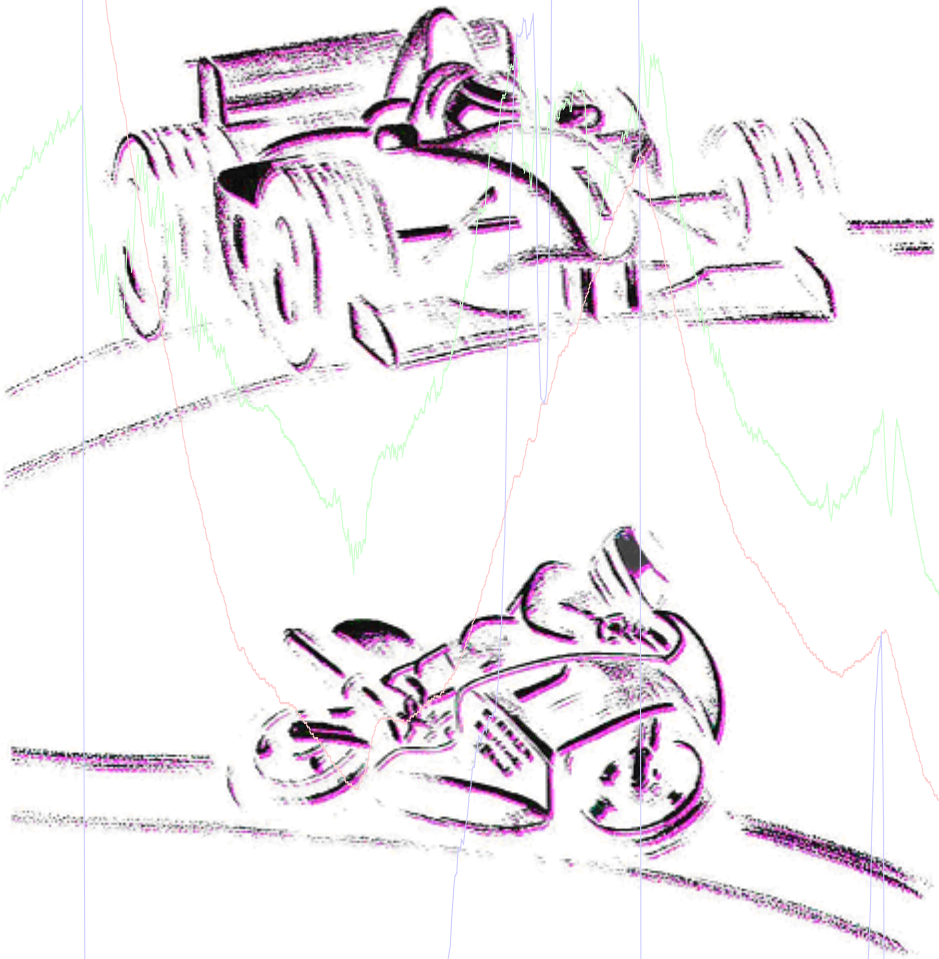
2d-datarecording.com

- English -



2011 Logger and channel settings

Art.No.: AC-DOC_Logger_setup_e-000 modified 20.03.2013

Table of content

Symbols used in the text

In the paragraphs highlighted with this symbol, you will find tips and practical advice to work with the 2D-Software.

In the paragraphs highlighted with this symbol, you will find additional information and it is very important that you follow the instructions given.

1 Communication

1.1 PC and 2D module

For setup and online communication most 2D modules are equipped with a serial, USB or Ethernet port which can be connected with the 2D communication cables. For downloading it is better to use Ethernet or USB because of higher data transfer rates.

1.1.1 USB cable

To operate with a USB connection, proceed as follows:

1. Connect the 2D-USB communication cable to the 2D module and the PC
2. Install the USB driver which can be found on the WinARace Software CD
3. Start WinIt
   → WinIt will automatically find the correct port

1.1.2 Serial Cable

For a connection through a serial cable proceed as follows:

1. Connect the RS232 communication cable to the 2D module and the PC
2. Start WinIt
   → WinIt will automatically find the correct port

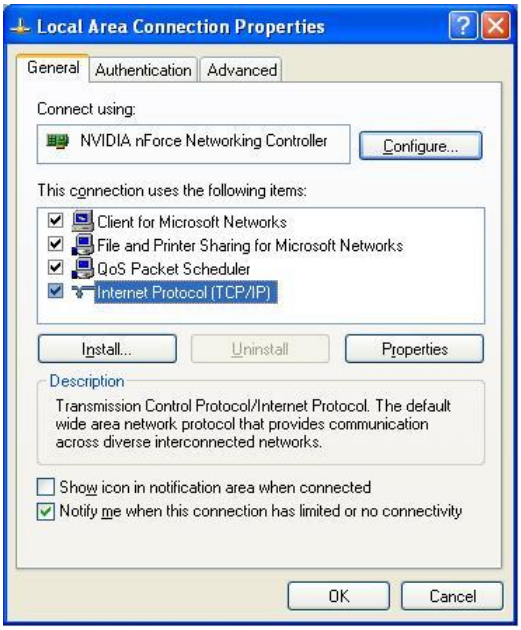
1.1.3 TCP / IP - Ethernet

The TCP / IP connection was developed for a high speed download. With this method it is also possible to connect 2D modules to your home or office network or a PC.
You can also adjust 2D modules with a wireless connection from a computer.
Before you can set up the TCP/ IP connection you must connect 2D module via Serial or USB as described in the next chapter.

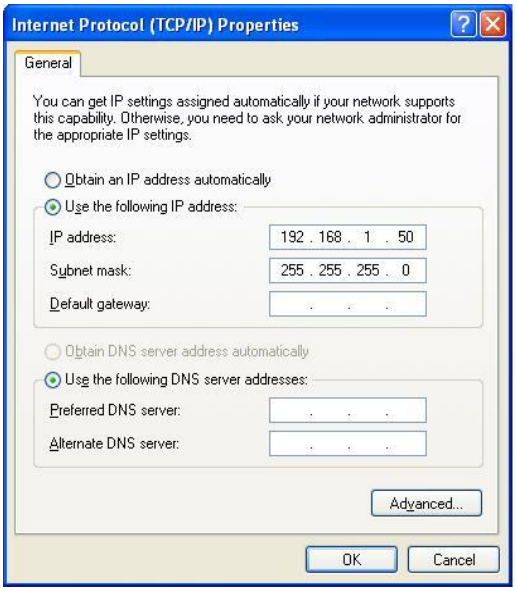
1.1.3.1 TCP / IP setting of the 2D module

To set up a TCP/ IP connection follow the next steps on your computer:

1. Open the network connection settings and double click on ***<Internet Protocol TCP/IP> or <TCP/IP v4>***



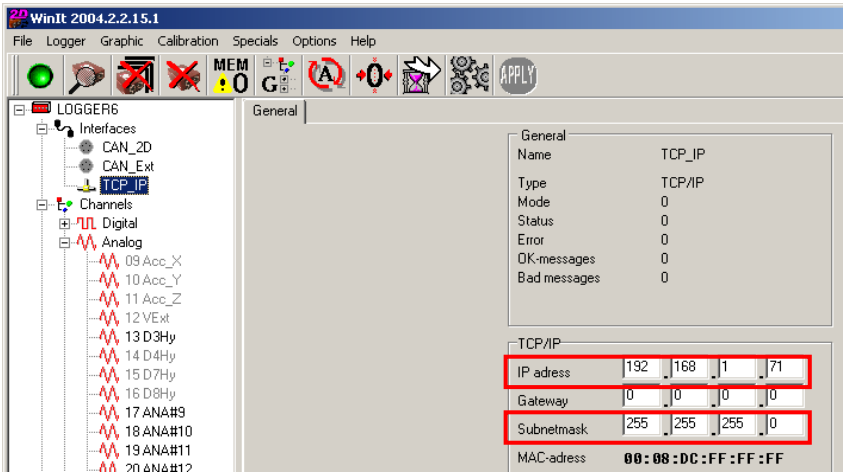
2. Choose an IP address for the computer which is not used in the logger (use the default network address: 192.168.1.xxx) Set the subnet mask to 255.255.255.0



3. Press ***<OK>*** to confirm all changes

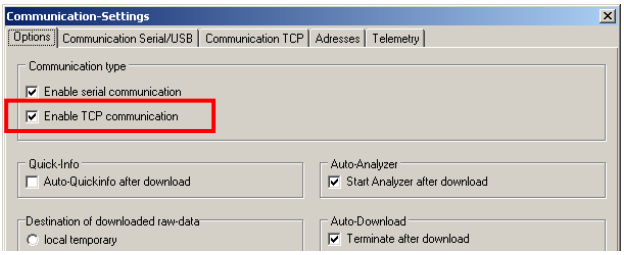
Following steps are needed to set the TCP/ IP connection on your logger:

1. Connect 2D module to your PC via serial cable or USB cable.
2. Select the tree ***<Interfaces> <TCP_IP>***
3. Choose an IP address for 2D module which is not used in your network (use the default network address: 192.168.1.xxx) and type it on the grid. (default: 192.168. 1.71)
4. Set the subnet mask 255.255.255.0
5. ***<Apply>***
6. Switch the loggers power supply off and on again
7. Set up the connection in WinIt (explained in the next chapter)

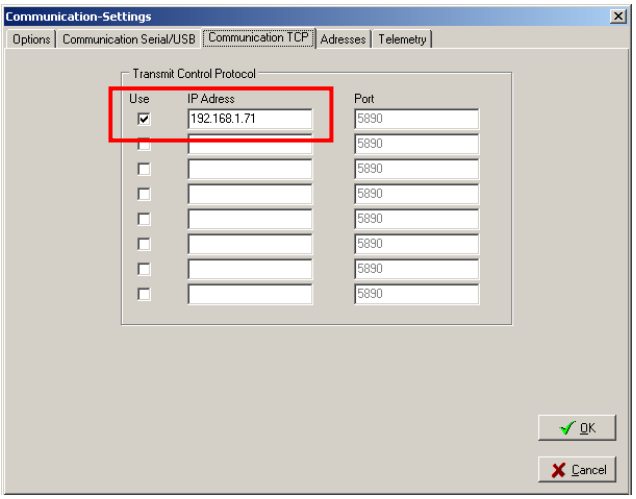


1.1.3.2 TCP / IP setting in WinIt

1. Start WinIt
2. Open the menu ***<Options> <Settings>***
3. Activate the checkbox ***<Enable TCP communication>***



4. Change to the page ***<Communication TCP>***
5. Enter the IP- address previously chosen for the logger and activate the checkbox.



6. Apply with ***<OK>***

More than one 2D module can be connected in this way by typing their IP addresses in the vacant rows. Make sure that each 2D module that communicates with the computer at the same time has a unique IP address.

If a different logger with the same IP address should be connected the windows address translation table has to be cleared first. (Use command: arp –d in the DOS-Box)

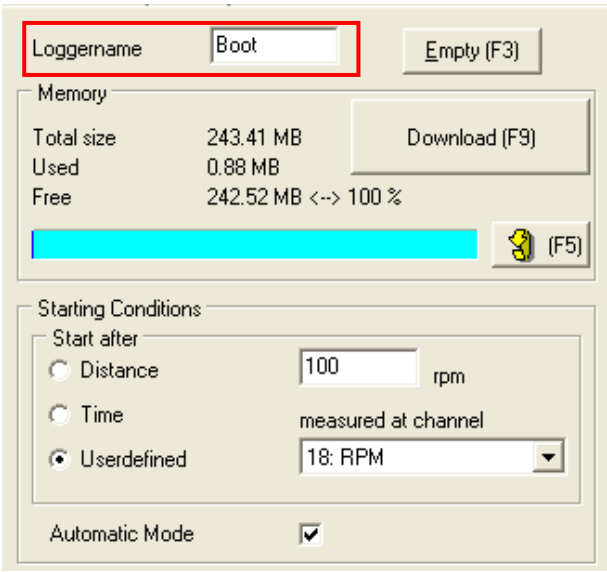
If there is no network traffic for about 12 minutes, windows will automatically delete this address. If the table has not been cleared the connection to a second logger with the same address will fail.

2 General module setup

2.1 Setting the module name

Renaming the data logger is useful in order to get a better overview of your data. This is especially important as on download the data name is combined with the module name. The module name is also important to distinguish between modules with the same properties

Change the entry in the box and confirm with **<Apply>**.



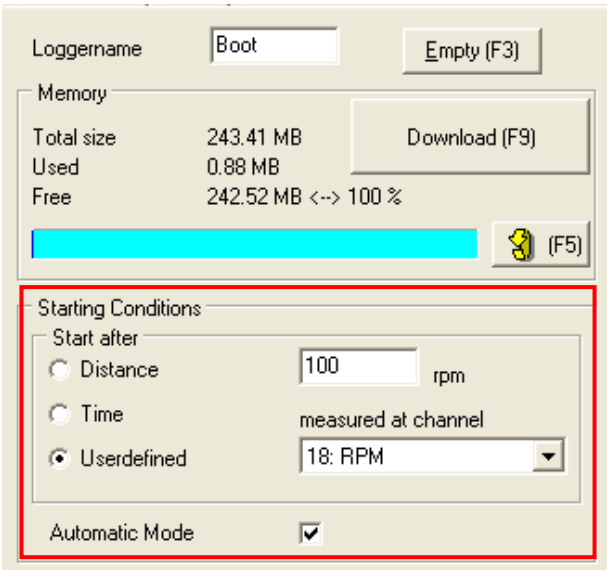
The last two characters of the module name are used to name data after download. Therefore make sure that the ending of your name can be clearly identified, for example Bike1_VR. 2D recommends using driver initials or starting number of the vehicle.

2.2 Setting the starting condition of logging modules

With the starting conditions the user defines under which conditions the logger records data.
If the box **<Automatic mode>** is ticked the logger stops recording if the user defined channel value is below the set starting condition. Otherwise the logger records until it is unpowered.

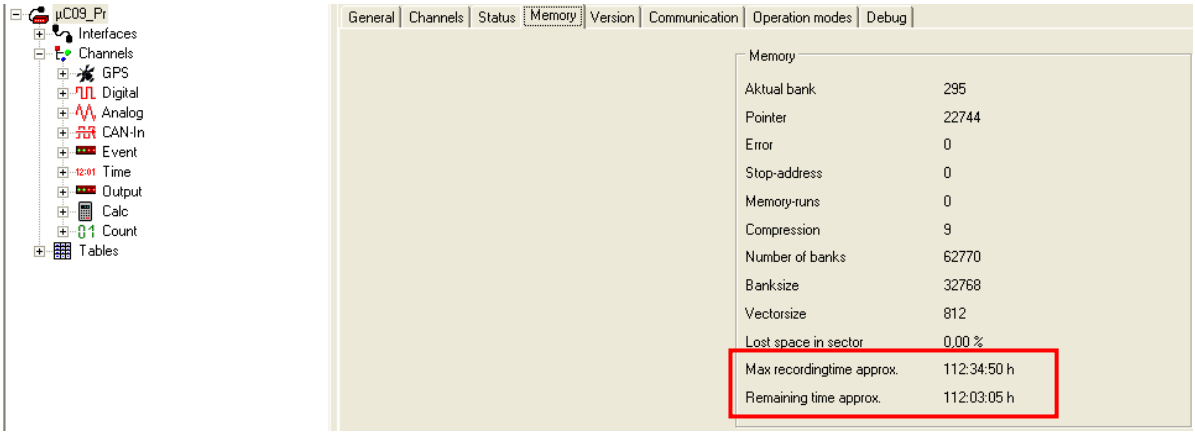
There are 3 possibilities to start the recording of a logger.

1. The first is to start after a certain distance. Click on **<Distance>** and enter the distance in meter after which the device should start recording.
2. The second possibility is to start after a certain runtime of the logger. Click on **<Time>** and enter the time in seconds after which the logger should start recording. Minimum time is 5 seconds.
3. Most users use a channel value to trigger the recording. Click on **<Userdefined>** and choose a channel e.g. RPM, put in the value above which the recording will be started.



2.3 Checking the maximum recording time

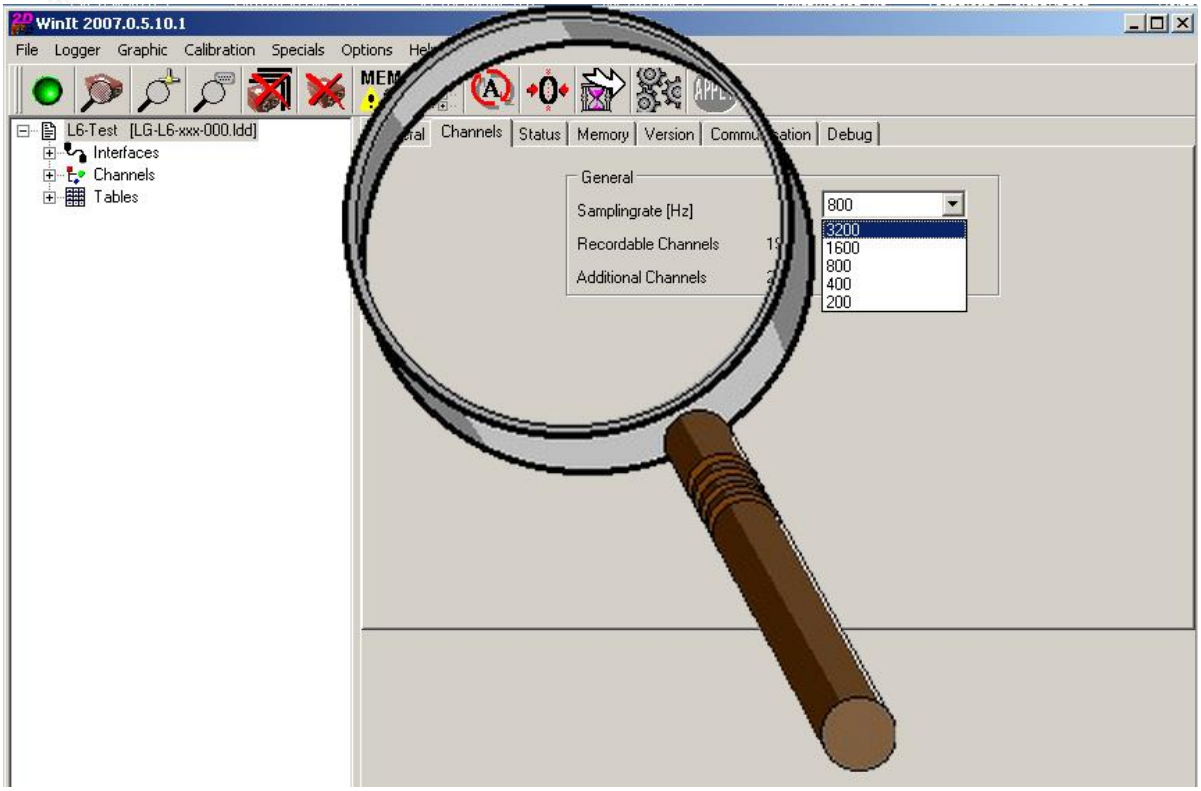
To check the maximum recording time click onto the main node in the tree view and go to the tab Memory.



2.4 Setting the base rate of a 2D module

- Select the “first basic node” (the node with the logger or memory name). In the example the node with the caption “L6-Test (LG-L6-xxx-000)”
- Select <Channel> from the tab (=right properties window) – see magnifying glass
- The responsible value is called <Samplingrate [Hz]>. A selection field with multiple baserates will be shown (3200, 1600, 800, 400, 200)

The selected base sampling rate should the highest sampling rate required for a channel.



2.5 Saving a logger setting file

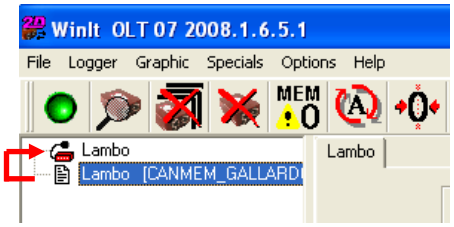
A copy of the current logger setting can be stored on the hard disk of your computer by selecting the option **<File / Save device in file>**.

2.6 Loading a logger setting file and sending the setting to the 2D module

A logger setting can be loaded by selecting the option **<File / Load device from file>**.

When the setting file is loaded, the Winit screen shows a setting file in grey as shown below. Select the entry at the end of the left tree view (entry appears blue) and “drag and drop” it onto the logger.

Select 2nd item with (pressed) left mouse button (=drag) and move it onto the logger node (=drop)



Confirm with **<Apply>**.

3 CAN bus

3.1 CAN-Interface

CAN is a type of network and bus system which uses 2 wires for sending data in both directions. Every CAN module connected with this network can send and receive those messages. Each message has unique address (CAN ID/ Identifier). The data are sent in packages of max 8 bytes (0-7). As the data are given in digits (raw data) they need to be converted before further use.
Each channel has a formula to convert the information into physical values.

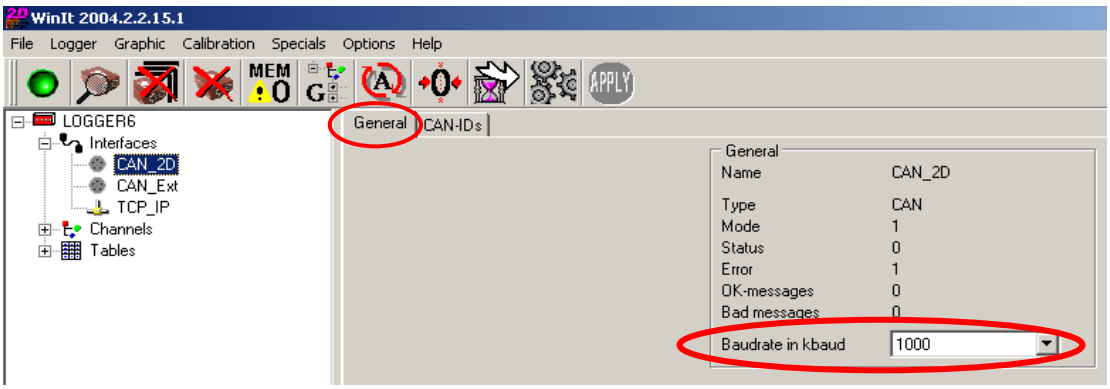
As can be seen in the branch ***<Interfaces* 2D>** a 2D module has up to 4 CAN- lines named ***CAN_2D*** and ***CAN_Ext*** for sending out data. The CAN input configuration can be found at ***<Channels>*** → ***<CAN>*** .

The point of having more than 1 CAN-line is that different modules communicating with different baud rates at the same time can be connected and data transferred. We recommend the CAN_2D line for the connection of CAN2D modules (e.g. GPS-module, DetoTempPressure-module, LSU2CAN, Dash etc.). For ECU transfer the CAN_Ext lines are an advantage to communicate with different parameters than the CAN_2D line.

3.1.1 CAN Bus speed

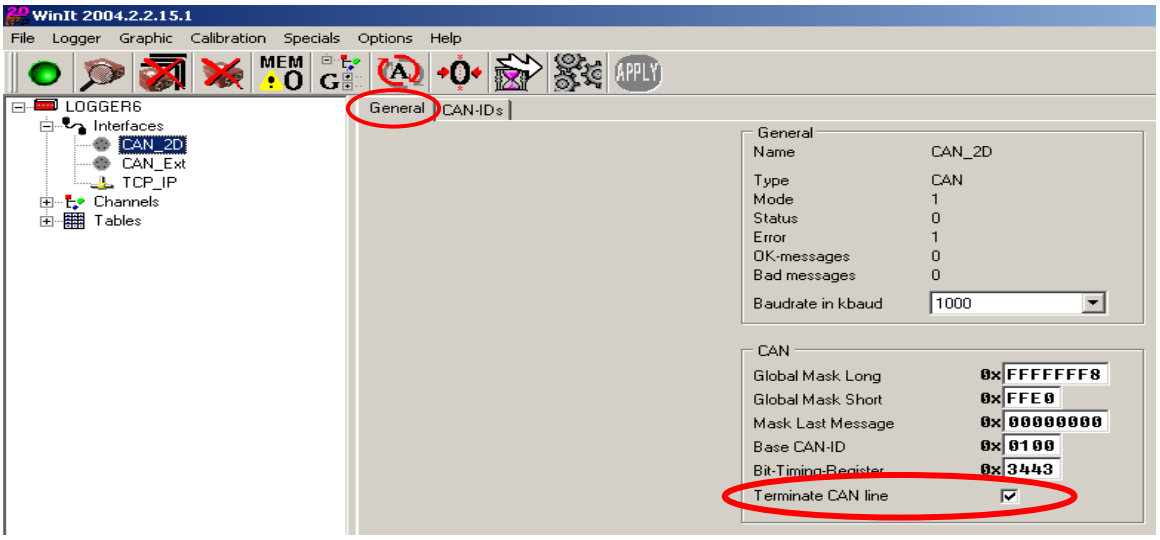
Each CAN Bus baud rate can be set individually. To adjust the rate select the CAN bus (***CAN_2D*** or ***CAN_Ext***. in the tree ***<Interfaces>*** and go to page ***<General>***.

All 2D modules have a default communication baud rate of 1 Mbaud (1000 kbaud).
If you change the baud rate make sure that all the modules the logger communicates with are at the same CAN bus speed !



3.1.2 Termination

Some 2D modules have an internal terminating resistor for each CAN line which can be enabled with a checkbox as shown in the picture. This way it is possible to terminate each CAN-line with a 120 Ohm resistor. There should be one resistor on each end of the CAN line.



4 Input channels

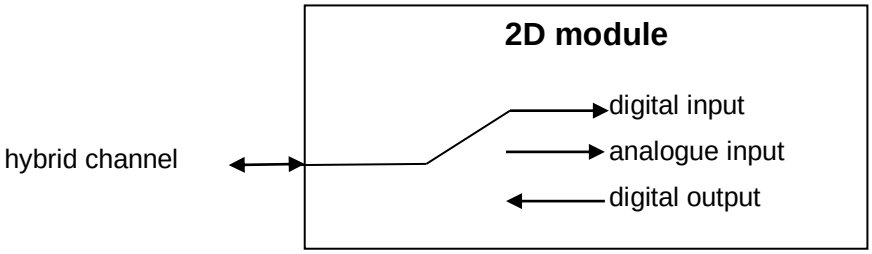
All channels have in common that their signal information is given in digits which is the unprocessed raw data. This information needs to be transferred into readable values with matching dimensions. Digits need to be multiplied with a multiplication factor and add an offset to convert into the physical value.

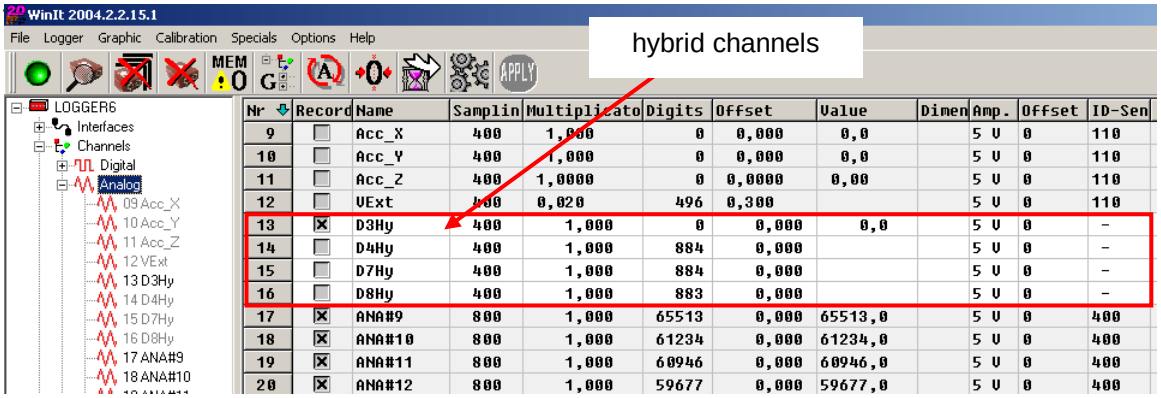
2D modules have different types of channels for different purposes:

- analogue input channels
- internal analogue channels
- digital input channels
- hybrid channels
- CAN channels
- GPS channels

4.1 Hybrid channels

Hybrid channels are inputs that can be used for analogue and digital signals. Furthermore a digital signal can be put out on this channel. This flexibility also allows monitoring the input voltage of a digital sensor. A hybrid channel can have only one function at a time.

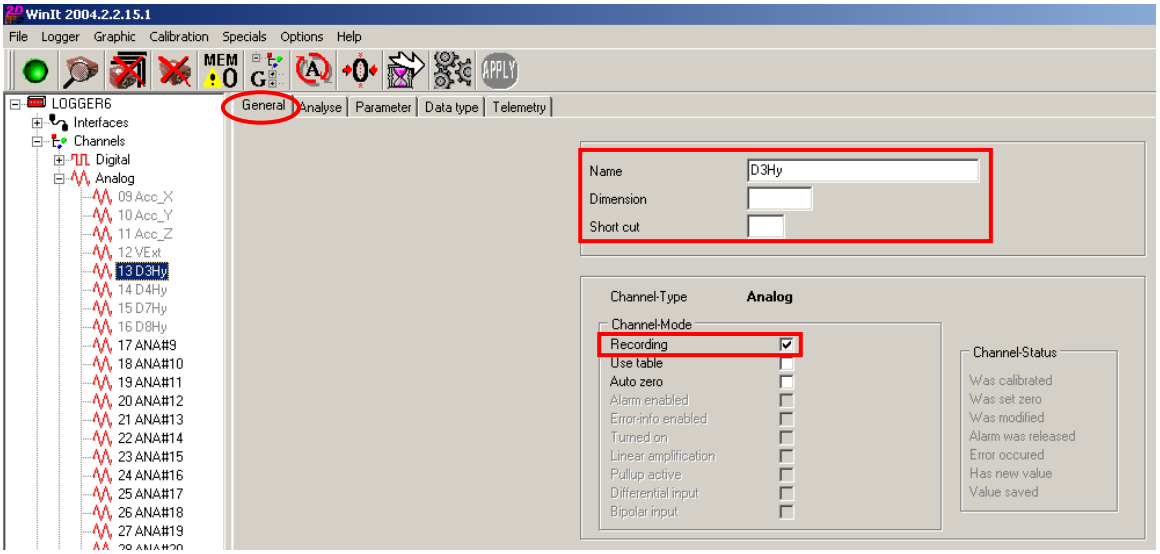




Hybrid channels have a resolution of 10 bit and a maximum range 0-20 V. Their sampling rate is ½ of the loggers basic sampling rate !

To set the channel:

1. Go to the page ***<Channels> <Analog><General>***
2. Enable the checkbox ***<Recording>***
3. Name the channel and choose a ***<Dimension>*** and a ***<Short Cut>***



For further adjustments refer to the following chapters depending if the channel is used as a analogue or digital hybrid channel.

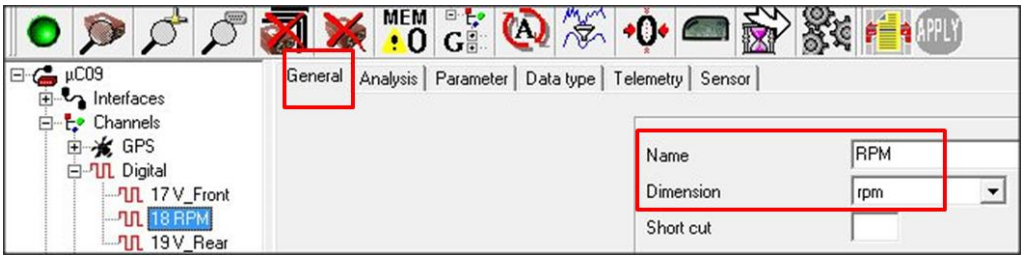
4.2 Digital Input

Digital inputs are square or sine wave signals produced by speed-, RPM- and lap sensors. The sensors receive impulses which generates signal with a rising and a falling edge. A digital channel calculates the time measured between these impulses.

4.2.1 General

At first the matching dimension for the value to be calculated should be set. To do this click on the specific channel under the tree ***<Channels>*** → ***<Digital>*** and go to page ***<General>***

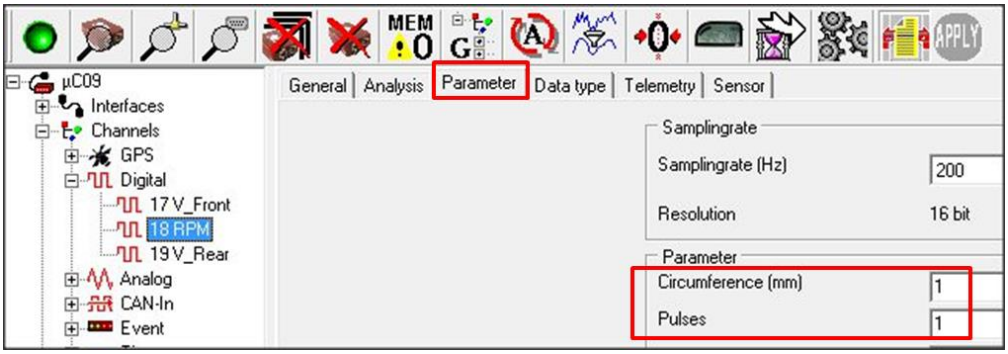
Here you can set the appropriate ***<Dimension>***. *(for speed: km/h, for rounds per minute: rpm).*
You can also change the ***<Name>*** of the channel and give it a *Short name* which might be useful for showing it on the display.



4.2.2 RPM channel

To set the rpm channel correctly in addition you must adjust the circumference and pulses in relation to each other. To do so go ***<Channels>*** → ***<Digital>*** and click on the **<rpm channel>**. Go to page ***<Parameter>*** and choose one of the settings suggested below:

Input pulses per revolution: Number of pulses that are received per engine revolution
One pulse per revolution: Circumference =1, pulses = 1
1 pulse every second revolution (camshaft sensor): Circumference =2, pulses = 1

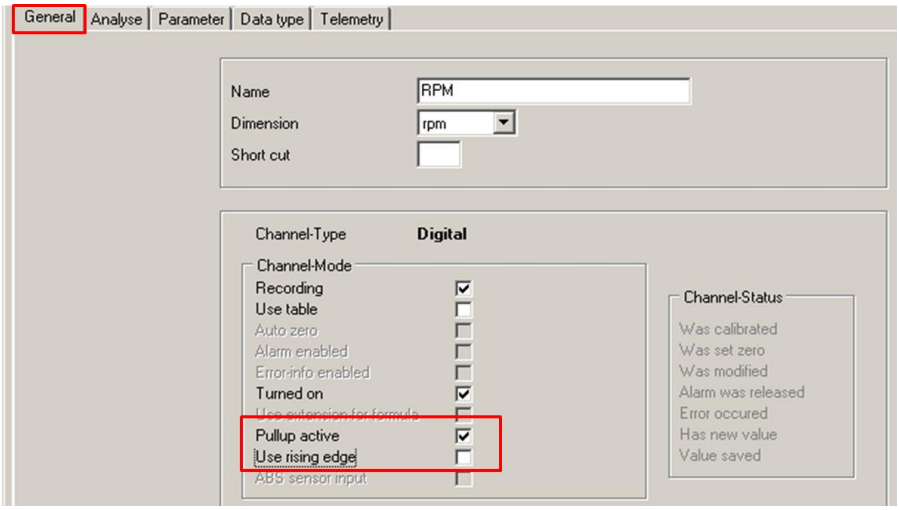


4.2.3 Pull up and edge

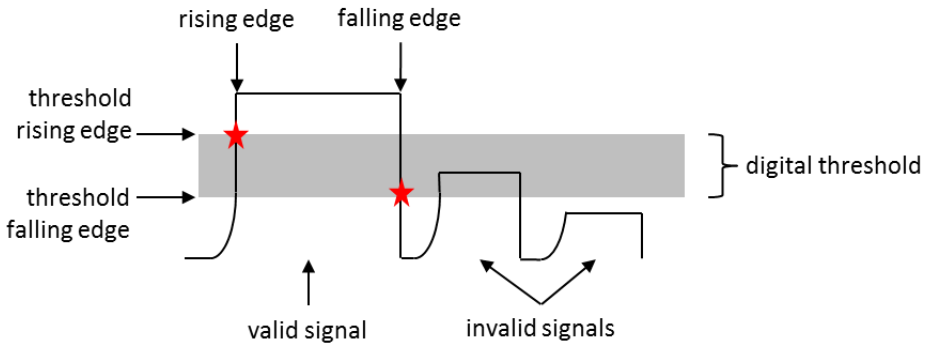
For all digital input channels you have the option of activating a pull up resistor 10 k ohm @ 12 V.
Click on the channel under ***<Channels>*** → ***<Digital>*** and activate the checkbox ***<Pullup active>***.
By doing so the signal voltage input is kept at a high level, so that an open collector sensor can be connected. An open collector sensor creates a short circuit to GND and therefore a square wave signal.

If the pull up is disabled the digital input has a pull down of 100 k ohm.

To trigger the channel through the signals rising edge enable the checkbox ***<Use rising edge>***.
If this option is not activated the logger will automatically use the falling edge of the signal. The meaning of rising and falling edge is also explained in the figure further down.

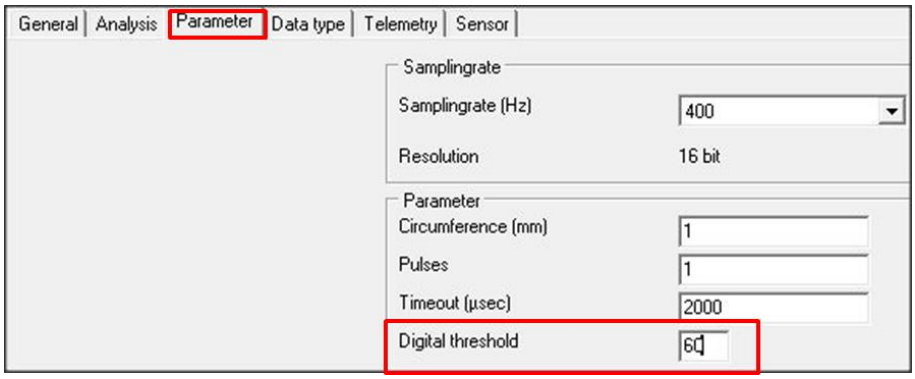


A threshold needs to be set so that the trigger level at which the signal is supposed to be low or zero can be recognized. This can be the case if an open collector sensor is connected. The sensor is not powerful enough to lower the voltage down to 0 Volt. The voltage is merely lowered down to 3 Volt. But with a threshold of 4 Volt the logger can still differ between the high and the low level signal. Therefore, you have to specify the threshold for the rising edge of the signals and the threshold of the falling edge. If the edges of the signal pass both thresholds the signals is recognized as a valid digital input signal. (see figure below, the red stars indicate the situation where the signals crosses thresholds)



Setting the threshold of the edge:

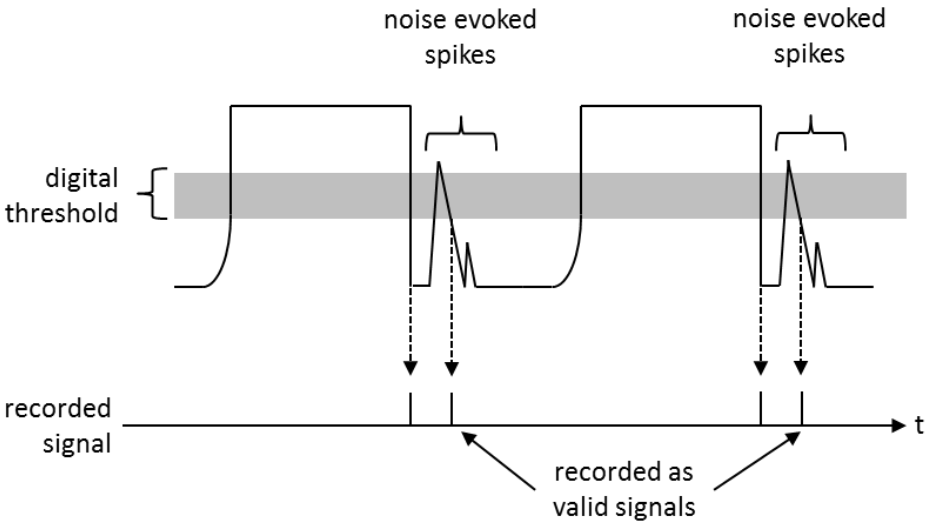
1. Select the channel
2. Go to page ***<Parameter>***
3. Set the **<digital threshold>** by using the table below



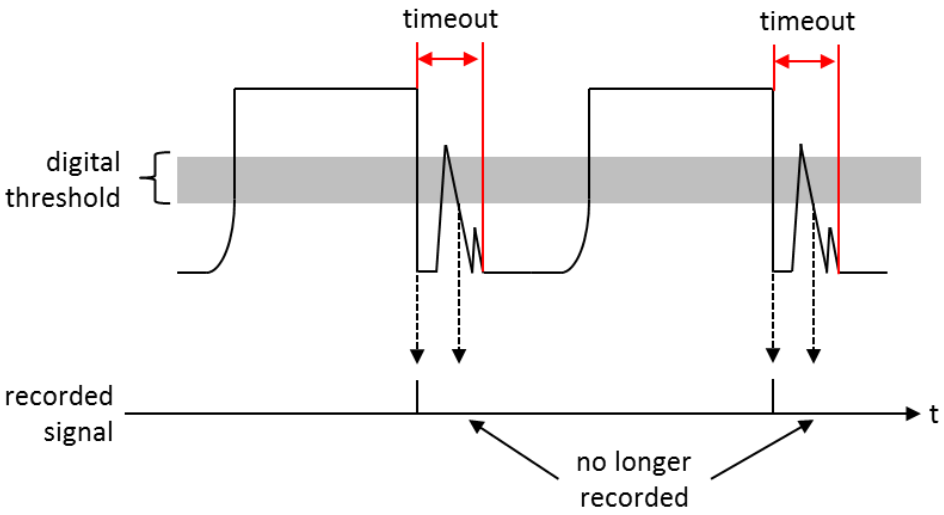
Digital threshold	Threshold rising edge [V]	Threshold falling edge [V]
1	0,04	0,00
10	0,42	0,31
20	0,84	0,64
30	1,24	0,94
40	1,63	1,26
50	2,00	1,55
60	2,36	1,84
70	2,71	2,11
80	3,05	2,38
90	3,38	2,64
100	3,70	2,89
110	4,01	3,13
120	4,31	3,37
130	4,60	3,59
140	4,88	3,82
150	5,15	4,03
160	5,42	4,24
170	5,68	4,44
180	5,93	4,64
190	6,17	4,84
200	6,41	5,02
210	6,64	5,20
220	6,87	5,38
230	7,09	5,55
240	7,30	5,72
250	7,51	5,89
255	7,61	5,97

4.2.4 Timeout and Trigger level

At higher frequencies the noise evoked spikes tend to increase. This means that they might rise above the trigger level and cause interference (see figure below).



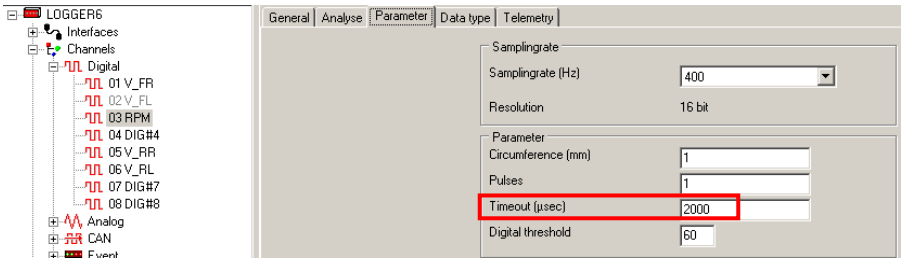
To avoid this problem it is possible to define a timeout period for the input signal. The timeout period starts as soon as the falling edge of a signal crosses the falling edge threshold. During the timeout period, the logger is “blind” on this channel. It does not react on incoming signals. After the timeout period recording of this channel continues.



The timeout needs to be set so that the noise spikes are completely masked out of the measurement. Be careful not to specify a too long timeout period because that might mask out valid signals.

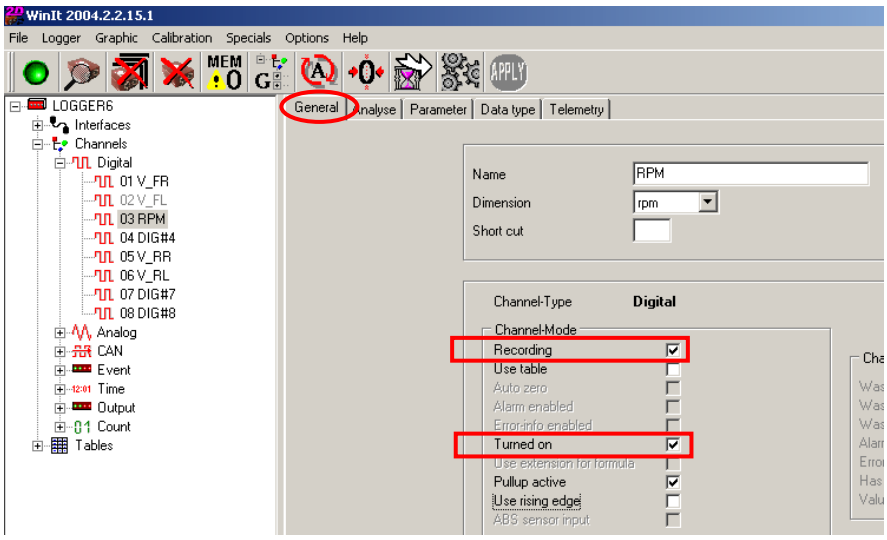
To set the timeout:

1. Select the channel
2. Go to page ***<Parameter>***
3. Set the time out in µsec
4. **<Apply>**



4.2.5 Hybrid channels as digital input

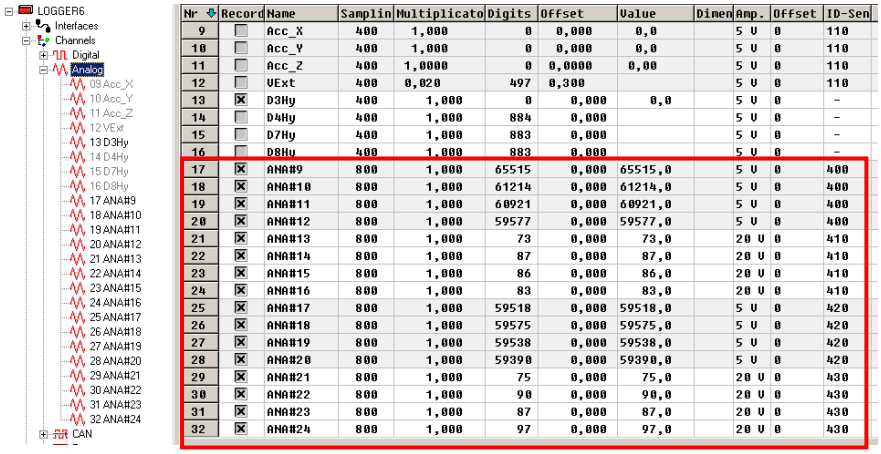
To use a hybrid channel as a digital input select the channel and go to page ***<General>***. *A*ctivate the checkbox ***<Turned on>*** and for recording also the box ***<Recording>*.**



After that you can use the channel just as a usual digital channel and set it in the same manner. (Don't forget to choose a dimension, name, and short name on page ***<General>***)

4.3 Analogue Input

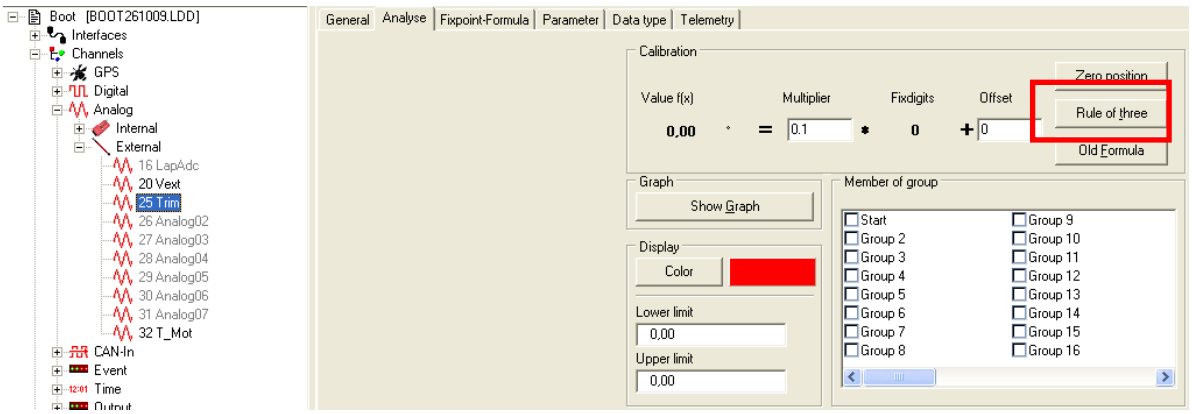
2D modules have mostly 16 bit analogue inputs and the option to use hybrid channels with 10 bit in addition. The maximum sampling rate of all analogue channels (except the internal and hybrid ones) is the same as the basic sampling rate of the logger itself. All channels are all sampled with the same frequency to minimize errors from aliasing and an average is calculated depending on the selected sampling rate.



Nr	Record	Name	Samplin	Multiplicato	Digits	Offset	Value	Dimen	Amp.	Offset	ID-Sen
9	☐	Acc_X	400	1,000	0	0,000	0,0		5 V	0	110
10	☐	Acc_Y	400	1,000	0	0,000	0,0		5 V	0	110
11	☐	Acc_Z	400	1,0000	0	0,0000	0,00		5 V	0	110
12	☐	VExt	400	0,020	497	0,300			5 V	0	110
13	☒	D3Hy	400	1,000	0	0,000	0,0		5 V	0	-
14	☐	D4Hy	400	1,000	884	0,000			5 V	0	-
15	☐	D7Hy	400	1,000	883	0,000			5 V	0	-
16	☐	D8Hy	400	1,000	883	0,000			5 V	0	-
17	☒	ANA#9	800	1,000	65515	0,000	65515,0		5 V	0	400
18	☒	ANA#10	800	1,000	61214	0,000	61214,0		5 V	0	400
19	☒	ANA#11	800	1,000	60921	0,000	60921,0		5 V	0	400
20	☒	ANA#12	800	1,000	59577	0,000	59577,0		5 V	0	400
21	☒	ANA#13	800	1,000	73	0,000	73,0		20 V	0	410
22	☒	ANA#14	800	1,000	87	0,000	87,0		20 V	0	410
23	☒	ANA#15	800	1,000	86	0,000	86,0		20 V	0	410
24	☒	ANA#16	800	1,000	83	0,000	83,0		20 V	0	410
25	☒	ANA#17	800	1,000	59518	0,000	59518,0		5 V	0	420
26	☒	ANA#18	800	1,000	59575	0,000	59575,0		5 V	0	420
27	☒	ANA#19	800	1,000	59538	0,000	59538,0		5 V	0	420
28	☒	ANA#20	800	1,000	59390	0,000	59390,0		5 V	0	420
29	☒	ANA#21	800	1,000	75	0,000	75,0		20 V	0	430
30	☒	ANA#22	800	1,000	90	0,000	90,0		20 V	0	430
31	☒	ANA#23	800	1,000	87	0,000	87,0		20 V	0	430
32	☒	ANA#24	800	1,000	97	0,000	97,0		20 V	0	430

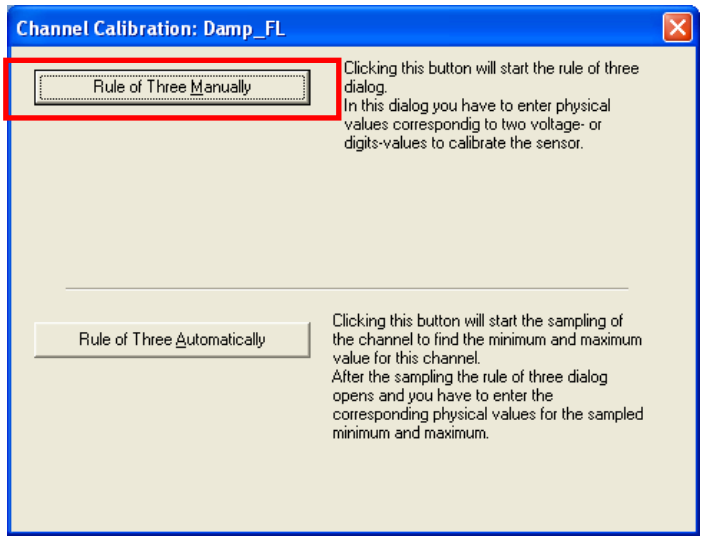
4.3.1 How to calibrate a sensor

1. Click on the channel and go to **<Rule of three>** in the tab Analyse.

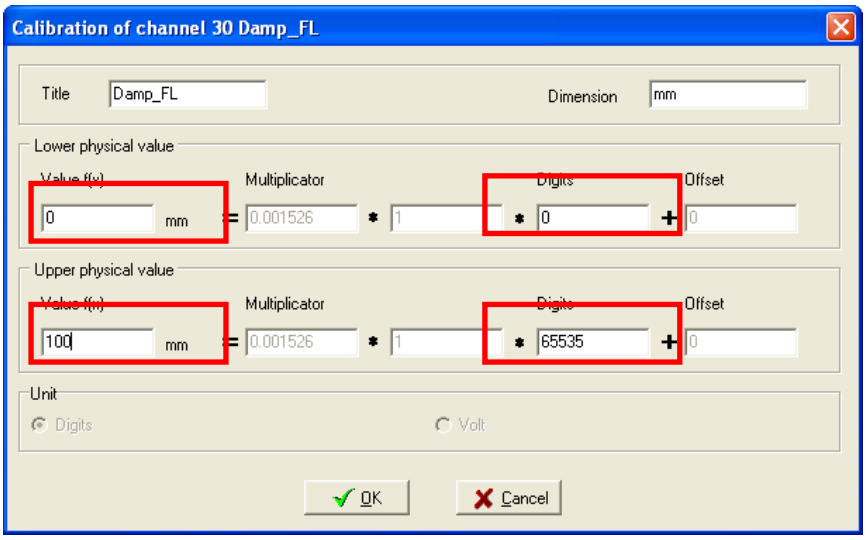


2. There are 2 different ways to calibrate the sensor. Use **<Manually>** if the calibration values are known e.g. 0V->0mm 5V->100mm Go to step 3

Use **<Automatically>** to move the sensor in 2 positions (mostly used for displacement measurement but also possible with pressures, temps,..) and specify the corresponding physical values. Go to step 5

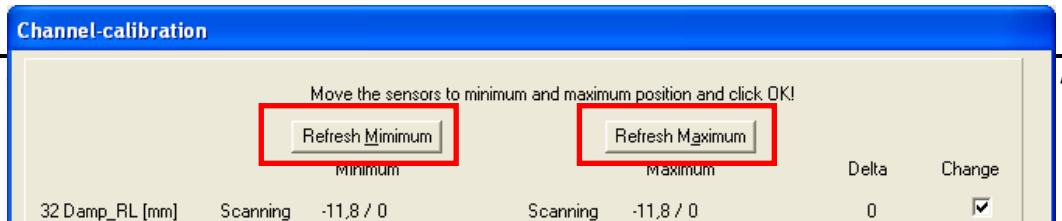


3. Enter the **Lower** and **Upper physical value** in the boxes.

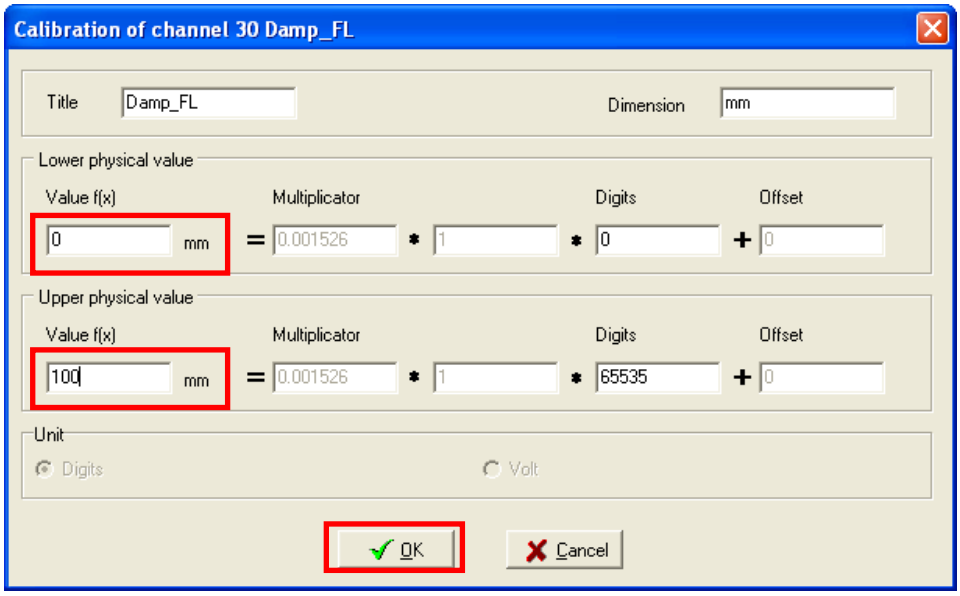


4. Confirm with **<OK>**.

5. Move the Sensor to its Minimum Position and Click on **<Minimum>.** Move the Sensor to its Maximum Position and Click on **<Maximum>** and confirm with **<OK>.**

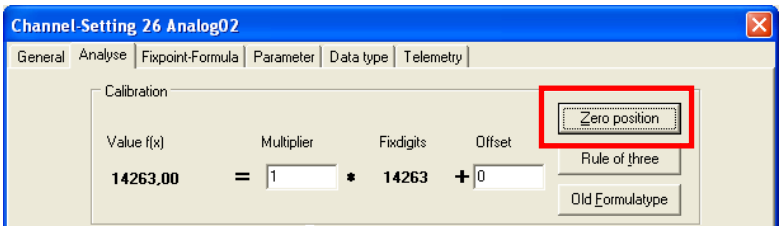


6. In the boxes enter the **Lower** and **Upper physical value** that you have moved the sensor to and confirm with **<OK>**.

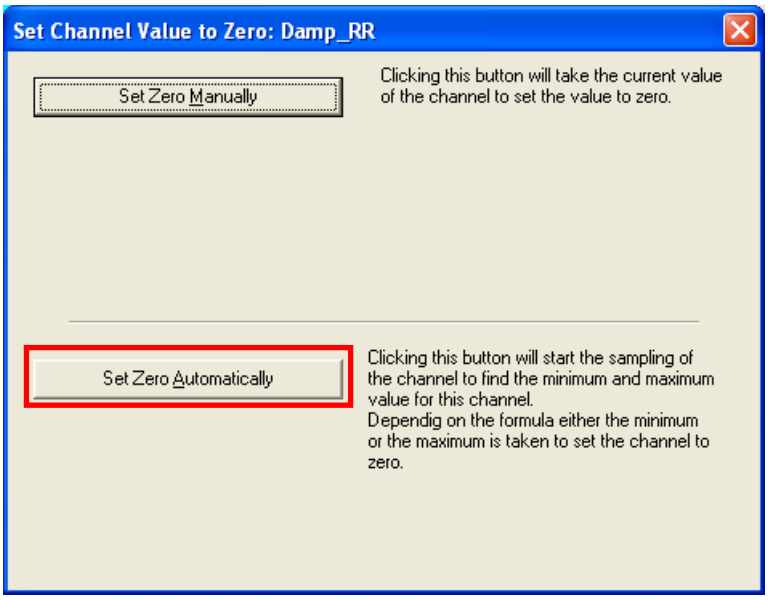


4.3.2 How to set a channel into Zero position

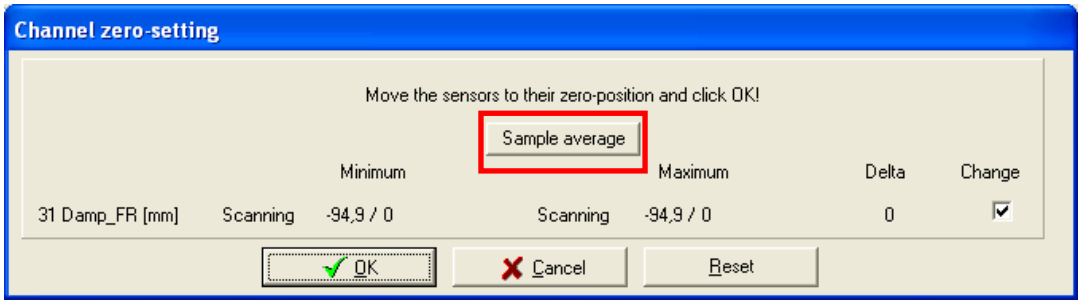
1. Sensors can be set to 0 via the button **<Zero>.**



2. If the following window pops up click on **<Set Zero Automatically>.**



3. When the sensor is in its true zero position press **<Sample average>** and **<OK>** to confirm.



4.3.3 Input range

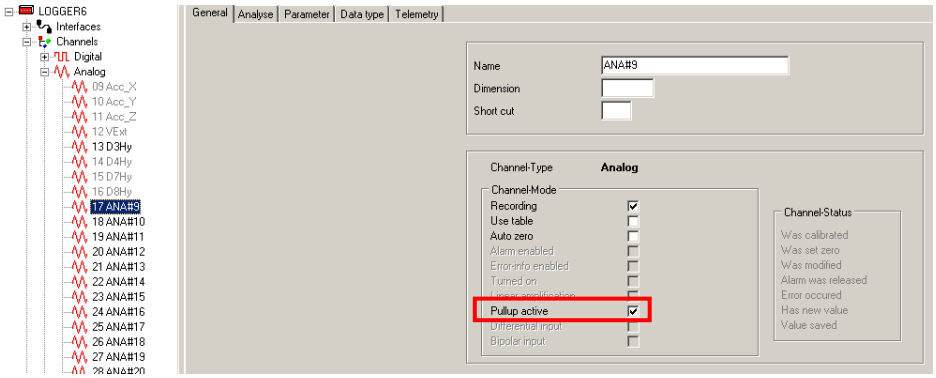
On some modules it is possible to vary the input range analogue channels between 0-5 V 0-10V and 0-20V. To do so, click on the channel under ***<Channels>*** → ***<Analog>*** and go to page ***<Parameter>*** where you can choose the input range.

4.3.4 Pullup

For some analogue channels there is the possibility of activating a pull up resistor. This causes the signal voltage to stay at high level so that an open collector or NTC sensor can be connected.

Click on one of these channels under ***<Channels>*** → ***<Analog>*** and go to page ***<General>***.

By activating the pullup you are connecting a 4.7 kOhm internal resistor to the 5V current. When using it together with a 2D temperature sensor an inverted table for the sensor has to be used! (table: NTC_L6.tbl)



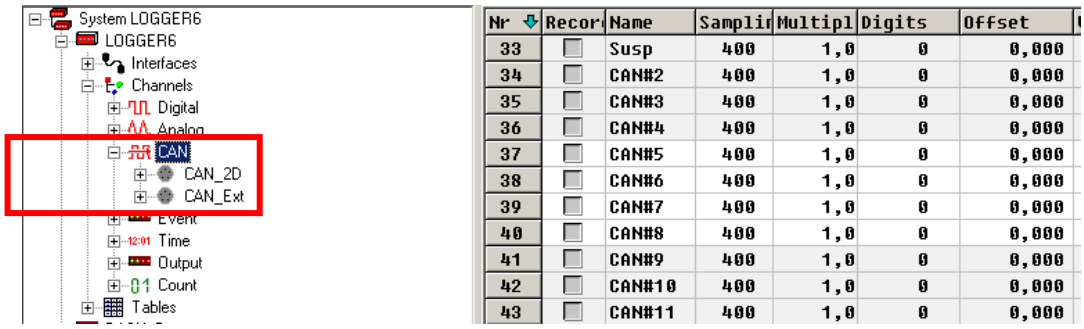
4.4 Internal channels

These channels can be calibrated just as any other analogue channel.
The difference is that they do not have an external connection. They are fixed sensors integrated into the module itself such as acceleration (ACC_X, ACC_Y, ACC_Z) or the modules supply voltage (Vext).

4.5 CAN input channels

4.5.1 General

Each 2D module has a fixed number of CAN input channels which can be moved to any of the CAN nodes depending where they are needed. When opening the path in a new 2D module you will find all CAN input channels under ***<Channels>*** → ***<CAN>*** → ***<CAN_2D>***. Here you will also find the additional ***CAN_Ext*** paths which will be empty.



Nr	Recor	Name	Samplir	Multipl	Digits	Offset
33		Susp	400	1,0	0	0,000
34		CAN#2	400	1,0	0	0,000
35		CAN#3	400	1,0	0	0,000
36		CAN#4	400	1,0	0	0,000
37		CAN#5	400	1,0	0	0,000
38		CAN#6	400	1,0	0	0,000
39		CAN#7	400	1,0	0	0,000
40		CAN#8	400	1,0	0	0,000
41		CAN#9	400	1,0	0	0,000
42		CAN#10	400	1,0	0	0,000
43		CAN#11	400	1,0	0	0,000

In the paths <***CAN_2D***> and <***CAN_Ext***> you can only set parameters for incoming data !

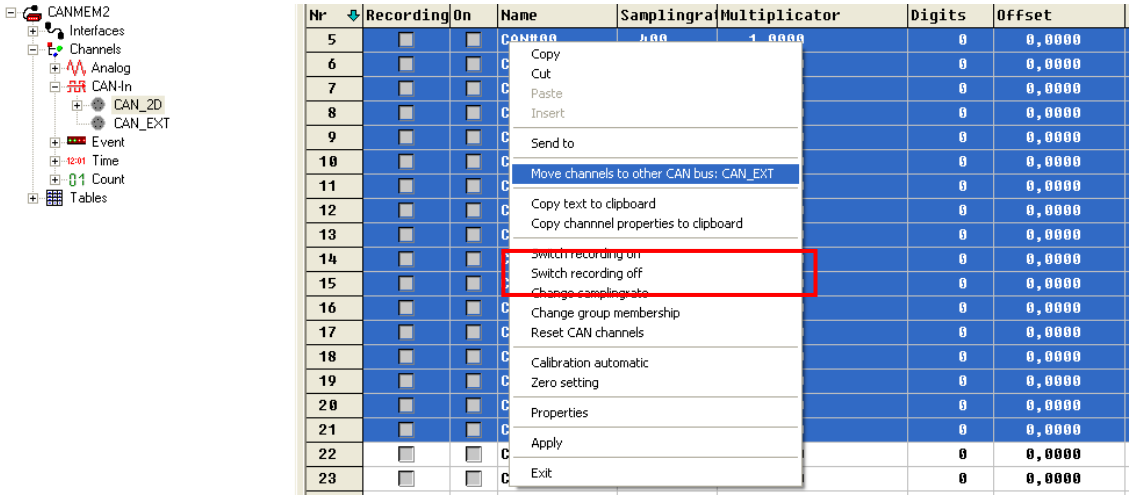
4.5.2 Distribution of the CAN channels

To be able to record incoming data on of the *CAN_Ext* you will need to move channels to this CAN node. Moving channels back and forth between the two paths is possible at any time. The channel number is moved with the channel therefore one might find some gaps in the CAN list order.

When channels are moved pay attention to the background of the grid. You will notice 4 channels with a white background followed by 4 channels with a grey background always taking in turns. Each group channels with the same background represents 8 bytes containing four 16 bit channels. One group can be sent with one identifier (meaning of this is explained in chapter Send/Routing channels). Make sure to move channels group wise. (Always 4/8/12 channels) !

To move CAN channels:

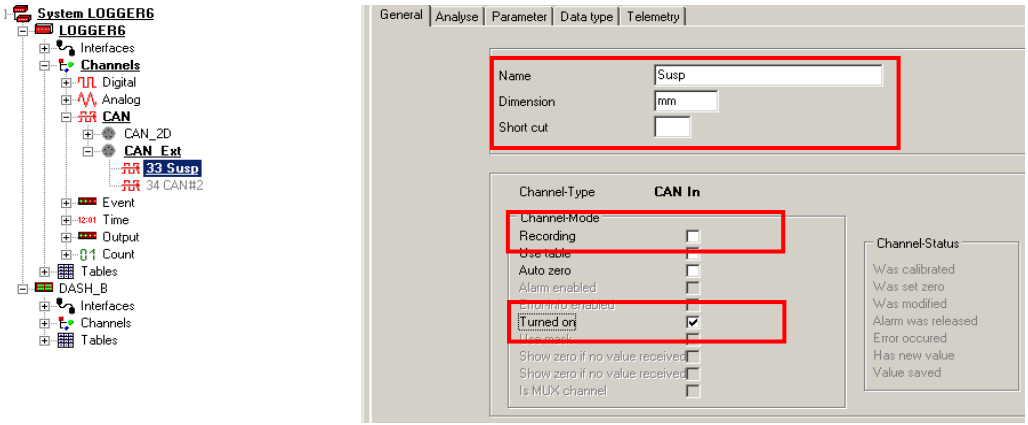
1. Select the path ***<Channels> → <CAN> → <CAN_2D>***
2. Select the channels to be moved
3. Use the right mouse button and select ***<Move channels to other CAN bus>***
4. Select the CAN path where you want to put the channels
5. Apply the changes



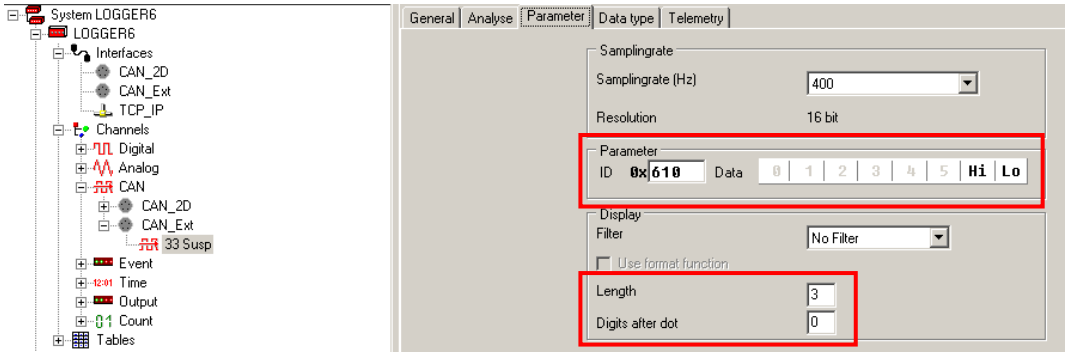
4.5.3 Setting CAN channel properties manually

To record the CAN channels:

1. Go to the channel under ***<Channels> → <CAN> → <CAN_2D/ CAN_Ext>***
2. On page ***<General>*** you can ***<Name>*** your channel and give it a ***<Dimension>*** and ***<Short cut>***
3. Activate the checkbox ***<Turned on>***
4. Activate the checkbox ***<Recording>***



5. Move to the page ***<Analyze>*** to set the multiplicator and offset
6. Go to the Page ***<Parameter>*** and set the receiving CAN-ID. (This is not necessary if working with 2D devices as channel properties can be copied form module to module) There you can also define the pre-decimal digits and the length of the displayed numbers
7. Go to the Page ***<Data type>*** and tick the box ***<Digits are signed>*** if the received message contains a sign bit.
8. Apply the changes



Notice: Step 5 and Step 6 are only necessary if you **don't** copy and paste the channels out of a 2D path. Otherwise these settings are automatically transferred with the channel !
If the length is to short *** will be shown instead of the physical value !

4.5.3.1 Masking CAN channels

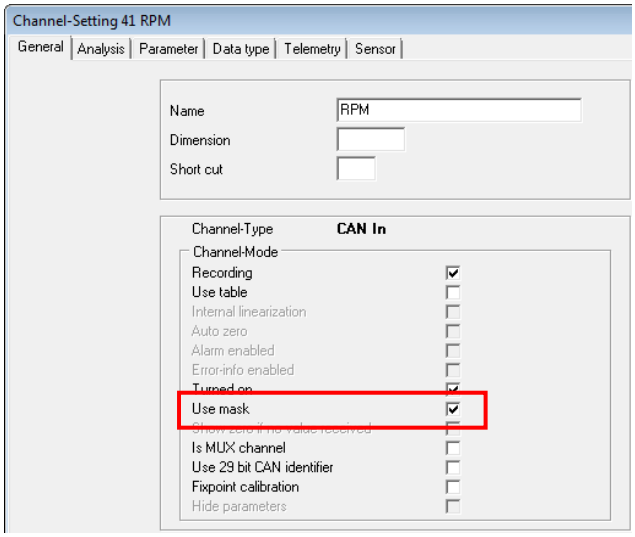
If less than 16 or 8 Bits should be recorded the CAN values need to be masked to filter out unwanted information (bits).

Practical example: only Bit 4 out of a 8 Bit channel should be recorded

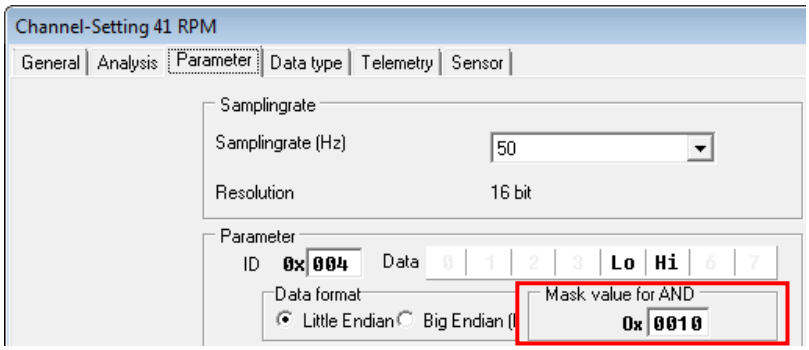
Bit Position	7	6	5	4	3	2	1	0
Decimal	128	64	32	16	8	4	2	1
Mask	0	0	0	1	0	0	0	0

The Bits that should be recorded need to be masked with 1. The decimal value of each Bit position is 2^N in this case 2^4 =16 which can be calculated via Windows calculator into the hexadecimal value that is needed for the software input 0x0010. If more than one Bit should be recorded the decimal numbers of all masking Bits are summed up and then calculated into the hex value.

Activate the **<Use mask>** function



Put in the masking value into the box shown below and send all changes to the module with **<Apply>.**

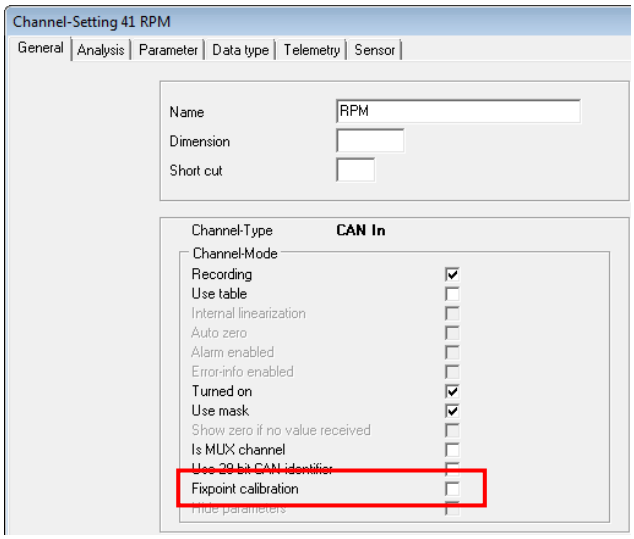


When channels are masked it is necessary to scale the output. In this example the channel output would be either 16 or 0, but with correct scaling it is 1 or 0 as only 1 bit is used. For details refer to next chapter.

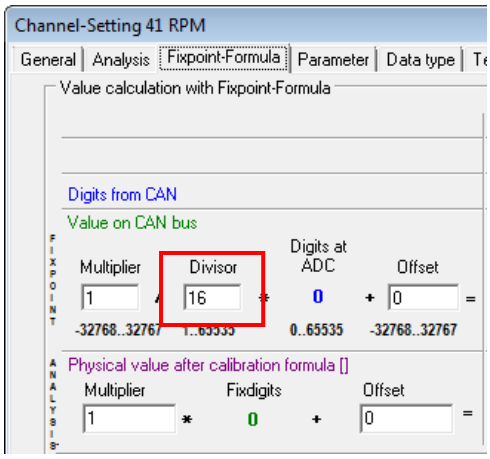
4.5.3.2 Scaling masked CAN channels

When CAN channels are masked they need to be scaled to avoid misreading. E.g if the 4th Bit of a channel is used the value without scaling would be either 16 or 0 instead of 1 or 0 what it should be.

CAN channels are scaled by enabling **<Fixpoint calibration>**



Put the value of the least significant bit as a decimal value in the box shown below and **<Apply>** the changes. For this example the 4th Bit is the least significant Bit which translates to the value of 16.



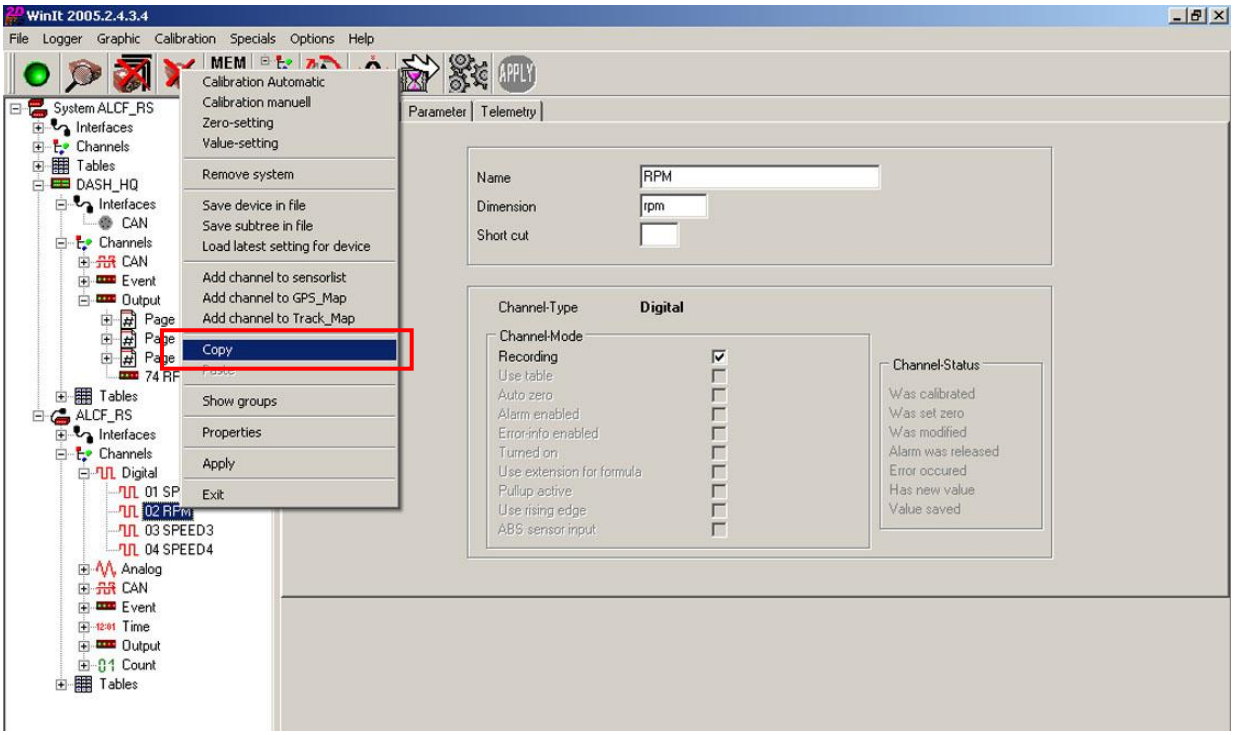
4.5.4 Importing CAN channels from 2D modules

The program Winit takes all necessary steps to transmit channel values from one 2D module to another by just copying and pasting the channel properties. All channels can be source channels to be send out onto the CAN bus.

4.5.4.1 How to copy a reference channel

To copy the reference channel, proceed as follows:

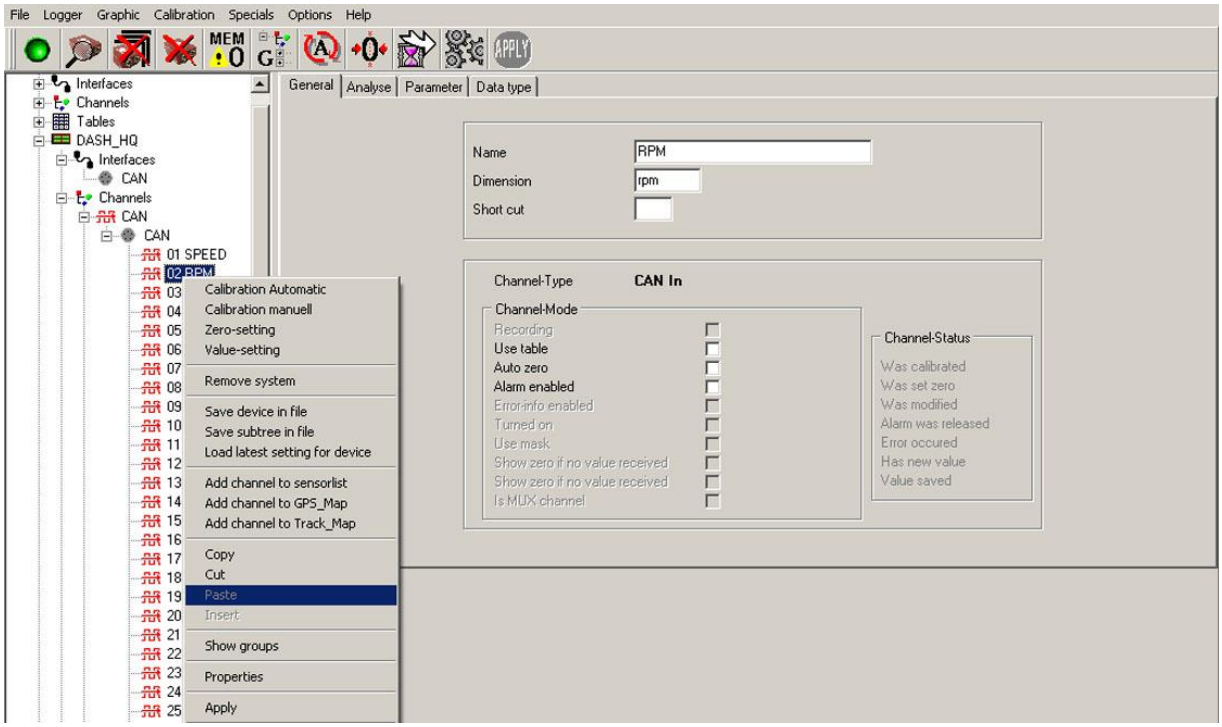
1. In the tree view choose the 2D module that is the source of the channel
2. Select a channel for example <*RPM*> from the logger digital group
3. In the context menu (right mouse key) select ***<Copy>***



4.5.4.2 How to paste a reference channel

- Click left in the CAN to choose an empty channel.
- Click right and select ***<Paste>*** from the context menu to insert the channel.

Instead of the mouse keys you can also use the **<STRG + C>** shortcut for copy and **<STRG + V>** for paste.

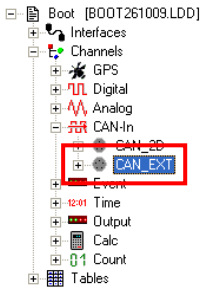


The received values of this channel will be shown with the formula that has been copied from the 2D source module.

4.5.5 Importing CAN channels via DBC file

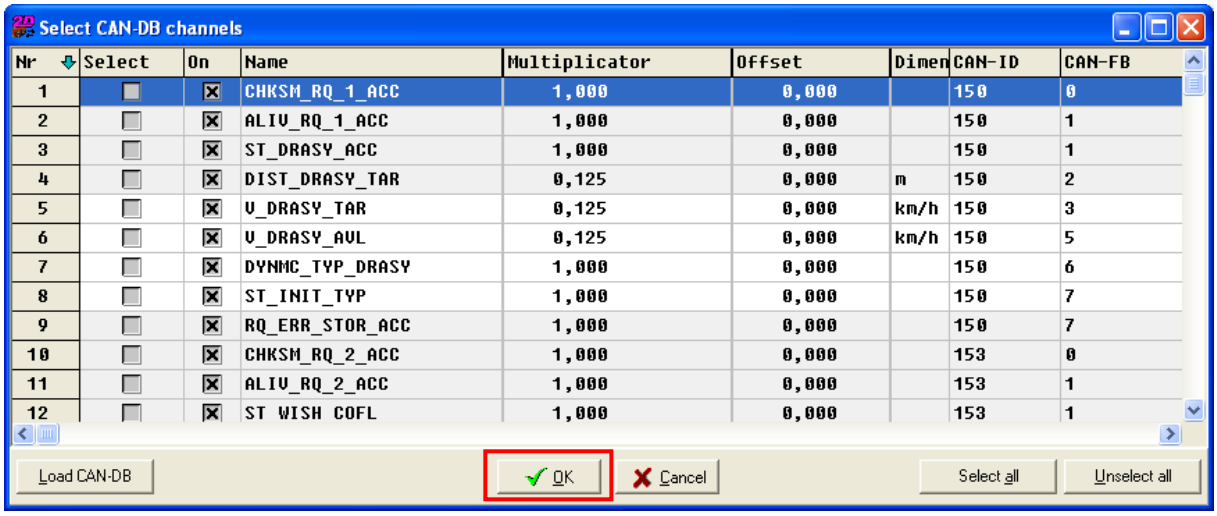
In a DBC file all necesarry information are stored so that 3rd party CAN module values can be received. Only CAN transmission speed and termination have to be adjusted manually if needed.

1. Select the CAN bus on CAN-In where the source module is connected.



Nr	Recording	On	Name	Samplingra	Multiplicator	Digits	Offset
41	☐	☐	CAN#1	50	1,000	0	0,000
42	☐	☐	CAN#2	6,25	1,000	0	0,000
43	☐	☐	CAN#3	6,25	1,000	0	0,000
44	☐	☐	CAN#4	6,25	1,000	0	0,000
45	☐	☐	CAN#5	50	1,0000	0	0,0000
46	☐	☐	CAN#6	25	1,000	0	0,000
47	☐	☐	CAN#7	6,25	1,000	0	0,000
48	☐	☐	CAN#8	400	1,0000	0	0,0000
49	☐	☐	CAN#9	6,25	1,000	0	0,000
50	☐	☐	CAN#10	6,25	1,0000	0	0,0000

2. Go to **<File/Import/CAN-DB>** and choose the DBC file to be imported.
3. Choose the channels to be imported and press **<OK>**.
4. Send the changes to the 2D module with **<Apply>**.



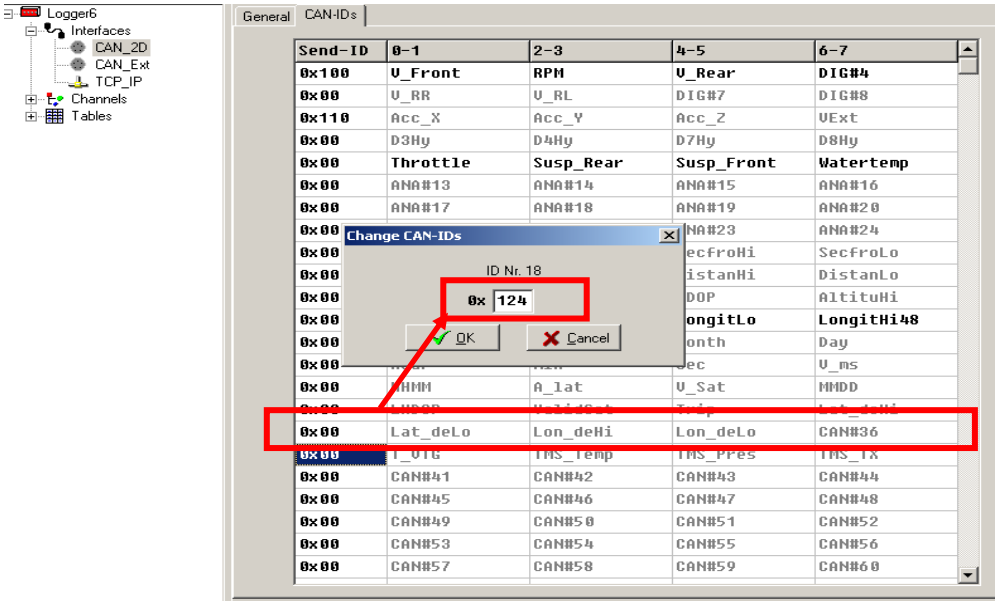
Nr	Select	On	Name	Multiplicator	Offset	Dimen	CAN-ID	CAN-FB
1	☐	☒	CHKSM_RQ_1_ACC	1,000	0,000		150	0
2	☐	☒	ALIV_RQ_1_ACC	1,000	0,000		150	1
3	☐	☒	ST_DRASY_ACC	1,000	0,000		150	1
4	☐	☒	DIST_DRASY_TAR	0,125	0,000	m	150	2
5	☐	☒	V_DRASY_TAR	0,125	0,000	km/h	150	3
6	☐	☒	V_DRASY_AVL	0,125	0,000	km/h	150	5
7	☐	☒	DYNMC_TYP_DRASY	1,000	0,000		150	6
8	☐	☒	ST_INIT_TYP	1,000	0,000		150	7
9	☐	☒	RQ_ERR_STOR_ACC	1,000	0,000		150	7
10	☐	☒	CHKSM_RQ_2_ACC	1,000	0,000		153	0
11	☐	☒	ALIV_RQ_2_ACC	1,000	0,000		153	1
12	☐	☒	ST_WISH_COFL	1,000	0,000		153	1

Routing CAN channels

It is possible to send the channels on the bus ***<CAN_2D>*** with the one identifier (e.g. 0x100) and also send the same channels on another bus ***<CAN_Ext>*** with a different identifier (e.g. 0x1A3). This can be useful for transferring information coming in from one module through the logger to a different module, for example to show channels received from an ECU (electronic control unit) on Dash or to send data from 2D sensors to an ECU.

If for example data are received on CAN_Ext and should be send onto CAN_2D:

1. Go to ***<Interfaces> <CAN_2D>*** Tab CAN ID´s
2. By double clicking on a row it is possible to change the send ID.

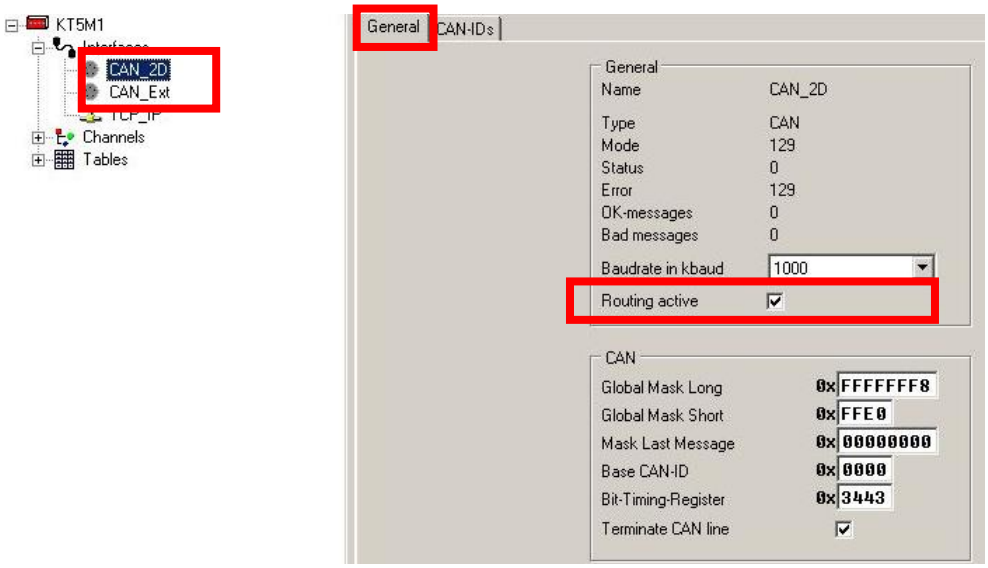


To change the byte order you will need to exchange channels you want to change with one another.

4.5.6 Deactivating 2D protocol routing over CAN

Routing means that the 2D communication protocol is transferred onto the CAN bus. This option is set by default and should only be turned off if the protocol interferes with other CAN messages on that bus.
If this option is activated it allows communication between logger and connected 2D modules back and forth via CAN line.

1. Go to ***<Interfaces>*** → ***<CAN_2D>*** or ***<CAN_Ext>***.
2. Activate the checkbox ***<Routing active>*** on page ***<General***>.



You will only find other 2D CAN devices connected to the system if the 2D protocol routing for this bus is active !

4.6 GPS channels

Some 2D modules have internal GPS channels. The incoming data are processed and can be recorded and send out to other modules. No adjustment of these channels is necessary. Depending on the type of module not all channels might be available.

Description	Channel	Dimension
Speed of object	V_Sat	[km/h]
Validity & number of satellites	ValidSat	
Hour and minutes	HHMM	
Satellite course (direction)	Course	[° dezimal]
Latidude	Lat_dez	[° dezimal]
Longitude	Lon_dez	[° dezimal]
Altitude	Altitude	[m]
Horizontal position	HDOP	
Month / Day	MMDD	
Second/Hundreth	SSHH	
Acceleration (lateral)	A_lat	[m/s^2]
Acceleration (longitudinal)	A_lon	[m/s^2]
Minutes / Seconds	MMSS	
GPS Fix data	CGA	
Track mode and ground speed	VTG	
Current year	Year	Y
Current month	Month	M
Current day	Day	D
Current hour	Hour	h
Current minute	Min	m
Current second	Sec	sec
Hundredths of seconds	HSec	sec
Latitude	Latitude	[° , min]
Longitude	Longitud	[° , min]
Seconds since midnight	SecfromM	[sec]
Current date	Date	
Distance	Distance	[m]
Lean angle of a bike in a corner	Banking	°
Turning speed of the vehicle	YawRate	°/s

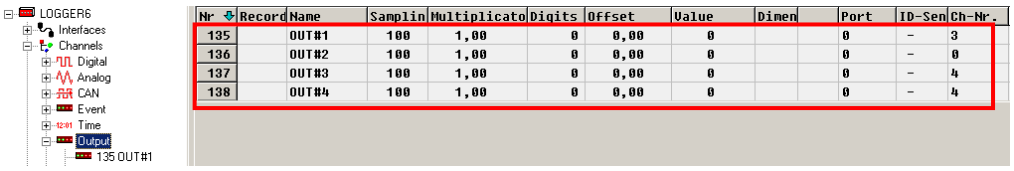
5 Output channels

5.1 Hybrid channels as digital output

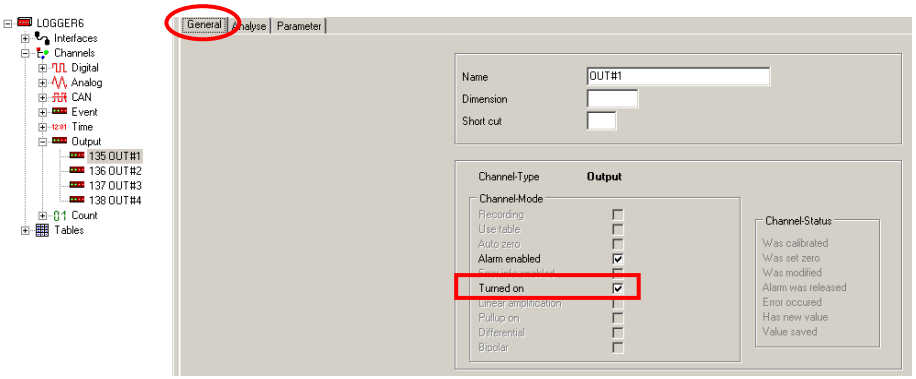
Hybrid channels can only be used as digital output. Make sure that this hybrid channel is not used as an input at the same time.

5.1.1 General

You can use the outputs either as a normal digital output (0V/12V) or combined with the internal pullup. Here the power supply comes from the logger itself.



To use a hybrid channel as an output activate the checkbox ***<Turned on>*** under ***<Channels>*** → ***<Output>*** page ***<General>***.



To set the channel and correct edge for triggering the output you will need to move to the page ***<Parameter>***. Set both high and low levels using a hysteresis. (E.g. for rpm that could be: turn off if less than 15000; turn on if higher than 15500)

5.1.2 Open collector output

An open collector output with an external power supply, enables the possibility to switch to a charge.

Follow these steps to use the open collector output:

1. Go to tree ***<Channels>*** → ***<Digital>***
2. Disable the checkbox ***<Pullup active>*** of the digital channel that should be used as open collector output.
3. After *applying* you can use the channel as an open collector output with 200mA.

Maximum current = 200 mA per output channel!

5.1.3 Voltage output

1. Go to the tree ***<Channels>*** → ***<Digital>***
2. Activate the checkbox ***<Pullup active>*** of the digital channel that should be used as an output channel.
   → After applying you can use this channel as a normal output (0V/12V)

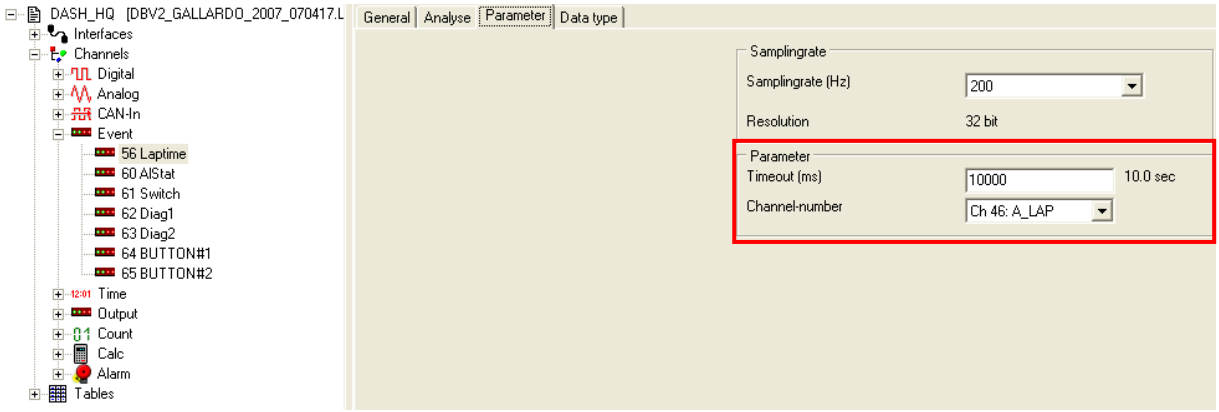
Impedance= 10 k ohm @ 12V !

6 Event channels

6.1 The Laptime channel

The laptime-channel allows to set a userdefined channel to trigger laptimes in the 2D module.

This function can be found in the path **<Channels> <Event> <Laptime>**. Turn on this function by setting the box **<Turned on>** in the tab **<General>**. In tab **<Parameter>** the triggering channel can be set at **<Channel-number>**. Whenever the assigned channel changes its value the laptime is updated and the laptime counter set to 0. **<Timeout>** set's the time in milliseconds until next trigger is accepted. **<Samplingrate>** set's the frequency that the triggering channel is checked for changes.



6.2 The Sectiontime channel

The Sectiontime-channel allows to set a userdefined channel to trigger sectiontimes in the 2D module. For adjustments refer to the previous chapter.

7 Time channels

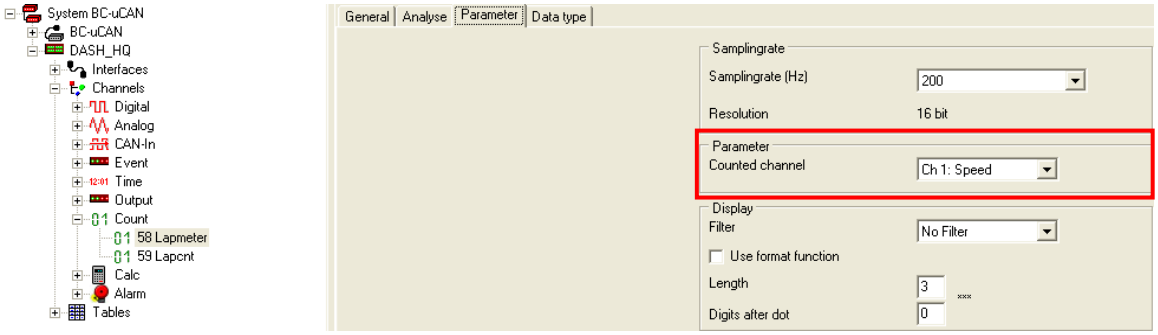
- Systime, is the time since the system is powered
- Rectime is the time since the 2D module is recording

8 Count channels

8.1 Lapmeter

The lapmeter channel integrates the assigned speed channel to show the driven distance in the current lap.

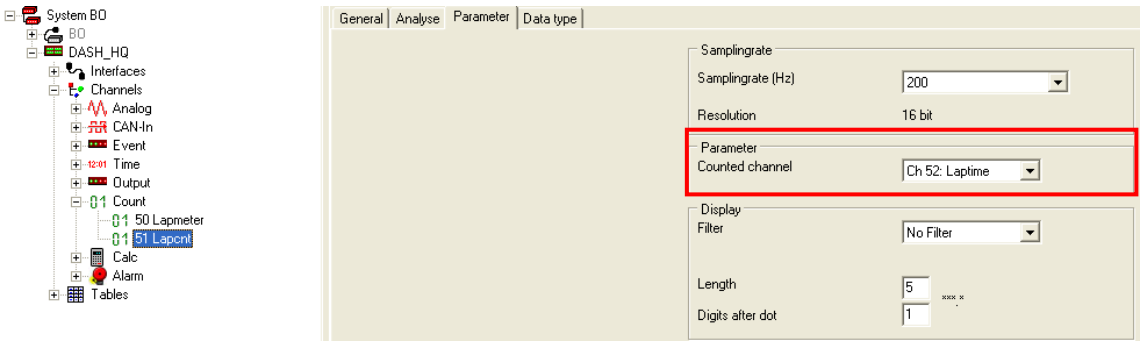
In the tab **<Parameter> <Counted-channel>** a valid speed channel has to be assigned.



8.2 Laps

The Laps-channel contains the value of driven laps since startup of the system.

In the tab **<Parameter> <Counted-channel>** a valid laptime channel has to be assigned.



8.3 Additional count channels

- CNT_VFro counts the driven distance on the front wheel, assign the front speed sensor
- CNT_VRea counts the driven distance on the rear wheel, assign the rear speed sensor
- CNT_RPM counts the revolutions of the engine, assign the RPM sensor
- SecMeter
- Secs

9 Calculation channels

A Calc-channel allows modifications to existing channels via mathematical formulas.By using the multiplicator and offset, the calculation result is changed into a displayable and transferable 16-bit value. The new Calc-channel can also be used to trigger alarm functions.

9.1 Calculation functions

For a detailed description of the individual functions refer to the Calc-tool manual
Art.No.: AC-DOC_CalcTool_e-000
Take a look at the 2D Homepage or the 2D CD-ROM <Support><Download><2D manuals><Software manuals> <The 2D Reference manual for the 2D software>→ "Calculate and editing channels"

Implemented are all the standard arithmetic functions: +, -, *, /, %(modulo)

Extended arithmetic functions: ^, sqrt(), ln(), log10(), abs(), der() "derivate", sum()

Comparative functions: <,<=,>,>=,==

Binary functions: & (binary AND), | (binary OR)

Logical functions: && (logical AND), || (logical OR), !(logical not), ~(binary not)

Trigonometric functions: rad(),deg(),sig(),sin(),cos(),tan()
asin(),acos(),atan(),dsin(),dcos(),dtan(),dasin(),dacos(),datan()

Min-max functions:
min(#x,#y) calculated channel is the minimum of channel x and y

max(#x,#y) calculated channel is the maximum of channel x and y

hmin(#x,t) calculated channel holds the minimum of channel x for a time t in seconds

hmax(#x,t) calculated channel holds the maximum of channel x for a time t in seconds

Conditional function:
if(#x, comparative function, constant or channel, true value, false value)

Non-linear functions
tab(table number, #channel or formula with channel) allows to create a non-linear calculation channel via an assigned table

Filter functions
flt(#channel, time in sec), tau filter

9.2 Variables for calculation functions

3 types of variables can be used for calculations or storing channel values permanently.

1. Variable x will be set to 0 after the Dash is unpowered. X represents the channel value of the previous sample.

   Example: counting the number of samples
   At every sample point 1 is added to the previous value of x.
   Calculation formula: x+1

2. Variables m1 …m6 keep the last value after power off and can be erased by pressing Empty(F3) in Winit.

   Example: Count the number of detonations in a run
   The channel Deto that is 1 when detonation occurs and 0 when the engine runs smoothly is counted with the help of the variable m1.
   Calculation formula: m1=(m1+#Deto)

3. Variables p1 and p2 keep the last value after power off and cannot be erased. They should be used for example as distance counter or lifetime counter.

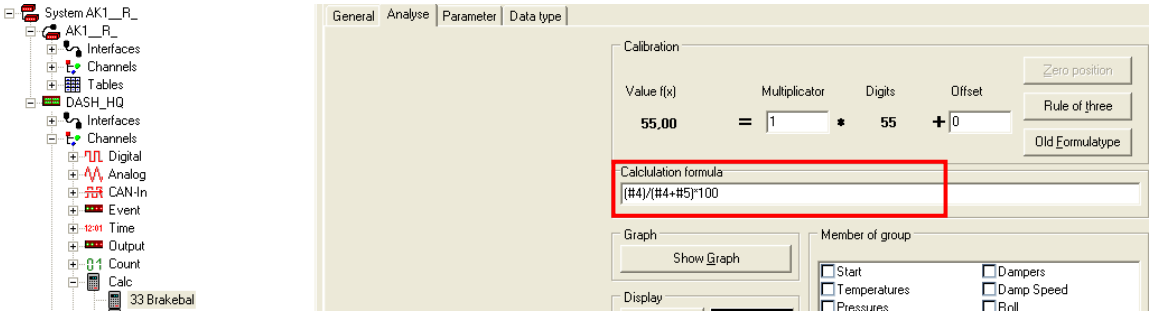
9.3 Calculation function examples

Example: Brake balance calculation

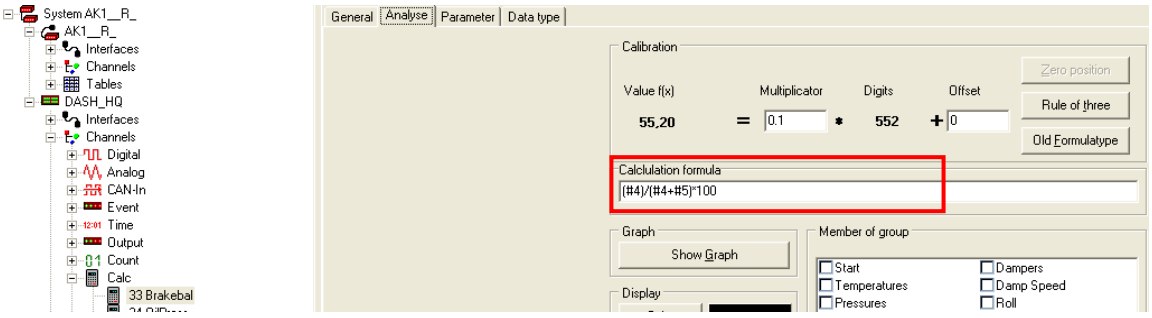
By using a data logging system, the front and rear brake pressure values are measured and sent via the CAN bus. The 2D module reads the values from the CAN bus on channel #4 (brake pressure front) and channel #5 (brake pressure rear).

$$\text{Brake balance is defined as} = \frac{100 * \text{Brake pressure front}}{(\text{Brake pressure front} + \text{Brake pressure rear})}$$

The calculation formula entered is: **#4/(#4+#5)*100**



The calculated result is 55.26% brake bias to the front. If a result with a resolution of 1% accuracy is acceptable, a multiplier of 1 is used (channel result 55). For a higher resolution, e.g. 0.1%, a multiplier of 0.1 would be used (channel result 55.2)

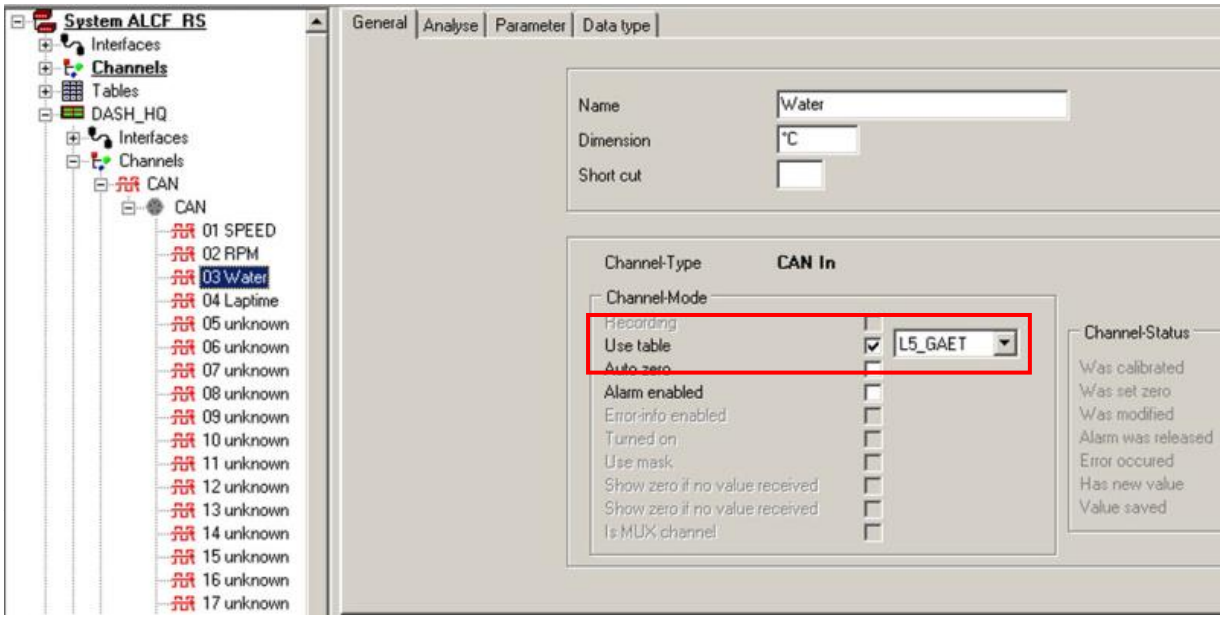


10 Tables

A table allows to transform a linear input into a nonlinear output. To each input value an output value is assigned.

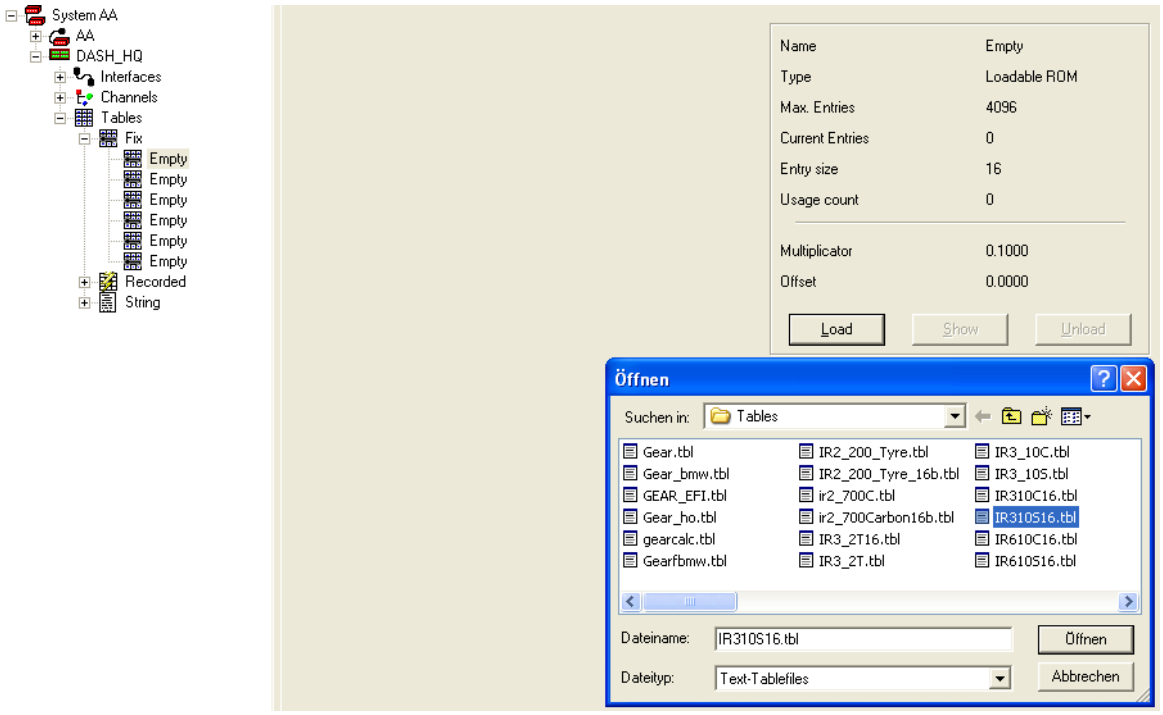
10.1 How to choose a table via WinIt

- Select a CAN channel (see Figure below)
- Select the tab ***<General>*** for this Channel, choose ***<Use Table>*** and select the table you want to use from the drop down list on the right (in the figure below the table is called ***<NTC4K7>***)
- Subsequently confirm your modifications with the button ***<Apply>***

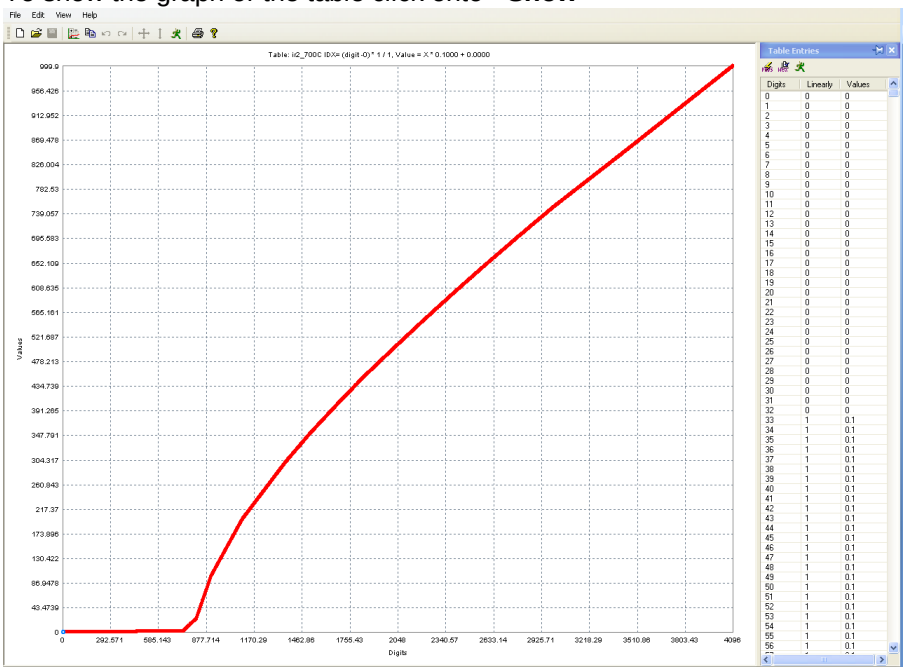


Loaded tables can be saved into the memory of the 2D module and can be assigned to any input channel. The channels value are linearized after download by the software tool Calctool.

2D delivers a set of predefined tables in the folder Racexxxx/System/ Tables.
To save a table into the 2D module click onto **<Load>** and choose the table in the explorer window.



To show the graph of the table click onto **<Show>**



To erase the table of the display memory click **<Unload>**

10.2.2 Fixed

Fixed tables can be saved into the permanent memory of the 2D module and can be assigned to any input channel. The channel is linearized online and those values can be send out for further use.

10.2.3 Recorded

10.2.3.1 Laptime

The Laptime-table contains all the laptimes received by the 2D module.

10.2.3.2 Sectime

The Sectime-table contains all the Section times received by the 2D module.

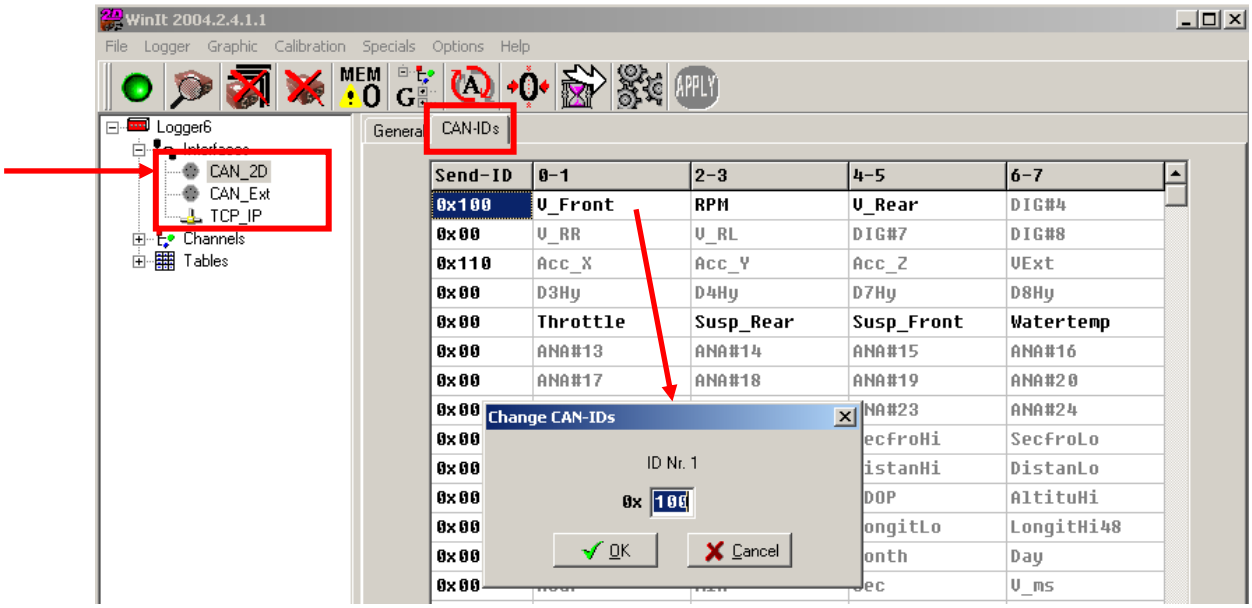
11 Sending out data via CAN bus

11.1 Sending out data to 2D modules

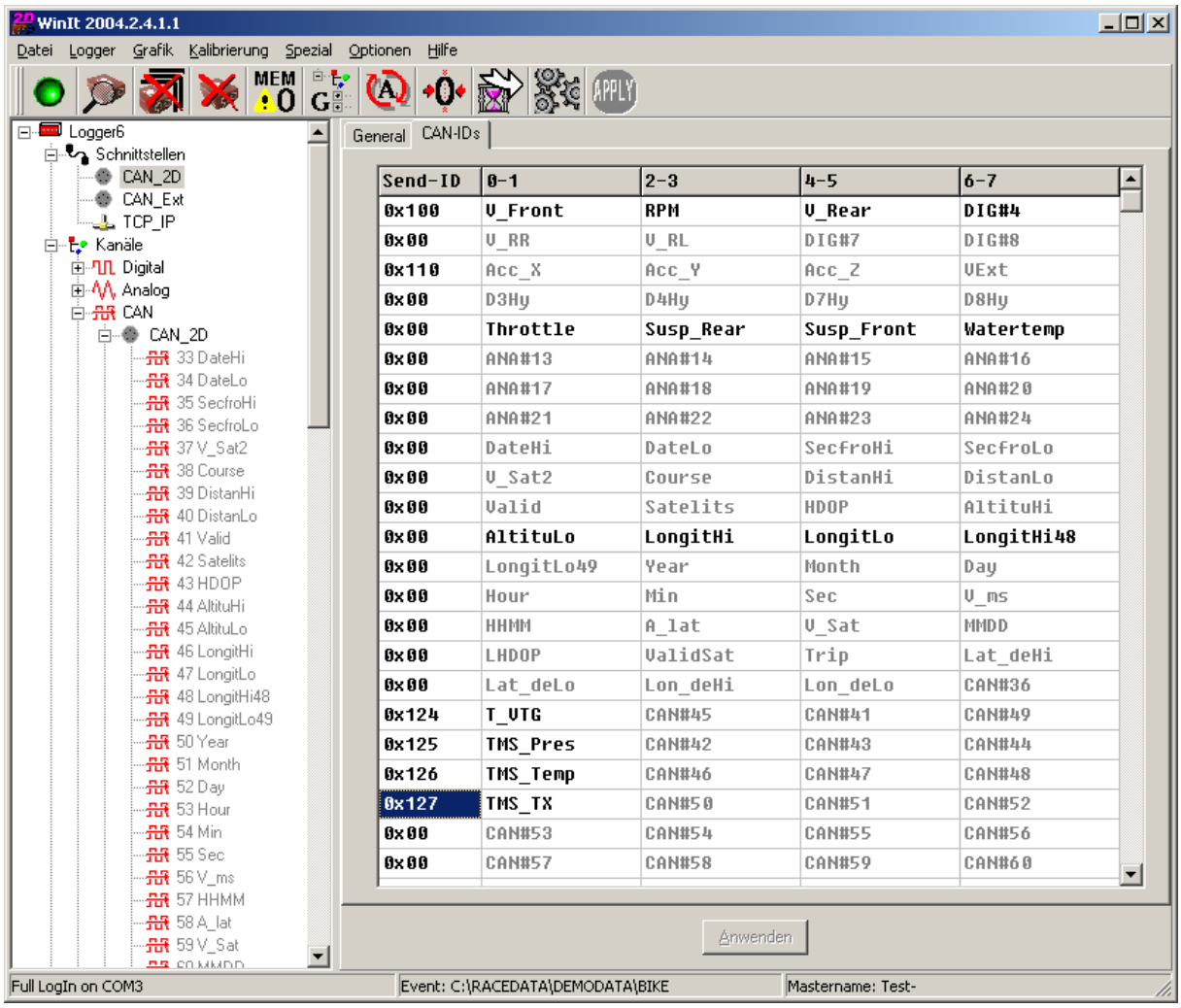
In ***<Interfaces>*** in the tab CAN-ID's one can define the CAN identifier on which channel groups can be send out. To do so proceed to *Interfaces* and click on the *CAN bus* you want to manipulate. Select the tab *CAN-ID´s*. On this page you will find all channels of the module. (Analogue, digital, and CAN). These channels are sorted into *channel groups*. Each group is placed in one row. You can set the identifiers by double clicking on a row and typing in the chosen ID number (shown in the image below).

The channels in grey letters are not transferred through the CAN bus. They are either not *recording* or not *turned* on.

It is not possible to use the ID 0x001 since the 2D protocol is routed on this identifier !



11.2 Optimizing CAN traffic

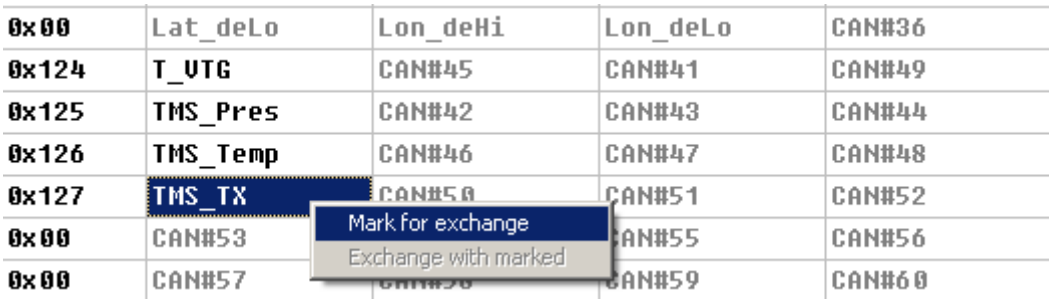


Send-ID	0-1	2-3	4-5	6-7
0x100	V_Front	RPM	V_Rear	DIG#4
0x00	V_RR	V_RL	DIG#7	DIG#8
0x110	Acc_X	Acc_Y	Acc_Z	VExt
0x00	D3Hy	D4Hy	D7Hy	D8Hy
0x00	Throttle	Susp_Rear	Susp_Front	Watertemp
0x00	ANA#13	ANA#14	ANA#15	ANA#16
0x00	ANA#17	ANA#18	ANA#19	ANA#20
0x00	ANA#21	ANA#22	ANA#23	ANA#24
0x00	DateHi	DateLo	SecfroHi	SecfroLo
0x00	V_Sat2	Course	DistanHi	DistanLo
0x00	Valid	Satelits	HDOP	AltituHi
0x00	AltituLo	LongitHi	LongitLo	LongitHi48
0x00	LongitLo49	Year	Month	Day
0x00	Hour	Min	Sec	V_ms
0x00	HHMM	A_lat	V_Sat	MMDD
0x00	LHDOP	ValidSat	Trip	Lat_deHi
0x00	Lat_deLo	Lon_deHi	Lon_deLo	CAN#36
0x124	T_VTG	CAN#45	CAN#41	CAN#49
0x125	TMS_Pres	CAN#42	CAN#43	CAN#44
0x126	TMS_Temp	CAN#46	CAN#47	CAN#48
0x127	TMS_TX	CAN#50	CAN#51	CAN#52
0x00	CAN#53	CAN#54	CAN#55	CAN#56
0x00	CAN#57	CAN#58	CAN#59	CAN#60

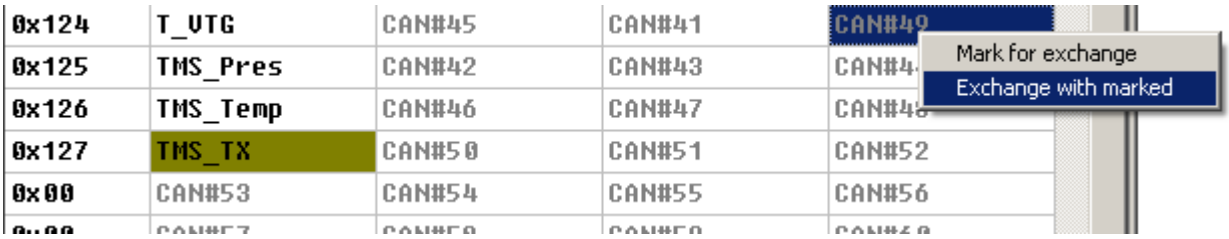
In the upper image you can see an arrangement of CAN send ID´s of a 2D module

This setting is not particularly good. Only the 2 first bytes of the identifiers 0x125-0x127 are being used. This will cause unnecessary traffic as 4x8 bytes are transmitted for sending only 4 channels. If these 4 had been in the same **CAN group** as described earlier (4 channels under each other in the same color shade of the grid) they would automatically be in one row under one ID as you can see for example in the first row. But if this is not the case you will have the possibility to rearrange the channels!

The next page is a step by step guide of how to gather the 4 channels into one identifier.

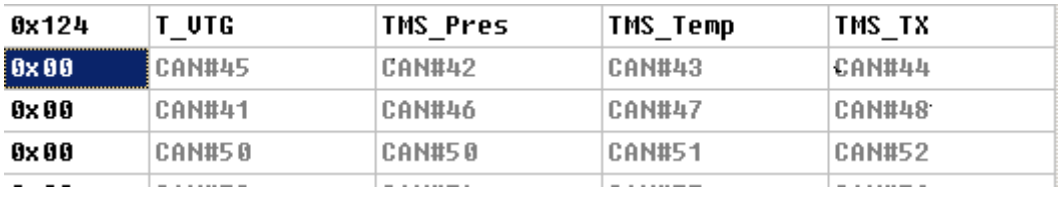


- As can be seen in the image above select one of the channels you would like to exchange with a right mouse click
- Click on ***<Mark for exchange>***
- The selected channel is shaded with an olive background.
- Select the channel you want to exchange it with and choose ***<Exchange with marked>*** with a right click



- The channels will change places and the shaded backgrounds are removed
- Repeat this procedure until you have gathered all your channels in rows in a most efficient way and set the unneeded ID´s to zero. (0x00)
- Apply the changes

In the end you should receive the following layout:



. Swapping and exchanging is only possible with CAN channels.

11.3 Sending out data to 3rd party modules via DBC file

In a DBC file all necesarry information are stored so that 3rd party CAN module values can be received. Only CAN transmission speed and termination have to be adjusted manually if needed.

1. Go to **<File/Export/CAN-DB>** and choose the CAN bus of the 2D source module on that the receiving module is connected and CAN data should be send.
2. Choose the location where the DBC file should be stored and press **<Save>.**
3. Send the changes to the 2D module with **<Apply>.**

12 Appendix A: Sampling rates <> Base rates dependence

The allocation of the usable sampling rates over the available number of channels at 2D logging modules is not equal. That means that the maximum sampling rate which can be provided by the logger can differ from channel to channel. Therefore it's up to the user to select a suitable channel for each signal he wants to log. The following table allows to find out which channel should be used for the requested sampling rate The table shows which maximum sampling rates can be set up for the different channels.

Example:

If for example vehicle speed and the water temperature should be logged, following setup is suggested.

1. **The user has to decide with which sampling rate he needs to log the both signals. The speed signal is changing very fast while the water temperature has a very slow variation. Thus both signals should be logged with different sampling frequencies, the speed signal with a fast one and the temperature signal with a slow one.**
2. **The user has to select a base sampling rate for his logger. This base sampling rate should be related to the highest sampling rate required.**
3. **By using this base sampling rate in the table shown above, the maximum available sampling rate for each logger channel can be found.**
4. **The user has to choose the fitting sampling rate for his signal and to allocate this value to the chosen logger channel. If we assume a base rate of 3200 Hz, the speed value should be assigned to one of the channels CANIN1….CANIN16 of the logger, because they work on a sampling rate of 1600 Hz (=Selected Base rate * ½). The water temperature can be assigned to one of the logger channels CANIN49..CANIN176 resulting in a maximum sampling rate of 400Hz (=Selected Base rate * ⅛)**

Art.No.: LG-L6xxx-000		
	12.1.1.1.1 AIN1 – AIN16 (=Analog Input #1 – Analog Input #16)	* Factor 1 / 1
	12.1.1.1.2 DIN1 – DIN8 (=Digital Input #1 – Digital Input #8)	* Factor 1 / 2
	12.1.1.1.3 AIN1 – AIN8 (=Internal Analog Input #1 – Internal Analog Input #8)	
	12.1.1.1.4 CANIN1 – CANIN16 (=CAN Input #1 – CAN Input #16)	
	12.1.1.1.5	* Factor 1 / 4
	12.1.1.1.6 CANIN17 – CANIN48 (=CAN Input #17 – CAN Input #48)	
	12.1.1.1.7 CANIN49 – CANIN176 (=CAN Input #49 – CAN Input #176)	* Factor 1 / 8

* Related to the "Base rate" (=settable in WinIt) of the used logging- or memory module

Art.No.: **LG-CANMEM1C064/128-000** **LG-CANMEM2C064/128-000** **LG-CANMEM2C128/512-000** **LG-CANMEM2C160/1000-000** **LG-CANMEM2C160/1000TCP-000** **LG-CANMEM2C256/1000TCP-000**	12.1.1.1.8 CANIN1 – CANIN16 (=CAN Input #1 – CAN Input #16)	* Factor 1 / 1
	12.1.1.1.9 CANIN17 – CANIN32 (=CAN Input #17 – CAN Input #32)	* Factor 1 / 2
	12.1.1.1.10 CANIN49 – CANIN80 (=CAN Input #49 – CAN Input #80)	* Factor 1 / 4
	12.1.1.1.11 12.1.1.1.12 CANIN81 – CANIN256 (=CAN Input #81 – CAN Input #256)	* Factor 1 / 8

While setting up a 2D logging module, these tables should always be kept in mind. The allocation of slow signals to logger channels with small sampling rates saves recording performance and memory space which will increase the maximum possible recording time substantially.

In summary the following “rules of thumb” can be defined:

- The smaller the change of a measuring signal, the smaller the sampling rate should be selected
- The smaller the sampling rate is, the higher the “channel number” (=in WinIt) must be chosen.