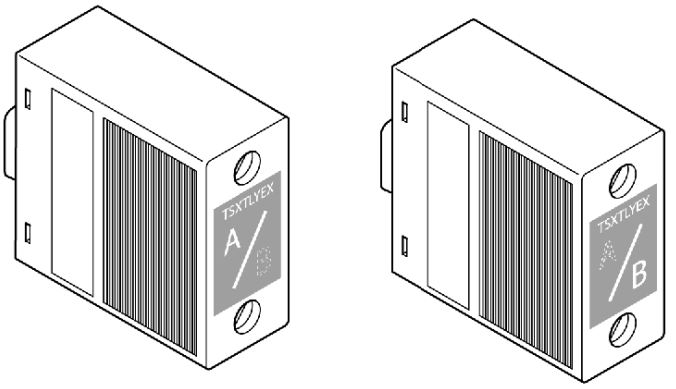
Reference		Length
Modicon M340 cable	BMX XBC 008K	0.8 m
	BMX XBC 015K	1.5 m
	BMX XBC 030K	3 m
	BMX XBC 050K	5 m
	BMX XBC 120K	12 m
Premium cable	TSX CBY 010K	1 m
	TSX CBY 030K	3 m
	TSX CBY 050K	5 m
	TSX CBY 120K	12 m
	TSX CBY 180K	18 m

Line Terminators TSX TLY EX

The local bus must be fitted with a line terminator at each end.

Line terminators are made up of a 9-pin SUB D connector and a cover containing the adaptation components. They are mounted on the 9-pin SUB D connector on the extension module at each end of the line.

Illustration



TSX TLY EX line terminators are provided in pairs marked **A/** and **/B**. The must be fitted with a terminator **A/** at one end and a terminator **/B** at the other end.

⚠ CAUTION
INRUSH CURRENT Insertion or extraction of a line terminator must only be done with all the station's racks switched off. **Failure to follow these instructions can result in injury or equipment damage.**

Chapter 18
BMX XBP xxxx Rack Functions

Subject of this Section

This section describes the different functions of the BMX XBP •••• racks.

What Is in This Chapter?

This chapter contains the following topics:

Module Addressing

Introduction

For all racks, the module address is geographic. It is based on its position on the rack.

Module Addressing

The following table shows the module addresses depending on the rack used.

Rack reference	Number of slots available for the modules	Module address
BMX XBP 0400	4	00 - 03
BMX XBP 0600	6	00 - 05
BMX XBP 0800	8	00 - 07
BMX XBP 1200	12	00 - 11

Installing the Power Supply Modules, Processors and Other Modules

General

A rack must house one power supply module and one processor.

Module Installation Rules

The rules for installing modules on a rack are as follows:

- The power supply module must always be installed in the slot marked CPS.
- The processor must be installed in the slot marked 00.
- The I/O and application-specific modules are installed in slots marked 01 to n (n varies according to the rack, see below table).
- The extension module is always installed in the slot marked XBE.

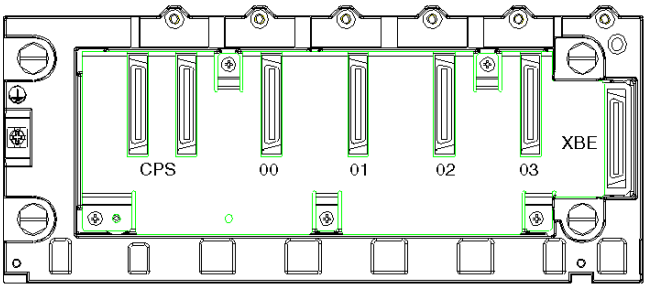
⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Check that the processor module is installed in slot 00 before powering up the system. Otherwise unexpected equipment operation can result.

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

The following illustration shows the BMX XBP 0400 rack with the module slot numbers:



It is possible to connect three I/O and application-specific modules to this rack using the connectors marked 01 to 03.

The following table describes the slot numbers to which the I/O and application-specific modules may be connected on BMX XBP •••• racks.

Rack	Module slot number (n)
BMX XBP 0400	01 - 03
BMX XBP 0600	01 - 05
BMX XBP 0800	01 - 07
BMX XBP 1200	01 - 11

Index

M

P

R

S

U

V

W