



Acuvim II Series Power Meter DNP3.0 (Distributed Network Protocol) User's Manual



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Please read this manual carefully before installation, operation and maintenance of the AcuRev 1310 series meter. The following symbols in this manual are used to provide warning of danger or risk during the installation and operation of the meters.



Electric Shock Symbol: Carries information about procedures which must be followed to reduce the risk of electric shock and danger to personal health.



Safety Alert Symbol: Carries information about circumstances which if not considered may result in injury or death.

Prior to maintenance and repair, the equipment must be de-energized and grounded. All maintenance work must be performed by qualified, competent accredited professionals who have received formal training and have experience with high voltage and current devices. Accuenergy shall not be responsible or liable for any damages or injuries caused by improper meter installation and/or operation.

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1. Overview

Structure Model

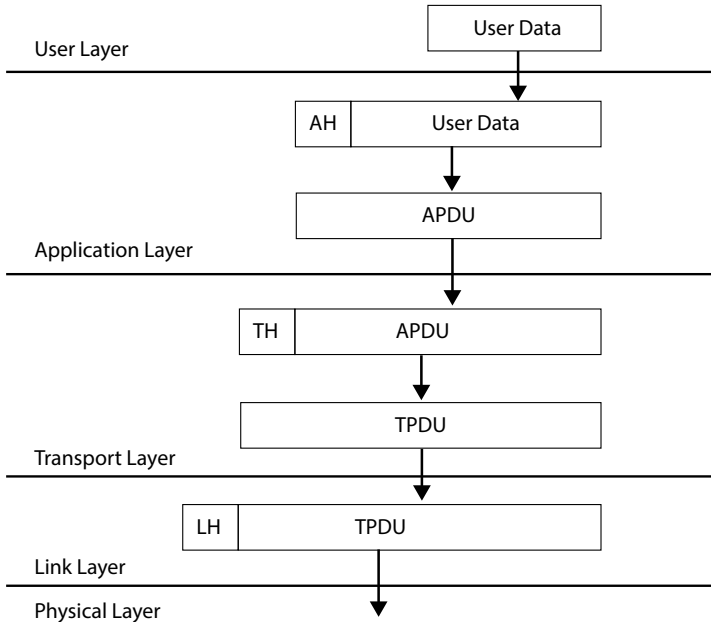


Figure 1: Each Layer of the relationship between the data unit

This document describes the DNP V3.00 communications protocol employed by Acuvim II Series Power Meter. This protocol can be selected for the serial communication port which can consist of RS232/RS485. It is assumed that the reader is familiar with the DNP V3.00 protocol and serial communications in general. This DNP3 is a reduced set of the Distributed Network Protocol Version 3.00, and it gives enough functionality to get critical measurement from the Acuvim II Series Power Meter. The DNP3 supports class0 object only. No event generation is supported. This DNP3 is always act as a slave device.

2. Physical Layer

The physical layer supported by DNP3 must transmit or receive data in serial mode. The data unit transferred will be 8 bits in length.

The port must be asynchronous half-duplex RS-485.

The data format supporting 8 bit data, 1 start bit, 1 stop bit, no parity.

The baud rate can be set to any supported value.

3. Data Link Layer

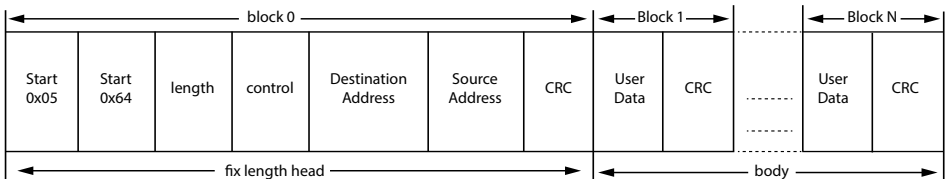
The Acuvim II Series Power Meter always acts as a Slave device .The device address can be set from 0 to 65534. The link layer comply with the stand FT3 frame format. The fixed length user data field is behind the fixed head. The link layer supports Reset Link, Reset User and Read Link Status. In order to ensure the stability of communication, it is recommended that you should better reset the link and reset the user before communicate with the Acuvim II Series Power Meter.

The function code supported as follows:

Reset Link (0X00), Reset User (0X01), Link Status (0X09).

FT3 Frame Format :

An FT3 frame is defined as a fixed length header block followed by optional data blocks. Each block has a 16-bit CRC appended to it. The header fields consist of 2 start octets, 1 octet length, 1 octet control, a destination address, a source address and a 16-bit CRC appended to it.



4. Transport Layer

The pseudo-transport layer segments application layer messages into multiple data link frames. For each frame, it inserts a single byte function code that indicates if the data link frame is the first frame of the message, the last frame of a message, or both (for single frame messages). The function code also includes a rolling frame sequence number which increments with each frame and allows the receiving transport layer to detect dropped frames.

5. Application Layer

The Acuvim II Series Power Meter implementation supports a subset of the objects and application layer function codes. The Acuvim II Series Power Meter will neither accept nor send multiple fragment application layer messages. The Acuvim II Series Power Meter's fragment size is fixed at 2k bytes.

Each application layer fragment begins with an application layer header followed by one object header or object header and data combinations. The application layer header contains an application control code and an application function code. The application control code contains an indication if the fragment is one of a multi-fragment message, contains an indication if an application layer confirmation is requested for the fragment, contains an indication if the fragment was unsolicited, and contains a rolling application layer sequence number. The application layer sequence number allows the receiving application layer to detect fragments that are out of sequence, or dropped fragments.

In the Acuvim II Series Power Meter, the Dnp3 supports the **Read** function, the **Direct Operate** function and the **Direct Operate Unconfirmed** function.

- **The Read function (0X01)**

The read function is the basic code used for requesting data objects from an Outstation. Here this function is used for reading the measurement data from the Power Meter. Learning more about the measurement data, please refer to the Data Address Table. In this function, the qualifier could be selected contain **0X00, 0X01, 0X06**.

The qualifier **0X00** refers that there two bytes called Range followed by, one is the start address want to request, the second is the stop address, this Range would be from 0 to 255.

The qualifier **0X01** indicates that the followed Range there are four bytes, the first two is the Start Address want to be request, the last two is the Stop Address, the two bytes consist of two 8-bit binary number , the low byte first, that the address Range would be from 0 to 65535.

The qualifier **0X06** means read All data from the object with its respective variations which would be list in the queue.

More about the message please see Message Layout, the detailed examples.

- **The Direct Operate function (0X05)**

The function is selects and sets or operates the specified outputs, the status of the control points will be responded. Here this function is intended for resetting the energy counters and the demand counters. These actions are mapped to Objects 12 Variations 1, point 1 and point 2, there are seen as a control relay. The relay must be operated On in 0 millisecond , and released Off in 1 millisecond .The qualifiers 0X17 and 0X28 are supported for writing the energy reset and demand reset. The examples will be shown in Message Layout.

- **The Direct Operate function (0X06)**

The function is selects and sets or operates the specified outputs but do not send a response to the request. Here this function is intended for switching the DNP3 protocol to Modbus protocol using the same communication port. This switching is seen as a control relay mapped into Object 12 Variation 1 and point 0 in the Acuvim II series Power Meter. The relay must be operated with qualifier 0X17, code 3, count 0, with 0 millisecond On and 1millisecond Off. After sending the request the current communication port will be changed to the Modbus protocol only. The example will be shown in the Message Layout.

6. Error Reply

When meet the can't recognize request , the unknown Object ,the unknown variation, the point unsupported, the unsupported function code , the unsupported qualifier, the unsupported range, the buffer overflow or any other exception error, an error reply will be generate from the Acuvim II series Power Meter to send to the requester station. The Internal Indicator field will reflect the type of error.

7. Profile

1) Device Function

Slave

2) Maximum Data Link Frame Size

Transmitted 292

Received 292

3) Maximum Application Fragment Size

Transmitted 2048

Received 2048

4) Transport Multi-Fragment

Supported

5) Data Link Layer Confirmation

Supported

6) Application Layer Confirmation

Supported

7) Application Layer Function

Request

Supported 0X01, Read

Qualifier, 0X00,0X01,0X06.

Response

Supported 129, Read Response

Qualifier, 0X00

Supported Error Internal Indicator Response

8) DATA OBJECT LIBRARY

a) ANALOG INPUT OBJECT 30

Variation: 3, 32-BIT ANALOG INPUT WITHOUT FLAG

Variation: 4, 16-BIT ANALOG INPUT WITHOUT FLAG

Variation 5, 32-BIT FLOAT WITH FLAG

b) COUNTER OBJECT DEFINITIONS 20

Variation: 5, 32-BIT COUNTER WITHOUT FLAG

c) ALTERNATE NUMERIC OBJECT 100

Variation: 1, SHORT FLOATING POINT

d) CONTROL RELAY OUTPUT BLOCK Object 12

Variation: 01, static digital output control

8. Data Address Table

Point Descriptions

The following tables describe the DNP V3.0 data objects provided by the Acuvim II series Power Meter. The object, variation, and point numbers are specified for each parameter, as well as the application layer function codes which may be used to operate on the parameter.

Description:

| | | | |
|--------|--|-----------|----------------------------------|
| Object | | Variation | 32-BIT ANALOG INPUT WITHOUT FLAG |
| 30 | | 3 | |
| Object | | Variation | 16-BIT ANALOG INPUT WITHOUT FLAG |
| 30 | | 4 | |
| Object | | Variation | 32-BIT FLOAT INPUT WITH FLAG |
| 30 | | 5 | |
| Object | | Variation | 32-BIT FLOAT INPUT WITH FLAG |
| 100 | | 1 | |
| Object | | Variation | 32-BIT COUNTER WITHOUT FLAG |
| 20 | | 5 | |
| Object | | Variation | CONTROL RELAY OUTPUT BLOCK |
| 12 | | 1 | |

Address Table:

| Object | Point | Variation | Name | Format | Range | Multiplier | Units | Description |
|--------|-------|-----------|----------|--------|-------|------------|-------|--------------------|
| 100 | 0 | 1 | Freq_rms | FLOAT | | 1.0 | Hz | Frequency |
| 100 | 1 | 1 | Ua_rms | FLOAT | | 1.0 | V | Voltage A |
| 100 | 2 | 1 | Ub_rms | FLOAT | | 1.0 | V | Voltage B |
| 100 | 3 | 1 | Uc_rms | FLOAT | | 1.0 | V | Voltage C |
| 100 | 4 | 1 | Uvag_rms | FLOAT | | 1.0 | V | Phrase Voltage Avg |
| 100 | 5 | 1 | Uab_rms | FLOAT | | 1.0 | V | Voltage A-B |
| 100 | 6 | 1 | Ubc_rms | FLOAT | | 1.0 | V | Voltage B-C |

| | | | | | | | | |
|-----|----|---|-----------|-------|--|-----|------|----------------------|
| 100 | 7 | 1 | Uca_rms | FLOAT | | 1.0 | A | Voltage C-A |
| 100 | 8 | 1 | Ulag_rms | FLOAT | | 1.0 | A | Line Voltage Avg. |
| 100 | 9 | 1 | Ia_rms | FLOAT | | 1.0 | A | Current A |
| 100 | 10 | 1 | Ib_rms | FLOAT | | 1.0 | A | Current B |
| 100 | 11 | 1 | Ic_rms | FLOAT | | 1.0 | A | Current C |
| 100 | 12 | 1 | Ivag_rms | FLOAT | | 1.0 | A | Current Average |
| 100 | 13 | 1 | In_rms | FLOAT | | 1.0 | A | Neutral Current |
| 100 | 14 | 1 | Pa_rms | FLOAT | | 1.0 | W | Pa |
| 100 | 15 | 1 | Pb_rms | FLOAT | | 1.0 | W | Pb |
| 100 | 16 | 1 | Pc_rms | FLOAT | | 1.0 | W | Pc |
| 100 | 17 | 1 | P_rms | FLOAT | | 1.0 | W | Total Active Power |
| 100 | 18 | 1 | Qa_rms | FLOAT | | 1.0 | var | Qa |
| 100 | 19 | 1 | Qb_rms | FLOAT | | 1.0 | var | Qb |
| 100 | 20 | 1 | Qc_rms | FLOAT | | 1.0 | var | Qc |
| 100 | 21 | 1 | Q_rms | FLOAT | | 1.0 | var | Total Reactive Power |
| 100 | 22 | 1 | Sa_rms | FLOAT | | 1.0 | VA | Sa |
| 100 | 23 | 1 | Sb_rms | FLOAT | | 1.0 | VA | Sb |
| 100 | 24 | 1 | Sc_rms | FLOAT | | 1.0 | VA | Sc |
| 100 | 25 | 1 | S_rms | FLOAT | | 1.0 | VA | Total Apparent Power |
| 100 | 26 | 1 | PFa_rms | FLOAT | | 1.0 | None | PFa |
| 100 | 27 | 1 | PFb_rms | FLOAT | | 1.0 | None | PFb |
| 100 | 28 | 1 | PFc_rms | FLOAT | | 1.0 | None | PFc |
| 100 | 29 | 1 | PF_rms | FLOAT | | 1.0 | None | Total Power Factor |
| 100 | 30 | 1 | Unbl_u2 | FLOAT | | 1.0 | None | Voltage Imbalance |
| 100 | 31 | 1 | Unbl_i2 | FLOAT | | 1.0 | None | Current Imbalance |
| 100 | 32 | 1 | Rlc_val | FLOAT | | 1.0 | None | Load Characteristics |
| 100 | 33 | 1 | P_dema | FLOAT | | 1.0 | W | P Demand |
| 100 | 34 | 1 | Q_dema | FLOAT | | 1.0 | var | Q Demand |
| 100 | 35 | 1 | S_dema | FLOAT | | 1.0 | VA | S Demand |
| 100 | 36 | 1 | Ia_Demand | FLOAT | | 1.0 | A | Ia Demand |
| 100 | 37 | 1 | Ib_Demand | FLOAT | | 1.0 | A | Ib Demand |
| 100 | 38 | 1 | Ic_Demand | FLOAT | | 1.0 | A | Ic Demand |

| Object | Point | Variation | Name | Format | Range | Multiplier | Units | Description |
|--------|-------|-----------|-----------------------|--------|-------------|------------|--------|----------------------|
| 20 | 0 | 5 | Active_Energy_IMP | UNIT32 | 0-999999999 | 0.1/0.001 | W hr | Active_Energy_IMP |
| 20 | 1 | 5 | Active_Energy_EXP | UNIT32 | 0-999999999 | 0.1/0.001 | W hr | Active_Energy_EXP |
| 20 | 2 | 5 | Reactive_Energy_IMP | UNIT32 | 0-999999999 | 0.1/0.001 | var hr | Reactive_Energy_IMP |
| 20 | 3 | 5 | Reactive_Energy_EXP | UNIT32 | 0-999999999 | 0.1/0.001 | var hr | Reactive_Energy_EXP |
| 20 | 4 | 5 | Active_Energy_TOTAL | UNIT32 | 0-999999999 | 0.1/0.001 | W hr | Active_Energy_TOTAL |
| 20 | 5 | 5 | Active_Energy_NET | UNIT32 | 0-999999999 | 0.1/0.001 | W hr | Active_Energy_NET |
| 20 | 6 | 5 | Reactive_Energy_TOTAL | UNIT32 | 0-999999999 | 0.1/0.001 | var hr | Reactive_EnergyTOTAL |
| 20 | 7 | 5 | Reactive_Energy_NET | UNIT32 | 0-999999999 | 0.1/0.001 | var hr | Reactive_Energy_NET |

| | | | | | | | | |
|----|----|---|-----------------|--------|--------------|-----------|-------|-----------------|
| 20 | 8 | 5 | Apparent_Energy | UNIT32 | 0-999999999 | 0.1/0.001 | VA hr | Apparent_Energy |
| 20 | 9 | 5 | DI1Count | UNIT32 | 0-4294967259 | 1 | None | DI1Count |
| 20 | 10 | 5 | DI2Count | UNIT32 | 0-4294967259 | 1 | None | DI2Count |
| 20 | 11 | 5 | DI3Count | UNIT32 | 0-4294967259 | 1 | None | DI3Count |
| 20 | 12 | 5 | DI4Count | UNIT32 | 0-4294967259 | 1 | None | DI4Count |
| 20 | 13 | 5 | DI5Count | UNIT32 | 0-4294967259 | 1 | None | DI5Count |
| 20 | 14 | 5 | DI6Count | UNIT32 | 0-4294967259 | 1 | None | DI6Count |
| 20 | 15 | 5 | DI7Count | UNIT32 | 0-4294967259 | 1 | None | DI7Count |
| 20 | 16 | 5 | DI8Count | UNIT32 | 0-4294967259 | 1 | None | DI8Count |
| 20 | 17 | 5 | DI9Count | UNIT32 | 0-4294967259 | 1 | None | DI9Count |
| 20 | 18 | 5 | DI10Count | UNIT32 | 0-4294967259 | 1 | None | DI10Count |
| 20 | 19 | 5 | DI11Count | UNIT32 | 0-4294967259 | 1 | None | DI11Count |
| 20 | 20 | 5 | DI12Count | UNIT32 | 0-4294967259 | 1 | None | DI12Count |
| 20 | 21 | 5 | DI13Count | UNIT32 | 0-4294967259 | 1 | None | DI13Count |
| 20 | 22 | 5 | DI14Count | UNIT32 | 0-4294967259 | 1 | None | DI14Count |
| 20 | 23 | 5 | DI15Count | UNIT32 | 0-4294967259 | 1 | None | DI15Count |
| 20 | 24 | 5 | DI16Count | UNIT32 | 0-4294967259 | 1 | None | DI16Count |
| 20 | 25 | 5 | DI17Count | UNIT32 | 0-4294967259 | 1 | None | DI17Count |
| 20 | 26 | 5 | DI18Count | UNIT32 | 0-4294967259 | 1 | None | DI18Count |
| 20 | 27 | 5 | DI19Count | UNIT32 | 0-4294967259 | 1 | None | DI19Count |
| 20 | 28 | 5 | DI20Count | UNIT32 | 0-4294967259 | 1 | None | DI20Count |
| 20 | 29 | 5 | DI21Count | UNIT32 | 0-4294967259 | 1 | None | DI21Count |
| 20 | 30 | 5 | DI22Count | UNIT32 | 0-4294967259 | 1 | None | DI22Count |
| 20 | 31 | 5 | DI23Count | UNIT32 | 0-4294967259 | 1 | None | DI23Count |
| 20 | 32 | 5 | DI24Count | UNIT32 | 0-4294967259 | 1 | None | DI24Count |
| 20 | 33 | 5 | DI25Count | UNIT32 | 0-4294967259 | 1 | None | DI25Count |
| 20 | 34 | 5 | DI26Count | UNIT32 | 0-4294967259 | 1 | None | DI26Count |
| 20 | 35 | 5 | DI27Count | UNIT32 | 0-4294967259 | 1 | None | DI27Count |
| 20 | 36 | 5 | DI28Count | UNIT32 | 0-4294967259 | 1 | None | DI28Count |

| Object | Point | Variation | Name | Format | Range | Multiplier | Units | Description |
|--------|-------|-----------|--------|--------|---------|------------|-------|-------------|
| 30 | 0 | 4 | THD_V1 | UINT16 | 0-10000 | 0.01 | None | THD_V1 |
| 30 | 1 | 4 | THD_V2 | UINT16 | 0-10000 | 0.01 | None | THD_V2 |
| 30 | 2 | 4 | THD_V3 | UINT16 | 0-10000 | 0.01 | None | THD_V3 |
| 30 | 3 | 4 | THD_V | UINT16 | 0-10000 | 0.01 | None | THD_V |
| 30 | 4 | 4 | THD_I1 | UINT16 | 0-10000 | 0.01 | None | THD_I1 |

| | | | | | | | | |
|----|---|---|--------|--------|---------|------|------|--------|
| 30 | 5 | 4 | THD_I2 | UINT16 | 0-10000 | 0.01 | None | THD_I2 |
| 30 | 6 | 4 | THD_I3 | UINT16 | 0-10000 | 0.01 | None | THD_I3 |
| 30 | 7 | 4 | THD_I | UINT16 | 0-10000 | 0.01 | None | THD_I |

| Object | Point | Variation | Name | Format | Range | Multiplier | Units | Description |
|--------|-------|-----------|-----------------------|--------|-------|------------|-------|---|
| 12 | 0 | 1 | DNP3_MODBUS | None | 1 | 1 | None | Responds to Function 6 (Direct Operate - No Ack), Qualifier Code 17x, Control Code 3, Count 0, On 0 msec. Off 1 msec ONLY |
| 12 | 1 | 1 | Reset_Energy_Counters | None | 1 | 1 | None | Responds to Function 5 (Direct Operate), Qualifier Code 17x or 28x, Control Code 3, Count 0, On 0 msec. Off 1 msec ONLY |
| 12 | 2 | 1 | Reset_Demand_Counters | None | 1 | 1 | None | Responds to Function 5 (Direct Operate), Qualifier Code 17x or 28x, Control Code 3, Count 0, On 0 msec. Off 1 msec ONLY |

9. DNP3 Message Layout

The following table is the abbreviation and explain.

| | |
|--------------|---|
| DestL | The destination address low byte |
| DestH | The destination address high byte |
| SorcL | The source address low byte |
| SorcH | The source address high byte |
| CrcL | The Cyclic Redundancy Checksum low byte |

| | |
|-------------|--|
| CrcH | The Cyclic Redundancy Checksum high byte |
| x | The transport layer data sequence num |
| y | The application layer data sequence num |
| I11 | The first byte of Internal Indicator |
| I12 | The second byte of Internal Indicator |

Link Layer Frames:

Reset Link:

| | | | | | | | | | | |
|----------|----|----|----|----|-------|-------|-------|-------|------|------|
| Request | 05 | 64 | 05 | C0 | DestL | DestH | SorCL | SorCH | CrcL | CrcH |
| Response | 05 | 64 | 05 | 00 | SorCL | SorCH | DestL | DestH | CrcL | CrcH |

Reset User:

| | | | | | | | | | | |
|----------|----|----|----|----|-------|-------|-------|-------|------|------|
| Request | 05 | 64 | 05 | C1 | DestL | DestH | SorCL | SorCH | CrcL | CrcH |
| Response | 05 | 64 | 05 | 00 | SorCL | SorCH | DestL | DestH | CrcL | CrcH |

Link Status:

| | | | | | | | | | | |
|----------|----|----|----|----|-------|-------|-------|-------|------|------|
| Request | 05 | 64 | 05 | C9 | DestL | DestH | SorCL | SorCH | CrcL | CrcH |
| Response | 05 | 64 | 05 | 0B | SorCL | SorCH | DestL | DestH | CrcL | CrcH |

Application Layer Frames:

Reset Energy:

| | | | | | | | | | | | | | | | | | | |
|---------------------|----|----|----|------|-------|-------|-------|-------|------|------|----|----|----|----|----|----|------|------|
| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Reset Energy | | | | | | | | | | | | | | | | | | |
| Request | 05 | 64 | 18 | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 05 | 0C | 01 | 17 | 01 | 01 | 03 | 00 | 00 | 00 | 00 | 00 | 01 | 00 | CrcL | CrcH |
| | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|-----|-------|-------|-------|-------|------|------|----|----|----|----|----|----|------|------|------|
| Response | 05 | 64 | 1A | 44 | SorCL | SorCH | DestL | DestH | CrcL | CrcH | | | | | | | | | |
| | Cx | Cy | 81 | 111 | 112 | 0C | 01 | 17 | 01 | 01 | 03 | 00 | 00 | 00 | 00 | 00 | CrcL | CrcH | |
| | 01 | 00 | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | | | | |
| Request | 05 | 64 | 1A | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | | |
| | Cx | Cy | 05 | 0C | 01 | 28 | 01 | 00 | 01 | 00 | 03 | 00 | 00 | 00 | 00 | 00 | 00 | CrcL | CrcH |
| | 01 | 00 | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | | | | |
| Response | 05 | 64 | 1C | 44 | SorCL | SorCH | DestL | DestH | CrcL | CrcH | | | | | | | | | |
| | Cx | Cy | 81 | 111 | 112 | 0C | 01 | 28 | 01 | 00 | 01 | 00 | 03 | 00 | 00 | 00 | 00 | CrcL | CrcH |
| | 00 | 00 | 01 | 00 | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | | |

Reset Demand:

| | | | | | | | | | | | | | | | | | | |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Reset Demand | | | | | | | | | | | | | | | | | | |
| Request | 05 | 64 | 18 | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 05 | 0C | 01 | 17 | 01 | 01 | 03 | 00 | 00 | 00 | 00 | 00 | 01 | 00 | CrcL | CrcH |
| | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | | | | | |
| Response | 05 | 64 | 1A | 44 | SorCL | SorCH | DestL | DestH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 81 | 111 | 112 | 0C | 01 | 17 | 01 | 02 | 03 | 00 | 00 | 00 | 00 | 00 | CrcL | CrcH |
| | 01 | 00 | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | | | |
| Request | 05 | 64 | 1A | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 05 | 0C | 01 | 28 | 01 | 00 | 02 | 00 | 03 | 00 | 00 | 00 | 00 | 00 | CrcL | CrcH |
| | 01 | 00 | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | | | |
| Response | 05 | 64 | 1C | 44 | SorCL | SorCH | DestL | DestH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 81 | 111 | 112 | 0C | 01 | 28 | 01 | 00 | 02 | 00 | 03 | 00 | 00 | 00 | CrcL | CrcH |
| | 00 | 00 | 01 | 00 | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | |

Switch to Modbus:

| | | | | | | | | | | | | | | | | | | |
|----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Request | 05 | 64 | 18 | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 06 | 0C | 01 | 17 | 01 | 00 | 03 | 00 | 00 | 00 | 00 | 00 | 01 | 00 | CrcL | CrcH |
| | 00 | 00 | 00 | CrcL | CrcH | | | | | | | | | | | | | |

Request Data:

Qualifier 0X06:

| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------|------|
| Reset Energy | 0X06 | | | | | | | | | | | | | | | | | |
| Request | 05 | 64 | 0B | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 01 | 1E | 04 | 06 | CrcL | CrcH | | | | | | | | | | |
| Response | 05 | 64 | 1F | 44 | SorCL | SorCH | DestL | DestH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 81 | 111 | 112 | 1E | 04 | 00 | 00 | 07 | Data0 L | Data0 H | Data1 L | Data1 H | Data2 L | Data2 H | CrcL | CrcH |
| | Data3 L | Data3 H | Data4 L | Data4 H | Data5 L | Data5 H | Data6 L | Data6 H | Data7 L | Data7 H | CrcL | CrcH | | | | | | |

Qualifier 0X00:

| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---------------------|------------|------------|------------|------------|-------|------------|------------|------------|------------|-------|------------|------------|------------|------------|------------|------------|------|------|
| Reset Energy | 0X00 | | | | | | | | | | | | | | | | | |
| Request | 05 | 64 | 0D | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 01 | 64 | 01 | 00 | 03 | 07 | CrcL | CrcH | | | | | | | | |
| Response | 05 | 64 | 28 | 44 | SorCL | SorCH | DestL | DestH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 81 | 111 | 112 | 64 | 01 | 00 | 03 | 07 | Flag3 | Data3 1 | Data3 2 | Data3 3 | Data3 4 | Flag4 | CrcL | CrcH |
| | Data4 1 | Data4 2 | Data4 3 | Data4 4 | Flag5 | Data5 1 | Data5 2 | Data5 3 | Data5 4 | Flag6 | Data6 1 | Data6 2 | Data6 3 | Data6 4 | Flag7 | Data7 1 | CrcL | CrcH |
| | Data7 2 | Data7 3 | Data7 4 | CrcL | CrcH | | | | | | | | | | | | | |

Qualifier 0X00:

| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---------------------|------|----|----|----|-------|-------|-------|-------|------|------|----|----|----|----|----|----|----|----|
| Reset Energy | 0X00 | | | | | | | | | | | | | | | | | |
| Request | 05 | 64 | 0D | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 01 | 14 | 05 | 00 | 03 | 07 | CrcL | CrcH | | | | | | | | |

| | | | | | | | | | | | | | | | | | | |
|-----------------|------------|------------|------------|------------|-------|-------|-------|-------|------|------|------------|------------|------------|------------|------------|------------|------|------|
| Response | 05 | 64 | 28 | 44 | SorCL | SorCH | DestL | DestH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 81 | II1 | II2 | 14 | 05 | 00 | 03 | 07 | Data3 L | Data3 H | Data4 L | Data4 H | Data5 L | Data5 H | CrcL | CrcH |
| | Data6 L | Data6 H | Data7 L | Data7 H | CrcL | CrcH | | | | | | | | | | | | |

Qualifier 0X01:

| | | | | | | | | | | | | | | | | | | |
|---------------------|-------------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------|-----------|
| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Reset Energy | 0X01 | | | | | | | | | | | | | | | | | |
| Request | 05 | 64 | 0F | C4 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 01 | 14 | 05 | 01 | 00 | 00 | 0A | 00 | CrcL | CrcH | | | | | | |
| Response | 05 | 64 | 3D | 44 | SorCL | SorCH | DestL | DestH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 81 | II1 | II2 | 14 | 05 | 01 | 00 | 00 | 0A | 00 | Data0 L | Data0 H | Data1 L | Data1 H | CrcL | CrcH |
| | Data2 L | Data2 H | Data3 L | Data3 H | Data4 L | Data4 H | Data5 L | Data5 H | Data6 L | Data6 H | Data7 L | Data7 H | Data8 L | Data8 H | Data9 L | Data9 H | CrcL | CrcH |
| | Data1 0L | Data1 0H | CrcL | CrcH | | | | | | | | | | | | | | |

Qualifier 0X01:

| | | | | | | | | | | | | | | | | | | |
|--------------------|----|----|----|-----|-------|-------|-------|-------|------|------|--|--|--|--|--|--|--|--|
| Error Reply | | | | | | | | | | | | | | | | | | |
| Response | 05 | 64 | 0A | 44 | DestL | DestH | SorCL | SorCH | CrcL | CrcH | | | | | | | | |
| | Cx | Cy | 81 | II1 | II2 | CrcL | CrcH | | | | | | | | | | | |



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