Bulletin 1404-M6 Functionality

Introduction

Read this document before using the Powermonitor 3000. Keep this document with the other Bulletin 1404 publications:

- 1404-IN001A-US-P - Master Module and Display Module
- 1404-IN002A-US-P - DF1 (RS-485) and RS-232 Communication Ports
- 1404-IN003A-US-P - DeviceNet™ Communication Port
- 1404-IN004A-US-P - Remote I/O Communication Port
- 1404-IN006A-US-P - Ethernet® Communication Port

All publications listed can be found at http://www.theautomationbookstore.com.

This release note contains information about the new 1404-M6.

The 1404-M6 has the same functionality as the 1404-M4 with the following additions:

- Oscillography
- Harmonics
- Sag and Swell
- Load Factor Log
- Event Log (additional 50 records, plus 2 new parameters in each record)
- Setpoints (10 additional setpoints, different action/release delay resolution, and a few additional output actions)

Table 1 Major Differences Between 1404-M4 and 1404-M6

Functionality	1404-M4	1404-M6
Oscillography	No	Yes (up to 8 captures x 7 channels x 408 cycles)
Harmonics	THD, Crest	THD, Crest, TIF, K-Factor, IEEE-519 TDD, IEEE-519 P/F, Harmonics 1-41 (percent and RMS mag)
Sag and Swell	No	Yes
Load Factor Log	No	Yes
Event Log	50 Records	100 Records
Setpoints	10 maximum	20 maximum

Oscillography

Oscillography functionality allows the capture of voltage and current waveforms present at the input terminals of the 1404-M6. An external application is used to retrieve the waveform data for display and/or processing. The main features of oscillography are:

- Simultaneous capture of all 7 voltage and current channels
- Up to 5.4k Hz sampling rate (90 samples/cycle at 60 Hz)
- Up to 8 captures of 7 channels are stored in non-volatile memory
- Each capture can contain up to 408 cycles of data per channel (at 60 Hz)
- The magnitude of each data point can be represented as 13-bit w/sign or 7-bit w/sign
- Configurable pre-trigger allows capture of data before an event of interest occurs
- Capture can be triggered by any setpoint, via the native communication port, or via the optional communication port
- Oscillograph data tables supported by all communication options

Use RSPower32 or RSEnergy to configure and read waveform data, or create a custom application to perform these functions. The following information provides details of the data table interface for oscillography.

Data Table Interface

There are two data tables that provide the interface to the oscillography functionality; Table 17 "Oscillograph Configuration/ Readback Data Select" and Table 18 "Oscillograph Results". Refer to the communication port manual that was shipped with your Powermonitor 3000 for descriptions on reading and/or writing to the data tables. The Display Module does not support oscillography configuration or results.

Table 17 "Oscillograph Configuration/Readback Data Select" is composed of the following groups of parameters:

- Configuration
- Command
- Status
- Readback select

Configuration

There are 2 parameters that control how waveforms are captured: *Capture Type* and *Pre-Trigger*. The *Capture Type* parameter selects both the sample rate and data point magnitude resolution. See Table 2 for a list of the possible selections.

Table 2 Capture Type Parameter Selections

Capture type	Sample rate	Magnitude Resolution	Samples/cycle @ 60 Hz	Total cycles per channel @ 60Hz	Duration of capture (in seconds)
0	5.4k Hz	13-bit w/sign	90	51.1	0.85
1	2.7k Hz	13-bit w/sign	45	102.2	1.70
2	1.35k Hz	13-bit w/sign	27.5	204.4	3.40
3	5.4k Hz	7-bit w/sign	90	102.1	1.70
4	2.7k Hz	7-bit w/sign	45	204.4	3.40
5	1.35k Hz	7-bit w/sign	27.5	408.8	6.81

The different capture types allow you to adjust sample rate, magnitude resolution, and total cycles recorded for each capture. A higher sample rate allows for a more accurate representation of the waveform when higher-order harmonics and transients are present. A higher magnitude resolution provides more granularity of voltage or current magnitude for each data point. Capture Type 5 has a lower sample rate and magnitude resolution, but allows the user to capture 408 cycles of all 7 channels. The oscillography settings do not affect the resolution or sample rate of the data used for metering. The *Pre-Trigger* parameter determines how much of the waveform is recorded by the 1404-M6 prior to the event that caused the trigger. A pre-trigger setting of 100% causes all of the waveform data prior to the trigger event to be saved. A pre-trigger setting of 50% indicates half of the waveform data to be saved prior to the trigger event and half of the data to be saved after the trigger event.

Command

There is one command parameter; it provides the ability to clear captures from non-volatile memory and initiate (trigger) new captures. One or all captures can be cleared with a single write of the data table. At least one capture location must be clear for a new capture to be saved. If all capture locations are full, the capture request is ignored. Refer to Table 6 for configuring a setpoint to trigger a capture.

Status

There are two status parameters.

- Capture Clear Status
- Capture Ready Status

Both status parameters contain 1 bit that corresponds to each of 8 possible non-volatile storage locations.

EXAMPLE

- If the *Capture Clear Status* bit is set, the storage location is clear and ready to accept a new capture. If the *capture clear status* bit is clear, the storage location contains a capture or is in the process of being cleared.
- If a *Capture Ready Status* bit is set, that capture has been completely saved to non-volatile memory and ready to be read. If a *capture ready status* bit is clear, the capture location is either cleared or in the process of being filled.

Readback Select

There are four readback select parameters.

- Capture #
- Channel #
- Block #
- Readback Mode

These parameters determine what data is read back from the *Oscillograph Result*s table on successive reads. *Capture #* selects which of the 8 possible captures is returned. *Channel #* selects which of the 7 voltage or current channels is returned. *Block #* indicates which portion of the waveform is returned. The capture type and communication protocol determines the maximum number of blocks that are required to read all of the data for one channel. *Readback Mode* selects how data is returned from the *Oscillograph Results* table on successive reads. The readback mode can be selected so successive reads of the result table return the next portion of data. Not all readback modes are supported by some communication protocols.

The *Oscillograph Results* table contains the following information:

- Readback Information
- Waveform Data Points
- Capture Statistics

Readback Information

The following parameters provide information on what waveform fragment is being read:

- Capture #
- Channel #
- Block #

Capture # indicates which of 8 captures is being read. *Channel #* indicates which of 7 voltage or current channels is being read. *Block #* indicates which portion of the waveform for that channel is being read.

Waveform Data Points

A read of this table returns 20 or 50 data points (depending on the communication port). Each data point is expressed in calibrated analog-to-digital counts and is a 13-bit w/sign or 7-bit w/sign value. These numbers can be converted into primary-side volts or amperes using the following formula:

$$\text{Voltage or Current} = \frac{(\text{Max RMS Magnitude} \times \sqrt{2})}{\text{Max A/D Counts}} \times \frac{\text{PT or CT Primary}}{\text{PT or CT Secondary}} \times \text{Data Point}$$

Where:

- Max RMS magnitude
  = 399.0 for channels 1, 3, and 5 (voltage channels)
  = 10.6 for channels 2, 4, 6, and 7 (current channels)
- Max A/D counts
  = 8192 for capture types 0, 1, and 2 (magnitude resolution of 13-bit w/sign)
  = 128 for capture types 3, 4, and 5 (magnitude resolution of 7-bit w/sign)

The 1404-M6 oscillography samples at approximately 5.4k Hz, 2.7k Hz, and 1.35k Hz.

Capture statistics

There are 6 parameters in the *Oscillograph Results* table that provide statistics associated with the captured data. The first 3 parameters indicate the timestamp of when the capture was triggered. The *Capture Type* parameter indicates how this capture was configured so that it can be displayed properly. The *Trigger Source and Unique Capture Identifier* parameter indicates 2 items. The trigger source identifies how the capture was triggered (via setpoint, native comm port, or option comm port). The unique capture identifier assigns a capture serial number. In the case of a setpoint-triggered capture, this number can also be used to find the specific event associated with the capture. Since this number increments for each new capture, it can also be used in lieu of the timestamp to determine the chronological order of captures stored in non-volatile memory. The *Trigger Position* parameter indicates the position in the waveform when the trigger occurred. This can be used by an external application to place a marker on the displayed waveform.

Harmonic Analysis

The 1404-M6 calculates a list of harmonic results. The harmonic results list follows:

- IEEE THD (per channel, average for voltage channels, average for current channels)
- DIN (per channel, average for voltage channels, average for current channels)
- Crest Factor (per channel, average for voltage channels, average for current channels)
- TIF (per channel, average for voltage channels, average for current channels)
- K-factor (per channel, average for voltage channels, average for current channels)
- IEEE-519 TDD (per current channel)
- IEEE-519 Pass/Fail (per channel)
- Harmonic distortion (per channel for harmonic 1-41)
- Harmonic magnitude (per channel for harmonic 1-41)

All 630 of the above results can be accessed via the native communication port or optional communication port. A few of these results (Average IEEE THD, Average DIN, and Average Crest Factor) can be accessed via the Display Module.

IEEE THD and DIN

Both of these total harmonic distortion calculation methods provide a summary indication of the amount of distortion due to harmonics present in a system. The standard IEEE definition of harmonic distortion is “Total Harmonic Distortion (THD)” and is computed for each channel as follows:

$$THD = \frac{\sqrt{\sum_{n=2}^{\infty} (H_n)^2}}{H_1}$$

Where:

- H_n = magnitude of the n^{th} harmonic ($n \leq 41$)
- H_1 = magnitude of fundamental

The standard IEC definition of harmonic distortion is the “Distortion Index (DIN)” and is computed for each channel as follows:

$$DIN = \sqrt{\frac{\sum_{n=2}^{\infty} (H_n)^2}{\sum_{n=1}^{\infty} (H_n)^2}}$$

Where:

- H_n = magnitude of the n^{th} harmonic ($n \leq 41$)
- DIN is equivalent to IEC THD

Crest Factor

This is another quantity that is sometimes used to describe the amount of distortion present in a waveform. It can also be used to express the dynamic range of a measurement device. Crest Factor is the ratio of the peak to the RMS.

Crest Factor = Peak value / RMS value

A pure sinusoid Crest Factor equals $\sqrt{2}$.

TIF

Another method of measuring signal distortion is the Telephone Influence Factor, sometimes called the Telephone Interference Factor. This measurement is used to estimate the effect that the power line harmonics have on nearby analog telephone conductors. This method weighs each of the harmonics based on the physiological and audiological characteristics of the human ear. The harmonics are additionally weighted to reflect the relationship of harmonic frequency and degree of coupling to the phone lines. These weights are called single frequency TIF weights. The 1404-M6 uses the most recent TIF weights (updated in 1960). The single frequency factors are used to compute the total TIF. The user multiplies the TIF numbers by the RMS magnitude of the power lines voltage or current to obtain an index for estimating the amount of interfering energy that is coupled to the telephone system. The formula for total TIF is:

$$TIF = \frac{\sqrt{\sum_{i=1}^{\infty} (w_i X_i)^2}}{\sqrt{\sum_{i=1}^{\infty} (X_i)^2}}$$

Where:

- X_i = single frequency RMS current or voltage at harmonic i.
- w_i = single frequency TIP weighting factor at harmonic i.

K-Factor

K-Factor measures additional heating in a power transformer due to the harmonics in the power signal. These harmonics cause additional heating due to increased core losses that occur at higher frequencies. The increased losses are related to the square of the harmonic frequency. Therefore, a slight harmonic content can significantly increase the heat rise in a power transformer. The additional harmonic heating may cause a transformer to exceed designed temperature limits even though the RMS current is less than the transformer rating. The K-Factor is used as justification to oversize a power transformer to allow extra margin for harmonic losses or to select an appropriate K-Factor rated transformer. A K-Factor rated transformer is the preferred choice since it has known performance in the presence of harmonics. The formula for K-Factor is as follows:

$$\text{K-Factor} = \frac{\sum_{n=1}^{\infty}\left(H_n^2 \bullet n^2\right)}{\sum_{n=1}^{\infty}(H_n)^2}$$

Where:

- H_n = magnitude of the n^{th} harmonic ($n \leq 41$).

IEEE-519 TDD and IEEE-519 Pass/Fail

IEEE-519 is the IEEE standard for "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems". The 1404-M6 refers to the 1992 version of this standard. IEEE-519 provides recommended limits for the level of harmonic current injection at the Point of Common Coupling (PCC) between the utility and the user. The PCC is typically defined as the location in the power distribution system where the utility meters are connected. The standard provides recommended limits for individual harmonic components as well as a limit for Total Demand Distortion (TDD). Total Demand Distortion is defined as the root sum square of the current distortion expressed as a percent of the maximum fundamental demand load current (based on the maximum demand over the applicable demand interval). The formula for computing TDD is the same as the IEEE THD formula except the configured value for maximum fundamental load current is substituted for the magnitude of the measured fundamental load current.

$$\text{TDD} = \frac{\sqrt{\sum_{n=2}^{\infty}(H_n)^2}}{H_1}$$

Where:

- H_n = magnitude of the n^{th} harmonic ($n \leq 41$)
- H_1 = maximum fundamental load current

Table 10.3 of the standard specifies the limits. The appropriate limits are selected by computing the ratio of the available short circuit current to the maximum fundamental demand load current. The row of the table that corresponds to the ratio is then used to determine the proper limits for each of the individual harmonics and the TDD specified in the table columns. IEEE-519 also recommends maximum voltage distortion levels that the utility should remain below. Table 11.1 specifies these limits based on the magnitude of the line to line voltage at the PCC. Once configured, the 1404-M6 will automatically monitor the system voltage and current for IEEE-519 compliance.

Harmonic Magnitude

The 1404-M6 calculates the RMS magnitude of each individual harmonic. Results are calculated for harmonics 1 to 41 for all 7 voltage and current channels. Each result is expressed in RMS volts or amps.

Harmonic Distortion

The 1404-M6 calculates the magnitude of each individual harmonic with respect to the fundamental. Results are calculated for harmonics 1 to 41 for all 7 voltage and current channels. Each result is expressed as a percentage of the fundamental.

Data Table Interface

There are 6 data tables that provide the interface to the harmonic analysis functionality: one table for configuration and five tables for result data. Refer to the appropriate 1404-M6 communication port manual for information on reading and writing to data tables.

Table 11 "Harmonic Analysis Configuration/Readback Data Select" contains 3 Configuration parameters and 3 Readback Select parameters. The configuration parameters provide the ability to enable or disable the calculation of all harmonic results, and allow the ability to set up information required by the IEEE-519 calculation parameters. The 3 readback parameters allow selection of what harmonic results appear in subsequent reads of the 5 harmonic result tables.

Table 12 "Harmonic Results; THD, Crest Factor and more" contains 7 harmonic results, a channel indicator, and 2 counters that increment each time new results have been calculated. The 7 harmonic results include IEEE THD, DIN, Crest Factor, TIF, K-Factor, IEEE-519 TDD and IEEE-519 Pass/Fail.

The remaining 4 tables contain individual harmonic result data, a channel indicator, a type of data indicator, and a counter that increments each time the new results are calculated.

Sag and Swell

The 1404-M6 is capable of detecting voltage sags and swells. There are many definitions for sag and swell. IEEE 1159[1] defines sag as:

> “A decrease to between 0.1 and 0.9 pu in rms voltage or current at the power frequency for durations of 0.5 cycle to 1 minute”.

IEEE 1159[1] defines swell as:

> “An increase in rms voltage or current at the power frequency for durations from 0.5 cycles to 1 minute. Typical values are 1.1-1.8 pu”.

In the 1404-M6, the pre-defined setpoint configuration for the detection of sag and swell is based on the IEEE-1159[1] standard. Although the 1404-M6 default setpoint configuration is applicable as-is for many sag and swell applications, it may be necessary to alter the 1404-M6 setpoint configuration to utilize the proper definition of sag and swell for your particular application.

Setpoint #19 is setup to detect voltage sag and has the following configuration data:

- Type = Voltage Sag
- Evaluation condition = Under low limit for positive values
- High Limit = 90% Nominal System Voltage
- Low Limit = 90% Nominal System Voltage
- Action delay = 0
- Release delay = 0
- Output action = Capture oscillograph

Setpoint #20 is setup to detect voltage swell and has the following configuration data:

- Type = Voltage Swell
- Evaluation condition = Over high limit for positive values
- High Limit = 110% Nominal System Voltage
- Low Limit = 110% Nominal System Voltage
- Action delay = 0
- Release delay = 0
- Output action = Capture oscillograph

If the nominal system voltage setting is changed, the high and low limits for setpoint #19 and #20 are automatically adjusted to 90% and 110% of the nominal system voltage.

To use sag and/or swell detection:

1. Set 'RMS result averaging' to 0 (no averaging) to ensure the quickest setpoint response to changes in input voltage.
2. Alter setpoint configuration if necessary to fit the definition of sag and/or swell for your application.
3. If using the setpoint to trigger an oscillograph capture, make sure there is at least one capture location in non-volatile memory that is clear and ready to accept a new capture.
4. Periodically check the event log or capture ready status for an indication that a sag or swell has occurred.
5. Read the event log to get the timestamp, duration of the disturbance, the worst case magnitude, and the identifier of the capture.
6. Find the capture that has the same identifier as the one found in the event log record (read 1 block from each non-volatile capture location). Read the entire capture from the 1404-M6. Depending on the duration of the disturbance, the capture may contain additional information prior to and during the sag or swell event.

The sag or swell duration reported in the event log has a tolerance of ± 2x the metering update rate. The metering update rate varies based on wiring configuration, the 'RMS resolution', how many setpoints are active, level of communication port traffic. The nominal update rate is approximately 70 ms. For sag and swell durations less than 500 milliseconds, examining the oscillograph data can result in a more accurate determination of sag or swell duration.

References:

IEEE Std 1159-1995, "IEEE Recommended Practice for Monitoring Electric Power Quality", page 5,6,12.
The Institute of Electrical & Electronics Engineers Inc, 345 East 47th Street, New York, NY 10017-2394, ISBN 1-55937-549-3

Load Factor

Load Factor is a plant demand metric that indicates how variable (or stable) a load is over a period of time. Load Factor is simply the average demand / peak demand for a given period of time (typically one month). If the load is perfectly constant, Load Factor = 100%. If the peak demand is 4 times greater than the average demand, Load Factor = 25%. The 1404-M6 calculates Load Factor for real power, reactive power, apparent power, and current. The last 12 Load Factor results are stored in non-volatile memory. The 1404-M6 can automatically restart load factor calculations at the end of each month and store the old result in non-volatile memory, or the load factor period can be controlled manually.

Options for reducing the *Peak Demand*, which lowers the demand portion of your electric bill, are found when Load Factor and Peak Demand are examined. The Peak Demand period is identified using the time and date stamp on the maximum demand in the *Min/Max Log* of the Powermonitor 3000. When the Peak period is determined, you can identify what plant activities caused the peak. Preventing those activities or installing a demand management system which prevents the demand from exceeding a preset limit, allows you to realize significant savings in demand charges. Using the Load Factor value, those savings are estimated by calculating the demand charge based on the peak versus the charge based on the average demand. The smaller the load factor the more opportunity exists to lower the demand charge.

Data Table Interface

The data table interface for Load Factor consists of two tables; one table for configuration and readback select, and one table for results. The result table can return 1 of 13 load factor records. One record is the load factor 'in progress' results, and the remaining 12 records are old load factor results that were stored into non-volatile memory at the end of each load factor period. The 1404-M6 factory default configuration causes the load factor to be stored and then restarted at the end of each month. The 'auto clear/reset day' configuration parameter should be set to the end of the demand period specified by your energy provider. Refer to the appropriate communication port manual for additional details for the two Load Factor tables.

Bulletin 1404 Data Tables

This section provides the data tables that have changed or are new for the 1404-M6. All other data tables can be found in the specific communication port documents.

Table 3 Summary of Powermonitor 3000 Data Tables for all Communication Protocols(1)

Name of data table	PM Input	PM Output	DF1 & Ethernet (CSP) File # (2)	R I/O BT #	# words	DNet Assy Inst#	M 4	M 6	Refer to
Basic Device Configuration	•	•	F10	20	16/18(3)	4,5	•	•	Table 4
Selftest/Diagnostic Results		•	N22	36	27	23	•	•	Table 5
Setpoint Setup/Readback Select and Status	•	•	N23	22	16	24,25	•	•	Table 6
Event Log Configuration/Readback Record Select	•	•	N28	9	5	32,33	•	•	Table 9
Event Log Results		•	N29	21	14	34	•	•	Table 10
Harmonic Analysis Configuration/Readback Data Select	•	•	N33	14	9	39,40	•	•	Table 11
Harmonic Results; THD, Crest Factor and more		•	F34	23	18/20(4)	41	•	•	Table 12
Harmonic Results; Odd Harmonics 1 - 21		•	F35	39	28	42		•	Table 13
Harmonic Results; Odd Harmonics 23 - 41		•	F36	40	28	43		•	Table 14
Harmonic Results; Even Harmonics 2 - 20		•	F37	41	28	44		•	Table 15
Harmonic Results; Even Harmonics 22 - 40		•	F38	42	28	45		•	Table 16
Oscillograph Configuration/Readback Data Select	•	•	N39	15	11	46,47		•	Table 17
Oscillograph Results		•	N40	61	28/58(5)	48		•	Table 18
Load Factor Log Configuration/Readback Select	•	•	N41	16	6	49,50		•	Table 19
Load Factor Log Results		•	F42	43	28	51		•	Table 20

(1) All tables are PLC/SLC compatible. 'PLC/SLC compatible' for DeviceNet is 26 words or less on writes to the Powermonitor and 29 words or less on reads from the Powermonitor. 'PLC/SLC compatible' for DF1 is 64 words (32 floats) or less.

(2) SLC file numbers 1-8 are typically of a fixed data type, Powermonitor starts with file #9 to avoid any data-type incompatibility which may be enforced by some products and/or programming tools.

(3) Basic Device Configuration data table size is 8 floats (16 words) for the 1404-M4 and 9 floats (18 words) for the 1404-M6.

(4) Harmonic Results; THD, Crest Factor and more data table size is 9 floats (18 integers) for the 1404-M4 and 10 floats (20 integers) for the 1404-M6.

(5) The oscillograph results table is 28 words for DeviceNet and 58 words for all other comms.

Table 4 Basic Device Configuration

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1 2	Password	•	•	0 to 9999	0	On a write, the correct password is required to change the basic device configuration. On a read, -1 is returned.
1	3 4	Voltage Mode (Wiring Configuration)	•	•	0 to 8	6	Should match the external electrical system and how it is wired to the Powermonitor's voltage and current input terminals. Refer to the wiring diagrams in the installation section of the instruction sheet. 0=Delta 3 CT 1=Delta 2 CT 2=Direct Delta 3 CT 3=Direct Delta 2 CT 4=Open Delta 3 CT 5=Open Delta 2 CT 6=Wye 7=Single Phase 8=Demo
2	5 6	PT Primary	•	•	1.0 to 10,000,000 .0	480.0	The first value of the PT ratio (**xxx**:xxx) indicating the nominal voltage present at the high-end of the transformer. If no transformer is used (for direct connect of up to 347V L-N or 600V L-L), set the PT ratio to any valid 1:1 ratio (480:480, etc.).
3	7 8	PT Secondary	•	•	1.0 to 600.0	480.0	The second value of the PT ratio (xxx:**xxx**) indicating the nominal voltage present at the low-end of the transformer.
4	9 10	I1/I2/I3 CT Primary	•	•	1.0 to 10,000,000 .0	5.0	The first value of the CT ratio (**xxx**:xxx) indicating the nominal current at the high-end of the transformer.
5	11 12	I1/I2/I3 CT Secondary	•	•	1.0 to 5.0	5.0	The second value of the CT ratio (xxx:**xxx**) indicating the nominal current at the low-end of the transformer.
6	13 14	I4 CT Primary	•	•	1.0 to 10,000,000 .0	5.0	The first value of the CT ratio (**xxx**:xxx) indicating the nominal current at the high-end of the transformer.
7	15 16	I4 CT Secondary	•	•	1.0 to 5.0	5.0	The second value of the CT ratio (xxx:**xxx**) indicating the nominal current at the low-end of the transformer.
8	17 18	Nominal System Voltage		•	1.0 to 10,000,000 .0	480.0	This parameter is for 1404-M6 only. This indicates the system voltage under normal operating conditions. This value is used to determine limits used by the default sag and swell setpoints.

Table 5 Selftest/Diagnostic Results

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1	Bulletin number	•	•	1404	-	Always returns 1404
1	2	Series	•	•	0 to 8	-	Indicates the series of the product (can also be found printed on the label) 0=A, 1=B, etc.
2	3	Overall status	•	•	-	-	0 indicates healthy status (normal operation)
3	4	Data Acquisition status	•	•	-	-	0 indicates healthy status (normal operation) bit 0=overall status; 0= pass, 1=fail bit 1=reserved bit 2=data bus connection failure bit 3=address test failure
4	5	Data FLASH status	•	•	-	-	0 indicates healthy status (normal operation)
5	6	Real-time clock status	•	•	-	-	0 indicates healthy status (normal operation)
6	7	RTC NVRAM status	•	•	-	-	0 indicates healthy status (normal operation) Non-zero indicates corruption of non-volatile memory. This does not cause product to shutdown. The error is cleared on a reset/ power cycle. If this error is detected, date/time, and energy values are reset.
7	8	Option comm status	•	•	-	-	0 indicates healthy status (normal operation) Also returns 0 if no option comm is present
8	9	Display module status	•	•	-	-	0 indicates healthy status (normal operation) Also returns 0 if no DM is connected
9	10	Watchdog status	•	•	-	-	0 indicates healthy status (normal operation)
10	11	Code FLASH status	•	•	-	-	0 indicates healthy status (normal operation) bit 1 = boot code checksum failure bit 2 = application code checksum failure bit 3 = calibration CRC failure bit 4 = no calibration data bit 5 = wrong application firmware loaded
11	12	RAM status	•	•	-	-	0 indicates healthy status (normal operation) bit 0 = read/write test failure
12	13	Application FRN	•	•	0 to 9999	-	Firmware revision number of the main application code which resides in a FLASH part on the master module digital board. 100 indicates V1.00, 103 indicates V1.03, etc.
13	14	Boot code FRN	•	•	0 to 9999	-	Firmware revision number of the bootloader code which resides in a FLASH part on the master module digital board. 100 indicates V1.00, 101 indicates V1.01, etc.
14	15	ASIC build #	•	•	0 to 9999	-	Revision number of the 'code' which was used to fabricate the ASIC.
15	16	Option comm FRN	•	•	0 to 9999	-	Revision of the firmware that resides on the optional communications card (DeviceNet). Returns 0 if no option comm present or if the comm card does not contain firmware (RS-232, Remote I/O).
16	17	Display module FRN	•	•	0 to 9999	-	Revision of the firmware that resides in the Display Module. 104 indicates V 1.04, 105 indicates V1.05, etc. Returns 0 if no DM connected
17	18	Reserved	•	•	0 to 9999	-	Reserved

Table 5 Selftest/Diagnostic Results

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
18	19	Digital board revision	•	•	0 to 7	-	Revision of the digital board within the master module. 0=02A, 1=03A, etc.
19	20	Analog board revision	•	•	0 to 7	-	Revision of the analog board within the master module. 0=02A, 1=03A, etc.
20	21	Reserved	•	•	0 to 9999	-	Revision of the optional communications board. Returns 0 if no option communication board is present.
21	22	Reserved	•	•	0 to 9999	-	Reserved
22	23	MM Device ID	•	•	0 to 255	-	A unique number assigned to a device at time it is manufactured. This number is used by some communication options to form a factory default network address. This allows multiple devices to be connected to a network 'out of the box' and not conflict. The device ID cannot be changed.
23	24	Master Module type	•	•	4 or 6	-	Indicates the type of Master Module. 4 = M4 (catalog 1404-M405x-xxx) 6 = M6 (catalog 1404-M605x-xxx)
24	25	Display module type	•	•	0 to 1	-	Indicates the type of display module connected to the master module. 00=No display module connected 01=1404-DM connected to master module
25	26	Option comm type	•	•	See Description	-	Indicates the type of option comm card contained in the master module. 00=No option comm card present (native RS-485 only) 81=DeviceNet 84=Remote I/O 86=RS-232 with handshaking
26	27	Reserved	•	•	0	-	Reserved

Table 6 Setpoint Setup/Readback Select and Status

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1	Password	•	•	0 to 9999	-	Correct password is required to configure a setpoint, but is not required to select setpoint configuration/result information to be read back. If you wish to select setpoint info to readback without performing a write of setpoint config data, set password to -1.
1	2	Setpoint number	•	•	1 to 10 (M4) 1 to 20 (M6)	-	On a write, this selects the setpoint config data to be returned during the next read…and if the password is not set to -1, this also indicates the setpoint number associated with the config data being written. On a read, this indicates the setpoint number associated with the config and result information is being returned.
2	3	Readback mode	•	•	0 to 1	0	Selects the readback mode for this table. 0 = Automatically increments the setpoint number after a read of this table (allows for all setpoint info to be read with successive reads). 1 = Setpoint number not incremented after a read (allows for monitoring of info on an individual setpoint with successive reads). DeviceNet does not support the 'auto-increment' mode (this value is ignored for the DeviceNet port and always acts as if set to 1).
3	4	Setpoint type	•	•	0 to 43 (M4) 0 to 45 (M6)	0(1)	Indicates which parameter value is being evaluated against high and low limits. Refer to Table 7 "List of Setpoint Types" for a list of setpoint types.
4	5	Evaluation condition	•	•	0 to 5	0(1)	Indicates how the setpoint type is evaluated against the limit(s). 0=Over high limit for positive values 1=Over high limit for negative values 2=Under low limit for positive values 3=Under low limit for negative values 4=Equal to high limit (low limit not used) 5=Not equal to high limit (low limit not used)
5	6	High limit Integer	•	•	0-9999	0(1)	The magnitude of the evaluated parameter must remain above this value for the specified action delay to activate an 'over' setpoint. The magnitude of the evaluated parameter must remain above this value for the specified release delay to de-activate an 'under' setpoint. For relay and KYZ setpoint types, 0 corresponds to a de-energized state, 1 corresponds to an energized state.
6	7	Exponent			-4 to 21	0(1)	High limit = integer x $10^{exponent}$ Example: If Integer = 1440 and exponent = 1, then the high limit value =1,440 x 10^{1} = 14,400.
7	8	Low limit Integer	•	•	0 to 9999	0(1)	The magnitude of the evaluated parameter must remain below this value for the specified release delay to de-activate an 'over' setpoint. The magnitude of the evaluated parameter must remain below this value for the specified action delay to activate an 'under' setpoint.

Table 6 Setpoint Setup/Readback Select and Status

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
8	9	Exponent	•	•	-4 to 21	0(1)	Low limit = integer x $10^{exponent}$ Example: If Integer = 1350 and exponent = 1, then the high limit value =1,350 x 10^{1} = 13,500.
9	10	Action delay	•	•	0-3600 (M4) 0-30000 (M6)	0	For the M4, this value specifies the amount of time in seconds that the setpoint limit must sustain the evaluation criteria before the output action is taken. For the M6, this value is specified in tenths of a second.
10	11	Release delay	•	•	0-3600 (M4) 0-30000 (M6)	0	Specifies the amount of time in seconds that the setpoint parameter must sustain the evaluation criteria before the output action is taken. For the M6, this value is specified in tenths of a second.
11	12	Output action	•	•	0 to 32 (M4) 0 to 43 (M6)	0(1)	Specifies the output action taken when the setpoint conditions have been met. Refer to Table 8 "Setpoint Output Actions" for a list of output actions.
12	13	Status	•	•	0 to 1	0	Indicates the current status of this setpoint. 0=not triggered 1=triggered
13	14	Accumulated time Integer	•	•	0 to 9999	-	The total accumulated time (in seconds) that the setpoint was triggered. Accumulated time = integer x $10^{exponent}$.
14	15	Exponent			-1 to 21	-	Example: If integer = 326 and exponent = -1, then Accumulated time = 326 x 10^{-1} = 32.6 seconds.
15	16	Clear time accumulator command	•	•	0 to 1	0	Write a 1 to clear the time accumulator for this setpoint. Write a 0 to leave the accumulated time for this setpoint unaffected. On a read, always returns a 0.

(1) For the 1404-M6, setpoints #19 and #20 default to detect voltage sag and voltage swell. Limits are based on the Nominal System Voltage parameter in Table 4 and the Output Action is set to “Capture Oscillograph”.

Table 7 List of Setpoint Types

Param #	Parameter name	M 4	M 6	Comment
0	Not used	•	•	Disables the setpoint.
1	Voltage(1)	•	•	Refer to the “Metering Voltage, Current and Frequency Results” table in your communication port manual.
2	Current(1)	•	•	Refer to the “Metering Voltage, Current and Frequency Results” table in your communication port manual.
3	Voltage unbalance	•	•	Refer to the “Metering Voltage, Current and Frequency Results” table in your communication port manual.
4	Current unbalance	•	•	Refer to the “Metering Voltage, Current and Frequency Results” table in your communication port manual.
5	Neutral current	•	•	Refer to the “Metering Voltage, Current and Frequency Results” table in your communication port manual.
6	KW	•	•	Refer to the “Metering Power Results” table in your communication port manual.
7	KVAR	•	•	Refer to the “Metering Power Results” table in your communication port manual.

Table 7 List of Setpoint Types

Param #	Parameter name	M 4	M 6	Comment
8	KVA	•	•	Refer to the “Metering Power Results” table in your communication port manual.
9	Total true PF	•	•	Refer to the “Metering Power Factor Results” table in your communication port manual.
10	Total disp PF	•	•	Refer to the “Metering Power Factor Results” table in your communication port manual.
11	Total dist PF	•	•	Refer to the “Metering Power Factor Results” table in your communication port manual.
12	KW demand	•	•	Refer to the “Metering Demand Results” table in your communication port manual.
13	KVAR demand	•	•	Refer to the “Metering Demand Results” table in your communication port manual.
14	KVA demand	•	•	Refer to the “Metering Demand Results” table in your communication port manual.
15	Amp demand	•	•	Refer to the “Metering Demand Results” table in your communication port manual.
16	Projected amp demand	•	•	Refer to the “Metering Demand Results” table in your communication port manual.
17	Projected KW Demand	•	•	Refer to the “Metering Demand Results” table in your communication port manual.
18	Projected KVAR Demand	•	•	Refer to the “Metering Demand Results” table in your communication port manual.
19	Projected KVA Demand	•	•	Refer to the “Metering Demand Results” table in your communication port manual.
20	Frequency	•	•	Refer to the “Metering Voltage, Current and Frequency Results” table in your communication port manual.
21	Phase rotation	•	•	Refer to the “Metering Voltage, Current and Frequency Results” table in your communication port manual.
22	Crest factor voltage	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
23	Crest factor current	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
24	Crest factor I	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
25	IEEE THD voltage(1)	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
26	IEEE THD current(1)	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
27	IEEE THD I4	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
28	IEC THD voltage(1)	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
29	IEC THD current(1)	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
30	IEC THD I4	•	•	Refer to Table 12 "Harmonic Results; THD, Crest Factor and more"
31	Status input 1	•	•	Refer to the “Discrete Data” table in your communication port manual.
32	Status input 2	•	•	Refer to the “Discrete Data” table in your communication port manual.
33	Any status input(1)	•	•	Refer to the “Discrete Data” table in your communication port manual.
34	Setpoint #1 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
35	Setpoint #2 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
36	Setpoint #3 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
37	Setpoint #4 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
38	Setpoint #5 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
39	Setpoint #6 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
40	Setpoint #7 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
41	Setpoint #8 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
42	Setpoint #9 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
43	Setpoint #10 time accumulator	•	•	Refer to Table 8 "Setpoint Output Actions"
44	Voltage Sag		•	Behaves same as Voltage Setpoint Type.
45	Voltage Swell		•	Behaves same as Voltage Setpoint Type.

(1) For an ‘over’ setpoint evaluation, the magnitude of any one of the phases over the high limit will trigger the output action, but the magnitude of all phases must drop below the low limit for the setpoint to release. For ‘under’ setpoint evaluation, the magnitude of any one of the phases under the low limit will trigger the output action, but the magnitude of all phases must rise above the high limit to release the setpoint.

Table 8 Setpoint Output Actions

Param #	Parameter name	M 4	M 6	Comment
0	None	•	•	No output action will be taken when the setpoint is asserted, however it will still be recorded into the event log and status of the assertion can be detected by reading the 'setpoint status' parameter via Table 6 or the "User-Configured Table Results" table in your communication port manual.
1	Energize relay (and alarm flag 1)	•	•	Energize the relay and set a bit in the output alarm word. Refer to the "Discrete Data" table in your communication port manual for more information on the relay and alarm output word.
2	Energize KYZ (and alarm flag 2)	•	•	Energize the solid-state KYZ output and set a bit in the alarm output word.
3	Set alarm flag 3	•	•	Set a bit (flag) in the alarm output word. Occurrence of the setpoint can be easily detected by an external program by reading the alarm word from the "Discrete Data" table. Please see your communication port manual for information.
4	Set alarm flag 4	•	•	
5	Set alarm flag 5	•	•	
6	Set alarm flag 6	•	•	
7	Set alarm flag 7	•	•	
8	Set alarm flag 8	•	•	
9	Set alarm flag 9	•	•	
10	Set alarm flag 10	•	•	
11	Set alarm flag 11	•	•	
12	Set alarm flag 12	•	•	
13	Set alarm flag 13	•	•	
14	Set alarm flag 14	•	•	
15	Set alarm flag 15	•	•	
16	Set alarm flag 16	•	•	
17	Save a trend log record	•	•	Causes a record to be recorded immediately into the trend log.
18	Clear kWh result	•	•	Clears the kWh result
19	Clear kVARh result	•	•	Clears the kVARh result
20	Clear kVAh result	•	•	Clears the kVAh result
21	Clear Ah result	•	•	Clears the Ah result
22	Clear all energy results	•	•	Clears all energy results (kWh, kVARh, kVAh, Ah)
23	Clear setpoint #1 time accumulator	•	•	Clears the time accumulator associated with setpoint #1
24	Clear setpoint #2 time accumulator	•	•	Clears the time accumulator associated with setpoint #2
25	Clear setpoint #3 time accumulator	•	•	Clears the time accumulator associated with setpoint #3
26	Clear setpoint #4 time accumulator	•	•	Clears the time accumulator associated with setpoint #4
27	Clear setpoint #5 time accumulator	•	•	Clears the time accumulator associated with setpoint #5
28	Clear setpoint #6 time accumulator	•	•	Clears the time accumulator associated with setpoint #6
29	Clear setpoint #7 time accumulator	•	•	Clears the time accumulator associated with setpoint #7
30	Clear setpoint #8 time accumulator	•	•	Clears the time accumulator associated with setpoint #8
31	Clear setpoint #9 time accumulator	•	•	Clears the time accumulator associated with setpoint #9
32	Clear setpoint #10 time accumulator	•	•	Clears the time accumulator associated with setpoint #10
33	Clear setpoint #11 time accumulator		•	Clears the time accumulator associated with setpoint #11
34	Clear setpoint #12 time accumulator		•	Clears the time accumulator associated with setpoint #12
35	Clear setpoint #13 time accumulator		•	Clears the time accumulator associated with setpoint #13

Table 8 Setpoint Output Actions

Param #	Parameter name	M4	M6	Comment
36	Clear setpoint #14 time accumulator		•	Clears the time accumulator associated with setpoint #14
37	Clear setpoint #15 time accumulator		•	Clears the time accumulator associated with setpoint #15
38	Clear setpoint #16 time accumulator		•	Clears the time accumulator associated with setpoint #16
39	Clear setpoint #17 time accumulator		•	Clears the time accumulator associated with setpoint #17
40	Clear setpoint #18 time accumulator		•	Clears the time accumulator associated with setpoint #18
41	Clear setpoint #19 time accumulator		•	Clears the time accumulator associated with setpoint #19
42	Clear setpoint #20 time accumulator		•	Clears the time accumulator associated with setpoint #20
43	Capture oscillograph		•	Captures 7 channels worth of data using current oscillograph configuration settings (see Table 17 "Oscillograph Configuration/ Readback Data Select")

Table 9 Event Log Configuration/Readback Record Select

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M4	M6	Range	Default Value	Description
0	1	Password	•	•	0 to 9999	-	The correct password is required to configure the event log, but is not required to select an event log record to be read back. If you are only selecting an event log record to be read, set password to -1.
1	2	Increment Parameter	•	•	-32768 to +32767	0	Increment this element if writing this table in a redundant manner.
2	3	Readback mode	•	•	0 to 6	2	Selects the readback mode for Table 10 "Event Log Results". 0 = Auto increment/start at beginning Start at the beginning of the event log and automatically point to the next record after each read of Table 10. 1 = Auto increment/start at end Start at the end of the event log and automatically point to the next Record after each read of Table 10. 2 = Auto decrement/start at end Start at the end of the event log and automatically point to the previous record after each read of Table 10. 3 = Point to the beginning of the event log 4 = Point to the end of the event log 5 = Point to the next record after a read from Table 10. 6 = Point to the previous record after a read from Table 10. Note: DeviceNet for the PM3000 only supports modes 3-6 For best readback throughput on RI/O and DF1, use mode 0,1, or 2.
3	4	Enable/disable save of status input changes to Event log	•	•	0 to 1	0	0=Disable recording of status input changes into the event log. 1=Enable recording of status input changes into the event log.
4	5	# events in the event log	•	•	1 to 50 (M4) 1 to 100 (M6)	-	Returns the number of events currently in the event log.

Table 10 Event Log Results

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1	Record # being returned	•	•	1 to 50 (M4) 1 to 100 (M6)	-	Indicates the number of the event log record returned in this table.
1	2	Internal identifier	•	•	0 to 32768	-	An incremental number assigned to each new event record in the event log. This can be used to make sure that multiple reads of this table contain a continuous sequence of records.
2	3	Timestamp of event; Year	•	•	1998 to 2097	-	Indicates the time when the event was logged Value = year
3	4	Timestamp of event; Month/day	•	•	0101 to 1231	-	Indicates the time when the event was logged Value/100 = Month, remainder = Day (Example: 1230 = December 30).
4	5	Timestamp of event; Hour/minute	•	•	0000 to 2359	-	Indicates the time when the event was logged Value/100 = Hour, remainder = minute (Example: 1108 = 11:08am)
5	6	Timestamp of event; Second/hsec	•	•	0000 to 5999	-	Indicates the time when the event was logged Value/100 = seconds, remainder = hundredths of seconds (Example: 5947 = 59.47 seconds)
6	7	Event type	•	•	0 to 15	-	Indicates the type of event that has occurred. Refer to the table “List of Event Types” in your specific Bulletin 1404 Communications Port manual for a list of event types.
7	8	Event code	•	•	-	-	Indicates additional information about the event that has occurred. If the event was a setpoint, this indicates the setpoint number.
8	9	Setpoint type	•	•	0 to 44	-	Indicates additional information about the event that has occurred. If the event was a setpoint, this indicates the type of setpoint that triggered the event.
9	10	Setpoint evaluation condition	•	•	0 to 5	-	Indicates additional information about the event that has occurred. If the event was a setpoint, this indicates the ‘evaluation condition’ that was part of the setpoint configuration (see Table 6).
10	11	Setpoint level integer	•	•	0 to 9999	-	Indicates additional information about the event that has occurred. If the event was a setpoint, this indicates the setpoint limit that was crossed to cause the setpoint to trigger.
11	12	exponent	•	•	-21 to 21	-	Setpoint limit = integer x $10^{exponent}$ (Example: if integer =1440 and exponent = 1, limit value = 14,400)
12	13	Setpoint action/release delay	•	•	0 to 3600	-	Indicates additional information about the event that has occurred. If the event was a setpoint, and the setpoint was asserted, this indicates the previously configured assert delay (if the setpoint was released, this indicates the previously configured release delay).

Table 10 Event Log Results

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
13	14	Setpoint action	•	•	0 to 32 (M4) 0 to 43 (M6)	-	Indicates additional information about the event that has occurred. If the event was a setpoint, this indicates the type of output action that was performed.
14	15	Sustain limit timer integer		•	0 to 9999	-	Indicates additional information about the event that has occurred. If the event was a setpoint, this indicates the amount of time (in seconds) that the evaluated parameter sustained a value in excess of the limit.
15	16	exponent		•	-4 to 21	-	Setpoint sustain limit timer = integer x $10^{exponent}$ Example: if integer =524 and exponent = -2, timer = 5.24 seconds
16	17	Capture identifier		•	0 to 999	-	Indicates additional information about the event that has occurred. If the event was a setpoint assert, and the output action *was initiate an oscillograph capture*, this value can be used to identify which of the captures in non-volatile memory is associated with this event.

Table 11 Harmonic Analysis Configuration/Readback Data Select

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1	Password	•	•	0 to 9999	-	The correct password or -1 can be used to select harmonic channel data to be read back during subsequent reads fromTable 12.
1	2	Channel	•	•	1 to 9	1	On a write, this specifies the channel associated with the data returned in a subsequent read ofTable 12. 1=V1, 2=I1, 3=V2, 4=I2, 5=V3, 6=I3, 7=I4, 8=Avg of Voltage channels, 9=Avg of Current Channels
2	3	Readback mode	•	•	0 to 1	0	Selects the readback mode for Table 12 "Harmonic Results; THD, Crest Factor and more". 0 = Channel number is incremented after each read ofTable 12. 1= Same channel data returned on successive reads of Table 12. DeviceNet does not support the 'auto-increment' mode (this value is ignored for the DeviceNet port and always acts as if set to 1).
3	4	Individual harmonic data type		•	0 to 1	0	Selects which type of data will appear in subsequent reads of Table 12 through Table 16. 0 =% Distortion data, 1=Magnitude data
4	5	Enable/disable Harmonics		•	0 to 1	1	On the M4, this parameter is reserved and returns 0. On the M6, this will enable or disable calculation of TIF, K-Factor, IEEE-519, and individual harmonic results. 0=disable, 1=Enable.
5	6	IEEE-519 Max I_{sc} Integer		•	0 to 9999	0	On the M4, this parameter is reserved and returns 0. On the M6, this is the maximum short circuit current used in the calculation of IEEE-519. IEEE-519 Imax = integer x $10^{exponent}$

Table 11 Harmonic Analysis Configuration/Readback Data Select

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
6	7	Exponent		•	-4 to 21	0	Example: If your maximum short-circuit current is 85,450 amperes; Imax can be expressed as 8545 x 10^1, so use Integer = 8545 and exponent = 1 on a write of this table.
7	8	IEEE 519 Max I_{dmnd} Integer		•	0 to 9999	0	On the M4, this parameter is reserved and returns 0. On the M6, this is the maximum demand load current over the last 12
8	9	Exponent		•	-4 to 21	0	months over the applicable demand interval. The value is expressed in this table as integer x $10^{exponent}$.

Table 12 Harmonic Results; THD, Crest Factor and more

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1 2	Channel # returned	•	•	1 to 9	-	Indicates the channel associated with the data in this table. 1=V1, 2=I1, 3=V2, 4=I2, 5=V3, 6=I3, 7=I4, 8=Avg of Voltage channels, 9=Avg of Current Channels
1	3 4	% IEEE THD	•	•	0.0 to 1000.0	-	Total harmonic distortion based on the IEEE definition. An indication of harmonic content relative to the fundamental.
2	5 6	% IEC thd (DIN)	•	•	0.0 to 1000.0	-	Total harmonic distortion (Distortion Index) based on IEC/DIN definition. An indication of the harmonic content relative to the fundamental.
3	7 8	Crest Factor	•	•	0.0 to 10.0	-	The ratio of the peak to the RMS for this channel. An indication of the amount of harmonic distortion present in a waveform.
4	9 10	THD & Crest iteration	•	•	0 to 32767	-	Increments by 1 for each new iteration of THD & Crest Factor results. Counts from 0 to 32767, then rolls over to 0. Can be used by an external device to determine if the current read of THD & Crest Factor results in this table contains newer data than the previous read of the same results from this table.
5	11 12	TIF		•	0.0 to 999.9x10^{22}	-	On the M4, this parameter is reserved and returns 0. On the M6, Telephone Influence Factor is returned for the channel indicated in element 0. TIF can be used to estimate the effect that power line harmonics will have on nearby analog telephone conductors.
6	13 14	K-Factor		•	0.0 to 999.9x10^{22}	-	On the M4, this parameter is reserved and returns 0. On the M6, K-Factor is returned. K-factor is a value that indicates additional heating in a transformer due to harmonics.

Table 12 Harmonic Results; THD, Crest Factor and more

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
7	15 16	IEEE-519 TDD		•	0.0 to $999.9x10^{22}$	-	On the M4, this parameter is reserved and returns a 0. On the M6, this value indicates the Total Demand Distortion.
8	17 18	IEEE-519 Pass/Fail		•	-1 to 1	-	On the M4, this parameter is reserved and returns 0. On the M6, this value indicates if a consumer of electrical power is putting an excessive level of harmonics back on the incoming power-line. -1 = Unknown, 0 = Fail, 1 = Pass.
9	19 20	FFT iteration		•	0 to 32767	-	This parameter is for 1404-M6 only. This increments by 1 for each new iteration of FFT calculations (TIF, K-Factor, IEEE-519, and individual harmonic results). Counts from 0 to 32767, then rolls over to 0. Can be used by an external device to determine if the current read of TIF, K-Factor, and IEEE-519 results in this table contains newer data than the previous read of the same results from this table

Table 13 Harmonic Results; Odd Harmonics 1 - 21

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1 2	Channel # returned		•	1 to 7	1	Indicates the channel associated with the data in this table. 1=V1, 2=I1, 3=V2, 4=I2, 5=V3, 6=I3, 7=I4
1	3 4	Type of harmonic data returned		•	0 to 1	0	Indicates the type of individual harmonic data returned in this table. 0 =% Distortion data, 1=Magnitude data
2	5 6	1st Harmonic (Fundamental)		•	0.0	-	Returns the % Distortion or magnitude for this harmonic. The value returned depends on what was selected as 'data type' during a previous write to Table 11.
3	7 8	3rd Harmonic		•	0.0 to $999.9x10^{22}$	-	
4	9 10	5th Harmonic		•	0.0 to $999.9x10^{22}$	-	
5	11 12	7th Harmonic		•	0.0 to $999.9x10^{22}$	-	
6	13 14	9th Harmonic		•	0.0 to $999.9x10^{22}$	-	
7	15 16	11th Harmonic		•	0.0 to $999.9x10^{22}$	-	
8	17 18	13th Harmonic		•	0.0 to $999.9x10^{22}$	-	
9	19 20	15th Harmonic		•	0.0 to $999.9x10^{22}$	-	
10	21 22	17th Harmonic		•	0.0 to $999.9x10^{22}$	-	
11	23 24	19th Harmonic		•	0.0 to $999.9x10^{22}$	-	
12	25 26	21st Harmonic		•	0.0 to $999.9x10^{22}$	-	
13	27 28	FFT iteration		•	0 to 32767	-	Increments by 1 for each new iteration of harmonic results found in this table. Counts from 0 to 32767, then rolls over to 0. Can be used by an external device to determine if the current read of results from this table contains newer data than a previous read of data from this table.

Table 14 Harmonic Results; Odd Harmonics 23 - 41

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1 2	Channel # returned		•	1 to 7	1	Indicates the channel associated with the data in this table. 1=V1, 2=I1, 3=V2, 4=I2, 5=V3, 6=I3, 7=I4
1	3 4	Type of harmonic data returned		•	0 to 1	0	Indicates the type of individual harmonic data returned in this table. 0 =% Distortion data, 1=Magnitude data
2	5 6	Reserved		•	0.0	-	Reserved for future use. Returns 0.0.
3	7 8	23rd Harmonic		•	0.0 to $999.9x10^{22}$	-	Returns the % Distortion or magnitude for this harmonic. The value returned depends on what was selected as 'data type' during a previous write to Table 11.
4	9 10	25th Harmonic		•	0.0 to $999.9x10^{22}$	-	
5	11 12	27th Harmonic		•	0.0 to $999.9x10^{22}$	-	
6	13 14	29th Harmonic		•	0.0 to $999.9x10^{22}$	-	
7	15 16	31st Harmonic		•	0.0 to $999.9x10^{22}$	-	
8	17 18	33rd Harmonic		•	0.0 to $999.9x10^{22}$	-	
9	19 20	35th Harmonic		•	0.0 to $999.9x10^{22}$	-	
10	21 22	37th Harmonic		•	0.0 to $999.9x10^{22}$	-	
11	23 24	39th Harmonic		•	0.0 to $999.9x10^{22}$	-	
12	25 26	41st Harmonic		•	0.0 to $999.9x10^{22}$	-	
13	27 28	FFT iteration		•	0 to 32767	-	Increments by 1 for each new iteration of harmonic results found in this table. Counts from 0 to 32767, then rolls over to 0. Can be used by an external device to determine if the current read of results from this table contains newer data than a previous read of data from this table.

Table 15 Harmonic Results; Even Harmonics 2 - 20

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1 2	Channel # returned		•	1 to 7	1	Indicates the channel associated with the data in this table. 1=V1, 2=I1, 3=V2, 4=I2, 5=V3, 6=I3, 7=I4
1	3 4	Type of harmonic data returned		•	0 to 1	0	Indicates the type of individual harmonic data returned in this table. 0 =% Distortion data, 1=Magnitude data
2	5 6	Reserved		•	0.0	-	Reserved for future use. Returns 0.0.
3	7 8	2nd Harmonic		•	0.0 to $999.9x10^{22}$	-	Returns the % Distortion or magnitude for this harmonic. The value returned depends on what was selected as 'data type' during a previous write to Table 11.
4	9 10	4th Harmonic		•	0.0 to $999.9x10^{22}$	-	
5	11 12	6th Harmonic		•	0.0 to $999.9x10^{22}$	-	
6	13 14	8th Harmonic		•	0.0 to $999.9x10^{22}$	-	
7	15 16	10th Harmonic		•	0.0 to $999.9x10^{22}$	-	
8	17 18	12th Harmonic		•	0.0 to $999.9x10^{22}$	-	
9	19 20	14th Harmonic		•	0.0 to $999.9x10^{22}$	-	
10	21 22	16th Harmonic		•	0.0 to $999.9x10^{22}$	-	
11	23 24	18th Harmonic		•	0.0 to $999.9x10^{22}$	-	
12	25 26	20th Harmonic		•	0.0 to $999.9x10^{22}$	-	
13	27 28	FFT iteration		•	0 to 32767	-	Increments by 1 for each new iteration of harmonic results found in this table. Counts from 0 to 32767, then rolls over to 0. Can be used by an external device to determine if the current read of results from this table contains newer data than a previous read of data from this table.

Table 16 Harmonic Results; Even Harmonics 22 - 40

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1 2	Channel # returned		•	1 to 7	1	Indicates the channel associated with the data in this table. 1=V1, 2=I1, 3=V2, 4=I2, 5=V3, 6=I3, 7=I4
1	3 4	Type of harmonic data returned		•	0 to 1	0	Indicates the type of individual harmonic data returned in this table. 0 =% Distortion data, 1=Magnitude data
2	5 6	Reserved		•	0.0	-	Reserved for future use. Returns 0.0.
3	7 8	22nd Harmonic		•	0.0 to $999.9x10^{22}$	-	Returns the % Distortion or magnitude for this harmonic. The value returned depends on what was selected as 'data type' during a previous write to Table 11.
4	9 10	24th Harmonic		•	0.0 to $999.9x10^{22}$	-	
5	11 12	26th Harmonic		•	0.0 to $999.9x10^{22}$	-	
6	13 14	28th Harmonic		•	0.0 to $999.9x10^{22}$	-	
7	15 16	30th Harmonic		•	0.0 to $999.9x10^{22}$	-	
8	17 18	32nd Harmonic		•	0.0 to $999.9x10^{22}$	-	
9	19 20	34th Harmonic		•	0.0 to $999.9x10^{22}$	-	
10	21 22	36th Harmonic		•	0.0 to $999.9x10^{22}$	-	
11	23 24	38th Harmonic		•	0.0 to $999.9x10^{22}$	-	
12	25 26	40th Harmonic		•	0.0 to $999.9x10^{22}$	-	
13	27 28	FFT iteration		•	0 to 32767	-	Increments by 1 for each new iteration of harmonic results found in this table. Counts from 0 to 32767, then rolls over to 0. Can be used by an external device to determine if the current read of results from this table contains newer data than a previous read of data from this table.

Table 17 Oscillograph Configuration/Readback Data Select

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1	Password		•	0 to 9999	-	The correct password is required to use the 'clear/trigger command', change the capture type, or change the pre-trigger…but not required to select a capture #, channel #, block # to be read, or change the readback mode. If you are just selecting data to readback, -1 can be used as the password. On a read, the password always returns -1.
1	2	Capture #		•	1 to 8	1	On a write, indicate the capture number you wish to get from non-volatile memory during subsequent reads from Table 18. 1=capture #1, 2=capture #2, 3=capture #3 … 8=capture #8 On a read, this returns the last value written.
2	3	Channel #		•	1 to 7	1	On a write, indicate the channel you wish to get during subsequent reads from Table 18. 1=V1, 2=I1, 3=V2, 4=I2, 5=V3, 6=I3, 7=I4 On a read, this returns the last value written.
3	4	Block #		•	1 to 92 1 to 184 1 to 230 or 1 to 460	1	On a write, indicate which data block (fragment) of the entire oscillograph to get on a subsequent read of Table 18. The maximum number of reads required to get all of the capture data for a channel depends on the communication protocol and the 'Capture type' parameter in this table. For DF1/RIO/ENET and Capture type 0-2, max # reads = 92 For DF1/RIO/ENET and Capture type 3-5, max # reads = 184 For DNet and Capture type 0-2, max # reads = 230 For DNet and capture type 3-5, max # reads = 460 On a read, this returns the last value written.
4	5	Readback mode		•	0 to 2	0	On a write, this selects how data is returned on successive reads from Table 18. 0 = Successive reads will increment through all remaining blocks of the current channel, increment through all remaining channels, and wrap back to the original channel of the same capture. 1 = Successive reads will increment and cycle though blocks of the current channel only. 2 = Successive reads will return the same block of data for the specified capture and channel. Note: DeviceNet always operates in Readback mode 2, regardless of the setting for this parameter. On a read, this returns the last value written.
5	6	Clear/trigger command		•	0 to 10	0	On a write, use this command to clear a capture from non-volatile memory or trigger a new capture: 0 = no effect (does not clear or trigger a capture) 1 = clear capture #1 from non-volatile memory 2 = clear capture #2 from non-volatile memory … 8 = clear capture #8 from non-volatile memory 9 = clear all captures from non-volatile memory 10 = initiate a capture (the capture will be stored to the first available empty capture location in non-volatile memory) On a read, this always returns a 0.

Table 17 Oscillograph Configuration/Readback Data Select

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
6	7	Capture type		•	0 to 5	0	On a write, this selects the sample rate (samples per cycle) and data point resolution (granularity of magnitude representation) for all captures. 0=5.40kHz, 13-bit w/sign (stores 0.85 seconds; 51.1 cycles @60Hz) 1=2.70kHz, 13-bit w/sign (stores 1.70 seconds; 102.2 cycles @60Hz) 2=1.35kHz, 13-bit w/sign (stores 3.40 seconds; 204.4 cycles @60Hz) 3=5.40kHz, 7-bit w/sign (stores 1.70 seconds; 102.1 cycles @60Hz) 4=2.70kHz, 7-bit w/sign (stores 3.40 seconds; 204.4 cycles @60Hz) 5=1.35kHz, 7-bit w/sign (stores 6.81 seconds; 408.8 cycles @60Hz) On a read, this indicates the current setting for this parameter.
7	8	% Pre-trigger		•	0 to 100	90	Specifies the desired trigger position within the captured waveform. 100% pre-trigger allows you to see the greatest amount of waveform prior to the event that triggered the capture.
8	9	Reserved		•	0	0	Reserved for future use. On a write, only a 0 is accepted. On a read, always returns 0.
9	10	Capture clear status		•	0 to 255	-	Indicates which non-volatile capture locations are erased and are ready to accept a new capture. Bit 0 (LSB) corresponds to capture #1, Bit 1 corresponds to capture #2, …Bit 7 corresponds to capture #8. If a bit is set to a 1, the capture is clear. For each bit, 0 indicates not clear.
10	11	Capture ready status		•	0 to 255	-	Indicates when one or more captures have been triggered, stored in non-volatile memory, and are ready to be read. Bit 0 (LSB) corresponds to capture #1, Bit 1 corresponds to capture #2, …Bit 7 corresponds to capture #8. If the bit is set to a '1', the capture is ready to be read. If a bit is 0, the capture is not ready yet…or there is no capture.

Table 18 Oscillograph Results

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Description
0	1	Timestamp of capture; Month/day		•	0000 to 1231	Indicates the time when the oscillograph was captured Value/100 = Month, remainder = Day (Example: 1230 = December 30). 0 is returned when there is no capture.
1	2	Timestamp of capture; Hour/minute		•	0000 to 2359	Indicates the time when the oscillograph was captured Value/100 = Hour, remainder = minute (Example: 1108 = 11:08am)
2	3	Timestamp of capture; Second/hsec		•	0000 to 5999	Indicates the time when the oscillograph was captured Value/100 = seconds, remainder = hundredths of seconds (Example: 5947 = 59.47 seconds)
3	4	Capture #		•	1 to 8	Indicates which capture from non-volatile memory is currently being returned in this table. 1=capture#1, 2=capture #2, …8=capture #8
4	5	Channel number		•	1 to 7	Indicates the channel associated with the data points returned in this table. 1=V1, 2=I1, 3=V2, 4=I2, 5=V3, 6=I3, 7=I4
5	6	Block number		•	1 to 92 1 to 184 1 to 230 or 1 to 460	Indicates which block of samples is currently being returned in this table. Increments each time the table is read if 'Readback mode' in Table 17 is set to 0 or 1. The maximum number of block reads required to get the entire oscillograph depends on the communication protocol and the Capture type (see description in Table 17).
6	7	Capture type		•	0 to 5	Indicates the capture type associated with data returned in this table. See description for 'Capture type' in Table 17.
7	8	Trigger source and Unique capture identifier		•	0 to 22999	Indicates the source of the trigger and a unique capture identifier. Value/1000 =Trigger source: 0=none, 1-20 = setpoint#, 21=native communication port, 22=option communications port Remainder = Unique capture identifier. This increments 1 for each new capture, rolls at 999 to 0. Can be used to associate to an event in the event log.
8	9	Trigger position		•	1 to 4600 or 1 to 9200	Indicates the position in the waveform (data point) that corresponds to the trigger of the capture. The maximum data point depends on the 'Capture type' parameter in this table. For capture types 0-2, the maximum trigger position = 4600 For capture types 3-5, the maximum trigger position = 9200
9	10	Oscillograph Data Point 1		•	-9830 to 9830	Data point = (Block# -1) * X +1, where X=20 for DNet, else X=50
10	11	Oscillograph Data Point 2		•	-9830 to 9830	Data point = (Block# -1) * X +2, where X=20 for DNet, else X=50
11	12	Oscillograph Data Point 3		•	-9830 to 9830	Data point = (Block# -1) * X +3, where X=20 for DNet, else X=50
12	13	Oscillograph Data Point 4		•	-9830 to 9830	Data point = (Block# -1) * X +4, where X=20 for DNet, else X=50
13	14	Oscillograph Data Point 5		•	-9830 to 9830	Data point = (Block# -1) * X +5, where X=20 for DNet, else X=50
14	15	Oscillograph Data Point 6		•	-9830 to 9830	Data point = (Block# -1) * X +6, where X=20 for DNet, else X=50
15	16	Oscillograph Data Point 7		•	-9830 to 9830	Data point = (Block# -1) * X +7, where X=20 for DNet, else X=50

Table 18 Oscillograph Results

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Description
16	17	Oscillograph Data Point 8		•	-9830 to 9830	Data point = (Block# -1) * X +8, where X=20 for DNet, else X=50
17	18	Oscillograph Data Point 9		•	-9830 to 9830	Data point = (Block# -1) * X +9, where X=20 for DNet, else X=50
18	19	Oscillograph Data Point 10		•	-9830 to 9830	Data point = (Block# -1) * X +10, where X=20 for DNet, else X=50
19	20	Oscillograph Data Point 11		•	-9830 to 9830	Data point = (Block# -1) * X +11, where X=20 for DNet, else X=50
20	21	Oscillograph Data Point 12		•	-9830 to 9830	Data point = (Block# -1) * X +12, where X=20 for DNet, else X=50
21	22	Oscillograph Data Point 13		•	-9830 to 9830	Data point = (Block# -1) * X +13, where X=20 for DNet, else X=50
22	23	Oscillograph Data Point 14		•	-9830 to 9830	Data point = (Block# -1) * X +14, where X=20 for DNet, else X=50
23	24	Oscillograph Data Point 15		•	-9830 to 9830	Data point = (Block# -1) * X +15, where X=20 for DNet, else X=50
24	25	Oscillograph Data Point 16		•	-9830 to 9830	Data point = (Block# -1) * X +16, where X=20 for DNet, else X=50
25	26	Oscillograph Data Point 17		•	-9830 to 9830	Data point = (Block# -1) * X +17, where X=20 for DNet, else X=50
26	27	Oscillograph Data Point 18		•	-9830 to 9830	Data point = (Block# -1) * X +18, where X=20 for DNet, else X=50
27	28	Oscillograph Data Point 19		•	-9830 to 9830	Data point = (Block# -1) * X +19, where X=20 for DNet, else X=50
28	29	Oscillograph Data Point 20		•	-9830 to 9830	Data point = (Block# -1) * X +20, where X=20 for DNet, else X=50
29	30	Oscillograph Data Point 21		•	-9830 to 9830	Data point = (Block# -1) * 50 +21
30	31	Oscillograph Data Point 22		•	-9830 to 9830	Data point = (Block# -1) * 50 +22
31	32	Oscillograph Data Point 23		•	-9830 to 9830	Data point = (Block# -1) * 50 +23
32	33	Oscillograph Data Point 24		•	-9830 to 9830	Data point = (Block# -1) * 50 +24
33	34	Oscillograph Data Point 25		•	-9830 to 9830	Data point = (Block# -1) * 50 +25
34	35	Oscillograph Data Point 26		•	-9830 to 9830	Data point = (Block# -1) * 50 +26
35	36	Oscillograph Data Point 27		•	-9830 to 9830	Data point = (Block# -1) * 50 +27
36	37	Oscillograph Data Point 28		•	-9830 to 9830	Data point = (Block# -1) * 50 +28
37	38	Oscillograph Data Point 29		•	-9830 to 9830	Data point = (Block# -1) * 50 +29

Table 18 Oscillograph Results

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Description
38	39	Oscillograph Data Point 30		•	-9830 to 9830	Data point = (Block# -1) * 50 +30
39	40	Oscillograph Data Point 31		•	-9830 to 9830	Data point = (Block# -1) * 50 +31
40	41	Oscillograph Data Point 32		•	-9830 to 9830	Data point = (Block# -1) * 50 +32
41	42	Oscillograph Data Point 33		•	-9830 to 9830	Data point = (Block# -1) * 50 +33
42	43	Oscillograph Data Point 34		•	-9830 to 9830	Data point = (Block# -1) * 50 +34
43	44	Oscillograph Data Point 35		•	-9830 to 9830	Data point = (Block# -1) * 50 +35
44	45	Oscillograph Data Point 36		•	-9830 to 9830	Data point = (Block# -1) * 50 +36
45	46	Oscillograph Data Point 37		•	-9830 to 9830	Data point = (Block# -1) * 50 +37
46	47	Oscillograph Data Point 38		•	-9830 to 9830	Data point = (Block# -1) * 50 +38
47	48	Oscillograph Data Point 39		•	-9830 to 9830	Data point = (Block# -1) * 50 +39
48	49	Oscillograph Data Point 40		•	-9830 to 9830	Data point = (Block# -1) * 50 +40
49	50	Oscillograph Data Point 41		•	-9830 to 9830	Data point = (Block# -1) * 50 +41
50	51	Oscillograph Data Point 42		•	-9830 to 9830	Data point = (Block# -1) * 50 +42
51	52	Oscillograph Data Point 43		•	-9830 to 9830	Data point = (Block# -1) * 50 +43
52	53	Oscillograph Data Point 44		•	-9830 to 9830	Data point = (Block# -1) * 50 +44
53	54	Oscillograph Data Point 45		•	-9830 to 9830	Data point = (Block# -1) * 50 +45
54	55	Oscillograph Data Point 46		•	-9830 to 9830	Data point = (Block# -1) * 50 +46
55	56	Oscillograph Data Point 47		•	-9830 to 9830	Data point = (Block# -1) * 50 +47
56	57	Oscillograph Data Point 48		•	-9830 to 9830	Data point = (Block# -1) * 50 +48
57	58	Oscillograph Data Point 49		•	-9830 to 9830	Data point = (Block# -1) * 50 +49
58	59	Oscillograph Data Point 50		•	-9830 to 9830	Data point = (Block# -1) * 50 +50

Table 19 Load Factor Log Configuration/Readback Select

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1	Password		•	0 to 9999	-	The correct password is required to use the 'Clear peak / reset average command' or change the 'Auto clear/reset day'…but not required to select a record to read back or change the readback mode (-1 can be used as the password).
1	2	Record to readback		•	0 to 12	0	Selects which record is returned in a subsequent read ofTable 20 "Load Factor Log Results": 0 = Read the preset (live) load factor values 1 = Read the oldest load factor record from non-volatile memory … 12 = Read the most recently saved load factor record from non-volatile memory Records 1-12 are stored in non-volatile memory. Record 0 is stored in volatile memory and is cleared on power-up.
2	3	Readback mode		•	0 to 1	1	Selects the readback mode for successive reads of Table 20 'Load Factor Log Results". 0 = Automatically increments the record number after a read of Table 20. 1 = Record number not incremented after a read. DeviceNet does not support the 'auto-increment' mode; this value is ignored for the DeviceNet port and always acts as if set to 1.
3	4	Clear peak / reset average command		•	0 to 1	0	Saves the current peak, average, and load factor results as a record in the non-volatile load factor log. Also clears the current peak and resets the average demand values to begin a new set of running calculations for peak, average, and load factor (until the next clear peak / reset average command or auto clear/reset day occurs).
4	5	Auto clear/reset day		•	0 to 31	31	Automatically stores the current peak, average, and load factor results as a record in the non-volatile load factor log…and clears the peak and resets the average demand values…at the end of the specified day of each month. 0 = Disables auto-clear of peak and average demand values. 1 = Clear peak and avg demand values at end of the 1st day of each month. 2 = Clear peak and avg demand values at end of 2nd day of each month. … 31 = Clear peak and avg demand values at end of 31st day of each month. Note: If this parameter is set to 29-31 and the month does not contain that many days, the record will be saved on the last day of that month.
5	6	Reserved		•	0	0	Reserved for future use. On a write, only a 0 is accepted. On a read, always returns 0.

Table 20 Load Factor Log Results

Enet/ DF1/ DNet Elem. #	RI/O Word #	Parameter name	M 4	M 6	Range	Default Value	Description
0	1 2	Peak Demand W		•	0.0 to $999.9x10^{21}$	-	The largest magnitude Demand real power result that occurred over all of the demand intervals since the last clear command or auto-clear day.
1	3 4	Average Demand W		•	0.0 to $999.9x10^{21}$	-	A running average of Demand real power results from the end of each demand interval since the last clear command or auto-clear day.
2	5 6	% Load Factor W		•	0 to 100	-	Average Demand W / Peak Demand W (in percent) A Demand management metric that indicates the how 'level' load is over a period of time (usually 1 month). A value approaching 1.0 indicates a constant or 'level' load.
3	7 8	Peak Demand VAR		•	0.0 to $999.9x10^{21}$	-	The largest magnitude Demand reactive power result that occurred over all of the demand intervals since the last clear command or auto-clear day.
4	9 10	Average Demand VAR		•	0.0 to $999.9x10^{21}$	-	A running average of Demand reactive power results from the end of each demand interval since the last clear command or auto-clear day.
5	11 12	% Load Factor VAR		•	0 to 100	-	Average Demand VAR / Peak Demand VAR
6	13 14	Peak Demand VA		•	0.0 to $999.9x10^{21}$	-	The largest magnitude Demand apparent power result that occurred over all of the demand intervals since the last clear command or auto-clear day.
7	15 16	Average Demand VA		•	0.0 to $999.9x10^{21}$	-	A running average of Demand apparent power results from the end of each demand interval since the last clear command or auto-clear day.
8	17 18	% Load Factor VA		•	0 to 100	-	Average Demand VA / Peak Demand VA
9	19 20	Peak Demand I		•	0.0 to $999.9x10^{21}$	-	The largest magnitude Demand current result that occurred over all of the demand intervals since the last clear command or auto-clear day.
10	21 22	Average Demand I		•	0.0 to $999.9x10^{21}$	-	A running average of Demand current results from the end of each demand interval since the last clear command or auto-clear day.
11	23 24	% Load Factor I		•	0 to 100	-	Average Demand current / Peak Demand current
12	25 26	Elapsed time		•	0.0 to $999.9x10^{21}$	-	Amount of time (in hours) that has elapsed since the last clear of the peak and average values.
13	27 28	Ending month/day/year		•	0 to 123199	-	Indicates ending the month, day, and year for this load factor record. Indicates the Mo/day/year of the last demand interval if it is the current 'in-progress' peak, average, and load factor results. Returns 0 if the record is blank.

NOTE

The data in this table is not updated continuously; it is updated every Demand interval (refer to 'Demand Period Length' and 'Number of Demand periods' parameters in the table "Advanced Device Configuration" in your specific Bulletin 1404 Communications Port manual). For records 1 to 12, data in this table returns 0 if the record is blank. For record 0, data in this table returns 0 if the first demand interval has not occurred since 1404-M6 power-up.

Notes:

Notes:

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

Americas Headquarters, 1201 South Second Street, Milwaukee, WI 53201-2496, USA, Tel: (1) 414 382-2000, Fax: (1) 414-382-4444
European Headquarters SA/NV, Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific Headquarters, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 1404-RN001B-EN-P - April 2001
Supersedes Publication 1404-RN001A-EN-P - November 2000
PN 40055-210-01(B)