



Data Logger and Sensor Interface C 80

Manual

Version 1.2 08/04/2025

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1 Preparation

Use the C 80 only as intended in this manual. Any maintenance or repair must be performed by authorized and qualified personnel approved by Bosch Motorsport.

Operation of the C 80 is only certified with the combinations and accessories that are specified in this manual. The use of variant combinations, accessories and other devices outside the scope of this manual are only permitted when they have been determined to be compliant from a performance and safety standpoint by a representative from Bosch Motorsport.

Read the manual carefully and follow the application hints step by step. Do not hesitate to contact us, contact data can be found on the last page of this document.

Important information on Electromagnetic Conformity

To avoid unwanted interference with the environment (people, animals, electronic devices) or unwanted harm to the environment, it is mandatory that the user of the C 80 carries out an appropriate analysis to determine the electromagnetic interaction the C 80 may have with its individual installation environment.

Disclaimer

Due to continuous enhancements, we reserve the rights to change any illustrations, photos, and technical data within this manual.

Please retain this manual for your records.

Note

In this document, many screenshots are created by way of example for a display. Please consider this and replace the product names with the name of your device.

2 Warnings and Safety Instructions

The classification of the warnings and safety instructions is carried out by the respective signal word (Danger, Warning, Caution) next to the warning symbol.

Danger

	5
	Nature and source of danger
	Consequences
	Warning of death or serious physical injury, which are sure to occur if ignored.
	Warning
	Nature and source of danger
	Consequences
	Warning of death or serious injury, which can occur if this is not observed.
	Caution
	Nature and source of danger
· · ·	Consequences
	Warning of slight bodily injury in case of Disregard.
	Notice
	NOTICE
	Nature and source of danger
	Consequences

Warning of damage to equipment in case of ignoring.

3 Onboard Network Concept

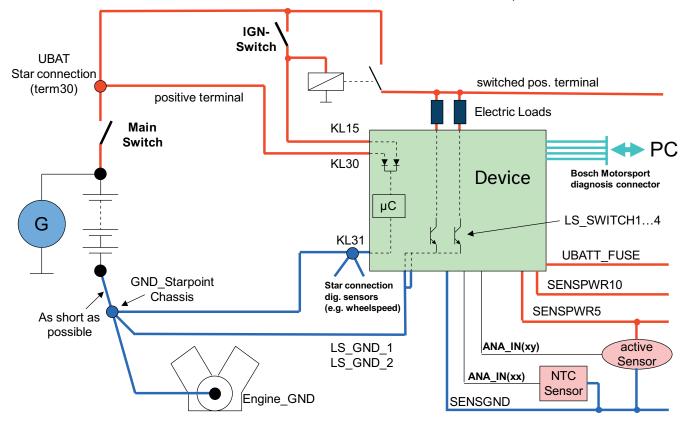
Please ensure that you have a good ground installation. That means:

- A ground that has a solid, low resistance connection to the negative battery terminal
- Connection should be free from dirt, grease, paint, anodizing, etc.
- Use large diameter wire
- More metal-to-metal contact is better!

The following notations for power signals are used:

- KL 15 is a switched battery rail controlled by the IGN-switch
- KL 30 is an unswitched battery positive rail (same as battery positive terminal)
- KL 31 is an unswitched ground rail (same as battery negative terminal)

Be careful to observe current limits of wires and connector pins!



Note

This schematic is not device specific. Please see the section Technical Data for the specifications of your device.

4 Technical Data

We offer the C 80 in two basic versions, on the one hand as a data logger and on the other hand as a sensor interface. Choose between these basic variants and combine or add functionalities now or later.

The data logger C 80 is a professional data logging system for motorsport applications. This allows for synchronized acquisition of engine data from the ECU and chassis data from up to 26 analog and 4 digital input channels. Additional input devices can be connected via Ethernet and CAN buses.

Recorded data from the up to 16 GB logger can be downloaded via high speed Ethernet.

Software upgrades for the C 80 (field upgradable by entering a key) activate tailored configurations like a second logging partition of 4 GB, USB recording, CCP/XCP-master for simple data access to third party devices, as well as additional input channels.

Converters	10 kHz 12 bit AD converters with digital low pass filter				
Configurable math channels					
User configurable CAN in/out messages	User configurable CAN in/out messages				
Sampling rate					
Online data compression					
Internal logger					
- FULL_LOG_1 (4 GB memory on Partition 1) enabled, optional in C80 Sensor Interface					
 PERF_LOG_1 (16 GB memory on Partition 1) optional 					
 FULL_LOG_2 (4 GB memory on Partition 2) optional 					

- 1,500 channels enabled
- 1 ms sampling rate enabled
- DATA_USB (Data copy to USB flash drive) optional

Logging rates

- Usage of all features: 800 kB/s
- Primary logging use case: >1,500 kB/s
- Logging data download rate: up to 7.5 MB/s

3-port network switch

Telemetry Support via Ethernet (recommended) and RS232

Mechanical Data

Size	105 x 34.5 x 137.5 mm
Weight	462 g
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Max. vibration	Vibration profile 1 (see Downloads or www.bosch-motorsport.com)
Operating temperature (internal)	0 to 85°C
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Operation outside the temperature limits can be tested on request during the manufacturing tests.

Electrical Data

Supply voltage	8 to 18 V
Max. power consumption (w/o loads)	10 W at 14 V

Inputs

6 x analog channels	
0 to 5 V input range	
12 bit resolution	
1 x 3 kOhm switchable pull up resistor	

Sensor Supplies and Screens

4 x PWM	outputs	(low	side	switch	2	A each)
---------	---------	------	------	--------	---	---------

1 x sensor supply 5 V \pm 1 % (250 mA)

Connectors and Wires

Motorsport connectors double density	2 x 41 pins
Mating connector I ASDD612-41SN	F02U.002.216-01
Mating connector II ASDD612-41SA	F02U.004.180-01

Pin Layout ASDD212-41PN

Pin	Name	Description
1	KL30	
2; 3	KL15	
4; 5	KL31	
6	Ethernet Channel0 Tx plus	Wire Ethernet_0 - TX+
7	Ethernet Channel0 Tx minus	Wire Ethernet_0 - TX-
8	Ethernet Channel0 Rx plus	Wire Ethernet_0 - RX+
9	Ethernet Channel0 Rx minus	Wire Ethernet_0 - RX-
10	Ethernet Schirm	Ethernet Schirm
11	Ethernet Channel1 Tx plus	Wire Ethernet_0 - TX+
12	Ethernet Channel1 Tx minus	Wire Ethernet_0 - TX-
13	Ethernet Channel1 Rx plus	Wire Ethernet_0 - RX+
14	Ethernet Channel1 Rx minus	Wire Ethernet_0 - RX-
15	Ethernet Channel2 Tx plus	Wire Ethernet_0 - TX+
16	Ethernet Channel2 Tx minus	Wire Ethernet_0 - TX-
17	Ethernet Channel2 Rx plus	Wire Ethernet_0 - RX+
18	Ethernet Channel2 Rx minus	Wire Ethernet_0 - RX-
19	CAN_A_H	CAN_A - HIGH
20	CAN_A_L	CAN_A - LOW
21	CAN_B_H	CAN_B - HIGH
22	CAN_B_L	CAN_B - LOW
23	USB Power	500mA USB_Power
24	USB Data Plus	USB_OTG_Plus

Pin	Name	Description
25	USB Data Minus	USB_OTG_Minus
26	USB GND	USB_Ground
27	SENSPWR5_1	
28	SENSGND	
29	Timestamp	
30	LS_GND_1	Low-Side Ground2
31	LS_SWITCH_1	lowside switch 2A
32	LS_SWITCH_2	lowside switch 2A
33	LS_SWITCH_3	lowside switch 2A
34	LS_SWITCH_4	lowside switch 2A
35	LS_GND_2	Low-Side Ground2
36	ANAIN_M1_1	0 to 5V Analog
37	ANAIN_M1_2	0 to 5V Analog
38	ANAIN_M1_3	0 to 5V Analog
39	ANAIN_M1_4	0 to 5V Analog
40	ANAIN_M1_5	0 to 5V Analog
41	ANAIN_M1_6	0 to 5V Analog

Pin Layout ASDD212-41PA

Pin	Name	Description
1	UBATT_FUSE1	
2	SENSPWR10_1	
3	SENSPWR5_2	
4	SENSPWR5_3	
5	SENSPWR5_4	
6; 7	SENSGND	
8	RS232A TX	Transmit Telemetry data
9	RS232A RX	Receive Telemetry data
10	RS232B TX	Transmit GPS data
11	RS232B RX	Receive GPS data
12	RS232_GND	RS232 Ground
13	REV1_P	Hall / Inductive
14	REV1_M	Hall / Inductive
15	REV2_P	Hall / Inductive
16	REV2_M	Hall / Inductive
17	REV3_P	Hall / Inductive
18	REV3_M	Hall / Inductive
19	REV4_P	Hall / Inductive
20	REV4_M	Hall / Inductive
21	ANAIN_M1_7	0 to 5V Analog
22	ANAIN_M1_8	0 to 5V Analog
23	ANAIN_M1_9	0 to 5V Analog

Pin	Name	Description
24	ANAIN_M1_10	0 to 5V Analog
25	ANAIN_M1_11	0 to 5V Analog
26	ANAIN_M1_12	0 to 5V Analog
27	ANAIN_M1_13	0 to 5V Analog
28	ANAIN_M1_14	0 to 5V Analog
29	ANAIN_M1_15	0 to 5V Analog
30	ANAIN_M1_16	0 to 5V Analog
31	ANAIN_M2_1	0 to 5V Analog
32	ANAIN_M2_2	0 to 5V Analog
33	ANAIN_M2_3	0 to 5V Analog
34	ANAIN_M2_4	0 to 5V Analog
35	ANAIN_M2_5	0 to 5V Analog
36	ANAIN_M2_6	0 to 5V Analog
37	ANAIN_M2_7	0 to 5V Analog
38	ANAIN_M2_8	0 to 5V Analog
39	ANAIN_M2_9	0 to 5V Analog
40	ANAIN_M2_10	0 to 5V Analog
41	LAPTRIGGER	

4.1 Status LEDs



Recording Status LED (green / amber / red)
 Boot Status LED (permanent green)
 Power Status LED (permanent green)

Recording Status LED

	Recorded Data	Telemetry
Amber constant No measurement configuration on Logger	No	No
Blinking green slow • Measurement configuration loaded • Start condition(s) not fulfilled	No	Yes
Blinking green fast Measurement configuration loaded Start conditions fulfilled Logger is recording data 	Yes	Yes
Blinking amber slow • Measurement configuration loaded • Measurement setup error (external device missing) • Start condition(s) not fulfilled	No	Yes (but some missing)
Blinking amber fast Measurement configuration loaded Measurement setup error (external device missing) Start conditions fulfilled, Logger is recording data 	Yes (but some missing)	Yes (but some missing)
Blinking red fast • Firmware update in progress • Do not power off Logger	No	No
Blinking red slow • Firmware update has finished	No	No
Red constant • Error during firmware update	No	No

4.2 Upgrades

CCP/XCP_MASTER

Enables CCP/XCP master functionality to request data from foreign devices via CAN/CCP protocol, XCP over Ethernet (UDP) or XCP via CAN. (ASAP2 file from ECU manufacturer required)

FULL_LOG_1 (enabled in C 80 logger)

4 GB memory on Partition 2, 600 kB/s (600 MHz)

PERF_LOG_1 (requires FULL_LOG_1)

16 GB memory on Partition 1, 800 kB/s (866 MHz)

FULL_LOG_2

4 GB memory on Partition 2

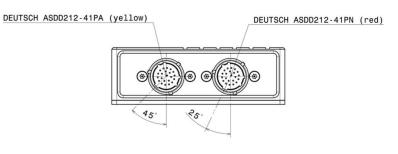
IO_EXTENS (included in C 80 Sensor Interface)

20 additional analog channels 4 rotational channels, input Hall (Input inductive on request, hardware change required) 3 additional sensor supply 5 V (250 mA each) 1 sensor supply 10 V (250 mA) 1 sensor supply 12 V (1 A), non-regulated RS232 GPS

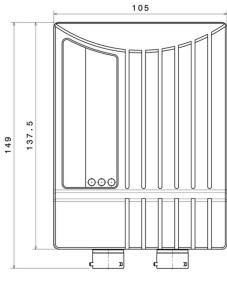
DATA_USB

Data copy to USB flash drive

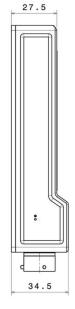
5 Mechanical Drawing











Left view Scale: 1:1

6 Communication Channels

CAN bus

The C 80 has two CAN buses configurable as input and output. Different baud rates are selectable. Please note that the C 80 does not contain any CAN termination resistors. Thus the CAN termination resistors need to be integrated into the wiring loom.

Ethernet channels

The C 80 has three 100 MBit full duplex Ethernet communication ports. The ports are internally connected with an Ethernet switch. The Ethernet ports have 'cable auto crossover' functionality.

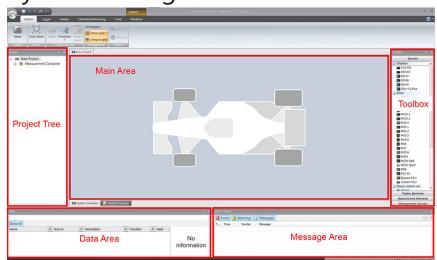
RS232 ports

The C 80 has two RS232 serial ports. Baud rate for both ports is programmable. RS232 port 1 is reserved for online telemetry, port 2 can be used for reception of data from a serial GPS receiver.

Vehicle diagnosis connector

The Bosch Motorsport vehicle diagnosis connector is used as a standard interface to connect the vehicle to a PC e.g. via a MSA-Box II. Loom connector: AS012-35SN

Pin	Name	Description	Used for C 80
Pin 1	Terminal 30	Permanent positive	+
Pin 2	Terminal 15	Switched positive	+
Pin 3	Terminal 31	GND	+
Pin 4	CAN High	Diagnostic CAN bus	
Pin 16	CAN Low	Diagnostic CAN bus	
Pin 10	K-Line	ECU diagnosis	
Pin 8	Ethernet RxD +	Ethernet interface	+
Pin 9	Ethernet RxD -	Ethernet interface	+
Pin 11	Ethernet TxD +	Ethernet interface	+
Pin 12	Ethernet TxD -	Ethernet interface	+
Pin 22	Screen	Cable screen	+



7 System Configuration Tool RaceCon

RaceCon is an all integrated software tool for configuration and calibration of Bosch Motorsport hardware products, such as ECUs, displays, loggers. The communication is based on Bosch Motorsport MSA-Box interface.

Calibration of ECU maps and curves
ECU data file and parameter file up- and download
Diagnostic functionality for Bosch Motorsport ECUs
Data file / Work base management
Integrated flash functionality and Bosch sensor database
Configuration of Bosch Motorsport displays, data loggers, CAN modules,
Communication via K-Line/CAN/Ethernet (KWP/CCP/XCP)
CAN communication log functionality (baud rate changeable)
Quick data access over Race Mode

PC

IBM PC Pentium/AMD Athlon compatible, min. 1.6 GHz Min. 2 GB RAM Min. 1 GB free hard disc space VGA/WGA monitor (min. 1,024 x 768) Recommended Operating System: Windows 10

Optional Accessories

MSA-Box II

F02U.V00.327-03

8 First Steps

Install the software required for the operation of the C 80. It is developed for Windows system software. The following software versions are used in this manual:

- C 80 setup, configuration and calibration: RaceCon Version 2.10.
- Measurement data analysis: WinDarab V7

Set up the 100 Mbit ethernet connection to the C 80.

- The ethernet port has "cable auto crossover" functionality.

8.1 Connecting the unit to RaceCon

For testing new device configurations, you can connect the device to your computer via MSA-Box or ethernet cable.

Connection via MSA-Box

- 1. Reassure that the MSA-Box driver is installed properly on your computer. If needed, download the MSA-Box driver from www.bosch-motorsport.com.
- 2. Connect an ethernet line of the device to the ethernet line of the MSA-Box.

Please note, that the MSA-Box also requires power supply on the MSA-Box connector of your wiring loom.

- 3. Open RaceCon and connect the MSA-Box to the computer.
- 4. In the 'Info / Status' Box of RaceCon, you will receive messages that the connection was successful.

Info /	Status			
(3 E	rrors <u> </u> W	arnings (i)) Messages(2)	2/2 🗙
т	Time	Sender	Message	
(i)	12:16:09	RaceCon	Connected to MSA Box.	
(i)	12:16:09	RaceCon	A Box successfully connected.	
Info	Status CAN	l I og - Stonne	ad SYS Log - Stopped	

- 5. Reassure that the device is switched on.
- 6. 'Link LED' at the computer's network adapter will illuminate.

If the LED is off, check the wiring harness.

After you created a RaceCon project with the device, the status icon of the device will switch from grey to one of the following colors: red, orange, green. For further information on how to set up a project, see the chapter "Setting up a new RaceCon Project [▶ 16]". For the status color, see chapter "Color indication [▶ 27]".

Connection via Ethernet Cable

Instead of connecting the ethernet line to the MSA-Box, connect the ethernet directly to your computer.

Troubleshooting while setting up the network interface

The C 80 contains a DHCP server, network addresses can be assigned automatically to the configuration PC. In case of problems during the network connection, please try the following steps:

7. Switch off the PC's firewall.

8. Reconfigure the PC or the MSA-Box network interface settings to obtain an IP address automatically as shown in the pictures below.

Local Area Connection Properties 2 x General Connecturing Connectur

8.2 Setting up a new RaceCon Project

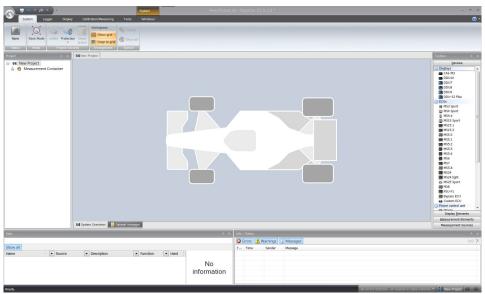
The following screenshot shows an overview of the RaceCon Main Screen with its areas. All (sub-) windows are resizable and dockable. You can find them under the 'Windows' tab.

	System	New Protect.rtp - RaceCon V2.5.5.0 *	X
System Looper Displa			Ø ·
None Race Mode Visible Project Se	en Shett lockad		
Project f x	64 New Project		Toolbox # ×
 64 New Project 	Main Area		Denotes □ Diseleys □ C65-M1 □ Diseleys □ Diseleys </td
Project			Toolbox
Project Tree	Magdam Danver		
Deta		4 > Info / Status	+ ×
Show all Name / 💌 Source	Decretor Turcton	Vued No information	rea
Ready.		No errors detector	ed - all cleaned or state unknown - 📴 New Project 🥶 🚥

1. Start the RaceCon software.



2. In the 'File' menu, select 'New project' to create a new project.



3. In the Toolbox, select the C80 and drag it into the Main Area. A pop up window to specify the C80 program archive appears.

A = A + A + J +	System	New Projec	- RaceCon V2.5.5.0		_ = X
System Logger Display	Calibration/Measuring Tools Windows				0 ·
None Race Mode Visible Protection	m Sheet lockal Introduction				
Project 0 x 64	New Project				Teolbex V x
Mew Project	1	Create a new DDU10	X		Devices
Measurement Container		Specify the program archive This creates the device defined in the pro	1		Displays CAS-M3 DDU10 DDU7
		ECU program archive: Please specify the ECU program archive			DDU8 DDU9 DDU-S2 Plus ECUs III MS3 Sport MS4 Sport III MS4.6
					MiSIS Sport MiSIS 2 MiSIS 3 MiSIS 3 MI
		< Back	Not> Firitin Cancel		Ko24 Ko24 Ko24 Ko25 Sport P08 P09 P09 P09 Sport Custon ECU Orgoly Jements
1	System Overview		-	· · · · ·	Measurement Elements
Deta	Colorem Cover view To Colorem Cover view Cover view Cover view To Colorem Cover view Cov		Irdo / Status		Measurement Sources
Show all		+ x	Control (Status C		* × 0/0 ×
Name / Source	Description Function	No information			

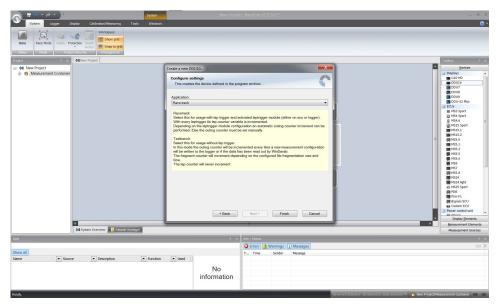
- 4. Download the firmware for your device:
 - from the RaceConnect project file share for PSU. This .pst file should be provided to RaceCon.
 - from www.bosch-motorsport.com for VCUs, DDUs, and Loggers.
 - You can get firmware for ECUs on request.

An information shows if the archive is valid or not.

5. Click 'Next' (for PSU: go on with step 7).

	System	New Project - RaceCon V2.5.5.0 *	- a x • (0)
None Race Mode Visible Pr	egriny Calibration/Meesuring Tools Window Wartapasce: Show grid Show grid Show grid Show grid Arrangement	a	<u>ر</u> .
Project 0 x	64 New Project		Toolbax # ×
B 64 New Project		Create a new DDU10	Devices
😐 🚳 Measurement Container		Specify the program archive	 Displays
		Specify the program archive This creates the device defined in the program archive	CAS-M3
			DDU7
		ECU program archive:	D008
		C1USers/SUA4ABT/Desktop/RaceCor/DOU10_BASE_0401_TST4.pst	DDU-52 Plus
		(i) The program archive is valid	ECUs M M53 Sport
		IP Address: 10 10.0.207	MS4 Sport
		Contained devices	目 M54.6 目 個 M515 Sport
		DDU10 DduPath.DUP	M515.1
			M515.2
		- Logger (2 recording: PCode: 444C) - External Display, resolution: (800x480) - 4CM interfaces	MSS.1
		- 4 CAN Interfaces - 20 Pins	MS5.2
		- 20 AWM Types	MS5.5 MS5.6
		- EPFrature:	🗰 MS6
		* LIHER/LELE + HZU VIZ 133-1, Endbe ethermel teernetivy * USB_DATA + FZU VIZ 214-1, Endbe data copy from logger to Bosch USB stick	MS7
		* CCP_MASTER - F02U V02213-1. Enable CCP master - measure 3rd party ECUs * FULL_LOG1 - F02U V02234-1. Full loaning accelerative on 1at party ECUs	MS24
		Zeppendia Martina Annotas Temperatura (2015) Temperat	MS24 light
			査 MS25 Sport 調 PDB
			PSU-F1
			🐺 Bypass ECU
			Custom ECU Power control unit
		< Back Next > Finish Cancel	Display Elements
			Measurement Elements
	🛤 System Overview 👔 Dataset manager		Measurement Sources
Data		0 × Info / Status	
		Errors Warnings () Messages	0/0 X
Show all		T Time Sender Message	00 A
Name / Source	e Description Function		
		No	
		information	
Ready.		No errors datodad – all cleared ar state unknown 💌 🃸 New Project	
ready.		No errers datactea - bil cleared or state ulknown 👻 📑 New Hoject	waresuremente container

6. Select 'Race track' or 'Testbench' mode according to your application.



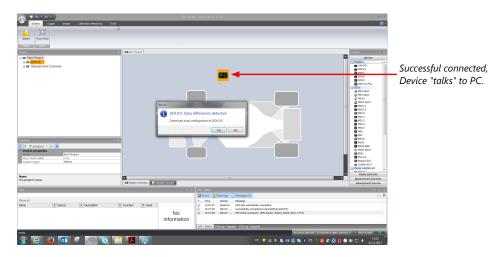
7. Click 'Finish'.

System Logar Dark Californian Term	System workow workow	
Here Projet Portugi Portugi		2 0.000 9 0.001 9
Data Show all	6 z // (risma) Warnings (i) Messages ↓ Tron Sender Messages	* × 0/0 ×
Name / Source Description	Indon No Information	stad of state streem • 🍘 New Project/Netatroniest Container, etc. Co

The C 80 is inserted into the project and RaceCon tries to connect to the device.

RaceCon detects configuration differences between the C 80 and the RaceCon project and asks for permission for data download.

Click 'Yes' to download the configurations to the device or 'No' to continue without downloading the data.

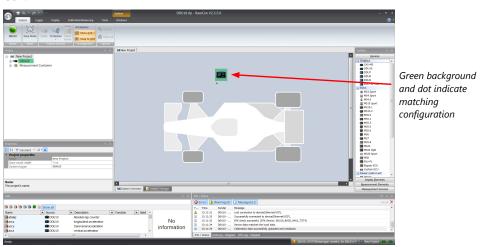


If the device turns red, you might need to do a firmware update on the device. For more information see chapter "Firmware update [> 134]".

System Logger Display Calibration/Measuring Tools	DDU10.rlp - RoceCon V2.5.5.0 Windows	_ = X
DDUID Race Mide Status Status		
	Get New Project	Teolbex 0 ×
Presence A New Project A New Project A New Analysis A New	v	2 Becard 0 0-0010
		Display Elements
Name The project's name.		Measurement Elements
	64 System Overview Dataset manager	Measugement Sources
		- • ×
abstap DDU10 Absolute lap counter accx DDU10 longitudinal acceleration accy DDU10 transversal acceleration	No 0 Issues Owner Summary Owner Owner Summary Owner	6/6 🗙
accz DDU10 vertical acceleration	· · · · · · · · · · · · · · · · · · ·	v
· .	Info / Status CAN Log - Stopped SYS Log - Stopped	

The download starts and the C 80 carries out a reset.

After the reset, RaceCon reconnects to the C 80. Local configuration on both the PC and C 80 match (indicated by green background and dot). The C 80 is now connected to Race-Con.



For further information on the color indication, see chapter "Color indication [▶ 27]".

8.3 Feature activation

- Optional software feature packages are available for the C 80
- All software feature packages can be purchased prior to delivery or after you have received your device.
- If you have purchased an optional software feature package, it must be activated before it becomes operational.
- The feature activation status is stored permanently in the device and requires activating once only.
- As the activation key is device specific, a key delivered with one C 80 does not work on any other C 80.
- When purchasing a software feature package, you have to tell Bosch the ECU ID code.
 The ECU ID code is device specific and can be found in the 'features info' window, shown in the screenshots below.
- If you have not purchased an optional software feature package, the next steps can be skipped.
- 1. Ensure a connection to the device.
- 2. To activate a feature, double-click on 'C 80' in the Project Tree.
- 3. Click on the 'Features info' tab in the Main Area.

		System			ricense Bosch * 🛛 🗕 🕯	a x
	System Logger Display Cal	bration,Measuring Tools Windows				0 -
	DOULD Race Mode Visible Protection Sheet					
	 Ioches 					
	Status Mode Project Security					_
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on DDU	8- 👸 Measurement Container	BOU ID 395	le778:1007d540	Copy to dpbo	nd 🗖 🗖 🖬 🖬	
					0007	
		Status/Unlock	Order informations			
		Name	Description		000-52 Plus	-
			ASTER F02U V02 213-01, Enable device to be CAN 0 06 1 F02U V02 304-01, Full logging on first partitio		COs MI MS3 Sport	
			DG_1 F02U V02 304-01, Full logging on first partitle DG_2 F02U V02 305-01, Enable full logging on seco		MS3 Sport	
			TA F02U V02 214-01, Enable data copy from loo		E M54.6	
			TELE FO2U VO2 138-01, Enable Ethernet / LTE Tele	metry	MS15 Sport	
		e 10,00	ENS F02U V02 205-01, Enable additional input / or	utput channels	MS15.1	
2nd: Click on					🐺 M35.0	
ZHU. CIICK OH					MS5.1	
'Features info' —					M M55.2	
reatures injo					MS5.4	
					🗰 M56	
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					Display genents Measurement Elements	_
		Statistics //- Math Channels //- Condit	ional Channels 🛛 🛃 CAN messages 🛛 🗮 Macros	📾 Settings 👔 Device info 🕑 Error 🗸	Features info Measurement Sources	
	Data		4 X Info/Status			• ×
			Errora(1)	Warnings(5) (i) Messages(39)	45/9	6 X
	(a) (a) (a) (a) (a) (b) (a) (a) (a) (b) (a) (b) (a) (b) (a) (b) (b) (b) (b) (b) (b) (b) (b) (b) (b		Type Time	Sender Message		
	Name · · Source	 Description Os Channel 	 A 11:07:07 	DDU10 - New Project Data upload car	celled (try to resynchronize the device by disconnecting/reconnecting it	
	absiap 🗰 OOU 10	Absolute lap count Provided by	00010		to device(Ethernet/NOP). nected to device(Ethernet/NOP).	- 1
	Bacx B00010	longitudinal accele Quantisatio	n: 0,1/nc () 11:07:09	DDU10 - New Project BPK check succe	ssful. (EPK Device: DDU10_BASE_0401_TST4)	
	accy CDU10	transversal accele Format: Conversion	%7.1 (1) 11:07:11		ches the local data. successfully uploaded and initialized.	
	accy COU10 COU10 COU10	Data type:	16 Bit signed 0x24700901	DOD to - New Project Calibration data	successmuly uploaded and initialized.	1
	ecz 00010	vertical accelerate * Address:	II Info/Status 64	N Log - running		
	Reedy.			No error detected - al cleared or state tricrowy	 New Project/00000/Computed Channels/Channel - Channel 	😁 .đ

4. The 'C 80 features info' window appears.

ECU ID ——	DOUUD features info Copy to dipboard Status/Unlock Status/Unlock Name Description CCP_MASTER FULL_IOG_1 F02U V02 204-01, Full logging on first partition FULL_IOG_2 F02U V02 203-01, Fulle data copy from logger to Bosch USB stok FILE_F02U V02 203-01, Enable data copy from logger to Bosch USB stok ETHER_TELE F02U V02 138-01, Enable Ethernet / LTE Telemetry ID_EXTENS F02U V02 205-01, Enable additional input / output channels	List of available features
	Locked (disabled)	

5. Double-click on the feature you want to activate. A feature unlock window appears.

	2778:1d0fd540 Copy to clipboa Order informations
Name	Description STER. F02U V02 213-01, Enable device to be CAN Communication Protocoll Master
	A Unlock Feature

6. Enter the activation key you received for this feature on this device and click 'OK' when done. The feature's status changes to 'unlocked'.

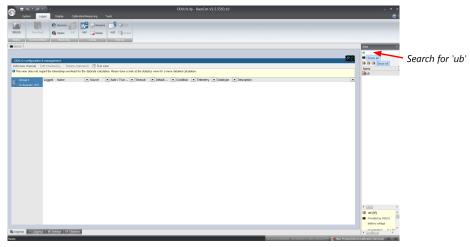
CU ID	33306770.	1d0fd540	Copy to dipboard
Status	/Unlock Orde	er informations	
	Name	Description	
6	CCP_MASTER	F02U V02 213-01, Enable device to be CAN Communication Protocoll Master	
ſ	FULL_LOG_1	F02U V02 304-01, Full logging on first partition	
Ð	FULL_LOG_2	F02U V02 305-01, Enable full logging on second partition	
ſ	USB_DATA	F02U V02 214-01, Enable data copy from logger to Bosch USB stick	
D	ETHER_TELE	F02U V02 138-01, Enable Ethernet / LTE Telemetry	
Ð	IO_EXTENS	F02U V02 205-01, Enable additional input / output channels	

- 7. Perform these steps to activate other features you purchased.
- 8. Switch the car's ignition off and on again to cycle the power of C 80.

8.4 First recording (Quick Start)

This chapter explains the configuration of the recording of the battery voltage channel. See chapter 'Recording [> 94]' for a detailed instruction to configure recordings.

- 1. Click on the 'Logger' tab to go to the page 'Logger'.
- 2. Use the search bar in the 'Data' window, to search for 'ub' (measurement channel for battery voltage).



3. Drag and drop the 'ub' measurement channel into the recording area.

	DDU10.rlp - RaceCon V2.5.5503.10 *	
System Logger Display	Califration/Measuring Tools	. .
DOU10 Download Status Communication Recording	Image: Second	
C DDU10		Data P
	ead for the datarate calculation. Please have a look at the statistics view for a more detailed calculation.	ub Show all Show all Name /
Group 1 Logged Name 1 channels Ø 0 🔽 ub	Source Saurce Vate/True Timeout Defaut Timeout Condition Telemetry Datatype Description Double Double Double Security Datatype Description Timeout Ti	
	Drag + Drop	
		<
		Provided by DDU10
		Quentisation: 0,1 [V] Limits: 0,25,5 Format: 94,1 Precision: 0 Conversion: (ub)/11 *
😰 Logging1 📑 Logging2 ill Settings 👪 St		< >
Ready.	His entre i dokatal er state en konon 📲 🍱 New Project/DOUN(Logae/Ju	igging1/Group 1/ub 😁 😁 "d

4. Click on the 'Download' button in the upper left corner. The configuration download starts and the C 80 carries out a reset. Now you can find the 'ub' measurement channel in the 'Data Area'. As we did not define global start conditions, recording starts immediately.

	System DDU10.rlp - RateCon V2.5.5.0	_ a x
System Logger Display Calibration/Measuring Tools	Windows	0 -
DUU30 Rece Mode Status Status Node		
Project 9 x	64 New Project	
ef New Nepet de Constance d	Contracting data to 0000 Contracting data t	Decest © District © District © District © District © District © COUT © COUT © COUT © COUT
The project's name.	det System Overview Delaset menoger	Measurement Elements Measurement Sources
J Deta	4 × [trfs/Status	= • ×
	Errors () Messages(6)	6/6 🗙
🗃 🗃 🗃 🗃 🗃 📓 🖬 🙀 Show all	T Time Sender Message	*
Name / Source Decrybon / Botobap Dicture / Botobap Dicture / Botop Dicture / Botop Dicture / Botop / Dicture / Botop / Dicture / Dictu	Financian Ibbel	

5. Start the WinDarab software.

(A) 🙀 🗧	WinDarab v7 Developer - Formula3		
Start Tools Windows			Style - 🔞 -
Dockable windows	CO DE LA CALLER CONTRACTOR CONTRA		
	•		
File Explorer 0 ×	Si la contra c	Channels	
 i × ∞ - Q → - □ Out Lap Laptime 			
Out Lap Laptime		Name 1	Source Descripti
	H 4 > H × Worksheet #1		^
Events	•	-	0 ×
Tano Cor I from To Durator/Durrot	Men Ma		
			1702 MD (ma

- 6. Disconnect the C 80 network cable.
- 7. Click on the 'Read Data from Logging Device' icon.

Choose your logger and click 'OK' when done. The 'Data Logger Import' dialog opens. Refer to the WinDarab V7 manual for instructions on how to use the 'Data Logger Import' dialog and for more detailed descriptions and instructions.



8. Choose the device and the IP address for the device.

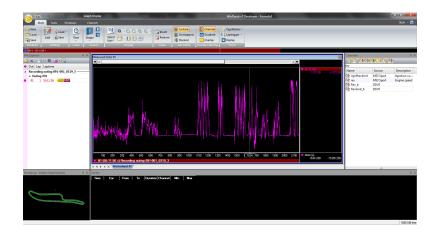
Click 'Apply changes' when done.

💱 Data Logger Import		-		Х	Choose your Device / I
Settings Current Import Recent Import					from dropdown list
Import sources	Common options				
FlashCard / USB-Stick	Delete ARP cache entry after ping to device failed.		/		
Device	Force password, if not set by recording configuration:				
Burst	V News				
	Delete transferred files				
Export file: One file Save files in: C:\					

- 9. Connect the C 80 network cable.
- 10. Click on the 'Current Import' tab.
- 11. Click on 'Import' in the lower right corner. If the 'Import all on connect' box is checked, the data transmission from the C 80 starts automatically. Measurement files are stored automatically in the folder defined under 'Settings'.

💱 Data Logger Import							
	Settings Current Import Recent Impor	't					
	Data source: FTP 23.06.2015 12:11:11				Network DDU7 - 10.10.0.207	, o	18 ms
	Name	Size (MB)	Get	Get (MB)	Progress		
	FTP 23.06.2015 12:11:11	0.0		0.0	Connecting		
	Auto Scroll Show all files					In	nport

- 12. Click on 'Close' when the transmission has finished.
- 13. Click on the Start button and choose 'Open measurement file'.
- 14. Select the measurement files from the storage folder.
- 15. Click on 'Open'.
- 16. Click on 'New Desktop' to open a new measurement data window.
- 17. Drag the 'ub' measurement channel from the channel list and drop it into the measurement data window. The 'ub' measurement channel's graph is displayed.

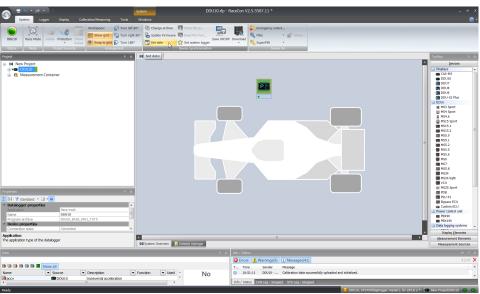


8.5 Set date and time

The C 80 is equipped with a real time clock which is supplied by an internal accumulator. Once this accumulator is charged correctly by 12 V supply of the display, 'Date & Time' can be programmed by RaceCon.

Reassure that the time is set correctly, if the device has not been used for more than two weeks.

- 1. Connect the C 80 to the PC.
- 2. Click on the 'Set date' button in the 'System' tab menu.



 Alternatively, click on 'Set Date & Time' in the context menu of the device. A 'Set Date & Time' menu opens

Project				Ŧ 🗙 Ka New F	Proj
🖃 🛤 New Project					
	Open				
📄 💼 Dis 🖾	Create measuring views				
	Download configuration				
	Synchronize	•	Ø	Set Date & Time	
	Current measuring media	•	(1)	with ECU	5
	Create dataset		f)	Change program archive	
	PIN/SuperPIN	.		Update firmware	L
	Export		₽	Upload configuration	L
🕂 🕒 CA 🔿	Import		×	Clear logged data	-11
	Properties		Ŕ	Clone ECU	-
	Delete			Adjustment data	
- 📄 Co aje	Rename	_	••	Save •	
📥 📲 1/0 Ch	annels	_			

- 4. Set the current local date and time as coordinated universal time.
- 5. At 'Set a specific date & time' click and type on the value you want to change or choose from the dropdown menu.

Set date&time for DDU10	×
Sets the date & time on a logger device. Use the 'set' buttons to configure the logger's recording date	e & time.
Set current local date & time 11/8/2017 Set as UTC Set	
Set a specific date & time 08.11.2017 10:53:35	
The logger's current date & time 1/13/2000 17:33:01	
	Close

8.6 Color indication

The color indication in RaceCon visualizes different messages, such as differences between tool and device, status of the device configuration or the accrual of errors.

Visible color indications:

- In the status area in the upper left corner.

۵ و	• •	• •	• •	• •	• •

 As a background, as well as a little dot around the display icon in the 'System window'.

|--|--|--|--|

C80 Logger C80 Logger C80 Logger C80 Logger C80 Logger

- As a colored stripe beside the device name in the project tree.

E New Project	🖃 🛤 New Project
🞯 Laptrigger	DDU10 💋
DDU10	Measurement Container

- As a colored background around the device name in the project tree.



- As a colored MIL in the "Error Info" window.

Existing DDU10 e	rrors		Existing DDU 10) errors	
MIL 😑			MIL 🔵		
Location	Туре	Du	Location	Туре	Du
ANA04	Open line		Location	1,100	00

- As a colored dot in the error memory at the bottom.

💛 DDU10, SYSTEM(laptrigger master), for 885,6 s 🤊

The colors and their meaning:

- Grey: No connection with the device.
- Green: Matching configuration and firmware between device and project.
- Orange: A different configuration between device and project.
- Red: A different firmware between device and project.
- Purple: Device is bricked, too many resets. Reflash the device, reconsider last changes.
- Colored background with orange stripes: Matching configuration with stored (inactive) errors in the device.
- Blinking colored background with orange stripes: Matching configuration with active errors in the device.
- Black MIL: No errors.
- Orange MIL: Inactive Errors (Error entries existing, but no longer active).
- Blinking MIL (orange/black): Active Errors.

For further information, see chapter Error Memory Properties [> 88].

8.7 Assign the Mounting Location

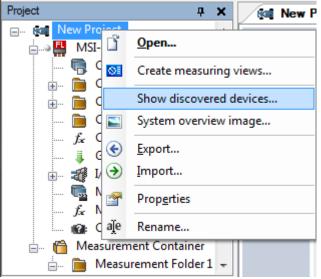
At delivery the default role of the devices is set. There is no need to change this, until you want more than one device of this kind. Up to eight C 80 can be used additionally in one network for I/O expansion and or Multilogging, the mounting location is used for determination between the different C 80.

In case of M60/MSI60, at delivery no mounting location is set. This is signalled by an orange 'RUN' LED on the device. Therefore one must first assign a mounting location to the C 80 before it can be used in the project.

The mounting location is permanently saved in the C 80. If necessary, you can reassign a different mounting location at any time following the same procedure.

A mounting location must not be used several times in one network, this would disturb the functionality of the respective C 80.

1. In the Project Tree right click on the project name e.g. 'New Project' and then select 'Show discovered devices...'.



All connected C 80 are listed.

Devices					~
Discovered devices This Dialog shows detected devices (M60/M	MSI60) on co	nnected network.		-4	
		Discovered Discovered, Used Conflicts			
K Z	Туре	FNumber	SNumber	Location	
	M60	F 02U V00 882-01	#102	Undefined	-
	M60	F 02U V00 882-02	#198	Rear	-
		Ok	Cancel	Apply	

2. Compare the listed device Type, FNumber and SNumber to the identification plate to identify the device you want to make changes to:



3. Assign the desired mounting location (e.g. 'Front') and confirm by clicking 'Apply'.

Devices Discovered devices				x
This Dialog shows detected devices (M60/		onnected network.		
		Discovered Discovered, Used Conflicts		
	Туре	FNumber	SNumber	Location
	M60	F 02U V00 882-01	#102	Undefined 🔹
	M60	F 02U V00 882-02	#198	Undefined FrontLeft FrontRight RearLeft RearLeft Rear Center Gearbox
		Oł	Cance	Apply

The mounting location is now stored in the device. The device will do a reset and the 'RUN' LED will change to green. The list will show the new mounting location assignment.

Devices					x
Discovered devices This Dialog shows detected devices (M60/	'MSI60) on c	onnected network.		-4	-
		Discovered Discovered, Used Conflicts			
	Туре	FNumber	SNumber	Location	
	M60	F 02U V00 882-02	#198	Rear	-
	M60	F 02U V00 882-01	#102	Front	-
		Ok	Cancel	Apply)

It is good practice to physically label the C 80 with its mounting location. Now the device is ready to be used.

A different coloring of the C 80 is used to indicate that the device is already configured in the currently loaded RaceCon project or not (white/orange).

A conflict of several connected C 80 using the same location is indicated by red coloring the involved devices:

evices					x
Discovered devices This Dialog shows de		(MSIED) on	connected network		-4-
		Туре	FNumber	SNumber	Location
	/1	M60	F 02U V00 882-02	#198	Rear
		M60	F 02U V00 882-01	#102	Rear
			Ok	: Can	cel Apply

9 Project Configuration

9.1 Math Channels

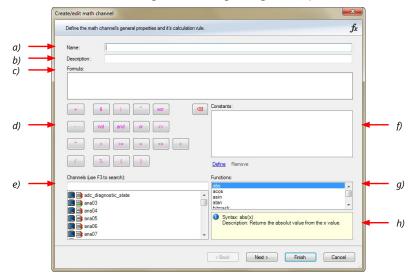
- Arithmetic and logical operations on up to 4 measurement channel(s)
- Numerical result
- Result can be used as input source for various display elements (numeric elements, alarms, bargraphs) and further calculations in the whole RaceCon project

Creating a new Math Channel

1. Follow the steps shown in the screenshot. The "Create/edit math channel" window appears.

•				
	System Logar Degr 0007 Race Mode Waller Resc 1007 Race Mode House 1006 House House		_	0
1st: Double-click on "Math Channels" in the Project tree 2nd: Click on	News I w K Image: Second	Al montal de anti-	Constant Section 2	• x
"Add channel"	* <u>- 11</u>		Sensitivety/Offset	
	1 Totandard - <	Definition Test Series Series Test Series	8 X 1234 X *	
	Properties - Helt Denvini B X 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Orman (Lag) Amount (Proves 000 / MML (Proves		

2. Define the math channel using the following configuration possibilities:



- a) Enter the name of the math channel.
- b) Enter a description of the math channel.
- c) Enter the formula.
- d) Select the logical operator.
- e) Choose a measurement channel.
- f) Define a value that can be used as a constant in the formula.
- g) Choose a function.
- h) Describes the function selected above.

Click 'Finish' when done. The math channel is displayed in the math channel window.

9.2 Conditional Functions

- Arithmetic and logical operations on one or more measurement channel(s)
- If-Else structure with reset
- Numerical result
- Result can be used as input source for various display elements (numeric elements, alarms, bargraphs) and further calculations in the whole RaceCon project.
 All math and conditional channels can be used globally in the whole RaceCon project.

Creating a new Conditional Function

1. Follow the steps shown in the screenshot. The "create/edit math channel" window appears.

	0	UU07.00 - Katelon V25.0.2002	
	System Logger Dep	ny Califeration/Measuring Tools Windows	0 -
	🕒 🔯 🐷 🤇		
	0007 Bace Mode visible Prote	Ten Bert Least	
	Status Node Project	early	
	Project 8 x	/ M. Hen/Project / 📕 0007	P X Toobax 0 X
	0 DDL0		Display Elements
1st: Double-click	a Constant	DDUT neth demol configuration	Measurement Elements
TSL. DOUDLE-CLICK		Ag Add channel. → ∫g Edit channel. /g Delete channel(t)	Measurement Sources
"Math Channels"	GAN Bus 2 Grouputed Channels	\$\overline{2}_{0}\$ \$\overl	Bosch Wzerd
Math Channels	a. 2 VO Channels	No contrast process	Customized Sensor
	Calibration Items		Analog sources Oranacteristic Carve
in Project Tree	- Macros	T T	Multipoint Adjustment
5	- f. Cenditional Channels		Sensitivity/Offset
	Group adjustments Group Master		Frequency sources Characteristic Curve
2nd: Click on	8- 👩 Measurement Container		Revolution
ZIIU. CIICK OII			Velocity
the dropdown	Data - Math Channels # 🗙		Computed sources Adustment channel
те агориомп	Data - Matricharres + X		Characteristic Curve
arrow beside	Show all		Fuel Gear Lookup Table
arrow beside	Name Sou		Gear Lookup Table Hysteresis
			E Laptigoer
'Add channel'			PWH Out
			Sensitivity/Offset
	·		
3rd: Choose	Properties - Math Channels & X	📓 Salatida 🖕 Mah Charrela 🔏 Conditional Charrela 🔯 GWI messages 🔩 Macras 💷 Settings 🕕 Device info 🙀 Francisch 🖓 Nacras Info	
SIU. CHOUSE	Tild Watersteel + + 10		×
'Conditional	🗄 Debog	C Erren(3) A Warrings(74) (C Messages(5)] 144/1-	4 🗙
Conallional	CanChangedPro: True CanChangelfisbil True	Type Time Serder Message	*
for a strange of the state of the strange of the st	E Math channels properties	(1) 1114551 0007-Ne BY deds accessful, BY/Cenier (1007,2466, 8727) All 114555 Marri-Ne BY deds accessful, BY/Cenier (1007,2466, 8727) All 114555 Marri-Ne By density accessful accessf	
function'	Name Math Channels	(i) 11+0-53 DOU7-Ne Logger data matches the local data.	
•		1114:13 DDU7-Ne Lost convection to device(BinnettOD). 1114:14 DDU7-Ne Lost convection to device(BinnettOD). 1114:14 DDU7-Ne Lost convection to device(BinnettOD).	
		(i) 11:42:14 DDU7-Ne DPK check successful. (DPK Device: DDU7_JMGE_D227)	
	CanChangedProtectionState	▲ 11:14:15 Alam-Ne No dware issues configured, skpping element (0) 11:46:15 Alam-Ne (soger data native the load data	- 00

2. Define the math channel using the following configuration possibilities:

	ĺ	Create/edit conditional function		×	
		Define the conditional function's gener	ral properties and it's calculation rules.	fx.	
		Name:			
a)		p_br_front_mx			
		H:	Then:		
b)	-	p_br_front > 20	<pre>max (p_br_front, p_br_front_mx)</pre>		 d)
		Otherwise:	Reset value:		
c)		p_br_front_mx	10	 +	 e)
		(i) If (p. br. front > 20) is TRUE, then return Reset value is used: before II-condition becomes TRUE for th or when II-condition changes state from	(max (p_br_front, p_br_front_mx)), else return (p_br_front_mx). he first time siter power-up FALSE to TRUE		
			< Back Next > Finish	Cancel	

a) Enter the name of the conditional function.

b) Enter the If-condition. Click pencil symbol to open an editor to enter expressions.c) Enter the Then-condition. Click pencil symbol to open an editor to enter expressions.d) Enter the Otherwise-condition. Click pencil symbol to open an editor to enter expressions.

e) Enter the reset value (must be a number).

Click 'Finish' when done.

The conditional function works the following way:

The program always calculates the condition entered in the IF window and checks if the condition is TRUE or FALSE.

If the condition entered in the IF window is TRUE, the program calculates the condition entered in the THEN window. The returned value is the content of the new variable (entered in "Name").

If the condition entered in the IF window is FALSE, the program calculates the condition entered in the OTHERWISE window. The returned value is the content of the new variable (entered in "Name").

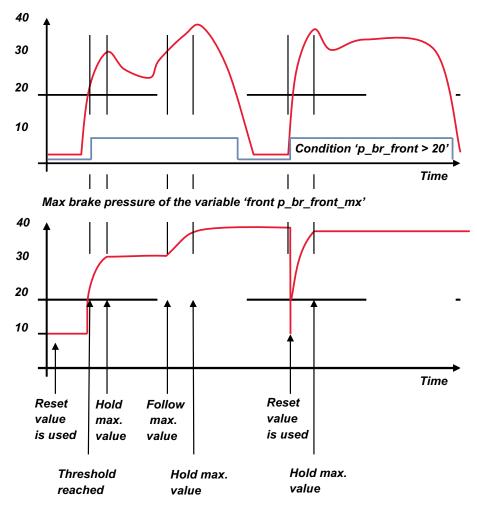
The reset value is always set for the new variable (entered in "Name"):

- before the If-condition becomes TRUE for the first time after power-up
- when the If-condition changes state from FALSE to TRUE.

An example of a condition to set up the maximum front brake pressure is given on the next page.

The conditional function is displayed in the C 80 math channel window.

Example: Setting up a condition for maximum front brake pressure Brake pressure 'front p_br_front'



- At power-up, the reset value (10) is used for 'p_br_front_mx'.

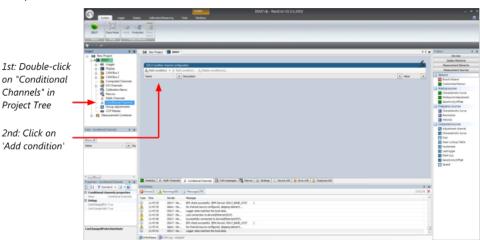
- 'p_br_front' rises to 30. As 'p_br_front' is > 20 (condition is TRUE), the condition 'max (p_br_front, p_br_front_mx)' in the THEN window is triggered. The condition sets the bigger value as new value for 'p_br_front_mx'. As 'p_br_front' (30) is bigger than 'p_br_front_mx' (10), the new value for 'p_br_front_mx' is set to 30.
- Although 'p_br_front' falls to 25, the value of 'p_br_front_mx' stays 30. This is caused by the THEN-condition, because p_br_front_mx' (30) is still bigger than p_br_front' (25).
- 'p_br_front' rises to 40. As 'p_br_front' (40) is bigger than 'p_br_front_mx' (30), the new value for 'p_br_front_mx' is set to 40.
- As 'p_br_front' falls below 20, the IF-condition turns to FALSE. Now the OTHERWISEcondition is triggered. Because the condition 'p_br_front_mx' sets the value of 'p_br_front_mx' and the value is already set to 40, nothing changes.
- When 'p_br_front' rises to 40, the IF-condition changes to TRUE again and triggers the THEN-condition. Now the reset value (10) is used for 'p_br_front_mx' in the THENcondition.
- The new value of 'p_br_front_mx' is 40 because 40 is bigger than 10.

9.3 Conditional Channels

- Logical operations on measurement channel(s)
- If-Else structure with reset
- Logical result
- Result can be used as input source for alarm display elements and further calculations in the whole RaceCon project.

Creating a new Conditional Channel

1. Follow the steps shown in the screenshot. The "Create/edit condition" window appears.



2. Define the condition channel, using the following configuration possibilities:

Name: Comparing mode Comparing mode Constant Channel Constant Constant Constant value:	Jx	ring mode.			general properties and the nannel/value or multiple constant	Define the conditions g Select between single ch	
Constant Channel Constant Constant Constant Constant Constant value:						Name:	
		 Multiple (constant list) 	e	⊚ Range	Channel		-
			Constant value:	<u> </u>		Input channel:	-
General antices							
			Output settings			General settings	
Debounce time: 0 - ms Output mode: Constant TRUE/FALSE	-	Constant TRUE/FALSE	Output mode:				
Tum off delay:				ms	0	Tum off delay:	-1

a) Enter the name of the conditional channel.

b) Select the comparing mode:

- Constant: Compare a measurement channel with a constant value.
- Channel: Compare a measurement channel with a measurement channel.
- Range: Compare a measurement channel with a defined value range.
- Multiple: Compare a measurement channel with up to 5 constant values.

c) Depending on the chosen comparing mode, you can enter the following values:

- Constant: Choose the measurement channel or condition, the operator and enter the value of the channel.
- Channel: Choose the measurement channel or condition, the operator and the measurement channel or condition to be compared.
- Range: Choose the measurement channel or condition, the operator and define the minium and maximum value.
- Multiple: Choose the measurement channel or condition, the operator and enter the value of up to 5 constants.

d) Enter the minimal time to detect the signal of the measurement channel, to avoid highfrequent switchovers.

e) Enter the time by which the signal of the measuring channel is delayed after its end.

f) Choose the output setting of the result.

- Constant TRUE/FALSE: Result is as a constant with the value TRUE or FALSE.
- Blinking: Result is a blinking, if the condition is fulfilled.
- Pulse: Result is a short one-time pulse, if the condition is fulfilled.
- Toggling output: Result is a pulse that lasts until the next condition is fulfilled.
- Click 'Ok' when done. The conditional channel is displayed in the C 80 condition channel window.

9.4 Condition Combination

- Combination of several (up to 16) conditional channels for more complex calculations
- Logical results
- All conditions can be used globally in the whole C 80 project.

Creating a new Condition Combination

Follow the steps shown in the screenshot.

		5 COUP de Bandon VI.5.5.000	•
		Taba	N Today & K
1st: Double-click on 'Conditional Channels' in Project Tree	Construction Construction	The control or more a character of the control of t	Daplas Benerits Heasurement Denenis Heasurement Jourses
2nd: Click on the dropdown arrow beside 'Add	Data Continuel Darwin & X Store at Name \ Dis		Compared starting Characteristic Chrise Characteristic Chrise Chrise Case Lookup Table Georgen Hell Cod Security (1979) Security Security Security Security
condition'	r r Properties Conditional Channels B K 20 31 V dandard - J - D	🖀 Salatas 🔏 init Dannis 🙊 Cadavad Quanda 🔯 Catemanges 🔩 Romes 💷 Sellinge 💷 Sellinge 💷 Sellinge 🔛 Sellinge Ale	
3rd: Choose 'Conditional	Canditional channels properties Name Canditonal Durvels Canditonal Durvels Defog Canditonal Durvels	D transfer Among All Jing Menagerilli 20112 Tare Mar Sandar Sandar Jin Ulli Jing Markan, in Production of Distribution (Sandar) (Jold J17 1 Jin Ulli Jing Markan, in Production of Distribution (Sandar) (Jold J17 1 Jin Ulli Jing Markan, in Order Among Alling Alling Markan, in Order Among Alling Markan, in Or	
combination'	CanChangedFrotectionState	1010 100-hc. Isourity any entry it is notifier strict(y) y 1010 100-hc. Isourity any entry it is notifier strict(y) y 1010 100-hc. Isourity any entry it is notifier strict(y) y 1010 100-hc. Isourity any entry it is notifier strict(y) y 1010 100-hc. Isourity any entry it is notifier strict(y) y 1010 100-hc. Isourity any entry it is notifier strict(y) y 1010 100-hc. Isourity any entry it is notifier strict(y) y 1010 100-hc. Isourity any entry it isourity it isourity any entry	

The "Create/edit condition combination" window appears. Define the condition combination, using the following configuration possibilities:

	Create/edit condition combination	×
	Combine multiple conditions.	fx
_	Name:	
	Add AND Add OR Remove Edit	
	< Back Next > Finish	Cancel

a) Enter the name of the condition combination.

b) Create the condition combination in the window.

- Choose a channel (condition, conditional function, math, measurement channel with binary values) to be compared.
- Combine multiple conditions, by adding 'AND' or 'OR' relations.
- To negate a condition, click with the right mouse-button on the condition and select 'Negation (!)'.
- Combine several (up to 16) conditions.

Click 'Next' to go to the next page. Choose the output setting of the result:

Create / edit condition combination		×
Create / edit condition combination		fr
Combine multiple conditions.		Jx
Name:		
condComb		
Output configuration:		
Constant TRUE/FALSE		ĸ
Constant TRUE/FALSE Blinking		7
Pulsing		
Toggling output		
	< Back Next >	Finish Cancel

- Constant TRUE/FALSE: Result is as a constant with the value TRUE or FALSE.
- Blinking: Result is a blinking, if the condition is fulfilled.
- Pulsing: Result is a short one-time pulse, if the condition is fulfilled.
- Toggling output: Result is a pulse that lasts until the next condition is fulfilled.

Click 'Finish' when done. The conditional combination is displayed in the C 80 condition channel window.

9.5 Display Switch Module

You can use the Display Switch Module to switch display pages and brightness. The output is a display page or brightness output that can be used in display configurations. The value sustains over a power cycle.

The conditions for incrementing/decrementing the value can be set freely. The maximum value can be set as constant or read from a measurement.

The page can be configured to wrap around. In this case, no page down condition is needed.

Display Switch Wizard - Add New	1					×
Display Switch properties					_	+
Setup the up and down signal sou	urces and the maximum cou	unt of steps.				-
Source for signal Up:					Edge:	
睅 🙆 page_up			đ	^ ~	Falling	~
Source for signal Down:					Edge:	
睅 🙆 page_dn			đ	 	Falling	~
Signal source: Signal source: Onstant: Display switch does not wrap aroun	nd				1:	2
Measurement Sheet:						~
	< Back	Next >	Finish		Cano	el

The resulting outputs are the display switch value and the input conditions.

Measurement label	Function
name	page or brightness value
name_ dn	input condition for decrement
name_ up	input condition for increment
Example:	
🙆 displayPage	C80 Logger
🖾 displayPage_dn	💭 C80 Logger
displayPage_up	C80 Logger

9.6 Timer Module

The Timer Module is designed to implement timing triggers, i.e. for rallye stage timing or minimum pit time calculations. Any event in the system can be used for starting, stopping and resetting the timer.

Up counting mode and down counting mode are available, triggers are fired at set time (up counting) or at zero (down counting). The running timer will keep its state over a power cycle.

Timer Wizard - Add New		×
Timer configuration Specify timer properties and a set of	control signals.	חו
Properties Mode: Count down Count down Count up 10,00 Measurement sheet	Control signals Start timer: Cond_start Stop timer (optional): Cond_stop Reset timer (optional): Cond_stop Reset timer (optional): Cond_reset Use timer expiration to reset timer	Edge: Falling V Edge: Falling V Edge: Falling V Falling V
	< Back Next > Finish	Cancel

The output channels for this module depend on the name used for the module and are called ..._time and ..._trig.

Measurement label	Function		
name_ time	actual timer value		
name_ trig	trigger set by timer alarm		

In this example, the module is named "Timer_Module". Resulting channels are:

Timer_Module_time	C70
Timer_Module_trig	C70

9.7 GPS Trigger Module

The GPS Trigger Module triggers depending on GPS-position, like the GPS-laptrigger.

There are 50 GPS trigger points for parameter application of latitude/longitude coordinates, as well as 10 macro-based coordinates.

If the car passes one of the trigger points, an output signal is set to 1 shortly. Each trigger requires a defined latitude, longitude, and detection range.

SPS Trigger configuration Specify GPS Trigger configuration.				5
Fudge Factor:	GPS positions (Parameter	based) Detection range (N	/acro based)	
	Latitude [DD]	Longitude [DD]	Detection range [m]	
Measurement sheet	0,0000000	0,0000000	20,00	
· ·	0,0000000	0.00000000	20,00	
	0,0000000	0,0000000	20,00	
	0.0000000	0.00000000	20.00	
	0,0000000	0.00000000	20,00	
	0,0000000	0.00000000	20,00	
	0,0000000	0.00000000	20,00	
	0,0000000	0.00000000	20,00	
	0,0000000	0,0000000	20,00	
	0,0000000	0.00000000	20,00	
	0,0000000	0,0000000	20,00	
	0,0000000	0.0000000	20,00	
	0,0000000	0,0000000	20,00	
	0,0000000	0.00000000	20.00	

The parameter-based trigger points need to be set manually in RaceCon, the macrobased trigger points will store latitude and longitude values when the configurable trigger condition comes true (i.e., steering wheel button). This trigger condition and the detection range need to be configured in RaceCon.

PS Trigger configuration		0
Specify GPS Trigger configuration.		
udge Factor: 1,000 🜩	GPS positions (Parameter based) Detection range (Macro based)	
	20,00	m
easurement sheet	20,00	m
· ·	20,00	m
	20.00	m
	20,00	m
	20,00	m

The GPS trigger points can also be used for segment triggering. If used as segment triggers and i.e., 3 trigger points are selected, the laptrigger module will use the first 3 trigger points on the list. The channel names depend on the name used for the module, in this example GPS_Trigger. Each trigger has a distance and a trigger channel with the abbreviation m for macro or p for parameter based. The trigger channel will be set to 1, when the lowest distance to the trigger point is detected. For the macro-based trigger, the stored latitude and longitude values can be seen with the channels.

Measurement label	Function
name_ lat	interpolated gps latitude
name_ long	interpolated gps longitude
name_ ptrig_150	trigger output of parameter based trigger (n)
name_ pdist_150	distance to trigger of parameter based trigger (n)
name_ mtrig_110	trigger output of macro based trigger (n)
name_ mdist_110	distance to trigger of parameter based trigger (n)
name_ macro_lat_110	stored latitude for macro based trigger (n)
name_macro_long_110	stored longitude for macro based trigger (n)
Example:	
GPS_Trigger_mdist_2	💽 C70
GPS_Trigger_mtrig_2	■C70
GPS_Trigger_pdist_2	■C70
GPS_Trigger_ptrig_2	■ C70
GPS_Trigger_macro_lat_2	■ C70
GPS_Trigger_macro_long_2	■ C70

9.8 CPU Load Limits

As all microprocessors, the two processors of the C 80 have limited capacities. The current load of the processors can be monitored using the channel "cpu_load_001" or "cpu_load_002". When configuring your device, please make sure the used CPU load is in a save range below 100 %.

Bosch recommends a maximum CPU load of 85 % (averaged). Exceeding this limit might result in the C 80 not being able to fulfill its required measuring/logging/display tasks or even in crashing and rebooting.

Main factors influencing the CPU load are:

- Number and complexity of math channels
- Number and complexity of conditions
- CAN traffic on both CAN lines
- Display configuration, especially displaying pictures
- Logger configuration (total logging rate [kB/s], conditional measurement rates)

To help respecting the limit of 85 % CPU load, the C 80 creates an error memory entry. To trigger this error entry, the CPU load must exceed the limit for 5 minutes without interruption.

When being confronted with this error memory entry (see 'Error info' in RaceCon) or when being confronted with C 80 resets due to complex configuration setups, please consider reducing the demands on the C 80 adapting the influencing factors mentioned above.

10 CAN Configuration

The C 80 has 2 fully configurable CAN bus(es).

- Baudrate 125 kbaud to 1 Mbaud
- 11 Bit or 29 Bit identifiers
- Input configuration: Read messages from CAN bus and convert to C 80 measurement/display variables. CAN bus supports row counter configuration.
- Output configuration: Write RaceCon measurement variables to CAN messages; output frequency and row counter are configurable, CAN gateway functionality (transfer from one bus to another).

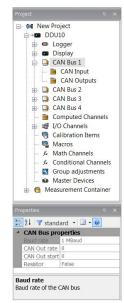
10.1 CAN Bus Trivia

CAN Message

- 11 Bit (standard) or 29 Bit (extended) identifier
- Up to 8 bytes of data payload

CAN Bus

- Needs termination resistors in wiring harness
- All devices connected to the bus must use identical data rate
- Configuration of bus data rate in the 'CAN messages overview' menu. To access the menu, double-click on one of the CAN bus items of the project tree



Row Counter Concept

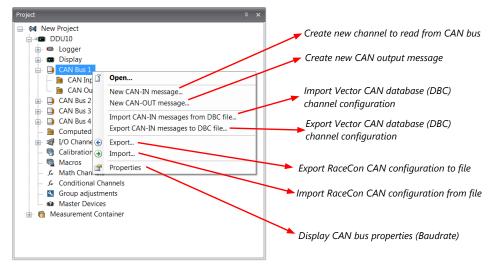
- Re-use (multiplex) of message identifiers
- One byte of message contains row counter
- 7 bytes payload remaining
- Position of row counter is configurable

		Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0	0x100	0	💁 p_oil		💁 t_oil				
C	0x100	1	💁 s_dam_fl		💁 s_dam_fr				
0	0x100	2	💁 s_dam_rl		💁 s_dam_rr				
Mes: Id	sage	Row Counter	Payloa	d Area					

10.2 CAN input

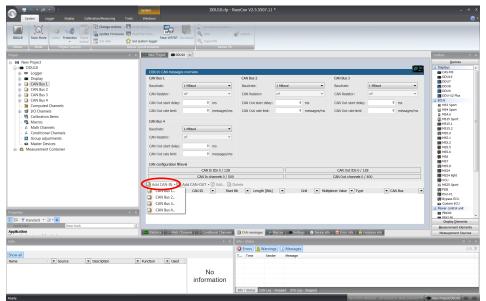
10.2.1 Input configuration

Click with the right mouse button on the desired CAN bus to open the CAN bus dropdown menu.



10.2.2 Create new CAN Input channel

- 1. Double-click on any CAN bus item, to open the "CAN messages overview".
- 2. Select 'Add CAN-IN' and choose the desired CAN bus for the new input channel.



3. A CAN channel configuration window opens.

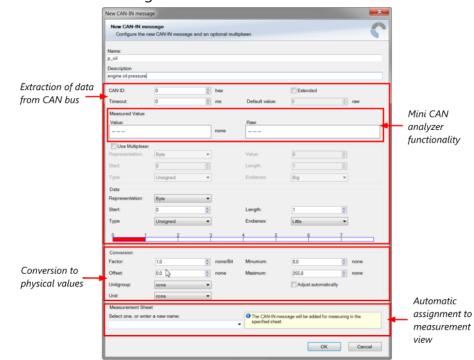
4. Insert the name and description of the channel.

New CAN-IN me Configure the n	ssage ew CAN-IN message	and an o	ptional multip	blexer.		<
Name:						
o_oil						
Description engine oil pressure						
ingine on pressure						
CAN ID:	0		hex		Extended	
Timeout:	0		ms	Default value:	0	a raw
Measured Value						
Value:				Raw:		
			none			
Use Multiplexer						
Representation:	Byte	-		Value:	0	
Start:	0	A V		Length:	1	
Туре	Unsigned	•		Endianes:	Big	•
Data						
Representation:	Byte	•				
Start:	0			Length:	1	
Туре	Unsigned	-		Endianes:	Little	•
0 1		3		4		
				4 5	0	
Conversion						
Factor:	1.0		none/Bit	Minumum:	0.0	none
Offset:	0.0	A	none	Maximum:	255,0	none
Unitgroup:	none	•			Adjust automatical	y
Unit:	none	•				
Measurement She	et					
Select one, or ente	er a new name:			snacified sheet	ssage will be added for mea	isuring in the

5. Click 'OK' when done.

The channel is listed in the Data window.

CAN Bus 1			CAN Bus 2			CAN Bus 3		
Baudrate:	1 MBaud	-	Baudrate:	1 MBaud	•	Baudrate:	1 MBaud	•
CAN Resistor:	off	Ŧ	CAN Resistor:	off	¥	CAN Resistor:	off	Ŧ
CAN Out start delay:	0 ms		CAN Out start delay:		ms	CAN Out start delay:	0	ms
CAN Out rate limit:	0 me	essages/ms	CAN Out rate limit:		messages/ms	CAN Out rate limit:	0	messages/ms
CAN Bus 4								
Baudrate:	1 MBaud	-						
CAN Resistor:	off	-						
CAN Out start delay:	0 ms							
CAN Out rate limit:	0 me	essages/ms						
CAN configuration fill	level					CAN Out IDs 0 / 128	3	
CAN configuration fill	evel CAN In ID	s 1 / 128						
CAN configuration fill						CAN Out channels 0 /	400	
	CAN In ID	nels 1 / 500	ete			CAN Out channels 0 / 4	400	
CAN configuration fil Add CAN-IN - ame	CAN In ID CAN In chan	nels 1 / 500	ete Length [Bits]		Grid 💌 Multi	CAN Out channels 0 / 4	400 • CA	N Bus

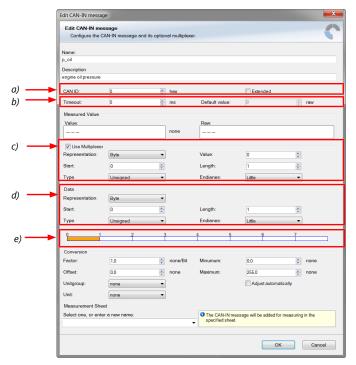


CAN channel configuration

10.2.3 Extracting data from CAN bus

Representation: Byte

Some CAN devices need to be addressed by a byte represented CAN channel. The address can be assigned in this window and is illustrated by a bargraph.



- a) Enter CAN message ID. If extended IDs (29 bit) are used, check the box.
- b) If replacement values are used, specify time-out period and raw value.

c) If a multiplexer (row counter) is used, check the box.

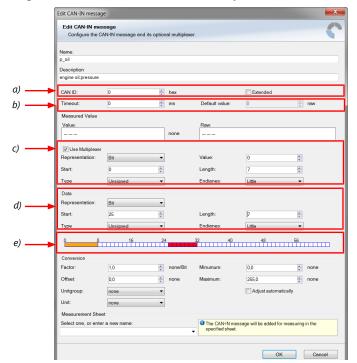
d) Enter data position, length and format.

e) The bargraph shows assignment of the bytes.

- Red colored fields show the assignment of the data bytes.
- Orange colored fields show the assignment of the multiplexer bytes.

Representation: Bit

Some CAN devices need to be addressed by a bit represented CAN channel. The address can be assigned in this window and is illustrated by a matrix table.



a) Enter CAN message ID. If extended IDs (29 bit) are used, check the box.

b) If replacement values are used, specify time-out period and raw value.

c) If a multiplexer (row counter) is used, check the box.

d) Enter data position, length and format.

e) The bargraph shows assignment of the bytes.

- Red colored fields show the assignment of the data bytes.
- Orange colored fields show the assignment of the multiplexer bytes.

Conversion to physical value



a) Enter factor (gain) for conversion to physical value.

b) Enter offset for conversion to physical value.

c) Select type of physical value.

d) Select unit of physical value.

e) Enter minimum physical limit of the channel. (for manual setup)

f) Enter maximum physical limit of the channel. (for manual setup)

g) Check the box to automatically adjust the limits of the channel.

CAN analyzer functionality

This functionality is only available, if a MSA-Box (I or II) is used to connect the C 80 to the PC. Choose the CAN bus that is connected to the MSA-Box to display the raw value and the converted physical value here.

Measured Value		
Value:		Raw:
	bar	

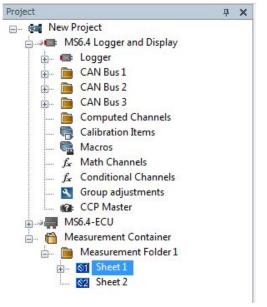
Automatic creation of online measurement sheets

The CAN channel can be automatically inserted into a measurement sheet. Insert a name for a new sheet or select an existing sheet from the list box.

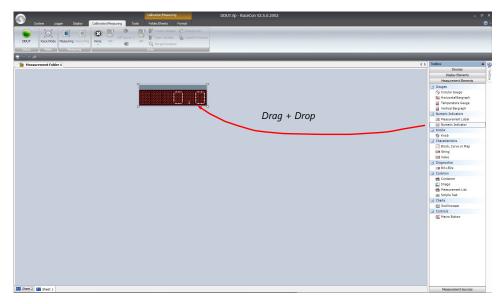
For an online view of the value measured by the C 80, insert the channel in an online measurement sheet which is described in the chapter Setting up an online measurement [▶ 77].

Measurement Sheet	
Select one, or enter a new name:	The CAN-IN message will be added for measuring in the
· · · ·	specified sheet.

10.2.4 Online view of CAN channels in vehicle



- 1. Double-click on 'Sheet 1' in Project Tree. Measurement Sheet 1 is displayed in Main Area.
- 2. Click on 'Measurement elements' in the Toolbox.
- 3. Drag the desired Measurement element (e.g. Numeric Indicator) and drop it on the Measurement Sheet.



- 4. Click on folder 'CAN Input' of desired CAN bus to display available channels.
- 5. Drag desired Measurement channel and drop it on the Measurement element.

©	Calbration/Measuring	DDU7.rlp - RaceCon V2.5.0.2002	_ @ X
System Logger Display Calibration/Measuring Tools	Folder/Sheets Format		0
ODU7 Race Mode Measuring Recording None NP NP Status Mode Measuring Measuring </th <th>Cheate dataset Change A2. Copen dataset Gupte Pirmise Agep/Compare Data</th> <th></th> <th></th>	Cheate dataset Change A2. Copen dataset Gupte Pirmise Agep/Compare Data		
Heasurement Folder 1		4.6	Data - Sheet 1 # R
		Drag + Drop	More al More al More v Source al port v Source al Nore v Sour
■ 9eet 2 (1) 9eet 1			model by DUDT moved b

- 6. The measurement element displays the values of the assigned channel.
- 7. Connect PC to the vehicle and switch to 'Race Mode' by clicking 'F11' on the keyboard to display online data.

10.2.5 Import a CAN database (DBC) file

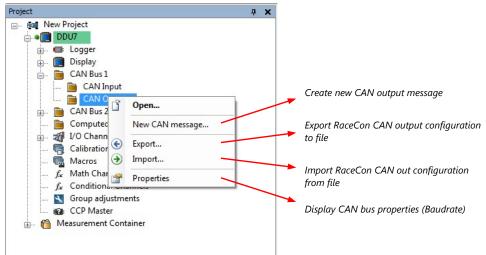
- 1. Right-click on CAN Input of desired bus (CAN1 or CAN2).
- 2. Select 'Import DBC file' from menu. A file browser opens.
- 3. Select DBC file to import and click 'OK' when done. A channel import window opens.

94 channels and 60								channels to import:
Name	Unit	ld	Size	RowCtr	RowVal	Descrit 🔺		aps ath
🛃 ассх	g	777	8			Vector		au
🛃 ассу	g	777	8			Vector		11
🛃 accz	g	777	8			Vector		
🛃 activate_blip	flag	100	1			Vector	A <u>d</u> d all	
🜙 activate_cut	flag	100	1			Vector		
🔜 aps	%	779	8			Vector		
🔜 ath	%	773	8			Vector		
🔜 ax1_Bremse60		5C0	16			Vector	<- Bemove	11
🔜 ay1_Bremse60	g	5C0	16			Vector		
🔜 batt_u	V	779	8			Vector	Remove all	
🜙 battlow_b		77A	1	0	5	Vector -		
<u>ا</u>								

- 4. Select desired channels on the left and use the 'Add' button to add them to import list.
- 5. Click 'OK' when complete. The channels are inserted in the Data window.

10.3 CAN output

10.3.1 Output configuration



10.3.2 Create a new CAN output message channel

- Double-click on any CAN bus item to open the "CAN messages overview".
- Select 'Add CAN-OUT' and choose the desired CAN bus for the new output channel.

System Loger Display Calbration/Measuring Tools	System DDU10.rlp - R Windows	xeCon V2.5.5507.11 *				_ = ×
DUUI0 Status Mode						
Project # x	Del New Project DOULO ×					Teelbax 9 X
et New Project Image: Second Secon	OF0192 OV Interceptor Solverser OCM Bit 1 Bandmitter Interceptor OVA Resource OVA Cost stat day: Over Resource OVA cost stat day: Descriptor Berd	CAN Bis 2 Backete: 1.898ee CAN Resistor: dr CAN Out rate limb: CAN Out rate limb:	• • • ms • mesaget/ms	CAN Bus 3 Baudrate: CAN Resistor: CAN Out start delay: CAN Out rate limt:	LMmad of • ms • mesages/ms	Decise Display + Cocie + Mission + <
	CAN In IDs 0 / 128 CAN In channels 0 / 500			CAN Out IDs 0 / 12 CAN Out channels 0 /		MS24 MS24 light
nyanna t a 1	Add CAN-IN Add CAN-OUT - Citic Do Name - CAN BUS 2. CAN BUS 3. CAN BUS 3. CAN BUS 4.	it 💌 Length (Bts) 💌		exer Value 💌 Type	V CAN Bus	VCU VH V
	Statistics 🖉 Math Channels 🖉 Conditional Channels	🙆 CAN messages 📃 🗟 Macros 🚺	Settings 🚺 Device info	🥹 Error info 🛛 🔒 Fe	atures info	Measurement Sources
Stor all Name / T Source Decoption T	Function Tubed No information	irfo / Status	essages			0/0 X
		Info / Status CAN Log - Stopped	SYS Log - Stopped			
Pandu						stream # No relation (The Chi-

- The 'New CAN-OUT message' window opens.

ew CAN-OUT messag	ge				
New CAN-OUT me					
Configure the CAN	-OUT message and an optional multiplexer.				
Name:					
CAN Message					
Description					
CAN ID:	0	hex	Extended		
Grid:	100 ms 💌		Trigger channel:		•
			Trigger on:	Rising	▼ edge
✓ Use Multiplexer					
Representation:	Byte 👻		Value:	1	
Start:	0		Length:		÷
oldri.	<u> </u>		Endianes:	Big	 ▼
Add row	Delete row(s) 🔄 Add channel 📑 Add const	ant 🖂			-
	Byte 1 Byte 2 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1				Byte 7
0 1 2 ⁻ 3'4 ⁻ 8	5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1	2 3 4 5	i 6 7 0 1 2 ⁻ 3 ⁻ 4 ⁻ 5 6	3 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1	23456
				ок	Cancel

 Enter name of message, description, CAN-Id, and Grid (output interval). Optionally, specify a multiplexer.

	New CAN-OUT messa	ige				X
	New CAN-OUT me Configure the CA	essage N-OUT message and an optional multiplexe	r.			\$
	Name: CAN Message Description					
	CAN ID:	0	hex	Extended		
Definition of	Grid:	100 ms	•	Trigger channel:		-
CAN message				Trigger on:	Rising	▼ edge
5	Use Multiplexer					
	Representation:	Byte	•	Value:	1	*
	Start:	0	-	Length:	1	-
				Endianes:	Big	-
Content of	-	Delete row(s) Add channel 📑 Add				
message '	0 1 2 3 4	Byte 1 Byte 2 Byte 2 Byte 2 Byte 2 Byte 3 4 5 6 7 0 1 2 3 4 5 6	7 0 1 2 3 4	Byte 4 5 6 7 0 1 2 3 4 5	Byte 5 Byte 6 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 8 7	Byte 7 0 1 2 3 4 5 6 7
message						
					ОК	Cancel

 Click on 'Add channel...' or 'Add constant...', this opens the 'Add new CAN out channel' window.

	System	DDU10.rlp - I		. a x
System Logger Display Calibration/Measuring Tools	Windows	1		
B dans antes Eliza	a lla u	The second secon		
	d the local of	and the second s	X	
00010 Race Mode visible Protection Sheet	system looger	New CAN-OUT message		
	Sales and a state of the	New CAN-OUT message		
Direct D	Dig New P	Configure the CAN-OUT message and an	optional multiple Add new CAN out channel	
B 64 New Project			Add new CAN out channel	Devices
A-C DDUID		Nome: CAN Message	Specify the properties of the CAN out channel.	
i 🖶 👄 Logger	000	Description		CAS-H3
B Display	CANE	Lescoption		00010
CAN Bus 1 GAN Bus 2	Baud			COU8
	CAN	CAN ID: 0	tater a channel name to filter	0009 000-52 Plus
E CAN Bus 4	CANE	Grid: 100 ms	1000	US
- 🐚 Computed Channels			V Mutplesed II	MS3 Sport ::
style 1/0 Channels Galibration Items	CAN			NS4.6
- m Calibration Items - Macros	CANE	Use Multiplexer	🖬 🗃 ads_diagnostic_state Endianes: Litte 🔹 🚇	MS15 Sport
- & Math Channels	Baude	Representation: Byte		NS15.1 NS15.2
 – & Conditional Channels 		Start 0		N\$5.0
 Group adjustments 	CAN		Ctive: 0.0 6	NS5.1
Masurement Container Click here -	CAN			NS5.5
Click here -	CAN			NS5.6 NS6
	CAN O	Byte 0 Byte 1	9/62 9 1 2 3 4 5 6 7	M57
	CANE	▶ 1 1		M55.8 M524
Properties 0 x				MS24 Felt
1 1 standard • 1 •	344			VCU MS25 Sport
Application Race track	Name			HS25 Sport
Name DOULO .	nene			Display Elements
Application				easurement Elements
The application type of the datalogger	Statu:			Nessurgement Seurces
Data			International In	= • ×
			Concess Warnings (1) Messages	0/0 X
🗃 🗃 🗃 🗃 🖬 🖬 Show all			T., Time Sender Messoe	
	Function	Used A		
atta DDU10		=		
aBfc DDU10 Babsap DDU10 Absolute lap counter				
abstap DDU10 Absolute tap counter accx DDU10 longtudnal acceleration		No		
Baccy DDU10 transversal acceleration		information		
accz DDU10 vertical acceleration		information		
ADC_DIAGNOSTIC DDU10 Triggers the on-demand dage				
degnostic_state DDU10 Signals if on demand degnosti Badiust, data, nv. copy DDU10 no description		*		
< II II			3/6 / Status CAN Log - Stapped SYS Log - Stapped	
Ready.			No errors detected - all cleaned or state uninvolve 💌 💌 New Pr	ajet/10.11 📾 🚥

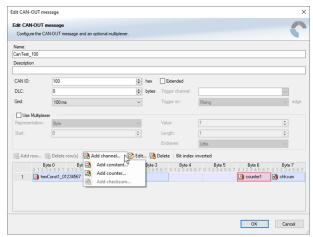
- Select the desired measurement channel and specify the message settings.

The measurement channel is now assigned to the CAN message.

10.3.2.1 Add CAN out constant

To send a constant value on the CAN, perform the following steps:

- 1. Create a new CAN output message or edit an existing message.
- 2. Click small arrow beside 'Add channel...' and select 'Add constant...'. The 'Add new CAN Out constant' window appears.
- 3. Define the name of the constant, the required value in hex and define the CAN channel settings.
- 4. Click 'OK' when done.



10.3.2.2 Adding CAN out counter

To send a counter value on the CAN, perform the following steps:

- 1. Create a new CAN output message or edit an existing message.
- 2. Click small arrow beside 'Add channel...' and select 'Add counter...'. The 'Add new CAN out counter' window appears.
- 3. Define the name of the counter, define the CAN channel settings.
- 4. Click 'OK' when done.

Add new Count	er				
Specify the prop	erties of the (CAN out Counter			
Name:					
counter1					
Representation:	Byte	\sim			
Start:	6	-	Length:	1	
Right shift:	0	-	Endianes:	Little	```
Counter start:	0	-	Counter end:	255	ŧ
	2	2	4 5		7
		3	4 7	6	

10.3.2.3 Adding CAN out checksum

To send a checksum on the CAN, perform the following steps:

- 1. Create a new CAN output message or edit an existing message.
- Click small arrow beside 'Add channel...' and select 'Add checksum...'. The 'Add new CAN out checksum' window appears.
- 3. Define the name of the checksum, the algorithm, the byte which should be covered by the checksum and define the CAN channel settings.
- 4. Click 'OK' when done.

Add new CAN	out cor tant					×
Add new Che	ecksum					
Specify the p	roperties of the	CAN out Ch	ecksum.			
Name:						
Please enter a	name for the C	AN out chec	ksum			
Position:	0					
0 1	2	3 4	4 5	6	7	
Checksum type	CRC8 (8H2F	F)				~
Select bytes th	e checksum sh	ould be com	puted from	(7 bytes se	lected)	
0	1 2	3	4	5	6	7
				OK	(Cancel

10.4 Multiplexer

Row counter concept

If certain channel messages are not time-critical and can be imported or exported slowly, you can use a multiplexer to put several channel messages on one message identifier.

- Re-use (multiplex) of message identifiers by splitting it into several rows.
- Every row is assigned to a unique value of the multiplexer.
- One byte of message contains row counter.

- 7 bytes payload remaining. A multiplexer does not have to consist of one byte only, it can consist of several bytes as well as single bits.
- Position of row counter is configurable.

To use a multiplexer perform the following steps:

- 1. Double-click on any CAN bus item to open the "CAN messages overview".
- 2. Select 'Add CAN-IN' and choose the desired CAN bus for the new input channel.
- Check the box 'Use Multiplexer' and configure the multiplexer for the new CAN-IN channel.

System Logger Duplay C		New CAN-IN messa					• ו)		
26U10 Race Mode visite Protection She lock		New CAN-IN me	isage w CAN-IN message and	en optionel mult	iplexer.		S		
of New Project	Collo 💌	Description					- 1		Toolbox Devices
	DOU10 CAN messages overview CAN Rus 1 Boudrate: 1 Mileud	CAN ID: Timeout: Measured Value	0	 ▲ hex ▲ ms 	Default value:	Extended	raw		CAS-M3
CAN Dutputs CAN Bus 2 CAN Bus 3 CAN Bus 4	CAN Resistor: off CAN Out start delay: CAN Out rate limit:	Value:	>	none	Raw.				DDU9 DDU-52 Plas ECUs MS3 Sport MS4 Sport
Computed Channels 49 UO Channels Galibration Items Galibration Items Advectos A Math Channels	CAN Bus 4 Baudrate: <u>1 MBaud</u> CAN Resistor: off	Representation: Start: Type	Byte 3 Unsigned	•	Value: Length: Endianes:	0 0 1 0 Big •			MS4.6 MS15 Sport MS15.1 MS15.2 MS5.0 MS5.1
A Conditional Channels Group adjustments Master Devices Measurement Container	CAN Out start delay: CAN Out rate limit: CAN configuration fill level	Data Representation: Start Type	ByN 0 Unsigned	•	Length: Endianes:	1			MISS.2 MISS.5 MISS.6 MISS.6 MISS.6 MISS.6 MISS.6 MISS.8
0 X	Add CAN-IN R Add CAN-	Conversion	7	3	1 1	<u>6</u> 7	- F	CAN Bus	MS24 MS24 light VCU W MS25 Sport PDB
ol No infor	 Multiplexer p_ol 	Factor: Offset: Unitgroup:	1.0 0.0 none	÷ none/Bit ↓ none ▼	Minumum: Maximum:	0.0 ÷	none	CAN Bus 1 CAN Bus 1	PSU-F1 Pypass EOU Custom EOU Pywer control unit PRX50
matio n	Statistics 🗍 A Math Channels 🗍 .	Unit: Measurement She Select one, or ente		•	The CAN-IN mer	ssage will be added for measuring i	1 the	_	Display Elements Measurement Elemen Measurement Source
rors 🔔 Warnings (i) Messages Time Sender Message					•	OK	Cancel		0

- 4. To configure the multiplexer for a CAN-OUT channel, select 'Add CAN-OUT'.
- 5. Check the box 'Use Multiplexer' and click on the button 'Add row...' to split the message identifiers into several rows.
- 6. Click on one row and select 'Add channel' to assign a channel to the row.

us Mode				New CAN-OUT m	nessage				—×	
New Project DDU10 DDU10 CAN Bus D CAN Bus D CAN Bus 2 CAN Bus 2 CAN Bus 2 CAN Bus 4 C	• x	DUDIO CAN message CAN Bus 1 Baddrate: CAN Resistor: CAN Out start delay: CAN Out start delay: CAN Out start delay: CAN Out start delay: CAN Bus 4 Baddrate: CAN Resistor:		New CAN-OU Configure the Name CAN Massage Description CAN ID: Grid:	0 100 ms	en optionel multipleaser.	Ebsended Trigger channel Trigger on: Value:	[Fibing	• udya	Tooles 204645 204645 204745 204745 204745 204745 20475 20
Conductorial Chambers Conductorial Chambers Group adjustments Measurement Container	6 x	CAN Out start delay: CAN Out rate limit: CAN configuration fill	CAI	Start:	Day D. Day 1	Add channed Add constant Byte 2 Byte	Length: Endenes:		• • •	KIS2.5 KIS2.6 KIS2.6 KIS2 KIS KI KIS KIS KIS KIS KI KIS KI KIS KI KIS KI KIS KI KI KIS KI
Sou Sou	pes	🕶 Statistics 📗 🖄 Mach C	ternels 2º Canditone	N Charmes S Char	r messoges 🛛 👻 Macros 🛓	👁 Sectorys 🛈 Device info 🖸 B	rror into 🗍 🛱 Footbured	Sittle	OK Cancel	Bypess ECU Castom ECU Power centrol uni Pixes Pixes Display Eleme Messurement Si

- 7. The 'Add new CAN out channel' dialog opens.
- 8. Select a channel and configure it. To assign it to the row selected before, check the box 'Multiplexed'.
- 9. To move the channel message, change the "Start" value or click and hold the green field in the "Add new CAN out message" window.
- 10. Click 'OK' when done.

Add new CAN ou Specify the prop	t channel erties of the CAN ou	ut channel			
opeeny me prop		it channel.			
Channel:					
🕮 📑 b_pwr_good					•
8 Bit unsigned / little	endian				
Representation:	Byte	•		Mult	tiplexed
Start:	4		Length:	2	▲ ▼
Right shift:	0		Endianes:	Little	•
	Force quantiz	zation			
Factor:	1,0		Offset:	0.0	A V
Туре:	Unsigned	•			
0 1	2 3	4	5 6	5 7	

- 11. The channel message is assigned to the selected fields.
- 12. Click 'OK' when done.

DUUD Status Propest 8 x	DDiven Project	New CAN-OUT messag	99	_	_	_	*	and the second se	
A fine hypert Daylor Daylor Daylor Daylor Daylor Daylor Call hours Call ho	COLIE CAN INSUE OF A THE OTHER OF A	Nome: CAN Message Description CAN ID: Gind: Representation: Start:	COLT message and an optional mu	· · · · · · · · · · · · ·		5 7 0 1 2 3 4 5 6 7 0 1 3	• • • • • • • • • • • • • • • • • • •	Control (1) Control () 12 Mus pert pert 2 light 5 pert 5 5 5 5 5 5 5 5 5 5 5 5 5
infor mation Not state Trees information	Statutes .o. Hath Channes .o. Gar	doosal Charnels 😗 G	N meseges 🛛 🗣 Meores 📔 🖬 Satt	nçs 🜒 Devrce info	😧 Error Indo 🔤 🔒 F	wares mb	OK Cancel	Measurer	

11 Export and Import in RaceCon

You can perform an export or an import on almost any level in the project tree.

11.1 Export in RaceCon

You can choose to export the whole project or you can export specific parts of the project. Proceed with the following steps to perform an export:

- 1. Click with the right mouse button on an item in the project tree.
- 2. Select 'Export...' from menu. An 'Export Selection' window opens.

Export displayed content to		—		×
Selected items below will be exported. Plea	ase click 'Export' to select a destin	ation to store to.		€
Image: Second state sta	2			
Select all Deselect all		Exp	ort as patch	file
	(Export	Cancel	

- 3. Click on 'Export' to select a destination to store.
- 4. Specify the filename.
- 5. Click 'Save' when done.

11.2 Import in RaceCon

You can choose to import into the whole project or you can import into specific parts of the project.

Proceed with the following steps to perform an import:

- 1. Click with the right mouse button on any item in the project tree.
- 2. Select 'Import...' from menu. A file browser opens.
- 3. Select the input file and click 'Open'. An 'Import Selection' window opens.

in porto a r	Project:		Current Project:		
Category:	All				
Filter:	Exact V Type a Name		Imported elements: 👔 👔 Missing Links:	1	
🗈 Fu 🕅 La	Jel Iptrigger	î	✓ ∰ New Project ■ Fuel		_
Sp Sp			Captrigger		
- 💷 DI	DU10		Speed		
► 1 03	⊧ Logger		- 💷 DDU10		
	Display		▶ I Logger		
	CAN Bus 1	U	▶ 📖 Display	2	
-	E CAN Input		- CAN Bus 1		
	can1_0x200_Rx_ana03		→ CAN Input		
	can1_0x200_Rx_timestamp_1ms		can1_0x300_Rx_speed		
	🔤 can1_0x200_Rx_ub		can1_0x300_Rx_trigger		
	can1_0x300_Rx_fueltest_flowrate		CAN Outputs		
	can1_0x300_Rx_speed		CAN Bus 2		
	<pre>can1_0x300_Rx_trigger</pre>		CAN Bus 3 CAN Bus 4		
	🖳 can1_0x301_Rx 📖 can1_0x302_Rx		CAN Bus 4 Computed Channels		
	Can1_ux3u2_FX	_	Figure Events		

- 4. Select channels to import.
- 5. Drag and drop the channel to 'CAN Input' of desired CAN bus on right hand side.
- 6. Click 'Finish'. If a measurement channel belongs to more than one source (e.g. C 80 and MS 6), the 'Solve Label Ambiguity' window opens.

Importing from file dummy.rex(2.13.1.4)			\times
Select for all ambigous objects the appropriate one.			•
Solve label ambiguity			
Ambigous Label	Target Label		
Import File/DDU10/Logger/Logging1/New Group/accz	🐖 📑 Current Project/MS6-ECU/accz		
Import File/DDU10/Logger/Logging1/New Group/accy			
Import File/DDU10/Logger/Logging1/New Group/accx			\sim
	Do not link Current Project/DDU10/Calibration Items/accx Current Project/MS6-ECU/accx		
	< Back Next > Finish	Cano	;el

- 7. Assign the ambiguous channels to the desired source.
- 8. Click 'Finish'.

12 Analog and Frequency Inputs

Analog inputs

- 0 to 5 V
- 12 bit A/D converter
- Switchable 3.01 kOhm pull-up resistor
- 10 kHz acquisition rate, up to 1 kHz recording rate
- Linear phase digital filter

Frequency inputs

- 5 V Hall-effect type, 2.5 V trigger level (DF11 input with current interface or 5 V Halleffect input with 2.5 V trigger level)
- 20 kHz max. frequency
- 10 ms measurement window

12.1 Analog inputs

12.1.1 Measurements channels

For each analog channel, several 'subchannels' are available.

Data - New Pi	roject - DDU 7 - Input-cha	innels - ANA	\06 - f_wheel_fl		д	x
<u>S</u> earch:						
Used	Name 🔺 💌	Source	 Description 	•		
	📑 f_wheel_fl	DDU7	Wheel force front left			
	📑 f_wheel_fl_fi	DDU7	Wheel force front left			
	💁 raw_f_wheel_fl	DDU7	Wheel force front left			
	💁 raw_f_wheel_fl_fi	DDU7	Wheel force front left			

Measurement labels with the characters 'raw' show the exact values in mV.

Measurement labels with the characters '_fi' show filtered values.

The word 'name' in the table is a placeholder for the channel's name.

Measurement label	Function
raw_name	mV value of sensor
raw_name_fi	Filtered mV value of sensor
name	Physical value of sensor
name_fi	Filtered physical value

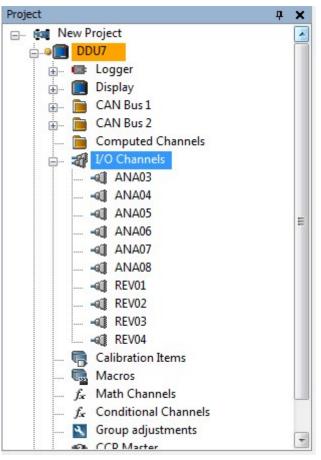
Filtered channels are routed through digital low pass filters:

- C 80 uses A/D converter oversampling and digital filtering to recording rate
- Digital filters eliminate 'out-of-band' noise
- Cut-off frequency automatically adjusted to recording rate
- Linear phase no signal distortion
- Latency compensation no filter delay in recorded data

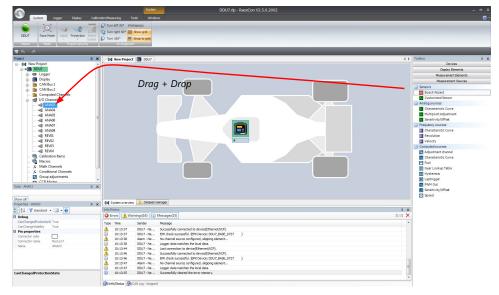
12.2 Configuring inputs

12.2.1 Configuring a predefined Bosch sensor with the 'Bosch Sensor Wizard'

- 1. Click on 'Measurement Sources' in the Toolbox.
- 2. To expand the list of 'I/O Channels', click on '+' in the C 80 Project Tree.



3. Drag the "Bosch Sensor Wizard" from the Toolbox and drop it on the desired analog input channel in the C 80 Project Tree.



4. The "Bosch Sensor Wizard" opens.

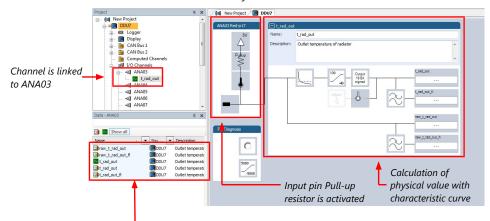
ĺ	Bosch Sensor Wizard	8				×	
1st: Choose the sensor´s category	Select Sensor Select a sensor, b	based on the order number.					_
	Sensor category	TEMPERATURE SENSORS	Calibrati	in data			
and: To parrow you	Sensor group	NTC M12	• V P	ullup			
2nd: To narrow you				Ohm	°C	· · •	These calibration
choice, choose a	Order number		•	89	130		values will be used
type	0 280 130 026 B 261 209 160			113	120		
	F 02U V00 123-0	01		144	110		
3rd: Select the				186	100	-	
exact type				322	80	-	
chuce type				435	70		
				834	50		
		Sensor category TEMPERATURE SENSORS		1175	40		
				1707	30		
Opens sensor's		Sensor group		2500 20			
		NTC M12		3792	10		
datasheet		Open datasheet		5896	0	*	
		< Bac	ck N	ext >	Finish	Cancel	-

- Click 'Finish' when done. The "Create channel" window opens.
- 6. Enter the channel name and description.

Create Channel	
Set the unique name for the ch	annel and add an optional description.
Name:	
t_rad_out	
jt_rad_out	
Description:	
Outlet temperature of radiator	
	Ok Cancel

7. Click 'Ok' when done.

The channel is inserted into the C 80 Project Tree.



Available measurements for channel:

Measurement label	Function
raw_name	mV value of sensor
raw_name_fi	Filtered mV value of sensor
name	Physical value of sensor
name_ fi	Filtered physical value

12.2.2 Configuring a generic linear sensor

Example: Acceleration sensor 5 g

- From sensor data sheet - operating characteristics:

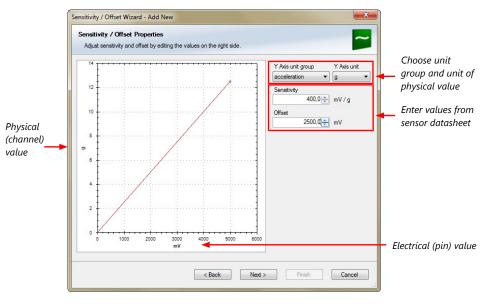
Dutput Signal			10.000	1000	
Zero g (T _A = 25°C, V _{DD} = 5.0 V) ⁽⁴⁾	VOFF	2.25	2.5	2.75	V
Zero g (V _{DD} = 5.0 V)	VOFF	2.0	2.5	3.0	V
Sensitivity (T _A = 25°C, V _{DD} = 5.0 V) ⁽⁵⁾	S	380	400	420	mV/g
Sensitivity (V _{DD} = 5.0 V)	S	370	400	430.1	mV/g
Bandwidth Response	f_3dB	42.5	50	57.5	Hz
Nonlinearity	NLOUT	-1.0	-	+1.0	% FSO

- Sensitivity 400 mV/g, Offset 2,500 mV
- The sensor has a linear output signal with sensitivity and offset
- 1. Click on 'Measurement Sources' in the Toolbox.
- 2. To expand the list of 'I/O Channels', click on '+' in the C 80 Project Tree.
- Drag the "Sensitivity/Offset" analog signal source from the Toolbox and drop it on the desired analog input channel in the C 80 Project Tree. A "Sensitivity/Offset Wizard" opens.
- 4. To activate the internal pullup-resistor, check the box. The internal pullup-resistor is used to get a 5 V signal at the analog channel of the C 80. It allows you to use a pushbutton. The fixed value of the internal pullup-resistor is 3,010 Ohm. If using an additional external pullup-resistor, set up the overall resistance.

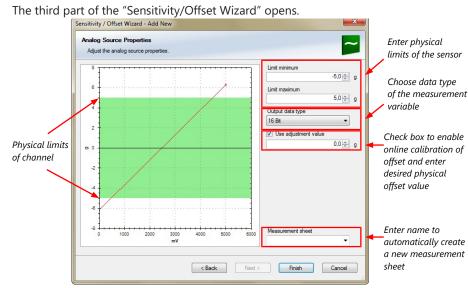
Pin Properties Configure the anal	log pin properties.
Pullup value:	3,01 kOhm
	Pin Diagnosis & monitoring limits
	Enabled Minimum: -5000 mV
	Maximum: 5000 (m) mV

5. Click 'Next' when done.

The second part of the "Sensitivity/Offset Wizard" opens.

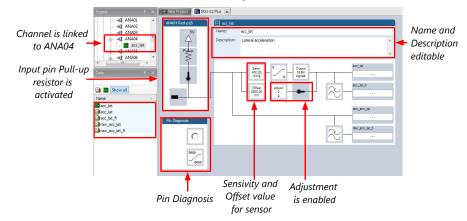


Click 'Next' when done. 6.



- 7. Click 'Finish' when done.
- Enter a channel name and a description. 8.
- Click 'OK' when done. 9.

The channel is inserted into the C 80 Project Tree.



Available measurements for channel:

Measurement label	Function
raw_name	mV value of sensor
raw_name_fi	filtered mV value of sensor
name	physical value of sensor
name_ fi	filtered physical value

Note

Working with automatically created measurement sheets is explained in chapter 'Setting up an online measurement [> 77]'.

12.2.3 Configuring a generic nonlinear sensor

Example: Thermistor 5 kOhm

- From sensor data sheet - resistance values over temperature:

PART NR.: 2381 640 502 HTCLE100E3502

Toper	RT
[°C]	[Ω]
-40	166 047
-35	119 950
-30	87 600
-25	64 643
-20	48 179
-15	36 250
-10	27 523
-5	21 078

Toper	RT
[°C]	[Ω]
0	16 277
5	12 669
10	9 936
15	7 849
20	8 244
25	5 000
30	4 030
35	3 267

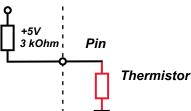
Toper	RT
[°C]	[Ω]
40	2 685
45	2 166
50	1 903
55	1 494
60	1 245
65	1 024
70	876
75	740

Toper	RT
[°C]	[Ω]
80	628
85	535
90	457
95	399
100	338
105	292
110	251
115	221

- The sensor has a nonlinear behavior

- Use characteristic curve for linearization

Input voltage is the ratio between pull-up resistor and thermistor _



- 1. Click 'Measurement Sources' in the Toolbox.
- 2. To expand the list of 'I/O Channels', click on '+' in the C 80 Project Tree.
- 3. Drag the "Characteristic Curve" analogue signal source from the Toolbox and drop it on the desired analogue input channel in the C 80 Project Tree.

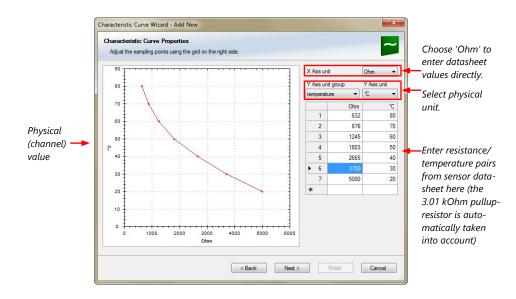
	System DDU7.rlp - RaceCon V2.5.0.2002	- r X
C		
		C C C
۰ <u></u>		
21 <	Type Time Sender Message	

- 4. A "Characteristic Curve Wizard" opens.
- 5. To activate the internal pull up-resistor, check the box. The C 80 pull up-resistor is used to get a 5 V signal at the analogue channel of the C 80. It allows you, to use a push-button. The fixed value of the internal pull up-resistor is 3,010 Ohm. If using an additional external pull up-resistor, set up the overall resistance.

Characteristic Curve	Wizard - Add New
Pin Properties Configure the anal	og pin properties.
Pullup value:	3.01 kOhm 🔹
	Pin Diagnosis & monitoring limits
	Enabled Minimum: -5000 (mV
	Maximum: 5000 📩 mV
	< Back Next > Finish Cancel

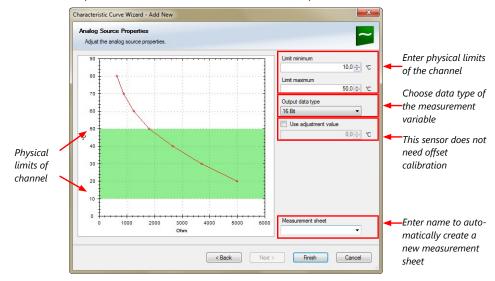
6. Click 'Next' when done.

The second part of the "Sensitivity/Offset Wizard" opens.



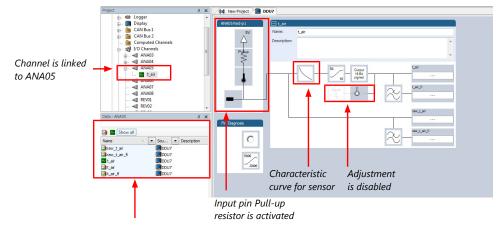
7. Click 'Next' when done.

The third part of the "Characteristic Curve Wizard" opens.



- 8. Click 'Finish' when done.
- 9. Enter channel name and description.
- 10. Click 'OK' when done.

The channel is inserted into the C 80 Project Tree.



Available measurements for channel:

Measurement label	Function
raw_name	mV value of sensor
raw_name_fi	filtered mV value of sensor
name	physical value of sensor
name_ fi	filtered physical value

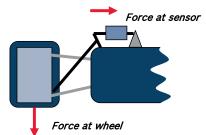
Note

Working with automatically created measurement sheets is explained in chapter 'Setting up an online measurement [\triangleright 77]'.

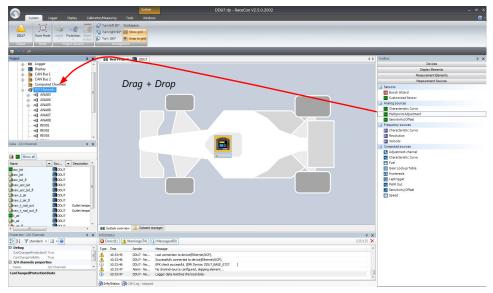
12.2.4 Configuring a multipoint adjustment

Example: Measurement of wheel force

- Physical property 'wheel force' not directly measurable
- Load transfer through suspension kinematics
- Physical value at sensor position defined by vehicle
- Curve definition by online adjustment at vehicle



- 1. Click on 'Measurement Sources' in the Toolbox.
- 2. Expand the list of 'I/O Channels' by clicking on '+' in the C 80 Project Tree.
- 3. Drag the 'Multipoint Adjustment' analog signal source from the Toolbox and drop it on the desired analog input channel in C 80 Project Tree.



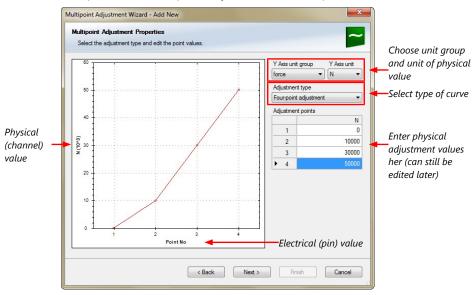
4. A 'Multipoint Adjustment Wizard' opens.

5. To activate the internal pullup-resistor, check the box. The internal pullup-resistor is used to get a 5 V signal at the analog channel of the C 80. It allows you to use a push-button. The fixed value of the internal pullup-resistor is 3.01 kOhm. If using an additional external pullup-resistor, set up the overall resistance.

Pin Properties Configure the ana	log pin properties.
Pullup value:	3,01 kOhm
	Pin Diagnosis & monitoring limits
	Enabled Minimum: -5000 🖕 mV
	Maximum: 5000 🖕 mV

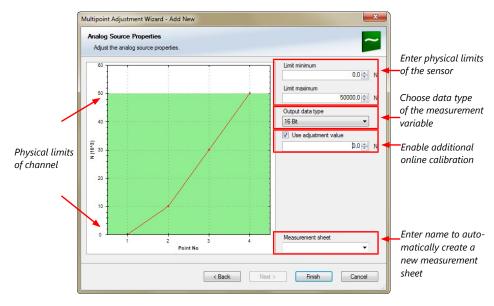
6. Click 'Next' when done.

The second part of the 'Multipoint Adjustment Wizard' opens.



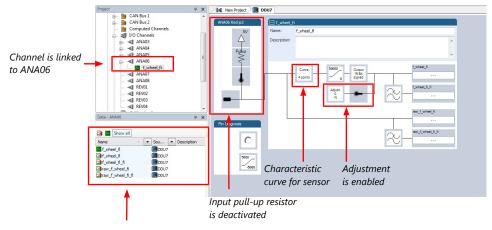
7. Click 'Next' when done.

The third part of the 'Multipoint Adjustment Wizard' opens.



- 8. Click 'Finish' when done.
- 9. Enter channel name and description.
- 10. Click 'OK' when done.

The channel is inserted into the C 80 Project Tree.



Available measurements for channel:

Measurement label	Function
raw_name	mV value of sensor
raw_name_fi	filtered mV value of sensor
name	physical value of sensor
name_ fi	filtered physical value

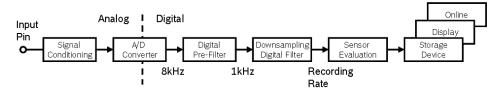
Online definition of the curve is covered in chapter 'Online calibration of measurement channels [> 82]'.

Note

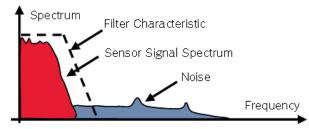
Working with automatically created measurement sheets is explained in chapter 'Setting up an online measurement $[\triangleright 77]$ '.

12.2.5 Digital filter details

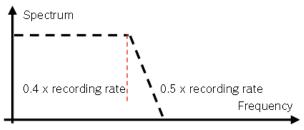
C 80 uses A/D converter oversampling and digital filtering to recording rate.



Digital filters eliminate 'out-of-band' noise



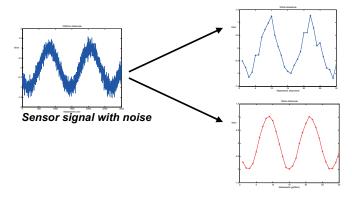
Cut-off frequency automatically adjusted to recording rate



Example:

- 100 Hz recording rate (10 ms)
- <40 Hz pass band (>99 %)
- >50 Hz stop band (<1 %)</p>

Linear phase - no signal distortion



Recorded signal 100Hz (unfiltered)

Recorded signal 100Hz (filtered)

Latency compensation - no filter delay in recorded data

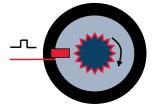
- Filtering is (smart) averaging over several samples
- Filtered signal is delayed with respect to real time signal

- C 80 filters have constant, frequency independent delay
- Delay (e.g. 22 samples at 10 ms) is corrected during recording
- No delay filtered vs. unfiltered in recorded data
- Correction is (of course) not possible for real time data (display, online, PWM out)
- Use filtered data for recording, use unfiltered data for real time

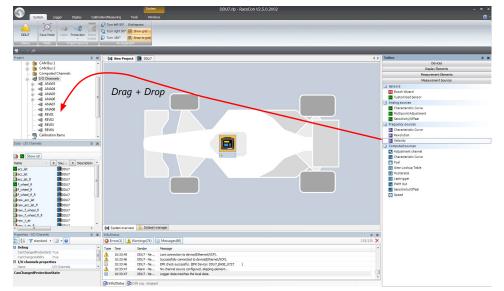
12.2.6 Configuring a frequency input

Example: measurement of wheel speed

- Pulse wheel attached to wheel
- Each passing tooth of pulse wheel triggers hall sensor
- Calculation of wheel speed with wheel circumference



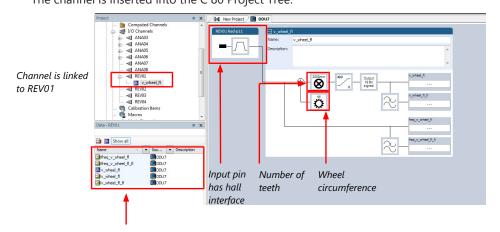
- 1. Click on 'Measurement Sources' in the Toolbox.
- 2. To expand the list of 'I/O Channels', click on the '+' in the C 80 Project Tree.
- 3. Drag the 'Velocity' digital signal source from the Toolbox and drop it on the desired 'REV' input channel in the C 80 Project Tree.



- 4. The 'Velocity Wizard' opens.
- 5. Define the settings for the sensor.

elocity Properties Configure a frequency	input to measure a linea	r velocity.		
Number of increments	:		44	Number of teeth on the pulse wheel
Wheel circumference			2000 💼 mm	Circumference of wheel for speed calculation
Output data type:	16 Bit		T	Choose data type of the measurement variable
Limit minimum:			0▲ km/	h
Limit maximum:			400 🔪 km/	h
Measurement sheet:			•	Enter name to automatically create a new measurement sheet

- 6. Click 'Finish' when done.
- 7. Enter the channel name and description.
- Click 'OK' when done. The channel is inserted into the C 80 Project Tree.



Available measurements for channel:

Measurement label	Function
raw_name	mV value of sensor
raw_name_fi	filtered mV value of sensor
name	physical value of sensor
name_ fi	filtered physical value

Note

Measurement of 'Revolution' is similar.

12.3 Configuring computed sources

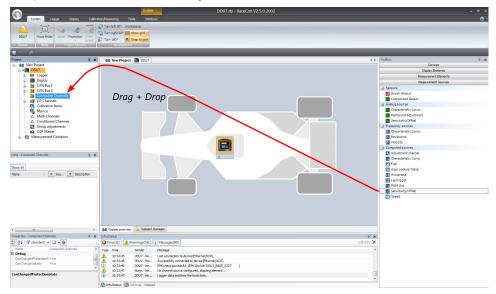
Computed sources receive data from a measurement channel rather than an input pin.

- Sensitivity/Offset calculation on input channel
- Characteristic curve calculation on input channel
- Computed vehicle speed

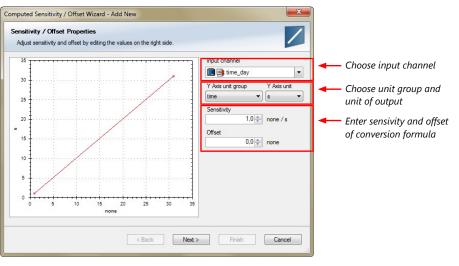
- Lap trigger (covered in a special separate section)

Example: Sensitivity/offset calculation on input channel

- 1. Click 'Measurement Sources' in the Toolbox.
- 2. Drag the 'Sensitivity/Offset' computed source from the Toolbox and drop it on 'Computed Channels' in the C 80 Project Tree.

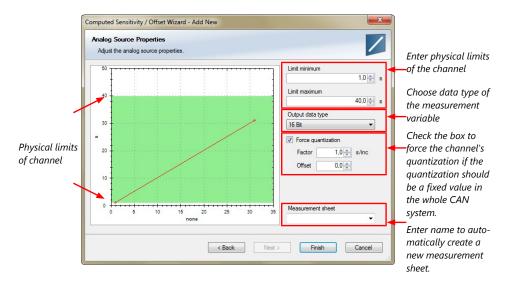


3. A 'Computed Sensitivity/Offset Wizard' opens.



4. Click 'Next' when done.

The second part of the 'Computed Sensitivity/Offset Wizard' opens.



- 5. Click 'Finish' when done.
- 6. Enter channel name and description.
- 7. Click 'OK' when done.

The channel is inserted into the C 80 Project Tree.

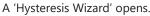
Note

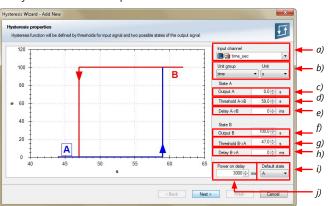
Working with automatically created measurement sheets is explained in chapter 'Setting up an online measurement [\triangleright 77]'.

12.4 Hysteresis

The hysteresis function avoids the high-frequent switchover of the measurement channel value. The hysteresis can be adjusted for each input measurement channel individually and can be used for further processing.

- 1. Click 'Measurement Sources' in the Toolbox.
- 2. Drag the 'Hysteresis' computed source from the Toolbox and drop it on 'Computed Channels' in the C 80 Project Tree.





a) Choose input measurement channel.

b) Choose unit group and unit of output.

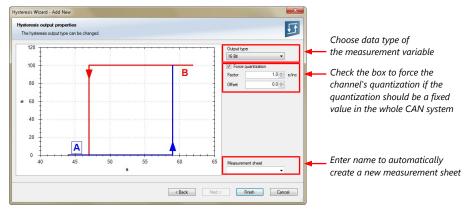
c) Enter output value of state A in the unit selected in b).

d) Enter threshold value when state changes from A to B.

e) Enter delay time when state changes from A to B.

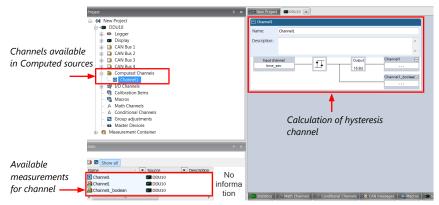
- f) Enter output value of state B in the unit selected in b).
- g) Enter threshold value when state changes from B to A.
- h) Enter delay time when state changes from B to A.
- i) Enter time when the hysteresis function is activated after vehicle's startup.
- j) Enter the channel's state (A or B) at startup.
- 3. Click 'Next' when done.

The second part of the 'Hysteresis Wizard' opens.



- 4. Click 'Finish' when done.
- 5. Enter channel name and description.
- 6. Click 'OK' when done.

The channel is inserted into the C 80 Project Tree.



12.4.1 Special functionality: Vehicle speed

This functionality allows:

- high performance vehicle owners to measure wheel spin under acceleration and wheel slip/lock under braking.
- calculating vehicle 'speed over ground'.

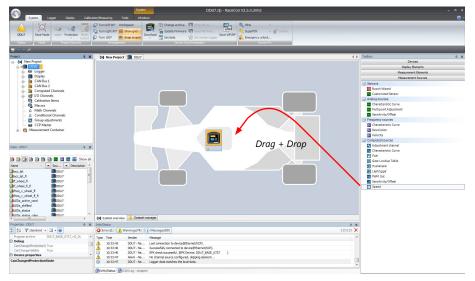
Vehicle speed calculation function

- Calculating vehicle speed of 2 wheel drive: (Wheel speeds of non-driven axle as input)
 - Calculated speed is average of both speeds if speed difference between wheels <
 limit.
 - Calculated speed is maximum of both speeds if speed difference between wheels
 > limit.

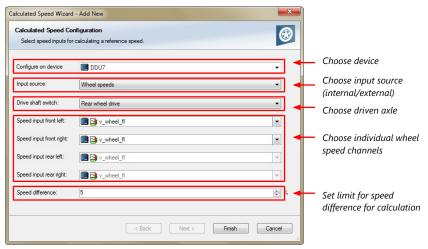
- Calculating vehicle speed of 4 wheel drive: (Wheel speeds of all wheels as input)
 - Calculated speed is speed of 2nd fastest wheel.

12.4.2 Setting up calculated speed

- 1. Click on tab 'System Overview'.
- 2. Click on 'Measurement Sources' in the Toolbox.
- 3. Drag the 'Speed' computed source from the Toolbox and drop it on the project name in the C 80 Project Tree. Do not drop it on 'C 80'!



A 'Calculated Speed Wizard' opens.



4. Click 'Finish' when done.

The speed calculation is inserted into the C 80 Project Tree.

Speed calculation	COUT COUT Same Mode Same Mode Same Mode Same Same Same Same Same Same Same Same	<mark>Cysten</mark> Wheasung Trols Windows	0007.4p - ReceCon V2.5.0.2002	_	- 5 X 8 -
	Project 0 x	/Ball New Project I 📕 2017 🖸 Speed		11.8	Toobox 8 x
in DDU Proje <u>ct</u>		and meridier and every a sheet			Devices
					Display Elements Measurement Elements
Tree	8- 68 Logger				Measurement Sources
	B- Display B- P CAN Bes 1			X	 Sensors
	8- 🛅 CAN Bus 2	Speed configuration			Bosch Waard Customized Sensor
	Gernpated Overnels JP VO Overnels	Canfigure an device 🛛 🕅 D	0.0		Analog sources
	Calibration Items	confidence a	007		Characteristic Curve
	- Macros	Input source Althem	Ispeed	•	Multipoint Adjustment Sensitivita/Offset
Measurement	- G Conditional Channels	Dive shaft saidh	ubeel drive		Frequency sources
	Group adjustments				Characteristic Curve
channels	CCP Master Measurement Container	Speed input front left	r_nheel_fl		Revalution Velocity
		Speed input front right	v_sheet_fl		Computed sources
calculated speed	Cato-Speed 9 K				Adjustment channel Characteristic Curve
,		Speed input rear left 👘	N_Meet_1		Toel
and calculated	Its work	Speed input rear right	v_shel_f		III Gear Lookup Table
una calcalatea					Tysteresis
distance 🔶 🔶	Speed_dat_ds COU7 datance Speed_vfpp_ds COU7 vehicle speed	Speed difference		5 <u>0</u> %	E Labrigger FWPI Out
uistunce					Sensitivity/Offset
					Speed
Configuration	Properties - Speed P x			з х	
window	😧 🗄 🗸 🐨 standard 🔹 🔛	Errors(1) Awarings(74) (1) Messages(64)		135/135 🗙	
	None Speed *	Type Time Sender Hessage			
	CanChargedProtectors True	10:33:45 DDU7 - Ne Last connection to device [21 10:33:46 DDU7 - Ne Successfully connected to de			
	CanChangeVisibility True	10:33:46 DDU7 - Ne EPK check successful. (EPK D)	lenice: DDU7_BASE_0727)		
	CanChangedProtectionState	10:33:47 Alarn - Ne No channel source configure 10:33:47 DOL/7 - Ne Looper data matches the loc			
		http://www.com/			

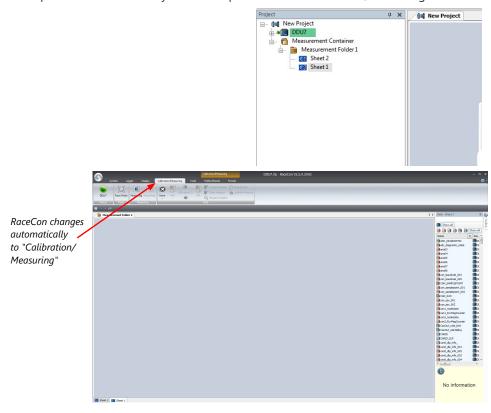
13 Online Measurement and Calibration

- System status and diagnosis
- Check and calibrate sensors in the vehicle
- Live display of sensor values on the PC
- Use RaceCon for diagnosis, online measurement and calibration
- Communication interface: Ethernet
- Communication protocol: XCP

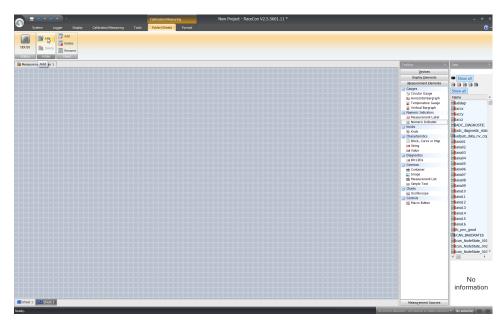
13.1 Setting up an online measurement

C 80 supports online measurement of sensor values and diagnostic variables.

1. Expand 'Measurement Container' and 'Measurement Folder 1' in the Project Tree and double-click on 'Sheet1'. Alternatively, click on the 'Calibration/Measuring' tab to open the window directly. 'Sheet 1' opens in a new 'Calibration/Measuring' window.

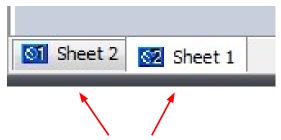


- 2. Click on the 'Folder/Sheets' tab, which appears when you are in the 'Calibration/ Measurement' window, to create a new measurement folder.
- 3. Click on the 'Add' button for folders in the upper left corner.



In the menu for sheets, you will find buttons to add, delete and rename new sheets

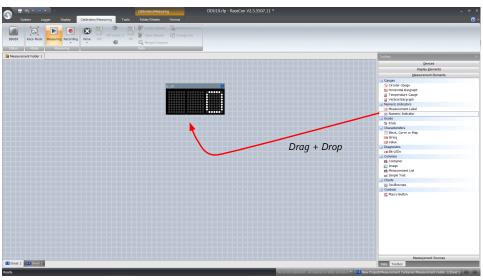
4. To change between different sheets, click on the tabs on the bottom of the 'Calibration/Measuring' window.



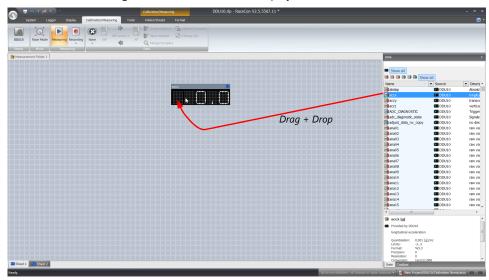
Tabs to switch between sheets

To add an element to a measurement sheet, perform the following steps:

5. Drag a measurement element from the Toolbox and drop it on the measurement sheet.



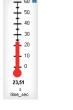
6. Select the desired measurement channel from the 'Data' area and drop it on the measurement element.

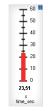


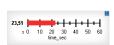
If the C 80 shows the green status, the value is displayed.

RaceCon offers different types of measurement elements:









Circular gauge

Temperature gauge

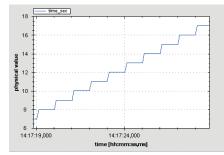
Vertical Bar graph style

Horizontal Bar graph style





Numeric indicator

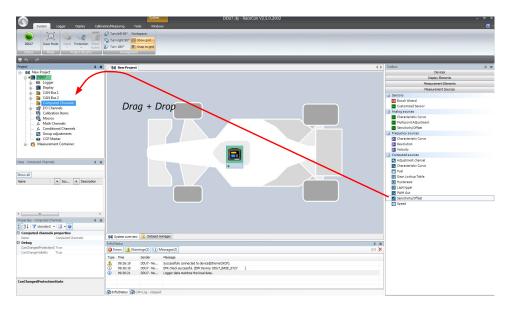


Oscilloscope (Chart)

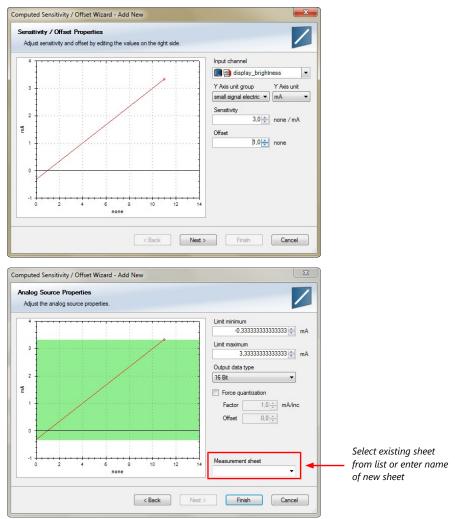
13.1.1 Automatic creation of measurement sheets

RaceCon can create measurement sheets automatically.

You can create and use measurement sheets with the C 80 as well as with all other devices connected to RaceCon.

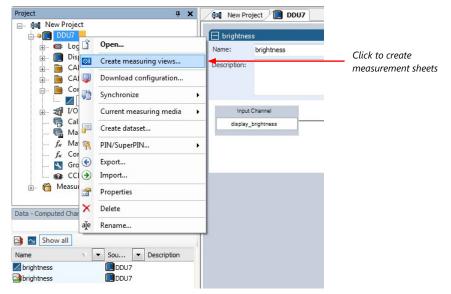


1. During the configuration of a measurement channel, select a measurement sheet from the list box or enter a name for a new measurement sheet.



Create Channel			
Set the unique name	for the channel and	d add an optional d	lescription.
Name:			
brightness			
Description:			

2. To create the sheets, right-click on C 80 and select 'Create measurement views...' from the C 80 context menu.



The automatically created sheet is inserted in the Project Tree under 'Measurement Container' and 'Device Channels'. If the C 80 is connected to RaceCon and the status is green, live values of the channels are shown.

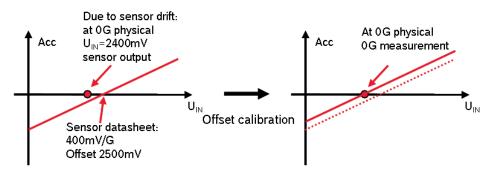
13.1.2 Using the measurement sheets

- 1. When RaceCon is online, press the 'F11' key to switch from 'Design Mode' into 'Race Mode'. The measurement sheet is extended to full screen. The button for offset calibration is active.
- 2. Switch between different sheets using the tabs at the bottom of the window.
- 3. Press the 'Esc' key to return to 'Design Mode'.

phys	0,0000 G	SENSITI	400,000		Z un pani calhador
raw	2490,0 mV	OFFSET	2500,000	mV	
		MIN	-5,000	G	
		MAX	5,000	G	
		ADJ_VAL	0,000		

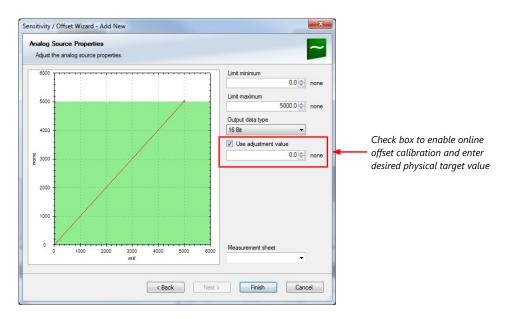
13.2 Online calibration of measurement channels

- Analog sensors drift with age, temperature, etc.
- Manual calibration is necessary
- Solution: online offset calibration
- Example: acceleration sensor

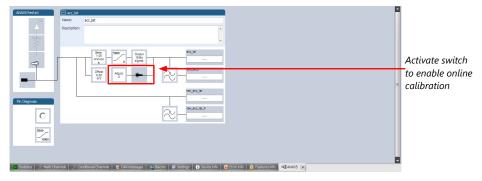


13.2.1 Enable online offset calibration for measurement channel

During creation of the measurement channel



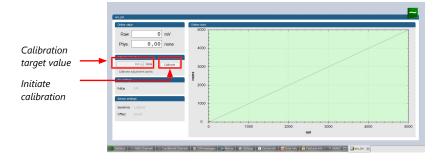




13.2.2 Performing the online offset calibration

C 80 has to be connected to RaceCon to calibrate the sensor's offset.

- 1. Apply the desired physical condition to the sensor (e.g. 1 G to an acceleration sensor).
- 2. Open the measurement channel's online page by double-clicking on the measurement channel name in the Data Area.
- 3. Enter the physical target value (e.g. 1 G) and press the 'Calibrate' button.

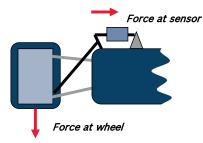


The sensor's offset is now calibrated.

13.3 Online calibration of multipoint adjustment channels

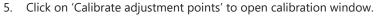
Example: measurement of wheel force

- Physical property 'wheel force' not directly measureable
- Load transfer through suspension kinematics
- Physical value at sensor position defined by vehicle
- Curve definition by online adjustment at vehicle



- 1. Create a multipoint adjustment measurement channel. To create a multipoint channel, see chapter 'Configuring a multipoint adjustment [> 66]'.
- Download the configuration on the C 80. To connect the C 80 to RaceCon, see chapter 'Setting up a new RaceCon Project [▶ 16]'.
- 3. Click on the desired channel in the C 80 Project Tree.
- 4. Double-click on a measurement channel in the Data Area to open the online view.

Click to open measurement channels in data view Double-click to open	Alex Project A	Raw 4 mV Phys 18883,50 norm Raw 200 mm 10000000000000000000000000000000	0000 001 0000 0000 0000	Analog value	and physical	
to open	Store / Sou	Click to open	5000	Value		
online view		calibration window	0 0 0	1000 2000 mV	3000 4000	5000
	(a) f_wheel_fr ^	🗙 Statistics 🔰 🌾 Mafri Channels 🚽 🌾 Conditional Channel	I 😫 CAN messages 🖉 Macros 📲 Set	ttings 🔹 🕦 Device info 📄 🥪 timer info 📄 📅 Features	amis 💷 AXXAOS 🕱 🗃 f_wheel_fr 💌	

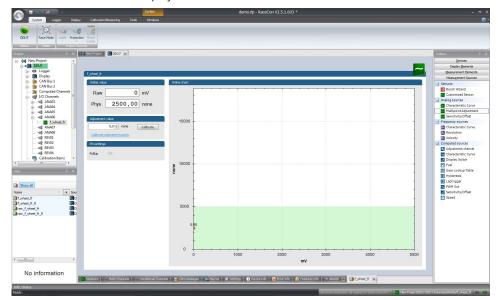


Point	Value	Unit	Calibration
1	1000,00	none	Calibrate
2	3000,00	none	Calibrate
3	4000,00	none	Calibrate
4	5000,00	none	Calibrate

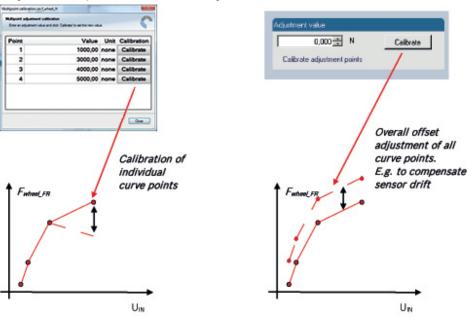
- 6. Apply the desired physical condition to the sensor (e.g. by applying a force on the wheel).
- 7. Enter the physical value in the value column of the desired calibration point (e.g. 745 N).

- 8. Press the 'Calibrate' button of the desired calibration point.
- 9. Repeat for all curve points.
- 10. Click 'Close' when done.

The calibration curve is displayed in the online view.



Adjustment points vs. offset adjustment

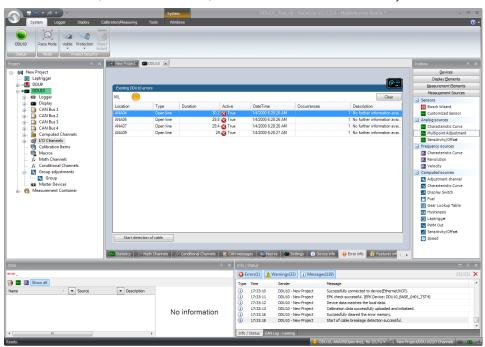


14 Error Memory

In this chapter "Error Memory", a lot of screenshots are created by way of example for DDU 8. Please consider this and replace the product name 'DDU 8' in this case with the name of your product.

14.1 Error memory representation in RaceCon

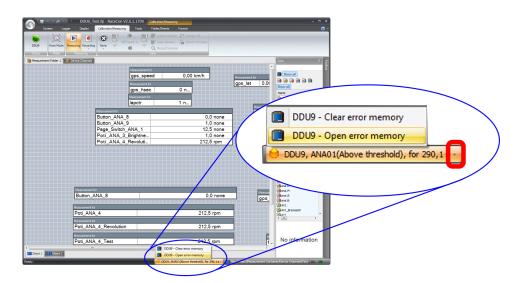
Bosch Motorsport devices feature an error memory. Information on errors can be visualized via RaceCon (online measurement) or can be transmitted via telemetry.



14.1.1 Accessing the memory

The error memory can be accessed as shown in the illustration:

	ation,Measuring To	System ols Windo	15	DDL	10_Test.rip - Racel	Con V2.5.5.0 - Masteric	ense Bosch *		
DCU 30 Race Mode veible Protection Sheet Solution Mode Project Security									
Project 0 X	New Project 💷 DO	J10 🗙						Toobox	0 X
del New Project Deptrigger def DDU0 det DDU0 det DDU0 det Douger	Existing DOU30 errors							Display Elements Measurement Berneri Measurement Source	
B- Display								 Sensors 	_
- CAN Bus 1	Location		Duration Activ				scription	Bosch Wizard	
🔬 🛄 CAN Bus 2	ANA04 ANA06	Open line Open line	30,2 👸 Tr 29,8 🙀 Tr		28.26 AM 28.26 AM		further information avai- further information avai-	Customized Sensor	
🐵 - 🛄 CAN Bus 3	ANA05	Open line	29,4 😋 Tr		28.26 AM		further information avail.	Characteristic Curve	
B- 📮 CAN Bus 4	ANACO	Open line	29 😋 Tr		28:27 AM		further information avail.	Multipoint Adjustme	
Computed Channels J/O Channels								Sensitivity/Offset	
								F Frequency sources	
- 🍯 Macros - 🌈 Math Channels - 🏂 Conditional Channels								Characteristic Curve Revolution	
👝 🛐 Group adjustments								 Computed sources 	
Group								Adjustment channel	
Master Devices								Characteristic Curve	- 1
B- 6 Measurement Container								Display Switch	
								Fuel	
								Gear Lookup Table	
								Hysteresis	
								C Laptrigger	
								PWM Out	
	Start detection of							Sensitivity/Offset	
1	Start DEDECTOR OF					-		Speed	
	Statistics 🦾 🥻 Math i	Darnds ja	Conditional Channels 🛛 😫 C		arros 🖬 Settings	Device in 🧶 Error i	10 🛱 Features inf		
erer_				C Errors(1)	Warnings(32) 🕕 N	Messages(119)			/152 🗙
🔁 🔤 Show all				Type Time	Sender	Message			
Name / 💌 Source	 Description 			(i) 17:33:10	DDU10 - New Proje		cted to device(tthernet/NCP)		
				(i) 17:33:11	DDU10 - New Proje		ul. (SPK Device: DOU 10_BASE	_0401_TST4)	
				17:33:12	DDU 10 - New Proje				
		No	information	(i) 17:33:13 (i) 17:33:16	DDU10 - New Proje DDU10 - New Proje		constuly uploaded and initial d the error memory.	zed.	
				17:33:16	DOU10 - New Proje		sole error memory.		1.0
					and a finish high		age and a second second.		
×	•			Info/Status G	N Log - running				



The memory is situated inside the device and is non-volatile. As a consequence, an error which has occurred and has not been cleared by the user will remain in the error memory even after a power cycle. The error state will then reflect if the error is still active or not.

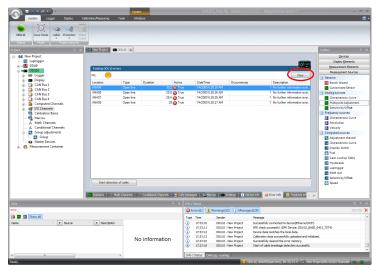
An error is deleted from the list when

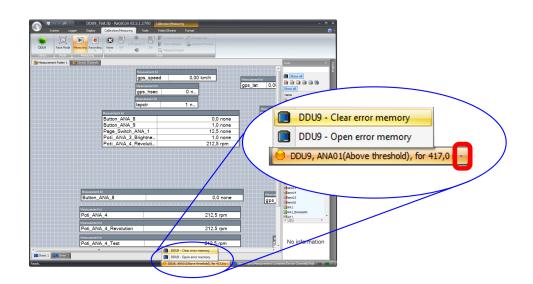
- the user actively clears the error memory
- the user updates the firmware

The error memory is not cleared by a configuration download and is not cleared by a power cycle.

14.1.2 Clearing the error memory

There are two ways of clearing the error memory, both are shown in the following illustration:





14.2 Information on errors available from the error memory

In general, properties of the error memory and properties of an individual error need to be distinguished.

14.2.1 Error Memory Properties

The following property is available for the error memory itself:

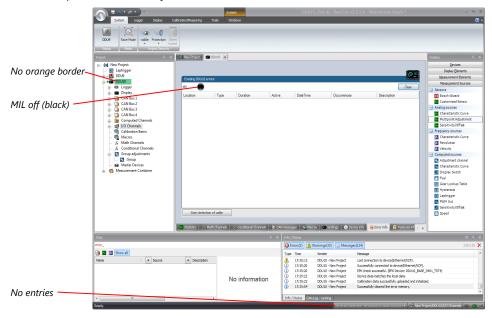
- Error Status (device measurement label "error_state")0: no error present in memory
 - 1: at least one inactive error present in memory, no active errors
 - 2: at least one active error present in memory

If displayed in a measurement sheet, this property's value (0, 1 or 2) is translated into a verbal description:



It is also represented by a color scheme within RaceCon (provided RaceCon is online with the system):

0 (no error present in memory):



1 (at least one inactive error present in memory, no active errors):

			System		DDU10_Test.rip	• RaceCon V2.5.5	.0 - Masterlicense Bosch *	- = X
	System Logger Dipolay Cal Solution DOUB Status Node Nod		Windows	-	-	-		• •
		😻 New Project 🔳 DDU 1	0 🕱					Toobox 0 X
Constantly orange border		Existing DDU 10 errors					0=	Devices Display Bements Measurement Bements
	- CB Logger	<u> </u>					Cear	Measurement Sources
MIL constantly orange	CAN Bus 1 CAN Bus 2 CAN Bus 3 CAN Bus 3	ANA04 C	ype Duration pen line pen line	Active 114.3 False 113.9 False 113.5 False	DateTime 14/2000 6/28/26 AM 1/4/2000 6/28/26 AM 1/4/2000 6/28/26 AM	Occurrences	Description 1 No further information avail. 1 No further information avail. 1 No further information avail.	Bosch Waard Customized Sensor Analog sources Characteristic Curve
			lpen line	113,1 False	1/4/2000 6 28 27 AM		1 No further information avail.	Multipoint Adjustment Sensitivity/Offset Frequency sources Characteristic Curve
	 f_x Math Channels f_x Conditional Channels Group adjustments Group Group 							Revolution Velocity Computed sources Adjustment chansel
	🖶 🆓 Muster Devices 🖶 👘 Measurement Container							Characteristic Curve Display Switch Fuel Gar Lookup Table Hysteresis Laptingper NM Out
		Start detection of ca		annels 🛛 🤰 CAN m	essages Remote State	iettings 🚺 Device in	io 😥 Error Info 🔐 Features Infi 🥡	Speed
	Deta			* × 1	nfo / Status			
	error_				Errors(1) A Warnings(3)			157/157 🗙
	Name / Source	Description		0	17:35:13 DOU10 -	New Project Sta New Project Los	sage rt of cable breakage detection successful. t connection to device(Ethernet/NCP).	*
Info cycling through errors, present in			No informa	tion	1) 17:35:20 00U10 - 1) 17:35:22 00U10 -	New Project EPN New Project Dev	cessfully connected to device/(Ethernet;/KDP) check successful. (BPK Device: DDU 10_BAS ice data matches the local data. bration data successfully uploaded and initial	E_0401_TST4)
error memory	e II				Info / Status C/N Log - runnin			Roject/20010/1/0 Channels 📧 🔳 💼
	waay,					- coun, i	www.sopenine), for 113,15 + Wr. NewP	ngergood lajo unames 👘 🥶 📅

Blinking orange border MIL blinking orange

2 (at least one active error present in memory):

14.2.2 Error Properties

The following channels are recognized and memorized inside the devices:

Data				
err				
👜 📑 🥶 🔄 👜 🤅		- 🛄 📖	Show all	
Name	Δ.	▼ Source ▼	Description	•
error_active_rotate	a di C	DDU9	error active rotation. signals if error is present or not	
error_location_rotate		DDU9	error location rotation	
error_state		DDU9	signals global state of error manager	
error_type_rotate		DDU9	error type rotation	

Error type (device label "error_type_rotate"):
 e.g. "below_threshold" for a violation of the minimum voltage range defined in the configuration, "shortcut_Batt" for a shortcut to battery voltage etc.

- Error locations (device label "error_location_rotate"):
 e.g. "ANA01" for an error concerning the first ANA channel
- Error durations

How long has the error been active? If an error encounters a non-active period before being cleared from the memory and is then detected again, the error duration keeps on accumulating. The number of active periods can be seen from the "number of occurrences".

- Number of occurrences

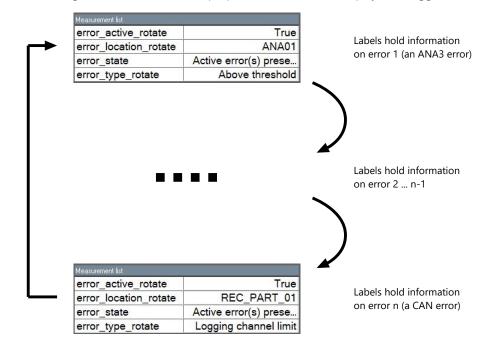
How many times has the error been detected since the last time the error memory was cleared.

- Error active state (device label "error_active_rotate")
 All failure modes are continuously diagnosed; any error detected will be written to the error memory. Once an error is detected, it is qualified as "active".
 - 1 (TRUE) Error was detected in most recent diagnose run (active)

 0 (FALSE) Error is inactive: error was not detected in most recent diagnostic run, however the error has not been cleared from the memory by the user and remains in the non-volatile memory

The aforementioned channels (error_active_rotate, error_location_rotate, error_type_rotate) are device specific properties (e.g., C 60) and are not related to the complete Race-Con project (e.g., "error no. 3 from the error memory"). Therefore, only one property label is available in each device. The errors from the error memory (possibly more than one error possible per device) share these three labels. The labels cycle through the errors currently present in the memory and represent the respective property of each error periodically.

The following screenshot shows error properties, which can be displayed or logged:



After the last error and its error properties have been displayed, the labels will start again with the first error in the error memory stack and its error properties will be displayed again. Therefore, monitoring these labels over a sufficiently long period provides the information on all individual errors in the error memory.

To understand this behavior, it is recommended to observe the three labels in a measurement sheet (while more than one error is active) and watch the values change periodically:

Measurement list					
error_active_rotate	True				
error_location_rotate	REC_PART_01				
error_state	Active error(s) prese				
error_type_rotate	Logging channel limit				

The verbal representation of the numerical codes of these labels can be visualized in the properties window of the measurement page:

Z↓ T standard → I · · ·		
Channel Measurement Actual measurement rate	100 ms - time synchronous event channel	
Default measurement rate	100 ms - time synchronous event channel	
Channel properties	100 ms - une synd i brious event chaimer	
Address	0x25040B95	
Annotations	0220 0055	
Description	signals global state of error manager	
Name	error_state	
Physical conversion	(Verbal)No error present[0]Passive error(s) present[1]Active error(s) present[2]	
Physical maximum	2	
Physical minimum	0	
Physical quantisation	none	
Physical unit		
Annotations		

14.3 Analog Input Diagnosis

14.3.1 Monitoring limits / Shortcut Detection / Cable Breakage

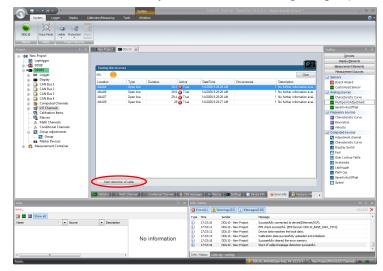
The pin diagnosis functionality (check whether measurement is within the desired range) can be activated in the ANA pin setup wizard; to allow for a diagnosis regarding shortcut to ground, shortcut to battery voltage and cable breakage, a minimum / maximum has to be defined.

Pin Properties	
Configure the anal	log pin properties.
Pullup value:	3,01 kOhm
	Pin Diagnosis & monitoring limits
	I Enabled Minimum: 1000 → mV
	Maximum: 4000 mV
	< Back Next > Finish Cancel
	Page_Switch_ANA_1
IA0 1 Red-p28	Page_Switch_ANA_1 Name: Page_Switch_ANA_1
S∨	Page_Switch_ANA_1
Sanda Andrea Branne	Page_Switch_ANA_1 Name: Page_Switch_ANA_1
Sv	Page_Switch_ANA_1 Name: Page_Switch_ANA_1 Description:
Sv	Page_Switch_ANA_1 Name: Page_Switch_ANA_1 Description:
S∨	Page_Switch_ANA_1 Name: Page_Switch_ANA_1 Description:
S∨	Page_Switch_ANA_1 Name: Page_Switch_ANA_1 Description: 0 9000 Output 1880 9900 0
S∨	Page_Switch_ANA_1 Name: Page_Switch_ANA_1 Description:
\uparrow	Page_Switch_ANA_1 Name: Page_Switch_ANA_1 Description: 999.5witch_ANA_1 Image: 999.5witch_ANA_1
SV Fulup Pulup	Page_Switch_ANA_1 Name: Page_Switch_ANA_1 Description: Page_Switch_ANA_1 Description: Page_Switch_ANA_1 Page_Switch_ANA_
SV Prilup	Page_Switch_ANA_1 Name: Page_Switch_ANA_1 Description: 999.5witch_ANA_1 Image: 999.5witch_ANA_1

14.3.2 Open Line Detection

The implementation of open line detection consists of pull up resistors being activated and deactivated; evaluating the behavior of the measured value detects cable breakage, regardless of the pull up resistor being activated by the user.

- 1. Open the Error Memory of the Device.
- 2. Click "start detection of cable".
- 3. Check the Error Memory for new fault entries, regarding "Open line errors".



15 Recording

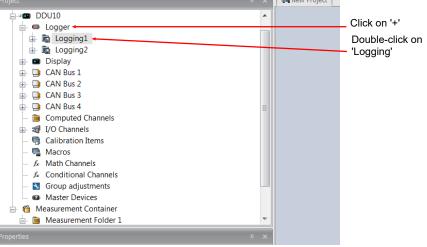
15.1 Features

- Synchronized recording of C 80 analog and digital input channels, C 80 internal measurement channels, ECU data, Data from external sensor interfaces
- Up to two independent recordings
- Measurement rate 1 ms to 1 s
- Two global start conditions (thresholds)
- Up to 16 measurement conditions (fast-slow-switches)

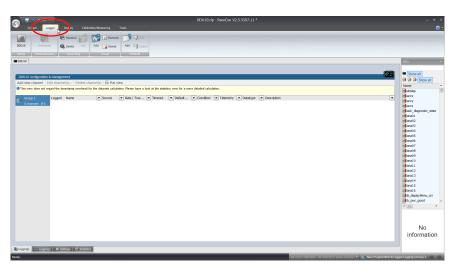
15.2 Configuration of Recordings

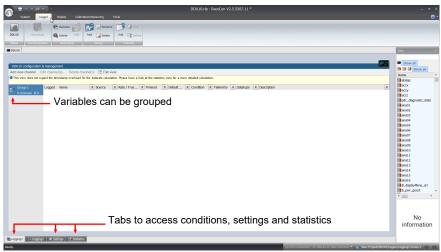
- 1. Expand the 'Logger' list by clicking on '+' in the C 80 Project Tree.
- 2. Double-click on 'Logging' in the C 80 Project Tree.

The recording configuration is displayed in the Main Area.



Alternatively, click on the 'Logger' tab to open the configuration directly.



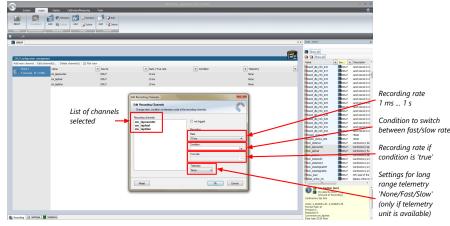


3. To add a measurement channel to a recording, select the wanted channel, drag and drop it onto the measurement group.

arop it onto the measurement group.		
ODU10.np - RaxeCon V2.5.5507.11*		
System Logger Display Caldratery/Weakuring Tools		😨 ·
D011 Construction Construction Construction		
		Data 0
000)/0 configuration & reservances Add new channel (Est channel()). Evene channel() (): That view () This view device stit report the treating viewhork for the discrite challence have a look of the discrite challence have	Recording	em Show all Show all Show all Name Completence Complet
Group 1 Logged Name Source Rate / True Timeout Default Condition Telemetry Datatype Description	- properties	an_kapfusi
☑ oru_byted D00J0 10 ms Nove 32 Bt bat Contention (see 0000) ☑ oru_bytere D00J0 10 ms Nove 32 Bt bat Contention (see 0000) It have a set bat bat bat bat bat bat bat bat bat ba		Cm_stateSgnalCM Cm_stateSgnalCM Cm_stateSgnalReady Cm_stateSgnalReady Cm_stateSgnalSG Cm_stateSgnalSattup Cm_stateSgnalStop
Drag measurement		msdcom_cmdRxCnt_1 msdcom_cmdRxCnt_2 msdcom_cmdRxErr 1
channels into group		madcum_cmdfix&fr_2 madcum_cmdfix&fr_2 madcum_cmdfix&fr_2 madcum_cmdfix&fr_1 madcum_cmdfix&fr_1 madcum_cmdfix&fr_1 madcum_cmdfix&fr_2 madcum_cmdfix&fr_2 madcum_dbg_cmdState_ madcum_dbg_cmdState_i
		<
		Cardmemory lap counts Quantization: 1/nc Umits: 0.235 Format: \$1.0
Ditopyngi Te Logyngi a Setting & Statistics		Precision: 0 Resolution: 0 *

4. To edit channel settings, mark the channel(s) and click 'Edit Recording Channel(s)'.

An 'Edit Recording Channels' window opens (if you choose only one channel, the window looks a bit differently).



5. Click 'OK' when done.

Note

If no recording condition is defined or the recording condition is 'false', measurement channels are recorded at the value chosen in 'Rate'.

If the condition is 'true', measurement channels are recorded at the value chosen in 'True rate'.

15.2.1 Adding a recording group

Recording channels can be grouped. These groups will also be visible in Darab and will help to get a better overview during the data analysis

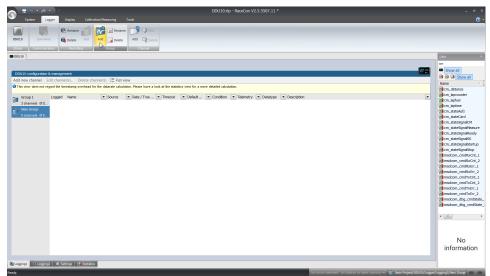
1. To add a new group, select the 'Logger' tab.

The 'Logger' window opens.

2. Click on the 'Add' button.

A new group will be added and can be renamed 'Gearbox', 'Aero', 'Engine', etc..

3. To rename a group, click on the 'Rename' button next to the 'Add' button.



15.2.2 Logger settings

To display the global C 80 settings, open the 'Logger' window and click on the 'Settings' tab at the bottom.

	yata Uger Depity Calibration Hoson Tells	DDU	18.4p - Rac€ar V2.5.5807.11 *	- • ×
	Side Connections Reacky			on on Show all Show all Name Con Show all Name Con Show conter
a)		0 settings settings		an_lapture an_lapture an_statolufz
b)	- Appl	ration: Race track •	File fragmentation size: 20 (5) HB File fragmentation time: 340 (5) sec Recording 2 - Logging2	Cm_stateGard T)
c) _		e: Engine recording	Type: Clease recording Statusblock: V De sting from recording 1 Configuration fil: Use FST content V De FST in the	Con_stateSignaStartup Con_stateSignaStop Con_state
d) .		bel start conditi	Global start conditi Use setting from recording 1 Encryption	msdcom_omdRxErr_1 msdcom_omdRxErr_2 msdcom_omdTxCrt_1 msdcom_omdTxCrt_2
e)	•	Password protected data can only be opened by www.narah.vzv	twosed prototol data can only be opened by wear-sub-time the password from recording 1 Sitt password	mstcom_ond1xt.fr_2 mstcom_ond1xtFr_1 mstcom_ond1xEr_2 mstcom_dbg_ondState_ mstcom_dbg_ondState_
				< 11 >
	The Gagging 11 The Logging 11 Settings 18 Soundas			No information

a) Choose setting for outing counter mode:

- For testbench (without lap trigger) select 'Testbench'.
- For racetrack (with lap trigger) select 'Racetrack'.

b) Choose wether the logging partition shall be named Engine recording or Chassis recording.

c) Advanced setting: Select your logging configuration file, if provided by your Bosch Support Engineer.

- d) Choose or create the condition to start recording
- e) Enter a password hint and a password (optional).
- f) Setting for automatic fragmentation. Do not change!

15.2.3 Recording statistics

The tab 'Statistics' shows the channels' allocation and their current data rate related to the transmission frequency of the C 80 and the whole transmission system.

The overview helps to detect bandwidth bottlenecks of channels. Bandwidth bottlenecks can be solved by changing the logging rate setting for each channel.

The data rate of the whole system is often less than the data rate of the C 80 and limits the overall transmission speed.

C80	1 ms	2 ms	5 ms	10 ms	20 ms	50 ms	100 ms	200 ms	500 ms	1 s	sync	Total	Data rate [Kb/s] Recording	Data rate [Kb/s] scrutineering	Data rate [Kb/ overall
Channels	26 - 28	1 - 3	0 - 6	465 - 471	2	7 - 13	26 - 27	0 - 6	14	0 - 3	0	557	103,02 - 125,40	63,58 - 70,24	166,60 - 195
Limit	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	0	1080			200,
MS6ECU															
Channels	21	22	18	84	26	0	0	0	0	0	7	178	30,30	73,30	103
Limit	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080			300
MS6Log															
Channels	1	0	0	0	0	0	0	0	0	0	0	1	0,00	8,00	8,
Limit	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	0	1080			200,
Overall															
Channels													133,32 - 155,70	144,88 - 151,54	278,20 - 307
Limit															800

15.2.4 Displaying online recording diagnosis ("statectrl_ok")

- 1. To add a Recording Diagnosis element to a measurement sheet, drag a 'Bit-LED' element from the Toolbox and drop it on measurement sheet.
- Systemtest C80_BASE_0516.rlp RaceCon V2.9.0.10 Masterlicer Create dataset 📓 Upda Open dataset 🖓 Char 4 Q. Merge/Com 👺 🚇 📾 👄 Shov No information ST Sheet 1 Steet 2 Steet 2 Steet 2
- Drag channel 'statectrl_ok' from the Data Area and drop it on the 'Bit-LED' element. 2.

The 'Bit-LED' element shows the state of received channel data in bit-representation. A green highlighted channel means 0, a red highlighted channel means 1.

- Measurement correctly initialized, but recording threshold(s) not reached: 254
- Measurement correctly initialized, C 80 is recording data: 255 _
- Values less than 254 indicate an error state

15.2.5 Further measurement labels

These additional measurement labels may help you diagnosing the state and operation of the data logging in more detail. There are a few more, but these are usually enough. Please refer to statectrl_ok, mentioned in more detail in chapter 'Recording diagnosis'.

Measurement label	Function
card_part1_size	Size of the first logging data partition in MB.
card_part2_size	Size of the second logging data partition in MB. Atten- tion, second logging can also be stored on first parti- tion, depending on chosen settings (Logger -> Set- tings).
ftp_UserLoggedIn	This measurement allows to monitor for active FTP connections. RaceCon (WinDCP) and WinDarab may not connect in parallel.
meas_globcond_m01 / _m03	State of the global logging start condition for first / second logging. TRUE means data is actively recorded.
meas_rate_m01 / _m03	Incoming measurement data rate (first / second log- ging) for further processing. Does not include com- pression. Active when meas_globcond_m0x is TRUE but may also be active while meas_globcond_m0x is FALSE, if a pretrigger time is configured. In that case data is transferred to the pretrigger buffer, but not necessarily written to storage medias.

Function
Processed data blocks for first / second logging. This does not ensure writing the data to a storage media, e.g., if pretrigger is configured and meas_globcond is FALSE.
Processed data blocks per media (internal / USB).
Compression factor for first / second logging. For ex- ample, factor 2.0 means incoming data can be reduced to half the size, before data is written to storage me- dias.
Size of data buffered in pretrigger, e.g., while global logging condition is FALSE. Data will be forwarded to storage medias when logging condition becomes TRUE.
Size of data buffered (for first / second logging) for processing by different storage medias (intern / USB). It is possible, that e.g., internal storage has processed the data already, while USB is still busy writing the data blocks. Data is removed from the buffer as soon as all medias have processed it.
Effective data write rate to internal storage media, after compression, for first / second logging.
Effective data write rate to USB storage media, after compression, for first / second logging.

15.3 Event logging

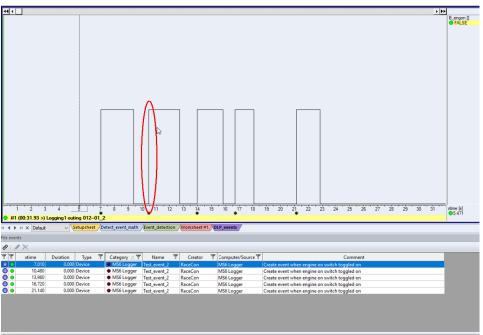
Event Logging implements the possibility to observe a channel if short spikes are expected. With Event Logging, every occurrence of a user defined threshold (more complex conditions are possible) leads to an event being raised. It is listed in a table along with its time stamp, its ID and even with a text string freely definable in RaceCon.

Events are stored as text in logging data and displayed in WinDarab like Darab-Events. Possible use cases are error entry, etc.

Configuration in RaceCon:

Project 무	×	🔍 New Proje	ct 🛛 🖙 MS6 Log	ger 🗙				
New Project	<u>^</u>	MS6 Logg	er Events					
MS6 Logger		🖗 Add Ev	ent 🝠 Edit E	vent 🐔 D	elete Events			
😥 🎟 Logger		Active	Name	`	/ Description		~	Trigger Channel
E CAN Bus 1			TemperatureHig	h	Chip temperature is critical h	igh		B_tempHigh
				Edit Event		-		×
Computed Channels				con even				~
Events				Edit Event				
Calibration Items				Fill out all	required fields to edit the select	ed event.		
- 🔄 Macros - fx Math Channels				Name				
	~			Temperature	Mah			
Properties P	×			Description	ar ng ri			
🚉 🛓 🍸 standard 🔹 📄 🗸 🥥					ature is critical high			
 Event properties 					atore is childer high			
Description Chip temperature is critica	l hig			Category Warning				~
Name TemperatureHigh								
				Trigger Cha				
				📾 🙆 B_t	empHign			1
Name	-1			Edge				
				Rising				~
		Statistics	🕼 Math Char	Reset Delay				1.0.1
Data				200				🚖 ms
Starts with								
							01/	0.1
F D Show all							OK	Cancel
Name 🔨 🗸 🗸 Source		× [escription					.11

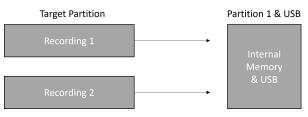




🖲 - 👒 🎯					
Name		•	Creator	Computer/Source	Desc.
User defined events	۲	0			
▲ Chassis		0			
DamperFL_on_bump	۲	0	KAM7FH	ABTZOKEI	
▲ Gearbox		0			
Shift_2-3	۲	0	KAM7FH	ABTZOKEI	
A 🔶 SYNC		0			
			KAM7FH	ABTZ0KL1	
MS6 Logger		5			
@ Test_event_2			RaceCon	MS6 Logger	

15.4 Data Logger and USB recording

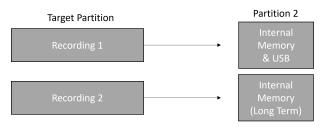
Default settings:



Data from **Recording 1** and **Recording 2** are stored both into the Internal Memory and additionally on the USB stick in copy.

To download the data from the Internal Memory of the logger, the Data Logger must be selected in WinDarab and the data will be downloaded in parallel.

Alternative setting:



Recording 1 is stored on the Internal Memory and additionally on the USB stick in copy. To download this data, the Data Logger must be selected in WinDarab.

Recording 2 is stored on only the Internal Memory. To download this data, the Long Term logger must be selected in WinDarab.

15.5 USB recording

This function requires the installation of Software Upgrades. Look into the datasheet of your device, to see which upgrades are available for your device.

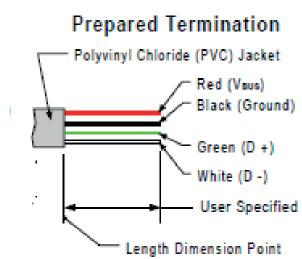
Software Upgrade DATA_USB enables USB recording. To activate Software Upgrade DATA_USB, enter the license key as described in the chapter 'Feature activation' [21].

For USB recording, Software Upgrade FULL_LOG_1 should also be enabled.

Wiring harness

Bit	Value
USB_Device_Power	Power (red)
USB_Device_DP	D+ (green)
USB_Device_DN	D- (white)
USB_Device_Gnd	GND (black)

For further information, see the pinlayout of the device.



Colors matching a standard USB cable

Storage device

The recording function can be used with a dedicated Bosch Motorsport USB device. The USB device must be preformatted with the Bosch File System (BFS) in RaceCon before first use.

To format the USB device with the Bosch File System (BFS), do the following steps:

In RaceCon, select 'Tools' - 'Extras' and choose 'Format USB stick'.

Press 'Format'.

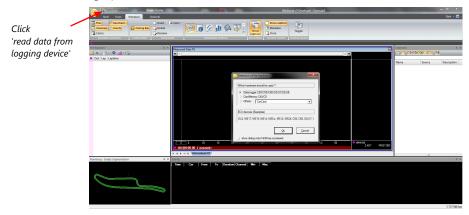
An USB device is recognized by Windows as a 'storage medium', but it can only be initialized with RaceCon and read with WinDarab.

15.5.1 Recording data on USB device

- 1. Plug an USB device to C 80.
- 2. Prepare a recording configuration in RaceCon.
- 3. Power on the system and connect with RaceCon to the vehicle.
- 4. Download the configuration to the C 80.
- 5. Record measurement data. If an USB device is present, the C 80 stores the data in parallel on the internal memory and the USB device.
- 6. Power off the system.
- 7. Remove USB device from the vehicle.
- 8. Start the WinDarab software.

💫 🚯 :	WinDarab v7 Developer - Formula3		- 0 ×
Start Tools Windows			style 🗸 🧭 🗸
Control Bars Contr	Doge De La Contentiate Content		
File Explorer A ×		Channels	+ ×
Out Lop Lopine	• 4 3 · u × "Wohanest H/	Name Source	Descripti
Events			# ×
Time Car From To Duration/Oxaved 1	An I Mar		

- 9. Click on the 'Import/Export' icon.
- 10. Select 'Data logger CXX/DDUX/MSX and click 'OK' when done. The 'Read measurement data' dialog opens.



11. Click on 'Settings' tab and select the option 'Flash Card/USB Stick'.

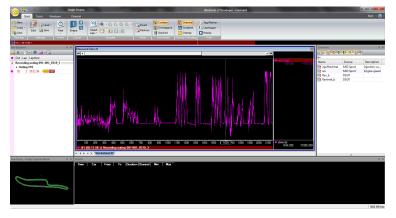
🂐 Data L	.ogger Import					—		×
Settings	Current Import	Recent Impo	rt					
	t sources ashCard / USB-St evice	ick			ptions e ARP cache entry afte password, if not set b			:
Bu	ırst						\sim New	
Device	Device / IP:	CBO → One file for ea D:\daten	ch lap V	~	☑ Delet	rt all on connec te transferred f rt latest files fir	files	
Subfo	older template:						~ [a]+	
Filen	ame template: [C65-USB-[Car	dInfo] outing [outing(13]-[lap03]-[n]			∽ [a]+	
Advan	ced Com	ment Fields			\searrow	Appl	y changes	

12. Activate 'Apply changes'.

Insert the USB device into the PC. Data transmission from device starts automatically. Measurement files are stored automatically in the base folder.

💐 Data Logger Import						
Settings Current Import Recent Import]					
Data source: FTP 23.06.2015 12:11:11				Network DDU7 - 10.1	0.0.207	🔷 18 ms
Name	Size (MB)	Get	Get (MB)	-		
FTP 23.06.2015 12:11:11	0.0		0.0	Connecting		
✓ Auto Scroll Show all files						Import
Auto Scroll Show all files						Import
💐 Data Logger Import						• ×
Settings Current Import Recent Import						
Name	Size (MB)	Succe	255			

- 13. Click 'Close' when transmission has finished.
- 14. Click on the Start button and choose 'Open measurement file'.
- 15. Select the measurement files from the storage folder.
- 16. Click on 'Open'.
- 17. Click in 'New Desktop' to open a new measurement data window.
- 18. Drag the desired measurement channel from the Channel list and drop it into the measurement data window. The measurement channel's graph is displayed



For more detailed descriptions and instructions, refer to the WinDarab V7 manual.

15.5.2 USB device handling hints

Using the USB device

Always plug the USB device into vehicle before power up to ensure that all measurement data is stored on the USB device.

If the USB device is plugged in after recording has started, only the current data is saved. Data recorded on the C 80 before the USB device is plugged in will not be saved.

Removing the USB device

Always power off the system before unplugging the USB device!

15.5.3 Troubleshooting

When no data on the USB device is recorded:

Configure the measurement label **usb_mediastate** on a RaceCon measurement view or on a C 80 display page.

The value of **usb_mediastate** reflects the operating condition of the USB bus:

State	Description
0: Wait: Device not found	The USB device is not found (also: waiting for re-plug stick).No USB device inserted.USB device is defect.No electrical connection or wiring harness problem.USB software upgrade not activated (Purchase of unlock code needed).
1: Wait: Device detected	An USB device is found, but not yet installed.

State	Description
2: Ok: Media installed	The USB device is found and is operational (idle). This does not imply that recording data is written!
4: Stop: Device unplugged	The USB device has been removed. The C 80 performs a restart when an USB device is re-plugged in.
5: Error: Media error	The communication to the USB device broke down. The USB device is defect. The USB device is not supported by C 80.
6: Error: Media corrupt	The USB device is not in valid BFS format. (Hint: Re-format the USB device in RaceCon.)

16 Lap Trigger

16.1 Lap trigger (timing beacon)

Why do we need a lap trigger (timing beacon)?

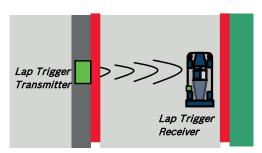
- Vehicle lap time measurement
- Calculation of lap-dependent functions (lap fuel consumption, min/max values)
- Calculation of lap distance dependent functions
- Control of data logging system

Types of Systems

- GPS based (low cost, low precision)
- IR based (low cost, high precision, limited reliability)
- RF (microwave) based (high precision, high reliability)

IR and RF based Systems consists of

- Transmitter (trackside unit)
- Receiver (in-vehicle unit)



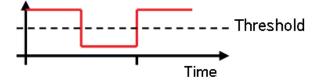
16.1.1 Electrical trigger signal

In C 80 all sources of measurement channels can be used as trigger signal.

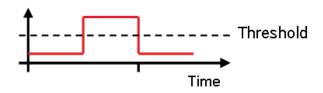
- Analog input
- Digital input
- CAN input

Signal (measurement channel) properties

Low active signal (Bosch triggers): Trigger releases if signal is below the threshold.



High active signal (other manufacturer's triggers): Trigger releases if signal is above the threshold.



Two types of trigger signal:

- Main trigger (end-of-lap at start/finish line)
- Sub-trigger (segment time, optional, not applicable with GPS lap trigger)

Bosch standard:

- Main trigger 20 ms, low active (Recommendation for RaceCon "Detection Time" setting: 15 ms, Setting must be a slightly shorter period than the signal length of the trigger to avoid a missed trigger due to the update rate)
- Sub trigger 40 ms, low active (Recommendation for RaceCon "Detection Time" setting: 30 ms)

16.1.2 GPS Lap trigger

The GPS lap trigger uses a GPS signal to trigger the lap timer. To function this timer an external GPS sensor (see GPS Sensor [> 121]) has to be connected to the device and a detection point with a detection range has to be defined in RaceCon.

The GPS detection point is defined by the latitude and longitude. The easiest way to get the latitude and longitude of a finishing line is due to a web mapping program such as google maps. With google maps, simply left-klick on the spot where you want to set the detection point. The information about the latitude and longitude will show up, in general the latitude is given at first. You should insert at least five decimal places for sufficient precision.

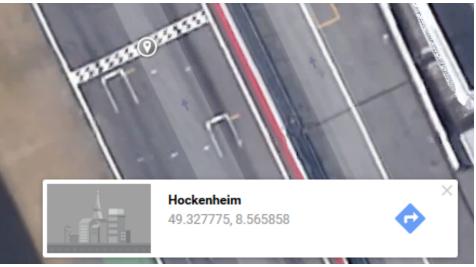


Photo: Google Maps

The detection range defines the radius of a circle around the detection point in which the lap trigger can be set. The lap trigger will be set as soon as the distance between the car and the detection point has reached its smallest peak. By this function an imaginary finishing line is calculated inside of the detection circle.

The imaginary finishing line can only be calculated if all channel sources are defined correctly. The latitude and longitude channel sources are mandatory for the functionality. Missing direction or speed source lowers the precision of the system.

			Ø
Define the latitude and longitude of the GPS detection point.		Laptrigger configuration General Presettings Conditions Trigger Countdown Segment timing GPS Decimal lattude:	
Define the detection		Laphigger detection range:	m
range around the detection point. Define the channel sources for Longitude, Latitude, Direction and Speed.		OFS channel sources: Longitude source: Longitude source:	-
		Latitude source:	•
	\sim	GPS speed source:	•
		gps_speed	•
	Configuration		

Note

The configuration of the sensor update rate and the detection range must insure to receive a valid GPS point in the detection range, despite the occurring vehicle speed near the detection point.

16.1.3 Prevention of false triggers

- Race track topology and transmitter location frequently cause false triggers.
- Software functionality prevents acceptance of false triggers.
- Minimum vehicle speed for acceptance of trigger prevents false triggers while vehicle is stationary in the pits.
- Time based re-trigger protection prevents false triggers due to signal reflections on Home Straight.
- Lap distance based retrigger protection prevents false triggers due to track topology.

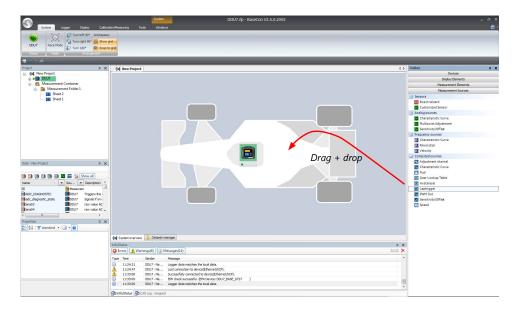
16.1.4 Forced triggers

Lap distance based insertion of 'forced trigger'.

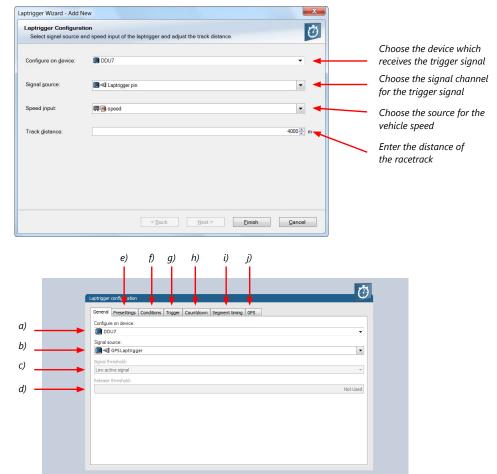
Under race conditions, trigger signals are sometimes missed. Software functionality introduces 'forced trigger'.

16.1.5 Setting up a lap trigger

- 1. Click 'Measurement Sources' in Toolbox.
- 2. Drag 'Laptrigger' into 'System Overview'. Do not drop it on 'C 80'!



A 'Laptrigger Wizard' window opens.



a) Change signal device, if desired.

Onfiguration

b) Change signal channel, if desired.

c) Choose signal threshold. See chapter 'Electrical trigger signal' for details.

d) Define threshold of input channel signal when trigger is released. Only possible, if no digital source is selected as signal source.

e) Define presettings for trigger. See chapter 'Lap trigger presettings' for details.

f) Define condition settings; change signal for vehicle speed, define speed settings. See chapter 'Distance based retrigger protection' and 'Distance based forced trigger' for details.

g) Define settings for main trigger. See chapter 'Lap timing' for details.

h) Define settings for counddown timer. See chapter 'Countdown timer' for details.

i) Define settings for sub trigger. See chapter 'Segment timing' for details.

j) Define settings for a GPS lap trigger. See chapter 'GPS lap trigger' for details. Only applicable if the signal source is set to 'GPS lap trigger'.

Click 'Finish' to complete the operation. A pre-configured lap trigger window opens.

	Sa www.httgett 🔞 Laptrigger 🗵
	Laptrigger configuration
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	General Presettings Conditions Trigger Countdown Segment timing
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best laptime' is accepted	Lap time threshold:
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ased retrigger protection.	800 m
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	Laptrigger configuration	U
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nain trigger).	Detection time:	
	Retrigger lock time:	
efine settings for sub trigger.	5000 🖗 m	
ot applicable with a GPS lap trigger.	Detection time: 30 (5) ms	
	Retrigger lock time:	
	5000 🐑 ms	

Configuration

Define settings for countdown time:			Lastrones configuration
Define settings for segment timing.			Laptrigger configuration
Define settings for segment timing.			
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timer.	Define settings for countdown		Mode:
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	Define settings for segment timing.	•	General Readings Conditions Traper Countions Segment timing Hode: Image: Les segment distance from naih traper:
Configuration			

Only applicable for a GPS Laptrigger

		ð
Define the latitude and longitude of the GPS detection point.	Laptigger configuration General Presettings Countions Trigger Countidown Segment timing 9PS Decimal lattucke: 49,32777400 (4
Define the detection range around the detection point.	8,55594700 (Laptrigger detection range: 20 (GPS channel sources: Longitude sources:	-
, Define the channel sources for Longitude,	Latitude source:	
Latitude, Direction and Speed.	Ges speed source:	•
	Configuration	

16.1.6 Lap trigger channel diagnosis/counter reset

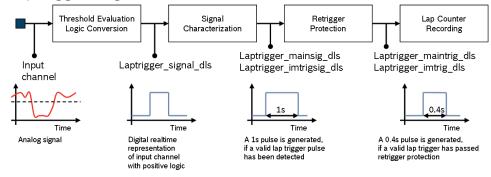
To display a quick lap trigger channel diagnosis and to reset counters use the diagnosis page in RaceCon. Any 'Laptrigger_xxx' channel can be displayed.

Double-click on any 'Laptrigger_xxx' channel in the Data Area. Example: 'laptrigger_lapdist_dls'

A diagnosis window opens in Main Area.

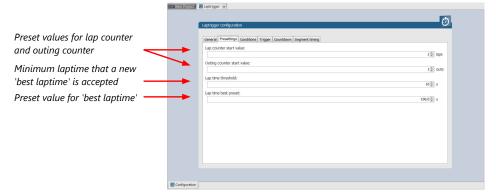


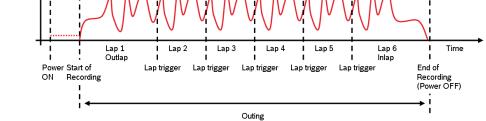
Lap trigger diagnosis scheme



16.1.7 Lap trigger presettings

When the reset buttons on the diagnosis page are activated, these values are used.





Functionality

- Power ON: system + measurement is initialized but not yet started

- Global start condition fulfilled: recording starts
- Reception of valid lap trigger: recording of lap completed, new lap starts
- Power OFF or Global start condition not fulfilled: recording of lap completed, system shutdown

The system is counting:

Outing:

 The outing counter is incremented with each power cycle when at least one valid lap (not by forced lap trigger) was recorded

Lap:

- Leaving the pits to lap trigger
- Lap trigger to lap trigger
- Enforced lap trigger (see Distance based forced trigger [▶ 115])

Fragment:

- Test bench operation
- Power cycle on track or box (e.g. engine stalled)
- File fragmentation size [MB], time [sec]

Channels for display

To display counters use the following channels:

Channel	Function
Laptrigger_outcnt_dls	Outing counter
Laptrigger_lapctr_dls	Lap counter
Fractr	Fragment counter

Counting in WinDarab

To automatically name recorded files use filename templates in WinDarab dialog:

Filename template	Function
[outing]	Value of outing counter
[lap]	Value of lap counter
[fragment]	Value of fragment counter

[###03] indicates: 'always use 3 digits with leading zeros'.

16.3 Lap timing

There are different possibilities to adjust the lap trigger to the timing situation.

The detection time defines the minimum time the input signal changes its state. E.g. a low active signal needs to be below the threshold for min. 15 ms to release the trigger.

Channels for display

To display lap times use the following channels:

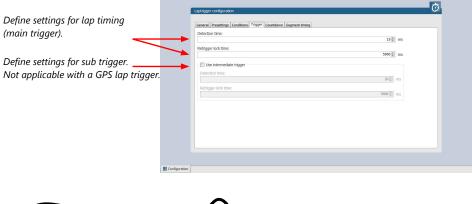
Channel	Function
Laptrigger_lapctr_dls	Number of completed laps

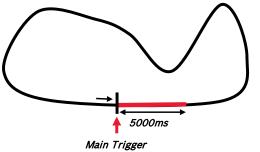
Channel	Function
Laptrigger_laptime_dls	Running laptime
Laptrigger_laptime_best_dls	Laptime of best lap
Laptrigger_laptimeold_dls	Laptime of last lap completed
Laptrigger_laptimeseg_dls	Segment time of last segment
Laptrigger_lapctr_dls	Number of completed laps

16.3.1 Time based retrigger protection

Trigger is locked for 5 s after main trigger was received.

To deactivate time based retrigger protection, set 'Retrigger lock time' to 0 ms.

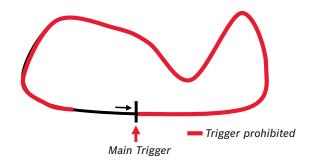




16.3.2 Distance based retrigger protection

Trigger is locked until configured min distance (i.e. 80 % \rightarrow 3200 m) of track distance (i.e. 4000 m) has been covered. To deactivate distance based retrigger protection, set min distance to 0 %.

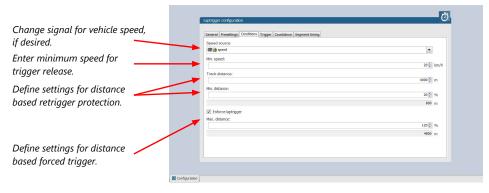
Change signal for vehicle speed, if desired. Enter minimum speed for trigger release.	Laptingue configuration General Interesting Conditions Tragger Counteres Segment Imma Segment Imma Segment Segment Imma No. speed No. speed Tack distance: Segment Segment Imma Segment I
Define settings for distance based retrigger protection.	Mn, distance: 20 ∰ % 20 ∰ % 20 ∰ % 20 ∰ % 20 % % 20 % %
Define settings for distance based forced trigger.	E Cartiguation

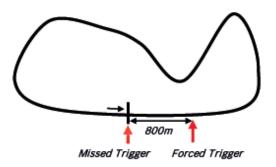


16.3.3 Distance based forced trigger

After a missed main trigger, a forced trigger is inserted, if the configured max. distance (i.e. 120 % \rightarrow 4800 m) of the track distance (i.e. 4000 m) has been reached. In this case, the channel 'Laptrigger_distlap_dls' starts at the delta between the max. distance and the track distance (i.e. 800 m).

To deactivate distance based forced triggers, uncheck box.





16.4 Segment timing

Segment timing is the calculation of elapsed time for parts of laps (segments).

Segments are defined:

- based on sub-trigger signals (additional transmitters)
- based on distance travelled

Times for segments are compared to:

- Last lap completed
- Fastest lap

Channels for display

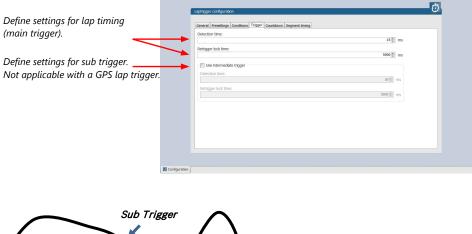
To display segment times use the following channels:

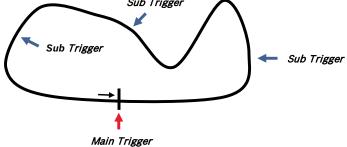
Channel	Function
Laptrigger_lapdiff	Time difference between finished lap and last lap
Laptrigger_lapdiffb	Time difference between finished lap and best lap
Laptrigger_lapseg_dlast	Difference of lap segment time compared to last lap
Laptrigger_lapseg_dbest	Difference of lap segment time compared to best lap

16.4.1 Sub trigger mode

Using main trigger (20 ms pulse) at Start-Finish-Line. 3 sub triggers (40 ms pulse) positioned at 1,000 m, 2,000 m and 3,000 m.

To deactivate sub trigger mode uncheck box.





The sub trigger mode cannot be used with the GPS lap trigger.

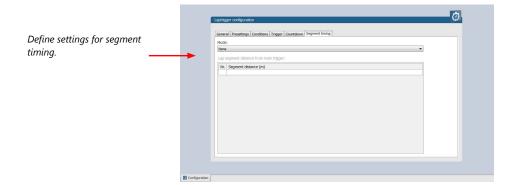
16.4.2 Distance mode

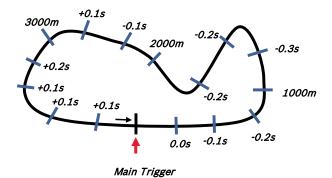
Using main trigger (20 ms pulse) at Start-Finish-Line.

Set 'Mode' to 'Distance' and enter desired segment distances.

Segment time is automatically calculated at each segment. Time difference to last lap and fastest lap is automatically calculated at each segment.

To deactivate distance mode set 'Mode' to 'None'.

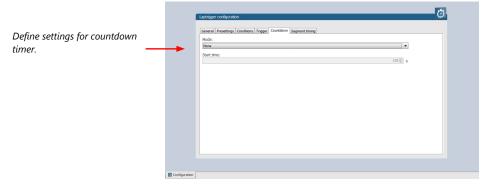




16.5 Countdown timer

Some race classes require a minimum time spent in the pits. An additional lap trigger Tx is configured as a segment trigger positioned at pit entry. The trigger signal starts a timer countdown.

The current value of the timer is stored in the variable **Laptrigger_cntdown_dls** which can be displayed.



16.6 Automatic GPS Track Detection

With the GPS lap trigger, an automatic track detection can be activated by checking the highlighted box in the lap trigger configuration at the GPS tab.

Activating this functionality will overwrite the GPS trigger point coordinates and the track length with the values of a detected racetrack. The coordinates and the track length will be grayed out in the tool.

The function will compare the current GPS position with the coordinates of the known Racetracks list and use the closest GPS trigger point. If there are track variants with different track length, the system will adapt itself to the correct variant, if it is in the known racetrack list, after ~three detected laps. Please note that the track length needs to be quite accurate, within +/- 100 m, to adapt itself to another variant.

neral	Presettings	Conditions	Trigger	Countdown	Segment timing	GPS	Known Racetracks			
	al latitude:									GPS Track detection
								49,32777400 🜲	DD	Override Track distance & position
Decim	al longitude:									
								8,56584700 🜲	DD	
Laptr	gger detectio	on range:								
								30 🌲	m	
	e source:									
	gps_lat									~
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ongitu engitu	de source: gps_long									
ongitu PS dir PS dir	de source: gps_long ection source	ion								~

The known Racetrack list can be found in the lap trigger configuration menu within the Known Racetracks tab. It contains a built-in list and a user-defined list. Each track can be activated or deactivated with the checkbox to manually set the variant if needed.

User defined tracks can either be added from scratch with the Add Track button or with the Copy Track button as a modified version of a built in track. Both buttons will open the same Edit Race Track menu.

In the menu a track name, length and the coordinates of the detection point is required. The coordinates can be pulled from the GPS tab with the button "Get values ..." or sent to the GPS tab with the button "Set values ...". This allows an easy interaction with the manual GPS lap trigger mode.

The user-defined tracks will be part of the project. If the tracks are required in another project, the lap trigger module can be ex-/imported into another project.

eneral Presettings Conditions Trigger Countdown S	egment timir	ng GPS Kno	wn Racetracks	
Builtin Racetracks			User defined Racetracks	
Active Track	^		Active Track	Add Track
Lime Rock Park			Nürburgring Nordschleife	Edit Track
Magny cours				Edit frack
Misano Misano				Remove Track(s)
Monza				
Ningbo Speedpark			Edit RaceTrack 'Nürburgring Nordschleife'	
Nogaro Nogaro				
Nürburgring			Specify Racetrack properties	
Oschersleben		Сору	The GPS position indicates the position of the start-finish line.	
Oulton Park		Track >		
Paul Ricard			Track Name: Nürburgring Nordschleife	
Pau-Ville				Get values from Laptrigge GPS definition
Portimao circuit Portland Int Raceway			Track length: 25378 🜩 m	GFS dennition
Portland Int Raceway Redbullring			GPS Latitude: 50,33401400 DD	
Road America			GPS Longitude: 6,94527800 ♠ DD	
Rockingham			GF 5 Longitude. 6,94527800 UD	Set values to Laptrigger
Sepang				GPS definition
Shanghai				
Silverstone				
				OK Canc
Snetterton 300			L	

Following signals are assigned to the function:

Laptrigger_trackdet_id	Signal will show the track name from the Racetracks list as an enumeration or can show the ID number as raw value. The enu- merated name will also be visible in the log- ging.
Laptrigger_trackdet_laplen	Track length of the used track variant
Laptrigger_trackdet_lat	Latitude GPS coordinate of the used GPS trigger point
Laptrigger_trackdet_long	Longitude GPS coordinate of the used GPS trigger point

16.7 Predicted Laptime

The predicted laptime function allows to compare the current lap- and segment time with the predicted time of an expected lap. Additionally, the function can estimate the laptime of the current lap. This functionality is integrated in the laptrigger module in RaceCon.

16.7.1 Setting up the predicted laptime

To use the predicted laptime function you need to set up a laptrigger as described in the chapter Lap Trigger [▶ 106]. Under the ribbon "Segment timing", you need to choose your segmentation mode which can either be distance or intermediate trigger based.

	Cener	al Presettings Conditions Trigger Countdo	wn Segment timing GPS	
ance or			Wit Segment draining GP3	
rmediate	Mode			
ger				
5	U V	se predated laptime		
er your	Lap s	egment lengths and times		
nent time	Nr.	Segment length (m)	Segment time (s)	
distance	1	500	44,800	
	2	1.000	93,200	
	3	1.500	135,600	
r your	_			
ected	Entire	e lap time:		

For the distance mode, you need to check on an old lap or estimate how long it takes to travel the segment distance. Please enter those values into input field. The values can also be copied and pasted to the input field from an excel sheet as a normal text. In the intermediate trigger, you just need to set the expected time the driver takes to reach the segment trigger.

Note

Please note that the segment time and length is always measured from the start line or where the main lap trigger is set.

16.7.2 Functionality and channel outputs

Following output channels are generated by the predicted laptime function.

Laptrigger_lapdiff_pred_dls	Laptime difference between the predicted and the last laptime
Laptrigger_lapsegdiffpred_dls	lagseg difference between the last segment and the predicted segment
Laptrigger_Lapcurrpred_dls	Estimated laptime of the current lap, based on the predicted laptime and the predicted segment deviations

The channel Laptrigger_lapdiff_pred_dls is updated as soon as the main lap trigger is received. Both other channels are updated as soon as the next segment distance is travelled, or the next intermediate trigger is received.

17 GPS Sensor

17.1 GPS (Global Positioning System)

Space-based global navigation satellite system.

GPS provides positioning, navigation, and timing services to worldwide users.

GPS receiver (sensor) gives digital information about position (longitude, latitude, height), ground speed, course, and status.

Two types of GPS receivers:

CAN output -> Read in messages via CAN Input of C 80 (not covered here)

Serial output -> Read in messages via RS232 Interface of C 80

Serial Interface is characterized by:

Voltage levels: RS232 is standard (+/-12 V), UART (0 V/ 5 V) needs level shifter

Baud rate: 9,600 is standard for GPS, C 80 supports 1,200 to 115,200 baud. GPS Rx interface baud rate must match C 80 interface baud rate. C 80 Baud rate can be set with the 'GPS_BAUDRATE' characteristic Data format: C 80 expects 8 data bits, no parity bit, 1 stop bit (8N1)

17.1.1 Serial interface characterization

Serial Interface is characterized by:

Voltage levels: RS232 is standard (+/-12 V), UART (0 V/ 5 V) needs level shifter

Baud rate: 9,600 is standard for GPS, C 80 supports 1,200 to 115,200 baud. GPS Rx interface baud rate must match C 80 interface baud rate. C 80 Baud rate can be set with the 'GPS_BAUDRATE' characteristic Data format: C 80 expects 8 data bits, no parity bit, 1 stop bit (8N1)

17.2 Protocol

C 80 expects NMEA Protocol (ASCII).

The following messages are decoded:

Message	Function
GGA	GPS fix information
GSA	Overall satellite data
GSV	Detailed satellite data
RMC	Recommended minimum data for GPS
VTG	Vector track and speed over the ground

On most GPS sensors, these messages are activated in the default configuration.

17.3 Sensor recommendation

The system has been tested with the Navilock NL-8004P MD6 Serial PPS Multi GNSS Receiver. This sensor is based on a U-Blox 8 chipset and is fully configurable with the Navilock "U-Center" software. To use this sensor with Bosch Motorsport components the transfer rate, the satellite system and the update rate need to be reconfigured. More information about the configuration can be found in the Appendix.

17.3.1 Configuration of the recommended Navilock NL-8004P MD6 Serial PPS Multi GNSS Receiver

For the sensor configuration, the sensor needs to be connected to the Navilock software "U-Center" which is available from Navilock free of charge. Navilock offers a USB connection cable for the sensor.

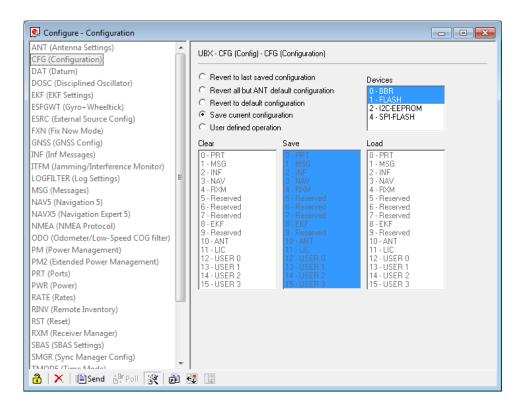
In "U-Center" click **"View"** – **"Configuration View"** to start the configuration. The following 3 points have to be changed:

Transfer Rate

- Click on "PRT (Ports)".
- Change the baud rate to a fixed value, this value needs to meet the setting of Race-Con. For a good signal quality we recommend 115,200 baud.
- Click on **"Send"** to store the new setting in "U-Center".

💽 Configure - Ports			
ANT (Antenna Settings)		onfig) - PRT (Ports)	3 s
CFG (Configuration)		Sing) - Fri (Fore)	
DAT (Datum)	Target	1-USART1	
DOSC (Disciplined Oscillator)	Target	1 - USART1	
EKF (EKF Settings)	Protocol in	0+1+2 - UBX+NMEA+R1 -	
ESFGWT (Gyro+Wheeltick)	Protocol out	0+1 · UBX+NMEA	
ESRC (External Source Config)	1 lococor out		
FXN (Fix Now Mode)	Baudrate	115200 💌	
GNSS (GNSS Config)		Auto bauding	
INF (Inf Messages)		,	
ITFM (Jamming/Interference Monitor)			
LOGFILTER (Log Settings)			
MSG (Messages)			
NAV5 (Navigation 5)			=
NAVX5 (Navigation Expert 5)			
NMEA (NMEA Protocol)	Oversampling		
ODO (Odometer/Low-Speed COG filter)			
PM (Power Management)			
PM2 (Extended Power Management)			
PRT (Ports)	E Enternal of Contract of Cont	TX timeout (>=FW7.00)	
PWR (Power)		eature (>=FW7.00)	
RATE (Rates)	Enable	eature (>=rw7.00)	
RINV (Remote Inventory)		Delectro (leur estico)	
RST (Reset)		Polarity (low-active)	
RXM (Receiver Manager)	Threshold	0	
SBAS (SBAS Settings)	PIO	0 -	
SMGR (Sync Manager Config)			-
TMODE (Time Mode) 9 ↓ ▼ ↓ ⊕ 100 µ ↓ ⊕ 1			
🔒 🗙 🖹 Send 🦉 Poll 🦹 💼	₩		

- Click on "CFG (Configuration)".
- Click on "Send" to save the new setting on the sensor.



Satellite System

- Click on "GNSS (GNSS Config)".
- Set the ticks as shown in the following picture.
- Click on "Send" to store the new setting in "U-Center".
- As during configuration step 1, click on "CFG (Configuration)".
- Click on"**Send**" to save the new setting on the sensor.

💽 Configure - GNSS Configuration								×
ANT (Antenna Settings)	UBX-0	CFG (Config) -	GNSS (GNSS	Config)				_
CFG (Configuration)	——							
DAT (Datum)					Channels			
DOSC (Disciplined Oscillator)	GNSS I	D configure	GNSS name	enable	min max	Signals		
EKF (EKF Settings)	0	- -	GPS	V	8 16	-		
ESFGWT (Gyro+Wheeltick)			GPS	,				
ESRC (External Source Config)	1		SBAS	v	1 3			
FXN (Fix Now Mode)	2		Galileo		0 0			
GNSS (GNSS Config) INF (Inf Messages)	3	V	BeiDou		8 16			
ITFM (Jamming/Interference Monitor)	4		IMES					
LOGFILTER (Log Settings)	1	-		_			_	
MSG (Messages)	5		QZSS		0 3		🗌 L1SAIF	
NAV5 (Navigation 5)	6	\checkmark	GLONASS		8 14			
NAVX5 (Navigation Expert 5)								
NMEA (NMEA Protocol)					32			
ODO (Odometer/Low-Speed COG filter)	Number	r of channels	available		32			
PM (Power Management)	Number	r of channels	to use		32	Auto set		
PM2 (Extended Power Management)	For spe	cific SBAS co	nfiguration use	e CFG-SBA	s			
PRT (Ports)								
PWR (Power)								
RATE (Rates)								
RINV (Remote Inventory)								
RST (Reset)								
RXM (Receiver Manager)	For spe	cific GLONAS	S configuration	n use CFG	-GLO			
SBAS (SBAS Settings)								
SMGR (Sync Manager Config)								•
TMODE (Time Mode)		_				_		
🔒 🗙 📰 Send 🦉 Poll 💦 💼	€.							

Update Rate

- Click on "RATE (Rates)".
- Change the "Measurement Period" to 55 ms.
- Change the "Navigation Rate" to 1 cyc.
- Values which lead to a lower frequency will lower the precision of the sensor, we recommend the mentioned values.
- Click on "Send" to store the new setting in "U-Center".
- As during configuration step 1, click on "CFG (Configuration)".
- Click on"**Send**" to save the new setting on the sensor.

🧕 Configure - Rates	_		- • •
ANT (Antenna Settings)		UBX - CFG (Config) - RATE (Rates)	9 s
CFG (Configuration)		OBA - Crid (Conlig) - RATE (nates)	
DAT (Datum)		Ti o	
DOSC (Disciplined Oscillator)		Time Source 1 - GPS time	
EKF (EKF Settings)		Measurement Period 55 [ms]	
ESFGWT (Gyro+Wheeltick)		Measurement Frequency 18.18 [Hz]	
ESRC (External Source Config)		Measurement Frequency 18.18 [Hz]	
FXN (Fix Now Mode)		Navigation Rate [Cyc]	
GNSS (GNSS Config)		Navigation Frequency 18.18 [Hz]	
INF (Inf Messages)		Navigation requeitcy 10.10 [12]	
ITFM (Jamming/Interference Monitor)			
LOGFILTER (Log Settings)	Ξ		
MSG (Messages)			
NAV5 (Navigation 5)			
NAVX5 (Navigation Expert 5)			
NMEA (NMEA Protocol)			
ODO (Odometer/Low-Speed COG filter)			
PM (Power Management)			
PM2 (Extended Power Management)			
PRT (Ports)			
PWR (Power)			
RATE (Rates)			
RINV (Remote Inventory)			
RST (Reset)			
RXM (Receiver Manager)			
SBAS (SBAS Settings)			
SMGR (Sync Manager Config)			
TMODE (Time Mode)	- I		
🔒 🗙 🖹 🖹 Send 🖓 Poll 🖹	1		

Note

Sensor needs reception for visible signal. It takes time to start the sensor.

17.4 Measurement labels

The decoded NMEA messages are copied to these C 80 measurement labels.

Measurement label	Function
gps_PDOP	Position Dilution Of Precision
gps_HDOP	Horizontal Dilution Of Precision
gps_VDOP	Vertical Dilution Of Precision
gps_lat	Latitude +/- [degree]
gps_long	Longitude +/- [degree]
gps_elv	Antenna altitude above/below mean sea level (geoid) in meters
gps_speed	Speed over the ground in kilometers/hour
gps_direction	Track angle in degrees

Function
Magnetic variation degrees (Easterly var. subtracts from true course)
Years since 1900
Months since January - [0,11]
Day of the month - [1,31]
Hours since midnight - [0,23]
Minutes after the hour - [0,59]
Seconds after the minute - [0,59]
Hundredth part of second - [0,99]
Bit mask over received NMEA sentences (Bit $0 = GGA$, Bit $1 = GSA$, Bit $2 = GSV$, Bit $3 = RMC$, Bit $4 = VTG$) within last second.
GPS quality indicator (0 = Invalid; 1 = Fix; 2 = Differential, 3 = Sensitive)
Operating mode, used for navigation (1 = Fix not available; 2 = 2D; 3 = 3D)

These measurement labels are arrays, where the indexed element points to the same satellite.

(E.g. gps_info_satsigstrength[3] tells the receiving signal strength of satellite 3. Satellite 3 has the SAT-ID given in gps_info_satid[3])

Measurement label	Function
gps_info_satid[]	Satellite PRN number
gps_info_satinuse[]	Used in position fix
gps_info_satelevation[]	Elevation in degrees, 90 maximum
gps_info_satazimuth[]	Azimuth, degrees from true north, 000 to 359
gps_info_satsigstrength[]	Signal, 00-99 dB

17.5 GPS troubleshooting

Electrical

Is the transmitter signal of the GPS sensor connected to the receiver pin of serial interface of the C 80?

Is the GPS sensor powered up?

Does the GPS sensor deliver RS232 signal levels?

Is the sensor connected to the "sensor ground" of the device?

Interface

Do the baud rates of the GPS sensor and the C 80 match?

Is the GPS sensor set up for 8N1 transmission parameters?

Is the GPS sensor set up for NMEA messages?

Are the GGA, VTG, RMC messages activated?

GPS sensor start-up

Does the GPS sensor 'view' the sky?

Did the GPS sensor complete its initial start-up procedure? This may take up to 20 min.

A correct reception is indicated when 'gps_fix' is showing '3D Fix'.

GPS sensor values are frozen

Does the sensor has lost its reception? The old values will be kept if the reception is lost. The gps_smask channel shows which NMEA sentence is received.

18 Telemetry System LTE 65

- Support for long-range online telemetry
- Individual programmable team code
- Fast block slow block mechanism
- Programmable data rate
- Ethernet or RS232 interface
- Full online track coverage on almost all tracks

18.1 Software setup

Drop Telemetry from Toolbox into system overview.

	System Edit C80_BASE_0516.rb - RaceCon V2.9.0.10 - Masterlicense Bosch *	- = ×
System Logger Display Ca	illfration/Measuring Tools Windows	0 -
MSELog Race Mode Visible Protection Sheet	Worksame of Learne Control Con	
Connection Mode Project Security		Toobox 🛡 🗙
Project 0 X		
B → 40 ResCre22 A Ford Constant Con		Implementation MSZ A Implementation
Properties 4 X		Power control unit PBX90
1 2 - 2 - 2		P5X190
V Project properties Name RearCarte(2) Road mode valide True True True Name RearCart(2) Version evaluat 2.5.1.102 Version back written 2.5.6.10		Charloging hystens C50 C50 C50 C50 C50 C5 C5
Name The project's name.		V V
The projects name.	Que System Overview Dotaset narvoger	Measurement Elements Measurement Sources
Osta Contains v statec		<pre></pre>
	2 🕀 🖪 Sowall	
Name / Source Source H56Log Statectf_enr H56Log Statectf_enr # K56Log Statectf_enr # K56Log	Cardeney protoci date recording de @ No information	
Beady.	No entros detacted - al detared or stata t	rinten • 📴 RaceCar#23 💷 🗰 🔬

Adding channels to telemetry

- 1. Expand the list of 'Loggers' by clicking on '+' in the C 80 Project Tree.
- 2. Double-click on 'Recording' in C 80 Project Tree.

The recording configuration is displayed in the Main Area.

3. Click 'Edit channel(s)'.

The 'Edit Recording Channels' window appears.

4. Choose between 'Fast/Slow block' transmission.

Using fast block/slow block transmission

C 80 telemetry has a bandwidth 200 kBit/s, the used bandwith can be adjusted to cope with the transmitting system. The bandwidth has to be divided into channel information to be transmitted high-frequently and low-frequently using the 'fast/ slow block' setting.

Channels are grouped into 8 blocks which are transferred each cycle:

- Fast block (Block 1) is transferred every cycle and used for a high-frequent transmission of channel information (e.g. speed, rpm).
- Slow blocks (Block 2...n) are transferred every n-th cycle and used for a low-frequent transmission of channel information (e.g. tire pressure, oil temperature).

Transmission Scheme

	e recording channels. You may also change the telemetry mode.
ecording channels:	Rate:
_wheel_rr _wheel_rl _wheel_fr	10 ms
_wheel_fl	Condition:
	True rate:
	Telemetru:
	Fast 💌
	None Slow
	Fast

None – channel(s) are not transferred Slow – channel(s) are transferred in the slow telemetry block Fast – channel(s) are transferred in the fast telemetry block

If the maximum bandwidth of a block is reached, a warning will be displayed. To fix this problem you can view the allocation of the channels and data rate in the 'Statistics' tab of the Main Area.



18.2 Telemetry channels with special functionality

The Telemetry system allows the transmission of special information such as running distance of current lap, lap number of current lap and lap time, fuel consumption of last lap completed. You have to assign the channel type to the telemetry channel so that it is recognized accurately by RaceCon.

Channel's names are e.g.: Laptrigger_lapdist_dls, fuelcons, lapctr, Laptrigger_lapdist_dls. Different channel names are possible between different devices (e.g. ECU MS6, laptrigger module used in RaceCon).

For displaying the position of the car in the cloud, additionally GPS-position and lapdist can be send to the cloud, this is activated with the checkbox "cloud statistics".

Telemetry settings				
General Settings				1
WD Server INI Folder	Use RaceCon project folder		•	
Project key:	04d2			hex
Configure on Device:	E80 Logger		~	1
Device Settings			Channel settings	_
Type:		N	Distance channel:	
LTE65	~	ß	🛺 🏊 Laptrigger_lapdist_dls	\sim
Mode:			Lap number channel:	
Ethernet	~		👭 👜 lapctr	\sim
Destination IP: 10	0.10.0.235		Lap fuel channel:	
Destination Port: 10	000		🐺 🔄 Fuel_fuelcons_dls	\sim
Data Rate:		it/s	Previous lap time channel:	
		140	🕌 🔄 Laptrigger_laptimeold_dls	\sim
Cloud statistics en			GPS Latitude channel:	
channel data will	d statistics, I understand device distance or GPS be decoded and available to Bosch in the Bosch		🕌 😁 gps_lat	\sim
LTE Cloud.			GPS Longitude channel:	
To enable the Bo channels must be	sch LTE cloud, at least the Distance or both GPS configured.		💭 🔤 gps_long	\sim

- 1. Assign the desired channels to the channel types. The table below shows the function of the available channel types.
- 2. Click 'Ok' when done.

Measurement channel	Function
Distance	Running distance of current lap
Lap number	Lap number of current lap
Lap fuel	Fuel consumption of last lap completed
Lap time	Exact lap time of lap completed

The telemetry channels and their assigned channel types are displayed in the overview list.

_	Welcome to RaceCon	-	New Project FM40					4 Þ 🗙
	FM40 configuration & ma	nager	nent					4
	🛃 <u>A</u> dd a new channel 🛛	🜛 <u>E</u> di	t channel(s) 📑 Delete cl	hannel(s)				
	Name 🔻	•	Source	Vidth [Byte]	~	Telemetry mode	 Channel type 	~
	acc_lat		DDU8	2		Slow		
	distlap		MS5.1	2		Fast	Lap distance	
	fuelcons		MS5.1	2		Fast	Lap fuel	
	lapetr		DDU8	1		Fast	Lap number	
	laptime		MS5.1	2		Fast	Lap time	
	xtime		FM40	4		Fast	Time	
	FM40							

18.3 Setting up car in WDServer

WDServer is a program used to capture data streaming from a transmitter and convert to WinDarab; WDServer also creates a log of the data received over telemetry.

C70. Test.bmscfg - WinDarab Server		
Workdesk CF-Cards Telemetry Protocol Options ?		
End Car B Stop Stop Part UDP.10000 Byter/Sec:: 0 lock/Set: 10 Dist - - Last Time: - - -	Computer Car	Application
21 12 (07) 17:15 (7 Using log 10, C. Usens Wildlack AppData/Local/Temp/WDServer Protocollog 21 12 (07) 17:15 (7 WDServer Protogravitor, 21 12 2017 17:15 (7) WDServer Protogravitor, 21 12 2017 17:15 (7) WDServer Protogravitor, and to each client using UDP, 21 12 2017 17:15 (7) WDServer Settings WDServer Settings		
Add Car		
CarSettings		
Press F1 to obtain help.		NUM

- 1. To set up a new car, select 'Add Car'.
- 2. In the Car settings tab, enter a name for the new vehicle.

This name will be used as a part of the file name for WDServer's log of received telemetry data and will show up in WinDarab, when searching for the telemetry stream in the Network folder.

Car settings		×
Car settings UDP:10000 New: COM		
Car name	Data output to back	up system
Name: Car #1	Port:	
Comment:	Baudrate:	9600 👻
Folder with the DCP-Configuration files Use global settings (Workdesk/Settin This folder: Lap protocol Print to: Save to file:	gs/Telemetry) No of lines per pa	age: 64
ОК Са	ncel Apply	Help

- 3. You are now at the final step of configuring the telemetry stream. In order for the data to be decrypted by WDServer, two *.ini files must be referenced by WDServer. After the configuration is sent to the logger, these two different *.ini files will be created in the base folder. You can find the base WDServer folder, if you right-click the Telemetry and select 'Properties'. You can change this folder location for easier access if desired.
- 4. Define the link to the folder of the *.ini files for each car or define it in the general WDServer settings, under the 'Telemetry' tab.

Settings	
Common Network adapters Telemetry	
Folder with the DCP-Configuration files C:\Users\kfl2abt\Documents\RaceCon Projects Change	
Template for the darab file name	
[year]-[mon]-[day] [hour].[min] Car [camame] File #[n]	
Folder to save the darab files in Change	
OK Cancel Apply Help	

- 5. Under the 'UDP' tab, select the drop-down menu and type in "UDP".
- For the UDP Port, type in the port number assigned to the device in RaceCon.
 Each vehicle being read by a single receiver device must have a unique port number.
 This information will be provided by Bosch upon delivery of the devices.

Car settings	×
Car settings UDP:10000 New: COM	
Settings	
Port: UDP -	
Udp Port: 10000	
OK Cancel Apply He	lp

7. Click 'OK', to close the window.

- 8. Select the button 'WDServer Settings'.
- 9. Under the 'Common' tab, choose directories where WDServer can store its temporary files and log files. These are created during telemetry reception and can be used to help diagnose issues.

Settings	×	
Common	Network adapters Telemetry	
	r for temporary files ers\kfl2abt\Documents\WD_Server Change	
	r for log file 'wdserver.log'' sers \kfl2abt \AppData \Local \Temp Change	
	OK Cancel Apply Help	

Under the 'Telemetry' tab, the first section requests a folder path for the DCP- Configuration files. This is the folder path where RaceCon stored the *.ini files required by WD-Server.

 Click on the "Change" button next to this section and navigate to this folder. A template can also be specified for the file nomenclature for logged telemetry as well as a save location.

Settings
Common Network adapters Telemetry
Folder with the DCP-Configuration files C:\Users\kfl2abt\Documents\RaceCon Projects Change
Template for the darab file name
[year]-[mon]-[day] [hour].[min] Car [camame] File #[n]
Folder to save the darab files in
Change
OK Cancel Apply Help

- To ensure proper communication between WDServer and the receiver, do not delete any old *.ini files from this folder path. As mentioned in section 5, RaceCon will generate a new *.ini file each time a project is synchronized; each new *.ini file instance has an incremented file name. Retaining all of these *.ini file iterations will ensure that WDServer always has a reference to whichever configuration is programmed into your vehicle's logger system.
- If the RaceCon project for the vehicle resides on a different computer, than that which is used for telemetry, then all *.ini files for a given project should be transferred to the telemetry computer after every data synchronization in RaceCon. WDServer may have trouble recognizing *.ini files stored on removable media, so best practice is to copy these files to the telemetry computer's hard drive.

18.4 Loading the telemetry data

The following is an example of a file name and data format for Car #91. File is typically located in WinDarab/Config/WDServer:

Cipen He										
🖌 🖉 🎍 + Computer + V	10_Demotral	ici) + Booch	• Wellands + Config	y + W05enet			• 4	Server WESterner		
Organics + New Note									• - Cl	4
1/ MinDanak v7	a New		* C	Data modeled	Type	Sex				
WDServer	81.4	6D-TrackLaptop	- Car #Elliments	11/10/2003 11/42	WinDarak Talamatry		3.98			
Esta file locations										
Tavorites										
RE Desktop										
A Devenipads										
Tacent Places										
L 01 Event Data UMP2	1									
 Speed Source SkyDrive 										
and paperson										
Libraries										
2 Decuments										
J Marie										
Pictures 1										
H Valeos										
d Humapoup										
N Camputer	+.									
Fixname								All supported line	("Amalian"	÷1
Show Inform Right +							Add fielder to locations	Open	Cancel	i.

In the File Explorer, click 'Open' and navigate to the data set. Under 'Network', search for the car or cars that are required for viewing.

19 Firmware

19.1 Firmware and configuration

C 80 holds 2 types of data:

Firmware: The software (PST program file) of the C 80.

Configuration: The default parameters for controlling the output of the C 80.

19.2 Firmware update

Firmware updates are performed via XCP. Following standards are supported:

- ASAM MCD-1 (XCP); Version 1.5.0; Date: 2017-11-30
- ASAM MCD-2 MC (ASAP2 / A2L); Version 1.7.1; Date: 2018-01-30

Additional files for firmware update (like ProF-Scripts for INCA) will be provided by BOSCH.

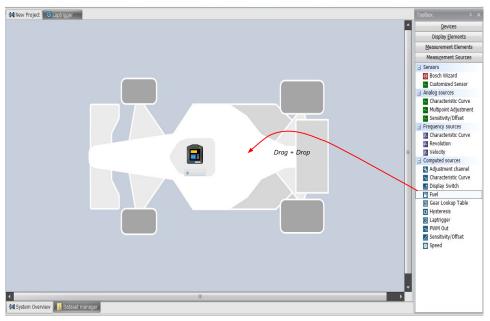
20 Cloning the Unit

Chapter left intentionally blank

21 Fuel Consumption Calculation

21.1 Setting up fuel consumption calculation and tank management

- 1. Select 'Measurement Sources' in Toolbox.
- 2. Drag 'Fuel' element and drop it on the vehicle in System Overview. Do not drop it on the C 80!



A 'fuel consumption wizard' opens.

Select a fuel consumption sour	ce channel for computing the fuel consumption.	0
General		
Configure on device		
Tank capacity	80.0 🚔 👔	
Fuel consumption calculation		
Mode	Using fuel consumed	
Fuel input	Fuelcons X 0,001 Adaption factor to fm	n]] 🚽
Consumption correction factor Remaining laps calculation	1,000	
Remaining laps calculation Mode	Last lap's consumption	
Remaining laps calculation		
Remaining laps calculation Mode	Last lap's consumption	
Remaining laps calculation Mode Target lap consumption	Last lap's consumption	
Remaining laps calculation Mode Target lap consumption Reset fuel consumption	Lastlap's consumption	
Remaining laps calculation Mode Target lap consumption Reset fuel consumption Mode	Last lap's consumption	
Remaining laps calculation Mode Target lap consumption Reset fuel consumption Mode Reset signal source	Last lap's consumption 3.0 → 1 By RaceCon	

- a) Change device for fuel calculation, if desired.
- b) Enter tank capacity of vehicle.
- c) Choose calculation mode:

- using fuel consumed (summed-up fuel consumption)
- using fuel flow rate (momentary fuel consumption)

d) Choose input channel and enter adaption factor. Use adaption factor to adapt value of input channel to:

- 1ml per inc for summed-up fuel consumption
- 1ml/s per inc for momentary consumption

e) Enter factor to correct calculated consumption in device vs. 'real' consumption of vehicle, if required.

f) Choose method to calculate remaining laps with fuel in tank, if desired:

- using fuel consumption of last lap completed
- using target lap consumption (entered in the field 'Target lap consumption')

g) Choose values to initiate a reset of fuel consumption, if desired:

- Manually using RaceCon
- On 'power down' (assuming that the tank is filled each time the ignition is turned off)
- By signal source as input channel (e.g. a switch connected to input pin)

Press 'Finish' when done.

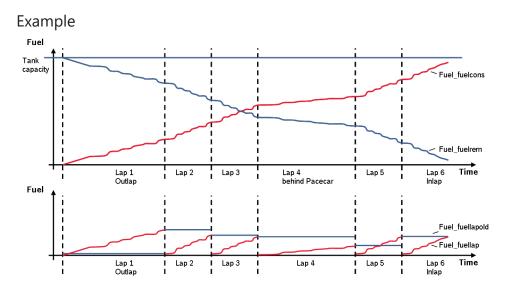
21.2 Fuel consumption diagnosis/counter reset

To display a fuel consumption diagnosis and to reset counters, use the diagnosis page in RaceCon.

Double-click on any 'fuel_xxx' channel in channel list.

A diagnosis window opens in Main Area.

	Fuel - Computes the fuel consumption.		
	Settings	Measurements	Button to reset total
	Tank capacity 60.0 I Comumption correction factor 1.000 Target lap consumption 3.00 I Remaining laps calculation Least tep's consumption	Total consumption I Reset to Fuel consumption I Fuel remaining I	fuel consumption (Reset with RaceCon only) Button to reset fuel
	Reset fuel consumption By Random	Last lap's consumption - I Reat Current lap's consumption - I Laps remaining -	consumption manually (Can also be triggered)
Settings overview	Configuration First Japanen_dis (x		



Measurement label	Function
Fuel_fuelcons_dls	Running fuel consumption, starting at '0'
Fuel_fuelrem_dls	Remaining fuel in tank, starting at tank capacity
Fuel_fuellap_dls	Fuel consumption for current lap, starting at '0'
Fuel_fuellapold_dls	Fuel consumption of last lap completed
Fuel_laprem_dls	Remaining laps with fuel in tank

22 RaceCon Shortcuts

The table shows important shortcuts simplify controlling the C 80 in RaceCon.

Shortcut	Function
General navigation	
F1	Open RaceCon help
F2	Rename selected object
F3	Select Data Area
F4	Select Project Tree
F5	-
F6	Start the data comparison
F7	Start dataset manager
F8	Toggle WP/RP
F9	Start measurement
CTRL + F9	Start recording
F10 or Alt	Go to menu bar
F11	Toggle display to fullscreen 'Race Mode'
F12	Enlarge main screen
CTRL + Tab	Switch between opened windows
Project Tree	
Plus (+) at numeric pad or right cursor	Expand selected node
Minus (-) at numeric pad or left cursor	Close selected node
Star (*) at numeric pad	Open all nodes
DEL	Delete seleted object
Display page, measuremen	t page
Cursor	Move selected display element one grid unit in chosen dir- ection
SHIFT + cursor	Enlarge/reduce selected display element one grid unit
Tab	Switch between display elements

23 Legal

23.1 Legal Restrictions

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SVHC Substance	CAS Number
Lead monoxide (lead oxide)	1317-36-8
Lead	7439-92-1

23.3 Open Source Software (OSS) declaration

23.3.1 antlr-2.7.7.jar License

ANTLR-2.7.7

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The primary ANTLR guy:

Terence Parr parrt@cs.usfca.edu parrt@antlr.org

23.3.2 antlr311runtime.jar License

ANTLR-3.1.1

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xml_io_tools

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24 Disposal

Hardware, accessories and packaging should be sorted for recycling in an environmentfriendly manner.

Do not dispose of this electronic device in your household waste.

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