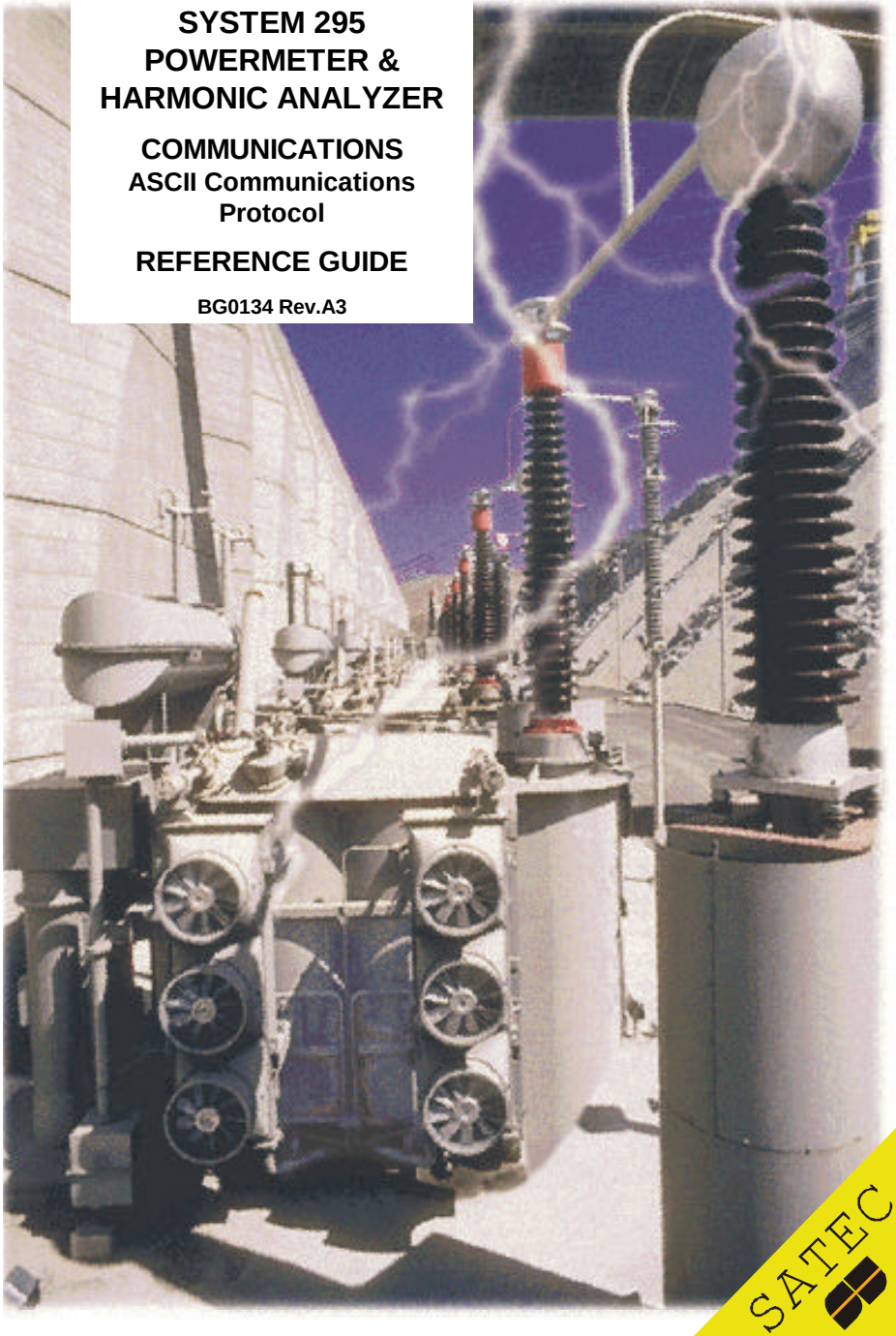
SYSTEM 295
POWERMETER & HARMONIC ANALYZER

COMMUNICATIONS
ASCII Communications Protocol

REFERENCE GUIDE

BG0134 Rev.A3



SATEC

SYSTEM 295 POWERMETER and

HARMONIC ANALYZER

ASCII Communications Protocol

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Chapter 1 GENERAL

This document specifies the ASCII serial communications protocol used to transfer data between a master computer station and PM295. The document provides the complete information necessary to develop a third-party communications software capable to communicate with the Series 295 instruments.

All messages within the ASCII communications protocol are designed to consist only of printable characters.

Additional information concerning communications operation, configuring the communications parameters and communications connections is found in publication "System 295 Powermeter and Harmonic Analyzer. Installation and Operation Manual".

Specification changes

The following indicates specification changes which apply to the PM295 instruments with firmware version 2.03 or later.

1. Added kVAh and present kW and kVA demand readings to the basic data table (Section 4.1).
2. Added variable-size direct read/write requests (Section 5.1.2).
3. Added basic setup and reset/clear registers accessible via direct read/write (Sections 5.3 and 5.6).
4. Added 120 user assignable registers allowing the user to access multiple data that reside in different locations with a single request by re-mapping them to adjacent addresses in the user assignable registers area (Section 5.1.3).
5. Added instrument options registers (Section 5.4).
6. Added alarm and self-check status registers (Section 5.5).

IMPORTANT

1. The voltage parameters throughout the protocol can represent line-to-neutral or line-to-line voltages depending on the wiring mode selected in the instrument. When the 4LN3 or 3LN3 wiring mode is selected, the voltages will be line-to-neutral; for any other wiring mode, they will be line-to-line voltages. In 4LN3, 4LL3, 3LN3 and 3LL3 wiring modes, harmonic voltages will represent line-to-neutral voltages. In a 3-wire direct connection, harmonic voltages will represent line-to-neutral voltages as they appear on the instrument's input transformers. In a 3-wire open delta connection, harmonic voltages will comprise L12 and L23 line-to-line voltages.
2. 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 can be used.

Chapter 2 ASCII FRAMING

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	Check sum	Trailer (CRLF)
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

Two characters between '00' and '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

One character representing the type of a host request. A list of the message types is shown in Tables 2-1 and 2-2. Notice 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. If not indicated else, 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 instruments) a decimal representation is preserved.

In a decimal notation, the parameters are transferred in a decimal representation as is, i.e., no conversion is needed. When a value is between 0 and 1, a decimal point would be placed in the data field. When the whole value is over the field range, it is divided by 1000 and truncated to the right. A decimal point is placed after the thousands to denote that the value has been truncated and must be multiplied by 1000 before it will be processed.

In a hexadecimal notation, all parameters are whole binary numbers of a 1-byte, 2-byte or 4-byte length. Each byte is transferred as two hexadecimal digits in ASCII notation (i.e., ASCII printable characters 0-9, A-F are used to represent hexadecimal digits 0h-9h, 0ah-0fh). Each byte would be transmitted high order digit first. Each 2-byte and 4-byte parameter would be transmitted high order bytes first. Negative numbers are transmitted in 2-complement code.

To represent numbers between 0 and 1, a modulus method is used. Such numbers are kept in the instrument being divided by a modulus that depends on the number of decimal digits in the fractional part, i.e., on the value precision. The modulus is given in the form $\times 0.1$, or $\times 0.01$. For example, the frequency value of 50.1 Hz having the modulus of $\times 0.1$ will be received from the instrument as the whole number of 501. To process the value received from the instrument in this format, the value must be multiplied by the modulus. To write such a number to the instrument, the number should be divided by the modulus.

Check sum

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 22h to 7Eh (hexadecimal) as follows: $[\sum(\text{each byte} - 22H)] \bmod 5CH + 22H$

Trailer

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
Char	**ASCII Hex**	
0	30h	Read basic data registers
1	31h	Read basic setup
2	32h	Write basic setup
3	33h	Read instrument status
4	34h	Reset/clear functions
8	38h	Reset the instrument
9	39h	Read version number
?	3F	Read extended status
@	40h	Read extended memory status
B	42h	Read multiplexed analog output allocation

Message type		Description
Char	ASCII Hex	
b	62h	Write multiplexed analog output allocation
C	43h	Read analog expander channel allocation
c	63h	Write analog expander channel allocation
D	44h	Read discrete input allocation
d	64h	Write discrete input allocation
E	45h	Read timer setup
e	65h	Write timer setup
F	46h	Read alarm/event setpoint
f	66h	Write alarm/event setpoint
G	47h	Read pulsing setpoint
g	67h	Write pulsing setpoint
H	48h	Read phase harmonics
i	69h	Write event flag
J	4Ah	Read pulse counter setup
j	6Ah	Write pulse counter setup
K	4Bh	Read memory partition setup
k	6Bh	Write memory partition setup
L	4Ch	Read data log setup
l	6Ch	Write data log setup
M	4Dh	Read event log
N	4Eh	Read data log
O	4Fh	Read Min/Max log
P	50h	Read TOU register allocation
p	70h	Write TOU register allocation
Q	51h	Read TOU daily profile
q	71h	Write TOU daily profile
R	52h	Read TOU calendar
r	72h	Write TOU calendar
S	53h	Read Real Time Clock
T	54h	Write Real Time Clock
U	55h	Read TOU calendar year
u	75h	Write TOU calendar year
V	56h	Read programmable Min/Max log setup
v	76h	Write programmable Min/Max log setup
W	57h	Read waveform

Table 2-2 Direct Read/Write ASCII Requests

Message type		Description
Char	ASCII Hex	
A	41h	Long-size direct read
a	61h	Long-size direct write
X	58h	Variable-size direct read
x	78h	Variable-size direct write

Chapter 3 EXCEPTION RESPONSES

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

XK - the powermeter 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 powermeter will not act on or respond to the master's request.

Chapter 4 SPECIFIC ASCII REQUESTS

4.1 Basic Data

Table 4-1 Read Request

Message type (ASCII)					
0					
Message body (decimal)					
Request - no body					
Response					
Field	**Offset**	**Length**	**Parameter**	**Unit**	**Range**
1	0	4	Voltage L1/L12	V/kV **À**	0 to Vmax
2	4	4	Voltage L2/L21	V/kV **À**	0 to Vmax
3	8	4	Voltage L3/L31	V/kV **À**	0 to Vmax
4	12	5	Current L1	A	0 to Imax
5	17	5	Current L2	A	0 to Imax
6	22	5	Current L3	A	0 to Imax
7	27	6	kW L1	kW/MW **À**	-Pmax to Pmax
8	33	6	kW L2	kW/MW **À**	-Pmax to Pmax
9	39	6	kW L3	kW/MW **À**	-Pmax to Pmax
10	45	4	Power factor L1		-.99 to 1.00 **Á**
11	49	4	Power factor L2		-.99 to 1.00 **Á**
12	53	4	Power factor L3		-.99 to 1.00 **Á**
13	57	6	kW total	kW/MW **À**	-Pmax to Pmax
14	63	4	Power factor total		-.99 to 1.00 **Á**
15	67	6	kWh import	kWh/MWh **À**	0 to 9999.
16	73	5	Neutral (unbalanced) current	A	0 to Imax
17	78	4	Frequency	Hz	45.0 to 65.0
18	82	6	kvar L1	kvar/Mvar **À**	-Pmax to Pmax
19	88	6	kvar L2	kvar/Mvar **À**	-Pmax to Pmax
20	94	6	kvar L3	kvar/Mvar **À**	-Pmax to Pmax
21	100	6	kVA L1	kVA/MVA **À**	0 to Pmax
22	106	6	kVA L2	kVA/MVA **À**	0 to Pmax
23	112	6	kVA L3	kVA/MVA **À**	0 to Pmax
24	118	6	kvarh net	kvarh/Mvarh **À**	-999.9 to 9999.9
25	124	6	kvar total	kvar/Mvar **À**	-Pmax to Pmax
26	130	6	kVA total	kVA/MVA **À**	0 to Pmax
27	136	6	Maximum kW demand	kW/MW **À**	0 to Pmax

28	142	6	Accumulated kW demand	kW/MW **À**	0 to Pmax
29	148	5	Max. amp. demand L1	A	0 to Imax
30	153	5	Max. amp. demand L2	A	0 to Imax
31	158	5	Max. amp. demand L3	A	0 to Imax
32	163	2	Status inputs (hex)		See Table 4-15
33	165	6	kWh export	kWh/MWh **À**	0 to -999.9
34	171	6	Maximum kVA demand	kVA/MVA **À**	0 to Pmax
35	177	4	Voltage THD L1/L12	%	0 to 99.9
36	181	4	Voltage THD L2/L23	%	0 to 99.9
37	185	4	Voltage THD L3	%	0 to 99.9
38	189	4	Current THD L1	%	0 to 99.9
39	193	4	Current THD L2	%	0 to 99.9
40	197	4	Current THD L3	%	0 to 99.9
41	201	8	kVAh	kVAh	0 to 9999999
42	209	6	Present kW demand	kW/MW **À**	0 to Pmax
43	215	6	Present kVA demand	kVA/MVA **À**	0 to Pmax

À When the value width is greater than the field resolution, the reading is converted to higher units and transmitted with a decimal point. The right-most digits of the reading are truncated.

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

Â The parameter limits are as follows:

Vmax (660 V input option) = 660V @ PT Ratio = 1
Vmax (660 V input option) = 144 × PT Ratio [V] @ PT Ratio > 1
Vmax (120 V input option) = 144 × PT Ratio [V]
Imax (20% over-range) = 1.2 × CT primary current [A]
Iaux max (20% over-range) = 1.2 × Auxiliary CT primary current [mA/A]
Pmax = (Imax × Vmax × 3)/1000 [kW] if wiring mode is 4LN3 or 3LN3
Pmax = (Imax × Vmax × 2)/1000 [kW] if wiring mode is 4LL3, 3OP2, 3DIR2, 3OP3 or 3LL3

4.2 Basic Setup

Table 4-2 Read Request

Message type (ASCII)				
1				
Message body (decimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	3	Parameter identifier	see Table 4-4
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	3	Parameter identifier	see Table 4-4
2	3	4	Not used	permanently set to 00.0
3	7	6	Parameter value	see Table 4-4

Table 4-3 Write Request

Message type (ASCII)				
2				
Message body (decimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	3	Parameter identifier	see Table 4-4
2	3	4	Not used	set to 00.0
3	7	6	Parameter value	see Table 4-4

Table 4-4 Basic Setup Parameters

Parameter	Identifier	Range
Wiring mode **À**	W40	0 = 3OP2, 1 = 4LN3, 2 = 3DIR2, 3 = 4LL3, 4 = 3OP3, 5 = 3LN3, 6 = 3LL3
PT ratio	U14	1.0 to 6500.0
CT primary current	I17	1 to 50000 A
Auxiliary CT primary current	G19	1 to 50000 A/mA
Power demand period	D11	1,2,5,10,15,20,30,60 min 255 = external synchronization
The number of demand periods	F47	1 - 15
Thermal demand time constant	J48	1.0 - 3600.0
Volt/ampere demand period	C12	0 to 1800 sec
The number of pre-event cycles	Q50	1-8
Averaging buffer size	S41	8, 16, 32
Reset enable/disable	R42	0 = disable, 1 = enable

À The wiring mode options are as follows:

3OP2 - 3-wire open delta using 2 CTs (2 element)
4LN3 - 4-wire WYE using 3 PTs (3 element), line to neutral voltage readings
3DIR2 - 3-wire direct connection using 2 CTs (2 element)
4LL3 - 4-wire WYE using 3 PTs (3 element), line to line voltage readings
3OP3 - 3-wire open delta using 3 CTs (2 1/2 element)
3LN3 - 4-wire WYE using 2 PTs (2 1/2 element), line to neutral voltage readings
3LL3 - 4-wire WYE using 2 PTs (2 1/2 element), line to line voltage readings

4.3 Instrument Status

Table 4-5 Read Request

Message type (ASCII)				
3				
Message body (hexadecimal)				
Request - no body				
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	8	Not used	permanently set to 00000000
2	8	1	Keypad status	0-F (see Table 4-6)
3	9	1	Relay status	0-F (see Table 4-7)

Table 4-6 Keypad Status

Bit	Description
0	Up key status
1	Enter key status
2	Select key status
3	Down key status

Bit meaning: 0 = key released, 1 = key pressed

Table 4-7 Relay Status

Bit	Description
0	Relay #4 status
1	Relay #3 status
2	Relay #2 status
3	Relay #1 status

Bit meaning: 0 = relay operated, 1 = relay released

4.4 Reset/Clear Functions

Table 4-8 Write Request

Message type (ASCII)				
4				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	1	Reset function	see Table 4-9
2	1	2	Target	see Table 4-9 (the field can be omitted if it is denoted as N/A)

Table 4-9 Reset/Clear Functions

Function	Description	Target
1	Clear total energy registers	N/A
2	Clear total extreme demand registers	N/A
3	Clear TOU energy registers	N/A
4	Clear TOU demand registers	N/A
5	Clear pulse counters	N/A
6	Clear Min/Max log	N/A
7	Clear event log	N/A
8	Clear data log	0-15 = log number 16 = all logs
9	Clear high-speed (32/16) waveform log	N/A
A	Clear high-resolution (128/4) waveform log	N/A
B	Reserved (no actions will be made)	N/A
C	Restore event log queue	N/A
D	Restore data log queue	0-15 = log number 16 = all logs
E	Restore high-speed waveform log queue	N/A
F	Restore high-resolution waveform log queue	N/A

4.5 Reset the Instrument (warm restart)

This request causes the instrument to perform full reset and restart as in the event of power up. No response is expected.

Table 4-10 Write Request

Message type (ASCII)
8
Message body
Request - no body
Response - no response

4.6 Firmware Version Number

Table 4-11 Read Request

Message type (ASCII)				
9				
Message body (decimal)				
Request - no body				
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	3	Firmware version	200-299

4.7 Extended Instrument Status

Table 4-12 Read Request

Message type (ASCII)				
?				
Message body (hexadecimal)				
Request - no body				
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	4	Relay status	see Table 4-13
2	4	4	User event flags status	see Table 4-14
3	8	4	Status inputs	see Table 4-15
4	12	4	Setpoints status	see Table 4-16
5	16	4	Log status	see Table 4-17
6	20	4	Data log status	see Table 4-18
7	24	2	Setpoint #1 conditions status	see Table 4-19
8	26	2	Setpoint #2 conditions status	see Table 4-19
9	28	2	Setpoint #3 conditions status	see Table 4-19
10	30	2	Setpoint #4 conditions status	see Table 4-19
11	32	2	Setpoint #5 conditions status	see Table 4-19
12	34	2	Setpoint #6 conditions status	see Table 4-19
13	36	2	Setpoint #7 conditions status	see Table 4-19
14	38	2	Setpoint #8 conditions status	see Table 4-19
15	40	2	Setpoint #9 conditions status	see Table 4-19
16	42	2	Setpoint #10 conditions status	see Table 4-19
17	44	2	Setpoint #11 conditions status	see Table 4-19
18	46	2	Setpoint #12 conditions status	see Table 4-19
19	48	2	Setpoint #13 conditions status	see Table 4-19
20	50	2	Setpoint #14 conditions status	see Table 4-19
21	52	2	Setpoint #15 conditions status	see Table 4-19
22	54	2	Setpoint #16 conditions status	see Table 4-19

Table 4-13 Relay Status

Bit	Description
0	Relay #1 status
1	Relay #2 status
2	Relay #3 status
3	Relay #4 status
4-15	Not used (permanently set to 0)

Bit meaning: 0 = relay released, 1 = relay operated

Table 4-14 User Event Flags Status

Bit	Description
0	Event flag #1 status
1	Event flag #2 status
2	Event flag #3 status
3	Event flag #4 status
4	Event flag #5 status
5	Event flag #6 status
6	Event flag #7 status
7	Event flag #8 status
8-15	Not used (permanently set to 0)

Bit meaning: 0 = flag is OFF, 1 = flag is ON

Table 4-15 Status Inputs

Bit	Description
0	Status input #1
1	Status input #2
2	Status input #3
3	Status input #4
4	Status input #5
5	Status input #6
6	Status input #7
7	Status input #8
8-15	Not used (permanently set to 0)

Bit meaning: 0 = contact open, 1 = contact closed

Table 4-16 Setpoints Status

Bit	Description
0	Setpoint # 1 status
1	Setpoint # 2 status
2	Setpoint # 3 status
3	Setpoint # 4 status
4	Setpoint # 5 status
5	Setpoint # 6 status

6	Setpoint # 7 status
7	Setpoint # 8 status
8	Setpoint # 9 status
9	Setpoint # 10 status
10	Setpoint # 11 status
11	Setpoint # 12 status
12	Setpoint # 13 status
13	Setpoint # 14 status
14	Setpoint # 15 status
15	Setpoint # 16 status

Bit meaning: 0 = setpoint is released, 1 = setpoint is operated

Table 4-17 Log Status

Bit	Description
0	Reserved
1	New Min/Max Log
2	New event log
3	New data log (any)
4	New high-speed (32/16) waveform log
5	New high-resolution (128/4) waveform log
6-15	Not used (permanently set to 0)

Bit meaning: 0 = no new logs, 1 = new log recorded (the new log flag is reset when the user reads the first log record after the flag has been set)

Table 4-18 Data Log Status

Bit	Description
0	New data log #1
1	New data log #2
2	New data log #3
3	New data log #4
4	New data log #5
5	New data log #6
6	New data log #7
7	New data log #8
8	New data log #9
9	New data log #10
10	New data log #11
11	New data log #12
12	New data log #13
13	New data log #14
14	New data log #15
15	New data log #16

Bit meaning: 0 = no new logs, 1 = new log recorded (the new log flag is reset when the user reads the first log record after the flag has been set)

Table 4-19 Setpoint Conditions Status

Bit	Description
0	Setpoint condition #1 status
1	Setpoint condition #2 status
2	Setpoint condition #3 status
3	Setpoint condition #4 status
4-7	Not used (permanently set to 0)

Bit meaning:

a) when a setpoint is operated: 0 = condition is false, 1 = condition is true

b) when a setpoint is released: 0 = condition is true, 1 = condition is false

4.8 Extended Memory Status

Table 4-20 Read Request

Message type (ASCII)			
@			
Message body (hexadecimal)			
Request - no body			
Response			
Field	**Offset**	**Length**	**Parameter**
1	0	8	Total memory size, byte
2	8	8	Free memory size, byte
3	16	4	The number of logged records in event log
4	20	4	The number of logged records in data log #1
5	24	4	The number of logged records in data log #2
6	28	4	The number of logged records in data log #3
7	32	4	The number of logged records in data log #4
8	36	4	The number of logged records in data log #5
9	40	4	The number of logged records in data log #6
10	44	4	The number of logged records in data log #7
11	48	4	The number of logged records in data log #8
12	52	4	The number of logged records in data log #9
13	56	4	The number of logged records in data log #10
14	60	4	The number of logged records in data log #11
15	64	4	The number of logged records in data log #12
16	68	4	The number of logged records in data log #13
17	72	4	The number of logged records in data log #14
18	76	4	The number of logged records in data log #15
19	80	4	The number of logged records in data log #16
20	84	4	The number of logged records in the high-speed (32/16) waveform log
21	88	4	The number of logged records in the high-resolution (128/4) waveform log
22	92	4	The number of new event log records
23	96	4	The number of new data log #1 records

24	100	4	The number of new data log #2 records
25	104	4	The number of new data log #3 records
26	108	4	The number of new data log #4 records
27	112	4	The number of new data log #5 records
28	116	4	The number of new data log #6 records
29	120	4	The number of new data log #7 records
30	124	4	The number of new data log #8 records
31	128	4	The number of new data log #9 records
32	132	4	The number of new data log #10 records
33	136	4	The number of new data log #11 records
34	140	4	The number of new data log #12 records
35	144	4	The number of new data log #13 records
36	148	4	The number of new data log #14 records
37	152	4	The number of new data log #15 records
38	156	4	The number of new data log #16 records
39	160	4	The number of new high-speed (32/16) waveform log records
40	164	4	The number of new high-resolution (128/4) waveform log records

The number of logged records includes all records currently logged in the memory partition. The number of the new records includes the number of records that are logged after the last read request has been issued for the memory partition.

4.9 Multiplexed Analog Output Allocation

Table 4-21 Read Request

Message type (ASCII)				
B				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Analog channel number	0-15
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Analog channel number	0-15
2	2	4	Output parameter index	see Table 5-7
3	6	8	Zero scale (0-4 mA)	see Table 5-7
4	14	8	Full scale (20 mA)	see Table 5-7

Table 4-22 Write Request

Message type (ASCII)				
b				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Analog channel number	0-15
2	2	4	Output parameter index	see Table 5-7
3	6	8	Zero scale (0-4 mA)	see Table 5-7
4	14	8	Full scale (20 mA)	see Table 5-7

1. The full scale value may not be less than the zero scale.
2. For signed (bi-directional) power factor, the conversion scales are permanently set in the instrument to the range of -0.00 to 0.00 and may not be changed. Through communications, these are transmitted as -1.00/1.00. In the write request, fields 3 and 4 for signed power factor will be ignored. No error will occur.

4.10 Analog Expander Channel Allocation

Table 4-23 Read Request

Message type (ASCII)				
C				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Analog channel number	0-13
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Analog channel number	0-13
2	2	4	Output parameter index	see Table 5-7
3	6	8	Zero scale (0-4 mA)	see Table 5-7
4	14	8	Full scale (20 mA)	see Table 5-7

Table 4-24 Write Request

Message type (ASCII)				
c				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Analog channel number	0-13
2	2	4	Output parameter index	see Table 5-7
3	6	8	Zero scale (0-4 mA)	see Table 5-7
4	14	8	Full scale (20 mA)	see Table 5-7

1. The full scale value may not be less than the zero scale.
2. For signed (bi-directional) power factor, see Note 2 to Table 4-22.

4.11 Discrete Inputs Allocation

Table 4-25 Read Request

Message type (ASCII)				
D				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Discrete input group ID	see Table 4-27
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Discrete input group ID	see Table 4-27
2	2	2	Allocation mask	see Table 4-28

Table 4-26 Write Request

Message type (ASCII)				
d				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Discrete input group ID	see Table 4-27
2	2	2	Allocation mask	see Table 4-28

1. Before allocating inputs for the selector of the internal multiplexed analog output, they should be allocated as status inputs. From one to four contiguous discrete inputs beginning from input #1 can be used for the multiplexer channels' selector.
2. Before allocating an input for the external synchronization pulse, it should be allocated as pulse input.
3. In the event that the discrete input has just been allocated for any source, you should disable it before trying to reallocate it to another input group.

Table 4-27 Discrete Input Groups

Group ID	Description
0	Status inputs
1	Pulse inputs
2	Analog output multiplexer selector inputs
3	External synchronization pulse input

Table 4-28 Discrete Inputs Allocation Mask

Bit number	Description
0	Discrete input # 1 allocation status
1	Discrete input # 2 allocation status
2	Discrete input # 3 allocation status
3	Discrete input # 4 allocation status
4	Discrete input # 5 allocation status
5	Discrete input # 6 allocation status
6	Discrete input # 7 allocation status
7	Discrete input # 8 allocation status

Bit meaning: 0 = input not allocated, 1 = input allocated to the group

4.12 Timer Setup

Table 4-29 Read Request

Message type (ASCII)				
E				
Message body (hexadecimal)				
Request				
Field	Offset	Length	Parameter	Range
1	0	2	Timer number	0 - 3
Response				
Field	Offset	Length	Parameter	Range
1	0	2	Timer number	0-3
2	2	4	Timer interval, sec	1-9999, 0 = timer disabled

Table 4-30 Write Request

Message type (ASCII)				
e				
Message body (hexadecimal)				
Request/Response				
Field	Offset	Length	Parameter	Range
1	0	2	Timer number	0-3
2	2	4	Timer interval, sec	1-9999, 0 = disable timer

4.13 Alarm/Event Setpoints

Table 4-31 Read Request

Message type (ASCII)					
F					
Message body (hexadecimal)					
Request					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	2	Setpoint number		0 - 15
Response					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	2	Setpoint number		0-15
2	2	2	Condition #1	Conjunction operation	0 = OR, 1 = AND
3	4	4		Trigger parameter index	see Table 4-33
4	8	2		Operate condition	see Table 4-33
5	10	8		Operate limit	see Table 4-33
6	18	8		Release limit	see Table 4-33
7	26	2	Condition #2	Conjunction operation	0 = OR, 1 = AND
8	28	4		Trigger parameter index	see Table 4-33
9	32	2		Operate condition	see Table 4-33
10	34	8		Operate limit	see Table 4-33
11	42	8		Release limit	see Table 4-33
12	50	2	Condition #3	Conjunction operation	0 = OR, 1 = AND
13	52	4		Trigger parameter index	see Table 4-33
14	56	2		Operate condition	see Table 4-33
15	58	8		Operate limit	see Table 4-33
16	66	8		Release limit	see Table 4-33
17	74	2	Condition #4	Conjunction operation	0 = OR, 1 = AND
18	76	4		Trigger parameter index	see Table 4-33
19	80	2		Operate condition	see Table 4-33
20	82	8		Operate limit	see Table 4-33
21	90	8		Release limit	see Table 4-33
22	98	4	Action #1	Action type	see Table 4-35
23	102	2		Action target	see Table 4-35
24	104	4	Action #2	Action type	see Table 4-35
25	108	2		Action target	see Table 4-35
26	110	4	Action #3	Action type	see Table 4-35
27	114	2		Action target	see Table 4-35
28	116	4	Action #4	Action type	see Table 4-35
29	120	2		Action target	see Table 4-35
30	122	2	Delays	Time unit	0 = 1s, 1 = 0.1s
31	124	4		Operate delay	0-9999
32	128	4		Release delay	0-9999

The setpoint is disabled when the first trigger parameter is set to NONE.

Table 4-32 Write Request

Message type (ASCII)					
f					
Message body (hexadecimal)					
Request					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	2	Setpoint number		0-15
2	2	2	Condition #1	Conjunction operation	0 = OR, 1 = AND
3	4	4		Trigger parameter index	see Table 4-33
4	8	2		Operate condition	see Table 4-33
5	10	8		Operate limit	see Table 4-33
6	18	8		Release limit	see Table 4-33
7	26	2	Condition #2	Conjunction operation	0 = OR, 1 = AND
8	28	4		Trigger parameter index	see Table 4-33
9	32	2		Operate condition	see Table 4-33
10	34	8		Operate limit	see Table 4-33
11	42	8		Release limit	see Table 4-33
12	50	2	Condition #3	Conjunction operation	0 = OR, 1 = AND
13	52	4		Trigger parameter index	see Table 4-33
14	56	2		Operate condition	see Table 4-33
15	58	8		Operate limit	see Table 4-33
16	66	8		Release limit	see Table 4-33
17	74	2	Condition #4	Conjunction operation	0 = OR, 1 = AND
18	76	4		Trigger parameter index	see Table 4-33
19	80	2		Operate condition	see Table 4-33
20	82	8		Operate limit	see Table 4-33
21	90	8		Release limit	see Table 4-33
22	98	4	Action #1	Action type	see Table 4-35
23	102	2		Action target	see Table 4-35
24	104	4	Action #2	Action type	see Table 4-35
25	108	2		Action target	see Table 4-35
26	110	4	Action #3	Action type	see Table 4-35
27	114	2		Action target	see Table 4-35
28	116	4	Action #4	Action type	see Table 4-35
29	120	2		Action target	see Table 4-35
30	122	2	Delays	Time unit	0 = 1s, 1 = 0.1s
31	124	4		Operate delay	0-9999
32	128	4		Release delay	0-9999
Response					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	2	Setpoint number		0 - 15

To disable the setpoint, send request 'f' with fields 2 through 6 padded with ASCII zeros.

Table 4-33 Alarm/Event Setpoint Trigger Parameters

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
None	0000h		N/A	N/A
Special inputs À				
Voltage disturbance	0100h	%	0 to 100 **Æ**	GE/LE/EQ/NE
Phase rotation	0101h		0 to 2 **Ç**	GE/LE/EQ/NE
User event flags				
Event flag #1	0300h		N/A	ON/OFF
Event flag #2	0301h		N/A	ON/OFF
Event flag #3	0302h		N/A	ON/OFF
Event flag #4	0303h		N/A	ON/OFF
Event flag #5	0304h		N/A	ON/OFF
Event flag #6	0305h		N/A	ON/OFF
Event flag #7	0306h		N/A	ON/OFF
Event flag #8	0307h		N/A	ON/OFF
Internal events				
kWh import pulse	0400h		N/A	ON/OFF
kWh export pulse	0401h		N/A	ON/OFF
kWh total pulse	0402h		N/A	ON/OFF
kvarh import pulse	0403h		N/A	ON/OFF
kvarh export pulse	0404h		N/A	ON/OFF
kvarh total pulse	0405h		N/A	ON/OFF
kVAh total pulse	0406h		N/A	ON/OFF
Start new demand interval	0407h		N/A	ON/OFF
Start new tariff	0409h		N/A	ON/OFF
Timers				
Timer #1	0500h		N/A	ON/OFF
Timer #2	0501h		N/A	ON/OFF
Timer #3	0502h		N/A	ON/OFF
Timer #4	0503h		N/A	ON/OFF
Status inputs				
Status input #1	0600h		N/A	ON/OFF
Status input #2	0601h		N/A	ON/OFF
Status input #3	0602h		N/A	ON/OFF
Status input #4	0603h		N/A	ON/OFF
Status input #5	0604h		N/A	ON/OFF
Status input #6	0605h		N/A	ON/OFF
Status input #7	0606h		N/A	ON/OFF
Status input #8	0607h		N/A	ON/OFF
Pulse inputs				
Pulse input #1	0700h		N/A	ON/OFF
Pulse input #2	0701h		N/A	ON/OFF
Pulse input #3	0702h		N/A	ON/OFF
Pulse input #4	0703h		N/A	ON/OFF
Pulse input #5	0704h		N/A	ON/OFF

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Pulse input #6	0705h		N/A	ON/OFF
Pulse input #7	0706h		N/A	ON/OFF
Pulse input #8	0707h		N/A	ON/OFF
Relay status				
Relay #1 status	0800h		N/A	ON/OFF
Relay #2 status	0801h		N/A	ON/OFF
Relay #3 status	0802h		N/A	ON/OFF
Relay #4 status	0803h		N/A	ON/OFF
Pulse counters				
Pulse counter #1	0A00h		0 to 10^9-1	GE/LE/EQ/NE
Pulse counter #2	0A01h		0 to 10^9-1	GE/LE/EQ/NE
Pulse counter #3	0A02h		0 to 10^9-1	GE/LE/EQ/NE
Pulse counter #4	0A03h		0 to 10^9-1	GE/LE/EQ/NE
Pulse counter #5	0A04h		0 to 10^9-1	GE/LE/EQ/NE
Pulse counter #6	0A05h		0 to 10^9-1	GE/LE/EQ/NE
Pulse counter #7	0A06h		0 to 10^9-1	GE/LE/EQ/NE
Pulse counter #8	0A07h		0 to 10^9-1	GE/LE/EQ/NE
Time/Date parameters À				
Packed date **Á**	0B00h		000101 to 991231	GE/LE/EQ/NE
Packed time **Â**	0B01h		000000 to 235959	GE/LE/EQ/NE
Day of week	0B02h		1= Sun, 7=Sat	GE/LE/EQ/NE
Year	0B03h		0 to 99	GE/LE/EQ/NE
Month	0B04h		1 to 12	GE/LE/EQ/NE
Day of month	0B05h		1 to 31	GE/LE/EQ/NE
Hour	0B06h		0 to 23	GE/LE/EQ/NE
Minute	0B07h		0 to 59	GE/LE/EQ/NE
Second	0B08h		0 to 59	GE/LE/EQ/NE
Real-time values per phase				
Voltage L1/L12	0C00h	V	0 to Vmax	GE/LE/EQ/NE
Voltage L2/L23	0C01h	V	0 to Vmax	GE/LE/EQ/NE
Voltage L3/L31	0C02h	V	0 to Vmax	GE/LE/EQ/NE
Current L1	0C03h	A	0 to Imax	GE/LE/EQ/NE
Current L2	0C04h	A	0 to Imax	GE/LE/EQ/NE
Current L3	0C05h	A	0 to Imax	GE/LE/EQ/NE
kW L1	0C06h	kW	-Pmax to Pmax	GE/LE/EQ/NE
kW L2	0C07h	kW	-Pmax to Pmax	GE/LE/EQ/NE
kW L3	0C08h	kW	-Pmax to Pmax	GE/LE/EQ/NE
kvar L1	0C09h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
kvar L2	0C0Ah	kvar	-Pmax to Pmax	GE/LE/EQ/NE
kvar L3	0C0Bh	kvar	-Pmax to Pmax	GE/LE/EQ/NE
kVA L1	0C0Ch	kVA	0 to Pmax	GE/LE/EQ/NE
kVA L2	0C0Dh	kVA	0 to Pmax	GE/LE/EQ/NE
kVA L3	0C0Eh	kVA	0 to Pmax	GE/LE/EQ/NE
Power factor L1	0C0Fh		-100 to 100 ×0.01	GE/LE/EQ/NE

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Power factor L2	0C10h		-100 to 100 ×0.01	GE/LE/EQ/NE
Power factor L3	0C11h		-100 to 100 ×0.01	GE/LE/EQ/NE
Voltage THD L1/L12	0C12h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Voltage THD L2/L23	0C13h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Voltage THD L3	0C14h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Current THD L1	0C15h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Current THD L2	0C16h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Current THD L3	0C17h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
K-Factor L1	0C18h		10 to 9999 ×0.1	GE/LE/EQ/NE
K-Factor L2	0C19h		10 to 9999 ×0.1	GE/LE/EQ/NE
K-Factor L3	0C1Ah		10 to 9999 ×0.1	GE/LE/EQ/NE
Real-time low values on any phase				
Low voltage	0D00h		0 to Vmax	GE/LE/EQ/NE
Low current	0D01h		0 to Imax	GE/LE/EQ/NE
Low kW	0D02h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Low kvar	0D03h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Low kVA	0D04h	kVA	0 to Pmax	GE/LE/EQ/NE
Low PF Lag	0D05h		0 to 100 ×0.01	GE/LE/EQ/NE
Low PF Lead	0D06h		0 to 100 ×0.01	GE/LE/EQ/NE
Low voltage THD	0D07h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Low current THD	0D08h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Low K-Factor	0D09h		10 to 9999 ×0.1	GE/LE/EQ/NE
Real-time high values on any phase				
High voltage	0E00h	V	0 to Vmax	GE/LE/EQ/NE
High current	0E01h	A	0 to Imax	GE/LE/EQ/NE
High kW	0E02h	kW	-Pmax to Pmax	GE/LE/EQ/NE
High kvar	0E03h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
High kVA	0E04h	kVA	0 to Pmax	GE/LE/EQ/NE
High PF Lag	0E05h		0 to 100 ×0.01	GE/LE/EQ/NE
High PF Lead	0E06h		0 to 100 ×0.01	GE/LE/EQ/NE
High voltage THD	0E07h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
High current THD	0E08h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
High K-Factor	0E09h		10 to 9999 ×0.1	GE/LE/EQ/NE
Real-time total values				
Total kW	0F00h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Total kvar	0F01h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Total kVA	0F02h	kVA	0 to Pmax	GE/LE/EQ/NE
Total PF	0F03h		-100 to 100 ×0.01	GE/LE/EQ/NE
Total PF Lag	0F04h		0 to 100 ×0.01	GE/LE/EQ/NE
Total PF Lead	0F05h		0 to 100 ×0.01	GE/LE/EQ/NE
Real-time auxiliary values				
Auxiliary current	1000h	mA/A	0 to Iaux max	GE/LE/EQ/NE
Neutral current	1001h	A	0 to Imax	GE/LE/EQ/NE
Frequency **Å**	1002h	Hz	0 to 1000 ×0.1	GE/LE/EQ/NE

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Voltage unbalance	1003h	%	0 to 300	GE/LE/EQ/NE
Current unbalance	1004h	%	0 to 300	GE/LE/EQ/NE
Average values per phase				
Voltage L1/L12	1100h	V	0 to Vmax	GE/LE/EQ/NE
Voltage L2/L23	1101h	V	0 to Vmax	GE/LE/EQ/NE
Voltage L3/L31	1102h	V	0 to Vmax	GE/LE/EQ/NE
Current L1	1103h	A	0 to Imax	GE/LE/EQ/NE
Current L2	1104h	A	0 to Imax	GE/LE/EQ/NE
Current L3	1105h	A	0 to Imax	GE/LE/EQ/NE
kW L1	1106h	kW	-Pmax to Pmax	GE/LE/EQ/NE
kW L2	1107h	kW	-Pmax to Pmax	GE/LE/EQ/NE
kW L3	1108h	kW	-Pmax to Pmax	GE/LE/EQ/NE
kvar L1	1109h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
kvar L2	110Ah	kvar	-Pmax to Pmax	GE/LE/EQ/NE
kvar L3	110Bh	kvar	-Pmax to Pmax	GE/LE/EQ/NE
kVA L1	110Ch	kVA	0 to Pmax	GE/LE/EQ/NE
kVA L2	110Dh	kVA	0 to Pmax	GE/LE/EQ/NE
kVA L3	110Eh	kVA	0 to Pmax	GE/LE/EQ/NE
Power factor L1	110Fh		-100 to 100 ×0.01	GE/LE/EQ/NE
Power factor L2	1110h		-100 to 100 ×0.01	GE/LE/EQ/NE
Power factor L3	1111h		-100 to 100 ×0.01	GE/LE/EQ/NE
Voltage THD L1/L12	1112h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Voltage THD L2/L23	1113h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Voltage THD L3	1114h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Current THD L1	1115h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Current THD L2	1116h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Current THD L3	1117h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
K-Factor L1	1118h		10 to 9999 ×0.1	GE/LE/EQ/NE
K-Factor L2	1119h		10 to 9999 ×0.1	GE/LE/EQ/NE
K-Factor L3	111Ah		10 to 9999 ×0.1	GE/LE/EQ/NE
Average low values on any phase				
Low voltage	1200h	V	0 to Vmax	GE/LE/EQ/NE
Low current	1201h	A	0 to Imax	GE/LE/EQ/NE
Low kW	1202h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Low kvar	1203h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Low kVA	1204h	kVA	0 to Pmax	GE/LE/EQ/NE
Low PF Lag	1205h		0 to 100 ×0.01	GE/LE/EQ/NE
Low PF Lead	1206h		0 to 100 ×0.01	GE/LE/EQ/NE
Low voltage THD	1207h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Low current THD	1208h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
Low K-Factor	1209h		10 to 9999 ×0.1	GE/LE/EQ/NE
Average high values on any phase				
High voltage	1300h	V	0 to Vmax	GE/LE/EQ/NE
High current	1301h	A	0 to Imax	GE/LE/EQ/NE
High kW	1302h	kW	-Pmax to Pmax	GE/LE/EQ/NE

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
High kvar	1303h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
High kVA	1304h	kVA	0 to Pmax	GE/LE/EQ/NE
High PF Lag	1305h		0 to 100 ×0.01	GE/LE/EQ/NE
High PF Lead	1306h		0 to 100 ×0.01	GE/LE/EQ/NE
High voltage THD	1307h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
High current THD	1308h	%	0 to 1000 ×0.1	GE/LE/EQ/NE
High K-Factor	1309h		10 to 9999 ×0.1	GE/LE/EQ/NE
Average total values				
Total kW	1400h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Total kvar	1401h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Total kVA	1402h	kVA	0 to Pmax	GE/LE/EQ/NE
Total PF	1403h		-100 to 100 ×0.01	GE/LE/EQ/NE
Total PF Lag	1404h		0 to 100 ×0.01	GE/LE/EQ/NE
Total PF Lead	1405h		0 to 100 ×0.01	GE/LE/EQ/NE
Average auxiliary values				
Auxiliary current	1500h	mA/A	0 to Iaux max	GE/LE/EQ/NE
Neutral current	1501h	A	0 to Imax	GE/LE/EQ/NE
Frequency **Å**	1502h	Hz	0 to 1000 ×0.1	GE/LE/EQ/NE
Voltage unbalance	1503h	%	0 to 300	GE/LE/EQ/NE
Current unbalance	1504h	%	0 to 300	GE/LE/EQ/NE
Present demands				
Volt demand L1/L12	1600h	V	0 to Vmax	GE/LE/EQ/NE
Volt demand L2/L23	1601h	V	0 to Vmax	GE/LE/EQ/NE
Volt demand L3/L31	1602h	V	0 to Vmax	GE/LE/EQ/NE
Amp. demand L1	1603h	A	0 to Imax	GE/LE/EQ/NE
Amp. demand L2	1604h	A	0 to Imax	GE/LE/EQ/NE
Amp. demand L3	1605h	A	0 to Imax	GE/LE/EQ/NE
Block kW demand (import)	1606h	kW	0 to Pmax	GE/LE/EQ/NE
Block kvar demand (total)	1607h	kvar	0 to Pmax	GE/LE/EQ/NE
Block kVA demand	1608h	kVA	0 to Pmax	GE/LE/EQ/NE
Sliding window kW demand (import)	1609h	kW	0 to Pmax	GE/LE/EQ/NE
Sliding window kvar demand (total)	160Ah	kvar	0 to Pmax	GE/LE/EQ/NE
Sliding window kVA demand	160Bh	kVA	0 to Pmax	GE/LE/EQ/NE
Thermal kW demand (import)	160Ch	kW	0 to Pmax	GE/LE/EQ/NE
Thermal kvar demand (total)	160Dh	kvar	0 to Pmax	GE/LE/EQ/NE
Thermal kVA demand	160Eh	kVA	0 to Pmax	GE/LE/EQ/NE
Accumulated kW demand (import)	160Fh	kW	0 to Pmax	GE/LE/EQ/NE
Accumulated kvar demand (total)	1610h	kvar	0 to Pmax	GE/LE/EQ/NE
Accumulated kVA demand	1611h	kVA	0 to Pmax	GE/LE/EQ/NE
Predicted kW demand (import)	1612h	kW	0 to Pmax	GE/LE/EQ/NE

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Predicted kvar demand (total)	1613h	kvar	0 to Pmax	GE/LE/EQ/NE
Predicted kVA demand	1614h	kVA	0 to Pmax	GE/LE/EQ/NE
L1/L12 phase voltage harmonics				
Harmonic H01	1900h	%	10000 ×0.01	GE/LE/EQ/NE
Harmonic H02	1901h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
...	...			
Harmonic H40	1927h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
L2/L23 phase voltage harmonics				
Harmonic H01	1A00h	%	10000 ×0.01	GE/LE/EQ/NE
Harmonic H02	1A01h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
...	...			
Harmonic H40	1A27h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
L3 phase voltage harmonics				
Harmonic H01	1B00h	%	10000 ×0.01	GE/LE/EQ/NE
Harmonic H02	1B01h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
...	...			
Harmonic H40	1B27h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
L1 phase current harmonics				
Harmonic H01	1C00h	%	10000 ×0.01	GE/LE/EQ/NE
Harmonic H02	1C01h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
...	...			
Harmonic H40	1C27h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
L2 phase current harmonics				
Harmonic H01	1D00h	%	10000 ×0.01	GE/LE/EQ/NE
Harmonic H02	1D01h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
...	...			
Harmonic H40	1D27h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
L3 phase current harmonics				
Harmonic H01	1E00h	%	10000 ×0.01	GE/LE/EQ/NE
Harmonic H02	1E01h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
...	...			
Harmonic H40	1E27h	%	0 to 10000 ×0.01	GE/LE/EQ/NE
L1/L12 phase harmonic voltages (odd harmonics)				
Harmonic H01	1F00h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H03	1F01h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H05	1F02h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H07	1F03h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H09	1F04h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H11	1F05h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H13	1F06h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H15	1F07h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H17	1F08h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H19	1F09h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H21	1F0Ah	V	0 to Vmax	GE/LE/EQ/NE

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Harmonic H23	1F0Bh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H25	1F0Ch	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H27	1F0Dh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H29	1F0Eh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H31	1F0Fh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H33	1F10h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H35	1F11h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H37	1F12h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H39	1F13h	V	0 to Vmax	GE/LE/EQ/NE
L2/L23 phase harmonic voltages (odd harmonics)				
Harmonic H01	2000h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H03	2001h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H05	2002h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H07	2003h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H09	2004h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H11	2005h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H13	2006h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H15	2007h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H17	2008h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H19	2009h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H21	200Ah	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H23	200Bh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H25	200Ch	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H27	200Dh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H29	200Eh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H31	200Fh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H33	2010h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H35	2011h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H37	2012h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H39	2013h	V	0 to Vmax	GE/LE/EQ/NE
L3 phase harmonic voltages (odd harmonics)				
Harmonic H01	2100h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H03	2101h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H05	2102h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H07	2103h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H09	2104h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H11	2105h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H13	2106h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H15	2107h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H17	2108h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H19	2109h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H21	210Ah	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H23	210Bh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H25	210Ch	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H27	210Dh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H29	210Eh	V	0 to Vmax	GE/LE/EQ/NE

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Harmonic H31	210Fh	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H33	2110h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H35	2111h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H37	2112h	V	0 to Vmax	GE/LE/EQ/NE
Harmonic H39	2113h	V	0 to Vmax	GE/LE/EQ/NE
L1 phase harmonic currents (odd harmonics)				
Harmonic H01	2200h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H03	2201h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H05	2202h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H07	2203h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H09	2204h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H11	2205h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H13	2206h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H15	2207h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H17	2208h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H19	2209h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H21	220Ah	A	0 to Imax	GE/LE/EQ/NE
Harmonic H23	220Bh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H25	220Ch	A	0 to Imax	GE/LE/EQ/NE
Harmonic H27	220Dh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H29	220Eh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H31	220Fh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H33	2210h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H35	2211h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H37	2212h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H39	2213h	A	0 to Imax	GE/LE/EQ/NE
L2 phase harmonic currents (odd harmonics)				
Harmonic H01	2300h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H03	2301h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H05	2302h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H07	2303h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H09	2304h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H11	2305h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H13	2306h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H15	2307h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H17	2308h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H19	2309h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H21	230Ah	A	0 to Imax	GE/LE/EQ/NE
Harmonic H23	230Bh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H25	230Ch	A	0 to Imax	GE/LE/EQ/NE
Harmonic H27	230Dh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H29	230Eh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H31	230Fh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H33	2310h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H35	2311h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H37	2312h	A	0 to Imax	GE/LE/EQ/NE

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Harmonic H39	2313h	A	0 to Imax	GE/LE/EQ/NE
L3 phase harmonic currents (odd harmonics)				
Harmonic H01	2400h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H03	2401h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H05	2402h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H07	2403h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H09	2404h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H11	2405h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H13	2406h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H15	2407h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H17	2408h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H19	2409h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H21	240Ah	A	0 to Imax	GE/LE/EQ/NE
Harmonic H23	240Bh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H25	240Ch	A	0 to Imax	GE/LE/EQ/NE
Harmonic H27	240Dh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H29	240Eh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H31	240Fh	A	0 to Imax	GE/LE/EQ/NE
Harmonic H33	2410h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H35	2411h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H37	2412h	A	0 to Imax	GE/LE/EQ/NE
Harmonic H39	2413h	A	0 to Imax	GE/LE/EQ/NE
Harmonic total kW (odd harmonics)				
Harmonic H01	2500h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H03	2501h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H05	2502h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H07	2503h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H09	2504h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H11	2505h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H13	2506h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H15	2507h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H17	2508h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H19	2509h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H21	250Ah	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H23	250Bh	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H25	250Ch	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H27	250Dh	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H29	250Eh	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H31	250Fh	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H33	2510h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H3	2511h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H37	2512h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H39	2513h	kW	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic total kvar (odd harmonics)				
Harmonic H01	2600h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H03	2601h	kvar	-Pmax to Pmax	GE/LE/EQ/NE

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Harmonic H05	2602h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H07	2603h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H09	2604h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H11	2605h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H13	2606h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H15	2607h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H17	2608h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H19	2609h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H21	260Ah	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H23	260Bh	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H25	260Ch	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H27	260Dh	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H29	260Eh	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H31	260Fh	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H33	2610h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H35	2611h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H37	2612h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic H39	2613h	kvar	-Pmax to Pmax	GE/LE/EQ/NE
Harmonic total power factors (odd harmonics)				
Harmonic H01	2700h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H03	2701h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H05	2702h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H07	2703h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H09	2704h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H11	2705h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H13	2706h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H15	2707h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H17	2708h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H19	2709h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H21	270Ah		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H23	270Bh		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H25	270Ch		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H27	270Dh		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H29	270Eh		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H31	270Fh		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H33	2710h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H35	2711h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H37	2712h		-100 to 100 ×0.01	GE/LE/EQ/NE
Harmonic H39	2713h		-100 to 100 ×0.01	GE/LE/EQ/NE
Minimum real-time values per phase				
Voltage L1/L12	2C00h		N/A	NEW
Voltage L2/L23	2C01h		N/A	NEW
Voltage L3/L31	2C02h		N/A	NEW
Current L1	2C03h		N/A	NEW
Current L2	2C04h		N/A	NEW

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Current L3	2C05h		N/A	NEW
kW L1	2C06h		N/A	NEW
kW L2	2C07h		N/A	NEW
kW L3	2C08h		N/A	NEW
kvar L1	2C09h		N/A	NEW
kvar L2	2C0Ah		N/A	NEW
kvar L3	2C0Bh		N/A	NEW
kVA L1	2C0Ch		N/A	NEW
kVA L2	2C0Dh		N/A	NEW
kVA L3	2C0Eh		N/A	NEW
Power factor L1 **Ä**	2C0Fh		N/A	NEW
Power factor L2 **Ä**	2C10h		N/A	NEW
Power factor L3 **Ä**	2C11h		N/A	NEW
Voltage THD L1/L12	2C12h		N/A	NEW
Voltage THD L2/L23	2C13h		N/A	NEW
Voltage THD L3	2C14h		N/A	NEW
Current THD L1	2C15h		N/A	NEW
Current THD L2	2C16h		N/A	NEW
Current THD L3	2C17h		N/A	NEW
K-Factor L1	2C18h		N/A	NEW
K-Factor L2	2C19h		N/A	NEW
K-Factor L3	2C1Ah		N/A	NEW
Minimum real-time total values				
Total kW	2D00h		N/A	NEW
Total kvar	2D01h		N/A	NEW
Total kVA	2D02h		N/A	NEW
Total PF **Ä**	2D03h		N/A	NEW
Total PF Lag	2D04h		N/A	NEW
Total PF Lead	2D05h		N/A	NEW
Minimum real-time auxiliary values				
Auxiliary current	2E00h		N/A	NEW
Neutral current	2E01h		N/A	NEW
Frequency	2E02h		N/A	NEW
Voltage unbalance	2E03h		N/A	NEW
Current unbalance	2E04h		N/A	NEW
Minimum demands				
Volt demand L1/L12	2F00h		N/A	NEW
Volt demand L2/L23	2F01h		N/A	NEW
Volt demand L3/L31	2F02h		N/A	NEW
Ampere demand L1	2F03h		N/A	NEW
Ampere demand L2	2F04h		N/A	NEW
Ampere demand L3	2F05h		N/A	NEW
Block kW demand (import)	2F06h		N/A	NEW
Block kvar demand (total)	2F07h		N/A	NEW
Block kVA demand	2F08h		N/A	NEW

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Sliding window kW demand (import)	2F09h		N/A	NEW
Sliding window kvar demand (total)	2F0Ah		N/A	NEW
Sliding window kVA demand	2F0Bh		N/A	NEW
Thermal kW demand (import)	2F0Ch		N/A	NEW
Thermal kvar demand (total)	2F0Dh		N/A	NEW
Thermal kVA demand	2F0Eh		N/A	NEW
Programmable Min/Max minimum registers				
Register #1	3000h		N/A	NEW
Register #2	3001h		N/A	NEW
Register #3	3002h		N/A	NEW
Register #4	3003h		N/A	NEW
Register #5	3004h		N/A	NEW
Register #6	3005h		N/A	NEW
Register #7	3006h		N/A	NEW
Register #8	3007h		N/A	NEW
Register #9	3008h		N/A	NEW
Register #10	3009h		N/A	NEW
Register #11	300Ah		N/A	NEW
Register #12	300Bh		N/A	NEW
Register #13	300Ch		N/A	NEW
Register #14	300Dh		N/A	NEW
Register #15	300Eh		N/A	NEW
Register #16	300Fh		N/A	NEW
Maximum real-time values per phase				
Voltage L1/L12	3400h		N/A	NEW
Voltage L2/L23	3401h		N/A	NEW
Voltage L3/L31	3402h		N/A	NEW
Current L1	3403h		N/A	NEW
Current L2	3404h		N/A	NEW
Current L3	3405h		N/A	NEW
kW L1	3406h		N/A	NEW
kW L2	3407h		N/A	NEW
kW L3	3408h		N/A	NEW
kvar L1	3409h		N/A	NEW
kvar L2	340Ah		N/A	NEW
kvar L3	340Bh		N/A	NEW
kVA L1	340Ch		N/A	NEW
kVA L2	340Dh		N/A	NEW
kVA L3	340Eh		N/A	NEW
Power factor L1 **Ä**	340Fh		N/A	NEW
Power factor L2 **Ä**	3410h		N/A	NEW
Power factor L3 **Ä**	3411h		N/A	NEW
Voltage THD L1/L12	3412h		N/A	NEW
Voltage THD L2/L23	3413h		N/A	NEW

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Voltage THD L3	3414h		N/A	NEW
Current THD L1	3415h		N/A	NEW
Current THD L2	3416h		N/A	NEW
Current THD L3	3417h		N/A	NEW
K-Factor L1	3418h		N/A	NEW
K-Factor L2	3419h		N/A	NEW
K-Factor L3	341Ah		N/A	NEW
Maximum real-time total values				
Total kW	3500h		N/A	NEW
Total kvar	3501h		N/A	NEW
Total kVA	3502h		N/A	NEW
Total PF **Ä**	3503h		N/A	NEW
Total PF Lag	3504h		N/A	NEW
Total PF Lead	3505h		N/A	NEW
Maximum real-time auxiliary values				
Auxiliary current	3600h		N/A N/A	NEW
Neutral current	3601h		N/A	NEW
Frequency	3602h		N/A	NEW
Voltage unbalance	3603h		N/A	NEW
Current unbalance	3604h		N/A	NEW
Maximum demands				
Volt demand L1/L12	3700h		N/A	NEW
Volt demand L2/L23	3701h		N/A	NEW
Volt demand L3/L31	3702h		N/A	NEW
Ampere demand L1	3703h		N/A	NEW
Ampere demand L2	3704h		N/A	NEW
Ampere demand L3	3705h		N/A	NEW
Block kW demand (import)	3706h		N/A	NEW
Block kvar demand (total)	3707h		N/A	NEW
Block kVA demand	3708h		N/A	NEW
Sliding window kW demand (import)	3709h		N/A	NEW
Sliding window kvar demand (total)	370Ah		N/A	NEW
Sliding window kVA demand	370Bh		N/A	NEW
Thermal kW demand (import)	370Ch		N/A	NEW
Thermal kvar demand (total)	370Dh		N/A	NEW
Thermal kVA demand	370Eh		N/A	NEW
Programmable Min/Max maximum registers				
Register #1	3800h		N/A	NEW
Register #2	3801h		N/A	NEW
Register #3	3802h		N/A	NEW
Register #4	3803h		N/A	NEW
Register #5	3804h		N/A	NEW

Trigger parameter	Trigger index (hex)	Unit	Range Ã	Conditions (table 4-34)
Register #6	3805h		N/A	NEW
Register #7	3806h		N/A	NEW
Register #8	3807h		N/A	NEW
Register #9	3808h		N/A	NEW
Register #10	3809h		N/A	NEW
Register #11	380Ah		N/A	NEW
Register #12	380Bh		N/A	NEW
Register #13	380Ch		N/A	NEW
Register #14	380Dh		N/A	NEW
Register #15	380Eh		N/A	NEW
Register #16	380Fh		N/A	NEW
TOU system parameters À				
Active tariff	3C00h		0 to 15	GE/LE/EQ/NE
Active profile	3C01h		0 to 15	GE/LE/EQ/NE
TOU minimum kW demands				
Tariff #1 register	4500h		N/A	NEW
Tariff #2 register	4501h		N/A	NEW
...	...			
Tariff #16 register	450Fh		N/A	NEW
TOU minimum kvar demands				
Tariff #1 register	4600h		N/A	NEW
Tariff #2 register	4601h		N/A	NEW
...	...			
Tariff #16 register	460Fh		N/A	NEW
TOU minimum kVA demands				
Tariff #1 register	4700h		N/A	NEW
Tariff #2 register	4701h		N/A	NEW
...	...			
Tariff #16 register	470Fh		N/A	NEW
TOU maximum kW demands				
Tariff #1 register	4800h		N/A	NEW
Tariff #2 register	4801h		N/A	NEW
...	...			
Tariff #16 register	480Fh		N/A	NEW
TOU maximum kvar demands				
Tariff #1 register	4900h		N/A	NEW
Tariff #2 register	4901h		N/A	NEW
...	...			
Tariff #16 register	490Fh		N/A	NEW
TOU maximum kVA demands				
Tariff #1 register	4A00h		N/A	NEW
Tariff #2 register	4A01h		N/A	NEW
...	...			
Tariff #16 register	4A0Fh		N/A	NEW

À Release limit isn't used

Á Packed date format: year × 10000 + month × 100 + day of month

Â Packed time format: hour × 10000 + minute × 100 + second

Ã For the parameter limits, see note **Â** to Table 4-1

Ä New absolute value (lag or lead).

Å The actual frequency range is 45.0 - 65.0 Hz.

Æ Operate limit for the voltage disturbance trigger specifies the voltage deviation allowed in percentage of nominal (full scale) voltage, which refers to line-to-line voltage in 3OP2 and 3OP3 wiring modes, and to line-to-neutral voltage in other modes. The nominal voltage is 120 × PT Ratio VRMS for instruments with the 120V input option, and 380 × PT Ratio VRMS for instruments with the 660V input option.

Ç The phase rotation limits: 0 = error, 1 = positive rotation, 2 = negative rotation

Table 4-34 Setpoint Conditions

Label	ID	Operate condition	Release condition	Limits
NONE	0	NONE	N/A	Both limits not used
GE	1	GREATER OR EQUAL (over operate limit)	LESS OR EQUAL (under release limit)	Both limits active
LE	2	LESS OR EQUAL (under operate limit)	GREATER OR EQUAL (over release limit)	Both limits active
EQ	3	EQUAL	NOT EQUAL	Release limit not used
NE	4	NOT EQUAL	EQUAL	Release limit not used
ON	5	ON	OFF	Both limits not used
OFF	6	OFF	ON	Both limits not used
NEW	7	NEW Min/Max value	N/A	Both limits not used

Table 4-35 Setpoint Actions

Action type		Action target	
Description	ID	Description	Range
No action	0	N/A	0
Set user event flag	32	Flag number	0-7
Reset user event flag	33	Flag number	0-7
Operate relay	48	Relay number	0-3
Increment counter	64	Counter number	0-7
Decrement counter	65	Counter number	0-7
Clear counter	66	Counter number	0-7
Reset total energy registers	96	N/A	0
Reset total extreme demand registers	97	N/A	0
Reset TOU energy	98	N/A	0
Reset TOU demands	99	N/A	0
Clear counters	100	N/A	0
Clear Min/Max registers	101	N/A	0

Action type		Action target	
Description	**ID**	**Description**	**Range**
Event logging	112	Setpoint transition mode - type of events that trigger logging	0 = operate setpoint 1 = release setpoint 2 = either transition (both operate and release)
Data logging	113	Log number	0-15
High-speed (32/16) waveform logging	114	N/A	0
High-resolution (128/4) waveform logging	115	N/A	0

4.14 Pulsing Setpoints

Table 4-36 Read Request

Message type (ASCII)				
G				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Pulse output ID	0 - 3 (see Table 4-38)
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Pulse output ID	0 - 3 (see Table 4-38)
2	2	2	Output parameter ID	see Table 4-39
3	4	4	For energy pulsing = number of unit-hours per pulse, otherwise - permanently set to 0.	0-9999

Table 4-37 Write Request

Message type (ASCII)				
g				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Pulse output ID	0 - 3 (see Table 4-38)
2	2	2	Output parameter ID	see Table 4-39
3	4	4	For energy pulsing = number of unit-hours per pulse, otherwise - set to 0.	0-9999

Table 4-38 Pulse Outputs

Pulsing output ID	Output allocation
0	Relay #1
1	Relay #2
2	Relay #3
3	Relay #4

Table 4-39 Pulsing Output Parameters

Pulsing parameter ID	Identifier
None	0
kWh import	1
kWh export	2
kWh total	3
kvarh import	4
kvarh export	5
kvarh total	6
kVAh total	7
Start demand interval pulse	8
Start tariff interval pulse	9

4.15 Phase Harmonics

Table 4-40 Read Request

Message type (ASCII)				
H				
Message body (decimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	1	Channel ID	1 - 6 (see Table 4-41)
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	5	RMS value for the channel Á , V/A	0 to Vmax À/Imax
2	5	5	Fundamental frequency	0 to 65.50
3	10	5	%THD	0.0 to 100.0
4	15	5	Harmonic H01 (reference)	100.0
5	20	5	Harmonic H02	0.00 to 100.0
6	25	5	Harmonic H03	0.00 to 100.0
			...	
43	210	5	Harmonic H40	0.00 to 100.0

À Phase voltage will be line-to-line voltage in 3OP2 and 3OP3 wiring modes, and line-to-neutral voltage in other configurations.

Á If a decimal point is present in the field, the value should be multiplied by 1000.

Table 4-41 Harmonic Spectrum Channels

Channel ID	Description
1	Voltage L1/L12
2	Voltage L2/L23
3	Voltage L3
4	Current L1
5	Current L2
6	Current L3

4.16 Set User Event Flags

Table 4-42 Read Request

Message type (ASCII)				
I				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Event flag number	0-7
2	2	2	Event flag preset value	0-1

4.17 Pulse Counters Setup

Table 4-43 Read Request

Message type (ASCII)				
J				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Pulse counter ID	0-7 (see Table 4-45)
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Pulse counter ID	0-7 (see Table 4-45)
2	2	2	Discrete input ID	0-8 (see Table 4-46)
3	4	4	Scale factor - number of units per pulse	1-9999

Table 4-44 Write Request

Message type (ASCII)				
j				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Pulse counter ID	0-7 (see Table 4-44)
2	2	2	Discrete input ID	0-8 (see Table 4-45)
3	4	4	Scale factor - number of units per pulse	1-9999

Table 4-45 Pulse Counters

Counter ID	Description
0	Pulse counter # 1
1	Pulse counter # 2
2	Pulse counter # 3
3	Pulse counter # 4
4	Pulse counter # 5
5	Pulse counter # 6
6	Pulse counter # 7
7	Pulse counter # 8

Table 4-46 Discrete Inputs

Input ID	Description
0	Not allocated
1	Discrete input # 1
2	Discrete input # 2
3	Discrete input # 3
4	Discrete input # 4
5	Discrete input # 5
6	Discrete input # 6
7	Discrete input # 7
8	Discrete input # 8

4.18 Log Memory Partition Setup

Table 4-47 Read Request

Message type (ASCII)				
K				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Partition number	0-18 (see Table 4-49)
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Partition number	0-18 (see Table 4-49)
2	2	8	Partition size, byte	0-516096
3	10	4	The number of records in the partition	0-65535
4	14	4	Record size, byte	
5	18	2	The number of log parameters in the record (for a data log partition)	0-16
6	20	2	Partition type	0 = non wrap 1 = wrap around

Table 4-48 Write Request

Message type (ASCII)				
k				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Partition number	0-18 (see Table 4-49)
2	2	4	The number of records in the partition	1-65535, 0=delete partition

3	6	2	The number of log parameters in the record (for a data log partition)	0-16
4	8	2	Partition type	0 = non wrap 1 = wrap around
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Partition number	0-18 (see Table 4-49)

This request allows you to allocate a memory partition for logging and to specify the partition size and type. Before allocating a partition, it is recommended to check the available memory by issuing request "@". To help you in planning memory, Table 4-50 shows the record size for each partition. Note that existing partition may not be resized. To change the partition properties, you should first delete a partition, and then reallocate it with the desirable properties. After reallocation of memory, the instrument performs the memory optimization and will not respond to the host requests for approximately 1 minute per 128 Kbyte of memory.

Table 4-49 Log Memory Partitions

Partition number	Partition allocation
0	Event log
1	Data log #1
2	Data log #2
3	Data log #3
4	Data log #4
5	Data log #5
6	Data log #6
7	Data log #7
8	Data log #8
9	Data log #9
10	Data log #10
11	Data log #11
12	Data log #12
13	Data log #13
14	Data log #14
15	Data log #15
16	Data log #16
17	High-speed (32/16) waveform log
18	High-resolution (128/4) waveform log

Table 4-50 Partitions' Record Size

Partition	Record size, byte
Event log	14
Data log	8 + 4 ∗ (NUMBER OF PARAMETERS)
Waveform log	6240

4.19 Data Log Setup

Table 4-51 Read Request

Message type (ASCII)				
L				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Data log number	0-15
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Data log number	0-15
2	2	2	The number of parameters in the data log record	1-16, 0=partition does not exist
3	4	4	Log parameter #1 ID	see Table 5-7
4	8	4	Log parameter #2 ID	see Table 5-7
5	12	4	Log parameter #3 ID	see Table 5-7
6	16	4	Log parameter #4 ID	see Table 5-7
7	20	4	Log parameter #5 ID	see Table 5-7
8	24	4	Log parameter #6 ID	see Table 5-7
9	28	4	Log parameter #7 ID	see Table 5-7
10	32	4	Log parameter #8 ID	see Table 5-7
11	36	4	Log parameter #9 ID	see Table 5-7
12	40	4	Log parameter #10 ID	see Table 5-7
13	44	4	Log parameter #11 ID	see Table 5-7
14	48	4	Log parameter #12 ID	see Table 5-7
15	52	4	Log parameter #13 ID	see Table 5-7
16	56	4	Log parameter #14 ID	see Table 5-7
17	60	4	Log parameter #15 ID	see Table 5-7
18	64	4	Log parameter #16 ID	see Table 5-7

Table 4-52 Write Request

Message type (ASCII)				
I				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Data log number	0-15
2	2	2	The number of parameters in the data log record	1-16
3	4	4	Log parameter #1 ID	see Table 5-7
4	8	4	Log parameter #2 ID	see Table 5-7
5	12	4	Log parameter #3 ID	see Table 5-7
6	16	4	Log parameter #4 ID	see Table 5-7
7	20	4	Log parameter #5 ID	see Table 5-7

8	24	4	Log parameter #6 ID	see Table 5-7
9	28	4	Log parameter #7 ID	see Table 5-7
10	32	4	Log parameter #8 ID	see Table 5-7
11	36	4	Log parameter #9 ID	see Table 5-7
12	40	4	Log parameter #10 ID	see Table 5-7
13	44	4	Log parameter #11 ID	see Table 5-7
14	48	4	Log parameter #12 ID	see Table 5-7
15	52	4	Log parameter #13 ID	see Table 5-7
16	56	4	Log parameter #14 ID	see Table 5-7
17	60	4	Log parameter #15 ID	see Table 5-7
18	64	4	Log parameter #16 ID	see Table 5-7
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Data log number	0-15

The memory partition must be allocated for the log before setting up its parameters.

4.20 Event Log

Table 4-53 Read Request

Message type (ASCII)					
M					
Message body (hexadecimal)					
Request - no body					
Response					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	2	The number of events in packet		1-8, 98 = no more events 99 = no events logged
2	2	2	Event log #1	Second	0-59, 97 = record corrupted
3	4	2		Minute	0-59
4	6	2		Hour	0-23
5	8	2		Day	1-31
6	10	2		Month	1-12
7	12	2		Year	0-99
8	14	2		Event cause	see Table 4-54
9	16	2		Event origin	see Table 4-54
10	18	8		Log value	see Table 4-54
11	26	4		Effect	see Table 4-54
12	30	2		Target	see Table 4-54
13	32	2	Event log #2	Second	0-59, 97 = record corrupted
14	34	2		Minute	0-59
15	36	2		Hour	0-23

16	38	2		Day	1-31
17	40	2		Month	1-12
18	42	2		Year	0-99
19	44	2		Event cause	see Table 4-54
20	46	2		Event origin	see Table 4-54
21	48	8		Log value	see Table 4-54
22	56	4		Effect	see Table 4-54
23	60	2		Target	see Table 4-54
. . .					
78	212	2	Event log #8	Second	0-59, 97 = record corrupted
79	214	2		Minute	0-59
80	216	2		Hour	0-23
81	218	2		Day	1-31
82	220	2		Month	1-12
83	222	2		Year	0-99
84	224	2		Event cause	see Table 4-54
85	226	2		Event origin	see Table 4-54
86	228	8		Log value	see Table 4-54
87	236	4		Effect	see Table 4-54
88	240	2		Target	see Table 4-54

This request allows you to read the packet of consequent records from the event log partition. Up to 8 event log records can be read at a time. The read queue pointer is shifted forward after each request until the last logged record is read. After that, the exception code 98 is returned instead of log data. To restore the pointer to the queue origin, request '4' followed by function code 'A' should be issued.

Table 4-54 Event Log Parameters

Event cause	Event cause code	Event origin (location)	Log value	Event effect	Event target
Setpoint event	Trigger parameter group (ID high byte) (Table 4-33)	Trigger parameter offset (ID low byte) (Table 4-33)	Trigger parameter value (Table 4-33) À	225 = setpoint operated 226 = setpoint released (Table 4-57)	Setpoint number = 0-15
Setpoint activity	90	Setpoint number = 0-15	N/A	Setpoint action type (Table 4-35) Á	Setpoint action target (Table 4-35)
Communi-cations activity	91	Data location code (Table 4-55)	N/A	Table 4-57	Table 4-57
Front panel activity	92	Data location code (Table 4-55)	N/A	Table 4-57	Table 4-57

Self-check	93	Data location code (Table 4-55)	N/A	Table 4-57	Table 4-57
Hardware failure	98	Diagnostic code (Table 4-56)	N/A	N/A	N/A
External event	99	0 = power down 8 = power up	N/A	N/A	N/A

À For the Min/Max parameter ranges, refer to Table 5-7.
Á Data logging actions are not logged to the event log.

Table 4-55 Data Location Codes

Location code	Description
0-2	Reserved
3	Data keeping memory
4	Factory setup
5	Access setup
6	Basic setup
7	Communications setup
8	Real-time clock setup
9	Discrete inputs allocation setup
10	Pulse counters allocation setup
11	Multiplexed analog outputs setup
12	External analog outputs setup
13	Reserved
14	Timers setup
15	Display options setup
16	Event/alarm setpoints setup
17	Pulsing setpoints setup
18	User assignable register map
19	Programmable Min/Max log setup
20	Data log setup
21	Extended memory partitions setup
22	TOU energy registers setup
23	TOU demand registers setup
24	TOU daily profiles setup
25	TOU calendar setup
26	TOU calendar years setup

Table 4-56 Diagnostic Codes

Diagnostic code	Description
0	Power down
1	ROM error
2	RAM error
3	Watch dog timer reset
4	Sampling failure
5	Out of control trap
6	Reserved
7	Timing failure
8	Power up

Table 4-57 Event Effect Codes

Effect code	Description	Target
96	Clear energy registers	N/A
97	Clear demand registers	N/A
98	Clear TOU energy registers	N/A
99	Clear TOU demand registers	N/A
100	Clear pulse counters	N/A
101	Clear Min/Max log registers	N/A
102	Clear event log	N/A
103	Clear data log	0-15=log number,16 = all
104	Clear 32/16 waveform log	N/A
105	Clear 128/4 waveform log	N/A
225	Setpoint operated	0-15 = setpoint number
226	Setpoint released	0-15 = setpoint number
240	Setpoint set	0-15 = setpoint number
241	Setpoint disabled	0-15 = setpoint number
242	Setup cleared	N/A
243	Setup set by default	N/A
244	Setup change	N/A
245	RTC set	N/A

4.21 Data Log

Table 4-58 Read Request

Message type (ASCII)				
N				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Data log number	0-15
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Number of the setpoint that triggered log	0-15, 97 = record corrupted 98 = no more logged records 99 = no data logged
2	2	2	Hundredths of second	0-99
3	4	2	Second	0-59
4	6	2	Minute	0-59
5	8	2	Hour	0-23
6	10	2	Day	1-31
7	12	2	Month	1-12
8	14	2	Year	0-99
9	16	2	The number of parameters in the packet	1-16
10	18	2	Parameter #1 value	see Table 5-7
11	18	2	Parameter #2 value	see Table 5-7
12	20	2	Parameter #3 value	see Table 5-7
			...	
25	48	2	Parameter #16 value	see Table 5-7

This request allows you to read a subsequent record from the data log partition. For each data log partition, a separate queue is used to access logged records. It's controlled by a queue pointer. A pointer is shifted to the next record automatically after each request until the last record is read. To restore the pointer to its origin, request '4' followed by function code 'B' should be issued.

4.22 Min/Max Log

Table 4-59 Read Request

Message type (ASCII)					
O					
Message body (hexadecimal)					
Request					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	4	Start Min/Max parameter ID		see Table 5-7
2	4	2	The number of subsequent parameters to read		1-12
Response					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	2	The number of parameters in message		1-12
2	2	2	Log parameter #1	Second	0-59
3	4	2		Minute	0-59
4	6	2		Hour	0-23
5	8	2		Day	1-31
6	10	2		Month	1-12
7	12	2		Year	0-99
8	14	8		Parameter value	see Table 5-7
9	22	2	Log parameter #2	Second	0-59
10	24	2		Minute	0-59
11	26	2		Hour	0-23
12	28	2		Day	1-31
13	30	2		Month	1-12
14	32	2		Year	0-99
15	34	8		Parameter value	see Table 5-7
. . .					
79	222	2	Log parameter #12	Second	0-59
80	224	2		Minute	0-59
81	226	2		Hour	0-23
82	228	2		Day	1-31
83	230	2		Month	1-12
84	232	2		Year	0-99
85	234	8		Parameter value	see Table 5-7

This request allows the user to obtain the Min/Max log parameters. Up to 12 parameters can be read in one packet from a single parameter group. The available Min/Max log parameters are listed in Table 5-7.

4.23 Programmable Min/Max Log Setup

Table 4-60 Read Request

Message type (ASCII)				
V				
Message body (hexadecimal)				
Request - no body				
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	4	Data ID for Min/Max log register #1	see Table 5-7
2	4	4	Data ID for Min/Max log register #2	see Table 5-7
3	8	4	Data ID for Min/Max log register #3	see Table 5-7
4	12	4	Data ID for Min/Max log register #4	see Table 5-7
5	16	4	Data ID for Min/Max log register #5	see Table 5-7
6	20	4	Data ID for Min/Max log register #6	see Table 5-7
7	24	4	Data ID for Min/Max log register #7	see Table 5-7
8	28	4	Data ID for Min/Max log register #8	see Table 5-7
9	32	4	Data ID for Min/Max log register #9	see Table 5-7
10	36	4	Data ID for Min/Max log register #10	see Table 5-7
11	40	4	Data ID for Min/Max log register #11	see Table 5-7
12	44	4	Data ID for Min/Max log register #12	see Table 5-7
13	48	4	Data ID for Min/Max log register #13	see Table 5-7
14	52	4	Data ID for Min/Max log register #14	see Table 5-7
15	56	4	Data ID for Min/Max log register #15	see Table 5-7
16	60	4	Data ID for Min/Max log register #16	see Table 5-7

Table 4-61 Write Request

Message type (ASCII)				
v				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Min/Max log register number	0-15
2	2	4	Associated parameter ID for the register	see Table 5-7
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Min/Max log register number	0-15
2	2	4	Associated parameter ID for the register	see Table 5-7

This request allows you to associate any of the 16 programmable Min/Max log registers with either harmonic parameter listed in Table 5-7.

4.24 TOU Registers Allocation

Table 4-62 Read Request

Message type (ASCII)				
P				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	TOU system register ID	0-10 (see Table 4-64)
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1 2 3	0 2 4	2 2 4	TOU system register ID Register input ID For a pulse input = number of unit-hours per pulse, otherwise - permanently set to 0.	0-10 (see Table 4-64) see Tables 4-65, 4-66 0-9999

Table 4-63 Write Request

Message type (ASCII)				
p				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1 2 3	0 2 4	2 2 4	TOU system register ID Register input ID For a pulse input = number of unit-hours per pulse, otherwise - set to 0.	0-10 (see Table 4-64) see Tables 4-65, 4-66 0-9999

Table 4-64 TOU System Registers Identifiers

Register ID	Description
0	TOU energy register #1
1	TOU energy register #2
2	TOU energy register #3
3	TOU energy register #4
4	TOU energy register #5
5	TOU energy register #6
6	TOU energy register #7
7	TOU energy register #8
8	TOU Min/Max kW demand register
9	TOU Min/Max kvar demand register
10	TOU Min/Max kVA demand register

Table 4-65 TOU Energy Registers Inputs

Register input	Input ID
None	0
kWh import	1
kWh export	2
kWh net	3
kWh total	4
kvarh import	5
kvarh export	6
kvarh net	7
kvarh total	8
kVAh total	9
Pulse input #1	10
Pulse input #2	11
Pulse input #3	12
Pulse input #4	13
Pulse input #5	14
Pulse input #6	15
Pulse input #7	16
Pulse input #8	17

Table 4-66 TOU Demand Registers Inputs

Register input	Input ID
None	0
Min/Max block demand	1
Min/Max sliding window demand	2
Min/Max thermal demand	3

4.25 TOU Daily Profiles

Table 4-67 Read Request

Message type (ASCII)					
Q					
Message body (hexadecimal)					
Request					
Field	Offset	Length	Parameter		Range
1	0	2	TOU daily profile number		0-15
Response					
Field	Offset	Length	Parameter		Range
1	0	2	TOU daily profile number		0-15
2	2	2	1st tariff change	Tariff start hour	0
3	4	2		Tariff start minute	0

4	6	2		Active tariff number	0-15
5	8	2	2nd tariff change	Tariff start hour	0-23
6	10	2		Tariff start minute	0-45
7	12	2		Active tariff number	0-15
. . .					
23	44	2	8th tariff change	Tariff start hour	0-23
24	46	2		Tariff start minute	0-45
25	48	2		Active tariff number	0-15

Table 4-68 Write Request

Message type (ASCII)					
q					
Message body (hexadecimal)					
Request					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	2	TOU daily profile number		0-15
2	2	2	1st tariff change	Tariff start hour	0
3	4	2		Tariff start minute	0
4	6	2		Active tariff number	0-15
5	8	2	2nd tariff change	Tariff start hour	0-23
6	10	2		Tariff start minute	0-45
7	12	2		Active tariff number	0-15
. . .					
23	44	2	8th tariff change	Tariff start hour	0-23
24	46	2		Tariff start minute	0-45
25	48	2		Active tariff number	0-15
Response					
Field	**Offset**	**Length**	**Parameter**		**Range**
1	0	2	TOU daily profile number		0-15

The request allows you to change the daily profile for any of the 16 TOU system profiles. The daily start time for each tariff is specified with a resolution of 15 minute. If another value specified, it will be truncated to the lower value divisible by 15 minute. No error will occur. The first daily tariff change time is always 00:00. It is preserved internally and cannot change.

4.26 TOU Calendars

Table 4-69 Read Request

Message type (ASCII)				
R				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Annual calendar number	0-1
1	2	2	Calendar month	1-12
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Annual calendar number	0-1
1	2	2	Calendar month	1-12
4	4	2	1st month day profile	0-15
5	6	2	2nd month day profile	0-15
6	8	2	3rd month day profile	0-15
			. . .	
33	64	2	31st month day profile	0-15

Table 4-70 Write Request

Message type (ASCII)				
r				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Annual calendar number	0-1
1	2	2	Calendar month	1-12
4	4	2	1st month day profile	0-15
5	6	2	2nd month day profile	0-15
6	8	2	3rd month day profile	0-15
			. . .	
33	64	2	31st month day profile	0-15
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Annual calendar number	0-1
1	2	2	Calendar month	1-12

These requests allows you to read/write the setup of the one-month calendar from one of the two TOU system annual calendars. The actual year should be previously assigned to the accessed calendar. The present calendar year can be obtained by using request U.

4.27 TOU Calendar Years

Table 4-71 Read Request

Message type (ASCII)				
U				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Annual calendar number	0-1
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Annual calendar number	0-1
1	2	2	Calendar year	0-99

Table 4-72 Write Request

Message type (ASCII)				
u				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Annual calendar number	0-1
1	2	2	Calendar year	0-99

This request allows you to associate a specific year with one of the two TOU system annual calendars.

4.28 Real Time Clock

Table 4-73 Read Request

Message type (ASCII)				
S				
Message body (decimal)				
Request - no body				
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Second	0-59
2	2	2	Minute	0-59
3	4	2	Hour	0-23
4	6	2	Day	1-31
5	8	2	Month	1-12
6	10	2	Year	0-99
7	12	2	Day of week	1-7 (1=Sunday)

Table 4-74 Write Request

Message type (ASCII)				
T				
Message body (decimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Second	0-59
2	2	2	Minute	0-59
3	4	2	Hour	0-23
4	6	2	Day	1-31
5	8	2	Month	1-12
6	10	2	Year	0-99
7	12	2	Day of week	1-7 (1=Sunday)

4.29 Waveform Log/Capture

Table 4-75 Lock Real-time Waveform/Read Header Record

Message type (ASCII)				
W				
Message body (decimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	1	Input channel ID	1-6 (see Table 4-79)
2	1	1	Request function	0 = lock the next waveform for the phase/read waveform header
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Capture code	0
2	2	2	Second	0-59
3	4	2	Minute	0-59
4	6	2	Hour	0-23
5	8	2	Day	1-31
6	10	2	Month	1-12
7	12	2	Year	0-99
8	14	5	Channel RMS value Á	0 to Vmax À/Imax V/A
9	19	5	Fundamental frequency	0.00 to 65.50 Hz
10	24	5	%THD	0.0 to 100.0 %

Table 4-76 Lock High-resolution Waveform Log/Read Header Record

Message type (ASCII)				
W				
Message body (decimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	1	Input channel ID	1-6 (see Table 4-79)
2	1	1	Request function	9 = lock the next waveform for the phase/read waveform header
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Capture code: trigger setpoint number	1-16, 98 = no more waveforms, 99 = no waveforms logged
2	2	2	Second	0-59
3	4	2	Minute	0-59
4	6	2	Hour	0-23
5	8	2	Day	1-31
6	10	2	Month	1-12
7	12	2	Year	0-99
8	14	5	Channel RMS value Á	0 to Vmax À/Imax V/A
9	19	5	Fundamental frequency	0.00 to 65.50 Hz

10	24	5	%THD	0.0 to 100.0 %

À Phase voltage will be line-to-line voltage in 3OP2 and 3OP3 wiring modes, and line-to-neutral voltage in other configurations.

Á If a decimal point is present in the field, the value should be multiplied by 1000.

Table 4-77 Lock High-speed Waveform Log/Read Header Record

Message type (ASCII)				
W				
Message body (decimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	1	Input channel ID	1-6 (see Table 4-79)
2	1	1	Request function	A = lock the next waveform for the phase/read waveform header
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Capture code: trigger setpoint number	1-16, 98 = no more logged waveforms 99 = no waveforms logged
2	2	2	Hundreds of second	0-99
3	4	2	Second	0-59
4	6	2	Minute	0-59
5	8	2	Hour	0-23
6	10	2	Day	1-31
7	12	2	Month	1-12
8	14	2	Year	0-99
9	16	5	Reserved	0
10	21	5	Sampling frequency	0.00 to 65.50 Hz
11	26	5	Reserved	0

Table 4-78 Read Waveform Samples

Message type (ASCII)				
W				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	1	Input channel ID	1-6 (see Table 4-79)
2	1	1	Start waveform sample point to read	N = 1-8 - read 64 waveform samples from the point (N-1)∗64
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	3	Waveform sample point #1	000-3FFh
2	3	3	Waveform sample point #2	000-3FFh
...	...	...	...	

64	189	3	Waveform sample point #64	000-3FFh

Table 4-79 Waveform Input Channels

Channel ID	Description
1	Voltage L1/L12
2	Voltage L2/L23
3	Voltage L3
4	Current L1
5	Current L2
6	Current L3

These requests allow you to read all types of waveforms sampled by the instrument: the real-time high-resolution waveforms (4 cycles x 128 samples per cycle), and the recorded waveforms - the high-resolution (4 cycles x 128 samples per cycle), and the high-speed logged waveforms (16 cycles x 32 samples per cycle).

Each waveform consists of 512 samples. A waveform record contains six waveforms: 2 inputs (voltage and current) x 3 phases. Both the voltage and current waveforms on any phase are always sampled and recorded simultaneously. With a single response message, it is possible to receive 64 waveform points: one half-cycle per message for the high-resolution waveform, and two cycles per message for the low-resolution waveform.

To access the real-time or recorded waveforms**, a particular order of requests is needed**. The waveform data is transmitted to a master PC via the special large scale communications buffer. Before accessing waveform points, the waveform record containing two waveforms for the selected phase should be locked in the communications buffer. It is made by issuing a request for the voltage waveform header (channel 1-3) with function '0', '9', or 'A' depending on the waveform source you want to access. Before accessing the current waveform samples, the current waveform header record must be read (channel 4-6).

Once a waveform is locked in the communications buffer, you can read 8 times by 64 sample points of the corresponding waveform using the requests with functions 1-8. Data in the communications buffer doesn't change until a new request for the voltage waveform header with function code '0', '9', or 'A' is sent.

Each waveform sample is represented by three hexadecimal digits in ASCII format in the range of 000h to 3FFh (1023 decimal). A value of 0 corresponds to the highest negative amplitude of the measured signal, and a value of 1023 corresponds to the highest positive amplitude.

IMPORTANT

When accessing the recorded waveforms, you should be informed of the logging memory organization. The memory partitions for recording waveforms are allocated separately for each waveform type. Also, for each partition, a separate queue is used to access logged records. It's controlled by the dedicated queue pointer. The queue

pointer is shifted to the next record automatically after the request 9 or A for the input channel 3 (voltage at phase L3) is issued. This continues until the last logged record has been read. After that, the exception code 98 is returned in the header record's first field. It should be checked before accepting the record. To restore the queue pointer to the origin, the reset request 4 followed by function code D or C should be issued.

Even if you don't intend to read all data from the present waveform record, you **must certainly** read the header record for **input channel 3** to advance to the following record. A special precaution should be taken if you are using the wrap around logging partition. To prevent possible overlapping of the accessed waveform record by a new one, the instrument temporarily locks the record when you access input channel 1 until you read the last phase waveforms. If you'll forget to unlock the record by reading the header record for **input channel 3,** new logging over the locked record will be impossible.

Chapter 5 Direct Read/Write Requests

5.1 General

This chapter describes the instrument data locations that are addressed directly using data location indexes. These locations can be accessed by using universal direct read/write requests instead of specific ASCII requests. A data index is a 4-digit hexadecimal number, which actually comprises a two-digit data group identifier followed by a two-digit location offset within a group. All data are transmitted in ASCII hexadecimal notation. Negative numbers are transmitted in 2-complement code.

5.1.1 Long-Size Direct Read/Write

Table 5-1 Read Request

Message type (ASCII)				
A				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	4	Start data index to read	0000h - FFFFh
2	4	2	The number of contiguous data items to read	1-30 (01h - 1Eh)
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Number of data items in the message	1-30 (01h - 1Eh)
2	2	8	Data #1 value	
3	10	8	Data #2 value	
...	...	...	...	
31	234	8	Data #30 value	

Table 5-2 Write Request

Message type (ASCII)				
a				
Message body (hexadecimal)				
Request/Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	4	Data index to write	0000h - FFFFh
2	4	8	Data value to write	1-30 (01h - 1Eh)

In long-size direct read/write messages, all data items are read and written as long signed integers, which are represented in messages by 8-digit hexadecimal numbers, regardless of the actual data size.

By using a long-size direct read request, up to 30 contiguous parameters can be read at once. A write request allows for writing only one data location at a time.

5.1.2 Variable-Size Direct Read/Write

Table 5-3 Read Request

Message type (ASCII)				
X				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	4	Start data index to read	0000h - FFFFh
2	4	2	The number of contiguous data items to read	1-61 (01h - 3Dh)
Response				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	2	Number of data items in the message	1-61 (01h - 3Dh)
2	2	2/4/8	Data #1 value	
3		2/4/8	Data #2 value	
...	...	...	...	
60		2/4/8	Data #60 value	

Table 5-4 Write Request

Message type (ASCII)				
x				
Message body (hexadecimal)				
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	4	Start data index to write	0000h - FFFFh
2	4	2	The number of contiguous data items to write	1-61 (01h - 3Dh)
2	2	2/4/8	Data #1 value	
3		2/4/8	Data #2 value	
...	...	...	...	
60		2/4/8	Data #60 value	
Request				
Field	**Offset**	**Length**	**Parameter**	**Range**
1	0	4	Start data index written	0000h - FFFFh
2	4	2	The number of data items written	1-61 (01h - 3Dh)

With variable-size direct read/write messages, data items 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 format 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.

5.1.3 User Assignable Registers

The instrument contains 120 user assignable registers in the range of indexes 8000h to 8077h (see Table 5-5). You can map any of these registers to either register index, accessible in the instrument through direct read/write requests. Registers that reside in different locations may be accessed by a single request by re-mapping them to adjacent addresses in the user assignable registers area.

The actual indexes of the user assignable registers which are accessed via indexes 8000h to 8077h are specified in the user assignable register map. It occupies indexes from 8100h to 8177h (see Table 5-6), where the map register 8100h should contain the actual index of the register accessed via assignable register 8000h, register 8101h should contain the actual index of the register accessed via assignable register 8001h, and so on. Note that the user assignable register indexes and the user register map indexes may not be re-mapped.

Table 5-5 User Assignable Registers

Data index (hex)	Register contents	Length	Direction	Range
8000h	User definable data 0	**À**	**À**	**À**
8001h	User definable data 1	**À**	**À**	**À**
8002h	User definable data 2	**À**	**À**	**À**
...	...	...		
8077h	User definable data 119	**À**	**À**	**À**

À - depends on the mapped register

Table 5-6 User Assignable Register Map

Data index (hex)	Register contents	Length	Direction	Range
8100h	Data index for user data 0	4	R/W	0000h-FFFFh
8101h	Data index for user data 1	4	R/W	0000h-FFFFh
8102h	Data index for user data 2	4	R/W	0000h-FFFFh
...	...	...		
8177h	Data index for user data 119	4	R/W	0000h-FFFFh

To build your own register map, write to map registers (8100h to 8177h) the actual addresses you want to read from or write to via the assignable area (8000h to 8077h).

For example, if you want to read registers 0C00h (real-time voltage of phase A) and 1700h (kWh import) via indexes 8000h-8001h, do the following:

- write 0C00h to register 8100h
- write 1700h to register 8101h

Reading from registers 8000h-8001h will return the voltage reading in register 8000h, and the kWh reading in register 8001h.

5.2 Extended Data Registers

Table 5-7 Extended Data Table

Parameter	Data index	Length	Direction	Unit	Range À
None (A)					
None	0000h	4	R		0
User flags					
User event flags	0300h	4	R		0 to 255 (see Table 4-14)
Status inputs					
Status inputs	0600h	4	R		0 to 255 (see Table 4-15)
Relays					
Relay status	0800h	4	R		0 to 15 (see Table 4-13)
Pulse counters					
Pulse counter #1	0A00h	8	R/W		0 to 10^9-1
Pulse counter #2	0A01h	8	R/W		0 to 10^9-1
Pulse counter #3	0A02h	8	R/W		0 to 10^9-1
Pulse counter #4	0A03h	8	R/W		0 to 10^9-1
Pulse counter #5	0A04h	8	R/W		0 to 10^9-1
Pulse counter #6	0A05h	8	R/W		0 to 10^9-1
Pulse counter #7	0A06h	8	R/W		0 to 10^9-1
Pulse counter #8	0A07h	8	R/W		0 to 10^9-1
Real-time values per phase (A)					
Voltage L1/L12	0C00h	8	R	V	0 to Vmax
Voltage L2/L23	0C01h	8	R	V	0 to Vmax
Voltage L3/L31	0C02h	8	R	V	0 to Vmax
Current L1	0C03h	8	R	A	0 to Imax
Current L2	0C04h	8	R	A	0 to Imax
Current L3	0C05h	8	R	A	0 to Imax
kW L1	0C06h	8	R	kW	-Pmax to Pmax
kW L2	0C07h	8	R	kW	-Pmax to Pmax
kW L3	0C08h	8	R	kW	-Pmax to Pmax
kvar L1	0C09h	8	R	kvar	-Pmax to Pmax

Parameter	Data index	Length	Direction	Unit	Range À
kvar L2	0C0Ah	8	R	kvar	-Pmax to Pmax
kvar L3	0C0Bh	8	R	kvar	-Pmax to Pmax
kVA L1	0C0Ch	8	R	kVA	0 to Pmax
kVA L2	0C0Dh	8	R	kVA	0 to Pmax
kVA L3	0C0Eh	8	R	kVA	0 to Pmax
Power factor L1	0C0Fh	4	R		-100 to 100 ×0.01
Power factor L2	0C10h	4	R		-100 to 100 ×0.01
Power factor L3	0C11h	4	R		-100 to 100 ×0.01
Voltage THD L1/L12	0C12h	4	R	%	0 to 1000 ×0.1
Voltage THD L2/L23	0C13h	4	R	%	0 to 1000 ×0.1
Voltage THD L3	0C14h	4	R	%	0 to 1000 ×0.1
Current THD L1	0C15h	4	R	%	0 to 1000 ×0.1
Current THD L2	0C16h	4	R	%	0 to 1000 ×0.1
Current THD L3	0C17h	4	R	%	0 to 1000 ×0.1
K-Factor L1	0C18h	4	R		10 to 9999 ×0.1
K-Factor L2	0C19h	4	R		10 to 9999 ×0.1
K-Factor L3	0C1Ah	4	R		10 to 9999 ×0.1
Real-time low values on any phase					
Low voltage	0D00h	8	R	V	0 to Vmax
Low current	0D01h	8	R	A	0 to Imax
Low kW	0D02h	8	R	kW	-Pmax to Pmax
Low kvar	0D03h	8	R	kvar	-Pmax to Pmax
Low kVA	0D04h	8	R	kVA	0 to Pmax
Low PF Lag	0D05h	4	R		0 to 100 ×0.01
Low PF Lead	0D06h	4	R		0 to 100 ×0.01
Low voltage THD	0D07h	4	R	%	0 to 1000 ×0.1
Low current THD	0D08h	4	R	%	0 to 1000 ×0.1
Low K-Factor	0D09h	4	R		10 to 9999 ×0.1
Real-time high values on any phase					
High voltage	0E00h	8	R	V	0 to Vmax
High current	0E01h	8	R	A	0 to Imax
High kW	0E02h	8	R	kW	-Pmax to Pmax
High kvar	0E03h	8	R	kvar	-Pmax to Pmax
High kVA	0E04h	8	R	kVA	0 to Pmax
High PF Lag	0E05h	4	R		0 to 100 ×0.01
High PF Lead	0E06h	4	R		0 to 100 ×0.01
High voltage THD	0E07h	4	R	%	0 to 1000 ×0.1
High current THD	0E08h	4	R	%	0 to 1000 ×0.1
High K-Factor	0E09h	4	R		10 to 9999 ×0.1
Real-time total value (A)					
Total kW	0F00h	8	R	kW	-Pmax to Pmax
Total kvar	0F01h	8	R	kvar	-Pmax to Pmax
Total kVA	0F02h	8	R	kVA	0 to Pmax
Total PF	0F03h	4	R		-100 to 100 ×0.01

Parameter	Data index	Length	Direction	Unit	Range À
Total PF Lag	0F04h	4	R		0 to 100 ×0.01
Total PF Lead	0F05h	4	R		0 to 100 ×0.01
Real-time auxiliary values (A)					
Auxiliary current	1000h	8	R	mA/A	0 to Iaux max
Neutral current	1001h	8	R	A	0 to Imax
Frequency **Ä**	1002h	4	R	Hz	0 to 1000 ×0.1
Voltage unbalance	1003h	4	R	%	0 to 300
Current unbalance	1004h	4	R	%	0 to 300
Average values per phase (A)					
Voltage L1/L12	1100h	8	R	V	0 to Vmax
Voltage L2/L23	1101h	8	R	V	0 to Vmax
Voltage L3/L31	1102h	8	R	V	0 to Vmax
Current L1	1103h	8	R	A	0 to Imax
Current L2	1104h	8	R	A	0 to Imax
Current L3	1105h	8	R	A	0 to Imax
kW L1	1106h	8	R	kW	-Pmax to Pmax
kW L2	1107h	8	R	kW	-Pmax to Pmax
kW L3	1108h	8	R	kW	-Pmax to Pmax
kvar L1	1109h	8	R	kvar	-Pmax to Pmax
kvar L2	110Ah	8	R	kvar	-Pmax to Pmax
kvar L3	110Bh	8	R	kvar	-Pmax to Pmax
kVA L1	110Ch	8	R	kVA	0 to Pmax
kVA L2	110Dh	8	R	kVA	0 to Pmax
kVA L3	110Eh	8	R	kVA	0 to Pmax
Power factor L1	110Fh	4	R		-100 to 100 ×0.01
Power factor L2	1110h	4	R		-100 to 100 ×0.01
Power factor L3	1111h	4	R		-100 to 100 ×0.01
Voltage THD L1/L12	1112h	4	R	%	0 to 1000 ×0.1
Voltage THD L2/L23	1113h	4	R	%	0 to 1000 ×0.1
Voltage THD L3	1114h	4	R	%	0 to 1000 ×0.1
Current THD L1	1115h	4	R	%	0 to 1000 ×0.1
Current THD L2	1116h	4	R	%	0 to 1000 ×0.1
Current THD L3	1117h	4	R	%	0 to 1000 ×0.1
K-Factor L1	1118h	4	R		10 to 9999 ×0.1
K-Factor L2	1119h	4	R		10 to 9999 ×0.1
K-Factor L3	111Ah	4	R		10 to 9999 ×0.1
Average low values on any phase					
Low voltage	1200h	8	R	V	0 to Vmax
Low current	1201h	8	R	A	0 to Imax
Low kW	1202h	8	R	kW	-Pmax to Pmax
Low kvar	1203h	8	R	kvar	-Pmax to Pmax
Low kVA	1204h	8	R	kVA	0 to Pmax
Low PF Lag	1205h	4	R		0 to 100 ×0.01
Low PF Lead	1206h	4	R		0 to 100 ×0.01

Parameter	Data index	Length	Direction	Unit	Range À
Low voltage THD	1207h	4	R	%	0 to 1000 ×0.1
Low current THD	1208h	4	R	%	0 to 1000 ×0.1
Low K-Factor	1209h	4	R		10 to 9999 ×0.1
Average high values on any phase					
High voltage	1300h	8	R	V	0 to Vmax
High current	1301h	8	R	A	0 to Imax
High kW	1302h	8	R	kW	-Pmax to Pmax
High kvar	1303h	8	R	kvar	-Pmax to Pmax
High kVA	1304h	8	R	kVA	0 to Pmax
High PF Lag	1305h	4	R		0 to 100 ×0.01
High PF Lead	1306h	4	R		0 to 100 ×0.01
High voltage THD	1307h	4	R	%	0 to 1000 ×0.1
High current THD	1308h	4	R	%	0 to 1000 ×0.1
High K-Factor	1309h	4	R		10 to 9999 ×0.1
Average total values (A)					
Total kW	1400h	8	R	kW	-Pmax to Pmax
Total kvar	1401h	8	R	kvar	-Pmax to Pmax
Total kVA	1402h	8	R	kVA	0 to Pmax
Total PF	1403h	4	R		-100 to 100 ×0.01
Total PF Lag	1404h	4	R		0 to 100 ×0.01
Total PF Lead	1405h	4	R		0 to 100 ×0.01
Average auxiliary values (A)					
Auxiliary current	1500h	8	R	mA/A	0 to Iaux max
Neutral current	1501h	8	R	A	0 to Imax
Frequency **Ä**	1502h	4	R	Hz	0 to 1000 ×0.1
Voltage unbalance	1503h	4	R	%	0 to 300
Current unbalance	1504h	4	R	%	0 to 300
Present demands (A)					
Volt demand L1/L12	1600h	8	R	V	0 to Vmax
Volt demand L2/L23	1601h	8	R	V	0 to Vmax
Volt demand L3/L31	1602h	8	R	V	0 to Vmax
Amp. demand L1	1603h	8	R	A	0 to Imax
Amp. demand L2	1604h	8	R	A	0 to Imax
Amp. demand L3	1605h	8	R	A	0 to Imax
Block kW demand (import)	1606h	8	R	kW	0 to Pmax
Block kvar demand (total)	1607h	8	R	kvar	0 to Pmax
Block kVA demand	1608h	8	R	kVA	0 to Pmax
Sliding window kW demand (import)	1609h	8	R	kW	0 to Pmax
Sliding window kvar demand (total)	160Ah	8	R	kvar	0 to Pmax
Sliding window kVA demand	160Bh	8	R	kVA	0 to Pmax
Thermal kW demand (import)	160Ch	8	R	kW	0 to Pmax

Parameter	Data index	Length	Direction	Unit	Range À
Thermal kvar demand (total)	160Dh	8	R	kvar	0 to Pmax
Thermal kVA demand	160Eh	8	R	kVA	0 to Pmax
Accumulated kW demand (import)	160Fh	8	R	kW	0 to Pmax
Accumulated kvar (total)	1610h	8	R	kvar	0 to Pmax
Accumulated kVA demand	1611h	8	R	kVA	0 to Pmax
Predicted kW demand (import)	1612h	8	R	kW	0 to Pmax
Predicted kvar demand (total)	1613h	8	R	kvar	0 to Pmax
Predicted kVA demand	1614h	8	R	kVA	0 to Pmax
Total energies					
kWh import	1700h	8	R	kWh	0 to 10^9-1
kWh export	1701h	8	R	kWh	-10^9+1 to 0
kWh net	1702h	8	R	kWh	-10^9+1 to 10^9-1
kWh total	1703h	8	R	kWh	0 to 10^9-1
kvarh import	1704h	8	R	kvarh	0 to 10^9-1
kvarh export	1705h	8	R	kvarh	-10^9+1 to 0
kvarh net	1706h	8	R	kvarh	-10^9+1 to 10^9-1
kvarh total	1707h	8	R	kvarh	0 to 10^9-1
kVAh total	1708h	8	R	kVAh	0 to 10^9-1
L1/L12 phase voltage harmonics (P)					
Harmonic H01	1900h	4	R	%	10000 ×0.01
Harmonic H02	1901h	4	R	%	0 to 10000 ×0.01
...	...				
Harmonic H40	1927h	4	R	%	0 to 10000 ×0.01
L2/L23 phase voltage harmonics (P)					
Harmonic H01	1A00h	4	R	%	10000 ×0.01
Harmonic H02	1A01h	4	R	%	0 to 10000 ×0.01
...	...				
Harmonic H40	1A27h	4	R	%	0 to 10000 ×0.01
L3 phase voltage harmonics (P)					
Harmonic H01	1B00h	4	R	%	10000 ×0.01
Harmonic H02	1B01h	4	R	%	0 to 10000 ×0.01
...	...				
Harmonic H40	1B27h	4	R	%	0 to 10000 ×0.01
L1 phase current harmonics (P)					
Harmonic H01	1C00h	4	R	%	10000 ×0.01
Harmonic H02	1C01h	4	R	%	0 to 10000 ×0.01
...	...				
Harmonic H40	1C27h	4	R	%	0 to 10000 ×0.01
L2 phase current harmonics (P)					
Harmonic H01	1D00h	4	R	%	10000 ×0.01
Harmonic H02	1D01h	4	R	%	0 to 10000 ×0.01

Parameter	Data index	Length	Direction	Unit	Range À
...	...				
Harmonic H40	1D27h	4	R	%	0 to 10000 ×0.01
L3 phase current harmonics (P)					
Harmonic H01	1E00h	4	R	%	10000 ×0.01
Harmonic H02	1E01h	4	R	%	0 to 10000 ×0.01
...	...				
Harmonic H40	1E27h	4	R	%	0 to 10000 ×0.01
L1/L12 phase harmonic voltages (odd harmonics) (A, P)					
Harmonic H01	1F00h	8	R	V	0 to Vmax
Harmonic H03	1F01h	8	R	V	0 to Vmax
Harmonic H05	1F02h	8	R	V	0 to Vmax
Harmonic H07	1F03h	8	R	V	0 to Vmax
Harmonic H09	1F04h	8	R	V	0 to Vmax
Harmonic H11	1F05h	8	R	V	0 to Vmax
Harmonic H13	1F06h	8	R	V	0 to Vmax
Harmonic H15	1F07h	8	R	V	0 to Vmax
Harmonic H17	1F08h	8	R	V	0 to Vmax
Harmonic H19	1F09h	8	R	V	0 to Vmax
Harmonic H21	1F0Ah	8	R	V	0 to Vmax
Harmonic H23	1F0Bh	8	R	V	0 to Vmax
Harmonic H25	1F0Ch	8	R	V	0 to Vmax
Harmonic H27	1F0Dh	8	R	V	0 to Vmax
Harmonic H29	1F0Eh	8	R	V	0 to Vmax
Harmonic H31	1F0Fh	8	R	V	0 to Vmax
Harmonic H33	1F10h	8	R	V	0 to Vmax
Harmonic H35	1F11h	8	R	V	0 to Vmax
Harmonic H37	1F12h	8	R	V	0 to Vmax
Harmonic H39	1F13h	8	R	V	0 to Vmax
L2/L23 phase harmonic voltages (odd harmonics) (A, P)					
Harmonic H01	2000h	8	R	V	0 to Vmax
Harmonic H03	2001h	8	R	V	0 to Vmax
Harmonic H05	2002h	8	R	V	0 to Vmax
Harmonic H07	2003h	8	R	V	0 to Vmax
Harmonic H09	2004h	8	R	V	0 to Vmax
Harmonic H11	2005h	8	R	V	0 to Vmax
Harmonic H13	2006h	8	R	V	0 to Vmax
Harmonic H15	2007h	8	R	V	0 to Vmax
Harmonic H17	2008h	8	R	V	0 to Vmax
Harmonic H19	2009h	8	R	V	0 to Vmax
Harmonic H21	200Ah	8	R	V	0 to Vmax
Harmonic H23	200Bh	8	R	V	0 to Vmax
Harmonic H25	200Ch	8	R	V	0 to Vmax
Harmonic H27	200Dh	8	R	V	0 to Vmax
Harmonic H29	200Eh	8	R	V	0 to Vmax
Harmonic H31	200Fh	8	R	V	0 to Vmax
Harmonic H33	2010h	8	R	V	0 to Vmax

Parameter	Data index	Length	Direction	Unit	Range À
Harmonic H35	2011h	8	R	V	0 to Vmax
Harmonic H37	2012h	8	R	V	0 to Vmax
Harmonic H39	2013h	8	R	V	0 to Vmax
L3 phase harmonic voltages (odd harmonics) (A, P)					
Harmonic H01	2100h	8	R	V	0 to Vmax
Harmonic H03	2101h	8	R	V	0 to Vmax
Harmonic H05	2102h	8	R	V	0 to Vmax
Harmonic H07	2103h	8	R	V	0 to Vmax
Harmonic H09	2104h	8	R	V	0 to Vmax
Harmonic H11	2105h	8	R	V	0 to Vmax
Harmonic H13	2106h	8	R	V	0 to Vmax
Harmonic H15	2107h	8	R	V	0 to Vmax
Harmonic H17	2108h	8	R	V	0 to Vmax
Harmonic H19	2109h	8	R	V	0 to Vmax
Harmonic H21	210Ah	8	R	V	0 to Vmax
Harmonic H23	210Bh	8	R	V	0 to Vmax
Harmonic H25	210Ch	8	R	V	0 to Vmax
Harmonic H27	210Dh	8	R	V	0 to Vmax
Harmonic H29	210Eh	8	R	V	0 to Vmax
Harmonic H31	210Fh	8	R	V	0 to Vmax
Harmonic H33	2110h	8	R	V	0 to Vmax
Harmonic H35	2111h	8	R	V	0 to Vmax
Harmonic H37	2112h	8	R	V	0 to Vmax
Harmonic H39	2113h	8	R	V	0 to Vmax
L1 phase harmonic currents (odd harmonics) (A, P)					
Harmonic H01	2200h	8	R	A	0 to Imax
Harmonic H03	2201h	8	R	A	0 to Imax
Harmonic H05	2202h	8	R	A	0 to Imax
Harmonic H07	2203h	8	R	A	0 to Imax
Harmonic H09	2204h	8	R	A	0 to Imax
Harmonic H11	2205h	8	R	A	0 to Imax
Harmonic H13	2206h	8	R	A	0 to Imax
Harmonic H15	2207h	8	R	A	0 to Imax
Harmonic H17	2208h	8	R	A	0 to Imax
Harmonic H19	2209h	8	R	A	0 to Imax
Harmonic H21	220Ah	8	R	A	0 to Imax
Harmonic H23	220Bh	8	R	A	0 to Imax
Harmonic H25	220Ch	8	R	A	0 to Imax
Harmonic H27	220Dh	8	R	A	0 to Imax
Harmonic H29	220Eh	8	R	A	0 to Imax
Harmonic H31	220Fh	8	R	A	0 to Imax
Harmonic H33	2210h	8	R	A	0 to Imax
Harmonic H35	2211h	8	R	A	0 to Imax
Harmonic H37	2212h	8	R	A	0 to Imax
Harmonic H39	2213h	8	R	A	0 to Imax
L2 phase harmonic currents (odd harmonics) (A, P)					

Parameter	Data index	Length	Direction	Unit	Range À
Harmonic H01	2300h	8	R	A	0 to Imax
Harmonic H03	2301h	8	R	A	0 to Imax
Harmonic H05	2302h	8	R	A	0 to Imax
Harmonic H07	2303h	8	R	A	0 to Imax
Harmonic H09	2304h	8	R	A	0 to Imax
Harmonic H11	2305h	8	R	A	0 to Imax
Harmonic H13	2306h	8	R	A	0 to Imax
Harmonic H15	2307h	8	R	A	0 to Imax
Harmonic H17	2308h	8	R	A	0 to Imax
Harmonic H19	2309h	8	R	A	0 to Imax
Harmonic H21	230Ah	8	R	A	0 to Imax
Harmonic H23	230Bh	8	R	A	0 to Imax
Harmonic H25	230Ch	8	R	A	0 to Imax
Harmonic H27	230Dh	8	R	A	0 to Imax
Harmonic H29	230Eh	8	R	A	0 to Imax
Harmonic H31	230Fh	8	R	A	0 to Imax
Harmonic H33	2310h	8	R	A	0 to Imax
Harmonic H35	2311h	8	R	A	0 to Imax
Harmonic H37	2312h	8	R	A	0 to Imax
Harmonic H39	2313h	8	R	A	0 to Imax
L3 phase harmonic currents (odd harmonics) (A, P)					
Harmonic H01	2400h	8	R	A	0 to Imax
Harmonic H03	2401h	8	R	A	0 to Imax
Harmonic H05	2402h	8	R	A	0 to Imax
Harmonic H07	2403h	8	R	A	0 to Imax
Harmonic H09	2404h	8	R	A	0 to Imax
Harmonic H11	2405h	8	R	A	0 to Imax
Harmonic H13	2406h	8	R	A	0 to Imax
Harmonic H15	2407h	8	R	A	0 to Imax
Harmonic H17	2408h	8	R	A	0 to Imax
Harmonic H19	2409h	8	R	A	0 to Imax
Harmonic H21	240Ah	8	R	A	0 to Imax
Harmonic H23	240Bh	8	R	A	0 to Imax
Harmonic H25	240Ch	8	R	A	0 to Imax
Harmonic H27	240Dh	8	R	A	0 to Imax
Harmonic H29	240Eh	8	R	A	0 to Imax
Harmonic H31	240Fh	8	R	A	0 to Imax
Harmonic H33	2410h	8	R	A	0 to Imax
Harmonic H35	2411h	8	R	A	0 to Imax
Harmonic H37	2412h	8	R	A	0 to Imax
Harmonic H39	2413h	8	R	A	0 to Imax
Harmonic total kW (odd harmonics) (A, P)					
Harmonic H01	2500h	8	R	kW	-Pmax to Pmax
Harmonic H03	2501h	8	R	kW	-Pmax to Pmax
Harmonic H05	2502h	8	R	kW	-Pmax to Pmax
Harmonic H07	2503h	8	R	kW	-Pmax to Pmax

Parameter	Data index	Length	Direction	Unit	Range À
Harmonic H09	2504h	8	R	kW	-Pmax to Pmax
Harmonic H11	2505h	8	R	kW	-Pmax to Pmax
Harmonic H13	2506h	8	R	kW	-Pmax to Pmax
Harmonic H15	2507h	8	R	kW	-Pmax to Pmax
Harmonic H17	2508h	8	R	kW	-Pmax to Pmax
Harmonic H19	2509h	8	R	kW	-Pmax to Pmax
Harmonic H21	250Ah	8	R	kW	-Pmax to Pmax
Harmonic H23	250Bh	8	R	kW	-Pmax to Pmax
Harmonic H25	250Ch	8	R	kW	-Pmax to Pmax
Harmonic H27	250Dh	8	R	kW	-Pmax to Pmax
Harmonic H29	250Eh	8	R	kW	-Pmax to Pmax
Harmonic H31	250Fh	8	R	kW	-Pmax to Pmax
Harmonic H33	2510h	8	R	kW	-Pmax to Pmax
Harmonic H35	2511h	8	R	kW	-Pmax to Pmax
Harmonic H37	2512h	8	R	kW	-Pmax to Pmax
Harmonic H39	2513h	8	R	kW	-Pmax to Pmax
Harmonic total kvar (odd harmonics) (A, P)					
Harmonic H01	2600h	8	R	kvar	-Pmax to Pmax
Harmonic H03	2601h	8	R	kvar	-Pmax to Pmax
Harmonic H05	2602h	8	R	kvar	-Pmax to Pmax
Harmonic H07	2603h	8	R	kvar	-Pmax to Pmax
Harmonic H09	2604h	8	R	kvar	-Pmax to Pmax
Harmonic H11	2605h	8	R	kvar	-Pmax to Pmax
Harmonic H13	2606h	8	R	kvar	-Pmax to Pmax
Harmonic H15	2607h	8	R	kvar	-Pmax to Pmax
Harmonic H17	2608h	8	R	kvar	-Pmax to Pmax
Harmonic H19	2609h	8	R	kvar	-Pmax to Pmax
Harmonic H21	260Ah	8	R	kvar	-Pmax to Pmax
Harmonic H23	260Bh	8	R	kvar	-Pmax to Pmax
Harmonic H25	260Ch	8	R	kvar	-Pmax to Pmax
Harmonic H27	260Dh	8	R	kvar	-Pmax to Pmax
Harmonic H29	260Eh	8	R	kvar	-Pmax to Pmax
Harmonic H31	260Fh	8	R	kvar	-Pmax to Pmax
Harmonic H33	2610h	8	R	kvar	-Pmax to Pmax
Harmonic H35	2611h	8	R	kvar	-Pmax to Pmax
Harmonic H37	2612h	8	R	kvar	-Pmax to Pmax
Harmonic H39	2613h	8	R	kvar	-Pmax to Pmax
Harmonic total PF (odd harmonics) (A, P)					
Harmonic H01	2700h	8	R		-100 to 100 ×0.01
Harmonic H03	2701h	8	R		-100 to 100 ×0.01
Harmonic H05	2702h	8	R		-100 to 100 ×0.01
Harmonic H07	2703h	8	R		-100 to 100 ×0.01
Harmonic H09	2704h	8	R		-100 to 100 ×0.01
Harmonic H11	2705h	8	R		-100 to 100 ×0.01
Harmonic H13	2706h	8	R		-100 to 100 ×0.01

Parameter	Data index	Length	Direction	Unit	Range À
Harmonic H15	2707h	8	R		-100 to 100 ×0.01
Harmonic H17	2708h	8	R		-100 to 100 ×0.01
Harmonic H19	2709h	8	R		-100 to 100 ×0.01
Harmonic H21	270Ah	8	R		-100 to 100 ×0.01
Harmonic H23	270Bh	8	R		-100 to 100 ×0.01
Harmonic H25	270Ch	8	R		-100 to 100 ×0.01
Harmonic H27	270Dh	8	R		-100 to 100 ×0.01
Harmonic H29	270Eh	8	R		-100 to 100 ×0.01
Harmonic H31	270Fh	8	R		-100 to 100 ×0.01
Harmonic H33	2710h	8	R		-100 to 100 ×0.01
Harmonic H35	2711h	8	R		-100 to 100 ×0.01
Harmonic H37	2712h	8	R		-100 to 100 ×0.01
Harmonic H39	2713h	8	R		-100 to 100 ×0.01
Minimum real-time values per phase (M)					
Voltage L1/L12	2C00h	8	R	V	0 to Vmax
Voltage L2/L23	2C01h	8	R	V	0 to Vmax
Voltage L3/L31	2C02h	8	R	V	0 to Vmax
Current L1	2C03h	8	R	A	0 to Imax
Current L2	2C04h	8	R	A	0 to Imax
Current L3	2C05h	8	R	A	0 to Imax
kW L1	2C06h	8	R	kW	-Pmax to Pmax
kW L2	2C07h	8	R	kW	-Pmax to Pmax
kW L3	2C08h	8	R	kW	-Pmax to Pmax
kvar L1	2C09h	8	R	kvar	-Pmax to Pmax
kvar L2	2C0Ah	8	R	kvar	-Pmax to Pmax
kvar L3	2C0Bh	8	R	kvar	-Pmax to Pmax
kVA L1	2C0Ch	8	R	kVA	0 to Pmax
kVA L2	2C0Dh	8	R	kVA	0 to Pmax
kVA L3	2C0Eh	8	R	kVA	0 to Pmax
Power factor L1 **Á**	2C0Fh	4	R		0 to 100 ×0.01
Power factor L2 **Á**	2C10h	4	R		0 to 100 ×0.01
Power factor L3 **Á**	2C11h	4	R		0 to 100 ×0.01
Voltage THD L1/L12	2C12h	4	R	%	0 to 1000 ×0.1
Voltage THD L2/L23	2C13h	4	R	%	0 to 1000 ×0.1
Voltage THD L3	2C14h	4	R	%	0 to 1000 ×0.1
Current THD L1	2C15h	4	R	%	0 to 1000 ×0.1
Current THD L2	2C16h	4	R	%	0 to 1000 ×0.1
Current THD L3	2C17h	4	R	%	0 to 1000 ×0.1
K-Factor L1	2C18h	4	R		10 to 9999 ×0.1
K-Factor L2	2C19h	4	R		10 to 9999 ×0.1
K-Factor L3	2C1Ah	4	R		10 to 9999 ×0.1
Minimum real-time total values (M)					
Total kW	2D00h	8	R	kW	-Pmax to Pmax
Total kvar	2D01h	8	R	kvar	-Pmax to Pmax

Parameter	Data index	Length	Direction	Unit	Range À
Total kVA	2D02h	8	R	kVA	0 to Pmax
Total PF Á	2D03h	4	R		0 to 100 ×0.01
Total PF Lag	2D04h	4	R		0 to 100 ×0.01
Total PF Lead	2D05h	4	R		0 to 100 ×0.01
Minimum real-time auxiliary values (M)					
Auxiliary current	2E00h	8	R	mA/A	0 to Iaux max
Neutral current	2E01h	8	R	A	0 to Imax
Frequency Ä	2E02h	4	R	Hz	0 to 1000 ×0.1
Voltage unbalance	2E03h	4	R	%	0 to 300
Current unbalance	2E04h	4	R	%	0 to 300
Minimum Demands (M)					
Volt demand L1/L12	2F00h	8	R	V	0 to Vmax
Volt demand L2/L23	2F01h	8	R	V	0 to Vmax
Volt demand L3/L31	2F02h	8	R	V	0 to Vmax
Amp. demand L1	2F03h	8	R	A	0 to Imax
Amp. demand L2	2F04h	8	R	A	0 to Imax
Amp. demand L3	2F05h	8	R	A	0 to Imax
Block kW demand (import)	2F06h	8	R	kW	0 to Pmax
Block kvar demand (total)	2F07h	8	R	kvar	0 to Pmax
Block kVA demand	2F08h	8	R	kVA	0 to Pmax
Sliding window kW demand (import)	2F09h	8	R	kW	0 to Pmax
Sliding window kvar demand (total)	2F0Ah	8	R	kvar	0 to Pmax
Sliding window kVA demand	2F0Bh	8	R	kVA	0 to Pmax
Thermal kW demand (import)	2F0Ch	8	R	kW	0 to Pmax
Thermal kvar demand (total)	2F0Dh	8	R	kvar	0 to Pmax
Thermal kVA demand	2F0Eh	8	R	kVA	0 to Pmax
Programmable Min/Max minimum registers (M)					
Register #1	3000h	8	R	Â	Â
Register #2	3001h	8	R	Â	Â
Register #3	3002h	8	R	Â	Â
Register #4	3003h	8	R	Â	Â
Register #5	3004h	8	R	Â	Â
Register #6	3005h	8	R	Â	Â
Register #7	3006h	8	R	Â	Â
Register #8	3007h	8	R	Â	Â
Register #9	3008h	8	R	Â	Â
Register #10	3009h	8	R	Â	Â
Register #11	300Ah	8	R	Â	Â
Register #12	300Bh	8	R	Â	Â
Register #13	300Ch	8	R	Â	Â
Register #14	300Dh	8	R	Â	Â
Register #15	300Eh	8	R	Â	Â

Parameter	Data index	Length	Direction	Unit	Range À
Register #16	300Fh	8	R	Â	Â
Maximum real-time values per phase (M)					
Voltage L1/L12	3400h	8	R	V	0 to Vmax
Voltage L2/L23	3401h	8	R	V	0 to Vmax
Voltage L3/L31	3402h	8	R	V	0 to Vmax
Current L1	3403h	8	R	A	0 to Imax
Current L2	3404h	8	R	A	0 to Imax
Current L3	3405h	8	R	A	0 to Imax
kW L1	3406h	8	R	kW	-Pmax to Pmax
kW L2	3407h	8	R	kW	-Pmax to Pmax
kW L3	3408h	8	R	kW	-Pmax to Pmax
kvar L1	3409h	8	R	kvar	-Pmax to Pmax
kvar L2	340Ah	8	R	kvar	-Pmax to Pmax
kvar L3	340Bh	8	R	kvar	-Pmax to Pmax
kVA L1	340Ch	8	R	kVA	0 to Pmax
kVA L2	340Dh	8	R	kVA	0 to Pmax
kVA L3	340Eh	8	R	kVA	0 to Pmax
Power factor L1 Á	340Fh	4	R		0 to 100 ×0.01
Power factor L2 Á	3410h	4	R		0 to 100 ×0.01
Power factor L3 Á	3411h	4	R		0 to 100 ×0.01
Voltage THD L1/L12	3412h	4	R	%	0 to 1000 ×0.1
Voltage THD L2/L23	3413h	4	R	%	0 to 1000 ×0.1
Voltage THD L3	3414h	4	R	%	0 to 1000 ×0.1
Current THD L1	3415h	4	R	%	0 to 1000 ×0.1
Current THD L2	3416h	4	R	%	0 to 1000 ×0.1
Current THD L3	3417h	4	R	%	0 to 1000 ×0.1
K-Factor L1	3418h	4	R		10 to 9999 ×0.1
K-Factor L2	3419h	4	R		10 to 9999 ×0.1
K-Factor L3	341Ah	4	R		10 to 9999 ×0.1
Maximum real-time total values (M)					
Total kW	3500h	8	R	kW	-Pmax to Pmax
Total kvar	3501h	8	R	kvar	-Pmax to Pmax
Total kVA	3502h	8	R	kVA	0 to Pmax
Total PF Á	3503h	4	R		0 to 100 ×0.01
Total PF Lag	3504h	4	R		0 to 100 ×0.01
Total PF Lead	3505h	4	R		0 to 100 ×0.01
Maximum real-time auxiliary values (M)					
Auxiliary current	3600h	8	R	mA/A	0 to Iaux max
Neutral current	3601h	8	R	A	0 to Imax
Frequency Ä	3602h	4	R	Hz	0 to 1000 ×0.1
Voltage unbalance	3603h	4	R	%	0 to 300
Current unbalance	3604h	4	R	%	0 to 300
Maximum Demands (M)					
Volt demand L1/L12	3700h	8	R	V	0 to Vmax
Volt demand L2/L23	3701h	8	R	V	0 to Vmax

Parameter	Data index	Length	Direction	Unit	Range À
Volt demand L3/L31	3702h	8	R	V	0 to Vmax
Amp. demand L1	3703h	8	R	A	0 to Imax
Amp. demand L2	3704h	8	R	A	0 to Imax
Amp. demand L3	3705h	8	R	A	0 to Imax
Block kW demand (import)	3706h	8	R	kW	0 to Pmax
Block kvar demand (total)	3707h	8	R	kvar	0 to Pmax
Block kVA demand	3708h	8	R	kVA	0 to Pmax
Sliding window kW demand (import)	3709h	8	R	kW	0 to Pmax
Sliding window kvar demand (total)	370Ah	8	R	kvar	0 to Pmax
Sliding window kVA demand	370Bh	8	R	kVA	0 to Pmax
Thermal kW demand (import)	370Ch	8	R	kW	0 to Pmax
Thermal kvar demand (total)	370Dh	8	R	kvar	0 to Pmax
Thermal kVA demand	370Eh	8	R	kVA	0 to Pmax
Programmable Min/Max maximum registers (M)					
Register #1	3800h	8	R	**Â**	**Â**
Register #2	3801h	8	R	**Â**	**Â**
Register #3	3802h	8	R	**Â**	**Â**
Register #4	3803h	8	R	**Â**	**Â**
Register #5	3804h	8	R	**Â**	**Â**
Register #6	3805h	8	R	**Â**	**Â**
Register #7	3806h	8	R	**Â**	**Â**
Register #8	3807h	8	R	**Â**	**Â**
Register #9	3808h	8	R	**Â**	**Â**
Register #10	3809h	8	R	**Â**	**Â**
Register #11	380Ah	8	R	**Â**	**Â**
Register #12	380Bh	8	R	**Â**	**Â**
Register #13	380Ch	8	R	**Â**	**Â**
Register #14	380Dh	8	R	**Â**	**Â**
Register #15	380Eh	8	R	**Â**	**Â**
Register #16	380Fh	8	R	**Â**	**Â**
TOU system parameters					
Active tariff	3C00h	2	R		0 to 15
Active profile	3C01h	2	R		0 to 15
TOU energy register #1					
Tariff #1 register	3D00h	8	R	**Ã**	-10^9+1 to 10^9-1
Tariff #2 register	3D01h	8	R	**Ã**	-10^9+1 to 10^9-1
...	...				
Tariff #16 register	3D0FH	8	R	**Ã**	-10^9+1 to 10^9-1
TOU energy register #2					
Tariff #1 register	3E00h	8	R	**Ã**	-10^9+1 to 10^9-1
Tariff #2 register	3E01h	8	R	**Ã**	-10^9+1 to 10^9-1
...	...				

Parameter	Data index	Length	Direction	Unit	Range À
Tariff #16 register	3E0FH	8	R	Ã	-10^9+1 to 10^9-1
TOU energy register #3					
Tariff #1 register	3F00h	8	R	Ã	-10^9+1 to 10^9-1
Tariff #2 register	3F01h	8	R	Ã	-10^9+1 to 10^9-1
...	...				
Tariff #16 register	3F0FH	8	R	Ã	-10^9+1 to 10^9-1
TOU energy register #4					
Tariff #1 register	4000h	8	R	Ã	-10^9+1 to 10^9-1
Tariff #2 register	4001h	8	R	Ã	-10^9+1 to 10^9-1
...	...				
Tariff #16 register	400FH	8	R	Ã	-10^9+1 to 10^9-1
TOU energy register #5					
Tariff #1 register	4100h	8	R	Ã	-10^9+1 to 10^9-1
Tariff #2 register	4101h	8	R	Ã	-10^9+1 to 10^9-1
...	...				
Tariff #16 register	410FH	8	R	Ã	-10^9+1 to 10^9-1
TOU energy register #6					
Tariff #1 register	4200h	8	R	Ã	-10^9+1 to 10^9-1
Tariff #2 register	4201h	8	R	Ã	-10^9+1 to 10^9-1
...	...				
Tariff #16 register	420FH	8	R	Ã	-10^9+1 to 10^9-1
TOU energy register #7					
Tariff #1 register	4300h	8	R	Ã	-10^9+1 to 10^9-1
Tariff #2 register	4301h	8	R	Ã	-10^9+1 to 10^9-1
...	...				
Tariff #16 register	430FH	8	R	Ã	-10^9+1 to 10^9-1
TOU energy register #8					
Tariff #1 register	4400h	8	R	Ã	-10^9+1 to 10^9-1
Tariff #2 register	4401h	8	R	Ã	-10^9+1 to 10^9-1
...	...				
Tariff #16 register	440FH	8	R	Ã	-10^9+1 to 10^9-1
TOU minimum kW demands (M)					
Tariff #1 register	4500h	8	R	kW	0 to Pmax
Tariff #2 register	4501h	8	R	kW	0 to Pmax
...	...				
Tariff #16 register	450Fh	8	R	kW	0 to Pmax
TOU minimum kvar demands (M)					
Tariff #1 register	4600h	8	R	kvar	0 to Pmax
Tariff #2 register	4601h	8	R	kvar	0 to Pmax
...	...				
Tariff #16 register	460Fh	8	R	kvar	0 to Pmax
TOU minimum kVA demands (M)					
Tariff #1 register	4700h	8	R	kVA	0 to Pmax
Tariff #2 register	4701h	8	R	kVA	0 to Pmax
...	...				

Parameter	Data index	Length	Direction	Unit	Range À
Tariff #16 register	470Fh	8	R	kVA	0 to Pmax
TOU maximum kW demands (M)					
Tariff #1 register	4800h	8	R	kW	0 to Pmax
Tariff #2 register	4801h	8	R	kW	0 to Pmax
...	...				
Tariff #16 register	480Fh	8	R	kW	0 to Pmax
TOU maximum kvar demands (M)					
Tariff #1 register	4900h	8	R	kvar	0 to Pmax
Tariff #2 register	4901h	8	R	kvar	0 to Pmax
...	...				
Tariff #16 register	490Fh	8	R	kvar	0 to Pmax
TOU maximum kVA demands (M)					
Tariff #1 register	4A00h	8	R	kVA	0 to Pmax
Tariff #2 register	4A01h	8	R	kVA	0 to Pmax
...	...				
Tariff #16 register	4A0Fh	8	R	kVA	0 to Pmax

À For the parameter limits, see note **Â** to Table 4-1.

Á New absolute min/max value (lag or lead)

Â The programmable Min/Max register attributes depend on the parameter for which the register is allocated. Parameters which can be directed to programmable Min/Max log are signed by a **(P)** mark.

Ã The TOU energy register unit will depend on the input parameter for which the register is allocated.

Ä The actual frequency range is 45.0 - 65.0 Hz.

(A) These parameters can be assigned to analog output.

(M) These parameters are logged to the Min/Max log.

(P) These parameters can be assigned to programmable Min/Max log.

5.3 Basic Setup Registers

Table 5-8 Basic Setup Registers

Parameter	Data index	Length	Direction	Range
Wiring mode À	8600h	4	R/W	0 = 3OP2, 1 = 4LN3, 2 = 3DIR2, 3 = 4LL3, 4 = 3OP3, 5 = 3LN3, 6 = 3LL3
PT ratio	8601h	4	R/W	10 to 65000 × 0.1
CT primary current	8602h	4	R/W	1 to 50000 A
Demand period	8603h	4	R/W	1,2,5,10,15,20,30,60 min 255 = external synchronization
Ampere demand period	8604h	4	R/W	1 to 1800 sec
Averaging buffer size	8605h	4	R/W	8, 16, 32
Reset enable/disable	8606h	4	R/W	0 = disable, 1 = enable
Auxiliary CT primary current	8607h	4	R/W	1 to 50000 A/mA
The number of demand periods	8608h	4	R/W	1 to 15
Thermal demand time constant	8609h	4	R/W	10 to 36000 × 0.1
The number of pre-event cycles	860Ah	4	R/W	1 to 8

For the wiring mode options, see note to Table 4-4.

5.4 Instrument Options Registers

Table 5-9 Instrument Options Registers

Parameter	Data index	Length	Direction	Range
Options 1 register	7F00h	4	R	see Table 5-10
Options 2 register	7F01h	4	R	see Table 5-10

Table 5-10 Instrument Options

Options register	Bit	Description
Options1	0	120V options
	1-5	Reserved
	6	Analog output 0/4-20 mA
	7-8	Reserved
	9	Relays option
	10	Digital inputs option

Options 2	11	Auxiliary current option
	12-15	Reserved
	0-2	The number of relays - 1
	3-6	The number of digital inputs - 1
	7-8	The number of analog outputs - 1
	9-13	Reserved
	14-15	Memory module size (00 = 128 Kbyte, 01= 256 Kbyte, 10 = 512 Kbyte)

5.5 Alarm Status Registers

Table 5-11 Alarm Status Registers

Parameter	Data index	Length	Direction	Range
Setpoint alarm status	7E00h	4	R/W	see Table 5-12
Self-check alarm status	7E01h	4	R/W	see Table 5-13

The setpoint alarm register stores the status of the operated setpoints by setting the appropriate bits to 1. The alarm status bits can be reset all together by writing zero to the setpoint alarm register. It is possible to reset each alarm status bit separately by writing back the contents of the alarm register with a corresponding alarm bit set to 0.

The self-check alarm register indicates possible problems with the instrument hardware or setup configuration. The hardware problems are indicated by the appropriate bits which are set whenever the instrument fails self-test diagnostics and in the event of loss of power. The setup configuration problems are indicated by the dedicated bit which is set when either configuration register is corrupted. In this event, the instrument will use the default configuration. Hardware fault bits can be reset by writing zero to the self-check alarm register. The configuration corrupt status bit is also reset automatically when you change setup either via the front panel or through communications.

Table 5-12 Setpoint Alarm Status

Bit	Description
0	Alarm #1
1	Alarm #2
2	Alarm #3
3	Alarm #4
4	Alarm #5
5	Alarm #6
6	Alarm #7
7	Alarm #8
8	Alarm #9
9	Alarm #10
10	Alarm #11

11	Alarm #12
12	Alarm #13
13	Alarm #14
14	Alarm #15
15	Alarm #16

Bit meaning: 1 = setpoint has been operated

Table 5-13 Self-check Alarm Status

Bit	Description
0	Reserved
1	ROM error
2	RAM error
3	Watchdog timer reset
4	Sampling failure
5	Out of control trap
6	Reserved
7	Timing failure
8	Loss of power (power up) or warm restart
9	Reserved
10	Configuration corrupted
11-15	Reserved

5.6 Reset/Clear Registers

Table 5-14 Reset/clear Registers

Action	Data index	Length	Direction	Range
Clear total energy registers	A000h	4	W	0
Clear total extreme demand registers	A001h	4	W	0
Clear TOU energy registers	A002h	4	W	0
Clear TOU demand registers	A003h	4	W	0
Clear pulse counters	A004h	4	W	0
Clear Min/Max log	A005h	4	W	0
Clear event log	A006h	4	W	0
Clear data log	A007h	4	W	0-15 = log number 16 = all logs
Clear high-speed (32/16) waveform log	A008h	4	W	0
Clear high-resolution (128/4) waveform log	A009h	4	W	0
Reserved (no action will be made)	A00Ah	4	W	0
Restore event log queue	A00Bh	4	W	0
Restore data log queue	A00Ch	4	W	0-15 = log number 16 = all logs
Restore high-speed waveform log queue	A00Dh	4	W	0
Restore high-resolution waveform log queue	A00Eh	4	W	0