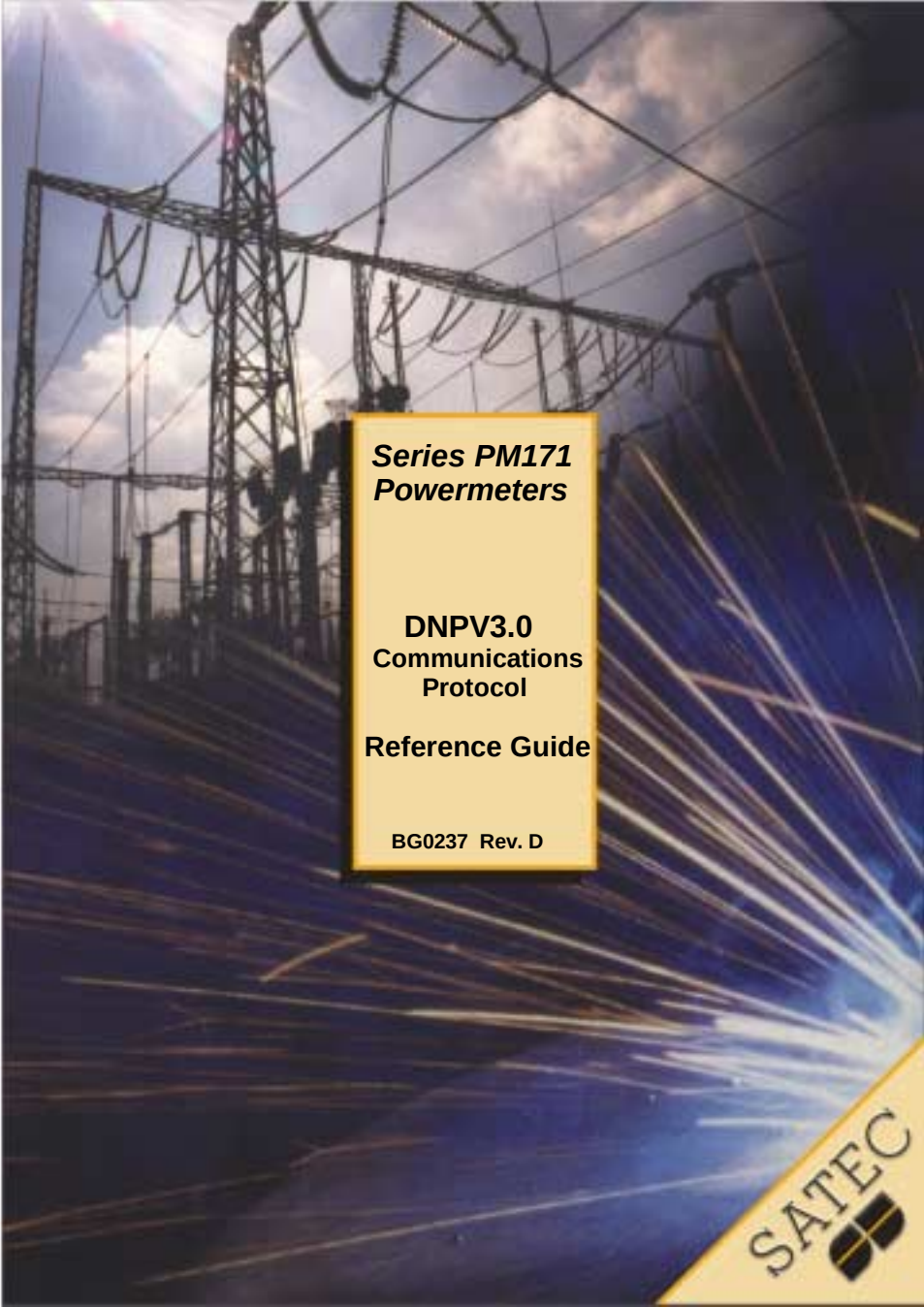
Series PM171
Powermeters
DNPV3.0
Communications
Protocol
Reference Guide
BG0237 Rev. D
SATEC

SERIES PM171 POWERMETERS

COMMUNICATIONS

DNP V3.0 Communications Protocol

REFERENCE GUIDE

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

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

This revision is applicable to Version 3.18 or later of the PM171 instrument. Version 3.18 incorporates the following changes regarding DNP3.0:

1. Scaling Analog Input Objects

Table of Contents

1 GENERAL

This document specifies a subset of the DNP V3.0 serial communications protocol used to transfer data between a master computer station and the Series PM171 Powermeters. The document provides all necessary information for developing a third-party communications software capable of communicating with the PM171.

Additional information concerning communications operation, configuration of communications parameters, and communications connections is found in the Series PM171 Installation and Operation Manual.

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.
3. Most of the instrument advanced features are configured using multiple setup parameters that can be accessed in contiguous registers. When writing the setup registers, it is recommended to write all the registers at once using a single request, or to clear (zero) the setup before writing into separate registers. Each written value is checked for compatibility with the other setup parameters, and if the new value does not conform to them, the request will be rejected.

2 DNP PROTOCOL

Introduction

DNP V3.00 (Distributed Network Protocol) is an open standard designed by Harris Control Division. DNP defines a command-response method of communicating digital information between a master and slave device. Detailed information regarding DNP V3.00 is available in the “Basic 4 Document Set” which can obtained from the DNP User Group.

PM171 Deviation from Standard

The *PM171* does not support unsolicited requests or hardware collision avoidance.

The data link layer differs from the Basic 4 specifications because of the master-slave relationship between devices. When the Powermeter receives a request, no further requests can be sent until after the Powermeter makes the appropriate response.

DNP Request/Response Overview

The *PM171* DNP implementation supports a wide variety of messages. The most common method to extract information from the Powermeter is to issue a Read Class-0 request. The instrument responds with the value of Analog-Inputs (see Table 4-1, *Input Data Parameters*) and Analog-Output-Status (see Table 4-2, *Basic Setup Registers*) by default.

The *PM171*, like most devices, retrieves regular analog and binary data from the instrument by executing a directed (non-broadcast) Read of the configured CLASS-0 objects (object 60, variation 1, qualifier 6). Analog-Inputs are sent with or without flags and Counters are sent without flags. Binary-Output-Status objects and Analog-Output-Status objects are sent with flags that always indicate ONLINE.

A Binary-Output-Status object that indicates the current state of a control digital point (relay) uses *remote forced data* as well as *local forced data* bits. The value of a *state* bit indicates the current state of the digital output point.

The Class-0 response may be configured with specially defined software binary points (see Table 4-30, *Class 0 Object Assignment*). These points can be read via Binary-Output-Status and can be changed by issuing the Direct-Operate (or SBO/Operate or SBO/Operate or Direct-Operate-No-Acknowledge) command to points 96 through 120 of the Control-Relay-Output-Block object.

The *PM171* executes the parameter clear function and demands resets using the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to specified points of the Control-Relay-Output-Block object.

Issuing the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to points 0 through 13 of the Analog-Output-Block object can change the setup parameters. The DNP functions Write, Cold-Restart and Delay Measurement are also supported by the *PM171*. Refer to *Appendix A* for specific requests and responses. *Appendix B* contains the standard DNP Device Profile Document.

The Powermeter attempts to respond with the same object variation and qualifier as those in the request. Exceptions to this rule include changing variation 0 to a specific variation and changing qualifier code 6 to 1.

If the Powermeter receives an invalid request, it sets the internal indication to the error code. The following internal indication bits are supported:

Octet Position	Bit Position	Description
0	0	Set when a request received with a broadcast destination address. Cleared after next response.
0	7	Device restart - set when the instrument powers up or after executing Cold Restart, cleared by writing zero to object 80.
0	4	Time-synchronization required from the master. Cleared when master sets the time.
0	5	Set when the instrument is in the Local state(is being programmed via the front panel). Cleared when the instrument is in the Remote state.
1	5	Set when the current configuration in the instrument is corrupted. May also be set as a result of the legal changes in the setup configuration whenever another setup is affected by the changes made. Cleared when either setup is reloaded.

3 DNP Interface

General

This section describes a LEVEL 1 DNP V3.00 communication protocol implemented between a master station and a slave Powermeter. A DNP device (RTU, Computer, etc.) has an address in the range of 0 to 65535, and it is this address that allows a master to selectively request data from any other device. DNP uses the address 65535 for broadcast function. A broadcast request never generates a DNP response.

The DNP implementation in the *PM171* conforms to all Harris IED implementation guidelines. All data items that are available from the Powermeter can be obtained via the DNP Read Class 0 command. Individual items can also be read using the Read Analog-Input, Read Counter, Read Analog Output Status or Read Binary Input commands.

Some registers can be reset to zero by issuing the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to specified points of the Control-Relay-Output-Block object. The reset request to reset the Energy, Demands, Counters and Min/Max values must use a code operation Pulse On. Latch-On / Latch-Off operation codes are used to control the digital software/hardware points.

The setpoint parameters can be changed by issuing the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command using the Analog-Output-Block object.

DNP Address

The instrument on a DNP link must have a unique address. The *PM171* allows one of 256 addresses to be selected. The selectable addresses have a range of 0-255.

Transaction Timing

To allow the master to switch the communication link, it is guaranteed that the Powermeter minimum response time be at least 3.5 character time (depending on the baud rate) and at least 5 ms. Table 3-1 shows the actual response time measured at 9600 bps.

Table 3-1 Response Time

Number of Parameters	Typical response time, ms	Maximum response time, ms
1	10	12
5	15	16
10	21	22
43 (Object 30:3)	45	62

Note that Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) requests for reset/clear registers and setpoint changing are immediately confirmed.

Object Format

The *PM171* uses two objects, which correspond to instrument measurements. These are Counter (object 20, variations 5 and 6) and Analog-Input (object 30, variations 1,2, 3 and 4).

The Single-Bit Binary-Input (object 1, variation 1) and Binary-Output-Status (object 10, variation 2) are used to represent the state of digital input/output points (software or hardware). The Control-Relay-Ouput-Block (object 12, variation 1) is used to control digital points.

The *PM171* supports a response when a value is requested as a variation 0 and will respond as if the requested variation was for a 32 bit Counter or 32/16 bit Analog-Input or 16 bit Analog-Output-Status. By the default Class 0 reads are treated as a request for Analog-Input (see Table 4-1, *Input Data Parameters*) and Analog-Output-Status points (see Table 4-2, *Basic Setup Registers*). To configure the Class 0 assignment use the Binary points 96-120. Table 4-30 lists the assignment meaning of these points.

Scaling Analog Input Objects

With Analog-Input objects, any of variations 1 through 4 can be used. Variations specified in the tables in Section 4 show those that should be used to read a full-range value without a possible over-range error when no scaling is used to accommodate the value to the requested object size.

When over-range occurs, a positive value is reported as 32767 and a negative value as -32768, with the over-range bit being set to 1 in the flag octet if variation 2 is requested. To avoid over-range errors when variation 2 or 4 is required, a liner scaling may be used (see Section DNP Options Setup) to scale 32-bit analog readings to 16-bit Analog Input objects. By default, scaling is disabled.

When scaling is enabled, either analog input requested with variation 2 or 4 will be scaled to the range of -32768 to 32767 for bi-directional parameters (such as power and power factor), and to the range of 0 to 32767 for single-ended positive parameters (voltage, current, frequency, etc.). To get a true reading, the reverse conversion should be performed using the following formula:

$$Y = ((X - DNP\_LO) \times (HI - LO)) / (DNP\_HI - DNP\_LO) + LO$$

where:

Y	-	the true reading in engineering units
X	-	the raw input data in the range of DNP_LO – DNP_HI
LO, HI	-	the data low and high scales in engineering units (specified for each Analog-Input point, see Section 4)
DNP_LO	-	DNP low conversion scale: DNP_LO = -32768 for a point with a negative LO scale, DNP_LO = 0 for a point with a zero or positive LO scale
DNP_HI	-	DNP high conversion scale: DNP_HI = 32767

EXAMPLE

Suppose you have read a value of 201 for point 3 that contains a current reading (see *Table 4-1*). If your instrument has CT primary current 5000 A, then the current high scale is HI = 1.5× 5000 = 7500, and in accordance with the above formula, the current reading in engineering units will be as follows:

$$(201 - 0) \times (7500 - 0)/(32767 - 0) + 0 = 46A$$

4 PM171 Registers

Basic Data Registers

These registers are used to retrieve a predefined set of the data measured by the Powermeter. All electrical parameters are averaged values over the specified number of real-time measurements.

Table 4-1 Input Data Parameters

Object/ Var. ③	Parameter	Object/ Point	Unit	Value range ①	Com-ment
30:3	Voltage L1/L12	AI:0	V	0 to Vmax	
30:3	Voltage L2/L23	AI:1	V	0 to Vmax	
30:3	Voltage L3/L31	AI:2	V	0 to Vmax	
30:3	Current L1	AI:3	A	0 to Imax	
30:3	Current L2	AI:4	A	0 to Imax	
30:3	Current L3	AI:5	A	0 to Imax	
30:3	kW L1	AI:6	kW	-Pmax to Pmax	
30:3	kW L2	AI:7	kW	-Pmax to Pmax	
30:3	kW L3	AI:8	kW	-Pmax to Pmax	
30:3	kvar L1	AI:9	kvar	-Pmax to Pmax	
30:3	kvar L2	AI:10	kvar	-Pmax to Pmax	
30:3	kvar L3	AI:11	kvar	-Pmax to Pmax	
30:3	kVA L1	AI:12	kVA	0 to Pmax	
30:3	kVA L2	AI:13	kVA	0 to Pmax	
30:3	kVA L3	AI:14	kVA	0 to Pmax	
30:4	Power factor L1	AI:15		-999 to 1000	×0.001
30:4	Power factor L2	AI:16		-999 to 1000	×0.001
30:4	Power factor L3	AI:17		-999 to 1000	×0.001
30:4	Total Power factor	AI:18		-999 to 1000	×0.001
30:3	Total kW	AI:19	kW	-Pmax to Pmax	
30:3	Total kvar	AI:20	kvar	-Pmax to Pmax	
30:3	Total kVA	AI:21	kVA	0 to Pmax	
30:3	Neutral current	AI:22	A	0 to Imax	
30:4	Frequency	AI:23	Hz	4500 to 6500	×0.01
30:3	Maximum sliding window kW demand ② (E)	AI:24	kW	0 to Pmax	
30:3	Accumulated kW demand (E)	AI:25	kW	0 to Pmax	

Object/ Var. ③	Parameter	Object/ Point	Unit	Value range ①	Com-ment
30:3	Maximum sliding window kVA demand ② (E)	AI:26	kVA	0 to Pmax	
30:3	Accumulated kVA demand (E)	AI:27	kVA	0 to Pmax	
30:3	Maximum ampere demand L1	AI:28	A	0 to Imax	
30:3	Maximum ampere demand L2	AI:29	A	0 to Imax	
30:3	Maximum ampere demand L3	AI:30	A	0 to Imax	
30:3	Present sliding window kW demand ② (E)	AI:31	kW	0 to Pmax	
30:3	Present sliding window kVA demand ② (E)	AI:32	kVA	0 to Pmax	
30:4	PF at maximum kVA sliding window demand(E)	AI:33		0 to 1000	×0.001
30:4	Voltage THD L1/L12	AI:34	%	0 to 9999	×0.1
30:4	Voltage THD L2/L23	AI:35	%	0 to 9999	×0.1
30:4	Voltage THD L3	AI:36	%	0 to 9999	×0.1
30:4	Current THD L1	AI:37	%	0 to 9999	×0.1
30:4	Current THD L2	AI:38	%	0 to 9999	×0.1
30:4	Current THD L3	AI:39	%	0 to 9999	×0.1
30:4	Current TDD L1	AI:40	%	0 to 1000	×0.1
30:4	Current TDD L2	AI:41	%	0 to 1000	×0.1
30:4	Current TDD L3	AI:42	%	0 to 1000	×0.1
20:5	kWh import (E)	CT:0	kWh	0 to 999,999,999	
20:5	kWh export (E)	CT:1	kWh	0 to 999,999,999	
20:5	kvarh net (E)	CT:2	kvarh	-999,999,999 to 999,999,999	
20:5	kVAh (E)	CT:3	kVAh	0 to 999,999,999	

AI indicates Analog-Input point, CT - Counter point. All these points are assigned to Class 0 by default.

① The parameter limits are as follows:

Vmax (690 V input option) = 828 V @ PT Ratio = 1
Vmax (690 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]
Imax = 1.5 * CT primary current [A] for the instruments with 50% over-range
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

② To get block interval demand readings, set the number of demand periods to 1 (see Table 4-2)

③ Variations specified in the table show those that should be used to read a full-range value without a possible over-range error when no scaling is used to accommodate the value to the requested object size (see Section *Scaling Analog Input Objects*).

(E) Available in the PM171E

Basic Setup Registers

These registers are used to access the basic setup parameters. In the event that the modulus field is not equal to 1, the value received from the Powermeter must be multiplied by the modulus. When written, such a number should be divided by the modulus. The basic setup registers (Object 40, Variation 2) are assigned to Class 0 by default.

Table 4-2 Basic Setup Registers

Object/ Variation	Parameter	Object/ Point	Range	Com-ment
40:2 (read) 41:2 (write)	Wiring mode ①	AO:0	0 = 3OP2, 1 = 4LN3,2 = 3DIR2, 3 = 4LL3, 4 = 3OP3, 5 = 3LN3, 6 = 3LL3	
40:1 (read) 41:1 (write)	PT ratio	AO:1	10 to 65000	×0.1
40:1 (read) 41:1 (write)	CT primary current	AO:2	1 to 50000 A	
40:2 (read) 41:2 (write)	Power demand period (E)	AO:3	1,2,5,10,15,20,30,60 min 255 = external synchronization	
40:2 (read) 41:2 (write)	Volt/ampere demand period	AO:4	0 to 1800 sec	
40:2 (read) 41:2 (write)	Averaging buffer size	AO:5	8, 16, 32	
40:2 (read) 41:2 (write)	Reset enable/disable	AO:6	0 = disable, 1 = enable	
40:1 (read)	Reserved	AO:7	Read as 65535	
40:2 (read) 41:2 (write)	The number of demand periods (E)	AO:8	1 – 15	
40:1 (read)	Reserved	AO:9	Read as 65535	
40:1 (read)	Reserved	AO:10	Read as 65535	
40:2 (read) 41:2 (write)	Nominal frequency	AO:11	50, 60	
40:2 (read) 41:2 (write)	Maximum demand load current	AO:12	1 to 50000	

AO indicates Analog-Output-Status (Read) and Analog-Output-Block (Write) points.

① 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

(E) Available in the PM171E

User Selectable Options Setup

Table 4-3 User Selectable Options Registers

Object/ Variation	Parameter	Object/ Point	Range
40:2 (read) 41:2 (write)	Power calculation mode	AO:92	0 = using reactive power, 1 = using non-active power
40:2 (read) 41:2 (write)	Energy roll value (E)	AO:93	0 = 1×10^4 1 = 1×10^5 2 = 1×10^6 3 = 1×10^7 4 = 1×10^8 5 = 1×10^9
40:2 (read) 41:2 (write)	Phase energy calculation mode (E)	AO:94	0 = disable, 1 = enable
40:2 (read) 41:2 (write)	Analog output option	AO:95	0 = none 3 = 0-1 mA 1 = 0-20 mA 4 = ±1 mA 2 = 4-20 mA
40:2 (read) 41:2 (write)	Analog expander output ①	AO:96	0 = none 3 = 0-1 mA 1 = 0-20 mA 4 = ±1 mA 2 = 4-20 mA

① Do not enable the analog expander output if the analog expander is not connected to the instrument, otherwise the computer communications will become garbled.

(E) Available in the PM171E (in the PM171P read as 65535)

The registers shown in *Table 4-4* are used to retrieve the firmware version number and instrument options.

Table 4-4 Firmware & Instrument Option Registers

Object/ Variation	Parameter	Object/ Point	Read/ Write	Range
30:4	Firmware version number	AI:1024	Read	0-65535
30:3	Instrument option 1	AI:1025	Read	see Table 4-5
30:3	Instrument option 2	AI:1026	Read	see Table 4-5

AI indicates Analog-Input points.

Table 4-5 Instrument Options

Options register	Bit number	Description
Options 1 (AI:1025)	0	120V option
	1	690V option
	2-5	Reserved
	6	Analog output 0/4-20 mA
	7	Analog output 0-1 mA
	8	Analog output -1-+1 mA
	9	Relays option
	10	Digital inputs option
	11-13	Reserved
	14	Analog expander output -1-+1 mA
	15	Reserved
Options 2 (AI:1026)	0-2	Number of relays – 1
	3-6	Number of digital inputs – 1
	7-8	Number of analog outputs –1
	9-15	Reserved

Communications Setup

These registers are used to access the communications setup parameters.

NOTE

When changing the instrument address, baudrate or data format, the new communications parameters will take effect in 100 ms after the instrument responds to the master's request.

Table 4-6 Communications Setup Registers

Object/ Variation	Parameter	Object/ Point	Range	
40:1 (read)	Reserved	AO:64	Read as 65535	
40:2 (read)	Interface	AO:65	0 = RS-232, 1 = RS-422, 2 = RS-485	
41:2 (write)				
40:2 (read)	Address	AO:66	0 to 255	
41:2 (write)				
40:2 (read)	Baudrate	AO:67	0 = 110 bps	4 = 2400 bps
41:2 (write)			1 = 300 bps	5 = 4800 bps
			2 = 600 bps	6 = 9600 bps
			3 = 1200 bps	7 = 19200 bps
40:2 (read)	Data format	AO:68	1 = 8 bits/no parity	
41:2 (write)			2 = 8 bits/even parity	

Object/ Variation	Parameter	Object/ Point	Range
40:2 (read) 41:2 (write)	Incoming flow control (handshaking)	AO:69	0 = no handshaking 1 = software handshaking (XON/XOFF protocol) 2 = hardware handshaking (CTS protocol)
40:2 (read) 41:2 (write)	Outgoing flow control (RTS/DTR)	AO:70	0 = RTS signal not used 1 = RTS permanently asserted (DTR mode) 2 = RTS asserted during the transmission

AO indicates Analog-Output points.

NOTE

When changing the instrument address, baud rate or data format, the new communications parameters will take effect 100 ms after the instrument responds to the master's request.

DNP Options Setup

These registers are used to access the DNP Options Setup parameters.

Table 4-7 DNP Options Setup Registers

Object/ Variation	Parameter	Object/ Point	Range
40:1 (read)	Reserved	AO:32-37	Read as 65535
40:1 (read) 41:1 (write)	Analog Input variation	AO:38	0-obj:30var:1, 1- obj:30var:3, 2-obj:30var:2, 3- obj:30var:4
40:1 (read)	Reserved	AO:39-43	Read as 65535
40:1 (read) 41:2 (write)	DNP Scaling	AO:44	0 – scaling OFF, 1-scaling ON
40:2 (read)	Reserved	AO:45-47	Read as 65535
40:2 (read) 41:2 (write)	Select/Operate Timeout	AO:48	2 to 30 seconds
40:2 (read)	Reserved	AO:49-52	Read as 65535
40:2 (read) 41:2 (write)	Time Synch Period(E)	AO:53	1 to 84600 seconds

AO indicates Analog-Output points.

(E) Available in the PM171E

The Analog Input variation defines the default variation of the Analog Input object that is selected when no specific variation is requested for the Analog Input object by a master station, particularly with the Class 0 polling requests and Analog Input object requests using Qualifier code 06 (variation 0). By default it is set to the 16-bit Analog Input object without flag (object 30, variation 4).

The DNP Scaling is used to control the scaling mechanism. The scaling is turned ON if this parameter is set to 1. By default this parameter is set to 0 and scaling is OFF. Choosing 32-bit Analog Input objects (object 30, variation 1, 3) disables this parameter.

The Select Before Operate command causes the *PM171* to start a timer. The Operate command must be received correctly before the value specified by the Select / Operate Timeout parameter expires.

The *PM171* requests for time synchs when the time specified by the TimeSyhchPeriod parameter elapsed. The bit 4 of the first octet of the internal indication word is set. The master synchronizes the time by writing the Time and Date object to Powermeter.

Resetting Energy, Demands, Counters and Min/Max log

The energy value can be reset to zero by issuing the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command using the Control-Relay-Output-Block object to point 0. The request must use the operation Pulse-On. Issuing the same parameters and Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to points 1-3 can reset the maximum demands.

Table 4-8 Reset/Clear Registers

Object/ Var.	Register function	Object/ Point	Read/ Write	Description
10:2	Clear total energy registers (E)	BO:0	Read	Return zero
12:1		CROB:0	Write	PULSE ON
10:2	Clear total maximum demand	BO:1	Read	Return zero
12:1	registers (all demands)	CROB:1	Write	PULSE ON
10:2	Clear power demands(E)	BO:2	Read	Return zero
12:1		CROB:2	Write	PULSE ON
10:2	Clear volt/ampere demands	BO:3	Read	Return zero
12:1		CROB:3	Write	PULSE ON
10:2	Reserved	BO:4-11	Read	Return zero
12:1		CROB:4-11	Write	
10:2	Clear pulse counters (all counters) (E)	BO:12	Read	Return zero
12:1		CROB:12	Write	PULSE ON
10:2	Clear pulse counter #1 (E)	BO:13	Read	Return zero
12:1		CROB:13	Write	PULSE ON
10:2	Clear pulse counter #2 (E)	BO:14	Read	Return zero
12:1		CROB:14	Write	PULSE ON
10:2	Clear pulse counter #3 (E)	BO:15	Read	Return zero
12:1		CROB:15	Write	PULSE ON
10:2	Clear pulse counters #4 (E)	BO:16	Read	Return zero
12:1		CROB:16	Write	PULSE ON
10:2	Reserved	BO:17-20	Read	Return zero
12:1		CROB:17-20	Write	
10:2	Clear Min/Max log	BO:21	Read	Return zero
12:1		CROB:21	Write	PULSE ON

BO indicates Binary Output Status. CROB indicates Control-Relay-Output-Block point.

(E) Available in the PM171E

The following restriction should be noticed when using object 12 to control the listed points.

- The *Count* byte is ignored.The *Control Code* byte is checked for the following:

  a code of *Pulse On* (1) is valid for all points;

  all other codes are invalid and will be rejected.
- The *On Time* and *Off Time* fields are ignored.
- The status byte in the response will reflect the success or failure of the control operation:

  a status of *Request Accepted* (0) will be returned if the command was accepted;

  a status of *Request not Accepted due to Formatting Errors* (3) will be returned if the *Control Code* byte was incorrectly formatted or if an invalid code was present in the command;

  a status of *Control Operation not Supported for this Point* (4) will be returned if the Control Point was out of control (for instance, reset is disabled via Basic Setup).

Issuing the same parameters and Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to point 12-16 can clear the Pulse Counters.

Issuing the same parameters and Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to point 21 can reset the Min/Max log.

Status Registers

These registers are used to retrieve the status of digital input/output points (hardware or software) from the instrument.

Table 4-9 Status Registers (Read)

Object/ Var.	Description	Object/ Point	Bit meaning
01:1 01:1 01:1	Relay #1 status Relay #2 status Reserved	BI:0 BI:1 BI:2-15	Relay status: 0 = released, 1 = operated Not used (permanently set to 0)
01:1 01:1 01:1	Status input #1 Status input #2 Reserved	BI:16 BI:17 BI:18-31	Contact: 0 = open, 1 = closed Not used (permanently set to 0)
01:1	Setpoints #1 - #16	BI:32-47	Setpoint status: 0-is released;1-is operated

BI indicates Single-Bit Binary-Input points (Read).

Alarm Status Registers

These registers are used to retrieve the status alarm parameters from the instrument.

NOTE

The PM171 provides two alarm registers: the first is the setpoint alarm register, and the second is the self-check alarm register.

The setpoint alarm points store the status of the operated alarm setpoints by setting the appropriate bits to 1. The alarm status points can be reset by issuing the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command using the Control-Relay-Output-Block (object 12, variation 1) to points 48 to 63. Only the Latch-Off operation code is accepted. It is possible to reset each alarm status point separately by writing 0 to a corresponding alarm point.

The self-check alarm points indicate possible problems with the instrument hardware or setup configuration. The hardware problems are indicated by the appropriate points, which are set whenever the instrument fails self-test diagnostics, or in the event of loss of power. The dedicated binary point indicates the setup configuration problems, which is set when either configuration register is corrupted. In this event, the instrument will use the default configuration. The configuration corrupt bit may also be set as a result of the legal changes in the setup configuration since the instrument might implicitly change or clear other setups if they are affected by the changes made.

Issuing the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command using the Contro-Relay-Output-Block object (with the code operation Latch-Off) to points from range 64 to 75 can reset hardware fault points. The configuration corrupt status point is also reset automatically when you change setup either via the front panel or through communications.

Table 4-10 Alarm Status Registers

Object/ Var.	Description	Object/ Point	Bit meaning
	Setpoint Alarm Register		1 = setpoint has been operated 0 = setpoint hasn't been operated
10:2(read) 12:1(write)	Alarm #1 -#16	B0:48-63 CROB:48-63	
	Self-check Alarm Register		1 = alarm has been asserted 0 = alarm hasn't been asserted
10:2(read) 12:1(write) 10:2(read) 12:1(write) 10:2(read) 12:1(write) 10:2(read) 12:1(write) 10:2(read) 12:1(write) 10:2(read) 12:1(write) 10:2(read) 12:1(write)	Reserved ROM error RAM error Watchdog timer reset Sampling failure Out of control trap Reserved 	B0:64 CROB:64 B0:65 CROB:65 B0:66 CROB:66 B0:67 CROB:67 B0:68 CROB:68 B0 :69 CROB:69 BI :70 CROB:70	Reading returns 0 Reading returns 0

Object/ Var.	Description	Object/ Point	Bit meaning
10:2(read)	Timing failure	B0 :71	
12:1(write)		CROB:71	
10:2(read)	Loss of power (power up)	B0:72	
12:1(write)		CROB:72	
10:2(read)	External reset (Cold Restart	B0:73	
12:1(write)	) ①	CROB:73	
10:2(read)	Configuration corrupted①	B0:74	
12:1(write)		CROB:74	
10:2(read)	Time synchronization	B0:75	
12:1(write)	required①	CROB:75	
10:2(read)	Reserved	76-79	Reading returns 0
12:1(write)		76-79	

BO indicates Binary-Output -Status (Read) or Control-Relay-Output Block (Write) points.

① - these self-check alarms are doubled with the corresponding internal indication bits.

The following restrictions should be noted when using object 12 to control the listed points:

- The *Count* byte is ignored.
- The *Control Code* byte is checked:

  a code of *Latch Off* is valid for all points;

  all other codes are invalid and wil be rejected.
- The *On Time* and *Off Time* fields are ignored.
- The status byte in the response will reflect the success or failure of the control operation:

  a status of *Request Accepted* (0) will be return if the command was accepted;

  a status of *Request not Accepted due to Formatting Errors* (3) will be returned if the *Control Code* byte was incorrectly formatted or if an invalid Code was present in the command.

Extended Data Registers

These registers are used to retrieve any data measured by the instrument. A list of the extended data parameters, their points and value ranges are shown in Table 4-11.

Table 4-11 Extended Data Registers

Object/ Var. ④	Parameter	Object/ Point	Unit	Value, range ①	Comment
30:4	None	AI:32768	n/a	0	
Status inputs					
01:1	Status input #1	BI:34304	n/a	0/1	
01:1	Status input #2	BI:34305	n/a	0/1	
01:1	Reserved	BI:34306-34319	n/a	0/0	
Relay status					
01:1	Relay #1 status	BI:34816	n/a	0/1	
01:1	Relay #2 status	BI:34817	n/a	0/1	
01:1	Reserved	BI:34818-34831	n/a	0/0	
Pulse counters (E)					
20:5	Pulse counter #1	BC:35328	n/a	0 to 999999	
20:5	Pulse counter #2	BC:35329	n/a	0 to 999999	
20:5	Pulse counter #3	BC:35330	n/a	0 to 999999	
20:5	Pulse counter #4	BC:35331	n/a	0 to 999999	
Real-time values per phase					
30:3	Voltage L1/L12	AI:35840	V	0 to Vmax	
30:3	Voltage L2/L23	AI:35841	V	0 to Vmax	
30:3	Voltage L3/L31	AI:35842	V	0 to Vmax	
30:3	Current L1	AI:35843	A	0 to Imax	
30:3	Current L2	AI:35844	A	0 to Imax	
30:3	Current L3	AI:35845	A	0 to Imax	
30:3	kW L1	AI:35846	kW	-Pmax to Pmax	
30:3	kW L2	AI:35847	kW	-Pmax to Pmax	
30:3	kW L3	AI:35848	kW	-Pmax to Pmax	
30:3	kvar L1	AI:35849	kvar	-Pmax to Pmax	
30:3	kvar L2	AI:35850	kvar	-Pmax to Pmax	
30:3	kvar L3	AI:35851	kvar	-Pmax to Pmax	
30:3	kVA L1	AI:35852	kVA	0 to Pmax	
30:3	kVA L2	AI:35853	kVA	0 to Pmax	
30:3	kVA L3	AI:35854	kVA	0 to Pmax	
30:4	Power factor L1	AI:35855	n/a	-999 to 1000	×0.001
30:4	Power factor L2	AI:35856	n/a	-999 to 1000	×0.001
30:4	Power factor L3	AI:35857	n/a	-999 to 1000	×0.001
30:4	Voltage THD L1/L12	AI:35858	%	0 to 9999	×0.1

Object/ Var. ④	Parameter	Object/ Point	Unit	Value, range ①	Comment
30:4	Voltage THD L2/L23	AI:35859	%	0 to 9999	×0.1
30:4	Voltage THD L3	AI:35860	%	0 to 9999	×0.1
30:4	Current THD L1	AI:35861	%	0 to 9999	×0.1
30:4	Current THD L2	AI:35862	%	0 to 9999	×0.1
30:4	Current THD L3	AI:35863	%	0 to 9999	×0.1
30:4	K-Factor L1	AI:35864	%	10 to 9999	×0.1
30:4	K-Factor L2	AI:35865	%	10 to 9999	×0.1
30:4	K-Factor L3	AI:35866	%	10 to 9999	×0.1
30:4	Current TDD L1	AI:35867	%	0 to 1000	×0.1
30:4	Current TDD L2	AI:35868	%	0 to 1000	×0.1
30:4	Current TDD L3	AI:35869	%	0 to 1000	×0.1
30:3	Voltage L12	AI:35870	V	0 to Vmax	
30:3	Voltage L23	AI:35871	V	0 to Vmax	
30:3	Voltage L31	AI:35872	V	0 to Vmax	
Real-time total values					
30:3	Total kW	AI:36608	kW	-Pmax to Pmax	
30:3	Total kvar	AI:36609	kvar	-Pmax to Pmax	
30:3	Total kVA	AI:36610	kVA	0 to Pmax	
30:4	Total PF	AI:36611	n/a	-999 to 1000	×0.001
30:4	Reserved	AI:36612	n/a	0	
30:4	Reserved	AI:36613	n/a	0	
Real-time auxiliary values					
30:4	Reserved	AI:36864		0	
30:3	Neutral current	AI:36865	A	0 to Imax	
30:4	Frequency ②	AI:36866	Hz	0 to 10000	×0.01
30:4	Voltage unbalance	AI:36867	%	0 to 300	
30:4	Current unbalance	AI:36868	%	0 to 300	×0.01
Average values per phase					
30:3	Voltage L1/L12	AI:37120	V	0 to Vmax	
30:3	Voltage L2/L23	AI:37121	V	0 to Vmax	
30:3	Voltage L3/L31	AI:37122	V	0 to Vmax	
30:3	Current L1	AI:37123	A	0 to Imax	
30:3	Current L2	AI:37124	A	0 to Imax	
30:3	Current L3	AI:37125	A	0 to Imax	
30:3	kW L1	AI:37126	kW	-Pmax to Pmax	
30:3	kW L2	AI:37127	kW	-Pmax to Pmax	
30:3	kW L3	AI:37128	kW	-Pmax to Pmax	
30:3	kvar L1	AI:37129	kvar	-Pmax to Pmax	
30:3	kvar L2	AI:37130	kvar	-Pmax to Pmax	
30:3	kvar L3	AI:37131	kvar	-Pmax to Pmax	

Object/ Var. ④	Parameter	Object/ Point	Unit	Value, range ①	Comment
30:3	kVA L1	AI:37132	kVA	0 to Pmax	
30:3	kVA L2	AI:37133	kVA	0 to Pmax	
30:3	kVA L3	AI:37134	kVA	0 to Pmax	
30:4	Power factor L1	AI:37135	n/a	-999 to 1000	×0.001
30:4	Power factor L2	AI:37136	n/a	-999 to 1000	×0.001
30:4	Power factor L3	AI:37137	n/a	-999 to 1000	×0.001
30:4	Voltage THD L1/L12	AI:37138	%	0 to 9999	×0.1
30:4	Voltage THD L2/L23	AI:37139	%	0 to 9999	×0.1
30:4	Voltage THD L3	AI:37140	%	0 to 9999	×0.1
30:4	Current THD L1	AI:37141	%	0 to 9999	×0.1
30:4	Current THD L2	AI:37142	%	0 to 9999	×0.1
30:4	Current THD L3	AI:37143	%	0 to 9999	×0.1
30:4	K-Factor L1	AI:37144	n/a	10 to 9999	×0.1
30:4	K-Factor L2	AI:37145	n/a	10 to 9999	×0.1
30:4	K-Factor L3	AI:37146	n/a	10 to 9999	×0.1
30:4	Current TDD L1	AI:37147	%	0 to 1000	×0.1
30:4	Current TDD L2	AI:37148	%	0 to 1000	×0.1
30:4	Current TDD L3	AI:37149	%	0 to 1000	×0.1
30:3	Voltage L12	AI:37150	V	0 to Vmax	
30:3	Voltage L23	AI:37151	V	0 to Vmax	
30:3	Voltage L31	AI:37152	V	0 to Vmax	
Average total values					
30:3	Total kW	AI:37888	kW	-Pmax to Pmax	
30:3	Total kvar	AI:37889	kvar	-Pmax to Pmax	
30:3	Total kVA	AI:37890	kVA	0 to Pmax	
30:4	Total PF	AI:37891	n/a	-999 to 1000	×0.001
30:4	Reserved	AI:37892		0	
30:4	Reserved	AI:37893		0	
Average auxiliary values					
30:4	Reserved	AI:38144		0	
30:3	Neutral current	AI:38145	A	0 to Imax	
30:4	Frequency ②	AI:38146	Hz	0 to 10000	×0.01
30:4	Voltage unbalance	AI:38147	%	0 to 300	
30:4	Current unbalance	AI:38148	%	0 to 300	×0.01
Present demands					
30:3	Volt demand L1	AI:38400		0 to Vmax	
30:3	Volt demand L2	AI:38401		0 to Vmax	
30:3	Volt demand L3	AI:38402		0 to Vmax	
30:3	Amp. Demand L1	AI:38403	A	0 to Imax	
30:3	Amp. Demand L2	AI:38404	A	0 to Imax	
30:3	Amp. Demand L3	AI:38405	A	0 to Imax	

Object/ Var. ④	Parameter	Object/ Point	Unit	Value, range ①	Comment
30:3	Block kW demand(E)	AI:38406	kW	0 to Pmax	
30:4	Reserved	AI:38407		0	
30:3	Block kVA demand(E)	AI:38408	kVA	0 to Pmax	
30:3	Sliding window kW demand(E)	AI:38409	kW	0 to Pmax	
30:4	Reserved	AI:38410		0	
30:3	Sliding window kVA demand(E)	AI:38411	kVA	0 to Pmax	
30:4	Reserved	AI:38412		0	
30:4	Reserved	AI:38413		0	
30:4	Reserved	AI:38414		0	
30:3	Accumulated kW demand (import) (E)	AI:38415	kW	0 to Pmax	
30:4	Reserved	AI:38416		0	
30:3	Accumulated kVA demand(E)	AI:38417	kVA	0 to Pmax	
30:3	Predicted sliding window kW demand(E)	AI:38418	kW	0 to Pmax	
30:4	Reserved	AI:38419			
30:3	Predicted sliding window kVA demand(E)	AI:38420	kVA	0 to Pmax	
30:4	PF at maximum kVA sliding window (E)	AI:38421		0 to 1000	×0.001
Total energies(E)					
20:5	kWh import	BC:38656	kWh	0 to 999,999,999	
20:5	kWh export	BC:38657	kWh	0 to 999,999,999	
20:5	Reserved	BC:38658		0	
20:5	Reserved	BC:38659		0	
20:5	kvarh import (inductive)	BC:38660	kvarh	0 to 999,999,999	
20:5	kvarh export (capacitive)	BC:38661	kvarh	0 to 999,999,999	
20:5	Reserved	BC:38662		0	
20:5	Reserved	BC:38663		0	
20:5	kVAh total	BC:38664	kVAh	0 to 999,999,999	
Phase energies(E)					
20:5	kWh import L1	BC:38912	kWh	0 to 999,999,999	
20:5	kWh import L2	BC:38913	kWh	0 to 999,999,999	
20:5	kWh import L3	BC:38914	kWh	0 to 999,999,999	
20:5	kvarh import L1	BC:38915	kvarh	0 to 999,999,999	
20:5	kvarh import L2	BC:38916	kvarh	0 to 999,999,999	
20:5	kvarh import L3	BC:38917	kvarh	0 to 999,999,999	
20:5	kVAh total L1	BC:38918	kVAh	0 to 999,999,999	
20:5	kVAh total L2	BC:38919	kVAh	0 to 999,999,999	

Object/ Var. ④	Parameter	Object/ Point	Unit	Value, range ①	Comment
20:5	kVAh total L3	BC:38920	kVAh	0 to 999,999,999	
Fundamental (H01) real-time values per phase					
30:3	Voltage L1/L12	AI:43264	V	0 to Vmax	
30:3	Voltage L2/L23	AI: 43265	V	0 to Vmax	
30:3	Voltage L3/L31	AI: 43266	V	0 to Vmax	
30:3	Current L1	AI: 43267	A	0 to Imax	
30:3	Current L2	AI: 43268	A	0 to Imax	
30:3	Current L3	AI: 43269	A	0 to Imax	
30:3	kW L1	AI: 43270	kW	-Pmax to Pmax	
30:3	kW L2	AI: 43271	kW	-Pmax to Pmax	
30:3	kW L3	AI: 43272	kW	-Pmax to Pmax	
30:3	kvar L1	AI: 43273	kvar	-Pmax to Pmax	
30:3	kvar L2	AI: 43274	kvar	-Pmax to Pmax	
30:3	kvar L3	AI: 43275	kvar	-Pmax to Pmax	
30:3	kVA L1	AI: 43276	kVA	0 to Pmax	
30:3	kVA L2	AI: 43277	kVA	0 to Pmax	
30:3	kVA L3	AI: 43278	kVA	0 to Pmax	
30:4	Power factor L1	AI: 43279		-999 to 1000	×0.001
30:4	Power factor L2	AI: 43280		-999 to 1000	×0.001
30:4	Power factor L3	AI: 43281		-999 to 1000	×0.001
Fundamental (H01) real-time total values					
30:3	Total kW	AI:43520	kW	-Pmax to Pmax	
30:3	Total kvar	AI: 43521	kvar	-Pmax to Pmax	
30:3	Total kVA	AI: 43522	kVA	0 to Pmax	
30:4	Total PF	AI: 43523		-999 to 1000	×0.001
Minimum real-time values per phase (M)					
30:3	Voltage L1/L12	AI:44032	V	0 to Vmax	
30:3	Voltage L2/L23	AI:44033	V	0 to Vmax	
30:3	Voltage L3/L31	AI:44034	V	0 to Vmax	
30:3	Current L1	AI:44035	A	0 to Imax	
30:3	Current L2	AI:44036	A	0 to Imax	
30:3	Current L3	AI:44037	A	0 to Imax	
Minimum real-time total values (M)					
30:3	Total kW	AI:44288	kW	-Pmax to Pmax	
30:3	Total kvar	AI:44289	kvar	-Pmax to Pmax	
30:3	Total kVA	AI:44290	kVA	0 to Pmax	
30:4	Total PF ③	AI:44291		-999 to 1000	×0.001
Minimum real-time auxiliary values (M)					
30:4	Reserved	AI:44544		0	
30:3	Neutral current	AI:44545	A	0 to Imax	

Object/ Var. ④	Parameter	Object/ Point	Unit	Value, range ①	Comment
30:4	Frequency ②	AI:44546	Hz	0 to 10000	×0.01
Maximum real-time values per phase (M)					
30:3	Voltage L1/L12	AI:46080	V	0 to Vmax	
30:3	Voltage L2/L23	AI:46081	V	0 to Vmax	
30:3	Voltage L3/L31	AI:46082	V	0 to Vmax	
30:3	Current L1	AI:46083	A	0 to Imax	
30:3	Current L2	AI:46084	A	0 to Imax	
30:3	Current L3	AI:46085	A	0 to Imax	
Maximum real-time total values (M)					
30:3	Total kW	AI:46336	kW	-Pmax to Pmax	
30:3	Total kvar	AI:46337	kvar	-Pmax to Pmax	
30:3	Total kVA	AI:46338	kVA	0 to Pmax	
30:4	Total PF ③	AI:46339		-999 to 1000	×0.001
Maximum real-time auxiliary values (M)					
30:4	Reserved	AI:46592		0	
30:3	Neutral current	AI:46593	A	0 to Imax	
30:4	Frequency ②	AI:46594	Hz	0 to 10000	×0.01
Maximum demands (M)					
30:3	Maximum volt demand L1	AI:46848	V	0 to Vmax	
30:3	Maximum volt demand L2	AI:46849	V	0 to Vmax	
30:3	Maximum volt demand L3	AI:46850	V	0 to Vmax	
30:3	Maximum ampere demand L1	AI:46851	A	0 to Imax	
30:3	Maximum ampere demand L2	AI:46852	A	0 to Imax	
30:3	Maximum ampere demand L3	AI:46853	A	0 to Imax	
30:4	Reserved	AI:46854		0	
30:4	Reserved	AI:46855		0	
30:4	Reserved	AI:46856		0	
30:3	Maximum sliding window kW demand (E)	AI:46857	kW	0 to Pmax	
30:4	Reserved	AI:46858		0	
30:3	Maximum sliding window kVA demand (E)	AI:46859	kVA	0 to Pmax	

① For the parameter limits, see note ① to Table 4-1. (E) Available in the PM171E

② The actual frequency range is 45.00 - 65.00 Hz

③ Absolute min/max value (lag or lead) (M) These parameters are logged to the Min/Max log

④ Variations specified in the table show those that should be used to read a full-range value without a possible over-range error when no scaling is used to accommodate the value to the requested object size (see Section *Scaling Analog Input Objects*).

Analog Output Setup

These registers are used to obtain or change the allocation of the internal multiplexed analog output channels. For the output parameters that can be selected see Table 4-14.

Table 4-12 Analog Output Allocation Registers

Channel	Points
Channel #1	192-194
Channel #2	195-197

Table 4-13 Analog Channel Allocation Registers

Channel	Object/ Var.	Register contents	Object/ Point	Range/scale
#1	40:2(read)	Output parameter ID	AO:192	see Table 4-14
	41:2(write)			
	40:1(read)	Zero scale (0/4 mA)	AO:193	
	41:1(write)			
	40:1(read)	Full scale (20/1 mA)	AO:194	
	41:1(write)			
#2	40:2(read)	Output parameter ID	AO:195	see Table 4-14
	41:2(write)			
	40:1(read)	Zero scale (0/4 mA)	AO:196	
	41:1(write)			
	40:1(read)	Full scale (20/1 mA)	AO:197	
	41:1(write)			

NOTES

1. Except for the signed power factor (see Note 3 to Table 4-14), the output scale is linear within the value range. The scale range will be inverted if the full scale specified is less than the zero scale.

2. For bi-directional analog output (±1 mA), the zero scale corresponds to the center of the scale range (0 mA) and the direction of current matches the sign of the output parameter. For signed (bi-directional) values, such as powers and signed power factor, the scale is always symmetrical with regard to 0 mA, and the full scale corresponds to +1 mA output for positive readings and to -1 mA output for negative readings. For these, the zero scale (0 mA output) is permanently set in the instrument to zero for all parameters except of signed power factor for which it is set to 1.000. In the write request, the zero scale is ignored. No error will occur when you attempt to change it. Unsigned parameters are output within the current range 0 to +1 mA and can be scaled using both zero and full scales as in the event of single-ended analog output.

Table 4-14 Analog Output Parameters

Parameter	ID	Unit	Scale range ①	Modulus
None	0	n/a	0	
Real-time values per phase				
Voltage L1/L12	3072	V	0 to Vmax	
Voltage L2/L23	3073	V	0 to Vmax	
Voltage L3/L31	3074	V	0 to Vmax	
Current L1	3075	A	0 to Imax	
Current L2	3076	A	0 to Imax	
Current L3	3077	A	0 to Imax	
Real-time total values				
Total kW	3840	kW	-Pmax to Pmax	
Total kvar	3841	kvar	-Pmax to Pmax	
Total kVA	3842	kVA	0 to Pmax	
Total PF③	3843	n/a	-1000 to 1000 ③	×0.001
Total PF lag	3844	n/a	0 to 1000	×0.001
Total PF lead	3845	n/a	0 to 1000	×0.001
Real-time auxiliary values				
Frequency ②	4098	Hz	0 to 10000	×0.01
Average values per phase				
Voltage L1/L12	4352	V	0 to Vmax	
Voltage L2/L23	4353	V	0 to Vmax	
Voltage L3/L31	4354	V	0 to Vmax	
Current L1	4355	A	0 to Imax	
Current L2	4356	A	0 to Imax	
Current L3	4357	A	0 to Imax	
Average total values				
Total kW	5120	kW	-Pmax to Pmax	
Total kvar	5121	kvar	-Pmax to Pmax	
Total kVA	5122	kVA	0 to Pmax	
Total PF ③	5123	n/a	-1000 to 1000 ③	×0.001
Total PF lag	5124	n/a	0 to 1000	×0.001
Total PF lead	5125	n/a	0 to 1000	×0.001
Average auxiliary values				
Neutral current	5377	A	0 to Imax	
Frequency ②	5378	Hz	0 to 10000	×0.01
Present demands				
Accumulated kW demand (E)	5647	kW	0 to Pmax	
Accumulated kVA demand(E)	5649	kVA	0 to Pmax	

① For the parameter limits, see Note ① to Table 4.1.

② The actual frequency range is 45.00 to 65.00 Hz

③ The output scale for signed (bi-directional) power factor is symmetrical with regard to ±1.000 and is linear from -0 to -1.000, and from 1.000 to +0 (note that -1.000 ≡ +1.000). Negative power factor is output as [-1.000 minus measured value], and non-negative power factor is output as [+1.000 minus measured value]. To define the entire range for power factor from -0 to +0, the scales would be specified as -0/0. Because a negative zero may not be transmitted, the value of -0.001 is used to specify the scale of -0, and both +0.001 and 0.000 are used to specify the scale of +0. To define the range of -0 to 0, you must send -1/1 or -1/0 (considering the modulus of ×0.001).

(E) Available in the PM171E

Analog Expander Channels Allocation Registers

These registers are used to obtain or change the allocation of the analog expander channels. For the output parameters that can be selected see Table 4-14.

Table 4-15 Analog Expander Allocation Registers

Channel	Points	Channel	Points
Channel #1	256-258	Channel #9	280-282
Channel #2	259-261	Channel #10	283-285
Channel #3	262-264	Channel #11	286-288
Channel #4	265-267	Channel #12	289-291
Channel #5	268-270	Channel #13	292-294
Channel #6	271-273	Channel #14	295-297
Channel #7	274-276	Channel #15	298-300
Channel #8	277-279	Channel #16	301-303

Table 4-16 Analog Expander Channel Allocation Registers

Channel	Object/ Var.	Register contents	Object/ Point	Range/scale
#1	40:2(read)	Output parameter ID	AO:256	See Table 4-14
	41:2(write)			
	40:1(read)	Zero scale (0/4 mA)	AO:257	
	41:1(write)			
	40:1(read)	Full scale (20/1 mA)	AO:258	
	41:1(write)			
	. . .			
#16	40:2(read)	Output parameter ID	AO:301	see Table 4-14
	41:2(write)			
	40:1(read)	Zero scale (0/4 mA)	AO:302	
	41:1(write)			
	40:1(read)	Full scale (20/1 mA)	AO:303	
	41:1(write)			

NOTE

Settings you made for analog expander outputs will not be in effect until the analog expander output is globally enabled. To activate the analog expander output, set the analog expander option to the enabled state in the user selectable options setup (see Table 4-3).

Digital Inputs Allocation Registers

These registers are used to obtain or change the allocation of the instrument digital inputs.

Table 4-17 Digital Inputs Allocation Registers(E)

Object/ Var.	Register contents	Object/ Point	Range
40:2(read) 41:2(write)	Status inputs allocation ①	AO:130	See Table 4-18
40:2(read) 41:2(write)	Pulse inputs allocation	AO:131	See Table 4-18
40:2(read) 41:2(write)	Not used ①	AO:132	Reads as 0
40:2(read) 41:2(write)	External synchronization pulse allocation	AO:133	See Table 4-18

① Writing to these locations is ignored. No error will occur.
(E) Available in the PM171E

NOTES

1. All digital inputs that were not allocated as pulse inputs will be automatically configured as status inputs.
2. A digital input allocated for the external synchronization pulse will be automatically configured as a pulse input.

Table 4-18 Digital Inputs Allocation Mask

Bit number	Description
0	Digital input # 1 allocation status
1	Digital input # 2 allocation status
2-15	N/A (read as 0)

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

Alarm/Event Setpoints Registers

These registers allow obtaining or changing the setup of the sixteen alarm setpoints.

Table 4-19 Alarm/Event Setpoints

Setpoint #	Points
Setpoint #1	512-517
Setpoint #2	518-523
Setpoint #3	524-529
Setpoint #4	530-535
Setpoint #5	536-541
Setpoint #6	542-547
Setpoint #7	548-553
Setpoint #8	554-559
Setpoint #9	560-565
Setpoint #10	566-571
Setpoint #11	572-577
Setpoint #12	578-583
Setpoint #13	584-589
Setpoint #14	590-595
Setpoint #15	596-601
Setpoint #16	602-607

Table 4-20 Setpoint Registers

Setpoint	Object/ Var.	Register contents	Object/ Point	Range/scale
#1	40:2(read) 41:2(write)	Trigger parameter ID	AO:512	see Table 4-21
	40:1(read) 41:1(write)	Action	AO:513	see Table 4-22
	40:2(read) 41:2(write)	Operate delay	AO:514	0-9999 (×0.1 sec)
	40:2(read) 41:2(write)	Release delay	AO:515	0-9999 (×0.1 sec)
	40:2(read) 41:2(write)	Operate limit	AO:516	see Table 4-21
	40:2(read) 41:2(write)	Release limit	AO:517	see Table 4-22
	….			
#16	40:2(read) 41:2(write)	Trigger parameter ID	AO:602	see Table 4-21

Setpoint	Object/ Var.	Register contents	Object/ Point	Range/scale
	40:2(read) 41:2(write)	Action	AO:603	see Table 4-22
	40:2(read) 41:2(write)	Operate delay	AO:604	0-9999 (×0.1 sec)
	40:2(read) 41:2(write)	Release delay	AO:605	0-9999 (×0.1 sec)
	40:2(read) 41:2(write)	Operate limit	AO:606	see Table 4-21
	40:1(read) 41:1(write)	Release limit	AO:607	see Table 4-22

NOTES

1. The setpoint is disabled when its trigger parameter is set to NONE. To disable the setpoint, write zero into this register.
2. When writing the setpoint registers (except the event when the setpoint is to be disabled), it is recommended to write all the setpoint registers using a single request, or disable the setpoint before writing into separate registers. Each value being written is checked for compatibility with the other setpoint parameters, and if the new value does not conform to those, the request will be rejected.
3. Operate and release limits for the trigger parameters and their conversion scales are indicated in Table 4-21. Each limit value occupies two contiguous registers, the first of which (low word) contains the limit value, and the second (high word) is reserved for long parameters. This register is always read as zero. When written, its value is ignored.
4. Limits indicated in Table 4-20 by a n/a mark are read as zeros and are not checked when written. Write them as zeros.
5. When a setpoint action is directed to a relay allocated to output energy pulses, an attempt to re-allocate it for a setpoint will result in a negative response.

Table 4-21 Setpoint Trigger Parameters

Trigger parameter	Trigger ID		Operate/Release Limits		
	Hex	Dec	Unit	Range ①	Modulus
None	0000	0		0	
Internal events (E)					
kWh import pulse	0400	1024		N/A	
kWh export pulse	0401	1025		N/A	
kvarh import pulse	0403	1027		N/A	
kvarh export pulse	0404	1028		N/A	
kvarh total pulse	0405	1029		N/A	
kVAh total pulse	0406	1030		N/A	

Trigger parameter	Trigger ID		Operate/Release Limits		
	Hex	Dec	Unit	Range ①	Modulus
Start new block demand interval	0407	1031		N/A	
Reserved	0408	1032		N/A	
Start new volt/ampere demand interval	0409	1033		N/A	
Start new sliding window demand interval	040A	1034		N/A	
Status inputs					
Status input #1 ON	0600	1536		n/a	
Status input #2 ON	0601	1537		n/a	
Status input #1 OFF	8600	34304		n/a	
Status input #2 OFF	8601	34305		n/a	
Pulse inputs (E)					
Pulse input #1	0700h	1792		N/A	
Pulse input #2	0701h	1793		N/A	
Phase reversal					
Positive phase rotation reversal ②	8901	35073		n/a	
Negative phase rotation reversal ②	8902	35074		n/a	
Pulse counters (E)					
High pulse counter #1	0A00	2560		0 t0 999999	
High pulse counter #2	0A01	2561		0 t0 999999	
High pulse counter #3	0A02	2562		0 t0 999999	
High pulse counter #4	0A03	2563		0 t0 999999	
High/low real-time values per phase					
High current L1	0C03	3075	A	0 to Imax	
High current L2	0C04	3076	A	0 to Imax	
High current L3	0C05	3077	A	0 to Imax	
Low current L1	8C03	35843	A	0 to Imax	
Low current L2	8C04	35844	A	0 to Imax	
Low current L3	8C05	35845	A	0 to Imax	
High/low real-time values on any phase					
High voltage	0E00	3584	V	0 to Vmax	
Low voltage	8D00	36096	V	0 to Vmax	
High current	0E01	3585	I	0 to Imax	
Low current	8D01	36097	I	0 to Imax	
High voltage THD	0E07	3591	%	0 to 9999	×0.1
High current THD	0E08	3592	%	0 to 9999	×0.1
High K-Factor	0E09	3593	%	10 to 9999	×0.1
High current TDD	0E0A	3594	%	0 to 1000	×0.1
High/low real-time auxiliary values					
High frequency ③	1002	4098	Hz	0 to 10000	×0.01
Low frequency ③	9002	36866	Hz	0 to 10000	×0.01

Trigger parameter	Trigger ID		Operate/Release Limits		
	Hex	Dec	Unit	Range ①	Modulus
High/low average values per phase					
High current L1	1103	4355	A	0 to Imax	
High current L2	1104	4356	A	0 to Imax	
High current L3	1105	4357	A	0 to Imax	
Low current L1	9103	37123	A	0 to Imax	
Low current L2	9104	37124	A	0 to Imax	
Low current L3	9105	37125	A	0 to Imax	
High/low average values on any phase					
High voltage	1300	4864	V	0 to Vmax	
Low voltage	9200	37376	V	0 to Vmax	
High current	1301	4865	V	0 to Vmax	
Low current	9201	37377	V	0 to Vmax	
High/low average total values					
High total kW import	1406	5126	kW	0 to Pmax	
High total kW export	1407	5127	kW	0 to Pmax	
High total kvar import	1408	5128	kvar	0 to Pmax	
High total kvar export	1409	5129	kvar	0 to Pmax	
High total kVA	1402	5122	kVA	0 to Pmax	
Low total PF lag	9404	37892		0 to 1000	×0.001
Low total PF lead	9405	37893		0 to 1000	×0.001
High/low average auxiliary values					
High neutral current	1501	5377	A	0 to Imax	
High frequency ③	1502	5378	Hz	0 to 10000	×0.01
Low frequency ③	9502	38146	Hz	0 to 10000	×0.01
High present demands					
High volt demand L1	1600	5632	v	0 to Vmax	
High volt demand L2	1601	5633	v	0 to Vmax	
High volt demand L3	1602	5634	v	0 to Vmax	
High ampere demand L1	1603	5635	A	0 to Imax	
High ampere demand L2	1604	5636	A	0 to Imax	
High ampere demand L3	1605	5637	A	0 to Imax	
High block kW demand (E)	1606	5638	kW	0 to Pmax	
High block kVA demand(E)	1608	5640	kVA	0 to Pmax	
High sliding window kW demand(E)	1609	5641	kW	0 to Pmax	
High sliding window kVA demand(E)	160B	5643	kVA	0 to Pmax	
High accumulated kW demand(E)	160F	5647	kW	0 to Pmax	
High accumulated kVA demand(E)	1611	5649	kVA	0 to Pmax	
Predicted kW demand(import)(E)	1612	5650	kW	0 to Pmax	
Predicted kVA demand(E)	1614	5652	kVA	0 to Pmax	

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

② The setpoint is operated when the actual phase sequence does not match the indicated phase rotation.

③ The actual frequency range is 45.00 - 65.00 Hz.

(E) Available in the PM171E

Table 4-22 Setpoint Actions

Description	Action ID	
	Hex	Dec
No action	0000	0
Operate relay #1	3000	12288
Operate relay #2	3001	12289
Increment counter #1 (E)	4000	16384
Increment counter #2 (E)	4001	16385
Increment counter #3 (E)	4002	16386
Increment counter #4 (E)	4003	16387
Clear counter #1 (E)	4200	16896
Clear counter #2 (E)	4201	16897
Clear counter #3 (E)	4202	16898
Clear counter #4 (E)	4203	16899
Clear all counters (E)	6400	25600
Reset total energy (E)	6000	24576
Reset all total maximum demands (E)	6100	24832
Reset power maximum demands (E)	6101	24833
Reset volt/ampere maximum demands (E)	6102	24834
Reserved	6200	25088
Reserved	6300	25344
Clear Min/Max registers (E)	6500	25856

(E) - available in the PM171E

Pulsing Setpoints Registers

These registers are used to obtain or change the setup of the pulsing output for any of two relays.

NOTE

Allocating a relay as a pulsing relay will unconditionally disable all setpoints associated with this relay. If a relay was manually operated or released, it will automatically revert to normal operation.

Table 4-23 Pulsing Setpoints (E)

Relay	Registers
Relay #1	768-769
Relay #2	770-771

(E)- available in the PM171E

Table 4-24 Pulsing Setpoint Registers

Object/ Var.	Register contents	Object/ Point	Range
40:2(read) 41:2(write)	Output parameter ID	AO:768	See Table 4-25
40:2(read) 41:2(write)	Number of unit-hours per pulse	AO:769	1-9999 for energy pulsing, otherwise write 0.
40:2(read) 41:2(write)	Output parameter ID	AO:770	See Table 4-25
40:2(read) 41:2(write)	Number of unit-hours per pulse	AO:771	1-9999 for energy pulsing, otherwise write 0.

Table 4-25 Pulsing Output Parameters

Pulsing parameter	Identifier
None	0
KWh import	1
KWh export	2
Kvarh import (inductive)	4
Kvarh export (capacitive)	5
Kvarh total (absolute)	6
KVAh	7

Relay Operation Control

These points allow the user to manually override relay operation normally operated via alarm setpoints. Starting with software version 3.16 the Pulse On & Pulse Off control code is valid.

NOTE

A relay allocated as a pulsing relay may not be manually operated or released. When a relay is allocated for pulsing, it automatically reverts to normal operation.

Table 4-26 Relay Operation Control Registers

Object/ Var.	Register contents	Object/ Point	State Range
10:2(read) 12:1(write)	Relay #1 Force operate/Force release/Normal	BO:80 CROB:80	0/1 = state OFF/ON
10:2(read) 12:1(write)	Relay #2 Force operate/Force release /Normal	BO:81 CROB:81	0/1 = state OFF/ON

The following restrictions should be noted when using object 12 to control the listed points:

- The *Count* byte is ignored.
- The *Control Code* byte is checked:
  codes of Pulse On , Pulse Off, Latch On, Latch Off are valid for all points;
  all others *Codes* are invalid and wil be rejected;
  the *Clear* sub-field is valid;
  the others sub-fields are ignored.
- The *On Time* specifies in ms the amount of time the digital point is to be turned on. The minimal value of the *On Time* is 500 ms and the actual value may differ from the specified value by up to 50 ms.
- The *Off Time* specifies in ms the amount of time the digital point is to be turned off. The minimal value of the *Off Time* is 500 ms and the actual value may differ from the specified value by up to 50 ms.
- The *Status* byte in the response will reflect the success or failure of the control operation:
  a status of *Request Accepted* (0) will be return if the command was accepted;
  a status of *Request not Accepted due to Formatting Errors* (3) will be returned if the *Control Code* byte was incorrectly formatted or an invalid Code was present in the command;
  a status of *Control Operation not Supported for this Point* (4) will be returned if the Control Point was out of control (for instance, a relay is allocated for pulsing via Basic Setup).

To manually operate relay #1, use the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to point 80 of the Control-Relay-Output-Block object with the *Contol Code* value *Latch On*. To manually release relay #1, use the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to point 80 of the Control-Relay-Output-Block object with the *Contol Code* value *Latch Off*. To control relay #2, use point 81. To revert relay #1 or #2 to normal operation, use the Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) command to the correspondent point of the Control-Relay-Output-Block object with the *Contol Code* value *Nul Operation* and *Clear* sub-field being set to 1.

Pulse Counter Setup

Table 4-27 Pulse Counter Register(E)

Counter	Setup registers (see Table 4-28)
Counter #1	832-833
Counter #2	834-835
Counter #3	836-837
Counter #4	838-839

(E)- available in the PM171E

Table 4-28 Pulse Counter Setup Registers

Object/ Var.	Register contents	Object/ Point	Range
40:2(read) 41:2(write)	Associated digital input ID	AO:832	See Table 4-29
40:2(read) 41:2(write)	Scale factor (number of units per input pulse)	AO:833	1-9999
…	…	…	…
40:2(read) 41:2(write)	Associated digital input ID	AO:838	See Table 4-29
40:2(read) 41:2(write)	Scale factor (number of units per input pulse)	AO:839	1-9999

Table 4-29 Pulsing Output Parameters

Discrete input	Identifier
Not allocated	0
Digital input #1	1
Digital input #2	2

Class 0 Object Assignment

The *PM171* provides Read/Direct-Operate (or SBO/Operate or Direct-Operate-No-Acknowledge) Configuration Points 96-120 that allow the user to configure Class 0 object assignment. These Configuration points are currently defined as shown in Table 4-30.

Table 4-30 Class 0 Object Assignment

Object/ Var.	ParameterGroup	Object/ Point
10:2(read) 12:1(write)	Basic Data Parameters	BO:96 CROB:96
10:2(read) 12:1(write)	Basic Energy Parameters	BO:97 CROB:97
10:2(read) 12:1(write)	Basic Setup Parameters	BO:98 CROB:98
10:2(read) 12:1(write)	Firmware & Instrument Options	BO:99 CROB:99
10:2(read) 12:1(write)	Communication Setup Parameters	BO:100 CROB:100
10:2(read) 12:1(write)	Real-time values per phase	BO:101 CROB:101

Object/ Var.	ParameterGroup	Object/ Point
10:2(read) 12:1(write)	Real-time total values	BO:102 CROB:102
10:2(read) 12:1(write)	Real-time auxiliary values	BO:103 CROB:103
10:2(read) 12:1(write)	Average values per phase	BO:104 CROB:104
10:2(read) 12:1(write)	Average values total	BO:105 CROB:105
10:2(read) 12:1(write)	Average values auxiliary	BO:106 CROB:106
10:2(read) 12:1(write)	Present demands	BO:107 CROB:107
10:2(read) 12:1(write)	Total energies	BO:108 CROB:108
10:2(read) 12:1(write)	Phase energies	BO:109 CROB:109
10:2(read) 12:1(write)	Fundamental's (H01) real-time values per phase	BO:110 CROB:110
10:2(read) 12:1(write)	Fundamental's (H01) real-time total values	BO:111 CROB:111
10:2(read) 12:1(write)	Minimum real-time values per phase	BO:112 CROB:112
10:2(read) 12:1(write)	Minimum real-time total values	BO:113 CROB:113
10:2(read) 12:1(write)	Minimum real-time auxiliary values	BO:114 CROB:114
10:2(read) 12:1(write)	Minimum demands (reserved)	BO:115 CROB:115
10:2(read) 12:1(write)	Maximum real-time values per phase	BO:116 CROB:116
10:2(read) 12:1(write)	Maximum real-time total values	BO:117 CROB:117
10:2(read) 12:1(write)	Maximum real-time auxiliary values	BO:118 CROB:118
10:2(read) 12:1(write)	Maximum demands	BO:119 CROB:119
10:2(read) 12:1(write)	Status Inputs	BO:120 CROB:120
10:2(read) 12:1(write)	Reserved	121-127 121-127

BO indicates Binary Output Status (Read) or Binary Output (Write) points.

The following restrictions should be noted when using object 12 to control the listed points:

- The *Count* byte is ignored.
- The *Control Code* byte is checked:
  codes of Latch On, Latch Off are valid for all points;
  all others codes are invalid and wil be rejected;
  all sub-fields are ignored.
- The *On Time* and *Off Time* fields are ignored.
- The status byte in the response will reflect the success or failure of the control operation:
  a status of *Request Accepted* (0) will be return if the command was accepted;
  a status of *Request not Accepted due to Formatting Errors* (3) will be returned if the *Control Code* byte was incorrectly formatted or an invalid code was present in the command.

The Basic Data Parameters (point 96) & Basic Setup Parameters (point 98) are assigned to Class 0 by default. Setting a value of the particular point to 1 causes the indicated objects to be sent. Attempting to set all points from the range 96 -127 to 0 causes default setting when the Class 0 object is requested.

Appendix A DNP Application Messages

The Powermeter is a DNP IED responding to external DNP Master requests. *Table A-1* describes the *Series PM171* application level responses to external requests, including object variations, functions, codes and qualifiers supported by the instrument. The object and formats are detailed in the DNP Basic 4 Documentation Set.

Table A-1 Application Responses

OBJECT			REQUEST		RESPONSE	
Obj	**Var**	**Description**	**Func. Code**	**Qual. Code**	**Func. Code**	**Qual. Code**
01	0	Single Bit Binary Input	1	B	129	01
01	1	Single Bit Binary Input	1	A	129	C
10	0	Binary Output	1	B	129	01
10	2	Binary Output Status	1	A	129	C
12	1	Control Relay Output Block	3,4,5	A	129	C
12	1	Control Relay Output Block	6	A	None	N/A
20	0	Counter (responds like 20:5)	1	B	129	01
20	5	32-bit Binary Counter without flag	1	A	129	C
20	6	16-bit Binary Counter without flag	1	A	129	C
30	0	Analog Input	1	B	129	01
30	1	32-bit Analog Input	1	A	129	C
30	2	16-bit Analog Input	1	A	129	C
30	3	32-bit Analog Input without flag	1	A	129	C
30	4	16-bit Analog Input without flag	1	A	129	C
40	0	Analog Output Status(respond like 40:1)	1	B	129	01
40	1	32-bit Analog Output Status	1	A	129	C
40	2	16-bit Analog Output Status	1	A	129	C
41	1	32-bit Analog Output Block	3,4,5	A	129	C
41	2	16-bit Analog Output Block	3,4,5	A	129	C
41	1	32-bit Analog Output Block	6	A	None	N/A
41	2	16-bit Analog Output Block	6	A	None	N/A
50	1	Time and Date ①	1,2	A	129	C
60	1	Class 0	1	B	129	01
60	2	Class 1	1	06,07,08	129	N/R

OBJECT			REQUEST		RESPONSE	
Obj	**Var**	**Description**	**Func. Code**	**Qual. Code**	**Func. Code**	**Qual. Code**
60	3	Class 2	1	06,07,08	129	N/R
60	4	Class 3	1	06,07,08	129	N/R
80	1	Internal indication ②	2	D	129	N/A
N/A	N/A	Cold Restart ③(respond obj. 52:2)	13	N/A	129	07
N/A	N/A	Delay Measurement (respond obj. 52:2)	23	N/A	129	07

① For this object, the quantity specified in the request must be exactly 1or an index of 0 only as there is only one instance of this object defined in the instrument.

② For this object, the qualifier code must specify an index 7 only.

③ Respond with a time object 50 variation 2 indicating time till the instrument availability

Qualifier Hex Codes for each category:

A - 00,01,03,04,07,17,27,08,18,28
B - 06 only
C - Qualifier echo
D - 00,01,03,04,17,27,18,28

N/A - Not Available

N/R- Null Response.

Appendix B DNP Device Profile

DNP V3.00 **DEVICE PROFILE DOCUMENT** This document must be accompanied by a table having the following headings: Object Group Request Function Codes Response Function Codes Object Variation Request Qualifiers Response Qualifiers Object Name (optional)	
Vendor Name: SATEC Ltd.	
Device Name: Powermeter Series PM171	
Highest DNP Level Supported: For Requests L1 For Responses L1	Device Function: ☐ Master ■ Slave
Instrument supports READ of each object using either all points (Qualifier = 6) or specific points using qualifier defined in Basic 4 Documentation Set: 00, 01, 03, 04, 07, 17, 27, 08, 18, 28. Control Relay Block requires specific parameters described in this manual. Treats range field of qualifier 07 and 08 to mean point range [0..N-1].	
Maximum Data Link Frame Size (octets): Transmitted 292 Received 292	Maximum Application Fragment Size (octets): Transmitted 2048 Received 249
Maximum Data Link Re-tries: ■ None ☐ Fixed at_____ ☐ Configurable, range ___ to_____	Maximum Application Layer Re-tries: ■ None ☐ Configurable, range ____ to _____ (Fixed is not permitted)

Device Profile Document (continued)

Requires Data Link Layer Confirmation:

■ Never

☐ Always

☐ Sometimes If 'Sometimes', when? _____

☐ Configurable If 'Configurable', how? _____

Requires Application Layer Confirmation:

■ Never

☐ Always (not recommended)

☐ When reporting Event Data (Slave devices only)

☐ When sending multi-fragment responses (Slave devices only)

☐ Sometimes If 'Sometimes', when? _____

☐ Configurable If 'Configurable', how? _____

Timeouts while waiting for:

Data Link Confirm ■ None ☐ Fixed at _____ ☐ Variable ☐ Configurable

Complete Appl. Fragment ■ None ☐ Fixed at _____ ☐ Variable ☐ Configurable

Application Confirm ■ None ☐ Fixed at _____ ☐ Variable ☐ Configurable

Complete Appl. Response ■ None ☐ Fixed at _____ ☐ Variable ☐ Configurable

Others

_____
_

Attach explanation if 'Variable' or 'Configurable' was checked for any timeout

Device Profile Document (continued)

Sends/Executes Control Operations:

WRITE Binary Outputs	■ Never	☐ Always	☐ Sometimes	☐ Configurable
SELECT/OPERATE	☐ Never	■ Always	☐ Sometimes	☐ Configurable
DIRECT OPERATE	☐ Never	■ Always	☐ Sometimes	☐ Configurable
DIRECT OPERATE - NO ACK	☐ Never	■ Always	☐ Sometimes	☐ Configurable
Count > 1	■ Never	☐ Always	☐ Sometimes	☐ Configurable
Pulse On	☐ Never	☐ Always	■ Sometimes①④	☐ Configurable
Pulse Off	☐ Never	☐ Always	■ Sometimes④	☐ Configurable
Latch On	☐ Never	☐ Always	■ Sometimes②	☐ Configurable
Latch Off	☐ Never	☐ Always	■ Sometimes③	☐ Configurable
Queue	■ Never	☐ Always	☐ Sometimes	☐ Configurable
Clear Queue	☐ Never	☐ Always	■ Sometimes④	☐ Configurable

♦ **Select timeout period is configurable : 2s to 30s**

① used to activate the *Reset* function associated with points 0 to 21

② ③ used to configure Class 0 object assignment (points 96 to 120)

② ③ ④ used to control Relays associated with points 80 to 81

③ used to reset the setpoint alarm and self-check alarm registers accosiated with points 48 to 75

Reports Binary Input Change Events when no specific variation requested: ■ Never ☐ Only time-tagged ☐ Only non-time-tagged ☐ Configurable to send both, one or the other (attach explanation)	Reports time-tagged Binary Input Change Events when no specific variation requested: ■ Never ☐ Binary Input Change With Time ☐ Binary Input Change With Relative Time ☐ Configurable (attach explanation)

Device Profile Document (continued)

Sends Unsolicited Responses: ■ Never ☐ Configurable (attach explanation) ☐ Only certain objects ☐ Sometimes (attach explanation) ☐ ENABLE/DISABLE UNSOLICITED Function codes supported	Sends Static Data in Unsolicited Responses: ■ Never ☐ When Device Restarts ☐ When Status Flags Change No other options are permitted.
Default Counter Object/Variation: ☐ No Counters Reported ☐ Configurable (attach explanation) ■ Default Object 20 Default Variation 5 ☐ Point-by-point list attached	Counters Roll Over at: ☐ No Counters Reported ☐ Configurable (attach explanation) ☐ 16 Bits ☐ 32 Bits ■ Other Value Counters -999999999 to 99999999 (point 2) 0 to 9999999 (points 0,1,3) ☐ Point-by-point list attached
Sends Multi-Fragment Responses: ■ Yes ☐ No	