Series PM172 Powermeters

SATEC ASCII Communications Protocol

Reference Guide

BG0402 Rev. A3

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.

This document is applicable to the devices with firmware versions 13.XX and 15.XX (PM172P/E), and 14.XX and 16.XX (PM172EH).

Rev.A2 (firmware versions 13.1.11, 14.1.11 and later)
1. Maximum CT primary current is increased to 20,000A.

Rev.A3 (PM172P/E, firmware versions 13.1.16 and later)
1. Added 3-min power demand interval.
2. Added DST start/end hour setup.
3. Added the current unbalance trigger.

Table of Contents

1 General

This document specifies the SATEC ASCII serial communications protocol used to transfer data between a master computer station and the PM172. The document provides the complete information necessary to develop third-party communications software capable of communication with the Series PM172 instruments. Additional information concerning communications operation, configuring the communications parameters, and communications connections is found in "Series PM172 Powermeters, Installation and Operation Manual".

IMPORTANT

1. 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 will be shown.
2. 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.

Designations used in the guide:

E - available in the meters with the E and EH suffixes
EH - available in the meters with the EH suffix

2 ASCII Protocol Description

2.1 ASCII FRAMING

2.1.1 ASCII Message Frame

The following specifies the ASCII message frame:

Field No.	1	2	3	4	5	6	7
Contents	SYNC (!)	Message length	Slave address	Message type	Message body	Checksum	Trailer (CR LF)
Length, char	1	3	2	1	0 to 246	1	2

SYNC

Synchronization character: one character '!' (ASCII 33), used for starting synchronization.

Message length

The length of the message including only number of bytes in fields #2, #3, #4 and #5. Contains three characters between '006' and '252'.

Slave address

Contains two characters from '00' to '99'. The instrument with address '00' responds to requests with any incoming address. For RS-422/RS-485 communications (multi-drop mode), this field must NEVER be zero.

Message type

Consists of one character representing the type of a host request. A list of the message types is shown in Tables 2-1 and 2-2. Note that they are case-sensitive.

Message body

Contains the message parameters in ASCII representation. All parameter fields have a fixed format. The data fields vary in length depending on the data type. Unless otherwise indicated, the parameters should be right justified and left-padded with zeros. Most parameters are represented in ASCII hexadecimal notation, and in some cases (to provide compatibility with old devices) a decimal representation is preserved. For data formats, see Section 3.2.

Checksum

Arithmetic sum, calculated in a 2-byte word over fields #2, #3, #4 and #5 to produce a one-byte check sum in the range of 0x22 to 0x7E (hexadecimal) as follows: [Σ(each byte – 0x22)] mod 0x5C + 0x22

Trailer

The message termination consisting of two ASCII characters CR (ASCII 13) and LF (ASCII 10).

NOTE

Fields #3 and #4 of the instrument response are always the same as those in the host request.

Table 2-1 Specific ASCII Requests

Message type		Description
ASCII Char	ASCII Hex	
0	0x30	Read basic data registers
1	0x31	Read basic setup
2	0x32	Write basic setup
4	0x34	Reset/clear functions
8	0x38	Reset the instrument
9	0x39	Read version number
?	0x3F	Read extended status
@	0x40	Read log memory status
B	0x42	Read analog output setup
b	0x62	Write analog output setup
C	0x43	Read analog expander setup
c	0x63	Write analog expander setup
E	0x45	Read timer setup
e	0x65	Write timer setup
G	0x47	Read pulsing setpoint
g	0x67	Write pulsing setpoint
i	0x68	Set/clear event flag
J	0x4A	Read pulse counter setup
j	0x6A	Write pulse counter setup
K	0x4B	Read log files setup
k	0x6B	Write log files setup
L	0x4C	Read data log setup
l	0x6C	Write data log setup
S	0x53	Read Real Time Clock
T	0x54	Write Real Time Clock

Table 2-2 Direct Read/Write ASCII Requests

Message type		Description
ASCII Char	ASCII Hex	
A	0x41	Long-size direct read
a	0x61	Long-size direct write
X	0x58	Variable-size direct read
x	0x78	Variable-size direct write

2.2 Exception Responses

The instrument will send the following error codes in the message body in response to incorrect host requests:

XK - the meter is in programming mode
XM - invalid request type or illegal operation
XP - invalid data address or data value, or data is not available

NOTE

When a check or framing error is detected, the meter will not act on or respond to the master's request.

2.3 PROTOCOL IMPLEMENTATION

2.3.1 ASCII Specific and Direct Requests

The ASCII protocol provides two different types of messages to transfer data between a master application and the meter: specific requests and direct read/write requests.

Specific ASCII requests use different formats for accessing different data locations. The message body differs depending on the request type. Each data field has a fixed position in the ASCII string. Section 3 describes specific ASCII requests and their message body formats.

Direct read/write requests use a universal message body format, described in Section 2.4. These requests allow a master application to access different data locations (registers) in the instrument by specifying a direct register index. A number of consequent registers can be read or written by a single request by specifying an arbitrary start register and the number of registers to be accessed. Section 4 gives a register map for direct read/write requests and their contents.

All measurement data in your instrument can be accessed using direct read requests, and some data can be read via specific ASCII requests. In all cases, a direct register read offers you more precise data with extended resolution. Setup data can be partially accessed using both specific and direct requests, and partially via either specific or direct requests.

2.3.2 Data Formats

Specific ASCII requests use both decimal and hexadecimal notation. Direct requests transfer ASCII data only in a hexadecimal format.

Using a decimal notation, data is transmitted in a decimal representation as is, i.e., no conversion is needed. Negative numbers are transmitted with a sign at the left. Fractional numbers are represented with a decimal point. When the value exceeds the field width, it is truncated to the right.

In a hexadecimal notation, each data byte is transferred by two hexadecimal characters in ASCII representation (i.e., ASCII printable characters 0-9, A-F are used to represent hexadecimal digits 0x00-0x09, 0x0a-0x0f). All data is transferred as 2-character (8-bit unsigned byte), 4-character (16-bit unsigned or signed integer) or 8-character (32-bit unsigned or signed long integer) whole numbers. Negative numbers are transmitted in 2-complement code. Each data byte is transmitted high order digit first. Each integer or long integer register is transmitted high order bytes first.

Fractional numbers are transmitted being scaled by 10 in 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 being pre-multiplied by 100. Whenever a data register contains a fractional number, the register measurement unit is given with a multiplier ×0.1, ×0.01 or ×0.001, showing an actual register resolution (the weight of the least significant decimal digit). To get an actual fractional number with specified precision, scale the register value with the given multiplier. To write a fractional number into the register, divide the number by the given multiplier.

2.4 DIRECT READ/WRITE REQUESTS

2.4.1 General

In direct read/write requests, data registers are addressed by point ID's that are given in a 4-digit hexadecimal format. All data is transmitted in ASCII hexadecimal notation as 2-character (UINT8, 8-bit unsigned byte), 4-character (16-bit unsigned UINT16 or signed INT16 integer) or 8-character (32-bit unsigned UINT32 or signed INT32 long integer) numbers. Negative numbers are transmitted in 2-complement code. Register type in the tables below shows an actual data size for data accessed using variable-size direct read/write requests. When long-size direct read/write request is used, an actual data size is ignored and all registers are transmitted in an 8-character format as long signed (INT32) or unsigned (UINT32) integers.

2.4.2 Long-Size Direct Read/Write

In long-size direct read/write messages, all data items are read and written as long unsigned (UINT32) or signed (INT32) integers, which are represented in messages by 8-digit hexadecimal numbers, regardless of the actual data size. Up to 30 contiguous points can be read in one message once. A write request allows for writing only one data location at a time.

Table 2-3 Read Request

Offset	Description	Range	Type
	Message type	**'A'**	
	Request body:		
+0	Start point ID	0x0000-0xFFFF	UINT16
+4	The number of points to read	1-30 (0x01-0x1E)	UINT8
	Response body:		
+0	Number of points read	1-30 (0x01-0x1E)	UINT8
+2	Point #1 value	0x00000000-0xFFFFFFFF	INT32
+10	Point #2 value	0x00000000-0xFFFFFFFF	INT32
…	…		…
+234	Point #30 value	0x00000000-0xFFFFFFFF	INT32

Table 2-4 Write Request

Offset	Description	Range	Type
	Message type	**'a'**	
	Request body:		
+0	Point ID	0x0000-0xFFFF	UINT16
+4	Point value to write	0x00000000-0xFFFFFFFF	INT32
	Response body:		
+0	Point ID	0x0000-0xFFFF	UINT16
+4	Written value	0x00000000-0xFFFFFFFF	INT32

2.4.3 Variable-Size Direct Read/Write

With variable-size direct read/write messages, data points are read and written as 2, 4 or 8-character hexadecimal numbers. The actual data size is indicated for each data location. When written, the data type should be exactly the same as indicated.

The number of parameters that can be read or written by a single read/write request depends on the size of each data item. The total length of all parameters should not exceed 240 characters.

Table 2-5 Read Request

Offset	Description	Range	Type
	Message type	**'X'**	
	Request body:		
+0	Start point ID	0x0000-0xFFFF	UINT16
+4	The number of points to read	1-60 (0x01-0x3C)	UINT8
	Response body:		
+0	Number of points read	1-60 (0x01-0x3C)	UINT8
+2	Point #1 value		INT8/16/32
	Point #2 value		INT8/16/32
	…		…
	Point #60 value		INT8/16/32

Table 2-6 Write Request

Offset	Description	Range	Type
	Message type	**'x'**	
	Request body:		
+0	Start point ID	0x0000-0xFFFF	UINT16
+4	The number of points to write	1-60 (0x01-0x3C)	UINT8
+6	Point #1 value		INT8/16/32
	Point #2 value		INT8/16/32
	…		…
	Point #60 value		INT8/16/32
	Response body:		
+0	Start point ID	0x0000-0xFFFF	UINT16
+4	Number of points written	1-60 (0x01-0x3C)	UINT8

2.4.4 User Assignable Registers

The PM172 contains 120 user assignable registers designated by points 0x8000 through 0x8077, any of which you can map to any point accessible in the instrument through direct read/write requests. Points that reside in different locations may be accessed by a single request by re-mapping them to adjacent points in the user assignable registers area.

The actual point ID's of the assignable registers, which are accessed via addresses 0x8000 through 0x8077, are specified in the register map through points 0x8100-0x8177, where point 0x8100 contains the actual point ID of the register accessed via point 0x8000, point 0x8101 contains the actual point ID of the register accessed via point 0x8001, and so on. The assignable registers and the map registers themselves may not be re-mapped.

To build your own register map, write to map registers (points 0x8100-0x8177) the actual point ID's of the registers you want to read from or write to via the assignable points 0x8000-0x8077. For example, if you want to read points 0x0C00 (real-time voltage of phase A) and 0x1700 (kWh import) through points 0x8000-0x8001, do the following:

- write 0x0C00 to point 0x8100
- write 0x1700 to point 0x8101

Reading from points 0x8000-0x8001 will return the voltage reading through point 0x8000, and the kWh reading through point 0x8001.

2.5 Password Protection

The PM172 has a password protection option allowing you to protect your setups, cumulative registers and logs from being changed or cleared through communications. You can disable or enable password protection through communications or via the front display. For details, refer to your instrument Installation and Operation Manual. When password protection is enabled, the user password you set in your instrument should be written into the device authorization register (point 0xFF00) before another write request is issued. If the correct password is not supplied while password protection is enabled, the instrument will respond to all write requests with the exception code XM (illegal operation). It is recommended to clear the password register after you have completed your changes in order to activate password protection.

2.6 Data Recording and File Transfers

2.6.1 Log File Organization

Historical files are stored to the non-volatile memory with a battery backup. Memory is allocated for each file statically when you set up your files and will not change unless you re-organize the files. The PM172 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 PM172 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 16) sections for multi-channel recording. An ordinal file consists of a single section. Some files, such as daily profile log files and waveform log files, are arranged as multi-section files.

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 through a particular register window related to the section.

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 Files

Data log files can store up to 16 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 Files

Data log file #8 can be configured to store 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. The number of sections is taken automatically from your 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 allocated Summary/TOU registers. In order to correctly allocate the memory space for the profile log file, you should set up the Summary/TOU registers before you allocate memory for your profile log file.

A daily profile log file stores the daily summary (total of all tariffs) data and/or all tariff data for each configured Summary/TOU register. New records are added to the file automatically every day at midnight. You can review the list of parameters that are recorded to the file through the Data log #8 setup. It is preset automatically by the meter and shows the recorded data for the first file section, which represents the first configured energy/usage register.

Waveform Log Files

Waveform log files are organized as multi-section files that store data for each recording channel in a separate section. A waveform log file can record 6 AC channels simultaneously: three voltage and three current waveforms. The number of sections in a file, or channels that a file can store, is defined when you set up the file. The channels that a file will record are selected in the waveform log setup. All selected channels are recorded in successive file sections.

A waveform file has a single read pointer for all sections, so that data from all channels of a single record can be read together without repositioning the file pointer. When you point to a particular file record, data from all sections related to the same event are all available for a read. Moreover, the PM172 takes all channel data for the currently accessed record to a separate buffer, so that even when the record is overwritten at the time of reading, you are still prevented from receiving partially updated data.

A single waveform record for a channel can contain up to 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.

If a waveform log is configured to record more samples per event than a single record can hold, the waveform recorder will store as many records per event as required to record the entire event. All waveform records related to the event are merged in a series and have the same series number, so that they can be plotted together. Each record within a series has a unique serial number that allows tracking the sequence of records in a series. A single waveform series can hold up to 81,920 points (2,560 cycles at a rate of 32 samples per cycle) of a sampled AC signal.

2.6.2 File Transfers

File transfer protocol provides both data transfer and information services. File transfer is performed through blocks of registers separate for each file and file section. File transfer control registers allow changing the file or section position in order to point to the desired record.

The information service uses separate status/control registers for each file. The extended file information is available including current file pointers' positions, the number of records in the file, allocated file size, and more.

Common File Transfer

Log files can be read either in a sequence record-by-record, or in a random order. Each read request fills the corresponding register 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 writing the desired sequence number into the file transfer control register. If you want to read a file from the beginning, you can simply write a corresponding command to the file command register 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 a sequence after you have uploaded the current record. Instead, continue reading the file through the file transfer block.

For the event log files, the file transfer block can contain up to 6 records that can be read at once: the file position automatically moves to the record following the last one you have just read in the file transfer block.

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 1 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 read 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, 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 want to begin reading a file from a particular record or from the first record, either set the file position to the desired record sequence number, or preset the file position to point to oldest record.
2) Read the record data through the corresponding file transfer block. The file pointer will be automatically moved to the next file record.
3) Repeat steps 1-2 until all the file records are read, i.e., until either bit 0 or bit 1 is set in the record status word.

Reading a Profile Log File

Reading a multi-section profile log file does not differ from reading ordinal files with the only exception that each file section is accessed through a separate transfer block.

If you want to know which registers are recorded to the file sections before reading them, check the daily profile log sections map through point `0xA0F4` (see Section 4.7, File Transfer Registers). This is a bitmap that contains one in a bit position if a designated register is recorded to the file, and contains zero if it is not.

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

1) If you want to begin reading a file section from a particular record or from the first record, either set the file section position to the desired record sequence number, or preset the file section position to point to oldest record.
2) Read the record data through the corresponding file section transfer block. The file pointer automatically moves to the next file record.
3) Repeat steps 1-2 until all the file section records are read, i.e., until either bit 0 or bit 1 is set in the record status word.

Reading Waveform Files

Each waveform record consists of 6 channel records that are read in sequence always starting with channel V1. Each channel's data is read in two stages. The channel header record is read first through a separate transfer block followed be reading the channel sample series. When the channel V1 header is first accessed, the meter stores the waveform records for all channels together into a communication buffer so you can then read them through the dedicated transfer blocks without the risk of losing data. The following gives a summary of steps for a waveform file:

1) If you want to begin reading a file from a particular record or from the first record, either set the file position to the desired record sequence number, or preset the file position to point to oldest record.
2) Read the V1 channel header data through the corresponding waveform header transfer block. The record data is moved to the port's communication buffer, and then the file pointer automatically moves to the next record.
3) Read the V1 channel sample series through the waveform series transfer block.
4) Read the next channel's header data through the corresponding waveform header transfer block.
5) Read the sample series for the selected channel through the waveform series transfer block.
6) Repeat steps 4, 5 until all channels' records are read.
7) Repeat steps 2-6 until all the file records are read.

Reading Real-time Waveforms

Real-time waveforms are accessed through the separate transfer blocks just like the waveform log data. The meter provides a large waveform buffer that can simultaneously store 6 waveform records – three voltage and three current waveforms. Each time you read the V1 channel header record, the meter captures new waveforms to the buffer so that you can then read all of them through the waveform transfer blocks. The following gives a summary of steps for reading real-time waveforms:

1) Read the V1 channel header data through the corresponding real-time waveform header transfer block. The captured waveform's data is moved to the port's communication buffer.
2) Read the V1 channel sample series through the waveform series transfer block.
3) Read the next channel's header data through the corresponding waveform header transfer block.
4) Read the sample series for the selected channel through the waveform series transfer block.
5) Repeat steps 3, 4 until all channels' records are read.

3 Specific ASCII Requests

3.1 Basic Data Set

Offset	Length	Description	Range[2]	Units[2]	Type	R/W	Notes
Basic Data Set							
		Message Type	**'0'**				
		Request Body	No				
		Response Body (decimal)					
+0	4	V1/V12 Voltage	0 to Vmax	U1			1
+4	4	V2/V23 Voltage	0 to Vmax	U1			1
+8	4	V3/V31 Voltage	0 to Vmax	U1			1
+12	5	I1 Current	0 to Imax	U2			
+17	5	I2 Current	0 to Imax	U2			
+22	5	I3 Current	0 to Imax	U2			
+27	6	kW L1	-Pmax to Pmax	U3			
+33	6	kW L2	-Pmax to Pmax	U3			
+39	6	kW L3	-Pmax to Pmax	U3			
+45	4	Power factor L1	-.99 to 1.00 [4]				
+49	4	Power factor L2	-.99 to 1.00 [4]				
+53	4	Power factor L3	-.99 to 1.00 [4]				
+57	6	kW total	-Pmax to Pmax	U3			
+63	4	Power factor total	-.99 to 1.00 [4]				
+67	6	kWh import	0 to 99999.	MWh			3
+73	5	Neutral (unbalanced) current	0 to Imax	A			
+78	4	Frequency	25.0 to 400.	Hz			
+82	6	kvar L1	-Pmax to Pmax	U3			
+88	6	kvar L2	-Pmax to Pmax	U3			
+94	6	kvar L3	-Pmax to Pmax	U3			
+100	6	kVA L1	0 to Pmax	U3			
+106	6	kVA L2	0 to Pmax	U3			
+112	6	kVA L3	0 to Pmax	U3			
+118	6	kvarh net	-9999. to 99999.	Mvarh			3
+124	6	kvar total	-Pmax to Pmax	U3			
+130	6	kVA total	0 to Pmax	U3			
+136	6	Maximum sliding window kW import demand [5]	0 to Pmax	U3			
+142	6	Accumulated kW import demand	0 to Pmax	U3			
+148	5	I1 Max. ampere demand	0 to Imax	U2			
+153	5	I2 Max. ampere demand	0 to Imax	U2			
+158	5	I3 Max. ampere demand	0 to Imax	U2			
+163	2	Status inputs (bitmap - hex)	0x00-0x03				
+165	6	kWh export	0 to 99999.	MWh			3

Offset	Length	Description	Range[2]	Units[2]	Type	R/W	Notes
+171	6	Maximum sliding window kVA demand [5]	0 to Pmax	U3			
+177	4	V1/V12 Voltage THD	0.0 to 999.	%			[1] 3-sec value
+181	4	V2/V23 Voltage THD	0.0 to 999.	%			[1] 3-sec value
+185	4	V3/V31 Voltage THD	0.0 to 999.	%			[1] 3-sec value
+189	4	I1 Current THD	0.0 to 999.	%			3-sec value
+193	4	I2 Current THD	0.0 to 999.	%			3-sec value
+197	4	I3 Current THD	0.0 to 999.	%			3-sec value
+201	8	kVAh total	0 to 99999.99	MVAh			[3]
+209	6	Present sliding window kW import demand [5]	0 to Pmax	U3			
+215	6	Present sliding window kVA demand [5]	0 to Pmax	U3			
+221	4	PF (import) at maximum KVA demand	0 to 1.00				
+225	4	I1 Current TDD	0.0 to 99.9	%			3-sec value
+229	4	I2 Current TDD	0.0 to 99.9	%			3-sec value
+233	4	I3 Current TDD	0.0 to 99.9	%			3-sec value

NOTES:

Energy and Power demand readings are only available in the meters with suffixes E and EH.

[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.
When the 4LN3, 4LL3, 3LN3, 3LL3, 3BLN3 or 3BLL3 wiring mode is selected, the voltage harmonics will be line-to-neutral; for any other wiring mode, they will be line-to-line.

[2] All analog registers except of harmonics are 1-second average values. For volts, amps and power scales and units, refer to Section 5 "Data Scales and Units".

When ASCII compatibility mode is disabled (see Section 5.5), voltages, currents and powers are transmitted with a decimal point in units defined in the table. When the value is greater than the field width, the right most digits of the fractional part are truncated.

When ASCII compatibility mode is enabled, the meter provides a fully downward-compatible response using a lower resolution for voltages, currents and powers - the value is transmitted as a whole number until the field is filled up, and then it is converted to higher units and transmitted with a decimal point. If the value is greater than the field width, the right most digits of the fractional part are truncated. Voltages are transmitted in volts as whole numbers or in kilovolts with a decimal point, currents in amperes as whole numbers, and powers in kilowatts as whole numbers or in megawatts with a decimal point.

[3] Energy readings are transmitted in MWh, Mvarh and MVAh units with a decimal point. If the energy value exceeds the field width, the right-most digits are truncated**. If you use these request for energy readings, then, to avoid overflow, limit the energy roll value (see Device Options Setup) to 7 digits if you use kvarh net reading or to 8 digits if you do not use it.**

[4] For negative power factor, the minus sign is transmitted before a decimal point as shown in the table.

3.2 Device Control and Status

Offset	Length	Description	Range	Units	Type	R/W	Notes
Reset/Clear							
		Message Type	**'4'**				
		Request Body (hexadecimal):					
+0	1	Reset function	F30				
+1	2	Target	F30				

Offset	Length	Description	Range	Units	Type	R/W	Notes
		Response – the same as request					
Warm Restart							
		Message Type	**'8'**				
		Request Body	No				
		Response Body	No				
Firmware Version							
		Message Type	**'9'**				
		Request Body	No				
		Response Body					
+0	4	Firmware version number	1300-1399,1500-1599 (PM172P/E), 1400-1499,1600-1699 (PM172EH)				Two higher decimal digits = major version number, two lower decimal digits = minor version number
+4	2	Firmware build number	1-99				
Device Status							
		Message Type	**'?'**				
		Request Body	No				
		Response Body					
+0	4	Relay status (bitmap)	0x0000-0x0003				
+4	4	User event flags status (bitmap) EH	0x0000-0x00FF				
+8	4	Digital (status) inputs (bitmap)	0x0000-0x0003				
+12	4	Setpoints status (bitmap)	0x0000-0xFFFF				
+16	4	Log status (bitmap) E	F26				
+20	4	Data log status (bitmap) E	F27				
+24	32	Not used					
File Allocation Status							
		Message Type	**'@'**				
		Request Body	No				
		Response Body					
+0	8	File memory size, Bytes	1040384				
+8	8	Free file memory size, Bytes	0-1040384				
+16	4	Total number of records in the Event log file	0-65535				
+20	4	Total number of records in the Data log #1 file	0-65535				
+24	4	Total number of records in the Data log #2 file	0-65535				
+28	4	Total number of records in the Data log #3 file	0-65535				
+32	4	Total number of records in the Data log #4 file	0-65535				
+36	4	Total number of records in the Data log #5 file	0-65535				
+40	4	Total number of records in the Data log #6 file	0-65535				
+44	4	Total number of records in the Data log #7 file	0-65535				
+48	4	Total number of records in the Data log #8 file	0-65535				
+52	32	Reserved	0				
+84	4	Total number of records in the Waveform log #1 file	0-65535				
+88	4	Total number of records in the Waveform log #2 file	0-65535				
+92	4	Number of new records in the Event log file	0-65535				

Offset	Length	Description	Range	Units	Type	R/W	Notes
+96	4	Number of new records in the Data log #1 file	0-65535				
+100	4	Number of new records in the Data log #2 file	0-65535				
+104	4	Number of new records in the Data log #3 file	0-65535				
+108	4	Number of new records in the Data log #4 file	0-65535				
+112	4	Number of new records in the Data log #5 file	0-65535				
+116	4	Number of new records in the Data log #6 file	0-65535				
+120	4	Number of new records in the Data log #7 file	0-65535				
+124	4	Number of new records in the Data log #8 file	0-65535				
+128	32	Reserved	0				
+160	4	Number of new records in the Waveform log #1 file	0-65535				
+164	4	Number of new records in the Waveform log #2 file	0-65535				

3.3 Device Setup

Offset	Length	Description	Range	Units	Type	R/W	Notes
Read Basic Setup							
		Message Type	**'1'**				
		Request Body (decimal):					
+0	3	Parameter ID	F31				
		Response Body (decimal)					
+0	3	Parameter ID	F31				
+3	4	Not used	00.0				
+7	6	Parameter value	See "Basic Setup" in Section 4.5				
Write Basic Setup							
		Message Type	**'1'**				
		Request Body (decimal):					
+0	3	Parameter ID	F31				
+3	4	Not used	00.0				
+7	6	Parameter value	See "Basic Setup" in Section 4.5				
		Response – the same as request					
Read Analog Output Setup							
		Message Type	**'B'**				
		Request Body					
+0	2	Analog channel number	0-1=channel AO1-AO2				
		Response Body (hexadecimal)					
+0	2	Analog channel number	0-1=channel AO1-AO2				
+2	4	Output parameter point ID	F18				
+6	8	Zero scale (0/4 mA)	See Section 4.2				
+14	8	Full scale (20/1 mA)	See Section 4.2				
Write Analog Output Setup							
		Message Type	**'b'**				
		Request Body (hexadecimal)					

Offset	Length	Description	Range	Units	Type	R/W	Notes
+0	2	Analog channel number	0-1=channel AO1-AO2				
+2	4	Output parameter point ID	F18				
+6	8	Zero scale (0/4 mA)	See Section 4.2				
+14	8	Full scale (20/1 mA)	See Section 4.2				
		Response Body – the same as request					
Read Analog Expander Setup							
		Message Type	**'C'**				
		Request Body					
+0	2	Analog channel number	0-7=AX8 #1 Channel #1-#8, 8-15=AX8 #2 Channel #1-#8				
		Response Body (hexadecimal)					
+0	2	Analog channel number	0-7=AX8 #1 Channel #1-#8, 8-15=AX8 #2 Channel #1-#8				
+2	4	Output parameter point ID	F18				
+6	8	Zero scale (0/4 mA)	See Section 4.2				
+14	8	Full scale (20/1 mA)	See Section 4.2				
Write Analog Expander Setup							
		Message Type	**'c'**				
		Request Body (hexadecimal)					
+0	2	Analog channel number	0-7=AX8 #1 Channel #1-#8 8-15=AX8 #2 Channel #1-#8				
+2	4	Output parameter point ID	F18				
+6	8	Zero scale (0/4 mA)	See Section 4.2				
+14	8	Full scale (20/1 mA)	See Section 4.2				
		Response Body – the same as request					
Read Periodic Timer Setup							
		Message Type	**'E'**				
		Request Body					
+0	2	Timer ID	0-1=timer #1-#2				
		Response Body (hexadecimal)					
+0	2	Timer ID	0-1=timer #1-#2				
+2	4	Timer interval	1-9999, 0=timer disabled	sec			
Write Periodic Timer Setup							
		Message Type	**'e'**				
		Request Body (hexadecimal)					
+0	2	Timer ID	0-15=channel #1-#16				
+2	4	Timer interval	1-9999, 0=timer disabled	sec			
		Response Body – the same as request					
Write Event Flag							
		Message Type	**'i'**				
		Request Body (hexadecimal)					
+0	2	Flag ID	0-7=flag #1-#8				
+2	2	Flag status	0-1				

Offset	Length	Description	Range	Units	Type	R/W	Notes
		Response Body – the same as request					
Read Pulse Counter Setup							
		Message Type	**'J'**				
		Request Body					
+0	2	Counter ID	0-3=counter #1-#4				
		Response Body (hexadecimal)					
+0	2	Counter ID	0-3=counter #1-#4				
+2	2	Source ID	0=not assigned, 1-2=DI1-DI2				
+4	4	Multiplier	1-9999				
Write Pulse Counter Setup							
		Message Type	**'j'**				
		Request Body (hexadecimal)					
+0	2	Counter ID	0-3=counter #1-#4				
+2	2	Source ID	0=not assigned, 1-2=DI1-DI2				
+4	4	Multiplier	1-9999				
+2	4	Timer interval	1-9999, 0=timer disabled				
		Response Body – the same as request					
Read File Setup							
		Message Type	**'K'**				
		Request Body (hexadecimal)					
+0	2	File ID	F8				
		Response Body (hexadecimal)					
+0	2	File ID	F8				
+2	8	Allocated file size, bytes					
+10	4	Number of records in the file	0-65535				
+14	4	File record size, bytes					
+18	2	The number of parameters per record	0-16				
+20	2	File attributes	F3				
Write File Setup							
		Message Type	**'k'**				
		Request Body (hexadecimal)					
+0	2	File ID	F8				
+2	4	Number of records in the file	1-65535, 0=delete a file				
+6	2	The number of parameters per record	0-16				Write 0 for event log and waveform log
+8	2	File attributes	F3				
		Response Body (hexadecimal)					
+0	2	File ID	F8				
Read Data Log Setup							
		Message Type	**'L'**				
		Request Body (hexadecimal)					
+0	2	Data log ID	0-7=Data log #1-#8				
		Response Body (hexadecimal)					

Offset	Length	Description	Range	Units	Type	R/W	Notes
+0	2	Data log ID	0-7=Data log #1-#8				
+2	2	Number of parameters per record	1-16, 0=file does not exist				
+4	4	Data log parameter #1 point ID	See Section 4.2				
+8	4	Data log parameter #2 point ID					
+12	4	Data log parameter #3 point ID					
+16	4	Data log parameter #4 point ID					
+20	4	Data log parameter #5 point ID					
+24	4	Data log parameter #6 point ID					
+28	4	Data log parameter #7 point ID					
+32	4	Data log parameter #8 point ID					
+36	4	Data log parameter #9 point ID					
+40	4	Data log parameter #10 point ID					
+44	4	Data log parameter #11 point ID					
+48	4	Data log parameter #12 point ID					
+52	4	Data log parameter #13 point ID					
+56	4	Data log parameter #14 point ID					
+60	4	Data log parameter #15 point ID					
+64	4	Data log parameter #16 point ID					
Write Data Log Setup							
		Message Type	**'I'**				
		Request Body (hexadecimal)					
+0	2	Data log ID	0-7=Data log #1-#8				
+2	2	Number of parameters per record	1-16				
+4	4	Data log parameter #1 point ID	See Section 4.2				
+8	4	Data log parameter #2 point ID					
+12	4	Data log parameter #3 point ID					
+16	4	Data log parameter #4 point ID					
+20	4	Data log parameter #5 point ID					
+24	4	Data log parameter #6 point ID					
+28	4	Data log parameter #7 point ID					
+32	4	Data log parameter #8 point ID					
+36	4	Data log parameter #9 point ID					
+40	4	Data log parameter #10 point ID					
+44	4	Data log parameter #11 point ID					
+48	4	Data log parameter #12 point ID					
+52	4	Data log parameter #13 point ID					
+56	4	Data log parameter #14 point ID					
+60	4	Data log parameter #15 point ID					
+64	4	Data log parameter #16 point ID					
		Response Body (hexadecimal)					
+0	2	Data log ID	0-7=Data log #1-#8				
Read Clock Indication							
		Message Type	**'S'**				

Offset	Length	Description	Range	Units	Type	R/W	Notes
		Request Body	No				
		Response Body (decimal)					
+0	2	Second	0-59				
+2	2	Minute	0-59				
+4	2	Hour	0-23				
+6	2	Day	1-31				
+8	2	Month	1-12				
+10	2	Year	0-99				
+12	2	Day of week	1-7 (1=Sunday)				
Write Clock Setup							
		Message Type	**'T'**				
		Request Body (decimal)					
+0	2	Second	0-59				
+2	2	Minute	0-59				
+4	2	Hour	0-23				
+6	2	Day	1-31				
+8	2	Month	1-12				
+10	2	Year	0-99				
+12	2	Day of week	1-7 (1=Sunday)				Ignored when written
		Response Body – the same as request					

4 Direct Read/Write Requests

4.1 Protocol Setup Registers

Point ID	Description	Options/Range	Units	Type	R/W	Notes
Assignable Registers						
0x8000	Register 0 contents	0-65535		UINT16	R/W	
0x8001	Register 1 contents	0-65535		UINT16	R/W	
	...					
0x8077	Register 119 contents	0-65535		UINT16	R/W	
Assignable Registers Map						
0x8100	Mapped point for register 0x8000	0x0000 - 0xFFFF		UINT16	R/W	
0x8101	Mapped point for register 0x8001	0x0000 - 0xFFFF		UINT16	R/W	
	...					
0x8177	Mapped point for register 0x8077	0x0000 - 0xFFFF		UINT16	R/W	
Device Data Scales						
0x81F2	Voltage scale, in secondary volts	60-828 (default 144V)	1V	UINT16	R/W	
0x81F3	Current scale, in secondary amps = CT secondary current (1A, 5A) × Current overload	20, 100 (2.0A, 10.0A)	×0.1A	UINT16	R	

4.2 Analog Registers, Binary Registers and Counters

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x0000	**None**	0		UINT16	R	
	Special Inputs					
0x0100	Voltage disturbance EH	0-100	%	UINT16	R	
0x0101	Phase rotation order	0=error, 1=positive (ABC), 2=negative (CBA)		UINT16	R	
0x0300	**Event Flags (bitmap) EH**	0x0000-0x00FF		UINT16	R	
0x0600	**Digital Inputs DI1-DI2 (bitmap)**	0x0000-0x0003		UINT16	R	
0x0800	**Relay Outputs RO1-RO2 (bitmap)**	0x0000-0x0003		UINT16	R	
	Counters					
0x0A00	Counter #1	0-999,999		UINT32	R/W	
0x0A01	Counter #2	0-999,999		UINT32	R/W	
0x0A02	Counter #3	0-999,999		UINT32	R/W	
0x0A03	Counter #4	0-999,999		UINT32	R/W	
	1-Cycle Phase Values					
0x0C00	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
0x0C01	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
0x0C02	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x0C03	I1 Current	0-Imax	U2	UINT32	R	
0x0C04	I2 Current	0-Imax	U2	UINT32	R	
0x0C05	I3 Current	0-Imax	U2	UINT32	R	
0x0C06	kW L1	-Pmax-Pmax	U3	INT32	R	
0x0C07	kW L2	-Pmax-Pmax	U3	INT32	R	
0x0C08	kW L3	-Pmax-Pmax	U3	INT32	R	
0x0C09	kvar L1	-Pmax-Pmax	U3	INT32	R	
0x0C0A	kvar L2	-Pmax-Pmax	U3	INT32	R	
0x0C0B	kvar L3	-Pmax-Pmax	U3	INT32	R	
0x0C0C	kVA L1	0-Pmax	U3	UINT32	R	
0x0C0D	kVA L2	0-Pmax	U3	UINT32	R	
0x0C0E	kVA L3	0-Pmax	U3	UINT32	R	
0x0C0F	Power factor L1	-1000-1000	×0.001	INT16	R	
0x0C10	Power factor L2	-1000-1000	×0.001	INT16	R	
0x0C11	Power factor L3	-1000-1000	×0.001	INT16	R	
0x0C12	V1/V12 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 4-cycle value
0x0C13	V2/V23 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 4-cycle value
0x0C14	V3/V31 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 4-cycle value
0x0C15	I1 Current THD	0-9999	×0.1%	UINT16	R	4-cycle value
0x0C16	I2 Current THD	0-9999	×0.1%	UINT16	R	4-cycle value
0x0C17	I3 Current THD	0-9999	×0.1%	UINT16	R	4-cycle value
0x0C18	I1 K-Factor	10-9999	×0.1	UINT16	R	4-cycle value
0x0C19	I2 K-Factor	10-9999	×0.1	UINT16	R	4-cycle value
0x0C1A	I3 K-Factor	10-9999	×0.1	UINT16	R	4-cycle value
0x0C1B	I1 Current TDD	0-1000	×0.1%	UINT16	R	4-cycle value
0x0C1C	I2 Current TDD	0-1000	×0.1%	UINT16	R	4-cycle value
0x0C1D	I3 Current TDD	0-1000	×0.1%	UINT16	R	4-cycle value
0x0C1E	V12 Voltage	0-Vmax	U1	UINT16	R	
0x0C1F	V23 Voltage	0-Vmax	U1	UINT16	R	
0x0C20	V31 Voltage	0-Vmax	U1	UINT16	R	
	1-Cycle Total Values					
0x0F00	Total kW	-Pmax-Pmax	U3	INT32	R	
0x0F01	Total kvar	-Pmax-Pmax	U3	INT32	R	
0x0F02	Total kVA	0-Pmax	U3	UINT32	R	
0x0F03	Total PF	-1000-1000	×0.001	INT16	R	
0x0F04	Total PF lag	0-1000	×0.001	UINT16	R	
0x0F05	Total PF lead	0-1000	×0.001	UINT16	R	
0x0F06	Total kW import	0-Pmax	U3	UINT32	R	
0x0F07	Total kW export	0-Pmax	U3	UINT32	R	
0x0F08	Total kvar import	0-Pmax	U3	UINT32	R	
0x0F09	Total kvar export	0-Pmax	U3	UINT32	R	
0x0F0A	3-phase average L-N/L-L voltage	0-Vmax	U1	UINT32	R	[1]
0x0F0B	3-phase average L-L voltage	0-Vmax	U1	UINT32	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x0F0C	3-phase average current	0-Imax	U2	UINT32	R	
	1-Cycle Auxiliary Values					
0x1000	Not used			UINT32	R	
0x1001	In (neutral) Current	0-Imax	U2	UINT32	R	
0x1002	Frequency	0-Fmax	×0.01Hz	UINT16	R	
0x1003	Voltage unbalance	0-3000	×0.1%	UINT16	R	
0x1004	Current unbalance	0-3000	×0.1%	UINT16	R	
	Phasor					
0x1080	V1/V12 Voltage magnitude	0-Vmax	U1	UINT32	R	1
0x1081	V2/V23 Voltage magnitude	0-Vmax	U1	UINT32	R	1
0x1082	V3/V31 Voltage magnitude	0-Vmax	U1	UINT32	R	1
0x1083	Not used			UINT32	R	
0x1084	I1 Current magnitude	0-Imax	U2	UINT32	R	
0x1085	I2 Current magnitude	0-Imax	U2	UINT32	R	
0x1086	I3 Current magnitude	0-Imax	U2	UINT32	R	
0x1087	Not used			UINT32	R	
0x1088	V1/V12 Voltage angle	-1800-1800	×0.1°	INT16	R	1
0x1089	V2/V23 Voltage angle	-1800-1800	×0.1°	INT16	R	1
0x108A	V3/V31 Voltage angle	-1800-1800	×0.1°	INT16	R	1
0x108B	Not used			INT16	R	
0x108C	I1 Current angle	-1800-1800	×0.1°	INT16	R	
0x108D	I2 Current angle	-1800-1800	×0.1°	INT16	R	
0x108E	I3 Current angle	-1800-1800	×0.1°	INT16	R	
0x108F	Not used			INT16	R	
	1-Second Phase Values					
0x1100	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
0x1101	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
0x1102	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1
0x1103	I1 Current	0-Imax	U2	UINT32	R	
0x1104	I2 Current	0-Imax	U2	UINT32	R	
0x1105	I3 Current	0-Imax	U2	UINT32	R	
0x1106	kW L1	-Pmax-Pmax	U3	INT32	R	
0x1107	kW L2	-Pmax-Pmax	U3	INT32	R	
0x1108	kW L3	-Pmax-Pmax	U3	INT32	R	
0x1109	kvar L1	-Pmax-Pmax	U3	INT32	R	
0x110A	kvar L2	-Pmax-Pmax	U3	INT32	R	
0x110B	kvar L3	-Pmax-Pmax	U3	INT32	R	
0x110C	kVA L1	0-Pmax	U3	UINT32	R	
0x110D	kVA L2	0-Pmax	U3	UINT32	R	
0x110E	kVA L3	0-Pmax	U3	UINT32	R	
0x110F	Power factor L1	-1000-1000	×0.001	INT16	R	
0x1110	Power factor L2	-1000-1000	×0.001	INT16	R	
0x1111	Power factor L3	-1000-1000	×0.001	INT16	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x1112	V1/V12 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 3-sec value
0x1113	V2/V23 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 3-sec value
0x1114	V3/V31 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 3-sec value
0x1115	I1 Current THD	0-9999	×0.1%	UINT16	R	3-sec value
0x1116	I2 Current THD	0-9999	×0.1%	UINT16	R	3-sec value
0x1117	I3 Current THD	0-9999	×0.1%	UINT16	R	3-sec value
0x1118	I1 K-Factor	10-9999	×0.1	UINT16	R	3-sec value
0x1119	I2 K-Factor	10-9999	×0.1	UINT16	R	3-sec value
0x111A	I3 K-Factor	10-9999	×0.1	UINT16	R	3-sec value
0x111B	I1 Current TDD	0-1000	×0.1%	UINT16	R	3-sec value
0x111C	I2 Current TDD	0-1000	×0.1%	UINT16	R	3-sec value
0x111D	I3 Current TDD	0-1000	×0.1%	UINT16	R	3-sec value
0x111E	V12 Voltage	0-Vmax	U1	UINT16	R	
0x111F	V23 Voltage	0-Vmax	U1	UINT16	R	
0x1120	V31 Voltage	0-Vmax	U1	UINT16	R	
	1-Second Total Values					
0x1400	Total kW	-Pmax-Pmax	U3	INT32	R	
0x1401	Total kvar	-Pmax-Pmax	U3	INT32	R	
0x1402	Total kVA	0-Pmax	U3	UINT32	R	
0x1403	Total PF	-1000-1000	×0.001	INT16	R	
0x1404	Total PF lag	0-1000	×0.001	UINT16	R	
0x1405	Total PF lead	0-1000	×0.001	UINT16	R	
0x1406	Total kW import	0-Pmax	U3	UINT32	R	
0x1407	Total kW export	0-Pmax	U3	UINT32	R	
0x1408	Total kvar import	0-Pmax	U3	UINT32	R	
0x1409	Total kvar export	0-Pmax	U3	UINT32	R	
0x140A	3-phase average L-N/L-L voltage	0-Vmax	U1	UINT32	R	[1]
0x140B	3-phase average L-L voltage	0-Vmax	U1	UINT32	R	
0x140C	3-phase average current	0-Imax	U2	UINT32	R	
	1-Second Auxiliary Values					
0x1500	Not used			UINT32	R	
0x1501	In (neutral) Current	0-Imax	U2	UINT32	R	
0x1502	Frequency	0-Fmax	×0.01Hz	UINT16	R	
0x1503	Voltage unbalance	0-3000	×0.1%	UINT16	R	
0x1504	Current unbalance	0-3000	×0.1%	UINT16	R	
	Present Harmonic Demands					
0x1580	V1/V12 THD demand	0-9999	×0.1%	UINT16	R	[1]
0x1581	V2/V23 THD demand	0-9999	×0.1%	UINT16	R	[1]
0x1582	V3/V31 THD demand	0-9999	×0.1%	UINT16	R	[1]
0x1583	Not used			UINT16	R	
0x1584	I1 THD demand	0-9999	×0.1%	UINT16	R	
0x1585	I2 THD demand	0-9999	×0.1%	UINT16	R	
0x1586	I3 THD demand	0-9999	×0.1%	UINT16	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x1587	Not used	0-9999	×0.1%	UINT16	R	
0x1588	I1 TDD demand	0-1000	×0.1%	UINT16	R	
0x1589	I2 TDD demand	0-1000	×0.1%	UINT16	R	
0x158A	I3 TDD demand	0-1000	×0.1%	UINT16	R	
0x158B	Not used	0-1000	×0.1%	UINT16	R	
	Present Volt, Ampere and Power Demands					
0x1600	V1/V12 Volt demand	0-Vmax	U1	UINT32	R	1
0x1601	V2/V23 Volt demand	0-Vmax	U1	UINT32	R	1
0x1602	V3/V31 Volt demand	0-Vmax	U1	UINT32	R	1
0x1603	I1 Ampere demand	0-Imax	U2	UINT32	R	
0x1604	I2 Ampere demand	0-Imax	U2	UINT32	R	
0x1605	I3 Ampere demand	0-Imax	U2	UINT32	R	
0x1606	kW import block demand	0-Pmax	U3	UINT32	R	
0x1607	kvar import block demand	0-Pmax	U3	UINT32	R	
0x1608	kVA block demand	0-Pmax	U3	UINT32	R	
0x1609	kW import sliding window demand	0-Pmax	U3	UINT32	R	
0x160A	kvar import sliding window demand	0-Pmax	U3	UINT32	R	
0x160B	kVA sliding window demand	0-Pmax	U3	UINT32	R	
0x160C	Not used	0		UINT32	R	
0x160D	Not used	0		UINT32	R	
0x160E	Not used	0		UINT32	R	
0x160F	kW import accumulated demand	0-Pmax	U3	UINT32	R	
0x1610	kvar import accumulated demand	0-Pmax	U3	UINT32	R	
0x1611	kVA accumulated demand	0-Pmax	U3	UINT32	R	
0x1612	kW import predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x1613	kvar import predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x1614	kVA predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x1615	PF (import) at Max. kVA sliding window demand	0-1000	×0.001	UINT16	R	
0x1616	kW export block demand	0-Pmax	U3	UINT32	R	
0x1617	kvar export block demand	0-Pmax	U3	UINT32	R	
0x1618	kW export sliding window demand	0-Pmax	U3	UINT32	R	
0x1619	kvar export sliding window demand	0-Pmax	U3	UINT32	R	
0x161A	kW export accumulated demand	0-Pmax	U3	UINT32	R	
0x161B	kvar export accumulated demand	0-Pmax	U3	UINT32	R	
0x161C	kW export predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x161D	kvar export predicted sliding window demand	0-Pmax	U3	UINT32	R	
	Total Energies [E]					
0x1700	kWh import	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
0x1701	kWh export	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
0x1702	Not used			INT32	R	
0x1703	Not used			UINT32	R	
0x1704	kvarh import	$0\text{-}10^9\text{-}1$	1 kvarh	UINT32	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x1705	kvarh export	0-10^9-1	1 kvarh	UINT32	R	
0x1706	Not used			INT32	R	
0x1707	Not used			UINT32	R	
0x1708	kVAh total	0-10^9-1	1 kVAh	UINT32	R	
0x1709 -0x170C	Not used			UINT32	R	
0x170D	Harmonic kWh import EH	0-10^9-1	1 kWh	UINT32	R	
0x170E	Harmonic kWh export EH	0-10^9-1	1 kWh	UINT32	R	
0x170F -0x1710	Not used			UINT32	R	
0x1711	Harmonic kVAh total EH	0-10^9-1	1 kVAh	UINT32	R	
	Summary Energy Registers E					
0x1780	Summary energy register #1	0-10^9-1	1 kWh	UINT32	R	
0x1781	Summary energy register #2	0-10^9-1	1 kWh	UINT32	R	
	...					
0x1787	Summary energy register #8	0-10^9-1	1 kWh	UINT32	R	
	Phase Energies E					
0x1800	kWh import L1	0-10^9-1	1 kWh	UINT32	R	
0x1801	kWh import L2	0-10^9-1	1 kWh	UINT32	R	
0x1802	kWh import L3	0-10^9-1	1 kWh	UINT32	R	
0x1803	kvarh import L1	0-10^9-1	1 kvarh	UINT32	R	
0x1804	kvarh import L2	0-10^9-1	1 kvarh	UINT32	R	
0x1805	kvarh import L3	0-10^9-1	1 kvarh	UINT32	R	
0x1806	kVAh total L1	0-10^9-1	1 kVAh	UINT32	R	
0x1807	kVAh total L2	0-10^9-1	1 kVAh	UINT32	R	
0x1808	kVAh total L3	0-10^9-1	1 kVAh	UINT32	R	
	V1/V12 Harmonic Distortions EH					1
0x1900	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1901	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1927	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	V2/V23 Harmonic Distortions EH					1
0x1A00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1A01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1A27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	V3/V31 Harmonic Distortions EH					1
0x1B00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1B01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x1B27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	I1 Harmonic Distortions EH					
0x1C00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1C01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1C27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	I2 Harmonic Distortions EH					
0x1D00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1D01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1D27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	I3 Harmonic Distortions EH					
0x1E00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1E01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1E27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	Fundamental (H01) Phase Values					4-cycle values
0x2900	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
0x2901	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
0x2902	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1
0x2903	I1 Current	0-Imax	U2	UINT32	R	
0x2904	I2 Current	0-Imax	U2	UINT32	R	
0x2905	I3 Current	0-Imax	U2	UINT32	R	
0x2906	kW L1	-Pmax-Pmax	U3	INT32	R	
0x2907	kW L2	-Pmax-Pmax	U3	INT32	R	
0x2908	kW L3	-Pmax-Pmax	U3	INT32	R	
0x2909	kvar L1	-Pmax-Pmax	U3	INT32	R	
0x290A	kvar L2	-Pmax-Pmax	U3	INT32	R	
0x290B	kvar L3	-Pmax-Pmax	U3	INT32	R	
0x290C	kVA L1	0-Pmax	U3	UINT32	R	
0x290D	kVA L2	0-Pmax	U3	UINT32	R	
0x290E	kVA L3	0-Pmax	U3	UINT32	R	
0x290F	Power factor L1	-1000-1000	×0.001	INT16	R	
0x2910	Power factor L2	-1000-1000	×0.001	INT16	R	
0x2911	Power factor L3	-1000-1000	×0.001	INT16	R	
	Harmonic Total Values					4-cycle values
0x2A00	Total fundamental kW	-Pmax-Pmax	U3	INT32	R	
0x2A01	Total fundamental kvar	-Pmax-Pmax	U3	INT32	R	
0x2A02	Total fundamental kVA	0-Pmax	U3	UINT32	R	
0x2A03	Total fundamental PF	-1000-1000	×0.001	INT16	R	
0x2A04	Total harmonic kW EH	-Pmax-Pmax	U3	INT32	R	
0x2A05	Not used			INT32	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x2A06	Total harmonic kVA EH	0-Pmax	U3	UINT32	R	
0x2A07	Not used			INT16	R	
	Minimum 1-Cycle Phase Values					
0x2C00	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
0x2C01	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
0x2C02	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1
0x2C03	I1 Current	0-Imax	U2	UINT32	R	
0x2C04	I2 Current	0-Imax	U2	UINT32	R	
0x2C05	I3 Current	0-Imax	U2	UINT32	R	
0x2C06 -0x2C11	Not used	0		INT32	R	
0x2C12	V1/V12 Voltage THD	0-9999	×0.1%	UINT32	R	1 4-cycle value
0x2C13	V2/V23 Voltage THD	0-9999	×0.1%	UINT32	R	1 4-cycle value
0x2C14	V3/V31 Voltage THD	0-9999	×0.1%	UINT32	R	1 4-cycle value
0x2C15	I1 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0x2C16	I2 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0x2C17	I3 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0x2C18	I1 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value
0x2C19	I2 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value
0x2C1A	I3 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value
0x2C1B	I1 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
0x2C1C	I2 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
0x2C1D	I3 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
	Minimum 1-Cycle Total Values					
0x2D00	Total kW	-Pmax-Pmax	U3	INT32	R	
0x2D01	Total kvar	-Pmax-Pmax	U3	INT32	R	
0x2D02	Total kVA	0-Pmax	U3	UINT32	R	
0x2D03	Total PF	0-1000	×0.001	UINT32	R	Absolute value
	Minimum 1-Cycle Auxiliary Values					
0x2E00	Not used			UINT32	R	
0x2E01	In Current	0-Imax	U2	UINT32	R	
0x2E02	Frequency	0-Fmax	×0.01Hz	UINT32	R	
	Maximum 1-Cycle Phase Values					
0x3400	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
0x3401	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
0x3402	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1
0x3403	I1 Current	0-Imax	U2	UINT32	R	
0x3404	I2 Current	0-Imax	U2	UINT32	R	
0x3405	I3 Current	0-Imax	U2	UINT32	R	
0x3406 -0x3411	Not used	0		INT32	R	
0x3412	V1/V12 Voltage THD	0-9999	×0.1%	UINT32	R	1 4-cycle value
0x3413	V2/V23 Voltage THD	0-9999	×0.1%	UINT32	R	1 4-cycle value

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x3414	V3/V31 Voltage THD	0-9999	×0.1%	UINT32	R	[1] 4-cycle value
0x3415	I1 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0x3416	I2 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0x3417	I3 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0x3418	I1 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value
0x3419	I2 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value
0x341A	I3 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value
0x341B	I1 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
0x341C	I2 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
0x341D	I3 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
	Maximum 1-Cycle Total Values					
0x3500	Total kW	-Pmax-Pmax	U3	INT32	R	
0x3501	Total kvar	-Pmax-Pmax	U3	INT32	R	
0x3502	Total kVA	0-Pmax	U3	UINT32	R	
0x3503	Total PF	0-1000	×0.001	UINT32	R	Absolute value
	Maximum 1-Cycle Auxiliary Values					
0x3600	Not used			UINT32	R	
0x3601	In Current	0-Imax	U2	UINT32	R	
0x3602	Frequency	0-Fmax	×0.01Hz	UINT32	R	
	Maximum Demands					
0x3700	V1/V12 Maximum volt demand	0-Vmax	U1	UINT32	R	[1]
0x3701	V2/V23 Maximum volt demand	0-Vmax	U1	UINT32	R	[1]
0x3702	V3/V31 Maximum volt demand	0-Vmax	U1	UINT32	R	[1]
0x3703	I1 Maximum ampere demand	0-Imax	U2	UINT32	R	
0x3704	I2 Maximum ampere demand	0-Imax	U2	UINT32	R	
0x3705	I3 Maximum ampere demand	0-Imax	U2	UINT32	R	
0x3706	Not used			UINT32	R	
0x3707	Not used			UINT32	R	
0x3708	Not used			UINT32	R	
0x3709	Maximum kW import sliding window demand	0-Pmax	U3	UINT32	R	
0x370A	Maximum kvar import sliding window demand	0-Pmax	U3	UINT32	R	
0x370B	Maximum kVA sliding window demand	0-Pmax	U3	UINT32	R	
0x3737	Not used			UINT32	R	
0x370D	Not used			UINT32	R	
0x370E	Not used			UINT32	R	
0x370F	Maximum kW export sliding window demand	0-Pmax	U3	UINT32	R	
0x3710	Maximum kvar export sliding window demand	0-Pmax	U3	UINT32	R	
	Maximum Harmonic Demands					
0x3880	V1/V12 THD demand	0-9999	×0.1%	UINT32	R	[1]
0x3881	V2/V23 THD demand	0-9999	×0.1%	UINT32	R	[1]
0x3882	V3/V31 THD demand	0-9999	×0.1%	UINT32	R	[1]
0x3883	Not used			UINT32	R	
0x3884	I1 THD demand	0-9999	×0.1%	UINT32	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x3885	I2 THD demand	0-9999	×0.1%	UINT32	R	
0x3886	I3 THD demand	0-9999	×0.1%	UINT32	R	
0x3887	Not used			UINT32	R	
0x3888	I1 TDD demand	0-1000	×0.1%	UINT32	R	
0x3889	I2 TDD demand	0-1000	×0.1%	UINT32	R	
0x388A	I3 TDD demand	0-1000	×0.1%	UINT32	R	
0x388B	Not used			UINT32	R	
	Scaled Analog Inputs					
0x3B00	Analog input AI1	AI1min-AI1Max		UINT32	R	
0x3B01	Analog input AI2	AI2min-AI2Max		UINT32	R	
	Raw Analog Inputs					
0x3B80	Analog input AI1	0-4095		UINT32	R	
0x3B81	Analog input AI2	0-4095		UINT32	R	
	TOU Parameters [E]					
0x3C00	Active tariff	0-7		UINT32	R	
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		UINT32	R	
	Scaled Analog Outputs					
0x3C80	Analog output AO1	0-4095		UINT32	R/W	
0x3C81	Analog output AO2	0-4095		UINT32	R/W	
	TOU Energy Register #1 [E]					
0x3D00	Tariff #1 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
0x3D01	Tariff #2 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
	...				R	
0x3D07	Tariff #8 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
	TOU Energy Register #2 [E]					
0x3E00	Tariff #1 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
0x3E01	Tariff #2 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
	...				R	
0x3E07	Tariff #8 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
	TOU Energy Register #3 [E]					
0x3F00	Tariff #1 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
0x3F01	Tariff #2 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
	...				R	
0x3F07	Tariff #8 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
	TOU Energy Register #4 [E]					
0x4000	Tariff #1 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
0x4001	Tariff #2 register	$0\text{-}10^9\text{-}1$	1 kWh	UINT32	R	
	...				R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x4007	Tariff #8 register	0-10^9-1	1 kWh	UINT32	R	
	TOU Energy Register #5 [E]					
0x4100	Tariff #1 register	0-10^9-1	1 kWh	UINT32	R	
0x4101	Tariff #2 register	0-10^9-1	1 kWh	UINT32	R	
	...				R	
0x4107	Tariff #8 register	0-10^9-1	1 kWh	UINT32	R	
	TOU Energy Register #6 [E]					
0x4200	Tariff #1 register	0-10^9-1	1 kWh	UINT32	R	
0x4201	Tariff #2 register	0-10^9-1	1 kWh	UINT32	R	
	...				R	
0x4207	Tariff #8 register	0-10^9-1	1 kWh	UINT32	R	
	TOU Energy Register #7 [E]					
0x4300	Tariff #1 register	0-10^9-1	1 kWh	UINT32	R	
0x4301	Tariff #2 register	0-10^9-1	1 kWh	UINT32	R	
	...				R	
0x4307	Tariff #8 register	0-10^9-1	1 kWh	UINT32	R	
	TOU Energy Register #8 [E]					
0x4400	Tariff #1 register	0-10^9-1	1 kWh	UINT32	R	
0x4401	Tariff #2 register	0-10^9-1	1 kWh	UINT32	R	
	...				R	
0x4407	Tariff #8 register	0-10^9-1	1 kWh	UINT32	R	
	Summary Energy Accumulated Demands [E]					
0x4500	Summary register #1 demand	0-Pmax	U3	UINT32	R	
0x4501	Summary register #2 demand	0-Pmax	U3	UINT32	R	
	...					
0x4507	Summary register #8 demand	0-Pmax	U3	UINT32	R	
	Summary Energy Block Demands [E]					
0x4580	Summary register #1 demand	0-Pmax	U3	UINT32	R	
0x4581	Summary register #2 demand	0-Pmax	U3	UINT32	R	
	...					
0x4587	Summary register #8 demand	0-Pmax	U3	UINT32	R	
	Summary Energy Sliding Window Demands [E]					
0x4600	Summary register #1 demand	0-Pmax	U3	UINT32	R	
0x4601	Summary register #2 demand	0-Pmax	U3	UINT32	R	
	...					
0x4607	Summary register #8 demand	0-Pmax	U3	UINT32	R	
	Summary Energy Maximum Demands [E]					
0x4780	Summary register #1 maximum demand	0-Pmax	U3	UINT32	R	
0x4781	Summary register #2 maximum demand	0-Pmax	U3	UINT32	R	
	...					

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x4787	Summary register #8 maximum demand	0-Pmax	U3	UINT32	R	
	TOU Maximum Demand Register #1 [E]					
0x4800	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0x4801	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
	...				R	
0x4807	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
	TOU Maximum Demand Register #2 [E]					
0x4900	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0x4901	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
	...				R	
0x4907	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
	TOU Maximum Demand Register #3 [E]					
0x4A00	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0x4A01	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
	...				R	
0x4A07	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
	TOU Maximum Demand Register #4 [E]					
0x4880	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0x4881	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
	...				R	
0x4887	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
	TOU Maximum Demand Register #5 [E]					
0x4980	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0x4981	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
	...				R	
0x4987	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
	TOU Maximum Demand Register #6 [E]					
0x4A80	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0x4A81	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
	...				R	
0x4A87	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
	TOU Maximum Demand Register #7 [E]					
0x5300	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0x5301	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
	...				R	
0x5307	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
	TOU Maximum Demand Register #8 [E]					
0x5380	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0x5381	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
	...				R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x5387	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
	V1/V12 Harmonic Angles [EH]					1, 3
0x6400	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6400	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6427	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	V2/V23 Harmonic Angles [EH]					1, 3
0x6500	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6500	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6527	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	V1/V31 Harmonic Angles [EH]					1, 3
0x6600	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6600	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6627	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	I1 Harmonic Angles [EH]					3
0x6700	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6700	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6727	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	I2 Harmonic Angles [EH]					3
0x6800	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6800	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6827	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	I3 Harmonic Angles [EH]					3
0x6900	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6900	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6927	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	Generic TOU Season Energy Registers ID's [E]					Point references only
0x7000	Tariff #1 register	0-10^9-1	1 kWh	UINT32		
0x7001	Tariff #2 register	0-10^9-1	1 kWh	UINT32		
	...					
0x7007	Tariff #8 register	0-10^9-1	1 kWh	UINT32		
	Generic TOU Season Maximum Demand Registers ID's [E]					Point references only
0x7100	Tariff #1 register	0-Pmax	U3	UINT32		
0x7101	Tariff #2 register	0-Pmax	U3	UINT32		
	...					

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x7107	Tariff #8 register	0-Pmax	U3	UINT32		
0x7C00	**Setpoint Status SP1-SP16 (bitmap)**	0x00000000-0x0000FFFF		UINT32	R	

NOTES:

Energy and Power demand readings are only available in the meters with suffixes E and EH.

[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.

When the 4LN3, 4LL3, 3LN3, 3LL3, 3BLN3 or 3BLL3 wiring mode is selected, the voltage harmonics will be line-to-neutral; for any other wiring mode, they will be line-to-line.

[2] For volts, amps, power and frequency scales and units, refer to Section 5 "Data Scales and Units".

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

4.3 Minimum/Maximum Log Registers

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
	Minimum Phase Values					
0xB000 0xB001	Min. V1/V12 Voltage Timestamp	0-Vmax F1	U1 sec	UINT32 UINT32	R R	[1]
0xB002 0xB003	Min. V2/V23 Voltage Timestamp	0-Vmax F1	U1 sec	UINT32 UINT32	R R	[1]
0xB004 0xB005	Min. V3/V31 Voltage Timestamp	0-Vmax F1	U1 sec	UINT32 UINT32	R R	[1]
0xB006 0xB007	Min. I1 Current Timestamp	0-Imax F1	U2 sec	UINT32 UINT32	R R	
0xB008 0xB009	Min. I2 Current Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
0xB00A 0xB00B	Min. I3 Current Timestamp	0-Imax	U2 sec	UINT32 UINT32	R R	
0xB00C -0xB023	Not used	0		INT32	R	
0xB024 0xB025	Min. V1/V12 Voltage THD Timestamp	0-9999	×0.1% sec	UINT32 UINT32	R R	[1] 4-cycle value
0xB026 0xB027	Min. V2/V23 Voltage THD Timestamp	0-9999	×0.1% sec	UINT32 UINT32	R R	[1] 4-cycle value
0xB028 0xB029	Min. V3/V31 Voltage THD Timestamp	0-9999	×0.1% sec	UINT32 UINT32	R R	[1] 4-cycle value
0xB02A 0xB02B	Min. I1 Current THD Timestamp	0-9999	×0.1% sec	UINT32 UINT32	R R	[1] 4-cycle value
0xB02C 0xB02D	Min. I2 Current THD Timestamp	0-9999	×0.1% sec	UINT32 UINT32	R R	4-cycle value
0xB02E 0xB02F	Min. I3 Current THD Timestamp	0-9999	×0.1% sec	UINT32 UINT32	R R	4-cycle value
0xB030 0xB031	Min. I1 K-Factor Timestamp	10-9999	×0.1 sec	UINT32 UINT32	R R	4-cycle value
0xB032 0xB033	Min. I2 K-Factor Timestamp	10-9999	×0.1 sec	UINT32 UINT32	R R	4-cycle value
0xB034 0xB035	Min. I3 K-Factor Timestamp	10-9999	×0.1 sec	UINT32 UINT32	R R	4-cycle value
0xB036 0xB037	Min. I1 Current TDD Timestamp	0-1000	×0.1% sec	UINT32 UINT32	R R	4-cycle value
0xB038 0xB039	Min. I2 Current TDD Timestamp	0-1000	×0.1% sec	UINT32 UINT32	R R	4-cycle value
0xB03A 0xB03B	Min. I3 Current TDD Timestamp	0-1000	x0.1% sec	UINT32 UINT32	R R	4-cycle value
	Minimum Total Values					
0xB080	Min. Total kW	-Pmax-Pmax	U3	INT32	R	

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
0xB081	Timestamp		sec	UINT32	R	
0xB082	Min. Total kvar	-Pmax-Pmax	U3	INT32	R	
0xB083	Timestamp		sec	UINT32	R	
0xB084	Min. Total kVA	0-Pmax	U3	UINT32	R	
0xB085	Timestamp		sec	UINT32	R	
0xB086	Min. Total PF	-1000-1000	×0.001	INT32	R	
0xB087	Timestamp		sec	UINT32	R	
	Minimum Auxiliary Values					
0xB100	Not used	0		UINT32	R	
0xB101				UINT32	R	
0xB102	Min. In Current	0-Imax	U2	UINT32	R	
0xB103	Timestamp		sec	UINT32	R	
0xB104	Min. Frequency	0-Fmax	×0.01Hz	UINT32	R	
0xB105	Timestamp		sec	UINT32	R	
	Maximum Phase Values					
0xB200	Max. V1/V12 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB201	Timestamp		sec	UINT32	R	
0xB202	Max. V2/V23 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB203	Timestamp		sec	UINT32	R	
0xB204	Max. V3/V31 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB205	Timestamp		sec	UINT32	R	
0xB206	Max. I1 Current	0-Imax	U2	UINT32	R	
0xB207	Timestamp		sec	UINT32	R	
0xB208	Max. I2 Current	0-Imax	U2	UINT32	R	
0xB209	Timestamp		sec	UINT32	R	
0xB20A	Max. I3 Current	0-Imax	U2	UINT32	R	
0xB20B	Timestamp		sec	UINT32	R	
0xB20C	Not used	0		INT32	R	
-0xB223						
0xB224	Max. V1/V12 Voltage THD	0-9999	×0.1%	UINT32	R	[1] 4-cycle value
0xB225	Timestamp		sec	UINT32	R	
0xB226	Max. V2/V23 Voltage THD	0-9999	×0.1%	UINT32	R	[1] 4-cycle value
0xB227	Timestamp		sec	UINT32	R	
0xB228	Max. V3/V31 Voltage THD	0-9999	×0.1%	UINT32	R	[1] 4-cycle value
0xB229	Timestamp		sec	UINT32	R	
0xB22A	Max. I1 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0xB22B	Timestamp		sec	UINT32	R	
0xB22C	Max. I2 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0xB22D	Timestamp		sec	UINT32	R	
0xB22E	Max. I3 Current THD	0-9999	×0.1%	UINT32	R	4-cycle value
0xB22F	Timestamp		sec	UINT32	R	
0xB230	Max. I1 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value
0xB231	Timestamp		sec	UINT32	R	
0xB232	Max. I2 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
0xB233	Timestamp		sec	UINT32	R	
0xB234	Max. I3 K-Factor	10-9999	×0.1	UINT32	R	4-cycle value
0xB235	Timestamp		sec	UINT32	R	
0xB236	Max. I1 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
0xB237	Timestamp		sec	UINT32	R	
0xB238	Max. I2 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
0xB239	Timestamp		sec	UINT32	R	
0xB23A	Max. I3 Current TDD	0-1000	×0.1%	UINT32	R	4-cycle value
0xB23B	Timestamp		sec	UINT32	R	
	Maximum Total Values					
0xB280	Max. Total kW	-Pmax-Pmax	U3	INT32	R	
0xB281	Timestamp		sec	UINT32	R	
0xB282	Max. Total kvar	-Pmax-Pmax	U3	INT32	R	
0xB283	Timestamp		sec	UINT32	R	
0xB284	Max. Total kVA	0-Pmax	U3	UINT32	R	
0xB285	Timestamp		sec	UINT32	R	
0xB286	Max. Total PF	-1000-1000	×0.001	INT32	R	
0xB287	Timestamp		sec	UINT32	R	
	Maximum Auxiliary Values					
0xB300	Not used	0		UINT32	R	
0xB301				UINT32	R	
0xB302	Max. In Current	0-Imax	U2	UINT32	R	
0xB303	Timestamp		sec	UINT32	R	
0xB304	Max. Frequency	0-Fmax	×0.01Hz	UINT32	R	
0xB305	Timestamp		sec	UINT32	R	
	Summary Energy Maximum Demands [E]					
0xB340	Summary register #1 Maximum Demand	0-Pmax	U3	UINT32	R	
0xB341	Timestamp					
0xB342	Summary register #2 Maximum Demand	0-Pmax	U3	UINT32	R	
0xB343	Timestamp					
	...					
0xB34E	Summary register #8 Maximum Demand	0-Pmax	U3	UINT32	R	
0xB34F	Timestamp					
	Maximum Demands					
0xB380	V1/V12 Maximum volt demand	0-Vmax	U1	UINT32	R	[1]
0xB381	Timestamp		sec	UINT32	R	
0xB382	V2/V23 Maximum volt demand	0-Vmax	U1	UINT32	R	[1]
0xB383	Timestamp		sec	UINT32	R	
0xB384	V3/V31 Maximum volt demand	0-Vmax	U1	UINT32	R	[1]
0xB385	Timestamp		sec	UINT32	R	
0xB386	I1 Maximum ampere demand	0-Imax	U2	UINT32	R	
0xB387	Timestamp		sec	UINT32	R	
0xB388	I2 Maximum ampere demand	0-Imax	U2	UINT32	R	

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
0xB389	Timestamp		sec	UINT32	R	
0xB38A	I3 Maximum ampere demand	0-Imax	U2	UINT32	R	
0xB38B	Timestamp		sec	UINT32	R	
0xB38C	Not used	0		UINT32	R	
0xB38D	Timestamp			UINT32	R	
0xB38E	Not used	0		UINT32	R	
0xB38F	Timestamp			UINT32	R	
0xB390	Not used	0		UINT32	R	
0xB391	Timestamp			UINT32	R	
0xB392	Maximum kW import sliding window demand	0-Pmax	U3	UINT32	R	
0xB393	Timestamp		sec	UINT32	R	
0xB394	Maximum kvar import sliding window demand	0-Pmax	U3	UINT32	R	
0xB395	Timestamp		sec	UINT32	R	
0xB396	Maximum kVA sliding window demand	0-Pmax	U3	UINT32	R	
0xB397	Timestamp		sec	UINT32	R	
0xB398	Not used	0		UINT32	R	
0xB399	Timestamp			UINT32	R	
0xB39A	Not used	0		UINT32	R	
0xB39B	Timestamp			UINT32	R	
0xB39C	Not used	0		UINT32	R	
0xB39D	Timestamp			UINT32	R	
0xB39E	Maximum kW export sliding window demand	0-Pmax	U3	UINT32	R	
0xB39F	Timestamp		sec	UINT32	R	
0xB390	Maximum kvar export sliding window demand	0-Pmax	U3	UINT32	R	
0xB391	Timestamp		sec	UINT32	R	
	Maximum Harmonic Demands					
0xB440	V1/V12 THD demand	0-9999	×0.1%	UINT32	R	1
0xB441	Timestamp		sec	UINT32	R	
0xB442	V2/V23 THD demand	0-9999	×0.1%	UINT32	R	1
0xB443	Timestamp		sec	UINT32	R	
0xB444	V3/V31 THD demand	0-9999	×0.1%	UINT32	R	1
0xB445	Timestamp		sec	UINT32	R	
0xB446	Not used			UINT32	R	
0xB447				UINT32	R	
0xB448	I1 THD demand	0-9999	×0.1%	UINT32	R	
0xB449	Timestamp		sec	UINT32	R	
0xB44A	I2 THD demand	0-9999	×0.1%	UINT32	R	
0xB44B	Timestamp		sec	UINT32	R	
0xB44C	I3 THD demand	0-9999	×0.1%	UINT32	R	
0xB44D	Timestamp		sec	UINT32	R	
0xB44E	Not used			UINT32	R	
0xB44F				UINT32	R	
0xB450	I1 TDD demand	0-1000	×0.1%	UINT32	R	
0xB451	Timestamp		sec	UINT32	R	

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
0xB452 0xB453	I2 TDD demand Timestamp	0-1000	×0.1% sec	UINT32 UINT32	R R	
0xB454 0xB455	I3 TDD demand Timestamp	0-1000	×0.1% sec	UINT32 UINT32	R R	
0xB456 0xB457	Not used			UINT32 UINT32	R R	
	TOU Maximum Demand Register #1 [E]					
0xB480 0xB481	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
0xB482 0xB483	Tariff #2 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
	...				R	
0xB48E 0xB48F	Tariff #8 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
	TOU Maximum Demand Register #2 [E]					
0xB500 0xB501	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
0xB502 0xB503	Tariff #2 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
	...				R	
0xB50E 0xB50F	Tariff #8 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
	TOU Maximum Demand Register #3 [E]					
0xB580 0xB581	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
0xB582 0xB583	Tariff #2 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
	...				R	
0xB58E 0xB58F	Tariff #8 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
	TOU Maximum Demand Register #4 [E]					
0xB4C0 0xB4C1	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
0xB4C2 0xB4C3	Tariff #2 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
	...				R	
0xB4CE 0xB4CF	Tariff #8 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
	TOU Maximum Demand Register #5 [E]					
0xB540 0xB541	Tariff #1 maximum demand Timestamp	0-Pmax	U3 sec	UINT32 UINT32	R R	
0xB542	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
0xB543	Timestamp		sec	UINT32	R	
	...				R	
0xB54E	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
0xB54F	Timestamp		sec	UINT32	R	
	TOU Maximum Demand Register #6 E					
0xB5C0	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0xB5C1	Timestamp		sec	UINT32	R	
0xB5C2	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
0xB5C3	Timestamp		sec	UINT32	R	
	...				R	
0xB5CE	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
0xB5CF	Timestamp		sec	UINT32	R	
	TOU Maximum Demand Register #7 E					
0xB600	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0xB601	Timestamp		sec	UINT32	R	
0xB602	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
0xB603	Timestamp		sec	UINT32	R	
	...				R	
0xB60E	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
0xB60F	Timestamp		sec	UINT32	R	
	TOU Maximum Demand Register #8 E					
0xB640	Tariff #1 maximum demand	0-Pmax	U3	UINT32	R	
0xB641	Timestamp		sec	UINT32	R	
0xB642	Tariff #2 maximum demand	0-Pmax	U3	UINT32	R	
0xB643	Timestamp		sec	UINT32	R	
	...				R	
0xB64E	Tariff #8 maximum demand	0-Pmax	U3	UINT32	R	
0xB64F	Timestamp		sec	UINT32	R	

NOTES:

Power demand readings are only available in the meters with suffixes E and EH.

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.
When the 4LN3, 4LL3, 3LN3, 3LL3, 3BLN3 or 3BLL3 wiring mode is selected, the voltage harmonics will be line-to-neutral; for any other wiring mode, they will be line-to-line.

2 For volts, amps, power and frequency scales and units, refer to Section 5 ”Data Scales and Units”.

4.4 Device Control and Status Registers

Point ID	Description	Options/Range	Units	Type	R/W	Notes
Device Authorization Register						
0xFF00	When write: 4-digit password. When read: 0 = access permitted, -1 = authorization required.	0-9999 (write) 0/-1 (read)		INT16	R/W	
Remote Relay Control						
0x8400-0x8401						
	Remote relay command	0 = remove a remote command 1 = operate relay 2 = remove a remote command and release a locally latched relay		UINT16	W	
+0	**RO1 Control**					
+1	**RO2 Control**					
Device Reset/Clear Registers						
0xA000	Clear total energy registers	0		UINT16	W	
0xA001	Clear total maximum demand registers	0 = Clear all maximum demands 1 = Clear power demands [E] 2 = Clear volt, ampere and harmonic demands		UINT16	W	
0xA002	Clear TOU energy registers [E]	0		UINT16	W	
0xA003	Clear TOU maximum demand registers [E]	0		UINT16	W	
0xA004	Clear pulse counters	0 = Clear all counters 1-4 = Clear counter #1-#4		UINT16	W	
0xA005	Clear Min/Max log	0		UINT16	W	
0xA006	Clear event log [E]	0		UINT16	W	
0xA007	Clear data log [E]	0-7 = Clear Data log #1-#8 16 = Clear all data logs		UINT16	W	
0xA008	Clear waveform log #1 [EH]	0		UINT16	W	
0xA009	Clear waveform log #2 [EH]	0		UINT16	W	
0xA00A	Reserved			UINT16	W	
0xA00B	Restore event log read pointer	0		UINT16	W	
0xA00C	Restore data log read pointer	0-7 = Data log #1-#8 48-55, 64-66 = Daily profile data log #8 (same as 7)		UINT16	W	
0xA00D	Restore waveform log #1 read pointer [EH]	0		UINT16	W	
0xA00E	Restore waveform log #2 read pointer [EH]	0		UINT16	W	

Point ID	Description	Options/Range	Units	Type	R/W	Notes
Device Status Registers						
0x7D00	Relay status RO1-RO2 (bitmap)	0x0000-0x0003		UINT16	R	Bits set to 1 indicate closed relay contacts.
0x7D01	Event flags (bitmap) [EH]	0x0000-0x00FF		UINT16	R	
0x7D02	Digital (status) inputs DI1-DI2	0x0000-0x0003		UINT16	R	Bits set to 1 indicate closed input contacts.
0x7D03	Present setpoint status SP1-SP16 (bitmap)	0x0000-0xFFFF		UINT16	R	Bits set to 1 indicate operated (activated) setpoints.
0x7D06	Current serial port number	0=COM1, 1=COM2		UINT16	R	
0x7D07	Battery status	0 = low battery, 1 = normal		UINT16	R	
Log Notification Registers [E]						
0x7D04	Log status (bitmap)	F26		UINT16	R	Bits set to 1 indicate that at least one new record is present in the designated files.
0x7D05	Data log status (bitmap)	F27		UINT16	R	Bits set to 1 indicate that at least one new record is present in the designated files.
Alarm Notification Registers						
0x7E00	Setpoint alarm status SP1-SP16 (bitmap). Nonvolatile register that keeps the status of the operated setpoints.	0x0000-0xFFFF		UINT16	R/W	When read: Bits set to 1 indicate that the designated setpoint have been operated at least once since the alarm bits were reset. When written: Bits preset to 0 clear corresponding alarms, Bits set to 1 have no effect.
0x7E01	Self-check alarm status (device diagnostics). Nonvolatile register that keeps the status of the internal device diagnostics.	F23		UINT16	R/W	When read: Bits set to 1 indicate that the designated diagnostics failed at least once since the alarm bits were reset. When written: Bits preset to 0 clear corresponding alarms; bits set to 1 have no effect.

4.5 Device Setup Registers

Address	Description	Options/Range	Units	Type	R/W	Notes
Device Identification						
0x7F00-0x7F01	Instrument options	F28		UINT16	R	
0xFF43	Device model ID	17210=PM172P, 17220=PM172E, 17230=PM172EH		UINT16	R	
Factory Device Settings						
0xFF40-0xFF42						
+0	I1-I3 input overload	200	%	UINT16	R	
+1	I1-I3 input range	1, 5	A	UINT16	R	
+2	V1-V3 input range	690, 120 (option U)	V	UINT16	R	Does not limit the 690V input range
Communication Ports Setup						
0x8500-0x851F						
+0	Communication protocol	COM1: 0=SATEC ASCII, 1=Modbus RTU, 2=DNP3.0, 4=DTE, 5=Profibus DP COM2: 0=SATEC ASCII, 1=Modbus RTU, 2=DNP3.0, 4=DTE		UINT16	R/W	
+1	Interface	COM1: 0=RS-232, 1=RS-422, 2=RS-485, 4=Dial-up Modem, 6=Ethernet, 7=Profibus COM2: 1=RS-422, 2=RS-485		UINT16	R/W	
+2	Device address	SATEC ASCII: 0-99 Modbus RTU: 1-247 DNP3.0: 0–65532 DTE: 1-65532 Profibus DP: 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	0=no flow control 1=software (XON/XOFF) 2=hardware (CTS)		UINT16	R/W	N/A for COM2 (read as 65535)
+6	RTS mode	0=not used, 1=RTS is permanently asserted 2=RTS is asserted during the transmission		UINT16	R/W	N/A for COM2 (read as 65535)

Address	Description	Options/Range	Units	Type	R/W	Notes
+7	ASCII compatibility mode	0=disabled, 1=enabled		UINT16	R/W	
+8-15	Reserved			UINT16	R	
0x8500-0x850F	**COM1 Setup**					
0x8510-0x851F	**COM2 Setup**					
Basic Setup						
0x8600-0x8614						
+0	Wiring mode	F2		UINT16	R/W	
+1	PT ratio	10 to 65000	×0.1	UINT16	R/W	
+2	CT primary current	1 to 20,000	A	UINT16	R/W	
+3	Power block demand period E	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 demand block accumulation interval. E
+4	Volt/ampere/harmonic 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 E	1 to 15		UINT16	R/W	E
+9	Reserved			UINT16	R/W	Read as 65535
+10	Number of cycles before trigger for the Waveform log #1 EH	1 to 8		UINT16	R/W	Obsolete register. Refer to the Waveform Log setup registers. EH
+11	Nominal line frequency	25, 50, 60, 400	Hz	UINT16	R/W	
+12	Maximum demand load current	0 to 20,000 (0 = CT primary current)	A	UINT16	R/W	
+13-15	Reserved			UINT16	R/W	Read as 65535
+16	Number of cycles per series for the Waveform log #1 EH	16 to 2560		UINT16	R/W	Obsolete register. Refer to the Waveform Log setup registers. EH
+17	Reserved			UINT16	R/W	Read as 65535
+18	Nominal secondary voltage EH	10 to 690 V		UINT16	R/W	EH
+19	Reserved			UINT16	R/W	Read as 65535
+20	PT ratio multiplication factor	×1, ×10		UINT16	R/W	
Device Options Setup						
0x8700-0x870A						
+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 E	$0=1\times10^4$, $1=1\times10^5$, $2=1\times10^6$, $3=1\times10^7$, $4=1\times10^8$, $5=1x10^9$		UINT16	R/W	E
+2	Phase energy calculation mode E	0=disabled, 1=enabled		UINT16	R/W	E
+3	Reserved			UINT16	R/W	Read as 65535
+4	Analog expander output option	0=none 1=0-20 mA 2=4-20 mA 3=0-1 mA 4=±1 mA		UINT16	R/W	

Address	Description	Options/Range	Units	Type	R/W	Notes
+5	Battery mode	0 = battery is OFF, 1 = battery is ON		UINT16	R/W	
+6-8	Reserved			UINT16	R/W	Read as 65535
+9	Harmonic power/energy calculation mode [EH]	0=disabled, 1=enabled		UINT16	R/W	[EH]
+10	Energy LED test mode [E]	0=disabled, 1=Wh test, 2=varh test		UINT16	R/W	LED pulse rate is 10,000 pulses/kWh
Digital Inputs Setup						
0x8900-0x8904						Obsolete registers. Refer to Digital Inputs setup registers 0X9600-0X9607
+0	Status inputs (bitmap)	0x0003		UINT16	R/W	Ignored when written
+1	Pulse inputs (bitmap)	0x0003		UINT16	R/W	Ignored when written
+2	Not used	0		UINT16	R/W	
+3	External demand synchronization input (bitmap)	0x0001=DI1		UINT16	R/W	Ignored when written
+4	Time synchronization input (bitmap)	0x0001=DI1, 0x0002=DI2		UINT16	R/W	
Alarm/Event Setpoints Setup						
0x8A00-0x8B9F						
+0	Condition #1: Logical operator	0 = OR, 1 = AND		UINT16	R/W	
+1	Condition #1: Trigger parameter ID	F12		UINT16	R/W	
+2	Condition #1: Reserved	0		UINT16	R/W	
+3	Condition #1: Operate limit	See Section 4.2		UINT32	R/W	Scaled value
+4	Condition #1: Release limit	See Section 4.2		UINT32	R/W	Scaled value
+5	Condition #2: Logical operator	0 = OR, 1 = AND		UINT16	R/W	
+6	Condition #2: Trigger parameter ID	F12		UINT16	R/W	
+7	Condition #2: Reserved	0		UINT16	R/W	
+8	Condition #2: Operate limit	See Section 4.2		UINT32	R/W	Scaled value
+9	Condition #2: Release limit	See Section 4.2		UINT32	R/W	Scaled value
+10	Condition #3: Logical operator	0 = OR, 1 = AND		UINT16	R/W	
+11	Condition #3: Trigger parameter ID	F12		UINT16	R/W	
+12	Condition #3: Reserved	0		UINT16	R/W	
+13	Condition #3: Operate limit	See Section 4.2		UINT32	R/W	Scaled value
+14	Condition #3: Release limit	See Section 4.2		UINT32	R/W	Scaled value
+15	Condition #4: Logical operator	0 = OR, 1 = AND		UINT16	R/W	
+16	Condition #4: Trigger parameter ID	F12		UINT16	R/W	
+17	Condition #4: Reserved	0		UINT16	R/W	
+18	Condition #4: Operate limit	See Section 4.2		UINT32	R/W	Scaled value
+19	Condition #4: Release limit	See Section 4.2		UINT32	R/W	Scaled value
+20	Action #1 ID	F14		UINT16	R/W	
+21	Action #2 ID	F14		UINT16	R/W	
+22	Action #3 ID	F14		UINT16	R/W	
+23	Action #4 ID	F14		UINT16	R/W	
+24	Operate delay	0-9999	×0.1 sec	UINT16	R/W	
+25	Release delay	0-9999	×0.1 sec	UINT16	R/W	
+26-27	Not used	0		UINT16	R/W	
0x8A00-0x8A19	Setpoint #1					

Address	Description	Options/Range	Units	Type	R/W	Notes
0x8A1A-0x8A33	Setpoint #2					
0x8A34-0x8A4D	Setpoint #3					
0x8A4E-0x8A67	Setpoint #4					
0x8A68-0x8A81	Setpoint #5					
0x8A82-0x8A96	Setpoint #6					
0x8A9C-0x8AB5	Setpoint #7					
0x8AB6-0x8ACF	**Setpoint #8**					
0x8AD0-0x8AE9	**Setpoint #9**					
0x8AEA-0x8B03	**Setpoint #10**					
0x8B04-0x8B1D	**Setpoint #11**					
0x8B1E-0x8B37	**Setpoint #12**					
0x8B38-0x8B51	**Setpoint #13**					
0x8B52-0x8B6B	**Setpoint #14**					
0x8B6C-0x8B85	**Setpoint #15**					
0x8B86-0x8B9F	**Setpoint #16**					
Local Settings						
0x8C00-0x8C0A						
+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, 3rd 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	1-2 = DI1-DI2, 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	
TOU Daily Profile Setup [E]						
0x9000-0x907F						
+0	1st tariff change	F10		UINT16	R/W	
+1	2nd tariff change	F10		UINT16	R/W	
+2	3rd tariff change	F10		UINT16	R/W	
+3	4th tariff change	F10		UINT16	R/W	
+4	5th tariff change	F10		UINT16	R/W	
+5	6th tariff change	F10		UINT16	R/W	
+6	7th tariff change	F10		UINT16	R/W	
+7	8th tariff change	F10		UINT16	R/W	

Address	Description	Options/Range	Units	Type	R/W	Notes
0x9000-0x9007	**Daily profile #1: Season 1, Day type 1**					
0x9008-0x900F	**Daily profile #2: Season 1, Day type 2**					
0x9010-0x9017	**Daily profile #3: Season 1, Day type 3**					
0x9018-0x901F	**Daily profile #4: Season 1, Day type 4**					
0x9020-0x9027	**Daily profile #5: Season 2, Day type 1**					
0x9028-0x902F	**Daily profile #6: Season 2, Day type 2**					
0x9030-0x9037	**Daily profile #7: Season 2, Day type 3**					
0x9038-0x903F	**Daily profile #8: Season 2, Day type 4**					
0x9040-0x9047	**Daily profile #9: Season 3, Day type 1**					
0x9048-0x904F	**Daily profile #10: Season 3, Day type 2**					
0x9050-0x9057	**Daily profile #11: Season 3, Day type 3**					
0x9058-0x905F	**Daily profile #12: Season 3, Day type 4**					
0x9060-0x9067	**Daily profile #13: Season 4, Day type 1**					
0x9068-0x906F	**Daily profile #14: Season 4, Day type 2**					
0x9070-0x9077	**Daily profile #15: Season 4, Day type 3**					
0x9078-0x907F	**Daily profile #16: Season 4, Day type 4**					
TOU Calendar Setup [E]						
0x9100-0x923F						
+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=3rd, 4=4th, 5=last week of the month		UINT16	R/W	
+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	
0x9100-0x9109	**Calendar entry #1**					
0x910A-0x9113	**Calendar entry #2**					
0x9114-0x911D	**Calendar entry #3**					
...						
0x9236-0X923F	**Calendar entry #32**					
Summary Energy/TOU Registers Setup [E]						
0X9400-0X941F						
+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	

Address	Description	Options/Range	Units	Type	R/W	Notes
+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	
0X9400-0X9403	**Register #1 Setup**					
0X9404-0X9407	**Register #2 Setup**					
0X9408-0X940B	**Register #3 Setup**					
0X940C-0X940F	**Register #4 Setup**					
0X9410-0X9413	**Register #5 Setup**					
0X9414-0X9417	**Register #6 Setup**					
0X9418-0X941B	**Register #7 Setup**					
0X941C-0X941F	**Register #8 Setup**					
Summary Energy/TOU Registers Source Setup [E]						
0X9500-0X9517						
+0	Energy source ID	F11		UINT16	R/W	
+1	Target summary register number	0-7 = register #1-#8		UINT16	R/W	
+2	Multiplier	0-1000000	×0.001	INT32	R/W	
0X9500-0X9502	**Energy Source #1**					
0X9503-0X9505	**Energy Source #2**					
0X9506-0X9508	**Energy Source #3**					
0X9509-0X950B	**Energy Source #4**					
0X950C-0X950E	**Energy Source #5**					
0X950F-0X9511	**Energy Source #6**					
0X9512-0X9514	**Energy Source #7**					
0X9515-0X9517	**Energy Source #8**					
Digital Inputs Setup						
0X9600-0X9607						
+0	Pulse mode	0 = pulse, 1 = KYZ		UINT16	R/W	
+1	Polarity	0 = normal, 1 = inverting		UINT16	R/W	
+2	De-bounce time, ms	1-1000		UINT16	R/W	Debounce time will be the same for both inputs
+3	Reserved			UINT16	R/W	
0X9600-0X9603	**DI1 Setup**					
0X9604-0X9607	**DI2 Setup**					
Relay Outputs Setup						
0X9700-0X970B						
+0	Operation Mode	0=latched, 1=unlatched, 2=pulse, 3=KYZ		UINT16	R/W	
+1	Polarity	Bit 0 – Polarity: 0=normal, 1=inverting,		UINT16	R/W	

Address	Description	Options/Range	Units	Type	R/W	Notes
		Bit 1 - Retentive mode: 0=disabled, 1=enabled				
+2	Pulse width, ms	1-1000		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	
0X9700-0X9705	**RO1 Setup**					
0X9706-0X970B	**RO2 Setup**					
Analog Inputs Setup						
0X9800-0X9807						
+0	Input parameter ID	0 = input not assigned		UINT16	R/W	
+1	Not used	0		UINT16	R/W	
+2	Zero scale value (0/4 mA)			INT32	R/W	
+3	Full scale value (20/1 mA)			INT32	R/W	
0X9800-0X9803	**AI1 Setup**					
0X9804-0X9807	**AI2 Setup**					
Waveform Recorder Setup [EH]						
0X9900-0X990B						
+0	Sampling rate, samples per cycle	32 (Waveform log #1), 128 (Waveform log #2)		UINT16	R/W	Ignored when written
+1	Number of cycles per series	16-10848 (32 samples/cycle), 4-2712 (128 samples/cycle)		UINT16	R/W	
+2	Not used	0		UINT16	R/W	
+3	Number of cycles before a trigger	1-20		UINT16	R/W	
+4	File channel mask, bitmap	F9, 0x00000033		UINT32	R/W	Ignored when written
+5	Not used	0		UINT32	R/W	
0X9900-0X9905	**Waveform Log #1 Setup**					
0X9906-0X990B	**Waveform Log #2 Setup**					

4.6 Analog and Digital I/O Configuration

Address	Description	Options/Range	Units	Type	R/W	Notes
I/O Slots Configuration Info						
0xF100-0xF12F						
+0	I/O type	F29		UINT16	R	
+1	Number of I/Os on the slot	0-2		UINT16	R	
+2	First I/O number on the slot	0		UINT16	R	
+3	Last I/O number on the slot	0-1		UINT16	R	
0xF100-0xF103	**DI Slot Configuration**					
0xF104-0xF107	**RO Slot Configuration**					
0xF108-0xF10B	**AI/AO Slot Configuration**					
0xF10C-0xF12F	Reserved					
I/O Type Info						
0xF200-0xF23F						
+0	Number of I/O slots of this type	0-1		UINT16	R	
+1	Total number of I/O's of this type	0-2		UINT16	R	
+2	Number of I/O's in the slot	0-2		UINT16	R	
+3	Not used	0		UINT16	R	
0xF200-0xF203	**DI Type Info**					
0xF204-0xF207	**RO Type Info**					
0xF208-0xF20B	**AI Type Info**					
0xF20C-0xF20F	**AO Type Info**					
0xF210-0xF23F	Reserved					

4.7 File Transfer Registers [E]

Address	Description	Options/Range	Units	Type	R/W	Notes
File Allocation Status Registers						
0xA0F0	File memory size, Bytes	1040384		UINT32	R	
0xA0F1	Free file memory size, Bytes	0-1040384		UINT32	R	
0xA0F2	File allocation map (bitmap)	F6		UINT32	R	Bits set to 1 indicate that the memory is allocated to the designated files
0xA0F3	Reserved	0		UINT32	R	
0xA0F4	Daily profile log sections map (bitmap)	F7		UINT32	R	Bits set to 1 indicate that the corresponding sections are allocated in the Data log #8 file to the designated energy/maximum demand registers
File Transfer Control/Status Registers						
0xA100-0xA3FF						
+0	File status (bitmap)	F4		UINT16	R	
+1	Number of records logged in the file	0 to 65535		UINT16	R	
+2	Number of the new records never read before	0 to 65535		UINT16	R	
+3	Sequence number of the last record in a file + 1 (modulo 65536)	0 to 65535 (increments modulo 65536 with each new record)		UINT16	R	Will return zero if the file is empty
+4	Sequence number of the first (oldest) record in a file	0 to 65535		UINT16	R	
+5	Sequence number of the first new record in a file never read before	0 to 65535		UINT16	R	
+6	Sequence number of the current record to be read through the file read window. Can be overwritten to point to the desired record in a file	0 to 65535		UINT16	R/W	If there is no a record in the file that matches the written sequence, the device will respond with the exception code 03 (invalid data)
+7	Command register (write-only)	Write value: 0 = point to the first (oldest) record in a file 1 = point to the first new record never read before. If there are no new records, the file pointer will be set to the oldest record in a file		UINT16	R/W	Read as 0
0xA100-0xA107	Event log file control			UINT16	R	
0xA108-0xA10F	Data log #1 file control			UINT16	R	
0xA110-0xA117	Data log #2 file control			UINT16	R	
0xA118-0xA11F	Data log #3 file control			UINT16	R	
0xA120-0xA127	Data log #4 file control			UINT16	R	
0xA128-0xA12F	Data log #5 file control			UINT16	R	
0xA130-0xA137	Data log #6 file control			UINT16	R	
0xA138-0xA13F	Data log #7 file control			UINT16	R	
0xA140-0xA147	Data log #8 file control			UINT16	R	
0xA148-0xA187	Reserved			UINT16	R	

Address	Description	Options/Range	Units	Type	R/W	Notes
0xA188-0xA18F	Waveform log #1 file control			UINT16	R	
0xA190-0xA197	Waveform log #2 file control			UINT16	R	
0xA198-0xA27F	Reserved			UINT16	R	
0xA300-0xA307	Daily Profile Log, Energy/Usage Reg.#1 control			UINT16	R	
0xA308-0xA30F	Daily Profile Log, Energy/Usage Reg.#2 control			UINT16	R	
0xA310-0xA317	Daily Profile Log, Energy/Usage Reg.#3 control			UINT16	R	
0xA318-0xA31F	Daily Profile Log, Energy/Usage Reg.#4 control			UINT16	R	
0xA320-0xA327	Daily Profile Log, Energy/Usage Reg.#5 control			UINT16	R	
0xA328-0xA32F	Daily Profile Log, Energy/Usage Reg.#6 control			UINT16	R	
0xA330-0xA337	Daily Profile Log, Energy/Usage Reg.#7 control			UINT16	R	
0xA338-0xA33F	Daily Profile Log, Energy/Usage Reg.#8 control			UINT16	R	
0xA340-0xA37F	Reserved			UINT16	R	
0xA380-0xA387	Daily Profile Log, Max. Demand Reg.#1 control			UINT16	R	
0xA388-0xA38F	Daily Profile Log, Max. Demand Reg.#2 control			UINT16	R	
0xA390-0xA397	Daily Profile Log, Max. Demand Reg.#3 control			UINT16	R	
0xA398-0xA39F	Daily Profile Log, Max. Demand Reg.#4 control			UINT16	R	
0xA3A0-0xA3A7	Daily Profile Log, Max. Demand Reg.#5 control			UINT16	R	
0xA3A8-0xA3AF	Daily Profile Log, Max. Demand Reg.#6 control			UINT16	R	
0xA3B0-0xA3B7	Daily Profile Log, Max. Demand Reg.#7 control			UINT16	R	
0xA3B8-0xA3BF	Daily Profile Log, Max. Demand Reg.#8 control			UINT16	R	
0xA3C0-0xA3FF	Reserved			UINT16	R	
Data Log File Transfer Registers						
0xC000-0xC77F						
	Data Log Record Structure					
+0	Record status (bitmap)	F5		UINT16	R	
+1	Record sequence number	0 to 65535 (increments modulo 65536)		UINT16	R	
+2	Record time, sec	F1	sec	UINT32	R	
+3	Record time, fractional seconds, ms	0-999	ms	UINT16	R	
+4	Trigger event ID	0=Profile log file, 1-16=SP1-SP16		UINT16	R	
+5	Parameter #1 value			INT32	R	
+6	Parameter #2 value			INT32	R	
+7	Parameter #3 value			INT32	R	
+8	Parameter #4 value			INT32	R	
+9	Parameter #5 value			INT32	R	
+10	Parameter #6 value			INT32	R	
+11	Parameter #7 value			INT32	R	
+12	Parameter #8 value			INT32	R	
+13	Parameter #9 value			INT32	R	
+14	Parameter #10 value			INT32	R	
+15	Parameter #12 value			INT32	R	
+16	Parameter #13 value			INT32	R	
+17	Parameter #13 value			INT32	R	

Address	Description	Options/Range	Units	Type	R/W	Notes
+18	Parameter #14 value			INT32	R	
+19	Parameter #15 value			INT32	R	
+20	Parameter #16 value			INT32	R	
+21-23	Reserved			INT32	R	
	Data Log Transfer Blocks					
0xC000-0xC017	Data log #1				R	
0xC018-0xC02F	Data log #2				R	
0xC030-0xC047	Data log #3				R	
0xC048-0xC05F	Data log #4				R	
0xC060-0xC077	Data log #5				R	
0xC078-0xC08F	Data log #6				R	
0xC090-0xC0A7	Data log #7				R	
0xC0A8-0xC0BF	Data log #8				R	
0xC0C0-0xC47F	Reserved				R	
0xC480-0xC497	Daily Profile Log, Energy/Usage Reg.#1 section				R	
0xC498-0xC4AF	Daily Profile Log, Energy/Usage Reg.#2 section				R	
0xC4B0-0xC4C7	Daily Profile Log, Energy/Usage Reg.#3 section				R	
0xC4C8-0xC4DF	Daily Profile Log, Energy/Usage Reg.#4 section				R	
0xC4E0-0xC4F7	Daily Profile Log, Energy/Usage Reg.#5 section				R	
0xC4F8-0xC50F	Daily Profile Log, Energy/Usage Reg.#6 section				R	
0xC510-0xC527	Daily Profile Log, Energy/Usage Reg.#7 section				R	
0xC528-0xC53F	Daily Profile Log, Energy/Usage Reg.#8 section				R	
0xC540-0xC5FF	Reserved				R	
0xC600-0xC617	Daily Profile Log, Max. Demand Reg.#1 section				R	
0xC618-0xC62F	Daily Profile Log, Max. Demand Reg.#2 section				R	
0xC630-0xC647	Daily Profile Log, Max. Demand Reg.#3 section				R	
0xC648-0xC65F	Daily Profile Log, Max. Demand Reg.#4 section				R	
0xC660-0xC677	Daily Profile Log, Max. Demand Reg.#5 section				R	
0xC678-0xC68F	Daily Profile Log, Max. Demand Reg.#6 section				R	
0xC690-0xC6A7	Daily Profile Log, Max. Demand Reg.#7 section				R	
0xC6A8-0xC6BF	Daily Profile Log, Max. Demand Reg.#8 section				R	
0xC6C0-0xC77F	Reserved				R	
Event Log File Transfer Registers						
0xCD80-0xCDAF						
	Event Record Structure					
+0	Record status (bitmap)	F5		UINT16	R	
+1	Record sequence number	0 to 65535 (increments modulo 65536)		UINT16	R	
+2	Record time, sec	F1	s	UINT32	R	
+3	Record time, fractional seconds, ms	0-999	ms	UINT16	R	
+4	Event point/cause ID	F19		UINT16	R	
+5	Log value			UINT32	R	32-bit non-scaled register
+6	Event effect	F20		UINT16	R	

Address	Description	Options/Range	Units	Type	R/W	Notes
+7	Reserved	0		UINT16	R	
	Event Log Transfer Blocks					
0xCD80-0xCD87	Event log record #1				R	
0xCD88-0xCD8F	Event log record #2				R	
0xCD90-0xCD97	Event log record #3				R	
0xCD98-0xCD9F	Event log record #4				R	
0xCDA0-0xCDA7	Event log record #5				R	
0xCDA8-0xCDAF	Event log record #6				R	
Waveform Header Transfer Registers EH						
0xCE00-0xCEFB						
	Waveform Header Structure					
+0	Record status (bitmap)	F5		UINT16	R	
+1	Record sequence number in a file	0 to 65535 (increments modulo 65536)		UINT16	R	
+2	Record time, sec	F1	sec	UINT32	R	Indicates the time for the last sample point in the record
+3	Record time, fractional seconds, ms	0-999	ms	UINT16	R	
+4	Trigger event ID	0=real-time waveform, 1-16=SP1-SP16		UINT16	R	
+5	Waveform series (compound waveform) number	1-65535 (rolls over to 1 after 65535)		UINT16	R	Each series can comprise up to 160 contiguous records of a compound waveform
+6	Record sequence number in a waveform series	0-159		UINT16	R	
+7	Analog input full scale, engineering units (volts/amperes) (ANALOG_SCALE)	Vmax, Imax		UINT32	R	
+8	Digital full scale for the channel, sample code (DIGITAL_SCALE)	-32768 to 32767		INT16	R	Corresponds to twice the analog input full-scale range.
+9	Zero offset, sample code (ZERO_OFFSET)	0		INT16	R	Corresponds to the center of the digital scale range
+10	Line frequency	0 to 6500	x 0.01Hz	UINT16	R	The sampling frequency is equal to the line frequency multiplied by the sampling rate in samples per cycle (32 for Waveform log #1 and 128 for Waveform log #2)
+11	Trigger sample point offset in the waveform series	0-511		UINT16	R	Corresponds to the first record in the series
+12,13	Reserved	0		UINT16	R	
	Waveform Header Transfer Blocks					
0xCE00-0xCE0D	Real-time waveform, channel V1/V12				R	1
0xCE0E-0xCE1B	Real-time waveform, channel V2/V23				R	1
0xCE1C-0xCE29	Real-time waveform, channel V3/V31				R	1
0xCE2A-0xCE37	Real-time waveform, channel I1				R	
0xCE38-0xCE45	Real-time waveform, channel I2				R	
0xCE46-0xCE53	Real-time waveform, channel I3				R	
0xCE54-0xCE61	Waveform log #1, channel V1/L12				R	1
0xCE62-0xCE6F	Waveform log #1, channel V2/L23				R	1

Address	Description	Options / Range	Units	Type	R / W	Notes
0xCE70-0xCE7D	Waveform log #1, channel V3/V31				R	1
0xCE7E-0xCE8B	Waveform log #1, channel I1				R	
0xCE8C-0xCE99	Waveform log #1, channel I2				R	
0xCE9A-0xCEA7	Waveform log #1, channel I3				R	
0xCEA8-0xCEB5	Waveform log #2, channel V1/V12				R	1
0xCEB6-0xCEC3	Waveform log #2, channel V2/V23				R	1
0xCEC4-0xCED1	Waveform log #2, channel V3/V31				R	1
0xCED2-0xCEDF	Waveform log #2, channel I1				R	
0xCEE0-0xCEED	Waveform log #2, channel I2				R	
0xCEEE-0xCEFB	Waveform log #2, channel I3				R	
Waveform Series Transfer Block EH						
0xD000-0xD1FF	**Waveform Sample Series**					2
+0	Sample point 1	-32768 to 32767		INT16	R	
+1	Sample point 2	-32768 to 32767		INT16	R	
+2	Sample point 2	-32768 to 32767		INT16	R	
+511	Sample point 512	-32768 to 32767		INT16	R	

NOTES:

1 When the 4LN3, 4LL3, 3LN3, 3LL3, 3BLN3 or 3BLL3 wiring mode is selected, the voltages will be line-to-neutral; for any other wiring mode, they will be line-to-line.

2 To convert digital samples to their analog equivalents in input measurement units (volts, amps), the following scaling should be applied:

$$\text{ANALOG\_SAMPLE [Volts / Amps]} = \frac{(\text{DIGITAL\_SAMPLE} - \text{ZERO\_OFFSET}) \times \text{ANALOG\_SCALE} \times 2}{\text{DIGITAL\_SCALE}}$$

5 Data Scales and Units

Code	Condition	Value/Range	Notes
Data Scales			
Vmax		Voltage scale × PT Ratio, V	2
Imax		Current scale (2A/10A) × 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	
AImin AImax	+/-1mA	AImin = -AI full scale × 2 AImax = AI full scale × 2	
	0-20mA	AImin = AI zero scale AImax = AI full scale	
	4-20mA	AImin = AI zero scale AImax = AI full scale	
	0-1mA	AImin = AI zero scale AImax = AI full scale	
Data Units			
U1	PT Ratio = 1	0.1V	
	PT Ratio > 1	1V	
U2		0.01A	
U3	PT Ratio = 1	1W/Var/VA	
	PT Ratio > 1	1kW/kvar/kVA	

1 CT Ratio = CT primary current/CT secondary current

2 The default Voltage scale is 144V (120V + 20%) unless you changed it in your device through the Device Data Scale setup registers (see Section 4.1) or via the supplemental PAS software.

3 The default Current scale is 2 × CT secondary current (2 × 1A or 2 × 5A depending on the order).

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.

6 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.	
Wiring Mode			
F2	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	
File Attributes			
F3	Bit 0 = 0 Bit 0 = 1	Non-wrap (stop when filled) Wrap-around (circular file)	
	Bit 5 = 1	TOU daily profile log	
File Status Word			
F4	Bit 0 = 0 Bit 0 = 1	Non-wrap (stop when filled) Wrap-around (circular file)	
	Bit 5 = 1	Daily profile log file	
	Bit 9 = 1	Reading after EOF	
File Record Status Word			
F5	Bit 0 = 1	The last record of the file is being read	
	Bit 1 = 1	Reading after EOF	
	Bit 8 = 1	File is empty	
	Bit 9 = 1	Corrupted record (CRC error)	
	Bit 15 = 1	Generic read error (with one of the bits 8-9)	
File Allocation Map			
F6	Bit 0	Event log file	
	Bit 1	Data log #1 file	
	Bit 2	Data log #2 file	
	Bit 3	Data log #3 file	
	Bit 4	Data log #4 file	
	Bit 5	Data log #5 file	
	Bit 6	Data log #6 file	
	Bit 7	Data log #7 file	
	Bit 8	Data log #8 file	
	Bits 9-16	Reserved	
	Bit 17	Waveform log #1 file	
	Bit 18	Waveform log #2 file	
	Bits 19-31	Reserved	
Profile Log Sections Map			
F7	Bit 0:7 = 1	Summary/TOU energy/usage registers #1-#8	
	Bit 16:23 = 1	Summary/TOU maximum demand registers #1-#8	
File ID			
F8	0	Event log file	
	1	Data log #1 file	
	2	Data log #2 file	
	3	Data log #3 file	
	4	Data log #4 file	
	5	Data log #5 file	
	6	Data log #6 file	
	7	Data log #7 file	
	8	Data log #8 file	
	9-16	Reserved	
	17	Waveform log #1 file	

Format Code	Value	Description	Notes
	18	Waveform log #2 file	
Waveform Log Channel Mask			
F9	Bit 0 = 1	Channel V1/V12	1
	Bit 1 = 1	Channel V2/V23	
	Bit 2 = 1	Channel V3/V31	
	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	
Summary/TOU Energy Register Source ID			
F11	0x0000	None	
	0x0700-0x0701	Pulse input DI1-DI2	
	0x1700	kWh import	
	0x1701	kWh export	
	0x1704	kvarh import	
	0x1705	kvarh export	
	0x1708	kVAh total	
Setpoint Trigger Parameters ID			
F12	0x0000	None (condition is not active)	
		Voltage Disturbance EH	
	0x0100	Voltage disturbance	
		Event Flags EH	
	0x0300	Event flag #1 ON	
	0x0301	Event flag #2 ON	
	0x0302	Event flag #3 ON	
	0x0303	Event flag #4 ON	
	0x0304	Event flag #5 ON	
	0x0305	Event flag #6 ON	
	0x0306	Event flag #7 ON	
	0x0307	Event flag #8 ON	
	0x8300	Event flag #1 OFF	
	0x8301	Event flag #2 OFF	
	0x8302	Event flag #3 OFF	
	0x8303	Event flag #4 OFF	
	0x8304	Event flag #5 OFF	
	0x8305	Event flag #6 OFF	
	0x8306	Event flag #7 OFF	
	0x8307	Event flag #8 OFF	
		Internal Events E	
	0x0400	kWh import pulse	
	0x0401	kWh export pulse	
	0x0403	kvarh import pulse	
	0x0404	kvarh export pulse	
	0x0405	kvarh total pulse	
	0x0406	kVAh total pulse	
	0x0407	Start new demand interval	
	0x0408	Start new tariff interval	
	0x0409	Start new volt/ampere demand interval	
	0x040A	Start new sliding window demand interval	
		Timers E	
	0x0500	Timer #1	
	0x0501	Timer #2	
		Status Inputs	
	0x0600	Status input #1 ON	
	0x0601	Status input #2 ON	
	0x8600	Status input #1 OFF	
	0x8601	Status input #2 OFF	
		Pulse Inputs	
	0x0700	Pulse input #1	
	0x0701	Pulse input #2	
		Relays	
	0x0800	Relay #1 ON	

Format Code	Value	Description	Notes
	0x0801	Relay #2 ON	
	0x8800	Relay #1 OFF	
	0x8801	Relay #2 OFF	
		Phase Reversal	4
	0x8901	Positive phase rotation reversal	
	0x8902	Negative phase rotation reversal	
		Pulse Counters	
	0x0A00	High pulse counter #1	
	0x0A01	High pulse counter #2	
	0x0A02	High pulse counter #3	
	0x0A03	High pulse counter #4	
		Time and Date Parameters E	
	0x0B02	Day of week	
	0x0B03	Year	
	0x0B04	Month	
	0x0B05	Day of month	
	0x0B06	Hour	
	0x0B07	Minutes	
	0x0B08	Seconds	
		1-Cycle Phase Values	
	0x0C03	High I1 current	
	0x0C04	High I2 current	
	0x0C05	High I3 current	
	0x8C03	Low I1 current	
	0x8C04	Low I2 current	
	0x8C05	Low I3 current	
		1-Cycle Values on any Phase	
	0x0E00	High voltage	
	0x8D00	Low voltage	
	0x0E01	High current	
	0x8D01	Low current	
	0x0E07	High voltage THD	
	0x0E08	High current THD	
	0x0E09	High K-Factor	
	0x0E0A	High current TDD	
		1-Cycle Auxiliary Values	
	0x1002	High frequency	
	0x9002	Low frequency	
	0x1003	High voltage unbalance	
	0x1004	High current unbalance	
		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	
	0x1503	High voltage unbalance	
	0x1504	High current unbalance	
		Present Demands	

Format Code	Value	Description	Notes
	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	
	0x1607	High block kvar import demand	
	0x1608	High block kVA demand	
	0x1609	High sliding window kW import demand	
	0x160A	High sliding window kvar import demand	
	0x160B	High sliding window kVA demand	
	0x160F	High accumulated kW import demand	
	0x1610	High accumulated kvar import demand	
	0x1611	High accumulated kVA demand	
	0x1612	High predicted kW import demand	
	0x1613	High predicted kvar import demand	
	0x1614	High predicted kVA demand	
	0x1616	High block kW export demand	
	0x1617	High block kvar export demand	
	0x1618	High sliding window kW export demand	
	0x1619	High sliding window kvar export demand	
	0x161A	High accumulated kW export demand	
	0x161B	High accumulated kvar export demand	
	0x161C	High predicted kW export demand	
	0x161D	High predicted kvar export demand	
		Setpoint Status	
	0x7C00	Setpoint #1 ON	
	0x7C01	Setpoint #2 ON	
	0x7C02	Setpoint #3 ON	
	0x7C03	Setpoint #4 ON	
	0x7C04	Setpoint #5 ON	
	0x7C05	Setpoint #6 ON	
	0x7C06	Setpoint #7 ON	
	0x7C07	Setpoint #8 ON	
	0x7C08	Setpoint #9 ON	
	0x7C09	Setpoint #10 ON	
	0x7C0A	Setpoint #11 ON	
	0x7C0B	Setpoint #12 ON	
	0x7C0C	Setpoint #13 ON	
	0x7C0D	Setpoint #14 ON	
	0x7C0E	Setpoint #15 ON	
	0x7C0F	Setpoint #16 ON	
Setpoint Action ID			
F14	0x0000	No action	
	0x2000	Set Event flag #1 [EH]	
	0x2001	Set Event flag #2 [EH]	
	0x2002	Set Event flag #3 [EH]	
	0x2003	Set Event flag #4 [EH]	
	0x2100	Clear Event flag #1 [EH]	
	0x2101	Clear Event flag #2 [EH]	
	0x2102	Clear Event flag #3 [EH]	
	0x2103	Clear Event flag #4 [EH]	
	0x3000	Operate Relay #1	
	0x3001	Operate Relay #2	
	0x3100	Release latched Relay #1	
	0x3101	Release latched Relay #2	
	0x4000	Increment counter #1	
	0x4001	Increment counter #2	
	0x4002	Increment counter #3	
	0x4003	Increment counter #4	
	0x4100	Clear counter #1	
	0x4101	Clear counter #2	
	0x4102	Clear counter #3	
	0x4103	Clear counter #4	
	0x6400	Clear all counters	
	0x6000	Reset total energy [E]	

Format Code	Value	Description	Notes
	0x6100	Reset all total maximum demands	
	0x6101	Reset power maximum demands [E]	
	0x6102	Reset volt/ampere/harmonic maximum demands	
	0x6200	Reset TOU energy [E]	
	0x6300	Reset TOU maximum demands [E]	
	0x6500	Clear Min/Max registers	
	0x7000	Event log [E]	
	0x7100	Data log #1 [E]	
	0x7101	Data log #2 [E]	
	0x7102	Data log #3 [E]	
	0x7103	Data log #4 [E]	
	0x7104	Data log #5 [E]	
	0x7105	Data log #6 [E]	
	0x7106	Data log #7 [E]	
	0x7107	Data log #8 [E]	
	0x7200	Waveform log #1 [EH]	
	0x7300	Waveform log #2 [EH]	
Counter Source ID			
F16	0x0000	None	
	0x0001-0x0002	Pulse input DI1-DI2	
Relay Output Pulse Source ID [E]			
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/Analog Expander Output 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	

Format Code	Value	Description	Notes
		1-Sec Auxiliary Values	
	0x1501	In Current	
	0x1502	Frequency	
		Present Demands [E]	
	0x160F	Accumulated kW import demand	
	0x1610	Accumulated kvar import demand	
	0x1611	Accumulated kVA demand	
	0x161A	Accumulated kW export demand	
	0x161B	Accumulated kvar export demand	
Event Cause/Point ID			
F19		**Setpoint Operation Events**	
	0x0000-0x59FF	Trigger parameter ID	
	0x6400-0xFFFF	Trigger parameter ID	
		Setpoint Action Events	
	0x5A00-0x5A0F	Setpoint #1-#16	
		Communications Events	
	0x5B00-0x5BFF	Data point ID (low byte, see F21)	
		Front Panel Operations	
	0x5C00-0x5CFF	Data point ID (low byte, see F21)	
		Self-Check Diagnostics Events	
	0x5D00-0x5DFF	Data point ID (low byte, see F21)	
		Self-Update Events	
	0x5E08	RTC DST/Standard time update	
		Hardware Diagnostics Events	
	0x6202	RAM/Data error	
	0x6203	Hardware watchdog reset	
	0x6204	DSP/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			
F20		**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/Harmonic maximum demands cleared	
	0x6200	Summary/TOU energy registers cleared	
	0x6300	Summary/TOU maximum demand registers cleared	
	0x6400	All counters cleared	
	0x6401-0x6403	Counter cleared (low byte = counter ID)	
	0x6500	Min/Max log cleared	
	0x6600	Event log file cleared (low byte = File ID)	
	0x6700-0x6707	Data log file cleared (low byte = File ID)	
	0x6710	All data logs cleared	
	0x6800	Waveform log #1 file cleared	
	0x6900	Waveform log #2 file 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	
		Setpoint Operation Events	
	0xE100-0xE10F	Setpoint operated (low byte = setpoint ID)	
	0xE200-0xE20F	Setpoint released (low byte = setpoint ID)	
		Setpoint Action Events	
	See F14	Setpoint action ID	
Data Point ID			
F21		**Data Locations**	
	0x03	Data memory	
	0x04	Factory setup	

Format Code	Value	Description	Notes
	0x05	Access/Password setup	
	0x06	Basic setup	
	0x07	Communications setup	
	0x08	Real-time clock	
	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	
	0x13	Programmable Min/Max log setup	
	0x14	Data log setup	
	0x15	File/Memory setup	
	0x16	TOU energy registers setup	
	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	
	0x26	AI setup	
	0x27	Waveform log setup	
	0x2B-0x3F	Reserved	
Device Diagnostics			
F23	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	Reserved	
	Bit 13 = 1	Low battery	
	Bit 14	Reserved	
	Bit 15 = 1	EEPROM fault	
DNP Object Types			
F24		**Static Binary Input Objects**	
	0	Single-Bit Binary Input	
	1	Binary Input With Status	
		Binary Input Change Event Objects	
	0	Binary Input Change Without Time	
	1	Binary Input Change With Time	
		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	
		Binary Counter Change Events	
	0	32-bit Counter Change Event Without Time	
	1	32-bit Counter Change Event With Time	
	2	16-bit Counter Change Event Without Time	
	3	16-bit Counter Change Event With Time	
		Frozen Binary Counters	
	0	32-bit Frozen Counter	
	1	32-bit Frozen Counter Without Flag	
	2	32-bit Frozen Counter With Time of Freeze	

Format Code	Value	Description	Notes
	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	
		Analog Input Change Events	
	0	32-bit Analog Change Event Without Time	
	1	32-bit Analog Change Event With Time	
	2	16-bit Analog Change Event Without Time	
	3	16-bit Analog Change Event With Time	
DNP Class 0 Objects			
F25	0x1E01	Analog Input 30:01	
	0x1E02	Analog Input 30:02	
	0x1E03	Analog Input 30:03	
	0x1E04	Analog Input 30:04	
	0x2801	Analog Output 40:01	
	0x2802	Analog Output 40:02	
	0x0101	Binary Input 01:01	
	0x0102	Binary Input 01:02	
	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	
Log Notification Status			
F26	Bit 0	Reserved	
	Bit 1=1	New Min/Max Log	
	Bit 2=1	New Event log record	
	Bit 3=1	New Data log record	
	Bit 4=1	New Waveform log #1 record	
	Bit 5=1	New Waveform log #2 record	
	Bits 6-15	Reserved	
Data Log Notification Status			
F27	Bit 0=1	New Data log #1 record	
	Bit 1=1	New Data log #2 record	
	Bit 2=1	New Data log #3 record	
	Bit 3=1	New Data log #4 record	
	Bit 4=1	New Data log #5 record	
	Bit 5=1	New Data log #6 record	
	Bit 6=1	New Data log #7 record	
	Bit 7=1	New Data log #8 record	
	Bits 8-15	Reserved	
Instrument Options			
F28	Bit 0=1	120V Option	
	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)	
	Bit 13=1	Reserved	
	Bit 14=1	Analog expander option ±1mA	
	Bit 15	Reserved	
	Bits 16-18	Number of RO - 1	
	Bits 19-22	Number of DI – 1	
	Bits 23-24	Number of AO - 1	

Format Code	Value		Description	Notes
	Bits 25-29		Reserved	
	Bits 30-31=11		Memory module 1MBytes [E]	
I/O Slot Types				
F29	DI	DRY	00000000B	× = Don't care
	RO		00100000B	
	AI	±1 mA	01010000B	
	AI	0-20 mA	01010001B	
	AI	4-20 mA	01010010B	
	AI	0-1 mA	01010011B	
	AO	±1 mA	01100000B	
	AO	0-20 mA	01100001B	
	AO	4-20 mA	01100010B	
	AO	0-1 mA	01100011B	
	Empty slot		1111××××B	
Reset/Clear Function				
F30	Function	Target		
	1	0	Clear total energy registers [E]	
	2	0=all maximum demands 1=power demands [E] 2=volt, ampere and harmonic demands	Clear total maximum demand registers	
	3	0	Clear TOU energy registers [E]	
	4	0	Clear TOU demand registers [E]	
	5	0=all counters 1-4=counter #1-#4	Clear pulse counters	
	6	0	Clear Min/Max log	
	7	0	Clear Event log [E]	
	8	0-7 = data logs #1-#8, 16=all data logs	Clear Data log [E]	
	9	0	Clear Waveform log #1 [EH]	
	A	0	Clear Waveform log #2 [EH]	
	B		Reserved	
	C	0	Restore Event log read pointer [E]	
	D	0-7=data log #1-#8	Restore Data log read pointer [E]	
	E	0	Restore Waveform log #1 read pointer [EH]	
	F	0	Restore Waveform log #2 log read pointer [EH]	
Basic Setup Parameters ID				
F31	W40		Wiring mode	
	U14		PT ratio	
	Q58		Nominal secondary voltage [EH]	
	I17		CT primary current	
	D11		Power block demand period [E]	
	F47		The number of blocks in a sliding window [E]	
	C12		Volt/ampere/harmonic demand period	
	Q51		Nominal frequency	
	Q52		Maximum demand load current	
	Q50		Number of cycles before trigger for Waveform log #1 [EH]	
	Q56		Number of cycles per series for Waveform log #1 [EH]	
	Q60		PT ratio multiplication factor	

NOTES:

[1] **Voltage Waveforms**

When the 4LN3, 4LL3, 3LN3, 3LL3, 3BLN3 or 3BLL3 wiring mode is selected, the voltage waveforms will be line-to-neutral; for any other wiring mode, they will be line-to-line.

[2] **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 instrument 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.

[3] **Voltage Disturbance Trigger**

The operate limit specifies the voltage deviation in percent of the nominal secondary voltage.

[4] **Phase Reversal Trigger**

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