Note: This document is only valid for ION7300 series, ION7500/7600, ION7550/7650, ION8600/8650 and ION8800 devices. For all other devices, this document has been replaced by the *Modbus Register Map* for your device. To obtain a copy, visit www.schneider-electric.com

Modbus protocol and register map for ION devices

This document summarizes the default Modbus™ protocol and the register maps for the PowerLogic™ ION™ power meters.

The Modbus map in an ION device is split into two components. The first is a flexible, user-configured component that utilizes the Modbus Slave Modules in the meter (see the *ION Reference* for details on this module setup and configuration). The second is a fixed register map that can be used for meter setup and control applications.

For information on using your ION meter as a Modbus slave or Modbus master, see the *Modbus and ION Technology* technical note and your meter's *User Guide*. For information on the Modbus implementation in the ION6200, see the *PowerLogic ION6200 Serial Communications Protocol and ION/Modbus Register Map* document.

In this document

Additional information

- *ION Reference*
- Visit www.modbus.org for Modbus protocol specifications.

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Hazard categories and special symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, can result in equipment damage.

NOTE

Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Safety Precautions

Installation, wiring, testing and service must be performed in accordance with all local and national electrical codes.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA or applicable local standards.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- Do not use the device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit
- Connect protective ground (earth) before turning on any power supplying this device.
- Do not modify a register's configuration without understanding the impact to the meter and any associated devices.

Failure to follow these instructions will result in death or serious injury.

Modbus implementation on the meter

Introduction

This section explains the Modbus protocol for ION meters. The meter performs Modbus communications according to the Modbus Application Protocol v1.1. It is assumed that the reader is familiar with the Modbus protocol and serial communications in general.

Purpose of the Modbus protocol

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

- Interrogation of all meter data which are exported via the Modbus Slave module.
- Configuration and interrogation of meter module Numeric Bounded and Enumerated setup registers.
- Interrogation and control of the meter External Control modules.

Ground rules

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

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

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

Modes of transmission

The Modbus protocol uses TCP, RTU and ASCII modes of transmission. The following meters support Modbus/TCP and Modbus/RTU protocols:

- Ethernet-enabled ION7300 series
- ION7500/ION7600
- ION7550/ION7650
- ION8600
- ION8800
- ION8650

Depending on the meter and firmware version, the meter may require 8 data bits, no parity and one stop bit (8N1) for serial communication.

Description of the Modbus packet structure

Every Modbus packet consists of four fields:

- Slave address field
- Function field
- Data field
- Error check field (checksum)

Slave address field

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

Function field

The function field of a Modbus request packet is one byte in length and tells the addressed slave which function to perform. Similarly, the function field of a response packet tells the master what function the addressed slave has just performed. See “Modbus functions supported by the meter as slave” on page 6 for a list of the Modbus functions supported by the meter when acting as slave.

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

Data field

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

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

Example:

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

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

This register is transmitted in the order 12 AB.

Error check field (checksum)

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

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

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

See “Appendix A: CRC-16 calculation” on page 80 for more detailed information on CRC-16 calculations.

Packet communications

This section illustrates the Modbus functions supported by the meter.

Modbus functions supported by the meter as slave

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

Function 03: Read Holding Registers

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

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

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

Read Holding Registers packet structure

Read Registers Request packet (master to slave)	Read Registers Response packet (slave to master)
Unit ID/slave address (1 byte)	Unit ID/slave address (1 byte)
03 (function code) (1byte)	03 (function code) (1 byte)
Start register (sr) (2 bytes)	Byte count (2 x nr) (1 byte)
# of registers to read (nr) (2 bytes)	First register in range (2 bytes)
CRC checksum	Second register in range (2 bytes)
	...
	CRC checksum (2 bytes)

Example:

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

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

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

Slave	Function	Start register (40011)		# of registers (3)		CRC checksum	
64	03	◆ 00	◆ 0A	◆ 00	◆ 03	◆ 2C	◆ 3C

Response packet:

Slave	Function	Byte count	Register 1		Register 2		Register 3		CRC checksum	
64	03	◆ 06	◆ 2E	◆ CE	◆ 2E	◆ E8	◆ 2F	◆ 13	◆ 0D	◆ 58

The master station retrieves the data from the response:

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

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

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

NOTE

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

Function 16: Preset Multiple Registers

⚠ WARNING

HAZARD OF UNINTENDED OPERATION

- Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.
- Be aware that an unexpected change of state of the digital outputs may result when the supply power to the meter is interrupted or after a meter firmware or template upgrade.

Failure to follow these instructions can result in death, serious injury or equipment damage.

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

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

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

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

Preset Multiple Registers

Preset Registers Request packet (master to slave)	Preset Registers Response packet (slave to master)
Unit ID/slave address (1 byte)	Unit ID/slave address (1 byte)
16 (function code) (1byte)	16 (function code) (1 byte)
Start register (sr) (2 bytes)	Start register (sr) (2 bytes)
# of registers to write (nr) (2 bytes)	# of registers written (nr) (2 bytes)
Byte count (2 x nr) (1 byte)	CRC checksum (2 bytes)
First register in range (2 bytes)	
Second register in range (2 bytes)	
...	
CRC checksum (2 bytes)	

NOTE

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

Example:

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

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

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

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

Slave	Function	Start register (46001)		# of registers (4)		Byte count	Register 1		Register 2		Register 3		Register 4		CRC checksum	
C8	10	17	70	00	04	08	00	00	04	B0	00	00	00	78	8B	F8

Response packet:

Slave	Function	Start register (46001)		# of registers (4)		CRC checksum	
C8	10	17	70	00	04	D4	3C

NOTE

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

Invalid registers

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

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

Modbus data format

This section covers the data format for the flexible Modbus Slave module registers and the fixed Modbus registers.

Modbus Slave module output registers

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

Modbus Slave module output registers are located in the Modbus register map (from 40001 to 41800). The actual location depends on the setup of the individual Modbus Slave modules.The Modbus Slave module can scale and offset input values, and format the outputs in one of eight selectable formats:

Format	Datatype	Range
UINT16	16 bit unsigned integer	0 to 65,535
INT16	16 bit signed integer	-32,768 to +32,767
UINT32	32 bit unsigned integer	0 to 4,294,967,295
INT32	32 bit signed integer	-2,147,483,648 to +2,147,483,647
INT32-M10K	32 bit signed Modulous 10k	-327,680,000 to +327,670,000
UINT32-M10K	32 bit unsigned Modulous 10k	0 to 655,350,000
BOOLEAN	Packed Boolean	See "Packed Boolean format" on page 12
UINT 16 R/W	16 bit unsigned integer input mode	0 to 65,535

NOTE

The available formats vary depending on your meter type and firmware.

16-bit integer format

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

32-bit integer format

To accommodate values that can reach beyond the 16-bit range, the Modbus Slave module provides 32-bit integer format as an output option. In signed and unsigned 32-bit integer formats, each ION input register to the module corresponds to two 16-bit Modbus holding register outputs.

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

High-order register

- $register_{high}$=value/65536

Low-order register

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

Example (unsigned 32-bit):

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

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

In unsigned 32-bit integer format, both the high-order and low-order registers are unsigned 16-bit integers.

Example (signed 32-bit):

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

- -12345678 = FF439EB2 Hex
- $Register_{high}$ = FF43 Hex (signed) = -189
- $Register_{low}$ = 9EB2 Hex (unsigned) = 40626
- value = -189 x 65536 + 40626 = -12345678

In signed 32-bit integer format, the high-order register is a signed 16-bit number, but the low-order register is unsigned.

32-bit 'Modulus-10000' format

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

High-order register

- $register_{high}$=value/10000

Low-order register

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

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

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

Example (unsigned):

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

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

Example (signed):

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

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

Packed Boolean format

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

Example:

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

Register: 0001110000000000 Bin = 1C00 Hex

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

Register: 1001110000000000 Bin = 9C00 Hex

Unsigned 16-bit input

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

Meter Modbus registers

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

There are four main classes of registers available via Modbus:

- Modbus Slave module output registers
- External Control registers
- Enumerated ION module setup registers
- Numeric Bounded ION module setup registers

Broadcast packets

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

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

Exception responses

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

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

Exception codes supported by the meter

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

Modbus Slave module registers

Modbus register map ION6200

Refer to the *PowerLogic ION6200 Serial Communications Protocol and ION/ Modbus Register Map* document for details on the ION6200 Modbus register map.

Modbus register map ION7300 series

This table outlines the default data registers available on the ION7300 series power meters. For further information on accessing configuration and control registers using the Modbus protocol, please see the *ION7300 series Modicon Modbus Serial Communications Protocol* document.

This register map is applicable to the following template revisions:

- 7300_FAC-4WYE_V2.2.0.0.0
- 7330_FAC-4WYE_V2.3.0.1.1
- 7350_FAC-4WYE_V1.2.0.0.0

And the following RMICAN approved frameworks, to be used with v265 firmware:

- 7300_FAC-RM_V2.2.0.0.0
- 7330_FAC-RM_V2.3.0.0.1

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Vln a	40011	1	Modbus Slave 1	1	UINT16	10	Yes
Vln b	40012	1	Modbus Slave 1	1	UINT16	10	Yes
Vln c	40013	1	Modbus Slave 1	1	UINT16	10	Yes
Vln avg	40014	1	Modbus Slave 1	1	UINT16	10	Yes
Vll ab	40015	1	Modbus Slave 1	1	UINT16	10	Yes
Vll bc	40016	1	Modbus Slave 1	1	UINT16	10	Yes
Vll ca	40017	1	Modbus Slave 1	1	UINT16	10	Yes
Vll avg	40018	1	Modbus Slave 1	1	UINT16	10	Yes
I a	40019	1	Modbus Slave 1	1	UINT16	10	Yes
I b	40020	1	Modbus Slave 1	1	UINT16	10	Yes
I c	40021	1	Modbus Slave 1	1	UINT16	10	Yes
I avg	40022	1	Modbus Slave 1	1	UINT16	10	Yes
V unbal	40023	1	Modbus Slave 1	1	UINT16	10	Yes
I unbal	40024	1	Modbus Slave 1	1	UINT16	10	Yes
Freq	40025	1	Modbus Slave 1	1	UINT16	10	Yes
Phase Rev	40026	1	Modbus Slave 1	1	UINT16	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kW a	40027	2	Modbus Slave 2	2	INT32	10	Yes
kW b	40029	2	Modbus Slave 2	2	INT32	10	Yes
kW c	40031	2	Modbus Slave 2	2	INT32	10	Yes
kW tot	40033	2	Modbus Slave 2	2	INT32	10	Yes
kVAR a	40035	2	Modbus Slave 2	2	INT32	10	Yes
kVAR b	40037	2	Modbus Slave 2	2	INT32	10	Yes
kVAR c	40039	2	Modbus Slave 2	2	INT32	10	Yes
kVAR tot	40041	2	Modbus Slave 2	2	INT32	10	Yes
kVA a	40043	2	Modbus Slave 2	2	INT32	10	Yes
kVA b	40045	2	Modbus Slave 2	2	INT32	10	Yes
kVA c	40047	2	Modbus Slave 2	2	INT32	10	Yes
kVA tot	40049	2	Modbus Slave 2	2	INT32	10	Yes
PF sign a	40051	2	Modbus Slave 2	2	INT32	10	Yes
PF sign b	40053	2	Modbus Slave 2	2	INT32	10	Yes
PF sign c	40055	2	Modbus Slave 2	2	INT32	10	Yes
PF sign tot	40057	2	Modbus Slave 2	2	INT32	10	Yes
kW td	40059	3	Modbus Slave 3	2	INT32	10	Yes
kVAR td	40061	3	Modbus Slave 3	2	INT32	10	Yes
kVA td	40063	3	Modbus Slave 3	2	INT32	10	Yes
kW td mx	40065	3	Modbus Slave 3	2	INT32	10	Yes
kVAR td mx	40067	3	Modbus Slave 3	2	INT32	10	Yes
kVA td mx	40069	3	Modbus Slave 3	2	INT32	10	Yes
Vln avg mx	40071	3	Modbus Slave 3	2	INT32	10	Yes
I avg mx	40073	3	Modbus Slave 3	2	INT32	10	Yes
kW tot mx	40075	3	Modbus Slave 3	2	INT32	10	Yes
kVAR tot mx	40077	3	Modbus Slave 3	2	INT32	10	Yes
kVA tot mx	40079	3	Modbus Slave 3	2	INT32	10	Yes
Freq mx	40081	3	Modbus Slave 3	2	INT32	10	Yes
Vln avg mn	40083	3	Modbus Slave 3	2	INT32	10	Yes
I avg mn	40085	3	Modbus Slave 3	2	INT32	10	Yes
Freq mn	40087	3	Modbus Slave 3	2	INT32	10	Yes
kWh imp (kWh del) [1]	40089	4	Modbus Slave 4	2	INT32-M10K	1	No
kWh exp (kWh rec) [1]	40091	4	Modbus Slave 4	2	INT32-M10K	1	No
kWh tot (kWh del+rec) [1]	40093	4	Modbus Slave 4	2	INT32-M10K	1	No
kWh net (kWh del-rec) [1]	40095	4	Modbus Slave 4	2	INT32-M10K	1	No
kVARh imp (kVARh del) [1]	40097	4	Modbus Slave 4	2	INT32-M10K	1	No
kVARh exp (kVARh rec) [1]	40099	4	Modbus Slave 4	2	INT32-M10K	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kW a	40027	2	Modbus Slave 2	2	INT32	10	Yes
kW b	40029	2	Modbus Slave 2	2	INT32	10	Yes
kW c	40031	2	Modbus Slave 2	2	INT32	10	Yes
kW tot	40033	2	Modbus Slave 2	2	INT32	10	Yes
kVAR a	40035	2	Modbus Slave 2	2	INT32	10	Yes
kVAR b	40037	2	Modbus Slave 2	2	INT32	10	Yes
kVAR c	40039	2	Modbus Slave 2	2	INT32	10	Yes
kVAR tot	40041	2	Modbus Slave 2	2	INT32	10	Yes
kVA a	40043	2	Modbus Slave 2	2	INT32	10	Yes
kVA b	40045	2	Modbus Slave 2	2	INT32	10	Yes
kVA c	40047	2	Modbus Slave 2	2	INT32	10	Yes
kVA tot	40049	2	Modbus Slave 2	2	INT32	10	Yes
PF sign a	40051	2	Modbus Slave 2	2	INT32	10	Yes
PF sign b	40053	2	Modbus Slave 2	2	INT32	10	Yes
PF sign c	40055	2	Modbus Slave 2	2	INT32	10	Yes
PF sign tot	40057	2	Modbus Slave 2	2	INT32	10	Yes
kW td	40059	3	Modbus Slave 3	2	INT32	10	Yes
kVAR td	40061	3	Modbus Slave 3	2	INT32	10	Yes
kVA td	40063	3	Modbus Slave 3	2	INT32	10	Yes
kW td mx	40065	3	Modbus Slave 3	2	INT32	10	Yes
kVAR td mx	40067	3	Modbus Slave 3	2	INT32	10	Yes
kVA td mx	40069	3	Modbus Slave 3	2	INT32	10	Yes
Vln avg mx	40071	3	Modbus Slave 3	2	INT32	10	Yes
I avg mx	40073	3	Modbus Slave 3	2	INT32	10	Yes
kW tot mx	40075	3	Modbus Slave 3	2	INT32	10	Yes
kVAR tot mx	40077	3	Modbus Slave 3	2	INT32	10	Yes
kVA tot mx	40079	3	Modbus Slave 3	2	INT32	10	Yes
Freq mx	40081	3	Modbus Slave 3	2	INT32	10	Yes
Vln avg mn	40083	3	Modbus Slave 3	2	INT32	10	Yes
I avg mn	40085	3	Modbus Slave 3	2	INT32	10	Yes
Freq mn	40087	3	Modbus Slave 3	2	INT32	10	Yes
kWh imp (kWh del) [1]	40089	4	Modbus Slave 4	2	INT32-M10K	1	No
kWh exp (kWh rec) [1]	40091	4	Modbus Slave 4	2	INT32-M10K	1	No
kWh tot (kWh del+rec) [1]	40093	4	Modbus Slave 4	2	INT32-M10K	1	No
kWh net (kWh del-rec) [1]	40095	4	Modbus Slave 4	2	INT32-M10K	1	No
kVARh imp (kVARh del) [1]	40097	4	Modbus Slave 4	2	INT32-M10K	1	No
kVARh exp (kVARh rec) [1]	40099	4	Modbus Slave 4	2	INT32-M10K	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kVARh tot (kVARh del+rec) [1]	40101	4	Modbus Slave 4	2	INT32-M10K	1	No
kVARh net (kVARh del-rec) [1]	40103	4	Modbus Slave 4	2	INT32-M10K	1	No
kVAh (kVAh del) [1]	40105	4	Modbus Slave 4	2	INT32-M10K	1	No
V1 THD mx	40107	4	Modbus Slave 4	2	INT32-M10K	1	No
V2 THD mx	40109	4	Modbus Slave 4	2	INT32-M10K	1	No
V3 THD mx	40111	4	Modbus Slave 4	2	INT32-M10K	1	No
I1 THD mx	40113	4	Modbus Slave 4	2	INT32-M10K	1	No
I2 THD mx	40115	4	Modbus Slave 4	2	INT32-M10K	1	No
I3 THD mx	40117	4	Modbus Slave 4	2	INT32-M10K	1	No

[1] The bracketed labels apply to the 7300_FAC-RM_V2.2.0.0.0 and 7330_FAC-RM_V2.3.0.0.1 frameworks only.

Modbus register map ION7500/ION7600

This table outlines the default data registers available on the following v251 RMICAN approved template revisions:

- 7500_v250_FAC-4WYE_V1.6.0.0.3
- 7600_v250_FAC-4WYE_V1.5.0.0.3

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Vln a	40011	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
Vln b	40012	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
Vln c	40013	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
Vln avg	40014	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
Vll ab	40015	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
Vll bc	40016	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
Vll ca	40017	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
Vll avg	40018	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
I a	40019	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
I b	40020	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
I c	40021	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
I avg	40022	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
V unbal	40023	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
I unbal	40024	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
Freq	40025	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
I4	40026	1	Volts/Amps/Freq [1]	1	UINT16	10	Yes
kW a	40027	2	Power/PF [2]	2	INT32	10	Yes
kW b	40029	2	Power/PF [2]	2	INT32	10	Yes
kW c	40031	2	Power/PF [2]	2	INT32	10	Yes
kW tot	40033	2	Power/PF [2]	2	INT32	10	Yes
kVAR a	40035	2	Power/PF [2]	2	INT32	10	Yes
kVAR b	40037	2	Power/PF [2]	2	INT32	10	Yes
kVAR c	40039	2	Power/PF [2]	2	INT32	10	Yes
kVAR tot	40041	2	Power/PF [2]	2	INT32	10	Yes
kVA a	40043	2	Power/PF [2]	2	INT32	10	Yes
kVA b	40045	2	Power/PF [2]	2	INT32	10	Yes
kVA c	40047	2	Power/PF [2]	2	INT32	10	Yes
kVA tot	40049	2	Power/PF [2]	2	INT32	10	Yes
PF sign a	40051	2	Power/PF [2]	2	INT32	10	Yes
PF sign b	40053	2	Power/PF [2]	2	INT32	10	Yes
PF sign c	40055	2	Power/PF [2]	2	INT32	10	Yes
PF sign tot	40057	2	Power/PF [2]	2	INT32	10	Yes
Vll avg mx	40059	3	Min/Max/Demand [3]	2	INT32	10	Yes
I avg mx	40061	3	Min/Max/Demand [3]	2	INT32	10	Yes
kW tot mx	40063	3	Min/Max/Demand [3]	2	INT32	10	Yes
kVAR tot mx	40065	3	Min/Max/Demand [3]	2	INT32	10	Yes
kVA tot mx	40067	3	Min/Max/Demand [3]	2	INT32	10	Yes
Freq mx	40069	3	Min/Max/Demand [3]	2	INT32	10	Yes
Vll avg mn	40071	3	Min/Max/Demand [3]	2	INT32	10	Yes
I avg mn	40073	3	Min/Max/Demand [3]	2	INT32	10	Yes
Freq mn	40075	3	Min/Max/Demand [3]	2	INT32	10	Yes
kW sd del-rec	40077	3	Min/Max/Demand [3]	2	INT32	10	Yes
kVA sd del+rec	40079	3	Min/Max/Demand [3]	2	INT32	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kVAR sd del-rec	40081	3	Min/Max/Demand [3]	2	INT32	10	Yes
kW sd mx d-r	40083	3	Min/Max/Demand [3]	2	INT32	10	Yes
kVA sd mx d+r	40085	3	Min/Max/Demand [3]	2	INT32	10	Yes
kVAR sd mx d-r	40087	3	Min/Max/Demand [3]	2	INT32	10	Yes
Phase Rev	40089	3	Min/Max/Demand [3]	2	INT32	10	Yes
kWh del	40091	4	Energy/THD [4]	2	INT32-M10K	10	No
kWh rec	40093	4	Energy/THD [4]	2	INT32-M10K	10	No
kWh del+rec	40095	4	Energy/THD [4]	2	INT32-M10K	10	No
kWh del-rec	40097	4	Energy/THD [4]	2	INT32-M10K	10	No
kVARh del	40099	4	Energy/THD [4]	2	INT32-M10K	10	No
kVARh rec	40101	4	Energy/THD [4]	2	INT32-M10K	10	No
kVARh del+rec	40103	4	Energy/THD [4]	2	INT32-M10K	10	No
kVARh del-rec	40105	4	Energy/THD [4]	2	INT32-M10K	10	No
kVAh del+rec	40107	4	Energy/THD [4]	2	INT32-M10K	10	No
V1 THD mx	40109	4	Energy/THD [4]	2	INT32-M10K	10	No
V2 THD mx	40111	4	Energy/THD [4]	2	INT32-M10K	10	No
V3 THD mx	40113	4	Energy/THD [4]	2	INT32-M10K	10	No
I1 THD mx	40115	4	Energy/THD [4]	2	INT32-M10K	10	No
I2 THD mx	40117	4	Energy/THD [4]	2	INT32-M10K	10	No
I3 THD mx	40119	4	Energy/THD [4]	2	INT32-M10K	10	No
I a	40150	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I b	40151	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I c	40152	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I 4	40153	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I 5	40154	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I avg	40155	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I avg mn	40156	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I avg mx	40157	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I avg mean	40158	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
Freq	40159	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Freq mn	40160	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
Freq mx	40161	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
Freq mean	40162	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
V unbal	40163	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
I unbal	40164	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
Phase Rev	40165	16 [5]	Amp/freq/unbal	1	UINT16	10	Yes
Vln a	40166	17 [6]	Volts	2	UINT32	10	No
Vln b	40168	17 [6]	Volts	2	UINT32	10	No
Vln c	40170	17 [6]	Volts	2	UINT32	10	No
Vln avg	40172	17 [6]	Volts	2	UINT32	10	No
Vln avg mx	40174	17 [6]	Volts	2	UINT32	10	No
Vll ab	40178	17 [6]	Volts	2	UINT32	10	No
Vll bc	40180	17 [6]	Volts	2	UINT32	10	No
Vll ca	40182	17 [6]	Volts	2	UINT32	10	No
Vll avg	40184	17 [6]	Volts	2	UINT32	10	No
Vll avg mx	40186	17 [6]	Volts	2	UINT32	10	No
Vll avg mean	40188	17 [6]	Volts	2	UINT32	10	No
kW a	40198	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kW b	40200	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kW c	40202	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kW tot	40204	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kW tot mx	40206	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR a	40208	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR b	40210	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR c	40212	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR tot	40214	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR tot mx	40216	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVA a	40218	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVA b	40220	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVA c	40222	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kVA tot	40224	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kVA tot mx	40226	18 [7]	kW/kVAr/kVA	2	INT32	1/1000	No
kWh del	40230	19 [8]	kWh/kVArh	2	INT32	1/1000	No
kWh rec	40232	19 [8]	kWh/kVArh	2	INT32	1/1000	No
kVARh del	40234	19 [8]	kWh/kVArh	2	INT32	1/1000	No
kVARh rec	40236	19 [8]	kWh/kVArh	2	INT32	1/1000	No
kVAh del+rec	40238	19 [8]	kWh/kVArh	2	INT32	1/1000	No
PF sign a	40262	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
PF sign b	40263	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
PF sign c	40264	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
PF sign tot	40265	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
V1 THD mx	40266	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
V2 THD mx	40267	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
V3 THD mx	40268	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I1 THD mx	40269	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I2 THD mx	40270	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I3 THD mx	40271	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I1 K Factor	40272	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I2 K Factor	40273	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I3 K Factor	40274	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I1 Crest Factor	40275	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I2 Crest Factor	40276	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes
I3 Crest Factor	40277	20 [9]	PF/THD/Kfactor	1	INT16	100	Yes

The following registers are only available on the ION7600 framework:

PO V1-Flck N	41000	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-Flck N1	41001	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-Flck N	41002	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-Flck N1	41003	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-Flck N	41004	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-Flck N1	41005	5	EN50160 Modbus1	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO Freq N	41006	5	EN50160 Modbus1	1	UINT16	1	No
PO Freq N1	41007	5	EN50160 Modbus1	1	UINT16	1	No
PO Freq N2	41008	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-MAG N	41009	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-MAG N1	41010	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-MAG N	41011	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-MAG N1	41012	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-MAG N	41013	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-MAG N1	41014	5	EN50160 Modbus1	1	UINT16	1	No
PO Vunbal N	41015	5	EN50160 Modbus1	1	UINT16	1	No
PO Vunbal N1	41016	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-MSignal N	41017	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-MSignal N1	41018	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-MSignal N	41019	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-MSignal N1	41020	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-MSignal N	41021	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-MSignal N1	41022	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-Hrm N	41023	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-Hrm N1	41024	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-Hrm N2	41025	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N	41026	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N1	41027	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N2	41028	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-Hrm N	41029	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-Hrm N1	41030	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-Hrm N2	41031	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-Inthrm N	41032	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Inthrm N1	41033	7	EN50160 Modbus3	1	UINT16	1	No
PO V2-Inthrm N	41034	7	EN50160 Modbus3	1	UINT16	1	No
PO V2-Inthrm N1	41035	7	EN50160 Modbus3	1	UINT16	1	No
PO V3-Inthrm N	41036	7	EN50160 Modbus3	1	UINT16	1	No
PO V3-Inthrm N1	41037	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N11	41038	7	EN50160 Modbus3	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V1-Dip N12	41039	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N13	41040	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N14	41041	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N21	41042	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N22	41043	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N23	41044	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N24	41045	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N31	41046	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N32	41047	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N33	41048	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N34	41049	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N41	41050	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N42	41051	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N43	41052	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N44	41053	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N51	41054	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N52	41055	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N53	41056	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N54	41057	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N61	41058	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N62	41059	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N63	41060	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N64	41061	8	EN50160 Modbus4	1	UINT16	1	No
PO V2-Dip N11	41062	8	EN50160 Modbus4	1	UINT16	1	No
PO V2-Dip N12	41063	8	EN50160 Modbus4	1	UINT16	1	No
PO V2-Dip N13	41064	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N14	41065	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N21	41066	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N22	41067	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N23	41068	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N24	41069	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N31	41070	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N32	41071	9	EN50160 Modbus5	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V2-Dip N33	41072	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N34	41073	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N41	41074	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N42	41075	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N43	41076	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N44	41077	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N51	41078	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N52	41079	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N53	41080	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N54	41081	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N61	41082	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N62	41083	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N63	41084	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N64	41085	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N11	41086	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N12	41087	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N13	41088	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N14	41089	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N21	41090	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N22	41091	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N23	41092	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N24	41093	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N31	41094	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N32	41095	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N33	41096	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N34	41097	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N41	41098	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N42	41099	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N43	41100	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N44	41101	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N51	41102	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N52	41103	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N53	41104	11	EN50160 Modbus7	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V3-Dip N54	41105	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N61	41106	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N62	41107	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N63	41108	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N64	41109	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N1	41110	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N2	41111	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N3	41112	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N1	41113	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N2	41114	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N3	41115	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N1	41116	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N2	41117	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N3	41118	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N11	41119	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N12	41120	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N13	41121	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N14	41122	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N15	41123	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N21	41124	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N22	41125	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N23	41126	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N24	41127	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N25	41128	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N31	41129	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N32	41130	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N33	41131	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N34	41132	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N35	41133	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N11	41134	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N12	41135	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N13	41136	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N14	41137	13	EN50160 Modbus9	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V2-Ovlt N15	41138	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N21	41139	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N22	41140	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N23	41141	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N24	41142	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N25	41143	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N31	41144	14	EN50160 Modbus10	1	UINT16	1	No
PO V2-Ovlt N32	41145	14	EN50160 Modbus10	1	UINT16	1	No
PO V2-Ovlt N33	41146	14	EN50160 Modbus10	1	UINT16	1	No
PO V2-Ovlt N34	41147	14	EN50160 Modbus10	1	UINT16	1	No
PO V2-Ovlt N35	41148	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N11	41149	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N12	41150	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N13	41151	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N14	41152	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N15	41153	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N21	41154	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N22	41155	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N23	41156	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N24	41157	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N25	41158	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N31	41159	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N32	41160	15	EN50160 Modbus11	1	UINT16	1	No
PO V3-Ovlt N33	41161	15	EN50160 Modbus11	1	UINT16	1	No
PO V3-Ovlt N34	41162	15	EN50160 Modbus11	1	UINT16	1	No
PO V3-Ovlt N35	41163	15	EN50160 Modbus11	1	UINT16	1	No

1) The ION7500 module label is ‘Modbus Slave 1’.
2) The ION7500 module label is ‘Modbus Slave 2’.
3) The ION7500 module label is ‘Modbus Slave 3’.
4) The ION7500 module label is ‘Modbus Slave 4’.
5) The ION7500 module number is 6.
6) The ION7500 module number is 7.
7) The ION7500 module number is 8.
8) The ION7500 module number is 9.
9) The ION7500 module number is 10.

Modbus register map ION7550/ION7650

This table outlines the default data registers available on the ION7550/ION7650 power meters. The v320 framework files are designed for use with the v321 RMICAN approved firmware. This register map is applicable to the following template revisions:

- 7550_v350_FAC_V3.3.0.0.2
- 7650_v350_FAC_V3.3.0.0.2
- 7650_v350_FAC-PQ_V3.3.0.0.1 (power quality framework)

And the following RMICAN approved frameworks:

- 7550_V320_FAC_V3.1.0.1.1
- 7650_V320_FAC_V3.1.0.1.1
- 7650_V320_FAC-PQ_V3.1.0.1.1 (power quality framework)

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
I a	40150	16	Amp/freq/unbal	1	UINT16	10	Yes
I b	40151	16	Amp/freq/unbal	1	UINT16	10	Yes
I c	40152	16	Amp/freq/unbal	1	UINT16	10	Yes
I 4	40153	16	Amp/freq/unbal	1	UINT16	10	Yes
I 5	40154	16	Amp/freq/unbal	1	UINT16	10	Yes
I avg	40155	16	Amp/freq/unbal	1	UINT16	10	Yes
I avg mn	40156	16	Amp/freq/unbal	1	UINT16	10	Yes
I avg mx	40157	16	Amp/freq/unbal	1	UINT16	10	Yes
I avg mean	40158	16	Amp/freq/unbal	1	UINT16	10	Yes
Freq	40159	16	Amp/freq/unbal	1	UINT16	10	Yes
Freq mn	40160	16	Amp/freq/unbal	1	UINT16	10	Yes
Freq mx	40161	16	Amp/freq/unbal	1	UINT16	10	Yes
Freq mean	40162	16	Amp/freq/unbal	1	UINT16	10	Yes
V unbal	40163	16	Amp/freq/unbal	1	UINT16	10	Yes
I unbal	40164	16	Amp/freq/unbal	1	UINT16	10	Yes
Phase Rev	40165	16	Amp/freq/unbal	1	UINT16	10	Yes
Vln a	40166	17	Volts	2	UINT32	10	No
Vln b	40168	17	Volts	2	UINT32	10	No
Vln c	40170	17	Volts	2	UINT32	10	No
Vln avg	40172	17	Volts	2	UINT32	10	No
Vln avg mx	40174	17	Volts	2	UINT32	10	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Vll ab	40178	17	Volts	2	UINT32	10	No
Vll bc	40180	17	Volts	2	UINT32	10	No
Vll ca	40182	17	Volts	2	UINT32	10	No
Vll avg	40184	17	Volts	2	UINT32	10	No
Vll avg mx	40186	17	Volts	2	UINT32	10	No
Vll avg mean	40188	17	Volts	2	UINT32	10	No
kW a	40198	18	kW/kVAr/kVA	2	INT32	1/1000	No
kW b	40200	18	kW/kVAr/kVA	2	INT32	1/1000	No
kW c	40202	18	kW/kVAr/kVA	2	INT32	1/1000	No
kW tot	40204	18	kW/kVAr/kVA	2	INT32	1/1000	No
kW tot mx	40206	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR a	40208	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR b	40210	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR c	40212	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR tot	40214	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVAR tot mx	40216	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVA a	40218	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVA b	40220	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVA c	40222	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVA tot	40224	18	kW/kVAr/kVA	2	INT32	1/1000	No
kVA tot mx	40226	18	kW/kVAr/kVA	2	INT32	1/1000	No
kWh del	40230	19	kWh/kVArh	2	INT32	1/1000	No
kWh rec	40232	19	kWh/kVArh	2	INT32	1/1000	No
kVARh del	40234	19	kWh/kVArh	2	INT32	1/1000	No
kVARh rec	40236	19	kWh/kVArh	2	INT32	1/1000	No
kVAh del+rec	40238	19	kWh/kVArh	2	INT32	1/1000	No
PF sign a	40262	20	PF/THD/Kfactor	1	INT16	100	Yes
PF sign b	40263	20	PF/THD/Kfactor	1	INT16	100	Yes
PF sign c	40264	20	PF/THD/Kfactor	1	INT16	100	Yes
PF sign tot	40265	20	PF/THD/Kfactor	1	INT16	100	Yes
V1 THD mx	40266	20	PF/THD/Kfactor	1	INT16	100	Yes
V2 THD mx	40267	20	PF/THD/Kfactor	1	INT16	100	Yes
V3 THD mx	40268	20	PF/THD/Kfactor	1	INT16	100	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
I1 THD mx	40269	20	PF/THD/Kfactor	1	INT16	100	Yes
I2 THD mx	40270	20	PF/THD/Kfactor	1	INT16	100	Yes
I3 THD mx	40271	20	PF/THD/Kfactor	1	INT16	100	Yes
I1 K Factor	40272	20	PF/THD/Kfactor	1	INT16	100	Yes
I2 K Factor	40273	20	PF/THD/Kfactor	1	INT16	100	Yes
I3 K Factor	40274	20	PF/THD/Kfactor	1	INT16	100	Yes
I1 Crest Factor	40275	20	PF/THD/Kfactor	1	INT16	100	Yes
I2 Crest Factor	40276	20	PF/THD/Kfactor	1	INT16	100	Yes
I3 Crest Factor	40277	20	PF/THD/Kfactor	1	INT16	100	Yes

The following registers are only available on the ION7650 with the EN50160 power quality framework:

PO V1-Flck N	41000	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-Flck N1	41001	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-Flck N	41002	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-Flck N1	41003	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-Flck N	41004	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-Flck N1	41005	5	EN50160 Modbus1	1	UINT16	1	No
PO Freq N	41006	5	EN50160 Modbus1	1	UINT16	1	No
PO Freq N1	41007	5	EN50160 Modbus1	1	UINT16	1	No
PO Freq N2	41008	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-MAG N	41009	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-MAG N1	41010	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-MAG N	41011	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-MAG N1	41012	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-MAG N	41013	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-MAG N1	41014	5	EN50160 Modbus1	1	UINT16	1	No
PO Vunbal N	41015	5	EN50160 Modbus1	1	UINT16	1	No
PO Vunbal N1	41016	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-MSignal N	41017	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-MSignal N1	41018	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-MSignal N	41019	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-MSignal N1	41020	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-MSignal N	41021	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-MSignal N1	41022	6	EN50160 Modbus2	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V1-Hrm N	41023	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-Hrm N1	41024	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-Hrm N2	41025	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N	41026	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N1	41027	6	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N2	41028	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-Hrm N	41029	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-Hrm N1	41030	6	EN50160 Modbus2	1	UINT16	1	No
PO V3-Hrm N2	41031	6	EN50160 Modbus2	1	UINT16	1	No
PO V1-Inthrm N	41032	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Inthrm N1	41033	7	EN50160 Modbus3	1	UINT16	1	No
PO V2-Inthrm N	41034	7	EN50160 Modbus3	1	UINT16	1	No
PO V2-Inthrm N1	41035	7	EN50160 Modbus3	1	UINT16	1	No
PO V3-Inthrm N	41036	7	EN50160 Modbus3	1	UINT16	1	No
PO V3-Inthrm N1	41037	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N11	41038	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N12	41039	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N13	41040	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N14	41041	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N21	41042	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N22	41043	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N23	41044	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N24	41045	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N31	41046	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N32	41047	7	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N33	41048	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N34	41049	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N41	41050	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N42	41051	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N43	41052	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N44	41053	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N51	41054	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N52	41055	8	EN50160 Modbus4	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V1-Dip N53	41056	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N54	41057	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N61	41058	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N62	41059	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N63	41060	8	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N64	41061	8	EN50160 Modbus4	1	UINT16	1	No
PO V2-Dip N11	41062	8	EN50160 Modbus4	1	UINT16	1	No
PO V2-Dip N12	41063	8	EN50160 Modbus4	1	UINT16	1	No
PO V2-Dip N13	41064	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N14	41065	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N21	41066	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N22	41067	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N23	41068	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N24	41069	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N31	41070	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N32	41071	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N33	41072	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N34	41073	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N41	41074	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N42	41075	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N43	41076	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N44	41077	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N51	41078	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N52	41079	9	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N53	41080	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N54	41081	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N61	41082	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N62	41083	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N63	41084	10	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N64	41085	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N11	41086	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N12	41087	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N13	41088	10	EN50160 Modbus6	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V3-Dip N14	41089	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N21	41090	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N22	41091	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N23	41092	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N24	41093	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N31	41094	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N32	41095	10	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N33	41096	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N34	41097	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N41	41098	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N42	41099	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N43	41100	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N44	41101	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N51	41102	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N52	41103	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N53	41104	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N54	41105	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N61	41106	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N62	41107	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N63	41108	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N64	41109	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N1	41110	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N2	41111	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N3	41112	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N1	41113	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N2	41114	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N3	41115	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N1	41116	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N2	41117	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N3	41118	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N11	41119	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N12	41120	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N13	41121	12	EN50160 Modbus8	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V1-Ovlt N14	41122	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N15	41123	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N21	41124	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N22	41125	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N23	41126	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N24	41127	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N25	41128	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N31	41129	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N32	41130	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N33	41131	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N34	41132	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N35	41133	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N11	41134	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N12	41135	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N13	41136	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N14	41137	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N15	41138	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N21	41139	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N22	41140	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N23	41141	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N24	41142	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N25	41143	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N31	41144	14	EN50160 Modbus10	1	UINT16	1	No
PO V2-Ovlt N32	41145	14	EN50160 Modbus10	1	UINT16	1	No
PO V2-Ovlt N33	41146	14	EN50160 Modbus10	1	UINT16	1	No
PO V2-Ovlt N34	41147	14	EN50160 Modbus10	1	UINT16	1	No
PO V2-Ovlt N35	41148	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N11	41149	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N12	41150	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N13	41151	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N14	41152	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N15	41153	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N21	41154	14	EN50160 Modbus10	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V3-Ovlt N22	41155	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N23	41156	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N24	41157	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N25	41158	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N31	41159	14	EN50160 Modbus10	1	UINT16	1	No
PO V3-Ovlt N32	41160	15	EN50160 Modbus11	1	UINT16	1	No
PO V3-Ovlt N33	41161	15	EN50160 Modbus11	1	UINT16	1	No
PO V3-Ovlt N34	41162	15	EN50160 Modbus11	1	UINT16	1	No
PO V3-Ovlt N35	41163	15	EN50160 Modbus11	1	UINT16	1	No

Modbus register map ION8300/ION8400/ION8500

This table outlines the default data registers available on the ION8300/ION8400/ION8500 power meters. The ION8300/ION8400/ION8500 meters have ten Modbus Slave modules. Modules 1 through 5 are part of the original Modbus mapping and are preserved for backward compatibility. If you are using the new Modbus mapping (modules 6 through 10), you can delete modules 1 through 5. Be aware that the register map table is ordered by Modbus address and not module number.

NOTE

The new Modbus register map (modules 6 through 10) were created to better group data values and resolve scaling issues in the legacy registers. Use the new modules for all new Modbus implementations.

This register map is applicable to the following templates to be used with v262 and v281 RMICAN approved firmware:

- 8300_FAC-9S-36S_V2.6.0.0.9
- 8300_FAC-35S_V2.6.0.0.9
- 8400_FAC-9S-39S-36S-76S_V2.6.0.0.9
- 8400_FAC-35S_V2.6.0.0.9
- 8500_FAC-9S-39S-36S-76S_V2.6.0.0.9
- 8500_FAC-35S_V2.6.0.0.9

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Vln a [1]	40011	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln b [1]	40012	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln c [1]	40013	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln avg [1]	40014	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll ab	40015	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll bc	40016	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll ca	40017	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll avg	40018	1	Volts/Amps/Freq	1	UINT16	10	Yes
I a	40019	1	Volts/Amps/Freq	1	UINT16	10	Yes
I b	40020	1	Volts/Amps/Freq	1	UINT16	10	Yes
I c	40021	1	Volts/Amps/Freq	1	UINT16	10	Yes
I avg	40022	1	Volts/Amps/Freq	1	UINT16	10	Yes
V unbal	40023	1	Volts/Amps/Freq	1	UINT16	10	Yes
I unbal	40024	1	Volts/Amps/Freq	1	UINT16	10	Yes
Freq	40025	1	Volts/Amps/Freq	1	UINT16	10	Yes
I4	40026	1	Volts/Amps/Freq	1	UINT16	10	Yes
kW a	40027	2	Power/PF	2	INT32	10	Yes
kW b	40029	2	Power/PF	2	INT32	10	Yes
kW c	40031	2	Power/PF	2	INT32	10	Yes
kW tot	40033	2	Power/PF	2	INT32	10	Yes
kVAR a	40035	2	Power/PF	2	INT32	10	Yes
kVAR b	40037	2	Power/PF	2	INT32	10	Yes
kVAR c	40039	2	Power/PF	2	INT32	10	Yes
kVAR tot	40041	2	Power/PF	2	INT32	10	Yes
kVA a	40043	2	Power/PF	2	INT32	10	Yes
kVA b	40045	2	Power/PF	2	INT32	10	Yes
kVA c	40047	2	Power/PF	2	INT32	10	Yes
kVA tot	40049	2	Power/PF	2	INT32	10	Yes
PF sign a	40051	2	Power/PF	2	INT32	10	Yes
PF sign b	40053	2	Power/PF	2	INT32	10	Yes
PF sign c	40055	2	Power/PF	2	INT32	10	Yes
PF sign tot	40057	2	Power/PF	2	INT32	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Vll avg mx	40059	3	Min/Max/Demand	2	INT32	10	Yes
I avg mx	40061	3	Min/Max/Demand	2	INT32	10	Yes
kW tot mx	40063	3	Min/Max/Demand	2	INT32	10	Yes
kVAR tot mx	40065	3	Min/Max/Demand	2	INT32	10	Yes
kVA tot mx	40067	3	Min/Max/Demand	2	INT32	10	Yes
Freq mx	40069	3	Min/Max/Demand	2	INT32	10	Yes
Vll avg mn	40071	3	Min/Max/Demand	2	INT32	10	Yes
I avg mn	40073	3	Min/Max/Demand	2	INT32	10	Yes
Freq mn	40075	3	Min/Max/Demand	2	INT32	10	Yes
kW sd del-rec	40077	3	Min/Max/Demand	2	INT32	10	Yes
kVA sd del+rec	40079	3	Min/Max/Demand	2	INT32	10	Yes
kVAR sd del-rec	40081	3	Min/Max/Demand	2	INT32	10	Yes
kW sd mx d-r	40083	3	Min/Max/Demand	2	INT32	10	Yes
kVA sd mx d+r	40085	3	Min/Max/Demand	2	INT32	10	Yes
kVAR sd mx d-r	40087	3	Min/Max/Demand	2	INT32	10	Yes
Phase Rev	40089	3	Min/Max/Demand	2	INT32	10	Yes
kWh del	40091	4	Energy/THD	2	INT32-M10K	10	No
kWh rec	40093	4	Energy/THD	2	INT32-M10K	10	No
kWh del+rec	40095	4	Energy/THD	2	INT32-M10K	10	No
kWh del-rec	40097	4	Energy/THD	2	INT32-M10K	10	No
kVARh del	40099	4	Energy/THD	2	INT32-M10K	10	No
kVARh rec	40101	4	Energy/THD	2	INT32-M10K	10	No
kVARh del+rec	40103	4	Energy/THD	2	INT32-M10K	10	No
kVARh del-rec	40105	4	Energy/THD	2	INT32-M10K	10	No
kVAh del+rec	40107	4	Energy/THD	2	INT32-M10K	10	No
V1 THD mx	40109	4	Energy/THD	2	INT32-M10K	10	No
V2 THD mx	40111	4	Energy/THD	2	INT32-M10K	10	No
V3 THD mx	40113	4	Energy/THD	2	INT32-M10K	10	No
I1 THD mx	40115	4	Energy/THD	2	INT32-M10K	10	No
I2 THD mx	40117	4	Energy/THD	2	INT32-M10K	10	No
I3 THD mx	40119	4	Energy/THD	2	INT32-M10K	10	No
I a	40150	6	Amp/freq/unbal	1	UINT16	10	Yes
I b	40151	6	Amp/freq/unbal	1	UINT16	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
I c	40152	6	Amp/freq/unbal	1	UINT16	10	Yes
I 4	40153	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg	40155	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mn	40156	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mx	40157	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mean [2]	40158	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq	40159	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mn	40160	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mx	40161	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mean [2]	40162	6	Amp/freq/unbal	1	UINT16	10	Yes
V unbal	40163	6	Amp/freq/unbal	1	UINT16	10	Yes
I unbal	40164	6	Amp/freq/unbal	1	UINT16	10	Yes
Phase Rev	40165	6	Amp/freq/unbal	1	UINT16	10	Yes
Vln a [1]	40166	7	Volts	2	UINT32	10	No
Vln b [1]	40168	7	Volts	2	UINT32	10	No
Vln c [1]	40170	7	Volts	2	UINT32	10	No
Vln avg [1]	40172	7	Volts	2	UINT32	10	No
Vln avg mx [1]	40174	7	Volts	2	UINT32	10	No
Vll ab	40178	7	Volts	2	UINT32	10	No
Vll bc	40180	7	Volts	2	UINT32	10	No
Vll ca	40182	7	Volts	2	UINT32	10	No
Vll avg	40184	7	Volts	2	UINT32	10	No
Vll avg mx	40186	7	Volts	2	UINT32	10	No
Vll avg mean [2]	40188	7	Volts	2	UINT32	10	No
kW a	40198	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW b	40200	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW c	40202	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW tot	40204	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW tot mx	40206	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR a	40208	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR b	40210	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR c	40212	8	kW/kVAr/kVA	2	INT32	1000	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kVAR tot	40214	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR tot mx	40216	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA a	40218	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA b	40220	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA c	40222	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA tot	40224	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA tot mx	40226	8	kW/kVAr/kVA	2	INT32	1000	Yes
kWh del	40230	9	kWh/kVArh	2	INT32	1/1000	No
kWh rec	40232	9	kWh/kVArh	2	INT32	1/1000	No
kVARh del	40234	9	kWh/kVArh	2	INT32	1/1000	No
kVARh rec	40236	9	kWh/kVArh	2	INT32	1/1000	No
kVAh del+rec	40238	9	kWh/kVArh	2	INT32	1/1000	No
PF sign a	40262	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign b	40263	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign c	40264	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign tot	40265	10	PF/THD/Kfactor	1	INT16	100	Yes
V1 THD mx	40266	10	PF/THD/Kfactor	1	INT16	100	Yes
V2 THD mx	40267	10	PF/THD/Kfactor	1	INT16	100	Yes
V3 THD mx	40268	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 THD mx	40269	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 THD mx	40270	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 THD mx	40271	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 K Factor	40272	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 K Factor	40273	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 K Factor	40274	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 Crest Factor	40275	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 Crest Factor	40276	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 Crest Factor	40277	10	PF/THD/Kfactor	1	INT16	100	Yes
PO V1-Flck N [3]	41000	5	Flicker Count	1	UINT16	1	No
PO V1-Flck N1 [3]	41001	5	Flicker Count	1	UINT16	1	No
PO V2-Flck N [3]	41002	5	Flicker Count	1	UINT16	1	No
PO V2-Flck N1[3]	41003	5	Flicker Count	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V3-Flck N [3]	41004	5	Flicker Count	1	UINT16	1	No
PO V3-Flck N1[3]	41005	5	Flicker Count	1	UINT16	1	No

1) Only available on the 8300_FAC-9S-36S_V2.6.0.0.9 and 8x00_FAC-9S-39S-36S-76S_V2.6.0.0.9 frameworks.
2) Only available on the ION8400 and ION8500 frameworks.
3) Only available on the ION8500 frameworks.

Modbus register map ION8600

This table outlines the default data registers available on the ION8600 power meters.

This register map is applicable to the following template revisions:

- 8600A_V330_FAC_V3.3.0.0.0
- 8600A_V330_FAC-35S_V3.3.0.0.0
- 8600B_V330_FAC_V3.3.0.0.0
- 8600B_V330_FAC-35S_V3.3.0.0.0
- 8600C_V330_FAC_V3.3.0.0.0
- 8600C_V330_FAC-35S_V3.3.0.0.0

And the following RMICAN approved frameworks, to be used with v321 firmware:

- 8600A_V321_FAC_V3.1.2.0.3
- 8600A_V321_FAC-35S_V3.1.2.0.3
- 8600B_V321_FAC_V3.1.2.0.3
- 8600B_V321_FAC-35S_V3.1.2.0.3
- 8600C_V321_FAC_V3.1.2.0.3
- 8600C_V321_FAC-35S_V3.1.2.0.3

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Vln a	40011	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln b	40012	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln c	40013	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln avg	40014	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll ab	40015	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll bc	40016	1	Volts/Amps/Freq	1	UINT16	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Vll ca	40017	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll avg	40018	1	Volts/Amps/Freq	1	UINT16	10	Yes
I a	40019	1	Volts/Amps/Freq	1	UINT16	10	Yes
I b	40020	1	Volts/Amps/Freq	1	UINT16	10	Yes
I c	40021	1	Volts/Amps/Freq	1	UINT16	10	Yes
I avg	40022	1	Volts/Amps/Freq	1	UINT16	10	Yes
V unbal	40023	1	Volts/Amps/Freq	1	UINT16	10	Yes
I unbal	40024	1	Volts/Amps/Freq	1	UINT16	10	Yes
Freq	40025	1	Volts/Amps/Freq	1	UINT16	10	Yes
I4	40026	1	Volts/Amps/Freq	1	UINT16	10	Yes
kW a	40027	2	Power/PF	2	INT32	10	Yes
kW b	40029	2	Power/PF	2	INT32	10	Yes
kW c	40031	2	Power/PF	2	INT32	10	Yes
kW tot	40033	2	Power/PF	2	INT32	10	Yes
kVAR a	40035	2	Power/PF	2	INT32	10	Yes
kVAR b	40037	2	Power/PF	2	INT32	10	Yes
kVAR c	40039	2	Power/PF	2	INT32	10	Yes
kVAR tot	40041	2	Power/PF	2	INT32	10	Yes
kVA a	40043	2	Power/PF	2	INT32	10	Yes
kVA b	40045	2	Power/PF	2	INT32	10	Yes
kVA c	40047	2	Power/PF	2	INT32	10	Yes
kVA tot	40049	2	Power/PF	2	INT32	10	Yes
PF sign a	40051	2	Power/PF	2	INT32	10	Yes
PF sign b	40053	2	Power/PF	2	INT32	10	Yes
PF sign c	40055	2	Power/PF	2	INT32	10	Yes
PF sign tot	40057	2	Power/PF	2	INT32	10	Yes
Vll avg mx	40059	3	Min/Max/Demand	2	INT32	10	Yes
I avg mx	40061	3	Min/Max/Demand	2	INT32	10	Yes
kW tot mx	40063	3	Min/Max/Demand	2	INT32	10	Yes
kVAR tot mx	40065	3	Min/Max/Demand	2	INT32	10	Yes
kVA tot mx	40067	3	Min/Max/Demand	2	INT32	10	Yes
Freq mx	40069	3	Min/Max/Demand	2	INT32	10	Yes
Vll avg mn	40071	3	Min/Max/Demand	2	INT32	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
I avg mn	40073	3	Min/Max/Demand	2	INT32	10	Yes
Freq mn	40075	3	Min/Max/Demand	2	INT32	10	Yes
kW sd del-rec	40077	3	Min/Max/Demand	2	INT32	10	Yes
kVA sd del+rec	40079	3	Min/Max/Demand	2	INT32	10	Yes
kVAR sd del-rec	40081	3	Min/Max/Demand	2	INT32	10	Yes
kW sd mx d-r	40083	3	Min/Max/Demand	2	INT32	10	Yes
kVA sd mx d+r	40085	3	Min/Max/Demand	2	INT32	10	Yes
kVAR sd mx d-r	40087	3	Min/Max/Demand	2	INT32	10	Yes
Phase Rev	40089	3	Min/Max/Demand	2	INT32	10	Yes
kWh del	40091	4	Energy/THD	2	INT32-M10K	10	No
kWh rec	40093	4	Energy/THD	2	INT32-M10K	10	No
kWh del+rec	40095	4	Energy/THD	2	INT32-M10K	10	No
kWh del-rec	40097	4	Energy/THD	2	INT32-M10K	10	No
kVARh del	40099	4	Energy/THD	2	INT32-M10K	10	No
kVARh rec	40101	4	Energy/THD	2	INT32-M10K	10	No
kVARh del+rec	40103	4	Energy/THD	2	INT32-M10K	10	No
kVARh del-rec	40105	4	Energy/THD	2	INT32-M10K	10	No
kVAh del+rec	40107	4	Energy/THD	2	INT32-M10K	10	No
V1 THD mx	40109	4	Energy/THD	2	INT32-M10K	10	No
V2 THD mx	40111	4	Energy/THD	2	INT32-M10K	10	No
V3 THD mx	40113	4	Energy/THD	2	INT32-M10K	10	No
I1 THD mx	40115	4	Energy/THD	2	INT32-M10K	10	No
I2 THD mx	40117	4	Energy/THD	2	INT32-M10K	10	No
I3 THD mx	40119	4	Energy/THD	2	INT32-M10K	10	No
I a	40150	6	Amp/freq/unbal	1	UINT16	10	Yes
I b	40151	6	Amp/freq/unbal	1	UINT16	10	Yes
I c	40152	6	Amp/freq/unbal	1	UINT16	10	Yes
I 4	40153	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg	40155	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mn	40156	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mx	40157	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mean [1]	40158	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq	40159	6	Amp/freq/unbal	1	UINT16	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Freq mn	40160	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mx	40161	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mean [1]	40162	6	Amp/freq/unbal	1	UINT16	10	Yes
V unbal	40163	6	Amp/freq/unbal	1	UINT16	10	Yes
I unbal	40164	6	Amp/freq/unbal	1	UINT16	10	Yes
Phase Rev	40165	6	Amp/freq/unbal	1	UINT16	10	Yes
Vln a	40166	7	Volts	2	UINT32	10	No
Vln b	40168	7	Volts	2	UINT32	10	No
Vln c	40170	7	Volts	2	UINT32	10	No
Vln avg	40172	7	Volts	2	UINT32	10	No
Vln avg mx	40174	7	Volts	2	UINT32	10	No
Vll ab	40178	7	Volts	2	UINT32	10	No
Vll bc	40180	7	Volts	2	UINT32	10	No
Vll ca	40182	7	Volts	2	UINT32	10	No
Vll avg	40184	7	Volts	2	UINT32	10	No
Vll avg mx	40186	7	Volts	2	UINT32	10	No
Vll avg mean [1]	40188	7	Volts	2	UINT32	10	No
kW a	40198	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW b	40200	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW c	40202	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW tot	40204	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW tot mx	40206	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR a	40208	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR b	40210	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR c	40212	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR tot	40214	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR tot mx	40216	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA a	40218	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA b	40220	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA c	40222	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA tot	40224	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA tot mx	40226	8	kW/kVAr/kVA	2	INT32	1000	Yes
kWh del	40230	9	kWh/kVArh	2	INT32	1/1000	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kWh rec	40232	9	kWh/kVArh	2	INT32	1/1000	No
kVARh del	40234	9	kWh/kVArh	2	INT32	1/1000	No
kVARh rec	40236	9	kWh/kVArh	2	INT32	1/1000	No
kVAh del+rec	40238	9	kWh/kVArh	2	INT32	1/1000	No
PF sign a	40262	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign b	40263	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign c	40264	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign tot	40265	10	PF/THD/Kfactor	1	INT16	100	Yes
V1 THD mx	40266	10	PF/THD/Kfactor	1	INT16	100	Yes
V2 THD mx	40267	10	PF/THD/Kfactor	1	INT16	100	Yes
V3 THD mx	40268	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 THD mx	40269	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 THD mx	40270	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 THD mx	40271	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 K Factor	40272	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 K Factor	40273	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 K Factor	40274	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 Crest Factor	40275	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 Crest Factor	40276	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 Crest Factor	40277	10	PF/THD/Kfactor	1	INT16	100	Yes
PO V1-Flck N [2]	41000	5	Flicker Count	1	UINT16	1	No
PO V1-Flck N1[2]	41001	5	Flicker Count	1	UINT16	1	No
PO V2-Flck N [2]	41002	5	Flicker Count	1	UINT16	1	No
PO V2-Flck N1[2]	41003	5	Flicker Count	1	UINT16	1	No
PO V3-Flck N [2]	41004	5	Flicker Count	1	UINT16	1	No
PO V3-Flck N1[2]	41005	5	Flicker Count	1	UINT16	1	No

1) This register is available on the ION8600A and ION8600B only.

2) This register is available on the ION8600A only.

Modbus register map ION8650

This table outlines the default data registers available on the ION8650 power meters.

This register map is applicable to the following template revisions:

- 8650A_V400_FAC-35S_V4.1.0.0.0
- 8650A_V400_FAC_V4.1.0.0.0
- 8650B_V400_FAC-35S_V4.1.0.0.0
- 8650B_V400_FAC_V4.1.0.0.0
- 8650C_V400_FAC-35S_V4.1.0.0.0
- 8650C_V400_FAC_V4.1.0.0.0

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Vln a scaled	40011	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln b scaled	40012	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln c scaled	40013	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vln avg scaled	40014	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll ab scaled	40015	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll bc scaled	40016	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll ca scaled	40017	1	Volts/Amps/Freq	1	UINT16	10	Yes
Vll avg scaled	40018	1	Volts/Amps/Freq	1	UINT16	10	Yes
I a scaled	40019	1	Volts/Amps/Freq	1	UINT16	10	Yes
I b scaled	40020	1	Volts/Amps/Freq	1	UINT16	10	Yes
I c scaled	40021	1	Volts/Amps/Freq	1	UINT16	10	Yes
I avg scaled	40022	1	Volts/Amps/Freq	1	UINT16	10	Yes
V unbal	40023	1	Volts/Amps/Freq	1	UINT16	10	Yes
I unbal	40024	1	Volts/Amps/Freq	1	UINT16	10	Yes
Freq	40025	1	Volts/Amps/Freq	1	UINT16	10	Yes
kW a scaled	40027	2	Power/PF	2	INT32	10	Yes
kW b scaled	40029	2	Power/PF	2	INT32	10	Yes
kW c scaled	40031	2	Power/PF	2	INT32	10	Yes
kW tot scaled	40033	2	Power/PF	2	INT32	10	Yes
kVAR a scaled	40035	2	Power/PF	2	INT32	10	Yes
kVAR b scaled	40037	2	Power/PF	2	INT32	10	Yes
kVAR c scaled	40039	2	Power/PF	2	INT32	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kVAR tot scaled	40041	2	Power/PF	2	INT32	10	Yes
kVA a scaled	40043	2	Power/PF	2	INT32	10	Yes
kVA b scaled	40045	2	Power/PF	2	INT32	10	Yes
kVA c scaled	40047	2	Power/PF	2	INT32	10	Yes
kVA tot scaled	40049	2	Power/PF	2	INT32	10	Yes
PF sign a	40051	2	Power/PF	2	INT32	10	Yes
PF sign b	40053	2	Power/PF	2	INT32	10	Yes
PF sign c	40055	2	Power/PF	2	INT32	10	Yes
PF sign tot	40057	2	Power/PF	2	INT32	10	Yes
Vll avg mx	40059	3	Min/Max/Demand	2	INT32	10	Yes
I avg mx	40061	3	Min/Max/Demand	2	INT32	10	Yes
kW tot mx	40063	3	Min/Max/Demand	2	INT32	10	Yes
kVAR tot mx	40065	3	Min/Max/Demand	2	INT32	10	Yes
kVA tot mx	40067	3	Min/Max/Demand	2	INT32	10	Yes
Freq mx	40069	3	Min/Max/Demand	2	INT32	10	Yes
Vll avg mn	40071	3	Min/Max/Demand	2	INT32	10	Yes
I avg mn	40073	3	Min/Max/Demand	2	INT32	10	Yes
Freq mn	40075	3	Min/Max/Demand	2	INT32	10	Yes
kW sd del-rec	40077	3	Min/Max/Demand	2	INT32	10	Yes
kVA sd del+rec	40079	3	Min/Max/Demand	2	INT32	10	Yes
kVAR sd del-rec	40081	3	Min/Max/Demand	2	INT32	10	Yes
kW sd mx d-r	40083	3	Min/Max/Demand	2	INT32	10	Yes
kVA sd mx d+r	40085	3	Min/Max/Demand	2	INT32	10	Yes
kVAR sd mx d-r	40087	3	Min/Max/Demand	2	INT32	10	Yes
Phase Rev	40089	3	Min/Max/Demand	2	INT32	10	Yes
kWh del	40091	4	Energy/THD	2	INT32-M10K	10	No
kWh rec	40093	4	Energy/THD	2	INT32-M10K	10	No
kWh del+rec	40095	4	Energy/THD	2	INT32-M10K	10	No
kWh del-rec	40097	4	Energy/THD	2	INT32-M10K	10	No
kVARh del	40099	4	Energy/THD	2	INT32-M10K	10	No
kVARh rec	40101	4	Energy/THD	2	INT32-M10K	10	No
kVARh del+rec	40103	4	Energy/THD	2	INT32-M10K	10	No
kVARh del-rec	40105	4	Energy/THD	2	INT32-M10K	10	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kVAh del+rec	40107	4	Energy/THD	2	INT32-M10K	10	No
V1 THD mx	40109	4	Energy/THD	2	INT32-M10K	10	No
V2 THD mx	40111	4	Energy/THD	2	INT32-M10K	10	No
V3 THD mx	40113	4	Energy/THD	2	INT32-M10K	10	No
I1 THD mx	40115	4	Energy/THD	2	INT32-M10K	10	No
I2 THD mx	40117	4	Energy/THD	2	INT32-M10K	10	No
I3 THD mx	40119	4	Energy/THD	2	INT32-M10K	10	No
I a scaled	40150	6	Amp/freq/unbal	1	UINT16	10	Yes
I b scaled	40151	6	Amp/freq/unbal	1	UINT16	10	Yes
I c scaled	40152	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg scaled	40155	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mn	40156	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mx	40157	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mean[1]	40158	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq	40159	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mn	40160	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mx	40161	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mean[1]	40162	6	Amp/freq/unbal	1	UINT16	10	Yes
V unbal	40163	6	Amp/freq/unbal	1	UINT16	10	Yes
I unbal	40164	6	Amp/freq/unbal	1	UINT16	10	Yes
Phase Rev	40165	6	Amp/freq/unbal	1	UINT16	10	Yes
Vln a scaled	40166	7	Volts	2	UINT32	10	No
Vln b scaled	40168	7	Volts	2	UINT32	10	No
Vln c scaled	40170	7	Volts	2	UINT32	10	No
Vln avg scaled	40172	7	Volts	2	UINT32	10	No
Vln avg mx	40174	7	Volts	2	UINT32	10	No
Vll ab scaled	40178	7	Volts	2	UINT32	10	No
Vll bc scaled	40180	7	Volts	2	UINT32	10	No
Vll ca scaled	40182	7	Volts	2	UINT32	10	No
Vll avg scaled	40184	7	Volts	2	UINT32	10	No
Vll avg mx	40186	7	Volts	2	UINT32	10	No
Vll avg mean[1]	40188	7	Volts	2	UINT32	10	No
kW a scaled	40198	8	kW/kVAr/kVA	2	INT32	1000	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kW b scaled	40200	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW c scaled	40202	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW tot scaled	40204	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW tot mx	40206	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR a scaled	40208	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR b scaled	40210	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR c scaled	40212	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR tot scaled	40214	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR tot mx	40216	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA a scaled	40218	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA b scaled	40220	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA c scaled	40222	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA tot scaled	40224	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA tot mx	40226	8	kW/kVAr/kVA	2	INT32	1000	Yes
kWh del	40230	9	kWh/kVArh	2	INT32	1/1000	No
kWh rec	40232	9	kWh/kVArh	2	INT32	1/1000	No
kVARh del	40234	9	kWh/kVArh	2	INT32	1/1000	No
kVARh rec	40236	9	kWh/kVArh	2	INT32	1/1000	No
kVAh del+rec	40238	9	kWh/kVArh	2	INT32	1/1000	No
PF sign a	40262	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign b	40263	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign c	40264	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign tot	40265	10	PF/THD/Kfactor	1	INT16	100	Yes
V1 THD mx	40266	10	PF/THD/Kfactor	1	INT16	100	Yes
V2 THD mx	40267	10	PF/THD/Kfactor	1	INT16	100	Yes
V3 THD mx	40268	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 THD mx	40269	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 THD mx	40270	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 THD mx	40271	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 K Factor	40272	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 K Factor	40273	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 K Factor	40274	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 Crest Factor	40275	10	PF/THD/Kfactor	1	INT16	100	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
I2 Crest Factor	40276	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 Crest Factor	40277	10	PF/THD/Kfactor	1	INT16	100	Yes

The following registers are only available on the ION8650A and ION8650B:

PO V1-Flck N	41000	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-Flck N1	41001	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-Flck N	41002	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-Flck N1	41003	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-Flck N	41004	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-Flck N1	41005	5	EN50160 Modbus1	1	UINT16	1	No
PO Freq N	41006	5	EN50160 Modbus1	1	UINT16	1	No
PO Freq N1	41007	5	EN50160 Modbus1	1	UINT16	1	No
PO Freq N2	41008	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-Mag N	41009	5	EN50160 Modbus1	1	UINT16	1	No
PO V1-Mag N1	41010	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-Mag N	41011	5	EN50160 Modbus1	1	UINT16	1	No
PO V2-Mag N1	41012	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-Mag N	41013	5	EN50160 Modbus1	1	UINT16	1	No
PO V3-Mag N1	41014	5	EN50160 Modbus1	1	UINT16	1	No
PO Vunbal N	41015	5	EN50160 Modbus1	1	UINT16	1	No
PO Vunbal N1	41016	16	EN50160 Modbus2	1	UINT16	1	No
PO V1-MSignal N	41017	16	EN50160 Modbus2	1	UINT16	1	No
PO V1-MSgnal N1	41018	16	EN50160 Modbus2	1	UINT16	1	No
PO V2-MSignal N	41019	16	EN50160 Modbus2	1	UINT16	1	No
PO V2-MSgnal N1	41020	16	EN50160 Modbus2	1	UINT16	1	No
PO V3-MSignal N	41021	16	EN50160 Modbus2	1	UINT16	1	No
PO V3-MSgnal N1	41022	16	EN50160 Modbus2	1	UINT16	1	No
PO V1-Hrm N	41023	16	EN50160 Modbus2	1	UINT16	1	No
PO V1-Hrm N1	41024	16	EN50160 Modbus2	1	UINT16	1	No
PO V1-Hrm N2	41025	16	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N	41026	16	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N1	41027	16	EN50160 Modbus2	1	UINT16	1	No
PO V2-Hrm N2	41028	16	EN50160 Modbus2	1	UINT16	1	No
PO V3-Hrm N	41029	16	EN50160 Modbus2	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V3-Hrm N1	41030	16	EN50160 Modbus2	1	UINT16	1	No
PO V3-Hrm N2	41031	16	EN50160 Modbus2	1	UINT16	1	No
PO V1-Inthrm N	41032	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Inthrm N1	41033	17	EN50160 Modbus3	1	UINT16	1	No
PO V2-Inthrm N	41034	17	EN50160 Modbus3	1	UINT16	1	No
PO V2-Inthrm N1	41035	17	EN50160 Modbus3	1	UINT16	1	No
PO V3-Inthrm N	41036	17	EN50160 Modbus3	1	UINT16	1	No
PO V3-Inthrm N1	41037	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N11	41038	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N12	41039	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N13	41040	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N14	41041	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N21	41042	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N22	41043	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N23	41044	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N24	41045	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N31	41046	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N32	41047	17	EN50160 Modbus3	1	UINT16	1	No
PO V1-Dip N33	41048	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N34	41049	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N41	41050	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N42	41051	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N43	41052	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N44	41053	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N51	41054	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N52	41055	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N53	41056	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N54	41057	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N61	41058	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N62	41059	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N63	41060	18	EN50160 Modbus4	1	UINT16	1	No
PO V1-Dip N64	41061	18	EN50160 Modbus4	1	UINT16	1	No
PO V2-Dip N11	41062	18	EN50160 Modbus4	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V2-Dip N12	41063	18	EN50160 Modbus4	1	UINT16	1	No
PO V2-Dip N13	41064	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N14	41065	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N21	41066	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N22	41067	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N23	41068	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N24	41069	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N31	41070	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N32	41071	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N33	41072	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N34	41073	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N41	41074	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N42	41075	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N43	41076	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N44	41077	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N51	41078	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N52	41079	19	EN50160 Modbus5	1	UINT16	1	No
PO V2-Dip N53	41080	20	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N54	41081	20	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N61	41082	20	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N62	41083	20	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N63	41084	20	EN50160 Modbus6	1	UINT16	1	No
PO V2-Dip N64	41085	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N11	41086	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N12	41087	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N13	41088	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N14	41089	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N21	41090	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N22	41091	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N23	41092	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N24	41093	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N31	41094	20	EN50160 Modbus6	1	UINT16	1	No
PO V3-Dip N32	41095	20	EN50160 Modbus6	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V3-Dip N33	41096	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N34	41097	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N41	41098	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N42	41099	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N43	41100	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N44	41101	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N51	41102	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N52	41103	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N53	41104	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N54	41105	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N61	41106	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N62	41107	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N63	41108	11	EN50160 Modbus7	1	UINT16	1	No
PO V3-Dip N64	41109	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N1	41110	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N2	41111	11	EN50160 Modbus7	1	UINT16	1	No
PO V1-Intrpt N3	41112	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N1	41113	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N2	41114	12	EN50160 Modbus8	1	UINT16	1	No
PO V2-Intrpt N3	41115	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N1	41116	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N2	41117	12	EN50160 Modbus8	1	UINT16	1	No
PO V3-Intrpt N3	41118	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N11	41119	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N12	41120	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N13	41121	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N14	41122	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N15	41123	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N21	41124	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N22	41125	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N23	41126	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N24	41127	12	EN50160 Modbus8	1	UINT16	1	No
PO V1-Ovlt N25	41128	13	EN50160 Modbus9	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V1-Ovlt N31	41129	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N32	41130	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N33	41131	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N34	41132	13	EN50160 Modbus9	1	UINT16	1	No
PO V1-Ovlt N35	41133	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N11	41134	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N12	41135	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N13	41136	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N14	41137	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N15	41138	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N21	41139	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N22	41140	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N23	41141	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N24	41142	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N25	41143	13	EN50160 Modbus9	1	UINT16	1	No
PO V2-Ovlt N31	41144	14	EN50160 Modbs10	1	UINT16	1	No
PO V2-Ovlt N32	41145	14	EN50160 Modbs10	1	UINT16	1	No
PO V2-Ovlt N33	41146	14	EN50160 Modbs10	1	UINT16	1	No
PO V2-Ovlt N34	41147	14	EN50160 Modbs10	1	UINT16	1	No
PO V2-Ovlt N35	41148	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N11	41149	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N12	41150	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N13	41151	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N14	41152	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N15	41153	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N21	41154	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N22	41155	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N23	41156	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N24	41157	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N25	41158	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N31	41159	14	EN50160 Modbs10	1	UINT16	1	No
PO V3-Ovlt N32	41160	15	EN50160 Modbs11	1	UINT16	1	No
PO V3-Ovlt N33	41161	15	EN50160 Modbs11	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO V3-Ovlt N34	41162	15	EN50160 Modbs11	1	UINT16	1	No
PO V3-Ovlt N35	41163	15	EN50160 Modbs11	1	UINT16	1	No

1) This register is available on the ION8650A and ION8600B only.

Modbus register map ION8800

This table outlines the default data registers available on the ION8800 power meters.

This register map is applicable to the following template revisions:

- 8800C_V330_FAC_V3.3.0.0.3
- 8800B_V330_FAC_V3.3.0.0.3
- 8800A_V330_FAC_V3.3.0.0.3

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Uln 1	40011	1	Volts/Amps/Freq	1	UINT16	10	Yes
Uln 2	40012	1	Volts/Amps/Freq	1	UINT16	10	Yes
Uln 3	40013	1	Volts/Amps/Freq	1	UINT16	10	Yes
Uln avg	40014	1	Volts/Amps/Freq	1	UINT16	10	Yes
Ull 12	40015	1	Volts/Amps/Freq	1	UINT16	10	Yes
Ull 23	40016	1	Volts/Amps/Freq	1	UINT16	10	Yes
Ull 31	40017	1	Volts/Amps/Freq	1	UINT16	10	Yes
Ull avg	40018	1	Volts/Amps/Freq	1	UINT16	10	Yes
I 1	40019	1	Volts/Amps/Freq	1	UINT16	10	Yes
I 2	40020	1	Volts/Amps/Freq	1	UINT16	10	Yes
I 3	40021	1	Volts/Amps/Freq	1	UINT16	10	Yes
I avg	40022	1	Volts/Amps/Freq	1	UINT16	10	Yes
U unbal	40023	1	Volts/Amps/Freq	1	UINT16	10	Yes
I unbal	40024	1	Volts/Amps/Freq	1	UINT16	10	Yes
Freq	40025	1	Volts/Amps/Freq	1	UINT16	10	Yes
I4	40026	1	Volts/Amps/Freq	1	UINT16	10	Yes
kW 1	40027	2	Power/PF	2	INT32	10	Yes
kW 2	40029	2	Power/PF	2	INT32	10	Yes
kW 3	40031	2	Power/PF	2	INT32	10	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kW tot	40033	2	Power/PF	2	INT32	10	Yes
kVAR 1	40035	2	Power/PF	2	INT32	10	Yes
kVAR 2	40037	2	Power/PF	2	INT32	10	Yes
kVAR 3	40039	2	Power/PF	2	INT32	10	Yes
kVAR tot	40041	2	Power/PF	2	INT32	10	Yes
kVA 1	40043	2	Power/PF	2	INT32	10	Yes
kVA 2	40045	2	Power/PF	2	INT32	10	Yes
kVA 3	40047	2	Power/PF	2	INT32	10	Yes
kVA tot	40049	2	Power/PF	2	INT32	10	Yes
PF sign 1	40051	2	Power/PF	2	INT32	10	Yes
PF sign 2	40053	2	Power/PF	2	INT32	10	Yes
PF sign 3	40055	2	Power/PF	2	INT32	10	Yes
PF sign tot	40057	2	Power/PF	2	INT32	10	Yes
Ull avg mx	40059	3	Min/Max/Demand	2	INT32	10	Yes
I avg mx	40061	3	Min/Max/Demand	2	INT32	10	Yes
kW tot mx	40063	3	Min/Max/Demand	2	INT32	10	Yes
kVAR tot mx	40065	3	Min/Max/Demand	2	INT32	10	Yes
kVA tot mx	40067	3	Min/Max/Demand	2	INT32	10	Yes
Freq mx	40069	3	Min/Max/Demand	2	INT32	10	Yes
Ull avg mn	40071	3	Min/Max/Demand	2	INT32	10	Yes
I avg mn	40073	3	Min/Max/Demand	2	INT32	10	Yes
Freq mn	40075	3	Min/Max/Demand	2	INT32	10	Yes
kW sd del-rec	40077	3	Min/Max/Demand	2	INT32	10	Yes
kVA sd del+rec	40079	3	Min/Max/Demand	2	INT32	10	Yes
kVAR sd del-rec	40081	3	Min/Max/Demand	2	INT32	10	Yes
kW sd mx d-r	40083	3	Min/Max/Demand	2	INT32	10	Yes
kVA sd mx d+r	40085	3	Min/Max/Demand	2	INT32	10	Yes
kVAR sd mx d-r	40087	3	Min/Max/Demand	2	INT32	10	Yes
Phase Rev	40089	3	Min/Max/Demand	2	INT32	10	Yes
kWh del	40091	4	Energy/THD	2	INT32-M10K	10	No
kWh rec	40093	4	Energy/THD	2	INT32-M10K	10	No
kWh del+rec	40095	4	Energy/THD	2	INT32-M10K	10	No
kWh del-rec	40097	4	Energy/THD	2	INT32-M10K	10	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
kVARh del	40099	4	Energy/THD	2	INT32-M10K	10	No
kVARh rec	40101	4	Energy/THD	2	INT32-M10K	10	No
kVARh del+rec	40103	4	Energy/THD	2	INT32-M10K	10	No
kVARh del-rec	40105	4	Energy/THD	2	INT32-M10K	10	No
kVAh del+rec	40107	4	Energy/THD	2	INT32-M10K	10	No
U1 THD mx	40109	4	Energy/THD	2	INT32-M10K	10	No
U2 THD mx	40111	4	Energy/THD	2	INT32-M10K	10	No
U3 THD mx	40113	4	Energy/THD	2	INT32-M10K	10	No
I1 THD mx	40115	4	Energy/THD	2	INT32-M10K	10	No
I2 THD mx	40117	4	Energy/THD	2	INT32-M10K	10	No
I3 THD mx	40119	4	Energy/THD	2	INT32-M10K	10	No
I 1	40150	6	Amp/freq/unbal	1	UINT16	10	Yes
I 2	40151	6	Amp/freq/unbal	1	UINT16	10	Yes
I 3	40152	6	Amp/freq/unbal	1	UINT16	10	Yes
I 4	40153	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg	40155	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mn	40156	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mx	40157	6	Amp/freq/unbal	1	UINT16	10	Yes
I avg mean [1]	40158	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq	40159	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mn	40160	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mx	40161	6	Amp/freq/unbal	1	UINT16	10	Yes
Freq mean [1]	40162	6	Amp/freq/unbal	1	UINT16	10	Yes
U unbal	40163	6	Amp/freq/unbal	1	UINT16	10	Yes
I unbal	40164	6	Amp/freq/unbal	1	UINT16	10	Yes
Phase Rev	40165	6	Amp/freq/unbal	1	UINT16	10	Yes
Uln 1	40166	7	Volts	2	UINT32	10	No
Uln 2	40168	7	Volts	2	UINT32	10	No
Uln 3	40170	7	Volts	2	UINT32	10	No
Uln avg	40172	7	Volts	2	UINT32	10	No
Uln avg mx	40174	7	Volts	2	UINT32	10	No
Ull 12	40178	7	Volts	2	UINT32	10	No
Ull 23	40180	7	Volts	2	UINT32	10	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
Ull 31	40182	7	Volts	2	UINT32	10	No
Ull avg	40184	7	Volts	2	UINT32	10	No
Ull avg mx	40186	7	Volts	2	UINT32	10	No
Ull avg mean [1]	40188	7	Volts	2	UINT32	10	No
kW 1	40198	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW 2	40200	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW 3	40202	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW tot	40204	8	kW/kVAr/kVA	2	INT32	1000	Yes
kW tot mx	40206	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR 1	40208	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR 2	40210	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR 3	40212	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR tot	40214	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVAR tot mx	40216	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA 1	40218	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA 2	40220	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA 3	40222	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA tot	40224	8	kW/kVAr/kVA	2	INT32	1000	Yes
kVA tot mx	40226	8	kW/kVAr/kVA	2	INT32	1000	Yes
kWh del	40230	9	kWh/kVArh	2	INT32	1/1000	No
kWh rec	40232	9	kWh/kVArh	2	INT32	1/1000	No
kVARh del	40234	9	kWh/kVArh	2	INT32	1/1000	No
kVARh rec	40236	9	kWh/kVArh	2	INT32	1/1000	No
kVAh del+rec	40238	9	kWh/kVArh	2	INT32	1/1000	No
PF sign 1	40262	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign 2	40263	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign 3	40264	10	PF/THD/Kfactor	1	INT16	100	Yes
PF sign tot	40265	10	PF/THD/Kfactor	1	INT16	100	Yes
U1 THD mx	40266	10	PF/THD/Kfactor	1	INT16	100	Yes
U2 THD mx	40267	10	PF/THD/Kfactor	1	INT16	100	Yes
U3 THD mx	40268	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 THD mx	40269	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 THD mx	40270	10	PF/THD/Kfactor	1	INT16	100	Yes

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
I3 THD mx	40271	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 K Factor	40272	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 K Factor	40273	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 K Factor	40274	10	PF/THD/Kfactor	1	INT16	100	Yes
I1 Crest Factor	40275	10	PF/THD/Kfactor	1	INT16	100	Yes
I2 Crest Factor	40276	10	PF/THD/Kfactor	1	INT16	100	Yes
I3 Crest Factor	40277	10	PF/THD/Kfactor	1	INT16	100	Yes

The following registers are only available on the ION8800A and ION8800B:

PO U1-Flck N	41000	5	EN50160 Modbus 1	1	UINT16	1	No
PO U1-Flck N1	41001	5	EN50160 Modbus 1	1	UINT16	1	No
PO U2-Flck N	41002	5	EN50160 Modbus 1	1	UINT16	1	No
PO U2-Flck N1	41003	5	EN50160 Modbus 1	1	UINT16	1	No
PO U3-Flck N	41004	5	EN50160 Modbus 1	1	UINT16	1	No
PO U3-Flck N1	41005	5	EN50160 Modbus 1	1	UINT16	1	No
PO Freq N	41006	5	EN50160 Modbus 1	1	UINT16	1	No
PO Freq N1	41007	5	EN50160 Modbus 1	1	UINT16	1	No
PO Freq N2	41008	5	EN50160 Modbus 1	1	UINT16	1	No
PO U1-MAG N	41009	5	EN50160 Modbus 1	1	UINT16	1	No
PO U1-MAG N1	41010	5	EN50160 Modbus 1	1	UINT16	1	No
PO U2-MAG N	41011	5	EN50160 Modbus 1	1	UINT16	1	No
PO U2-MAG N1	41012	5	EN50160 Modbus 1	1	UINT16	1	No
PO U3-MAG N	41013	5	EN50160 Modbus 1	1	UINT16	1	No
PO U3-MAG N1	41014	5	EN50160 Modbus 1	1	UINT16	1	No
PO Uunbal N	41015	5	EN50160 Modbus 1	1	UINT16	1	No
PO Uunbal N1	41016	16	EN50160 Modbus 2	1	UINT16	1	No
PO U1-MSignal N	41017	16	EN50160 Modbus 2	1	UINT16	1	No
PO U1-MSignal N1	41018	16	EN50160 Modbus 2	1	UINT16	1	No
PO U2-MSignal N	41019	16	EN50160 Modbus 2	1	UINT16	1	No
PO U2-MSignal N1	41020	16	EN50160 Modbus 2	1	UINT16	1	No
PO U3-MSignal N	41021	16	EN50160 Modbus 2	1	UINT16	1	No
PO U3-MSignal N1	41022	16	EN50160 Modbus 2	1	UINT16	1	No
PO U1-Hrm N	41023	16	EN50160 Modbus 2	1	UINT16	1	No
PO U1-Hrm N1	41024	16	EN50160 Modbus 2	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO U1-Hrm N2	41025	16	EN50160 Modbus 2	1	UINT16	1	No
PO U2-Hrm N	41026	16	EN50160 Modbus 2	1	UINT16	1	No
PO U2-Hrm N1	41027	16	EN50160 Modbus 2	1	UINT16	1	No
PO U2-Hrm N2	41028	16	EN50160 Modbus 2	1	UINT16	1	No
PO U3-Hrm N	41029	16	EN50160 Modbus 2	1	UINT16	1	No
PO U3-Hrm N1	41030	16	EN50160 Modbus 2	1	UINT16	1	No
PO U3-Hrm N2	41031	16	EN50160 Modbus 2	1	UINT16	1	No
PO U1-Inthrm N	41032	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Inthrm N1	41033	17	EN50160 Modbus 3	1	UINT16	1	No
PO U2-Inthrm N	41034	17	EN50160 Modbus 3	1	UINT16	1	No
PO U2-Inthrm N1	41035	17	EN50160 Modbus 3	1	UINT16	1	No
PO U3-Inthrm N	41036	17	EN50160 Modbus 3	1	UINT16	1	No
PO U3-Inthrm N1	41037	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N11	41038	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N12	41039	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N13	41040	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N14	41041	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N21	41042	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N22	41043	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N23	41044	17	EN50160 Modbus 3	1	UINT16	1	No
PO V1-Dip N24	41045	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N31	41046	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N32	41047	17	EN50160 Modbus 3	1	UINT16	1	No
PO U1-Dip N33	41048	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N34	41049	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N41	41050	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N42	41051	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N43	41052	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N44	41053	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N51	41054	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N52	41055	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N53	41056	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N54	41057	18	EN50160 Modbus 4	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO U1-Dip N61	41058	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N62	41059	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N63	41060	18	EN50160 Modbus 4	1	UINT16	1	No
PO U1-Dip N64	41061	18	EN50160 Modbus 4	1	UINT16	1	No
PO U2-Dip N11	41062	18	EN50160 Modbus 4	1	UINT16	1	No
PO U2-Dip N12	41063	18	EN50160 Modbus 4	1	UINT16	1	No
PO U2-Dip N13	41064	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N14	41065	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N21	41066	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N22	41067	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N23	41068	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N24	41069	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N31	41070	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N32	41071	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N33	41072	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N34	41073	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N41	41074	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N42	41075	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N43	41076	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N44	41077	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N51	41078	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N52	41079	19	EN50160 Modbus 5	1	UINT16	1	No
PO U2-Dip N53	41080	20	EN50160 Modbus 6	1	UINT16	1	No
PO U2-Dip N54	41081	20	EN50160 Modbus 6	1	UINT16	1	No
PO U2-Dip N61	41082	20	EN50160 Modbus 6	1	UINT16	1	No
PO U2-Dip N62	41083	20	EN50160 Modbus 6	1	UINT16	1	No
PO U2-Dip N63	41084	20	EN50160 Modbus 6	1	UINT16	1	No
PO U2-Dip N64	41085	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N11	41086	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N12	41087	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N13	41088	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N14	41089	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N21	41090	20	EN50160 Modbus 6	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO U3-Dip N22	41091	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N23	41092	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N24	41093	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N31	41094	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N32	41095	20	EN50160 Modbus 6	1	UINT16	1	No
PO U3-Dip N33	41096	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N34	41097	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N41	41098	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N42	41099	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N43	41100	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N44	41101	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N51	41102	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N52	41103	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N53	41104	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N54	41105	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N61	41106	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N62	41107	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N63	41108	11	EN50160 Modbus 7	1	UINT16	1	No
PO U3-Dip N64	41109	11	EN50160 Modbus 7	1	UINT16	1	No
PO U1-Intrpt N1	41110	11	EN50160 Modbus 7	1	UINT16	1	No
PO U1-Intrpt N2	41111	11	EN50160 Modbus 7	1	UINT16	1	No
PO U1-Intrpt N3	41112	12	EN50160 Modbus 8	1	UINT16	1	No
PO U2-Intrpt N1	41113	12	EN50160 Modbus 8	1	UINT16	1	No
PO U2-Intrpt N2	41114	12	EN50160 Modbus 8	1	UINT16	1	No
PO U2-Intrpt N3	41115	12	EN50160 Modbus 8	1	UINT16	1	No
PO U3-Intrpt N1	41116	12	EN50160 Modbus 8	1	UINT16	1	No
PO U3-Intrpt N2	41117	12	EN50160 Modbus 8	1	UINT16	1	No
PO U3-Intrpt N3	41118	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N11	41119	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N12	41120	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N13	41121	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N14	41122	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N15	41123	12	EN50160 Modbus 8	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO U1-Ovlt N21	41124	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N22	41125	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N23	41126	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N24	41127	12	EN50160 Modbus 8	1	UINT16	1	No
PO U1-Ovlt N25	41128	13	EN50160 Modbus 9	1	UINT16	1	No
PO U1-Ovlt N31	41129	13	EN50160 Modbus 9	1	UINT16	1	No
PO U1-Ovlt N32	41130	13	EN50160 Modbus 9	1	UINT16	1	No
PO U1-Ovlt N33	41131	13	EN50160 Modbus 9	1	UINT16	1	No
PO U1-Ovlt N34	41132	13	EN50160 Modbus 9	1	UINT16	1	No
PO U1-Ovlt N35	41133	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N11	41134	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N12	41135	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N13	41136	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N14	41137	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N15	41138	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N21	41139	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N22	41140	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N23	41141	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N24	41142	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N25	41143	13	EN50160 Modbus 9	1	UINT16	1	No
PO U2-Ovlt N31	41144	14	EN50160 Modbus 10	1	UINT16	1	No
PO U2-Ovlt N32	41145	14	EN50160 Modbus 10	1	UINT16	1	No
PO U2-Ovlt N33	41146	14	EN50160 Modbus 10	1	UINT16	1	No
PO U2-Ovlt N34	41147	14	EN50160 Modbus 10	1	UINT16	1	No
PO U2-Ovlt N35	41148	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N11	41149	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N12	41150	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N13	41151	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N14	41152	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N15	41153	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N21	41154	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N22	41155	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N23	41156	14	EN50160 Modbus 10	1	UINT16	1	No

Label	Address	Module number	Module label	Number of registers	Format	Scaling	Scaling enabled
PO U3-Ovlt N24	41157	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N25	41158	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N31	41159	14	EN50160 Modbus 10	1	UINT16	1	No
PO U3-Ovlt N32	41160	15	EN50160 Modbus 11	1	UINT16	1	No
PO U3-Ovlt N33	41161	15	EN50160 Modbus 11	1	UINT16	1	No
PO U3-Ovlt N34	41162	15	EN50160 Modbus 11	1	UINT16	1	No
PO U3-Ovlt N35	41163	15	EN50160 Modbus 11	1	UINT16	1	No

1) Register is available on the ION8800A and ION8800B only.

Common Modbus registers

This section contains an abbreviated list of configuration and control registers applicable to ION7300 series, ION7500, ION7600, ION7550, ION7650, ION8600, ION8800 and ION8650 devices. It does not apply to ION6200 meters. For ION6200-specific information, see the *PowerLogic ION6200 Serial Communications Protocol and ION Modbus Register Map*. Not all registers are available for all power meters or firmware versions. Please see your meter's *User Guide* for information specific to your device.

There are two data formats used to set configuration registers in this section, enumerated registers and numeric bounded registers.

Enumerated ION module setup registers

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

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

Value	Volts mode register setting
0	4W-Wye or 9S 4 Wire Wye/Delta
1	Delta or 35S - 3 Wire
2	Single
3	Demo
4	3W-Wye or 36S - 4 Wire Wye
5	Direct-Delta
6	29S - 4 Wire Wye

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

Numeric Bounded ION module setup registers

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

Numeric bounded registers are represented in Modbus in signed 32-bit integer format, where each ION numeric bounded register spans two 16-bit Modbus registers. Because of the Modbus register format, an absolute boundary of -2,147,483,648 to +2,147,483,647 is imposed on numeric bounded ION module setup registers. Even if the ION register bounds are beyond the 32-bit signed integer boundary, the bounds are effectively limited by Modbus capabilities.

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

Like enumerated ION module setup registers, numeric bounded setup registers are located in the Modbus register map ordered by their ION handles.

Clock module registers

The Clock module setup can be adjusted using the following registers. See your meter's *User Guide* for device specific information regarding the Clock module.

NOTE

The ION7300 does not have a Clock module, therefore the following module configuration does not apply to this device. The ION7300 does keep time and can accept the Modbus Meter Time Set operation.

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800	Enumeration and numeric bounding
CL1 Time Sync Source	44952	7BB7		√	√	√	√	√	√	√	√	√	√	√	√	See Time Sync Source sub table
CL1 Time Sync Type	44953	7BB8		√	√	√	√	√	√	√	√	√	√	√	√	0 = 'UTC' 1 = 'LOCAL'
CL1 Clock Source	45061	7C24		√	√	√	√	√	√	√	√	√	√	√	√	0 = 'Internal' 1 = 'line frequency' 2 = 'com'
CL1 TZ Offset	47117 to 47118	722E		√	√	√	√	√	√	√	√	√	√	√	√	-43200 to 46800
CL1 DST Start	47119 to 47120	722F		√	√	√	√	√	√	√	√	√	√	√	√	0 to 2147483647
CL1 DST Stop	47121 to 47122	7230		√	√	√	√	√	√	√	√	√	√	√	√	86400 to 2147483647
CL1 DST Offset	47123 to 47124	7231		√	√	√	√	√	√	√	√	√	√	√	√	-10800 to 10800

Time sync source

This table contains the enumerated values used to configure the *Time Sync Source* register for the various meter types. Ensure that *Time Sync Source* hardware is present on your device prior to setting this register via Modbus.

Meter type	Com 1	Com 2	Com 3	Com 4	IR	Ethernet	Ethernet - ION	Ethernet - DNP	Ethernet - Modbus	IRIG-B
ION7300										
ION7330	0	1			2	4				
ION7350	0	1			2	4				
ION7500	0	1	2			4				
ION7550	0	1	2	3		4	6	7		
ION7600	0	1	2			4				
ION7650	0	1	2	3		4	6	7		
ION8300	0	1	2			4				5
ION8400	0	1	2	3		4				5
ION8500	0	1	2	3		4				5
ION8600	0	1	2	3	2	5	7	8	9	6
ION8650	0	1	2	3	2	5	7	8	9	6
ION8800	0	1	2	3		4	6	7		5

Modbus meter time set

This section details the Modbus meter UNIX time set function.

UNIX Time (UTC) seconds is an unsigned 32-bit numeric bounded register. Consult the *ION Reference* manual for a description of the Clock module time format.

UTC microseconds is a read only, unsigned 32-bit value. The format is absolute time in microseconds.

Only resolution by seconds is supported when setting meter time via Modbus.

Label	Modbus register	Number of registers	Format	Properties
UTC seconds	41926 to 41927	2	UINT32	Read/Write
UTC microseconds	41928 to 41929	2	UINT32	Read

Modbus time set

To set the meter time via Modbus communications:

1. Set the Clock module *Time Sync Source* register to the Modbus communications port. This step does not apply to the ION7300 model.
2. Write the UNIX time in seconds as an unsigned 32-bit value to Modbus registers 41926 (high order) and 41927 (low order).

Communication module registers

The Communication module setup can be adjusted using the following registers. See your meter's *User Guide* for device specific information regarding the Communication module.

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800	Enumeration and numeric bounding
CM1 Comm Mode	44391	7986	√	√	√	√	√	√	√	√	√	√	√	√	√	0 = 'RS232' 1 = 'RS485'
CM1 Baud Rate	44392	7987	√	√	√	√	√	√	√	√	√	√	√	√	√	See Baud Rate sub table
CM1 Protocol	44592	7A4F	√	√	√	√	√	√	√	√	√	√	√	√	√	See Protocol sub table
CM1 RTS Delay	46977 to 46978	71E8	√	√	√	√	√	√	√	√	√	√	√	√	√	0 to 1000 ms
CM1 Unit ID	46979 to 46980	71E9	√	√	√	√	√	√	√	√	√	√	√	√	√	1 to 9999[1]
CM2 Baud Rate	44590	7A4D		√	√	√	√	√	√	√	√	√	√	√	√	See Baud Rate sub table
CM2 Protocol	44593	7A50		√	√	√	√	√	√	√	√	√	√	√	√	See Protocol sub table
CM2 RTS Delay	47125 to 47126	7232		√	√	√	√	√	√	√	√	√	√	√	√	0 to 1000 ms
CM2 Unit ID	47129 to 47130	7234		√	√	√	√	√	√	√	√	√	√	√	√	1 to 9999[1]
CM3 Baud Rate	44591	7A4E	√			√	√	√	√	√	√	√	√	√	√	See Baud Rate sub table
CM3 Protocol	44594	7A51	√			√	√	√	√	√	√	√	√	√	√	See Protocol sub table
CM3 RTS Delay	47127 to 47128	7233	√			√	√	√	√	√	√	√	√	√	√	0 to 1000 ms
CM3 Unit ID	47131 to 47132	7235	√			√	√	√	√	√	√	√	√	√	√	1 to 9999[1]
CM4 Baud Rate	45460	7DB3						√	√				√	√	√	See Baud Rate sub table
CM4 Protocol	45461	7DB4						√	√				√	√	√	See Protocol sub table

1) This parameter is used by both ION and 3rd party protocols. The valid range is dependant on the protocol. The ION protocol allows a Unit ID of between 1 and 9999. The Modbus protocol requires a Unit ID (slave address) between 1 and 247.

Baud rate

This table contains the enumerated values used to configure the *Baud Rate* register of the various meter types. Ensure that your hardware and firmware support the baud rate prior to setting this register via Modbus.

Value	Baud rate
0	300 Baud
1	1200 Baud
2	2400 Baud
3	4800 Baud
4	9600 Baud
5	19200 Baud
6	38400 Baud
7	57600 Baud
8	115200 Baud

Protocol

This table contains the enumerated values used to configure the *Protocol* register of a meter's Communication module. Ensure that your hardware and firmware support the protocol prior to setting this register via Modbus.

Value	Protocol
0	ION
1	Modbus RTU
3	Factory
4	DNP 3.0
6	GPS: Truetime/Datum
7	GPS: Arbiter
8	GPS: Arbiter-Vorne
9	Modbus Master
100	EtherGate
101	ModemGate

Power Meter module registers

The Power Meter module setup can be adjusted using the following registers. See your meter's *User Guide* for device specific information regarding the Power Meter module.

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800	Enumeration and numeric bounding
PM Volts Mode	44001	7800	√	√	√	√	√	√	√	√	√	√	√	√	√	See Volts Mode sub table
PM CT Primary	46005 to 46006	7002	√	√	√	√	√	√	√	√	√	√	√	√	√	1 to 999999
PM CT Secondary	46007 to 46008	7003	√	√	√	√	√	√	√	√	√	√	√	√	√	
PM PT Primary	46001 to 46002	7000	√	√	√	√	√	√	√	√	√	√	√	√	√	
PM PT Secondary	46003 to 46004	7001	√	√	√	√	√	√	√	√	√	√	√	√	√	
PM Phase Order	44005	7804	√	√	√	√	√	√	√	√	√	√	√	√	√	0='ABC', 1='ACB'
PM Phase Lbls	44006	7805	√	√	√	√	√	√	√	√	√	√	√	√	√	See Phase Labels sub table
PM I1 Polarity	44002	7801	√	√	√	√	√	√	√	√	√	√	√	√	√	0='Normal', 1='Inverted'
PM I2 Polarity	44003	7802	√	√	√	√	√	√	√	√	√	√	√	√	√	
PM I3 Polarity	44004	7803	√	√	√	√	√	√	√	√	√	√	√	√	√	
PM I4 Polarity	44586	7A49				√	√	√	√						√	
PM I5 Polarity	45044	7C13				√	√	√	√							
PM V1 Polarity	44587	7A4A	√	√	√	√	√	√	√	√	√	√	√	√	√	
PM V2 Polarity	44588	7A4B	√	√	√	√	√	√	√	√	√	√	√	√	√	
PM V3 Polarity	44589	7A4C	√	√	√	√	√	√	√	√	√	√	√	√	√	
PM V4 Polarity	45043	7C12				√	√	√	√							
PM I4 CT Primary	46009 to 46010	7004				√	√	√	√						√	1 to 999999
PM I4 CT Secondary	46011 to 46012	7005				√	√	√	√						√	
PM I5 CT Primary	48907 to 48908	75AD				√	√	√	√							
PM I5 CT Secondary	48909 to 48910	75AE				√	√	√	√							
PM V4 PT Primary	48903 to 48904	75AB				√	√	√	√							
PM V4 PT Secondary	48905 to 48906	75AC				√	√	√	√							

Volts mode

This table contains the enumerated values used to configure the *Volts Mode* register of the Power Meter module.

Value	Volts mode register setting
0	4W-Wye or 9S 4 Wire Wye/Delta
1	Delta or 35S - 3 Wire

Value	Volts mode register setting
2	Single
3	Demo
4	3W-Wye or 36S - 4 Wire Wye
5	Direct-Delta
6	29S - 4 Wire Wye

Phase labels

This table contains the enumerated values used to configure the *Phase Labels* register of the Power Meter Module.

Value	Label style
0	ABC
1	RST
2	XYZ
3	RYB
4	RWB
5	123

Factory module registers

The Factory module setup can be viewed using the following registers:

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800	Enumeration and numeric bounding
FAC1 Nom Freq	44396	798B	√	√	√	√	√	√	√	√	√	√	√	√	√	0 = '60 Hz' 1 = '50 Hz'
FAC1 Revision	41901 to 41912	1303	√	√	√	√	√	√	√	√	√	√	√	√	√	See Revision sub table

Revision

This register contains the meter's firmware revision. All meters contain a firmware string which denotes the meter type and revision (for example, "7300V200" denotes revision 200 of the ION7300 meter firmware).

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

possible firmware revision string length. On the meter, the firmware revision string appears in Modbus holding registers 41901 to 41912.

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

The following table shows how the Modbus encoding of the string “7300V200” appears:

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

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

External Pulse module registers

⚠ WARNING

HAZARD OF UNINTENDED OPERATION

- Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.
- Be aware that an unexpected change of state of the digital outputs may result when the supply power to the meter is interrupted or after a meter firmware or template upgrade.

Failure to follow these instructions can result in death, serious injury or equipment damage.

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

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

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Pulse 1	42001	68AE	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 2	42002	68AF	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 3	42003	68B0	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 4	42004	68B1	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 5	42005	68B2	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 6	42006	68B3	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 7	42007	68B4	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 8	42008	68B5	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 9	42009	68B6	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 10	42010	68B7	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 11	42011	68B8	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 12	42012	68B9	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 13	42013	68BA	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 14	42014	68BB	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 15	42015	68BC	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 16	42016	68BD	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 17	42017	68BE	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 18	42018	68BF	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 19	42019	68C0	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 20	42020	68C1	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 21	42021	68C2	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 22	42022	68C3	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 23	42023	68C4	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 24	42024	68C5	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 25	42025	68C6	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 26	42026	68C7	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 27	42027	68C8	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 28	42028	68C9	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 29	42029	68CA	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 30	42030	68CB	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 31	42031	68CC	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Pulse 32	42032	68CD	√	√	√	√	√	√	√	√	√	√	√	√	√

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Pulse 33	42033	68CE				√	√	√	√	√	√	√	√	√	√
Ext Pulse 34	42034	68CF				√	√	√	√	√	√	√	√	√	√
Ext Pulse 35	42035	68D0				√	√	√	√	√	√	√	√	√	√
Ext Pulse 36	42036	68D1				√	√	√	√	√	√	√	√	√	√
Ext Pulse 37	42037	68D2				√	√	√	√	√	√	√	√	√	√
Ext Pulse 38	42038	68D3				√	√	√	√	√	√	√	√	√	√
Ext Pulse 39	42039	68D4				√	√	√	√	√	√	√	√	√	√
Ext Pulse 40	42040	68D5				√	√	√	√	√	√	√	√	√	√
Ext Pulse 41	42041	68D6				√	√	√	√	√	√	√	√	√	√
Ext Pulse 42	42042	68D7				√	√	√	√	√	√	√	√	√	√
Ext Pulse 43	42043	68D8				√	√	√	√	√	√	√	√	√	√
Ext Pulse 44	42044	68D9				√	√	√	√	√	√	√	√	√	√
Ext Pulse 45	42045	68DA				√	√	√	√	√	√	√	√	√	√
Ext Pulse 46	42046	68DB				√	√	√	√	√	√	√	√	√	√
Ext Pulse 47	42047	68DC				√	√	√	√	√	√	√	√	√	√
Ext Pulse 48	42048	68DD				√	√	√	√	√	√	√	√	√	√
Ext Pulse 49	42049	68DE				√	√	√	√	√	√	√	√	√	√
Ext Pulse 50	42050	68DF				√	√	√	√	√	√	√	√	√	√
Ext Pulse 51	42051	68E0					√	√	√	√	√	√	√	√	√
Ext Pulse 52	42052	68E1					√	√	√	√	√	√	√	√	√
Ext Pulse 53	42053	68E2					√	√	√	√	√	√	√	√	√
Ext Pulse 54	42054	68E3					√	√	√	√	√	√	√	√	√
Ext Pulse 55	42055	68E4					√	√	√	√	√	√	√	√	√
Ext Pulse 56	42056	68E5					√	√	√	√	√	√	√	√	√
Ext Pulse 57	42057	68E6					√	√	√	√	√	√	√	√	√
Ext Pulse 58	42058	68E7					√	√	√	√	√	√	√	√	√
Ext Pulse 59	42059	68E8					√	√	√	√	√	√	√	√	√
Ext Pulse 60	42060	68E9					√	√	√	√	√	√	√	√	√
Ext Pulse 61	42061	68EA					√	√	√	√	√	√	√	√	√
Ext Pulse 62	42062	68EB					√	√	√	√	√	√	√	√	√
Ext Pulse 63	42063	68EC					√	√	√	√	√	√	√	√	√
Ext Pulse 64	42064	68ED					√	√	√	√	√	√	√	√	√
Ext Pulse 65	42065	68EE					√	√	√	√	√	√	√	√	√

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Pulse 66	42066	68EF					√	√	√	√	√	√	√	√	√
Ext Pulse 67	42067	68F0					√	√	√	√	√	√	√	√	√
Ext Pulse 68	42068	68F1					√	√	√	√	√	√	√	√	√
Ext Pulse 69	42069	68F2					√	√	√	√	√	√	√	√	√
Ext Pulse 70	42070	68F3					√	√	√	√	√	√	√	√	√
Ext Pulse 71	42071	68F4					√	√	√	√	√	√	√	√	√
Ext Pulse 72	42072	68F5					√	√	√	√	√	√	√	√	√
Ext Pulse 73	42073	68F6					√	√	√	√	√	√	√	√	√
Ext Pulse 74	42074	68F7					√	√	√	√	√	√	√	√	√
Ext Pulse 75	42075	68F8					√	√	√	√	√	√	√	√	√
Ext Pulse 76	42076	68F9					√	√	√	√	√	√	√	√	√
Ext Pulse 77	42077	68FA					√	√	√	√	√	√	√	√	√
Ext Pulse 78	42078	68FB					√	√	√	√	√	√	√	√	√
Ext Pulse 79	42079	68FC					√	√	√	√	√	√	√	√	√
Ext Pulse 80	42080	68FD					√	√	√	√	√	√	√	√	√
Ext Pulse 81	42081	68FE					√	√	√	√	√	√	√	√	√
Ext Pulse 82	42082	68FF					√	√	√	√	√	√	√	√	√
Ext Pulse 83	42083	6900					√	√	√	√	√	√	√	√	√
Ext Pulse 84	42084	6901					√	√	√	√	√	√	√	√	√
Ext Pulse 85	42085	6902					√	√	√	√	√	√	√	√	√
Ext Pulse 86	42086	6903					√	√	√	√	√	√	√	√	√
Ext Pulse 87	42087	6904					√	√	√	√	√	√	√	√	√
Ext Pulse 88	42088	6905					√	√	√	√	√	√	√	√	√
Ext Pulse 89	42089	6906					√	√	√	√	√	√	√	√	√
Ext Pulse 90	42090	6907					√	√	√	√	√	√	√	√	√
Ext Pulse 91	42091	6908					√	√	√	√	√	√	√	√	√
Ext Pulse 92	42092	6909					√	√	√	√	√	√	√	√	√
Ext Pulse 93	42093	690A					√	√	√	√	√	√	√	√	√
Ext Pulse 94	42094	690B					√	√	√	√	√	√	√	√	√
Ext Pulse 95	42095	690C					√	√	√	√	√	√	√	√	√
Ext Pulse 96	42096	690D					√	√	√	√	√	√	√	√	√
Ext Pulse 97	42097	690E					√	√	√	√	√	√	√	√	√
Ext Pulse 98	42098	690F					√	√	√	√	√	√	√	√	√

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Pulse 99	42099	6910					√	√	√	√	√	√	√	√	√
Ext Pulse 100	42100	6911					√	√	√	√	√	√	√	√	√
Ext Pulse 101	42101	6912					√	√	√	√	√	√	√	√	√
Ext Pulse 102	42102	6913					√	√	√	√	√	√	√	√	√
Ext Pulse 103	42103	6914					√	√	√	√	√	√	√	√	√
Ext Pulse 104	42104	6915					√	√	√	√	√	√	√	√	√
Ext Pulse 105	42105	6916					√	√	√	√	√	√	√	√	√
Ext Pulse 106	42106	6917					√	√	√	√	√	√	√	√	√
Ext Pulse 107	42107	6918					√	√	√	√	√	√	√	√	√
Ext Pulse 108	42108	6919					√	√	√	√	√	√	√	√	√
Ext Pulse 109	42109	691A					√	√	√	√	√	√	√	√	√
Ext Pulse 110	42110	691B					√	√	√	√	√	√	√	√	√
Ext Pulse 111	42111	691C					√	√	√	√	√	√	√	√	√
Ext Pulse 112	42112	691D					√	√	√	√	√	√	√	√	√
Ext Pulse 113	42113	691E					√	√	√	√	√	√	√	√	√
Ext Pulse 114	42114	691F					√	√	√	√	√	√	√	√	√
Ext Pulse 115	42115	6920					√	√	√	√	√	√	√	√	√
Ext Pulse 116	42116	6921					√	√	√	√	√	√	√	√	√
Ext Pulse 117	42117	6922					√	√	√	√	√	√	√	√	√
Ext Pulse 118	42118	6923					√	√	√	√	√	√	√	√	√
Ext Pulse 119	42119	6924					√	√	√	√	√	√	√	√	√
Ext Pulse 120	42120	6925					√	√	√	√	√	√	√	√	√
Ext Pulse 121	42121	6926					√	√	√	√	√	√	√	√	√
Ext Pulse 122	42122	6927					√	√	√	√	√	√	√	√	√
Ext Pulse 123	42123	6928					√	√	√	√	√	√	√	√	√
Ext Pulse 124	42124	6929					√	√	√	√	√	√	√	√	√
Ext Pulse 125	42125	692A					√	√	√	√	√	√	√	√	√
Ext Pulse 126	42126	692B					√	√	√	√	√	√	√	√	√
Ext Pulse 127	42127	692C					√	√	√	√	√	√	√	√	√
Ext Pulse 128	42128	692D					√	√	√	√	√	√	√	√	√

External Boolean module registers

⚠ WARNING

HAZARD OF UNINTENDED OPERATION

- Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.
- Be aware that an unexpected change of state of the digital outputs may result when the supply power to the meter is interrupted or after a meter firmware or template upgrade.

Failure to follow these instructions can result in death, serious injury or equipment damage.

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

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

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Bool 1	42201	608F	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Bool 2	42202	6090	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Bool 3	42203	6091	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Bool 4	42204	6092	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Bool 5	42205	6093	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Bool 6	42206	6094	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Bool 7	42207	6095	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Bool 8	42208	6096	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Bool 9	42209	6097			√	√	√	√	√	√	√	√	√	√	√
Ext Bool 10	42210	6098			√	√	√	√	√	√	√	√	√	√	√
Ext Bool 11	42211	6099			√	√	√	√	√	√	√	√	√	√	√
Ext Bool 12	42212	609A			√	√	√	√	√	√	√	√	√	√	√
Ext Bool 13	42213	609B				√	√	√	√	√	√	√	√	√	√
Ext Bool 14	42214	609C				√	√	√	√	√	√	√	√	√	√
Ext Bool 15	42215	609D				√	√	√	√	√	√	√	√	√	√
Ext Bool 16	42216	609E				√	√	√	√	√	√	√	√	√	√
Ext Bool 17	42217	609F				√	√	√	√	√	√	√	√	√	√

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Bool 18	42218	60A0				√	√	√	√	√	√	√	√	√	√
Ext Bool 19	42219	60A1				√	√	√	√	√	√	√	√	√	√
Ext Bool 20	42220	60A2				√	√	√	√	√	√	√	√	√	√
Ext Bool 21	42221	60A3				√	√	√	√	√	√	√	√	√	√
Ext Bool 22	42222	60A4				√	√	√	√	√	√	√	√	√	√
Ext Bool 23	42223	60A5				√	√	√	√	√	√	√	√	√	√
Ext Bool 24	42224	60A6				√	√	√	√	√	√	√	√	√	√
Ext Bool 25	42225	60A7				√	√	√	√	√	√	√	√	√	√
Ext Bool 26	42226	60A8				√	√	√	√	√	√	√	√	√	√
Ext Bool 27	42227	60A9				√	√	√	√	√	√	√	√	√	√
Ext Bool 28	42228	60AA				√	√	√	√	√	√	√	√	√	√
Ext Bool 29	42229	60AB				√	√	√	√	√	√	√	√	√	√
Ext Bool 30	42230	60AC				√	√	√	√	√	√	√	√	√	√
Ext Bool 31	42231	60AD				√	√	√	√	√	√	√	√	√	√
Ext Bool 32	42232	60AE				√	√	√	√	√	√	√	√	√	√
Ext Bool 33	42233	633E				√	√	√	√	√	√	√	√	√	√
Ext Bool 34	42234	633F				√	√	√	√	√	√	√	√	√	√
Ext Bool 35	42235	6340				√	√	√	√	√	√	√	√	√	√
Ext Bool 36	42236	6341				√	√	√	√	√	√	√	√	√	√
Ext Bool 37	42237	6342				√	√	√	√	√	√	√	√	√	√
Ext Bool 38	42238	6343				√	√	√	√	√	√	√	√	√	√
Ext Bool 39	42239	6344				√	√	√	√	√	√	√	√	√	√
Ext Bool 40	42240	6345				√	√	√	√	√	√	√	√	√	√
Ext Bool 41	42241	6346				√	√	√	√	√	√	√	√	√	√
Ext Bool 42	42242	6347				√	√	√	√	√	√	√	√	√	√
Ext Bool 43	42243	6348				√	√	√	√	√	√	√	√	√	√
Ext Bool 44	42244	6349				√	√	√	√	√	√	√	√	√	√
Ext Bool 45	42245	634A				√	√	√	√	√	√	√	√	√	√
Ext Bool 46	42246	634B				√	√	√	√	√	√	√	√	√	√
Ext Bool 47	42247	634C				√	√	√	√	√	√	√	√	√	√
Ext Bool 48	42248	634D				√	√	√	√	√	√	√	√	√	√
Ext Bool 49	42249	634E				√	√	√	√	√	√	√	√	√	√
Ext Bool 50	42250	634F				√	√	√	√	√	√	√	√	√	√

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Bool 51	42251	6350					√	√	√	√	√	√	√	√	√
Ext Bool 52	42252	6351					√	√	√	√	√	√	√	√	√
Ext Bool 53	42253	6352					√	√	√	√	√	√	√	√	√
Ext Bool 54	42254	6353					√	√	√	√	√	√	√	√	√
Ext Bool 55	42255	6354					√	√	√	√	√	√	√	√	√
Ext Bool 56	42256	6355					√	√	√	√	√	√	√	√	√
Ext Bool 57	42257	6356					√	√	√	√	√	√	√	√	√
Ext Bool 58	42258	6357					√	√	√	√	√	√	√	√	√
Ext Bool 59	42259	6358					√	√	√	√	√	√	√	√	√
Ext Bool 60	42260	6359					√	√	√	√	√	√	√	√	√
Ext Bool 61	42261	64F0					√	√	√	√	√	√	√	√	√
Ext Bool 62	42262	64F1					√	√	√	√	√	√	√	√	√
Ext Bool 63	42263	64F2					√	√	√	√	√	√	√	√	√
Ext Bool 64	42264	64F3					√	√	√	√	√	√	√	√	√
Ext Bool 65	42265	64F4					√	√	√	√	√	√	√	√	√
Ext Bool 66	42266	64F5					√	√	√	√	√	√	√	√	√
Ext Bool 67	42267	64F6					√	√	√	√	√	√	√	√	√
Ext Bool 68	42268	64F7					√	√	√	√	√	√	√	√	√
Ext Bool 69	42269	64F8					√	√	√	√	√	√	√	√	√
Ext Bool 70	42270	64F9					√	√	√	√	√	√	√	√	√
Ext Bool 71	42270	64FA					√	√	√	√	√	√	√	√	√
Ext Bool 72	42270	64FB					√	√	√	√	√	√	√	√	√
Ext Bool 73	42270	64FC					√	√	√	√	√	√	√	√	√
Ext Bool 74	42270	64FD					√	√	√	√	√	√	√	√	√
Ext Bool 75	42270	64FE					√	√	√	√	√	√	√	√	√
Ext Bool 76	42270	64FF								√	√	√	√	√	
Ext Bool 77	42270	6500								√	√	√	√	√	
Ext Bool 78	42270	6501								√	√	√	√	√	
Ext Bool 79	42270	6502								√	√	√	√	√	
Ext Bool 80	42280	6503								√	√	√	√	√	

External Numeric module registers

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

The External Numeric registers are 32-bit values represented in 32-bit signed integer format (See "Modbus data format" on page 9). Each External Numeric register spans two 16-bit Modbus registers. The first Modbus register of the pair represents the high order word of the 32-bit value. The second Modbus register represents the low order word. The 32-bit value read from or written to an External Numeric register via Modbus is represented as a 32-bit signed integer value, therefore the range of possible values is -2,147,483,648 to +2,147,483,647.

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Numeric 1	42301 to 42302	5ADC	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Numeric 2	42303 to 42304	5ADD	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Numeric 3	42305 to 42306	5ADE	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Numeric 4	42307 to 42308	5ADF	√	√	√	√	√	√	√	√	√	√	√	√	√
Ext Numeric 5	42309 to 42310	5AE0				√	√	√	√	√	√	√	√	√	√
Ext Numeric 6	42311 to 42312	5AE1				√	√	√	√	√	√	√	√	√	√
Ext Numeric 7	42313 to 42314	5AE2				√	√	√	√	√	√	√	√	√	√
Ext Numeric 8	42315 to 42316	5AE3				√	√	√	√	√	√	√	√	√	√
Ext Numeric 9	42317 to 42318	5E42				√	√	√	√	√	√	√	√	√	√
Ext Numeric 10	42319 to 42320	5E43				√	√	√	√	√	√	√	√	√	√
Ext Numeric 11	42321 to 42322	5E44				√	√	√	√	√	√	√	√	√	√
Ext Numeric 12	42323 to 42324	5E45				√	√	√	√	√	√	√	√	√	√
Ext Numeric 13	42325 to 42326	5E46				√	√	√	√	√	√	√	√	√	√
Ext Numeric 14	42327 to 42328	5E47				√	√	√	√	√	√	√	√	√	√
Ext Numeric 15	42329 to 42330	5E48				√	√	√	√	√	√	√	√	√	√
Ext Numeric 16	42331 to 42332	5E49				√	√	√	√	√	√	√	√	√	√
Ext Numeric 17	42333 to 42334	5E4A				√	√	√	√	√	√	√	√	√	√
Ext Numeric 18	42335 to 42336	5E4B				√	√	√	√	√	√	√	√	√	√
Ext Numeric 19	42337 to 42338	5E4C				√	√	√	√	√	√	√	√	√	√
Ext Numeric 20	42339 to 42340	5E4D				√	√	√	√	√	√	√	√	√	√
Ext Numeric 21	42341 to 42342	4B7A				√	√	√	√	√	√	√	√	√	√
Ext Numeric 22	42343 to 42344	4B7B				√	√	√	√	√	√	√	√	√	√

ION register	Address	ION handle	ION7300	ION7330	ION7350	ION7500	ION7600	ION7550	ION7650	ION8300	ION8400	ION8500	ION8600	ION8650	ION8800
Ext Numeric 23	42345 to 42346	4B7C				√	√	√	√	√	√	√	√	√	√
Ext Numeric 24	42347 to 42348	4B7D				√	√	√	√	√	√	√	√	√	√
Ext Numeric 25	42349 to 42350	4B7E				√	√	√	√	√	√	√	√	√	√
Ext Numeric 26	42351 to 42352	4B7F				√	√	√	√	√	√	√	√	√	√
Ext Numeric 27	42353 to 42354	4B80				√	√	√	√	√	√	√	√	√	√
Ext Numeric 28	42355 to 42356	4B81				√	√	√	√	√	√	√	√	√	√
Ext Numeric 29	42357 to 42358	4B82				√	√	√	√	√	√	√	√	√	√
Ext Numeric 30	42359 to 42360	4B83				√	√	√	√	√	√	√	√	√	√
Ext Numeric 31	42361 to 42362	4B84				√	√	√	√	√	√	√	√	√	√
Ext Numeric 32	42363 to 42364	4B85				√	√	√	√	√	√	√	√	√	√
Ext Numeric 33	42365 to 42366	4B86				√	√	√	√	√	√	√	√	√	√
Ext Numeric 34	42367 to 42368	4B87				√	√	√	√	√	√	√	√	√	√
Ext Numeric 35	42369 to 42370	4B88				√	√	√	√	√	√	√	√	√	√
Ext Numeric 36	42371 to 42372	4B89				√	√	√	√	√	√	√	√	√	√
Ext Numeric 37	42373 to 42374	4B8A				√	√	√	√	√	√	√	√	√	√
Ext Numeric 38	42375 to 42376	4B8B				√	√	√	√	√	√	√	√	√	√
Ext Numeric 39	42377 to 42378	4B8C				√	√	√	√	√	√	√	√	√	√
Ext Numeric 40	42379 to 42380	4B8D				√	√	√	√	√	√	√	√	√	√

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 shows how to obtain the checksum for a simple Modbus RTU frame.

Steps for generating the CRC-16 checksum:

1. Drop the MSB (Most Significant Bit) of the generator polynomial and reversing the bit sequence to form a new polynomial. This yields the binary number 1010 0000 0000 0001, or A0 01 (hex).
2. Load a 16-bit register with initial value FF FF (hex).
3. Exclusive OR the first data byte with the low-order byte of the 16-bit register. Store the result in the 16-bit register.
4. Shift the 16-bit register one bit to the right.
5. If the bit shifted out to the right is one (1), Exclusive OR the 16-bit register with the new generator polynomial, store the result in the 16-bit registers. Return to step 4.
6. If the bit shifted out to the right is zero (0), return to step 4.
7. Repeat steps 4 and 5 until 8 shifts have been performed.
8. Exclusive OR the next data byte with the 16-bit register.
9. Repeat steps 4 through 7 until all bytes of the frame are Exclusive OR with the 16-bit register and shifted 8 times.
10. The content of the 16-bit register is the checksum and is appended to the end of the frame.

Pseudocode For CRC-16 generation

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

```
Initialize a 16-bit register to FFFF Hex

        Initialize the generator polynomial to A001 Hex

FOR n=1 to # of bytes in packet
```

```
BEGIN
        XOR nth data byte with the 16-bit register
        FOR bits_shifted = 1 to 8
        BEGIN
                SHIFT 1 bit to the right
                IF (bit shifted out EQUAL 1)
                        XOR generator polynomial with the 16-bit register
                        and store result in the 16-bit register
        END
END
```

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

Appendix B: Data record / Modbus map

This appendix contains the Data record/Modbus register map for ION meters.

Modbus Data Recorder registers

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

Modbus Data Recorder map

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

Modbus Data Recorder retrieval

Follow these steps to retrieve data record via Modbus communications:

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

NOTE

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

Modbus Record Availability and Selection Block registers

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

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

Modbus data record block registers

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

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

The Time Stamp Seconds is returned as an unsigned 32-bit value stored in two Modbus registers.

The first register is the high order followed by the low order second register. The format is UNIX time (UTC). Consult the *ION Reference* for a description of Clock module configuration.

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

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

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

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

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

Modbus register	# of Modbus registers	Description	Format	Properties
43012	2	Record Number (x)	UINT32	Read
43014	2	UTC Seconds	UINT32	Read
43016	2	UTC MicroSeconds	UINT32	Read
43018	2	Source 1 Input Data	FLOAT	Read
43020	2	Source 2 Input Data	FLOAT	Read
43022	2	Source 3 Input Data	FLOAT	Read
43024	2	Source 4 Input Data	FLOAT	Read
43026	2	Source 5 Input Data	FLOAT	Read
43028	2	Source 6 Input Data	FLOAT	Read
43030	2	Source 7 Input Data	FLOAT	Read
43032	2	Source 8 Input Data	FLOAT	Read
43034	2	Source 9 Input Data	FLOAT	Read
43036	2	Source 10 Input Data	FLOAT	Read
43038	2	Source 11 Input Data	FLOAT	Read
43040	2	Source 12 Input Data	FLOAT	Read

Modbus register	# of Modbus registers	Description	Format	Properties
43042	2	Source 13 Input Data	FLOAT	Read
43044	2	Source 14 Input Data	FLOAT	Read
43046	2	Source 15 Input Data	FLOAT	Read
43048	2	Source 16 Input Data	FLOAT	Read
43088	2	Record Number (x+2)	UINT32	Read
43090	2	UTC Seconds	UINT32	Read
43092	2	UTC MicroSeconds	UINT32	Read
43094	2	Source 1 Input Data	FLOAT	Read
43096	2	Source 2 Input Data	FLOAT	Read
43098	2	Source 3 Input Data	FLOAT	Read
43100	2	Source 4 Input Data	FLOAT	Read
43102	2	Source 5 Input Data	FLOAT	Read
43104	2	Source 6 Input Data	FLOAT	Read
43106	2	Source 7 Input Data	FLOAT	Read
43108	2	Source 8 Input Data	FLOAT	Read
43110	2	Source 9 Input Data	FLOAT	Read
43112	2	Source 10 Input Data	FLOAT	Read
43114	2	Source 11 Input Data	FLOAT	Read
43116	2	Source 12 Input Data	FLOAT	Read
43118	2	Source 13 Input Data	FLOAT	Read
43120	2	Source 14 Input Data	FLOAT	Read
43122	2	Source 15 Input Data	FLOAT	Read
43124	2	Source 16 Input Data	FLOAT	Read

Modbus handle ID registers

Modbus registers 43138 through 43153 contain the Handle IDs for the Source Inputs.

Modbus register	# of Modbus registers	Description	Format	Properties
43138	1	Source 1 Handle ID	UINT16	Read
43139	1	Source 2 Handle ID	UINT16	Read
43140	1	Source 3 Handle ID	UINT16	Read
43141	1	Source 4 Handle ID	UINT16	Read
43142	1	Source 5 Handle ID	UINT16	Read
43143	1	Source 6 Handle ID	UINT16	Read
43144	1	Source 7 Handle ID	UINT16	Read
43145	1	Source 8 Handle ID	UINT16	Read

Modbus register	# of Modbus registers	Description	Format	Properties
43146	1	Source 9 Handle ID	UINT16	Read
43147	1	Source 10 Handle ID	UINT16	Read
43148	1	Source 11 Handle ID	UINT16	Read
43149	1	Source 12 Handle ID	UINT16	Read
43150	1	Source 13 Handle ID	UINT16	Read
43151	1	Source 14 Handle ID	UINT16	Read
43152	1	Source 15 Handle ID	UINT16	Read
43153	1	Source 16 Handle ID	UINT16	Read