


<b>Maple Model(s)</b>	<b>PLC or Controller</b>
HMI5000 Series	Bardac Smarty Controller (Ethernet)



## Summary

Maple Systems’ **HMI5000 Series** Human/Machine Interface Terminals (Maple HMIs) communicate with Smarty Controllers using the Modbus TCP/IP protocol to allow the Maple HMI to act as the master in a **point-to-point single master, multiple-slave format**.

The MODBUS TCP/IP protocol driver in EZware also has the following features:

- Ability to communicate over Ethernet for 100m
- Ability to communicate over Ethernet at 10 Mbps
- Ability to read/write to individual bits in 3x and 4x memory

## Communications Cable

The Maple HMI should be connected to the device’s Modbus TCP/IP Ethernet port

The Smarty Controller auto-senses the cable, so a straight-through or crossover Ethernet cable may be used. A list of communications cables offered by Maple Systems as well as cable assembly instructions to assist you in assembling your own Ethernet cable are available on our website at [www.maplesystems.com](http://www.maplesystems.com).

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**WARNING** *If your communications cable is not wired exactly as shown in our cable assembly instructions, damage to the HMI or loss of communications can result.*

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## Controller Settings

The Ethernet port on the controller must be set to Modbus TCP/IP Slave mode in order to properly communicate with the HMI.

## Accessible PLC Memory

### Register Memory

The following table lists the PLC's register memory ranges that the Maple HMIs are able to access. Please note that your PLC's memory range may be *smaller* or *larger* than that supported by these HMIs. The following register memory can be displayed in 16 or 32-bit format on the Maple HMI.

(Note: d=decimal)

Controller Register Type	Address Range	Format	Controller Register Description
3x	1-65535	dddd	Analog Values (read only)
4x	1-65535	dddd	Analog Values
5x	1-65535	dddd	32-bit analog values, word-swapped
6x	1-65535	dddd	Same as 4x memory uses Modbus function code 6 for register writes.

In the Smarty controller, the 3x and 4x device types access the same memory locations.

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**Note** *The 5x Register Type reads and writes to the same memory as the 4x Register Type. However, when writing 32-bit values, the 5x Register Type 'swaps' the 16-bit word arrangement so that the low word comes first.*

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In the Bardac Smarty controller, the 3x and 4x device types access the same memory area.

For example: If a register in the 4x memory area has:

4x memory address	400001	400002
Data in memory (in hex)	0x1234	0x5678
Data as read by HMI when using 4x Device Type with 32-bit hex format.	0x56781234	
Data as read by HMI when using 5x Device Type with 32-bit hex format.	0x12345678	

The 6x type reads and writes to the same memory as the 4x type. However, it uses Modbus Function Code 6 (Write Single Register) to write to this memory area. By default, the 4x memory uses Modbus Function Code 16 (Write Multiple Registers).

## Discrete Memory

The following table lists the PLC's discrete memory ranges that the Maple HMIs are able to access. Please note that your PLC's memory range may be *smaller* or *larger* than that supported by these HMIs. The following discrete memory is displayable in single-bit format on the Maple HMI.

(Note: d=decimal, bb = bit#, 00 to 15)

Controller Register Type	Address Range	Format	PLC Bit Description
0x	1-65535	dddd	Boolean Values
1x	1-65535	dddd	Boolean Values (read only)
3x_Bit	100-6553515	ddddbb	Individual Bits in an Analog Value (read only)
4x_Bit	100-6553515	ddddbb	Individual Bits in an Analog Value
6x_Bit	100 to 6553515	ddddbb	Individual bits in 4x memory area. Writes to these bits using Modbus Function Code 16
0x_mult_coils	1 to 65535	dddd	Write to 0x memory area using Modbus Function Code 15 (Write Multiple Coils)

In the Bardac Smarty controller, the 3x and 4x device types access the same memory area.

The 3x\_Bit and 4x\_Bit allow bit access to the 3x and 4x memory respectively. The 6x-Bit accesses the same memory area as 4x\_Bit but writes using Modbus Function Code 6 (Write Single Register) instead of Function Code 16 (Write Multiple Registers) which is used by 4x memory area.

The 0x\_mult\_coils device type allows bit access to the 0x memory area but uses Modbus Function Code 15 (Write Multiple Coils) instead of Function Code 5 (write Single Coil) that is used by the 0x memory area.

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**Important** When using the 3x\_Bit, 4x\_Bit, and 6x\_Bit device types, you must enter the register location followed by bit location into the Address field in the EZware5000 object. If the bit number is smaller than 10, you must enter a leading zero. For example, to target the 3<sup>rd</sup> bit of 400015, you must enter "1502" into the Address field.

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In the Smarty controller, the 3x and 4x device types access the same memory locations.

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**Note** The 3x\_Bit and 4x\_Bit memory area is used to read/write to individual bits in the 3x and 4x memory area. To use this feature, select the 3x\_Bit or 4x\_Bit as **Device Type** for bit type objects such as Bit Lamps. Under **Device Address**, use the format nnnnbb to enter the word memory area followed by the two digit bit reference. For example, to target the 3rd bit of 400015, enter "1502" into the Device Address, (nn=15, bb=02).

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## EZware Settings

The following table lists the communications settings that must be configured in EZware. These settings can be found in the *Edit-System Parameters* menu under the *Device* tab.

Please note:

- The **Recommended Settings** column provides the recommended setting based upon the default settings most commonly used in the controller.
- The **Options** column lists EZware's options; your PLC may not support every option.

Name	Recommended Settings	Options	Important Notes
Name:	Modbus TCP/IP Master		Description label
HMI or PLC	PLC		
Location	Local	Local, Remote	Select <i>Local</i> if PLC directly connected to HMI, <i>Remote</i> if PLC connected thru another HMI.
PLC type:	Modbus TCP/IP Master		
PLC I/F:	Ethernet	RS-232, RS-485 2W, RS-485 4W, Ethernet	Using Modbus TCP/IP requires the use of the Ethernet port.
PLC default station no.:	1	0-255	Must match the node address assigned to the Bardac Smarty Controller.
Use UDP	Unchecked	Checked or Unchecked	Must be Unchecked
Settings: IP Address:	xxx.xxx.xxx.xxx	Any valid IP Address	Must be set to the IP address of the controller
Settings: Port Number	502	502	Must be set to 502
Settings: Timeout (sec)	1.0	0.1 to 25.5	Adjust if longer timeout is required.
Settings: Turn around delay (ms):	0	0-1000	Timeout period between HMI polls. For "X" models set to 10 msec.

<b>Name</b>	<b>Recommended Settings</b>	<b>Options</b>	<b>Important Notes</b>
Settings: Send ACK delay:	0		Not Applicable
Settings: Parameter 1:	0		Not Applicable
Settings: Parameter 2:	0		Not Applicable
Settings: Parameter 3:	0		Not Applicable
Interval of block pack words	5	0-512	See <i>HMI5000 Series Programming Manual</i> . (Maple p/n 1010-1007)
Max. read-command size (words):	120		Not Adjustable
Max. write-command size (words):	120		Not Adjustable