DewesoftX® Serial Com Module

DEWESoft®

SOFTWARE USER MANUAL

DewesoftX® Serial Com Module V20-1

1. Table of contents

2. About this document

2.1. Legend

The following symbols and formats will be used throughout the document.

Important
It gives you important information about the subject.
Please read carefully!

Hint
It gives you a hint or provides additional information about a subject.

Example
Gives you an example of a specific subject.

2.2. Compatibility

The Module requires Dewesoft X2 ® (32-bit) or higher version of ‚DewesoftX® (X3, 2020, both 32-bit and 64-bit version)

2.3. Glossary and abbreviations

This glossary includes explanations of some of the most important terms and abbreviations that are used in documentation.

ASCII
The American Standard Code for Information Interchange (ASCII, pronunciation: /ˈæski/ ass-kee;) is a character-encoding scheme originally based on the English alphabet. ASCII codes represent text in computers, communications equipment, and other devices that use text. Most modern character-encoding schemes are based on ASCII, though they support many additional characters.

Bin
Binary: The binary numeral system, or base-2 number system, represents numeric values using two symbols: 0 and 1.

Bit
Bit, the basic unit of information storage, a single binary digit that is either 0 or 1. see also Baud (Bd)

Baud (Bd)
is synonymous to symbols per second per second. It is the unit of symbol rate, also known as baud rate or modulation rate; the number of distinct symbol changes.

A baud rate, by definition, means the number of times a signal in a communications channel changes state or varies.

Example
A 2400 baud rate means that the channel can change states up to 2400 times per second.

This is often confused with the bit rate (expressed in bit/s), which is related, but may be different. The number of bits per baud is determined by the modulation technique.

Example
If we use a baud rate of 2400,and a phase modulation (which can transmit four bits per baud), this means that we can transfer 9600 bit/s. 2400 baud x 4 bits per baud = 9600 bps

The baud rate (communication speed) between the serial device and the PC can be configured in the hardware setup of the Module (see chapter Connection settings).

Dec
Decimal: The decimal numeral system (also called base ten or occasionally denary) has ten as its base. It is the numerical base most widely used by modern civilizations.

EPAD2
EPAD2 series modules are rugged low-speed isolation amplifiers for RS485-bus. These modules are mainly used to add multiple slow channels to dynamic data acquisition instruments.

Esc
Escaped representation: an escape character is used to encode special characters: An escape character is a character which invokes an alternative interpretation on subsequent characters in a character sequence. see 2.2 Character escaping on page 8 for more details.

Hex
In mathematics and computer science, hexadecimal (also base 16, or hex) is a positional numeral system with a radix, or base, of 16. It uses sixteen distinct symbols, most often the symbols 0–9 to represent values zero to nine, and A, B, C, D, E, F (or alternatively a–f) to represent values ten to fifteen.

Hz
The hertz (symbol: Hz) is the SI unit of frequency defined as the number of cycles per second of a periodic signal.

IEEE 754
The IEEE Standard for Floating-Point Arithmetic (IEEE 754) is a technical standard for floating-point computation established in 1985 by the Institute of Electrical and Electronics Engineers (IEEE).

LSB
The Least Significant Bit is the bit position in a binary integer giving the units value, that is, determining whether the number is even or odd. The LSB is sometimes referred to as the right-most bit, due to the convention in positional notation of writing less significant digits further to the right.

NMEA-0183
is a combined electrical and data specification for communication between marine electronic devices such as echo sounder, sonars, anemometer, gyrocompass, autopilot, GPS receivers and many other types of instruments.

Oct
The octal numeral system, or oct for short, is the base-8 number system, and uses the digits 0 to 7. Numerals can be made from binary numerals by grouping consecutive binary digits into groups of three (starting from the right). For example, the binary representation for decimal 74 is 1001010, which can be grouped into (00)1 001 010 — so the octal representation is 112.

PC
DS NET systems are typically connected to a Personal Computer which runs DewesoftX® to fetch the measurement data.

RS-232
Recommended Standard 232: is a standard for serial communication. It is commonly used in computer serial ports.

RS-485
RS-485 is a synonym for EIA-485 which is a standard defining the electrical characteristics of drivers and receivers. Digital communications networks implementing the EIA-485 standard can be used effectively over long distances and in electrically noisy environments. Multiple receivers may be connected to such a network in a linear, multi-drop configuration. These characteristics make such networks useful in industrial environments and similar applications.

Request
data that is sent from DewesoftX® to the serial device

Response
data that the serial device sends to DewesoftX® usually as a reaction to a *Request*.

Rx
Receive – see also *Response*

Tx
Transmit – see also *Request*.

USB
Universal Serial Bus is a specification to establish communication between devices and a host controller (usually PCs).

2.4. Files and Directories

The actual location of the directories on your computer may vary depending on your computer's locale settings and the settings you chose when installing DewesoftX® .

2.4.1. Important DewesoftX® Directories

2.4.1.1. DeweSoft Measurement Unit [recommended]

Directory name	Explanation	Default path
Bin	contains DEWSoftX.exe	D:\DewesoftX\Bin\X
Addons	.dll files for Modules must be copied into this directory	D:\DewesoftX\Bin\Addons
Data	this is where DewesoftX® will store your measurement data	D:\DewesoftX\Data
Setups	this is where your DewesoftX® setup files will be stored	D:\DewesoftX\Setups
System	this is where DewesoftX® project files are stored	D:\DewesoftX\System
Log	this is where DewesoftX® will store log files	D:\DewesoftX\System\Logs

2.4.1.2. Windows Standard

In this mode your system only needs one partition.

Directory name	Default path
Bin	C:\DewesoftX\Bin
Addons	C:\DewesoftX\Bin\AddOns
Data	C:\Documents and settings\All Users\Documents\DewesoftX\Data
Setups	C:\Documents and settings\All Users\Documents\DewesoftX\Setups
System	C:\Documents and settings\All Users\Documents\DewesoftX\System
Log	C:\Documents and settings\All Users\Documents\DewesoftX\System\Logs

2.4.2. Links

DewesoftX® download section
https://www.dewesoft.com/download

2.5. Licensing

The Module requires a valid DewesoftX® license.
To test the Module you can use an *Evaluation license*.

2.5.1. Requesting an Evaluation license

You can request an *Evaluation license* from our homepage:
http://www.dewesoft.com/registration

(1) Click on *Evaluation license*
(2) Fill out all the required fields
(3) Click the **Request** license button

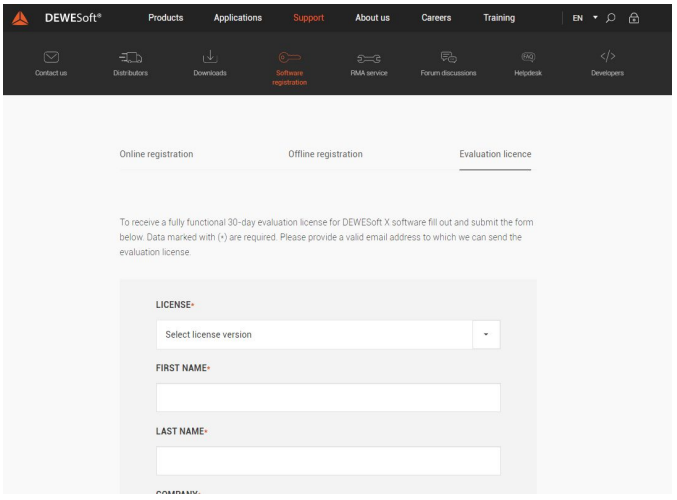


Image 1: Evaluation license

2.5.2. Activating the Evaluation license

When you have received your trial licence key, open DewesoftX® go to *Settings - Hardware Setup...*, select the Registration tab sheet and enter the license code (if you already have other licenses, you may need to click the **Create** button).

Now enter the license code and click the **Register online** button.

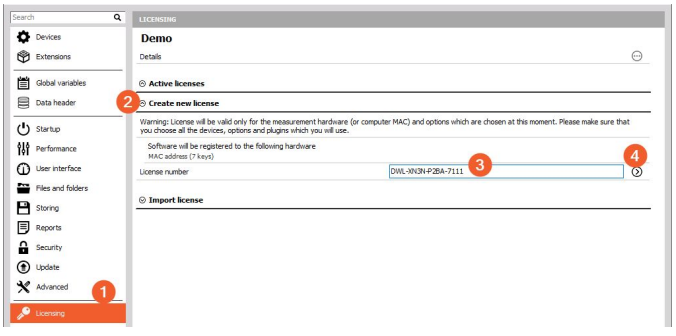


Image 2: Enter license key

Then your new license key will show up in the list and should have the *Status Valid*.

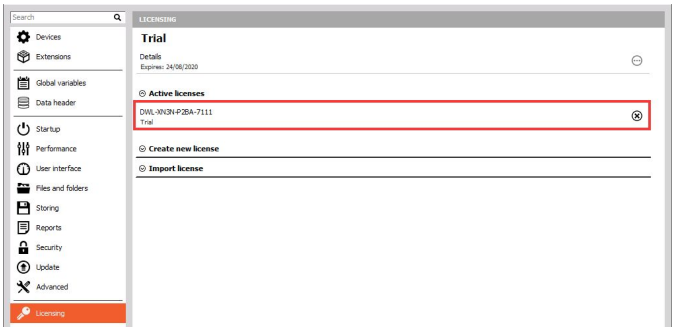


Image 3: Valid trial license

2.6. Plug-in Installation

Simply copy the file SerialCom.dll into the Addons folder of your DewesoftX® installation (e.g. D:\DewesoftX\Bin\Addons\).
Then you can start DewesoftX® and register the Module (aka. Extension). Click Settings - Settings..., select Extensions and click the plus sign. Then find the Module in the list and activate it (i.e. click the check-box (1) in Image 4) - when the Module does not show up in the list, you may need to register it first (see the next chapter Registering the Plug-In)

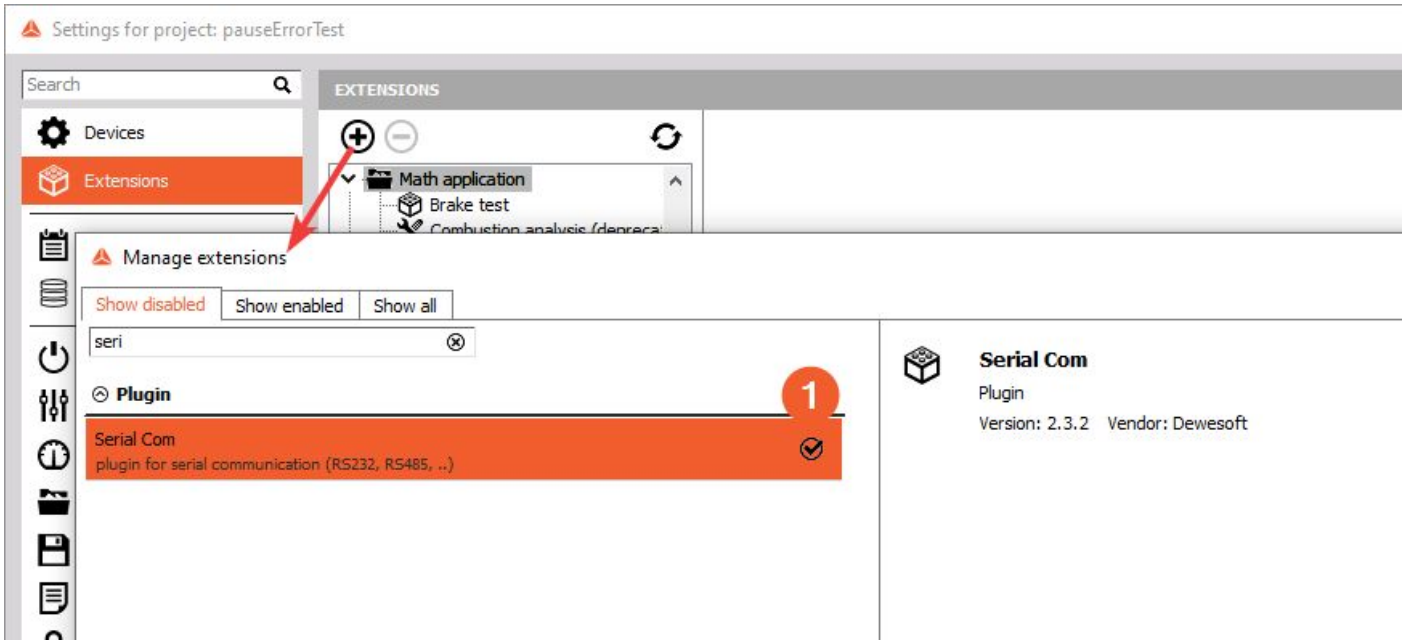


Image 4: Enable Plug-In

2.6.1. Registering the Plug-In

Before you can use Modules in DewesoftX® the Modules must be registered once.
When DewesoftX® is started it will try to register all Modules (*.dll files) that it finds in the AddOns folder. But in order to do that, DewesoftX® requires administrator permissions (because it must write to the Windows® registry). When DewesoftX® is not with administrator permissions, the registration cannot be done automatically.

When the Module does not show up in the Extensions list, you must press the **Refresh** button (see (2) in Image 5). Note: you may need to start DewesoftX® as administrator (depending on the UAC settings of your Windows user/installation).	When you have pressed the **Refresh** button, then you will see the registration Window in Image 6 for a short time. After that, you must restart DewesoftX® .

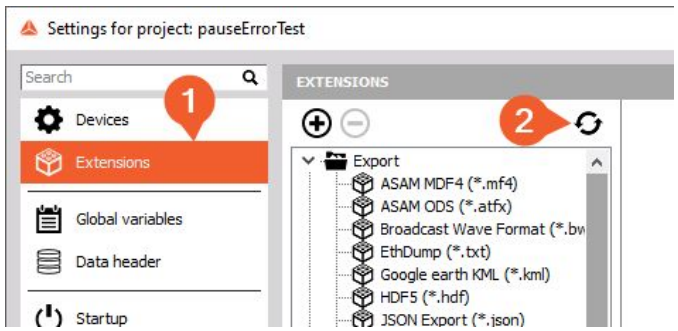


Image 5: Extensions: Refresh button

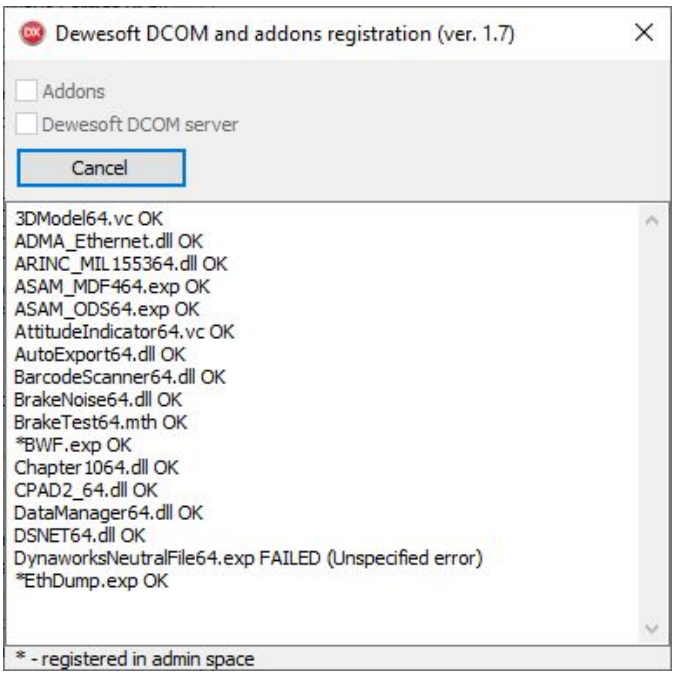


Image 6: Registration Window

3. General

3.1. Timing

The *SerialCom* Module will use the time when it receives the serial data for time-stamping.
You could use the *Communication Delay* setting in the hardware setup to adjust the offset: see chapter Communication Delay.

3.1.1. Fast Data

Modules in DewesoftX® will only get a chance to read the data every now and then (usually about every 33 ms, but this can be configured in Settings...-*Global Settings-General-Acquisition update rate*).
Since serial data is usually very slow, this is fine. But when we have a device that sends data very fast (e.g. at a rate of 1kHz), then the data in DewesoftX® would look like that in Image 7. You can see that all data was received between the time when the Module had a chance to read the data will have the same time-stamp.
In such a case, the Module will wait for some more data to arrive and then evenly distribute those data-points: see Image 8. The duration how long we wait for the next data to arrive can be configured in the Hardware setup: see *Data-Wait [ms]* in chapter Connection setting.

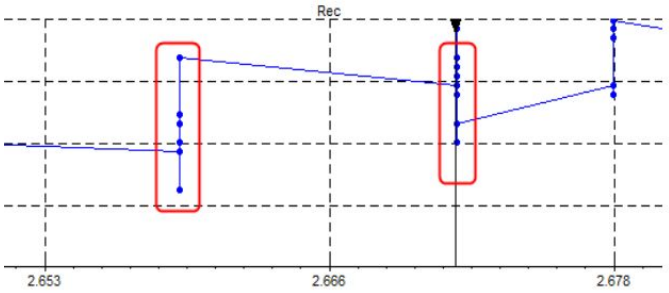


Image 7: Fast Data: Multiple Points At Same Time

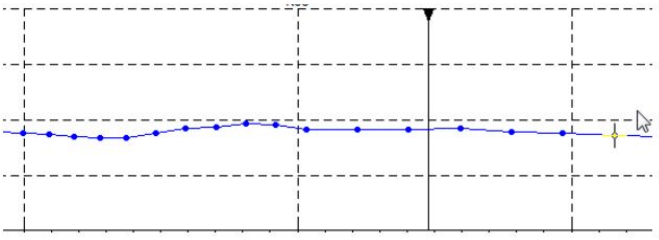


Image 8: Fast Data: Distributed Data-points

3.2. Character escaping

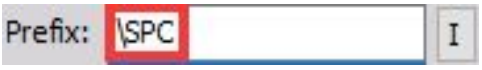
Since many protocols use non-printable special characters as separators, you must escape those special characters. e.g. you cannot directly enter a carriage return into an edit field. You must use an escape sequence instead: e.g. \CR, #13, $0A

For a complete list of escape sequences just open the ASCII Chars dialogue (see chapter ASCII Chars window).

3.2.1. Automatic escaping

Whenever you leave an input field that supports character escaping (e.g. Startstring, Stopstring, Field Separator), the content of the field will automatically be escaped.

For example, when you enter a space character in the *Prefix* input field, it will look in the image below. You can see that the cursor moved a little	When you leave the input field by clicking into the next field or pressing the Tab key on your keyboard you can see that the space character

to the right, because you have entered the space character.	has automatically been escaped and you can now see the escape sequence for the space character which is: \SPC.
 *Image 9: Space in an input field*	 *Image 10: Escaped Space character*

You can also click the small I button (the I stands for information) to get a more comfortable view of the input:

3.2.2. Sequence input dialogue

When you click the small **I** button (the I stands for information) to get a more comfortable view of the input (see Image 9):

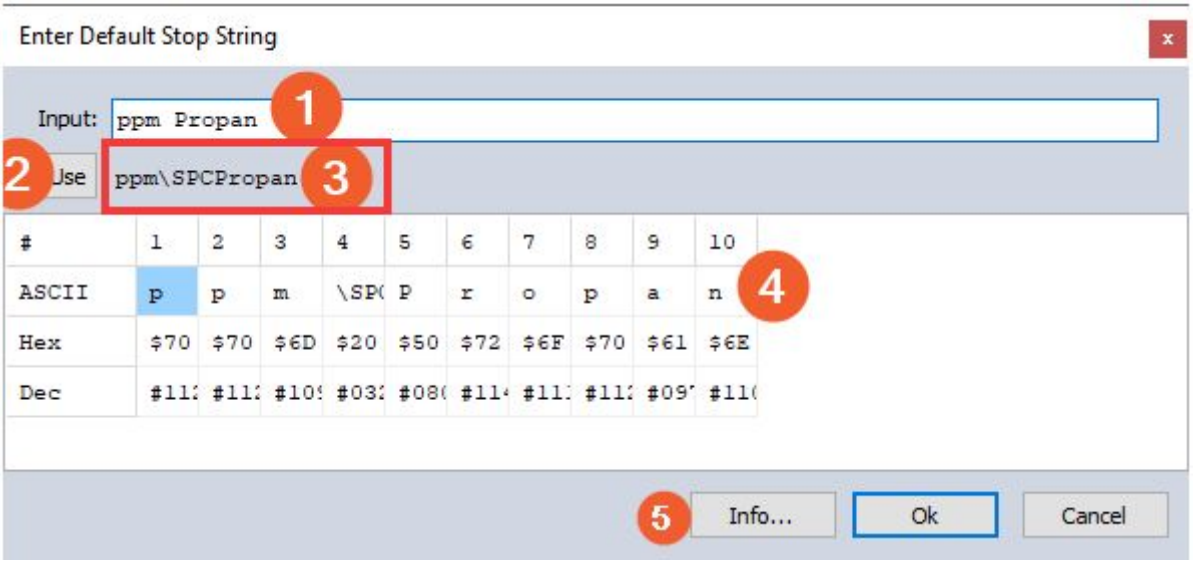


Image 11: Sequence input dialogue

1. In the input dialogue you can enter or paste arbitrary text. You may need to escape special characters. The escaped version of the input string will be shown below the Input field (see 3.)
2. When you click the **Use** button, the escaped input (see 3) will be copied to the Input field. In the example above, you can see that the *Input* field (1.) shows a space character, while the escaped input (3.) shows the escape sequence \SPC for the space character.
3. Will always show the escaped version of the *Input* field (1.)
4. A tabular display of the current Input which makes it easy to identify each input character.
   - The first row named # shows the index number of the character
   - the 2nd row called *ASCII* shows the ASCII representation of the character or the escape sequence (e.g. the 4th input character is the escape sequence \SPC)
   - the 3rd row called *Hex* shows the hexadecimal representation of the character
   - the 4th row called *Dec* shows the decimal representation of the character
5. The **Info...** button will open another window that shows a detailed list of all ASCII characters and their escape sequences (see chapter ASCII Chars window)

3.2.3. ASCII Chars window

When you click the **Info...** button (see 5 in Image 11) you will see a list of all ASCII characters: row called ASCII shows the ASCII representation of the character or the escape sequence (e.g. the 4th

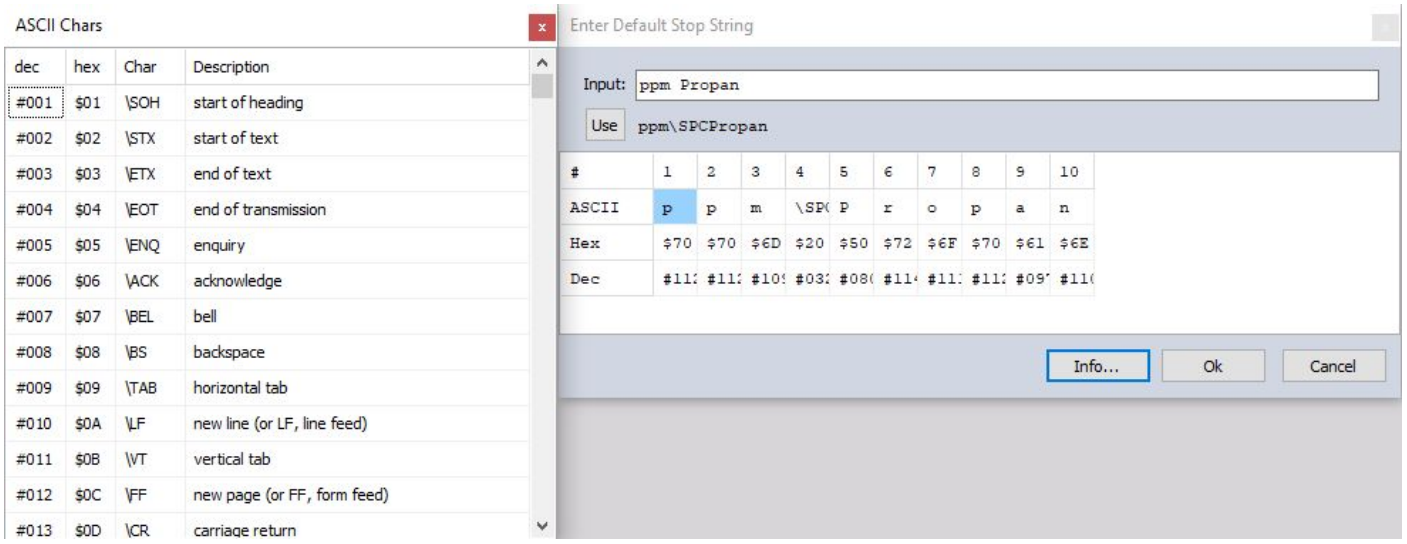


Image 12: ASCII chars window

Note: you can leave the info window open while you work in the *Sequence input dialogue*. When you double click on a row in the list of ASCII chars, the corresponding character or escape sequence will be inserted at the current cursor position of the *Input* field (of the *Sequence input dialogue*).

3.2.4. Odds and Ends

When you want to use any of the escape characters ($, #, \) directly, you must escape it with a backslash. E.g. in Image 13 below you can see that $D is treated as the carriage return character, but the escaped version (\$D) is treated as the two characters: $ and D.	The same is true for decimal numbers. E.g. in Image 14 below you can see that #13 is treated as the carriage return character, but the escaped version (\#13) is treated as the three characters: #, 1 and 3.

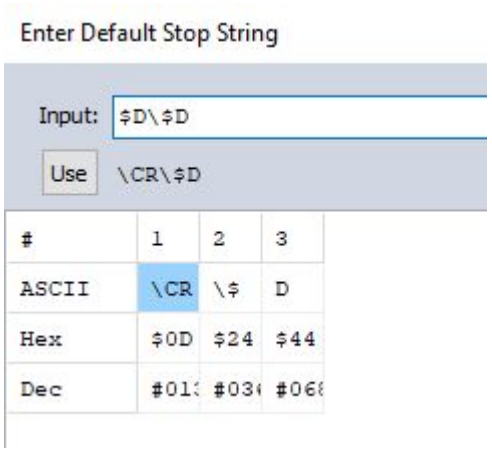
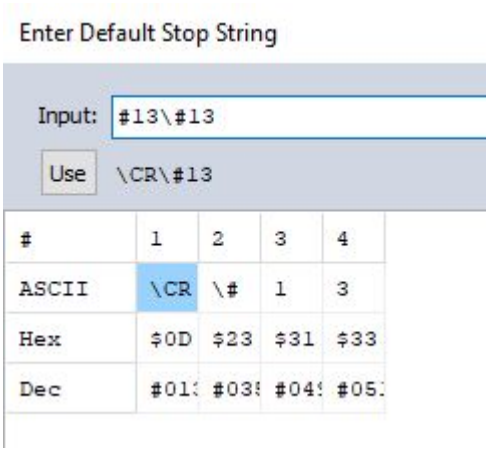
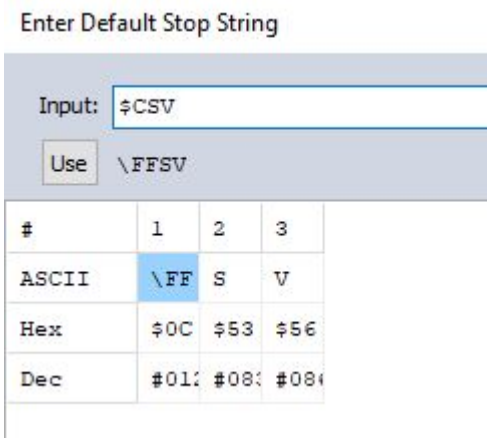
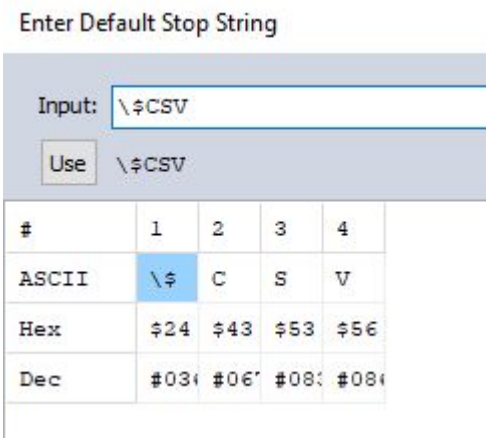

	

Image 13: Escape hexadecimal	*Image 14: Escape decimal*

The parser is built in a lenient way. It will always try to find matching escape sequences and if it doesn't find them the characters are used as they are. When you enter $CSV the lenient parser will try to find the best match for a hexadecimal sequence after the $. The only valid hexadecimal character that follows the $ sign is the C (S is not a valid hexadecimal char) and therefore $C is interpreted as a hexadecimal escape sequence which relates to the Formfeed ASCII character. Note: the input $0CSV would have the same result.	If you want to use $C as it is in your text, you must escape the $ sign with a backslash (see Image 16 below).
 *Image 15: Input $CSV*	 *Image 16: Input: \$CSV*
In Image 17 you can see that the lenient parser automatically escapes the $ sign, if the following characters form no valid hexadecimal escape sequence.	Image 18 shows an example of parsing a decimal escape sequence: only a maximum of the first 3 numbers can form the decimal escape sequence (since the highest possible ordinal value for ASCII characters is 255). Therefore the string #123 is interpreted as { character and the remaining 4 characters are used as is.

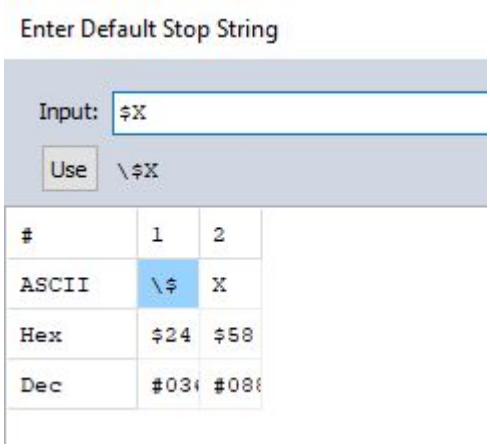


Image 17: Invalid hexadecimal

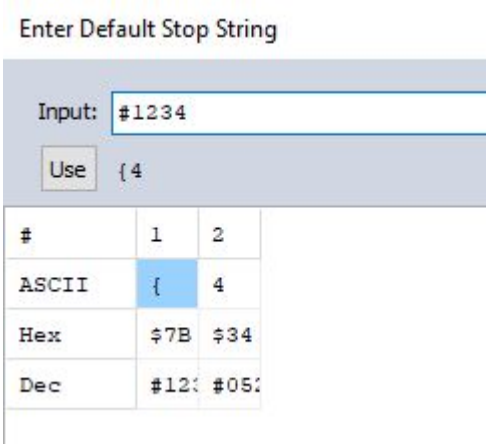


Image 18: Decimal example

Image 19: again, only the first character 9 after the decimal escape character # is a valid decimal character (A is not). Therefore #9 is interpreted as the TAB character and the remaining A character is used as it is.

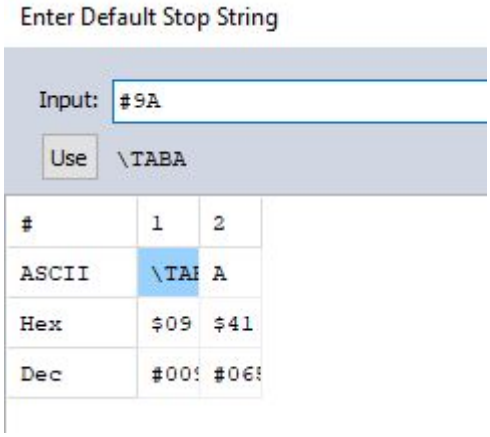


Image 19: Tab character

3.2.4.1. Decimal Separators

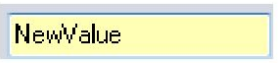
The *decimal separator* is configurable:
When the *decimal separator* is a '.' then the *thousand separator* will automatically be ','.
When the *decimal separator* is a ',' then the *thousand separator* will automatically be '.'.

These settings will be used for Numeric data in Ascii interpretation: see chapter Numeric Data Ascii Interpretation.

Scientific notation is also supported: e.g. 1.2e2 has a value of 120. Note that an uppercase E is also okay.
valid examples (when the decimal separator is set to '.'):

Data	Note
1	integer value of 1
1.	integer value of 1 (trailing decimal separator is okay)
1,234.56	floating point value of 1234.56 (thousand separator is ignored)
1.23456e2	scientific notation – value is 123.456
-2	minus 2
-2.	minus 2 (trailing decimal separator is okay)
-1.4e-1	scientific notation – value is: -0.14

3.3. Input confirmation

When you change the value of an input field, the background colour of the input field will turn yellow to indicate that you have changed something and that this change has not been confirmed yet. Your input will automatically be confirmed when you set the focus to another input field (i.e. by clicking with the mouse or by pressing the Tab key). You can also press Return to manually confirm your change.	
After the input has been confirmed the background colour of the input field will be white again (or red/orange, when there are errors/warnings.	

3.4. Flow Control Settings

Usually the default flow control settings are fine. But for some older devices it may be necessary to configure special settings. e.g. the settings in Image 20 show the required settings for a HBM UGR-60 device.

Flow control can be performed either by control signal lines (hardware), or by reserving in-band control characters (software) to signal flow start and stop (such as the ASCII codes for XON/XOFF). In common RS 232 there are pairs of control lines which are usually referred to as hardware flow control:

- RTS (Request To Send) and CTS (Clear To Send), used in RTS flow control
- DTR (Data Terminal Ready) and DSR (Data Set Ready), used in DTR flow control

The XOFF character has value 19; XON has value 17.

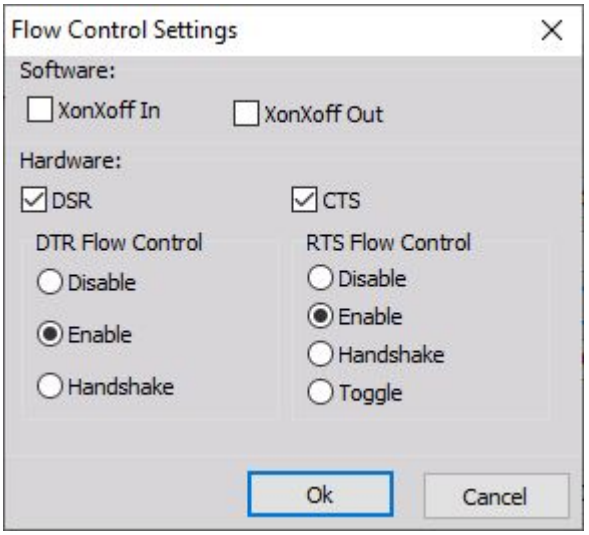


Image 20: Flow Control Settings

See also: chapter Connection settings
For more information on flow control see:

- http://en.wikipedia.org/wiki/Serial_port#Flow_control
- http://en.wikipedia.org/wiki/Flow_control_(data)

4. Serial communication control centre

Here you can see the *Serial Communication Control Centre* dialogue which allows you to test your connection settings and also the communication with your serial device:

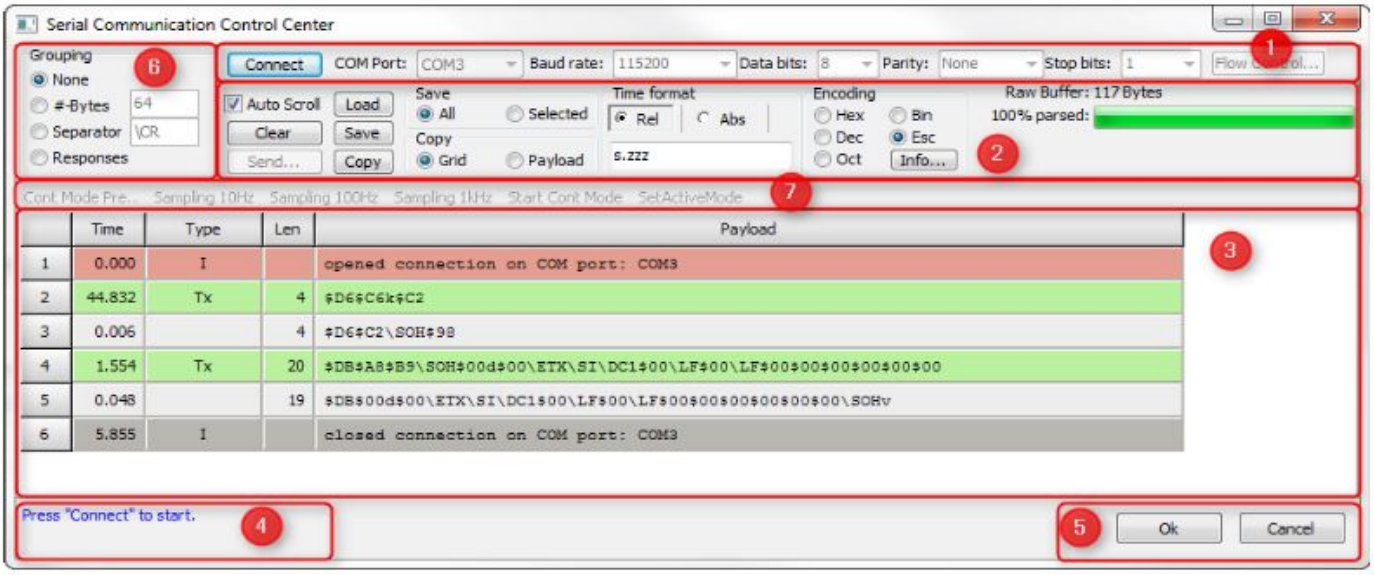


Image 21: Control Centre

(1) *Connection Settings*:
when you open the control centre, the existing settings of the hardware setup will be pre-set (see chapter Connection settings)
In Hardware setup: you can change the settings for testing – if you then click **Ok** to close the control centre, the changes will be applied to the hardware setup – if you click **Cancel**, the changes will be dismissed. **Connect/Disconnect** button: will open/close the COM port for communication: see chapter Opening the connection.
Note: when you open the control centre from channel setup, the connection will be opened automatically
(2) Command buttons and settings for the control centre

- *Auto Scroll*: when activated the grid will automatically scroll to the last data row whenever new data is available
- **Clear**: will clear the data in the main data grid
- **Send...**: will open a dialogue where you can send an arbitrary command to the serial device (only enabled when you are connected to the device): see chapter Transmitting requests Load: will load an XML data file: see chapter Loading and saving data
- **Save**: will save the current data in the grid to an XML file: see chapter Loading and saving data
- *Save radio-group*: will specify if you want to save All rows or just the Selected rows: see chapter Loading and saving data
- **Copy**: will copy the data of the selected rows to the clipboard, so that you can paste them to spreadsheet applications (like Open Office Calc, etc.) depending on the
- *Copy* radio group: Copy radio group:
    - Grid: all columns in the grid will be copied as tabular separated values
    - Payload: only the payload column will be copied

- *Time* radio-group: will change the representation of the Time column: see chapter Time
- *Time format*: will change the representation of the Time column: see chapter Time Payload Encoding radio-group: will change the representation of the Payload column: see chapter Payload
  Info: will show a list of all escape sequences (only active if the
- *Payload Encoding* is Esc): see chapter Payload, chapter Character escaping
- *Raw Buffer* and *Progress bar*: will show you how much data has been received and how much of this data has already been parsed: see chapter Receiving Responses for details

(3) the main data grid showing the communication data: see chapter Main Data Grid
(4) Status label: will show you status/warning/error messages
(5) Main dialogue buttons to close the control centre: see *Connection Settings* above
(6) Grouping: will change the grouping of the Rx rows: see chapter Grouping
(7) Send Requests bar: Only available when you have opened the control centre from channel setup and when you have defined some *Requests* (see 6 Requests on page 30): see also chapter Transmitting requests

4.1. Opening the connection

After you have configured the the connection settings, you can click the **Connect** button to open the COM port for communication:

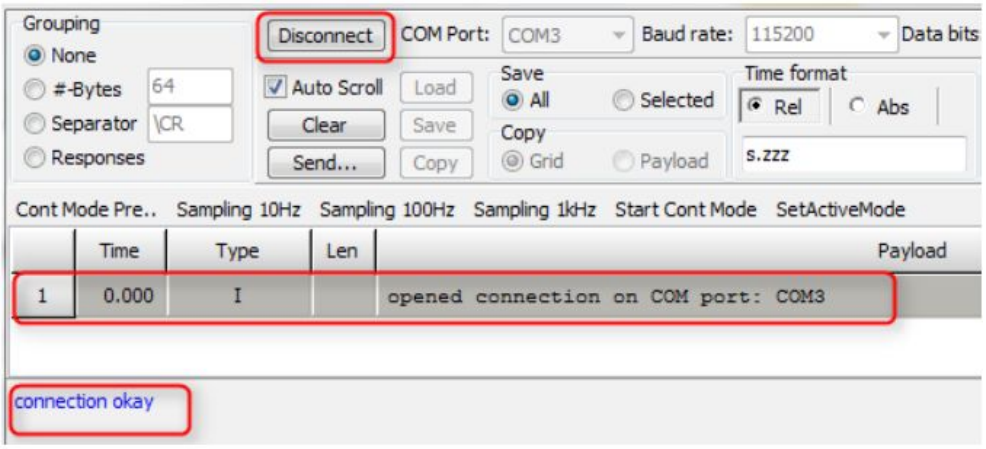


Image 22: Control Centre

Hint

When the Control Centre is opened from the channel setup, the connection will automatically be established (you need not press the Connect button).

If the connection is okay (Image 22), you can see that

- the **Connect** button now changed to **Disconnect** (1) and that the *Send* functions are now active: i.e. the **Send Command** button is now active and the request buttons on the *Send Request* bar
- there is a status line in the main data grid (2)
- the status label shows *connection okay* (3)

If any problem occurs, you will see an error-message and also the status label will turn red:
The error number in the status label gives more detailed information:

- *Error 2*: means that the COM port does not exist (any longer). e.g. this can happen when you use a device that only emulates a COM port but is connected via USB to the computer. When you then disconnect the USB cable, also the emulated COM port may be gone.
- *Error 5*: usually indicates that the COM port is already opened by another application. Close all other applications that may use the COM port and try again.

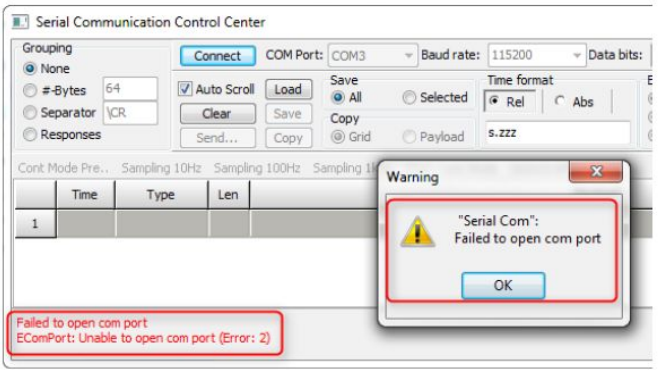


Image 23: Connection failed

4.2. Transmitting requests

When the connection is open, you can click the **Send...** button. Now you can enter a character/byte sequence that will be sent to the device:

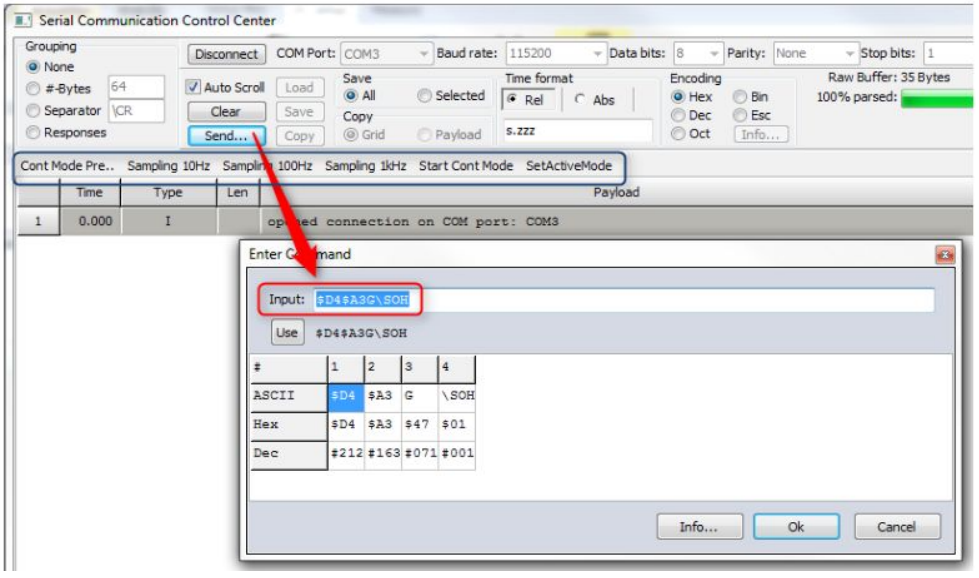


Image 24: Enter Command

Note, that special characters need to be escaped (see chapter Character escaping) and also do not forget to include the terminating characters (e.g. \CR for *carriage return*), if the protocol of your device requires such characters. When you click **Ok**, the command will be sent to the device and a Tx line will be added to the main data-grid:

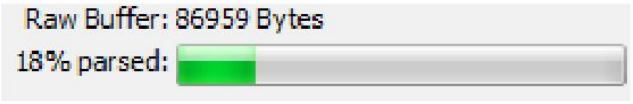
	Time	Type	Len	Payload
1	0.000	I		opened connection on COM port: COM3
2	31.755	Tx	4	D4 A3 47 01
3	0.004		4	D4 01 00 D5

Image 25: Request and response

In the Image you can see the request that you have just sent to the device ((1) the green line of type Tx: transmit) and the response data from the device ((2) the grey lines of type Rx: receive).
Note: when you click the **Send...** button the next time, the last input text will still be shown.
Note: when you have opened the control centre from channel setup and you have defined some Requests (see chapter Requests), you will see all those requests in the *Send requests* bar (see blue rectangle in Image 24 above). When you click on any of those requests, they will be sent right away.

4.3. Receiving Responses

The data that is sent from the serial device to DewesoftX® is called a response. Responses show up as grey lines in the main data grid (see (2) in Image 25 above). Once the connection is open, the Serial Communication Control Center will listen to all incoming responses and add them to the main data grid.

The parsing of the serial stream is done by a separate thread. When you have a slow CPU, or data comes in very fast or you load a big data file, you can see how much of the serial data has already been parsed. Only the parsed data will be shown in the *Main Data Grid*.	 *Image 26: Parsing Progress Indication*

4.4. Main Data Grid

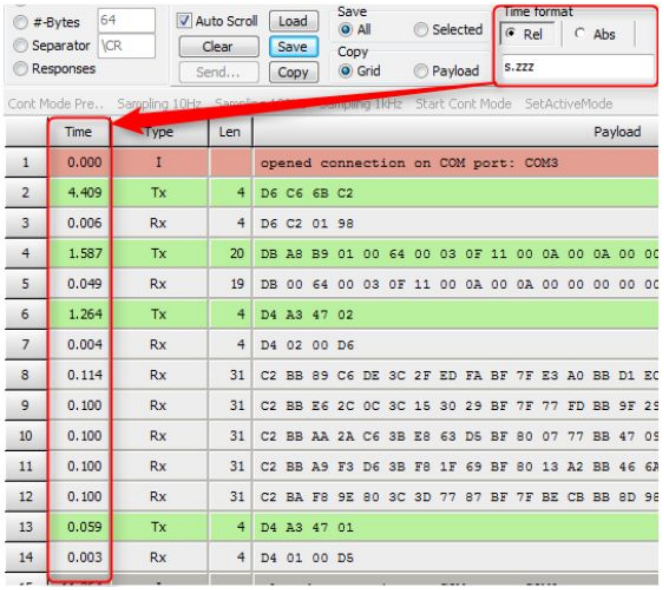
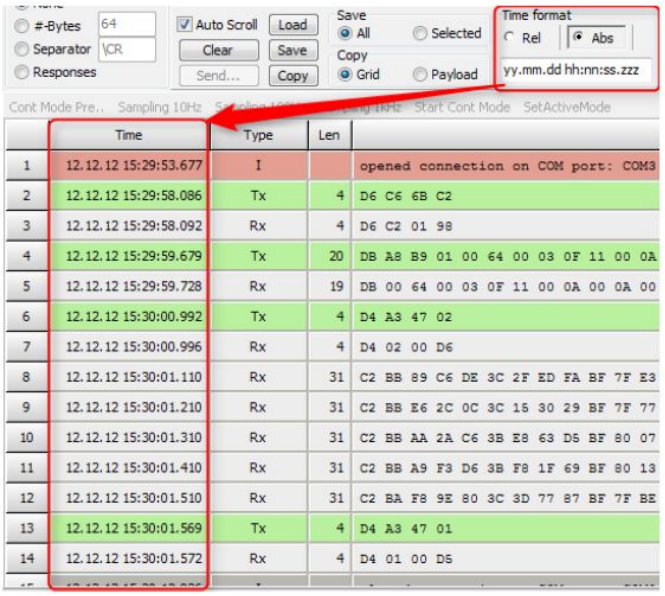
ID	Time	Type	Len	Payload
1	0.000	I		opened connection on COM port: COM7
2	52.889	Tx	5	\$01A\CR
3	0.052	Rx	1	$00
4	0.015	Rx	13	>+00022.6+013
5	0.015	Rx	16	72.0+01372.0+013
6	0.015	Rx	15	72.0+01372.0+01
7	0.015	Rx	16	372.0+01372.0+01
8	0.006	Rx	6	372.0\CR
9	0.002	Rx	1	$00
10	18.072	I		closed connection on COM port: COM7

Image 27: Main Data Grid

The main data grid shows status information (red lines of type I: Information; e.g. when the COM port is opened), transmitted requests (green lines of type Tx: Transmit) and received responses (grey lines of type Rx: Receive). Selected rows are highlighted in dark grey colour (row 7 and 8 in Image 27). The *ID column* is just a consecutive row number.

4.4.1. Time

The Time column shows the time when the event of the row has occurred: e.g. when a response has been received.

When the Time radio box is set to *Rel* (relative), the *Time* column shows how many seconds have passed relative to the last event. e.g. The request (ID 2) has been sent about 4.5 seconds, after the connection has been opened. The first part of the response from the device (ID 3) has been received 6ms after the request.	When the Time radio box is set to *Abs* (absolute), the Time column shows the absolute date/time when the event has occurred. You can change the date/time format in the Time format edit field: see Table 2: Time formatting characters below
 *Image 28: Time relative*	 *Image 29: Time absolute*

y	Year last 2 digits
yy	Year last 2 digits
yyyy	Year as 4 digits
m	Month number no-leading 0
mm	Month number as 2 digits
mmm	Month using ShortDayNames (Jan)
mmmm	Month using LongDayNames (January)
d	Day number no-leading 0
dd	Day number as 2 digits
ddd	Day using ShortDayNames (Sun)
dddd	Day using LongDayNames (Sunday)
ddddd	Day in ShortDateFormat
dddddd	Day in LongDateFormat

am/pm	Use after h : gives 12 hours + am/pm
a/p	Use after h : gives 12 hours + a/p
ampm	As a/p but TimeAMString,TimePMString
/	Substituted by DateSeparator value
:	Substituted by TimeSeparator value
c	Use ShortDateFormat + LongTimeFormat
h	Hour number no-leading 0
hh	Hour number as 2 digits
n	Minute number no-leading 0
nn	Minute number as 2 digits
s	Second number no-leading 0
ss	Second number as 2 digits
z	Milli-sec number no-leading 0s
zzz	Milli-sec number as 3 digits
t	Use ShortTimeFormat
tt	Use LongTimeFormat

4.4.2. Type

The *Type* column can have following values:

Name	Colour	Value	Description
Information	red	I	Information text
Transmitted data	green	Tx	Data that has been sent from DewesoftX® to the serial device
Received data	grey	Rx[1]	Data that has received by from DewesoftX® from the serial device
		skipped	Only for grouping type Responses: when the data did not match any of the defined Responses: see chapter Grouping Type: Responses for more details
		...	Only for grouping types other than None: when the data has not matched any of the grouping criteria, it will be shown in the last line (for an example see Image 42: Grouping: 8 Bytes (Esc) on page 21)

4.4.3. Len

The length of the transmitted or received data in bytes.

4.4.4. Payload

The *Payload* column shows the data for the given column.
For information columns it's just plain text. For requests and responses, it is the data that has been sent to or received from the serial device.

You can use the *Payload Encoding* radio box to select how to display the data of the Rx/Tx rows.

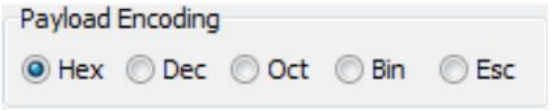


Image 30: Payload Encoding

4.4.4.1. Hex

The bytes are encoded in hexadecimal notation and they are separated by a space from each other. e.g. the first encoded byte in row 2 is 24 which is 36 in decimal notation and represents the character $.

ID	Time	Type	Len	Payload
1	0.000	I		opened connection on COM port: COM7
2	9.394	Tx	5	24 30 31 41 0D
3	0.020	Rx	9	00 3E 2B 30 30 30 32 34 2E
4	0.015	Rx	15	33 2B 30 31 33 37 32 2E 30 2B 30 31 33 37 32
5	0.015	Rx	16	2E 30 2B 30 31 33 37 32 2E 30 2B 30 31 33 37 32
6	0.015	Rx	15	2E 30 2B 30 31 33 37 32 2E 30 2B 30 31 33 37
7	0.011	Rx	12	32 2E 30 2B 30 31 33 37 32 2E 30 0D
8	0.002	Rx	1	00
9	3.311	I		closed connection on COM port: COM7

Image 31: Encoding Hex

4.4.4.2. Dec

The bytes are encoded in decimal notation and they are separated by a space from each other. e.g. the first encoded byte in row 2 is 036 which represents the character $.

ID	Time	Type	Len	Payload
1	0.000	I		opened connection on COM port: COM7
2	9.394	Tx	5	036 048 049 065 013
3	0.020	Rx	9	000 062 043 048 048 048 050 052 046
4	0.015	Rx	15	051 043 048 049 051 055 050 046 048 043 048 049 051 055 050
5	0.015	Rx	16	046 048 043 048 049 051 055 050 046 048 043 048 049 051 055 050
6	0.015	Rx	15	046 048 043 048 049 051 055 050 046 048 043 048 049 051 055
7	0.011	Rx	12	050 046 048 043 048 049 051 055 050 046 048 013
8	0.002	Rx	1	000
9	3.311	I		closed connection on COM port: COM7

Image 32: Encoding Dec

4.4.4.3. Oct

The bytes are encoded in octal notation and they are separated by a space from each other. e.g. the first encoded byte in row 2 is 044 which is 36 in decimal notation and represents the character $.

ID	Time	Type	Len	Payload
1	0.000	I		opened connection on COM port: COM7
2	9.394	Tx	5	044 060 061 101 015
3	0.020	Rx	9	000 076 053 060 060 060 062 064 056
4	0.015	Rx	15	063 053 060 061 063 067 062 056 060 053 060 061 063 067 062
5	0.015	Rx	16	056 060 053 060 061 063 067 062 056 060 053 060 061 063 067 062
6	0.015	Rx	15	056 060 053 060 061 063 067 062 056 060 053 060 061 063 067
7	0.011	Rx	12	062 056 060 053 060 061 063 067 062 056 060 015
8	0.002	Rx	1	000
9	3.311	I		closed connection on COM port: COM7

Image 33: Encoding Oct

4.4.4.4. Bin

The bytes are encoded in binary notation and they are separated by a space from each other. e.g. the first encoded byte in row 2 is 00100100 which is 36 in decimal notation and represents the character $.

ID	Time	Type	Len	Payload
1	0.000	I		opened connection on COM port: COM7
2	9.394	Tx	5	00100100 00110000 00110001 01000001 00001101
3	0.020	Rx	9	00000000 00111110 00101011 00110000 00110000 001100
4	0.015	Rx	15	00110011 00101011 00110000 00110001 00110011 001101
5	0.015	Rx	16	00101110 00110000 00101011 00110000 00110001 001100
6	0.015	Rx	15	00101110 00110000 00101011 00110000 00110001 001100
7	0.011	Rx	12	00110010 00101110 00110000 00101011 00110000 001100
8	0.002	Rx	1	00000000
9	3.311	I		closed connection on COM port: COM7

Image 34: Encoding Bin

4.4.4.5. Esc

The bytes are displayed in an escaped encoding; i.e. the readable characters are displayed as they are and special characters are represented by escape sequences: for more details see: chapter Character escaping. e.g. the data of row 2 starts with \$, which is the escape sequence of the $ sign. Followed by the literal characters 01A and terminated by the \CR escape sequence which represents the carriage return character (hex: 0D, dec: 13).

ID	Time	Type	Len	
1	0.000	I		opened connection on COM port: COM7
2	9.394	Tx	5	\$01A\CR
3	0.020	Rx	9	$00>+00024.
4	0.015	Rx	15	3+01372.0+01372
5	0.015	Rx	16	.0+01372.0+01372
6	0.015	Rx	15	.0+01372.0+0137
7	0.011	Rx	12	2.0+01372.0\CR
8	0.002	Rx	1	$00
9	3.311	I		closed connection on COM port: COM7

Image 35: Encoding Bin

4.4.5. Grouping

The *Grouping* radio group box lets you define how to group the data.
The following examples all show the same data with different *Grouping* type:

Grouping type *None* shows the data in the same way that it has been received.

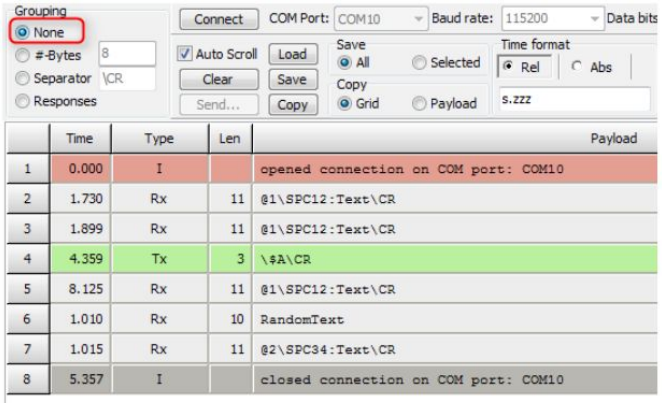


Image 36: Grouping None

it has been received.
Grouping type Bytes (in this case 8 Bytes) shows exactly 8 Bytes of data in one Rx line

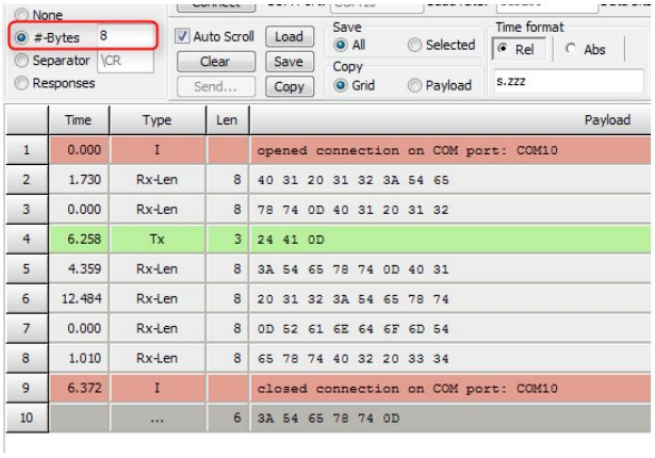


Image 37: Grouping Bytes (8)

Grouping type *Separator* shows all the data in one line, until the *Separator* sequence (\CR in this case) is found

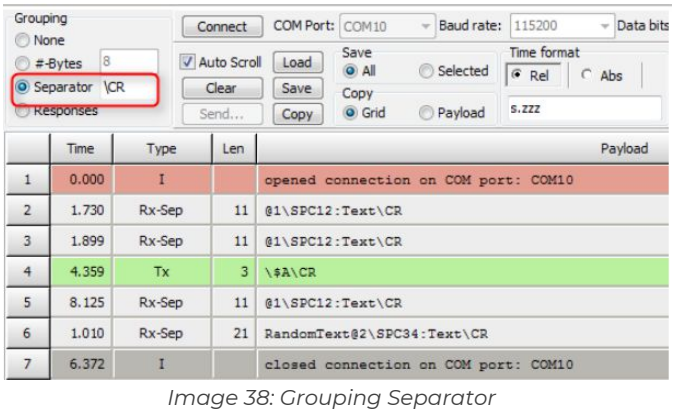


Image 38: Grouping Separator

Grouping type *Responses* will parse the data for the responses that you have defined in *channel setup*.

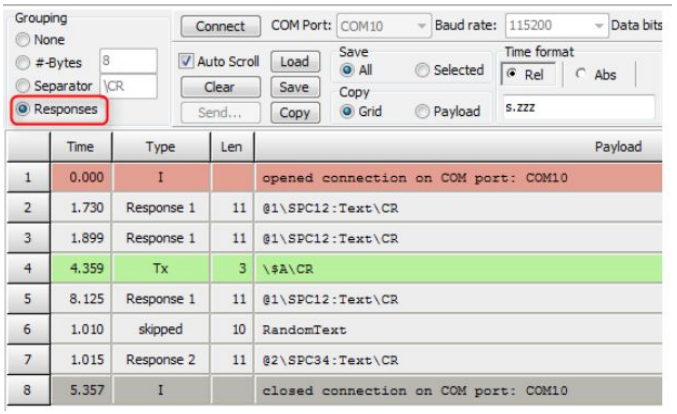


Image 39: Grouping Responses

4.4.5.1. Grouping Type: None

The default grouping is *None*: which means that the data is displayed in the same way that DewesoftX® has received the data.
In the example on the right, you can see that the first data was received (row with ID 2) is the string @1\SPC12:Text\CR. About one second later the same string was received again (row with ID 3). About 4 seconds later, the command $A\CR was sent (row with ID 4).
And 8 seconds later we received the text @1\SPC12:Text\CR (row with ID 5).

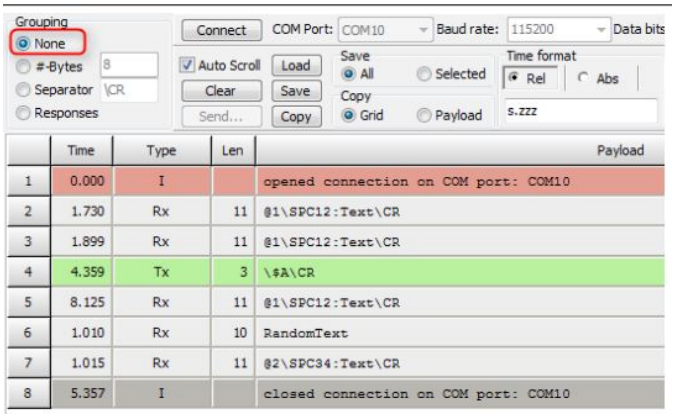


Image 40: Grouping: None

4.4.5.2. Grouping Type: # of Bytes

When you group by a number of bytes, a row will contain exactly the specified maximum (if possible). In Image 41 shows the same data as Image 40, but grouped by 8 bytes (note: the Encoding has been changed to Hex, so that the number of bytes is easier to see):
Note, that each Rx-Len row contains exactly 8 bytes.

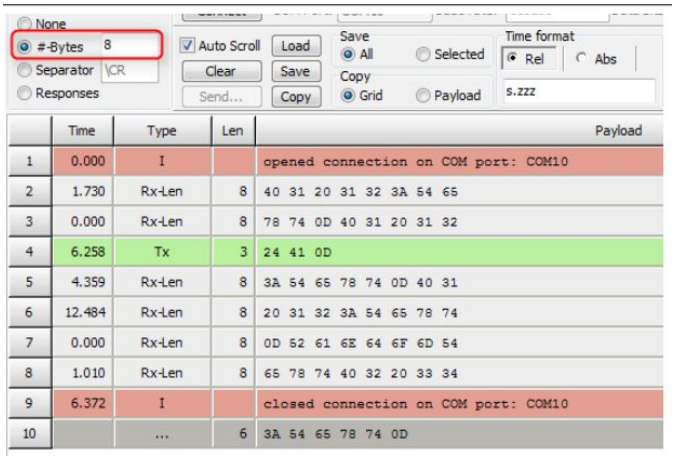


Image 41: Grouping: 8 Bytes (Hex)

Also note, that all Rx rows will be considered and the Tx rows are not affected: e.g. the row with ID 3 from Image 40 (@1\SPC12:Text\CR) has been split into the rows 2 (@1\SPC12) and 3 (:Text\CR) of Image 41. In between is the Tx row, which is not affected.
Another thing to note, is the last row (ID: 10) which shows ... in the *Type* column. This means that this data has not been finished yet: in this example the last row has only 6 bytes – but we want to split the line after 8 characters – therefore we need to wait until 2 more characters are received to form a line break.

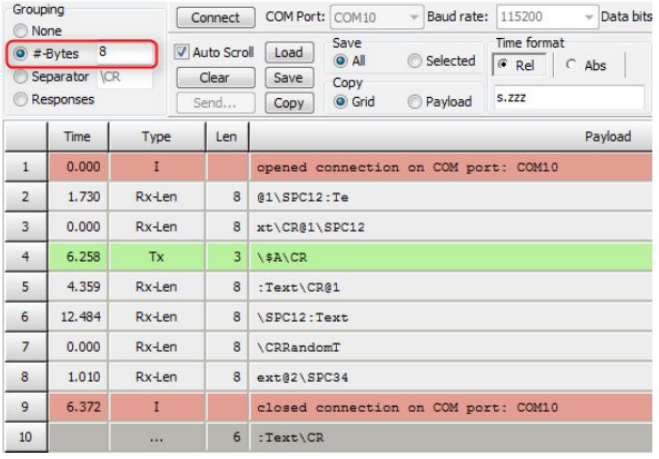


Image 42: Grouping: 8 Bytes (Esc)

Hint

When you change the #-Bytes in the edit field, the grouping will be applied when you press the Enter key or when you leave the edit field (set the focus to another control).

4.4.5.3. Grouping Type: Separator

When you group by Separator a new receive line will be made whenever the Separator string is found in the received data.
Image 43 shows the same data as Image 41 and Image 40, but this time grouped by the carriage return byte \CR.
You can see that, whenever the carriage return byte \CR occurs in the data, a new Rx-Sep line is shown: i.e. the last character of each Rx-Sep line is a \CR. You can also specify several characters as Separator: e.g. \CR\LF.
If you specify a separator that does not exist in the received data, you will end up with one very long line.

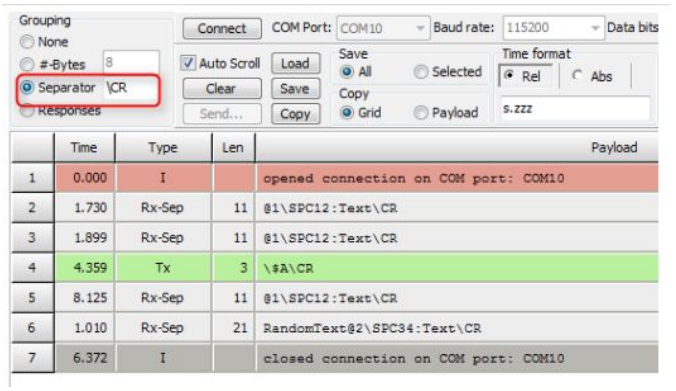


Image 43: Grouping: Separator

Hint

When you change the *Separator* in the edit field, the grouping will be applied when you press the *Enter key* or when you leave the edit field (set the focus to another control).

4.4.5.4. Grouping Type: Responses

Hint

The grouping type Responses are only enabled, when you have opened the control centre from channel setup and when you have defined some Responses (see chapter Responses). Note: this is because the result of this grouping is dependent on the current Response definitions in the loaded setup.

Image 44 shows the same data as Image 43 (and Image 41 and Image 40), but this time grouped by the *Responses* (see chapter Responses) that have been defined in the channel setup. The Type column will show you the name of the matching response (or *skipped* if the data did not match any response).
In this example we have defined 2 Responses:
Response 1 starts with @1\SPC until \CR.
Response 2 starts with @ until \CR. In the data grid you can see that we have received Response 1 three times (lines 2, 3, 5).
The text RandomText does not match any Response – therefore the Type column says skipped. Line 7 did not match our first response (it does not start with @1\SPC, but only with @), but it matches the second response.

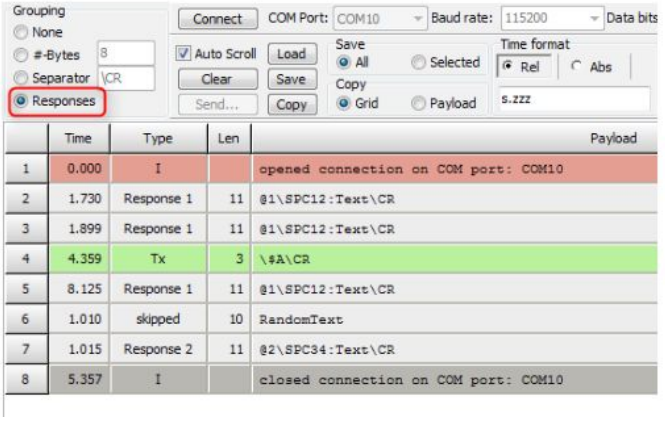


Image 44: Grouping: Responses

4.5. Loading and saving data

You can use the **Save** button to store the data in the main data grid to an XML file. The setting of the Save radio group is important.
If *All* is active, all rows in the main data grid will be stored in the XML file. If *Selected* is active, only the selected rows of the main data grid will be saved to the XML file (in Image 45 below, the rows 3 and 4 are selected).
Only the raw data will be stored in the file: i.e. exactly what you see when you switch to *Grouping mode* None (see chapter Grouping Type: None).
NOTE: Since only the raw data is saved, the result of Grouping type Responses (see chapter Grouping Type: Responses above) depends on the currently loaded setup.

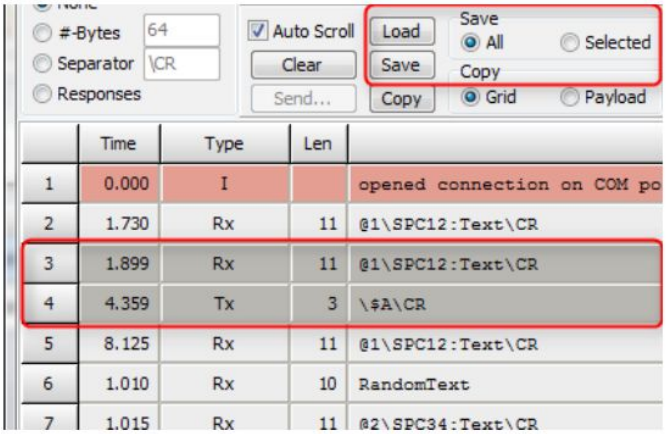


Image 45: Load/Save Data

You can then use the **Load** button to open the saved files again.

Hint

The display settings (like *Time*, *Time format*, *Payload Encoding*) do not matter when you save a file; i.e. after reloading you can still change all those settings.

5. Hardware setup

When you have successfully installed the Plug-in (see chapter Plug-in Installation), it will show up in the Hardware setup:

To open the *Hardware Setup* click on *Options– Settings*
Note: *Hardware Setup* will be disabled during the measurement.

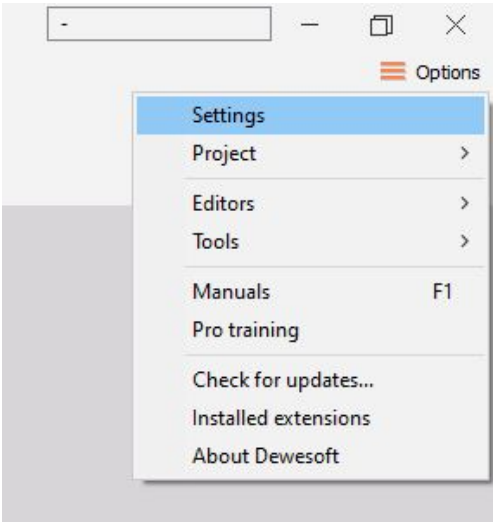


Image 46: Open Hw Setup

In the *Hardware Setup* select *Extensions* and then select in the Extensions tree (if you don't find it, see: chapter Plug-in Installation).
(1) Toolbar
(2) Shows a list of all configured devices
(3) General log level: see chapter Log files
Note that also each device has its own log level

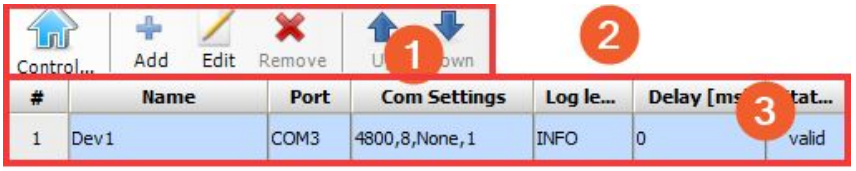


Image 47: Hardware Setup

5.1. Devices

The Module supports several serial devices. Use the toolbar buttons to manipulate the device list:

- **Control Centre** : allows you to test the selected serial device: see chapter Serial communication control centre
  Note: you can also double click a row in the device list to open the control centre
- **Add** : Add a new device (will only be enabled if there is still a free COM port) see chapter Add/Edit Device below Edit :
- **Edit** the selected device (will only be enabled if you have selected exactly one device in the list) see chapter Add/Edit Device below
- **Remove** : Will remove the selected device from the list. Note: you cannot remove the last device.
- **Up/Down**: Will change the position of the device in the list. This order will also be used in the channel setup. The top device will be the leftmost device in channel setup.

5.1.1. No Com Ports

When there are no COM ports on your PC, you will see an error-message.
You can press the **Scan for COM ports** buttons to rescan for COM ports: i.e. when you connect an RS232-to-USB converter to your PC it will mount a virtual COM port.

Image 48: No Com Ports

5.1.2. Add/Edit Device

- Device Name: the name must be unique and it will be used to find the corresponding channel setup information.
- Log level: the log level for this device (see also: chapter Log files)
- Delay: see chapter Communication Delay
- other fields: see chapter Connection settings below

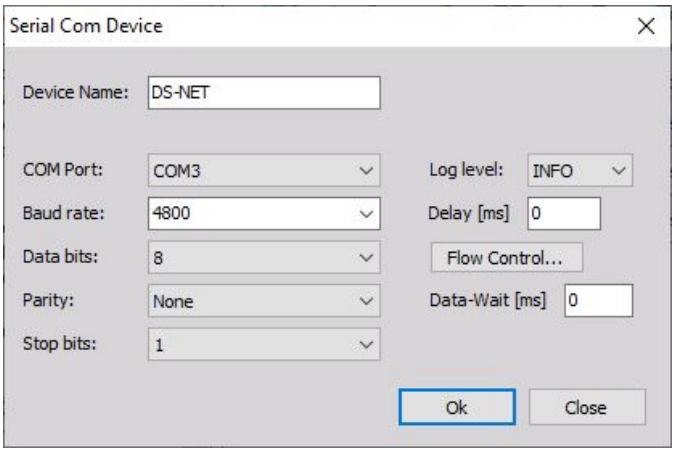


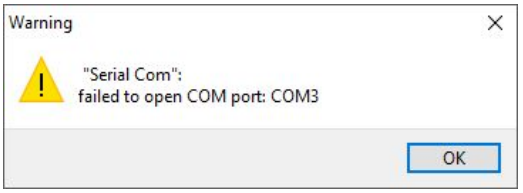
Image 49: Add/Edit Device

5.1.2.1. Connection settings

In the *Module properties* section at the bottom, you must enter the correct connection settings for your device:

- *COM Port*: the communication port of your PC that your device is connected to
  Note: if the COM port that has been stored in the Hardware setup before does not exist any more, the first available COM port will be used.
- *Baud rate*: the Baud rate of the device Since version 2.1.1 the Module allows to input arbitrary baud rates. The items in the drop-down are just common default values.
- *Stop bits*: the number of Stop bits of the device
- *Data bits*: the number of Data bits of the device
- *Parity*: the Parity setting of the device
- **Flow Control**...: Opens the Flow Control Settings dialogue: see chapter Flow Control Settings
- *Data-Wait [ms]*: this is the time in milliseconds that the Module will wait for more data to arrive, before the data in the buffer will be evenly distributed in time: see also chapter Fast Data

Please consult the manual of your device for these settings. If any one of the connection settings are wrong DewesoftX® may not be able to connect to the device and may not receive any data.

When you select a COM Port that is already in use or cannot be opened for any other reason, you will get a warning message when you try to start the measurement or go to the setup screen:	

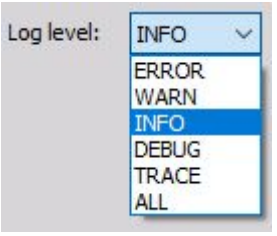
5.2. Log files

The Module will write log files during operation. The amount of log messages is configurable via the *Log level* drop down box in the *Hardware setup*. The name of the logfile for the Module is SerialComModuleLogfile.log. Moreover each device will write a log file with the name: Serial_Com_[COM-PORT].log, where COM-PORT is the currently used COM port (as defined in the hardware setup: e.g. Serial_Com_COM3.log.

When the Module is started, it will immediately start to log to the windows temporary directory.

As soon as the DewesoftX® application is available to the Module, all subsequent logs will be written to the standard DewesoftX® log directory (e.g. D:\DewesoftX\System\V7_0\Logs).

5.2.1 Log levels

With the *log level* drop down box you can set the detail level of the logging function. If you set a high log level (e.g. TRACE, ALL) a lot of log messages will be written and the log files will roll over quite often. This is also dependent on the sample rate – the higher the sample rate is, the more often data will be fetched and therefore more log messages will be written.	

For production-use the log level *INFO* is recommended.

Log level	Description
Error	Will only log error messages
Warn	Will also log warning messages
Info	Will also log info messages – this is recommended for production use
Debug	Will also log debug messages
Trace	will also log trace messages: e.g. data that is received via the RS232 port.
All	will log all messages everything

5.3. Communication Delay

There is of course a certain delay, between the real time when the measurement data is taken and when it is received in DewesoftX® : e.g. because the serial device is doing some filtering, some calculations and also the serial transmission takes some finite amount of time (dependant on the baud rate and the amount of data that will be sent).

With the delay time setting you can compensate for those delays. The delay time will simply be subtracted from the time of the signal; i.e. the signal will be shifted to the left on the time-axis.

In the example below you can see the original signal in green and the red signal has a delay of 5ms.

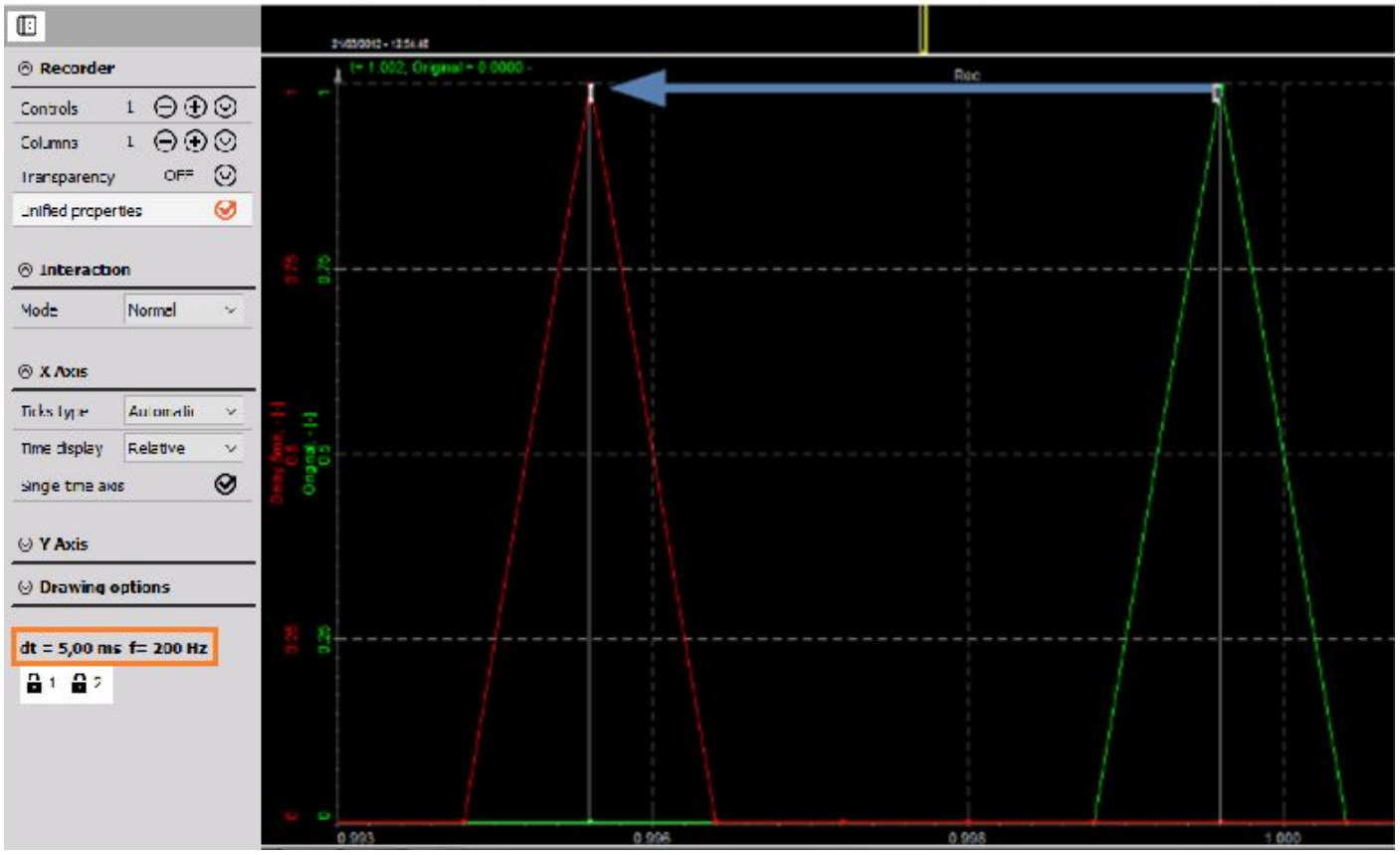


Image 50: Delay 5ms

Note: the delay time only affects the responses (the data that we receive from the device).

6. Channel Setup

When you go to the *Channel setup* of the Module you will see a screen similar to Image 51.
(1) Shows the version number of the SerialCom Module
(2) The status label is only active, if there are warning or error messages: see chapter Warnings and Errors
(3) List of all defined devices: see chapter Device List
(4) Device toolbar: see chapter Device Toolbar
(5) This section shows the connection settings of the current device that you have made in the *Hardware setup* (see chapter Hardware setup)
(6) Here you can switch between the main tab-sheets of the channel setup. The specific tab-sheets will be described in detail in the corresponding chapters: Request, Responses, Monitoring, Default Settings, The content of this area is depending on the selected tab-sheet: 6 Requests , Responses, 7 Monitoring, Default Settings

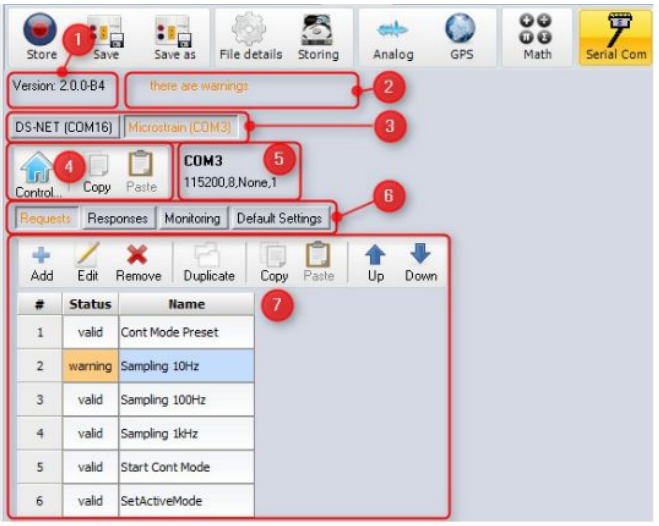


Image 51: Channel Setup

6.1. Device List

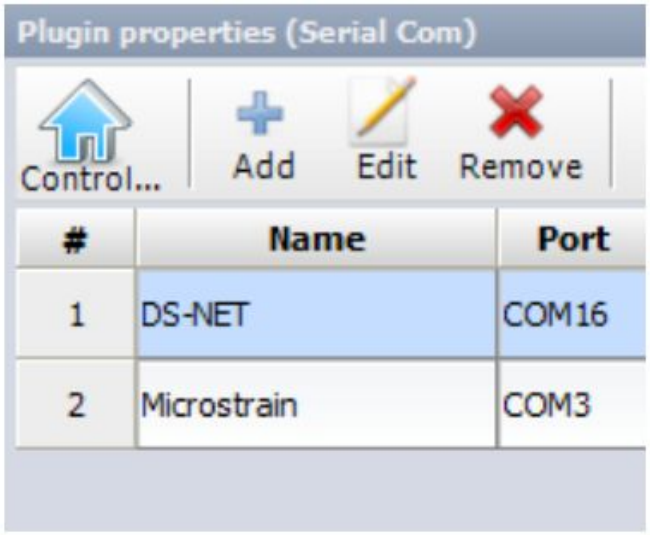
The device list will show the name of all devices (and the assigned COM port) that are defined in the hardware setup (in the same order as they are defined in the hardware setup). If orphaned devices (see chapter Orphaned devices below) exist, they will be shown at the end of the list (right side).

Devices which contain errors or warnings will be displayed in red/orange colour (see chapter Warnings and Errors). In the example above the 2nd device named *Microstrain* has warnings.

6.1.1. Orphaned devices

An orphaned device is a device that exists in channel setup, but does not exist any more in the current hardware setup. Orphaned devices may occur in the following cases:

1. if you go to hardware setup, delete one of the devices (or rename a device) and go back to channel setup
2. if you load a setup which included a device that does not exist in the current hardware setup



In this example we have defined only 2 devices in the hardware setup (see Image to the left), named DS-NET and *Microstrain*.
Now we load an old setup which has included 3 devices named DS-NET and *Microstrain* and *OldDevice*.
Then the device list in channel setup will look this:

The devices which still exist in hardware setup are listed first (in the same order like in the hardware setup list). And at the end you have the orphaned *OldDevice* which no longer exists in hardware setup (these devices do of course not show a COM port).

When you have an orphaned device in channel setup, you have the following options:

- Open the hardware setup: you can add a device to the hardware setup with the name of the orphaned device (or rename an existing device) – then you can re-use the device.
- Delete the device, if you don't need it any longer
- Ignore it

Image 52: Orphaned Device – Channel Setup

6.2. Device Toolbar

The device toolbar shows some toolbar buttons for the device which is currently active in the device list. On the right side of the toolbar you can see the connection settings (see chapter Connection settings) for the current device which you have defined in the hardware setup of the device.

- **Control**...: will open the Control Centre: see chapter Serial communication control centre
- **Copy**:will copy all data of the device to the clipboard (including all Requests, Responses, Monitoring settings, etc.).
  For details see: chapter Copy and Paste
- **Paste**: will paste all data to the currently selected device (only active if there is valid device data in the clipboard – e.g. after you have pressed the Copy button). For details see: chapter Copy and Paste

6.3. Warnings and Errors

The Module may show some warning and error messages:

Image 53: Errors and Warnings

Warnings will be highlighted in orange, errors in red.

There is a label in the main channel setup form that shows you if there are any warnings or errors. If so, the items with warnings/errors are also highlighted in the corresponding colour (In the example above, you can see that the caption of the Requests tab-sheet is red, because there, request 3 has an error. Besides this error you can also see that there is at least one warning in the Responses tab-sheet (because it is orange).

When you move the mouse over an element with a warning or error, you will see a hint with the details of the warning/error. In the screen-shot below, you can see that the warning of the response name is, that the same name is already used by another response.

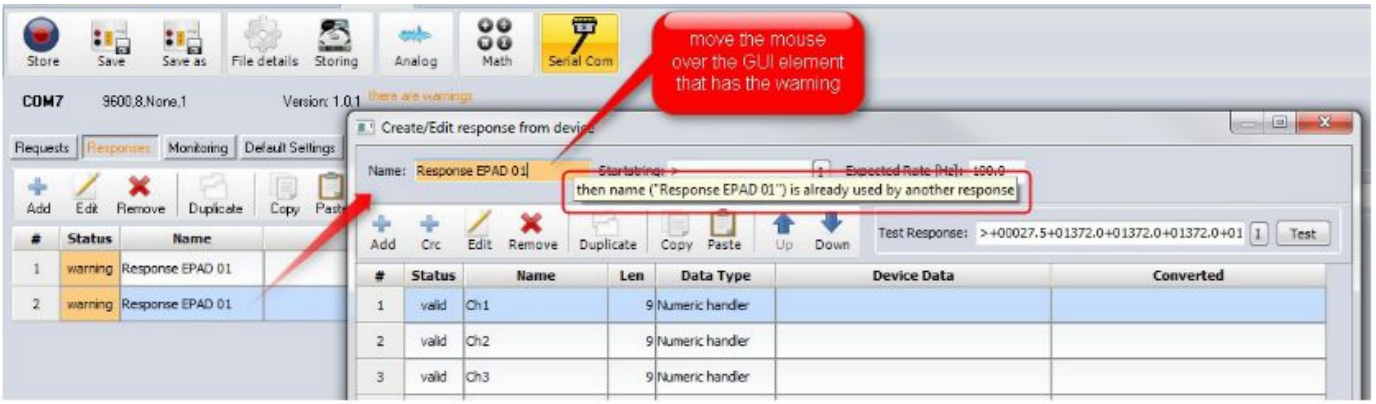


Image 54: Warning Hint

6.4. Default Settings

The first thing you should do when you prepare the channel setup is to check the Default Settings tab-sheet.

The values that you enter in the Default Settings tab-sheet will be used as defaults when you create a new request/response definition; i.e. you can always override these values. When you change these values later, existing request/response definitions will not be changed; it only affects new requests/responses. See also chapter Decimal Separators

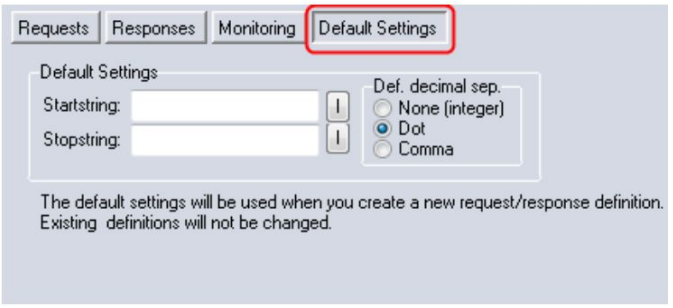


Image 55: Default Settings

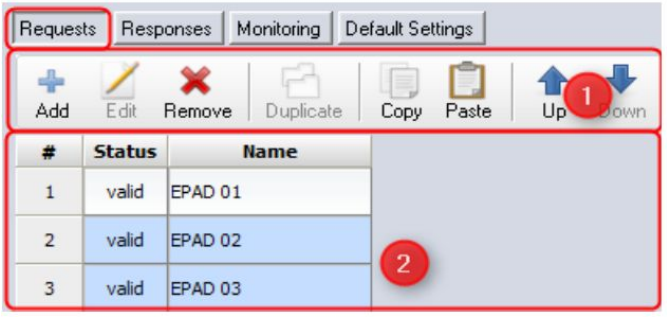
7. Requests

A request (aka. *Command*) is a byte sequence that will be sent from DewesoftX® to the serial device.

Some devices may not have any commands (e.g. a weather station may just start to send data when it's powered on and stop when it's powered off) – in this case you do not need to define any request, you can skip this chapter and continue with your response definitions: 7 Responses on page 47.

Each request consists of one or more request parts: the request parts actually define what data you sent to the device.

7.1. Requests tab-sheet

In the Requests tab-sheet there is a list of all defined requests. (1) on the top you can see the main toolbar (2) the main data grid shows a list of all requests: selected requests are highlighted in light blue (e.g. in the image to the right, the requests 2 and 3 are selected)	

7.1.1. Requests: Main Toolbar

The main toolbar for requests has following buttons:

Add	will add a new request and open a dialogue window so that you can configure it see also chapter Add/Edit Request
Edit	will open a dialogue window so that you can edit the currently selected request (only active if exactly one request is selected) see also chapter Add/Edit Request
Remove	will remove all selected requests
Duplicate	will duplicate the selected request (only active if exactly one request is selected) see also chapter Copy and Paste
Copy	will copy the currently selected request/s to the clipboard see also chapter Copy and Paste
Paste	will paste the request/s (that has/have been copied before) back into DewesoftX® see also chapter Copy and Paste

Up	Will move the selected request/s up: see chapter Requests Order below
Down	Will move the selected request/s down: see chapter Requests Order below

7.1.2.Requests Order

The order of the requests in the requests list is only relevant if several requests have the same activation event (see chapter Activation Event).
To change the order you can use the **Up/Down** buttons in the toolbar or you can drag and drop the row in the data grid (see chapter Drag And Drop).

Example
When we have 2 requests and both have the activation event '*On Start*' then the first request in the requests list will be executed first and then the second one in the list.

7.2. Add/Edit Request

To create a new request, click the **Add** button in the Requests tab-sheet. To edit an existing request, select it in the main data grid and then click **Edit** or just double click the row of the datagrid.

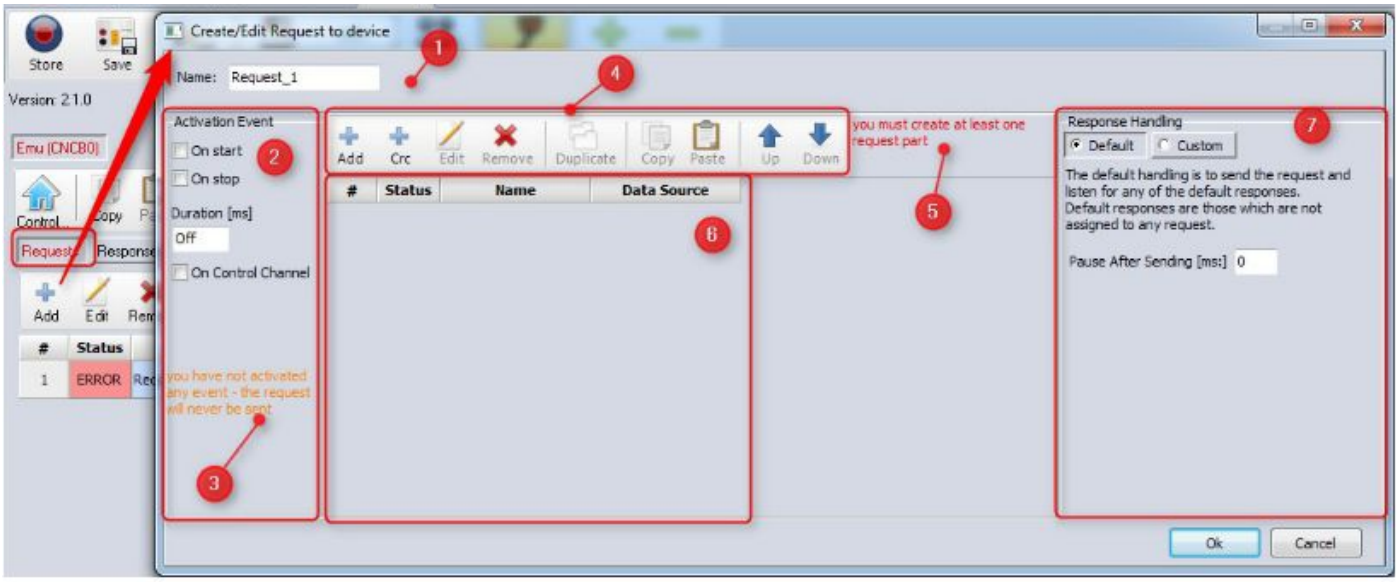


Image 56: Create/Edit request

The *Create/Edit Request* dialogue will appear:

(1) *Name*: is the name of the request. The name can be an arbitrary string. The name will be shown in the list of requests, so it should be unique. Especially when you have several requests you should make sure to find a meaningful name to clearly identify each request.
(2) *Activation Event*: let's you choose when the request will be sent to the device: see chapter Activation Event
(3) *Status label* for Activation Event: will show you warnings/errors related to the Activation Event

(4) *Main toolbar*: provides functions to manipulate the parts of the request: see chapter Request Parts
(5) *Status label* for the parts of the request
(6) *Main data grid*: List of the parts of this request: see chapter Request Parts
(7) *Response Handling*: let's you define how to handle responses for this request: see chapter Request: Response Handling

7.2.1. Activation Event

Let's you choose when the request will be sent to the device:

- *On Start*: will be sent immediately after the COM port has been opened (e.g. when you start the measurement). So you can use it to initialize your device: e.g. you may send a command to tell the device to start sending data to DewesoftX® .
- *On Stop*: will be sent before the COM port is closed (e.g. when you stop the measurement). You can use it to finalize your device: e.g. you may send a command to tell the device to stop sending data to DewesoftX® .
  Note: In this case the Response Handling will be ignored (i.e. when you stop the Measurement in DewesoftX® the Module does not wait for any responses of the serial device)
- *Duration [ms]*: if this is activated the request will be sent every x milliseconds to the device.
  Note: this is implemented using Windows timers: so the timer will not always fire exactly after the specified duration, but it will for sure not fire before the specified duration.
- *On Control Channel:* if this is activated, the Module will create a DewesoftX® control channel. You can then assign a visual control (e.g. a push-button) to this channel and whenever the button is pressed, the request will be sent to the device. Or you can activate the control channel via the DewesoftX® alarm handling. See 6.2.1.1 Control Channel on page 32 for details

Note: you should activate at least one of the options above, otherwise the request will never be sent.

7.2.1.1. User input

If this is activated, the Module will create a DewesoftX® user input. You can then assign a visual control (e.g. a push-button) to this channel and whenever the button is pressed, the request will be sent to the device.
In this example, we create a request called SerialRequest1, with a single request part that has a fixed byte sequence: \$ALARM\CR.
We activate only one *Activation Event*: the *On User input*.

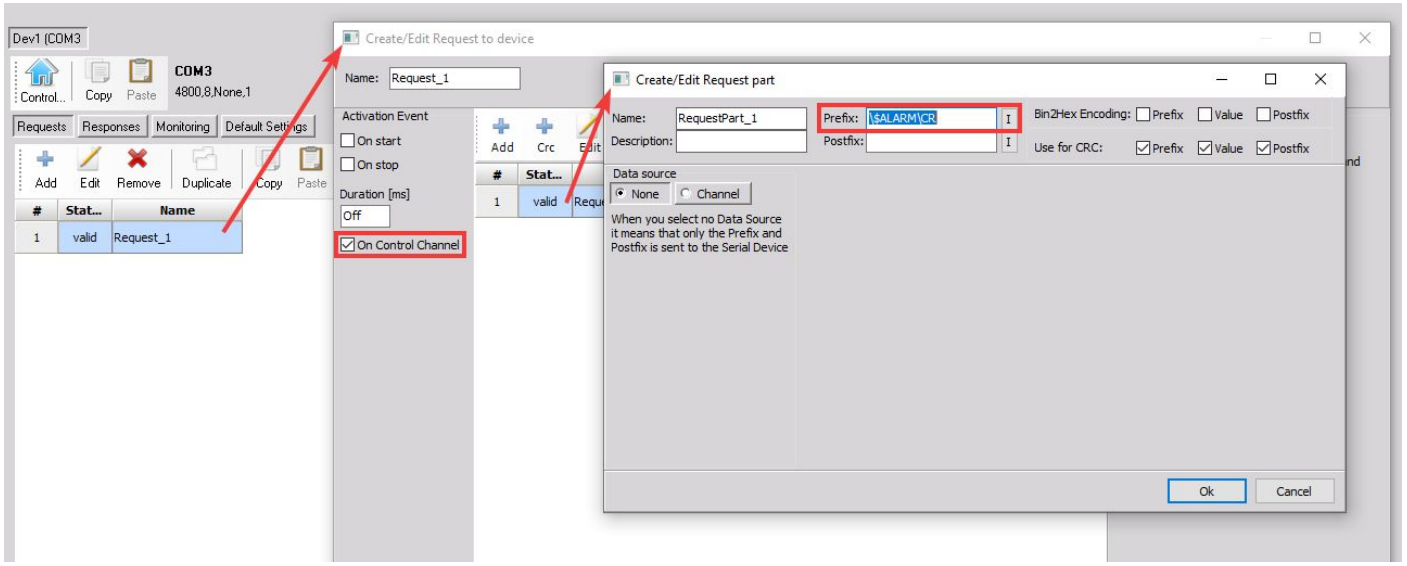
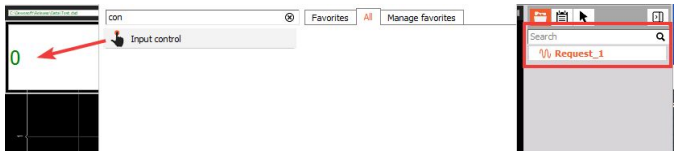
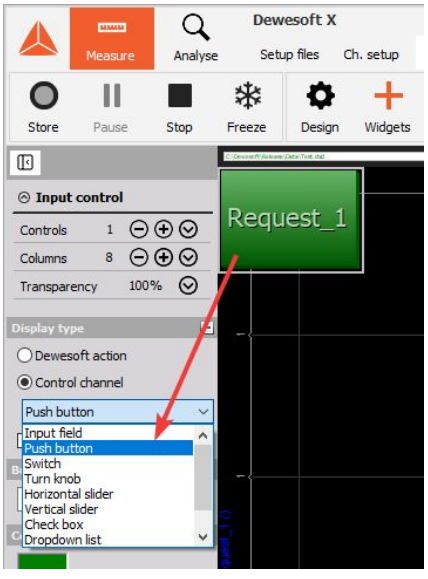


Image 57: Activation Event: On User input

In the screen design mode of DewesoftX® we can now drag an *Input control display* to our measurement screen. You can see in the channel list, that only control channels can be assigned to this visual control – in our example we have exactly one control channel, which has the same name as the request, that we have defined: *SerialRequest1*.	After assigning the control channel *SerialRequest1* to the Input control display, we can change the Display Type of the *Input control display* to *Push button*.
 *Image 58: Input control display*	 *Image 59: Push button*

We can now go to measure screen, click the button and check the output. To easier see what happens, we have also added a *Tabular values display* to the measurement screen. In the *Tabular values display* we can see 3 events. The first 2 events show that the value of the control channel *SerailRequest1* has been changed from 0 to 1 (because we pushed the button). Some time later, the *SerialCom* Module notices that the value of the control channel has changed and will fire request *SerialRequest1*: we can see in the *Tabular values* display in the column of the *Sent requests* channel (8.1.3 Sent requests on page 70), that the request has now really been sent.

Image 60: User input Channel: Measurement Data

Alarm
The control channel can also be used in the alarm handling of DewesoftX® : see *Alarm output selection* in Image 61.

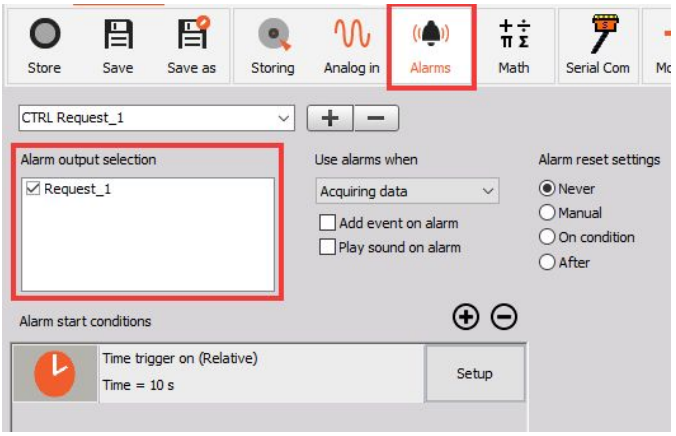


Image 61: Alarms

Caution
Since Windows is not a real time operating system the delay between the alarm-condition event and the time when the *SerialCom* Module notices the alarm is not constant. More important is the fact that the *SerialCom* Module may not send the request immediately, but may queue or even skip the request! See chapter Queueing for details.

7.2.2. Request: Response Handling

The *Response Handling* let's you define how we should react to responses that we receive after the request has been sent.

Default Responses
Default Responses are all responses that are defined (see 7 Responses on page 47), but are not used in the *Response Handling* of any request.

7.2.2.1. Default

The default setting (*Pause After Sending* value = 0) is to send the request and listen to all default responses.
The next request may be sent immediately after the current request.

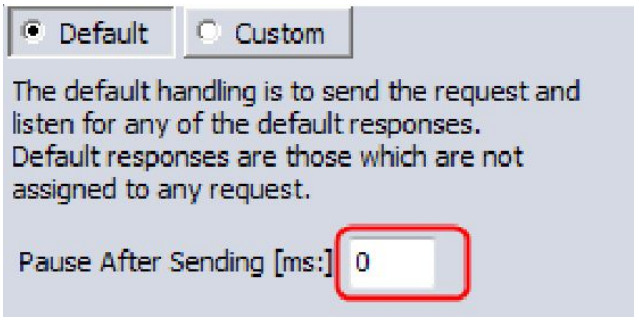


Image 62: Default

7.2.2.2. Pause After Sending

If the *Pause After Sending* value is > 0 then the Module will send the request to the serial device and make sure that, during the specified time, no other request will be sent. In the pause interval, it still listens to all default responses. Even if we receive a valid response during the pause interval, no other request will be sent (in contrast to Custom below)

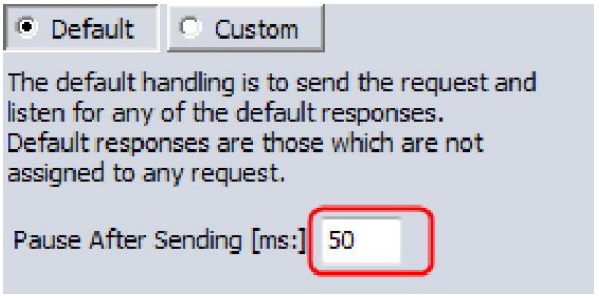


Image 63: Pause

7.2.2.3. Custom

The Custom handling allows you to select individual responses. After sending the request the Module will only listen to the selected responses (other responses will be ignored).
The next request will not be sent until we have received any of the selected responses (in contrast to Pause After Sending above) or until the Timeout period has been reached.
Example: (related to Image 64):
If we receive 'Response EPAD 01' or 'Error Response' after sending the request (in less than 250 ms), the next request can be sent (if any).
If we receive 'Response EPAD02' in the Timeout period, it will be ignored: the Module keeps waiting.
If we do not receive any response in the Timeout period, the next request may be sent (if any) and we will continue to listen for the default responses
Hints:

- To select a consecutive group of responses, click the first response, hold down the SHIFT key, and then click the last response.
- To select non-consecutive responses, hold down CTRL, and then click each response you want to select.

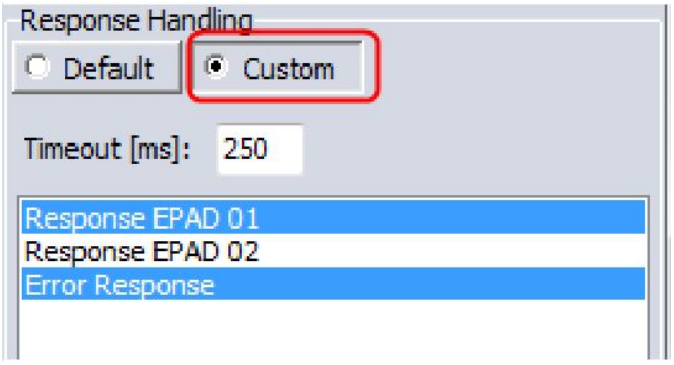


Image 64: Custom

7.2.2.4. Queueing

When a request should be executed (e.g. because you click a button, or it's timer fire), it will first be added to a queue and will then eventually be executed – depending on other requests in the queue and on the *Response Handling* settings of those requests.

If the same request is already in the queue (or currently active; i.e. it has been sent and we still wait for a reply), then it will not be added to the queue again. In this case a text-info will be added to the status channel (if the status channel is activated - see chapter Status Channel).

Always the oldest request in the queue will be executed next.

Example

Let's assume we have *Request A* with *Activation Event On start* and *Pause After Sending* set to 1000ms and Request B with an Activation Event Duration of 100ms.
When we start the measurement, *Request A* will be sent immediately.
After about 100ms the timer for *Request B* will fire and *Request B* will be added to the queue (It will not be executed, because *Request A's Pause After Sending* interval of 1000ms is not over yet).
The request will already be built when it is inserted into the queue; i.e. if a request part uses some channel data (see chapter Channel data), then the current value of the channel at the time when the request is fired is used.
After another 100ms the timer for *Request B* will fire again. This time *Request B* will not even be added to the queue, because the first *Request B* is still in the queue. The same will now happen every 100ms, until *Request A's Pause After Sending* interval of 1000ms is over.
Right after *Request A's Pause After Sending* interval of 1000ms is over, *Request B* (which is still in the queue) will be sent.

7.2.3. Request: Main Toolbar

Add	will add a new request part and open a dialogue window so that you can configure it see also chapter Request Parts
Cre	will add a CRC part for this request and open a dialogue window so that you can configure it see also: chapter Request Part Crc
Edit	will open a dialogue window so that you can edit the currently selected request part or CRC (only active if exactly one request part is selected) see also chapter Request Parts
Remove	will remove all selected request parts
Duplicate	will duplicate the selected request part (only active if exactly one request part is selected) see also chapter Copy and Paste
Copy	will copy the currently selected request part to the clipboard see also chapter Copy and Paste

Paste	will paste the request part/s (that have been copied before) back into DewesoftX® see also chapter Copy and Paste
Up	Will move the selected request part/s up
Down	Will move the selected request part/s down

7.3. Request Parts

The request parts actually define the data that will be sent to the serial device, so it should be obvious that each request must have at least one request part. If you have several request parts, the data of all parts will be concatenated; i.e. the order of the request parts is very important. You can also define a special part to do a check value calculation: see chapter Request Part CRC.

To change the order you can use the **Up/Down** buttons in the toolbar or you can drag and drop the row in the data grid (see chapter Drag And Drop).

7.3.1. Request Parts Example

In this short example we will use 4 different request parts – the request will be sent via a control channel.

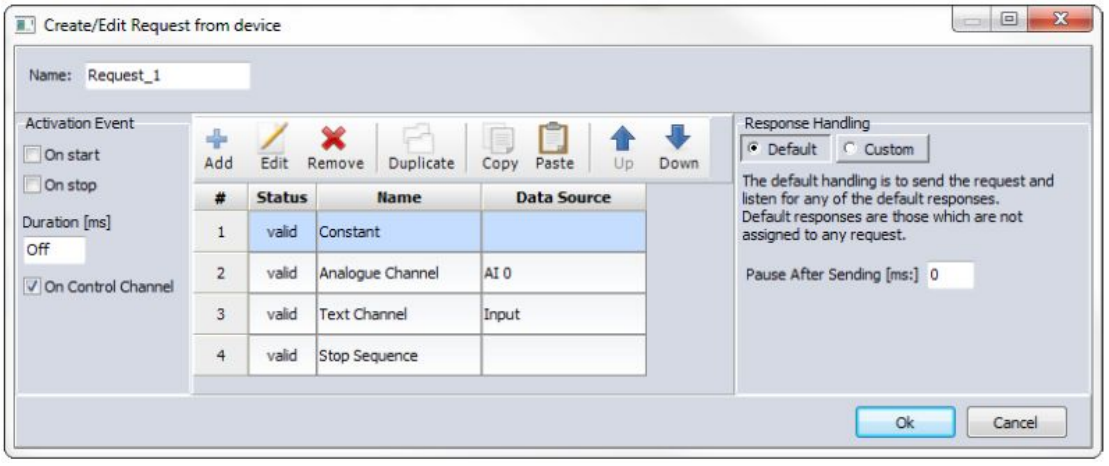


Image 65: Request Parts Example

The first part is a simple constant part. You can see in Image 66 below, that we have set the *Data source* to *None* (since we only use a constant expression). On the right top we have entered a Prefix (the literal char sequence Prefix) and *Postfix* (char sequence Postfix;).	The second part uses the data of the analogue DewesoftX® channel: *AI 0* and also a *Prefix* (>) and a *Postfix* (<;). The use of the *Prefix* and *Postfix* will make it easy on this example to identify the position of the value in the output.

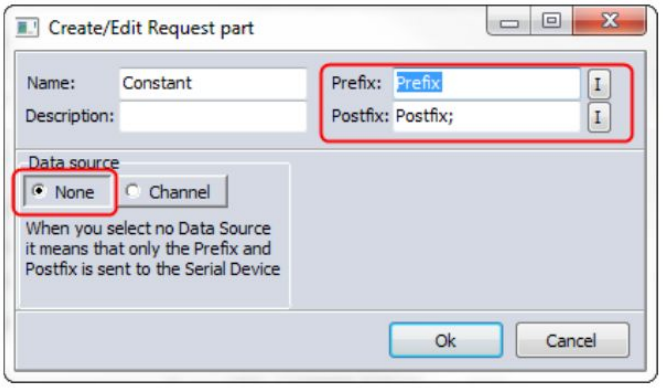


Image 66: Request Part: Constant

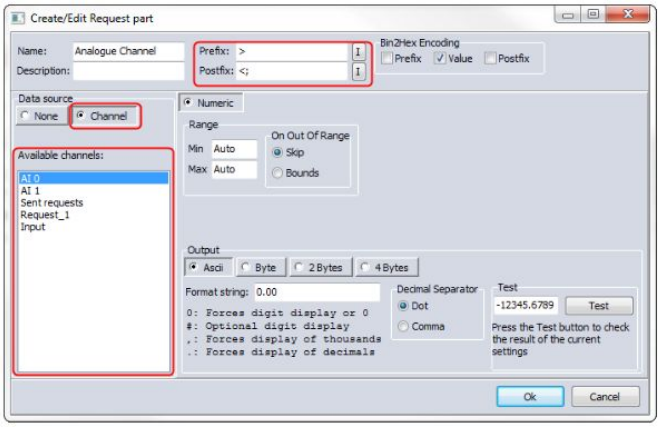


Image 67: Request Part: Analogue

The 3rd request part shows how to output a text-channel. We use " as *Prefix* and *Postfix*.

The last part is a fixed string again. Many serial protocols need a special string at the end of every request. In this case we use only one character: the carriage return character \CR.
Note: we could also enter the character in the Prefix instead of the *Postfix* – but since the Prefix is empty in this case, it has the same effect.
Note: we could also decide to skip this part completely and just add the carriage return character to the end of the *Postfix* in the 3rd request.

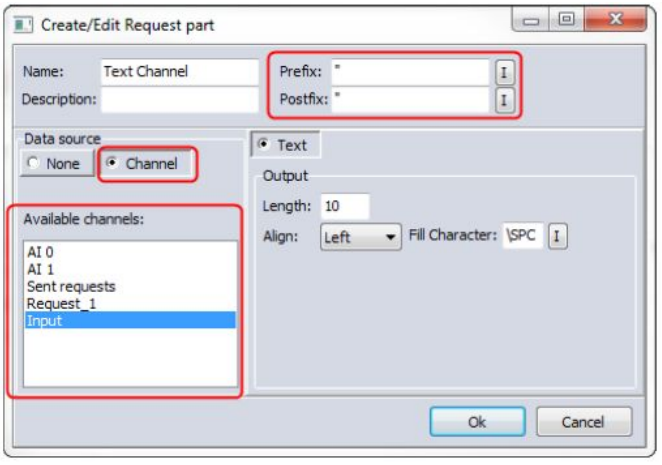


Image 68: Request Part: Text

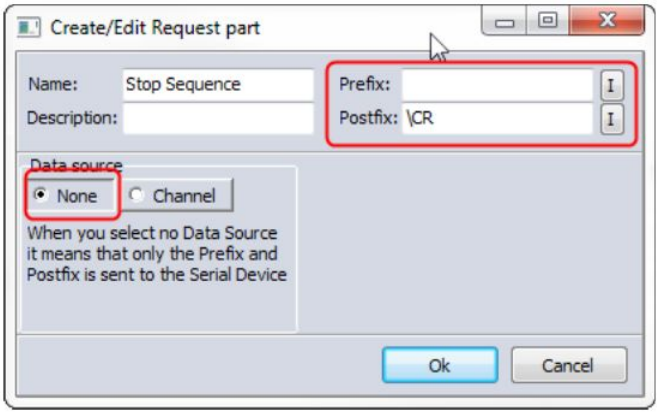


Image 69: Request Part: Stop sequence

When we start the measurement and fire the request, we can see the data that will be sent to the serial port in the *Sent requests* channel: see Image 70.
Note that special characters (like the trailing \CR) will not be visible in the DewesoftX® *Tabular values display*.

Image 70: Sent requests

In the table below you can see how the data relates to the request parts – we use the top entry of Image 70: Sent requests for this example:

Data:	Prefix	Postfix;	>	-1.55	<;	“	Text Channel	“	\CR
Notes:	Prefix	Postfix	Prefix	Data	Postfix	Prefix	Data	Postfix	Postfix
Request Part:	Part 1		Part 2			Part 3			Part 4

7.3.2. Request Part

7.3.2.1. BinHex Encoding

For each request part you can choose if the *Prefix*, *Value* or *Postfix* should be BinHex encoded or not.
The *Value* will be encoded right before it is sent. So all other conversions, formatting, etc. will be done before the encoding.

Image 71: Request Part: BinHex Encoding

When using BinHex encoding, the hexadecimal representation of byte is converted to 2 hexadecimal bytes, each representing the ASCII code of the hexadecimal character.

Example
The single byte value of #42 has the hexadecimal representation $2A. Now every character of the hexadecimal representation is converted to it's ASCII code.
2 → #50, $32
A → #65, $41
So the BinHex encoded value consists of the 2 bytes $32 $41.

7.3.2.2. Use for CRC

For each request part you can choose if the *Prefix*, *Value* or *Postfix* should be used for the check value calculation. This is only relevant, when you also add a CRC request part (see chapter Request Part Crc).

Image 72: Request Part: Use for CRC

7.3.2.3. Constant expressions

If the part of the response is just a constant byte-sequence, then use the *Data source* option *None* and enter the constant expression in the *Prefix* or *Postfix* fields. Prefix and Postfix will be concatenated, so all combinations below will result in the the same output:

Prefix	Postfix	Result
abc	def	abcdef
abcdef		abcdef
	abcdef	abcdef

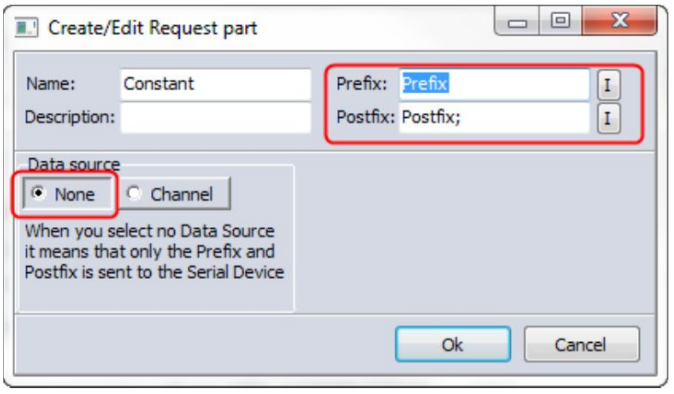


Image 73: Data source: None

7.3.2.4. Channel data

When you want to include the current values of a DewesoftX® channel in a request, you must select the *Data source* option *Channel*.
In this case you can also define a *Prefix* and *Postfix* (same as in 6.3.2.3 Constant expressions above): see (1) in Image 74.
And you will see a list of available channels that you can use as a data source for this request part: see (2) in Image 74. The list will only contain channels that are supported by the Module. You must choose only one channel.
The options in the main area of the dialogue (see (3) in Image 74) are dependant on the data type of the selected channel and will now be explained in detail. So the sent data will have this format: [Prefix]ChannelData[Postfix]

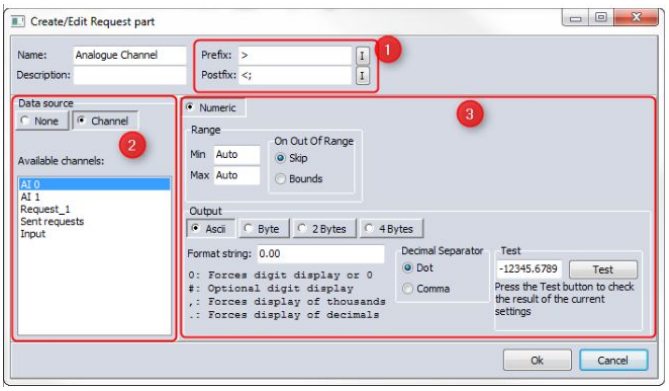


Image 74: Data source: Channel Data

Important

If the channel that you want to use does not contain any data yet, the request will be skipped. This is possible, especially when the *Activation Event* is *On Start* (see chapter Activation Event on)

Also note, that the channel value is taken when the request is fired – not at the time when the request will be sent to the device: see Example 4 in chapter Queueing for a detailed description.

Numeric channels

For all numeric DewesoftX® channels, you can define a valid range (see (1) in Image 75) and what to do if the value is out of range (see (2) in Image 75): for details see Numeric range validation below.

And you can define the data representation of the output (see (3) in Image 75). This will be explained in detail in the following topics.

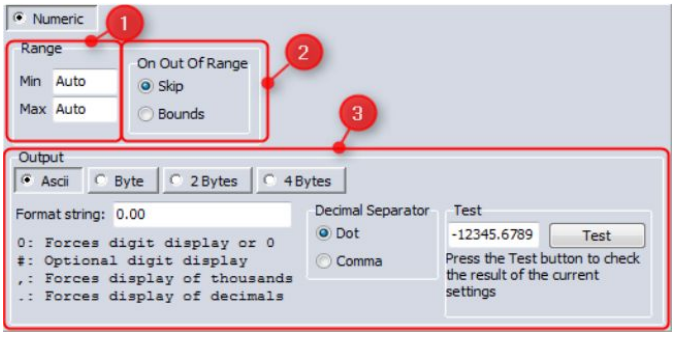


Image 75: Numeric Channel

Numeric range validation

For all numeric DewesoftX® channels, you can define a valid range (see (1) in Image 75) and what to do if the value is out of range (see (2) in Image 75).

In the *Min/Max* fields, you can enter either numbers or the text Auto (for automatic minimum/maximum). The default setting is Auto which means that the lowest possible value for *Min*/the highest maximum value for *Max* is used.

If you enter any numbers, then the value of the channel will be checked against this range value. If the channel value is outside of the specified range, then the *On Out Of Range* setting is important:

- Skip: means that he complete request will be skipped
- Bound: means that the value you have entered in the Min/Max fields will be used instead.

Example

In this example we have set -275 for Min and keep Auto for Max. The On Out Of Range condition has been set to bounds.

The following list will show the value that is sent to the serial device depending on the channel value:

Channel Value	Output value
-300	-275
-170	-170
0	0
100	100

Output data interpretation

For numeric data channels you can choose one of the available output data interpretations.

ASCII

This data interpretation will convert the numeric value of the channel to an ASCII string and send the converted text to the serial device.

(1) You can use the *Format string* to specify the basic structure of the ASCII string; i.e. how many digits are used, if thousands-/decimal separators are used or not.

(2) You can choose if you want to use a *Dot* or a *Comma* as decimal separator (if you don't want to use decimal places at all, you would not include a . in the *Format string*).

(3) Here you can enter a numeric value and test the output.
Note: No range validation is done for the test.

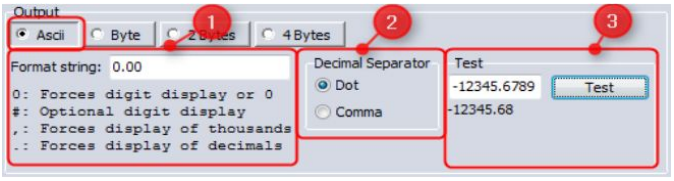
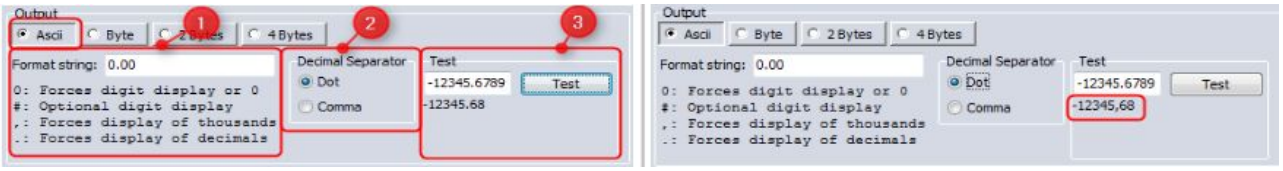


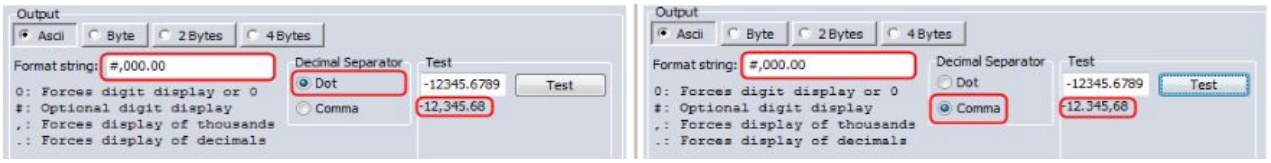
Image 76: Ascii

Example



In the left image the Decimal Separator is Dot: the output is: -12345.68 In the right image the Decimal Separator is Comma: the output is: -12345,68

Example



In this example we include a , in the *Format string* to force the display of a thousands-separator. The thousands-separator in the output will be the opposite of the *Decimal Separator*:

- if the *Decimal Separator* is *Dot*, then the thousands-separator will be a Comma (,)
- if the *Decimal Separator* is *Comma*, then the thousands-separator will be a Dot(.)

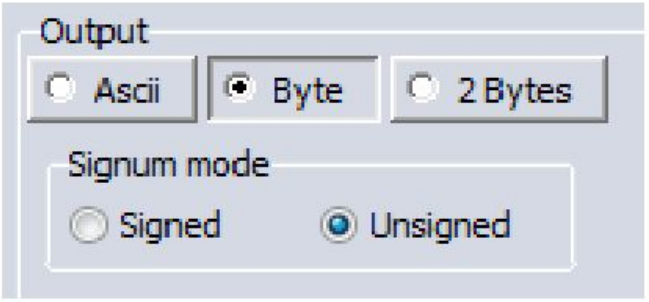
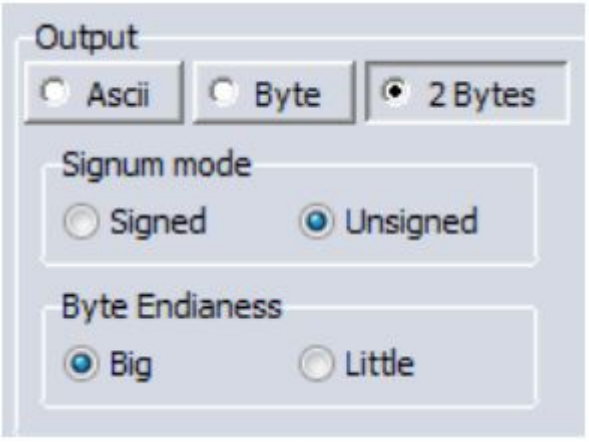
In the left image the Decimal Separator is Dot: the output is: -12,345.68 In the right image the Decimal Separator is Comma: the output is: -12.345,68

Example

Some examples regarding the *Format string*:(we use the *Decimal Separator* option *Dot*):

Format String	Test value	Output	Notes
0.0	-3.1415	-3.1	the 2nd decimal place is rounded
	-3.15	-3.2	
0.0	-123.45	-123.4	the integer part is never truncated or rounded
00.000	-3.1	-03.100	a 0 in the format string will always result in a place in the output string
00.00#	-3.1	-03.10	a # in the format string will only result in a place in the output string, if the value of the place is not 0
	-3.15	-03.15	
,0.00#	-3.15	-3.15	The thousands-separator

	-1234.15	-1,234.15	will only be included in the output if the integral part is high enough
0,000.00#	-1234.15	-1234.15	In combination with the 0 format identifier, you can force the display of a thousands-separator
	-4.15	-0,004.15	

Byte This data interpretation will convert the numeric value of the channel to a single byte. You can choose if the data should be interpreted as a signed or unsigned value. The range for a signed byte is -127 to 127. The range for an unsigned byte is 0 to 255.	 *Image 77: Byte*
2 Bytes This data interpretation will convert the numeric value of the channel to 2 bytes. You can choose the endianness and if the data should be interpreted as a signed or unsigned value. The range for 2 signed bytes is -32,768 to 32,767. The range for 2 unsigned bytes is 0 to 65,535.	 *Image 78: 2 Bytes*

Byte Endianess
The endianess defines the order of the 2 bytes in the data stream.
Big means that the most significant byte comes first, *Little* means, that the most significant bit comes last.

Endianess	First byte	Last byte	Notes
Big	most significant	least significant	Similar to a number written on paper (in Arabic numerals as used in most Western scripts)
Little	least significant	most significant	Arithmetic calculation order

Most significant means the byte in the position of a multi-byte number which has the greatest potential value.
Least significant means the byte in the position of a multi-byte number which has the smallest potential value.

Example

For a channel value of 2826 (the hexadecimal representation of this value is $0B$0A4 output in the data stream will depend on the Byte Endianness:

Byte Endianness	Result in data stream
Big	$0B$0A
Little	$0A$0B

4 Bytes
This data interpretation will convert the numeric value of the channel to 4 bytes.
The *Byte Endianess* defines if the byte order is *Big* or *Little Endian*: see Byte Endianness.
The *Word Endianess* defines if the word order is *Big* or *Little Endian*.

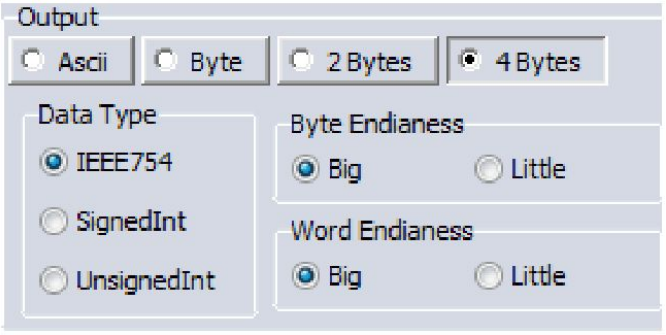


Image 79: Request part numeric: 4-Byte

The *Data Type* lets you choose if you want to interpret the 4 bytes as IEEE754 floating point number, or as signed integer (*SignedInt*) or unsigned integer (*UnsignedInt*) number:

Data Type	Range Min	Range Max
IEEE754	-3.4e38	3.4e38
Signed integer	-2,147,483,648	2,147,483,647
Unsigned integer	0	4,294,967,295

Text channels
For text channels you can specify the output length, the alignment and the fill character.

If the length is set to *Auto*, then the channel of the text value will be output as it is.

If you specify a number for the *Length*, then:
- If the text is longer than the specified length, it will be truncated.
- If it is shorter, the alignment and fill character are important.

Image 80: Text

Example
In this example we will use a Length of 4 and a – as Fill Character.

Channel Text	Alignment	Output
abcdef	Left	abcd
	Right	cdef
ab	Left	ab--
	Right	--ab

Channel References
DewesoftX® does not use the channel names to reference channels, but some internal index numbers. This makes a unique identification of each channel possible – even if some channels have the same name. Moreover, you can rename a channel without breaking any references to it. Therefore, channel references may become invalid: e.g. when you set a channel to Unused, delete a referenced channel or if

you copy a request to another setup where the referenced channel does not exist (or is Unused in that setup). Renaming referenced channels is no problem.

First, we create a *Math* channel with the name MathCh1.	Then we create a request with a request part which uses the MathCh1 as reference:

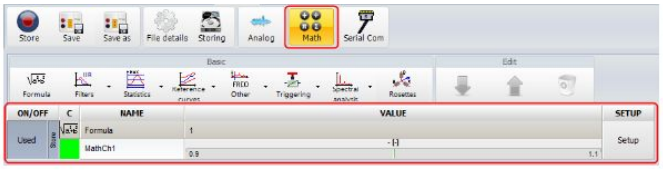
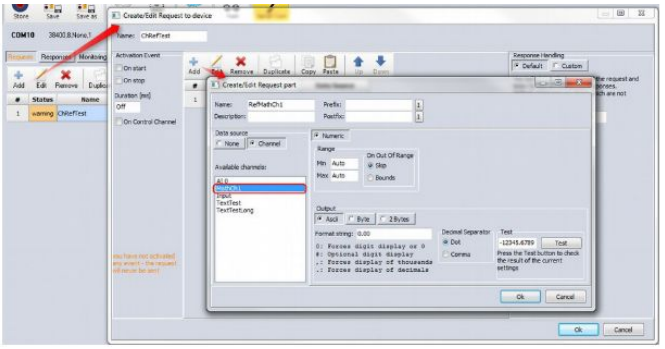

	

Image 81: Create channel MathCh1	*Image 82: Create Request*

When we now look at the Requests we can see that the request is valid (and references the *Math* channel).

Image 83: Valid reference

We can now go to the *Math* channel setup and rename the referenced Math channel: e.g. to MathCh1-Renamed.

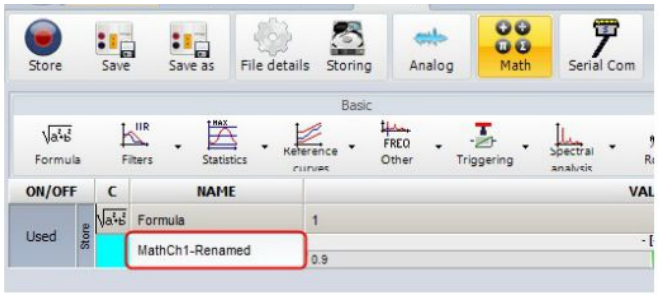


Image 84: Rename Math channel

When we now go back to the Requests, we can see that everything is still valid and that the new channel name is shown in the channel list:

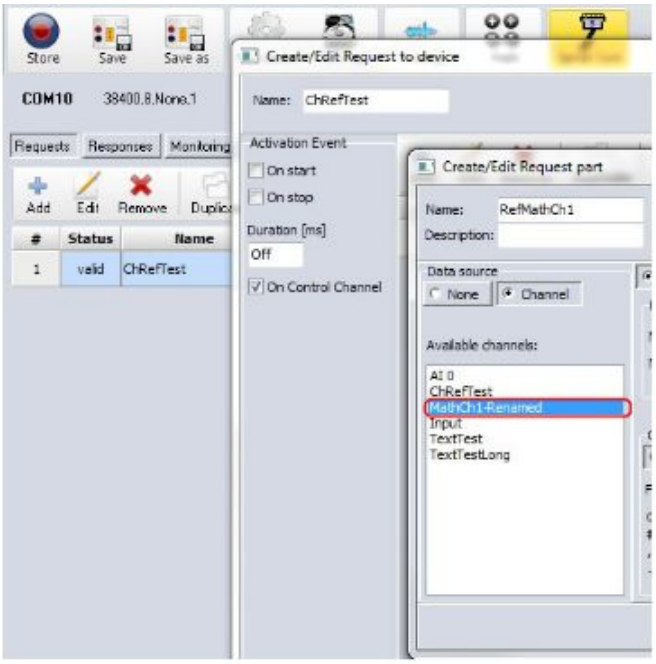


Image 85: Renamed channel

Deleting a referenced channel

Let's go to the *Math* channel setup and delete the channel MathCh1 that we have created before and which is still referenced by our request.

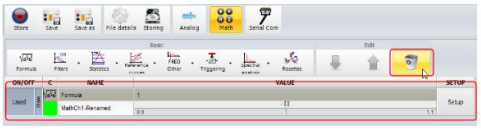


Image 86: Delete channel MathCh1-Renamed

When we now go back to the Requests we can see that the request shows an error. When we open the request and then the request part we can see the error message: channel "*MathCh1-Renamed*" *not found* (see (1) in Image 87). You must select another existing channel to make the message disappear.
Note: if the error message is too long to be displayed, it will be truncated - you will see the ellipses ... at the end of the message. If you hover the mouse over the message, a tooltip will appear and show the complete message (see (2) in Image 87)

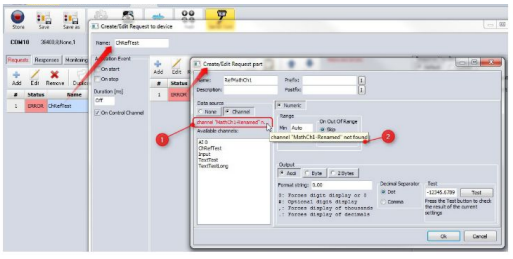


Image 87: Invalid channel reference

Note: even if we now recreate a new channel with the same name MathCh1, the error message will still be there (since the new *Math* channel will have another unique index as the original channel: see chapter Channel References for details).

7.3.3. Request Part Crc

When you click the CRC button in the toolbar, you can add a check value calculation. The result of the calculation will be added to the request that we send to the Serial device, so that the device can check if the data is still valid when it is being received. The CRC definition is the same as for the Responses: please refer to chapter 7.3.2 CRC on page 66. Also note that you can define for each response part if the *Prefix, Value* and/or *Postfix* are used for the CRC calculation: see chapter Use for CRC.

8. Responses

A response is a byte sequence that will be sent from the serial device to DewesoftX® . Devices may send responses automatically in certain time intervals or asynchronously (if some event occurs), or because they are answering to a request that has been set to the device before (see chapter Requests).

The main purpose of the *SerialCom* Module is to process the received responses and store the data of the responses in DewesoftX® channels so that you can display, store and analyse the data. A response can consist of several parts and contain different kinds of data; i.e.

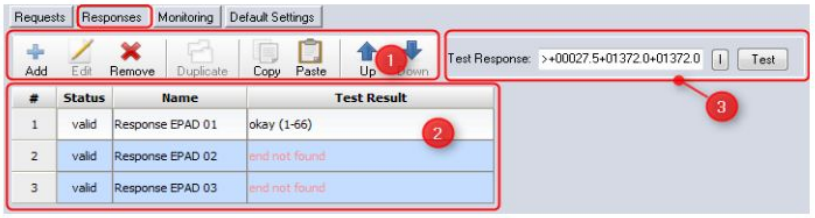
- *static data*: e.g. start-sequence, end-sequence (typically a line-break or carriage return for text-based protocols) static data is always the same and not interesting – you do not want to store it in DewesoftX® channels
- *variable data*: data that changes between different responses: e.g. the temperature reading of a weather station this kind of data is what you want to store in DewesoftX® channels
- *checksum data*: some serial protocols include a kind of checksum which is a fixed-size datum computed from the payload (or maybe only parts of the payload) of the response to detect accidental errors that may have been introduced during its transmission.

The serial Module lets you define all those kinds of data. Each response may have several response parts.

8.1. Responses tab-sheet

In the Responses tab-sheet there is a list of all defined responses.

(1) on the top you can see the main toolbar: see chapter Responses: Main Toolbar
(2) the main data grid shows a list of all responses: selected responses are highlighted in light blue (e.g. in the image to the right, the responses 2 and 3 are selected)
(3) here you can test your response definitions: see chapter Response Test



8.1.1. Responses: Main Toolbar

The main toolbar for responses has following buttons:

Add	will add a new response and open a dialogue window so that you can configure it see also chapter Add/Edit Response
Edit	will open a dialogue window so that you can edit the currently selected response (only active if exactly one response is selected) see also chapter Add/Edit Response
Remove	will remove all selected responses
Duplicate	will duplicate the selected response (only active if exactly one response is selected) see also chapter Copy and Paste
Copy	will copy the currently selected response/s to the clipboard see also chapter Copy and Paste
Paste	will paste the response/s (that has/have been copied before) back into DewesoftX® see also chapter Copy and Paste
Up	Will move the selected response/s up: see chapter Responses Order below
Down	Will move the selected response/s down: see chapter Responses Order below

8.1.2. Responses Order

The order of the responses in the requests list is only relevant if several responses would match the data. To change the order you can use the **Up/Down** buttons in the toolbar or you can drag and drop the row in the data grid (see chapter Drag And Drop).

8.1.3. Response Test

When you enter a byte sequence in the *Test Response* edit field and then click **Test**, the *SerialCom* Module will test every response if it matches the request. You can then see the results in the *Test Result* column of the main data grid.
In Image 88 you can see that the byte sequence matches response 1 and response 3 (response 3 is actually a copy of response 1 in this example), but not response 2.
You can also test a single response and see more details: see chapter Single Response Test

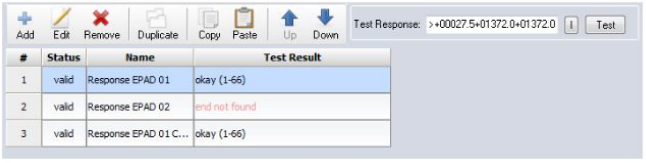


Image 88: Response Test

8.2. Add/Edit Response

To create a new response, click the **Add** button in the Responses tab-sheet. To edit an existing response, select it in the main data grid and then click **Edit** or just double click the row of the datagrid.

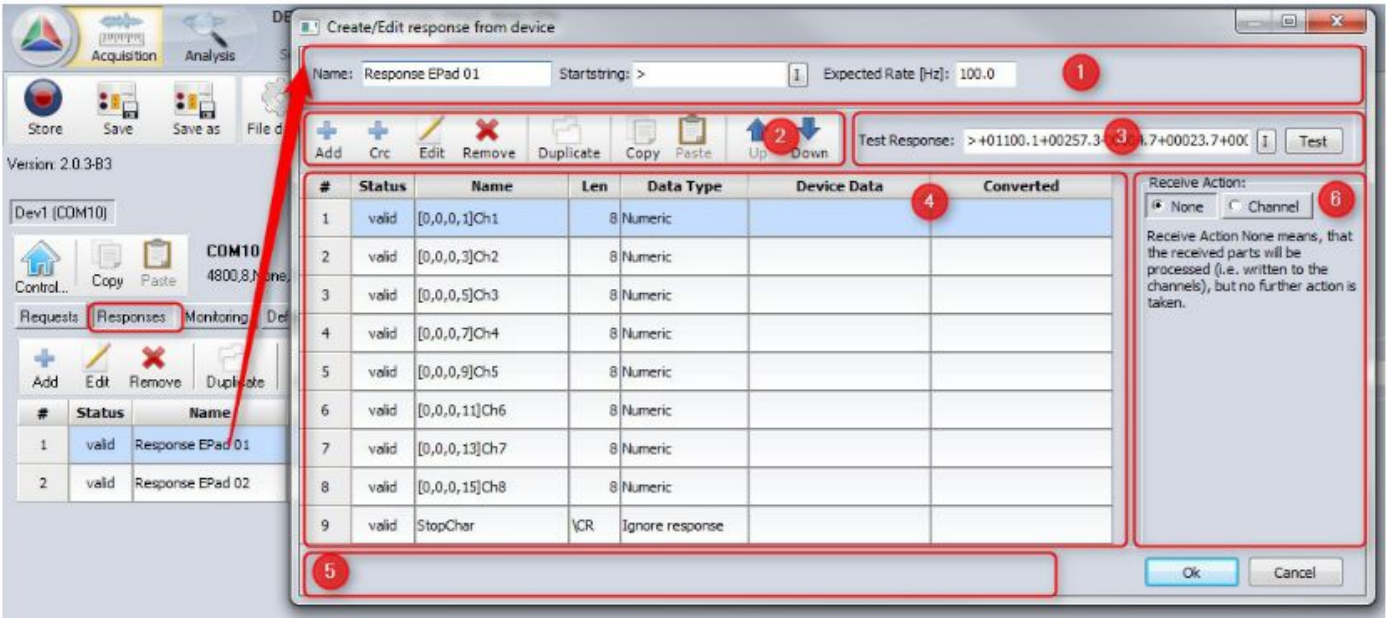


Image 89: Create/Edit request

The *Create/Edit* response dialogue will appear:

(1) *Response properties*: see chapter Response properties
(2) *Main toolbar*: provides functions to manipulate the parts of the response: see chapter Response: Main Toolbar
(3) *Test response*: see chapter Single Response Test
(4) *Main Data Grid*: a list of the parts of this response: see chapter Response Parts
(5) *Status Label*: for the response parts: will show you warnings/errors related to the response parts (in Image 89 it is empty, since there are no warnings or errors)
(6) *Receive Action*: see chapter Receive Action. Note: This Receive Action feature has been added in version 2.0.3 of the Module and is only visible when a *Request* with *Activation Event* 'On Control Channel' exists (see chapter Control Channel).

8.2.1. Response properties

8.2.1.1. Name

The name can be an arbitrary string. The name will be shown in the list of responses and also in the response handling of the requests (6.2.2 Request: Response Handling on page 34), so it should be unique. Especially when you have several responses you should make sure to find a meaningful name to clearly identify each response.

8.2.1.2. Startstring

Some serial protocols define their responses (and maybe also their requests) to always start with the same string.

Example
The responses from EPAD modules always start with the character >. The responses of NMEA-0183 compatible GPS devices always start with the string $GP.

Hint

It is recommended that you always use the *Startstring*, if possible, because it will speed up the parsing process.

e.g. when defining responses for EPAD modules, you can choose from 2 definitions, which will both work:

1. define > as the *Startstring* and then add the response parts for the data
2. you could leave the *Startstring* empty and define the first response part to be of type *Ignore Text* with *Exact match* enabled and a *Stop string* of >

Both definitions would work, but it is highly recommended to use the first approach.

8.2.1.3. Expected Rate

This is just a hint to DewesoftX® about the expected update rate of the response channels. If you enter a value that's too low you may see that the data in recorder visual controls does not look nice during measurement.

8.2.2. Receive Action

The *Receive Action* feature allows you to define an action after a valid response has been received. A typical use-case is to send an acknowledge back to the serial device after we have received the response.

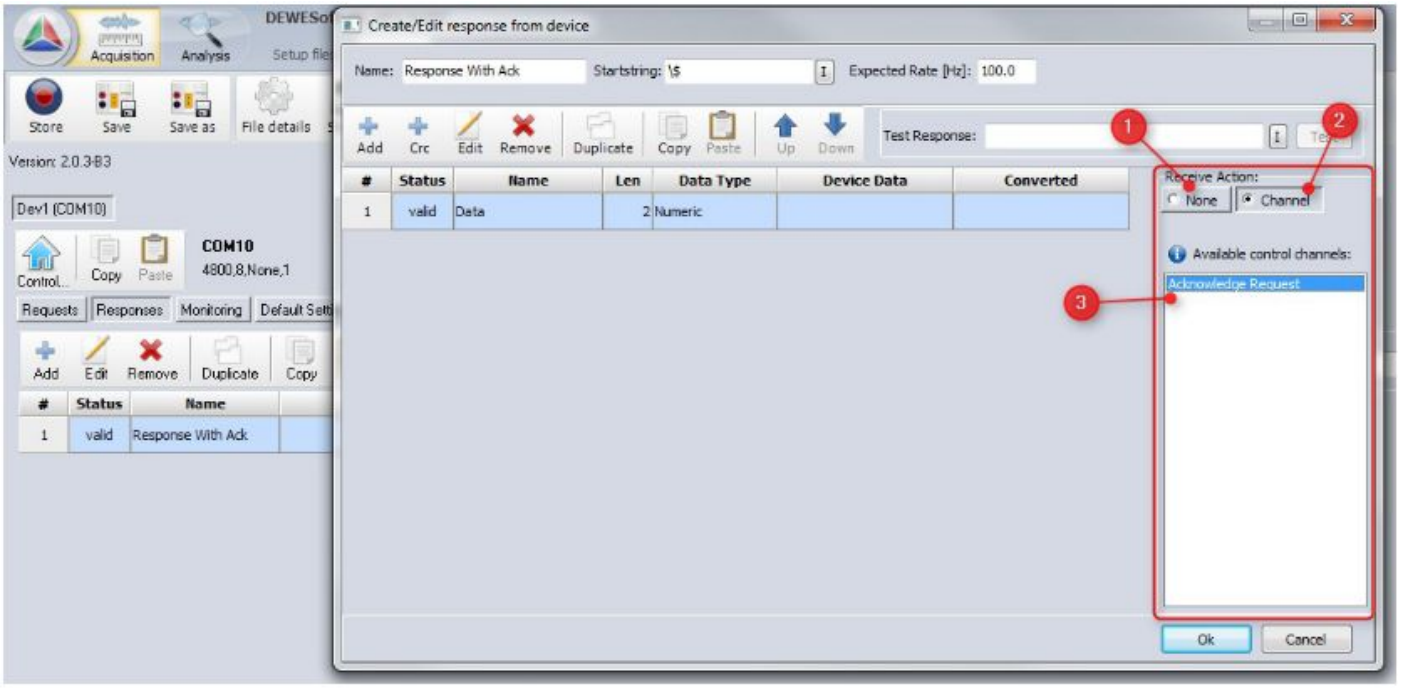


Image 90: Receive Action

Hint

The Receive *Action* feature has been added in version 2.0.3 of the Module and is only visible when a *Request* with *Activation Event* 'On Control Channel' exists (see chapter Control Channel).

Available *Actions*:

(1) None: no special action will be made after receiving a valid response.
(2) Channel: allows you to select any control channel from the channel list.
(3) When a valid response has been received, the value of the selected control channel will be set to 1 (and then immediately back to 0). So basically this is the same as if you would press a DewesoftX® push-button control during measurement. Note: you can use **any** control channel (not only those created by the SerialCom Requests): i.e. you can also use control channels from other Modules or DewesoftX® features!

Example

Let's assume we have a serial device that accepts a request, then sends a response and wants an acknowledge that we have received the response. In this case we can use the following steps to setup the Module:

- First we create the response that the device expects: let's call it *DataRequest*
- Next we define the expected response: let's call this *DataResponse*
- Now we could already send the *DataRequest* and the device will return the *DataResponse* and the data would end up in a DewesoftX® channel. But since the device expects an acknowledge, it might wait for a specific time until the acknowledge is received. If we just don't send the acknowledge, the device may time-out and send the data again. This is of course not ideal, because it would decrease the possible throughput and also cause redundant data values to show up in our DewesoftX® datafile.
- Therefore we define another *Request* called *Acknowledge Request* and set its *Activation Event* to *On Control Channel* exists (see chapter Control Channel).
- Now we open our response *DataResponse* again and select the corresponding control channel of *Acknowledge Request* as the *Receive Action* and we are done.
- Now the full chain of command will be like this:
  - The Module will send the *DataRequest*.
  - The device will answer with a *DataResponse*
  - When the Module has successfully parsed the *DataResponse*, it will activate the selected *Control Channel*,which in turn will send the *Acknowledge Request*.
  - The device is happy that it got the acknowledge and can immediately be used for following requests.

8.2.3. Single Response Test

When you enter a byte sequence in the *Test Response* edit field and then click **Test**, the *SerialCom* Module will process the *Test Response* and show you the resulting value of each part in the columns *Device Data* and *Converted* of the main data grid.
In Image 91 you can see that the byte sequence completely matches the response definition – all response parts match, including the terminating line-break character.

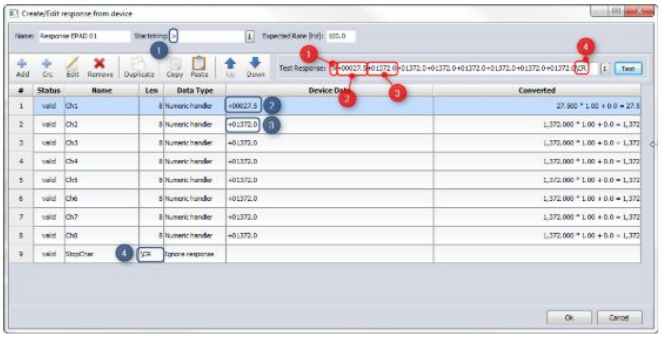
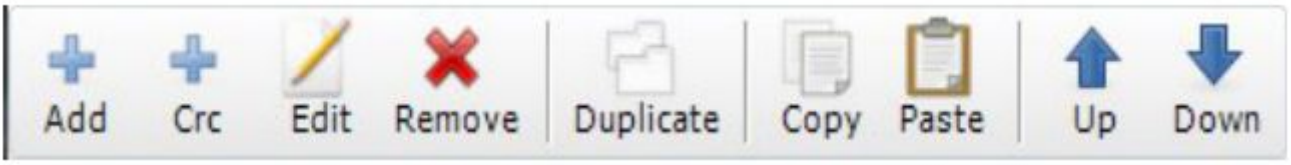


Image 91: Single Response Test

(1) The *Startstring* (in this case just the character >) is directly at the beginning of the *Test Response*
(2) The first data field of the request is defined as an 8 byte ASCII sequence interpreted as a number: in this case the characters +00027.5 match this definition. The Device Data column shows the original byte-sequence that matches the response part (+00027.5). And the Converted column gives more detailed information about the final value, as it also shows how the scale and offset affect the final value (27.5) that will be stored in the DewesoftX® data channel.
(3) The second data field : Device Data: +01372.0, Converted 1,372. The procedure for the following response parts is the same as in 2 and 3...
(4) The last character of the Test Response is the carriage return. This matches the last response part in this response definition.

See also: chapter Response Test
See also: chapter CRC for testing a checksum

8.2.4. Response: Main Toolbar



Add	will add a new response part and open a dialogue window so that you can configure it see also chapter Response Parts
Crc	Cyclic Redundancy Check: allows you to add a checksum definition: see chapter CRC
Edit	will open a dialogue window so that you can edit the currently selected response part (only active if exactly one response part is selected) see also chapter Response Parts
Remove	will remove all selected response parts
Duplicate	will duplicate the selected response part (only active if exactly one response part is selected) see also chapter Copy and Paste
Copy	will copy the currently selected response part to the clipboard see also chapter Copy and Paste
Paste	will paste the response part/s (that have been copied before) back into DewesoftX® see also chapter Copy and Paste
Up	Will move the selected response part/s up
Down	Will move the selected response part/s down

To change the order you can use the **Up/Down** buttons in the toolbar or you can drag and drop the row in the data grid (see chapter Drag And Drop).

8.2.5. Response: Main Data Grid

In the main data grid of the response you can see a list of all response parts.

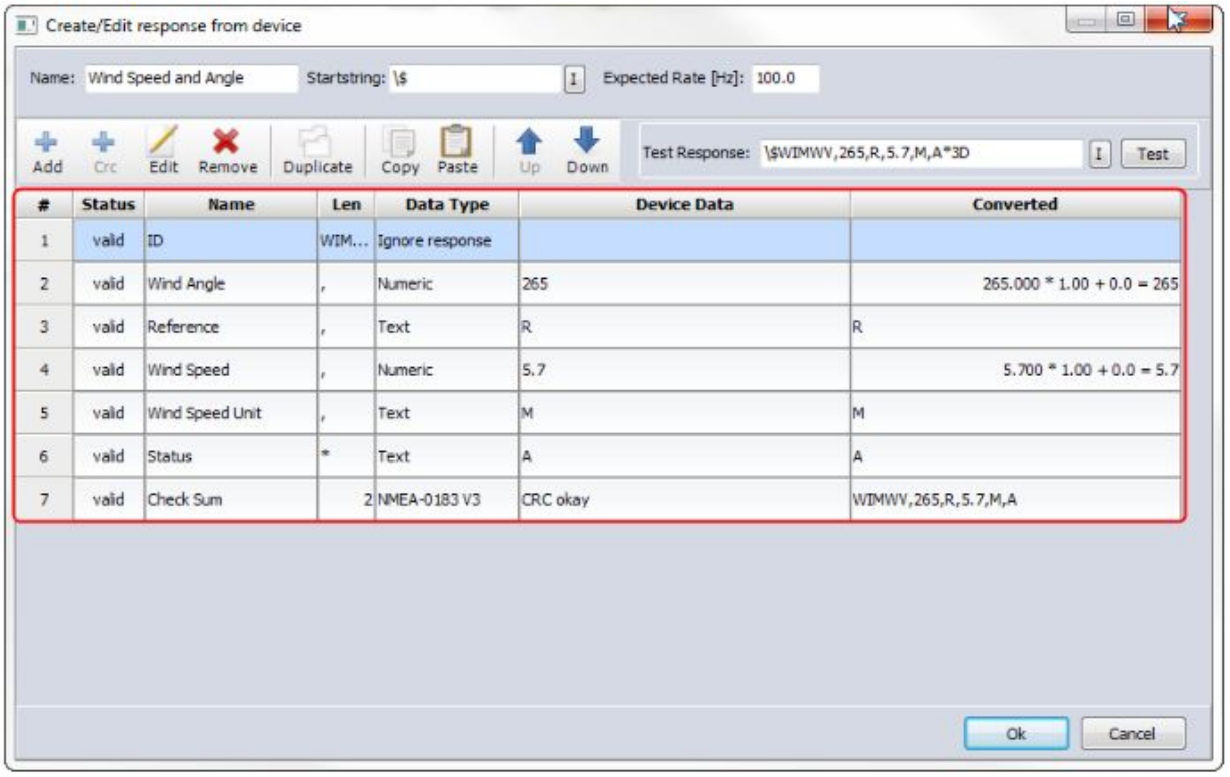


Image 92: Response: Main Data Grid

The main data grid has the following columns:

- #: just a unique index number
- *Status*: the validation status of the response part: see chapter Warnings and Errors
- *Name*: The Name is the name of the response part and can be an arbitrary string. The name will be shown in the list of response parts, so it should be unique. Especially when you have several response parts you should make sure to find a meaningful name to clearly identify each response part. Moreover the name will be used for the corresponding DewesoftX® channels (if the response part has a channel; i.e. response parts of type Text (see chapter Text) or *Numeric* (chapter Numeric).
- *Len*: Will show the *End Definition* (see (2) in chapter General response parts) of the response part. If the *End Definition* is *Fixed Length*, the number of bytes will be shown (see request part 7 in Image 92) If the *End Definition* is *Stop string*, the Stop string will be shown (see request parts 1-6 in Image 92)
- *Data Type*: will show the selected Response Part Data Handler of the response part(see chapter General response parts). Device Data: only used when you test a response: see chapter Single Response Test
- Converted: only used when you test a response: see chapter Single Response Test

8.3. Response Parts

The response parts actually define the format of the data that will be received from the serial device, so it should be obvious that each response should have at least one request part. If you have several response parts, the order is very important and must be matched by the received data.
You can also define a special response part named CRC for handling a checksum (see chapter CRC).

8.3.1. General response parts

You can create a new general response part by clicking the **Add** button of the main toolbar in the *Create/Edit response from device dialogue* (see chapter Response: Main Toolbar).
Then the *Create/Edit response part* dialogue will be opened: see Image 93.

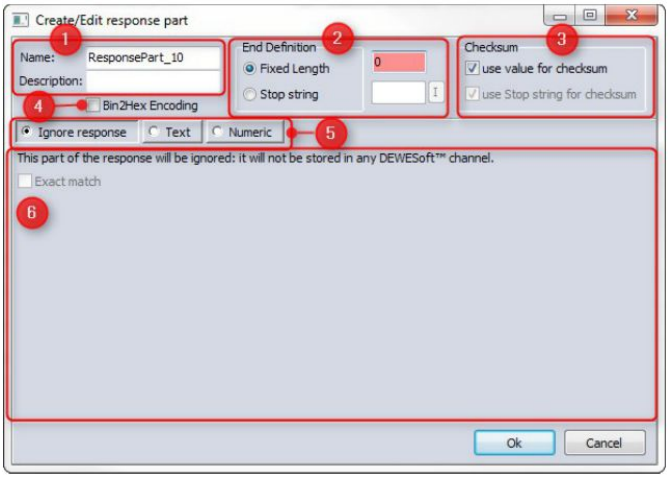


Image 93: Create/Edit response part dialogue

(1) *Name and Description*:
The Name is the name of the response part and can be an arbitrary string. The name will be shown in the list of response parts, so it should be unique. Especially when you have several response parts you should make sure to find a meaningful name to clearly identify each response part.
Moreover the name and description will be used for the corresponding DewesoftX® channels (if the response part has a channel; i.e. response parts of type Text (see chapter Text) or Numeric (chapter Numeric).
(2) *End Definition*: the end definition is used to define the length of the response part.
Fixed Length: if the size of the response part is fixed; i.e. always has the same number of bytes (e.g. room temperature values may be represented by a single byte)
Stop string: if the response part always ends with the same characters (e.g. ; in a list of comma separated values)
(3) *Checksum*: let's you specify if the value/*Stop string* of this response part will be used for the calculation of the checksum: see also chapter CRC
(4) BinHex encoding: see chapter Response Part: BinHex Encoding
(5) *Response Part Data Handler Selection*: here you can specify how to interpret the data of this response part *Ignore Response*: the data will be ignored: see chapter Ignore response on page
Text: the data will be interpreted as text: see chapter Text
Numeric: the data will be interpreted as a number: see chapter Numeric

(6) *Response Part Data Handler Settings*: will show detailed settings which are different depending on the *Response Part Data Handler Selection*.

8.3.1.1. Response Part: BinHex Encoding

When activated, every pair of received bytes will be converted from the BinHex encoded format to a single byte.

Example

Let's take the following 2 received bytes $32 $41 (#50 #65). The ASCII codes of the 2 bytes are 2 and A. These codes are now interpreted as a single hexadecimal byte: $2A. So the result of the BinHex conversion of $32 $41 is $2A.

Note: when you activate the BinHex encoding, the encoding is the first thing that will be done when the bytes are received.
That means that when you enter a fixed length of 4 bytes for the *End Definition*, you will only have 2 Bytes available for the numeric conversion: see Image 94.
When you select *Stop string* for the *End Definition*, then you must make sure that the number of bytes until the stop string is even. If not, the BinHex encoding cannot be applied and the data is invalid.

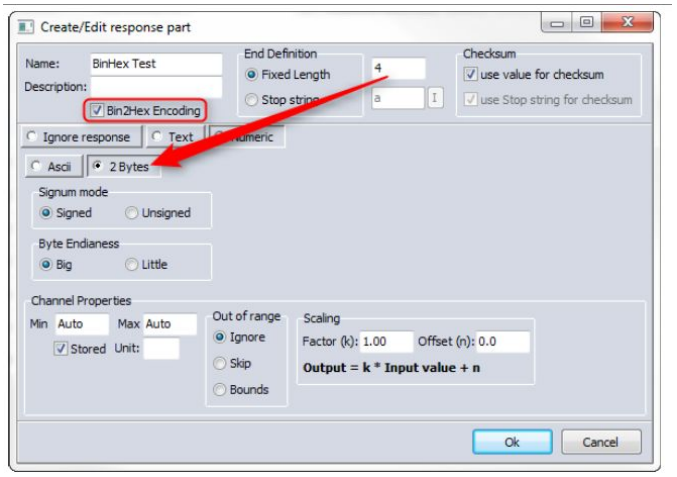


Image 94: Response Part: BinHex Encoding

8.3.1.2. Ignore response

There might be parts in the response that are not interesting for you at all; i.e. you do not want to store that data in any DewesoftX® channel.

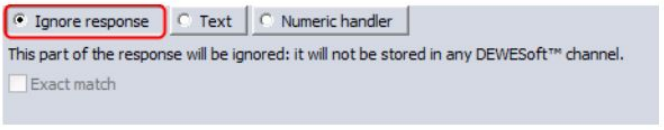


Image 95: Ignore response

Example

If you are not interested in the 1st part (time information – 081836 in the example below) of a GPRMC sentence: $GPRMC,081836,A,3751.65,S,14507.36,E,000.0,360.0,130998,011.3,E*62\CR\LF then you could define the beginning $GPRMC, as the Startstring of the response, and the first part could be defined as type Ignore response with the stop string. Then this response part would match the data (081836,), but it would be ignored – Nevertheless, the parsed value could still be used for the checksum calculation.

Exact Match

If *Exact Match* is activated, then the response part must exactly match the *Stop string* otherwise data before the *Stop string* will also be consumed.
Note: *Exact Match* is only enabled when the *End Definition* is *Stop string* (for a *Fixed Length* it does not make sense, because the fixed length always matches exactly).

Example

Let's say we have defined the $ as Starstring of the response. And the first part is of type Ignore response with the Stop string C, then we would get these results for the response part:

Data	Exact Match activated	Result for response part one
$CDEF	☒	C
	☐	C
$ABCDEF	☒	No match
	☐	ABC

8.3.1.3. Text

When you choose the *Response Part Data Handler Text*, then the received byte sequence will be interpreted as ASCII characters and will be stored in a DewesoftX® string channel.

Image 96: Text

Length: defines the Length of the string channel. If the data is longer than the specified length, the text will be truncated. You should the lowest possible length, because otherwise it will just increase the size of the DewesoftX® file without giving you more information.
Stored: if this is deactivated, the data of the channel can be displayed in Measurement mode, but will not be stored in the DewesoftX® data file; i.e. it will not be available in Analyze mode when you reload the data file.

8.3.1.4. Numeric

The *Response Part Data Handler Numeric*, is the most interesting one, because you usually want to use the data as a number that you can display, calculate and analyse easily.
Depending on the *End Definition* settings there are different data interpretations available:

Interpretation name	Available if	See also
Numeric Data Ascii Interpretation	always	chapter Numeric Data Ascii Interpretation
One Byte Numeric Data Interpretation	*Fixed Length* is 1 or *Fixed Length* is 2 (BinHex encoding)	chapter Numeric Data Ascii Interpretation
Two Byte Numeric Data Interpretation	*Fixed Length* is 1 or *Fixed Length* is 2 (BinHex encoding)	chapter Two Byte Numeric Data Interpretation
Four Byte Numeric Data Interpretation	*Fixed Length* is 4 or *Fixed Length* is 8 (BinHex encoding)	chapter Four Byte Numeric Data Interpretation

Numeric Data Ascii Interpretation

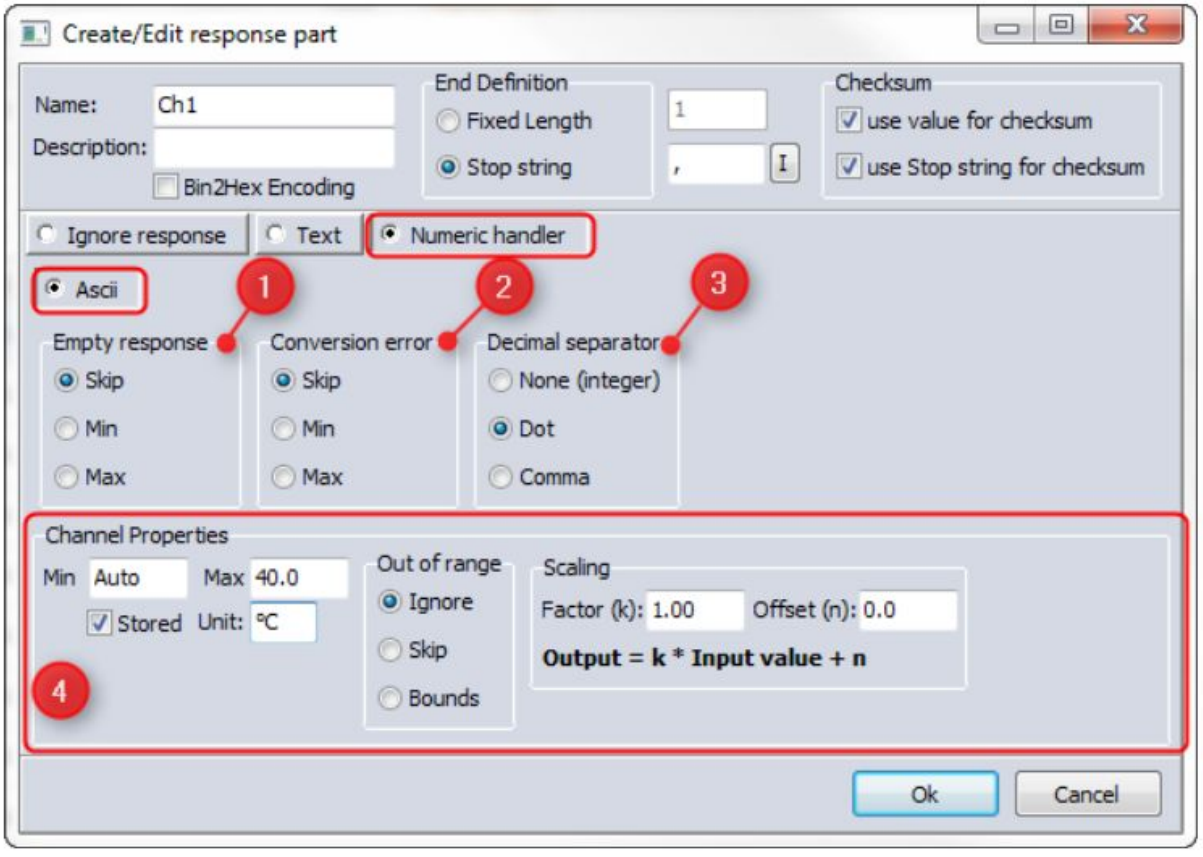


Image 97: Numeric: Ascii

In this case the response data will be interpreted as ASCII characters and then be converted to a number (using the selected *Decimal separator*).

(1) *Empty response*: define what to do if the response part is empty: see chapter Empty Response
(2) *Conversion error*: define what to do if the data cannot be converted to a number: see chapter Conversion error
(3) *Decimal separator*: define which decimal separator to use: see chapter Decimal separator
(4) *Channel Properties*: define properties of the DewesoftX® channel: see chapter Channel Properties

Hint

Since version 2.0.1 of the Module, space and tabulator characters after the signum in the Response part are ignored. See the following table for details.

Raw Data	Module Version <2.0.1	Module Version >=2.0.1	Hint
-1.23	-1.23	-1.23	No white space
\SPC-1.23	-1.23	-1.23	Leading white space
SPC-1.23\SPC	-1.23	-1.23	Trailing white space
\SPC-\SPC1.23\SPC	Conversion error	-1.23	Space after signum
\SPC-\SPC\SPC1.23\SPC	Conversion error	-1.23	Spaces after signum
\SPC-\TAB1.23\SPC	Conversion error	-1.23	Tab after negative signum
\SPC+\TAB1.23\SPC	Conversion error	+1.23	Tab after positive signum
\SPC\TAB1.23\SPC	Conversion error	Conversion error	Tab without signum

One Byte Numeric Data Interpretation

The *One Byte Numeric Data Interpretation* is only available when the *End Definition* is set to a *Fixed Length* of 1 (or 2 if *BinHex Encoding* is active).
That means that exactly one byte of the incoming response will be used for this response part.

The *Signum mode* lets you choose if the byte is interpreted as a signed number or unsigned number.
The maximum ranges are:

- Signed byte: -127 to 127
- Unsigned byte: 0 to 255

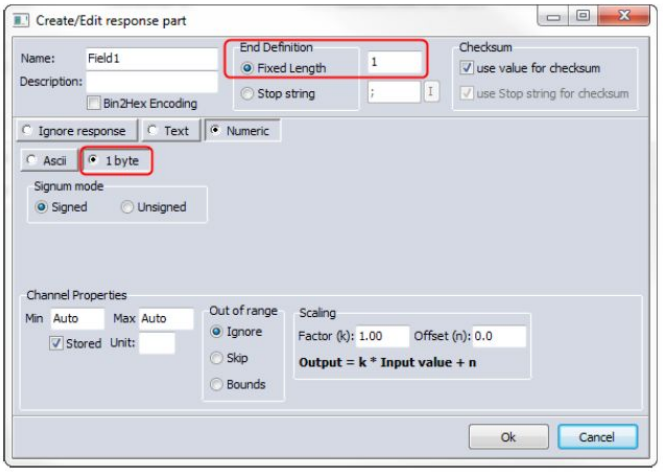


Image 98: One Byte - Interpretation

Two Byte Numeric Data Interpretation

The *Two Byte Numeric Data Interpretation* is only available when the *End Definition* is set to a *Fixed Length* of 2 (or 4 if *BinHex Encoding* is active). That means that exactly 2 bytes of the incoming response will be used for this response part.

The *Signum mode* lets you choose if the byte is interpreted as a signed number or unsigned number. The maximum ranges are:

- Signed byte: -32,768 to 32,767
- Unsigned byte: 0 to 65,535

The Byte *Endianess* defines if the byte order is *Big* or *Little Endian*:: see Byte Endianess.

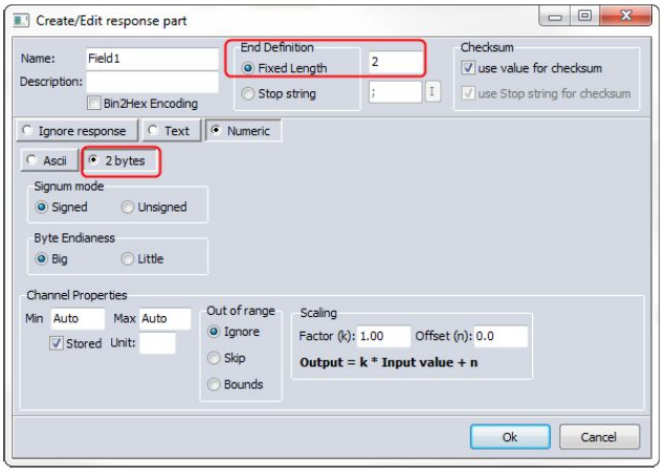


Image 99: Two Bytes - Interpretation

Four Byte Numeric Data Interpretation

The *Four Byte Numeric Data Interpretation* is only available when the *End Definition* is set to a *Fixed Length* of 4 (or 8 if *BinHex Encoding* is active).

That means that exactly 4 bytes of the incoming response will be used for this response part.

The *Byte Endianess* defines if the byte order is Big or Little Endian: see Byte Endianess on page 42.
The *Word Endianess* defines if the word order is *Big* or *Little Endian*.

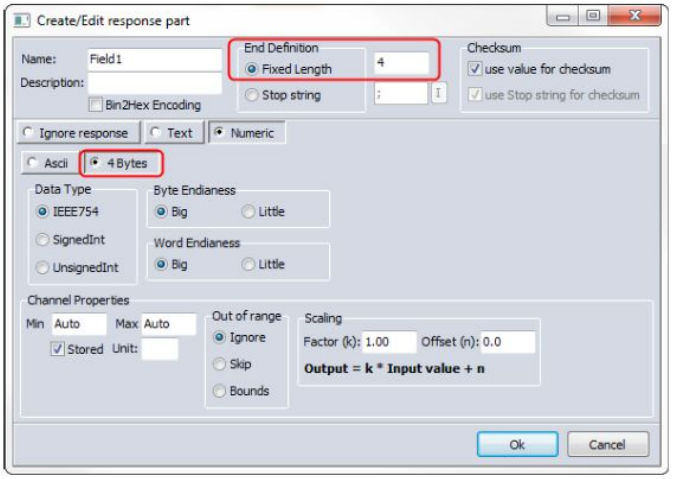


Image 100: Four Bytes - Interpretation

The *Data Type* lets you choose if you want to interpret the 4 bytes as IEEE754 floating point number, or as signed integer (*SignedInt*) or unsigned integer (UnsignedInt) number:

Data Type	Range Min	Range Max
IEEE754	-3.4e38	3.4e38
Signed integer	-2,147,483,648	2,147,483,647
Unsigned integer	0	2,147,483,647

8.3.1.5. Exception Handling Of Response Parts

If an exceptional condition occurs when processing the data for a response part, you can define how to handle this situation.

Example

We will now define a simple protocol and take a look at the options you have.
Let's say, our protocol always starts with a $ sign and has 3 numeric fields which are terminated by a ;.
e.g. the data-string $1;11;21; would be valid and field one has the value 1, field two the value 11 and field three the value 21.
The setup in the *SerialCom* Module for this protocol is very easy. We use \$ as *Startstring* of the response and create a response part named *Field1* with the stop string ; and choose the *Response Part Data Handler Numeric*.
Then we click duplicate and change the name of the second response part to *Field2* and then we do the same again to create a response part *Field3*.

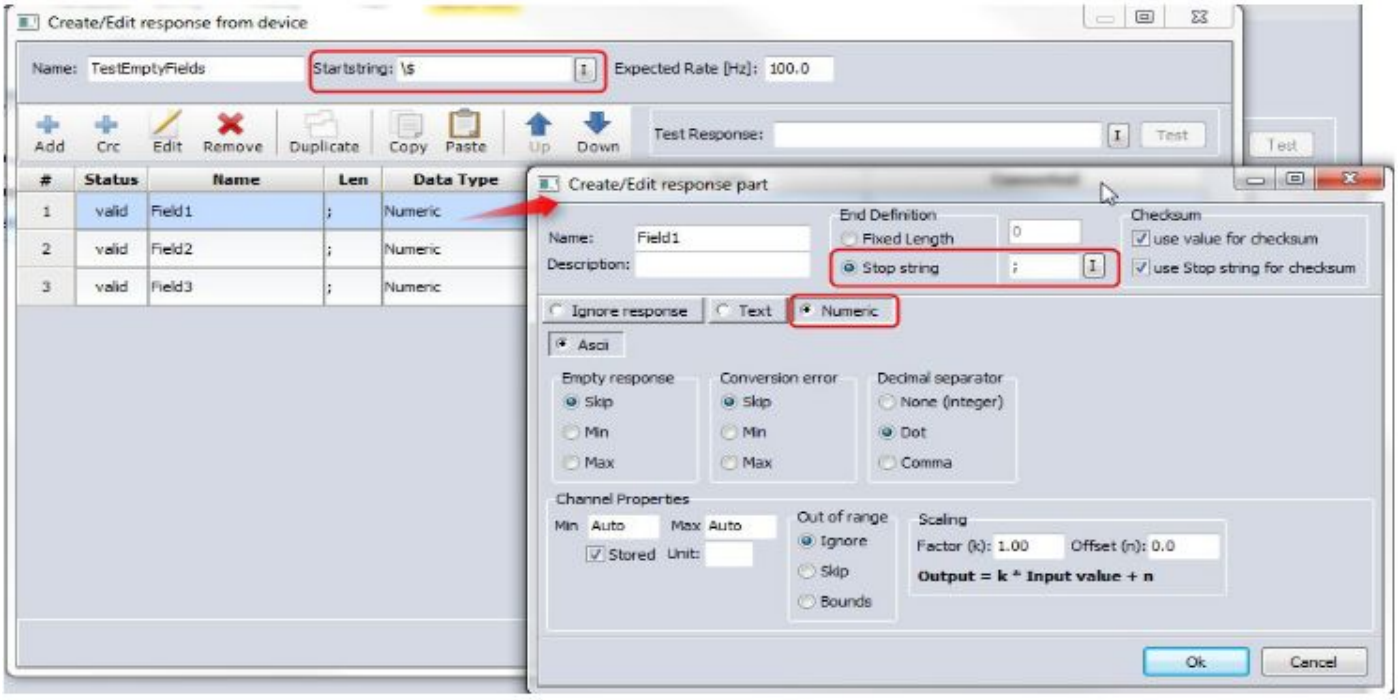


Image 101: Exception Handling Setup

Now we will take a look at the exceptional cases:

Empty Response
Will define what to do if the response part is empty. This is only active if the *End Definition Stop string* is selected.
Let's assume we receive the following 3 responses (the start strings are bold for clarity):
$1;11;21;$2;;22;$3;13;23;
When we look at the 2nd response ($2;;22;), we can see that the 2nd field is empty (2 colons follow each other without any data in between).
In this case you can choose to skip this response part or use the *Min/Max* value instead.

Skip the response part
In Image 105 you can see what happens if the data point is skipped – the data (*Field2* of response 2 – received at the time 6.061) is just missing, all other fields of the response are there (*Field1* has the value 2 and *Field3* has the value 22).

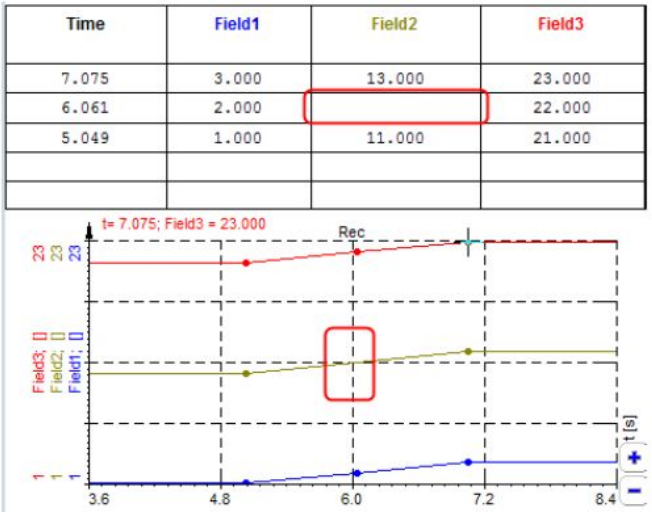


Image 102: Skipped Response Part

Use Min/Max
Instead of skipping the response you can also choose to use the *Min* or *Max* value instead.
To do this, we will change the Empty response handling of Field2 and enter a Min value of -13.

When we now take a look at the received data, we can see that the empty field in response 2 has now been replaced with the specified *Min* value of -13.

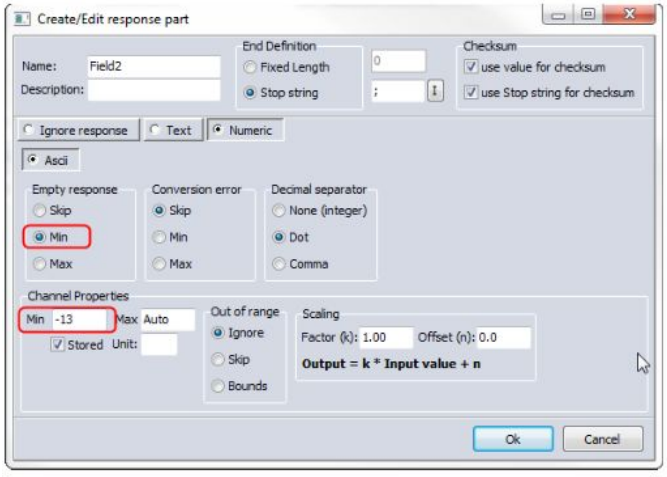


Image 103: Empty Response: Min

Image 104: Empty Response: Min Data

Hint

You should not use *Auto* when you use *Min/Max*, because the missing response would be replaced with *-INF* (negative infinity) and *+INF* (positive infinity). This could cause errors in the displays or in mathematical calculations.

Conversion error
A conversion error can happen, if the data of the response part cannot be converted to a number: e.g when we receive the data $2;ab;22; (related to Example 17 on page 59), then the second field cannot be converted to a number. In this case you can choose again if you want to skip this response part or use *Min/Max* instead.

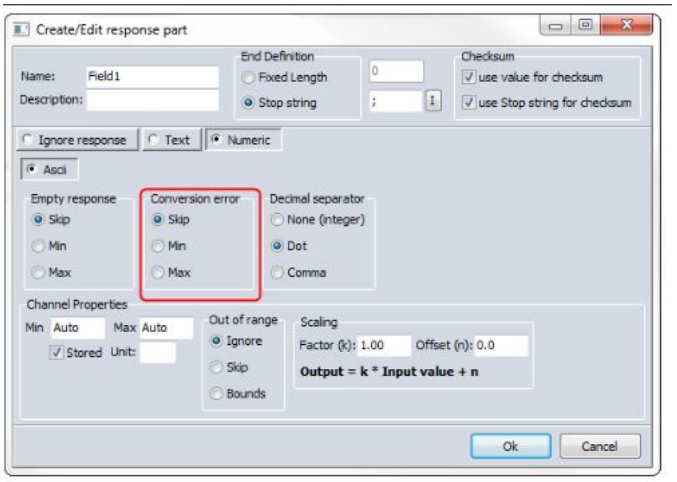


Image 106: Decimal separator

Decimal separator
You can choose which decimal separator the numbers have. We will adapt Example 17 (on page 59) and set the *Decimal Separators* like this:

Response Part Name	Decimal Separator
Field1	*None (Integer)*
Field2	*Dot*
Field3	*Comma*

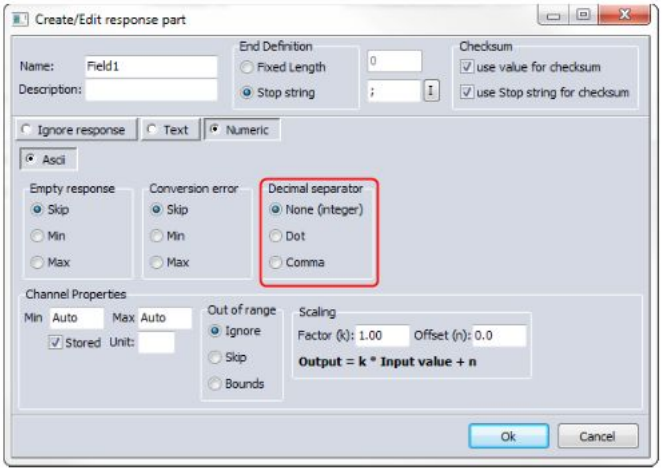


Image 106: Decimal separator

Now let's take a look at the results, when we receive these 3 responses:
$1;11;21;$2.2;12.3;22,3;$2,2;12,3;22.3;

- Response 1: $1;11;21; all 3 fields are valid – note that the selected decimal separator may be missing (e.g. Field2 has Decimal *Separator Dot*, but the data does not contain a .)
- Response 2: $2.2;12.3;22,3; *Field1* (2.2) is invalid – we have specified *Decimal Separator None (Integer)*, but the data contains a . as a decimal separator. The other 2 fields are valid and they contain the specified decimal separator.
- Response 3: $2,2;12,3;22.3; is completely missing, since all fields are invalid: *Field1* contains a , as decimal separator, but we have specified *Decimal Separator None (Integer)*. *Field2* contains a , as decimal separator, but we have specified *Decimal Separator Dot*. *Field3* contains a . as decimal separator, but we have specified *Decimal Separator Comma*.

Time	Field1	Field2	Field3
2.537		12.300	22.300
1.525	1	11.000	21.000

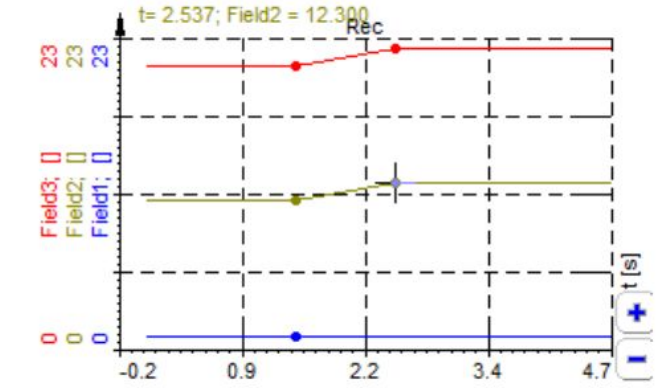


Image 107: Decimal Separator Data

Hint

When you have selected *Dot* as *Decimal Separator*, then the data may also contain optional Commas as thousand separators: e.g. 1,234,567.12 is valid. When you have selected *Comma* as *Decimal Separator*, then the data may also contain optional *Dots* as thousand separators: e.g. 1.234.567,12 is valid.

8.3.1.6. Channel Properties

Here you can define general properties of the numeric channels.

- *Min/Max*: here you can define a valid range of the numeric data: see chapter Out Of Range Handling for details
  The values can also be used in the *Empty response* and *Conversion error* handling: see chapter Exception Handling Of Response Parts.
  And the values will also be used as the default range when you assign the channel to a visual control (e.g. to a *Recorder*) in the measure mode of DewesoftX® .
- *Stored*: if the data will be stored in the DewesoftX® data file or not.
- *Unit*: the unit that will be displayed for this channel: e.g. A, V, °C, etc.
- *Out of Range*: here you can define what

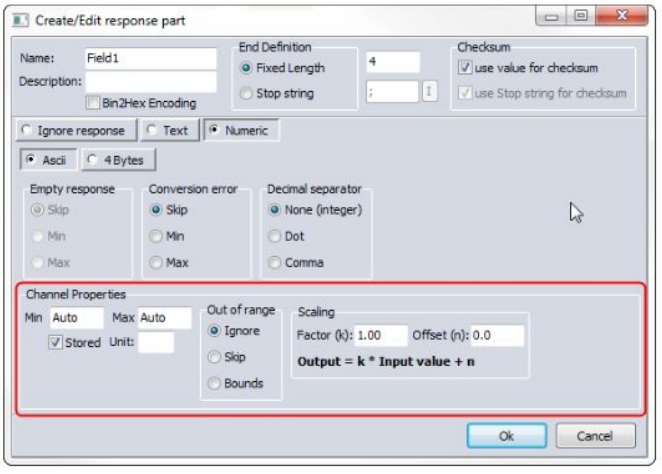


Image 108: Channel Properties

• happens if the data is out of the range (which you can define via *Min/Max*): see chapter Out Of Range Handling for details • *Scaling*: here you can define a scale factor and offset that will be applied to the numeric value: see chapter Scaling for details	

Out Of Range Handling

You can use the *Min/Max* fields to define a valid range for your data and the *Out of range* radio group let's you define how to handle the out of range condition.
Note that the *Out Of Range* checking is done after the scaling (see 7.3.1.6.2 Scaling on page 65).

Example

In this example we will use a very simple protocol that only gives us the current temperature. The start string is $ and the end-sequence of the protocol is a ;. Then our only response part definition may look like this:

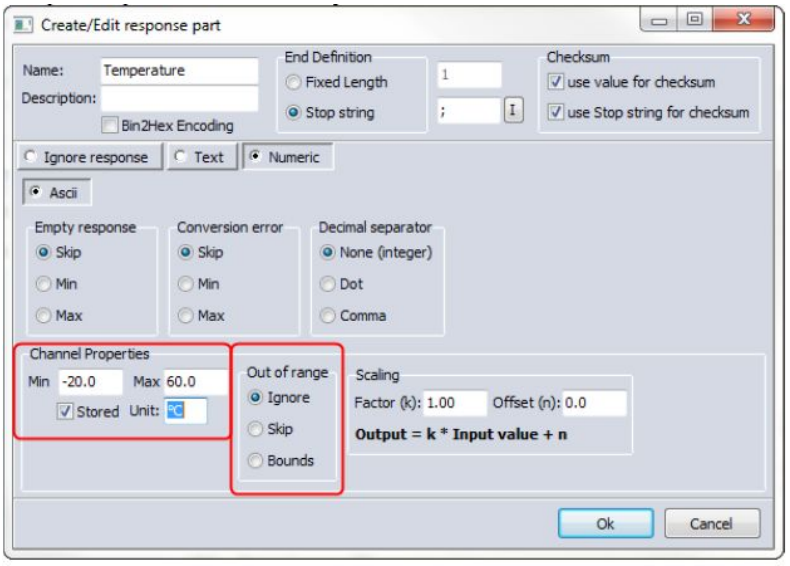


Image 109: Out Of Range - Temperature

In this case we use a range of -20 to +60 °C and will check the output in DewesoftX® for the following test-data (the values that are out of the valid range are highlighted):
-17-32;$-20;$-5;$0;$30;$60;$70;$45;

Out Of Range: Ignore
In this case, the *Out Of Range* condition will be ignored; i.e. the data that is out of the specified range will still be used: in our example data the values -32 °C and +70 °C are out of range, but will still show up in the DewesoftX® data channel: see Image 111.
So the only reason why you would specify *Min/Max* and use the *Out Of Range* setting Ignore, is that the *Min/Max* values will automatically be used as *Min/Max* range for the DewesoftX® channel: i.e. when you assign the channel to a recorder display, the initial range will be set correctly – see Image 110

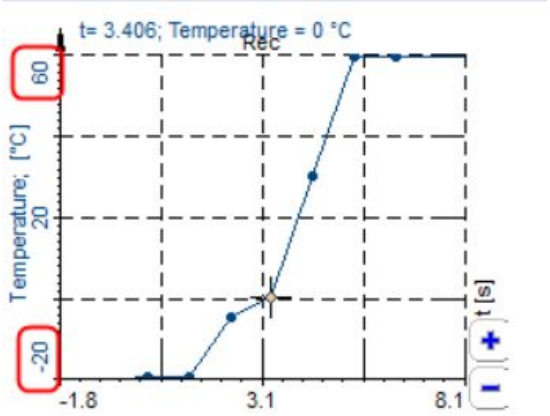


Image 110: Recorder: Initial Range

Time	Temperature °C
8.316	45
7.301	70
6.288	60
5.274	30
4.261	0
3.246	-5
2.233	-20
1.217	-32
0.206	-17

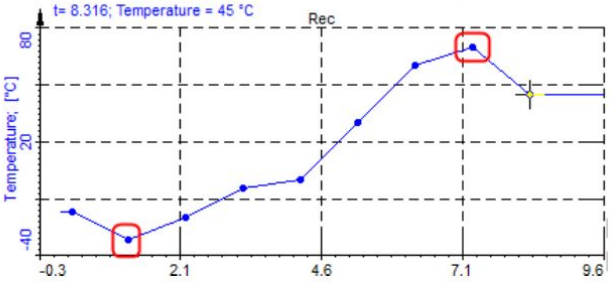


Image 111: Out Of Range: Ignore

Out Of Range: Skip
In this case, data that is *Out Of Range* will be skipped (see also Skip the response part).

You can see in Image 113 that the data that is out of range (in our example data the values -32 °C and +70 °C) will just not show up in the DewesoftX® channel – they are skipped (compare this to Image 111 above).

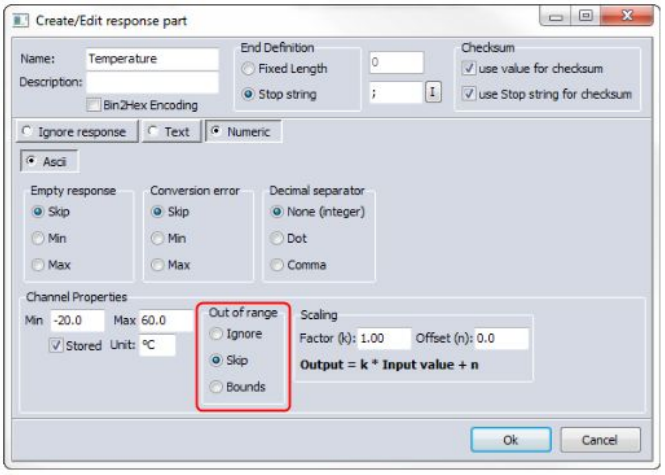


Image 112: Out Of Range: Skip

Time	Temperature °C
8.637	45
6.608	60
5.596	30
4.583	0
3.570	-5
2.553	-20
0.528	-17

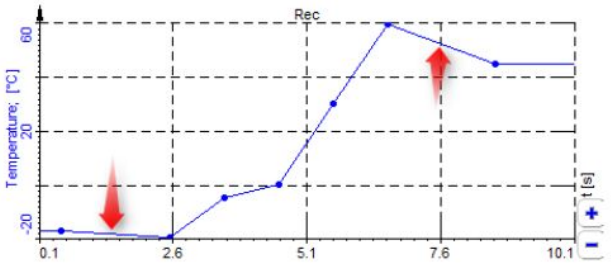


Image 113: Out Of Range: Skip Data

Out Of Range: Bounds
In this case, the *Min* or *Max* value will be used for data that is *Out Of Range*.

You can see in Image 115 that the data that the specified *y* values will be used for data that is out of range: in our example data the value -32 °C is too low and therefore the specified Min value (-20 °C) will be used instead the value +70 °C is too high and therefore the specified Max value (60 °C) will be used instead (compare this to Image 111 above).

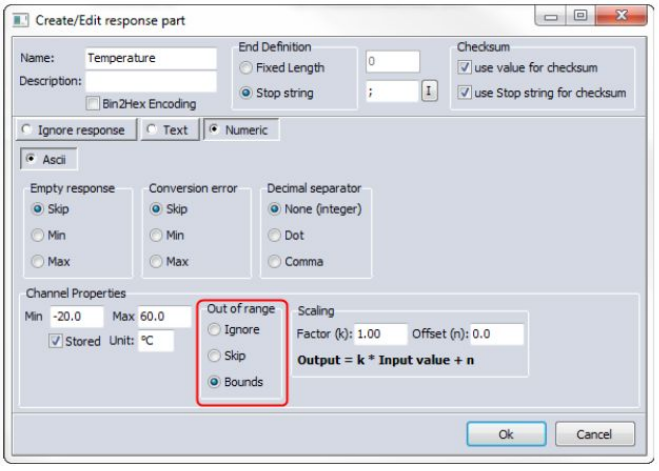


Image 114: Out Of Range: Bounds

Time	Temperature °C
8.896	45
7.881	60
6.866	60
5.854	30
4.839	0
3.825	-5
2.810	-20
1.800	-20
0.785	-17

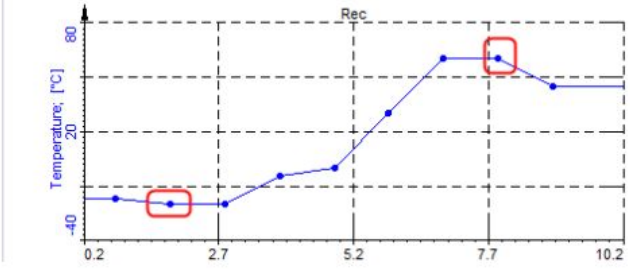


Image 115: Out Of Range: Bounds Data

Scaling

The scaling let's you apply a factor and offset to the data that we have received from the serial device. Note, that the *Min/Max* values for the *Out Of Range* checks will use the scaled values.

In this example we use the same data as in Out Of Range: Bounds on page 64, but we adapt the response part settings like this: the scale factor is 2, the offset is 3 Min -40, Max is 120 Note: that we have set Decimal separator to None (Integer) – so DewesoftX® uses an Integer channel internally.

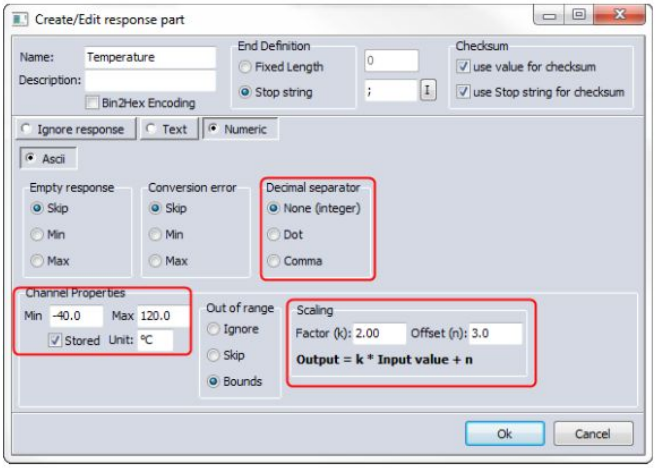


Image 116: Integer with Scaling

At a first glance some values in the result may be unexpected: You may have expected to see the values 120 °C instead of 119 °C and -40 °C instead of -39 °C. This is because we have told DewesoftX® to use an Integer channel. It may become clearer if we look at the unscaled data...

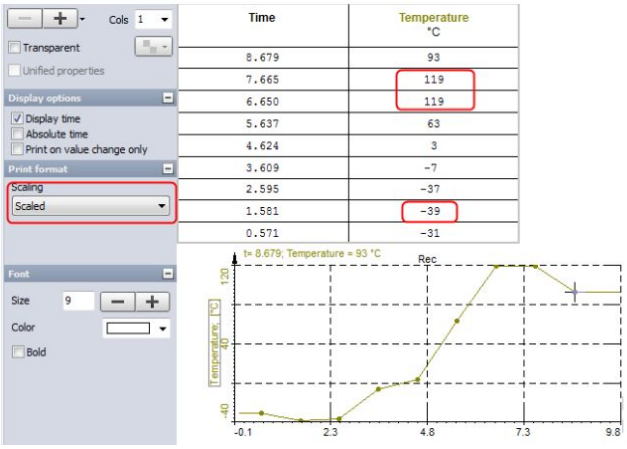


Image 117: Integer: Scaled Data

In Image 118 we have changed the Scaling of the Tabular values display from Scaled (like in Image 117) to Raw. Now we can see the raw data in the Integer channel without the scale factor and offset applied; i.e. these are the values that the serial device has actually sent. The raw values can only be an Integer number in an Integer channel. And therefore we cannot get a scaled value of exactly -40 or 120 with our scaling settings; i.e. the raw value of -22 would result in a scaled value of -41 and is therefore already too low for the specified minimum of 40 – therefore we must use the raw value of -21 which results in the scaled value of -39 which is the nearest possible value for the specified minimum value of -40.

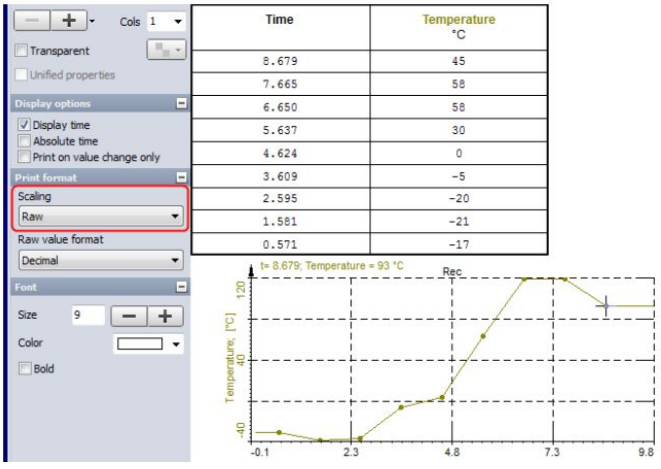


Image 118: Integer: Raw Data

Floating-Point channel with Scaling

Now we will run the same test as above again, with the only difference, that we now select Dot (or *Comma*) as the *Decimal separator*. Therefore we will get a Floating-Point channel (instead of an Integer channel as above).

Now we get the expected results of 120 °C and -40 °C. This is because we now have a *Floating Point* channel, which can also store decimal data...

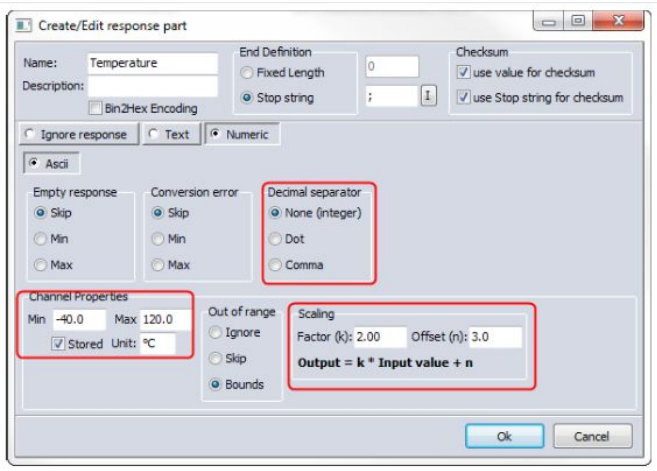


Image 119: Floating Point with Scaling

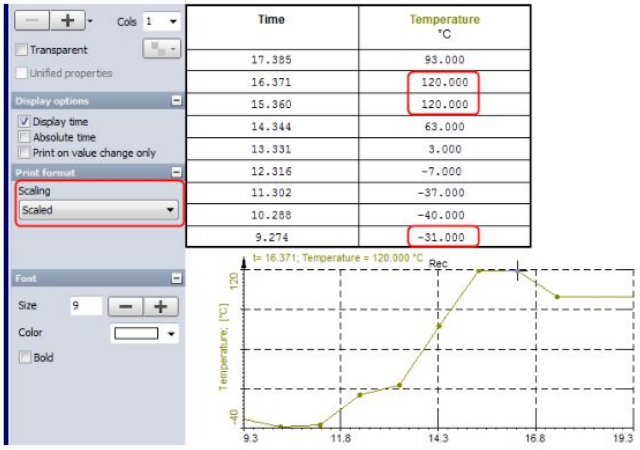


Image 120: Floating Point: Scaled Data

In the Raw data view, we can see that we now can store floating point values and can therefore get the desired results for the *Min/Max* values: e.g. 58.5 which relates to the scaled value of 120.

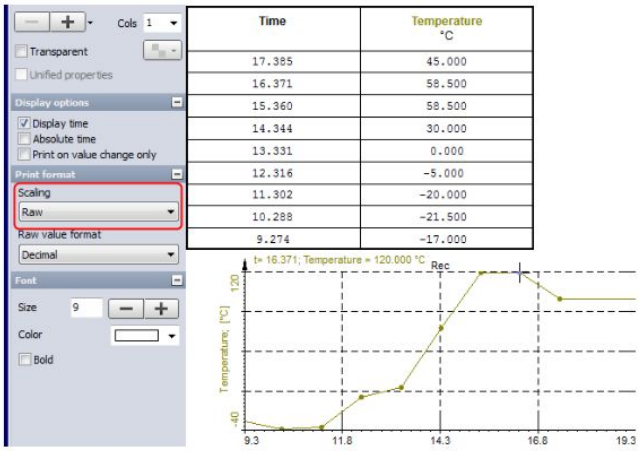


Image 121: Floating Point: Raw Data

8.3.2. CRC

Note: the CRC handling has changed a lot in version 2.1.0 of the Module: see also chapter Update to V2.1.0.
You can create a new CRC response part by clicking the **CRC** button (1) of the main toolbar in the *Create/Edit response from device dialogue* (see 7.2.4 Response: Main Toolbar on page 52).
Each response can contain a maximum of one CRC part: when you have already added a CRC the **CRC** button will be disabled. An existing CRC will show up in the *Response part list* (2) and can be edited like any other response part.
Note: since version 2.1.0 the CRC calculation can also use parts that are ordered after the CRC part.

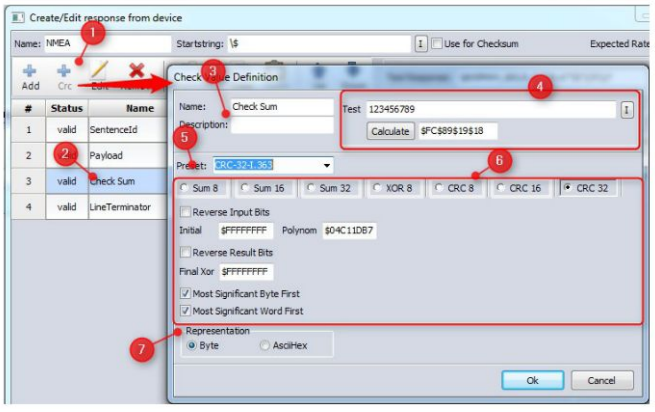


Image 122: Check Value Definition

Name and Description (3) are arbitrary strings for the CRC-response part: You should define meaningful values. The *Test* (4) allows you to test the CRC calculation. When you press the **Calculate** button , the data in the *Test* input field will be used to calculate the Check value with the currently selected settings (7). The calculated value will be written to the output field (right to the **Calculate** button). When there is an error (e.g. when you set the *Polynom* to 0), the error-message will be written to the output field.
The actual Check value calculation algorithm and parameters can be set via the *Preset* drop-down box (6) and the settings (7).

8.3.2.1. Presets

Presets are some predefined configurations with well known names: e.g. the *NMEA0183* V3 protocol uses an *XOR* 8 check value calculation and *AsciiHex* representation. When you select a preset from the drop-down list, the settings (7) will be changed accordingly.

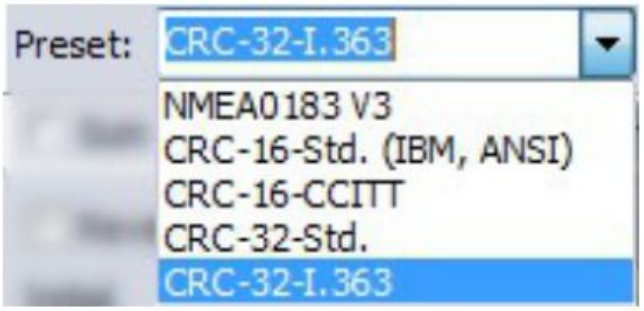


Image 123: Presets

8.3.2.2. Check Value Settings

The settings (see 7 in Image 122) define which algorithm (and which parameters) are used for the check value calculation.

Sum 8
Each relevant byte of the input data will be added to a Byte variable. The sum may overflow the number range.

Sum 16
Each relevant byte of the input data will be added to a variable with the selected Data Type (8 or 16 bit unsigned: see Image 124). The sum may overflow the number range.
You can also define the byte order of the result.

Sum 32
Each relevant byte of the input data will be added to a variable with the selected Data Type (8, 16 or 32 bit unsigned: see Image 124). The sum may overflow the number range.
You can also define the byte/word order of the result.

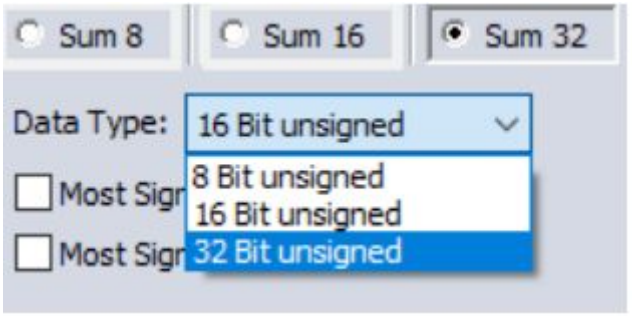


Image 124: Data Type Selection

XOR 8
This setting will apply the XOR operator to all input bytes.

CRC 8/16/32
This setting will do a cyclic redundancy check and you can define the corresponding parameters. For the multi-bytes sums you can also define the byte/word order.

Representation

The representation setting will be applied to the calculated result. You can choose to output the result as bytes directly or to use *AsciiHex* representation:

Example
When the calculation result is $61$04$30$6C , then the Byte representation will result in exactly those 4 bytes. The *AsciiHex* representation will result in 8 bytes, where each word will correspond to the ASCII representation of the bytes hexadecimal value: so the result will be the ASCII characters: 6104306C.

8.3.2.3. Check Value data

You can define for each response part separately if its value (and also its *Stop string*, if the response part has one defined), is used for the checksum calculation: see Image 125.

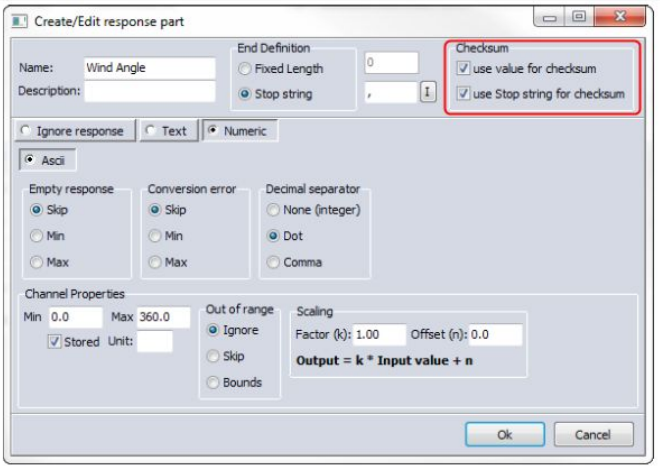


Image 125: Request Part: Checksum

In the *Response* dialogue (Image 126), the *Use for Checksum* check-box (2) will define if the *Startstring* (2)of the response ($ in this case) is used for the check value calculation.
Since the starting $ in the NMEA-0183 format must not be part of the checksum, the *Use for Checksum* check-box is deactivated.
When you enter a *Test Response* and then click the **Test** button (3), you can see in the *Converted* column of the *Checksum* part that the CRC calculation was okay. The value in the *Device Data* column matches your *Test response* input (3D).

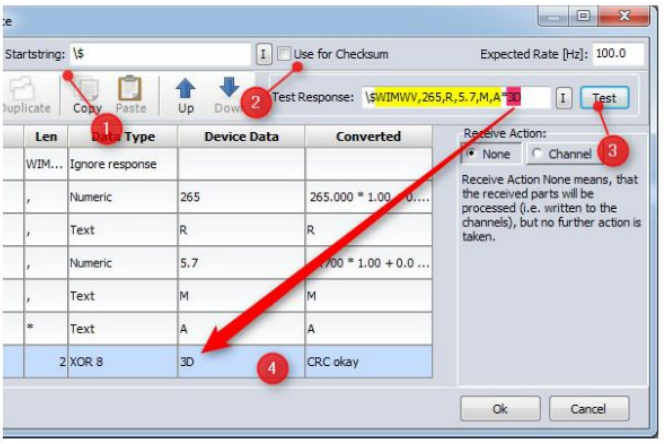
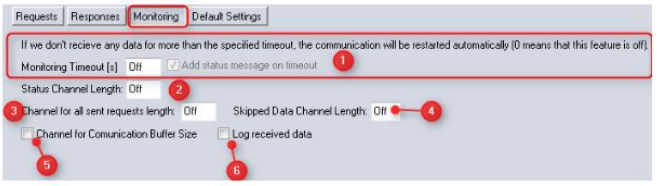


Image 126: Request Part: Checksum

9. Monitoring

In the Monitoring tab-sheet you can find some monitoring/debug settings. (1) see chapter Monitoring Timeout (2) see chapter Status Channel (3) see chapter Sent requests (4) see chapter Skipped Data Channel (5) see chapter Com Buffer Size (6) see chapter Log received data	 *Image 127: Monitoring Off*

9.1. Monitoring Timeout

When you enter a time-out value (in seconds) the *SerialCom* Module will monitor the COM port and if no data is received in the time-out period, then the COM port will be closed and reopened. Note: it does not matter if the data that is received matches a response definition or not.
Before closing the COM port the *SerialCom* Module will try to send any requests with the Activation *Event On Stop* (6.2.1 Activation Event on page 31).
After reopening the COM port the *SerialCom* Module will send any requests with the Activation *Event On Start* (6.2.1 Activation Event on page 31).

Hint

This monitoring is usually only useful if you have a true RS232 connection; i.e. a native RS232 port on the PC.
It does not work with most virtual COM ports (i.e. some devices can be connected to the PC via a USB cable and a dedicated software driver will emulate a so called virtual COM port).

9.1.1. Add status message on timeout

This check-box will only be enabled if the *Monitoring Timeout* and the *Status Channel* are active.
If the check-box is activated and a time-out occurs, then a status message will be added to the *Status Channel*.

9.2. Status Channel

You can activate the status channel to get some debug information

Time	Status
5.001	timeout detected - restarting communication
0.000	request "Request_1" has been skipped because no data was available: the channel AI 0 does not have a

Image 128: Status Channel assigned to a tabular values display

Status messages will be written to the Status Channel,

- if: a time-out has occurred: see chapter Monitoring Timeout
- a request is fired, but is already active or already in the queue: see chapter Queueing

- a request has been skipped: e.g. because it is out of the specified range: see Numeric range validation
- no data was available for sending the request: see chapter Channel data
- an unexpected error occurred when trying to send the request

The value that you enter in the *Status Channel Length* edit field is the length of the DewesoftX® string channel; i.e. if you enter a low value, longer messages will be cut off.

9.3. Sent requests

If activated, all sent requests will be written to this string channel.

Time	Sent requests
6.091	$02A
5.058	$01A
4.077	$02A
2.064	$02A

Image 129: Status Channel assigned to a tabular values display

The value that you enter in the *Status Channel Length* edit field is the length of the DewesoftX® string channel; i.e. if the sent request is longer than the entered length, it will be cut off.

9.4. Skipped Data Channel

When you activate the *Skipped Data Channel*, you will see a new text-channel named *Skipped Data* in the channel list (see Image 130). When we receive data, which does not match any of the defined responses, the bytes will be added to this channel (see column *Skipped Data* in Image 131).
This can be very useful for debugging.

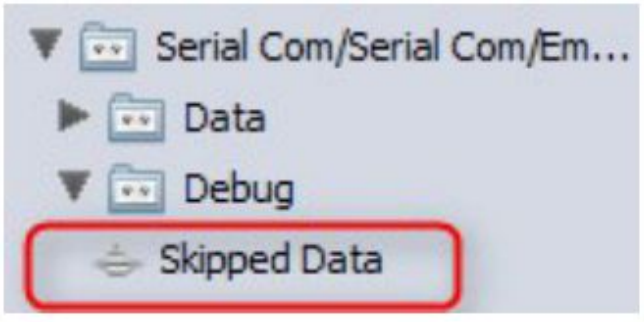


Image 130: Skipped Data: Channel List

Time	R1- N...	R1 Text	R1 Text	Skipped Data
8.278			2 34:Text	
7.262				RandomText
6.255	12	Text		
5.234			2 34:Text	
4.221				RandomText
3.208	12	Text		

Image 131: Skipped Data Channel

9.5. Com Buffer Size

If you activate the *Channel for Communication Buffer Size* check-box, then the size of the communication buffer will be written to this debug channel. This can be useful for debugging; i.e. when you see that the buffer continually fills up and never decreases, then your response definitions are wrong and don't match the received data.

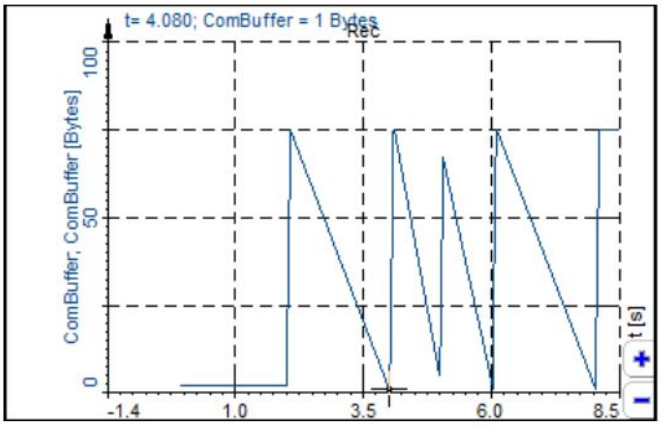


Image 132: ComBuffer Channel

9.6. Log received data

If you activate this check-box, all the received data (during storing) will be logged to a file text file (in the same directory like the DewesoftX® data-file), with the same name as the DewesoftX® data-file plus the file-extension .txt.

Example

If your DewesoftX® data file is stored as:
C:\D2007Projects\DewesoftX\DEWEsoft\Data\Measurement_0001.dxd then the log file is stored as:
C:\D2007Projects\DewesoftX\DEWEsoft\Data\Measurement_0001.dxd.txt

10. Advanced Topics

10.1. Copy and Paste

You can copy a complete device (see chapter Device Toolbar) responses, response parts, requests and request parts to the clipboard and paste those objects back from the clipboard. The data in the clipboard will have a special XML syntax, so you could even paste the clipboard data into a mail (or text file), send it to another location and paste it into another DewesoftX® setup.
Note: when you paste objects from one DewesoftX® setup to another one, you may see warnings and errors after pasting - Examples:

- when you paste the same request twice, you will get a warning because now you have (at least) 2 requests with the same name
- when you paste a request, which has a reference to e.g. a Math channel called 'MathCalc1', into another setup, where this channel does not exist, you will see that this request has an error after pasting

10.2. Drag And Drop

In the data-grids you can use drag and drop to change the order of the rows. Just click on the # column of the row, that you want to move, and keep the left mouse button down. Then move the row up/down (while still holding the left mouse button pressed) - the black horizontal line between the rows will show you where the row will be inserted, when you release the left mouse-button.

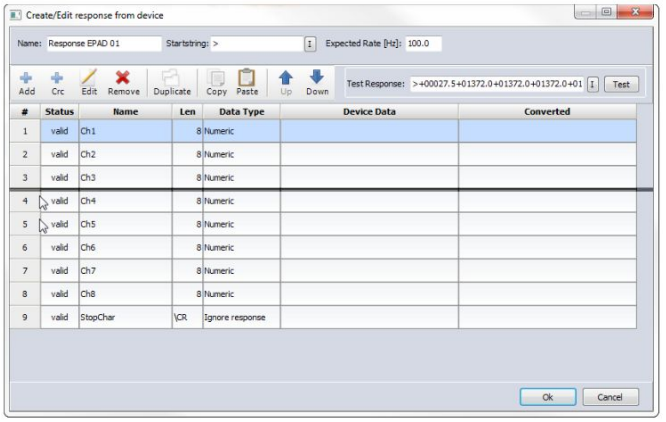


Image 133: Drag And Drop Of Rows

10.3. Testing the Module without hardware

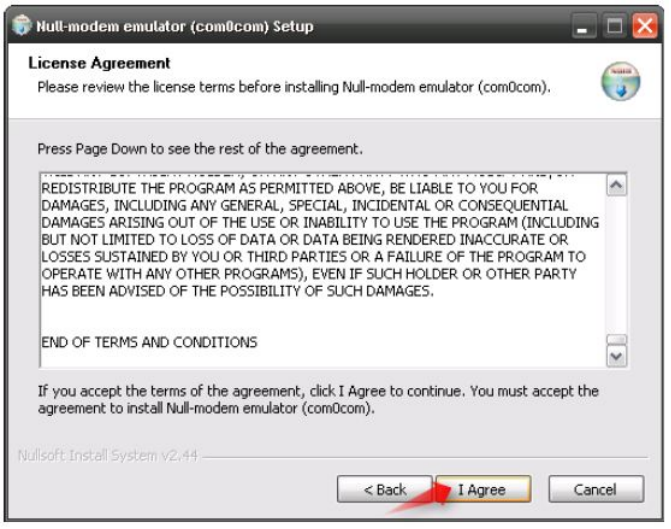
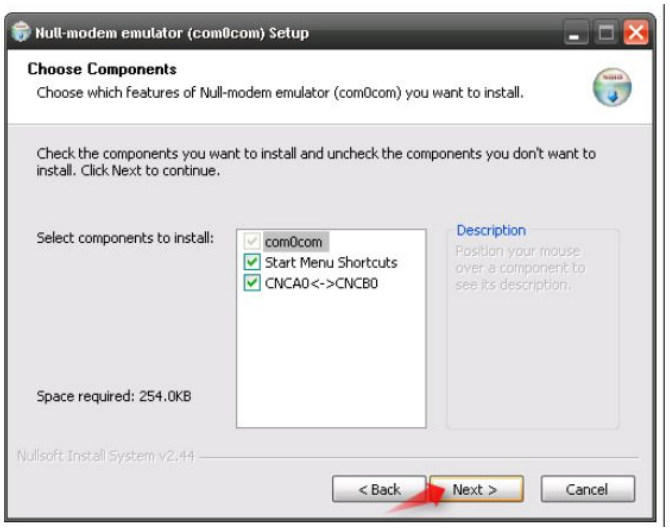
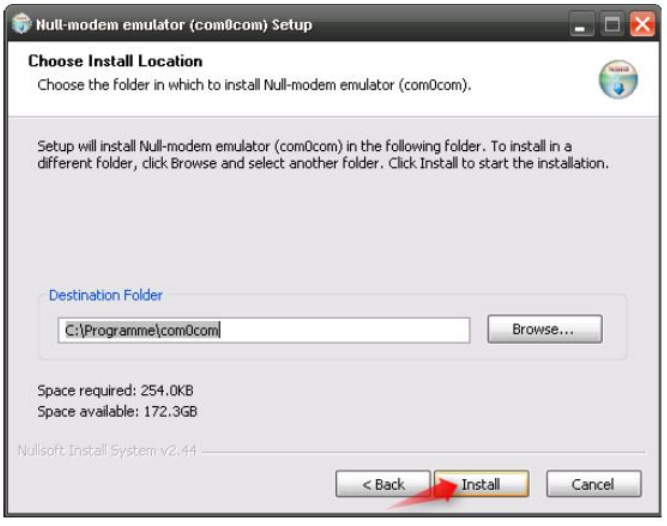
It is possible to test the Module without actual hardware. This requires the installation of some test-programs.

10.3.1. Null-modem emulator

Since there is no serial hardware available, we need to use a program to emulate a COM-port.
We will use the program *com0com* which is open source and freeware:
http://com0com.sourceforge.net/

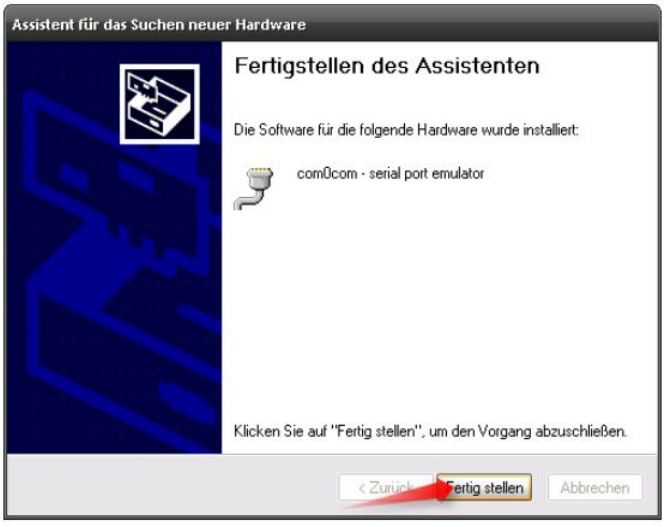
10.3.1.1. Installation

Download the latest version from the projects download page:
http://sourceforge.net/projects/com0com/files/com0com/
Click on the latest version: e.g. 2.2.2.0 and then download com0com-2.2.2.0-i386-fre.zip to get the installation files for 32-bit Windows Systems (for Windows 7 you may need the com0com-2.2.2.0-x64-fre-signed.zip file). Extract the archive and start setup.exe.

<table>
<tr>
<td>click Next >
 
</td>
<td>read the license agreement carefully and click I Agree if you agree to the terms and conditions.
 
</td>
</tr>
<tr>
<td>click Next >
 
</td>
<td>click Next >
 
</td>
</tr>
<tr>
<td>now the Windows Hardware Assistant will appear and ask you to install the drivers for this new “hardware”. Select “No, not this time” and click Now select “Install the software automatically (Recommended)” and click Next >..</td>
<td>Now select “Install the software automatically (Recommended)” and click Next >.</td>
</tr>
</table>

wait until the drivers are being installed

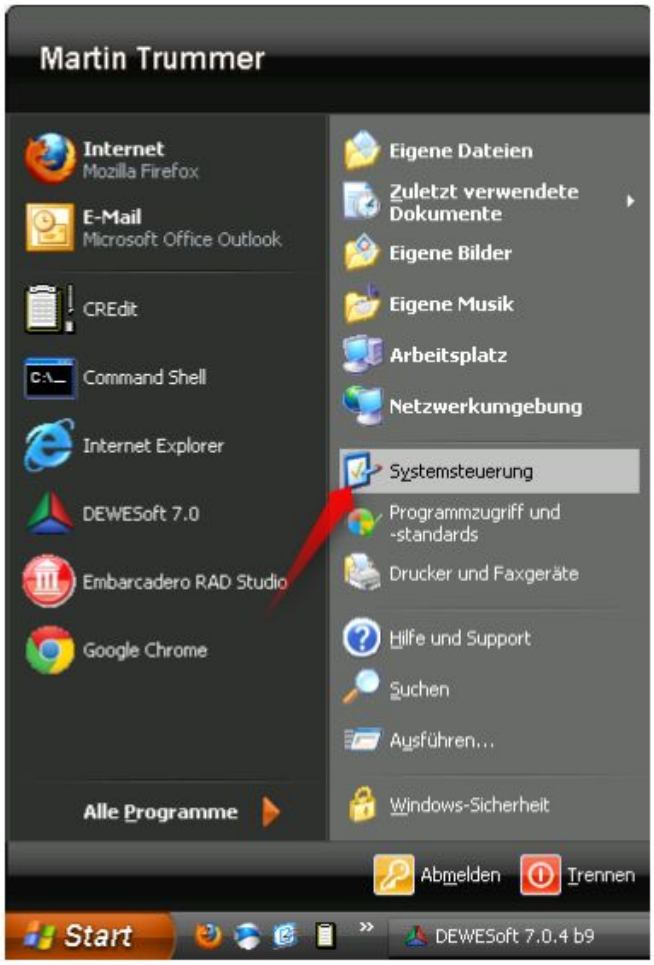
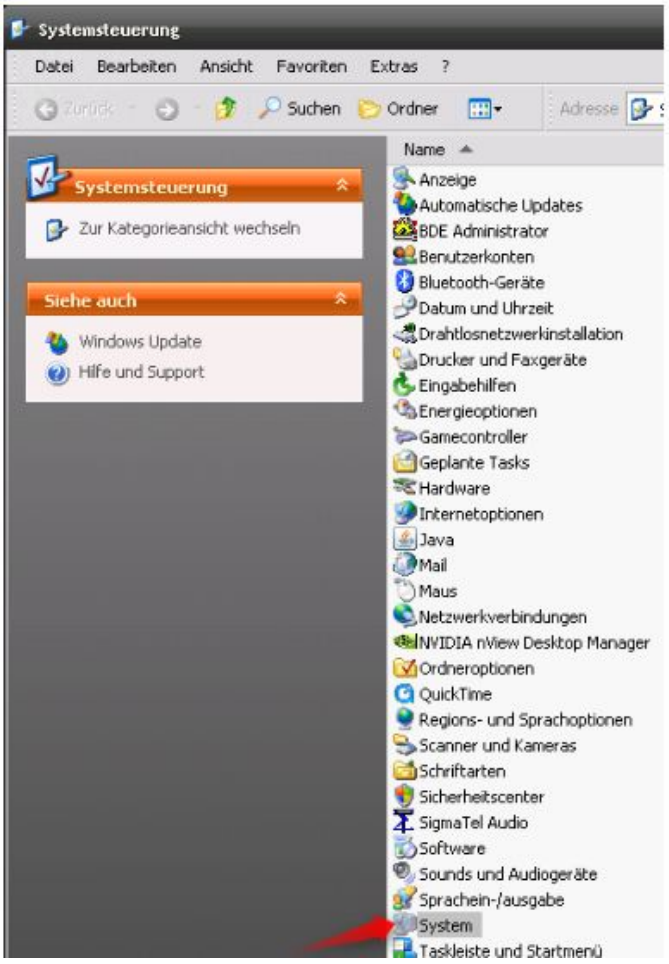
then click **Finish** to close the setup wizard

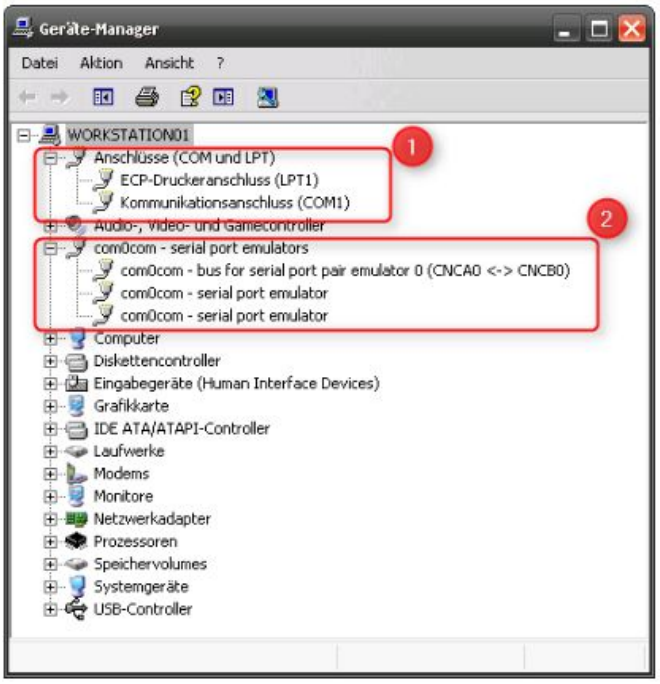


10.3.1.2. Checking the Installation

Now we will open the *Windows Device Manager* to check if the installation was successful and to find free COM ports for our tests:

first open the Windows control panel	click the *System* entry

	
go to the Hardware tab sheet and click the **Device Manager** button	1) shows all COM and LPT ports on your computer 2) shows the emulated COM ports that we have just installed



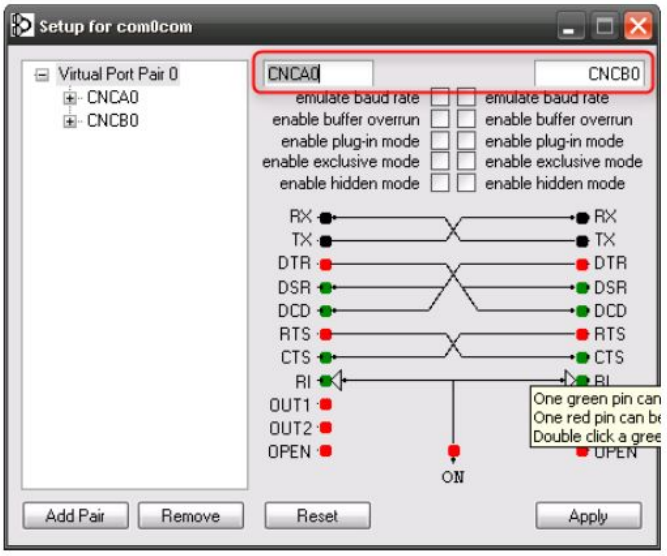
In this case only COM-port *COM1* is used on the computer. So we must not use this port for our emulator (we use *COM17* and *COM18* instead).

10.3.1.3. Renaming the COM Ports

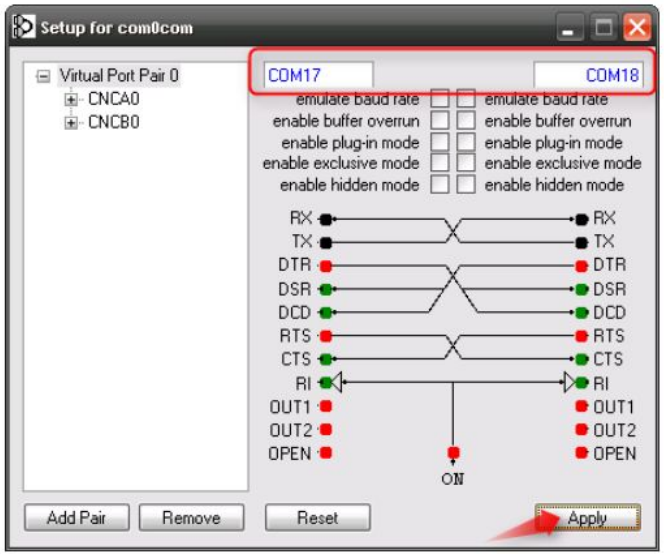
The emulator ports are currently called CNCA0 and CNCB0 we will change this to COM17 and COM18 in the next steps:

first start the *com0com-Setup* program that we have just installed:

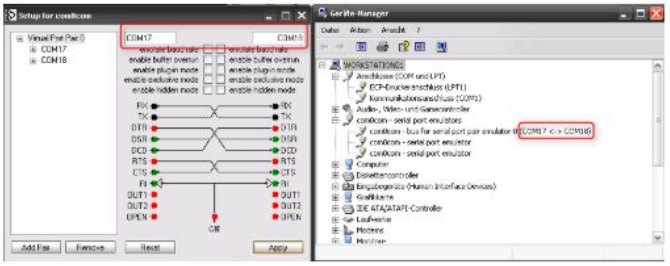
Now change the names of the COM-ports:



After you have changed the names, they appear in blue colour. Press the **Apply** button to actually apply the changes to your system.



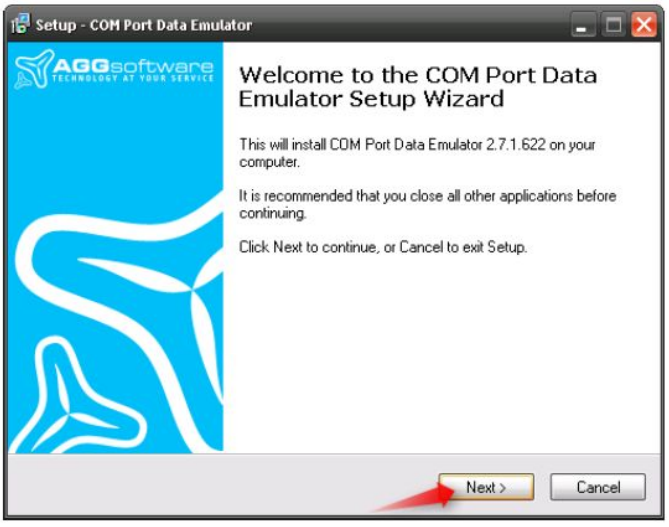
When this has finished the names of the ports will be in black colour again and you can also see the new names in the *Windows Device Manager*

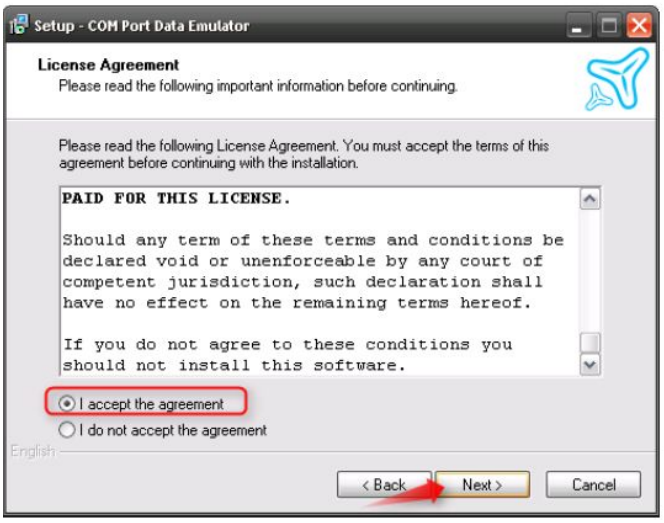


10.3.2. Data emulator

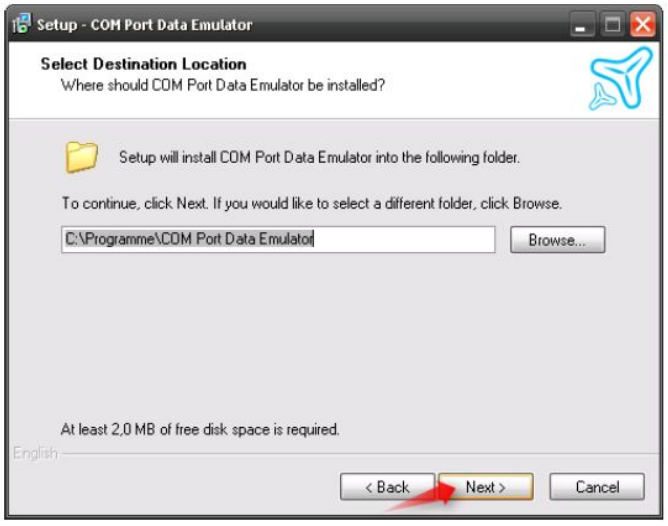
Now we need to write some data on the COM port. We can use the freeware program *COM Port Data Emulator*. Download the program from here: http://www.aggsoft.com/com-port-emulator/download.htm and start the setup program: asdlemul2.exe.

on the *Welcome* screen click **Next >**	read the license agreement carefully and if you agree to the terms and conditions, select the *'I accept the agreement'* option and click **Next >**

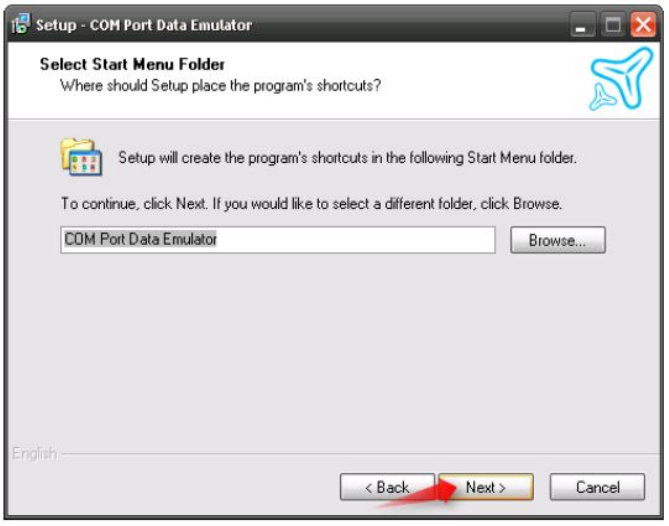




keep the default installation location and click **Next >**

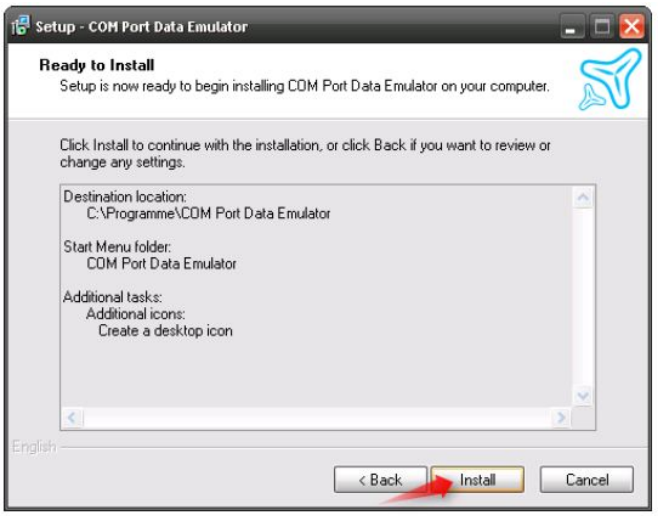


keep the default settings, and click **Next >**

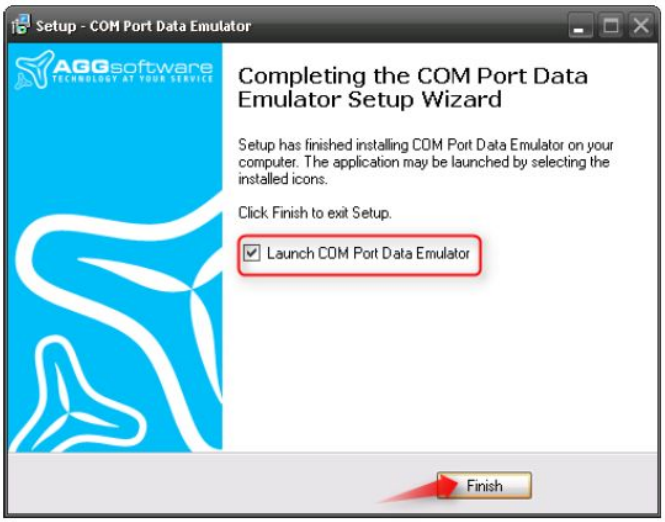


choose which additional tasks you want and click **Next >**

check the settings again and click **Install** to start the installation.



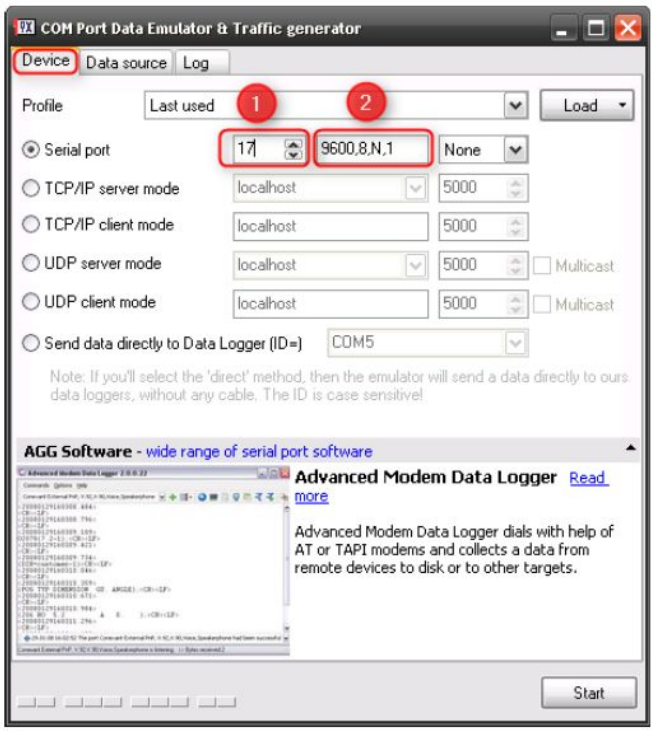
after the installation has finished, make sure, that the '*Launch COM Port Data Emulator*' checkbox is activated click the **Finish** button

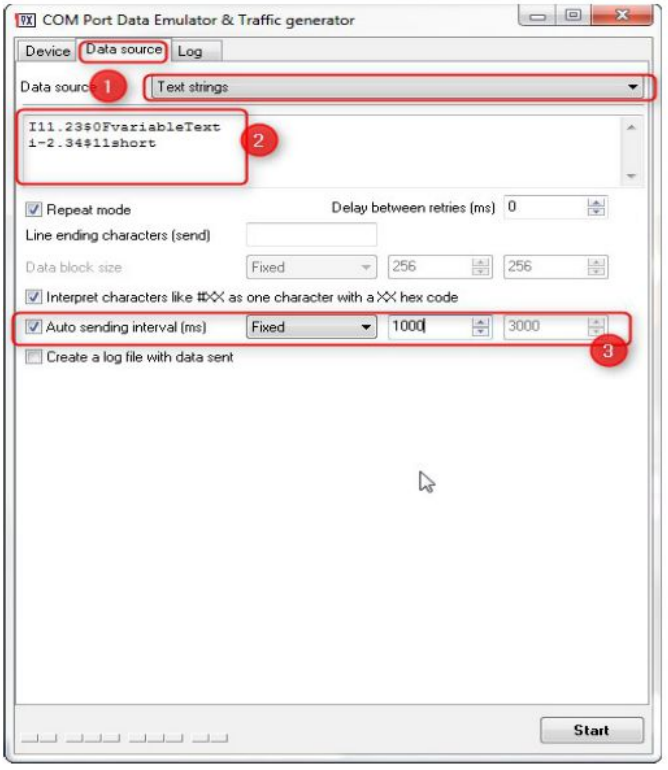


Now the COM Port *Data Emulator* is started and we will generate some test-data:

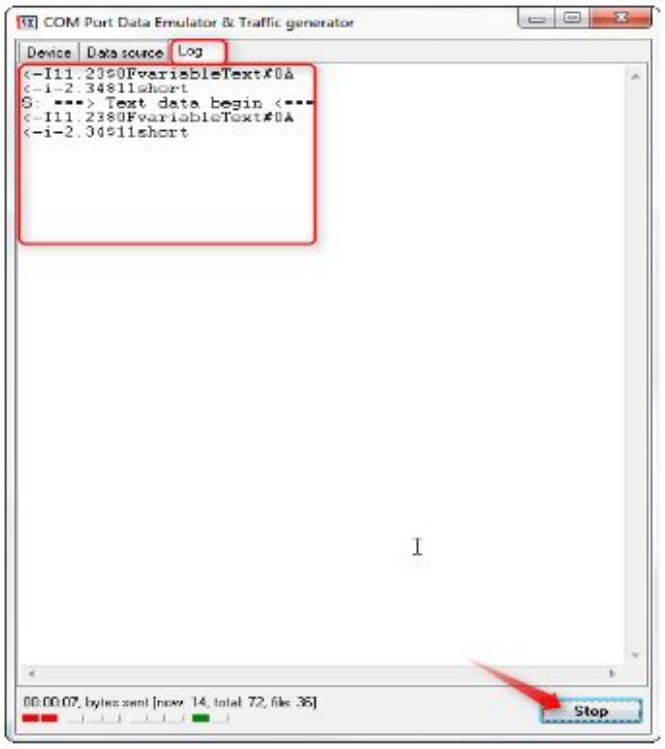
in the Device tab-sheet:
1) change the Serial port to 17 and
2) keep the connection settings in mind (we will need them later in DewesoftX® 's hardware setup) the comma separated numbers have the following meaning: Baud Rate, Data Bits, Parity, Stop Bit

then click the Data source tab-sheet:
1. select *Text strings* for the *Data source*
2. enter some test-message: e.g. l11.23#0FvariableText i-2.34#11short
3. activate the '*Auto sending interval (ms)*' checkbox and change the interval to 1000 ms, so that the test-messages will be sent every second when the settings are okay, press the **Start** button.





the application will switch to the Log tab-sheet and show the data that it is now sending to COM port 17 and also some information messages. You can press **Stop** any time to stop the communication.



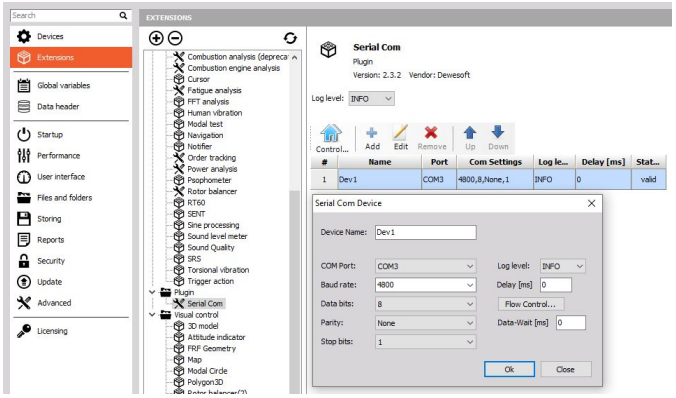
The Null-modem emulator (see chapter Null-modem emulator) will receive all messages that the Data emulator sends to COM Port 17 and copy them to COM Port 18.

10.3.3. Test-data in DewesoftX®

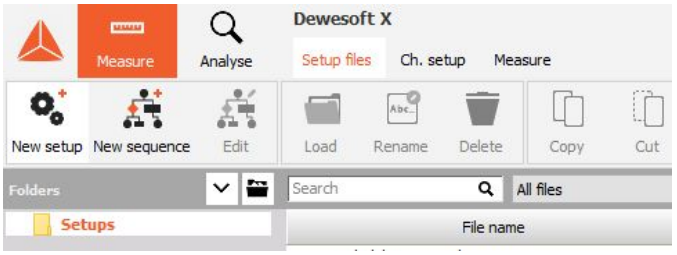
Now we start DewesoftX® and check if the test-data is received correctly:

- first open *Options... - Settings*. Go to the
- Extension tab-sheet and select the Serial Com Module. At the right side enter the Module properties. COM Port: this must be the COM Port that the *Null-modem emulator* is sending the output to (in our case we have to choose *COM18*.
- Baud rate, Stop bits, Data bits and Parity must match the settings that you have selected in the *Data emulator* setup. In our case: *9600, 1, 8, None*

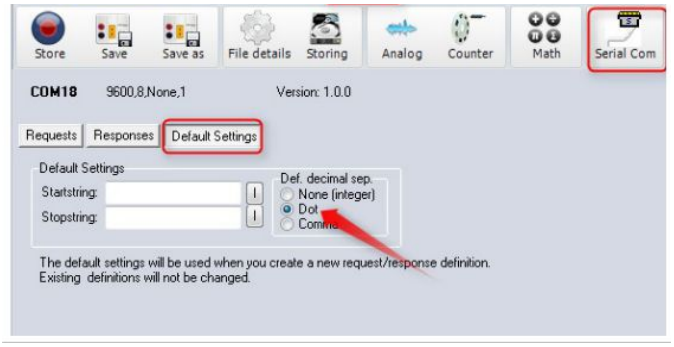
When you are done, press the **OK** button to leave hardware setup.



Go to Setup files and press the *New Setup* button to create a new DewesoftX® channel setup.



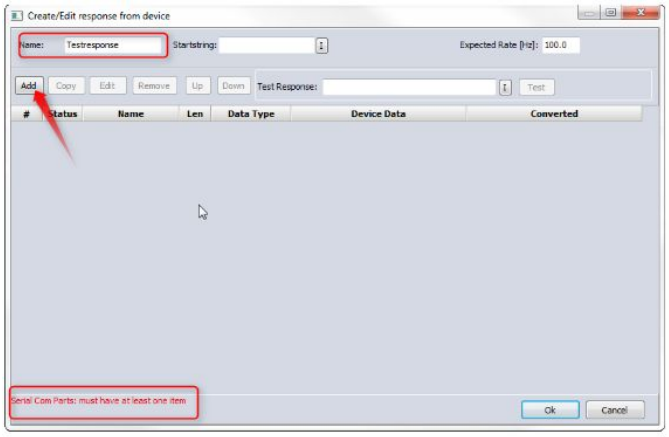
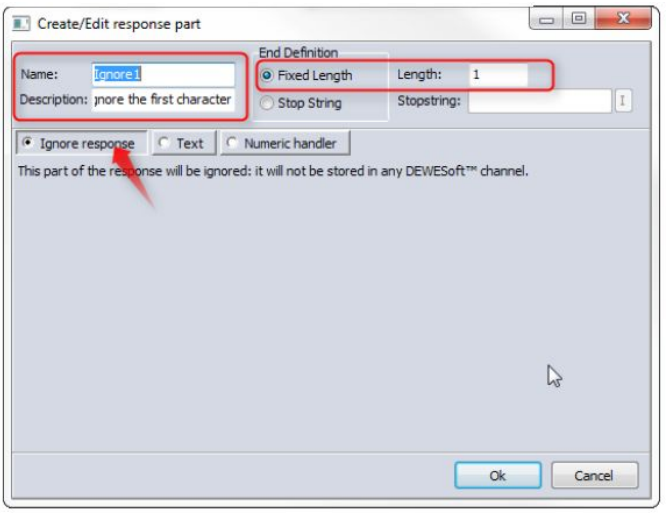
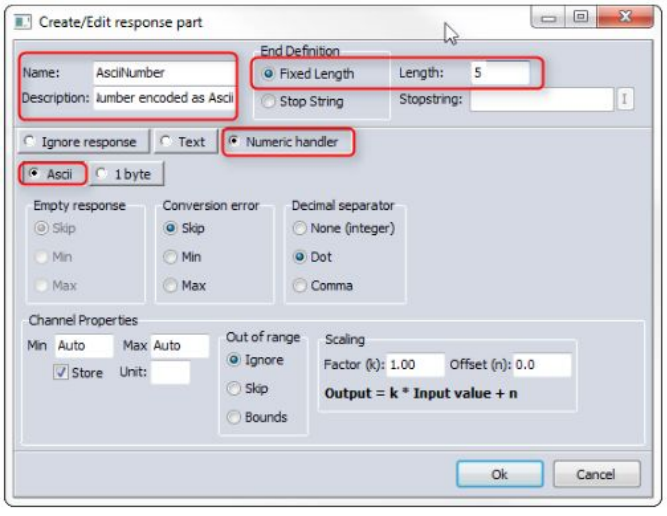
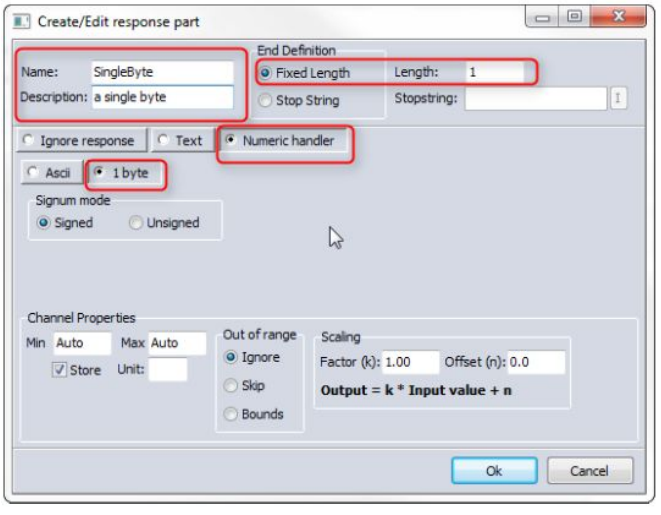
Now go to channel setup (Ch. setup). You will see which COM port is in use and its communication settings.
First we go to the Default Settings and make sure that 'Dot' is selected as default decimal separator:

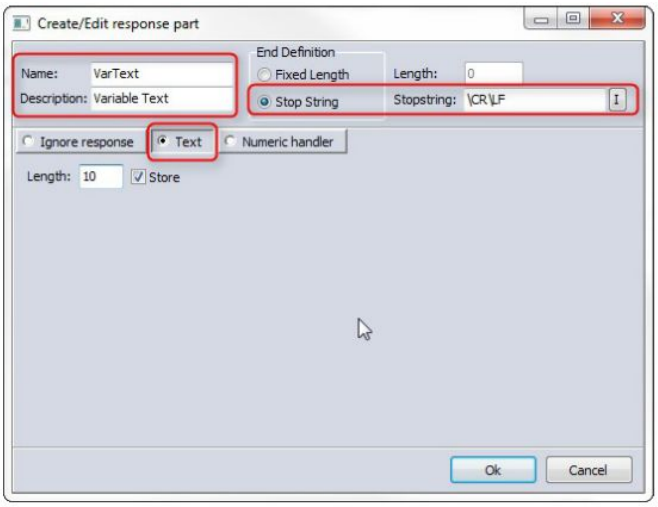


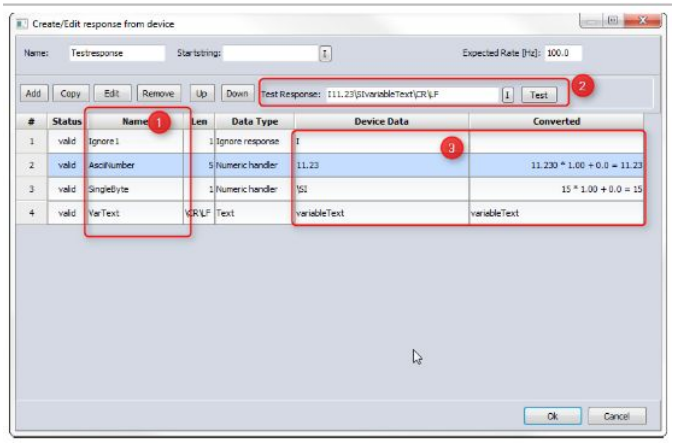
Now we go to the Responses tabsheet and create our Response definition – just click the Add button:

We can enter a meaningful name for the response and then we click the Add button to enter the first part of our response (note, that you can see an error message at the left bottom of the dialogue, because we have not defined any response part yet).

When we look at our test-message: I11.23#0FvariableText i-2.34#11short we can see that the first char is not very meaningful – we will just skip it and not store it in any DewesoftX® channel. When you have changed the settings like in the image below, press OK to go back to

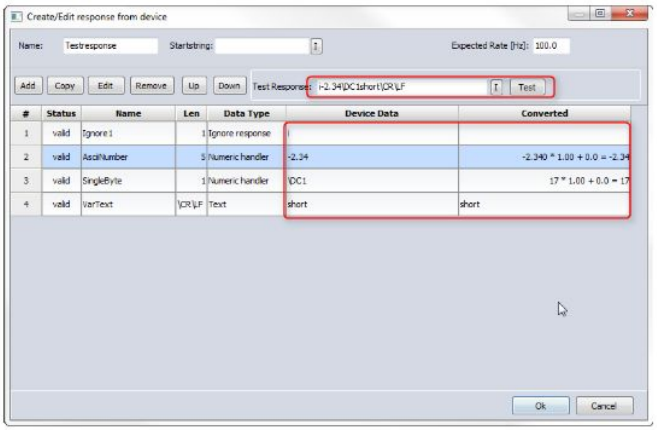
	the Testresponse form and then press the Add button again to create the next part of our response...
	
The 2nd part of the message is already more meaningful: I11.23#0FvariableText i-2.34#11short we can see that the number is exactly 5 characters long, so we use 'Fixed Length' of 5 and use the 'Numeric handler':	The part of the message is a single byte number: I11.23#0FvariableText i-2.34#11short we enter the length of 1 and when you leave the field, you can see that the 'Numeric handler' now also has a new option '1 byte' which we will select:
	
The last part of the message is a text of variable length: I11.23#0FvariableText i-2.34#11short Also note, that we have set up the data emulator to send a CR-LF after each line. Therefore we choose the 'End Definition' 'Stop String' and enter '\CR\LF' as our stop string:	Now that we have defined all parts of our response, we can already test the response in the response form. Just enter the expected response in the 'Test response' input field and click the 'Test' button. Note, that the data emulator uses a different escape character for hexadecimal values (#) than our Module ($)!





We can also test the second line of your data. And now that everything seems to work, we should save the setup and then go to Measure mode to see the results..

Note: when you switch to measure mode, you may need to restart the data emulator in order to see the data in DewesoftX® . This is a restriction of the Null-modem emulator.



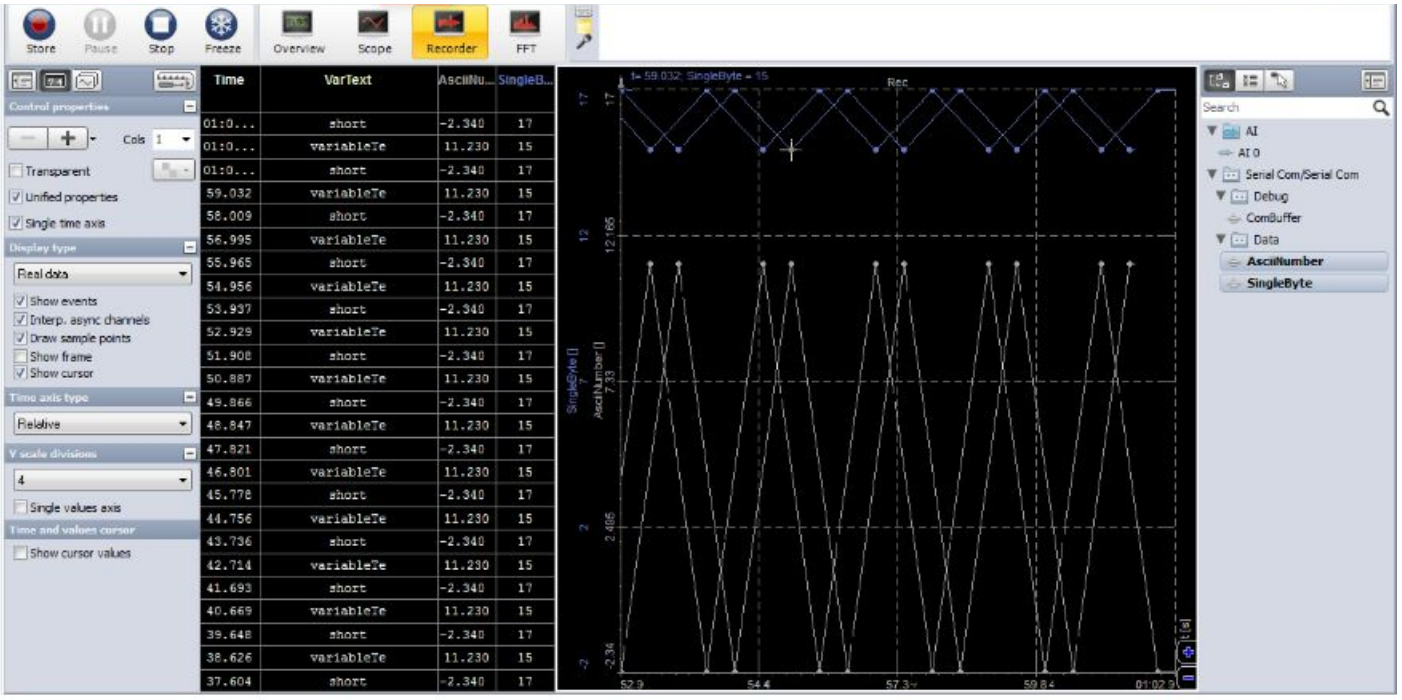


Image 134: Result in Measure Mode

10.4. Update to V2.1.0

Version 2.1.0 introduced major new features which require you to update the channel setup structure. There is nothing for the user to do, but you should be aware of the consequences:

- When you load an old setup (i.e. a setup that has been created with version 2.0.7), the Module will do the update automatically.
    - During the update, the Module will try to backup the original setup file to the DewesoftX Temp directory (the current date-time will be appended to the file-name). So when your channel setup is called NMEA.dxs, the backup file may be: D:\DewesoftX\System\Temp\SerialCom_Upgrade_2_1_0\NMEA_2016_05_11_11_21_34.dxs
- The original setup file that you just loaded will not be changed (on the disk) until you click the **Save** button.
    - So, if you load a setup and then close DewesoftX® without saving it, the setup file will not be changed.
- When you try to load a new setup (i.e. a setup that has been saved with Module version 2.1.0) with an old Module (e.g. Module version 2.0.7), the old Module may not work correctly or even crash! So if you have the Module installed on multiple machines in your organisation, we recommend to first test the new Module on one machine and then update all your machines to the new version.

10.4.1. CRC changes in V2.1.0

The following images show the new CRC dialogue (Version 2.1.0) and the old CRC dialogue (pre version 2.1.0):

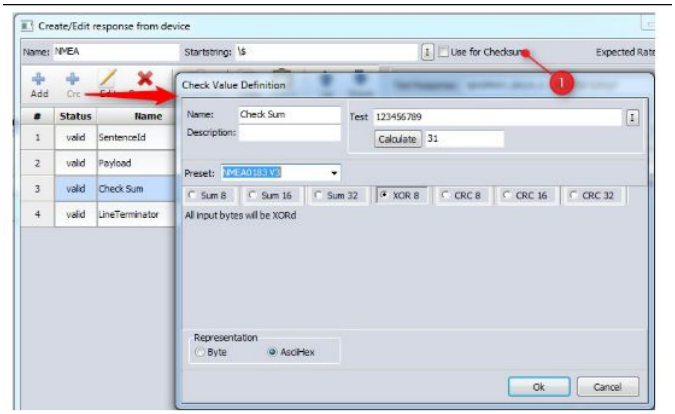


Image 135: CRC 2.1.0

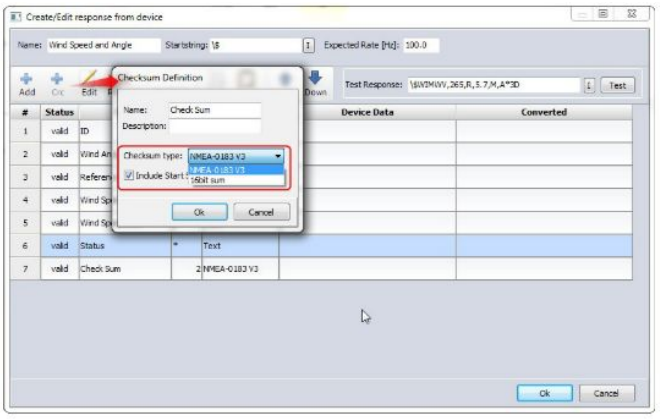


Image 136: CRC pre V2.1.0

Notes:

- The old *Include Start String* check-box has been moved to the Response dialogue and is now called '*Use for Checksum*' (see in Image 135)
- The old *NMEA0183* V3 checksum (which is just an XOR8 checksum) can now be activated via the corresponding preset (see chapter Presets) or by selecting XOR 8 directly.
- The old *16bit Sum* is now called *Sum 16* see also: chapter CRC

11. Configuration Examples

11.1. NMEA-0183 WIMWV

$WIMWV is an NMEA sentence that provides information about wind speed and angle, which will be sent by simple wind sensors via serial port to the PC.

11.1.1. Format

The format of the $WIMWV sentence is defined like this: $WIMWV,(1),(2),(3),(4),(5)*hh<CR><LF>
Fields:

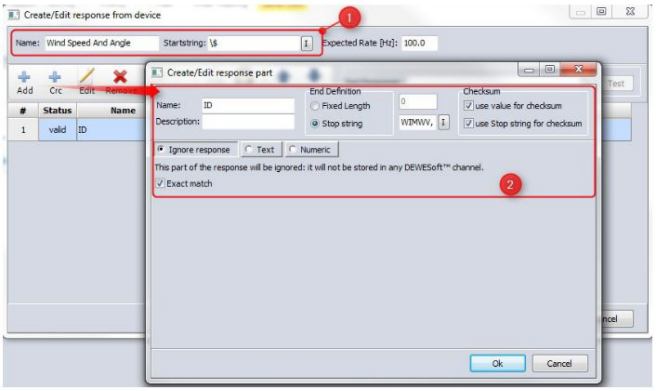
(1) Wind angle, 0.0 to 359.9 degrees
(2) Reference: R = Relative, T = Theoretical
(3) Wind speed
(4) Wind speed units: K = km/h, M = m/s, N = knots
(5) Status: A = data valid; V = data invalid

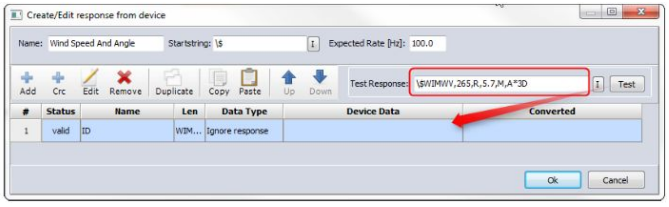
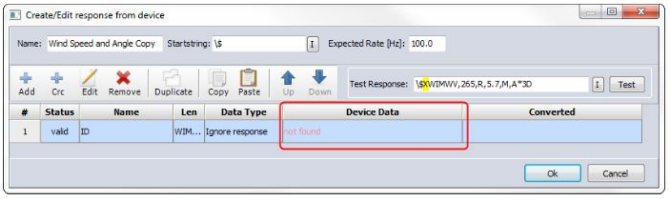
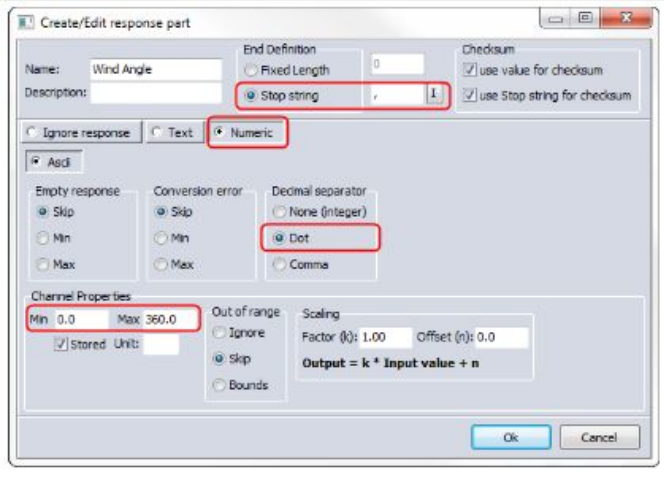
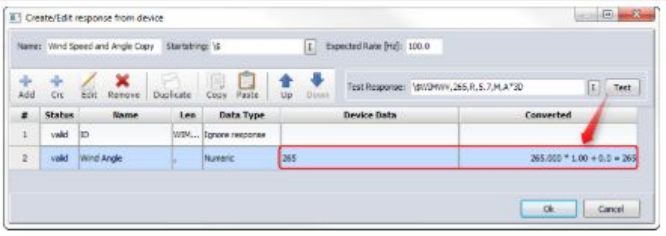
* is the checksum separator

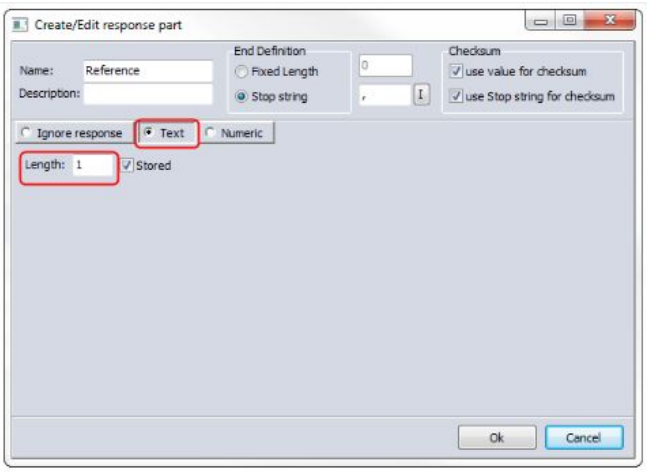
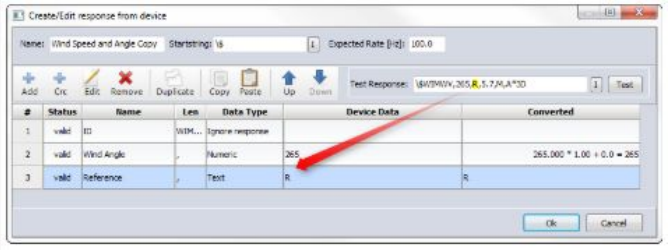
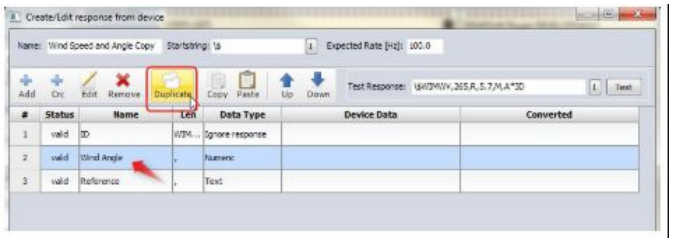
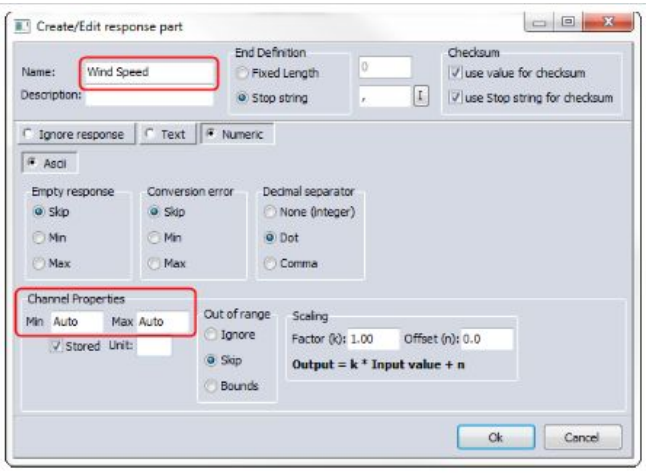
hh is the NMEA-0183 V3 check sum: the data to calculate the checksum is the complete request, except the starting $, the * and the checksum itself.

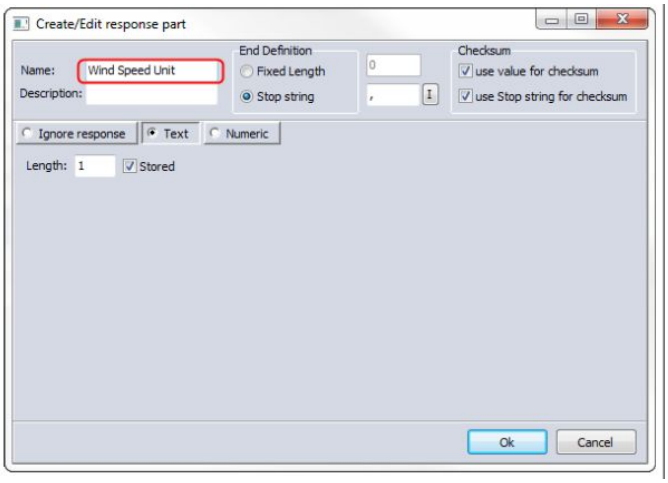
11.1.2. Configuration

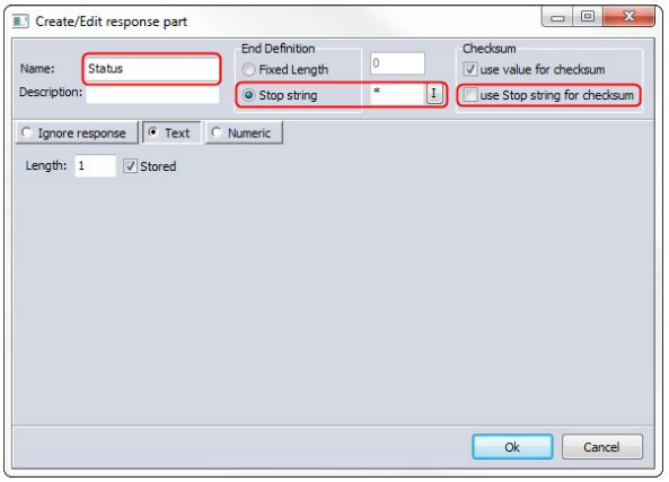
Weather stations usually just start to transmit data automatically once they are powered up, so we need not define any requests – just the response definition for the WIMWV sentence. In order to test the response that we create throughout this example, we will use this valid test-data : \$WIMWV,265,R,5.7,M,A*3D

We create a new response and call it *Wind Speed And Angle* and enter the *Startstring* ($) of this response (see (1) in Image 137): Note: that the start-string needs to be escaped correctly (\$): see chapter Character escaping. Now we can click the **Add** button to create the first response part (see (2) in Image 137): we call it ID and set the *End Definition* to the *Stop string* WIMWV,. We also activate the Exact match check-box, because between the *Startstring* ($) and the *Stop string* (WIMWV,), there must not be any other characters. We keep both check-boxes in the *Checksum* group active, because the *Stop string* must be part of the checksum.	 *Image 137: WIMWV Id*
Now we can already enter the test-data and click the Test button: we can see that the *Device Data* column is still empty – which is okay in this case, because we have selected *Ignore response* for this response part.	Just to show the difference, we can now enter an error into the Test Response; e.g. we can enter an X between $ and WIMWV, so that our response part definition for the first part does not match anymore: \$XWIMWV,265,R,5.7,M,A*3D After clicking the **Test** button, the *Device Data*

	column now shows the error message '*not found*' for the first response part: because the *Stop string* WIMWV, has not been found after the *Startstring*. Note: if we had not activated the *Exact match* check-box for the response part, the data would still match (you can try it). Before you continue, make sure to enter the correct *Test Response* again, for the next steps.
	
Now we enter the 2nd response part, called *Wind Angle*. We use the *Stop string* , and select the *Response Part Handler Numeric*. The decimal separator must be *Dot* (according to the NMEA specification). And we can enter Min of 0.0 and Max of 360.0.	It is always a good idea to test the new response part immediately after you create it, to find problems/errors immediately. In our case, the test works fine: we can see in column *Device Data*, that the characters 265 (highlighted in yellow) of the *Test Response* were used for the 2nd response part *Wind Angle*. Since we have chosen the *Response Part Handler* Numeric with interpretation *Ascii*, these characters will be converted to the floating point number 256, multiplied with the scale factor (which is 1) and finally the offset is added (which is 0) and so the final result that will show up in the DewesoftX® channel, is 256.
 *Image 138: Response Part 2: Wind Angle*	
We call the next response part *Reference*, and use the *Stop string* , again. But this time the data	Time for another test. Also this test is okay – we can see that the character R of the *Test Response*

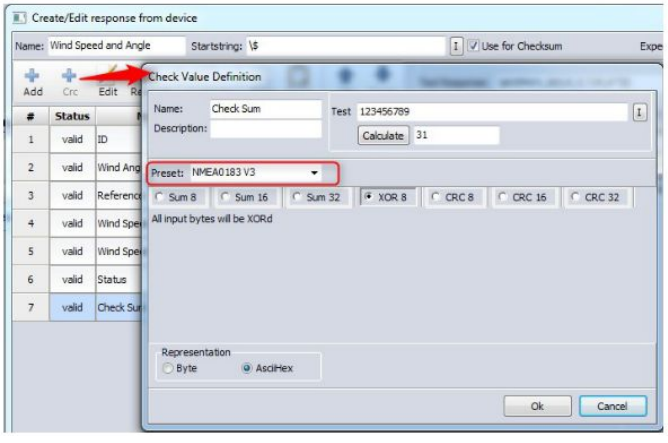
is not numeric, but a character, so we select the *Response Part Handler Text*. Since the data for this part is only a single character, we set the *Length* to *1*.	is used for the request part. Since there is no scaling possible for text data the *Converted* column shows the same a s the *Device Data* column.
	
The next response part *Wind Speed* is very much like the response part *Wind Angle* which we have already created. Therefore it is the fastest way to select the existing Wind Speed response part and click the **Duplicate** button:	Now we just need to change the *Name* of the duplicated response part to *Wind Speed* and we change the *Min/Max* values to *Auto* (since the documentation does not say what the minimum and maximum values are).
	
Next is the *Wind Speed* Unit which is very similar to *Reference* – so just select *Reference*, click **Duplicate** and change the name – done.	Next is the last data field, named *Status* – since the data is also very similar we can create a duplicate of *Reference*. But this time there are 2 things to change: 1) the character after the *Status* is not a ,, but an * instead – so we change the *Stop string* 2) the * must not be used for the checksum calculation, so we deactivate the use *Stop string for checksum* check-box

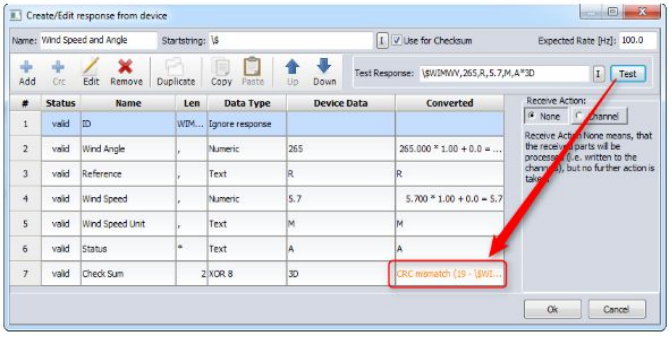


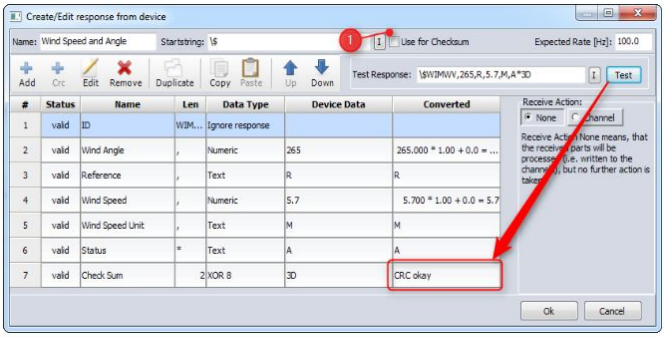


Now that we have defined all the response parts, we can add the check sum: just click the **CRC** button and select *Preset NMEA-0183 V3:*

Finished – time for a test. The test looks already quite good – all the response parts have been found correctly. The only problem is that the *Device Data* column of the *Checksum* shows a warning CRC mismatch. In the Converted column, you can see which parts of the *Test Response* have been used for the checksum calculation: $WIMWV,265,R,5.7,M,A
The problem is, that the start string ($) has also been used
for the checksum calculation – but it should not be used…





We can change this by deactivating the *Use for Checksum* checkbox (1). Now click the **Test** button again: very good, everything's okay – also the checksum calculation!	

11.2. DMU02 Gyro & Eval board

In this example we will use the following hardware (by Silicon Sensing®):

- Capacitive Gyro Evaluation System (CG9230)
- DMU02: Six Degrees of Freedom Dynamics Measurement Unit

The DMU02 sensor is connected to the J4 DMU02 CONNECTOR of the *Evaluation Board*.
The *Evaluation Board* is connected via USB cable to the PC – on the PC we have a virtual COM port with a baud rate of 38.4k.
Note: The drivers seems to work fine on 32-bit systems (tested on Windows XP/Prof./32-bit and Windows 7/Ultimate/32-bit, but sometimes causes a crash (blue screen) on 64 bit systems (seen on Windows 7 (64 bit).

11.2.1. Format

The data format of the *Evaluation Board* is very simple (too simple for production use, because it does not include start string/stop string or checksum).

To start the continuous data transmission we must transfer the command: $01. To stop it: $FF.

The data itself are transmitted as a 2 byte signed integer. The angular rates are transmitted with Big Byte Endianess and the acceleration data are transmitted in Little Byte Endianess.

11.2.2. Configuration

11.2.2.1. Requests

We start with the configuration of the requests, which are very simple.

We create a new request, call it *StartDMU* and activate the *On start Activation Event.*: so that this request will be sent to the device when we start the measurement in DewesoftX® .
Then we add the one and only response part for this request: we call it *StartByte* and the only thing we need to send is the byte $01 (it does not matter if you enter the value in the *Prefix* or *Postfix* field). Note: as soon as you leave the edit field, your input $01 will be automatically escaped and then the edit field will show the escape sequence \SOH.

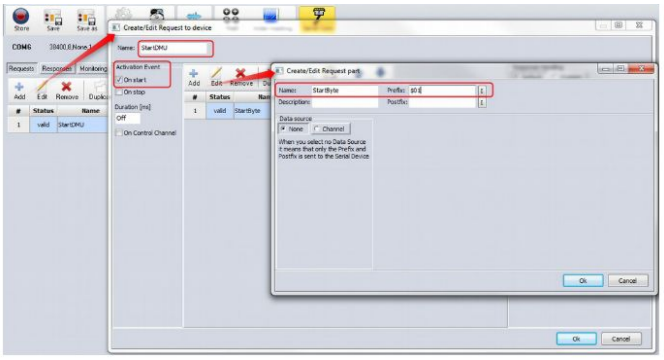


Image 139: DMU2 Start Byte

Next we create another new request, call it Stop and activate the On stop Activation Event.: so that this request will be sent to the device when we stop the measurement in DewesoftX® . Then we add the one and only response part for this request: we call it StopByte and the only thing we need to send is the byte $FF (it does not matter if you enter the value in the Prefix or Postfix field). Note: stopping the data-stream is not strictly necessary, but good common practice.

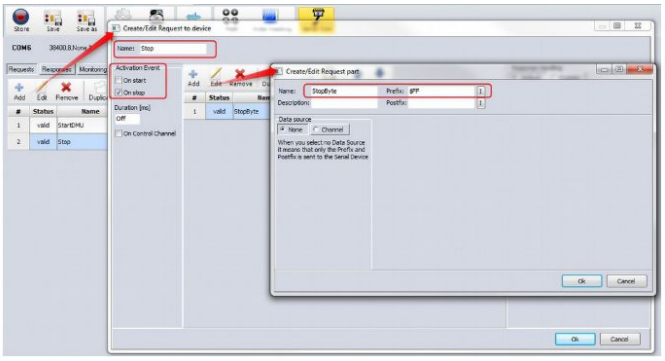


Image 140: DMU2 Stop Byte

11.2.2.2. Response

We create a response and call it DMU. Since the device will send at a fixed rate of 1kHz, we enter the value 1000 into the *Expected Rate [Hz]* field, to get an optimal display in the recorder visual controls.
Then we enter the first response part, called *AngRateX*. The response is exactly 2 bytes long – so we select The *End Definition Fixed Length* and enter the value 2. Then we select the *Response Part Handler Numeric* with interpretation *2 bytes*. According to the Silicon Sensing® documentation the angular rates are transmitted as signed integer with big byte endianness and a scaling factor of 0.03125: so We select the *Signum mode Signed*, the *Byte Endianness Big* and enter the *Scaling Factor (k)* 0.03125.
We can also enter the *Unit deg/s*.

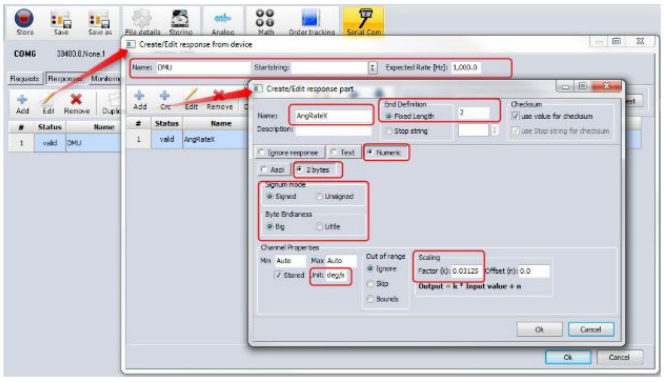
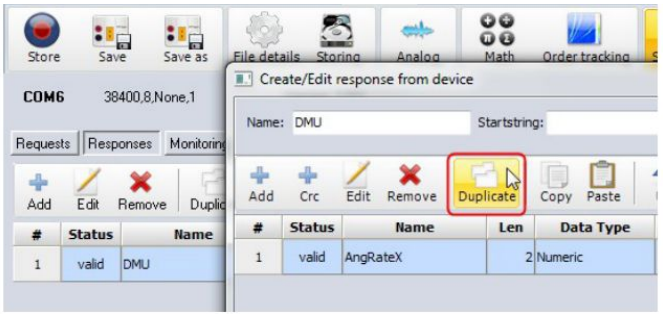
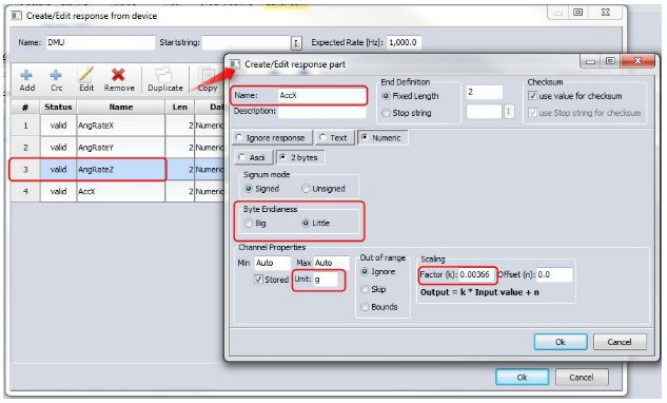
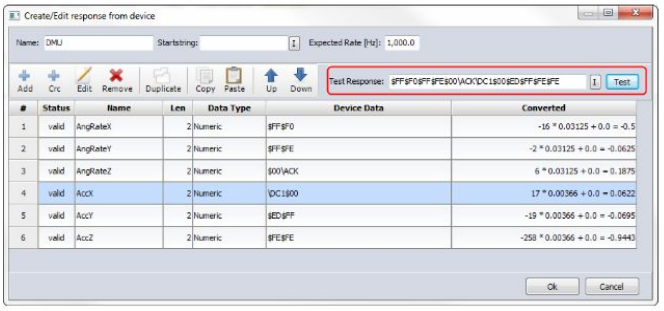


Image 141: Response Part: AngRateX

Since the data-format specification of the angular rate y is the same as for the angular rate x, we can simply select the response part AngRateX and click **Duplicate**. The only thing that we must change now is the name of the response part: *AngRateY* and we are done – all other settings are the same as for the *AngRateX*. After that we do the same again for *AngRateZ* and we have already defined all angular rates.	 *Image 142: Response Part: Duplicate AngRateX*
The acceleration data is also quite similar to the angular rates, so we can create a duplicate of e.g. *AngRateZ* and change the following settings: Name is *AccX*, the *Byte Endianness* is now *Little*, *the Unit* is g and the *Scaling Factor (k)* is 0.00366. Since the other acceleration data is the same, we can duplicate *AccX* twice and change the names of the duplicates to *AccY* and *AccZ* respectively.	 *Image 143: Response Part: Duplicate AngRateZ*
Now the response definitions should look like Image 144. We enter some test-data FFF0FFFE$00\ACK\DC1$00EDFFFEFE and can see that the final calculated values in the *Converted* column are correct.	 *Image 144: Response Test*

11.3. EPAD modules

In this example we will use the following hardware (by DEWETRON):

- EPAD-TH8-P
- EPAD-V8-P

Note: since the EPAD modules use RS-485 you also need some kind of converter to connect it to the PC and to have a virtual COM port on the PC (e.g. EPAD-BASE module).

11.3.1. Format

From the *DEWE-Modules Programmers Reference Manual*, we can see the syntax of the command to read all 8 channels of the EPAD-TH8-P module:

EPAD-TH8-P: Read all 8 channels data values		
Command		$(Addr)A\r[7]
Response	Valid	>(Data)(Data)(Data)(Data)(Data)(Data)(Data)(Data)\r[7]
	Invalid	?AA\r
	>	Response leading code for valid command
	?	Response leading code for invalid command
	Addr	Response leading code for invalid command
	Data	8 or 9 character ASCII value (depending on precision)
Example	Command	$01A\r
	Response	>+01100.1+00257.3-00004.7+00023.7+00029.2+00097.4-00002.3+00119.5\r[7]
	channel 0	+1100.1 °C
	channel 1	+257.3 °C
	channel 2	-4.7 °C
	channel 3	+23.7 °C
	channel 4	+29.2 °C
	channel 5	+97.4 °C
	channel 6	-2.3 °C
	channel 7	+119.5 °C

EPAD-V8-P: Read all 8 channels data values		
Command		$(Addr)A\r[7]
Response	Valid	>(Data)(Data)(Data)(Data)(Data)(Data)(Data)(Data)\r[7]
	Invalid	?AA\r
	>	Response leading code for valid command
	?	Response leading code for invalid command
	Addr	8 or 9 character ASCII value (depending on precision)

	Data	8 or 9 character ASCII value (depending on precision)
Example	Command	$01A\r
	Response	+01100.1+00257.3-47004.7+00237.0+08029.2+00097.4-00002.3+05119.5\r[7]
	channel 0	+1100.1 mV
	channel 1	+0257.3 mV
	channel 2	-47004.7 mV
	channel 3	-47004.7 mV
	channel 4	+8029.2 mV
	channel 5	+0097.4 mV
	channel 6	-0002.3 mV
	channel 7	+5119.5 mV

Table 4: EPAD-V8-P: Citation from the DEWE-manual

11.3.2. Configuration

In this example we will use the command to read all 8 channels of the 2 EPAD modules. We will start with the first module EPAD-TH8-P and will then add the second module and discuss important settings to interpret the data right.

11.3.2.1. Module 1: EPAD-TH8-P

First we create a new request named *EPAD 01* and select 2 *Activation Events*: *Duration [ms]* 5000 and *On Control Channel*; i.e. the request will be sent every 5 seconds or when we click a button for the control channel.
Now we create the one and only request part, which consists only of the fixed byte sequence: \$01A\CR to request the data of all channels of the first EPAD module, which is the EPAD-TH8-P in our case.

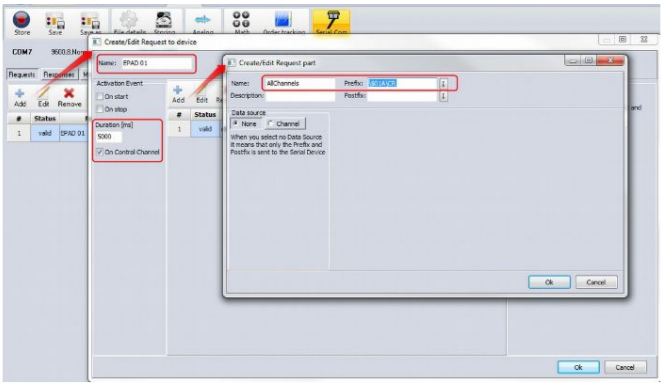
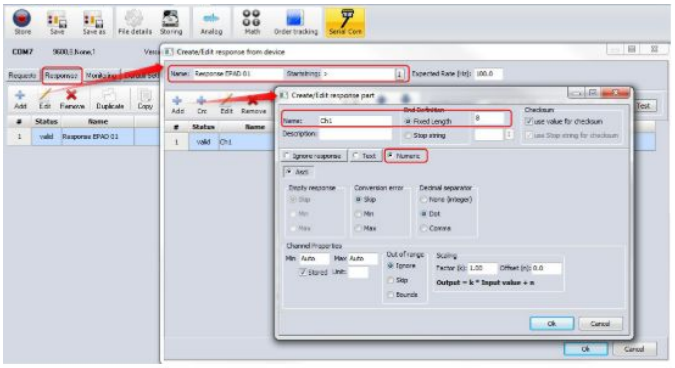
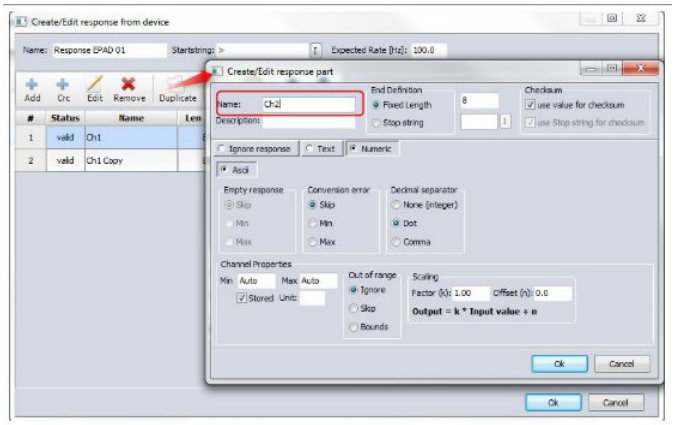
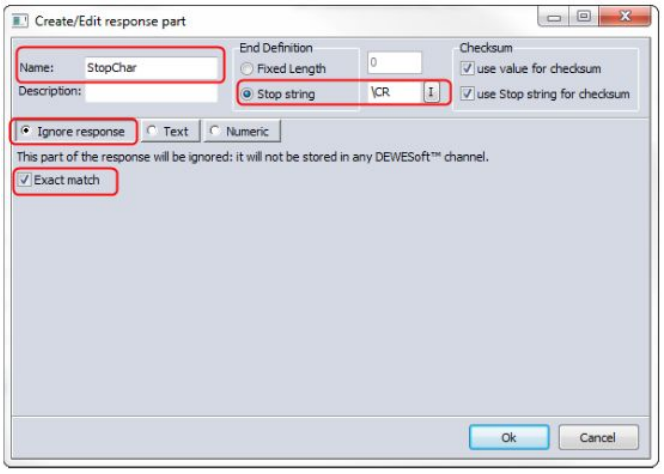


Image 145: EPAD 01 request

Now we create the corresponding response. We call it Response EPAD 01. The start string is a > sign. We create the response part for the first temperature channel and call it *Ch1*. The data that we receive has a fixed size of 8 characters, so we set the *End Definition* to a *Fixed Length* of 8.	 *Image 146: EPAD 01: Ch1*
The other 7 channels are easy to create. We simply **Duplicate** *Ch1* and change the names to *Ch2, Ch3*, etc.	 *Image 147: EPAD 01: Duplicate Ch1*
The channel data is followed by a terminating carriage return character, so we create a final response part named *StopChar*. The *End Definition* is of course the *Stop string* \CR. And we select *Ignore response* and activate *Exact match*.	 *Image 148: EPAD 01: StopChar*

Now we can insert the Test Response >+01100.1+00257.3-00004.7+00023.7+00029.2+00097.4-00002.3+00119.5\CR from the DEWE-manual and check the results, which are correct in this case:

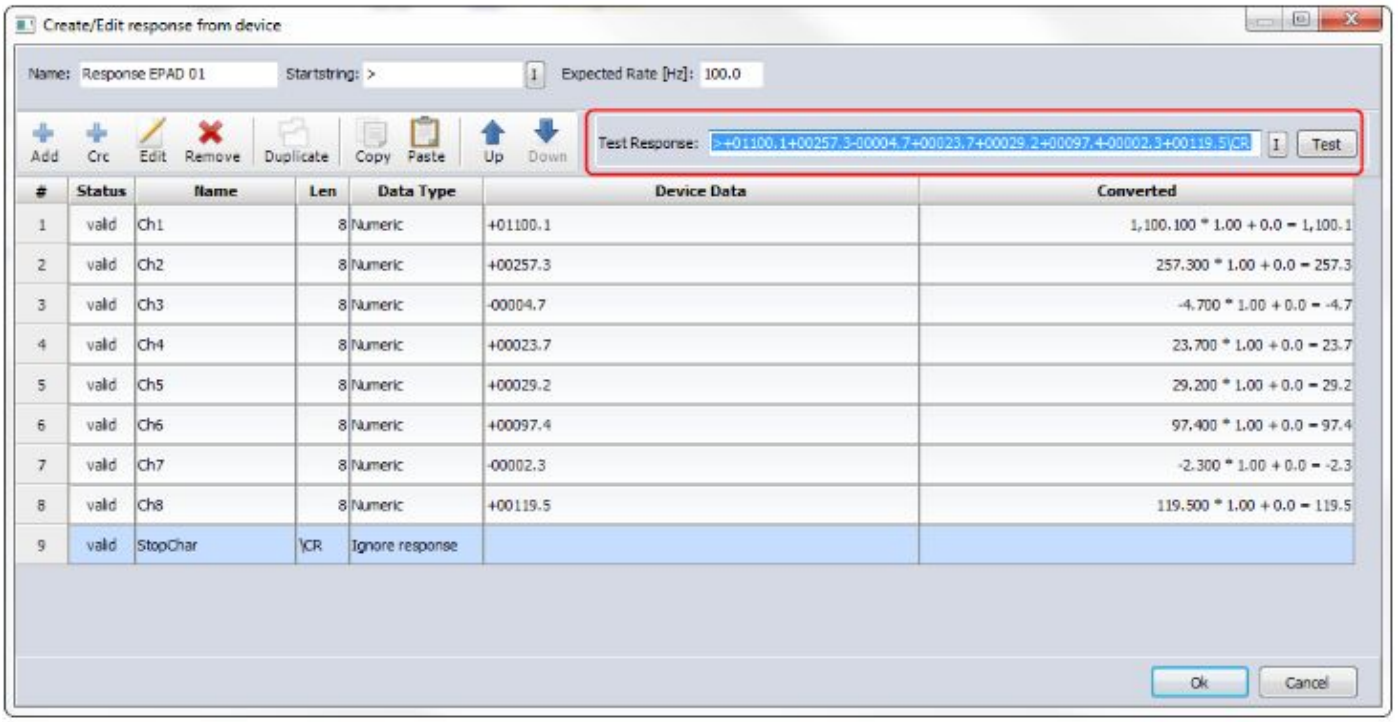


Image 149: EPAD 01: Test Response

Now, let's go to measure mode and check the results.
In this example we have added an *Input Control Display* visual control (*Display type to Push Button*) and assigned the control channel of the *EPAD 01* request: see (1) in Image 150. Right to it, we have a digital display to show all 8 channels of the response.
Directly below, we have a *Tabular values* display to show the *Sent requests* debug channel (see chapter Sent requests).

At the very bottom of the screen there is a recorder showing the data of temperature channel one. At the beginning of the measurement the temperature sensor was just exposed to the room temperature (we see almost no change) and we've never clicked the **EPAD 01** button, so that only the timer fired the request every 5 seconds: these data are highlighted by the blue rectangles in Image 150.
At the end of the measurement, I've touched the temperature sensor, and clicked the **EPAD 01** button several times, so that we can see some changes: see (2) and the red rectangles in Image 150.

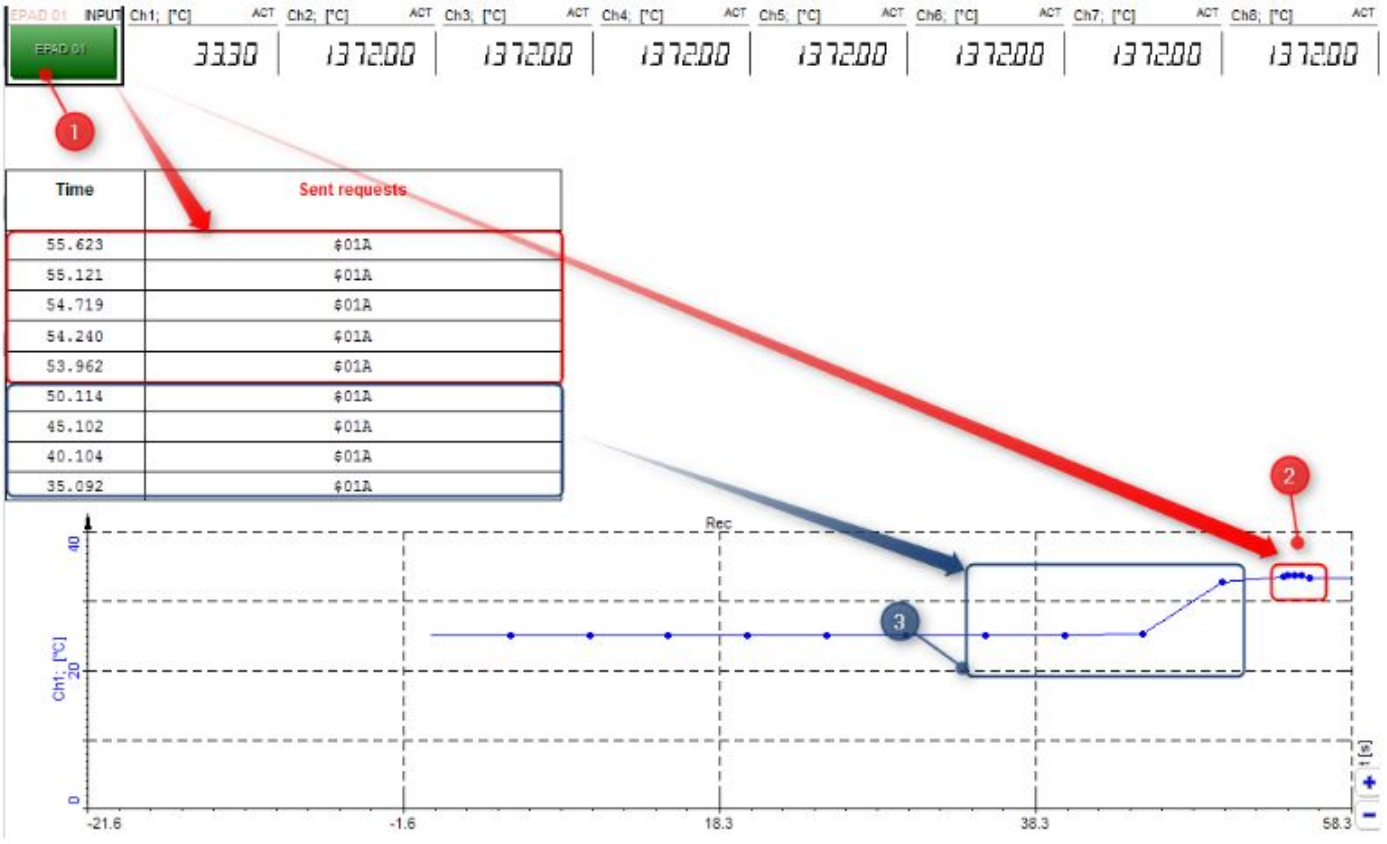


Image 150: EPAD 01: Measurement Data

11.3.2.2. Module 2: EPAD-V8-P

The request for the EPAD-V8-P module is almost the same as the request for the response of the EPAD-TH8-P module (except for the module address). Therefore, we can simply **Duplicate** the response *EPAD 01*, change the name to *EPAD 02* and the *Duration [ms]* to 1500 and edit the one and only request part *AllChannels* and change the *Prefix* to: \$02A\CR (the Prefix of the 1st \$01A\CR).
module was:

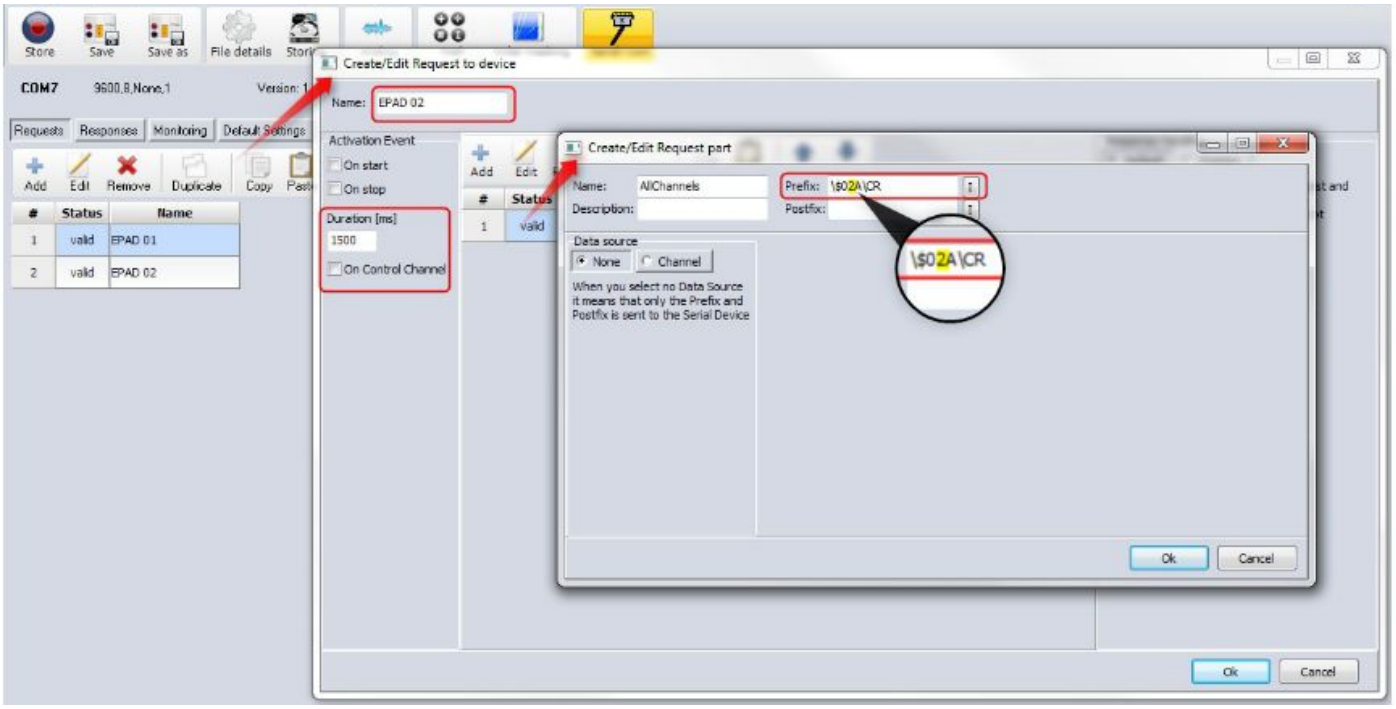


Image 151: EPAD 02

The response definition of the second module is also very easy to create. We just **Duplicate** *Response EPAD 01*, change the name to *Response EPAD 02* and that's it.
Now we can enter the *Test Response* for the EPAD-V8-P module:
>+01100.1+00257.3-47004.7+00237.0+08029.2+00097.4-00002.3+05119.5\CR and see that it works fine.

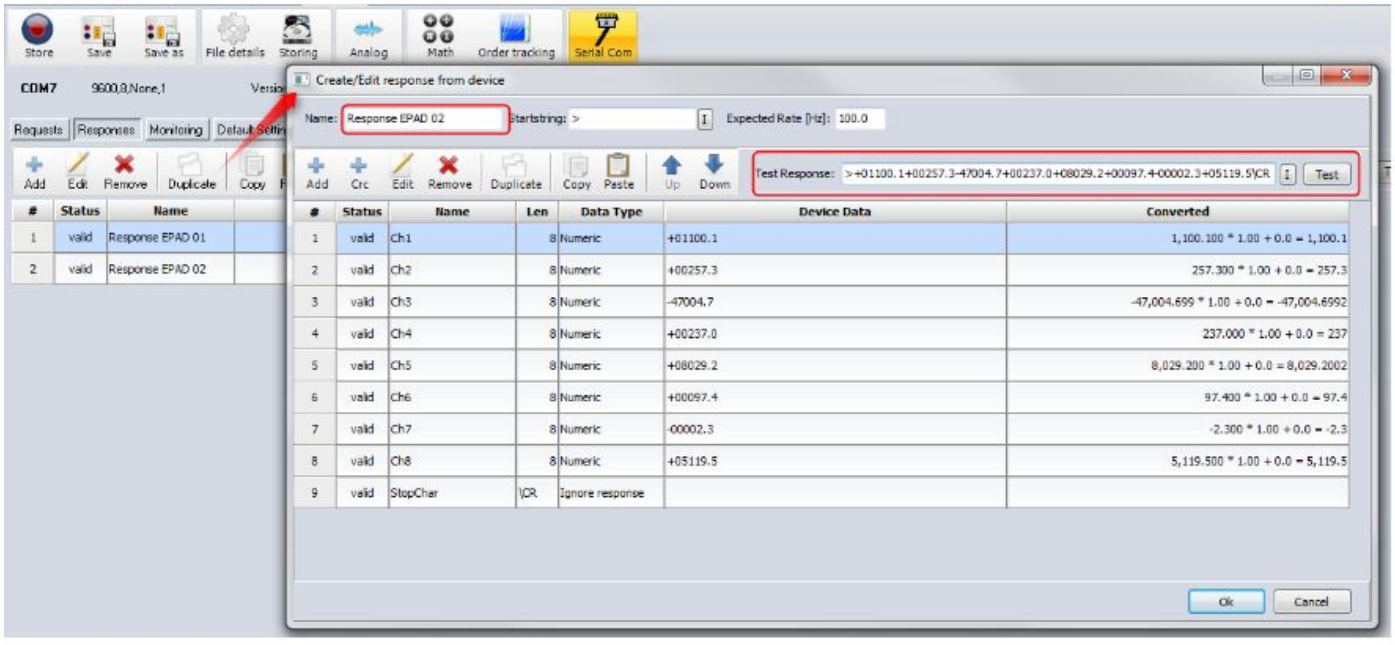


Image 152: EPAD 02: Response

When we now go to measure mode and check the data, we can see that something is wrong (Image 153): We've added a digital display with all channels of the EPAD-V8-P module (see (1) in Image 153), which shows no data at all.

Also the tabular values display (see (2) in Image 153), shows only data for *Ch1* (blue text) one of the *Response EPAD 01,* but no data for *Ch1* (yellowish text) one of the *Response EPAD 02*.
In the recorder (see (3) in Image 153) we can see that the data in *Ch1* (blue line) one of the *Response EPAD 01* seems unstable. Sometimes it's 0 and every 5 seconds it is about 25. This can already show us the way to the problem: it seems that the data of both modules is written to the same response – always to *Response EPAD 01* and never to *Response EPAD 02*...

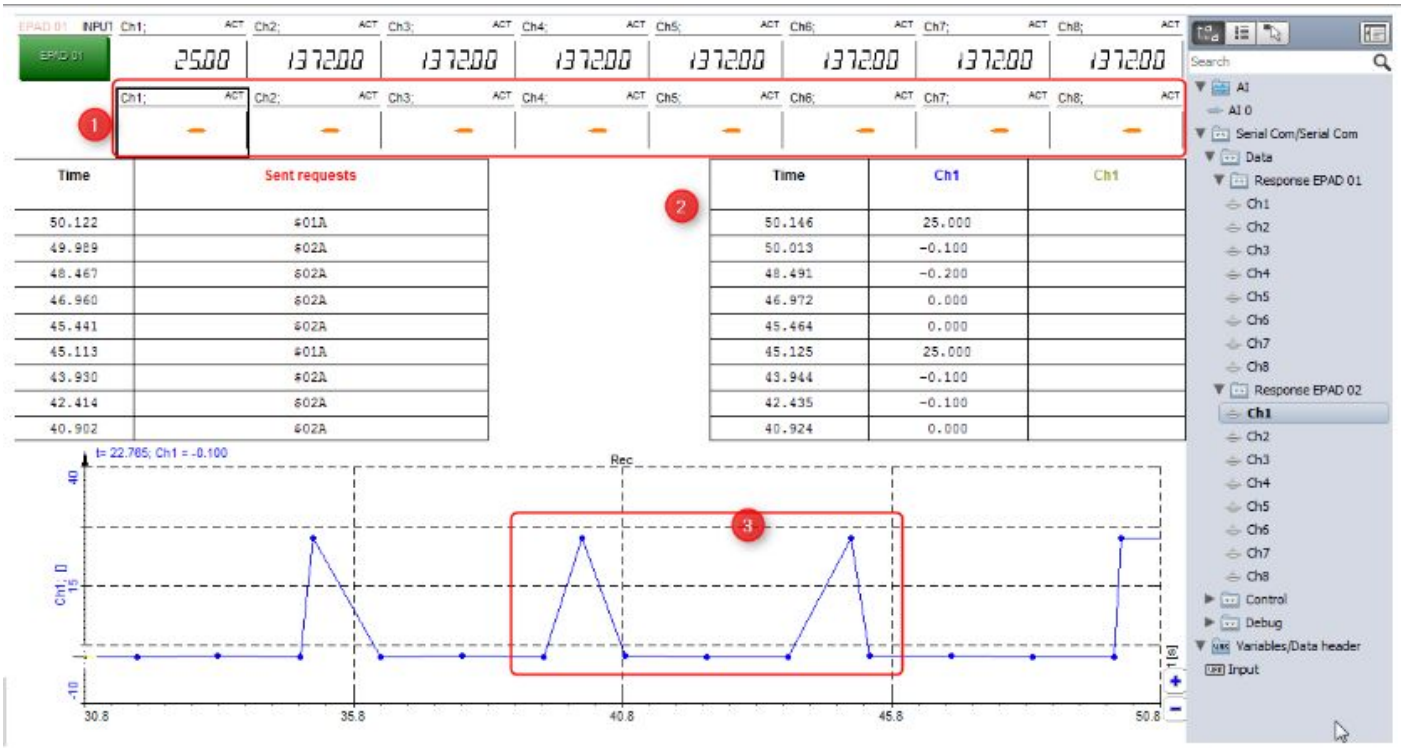


Image 153: EPAD 02: Wrong Measurement Data

To prove our suspicion, we can use the *Test Response* function (see chapter Response Test) in the Responses tab-sheet. We enter the *Test Response* of *Response EPAD 02* into the *Response Test*, and click the **Test** button.

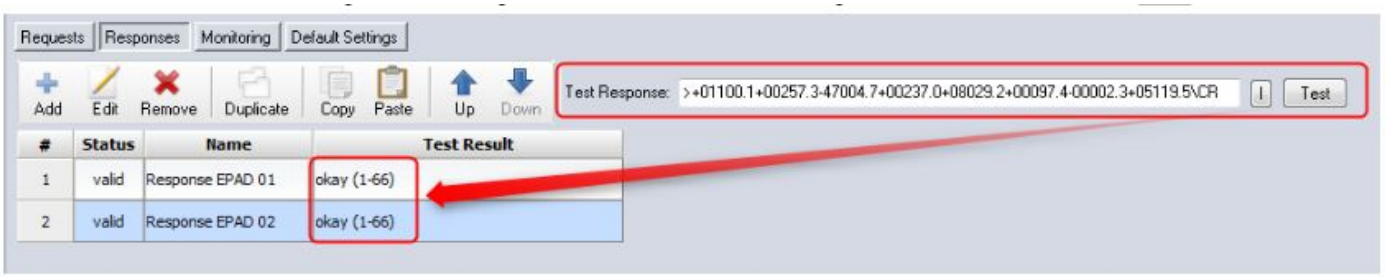


Image 154: EPAD: Response test

We can see that both response definitions match the *Test Response* (which should not be much of a surprise, because Response EPAD 01 is actually a duplicate of *Response EPAD 02* - and the format of the responses **IS** actually the same). In this case it is impossible for the Module to distinguish to which response definition the data belongs. So every response will end up in *Response EPAD 01* and none in *Response EPAD 02*.
To solve this problem, we need to give the SerialCom Module more information:

We change the *Response Handling* of the request *EPAD 01* to *Custom* and select only *Response EPAD 01*. As time-out we use 250 ms which is fine for the slow EPAD modules.	We do the same for request *EPAD 02*, but now we select only *Response EPAD 02*.
 *Image 155: EPAD 01: Response Handling*	 *Image 156: EPAD 02: Response Handling*

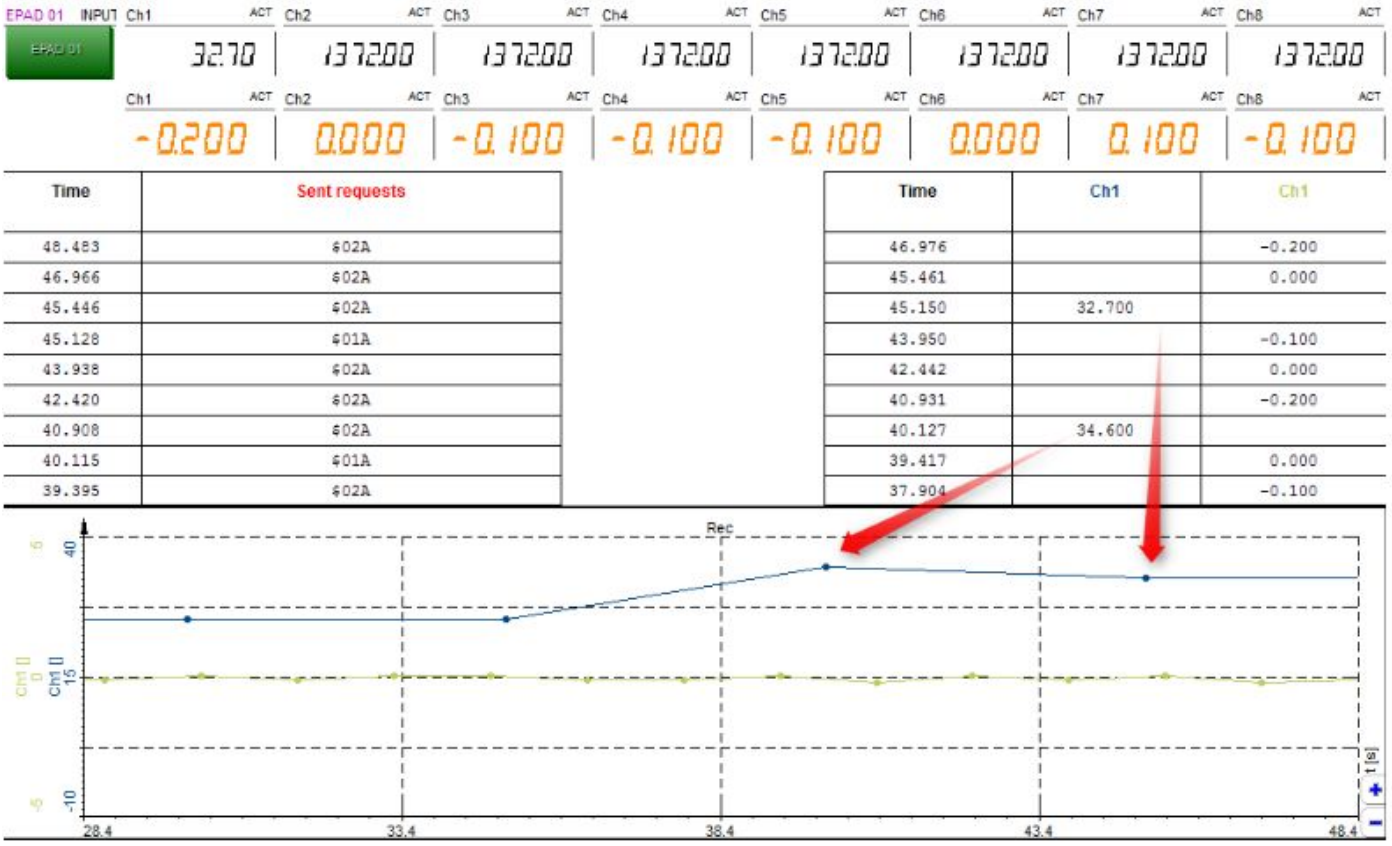
When we now look at the measurement data we can see that everything's fine.
The blue line in the recorder shows only the data of the first channel of the EPAD-TH8-P module.
The yellowish line in the recorder shows only the data of the first channel of the EPAD-V8-P module (around 0 in this case, because no voltage is connected).

This is, because now the *SerialCom* Module now works like this:

- when it sends the request *EPAD 01* it will for response: *Response EPAD 01*.
- no other request will be sent until the response: *Response EPAD 01* is received (or the time-out occurs).
- when the response: *Response EPAD 01* is received (in the specified time-out period), the data will be written to the channels of *Response EPAD 01*.

The same is true for the 2nd EPAD module. The SerialCom Module will

- send the request *EPAD 02* it will for response: *Response EPAD 02*.
- no other request will be sent until the response: *Response EPAD 02* is received (or the time-out occurs).
- when the response: *Response EPAD 02* is received (in the specified time-out period), the data will be written to the channels of *Response EPAD 02*.



Time	Sent requests
48.483	&02A
46.966	&02A
45.446	&02A
45.128	&01A
43.938	&02A
42.420	&02A
40.908	&02A
40.115	&01A
39.395	&02A

Time	Ch1	Ch1
46.976		-0.200
45.461		0.000
45.150	32.700	
43.950		-0.100
42.442		0.000
40.931		-0.200
40.127	34.600	
39.417		0.000
37.904		-0.100

Image 157: EPAD: Measurement Data

11.4. Analyt-MTC Massflow meter

The *Analyt-MTC Massflow meter* was connected via *ATHEN USB to Serial Bridge* to a Windows 7 (64 bit) PC.
The baud rate of the device is 19.200 baud (8-N-1 format). The device is configured to send the data automatically after it is powered up.

11.4.1. Format

The serial data consists of 5 space-separated fields and a terminating carriage return character:
(1) (2) (3) (4) (5)\CR
Fields:

(1) absolute pressure
(2) temperature
(3) volumetric flow rate
(4) mass flow
(5) text field showing the unit (e.g. AIR)

11.4.2. Configuration

This format is quite easy to set up: We create one response with 1 field for each of the data fields:

We create a single response and add the first part: we call it *pressure* and use the *Numeric* handler (with *Ascii* interpretation). The *Stop string* is a space character. Then we Duplicate this part 3 times and call the parts *temperature*, *flow rate* and *mass flow* respectively.

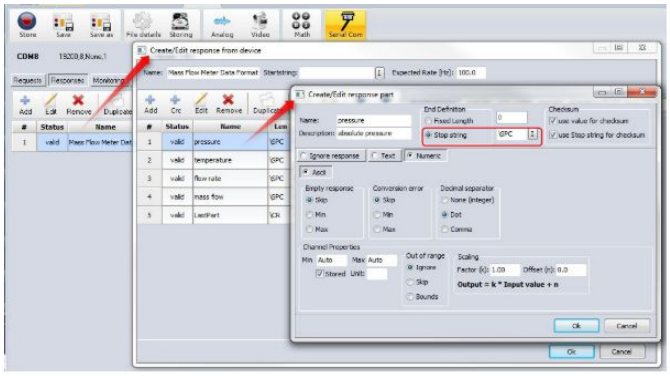


Image 158: Analyt-MTC: Response Definition

The last part is a little different. We call it *LastPart*, the *Stop string* is a carriage return character in this case and we select the *Text* handler.

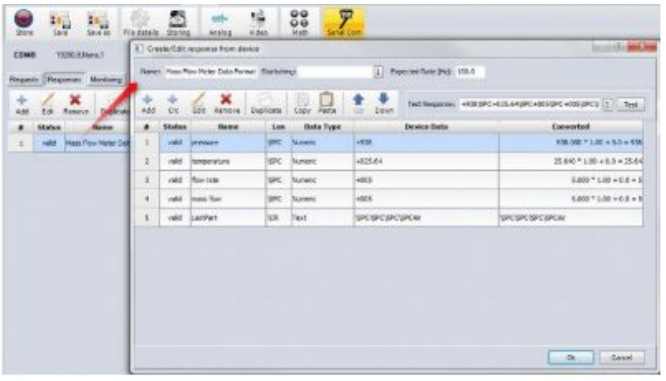


Image 159: Analyt-MTC: Last Part

That's it – we can already test the definition with this *Test Response*:
+938\SPC+025.64\SPC+005\SPC+005\SPC\SPC\SPC\SPC\SPCAir\CR
Then click **Test** and check the results:

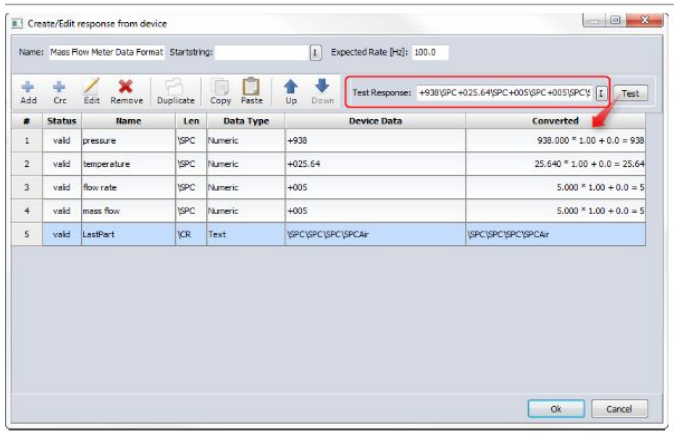


Image 160: Analyt-MTC: Test

When we go to measurement, we can already see the data in the recorder and digital displays.

Image 161: Analyt-MTC: Measurement

12. Warranty information

Notice
The information contained in this document is subject to change without notice.

Note:
Dewesoft d.o.o. shall not be liable for any errors contained in this document. Dewesoft MAKES NO WARRANTIES OF ANY KIND WITH REGARD TO THIS DOCUMENT, WHETHER EXPRESS OR IMPLIED. DEWESOFT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Dewesoft shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory, in connection with the furnishing of this document or the use of the information in this document.

The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit https://dewesoft.com/support/distributors.

12.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

12.2. Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

Dewesoft d.o.o.
Gabrsko 11a
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300
Web: http://www.dewesoft.com
Email: Support@dewesoft.com
The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

12.3. Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on https://dewesoft.com/support/rma-service.

12.4. Restricted Rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

12.5. Printing History

Version 2.0.0, Revision 217 Released 2015 Last changed: 23. July 2018 at 16:54.

12.6. Copyright

12.7. Trademarks

We take pride in our products and we take care that all key products and technologies are registered as trademarks all over the world. The Dewesoft name is a registered trademark. Product families (KRYPTON, SIRIUS, DSI, DS-NET) and technologies (DualCoreADC, SuperCounter, GrandView) are registered trademarks as well. When used as the logo or as part of any graphic material, the registered trademark sign is used as a part of the logo. When used in text representing the company, product or technology name, the ® sign is not used. The Dewesoft triangle logo is a registered trademark but the ® sign is not used in the visual representation of the triangle logo.

13. Safety instructions

Your safety is our primary concern! Please be safe!

13.1. Safety symbols in the manual

Warning

Calls attention to a procedure, practice, or condition that could cause the body injury or death

Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

13.2. General Safety Instructions

Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft GmbH assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

13.2.1. Environmental Considerations

Information about the environmental impact of the product.

13.2.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

13.2.3. System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.

This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

13.2.4. General safety and hazard warnings for all Dewesoft systems

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more

riskless operation is not possible anymore if the system is damaged obviously or causes strange noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.

- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

EN 61326-3-1:2008

IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

14. Documentation version history

Version	Date	Notes
2.0.0	14.12.2012	☑Now multiple serial devices are supported by the Module ▫ Each device has it's own logfile ☑Major changes to the parsing logic ▫ better performance ▫ improved GUI responsiveness in Measure mode (parsing is done in a separate thread/s) ☑BinHex Encoding is now supported ☑Request Parts now support 4 byte numeric data ☑ Monitoring: added skipped data channel ☑Major changes to Control Centre ▫ the Control Centre can now also be used in channel setup ▫ sending of the predefined requests in channel setup is possible ▫ grouping mode responses is supported in channel setup ▫ better parsing performance + added progress indication ▫ improved GUI responsiveness (parsing is done in a separate thread) ▫ improved performance when saving a big xml file ▫ added Auto Scroll check-box ▫ settings for encoding an grouping will be saved in channel setup ☑ Input fields: added indication for unsaved changes (yellow colour) **Documentation changes:** ☑Major changes to Control Centre chapter ☑Chapter Monitoring is now one level higher (was sub-chapter of Responses before) ☑ TOC: entries are now hyper-links, showing less heading levels
2.0.1	25.02.2013	☑Numeric Data Ascii Interpretation: ASCII: space and tab characters after the signum are ignored **Documentation changes**: ☑ 7.3.1.4.1 Numeric Data Ascii Interpretation: ASCII: space and tab characters after the signum are ignored ☑ now all TOC entries are hyper links (was only for top-level chapters before)
2.0.2	22.03.2013	☑Added Flow Control settings ☑ Fixed problem with COM port selection when opening the Control Centre from Hardware setup ☑ LongTest resources (for internal startup tests) are now compiled into the dll (instead of using a fixed path to the file location) **Documentation changes**: ☑Added Flow Control settings

2.0.3	04.11.2013	☑Added feature to send acknowledge to responses ☑Now the Scale factor can have more than only 2 decimal places ☑ Fixed possible Access Violation when using the Custom Response Handling ☑ Fixed issue with handling of the modal windows of the Module ☑ Fixed possible issue with dangling DewesoftX® channel references (introduced new IHasIChannelRefs interface) **Documentation changes**: ☑Added chapter 7.2.2 Receive Action ☑Updated to Open Office 4.0.1 (removed frames around images)
2.0.4	02.04.2015	☑ Improved error handling in HW-setup ☑Added Data-Wait [ms] in HW-setup ☑Max. Timeout for Requests is now 10s ☑New Module logo is a png for transparency **Documentation changes**: ☑Updated to X2 (installation, registration) and to the new orange design
2.0.5	28.05.2015	☑ Fixed a problem with negative scale factors (the user-input field doubled the negative signum and then reported an error)
2.0.6	13.07.2015	☑ Improved timestamps when the CPU load is very high and you start storing directly from Ch. Setup
2.0.7	06.08.2015	☑DewesoftX® X2 input channels can now be used in Requests ☑ Fixed possible problem with Status Channel ☑Better error-handling when sending requests (old version showed pop-ups)
2.1.0	11.05.2016	☑Major improvements to CRC handling: new XML setup version: see chapter1 CRC changes in V2.1.0 ☑ Fixed problem with Store checkbox of the Response parts. Documentation changes: ☑ chapter 6 Requests: ▫Updated some screenshots ▫Rearranged some chapters ▫Added 6.3.2.2 User for Crc ▫Added Request Part Crc ☑Updated Response CRC chapter ☑Updated some screenshots in chapter "10.1 NEMA-0183 WIMWV" ☑Added Chapter "Update to V2.1.0" ☑History: Merged the Module and Documentation, removed old entries (before version 2)
2.1.1	24.10.2017	☑ The Module now supports arbitrary baud rates ▫ This also required a change in the

		Hardware setup: when you open an existing setup with the new version the old baud rate will automatically be converted to the new one ☑ Fixed a bug in the Check Value Definition dialogue: The test-input data was only interpreted as ASCII: therefore non-ASCII chars showed a wrong checksum output (note: this did NOT affect the data in measure mode: it was only a display issue in this channel setup dialogue)
2.1.2	20.12.2017	☑ Fixed bug SWAUTO-455: SerialCOM may lose the Ch. Setup (when you close the Hardware settings dialogue)
2.2.0	14.02.2018	☑ Improved Check-Sums: now you can specify the data type of the sum-variable.
2.2.1	05.04.2018	☑ Fixed start-storing issue: for multiple devices when you go to Measure first and then start storing, it was possible that the data of some devices was ignored
2.2.2	27.04.2018	☑ Fixed <SWAUTO-450> SerialCom dialogue window in background The ASCII Chars window was sometimes hidden behind another modal windows which blocked all input ☑Control Centre did not show the received data any more