XTREM / XTREM-S

Communication Protocol

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1 Xtrem Overview

Xtrem is defined as an ADPD weighing module (analogic data processing device) following OIML R76:2006/EN45501:2015 standards: an electronic device intended to drive a load cell sensor measurement system (typically a weighing scale) and transmit the weight information through a communication interface. There is available an **evaluation certificate** as weighing module according to OIML R76 for the **Xtrem** ADPD module with number **TC12036**.

Xtrem is equipped with 2 serial ports:
- UART-0 is a serial RS232C interface always present.
- UART-1 can be equipped with several optional interfaces (available as option, not supplied as standard). Alternative options are WIFI 802.11, RS485 and Ethernet LAN wired.

Xtrem power supply is 7,5Vdc / 1A.
The standard assembly of the **Xtrem** includes a cable for connect both the RS232C interface and the power supply given by an AC/DC power adaptor plugged to the mains.

Scale (load cell) cable

Sealing switch

2 LED (green and red)

Serial interface & Power supply cable
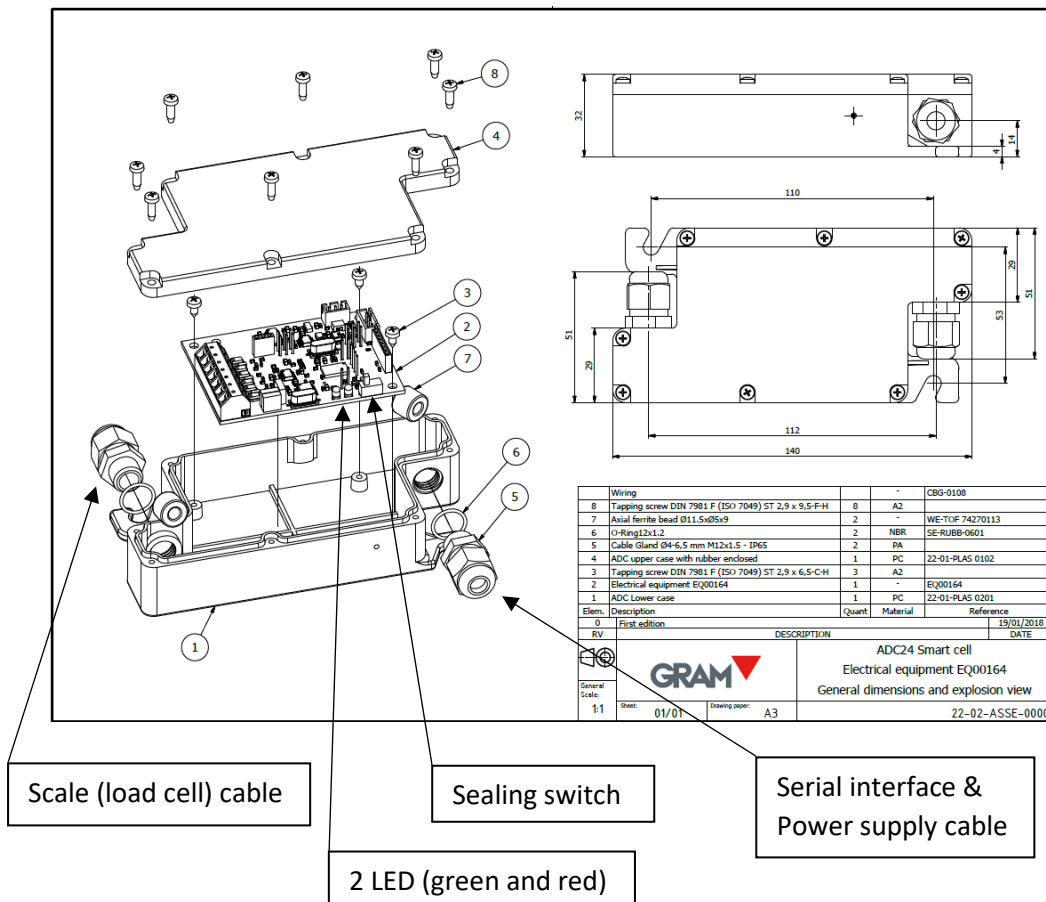
Green LED is on indicating that the device is on and running.

Green LED blinks while UART0 serial port is sending or receiving data.

Red LED is on when a hardware default is detected at working time:

Description	Red LED
No error	OFF
Weighing default	ON
Power supply < 5,8Vdc	BLINKING
Power supply > 8,5Vdc	BLINKING
Error R/W flash memory	FAST BLINKING

There is a detailed error code related to each one of the above-mentioned defaults and can be obtained using the communication protocol explained on this document. The error code result will help you fixing the scale.

The **"sealing switch"** is provided to avoid any "write" operation on any of the instrument's legally relevant parameters as well as for activate the software protection protocol. When "Sealing switch" is activated (switched to the "lock" position):

- Settings defined as "legally relevant parameter" according to EN45501 / OIML R76 cannot be written.
- Only approved terminals can be connected to the Xtrem module.

It allows sealing the ADPD module after adjustment and verification of the instrument.

Once powered-on, the **Xtrem** module, right after the initialization, it will send a broadcast message giving the information into the memory data address "0100h Device state information".

2 Load cell wiring

GRAM PRECISION PCB00210B

Exc + (blue) — J17
Exc - (black) — J16
Sense + (green) — J14
Sense - (grey) — J15
Sig + (white) — J18
Sig - (red) — J19
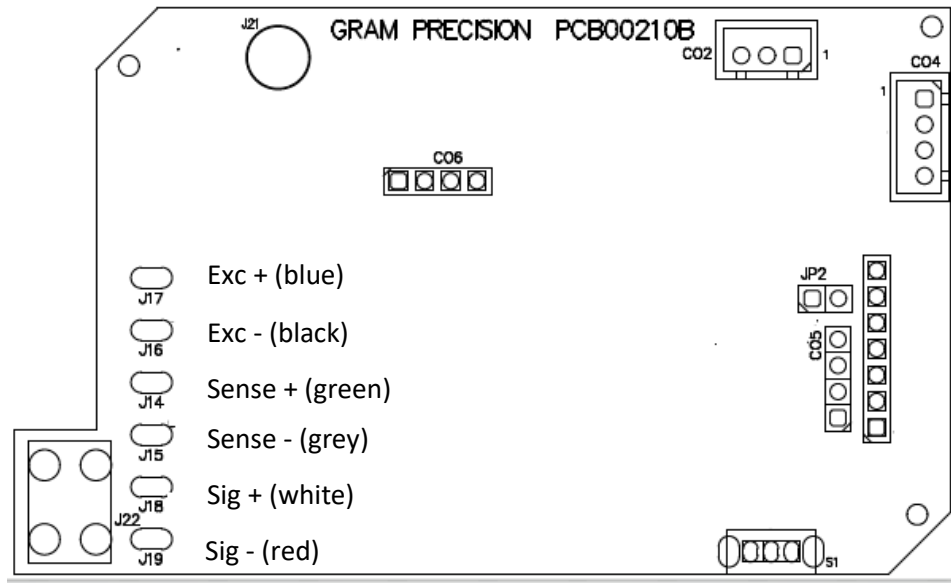
J14-J19	Load cell / Junction box
C02	Power
C04	RS232 (UART0)
C03 + C05	Expansion board (UART1)
S1	Sealing switch

3   Sealing switch

The scale adjust settings can be protected against manipulation using the "sealing switch" and sealing the XTREM housing using two ultra-destructible (or "VOID" destructible) stickers.

S1 UNLOCK: UNPROTECTED:
- Allows to modify settings for legally relevant functions.
- Allows free communication with any terminal connected.

S1 LOCK: PROTECTED:

- Settings for legally relevant functions cannot be changed.
- Communication is only allowed to approved terminals.
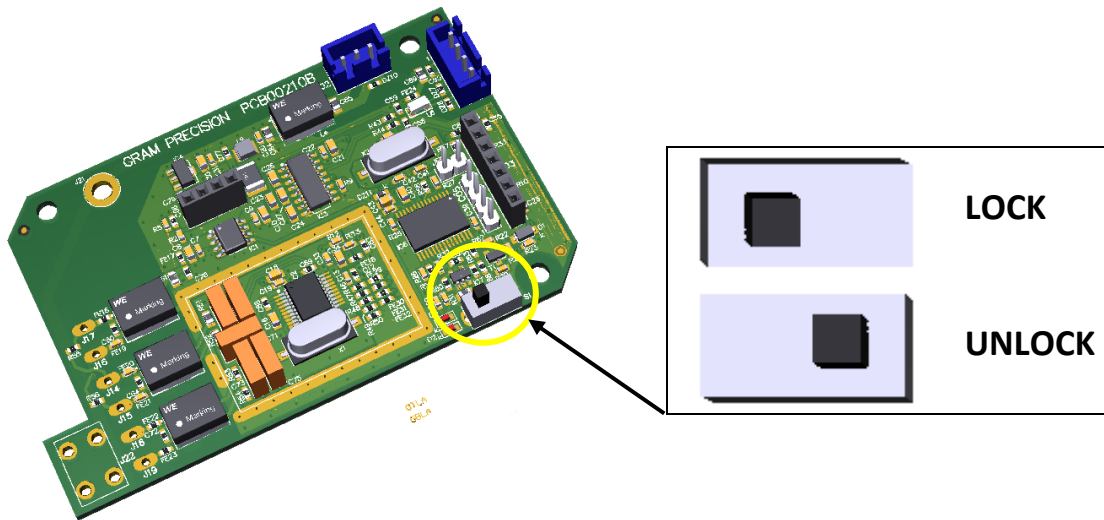
When S1 is switch to **LOCK, a**ny attempt to write a protected value will be denied.
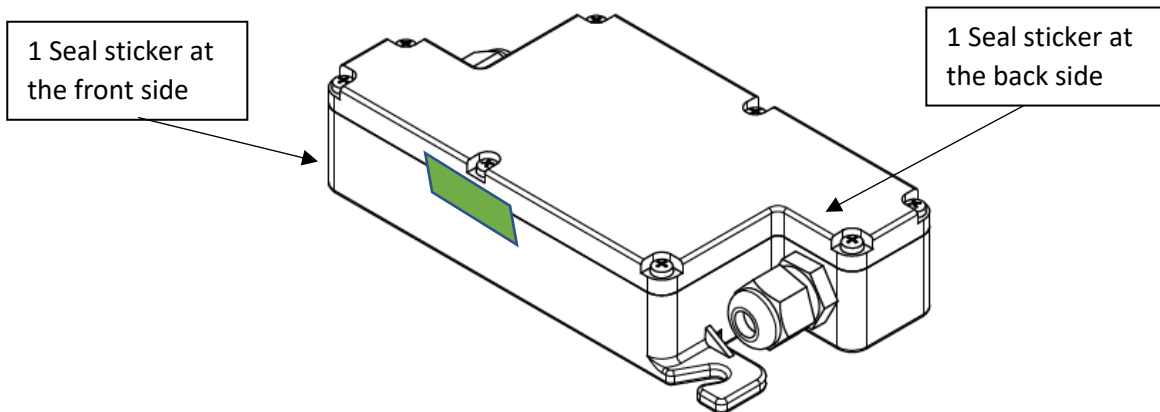
In the case that is needed to break a seal to access the S1 switch (e.g.: for adjust the scale after a calibration), please consult your representative, because an official re-verification of the weighing instrument could be mandatory depending on legal regulations in your country.

4 Protocol overview

Xtrem module is provided with a communication protocol that allows the device to be commanded remotely by a terminal device as well to share information on weighing process with that terminal using the same protocol. This manual describes this communication protocol.

Default settings for RS232C / RS485 communication are 9600 bauds, 8 data bits, no parity bit, 1 stop bit. Baud rates allowed are 9600, 19200, 38400, 57600 and 115200 baud. Format is always 8 data bits, no parity bit, 1 stop bit. No handshake control, hardware or software is provided.

Each device can send query messages to any other device and must respond only the messages addressed to itself. This applies both to network connections and point to point connections. Broadcast messaging is supported using destination address 255 (FFh).

Both query and response frames have the same structure. Messages consist in a frame of 8-bit bytes coded as an ASCII character.

Any message is placed by the transmitting device into a frame that has a known beginning and ending point: message begins with a character STX (ASCII code 02h) and ends with a character ETX (ASCII code 03h). Optionally, it can be added a CR + LF termination (activated as default settings).

The receiver device must respond using the same message frame structure. The response must include at least 1 byte of data that gives a result on the action taken.

Before the ETX, each frame has an error check field, which is the LRC (longitudinal redundancy check) of the message content, coded as a hexadecimal number in two ASCII characters.

Devices on the network must monitor the bus continuously for a STX character (the beginning of a message). The interval allowed between the start of any income message and the end of the message (by receiving a character ETX) is up to one second. Once elapsed this timeout the start of message and the following information will be ignored. Any information received out of a STX – ETX frame will be ignored.

5 Message framing

0	1	2	3	4	5	6	7	8	9	10	11	12	…	11+ DL	12+ DL	13+ DL	14+ DL
STX	ID_O		ID_D		F	D_ADDRESS				D_L		DATA			LRC		ETX

Field name	Description	Bytes Length
STX	Start of message: ASCII character 02h	1
ID-O	Network address of the device sending the message.	2
ID-D	Network address of the destination device	2
F	Function, action to perform.	1
D_ADDRESS	Data address: Identification code of the data register on which the action will be carried out.	4
D_L	Data length (number of bytes)	2
DATA	Data sent.	Variable
LRC	Longitudinal redundancy check	2
ETX	End of message: ASCII character 03h	1

5.1 Network address fields ID_O and ID_D

Network address is an 8-bit value (range 0-255) assigned to each device. By default, all ADC24 devices have this parameter set to 01h. Each device in the network must be configured with a unique device identification code.

The network address of the message sender and the network address of the destination device is coded as a hexadecimal number in two ASCII characters. Example:

Device id 23 (17h) will be coded into the message frame as "17" (31h, 37h)

Device id 1 (01h) will be coded into the message frame as "01" (30h, 31h)

A message from device 23 to device 1 will begin as follows:

0	1	2	3	4	5…
02h	31h	37h	30h	31h	…
STX	'1'	'7'	'0'	'1'	…

Broadcast messaging is admitted using the destination address 255 (FFh).
Example Device Id 01 (01h) sends a message to every device connected to the network:

0	1	2	3	4	5…
02h	30h	31h	46h	45h	…
STX	'0'	'1'	'F'	'E'	…

5.2 Function

Action to be taken by the recipient of the message coded as an ASCII character (one byte). Possible values are:

- 'R' (ASCII code 52h) request for read. Data length for this kind of request is always 0, and data field is not needed.

- 'r' (ASCII code 72h) response to a read request. The data field in this type of message is an ASCII character string with the requested information. The length and format depend on the data sent. In case there is no information to send, the length of the data will be 0 and no data field will be added to the message.

- 'W' (ASCII code 57h) request for write.

- 'w' (ASCII code 77h) response to a write request. This type of message always includes 1 data byte, which is a result code of the write operation performed. The result code can have the following values:
  - '0' (30h) the writing operation was successful.
  - '1' (31h) cannot write. The register is protected by the sealing switch.
  - '2' (32h) cannot write. Read only record.
  - '3' (33h) cannot write: Incorrect value / out of range.
  - Any different value means that an error occurred while trying to write the flash memory of the device.

- 'E' (ASCII code 45h) request for execution. Data length for this kind of request is always 0, and data field is not needed.

- 'e' (ASCII code 65h) response to an execute request. This type of message always includes 1 byte of data which is a result code of the function performed. The result code can have the following values:
  - '0' (30h) the function has been executed correctly.
  - '1' (31h) can not execute that function. The execution is protected by the sealing switch.
  - Any different value means an error result which depends on each function.

5.3 Data address code

The data address field is a 16bits decimal number coded as 4 hexadecimal bytes representing the memory space of the device on which the function will be carried out.

Example:

- The device 23 requests the device 1 for read data 257 (0101h)

0	1	2	3	4	5	**6**	**7**	**8**	**9**	10…
02h	31h	37h	30h	31h	52h	**30h**	**31h**	**30h**	**31h**	…
STX	'1'	'7'	'0'	'1'	'R'	**'0'**	**'1'**	**'0'**	**'1'**	…

- The device 1 responds to the device 23 with the result of the request to read the data 257 (0101h)

0	1	2	3	4	5	**6**	**7**	**8**	**9**	10...
02h	30h	31h	31h	37h	72h	**30h**	**31h**	**30h**	**31h**	...
STX	'0'	'1'	'1'	'7'	'r'	**'0'**	**'1'**	**'0'**	**'1'**	...

5.4   Data length field

Data length field is an 8-bit decimal number coded as 2 hexadecimal bytes giving the number of bytes into the data field of the message frame.

Example:

- The device 23 query the device 1 for read data 257 (0101h). No data is sent, and the data length field is "00".

0	1	2	3	4	5	6	7	8	9	**10**	**11**	12...
02h	31h	37h	30h	31h	52h	30h	31h	30h	31h	**30h**	**30h**	...
STX	'1'	'7'	'0'	'1'	'R'	'0'	'1'	'0'	'1'	**'0'**	**'0'**	...

- The device 1 responds to the device 23 with the result of the query to read the data 257 (0101h). The response message includes 8 bytes of data, so the data length field is "08".

0	1	2	3	4	5	6	7	8	9	**10**	**11**	12...
02h	30h	31h	31h	37h	72h	30h	31h	30h	31h	**30h**	**38h**	...
STX	'0'	'1'	'1'	'7'	'r'	'0'	'1'	'0'	'1'	**'0'**	**'8'**	...

- The device 0 requests the device 1 to write the data record 112 (0070h). The data that is sent to write is a single byte and the data length field is "01".

0	1	2	3	4	5	6	7	8	9	**10**	**11**	12...
02h	30h	30h	30h	31h	57h	30h	30h	37h	30h	**30h**	**31h**	...
STX	'0'	'0'	'0'	'1'	'W'	'0'	'0'	'7'	'0'	**'0'**	**'1'**	...

5.5   Data field

Data field is a string of ASCII characters representing the information contained in a data record of the device.

Only ASCII characters in a range between 20h and FFh are valid.

The format and content of this field depends on each data address code.

When the data length field is 0, no data field must be appended.

5.6   LRC

Messages include an error-checking field based on an LRC (longitudinal redundancy check).

LRC is one byte containing a 8-bit binary value calculated by the transmitting device, which appends the LRC to the message right before the last character of the data field. That LRC value is coded as a hexadecimal number using 2 ASCII characters.

The LRC byte is calculated as exclusive or (XOR) between all bytes of the message, excluding the start character (STX), the same two characters of LRC and the end character (ETX).

0	1	2	3	4	5	6	7	8	9	10	11	12	...	11+ DL	12+ DL	13+ DL	14+ DL
STX	ID_O		ID_D		F	D_ADDRESS			D_L			DATA			LRC		ETX
	LRC calculation																

LRC is calculated using the following code:

```c
unsigned char LRC(unsigned char* s)
{
        unsigned char lrc = 0;

        while (*s)
        {
                lrc ^= *(s++);
        }

        return lrc;
}
```

6 Software protection protocol

Once the "seal switch" is in the LOCK position, it is necessary for the terminal to send a software identification signature periodically to get any response from the Xtrem module.

Xtrem module stores a 128-bit signature that can only be set at factory time.

When terminal fails to send the correct signature to the Xtrem module in 5", communication stops: Xtrem module will not accept any income message and will not respond anything.

Once the Xtrem module receive a signature that matches the expected one:

- the 5" communication timeout resets allowing communication between the Xtrem module and the terminal.
- Xtrem module sends to the terminal a 16-bit integer as response. That 16-bit value will modify the expected signature by bitwise rotating to the left (circular rotation) the 128-bit signature.

The terminal must calculate the new valid signature using the 16-bit value sent by the Xtrem module and send it again before the 5 "timeout expires.

The 16-bit value sent is a pseudo-random integer (0 to 7FFFh) generated from a variable seed value, which depends on the Xtrem serial number and the Xtrem clock tick since the last reboot.

Communication will stop if the Xtrem module receives an invalid signature as well as at the end of the 5" timeout.
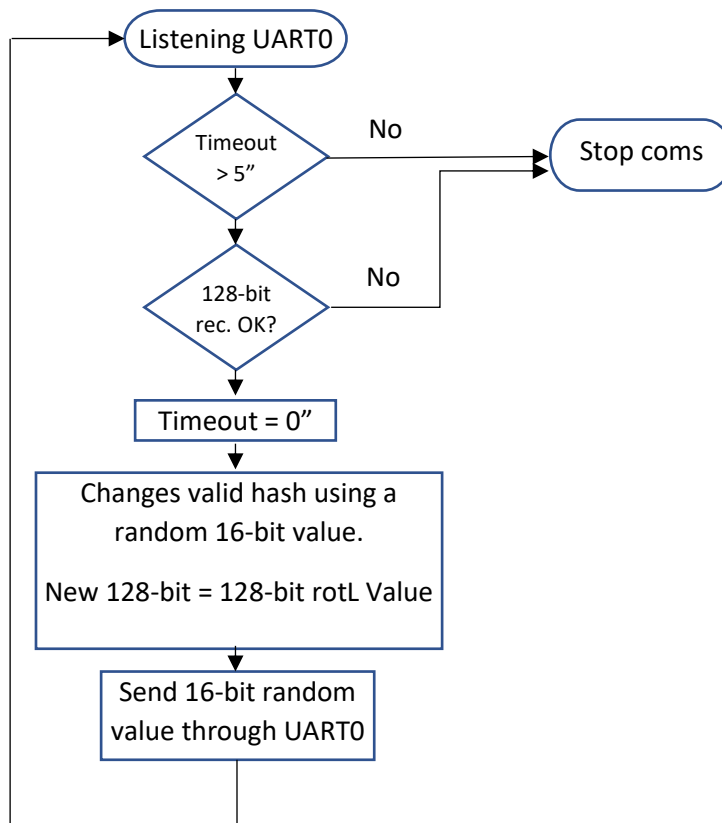
Messages consist in a frame of 8-bit bytes in binary format.
Any message is placed by the transmitting device into a frame that has a known beginning and ending point, having a fixed length.

The terminal message to the Xtrem module must be 20 bytes long in the following format:

0	1	2 ... 17																18	19
AAh	55h	$L1_3$	$L1_2$	$L1_1$	$L1_0$	$L2_3$	$L2_2$	$L2_1$	$L2_0$	$L3_3$	$L3_2$	$L3_1$	$L3_0$	$L4_3$	$L4_2$	$L4_1$	$L4_0$	0Dh	0Ah
START		128-bit signature as 4 Int32 binary values																END	

Message begins with the 2 bytes AAh + 55h and ends with a CR + LF termination.
The 128-bit signature must be transmitted as a sequence of four Int32 values. Each Int32 is transmitted starting with its higher byte.

When there is a 00h byte in the 128-bit signature, it should be changed to 01h.
When there is a AAh byte in the 128-bit signature, it should be changed to ABh.

Response from the Xtrem module to the terminal after receiving a valid 128-bit signature is a 6 bytes frame as follows:

0	1	2 -3		4	5
55h	AAh	B_1	B_0	0Dh	0Ah
START		16-bit value		END	

16-bit value transmitted by the Xtrem module cannot contain byte 55h, AAh, or 00h

The new 128-bit signature is calculated from the 16-bit value sent by applying the following function on each of the 4 Int32 values of the signature:

```c
union long_array_u
{
  char b[4];
  long l;
};

union long_array_u rLeft(long value, int rnd_value)
{
    union long_array_u result;
    unsigned long val = (unsigned long) value;
    unsigned int mask = 8 * sizeof(unsigned long);
    int c = rnd_value % mask;


    //rotate left
    result.l = (long) (val << c | val >> (mask - c));

    return result;
}
```

7 Data address map

The following table is a list of the **Xtrem** memory data registers that can be accessed using the communication protocol. The last column on the table is a hyperlink to the detailed explanation of each data address.

The "type" column indicates which function can be requested on each data: 'R' for read, 'W' for write. The 'E' request (execute a function) can be done with every register: Registers with no function available will execute a void function and will return a result code. Registers type 'E' will respond with no data information to a read request.

The table show the data registers that are protected as legally relevant parameters according EN45501/OIML R76 and therefor can only be written when the sealing switch is in UNLOCK position. The device will respond with an error status code when attempting to write a read-only data register or a "seal protected" data (when the sealing switch is at LOCK position).

Data address (hex)	Description	Type	Seal	Link
0000	Serial number	R		0000h
0001	Device Id	RW		0001h
0002	Vcc input minimum (ADC counts)	RW		
0003	Vcc input maximum (ADC counts)	RW		
0004	Vcc output minimum (ADC counts)	RW		
0005	Vcc output maximum (ADC counts)	RW		
0007	Hardware version	R		0007h
0008	Software version	R		0008h
0009	Sealing switch state	R		0009h
0010	Baud rate	RW		0010h
0011	LRC check ON/OFF	RW		0011h
0012	Add CR+LF ON/OFF	RW		0012h
0013	Output rate for streaming mode	RW		0013h
0020	Weighing unit (g / kg)	RW	✓	
0021	Weighing range mode	RW	✓	
0022	Max (Max$_1$) (scale maximum capacity)	RW	✓	
0023	e (e$_1$) (scale interval)	RW	✓	
0024	Max$_2$ (scale capacity when 2 ranges or 2 interval)	RW	✓	
0025	e$_2$ (scale interval when 2 ranges or 2 intervals)	RW	✓	
0026	Decimal position	RW	✓	
0029	Allow negative weight (ON/OFF)	RW	✓	
0030	Initial zero (ADC counts value)	RW	✓	
0031	Slope divisor (ADC counts value)	RW	✓	
0033	Input voltage from the load cells (uV/e)	R		
0034	Weight value for scale adjustment using 1031h function	RW		
0035	Max ADC count number	R		

Data address (hex)	Description	Type	Seal	Link
0036	ADC counts /e	R		
0038	ADC reading speed (0= 12 SPS, 1=50 SPS)	RW		
0040	Geo geographical area correction (ON/OFF)	RW	✓	
0041	Geo local area	RW	✓	
0042	Geo adjust area	RW	✓	
0050	Zero tracking device (ON/OFF)	RW	✓	
0051	Zero tracking range (0…3)	RW	✓	
0052	Initial zero setting device (ON/OFF)	RW	✓	
0053	Initial Zero Setting Range (%Max)	RW	✓	
0060	Tare mode	RWE		
0061	Auto tare (ON/OFF)	RW	✓	
0062	Tare on stability (ON/OFF)	RW	✓	
0070	Filter level	RW		
0071	Motion filter (ON/OFF)	RW		
0072	Livestock (animal) filter (ON/OFF)	RW		
0073	Stability range (Interval for stability expressed in 1/10e)	RW	✓	
0100	Device state information	R		0100h
0101	Gross (brut) weight value	R		
0102	Tare value	RE		
0103	Net weight value	R		
0104	Weight stability indicator	R		
0105	Zero indicator	RE		
0106	Zero tracking activity indicator	R		
0107	Weighing register	R		0107h
0108	Pre-set or manual tare value	RWE		
0110	ADC counts instant reading	R		
0111	ADC counts filtered	R		
0112	Zero ADC counts	R		
0113	Tare ADC counts	R		
0200	Vcc input (V)	R		
0201	Vcc output (V)	R		
0202	Board temperature in ºC	R		
0210	Vcc input (A/D counts)	R		
0211	Vcc output (A/D counts)	R		
0220	Temperature (A/D counts)	R		
0500	WIFI AP SSID name	RW		
0501	WIFI AP password	RW		
0502	WIFI AP IP address	RW		
0503	WIFI AP DHCP (on/off)	RW		
0504	WIFI AP (on/off)	RW		
0600	WIFI SSID of the network to connect as station	RW		
0601	WIFI password of the network to connect as station	RW		
0602	WIFI STA IP address	RW		
0603	WIFI STA DHCP (on/off)	RW		

Data address (hex)	Description	Type	Seal	Link
0604	WIFI as STA (on/off)	RW		
0700	WIFI UDP remote port	RW		
0701	WIFI UDP local port	RW		
0702	WIFI TCP server port	RW		
0900	Resets the optional board connected to UART1	E		
1010	Stop the stream mode	E		1010h
1011	Start the stream mode sending string 0107h (weighing)	E		1011h
1012	Start the stream mode sending value 0110h (ADC counts)	E		1012h
1013	Start the stream mode value 0111h (filtered ADC counts)	E		1013h
1030	Sets the initial zero adjust	E	✔	
1031	Sets the Span adjust using the weight value provided on address 0034h	E	✔	
1103	Clear tare	E		
1104	High resolution mode on/off	E		
9999	Device reset	E		9999h
EEEE	Reset settings to factory default (Warning: the current scale adjustment and calibration will be lost)	E	✔	EEEEh

8   General settings

Data address (hex)	Description	Type	Seal	Link
0000	Serial number	R		0000h
0001	Device Id	RW		0001h
0002	Vcc input minimum	RW		
0003	Vcc input maximum	RW		
0200	Vcc input	R		
0004	Vcc output minimum	RW		
0005	Vcc output maximum	RW		
0201	Vcc output	R		
0007	Hardware version	R		0007h
0008	Software version	R		0008h
0009	Sealing switch state	R		0009h
0100	Device state information	R		0100h
9999	Device reset	E		9999h
EEEE	Reset settings to factory default	E	✓	EEEEh

8.1   0000h - Serial number

Serial number of the Xtrem device.

It's a read-only data register: Is written at production time and cannot be changed.

Response to the request is a string with the numeric value of the serial number. Serial numbers are decimal numbers in a range from 0 to 4294967294 (32-bit unsigned integer number).

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	30h	30h	30h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'0'	'0'	'0'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	…
02h					72h	30h	30h	30h	30h			…
STX	ID_O		ID_D		'r'	'0'	'0'	'0'	'0'	Data length		⋯

…	12	13	14	15	16	17	18	19	20	21	22
…											03h
…	n	n	n	n	n	n	n	n	LRC		ETX

Note that Data length is variable: It will be "06" for the serial number "345622" but it will be "0A" for the serial number "1123456724".

8.2   0001h – Device Id.

Sets the RS485 network address for the Xtrem device. Network addresses are a 8-bit binary number. The value must be in a range from 0 to 255 and must be coded in hexadecimal format using two ascii characters. Example:

- 23 → "17" (31h, 37h)
- 1 → "01" (30h, 31h)
- 14 →"0E" (30h, 45h)
- 163 → "A3" (41h, 33h)

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	30h	30h	31h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'0'	'0'	'1'	'0'	'0'	LRC		ETX

Response to the read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
02h					72h	30h	30h	30h	31h	30h	32h					03h
STX	ID_O		ID_D		'r'	'0'	'0'	'0'	'1'	'0'	'2'	Value = ID_O		LRC		ETX

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
02h					57h	30h	30h	30h	31h	30h	32h					03h
STX	ID_O		ID_D		'W'	'0'	'0'	'0'	'1'	'0'	'2'	Value		LRC		ETX

Response to the write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16
02h					77h	30h	30h	30h	31h	30h	31h			03h
STX	ID_O		ID_D		'w'	'0'	'0'	'0'	'1'	'0'	'1'	Result	LRC		ETX

Result for a write request is 1 ASCII character:

- '0' (30h) write operation performed ok.
- A different value means that an error occurred when attempting to write the flash memory of the device.

The ID_O field into the response message still the original device Id, not the new one.

8.3 0007h Hardware version.

Hardware version of the Xtrem electronic board.

It's a read-only data register: Is written at production time and cannot be changed.

Response to the request is a string with a numeric value assigned to each hardware version.
It's a decimal number in a range from 0 to 255.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	30h	30h	37h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'0'	'0'	'7'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
02h					72h	30h	30h	30h	37h							03h
STX	ID_O		ID_D		'r'	'0'	'0'	'0'	'7'	Data length		n		n	LRC	ETX

Note that Data length is variable.

8.4 0008h Software version.

Software version of the Xtrem electronic board.

It's a read-only data register: Is written at production time and cannot be changed.

Response to the request is a string with a numeric value assigned to the software version.
It's a decimal number with a variable length.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	30h	30h	38h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'0'	'0'	'8'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
02h					72h	30h	30h	30h	38h							03h
STX	ID_O		ID_D		'r'	'0'	'0'	'0'	'8'	Data length		n		n	LRC	ETX

8.5 0009h Sealing switch status

The response returns a binary value indicating the position of the sealing switch: The response is '0' when the switch is UNLOCK and '1' when at LOCK position.

It's a read-only data register and cannot be written.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	30h	30h	39h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'0'	'0'	'9'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					72h	30h	30h	30h	39h	30h	31h				03h
STX	ID_O		ID_D		'r'	'0'	'0'	'0'	'9'	'0'	'1'	N	LRC		ETX

N = '0' (30h) ➔ Sealing switch is turned to UNLOCK

N = '1' (31h) ➔ Sealing switch is LOCK position.

8.6 0100h Device state information

The read response returns 2 bytes indicating the state of the Xtrem device. It's a read-only data register and cannot be written.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	31h	30h	30h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'1'	'0'	'0'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
02h					72h	30h	31h	30h	30h	30h	32h					03h
STX	ID_O		ID_D		'r'	'0'	'1'	'0'	'0'	'0'	'2'	SH	SL	LRC		ETX

The 2 bytes SH and SL is a 8-bit value coded in hexadecimal format, giving information on the state of the initialization of the device. The information is coded in a binary format.

SH				SL			
B7	**B6**	**B5**	**B4**	**B3**	**B2**	**B1**	**B0**
WIFI module		Power alarm		Weighing status			

Weighing status (B0-B4):

Code	Description
00	No error
01	Error reading the E2PROM settings
02	ADC (load cell) does not work
03	ADC input signal out of range
04	ADC input signal > 30mV
05	ADC input signal < -30mV
06	Vcc output to the load cell out of range: Power to the load cell has been shut down to protect the voltage regulator.
07	Weight > Max +9e (over load)
08	Weight < -19e (negative weight)

Power alarm (B5) is set to 1 in the case that $Vcc_{out} < 5,8Vdc$ or $Vcc_{in} > 8,5Vdc$. When $Vcc_{in} > 8,5Vcc$, the output voltage to the load cell is automatically shut down to protect the voltage regulator and the measurement system. The shutdown of the output voltage to the measurement chain will cause an additional weighing error code.

WIFI module:

Code	Description
00	WIFI 802.11 board not present
01	WIFI 802.11 board ready
02	WIFI connected to the access point
03	WIFI connection error

Output examples for the status response (hex value coded as 2 ASCII characters):

Code	Description
"00"	• Weighing ok • Power supply ok • WIFI module is not available.
"40"	• Weighing ok • Power supply ok • WIFI module is ready.
"80"	• Weighing ok • Power supply ok • WIFI module connected to the server.
"C0"	• Weighing ok • Power supply ok • WIFI connection error.
"A0"	• Weighing ok • Power supply alarm (red LED blinking) • WIFI module connected to the server.
"03"	• ADC input signal out of range • Power supply ok • WIFI module is not available.
"87"	• Scale over load • Power supply ok • WIFI module connected to the server.

8.7 9999h Device reset

The execution of the register 9999h will reset the device since the response to the request has been sent.

Execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					45h	31h	30h	30h	30h	30h	30h			03h
STX	ID_O		ID_D		'E'	'9'	'9'	'9'	'9'	'0'	'0'	LRC		ETX

Response to the execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					65h	31h	30h	31h	31h	30h	30h	30h			03h
STX	ID_O		ID_D		'e'	'9'	'9'	'9'	'9'	'0'	'1'	'0'	LRC		ETX

Result for this function is always '0' (actually, the function ends before returning a value because the software reset itself).

Once the reset function is performed, the red LED will light for 2 seconds due to the shutdown of the power supply to the load cell system.

8.8 EEEEh Reset settings to factory default

The execution of the register EEEEh will restore the factory default values for all the device settings.

Execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					45h	31h	30h	30h	33h	30h	30h			03h
STX	ID_O		ID_D		'E'	'E'	'E'	'E'	'E'	'0'	'0'	LRC		ETX

Response to the execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					65h	31h	30h	31h	33h	30h	30h				03h
STX	ID_O		ID_D		'e'	'E'	'E'	'E'	'E'	'0'	'1'	Result	LRC		ETX

The result code can have the following values:

- '0' (30h) the function has been executed correctly.
- '1' (31h) cannot execute that function. The execution is protected by the sealing switch.
- Any different value means that the function failed due to an error writing the flash memory of the device.

9 Serial port (UART 0) settings

Data address (hex)	Description	Type	Seal	Link
0010	Baud rate	RW		0010h
0011	LRC check ON/OFF	RW		0011h
0013	Output rate for stream mode	RW		0013h
1010	Stop the stream mode	E		1010h
1011	Start the stream mode sending string 0107h (weight)	E		1011h
1012	Start the stream mode sending value 0110h (ADC counts)	E		1012h
1013	Start the stream mode value 0111h (filtered ADC counts)	E		1013h

9.1 0010h Baud rate

Set the baud rate of the serial port by writing one ASCII character in this address.

The range of values for baud rate is 0 to 4:

- '0' (30h) – 9600 baud
- '1' (31h) – 19200 baud
- '2' (32h) – 38400 baud
- '3' (33h) – 57600 baud
- '4' (34h) – 115200 baud

The default value is '0' (9600 baud).

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					57h	30h	30h	31h	30h	30h	32h				03h
STX	ID_O		ID_D		'W'	'0'	'0'	'1'	'0'	'0'	'1'	Value	LRC		ETX

Response to the write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16
02h					77h	30h	30h	30h	31h	30h	31h				03h
STX	ID_O		ID_D		'w'	'0'	'0'	'0'	'1'	'0'	'1'	Result	LRC		ETX

Once the new baud rate is set up, the

9.2 0011h LRC error check

Set ON/OFF the LRC error checking on each message received.

Writing character '0' will switch OFF the LRC error checking.

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					57h	30h	30h	31h	31h	30h	31h				03h
STX	ID_O		ID_D		'W'	'0'	'0'	'1'	'1'	'0'	'1'	Value	LRC		ETX

Value must be '0' (30h) or '1' (31h)

9.3 0012h Add CR+LF

Set ON/OFF a line termination after each message sent.

Writing character '0' will switch OFF the line termination.

Writing character '1' will switch ON the line termination. It will add a CR+LF right after each message sent.

CR+LF termination is out of the end of message, being added after the 0x03 message termination character. It must be ignored for CRC calculation and as message information.

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					57h	30h	30h	31h	32h	30h	31h				03h
STX	ID_O		ID_D		'W'	'0'	'0'	'1'	'2'	'0'	'1'	Value	LRC		ETX

Value must be '0' (30h) or '1' (31h)

Factory default value is '1'.

9.4 0013h Output rate in stream mode

In stream mode, the Xtrem is permanently sending a response message with the reading of the 0107h register, giving weighing information (see 0107h Weighing register in stream mode).

The 0013h register configures the time interval between each message transmission expressed in ms. The factory default value is 50ms. The weighing information is updated each 20ms or each 80ms depending on setting of 0038h data register (ADC sampling speed). A time interval of less than 20 ms is possible, but it will not provide more weighing

information. When sending in stream mode, the communication quality may be degraded to the point of not reaching the desired refresh rate due to a too low wi-fi signal or because too many clients connected to the device.

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	...
02h					57h	30h	30h	31h	33h			...
STX	ID_O		ID_D		'W'	'0'	'0'	'1'	'3'	Data length = n		...

...	12	...	12+n	13+n	14+n	15+n
...						03h
...	S$_1$	...	S$_n$	LRC		ETX

Example: Device "00" request device "01" for write 500ms at register 0013h

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
02h	30h	30h	30h	31h	57h	30h	30h	31h	33h	30h	33h	35h	30h	30h	36h	32h	03h
STX	'0'	'0'	'0'	'1'	'W'	'0'	'0'	'1'	'3'	'0'	'3'	'5'	'0'	'0'	'6'	'2'	ETX

Device "01" response to the write request is:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h	30h	31h	30h	30h	77h	30h	30h	31h	33h	30h	31h	30h	34h	35h	03h
STX	'0'	'1'	'0'	'0'	'w'	'0'	'0'	'1'	'3'	'0'	'1'	'0'	'4'	'5'	ETX

9.5   1011h Start the stream mode sending string 0107h (weight)

The execution of the register 1011h will start the transmission in continuous mode, sending the register 0107h on a given frequency for the time interval set in the register 0013h.

Execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					45h	31h	30h	31h	31h	30h	30h			03h
STX	ID_O		ID_D		'E'	'1'	'0'	'1'	'1'	'0'	'0'	LRC		ETX

Response to the execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					65h	31h	30h	31h	31h	30h	30h				03h
STX	ID_O		ID_D		'e'	'1'	'0'	'1'	'1'	'0'	'1'	Result		LRC	ETX

9.6 1012h Start the stream mode sending string 0110h (ADC counts)

The execution of the register 1012h will start the transmission in continuous mode, sending the register 0110h on a given frequency for the time interval set in the register 0013h.

Register 0110h is the direct reading of the ADC count of the weighing system.

Execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					45h	31h	30h	31h	32h	30h	30h			03h
STX	ID_O		ID_D		'E'	'1'	'0'	'1'	'2'	'0'	'0'	LRC		ETX

Response to the execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					65h	31h	30h	31h	32h	30h	30h				03h
STX	ID_O		ID_D		'e'	'1'	'0'	'1'	'2'	'0'	'1'	Result		LRC	ETX

9.7 1013h Start the stream mode sending string 0111h (filtered ADC counts)

The execution of the register 1013h will start the transmission in continuous mode, sending the register 0111h on a given frequency for the time interval set in the register 0013h.

Register 0111h is the reading of the ADC count of the weighing system after digital filtering.

Execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					45h	31h	30h	31h	33h	30h	30h			03h
STX	ID_O		ID_D		'E'	'1'	'0'	'1'	'3'	'0'	'0'	LRC		ETX

Response to the execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					65h	31h	30h	31h	33h	30h	30h				03h
STX	ID_O		ID_D		'e'	'1'	'0'	'1'	'3'	'0'	'1'	Result		LRC	ETX

9.8   1010h Stop the stream mode

The execution of the register 1010h will stop the transmission in continuous mode.

Execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					45h	31h	30h	31h	30h	30h	30h			03h
STX	ID_O		ID_D		'E'	'1'	'0'	'1'	'0'	'0'	'0'	LRC		ETX

Response to the execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					65h	31h	30h	31h	30h	30h	30h				03h
STX	ID_O		ID_D		'e'	'1'	'0'	'1'	'0'	'0'	'1'	Result	LRC		ETX

10 Scale definition

Data address (hex)	Description	Type	Seal	Link
0020	Weighing unit (g / kg)	RW	✓	
0021	Weighing range mode	RW	✓	
0022	Max (Max_1)	RW	✓	
0023	e (e_1)	RW	✓	
0024	Max_2	RW	✓	
0025	e_2	RW	✓	
0026	Decimal position	RW	✓	
0029	Allow negative weight (ON/OFF)	RW	✓	
1104	High resolution mode on/off	E		

11 Scale adjustment

Data address (hex)	Description	Type	Seal	Link
0030	Initial zero (ADC counts value)	RW	✓	
0031	Slope divisor (ADC counts value)	RW	✓	
0032	Pre-calibration (ADC counts value)	RW	✓	
1030	Initial zero adjust	E	✓	
1031	Span adjust	E	✓	
0034	Weight value for adjust.	RW		
0035	Max count number	R		
0033	Input voltage from the load cells (uV/e)	R		
0036	ADC counts /e	R		

12 Gravity force correction

Data address (hex)	Description	Type	Seal	Link
0040	Geo area correction (ON/OFF)	RW	✓	
0041	Geo local area	RW	✓	
0042	Geo adjust area	RW	✓	

13 Digital filter

Data address (hex)	Description	Type	Seal	Link
	Digital filter			
0070	Filter level	RW		
0071	Motion filter (ON/OFF)	RW		
0072	Livestock filter (ON/OFF)	RW		
0073	Stability range	RW		

14 Zero and tare device

Data address (hex)	Description	Type	Seal	Link
0050	Zero tracking device (ON/OFF)	RW	✔	
0051	Zero tracking range (0…3)	RW	✔	
0052	Initial zero setting (ON/OFF)	RW	✔	
0053	IZSR (%Max)	RW	✔	
0060	Tare mode	RW		
1060	Switch tare mode	E		
0061	Auto tare (ON/OFF)	RW	✔	
0062	Tare on stability (ON/OFF)	RW	✔	
1103	Clear tare	E		

15 Counting mode

Data address (hex)	Description	Type	Seal	Link
	Counting mode			
0109	Number of pieces	R		
0114	Count average per piece	RWE		
0115	Unit weight	RW		
0116	Counting mode ON/OFF	RW		

16 Weighing information

Data address (hex)	Description	Type	Seal	Link
	Weighing information			
0101	Weight value	R		
0102	Tare value	RE		
0103	Net weight value	R		
0104	Weight stability indicator	R		
0105	Zero indicator	RE		
0106	Zero tracking activity indicator	R		
0107	Weighing register in stream mode	R		
0108	Pre-set or manual tare value	RWE		
0110	ADC counts instant reading	R		
0111	ADC counts filtered	R		
0112	Zero ADC counts	R		
0113	Tare ADC counts	R		

16.1 0101h Weight value

After a read request returns an ASCII string with the current weigh value.

It's a read-only data register and cannot be written.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	31h	30h	31h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'1'	'0'	'1'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	...
02h					72h	30h	31h	30h	31h	30h	38h	...
STX	ID_O		ID_D		'r'	'0'	'1'	'0'	'1'	'0'	'8'	...

...	12	13	14	15	16	17	18	19	20	21	22	23	24
...													03h
...	W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8	U_1	U_2	LRC		ETX

Data length field is always 0Ah (10 characters length) with the last measurement of weight (gross weight). Is a numerical decimal value in a fixed length of 8 digits. Numeric values are aligned to the right, leaving blank spaces to the left to fill the 8 characters string.

The decimal point is a dot symbol '.' (ASCII code 2Eh).

A negative sign '-' (ASCII code 2Dh) could precede the most significative digit. The weight measurement could be negative in the case that there is a problem with the zero acquisition of the instrument.

After weight value, the 2 characters U_1 and U_2 shows the weighing unit: "g ", "kg", "lb", "oz".

Example:

W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8	U_1	U_2
20h	32h	30h	35h	33h	2Eh	31h	35h	6Bh	67h
' '	'2'	'0 '	'5'	'3'	'.'	'1'	'5'	'k'	'g'

16.2 0102h Tare value

After a read request returns an ASCII string with the current tare value.

It's a read-only data register and cannot be written.

The execution of the register 0102h will set the tare value with the current weight value

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	31h	30h	32h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'1'	'0'	'2'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	…
02h					72h	30h	31h	30h	32h	30h	38h	…
STX	ID_O		ID_D		'r'	'0'	'1'	'0'	'2'	'0'	'8'	…

…	12	13	14	15	16	17	18	19	20	21	22	23	24
…													03h
…	W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8	U_1	U_2	LRC		ETX

Data length field is always 0Ah (10 characters length) with the last result of the net weight calculation. Is a numerical decimal value in a fixed length of 8 digits. Numeric values are aligned to the right, leaving blank spaces to the left to fill the 8 characters string.

The decimal point is a dot symbol '.' (ASCII code 2Eh).

A negative sign '-' (ASCII code 2Dh) could precede the most significative digit. The weight measurement could be negative in the case that there is a problem with the zero acquisition of the instrument.

After tare value, the 2 characters U_1 and U_2 shows the weighing unit: "g ", "kg", "lb", "oz".

Example:

W₁	W₂	W₃	W₄	W₅	W₆	W₇	W₈	U₁	U₂
20h	32h	30h	35h	2Eh	30h	31h	35h	6Bh	67h
' '	'2'	'0 '	'5'	'.'	'0'	'1'	'5'	'k'	'g'

Execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					45h	30h	31h	30h	32h	30h	30h			03h
STX	ID_O		ID_D		'E'	'0'	'1'	'0'	'2'	'0'	'0'	LRC		ETX

Response to the execute request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					65h	30h	31h	30h	32h	30h	30h				03h
STX	ID_O		ID_D		'e'	'0'	'1'	'0'	'2'	'0'	'1'	Result		LRC	ETX

The result code can have the following values:

- '0' (30h) the function has been executed correctly.
- '4' (34h) timeout waiting for stability.
- '3' (33h) maximum tare value is Max_1 when the scale range is configured with 2 intervals.

16.3 0103h Net weight

After a read request returns an ASCII string with the current net weigh value.

It's a read-only data register and cannot be written.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	31h	30h	33h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'1'	'0'	'3'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	...
02h					72h	30h	31h	30h	33h	30h	38h	...
STX	ID_O		ID_D		'r'	'0'	'1'	'0'	'3'	'0'	'8'	...

...	12	13	14	15	16	17	18	19	20	21	22	23	24
...													03h
...	W₁	W₂	W₃	W₄	W₅	W₆	W₇	W₈	U₁	U₂	LRC		ETX

Data length field is always 0Ah (10 characters length) with the last result of the net weight calculation. Is a numerical decimal value in a fixed length of 8 digits. Numeric values are aligned to the right, leaving blank spaces to the left to fill the 8 characters string.

The decimal point is a dot symbol '.' (ASCII code 2Eh).

A negative sign '-' (ASCII code 2Dh) could precede the most significative digit. The net weight will be negative when a tare is set but the load receptor is empty.

After the value, the 2 characters U_1 and U_2 shows the weighing unit: "g ", "kg", "lb", "oz".

Example:

W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8	U_1	U_2
20h	32h	30h	35h	33h	2Eh	31h	35h	6Bh	67h
' '	'2'	'0 '	'5'	'3'	'.'	'1'	'5'	'k'	'g'

16.4 0104h Stability indicator

After a read request returns an ASCII character with the current value of the stability flag.

It's a read-only data register and cannot be written.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	31h	30h	34h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'1'	'0'	'4'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					72h	30h	31h	30h	34h	30h	38h				03h
STX	ID_O		ID_D		'r'	'0'	'1'	'0'	'4'	'0'	'1'	S	LRC		ETX

S = '0' (ASCII 30h) if weight is not stable.

S = '1' (ASCII 31h) if weight is stable.

16.5 0105h Zero indicator

After a read request returns an ASCII character with the current value of the zero flag.

It's a read-only data register and cannot be written.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	31h	30h	35h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'1'	'0'	'5'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					72h	30h	31h	30h	35h	30h	38h				03h
STX	ID_O		ID_D		'r'	'0'	'1'	'0'	'5'	'0'	'1'	S	LRC		ETX

S = '0' (ASCII 30h) not zero.

S = '1' (ASCII 31h) zero.

16.6 0106h Zero tracking activity indicator

After a read request returns an ASCII character with the current value of the zero-tracking flag.

It's a read-only data register and cannot be written.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	31h	30h	36h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'1'	'0'	'6'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					72h	30h	31h	30h	36h	30h	38h				03h
STX	ID_O		ID_D		'r'	'0'	'1'	'0'	'6'	'0'	'1'	S	LRC		ETX

S = '0' (ASCII 30h) zero-tracking is not working.

S = '1' (ASCII 31h) zero-tracking is on.

16.7 0107h Weighing register in stream mode.

After a read request returns an ASCII string with the current weighing information.

It's a read-only data register and cannot be written.

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	31h	30h	37h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'1'	'0'	'7'	'0'	'0'	LRC		ETX

Response:

0	1	2	3	4	5	6	7	8	9	10	11	…
02h					72h	30h	31h	30h	37h	31h	36h	…
STX	ID_O		ID_D		'r'	'0'	'1'	'0'	'7'	'1'	'6'	…

…	12	13	14	15	16	17	18	19	20	21	22	…
…	57h											…
…	'W'	W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8	U_1	U_2	…

…	23	24	25	26	27	28	29	30	31	32	33	…
…	54h											…
…	'T'	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	U_1	U_2	…

…	34	35	36	37	38	39	40
…	53h						03h
…	'S'	S_1	S_2	S_3	LRC		ETX

Data length field is always 1Ah (26 characters length). This 26-character string is divided in 3 different fields with a fixed length structure.

Weight field: Last measurement of weight (gross weight). Starts with the character 'W' (ASCII code 57h) and then, a numerical decimal value in a fixed length of 8 digits.

Numeric values are aligned to the right, leaving blank spaces to the left to fill the 8 characters string.

The decimal point is a dot symbol '.' (ASCII code 2Eh).

A negative sign '-' (ASCII code 2Dh) could precede the most significative digit. The weight measurement could be negative in the case that there is a problem with the zero acquisition of the instrument.

After weight value, the 2 characters U_1 and U_2 shows the weighing unit: "g ", "kg", "lb", "oz".

Example:

'W'	W$_1$	W$_2$	W$_3$	W$_4$	W$_5$	W$_6$	W$_7$	W$_8$	U$_1$	U$_2$
57h	20h	20h	20h	32h	33h	30h	2Eh	33h	6Bh	67h
'W'	' '	' '	' '	'2'	'3'	'0'	'.'	'3'	'k'	'g'

Tare field: Tare value. Starts with the character 'T' (ASCII code 54h) and then, a numerical decimal value in a fixed length of 8 digits.

Numeric values are aligned to the right, leaving blank spaces to the left to fill the 8 characters string.

The decimal point is a dot symbol '.' (ASCII code 2Eh).

A negative sign '-' (ASCII code 2Dh) could precede the most significative digit. The weight measurement could be negative in case there is a problem with the zero acquisition of the instrument.

After tare value, the 2 characters U$_1$ and U$_2$ shows the weighing unit: "g ", "kg", "lb", "oz".

Example:

'T'	W$_1$	W$_2$	W$_3$	W$_4$	W$_5$	W$_6$	W$_7$	W$_8$	U$_1$	U$_2$
54h	20h	20h	20h	31h	34h	30h	2Eh	30h	6Bh	67h
'T'	' '	' '	' '	'1'	'4'	'0'	'.'	'0'	'k'	'g'

Status field: Weighing process information. Starts with the character 'S' (ASCII code 53h) and then, a 12-bit value coded in hexadecimal in 3 ASCII characters. This 12-bit value is giving information on the weight measurement sent and is coded in binary format:

S$_1$				S$_2$				S$_3$			
B11	**B10**	**B9**	**B8**	**B7**	**B6**	**B5**	**B4**	**B3**	**B2**	**B1**	**B0**
Reserved	P_T	RANGE	NW	OV	Z_I	HR	T_T	NET	STAB	TARE	ZERO

Bit	Description
0	ZERO condition. (is set to 1 if Weight < 1/4e or Weight > -1/4e)
1	TARE device is ON
2	Stability (1= stable weight)
3	Net weight
4	Tare mode (0=normal tare, 1= fixed tare)
5	High resolution mode (1 when HR mode is ON)
6	Initial zero (the device is performing the initial zero after start)
7	Weight > Max +9e (over load)
8	Weight < -19e (negative weight)
9	Range indication (0=range 1 / 1=range 2) when the instrument is configured as multi-range (2 ranges).
10	Pre-set tare is in operation
11	Reserved (always 0)

17 WIFI module

XTREM has an optional Wi-Fi module that can be connected to the expansion board port by adding wireless and network communication functions.

Wi-fi module specifications	
RF certification	FCC/CE/RoHS
Protocols	A-MPDU and A-MSDU aggregation and 0.4 µs guard interval support
Frequency range	2,4-2,5 GHz

The Wi-Fi module allows two different network modes at once:

- **AP mode** works as a Wi-Fi access point creating a private network of up to 4 nodes
- **STA mode:** operating in station mode you can join a network using any available Wi-Fi access point or router.

Both modes are compatible and can work at once.

As TCP server, XTREM supports up to 3 different clients linked at once in a point-to-point connection in addition to the client linked through the serial port.

In addition, when a network is available, XTREM opens two different UDP channels that are available for sending / receiving in broadcast mode to all the network nodes.

Once a TCP or UDP link is established, communication is carried out using the communication protocol described in this document.

The Wi-Fi module requires an additional CR+LF at the end of each message (after the ETX character) for send it through the network. Example, asking the XTREM for sending the weight information register in stream mode:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					45h	31h	30h	31h	31h	30h	30h			03h
STX	ID_O		ID_D		'E'	'1'	'0'	'1'	'1'	'0'	'0'	LRC		ETX

+

15	16
0Dh	0Ah
CR	LF

The XTREM protocol don't uses network IP addresses to forward messages. To transmit messages using UDP, it is necessary to assign a different "device ID" to each XTREM device in the network.

Example of weighing using the stream mode:

From IP	Port	To IP	To P.	ASCII	Hex
You	5556	192.168.0.<mark>255</mark>	4445	\020001E10110000\03\r\n	02 30 30 30 31 45 31 30 31 31 30 30 30 30 03 0D 0A
192.168.0.139	4445	You	5556	\020100e101101054\03\r\n	02 30 31 30 30 65 31 30 31 31 30 31 30 35 34 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 0.0g T 0.0g S01561\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 20 20 30 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 35 36 31 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 0.0g T 0.0g S01561\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 20 20 30 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 35 36 31 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 11.5g T 0.0g S01071\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 20 31 31 2E 35 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 37 31 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 43.0g T 0.0g S01073\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 20 34 33 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 37 33 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 203.0g T 0.0g S01065\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 32 30 33 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 35 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 297.0g T 0.0g S01068\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 32 39 37 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 38 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 359.5g T 0.0g S0106E\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 33 35 39 2E 35 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 45 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 413.0g T 0.0g S01062\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 34 31 33 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 32 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 472.5g T 0.0g S01060\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 34 37 32 2E 35 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 30 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 499.5g T 0.0g S01461\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 34 39 39 2E 35 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 34 36 31 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 500.0g T 0.0g S01465\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 35 30 30 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 34 36 35 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 500.0g T 0.0g S01465\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 35 30 30 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 34 36 35 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 500.0g T 0.0g S01465\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 35 30 30 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 34 36 35 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 500.0g T 0.0g S01465\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 35 30 30 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 34 36 35 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 398.0g T 0.0g S01066\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 33 39 38 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 36 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 335.5g T 0.0g S01064\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 33 33 35 2E 35 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 34 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 272.5g T 0.0g S01066\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 32 37 32 2E 35 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 36 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 160.5g T 0.0g S01066\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 31 36 30 2E 35 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 36 36 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 94.5g T 0.0g S0107C\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 20 39 34 2E 35 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 37 43 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 28.0g T 0.0g S0107E\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 20 32 38 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 30 37 45 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 0.0g T 0.0g S01561\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 20 20 30 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 35 36 31 03 0D 0A
192.168.0.139	4445	You	5556	\020100r01071AW 0.0g T 0.0g S01561\03\r\n	02 30 31 30 30 72 30 31 30 37 31 41 57 20 20 20 20 30 2E 30 67 20 54 20 20 20 20 30 2E 30 67 20 53 30 31 35 36 31 03 0D 0A

The example above shows the result of a weighing operation:

Communication is done between a PC ("You") and a XTREM unit on the same network using two UDP channels (port 4445 at PC side and port 5556 at XTREM side). XTREM use the IP 192.168.0.139 and its device ID is "01".

1. PC starts the communication by sending a command 0x1011 to the XTREM device '01'. Note that the message is broadcast to all the network nodes listening the UDP port. Is not needed to know the IP address of any of the XTREM modules in the network.
2. XTREM '01' knowledge the message by sending a response to the device that sent the initial message.
3. XTREM '01' executes the command 0x1011 sending in stream mode the weighing information at the output rate selected.

Network settings using the Wi-Fi module:

Data address (hex)	Description	Type	Seal	Link
0500	WIFI AP SSID name	RW		
0501	WIFI AP password	RW		
0502	WIFI AP IP address	RW		
0503	WIFI AP DHCP (on/off)	RW		
0600	WIFI STA SSID: name of the Wi-fi access point to connect as station	RW		
0601	WIFI password of the access point to connect as station	RW		
0602	WIFI STA IP address	RW		
0603	WIFI STA DHCP (on/off)	RW		
0700	WIFI UDP remote port	RW		
0701	WIFI UDP local port	RW		
0702	WIFI TCP server port	RW		

Default values configured as factory settings		
0500	SSID name as AP	"GRAM_01"
0501	Access point password	"12345678"
0502	IP address (for its own private network)	192.168.4.1
0503	DHCP in AP mode	'1' (activated)
0702	TCP port (as server)	6666
0700	UDP remote port (sending)	4444
0701	UDP local port (listening)	5555

NOTE: it is convenient to reset the device after changing the network settings.

17.1 0500h WIFI AP SSID name

Name assigned to the wireless network of the XTREM module in AP mode. String up to 32 ASCII bytes.

A null value will disable the access point as well as the device private network.

The default AP SSID name is "GRAM_01".

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	35h	30h	30h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'5'	'0'	'0'	'0'	'0'	LRC		ETX

Response to the read request:

0	1	2	3	4	5	6	7	8	9	10	11	...
02h					72h	30h	35h	30h	30h			...
STX	ID_O		ID_D		'r'	'0'	'5'	'0'	'0'	Data length		...

...	12	...	12+n	13+n	14+n	15+n
...						03h
...	S_1	...	S_n	LRC		ETX

Note that Data length can be up to 32 bytes.

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	...
02h					57h	30h	35h	30h	30h			...
STX	ID_O		ID_D		'W'	'0'	'5'	'0'	'0'	Data length = n		...

...	12	...	12+n	13+n	14+n	15+n
...						03h
...	S_1	...	S_n	LRC		ETX

Response to the write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16
02h					77h	30h	35h	30h	31h	30h	31h				03h
STX	ID_O		ID_D		'w'	'0'	'5'	'0'	'0'	'0'	'1'	Result	LRC		ETX

Result for a write request is 1 ASCII character:

- '0' (30h) write operation performed ok.
- A different value means that an error occurred when attempting to write the flash memory of the device.

17.2 0501 Set password for Wi-Fi access point

Password string with a length of 8 - 64 ASCII bytes.

The default password for the access point is "12345678".

A null string will configure the AP as "open".

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	35h	30h	31h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'5'	'0'	'1'	'0'	'0'	LRC		ETX

Response to the read request:

0	1	2	3	4	5	6	7	8	9	10	11	...
02h					72h	30h	35h	30h	31h			...
STX	ID_O		ID_D		'r'	'0'	'5'	'0'	'1'	Data length = n		...

...	12	...	12+n	13+n	14+n	15+n
...						03h
...	S_1	...	S_n	LRC		ETX

Note that Data length can be up to 64 bytes.

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	...
02h					57h	30h	35h	30h	31h			...
STX	ID_O		ID_D		'W'	'0'	'5'	'0'	'1'	Data length = n		...

...	12	...	12+n	13+n	14+n	15+n
...						03h
...	S_1	...	S_n	LRC		ETX

Response to the write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16
02h					77h	30h	35h	30h	31h	30h	31h				03h
STX	ID_O		ID_D		'w'	'0'	'5'	'0'	'1'	'0'	'1'	Result	LRC		ETX

Result for a write request is 1 ASCII character:

- '0' (30h) write operation performed ok.
- A different value means that an error occurred when attempting to write the flash memory of the device.

17.3 0502 Set the IP address in AP mode

Configures the IP address of the device in its own private network. The XTREM Wi-Fi module only supports class C IP addresses. When DHCP mode is on, devices connected to the network will get an IP address in the same range.

The default IP address configured is "192.168.4.1".

Read request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
02h					52h	30h	35h	30h	32h	30h	30h			03h
STX	ID_O		ID_D		'R'	'0'	'5'	'0'	'2'	'0'	'0'	LRC		ETX

Response to the read request:

0	1	2	3	4	5	6	7	8	9	10	11	…
02h					72h	30h	35h	30h	32h			…
STX	ID_O		ID_D		'r'	'0'	'5'	'0'	'2'	Data length = n		…

…	12	…	12+n	13+n	14+n	15+n
…						03h
…	S_1	…	S_n	LRC		ETX

Note that Data length can be up to 15 bytes.

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	…
02h					57h	30h	35h	30h	32h			…
STX	ID_O		ID_D		'W'	'0'	'5'	'0'	'2'	Data length = n		…

…	12	…	12+n	13+n	14+n	15+n
…						03h
…	S_1	…	S_n	LRC		ETX

Response to the write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16
02h					77h	30h	35h	30h	32h	30h	31h				03h
STX	ID_O		ID_D		'w'	'0'	'5'	'0'	'2'	'0'	'1'	Result	LRC		ETX

Result for a write request is 1 ASCII character:

- '0' (30h) write operation performed ok.
- A different value means that an error occurred when attempting to write the flash memory of the device.

17.4 0503 Set DHCP mode in AP

Set ON/OFF the DHCP mode of the private network created when starting the Wi-fi access point.

Writing character '0' will switch OFF DHCP of the access point.

Writing character '1' will switch ON DHCP.

Write request:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
02h					57h	30h	35h	30h	33h	30h	31h				03h
STX	ID_O		ID_D		'W'	'0'	'5'	'0'	'3'	'0'	'1'	Value	LRC		ETX

Value must be '0' (30h) or '1' (31h)

Factory default value is '1' (DHCP set to ON).

17.5 0702 TCP server port

Define the TCP port number for connect using TCP protocol.

The default value as factory setting is "6666".

17.6 0700 UDP remote port

UDP port for send the information requested for a remote device.

The default value is "5555" for the private network created in AP mode, and "5556" when connected to a different network being a station of another Wi-Fi router / access point.

XTREM opens those UDP channels at the start.

17.7 0701 UDP local port

XTREM is listening this UPD port waiting for any request from other devices in the network.

Default value is "4444" for the private network created in AP mode, and "4445" when connected to a different network being a station of another Wi-Fi router / access point.

XTREM opens those UDP channels at the start.