7700 ION

Advanced Digital Power Instrumentation Package

7700 ION / Modicon Modbus

Serial Communications Protocol and ION / Modbus Register Map

Version 2.1

POWER MEASUREMENT

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1. INTRODUCTION

The 7700 ION performs Modbus communications by emulating the Modicon 984 Programmable Controller. This document describes the Modbus communications protocol employed by the 7700 ION and how to pass information into and out of the 7700 ION in a Modbus network.

It is assumed that the reader is familiar with the Modbus protocol and serial communications in general.

1.1 Purpose of the Communications Protocol

The purpose of the 7700 ION Modbus communications protocol is to allow measured data and setup information to be efficiently transferred between a Modbus Master Station and a 7700 ION. This includes:

1) Allowing interrogation of all data measured by a 7700 ION which are exported via the Modbus Slave ION Module.

1) Allowing configuration and interrogation of all 7700 ION Module Numeric Bounded and Enumerated set-up registers.

4) Allowing interrogation and control of the 7700 ION External Control ION Modules.

1.2 7700 Modbus Communications Protocol Revisions

November 1996 Initial Release.
July 1997 Remove “Access Protection” Scheme.
November 1997 Added Firmware Revision String.

2. MODBUS IMPLEMENTATION ON THE 7700 ION

2.1 Ground Rules

The 7700 ION is capable of communication on both the RS-232C and the RS-485 serial communication standards. The RS-485 medium allows for multiple devices on a multi-drop network, whereas RS-232C allows for only a single device. The 7700 ION Modbus protocol is identical for both environments.

The following rules define the protocol for information transfer between a Modbus Master device and the 7700 ION.

1) All communications on the communications loop conforms to a MASTER/SLAVE scheme. In this scheme, information and data is transferred between a Modbus MASTER device and up to 32 SLAVE monitoring devices for RS-485 and only one SLAVE device for RS-232C.

2) The MASTER will initiate and control all information transfer on the communications loop.

3) Under no circumstances will a SLAVE device initiate a communications sequence.

4) All communications activity on the loop occurs in the form of “PACKETS”, a packet being simply a serial string of 8-bit bytes. The maximum number of bytes contained within one packet is 255.

5) All PACKETS transmitted by the MASTER are REQUESTS. All PACKETS transmitted by a SLAVE device are RESPONSES.

6) At most one SLAVE can respond to a single request from a MASTER.

2.2 Modes of Transmission

The Modbus protocol uses ASCII and RTU modes of transmission. The 7700 ION supports only the RTU mode of transmission, with 8 data bits, no parity, and one stop bit.

2.3 Description of the Modbus packet structure

Every Modbus packet consists of four fields:

1) The Slave Address Field
2) The Function Field
3) The Data Field
4) The Error Check Field (Checksum)

2.3.1 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, when receiving a request packet with the slave address field matching its own address, will perform the command specified in the packet. A response packet generated by the slave will have the same value in the slave address field.

2.3.2 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 2-1 lists the Modbus functions supported by the 7700 ION.

2.3.3 Data Field

The data field of a Modbus request is of variable length, and depends upon 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 are contained in 16-bit or 32-bit registers. Registers are transmitted in the order of high-order byte first, low-order byte second. This ordering of bytes is called "Big Endian" format.

Example 2.1:

> 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 will be transmitted in the order 12 AB.

2.3.4 Error Check Field (Checksum)

The checksum field allows the receiving device to determine if a packet has been 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 same calculation on the entire packet it receives, excepting the error check field. The resulting value is compared to the error check field. If the calculated checksum is not equal to the checksum stored in the incoming packet, transmission errors have occurred and corrupted the packet. A bad packet will be ignored by the receiving device.

The CRC-16 algorithm is detailed in appendix A of this document.

2.4 Exception Responses

If a Modbus master device sends an invalid command to a 7700 ION or attempts to read an invalid holding register, an exception response will be 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. Table 2-2 describes the exception codes supported by the 7700 ION and their possible

FUNCTION	MEANING	ACTION
03	Read Holding Registers	Obtains the current value in one or more holding registers of the 7700 ION.
16	Preset Multiple Registers	Places specific values into a series of consecutive holding registers of the 7700 ION. The holding registers that can be written to a 7700 ION are shown in the register map.

Table 2-1: Modbus Function Supported by the 7700 ION

causes.

2.5 Broadcast Packets

The 7700 ION Modbus protocol supports the use of broadcast request packets. The purpose of a broadcast request packet is to allow all the Slave devices to receive the same command from the Master station.

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 will receive and execute a broadcast request command, but no device will respond.

The Preset Multiple Registers command is the only command supporting broadcast packets.

CODE	NAME	MEANING
01	Illegal Function	An Invalid command is contained in the function field of the request packet. The 7700 ION only support Modbus functions 3 and 16.
02	Illegal Address	The address referenced in the data field is an invalid address for the specified function. This could also indicate that the registers requested are not within the valid register range of the 7700 ION.
03	Illegal Value	The value referenced in the data field is not allowable for the referenced register on the 7700 ION.

Table 2-2: Exception Codes supported by the 7700 ION

3. PACKET COMMUNICATIONS

This section will illustrate the Modbus functions supported by the 7700 ION.

3.1 Function 03: Read Holding Registers

To read 7700 ION parameter values, a Master station 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 7700 ION responds with a packet containing the values of the registers in the range defined in the request.

Figure 3-1 shows the Read Holding Registers request and response packet formats, and an example transaction.

READ HOLDING REGISTERS

READ REGISTERS REQUEST PACKET (Master station to 7700 ION)

Unit ID/Slave Address	(1 byte)
03 (Function code)	(1 byte)
Start Register (sr)	(2 bytes)
# of Registers to Read (nr)	(2 bytes)
CRC Checksum	(2 bytes)

READ REGISTERS RESPONSE PACKET (7700 ION to Master station)

Unit ID/Slave Address	(1 byte)
03 (Function Code)	(1 byte)
Byte Count (2 x nr)	(1 byte)
First Register in range	(2 bytes)
Second Register in range	(2 bytes)
...	
CRC Checksum	(2 bytes)

Example 3.1:

A 7700 ION, in 4-wire WYE volts mode, is configured as a Modbus slave device, with slave address 100. The Master station requests to read realtime volts, phases A, B, and C. Those 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: (The 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	
64	03	06	2E	CE	2E	E8

Register 3		CRC Checksum	
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 illustrated packets are all represented in hexadecimal format.

Figure 3-1: Read Holding Registers

3.2 Function 16: Preset Multiple Registers

The Preset Multiple Registers command packet allows a Modbus master to configure or control the 7700 ION.

The Preset Multiple Registers request packet contains, as the data field, a definition of a range of registers to write to, and the values to write to those registers.

The 7700 ION responds with a packet indicating that a write was performed to the range of registers specified in the request.

Figure 3-2 shows the Preset Multiple Registers request and response packet formats, and an example transaction.

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

PRESET MULTIPLE REGISTERS

PRESET REGISTERS REQUEST PACKET (Master station to 7700 ION)

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

PRESET REGISTERS RESPONSE PACKET (7700 ION to Master station)

Unit ID/Slave Address	(1 byte)
16 (Function Code)	(1 byte)
Start Register (sr)	(2 bytes)
# of Registers Written (nr)	(2 bytes)
CRC Checksum	(2 bytes)

Example 3.2:

A 7700 ION is configured as a Modbus slave device, with slave address 200. The Master station requests to set the PT ratio to 1200:120. From the register map, those Power Meter PT Primary and Secondary setup registers are 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: (The white background denotes the DATA field of the packet.)

Slave	Function	Start Register (*46001*)		# of Registers (4)		Byte Count
C8*	10	17	70	00	04	08

Register 1		Register 2		Register 3	
00	00	04	B0	00	00

Register 4		CRC Checksum	
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 illustrated packets are all represented in hexadecimal format.

Figure 3-2: Preset Multiple Registers

3.3 Invalid Registers

In the 7700 ION Modbus register map, there are gaps between some registers. For example, the next register after *42232* is *42301*. The unmapped registers *42233* through to *42300* are said to be INVALID. Invalid registers store no information.

When an invalid register is read, the value included is FFFF(hex). When an invalid register is written, the value supplied is not stored. The 7700 ION will not, however, reject the request.

4. 7700 ION MODBUS REGISTERS

The 7700 ION Modbus register map defines a set of parameters which are treated as HOLDING REGISTERS of the Modicon 984 PLC, having addresses ***4xxxx***. According to the Modbus protocol, in response to a request for register ***4xxxx*** of a particular slave device (7700), the Modbus master reads register ***xxxx-1*** from the slave. For example, register ***40011*** corresponds to register 10.

There are four main classes of register available via Modbus:

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

4.1 Modbus Slave Module Output Registers

The 7700 ION contains four ION Modbus Slave Modules, each of which is capable of exporting up to sixteen ION registers into the Modbus protocol. This module takes Numeric or Boolean type ION registers as input, scales and formats the input values according to a configurable setup, and makes the ION data available in a contiguous set of Modbus Holding Registers.

Modbus Slave Module output registers can be 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 can 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

4.1.1 16-bit Integer Format

Unsigned and Signed 16-bit Integer Formats are the simplest formats: each ION input register to the module is 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.

4.1.2 32-bit Integer Format

To accommodate values which 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:

$$\text{High-Order Register} = \frac{\text{value}}{65536}$$

Low-Order Register = value **modulus** 65536

$\text{value} = \text{register}_{high} \times 65536 + \text{register}_{low}$, or
$\text{value} = \text{register}_{high} | \text{register}_{low}$

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

Example 4.1:

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

Example 4.2:

> 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

4.1.3 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:

$$\text{High-Order Register} = \frac{\text{value}}{10000}$$

Low-Order Register = value **modulus** 10000

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

$$\text{value} = \text{register}_{high} \times 10000 + \text{register}_{low}$$

Example 4.3:

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 4.4:

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

Register_{high}: -1234 = FB2E Hex
Register_{low}: -5678 = E9D2 Hex

value = -1234 * 10000 + -5678 = -12345678

4.1.4 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 one 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 4.5:

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 would be:

Register: 0001110000000000 Bin = 1C00 Hex

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

Register: 1001110000000000 Bin = 9C00 Hex

4.2 Meter Firmware Revision

All 7000 series ION devices contain a firmware revision string which denotes the meter type and version (e.g. "7700V200" denotes version 2.0.0 of the 7700 ION.

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 7700 ION, 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 "7700V200" would appear.

Register	Value (Hex)	ASCII	
41901	3737	'7'	'7'
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*) contain null values (0000 Hex).

4.3 ION External Control Registers

All ION external control registers in the 7700 ION are available to be read and written via Modbus. This section describes how those 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

4.3.1 External Pulse Registers

External Pulse registers provide an interface for manually triggering events in the 7700 ION. For example, they can be used to reset counters or timers, or pulse external equipment. All of the 7700 ION's external pulse registers are available via Modbus.

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

The 7700 ION's 128 External Pulse registers are located in the 7700 Modbus register map from *42001* to *42128*.

Example 4.6:

> A 7700 ION is configured with the following external pulse modules:
>
> ExtPulse #1: Min/Max Reset
> ExtPulse #2: unlinked
> ExtPulse #3: Sliding Window Demand (SWD) reset
> ExtPulse #4: Thermal Demand (TD) reset
> ExtPulse #5: unlinked
> ExtPulse #6: Counter (CNT) reset
> ExtPulse #7: Integrators (INT) reset
>
> The Modbus master requests to reset Min/Max, SWD, TD, and Integrators. The outgoing write request would be to write 7 registers, starting at *42001*, with values 1, 0, 1, 1, 0, 0, and 1.

4.3.2 External Boolean Registers

ION External Boolean registers provide an interface to manually turn a signal ON or OFF. For example, these registers could be used to enable or disable ION modules. The functionality depends on the 7700's ION linkages.

A value of one for a Boolean register represents 'ON' or 'TRUE'. A value of zero represents 'OFF' or 'FALSE'. Writing a value other than zero or one will result in the value of one being written.

The 7700 ION's 32 External Boolean registers are located in the 7700 Modbus register map from *42201* to *42232*.

4.3.3 External Numeric Registers

External Numeric registers can be set to a certain value. Consult the *7700 ION User's Guide* and the *ION Reference* for an example of how and where these registers might be used.

The External Numeric registers are 32-bit values which are represented in 32-bit Signed Integer Format (see section 4.1.2 of this document). 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 7700 ION's 8 External Numeric registers are located in the 7700 Modbus register map from *42301* to *42316*.

4.4 Enumerated ION Module Setup Registers

One major class of setup register in ION modules is the Enumerated setup register. Enumerated registers are used where there is a list of options to choose from. For example, the Power Meter Module has five options for Volts Mode: 4W-WYE, DELTA, SINGLE, DEMO, and 3W-WYE.

In Modbus protocol, Enumeration 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

All Enumerated ION Module setup registers on the 7700 ION are included in the Modbus register map. The

register map details how enumerations are represented numerically in Modbus for each register.

Enumerated ION Module setup registers are located in the Modbus register map in order of ION handles. The following formula shows the relationship:

EnumAddr = 44001 + dec(EnumHandle-7800 hex)

Example 4.7:

A 7700 ION has a Modbus Slave Module #1 is to be configured to export data in Unsigned 32-bit Integer Format. The ION handle for the Modbus Slave Module #1 Format register is 7A53 hex. The enumeration for 'Unsigned 32B' is 2.

Register Address = 44001 + dec(7A53 hex - 7800 hex)
= 44001 + dec(0253 hex)
= 44001 + 595
= 44596

A write request of value 2 to register *44596* would make this configuration change.

The Enumerated ION setup registers on the 7700 ION are mapped from *44001* to *44603*.

4.5 Numeric Bounded ION Module Setup Registers

The other major class of setup register in ION modules is the Numeric Bounded setup register. 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 section 4.1.2), 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 effectifely limited by Modbus capabilities.

All Numeric Bounded ION Module setup registers on the 7700 ION 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. The following formula shows the relationship:

NBAddr = 46001 + 2 x dec(NBHandle-7000 hex)

Example 4.8:

A 7700 ION has a Modbus Slave Module #2 is to be configured to export data to Modbus register base address 40027. Modbus Slave Module #1, with 16 ION inputs, is changed from 16 to 32 bit format, thus increasing the output register range of that module. Modbus Slave Module #2 needs to be configured to make room for the additional Modbus registers generated by Modbus Slave #1. The ION handle for the Modbus Slave Module #2 BaseAddr register is 7238 hex. To accomodate the 16 new output registers from Modbus Slave Module #1, the new BaseAddr for Modbus Slave Module #2 should be changed to 40043.

Register Address = 46001 + dec(7238 hex - 7000 hex)
= 46001 + dec(238 hex)
= 46001 + 1136
= 47137

A write request of values 0 and 40043 to two registers starting at register *47137* would make this configuration change.

Note: in this example, if Modbus Slave Modules #3 and #4 were previously configured to export registers to an address range following Modbus Slave Module #2, they would of course also have to be reconfigured, by a similar process.

The Numeric Bounded ION setup registers on the 7700 ION are mapped from *46001* to *47174*.

5. 7700 ION MODBUS CONFIGURATION

Modbus on the 7700 ION is configurable in two components:

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

Consult the *ION Reference* for a full functional description of the Communications and Modbus Slave Modules.

5.1 Modbus Protocol Configuration (Communications Module)

The 7700 ION Communications Module stores all setup information that applies to a serial 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 7700 ION are accessible via Modbus as fixed-location readable and writeable registers: See sections 4.4 and 4.5 of this document for format details of these Modbus registers.

SETUP REGISTER	MODBUS REGISTER(S)
CM01 Comm Mode	44391
CM01 Baud Rate	44392
CM01 HshakeMode	44393
CM01 RTS Level	44394
CM01 CTS Level	44395
CM01 Protocol	44592
CM01 RTS Delay	46977 to 46978
CM01 Unit ID	46979 to 46980
CM02 Baud Rate	44590
CM02 Protocol	44593
CM02 RTS Delay	47125 to 47126
CM02 Unit ID	47129 to 47130
CM03 Baud Rate	44591
CM03 Protocol	44594
CM03 RTS Delay	47127 to 47128
CM03 Unit ID	47131 to 47132

Table 5-1: Modbus Configuration Parameters

These registers are explained in the following sections.

5.1.1 Comm Mode

The first Communications Module applies to a communications port which can be configured as RS-232 or as RS-485. Via Modbus, the Comm Mode setup register can be one of two values:

0 = RS-232
1 = RS-485

5.1.2 Baud Rate

Each Communications Module on the 7700 ION has a Baud Rate register, which specifies the speed of serial communications.

The following values apply to all of the Communications Modules:

0 = 300 Baud
1 = 1200 Baud
2 = 2400 Baud
3 = 4800 Baud
4 = 9600 Baud
5 = 19200 Baud

The following values apply only to the Xpress Card expansion Communications Modules (2 and 3):

6 = 38400 Baud
7 = 57600 Baud
8 = 115200 Baud

5.1.3 Handshake Mode

This register applies to the physical handshaking protocol on the RS-232 port. The following values are valid:

0 = RTS with Delay
1 = RTS/CTS Handshaking

5.1.4 RTS Level, CTS Level

These register define the assertion levels of the RS-232 RTS and CTS signals. The following values are valid:

0 = Normal
1 = Inverted

5.1.5 Protocol

This register defines the serial protocol to be used on the communications port. The following values are valid:

0 = ION Protocol
1 = Modbus Protocol

5.1.6 RTS Delay

The RTS Delay parameter defines a delay between when the 7700 ION becomes ready to transmit data on the serial port and when it starts transmitting data. On an RS-232 port, the 7700 ION will assert the RTS signal when it is ready to transmit 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.

5.1.7 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, ***this parameter's valid range is effectively limited to 1 to 247***.

5.2 Modbus Register Configuration (Modbus Slave Module)

The 7700 ION's Modbus Slave Module provides a configurable interface to export ION data to the Modbus protocol. Consult the *ION Refererence* for a full description of this module.

The Modbus Slave Module is configurable in two ways: ION Registers can be 'linked' to the module, and the Modbus Slave Module setup can be altered.

The first type of configuration is beyond the scope of the Modbus protocol. The 7700 ION comes with a set of default linkages for Modbus Slave Modules which should suit a wide range of applications.

The second type of Modbus Slave Module configuration can be accomplished via the 7700 MGT, the ION protocol, or the Modbus protocol.

The setup registers for the Modbus Slave Modules on the 7700 ION are available via Modbus for control and interrogation. See sections 4.4 and 4.5 of this document for format details of these Modbus registers.

SETUP REGISTER	MODBUS REGISTER(S)
MSR1 Format	44596
MSR1 BaseAddr	47135 to 47136
MSR1 Scaling	44600
MSR1 InFull	47151 to 47152
MSR1 InZero	47143 to 47144
MSR1 OutFull	47167 to 47168
MSR1 OutZero	47159 to 47160
MSR2 Format	44597
MSR2 BaseAddr	47137 to 47138
MSR2 Scaling	44601
MSR2 InFull	47153 to 47154
MSR2 InZero	47145 to 47146
MSR2 OutFull	47169 to 47170
MSR2 OutZero	47161 to 47162
MSR3 Format	44598
MSR3 BaseAddr	47139 to 47140
MSR3 Scaling	44602
MSR3 InFull	47155 to 47156
MSR3 InZero	47147 to 47148
MSR3 OutFull	47171 to 47172
MSR3 OutZero	47163 to 47164
MSR4 Format	44599
MSR4 BaseAddr	47141 to 47142
MSR4 Scaling	44603
MSR4 InFull	47157 to 47158
MSR4 InZero	47149 to 47150
MSR4 OutFull	47173 to 47174
MSR4 OutZero	47165 to 47166

These registers are explained in the following sections.

5.2.1 Format

As described in section 4.1 of this document, the 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

5.2.2 BaseAddr

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

5.2.3 Scaling

The Modbus Slave Module can optionally scale and offset input values to fit within the output range for the selected format. The Scaling setup register selects whether 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

5.2.4 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 will be represented as OutZero, and input values falling at or above InFull will be represented as OutFull. Input values between InZero and InFull will be 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.

5.2.5 OutZero, OutFull

If Scaling is set to YES, the input values to the Modbus Slave Module will be 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:

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

APPENDIX A: CRC-16 CALCULATION

This appendix 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 is provided to show how to obtain the checksum for a simple Modbus RTU frame.

Steps for generating the CRC-16 checksum:

1) Form a new polynomial by dropping the MSB (Most Significant Bit) of the generator polynomial and reversing the bit sequence. 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, storing the result in the 16-bit register.
4) Shift the 16-bit register one bit to the right.
5a) If the bit shifted out to the right is one, Exclusive OR the 16-bit register with the new generator polynomial, with the result stored in the 16-bit registers. Return to step 4.
5b) If the bit shifted out to the right is zero, return to step 4.
6) Repeat steps 4 and 5 until 8 shifts have been performed.
7) Exclusive OR the next data byte with the 16-bit register.
8) Repeat steps 4 through 7 until all bytes of the frame have been Exclusive Ored with the 16-bit register and shifted 8 times.
9) The content of the 16-bit register is the checksum and is appended to the end of the frame.

Example:

A Modbus master node requests to read register 40011 from a Modbus slave with address 100 (64 hex). As per the Modbus protocol, reading register 40011 means using the READ HOLDING REGISTERS function (03 hex) with start register 10.

Initial frame:

Slave Address	Function	Start Register		# of Registers		Error Check (CRC-16)
64	03	00	0A	00	01	To be calculated

Step	Byte	Bits Shifted	Action	16-Bit Register	Bit Shifted Out
2			Initial Value	1111 1111 1111 1111	
	1		Load First Data Byte	0000 0000 0110 0100	
3			Exclusive OR	1111 1111 1001 1011	
4		1	Shift 1 bit to the Right	0111 1111 1100 1101	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1101 1111 1100 1100	
4		2	Shift 1 bit to the Right	0110 1111 1110 0110	0
4		3	Shift 1 bit to the Right	0011 0111 1111 0011	0

Step	Byte	Bits Shifted	Action	16-Bit Register	Bit Shifted Out
4		4	Shift 1 bit to the Right	0001 1011 1111 1001	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1011 1011 1111 1000	
4		5	Shift 1 bit to the Right	0101 1101 1111 1100	0
4		6	Shift 1 bit to the Right	0010 1110 1111 1110	0
4		7	Shift 1 bit to the Right	0001 0111 0111 1111	0
4		8	Shift 1 bit to the Right	0000 1011 1011 1111	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1010 1011 1011 1110	
	2		Load 2nd Data Byte	0000 0000 0000 0011	
7			Exclusive OR	1010 1011 1011 1101	
4		1	Shift 1 bit to the Right	0101 0101 1101 1110	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1111 0101 1101 1111	
4		2	Shift 1 bit to the Right	0111 1010 1110 1111	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1101 1010 1110 1110	
4		3	Shift 1 bit to the Right	0110 1101 0111 0111	0
4		4	Shift 1 bit to the Right	0011 0110 1011 1011	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1001 0110 1011 1010	
4		5	Shift 1 bit to the Right	0100 1011 0101 1101	0
4		6	Shift 1 bit to the Right	0010 0101 1010 1110	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1000 0101 1010 1111	
4		7	Shift 1 bit to the Right	0100 0010 1101 0111	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1110 0010 1101 0110	
4		8	Shift 1 bit to the Right	0111 0001 0110 1011	0
	3		Load 3rd Data Byte	0000 0000 0000 0000	
7			Exclusive OR	0111 0001 0110 1011	
4		1	Shift 1 bit to the Right	0011 1000 1011 0101	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1001 1000 1011 0100	
4		2	Shift 1 bit to the Right	0100 1100 0101 1010	0
4		3	Shift 1 bit to the Right	0010 0110 0010 1101	0
4		4	Shift 1 bit to the Right	0001 0011 0001 0110	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1011 0011 0001 0111	
4		5	Shift 1 bit to the Right	0101 1001 1000 1011	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1111 1001 1000 1010	
4		6	Shift 1 bit to the Right	0111 1100 1100 0101	0
4		7	Shift 1 bit to the Right	0011 1110 0110 0010	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1001 1110 0110 0011	
4		8	Shift 1 bit to the Right	0100 1111 0011 0001	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1110 1111 0011 0000	
7	4		Load 4th Data Byte	0000 0000 0000 1010	
			Exclusive OR	1110 1111 0011 1010	
4		1	Shift 1 bit to the Right	0111 0111 1001 1101	0
4		2	Shift 1 bit to the Right	0011 1011 1100 1110	1
			Generator Polynomial	1010 0000 0000 0001	

Step	Byte	Bits Shifted	Action	16-Bit Register	Bit Shifted Out
5a			Exclusive OR	1001 1011 1100 1111	
4		3	Shift 1 bit to the Right	0100 1101 1110 0111	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1110 1101 1110 0110	
4		4	Shift 1 bit to the Right	0111 0110 1111 0011	0
4		5	Shift 1 bit to the Right	0011 1011 0111 1001	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1001 1011 0111 1000	
4		6	Shift 1 bit to the Right	0100 1101 1011 1100	0
4		7	Shift 1 bit to the Right	0010 0110 1101 1110	0
4		8	Shift 1 bit to the Right	0001 0011 0110 1111	0
7	5		Load 5th Data Byte	0000 0000 0000 0000	
			Exclusive OR	0001 0011 0110 1111	
4		1	Shift 1 bit to the Right	0000 1001 1011 0111	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1010 1001 1011 0110	
4		2	Shift 1 bit to the Right	0101 0100 1101 1011	0
4		3	Shift 1 bit to the Right	0010 1010 0110 1101	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1000 1010 0110 1100	
4		4	Shift 1 bit to the Right	0100 0101 0011 0110	0
4		5	Shift 1 bit to the Right	0010 0010 1001 1011	0
4		6	Shift 1 bit to the Right	0001 0001 0100 1101	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1011 0001 0100 1100	
4		7	Shift 1 bit to the Right	0101 1000 1010 0110	0
4		8	Shift 1 bit to the Right	0010 1100 0101 0011	0
7	6		Load 6th Data Byte	0000 0000 0000 0001	
			Exclusive OR	0010 1100 0101 0010	
4		1	Shift 1 bit to the Right	0001 0110 0010 1001	0
4		2	Shift 1 bit to the Right	0000 1011 0001 0100	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1010 1011 0001 0101	
4		3	Shift 1 bit to the Right	0101 0101 1000 1010	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1111 0101 1000 1011	
4		4	Shift 1 bit to the Right	0111 1010 1100 0101	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1101 1010 1100 0100	
4		5	Shift 1 bit to the Right	0110 1101 0110 0010	0
4		6	Shift 1 bit to the Right	0011 0110 1011 0001	0
4		7	Shift 1 bit to the Right	0001 1011 0101 1000	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1011 1011 0101 1001	
4		8	Shift 1 bit to the Right	0101 1101 1010 1100	1
			Generator Polynomial	1010 0000 0000 0001	
5a			Exclusive OR	1111 1101 1011 1100	
			RESULT	Hex FD Hex AD	

The frame completed with the CRC-16 checksum is as follows:

Slave Address	Function	Start Register		# of Registers		Error Check (CRC-16)	
64	03	00	0A	00	01	AD	FD

PSEUDOCODE FOR CRC-16 GENERATION

For the users who are 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.

APPENDIX B: ION/MODBUS MAP

This appendix contains the ION/Modbus register map for the 7700 ION.

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1. MODBUS SLAVE MODULE REGISTERS

The 7700 ION provides four Modbus Slave Modules, which export real-time ION registers into Modbus Registers. The meaning and location of Modbus Slave Module output registers is determined by the configuration of the Modbus Slave Modules. Consult the *ION Reference* for a description of the Modbus Slave Modules.

Modbus Registers	ION Register
40001 to 41800	Modbus Slave Module Outputs

See also Section 6 of this appendix for a list of the factory default Modbus Slave Module configuration.

2. FIRMWARE REVISION STRING REGISTERS

The 7700 ION provides a device firmware revision string via a fixed group of holding registers. The values contained in these registers are ASCII characters, two per register. The ASCII characters, concatenated together, form a 'C' style string: a series of characters terminated by a null value (00 Hex).

Section 4.2 of this document describes the string format in further detail.

Modbus Registers	ION Register	ION Handle
41901 to 41912	FAC Revision	1303

3. ION EXTERNAL CONTROL REGISTERS

All ION external control registers are available to be READ and WRITTEN via Modbus. This section describes how those registers appear in the Modbus register map. There are three types of external control registers:

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

3.1 External Pulse Registers

External Pulse registers provide an interface for manually triggering events in the ION device. For example, they can be used to reset counters or timers, or pulse external equipment. All of the device's external pulse registers are available via Modbus.

Pulse registers are meaningful mainly for writing. Writing a nonzero value to a pulse register will cause a pulse, writing a zero value will have no effect, but will be acknowledged as a successful write operation.

Modbus Register	ION Register	ION Handle
42001	ExtPulse #1	68AE
42002	ExtPulse #2	68AF
42003	ExtPulse #3	68B0
42004	ExtPulse #4	68B1
42005	ExtPulse #5	68B2
42006	ExtPulse #6	68B3
42007	ExtPulse #7	68B4
42008	ExtPulse #8	68B5
42009	ExtPulse #9	68B6
42010	ExtPulse #10	68B7
42011	ExtPulse #11	68B8
42012	ExtPulse #12	68B9
42013	ExtPulse #13	68BA
42014	ExtPulse #14	68BB
42015	ExtPulse #15	68BC
42016	ExtPulse #16	68BD
42017	ExtPulse #17	68BE
42018	ExtPulse #18	68BF
42019	ExtPulse #19	68C0
42020	ExtPulse #20	68C1
42021	ExtPulse #21	68C2
42022	ExtPulse #22	68C3
42023	ExtPulse #23	68C4
42024	ExtPulse #24	68C5
42025	ExtPulse #25	68C6
42026	ExtPulse #26	68C7
42027	ExtPulse #27	68C8
42028	ExtPulse #28	68C9
42029	ExtPulse #29	68CA
42030	ExtPulse #30	68CB
42031	ExtPulse #31	68CC
42032	ExtPulse #32	68CD
42033	ExtPulse #33	68CE
42034	ExtPulse #34	68CF
42035	ExtPulse #35	68D0
42036	ExtPulse #36	68D1
42037	ExtPulse #37	68D2
42038	ExtPulse #38	68D3
42039	ExtPulse #39	68D4
42040	ExtPulse #40	68D5
42041	ExtPulse #41	68D6
42042	ExtPulse #42	68D7
42043	ExtPulse #43	68D8
42044	ExtPulse #44	68D9
42045	ExtPulse #45	68DA
42046	ExtPulse #46	68DB
42047	ExtPulse #47	68DC
42048	ExtPulse #48	68DD
42049	ExtPulse #49	68DE
42050	ExtPulse #50	68DF
42051	ExtPulse #51	68E0
42052	ExtPulse #52	68E1
42053	ExtPulse #53	68E2
42054	ExtPulse #54	68E3
42055	ExtPulse #55	68E4
42056	ExtPulse #56	68E5
42057	ExtPulse #57	68E6
42058	ExtPulse #58	68E7
42059	ExtPulse #59	68E8
42060	ExtPulse #60	68E9
42061	ExtPulse #61	68EA
42062	ExtPulse #62	68EB
42063	ExtPulse #63	68EC
42064	ExtPulse #64	68ED
42065	ExtPulse #65	68EE
42066	ExtPulse #66	68EF
42067	ExtPulse #67	68F0
42068	ExtPulse #68	68F1
42069	ExtPulse #69	68F2
42070	ExtPulse #70	68F3

Modbus Register	ION Register	ION Handle
42071	ExtPulse #71	68F4
42072	ExtPulse #72	68F5
42073	ExtPulse #73	68F6
42074	ExtPulse #74	68F7
42075	ExtPulse #75	68F8
42076	ExtPulse #76	68F9
42077	ExtPulse #77	68FA
42078	ExtPulse #78	68FB
42079	ExtPulse #79	68FC
42080	ExtPulse #80	68FD
42081	ExtPulse #81	68FE
42082	ExtPulse #82	68FF
42083	ExtPulse #83	6900
42084	ExtPulse #84	6901
42085	ExtPulse #85	6902
42086	ExtPulse #86	6903
42087	ExtPulse #87	6904
42088	ExtPulse #88	6905
42089	ExtPulse #89	6906
42090	ExtPulse #90	6907
42091	ExtPulse #91	6908
42092	ExtPulse #92	6909
42093	ExtPulse #93	690A
42094	ExtPulse #94	690B
42095	ExtPulse #95	690C
42096	ExtPulse #96	690D
42097	ExtPulse #97	690E
42098	ExtPulse #98	690F
42099	ExtPulse #99	6910
42100	ExtPulse #100	6911
42101	ExtPulse #101	6912
42102	ExtPulse #102	6913
42103	ExtPulse #103	6914
42104	ExtPulse #104	6915
42105	ExtPulse #105	6916
42106	ExtPulse #106	6917
42107	ExtPulse #107	6918
42108	ExtPulse #108	6919
42109	ExtPulse #109	691A
42110	ExtPulse #110	691B
42111	ExtPulse #111	691C
42112	ExtPulse #112	691D
42113	ExtPulse #113	691E
42114	ExtPulse #114	691F
42115	ExtPulse #115	6920
42116	ExtPulse #116	6921
42117	ExtPulse #117	6922
42118	ExtPulse #118	6923
42119	ExtPulse #119	6924
42120	ExtPulse #120	6925
42121	ExtPulse #121	6926
42122	ExtPulse #122	6927
42123	ExtPulse #123	6928
42124	ExtPulse #124	6929
42125	ExtPulse #125	692A
42126	ExtPulse #126	692B
42127	ExtPulse #127	692C
42128	ExtPulse #128	692D

3.2 External Boolean Registers

External Boolean registers provide an interface to manually turn a signal ON or OFF. For example, these registers could be used to enable or disable ION modules. The functionality depends on the device's ION linkages.

A value of one for a Boolean register represents 'ON'. A value of zero represents 'OFF'. Writing a value other than zero or one will result in the value of one being written.

Modbus Register	ION Register	ION Handle
42201	ExtBool #1	608F
42202	ExtBool #2	6090
42203	ExtBool #3	6091
42204	ExtBool #4	6092
42205	ExtBool #5	6093
42206	ExtBool #6	6094
42207	ExtBool #7	6095
42208	ExtBool #8	6096
42209	ExtBool #9	6097
42210	ExtBool #10	6098
42211	ExtBool #11	6099
42212	ExtBool #12	609A
42213	ExtBool #13	609B
42214	ExtBool #14	609C
42215	ExtBool #15	609D
42216	ExtBool #16	609E
42217	ExtBool #17	609F
42218	ExtBool #18	60A0
42219	ExtBool #19	60A1
42220	ExtBool #20	60A2
42221	ExtBool #21	60A3
42222	ExtBool #22	60A4
42223	ExtBool #23	60A5
42224	ExtBool #24	60A6
42225	ExtBool #25	60A7
42226	ExtBool #26	60A8

Modbus Register	ION Register	ION Handle
42227	ExtBool #27	60A9
42228	ExtBool #28	60AA
42229	ExtBool #29	60AB
42230	ExtBool #30	60AC
42231	ExtBool #31	60AD
42232	ExtBool #32	60AE

3.3 External Numeric Registers

External Numeric registers can be set to a certain value. Consult the *7700 ION User's Guide* and the *ION Reference* for an example of how and where these registers might be used.

The External Numeric registers are 32-bit values which each span 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.

Modbus Registers	ION Register	ION Handle
42301 to 42302	ExtNum #1	5ADC
42303 to 42304	ExtNum #2	5ADD
42305 to 42306	ExtNum #3	5ADE
42307 to 42308	ExtNum #4	5ADF
42309 to 42310	ExtNum #5	5AE0
42311 to 42312	ExtNum #6	5AE1
42313 to 42314	ExtNum #7	5AE2
42315 to 42316	ExtNum #8	5AE3

4. ION SETUP REGISTERS

All ION module setup register that are of type ENUMERATED or NUMERIC BOUNDED are available to be READ and WRITTEN via Modbus. This section describes how those registers appear in the Modbus register map.

Note: It is recommended that only one register be written for a Preset Multiple Registers when writing ION setup registers.

4.1 Enumerated Setup Registers

All ION module ENUMERATED setup registers are available to be READ and WRITTEN via Modbus. This section defines how those enumerated registers appear as Modbus registers.

How to interpret this table: Registers are ordered by Modbus register address and grouped by enumeration. For example, registers 44002-44004 all use one enumeration list (0 = 'Normal', 1 = 'Inverted'). Similarly, the group of registers 44007-44044 use another enumeration list (0 = 'Pulse', 1 = 'KYZ').

Modbus Register	ION Register	ION Handle	Enumeration
44001	PM Volts Mode	7800	0='4W-WYE' 1='DELTA' 2='SINGLE' 3='DEMO' 4='3W-WYE'
44002	PM I1Polarity	7801	0='Normal'
44003	PM I2Polarity	7802	1='Inverted'
44004	PM I3Polarity	7803	...
44005	PM PhaseOrder	7804	0='ABC' 1='ACB'
44006	PM Phase Lbls	7805	0='ABC' 1='RST' 2='XYZ' 3='RYB' 4='RWB' 5='123'
44007	DI01 Input Mode	7806	0='Pulse'
44008	DI02 Input Mode	7807	1='KYZ'
44009	DI03 Input Mode	7808	...
44010	DI04 Input Mode	7809	...
44011	DI05 Input Mode	780A	...
44012	DI06 Input Mode	780B	...
44013	DI07 Input Mode	780C	...
44014	DI08 Input Mode	780D	...
44015	DI09 Input Mode	780E	...
44016	DI10 Input Mode	780F	...
44017	DI11 Input Mode	7810	...
44018	DI12 Input Mode	7811	...
44019	DI13 Input Mode	7812	...
44020	DI14 Input Mode	7813	...
44021	DI15 Input Mode	7814	...
44022	DI16 Input Mode	7815	...
44023	DI17 Input Mode	7816	...
44024	DI18 Input Mode	7817	...
44025	DI19 Input Mode	7818	...

Modbus Register	ION Register	ION Handle	Enumeration
44026	DI20 Input Mode	7819	...
44027	DI21 Input Mode	781A	...
44028	DI22 Input Mode	781B	...
44029	DI23 Input Mode	781C	...
44030	DI24 Input Mode	781D	...
44031	DI25 Input Mode	781E	...
44032	DI26 Input Mode	781F	...
44033	DI27 Input Mode	7820	...
44034	DI28 Input Mode	7821	...
44035	DI29 Input Mode	7822	...
44036	DI30 Input Mode	7823	...
44037	DI31 Input Mode	7824	...
44038	DI32 Input Mode	7825	...
44039	DI33 Input Mode	7826	...
44040	DI34 Input Mode	7827	...
44041	DI35 Input Mode	7828	...
44042	DI36 Input Mode	7829	...
44043	DI37 Input Mode	782A	...
44044	DI38 Input Mode	782B	...
44045	DI01 EvLog Mode	782C	0='Log Off'
44046	DI02 EvLog Mode	782D	1='Log On'
44047	DI03 EvLog Mode	782E	...
44048	DI04 EvLog Mode	782F	...
44049	DI05 EvLog Mode	7830	...
44050	DI06 EvLog Mode	7831	...
44051	DI07 EvLog Mode	7832	...
44052	DI08 EvLog Mode	7833	...
44053	DI09 EvLog Mode	7834	...
44054	DI10 EvLog Mode	7835	...
44055	DI11 EvLog Mode	7836	...
44056	DI12 EvLog Mode	7837	...
44057	DI13 EvLog Mode	7838	...
44058	DI14 EvLog Mode	7839	...
44059	DI15 EvLog Mode	783A	...
44060	DI16 EvLog Mode	783B	...
44061	DI17 EvLog Mode	783C	...
44062	DI18 EvLog Mode	783D	...
44063	DI19 EvLog Mode	783E	...
44064	DI20 EvLog Mode	783F	...
44065	DI21 EvLog Mode	7840	...
44066	DI22 EvLog Mode	7841	...
44067	DI23 EvLog Mode	7842	...
44068	DI24 EvLog Mode	7843	...
44069	DI25 EvLog Mode	7844	...
44070	DI26 EvLog Mode	7845	...
44071	DI27 EvLog Mode	7846	...
44072	DI28 EvLog Mode	7847	...
44073	DI29 EvLog Mode	7848	...
44074	DI30 EvLog Mode	7849	...
44075	DI31 EvLog Mode	784A	...
44076	DI32 EvLog Mode	784B	...
44077	DI33 EvLog Mode	784C	...
44078	DI34 EvLog Mode	784D	...
44079	DI35 EvLog Mode	784E	...
44080	DI36 EvLog Mode	784F	...
44081	DI37 EvLog Mode	7850	...
44082	DI38 EvLog Mode	7851	...

Modbus Register	ION Register	ION Handle	Enumeration
44083	DI01 Polarity	7852	0='Non-Inverting'
44084	DI02 Polarity	7853	1='Inverting'
44085	DI03 Polarity	7854	...
44086	DI04 Polarity	7855	...
44087	DI05 Polarity	7856	...
44088	DI06 Polarity	7857	...
44089	DI07 Polarity	7858	...
44090	DI08 Polarity	7859	...
44091	DI09 Polarity	785A	...
44092	DI10 Polarity	785B	...
44093	DI11 Polarity	785C	...
44094	DI12 Polarity	785D	...
44095	DI13 Polarity	785E	...
44096	DI14 Polarity	785F	...
44097	DI15 Polarity	7860	...
44098	DI16 Polarity	7861	...
44099	DI17 Polarity	7862	...
44100	DI18 Polarity	7863	...
44101	DI19 Polarity	7864	...
44102	DI20 Polarity	7865	...
44103	DI21 Polarity	7866	...
44104	DI22 Polarity	7867	...
44105	DI23 Polarity	7868	...
44106	DI24 Polarity	7869	...
44107	DI25 Polarity	786A	...
44108	DI26 Polarity	786B	...
44109	DI27 Polarity	786C	...
44110	DI28 Polarity	786D	...
44111	DI29 Polarity	786E	...
44112	DI30 Polarity	786F	...
44113	DI31 Polarity	7870	...
44114	DI32 Polarity	7871	...
44115	DI33 Polarity	7872	...
44116	DI34 Polarity	7873	...
44117	DI35 Polarity	7874	...
44118	DI36 Polarity	7875	...
44119	DI37 Polarity	7876	...
44120	DI38 Polarity	7877	...
44121	DO01 EvLog Mode	7878	0='Log Off'
44122	DO02 EvLog Mode	7879	1='Log On'
44123	DO03 EvLog Mode	787A	...
44124	DO04 EvLog Mode	787B	...
44125	DO05 EvLog Mode	787C	...
44126	DO06 EvLog Mode	787D	...
44127	DO07 EvLog Mode	787E	...
44128	DO08 EvLog Mode	787F	...
44129	DO09 EvLog Mode	7880	...
44130	DO10 EvLog Mode	7881	...
44131	DO11 EvLog Mode	7882	...
44132	DO12 EvLog Mode	7883	...
44133	DO13 EvLog Mode	7884	...
44134	DO14 EvLog Mode	7885	...
44135	DO15 EvLog Mode	7886	...
44136	DO16 EvLog Mode	7887	...
44137	DO17 EvLog Mode	7888	...
44138	DO18 EvLog Mode	7889	...

Modbus Register	ION Register	ION Handle	Enumeration
44139	DO19 EvLog Mode	788A	...
44140	DO20 EvLog Mode	788B	...
44141	DO21 EvLog Mode	788C	...
44142	DO22 EvLog Mode	788D	...
44143	DO23 EvLog Mode	788E	...
44144	DO24 EvLog Mode	788F	...
44145	DO25 EvLog Mode	7890	...
44146	DO26 EvLog Mode	7891	...
44147	DO27 EvLog Mode	7892	...
44148	DO28 EvLog Mode	7893	...
44149	DO29 EvLog Mode	7894	...
44150	DO30 EvLog Mode	7895	...
44151	DO01 Polarity	7896	0='Non-Inverting'
44152	DO02 Polarity	7897	1='Inverting'
44153	DO03 Polarity	7898	...
44154	DO04 Polarity	7899	...
44155	DO05 Polarity	789A	...
44156	DO06 Polarity	789B	...
44157	DO07 Polarity	789C	...
44158	DO08 Polarity	789D	...
44159	DO09 Polarity	789E	...
44160	DO10 Polarity	789F	...
44161	DO11 Polarity	78A0	...
44162	DO12 Polarity	78A1	...
44163	DO13 Polarity	78A2	...
44164	DO14 Polarity	78A3	...
44165	DO15 Polarity	78A4	...
44166	DO16 Polarity	78A5	...
44167	DO17 Polarity	78A6	...
44168	DO18 Polarity	78A7	...
44169	DO19 Polarity	78A8	...
44170	DO20 Polarity	78A9	...
44171	DO21 Polarity	78AA	...
44172	DO22 Polarity	78AB	...
44173	DO23 Polarity	78AC	...
44174	DO24 Polarity	78AD	...
44175	DO25 Polarity	78AE	...
44176	DO26 Polarity	78AF	...
44177	DO27 Polarity	78B0	...
44178	DO28 Polarity	78B1	...
44179	DO29 Polarity	78B2	...
44180	DO30 Polarity	78B3	...
44181	PU01 OutputMode	78B4	0='Pulse'
44182	PU02 OutputMode	78B5	1='KYZ'
44183	PU03 OutputMode	78B6	...
44184	PU04 OutputMode	78B7	...
44185	PU05 OutputMode	78B8	...
44186	PU06 OutputMode	78B9	...
44187	PU07 OutputMode	78BA	...
44188	PU08 OutputMode	78BB	...
44189	PU09 OutputMode	78BC	...
44190	PU10 OutputMode	78BD	...
44191	PU01 Polarity	78BE	0='Non-Inverting'
44192	PU02 Polarity	78BF	1='Inverting'
44193	PU03 Polarity	78C0	...

Modbus Register	ION Register	ION Handle	Enumeration
44194	PU04 Polarity	78C1	...
44195	PU05 Polarity	78C2	...
44196	PU06 Polarity	78C3	...
44197	PU07 Polarity	78C4	...
44198	PU08 Polarity	78C5	...
44199	PU09 Polarity	78C6	...
44200	PU10 Polarity	78C7	...
44201	(unused)	78C8	...
44202	(unused)	78C9	...
44203	(unused)	78CA	...
44204	(unused)	78CB	...
44205	(unused)	78CC	...
44206	(unused)	78CD	...
44207	(unused)	78CE	...
44208	(unused)	78CF	...
44209	(unused)	78D0	...
44210	(unused)	78D1	...
44211	(unused)	78D2	...
44212	(unused)	78D3	...
44213	(unused)	78D4	...
44214	(unused)	78D5	...
44215	(unused)	78D6	...
44216	(unused)	78D7	...
44217	IN01 Mode	78D8	0='Forward'
44218	IN02 Mode	78D9	1='Reverse'
44219	IN03 Mode	78DA	2='Absolute'
44220	IN04 Mode	78DB	3='Net'
44221	IN05 Mode	78DC	...
44222	IN06 Mode	78DD	...
44223	IN07 Mode	78DE	...
44224	IN08 Mode	78DF	...
44225	IN09 Mode	78E0	...
44226	IN10 Mode	78E1	...
44227	IN11 Mode	78E2	...
44228	IN12 Mode	78E3	...
44229	IN13 Mode	78E4	...
44230	IN14 Mode	78E5	...
44231	IN15 Mode	78E6	...
44232	IN16 Mode	78E7	...
44233	SP01 Input Mode	78E8	0='Signed'
44234	SP02 Input Mode	78E9	1='Absolute'
44235	SP03 Input Mode	78EA	...
44236	SP04 Input Mode	78EB	...
44237	SP05 Input Mode	78EC	...
44238	SP06 Input Mode	78ED	...
44239	SP07 Input Mode	78EE	...
44240	SP08 Input Mode	78EF	...
44241	SP09 Input Mode	78F0	...
44242	SP10 Input Mode	78F1	...
44243	SP11 Input Mode	78F2	...
44244	SP12 Input Mode	78F3	...
44245	SP13 Input Mode	78F4	...
44246	SP14 Input Mode	78F5	...
44247	SP15 Input Mode	78F6	...
44248	SP16 Input Mode	78F7	...

Modbus Register	ION Register	ION Handle	Enumeration
44249	SP17 Input Mode	78F8	...
44250	SP18 Input Mode	78F9	...
44251	SP19 Input Mode	78FA	...
44252	SP20 Input Mode	78FB	...
44253	SP21 Input Mode	78FC	...
44254	SP22 Input Mode	78FD	...
44255	SP23 Input Mode	78FE	...
44256	SP24 Input Mode	78FF	...
44257	SP01 Eval Mode	7900	0='LessThan'
44258	SP02 Eval Mode	7901	1='GreaterThan'
44259	SP03 Eval Mode	7902	...
44260	SP04 Eval Mode	7903	...
44261	SP05 Eval Mode	7904	...
44262	SP06 Eval Mode	7905	...
44263	SP07 Eval Mode	7906	...
44264	SP08 Eval Mode	7907	...
44265	SP09 Eval Mode	7908	...
44266	SP10 Eval Mode	7909	...
44267	SP11 Eval Mode	790A	...
44268	SP12 Eval Mode	790B	...
44269	SP13 Eval Mode	790C	...
44270	SP14 Eval Mode	790D	...
44271	SP15 Eval Mode	790E	...
44272	SP16 Eval Mode	790F	...
44273	SP17 Eval Mode	7910	...
44274	SP18 Eval Mode	7911	...
44275	SP19 Eval Mode	7912	...
44276	SP20 Eval Mode	7913	...
44277	SP21 Eval Mode	7914	...
44278	SP22 Eval Mode	7915	...
44279	SP23 Eval Mode	7916	...
44280	SP24 Eval Mode	7917	...
44281	RE01 RecordMode	7918	0='Circular'
44282	RE02 RecordMode	7919	1='Stop-when-Full'
44283	RE03 RecordMode	791A	...
44284	RE04 RecordMode	791B	...
44285	RE05 RecordMode	791C	...
44286	RE06 RecordMode	791D	...
44287	RE07 RecordMode	791E	...
44288	RE08 RecordMode	791F	...
44289	RE09 RecordMode	7920	...
44290	RE10 RecordMode	7921	...
44291	RE11 RecordMode	7922	...
44292	RE12 RecordMode	7923	...
44293	RE13 RecordMode	7924	...
44294	RE14 RecordMode	7925	...
44295	RE15 RecordMode	7926	...
44296	RE16 RecordMode	7927	...
44297	RE17 RecordMode	7928	...
44298	RE18 RecordMode	7929	...
44299	RE19 RecordMode	792A	...
44300	RE20 RecordMode	792B	...
44301	WR01 RecordMode	792C	...
44302	WR02 RecordMode	792D	...
44303	WR03 RecordMode	792E	...
44304	WR04 RecordMode	792F	...

Modbus Register	ION Register	ION Handle	Enumeration
44305	WR05 RecordMode	7930	...
44306	WR06 RecordMode	7931	...
44307	WR07 RecordMode	7932	...
44308	WR08 RecordMode	7933	...
44309	WR09 RecordMode	7934	...
44310	WR10 RecordMode	7935	...
44311	WR11 RecordMode	7936	...
44312	WR12 RecordMode	7937	...
44313	WR01 Format	7938	0='128x14'
44314	WR02 Format	7939	1='64x14'
44315	WR03 Format	793A	2='64x28'
44316	WR04 Format	793B	3='32x12'
44317	WR05 Format	793C	4='32x26'
44318	WR06 Format	793D	5='32x40'
44319	WR07 Format	793E	6='32x54'
44320	WR08 Format	793F	7='16x22'
44321	WR09 Format	7940	8='16x48'
44322	WR10 Format	7941	9='16x72'
44323	WR11 Format	7942	10='16x96'
44324	WR12 Format	7943	...
44325	(unused)	7944	...
44326	(unused)	7945	...
44327	(unused)	7946	...
44328	(unused)	7947	...
44329	(unused)	7948	...
44330	(unused)	7949	...
44331	(unused)	794A	...
44332	(unused)	794B	...
44333	(unused)	794C	...
44334	(unused)	794D	...
44335	(unused)	794E	...
44336	(unused)	794F	...
44337	(unused)	7950	...
44338	(unused)	7951	...
44339	(unused)	7952	...
44340	(unused)	7953	...
44341	(unused)	7954	...
44342	(unused)	7955	...
44343	(unused)	7956	...
44344	(unused)	7957	...
44345	PT01 Sync Mode	7958	0='No Trig on Sync'
44346	PT02 Sync Mode	7959	1='Trigger on Sync'
44347	PT03 Sync Mode	795A	...
44348	PT04 Sync Mode	795B	...
44349	PT05 Sync Mode	795C	...
44350	PT06 Sync Mode	795D	...
44351	PT07 Sync Mode	795E	...
44352	PT08 Sync Mode	795F	...
44353	PT09 Sync Mode	7960	...
44354	PT10 Sync Mode	7961	...
44355	PT11 Sync Mode	7962	...
44356	PT12 Sync Mode	7963	...
44357	PT13 Sync Mode	7964	...
44358	PT14 Sync Mode	7965	...
44359	PT15 Sync Mode	7966	...

Modbus Register	ION Register	ION Handle	Enumeration
44360	PT16 Sync Mode	7967	...
44361	PT17 Sync Mode	7968	...
44362	PT18 Sync Mode	7969	...
44363	PT19 Sync Mode	796A	...
44364	PT20 Sync Mode	796B	...
44365	CN01 Count Mode	796C	0='Up' 1='Down'
44366	CN02 Count Mode	796D	
44367	CN03 Count Mode	796E	...
44368	CN04 Count Mode	796F	...
44369	CN05 Count Mode	7970	...
44370	CN06 Count Mode	7971	...
44371	CN07 Count Mode	7972	...
44372	CN08 Count Mode	7973	...
44373	CN09 Count Mode	7974	...
44374	CN10 Count Mode	7975	...
44375	AN01 Mode	7976	0='AND' 1='NAND' 2='OR' 3='NOR'
44376	AN02 Mode	7977	
44377	AN03 Mode	7978	
44378	AN04 Mode	7979	
44379	AN05 Mode	797A	...
44380	AN06 Mode	797B	...
44381	AN07 Mode	797C	...
44382	AN08 Mode	797D	...
44383	AN01 EvLog Mode	797E	0='Log Off' 1='Log On'
44384	AN02 EvLog Mode	797F	
44385	AN03 EvLog Mode	7980	...
44386	AN04 EvLog Mode	7981	...
44387	AN05 EvLog Mode	7982	...
44388	AN06 EvLog Mode	7983	...
44389	AN07 EvLog Mode	7984	...
44390	AN08 EvLog Mode	7985	...
44391	CM01 Comm Mode	7986	0='RS232' 1='RS485'
44392	CM01 Baud Rate	7987	0='300' 1='1200' 2='2400' 3='4800' 4='9600' 5='19200'
44393	CM01 HshakeMode	7988	0='RTS with Delay' 1='RTS/CTS'
44394	CM01 RTS Level	7989	0='Normal' 1='Inverted'
44395	CM01 CTS Level	798A	0='Normal' 1='Inverted'
44396	FAC NomFreq	798B	0='60Hz' 1='50Hz'
44397	(unused)	798C	...

Modbus Register	ION Register	ION Handle	Enumeration
44398	AI01 Port	798D	0='NotUsed'
44399	AI02 Port	798E	1='PortA-8'
44400	AI03 Port	798F	2='PortA-9'
44401	AI04 Port	7990	3='PortA-10'
44402	AI05 Port	7991	4='PortA-11'
44403	AI06 Port	7992	5='PortA-12'
44404	AI07 Port	7993	6='PortA-13'
44405	AI08 Port	7994	7='PortA-14'
44406	AI09 Port	7995	8='PortB-8'
44407	AI10 Port	7996	9='PortB-9'
44408	AI11 Port	7997	10='PortB-10'
44409	AI12 Port	7998	11='PortB-11'
44410	AI13 Port	7999	12='PortB-12'
44411	AI14 Port	799A	13='PortB-13'
44412	AI15 Port	799B	14='PortB-14'
44413	AI16 Port	799C	15='PortA-0'
44414	AI17 Port	799D	16='PortA-1'
44415	AI18 Port	799E	17='PortA-2'
44416	AO01 Port	799F	18='PortA-3'
44417	AO02 Port	79A0	19='PortA-4'
44418	AO03 Port	79A1	20='PortA-5'
44419	AO04 Port	79A2	21='PortA-6'
44420	AO05 Port	79A3	22='PortA-7'
44421	AO06 Port	79A4	23='PortB-0'
44422	AO07 Port	79A5	24='PortB-1'
44423	AO08 Port	79A6	25='PortB-2'
44424	AO09 Port	79A7	26='PortB-3'
44425	AO10 Port	79A8	27='PortB-4'
44426	AO11 Port	79A9	28='PortB-5'
44427	AO12 Port	79AA	29='PortB-6'
44428	AO13 Port	79AB	30='PortB-7'
44429	AO14 Port	79AC	31='STATUS1'
44430	AO15 Port	79AD	32='STATUS2'
44431	AO16 Port	79AE	33='STATUS3'
44432	AO17 Port	79AF	34='STATUS4'
44433	AO18 Port	79B0	35='STATUS5'
44434	AO19 Port	79B1	36='STATUS6'
44435	AO20 Port	79B2	37='STATUS7'
44436	AO21 Port	79B3	38='STATUS8'
44437	AO22 Port	79B4	39=*Auxiliary 1*
44438	AO23 Port	79B5	40=*Auxiliary 2*
44439	AO24 Port	79B6	41=*Auxiliary 3*
44440	AO25 Port	79B7	42=*Auxiliary 4*
44441	AO26 Port	79B8	43=*Auxiliary 5*
44442	AO27 Port	79B9	44=*Auxiliary 6*
44443	AO28 Port	79BA	45=*Auxiliary 7*
44444	AO29 Port	79BB	46=*Auxiliary 8*
44445	AO30 Port	79BC	...
44446	DO01 Port	79BD	...
44447	DO02 Port	79BE	...
44448	DO03 Port	79BF	...
44449	DO04 Port	79C0	...
44450	DO05 Port	79C1	...
44451	DO06 Port	79C2	...
44452	DO07 Port	79C3	...
44453	DO08 Port	79C4	...
44454	DO09 Port	79C5	...

Modbus Register	ION Register	ION Handle	Enumeration
44455	DO10 Port	79C6	...
44456	DO11 Port	79C7	...
44457	DO12 Port	79C8	...
44458	DO13 Port	79C9	...
44459	DO14 Port	79CA	...
44460	DO15 Port	79CB	...
44461	DO16 Port	79CC	...
44462	DO17 Port	79CD	...
44463	DO18 Port	79CE	...
44464	DO19 Port	79CF	...
44465	DO20 Port	79D0	...
44466	DO21 Port	79D1	...
44467	DO22 Port	79D2	...
44468	DO23 Port	79D3	...
44469	DO24 Port	79D4	...
44470	DO25 Port	79D5	...
44471	DO26 Port	79D6	...
44472	DO27 Port	79D7	...
44473	DO28 Port	79D8	...
44474	DO29 Port	79D9	...
44475	DO30 Port	79DA	...
44476	DI01 Port	79DB	...
44477	DI02 Port	79DC	...
44478	DI03 Port	79DD	...
44479	DI04 Port	79DE	...
44480	DI05 Port	79DF	...
44481	DI06 Port	79E0	...
44482	DI07 Port	79E1	...
44483	DI08 Port	79E2	...
44484	DI09 Port	79E3	...
44485	DI10 Port	79E4	...
44486	DI11 Port	79E5	...
44487	DI12 Port	79E6	...
44488	DI13 Port	79E7	...
44489	DI14 Port	79E8	...
44490	DI15 Port	79E9	...
44491	DI16 Port	79EA	...
44492	DI17 Port	79EB	...
44493	DI18 Port	79EC	...
44494	DI19 Port	79ED	...
44495	DI20 Port	79EE	...
44496	DI21 Port	79EF	...
44497	DI22 Port	79F0	...
44498	DI23 Port	79F1	...
44499	DI24 Port	79F2	...
44500	DI25 Port	79F3	...
44501	DI26 Port	79F4	...
44502	DI27 Port	79F5	...
44503	DI28 Port	79F6	...
44504	DI29 Port	79F7	...
44505	DI30 Port	79F8	...
44506	DI31 Port	79F9	...
44507	DI32 Port	79FA	...
44508	DI33 Port	79FB	...
44509	DI34 Port	79FC	...
44510	DI35 Port	79FD	...
44511	DI36 Port	79FE	...
44512	DI37 Port	79FF	...

Modbus Register	ION Register	ION Handle	Enumeration
44513	DI38 Port	7A00	...
44514	PU01 Port	7A01	...
44515	PU02 Port	7A02	...
44516	PU03 Port	7A03	...
44517	PU04 Port	7A04	...
44518	PU05 Port	7A05	...
44519	PU06 Port	7A06	...
44520	PU07 Port	7A07	...
44521	PU08 Port	7A08	...
44522	PU09 Port	7A09	...
44523	PU10 Port	7A0A	...
44524	(unused)	7A0B	...
44525	(unused)	7A0C	...
44526	(unused)	7A0D	...
44527	(unused)	7A0E	...
44528	(unused)	7A0F	...
44529	(unused)	7A10	...
44530	(unused)	7A11	...
44531	(unused)	7A12	...
44532	(unused)	7A13	...
44533	(unused)	7A14	...
44534	(unused)	7A15	...
44535	(unused)	7A16	...
44536	(unused)	7A17	...
44537	(unused)	7A18	...
44538	(unused)	7A19	...
44539	(unused)	7A1A	...
44540	(unused)	7A1B	...
44541	(unused)	7A1C	...
44542	(unused)	7A1D	...
44543	(unused)	7A1E	...
44544	(unused)	7A1F	...
44545	(unused)	7A20	...
44546	(unused)	7A21	...
44547	(unused)	7A22	...
44548	(unused)	7A23	...
44549	(unused)	7A24	...
44550	(unused)	7A25	...
44551	(unused)	7A26	...
44552	(unused)	7A27	...
44553	(unused)	7A28	...
44554	(unused)	7A29	...
44555	(unused)	7A2A	...
44556	(unused)	7A2B	...
44557	(unused)	7A2C	...
44558	(unused)	7A2D	...
44559	(unused)	7A2E	...
44560	(unused)	7A2F	...
44561	(unused)	7A30	...
44562	(unused)	7A31	...
44563	(unused)	7A32	...
44564	(unused)	7A33	...
44565	(unused)	7A34	...
44566	(unused)	7A35	...
44567	(unused)	7A36	...
44568	(unused)	7A37	...
44569	(unused)	7A38	...

Modbus Register	ION Register	ION Handle	Enumeration
44570	(unused)	7A39	...
44571	(unused)	7A3A	...
44572	(unused)	7A3B	...
44573	(unused)	7A3C	...
44574	PG01 EvLog Mode	7A3D	0='Log Off'
44575	PG02 EvLog Mode	7A3E	1='Log On'
44576	PG03 EvLog Mode	7A3F	...
44577	PG04 EvLog Mode	7A40	...
44578	PG05 EvLog Mode	7A41	...
44579	PG06 EvLog Mode	7A42	...
44580	PG07 EvLog Mode	7A43	...
44581	PG08 EvLog Mode	7A44	...
44582	WR13 RecordMode	7A45	0='Circular'
44583	WR14 RecordMode	7A46	1='Stop-when-Full'
44584	WR13 Format	7A47	0='128x14'
44585	WR14 Format	7A48	1='64x14' 2='64x28' 3='32x12' 4='32x26' 5='32x40' 6='32x54' 7='16x22' 8='16x48' 9='16x72' 10='16x96'
44586	PM I4Polarity	7A49	0='Normal'
44587	PM V1Polarity	7A4A	1='Inverted'
44588	PM V2Polarity	7A4B	...
44589	PM V3Polarity	7A4C	...
44590	CM02 Baud Rate	7A4D	0='300'
44591	CM03 Baud Rate	7A4E	1='1200' 2='2400' 3='4800' 4='9600' 5='19200' 6='38400' 7='57600' 8='115200'
44592	CM01 Protocol	7A4F	0='ION' 1='MODBUS RTU' 3='FACTORY' 6='GPS:TRUETIME/DATUM' 7='GPS:ARBITER'
44593	CM02 Protocol	7A50	0='ION' 1='MODBUS RTU' 4='DNP 3.0' 6='GPS:TRUETIME/DATUM' 7='GPS:ARBITER' 100='ETHERGATE'
44594	CM03 Protocol	7A51	0='ION' 1='MODBUS RTU' 4='DNP 3.0'

Modbus Register	ION Register	ION Handle	Enumeration
			6=’GPS:TRUETIME/DATUM’ 7=’GPS:ARBITER’ 100=’ETHERGATE’
44595	Ether Protocol	7A52	0='ION' 1=’MODBUS RTU’
44596	MSR1 Format	7A53	0='Unsigned 16B'
44597	MSR2 Format	7A54	1='Signed 16B'
44598	MSR3 Format	7A55	2='Unsigned 32B'
44599	MSR4 Format	7A56	3='Signed 32B' 4='Unsigned 32B-M10K' 5='Signed 32B-M10K' 6='Packed Boolean'
44600	MSR1 Scaling	7A57	0='No'
44601	MSR2 Scaling	7A58	1='Yes'
44602	MSR3 Scaling	7A59	...
44603	MSR4 Scaling	7A5A	...

4.2 Numeric Bounded Setup Registers

All ION module NUMERIC BOUNDED setup registers are available to be READ and WRITTEN via Modbus. This section defines how those enumerated registers appear as Modbus registers.

How to interpret this table: Registers are ordered by Modbus register address, and grouped by numeric bounds. Each ION register (32-bit integer) 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 a Numeric Bounded Setup 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.

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46001 to 46002	PM PT Prim	7000	1	999999
46003 to 46004	PM PT Sec	7001	1	999999
46005 to 46006	PM CT Prim	7002	1	999999
46007 to 46008	PM CT Sec	7003	1	999999
46009 to 46010	PM I4 CT Prim	7004	1	999999
46011 to 46012	PM I4 CT Sec	7005	1	999999
46013 to 46014	AI01 Zero Scale	7006	-1000000000	1000000000
46015 to 46016	AI02 Zero Scale	7007	-1000000000	1000000000
46017 to 46018	AI03 Zero Scale	7008	-1000000000	1000000000
46019 to 46020	AI04 Zero Scale	7009	-1000000000	1000000000
46021 to 46022	AI05 Zero Scale	700A	-1000000000	1000000000
46023 to 46024	AI06 Zero Scale	700B	-1000000000	1000000000
46025 to 46026	AI07 Zero Scale	700C	-1000000000	1000000000
46027 to 46028	AI08 Zero Scale	700D	-1000000000	1000000000
46029 to 46030	AI09 Zero Scale	700E	-1000000000	1000000000
46031 to 46032	AI10 Zero Scale	700F	-1000000000	1000000000
46033 to 46034	AI11 Zero Scale	7010	-1000000000	1000000000
46035 to 46036	AI12 Zero Scale	7011	-1000000000	1000000000
46037 to 46038	AI13 Zero Scale	7012	-1000000000	1000000000
46039 to 46040	AI14 Zero Scale	7013	-1000000000	1000000000
46041 to 46042	AI15 Zero Scale	7014	-1000000000	1000000000
46043 to 46044	AI16 Zero Scale	7015	-1000000000	1000000000
46045 to 46046	AI17 Zero Scale	7016	-1000000000	1000000000
46047 to 46048	AI18 Zero Scale	7017	-1000000000	1000000000
46049 to 46050	AI01 Full Scale	7018	-1000000000	1000000000
46051 to 46052	AI02 Full Scale	7019	-1000000000	1000000000
46053 to 46054	AI03 Full Scale	701A	-1000000000	1000000000
46055 to 46056	AI04 Full Scale	701B	-1000000000	1000000000
46057 to 46058	AI05 Full Scale	701C	-1000000000	1000000000
46059 to 46060	AI06 Full Scale	701D	-1000000000	1000000000
46061 to 46062	AI07 Full Scale	701E	-1000000000	1000000000
46063 to 46064	AI08 Full Scale	701F	-1000000000	1000000000
46065 to 46066	AI09 Full Scale	7020	-1000000000	1000000000
46067 to 46068	AI10 Full Scale	7021	-1000000000	1000000000
46069 to 46070	AI11 Full Scale	7022	-1000000000	1000000000
46071 to 46072	AI12 Full Scale	7023	-1000000000	1000000000
46073 to 46074	AI13 Full Scale	7024	-1000000000	1000000000
46075 to 46076	AI14 Full Scale	7025	-1000000000	1000000000
46077 to 46078	AI15 Full Scale	7026	-1000000000	1000000000
46079 to 46080	AI16 Full Scale	7027	-1000000000	1000000000
46081 to 46082	AI17 Full Scale	7028	-1000000000	1000000000
46083 to 46084	AI18 Full Scale	7029	-1000000000	1000000000

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46085 to 46086	AO01 Zero Scale	702A	-1000000000	1000000000
46087 to 46088	AO02 Zero Scale	702B	-1000000000	1000000000
46089 to 46090	AO03 Zero Scale	702C	-1000000000	1000000000
46091 to 46092	AO04 Zero Scale	702D	-1000000000	1000000000
46093 to 46094	AO05 Zero Scale	702E	-1000000000	1000000000
46095 to 46096	AO06 Zero Scale	702F	-1000000000	1000000000
46097 to 46098	AO07 Zero Scale	7030	-1000000000	1000000000
46099 to 46100	AO08 Zero Scale	7031	-1000000000	1000000000
46101 to 46102	AO09 Zero Scale	7032	-1000000000	1000000000
46103 to 46104	AO10 Zero Scale	7033	-1000000000	1000000000
46105 to 46106	AO11 Zero Scale	7034	-1000000000	1000000000
46107 to 46108	AO12 Zero Scale	7035	-1000000000	1000000000
46109 to 46110	AO13 Zero Scale	7036	-1000000000	1000000000
46111 to 46112	AO14 Zero Scale	7037	-1000000000	1000000000
46113 to 46114	AO15 Zero Scale	7038	-1000000000	1000000000
46115 to 46116	AO16 Zero Scale	7039	-1000000000	1000000000
46117 to 46118	AO17 Zero Scale	703A	-1000000000	1000000000
46119 to 46120	AO18 Zero Scale	703B	-1000000000	1000000000
46121 to 46122	AO19 Zero Scale	703C	-1000000000	1000000000
46123 to 46124	AO20 Zero Scale	703D	-1000000000	1000000000
46125 to 46126	AO21 Zero Scale	703E	-1000000000	1000000000
46127 to 46128	AO22 Zero Scale	703F	-1000000000	1000000000
46129 to 46130	AO23 Zero Scale	7040	-1000000000	1000000000
46131 to 46132	AO24 Zero Scale	7041	-1000000000	1000000000
46133 to 46134	AO25 Zero Scale	7042	-1000000000	1000000000
46135 to 46136	AO26 Zero Scale	7043	-1000000000	1000000000
46137 to 46138	AO27 Zero Scale	7044	-1000000000	1000000000
46139 to 46140	AO28 Zero Scale	7045	-1000000000	1000000000
46141 to 46142	AO29 Zero Scale	7046	-1000000000	1000000000
46143 to 46144	AO30 Zero Scale	7047	-1000000000	1000000000
46145 to 46146	AO01 Full Scale	7048	-1000000000	1000000000
46147 to 46148	AO02 Full Scale	7049	-1000000000	1000000000
46149 to 46150	AO03 Full Scale	704A	-1000000000	1000000000
46151 to 46152	AO04 Full Scale	704B	-1000000000	1000000000
46153 to 46154	AO05 Full Scale	704C	-1000000000	1000000000
46155 to 46156	AO06 Full Scale	704D	-1000000000	1000000000
46157 to 46158	AO07 Full Scale	704E	-1000000000	1000000000
46159 to 46160	AO08 Full Scale	704F	-1000000000	1000000000
46161 to 46162	AO09 Full Scale	7050	-1000000000	1000000000
46163 to 46164	AO10 Full Scale	7051	-1000000000	1000000000
46165 to 46166	AO11 Full Scale	7052	-1000000000	1000000000
46167 to 46168	AO12 Full Scale	7053	-1000000000	1000000000
46169 to 46170	AO13 Full Scale	7054	-1000000000	1000000000
46171 to 46172	AO14 Full Scale	7055	-1000000000	1000000000
46173 to 46174	AO15 Full Scale	7056	-1000000000	1000000000
46175 to 46176	AO16 Full Scale	7057	-1000000000	1000000000
46177 to 46178	AO17 Full Scale	7058	-1000000000	1000000000
46179 to 46180	AO18 Full Scale	7059	-1000000000	1000000000
46181 to 46182	AO19 Full Scale	705A	-1000000000	1000000000
46183 to 46184	AO20 Full Scale	705B	-1000000000	1000000000
46185 to 46186	AO21 Full Scale	705C	-1000000000	1000000000
46187 to 46188	AO22 Full Scale	705D	-1000000000	1000000000
46189 to 46190	AO23 Full Scale	705E	-1000000000	1000000000
46191 to 46192	AO24 Full Scale	705F	-1000000000	1000000000
46193 to 46194	AO25 Full Scale	7060	-1000000000	1000000000
46195 to 46196	AO26 Full Scale	7061	-1000000000	1000000000

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46197 to 46198	AO27 Full Scale	7062	-1000000000	1000000000
46199 to 46200	AO28 Full Scale	7063	-1000000000	1000000000
46201 to 46202	AO29 Full Scale	7064	-1000000000	1000000000
46203 to 46204	AO30 Full Scale	7065	-1000000000	1000000000
46205 to 46206	DI01 Debounce	7066	0	65
46207 to 46208	DI02 Debounce	7067	0	65
46209 to 46210	DI03 Debounce	7068	0	65
46211 to 46212	DI04 Debounce	7069	0	65
46213 to 46214	DI05 Debounce	706A	0	65
46215 to 46216	DI06 Debounce	706B	0	65
46217 to 46218	DI07 Debounce	706C	0	65
46219 to 46220	DI08 Debounce	706D	0	65
46221 to 46222	DI09 Debounce	706E	0	65
46223 to 46224	DI10 Debounce	706F	0	65
46225 to 46226	DI11 Debounce	7070	0	65
46227 to 46228	DI12 Debounce	7071	0	65
46229 to 46230	DI13 Debounce	7072	0	65
46231 to 46232	DI14 Debounce	7073	0	65
46233 to 46234	DI15 Debounce	7074	0	65
46235 to 46236	DI16 Debounce	7075	0	65
46237 to 46238	DI17 Debounce	7076	0	65
46239 to 46240	DI18 Debounce	7077	0	65
46241 to 46242	DI19 Debounce	7078	0	65
46243 to 46244	DI20 Debounce	7079	0	65
46245 to 46246	DI21 Debounce	707A	0	65
46247 to 46248	DI22 Debounce	707B	0	65
46249 to 46250	DI23 Debounce	707C	0	65
46251 to 46252	DI24 Debounce	707D	0	65
46253 to 46254	DI25 Debounce	707E	0	65
46255 to 46256	DI26 Debounce	707F	0	65
46257 to 46258	DI27 Debounce	7080	0	65
46259 to 46260	DI28 Debounce	7081	0	65
46261 to 46262	DI29 Debounce	7082	0	65
46263 to 46264	DI30 Debounce	7083	0	65
46265 to 46266	DI31 Debounce	7084	0	65
46267 to 46268	DI32 Debounce	7085	0	65
46269 to 46270	DI33 Debounce	7086	0	65
46271 to 46272	DI34 Debounce	7087	0	65
46273 to 46274	DI35 Debounce	7088	0	65
46275 to 46276	DI36 Debounce	7089	0	65
46277 to 46278	DI37 Debounce	708A	0	65
46279 to 46280	DI38 Debounce	708B	0	65
46281 to 46282	DO01 PulseWidth	708C	0	2000000
46283 to 46284	DO02 PulseWidth	708D	0	2000000
46285 to 46286	DO03 PulseWidth	708E	0	2000000
46287 to 46288	DO04 PulseWidth	708F	0	2000000
46289 to 46290	DO05 PulseWidth	7090	0	2000000
46291 to 46292	DO06 PulseWidth	7091	0	2000000
46293 to 46294	DO07 PulseWidth	7092	0	2000000
46295 to 46296	DO08 PulseWidth	7093	0	2000000
46297 to 46298	DO09 PulseWidth	7094	0	2000000
46299 to 46300	DO10 PulseWidth	7095	0	2000000
46301 to 46302	DO11 PulseWidth	7096	0	2000000
46303 to 46304	DO12 PulseWidth	7097	0	2000000
46305 to 46306	DO13 PulseWidth	7098	0	2000000
46307 to 46308	DO14 PulseWidth	7099	0	2000000

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46309 to 46310	DO15 PulseWidth	709A	0	2000000
46311 to 46312	DO16 PulseWidth	709B	0	2000000
46313 to 46314	DO17 PulseWidth	709C	0	2000000
46315 to 46316	DO18 PulseWidth	709D	0	2000000
46317 to 46318	DO19 PulseWidth	709E	0	2000000
46319 to 46320	DO20 PulseWidth	709F	0	2000000
46321 to 46322	DO21 PulseWidth	70A0	0	2000000
46323 to 46324	DO22 PulseWidth	70A1	0	2000000
46325 to 46326	DO23 PulseWidth	70A2	0	2000000
46327 to 46328	DO24 PulseWidth	70A3	0	2000000
46329 to 46330	DO25 PulseWidth	70A4	0	2000000
46331 to 46332	DO26 PulseWidth	70A5	0	2000000
46333 to 46334	DO27 PulseWidth	70A6	0	2000000
46335 to 46336	DO28 PulseWidth	70A7	0	2000000
46337 to 46338	DO29 PulseWidth	70A8	0	2000000
46339 to 46340	DO30 PulseWidth	70A9	0	2000000
46341 to 46342	PU01 PulseWidth	70AA	1	2000000
46343 to 46344	PU02 PulseWidth	70AB	1	2000000
46345 to 46346	PU03 PulseWidth	70AC	1	2000000
46347 to 46348	PU04 PulseWidth	70AD	1	2000000
46349 to 46350	PU05 PulseWidth	70AE	1	2000000
46351 to 46352	PU06 PulseWidth	70AF	1	2000000
46353 to 46354	PU07 PulseWidth	70B0	1	2000000
46355 to 46356	PU08 PulseWidth	70B1	1	2000000
46357 to 46358	PU09 PulseWidth	70B2	1	2000000
46359 to 46360	PU10 PulseWidth	70B3	1	2000000
46361 to 46362	SD01 Sub Intvl	70B4	60	5940
46363 to 46364	SD02 Sub Intvl	70B5	60	5940
46365 to 46366	SD03 Sub Intvl	70B6	60	5940
46367 to 46368	SD04 Sub Intvl	70B7	60	5940
46369 to 46370	SD05 Sub Intvl	70B8	60	5940
46371 to 46372	SD06 Sub Intvl	70B9	60	5940
46373 to 46374	SD07 Sub Intvl	70BA	60	5940
46375 to 46376	SD08 Sub Intvl	70BB	60	5940
46377 to 46378	SD09 Sub Intvl	70BC	60	5940
46379 to 46380	SD10 Sub Intvl	70BD	60	5940
46381 to 46382	SD11 Sub Intvl	70BE	60	5940
46383 to 46384	SD12 Sub Intvl	70BF	60	5940
46385 to 46386	SD13 Sub Intvl	70C0	60	5940
46387 to 46388	SD14 Sub Intvl	70C1	60	5940
46389 to 46390	SD15 Sub Intvl	70C2	60	5940
46391 to 46392	SD16 Sub Intvl	70C3	60	5940
46393 to 46394	SD01 #SubIntvls	70C4	1	15
46395 to 46396	SD02 #SubIntvls	70C5	1	15
46397 to 46398	SD03 #SubIntvls	70C6	1	15
46399 to 46400	SD04 #SubIntvls	70C7	1	15
46401 to 46402	SD05 #SubIntvls	70C8	1	15
46403 to 46404	SD06 #SubIntvls	70C9	1	15
46405 to 46406	SD07 #SubIntvls	70CA	1	15
46407 to 46408	SD08 #SubIntvls	70CB	1	15
46409 to 46410	SD09 #SubIntvls	70CC	1	15
46411 to 46412	SD10 #SubIntvls	70CD	1	15
46413 to 46414	SD11 #SubIntvls	70CE	1	15
46415 to 46416	SD12 #SubIntvls	70CF	1	15
46417 to 46418	SD13 #SubIntvls	70D0	1	15

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46419 to 46420	SD14 #SubIntvls	70D1	1	15
46421 to 46422	SD15 #SubIntvls	70D2	1	15
46423 to 46424	SD16 #SubIntvls	70D3	1	15
46425 to 46426	SD01 Pred Resp	70D4	0	99
46427 to 46428	SD02 Pred Resp	70D5	0	99
46429 to 46430	SD03 Pred Resp	70D6	0	99
46431 to 46432	SD04 Pred Resp	70D7	0	99
46433 to 46434	SD05 Pred Resp	70D8	0	99
46435 to 46436	SD06 Pred Resp	70D9	0	99
46437 to 46438	SD07 Pred Resp	70DA	0	99
46439 to 46440	SD08 Pred Resp	70DB	0	99
46441 to 46442	SD09 Pred Resp	70DC	0	99
46443 to 46444	SD10 Pred Resp	70DD	0	99
46445 to 46446	SD11 Pred Resp	70DE	0	99
46447 to 46448	SD12 Pred Resp	70DF	0	99
46449 to 46450	SD13 Pred Resp	70E0	0	99
46451 to 46452	SD14 Pred Resp	70E1	0	99
46453 to 46454	SD15 Pred Resp	70E2	0	99
46455 to 46456	SD16 Pred Resp	70E3	0	99
46457 to 46458	TD01 Interval	70E4	60	5940
46459 to 46460	TD02 Interval	70E5	60	5940
46461 to 46462	TD03 Interval	70E6	60	5940
46463 to 46464	TD04 Interval	70E7	60	5940
46465 to 46466	TD05 Interval	70E8	60	5940
46467 to 46468	TD06 Interval	70E9	60	5940
46469 to 46470	TD07 Interval	70EA	60	5940
46471 to 46472	TD08 Interval	70EB	60	5940
46473 to 46474	TD09 Interval	70EC	60	5940
46475 to 46476	TD10 Interval	70ED	60	5940
46477 to 46478	TD11 Interval	70EE	60	5940
46479 to 46480	TD12 Interval	70EF	60	5940
46481 to 46482	TD13 Interval	70F0	60	5940
46483 to 46484	TD14 Interval	70F1	60	5940
46485 to 46486	TD15 Interval	70F2	60	5940
46487 to 46488	TD16 Interval	70F3	60	5940
46489 to 46490	TD01 Time Const	70F4	1	99
46491 to 46492	TD02 Time Const	70F5	1	99
46493 to 46494	TD03 Time Const	70F6	1	99
46495 to 46496	TD04 Time Const	70F7	1	99
46497 to 46498	TD05 Time Const	70F8	1	99
46499 to 46500	TD06 Time Const	70F9	1	99
46501 to 46502	TD07 Time Const	70FA	1	99
46503 to 46504	TD08 Time Const	70FB	1	99
46505 to 46506	TD09 Time Const	70FC	1	99
46507 to 46508	TD10 Time Const	70FD	1	99
46509 to 46510	TD11 Time Const	70FE	1	99
46511 to 46512	TD12 Time Const	70FF	1	99
46513 to 46514	TD13 Time Const	7100	1	99
46515 to 46516	TD14 Time Const	7101	1	99
46517 to 46518	TD15 Time Const	7102	1	99
46519 to 46520	TD16 Time Const	7103	1	99
46521 to 46522	IN01 Divisor	7104	1	1000000
46523 to 46524	IN02 Divisor	7105	1	1000000
46525 to 46526	IN03 Divisor	7106	1	1000000

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46527 to 46528	IN04 Divisor	7107	1	1000000
46529 to 46530	IN05 Divisor	7108	1	1000000
46531 to 46532	IN06 Divisor	7109	1	1000000
46533 to 46534	IN07 Divisor	710A	1	1000000
46535 to 46536	IN08 Divisor	710B	1	1000000
46537 to 46538	IN09 Divisor	710C	1	1000000
46539 to 46540	IN10 Divisor	710D	1	1000000
46541 to 46542	IN11 Divisor	710E	1	1000000
46543 to 46544	IN12 Divisor	710F	1	1000000
46545 to 46546	IN13 Divisor	7110	1	1000000
46547 to 46548	IN14 Divisor	7111	1	1000000
46549 to 46550	IN15 Divisor	7112	1	1000000
46551 to 46552	IN16 Divisor	7113	1	1000000
46553 to 46554	IN01 Valu/Pulse	7114	0	1000000000
46555 to 46556	IN02 Valu/Pulse	7115	0	1000000000
46557 to 46558	IN03 Valu/Pulse	7116	0	1000000000
46559 to 46560	IN04 Valu/Pulse	7117	0	1000000000
46561 to 46562	IN05 Valu/Pulse	7118	0	1000000000
46563 to 46564	IN06 Valu/Pulse	7119	0	1000000000
46565 to 46566	IN07 Valu/Pulse	711A	0	1000000000
46567 to 46568	IN08 Valu/Pulse	711B	0	1000000000
46569 to 46570	IN09 Valu/Pulse	711C	0	1000000000
46571 to 46572	IN10 Valu/Pulse	711D	0	1000000000
46573 to 46574	IN11 Valu/Pulse	711E	0	1000000000
46575 to 46576	IN12 Valu/Pulse	711F	0	1000000000
46577 to 46578	IN13 Valu/Pulse	7120	0	1000000000
46579 to 46580	IN14 Valu/Pulse	7121	0	1000000000
46581 to 46582	IN15 Valu/Pulse	7122	0	1000000000
46583 to 46584	IN16 Valu/Pulse	7123	0	1000000000
46585 to 46586	SP01 High Limit	7124	-1000000000	1000000000
46587 to 46588	SP02 High Limit	7125	-1000000000	1000000000
46589 to 46590	SP03 High Limit	7126	-1000000000	1000000000
46591 to 46592	SP04 High Limit	7127	-1000000000	1000000000
46593 to 46594	SP05 High Limit	7128	-1000000000	1000000000
46595 to 46596	SP06 High Limit	7129	-1000000000	1000000000
46597 to 46598	SP07 High Limit	712A	-1000000000	1000000000
46599 to 46600	SP08 High Limit	712B	-1000000000	1000000000
46601 to 46602	SP09 High Limit	712C	-1000000000	1000000000
46603 to 46604	SP10 High Limit	712D	-1000000000	1000000000
46605 to 46606	SP11 High Limit	712E	-1000000000	1000000000
46607 to 46608	SP12 High Limit	712F	-1000000000	1000000000
46609 to 46610	SP13 High Limit	7130	-1000000000	1000000000
46611 to 46612	SP14 High Limit	7131	-1000000000	1000000000
46613 to 46614	SP15 High Limit	7132	-1000000000	1000000000
46615 to 46616	SP16 High Limit	7133	-1000000000	1000000000
46617 to 46618	SP17 High Limit	7134	-1000000000	1000000000
46619 to 46620	SP18 High Limit	7135	-1000000000	1000000000
46621 to 46622	SP19 High Limit	7136	-1000000000	1000000000
46623 to 46624	SP20 High Limit	7137	-1000000000	1000000000
46625 to 46626	SP21 High Limit	7138	-1000000000	1000000000
46627 to 46628	SP22 High Limit	7139	-1000000000	1000000000
46629 to 46630	SP23 High Limit	713A	-1000000000	1000000000
46631 to 46632	SP24 High Limit	713B	-1000000000	1000000000
46633 to 46634	SP01 Low Limit	713C	-1000000000	1000000000
46635 to 46636	SP02 Low Limit	713D	-1000000000	1000000000
46637 to 46638	SP03 Low Limit	713E	-1000000000	1000000000

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46639 to 46640	SP04 Low Limit	713F	-1000000000	1000000000
46641 to 46642	SP05 Low Limit	7140	-1000000000	1000000000
46643 to 46644	SP06 Low Limit	7141	-1000000000	1000000000
46645 to 46646	SP07 Low Limit	7142	-1000000000	1000000000
46647 to 46648	SP08 Low Limit	7143	-1000000000	1000000000
46649 to 46650	SP09 Low Limit	7144	-1000000000	1000000000
46651 to 46652	SP10 Low Limit	7145	-1000000000	1000000000
46653 to 46654	SP11 Low Limit	7146	-1000000000	1000000000
46655 to 46656	SP12 Low Limit	7147	-1000000000	1000000000
46657 to 46658	SP13 Low Limit	7148	-1000000000	1000000000
46659 to 46660	SP14 Low Limit	7149	-1000000000	1000000000
46661 to 46662	SP15 Low Limit	714A	-1000000000	1000000000
46663 to 46664	SP16 Low Limit	714B	-1000000000	1000000000
46665 to 46666	SP17 Low Limit	714C	-1000000000	1000000000
46667 to 46668	SP18 Low Limit	714D	-1000000000	1000000000
46669 to 46670	SP19 Low Limit	714E	-1000000000	1000000000
46671 to 46672	SP20 Low Limit	714F	-1000000000	1000000000
46673 to 46674	SP21 Low Limit	7150	-1000000000	1000000000
46675 to 46676	SP22 Low Limit	7151	-1000000000	1000000000
46677 to 46678	SP23 Low Limit	7152	-1000000000	1000000000
46679 to 46680	SP24 Low Limit	7153	-1000000000	1000000000
46681 to 46682	SP01 SusUntION	7154	0	3600
46683 to 46684	SP02 SusUntION	7155	0	3600
46685 to 46686	SP03 SusUntION	7156	0	3600
46687 to 46688	SP04 SusUntION	7157	0	3600
46689 to 46690	SP05 SusUntION	7158	0	3600
46691 to 46692	SP06 SusUntION	7159	0	3600
46693 to 46694	SP07 SusUntION	715A	0	3600
46695 to 46696	SP08 SusUntION	715B	0	3600
46697 to 46698	SP09 SusUntION	715C	0	3600
46699 to 46700	SP10 SusUntION	715D	0	3600
46701 to 46702	SP11 SusUntION	715E	0	3600
46703 to 46704	SP12 SusUntION	715F	0	3600
46705 to 46706	SP13 SusUntION	7160	0	3600
46707 to 46708	SP14 SusUntION	7161	0	3600
46709 to 46710	SP15 SusUntION	7162	0	3600
46711 to 46712	SP16 SusUntION	7163	0	3600
46713 to 46714	SP17 SusUntION	7164	0	3600
46715 to 46716	SP18 SusUntION	7165	0	3600
46717 to 46718	SP19 SusUntION	7166	0	3600
46719 to 46720	SP20 SusUntION	7167	0	3600
46721 to 46722	SP21 SusUntION	7168	0	3600
46723 to 46724	SP22 SusUntION	7169	0	3600
46725 to 46726	SP23 SusUntION	716A	0	3600
46727 to 46728	SP24 SusUntION	716B	0	3600
46729 to 46730	SP01 SusUntIOFF	716C	0	3600
46731 to 46732	SP02 SusUntIOFF	716D	0	3600
46733 to 46734	SP03 SusUntIOFF	716E	0	3600
46735 to 46736	SP04 SusUntIOFF	716F	0	3600
46737 to 46738	SP05 SusUntIOFF	7170	0	3600
46739 to 46740	SP06 SusUntIOFF	7171	0	3600
46741 to 46742	SP07 SusUntIOFF	7172	0	3600
46743 to 46744	SP08 SusUntIOFF	7173	0	3600
46745 to 46746	SP09 SusUntIOFF	7174	0	3600
46747 to 46748	SP10 SusUntIOFF	7175	0	3600
46749 to 46750	SP11 SusUntIOFF	7176	0	3600
46751 to 46752	SP12 SusUntIOFF	7177	0	3600

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46753 to 46754	SP13 SusUntlOFF	7178	0	3600
46755 to 46756	SP14 SusUntlOFF	7179	0	3600
46757 to 46758	SP15 SusUntlOFF	717A	0	3600
46759 to 46760	SP16 SusUntlOFF	717B	0	3600
46761 to 46762	SP17 SusUntlOFF	717C	0	3600
46763 to 46764	SP18 SusUntlOFF	717D	0	3600
46765 to 46766	SP19 SusUntlOFF	717E	0	3600
46767 to 46768	SP20 SusUntlOFF	717F	0	3600
46769 to 46770	SP21 SusUntlOFF	7180	0	3600
46771 to 46772	SP22 SusUntlOFF	7181	0	3600
46773 to 46774	SP23 SusUntlOFF	7182	0	3600
46775 to 46776	SP24 SusUntlOFF	7183	0	3600
46777 to 46778	SP01 EvPriority	7184	0	255
46779 to 46780	SP02 EvPriority	7185	0	255
46781 to 46782	SP03 EvPriority	7186	0	255
46783 to 46784	SP04 EvPriority	7187	0	255
46785 to 46786	SP05 EvPriority	7188	0	255
46787 to 46788	SP06 EvPriority	7189	0	255
46789 to 46790	SP07 EvPriority	718A	0	255
46791 to 46792	SP08 EvPriority	718B	0	255
46793 to 46794	SP09 EvPriority	718C	0	255
46795 to 46796	SP10 EvPriority	718D	0	255
46797 to 46798	SP11 EvPriority	718E	0	255
46799 to 46800	SP12 EvPriority	718F	0	255
46801 to 46802	SP13 EvPriority	7190	0	255
46803 to 46804	SP14 EvPriority	7191	0	255
46805 to 46806	SP15 EvPriority	7192	0	255
46807 to 46808	SP16 EvPriority	7193	0	255
46809 to 46810	SP17 EvPriority	7194	0	255
46811 to 46812	SP18 EvPriority	7195	0	255
46813 to 46814	SP19 EvPriority	7196	0	255
46815 to 46816	SP20 EvPriority	7197	0	255
46817 to 46818	SP21 EvPriority	7198	0	255
46819 to 46820	SP22 EvPriority	7199	0	255
46821 to 46822	SP23 EvPriority	719A	0	255
46823 to 46824	SP24 EvPriority	719B	0	255
46825 to 46826	RE01 Depth	719C	0	2000000000
46827 to 46828	RE02 Depth	719D	0	2000000000
46829 to 46830	RE03 Depth	719E	0	2000000000
46831 to 46832	RE04 Depth	719F	0	2000000000
46833 to 46834	RE05 Depth	71A0	0	2000000000
46835 to 46836	RE06 Depth	71A1	0	2000000000
46837 to 46838	RE07 Depth	71A2	0	2000000000
46839 to 46840	RE08 Depth	71A3	0	2000000000
46841 to 46842	RE09 Depth	71A4	0	2000000000
46843 to 46844	RE10 Depth	71A5	0	2000000000
46845 to 46846	RE11 Depth	71A6	0	2000000000
46847 to 46848	RE12 Depth	71A7	0	2000000000
46849 to 46850	RE13 Depth	71A8	0	2000000000
46851 to 46852	RE14 Depth	71A9	0	2000000000
46853 to 46854	RE15 Depth	71AA	0	2000000000
46855 to 46856	RE16 Depth	71AB	0	2000000000
46857 to 46858	RE17 Depth	71AC	0	2000000000
46859 to 46860	RE18 Depth	71AD	0	2000000000
46861 to 46862	RE19 Depth	71AE	0	2000000000
46863 to 46864	RE20 Depth	71AF	0	2000000000

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46865 to 46866	WR01 Depth	71B0	0	2000000000
46867 to 46868	WR02 Depth	71B1	0	2000000000
46869 to 46870	WR03 Depth	71B2	0	2000000000
46871 to 46872	WR04 Depth	71B3	0	2000000000
46873 to 46874	WR05 Depth	71B4	0	2000000000
46875 to 46876	WR06 Depth	71B5	0	2000000000
46877 to 46878	WR07 Depth	71B6	0	2000000000
46879 to 46880	WR08 Depth	71B7	0	2000000000
46881 to 46882	WR09 Depth	71B8	0	2000000000
46883 to 46884	WR10 Depth	71B9	0	2000000000
46885 to 46886	WR11 Depth	71BA	0	2000000000
46887 to 46888	WR12 Depth	71BB	0	2000000000
46889 to 46890	PT01 Period	71BC	1	2000000
46891 to 46892	PT02 Period	71BD	1	2000000
46893 to 46894	PT03 Period	71BE	1	2000000
46895 to 46896	PT04 Period	71BF	1	2000000
46897 to 46898	PT05 Period	71C0	1	2000000
46899 to 46900	PT06 Period	71C1	1	2000000
46901 to 46902	PT07 Period	71C2	1	2000000
46903 to 46904	PT08 Period	71C3	1	2000000
46905 to 46906	PT09 Period	71C4	1	2000000
46907 to 46908	PT10 Period	71C5	1	2000000
46909 to 46910	PT11 Period	71C6	1	2000000
46911 to 46912	PT12 Period	71C7	1	2000000
46913 to 46914	PT13 Period	71C8	1	2000000
46915 to 46916	PT14 Period	71C9	1	2000000
46917 to 46918	PT15 Period	71CA	1	2000000
46919 to 46920	PT16 Period	71CB	1	2000000
46921 to 46922	PT17 Period	71CC	1	2000000
46923 to 46924	PT18 Period	71CD	1	2000000
46925 to 46926	PT19 Period	71CE	1	2000000
46927 to 46928	PT20 Period	71CF	1	2000000
46929 to 46930	OS01 Duration	71D0	1	2000000
46931 to 46932	OS02 Duration	71D1	1	2000000
46933 to 46934	OS03 Duration	71D2	1	2000000
46935 to 46936	OS04 Duration	71D3	1	2000000
46937 to 46938	OS05 Duration	71D4	1	2000000
46939 to 46940	OS06 Duration	71D5	1	2000000
46941 to 46942	OS07 Duration	71D6	1	2000000
46943 to 46944	OS08 Duration	71D7	1	2000000
46945 to 46946	OS09 Duration	71D8	1	2000000
46947 to 46948	OS10 Duration	71D9	1	2000000
46949 to 46950	OS11 Duration	71DA	1	2000000
46951 to 46952	OS12 Duration	71DB	1	2000000
46953 to 46954	CN01 Multiplier	71DC	-1000000000	1000000000
46955 to 46956	CN02 Multiplier	71DD	-1000000000	1000000000
46957 to 46958	CN03 Multiplier	71DE	-1000000000	1000000000
46959 to 46960	CN04 Multiplier	71DF	-1000000000	1000000000
46961 to 46962	CN05 Multiplier	71E0	-1000000000	1000000000
46963 to 46964	CN06 Multiplier	71E1	-1000000000	1000000000
46965 to 46966	CN07 Multiplier	71E2	-1000000000	1000000000
46967 to 46968	CN08 Multiplier	71E3	-1000000000	1000000000
46969 to 46970	CN09 Multiplier	71E4	-1000000000	1000000000
46971 to 46972	CN10 Multiplier	71E5	-1000000000	1000000000

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
46973 to 46974	EL Depth	71E6	0	20000
46975 to 46976	EL Protection	71E7	128	128
46977 to 46978	CM01 RTS Delay	71E8	0	1
46979 to 46980	CM01 Unit ID	71E9	1	9999
46981 to 46982	(unused)	71EA	0	0
46983 to 46984	FAC Vnominal	71EB	1	999999
46985 to 46986	FAC Inominal	71EC	1	999999
46987 to 46988	FAC I4nominal	71ED	1	999999
46989 to 46990	FAC I20nominal	71EE	1	999999
46991 to 46992	FAC V1cal	71EF	0	2
46993 to 46994	FAC V2cal	71F0	0	2
46995 to 46996	FAC V3cal	71F1	0	2
46997 to 46998	FAC I1cal	71F2	0	2
46999 to 47000	FAC I2cal	71F3	0	2
47001 to 47002	FAC I3cal	71F4	0	2
47003 to 47004	FAC I4cal	71F5	0	2
47005 to 47006	FAC I1x20cal	71F6	0	2
47007 to 47008	FAC I2x20cal	71F7	0	2
47009 to 47010	FAC I3x20cal	71F8	0	2
47011 to 47012	FAC CT1aSmooth	71F9	-1	1
47013 to 47014	FAC CT1bSmooth	71FA	-1	1
47015 to 47016	FAC CT1cSmooth	71FB	-1	1
47017 to 47018	FAC CT2aSmooth	71FC	-1	1
47019 to 47020	FAC CT2bSmooth	71FD	-1	1
47021 to 47022	FAC CT2cSmooth	71FE	-1	1
47023 to 47024	FAC CT3aSmooth	71FF	-1	1
47025 to 47026	FAC CT3bSmooth	7200	-1	1
47027 to 47028	FAC CT3cSmooth	7201	-1	1
47029 to 47030	FAC i1Off	7202	0	1
47031 to 47032	FAC i2Off	7203	0	1
47033 to 47034	FAC i3Off	7204	0	1
47035 to 47036	FAC i4Off	7205	0	1
47037 to 47038	FAC V_force	7206	0	1
47039 to 47040	FAC I_force	7207	0	1
47041 to 47042	FAC I4_force	7208	0	1
47043 to 47044	FAC VX_force	7209	0	1
47045 to 47046	FAC Vx1cal	720A	0	2
47047 to 47048	FAC Vx2cal	720B	0	2
47049 to 47050	FAC Vx3cal	720C	0	2
47051 to 47052	FAC Vx4cal	720D	0	2
47053 to 47054	FAC Vx1dc	720E	-10	10
47055 to 47056	FAC Vx2dc	720F	-10	10
47057 to 47058	FAC Vx3dc	7210	-10	10
47059 to 47060	FAC Vx4dc	7211	-10	10
47061 to 47062	WR13 Depth	7212	0	2000000000
47063 to 47064	WR14 Depth	7213	0	2000000000

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
47065 to 47066	SS01 Swell Lim	7214	100	1000
47067 to 47068	(unused)	7215	0	0
47069 to 47070	SS01 Sag Lim	7216	0	100
47071 to 47072	(unused)	7217	0	0
47073 to 47074	SS01 ChangeCrit	7218	0	100
47075 to 47076	(unused)	7219	0	0
47077 to 47078	SS01 Nom Volts	721A	1	1000000
47079 to 47080	(unused)	721B	0	0
47081 to 47082	SS01 EvPriority	721C	0	255
47083 to 47084	(unused)	721D	0	0
47085 to 47086	IN01 RollValue	721E	0	1000000000
47087 to 47088	IN02 RollValue	721F	0	1000000000
47089 to 47090	IN03 RollValue	7220	0	1000000000
47091 to 47092	IN04 RollValue	7221	0	1000000000
47093 to 47094	IN05 RollValue	7222	0	1000000000
47095 to 47096	IN06 RollValue	7223	0	1000000000
47097 to 47098	IN07 RollValue	7224	0	1000000000
47099 to 47100	IN08 RollValue	7225	0	1000000000
47101 to 47102	IN09 RollValue	7226	0	1000000000
47103 to 47104	IN10 RollValue	7227	0	1000000000
47105 to 47106	IN11 RollValue	7228	0	1000000000
47107 to 47108	IN12 RollValue	7229	0	1000000000
47109 to 47110	IN13 RollValue	722A	0	1000000000
47111 to 47112	IN14 RollValue	722B	0	1000000000
47113 to 47114	IN15 RollValue	722C	0	1000000000
47115 to 47116	IN16 RollValue	722D	0	1000000000
47117 to 47118	CL01 TZ Offset	722E	-43200	46800
47119 to 47120	CL01 DST Start	722F	0	2147483647
47121 to 47122	CL01 DST End	7230	86400	2147483647
47123 to 47124	CL01 DST Offset	7231	-10800	10800
47125 to 47126	CM02 RTS Delay	7232	0	1
47127 to 47128	CM03 RTS Delay	7233	0	1
47129 to 47130	CM02 Unit ID	7234	1	9999
47131 to 47132	CM03 Unit ID	7235	1	9999
47133 to 47134	Ether IP Addr	7236	0	-1
47135 to 47136	MSR1 BaseAddr	7237	40001	41800
47137 to 47138	MSR2 BaseAddr	7238	40001	41800
47139 to 47140	MSR3 BaseAddr	7239	40001	41800
47141 to 47142	MSR4 BaseAddr	723A	40001	41800
47143 to 47144	MSR1 InZero	723B	-2147483648	2147483647
47145 to 47146	MSR2 InZero	723C	-2147483648	2147483647
47147 to 47148	MSR3 InZero	723D	-2147483648	2147483647

Modbus Registers	ION Register	ION Handle	Low Bound	High Bound
47149 to 47150	MSR4 InZero	723E	-2147483648	2147483647
47151 to 47152	MSR1 InFull	723F	-2147483648	2147483647
47153 to 47154	MSR2 InFull	7240	-2147483648	2147483647
47155 to 47156	MSR3 InFull	7241	-2147483648	2147483647
47157 to 47158	MSR4 InFull	7242	-2147483648	2147483647
47159 to 47160	MSR1 OutZero	7243	-2147483647	2147483647
47161 to 47162	MSR2 OutZero	7244	-2147483647	2147483647
47163 to 47164	MSR3 OutZero	7245	-2147483647	2147483647
47165 to 47166	MSR4 OutZero	7246	-2147483647	2147483647
47167 to 47168	MSR1 OutFull	7247	-2147483647	2147483647
47169 to 47170	MSR2 OutFull	7248	-2147483647	2147483647
47171 to 47172	MSR3 OutFull	7249	-2147483647	2147483647
47173 to 47174	MSR4 OutFull	724A	-2147483647	2147483647

5. ION REGISTER CROSS-REFERENCE

5.1 Enumerated Setup Registers

ION Register	ION Handle	Modbus Register
AI01 Port	798D	44398
AI02 Port	798E	44399
AI03 Port	798F	44400
AI04 Port	7990	44401
AI05 Port	7991	44402
AI06 Port	7992	44403
AI07 Port	7993	44404
AI08 Port	7994	44405
AI09 Port	7995	44406
AI10 Port	7996	44407
AI11 Port	7997	44408
AI12 Port	7998	44409
AI13 Port	7999	44410
AI14 Port	799A	44411
AI15 Port	799B	44412
AI16 Port	799C	44413
AI17 Port	799D	44414
AI18 Port	799E	44415
AN01 EvLog Mode	797E	44383
AN01 Mode	7976	44375
AN02 EvLog Mode	797F	44384
AN02 Mode	7977	44376
AN03 EvLog Mode	7980	44385
AN03 Mode	7978	44377
AN04 EvLog Mode	7981	44386
AN04 Mode	7979	44378
AN05 EvLog Mode	7982	44387
AN05 Mode	797A	44379
AN06 EvLog Mode	7983	44388
AN06 Mode	797B	44380
AN07 EvLog Mode	7984	44389
AN07 Mode	797C	44381
AN08 EvLog Mode	7985	44390
AN08 Mode	797D	44382
AO01 Port	799F	44416
AO02 Port	79A0	44417
AO03 Port	79A1	44418
AO04 Port	79A2	44419
AO05 Port	79A3	44420
AO06 Port	79A4	44421
AO07 Port	79A5	44422
AO08 Port	79A6	44423
AO09 Port	79A7	44424
AO10 Port	79A8	44425
AO11 Port	79A9	44426
AO12 Port	79AA	44427
AO13 Port	79AB	44428
AO14 Port	79AC	44429
AO15 Port	79AD	44430
AO16 Port	79AE	44431
AO17 Port	79AF	44432
AO18 Port	79B0	44433
AO19 Port	79B1	44434
AO20 Port	79B2	44435
AO21 Port	79B3	44436
AO22 Port	79B4	44437
AO23 Port	79B5	44438
AO24 Port	79B6	44439
AO25 Port	79B7	44440
AO26 Port	79B8	44441
AO27 Port	79B9	44442
AO28 Port	79BA	44443
AO29 Port	79BB	44444
AO30 Port	79BC	44445
CM01 Baud Rate	7987	44392
CM01 Comm Mode	7986	44391
CM01 CTS Level	798A	44395
CM01 HshakeMode	7988	44393
CM01 Protocol	7A4F	44592
CM01 RTS Level	7989	44394
CM02 Baud Rate	7A4D	44590
CM02 Protocol	7A50	44593
CM03 Baud Rate	7A4E	44591
CM03 Protocol	7A51	44594
CN01 Count Mode	796C	44365
CN02 Count Mode	796D	44366
CN03 Count Mode	796E	44367
CN04 Count Mode	796F	44368
CN05 Count Mode	7970	44369
CN06 Count Mode	7971	44370
CN07 Count Mode	7972	44371
CN08 Count Mode	7973	44372
CN09 Count Mode	7974	44373
CN10 Count Mode	7975	44374
DI01 EvLog Mode	782C	44045
DI01 Input Mode	7806	44007
DI01 Polarity	7852	44083
DI01 Port	79DB	44476
DI02 EvLog Mode	782D	44046
DI02 Input Mode	7807	44008
DI02 Polarity	7853	44084
DI02 Port	79DC	44477
DI03 EvLog Mode	782E	44047
DI03 Input Mode	7808	44009
DI03 Polarity	7854	44085
DI03 Port	79DD	44478
DI04 EvLog Mode	782F	44048
DI04 Input Mode	7809	44010
DI04 Polarity	7855	44086
DI04 Port	79DE	44479
DI05 EvLog Mode	7830	44049
DI05 Input Mode	780A	44011

ION Register	ION Handle	Modbus Register
DI05 Polarity	7856	44087
DI05 Port	79DF	44480
DI06 EvLog Mode	7831	44050
DI06 Input Mode	780B	44012
DI06 Polarity	7857	44088
DI06 Port	79E0	44481
DI07 EvLog Mode	7832	44051
DI07 Input Mode	780C	44013
DI07 Polarity	7858	44089
DI07 Port	79E1	44482
DI08 EvLog Mode	7833	44052
DI08 Input Mode	780D	44014
DI08 Polarity	7859	44090
DI08 Port	79E2	44483
DI09 EvLog Mode	7834	44053
DI09 Input Mode	780E	44015
DI09 Polarity	785A	44091
DI09 Port	79E3	44484
DI10 EvLog Mode	7835	44054
DI10 Input Mode	780F	44016
DI10 Polarity	785B	44092
DI10 Port	79E4	44485
DI11 EvLog Mode	7836	44055
DI11 Input Mode	7810	44017
DI11 Polarity	785C	44093
DI11 Port	79E5	44486
DI12 EvLog Mode	7837	44056
DI12 Input Mode	7811	44018
DI12 Polarity	785D	44094
DI12 Port	79E6	44487
DI13 EvLog Mode	7838	44057
DI13 Input Mode	7812	44019
DI13 Polarity	785E	44095
DI13 Port	79E7	44488
DI14 EvLog Mode	7839	44058
DI14 Input Mode	7813	44020
DI14 Polarity	785F	44096
DI14 Port	79E8	44489
DI15 EvLog Mode	783A	44059
DI15 Input Mode	7814	44021
DI15 Polarity	7860	44097
DI15 Port	79E9	44490
DI16 EvLog Mode	783B	44060
DI16 Input Mode	7815	44022
DI16 Polarity	7861	44098
DI16 Port	79EA	44491
DI17 EvLog Mode	783C	44061
DI17 Input Mode	7816	44023
DI17 Polarity	7862	44099
DI17 Port	79EB	44492
DI18 EvLog Mode	783D	44062
DI18 Input Mode	7817	44024
DI18 Polarity	7863	44100
DI18 Port	79EC	44493
DI19 EvLog Mode	783E	44063
DI19 Input Mode	7818	44025
DI19 Polarity	7864	44101
DI19 Port	79ED	44494
DI20 EvLog Mode	783F	44064
DI20 Input Mode	7819	44026
DI20 Polarity	7865	44102
DI20 Port	79EE	44495
DI21 EvLog Mode	7840	44065
DI21 Input Mode	781A	44027
DI21 Polarity	7866	44103
DI21 Port	79EF	44496
DI22 EvLog Mode	7841	44066
DI22 Input Mode	781B	44028
DI22 Polarity	7867	44104
DI22 Port	79F0	44497
DI23 EvLog Mode	7842	44067
DI23 Input Mode	781C	44029
DI23 Polarity	7868	44105
DI23 Port	79F1	44498
DI24 EvLog Mode	7843	44068
DI24 Input Mode	781D	44030
DI24 Polarity	7869	44106
DI24 Port	79F2	44499
DI25 EvLog Mode	7844	44069
DI25 Input Mode	781E	44031
DI25 Polarity	786A	44107
DI25 Port	79F3	44500
DI26 EvLog Mode	7845	44070
DI26 Input Mode	781F	44032
DI26 Polarity	786B	44108
DI26 Port	79F4	44501
DI27 EvLog Mode	7846	44071
DI27 Input Mode	7820	44033
DI27 Polarity	786C	44109
DI27 Port	79F5	44502
DI28 EvLog Mode	7847	44072
DI28 Input Mode	7821	44034
DI28 Polarity	786D	44110
DI28 Port	79F6	44503
DI29 EvLog Mode	7848	44073
DI29 Input Mode	7822	44035
DI29 Polarity	786E	44111
DI29 Port	79F7	44504
DI30 EvLog Mode	7849	44074
DI30 Input Mode	7823	44036
DI30 Polarity	786F	44112
DI30 Port	79F8	44505
DI31 EvLog Mode	784A	44075
DI31 Input Mode	7824	44037
DI31 Polarity	7870	44113
DI31 Port	79F9	44506
DI32 EvLog Mode	784B	44076
DI32 Input Mode	7825	44038
DI32 Polarity	7871	44114
DI32 Port	79FA	44507
DI33 EvLog Mode	784C	44077
DI33 Input Mode	7826	44039
DI33 Polarity	7872	44115
DI33 Port	79FB	44508

ION Register	ION Handle	Modbus Register
DI34 EvLog Mode	784D	44078
DI34 Input Mode	7827	44040
DI34 Polarity	7873	44116
DI34 Port	79FC	44509
DI35 EvLog Mode	784E	44079
DI35 Input Mode	7828	44041
DI35 Polarity	7874	44117
DI35 Port	79FD	44510
DI36 EvLog Mode	784F	44080
DI36 Input Mode	7829	44042
DI36 Polarity	7875	44118
DI36 Port	79FE	44511
DI37 EvLog Mode	7850	44081
DI37 Input Mode	782A	44043
DI37 Polarity	7876	44119
DI37 Port	79FF	44512
DI38 EvLog Mode	7851	44082
DI38 Input Mode	782B	44044
DI38 Polarity	7877	44120
DI38 Port	7A00	44513
DO01 EvLog Mode	7878	44121
DO01 Polarity	7896	44151
DO01 Port	79BD	44446
DO02 EvLog Mode	7879	44122
DO02 Polarity	7897	44152
DO02 Port	79BE	44447
DO03 EvLog Mode	787A	44123
DO03 Polarity	7898	44153
DO03 Port	79BF	44448
DO04 EvLog Mode	787B	44124
DO04 Polarity	7899	44154
DO04 Port	79C0	44449
DO05 EvLog Mode	787C	44125
DO05 Polarity	789A	44155
DO05 Port	79C1	44450
DO06 EvLog Mode	787D	44126
DO06 Polarity	789B	44156
DO06 Port	79C2	44451
DO07 EvLog Mode	787E	44127
DO07 Polarity	789C	44157
DO07 Port	79C3	44452
DO08 EvLog Mode	787F	44128
DO08 Polarity	789D	44158
DO08 Port	79C4	44453
DO09 EvLog Mode	7880	44129
DO09 Polarity	789E	44159
DO09 Port	79C5	44454
DO10 EvLog Mode	7881	44130
DO10 Polarity	789F	44160
DO10 Port	79C6	44455
DO11 EvLog Mode	7882	44131
DO11 Polarity	78A0	44161
DO11 Port	79C7	44456
DO12 EvLog Mode	7883	44132
DO12 Polarity	78A1	44162
DO12 Port	79C8	44457
DO13 EvLog Mode	7884	44133
DO13 Polarity	78A2	44163
DO13 Port	79C9	44458
DO14 EvLog Mode	7885	44134
DO14 Polarity	78A3	44164
DO14 Port	79CA	44459
DO15 EvLog Mode	7886	44135
DO15 Polarity	78A4	44165
DO15 Port	79CB	44460
DO16 EvLog Mode	7887	44136
DO16 Polarity	78A5	44166
DO16 Port	79CC	44461
DO17 EvLog Mode	7888	44137
DO17 Polarity	78A6	44167
DO17 Port	79CD	44462
DO18 EvLog Mode	7889	44138
DO18 Polarity	78A7	44168
DO18 Port	79CE	44463
DO19 EvLog Mode	788A	44139
DO19 Polarity	78A8	44169
DO19 Port	79CF	44464
DO20 EvLog Mode	788B	44140
DO20 Polarity	78A9	44170
DO20 Port	79D0	44465
DO21 EvLog Mode	788C	44141
DO21 Polarity	78AA	44171
DO21 Port	79D1	44466
DO22 EvLog Mode	788D	44142
DO22 Polarity	78AB	44172
DO22 Port	79D2	44467
DO23 EvLog Mode	788E	44143
DO23 Polarity	78AC	44173
DO23 Port	79D3	44468
DO24 EvLog Mode	788F	44144
DO24 Polarity	78AD	44174
DO24 Port	79D4	44469
DO25 EvLog Mode	7890	44145
DO25 Polarity	78AE	44175
DO25 Port	79D5	44470
DO26 EvLog Mode	7891	44146
DO26 Polarity	78AF	44176
DO26 Port	79D6	44471
DO27 EvLog Mode	7892	44147
DO27 Polarity	78B0	44177
DO27 Port	79D7	44472
DO28 EvLog Mode	7893	44148
DO28 Polarity	78B1	44178
DO28 Port	79D8	44473
DO29 EvLog Mode	7894	44149
DO29 Polarity	78B2	44179
DO29 Port	79D9	44474
DO30 EvLog Mode	7895	44150
DO30 Polarity	78B3	44180
DO30 Port	79DA	44475
Ether Protocol	7A52	44595
FAC NomFreq	798B	44396
IN01 Mode	78D8	44217
IN02 Mode	78D9	44218

ION Register	ION Handle	Modbus Register
IN03 Mode	78DA	44219
IN04 Mode	78DB	44220
IN05 Mode	78DC	44221
IN06 Mode	78DD	44222
IN07 Mode	78DE	44223
IN08 Mode	78DF	44224
IN09 Mode	78E0	44225
IN10 Mode	78E1	44226
IN11 Mode	78E2	44227
IN12 Mode	78E3	44228
IN13 Mode	78E4	44229
IN14 Mode	78E5	44230
IN15 Mode	78E6	44231
IN16 Mode	78E7	44232
MSR1 Format	7A53	44596
MSR1 Scaling	7A57	44600
MSR2 Format	7A54	44597
MSR2 Scaling	7A58	44601
MSR3 Format	7A55	44598
MSR3 Scaling	7A59	44602
MSR4 Format	7A56	44599
MSR4 Scaling	7A5A	44603
PG01 EvLog Mode	7A3D	44574
PG02 EvLog Mode	7A3E	44575
PG03 EvLog Mode	7A3F	44576
PG04 EvLog Mode	7A40	44577
PG05 EvLog Mode	7A41	44578
PG06 EvLog Mode	7A42	44579
PG07 EvLog Mode	7A43	44580
PG08 EvLog Mode	7A44	44581
PM I1Polarity	7801	44002
PM I2Polarity	7802	44003
PM I3Polarity	7803	44004
PM I4Polarity	7A49	44586
PM Phase Lbls	7805	44006
PM PhaseOrder	7804	44005
PM V1Polarity	7A4A	44587
PM V2Polarity	7A4B	44588
PM V3Polarity	7A4C	44589
PM Volts Mode	7800	44001
PT01 Sync Mode	7958	44345
PT02 Sync Mode	7959	44346
PT03 Sync Mode	795A	44347
PT04 Sync Mode	795B	44348
PT05 Sync Mode	795C	44349
PT06 Sync Mode	795D	44350
PT07 Sync Mode	795E	44351
PT08 Sync Mode	795F	44352
PT09 Sync Mode	7960	44353
PT10 Sync Mode	7961	44354
PT11 Sync Mode	7962	44355
PT12 Sync Mode	7963	44356
PT13 Sync Mode	7964	44357
PT14 Sync Mode	7965	44358
PT15 Sync Mode	7966	44359
PT16 Sync Mode	7967	44360
PT17 Sync Mode	7968	44361
PT18 Sync Mode	7969	44362
PT19 Sync Mode	796A	44363
PT20 Sync Mode	796B	44364
PU01 OutputMode	78B4	44181
PU01 Polarity	78BE	44191
PU01 Port	7A01	44514
PU02 OutputMode	78B5	44182
PU02 Polarity	78BF	44192
PU02 Port	7A02	44515
PU03 OutputMode	78B6	44183
PU03 Polarity	78C0	44193
PU03 Port	7A03	44516
PU04 OutputMode	78B7	44184
PU04 Polarity	78C1	44194
PU04 Port	7A04	44517
PU05 OutputMode	78B8	44185
PU05 Polarity	78C2	44195
PU05 Port	7A05	44518
PU06 OutputMode	78B9	44186
PU06 Polarity	78C3	44196
PU06 Port	7A06	44519
PU07 OutputMode	78BA	44187
PU07 Polarity	78C4	44197
PU07 Port	7A07	44520
PU08 OutputMode	78BB	44188
PU08 Polarity	78C5	44198
PU08 Port	7A08	44521
PU09 OutputMode	78BC	44189
PU09 Polarity	78C6	44199
PU09 Port	7A09	44522
PU10 OutputMode	78BD	44190
PU10 Polarity	78C7	44200
PU10 Port	7A0A	44523
RE01 RecordMode	7918	44281
RE02 RecordMode	7919	44282
RE03 RecordMode	791A	44283
RE04 RecordMode	791B	44284
RE05 RecordMode	791C	44285
RE06 RecordMode	791D	44286
RE07 RecordMode	791E	44287
RE08 RecordMode	791F	44288
RE09 RecordMode	7920	44289
RE10 RecordMode	7921	44290
RE11 RecordMode	7922	44291
RE12 RecordMode	7923	44292
RE13 RecordMode	7924	44293
RE14 RecordMode	7925	44294
RE15 RecordMode	7926	44295
RE16 RecordMode	7927	44296
RE17 RecordMode	7928	44297
RE18 RecordMode	7929	44298
RE19 RecordMode	792A	44299
RE20 RecordMode	792B	44300
SP01 Eval Mode	7900	44257
SP01 Input Mode	78E8	44233
SP02 Eval Mode	7901	44258
SP02 Input Mode	78E9	44234

ION Register	ION Handle	Modbus Register
SP03 Eval Mode	7902	44259
SP03 Input Mode	78EA	44235
SP04 Eval Mode	7903	44260
SP04 Input Mode	78EB	44236
SP05 Eval Mode	7904	44261
SP05 Input Mode	78EC	44237
SP06 Eval Mode	7905	44262
SP06 Input Mode	78ED	44238
SP07 Eval Mode	7906	44263
SP07 Input Mode	78EE	44239
SP08 Eval Mode	7907	44264
SP08 Input Mode	78EF	44240
SP09 Eval Mode	7908	44265
SP09 Input Mode	78F0	44241
SP10 Eval Mode	7909	44266
SP10 Input Mode	78F1	44242
SP11 Eval Mode	790A	44267
SP11 Input Mode	78F2	44243
SP12 Eval Mode	790B	44268
SP12 Input Mode	78F3	44244
SP13 Eval Mode	790C	44269
SP13 Input Mode	78F4	44245
SP14 Eval Mode	790D	44270
SP14 Input Mode	78F5	44246
SP15 Eval Mode	790E	44271
SP15 Input Mode	78F6	44247
SP16 Eval Mode	790F	44272
SP16 Input Mode	78F7	44248
SP17 Eval Mode	7910	44273
SP17 Input Mode	78F8	44249
SP18 Eval Mode	7911	44274
SP18 Input Mode	78F9	44250
SP19 Eval Mode	7912	44275
SP19 Input Mode	78FA	44251
SP20 Eval Mode	7913	44276
SP20 Input Mode	78FB	44252
SP21 Eval Mode	7914	44277
SP21 Input Mode	78FC	44253
SP22 Eval Mode	7915	44278
SP22 Input Mode	78FD	44254
SP23 Eval Mode	7916	44279
SP23 Input Mode	78FE	44255
SP24 Eval Mode	7917	44280
SP24 Input Mode	78FF	44256
WR01 Format	7938	44313
WR01 RecordMode	792C	44301
WR02 Format	7939	44314
WR02 RecordMode	792D	44302
WR03 Format	793A	44315
WR03 RecordMode	792E	44303
WR04 Format	793B	44316
WR04 RecordMode	792F	44304
WR05 Format	793C	44317
WR05 RecordMode	7930	44305
WR06 Format	793D	44318
WR06 RecordMode	7931	44306
WR07 Format	793E	44319
WR07 RecordMode	7932	44307
WR08 Format	793F	44320
WR08 RecordMode	7933	44308
WR09 Format	7940	44321
WR09 RecordMode	7934	44309
WR10 Format	7941	44322
WR10 RecordMode	7935	44310
WR11 Format	7942	44323
WR11 RecordMode	7936	44311
WR12 Format	7943	44324
WR12 RecordMode	7937	44312
WR13 Format	7A47	44584
WR13 RecordMode	7A45	44582
WR14 Format	7A48	44585
WR14 RecordMode	7A46	44583

5.2 Numeric Bounded Setup Registers

ION Register	ION Handle	Modbus Registers
AI01 Full Scale	7018	46049 to 46050
AI01 Zero Scale	7006	46013 to 46014
AI02 Full Scale	7019	46051 to 46052
AI02 Zero Scale	7007	46015 to 46016
AI03 Full Scale	701A	46053 to 46054
AI03 Zero Scale	7008	46017 to 46018
AI04 Full Scale	701B	46055 to 46056
AI04 Zero Scale	7009	46019 to 46020
AI05 Full Scale	701C	46057 to 46058
AI05 Zero Scale	700A	46021 to 46022
AI06 Full Scale	701D	46059 to 46060
AI06 Zero Scale	700B	46023 to 46024
AI07 Full Scale	701E	46061 to 46062
AI07 Zero Scale	700C	46025 to 46026
AI08 Full Scale	701F	46063 to 46064
AI08 Zero Scale	700D	46027 to 46028
AI09 Full Scale	7020	46065 to 46066
AI09 Zero Scale	700E	46029 to 46030
AI10 Full Scale	7021	46067 to 46068
AI10 Zero Scale	700F	46031 to 46032
AI11 Full Scale	7022	46069 to 46070
AI11 Zero Scale	7010	46033 to 46034
AI12 Full Scale	7023	46071 to 46072
AI12 Zero Scale	7011	46035 to 46036
AI13 Full Scale	7024	46073 to 46074
AI13 Zero Scale	7012	46037 to 46038
AI14 Full Scale	7025	46075 to 46076
AI14 Zero Scale	7013	46039 to 46040
AI15 Full Scale	7026	46077 to 46078
AI15 Zero Scale	7014	46041 to 46042
AI16 Full Scale	7027	46079 to 46080
AI16 Zero Scale	7015	46043 to 46044
AI17 Full Scale	7028	46081 to 46082
AI17 Zero Scale	7016	46045 to 46046
AI18 Full Scale	7029	46083 to 46084
AI18 Zero Scale	7017	46047 to 46048
AO01 Full Scale	7048	46145 to 46146
AO01 Zero Scale	702A	46085 to 46086
AO02 Full Scale	7049	46147 to 46148
AO02 Zero Scale	702B	46087 to 46088
AO03 Full Scale	704A	46149 to 46150
AO03 Zero Scale	702C	46089 to 46090
AO04 Full Scale	704B	46151 to 46152
AO04 Zero Scale	702D	46091 to 46092
AO05 Full Scale	704C	46153 to 46154
AO05 Zero Scale	702E	46093 to 46094
AO06 Full Scale	704D	46155 to 46156
AO06 Zero Scale	702F	46095 to 46096
AO07 Full Scale	704E	46157 to 46158
AO07 Zero Scale	7030	46097 to 46098
AO08 Full Scale	704F	46159 to 46160
AO08 Zero Scale	7031	46099 to 46100
AO09 Full Scale	7050	46161 to 46162
AO09 Zero Scale	7032	46101 to 46102

ION Register	ION Handle	Modbus Registers
AO10 Full Scale	7051	46163 to 46164
AO10 Zero Scale	7033	46103 to 46104
AO11 Full Scale	7052	46165 to 46166
AO11 Zero Scale	7034	46105 to 46106
AO12 Full Scale	7053	46167 to 46168
AO12 Zero Scale	7035	46107 to 46108
AO13 Full Scale	7054	46169 to 46170
AO13 Zero Scale	7036	46109 to 46110
AO14 Full Scale	7055	46171 to 46172
AO14 Zero Scale	7037	46111 to 46112
AO15 Full Scale	7056	46173 to 46174
AO15 Zero Scale	7038	46113 to 46114
AO16 Full Scale	7057	46175 to 46176
AO16 Zero Scale	7039	46115 to 46116
AO17 Full Scale	7058	46177 to 46178
AO17 Zero Scale	703A	46117 to 46118
AO18 Full Scale	7059	46179 to 46180
AO18 Zero Scale	703B	46119 to 46120
AO19 Full Scale	705A	46181 to 46182
AO19 Zero Scale	703C	46121 to 46122
AO20 Full Scale	705B	46183 to 46184
AO20 Zero Scale	703D	46123 to 46124
AO21 Full Scale	705C	46185 to 46186
AO21 Zero Scale	703E	46125 to 46126
AO22 Full Scale	705D	46187 to 46188
AO22 Zero Scale	703F	46127 to 46128
AO23 Full Scale	705E	46189 to 46190
AO23 Zero Scale	7040	46129 to 46130
AO24 Full Scale	705F	46191 to 46192
AO24 Zero Scale	7041	46131 to 46132
AO25 Full Scale	7060	46193 to 46194
AO25 Zero Scale	7042	46133 to 46134
AO26 Full Scale	7061	46195 to 46196
AO26 Zero Scale	7043	46135 to 46136
AO27 Full Scale	7062	46197 to 46198
AO27 Zero Scale	7044	46137 to 46138
AO28 Full Scale	7063	46199 to 46200
AO28 Zero Scale	7045	46139 to 46140
AO29 Full Scale	7064	46201 to 46202
AO29 Zero Scale	7046	46141 to 46142
AO30 Full Scale	7065	46203 to 46204
AO30 Zero Scale	7047	46143 to 46144
CL01 DST End	7230	47121 to 47122
CL01 DST Offset	7231	47123 to 47124
CL01 DST Start	722F	47119 to 47120
CL01 TZ Offset	722E	47117 to 47118
CM01 RTS Delay	71E8	46977 to 46978
CM01 Unit ID	71E9	46979 to 46980
CM02 RTS Delay	7232	47125 to 47126
CM02 Unit ID	7234	47129 to 47130
CM03 RTS Delay	7233	47127 to 47128
CM03 Unit ID	7235	47131 to 47132
CN01 Multiplier	71DC	46953 to 46954
CN02 Multiplier	71DD	46955 to 46956

ION Register	ION Handle	Modbus Registers
CN03 Multiplier	71DE	46957 to 46958
CN04 Multiplier	71DF	46959 to 46960
CN05 Multiplier	71E0	46961 to 46962
CN06 Multiplier	71E1	46963 to 46964
CN07 Multiplier	71E2	46965 to 46966
CN08 Multiplier	71E3	46967 to 46968
CN09 Multiplier	71E4	46969 to 46970
CN10 Multiplier	71E5	46971 to 46972
DI01 Debounce	7066	46205 to 46206
DI02 Debounce	7067	46207 to 46208
DI03 Debounce	7068	46209 to 46210
DI04 Debounce	7069	46211 to 46212
DI05 Debounce	706A	46213 to 46214
DI06 Debounce	706B	46215 to 46216
DI07 Debounce	706C	46217 to 46218
DI08 Debounce	706D	46219 to 46220
DI09 Debounce	706E	46221 to 46222
DI10 Debounce	706F	46223 to 46224
DI11 Debounce	7070	46225 to 46226
DI12 Debounce	7071	46227 to 46228
DI13 Debounce	7072	46229 to 46230
DI14 Debounce	7073	46231 to 46232
DI15 Debounce	7074	46233 to 46234
DI16 Debounce	7075	46235 to 46236
DI17 Debounce	7076	46237 to 46238
DI18 Debounce	7077	46239 to 46240
DI19 Debounce	7078	46241 to 46242
DI20 Debounce	7079	46243 to 46244
DI21 Debounce	707A	46245 to 46246
DI22 Debounce	707B	46247 to 46248
DI23 Debounce	707C	46249 to 46250
DI24 Debounce	707D	46251 to 46252
DI25 Debounce	707E	46253 to 46254
DI26 Debounce	707F	46255 to 46256
DI27 Debounce	7080	46257 to 46258
DI28 Debounce	7081	46259 to 46260
DI29 Debounce	7082	46261 to 46262
DI30 Debounce	7083	46263 to 46264
DI31 Debounce	7084	46265 to 46266
DI32 Debounce	7085	46267 to 46268
DI33 Debounce	7086	46269 to 46270
DI34 Debounce	7087	46271 to 46272
DI35 Debounce	7088	46273 to 46274
DI36 Debounce	7089	46275 to 46276
DI37 Debounce	708A	46277 to 46278
DI38 Debounce	708B	46279 to 46280
DO01 PulseWidth	708C	46281 to 46282
DO02 PulseWidth	708D	46283 to 46284
DO03 PulseWidth	708E	46285 to 46286
DO04 PulseWidth	708F	46287 to 46288
DO05 PulseWidth	7090	46289 to 46290
DO06 PulseWidth	7091	46291 to 46292
DO07 PulseWidth	7092	46293 to 46294
DO08 PulseWidth	7093	46295 to 46296
DO09 PulseWidth	7094	46297 to 46298
DO10 PulseWidth	7095	46299 to 46300
DO11 PulseWidth	7096	46301 to 46302
DO12 PulseWidth	7097	46303 to 46304
DO13 PulseWidth	7098	46305 to 46306
DO14 PulseWidth	7099	46307 to 46308
DO15 PulseWidth	709A	46309 to 46310
DO16 PulseWidth	709B	46311 to 46312
DO17 PulseWidth	709C	46313 to 46314
DO18 PulseWidth	709D	46315 to 46316
DO19 PulseWidth	709E	46317 to 46318
DO20 PulseWidth	709F	46319 to 46320
DO21 PulseWidth	70A0	46321 to 46322
DO22 PulseWidth	70A1	46323 to 46324
DO23 PulseWidth	70A2	46325 to 46326
DO24 PulseWidth	70A3	46327 to 46328
DO25 PulseWidth	70A4	46329 to 46330
DO26 PulseWidth	70A5	46331 to 46332
DO27 PulseWidth	70A6	46333 to 46334
DO28 PulseWidth	70A7	46335 to 46336
DO29 PulseWidth	70A8	46337 to 46338
DO30 PulseWidth	70A9	46339 to 46340
EL Depth	71E6	46973 to 46974
EL Protection	71E7	46975 to 46976
Ether IP Addr	7236	47133 to 47134
FAC CT1aSmooth	71F9	47011 to 47012
FAC CT1bSmooth	71FA	47013 to 47014
FAC CT1cSmooth	71FB	47015 to 47016
FAC CT2aSmooth	71FC	47017 to 47018
FAC CT2bSmooth	71FD	47019 to 47020
FAC CT2cSmooth	71FE	47021 to 47022
FAC CT3aSmooth	71FF	47023 to 47024
FAC CT3bSmooth	7200	47025 to 47026
FAC CT3cSmooth	7201	47027 to 47028
FAC I_force	7207	47039 to 47040
FAC I1cal	71F2	46997 to 46998
FAC i1Off	7202	47029 to 47030
FAC I1x20cal	71F6	47005 to 47006
FAC I20nominal	71EE	46989 to 46990
FAC I2cal	71F3	46999 to 47000
FAC i2Off	7203	47031 to 47032
FAC I2x20cal	71F7	47007 to 47008
FAC I3cal	71F4	47001 to 47002
FAC i3Off	7204	47033 to 47034
FAC I3x20cal	71F8	47009 to 47010
FAC I4_force	7208	47041 to 47042
FAC I4cal	71F5	47003 to 47004
FAC I4nominal	71ED	46987 to 46988
FAC i4Off	7205	47035 to 47036
FAC Inominal	71EC	46985 to 46986
FAC V_force	7206	47037 to 47038
FAC V1cal	71EF	46991 to 46992
FAC V2cal	71F0	46993 to 46994
FAC V3cal	71F1	46995 to 46996
FAC Vnominal	71EB	46983 to 46984
FAC VX_force	7209	47043 to 47044
FAC Vx1cal	720A	47045 to 47046
FAC Vx1dc	720E	47053 to 47054
FAC Vx2cal	720B	47047 to 47048
FAC Vx2dc	720F	47055 to 47056

ION Register	ION Handle	Modbus Registers
FAC Vx3cal	720C	47049 to 47050
FAC Vx3dc	7210	47057 to 47058
FAC Vx4cal	720D	47051 to 47052
FAC Vx4dc	7211	47059 to 47060
IN01 Divisor	7104	46521 to 46522
IN01 RollValue	721E	47085 to 47086
IN01 Valu/Pulse	7114	46553 to 46554
IN02 Divisor	7105	46523 to 46524
IN02 RollValue	721F	47087 to 47088
IN02 Valu/Pulse	7115	46555 to 46556
IN03 Divisor	7106	46525 to 46526
IN03 RollValue	7220	47089 to 47090
IN03 Valu/Pulse	7116	46557 to 46558
IN04 Divisor	7107	46527 to 46528
IN04 RollValue	7221	47091 to 47092
IN04 Valu/Pulse	7117	46559 to 46560
IN05 Divisor	7108	46529 to 46530
IN05 RollValue	7222	47093 to 47094
IN05 Valu/Pulse	7118	46561 to 46562
IN06 Divisor	7109	46531 to 46532
IN06 RollValue	7223	47095 to 47096
IN06 Valu/Pulse	7119	46563 to 46564
IN07 Divisor	710A	46533 to 46534
IN07 RollValue	7224	47097 to 47098
IN07 Valu/Pulse	711A	46565 to 46566
IN08 Divisor	710B	46535 to 46536
IN08 RollValue	7225	47099 to 47100
IN08 Valu/Pulse	711B	46567 to 46568
IN09 Divisor	710C	46537 to 46538
IN09 RollValue	7226	47101 to 47102
IN09 Valu/Pulse	711C	46569 to 46570
IN10 Divisor	710D	46539 to 46540
IN10 RollValue	7227	47103 to 47104
IN10 Valu/Pulse	711D	46571 to 46572
IN11 Divisor	710E	46541 to 46542
IN11 RollValue	7228	47105 to 47106
IN11 Valu/Pulse	711E	46573 to 46574
IN12 Divisor	710F	46543 to 46544
IN12 RollValue	7229	47107 to 47108
IN12 Valu/Pulse	711F	46575 to 46576
IN13 Divisor	7110	46545 to 46546
IN13 RollValue	722A	47109 to 47110
IN13 Valu/Pulse	7120	46577 to 46578
IN14 Divisor	7111	46547 to 46548
IN14 RollValue	722B	47111 to 47112
IN14 Valu/Pulse	7121	46579 to 46580
IN15 Divisor	7112	46549 to 46550
IN15 RollValue	722C	47113 to 47114
IN15 Valu/Pulse	7122	46581 to 46582
IN16 Divisor	7113	46551 to 46552
IN16 RollValue	722D	47115 to 47116
IN16 Valu/Pulse	7123	46583 to 46584
MSR1 BaseAddr	7237	47135 to 47136
MSR1 InFull	723F	47151 to 47152
MSR1 InZero	723B	47143 to 47144
MSR1 OutFull	7247	47167 to 47168
MSR1 OutZero	7243	47159 to 47160
MSR2 BaseAddr	7238	47137 to 47138
MSR2 InFull	7240	47153 to 47154
MSR2 InZero	723C	47145 to 47146
MSR2 OutFull	7248	47169 to 47170
MSR2 OutZero	7244	47161 to 47162
MSR3 BaseAddr	7239	47139 to 47140
MSR3 InFull	7241	47155 to 47156
MSR3 InZero	723D	47147 to 47148
MSR3 OutFull	7249	47171 to 47172
MSR3 OutZero	7245	47163 to 47164
MSR4 BaseAddr	723A	47141 to 47142
MSR4 InFull	7242	47157 to 47158
MSR4 InZero	723E	47149 to 47150
MSR4 OutFull	724A	47173 to 47174
MSR4 OutZero	7246	47165 to 47166
OS01 Duration	71D0	46929 to 46930
OS02 Duration	71D1	46931 to 46932
OS03 Duration	71D2	46933 to 46934
OS04 Duration	71D3	46935 to 46936
OS05 Duration	71D4	46937 to 46938
OS06 Duration	71D5	46939 to 46940
OS07 Duration	71D6	46941 to 46942
OS08 Duration	71D7	46943 to 46944
OS09 Duration	71D8	46945 to 46946
OS10 Duration	71D9	46947 to 46948
OS11 Duration	71DA	46949 to 46950
OS12 Duration	71DB	46951 to 46952
PM CT Prim	7002	46005 to 46006
PM CT Sec	7003	46007 to 46008
PM I4 CT Prim	7004	46009 to 46010
PM I4 CT Sec	7005	46011 to 46012
PM PT Prim	7000	46001 to 46002
PM PT Sec	7001	46003 to 46004
PT01 Period	71BC	46889 to 46890
PT02 Period	71BD	46891 to 46892
PT03 Period	71BE	46893 to 46894
PT04 Period	71BF	46895 to 46896
PT05 Period	71C0	46897 to 46898
PT06 Period	71C1	46899 to 46900
PT07 Period	71C2	46901 to 46902
PT08 Period	71C3	46903 to 46904
PT09 Period	71C4	46905 to 46906
PT10 Period	71C5	46907 to 46908
PT11 Period	71C6	46909 to 46910
PT12 Period	71C7	46911 to 46912
PT13 Period	71C8	46913 to 46914
PT14 Period	71C9	46915 to 46916
PT15 Period	71CA	46917 to 46918
PT16 Period	71CB	46919 to 46920
PT17 Period	71CC	46921 to 46922
PT18 Period	71CD	46923 to 46924
PT19 Period	71CE	46925 to 46926
PT20 Period	71CF	46927 to 46928
PU01 PulseWidth	70AA	46341 to 46342
PU02 PulseWidth	70AB	46343 to 46344
PU03 PulseWidth	70AC	46345 to 46346
PU04 PulseWidth	70AD	46347 to 46348

ION Register	ION Handle	Modbus Registers
PU05 PulseWidth	70AE	46349 to 46350
PU06 PulseWidth	70AF	46351 to 46352
PU07 PulseWidth	70B0	46353 to 46354
PU08 PulseWidth	70B1	46355 to 46356
PU09 PulseWidth	70B2	46357 to 46358
PU10 PulseWidth	70B3	46359 to 46360
RE01 Depth	719C	46825 to 46826
RE02 Depth	719D	46827 to 46828
RE03 Depth	719E	46829 to 46830
RE04 Depth	719F	46831 to 46832
RE05 Depth	71A0	46833 to 46834
RE06 Depth	71A1	46835 to 46836
RE07 Depth	71A2	46837 to 46838
RE08 Depth	71A3	46839 to 46840
RE09 Depth	71A4	46841 to 46842
RE10 Depth	71A5	46843 to 46844
RE11 Depth	71A6	46845 to 46846
RE12 Depth	71A7	46847 to 46848
RE13 Depth	71A8	46849 to 46850
RE14 Depth	71A9	46851 to 46852
RE15 Depth	71AA	46853 to 46854
RE16 Depth	71AB	46855 to 46856
RE17 Depth	71AC	46857 to 46858
RE18 Depth	71AD	46859 to 46860
RE19 Depth	71AE	46861 to 46862
RE20 Depth	71AF	46863 to 46864
SD01 #SubIntvls	70C4	46393 to 46394
SD01 Pred Resp	70D4	46425 to 46426
SD01 Sub Intvl	70B4	46361 to 46362
SD02 #SubIntvls	70C5	46395 to 46396
SD02 Pred Resp	70D5	46427 to 46428
SD02 Sub Intvl	70B5	46363 to 46364
SD03 #SubIntvls	70C6	46397 to 46398
SD03 Pred Resp	70D6	46429 to 46430
SD03 Sub Intvl	70B6	46365 to 46366
SD04 #SubIntvls	70C7	46399 to 46400
SD04 Pred Resp	70D7	46431 to 46432
SD04 Sub Intvl	70B7	46367 to 46368
SD05 #SubIntvls	70C8	46401 to 46402
SD05 Pred Resp	70D8	46433 to 46434
SD05 Sub Intvl	70B8	46369 to 46370
SD06 #SubIntvls	70C9	46403 to 46404
SD06 Pred Resp	70D9	46435 to 46436
SD06 Sub Intvl	70B9	46371 to 46372
SD07 #SubIntvls	70CA	46405 to 46406
SD07 Pred Resp	70DA	46437 to 46438
SD07 Sub Intvl	70BA	46373 to 46374
SD08 #SubIntvls	70CB	46407 to 46408
SD08 Pred Resp	70DB	46439 to 46440
SD08 Sub Intvl	70BB	46375 to 46376
SD09 #SubIntvls	70CC	46409 to 46410
SD09 Pred Resp	70DC	46441 to 46442
SD09 Sub Intvl	70BC	46377 to 46378
SD10 #SubIntvls	70CD	46411 to 46412
SD10 Pred Resp	70DD	46443 to 46444
SD10 Sub Intvl	70BD	46379 to 46380
SD11 #SubIntvls	70CE	46413 to 46414
SD11 Pred Resp	70DE	46445 to 46446
SD11 Sub Intvl	70BE	46381 to 46382
SD12 #SubIntvls	70CF	46415 to 46416
SD12 Pred Resp	70DF	46447 to 46448
SD12 Sub Intvl	70BF	46383 to 46384
SD13 #SubIntvls	70D0	46417 to 46418
SD13 Pred Resp	70E0	46449 to 46450
SD13 Sub Intvl	70C0	46385 to 46386
SD14 #SubIntvls	70D1	46419 to 46420
SD14 Pred Resp	70E1	46451 to 46452
SD14 Sub Intvl	70C1	46387 to 46388
SD15 #SubIntvls	70D2	46421 to 46422
SD15 Pred Resp	70E2	46453 to 46454
SD15 Sub Intvl	70C2	46389 to 46390
SD16 #SubIntvls	70D3	46423 to 46424
SD16 Pred Resp	70E3	46455 to 46456
SD16 Sub Intvl	70C3	46391 to 46392
SP01 EvPriority	7184	46777 to 46778
SP01 High Limit	7124	46585 to 46586
SP01 Low Limit	713C	46633 to 46634
SP01 SusUntlOFF	716C	46729 to 46730
SP01 SusUntlON	7154	46681 to 46682
SP02 EvPriority	7185	46779 to 46780
SP02 High Limit	7125	46587 to 46588
SP02 Low Limit	713D	46635 to 46636
SP02 SusUntlOFF	716D	46731 to 46732
SP02 SusUntlON	7155	46683 to 46684
SP03 EvPriority	7186	46781 to 46782
SP03 High Limit	7126	46589 to 46590
SP03 Low Limit	713E	46637 to 46638
SP03 SusUntlOFF	716E	46733 to 46734
SP03 SusUntlON	7156	46685 to 46686
SP04 EvPriority	7187	46783 to 46784
SP04 High Limit	7127	46591 to 46592
SP04 Low Limit	713F	46639 to 46640
SP04 SusUntlOFF	716F	46735 to 46736
SP04 SusUntlON	7157	46687 to 46688
SP05 EvPriority	7188	46785 to 46786
SP05 High Limit	7128	46593 to 46594
SP05 Low Limit	7140	46641 to 46642
SP05 SusUntlOFF	7170	46737 to 46738
SP05 SusUntlON	7158	46689 to 46690
SP06 EvPriority	7189	46787 to 46788
SP06 High Limit	7129	46595 to 46596
SP06 Low Limit	7141	46643 to 46644
SP06 SusUntlOFF	7171	46739 to 46740
SP06 SusUntlON	7159	46691 to 46692
SP07 EvPriority	718A	46789 to 46790
SP07 High Limit	712A	46597 to 46598
SP07 Low Limit	7142	46645 to 46646
SP07 SusUntlOFF	7172	46741 to 46742
SP07 SusUntlON	715A	46693 to 46694
SP08 EvPriority	718B	46791 to 46792
SP08 High Limit	712B	46599 to 46600
SP08 Low Limit	7143	46647 to 46648
SP08 SusUntlOFF	7173	46743 to 46744
SP08 SusUntlON	715B	46695 to 46696

ION Register	ION Handle	Modbus Registers
SP09 EvPriority	718C	46793 to 46794
SP09 High Limit	712C	46601 to 46602
SP09 Low Limit	7144	46649 to 46650
SP09 SusUntlOFF	7174	46745 to 46746
SP09 SusUntlON	715C	46697 to 46698
SP10 EvPriority	718D	46795 to 46796
SP10 High Limit	712D	46603 to 46604
SP10 Low Limit	7145	46651 to 46652
SP10 SusUntlOFF	7175	46747 to 46748
SP10 SusUntlON	715D	46699 to 46700
SP11 EvPriority	718E	46797 to 46798
SP11 High Limit	712E	46605 to 46606
SP11 Low Limit	7146	46653 to 46654
SP11 SusUntlOFF	7176	46749 to 46750
SP11 SusUntlON	715E	46701 to 46702
SP12 EvPriority	718F	46799 to 46800
SP12 High Limit	712F	46607 to 46608
SP12 Low Limit	7147	46655 to 46656
SP12 SusUntlOFF	7177	46751 to 46752
SP12 SusUntlON	715F	46703 to 46704
SP13 EvPriority	7190	46801 to 46802
SP13 High Limit	7130	46609 to 46610
SP13 Low Limit	7148	46657 to 46658
SP13 SusUntlOFF	7178	46753 to 46754
SP13 SusUntlON	7160	46705 to 46706
SP14 EvPriority	7191	46803 to 46804
SP14 High Limit	7131	46611 to 46612
SP14 Low Limit	7149	46659 to 46660
SP14 SusUntlOFF	7179	46755 to 46756
SP14 SusUntlON	7161	46707 to 46708
SP15 EvPriority	7192	46805 to 46806
SP15 High Limit	7132	46613 to 46614
SP15 Low Limit	714A	46661 to 46662
SP15 SusUntlOFF	717A	46757 to 46758
SP15 SusUntlON	7162	46709 to 46710
SP16 EvPriority	7193	46807 to 46808
SP16 High Limit	7133	46615 to 46616
SP16 Low Limit	714B	46663 to 46664
SP16 SusUntlOFF	717B	46759 to 46760
SP16 SusUntlON	7163	46711 to 46712
SP17 EvPriority	7194	46809 to 46810
SP17 High Limit	7134	46617 to 46618
SP17 Low Limit	714C	46665 to 46666
SP17 SusUntlOFF	717C	46761 to 46762
SP17 SusUntlON	7164	46713 to 46714
SP18 EvPriority	7195	46811 to 46812
SP18 High Limit	7135	46619 to 46620
SP18 Low Limit	714D	46667 to 46668
SP18 SusUntlOFF	717D	46763 to 46764
SP18 SusUntlON	7165	46715 to 46716
SP19 EvPriority	7196	46813 to 46814
SP19 High Limit	7136	46621 to 46622
SP19 Low Limit	714E	46669 to 46670
SP19 SusUntlOFF	717E	46765 to 46766
SP19 SusUntlON	7166	46717 to 46718
SP20 EvPriority	7197	46815 to 46816
SP20 High Limit	7137	46623 to 46624
SP20 Low Limit	714F	46671 to 46672
SP20 SusUntlOFF	717F	46767 to 46768
SP20 SusUntlON	7167	46719 to 46720
SP21 EvPriority	7198	46817 to 46818
SP21 High Limit	7138	46625 to 46626
SP21 Low Limit	7150	46673 to 46674
SP21 SusUntlOFF	7180	46769 to 46770
SP21 SusUntlON	7168	46721 to 46722
SP22 EvPriority	7199	46819 to 46820
SP22 High Limit	7139	46627 to 46628
SP22 Low Limit	7151	46675 to 46676
SP22 SusUntlOFF	7181	46771 to 46772
SP22 SusUntlON	7169	46723 to 46724
SP23 EvPriority	719A	46821 to 46822
SP23 High Limit	713A	46629 to 46630
SP23 Low Limit	7152	46677 to 46678
SP23 SusUntlOFF	7182	46773 to 46774
SP23 SusUntlON	716A	46725 to 46726
SP24 EvPriority	719B	46823 to 46824
SP24 High Limit	713B	46631 to 46632
SP24 Low Limit	7153	46679 to 46680
SP24 SusUntlOFF	7183	46775 to 46776
SP24 SusUntlON	716B	46727 to 46728
SS01 ChangeCrit	7218	47073 to 47074
SS01 EvPriority	721C	47081 to 47082
SS01 Nom Volts	721A	47077 to 47078
SS01 Sag Lim	7216	47069 to 47070
SS01 Swell Lim	7214	47065 to 47066
TD01 Interval	70E4	46457 to 46458
TD01 Time Const	70F4	46489 to 46490
TD02 Interval	70E5	46459 to 46460
TD02 Time Const	70F5	46491 to 46492
TD03 Interval	70E6	46461 to 46462
TD03 Time Const	70F6	46493 to 46494
TD04 Interval	70E7	46463 to 46464
TD04 Time Const	70F7	46495 to 46496
TD05 Interval	70E8	46465 to 46466
TD05 Time Const	70F8	46497 to 46498
TD06 Interval	70E9	46467 to 46468
TD06 Time Const	70F9	46499 to 46500
TD07 Interval	70EA	46469 to 46470
TD07 Time Const	70FA	46501 to 46502
TD08 Interval	70EB	46471 to 46472
TD08 Time Const	70FB	46503 to 46504
TD09 Interval	70EC	46473 to 46474
TD09 Time Const	70FC	46505 to 46506
TD10 Interval	70ED	46475 to 46476
TD10 Time Const	70FD	46507 to 46508
TD11 Interval	70EE	46477 to 46478
TD11 Time Const	70FE	46509 to 46510
TD12 Interval	70EF	46479 to 46480
TD12 Time Const	70FF	46511 to 46512
TD13 Interval	70F0	46481 to 46482
TD13 Time Const	7100	46513 to 46514
TD14 Interval	70F1	46483 to 46484
TD14 Time Const	7101	46515 to 46516
TD15 Interval	70F2	46485 to 46486

ION Register	ION Handle	Modbus Registers
TD15 Time Const	7102	46517 to 46518
TD16 Interval	70F3	46487 to 46488
TD16 Time Const	7103	46519 to 46520
WR01 Depth	71B0	46865 to 46866
WR02 Depth	71B1	46867 to 46868
WR03 Depth	71B2	46869 to 46870
WR04 Depth	71B3	46871 to 46872
WR05 Depth	71B4	46873 to 46874
WR06 Depth	71B5	46875 to 46876
WR07 Depth	71B6	46877 to 46878
WR08 Depth	71B7	46879 to 46880
WR09 Depth	71B8	46881 to 46882
WR10 Depth	71B9	46883 to 46884
WR11 Depth	71BA	46885 to 46886
WR12 Depth	71BB	46887 to 46888
WR13 Depth	7212	47061 to 47062
WR14 Depth	7213	47063 to 47064

6. MODBUS SLAVE MODULE FACTORY DEFAULT

NB: This section applies only to a 7700 ION device which has been factory-initialized. Any setup changes to the Modbus Slave Modules negates the validity of this register map.

6.1 Modbus Slave Module #1

Format: ***Unsigned 16 bit***
Base Address: ***40011***
Scaling: ***Yes***
In Zero, In Full: ***0, +6553***
Out Zero, Out Full: ***0, +65530***

Input	Modbus Register	Parameter	Input	Modbus Register	Parameter
Source #1	40011	Van	Source #9	40019	Ia
Source #2	40012	Vbn	Source #10	40020	Ib
Source #3	40013	Vcn	Source #11	40021	Ic
Source #4	40014	Vln avg	Source #12	40022	I avg
Source #5	40015	Vab	Source #13	40023	V unbal
Source #6	40016	Vbc	Source #14	40024	I unbal
Source #7	40017	Vca	Source #15	40025	Freq
Source #8	40018	Vll avg	Source #16	40026	I4

6.2 Modbus Slave Module #2

Format: ***Signed 32 bit***
Base Address: ***40027***
Scaling: ***Yes***
In Zero, In Full: ***-214748364, +214748364***
Out Zero, Out Full: ***-2147483640, +2147483640***

Input	Modbus Registers	Parameter	Input	Modbus Registers	Parameter
Source #1	40027 to 40028	kWa	Source #9	40043 to 40044	kVAa
Source #2	40029 to 40030	kWb	Source #10	40045 to 40046	kVAb
Source #3	40031 to 40032	kWc	Source #11	40047 to 40048	kVAc
Source #4	40033 to 40034	kW tot	Source #12	40049 to 40050	kVA tot
Source #5	40035 to 40036	kVARa	Source #13	40051 to 40052	pf signed a
Source #6	40037 to 40038	kVARb	Source #14	40053 to 40054	pf signed b
Source #7	40039 to 40040	kVARc	Source #15	40055 to 40056	pf signed c
Source #8	40041 to 40042	kVAR tot	Source #16	40057 to 40058	pf signed tot

6.3 Modbus Slave Module #3

Format: ***Signed 32 bit***
Base Address: ***40059***
Scaling: ***Yes***
In Zero, In Full: ***-214748364, +214748364***
Out Zero, Out Full: ***-2147483640, +2147483640***

Input	Modbus Registers	Parameter	Input	Modbus Registers	Parameter
Source #1	40059 to 40060	Vll avg Max	Source #9	40075 to 40076	Freq Min
Source #2	40061 to 40062	I avg Max	Source #10	40077 to 40078	kW tot SWD
Source #3	40063 to 40064	kW tot Max	Source #11	40079 to 40080	kVA tot SWD
Source #4	40065 to 40066	kVAR tot Max	Source #12	40081 to 40082	kVAR tot SWD
Source #5	40067 to 40068	kVA tot Max	Source #13	40083 to 40084	kW tot SWD Max
Source #6	40069 to 40070	Freq Max	Source #14	40085 to 40086	kVA tot SWD Max
Source #7	40071 to 40072	Vll avg Min	Source #15	40087 to 40088	kVAR tot SWD Max
Source #8	40073 to 40074	I avg Min	Source #16		(unused)

6.4 Modbus Slave Module #4

Format: ***Signed 32 bit-M10K***
Base Address: ***40089***
Scaling: ***No***

Input	Modbus Registers	Parameter	Input	Modbus Registers	Parameter
Source #1	40089 to 40090	kWh import	Source #9	40105 to 40106	kVAh tot
Source #2	40091 to 40092	kWh export	Source #10		(unused)
Source #3	40093 to 40094	kWh tot	Source #11		(unused)
Source #4	40095 to 40096	kWh net	Source #12		(unused)
Source #5	40097 to 40098	kVARh import	Source #13		(unused)
Source #6	40099 to 40100	kVARh export	Source #14		(unused)
Source #7	40101 to 40102	VARh tot	Source #15		(unused)
Source #8	40103 to 40104	kVARh net	Source #16		(unused)