



EM133 Multifunction Meter

Modbus Communications Protocol

Reference Guide

Every effort has been made to ensure that the material herein is complete and accurate. However, the manufacturer is not responsible for any mistakes in printing or faulty instructions contained in this book. Notification of any errors or misprints will be received with appreciation.

For further information regarding a particular installation, operation or maintenance of equipment, contact the manufacturer or your local representative or distributor.

REVISION HISTORY

A1	Aug 2011	Release
A2	Jan 2013	Added support for the 12DI/4RO module and IEC 60870 options extensions.
A3	Mar 2016	CANopen protocol & interface added for COM2.
A4	Nov 2016	Added front panel security option, firmware download event and configuration fault diagnostic.
A5	Dec 2016	Added symmetrical components.
A6	Feb 2017	Added Device firmware build major & minor numbers (registers 2562, 2563, 46106 & 46107).s Updated CANopen Data Transfer functionality (registers 2391 & 2392). Added IEC 60870-5-104 IP Redundancy functionality (register 49495)
A7	June 2017	Added WiFi module support.
A8	Oct 2017	Added support for the GSM/2*AI module. Added Short/Long (PM180 style) Notification Message.

Modbus is a trademark of Schneider Electric.

Table of Contents

1 GENERAL	8
2 MODBUS PROTOCOL IMPLEMENTATION	9
2.1 Transmission Modes	9
2.2 Address Field	9
2.3 Function Field	9
2.4 Exception Responses	9
2.5 Transaction Timing	9
2.6 Modbus Register Addresses	10
2.7 Data Formats	10
2.7.1 16-bit Scaled Integer Format	10
2.7.2 32-bit Long Integer Format.....	11
2.7.3 32-bit Floating Point Format.....	12
2.7.4 32-bit Modulo-10000 Format	12
2.8 User Assignable Registers	12
2.9 Password Protection	13
2.10 Data Recording and File Transfers	13
2.10.1 Log File Organization	13
Multi-section Files	13
Data Log File.....	14
Profile Data Log File	14
Real-time Waveforms.....	14
2.10.2 File Transfers	14
Common File Transfer	14
Reading Multi-section Data Log Files	15
Reading Real-time Waveforms.....	16
2.11 TCP Notification Client	16
3 MODBUS REGISTER MAP	17
3.1 Modbus Setup Registers	17
Assignable Modbus Registers.....	17
Assignable Registers Map.....	17
Modbus Conversion Scales	17
Device Data Scales	17
32-bit Register Type	17
3.2 16-bit Scaled Analog Registers and Energy Counters - Basic Register Set	18
3.3 16-bit Scaled Analog Registers, Binary Registers and Counters	20
None.....	20
Special Inputs	20
Digital Inputs	20
Relay Outputs	20
Counters	20
1-Cycle Phase Values	20
1-Cycle Total Values	21
1-Cycle Auxiliary Values	21
Phasor.....	21
1-Second Phase Values	22
1-Second Total Values.....	22
1-Second Auxiliary Values.....	23
Present Volt, Ampere and Power Demands.....	23
Total Energies	24
Phase Energies.....	24
Symmetrical Components	24
V1/V12 Harmonics	25

V2/V23 Harmonics	25
V3/V31 Harmonics	25
I1 Harmonics	25
I2 Harmonics	25
I3 Harmonics	25
Fundamental Phase Values.....	25
Fundamental Total Values.....	26
Minimum 1-Cycle Phase Values	26
Minimum 1-Cycle Total Values.....	26
Minimum 1-Cycle Auxiliary Values.....	26
Maximum 1-Cycle Phase Values.....	26
Maximum 1-Cycle Total Values.....	26
Maximum 1-Cycle Auxiliary Values	26
Maximum Demands	27
Scaled Analog Inputs	27
Raw Analog Inputs.....	27
TOU Parameters	27
Scaled Analog Outputs	27
TOU Energy Register #1	28
TOU Energy Register #2	28
TOU Energy Register #3	28
TOU Energy Register #4	28
Billing Summary Accumulated Demands	28
Billing Summary Block Demands.....	28
Billing Summary Sliding Window Demands.....	28
Billing Summary Maximum Demands	28
TOU Maximum Demand Register #1	29
TOU Maximum Demand Register #2	29
TOU Maximum Demand Register #3	29
TOU Maximum Demand Register #4	29
V1/V12 Harmonic Angles	29
V2/V23 Harmonic Angles	29
V1/V31 Harmonic Angles	29
I1 Harmonic Angles.....	29
I2 Harmonic Angles.....	29
I3 Harmonic Angles.....	30
Setpoint Status	30
3.4 32-bit Analog Registers, Binary Registers and Counters	31
Special Inputs	31
Digital Inputs	31
Relay Outputs	31
Counters	31
1-Cycle Phase Values	31
1-Cycle Total Values	32
1-Cycle Auxiliary Values	32
Phasor.....	32
1-Second Phase Values	33
1-Second Total Values.....	33
1-Second Auxiliary Values.....	34
Present Volt, Ampere and Power Demands.....	34
Total Energies	35
Billing Summary Energy Registers	35
Phase Energies	35
Symmetrical Components	35
V1/V12 Harmonics	36
V2/V23 Harmonics	36
V3/V31 Harmonics	36
I1 Harmonics	36
I2 Harmonics	36
I3 Harmonics	36

Fundamental (H01) Phase Values	36
Harmonic Total Values.....	37
Minimum 1-Cycle Phase Values	37
Minimum 1-Cycle Total Values.....	37
Minimum 1-Cycle Auxiliary Values.....	37
Maximum 1-Cycle Phase Values.....	37
Maximum 1-Cycle Total Values.....	37
Maximum 1-Cycle Auxiliary Values	38
Maximum Demands	38
Scaled Analog Inputs	38
Raw Analog Inputs.....	38
TOU Parameters	38
Scaled Analog Outputs	39
TOU Energy Register #1	39
TOU Energy Register #2	39
TOU Energy Register #3	39
TOU Energy Register #4	39
Billing Summary Accumulated Demands	39
Billing Summary Block Demands.....	39
Billing Summary Sliding Window Demands.....	39
Billing Summary Maximum Demands	40
TOU Maximum Demand Register #1	40
TOU Maximum Demand Register #2	40
TOU Maximum Demand Register #3	40
TOU Maximum Demand Register #4	40
V1/V12 Harmonic Angles	40
V2/V23 Harmonic Angles	40
V1/V31 Harmonic Angles	40
I1 Harmonic Angles.....	40
I2 Harmonic Angles.....	41
I3 Harmonic Angles.....	41
Setpoint Status	41
Generic TOU Season Energy Registers.....	41
Generic TOU Season Maximum Demand Registers	41
Generic Data.....	41
3.5 Minimum/Maximum Log Registers.....	43
Minimum Phase Values	43
Minimum Total Values	43
Minimum Auxiliary Values	43
Maximum Phase Values	43
Maximum Total Values	44
Maximum Auxiliary Values	44
Billing Summary Maximum Demands	44
Maximum Demands	44
TOU Maximum Demand Register #1	45
TOU Maximum Demand Register #2	45
TOU Maximum Demand Register #3	46
TOU Maximum Demand Register #4	46
3.6 Device Control and Status Registers	47
Device Restart Register	47
Device Authorization Registers	47
Remote Relay Control.....	47
Device Reset/Clear Registers.....	47
Device Identification	47
Device Status Registers.....	48
Alarm Notification Registers	48
DI Change Events	48
Memory Status Registers	48
Log Notification Registers	48
Communication Status	48

Communication Counters.....	49
3.7 Device Setup Registers	50
Device Identification	50
Factory Device Settings	50
Basic Setup.....	50
Communication Ports Setup	51
Device Options Setup	52
Local Settings	52
Clock Indication and Setup	52
Alarm/Event Setpoints Setup	53
Pulse Counters Setup	53
Analog Outputs Setup	53
Network Setup	54
WiFi Station Setup	54
WiFi Access Point Setup.....	54
Password Setup.....	54
Expert Power Service Setup	55
Internet Service Provider (ISP) accounts	55
GPRS Setup	55
TCP Notification Client Setup	55
Transformer Correction Setup	55
Display Setup.....	56
IEC 60870-5 Options Setup.....	56
IEC 60870-5 Class 2 Data and Counters Setup	57
IEC 60870-5 Assignable Point Map and Events Setup	57
DNP Options Setup	57
DNP Class 0 Point Assignments	58
File Setup	58
Data Log Setup	58
TOU Daily Profile Setup	59
TOU Calendar Setup.....	59
Billing/TOU Registers Setup	60
Billing/TOU Registers Source Setup.....	60
Digital Inputs Setup	60
Relay Outputs Setup	61
Analog Inputs Setup	61
Analog Outputs Setup	61
3.8 Analog and Digital I/O Configuration.....	62
I/O Slots Configuration Info	62
I/O Type Info	62
3.9 File Transfer Registers	63
File Transfer Control Blocks.....	63
File Info Response Block (Variation 0 – File info).....	64
File Info Response Block (Variation 1 – Current record info)	65
File Info Response Block (Variation 2 – Data log record structure)	65
Event Log Response Block	65
Data Log Response Block.....	66
RT Waveform Response Block	66
3.10 Billing/TOU Daily Profile Data Log	68
4 DATA SCALES AND UNITS	70
Data Scales.....	70
Data Units – Low Resolution Option	70
Data Units – High Resolution Option.....	70
5 DATA FORMATS	71
Timestamp.....	71
File ID	71
File Attributes.....	71

File Status Word (bitmap).....	71
File Record Status Word (bitmap)	71
TOU Profile Log Channel ID	71
Waveform Log Channel ID	71
Profile Log Sections Mask.....	71
Waveform Channel Mask	71
TOU Tariff Change Time.....	71
Billing/TOU Energy Register Source ID	71
Setpoint Trigger Parameters ID	72
Relays	72
Setpoint Action ID	73
Counter Source ID	74
Relay Output Pulse Source ID.....	74
AO Parameters ID.....	74
AI Parameters ID.....	75
Event Cause/Point ID	75
Event Effect ID	75
Data Point ID	75
Device operation	76
Event Type ID	76
Device Diagnostics.....	76
DNP Object Variations	76
DNP Class 0 Objects.....	76
Wiring Mode.....	77
Device Options	77
I/O Slot Types.....	77
Single Point Info Static Type	77
Single Point Info Event Type	77
Double Point Info Static Type	78
Double Point Info Event Type	78
Measured Value Static Type	78
Measured Value Event Type	78
Integrated Totals Static Type	78
Integrated Totals Event Type	78

1 General

This document specifies a subset of the Modbus serial communications protocol used to transfer data between a master computer station and the EM133. The document provides the complete information necessary to develop third-party communications software capable of communication with EM133 meters. For additional information concerning operating the device, configuring communication parameters, and communication connections see the EM133 Installation and Operation Manual.

IMPORTANT

In 3-wire connection schemes, the unbalanced current and phase readings for power factor, active power, and reactive power will be zeros, because they have no meaning. Only the total three-phase power values are provided.

Most of the advanced features are configured using multiple setup parameters that can be accessed in a number of contiguous registers. When writing the setup registers, it is recommended to write all the registers at once using a single request, or to clear (zero) the setup before writing into separate registers.

2 Modbus Protocol Implementation

For detailed information about Modbus protocol, Modbus message framing and error checking, refer to the "Modicon Modbus Protocol Reference Guide". It can be downloaded from the www.modbus.org Website. The following paragraphs outline some issues concerning the implementation of the Modbus protocol in the EM133.

2.1 Transmission Modes

The EM133 can be set up to communicate on a Modbus network using RTU transmission mode. Refer to the EM133 Installation and Operation Manual on how to select the transmission mode in your meter.

2.2 Address Field

The address field contains a user assigned address of the meter (1-247) on a Modbus network. Broadcast mode using address 0 is not supported.

2.3 Function Field

The Modbus functions implemented in the EM133 are shown in Table 2-1. Function 04 can be used in the same context as function 03.

Table 2-2 Modbus Function Codes

Code (decimal)	Meaning in Modbus	Action
03	Read holding registers	Read multiple registers
04	Read input registers	Read multiple registers
06	Preset single register	Write single register
16	Preset multiple registers	Write multiple registers
08 ¹	Loop-back test	Communications test

¹ The EM133 supports only diagnostic code 0 - return query data.

2.4 Exception Responses

The meter sends an exception response when an error is detected in the received message. To indicate that the response is notification of an error, the high order bit of the function code is set to 1.

Implemented exception response codes:

- 01** - Illegal function
- 02** - Illegal data address
- 03** - Illegal data value
- 04** - Device failure

When the character framing, parity, or redundancy check detects a communication error, processing of the master's request stops. The meter will not act on or respond to the message.

2.5 Transaction Timing

The EM133 response time to master requests is indicated in Table 2-2.

Table 2-2 Response Time

Baud Rate, bps	Response Time, ms		
	Min	Max	Typical
9600	13	15	13
19200	11	12	11
57600	9	10	9
115200	9	10	9

2.6 Modbus Register Addresses

The EM133 Modbus registers are numbered in the range of 0 to 65535. From the Modbus applications, the EM133 Modbus registers can be accessed by simulating holding registers of the Modicon 584, 884 or 984 Programmable Controller, using a 5-digit "4XXXX" or 6-digit "4XXXXX" addressing scheme.

To map the EM133 register address to the range of the Modbus holding registers, add a value of 40001 to the EM133 register address. When a register address exceeds 9999, use a 6-digit addressing scheme by adding 400001 to the EM133 register address.

2.7 Data Formats

The EM133 uses four data formats to pass data between a master application and the meter: 16-bit short integer, 32-bit long integer, 32-bit floating point and 32-bit modulo-10000 formats. Binary values and counters are always transmitted in 32-bit registers, while analog values can be read both in 32-bit and in 16-bit scaled registers.

32-bit analog and energy registers and counters can be read either in long integer or in single precision floating point format. The register type can be selected in the meter separately for analog registers, binary counters and energy registers via Modbus register 246 (see Section 3.1, Modbus Setup Registers). Refer to the "EM133 Powermeters, Installation and Operation Manual, Device Options Setup" for information on how to setup the type of 32-bit registers in your meter.

Analog registers 256 through 308 and 6656 through 10935 contain scaled 16-bit data.

2.7.1 16-bit Scaled Integer Format

16-bit scaled analog data is transmitted in a single 16-bit Modbus register being scaled to the range of 0 to 9999. To get a true reading, a reverse conversion should be done using the following formula:

$$Y = \frac{X \times (HI - LO)}{9999} + LO$$

where:

- Y - True reading in engineering units
- X - Raw input data in the range of 0 to 9999
- LO and HI - Data low and high scales in engineering units

The engineering scales are indicated for every scaled 16-bit register. Refer to Section 4 "Data Scales and Units" for applicable data scales and measurement units.

The default voltage scale in the device is 144V (120V+20%). It can be changed through register 242 (see Section 3.1, Device Data Scales), or via the supplemental PAS software. The recommended voltage scale is 120V+20% = 144V for using with external PT's, and 690V+20% = 828V for a direct connection to power line.

CONVERSION EXAMPLES

1. Voltage readings

- a) Assume device settings (direct wiring): PT ratio = 1; Voltage scale = 828V (690V + 20%).

Voltage engineering scales (see Section 4):

$$HI_ENG = V_{max} = 828.0 \times PT \text{ ratio} = 828.0 \times 1 = 828.0V$$

$$LO_ENG = 0V$$

If the raw data reading is 1449 then the voltage reading in engineering units will be as follows:

$$\text{Volts reading} = 1449 \times (828.0 - 0) / (9999 - 0) + 0 = 120.0V$$

- b) Assume device settings (wiring via PT): PT ratio = 14,400V : 120V = 120; Voltage scale = 144V.

Voltage engineering scales (see Section 4):

$$HI_ENG = V_{max} = 144.0 \times PT \text{ ratio} = 144 \times 120 = 17,280V$$

$$\text{LO_ENG} = 0\text{V}$$

If the raw data reading is 8314 then the voltage reading in engineering units will be as follows:

$$\text{Volts reading} = 8314 \times (17,280 - 0)/9999 + 0 = 14,368\text{V}$$

2. Current readings

Assume device settings: CT primary current = 200A.

Current engineering scales (see Section 4):

$$\text{HI_ENG} = I_{\text{max}} = \text{CT primary current} \times 2 = 200.00 \times 2 = 400.00\text{A}$$

$$\text{LO_ENG} = 0\text{A}$$

If the raw data reading is 250 then the current reading in engineering units will be as follows:

$$\text{Amps reading} = 250 \times (400.00 - 0)/(9999 - 0) + 0 = 10.00\text{A}$$

3. Power readings

a) Assume device settings (direct wiring): Wiring 4LL3; PT = 1; CT primary current = 200A; Voltage scale = 828V.

Active Power engineering scales (rounded to whole kW, see Section 4):

$$\text{HI_ENG} = P_{\text{max}} = V_{\text{max}} \times I_{\text{max}} \times 2 = (828.0 \times 1) \times (200.00 \times 2) \times 2 = 662,400\text{W} = 662 \text{ kW}$$

$$\text{LO_ENG} = -P_{\text{max}} = -662 \text{ kW}$$

If the raw data reading is 5500 then the power reading in engineering units will be as follows:

$$\text{Watts reading} = 5500 \times (662 - (-662))/(9999 - 0) + (-662) = 66.3 \text{ kW}$$

If the raw data reading is 500 then the power reading in engineering units will be as follows:

$$\text{Watts reading} = 500 \times (662 - (-662))/(9999 - 0) + (-662) = -595.8 \text{ kW}$$

b) Assume device settings (wiring via PT): Wiring 4LN3; PT = 120; CT primary current = 200A.

Active Power engineering scales (rounded to whole kW, see Section 4):

$$\text{HI_ENG} = P_{\text{max}} = V_{\text{max}} \times I_{\text{max}} \times 3 = (828 \times 120) \times (200.00 \times 2) \times 3/1000 = 119,232 \text{ kW}$$

$$\text{LO_ENG} = -P_{\text{max}} = -119,232 \text{ kW}$$

If the raw data reading is 5500 then the power reading in engineering units will be as follows:

$$\text{Watts reading} = 5500 \times (119,232 - (-119,232))/(9999 - 0) + (-119,232) = 11,936 \text{ kW}$$

If the raw data reading is 500 then the power reading in engineering units will be as follows:

$$\text{Watts reading} = 500 \times (119,232 - (-119,232))/(9999 - 0) + (-119,232) = -107,307 \text{ kW}$$

4. Power Factor readings

Power factor engineering scales (see Section 3.3):

$$\text{HI_ENG} = 1.000.$$

$$\text{LO_ENG} = -1.000.$$

If the raw data reading is 8900 then the power factor in engineering units will be as follows:

$$\text{Power factor reading} = 8900 \times (1.000 - (-1.000))/(9999 - 0) + (-1.000) = 0.78$$

2.7.2 32-bit Long Integer Format

32-bit long integer data is transmitted in two adjacent 16-bit Modbus registers as unsigned (UINT32) or signed (INT32) whole numbers. The first register contains the low-order word (lower 16 bits) and the second register contains the high order word (higher 16 bits). The low-order word always starts at an even Modbus address.

The value range for unsigned data is 0 to 4,294,967,295; for signed data the range is -2,147,483,648 to 2,147,483,647.

If your Modbus driver does not support a 32-bit long integer format, you can read the two 16-bit registers separately, and then convert them into a 32-bit value as follows (using C notation):

$$\text{32-bit value} = (\text{signed short})\text{high_order_register} \times 65536\text{L} + (\text{unsigned short})\text{low_order_register}$$

EXAMPLES

1. Unsigned 32-bit Values

If you read unsigned Voltage V1 of 69,000V from registers 13952-13953, then the register readings will be as follows:

$$(13952) = 3464$$

$$(13953) = 1$$

The 32-bit value is $(1 \times 65536 + 3464) = 69000V$.

2. Signed 32-bit Values

If you read signed kW of -789kW from registers 14336-14337, then the register readings will be:

$$(14336) = 64747 \text{ (unsigned)}$$

$$(14337) = 65535 \text{ (unsigned) or } -1 \text{ (signed value)}$$

To take the high order register as a signed value, compare it with 32767. If the value is less or equal to 32767, use it as is. If it is greater than 32767, then this is a negative number in a two's complement code (like in our example) - just subtract it from 65536 to get the original negative value.

The 32-bit reading is $(-1 \times 65536 + 64747) = -789kW$.

Fractional 32-bit data is transmitted using a decimal pre-multiplier to pass fractional numbers in an integer format. Fractional numbers are pre-multiplied by 10 to the power N, where N is the number of digits in the fractional part. For example, the frequency reading of 50.01 Hz is transmitted as 5001, having been pre-multiplied by 100.

Whenever a data register contains a fractional number, the register measurement unit is given with a multiplier $\times 0.1$, $\times 0.01$ or $\times 0.001$, showing the weight of the least significant decimal digit. To get an actual fractional number with specified precision, multiply the register value by the given multiplier. To write a fractional number into the register, divide the number by the given multiplier.

2.7.3 32-bit Floating Point Format

32-bit analog registers, energy registers and binary counters, and 32-bit Min/Max registers (see Sections 3.3-3.5) can be read in IEEE single precision floating point format in two adjacent 16-bit Modbus registers, the low order register first.

The low-order register always starts at an even Modbus address.

2.7.4 32-bit Modulo-10000 Format

Energy counters 287-294 and 301-302 are read in two contiguous 16-bit registers in a modulo-10000 format. The first (low order) register contains the value mod 10000, and the second (high order) register contains the value/10000. To get the true energy reading, the high order register value should be multiplied by 10,000 and added to the low order register.

2.8 User Assignable Registers

The EM133 provides 120 user assignable registers in the address range of 0 to 119. You can re-map any register available in the meter to any assignable register so that Modbus registers that reside at different locations may be simply accessed using a single request by re-mapping them to adjacent addresses. Refer to Configuring Modbus in the EM133 Installation and Operation Manual for information on how to configure the assignable registers via PAS.

The actual addresses of the assignable registers, which are accessed via addresses 0 through 119, are specified in the register map (registers 120 through 239), where register 120 contains the actual address of the register accessed via register 0, register 121 contains the actual address of the register accessed via register 1, and so on. The assignable registers and the map registers themselves may not be re-mapped.

Initially these registers are reserved and none of them points to an actual register address. To build your own register map, write to map registers 120 to 239 the actual addresses you

want to read from or write to via the assignable area (registers 0 to 119). 32-bit long registers should always be aligned at even addresses. For example, if you want to read registers 7136 (1-second V1 voltage, scaled short integer) and 14720-14721 (kWh Import, long integer) via registers 0-2, do the following:

- write 14720 to register 120
- write 14721 to register 121
- write 7136 to register 122

Reading from registers 0-2 will return the kWh reading in registers 0 (low 16 bits) and 1 (high 16 bits), and the voltage reading in register 2.

2.9 Password Protection

System and configuration parameters in the EM133 are password protected from unauthorized changes via communications. Refer to the meter Installation and Operation Manual for details.

A user password must be written to the device authorization register (2575) before another write request is issued. If the correct password is not supplied, the meter responds to all write requests with the exception code 01 (illegal operation).

It is recommended to clear the password register after you have completed changes in order to activate password protection.

2.10 Data Recording and File Transfers

2.10.1 Log File Organization

Historical files are stored to the non-volatile memory. Memory is allocated for each file statically when you set up your files and will not change unless you re-organize the files. The meter automatically performs de-fragmentation of the memory each time you re-organize your files. This helps keep all free memory in one continuous chunk and thus prevents possible leakage of memory caused by fragmentation.

Data records in a file are arranged in the order of their recording. Each record has a unique 16-bit sequence number that is incremented modulo 65536 with each new record. The sequence number can be used to point to a particular record in the file, or to check the sequence of records when uploading files from the device.

Each file has a write position pointer that indicates the place where the next record will be recorded, and a read position pointer that indicates the place from where the current record will be read. Both pointers show sequence numbers of the records they point to rather than record offsets in the file.

After acknowledging a record you have read, the read pointer automatically advances to the next record in the file. When the read pointer gets to the record to which the file write pointer points, the end-of-file (EOF) flag is set. It is automatically cleared when a new record is added to the file, or when you explicitly move the read pointer to any record within a file.

If a file has a wrap-around attribute (circular file), the most recent records can overwrite the oldest records. When this happens at the current read position, the read pointer automatically advances forward in order to point to the oldest record in the file.

The meter keeps a separate read pointer for each communication port so that access to the same file through a different port will not affect current active sessions for other ports.

Multi-section Files

Log files can have one or more (up to 8) sections for multi-channel recording. An ordinal file consists of a single section. A daily profile log file is arranged as multi-section file.

A multi-section file is subdivided into multiple sections of the same structure, one section per recording channel. The number of sections in each file is defined at the time you set up your files and may not change unless you re-organize the file. Each section within a multi-section file can be addressed by a section number, or by a section channel ID.

A multi-section file has a single write position pointer for all sections and stores data in all sections simultaneously. This means that records with the same sequence number in all sections are associated with the same event. A multi-section file has also a single read position pointer for all sections.

Data Log File

A data log file can store up to 9 measured parameters per a record. Any data measured by the device can be stored in the log file. The number of parameters that each record will hold and the list of parameters you want to be recorded in the file can be selected through the Data log setup registers for a particular file.

Recording data to the data log files can be triggered through the setpoints, either on a time basis using the meter clock or periodic timers, or upon any event detected by the setpoints.

Profile Data Log File

Data log file #16 can be configured for a daily profile log of the energy usage and maximum demand registers. A profile log file is organized as a multi-section file that has a separate section for each energy and maximum demand register. A file record stores the summary data (total of all tariffs) and all tariff data for each configured Summary/TOU register. See Section 3.10 for information on the file record structure.

The number of sections is taken automatically from the Summary/TOU Registers setup. Since each Summary/TOU energy register has a shadow maximum demand register, the number of sections in the file can be twice the number of the allocated Summary/TOU registers. Always configure the Summary/TOU registers before you allocate memory for your profile log file.

New records are added to the file automatically every day at midnight. You can review the list of parameters recorded to the file through the file info request/response blocks using info requests with variation 2 (see Section 3.9), or through the Data log #16 setup - it shows the list of parameters for the first file section, which represents the first configured energy usage register.

Real-time Waveforms

Real-time waveforms are read as a multi-section file that stores data for each recording channel in a separate section. A real-time waveform contains six AC channels - three voltage and three current waveforms, which are recorded in successive sections.

A single waveform record for a channel contains 512 points of the sampled input signal. Refer to the line frequency field in the channel header record to correctly set up the time scale for the waveforms.

2.10.2 File Transfers

File transfer protocol provides both data transfer and information services. File transfer is performed through two blocks of registers: a 32-word master request block and a 648-word read-only file response block. After a master application has written the request into the file request block, the requested data is available for a read through the file response block registers. File transfer functions allow changing the file or section position in order to point to the desired record.

The information services use separate 8-word file info request and 200-word file info response blocks. The extended file information is available including current file pointers' positions, file contents, the number of records in the file, allocated file size, time of the last file update, and more.

See Section 3.9 File Transfer Registers for information on register locations.

Common File Transfer

Log files can be read either in a sequence record-by-record, or in a random order. Each Read-File request fills the file response block with the data of the record pointed to by the file (or section) read pointer. If you want to begin reading a file from a particular record, which sequence number is known, you can change the pointer position by issuing the Set-File-Position request with the desired sequence number. If you want to read a file from the

beginning, send the Reset-File-Position request that moves the pointer to the oldest file record. If you do not change the file position, then you will continue reading the file from the record following the one you have read the last time you accessed the file.

You need not explicitly move the file position to the following record if you want to continue reading a file in sequence after you have uploaded the current record. Instead, issue an acknowledgment request that automatically advances the file pointer to the next record, and then read the record data through the file response block.

The file response block can contain more than one record. The number of records available in the block and the file record size in words are always reported in the block heading. There are no special rules on how to read records from the file transfer block. You can read a single record or all records together, or begin reading from the last record and end with the first record. However, you should remember: 1) after an acknowledgment, the file position moves to the record following the last one you have accessed in the file transfer block; and 2) data in the file transfer block does not change until you either issue an acknowledgment, or explicitly change the file position by the Set-File-Position or Reset-File-Position requests.

The file transfer is completed after you have read the last record of the file. Before storing a file record to your database, always check bit 9 in the record status word, which contains the end-of-file (EOF) flag. This bit set to 1 indicates that the file read pointer does not point to any record within the file, and you should not store any record that has this bit set. The EOF flag is set only after you have acknowledged the last record of the file, so that testing for end-of-file requires one extra read. If you wish to stop the transfer just after storing the last file record, acknowledge the record and check bit 0 in the record status word. Bit 0 is set to 1 only once when you read the last record of the file.

The following gives a summary of steps you should do to read an ordinal log file:

1. If you wish to begin reading a file from a particular record or from the first record, use either the Set-File-Position request with the desired record sequence number, or the Reset-File-Position request. Preset a section number and channel ID to zero.
2. Write the Read-File request with a section number and channel ID set to zero.
3. Read the record data from the file response block.
4. Write an acknowledgment for the file. You need not fill all the request fields: only the file function is required. The file pointer will be moved to the next file record.
5. Repeat steps 3-4 until all the file records are read.

Reading Multi-section Data Log Files

In a multi-section data log file, all user requests including an acknowledgment, the Read-File, Set-File-Position and Reset-File-Position requests, relate to a particular file section rather than to the file itself. The only request that affects the entire file is the Erase-File that clears all the file sections together.

A file section can be requested either by a section number, or by a section channel ID. If you use a channel ID, preset the section number field to 0xFFFF. If a section number is specified, the channel ID field will not be checked. The device returns both fields in the response block heading, so you can always identify what channel data is being read from the present file section. If you want to know which channels are recorded to the file sections, check the file channel mask in the file info block. This is a bitmap that contains one in a bit position if a channel with an ID equal to the bit number is recorded to the file, and contains zero if it is not.

The following gives a summary of steps for reading a multi-section data log file:

1. If you wish to begin reading a file section from a particular record or from the first record, use either the Set-File-Position request with the desired record sequence number, or the Reset-File-Position request. Specify either a section number, or the channel ID for the section from where you want to read data. If you use a channel ID, preset the section number field to 0xFFFF.
2. Write the Read-File request with the section number and channel ID as shown in the previous step.

3. Read the record data from the file response block.
4. Write an acknowledgment for the file. The file section pointer will be moved to the next record.
5. Repeat steps 3-4 until all the section records are read.

Reading Real-time Waveforms

Writing the Read-File request for file 128 provides a simultaneous capture of 6 real-time waveform records – three voltage and three current waveforms – into a communication buffer that can be read through the common file response block. The following gives a summary of steps for reading real-time waveforms:

1. Write the Read-File request for file 128. Address you request to the first file section (its number is always zero), or to the first file channel (if you know channel's ID). If you use a channel ID, preset the section number field to 0xFFFF.
2. Read the channel's data from the file response block.
3. Write the Read-File request for the next file section or channel. The file response block will be refilled with the data for the requested channel.
4. Repeat steps 3, 4 until all the channel records are read.
5. Write an acknowledgment to release the buffer.

2.11 TCP Notification Client

The TCP notification client can establish connections with a remote Modbus/TCP server and send notification messages either on events, or periodically on a time basis.

Notification messages are sent via a block of 16 Modbus registers using write function 16. The following table shows the message exchange structure.

Modbus Register	Description	Type	Comment
+0-1	Device serial number	UINT32	
+2-4	Device MAC address	CHAR6	
+5	Device address	UINT16	Device port address
+6-7	Device IP address	UINT32	Network byte order
+8	Event type	UINT16	See F23 in Section 5
+9	Event sequence number	UINT16	Not used
+10-11	Event timestamp, seconds	UINT32	Local time since Jan 1, 1970
+12-13	Event timestamp, seconds fraction, in microseconds	UINT32	
+14-15	Reserved	UINT32	Written as 0

After receiving a write acknowledgement from a server, a TCP connection is still open for 10 seconds (60 seconds via GPRS) to give the server an opportunity to access meter registers through an open socket. It may help you access the meter from outside your local network when the server is located on another network, or when using wireless GPRS communications. The notification client will respond to all server requests as if it were a regular incoming connection.

If the server does not close a connection, it will be closed in 10 seconds if there is no activity on the socket. In the event a connection attempt was unsuccessful, the notification client retries two more times before announcing a connection failure.

The server's IP address, port number and starting Modbus register address are programmable in the meter. See "TCP Notification Client Setup" for more information on the client setup. To configure and enable the notification client in your meter via PAS, select Communication Setup in the Meter Setup menu, and click on the TCP Notification Client Setup tab.

Client connections are triggered via programmable setpoints. To send event notifications to a server, configure a setpoint to respond to a desired trigger or to periodic time events and put "Notification" to the setpoint action list.

3 Modbus Register Map

3.1 Modbus Setup Registers

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
Assignable Modbus Registers							
0-119							
+0		Register 0 contents	0-65535		UINT16	R/W	
+1		Register 1 contents	0-65535		UINT16	R/W	
		...					
+119		Register 119 contents	0-65535		UINT16	R/W	
Assignable Registers Map							
120-239							
+0		Mapped register 0 address	0-65535		UINT16	R/W	
+1		Mapped register 1 address	0-65535		UINT16	R/W	
+119		Mapped register 119 address	0-65535		UINT16	R/W	
Modbus Conversion Scales							
240		Low raw scale	0		UINT16	R	
241		High raw scale	9999		UINT16	R	
Device Data Scales							
242		Voltage scale, secondary volts	60-828	1V	UINT16	R/W	Default 144V
243		Current scale, secondary amps	10-100	×0.1A	UINT16	R/W	Default 2×CT secondary
244-245		Reserved	0		UINT16	R	
32-bit Register Type							
246		Type of 32-bit registers	Bits 0-1 - analog values: 0 = 32-bit integer 1 = 32-bit floating point Bits 2-3 - binary counters: 0 = 32-bit integer 1 = 32-bit floating point Bit 4-5 - energy counters: 0 = 32-bit integer 1 = 32-bit floating point		UINT16	R/W	Default 0

3.2 16-bit Scaled Analog Registers and Energy Counters - Basic Register Set

Address	Point ID	Description	Low and High Scales ²	Units ²	Type	R/W	Notes
256-308							
+0	0x1100	V1/V12 Voltage	0-Vmax	U1	UINT16	R	1
+1	0x1101	V2/V23 Voltage	0-Vmax	U1	UINT16	R	1
+2	0x1102	V3/V31 Voltage	0-Vmax	U1	UINT16	R	1
+3	0x1103	I1 Current	0-Imax	U2	UINT16	R	
+4	0x1104	I2 Current	0-Imax	U2	UINT16	R	
+5	0x1105	I3 Current	0-Imax	U2	UINT16	R	
+6	0x1106	kW L1	-Pmax-Pmax	U3	INT16	R	
+7	0x1107	kW L2	-Pmax-Pmax	U3	INT16	R	
+8	0x1108	kW L3	-Pmax-Pmax	U3	INT16	R	
+9	0x1109	kvar L1	-Pmax-Pmax	U3	INT16	R	
+10	0x110A	kvar L2	-Pmax-Pmax	U3	INT16	R	
+11	0x110B	kvar L3	-Pmax-Pmax	U3	INT16	R	
+12	0x110C	kVA L1	-Pmax-Pmax	U3	UINT16	R	
+13	0x110D	kVA L2	-Pmax-Pmax	U3	UINT16	R	
+14	0x110E	kVA L3	-Pmax-Pmax	U3	UINT16	R	
+15	0x110F	Power factor L1	-1.000-1.000	0.001	INT16	R	
+16	0x1110	Power factor L2	-1.000-1.000	0.001	INT16	R	
+17	0x1111	Power factor L3	-1.000-1.000	0.001	INT16	R	
+18	0x1403	Total PF	-1.000-1.000	0.001	INT16	R	
+19	0x1400	Total kW	-Pmax-Pmax	U3	INT16	R	
+20	0x1401	Total kvar	-Pmax-Pmax	U3	INT16	R	
+21	0x1402	Total kVA	-Pmax-Pmax	U3	UINT16	R	
+22	0x1501	In (neutral) Current	0-Imax	U2	UINT16	R	
+23	0x1502	Frequency	45.00-65.00	0.01Hz	UINT16	R	
+24	0x3709	Maximum kW import sliding window demand	-Pmax-Pmax	U3	UINT16	R	
+25	0x160F	kW import accumulated demand	-Pmax-Pmax	U3	UINT16	R	
+26	0x370B	Maximum kVA sliding window demand	-Pmax-Pmax	U3	UINT16	R	
+27	0x1611	kVA accumulated demand	-Pmax-Pmax	U3	UINT16	R	
+28	0x3703	I1 Maximum ampere demand	0-Imax	U2	UINT16	R	
+29	0x3704	I2 Maximum ampere demand	0-Imax	U2	UINT16	R	
+30	0x3705	I3 Maximum ampere demand	0-Imax	U2	UINT16	R	
+31		kWh import (low)	0-9999	1kWh	UINT16	R	5
+32		kWh import (high)	0-9999	×10MWh	UINT16	R	5
+33		kWh export (low)	0-9999	1kWh	UINT16	R	5
+34		kWh export (high)	0-9999	×10MWh	UINT16	R	5
+35		+kvarh net (low)	0-9999	1kvarh	UINT16	R	3, 5
+36		+kvarh net (high)	0-9999	×10Mvarh	UINT16	R	3, 5
+37		-kvarh net (low)	0-9999	1kvarh	UINT16	R	4, 5
+38		-kvarh net (high)	0-9999	×10Mvarh	UINT16	R	4, 5

Address	Point ID	Description	Low and High Scales ²	Units ²	Type	R/W	Notes
+39	0x1112	V1/V12 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 3-sec value
+40	0x1113	V2/V23 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 3-sec value
+41	0x1114	V3/V31 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 3-sec value
+42	0x1115	I1 Current THD	0-999.9	0.1%	UINT16	R	3-sec value
+43	0x1116	I2 Current THD	0-999.9	0.1%	UINT16	R	3-sec value
+44	0x1117	I3 Current THD	0-999.9	0.1%	UINT16	R	3-sec value
+45		kVAh (low)	0-9999	1kVAh	UINT16	R	⁵
+46		kVAh (high)	0-9999	10MVAh	UINT16	R	⁵
+47	0x1609	Present kW import sliding window demand	-Pmax-Pmax	U3	UINT16	R	
+48	0x160B	Present kVA sliding window demand	-Pmax-Pmax	U3	UINT16	R	
+49	0x1615	PF (import) at Max. kVA sliding window demand	0-1.000	0.001	UINT16	R	
+50	0x111B	I1 Current TDD	0-100.0	0.1%	UINT16	R	3-sec value
+51	0x111C	I2 Current TDD	0-100.0	0.1%	UINT16	R	3-sec value
+52	0x111D	I3 Current TDD	0-100.0	0.1%	UINT16	R	3-sec value

NOTES:

¹ Voltage and Voltage Harmonics Readings:

When the 4LN3, 3LN3 or 3BLN3 wiring mode is selected, the voltages will be line-to-neutral; for any other wiring mode, they will be line-to-line voltages.

² All analog registers except of harmonics are 1-second average values. For volts, amps and power scales and units, refer to Section 4 "Data Scales and Units". For analog data scaling formulas and examples, see Section 2.7.1, "16-bit Scaled Integer Format".

³ Positive readings of kvarh net

⁴ Negative readings of kvarh net

⁵ If you use these energy registers instead of 32-bit registers, limit the energy roll value to 8 digits to avoid overflow (see Device Options Setup).

3.3 16-bit Scaled Analog Registers, Binary Registers and Counters

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
6656	0x0000	None	0		UINT16	R	
		Special Inputs					
6697	0x0101	Phase rotation order	0=error, 1=positive (ABC), 2=negative (CBA)		UINT16	R	
6896	0x0600	Digital Inputs	0x0000-0x3FFF		UINT16	R	Bitmap: 0=open, 1=closed
6976	0x0800	Relay Outputs	0x0000-0x001F		UINT16	R	Bitmap: 0=open, 1=closed
7056-7063		Counters					
+0,1	0x0A00	Counter #1	0-999,999,999		UINT32	R/W	
+2,3	0x0A01	Counter #2	0-999,999,999		UINT32	R/W	
+4,5	0x0A02	Counter #3	0-999,999,999		UINT32	R/W	
+6,7	0x0A03	Counter #4	0-999,999,999		UINT32	R/W	
7136-7168		1-Cycle Phase Values					
+0	0x0C00	V1/V12 Voltage	0-Vmax	U1	UINT16	R	¹
+1	0x0C01	V2/V23 Voltage	0-Vmax	U1	UINT16	R	¹
+2	0x0C02	V3/V31 Voltage	0-Vmax	U1	UINT16	R	¹
+3	0x0C03	I1 Current	0-Imax	U2	UINT16	R	
+4	0x0C04	I2 Current	0-Imax	U2	UINT16	R	
+5	0x0C05	I3 Current	0-Imax	U2	UINT16	R	
+6	0x0C06	kW L1	-Pmax-Pmax	U3	INT16	R	
+7	0x0C07	kW L2	-Pmax-Pmax	U3	INT16	R	
+8	0x0C08	kW L3	-Pmax-Pmax	U3	INT16	R	
+9	0x0C09	kvar L1	-Pmax-Pmax	U3	INT16	R	
+10	0x0C0A	kvar L2	-Pmax-Pmax	U3	INT16	R	
+11	0x0C0B	kvar L3	-Pmax-Pmax	U3	INT16	R	
+12	0x0C0C	kVA L1	0-Pmax	U3	UINT16	R	
+13	0x0C0D	kVA L2	0-Pmax	U3	UINT16	R	
+14	0x0C0E	kVA L3	0-Pmax	U3	UINT16	R	
+15	0x0C0F	Power factor L1	-1.000-1.000	0.001	INT16	R	
+16	0x0C10	Power factor L2	-1.000-1.000	0.001	INT16	R	
+17	0x0C11	Power factor L3	-1.000-1.000	0.001	INT16	R	
+18	0x0C12	V1/V12 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 2-cycle value
+19	0x0C13	V2/V23 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 2-cycle value
+20	0x0C14	V3/V31 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 2-cycle value
+21	0x0C15	I1 Current THD	0-999.9	0.1%	UINT16	R	2-cycle value
+22	0x0C16	I2 Current THD	0-999.9	0.1%	UINT16	R	2-cycle value
+23	0x0C17	I3 Current THD	0-999.9	0.1%	UINT16	R	2-cycle value
+24	0x0C18	I1 K-Factor	1.0-999.9	0.1	UINT16	R	2-cycle value
+25	0x0C19	I2 K-Factor	1.0-999.9	0.1	UINT16	R	2-cycle value
+26	0x0C1A	I3 K-Factor	1.0-999.9	0.1	UINT16	R	2-cycle value
+27	0x0C1B	I1 Current TDD	0-100.0	0.1%	UINT16	R	2-cycle value

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
+28	0x0C1C	I2 Current TDD	0-100.0	0.1%	UINT16	R	2-cycle value
+29	0x0C1D	I3 Current TDD	0-100.0	0.1%	UINT16	R	2-cycle value
+30	0x0C1E	V12 Voltage	0-Vmax	U1	UINT16	R	
+31	0x0C1F	V23 Voltage	0-Vmax	U1	UINT16	R	
+32	0x0C20	V31 Voltage	0-Vmax	U1	UINT16	R	
7256-7359		1-Cycle Total Values					
+0	0x0F00	Total kW	-Pmax-Pmax	U3	INT16	R	
+1	0x0F01	Total kvar	-Pmax-Pmax	U3	INT16	R	
+2	0x0F02	Total kVA	0-Pmax	U3	UINT16	R	
+3	0x0F03	Total PF	-1.000-1.000	0.001	INT16	R	
+4	0x0F04	Total PF lag	0-1.000	0.001	UINT16	R	
+5	0x0F05	Total PF lead	0-1.000	0.001	UINT16	R	
+5	0x0F06	Total kW import	0-Pmax	U3	UINT32	R	
+7	0x0F07	Total kW export	0-Pmax	U3	UINT32	R	
+8	0x0F08	Total kvar import	0-Pmax	U3	UINT32	R	
+9	0x0F09	Total kvar export	0-Pmax	U3	UINT32	R	
+10	0x0FOA	3-phase average L-N/L-L voltage	0-Vmax	U1	UINT32	R	1
+11	0x0FOB	3-phase average L-L voltage	0-Vmax	U1	UINT32	R	
+12	0x0FOC	3-phase average current	0-Imax	U2	UINT32	R	
7296-7300		1-Cycle Auxiliary Values					
+0	0x1000	Not used			UINT16	R	
+1	0x1001	In (neutral) Current	0-Imax	U2	UINT16	R	
+2	0x1002	Frequency	0-Fmax	0.01Hz	UINT16	R	
+3	0x1003	Voltage unbalance	0-300	%	UINT16	R	
+4	0x1004	Current unbalance	0-300	%	UINT16	R	
7316-7331		Phasor					
+0	0x1080	V1/V12 Voltage magnitude	0-Vmax	U1	UINT16	R	1
+1	0x1081	V2/V23 Voltage magnitude	0-Vmax	U1	UINT16	R	1
+2	0x1082	V3/V31 Voltage magnitude	0-Vmax	U1	UINT16	R	1
+3	0x1083	Not used			UINT16	R	
+4	0x1084	I1 Current magnitude	0-Imax	U2	UINT16	R	
+5	0x1085	I2 Current magnitude	0-Imax	U2	UINT16	R	
+5	0x1086	I3 Current magnitude	0-Imax	U2	UINT16	R	
+7	0x1087	Not used			UINT16	R	
+8	0x1088	V1/V12 Voltage angle	-180.0-180.0	0.1°	INT16	R	1
+9	0x1089	V2/V23 Voltage angle	-180.0-180.0	0.1°	INT16	R	1
+10	0x108A	V3/V31 Voltage angle	-180.0-180.0	0.1°	INT16	R	1
+11	0x108B	Not used			INT16	R	
+12	0x108C	I1 Current angle	-180.0-180.0	0.1°	INT16	R	
+13	0x108D	I2 Current angle	-180.0-180.0	0.1°	INT16	R	
+14	0x108E	I3 Current angle	-180.0-180.0	0.1°	INT16	R	
+15	0x108F	Not used			INT16	R	

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
7336-7368		1-Second Phase Values					
+0	0x1100	V1/V12 Voltage	0-Vmax	U1	UINT16	R	¹
+1	0x1101	V2/V23 Voltage	0-Vmax	U1	UINT16	R	¹
+2	0x1102	V3/V31 Voltage	0-Vmax	U1	UINT16	R	¹
+3	0x1103	I1 Current	0-Imax	U2	UINT16	R	
+4	0x1104	I2 Current	0-Imax	U2	UINT16	R	
+5	0x1105	I3 Current	0-Imax	U2	UINT16	R	
+6	0x1106	kW L1	-Pmax-Pmax	U3	INT16	R	
+7	0x1107	kW L2	-Pmax-Pmax	U3	INT16	R	
+8	0x1108	kW L3	-Pmax-Pmax	U3	INT16	R	
+9	0x1109	kvar L1	-Pmax-Pmax	U3	INT16	R	
+10	0x110A	kvar L2	-Pmax-Pmax	U3	INT16	R	
+11	0x110B	kvar L3	-Pmax-Pmax	U3	INT16	R	
+12	0x110C	kVA L1	0-Pmax	U3	UINT16	R	
+13	0x110D	kVA L2	0-Pmax	U3	UINT16	R	
+14	0x110E	kVA L3	0-Pmax	U3	UINT16	R	
+15	0x110F	Power factor L1	-1.000-1.000	0.001	INT16	R	
+16	0x1110	Power factor L2	-1.000-1.000	0.001	INT16	R	
+17	0x1111	Power factor L3	-1.000-1.000	0.001	INT16	R	
+18	0x1112	V1/V12 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 3-sec value
+19	0x1113	V2/V23 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 3-sec value
+20	0x1114	V3/V31 Voltage THD	0-999.9	0.1%	UINT16	R	¹ 3-sec value
+21	0x1115	I1 Current THD	0-999.9	0.1%	UINT16	R	3-sec value
+22	0x1116	I2 Current THD	0-999.9	0.1%	UINT16	R	3-sec value
+23	0x1117	I3 Current THD	0-999.9	0.1%	UINT16	R	3-sec value
+24	0x1118	I1 K-Factor	1.0-999.9	0.1	UINT16	R	3-sec value
+25	0x1119	I2 K-Factor	1.0-999.9	0.1	UINT16	R	3-sec value
+26	0x111A	I3 K-Factor	1.0-999.9	0.1	UINT16	R	3-sec value
+27	0x111B	I1 Current TDD	0-100.0	0.1%	UINT16	R	3-sec value
+28	0x111C	I2 Current TDD	0-100.0	0.1%	UINT16	R	3-sec value
+29	0x111D	I3 Current TDD	0-100.0	0.1%	UINT16	R	3-sec value
+30	0x111E	V12 Voltage	0-Vmax	U1	UINT16	R	
+31	0x111F	V23 Voltage	0-Vmax	U1	UINT16	R	
+32	0x1120	V31 Voltage	0-Vmax	U1	UINT16	R	
7456-7459		1-Second Total Values					
+0	0x1400	Total kW	-Pmax-Pmax	U3	INT16	R	
+1	0x1401	Total kvar	-Pmax-Pmax	U3	INT16	R	
+2	0x1402	Total kVA	0-Pmax	U3	UINT16	R	
+3	0x1403	Total PF	-1.000-1.000	0.001	INT16	R	
+4	0x1404	Total PF lag	0-1.000	0.001	UINT16	R	
+5	0x1405	Total PF lead	0-1.000	0.001	UINT16	R	
+5	0x1406	Total kW import	0-Pmax	U3	UINT32	R	
+7	0x1407	Total kW export	0-Pmax	U3	UINT32	R	

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
+8	0x1408	Total kvar import	0-Pmax	U3	UINT32	R	
+9	0x1409	Total kvar export	0-Pmax	U3	UINT32	R	
+10	0x140A	3-phase average L-N/L-L voltage	0-Vmax	U1	UINT32	R	1
+11	0x140B	3-phase average L-L voltage	0-Vmax	U1	UINT32	R	
+12	0x140C	3-phase average current	0-Imax	U2	UINT32	R	
7496-7500		1-Second Auxiliary Values					
+0	0x1500	Not used			UINT16	R	
+1	0x1501	In (neutral) Current	0-Imax	U2	UINT16	R	
+2	0x1502	Frequency	0-Fmax	0.01Hz	UINT16	R	
+3	0x1503	Voltage unbalance	0-300	%	UINT16	R	
+4	0x1504	Current unbalance	0-300	%	UINT16	R	
7536-7565		Present Volt, Ampere and Power Demands					
+0	0x1600	V1/V12 Volt demand	0-Vmax	U1	UINT16	R	1
+1	0x1601	V2/V23 Volt demand	0-Vmax	U1	UINT16	R	1
+2	0x1602	V3/V31 Volt demand	0-Vmax	U1	UINT16	R	1
+3	0x1603	I1 Ampere demand	0-Imax	U2	UINT16	R	
+4	0x1604	I2 Ampere demand	0-Imax	U2	UINT16	R	
+5	0x1605	I3 Ampere demand	0-Imax	U2	UINT16	R	
+6	0x1606	kW import block demand	0-Pmax	U3	UINT16	R	
+7	0x1607	kvar import block demand	0-Pmax	U3	UINT16	R	
+8	0x1608	kVA block demand	0-Pmax	U3	UINT16	R	
+9	0x1609	kW import sliding window demand	0-Pmax	U3	UINT16	R	
+10	0x160A	kvar import sliding window demand	0-Pmax	U3	UINT16	R	
+11	0x160B	kVA sliding window demand	0-Pmax	U3	UINT16	R	
+12	0x160C	Not used			UINT16	R	
+13	0x160D	Not used			UINT16	R	
+14	0x160E	Not used			UINT16	R	
+15	0x160F	kW import accumulated demand	0-Pmax	U3	UINT16	R	
+16	0x1610	kvar import accumulated demand	0-Pmax	U3	UINT16	R	
+17	0x1611	kVA accumulated demand	0-Pmax	U3	UINT16	R	
+18	0x1612	kW import predicted sliding window demand	0-Pmax	U3	UINT16	R	
+19	0x1613	kvar import predicted sliding window demand	0-Pmax	U3	UINT16	R	
+20	0x1614	kVA predicted sliding window demand	0-Pmax	U3	UINT16	R	
+21	0x1615	PF (import) at Max. kVA sliding window demand	0-1.000	0.001	UINT16	R	
+22	0x1616	kW export block demand	0-Pmax	U3	UINT16	R	
+23	0x1617	kvar export block demand	0-Pmax	U3	UINT16	R	
+24	0x1618	kW export sliding window demand	0-Pmax	U3	UINT16	R	
+25	0x1619	kvar export sliding window demand	0-Pmax	U3	UINT16	R	
+26	0x161A	kW export accumulated demand	0-Pmax	U3	UINT16	R	
+27	0x161B	kvar export accumulated demand	0-Pmax	U3	UINT16	R	
+28	0x161C	kW export predicted sliding window demand	0-Pmax	U3	UINT16	R	
+29	0x161D	kvar export predicted sliding window demand	0-Pmax	U3	UINT16	R	
+30	0x161E	Not used			UINT16	R	

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
+31	0x161F	Not used			UINT16	R	
+32	0x1620	Not used			UINT16	R	
+33	0x1621	Not used			UINT16	R	
+34	0x1622	In Ampere demand	0-Imax	U2	UINT16	R	
7576-7609		Total Energies					
+0,1	0x1700	kWh import	0-999,999,999	kWh	UINT32	R	
+2,3	0x1701	kWh export	0-999,999,999	kWh	UINT32	R	
+4,5		Not used			INT32	R	
+6,7		Not used			UINT32	R	
+8,9	0x1704	kvarh import	0-999,999,999	kvarh	UINT32	R	
+10,11	0x1705	kvarh export	0-999,999,999	kvarh	UINT32	R	
+12,13		Not used			INT32	R	
+14,15		Not used			UINT32	R	
+16,17	0x1708	kVAh total	0-999,999,999	kVAh	UINT32	R	
+18,19	0x1709	Not used			UINT32	R	
+20,21	0x170A	Not used			UINT32	R	
+22,23	0x170B	kVAh import	0-999,999,999	kVAh	UINT32	R	
+24,25	0x170C	kVAh export	0-999,999,999	kVAh	UINT32	R	
+26,27	0x1712	kvarh Q1	0-999,999,999	kvarh	UINT32	R	
+28,29	0x1713	kvarh Q2	0-999,999,999	kvarh	UINT32	R	
+30,31	0x1714	kvarh Q3	0-999,999,999	kvarh	UINT32	R	
+32,33	0x1715	kvarh Q4	0-999,999,999	kvarh	UINT32	R	
7616-7633		Phase Energies					
+0,1	0x1800	kWh import L1	0-999,999,999	kWh	UINT32	R	
+2,3	0x1801	kWh import L2	0-999,999,999	kWh	UINT32	R	
+4,5	0x1802	kWh import L3	0-999,999,999	kWh	UINT32	R	
+6,7	0x1803	kvarh import L1	0-999,999,999	kvarh	UINT32	R	
+8,9	0x1804	kvarh import L2	0-999,999,999	kvarh	UINT32	R	
+10,11	0x1805	kvarh import L3	0-999,999,999	kvarh	UINT32	R	
+12,13	0x1806	kVAh total L1	0-999,999,999	kVAh	UINT32	R	
+14,15	0x1807	kVAh total L2	0-999,999,999	kVAh	UINT32	R	
+16,17	0x1808	kVAh total L3	0-999,999,999	kVAh	UINT32	R	
7636-7645		Symmetrical Components					
+0	0x1880	Positive-sequence voltage	0-Vmax	U1	UINT16	R	
+1	0x1881	Negative-sequence voltage	0-Vmax	U1	UINT16	R	
+2	0x1882	Zero-sequence voltage	0-Vmax	U1	UINT16	R	
+3	0x1883	Negative-sequence voltage unbalance	0-300.0	0.1%	UINT16	R	
+4	0x1884	Zero-sequence voltage unbalance	0-300.0	0.1%	UINT16	R	
+5	0x1885	Positive-sequence current	0-Imax	U2	UINT16	R	
+6	0x1886	Negative-sequence current	0-Imax	U2	UINT16	R	
+7	0x1887	Zero-sequence current	0-Imax	U2	UINT16	R	
+8	0x1888	Negative-sequence current unbalance	0-300.0	0.1%	UINT16	R	
+9	0x1889	Zero-sequence current unbalance	0-300.0	0.1%	UINT16	R	

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
7656-7695		V1/V12 Harmonics					1
+0	0x1900	H01 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
+1	0x1901	H02 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
		...					
+39	0x1927	H40 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
7696-7735		V2/V23 Harmonics					1
+0	0x1A00	H01 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
+1	0x1A01	H02 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
		...					
+39	0x1A27	H40 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
7736-7775		V3/V31 Harmonics					1
+0	0x1B00	H01 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
+1	0x1B01	H02 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
		...					
+39	0x1B27	H40 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
7776-7815		I1 Harmonics					
+0	0x1C00	H01 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
+1	0x1C01	H02 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
		...					
+39	0x1C27	H40 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
7816-7855		I2 Harmonics					
+0	0x1D00	H01 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
+1	0x1D01	H02 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
		...					
+39	0x1D27	H40 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
7856-7895		I3 Harmonics					
+0	0x1E00	H01 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
+1	0x1E01	H02 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
		...					
+39	0x1E27	H40 Harmonic magnitude	0-100.00	0.01%	UINT16	R	
8296-8313		Fundamental Phase Values					2-cycle values
+0	0x2900	V1/V12 Voltage	0-Vmax	U1	UINT16	R	1
+1	0x2901	V2/V23 Voltage	0-Vmax	U1	UINT16	R	1
+2	0x2902	V3/V31 Voltage	0-Vmax	U1	UINT16	R	1
+3	0x2903	I1 Current	0-Imax	U2	UINT16	R	
+4	0x2904	I2 Current	0-Imax	U2	UINT16	R	
+5	0x2905	I3 Current	0-Imax	U2	UINT16	R	
+6	0x2906	kW L1	-Pmax-Pmax	U3	INT16	R	
+7	0x2907	kW L2	-Pmax-Pmax	U3	INT16	R	
+8	0x2908	kW L3	-Pmax-Pmax	U3	INT16	R	
+9	0x2909	kvar L1	-Pmax-Pmax	U3	INT16	R	

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
+10	0x290A	kvar L2	-Pmax-Pmax	U3	INT16	R	
+11	0x290B	kvar L3	-Pmax-Pmax	U3	INT16	R	
+12	0x290C	kVA L1	0-Pmax	U3	UINT16	R	
+13	0x290D	kVA L2	0-Pmax	U3	UINT16	R	
+14	0x290E	kVA L3	0-Pmax	U3	UINT16	R	
+15	0x290F	Power factor L1	-1.000-1.000	0.001	INT16	R	
+16	0x2910	Power factor L2	-1.000-1.000	0.001	INT16	R	
+17	0x2911	Power factor L3	-1.000-1.000	0.001	INT16	R	
8336-8343		Fundamental Total Values					2-cycle values
+0	0x2A00	Total fundamental kW	-Pmax-Pmax	U3	INT16	R	
+1	0x2A01	Total fundamental kvar	-Pmax-Pmax	U3	INT16	R	
+2	0x2A02	Total fundamental kVA	0-Pmax	U3	UINT16	R	
+3	0x2A03	Total fundamental PF	-1.000-1.000	0.001	INT16	R	
8416-8445		Minimum 1-Cycle Phase Values					
+0	0x2C00	V1/V12 Voltage	0-Vmax	U1	UINT16	R	1
+1	0x2C01	V2/V23 Voltage	0-Vmax	U1	UINT16	R	1
+2	0x2C02	V3/V31 Voltage	0-Vmax	U1	UINT16	R	1
+3	0x2C03	I1 Current	0-Imax	U2	UINT16	R	
+4	0x2C04	I2 Current	0-Imax	U2	UINT16	R	
+5	0x2C05	I3 Current	0-Imax	U2	UINT16	R	
8456-8459		Minimum 1-Cycle Total Values					
+0	0x2D00	Total kW	-Pmax-Pmax	U3	INT16	R	
+1	0x2D01	Total kvar	-Pmax-Pmax	U3	INT16	R	
+2	0x2D02	Total kVA	0-Pmax	U3	UINT16	R	
+3	0x2D03	Total PF	0-1.000	0.001	UINT16	R	Absolute value
8496-8498		Minimum 1-Cycle Auxiliary Values					
+0	0x2E00	Not used		U2	UINT16	R	
+1	0x2E01	In Current	0-Imax	U2	UINT16	R	
+2	0x2E02	Frequency	0-Fmax	0.01Hz	UINT16	R	
8736-8765		Maximum 1-Cycle Phase Values					
+0	0x3400	V1/V12 Voltage	0-Vmax	U1	UINT16	R	1
+1	0x3401	V2/V23 Voltage	0-Vmax	U1	UINT16	R	1
+2	0x3402	V3/V31 Voltage	0-Vmax	U1	UINT16	R	1
+3	0x3403	I1 Current	0-Imax	U2	UINT16	R	
+4	0x3404	I2 Current	0-Imax	U2	UINT16	R	
+5	0x3405	I3 Current	0-Imax	U2	UINT16	R	
8776-8779		Maximum 1-Cycle Total Values					
+0	0x3500	Total kW	-Pmax-Pmax	U3	INT16	R	
+1	0x3501	Total kvar	-Pmax-Pmax	U3	INT16	R	
+2	0x3502	Total kVA	0-Pmax	U3	UINT16	R	
+3	0x3503	Total PF	0-1.000	0.001	UINT16	R	Absolute value
881608818		Maximum 1-Cycle Auxiliary Values					
+0	0x3600	Not used		U2	UINT16	R	

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
+1	0x3601	In Current	0-Imax	U2	UINT16	R	
+2	0x3602	Frequency	0-Fmax	0.01Hz	UINT16	R	
8856-8872		Maximum Demands					
+0	0x3700	V1/V12 Maximum volt demand	0-Vmax	U1	UINT16	R	1
+1	0x3701	V2/V23 Maximum volt demand	0-Vmax	U1	UINT16	R	1
+2	0x3702	V3/V31 Maximum volt demand	0-Vmax	U1	UINT16	R	1
+3	0x3703	I1 Maximum ampere demand	0-Imax	U2	UINT16	R	
+4	0x3704	I2 Maximum ampere demand	0-Imax	U2	UINT16	R	
+5	0x3705	I3 Maximum ampere demand	0-Imax	U2	UINT16	R	
+6	0x3706	Not used			UINT16	R	
+7	0x3707	Not used			UINT16	R	
+8	0x3708	Not used			UINT16	R	
+9	0x3709	Maximum kW import sliding window demand	0-Pmax	U3	UINT16	R	
+10	0x370A	Maximum kvar import sliding window demand	0-Pmax	U3	UINT16	R	
+11	0x370B	Maximum kVA sliding window demand	0-Pmax	U3	UINT16	R	
+12	0x370C	Not used			UINT16	R	
+13	0x370D	Not used			UINT16	R	
+14	0x370E	Not used			UINT16	R	
+15	0x370F	Maximum kW export sliding window demand	0-Pmax	U3	UINT16	R	
+16	0x3710	Maximum kvar export sliding window demand	0-Pmax	U3	UINT16	R	
+17	0x3711	Not used			UINT16	R	
+18	0x3712	Not used			UINT16	R	
+19	0x3713	Not used			UINT16	R	
+20	0x3714	Not used			UINT16	R	
+21	0x3715	In Maximum ampere demand	0-Imax	U2	UINT16	R	
9016-9017		Scaled Analog Inputs					
+0	0x3B00	Analog input AI1	AI1min-AI1Max		UINT16	R	
+1	0x3B01	Analog input AI2	AI2min-AI2Max		UINT16	R	
9036-9037		Raw Analog Inputs					
+0	0x3B80	Analog input AI1	0-4095		UINT16	R	
+1	0x3B81	Analog input AI2	0-4095		UINT16	R	
9056-9057		TOU Parameters					
+0	0x3C00	Active tariff	0-7		UINT16	R/W	
+1	0x3C01	Active profile	0-15: 0-3 = Season 1 Profile #1-4, 4-7 = Season 2 Profile #1-4, 8-11 = Season 3 Profile #1-4, 12-15 = Season 4 Profile #1-4		UINT16	R/W	
9076-9079		Scaled Analog Outputs					
+0	0x3C80	Analog output AO1	0-4095		UINT16	R/W	
+1	0x3C81	Analog output AO2	0-4095		UINT16	R/W	
+2	0x3C82	Analog output AO3	0-4095		UINT16	R/W	
+3	0x3C83	Analog output AO4	0-4095		UINT16	R/W	

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
9096-9111		TOU Energy Register #1					
+0,1	0x3D00	Tariff #1 register	0-999,999,999	kWh	UINT32	R	
+2,3	0x3D01	Tariff #2 register	0-999,999,999	kWh	UINT32	R	
		...				R	
+14,15	0x3D07	Tariff #8 register	0-999,999,999	kWh	UINT32	R	
9136-9151		TOU Energy Register #2					
+0,1	0x3E00	Tariff #1 register	0-999,999,999	kWh	UINT32	R	
+2,3	0x3E01	Tariff #2 register	0-999,999,999	kWh	UINT32	R	
		...				R	
+14,15	0x3E07	Tariff #8 register	0-999,999,999	kWh	UINT32	R	
9176-9191		TOU Energy Register #3					
+0,1	0x3F00	Tariff #1 register	0-999,999,999	kWh	UINT32	R	
+2,3	0x3F01	Tariff #2 register	0-999,999,999	kWh	UINT32	R	
		...				R	
+14,15	0x3F07	Tariff #8 register	0-999,999,999	kWh	UINT32	R	
9216-9231		TOU Energy Register #4					
+0,1	0x4000	Tariff #1 register	0-999,999,999	kWh	UINT32	R	
+2,3	0x4001	Tariff #2 register	0-999,999,999	kWh	UINT32	R	
		...				R	
+14,15	0x4007	Tariff #8 register	0-999,999,999	kWh	UINT32	R	
9416-9419		Billing Summary Accumulated Demands					
+0	0x4500	Summary register #1 demand	0-Pmax	U3	UINT16	R	
+1	0x4501	Summary register #2 demand	0-Pmax	U3	UINT16	R	
+2	0x4502	Summary register #3 demand	0-Pmax	U3	UINT16	R	
+3	0x4503	Summary register #4 demand	0-Pmax	U3	UINT16	R	
9436-9439		Billing Summary Block Demands					
+0	0x4580	Summary register #1 demand	0-Pmax	U3	UINT16	R	
+1	0x4581	Summary register #2 demand	0-Pmax	U3	UINT16	R	
+2	0x4582	Summary register #3 demand	0-Pmax	U3	UINT16	R	
+3	0x4583	Summary register #4 demand	0-Pmax	U3	UINT16	R	
9456-9459		Billing Summary Sliding Window Demands					
+0	0x4600	Summary register #1 demand	0-Pmax	U3	UINT16	R	
+1	0x4601	Summary register #2 demand	0-Pmax	U3	UINT16	R	
+2	0x4602	Summary register #3 demand	0-Pmax	U3	UINT16	R	
+3	0x4603	Summary register #4 demand	0-Pmax	U3	UINT16	R	
9516-9519		Billing Summary Maximum Demands					
+0	0x4780	Summary register #1 maximum demand	0-Pmax	U3	UINT16	R	
+1	0x4781	Summary register #2 maximum demand	0-Pmax	U3	UINT16	R	
+2	0x4782	Summary register #3 maximum demand	0-Pmax	U3	UINT16	R	
+3	0x4783	Summary register #4 maximum demand	0-Pmax	U3	UINT16	R	

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
9536-9543		TOU Maximum Demand Register #1					
+0	0x4800	Tariff #1 maximum demand	0-Pmax	U3	UINT16	R	
+1	0x4801	Tariff #2 maximum demand	0-Pmax	U3	UINT16	R	
		...				R	
+7	0x4807	Tariff #8 maximum demand	0-Pmax	U3	UINT16	R	
9576-9583		TOU Maximum Demand Register #2					
+0	0x4900	Tariff #1 maximum demand	0-Pmax	U3	UINT16	R	
+1	0x4901	Tariff #2 maximum demand	0-Pmax	U3	UINT16	R	
		...				R	
+7	0x4907	Tariff #8 maximum demand	0-Pmax	U3	UINT16	R	
9616-9623		TOU Maximum Demand Register #3					
+0	0x4A00	Tariff #1 maximum demand	0-Pmax	U3	UINT16	R	
+1	0x4A01	Tariff #2 maximum demand	0-Pmax	U3	UINT16	R	
		...				R	
+7	0x4A07	Tariff #8 maximum demand	0-Pmax	U3	UINT16	R	
9556-9563		TOU Maximum Demand Register #4					
+0	0x4880	Tariff #1 maximum demand	0-Pmax	U3	UINT16	R	
+1	0x4881	Tariff #2 maximum demand	0-Pmax	U3	UINT16	R	
		...				R	
+7	0x4887	Tariff #8 maximum demand	0-Pmax	U3	UINT16	R	
10656-10695		V1/V12 Harmonic Angles					1, 3
+0	0x6400	H01 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
+1	0x6400	H02 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
		...					
+39	0x6427	H40 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
10696-10735		V2/V23 Harmonic Angles					1, 3
+0	0x6500	H01 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
+1	0x6500	H02 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
		...					
+39	0x6527	H40 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
10736-10775		V1/V31 Harmonic Angles					1, 3
+0	0x6600	H01 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
+1	0x6600	H02 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
		...					
+39	0x6627	H40 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
10816-10855		I1 Harmonic Angles					3
+0	0x6700	H01 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
+1	0x6700	H02 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
		...					
+39	0x6727	H40 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
10856-10895		I2 Harmonic Angles					3

Address	Point ID	Description	Low and High Scales ²	Units ^{2, 4}	Type	R/W	Notes
+0	0x6800	H01 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
+1	0x6800	H02 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
		...					
+39	0x6827	H40 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
10896-10935		I3 Harmonic Angles					³
+0	0x6900	H01 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
+1	0x6900	H02 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
		...					
+39	0x6927	H40 Harmonic angle	-180.0-180.0	0.1°	INT16	R	
11616	0x7C00	Setpoint Status	0x0000-0xFFFF		UINT16	R	Bitmap: 0=released, 1=operated

NOTES:

¹ Voltage and voltage harmonics readings:

When the 4LN3, 3LN3 or 3BLN3 wiring mode is selected, the voltages will be line-to-neutral; for any other wiring mode, they will be line-to-line voltages.

² For volts, amps, power and frequency scales and units refer to Section 4 "Data Scales and Units". For analog data scaling formulas and examples, see Section 2.7.1, "16-bit Scaled Integer Format".

³ Harmonic angles are referenced to the fundamental voltage harmonic H01 on phase L1.

⁴ The binary counters and energy registers can be read either as 32-bit integer, or 32-bit floating-point values. Refer to Section 2.7 for details.

3.4 32-bit Analog Registers, Binary Registers and Counters

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
11776-11777	0x0000	None	0		UINT32	R	
		Special Inputs					
11904-11905	0x0101	Phase rotation order	0=error, 1=positive (ABC), 2=negative (CBA)		UINT32	R	
12544-12545	0x0600	Digital Inputs	0x00000000-0x00003FFF		UINT32	R	Bitmap: 0=open, 1=closed
12800-12801	0x0800	Relay Outputs	0x00000000-0x0000001F		UINT32	R	Bitmap: 0=open, 1=closed
13056-13063		Counters					
+0,1	0x0A00	Counter #1	0-999,999,999		UINT32	R/W	
+2,3	0x0A01	Counter #2	0-999,999,999		UINT32	R/W	
+4,5	0x0A02	Counter #3	0-999,999,999		UINT32	R/W	
+6,7	0x0A03	Counter #4	0-999,999,999		UINT32	R/W	
13312-13377		1-Cycle Phase Values					
+0,1	0x0C00	V1/V12 Voltage	0-Vmax	U1	UINT32	R	¹
+2,3	0x0C01	V2/V23 Voltage	0-Vmax	U1	UINT32	R	¹
+4,5	0x0C02	V3/V31 Voltage	0-Vmax	U1	UINT32	R	¹
+6,7	0x0C03	I1 Current	0-Imax	U2	UINT32	R	
+8,9	0x0C04	I2 Current	0-Imax	U2	UINT32	R	
+10,11	0x0C05	I3 Current	0-Imax	U2	UINT32	R	
+12,13	0x0C06	kW L1	-Pmax-Pmax	U3	INT32	R	
+14,15	0x0C07	kW L2	-Pmax-Pmax	U3	INT32	R	
+16,17	0x0C08	kW L3	-Pmax-Pmax	U3	INT32	R	
+18,19	0x0C09	kvar L1	-Pmax-Pmax	U3	INT32	R	
+20,21	0x0C0A	kvar L2	-Pmax-Pmax	U3	INT32	R	
+22,23	0x0C0B	kvar L3	-Pmax-Pmax	U3	INT32	R	
+24,25	0x0C0C	kVA L1	0-Pmax	U3	UINT32	R	
+26,27	0x0C0D	kVA L2	0-Pmax	U3	UINT32	R	
+28,29	0x0C0E	kVA L3	0-Pmax	U3	UINT32	R	
+30,31	0x0C0F	Power factor L1	-1000-1000	×0.001	INT32	R	
+32,33	0x0C10	Power factor L2	-1000-1000	×0.001	INT32	R	
+34,35	0x0C11	Power factor L3	-1000-1000	×0.001	INT32	R	
+36,37	0x0C12	V1/V12 Voltage THD	0-9999	×0.1%	UINT32	R	¹ 2-cycle value
+38,39	0x0C13	V2/V23 Voltage THD	0-9999	×0.1%	UINT32	R	¹ 2-cycle value
+40,41	0x0C14	V3/V31 Voltage THD	0-9999	×0.1%	UINT32	R	¹ 2-cycle value
+42,43	0x0C15	I1 Current THD	0-9999	×0.1%	UINT32	R	2-cycle value
+44,45	0x0C16	I2 Current THD	0-9999	×0.1%	UINT32	R	2-cycle value
+46,47	0x0C17	I3 Current THD	0-9999	×0.1%	UINT32	R	2-cycle value
+48,49	0x0C18	I1 K-Factor	10-9999	×0.1	UINT32	R	2-cycle value
+50,51	0x0C19	I2 K-Factor	10-9999	×0.1	UINT32	R	2-cycle value
+52,53	0x0C1A	I3 K-Factor	10-9999	×0.1	UINT32	R	2-cycle value
+54,55	0x0C1B	I1 Current TDD	0-1000	×0.1%	UINT32	R	2-cycle value

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
+56,57	0x0C1C	I2 Current TDD	0-1000	×0.1%	UINT32	R	2-cycle value
+58,59	0x0C1D	I3 Current TDD	0-1000	×0.1%	UINT32	R	2-cycle value
+60,61	0x0C1E	V12 Voltage	0-Vmax	U1	UINT32	R	
+62,63	0x0C1F	V23 Voltage	0-Vmax	U1	UINT32	R	
+64,65	0x0C20	V31 Voltage	0-Vmax	U1	UINT32	R	
13696-13721		1-Cycle Total Values					
+0,1	0x0F00	Total kW	-Pmax-Pmax	U3	INT32	R	
+2,3	0x0F01	Total kvar	-Pmax-Pmax	U3	INT32	R	
+4,5	0x0F02	Total kVA	0-Pmax	U3	UINT32	R	
+6,7	0x0F03	Total PF	-1000-1000	×0.001	INT32	R	
+8,9	0x0F04	Total PF lag	0-1000	×0.001	UINT16	R	
+10,11	0x0F05	Total PF lead	0-1000	×0.001	UINT16	R	
+12,13	0x0F06	Total kW import	0-Pmax	U3	UINT32	R	
+14,15	0x0F07	Total kW export	0-Pmax	U3	UINT32	R	
+16,17	0x0F08	Total kvar import	0-Pmax	U3	UINT32	R	
+18,19	0x0F09	Total kvar export	0-Pmax	U3	UINT32	R	
+20,21	0x0FOA	3-phase average L-N/L-L voltage	0-Vmax	U1	UINT32	R	1
+22,23	0x0FOB	3-phase average L-L voltage	0-Vmax	U1	UINT32	R	
+24,25	0xFOFC	3-phase average current	0-Imax	U2	UINT32	R	
13824-13833		1-Cycle Auxiliary Values					
+0,1	0x1000	Not used			UINT32	R	
+2,3	0x1001	In (neutral) Current	0-Imax	U2	UINT32	R	
+4,5	0x1002	Frequency	0-Fmax	×0.01Hz	UINT32	R	
+6,7	0x1003	Voltage unbalance	0-300	%	UINT32	R	
+8,9	0x1004	Current unbalance	0-300	%	UINT32	R	
13864-13895		Phasor					
+0,1	0x1080	V1/V12 Voltage magnitude	0-Vmax	U1	UINT32	R	1
+2,3	0x1081	V2/V23 Voltage magnitude	0-Vmax	U1	UINT32	R	1
+4,5	0x1082	V3/V31 Voltage magnitude	0-Vmax	U1	UINT32	R	1
+6,7	0x1083	Not used			UINT32	R	
+8,9	0x1084	I1 Current magnitude	0-Imax	U2	UINT32	R	
+10,11	0x1085	I2 Current magnitude	0-Imax	U2	UINT32	R	
+12,13	0x1086	I3 Current magnitude	0-Imax	U2	UINT32	R	
+14,15	0x1087	Not used			UINT32	R	
+16,17	0x1088	V1/V12 Voltage angle	-1800-1800	×0.1°	INT32	R	1
+18,19	0x1089	V2/V23 Voltage angle	-1800-1800	×0.1°	INT32	R	1
+20,21	0x108A	V3/V31 Voltage angle	-1800-1800	×0.1°	INT32	R	1
+22,23	0x108B	Not used			INT32	R	
+24,25	0x108C	I1 Current angle	-1800-1800	×0.1°	INT32	R	
+26,27	0x108D	I2 Current angle	-1800-1800	×0.1°	INT32	R	
+28,29	0x108E	I3 Current angle	-1800-1800	×0.1°	INT32	R	
+30,31	0x108F	Not used			INT32	R	

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
13952-14017		1-Second Phase Values					
+0,1	0x1100	V1/V12 Voltage	0-Vmax	U1	UINT32	R	¹
+2,3	0x1101	V2/V23 Voltage	0-Vmax	U1	UINT32	R	¹
+4,5	0x1102	V3/V31 Voltage	0-Vmax	U1	UINT32	R	¹
+6,7	0x1103	I1 Current	0-Imax	U2	UINT32	R	
+8,9	0x1104	I2 Current	0-Imax	U2	UINT32	R	
+10,11	0x1105	I3 Current	0-Imax	U2	UINT32	R	
+12,13	0x1106	kW L1	-Pmax-Pmax	U3	INT32	R	
+14,15	0x1107	kW L2	-Pmax-Pmax	U3	INT32	R	
+16,17	0x1108	kW L3	-Pmax-Pmax	U3	INT32	R	
+18,19	0x1109	kvar L1	-Pmax-Pmax	U3	INT32	R	
+20,21	0x110A	kvar L2	-Pmax-Pmax	U3	INT32	R	
+22,23	0x110B	kvar L3	-Pmax-Pmax	U3	INT32	R	
+24,25	0x110C	kVA L1	0-Pmax	U3	UINT32	R	
+26,27	0x110D	kVA L2	0-Pmax	U3	UINT32	R	
+28,29	0x110E	kVA L3	0-Pmax	U3	UINT32	R	
+30,31	0x110F	Power factor L1	-1000-1000	×0.001	INT32	R	
+32,33	0x1110	Power factor L2	-1000-1000	×0.001	INT32	R	
+34,35	0x1111	Power factor L3	-1000-1000	×0.001	INT32	R	
+36,37	0x1112	V1/V12 Voltage THD	0-9999	×0.1%	UINT32	R	¹ 3-sec value
+38,39	0x1113	V2/V23 Voltage THD	0-9999	×0.1%	UINT32	R	¹ 3-sec value
+40,41	0x1114	V3/V31 Voltage THD	0-9999	×0.1%	UINT32	R	¹ 3-sec value
+42,43	0x1115	I1 Current THD	0-9999	×0.1%	UINT32	R	3-sec value
+44,45	0x1116	I2 Current THD	0-9999	×0.1%	UINT32	R	3-sec value
+46,47	0x1117	I3 Current THD	0-9999	×0.1%	UINT32	R	3-sec value
+48,49	0x1118	I1 K-Factor	10-9999	×0.1	UINT32	R	3-sec value
+50,51	0x1119	I2 K-Factor	10-9999	×0.1	UINT32	R	3-sec value
+52,53	0x111A	I3 K-Factor	10-9999	×0.1	UINT32	R	3-sec value
+54,55	0x111B	I1 Current TDD	0-1000	×0.1%	UINT32	R	3-sec value
+56,57	0x111C	I2 Current TDD	0-1000	×0.1%	UINT32	R	3-sec value
+58,59	0x111D	I3 Current TDD	0-1000	×0.1%	UINT32	R	3-sec value
+60,61	0x111E	V12 Voltage	0-Vmax	U1	UINT32	R	
+62,63	0x111F	V23 Voltage	0-Vmax	U1	UINT32	R	
+64,65	0x1120	V31 Voltage	0-Vmax	U1	UINT32	R	
14336-14361		1-Second Total Values					
+0,1	0x1400	Total kW	-Pmax-Pmax	U3	INT32	R	
+2,3	0x1401	Total kvar	-Pmax-Pmax	U3	INT32	R	
+4,5	0x1402	Total kVA	0-Pmax	U3	UINT32	R	
+6,7	0x1403	Total PF	-1000-1000	×0.001	INT32	R	
+8,9	0x1404	Total PF lag	0-1000	×0.001	UINT16	R	
+10,11	0x1405	Total PF lead	0-1000	×0.001	UINT16	R	
+12,13	0x1406	Total kW import	0-Pmax	U3	UINT32	R	
+14,15	0x1407	Total kW export	0-Pmax	U3	UINT32	R	

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
+16,17	0x1408	Total kvar import	0-Pmax	U3	UINT32	R	
+18,19	0x1409	Total kvar export	0-Pmax	U3	UINT32	R	
+20,21	0x140A	3-phase average L-N/L-L voltage	0-Vmax	U1	UINT32	R	1
+22,23	0x140B	3-phase average L-L voltage	0-Vmax	U1	UINT32	R	
+24,25	0x140C	3-phase average current	0-Imax	U2	UINT32	R	
14464-14473		1-Second Auxiliary Values					
+0,1	0x1500	Not used			UINT32	R	
+2,3	0x1501	In (neutral) Current	0-Imax	U2	UINT32	R	
+4,5	0x1502	Frequency	0-Fmax	×0.01Hz	UINT32	R	
+6,7	0x1503	Voltage unbalance	0-300	%	UINT32	R	
+8,9	0x1504	Current unbalance	0-300	%	UINT32	R	
14592-14651		Present Volt, Ampere and Power Demands					
+0,1	0x1600	V1/V12 Volt demand	0-Vmax	U1	UINT32	R	1
+2,3	0x1601	V2/V23 Volt demand	0-Vmax	U1	UINT32	R	1
+4,5	0x1602	V3/V31 Volt demand	0-Vmax	U1	UINT32	R	1
+6,7	0x1603	I1 Ampere demand	0-Imax	U2	UINT32	R	
+8,9	0x1604	I2 Ampere demand	0-Imax	U2	UINT32	R	
+10,11	0x1605	I3 Ampere demand	0-Imax	U2	UINT32	R	
+12,13	0x1606	kW import block demand	0-Pmax	U3	UINT32	R	
+14,15	0x1607	kvar import block demand	0-Pmax	U3	UINT32	R	
+16,17	0x1608	kVA block demand	0-Pmax	U3	UINT32	R	
+18,19	0x1609	kW import sliding window demand	0-Pmax	U3	UINT32	R	
+20,21	0x160A	kvar import sliding window demand	0-Pmax	U3	UINT32	R	
+22,23	0x160B	kVA sliding window demand	0-Pmax	U3	UINT32	R	
+24,25	0x160C	Not used			UINT32	R	
+26,27	0x160D	Not used			UINT32	R	
+28,29	0x160E	Not used			UINT32	R	
+30,31	0x160F	kW import accumulated demand	0-Pmax	U3	UINT32	R	
+32,33	0x1610	kvar import accumulated demand	0-Pmax	U3	UINT32	R	
+34,35	0x1611	kVA accumulated demand	0-Pmax	U3	UINT32	R	
+36,37	0x1612	kW import predicted sliding window demand	0-Pmax	U3	UINT32	R	
+38,39	0x1613	kvar import predicted sliding window demand	0-Pmax	U3	UINT32	R	
+40,41	0x1614	kVA predicted sliding window demand	0-Pmax	U3	UINT32	R	
+42,43	0x1615	PF (import) at Max. kVA sliding window demand	0-1000	×0.001	UINT32	R	
+44,45	0x1616	kW export block demand	0-Pmax	U3	UINT32	R	
+46,47	0x1617	kvar export block demand	0-Pmax	U3	UINT32	R	
+48,49	0x1618	kW export sliding window demand	0-Pmax	U3	UINT32	R	
+50,51	0x1619	kvar export sliding window demand	0-Pmax	U3	UINT32	R	
+52,53	0x161A	kW export accumulated demand	0-Pmax	U3	UINT32	R	
+54,55	0x161B	kvar export accumulated demand	0-Pmax	U3	UINT32	R	
+56,57	0x161C	kW export predicted sliding window demand	0-Pmax	U3	UINT32	R	
+58,59	0x161D	kvar export predicted sliding window demand	0-Pmax	U3	UINT32	R	
+60,61	0x161E	Not used			UINT32	R	

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
+62,63	0x161F	Not used			UINT32	R	
+64,65	0x1620	Not used			UINT32	R	
+66,67	0x1621	Not used			UINT32	R	
+68,69	0x1622	In Ampere demand	0-Imax	U2	UINT32	R	
14720-14753		Total Energies					
+0,1	0x1700	kWh import	0-999,999,999	kWh	UINT32	R	
+2,3	0x1701	kWh export	0-999,999,999	kWh	UINT32	R	
+4,5	0x1702	Not used			INT32	R	
+6,7	0x1703	Not used			UINT32	R	
+8,9	0x1704	kvarh import	0-999,999,999	kvarh	UINT32	R	
+10,11	0x1705	kvarh export	0-999,999,999	kvarh	UINT32	R	
+12,13	0x1706	Not used			INT32	R	
+14,15	0x1707	Not used			UINT32	R	
+16,17	0x1708	kVAh total	0-999,999,999	kVAh	UINT32	R	
+18,19	0x1709	Not used			UINT32	R	
+20,21	0x170A	Not used			UINT32	R	
+22,23	0x170B	kVAh import	0-999,999,999	kVAh	UINT32	R	
+24,25	0x170C	kVAh export	0-999,999,999	kVAh	UINT32	R	
+26,27	0x1712	kvarh Q1	0-999,999,999	kvarh	UINT32	R	
+28,29	0x1713	kvarh Q2	0-999,999,999	kvarh	UINT32	R	
+30,31	0x1714	kvarh Q3	0-999,999,999	kvarh	UINT32	R	
+32,33	0x1715	kvarh Q4	0-999,999,999	kvarh	UINT32	R	
14760-14767		Billing Summary Energy Registers					
+0,1	0x1780	Summary energy register #1	0-999,999,999	kWh	UINT32	R	
+2,3	0x1781	Summary energy register #2	0-999,999,999	kWh	UINT32	R	
+4,5	0x1782	Summary energy register #3	0-999,999,999	kWh	UINT32	R	
+6,7	0x1783	Summary energy register #4	0-999,999,999	kWh	UINT32	R	
14848-14865		Phase Energies					
+0,1	0x1800	kWh import L1	0-999,999,999	kWh	UINT32	R	
+2,3	0x1801	kWh import L2	0-999,999,999	kWh	UINT32	R	
+4,5	0x1802	kWh import L3	0-999,999,999	kWh	UINT32	R	
+6,7	0x1803	kvarh import L1	0-999,999,999	kvarh	UINT32	R	
+8,9	0x1804	kvarh import L2	0-999,999,999	kvarh	UINT32	R	
+10,11	0x1805	kvarh import L3	0-999,999,999	kvarh	UINT32	R	
+12,13	0x1806	kVAh total L1	0-999,999,999	kVAh	UINT32	R	
+14,15	0x1807	kVAh total L2	0-999,999,999	kVAh	UINT32	R	
+16,17	0x1808	kVAh total L3	0-999,999,999	kVAh	UINT32	R	
14888-14907		Symmetrical Components					
+0, 1	0x1880	0-Vmax	U1	UINT32	R		
+2, 3	0x1881	0-Vmax	U1	UINT32	R		
+4, 5	0x1882	0-Vmax	U1	UINT32	R		
+6, 7	0x1883	0-3000	×0.1%	UINT32	R		

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
+8, 9	0x1884	0-3000	×0.1%	UINT32	R		
+10, 11	0x1885	0-Imax	U2	UINT32	R		
+12, 13	0x1886	0-Imax	U2	UINT32	R		
+14, 15	0x1887	0-Imax	U2	UINT32	R		
+16, 17	0x1888	0-3000	×0.1%	UINT32	R		
+18, 19	0x1889	0-3000	×0.1%	UINT32	R		
14976-15055		V1/V12 Harmonics					1
+0,1	0x1900	H01 Harmonic magnitude	0-10000	0.01%	UINT32	R	
+2,3	0x1901	H02 Harmonic magnitude	0-10000	0.01%	UINT32	R	
		...					
+78,79	0x1927	H40 Harmonic magnitude	0-10000	0.01%	UINT32	R	
15104-15183		V2/V23 Harmonics					1
+0,1	0x1A00	H01 Harmonic magnitude	0-10000	0.01%	UINT32	R	
+2,3	0x1A01	H02 Harmonic magnitude	0-10000	0.01%	UINT32	R	
		...					
+78,79	0x1A27	H40 Harmonic magnitude	0-10000	0.01%	UINT32	R	
15232-15311		V3/V31 Harmonics					1
+0,1	0x1B00	H01 Harmonic magnitude	0-10000	0.01%	UINT32	R	
+2,3	0x1B01	H02 Harmonic magnitude	0-10000	0.01%	UINT32	R	
		...					
+78,79	0x1B27	H40 Harmonic magnitude	0-10000	0.01%	UINT32	R	
15360-15439		I1 Harmonics					
+0,1	0x1C00	H01 Harmonic magnitude	0-10000	0.01%	UINT32	R	
+2,3	0x1C01	H02 Harmonic magnitude	0-10000	0.01%	UINT32	R	
		...					
+78,79	0x1C27	H40 Harmonic magnitude	0-10000	0.01%	UINT32	R	
15488-15567		I2 Harmonics					
+0,1	0x1D00	H01 Harmonic magnitude	0-10000	0.01%	UINT32	R	
+2,3	0x1D01	H02 Harmonic magnitude	0-10000	0.01%	UINT32	R	
		...					
+78,79	0x1D27	H40 Harmonic magnitude	0-10000	0.01%	UINT32	R	
15616-15695		I3 Harmonics					
+0,1	0x1E00	H01 Harmonic magnitude	0-10000	0.01%	UINT32	R	
+2,3	0x1E01	H02 Harmonic magnitude	0-10000	0.01%	UINT32	R	
		...					
+78,79	0x1E27	H40 Harmonic magnitude	0-10000	0.01%	UINT32	R	
17024-17059		Fundamental (H01) Phase Values					2-cycle values
+0,1	0x2900	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
+2,3	0x2901	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
+4,5	0x2902	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1
+6,7	0x2903	I1 Current	0-Imax	U2	UINT32	R	

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
+8,9	0x2904	I2 Current	0-Imax	U2	UINT32	R	
+10,11	0x2905	I3 Current	0-Imax	U2	UINT32	R	
+12,13	0x2906	kW L1	-Pmax-Pmax	U3	INT32	R	
+14,15	0x2907	kW L2	-Pmax-Pmax	U3	INT32	R	
+16,17	0x2908	kW L3	-Pmax-Pmax	U3	INT32	R	
+18,19	0x2909	kvar L1	-Pmax-Pmax	U3	INT32	R	
+20,21	0x290A	kvar L2	-Pmax-Pmax	U3	INT32	R	
+22,23	0x290B	kvar L3	-Pmax-Pmax	U3	INT32	R	
+24,25	0x290C	kVA L1	0-Pmax	U3	UINT32	R	
+26,27	0x290D	kVA L2	0-Pmax	U3	UINT32	R	
+28,29	0x290E	kVA L3	0-Pmax	U3	UINT32	R	
+30,31	0x290F	Power factor L1	-1000-1000	×0.001	INT32	R	
+32,33	0x2910	Power factor L2	-1000-1000	×0.001	INT32	R	
+34,35	0x2911	Power factor L3	-1000-1000	×0.001	INT32	R	
17152-17164		Harmonic Total Values					2-cycle values
+0,1	0x2A00	Total fundamental kW	-Pmax-Pmax	U3	INT32	R	
+2,3	0x2A01	Total fundamental kvar	-Pmax-Pmax	U3	INT32	R	
+4,5	0x2A02	Total fundamental kVA	0-Pmax	U3	UINT32	R	
+6,7	0x2A03	Total fundamental PF	-1000-1000	×0.001	INT32	R	
17408-17467		Minimum 1-Cycle Phase Values					
+0,1	0x2C00	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
+2,3	0x2C01	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
+4,5	0x2C02	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1
+6,7	0x2C03	I1 Current	0-Imax	U2	UINT32	R	
+8,9	0x2C04	I2 Current	0-Imax	U2	UINT32	R	
+10,11	0x2C05	I3 Current	0-Imax	U2	UINT32	R	
17536-17543		Minimum 1-Cycle Total Values					
+0,1	0x2D00	Total kW	-Pmax-Pmax	U3	INT32	R	
+2,3	0x2D01	Total kvar	-Pmax-Pmax	U3	INT32	R	
+4,5	0x2D02	Total kVA	0-Pmax	U3	UINT32	R	
+6,7	0x2D03	Total PF	0-1000	×0.001	UINT32	R	Absolute value
17664-17669		Minimum 1-Cycle Auxiliary Values					
+0,1	0x2E00	Not used			UINT32	R	
+2,3	0x2E01	In Current	0-Imax	U2	UINT32	R	
+4,5	0x2E02	Frequency	0-Fmax	×0.01Hz	UINT32	R	
18432-18491		Maximum 1-Cycle Phase Values					
+0,1	0x3400	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
+2,3	0x3401	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
+4,5	0x3402	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1
+6,7	0x3403	I1 Current	0-Imax	U2	UINT32	R	
+8,9	0x3404	I2 Current	0-Imax	U2	UINT32	R	
+10,11	0x3405	I3 Current	0-Imax	U2	UINT32	R	
18560-18567		Maximum 1-Cycle Total Values					

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
+0,1	0x3500	Total kW	-Pmax-Pmax	U3	UINT32	R	
+2,3	0x3501	Total kvar	-Pmax-Pmax	U3	UINT32	R	
+4,5	0x3502	Total kVA	0-Pmax	U3	UINT32	R	
+6,7	0x3503	Total PF	0-1000	×0.001	UINT32	R	Absolute value
18688-18693		Maximum 1-Cycle Auxiliary Values					
+0,1	0x3600	Not used			UINT32	R	
+2,3	0x3601	In Current	0-Imax	U2	UINT32	R	
+4,5	0x3602	Frequency	0-Fmax	×0.01Hz	UINT32	R	
18816-18849		Maximum Demands					
+0,1	0x3700	V1/V12 Maximum volt demand	0-Vmax	U1	UINT32	R	1
+2,3	0x3701	V2/V23 Maximum volt demand	0-Vmax	U1	UINT32	R	1
+4,5	0x3702	V3/V31 Maximum volt demand	0-Vmax	U1	UINT32	R	1
+6,7	0x3703	I1 Maximum ampere demand	0-Imax	U2	UINT32	R	
+8,9	0x3704	I2 Maximum ampere demand	0-Imax	U2	UINT32	R	
+10,11	0x3705	I3 Maximum ampere demand	0-Imax	U2	UINT32	R	
+12,13	0x3706	Not used			UINT32	R	
+14,15	0x3707	Not used			UINT32	R	
+16,17	0x3708	Not used			UINT32	R	
+18,19	0x3709	Maximum kW import sliding window demand	0-Pmax	U3	UINT32	R	
+20,21	0x370A	Maximum kvar import sliding window demand	0-Pmax	U3	UINT32	R	
+22,23	0x370B	Maximum kVA sliding window demand	0-Pmax	U3	UINT32	R	
+24,25	0x3737	Not used			UINT32	R	
+26,27	0x370D	Not used			UINT32	R	
+28,29	0x370E	Not used			UINT32	R	
+30,31	0x370F	Maximum kW export sliding window demand	0-Pmax	U3	UINT32	R	
+32,33	0x3710	Maximum kvar export sliding window demand	0-Pmax	U3	UINT32	R	
+34,35	0x3711	Not used			UINT32	R	
+36,37	0x3712	Not used			UINT32	R	
+38,39	0x3713	Not used			UINT32	R	
+40,41	0x3714	Not used			UINT32	R	
+42,43	0x3715	In Maximum ampere demand	0-Imax	U2	UINT32	R	
19328-19331		Scaled Analog Inputs					
+0,1	0x3B00	Analog input AI1	AI1min-AI1Max		UINT32	R	
+2,3	0x3B01	Analog input AI2	AI2min-AI2Max		UINT32	R	
19368-19371		Raw Analog Inputs					
+0,1	0x3B80	Analog input AI1	0-4095		UINT32	R	
+2,3	0x3B81	Analog input AI2	0-4095		UINT32	R	
19456-19459		TOU Parameters					
+0,1	0x3C00	Active tariff	0-7		UINT32	R	
+2,3	0x3C01	Active profile	0-15: 1-3 = Season 1 Profile #1-4, 4-7 = Season 2 Profile #1-4, 8-11 = Season 3 Profile #1-4,		UINT32	R	

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
			12-15 = Season 4 Profile #1-4				
19496-19503		Scaled Analog Outputs					
+0,1	0x3C80	Analog output AO1	0-4095		UINT32	R/W	
+2,3	0x3C81	Analog output AO2	0-4095		UINT32	R/W	
+4,5	0x3C82	Analog output AO3	0-4095		UINT32	R/W	
+6,7	0x3C83	Analog output AO4	0-4095		UINT32	R/W	
19584-19599		TOU Energy Register #1					
+0,1	0x3D00	Tariff #1 register	0-999,999,999	kWh	UINT32	R	
+2,3	0x3D01	Tariff #2 register	0-999,999,999	kWh	UINT32	R	
		...				R	
+14,15	0x3D07	Tariff #8 register	0-999,999,999	kWh	UINT32	R	
19712-19727		TOU Energy Register #2					
+0,1	0x3E00	Tariff #1 register	0-999,999,999	kWh	UINT32	R	
+2,3	0x3E01	Tariff #2 register	0-999,999,999	kWh	UINT32	R	
		...				R	
+14,15	0x3E07	Tariff #8 register	0-999,999,999	kWh	UINT32	R	
19840-19855		TOU Energy Register #3					
+0,1	0x3F00	Tariff #1 register	0-999,999,999	kWh	UINT32	R	
+2,3	0x3F01	Tariff #2 register	0-999,999,999	kWh	UINT32	R	
		...				R	
+14,15	0x3F07	Tariff #8 register	0-999,999,999	kWh	UINT32	R	
19968-19983		TOU Energy Register #4					
+0,1	0x4000	Tariff #1 register	0-999,999,999	kWh	UINT32	R	
+2,3	0x4001	Tariff #2 register	0-999,999,999	kWh	UINT32	R	
		...				R	
+14,15	0x4007	Tariff #8 register	0-999,999,999	kWh	UINT32	R	
20608-20615		Billing Summary Accumulated Demands					
+0,1	0x4500	Summary register #1 demand	0-Pmax	U3	UINT32	R	
+2,3	0x4501	Summary register #2 demand	0-Pmax	U3	UINT32	R	
+4,5	0x4502	Summary register #3 demand	0-Pmax	U3	UINT32	R	
+6,7	0x4503	Summary register #4 demand	0-Pmax	U3	UINT32	R	
20648-20655		Billing Summary Block Demands					
+0,1	0x4580	Summary register #1 demand	0-Pmax	U3	UINT32	R	
+2,3	0x4581	Summary register #2 demand	0-Pmax	U3	UINT32	R	
+4,5	0x4582	Summary register #3 demand	0-Pmax	U3	UINT32	R	
+6,7	0x4583	Summary register #4 demand	0-Pmax	U3	UINT32	R	
20736-20743		Billing Summary Sliding Window Demands					
+0,1	0x4600	Summary register #1 demand	0-Pmax	U3	UINT32	R	
+2,3	0x4601	Summary register #2 demand	0-Pmax	U3	UINT32	R	
+4,5	0x4602	Summary register #3 demand	0-Pmax	U3	UINT32	R	
+6,7	0x4603	Summary register #4 demand	0-Pmax	U3	UINT32	R	

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
20904-20911		Billing Summary Maximum Demands					
+0,1	0x4780	Summary register #1 maximum demand	0-Pmax	U3	UINT32	R	
+2,3	0x4781	Summary register #2 maximum demand	0-Pmax	U3	UINT32	R	
+4,5	0x4782	Summary register #3 maximum demand	0-Pmax	U3	UINT32	R	
+6,7	0x4783	Summary register #4 maximum demand	0-Pmax	U3	UINT32	R	
20992-21023		TOU Maximum Demand Register #1					
+0,1	0x4800	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
+2,3	0x4801	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
		...				R	
+14,15	0x4807	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
21120-21135		TOU Maximum Demand Register #2					
+0,1	0x4900	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
+2,3	0x4901	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
		...				R	
+14,15	0x4907	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
21248-21263		TOU Maximum Demand Register #3					
+0,1	0x4A00	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
+2,3	0x4A01	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
		...				R	
+14,15	0x4A07	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
21032-21047		TOU Maximum Demand Register #4					
+0,1	0x4880	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
+2,3	0x4881	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
		...				R	
+14,15	0x4887	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
24576-24655		V1/V12 Harmonic Angles					1, 3
+0,1	0x6400	H01 Harmonic angle	-1800-1800	×0.1°	INT32	R	
+2,3	0x6400	H02 Harmonic angle	-1800-1800	×0.1°	INT32	R	
		...					
+78,79	0x6427	H40 Harmonic angle	-1800-1800	×0.1°	INT32	R	
24704-24783		V2/V23 Harmonic Angles					1, 3
+0,1	0x6500	H01 Harmonic angle	-1800-1800	×0.1°	INT32	R	
+2,3	0x6500	H02 Harmonic angle	-1800-1800	×0.1°	INT32	R	
		...					
+78,79	0x6527	H40 Harmonic angle	-1800-1800	×0.1°	INT32	R	
24832-24911		V1/V31 Harmonic Angles					1, 3
+0,1	0x6600	H01 Harmonic angle	-1800-1800	×0.1°	INT32	R	
+2,3	0x6600	H02 Harmonic angle	-1800-1800	×0.1°	INT32	R	
		...					
+78,79	0x6627	H40 Harmonic angle	-1800-1800	×0.1°	INT32	R	
25088-25167		I1 Harmonic Angles					3

Address	Point ID	Description	Options/Range ²	Units ^{2, 4}	Type ²	R/W	Notes
+0,1	0x6700	H01 Harmonic angle	-1800-1800	×0.1°	INT32	R	
+2,3	0x6700	H02 Harmonic angle	-1800-1800	×0.1°	INT32	R	
		...					
+78,79	0x6727	H40 Harmonic angle	-1800-1800	×0.1°	INT32	R	
25216-25295		I2 Harmonic Angles					³
+0,1	0x6800	H01 Harmonic angle	-1800-1800	×0.1°	INT32	R	
+2,3	0x6800	H02 Harmonic angle	-1800-1800	×0.1°	INT32	R	
		...					
+78,79	0x6827	H40 Harmonic angle	-1800-1800	×0.1°	INT32	R	
25344-25423		I3 Harmonic Angles					³
+0,1	0x6900	H01 Harmonic angle	-1800-1800	×0.1°	INT32	R	
+2,3	0x6900	H02 Harmonic angle	-1800-1800	×0.1°	INT32	R	
		...					
+78,79	0x6927	H40 Harmonic angle	-1800-1800	×0.1°	INT32	R	
27648-27649	0x7C00	Setpoint Status	0x00000000-0x0000FFFF		UINT32	R	Bitmap: 0=released, 1=operated
		Generic TOU Season Energy Registers					Point references
	0x7000	Tariff #1 register	0-999,999,999	kWh	UINT32		
	0x7001	Tariff #2 register	0-999,999,999	kWh	UINT32		
		...					
	0x7007	Tariff #8 register	0-999,999,999	kWh	UINT32		
		Generic TOU Season Maximum Demand Registers					Point references
	0x7100	Tariff #1 register	0-Pmax	U3	UINT32		
	0x7101	Tariff #2 register	0-Pmax	U3	UINT32		
		...					
	0x7107	Tariff #8 register	0-Pmax	U3	UINT32		
		Generic Data					Point references
	0x7400	V1 voltage	0-Vmax	U1	UINT32		
	0x7401	V2 voltage	0-Vmax	U1	UINT32		
	0x7402	V3 voltage	0-Vmax	U1	UINT32		
	0x7404	V12 voltage	0-Vmax	U1	UINT32		
	0x7405	V23 voltage	0-Vmax	U1	UINT32		
	0x7406	V31 voltage	0-Vmax	U1	UINT32		
	0x7407	I1 current	0-Imax	U2	UINT32		
	0x7408	I2 current	0-Imax	U2	UINT32		
	0x7409	I3 current	0-Imax	U2	UINT32		

NOTES:

- ¹ Voltage and voltage harmonics readings:
When the 4LN3, 3LN3 or 3BLN3 wiring mode is selected, the voltages will be line-to-neutral; for any other wiring mode, they will be line-to-line voltages.
- ² For volts, amps, power and frequency scales and units, refer to Section 4 "Data Scales and Units".
- ³ Harmonic angles are referenced to the fundamental voltage harmonic H01 on phase L1.

⁴ The registers can be read as 32-bit integer or 32-bit floating-point values. Refer to Section 2.7 for details.

3.5 Minimum/Maximum Log Registers

Address	Point ID	Description	Options/Range/Format ²	Units ^{2, 3}	Type	R/W	Notes
35840-35959		Minimum Phase Values					
+0,1 +2,3	0x2C00	Min. V1/V12 Voltage Timestamp	0-Vmax F1	U1 sec	UINT32 UINT32	R R	1
+4,5 +6,7	0x2C01	Min. V2/V23 Voltage Timestamp	0-Vmax F1	U1 sec	UINT32 UINT32	R R	1
+8,9 +10,11	0x2C02	Min. V3/V31 Voltage Timestamp	0-Vmax F1	U1 sec	UINT32 UINT32	R R	1
+12,13 +14,15	0x2C03	Min. I1 Current Timestamp	0-Imax F1	U2 sec	UINT32 UINT32	R R	
+16,17 +18,19	0x2C04	Min. I2 Current Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
+20,21 +22,23	0x2C05	Min. I3 Current Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
36096-36111		Minimum Total Values					
+0,1 +2,3	0x2D00	Min. Total kW Timestamp	-Pmax-Pmax	U3 sec	INT32 UINT32	R R	
+4,5 +6,7	0x2D01	Min. Total kvar Timestamp	-Pmax-Pmax	U3 sec	INT32 UINT32	R R	
+8,9 +10,11	0x2D02	Min. Total kVA Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+12,13 +14,15	0x2D03	Min. Total PF Timestamp	-1000-1000	×0.001 sec	INT32 UINT32	R R	
36352-36362		Minimum Auxiliary Values					
+0,1 +2,3	0x2E00	Not used			UINT32 UINT32	R R	
+4,5 +6,7	0x2E01	Min. In Current Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
+8,9 +10,11	0x2E02	Min. Frequency Timestamp	0-Fmax	×0.01Hz sec	UINT32 UINT32	R R	
36864-36983		Maximum Phase Values					
+0,1 +2,3	0x3400	Max. V1/V12 Voltage Timestamp	0-Vmax	U1 sec	UINT32 UINT32	R R	1
+4,5 +6,7	0x3401	Max. V2/V23 Voltage Timestamp	0-Vmax	U1 sec	UINT32 UINT32	R R	1
+8,9 +10,11	0x3402	Max. V3/V31 Voltage Timestamp	0-Vmax	U1 sec	UINT32 UINT32	R R	1
+12,13 +14,15	0x3403	Max. I1 Current Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
+16,17 +18,19	0x3404	Max. I2 Current Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
+20,21	0x3405	Max. I3 Current	0-Imax	U2	UINT32	R	

Address	Point ID	Description	Options/Range/Format ²	Units ^{2, 3}	Type	R/W	Notes
+22,23		Timestamp		sec	UINT32	R	
37120-37135		Maximum Total Values					
+0,1 +2,3	0x3500	Max. Total kW Timestamp	-Pmax-Pmax	U3 sec	INT32 UINT32	R R	
+4,5 +6,7	0x3501	Max. Total kvar Timestamp	-Pmax-Pmax	U3 sec	INT32 UINT32	R R	
+8,9 +10,11	0x3502	Max. Total kVA Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+12,13 +14,15	0x3503	Max. Total PF Timestamp	-1000-1000	×0.001 sec	INT32 UINT32	R R	
37376-37387		Maximum Auxiliary Values					
+0,1 +2,3	0x3600	Not used			UINT32 UINT32	R R	
+4,5 +6,7	0x3601	Max. In Current Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
+8,9 +10,11	0x3602	Max. Frequency Timestamp	0-Fmax	×0.01Hz sec	UINT32 UINT32	R R	
37504-37535		Billing Summary Maximum Demands					
+0,1 +2,3	0x4780	Summary register #1 Maximum Demand Timestamp	0-Pmax	U3	UINT32	R	
+4,5 +6,7	0x4781	Summary register #2 Maximum Demand Timestamp	0-Pmax	U3	UINT32	R	
		...					
+12,13 +14,15	0x4783	Summary register #4 Maximum Demand Timestamp	0-Pmax	U3	UINT32	R	
37632-37695		Maximum Demands					
+0,1 +2,3	0x3700	V1/V12 Maximum volt demand Timestamp	0-Vmax	U1 sec	UINT32 UINT32	R R	1
+4,5 +6,7	0x3701	V2/V23 Maximum volt demand Timestamp	0-Vmax	U1 sec	UINT32 UINT32	R R	1
+8,9 +10,11	0x3702	V3/V31 Maximum volt demand Timestamp	0-Vmax	U1 sec	UINT32 UINT32	R R	1
+12,13 +14,15	0x3703	I1 Maximum ampere demand Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
+16,17 +18,19	0x3704	I2 Maximum ampere demand Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
+20,21 +22,23	0x3705	I3 Maximum ampere demand Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
+24,25 +26,27	0x3706	Not used Timestamp			UINT32 UINT32	R R	
+28,29 +30,31	0x3707	Not used Timestamp			UINT32 UINT32	R R	
+32,33 +34,35	0x3708	Not used Timestamp			UINT32 UINT32	R R	

Address	Point ID	Description	Options/Range/Format ²	Units ^{2, 3}	Type	R/W	Notes
+36,37 +38,39	0x3709	Maximum kW import sliding window demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+40,41 +42,43	0x370A	Maximum kvar import sliding window demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+44,45 +46,47	0x370B	Maximum kVA sliding window demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+48,49 +50,51	0x3737	Not used Timestamp			UINT32 UINT32	R R	
+52,53 +54,55	0x370D	Not used Timestamp			UINT32 UINT32	R R	
+56,57 +58,59	0x370E	Not used Timestamp			UINT32 UINT32	R R	
+60,61 +62,63	0x370F	Maximum kW export sliding window demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+64,65 +66,67	0x3710	Maximum kvar export sliding window demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+68,69 +70,71	0x3711	Not used Timestamp			UINT32 UINT32	R R	
+71,73 +74,75	0x3712	Not used Timestamp			UINT32 UINT32	R R	
+76,77 +78,79	0x3713	Not used Timestamp			UINT32 UINT32	R R	
+80,81 +82,83	0x3714	Not used Timestamp			UINT32 UINT32	R R	
+84,85 +86,87	0x3715	In Maximum ampere demand Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
38144-38175		TOU Maximum Demand Register #1					
+0,1 +2,3	0x4800	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+4,5 +6,7	0x4801	Tariff #2 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
		...				R	
+28,29 +30,31	0x4807	Tariff #8 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
38400-38431		TOU Maximum Demand Register #2					
+0,1 +2,3	0x4900	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+4,5 +6,7	0x4901	Tariff #2 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
		...				R	
+28,29 +30,31	0x4907	Tariff #8 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	

Address	Point ID	Description	Options/Range/Format ²	Units ^{2, 3}	Type	R/W	Notes
38656-38687		TOU Maximum Demand Register #3					
+0,1 +2,3	0x4A00	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+4,5 +6,7	0x4A01	Tariff #2 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
		...				R	
+28,29 +30,31	0x4A07	Tariff #8 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
38272-38313		TOU Maximum Demand Register #4					
+0,1 +2,3	0x4880	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
+4,5 +6,7	0x4881	Tariff #2 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
		...				R	
+28,29 +30,31	0x4887	Tariff #8 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	

NOTES:

- ¹ Voltage and voltage harmonics readings:
When the 4LN3, 3LN3 or 3BLN3 wiring mode is selected, the voltages will be line-to-neutral; for any other wiring mode, they will be line-to-line voltages.
- ² For volts, amps, power and frequency scales and units, refer to Section 4 "Data Scales and Units".
- ³ The Min/Max register values can be read as 32-bit integer or 32-bit floating-point values. Refer to Section 2.7 for details.

3.6 Device Control and Status Registers

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
Device Restart Register							
2560		Warm restart of the device	0 when read, 0xFFFF when written = restart the device		UINT16	R/W	
Device Authorization Registers							
2575		When write: 4-digit password. When read: 0 = access permitted, -1 = authorization required.	0-9999 (write) 0/-1 (read)		INT16	R/W	
44378-44379		When write: 8-digit password. When read: 0 = access permitted, -1 = authorization required.	0 - 99999999 (write) 0/-1 (read)		INT32	R/W	
Remote Relay Control							
3244-3248							
+0		Remote relay command	0 = remove a remote command 1 = operate relay 2 = remove a remote command and release a locally latched relay		UINT16	W	
3244		RO1 Control					
3245		RO2 Control					
3246		RO3 Control					
3247		RO4 Control					
3248		RO5 Control					
Device Reset/Clear Registers							
3404		Clear total energy registers	0		UINT16	W	
3405		Clear total maximum demand registers	0 = clear all maximum demands 1 = clear power demands 2 = clear volt and ampere demands		UINT16	W	
3406		Clear TOU energy registers	0		UINT16	W	
3407		Clear TOU maximum demand registers	0		UINT16	W	
3408		Clear pulse counters	0 = clear all counters 1-4 = clear counter #1-#4		UINT16	W	
3409		Clear Min/Max log	0		UINT16	W	
3414		Clear operation/event counters	2 = clear meter operation counters 6 = clear communication counters		UINT16	W	
Device Identification							
2561		Reserved	0		UINT16	R	
2562		Firmware build major number	1-99		UINT16	R	
2563		Firmware build minor number	1-99		UINT16	R	
2564		Reserved	0		UINT16	R	
2565		Firmware version number	1200-1299		UINT16	R	Two higher decimal digits = major version number, two lower decimal digits = minor version number
2566,2567		Device options	F29		UINT32	R	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
3484		Current serial port number	0=COM1, 1=COM2, 2 = COM3		UINT16	R	
Device Status Registers							
3452		Relay status	0x0000-0x001F		UINT16	R	Bitmap: 0=open, 1= closed
3453		Reserved	0		UINT16	R	
3454		Digital inputs	0x0000-0x3FFF		UINT16	R	Bitmap: 0=open, 1=closed
3455		Present setpoint status	0x0000-0xFFFF		UINT16	R	Bitmap: 0=released, 1=operated
Alarm Notification Registers							
3474		Latched setpoint SP1-SP16 alarm status. Nonvolatile register.	0x0000-0xFFFF		UINT16	R/W	Bitmap: Read - 1=setpoint has been operated at least once since last reset; Write - 0=clear alarm, 1=has no effect.
3475		Device diagnostics. Nonvolatile register.	F24		UINT16	R/W	Bitmap: Read - 1=diagnostic failed at least once since last reset; Write - 0=clear diagnostic flag, 1=has no effect.
DI Change Events							
4368-4397							
+0,1		Timestamp, seconds since 1/1/1970	F1	sec	UINT32	R	
+2,3		Timestamp, seconds fraction, μ sec	0-999000	μ sec	UINT32	R	
+4		DI number	0-13 = DI1-DI14		UINT16	R	
+5		DI status	0=open, 1=closed		UINT16	R	
4368-4373		Event 1 (oldest)					
4374-4379		Event 2					
4380-4385		Event 3					
4386-4391		Event 4					
4392-4397		Event 5 (most recent)					
Memory Status Registers							
44262-44263		Memory size, bytes	125056		UINT32	R	
44264-44265		Free memory, bytes	0-125056		UINT32	R	
44266-44277		Reserved			UINT32	R	
Log Notification Registers							
44278-44279		Log files 0,1 and 16 status	0x00000000 - 0x00010003		UINT32	R	Bitmap: 0=no new logs, 1=new record has been recorded to the file
Communication Status							
44394		Cellular received signal strength (RSSI), dBm	0 = not known or not detectable, 51-113 = -51 to -113 dBm		UINT16	R	
44395		Cellular connection status	0 = not connected, 1 = not registered, 2 = registered		UINT16	R	
44396		WiFi signal quality. %	0 = not known or not detectable, 1-100 %		UINT16	R	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
44397		WiFi connection status	0 = not connected, 1 = connected		UINT16	R	
44398-44409		Reserved			UINT16	R	65535 = N/A
Communication Counters							
44410		Successful eXpertPower client connections	0-65534		UINT16	R	
44411		Failed eXpertPower client connections	0-65534		UINT16	R	
44412		Successful TCP notification client connections	0-65534		UINT16	R	
44413		Failed TCP notification client connections	0-65534		UINT16	R	
44414-44441		Reserved			UINT16	R	65535 = N/A

3.7 Device Setup Registers

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
Device Identification							
46080-46111							
+0,1		Device serial number	0-99999999		UINT32	R	
+2,3		Device model ID	13330		UINT32	R	
+4-11		Device model name	"EM133EH"		CHAR16	R	Null-terminated string
+12-13		Device options	0		UINT32	R	Bitmap
+14-19		Reserved			UINT16	R	
+20		Device firmware version number	1201-1299		UINT16	R	Two higher decimal digits = major version number, two lower decimal digits = minor version number
+21		Device firmware build major number	1-99		UINT16	R	
+22,23		Reserved			UINT16	R	
+24		Boot loader version number	0101-0199		UINT16	R	Two higher decimal digits = major version number, two lower decimal digits = minor version number
+25		Boot loader build number	1-99		UINT16	R	
+26		Device firmware build major number	1-99		UINT16	R	
+27		Device firmware build minor number	1-99		UINT16	R	
+28-31		Reserved			UINT16	R	
Factory Device Settings							
46112-46178							
+0		V1-V3 input range	690	V	UINT16	R	
+1		V1-V3 input overload	120	%	UINT16	R	
+2,3		Reserved			UINT16	R	
+4		I1-I3 input range	1, 5	A	UINT16	R	
+5		I1-I3 input overload	200	%	UINT16	R	
+6-13		Reserved			UINT16	R	
+14-63		Unused			UINT16		
+64		Ethernet MAC address 0-1	0x0500		UINT16	R	
+65		Ethernet MAC address 2-3	0x00F0		UINT16	R	
+66		Ethernet MAC address 4-5	0x0000-0xFFFF		UINT16	R	
Basic Setup							
2304-2324							
+0		Wiring mode	F27		UINT16	R/W	
+1		PT ratio	10 to 65000	×0.1	UINT16	R/W	
+2		CT primary current	1 to 50,000	A	UINT16	R/W	
+3		Power block demand period	1,2,3,5,10,15,20,30,60 min, 255 = external synchronization	min	UINT16	R/W	If the external synchronization is selected, the DI1 input is considered a pulse or KYZ input. The pulse edge restarts the power

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
							demand block accumulation interval.
+4		Volt/ampere demand period	0 to 1800	sec	UINT16	R/W	
+5-7		Reserved			UINT16	R/W	Read as 65535
+8		Number of blocks in a sliding window	1 to 15		UINT16	R/W	
+9,10		Reserved			UINT16	R/W	Read as 65535
+11		Nominal line frequency	25, 50, 60, 400	Hz	UINT16	R/W	
+12		Maximum demand load current	0 to 50,000 (0=CT primary current)	A	UINT16	R/W	
+13-19		Reserved			UINT16	R/W	Read as 65535
+20		PT ratio multiplication factor	×1, ×10		UINT16	R/W	
Communication Ports Setup							
2344-2367							
+0		Communication protocol	COM1: 0=SATEC ASCII, 1=Modbus RTU, 2=DNP3.0, 7= IEC 60870-5 COM2: 0=SATEC ASCII, 1=Modbus RTU, 2=DNP3.0, 5=Profibus DP, 7= IEC 60870-5, 8=CANopen COM3: 0=SATEC ASCII, 1=Modbus RTU		UINT16	R/W	
+1		Interface	COM1: 2=RS-485 COM2: 0=RS-232, 1=RS-422, 2=RS-485, 5=RF, 6=Ethernet, 7=Profibus, 8=GSM/GPRS, 10=CANopen COM3: 3=IR port		UINT16	R/W	
+2		Device address	SATEC ASCII: 0-99 Modbus RTU: 1-247 DNP3.0: 0-65532 Profibus DP: 0-126 IEC 60870-5: 1-65535 CANopen: 0-126		UINT16	R/W	
+3		Baud rate	1=300 bps, 2=600 bps, 3=1200 bps, 4=2400 bps, 5=4800 bps, 6=9600 bps, 7=19200 bps, 8=38400 bps, 9=57600 bps, 10=115200 bps		UINT16	R/W	
+4		Data format	0=7 bits/even parity, 1=8 bits/no parity, 2=8 bits/even parity		UINT16	R/W	
+5		Flow control	N/A		UINT16	R/W	Read as 65535
+6		RTS mode	N/A		UINT16	R/W	Read as 65535
+7		Send delay	2-1000 ms		UINT16	R/W	
2344-2351		COM1 Setup					
2352-2359		COM2 Setup					

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
2360-2367		COM3 Setup					
Device Options Setup							
2376-2392							
+0		Power calculation mode	0=using reactive power: $S=f(P,Q)$, 1=using non-active power: $Q=f(S,P)$		UINT16	R/W	
+1		Energy roll value	0= 1×10^4 , 1= 1×10^5 , 2= 1×10^6 , 3= 1×10^7 , 4= 1×10^8 , 5= 1×10^9		UINT16	R/W	Default=5
+2		Phase energy calculation mode	0=disabled, 1=enabled		UINT16	R/W	
+3-9		Reserved			UINT16	R/W	Read as 65535
+10		Energy LED test mode	0=disabled, 1=Wh test, 2=varh test		UINT16	R/W	LED pulse rate is 10,000 pulses/kWh
+11		Starting voltage, percent of FS voltage	15-50	×0.1%	UINT16	R/W	Default 1.5%
+12-13		Reserved			UINT16	R/W	Read as 65535
+14		Device resolution (see Section 4 for details)	0 = Low resolution, 1 = High resolution		UINT16	R/W	Default 0
+15		CANopen Data Transfer Mode	0=Disabled, 1="SYNC" Driven, 2=External Request		UINT16	R/W	Default 0
+16		CANopen Data Transfer Update Interval	100-5000	×0.1 sec	UINT16	R/W	Default=100
Local Settings							
4320-4330							
+0		Daylight savings time (DST) option	0 = DST disabled (standard time only), 1 = DST enabled		UINT16	R/W	
+1		DST start month	1-12		UINT16	R/W	
+2		DST start week of the month	1-4 = 1st, 2nd, 3rd and 4th week, 5=the last week of the month		UINT16	R/W	
+3		DST start weekday	1-7 (1=Sun, 7=Sat)		UINT16	R/W	
+4		DST end month	1-12		UINT16	R/W	
+5		DST end week of the month	1-4=1st, 2nd, 3 rd and 4th week, 5=the last week of the month		UINT16	R/W	
+6		DST end weekday	1-7 (1=Sun, 7=Sat)		UINT16	R/W	
+7		Clock synchronization source	1-14 = DI1-DI14, 32767 = meter clock		UINT16	R/W	A DI input is considered a pulse or KYZ input. The pulse edge adjusts the clock at the nearest whole minute.
+8		Country code	ITU calling number		UINT16	R/W	
+9		DST start hour	1-6		UINT16	R/W	
+10		DST end hour	1-6		UINT16	R/W	
Clock Indication and Setup							
4352-4358							
+0		Seconds	0-59		UINT16	R/W	
+1		Minutes	0-59		UINT16	R/W	
+2		Hour	0-23		UINT16	R/W	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
+3		Day of month	1-31		UINT16	R/W	
+4		Month	1-12		UINT16	R/W	
+5		Year (calendar year minus 2000)	0-99		UINT16	R/W	
+6		Weekday	1-7 (1=Sun, 7=Sat)		UINT16	R/W	Ignored when written
Alarm/Event Setpoints Setup							
2576-2703							
+0		Trigger parameter ID	F12		UINT16	R/W	
+1		Action	F14		UINT16	R/W	
+2		Operate delay	0-9999	×0.1 sec	UINT16	R/W	
+3		Release delay	0-9999	×0.1 sec	UINT16	R/W	
+4,5		Operate limit	See Section 3.3		UINT32	R/W	Scaled value
+6,7		Release limit	See Section 3.3		UINT32	R/W	Scaled value
2576-2583		Setpoint #1					
2584-2591		Setpoint #2					
2592-2599		Setpoint #3					
2600-2607		Setpoint #4					
2608-2615		Setpoint #5					
2616-2623		Setpoint #6					
2624-2631		Setpoint #7					
2632-2639		Setpoint #8					
2640-2647		Setpoint #9					
2648-2655		Setpoint #10					
2656-2663		Setpoint #11					
2664-2671		Setpoint #12					
2672-2679		Setpoint #13					
2680-2687		Setpoint #14					
2688-2695		Setpoint #15					
2696-2703		Setpoint #16					
Pulse Counters Setup							
2940-2947							
+0		Source digital input ID	0=not assigned, 1-14=DI1-DI14		UINT16	R/W	
+1		Multiplier	0-9999		UINT16	R/W	
2940-2941		Counter #1 Setup					
2942-2943		Counter #2 Setup					
2944-2945		Counter #3 Setup					
2946-2947		Counter #4 Setup					
Analog Outputs Setup							
3148-3153							
+0		Output parameter ID	F18		UINT16	R/W	
+1		Zero scale value (0/4 mA)	See Section 3.3		UINT16	R/W	Scaled value
+2		Full scale value (1/20 mA)	See Section 3.3		UINT16	R/W	Scaled value

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
3148-3150		AO1 Setup					
3151-3153		AO2 Setup					
Network Setup							
46576-46703							
+0,1		Device IP Address	0x01000000-0xFFFFFFFF		UINT32	R/W	Network byte order
+2,3		Network subnet mask	0x00000001-0xFFFFFFFF		UINT32	R/W	Network byte order
+4,5		Network default gateway	0x00000000-0xFFFFFFFF		UINT32	R/W	Network byte order
+6,7		Use DHCP	0 = NO, 1 = YES		UINT32	R/W	
+8,9		TCP service port	502 = Modbus/TCP, 20000 = DNP3.0/TCP, 2404 = IEC 60870-5-104		UINT32	R/W	
+10-127		Reserved				R/W	
WiFi Station Setup							
59178-59211							
+0-7		Network name (SSID)	1-15 ASCII characters		CHAR16	R/W	
+8,9		Security/encryption type	0=Unsecured, 1=Open/WEP, 2=Shared/WEP, 3=WPA/TKIP, 4=WPA/AES, 5=WPA/TKIP+AES		UINT32	R/W	
+10-17		Security key	WEP: 5 or 13 ASCII characters TKIP/AES: 8-15 ASCII characters		CHAR16	R/W	
+18-33		Reserved				R/W	
WiFi Access Point Setup							
59212-59253							
+0,1		Access point enable	0=disabled, 1=enabled		UINT32	R/W	
+2,3		WiFi protocol	0=802.11b, 1=802.11g, 2=802.11n, 3=802.11b/g, 4=802.11b/g/n		UINT32	R/W	
+4,5		LAN IP address	0x01000000-0xFFFFFFFF		UINT32	R/W	Network byte order
+6,7		LAN subnet mask	0x00000001-0xFFFFFFFF		UINT32	R/W	Network byte order
+8-15		Network name (SSID)	1-15 ASCII characters		CHAR16	R/W	
+16,17		Security/encryption type	0=Unsecured, 1=Open/WEP, 2=Shared/WEP, 3=WPA/TKIP, 4=WPA/AES, 5=WPA/TKIP+AES		UINT32	R/W	
+18-25		Security key	WEP: 5 or 13 ASCII characters TKIP/AES: 8-15 ASCII characters		CHAR16	R/W	
+26,27		WiFi channel	0=auto, 1-11=CH1-CH11		UINT32	R/W	
+28-41		Reserved				R/W	
Password Setup							
46704-46711							
+0,1		Password 1 (low level)	0-99999999		UINT32	R/W	Read as 0
+2,3		Password protection (always ON)	1 = enabled		UINT16	R/W	
+4,5		Password 2 (medium level)	0-99999999		UINT32	R/W	Read as 0
+6,7		Password 3 (high level)	0-99999999		UINT32	R/W	Read as 0

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
Expert Power Service Setup							
46768-46783							
+0,1		Expert Power server IP Address	0x01000000-0xFFFFFFFF		UINT32	R/W	Default = 207.232.60.18
+2,3		Expert Power server TCP service port	0-65535		UINT32	R/W	Default = 5001
+4,5		Expert Power client enabled	0 = client disabled, 1 = client enabled		UINT32	R/W	
+6,7		Time to next session	1-99999	min	UINT32	R/W	
+8,9		Not used			UINT32	R	
+10,11		Not used			UINT32	R	
+12,13		Connection idle timeout	1-120	min	UINT32	R/W	
+14-15		Reserved			UINT32		
Internet Service Provider (ISP) accounts							
46784-46831							
+0-15		ISP telephone number			CHAR32	R/W	
+16-31		Login name			CHAR32	R/W	
+32-47		Login password			CHAR32	R/W	
GPRS Setup							
46832-46879							
+0-15		Access Point Name (APN)			CHAR32	R/W	
+16-31		User name			CHAR32	R/W	
+32-39		Password			CHAR16	R/W	
+40-47		Reserved			CHAR16	R/W	
TCP Notification Client Setup							
46896-46991							
+0,1		Client enabled	0 = disabled, 1 = enabled		UINT32	R/W	
+2,3		Server address	0x01000000-0xFFFFFFFF		UINT32	R/W	
+4,5		Server port	0-65535		UINT32	R/W	
+6,7		Message exchange address	0-65535		UINT32	R/W	
+8,9		Reserved					Reserved for network type: 0=ENET, 1=PNET
+10,11		Extended Notification Message	0 = disabled (default, short notification message), 1 = enabled (long notification message, PM180 style)		UINT32	R/W	
+12-15		Reserved					
Transformer Correction Setup							
47072-47099							
+0		Ratio correction factor	700-1300	×0.001	UINT16	R/W	
+1		Phase angle error	-600 to 600	min	INT16	R/W	
+2, 3		Reserved			INT16	R/W	
47072-47075		V1 transformer correction					
47076-47079		V2 transformer correction					
47080-47083		V3 transformer correction					

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
47084-47087		Reserved					
47088-47091		I1 transformer correction					
47092-47095		I2 transformer correction					
47096-47099		I3 transformer correction					
Display Setup							
48664-48695							
+0		Reserved			UINT16	R	
+1		Auto-scroll interval	0 = disabled, 1-10, 15, 20, 25, 30	sec	UINT16	R/W	
+2		Auto-return interval	0 = disabled, 1-5, 10, 15, 20, 25, 30	min	UINT16	R/W	
+3		Backlight time	0 = continuous, 1-10	min	UINT16	R/W	
+4-7		Reserved			UINT16	R/W	Read as 65535
+8		Phase powers	0 = disabled, 1 = enabled		UINT16	R/W	
+9		Fundamental powers	0 = disabled, 1 = enabled		UINT16	R/W	
+10-31		Reserved			UINT16	R/W	
IEC 60870-5 Options Setup							
49460-49494							
+0		Maximum length of variable frame, octets	32-255		UINT16	R/W	
+1		Link address length, octets	1-2		UINT16	R/W	
+2		Cause of transmission length, octets	1-2		UINT16	R/W	
+3		Length of common address of ASDU, octets	1-2		UINT16	R/W	
+4		Length of information object address, octets	1-3		UINT16	R/W	
+5		Select-before-operate timeout, s	0-30		UINT16	R/W	
+6		Short pulse duration, ms	100-3000	ms	UINT16	R/W	
+7		Long pulse duration, ms	100-3000	ms	UINT16	R/W	
+8,9		Time synchronization period, s	1-86400, 0=not active	s	UINT32	R/W	
+10		Local counter freeze period, min	1-60, 0=not active	min	UINT16	R/W	
+11		Cyclic data transmission period, ms	100-30000, 0=not active	ms	UINT16	R/W	
+12,13		Client IP address for cyclic data transmission	0-0xFFFFFFFF, 0=not active		UINT32	R/W	
+14,15		Client IP address for spontaneous transmission	0-0xFFFFFFFF, 0=not active		UINT32	R/W	
+16,17		Not used	0		UINT32	R/W	
+18		Not used	0		UINT16	R/W	
+19		Respond with class 1 data to class 2 requests	0=disabled, 1=enabled		UINT16	R/W	
+20		Single point start mapped address	1-4095		UINT16	R/W	
+21		Single point default static object type	F31		UINT16	R/W	
+22		Single point default event object type	F32		UINT16	R/W	
+23		Double point start mapped address	1-4095		UINT16	R/W	
+24		Double point default static object type	F33		UINT16	R/W	
+25		Double point default event object type	F34		UINT16	R/W	
+26		Measured value start mapped address	1-4095		UINT16	R/W	
+27		Measured value default static object type	F35		UINT16	R/W	
+28		Measured value default event object type	F36		UINT16	R/W	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
+29		Integrated totals start mapped address	1-4095		UINT16	R/W	
+30		Integrated totals default static object type	F37		UINT16	R/W	
+31		Integrated totals default event object type	F38		UINT16	R/W	
+32		Voltage units	0=V, 1=kV		UINT16	R/W	
+33		Current units	0=A, 1=kA		UINT16	R/W	
+34		Power units	0=kW, 1=MW		UINT16	R/W	
+35		IEC 60870-5-104 IP Redundancy Mode	1="Standard" 2="Enhanced"		UINT16	R/W	Default=1
IEC 60870-5 Class 2 Data and Counters Setup							
49524-49619							
+0		Information object type and flags	Bits 0:7 – static object type identification (F31, F33, F35, F37), Bit 8=1 – freeze with reset, Bit 9=1 – local freeze, Bit 10=1 – cyclic data transmission, Bit 11=1 – general interrogation, Bits 12:15 – interrogation group = 0-15 (0=no group assigned)				
+1		Start information object address	1-65535		UINT16	R/W	
+2		Number of elements in the range	1-128		UINT16	R/W	
49524-49526		Object address range #1					
49527-49529		Object address range #2					
...		...					
49617-46619		Object address range #32					
IEC 60870-5 Assignable Point Map and Events Setup							
49716-49971					UINT16	R/W	
+0		Point ID	See Section 3.4		UINT16	R/W	
+1		Information object type and flags	Bits 0:7 – static object type identification (F3, F5, F7), Bits 8:9 – relation (0=delta, 1= more than, 2 = less than) Bit 10=1 – class 1 assignment		UINT16	R/W	
+2,3		Deadband/threshold	See Section 3.4 for the point range and resolution		INT32	R/W	
49716-49719		Mapped static/event point #1					
49720-49723		Mapped static/event point #2					
...		...					
49968-49971		Mapped static/event point #64					
DNP Options Setup							
51158-51183							
+0		Default Binary Input Static object variation	F25 (default 0)		UINT16	R/W	
+1		Reserved			UINT16	R/W	
+2		Default Binary Counter object variation	F25 (default 3)		UINT16	R/W	
+3		Default Frozen Binary Counter object variation	F3 (default 4)		UINT16	R/W	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
+4-5		Reserved			UINT16	R/W	
+6		Default Analog Input object variation	F25 (default 3)		UINT16	R/W	
+7-10		Reserved			UINT16	R/W	
+11		16-bit BC scaling	0= $\times 1$ (default), 1= $\times 10$, 2= $\times 100$, 3= $\times 1000$		UINT16	R/W	
+12		16-bit AI scaling	0=scaling is OFF, 1=scaling is ON		UINT16	R/W	
+13-5		Reserved			UINT16	R/W	
+16		Select/Operate Timeout	2 to 30 seconds (default 10 sec)		UINT16	R/W	
+17		Multi Fragment Interval	5 to 500 ms (default 10 ms)		UINT16	R/W	
+18-21		Reserved	Read as 65535		UINT16	R/W	
+22,23		Time Sync Period	0 to 86400 seconds (default 86400 sec)		UINT32	R/W	
51184-51189		Reserved					
DNP Class 0 Point Assignments							
51702-51797							
+0		DNP object and variation	F26		UINT16	R/W	
+1		DNP point number	Point number for the selected object		UINT16	R/W	
+2		Number of points	0-128		UINT16	R/W	
51702-51704		DNP Class 0 Points Range 1					
51705-51707		DNP Class 0 Points Range 2					
		...					
51795-51797		DNP Class 0 Points Range 32					
51798-51893		Reserved					
File Setup							
52598-52767							
+0		File type	0		UINT16	R/W	
+1		File attributes	F3		UINT16	R/W	Bitmap
+2		Number of records in the file	0-65535 (0 = delete file)		UINT16	R/W	
+3		Number of sections/channels in the file	0-8		UINT16	R/W	0 = non-partitioned file
+4		Number of parameters per section record	1-9		UINT16	R/W	
+5		Not used	0		UINT16	R/W	
+6		Section record size, bytes (for info only)			UINT16	R	
+7		File record size, bytes (for info only)			UINT16	R	
+8, 9		Allocated file size, bytes (for info only)			UINT32	R	
52598-52607		Event Log File Setup					
52608-52617		Data Log #1 File Setup					
52758-52767		Data Log #16 File Setup					
Data Log Setup							
54006-54517							
+0		Data log parameter #1 ID	0x0000-0xFFFF		UINT16	R/W	
+1		Data log parameter #2 ID	0x0000-0xFFFF		UINT16	R/W	
+2		Data log parameter #3 ID	0x0000-0xFFFF		UINT16	R/W	
+3		Data log parameter #4 ID	0x0000-0xFFFF		UINT16	R/W	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
+4		Data log parameter #5 ID	0x0000-0xFFFF		UINT16	R/W	
+5		Data log parameter #6 ID	0x0000-0xFFFF		UINT16	R/W	
+6		Data log parameter #7 ID	0x0000-0xFFFF		UINT16	R/W	
+7		Data log parameter #8 ID	0x0000-0xFFFF		UINT16	R/W	
+8		Data log parameter #9 ID	0x0000-0xFFFF		UINT16	R/W	
+9-31		Reserved			UINT16	R/W	
54006-54037		Data log #1 Setup					
54486-54517		Data log #16 Setup					
TOU Daily Profile Setup							
55574-55701							
+0		1 st tariff change	F10		UINT16	R/W	
+1		2 nd tariff change	F10		UINT16	R/W	
+2		3 rd tariff change	F10		UINT16	R/W	
+3		4 th tariff change	F10		UINT16	R/W	
+4		5 th tariff change	F10		UINT16	R/W	
+5		6 th tariff change	F10		UINT16	R/W	
+6		7 th tariff change	F10		UINT16	R/W	
+7		8 th tariff change	F10		UINT16	R/W	
55574-55581		Daily profile #1: Season 1, Day type 1					
55582-55589		Daily profile #2: Season 1, Day type 2					
55590-55597		Daily profile #3: Season 1, Day type 3					
55598-55605		Daily profile #4: Season 1, Day type 4					
55606-55613		Daily profile #5: Season 2, Day type 1					
55614-55621		Daily profile #6: Season 2, Day type 2					
55622-55629		Daily profile #7: Season 2, Day type 3					
55630-55637		Daily profile #8: Season 2, Day type 4					
55638-55645		Daily profile #9: Season 3, Day type 1					
55646-55653		Daily profile #10: Season 3, Day type 2					
55654-55661		Daily profile #11: Season 3, Day type 3					
55662-55669		Daily profile #12: Season 3, Day type 4					
55670-55677		Daily profile #13: Season 4, Day type 1					
55678-55685		Daily profile #14: Season 4, Day type 2					
55686-55693		Daily profile #15: Season 4, Day type 3					
55694-55701		Daily profile #16: Season 4, Day type 4					
55702-55711		Reserved					
TOU Calendar Setup							
55712-56031							
+0-9		Calendar entry record				R/W	
+0		Daily profile	0-3 = Season 1, Day types 0-3 4-7 = Season 2, Day types 0-3 8-11 = Season 3, Day types 0-3 12-15 = Season 4, Day types 0-3		UINT16	R/W	
+1		Week of month	0=all, 1=1st, 2=2nd, 3=3 rd , 4=4th,		UINT16	R/W	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
			5=last week of the month				
+2		Weekday	0=all, 1-7 (Sun=1, Sat=7)		UINT16	R/W	
+3		Till Weekday	0=all, 1-7 (Sun=1, Sat=7)		UINT16	R/W	
+4		Month	0=all, 1-12=January - December		UINT16	R/W	
+5		Day of month	0=all, 1-31=day 1-31		UINT16	R/W	
+6		Till Month	0=all, 1-12=January - December		UINT16	R/W	
+7		Till Day of month	0=all, 1-31=day 1-31		UINT16	R/W	
+8-9		Reserved			UINT16	R/W	
55712-55721		Calendar entry #1					
55722-55731		Calendar entry #2					
55732-55741		Calendar entry #3					
...							
56022-56031		Calendar entry #32					
56032-56191		Reserved					
Billing/TOU Registers Setup							
56672-56703							
+0		Not used			UINT16	R/W	
+1		Units of measurement	0=none, 1=kWh, 2=kvarh, 3=kVAh, 4=m ³ , 5=CF (cubic feet), 6=CCF (hundred cubic feet)		UINT16	R/W	
+2		Flags (bitmap)	Bit 0=1 - TOU enabled Bit 1=1 - Use profile enabled Bit 2=1 - Max. demand profile enabled Bit 3=1 - Summary (total) profile enabled		UINT16	R/W	
+3		Not used	0		UINT16	R/W	
56672-56675		Register #1 Setup					
56676-56679		Register #2 Setup					
56680-56683		Register #3 Setup					
56684-56687		Register #4 Setup					
Billing/TOU Registers Source Setup							
56928-57183							
+0		Energy source ID	F11		UINT16	R/W	
+1		Target billing register number	0-3 = register #1-#3		UINT16	R/W	
+2,3		Multiplier	0-1000000	×0.001	INT32	R/W	
56928-56931		Energy Source #1					
56932-56935		Energy Source #2					
56936-56939		Energy Source #3					
56940-56943		Energy Source #4					
Digital Inputs Setup							
61728-61783							
+0		Pulse mode	0 = pulse, 1 = KYZ		UINT16	R/W	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
	+1	Polarity	Bit 0 – pulse polarity: 0=normal, 1=inverting Bit 1 – input polarity: 0=normal, 1=inverting		UINT16	R/W	
	+2	De-bounce time, ms	1-100		UINT16	R/W	The same debounce time is set in groups of 4 inputs
	+3	Reserved			UINT16	R/W	
61728-61731		DI1 Setup					
61732-61735		DI2 Setup					
		...					
61780-61783		DI14 Setup					
Relay Outputs Setup							
61984-62013							
	+0	Operation Mode	0=unlatched, 1=latched, 2=pulse, 3=KYZ		UINT16	R/W	
	+1	Polarity	0=normal, 1=inverting		UINT16	R/W	
	+2	Pulse width, ms	1-3000		UINT16	R/W	
	+3	Pulse source ID	F17		UINT16	R/W	
	+4	Units per pulse	1-10000	x0.1	UINT16	R/W	
	+5	Reserved			UINT16	R/W	
61984-61989		RO1 Setup					
61990-61995		RO2 Setup					
61996-62001		RO3 Setup					
62002-62007		RO4 Setup					
62008-62013		RO5 Setup					
Analog Inputs Setup							
62368-62379							
	+0	Input parameter ID	F19		UINT16	R/W	
	+1	Not used	0		UINT16	R/W	
	+2,3	Zero scale value (0/4 mA)	See Section 3.4		INT32	R/W	
	+4,5	Full scale value (20/1 mA)	See Section 3.4		INT32	R/W	
62368-62373		AI1 Setup					
62374-62379		AI2 Setup					
Analog Outputs Setup							
62560-62571							
	+0	Output parameter ID	F18		UINT16	R/W	
	+1	Not used	0		UINT16	R/W	
	+2,3	Zero scale value (0/4 mA)	See Section 3.4		INT32	R/W	
	+4,5	Full scale value (20/1 mA)	See Section 3.4		INT32	R/W	
62560-62565		AO1 Setup					
62566-62571		AO2 Setup					

3.8 Analog and Digital I/O Configuration

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
I/O Slots Configuration Info							
63008-63055							
+0		I/O type	F30		UINT16	R	
+1		Number of I/Os on the slot	0-4		UINT16	R	
+2		First I/O number on the slot	0		UINT16	R	
+3		Last I/O number on the slot	0-4		UINT16	R	
63008-63011		DI Slot Configuration					
63012-63015		RO Slot Configuration					
63016-63019		AI/AO Slot Configuration					
63020-63055		Reserved					
I/O Type Info							
63056-63119							
+0		Number of I/O slots of this type	0-1		UINT16	R	
+1		Total number of I/O's of this type	0-4		UINT16	R	
+2		Number of I/O's on the slot	0-4		UINT16	R	
+3		Not used	0		UINT16	R	
63056-63059		DI Type Info					
63060-63063		RO Type Info					
63064-63067		AI Type Info					
63068-63071		AO Type Info					
63076-63119		Reserved					

3.9 File Transfer Registers

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
File Transfer Control Blocks							
63120-63151		File Request Block					
+0		File function	1 = ACK - acknowledgement 3 = set file position 5 = reset file position 7 = find 11 = read file 127 = erase file		UINT16	R/W	1 - clears the file transfer block 3 - changes the file position 5 - sets the file position at the first (oldest) record 7 - finds a record matching an event or/and time (see Note 3) 11 - opens the file for reading from the present file position
+1		File ID	F2		UINT16	R/W	
+2		Section number (functions 3, 5, 11)	0-7, 0xFFFF = use channel ID		UINT16	R/W	
+3		Section channel ID (functions 3, 5, 11)	F6, F7		UINT16	R/W	
+4		Record sequence number (functions 3, 11)	0-65535		UINT16	R/W	The record sequence number with function 11 does not change the file position (see Note 2).
+5		Request variation (function 11)	0		UINT16	R/W	See file response headings
+6		Find key: N/A			UINT16	R/W	
+7		Find key: N/A			UINT16	R/W	
+8, 9		Find key: Start time, seconds since 1/1/1970	F1	sec	UINT32	R/W	Note 3
+10, 11		Find key: Start time, fractional seconds in μ sec		μ sec	UINT32	R/W	Note 3
+12, 13		Find key: End time, seconds since 1/1/1970	F1	sec	UINT32	R/W	Note 3
+14, 15		Find key: End time, fractional seconds in μ sec		μ sec	UINT32	R/W	Note 3
+16-31		Reserved			UINT16	R/W	
63152-63799		File Response Block					
		Data transfer area [0 – 647]			UINT16	R	
64944-64951		File Info Request Block					
+0		File function	9 = read file info		UINT16	R/W	
+1		File ID	F2		UINT16	R/W	
+2		Section number	0-7, 0xFFFF = use channel ID		UINT16	R/W	
+3		Section channel ID	F6, F7		UINT16	R/W	
+4		Not used	0		UINT16	R/W	
+5		Request variation	0, 1, 2		UINT16	R/W	
+6-7		Reserved			UINT16	R/W	
64952-65151		File Info Response Block					
		Data transfer area [0 - 199]			UINT16	R	

NOTES:

1. File sections for partitioned (multi-section) files, like Billing/TOU profile log files, can be requested either by a section number, or by a section channel ID. If a section number is set to 0xFFFF, the section channel ID will be used to identify the section. The section number will be returned in the response block. If a section number is written, then the corresponding channel ID will be returned in the file response block.

2. The record sequence number with function 11 (Read-File) does not change the file position and is used only as a reference to track the order of records. The file transfer block will continue to hold the same data until it is acknowledged, or until the file position is explicitly moved to another record. For multi-section, the Read-File request, which addresses a different file section, will refill the transfer block with data of the record from the requested file section with the identical sequence number. After acknowledgment, the file position will be moved to the next record.
3. Function 7 (Find) puts into the file request block the sequence number of the first record in the file that matches the event time. Any one of the find keys can be omitted by setting it to 0. If one or a number of find keys are omitted, the device will use the remaining keys to locate the matching record. If the record could not be found, the device responds to the write request with the exception code 3 (illegal data). The status of the operation can be read through the file status word in the file info block.

File Response Blocks

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
File Info Response Block (Variation 0 – File info)							
64952-64959		Block Heading					
+0		File function	9		UINT16	R	
+1		File ID	16		UINT16	R	
+2		Section number	0-31		UINT16	R	
+3		Section channel ID	F6, F7		UINT16	R	
+4		Maximum number of records in the block	1		UINT16	R	
+5		Record size, words	36		UINT16	R	
+6		Request variation	0		UINT16	R	
+7		Reserved	0		UINT16	R	
64960-64997		File Info					
+0		File type	0		UINT16	R	
+1		File attributes	F3		UINT16	R	
+2		File (section) status	F4		UINT16	R	
+3		Number of sections in the file	0-32		UINT16	R	0 = non-partitioned file
+4,5		File channel mask (channels 1-32), bitmap	F8, F9		UINT32	R	
+6,7		File channel mask (channels 33-64), bitmap	F8, F9		UINT32	R	
+8		Number of records in the file	0-65535		UINT16	R	
+9		Number of records until the end of the file	0-65535		UINT16	R	
+10		Current record (read position) sequence number	0-65535		UINT16	R	
+11		Current write position sequence number	0-65535		UINT16	R	
+12		First (oldest) record sequence number	0-65535		UINT16	R	
+13		Last (newest) record sequence number	0-65535		UINT16	R	
+14,15		Last record time, seconds since 1/1/1970	F1	sec	UINT32	R	
+16,17		Last record time, fractional seconds		µsec	UINT32	R	
+18,19		First record time, seconds since 1/1/1970	F1	sec	UINT32	R	
+20,21		First record time, fractional seconds		µsec	UINT32	R	
+22,23		Null	0		UINT32	R	
+24,25		Null	0	µsec	UINT32	R	
+26,27		Null	0	sec	UINT32	R	
+28,29		Null	0	µsec	UINT32	R	
+30		Maximum number of records	0-65535		UINT16	R	
+31		Number of parameters per data section record	0-16		UINT16	R	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
+32		Section record size, bytes		Byte	UINT16	R	
+33		File record size, bytes		Byte	UINT16	R	
+34,35		Allocated file size, bytes		Byte	UINT32	R	
File Info Response Block (Variation 1 – Current record info)							
64952-64959		Block Heading					
+0		File function	9		UINT16	R	
+1		File ID	F2		UINT16	R	
+2		Section number	0-31		UINT16	R	
+3		Section channel ID	F6, F7		UINT16	R	
+4		Maximum number of records in the block	1		UINT16	R	
+5		Record size, words	8		UINT16	R	
+6		Request variation	1		UINT16	R	
+7		Reserved	0		UINT16	R	
64960-64997		File Info					
+0		File (section) status	F4		UNT16	R	
+1		Number of records in the file	0-65535		UINT16	R	
+2		Number of records until the end of the file	0-65535		UINT16	R	
+3		Current record (read position) sequence number	0-65535		UINT16	R	
+4,5		Current record time, seconds since 1/1/1970	F1	sec	UINT32	R	
+6,7		Current record time, fractional seconds		µsec	UINT32	R	
File Info Response Block (Variation 2 – Data log record structure)							
64952-64959		Block Heading					
+0		File function	9		UINT16	R	
+1		File ID	1,16		UINT16	R	
+2		Section number	0-7		UINT16	R	
+3		Section channel ID	F6, F7		UINT16	R	
+4		Number of records in the block	1		UINT16	R	
+5		Record size, words	18		UINT16	R	
+6		Request variation	2		UINT16	R	
+7		Reserved	0		UINT16	R	
64960-64997		File Info					
+0		Not used	0		UINT16	R	
+1		Number of fields in a data record	1-9		UINT16	R	
+2		Field 1 parameter ID	0-0xFFFF		UINT16	R	
+3		Field 2 parameter ID	0-0xFFFF		UINT16	R	
		...					
+10		Field 9 parameter ID	0-0xFFFF		UINT16	R	
Event Log Response Block							
63152-63159		Block Heading					
+0		Last file function	1, 3, 5, 11		UINT16	R	
+1		File ID	0		UINT16	R	
+2		Section number	0		UINT16	R	
+3		Section channel ID	0		UINT16	R	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
+4		Maximum number of records in the block	32		UINT16	R	
+5		Record size, words	12		UINT16	R	
+6		Request variation	0		UINT16	R	
+7		Reserved	0		UINT16	R	
63160-63543		Event Log Records					
+0		Record status	F5		INT16	R	
+1		Record sequence number	0-65535		UINT16	R	
+2,3		Trigger time, seconds since 1/1/1970	F1	sec	UINT32	R	
+4,5		Trigger time, fractional seconds in μ sec		μ sec	UINT32	R	
+6		Event number	1-65535		UINT16	R	
+7		Event point/source ID	F20		UINT16	R	
+8		Event effect	F21		UINT16	R	
+9		Reserved	0		UINT16	R	
+10,11		Value triggered			INT32	R	
63160-63171		Record #1					
		...					
63532-63543		Record #32					
Data Log Response Block							
63152-63159		Block Heading					
+0		Last file function	1, 3, 5, 11		UINT16	R	
+1		File ID	1,16		UINT16	R	
+2		Section number	0-7		UINT16	R	
+3		Section channel ID	F6		UINT16	R	
+4		Maximum number of records in the block	8 for regular log, 4 for profile log		UINT16	R	
+5		Record size, words	8 + 2 \times Number of parameters		UINT16	R	
+6		Request variation	0		UINT16	R	
+7		Reserved	0		UINT16	R	
63160-63367		Data Log Records					
+0		Record status	F5		INT16	R	
+1		Record sequence number	0-65535		UINT16	R	
+2,3		Record time, seconds since 1/1/1970	F1	sec	UINT32	R	
+4,5		Record time, fractional seconds in μ sec		μ sec	UINT32	R	
+6		Trigger event type	F23		INT16	R	
+7		Trigger event number	0		UINT16	R	
+8,9		Log value #1			INT32	R	
+10,11		Log value #2			INT32	R	
		...				R	
63160-...		Record #1 (variable length)					
		...					
		Record #8 (variable length)					
RT Waveform Response Block							
63152-63159		Block Heading					
+0		Last file function	1, 3, 5, 11		UINT16	R	

Address	Point ID	Description	Options/Range	Units	Type	R/W	Notes
+1		File ID	128		UINT16	R	
+2		Section number	0-9		UINT16	R	
+3		Section channel ID	F7		UINT16	R	
+4		Maximum number of records in the block	1		UINT16	R	
+5		Record size, words	640		UINT16	R	
+6		Request variation	0		UINT16	R	
+7		Reserved	0		UINT16	R	
63160-63799		Waveform Record					
+0		Record status	F5		INT16	R	
+1		Record sequence number	0		UINT16	R	
+2,3		Start time, seconds since 1/1/1970	F1	sec	UINT32	R	
+4,5		Start time, fractional seconds		µsec	UINT32	R	
+6,7		Trigger time, seconds since 1/1/1970	F1	sec	UINT32	R	
+8,9		Trigger time, fractional seconds		µsec	UINT32	R	
+10		Record series number	1-65535		UINT16	R	
+11		Record serial number in a series	0-65535		UINT16	R	
+12		Trigger event type	0		UINT16	R	
+13		Trigger event number	0		UINT16	R	
+14		Source point ID (generic)	See Generic Data in Section 3.4		UINT16	R	
+15		Trigger reference sample index	0-511		UINT16	R	
+16		Sampling rate, µsec/sample	600-27000	×0.1µsec	UINT16	R	
+17		Sampling rate, samples/cycle	32, 64, 128		UINT16	R	
+18		Sampling frequency	4500 – 6500	×0.01Hz	UINT16	R	
+19		Channel offset, sampling units	0		INT16	R	
+20,21		Channel multiplier, primary units	See Generic Data in Section 3.4		UINT32	R	
+22		Channel divisor, sampling units	4095		UINT16	R	
+23		Length of a sample series, data points	512		UINT16	R	
+24-127		Not used	0		UINT16	R	
+128		Sample Series					
+128-639		Sample data series points [0...511]	-4096 - 4095		INT16	R	¹

¹ To restore the original sampled data in the channel units (e.g., Volts, Amps), the following conversion should be applied:

$$\text{Sampled Data [primary units]} = \frac{(\text{Data Sample} - \text{Channel Offset}) \times \text{Channel Multiplier}}{\text{Channel Divisor}}$$

NOTE

If a file is read through a TCP connection, your assignments for the transfer will be effective only within the current connection socket. Since the device cannot guarantee that your next connection will be made through the same socket, you should not make any assumptions regarding the present block settings. When you open a new connection, always check the file status and pointers before reading file records.

3.10 Billing/TOU Daily Profile Data Log

File Channel/ Section ¹	Record Field No. ²	Point Label	Point ID	Description	Range	Units ³	Type	Notes
0/0				Energy Register #1				
	1	REG1	0x1780	Summary (total) energy reading	0-999,999,999	kWh	UINT32	
	2	TRF1	0x7000	Tariff #1 energy reading	0-999,999,999	kWh	UINT32	
	3	TRF2	0x7001	Tariff #2 energy reading	0-999,999,999	kWh	UINT32	
	4	TRF3	0x7002	Tariff #3 energy reading	0-999,999,999	kWh	UINT32	
	5	TRF4	0x7003	Tariff #4 energy reading	0-999,999,999	kWh	UINT32	
	6	TRF5	0x7004	Tariff #5 energy reading	0-999,999,999	kWh	UINT32	
	7	TRF6	0x7005	Tariff #6 energy reading	0-999,999,999	kWh	UINT32	
	8	TRF7	0x7006	Tariff #7 energy reading	0-999,999,999	kWh	UINT32	
	9	TRF8	0x7007	Tariff #8 energy reading	0-999,999,999	kWh	UINT32	
...				...				
3/3				Energy Register #4				
	1	REG4	0x1783	Summary (total) energy reading	0-999,999,999	kWh	UINT32	
	2	TRF1	0x7000	Tariff #1 energy reading	0-999,999,999	kWh	UINT32	
	3	TRF2	0x7001	Tariff #2 energy reading	0-999,999,999	kWh	UINT32	
	4	TRF3	0x7002	Tariff #3 energy reading	0-999,999,999	kWh	UINT32	
	5	TRF4	0x7003	Tariff #4 energy reading	0-999,999,999	kWh	UINT32	
	6	TRF5	0x7004	Tariff #5 energy reading	0-999,999,999	kWh	UINT32	
	7	TRF6	0x7005	Tariff #6 energy reading	0-999,999,999	kWh	UINT32	
	8	TRF7	0x7006	Tariff #7 energy reading	0-999,999,999	kWh	UINT32	
	9	TRF8	0x7007	Tariff #8 energy reading	0-999,999,999	kWh	UINT32	
16/4				Daily Maximum Demand Register #1				
	1	REG1 MD	0x4780	Summary (total) max. demand reading	0-Pmax	U3	UINT32	
	2	TRF1 MD	0x7100	Tariff #1 max. demand reading	0-Pmax	U3	UINT32	
	3	TRF2 MD	0x7101	Tariff #2 max. demand reading	0-Pmax	U3	UINT32	
	4	TRF3 MD	0x7102	Tariff #3 max. demand reading	0-Pmax	U3	UINT32	
	5	TRF4 MD	0x7103	Tariff #4 max. demand reading	0-Pmax	U3	UINT32	
	6	TRF5 MD	0x7104	Tariff #5 max. demand reading	0-Pmax	U3	UINT32	
	7	TRF6 MD	0x7105	Tariff #6 max. demand reading	0-Pmax	U3	UINT32	
	8	TRF7 MD	0x7106	Tariff #7 max. demand reading	0-Pmax	U3	UINT32	
	9	TRF8 MD	0x7107	Tariff #8 max. demand reading	0-Pmax	U3	UINT32	
...				...				
19/7				Daily Maximum Demand Register #4				
	1	REG4 MD	0x4783	Summary (total) max. demand reading	0-Pmax	U3	UINT32	
	2	TRF1 MD	0x7100	Tariff #1 max. demand reading	0-Pmax	U3	UINT32	
	3	TRF2 MD	0x7101	Tariff #2 max. demand reading	0-Pmax	U3	UINT32	
	4	TRF3 MD	0x7102	Tariff #3 max. demand reading	0-Pmax	U3	UINT32	
	5	TRF4 MD	0x7103	Tariff #4 max. demand reading	0-Pmax	U3	UINT32	

File Channel/ Section ¹	Record Field No. ²	Point Label	Point ID	Description	Range	Units ³	Type	Notes
	6	TRF5 MD	0x7104	Tariff #5 max. demand reading	0-Pmax	U3	UINT32	
	7	TRF6 MD	0x7105	Tariff #6 max. demand reading	0-Pmax	U3	UINT32	
	8	TRF7 MD	0x7106	Tariff #7 max. demand reading	0-Pmax	U3	UINT32	
	9	TRF8 MD	0x7107	Tariff #8 max. demand reading	0-Pmax	U3	UINT32	

¹ An energy use profile section is allocated for registers for which a source input is selected in the Billing/TOU Register setup and for which energy use profile is enabled. A maximum demand profile section is allocated for registers for which maximum demand profile is enabled in the Billing/TOU Register setup. Not configured sections/channels are not available for download. Refer to the file channel mask in the file info for configured channels.

² The number of parameters in a section is automatically configured depending on the number of actually used tariffs selected in the TOU Daily Profiles.

³ For power scale and units, refer to Section 4 "Data Scales and Units".

4 Data Scales and Units

Code	Condition	Value/Range	Notes
Data Scales			
Vmax		Voltage scale × PT Ratio, V	2
Imax		Current scale × CT Ratio = CT Primary current × 2, A	1, 3
Pmax	Wiring 4LN3, 3LN3, 3BLN3	Vmax × Imax × 3, W	4
	Wiring 4LL3, 3LL3, 3BLL3, 3OP2, 3OP3, 3DIR2	Vmax × Imax × 2, W	
Fmax	Nominal frequency 25, 50 or 60 Hz	100 Hz	
	Nominal frequency 400Hz	500 Hz	
Data Units – Low Resolution Option			
U1		1 V	
U2		1 A	
U3		1 kW/kvar/kVA	
Data Units – High Resolution Option			
U1	PT Ratio = 1	0.1 V	
	PT Ratio > 1	1 V	
U2		0.01 A	
U3	PT Ratio = 1	0.001 kW/kvar/kVA	
	PT Ratio > 1	1 kW/kvar/kVA	

See Device Options Setup for information on selecting the device resolution option.

¹ CT Ratio = CT primary current/CT secondary current

² The default Voltage scale is 144V (120V +20%). You can change it via the Device Data Scale setup (see Section 3.1) or via the Device Options setup in PAS.

³ The default Current scale is 2 × CT secondary current (2.0A with 1A secondaries, 10.A with 5A secondaries). You can change it via the Device Data Scale setup (see Section 3.1) or via the Device Options setup in PAS.

⁴ Pmax is rounded to whole kilowatts. With PT=1.0, if Pmax is greater than 9,999,000 W, it is truncated to 9,999,000 W.

5 Data Formats

Format Code	Value	Description	Notes
Timestamp			
F1		Local time in a UNIX-style format. Represents the number of seconds since midnight (00:00:00), January 1, 1970. The time is valid after January 1, 2000.	
File ID			
F2	0	Event log	
	1	Data log #1	
	16	Data log #16	
	128	Real time waveform	
File Attributes			
F3	Bit 0 = 0	Non-wrap file (stop when full)	
	Bit 0 = 1	Wrap-around (circular) file	
	Bit 1 = 1	Fixed (non-changeable) file attributes	
	Bits 4:6 =	Multi-section data log file attributes:	
	0	Regular file	
	2	TOU daily profile log	Multi-section file
File Status Word (bitmap)			
F4	Bit 0 = 1	The last record of the file is being read	
	Bit 8 = 1	File is empty	
	Bit 9 = 1	Reading after EOF	
	Bit 10 = 1	Corrupted record (CRC error)	
	Bit 11 = 1	No file section found for the requested channel	
	Bit 12 = 1	Reading after the end of a data block	
	Bit 13 = 1	File is not accessible	
	Bit 14 = 1	Record not found	
	Bit 15 = 1	Generic read error (with one of the bits 8-14)	
File Record Status Word (bitmap)			
F5	Bit 0 = 1	The last record of the file is being read	
	Bit 8 = 1	File is empty	
	Bit 9 = 1	Reading after EOF	
	Bit 10 = 1	Corrupted record (CRC error)	
	Bit 11 = 1	No file section found for the requested channel	
	Bit 12 = 1	Reading after the end of a data block	
	Bit 13 = 1	File is not accessible	
	Bit 14 = 1	Record not found	
	Bit 15 = 1	Generic read error (with one of the bits 8-14)	
TOU Profile Log Channel ID			
F6	0-3	Billing/TOU energy usage registers #1-#4	
	16-19	Billing/TOU maximum demand registers #1-#4	
Waveform Log Channel ID			
F7	0	V1/V12	3
	1	V2/V23	3
	2	V3/V31	3
	4	I1	
	5	I2	
	6	I3	
	Profile Log Sections Mask		
F8	Bit 0:3 = 1	Billing/TOU energy usage registers #1-#4	
	Bit 16:19 = 1	Billing/TOU maximum demand registers #1-#4	
Waveform Channel Mask			
F9	Bit 0 = 1	Channel V1/V12	3
	Bit 1 = 1	Channel V2/V23	3
	Bit 2 = 1	Channel V3/V31	3
	Bit 3 = 1	N/A	
	Bit 4 = 1	Channel I1	
	Bit 5 = 1	Channel I2	
	Bit 6 = 1	Channel I3	
TOU Tariff Change Time			
F10	Bits 8:15 = 0-7	Tariff number #1-#8	
	Bits 2:7 = 0-23	Tariff start hour	
	Bits 0:1 = 0-3	Tariff start quarter of an hour	
Billing/TOU Energy Register Source ID			
F11	0x0000	None	

Format Code	Value	Description	Notes
	0x0700-0x070D	Pulse input DI1-DI14	
	0x1700	kWh import	
	0x1701	kWh export	
	0x1704	kvarh import	
	0x1705	kvarh export	
	0x1708	kVAh total	
	0x1709	kVAh import	
	0x170A	kVAh export	
	0x170B	kvarh Q1	
	0x170C	kvarh Q2	
	0x170D	kvarh Q3	
	0x170E	kvarh Q4	
	0x170F	kWh L1 import	
	0x1710	kWh L2 import	
	0x1711	kWh L3 import	
Setpoint Trigger Parameters ID			
F12	0x0000	None (condition is not active)	
		Status Inputs	
	0x0600	Status input #1 ON	
	0x0601	Status input #2 ON	
	0x0602	Status input #3 ON	
	0x0603	Status input #4 ON	
	0x0604	Status input #5 ON	
	0x0605	Status input #6 ON	
	0x0606	Status input #7 ON	
	0x0607	Status input #8 ON	
	0x0608	Status input #9 ON	
	0x0609	Status input #10 ON	
	0x060A	Status input #11 ON	
	0x060B	Status input #12 ON	
	0x060C	Status input #13 ON	
	0x060D	Status input #14 ON	
	0x8600	Status input #1 OFF	
	0x8601	Status input #2 OFF	
	0x8602	Status input #3 OFF	
	0x8603	Status input #4 OFF	
	0x8604	Status input #5 OFF	
	0x8605	Status input #6 OFF	
	0x8606	Status input #7 OFF	
	0x8607	Status input #8 OFF	
	0x8608	Status input #9 OFF	
	0x8609	Status input #10 OFF	
	0x860A	Status input #11 OFF	
	0x860B	Status input #12 OFF	
	0x860C	Status input #13 OFF	
	0x860D	Status input #14 OFF	
		Relays	
	0x0800	Relay #1 ON	
	0x0801	Relay #2 ON	
	0x0802	Relay #3 ON	
	0x0803	Relay #4 ON	
	0x0804	Relay #5 ON	
	0x8800	Relay #1 OFF	
	0x8801	Relay #2 OFF	
	0x8802	Relay #3 OFF	
	0x8803	Relay #4 OFF	
	0x8804	Relay #5 OFF	
		Phase Reversal	2
	0x8901	Positive phase rotation reversal	2-cycle response
	0x8902	Negative phase rotation reversal	2-cycle response
		1-Cycle Values on any Phase	
	0x0E00	High voltage	
	0x8D00	Low voltage	
	0x0E01	High current	
	0x8D01	Low current	
	0x0E07	High voltage THD	2-cycle values
	0x0E08	High current THD	2-cycle values

Format Code	Value	Description	Notes
	0x0E09	High K-Factor	2-cycle values
	0x0E0A	High current TDD	2-cycle values
		1-Cycle Auxiliary Values	
	0x1002	High frequency	
	0x9002	Low frequency	
	0x1003	High voltage unbalance	
	0x1004	High current balance	
		1-Sec Phase Values	
	0x1103	High I1 current	
	0x1104	High I2 current	
	0x1105	High I3 current	
	0x9103	Low I1 current	
	0x9104	Low I2 current	
	0x9105	Low I3 current	
		1-Sec Values on any Phase	
	0x1300	High voltage	
	0x9200	Low voltage	
	0x1301	High current	
	0x9201	Low current	
		1-Sec Total Values	
	0x1406	High total kW import	
	0x1407	High total kW export	
	0x1408	High total kvar import	
	0x1409	High total kvar export	
	0x1402	High total kVA	
	0x9404	Low total PF Lag	
	0x9405	Low total PF Lead	
		1-Sec Auxiliary Values	
	0x1501	High neutral current	
	0x1502	High frequency	
	0x9502	Low frequency	
		Present Demands	
	0x1600	High V1/V12 Volt demand	
	0x1601	High V2/V23 Volt demand	
	0x1602	High V3/V31 Volt demand	
	0x1603	High I1 Ampere demand	
	0x1604	High I2 Ampere demand	
	0x1605	High I3 Ampere demand	
	0x1606	High block kW import demand	
	0x1608	High block kVA demand	
	0x1609	High sliding window kW import demand	
	0x160B	High sliding window kVA demand	
	0x160F	High accumulated kW import demand	
	0x1611	High accumulated kVA demand	
	0x1612	High predicted kW import demand	
	0x1614	High predicted kVA demand	
		Time and Date Parameters	
	0x0B02	Day of week	
	0x0B03	Year	
	0x0B04	Month	
	0x0B05	Day of month	
	0x0B06	Hour	
	0x0B07	Minutes	
	0x0B08	Seconds	
	0x0B09	Minute interval (1,2,3,4,5,10,15,20,30,60 min)	
Setpoint Action ID			
F14	0x0000	No action	
	0x3000	Operate Relay #1	
	0x3001	Operate Relay #2	
	0x3002	Operate Relay #3	
	0x3003	Operate Relay #4	
	0x3004	Operate Relay #5	
	0x3100	Release latched Relay #1	
	0x3101	Release latched Relay #2	
	0x3102	Release latched Relay #3	
	0x3103	Release latched Relay #4	
	0x3104	Release latched Relay #5	

Format Code	Value	Description	Notes
	0x4000	Increment counter #1	
	0x4001	Increment counter #2	
	0x4002	Increment counter #3	
	0x4003	Increment counter #4	
	0x4400	Count operating time using counter #1	
	0x4401	Count operating time using counter #2	
	0x4402	Count operating time using counter #3	
	0x4403	Count operating time using counter #4	
	0x5100	Send event notification	
	0x7100	Data log #1	
Counter Source ID			
F16	0x0000	None	
	0x0001-0x000E	Pulse input DI1-DI14	
Relay Output Pulse Source ID			
F17	0x0000	None	
	0x0400	kWh import pulse	
	0x0401	kWh export pulse	
	0x0403	kvarh import pulse	
	0x0404	kvarh export pulse	
	0x0405	kvarh total pulse	
	0x0406	kVAh pulse	
AO Parameters ID			
F18	0x0000	None (output disabled)	2
		1-Cycle Phase Values	
	0x0C00	V1/V12 Voltage	
	0x0C01	V2/V23 Voltage	
	0x0C02	V3/V31 Voltage	
	0x0C03	I1 Current	
	0x0C04	I2 Current	
	0x0C05	I3 Current	
	0x0C1E	V12 Voltage	
	0x0C1F	V23 Voltage	
	0x0C20	V31 Voltage	
		1-Cycle Total Values	
	0x0F00	Total kW	
	0x0F01	Total kvar	
	0x0F02	Total kVA	
	0x0F03	Total PF	
	0x0F04	Total PF Lag	
	0x0F05	Total PF Lead	
		1-Cycle Auxiliary Values	
	0x1001	In Current	
	0x1002	Frequency	
		1-Sec Phase Values	
	0x1100	V1/V12 Voltage	
	0x1101	V2/V23 Voltage	
	0x1102	V3/V31 Voltage	
	0x1103	I1 Current	
	0x1104	I2 Current	
	0x1105	I3 Current	
	0x111E	V12 Voltage	
	0x111F	V23 Voltage	
	0x1120	V31 Voltage	
		1-Sec Total Values	
	0x1400	Total kW	
	0x1401	Total kvar	
	0x1402	Total kVA	
	0x1403	Total PF	
	0x1404	Total PF Lag	
	0x1405	Total PF Lead	
		1-Sec Auxiliary Values	
	0x1501	In Current	
	0x1502	Frequency	
		Present Demands	
	0x160F	Accumulated kW import demand	
	0x1610	Accumulated kvar import demand	
	0x1611	Accumulated kVA demand	

Format Code	Value	Description	Notes
	0x161A	Accumulated kW export demand	
	0x161B	Accumulated kvar export demand	
AI Parameters ID			
F19	0x0000	None (output disabled)	
		1-Cycle Scaled Values	
	0x3B00	Analog input AI1	
	0x3B01	Analog input AI2	
Event Cause/Point ID			
F20		Communications Events	
	0x5B00-0x5BFF	Point ID (low byte, see F22)	
		Front Panel Operations	
	0x5C00-0x5CFF	Point ID (low byte, see F22)	
		Self-Check Diagnostics Events	
	0x5D00-0x5DFF	Point ID (low byte, see F22)	
		Hardware Diagnostics Events	
	0x6202	RAM/Data error	
	0x6203	Hardware watchdog reset	
	0x6204	Sampling fault	
	0x6205	CPU exception	
	0x6206	Reserved	
	0x6207	Software watchdog reset	
	0x620D	Low battery	
	0x620F	EEPROM fault	
		External Events	
	0x6300	Power down	
	0x6308	Power up	
	0x6309	External reset	
	Event Effect ID		
F21		Communications/Self-check/Front Panel Events	
	0x0000	None	
	0x6000	Total energy registers cleared	
	0x6100	All total maximum demands cleared	
	0x6101	Power maximum demands cleared	
	0x6102	Volt/Ampere maximum demands cleared	
	0x6200	Billing/TOU energy registers cleared	
	0x6300	Billing/TOU maximum demand registers cleared	
	0x6400	All counters cleared	
	0x6401-0x6403	Counter cleared (low byte = counter ID)	
	0x6500	Min/Max log cleared	
	0x6A00-0x6A1A	Log file cleared (low byte = File ID)	
	0x6B06	Communication counters cleared	
	0xF100-0xF10F	Setpoint cleared (low byte = setpoint ID)	
	0xF200	Setup/Data cleared	
	0xF300	Setup reset (set by default)	
	0xF400	Setup changed	
	0xF500	RTC set	
	0xFAxx	Successful operation (low byte=major version number with firmware download event)	
	0xFB00	No change	
Data Point ID			
F22		Data Locations	
	0x03	Data memory	
	0x04	Factory setup	
	0x05	Access/Password setup	
	0x06	Basic setup	
	0x07	Communications setup	
	0x08	Real-time clock	4
	0x09	Digital inputs setup	
	0x0A	Pulse counters setup	
	0x0B	AO setup	
	0x0E	Timers setup	
	0x10	Event/alarm setpoints	
	0x11	Pulsing setup	
	0x12	User assignable register map	
	0x14	Data log setup	
	0x15	File/Memory setup	
0x16	TOU energy registers setup		

Format Code	Value	Description	Notes
	0x18	TOU daily profiles	
	0x19	TOU calendar	
	0x1B	RO Setup	
	0x1C	User selectable options	
	0x1F	DNP 3.0 class 0 map	
	0x20	DNP 3.0 options setup	
	0x21	DNP 3.0 events setup	
	0x22	DNP 3.0 event setpoints	
	0x23	Calibration registers	
	0x24	Date/Time Setup	
	0x25	Net setup	
	0x30	IEC 60870-5 setup	
		Device operation	
	0x4E	Firmware download (low byte of the event effect contains major version number and the event value - mid and minor version numbers)	
Event Type ID			
F23		Setpoint Events	
	0x0000	SP: Generic setpoint event	
	0x0001-0x0010	SP1-SP16: Setpoint #1-#16 event	
Device Diagnostics			
F24	Bit 0	Reserved	
	Bit 1	Reserved	
	Bit 2 = 1	RAM/Data error	
	Bit 3 = 1	CPU watchdog reset	
	Bit 4 = 1	Sampling fault	
	Bit 5 = 1	CPU exception	
	Bit 6	Reserved	
	Bit 7 = 1	Software watchdog reset	
	Bit 8 = 1	Power down	
	Bit 9 = 1	Device reset	
	Bit 10 = 1	Configuration reset	
	Bit 11 = 1	RTC fault	
	Bit 12	Configuration fault	
	Bit 13	Reserved	
	Bit 14	Reserved	
	Bit 15 = 1	EEPROM fault	
DNP Object Variations			
F25		Static Binary Input Objects	
	0	Single-Bit Binary Input	
	1	Binary Input With Status	
		Static Binary Counters	
	0	32-bit Binary Counter	
	1	32-bit Binary Counter Without Flag	
	2	16-bit Binary Counter	
	3	16-bit Binary Counter Without Flag	
		Frozen Binary Counters	
	0	32-bit Frozen Counter	
	1	32-bit Frozen Counter Without Flag	
	2	32-bit Frozen Counter With Time of Freeze	
	3	16-bit Frozen Counter	
	4	16-bit Frozen Counter Without Flag	
	5	16-bit Frozen Counter With Time of Freeze	
		Static Analog Input Objects	
	0	32-bit Analog Input	
	1	32-bit Analog Input Without Flag	
	2	16-bit Analog Input	
	3	16-bit Analog Input Without Flag	
DNP Class 0 Objects			
F26	0x1E01	Analog Input 30:01	
	0x1E02	Analog Input 30:02	
	0x1E03	Analog Input 30:03	
	0x1E04	Analog Input 30:04	
	0x1F01	Frozen Analog Input 31:01	
	0x1F02	Frozen Analog Input 31:02	
	0x1F03	Frozen Analog Input 31:03	
	0x1F04	Frozen Analog Input 31:04	

Format Code	Value	Description	Notes
	0x1F05	Frozen Analog Input 31:05	
	0x1F06	Frozen Analog Input 31:06	
	0x2801	Analog Output 40:01	
	0x2802	Analog Output 40:02	
	0x0101	Binary Input 01:01	
	0x0102	Binary Input 01:02	
	0x0A01	Binary Output 10:01	
	0x0A02	Binary Output Status 10:02	
	0x1401	Binary Counter 20:01	
	0x1402	Binary Counter 20:02	
	0x1405	Binary Counter 20:05	
	0x1406	Binary Counter 20:06	
	0x1501	Frozen Counter 21:01	
	0x1502	Frozen Counter 21:02	
	0x1505	Frozen Counter 21:05	
	0x1506	Frozen Counter 21:06	
	0x1509	Frozen Counter 21:09	
	0x150A	Frozen Counter 21:10	
	0x3201	Time and Date 50:01	
Wiring Mode			
F27	0	3OP2 - 3-wire open delta using 2 CTs (2 element)	
	1	4LN3 - 4-wire WYE using 3 PTs (3 element), line-to-neutral voltage readings	
	2	3DIR2 - 3-wire direct connection using 2 CTs (2 element)	
	3	4LL3 - 4-wire WYE using 3 PTs (3 element), line-to-line voltage readings	
	4	3OP3 - 3-wire open delta using 3 CTs (2 1/2 element)	
	5	3LN3 - 4-wire WYE using 2 PTs (2 1/2 element), line-to-neutral voltage readings	
	6	3LL3 - 4-wire WYE using 2 PTs (2 1/2 element), line-to-line voltage readings	
	8	3BLN3 - 3-wire broken delta using 2 PTs (2 1/2 element), line-to-neutral voltage readings	
	9	3BLL3 - 3-wire broken delta using 2 PTs (2 1/2 element), line-to-line voltage readings	
Device Options			
F29	Bit 1=1	690V Option	
	Bits 2-5	Reserved	
	Bit 6=1	Analog output 0/4 or 4/20mA	
	Bit 7=1	Analog output 0-1mA	
	Bit 8=1	Analog output ±1mA	
	Bit 9=1	RO option	
	Bit 10=1	DI option	
	Bit 11=1	Reserved	
	Bit 12=1	Setup is secured by a password (authorization required)	
	Bits 13-15	Reserved	
	Bits 16-18	Number of RO - 1	
	Bits 19-22	Number of DI - 1	
	Bits 23-24	Number of AO - 1	
	Bits 25-31	Reserved	
I/O Slot Types			
F30	DI	DRY	0000000B
	RO		0010000B
	AI	±1 mA	0101000B
	AI	0-20 mA	01010001B
	AI	4-20 mA	01010010B
	AI	0-1 mA	01010011B
	AO	±1 mA	0110000B
	AO	0-20 mA	01100001B
	AO	4-20 mA	01100010B
	AO	0-1 mA	01100011B
	Empty slot		11111111B
Single Point Info Static Type			
F31	1	M_SP_NA_1	
	2	M_SP_TA_1 (CP24Time2a)	
	30	M_SP_TB_1 (CP56Time2a)	
Single Point Info Event Type			
F32	2	M_SP_TA_1 (CP24Time2a)	

Format Code	Value	Description	Notes
	30	M_SP_TB_1 (CP56Time2a)	
Double Point Info Static Type			
F33	3	M_DP_NA_1	
	4	M_DP_TA_1 (CP24Time2a)	
	31	M_DP_TB_1 (CP56Time2a)	
Double Point Info Event Type			
F34	4	M_DP_TA_1 (CP24Time2a)	
	31	M_DP_TB_1 (CP56Time2a)	
Measured Value Static Type			
F35	9	M_ME_NA_1	
	10	M_ME_NB_1	
	11	M_ME_NC_1	
	12	M_ME_TA_1 (CP24Time2a)	
	13	M_ME_TB_1 (CP24Time2a)	
	14	M_ME_TC_1 (CP24Time2a)	
	34	M_ME_TD_1 (CP56Time2a)	
	35	M_ME_TE_1 (CP56Time2a)	
	36	M_ME_TF_1 (CP56Time2a)	
Measured Value Event Type			
F36	12	M_ME_TA_1 (CP24Time2a)	
	13	M_ME_TB_1 (CP24Time2a)	
	14	M_ME_TC_1 (CP24Time2a)	
	34	M_ME_TD_1 (CP56Time2a)	
	35	M_ME_TE_1 (CP56Time2a)	
	36	M_ME_TF_1 (CP56Time2a)	
Integrated Totals Static Type			
F37	15	M_IT_NA_1	
	16	M_IT_TA_1 (CP24Time2a)	
	37	M_IT_TB_1 (CP56Time2a)	
Integrated Totals Event Type			
F38	16	M_IT_TA_1 (CP24Time2a)	
	37	M_IT_TB_1 (CP56Time2a)	

NOTES:

1 Analog Outputs

1) For bi-directional analog output (± 1 mA), the zero scale setup corresponds to the center (0 mA) of the scale range, and the direction of the current matches the sign of the output parameter. Unsigned parameters are output within the current range 0 to +1 mA and can be scaled as in the case of single-ended analog output (0-1 mA).

For signed values, such as powers and signed power factor, the scale is always symmetrical with regard to 0 mA, and the full scale corresponds to +1 mA output for positive readings and to -1 mA output for negative readings. The zero scale (0 mA output) is permanently set in the meter to zero for all parameters except the signed power factor for which it is set to 1.000 (see Note 2). In write requests, the zero scale is ignored.

2) Except for the signed power factor, the setup scale is continuous within the entire value range. For signed power factor, the setup scale is broken at +1.000 in order to provide continuous output current when the power factor changes close to ± 1.000 . The setup scale is symmetrical in the range of -0 to +0 with a center at 1.000 (-1.000 is assumed to be equal to +1.000). Negative power factor is output as -1.000 minus measured value, and non-negative power factor is output as +1.000 minus measured value. To set the entire range for power factor from -0 to +0, the scales would be specified as -0 to 0. Because of the fact that negative zero may not be transmitted through communications, the value of -0.001 is used to specify the scale of -0, and both +0.001 and 0.000 are used to specify the scale of +0.

2 Phase Reversal Trigger

The setpoint is operated when the actual phase sequence does not match the designated phase rotation order.

³ In 3OP2 and 3OP3 wiring modes, the voltage waveforms represent line-to-line voltages; in any other wiring mode, they will be line-to-neutral voltages.

⁴ The event value field shows the present meter time in the F1 format.