MP8000
PROGRAMMING GUIDE

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Technical Support
+1 800-832-3873

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.

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.

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.

CONFIGURATION SETTINGS

Table 1 - MP8000 Memory Map Settings (Configuration parameters)

FIELD NAME	MODBUS REGISTER			DEFAULT	DESCRIPTION	FORMAT	PERMISSION
	ADDRESS HEX	ADDRESS DECIMAL	SIZE				
CONFIGURATION REGISTERS							
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**

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

*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 => 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.

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			
REALTIME STATUS REGISTERS						
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.

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	58	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

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

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	Contactor 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

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

Assembly Object

ATTRIBUTE NUMBER	ATTRIBUTE NAME	SERVICES	DESCRIPTION	DEFAULT, MINIMUM, MAXIMUM	DATA TYPE
1 0x01	Revision	Get_Attibute_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/ 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/ 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

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
MOTORR	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
TOTAL	**100**			

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

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
FSDF	6	146	R	UINT
TOTAL	**152**			

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		
TOTAL	**152**			

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

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
TOTAL	**116**			

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

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
TOTAL	**152**			

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		
TOTAL	**268**			

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

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
TOTAL	**52**			

Table 23 - Config Instance 150 (Basic Config Settings)

NAME	BYTES	OFFSET	ACCESS	TYPE
Config Instance 150 (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
TOTAL	**112**			

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

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

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

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