8.1.1 DEVICE PROFILE DOCUMENT

The communications port configured as a DNP slave port must support the full set of features listed in the Level 2 DNP V3.00 Implementation (DNP-L2) described in Chapter 2 of the subset definitions.

DNP 3.0 DEVICE PROFILE DOCUMENT	
Vendor Name: General Electric Power Management Inc.	
Device Name: PQM Power Quality Meter	
Highest DNP Level Supported: For Requests: Level 2 For Responses: Level 2	Device Function: ☐ Master ☒ Slave
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table): none	
Maximum Data Link Frame Size (octets): Transmitted: 249 Received: 292	Maximum Application Fragment Size (octets): Transmitted: 2048 Received: 2048
Maximum Data Link Re-tries: ☒ None ☐ Fixed ☐ Configurable	Maximum Application Layer Re-tries: ☒ None ☐ Configurable
Requires Data Link Layer Confirmation: ☒ Never ☐ Always ☐ Sometimes ☐ Configurable	
Requires Application Layer Confirmation: ☐ Never ☐ Always ☒ When reporting Event Data ☐ When sending multi-fragment responses ☐ Sometimes ☐ Configurable	
Timeouts while waiting for: Data Link Confirm ☒ None ☐ Fixed ☐ Variable ☐ Configurable Complete Appl. Fragment ☒ None ☐ Fixed ☐ Variable ☐ Configurable Application Confirm ☐ None ☒ Fixed ☐ Variable ☐ Configurable (fixed value is 5000 milliseconds) Complete Appl. Response ☒ None ☐ Fixed ☐ Variable ☐ Configurable Others: (None)	

DNP 3.0
DEVICE PROFILE DOCUMENT (Continued)

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	☒ Sometimes	☐ Configurable
Pulse Off	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Latch On	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Latch Off	☒ Never	☐ Always	☐ Sometimes	☐ Configurable

- No action is taken if Count is zero
- Queue, Clear, Trip, Close, On-Time, and Off-Time fields are ignored

Queue	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Clear Queue	☒ Never	☐ Always	☐ Sometimes	☐ Configurable

Reports Binary Input Change Events when no specific variations requested:
- ☐ Never
- ☒ Only time-tagged
- ☐ Only non-time-tagged
- ☐ Configurable to send both, one or the other

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

Sends Unsolicited Responses:
- ☒ Never
- ☐ Configurable
- ☐ Only certain objects
- ☐ Sometimes
- ☒ ENABLE/DISABLE UNSOLICITED Function codes supported

Sends Static Data in Unsolicited Responses:
- ☒ Never
- ☐ When Device Restarts
- ☐ When Status Flags Change

Default Counter Object/Variation:
- ☐ No Counters Reported
- ☐ Configurable
- ☒ Default Object / Default Variation
- ☐ Point-by-point list attached

Counters Roll Over at:
- ☐ No Counters Reported
- ☐ Configurable
- ☒ 16 Bits
- ☒ 32 Bits
- ☐ Other Value
- ☐ Point-by-point list attached

Sends Multi-Fragment Responses: ☐ Yes ☒ No

8.1.2 IMPLEMENTATION TABLE

The table below lists all objects recognized and returned by the PQM. Additional information provided on the following pages includes lists of the default variations and defined point numbers returned for each object.

DNP IMPLEMENTATION TABLE						
OBJECT			REQUEST		RESPONSE	
OBJ	VAR	DESCRIPTION	FUNC CODES	QUAL CODES (hex)	FUNC CODES	QUAL CODES (hex)
1	0	Binary Input - All Variations	1	06		
1	1	Binary Input	1	00, 01, 06	129	00, 01
1	2	Binary Input With Status (Note 6)	1	00, 01, 06	129	00, 01
2	0	Binary Input Change - All Variations	1	06, 07, 08		
2	1	Binary Input Change Without Time	1	06, 07, 08	129	17, 28
2	2	Binary Input Change With Time	1	06, 07, 08	129	17, 28
10	0	Binary Output - All Variations	1	06		
10	2	Binary Output Status	1	00, 01, 06	129	00, 01
12	1	Control Relay Output Block	3, 4, 5, 6	17, 28	129	17, 28
20	0	Binary Counter - All Variations	1, 7, 8, 9,10	06, 07, 08	129	00. 01
20	5	32-Bit Binary Counter Without Flag	1, 7, 8, 9, 10	06, 07, 08	129	00. 01
20	6	16-Bit Binary Counter Without Flag	1, 7, 8, 9, 10	06, 07, 08	129	00. 01
21	0	Frozen Counter - All Variations	1	06, 07, 08	129	00. 01
21	9	32-Bit Frozen Counter Without Flag	1	06, 07, 08	129	00. 01
21	10	16-Bit Frozen Counter Without Flag	1	06, 07, 08	129	00. 01
30	0	Analog Input - All Variations	1	06		
30	1	32-Bit Analog Input With Flag	1	00, 01, 06	129	00, 01
30	2	16-Bit Analog Input With Flag	1	00, 01, 06	129	00, 01
30	3	32-Bit Analog Input Without Flag	1	00, 01, 06	129	00, 01
30	4	16-Bit Analog Input Without Flag	1	00, 01, 06	129	00, 01
32	0	Analog Input Change - All Variations	1	06, 07, 08		
32	1	32-Bit Analog Input Change without Time	1	06, 07, 08	129	17, 28
32	2	16-Bit Analog Input Change without Time	1	06, 07, 08	129	17, 28
32	3	32-Bit Analog Input Change with Time	1	06, 07, 08	129	17, 28
32	4	16-Bit Analog Input Change with Time	1	06, 07, 08	129	17, 28
50	1	Time and Date	1, 2	07 (Note 1)	129	07
60	1	Class 0 Data (Note 2)	1	06	129	
60	2	Class 1 Data (Note 3)	1	06, 07, 08	129	
60	3	Class 2 Data (Note 3)	1	06, 07, 08	129	
60	4	Class 3 Data (Note 3)	1	06, 07, 08	129	
80	1	Internal Indications	2	00 (Note 4)	129	
		No object - Cold Start	13			
		No object - Warm Start (Note 5)	14			
		No object - enable unsolicited (parsed only)	20			
		No object - disable unsolicited (parsed only)	21			
		No object - Delay Measurement	23			

1, 2, 3, 4, 5, 6: see the IMPLEMENATION TABLE NOTES on the following page.

Implementation Table Notes:

1. For this object, the quantity specified in the request must be exactly 1 as there is only one instance of this object defined in the relay.
2. All static input data known to the relay is returned in response to a request for Class 0. This includes all objects of type 1 (Binary Input) and type 30 (Analog Input).
3. The point tables for Binary Input and Analog Input objects contain a field which defines which event class the corresponding static data has been assigned to.
4. For this object, the qualifier code must specify an index of 7 only.
5. Warm Restart (function code 14) is supported although it is not required by the DNP level 2 specification.
6. Object 1 Variation 1 always indicates ON LINE for all points.

8.1.3 DEFAULT VARIATIONS

The following table specifies the default variation for all objects returned by the relay. These are the variations that will be returned for the object in a response when no specific variation is specified in a request.

DEFAULT VARIATIONS		
Object	**Description**	**Default Variation**
1	Binary Input - Single Bit	1
2	Binary Input Change With Time	2
10	Binary Output Status	2
12	Control Relay Output Block	1
20	16-Bit Binary Counter Without Flag	6
21	16-Bit Frozen Counter Without Flag	10
30	16-Bit Analog Input Without Flag	4
32	16-Bit Analog Input Change Without Time	2

8.1.4 INTERNAL INDICATION BITS

The following internal indication bits are supported:

CHARACTER POSITION	BIT POSITION	DESCRIPTION
0	7	Device Restart -- set when PQM powers up, cleared by writing zero to object 80
0	4	Need Time -- set whenever the PQM has a “CLOCK NOT SET” alarm, cleared by setting the clock
0	1	Class 1 -- indicates that class 1 events are available
0	2	Class 2 -- indicates that class 2 events are available
0	3	Class 3 -- indicates that class 2 events are available
1	3	Buffer Overflow -- generally indicates that the host has not picked up the event data often enough

8.1.5 BINARY INPUT / BINARY INPUT CHANGE POINT LIST

POINT LIST FOR: BINARY INPUT (OBJECT 01) / BINARY INPUT CHANGE (OBJECT 02)			
INDEX	**DESCRIPTION**	**EVENT CLASS ASSIGNED TO**	**NOTES**
0	Alarm condition(s) active	Class 1	
1	Clock not set	Class 1	Note 1
2	Clock drifting	Class 1	
3	Internal error: ADC reference out of range	Class 1	
4	Internal error: HC705 processor not responding	Class 1	
5	Internal error: switch input circuit fault	Class 1	
6	PQM (display) option installed	Class 1	
7	T20 (4-20 mA transducer) option installed	Class 1	
8	T1 (0-1 mA transducer) option installed	Class 1	
9	C (control) option installed	Class 1	
10	A (power analysis) option installed	Class 1	
11	Switch A closed	Class 1	
12	Switch B closed	Class 1	
13	Switch C closed	Class 1	
14	Switch D closed	Class 1	
15	Alarm relay energized	Class 1	
16	Auxiliary relay 1 energized	Class 1	
17	Auxiliary relay 2 energized	Class 1	
18	Auxiliary relay 3 energized	Class 1	
19	Aux 1 relay LED active	Class 1	
20	Aux 2 relay LED active	Class 1	
21	Aux 3 relay LED active	Class 1	
22	Alarm LED active	Class 1	
23	Program LED active	Class 1	
24	Simulation LED active	Class 1	
25	Alarm relay LED active	Class 1	
26	Self test LED active	Class 1	
27	Aux 1 relay LED solid (not flashing)	Class 1	
28	Aux 2 relay LED solid (not flashing)	Class 1	
29	Aux 3 relay LED solid (not flashing)	Class 1	
30	Alarm LED solid (not flashing)	Class 1	
31	Program LED solid (not flashing)	Class 1	
32	Simulation LED solid (not flashing)	Class 1	
33	Alarm relay LED solid (not flashing)	Class 1	
34	Self test LED solid (not flashing)	Class 1	
35	Alarm active: phase undercurrent	Class 1	
36	Alarm active: phase overcurrent	Class 1	
37	Alarm active: neutral overcurrent	Class 1	
38	Alarm active: undervoltage	Class 1	
39	Alarm active: overvoltage	Class 1	
40	Alarm active: current unbalance	Class 1	

Note 1: This point is also reflected in the corresponding internal indication (IIN) bit in each response header.

POINT LIST FOR: BINARY INPUT (OBJECT 01) / BINARY INPUT CHANGE (OBJECT 02) (Continued)			
INDEX	**DESCRIPTION**	**EVENT CLASS ASSIGNED TO**	**NOTES**
41	Alarm active: voltage unbalance	Class 1	
42	Alarm active: voltage phase reversal	Class 1	
43	Alarm active: power factor lead alarm 1	Class 1	
44	Alarm active: power factor lead alarm 2	Class 1	
45	Alarm active: power factor lag alarm 1	Class 1	
46	Alarm active: power factor lag alarm 2	Class 1	
47	Alarm active: positive real power	Class 1	
48	Alarm active: negative real power	Class 1	
49	Alarm active: positive reactive power	Class 1	
50	Alarm active: negative reactive power	Class 1	
51	Alarm active: underfrequency	Class 1	
52	Alarm active: overfrequency	Class 1	
53	Alarm active: real power demand	Class 1	
54	Alarm active: reactive power demand	Class 1	
55	Alarm active: apparent power demand	Class 1	
56	Alarm active: phase A current demand	Class 1	
57	Alarm active: phase B current demand	Class 1	
58	Alarm active: phase C current demand	Class 1	
59	Alarm active: Neutral demand	Class 1	
60	Alarm active: switch A	Class 1	
61	Alarm active: switch B	Class 1	
62	Alarm active: switch C	Class 1	
63	Alarm active: switch D	Class 1	
64	Alarm active: internal fault	Class 1	
65	Alarm active: serial COM1 failure	Class 1	
66	Alarm active: serial COM2 failure	Class 1	
67	Alarm active: clock not set	Class 1	
68	Alarm active: parameters not set	Class 1	
69	Alarm active: Pulse input 1	Class 1	
70	Alarm active: current THD	Class 1	
71	Alarm active: voltage THD	Class 1	
72	Alarm active: analog input main	Class 1	
73	Alarm active: analog input alt	Class 1	
74	Alarm active: data log 1	Class 1	
75	Alarm active: data log 2	Class 1	
76	Alarm active: Negative real demand	Class 1	
77	Alarm active: Negative reactive demand	Class 1	
78	Alarm active: Pulse input 2	Class 1	
79	Alarm active: Pulse input 3	Class 1	
80	Alarm active: Pulse input 4	Class 1	
81	Alarm active: Pulse input total	Class 1	
82	Alarm active: Time	Class 1	

Note 1: This point is also reflected in the corresponding internal indication (IIN) bit in each response header.

8.1.6 BINARY OUTPUT / CONTROL RELAY OUTPUT POINT LIST

POINT LIST FOR: BINARY OUTPUT (OBJECT 10) CONTROL RELAY OUTPUT BLOCK (OBJECT 12)	
INDEX	**DESCRIPTION**
0	Reset
1	Alarm relay on
2	Alarm relay off
3	Auxiliary relay 1 on
4	Auxiliary relay 1 off
5	Auxiliary relay 2 on
6	Auxiliary relay 2 off
7	Auxiliary relay 3 on
8	Auxiliary relay 3 off
9	Display 40 character flash message for 5 seconds (next to useless at the moment, since you have to set up the display message using Modbus)
10	Clear energy values
11	Clear max. demand values
12	Clear min./max current values
13	Clear min./max voltage values
14	Clear min./max power values
15	Clear max. THD values
16	Clear switch input pulse count
17	Clear event record
18	Simulate “SETPOINT” keypress
19	Simulate “ACTUAL” keypress
20	Simulate “RESET” keypress
21	Simulate “STORE” keypress
22	Simulate “MESSAGE UP” keypress
23	Simulate “MESSAGE DOWN” keypress
24	Simulate “MESSAGE LEFT” keypress
25	Simulate “MESSAGE RIGHT” keypress
26	Simulate “VALUE UP” keypress
27	Simulate “VALUE DOWN” keypress

The following restrictions should be observed when using object 12 to control the points listed in the following table.

1. The **Count** field is checked first. If it is zero, the command will be accepted but no action will be taken. If this field is non-zero, the command will be executed exactly once regardless of its value.
2. The **Control Code** field of object 12 is then inspected:

- A NUL Code will cause the command to be accepted without any action being taken.
- A Code of “Pulse On” (1) is valid for all points. This is used to activate the function (e.g., Reset) associated with the point.
- All other Codes are invalid and will be rejected.
- The Queue, Clear, and Trip/Close sub-fields are ignored.

3. The **On Time** and **Off Time** fields are ignored. A ”Pulse On” Code takes effect immediately when received. Thus, the timing is irrelevant.
4. The **Status** field in the response will reflect the success or failure of the control attempt thus:

- 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** field 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 in response to a “Latch On” or “Latch Off” command

5. An operate of the Reset, alarm relay on/off or Aux Relay 1-3 on/off points may fail (even if the command is accepted) due to other inputs or conditions (e.g., alarm conditions) existing at the time. To verify the success or failure of an operate of these points it is necessary that the associated Binary Input(s) be examined after the control attempt is performed.
6. When using object 10 to read the status of a Binary Output, a read will always return zero.

8.1.7 POINT LIST FOR ANALOG INPUT/OUTPUT CHANGE

In the following table, the entry in the “Format” column indicates that the format of the associated data point can be determined by looking up the entry in Table 7–11: MEMORY MAP DATA FORMATS on page 7–55. For example, an “F1” format is described in that table as a (16-bit) unsigned value without any decimal places. Therefore, the value read should be interpreted in this manner

Table 8–1: POINT LIST FOR ANALOG INPUT/OUTPUT CHANGE (Sheet 1 of 5)

POINT	MOBUS REG	DESCRIPTION	UNIT / VALUE	DEADBAND	FORMAT CODE	EVENT CLASS ASSIGNED TO
1	1050	Phase CT Primary setpoint [1]	amps	1 unit	F1	3
2	1052	Neutral CT Primary setpoint [1]	amps	1 unit	F1	3
3	1054	VT Ratio setpoint [2]	0.1 x ratio	1 unit	F1	3
4	1055	VT Nominal Secondary Voltage setpoint	volts	1 unit	F1	3
5	-	VT Nominal Phase-to-Phase Voltage [3] (VT Ratio x Nominal Sec. adjusted for wye or delta)	32-bit volts	1 unit	F3	3
6	-	VT Nominal Phase-to-Neutral Voltage (VT Ratio x Nominal Sec. adjusted for wye or delta)	32-bit volts	1 unit	F3	3
7	-	Nominal Single-Phase VA[4] (VT Nominal Pri. x Phase CT Pri.)	32-bit VA	1 unit	F3	3
8	-	Nominal Three-Phase VA (VT Nominal Pri. x Phase CT Pri. x 3)	32-bit VA	1 unit	F3	3
9	0240	Phase A Current	1000ths of nominal A	20 units	F1	1
10	0241	Phase B Current	1000ths of nominal	20 units	F1	1
11	0242	Phase C Current	1000ths of nominal	20 units	F1	1
12	0243	Average Current	1000ths of nominal	20 units	F1	1
13	0244	Neutral Current	1000ths of nominal	20 units	F1	1
14	0245	Current Unbalance	tenths of 1 percent	10 units	F1	2
15	0280	Voltage Van	1000ths of nominal V	20 units	F3	1
16	0282	Voltage Vbn	1000ths of nominal V	20 units	F3	1
17	0284	Voltage Vcn	1000ths of nominal V	20 units	F3	1
18	0286	Average Phase Voltage	1000ths of nominal V	20 units	F3	1
19	0288	Voltage Vab	1000ths of nominal V	20 units	F3	1
20	028A	Voltage Vbc	1000ths of nominal V	20 units	F3	1
21	028C	Voltage Vca	1000ths of nominal V	20 units	F3	1
22	028E	Average Line Voltage	1000ths of nominal	20 units	F3	1
23	0290	Voltage Unbalance	0.1 x %	10 units	F1	2
24	02F0	3 Phase Real Power	1000ths of nominal VA	20 units	F4	2
25	02F2	3 Phase Reactive Power	1000ths of nominal VA	20 units	F4	2
26	02F4	3 Phase Apparent Power	1000ths of nominal VA	20 units	F3	2

see footnote explanations at the end of the table

Table 8–1: POINT LIST FOR ANALOG INPUT/OUTPUT CHANGE (Sheet 2 of 5)

POINT	MOBUS REG	DESCRIPTION	UNIT / VALUE	DEADBAND	FORMAT CODE	EVENT CLASS ASSIGNED TO
27	02F6	3 Phase Power Factor	%	5 units	F2	2
28	02F7	Phase A Real Power	1000ths of nominal	20 units	F4	3
29	02F9	Phase A Reactive Power	1000ths of nominal	20 units	F4	3
30	02FB	Phase A Apparent Power	1000ths of nominal	20 units	F3	3
31	02FD	Phase A Power Factor	%	5 units	F2	3
32	02FE	Phase B Real Power	1000ths of nominal	20 units	F4	3
33	0300	Phase B Reactive Power	1000ths of nominal	20 units	F4	3
34	0302	Phase B Apparent Power	1000ths of nominal	20 units	F3	3
35	0304	Phase B Power Factor	%	5 units	F2	3
36	0305	Phase C Real Power	1000ths of nominal	20 units	F4	3
37	0307	Phase C Reactive Power	1000ths of nominal	20 units	F4	3
38	0309	Phase C Apparent Power	1000ths of nominal	20 units	F3	3
39	030B	Phase C Power Factor	%	5 units	F2	3
40	0400	Phase A Current Demand	1000ths of nominal	20 units	F1	3
41	0401	Phase B Current Demand	1000ths of nominal	20 units	F1	3
42	0402	Phase C Current Demand	1000ths of nominal	20 units	F1	3
43	0403	Neutral Current Demand	1000ths of nominal	20 units	F1	3
44	0404	3 Phase Real Power Demand	1000ths of nominal	20 units	F4	3
45	0406	3 Phase React Power Demand	1000ths of nominal	20 units	F4	3
46	0408	3 Phase Apparent Power Demand	1000ths of nominal	20 units	F3	3
47	0440	Frequency	0.01x Hz	.05 Hz	F1	1
48	0458	Main/Alternate Analog Input	Unit varies -- 32 bits	10	F3	2
49	0470	Ia Crest Factor	0.001 x CF	-	F1	-
50	0471	Ib Crest Factor	0.001 x CF	-	F1	-
51	0472	Ic Crest Factor	0.001 x CF	-	F1	-
52	0473	Ia Transformer Harmonic Derating Factor	0.01 x THDF	-	F1	-
53	0474	Ib Transformer Harmonic Derating Factor	0.01 x THDF	-	F1	-
54	0475	Ic Transformer Harmonic Derating Factor	0.01 x THDF	-	F1	-
55	0478	Phase A Current THD	0.1 x %	5.0%	F1	3
56	0479	Phase B Current THD	0.1 x %	5.0%	F1	3
57	047A	Phase C Current THD	0.1 x %	5.0%	F1	3
58	047B	Neutral Current THD	0.1 x %	5.0%	F1	3
59	047C	Voltage Van THD	0.1 x %	5.0%	F1	3
60	047D	Voltage Vbn THD	0.1 x %	5.0%	F1	3
61	047E	Voltage Vcn THD	0.1 x %	5.0%	F1	3
62	047F	Voltage Vab THD	0.1 x %	5.0%	F1	3

see footnote explanations at the end of the table

Table 8–1: POINT LIST FOR ANALOG INPUT/OUTPUT CHANGE (Sheet 3 of 5)

POINT	MOBUS REG	DESCRIPTION	UNIT / VALUE	DEADBAND	FORMAT CODE	EVENT CLASS ASSIGNED TO
63	0480	Voltage Vbc THD	0.1 x %	5.0%	F1	3
64	0481	Voltage Vca THD	0.1 x %	5.0%	F1	3
65	04B4	Average Current THD	0.1 x %	5.0%	F1	3
66	04B5	Average Voltage THD	0.1 x %	5.0%	F1	3
67	0246	Phase A Current - Minimum	1000ths of nominal A	1 unit	F1	3
68	0247	Phase B Current - Minimum	1000ths of nominal A	1 unit	F1	3
69	0248	Phase C Current - Minimum	1000ths of nominal A	1 unit	F1	3
70	0249	Neutral Current - Minimum	1000ths of nominal A	1 unit	F1	3
71	024A	Current Unbalance - Minimum	tenths of 1 percent	1 unit	F1	3
72	024B	Phase A Current - Maximum	1000ths of nominal A	1 unit	F1	3
73	024C	Phase B Current - Maximum	1000ths of nominal A	1 unit	F1	3
74	024D	Phase C Current - Maximum	1000ths of nominal A	1 unit	F1	3
75	024E	Neutral Current - Maximum	1000ths of nominal A	1 unit	F1	3
76	024F	Current Unbalance - Maximum	tenths of 1 percent	1 unit	F1	3
77	0291	Voltage Van - Minimum	1000ths of nominal V	1 unit	F3	3
78	0293	Voltage Vbn - Minimum	1000ths of nominal V	1 unit	F3	3
79	0295	Voltage Vcn - Minimum	1000ths of nominal V	1 unit	F3	3
80	0297	Voltage Vab - Minimum	1000ths of nominal V	1 unit	F3	3
81	0299	Voltage Vbc - Minimum	1000ths of nominal V	1 unit	F3	3
82	029B	Voltage Vca - Minimum	1000ths of nominal V	1 unit	F3	3
83	029D	Voltage Unbalance - Minimum	0.1 x %	1 unit	F1	3
84	029E	Voltage Van - Maximum	1000ths of nominal V	1 unit	F3	3
85	02A0	Voltage Vbn - Maximum	1000ths of nominal V	1 unit	F3	3
86	02A2	Voltage Vcn - Maximum	1000ths of nominal V	1 unit	F3	3
87	02A4	Voltage Vab - Maximum	1000ths of nominal V	1 unit	F3	3
88	02A6	Voltage Vbc - Maximum	1000ths of nominal V	1 unit	F3	3
89	02A8	Voltage Vca - Maximum	1000ths of nominal V	1 unit	F3	3
90	02AA	Voltage Unbalance - Maximum	0.1 x %	1 unit	F1	3
91	030C	3 Phase Real Power - Minimum	1000ths of nominal W	1 unit	F4	3
92	030E	3 Phase Reactive Power Minimum	1000ths of nominal kvar	1 unit	F4	3
93	0310	3 Phase Apparent Power Minimum	1000ths of nominal VA	1 unit	F3	3
94	0312	3 Phase Power Factor - Minimum	%	1 unit	F2	3
95	0313	3 Phase Real Power - Maximum	1000ths of nominal	1 unit	F4	3
96	0315	3 Phase Reactive Power Maximum	1000ths of nominal	1 unit	F4	3
97	0317	3 Phase Apparent Power Maximum	1000ths of nominal	1 unit	F3	3
98	0319	3 Phase Power Factor - Maximum	%	1 unit	F2	3
99	031A	Phase A Real Power - Minimum	1000ths of nominal	1 unit	F4	3

see footnote explanations at the end of the table

Table 8–1: POINT LIST FOR ANALOG INPUT/OUTPUT CHANGE (Sheet 4 of 5)

POINT	MOBUS REG	DESCRIPTION	UNIT / VALUE	DEADBAND	FORMAT CODE	EVENT CLASS ASSIGNED TO
100	031C	Phase A Reactive Power Minimum	1000ths of nominal	1 unit	F4	3
101	031E	Phase A Apparent Power Minimum	1000ths of nominal	1 unit	F3	3
102	0220	Phase A Power Factor - Minimum	%	1 unit	F2	3
103	0321	Phase A Real Power - Maximum	1000ths of nominal	1 unit	F4	3
104	0323	Phase A Reactive Power Maximum	1000ths of nominal	1 unit	F4	3
105	0325	Phase A Apparent Power Maximum	1000ths of nominal	1 unit	F3	3
106	0327	Phase A Power Factor Maximum	%	1 unit	F2	3
107	0328	Phase B Real Power Minimum	1000ths of nominal	1 unit	F4	3
108	032A	Phase B Reactive Power Minimum	1000ths of nominal	1 unit	F4	3
109	032C	Phase B Apparent Power Minimum	1000ths of nominal	1 unit	F3	3
110	032E	Phase B Power Factor Minimum	%	1 unit	F2	3
111	032F	Phase B Real Power Maximum	1000ths of nominal	1 unit	F4	3
112	0331	Phase B Reactive Power Maximum	1000ths of nominal	1 unit	F4	3
113	0333	Phase B Apparent Power Maximum	1000ths of nominal	1 unit	F3	3
114	0335	Phase B Power Factor Maximum	%	1 unit	F2	3
115	0336	Phase C Real Power Minimum	1000ths of nominal	1 unit	F4	3
116	0338	Phase C Reactive Power Minimum	1000ths of nominal	1 unit	F4	3
117	033A	Phase C Apparent Power - Minimum	1000ths of nominal	1 unit	F3	3
118	033C	Phase C Power Factor Minimum	%	1 unit	F2	3
119	033D	Phase C Real Power Maximum	1000ths of nominal	1 unit	F4	3
120	033F	Phase C Reactive Power Maximum	1000ths of nominal	1 unit	F4	3
121	0341	Phase C Apparent Power Maximum	1000ths of nominal	1 unit	F3	3
122	0343	Phase C Power Factor Maximum	%	1 unit	F2	3
123	040A	Phase A Current Demand Maximum	1000ths of nominal	1 unit	F1	3
124	040B	Phase B Current Demand Maximum	1000ths of nominal	1 unit	F1	3
125	040C	Phase C Current Demand Maximum	1000ths of nominal	1 unit	F1	3
126	040D	Neutral Current Demand Maximum	1000ths of nominal	1 unit	F1	3
127	040E	3 Phase Real Power Dmd Max	1000ths of nominal	1 unit	F4	3
128	0410	3 Phase React Power Dmd Max	1000ths of nominal	1 unit	F4	3
129	0412	3 Phase Apparent Power Dmd Max	1000ths of nominal	1 unit	F3	3
130	0441	Frequency Minimum	0.01x Hz	.01 Hz	F1	3
131	0442	Frequency Maximum	0.01x Hz	.01 Hz	F1	3
132	0482	Phase A Current THD - Maximum	0.1 x %	1 unit	F1	3
133	0483	Phase B Current THD - Maximum	0.1 x %	1 unit	F1	3
134	0484	Phase C Current THD - Maximum	0.1 x %	1 unit	F1	3
135	0485	Neutral Current THD - Maximum	0.1 x %	1 unit	F1	3
136	0486	Voltage Van THD - Maximum	0.1 x %	1 unit	F1	3

see footnote explanations at the end of the table

Table 8–1: POINT LIST FOR ANALOG INPUT/OUTPUT CHANGE (Sheet 5 of 5)

POINT	MOBUS REG	DESCRIPTION	UNIT / VALUE	DEADBAND	FORMAT CODE	EVENT CLASS ASSIGNED TO
137	0487	Voltage Vbn THD - Maximum	0.1 x %	1 unit	F1	3
138	0488	Voltage Vcn THD - Maximum	0.1 x %	1 unit	F1	3
139	0489	Voltage Vab THD - Maximum	0.1 x %	1 unit	F1	3
140	048A	Voltage Vbc THD - Maximum	0.1 x %	1 unit	F1	3
141	048B	Voltage Vca THD - Maximum	0.1 x %	1 unit	F1	3
142	04C8	ADC Reference	-	20 units	F1	2
143	04C9	Power Loss Fine Time	10 ms	1 unit	F1	2
144	04CA	Power Loss Coarse Time	0.1 min.	1 unit	F1	2
145	04CB	Current Key Press	-	1 unit	F8[5]	2
146	04CC	Internal Fault Error Code	-	1 unit	F108	2
147	0000	Multilin Product Device Code	always 65	-	F1	-
148	0001	Hardware Version Code	-	-	F5	-
149	0002	Main Software Version Code	-	-	F1	-
150	0003	Modification File Number 1	-	-	F1	-
151	0004	Boot Software Version Code	-	-	F1	-
152	0005	Supervisor Processor Version Code	-	-	F1	-
153	0007	Modification File Number 2	-	-	F1	-
154	0008	Modification File Number 3	-	-	F1	-
155	0009	Modification File Number 4	-	-	F1	-
156	000A	Modification File Number 5	-	-	F1	-
157	0020	Serial Number Character 1 and 2	-	-	F10	-
158	0021	Serial Number Character 3 and 4	-	-	F10	-
159	0022	Serial Number Character 5 and 6	-	-	F10	-
160	0023	Serial Number Character 7 and 8	-	-	F10	-
161	0030	Manufacture Month/Day	-	-	F24	-
162	0031	Manufacture Year	-	-	F25	-
163	0032	Calibration Month/Day	-	-	F24	-
164	0033	Calibration Year	-	-	F25	-

see footnote explanations at the end of the table

1. This point is used to reconstruct neutral current values from the 1,000ths per-unit quantities given in the other points. Multiply the particular point by this one, and divide by 1000 to get amps.
2. The VT Ratio setpoint is always reported, but is not used if a direct (i.e., without VTs) voltage wiring scheme is configured. In this case the VT Ratio setpoint is ignored, and a ratio of 1.0:1 is used in the PQM.
3. This point is used to reconstruct voltage values from the 1,000ths per-unit quantities given in the other points. Multiply the particular point by this one, and divide by 1000 to get volts. Since some SCADA systems don't read 32 bit values, you can also multiply the VT ratio and nominal secondary (both of which are 16 bit) in the master in cases where the nominal primary may exceed 32767 volts.
4. This point is used to reconstruct power values from the 1,000ths per-unit quantities given in the other points. Multiply the particular point by this one, and divide by 1000 to get VA, kW or kvar.
5. In Modbus, the current keypress is reported with format code F6. In order to fit the value into a sixteen-bit signed value, F8 is used in DNP, with ASCII zero (49 decimal) returned when no key is pressed.

8.1.8 POINT LIST FOR COUNTERS

Point list for: Binary Counters (object 20)
Frozen Counters (object 21)
Counter Change Event (object 22)
Frozen Counter Events (object 23)

Point Num	Modbus Register	Description	Unit	Deadband	Format code	Event class point assigned to
0	0450	Pulse Input 1	-	-	F3	-
1	0452	Pulse Input 2	-	-	F3	-
2	0454	Pulse Input 3	-	-	F3	-
3	0456	Pulse Input 4	-	-	F3	-
4	0460	Totalized Pulse Input	-	-	F3	-
5	03D0	3 Phase Positive Real Energy Used	kWh	-	F3	-
6	03D2	3 Phase Negative Real Energy Used	kWh	-	F3	-
7	03D4	3 Phase Positive React. Energy Used	kvarh	-	F3	-
8	03D6	3 Phase Negative React. Energy Used	kvarh	-	F3	-
9	03D8	3 Phase Apparent Energy Used	kVAh	-	F3	-
10	03DA	3 Phase Energy Used in Last 24 h	kWh	-	F3	-
11	03DC	3 Phase Energy Cost Since Reset	cents	-	F3	-
12	03DE	3 Phase Energy Cost Per Day	cents	-	F3	-

NOTE

Only counter points 0 to 4 can be cleared using function codes 9 and 10, and doing so disturbs the totals presented on the display and via Modbus communications. In general, the binary output points which clear data should be used if it is necessary to clear any of these counters.