Common Modbus Registers

This document describes how the Modbus protocol is implemented on PowerLogic® ION7300 Series, ION7550 / ION7650, ION8600 and ION8800 meters. It does not apply to ION6200 meters; for ION6200-specific information, see the *PowerLogic ION6200 Serial Communications Protocol and ION / Modbus Register Map*.

The features described in this document may or may not be supported on your meter's firmware version. For meter-specific information, see your meter's *User Guide*.

In This Document

www.powerlogic.com

Schneider Electric

Introduction

This document explains the Modbus protocol for certain ION meters. The ION meter performs Modbus communications according to the Modbus Application Protocol v1.1. It is assumed that the reader is familiar with the Modbus protocol and serial communications in general. Visit www.modbus.org for Modbus protocol specifications.

Purpose of the Communications Protocol

The Modbus protocol allows data and setup information to be transferred between a Modbus Master and a Modbus Slave. This includes:

- interrogation of all meter data which are exported via the Modbus Slave ION module.
- configuration and interrogation of meter module Numeric Bounded and Enumerated set-up registers.
- interrogation and control of the meter External Control ION modules.

Modbus Implementation on the Meter

Ground Rules

The meter is capable of communicating via the RS-485 serial communication standard. The RS-485 medium allows for multiple devices on a multi-drop network.

The following rules define the protocol for information transfer between a Modbus Master device and the meter:

- All communications on the network conform to a MASTER/SLAVE scheme. In this scheme, information and data is transferred between a Modbus MASTER device and up to 32 SLAVE devices.
- The MASTER initiates and controls all information transfer on the communications loop.
- A SLAVE device never initiates a communications sequence.
- All communications activity on the loop occurs in the form of “PACKETS.” A packet is a serial string of 8-bit bytes. The maximum number of bytes contained within one packet is 255.
- All PACKETS transmitted by the MASTER are REQUESTS. All PACKETS transmitted by a SLAVE device are RESPONSES.
- At most, one SLAVE can respond to a single request from a MASTER.

Modes of Transmission

The Modbus protocol uses ASCII and RTU modes of transmission. ION7300 Series Ethernet meters, ION7500, ION7600 and ION8600 meters support TCP and RTU modes of transmission, with 8 data bits, no parity, and one stop bit (8N1). The ION7500 RTU supports 8N1, 8N2, 8E1, 8E2, 8odd1 and 8odd2.

Description of the Modbus packet structure

Every Modbus packet consists of four fields:

- Slave Address Field
- Function Field
- Data Field
- Error Check Field (Checksum)

Slave Address Field

The slave address field of a Modbus packet is one byte in length and uniquely identifies the slave device involved in the transaction. Valid addresses range between 1 and 247. A slave device performs the command specified in the packet when it receives a request packet with the slave address field matching its own address. A response packet generated by the slave has the same value in the slave address field.

Function Field

The function field of a Modbus request packet is one byte in length and tells the addressed slave which function to perform. Similarly, the function field of a response packet tells the master what function the addressed slave has just performed. "Table 2: Modbus Functions Supported by the Meter as Slave" on page 5 lists the Modbus functions supported by the meter when acting as Slave.

For function codes supported by meters acting as Masters, see the Modbus Import module and Modbus Export module descriptions in the *ION Reference*, available from the website.

Data Field

The data field of a Modbus request is of variable length, and depends on the function. This field contains information required by the slave device to perform the command specified in a request packet or data being passed back by the slave device in a response packet.

Data in this field is contained in 16-bit. Registers are transmitted in the order of high-order byte first, low-order byte second.

Example:

A 16-bit register contains the value 12AB Hex. This register is transmitted:

- High order byte = 12 Hex
- Low order byte = AB Hex

This register is transmitted in the order 12 AB.

Error Check Field (Checksum)

The checksum field lets the receiving device determine if a packet is corrupted with transmission errors. In Modbus RTU mode, a 16-bit Cyclic Redundancy Check (CRC-16) is used.

The sending device calculates a 16-bit value, based on every byte in the packet, using the CRC-16 algorithm. The calculated value is inserted in the error check field.

The receiving device performs the calculation, without the error check field, on the entire packet it receives. The resulting value is compared to the error check field. Transmission errors are indicated when the calculated checksum is not equal to the checksum stored in the incoming packet. The receiving device ignores a bad packet.

Exception Responses

If a Modbus master device sends an invalid command to a meter or attempts to read an invalid holding register, an exception response is generated. The exception response follows the standard packet format. The high order bit of the function code in an exception response is set to 1.

The data field of an exception response contains the exception error code. The table below describes the exception codes supported by the meter and the possible causes.

Table 1: Exception Codes supported by the meter

Code	Name	Meaning
01	Illegal Function	An Invalid command is contained in the function field of the request packet. The meter only supports Modbus functions 3 and 16.
02	Illegal Address	The address referenced in the data field is an invalid address for the specified function. This can also indicate that the registers requested are not within the valid register range of the meter. Additionally, this can indicate that the meter has Advanced Security enabled. See the Security Options module description (specifically the *Modbus Map Access* setup register) in the *ION Reference* for more information.
03	Illegal Value	The value referenced in the data field is not allowed for the referenced register on the meter.

Broadcast Packets

The ION Modbus protocol supports broadcast request packets. The purpose of a broadcast request packet is to allow all Slave devices to receive the same command from the Master.

A broadcast request packet is the same as a normal request packet, except the slave address field is set to zero (0). All Modbus slave devices receive and execute a broadcast request command, but no device will respond. The Preset Multiple Registers command is the only command supporting broadcast packets for Slaves.

Packet Communications

This section illustrates the Modbus functions supported by the meter.

Function 03: Read Holding Registers

To read meter parameter values, a Master must send the Slave device a Read Holding Registers request packet.

The Read Holding Registers request packet specifies a start register and a number of registers to read. The start register is numbered from zero (40001 = zero, 40002 = one, etc.).

The meter responds with a packet containing the values of the registers in the range defined in the request.

Table 2: Modbus Functions Supported by the Meter as Slave

Function	Meaning	Action
03	Read Holding Registers	Obtains the current value in one or more holding registers of the meter.
16	Preset Multiple Registers	Places specific values into a series of consecutive holding registers of the meter. The holding registers that can be written to the meter are shown in the register map.

Read Holding Registers Packet Structure

Read Registers Request Packet (Master to Slave)	Read Registers Response Packet (Slave to Master)
Unit ID/Slave Address (1 byte)	Unit ID/Slave Address (1 byte)
03 (Function code) (1byte)	03 (Function code) (1 byte)
Start Register (sr) (2 bytes)	Byte Count (2 x nr) (1 byte)
# of Registers to Read (nr) (2 bytes)	First Register in range (2 bytes)
CRC Checksum	Second Register in range (2 bytes)
	...
	CRC Checksum (2 bytes)

Example:

A meter in 4-wire WYE volts mode is configured as a Modbus slave device with slave address 100. The Master requests to read all three voltage phases (A, B, C). These three parameters are exported via a Modbus Slave module to Modbus registers 40011, 40012 and 40013, with a scaling factor of 10. In accordance with the Modbus protocol, register 40011 is numbered as 10 when transmitted. The request must read 3 registers starting at 10.

Slave address: 100 = 64 (hex) Start register 10 = 000A (hex)

Request Packet: white background denotes the DATA field of the packet.

Slave	Function	Start Register (40011)		# of Registers (3)		CRC Checksum	
64	03	00	0A	00	03	2C	3C

Response Packet:

Slave	Function	Byte Count	Register 1		Register 2		Register 3		CRC Checksum	
64	03	06	2E	CE	2E	E8	2F	13	0D	58

The Master station retrieves the data from the response:

Register 40011: 2ECE(hex) = 11982 (scaled: 1198.2)

Register 40012: 2EE8(hex) = 12008 (scaled: 1200.8)

Register 40013: 2F13(hex) = 12051 (scaled: 1205.1)

NOTE

The values shown in the packets illustrated above are in hexadecimal format.

Function 16: Preset Multiple Registers

The Preset Multiple Registers command packet allows a Modbus master to configure or control the slave meter.

A Preset Multiple Registers data-field request packet contains a definition of a range of registers to write to, and the values that are written to those registers.

The slave meter responds with a packet indicating that a write was performed to the range of registers specified in the request.

The Preset Multiple Registers request and response packet formats are shown in the following example transaction.

Preset Multiple Registers

Preset Registers Request Packet (Master to Slave)	Preset Registers Response Packet (Slave to Master)
Unit ID/Slave Address (1 byte)	Unit ID/Slave Address (1 byte)
16 (Function code) (1byte)	16 (Function code) (1 byte)
Start Register (sr) (2 bytes)	Start Register (sr) (2 bytes)
# of Registers to Write (nr) (2 bytes)	# of Registers Written (nr) (2 bytes)
Byte Count (2 x nr) (1 byte)	CRC Checksum (2 bytes)
First Register in range (2 bytes)	
Second Register in range (2 bytes)	
...	
CRC Checksum (2 bytes)	

NOTE

Except for the function field, the Preset Registers Response packet is identical in format to the Read Registers Request packet.

Example:

A meter is configured as a Modbus slave device with slave address 200. The Master requests to set the PT ratio to 1200:120. From the register map, the Power Meter PT Primary and Secondary setup registers are Modbus registers 46001/2 and 46003/4. Register 46001 is numbered 6000. The request must write 4 registers starting at 6000.

Slave address: 200 = C8(hex) Start register 6000 = 1770 (hex)

Value 1: 1200 = = 0000 | 04B0 (hex) Value 2: 120 = 0000 | 0078 (hex)

Request Packet: white background denotes the DATA field of the packet.

Slave	Function	Start Register (46001)		# of Registers (4)		Byte Count	Register 1		Register 2		Register 3		Register 4		CRC Checksum	
C8	10	17	70	00	04	08	00	00	04	B0	00	00	00	78	8B	F8

Response Packet:

Slave	Function	Start Register (46001)		# of Registers (4)		CRC Checksum	
C8	10	17	70	00	04	D4	3C

NOTE

The values shown in the packets illustrated above are in hexadecimal format.

Invalid Registers

In the meter Modbus register map, there are gaps between some registers. For example, the next register after *42232* is *42301*. Unmapped registers (*42233* through to *42300*) are INVALID. Invalid registers store no information.

When an invalid register is read, the data field is FFFF(hex). When an invalid register is written, the data field is not stored. The meter does not reject the request.

Meter Modbus Registers

The meter Modbus register map defines a set of parameters which are treated as HOLDING REGISTERS, having addresses ***4xxxx***. According to the Modbus protocol, in response to a request for register ***4xxxx*** of a particular slave device, the Modbus master reads register ***xxxx-1*** from the slave. For example, register ***40011*** corresponds to holding register 10.

There are four main classes of registers available via Modbus:

- Modbus Slave module Output Registers
- External Control Registers
- Enumerated ION module Setup Registers
- Numeric Bounded ION module Setup Registers.

Modbus Slave Module Output Registers

The meter contains ION Modbus Slave modules, each capable of exporting up to sixteen ION registers into the Modbus protocol. Some modules are pre-configured with common meter values. The Slave module takes Numeric or Boolean type ION registers as input, scales and formats the input values according to configurable setup registers, and makes the ION data available in a contiguous set of Modbus Holding Registers.

Modbus Slave module output registers are located in the Modbus register map (from *40001* to *41800*). The actual location depends on the setup of the individual Modbus Slave modules.

The Modbus Slave module can scale and offset input values, and format the outputs in one of seven selectable formats:

- Unsigned 16-bit Integer Format
- Signed 16-bit Integer Format
- Unsigned 32-bit Integer Format
- Signed 32-bit Integer Format
- Unsigned 32-bit 'Modulus-10000' Format
- Signed 32-bit 'Modulus-10000' Format

- Packed Boolean Format
- Unsigned 16-bit Input Mode

NOTE

Depending on your meter and its firmware version, the above formats may or may not be available.

16-bit Integer Format

Unsigned and Signed 16-bit Integer Formats are the simplest formats. Each ION input register to the module corresponds to one 16-bit Modbus Holding Register output. If the format is unsigned, the value range for the output registers is 0 to 65535. If the format is signed, the value range is -32767 to +32767.

32-bit Integer Format

To accommodate values that can reach beyond the 16-bit limitation, the Modbus Slave module provides 32-bit integer format as an output option. In Signed and Unsigned 32-bit Integer Formats, each ION input register to the module corresponds to two 16-bit Modbus Holding Register outputs.

A 32-bit register represented in 32-bit Integer format is passed via communications as two 16-bit registers:

High-Order Register

- $register_{high}$=value/65536

Low-Order Register

- $register_{low}$= value **modulus** 65536
- value = $register_{high}$ x 65536 + $register_{low}$ or
- value = $register_{high}$ | $register_{low}$

Example (Unsigned 32-bit):

Value 12345678 is passed in *unsigned* 32-bit integer format:

- 12345678 = 00BC614E Hex
- $Register_{high}$ = 00BC Hex (unsigned) = 188
- $Register_{low}$ = 614E Hex (unsigned) = 24910
- Value = 188 x 65536 + 24910 = 12345678

In Unsigned 32-bit Integer Format, both the High-Order and Low-Order registers are unsigned 16-bit integers.

Example (Signed 32-bit):

Value -12345678 is passed in *signed* 32-bit integer format:

- -12345678 = FF439EB2 Hex
- $Register_{high}$ = FF43 Hex (signed) = -189

- $Register_{low}$ = 9EB2 Hex (unsigned) = 40626
- value = -189 x 65536 + 40626 = -12345678

In Signed 32-bit Integer Format, the High-Order register is a signed 16-bit number, but the Low-Order register is unsigned.

32-bit 'Modulus-10000' Format

The Modulo-10000 (M10K) format breaks a 32-bit value into two 16-bit registers, according to the following relationship:

High-Order Register

- $register_{high}$=value/10000

Low-Order Register

- $register_{low}$= value **modulus**10000

The 32-bit value can be retrieved by the following calculation:

Value = $register_{high}$ x 10000 + $register_{low}$

Example (Unsigned):

Value 12345678 is passed in *unsigned* 32-bit Modulus-10000 format.

- $Register_{high}$: 1234 = 04D2 Hex
- $Register_{low}$: 5678 = 162E Hex
- Value = 1234 * 10000 + 5678 = 12345678

Example (Signed):

Value -12345678 is passed in *signed* 32-bit Modulus-10000 format. Both high and low are signed.

- $Register_{high}$: -1234 = FB2E Hex
- $Register_{low}$: -5678 = E9D2 Hex
- Value = -1234 * 10000 + -5678 = -12345678

Packed Boolean Format

Boolean ION registers can be packed into a single Modbus register via the Modbus Slave module. When the Modbus Slave module is configured to produce packed Boolean outputs, each input register (to the module) corresponds to one bit in the single output register of the module. The relationship is left to right: the first input register corresponds to the left-most bit in the 16-bit output register, etc.

Example:

Six Boolean registers are linked to a Modbus Slave module, which is configured for Packed Boolean output format. If the first three are valued 'False', and the remaining three are valued 'True', the output register value is:

Register: 0001110000000000 Bin = 1C00 Hex

If the first input register became 'True', the output register value changes to:

Register: 1001110000000000 Bin = 9C00 Hex

Unsigned 16-bit Input

When a Modbus Slave module in the Virtual Processor (VIP) has no links to its inputs, the output registers of the module show the contents of the Modbus register map. Currently, only the Modbus Slave modules in the VIP have this additional capability (the Modbus Slave modules in ION meters cannot do this).

See the Modbus Applications section in the *ION Enterprise Online Help* for more information.

Meter Firmware Revision

All ION meters contain a firmware revision string which denotes the meter type and version (e.g. "7300V200" denotes firmware version 200 of the ION7300 meter).

The firmware revision string is available via Modbus at a fixed location in the Modbus register map. While the string may vary in length from one revision to the next, the set of Modbus registers used to represent the string spans the maximum possible firmware revision string length. On the meter, the firmware revision string appears in Modbus Holding registers *41901* to *41912*.

The format of the firmware revision string in Modbus follows a 'C' style string convention: a series of bytes representing ASCII characters terminated by a 'null' byte (value 00 Hex). In Modbus, each 16-bit holding register contains two ASCII characters.

The following table shows how the Modbus encoding of the string "7300V200" appears.

Table 3: Modbus string encoding

Register	Value (Hex)	ASCII	
41901	3733	'7'	'3'
41902	3030	'0'	'0'
41903	5632	'V'	'2'
41904	3030	'0'	'0'
41905	0000	NUL	NUL

The remainder of the firmware revision string registers (in the above case, *41906* to *41912*) contains null values (0000 Hex).

ION External Control Registers

All ION external control registers in the meter can be read and written via Modbus. This section describes how the registers appear to the Modbus protocol. There are three types of external control registers:

- External Pulse Control Registers
- External Boolean Control Registers
- External Numeric Control Registers

For a complete Modbus external control register map, see the *ION 7300 Series Meter Modbus Protocol* document (Appendix E), available from the website.

External Pulse Registers

External Pulse registers interface to manually triggering events in the meter. For example, they can reset counters or timers, or pulse external equipment. All of the meter external pulse registers are available via Modbus.

Pulse registers are meaningful mainly for writing. Writing a nonzero value to a pulse register causes a pulse. Writing a zero value has no effect, but is acknowledged as a successful write operation. This feature provides the capability to 'skip' triggers when pulsing multiple registers in one request.

The meter's External Pulse registers are located in the Modbus register map starting at *42001*.

Example:

A meter is pre-configured with external pulse modules. See your meter's *User Guide* for more information.

The Modbus master requests to reset Min/Max, SWD, TD, and Integrators. The outgoing write request is to write 7 registers, starting at *42001*, with values 1, 0, 1, 1, 0, 0, and 1.

External Boolean Registers

ION External Boolean registers provide an interface to manually turn a signal ON or OFF. For example, these registers can enable or disable ION modules. The functionality depends on the meter configuration.

A value of one (1) for a Boolean register represents 'ON' or 'TRUE'. A value of zero (0) represents 'OFF' or 'FALSE'. Writing a value other than zero or one results in the value of one.

The meter's External Boolean registers are located in the Modbus register map starting at *42201*.

External Numeric Registers

External Numeric registers can be set to a certain value. See your meter's *User Guide* and the *ION Reference* for an example of how and where these registers can be used.

The External Numeric registers are 32-bit values represented in 32-bit Signed Integer Format (see "32-bit Integer Format" on page 9). Each External Numeric register spans two 16-bit Modbus registers. The first Modbus register of the pair

represents the high order word of the 32-bit value. The second Modbus register represents the low order word. The 32-bit value read from or written to an External Numeric register via Modbus is represented as a 32-bit signed integer value, therefore the range of possible values is -2,147,483,648 to +2,147,483,647.

The meter's External Numeric registers are located in the Modbus register map starting at *42301*.

Enumerated ION Module Setup Registers

The Enumerated setup register is a major class of setup registers in ION modules. Enumerated registers are used where there is a list of options to choose from.

In Modbus protocol, Enumerated register lists are represented by a numeric relationship. For example, with the Power Meter module Volts Mode register, the following relationship is defined:

0 = 4W-WYE
1 = DELTA
2 = SINGLE
3 = DEMO
4 = 3W-WYE
5 = DIRECT-DELTA

Not all Enumerated ION module setup registers on the meter are included in the Modbus register map. The register map details how enumerations are represented numerically in Modbus for each register.

Numeric Bounded ION Module Setup Registers

The Numeric Bounded setup register is another major class of setup registers in ION modules. Examples of numeric bounded setup registers include Power Meter module PT/CT Ratios, Communications module Unit ID, etc.

Numeric Bounded registers are represented in Modbus in Signed 32-bit Integer Format (see "32-bit Integer Format" on page 9), where each ION Numeric Bounded register spans two 16-bit Modbus registers. Because of the Modbus register format, an absolute boundary of -2,147,483,648 to +2,147,483,647 is imposed on Numeric Bounded ION module setup registers. Even if the ION register bounds are beyond the 32-bit signed integer boundary, the bounds are effectively limited by Modbus capabilities.

All Numeric Bounded ION module setup registers on the meter are included in the Modbus register map. The register map details the numeric bounds in Modbus for each register.

Like Enumerated ION module setup registers, Numeric Bounded setup registers are located in the Modbus register map in order of ION handles.

Modbus Configuration

Modbus on the meter is configurable in two components:

- Protocol Configuration (Communications module)
- Register Configuration (Modbus Slave module)

See the *ION Reference* for full descriptions of the Communications and Modbus Slave modules.

Modbus Protocol Configuration (Communications Module)

The meter Communications module stores all setup information that applies to a protocol on a communications port. Setup registers in this module store both the protocol selected and all setup parameters for that protocol.

The setup registers for the Communications modules on the meter are accessible via Modbus as fixed-location readable and writable registers.

SETUP REGISTER	MODBUS REGISTER(S)
COM1 Baud Rate	44392
COM1 Protocol	44592
COM1 RTS Delay	46977 to 46978
COM1 Unit ID	46979 to 46980
COM2 Baud Rate	44590
COM2 Protocol	44593
COM2 RTS Delay	47125 to 47126
COM2 Unit ID	47129 to 47130
COM3 Baud Rate	44591
COM3 Protocol	44594
COM3 Unit ID	47131 to 47132
COM4 Protocol	45461

These registers are explained in the following sections.

Baud Rate

Each Communications module on the meter has a Baud Rate register, which specifies the speed of serial communications. The following values apply to all Communications modules:

Baud Rate (bps)	Value
300	0
1,200	1
2,400)	2
4,800	3
9,600	4
19,200	5
38,400	6
57,600	7
115,200	8

Protocol

This register defines the protocol to be used on the communications port.

Protocol	Value
ION	0
Modbus RTU	1
Infrared I/O (ION7300 Series only)	2
Factory	3
DNP 3.0	4
GPS: Truetime/Datum	6
GPS: Arbiter	7
GPS: Arbiter-Vorne	8
Modbus Master	9
Ethergate	100
Modemgate	101

NOTE

Not all protocols are supported on all meters or on all firmwares. See your meter's *User Guide* or contact Technical Support for the protocols your meter (and specific firmware) supports.

RTS Delay

The RTS Delay parameter defines a delay between when the ION meter is ready to transmit data on the serial port and when it starts transmitting data.

The RTS Delay parameter applies to all Communications modules, and is expressed in milliseconds. The valid value range is from 0 to 1000 ms.

Unit ID

The Unit ID register defines the slave address for the protocol being used on the communications port.

In Modbus protocol, the Unit ID parameter defines the slave address used in Modbus packets for the device in question.

Since this parameter applies to both ION and Modbus protocols, the valid range for the parameter is defined to fit both protocols. Thus the range is specified as 1 to 9999. However, since the slave address range specified for Modbus is smaller than that of the Unit ID setup register, ***the valid range of this parameter is limited to 1 to 247***.

CRC-16 Calculation

This section describes the procedure for obtaining the CRC-16 error check field for a Modbus RTU frame.

Procedure

A frame can be considered as a continuous, serial stream of binary data (ones and zeros). The 16-bit checksum is obtained by multiplying the serial data stream by 2^{16} (10000000000000000) and then dividing it by the ***generator polynomial*** $x^{16}+x^{15}+x^2+1$, which can be expressed as the 16-bit binary number 11000000000000101. The quotient is ignored and the 16-bit remainder is the checksum, which is appended to the end of the frame.

In calculating the CRC, all arithmetic operations (additions and subtractions) are performed using MODULO TWO, or EXCLUSIVE OR operation. A step-by-step example shows how to obtain the checksum for a simple Modbus RTU frame.

Steps for generating the CRC-16 checksum:

1. Drop the MSB (Most Significant Bit) of the generator polynomial and reverse the bit sequence to form a new polynomial. This yields the binary number 1010 0000 0000 0001, or A0 01 (hex).
2. Load a 16-bit register with initial value FF FF (hex).
3. Exclusive OR the first data byte with the low-order byte of the 16-bit register. Store the result in the 16-bit register.
4. Shift the 16-bit register one bit to the right.
5. If the bit shifted out to the right is one, Exclusive OR the 16-bit register with the new generator polynomial, store the result in the 16-bit registers.
   Return to step 4.
6. If the bit shifted out to the right is zero, return to step 4.
7. Repeat steps 4 and 5 until 8 shifts have been performed.
8. Exclusive OR the next data byte with the 16-bit register.

9. Repeat steps 4 through 7 until all bytes of the frame are Exclusive OR'ed with the 16-bit register and shifted 8 times.
10. The content of the 16-bit register is the checksum and is appended to the end of the frame.

Pseudocode For CRC-16 Generation

For users familiar with computer programming, the following is the pseudocode for calculating the 16-bit Cyclic Redundancy Check:

```
Initialize a 16-bit register to FFFF Hex
        Initialize the generator polynomial to A001 Hex
FOR n=1 to # of bytes in packet
        BEGIN
            XOR nth data byte with the 16-bit register
            FOR bits_shifted = 1 to 8
            BEGIN
                SHIFT 1 bit to the right
                IF (bit shifted out EQUAL 1)
                    XOR generator polynomial with the 16-bit register
        and store result in the 16-bit register
            END
        END
```

The resultant 16-bit register contains the CRC-16 checksum.

Modbus Register Configuration (Modbus Slave Module)

The ION Modbus Slave module provides a configurable interface to export ION data to the Modbus protocol.

The Modbus Slave module is configurable in two ways:

- ION Registers are 'linked' to the module
- the Modbus Slave module setup is altered

The first type of configuration is beyond the scope of the Modbus protocol. The meter comes with a set of default linkages for Modbus Slave modules that suit a wide range of applications. For more information on your meter's specific default Modbus Slave modules, see your meter's *User Guide*.

The second type of Modbus Slave module configuration is accomplished via the meter display, the ION protocol, or the Modbus protocol.

The setup registers for the Modbus Slave modules on the meter are available via Modbus for control and interrogation. See "Common Modbus Registers" on page 26 for details of these Modbus registers.

Format

Modbus Slave modules can export ION data to Modbus Holding registers in a variety of formats. These formats are selectable via the Format setup register of the Modbus Slave module. The following values are valid Format selections:

0 = Unsigned 16B
1 = Signed 16B
2 = Unsigned 32B
3 = Signed 32B
4 = Unsigned 32B-M10K
5 = Signed 32B-M10K
6 = Packed Boolean
7 = Unsigned 16B Input Mode

BaseAddr

The BaseAddr setup register defines the starting Modbus register address to which the Modbus Slave module exports ION data. The valid range for this setup register is 40001 to 41800.

Scaling

The Modbus Slave module can scale and offset input values to fit within the output range for the selected format. The Scaling setup register selects if scaling (as defined by InZero, InFull, OutZero, and OutFull) is applied to the inputs. The following values are valid for the Scaling setup register:

0 = No

1 = Yes

InZero, InFull

If Scaling is set to YES for a Modbus Slave module, the input values are scaled according to a formula derived partly from the InZero, InFull setup registers. Input values falling at or below InZero are represented as OutZero. Input values falling at or above InFull are represented as OutFull. Input values between InZero and InFull are represented as a proportionate value between OutZero and OutFull.

InZero and InFull are defined to range from $-1x10^{38}$ to $+1x10^{38}$, but via Modbus, these registers are represented in Signed 32-bit Integer format, so the integer bounds of -2,147,483,648 to +2,147,483,647 are imposed upon these registers.

OutZero, OutFull

If Scaling is set to YES, the input values to the Modbus Slave module are scaled by a formula derived partly from OutZero, OutFull. The absolute range of these registers is -2,147,483,647 to +2,147,483,647, but the valid range varies depending on the selected Format for the Modbus Slave module. The following chart shows the OutZero, OutFull ranges for the various Formats:

Table 6: Out Zero and Out Full ranges for Modbus formats

Format	Low Bound	High Bound
Unsigned 16B	0	+65535
Signed 16B	-32767	+32767
Unsigned 32B	0	+2,147,478,647
Signed 32B	-2,147,478,647	+2,147,478,647
Unsigned 32B-M10K	0	+65,535,999
Signed 32B-M10K	-32,767,999	+32,767,999
Packed Boolean	N/A	N/A

Data Record / Modbus Map

This section contains the Data Record/Modbus register map for ION meters.

Modbus Data Recorder Registers

ION meters provide data from Data Recorder modules to be exported into Modbus Registers. The Register Map is a dynamic map and dependent on the configuration of Data Recorder Source inputs. See the *ION Reference* for a description of Data Recorder modules.

Modbus Data Recorder Map

Modbus Register	Contents
43001 to 43011	Record Availability and Selection Block
43012 to 43125	Data Record Block
43126 to 43137	Reserved Registers
43138 to 43153	Source Input Handle ID

Modbus Data Recorder Retrieval

To retrieve Data Record via Modbus communications the following steps must be followed:

1. Ensure the Data Recorder is online.
2. Write the Data Recorder module Number to Modbus Register 43001. If an invalid Data Recorder module Number is written, a Modbus Exception is returned.
3. Determine a valid Starting Record with a Read of Modbus Registers 43001 through 43011. This returns the Modbus Record Availability and Selection. All valid Record Numbers lie in the range of the Oldest Record Number (Modbus Registers 43008 and 43009) and the Newest Record Number (Modbus Registers 43010 and 43011).
4. After a valid Record Number is determined write it to Modbus Registers 43002 and 43003 (Master's Request for Starting Record) so a valid data is cached and read back.
5. A Read returns the data for each available record starting at record number written to Modbus Registers 43002 and 43003. The number of records returned depends on the number of Source Inputs connected to the Data Recorder and the number of records available with respect to the Start Record.
6. Repeat steps 3 through 6 for new records.

NOTE

All data is cached and can be read back at any time until a new write is requested. Any setup changes in the Data Recorder module clears all cached Data Records.

Modbus Record Availability and Selection Block Registers

Modbus Register	# of Modbus Registers	Description	Format	Properties
43001	1	Data Recorder module Number - write to this register with the data recorder module number you want to access.	UINT16	Read / Write
43002, 43003	2	Master's Request for Starting Record - write to these registers with the starting record number. Write the high order word to register 43002 and the low order word to register 43003.	UINT32	Read / Write
43004	1	Number of Source Inputs - read this register to return the number of source input connected to the data recorder module (register 43001).	UINT16	Read
43005	1	Module Setup Count - read this register to return the module setup count. A change in the module setup count reflects a change in the data recorder module setup.	UINT16	Read
43006	1	Maximum Number of Records / Request - read this register to return the maximum number of records per request.	UINT16	Read
43007	1	Number of Available Records / Request - read this register to return the number of available record per request.	UINT16	Read
43008, 43009	2	Oldest Record Number - read these registers to return the oldest available record number. Register 43008 returns the high order word and register 43009 returns the low order word.	UINT32	Read
43010, 43011	2	Newest Record Number - read these registers to return the newest available record number. Register 43010 returns the high order word and register 43011 return the low order word.	UINT32	Read

Modbus registers 43001 through 43011 contain the Data Recorder Record information necessary to retrieve valid records. A valid Data Recorder module Number must be written to Modbus Register 43001 prior to reading any Modbus Data Recorder Registers, otherwise a Modbus exception will be returned.

Modbus Data Record Block Registers

Modbus registers 43012 through 43125 contain the Record Number, Time Stamp, and Source Input Data for each record retrieved. This Modbus mapping is dynamic, dependant on the number of source inputs connected to the Data Recorder module.

The Record Number is returned as an unsigned 32-bit value stored in two Modbus registers. The first register is the high order followed by the low order second register.

The Time Stamp Seconds is returned as an unsigned 32-bit value stored in two Modbus registers. The first register is the high order followed by the low order second register. The format is UNIX time (UTC). See the *ION Reference* for a description of the Clock module time format.

The Time Stamp MicroSeconds is returned as an unsigned 32-bit value stored in two Modbus registers. The first register is the high order followed by the low order second register. The format is absolute time in micro seconds.

The Source Input Data is returned as a Float value stored in two Modbus registers. The first register is the high order followed by the low order second register. The format is IEEE-754.

The following is an example of a Data Recorder module with one source input connected (14 records maximum):

Modbus Register	# of Modbus Registers	Description	Format	Properties
43012	2	Record Number (x)	UINT32	Read
43014	2	UTC Seconds	UINT32	Read
43016	2	UTC MicroSeconds	UINT32	Read
43018	2	Source 1 Input Data	FLOAT	Read
43020	2	Record Number (x+1)	UINT32	Read
43022	2	UTC Seconds	UINT32	Read
43024	2	UTC MicroSeconds	UINT32	Read
43026	2	Source 1 Input Data	FLOAT	Read
43116	2	Record Number (x+13)	UINT32	Read
43118	2	UTC Seconds	UINT32	Read
43120	2	UTC MicroSeconds	UINT32	Read
43122	2	Source 1 Input Data	FLOAT	Read

The following is an example of a Data Recorder module with 16 source inputs connected (3 records maximum):

Modbus Register	# of Modbus Registers	Description	Format	Properties
43012	2	Record Number (x)	UINT32	Read
43014	2	UTC Seconds	UINT32	Read
43016	2	UTC MicroSeconds	UINT32	Read
43018	2	Source 1 Input Data	FLOAT	Read
43020	2	Source 2 Input Data	FLOAT	Read
43022	2	Source 3 Input Data	FLOAT	Read
43024	2	Source 4 Input Data	FLOAT	Read
43026	2	Source 5 Input Data	FLOAT	Read
43028	2	Source 6 Input Data	FLOAT	Read
43030	2	Source 7 Input Data	FLOAT	Read
43032	2	Source 8 Input Data	FLOAT	Read
43034	2	Source 9 Input Data	FLOAT	Read
43036	2	Source 10 Input Data	FLOAT	Read
43038	2	Source 11 Input Data	FLOAT	Read
43040	2	Source 12 Input Data	FLOAT	Read
43042	2	Source 13 Input Data	FLOAT	Read
43044	2	Source 14 Input Data	FLOAT	Read
43046	2	Source 15 Input Data	FLOAT	Read
43048	2	Source 16 Input Data	FLOAT	Read
43088	2	Record Number (x+2)	UINT32	Read
43090	2	UTC Seconds	UINT32	Read
43092	2	UTC MicroSeconds	UINT32	Read
43094	2	Source 1 Input Data	FLOAT	Read
43096	2	Source 2 Input Data	FLOAT	Read
43098	2	Source 3 Input Data	FLOAT	Read
43100	2	Source 4 Input Data	FLOAT	Read
43102	2	Source 5 Input Data	FLOAT	Read
43104	2	Source 6 Input Data	FLOAT	Read
43106	2	Source 7 Input Data	FLOAT	Read
43108	2	Source 8 Input Data	FLOAT	Read
43110	2	Source 9 Input Data	FLOAT	Read
43112	2	Source 10 Input Data	FLOAT	Read
43114	2	Source 11 Input Data	FLOAT	Read
43116	2	Source 12 Input Data	FLOAT	Read
43118	2	Source 13 Input Data	FLOAT	Read
43120	2	Source 14 Input Data	FLOAT	Read

Modbus Register	# of Modbus Registers	Description	Format	Properties
43122	2	Source 15 Input Data	FLOAT	Read
43124	2	Source 16 Input Data	FLOAT	Read

Modbus Handle ID Registers

Modbus registers 43138 through 43153 contain the Handle ID's for the Source Inputs.

Modbus Register	# of Modbus Registers	Description	Format	Properties
43138	1	Source 1 Handle ID	UINT16	Read
43139	1	Source 2 Handle ID	UINT16	Read
43140	1	Source 3 Handle ID	UINT16	Read
43141	1	Source 4 Handle ID	UINT16	Read
43142	1	Source 5 Handle ID	UINT16	Read
43143	1	Source 6 Handle ID	UINT16	Read
43144	1	Source 7 Handle ID	UINT16	Read
43145	1	Source 8 Handle ID	UINT16	Read
43146	1	Source 9 Handle ID	UINT16	Read
43147	1	Source 10 Handle ID	UINT16	Read
43148	1	Source 11 Handle ID	UINT16	Read
43149	1	Source 12 Handle ID	UINT16	Read
43150	1	Source 13 Handle ID	UINT16	Read
43151	1	Source 14 Handle ID	UINT16	Read
43152	1	Source 15 Handle ID	UINT16	Read
43153	1	Source 16 Handle ID	UINT16	Read

Modbus Meter Time Set

This section contains the Modbus Meter UNIX Time Set function of ION meters.

Modbus Meter Time Set

Unix Time (UTC) Seconds is an unsigned 32-bit value stored in two Modbus registers. The first register is the high order followed by the low order second register. See the *ION Reference* for a description of the Clock module time format.

UTC microseconds is an unsigned 32-bit value stored in two Modbus registers. The first register is the high order followed by the low order second register. The format is absolute time in MicroSeconds.

Only resolution by seconds is supported when setting Meter Time via Modbus.

Modbus Register	# of Modbus Registers	Description	Format	Properties
41926	2	UTC Seconds	UINT32	Read / Write
41928	2	UTC microseconds	UINT32	Read

Modbus Time Set

To set the Meter time via Modbus communications, do the following:

1. Set the ION Clock module *Time Sync Source* register to the Modbus communications port.
2. Write the UNIX time in seconds as an unsigned 32-bit value to Modbus Registers 41926 (high order) and 41927 (low order).

Common Modbus Registers

The following table provides ION to Modbus mappings for many of the commonly used registers. A check mark signifies that the meter supports that register. For a complete map for your device, see the website.

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
MODBUS SLAVE MODULE OUTPUT REGISTERS											
40001 to 41831	N/A	Refer to your meter's User Guide for details.	✔	✔	✔	✔	✔	✔	✔	✔	✔
MODBUS SLAVE MODULE SETUP REGISTERS											
44596	7A53	Modbus Slave 1 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
44597	7A54	Modbus Slave 2 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
44598	7A55	Modbus Slave 3 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
44599	7A56	Modbus Slave 4 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45196	7CAB	Modbus Slave 5 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45197	7CAC	Modbus Slave 6 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45198	7CAD	Modbus Slave 7 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45199	7CAE	Modbus Slave 8 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45200	7CAF	Modbus Slave 9 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45201	7CB0	Modbus Slave 10 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45618	7E51	Modbus Slave 11 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45619	7E52	Modbus Slave 12 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45620	7E53	Modbus Slave 13 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45621	7E54	Modbus Slave 14 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45622	7E55	Modbus Slave 15 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45623	7E56	Modbus Slave 16 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45624	7E57	Modbus Slave 17 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
MODBUS SLAVE MODULE SETUP REGISTERS CONTINUED											
45625	7E58	Modbus Slave 18 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45626	7E59	Modbus Slave 19 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
45627	7E5A	Modbus Slave 20 Format see note 1	✔	✔	✔	✔	✔	✔	✔	✔	✔
44600	7A57	Modbus Slave 1 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
44601	7A58	Modbus Slave 2 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
44602	7A59	Modbus Slave 3 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
44603	7A5A	Modbus Slave 4 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45202	7CB1	Modbus Slave 5 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45203	7CB2	Modbus Slave 6 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45204	7CB3	Modbus Slave 7 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45205	7CB4	Modbus Slave 8 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45206	7CB5	Modbus Slave 9 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45207	7CB6	Modbus Slave 10 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45628	7E5B	Modbus Slave 11 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45629	7E5C	Modbus Slave 12 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45630	7E5D	Modbus Slave 13 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45631	7E5E	Modbus Slave 14 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45632	7E5F	Modbus Slave 15 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45633	7E60	Modbus Slave 16 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45634	7E61	Modbus Slave 17 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45635	7E62	Modbus Slave 18 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45636	7E63	Modbus Slave 19 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔
45637	7E64	Modbus Slave 20 Scaling see note 2	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
MODBUS SLAVE MODULE SETUP REGISTERS CONTINUED											
47135	7237	Modbus Slave 1 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47136	7237	Modbus Slave 1 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47137	7238	Modbus Slave 2 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47138	7238	Modbus Slave 2 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47139	7239	Modbus Slave 3 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47140	7239	Modbus Slave 3 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47141	723A	Modbus Slave 4 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47142	723A	Modbus Slave 4 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49915	77A5	Modbus Slave 5 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49916	77A5	Modbus Slave 5 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49917	77A6	Modbus Slave 6 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49918	77A6	Modbus Slave 6 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49919	77A7	Modbus Slave 7 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49920	77A7	Modbus Slave 7 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49921	77A8	Modbus Slave 8 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49922	77A8	Modbus Slave 8 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49923	77A9	Modbus Slave 9 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
MODBUS SLAVE MODULE SETUP REGISTERS CONTINUED											
49924	77A9	Modbus Slave 9 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49925	77AA	Modbus Slave 10 Base Address High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49926	77AA	Modbus Slave 10 Base Address Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47143	723B	Modbus Slave 1 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47144	723B	Modbus Slave 1 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47145	723C	Modbus Slave 2 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47146	723C	Modbus Slave 2 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47147	723D	Modbus Slave 3 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47148	723D	Modbus Slave 3 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47149	723E	Modbus Slave 4 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47150	723E	Modbus Slave 4 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49927	77AB	Modbus Slave 5 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49928	77AB	Modbus Slave 5 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49929	77AC	Modbus Slave 6 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49930	77AC	Modbus Slave 6 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49931	77AD	Modbus Slave 7 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49932	77AD	Modbus Slave 7 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
MODBUS SLAVE MODULE SETUP REGISTERS CONTINUED											
49933	77AE	Modbus Slave 8 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49934	77AE	Modbus Slave 8 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49935	77AF	Modbus Slave 9 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49936	77AF	Modbus Slave 9 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49937	77B0	Modbus Slave 10 In Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49938	77B0	Modbus Slave 10 In Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47151	723F	Modbus Slave 1 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47152	723F	Modbus Slave 1 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47153	7240	Modbus Slave 2 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47154	7240	Modbus Slave 2 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47155	7241	Modbus Slave 3 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47156	7241	Modbus Slave 3 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47157	7242	Modbus Slave 4 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47158	7242	Modbus Slave 4 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49939	77B1	Modbus Slave 5 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49940	77B1	Modbus Slave 5 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49941	77B2	Modbus Slave 6 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
MODBUS SLAVE MODULE SETUP REGISTERS CONTINUED											
49942	77B2	Modbus Slave 6 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49943	77B3	Modbus Slave 7 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49944	77B3	Modbus Slave 7 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49945	77B4	Modbus Slave 8 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49946	77B4	Modbus Slave 8 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49947	77B5	Modbus Slave 9 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49948	77B5	Modbus Slave 9 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49949	77B6	Modbus Slave 10 In Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49950	77B6	Modbus Slave 10 In Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47159	7243	Modbus Slave 1 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47160	7243	Modbus Slave 1 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47161	7244	Modbus Slave 2 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47162	7244	Modbus Slave 2 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47163	7245	Modbus Slave 3 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47164	7245	Modbus Slave 3 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47165	7246	Modbus Slave 4 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47166	7246	Modbus Slave 4 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
MODBUS SLAVE MODULE SETUP REGISTERS CONTINUED											
49951	77B7	Modbus Slave 5 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49952	77B7	Modbus Slave 5 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49953	77B8	Modbus Slave 6 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49954	77B8	Modbus Slave 6 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49955	77B9	Modbus Slave 7 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49956	77B9	Modbus Slave 7 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49957	77BA	Modbus Slave 8 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49958	77BA	Modbus Slave 8 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49959	77BB	Modbus Slave 9 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49960	77BB	Modbus Slave 9 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49961	77BC	Modbus Slave 10 Out Zero High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49962	77BC	Modbus Slave 10 Out Zero Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47167	7247	Modbus Slave 1 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47168	7247	Modbus Slave 1 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47169	7248	Modbus Slave 2 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47170	7248	Modbus Slave 2 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47171	7249	Modbus Slave 3 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
MODBUS SLAVE MODULE SETUP REGISTERS CONTINUED											
47172	7249	Modbus Slave 3 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47173	724A	Modbus Slave 4 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
47174	724A	Modbus Slave 4 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49963	77BD	Modbus Slave 5 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49964	77BD	Modbus Slave 5 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49965	77BE	Modbus Slave 6 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49966	77BE	Modbus Slave 6 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49967	77BF	Modbus Slave 7 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49968	77BF	Modbus Slave 7 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49969	77C0	Modbus Slave 8 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49970	77C0	Modbus Slave 8 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49971	77C1	Modbus Slave 9 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49972	77C1	Modbus Slave 9 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49973	77C2	Modbus Slave 10 Out Full High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
49974	77C2	Modbus Slave 10 Out Full Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL PULSE REGISTERS											
Write a value of '1' to perform the pulse											
42001	68AE	External Pulse 1 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42002	68AF	External Pulse 2 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42003	68B0	External Pulse 3 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42004	68B1	External Pulse 4 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42005	68B2	External Pulse 5 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42006	68B3	External Pulse 6 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42007	68B4	External Pulse 7 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42008	68B5	External Pulse 8 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42009	68B6	External Pulse 9 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42010	68B7	External Pulse 10 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42011	68B8	External Pulse 11 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42012	68B9	External Pulse 12 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42013	68BA	External Pulse 13 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42014	68BB	External Pulse 14 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42015	68BC	External Pulse 15 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42016	68BD	External Pulse 16 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42017	68BE	External Pulse 17 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42018	68BF	External Pulse 18 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42019	68C0	External Pulse 19 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42020	68C1	External Pulse 20 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42021	68C2	External Pulse 21 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42022	68C3	External Pulse 22 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL PULSE REGISTERS CONTINUED											
42023	68C4	External Pulse 23 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42024	68C5	External Pulse 24 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42025	68C6	External Pulse 25 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42026	68C7	External Pulse 26 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42027	68C8	External Pulse 27 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42028	68C9	External Pulse 28 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42029	68CA	External Pulse 29 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42030	68CB	External Pulse 30 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42031	68CC	External Pulse 31 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42032	68CD	External Pulse 32 Trigger	✔	✔	✔	✔	✔	✔	✔	✔	✔
42033	68CE	External Pulse 33 Trigger				✔	✔	✔	✔	✔	✔
42034	68CF	External Pulse 34 Trigger				✔	✔	✔	✔	✔	✔
42035	68D0	External Pulse 35 Trigger				✔	✔	✔	✔	✔	✔
42036	68D1	External Pulse 36 Trigger				✔	✔	✔	✔	✔	✔
42037	68D2	External Pulse 37 Trigger				✔	✔	✔	✔	✔	✔
42038	68D3	External Pulse 38 Trigger				✔	✔	✔	✔	✔	✔
42039	68D4	External Pulse 39 Trigger				✔	✔	✔	✔	✔	✔
42040	68D5	External Pulse 40 Trigger				✔	✔	✔	✔	✔	✔
42041	68D6	External Pulse 41 Trigger				✔	✔	✔	✔	✔	✔
42042	68D7	External Pulse 42 Trigger				✔	✔	✔	✔	✔	✔
42043	68D8	External Pulse 43 Trigger				✔	✔	✔	✔	✔	✔
42044	68D9	External Pulse 44 Trigger				✔	✔	✔	✔	✔	✔
42045	68DA	External Pulse 45 Trigger				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL PULSE REGISTERS CONTINUED											
42046	68DB	External Pulse 46 Trigger				✔	✔	✔	✔	✔	✔
42047	68DC	External Pulse 47 Trigger				✔	✔	✔	✔	✔	✔
42048	68DD	External Pulse 48 Trigger				✔	✔	✔	✔	✔	✔
42049	68DE	External Pulse 49 Trigger				✔	✔	✔	✔	✔	✔
42050	68DF	External Pulse 50 Trigger				✔	✔	✔	✔	✔	✔
42051	68E0	External Pulse 51 Trigger				✔	✔	✔	✔	✔	✔
42052	68E1	External Pulse 52 Trigger				✔	✔	✔	✔	✔	✔
42053	68E2	External Pulse 53 Trigger				✔	✔	✔	✔	✔	✔
42054	68E3	External Pulse 54 Trigger				✔	✔	✔	✔	✔	✔
42055	68E4	External Pulse 55 Trigger				✔	✔	✔	✔	✔	✔
42056	68E5	External Pulse 56 Trigger				✔	✔	✔	✔	✔	✔
42057	68E6	External Pulse 57 Trigger				✔	✔	✔	✔	✔	✔
42058	68E7	External Pulse 58 Trigger				✔	✔	✔	✔	✔	✔
42059	68E8	External Pulse 59 Trigger				✔	✔	✔	✔	✔	✔
42060	68E9	External Pulse 60 Trigger				✔	✔	✔	✔	✔	✔
42061	68EA	External Pulse 61 Trigger				✔	✔	✔	✔	✔	✔
42062	68EB	External Pulse 62 Trigger				✔	✔	✔	✔	✔	✔
42063	68EC	External Pulse 63 Trigger				✔	✔	✔	✔	✔	✔
42064	68ED	External Pulse 64 Trigger				✔	✔	✔	✔	✔	✔
42065	68EE	External Pulse 65 Trigger				✔	✔	✔	✔	✔	✔
42066	68EF	External Pulse 66 Trigger				✔	✔	✔	✔	✔	✔
42067	68F0	External Pulse 67 Trigger				✔	✔	✔	✔	✔	✔
42068	68F1	External Pulse 68 Trigger				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL PULSE REGISTERS CONTINUED											
42069	68F2	External Pulse 69 Trigger				✔	✔	✔	✔	✔	✔
42070	68F3	External Pulse 70 Trigger				✔	✔	✔	✔	✔	✔
42071	68F4	External Pulse 71 Trigger				✔	✔	✔	✔	✔	✔
42072	68F5	External Pulse 72 Trigger				✔	✔	✔	✔	✔	✔
42073	68F6	External Pulse 73 Trigger				✔	✔	✔	✔	✔	✔
42074	68F7	External Pulse 74 Trigger				✔	✔	✔	✔	✔	✔
42075	68F8	External Pulse 75 Trigger				✔	✔	✔	✔	✔	✔
42076	68F9	External Pulse 76 Trigger				✔	✔	✔	✔	✔	✔
42077	68FA	External Pulse 77 Trigger				✔	✔	✔	✔	✔	✔
42078	68FB	External Pulse 78 Trigger				✔	✔	✔	✔	✔	✔
42079	68FC	External Pulse 79 Trigger				✔	✔	✔	✔	✔	✔
42080	68FD	External Pulse 80 Trigger				✔	✔	✔	✔	✔	✔
42081	68FE	External Pulse 81 Trigger				✔	✔	✔	✔	✔	✔
42082	68FF	External Pulse 82 Trigger				✔	✔	✔	✔	✔	✔
42083	6900	External Pulse 83 Trigger				✔	✔	✔	✔	✔	✔
42084	6901	External Pulse 84 Trigger				✔	✔	✔	✔	✔	✔
42085	6902	External Pulse 85 Trigger				✔	✔	✔	✔	✔	✔
42086	6903	External Pulse 86 Trigger				✔	✔	✔	✔	✔	✔
42087	6904	External Pulse 87 Trigger				✔	✔	✔	✔	✔	✔
42088	6905	External Pulse 88 Trigger				✔	✔	✔	✔	✔	✔
42089	6906	External Pulse 89 Trigger				✔	✔	✔	✔	✔	✔
42090	6907	External Pulse 90 Trigger				✔	✔	✔	✔	✔	✔
42091	6908	External Pulse 91 Trigger				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL PULSE REGISTERS CONTINUED											
42092	6909	External Pulse 92 Trigger				✔	✔	✔	✔	✔	✔
42093	690A	External Pulse 93 Trigger				✔	✔	✔	✔	✔	✔
42094	690B	External Pulse 94 Trigger				✔	✔	✔	✔	✔	✔
42095	690C	External Pulse 95 Trigger				✔	✔	✔	✔	✔	✔
42096	690D	External Pulse 96 Trigger				✔	✔	✔	✔	✔	✔
42097	690E	External Pulse 97 Trigger				✔	✔	✔	✔	✔	✔
42098	690F	External Pulse 98 Trigger				✔	✔	✔	✔	✔	✔
42099	6910	External Pulse 99 Trigger				✔	✔	✔	✔	✔	✔
42100	6911	External Pulse 100 Trigger				✔	✔	✔	✔	✔	✔
42101	6912	External Pulse 101 Trigger				✔	✔	✔	✔	✔	✔
42102	6913	External Pulse 102 Trigger				✔	✔	✔	✔	✔	✔
42103	6914	External Pulse 103 Trigger				✔	✔	✔	✔	✔	✔
42104	6915	External Pulse 104 Trigger				✔	✔	✔	✔	✔	✔
42105	6916	External Pulse 105 Trigger				✔	✔	✔	✔	✔	✔
42106	6917	External Pulse 106 Trigger				✔	✔	✔	✔	✔	✔
42107	6918	External Pulse 107 Trigger				✔	✔	✔	✔	✔	✔
42108	6919	External Pulse 108 Trigger				✔	✔	✔	✔	✔	✔
42109	691A	External Pulse 109 Trigger				✔	✔	✔	✔	✔	✔
42110	691B	External Pulse 110 Trigger				✔	✔	✔	✔	✔	✔
42111	691C	External Pulse 111 Trigger				✔	✔	✔	✔	✔	✔
42112	691D	External Pulse 112 Trigger				✔	✔	✔	✔	✔	✔
42113	691E	External Pulse 113 Trigger				✔	✔	✔	✔	✔	✔
42114	691F	External Pulse 114 Trigger				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL PULSE REGISTERS CONTINUED											
42115	6920	External Pulse 115 Trigger				✔	✔	✔	✔	✔	✔
42116	6921	External Pulse 116 Trigger				✔	✔	✔	✔	✔	✔
42117	6922	External Pulse 117 Trigger				✔	✔	✔	✔	✔	✔
42118	6923	External Pulse 118 Trigger				✔	✔	✔	✔	✔	✔
42119	6924	External Pulse 119 Trigger				✔	✔	✔	✔	✔	✔
42120	6925	External Pulse 120 Trigger				✔	✔	✔	✔	✔	✔
42121	6926	External Pulse 121 Trigger				✔	✔	✔	✔	✔	✔
42122	6927	External Pulse 122 Trigger				✔	✔	✔	✔	✔	✔
42123	6928	External Pulse 123 Trigger				✔	✔	✔	✔	✔	✔
42124	6929	External Pulse 124 Trigger				✔	✔	✔	✔	✔	✔
42125	692A	External Pulse 125 Trigger				✔	✔	✔	✔	✔	✔
42126	692B	External Pulse 126 Trigger				✔	✔	✔	✔	✔	✔
42127	692C	External Pulse 127 Trigger				✔	✔	✔	✔	✔	✔
42128	692D	External Pulse 128 Trigger				✔	✔	✔	✔	✔	✔
EXTERNAL BOOLEAN REGISTERS											
Write a value of 0 (zero) to turn 'OFF' Write a value of 1 (or any value other than zero) to turn 'ON'											
42201	608F	External Boolean 1 Switch	✔	✔	✔	✔	✔	✔	✔	✔	✔
42202	6090	External Boolean 2 Switch	✔	✔	✔	✔	✔	✔	✔	✔	✔
42203	6091	External Boolean 3 Switch	✔	✔	✔	✔	✔	✔	✔	✔	✔
42204	6092	External Boolean 4 Switch	✔	✔	✔	✔	✔	✔	✔	✔	✔
42205	6093	External Boolean 5 Switch	✔	✔	✔	✔	✔	✔	✔	✔	✔
42206	6094	External Boolean 6 Switch	✔	✔	✔	✔	✔	✔	✔	✔	✔
42207	6095	External Boolean 7 Switch	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL BOOLEAN REGISTERS CONTINUED											
42208	6096	External Boolean 8 Switch	✔	✔	✔	✔	✔	✔	✔	✔	✔
42209	6097	External Boolean 9 Switch			✔	✔	✔	✔	✔	✔	✔
42210	6098	External Boolean 10 Switch			✔	✔	✔	✔	✔	✔	✔
42211	6099	External Boolean 11 Switch			✔	✔	✔	✔	✔	✔	✔
42212	609A	External Boolean 12 Switch			✔	✔	✔	✔	✔	✔	✔
42213	609B	External Boolean 13 Switch				✔	✔	✔	✔	✔	✔
42214	609C	External Boolean 14 Switch				✔	✔	✔	✔	✔	✔
42215	609D	External Boolean 15 Switch				✔	✔	✔	✔	✔	✔
42216	609E	External Boolean 16 Switch				✔	✔	✔	✔	✔	✔
42217	609F	External Boolean 17 Switch				✔	✔	✔	✔	✔	✔
42218	60A0	External Boolean 18 Switch				✔	✔	✔	✔	✔	✔
42219	60A1	External Boolean 19 Switch				✔	✔	✔	✔	✔	✔
42220	60A2	External Boolean 20 Switch				✔	✔	✔	✔	✔	✔
42221	60A3	External Boolean 21 Switch				✔	✔	✔	✔	✔	✔
42222	60A4	External Boolean 22 Switch				✔	✔	✔	✔	✔	✔
42223	60A5	External Boolean 23 Switch				✔	✔	✔	✔	✔	✔
42224	60A6	External Boolean 24 Switch				✔	✔	✔	✔	✔	✔
42225	60A7	External Boolean 25 Switch				✔	✔	✔	✔	✔	✔
42226	60A8	External Boolean 26 Switch				✔	✔	✔	✔	✔	✔
42227	60A9	External Boolean 27 Switch				✔	✔	✔	✔	✔	✔
42228	60AA	External Boolean 28 Switch				✔	✔	✔	✔	✔	✔
42229	60AB	External Boolean 29 Switch				✔	✔	✔	✔	✔	✔
42230	60AC	External Boolean 30 Switch				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL BOOLEAN REGISTERS CONTINUED											
42231	60AD	External Boolean 31 Switch				✔	✔	✔	✔	✔	✔
42232	60AE	External Boolean 32 Switch				✔	✔	✔	✔	✔	✔
42233	633E	External Boolean 33 Switch				✔	✔	✔	✔	✔	✔
42234	633F	External Boolean 34 Switch				✔	✔	✔	✔	✔	✔
42235	6340	External Boolean 35 Switch				✔	✔	✔	✔	✔	✔
42236	6341	External Boolean 36 Switch				✔	✔	✔	✔	✔	✔
42237	6342	External Boolean 37 Switch				✔	✔	✔	✔	✔	✔
42238	6343	External Boolean 38 Switch				✔	✔	✔	✔	✔	✔
42239	6344	External Boolean 39 Switch				✔	✔	✔	✔	✔	✔
42240	6345	External Boolean 40 Switch				✔	✔	✔	✔	✔	✔
42241	6346	External Boolean 41 Switch				✔	✔	✔	✔	✔	✔
42242	6347	External Boolean 42 Switch				✔	✔	✔	✔	✔	✔
42243	6348	External Boolean 43 Switch				✔	✔	✔	✔	✔	✔
42244	6349	External Boolean 44 Switch				✔	✔	✔	✔	✔	✔
42245	634A	External Boolean 45 Switch				✔	✔	✔	✔	✔	✔
42246	634B	External Boolean 46 Switch				✔	✔	✔	✔	✔	✔
42247	634C	External Boolean 47 Switch				✔	✔	✔	✔	✔	✔
42248	634D	External Boolean 48 Switch				✔	✔	✔	✔	✔	✔
42249	634E	External Boolean 49 Switch				✔	✔	✔	✔	✔	✔
42250	634F	External Boolean 50 Switch				✔	✔	✔	✔	✔	✔
42251	6350	External Boolean 51 Switch				✔	✔	✔	✔	✔	✔
42252	6351	External Boolean 52 Switch				✔	✔	✔	✔	✔	✔
42253	6352	External Boolean 53 Switch				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL BOOLEAN REGISTERS CONTINUED											
42254	6353	External Boolean 54 Switch				✔	✔	✔	✔	✔	✔
42255	6354	External Boolean 55 Switch				✔	✔	✔	✔	✔	✔
42256	6355	External Boolean 56 Switch				✔	✔	✔	✔	✔	✔
42257	6356	External Boolean 57 Switch				✔	✔	✔	✔	✔	✔
42258	6357	External Boolean 58 Switch				✔	✔	✔	✔	✔	✔
42259	6358	External Boolean 59 Switch				✔	✔	✔	✔	✔	✔
42260	6359	External Boolean 60 Switch				✔	✔	✔	✔	✔	✔
42261	64F0	External Boolean 61 Switch				✔	✔	✔	✔	✔	✔
42262	64F1	External Boolean 62 Switch				✔	✔	✔	✔	✔	✔
42263	64F2	External Boolean 63 Switch				✔	✔	✔	✔	✔	✔
42264	64F3	External Boolean 64 Switch				✔	✔	✔	✔	✔	✔
42265	64F4	External Boolean 65 Switch				✔	✔	✔	✔	✔	✔
42266	64F5	External Boolean 66 Switch				✔	✔	✔	✔	✔	✔
42267	64F6	External Boolean 67 Switch				✔	✔	✔	✔	✔	✔
42268	64F7	External Boolean 68 Switch				✔	✔	✔	✔	✔	✔
42269	64F8	External Boolean 69 Switch				✔	✔	✔	✔	✔	✔
42270	64F9	External Boolean 70 Switch				✔	✔	✔	✔	✔	✔
42271	64FA	External Boolean 71 Switch				✔	✔	✔	✔	✔	✔
42272	64FB	External Boolean 72 Switch				✔	✔	✔	✔	✔	✔
42273	64FC	External Boolean 73 Switch				✔	✔	✔	✔	✔	✔
42274	64FD	External Boolean 74 Switch				✔	✔	✔	✔	✔	✔
42275	64FE	External Boolean 75 Switch				✔	✔	✔	✔	✔	✔
42276	64FF	External Boolean 76 Switch				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL BOOLEAN REGISTERS CONTINUED											
42277	6500	External Boolean 77 Switch				✔	✔	✔	✔	✔	✔
42278	6501	External Boolean 78 Switch				✔	✔	✔	✔	✔	✔
42279	6502	External Boolean 79 Switch				✔	✔	✔	✔	✔	✔
42280	6503	External Boolean 80 Switch				✔	✔	✔	✔	✔	✔
42281	6504	External Boolean 81 Switch				✔	✔	✔	✔	✔	✔
42282	6505	External Boolean 82 Switch				✔	✔	✔	✔	✔	✔
42283	6506	External Boolean 83 Switch				✔	✔	✔	✔	✔	✔
42284	6507	External Boolean 84 Switch				✔	✔	✔	✔	✔	✔
42285	6508	External Boolean 85 Switch				✔	✔	✔	✔	✔	✔
EXTERNAL NUMERIC REGISTERS											
32 bit signed integer values in the range of -2,147,483,648 to 2,147,483,647											
42301	5ADC	External Numeric 1 Value - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
42302	5ADC	External Numeric 1 Value - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
42303	5ADD	External Numeric 2 Value - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
42304	5ADD	External Numeric 2 Value - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
42305	5ADE	External Numeric 3 Value - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
42306	5ADE	External Numeric 3 Value - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
42307	5ADF	External Numeric 4 Value - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
42308	5ADF	External Numeric 4 Value - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
42309	5AE0	External Numeric 5 Value - High Order Word				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL NUMERIC REGISTERS CONTINUED											
42310	5AE0	External Numeric 5 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42311	5AE1	External Numeric 6 Value - High Order Word				✔	✔	✔	✔	✔	✔
42312	5AE1	External Numeric 6 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42313	5AE2	External Numeric 7 Value - High Order Word				✔	✔	✔	✔	✔	✔
42314	5AE2	External Numeric 7 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42315	5AE3	External Numeric 8 Value - High Order Word				✔	✔	✔	✔	✔	✔
42316	5AE3	External Numeric 8 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42317	5E42	External Numeric 9 Value - High Order Word				✔	✔	✔	✔	✔	✔
42318	5E42	External Numeric 9 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42319	5E43	External Numeric 10 Value - High Order Word				✔	✔	✔	✔	✔	✔
42320	5E43	External Numeric 10 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42321	5E44	External Numeric 11 Value - High Order Word				✔	✔	✔	✔	✔	✔
42322	5E44	External Numeric 11 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42323	5E45	External Numeric 12 Value - High Order Word				✔	✔	✔	✔	✔	✔
42324	5E45	External Numeric 12 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42325	5E46	External Numeric 13 Value - High Order Word				✔	✔	✔	✔	✔	✔
42326	5E46	External Numeric 13 Value - Low Order Word				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL NUMERIC REGISTERS CONTINUED											
42327	5E47	External Numeric 14 Value - High Order Word				✔	✔	✔	✔	✔	✔
42328	5E47	External Numeric 14 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42329	5E48	External Numeric 15 Value - High Order Word				✔	✔	✔	✔	✔	✔
42330	5E48	External Numeric 15 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42331	5E49	External Numeric 16 Value - High Order Word				✔	✔	✔	✔	✔	✔
42332	5E49	External Numeric 16 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42333	5E4A	External Numeric 17 Value - High Order Word				✔	✔	✔	✔	✔	✔
42334	5E4A	External Numeric 17 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42335	5E4B	External Numeric 18 Value - High Order Word				✔	✔	✔	✔	✔	✔
42336	5E4B	External Numeric 18 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42337	5E4C	External Numeric 19 Value - High Order Word				✔	✔	✔	✔	✔	✔
42338	5E4C	External Numeric 19 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42339	5E4D	External Numeric 20 Value - High Order Word				✔	✔	✔	✔	✔	✔
42340	5E4D	External Numeric 20 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42341	4B7A	External Numeric 21 Value - High Order Word				✔	✔	✔	✔	✔	✔
42342	4B7A	External Numeric 21 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42343	4B7B	External Numeric 22 Value - High Order Word				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL NUMERIC REGISTERS CONTINUED											
42344	4B7B	External Numeric 22 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42345	4B7C	External Numeric 23 Value - High Order Word				✔	✔	✔	✔	✔	✔
42346	4B7C	External Numeric 23 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42347	4B7D	External Numeric 24 Value - High Order Word				✔	✔	✔	✔	✔	✔
42348	4B7D	External Numeric 24 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42349	4B7E	External Numeric 25 Value - High Order Word				✔	✔	✔	✔	✔	✔
42350	4B7E	External Numeric 25 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42351	4B7F	External Numeric 26 Value - High Order Word				✔	✔	✔	✔	✔	✔
42352	4B7F	External Numeric 26 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42353	4B80	External Numeric 27 Value - High Order Word				✔	✔	✔	✔	✔	✔
42354	4B80	External Numeric 27 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42355	4B81	External Numeric 28 Value - High Order Word				✔	✔	✔	✔	✔	✔
42356	4B81	External Numeric 28 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42357	4B82	External Numeric 29 Value - High Order Word				✔	✔	✔	✔	✔	✔
42358	4B82	External Numeric 29 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42359	4B83	External Numeric 30 Value - High Order Word				✔	✔	✔	✔	✔	✔
42360	4B83	External Numeric 30 Value - Low Order Word				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL NUMERIC REGISTERS CONTINUED											
42361	4B84	External Numeric 31 Value - High Order Word				✔	✔	✔	✔	✔	✔
42362	4B84	External Numeric 31 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42363	4B85	External Numeric 32 Value - High Order Word				✔	✔	✔	✔	✔	✔
42364	4B85	External Numeric 32 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42365	4B86	External Numeric 33 Value - High Order Word				✔	✔	✔	✔	✔	✔
42366	4B86	External Numeric 33 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42367	4B87	External Numeric 34 Value - High Order Word				✔	✔	✔	✔	✔	✔
42368	4B87	External Numeric 34 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42369	4B88	External Numeric 35 Value - High Order Word				✔	✔	✔	✔	✔	✔
42370	4B88	External Numeric 35 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42371	4B89	External Numeric 36 Value - High Order Word				✔	✔	✔	✔	✔	✔
42372	4B89	External Numeric 36 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42373	4B8A	External Numeric 37 Value - High Order Word				✔	✔	✔	✔	✔	✔
42374	4B8A	External Numeric 37 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42375	4B8B	External Numeric 38 Value - High Order Word				✔	✔	✔	✔	✔	✔
42376	4B8B	External Numeric 38 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42377	4B8C	External Numeric 39 Value - High Order Word				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
EXTERNAL NUMERIC REGISTERS CONTINUED											
42378	4B8C	External Numeric 39 Value - Low Order Word				✔	✔	✔	✔	✔	✔
42379	4B8D	External Numeric 40 Value - High Order Word				✔	✔	✔	✔	✔	✔
42380	4B8D	External Numeric 40 Value - Low Order Word				✔	✔	✔	✔	✔	✔
COMMUNICATIONS SETUP REGISTERS											
See the Communications Module section on p.15 for more information.											
44391	7986	Communications 1 Comm Mode see note 3				✔	✔	✔	✔	✔	✔
44392	7987	Communications 1 Baud Rate see note 4	✔	✔	✔	✔	✔	✔	✔	✔	✔
44393	7988	Communications 1 Handshake Mode see note 5				✔	✔	✔	✔	✔	✔
44394	7989	Communications 1 RTS Level				✔	✔	✔	✔	✔	✔
44395	798A	Communications 1 CTS Level				✔	✔	✔	✔	✔	✔
46977	71E8	Communications 1 RTS Delay - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46978	71E8	Communications 1 RTS Delay - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46979	71E9	Communications 1 Unit ID - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46980	71E9	Communications 1 Unit ID - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
44590	7A4D	Communications 2 Baud Rate see note 4		✔	✔	✔	✔	✔	✔	✔	✔
44591	7A4E	Infrared Communications 1 Baud Rate see note 4	✔	✔	✔						
44591	7A4E	Communications 3 Baud Rate see note 4				✔	✔	✔	✔	✔	✔
44592	7A4F	Communications 1 Protocol	✔	✔	✔	✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
COMMUNICATIONS SETUP REGISTERS CONTINUED											
44593	7A50	Communications 2 Protocol		✔	✔	✔	✔	✔	✔	✔	✔
44594	7A51	Infrared Communications 1 Protocol	✔	✔	✔						
44594	7A51	Communications 3 Protocol				✔	✔	✔	✔	✔	✔
47125	7232	Communications 2 RTS Delay - High Order Word		✔	✔	✔	✔	✔	✔	✔	✔
47126	7232	Communications 2 RTS Delay - Low Order Word		✔	✔	✔	✔	✔	✔	✔	✔
47127	7233	Infrared Communications 1 RTS Delay - High Order Word	✔	✔	✔						
47128	7233	Infrared Communications 1 RTS Delay - Low Order Word	✔	✔	✔						
47127	7233	Communications 3 RTS Delay - High Order Word				✔	✔	✔	✔	✔	✔
47128	7233	Communications 3 RTS Delay - Low Order Word				✔	✔	✔	✔	✔	✔
47129	7234	Communications 2 Unit ID - High Order Word		✔	✔	✔	✔	✔	✔	✔	✔
47130	7234	Communications 2 Unit ID - Low Order Word		✔	✔	✔	✔	✔	✔	✔	✔
47131	7235	Infrared Communications 1 Unit ID - High Order Word	✔	✔	✔						
47132	7235	Infrared Communications 1 Unit ID - Low Order Word	✔	✔	✔						
47131	7235	Communications 3 Unit ID - High Order Word				✔	✔	✔	✔	✔	✔
47132	7235	Communications 3 Unit ID - Low Order Word				✔	✔	✔	✔	✔	✔
47133	7236	Profibus Communications Unit ID - High Order Word	✔	✔	✔						

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
COMMUNICATIONS SETUP REGISTERS CONTINUED											
47134	7236	Profibus Communications Unit ID - Low Order Word	✔	✔	✔						
POWER METER SETUP REGISTERS											
44001	7800	Power Meter 1 Volts Mode see notes 6, 7, 8	✔	✔	✔	✔	✔	✔	✔	✔	✔
46001	7000	Power Meter 1 PT Primary - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46002	7000	Power Meter 1 PT Primary - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46003	7001	Power Meter 1 PT Secondary - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46004	7001	Power Meter 1 PT Secondary - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46005	7002	Power Meter 1 CT Primary - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46006	7002	Power Meter 1 CT Primary - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46007	7003	Power Meter 1 CT Secondary - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46008	7003	Power Meter 1 CT Secondary - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46009	7004	Power Meter 1 I4 CT Primary - High Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46010	7004	Power Meter 1 I4 CT Primary - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
46011	7005	Power Meter 1 I4 CT Secondary - High Order Word				✔	✔	✔	✔	✔	✔
46012	7005	Power Meter 1 I4 CT Secondary - Low Order Word				✔	✔	✔	✔	✔	✔
48903	75AB	Power Meter 1 V4 PT Primary - High Order Word				✔	✔	✔	✔	✔	✔
48904	75AB	Power Meter 1 V4 PT Primary - Low Order Word				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
POWER METER SETUP REGISTERS CONTINUED											
48905	75AC	Power Meter 1 V4 PT Secondary - High Order Word				✔	✔	✔	✔	✔	✔
48906	75AC	Power Meter 1 V4 PT Secondary - Low Order Word				✔	✔	✔	✔	✔	✔
48907	75AD	Power Meter 1 I5 CT Primary - High Order Word				✔	✔	✔	✔	✔	✔
48908	75AD	Power Meter 1 I5 CT Primary - Low Order Word				✔	✔	✔	✔	✔	✔
48909	75AE	Power Meter 1 I5 CT Secondary - High Order Word				✔	✔	✔	✔	✔	✔
48910	75AE	Power Meter 1 I5 CT Secondary - Low Order Word				✔	✔	✔	✔	✔	✔
44587	7A4A	Power Meter 1 V1 Polarity - see note 9	✔	✔	✔	✔	✔	✔	✔	✔	✔
44588	7A4B	Power Meter 1 V2 Polarity - see note 9	✔	✔	✔	✔	✔	✔	✔	✔	✔
44589	7A4C	Power Meter 1 V3 Polarity - see note 9	✔	✔	✔	✔	✔	✔	✔	✔	✔
45043	7C12	Power Meter 1 V4 Polarity - see note 9				✔	✔	✔	✔	✔	✔
44002	7801	Power Meter 1 I1 Polarity - see note 9	✔	✔	✔	✔	✔	✔	✔	✔	✔
44003	7802	Power Meter 1 I2 Polarity - see note 9	✔	✔	✔	✔	✔	✔	✔	✔	✔
44004	7803	Power Meter 1 I3 Polarity - see note 9	✔	✔	✔	✔	✔	✔	✔	✔	✔
44586	7A49	Power Meter 1 I4 Polarity - see note 9				✔	✔	✔	✔	✔	✔
45044	7C13	Power Meter 1 I5 Polarity - see note 9				✔	✔	✔	✔	✔	✔

Modbus Address	ION Handle	ION Register	ION 7300	ION 7330	ION 7350	ION 7550	ION 7650	ION 8600 C	ION 8600 B	ION 8600	ION 8800
METER TIME SYNC REGISTERS											
See "Modbus Meter Time Set" on page 25.											
41926	NA	UTC Seconds - High Order	✔	✔	✔	✔	✔	✔	✔	✔	✔
41927	NA	UTC Seconds - Low Order Word	✔	✔	✔	✔	✔	✔	✔	✔	✔
FACTORY REVISION REGISTERS											
See "Meter Firmware Revision" on page 11.											
41901 to 41912	NA	FAC1 Revision	✔	✔	✔	✔	✔	✔	✔	✔	✔
44396	798B	Factory 1 Nominal Frequency - see note 10	✔	✔	✔	✔	✔	✔	✔	✔	✔
DATA RECORDS REGISTERS											
43001 to 43153	NA	See "Data Record / Modbus Map" on page 20.	✔	✔	✔	✔	✔	✔	✔	✔	✔

Notes

[1] Format values are: 0='Unsigned 16B' 1='Signed 16B' 2='Unsigned 32B' 3='Signed 32B' 4='Unsigned 32B-M10K' 5='Signed 32B-M10K' 6='Packed Boolean' 7='Unsigned 16B Input Mode'

[2] Scale values are: 0='No' 1='Yes'

[3] Comm Mode values are: 0='RS232' 1='RS485'

[4] Baud Rate values are: 0='300' 1='1200' 2='2400' 3='4800' 4='9600' 5='19200' 6='38400' 7='57600' 8='115200'

[5] Handshake Mode values are: 0='RTS with Delay' 1='RTS/CTS'

[6] Volts Mode values for ION7300 Series are: 0='4W-WYE' 1='DELTA' 2='SINGLE' 3='DEMO' 4='3W-WYE' 5='DIRECT-DELTA'

[7] Volts Mode values for ION7500 / ION7600 are: 0='4W-WYE' 1='DELTA' 2='SINGLE' 3='DEMO' 4='3W-WYE'

[8] Volts Mode values for ION8600 meters are: 0='9S - 4 Wire Wye/Delta' 1='35S - 3 Wire' 3='DEMO' 4='36S - 4 Wire Wye'

[9] Polarity values are: 0='Normal' 1='Inverted'

[10] Frequency values are: 0='60Hz' 1='50Hz'