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MM300

# Motor Management System

COMMUNICATIONS GUIDE



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# MM300 Motor Management System

## Communications Guide

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### Communications interfaces

The MM300 has three communications interfaces:

- RS485
- 10/100Base-T Ethernet
- Fieldbus



NOTE

Setpoint changes related to DeviceNet, Profibus, and Ethernet, require a power cycle to be activated.



NOTE

External power must be present on the Fieldbus port at power-up, in order to correctly initialize.

## RS485 interface (Modbus RTU)

The RS485 interface is a serial two-wire port intended for use as a Modbus RTU slave. The RS485 port has the following characteristics.

- Address: 1 to 254
- Baud rate: 9600 to 115200 bps
- Supported Modbus function codes: 3, 4, 5, 6, 7, 8, 16

### Modbus Protocol

The MM300 implements a subset of the Modicon Modbus RTU serial communication standard. The Modbus protocol is hardware-independent. That is, the physical layer can be any of a variety of standard hardware configurations. This includes RS232, RS422, RS485, fibre optics, etc. Modbus is a single master / multiple slave type of protocol suitable for a multi-drop configuration as provided by RS485 hardware. The MM300 Modbus implementation employs two-wire RS485 hardware. Using RS485, up to 32 MM300s can be daisy-chained together on a single communication channel.

The MM300 is always a Modbus slave. It can not be programmed as a Modbus master. Computers or PLCs are commonly programmed as masters.

Both monitoring and control are possible using read and write register commands. Other commands are supported to provide additional functions.

### Electrical Interface

The hardware or electrical interface in the MM300 is two-wire RS485. In a two-wire link, data is transmitted and received over the same two wires. Although RS485 two wire communication is bi-directional, the data is never transmitted and received at the same time. This means that the data flow is half duplex.

RS485 lines should be connected in a daisy chain configuration with terminating networks installed at each end of the link (i.e. at the master end and at the slave farthest from the master). The terminating network should consist of a 120  $\Omega$  resistor in series with a 1 nF ceramic capacitor when used with Belden 9841 RS485 wire. Shielded wire should always be used to minimize noise. The shield should be connected to all of the MM300s as well as the master, then grounded at one location only. This keeps the ground potential at the same level for all of the devices on the serial link.



NOTE

Polarity is important in RS485 communications. The '+' (positive) terminals of every device must be connected together.

### Data Frame Format and Data Rate

One data frame of an asynchronous transmission to or from a MM300 typically consists of 1 start bit, 8 data bits, and 1 stop bit. This produces a 10 bit data frame. This is important for transmission through modems at high bit rates (11 bit data frames are not supported by Hayes modems at bit rates of greater than 300 bps).

Modbus protocol can be implemented at any standard communication speed. The MM300 supports operation at 9600, 19200, 38400, 57600, and 115200 baud.

### Data Packet Format

A complete request/response sequence consists of the following bytes (transmitted as separate data frames):

Master Request Transmission:

SLAVE ADDRESS: 1 byte

FUNCTION CODE: 1 byte

DATA: variable number of bytes depending on FUNCTION CODE

CRC: 2 bytes

Slave Response Transmission:

SLAVE ADDRESS: 1 byte

FUNCTION CODE: 1 byte

DATA: variable number of bytes depending on FUNCTION CODE

CRC: 2 bytes

**SLAVE ADDRESS:** This is the first byte of every transmission. This byte represents the user-assigned address of the slave device that is to receive the message sent by the master. Each slave device must be assigned a unique address and only the addressed slave will respond to a transmission that starts with its address. In a master request transmission the SLAVE ADDRESS represents the address of the slave to which the request is being sent. In a slave response transmission the SLAVE ADDRESS represents the address of the slave that is sending the response.

**FUNCTION CODE:** This is the second byte of every transmission. Modbus defines function codes of 1 to 127.

**DATA:** This will be a variable number of bytes depending on the FUNCTION CODE. This may be Actual Values, Setpoints, or addresses sent by the master to the slave or by the slave to the master.

**CRC:** This is a two byte error checking code.

## Error Checking

The RTU version of Modbus includes a two byte CRC-16 (16 bit cyclic redundancy check) with every transmission. The CRC-16 algorithm essentially treats the entire data stream (data bits only; start, stop and parity ignored) as one continuous binary number. This number is first shifted left 16 bits and then divided by a characteristic polynomial (11000000000000101B). The 16 bit remainder of the division is appended to the end of the transmission, MSByte first. The resulting message including CRC, when divided by the same polynomial at the receiver will give a zero remainder if no transmission errors have occurred.

If a MM300 Modbus slave device receives a transmission in which an error is indicated by the CRC-16 calculation, the slave device will not respond to the transmission. A CRC-16 error indicates that one or more bytes of the transmission were received incorrectly and thus the entire transmission should be ignored in order to avoid the MM300 performing any incorrect operation.

The CRC-16 calculation is an industry standard method used for error detection. An algorithm is included here to assist programmers in situations where no standard CRC-16 calculation routines are available.

## CRC-16 Algorithm

Once the following algorithm is complete, the working register "A" will contain the CRC value to be transmitted. Note that this algorithm requires the characteristic polynomial to be reverse bit ordered. The MSBit of the characteristic polynomial is dropped since it does not affect the value of the remainder. The following symbols are used in the algorithm:

—>: data transfer

A: 16 bit working register

AL: low order byte of A

AH: high order byte of A

CRC: 16 bit CRC-16 value

i, j: loop counters

(+): logical exclusive or operator

Di: i-th data byte (i = 0 to N-1)

G: 16 bit characteristic polynomial = 101000000000001 with MSbit dropped and bit order reversed

shr(x): shift right (the LSbit of the low order byte of x shifts into a carry flag, a '0' is shifted into the MSbit of the high order byte of x, all other bits shift right one location)

The algorithm is:

1. FFFF hex  $\rightarrow$  A
2. 0  $\rightarrow$  i
3. 0  $\rightarrow$  j
4. Di (+) AL  $\rightarrow$  AL
5. j+1  $\rightarrow$  j
6. shr(A)
7. is there a carry? No: go to 8. Yes: G (+) A  $\rightarrow$  A
8. is j = 8? No: go to 5. Yes: go to 9.
9. i+1  $\rightarrow$  i
10. is i = N? No: go to 3. Yes: go to 11.
11. A  $\rightarrow$  CRC

## Timing

Data packet synchronization is maintained by timing constraints. The receiving device must measure the time between the reception of characters. If 3.5 character times elapse without a new character or completion of the packet, then the communication link must be reset (i.e. all slaves start listening for a new transmission from the master). Thus at 9600 baud a delay of greater than  $3.5 \times 1 / 9600 \times 10 \times 3.65 \times \text{ms}$  will cause the communication link to be reset.

## MM300 supported functions

The following functions are supported by the MM300:

- FUNCTION CODE 03 - Read Setpoints and Actual Values
- FUNCTION CODE 04 - Read Setpoints and Actual Values
- FUNCTION CODE 05 - Execute Operation
- FUNCTION CODE 06 - Store Single Setpoint
- FUNCTION CODE 07 - Read Device Status
- FUNCTION CODE 08 - Loopback Test
- FUNCTION CODE 10 - Store Multiple Setpoints

## Modbus Functions

### Function Code 03H

Modbus implementation: Read Holding Registers



## MM300 implementation: Read Setpoints

For the MM300 implementation of Modbus, this function code can be used to read any setpoints ("holding registers"). Holding registers are 16 bit (two byte) values transmitted high order byte first. Thus all MM300 Setpoints are sent as two bytes. The maximum number of registers that can be read in one transmission is 125.

The slave response to this function code is the slave address, function code, a count of the number of data bytes to follow, the data itself and the CRC. Each data item is sent as a two byte number with the high order byte sent first.

For example, consider a request for slave 17 to respond with 3 registers starting at address 006B. For this example the register data in these addresses is as follows:

Address	Data
006B	022B
006C	0000
006D	0064

The master/slave packets have the following format:

**Table 1: Master/slave packet format for function code 03H**

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	03	read registers
DATA STARTING ADDRESS	2	00 6B	data starting at 006B
NUMBER OF SETPOINTS	2	00 03	3 registers = 6 bytes total
CRC	2	76 87	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	03	read registers
BYTE COUNT	1	06	3 registers = 6 bytes
DATA 1 (see definition above)	2	02 2B	value in address 006B
DATA 2 (see definition above)	2	00 00	value in address 006C
DATA 3 (see definition above)	2	00 64	value in address 006D
CRC	2	54 83	CRC error code

## Function Code 04H

### Modbus Implementation: Read Input Registers

#### MM300 implementation: Read Actual Values

For the MM300 implementation of Modbus, this function code can be used to read any actual values ("input registers"). Input registers are 16 bit (two byte) values transmitted high order byte first. Thus all MM300 Actual Values are sent as two bytes. The maximum number of registers that can be read in one transmission is 125.

The slave response to this function code is the slave address, function code, a count of the data bytes to follow, the data itself and the CRC. Each data item is sent as a two byte number with the high order byte sent first.

For example, request slave 17 to respond with 1 register starting at address 0008. For this example the value in this register (0008) is 0000.

**Table 2: Master/slave packet format for function code 04H**

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	04	read registers
DATA STARTING ADDRESS	2	00 08	data starting at 0008
NUMBER OF ACTUAL VALUES	2	00 01	1 register = 2 bytes
CRC	2	B2 98	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	04	read registers
BYTE COUNT	1	02	1 register = 2 bytes
DATA (see definition above)	2	00 00	value in address 0008
CRC	2	78 F3	CRC error code

## Function Code 05H

Modbus Implementation: Force Single Coil

MM300 Implementation: Execute Operation

This function code allows the master to request a MM300 to perform specific command operations.

For example, to request slave 17 to execute operation code 1 (reset), we have the following master/slave packet format:

**Table 3: Master/slave packet format for function code 05H**

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	05	execute operation
OPERATION CODE	2	00 01	operation code 1
CODE VALUE	2	FF 00	perform function
CRC	2	DF 6A	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	05	execute operation
OPERATION CODE	2	00 01	operation code 1
CODE VALUE	2	FF 00	perform function
CRC	2	DF 6A	CRC error code

The commands that can be performed by the MM300 using function code 05 can also be initiated by using function code 10.

Operation Code	Description
1	Reset
2	Lockout Reset
3	Stop
4	Start A
5	Start B
96	Clear Last Trip Data Prompt
97	Reset MWh and Mvarh Meters
99	Clear Counters
100	Clear Event Records
102	Clear Maintenance Timer
112	Clear RTD Maximums
113	Reset Motor Information
114	Auto Mode
115	Manual Mode
116	Manual Inhibit
117	Manual Restore

## Function Code 06H

Modbus Implementation: Preset Single Register

MM300 Implementation: Store Single Setpoint

This command allows the master to store a single setpoint into the memory of a MM300. The slave response to this function code is to echo the entire master transmission.

For example, request slave 17 to store the value 2 in setpoint address 04 5C. After the transmission in this example is complete, setpoints address 04 5C will contain the value 01F4. The master/slave packet format is shown below:

**Table 4: Master/slave packet format for function code 06H**

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	06	store single setpoint
DATA STARTING ADDRESS	2	04 5C	setpoint address 04 5C
DATA	2	00 02	data for setpoint address 04 5C
CRC	2	CB B9	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	06	store single setpoint
DATA STARTING ADDRESS	2	04 5C	setpoint address 04 5C
DATA	2	00 02	data stored in setpoint address 04 5C
CRC	2	CB B9	CRC error code

## Function Code 07H

Modbus Implementation: Read Exception Status

MM300 Implementation: Read Device Status

This is a function used to quickly read the status of a selected device. A short message length allows for rapid reading of status. The status byte returned will have individual bits set to 1 or 0 depending on the status of the slave device. For this example, consider the following MM300 general status byte:

The master/slave packets have the following format:

**Table 5: Function code 7 bitmask**

Bit	Function
0	Alarm
1	Trip
2	Internal fault
3	Auto
4	Contact A
5	Contact B
6	Contact output 3
7	Drive available (communications control)

**Table 6: Master/slave packet format for function code 07H**

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	07	read device status
CRC	2	4C 22	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	07	read device status
DEVICE STATUS (see definition above)	1	2C	status = 00101100 (in binary)
CRC	2	22 28	CRC error code

## Function Code 08H

Modbus Implementation: Loopback

Test MM300 Implementation: Loopback Test

This function is used to test the integrity of the communication link. The MM300 will echo the request.

For example, consider a loopback test from slave 17:

**Table 7: Master/slave packet format for function code 08H**

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	08	loopback test
DIAG CODE	2	00 00	must be 00 00
DATA	2	00 00	must be 00 00
CRC	2	E0 0B	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	08	loopback test
DIAG CODE	2	00 00	must be 00 00
DATA	2	00 00	must be 00 00
CRC	2	E0 0B	CRC error code

## Function Code 10H

Modbus Implementation: Preset Multiple Registers

MM300 Implementation: Store Multiple Setpoints

This function code allows multiple Setpoints to be stored into the MM300 memory. Modbus "registers" are 16-bit (two byte) values transmitted high order byte first. Thus all MM300 setpoints are sent as two bytes. The maximum number of Setpoints that can be stored in one transmission is dependent on the slave device. Modbus allows up to a maximum of 60 holding registers to be stored. The MM300 response to this function code is to echo the slave address, function code, starting address, the number of Setpoints stored, and the CRC.

For example, consider a request for slave 17 to store the value 00 02 to setpoint address 04 5C and the value 01 F4 to setpoint address 04 5D. After the transmission in this example is complete, MM300 slave 17 will have the following setpoints information stored:

Address	Data
04 5C	00 02
04 5D	01 F4

The master/slave packets have the following format:

**Table 8: Master/slave packet format for function code 10H**

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	10	store setpoints
DATA STARTING ADDRESS	2	04 5C	setpoint address 04 5C
NUMBER OF SETPOINTS	2	00 02	2 setpoints = 4 bytes total
BYTE COUNT	1	04	4 bytes of data
DATA 1	2	00 02	data for setpoint address 04 5C
DATA 2	2	01 F4	data for setpoint address 04 5D
CRC	2	31 11	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	10	store setpoints
DATA STARTING ADDRESS	2	04 5C	setpoint address 04 5C
NUMBER OF SETPOINTS	2	00 02	2 setpoints
CRC	2	82 7A	CRC error code

## Error Responses

When a MM300 detects an error other than a CRC error, a response will be sent to the master. The MSBit of the FUNCTION CODE byte will be set to 1 (i.e. the function code sent from the slave will be equal to the function code sent from the master plus 128). The following byte will be an exception code indicating the type of error that occurred.

Transmissions received from the master with CRC errors will be ignored by the MM300.

The slave response to an error (other than CRC error) will be:

SLAVE ADDRESS: 1 byte

FUNCTION CODE: 1 byte (with MSbit set to 1)

EXCEPTION CODE: 1 byte

CRC: 2 bytes

The MM300 implements the following exception response codes:

01 - ILLEGAL FUNCTION

The function code transmitted is not one of the functions supported by the MM300.

02 - ILLEGAL DATA ADDRESS

The address referenced in the data field transmitted by the master is not an allowable address for the MM300.

03 - ILLEGAL DATA VALUE

The value referenced in the data field transmitted by the master is not within range for the selected data address.

## Modbus memory map

	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
ACTUAL VALUES										
PRODUCT INFORMATION										
	30001	0000	Product Device Code	---	---	---	---	F22	N/A	1
	30002	0001	Hardware Revision	---	---	---	---	F15	N/A	1
	30003	0002	Firmware Version	---	---	---	---	F3	N/A	1
	30004	0003	Display Software Version	---	---	---	---	F3	N/A	1
	30005	0004	Modification Number	---	---	---	---	F1	N/A	1
	30006	0005	Boot Version	---	---	---	---	F3	N/A	1
	30007	0006	Boot Modification #	---	---	---	---	F1	N/A	1
	30008	0007	Serial Number	---	---	---	---	F22	N/A	6
	30014	000D	Order Code	---	---	---	---	F22	N/A	16
	30030	001D	MAC Address	---	---	---	---	F22	N/A	6
	30036	0023	Reserved	---	---	---	---	---	---	1
	30037	0024	Build Date	---	---	---	---	F22	N/A	6
	30043	002A	Build Time	---	---	---	---	F22	N/A	4
	30047	002E	Original Calibration Date	---	---	---	---	F18	N/A	2
	30049	0030	Last Calibration Date	---	---	---	---	F18	N/A	2
	30051	0032	Communications Build Date	---	---	---	---	F22	N/A	6
	30057	0038	Communications Build Time	---	---	---	---	F22	N/A	4
	30061	003C	Communications Revision	---	---	---	---	F3	N/A	1
	30062	003D	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30185	00B8	Reserved							1
LAST TRIP DATA										
	30186	00B9	Cause of Last Trip	---	---	---	---	FC134	N/A	1
	30187	00BA	Time of Last Trip 2 words	---	---	---	---	F19	N/A	2
	30189	00BC	Date of Last Trip 2 words	---	---	---	---	F18	N/A	2
	30191	00BE	Motor Speed During Trip	---	---	---	---	FC135	N/A	1
	30192	00BF	Pre Trip Ia	---	---	---	A	F10	N/A	2
	30194	00C1	Pre Trip Ib	---	---	---	A	F10	N/A	2
	30196	00C3	Pre Trip Ic	---	---	---	A	F10	N/A	2
	30198	00C5	Reserved	---	---	---	---	---	---	1
	30199	00C6	Reserved	---	---	---	---	---	---	1
	30200	00C7	Reserved	---	---	---	---	---	---	1
	30201	00C8	Pre Trip Motor Load	---	---	---	A	F3	N/A	1
	30202	00C9	Pre Trip Current Unbalance	---	---	---	%	F1	N/A	1
	30203	00CA	Pre Trip Ig	---	---	---	A	F10	N/A	2
	30205	00CC	Pre Trip Vab	---	---	---	V	F1	N/A	1
	30206	00CD	Pre Trip Vbc	---	---	---	V	F1	N/A	1
	30207	00CE	Pre Trip Vca	---	---	---	V	F1	N/A	1
	30208	00CF	Pre Trip Van	---	---	---	V	F1	N/A	1
	30209	00D0	Pre Trip Vbn	---	---	---	V	F1	N/A	1

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
30210	00D1	Pre Trip Vcn	---	---	---	V	F1	N/A	1
30211	00D2	Pre Trip System Frequency	---	---	---	Hz	F3	N/A	1
30212	00D3	Pre Trip Real Power	---	---	---	kW	F13	N/A	2
30214	00D5	Pre Trip Reactive Power	---	---	---	kvar	F13	N/A	2
30216	00D7	Pre Trip Apparent Power	---	---	---	kVA	F2	N/A	1
30217	00D8	Pre Trip Power Factor	---	---	---	---	F21	N/A	1
30218	00D9	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
30222	00DD	Reserved	---	---	---	---	---	---	1
REAL-TIME CLOCK									
30223	00DE	Weekday	---	---	---	---	FC171	N/A	1
30224	00DF	Date Read Only	---	---	---	---	F18	N/A	2
30226	00E1	Time Read Only	---	---	---	---	F19	N/A	2
30228	00E3	Daylight Savings Active	---	---	---	---	FC126	N/A	1
30229	00E4	Reserved	---	---	---	---	---	---	1
TRIP COUNTERS									
30230	00E5	Total Number of Trips	---	---	---	---	F1	N/A	1
30231	00E6	Incomplete Sequence Trips	---	---	---	---	F1	N/A	1
30232	00E7	Overload Trips	---	---	---	---	F1	N/A	1
30233	00E8	Mechanical Jam Trips	---	---	---	---	F1	N/A	1
30234	00E9	Undercurrent Trips	---	---	---	---	F1	N/A	1
30235	00EA	Current Unbalance Trips	---	---	---	---	F1	N/A	1
30236	00EB	Ground Fault Trips	---	---	---	---	F1	N/A	1
30237	00EC	Motor Acceleration Trips	---	---	---	---	F1	N/A	1
30238	00ED	Undervoltage Trips	---	---	---	---	F1	N/A	1
30239	00EE	Overvoltage Trips	---	---	---	---	F1	N/A	1
30240	00EF	Voltage Phase Reversal Trips	---	---	---	---	F1	N/A	1
30241	00F0	Voltage Freq Trips	---	---	---	---	F1	N/A	1
30242	00F1	Underpower Trips	---	---	---	---	F1	N/A	1
30243	00F2	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
30256	00FF	Reserved							1
GENERAL TIMERS									
30257	0100	Number of Motor Starts	---	---	---	---	F1	N/A	1
30258	0101	Number of UV Restarts	---	---	---	---	F1	N/A	1
30259	0102	Motor Running Hours	---	---	---	hrs	F9	N/A	2
30261	0104	UVR Timer	---	---	---	s	F1	N/A	1
30262	0105	Start Timer 1	---	---	---	s	F1	N/A	1
30263	0106	Start Timer 2	---	---	---	s	F1	N/A	1
30264	0107	Start Timer 3	---	---	---	s	F1	N/A	1
30265	0108	Start Timer 4	---	---	---	s	F1	N/A	1
30266	0109	Start Timer 5	---	---	---	s	F1	N/A	1
30267	010A	TransferTimer	---	---	---	s	F1	N/A	1
30268	010B	Reserved	---	---	---	---	---	---	1
30269	010C	Motor Stopped Hours	---	---	---	hrs	F1	N/A	1
START BLOCKS									



	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
	30270	010D	Overload Lockout	---	---	---	---	F1	N/A	1
	30271	010E	Starts/Hour Block	---	---	---	s	F1	N/A	1
	30272	010F	Time Between Starts	---	---	---	s	F1 <sup>1</sup>	N/A	1
	30273	0110	Restart Block	---	---	---	s	F1	N/A	1
	30274	0111	Reserved	---	---	---	---	---	---	1
	30275	0112	Pre-Contactor Timer	---	---	---	s	F1	N/A	1
	30276	0113	Reserved	---	---	---	---	---	---	2
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30282	0119	Reserved	---	---	---	---	---	---	1
CONTACT/VIRTUAL INPUTS/OUTPUTS STATUS										
	30283	011A	Contact Input 64-33 (Bit Field)	---	---	---	---	FC168	N/A	2
	30285	011C	Contact Input 32-1 (Bit Field)	---	---	---	---	FC167	N/A	2
	30287	011E	Reserved	---	---	---	---	---	---	1
	30288	011F	Virtual Input 32-1 (Bit Field)	---	---	---	---	FC167	N/A	2
	30290	0121	Virtual Output 32-1 (Bit Field)	---	---	---	---	FC167	N/A	2
	30292	0123	Reserved	---	---	---	---	---	---	2
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30297	0128	Reserved	---	---	---	---	---	---	1
	30298	0129	Contact Output 32-1 (Bit Field)	---	---	---	---	FC167	N/A	2
	30300	012B	Reserved	---	---	---	---	---	---	1
	30301	012C	Reserved	---	---	---	---	---	---	1
SECURITY										
	30302	012D	Current Security Access Level	---	---	---	---	F1	N/A	1
	30303	012E	Reserved	---	---	---	---	---	---	1
	30304	012F	Reserved	---	---	---	---	---	---	1
STATUS - MOTOR										
	30305	0130	Motor Status	---	---	---	---	FC129	N/A	1
	30306	0131	Extended Status	---	---	---	---	FC178	N/A	1
	30307	0132	Thermal Cap Used	---	---	---	%	F1	N/A	1
	30308	0133	Time to Overload Trip	---	---	---	s	F20	N/A	2
	30310	0135	Drive Status	---	---	---	---	FC143	N/A	1
	30311	0136	Reserved	---	---	---	---	---	---	1
	30312	0137	Command Status	---	---	---	---	FC128	N/A	1
	30313	0138	Time To Reset	---	---	---	min	F1	N/A	1
	30314	0139	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30327	0146	Reserved							1
CURRENT METERING										
	30328	0147	Ia	---	---	---	A	F10	N/A	2
	30330	0149	Ib	---	---	---	A	F10	N/A	2
	30332	014B	Ic	---	---	---	A	F10	N/A	2
	30334	014D	Iavg	---	---	---	A	F10	N/A	2
	30336	014F	Motor Load	---	---	---	%	F1	N/A	1
	30337	0150	Current Unbalance	---	---	---	%Ub	F1	N/A	1
	30338	0151	Ig	---	---	---	A	F10	N/A	2
VOLTAGE METERING										

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
30340	0153	Va1 Angle	---	---	---	°	F1	N/A	1
30341	0154	Vb1 Angle	---	---	---	°	F1	N/A	1
30342	0155	Vc1 Angle	---	---	---	°	F1	N/A	1
30343	0156	Reserved	---	---	---	---	---	---	1
30344	0157	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
30357	0164	Reserved							1
30358	0165	Vab	---	---	---	V	F1	N/A	1
30359	0166	Vbc	---	---	---	V	F1	N/A	1
30360	0167	Vca	---	---	---	V	F1	N/A	1
30361	0168	Average Line Voltage	---	---	---	V	F1	N/A	1
30362	0169	Van	---	---	---	V	F1	N/A	1
30363	016A	Vbn	---	---	---	V	F1	N/A	1
30364	016B	Vcn	---	---	---	V	F1	N/A	1
30365	016C	Reserved	---	---	---	---	---	---	1
30366	016D	Freq	---	---	---	Hz	F3	N/A	1
30367	016E	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
30375	0176	Reserved	---	---	---	---	---	---	1
30376	0177	VAux	---	---	---	V	F1	N/A	1
30377	0178	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
30383	017E	Reserved	---	---	---	---	---	---	1
POWER METERING									
30384	017F	Power Factor	---	---	---	---	F21	N/A	1
30385	0180	Real Power	---	---	---	kW	F13	N/A	2
30387	0182	Reserved	---	---	---	---	---	---	1
30388	0183	Reserved	---	---	---	---	---	---	1
30389	0184	Reactive Power	---	---	---	kvar	F13	N/A	2
30391	0186	Apparent Power	---	---	---	kVA	F2	N/A	1
30392	0187	MWh Consumption	---	---	---	MWh	F17	N/A	2
30394	0189	Mvarh Consumption	---	---	---	Mvarh	F17	N/A	2
30396	018B	Reserved	---	---	---	---	---	---	2
30398	018D	Apparent Power	---	---	---	kVA	F10	N/A	2
30400	018F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
30427	01A9	Reserved							1
TEMPERATURE METERING									
30427	01AA	Hottest Stator RTD	---	---	---	---	F1	N/A	1
30428	01AB	Hottest Stator RTD	---	---	---	°C	F4	N/A	1
30429	01AC	RTD 1 Temp	---	---	---	°C	F4	N/A	1
30430	01AD	RTD 2 Temp	---	---	---	°C	F4	N/A	1
30431	01AE	RTD 3 Temp	---	---	---	°C	F4	N/A	1
30432	01AF	RTD 4 Temp	---	---	---	°C	F4	N/A	1
30433	01B0	RTD 5 Temp	---	---	---	°C	F4	N/A	1
30434	01B1	RTD 6 Temp	---	---	---	°C	F4	N/A	1

	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
	30435	01B2	Thermistor	---	---	---	ohms	F1	N/A	1
	30436	01B3	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30466	01D1	Reserved							1
MOTOR STARTING LEARNED DATA										
	30467	01D2	Learned Acceleration Time	---	---	---	s	F2	N/A	1
	30468	01D3	Learned Starting Current	---	---	---	A	F10	N/A	2
	30470	01D5	Learned Starting Capacity	---	---	---	%	F1	N/A	1
	30471	01D6	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30483	01E2	Reserved	---	---	---	---	---	---	1
	30484	01E3	Average Motor Load Learned	---	---	---	%FLA	F3	N/A	1
RTD MAXIMIUM TEMPERATURE										
	30485	01E4	RTD 1 MAX Temp	---	---	---	°C	F4	N/A	1
	30486	01E5	RTD 2 MAX. Temp	---	---	---	°C	F4	N/A	1
	30487	01E6	RTD 3 MAX. Temp	---	---	---	°C	F4	N/A	1
	30488	01E7	RTD 4 MAX. Temp	---	---	---	°C	F4	N/A	1
	30489	01E8	RTD 5 MAX. Temp	---	---	---	°C	F4	N/A	1
	30490	01E9	RTD 6 MAX. Temp	---	---	---	°C	F4	N/A	1
	30491	01EA	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30504	01F7	Reserved	---	---	---	---	---	---	1
LED STATUS FOR GRAPHICAL AND BASIC CONTROL PANEL										
	30505	01F8	LED Status	---	---	---	---	FC144	N/A	2
	30507	01FA	LED Flash	---	---	---	---	FC130	N/A	1
	30508	01FB	Reserved	---	---	---	---	---	---	1
GCP FACTORY TEST										
	30509	01FC	LCD Test Color	---	---	---	---	FC212	N/A	1
	30510	01FD	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30523	020A	Reserved	---	---	---	---	---	---	1
USER MAP VALUES										
	30524	020B	User Map Value 1	---	---	---	---	F1	N/A	1
	30525	020C	User Map Value 2	---	---	---	---	F1	N/A	1
	30526	020D	User Map Value 3	---	---	---	---	F1	N/A	1
	30527	020E	User Map Value 4	---	---	---	---	F1	N/A	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30645	0284	User Map Value 122	---	---	---	---	F1	N/A	1
	30646	0285	User Map Value 123	---	---	---	---	F1	N/A	1
	30647	0286	User Map Value 124	---	---	---	---	F1	N/A	1
	30648	0287	User Map Value 125	---	---	---	---	F1	N/A	1
	30649	0288	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	30656	028F	Reserved	---	---	---	---	---	---	1
SELF TEST										
	30657	0290	Internal Fault Cause	---	---	---	---	FC188	N/A	2

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words	
EVENT RECORDER										
30659	0292	Event Recorder Last Reset 2 words	---	---	---	---	F18	N/A	2	
30661	0294	Total Number of Events Since Last Clear	---	---	---	---	F1	N/A	1	
30662	0295	Cause	---	---	---	---	FC134	N/A	1	
30663	0296	Contactora	---	---	---	---	FC136	N/A	1	
30664	0297	Time	---	---	---	---	F19	N/A	2	
30666	0299	Date	---	---	---	---	F18	N/A	2	
30668	029B	Ia	---	---	---	A	F10	N/A	2	
30670	029D	Ib	---	---	---	A	F10	N/A	2	
30672	029F	Ic	---	---	---	A	F10	N/A	2	
30674	02A1	Motor Load	---	---	---	x FLA	F3	N/A	1	
30675	02A2	Iunb	---	---	---	%	F1	N/A	1	
30676	02A3	Ig	---	---	---	A	F10	N/A	2	
30678	02A5	Vab	---	---	---	V	F1	N/A	1	
30679	02A6	Vbc	---	---	---	V	F1	N/A	1	
30680	02A7	Vca	---	---	---	V	F1	N/A	1	
30681	02A8	Van	---	---	---	V	F1	N/A	1	
30682	02A9	Vbn	---	---	---	V	F1	N/A	1	
30683	02AA	Vcn	---	---	---	V	F1	N/A	1	
30684	02AB	Freq	---	---	---	Hz	F3	N/A	1	
30685	02AC	Power Factor	---	---	---	---	F21	N/A	1	
30686	02AD	Real Power	---	---	---	kW	F13	N/A	2	
30688	02AF	Reactive Power	---	---	---	kvar	F13	N/A	2	
30690	02B1	Apparent Power	---	---	---	kVA	F2	N/A	1	
30691	02B2	Hottest Stator RTD	---	---	---	---	F1	N/A	1	
30692	02B3	Hottest Stator RTD	---	---	---	°C	F4	N/A	1	
30693	02B4	Reserved	---	---	---	---	---	---	1	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
30951	03B6	Reserved							1	
STATUS BUFFER										
30952	03B7	Alarm Status 4	---	---	---	---	FC182	N/A	2	
30954	03B9	Alarm Status 3	---	---	---	---	FC181	N/A	2	
30956	03BB	Alarm Status 2	---	---	---	---	FC180	N/A	2	
30958	03BD	Alarm Status 1	---	---	---	---	FC179	N/A	2	
30960	03BF	Trip Status 4	---	---	---	---	FC186	N/A	2	
30962	03C1	Trip Status 3	---	---	---	---	FC185	N/A	2	
30964	03C3	Trip Status 2	---	---	---	---	FC184	N/A	2	
30966	03C5	Trip Status 1	---	---	---	---	FC183	N/A	2	
30968	03C7	Message Status 4	---	---	---	---	FC190	N/A	2	
30970	03C9	Message Status 3	---	---	---	---	FC189	N/A	2	
30972	03CB	Message Status 2	---	---	---	---	FC188	N/A	2	
30974	03CD	Message Status 1	---	---	---	---	FC187	N/A	2	
30976	03CF	Ctrl Element Status 4	---	---	---	---	FC194	N/A	2	
30978	03D1	Ctrl Element Status 3	---	---	---	---	FC193	N/A	2	
30980	03D3	Ctrl Element Status 2	---	---	---	---	FC192	N/A	2	

	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
	30982	03D5	Ctrl Element Status 1	---	---	---	---	FC191	N/A	2
	30984	03D7	Reserved	---	---	---	---	---	---	1
	30985	03D8	Reserved	---	---	---	---	---	---	1
	30986	03D9	Reserved	---	---	---	---	---	---	1
FLEXLOGIC										
	30987	03DA	Element Flag	---	---	---	---	FC145	N/A	384
	31371	055A	Program Status	---	---	---	---	FC109	N/A	1
	31372	055B	Flex Lines Used	---	---	---	---	F1	N/A	1
	31373	055C	Error Line	---	---	---	---	F1	N/A	1
	31374	055D	Reserved	---	---	---	---	---	---	1
	31375	055E	Reserved	---	---	---	---	---	---	1
	31376	055F	Reserved	---	---	---	---	---	---	1
	31377	0560	Reserved	---	---	---	---	---	---	1
COMMUNICATION										
	31378	0561	Serial Status	---	---	---	---	FC112	N/A	1
	31379	0562	Ethernet Status	---	---	---	---	FC112	N/A	1
	31380	0563	Profibus Status	---	---	---	---	FC112	N/A	1
	31381	0564	DeviceNet Status	---	---	---	---	FC112	N/A	1
	31382	0565	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	32272	08DF	Reserved							1
SETPOINTS										
COMMANDS										
	40001	0000	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	40128	007F	Reserved							1
	40129	0080	Command address	0	65535	0	---	F1	0	1
	40130	0081	Command Function	0	65535	0	---	F1	0	1
	40131	0082	Command Data 1	0	65535	0	---	F1	0	1
	40132	0083	Command Data 2	0	65535	0	---	F1	0	1
	40133	0084	Command Data 3	0	65535	0	---	F1	0	1
	40134	0085	Command Data 4	0	65535	0	---	F1	0	1
	40135	0086	Command Data 5	0	65535	0	---	F1	0	1
	40136	0087	Command Data 6	0	65535	0	---	F1	0	1
	40137	0088	Command Data 7	0	65535	0	---	F1	0	1
	40138	0089	Command Data 8	0	65535	0	---	F1	0	1
	40139	008A	Command Data 9	0	65535	0	---	F1	0	1
	40140	008B	Command Data 10	0	65535	0	---	F1	0	1
	40141	008C	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	40171	00AA	Reserved							1
COMMUNICATION SETTINGS										
	40172	00AB	Slave Address	1	254	1	---	F1	254	1
	40173	00AC	RS485 Baud Rate	0	4	1	---	FC101	4	1

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
40174	00AD	Reserved	---	---	---	---	---	---	1
40175	00AE	Reserved	---	---	---	---	---	---	1
40176	00AF	Reserved	---	---	---	---	---	---	1
40177	00B0	Reserved	---	---	---	---	---	---	1
40178	00B1	DeviceNet MAC ID	0	63	1	---	F1	63	1
40179	00B2	DeviceNet Baud Rate	0	2	1	---	FC156	0	1
40180	00B3	Reserved	---	---	---	---	---	---	1
40181	00B4	NTP IP Address	0	0xFFFFFFFF	1	---	FC150	0	2
40183	00B6	Ethernet IP address	0	0xFFFFFFFF	1	---	FC150	0	2
40185	00B8	Ethernet subnet mask	0	0xFFFFFFFF	1	---	FC150	0xFFFFFFFFC00	2
40187	00BA	Ethernet gateway address	0	0xFFFFFFFF	1	---	FC150	0	2
40189	00BC	Reserved	---	---	---	---	---	---	1
40190	00BD	Reserved	---	---	---	---	---	---	1
40191	00BE	Reserved	---	---	---	---	---	---	1
40192	00BF	Profibus address	1	125	1	---	F1	125	1
40193	00C0	Profibus Baud Rate	1	2018	1	---	FC155	2018	1
40194	00C1	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40227	00E2	Reserved							1
REAL-TIME CLOCK/DAYLIGHT SAVINGS									
40228	00E3	Set Date	0	0x0C1F082E	0	---	F18	0	2
40230	00E5	Set Time	0	0x173B3B63	0	---	F19	0	2
40232	00E7	Time Offset From UTC	-2400	2400	25	hrs	F6	0	1
40233	00E8	Reserved	---	---	---	---	---	---	1
40234	00E9	Daylight Savings	0	1	1	---	FC126	0	1
40235	00EA	DST Start Month	0	12	1	---	FC169	0	1
40236	00EB	DST Start Week	0	5	1	---	FC170	0	1
40237	00EC	DST Start Weekday	0	7	1	---	FC171	0	1
40238	00ED	DST End Month	0	12	1	---	FC169	0	1
40239	00EE	DST End Week	0	5	1	---	FC170	0	1
40240	00EF	DST End Weekday	0	7	1	---	FC171	0	1
40241	00F0	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40261	0104	Reserved	---	---	---	---	---	---	1
VIRTUAL INPUT									
40262	0105	Virtual Input 32-1 (Bit Field)	0	0xFFFFFFFF	1	---	FC167	0	2
40264	0107	Reserved	---	---	---	---	---	---	1
40265	0108	Reserved	---	---	---	---	---	---	1
CURRENT SENSING									
40266	0109	Phase CT Type	0	3	1	---	FC105	0	1
40267	010A	CT Primary	5	1000	1	A	F1	5	1
40268	010B	Ground CT Type	0	2	1	---	FC104	2	1
40269	010C	High Speed CT Primary	5	1000	1	A	F1	5	1
40270	010D	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40275	0112	Reserved	---	---	---	---	---	---	1

	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
VOLTAGE SENSING										
	40276	0113	3 Phase Voltage Connection	0	1	1	---	FC106	0	1
	40277	0114	Aux VT Connection	0	8	1	---	FC176	0	1
	40278	0115	Aux VT Primary	110	690	1	V	F1	415	1
	40279	0116	Aux VT Secondary	110	300	1	V	F1	110	1
	40280	0117	Reserved	---	---	---	---	---	---	1
	40281	0118	Reserved	---	---	---	---	---	---	1
	40282	0119	Reserved	---	---	---	---	---	---	1
	40283	011A	Reserved	---	---	---	---	---	---	1
MOTOR DATA SETUP										
	40284	011B	Supply Frequency	0	1	1	Hz	FC107	0	1
	40285	011C	Motor Name	0	10	0	---	F22	3	10
	40295	0126	Starter Type	0	7	1	---	FC139	0	1
	40296	0127	Reserved	---	---	---	---	---	---	1
	40297	0128	Reserved	---	---	---	---	---	---	1
	40298	0129	Motor FLA	5	10001	1	A	F2*	10001	1
	40299	012A	High Speed FLA	5	10001	1	A	F2*	10001	1
	40300	012B	Motor Nameplate Voltage	100	690	1	V	F1	690	1
	40301	012C	Change Over Current	10	51	1	x FLA	F2*	15	1
	40302	012D	Reserved	---	---	---	---	---	---	1
	40303	012E	Transfer Time	0	125	1	s	F1	1	1
	40304	012F	High Speed Start Block	0	1	1	---	FC126	1	1
	40305	0130	Ramp Up Time	0	125	1	s	F1	1	1
	40306	0131	Ramp Down Time	0	125	1	s	F1	1	1
	40307	0132	Pre-contactor Time	0	60	1	s	F1	0	1
	40308	0133	Motor Rating	3	11001	1	kW	F2*	11001	1
	40309	0134	High Speed Motor Rating	3	11001	1	kW	F2*	11001	1
	40310	0135	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	40316	013B	Reserved	---	---	---	---	---	---	1
PROCESS INTERLOCK										
	40317	013C	IL Ignore In Test	0	1	1	---	FC126	0	1
	40318	013D	IL A Name	0	10	1	---	F22	4	10
	40328	0147	IL A Function	0	3	1	---	FC140	0	1
	40329	0148	IL A Inst Alarm	0	1	1	---	FC126	0	1
	40330	0149	IL A Startup Override	0	3600	1	s	F1	0	1
	40331	014A	IL A Running Override	0	3601	1	s	F1*	0	1
	40332	014B	IL A Healthy State	0	1	1	---	FC116	1	1
	40333	014C	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	40337	0150	Reserved	---	---	---	---	---	---	1
	40338	0151	IL B Name	0	10	1	---	F22	5	10
	40348	015B	IL B Function	0	3	1	---	FC140	0	1
	40349	015C	IL B Inst Alarm	0	1	1	---	FC126	0	1
	40350	015D	IL B Startup Override	0	3600	1	s	F1	0	1
	40351	015E	IL B Running Override	0	3601	1	s	F1*	0	1

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
40352	015F	IL B Healthy State	0	1	1	---	FC116	1	1
40353	0160	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40357	0164	Reserved	---	---	---	---	---	---	1
40358	0165	IL C Name	0	10	1	---	F22	6	10
40368	016F	IL C Function	0	3	1	---	FC140	0	1
40369	0170	IL C Inst Alarm	0	1	1	---	FC126	0	1
40370	0171	IL C Startup Override	0	3600	1	s	F1	0	1
40371	0172	IL C Running Override	0	3601	1	s	F1*	0	1
40372	0173	IL C Healthy State	0	1	1	---	FC116	1	1
40373	0174	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40377	0178	Reserved	---	---	---	---	---	---	1
40378	0179	IL D Name	0	10	1	---	F22	7	10
40388	0183	IL D Function	0	3	1	---	FC140	0	1
40389	0184	IL D Inst Alarm	0	1	1	---	FC126	0	1
40390	0185	IL D Startup Override	0	3600	1	s	F1	0	1
40391	0186	IL D Running Override	0	3601	1	s	F1*	0	1
40392	0187	IL D Healthy State	0	1	1	---	FC116	1	1
40393	0188	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40397	018C	Reserved	---	---	---	---	---	---	1
40398	018D	IL E Name	0	10	1	---	F22	8	10
40408	0197	IL E Function	0	3	1	---	FC140	0	1
40409	0198	IL E Inst Alarm	0	1	1	---	FC126	0	1
40410	0199	IL E Startup Override	0	3600	1	s	F1	0	1
40411	019A	IL E Running Override	0	3601	1	s	F1*	0	1
40412	019B	IL E Healthy State	0	1	1	---	FC116	1	1
40413	019C	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40417	01A0	Reserved	---	---	---	---	---	---	1
40418	01A1	IL F Name	0	10	1	---	F22	9	10
40428	01AB	IL F Function	0	3	1	---	FC140	0	1
40429	01AC	IL F Inst Alarm	0	1	1	---	FC126	0	1
40430	01AD	IL F Startup Override	0	3600	1	s	F1	0	1
40431	01AE	IL F Running Override	0	3601	1	s	F1*	0	1
40432	01AF	IL F Healthy State	0	1	1	---	FC116	1	1
40433	01B0	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40437	01B4	Reserved	---	---	---	---	---	---	1
40438	01B5	IL G Name	0	10	1	---	F22	10	10
40448	01BF	IL G Function	0	3	1	---	FC140	0	1
40449	01C0	IL G Inst Alarm	0	1	1	---	FC126	0	1
40450	01C1	IL G Startup Override	0	3600	1	s	F1	0	1
40451	01C2	IL G Running Override	0	3601	1	s	F1*	0	1
40452	01C3	IL G Healthy State	0	1	1	---	FC116	1	1



	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
	40453	01C4	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	40457	01C8	Reserved	---	---	---	---	---	---	1
	40458	01C9	IL H Name	0	10	1	---	F22	11	10
	40468	01D3	IL H Function	0	3	1	---	FC140	0	1
	40469	01D4	IL H Inst Alarm	0	1	1	---	FC126	0	1
	40470	01D5	IL H Startup Override	0	3600	1	s	F1	0	1
	40471	01D6	IL H Running Override	0	3601	1	s	F1*	0	1
	40472	01D7	IL H Healthy State	0	1	1	---	FC116	1	1
	40473	01D8	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	40477	01DC	Reserved	---	---	---	---	---	---	1
	40478	01DD	IL I Name	0	10	1	---	F22	12	10
	40488	01E7	IL I Function	0	3	1	---	FC140	0	1
	40489	01E8	IL I Inst Alarm	0	1	1	---	FC126	0	1
	40490	01E9	IL I Startup Override	0	3600	1	s	F1	0	1
	40491	01EA	IL I Running Override	0	3601	1	s	F1*	0	1
	40492	01EB	IL I Healthy State	0	1	1	---	FC116	1	1
	40493	01EC	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	40497	01F0	Reserved	---	---	---	---	---	---	1
	40498	01F1	IL J Name	0	10	1	---	F22	13	10
	40508	01FB	IL J Function	0	3	1	---	FC140	0	1
	40509	01FC	IL J Inst Alarm	0	1	1	---	FC126	0	1
	40510	01FD	IL J Startup Override	0	3600	1	s	F1	0	1
	40511	01FE	IL J Running Override	0	3601	1	s	F1*	0	1
	40512	01FF	IL J Healthy State	0	1	1	---	FC116	1	1
	40513	0200	Reserved	---	---	---	---	---	---	1
	40514	0201	Reserved	---	---	---	---	---	---	1
	40515	0202	Reserved	---	---	---	---	---	---	1
	40516	0203	Reserved	---	---	---	---	---	---	1
COMMUNICATION SETUP										
	40517	0204	Comms OK Evaluation	0	64	1	---	FC131	1	1
	40518	0205	Reserved	---	---	---	---	---	---	1
	40519	0206	Comm Failure Trip	5	30	5	s	F1*	30	1
	40520	0207	Comm Failure Alarm	5	30	5	s	F1*	30	1
OPEN CONTROL CIRCUIT										
	40521	0208	Open Ctrl Circuit Trip	0	1	1	---	FC126	0	1
	40522	0209	Reserved	---	---	---	---	---	---	1
	40523	020A	Reserved	---	---	---	---	---	---	1
USER MAP ADDRESSES										
	40524	020B	User Map Address 1	30001	43763	1	---	F1	30001	1
	40525	020C	User Map Address 2	30001	43763	1	---	F1	30001	1
	40526	020D	User Map Address 3	30001	43763	1	---	F1	30001	1
	40527	020E	User Map Address 4	30001	43763	1	---	F1	30001	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
40645	0284	User Map Address 122	30001	43763	1	---	F1	30001	1
40646	0285	User Map Address 123	30001	43763	1	---	F1	30001	1
40647	0286	User Map Address 124	30001	43763	1	---	F1	30001	1
40648	0287	User Map Address 125	30001	43763	1	---	F1	30001	1
40649	0288	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40658	0291	Reserved	---	---	---	---	---	---	1
EVENT RECORDER									
40659	0292	Event Recorder Function	0	1	1	---	FC126	1	1
40660	0293	Recording of Trip Events	0	1	1	---	FC126	1	1
40661	0294	Recording of Alarm Events	0	1	1	---	FC126	1	1
40662	0295	Recording of Control Events	0	1	1	---	FC126	1	1
40663	0296	Recording of Logic Input Events	0	1	1	---	FC126	1	1
40664	0297	Recording of Level Events	0	1	1	---	FC126	1	1
40665	0298	Recording of Dropout Events	0	1	1	---	FC126	1	1
40666	0299	Recording of Set Time/Date Events	0	1	1	---	FC126	0	1
40667	029A	Event Record Selector	1	65535	1	---	F1	1	1
40668	029B	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40700	02BB	Reserved							1
RESET SETUP									
40701	02BC	Reset Lockout Using Reset Key	0	1	0	---	FC126	0	1
THERMAL MODEL SETUP									
40702	02BD	Overload Pickup Level	101	125	1	x FLA	F3	101	1
40703	02BE	Unbalance K Factor	0	19	1	---	F1	0	1
40704	02BF	Cool Time Constant Running	1	1000	1	min	F1	15	1
40705	02C0	Cool Time Constant Stopped	1	1000	1	min	F1	30	1
40706	02C1	Hot/Cold Safe Stall Ratio	1	100	1	%	F1	75	1
40707	02C2	Thermal Capacity Alarm Level	10	101	1	%	F1*	101	1
40708	02C3	Standard Overload Curve	1	15	1	---	F1	4	1
40709	02C4	Reserved	---	---	---	---	---	---	1
40710	02C5	RTD Bias - Minimum T	0	251	1	°C	F1*	251	1
40711	02C6	RTD Bias - Center T	0	251	1	°C	F1*	251	1
40712	02C7	RTD Bias - Maximum T	0	251	1	°C	F1*	251	1
40713	02C8	Minimize Reset Time	0	1	1	---	FC126	0	1
40714	02C9	Overload Reset Mode	0	1	1	---	FC160	1	1
40715	02CA	Reserved	---	---	---	---	---	---	1
40716	02CB	Reserved	---	---	---	---	---	---	1
40717	02CC	Reserved	---	---	---	---	---	---	1
40718	02CD	Reserved	---	---	---	---	---	---	1
MECHANICAL JAM									
40719	02CE	Mechanical Jam Level	101	451	1	x FLA	F3*	451	1
40720	02CF	Mechanical Jam Delay	1	300	1	s	F2	1	1
40721	02D0	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
40728	02D7	Reserved	---	---	---	---	---	---	1
RTD OPEN/SHORT CIRCUIT (REQUIRED=IO_G)									
40729	02D8	RTD Open/Short Alarm	0	1	1	---	FC126	0	1
40730	02D9	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40734	02DD	Reserved	---	---	---	---	---	---	1
RTD #1 (REQUIRED=IO_G)									
40735	02DE	RTD 1 Application	0	4	1	---	FC121	0	1
40736	02DF	RTD 1 Name	0	10	1	---	F22	14	10
40746	02E9	RTD 1 Alarm Temp	-50	251	1	°C	F4*	251	1
40747	02EA	RTD 1 Trip Voting	0	6	1	---	FC122	0	1
40748	02EB	RTD 1 Trip Temp	-50	251	1	°C	F4*	251	1
RTD #2 (REQUIRED=IO_G)									
40749	02EC	RTD 2 Application	0	4	1	---	FC121	0	1
40750	02ED	RTD 2 Name	0	10	1	---	F22	15	10
40760	02F7	RTD 2 Alarm Temp	-50	251	1	°C	F4*	251	1
40761	02F8	RTD 2 Trip Voting	0	6	1	---	FC122	0	1
40762	02F9	RTD 2 Trip Temp	-50	251	1	°C	F4*	251	1
RTD #3 (REQUIRED=IO_G)									
40763	02FA	RTD 3 Application	0	4	1	---	FC121	0	1
40764	02FB	RTD 3 Name	0	10	1	---	F22	16	10
40774	0305	RTD 3 Alarm Temp	-50	251	1	°C	F4*	251	1
40775	0306	RTD 3 Trip Voting	0	6	1	---	FC122	0	1
40776	0307	RTD 3 Trip Temp	-50	251	1	°C	F4*	251	1
RTD #4 (REQUIRED=IO_G)									
40777	0308	RTD 4 Application	0	4	1	---	FC121	0	1
40778	0309	RTD 4 Name	0	10	1	---	F22	17	10
40788	0313	RTD 4 Alarm Temp	-50	251	1	°C	F4*	251	1
40789	0314	RTD 4 Trip Voting	0	6	1	---	FC122	0	1
40790	0315	RTD 4 Trip Temp	-50	251	1	°C	F4*	251	1
RTD #5 (REQUIRED=IO_G)									
40791	0316	RTD 5 Application	0	4	1	---	FC121	0	1
40792	0317	RTD 5 Name	0	10	1	---	F22	18	10
40802	0321	RTD 5 Alarm Temp	-50	251	1	°C	F4*	251	1
40803	0322	RTD 5 Trip Voting	0	6	1	---	FC122	0	1
40804	0323	RTD 5 Trip Temp	-50	251	1	°C	F4*	251	1
RTD #6 (REQUIRED=IO_G)									
40805	0324	RTD 6 Application	0	4	1	---	FC121	0	1
40806	0325	RTD 6 Name	0	10	1	---	F22	19	10
40816	032F	RTD 6 Alarm Temp	-50	251	1	°C	F4*	251	1
40817	0330	RTD 6 Trip Voting	0	6	1	---	FC122	0	1
40818	0331	RTD 6 Trip Temp	-50	251	1	°C	F4*	251	1
40819	0332	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40824	0337	Reserved	---	---	---	---	---	---	1
THERMISTOR (CPU)									

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
40825	0338	Cold Resistance	1	300	1	k ohms	F2	1	1
40826	0339	Hot Resistance	1	300	1	k ohms	F2	50	1
40827	033A	Thermistor Alarm	0	1	1	---	FC126	0	1
40828	033B	Thermistor Trip	0	1	1	---	FC126	0	1
40829	033C	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40833	0340	Reserved	---	---	---	---	---	---	1
UNDERCURRENT (REQUIRED=IO_A)									
40834	0341	Undercurrent Alarm Level	1	101	1	%FLA	F1*	101	1
40835	0342	Undercurrent Alarm Delay	1	60	1	s	F1	1	1
40836	0343	Undercurrent Trip Level	1	101	1	%FLA	F1*	101	1
40837	0344	Undercurrent Trip Delay	1	60	1	s	F1	1	1
40838	0345	Reserved	---	---	---	---	---	---	1
40839	0346	Reserved	---	---	---	---	---	---	1
40840	0347	Reserved	---	---	---	---	---	---	1
40841	0348	Reserved	---	---	---	---	---	---	1
UNDERPOWER (IO_A + IO_C) OR (IO_A + IO_B)									
40842	0349	Underpower Alarm Level	1	101	1	%MNR	F1*	101	1
40843	034A	Underpower Alarm Delay	1	60	1	s	F1	1	1
40844	034B	Underpower Trip Level	1	101	1	%MNR	F1*	101	1
40845	034C	Underpower Trip Delay	1	60	1	s	F1	1	1
40846	034D	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
40850	0351	Reserved	---	---	---	---	---	---	1
ACCELERATION									
40851	0352	Acceleration Alarm Timer	5	2501	1	s	F2*	2501	1
40852	0353	Acceleration Trip Timer	5	2501	1	s	F2*	2501	1
40853	0354	Reserved	---	---	---	---	---	---	1
40854	0355	Reserved	---	---	---	---	---	---	1
40855	0356	Reserved	---	---	---	---	---	---	1
40856	0357	Reserved	---	---	---	---	---	---	1
CURRENT UNBALANCE (REQUIRED=IO_A)									
40857	0358	Current Unbalance Alarm Level	4	41	1	%	F1*	15	1
40858	0359	Current Unbalance Alarm Delay	1	60	1	s	F1	1	1
40859	035A	Current Unbalance Trip Level	4	41	1	%	F1*	30	1
40860	035B	Current Unbalance Trip Delay	1	60	1	s	F1	1	1
40861	035C	Reserved	---	---	---	---	---	---	1
40862	035D	Reserved	---	---	---	---	---	---	1
40863	035E	Reserved	---	---	---	---	---	---	1
40864	035F	Reserved	---	---	---	---	---	---	1
GROUND FAULT									
40865	0360	Ground Alarm Level	10	101	1	%FLA	F1*	101	1
40866	0361	CBCT Ground Alarm Level	5	151	1	A	F2*	151	1
40867	0362	Ground Alarm Delay On Start	0	60	1	s	F1	10	1
40868	0363	Ground Trip Level	10	101	1	%FLA	F1*	101	1

	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
	40869	0364	CBCT Ground Trip Level	5	151	1	A	F2*	151	1
	40870	0365	Ground Trip Delay On Start	0	100	1	s	F2	0	1
	40871	0366	Ground Alarm Delay On Run	0	60	1	s	F1	10	1
	40872	0367	Ground Trip Delay On Run	0	50	1	s	F2	0	1
	40873	0368	Reserved	---	---	---	---	---	---	1
	40874	0369	Reserved	---	---	---	---	---	---	1
LOAD INCREASE										
	40875	036A	Load Increase Alarm Level	50	151	1	%FLA	F1*	151	1
	40876	036B	Reserved	---	---	---	---	---	---	1
	40877	036C	Reserved	---	---	---	---	---	---	1
	40878	036D	Reserved	---	---	---	---	---	---	1
PHASE UNDERVOLTAGE (REQUIRED=IO_B)										
	40879	036E	Undervoltage Alarm Level	60	100	1	%MNV	F1*	100	1
	40880	036F	Undervoltage Alarm Delay	1	60	1	s	F1	30	1
	40881	0370	Undervoltage Trip Level	60	100	1	%MNV	F1*	100	1
	40882	0371	Undervoltage Trip Delay	1	60	1	s	F1	30	1
	40883	0372	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	40887	0376	Reserved	---	---	---	---	---	---	1
AUXILIARY UNDERVOLTAGE PROTECTION (REQUIRED=IO_C)										
	40888	0377	Aux U/V Alarm	60	91	1	%NCV	F1*	91	1
	40889	0378	Aux U/V Alarm Delay	1	60	1	s	F1	5	1
	40890	0379	Aux UV Trip	60	91	1	%NCV	F1*	91	1
	40891	037A	Aux UV Trip Delay	1	60	1	s	F1	5	1
	40892	037B	Reserved	---	---	---	---	---	---	1
	40893	037C	Reserved	---	---	---	---	---	---	1
	40894	037D	Reserved	---	---	---	---	---	---	1
PHASE OVERVOLTAGE (REQUIRED=IO_B)										
	40895	037E	Overvoltage Alarm Level	101	121	1	%MNV	F1*	121	1
	40896	037F	Overvoltage Alarm Delay	1	60	1	s	F1	30	1
	40897	0380	Overvoltage Trip Level	101	121	1	%MNV	F1*	121	1
	40898	0381	Overvoltage Trip Delay	1	60	1	s	F1	30	1
	40899	0382	Reserved	---	---	---	---	---	---	1
	40900	0383	Reserved	---	---	---	---	---	---	1
	40901	0384	Reserved	---	---	---	---	---	---	1
	40902	0385	Reserved	---	---	---	---	---	---	1
PHASE REVERSAL (REQUIRED=IO_B)										
	40903	0386	Voltage Phase Reversal	0	2	1	---	FC140	1	1
	40904	0387	Reserved	---	---	---	---	---	---	1
	40905	0388	Reserved	---	---	---	---	---	---	1
	40906	0389	Reserved	---	---	---	---	---	---	1
	40907	038A	Reserved	---	---	---	---	---	---	1
VT FUSE FAIL (REQUIRED=IO_B)										
	40908	038B	VT Fuse Fail	0	2	1	---	FC140	0	1
	40909	038C	Reserved	---	---	---	---	---	---	1
	40910	038D	Reserved	---	---	---	---	---	---	1

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
40911	038E	Reserved	---	---	---	---	---	---	1
MAINTENANCE									
40912	038F	Drive Greasing Interval	100	50100	100	hrs	F1*	50100	1
40913	0390	Contactors Inspection Interval	100	65000	100	ops	F1*	65000	1
40914	0391	Max Motor Stopped Time	10	10010	10	hrs	F1*	10010	1
40915	0392	Reserved	---	---	---	---	---	---	1
40916	0393	Reserved	---	---	---	---	---	---	1
START INHIBIT									
40917	0394	Start Inhibit Margin	0	11	1	%	F1*	11	1
40918	0395	Reserved	---	---	---	---	---	---	1
40919	0396	Starts/Hour Limit	1	6	1	---	F1*	6	1
40920	0397	Time Between Starts	1	3601	1	s	F1*	3601	1
40921	0398	Reserved	---	---	---	---	---	---	1
CHANGE MODE									
40922	0399	Change Mode on Comm Alarm	0	1	1	---	FC126	0	1
40923	039A	Change Mode when running	0	1	1	---	FC126	0	1
40924	039B	Reserved	---	---	---	---	---	---	1
40925	039C	Reserved	---	---	---	---	---	---	1
RESTART BLOCK									
40926	039D	Restart Block Time	1	50001	1	s	F1*	50001	1
40927	039E	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41039	040E	Reserved							1
CALIBRATION									
41040	040F	Calibration Date	0	203360302	1	---	F18	0	2
41042	0411	Calibration Time	0	389757795	1	---	F19	0	2
41044	0413	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41105	0450	Reserved							1
SECURITY									
41106	0451	Passcode Level 1	11111	55556	1	---	F1*	11111	1
41107	0452	Passcode Level 2	11111	55556	1	---	F1*	22222	1
41108	0453	Reserved	---	---	---	---	---	---	1
41109	0454	Access Switch Level	1	3	1	---	F1	1	1
41110	0455	Comms Security	0	1	1	---	FC126	0	1
41111	0456	MCC Setpoint Access	0	1	1	---	FC126	1	1
41112	0457	Passcode Entry	0	55555	1	---	F1	0	1
41113	0458	Reserved	---	---	---	---	---	---	1
41114	0459	Reserved	---	---	---	---	---	---	1
41115	045A	Reserved	---	---	---	---	---	---	1
41116	045B	Reserved	---	---	---	---	---	---	1
FLEXLOGIC TIMERS									
41117	045C	Timer 1 Type	0	2	1	---	FC141	0	1
41118	045D	Timer 1 Pickup Delay	0	1000	1	---	F1	1	1
41119	045E	Timer 1 Dropout Delay	0	1000	1	---	F1	1	1
41120	045F	Reserved	---	---	---	---	---	---	1

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41124	0463	Reserved	---	---	---	---	---	---	1
41125	0464	Timer 2 Type	0	2	1	---	FC141	0	1
41126	0465	Timer 2 Pickup Delay	0	1000	1	---	F1	1	1
41127	0466	Timer 2 Dropout Delay	0	1000	1	---	F1	1	1
41128	0467	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41132	046B	Reserved	---	---	---	---	---	---	1
41133	046C	Timer 3 Type	0	2	1	---	FC141	0	1
41134	046D	Timer 3 Pickup Delay	0	1000	1	---	F1	1	1
41135	046E	Timer 3 Dropout Delay	0	1000	1	---	F1	1	1
41136	046F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41140	0473	Reserved	---	---	---	---	---	---	1
41141	0474	Timer 4 Type	0	2	1	---	FC141	0	1
41142	0475	Timer 4 Pickup Delay	0	1000	1	---	F1	1	1
41143	0476	Timer 4 Dropout Delay	0	1000	1	---	F1	1	1
41144	0477	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41148	047B	Reserved	---	---	---	---	---	---	1
41149	047C	Timer 5 Type	0	2	1	---	FC141	0	1
41150	047D	Timer 5 Pickup Delay	0	1000	1	---	F1	1	1
41151	047E	Timer 5 Dropout Delay	0	1000	1	---	F1	1	1
41152	047F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41156	0483	Reserved	---	---	---	---	---	---	1
41157	0484	Timer 6 Type	0	2	1	---	FC141	0	1
41158	0485	Timer 6 Pickup Delay	0	1000	1	---	F1	1	1
41159	0486	Timer 6 Dropout Delay	0	1000	1	---	F1	1	1
41160	0487	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41164	048B	Reserved	---	---	---	---	---	---	1
41165	048C	Timer 7 Type	0	2	1	---	FC141	0	1
41166	048D	Timer 7 Pickup Delay	0	1000	1	---	F1	1	1
41167	048E	Timer 7 Dropout Delay	0	1000	1	---	F1	1	1
41168	048F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41172	0493	Reserved	---	---	---	---	---	---	1
41173	0494	Timer 8 Type	0	2	1	---	FC141	0	1
41174	0495	Timer 8 Pickup Delay	0	1000	1	---	F1	1	1
41175	0496	Timer 8 Dropout Delay	0	1000	1	---	F1	1	1
41176	0497	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41180	049B	Reserved	---	---	---	---	---	---	1
41181	049C	Timer 9 Type	0	2	1	---	FC141	0	1
41182	049D	Timer 9 Pickup Delay	0	1000	1	---	F1	1	1

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
41183	049E	Timer 9 Dropout Delay	0	1000	1	---	F1	1	1
41184	049F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41188	04A3	Reserved	---	---	---	---	---	---	1
41189	04A4	Timer 10 Type	0	2	1	---	FC141	0	1
41190	04A5	Timer 10 Pickup Delay	0	1000	1	---	F1	1	1
41191	04A6	Timer 10 Dropout Delay	0	1000	1	---	F1	1	1
41192	04A7	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41196	04AB	Reserved	---	---	---	---	---	---	1
41197	04AC	Timer 11 Type	0	2	1	---	FC141	0	1
41198	04AD	Timer 11 Pickup Delay	0	1000	1	---	F1	1	1
41199	04AE	Timer 11 Dropout Delay	0	1000	1	---	F1	1	1
41200	04AF	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41204	04B3	Reserved	---	---	---	---	---	---	1
41205	04B4	Timer 12 Type	0	2	1	---	FC141	0	1
41206	04B5	Timer 12 Pickup Delay	0	1000	1	---	F1	1	1
41207	04B6	Timer 12 Dropout Delay	0	1000	1	---	F1	1	1
41208	04B7	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41212	04BB	Reserved	---	---	---	---	---	---	1
41213	04BC	Timer 13 Type	0	2	1	---	FC141	0	1
41214	04BD	Timer 13 Pickup Delay	0	1000	1	---	F1	1	1
41215	04BE	Timer 13 Dropout Delay	0	1000	1	---	F1	1	1
41216	04BF	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41220	04C3	Reserved	---	---	---	---	---	---	1
41221	04C4	Timer 14 Type	0	2	1	---	FC141	0	1
41222	04C5	Timer 14 Pickup Delay	0	1000	1	---	F1	1	1
41223	04C6	Timer 14 Dropout Delay	0	1000	1	---	F1	1	1
41224	04C7	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41228	04CB	Reserved	---	---	---	---	---	---	1
41229	04CC	Timer 15 Type	0	2	1	---	FC141	0	1
41230	04CD	Timer 15 Pickup Delay	0	1000	1	---	F1	1	1
41231	04CE	Timer 15 Dropout Delay	0	1000	1	---	F1	1	1
41232	04CF	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41236	04D3	Reserved	---	---	---	---	---	---	1
41237	04D4	Timer 16 Type	0	2	1	---	FC141	0	1
41238	04D5	Timer 16 Pickup Delay	0	1000	1	---	F1	1	1
41239	04D6	Timer 16 Dropout Delay	0	1000	1	---	F1	1	1
41240	04D7	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41244	04DB	Reserved	---	---	---	---	---	---	1



Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
41245	04DC	Timer 17 Type	0	2	1	---	FC141	0	1
41246	04DD	Timer 17 Pickup Delay	0	1000	1	---	F1	1	1
41247	04DE	Timer 17 Dropout Delay	0	1000	1	---	F1	1	1
41248	04DF	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41252	04E3	Reserved	---	---	---	---	---	---	1
41253	04E4	Timer 18 Type	0	2	1	---	FC141	0	1
41254	04E5	Timer 18 Pickup Delay	0	1000	1	---	F1	1	1
41255	04E6	Timer 18 Dropout Delay	0	1000	1	---	F1	1	1
41256	04E7	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41260	04EB	Reserved	---	---	---	---	---	---	1
41261	04EC	Timer 19 Type	0	2	1	---	FC141	0	1
41262	04ED	Timer 19 Pickup Delay	0	1000	1	---	F1	1	1
41263	04EE	Timer 19 Dropout Delay	0	1000	1	---	F1	1	1
41264	04EF	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41268	04F3	Reserved	---	---	---	---	---	---	1
41269	04F4	Timer 20 Type	0	2	1	---	FC141	0	1
41270	04F5	Timer 20 Pickup Delay	0	1000	1	---	F1	1	1
41271	04F6	Timer 20 Dropout Delay	0	1000	1	---	F1	1	1
41272	04F7	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41276	04FB	Reserved	---	---	---	---	---	---	1
41277	04FC	Timer 21 Type	0	2	1	---	FC141	0	1
41278	04FD	Timer 21 Pickup Delay	0	1000	1	---	F1	1	1
41279	04FE	Timer 21 Dropout Delay	0	1000	1	---	F1	1	1
41280	04FF	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41284	0503	Reserved	---	---	---	---	---	---	1
41285	0504	Timer 22 Type	0	2	1	---	FC141	0	1
41286	0505	Timer 22 Pickup Delay	0	1000	1	---	F1	1	1
41287	0506	Timer 22 Dropout Delay	0	1000	1	---	F1	1	1
41288	0507	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41292	050B	Reserved	---	---	---	---	---	---	1
41293	050C	Timer 23 Type	0	2	1	---	FC141	0	1
41294	050D	Timer 23 Pickup Delay	0	1000	1	---	F1	1	1
41295	050E	Timer 23 Dropout Delay	0	1000	1	---	F1	1	1
41296	050F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41300	0513	Reserved	---	---	---	---	---	---	1
41301	0514	Timer 24 Type	0	2	1	---	FC141	0	1
41302	0515	Timer 24 Pickup Delay	0	1000	1	---	F1	1	1
41303	0516	Timer 24 Dropout Delay	0	1000	1	---	F1	1	1
41304	0517	Reserved	---	---	---	---	---	---	1

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41308	051B	Reserved	---	---	---	---	---	---	1
41309	051C	Timer 25 Type	0	2	1	---	FC141	0	1
41310	051D	Timer 25 Pickup Delay	0	1000	1	---	F1	1	1
41311	051E	Timer 25 Dropout Delay	0	1000	1	---	F1	1	1
41312	051F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41316	0523	Reserved	---	---	---	---	---	---	1
41317	0524	Timer 26 Type	0	2	1	---	FC141	0	1
41318	0525	Timer 26 Pickup Delay	0	1000	1	---	F1	1	1
41319	0526	Timer 26 Dropout Delay	0	1000	1	---	F1	1	1
41320	0527	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41324	052B	Reserved	---	---	---	---	---	---	1
41325	052C	Timer 27 Type	0	2	1	---	FC141	0	1
41326	052D	Timer 27 Pickup Delay	0	1000	1	---	F1	1	1
41327	052E	Timer 27 Dropout Delay	0	1000	1	---	F1	1	1
41328	052F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41332	0533	Reserved	---	---	---	---	---	---	1
41333	0534	Timer 28 Type	0	2	1	---	FC141	0	1
41334	0535	Timer 28 Pickup Delay	0	1000	1	---	F1	1	1
41335	0536	Timer 28 Dropout Delay	0	1000	1	---	F1	1	1
41336	0537	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41340	053B	Reserved	---	---	---	---	---	---	1
41341	053C	Timer 29 Type	0	2	1	---	FC141	0	1
41342	053D	Timer 29 Pickup Delay	0	1000	1	---	F1	1	1
41343	053E	Timer 29 Dropout Delay	0	1000	1	---	F1	1	1
41344	053F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41348	0543	Reserved	---	---	---	---	---	---	1
41349	0544	Timer 30 Type	0	2	1	---	FC141	0	1
41350	0545	Timer 30 Pickup Delay	0	1000	1	---	F1	1	1
41351	0546	Timer 30 Dropout Delay	0	1000	1	---	F1	1	1
41352	0547	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41356	054B	Reserved	---	---	---	---	---	---	1
41357	054C	Timer 31 Type	0	2	1	---	FC141	0	1
41358	054D	Timer 31 Pickup Delay	0	1000	1	---	F1	1	1
41359	054E	Timer 31 Dropout Delay	0	1000	1	---	F1	1	1
41360	054F	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41364	0553	Reserved	---	---	---	---	---	---	1
41365	0554	Timer 32 Type	0	2	1	---	FC141	0	1
41366	0555	Timer 32 Pickup Delay	0	1000	1	---	F1	1	1

	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
	41367	0556	Timer 32 Dropout Delay	0	1000	1	---	F1	1	1
	41368	0557	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	41372	055B	Reserved	---	---	---	---	---	---	1
CONTACT INPUT ASSIGNMENT										
	41373	055C	U/V Restart Inhibit	0	57344	0	---	FC142	0	1
	41374	055D	Lockout Reset	0	57344	0	---	FC142	0	1
	41375	055E	Access Switch	0	57344	0	---	FC142	0	1
	41376	055F	Field Permissive	0	57344	0	---	FC142	0	1
	41377	0560	Comms Permissive	0	57344	0	---	FC142	0	1
	41378	0561	Forward Limit	0	57344	0	---	FC142	0	1
	41379	0562	Reverse Limit	0	57344	0	---	FC142	0	1
	41380	0563	Remote Reset	0	57344	0	---	FC142	0	1
	41381	0564	MCC Permissive	0	57344	0	---	FC142	0	1
	41382	0565	Hard Wired Start A	0	57344	0	---	FC142	0	1
	41383	0566	Hard Wired Start B	0	57344	0	---	FC142	0	1
	41384	0567	Hard Wired Stop	0	57344	0	---	FC142	0	1
	41385	0568	Hard Wired Permissive	0	57344	0	---	FC142	0	1
	41386	0569	Field Start A	0	57344	0	---	FC142	0	1
	41387	056A	Field Start B	0	57344	0	---	FC142	0	1
	41388	056B	Field Stop	0	57344	0	---	FC142	0	1
	41389	056C	Contactor Status A	0	57344	0	---	FC142	0	1
	41390	056D	Contactor Status B	0	57344	0	---	FC142	0	1
	41391	056E	Auto/Manual Switch	0	57344	0	---	FC142	0	1
	41392	056F	Reserved	---	---	---	---	---	---	1
	41393	0570	Test Switch	0	57344	0	---	FC142	0	1
	41394	0571	Process Interlock A	0	57344	0	---	FC142	0	1
	41395	0572	Process Interlock B	0	57344	0	---	FC142	0	1
	41396	0573	Process Interlock C	0	57344	0	---	FC142	0	1
	41397	0574	Process Interlock D	0	57344	0	---	FC142	0	1
	41398	0575	Process Interlock E	0	57344	0	---	FC142	0	1
	41399	0576	Process Interlock F	0	57344	0	---	FC142	0	1
	41400	0577	Process Interlock G	0	57344	0	---	FC142	0	1
	41401	0578	Process Interlock H	0	57344	0	---	FC142	0	1
	41402	0579	Process Interlock I	0	57344	0	---	FC142	0	1
	41403	057A	Process Interlock J	0	57344	0	---	FC142	0	1
	41404	057B	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	41470	05BD	Reserved							1
SELF TEST										
	41471	05BE	Self Test Action	0	1	1	---	FC111	0	1
	41472	05BF	Reserved	---	---	---	---	---	---	1
	41473	05C0	Reserved	---	---	---	---	---	---	1
	41474	05C1	Reserved	---	---	---	---	---	---	1
	41475	05C2	Reserved	---	---	---	---	---	---	1
LEDs										

Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
41476	05C3	Orange LED Intensity	0	15	1	---	FC147	0	1
41477	05C4	Green LED Intensity	0	15	1	---	FC147	0	1
41478	05C5	Red LED Intensity	0	15	1	---	FC147	0	1
41479	05C6	LED colour invert	0	1	1	---	FC177	0	1
41480	05C7	Tripped LED Flasher	0	1	1	---	FC103	0	1
41481	05C8	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41494	05D5	Reserved	---	---	---	---	---	---	1
41495	05D6	USER1 LED Assignment	0	57344	1	---	FC142	0	1
41496	05D7	USER1 LED Colour	0	3	1	---	FC157	1	1
41497	05D8	USER2 LED Assignment	0	57344	1	---	FC142	0	1
41498	05D9	USER2 LED Colour	0	3	1	---	FC157	1	1
41499	05DA	USER3 LED Assignment	0	57344	1	---	FC142	0	1
41500	05DB	USER3 LED Colour	0	3	1	---	FC157	1	1
41501	05DC	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41514	05E9	Reserved	---	---	---	---	---	---	1
CONTACT OUTPUTS									
41515	05EA	Contact Output 1	0	57344	0	---	FC142	0	1
41516	05EB	Contact Output 2	0	57344	0	---	FC142	0	1
41517	05EC	Contact Output 3	0	57344	0	---	FC142	0	1
41518	05ED	Contact Output 4	0	57344	0	---	FC142	0	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41543	0606	Contact Output 29	0	57344	0	---	FC142	0	1
41544	0607	Contact Output 30	0	57344	0	---	FC142	0	1
41545	0608	Contact Output 31	0	57344	0	---	FC142	0	1
41546	0609	Contact Output 32	0	57344	0	---	FC142	0	1
41547	060A	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41552	060F	Reserved	---	---	---	---	---	---	1
UNDERVOLTAGE RESTART									
41553	0610	Under Voltage Restart	0	1	1	---	FC126	0	1
41554	0611	UVR Short Dip Time	100	510	10	ms	F1*	200	1
41555	0612	UVR Med Dip Time	1	100	1	s	F2	20	1
41556	0613	UVR Long Dip Time	5	605	5	min	F2*	605	1
41557	0614	UVR Med Dip Delay	2	600	2	s	F2	20	1
41558	0615	UVR Long Dip Delay	2	12000	2	s	F2	100	1
41559	0616	UVR Dropout Level	60	100	1	%	F1	65	1
41560	0617	UVR Pickup Level	60	100	1	%	F1	90	1
41561	0618	Reserved	---	---	---	---	---	---	1
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
41571	0622	Reserved	---	---	---	---	---	---	1
AUTO / MANUAL CONTROL									
41572	0623	Comms Start Ctrl	0	1	1	---	FC126	0	1
41573	0624	Comms Stop Mode	0	1	1	---	FC172	0	1
41574	0625	Hard Wired Start Ctrl	0	1	1	---	FC126	0	1

	Modbus	Hex	Description	Min	Max	Step	Units	Format	Default	Size in Words
	41575	0626	Hard Wired Stop Mode	0	1	1	---	FC172	0	1
	41576	0627	Hard Wired Stop Actn	0	1	1	---	FC174	0	1
	41577	0628	Hard Wired 2W/3W	0	1	1	---	FC173	1	1
	41578	0629	Field Start Ctrl	0	1	1	---	FC126	0	1
	41579	062A	Field Stop Mode	0	1	1	---	FC172	0	1
	41580	062B	Field Stop Action	0	1	1	---	FC174	0	1
	41581	062C	Field 2W/3W	0	1	1	---	FC173	1	1
	41582	062D	MCC Start Ctrl	0	1	1	---	FC126	0	1
	41583	062E	MCC Stop Mode	0	1	1	---	FC172	0	1
	41584	062F	MCC Stop Action	0	1	1	---	FC174	0	1
	41585	0630	Test Auto Mode	0	2	1	---	FC175	1	1
	41586	0631	Test Manual Mode	0	2	1	---	FC175	0	1
	41587	0632	External Stop Action	0	1	1	---	FC174	0	1
	41588	0633	Auto/Manual Key	0	1	1	---	FC126	0	1
	41589	0634	Reserved	---	---	---	---	---	---	7
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	41696	069F	Reserved							1
FLEXLOGIC EQUATION										
	41697	06A0	Flex Equation	0	65535	1	---	FC142	1024	512
	42209	08A0	Reserved	---	---	---	---	---	---	1
	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
	43763	0EB2	Reserved							2

1.Maximum setpoint values represent OFF.

## Format codes

Code	Type	Definition
F1	16 bits	UNSIGNED VALUE
Example: 1234 stored as 1234		
F2	16 bits	UNSIGNED VALUE, 1 DECIMAL PLACE
Example: 123.4 stored as 1234		
F3	16 bits	UNSIGNED VALUE, 2 DECIMAL PLACES
Example: 12.34 stored as 1234		
F4	16 bits	2's COMPLEMENT SIGNED VALUE
Example: -1234 stored as -1234 i.e. 64302		
F6	16 bits	2's COMPLEMENT SIGNED VALUE, 2 DECIMAL PLACES
Example: -12.34 stored as -1234 i.e. 64302		
F9	32 bits	UNSIGNED LONG VALUE
1st 16 bits		High Order Word of Long Value
2nd 16 bits		Low Order Word of Long Value
Example: 123456 stored as 123456		
i.e. 1st word: 0001 hex, 2nd word: E240 hex		
F10	32 bits	UNSIGNED LONG VALUE, 1 DECIMAL PLACE
1st 16 bits		UNSIGNED LONG VALUE, 1 DECIMAL PLACE
2nd 16 bits		Low Order Word of Long Value
Example: 12345.6 stored as 123456		
i.e. 1st word: 0001 hex, 2nd word: E240 hex		
F13	32 bits	2's COMPLEMENT SIGNED LONG VALUE, 1 DECIMAL PLACE
1st 16 bits		High Order Word of Long Value
2nd 16 bits		Low Order Word of Long Value
Example: -12345.6 stored as -123456		
i.e. 1st word: FFFE hex, 2nd word: 1DC0 hex		
F15	16 bits	HARDWARE REVISION
0		Prototype
1		A
2		B
3		C
4		D
5		E
6		F
7		G
8		H
9		I
10		J
11		K
12		L
13		M
14		N
15		O
16		P
17		Q

Code	Type	Definition
18		R
19		S
20		T
21		U
22		V
23		W
24		X
25		Y
26		Z
F17	32 bits	UNSIGNED LONG VALUE, 3 DECIMAL PLACES
1st 16 bits		High Order Word of Long Value
2nd 16 bits		Low Order Word of Long Value
Example: 123456 stored as 123456		
i.e. 1st word: 0001 hex, 2nd word: E240 hex		
F18	32 bits	DATE MM/DD/YYYY
1st byte		Month 1 to 12
2nd byte		Day 1 to 31
3rd and 4th byte		Year 1995 to 2094
Example: Feb 20, 1995 stored as 34867142		
i.e. 1st word: 0214, 2nd word 07C6		
F19	32 bits	TIME HH:MM:SS:hh
1st byte		Hours 0 to 23
2nd byte		Minutes 0 to 59
3rd byte		Seconds 0 to 59
4th byte		Hundredths of seconds 0 to 99
Example: 2:05pm stored as 235208704		
i.e. 1st word: 0E05, 2nd word 0000		
F20	32 bits	2's COMPLEMENT SIGNED LONG VALUE
1st 16 bits		High Order Word of Long Value
2nd 16 bits		Low Order Word of Long Value
Note: -1 means "Never"		
F21	16 bits	2's COMPLEMENT SIGNED VALUE, 2 DECIMAL PLACES Power Factor
< 0		Leading Power Factor - Negative
> 0		Lagging Power Factor - Positive
Example: Power Factor of 0.87 lag is used as 87		
i.e. 0057		
F22	16 bits	TWO 8-BIT CHARACTERS PACKED INTO 16-BIT UNSIGNED
MSB		First Character
LSB		Second Character
Example: String 'AB' stored as 4142 hex		
FC101	16 bits	RS 485 Baud Rate
0		9600 baud
1		19200 baud
2		38400 baud
3		57600 baud
4		115200 baud

Code	Type	Definition
FC103	16 bits	Off / On or No / Yes Selection
0		OFF / NO
1		ON / YES
FC104	16 bits	Ground CT Type
0		None
1		Residual
2		CBCT 2000:1
FC105	16 bits	Differential CT Type
0		None
1		1 A Secondary
2		5 A Secondary
3		Direct Connect
FC106	16 bits	Voltage Transformer Connection Type
0		Wye
1		Delta
FC107	16 bits	Supply Frequency
0		60
1		50
FC109	16 bits	Flex Logic Status
0		OK
1		Unknown Token
2		Too Many Latches
3		Too Many Timers
4		Too Many + OneShots
5		Too Many - OneShots
6		Too Many Duel OneShots
7		Stack Overflow
8		Stack Underflow
9		Program Too Long
FC111	16 bits	Trip Relays
0		Trip
1		Alarm
FC112	16 bits	Communication Status
0		Error
1		OK
FC116	16 bits	Switch Type
0		Open
1		Closed
FC121	16 bits	RTD Application
0		None
1		Stator
2		Bearing
3		Ambient
4		Other
FC122	16 bits	RTD Voting Selection
0		OFF
1		RTD #1



Code	Type	Definition
2		RTD #2
3		RTD #3
4		RTD #4
5		RTD #5
6		RTD #6
FC126	16 bits	Disabled / Enabled Selection
0		Disabled
1		Enabled
FC128	16 bits	Command Status
0		Manual
1		Auto
2		Manual Inhibit
3		Auto/ Manual
4		Hardwired Auto
5		None
FC129	16 bits	Quick Status Status
Bit 0		Alarm
Bit 1		Trip
Bit 2		Self Test Fault
Bit 3		Auto
Bit 4		Contact A
Bit 5		Contact B
Bit 6		Contact Output 3
Bit 7		Drive Available
FC130	16 bits	LED Flash
Bit 0		Running
Bit 1		Stopped
Bit 2		Tripped
Bit 3		Alarm
Bit 4		Comms OK
Bit 5		Auto
Bit 6		Manual
Bit 7		USER1
Bit 8		USER2
Bit 9		USER3
Bit 10		50%
Bit 11		80%
Bit 12		100%
FC131	16 bits	Comm Fail Mode
1		Serial
2		Serial & Ethernet
4		Serial & FieldBus
8		Ethernet
16		FieldBus
32		Ethernet & Fieldbus
64		All
FC134	16 bits	Cause of Event

Code	Type	Definition
0		No Event/Trip To Date
1		Control Power Lost
2		Control Power Applied
3		Date or Time Set
4		Reset
5		Lockout Reset
0x8002		Any Trip
0x8042		Thermal O/L Trip
0x8082		Ground Fault Trip
0x80C2		Acceleration Trip
0x8102		Phase Reversal Trip
0x8142		UnderPower Trip
0x8182		UnderVoltage Trip
0x81C2		OverVoltage Trip
0x8202		Mechanical Jam Trip
0x8242		UnderCurrent Trip
0x8282		Unbalance Trip
0x82C2		RTD 1 Trip
0x8302		RTD 2 Trip
0x8342		RTD 3 Trip
0x8382		RTD 4 Trip
0x83C2		RTD 5 Trip
0x8402		RTD 6 Trip
0x8442		Comm Fail Trip
0x8482		Relay Not Configured
0x84C2		Process I Lock A Trip
0x8502		Process I Lock B Trip
0x8542		Process I Lock C Trip
0x8582		Process I Lock D Trip
0x85C2		Process I Lock E Trip
0x8602		Process I Lock F Trip
0x8642		Process I Lock G Trip
0x8682		Process I Lock H Trip
0x86C2		Process I Lock I Trip
0x8702		Process I Lock J Trip
0x8742		Hard Wired Trip
0x8782		Field Trip
0x87C2		MCC Trip
0x8802		Aux U/V Trip
0x8842		Emergency Stop
0x8882		Fuse Fail Trip
0x88C2		Open Control Circuit Trip
0x8902		Thermistor Trip
0x89C2		Self Test Trip
0xA002		Any Alarm
0xA042		Thermal Level Alarm
0xA082		Ground Fault Alarm

Code	Type	Definition
0xA0C2		Acceleration Alarm
0xA102		Phase Reversal Alarm
0xA142		UnderPower Alarm
0xA182		UnderVoltage Alarm
0xA1C2		OverVoltage Alarm
0xA242		UnderCurrent Alarm
0xA282		Unbalance Alarm
0xA2C2		RTD 1 Alarm
0xA302		RTD 2 Alarm
0xA342		RTD 3 Alarm
0xA382		RTD 4 Alarm
0xA3C2		RTD 5 Alarm
0xA402		RTD 6 Alarm
0xA442		RTD Open/Short Alarm
0xA482		RTD Open/Short Alarm
0xA4C2		Process I Lock A Alarm
0xA502		Process I Lock B Alarm
0xA542		Process I Lock C Alarm
0xA582		Process I Lock D Alarm
0xA5C2		Process I Lock E Alarm
0xA602		Process I Lock F Alarm
0xA642		Process I Lock G Alarm
0xA682		Process I Lock H Alarm
0xA6C2		Process I Lock I Alarm
0xA702		Process I Lock J Alarm
0xA742		Drive Failed to Start
0xA782		Inverter Failed
0xA7C2		Drive Stop Failed
0xA802		Aux U/V Alarm
0xA842		External Stop Alarm
0xA882		Fuse Fail Alarm
0xA8C2		Open Ctrl Cct Alarm
0xA902		Thermistor Alarm
0xA982		External Start A Alarm
0xA9C2		External Start B Alarm
0xAA02		Welded Contactor
0xAB02		Load Increase Alarm
0XAB42		Drive Greasing Alarm
0xAB82		Contactor Inspect Alarm
0xABC2		Max Stopped Alarm
0xAC82		Comm Fail Alarm
0xC002		Any Stop
0xC042		Thermal Inhibit
0xC082		AutoMode
0xC0C2		Manual Mode
0xC102		Auto/Manual Mode Input
0xC142		Restart Inhibit

Code	Type	Definition
0xC182		Contactor A
0xC1C2		Contactor B
0xC202		Forward Limit
0xC242		Reverse Limit
0xC282		Starts/Hr Inhibit
0xC2C2		Time Between Inhibit
0xC3C2		Comms Ctrl Active
0xC402		Hard Wired Ctrl Active
0xC442		Field Ctrl Active
0xC482		MCC Ctrl Active
0xC4C2		Process ILock A Stop
0xC502		Process ILock B Stop
0xC542		Process ILock C Stop
0xC582		Process ILock D Stop
0xC5C2		Process ILock E Stop
0xC602		Process ILock F Stop
0xC642		Process ILock G Stop
0xC682		Process ILock H Stop
0xC6C2		Process ILock I Stop
0xC702		Process ILock J Stop
0xC742		HW Stop
0xC782		Field Stop
0xC7C2		MCC Stop
0xC802		Access Switch Closed
0xC842		Test Switch Closed
0xC882		Hard Wired Start A
0xC8C2		Hard Wired Start B
0xC902		Start A
0xC942		Start B
0xC982		Field Start A
0xC9C2		Field Start B
0xCA02		Contactor A Status
0xCA42		Contactor B Status
0xCA82		Remote Reset Closed
0xCAC2		Lockout Reset Closed
0xCB02		UV Restart
0xCB42		Pre-Contactor
0xCB82		MCC Start A
0xCBC2		MCC Start B
0xCC02		Bypass Contact
0xCC42		Comm Start A
0xCC82		Comm Start B
0xCCC2		Comm Stop
0xCD02		Fuse Fail Inhibit
0xCD42		Phase Reversal Inhibit
0xCD82		Low Aux Voltage Inhibit
FC135	16 bits	Motor Speed During Trip / Motor Speed During Event

Code	Type	Definition
0		Low Speed
1		High Speed
FC136	16 bits	Motor Speed During Trip / Motor Speed During Event
0		None
1		A
2		B
FC139	16 bits	Starter Type
0		None
1		FV Nonreversing
2		FV Reversing
3		Two Speed
4		Wye-Delta
5		Inverter
6		Soft Starter
7		Custom Starter
FC140	16 bits	Interlock Function
0		Disabled
1		Trip
2		Alarm
3		Stop
FC141	16 bits	Timer Type
0		Millisecond
1		Second
2		Minute
FC142	16 bits	FlexLogic Bit Field EEETTTTTTSSSSSS S-Bits denotes the element state or Operator specific data Number of inputs T-Bits denote Flex logic Operands and Parameters or when one of the E bits are set they denote specific details for the Element Type E-Bits
0x0000		OFF
0x0001		ON
0x0040		Contact Inputs
0x0080		Virtual Inputs
0x00C0		Virtual Outputs
0x01C0		Remote Inputs
0x0380		Insert
0x0400		End
0x0440		NOT
0x0480		XOR
0x04C0		LATCH
0x0500		OR
0x0540		AND
0x0580		NOR
0x05C0		NAND
0x0600		TIMER
0x0640		ASSIGN
0x8000		Trip
0xA000		Alarm

Code	Type	Definition
0xC000		Control
<b>FC143</b>	<b>16 bits</b>	<b>Drive Status</b>
0		Drive Unavailable
1		Available Auto
2		Available Manual
3		Available
4		Running
<b>FC144</b>	<b>32 bits</b>	<b>LED Status</b>
Bit 0		Running Red
Bit 1		Running Green
Bit 2		Stopped Red
Bit 3		Stopped Green
Bit 4		Tripped Red
Bit 5		Tripped Green
Bit 6		Alarm Red
Bit 7		Alarm Green
Bit 8		Auto Red
Bit 9		Auto Green
Bit 10		Manual Red
Bit 11		Manual Green
Bit 12		Comms OK Red
Bit 13		Comms OK Green
Bit 14		USER1 Red
Bit 15		USER1 Green
Bit 16		USER2 Red
Bit 17		USER2 Green
Bit 18		USER3 Red
Bit 19		USER3 Green
Bit 20		50% Red
Bit 21		50% Green
Bit 22		80% Red
Bit 23		80% Green
Bit 24		100% Red
Bit 25		100% Green
<b>FC145</b>	<b>16 bits</b>	<b>Element Status 1</b>
Bit 0		Level
Bit 1		Operated
Bit 2		Latched
Bit 3		Spare
<b>FC147</b>	<b>16 bits</b>	<b>LED Intensity</b>
0		Level 1
3		Level 2
6		Level 3
9		Level 4
12		Level 5
15		Level 6
<b>FC150</b>	<b>32 bits</b>	<b>IP Address</b>

Code	Type	Definition
IP address, subnet mask or default gateway Each byte in this register represents one octet of an IP address For example: 0x015EDA1F represents address 19421831		
<b>FC155</b>	<b>16 bits</b>	<b>Profibus Baud Rate</b>
0x0001		9600
0x0002		19200
0x0004		31250
0x0008		45450
0x0010		93750
0x0020		187500
0x0040		500000
0x0080		1500000
0x07E2		Auto Detect
<b>FC156</b>	<b>16 bits</b>	<b>DeviceNet Baud Rate</b>
0		125 kbps
1		250 kbps
2		500 kbps
<b>FC157</b>	<b>16 bits</b>	<b>LED Colour</b>
0		None
1		Red
2		Green
3		Orange
<b>FC160</b>	<b>16 bits</b>	<b>Auto/Manual Mode</b>
0		Auto
1		Manual
<b>FC167</b>	<b>32 bits</b>	<b>Contact/Virtual Input/Output Status</b>
Bit 0		Input/Output 1
Bit 1		Input/Output 2
Bit 2		Input/Output 3
Bit 3		Input/Output 4
Bit 4		Input/Output 5
Bit 5		Input/Output 6
Bit 6		Input/Output 7
Bit 7		Input/Output 8
Bit 8		Input/Output 9
Bit 9		Input/Output 10
Bit 10		Input/Output 11
Bit 11		Input/Output 12
Bit 12		Input/Output 13
Bit 13		Input/Output 14
Bit 14		Input/Output 15
Bit 15		Input/Output 16
Bit 16		Input/Output 17
Bit 17		Input/Output 18
Bit 18		Input/Output 19
Bit 19		Input/Output 20
Bit 20		Input/Output 21
Bit 21		Input/Output 22

Code	Type	Definition
Bit 22		Input/Output 23
Bit 23		Input/Output 24
Bit 24		Input/Output 25
Bit 25		Input/Output 26
Bit 26		Input/Output 27
Bit 27		Input/Output 28
Bit 28		Input/Output 29
Bit 29		Input/Output 30
Bit 30		Input/Output 31
Bit 31		Input/Output 32
FC168	32 bits	Contact/Virtual Input/Output Status
Bit 0		Input/Output 33
Bit 1		Input/Output 34
Bit 2		Input/Output 35
Bit 3		Input/Output 36
Bit 4		Input/Output 37
Bit 5		Input/Output 38
Bit 6		Input/Output 39
Bit 7		Input/Output 40
Bit 8		Input/Output 41
Bit 9		Input/Output 42
Bit 10		Input/Output 43
Bit 11		Input/Output 44
Bit 12		Input/Output 45
Bit 13		Input/Output 46
Bit 14		Input/Output 47
Bit 15		Input/Output 48
Bit 16		Input/Output 49
Bit 17		Input/Output 50
Bit 18		Input/Output 51
Bit 19		Input/Output 52
Bit 20		Input/Output 53
Bit 21		Input/Output 54
Bit 22		Input/Output 55
Bit 23		Input/Output 56
Bit 24		Input/Output 57
Bit 25		Input/Output 58
Bit 26		Input/Output 59
Bit 27		Input/Output 60
Bit 28		Input/Output 61
Bit 29		Input/Output 62
Bit 30		Input/Output 63
Bit 31		Input/Output 64
FC169	16 bits	Month
0		Not Set
1		January
2		February



Code	Type	Definition
3		March
4		April
5		May
6		June
7		July
8		August
9		September
10		October
11		November
12		December
<b>FC170</b>	<b>16 bits</b>	<b>Count of Week</b>
0		Not Set
1		1st
2		2nd
3		3rd
4		4th
5		Last
<b>FC171</b>	<b>16 bits</b>	<b>Weekdays</b>
0		Not Set
1		SUN
2		MON
3		TUE
4		WED
5		THU
6		FRI
7		SAT
<b>FC172</b>	<b>16 bits</b>	<b>Auto/Manual Control Stop Mode</b>
0		Always Enabled
1		Follow Ctrl Mode
<b>FC173</b>	<b>16 bits</b>	<b>Wire Selection</b>
0		2W
1		3W
<b>FC174</b>	<b>16 bits</b>	<b>Source Stop Action</b>
0		Stop
1		Trip
<b>FC175</b>	<b>16 bits</b>	<b>Test Auto/Manual Mode</b>
0		ON
1		OFF
2		Unaffected
<b>FC176</b>	<b>16 bits</b>	<b>Auxiliary VT Connection</b>
0		Vab VT
1		Vbc VT
2		Vca VT
3		Van VT
4		Vbn VT
5		Vcn VT
6		Van Direct

Code	Type	Definition
7		Vbn Direct
8		Vcn Direct
FC177	16 bits	LED Color Invert
0		Green/Red
1		Red/Green
FC178	16 bits	Motor Status
Bit 0		Lockout
Bit 1		Non-Lockout Trip
Bit 2		UVR Pending
Bit 4		Running
Bit 5		Precontactor
Bit 6		Starting
Bit 8		Inhibit
Bit 9		Stopped
Bit 10		Self Test Fault
Bit 11		Alarm
Bit 12		Forward
Bit 13		Reverse
Bit 14		Low Speed
Bit 15		High Speed
FC179	32 bits	Alarm Status 1
Bit 0		Any Alarm
Bit 1		Thermal Level Alarm
Bit 2		Ground Fault Alarm
Bit 3		Acceleration Alarm
Bit 4		Phase Reversal Alarm
Bit 5		UnderPower Alarm
Bit 6		UnderVoltage Alarm
Bit 7		OverVoltage Alarm
Bit 9		UnderCurrent Alarm
Bit 10		Unbalance Alarm
Bit 11		RTD 1 Alarm
Bit 12		RTD 2 Alarm
Bit 13		RTD 3 Alarm
Bit 14		RTD 4 Alarm
Bit 15		RTD 5 Alarm
Bit 16		RTD 6 Alarm
Bit 17		RTD Open/Short Alarm
Bit 18		RTD Open/Short Alarm
Bit 19		Process ILock A Alarm
Bit 20		Process ILock B Alarm
Bit 21		Process ILock C Alarm
Bit 22		Process ILock D Alarm
Bit 23		Process ILock E Alarm
Bit 24		Process ILock F Alarm
Bit 25		Process ILock G Alarm
Bit 26		Process ILock H Alarm

Code	Type	Definition
Bit 27		Process I Lock I Alarm
Bit 28		Process I Lock J Alarm
Bit 29		Drive Failed to Start
Bit 30		Inverter Failed
Bit 31		Drive Stop Failed
FC180	32 bits	Alarm Status 2
Bit 0		Aux U/V Alarm
Bit 1		External Stop Alarm
Bit 2		Fuse Fail Alarm
Bit 3		Open Ctrl Cct Alarm
Bit 4		Thermistor Alarm
Bit 6		External Start A Alarm
Bit 7		External Start B Alarm
Bit 8		Welded Contactor
Bit 12		Load Increase Alarm
Bit 13		Drive Greasing Alarm
Bit 14		Contactor Inspect Alarm
Bit 15		Max Stopped Alarm
Bit 18		Comm Fail Alarm
FC181	32 bits	Alarm Status 3 (Reserved)
FC182	32 bits	Alarm Status 4 (Reserved)
FC183	32 bits	Trip Status 1
Bit 0		Any Trip
Bit 1		Thermal O/L Trip
Bit 2		Ground Fault Trip
Bit 3		Acceleration Trip
Bit 4		Phase Reversal Trip
Bit 5		UnderPower Trip
Bit 6		UnderVoltage Trip
Bit 7		OverVoltage Trip
Bit 8		Mechanical Jam Trip
Bit 9		UnderCurrent Trip
Bit 10		Unbalance Trip
Bit 11		RTD 1 Trip
Bit 12		RTD 2 Trip
Bit 13		RTD 3 Trip
Bit 14		RTD 4 Trip
Bit 15		RTD 5 Trip
Bit 16		RTD 6 Trip
Bit 17		Comm Fail Trip
Bit 18		Relay Not Configured
Bit 19		Process I Lock A Trip
Bit 20		Process I Lock B Trip
Bit 21		Process I Lock C Trip
Bit 22		Process I Lock D Trip
Bit 23		Process I Lock E Trip
Bit 24		Process I Lock F Trip

Code	Type	Definition
Bit 25		Process I Lock G Trip
Bit 26		Process I Lock H Trip
Bit 27		Process I Lock I Trip
Bit 28		Process I Lock J Trip
Bit 29		Hard Wired Trip
Bit 30		Field Trip
Bit 31		MCC Trip
FC184	32 bits	Trip Status 2
Bit 0		Aux U/V Trip
Bit 1		Emergency Stop
Bit 2		Fuse Fail Trip
Bit 3		OpenControl Circuit
Bit 4		Thermistor Trip
FC185	32 bits	Trip Status 3 (Reserved)
FC186	32 bits	Trip Status 4 (Reserved)
FC187	32 bits	Message Status 1
Bit 1		Transfer Timer
Bit 2		FLA Not Set
Bit 3		CT Type Not Set
Bit 4		Starter Type Not Set
Bit 5		No Control Source
Bit 6		Clock Not Set
Bit 7		FLA Too High
FC188	32 bits	Message Status 2
Bit 1		IO Communication Failure
Bit 2		Metering Failure
Bit 3		Order Code Error
Bit 4		Clock Error
Bit 5		Calibration Error
Bit 6		EEPROM Error
Bit 7		IO Input Read Error
Bit 8		IO 3.3V Error
Bit 9		IO 5V Error
Bit 10		IO -5V Error
Bit 11		IO Input Overvoltage
Bit 12		IO Frequency Error
Bit 13		DPRAM Error
Bit 14		System Health Error
FC189	32 bits	Message Status 3 (Reserved)
FC190	32 bits	Message Status 4 (Reserved)
FC191	32 bits	Ctrl Element Status 1
Bit 0		Any Stop
Bit 1		Thermal Inhibit
Bit 2		AutoMode
Bit 3		Manual Mode
Bit 4		AutoManualMode
Bit 5		Restart Inhibit

Code	Type	Definition
Bit 8		Forward Limit
Bit 9		Reverse Limit
Bit 10		Starts/Hr Inhibit
Bit 11		Time Between Inhibit
Bit 15		Comms Ctrl Active
Bit 16		Hard Wired Ctrl Active
Bit 17		Field Ctrl Active
Bit 18		MCC Ctrl Active
Bit 19		Process I Lock A Stop
Bit 20		Process I Lock B Stop
Bit 21		Process I Lock C Stop
Bit 22		Process I Lock D Stop
Bit 23		Process I Lock E Stop
Bit 24		Process I Lock F Stop
Bit 25		Process I Lock G Stop
Bit 26		Process I Lock H Stop
Bit 27		Process I Lock I Stop
Bit 28		Process I Lock J Stop
FC192	32 bits	Ctrl Element Status 2
Bit 0		Access Switch
Bit 1		Test Switch
Bit 10		Remote Reset
Bit 11		Lockout Reset
Bit 13		Pre-Contactor
Bit 20		Fuse Fail Inhibit
Bit 21		Phase Reversal Inhibit
Bit 22		Low Aux Voltage Inhibit
FC193	32 bits	Ctrl Status 3 (Reserved)
FC194	32 bits	Ctrl Status 4 (Reserved)
FC212	16 bits	LCD Test Paint Color
0		None
1		Red
2		Green
3		Blue

## Performing Commands Using Function Code 10H

Commands can be performed using function code 16 as well as function code 5. When using FUNCTION CODE 16, the Command Function register must be written with a value of 5. The Command Operation register must be written with a valid command operation number. The Command Data registers must be written with valid data; this is dependent upon the command operation.

For example, consider a request for slave 17 to perform command operation 1 (RESET): The master/slave packets have the following format:

**Table 9: Master/slave packet format for performing commands**

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	10	store multiple setpoints
DATA STARTING ADDRESS	2	00 80	setpoint address 00 80
NUMBER OF SETPOINTS	2	00 02	2 setpoints = 4 bytes total
BYTE COUNT	1	04	4 bytes of data
DATA 1	2	00 05	data for address 00 80
DATA 2	2	00 01	data for address 00 81
CRC	2	7E CE	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	10	store multiple setpoints
DATA STARTING ADDRESS	2	00 80	setpoint address 00 80
NUMBER OF SETPOINTS	2	00 02	2 setpoints
CRC	2	42 B0	CRC error code

## Using the User Definable Memory Map

The MM300 contains a User Definable area in the memory map. This area allows re-mapping of the addresses of any Actual Values or Setpoints registers. The User Definable area has two sections:

1. A Register Index area (memory map addresses 020BH-0287H) that contains 125 Actual Values or Setpoints register addresses.
2. A Register area (memory map addresses 020BH-0287H) that contains the data at the addresses in the Register Index.

Register data that is separated in the rest of the memory map may be re-mapped to adjacent register addresses in the User Definable Registers area. This is accomplished by writing to register addresses in the User Definable Register Index area. This allows for improved throughput of data and can eliminate the need for multiple read command sequences. The User Definable Register Index is stored as a setpoint and therefore it is "remembered" even when the power is removed.

For example, if the values of MOTOR LOAD (register address 014FH; modbus address 30336) and DRIVE STATUS (register address 0135H; modbus address 30310) are required to be read from a MM300, their addresses may be re-mapped as follows:

1. Write 30336 to address 020BH (40524) (User Definable Register Index 0000) using function code 06 or 16.
2. Write 30310 to address 020CH (40525) (User Definable Register Index 0001) using function code 06 or 16.

The MM300PC software can be used to write these locations to the User Definable Register Index using the **Setpoints > Modbus Memory Map > User Map** screen.

It is now possible to read these two data registers with one read, at addresses 020BH, 020CH. Address 020BH will contain MOTOR LOAD. Address 020CH will contain DRIVE STATUS.

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## Ethernet interface

The 10/100Base-T Ethernet interface is configured as a Modbus RTU slave. The Ethernet port has the following characteristics.

- Configuration: setup using IP address, subnet mask, and gateway address.
- Supported Modbus function codes: 3, 4, 5, 6, and 16.
- Supports time/date synchronization via the Network Time Protocol (NTP).
- Ethernet port 502.
- Supports a maximum of 5 virtual connections.

The Ethernet interface has the same memory map layout as the serial Modbus RTU interface.

Network Time Protocol is enabled if the NTP address is non-zero and the source is detected.

Once connected to the source, the clock is updated every 30 seconds.



## Fieldbus interface

The fieldbus interface is configurable as either Profibus DPV0 or DeviceNet. Both Fieldbus interfaces support control and status – refer to the specific data map below for details.

Note that external power, 5 to 24 VDC, is required for this interface to operate. (Ensure that switches 7 and 8 of the DIPswitch on the communication card, are ON.)

### Profibus protocol (DP V0)

To enable the Profibus physical interface, ensure that switches 3 and 4 of the DIP switch on the communications card (on the CPU module) are on. The external connections through the Fieldbus interface are as follows.

**Table 10: Fieldbus interface external connections (Profibus)**

Pin	Connection (external device)
V-	Pin 5
L	Pin 8, line A (negative TX/RX)
C	Common drain
H	Pin 3, line B (positive TX/RX)
V+	Pin 6

The Modbus status (MS) and network status (NS) LEDs indicate the status of the Fieldbus interface.

**Table 11: Profibus LED indications**

LED	Color	Description
MS	Green	Processor OK
	Off	Processor FAIL
NS	Green	Communications to master OK
	Red	Communications to master FAIL

When used for Profibus, the fieldbus port has the following characteristics.

- Baud rate: 9600, 19200, 31250, 45450, 93750, 187500, 500000, and 1.5M bps (auto-detect)
- Address: 1 to 125
- Vendor ID: 3005 (hex)
- Data table size: inputs = 240 bytes, outputs = 240 bytes

Output bit must be 1 for a minimum time of 100 ms, to be actioned.

### Profibus Output Data

Bit	Description
1	Reset
2	Lockout Reset
3	Stop
4	Start A
5	Start B

Commands are actioned on rising edge (0 to 1 transition).

### Profibus DP-Diagnostics

MM300 supports both slave mandatory and slave specific diagnostic data.

**Table 12: System Standard Diagnostics Bytes 1 through 6**

Byte	Description
1	Station Status 1
2	Station Status 2
3	Station Status 3
4	Diagnostic Master Address
5	Identification Number (High Byte)
6	Identification Number (Low Byte)

The extended diagnosis for the relay is composed of 49 bytes (bytes 7 to 55) and contains diagnostic information according to the following table, with bit descriptions listed in the following pages.

Address (By Bytes)	Description	Format
7	No. of Extended Diagnostic Bytes	Unsigned
8-11	Trip Status 3	FC185
12-15	Trip Status 2	FC184
16-19	Trip Status 1	FC183
20-23	Alarm Status 3	FC181
24-27	Alarm Status 2	FC180
28-31	Alarm Status 1	FC179
32-35	Message Status 3	FC189
36-39	Message Status 2	FC188
40-43	Message Status 1	FC187
44-47	Ctrl Element Status 3	FC193
48-51	Ctrl Element Status 2	FC192
52-55	Ctrl Element Status 1	FC191

### Profibus Input Data

Category	Address (By Bytes)	Description	Format
Status-Motor	0	Motor Status	FC129
	2	Extended Status	FC178
	4	Thermal Cap Used	F1
	6	Time to Overload Trip	F20
	10	Reserved	NA
Start Blocks	12	Starts/Hour Block	F1
	14	Time Between Starts Lockout	F1B
	16	Restart Block Lockout	F1
	18	Reserved	NA
	20	Reserved	NA
	22	Reserved	NA
	24	Reserved	NA
Learned	26	Average Motor Load Learned	F3
	28	Learned Acceleration Time	F2
	30	Learned Starting Current	F10

Category	Address (By Bytes)	Description	Format
	34	Learned Starting Capacity	F1
Counters	36	Number of Motor Starts	F1
	38	Number of UV Restarts	F1
	40	Motor Running Hours	F9
	44	Motor Stopped Hours	F1
	46	Reserved	NA
	48	Reserved	NA
	50	Reserved	NA
	52	Reserved	NA
	54	Reserved	NA
	56	Reserved	NA
	58	Reserved	NA
Current Metering	60	Ia	F10
	64	Ib	F10
	68	Ic	F10
	72	Reserved	NA
	74	Reserved	NA
	76	Reserved	NA
	78	Iavg	F10
	82	Igrd	F10
	86	Motor Load	F1
	88	I Unb	F1
Voltage Metering	90	Vab	F1
	92	Vbc	F1
	94	Vca	F1
	96	Va1 Angle	F1
	98	Vb1 Angle	F1
	100	Vc1 Angle	F1
	102	Van	F1
	104	Vbn	F1
	106	Vcn	F1
	108	VAux	F1
	110	Reserved	NA
	112	Reserved	NA
	114	Reserved	NA
	116	Frequency	F3
	118	Reserved	NA
Power Metering	120	Power Factor	F21
	122	Real Power	F13
	126	Reserved	NA
	128	Reactive Power	F13
	132	Apparent Power	F2
	134	MWh Consumption	F17
	138	Reserved	NA
	140	Reserved	NA
	142	Mvarh Consumption	F17
	146	Reserved	NA

Category	Address (By Bytes)	Description	Format
	148	Reserved	NA
	150	Reserved	NA
Sensor Metering	152	Hottest Stator RTD	F1
	154	Hottest Stator RTD Temp	F4
	156	RTD 1 Temp	F4
	158	RTD 2 Temp	F4
	160	RTD 3 Temp	F4
	162	RTD 4 Temp	F4
	164	RTD 5 Temp	F4
	166	RTD 6 Temp	F4
	168	Reserved	NA
	170	Reserved	NA
	172	Reserved	NA
	174	Reserved	NA
	176	Reserved	NA
	178	Reserved	NA
Last Trip Data	180	Cause of Last Trip	FC134
	182	Date of Last Trip 2 words	F18
	186	Time of Last Trip 2 words	F19
	190	Pre Trip Ia	F10
	194	Pre Trip Ib	F10
	198	Pre Trip Ic	F10
	202	Pre Trip Motor Load	F3
	204	Pre Trip Current Unbalance	F1
	206	Pre Trip Igrd	F10
	210	Reserved	NA
	212	Reserved	NA
	214	Pre Trip Vab	F1
	216	Pre Trip Vbc	F1
	218	Pre Trip Vca	F1
	220	Pre Trip Van	F1
	222	Pre Trip Vbn	F1
	224	Pre Trip Vcn	F1
	226	Pre Trip System Frequency	F3
	228	Pre Trip Real Power	F13
	232	Pre Trip Reactive Power	F13
	236	Pre Trip Apparent Power	F2
	238	Pre Trip Power Factor	F21

## DeviceNet protocol

To enable the DeviceNet physical interface, ensure that switches 1 and 2 of the DIP switch communications card (on the CPU module) are on. The external connections through the fieldbus interface are as follows.

**Table 13: Fieldbus interface external connections (DeviceNet)**

Path	Connection (external)	Wire color
V-	Pin 3, CAN_GND	Black
L	Pin 2, CAN_L	Blue
C	Pin 5, CAN_SHLD	Bare
H	Pin 7, CAN_H	White
V+	Pin 9, CAN_V	Red

The Modbus status (MS) and network status (NS) LEDs indicate the status of the Fieldbus interface.

**Table 14: DeviceNet LED indications**

LED	LED operation	Description
MS	Green on, red on, green on	Device self-test
	Flashing green	Device in standby state
	Green on	Device operational
	Flashing red	Recoverable fault
	Red on	Unrecoverable fault
NS	Flashing green	Online, not connected
	Green on	Online, connected
	Flashing red	Connection timeout
	Red on	Critical link failure
	Red and green	Network access detected

When used for DeviceNet, the fieldbus port has the following characteristics.

- Baud rate: 125, 250, and 500 kbps
- MAC ID: 0 to 63
- Vendor ID: 928
- Product Code: 0x4D39
- Message types: poll, and explicit messaging

## DeviceNet Communications

The device profile is an extension of the Communications Adapter Device Profile (0xC0). It is a group 2 only server. The MAC ID and baud rate are programmable through the EnerVista MM300 Setup software and the Graphical Control Panel. The MM300 supports the following DeviceNet object classes.

CLASS	OBJECT
01H	Identify
02H	Message Router
03H	DeviceNet
05H	Connection
A0H	Generic Data - Polling/Explicit
B1H	Explicit Control Writes
B0H	Analog Data - Explicit

The MM300 supports poll and explicit messaging types.

The Poll function will return 38 bytes of status and metering data as described in User Object Class A0h, Instance 01h, Attribute 01h.

USINT, UINT, UDINT and DINT, stated in this document, stand for the following data types :

USINT = Unsigned integer byte

UINT = Unsigned integer word

UDINT = Unsigned integer double word

DINT = Signed integer double word

### Identity Object (Class Code 01H)

**Table 15: Identity Object, Class Code 01h, Services:**

CODE	SERVICES AVAILABLE TO THIS OBJECT	
	NAME	DESCRIPTION
0x05	Reset	Reset the device to power up configuration
0x0E	Get_Attribute_Single	Returns the contents of the given attribute

**Table 16: Identity Object, Class Code 01h, Attributes:**

ATTRIBUTE	ACCESS	NAME/DESCRIPTION	DATA TYPE	VALUE
01h	Get	Revision of Identity Object	UINT	1

**Table 17: Identity Object, Class Code 01h, Instance 01h, Attributes:**

ATTRIBUTE	ACCESS	NAME/DESCRIPTION	DATA TYPE	VALUE
01h	Get	Vendor ID	UINT	928
02h	Get	Device Type	UINT	12
03h	Get	Product Code	UINT	0x4D39
04h	Get	Revision (Major, Minor)	USINT	1.00

### Message Router (Class Code 02H)

The message router (class code 2) object provides a messaging connection point through which a client may address a service to any object or instance residing in the physical device. There is no external visible interface to the message router object.

### DeviceNet Object (Class Code 03H)

**Table 18: Identity Object, Class Code 03h, Services:**

CODE	SERVICES AVAILABLE TO THIS OBJECT	
	NAME	DESCRIPTION
0x0E	Get_Attribute_Single	Returns the contents of the given attribute

**Table 19: Identity Object, Class Code 03h, Attributes:**

ATTRIBUTE	ACCESS	NAME/DESCRIPTION	DATA TYPE	VALUE
01h	Get	Revision of DeviceNet Object	UINT	1

**Table 20: Identity Object, Class Code 03h, Instance 01h, Attributes:**

ATTRIBUTE	ACCESS	NAME/DESCRIPTION	DATA TYPE	VALUE
01h	Get	Vendor ID	UINT	928 (to be defined)
02h	Get	Baud Rate	USINT	0 = 125 kbps 1 = 250 kbps 2 = 500 kbps
05h	Get	Allocation Choice	BYTE	Bit 0: Explicit Messaging Bit 1: polled I/O Bit 6: acknowledge suppression
		Master/s MAC ID	USINT	0 to 63: address; 255 = unallocated

**DeviceNet Connection Object (Class Code 05H)****Table 21: Connection Object, Class Code 05h, Services:**

CODE	SERVICES AVAILABLE TO THIS OBJECT	
	NAME	DESCRIPTION
0x05	Reset	Reset the device to power up configuration
0x0E	Get_Attribute_Single	Returns the contents of the given attribute
0x10	Set_Attribute_Single	Sets the contents of the given attribute

**Table 22: Connection Object, Class Code 05h, Instance 01h (Explicit Message Connection):**

ATTRIBUTE	ACCESS	NAME/DESCRIPTION	DATA TYPE	VALUE
01h	Get	State	BYTE	0x03
02h	Get	Instance type	BYTE	0x00
03h	Get	Export class trigger	BYTE	0x83
04h	Get	Produced connection ID	UINT	10xxxxxx011, xxxxxx - MAC ID
05h	Get	Consumed connection ID	UINT	10xxxxxx100, xxxxxx - MAC ID
06h	Get	Initial comm. characteristics	USINT	0x21
07h	Get	Produced connection size	UINT	0x00EF
08h	Get	Consumed connection size	UINT	0x00EF
09h	Get/Set	Expected package rate	UINT	0x0000
0Ch	Get/Set	Watchdog timeout action	USINT	0 = transition to time-out 1 = auto delete 2 = auto reset 3 = deferred delete
0Dh	Get	Produced path length	UINT	0x0000
0Eh	Get	Produced path	BYTE [6]	<null>
0Fh	Get	Consumed path length	UINT	0x0000
10h	Get	Consumed path	BYTE [6]	<null>
11h	Get	Production inhibit timer	UINT	0x0000

**Table 23: Connection Object, Class Code 05h, Instance 04h (Polled Input/Output Connection):**

ATTRIBUTE	ACCESS	NAME/DESCRIPTION	DATA TYPE	VALUE
01h	Get	State	BYTE	0x03
02h	Get	Instance type	BYTE	0x01
03h	Get	Export class trigger	BYTE	0x82
04h	Get	Produced connection ID	UINT	MAC ID
05h	Get	Consumed connection ID	UINT	MAC ID
06h	Get	Initial comm. characteristics	USINT	0x01
07h	Get	Produced connection size	UINT	0x0026
08h	Get	Consumed connection size	UINT	0x0020
09h	Get/Set	Expected package rate	UINT	0x0000
0Ch	Get/Set	Watchdog timeout action	USINT	0x00
0Dh	Get	Produced path length	UINT	0x0006
0Eh	Get	Produced path	BYTE [6]	variable
0Fh	Get	Consumed path length	UINT	0x0006
10h	Get	Consumed path	BYTE [6]	variable
11h	Get	Production inhibit timer	UINT	0x0000

**DeviceNet Motor Data - Poll, Explicit Object (Class Code A0H)**

**Table 24: Motor Data Object, Class Code A0h, Services:**

CODE	SERVICES AVAILABLE TO THIS OBJECT	
	NAME	DESCRIPTION
0x0E	Get_Attribute_Single	Returns the contents of the given attribute

**Table 25: Motor Data Object, Class Code A0h, Attributes:**

ATTRIBUTE	ACCESS	NAME/DESCRIPTION	DATA TYPE	VALUE
01H	Get	Revision of Motor Data Object	UINT	1

**Table 26: Motor Data Object, Class Code A0h, Instance 01h, Attributes, Get Access:**

ATTRIBUTE	NAME/DESCRIPTION	SIZE IN BYTES	FORMAT
01H	Motor Data (Poll group 1)	38	See below
02H	Digital Data	9	See below
03H	Summary of Motor Data	7	See below
04H	Reserved	NA	NA
05H	Motor status	1	FC129 (low byte only)
06H	Motor load (%)	2	F1
07H	Cause of last trip	2	FC134
08H	Thermal capacity used (%)	2	F1
09H	Current metering	8	See below
0AH	Average Line Voltage (V)	2	F1
0BH	Power metering	6	See below
0CH	Contact Input Status	8	BIT per input
0DH	Contact Output Status	4	BIT per output
0EH	RTD metering	3	See below



DATA FORMAT, DIGITAL DATA		
ITEM DESCRIPTION	SIZE IN BYTES	FORMAT
Motor status	1	FC129 (low byte only)
Contact Input Status	8	BIT per input

DATA FORMAT, SUMMARY OF MOTOR DATA		
ITEM DESCRIPTION	SIZE IN BYTES	FORMAT
Motor status	1	FC129 (low byte only)
Motor load (%)	2	F1
Cause of last trip	2	FC134
Thermal capacity used (%)	2	F1

DATA FORMAT, MOTOR DATA		
ITEM DESCRIPTION	SIZE IN BYTES	FORMAT
Motor status	1	FC129 (low byte only)
Motor load (%)	2	F1
Cause of last trip	2	FC134
Thermal capacity used (%)	2	F1
Average phase current (A)	4	F10
Ground current (A)	4	F10
Average Line Voltage (V)	2	F1
Real power (kW)	4	F13
Power factor	2	F21
Contact Input Status	8	BIT per input
Contact Output Status	4	BIT per output
Local hottest RTD number	1	Unsigned 8 bit integer
Local hottest RTD temperature	2	F4

DATA FORMAT, CURRENT METERING		
ITEM DESCRIPTION	SIZE IN BYTES	FORMAT
Average phase current (A)	4	F10
Ground current (A)	4	F10

DATA FORMAT, POWER METERING		
ITEM DESCRIPTION	SIZE IN BYTES	FORMAT
Real power (kW)	4	F13
Power factor	2	F21

DATA FORMAT, RTD METERING		
ITEM DESCRIPTION	SIZE IN BYTES	FORMAT
Local hottest RTD number	1	Unsigned 8 bit integer
Local hottest RTD temperature	2	F4

DeviceNet - Explicit Motor Analog Data Object, Class Code B0H, Services

Table 27: Explicit Motor Analog Data Object, Class Code B0h, Services:

CODE	SERVICES AVAILABLE TO THIS OBJECT	
	NAME	DESCRIPTION
0x0E	Get_Attribute_Single	Returns the contents of the given attribute

Table 28: Explicit Motor Analog Data Object, Class Code B0h, Attributes:

ATTRIBUTE	DESCRIPTION	SIZE IN BYTES
01H Currents	Currents	20
02H	Reserved	6
03H	Motor load	4
04H	Line voltages	8
05H	Phase voltages	8
06H	Phase voltage angles	6
07H	Frequency	2
08H	Power	14
09H	Energy	12
0AH	Local hottest stator RTD and temperature	3
0BH	Local RTD temperatures	12
0CH	Learned data	10
0DH	Motor statistics	8
0EH	Cause of trip	2
0FH	Last trip date and time	8
10H Currents	Last pre-trip currents	16
11H	Last pre-trip motor load	4
12H	Last pre-trip line voltages	6
13H	Last pre-trip phase voltages	6
14H	Last pre-trip frequency	2
15H	Last pre-trip power	12
16H	Trip diagnostic data	12
17H	Alarm diagnostic data	12
18H	Start block status data	18
19H	All actual values	211

Table 29: Data Formats, Explicit Motor Analog Data Object

ATTRIBUTE		ITEM DESCRIPTION	SIZE IN BYTES	FORMAT
01H	Currents	Ia	4	F10
		Ib	4	F10
		Ic	4	F10
		Iavg	4	F10
		Igrd	4	F10
03H	Motor load	Motor Load	2	F1
		I Unb	2	F1
04H	Line voltages	Vab	2	F1
		Vbc	2	F1
		Vca	2	F1
		Average Line Voltage	2	F1
05H	Phase voltages	Van	2	F1
		Vbn	2	F1
		Vcn	2	F1
		Reserved	2	NA
06H	Phase voltage angles	Va Angle	2	F1
		Vb Angle	2	F1
		Vc Angle	2	F1
07H	Frequency	Frequency	2	F3
08H	Power	Power Factor	2	F21
		Real Power	4	F13
		Reserved	2	NA
		Reactive Power	4	F13
		Apparent Power	2	F2
09H	Energy	MWh Consumption	4	F17
		Mvarh Consumption	4	F17
		Reserved	2	NA
		Reserved	2	NA
0AH	Local hottest stator RTD and temperature	Hottest Stator RTD	1	Unsigned 8 bit integer
		Hottest Stator RTD Temp	2	F4
0BH	Local RTD Temperatures	RTD 1 Temp	2	F4
		RTD 2 Temp	2	F4
		RTD 3 Temp	2	F4
		RTD 4 Temp	2	F4
		RTD 5 Temp	2	F4
		RTD 6 Temp	2	F4
0CH	Learned data	Learned Acceleration Time	2	F2
		Learned Starting Current	4	F10
		Learned Starting Capacity	2	F1
		Average Motor Load Learned	2	F3
0DH	Motor Statistics	Number of Motor Starts	2	F1
		Number of UV Restarts	2	F1
		Motor Running Hours	4	F9
0EH	Cause of Trip	Cause of Last Trip	2	FC134

ATTRIBUTE		ITEM DESCRIPTION	SIZE IN BYTES	FORMAT
0FH	Last trip date and time	Time of Last Trip	4	F19
		Date of Last Trip	4	F18
10H	Last pre-trip currents	Pre Trip Ia	4	F10
		Pre Trip Ib	4	F10
		Pre Trip Ic	4	F10
		Pre Trip Igrd	4	F10
11H	Last pre-trip motor load	Pre Trip Motor Load	2	F3
		Pre Trip Current Unbalance	2	F1
12H	Last pre-trip line voltages	Pre Trip Vab	2	F1
		Pre Trip Vbc	2	F1
		Pre Trip Vca	2	F1
13H	Last pre-trip phase voltages	Pre Trip Van	2	F1
		Pre Trip Vbn	2	F1
		Pre Trip Vcn	2	F1
14H	Last pre-trip frequency	Pre Trip System Frequency	2	F3
15H	Last pre-trip power	Pre Trip Real Power	4	F13
		Pre Trip Reactive Power	4	F13
		Pre Trip Apparent Power	2	F2
		Pre Trip Power Factor	2	F21
16H	Trip diagnostic data	Trip Status 3	4	FC185
		Trip Status 2	4	FC184
		Trip Status 1	4	FC183
17H	Alarm diagnostic data	Alarm Status 3	4	FC181
		Alarm Status 2	4	FC180
		Alarm Status 1	4	FC179
18H	Start block status data	Reserved	2	F1
		Start Timer 1	2	F1
		Start Timer 2	2	F1
		Start Timer 3	2	F1
		Start Timer 4	2	F1
		Start Timer 5	2	F1
		Time Between Starts Lockout	2	F1B
		Restart Block Lockout	2	F1
Starts/Hour Block	2	F1		
19H	All of the above items from attributes 01H-18H			

## DeviceNet - Explicit Motor Object, Class Code B1H

**Table 30: Explicit Motor Control Object, Class Code B1h, Services:**

CODE	SERVICES AVAILABLE TO THIS OBJECT	
	NAME	DESCRIPTION
0x10	Set_Attribute_Single	Sets the contents of the given attribute

**Table 31: Explicit Motor Control Object, Class Code B1h, Attributes:**

ATTRIBUTE	ACCESS	DESCRIPTION	DATA TYPE	VALUE
01H	Set	Control Command	BYTE	See below

**Table 32: Data Value, Class B1h**

VALUE	DESCRIPTION
1	Reset
2	Lockout Reset
3	Stop
4	Start A
5	Start B

Commands are actioned on rising edge (0 to 1 transition).



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