

STATIC ENERGY METER CONTO D4 Pd

Version 1.0

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1.0 INTRODUCTION

Logical level

The communication protocol used is MODBUS / JBUS compatible.
Up to 255 different instruments can be managed by the protocol.
The data are transmitted in a packet form (message) and are checked by a word (CRC).
There are no limitations to the number of possible retries done by the master.

Physical level

The physical communication line respects the EIA-RS485 standard in half-duplex modality.
In this case, as only two wires are used, only one instrument at a time can engage the line; this means that there must be a master which polls the slave instruments so the demand and the request are alternated.

On the same physical line only 32 instruments can be attached (master included). In order to increase the number of the slave instrument, the necessary repeaters must be used.

The communication parameters are :

speed : programmable
19200, 9600, 4800 Baud/s
bit n. : 8
stop bit : 1
parity : programmable

2.0 DATA PACKET DESCRIPTION

The generic data message is composed as following :

| | | | |
|--------------------|-----------------|------|----------|
| Instrument address | Functional code | Data | CRC word |
|--------------------|-----------------|------|----------|

Two answers are possible :

Answer containing data

| | | | |
|--------------------|-----------------|------|----------|
| Instrument address | Functional code | Data | CRC word |
|--------------------|-----------------|------|----------|

Error answer

| | | | |
|--------------------|---------------------------|------------|----------|
| Instrument address | Functional code + 0x80 | Error code | CRC word |
|--------------------|---------------------------|------------|----------|

2.1 Parameter description

Instrument address : instrument identification number in the network

It must be the same for the demand and the answer.

Format : 1 BYTE from 0 to 0xff

0 is for broadcast messages with no

answer

Functional code : command code

Used functional code :

Format : 1 BYTE

0x03 : reading of consecutive words

0x10 : writing of consecutive words

Data : they can be :

- the address of the required words (in the demand)
- the data (in the answer)

CRC word : it is the result of the calculation made on all the bytes

in the message

2.2 Data format

Three types of format are used for the data :

- * BYTE
- * WORD : two BYTES
- * long : two WORDS

The base data format is the WORD.

If the required data is in a BYTE format, a WORD with the MSB (Most Significant Byte) set to 0 is anyway transmitted and this BYTE comes before the LSB (Least Significant Byte).

If the required data is in a long format, 2 WORDS are transmitted and the MSW comes before the LSW.

Briefly :

| | | | |
|-----------------------|-----|------------------------|-----|
| MSB | LSB | MSB | LSB |
| Most Significant WORD | | Least Significant WORD | |

Example : 1000 = 0x 03 e8 or
0x 00 00 03 e8 (if long)

| | | | |
|------|------|------|------|
| MSB | LSB | MSB | LSB |
| 0x00 | 0x00 | 0x03 | 0xe8 |

All data are positive and the sign indications are reported in other variables.


```
    }  
  
    crc16 = (crc16 >> 8) | (crc16 << 8); /* LSB is  
exchanged with MSB */  
  
    return (crc16);  
  
} /* calc_crc */
```

2.4 Error management

If the received message is incorrect (CRC16 is wrong) the polled slave doesn't answer.

If the message is correct but there are errors (wrong functional code or data) and so it can't be accepted, the slave answers with an error message.

The error codes are defined in the following part of the document.

Timing

TIMING DIAGRAM FOR CONTO D4S COMMUNICATION

Where:

| TIME | DESCRIPTION | Min & Max VALUES |
|------|-------------|------------------|
|------|-------------|------------------|

| | | |
|----|---|------------------------------|
| T1 | Time between characters. If this time exceeds the max. time allowed, the message is not considered by device. | Max < 20 ms. |
| T2 | Slave response time Minimum and maximum response time of device to the Master request. | Min = 20 ms. Max = 300ms. |
| T3 | Time before a new message request from the Master | Min = 20 ms. |

3.0 COMMANDS

Code 0x03 : reading of one or more consecutive WORDS

Command format :

| BYTE | BYTE | MSB LSB | MSB LSB | MSB LSB |
|-----------------------|----------------|-----------------------|-----------------|------------|
| Instrument address | Funct. Code | First WORD address | WORDS number | CRC16 |

Answer format (containing data) :

| BYTE | BYTE | BYTE | MSB LSB | MSB LSB | MSB LSB |
|-----------------------|----------------|-----------------|-----------------|------------|------------|
| Instrument Address | Funct. Code | BYTES number | WORD 1 | WORD N. | CRC16 |

The BYTES number must always match the WORDS number (in the demand) * 2.

Answer format (the demand was wrong) :

| BYTE | BYTE | BYTE | MSB LSB |
|-----------------------|-----------------------|------------|------------|
| Instrument Address | Funct. Code + 0x80 | Error code | CRC16 |

Error codes :

- * 0x01 : incorrect functional code
- * 0x02 : wrong first WORD address
- * 0x03 : incorrect data

Code 0x10 : writining of more consecutive WORDS

Command format :

| BYTE | BYTE | MSB LSB | MSB LSB | BYTE | MSB LSB MSB LSB | MSB LSB |
|-------------------|----------------|--------------------------|-----------------|-----------------|--------------------------|------------|
| Instr. address | Funct. Code | First WORD address | WORDS number | BYTE numbers | Word Value | CRC16 |

Answer format (containing data) :

| | | | | | |
|-----------------------|----------------|-----------------|--------------------------|------------|------------|
| BYTE | BYTE | BYTE | MSB LSB | MSB LSB | MSB LSB |
| Instrument Address | Funct. Code | BYTES number | First WORD address | 00 00 | CRC16 |

The BYTES number must always match the WORDS number (in the demand) * 2.

Answer format (the demand was wrong) :

| | | | |
|-----------------------|-----------------------|------------|------------|
| BYTE | BYTE | BYTE | MSB LSB |
| Instrument Address | Funct. Code + 0x80 | Error code | CRC16 |

Error codes :

- * 0x01 : incorrect functional code
- * 0x02 : wrong first WORD address
- * 0x03 : incorrect data

4.0 VARIABLES

4.1 Data addresses

Both variables and groups of variables can be required.
All the variables with consecutive addresses can be required at one time.
The following is the table with the addresses and the meaning of the variables.

| Address | Read/Write | Format | Description |
|---------|------------|--------|-------------|
| HEX | DEC | | |
| 0x325 | 805 | R | Long |
| 0x329 | 809 | R | Long |

Energy
3-phase :
Total positive
active energy
3-phase :
Total positive
reactive
energy

| | | | | |
|-------|-----|--------------------|------|--|
| 0x32d | 813 | R/W ⁽¹⁾ | Long | 3-phase : Partial positive active energy |
| 0x331 | 817 | R/W ⁽¹⁾ | Long | 3-phase : Partial positive reactive energy |
| | | | | Average power |

Note 1: The only writable value is 0x0000000 in order to reset the stored value.
Different values won't have effect.

The following table must be used to retrieve all information of the real time measurements.

The user can poll on both tables without any more operation, just change the Modbus address in the protocol data message.

| Address | Byte n. | Description | Unit |
|---------|---------|---|-----------|
| 0x1000 | Long | Phase 1 : phase voltage | mV |
| 0x1002 | Long | Phase 2 : phase voltage | mV |
| 0x1004 | Long | Phase 3 : phase voltage | mV |
| 0x1006 | Long | Phase 1 : current | mA |
| 0x1008 | Long | Phase 2 : current | mA |
| 0x100a | Long | Phase 3 : current | mA |
| 0x100c | Long | 0 | |
| 0x100e | Long | Chained voltage : L1-L2 | mV |
| 0x1010 | Long | Chained voltage : L2-L3 | mV |
| 0x1012 | Long | Chained voltage : L3-L1 | mV |
| 0x1014 | Long | 3-phase : active power | W/100 |
| 0x1016 | Long | 3-phase : reactive power | W/100 |
| 0x1018 | Long | 3-phase : apparent power | W/100 |
| 0x101a | WORD | 3-phase : sign of active power | (2) |
| 0x101b | WORD | 3-phase : sign of reactive power | (2) |
| 0x101c | Long | 3-phase : total positive active energy | kWh/100 |
| 0x101e | Long | 3-phase : total positive reactive energy | kvarh/100 |
| 0x1020 | Long | For future use | |
| 0x1022 | Long | 0 | |
| 0x1024 | WORD | 3-phase : power factor | 1/100 |
| 0x1025 | WORD | 3-phase : sector of power factor (cap or ind) | (1) |
| 0x1026 | WORD | Frequency | Hz/10 |
| 0x1027 | Long | 3-phase : average power | W/100 |
| 0x1029 | Long | 3-phase : peak maximum demand | W/100 |
| 0x102b | WORD | Time counter for average power | minutes |
| 0x102c | Long | Phase 1 : active power | W/100 |
| 0x102e | Long | Phase 2 : active power | W/100 |
| 0x1030 | Long | Phase 3 : active power | W/100 |

| | | | |
|--------|------|--|-----------|
| 0x1032 | WORD | Phase 1 : sign of active power | (2) |
| 0x1033 | WORD | Phase 2 : sign of active power | (2) |
| 0x1034 | WORD | Phase 3 : sign of active power | (2) |
| 0x1035 | Long | Phase 1 : reactive power | var/100 |
| 0x1037 | Long | Phase 2 : reactive power | var/100 |
| 0x1039 | Long | Phase 3 : reactive power | var/100 |
| 0x103b | WORD | Phase 1 : sign of reactive power | (2) |
| 0x103c | WORD | Phase 2 : sign of reactive power | (2) |
| 0x103d | WORD | Phase 3 : sign of reactive power | (2) |
| 0x103e | Long | 3-phase : partial/second tariff positive active energy | kWh/100 |
| 0x1040 | Long | 3-phase : partial/second tariff positive reactive energy | kvarh/100 |
| 0x1042 | Long | 3-phase : second tariff peak maximum demand | W/100 |
| 0x1044 | Long | 0 | |
| 0x1046 | Long | 0 | |
| | | | |
| 0xC8 | WORD | Parameter reset | (3) |
| 0300 | WORD | Device identifier | 0x77 |

(1) -----

0 : PF = 0 or 1
1 : ind
2 : cap

(2) -----

0 : positive
1 : negative

(3) -----

WRITABLE ONLY

0x01 : reset partial active energy
0x02 : reset partial reactive energy
0x10 : reset Peak Maximum Demand tariff 1 (when selected)
0x20 : reset Peak Maximum Demand tariff 2 (when selected)

4.2 Variables description

Energy

Positive energy

Format : long

Measurement unit : Hundreds of kWh/kvarh

Average power

Average power

This is the power calculated with the shifting average algorithm. It is updated every minute.

Format : long

Measurement unit : W/100

Peak maximum demand

This is the power obtained as the maximum of the average powers and it is updated at the end of average period.

Format : long

Measurement unit : W/100

Operating time counter

Format : long

Measurement unit : min

Example

Demand of 4 WORDS (8 BYTES – 2 variables) starting from the address 0x0325 :

| BYTE | BYTE | MSB LSB | MSB LSB | MSB LSB |
|-----------------------------|-------------|--|-----------------------------------|----------------------|
| Instrum. address 0x01 | F.code 0x03 | 1 st WORD address 0x03 0x25 | WORDS number 0x00 0x04 | CRC16 0x55 0x86 |

Answer

| BYTE | BYTE | BYTE | MSB LSB | MSB LSB | MSB LSB | MSB LSB | MSB LSB |
|------|------|-------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------------------------|
| 0x01 | 0x03 | BYTES number 0x08 | WORD 1 0x00 0x00 | WORD 2 0x64 0x8c | WORD 3 0x00 0x00 | WORD 4 0x35 0x54 | CRC16 0x9a 0x83 |

In the above case, the information is :

WORD 1 ,WORD 2 : Total active energy 0x0000648C = 25740

WORD 3 ,WORD 4 : Total reactive energy 0x00003554 = 13652

COMMUNICATION PROTOCOL

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| Revisione C: | | | |
| Revisione D: | Compilato | Controllato | Approvato |

MASTER

REQUEST MESSAGE

NEXT REQUEST MESSAGE

BYTE 1

BYTE 2

BYTE n

SLAVE

BYTE 1

BYTE 2

BYTE n

RESPONSE MESSAGE

T1

T2

T3