

Performance Characteristics



(Original Document)

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Introduction

All M580 CPUs have an embedded DIO scanner service to manage distributed equipment on the M580 device network. Some M580 CPUs also have an embedded RIO scanner service to manage RIO drops.

To manage RIO drops on the device network, select one of these CPUs with Ethernet I/O scanner service (both RIO and DIO scanner service):

- BMEP582040, BMEP582040H
- BMEP583040
- BMEP584040
- BMEP585040, BMEP585040C
- BMEP586040, BMEP586040C
- BMEH582040, BMEH582040C
- BMEH584040, BMEH584040C
- BMEH586040, BMEH586040C

Embedded Ethernet I/O scanner services are configured via CPU [IP configuration](#).

NOTE: Some of this information applies to M580 Hot Standby configurations. For more information, refer to the [Modicon M580 Hot Standby System Planning Guide for Frequently Used Architectures](#).

CPU Characteristics

These tables show the key characteristics of the M580 standalone and Hot Standby CPUs. These characteristics represent the maximum values that a specific CPU can manage in the M580 system.

NOTE: The values in these tables may not be achieved depending on the I/O density and the number of available rack slots.

Standalone CPUs:

Maximum number of ...	Reference (BMEP58 ...)								
	1020 (H)	2020 (H)	2040 (H)	3020	3040	4020	4040	5040 (C)	6040 (C)
discrete I/O channels	1024	2048	2048	3072	3072	4096	4096	5120	6144
analog I/O channels	256	512	512	768	768	1024	1024	1280	1536
expert channels	36	72	72	108	108	144	144	180	216
distributed devices ⁴	64	128	64	128	64	128	64	64	64
memory size In+Out (KB)	2+2	4+4	2+2	4+4	2+2	4+4	2+2	2+2	2+2
Ethernet communication modules (including BMENOC0301/11	2	2	2	3	3	4 ⁽¹⁾	4 ⁽¹⁾	6 ⁽¹⁾	6 ⁽¹⁾

modules, but not the CPU)									
local racks (main rack + extended rack)	4	4	4	8	8	8	8	8	8
RIO drops (maximum of 2 racks per drop) (main rack + extended rack)	–	–	8 ⁽²⁾	–	16 ⁽²⁾	–	16 ⁽³⁾	31 ⁽³⁾	31 ⁽³⁾
Ethernet ports:									
• service	1	1	1	1	1	1	1	1	1
• RIO or distributed equipment	–	–	2	–	2	–	2	2	2
• distributed equipment	2	2	–	2	–	2	–	–	–
– (not available) H (hardened) C (coated version) 1. Only three of these modules can be BMENOC0301/BMENOC0311 modules. All other are BMX Ethernet modules. 2. Supports BM•CRA312•0 adapter modules. 3. Supports BM•CRA312•0 and 140CRA31200 adapter modules. 4. Of these connections: 3 are reserved for local slaves; the remainder are available for scanning distributed equipment.									

Hot Standby CPUs:

Maximum number of ...	Reference (BMEH58 ...)		
	2040(C)	4040(C)	6040(C)
distributed devices	64	64	64
memory In+Out (KB)	2+2	2+2	2+2
Ethernet communication modules (including BMENOC0301/11 modules, but not the CPU)	2	4 ⁽¹⁾	6 ⁽¹⁾
local racks (main rack + extended rack)	1	1	1
RIO drops (maximum of 2 racks per drop) (main rack + extended rack)	8 ⁽²⁾	16 ⁽³⁾	31 ⁽³⁾
Ethernet ports:			
• service	1	1	1
• RIO or distributed equipment	2	2	2
• distributed equipment	0	0	0
1. Only three of these communication modules can be BMENOC0301/BMENOC0311 modules. 2. Supports BM•CRA312•0 adapter modules.			

3. Supports BM•CRA312•0 and 140CRA31200 adapter modules.

RIO Drop Maximum Configuration

The maximum number of channels in an RIO drop depends on the eX80 EIO adapter module:

EIO adapter	Maximum number of Channels			
	Discrete	Analog	Expert	Sensor bus
BMXCRA31200	128	16	–	–
BMXCRA31210	1024	256	36	2
BMECRA31210	1024	256	36	2

NOTE: The number of available channels could differ from the maximum values shown because the values depend on the CPU reference and the other modules in the same drop. More information is given in [Modicon X80 I/O Modules](#).

To configure Quantum RIO drops, refer to the [Quantum EIO installation and configuration guide](#).

Maximum Internal Memory Size

Program and Data Memory (Standalone). This table shows the program and data memory capacity for M580 standalone CPUs:

Memory Size	Reference (BMEP58 ...)								
	1020 (H)	2020 (H)	2040 (H)	3020	3040	4020	4040	5040(C)	6040(C)
internal memory size (KB)	4598	9048	9048	13558	13558	18678	18678	29174	65535 ⁽¹⁾

1. The sum of saved data, unsaved data, and program data is limited to 65535 KB.

Program and Data Memory (Hot Standby). This table shows the program and data memory capacity for M580 Hot Standby CPUs:

Memory Size	Reference (BMEH58 ...)		
	2040(C)	4040(C)	6040(C)
internal memory size (KB)	9462	18934	65536 ⁽¹⁾

1. The sum of saved data, unsaved data, and program data is limited to 65536 KB.

Memory Areas (Standalone). This table shows the maximum memory size per area for M580 standalone CPUs:

Maximum Memory Size	Reference (BMEP58 ...)								
	1020 (H)	2020 (H)	2040 (H)	3020	3040	4020	4040	5040 (C)	6040 (C)

saved data (KB) ⁽¹⁾	384	768	768	1024	1024	2048	2048	4096	4096
program (KB)	4096	8162	8162	12288	12288	16384	16384	24576	65536 ⁽²⁾

1. 10 KB are reserved for the system
2. The sum of saved data, unsaved data, and program data is limited to 65536 KB.

Memory Areas (Hot Standby). This table shows the maximum memory size per area for M580 Hot Standby CPUs:

Maximum Memory Size	Reference (BMEH58 ...)		
	2040(C)	4040(C)	6040(C)
saved data (KB) ⁽¹⁾	768	2048	4096
Hot Standby data exchanged (KB)	768	2048	4096
program (KB)	4096	16384	65536 ⁽²⁾

1. 10 KB are reserved for the system
2. The sum of saved data, unsaved data, and program data is limited to 65536 KB.

NOTE: Versions 2.30 and later of M580 processor firmware provide a maximum of 64 K words of memory for State RAM. By contrast, firmware versions 2.20 and earlier seem to provide a maximum of 128 K words; however, the display is incorrect. As a result, if you upgrade CPU firmware from version 2.20 or earlier to version 2.30 or later for an existing project, the percentage of State RAM used by the application will appear to have doubled. In some cases, the percentage of State RAM used can exceed 100% and the application cannot be re-built. To re-build your application in this case, you will need to perform one or both of the following edits:

- Increase the amount of State RAM (the total of %M, %MW, %I, %IW), if possible.
- Re-define some located variables as unlocated (by removing the assigned address), until the total amount of State RAM used (the sum of %M, %MW, %I, %IW) no longer exceeds 100%.

Located Data (Standalone). This table shows the maximum and default size of located data (in KB) for each M580 standalone CPU:

Object Types	Address	Reference (BMEP58 ...)								
		1020 (H)	2020 (H)	2040 (H)	3020	3040	4020	4040	5040 (C)	6040 (C)
internal bits	%Mi maximum	32624	32624	32624	32624	32624	32624	65280 ⁽²⁾	65280 ⁽²⁾	65280 ⁽²⁾
	%Mi default	512	512	512	512	512	512	512	512	512
input/output bits	%Ir.m.c %Qr.m.c	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
system bits	%Si	128	128	128	128	128	128	128	128	128

internal words	%MWi maximum	32464	32464	32464	65232	65232	65232	64968 ⁽³⁾	64968 ⁽³⁾	64968 ⁽³⁾
	%MWi default	1024	1024	1024	2048	2048	2048	2048	2048	2048
1 Memory size depends on the equipment configuration declared (I/O modules). 2 32624 for versions before 2.30. 3 65232 for versions before 2.30.										

Located Data (Hot Standby). This table shows the maximum and default size of located data (in KB) for each M580 Hot Standby CPU:

Object Types	Address	Reference (BMEH58 ...)		
		2040(C)	4040(C)	6040(C)
internal bits	%Mi maximum	32624	65280 ⁽²⁾	65280 ⁽²⁾
	%Mi default	512	512	512
input/output bits	%Ir.m.c	(1)	(1)	(1)
	%Qr.m.c			
system bits	%Si	128	128	128
internal words	%MWi maximum	32464	64968 ⁽³⁾	64968 ⁽³⁾
	%MWi default	1024	1024	2048
1 Memory size depends on the equipment configuration declared (I/O modules). 2 32624 for versions before 2.30. 3 65232 for versions before 2.30.				

Size of Non-Located Data Memory

This list contains non-located data types:

- elementary data type (EDT)
- derived data type (DDT)
- derived function block (DFB) and elementary function block (EFB)

The size limit of non-located data is the global [maximum memory size for data](#) minus the size consumed by located data.

Client and Server Requests per Scan

The communication performance of standalone (BMEP58•0•0) and Hot Standby (BMEH58•0•0) CPUs is described in terms of the number of client and server requests per scan.

Modbus TCP and EtherNet/IP Server: The table below shows the maximum number of Modbus TCP, EtherNet/IP, or **UMAS** requests that can be served by the CPU's Modbus TCP server at each MAST scan.

When the incoming requests exceed these maximums, they are queued in a first-in/first out (FIFO) buffer. The size of the FIFO buffer is according to the selected CPU:

CPU	Overall Maximum		From		

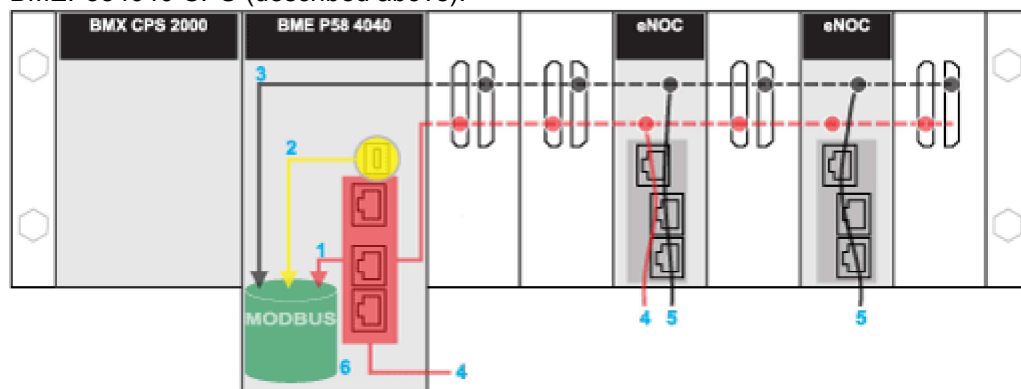
	Requests per Scan ⁽¹⁾	Request FIFO Size	USB	Maximum requests sent to IP address of the CPU	Maximum requests sent to IP address of comm. modules
BMXP581020	8 (16)	32	4	8	16
BMX•5820•0	16 (24)	32	4	12	16
BMXP5830•0	24 (32)	32	4	16	16
BMX•5840•0	32 (40)	50	4	24	16
BMEP5850•0	40 (48)	50	4	32	16
BME•5860•0	56 (64) ⁽²⁾	50	4	32	16

1. This column shows the default limits for the number of requests served per cycle. The limit can be modified through %SW90, between 2 and the number indicated between brackets.

2. The overall limit for the BME•5860•0 CPU is higher than the sum of the limits for the USB, CPU, and NOC modules. This is a provision for future evolutions.

The MAST task cycle time may increase by up to 0.5 ms per incoming request. When the communications load is high, you can limit the potential jitter of the MAST time by limiting the number of requests that are processed per cycle in %SW90.

Example: This example local rack assembly includes a BMEP584040 CPU and two BMENOC0301/11 Ethernet communication modules. Therefore, the maximum values in this example apply to the BMEP584040 CPU (described above):



red: These requests are sent to the IP address of the CPU.

yellow: These requests are from the USB port of the CPU.

gray: These requests are sent to the IP address of a communications module (NOC).

1 The maximum number of requests to the IP address of the BMEP584040 CPU (24).

2 The maximum number of requests from the USB port of the CPU (4). (For example, a PC that runs Control Expert may be connected to the USB port.)

3 The maximum number of requests from all communications modules on the local rack (16).

4 These requests are sent to the IP address of the BMEP584040 CPU from devices that are connected to an Ethernet port on either the CPU or a BMENOC0301/11 module.

5 These requests are sent to the IP address of the BMENOC0301/11 from devices that are connected on the Ethernet port of either the BMENOC0301/11 or the CPU. (In this case, enable the Ethernet backplane port of the BMENOC0301/11.)

6 The Modbus server can manage in each request the maximum number of requests from the BMEP584040 CPU (32). It also holds a maximum of 50 requests in a FIFO buffer.

Number of Connections: This table shows the maximum number of simultaneous Modbus TCP, EtherNet/IP, and UMAS connections for the embedded Ethernet port on these CPUs:

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CPU	Connections
BMXP581020	32
BMX•5820•0	32
BMXP5830•0	48
BMX•5840•0	64
BMEP5850•0	64
BME•5860•0	80

When an incoming connection request is accepted, the open connection that has been idle for the longest time is closed.

Modbus TCP and EtherNet/IP Client: This table shows the maximum number (per cycle) of communication EFs that support Modbus TCP and EtherNet/IP clients according to the selected CPU:

CPU	EFs per Cycle
BMEP581020	16
BME•5820•0	32
BMEP5830•0	48
BME•5840•0	80
BMEP5850•0	80
BME•5860•0	96

Application Code Execution Performance

This table shows the performance of the application code for each M580 standalone (BMEP58 ...) and Hot Standby (BMEH58...) CPU:

	Reference BMEH58 .../BMEH58 ...								
	1020 (H)	2020 (H)	2040 (H)	3020	3040	4020	4040 (C)	5040 (C)	6040 (C)
boolean application execution (Kinst/ms ⁽¹⁾)	10	10	10	20	20	40	40	50	50
typical execution (Kinst/ms ⁽¹⁾)	7.5	7.5	7.5	15	15	30	30	40	40
1. • Kinst/ms: 1,024 instructions per millisecond • A typical execution holds 65% boolean instructions + 35% fixed arithmetic.									

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