

**CARLO GAVAZZI
CONTROLS**

WM14 AND CPT BASIC
Serial protocol
V3 R0

SERIAL COMMUNICATION PROTOCOL

WM14-DIN Basic
WM14-96 Basic
CPT-DIN Basic

Ver. 3 Rev. 0

17th March 2006

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1 COMMUNICATION PROTOCOL

1.1 INTRODUCTION

WM14 and CPT are provided with a RS485 serial interface. The serial communication protocol is MODBUS/JBUS.

The data format is fixed:

- 1 start bit
- 8 data bit
- 1 stop bit
- 9600 baud
- Parity: none

The host starts the communication, by sending the frame relevant to the query. Each frame is composed of 4 types of information:

- slave address: it is a number within the range from 1 to 255, which identifies each instrument connected to the network.
- function code (command): it defines the control type (reading of n words, writing of one word)
- data field: it defines the function parameters (e.g. address of the word to write, value of this word, etc.)
- control word (CRC): it is used to detect transmission errors that may occur.

The master calculates the CRC after defining address, function number and data field. When the slave receives the query, it stores it in a temporary buffer. After that, the CRC is calculated and compared with the one received. If the two CRC values are the same and the address is correct, the slave carries out the command and then sends back its reply.

The frame synchronisation is forced after a minimum time of 3 msec without communicating.

1.2 FUNCTIONS

Three functions are available on WM14 and CPT:

- Reading of n words (function 03)
- Reading of n words (function 04)
- Writing of one word (function 06) **(available only for C.G. Controls, except for the reset instructions)**

Note: The functions 03 and 04 have exactly the same effect.

The user is allowed to reset the peak values (Wdmdmax, Amax, Admdmax), the meters (energy meters and hourmeter) and the latch alarm. To carry out the reset a write command must be sent.

Pay attention to follow scrupulously the reset instructions and to send the exact frame, because a different write command could modify some calibration parameters, invalidating the accuracy of the measurements.

1.2.1 FUNCTIONS 03 AND 04

Query

| Address | Function * | Word address | | n° of words ** | | CRC | |
|---------------|------------|--------------|-----|----------------|-----|---------|-----|
| 1 byte | 1 byte | 2 bytes | | 2 bytes | | 2 bytes | |
| from 1 to 255 | 04 * | MSB | LSB | MSB | LSB | MSB | LSB |

Note: * The function code can be either 04 or 03

** The maximum number of words is 12

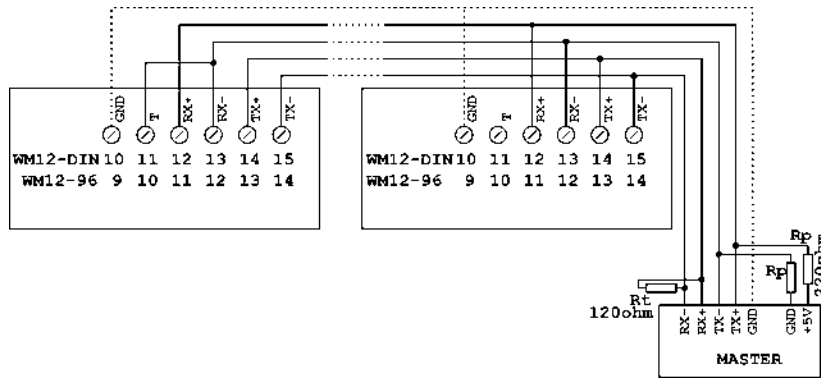
Reply

| Address | Function | n° bytes | Values | CRC | |
|---------------|----------|----------|----------|---------|-----|
| 1 byte | 1 byte | 1 byte | n° bytes | 2 bytes | |
| from 1 to 255 | 04 * | | *** | MSB | LSB |

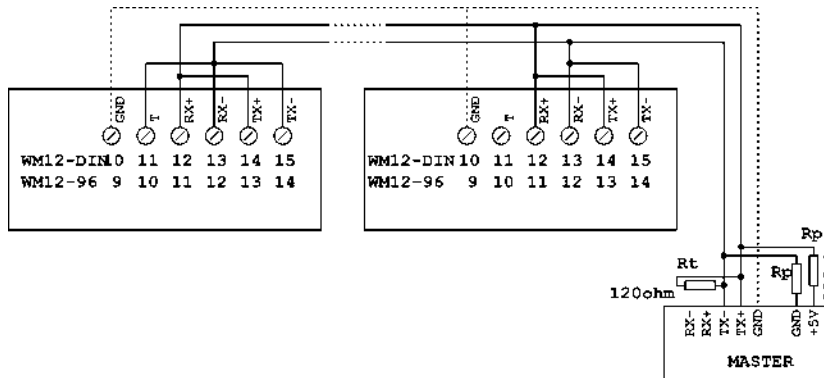
Note: *** The byte order is LSB-MSB if the “dat” parameter is “A” or MSB-LSB if it is “b”

1.3 WIRING DIAGRAMS

1.3.1 FOUR-WIRE CONNECTION



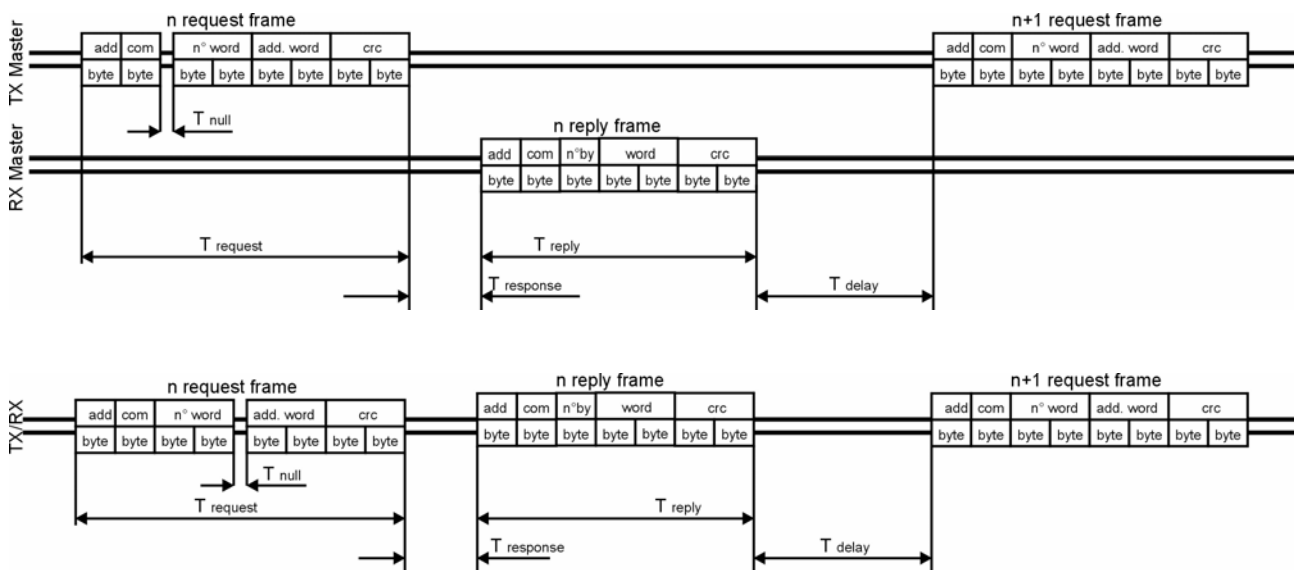
1.3.2 TWO-WIRE CONNECTION



Notes:

1. To avoid errors due to the signal reflections or line coupling, it is necessary to terminate the input of the last instrument on the network, and also the reception of the Host. If this is not enough, it is also possible to bias the Host transmission (in case of 2-wire connection, it is only possible to either terminate or bias the Host, not both). The termination on both the instrument and the host is necessary even in case of point-to-point connection, within short distances.
2. The GND connection is optional if a shielded cable is used.
3. For connections longer than 1000m, a line amplifier is necessary.

1.3.3 TIMING



| Timing characteristics of reading function, 4-wires/2-wires connections | msec |
|---|-------|
| T response: Max answering time | 300ms |
| T response: Typical answering time | 40ms |
| T delay: Minimum time for a new query | 10ms |
| T null: Max interruption time on the request frame | 2ms |

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1.3.4 APPLICATION NOTES

1. If an instrument does not answer within the “max answering time”, it is necessary to repeat the query. If the instrument does not answer after 2 or 3 consecutive queries, it must be considered as not connected, faulty or with wrong address. The same consideration is valid in case of CRC errors or incomplete frames.
2. By entering the programming mode (by pushing the “S” key) the communication is interrupted. Any data received during the programming mode are ignored.
3. The writing is allowed only for C.G. Controls internal and service use (except for the reset instructions).
4. For the timing calculation, please refer to the following formulae:

$$T_{request} = \frac{N^{\circ} bit}{Baud_rate} * 8$$

$$T_{reply} = \frac{N^{\circ} bit}{Baud_rate} * N^{\circ} char$$

$$TS = T_request + T_response + T_reply + T_delay1$$

$$TA = TS * N^{\circ} request$$

$$TM = (TS + Tdelay2) * N^{\circ} instruments$$

| | |
|---------------|---|
| N°bit | 10 |
| N°char | 5+N° Word*2 if function 04 o 03, 8 if function 06 |
| N°word | Number of words to be read in an instrument |
| TS | Execution time of one reading |
| Tdelay1 | Minimum time for new query on the same address |
| TA | Data acquiring time from one instrument |
| TM | Monitoring time of all the instruments |
| N°instruments | Number of instruments connected to the network. |
| Tdelay2 | Minimum time for new query on a different address |

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2 VARIABLE MAPPING

2.1 RAM MEMORY MAPPING

| ADDRESS | BYTES | VARIABLE | Type | ADDRESS | BYTES | VARIABLE | Type |
|---------|-------|---------------|------------|---------|-------|----------------------|------------|
| 0280h | 2 | V L1-N | VN | 02A6h | 2 | VA Σ | P Σ |
| 0282h | 2 | A L1 | A | 02A8h | 2 | var L1 | P |
| 0284h | 2 | W L1 | P | 02AAh | 2 | var L2 | P |
| 0286h | 2 | V L2-N | V | 02ACh | 2 | var L3 | P |
| 0288h | 2 | A L2 | A | 02AEh | 2 | var Σ | P Σ |
| 028Ah | 2 | W L2 | P | 02B0h | 2 | W dmd | P Σ |
| 028Ch | 2 | V L3-N | V | 02B2h | 2 | VA dmd | P Σ |
| 028Eh | 2 | A L3 | A | 02B4h | 2 | W dmd MAX | P Σ |
| 0290h | 2 | W L3 | P | 02B6h | 2 | | |
| 0292h | 2 | V L1-L2 | VC | 02B8h | 2 | Hz | H |
| 0294h | 2 | V L2-L3 | VC | 02BAh | 2 | Admdmax | A |
| 0296h | 2 | V L3-L1 | VC | 02BCh | 1+1 | PF L1/PF L2 * | PF |
| 0298h | 2 | VL-L Σ | VC | 02BEh | 1+1 | PF L3/ PF Σ * | PF |
| 029Ah | 2 | A max | A | 02C0h | 2 | A L1 dmd | A |
| 029Ch | 2 | A n | A | 02C2h | 2 | A L2 dmd | A |
| 029Eh | 2 | W Σ | P Σ | 02C4h | 2 | A L3 dmd | A |
| 02A0h | 2 | VA L1 | P | 02C6h | 4 | kWh | E |
| 02A2h | 2 | VA L2 | P | 02CAh | 4 | varh | E |
| 02A4h | 2 | VA L3 | P | 02CEh | 4 | Hourmeter | HM |

The byte order in each word is depending on the “dat” parameter (LSB-MSB if “dat”=“A” or MSB-LSB if “dat”=“b”).

Note *: if the “dat” parameter is “A”, the word 2BCh contains the PF L1 value on its LSB and the PF L2 value on its MSB (most significant byte); the word 2BEh contains the PF L3 value on its LSB and the PF Σ value on its MSB. If the “dat” parameter is “b”, the word 2BCh contains the PF L2 value on its LSB and the PF L1 value on its MSB (most significant byte); the word 2BEh contains the PF Σ value on its LSB and the PF L3 value on its MSB.

For each byte related to the power-factor variables, the most significant bit indicates the sign, in the following way:

- msb=0 L (inductive) type
- msb=1 C (capacitive) type.

2.1.1 VARIABLE REPRESENTATION

All the variables, except for the PF values, are represented as signed two’s complement integers, by using the number of bytes specified in the memory-mapping table. For the correct interpretation, it is necessary to consider also the decimal point and the engineering unit, according to the following table, and multiply the value by the relevant CT (current transformer) and VT (voltage transformer) ratios:

| INF | d.p | ENG. Unit |
|------------|-------|------------|
| VN | 111.1 | V |
| VC | 111 | V |
| A | 111 | mA |
| P Σ | 111 | W, VA, VAR |
| P | 111.1 | W, VA, VAR |
| H | 111.1 | HZ |
| PF | 1.11 | PF |

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The following variables are not to be multiplied by the CT and the VT ratios:

| INF | d.p | ENG. Unit |
|-----|-------|--------------|
| E | 111.1 | kWh or kvarh |
| HM | 11.11 | Hours |

Note: The format of the single variables is referred to the electrical input of the instrument and it does not depend on the setting of the CT (current transformer) and VT (voltage transformer) ratios.

It means that the software which reads the values from the RAM must multiply them by CT and/or VT according to the variable type and then consider the variable format.

2.2 ALARM MAPPING (READING ONLY)

| ADDRESS | BYTE | CONSTANT | Description |
|---------|------|-----------|-------------------|
| 027Eh | 1 | XXXXXXXX1 | Voltage alarm ON |
| | | XXXXXXXX0 | Voltage alarm OFF |
| 027Eh | 1 | XXXXXX1X | Current alarm ON |
| | | XXXXXX0X | Current alarm OFF |

2.3 EEPROM MEMORY MAPPING

| ADDRESS | BYTES | PARAMETER | DESCRIPTION | FORMAT |
|---------|-------|------------|------------------------------------|-----------------------|
| 1080h | 2 | Password | Programming access password | 111 |
| 1082h | 2 | Vt_ratio | Voltage transformer ratio | 11.1 |
| 1084h | 2 | Ct_ratio | Current transformer ratio | 111 |
| 1086h | 2 | P_int | Integration period (Wdmd) | 111 [minutes] |
| 1088h | 2 | Filter_rng | Filter range | 111 [% f.s.] |
| 108ah | 2 | Filter_coe | Filter coefficient | 111 |
| 108ch | 2 | Address | Instrument address | 111 |
| 108eh | 2 | Set_vup | Upper voltage threshold | 111 [V] ¹ |
| 1090h | 2 | Set_vdown | Lower voltage threshold | 111 [V] ¹ |
| 1092h | 2 | Set_an | Neutral current threshold | 1.11 [A] ² |
| 1094h | 2 | System | System type (see 2.3.1) | 111 |
| 1096h | 2 | Reserved | DON'T MODIFY | === |
| 1098h | 2 | A_int | Integration period (Admd) | 111 [minutes] |
| 109Ah | 2 | dat | Byte order in the words(see 2.3.2) | 111 |

¹ Value with voltage transformer ratio = 1

² Value with current transformer ratio = 1

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2.3.1 SYSTEM CODE

| Value | System type |
|-------|-------------|
| 0 | 3P (*) |
| 1 | 3P.n |
| 2 | 2P |
| 3 | 1P |
| 4 | 3P.A |

(*) NOTE: the 3-phase without neutral selection is only for balanced loads. The current A L2 and A L3 are a copy of A L1 value, even if there is a different current in the relevant input.

2.3.2 BYTE ORDER IN THE DATA WORDS

| Value | Byte order |
|-------|-------------|
| 0 | A (LSB-MSB) |
| 1 | b (MSB-LSB) |

2.4 RESET OF THE PEAK VALUES AND OF THE LATCH ALARM

Pay attention to follow scrupulously the reset instructions and to send the exact frame, because a different write command could modify some calibration parameters, invalidating the accuracy of the measurements.

The following frame must be sent to reset Wdmdmax, Amax, Admdmax and the latch alarm:

Request frame

| Address | Function | Data address | Value | CRC |
|---------------|----------|--------------|-----------|-----------|
| 1 byte | 1 byte | 2 byte | 2 byte | 2 byte |
| From 1 to 255 | 06h | 33h 00h | 00h 00h | MSB LSB |

Answer frame

| Address | Function | Data address | Value | CRC |
|---------------|----------|--------------|-----------|-----------|
| 1 byte | 1 byte | 2 byte | 2 byte | 2 byte |
| From 1 to 255 | 06h | 33h 00h | 00h 00h | MSB LSB |

NOTE: the answer frame is an echo of the request frame, which confirm the execution of the command.

2.5 RESET OF THE LATCH ALARM ONLY

Pay attention to follow scrupulously the reset instructions and to send the exact frame, because a different write command could modify some calibration parameters, invalidating the accuracy of the measurements.

The following frame must be sent to reset the latch alarm only:

Request frame

| Address | Function | Data address | Value | CRC |
|---------------|----------|--------------|-----------|-----------|
| 1 byte | 1 byte | 2 byte | 2 byte | 2 byte |
| From 1 to 255 | 06h | 33h 01h | 00h 00h | MSB LSB |

| | | |
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Answer frame

| Address | Function | Data address | | Value | | CRC | |
|---------------|----------|--------------|-----|--------|-----|--------|-----|
| 1 byte | 1 byte | 2 byte | | 2 byte | | 2 byte | |
| From 1 to 255 | 06h | 33h | 01h | 00h | 00h | MSB | LSB |

NOTE: the answer frame is an echo of the request frame, which confirm the execution of the command.

2.6 RESET OF THE PEAK VALUES RELEVANT TO THE CURRENTS ONLY

Pay attention to follow scrupulously the reset instructions and to send the exact frame, because a different write command could modify some calibration parameters, invalidating the accuracy of the measurements.

The following frame must be sent to reset Amax and Admdmax:

Request frame

| Address | Function | Data address | | Value | | CRC | |
|---------------|----------|--------------|-----|--------|-----|--------|-----|
| 1 byte | 1 byte | 2 byte | | 2 byte | | 2 byte | |
| From 1 to 255 | 06h | 33h | 02h | 00h | 00h | MSB | LSB |

Answer frame

| Address | Function | Data address | | Value | | CRC | |
|---------------|----------|--------------|-----|--------|-----|--------|-----|
| 1 byte | 1 byte | 2 byte | | 2 byte | | 2 byte | |
| From 1 to 255 | 06h | 33h | 02h | 00h | 00h | MSB | LSB |

NOTE: the answer frame is an echo of the request frame, which confirm the execution of the command.

2.7 RESET OF THE ENERGY AND HOUR METERS

Pay attention to follow scrupulously the reset instructions and to send the exact frame, because a different write command could modify some calibration parameters, invalidating the accuracy of the measurements.

The following frame must be sent to reset the energy (kWh and kvarh) and hour meters:

Request frame

| Address | Function | Data address | | Value | | CRC | |
|---------------|----------|--------------|-----|--------|-----|--------|-----|
| 1 byte | 1 byte | 2 byte | | 2 byte | | 2 byte | |
| From 1 to 255 | 06h | 33h | 03h | 00h | 00h | MSB | LSB |

Answer frame

| Address | Function | Data address | | Value | | CRC | |
|---------------|----------|--------------|-----|--------|-----|--------|-----|
| 1 byte | 1 byte | 2 byte | | 2 byte | | 2 byte | |
| From 1 to 255 | 06h | 33h | 03h | 00h | 00h | MSB | LSB |

NOTE: the answer frame is an echo of the request frame, which confirm the execution of the command.

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3 VARIABLE READING

3.1 INTRODUCTION

WM14 and CPT allow reading up to 12 consecutive words. A reading access is always possible: if the query is related to a non-existing variable, WM14/CPT replies with non-significant values.

The field "Word address" in the request frame must be exactly the physical memory address (not the register number). During n-words reading, the answer contains the exact memory image. This means that the first byte is the content of the memory address specified in the request frame. The following bytes are the contents of the following addresses.

3.2 READING OF INSTANTANEOUS VARIABLES

To read all the variables, it is necessary to carry out at least four reading instructions as indicated below. If the values of current ratio and/or voltage ratio are different from 1, A, V and P values shall be calculated after the reading by multiplying the relevant values for CT and VT.

The examples in this paragraph 3.2.x are valid when considering "dat" = "A".

3.2.1 FIRST READING (FROM ADDRESS 0280H TO 0297H)

Request (8bytes)

| | | | | | | | |
|---|---|---|----|---|---|----|----|
| 1 | 4 | 2 | 80 | 0 | C | F0 | 5F |
|---|---|---|----|---|---|----|----|

Answer (29 bytes)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|---|----|---|----|----|----|---|----|---|----|----|----|---|----|---|----|----|----|---|----|---|----|---|-----|-----|
| 2 | 4 | 18 | 98 | 8 | DF | 5 | C5 | 6F | 97 | 8 | DB | 5 | 9C | 6F | 97 | 8 | D9 | 5 | 4B | 6F | BF | 0 | BF | 0 | BF | 0 | CRC | CRC |
|---|---|----|----|---|----|---|----|----|----|---|----|---|----|----|----|---|----|---|----|----|----|---|----|---|----|---|-----|-----|

Example of interpretation

| Variable | Value read(h) | Value converted (d) | Value formatted |
|----------|---------------|---------------------|-----------------|
| V L1-N | 0898 | 2200 | 220,0V |
| A L1 | 05DF | 1503 | 1,503A |
| W L1 | 6FC5 | 28613 | 2861W |
| V L2-N | 0897 | 2199 | 219,9V |
| A L2 | 05DB | 1499 | 149,9A |
| W L2 | 6F9C | 28572 | 2857W |
| V L3-N | 0897 | 2199 | 219,9V |
| A L3 | 05D9 | 1497 | 1,497A |
| W L3 | 6F4B | 28491 | 2849W |
| V L1-L2 | 00BF | 191 | 191V |
| V L3-L1 | 00BF | 191 | 191V |
| V L2-L3 | 00BF | 191 | 191V |

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3.2.2 SECOND READING (FROM ADDRESS 0298H TO 02AFH)

Request (8 bytes)

| | | | | | | | |
|---|---|---|----|---|---|----|----|
| 2 | 4 | 2 | 98 | 0 | C | 70 | 6B |
|---|---|---|----|---|---|----|----|

Answer (29 bytes)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|---|----|---|---|---|----|----|----|---|----|---|----|---|----|----|----|---|----|---|----|---|----|----|-----|-----|
| 2 | 4 | 18 | BF | 0 | E4 | 5 | 0 | 0 | 80 | 21 | EF | C | E3 | C | E3 | C | B4 | 26 | 7B | 6 | 71 | 6 | 76 | 6 | 62 | 13 | CRC | CRC |
|---|---|----|----|---|----|---|---|---|----|----|----|---|----|---|----|---|----|----|----|---|----|---|----|---|----|----|-----|-----|

Example of interpretation

| Variable | Value read (h) | Value converted (d) | Value formatted |
|---------------|----------------|---------------------|-----------------|
| VL-L Σ | 00BF | 191 | 191V |
| A max | 05E4 | 1508 | 1,508A |
| A n | 0000 | 0 | 0A |
| W Σ | 2180 | 8576 | 8576W |
| VA L1 | 0CEF | 3311 | 3311VA |
| VA L2 | 0CE3 | 3299 | 3299VA |
| VA L3 | 0CE3 | 3299 | 3299VA |
| VA Σ | 26B4 | 9908 | 9908VA |
| var L1 | 067B | 1659 | 1659var |
| var L2 | 0671 | 1649 | 1649var |
| var L3 | 0676 | 1654 | 1654var |
| var Σ | 1362 | 4926 | 4926var |

3.2.3 THIRD READING (FROM ADDRESS 02B0H TO 02BFH)

Request (8 bytes)

| | | | | | | | |
|---|---|---|----|---|---|----|----|
| 2 | 4 | 2 | B0 | 0 | 8 | F1 | A0 |
|---|---|---|----|---|---|----|----|

Answer (21 bytes)

| | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|----|---|---|----|---|----|----|----|----|----|----|-----|-----|
| 2 | 4 | 10 | 5A | 21 | 8A | 26 | 82 | 21 | 0 | 0 | F5 | 1 | DB | 05 | 57 | 57 | 57 | 57 | CRC | CRC |
|---|---|----|----|----|----|----|----|----|---|---|----|---|----|----|----|----|----|----|-----|-----|

Example of interpretation

| Variable | Value read (h) | Value converted (d) | Value formatted |
|-------------|----------------|---------------------|-----------------|
| W dmd | 215A | 8538 | 8538W |
| VA dmd | 268A | 9866 | 9866VA |
| W dmd max | 2182 | 8578 | 8578W |
| | | | |
| Hz | 01F5 | 501 | 50,1HZ |
| A dmd max | 05DB | 1499 | 1,499A |
| PF L1 | 57 | 87 | L.87 |
| PF L2 | 57 | 87 | L.87 |
| PF L3 | 57 | 87 | L.87 |
| PF Σ | 57 | 87 | L.87 |

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3.2.4 FOURTH READING (FROM ADDRESS 02C0H TO 02D1H)

Request (8 bytes)

| | | | | | | | |
|---|---|---|----|---|---|----|----|
| 2 | 4 | 2 | C0 | 0 | 9 | 31 | BB |
|---|---|---|----|---|---|----|----|

Answer (23 bytes)

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|
| 2 | 4 | 12 | DF | 05 | D9 | 05 | DA | 05 | FC | 0B | 00 | 00 | B8 | 06 | 00 | 00 | 1D | 0E | 00 | 00 | CRC | CRC |
|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|

Example of interpretation

| Variable | Value read (h) | Value converted (d) | Value formatted |
|-----------|----------------|---------------------|-----------------|
| A L1 dmd | 05DF | 1503 | 1,503 A |
| A L2 dmd | 05D9 | 1497 | 1,497 A |
| A L3 dmd | 05DA | 1498 | 1,498 A |
| kWh | 0000 0BFC | 3068 | 306,8 kWh |
| kvarh | 0000 06B8 | 1720 | 172,0 kvarh |
| Hourmeter | 0000 0E1D | 3613 | 36,13 hour |

3.3 FIRST READING WITH BYTE ORDER INVERTION

Should the "dat" parameter be set to "b", the previous example must be interpreted as follows:

Request (8bytes)

| | | | | | | | |
|---|---|---|----|---|---|----|----|
| 1 | 4 | 2 | 80 | 0 | C | F0 | 5F |
|---|---|---|----|---|---|----|----|

Answer (29 bytes)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|---|----|---|----|----|----|---|----|---|----|----|----|---|----|---|----|----|----|---|----|---|----|---|----|-----|-----|
| 2 | 4 | 18 | 8 | 98 | 5 | DF | 6F | C5 | 8 | 97 | 5 | DB | 6F | 9C | 8 | 97 | 5 | D9 | 6F | 4B | 0 | BF | 0 | BF | 0 | BF | CRC | CRC |
|---|---|----|---|----|---|----|----|----|---|----|---|----|----|----|---|----|---|----|----|----|---|----|---|----|---|----|-----|-----|

Example of interpretation

| Variable | Value read(h) | Value converted (d) | Value formatted |
|----------|---------------|---------------------|-----------------|
| V L1-N | 0898 | 2200 | 220,0V |
| A L1 | 05DF | 1503 | 1,503A |
| W L1 | 6FC5 | 28613 | 2861W |
| V L2-N | 0897 | 2199 | 219,9V |
| ... | ... | ... | ... |

Etc.

3.4 READING OF CONFIGURATION PARAMETERS

Request (8 bytes)

| | | | | | | | |
|---|---|----|----|---|---|-----|-----|
| 1 | 4 | 10 | 80 | 0 | E | CRC | CRC |
|---|---|----|----|---|---|-----|-----|

Answer (33 bytes)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|---|----|---|----|---|---|---|---|---|---|---|---|---|-----|-----|
| 1 | 4 | 1A | 3 | 0 | F | 0 | 5 | 0 | F | 0 | 3 | 0 | 2 | 0 | 1 | 0 | 6E | 0 | 64 | 0 | 64 | 0 | 1 | 0 | 1 | 0 | 5 | 0 | 0 | 0 | CRC | CRC |
|---|---|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|---|----|---|----|---|---|---|---|---|---|---|---|---|-----|-----|

Example of interpretation

| Variable | Value read (h) | Value converted (d) | Value formatted |
|----------|----------------|---------------------|-----------------|
| Password | 0003 | 3 | 3 |
| Tv | 000F | 15 | 1,5 |
| Ta | 0005 | 5 | 5 |
| P_int | 000F | 15 | 15min |

| | | |
|-----------------------------------|---|--|
| CARLO GAVAZZI CONTROLS | WM14 AND CPT BASIC Serial protocol V3 R0 | |
|-----------------------------------|---|--|

| | | | |
|-----------|------|-----|-------------------|
| FiS | 0003 | 3 | 3% |
| Fic | 0002 | 2 | 2 |
| Add | 0001 | 1 | 1 |
| AL_V up | 006E | 110 | 110V |
| AL_V down | 0064 | 100 | 100V |
| AL_I | 0064 | 100 | 1,00A |
| System | 0001 | 1 | 3P.n |
| Reserved | 0001 | 1 | === |
| A_int | 0005 | 5 | 5min |
| dat | 0000 | 0 | A (order MSB-LSB) |

3.5 READING OF ALARM STATE

Request (8 bytes)

| | | | | | | | |
|---|---|---|----|---|---|----|----|
| 2 | 4 | 2 | 7E | 0 | 1 | 50 | 59 |
|---|---|---|----|---|---|----|----|

Answer (7 bytes)

| | | | | | | |
|---|---|---|---|---|----|----|
| 2 | 4 | 2 | 1 | 0 | FC | A0 |
|---|---|---|---|---|----|----|

To obtain the alarm representation, mask the not-significant bits of the byte indicated in bold (AND with the value 03h). In the example, the voltage alarm is ON.

3.6 READING OF C.G.C. INSTRUMENT CODE

Table of identification codes

| Code | Model | Description |
|------|----------------|----------------------|
| 1Dh | WM14 AV5 Basic | 400VL-L / 660VL-L 5A |
| 1Eh | WM14 AV6 Basic | 100VL-L / 208VL-L 5A |
| 2Bh | CPT AV5 Basic | 400VL-L / 660VL-L 5A |
| 2Ch | CPT AV6 Basic | 100VL-L / 208VL-L 5A |

To read the identification code, send the following rigid-structure frame (the example is related to the address 2). The code is contained on the position 5 of the reply.

Example:

Request (8 bytes)

| | | | | | | | |
|---|---|---|---|---|---|----|----|
| 2 | 4 | 0 | B | 0 | 1 | 40 | 3B |
|---|---|---|---|---|---|----|----|

Answer (21 bytes)

| | | | | | | |
|---|---|---|---|----|----|----|
| 2 | 4 | 2 | 0 | 1D | 3C | FF |
|---|---|---|---|----|----|----|

1Dh is the identification code of the WM14 AV5

4 CRC CALCULATION

4.1 EXAMPLE OF CRC CALCULATION

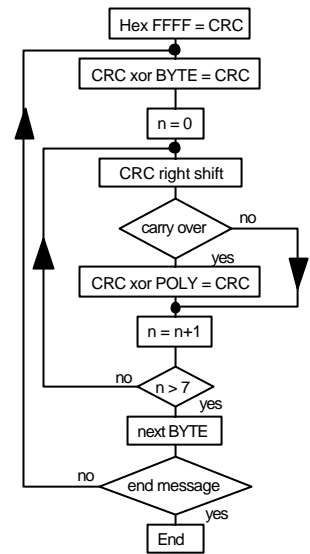
Frame = 0207h

| | |
|---|-----------------------|
| Init CRC | 1111 1111 1111 1111 |
| Load first character | 0000 0010 |
| Execute the XOR with the first char. of the frame | 1111 1111 1111 1101 |
| Execute first Shift to the right | 0111 1111 1111 1110 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1101 1111 1111 1111 |
| Execute 2° Shift to the right | 0110 1111 1111 1111 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1100 1111 1111 1110 |
| Execute 3° Shift to the right | 0110 0111 1111 1111 0 |
| Execute 4° Shift to the right | 0011 0011 1111 1111 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1001 0011 1111 1110 |
| Execute 5° Shift to the right | 0100 1001 1111 1111 0 |
| Execute 6° Shift to the right | 0010 0100 1111 1111 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1000 0100 1111 1110 |
| Execute 7° Shift to the right | 0100 0010 0111 1111 0 |
| Execute 8° Shift to the right | 0010 0001 0011 1111 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1000 0001 0011 1110 |

| | |
|--|-----------------------|
| Load second character of the frame | 0000 0111 |
| Execute XOR with the second character of the frame | 1000 0001 0011 1001 |
| Execute 1° Shift to the right | 0100 0000 1001 1100 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1110 0000 1001 1101 |
| Execute 2° Shift to the right | 0111 0000 0100 1110 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1101 0000 0100 1111 |
| Execute 3° Shift to the right | 0110 1000 0010 0111 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1100 1000 0010 0110 |
| Execute 4° Shift to the right | 0110 0100 0001 0011 0 |
| Execute 5° Shift to the right | 0011 0010 0000 1001 1 |
| Carry = 1, load polynomial | 1010 0000 0000 0001 |
| Execute XOR with the polynomial | 1001 0010 0000 1000 |
| Execute 6° Shift to the right | 0100 1001 0000 0100 0 |
| Execute 7° Shift to the right | 0010 0100 1000 0010 0 |
| Execute 8° Shift to the right | 0001 0010 0100 0001 0 |

| | |
|------------|---------------------|
| CRC result | 0001 0010 0100 0001 |
| | 12h 41h |

Note: the byte 41h is sent first.



POLY = crc calculation polynomial: A001h