

# MP8000 Programming Guide

MODBUS TCP and Ethernet/IP Software Development Guide



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## MP8000 PROGRAMMING GUIDE

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# MP8000 Programming Guide

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# MP8000 Programming Guide

## INTRODUCTION

This guide is addressed to systems integrators who will be developing software for a master device to communicate with the Model MP8000 product. The software developer is expected to have reasonable working knowledge (example: understanding what uint16\_t Base 10.xx means) for writing programs. This document also describes the EtherNet/IP features supported by the MP8000. The MP8000 supports Explicit I/O messaging as defined by the ODVA EtherNet/IP Specification.

NOTE: Littelfuse has developed a PC based program called MP8000 Software. It is available for free and should work for most applications.

The master device would typically be a Programmable Logic Controller (PLC) or a Personal Computer (PC) that will communicate with one or more slave devices. A PLC normally would have the command protocols built into it, so the programmer would not have to develop them. If programming a Personal Computer, these would have to be developed or find a library online that supports MODBUS TCP or Ethernet/IP.

If programming a PC, it may be worth noting that it is the responsibility of the master controller to initiate communication. In other words, the master controller must be programmed to periodically poll the slave devices and initiate a request for data or to issue a command to the Model MP8000 to stop or reset the Model MP8000's control relay. When the Model MP8000 responds with the requested data or confirmation of the stop command, it is the responsibility of the master controller to determine if the information arrived correctly with no communication errors. If there are communication errors or if there is a time-out waiting for a response, it is the responsibility of the master controller to reissue the command to the slave device. If the response arrives correctly, the master controller is then required to further process the data to put it in a form suitable for viewing by an operator.

## Connecting to the MP8000

The RJ45 jack on the side of the MP8000 is the interface for MODBUS TCP and Ethernet/IP. The user can access the MP8000 via a network or via a direct connection. Accessing the MP8000 via a network can be done by simply connecting a standard Ethernet cable between the network (switch/router) and the MP8000 RJ45 jack. Another way to connect via a network that has Wi-Fi is to use a low cost router (example: VONETS VAR11N-300 or similar).

To connect directly from a laptop to the MP8000, connect a standard Ethernet cable between the laptop and the MP8000 RJ45 jack. You will need to configure according to the instructions in the MP8000 Point to Point Configuration Document.

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## MODBUS TCP CONFIGURATION

### MODBUS Memory and Data Location Terminology / Register vs. Address

The MODBUS standard defines a memory location in terms of registers and addresses. The “register” numbering system starts Xxxxxx1 and goes up to X65536, where the leading X is a reference number that designates a register type. The “address” numbering system starts at 0 rather than 1 and does not contain a prefix. The prefix indicates which read and write functions should be used to get or set the corresponding location. The Modicon MODBUS Protocol Reference Guide refers to these XX references, such as 4X reference for holding registers.

Older standards and products tend to use a 5-digit numbering system for registers. (Ex: 40,001 for the first holding register) However, other documentation is written using a 6-digit numbering system; MODBUS supports registers up to 65536. (Ex: 400,001 for the first holding register).

The “address” numbering system is defined in the standard to describe the message that is actually sent to the physical communications bus. By starting the addresses at 0 rather than 1 and by truncating the register type prefix or reference, the number of usable memory or data locations is maximized. This document will use the terms “address” and “location” interchangeably to refer to the actual address placed on the bus to get the intended piece of data.

### Supported MODBUS Message Function Codes

The following four function codes are supported. The 03 Read and 04 Read functions can be used on any register. Broadcast is not supported.

1. **FUNCTION CODE 03 Read Holding Registers:** Block read
2. **FUNCTION CODE 04 Read Input Registers:** Block read
3. **FUNCTION CODE 06 Preset Single Register:** Write one value
4. **FUNCTION CODE 16 (0x10) Preset Multiple Registers:** Block write

Registers are 16 bits. Many MP8000 parameters are stored as 32 bit integers. Therefore, two Register reads or writes are required when accessing these parameters.

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## Read Command Example

A typical request for a Model MP8000 would be to ask for the 3 voltages (32 bits each) starting at address 0x0213, which are the Voltage between L1-L2, L2-L3, and L3-L1. In the example below, the values will be returned as 481, 476, and 483 volts for these variables.

Assume that the Model MP8000 has been programmed with a device address of A02. The MODBUS command message from the master device to a slave device would look like:

| Byte | Contents                         | Example (in Hex)       |
|------|----------------------------------|------------------------|
| 1    | Address of Slave Device          | 02                     |
| 2    | Command to Slave Device          | 03                     |
| 3    | High Byte of Address             | 02 .(Address of L1-L2) |
| 4    | Low Byte of Address              | 26                     |
| 5    | High Byte of Number of Registers | 00 .(Read 6 registers) |
| 6    | Low Byte of Number of Registers  | 06                     |

The above sequence would be a request to read 6 registers (12 bytes) starting at address 0x0213. The normal response from the slave device to the master device would look something like:

| Byte | Contents                        | Example (in Hex) |
|------|---------------------------------|------------------|
| 1    | Address of Slave Device         | 02               |
| 2    | Echo of Command to Slave Device | 03               |
| 3    | Number of Bytes sent back       | 10               |
| 4    | High Byte of Word at 0017       | 00 (L1-L2 = 481) |
| 5    | Low Byte of Word at 0017        | 00               |
| 4    | High Byte of Word at 0018       | 01               |
| 5    | Low Byte of Word at 0018        | E1               |
| 6    | High Byte of Word at 0019       | 00 (L2-L3 = 476) |
| 7    | Low Byte of Word at 0019        | 00               |
| 6    | High Byte of Word at 001A       | 01               |
| 7    | Low Byte of Word at 001A        | DC               |
| 8    | High Byte of Word at 001B       | 00 (L3-L1 = 483) |
| 9    | Low Byte of Word at 001B        | 00               |
| 8    | High Byte of Word at 001C       | 01               |
| 9    | Low Byte of Word at 001C        | E3               |

The voltage values listed would be values that might be expected from a 480 volt system.

The Address and Number-Of-Words-To-Send words are sent with the high byte first followed by the low byte.

## Special Notes When Using the 4X Addresses

Some software packages, such as Human-Machine-Interface (HMI) software packages for PLCs, can only use registers from 400001 to 465536 in the MODBUS 03 and 06 commands.

If this is the case, add 400001 to the hexadecimal addresses in the tables to select the start of the data to read. Many of these software packages will automatically subtract the 400001 part of the address before sending the actual address in the MODBUS command.

## MP8000 MODBUS MEMORY MAP

Many MP8000 parameters are stored as 32 bit integers. Therefore, two Register (defined as 16 bits) reads or writes are required when accessing these parameters. See the tables below for address and bit details. Although all parameters are stored as integers (excluding the device name), the integers may be "scaled" in various ways. See Table 3 - Memory Map Data Format Codes for details.

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## CONFIGURATION SETTINGS

**Table 1 - MP8000 Memory Map Settings (Configuration parameters)**

| FIELD NAME                     | MODBUS REGISTER |                 |      | DEFAULT    | DESCRIPTION                             | FORMAT | PERMISSION |
|--------------------------------|-----------------|-----------------|------|------------|---|--------|------------|
|                                | ADDRESS HEX     | ADDRESS DECIMAL | SIZE |            |   |        |            |
| <b>CONFIGURATION REGISTERS</b> |                 |                 |      |            |   |        |            |
| FW_REV                         | 0x0000          | 0               | 2    | 0x03000000 | Software Revision                       | C      | R          |
| PC                             | 0x0002          | 2               | 1    | 0x8002     | Product Code                            | B      | R          |
| MULT                           | 0x0003          | 3               | 1    | 1          | Current Transformer Ratio               | B      | R/W        |
| PT                             | 0x0004          | 4               | 1    | 1          | Potential Transformer Ratio             | B      | R/W        |
| LV                             | 0x0005          | 5               | 2    | 600.00     | Low Voltage Holdoff Condition           | H      | R/W        |
| HV                             | 0x0007          | 7               | 2    | 0.00       | High Voltage Holdoff Condition          | H      | R/W        |
| VUB                            | 0x0009          | 9               | 1    | 5          | Voltage Unbalance Holdoff Percentage    | G      | R/W        |
| TC                             | 0x000A          | 10              | 1    | 5          | NEMA Trip Class                         | B      | R/W        |
| OC                             | 0x000B          | 11              | 2    | 10.00      | Overcurrent Threshold (FLA of motor)    | H      | R/W        |
| UC                             | 0x000D          | 13              | 2    | 5.00       | Undercurrent Threshold                  | H      | R/W        |
| UCTD                           | 0x000F          | 15              | 1    | 5          | Undercurrent Trip Delay                 | L      | R/W        |
| CUB                            | 0x0010          | 16              | 1    | 7          | Current Unbalance Threshold             | G      | R/W        |
| CUBTD                          | 0x0011          | 17              | 1    | 30         | Current Unbalance Trip Delay            | Q      | R/W        |
| LIN                            | 0x0012          | 18              | 1    | 0          | Linear Overcurrent Trip Delay           | L      | R/W        |
| RD0                            | 0x0013          | 19              | 2    | 0          | Restart Delay 0                         | L      | R/W        |
| RD1                            | 0x0015          | 21              | 2    | 0          | Restart Delay 1                         | L      | R/W        |
| RD2                            | 0x0017          | 23              | 2    | 300        | Restart Delay 2                         | L      | R/W        |
| RD3                            | 0x0019          | 25              | 2    | 300        | Restart Delay 3                         | L      | R/W        |
| RU                             | 0x001B          | 27              | 1    | 1          | Restart Attempts for Undercurrent Trips | B      | R/W        |
| RF                             | 0x001C          | 28              | 1    | 1          | Restart Attempts for all other faults   | B      | R/W        |
| GF                             | 0x001D          | 29              | 2    | 0          | Ground Fault Current Threshold          | H      | R/W        |
| GFTD                           | 0x001F          | 31              | 1    | 50         | Ground Fault Trip Delay                 | S      | R/W        |
| GFID                           | 0x0020          | 32              | 1    | 0          | Ground Fault Inhibit Delay              | L      | R/W        |
| LKW                            | 0x0021          | 33              | 2    | 0.00       | Low Power Trip Threshold                | H      | R/W        |
| HKW                            | 0x0023          | 35              | 2    | 0.00       | High Power Trip Threshold               | H      | R/W        |
| HPRTD                          | 0x0025          | 37              | 1    | 60         | High Power Trip Delay                   | C      | R/W        |
| STLP                           | 0x0026          | 38              | 1    | 0          | Stall Percentage (of OC)                | B      | R/W        |
| STLTD                          | 0x0027          | 39              | 1    | 5          | Stall Trip Delay                        | Q      | R/W        |
| STLID                          | 0x0028          | 40              | 1    | 0          | Stall Inhibit Delay                     | Q      | R/W        |
| MACCTRL                        | 0x0029          | 41              | 1    | 0          | Motor Acceleration Control Bits         | C      | R/W        |
| MACTD                          | 0x002A          | 42              | 1    | 0          | Motor Acceleration Trip Delay           | Q      | R/W        |
| ENDIS                          | 0x002B          | 43              | 2    | 0          | Feature Enable/Disable Mask             | C      | R/W        |
| CNFG                           | 0x002D          | 45              | 2    | 0x6001     | Hardware Configuration Fields           | C      | R/W        |
| COMCFG                         | 0x002F          | 47              | 2    | 0x00000000 | Communication Configuration             | C      | R/W        |
| CAN_CNFG                       | 0x0031          | 49              | 2    | 0x00000000 | CAN Configuration                       | C      | R/W        |
| MOD_CNFG                       | 0x0033          | 51              | 2    | 0x00000000 | ModBus Configuration                    | C      | R/W        |
| NAME                           | 0x0035          | 53              | 6    | ""         | Friendly Device Name                    | R      | R/W        |
| CMD                            | 0x003B          | 59              | 1    | N/A        | Command Interface                       | C      | W          |

\* See Instruction Manual (IM) Ref section for more details

See Instruction Manual (IM) tables 4.2 & 4.5 for default values

**NOTE: "Reserved" fields should be maintained as 0.**

\* For CNFG, see Table 2

\* For CMD, see Table 4

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**Table 2 - CNFG Details (Hardware Configuration Control Register)**

| FIELD NAME          | BIT | MASK   | DESCRIPTION  |
|---------------------|-----|--------|--|
| CNFG bit Masks      |     |        |  |
| GFMT                | 0   | 0x0001 | Ground fault motor trip selection, if set release motor on GF, is not set energize the alarm relay |
| AUXCNTL             | 1   | 0x0002 | AUX Relay Control  |
| Disable BLE Module  | 2   | 0x0004 | If bit set BLE module will be disabled   |
| Current Only Mode   | 3   | 0x0008 | Current only mode  |
| AUX Relay FS        | 4   | 0x0010 | AUX relay fail safe control  |
| Single-Phase Motor  | 5   | 0x0020 | Single phase motor operation   |
| 3-Phase w/1 Volt    | 6   | 0x0040 | 3phase motor with single voltage PT  |
| AUX AAI Holdoff     | 7   | 0x0080 | AUX alarm hold-off enabled   |
| AUX AAI Fault       | 8   | 0x0100 | AUX alarm on fault enabled   |
| PTC Enable          | 9   | 0x0200 |  |
| Reserved            | 10  | 0x0400 |  |
| Reserved            | 11  | 0x0800 |  |
| CBA Phase Rotation  | 12  | 0x1000 | Phase rotation   |
| RD0 on Power Up     | 13  | 0x2000 | RD0 on power up  |
| RD1 on Current Loss | 14  | 0x4000 | RD1 on Current Loss  |
| Reserved            | 15  | 0x8000 |  |

\*Available in the listed Version or newer.

**Table 3 - Memory Map Data Format Codes**

*All fields are in little endian*

| CODE | DESCRIPTION                              | SIZE BYTES |
|------|--|------------|
| A    | uint8_t                                  | 1          |
| B    | uint16_t                                 | 2          |
| C    | uint32_t                                 | 4          |
| D    | int8_t                                   | 1          |
| E    | int16_t                                  | 2          |
| F    | int32_t                                  | 4          |
| G    | uint16_t Base 10.xx                      | 2          |
| H    | uint32_t Base 10.xx                      | 4          |
| I    | int16_t Base 10.xx                       | 2          |
| J    | int32_t Base 10.xx                       | 4          |
| K    | uint32_t Unix time_t                     | 4          |
| L    | uint32_t Seconds                         | 4          |
| M    | int32_t Seconds                          | 4          |
| N    | int16_t Signed Percentage                | 2          |
| O    | uint8_t Base 10.x                        | 1          |
| P    | int16_t Power Factor*                    | 2          |
| Q    | uint16_t Seconds                         | 2          |
| R    | String                                   | N/A        |
| S    | uint16_t 1/10s of a Seconds (10 = 1 sec) | 2          |

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\*The Power Factor (PF) is represented as a 16 bit integer value.

The 2 most significant bits are used to represent the quadrant of the PF (0xC000):

- 00 => inductive (lagging, current lags voltage) and positive (load/motor condition)
- 10 => inductive (lagging, current lags voltage) and negative (source/generator condition)
- 01 => capacitive (leading, current leads voltage) and positive (load/motor condition)
- 11 => capacitive (leading, current leads voltage) and negative (source/generator condition)

The remaining bits represents the ratio of the PF. To extract the ratio value take the remaining bits and divide by 0x3FFF (16383).

As an example, if the provided value is 12216 (0x2F6B), masking off the upper two bits gives us 0x00, so the PF is inductive lagging.

The PF is then  $12216/16383 \Rightarrow 0.7456$  which is rounded up to 0.75.

## Command Register

Write to the Command Interface register (0x0076) to perform the following tasks.

**Table 4 – CMD (Command Interface; address 0x0076)**

| HEX    | DEFINED NAME                  | DESCRIPTION  |
|--------|-------------------------------|--|
| 0x0009 | CMD_MOTOR_RESTART             | Attempt to Restart the Motor   |
| 0x0010 | CMD_RESET_MOTOR_SERVICE_TIME  | Reset Motor Service time to NOW  |
| 0x0011 | CMD_FAULT_LOOKUP              | Fault Lookup (From FIDX and FRO) [Modbus only]                                 |
| 0x0012 | CMD_RESET_FACTOR_DEFAULTS     | Reset Configuration to Factory Defaults  |
| 0x0013 | CMD_RESET_MOTOR_RUN_TIME      | Reset the amount of time current has been detected flowing through the MP8000  |
| 0x0014 | CMD_RESET_MOTOR_SCNT          | Reset the number of times the motor has started                                |
| 0x0020 | CMD_FORCE_TRIP                | Force the MP8000 to trip, require restart to recover                           |
| 0x0030 | CMD_AUX_RELAY_OFF             | De-Energize/Release the AUX relay  |
| 0x0031 | CMD_AUX_RELAY_ON              | Energize/Activate the AUX relay  |
| 0x0040 | CMD_SET_BLE_DISABLE_BIT       | Set the BLE Disable bit of the CNFG register (bit 2) and stop BLE operation    |
| 0x0041 | CMD_CLR_BLE_DISABLE_BIT       | Clear the BLE Disable bit of the CNFG register (bit 2) and allow BLE operation |
| 0x0080 | CMD_ENABLE_CURRENT_ONLY_MODE  | Enable Current only measurement operation                                      |
| 0x0081 | CMD_DISABLE_CURRENT_ONLY_MODE | Disable Current only measurement operation                                     |

\*Available in the listed Version or newer.



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## Real Time Status

All parameters listed in Table 5 - MP8000 Memory Map Real Time Status are updated every second.

**Table 5 - MP8000 Memory Map Real Time Status**

| FIELD NAME                       | MODBUS REGISTER |                 |      | DESCRIPTION  | FORMAT | PERMISSION |
|----------------------------------|-----------------|-----------------|------|--|--------|------------|
|                                  | ADDRESS HEX     | ADDRESS DECIMAL | SIZE |  |        |            |
| <b>REALTIME STATUS REGISTERS</b> |                 |                 |      |  |        |            |
| MST                              | 0x0200          | 512             | 2    | Time since motor last serviced (can only be written to zero) | L      | R          |
| MRT                              | 0x0202          | 514             |      | Time since motor started                                     | L      | R          |
| SCNT                             | 0x0204          | 516             | 1    | Start Count -- Number of Motor starts (since last cleared)   | B      | R          |
| FAULT_STAT                       | 0x0205          | 517             | 2    | Current Fault Status Mask                                    | C      | R          |
| WARN_STAT                        | 0x0207          | 519             | 2    | Current Warning Status Mask                                  | C      | R          |
| FAULT_CODE                       | 0x0209          | 521             | 1    | Indicates the reason we have tripped or are in holdoff       | B      | R          |
| RTDT                             | 0x020A          | 522             | 2    | Remaining Trip Delay Time                                    | L      | R          |
| RDR                              | 0x020C          | 524             | 2    | Restart Time Remaining                                       | L      | R          |
| TCU                              | 0x020E          | 526             | 1    | Thermal Capacity Used  | B      | R          |
| MLF                              | 0x020F          | 527             | 1    | Measured Line Frequency                                      | G      | R          |
| SEQ                              | 0x0210          | 528             | 1    | Measured Phase Sequence                                      | B      | R          |
| VUBM                             | 0x0211          | 529             | 1    | Measured Voltage Unbalance                                   | G      | R          |
| CUBM                             | 0x0212          | 530             | 1    | Measured Current Unbalance                                   | G      | R          |
| V1                               | 0x0213          | 531             | 2    | Measured line 1 Voltage RMS                                  | H      | R          |
| V2                               | 0x0215          | 533             | 2    | Measured line 2 Voltage RMS                                  | H      | R          |
| V3                               | 0x0217          | 535             | 2    | Measured line 3 Voltage RMS                                  | H      | R          |
| I1                               | 0x0219          | 537             | 2    | Measured line 1 Current RMS                                  | H      | R          |
| I2                               | 0x021B          | 539             | 2    | Measured line 2 Current RMS                                  | H      | R          |
| I3                               | 0x021D          | 541             | 2    | Measured line 3 Current RMS                                  | H      | R          |
| P1                               | 0x021F          | 543             | 2    | Measured line 1 Power  | C      | R          |
| P2                               | 0x0221          | 545             | 2    | Measured line 2 Power  | C      | R          |
| P3                               | 0x0223          | 547             | 2    | Measured line 3 Power  | C      | R          |
| PF1                              | 0x0225          | 549             | 1    | Measured line 1 Power Factor                                 | P      | R          |
| PF2                              | 0x0226          | 550             | 1    | Measured line 2 Power Factor                                 | P      | R          |
| PF3                              | 0x0227          | 551             | 1    | Measured line 3 Power Factor                                 | P      | R          |
| IGF                              | 0x0228          | 552             | 2    | Ground Fault Current   | H      | R          |
| PTC                              | 0x022A          | 554             | 1    | Positive Temperature Coeficent                               | E      | R          |
| MOTORR                           | 0x022B          | 555             | 1    | Motor Relay State (0-open, 1-energized)                      | E      | R          |
| AUXR                             | 0x022C          | 556             | 1    | Aux Relay State (0-open, 1-energized)                        | E      | R          |
| TOTPWR                           | 0x022E          | 557             | 2    | Current total real motor power level                         | C      | R          |
| REAPWR                           | 0x022E          | 559             | 2    | Current total reactive motor power level                     | C      | R          |
| INPUT                            | 0x022F          | 561             | 1    | Input pin state  | B      | R          |
| RPWR                             | 0x0230          | 562             | 2    | Real measured power in Watt hours                            | C      | R          |
| IPWR                             | 0x0232          | 564             | 2    | Reactive measured power in VAR hours                         | C      | R          |

\*Available in the listed Version or newer.

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## Fault Record Retrieval

There are two methods of requesting a fault record: By index, and by date. (See Table 6)

To request fault records by Index:

1. Write the fault index to the FRI register (0x300). Note, this index is zero based, so the most recent fault record will have an index of zero.
  - a. Also the maximum valid index is 1023
2. Write to the CMD register (0x0076) with command 0x11 (see Table 4)
3. Continuously read the FRI register until it has been updated to 0xFFFF
4. The fault record is ready to read, starting at address 0x0308. (see Table 6)

To request fault records by date:

1. Write zero to the FRI register (0x0300).
2. Write the UNIX (32bit) time stamp to the FRO register (0x0304).
  - a. The log entry with the next earlier time entry will be retrieved.
3. Write to the CMD register (0x0076) with command 0x11 (see Table 4)
4. Continuously read the FRI register until it has been updated to 0xFFFF
5. The fault record is ready to read, starting at address 0x0308. (see Table 6)

**Table 6 - Fault Record Retrieval**

| FIELD NAME | MODBUS REGISTER |                 |      | DESCRIPTION                                   | FORMAT | PERMISSION |
|------------|-----------------|-----------------|------|---|--------|------------|
|            | ADDRESS HEX     | ADDRESS DECIMAL | SIZE |   |        |            |
| FRI        | 0x0300          | 768             | 2    | Fault Request Index (Or base DT)              | C      | W          |
| FRO        | 0x0302          | 770             | 2    | Fault Request Offset                          | F      | W          |
| FCODE      | 0x0304          | 772             | 2    | Fault Code indicating the source of the fault | B      | R          |
| FDT        | 0x0306          | 774             | 2    | Date Time of Fault                            | K      | R          |
| V1F        | 0x0308          | 776             | 2    | Measured line 1 Voltage RMS                   | H      | R          |
| V2F        | 0x030A          | 778             | 2    | Measured line 2 Voltage RMS                   | H      | R          |
| V3F        | 0x030C          | 780             | 2    | Measured line 3 Voltage RMS                   | H      | R          |
| I1F        | 0x030E          | 782             | 2    | Measured line 1 Current RMS                   | H      | R          |
| I2F        | 0x0310          | 784             | 2    | Measured line 2 Current RMS                   | H      | R          |
| I3F        | 0x0312          | 786             | 2    | Measured line 3 Current RMS                   | H      | R          |
| MRTF       | 0x0314          | 788             | 2    | Time since motor started                      | H      | R          |
| TCUF       | 0x0316          | 790             | 2    | Thermal Capacity Used                         | L      | R          |
| P1F        | 0x0318          | 792             | 2    | Measured line 1 Power                         | C      | R          |
| P2F        | 0x031A          | 794             | 2    | Measured line 2 Power                         | C      | R          |
| P3F        | 0x031C          | 796             | 2    | Measured line 3 Power                         | C      | R          |
| PF1F       | 0x031E          | 798             | 1    | Measured line 1 Power Factor                  | P      | R          |
| PF2F       | 0x031F          | 799             | 1    | Measured line 2 Power Factor                  | P      | R          |
| PF3F       | 0x0320          | 800             | 1    | Measured line 3 Power Factor                  | P      | R          |
| IGFF       | 0x0321          | 801             | 2    | Ground Fault Current                          | H      | R          |
| VUBF       | 0x0323          | 803             | 1    | Measured Voltage Unbalance                    | G      | R          |
| CUBF       | 0x0324          | 804             | 1    | Measured Current Unbalance                    | G      | R          |
| FAF        | 0x0325          | 805             | 1    | Frequency Measured from Phase A               | G      | R          |
| SEQF       | 0x0326          | 806             | 1    | Measured Phase Sequence                       | B      | R          |
| FSDF       | 0x0327          | 807             | 5    | Fault Specific Data                           | N.A    | R          |

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**Table 7 - Fault Status**

| ALIAS    | ACTIVE FAULT/TRIP CONDITION          | MASK       | FAULT CODE | *VERSION  |
|----------|--------------------------------------|------------|------------|-----------|
| NOFAULT  | No fault or warning condition        | 0x00000000 | 0          | 2.0.17.12 |
| OCF      | Tripped on overcurrent               | 0x00000001 | 1          | 2.0.17.12 |
| UCF      | Tripped on undercurrent              | 0x00000002 | 2          | 2.0.17.12 |
| CUBF     | Tripped on current unbalance         | 0x00000004 | 3          | 2.0.17.12 |
| CSPF     | Tripped on current single-phasing    | 0x00000008 | 4          | 2.0.17.12 |
| CTCF     | Tripped on contactor failure         | 0x00000010 | 5          | 2.0.17.12 |
| GFF      | Tripped on ground fault              | 0x00000020 | 6          | 2.0.17.12 |
| HPF      | Tripped on High Power Fault          | 0x00000040 | 7          | 2.0.17.12 |
| LPF      | Tripped on low power fault           | 0x00000080 | 8          | 2.0.17.12 |
| LCVF     | Low Control Voltage Fault            | 0x00000100 | 9          | 2.0.17.12 |
| PTCF     | Trip or holdoff due to PTC fault     | 0x00000200 | 10         | 2.0.17.12 |
| RMTF     | Tripped triggered from remote source | 0x00000400 | 11         | 2.0.17.12 |
| LIN      | Tripped on Linear Overcurrent        | 0x00000800 | 12         | 2.0.17.12 |
| STALL    | Tripped Motor Stall                  | 0x00001000 | 13         | 2.0.17.12 |
| ARD0     | Active Restart Delay Field Bit 0     | 0x00010000 | N/A        | 2.0.17.12 |
| ARD1     | Active Restart Delay Field Bit 1     | 0x00020000 | N/A        | 2.0.17.12 |
| ARD2     | Active Restart Delay Field Bit 2     | 0x00040000 | N/A        | 2.0.17.12 |
| PTCS     | Tripped on PTC Short                 | 0x00200000 | 14         | 2.0.17.12 |
| PTCO     | Tripped on PTC Open                  | 0x00400000 | 15         | 2.0.17.12 |
| MANR     | Manual Restart Required              | 0x00080000 | N/A        | 2.0.17.12 |
| FWUpdate | F/W Update                           | n/a        | 0x1000     | 2.0.17.12 |
| UNDEFF   | Undefined trip condition             | 0x00100000 | 61166      | 2.0.17.12 |
| FMEA     | MP8000 Replacement Fault             | 0x01000000 | 4097       | 2.2.17.15 |

\*Available in the listed Version or newer.

**Table 8 - Active Restart Delay**

| ARD[2:0] | RDR IS   |
|----------|----------|
| 000      | Inactive |
| 001      | RD0      |
| 010      | RD1      |
| 011      | RD2      |
| 100      | RD3      |

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**Table 9 - Warning Status**

| ALIAS   | ACTIVE WARNING OR HOLDOFF       | MASK       | WARN CODE |
|---------|---------------------------------|------------|-----------|
| NOWARN  | No Warning Condition Present    | 0x00000000 | N/A       |
| W_OCF   | Overcurrent Detected            | 0x00000001 | N/A       |
| W_UCF   | Undercurrent Detected           | 0x00000002 | N/A       |
| W_CUBF  | Current Unbalance Detected      | 0x00000004 | N/A       |
| W_CSPF  | Current Single Phasing Detected | 0x00000008 | N/A       |
| W_CTCF  | Contactors Failure Detected     | 0x00000010 | N/A       |
| W_GFF   | Ground Fault Detected           | 0x00000020 | N/A       |
| W_HPF   | High Power Detected             | 0x00000040 | N/A       |
| W_LPF   | Low Power Detected              | 0x00000080 | N/A       |
| W_LCVF  | Low Control Voltage Detected    | 0x00000100 | N/A       |
| W_PTCF  | PTC Holdoff                     | 0x00000200 | N/A       |
| W_LIN   | Linear Overcurrent Detected     | 0x00000800 | N/A       |
| W_STALL | Motor Stall Detected            | 0x00001000 | N/A       |
| LVH     | Low Voltage Holdoff             | 0x00010000 | 100       |
| HVH     | High Voltage Holdoff            | 0x00020000 | 101       |
| VUBH    | Voltage Unbalanced Holdoff      | 0x00040000 | 102       |
| PHSQ    | Phase Sequence Holdoff          | 0x00080000 | 103       |
| UNDEFF  | Undefined Holdoff               | 0x00100000 | N/A       |
| GFALARM | Ground Fault Alarm              | 0x00800000 | 16        |

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## MP8000 ETHERNET/IP INTERFACE

### MP8000 Network Settings

By default, the MP8000 is configured to request its IP address and network configuration from a DHCP server. It is also possible to set a static IP address using the MP8000 software or Littelfuse smartphone/tablet app.

### RSLOGIX5000 Setup

Add a Generic EtherNet/IP Module as a New Module to the PLC. The Comm Format for the MP8000 is DATA-SINT. The Input Assembly is instance 50 or 51 with a size of 1, and the Output Assembly is instance 2 with a size of 1.

### LED Indication

There are two LED's on the RJ45 connector on the side of the MP8000. The amber LED indicates the existence of a network connection. The green LED indicates data transfer.

## ETHERNET/IP OBJECTS

### Identify Object

The module supports the following objects:

**Table 10 - Ethernet NET/IP Objects**

| CLASS | DESCRIPTION |
|-------|-------------|
| 0x01  | Identity    |
| 0x04  | Assembly    |

### Identity Object Class Services

Get\_Attribute\_Single: Returns contents of specified attribute.

**Table 11 - Identity Class 1, Instance 0 Attributes**

| ATTRIBUTE NUMBER | ATTRIBUTE NAME | SERVICES | DESCRIPTION                 | DEFAULT, MINIMUM, MAXIMUM | DATA TYPE |
|------------------|----------------|----------|-----------------------------|---------------------------|-----------|
| 1                | Revision       | Get      | Revision of this object     | 1                         | UINT      |
| 2                | Max Instance   | Get      | Maximum number of instances | 1                         | UINT      |

### Identity Object Instance Services

Get\_Attribute\_Single: Returns contents of specific attribute.

Set\_Attribute\_Single: Modify the specified attribute.

Reset: Performs reset services based on the parameter.

**Table 12 - Identity Class 1, Instance 1 Attributes**

| ATTRIBUTE NUMBER | ATTRIBUTE NAME | SERVICES | DESCRIPTION   | DEFAULT, MINIMUM, MAXIMUM | DATA TYPE    |
|------------------|----------------|----------|---|---------------------------|--------------|
| 1                | Vendor ID      | Get      | Identification of each vendor by number               | 691                       | UINT         |
| 2                | Device Type    | Get      | Motor Overload  | 03                        | UINT         |
| 3                | Product Code   | Get      | Motor protection relay series                         | 8000                      | UINT         |
| 4                | Revision       | Get      | Major revision must match the eds value (Major.Minor) | 3, 002                    | UINT         |
| 7                | Product Name   | Get      | Human readable identification                         | MP8000                    | SHORT_STRING |

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## Assembly Object

| ATTRIBUTE NUMBER | ATTRIBUTE NAME | SERVICES             | DESCRIPTION              | DEFAULT, MINIMUM, MAXIMUM | DATA TYPE |
|------------------|----------------|----------------------|--------------------------|---------------------------|-----------|
| 1<br>0x01        | Revision       | Get_Attribute_Single | Revision of this object. | 1, 1, 1                   | UINT      |

## Input Assembly

**Table 13 - Assembly Class (4), Instance (50), Attribute (3) – Input 1 (1 Byte): Basic Overload**

| BYTE | BIT7     | BIT6     | BIT5     | BIT4     | BIT3     | BIT2     | BIT1     | BIT0             |
|------|----------|----------|----------|----------|----------|----------|----------|------------------|
| 0    | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved | Faulted/<br>Trip |

**Table 14 - Assembly Class (4), Instance (51), Attribute (3) – Input 1 (1 Byte): Extended Overload**

| BYTE | BIT7     | BIT6     | BIT5     | BIT4     | BIT3     | BIT2     | BIT1    | BIT0             |
|------|----------|----------|----------|----------|----------|----------|---------|------------------|
| 0    | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved | Warning | Faulted/<br>Trip |

## Output Assembly

**Table 15 - Assembly Class (4), Instance (2), Attribute (3) – Output 1 (1 Byte)**

| BYTE | BIT7     | BIT6     | BIT5     | BIT4     | BIT3     | BIT2        | BIT1     | BIT0     |
|------|----------|----------|----------|----------|----------|-------------|----------|----------|
| 0    | Reserved | Reserved | Reserved | Reserved | Reserved | Fault Reset | Reserved | Reserved |

**Table 16 -Input Instance 103 (Real Time Status with Power Metering)**

| NAME       | BYTES | OFFSET | ACCESS | TYPE  |
|------------|-------|--------|--------|-------|
| MST        | 4     | 0      | R      | UDINT |
| MRT        | 4     | 4      | R      | UDINT |
| SCNT       | 2     | 8      | R      | UINT  |
| FAULT_CODE | 2     | 10     | R      | UINT  |
| FAULT_STAT | 4     | 12     | R      | UDINT |
| WARN_STAT  | 4     | 16     | R      | UDINT |
| RTDT       | 4     | 20     | R      | UDINT |
| RDR        | 4     | 24     | R      | UDINT |
| TCU        | 2     | 28     | R      | UINT  |
| MLF        | 2     | 30     | R      | UINT  |
| SEQ        | 2     | 32     | R      | UINT  |
| VUBM       | 2     | 34     | R      | UINT  |
| CUBM       | 2     | 36     | R      | UINT  |
| PF1        | 2     | 38     | R      | UINT  |
| PF2        | 2     | 40     | R      | UINT  |
| PF3        | 2     | 42     | R      | UINT  |
| V1         | 4     | 44     | R      | UDINT |
| V2         | 4     | 48     | R      | UDINT |

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**Table 16 continued**

| NAME         | BYTES      | OFFSET | ACCESS | TYPE  |
|--------------|------------|--------|--------|-------|
| V3           | 4          | 52     | R      | UDINT |
| I1           | 4          | 56     | R      | UDINT |
| I2           | 4          | 60     | R      | UDINT |
| I3           | 4          | 64     | R      | UDINT |
| P1           | 4          | 72     | R      | UDINT |
| P3           | 4          | 76     | R      | UDINT |
| IGF          | 4          | 80     | R      | UDINT |
| PTC          | 2          | 84     | R      | UINT  |
| MOTRR        | 1          | 86     | R      | BOOL  |
| AUXR         | 1          | 87     | R      | BOOL  |
| TOTPWR       | 4          | 88     | R      | UDINT |
| FW_REV       | 4          | 92     | R      | UDINT |
| PC           | 4          | 96     | R      | UDINT |
| <b>TOTAL</b> | <b>100</b> |        |        |       |

**Table 17 -Input Instance 101 (Fault)**

| NAME  | BYTES | OFFSET | ACCESS | TYPE  |
|-------|-------|--------|--------|-------|
| FCODE | 4     | 0      | R      | UDINT |
| FDT   | 4     | 4      | R      | UDINT |
| V1F   | 4     | 8      | R      | UDINT |
| V2F   | 4     | 12     | R      | UDINT |
| V3F   | 4     | 16     | R      | UDINT |
| I1F   | 4     | 20     | R      | UDINT |
| I2F   | 4     | 24     | R      | UDINT |
| I3F   | 4     | 28     | R      | UDINT |
| MRTF  | 4     | 32     | R      | UDINT |
| TCUF  | 4     | 36     | R      | UDINT |
| P1F   | 4     | 40     | R      | UDINT |
| P2F   | 4     | 44     | R      | UDINT |
| P3F   | 4     | 48     | R      | UDINT |
| IGFF  | 4     | 52     | R      | UDINT |
| VUBF  | 2     | 56     | R      | UINT  |
| CUBF  | 2     | 58     | R      | UINT  |
| FAF   | 2     | 60     | R      | UINT  |
| SEQF  | 2     | 62     | R      | UINT  |
| PF1F  | 2     | 64     | R      | UINT  |
| PF2F  | 2     | 66     | R      | UINT  |
| PF3F  | 2     | 68     | R      | UINT  |
| FSDF  | 6     | 70     | R      | UINT  |
| FCODE | 4     | 76     | R      | UDINT |
| FDT   | 4     | 80     | R      | UDINT |
| V1F   | 4     | 84     | R      | UDINT |
| V2F   | 4     | 88     | R      | UDINT |

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**Table 17 continued**

| NAME         | BYTES      | OFFSET | ACCESS | TYPE  |
|--------------|------------|--------|--------|-------|
| V3F          | 4          | 92     | R      | UDINT |
| I1F          | 4          | 96     | R      | UDINT |
| I2F          | 4          | 100    | R      | UDINT |
| I3F          | 4          | 104    | R      | UDINT |
| MRTF         | 4          | 108    | R      | UDINT |
| TCUF         | 4          | 112    | R      | UDINT |
| P1F          | 4          | 116    | R      | UDINT |
| P2F          | 4          | 120    | R      | UDINT |
| P3F          | 4          | 124    | R      | UDINT |
| IGFF         | 4          | 128    | R      | UDINT |
| VUBF         | 2          | 132    | R      | UINT  |
| CUBF         | 2          | 134    | R      | UINT  |
| FAF          | 2          | 136    | R      | UINT  |
| SEQF         | 2          | 138    | R      | UINT  |
| PF1F         | 2          | 140    | R      | UINT  |
| PF2F         | 2          | 142    | R      | UINT  |
| PF3F         | 2          | 144    | R      | UINT  |
| FADF         | 6          | 146    | R      | UINT  |
| <b>TOTAL</b> | <b>152</b> |        |        |       |

**Table 18 - Input Instance 102 (Real Time Status & Fault)**

| NAME                                  | BYTES      | OFFSET | ACCESS | TYPE |
|---------------------------------------|------------|--------|--------|------|
| Input Instance 100 (Real Time Status) | 100        | 0      |        |      |
| Input Instance 101 (Fault)            | 152        | 100    |        |      |
| <b>TOTAL</b>                          | <b>152</b> |        |        |      |

**Table 19 - Input Instance 103 (Real Time Status with Power Metering)**

| NAME       | BYTES | OFFSET | ACCESS | TYPE  |
|------------|-------|--------|--------|-------|
| MST        | 4     | 0      | R      | UDINT |
| MRT        | 4     | 4      | R      | UDINT |
| SCNT       | 2     | 8      | R      | UINT  |
| FAULT_CODE | 2     | 10     | R      | UINT  |
| FAULT_STAT | 4     | 12     | R      | UDINT |
| WARN_STAT  | 4     | 16     | R      | UDINT |
| RTDT       | 4     | 20     | R      | UDINT |
| RDR        | 4     | 24     | R      | UDINT |
| TCU        | 2     | 28     | R      | UINT  |
| MLF        | 2     | 30     | R      | UINT  |
| SEQ        | 2     | 32     | R      | UINT  |
| VUBM       | 2     | 34     | R      | UINT  |
| CUBM       | 2     | 36     | R      | UINT  |
| PF1        | 2     | 38     | R      | UINT  |
| PF2        | 2     | 40     | R      | UINT  |
| PF3        | 2     | 42     | R      | UINT  |



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**Table 19 continued**

| NAME         | BYTES      | OFFSET | ACCESS | TYPE  |
|--------------|------------|--------|--------|-------|
| V1           | 4          | 44     | R      | UDINT |
| V2           | 4          | 48     | R      | UDINT |
| V3           | 4          | 52     | R      | UDINT |
| I1           | 4          | 56     | R      | UDINT |
| I2           | 4          | 60     | R      | UDINT |
| I3           | 4          | 64     | R      | UDINT |
| P1           | 4          | 68     | R      | UDINT |
| P2           | 4          | 72     | R      | UDINT |
| P3           | 4          | 76     | R      | UDINT |
| IGF          | 4          | 80     | R      | UDINT |
| PTC          | 2          | 84     | R      | UINT  |
| MOTORR       | 1          | 86     | R      | BOOL  |
| AUXR         | 1          | 87     | R      | BOOL  |
| TotPwr       | 4          | 88     | R      | UDINT |
| ReaPwr       | 4          | 92     | R      | UDINT |
| Input        | 4          | 96     | R      | DINT  |
| RPWR         | 4          | 100    | R      | UDINT |
| IPWR         | 4          | 104    | R      | UDINT |
| FW_REV       | 4          | 108    | R      | UDINT |
| PC           | 4          | 112    | R      | UDINT |
| <b>TOTAL</b> | <b>116</b> |        |        |       |

**Table 20 - Input Instance 104 (Fault) (Same as 101)**

| NAME  | BYTES | OFFSET | ACCESS | TYPE  |
|-------|-------|--------|--------|-------|
| FCODE | 4     | 0      | R      | UDINT |
| FDT   | 4     | 4      | R      | UDINT |
| V1F   | 4     | 8      | R      | UDINT |
| V2F   | 4     | 12     | R      | UDINT |
| V3F   | 4     | 16     | R      | UDINT |
| I1F   | 4     | 20     | R      | UDINT |
| I2F   | 4     | 24     | R      | UDINT |
| I3F   | 4     | 28     | R      | UDINT |
| MRTF  | 4     | 32     | R      | UDINT |
| TCUF  | 4     | 36     | R      | UDINT |
| P1F   | 4     | 40     | R      | UDINT |
| P2F   | 4     | 44     | R      | UDINT |
| P3F   | 4     | 48     | R      | UDINT |
| IGFF  | 4     | 52     | R      | UDINT |
| VUBF  | 2     | 56     | R      | UINT  |
| CUBF  | 2     | 58     | R      | UINT  |
| FAF   | 2     | 60     | R      | UINT  |
| SEQF  | 2     | 62     | R      | UINT  |
| PF1F  | 2     | 64     | R      | UINT  |
| PF2F  | 2     | 66     | R      | UINT  |

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**Table 20 continued**

| NAME         | BYTES      | OFFSET | ACCESS | TYPE  |
|--------------|------------|--------|--------|-------|
| PF3F         | 2          | 68     | R      | UINT  |
| FSDF         | 6          | 70     | R      | UINT  |
| FCODE        | 4          | 76     | R      | UDINT |
| FDT          | 4          | 80     | R      | UDINT |
| V1F          | 4          | 84     | R      | UDINT |
| V2F          | 4          | 88     | R      | UDINT |
| V3F          | 4          | 92     | R      | UDINT |
| I1F          | 4          | 96     | R      | UDINT |
| I2F          | 4          | 100    | R      | UDINT |
| I3F          | 4          | 104    | R      | UDINT |
| MRTF         | 4          | 108    | R      | UDINT |
| TCUF         | 4          | 112    | R      | UDINT |
| P1F          | 4          | 116    | R      | UDINT |
| P2F          | 4          | 120    | R      | UDINT |
| P3F          | 4          | 124    | R      | UDINT |
| IGFF         | 4          | 128    | R      | UDINT |
| VUBF         | 2          | 132    | R      | UINT  |
| CUBF         | 2          | 134    | R      | UINT  |
| FAF          | 2          | 136    | R      | UINT  |
| SEQF         | 2          | 138    | R      | UINT  |
| PF1F         | 2          | 140    | R      | UINT  |
| PF2F         | 2          | 142    | R      | UINT  |
| PF3F         | 2          | 144    | R      | UINT  |
| FSDF         | 6          | 146    | R      | UINT  |
| <b>TOTAL</b> | <b>152</b> |        |        |       |

**Table 21 - Input Instance 105 (Real Time Status with Power Metering & Fault)**

| NAME                                  | BYTES      | OFFSET | ACCESS | TYPE |
|---------------------------------------|------------|--------|--------|------|
| Input Instance 103 (Real Time Status) | 116        | 0      |        |      |
| Input Instance 104 (Fault)            | 152        | 116    |        |      |
| <b>TOTAL</b>                          | <b>268</b> |        |        |      |

**Table 22 - Config Instance 150 (Basic Config Settings)**

| NAME | BYTES | OFFSET | ACCESS | TYPE  |
|------|-------|--------|--------|-------|
| MULT | 2     | 0      | R/W    | UINT  |
| PT   | 2     | 2      | R/W    | UINT  |
| LV   | 4     | 4      | R/W    | UDINT |
| HV   | 4     | 8      | R/W    | UDINT |
| VUB  | 2     | 12     | R/W    | UINT  |
| TC   | 2     | 14     | R/W    | UINT  |
| OC   | 4     | 16     | R/W    | UDINT |
| UC   | 4     | 20     | R/W    | UDINT |
| UCTD | 2     | 24     | R/W    | UINT  |
| CUB  | 2     | 26     | R/W    | UINT  |

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**Table 22 continued**

| NAME         | BYTES     | OFFSET | ACCESS | TYPE  |
|--------------|-----------|--------|--------|-------|
| CUBTD        | 2         | 28     | R/W    | UINT  |
| LIN          | 2         | 30     | R/W    | UINT  |
| RD0          | 4         | 32     | R/W    | UDINT |
| RD1          | 4         | 36     | R/W    | UDINT |
| RD2          | 4         | 40     | R/W    | UDINT |
| RD3          | 4         | 44     | R/W    | UDINT |
| RU           | 2         | 48     | R/W    | UINT  |
| RF           | 2         | 50     | R/W    | UINT  |
| <b>TOTAL</b> | <b>52</b> |        |        |       |

**Table 23 - Config Instance 150 (Basic Config Settings)**

| NAME   | BYTES      | OFFSET | ACCESS | TYPE   |
|--|------------|--------|--------|--------|
| Config Instance 150<br>(Basic Config Settings) | 52         | 0      |        |        |
| GF   | 4          | 52     | R/W    | UDINT  |
| GFTD   | 2          | 56     | R/W    | UINT   |
| GFID   | 2          | 58     | R/W    | UINT   |
| LKW  | 4          | 60     | R/W    | UDINT  |
| HKW  | 4          | 64     | R/W    | UDINT  |
| HPRTD  | 2          | 68     | R/W    | UINT   |
| STLP   | 2          | 70     | R/W    | UINT   |
| STLTD  | 2          | 72     | R/W    | UINT   |
| STLID  | 2          | 74     | R/W    | UINT   |
| MACCTRL  | 2          | 76     | R/W    | UINT   |
| MACTD  | 2          | 78     | R/W    | UINT   |
| ENDIS  | 4          | 80     | R/W    | UDINT  |
| CNFG   | 4          | 84     | R/W    | UDINT  |
| COMCFG   | 4          | 88     | R/W    | UDINT  |
| CAN_CNFG                                       | 4          | 92     | R/W    | UDINT  |
| MOD_CNFG                                       | 4          | 96     | R/W    | UDINT  |
|  | 12         | 100    | R/W    | STRING |
| <b>TOTAL</b>                                   | <b>112</b> |        |        |        |

**Table 24 - Configuration Object Class 100 (0x64)**

| ATTRIBUTE ID | NAME | ACCESS | TYPE  |
|--------------|------|--------|-------|
| 1            | MULT | R/W    | UINT  |
| 2            | PT   | R/W    | UINT  |
| 3            | LV   | R/W    | UDINT |
| 4            | HV   | R/W    | UDINT |
| 5            | VUB  | R/W    | UDINT |
| 6            | TC   | R/W    | UINT  |
| 7            | OC   | R/W    | UDINT |
| 8            | UC   | R/W    | UDINT |

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**Table 24 continued**

| ATTRIBUTE ID | NAME  | ACCESS | TYPE   |
|--------------|-------|--------|--------|
| 9            | UCTD  | R/W    | UINT   |
| 10           | CUB   | R/W    | UINT   |
| 11           | CUBTD | R/W    | UINT   |
| 12           | LIN   | R/W    | UINT   |
| 13           | RD0   | R/W    | UDINT  |
| 14           | RD1   | R/W    | UDINT  |
| 15           | RD2   | R/W    | UDINT  |
| 16           | RD3   | R/W    | UDINT  |
| 17           | RU    | R/W    | UINT   |
| 18           | RF    | R/W    | UINT   |
| 19           | GF    | R/W    | UDINT  |
| 20           | GFTD  | R/W    | UINT   |
| 22           | LKW   | R/W    | UDINT  |
| 23           | HKW   | R/W    | UDINT  |
| 24           | HPRTD | R/W    | UINT   |
| 25           | STLP  | R/W    | UINT   |
| 26           | STLTD | R/W    | UINT   |
| 27           | STLID | R/W    | UINT   |
| 30           | POWER | R      | UDINT  |
| 31           | CNFG  | R/W    | UDINT  |
| 35           | NAME  | R/W    | STRING |
| 36           | CMD   | R/W    | UINT   |

**Table 25 - Real-Time Object: Class 101 (0x65)**

| ATTRIBUTE ID | NAME       | ACCESS | TYPE  |
|--------------|------------|--------|-------|
| 1            | MST        | R      | UDINT |
| 2            | MRT        | R      | UDINT |
| 3            | SCNT       | R      | UINT  |
| 4            | FAULT_STAT | R      | UDINT |
| 5            | WARN_STAT  | R      | UDINT |
| 6            | FAULT_CODE | R      | UINT  |
| 7            | RTDT       | R      | UDINT |
| 8            | RDR        | R      | UDINT |
| 9            | TCU        | R      | UINT  |
| 10           | MLF        | R      | UINT  |
| 11           | SEQ        | R      | UINT  |
| 12           | VUBM       | R      | UINT  |
| 13           | CUBM       | R      | UINT  |
| 14           | V1         | R      | UDINT |
| 15           | V2         | R      | UDINT |
| 16           | V3         | R      | UDINT |

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**Table 25 continued**

| ATTRIBUTE ID | NAME    | ACCESS | TYPE  |
|--------------|---------|--------|-------|
| 17           | I1      | R      | UDINT |
| 18           | I2      | R      | UDINT |
| 19           | I3      | R      | UDINT |
| 20           | P1      | R      | UDINT |
| 21           | P2      | R      | UDINT |
| 22           | P3      | R      | UDINT |
| 23           | PF1     | R      | UINT  |
| 24           | PF2     | R      | UINT  |
| 25           | PF3     | R      | UINT  |
| 26           | IGF     | R      | UDINT |
| 27           | PTC     | R      | UINT  |
| 28           | MOTORR  | R      | UINT  |
| 29           | AUXR    | R      | UINT  |
| 30           | TotPwr  | R      | UDINT |
| 31           | ReacPwr | R      | UDINT |
| 32           | Input   | R      | UINT  |
| 33           | RPWR    | R      | UDINT |
| 34           | IPWR    | R      | UDINT |

**Table 26 - Control Supervisor Object: Class 41 (0x29)**

| ATTRIBUTE ID DECIMAL | NAME            | ACCESS | TYPE |
|----------------------|-----------------|--------|------|
| 10                   | Faulted         | R      | BOOL |
| 11                   | Warning         | R      | BOOL |
| 12                   | FaultRst        | W      | BOOL |
| 3                    | RUN1            | S      | UINT |
| 7                    | Running1        | R      | UINT |
| 15                   | CtrlFromNet     | R      | BOOL |
| 17                   | ForceFault/Trip | S      | BOOL |

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## SPECIFICATIONS

Protocol.....EtherNet/IP and Modbus TCP  
Ports .....1  
IP Address .....1  
Number of Connections .....2 (ModbusTCP) or 1 (EtherNet/IP)

Connection:  
Connector .....RJ45  
Cable .....CAT5  
Length .....100 m (328')  
Interface .....10BASE-T, 100BASE-Tx