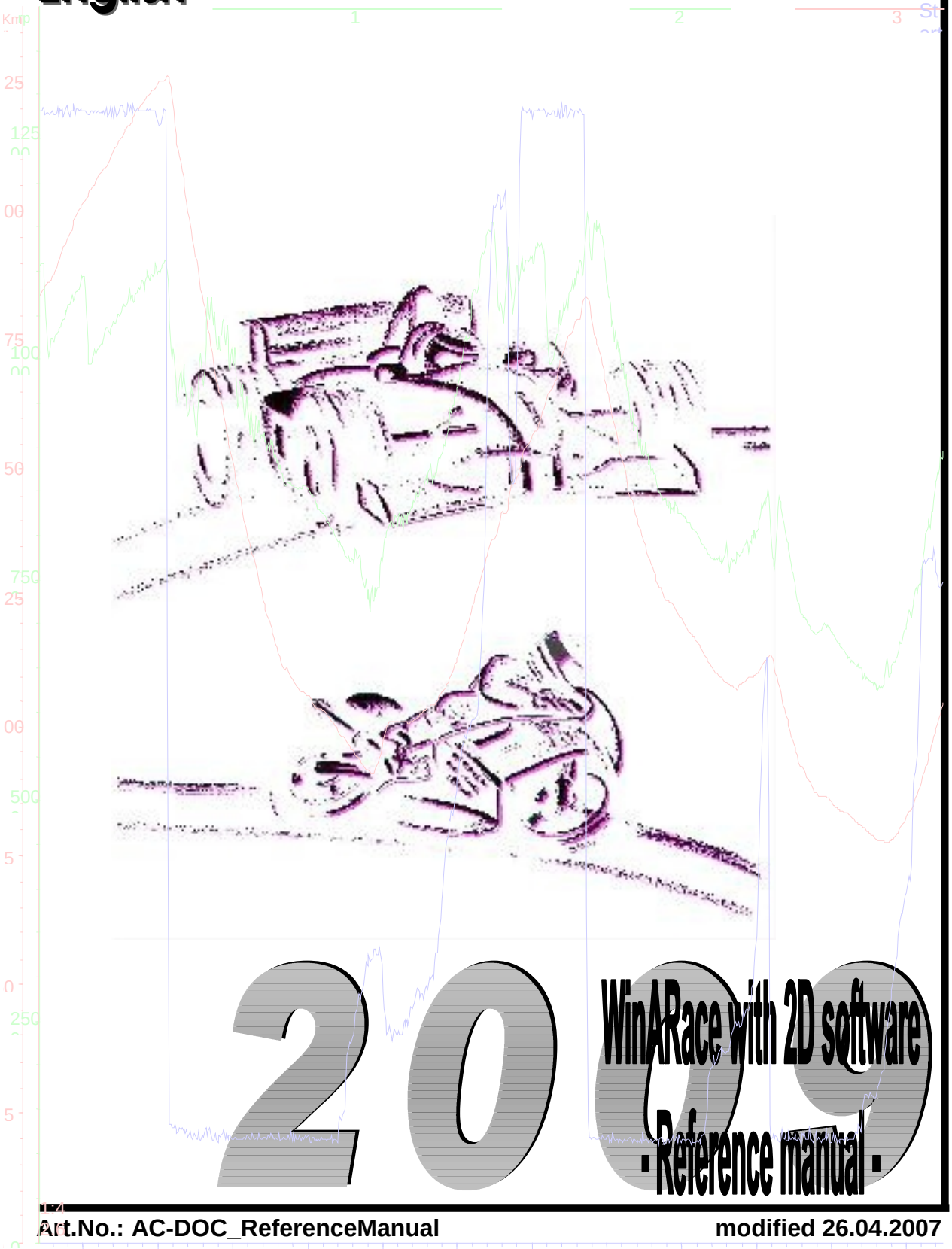
2d-datarecording.com

- English -



2009

WinARace with 2D software

- Reference manual -

Art.No.: AC-DOC_ReferenceManual modified 26.04.2007

Reference Manual

Chapter	Reference at 2D CD-ROM
Preface: General working with a 2D datarecording system	AC-DOC_System_e-000
2D Software license agreement	AC-DOC_LicenseAgreement_e-000
Installation and Registration of the 2D software	AC-DOC_SoftwareInstallation_e-000
Installing of the USB drivers	AC-DOC_USBdriverInstallation_e-000
Mounting the hardware according to the system specification	AC-DOC_HardwareInstallation_e-000
Introduction to the 2D Front-end tool WinaRace	AC-DOC_WinARace_e-000
Introduction to the 2D communication tool WinIt	AC-DOC_WinIt_e-000.doc
Introduction to the 2D analysis tool Analyzer	AC-DOC_Analyzer_e-000
Introduction to the 2D data administration SpecView	AC-DOC_SpecView_e-000
Calculate- and editing channels	AC-DOC_CalcTool_e-000
License informations (main software modules)	AC-DOC_LicenseTypes_e-000

- Insert the2D CD in your CD-ROM drive
- The CD should start automatically.

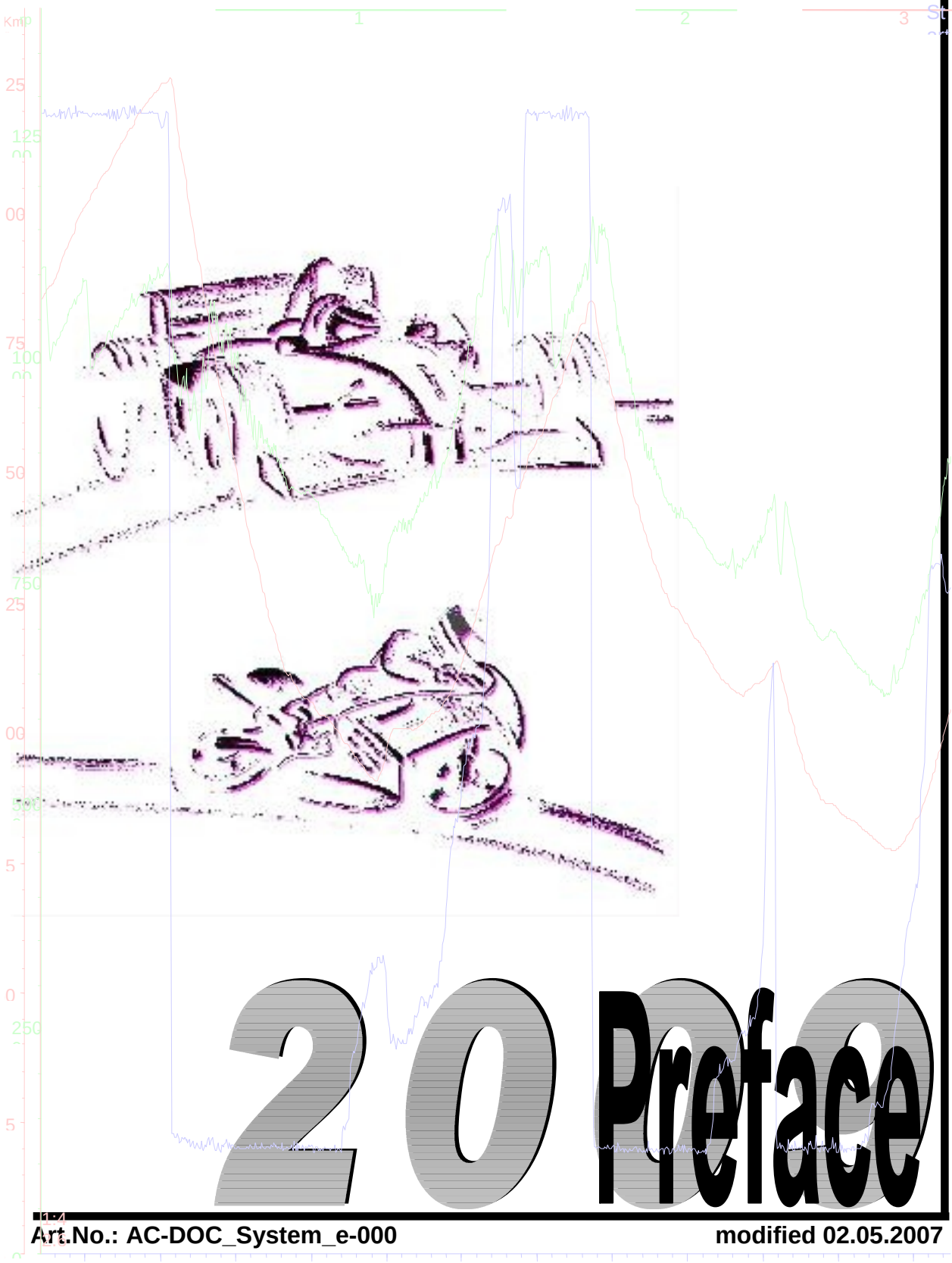
If the CD does not start automatically, start the program “D:\AUTORUN.EXE” manually. (Given D:\ is the drive letter of your CD-ROM drive. Choose your CD ROM drive by first double clicking the icon *My Computer* on the desktop, then the program *AUTORUN.EXE*).

- Choose your language
- Select the button <Manuals>
- Select the tree node <Software manuals>
- Select the tree node <The 2D Reference Manual>
- Afterwards select the following hyperlink

Art.No.: AC-DOC_ReferenceManual_e-000 (Download 20 MByte;340 pages)

2d-datarecording.com

- English -



2000 Preface

Introduction

Users with different skills like beginners, advanced or professional users needs an individual user level concept to work with the software efficiently. We implemented in our software four different user levels.

In this manual we implemented three different user levels. So if you are a beginner user you should only read the chapters with the coloured *Beginner* rectangle in the top of the corresponding page.
We defined the following three coloured rectangles:



You can see these coloured rectangles in some famous chapters especially in the help documents for *WinaRace* (2D Front-end tool), *Analyzer* (2D Analysis tool), *WinIt* (2D communication tool) and *SpecView* (2D data administration tool)

General working with a 2D datarecording system

AC-DOC_SoftwareInstallation_e-000: Installation and registration of the 2D software

AC-DOC_USBdriverInstallation_e-000:
Installation of the USB drivers on your computer
→ This step is be part of the software installation and will be done automatically !!

AC-DOC_HardwareInstallation_e-000:
Mounting the hardware according to your system specification

AC-DOC_WinARace_e-000: - 2D Front-end tool -

Introduction to the software module WinaRace
- Measurement selecting
- Event handling
- Global settings

AC-DOC_WinIt_e-000: - 2D communication tool -
Introduction to the software module WinIt
- Check communication with the *Datalogger*
- Choose standard system – configuring the *Datalogger*
- Configure standard system (calibrate sensors, etc.)
- Read measurement values from the *Datalogger*

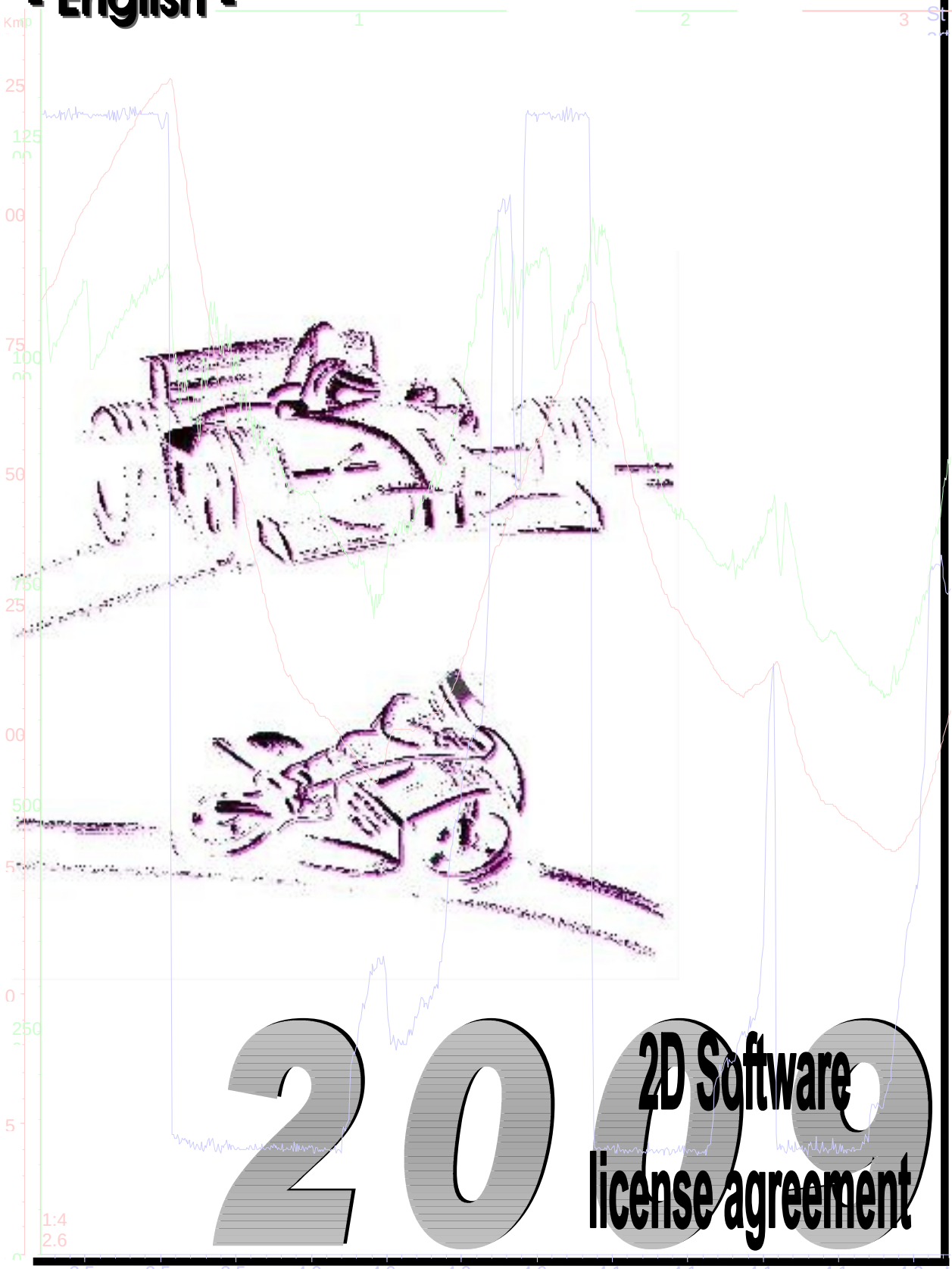
AC-DOC_Analyzer_e-000: - 2D analysis tool -
Introduction to the software module Analyzer

AC-DOC_CalcTool_e-000: – 2D calculation tool -
Introduction to the software module CalcTool
- Calculate new channels
- Changing existing channels

AC-DOC_SpecView_e-000: – 2D data administration tool -
Introduction to the software module SpecView
- Updating of SpecSheets

2d-datarecording.com

- English -



2009 2D Software license agreement

Conditions of use for 2D Race software

Copyright(c) 1998-2009 2D Debus & Diebold Meßsysteme GmbH. All rights reserved.

This Software is owned by 2D Debus & Diebold Meßsysteme GmbH. The Software is also protected by German Copyright Law and International Treaty provisions. Any complete or partial reproduction (modification, adaptation, translation, reverse engineering, decompiling, disassembly or other attempts to discover the source code of the Software) is strictly forbidden.

General licence agreement

Important:
Please read this licence agreement thoroughly before using this product. With the installation, copying or other use if this product you acknowledge that you have read the licence contract and accept all of the conditions written it.

The use of the Software 2D Race requires the purchase of a licensed version corresponding to the 2D Debus & Diebold Meßsysteme GmbH conditions of sale and use.

The following actions are allowed:

1. Installing and use of a product copy on a single computer or a network. This copy is only allowed to be used by one user at the same time. If this product is used by several users, a licence fee is charged for each user.
2. Copying the software for the purpose of archiving and backup.
3. Use of a product copy with a home computer and a mobile computer (Notebook) provided that this product is not loaded on both system at the same time, furthermore it is not installed a third time on an other PC system.
4. Transfer of the product to another person, only if you assign all rights according to this licence contract to this person and make sure that the corresponding person agrees to this licence contract. Furthermore you have to stop your use of this product and delete or destroy all software copies created during the previous periods of use (including the copy on your hard disk).

System demands

For a faultless operation of 2D Race the following minimal configuration should be used.

Hardware requirements

* Pentium-PC 500 MHz or higher
* Working storage (RAM) of 256 MB RAM
* Hard disk size: minimum of 150 MB free memory
* Display resolution: VGA 800x600 or higher

Software requirements:

* Windows 2000, Windows XP recommended, Windows 98 SE, Windows Millenium, Windows Vista

Delivery of the software on a CD

Disclaimer of warranties

To the maximum extent permitted by applicable law, 2D and its suppliers provide the software and support services (if any) as is and with all faults, and hereby disclaim all other warranties and conditions, whether express, implied or statutory, including, but not limited to, any (if any) implied

warranties, duties or conditions of merchantability, of fitness for a particular purpose, of reliability or availability, of accuracy or completeness responses, of results, of workmanlike effort, of lack of viruses, and of lack of negligence, all with regard to the software and the provision of or failure provide support or other services, information, software, and related content through the software or otherwise arising out of the use of the software. Also there is no warranty or condition of title, quiet enjoyment, quit possession, correspondence to description or non-infringement with regard to the software.

Exclusion of incidental, consequential and certain other damages

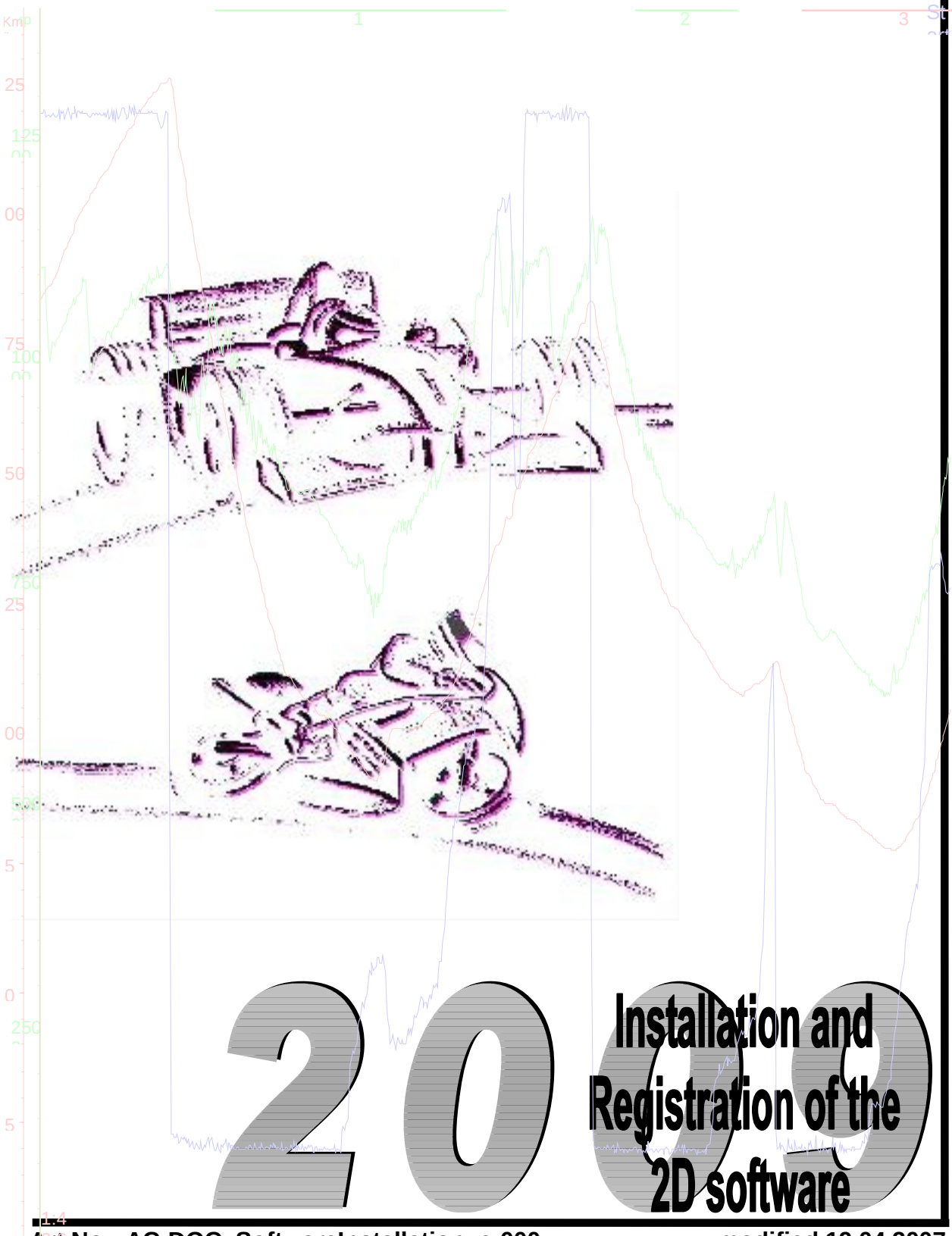
To the maximum extent permitted by applicable law, in no event shall 2D or its suppliers be liable for any special, incidental, punitive, indirect, or consequential damages whatsoever (including, but not limited to, damages for loss or profits or confidential or other information, for business interruption, for personal injury, for loss of privacy, for failure to meet and duty including of good faith or of reasonable care, for negligence, and for any other pecuniary or the loss whatsoever) arising out of or in any way related to the use of or inability to use the software, the provision of or failure to provide support or other services, information, software, and related content through the software or otherwise arising out of the use of the software, or otherwise under or in connection with any provision of this EULA, even in the event of the fault, tort (including negligence), misrepresentation, strict liability, breach of contract or breach of warranty of 2D or any supplier, and even if 2D or any supplier has been advised of the possibility of such damages.

Limitation of liability and remedies

Notwithstanding any damages that you might incur for any reason whatsoever (including, without limitation, all damages referenced herein and all direct or general damages in contract or anything else, the entire liability of 2D and any of its suppliers under any provision of this EULA and your exclusive remedy hereunder (except for any remedy of repair of replacement elected by 2D with respect to any breach or the limited warranty) shall be limited to the greater of the actual damages you incur in reasonable reliance on the software up to the amount actually paid by you for the software or US$5.00. The foregoing limitations, exclusions and disclaimers shall apply to the maximum extent permitted by applicable law, even if any remedy fails its essential purpose.

- English -

2d-datarecording.com



2009 Installation and Registration of the 2D software

Art.No.: AC-DOC_SoftwareInstallation_e-000 modified 19.04.2007

Table of Contents

1 SYSTEM REQUIREMENTS 3

1.1 WE SUPPORTED THE FOLLOWING OPERATING SYSTEMS 3
1.2 YOUR COMPUTER SHOULD HAVE THE FOLLOWING FEATURES 3

2. SOFTWARE INSTALLATION 4

2.1 INSTALLATION DER 2D SOFTWARE 4
2.2 WHAT TO KEEP IN MIND WHEN INSTALL THE 2D DEMO SOFTWARE ? 6
2.3 INSTALLATION OF THE PROGRAM ACROBAT READER 7
2.3.1 Why need I the program Acrobat Reader ? 7

3. WHAT TO KEEP IN MIND WHEN REGISTER THE 2D SOFTWARE ? 8

3.1 HOW CAN I RECOGNIZE AN UNREGISTERED 2D SOFTWARE ? 8
3.2 HOW CAN I REGISTER THE 2D SOFTWARE ? 9

1 System Requirements

1.1 We supported the following operating systems

Windows 98 SE (Full USB support)
Windows 2000
Windows XP
Windows Vista

1.2 Your computer should have the following features

At least 256 MByte RAM
At least a 500MHz CPU
At least 150MByte free disk space
At least a resolution of 800 x 600 pixel of your graphic card



We not supported the operating systems Windows95 and Windows NT. So if you use one of this operating system we can't guarantee the faultless function of our software - especially if you want to work with the USB port.

2. Software Installation

2.1 Installation der 2D Software

- Please insert the 2D CD in your CD-ROM drive.
- Normally the CD starts automatically (Automatic play mode of your CD-ROM drive).
- If the CD not starts automatically start the program *D:\AUTORUN.EXE* manually. Provides *D:* is the drive letter of your CD-ROM Drive. Choose via the *My Computer Icon* at the desktop your CD-ROM drive and afterwards the program named as *AUTORUN.EXE*.

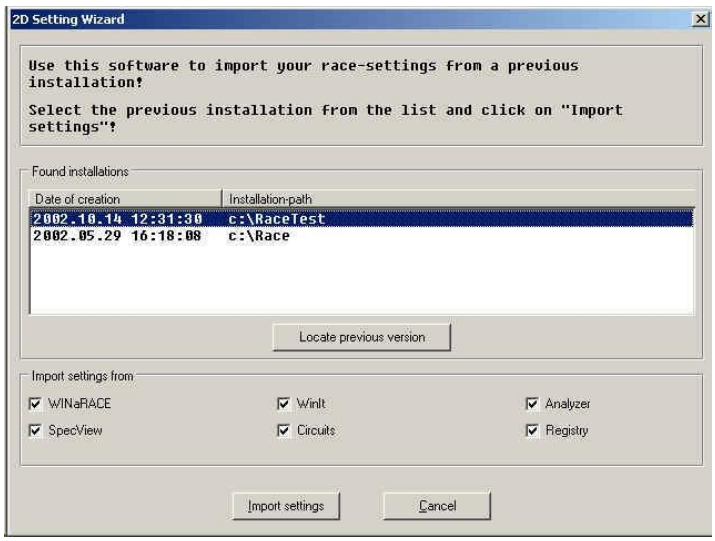


- You can install our software via the button <*Race*> (below Software Setup) refer the figure above.
- The Setup start directly after a view seconds

Do not press the installation button again and again !

- An installation Wizard prepares the installation – the *2D Installations Shield* will be started. he first mask you will see is a *Welcome dialog* – after reading confirm with button <*Next*>
- Afterwards you will see a standard dialog for selecting the installation directory. If you agree with the default directory press the button <*Install*>. Otherwise select at the tree view an existing install directory or enter directly a new directory in the first field
- During the installation process you will get a progress window.
- It is not necessary to reboot you computer. After the software installation was finished you will get a mask named as *2D Setting Wizard*. The wizard give you the chance to import important settings (mostly in files) of all our software modules directly into the new software.

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529



The *2D Setting Wizard* enables you to import important settings (mostly in files) of all our software modules directly from the previous version to the newly installed software

If you choose this option press the button *<Import settings>*. This function is recommended for users who install our software regularly, so the newly installed version has the same appearance as the previous one - Otherwise press the button *<Cancel>.*

If this is the first installation of 2D software on your computer, there will be no entries in the Fixed installation list (see figure above) and you can close the 2D Setting Wizard with the button *<Cancel>* or *<ALT + F4>*

Take notice of: If you use the 2D Setting Wizard you don't need register the newly installed version again !

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

2.2 What to keep in mind when install the 2D demo software ?

The 2D Demo Setup is exactly the same setup as described in the chapter before (chapter 2.1)

 Our demo software runs without any license information, but you have the following restrictions.

- You can analysis only three demo measurements. These demo files exists at the following fixed directory: ..*RaceData**DemoData*\. The drive letter depends of the location of your current operating system. Inside of this data directory you will get three sub-directories. This directories also called as *Event directories*. One measurement from a motorbike *BIKE*, one measurement from a car *CAR*, and also a measurement from the formula3 series *FORMEL*. Do not rename these directories, otherwise you can't analyse these demo measurements at the analysis tool !
- The communication tool (WinIt) can be start only at the *formula edit mode*. It means you can load and edit (if necessary) the corresponding formula files of each demo measurement. You have no access to the download operation !

2.3 Installation of the program Acrobat Reader

2.3.1 Why need I the program Acrobat Reader ?

You can find at our CD a setup file for the newest version of the program *Acrobat Reader*. With this program you have the possibility to open and load special files directly from our CD - so called *PDF files.* The advantage of these files is the compact file size and the illustrative information overview. You can easily and quickly jump to the several chapters via a tree view. This program is free distributed and need none license.
Many files at the 2D CD, especially datasheets are in this format.



- First of all insert the 2D CD in your CD-ROM drive.
- Normally the CD starts automatically (Automatic play mode of your CD-ROM drive). If the CD not starts automatically start the program *D:\AUTORUN.EXE* manually. Provides *D:* is the drive letter of your CD-ROM Drive.
- Choose from the start window the button with the caption <*Enter*>
- Choose <Support> <Download> <2D utilities>



- Choose from the selection tree the item “Adobe Acrobat Reader (Version 5.05)>
- The Setup start directly after a view seconds

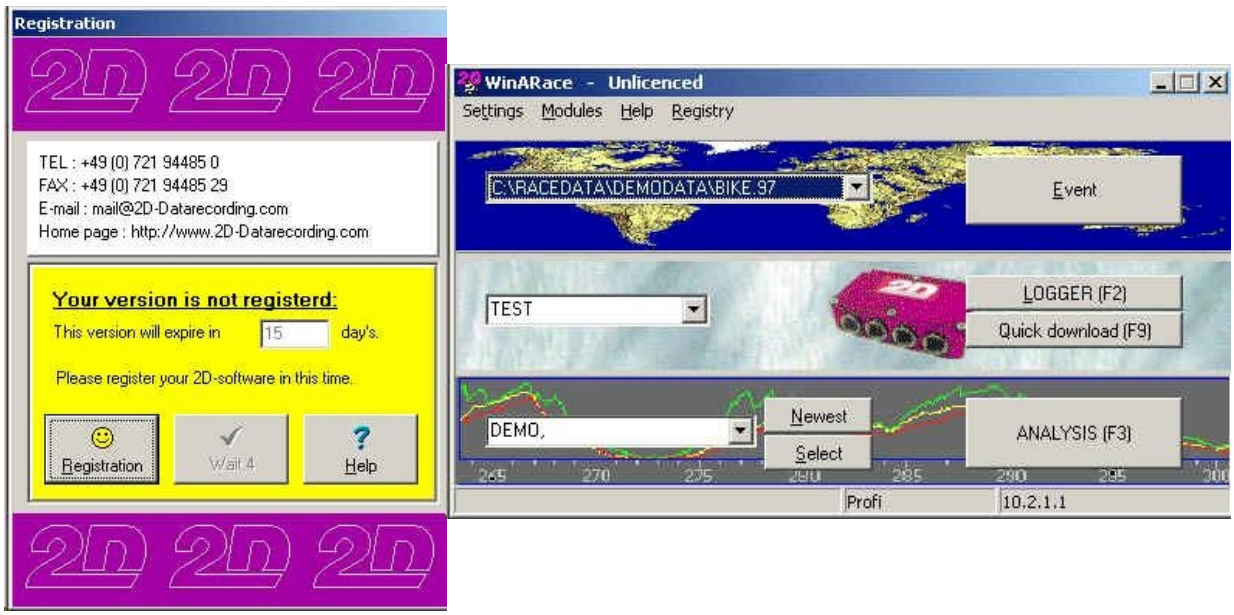
Do not press the installation button again and again !

- An installation Wizard prepares the installation and will helps you to install the software correctly. The first window you will see is a Welcome dialog – after reading confirm with button <*Next*>
- Choose the installation directory. If you agree with the default directory confirm with the button <*Next*>. Otherwise use the button <*Browse*> to change the directory. Afterward the installation operation will be started. After the installation is finished you will get a corresponding message. It is not necessary to reboot your computer !

3. What to keep in mind when register the 2D Software ?

3.1 How can I recognize an unregistered 2D Software ?

You can recognize an unregistered software at the top (main menu) of the front-end tool. There is an additional menu item *Registry*. If you select them you will get the following registration window. Note you will get a reminding mask automatically after each program start of *WinaRace* until your software version is not registered from us.



3.2 How can I register the 2D software ?

You have general the following two possibilities to register the 2D software - they are:

1 You have already a registered version of our software. So you can use the *2D Setting Wizard* to register your new software. This wizard will be start automatically at each software installation. *Refer chapter 2.1 for more details*

2 You have installed momentary no 2D software at your pc and would like to register the software at first time To do so following the next explanations step by step:

If you want to register the 2D software at first time:

- Start the 2D Front-end tool WinaRace and choose from the *reminding mask (refer chapter 3.1)* the button <*Registration*> or select from our front-end tool WinaRace the menu item *Registry (refer chapter 3.1)*
- Afterwards your will get the next window:



- Enter at the field besides Licence name of the software (for example the name of your race team). The quickest way to register your software is if you press the button <*Print FAX to 2D*>. You get the from us a printing paper with all necessary information. You can send us this paper via fax.

Important: Check at the first step if the system date of your computer is the current date. Please note that you have maximum one day time sending us the registration fax and registry your software.

- You get from us two informations:

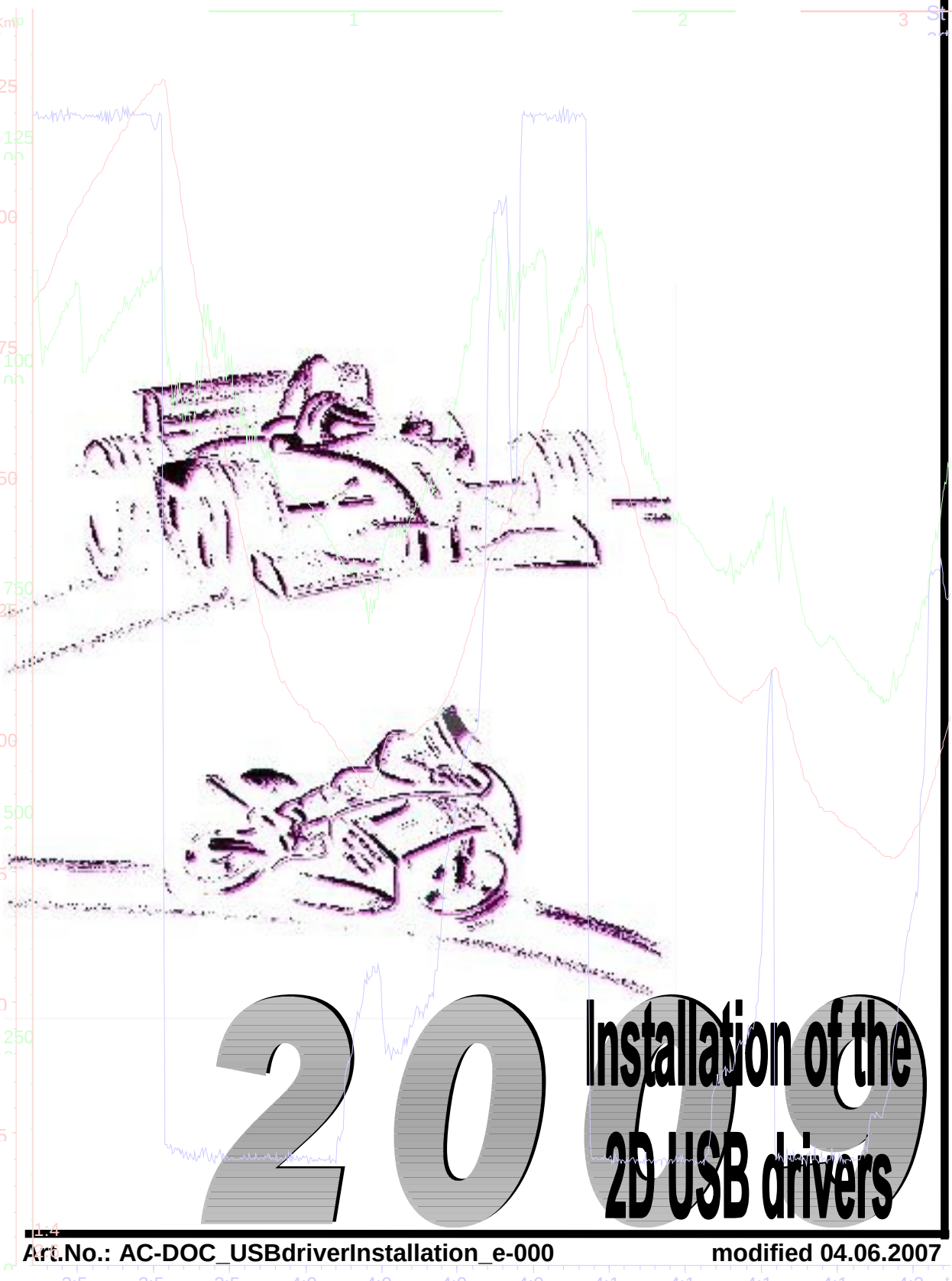
  A Licence key

  A Serial number

- Enter both numbers and your licence name in the corresponding fields at the registration window and confirm it with the button <*Registration*>.You will get a corresponding message if the software registration is successful.

2d-datarecording.com

- English -



2009 Installation of the 2D USB drivers

Art.No.: AC-DOC_USBdriverInstallation_e-000 modified 04.06.2007

Table of Contents

1. INSTALLATION OF THE 2D USB DRIVERS 3

1.1 WHAT TO KEEP IN MIND WHEN INSTALL THE 2D USB DRIVERS FROM OUR CD ? 3
1.1.1 Enter the device manager under Window 98SE systems 3
1.1.2 Enter the device manager under Window 2000 & XP systems 4

2. 2D USB DRIVER UPDATE 8

2.1 HOW CAN I REMOVE THE CURRENT 2D USB DRIVERS VIA 2D CD-ROM ? 8
2.2 HOW CAN I UPDATE THE USB DRIVERS MANUALLY VIA THE DEVICE MANAGER ? 9

3. WHERE CAN I GET VERSION INFORMATIONS OF THE CURRENT INSTALLED USB DRIVERS ? 15

3.1 WHERE IS THE 2D USB DRIVER LOCATION ON THE 2D CD ROM ? 16
3.1.1 Which 2D hardware requires USB drivers ? 16

1. Installation of the 2D USB drivers

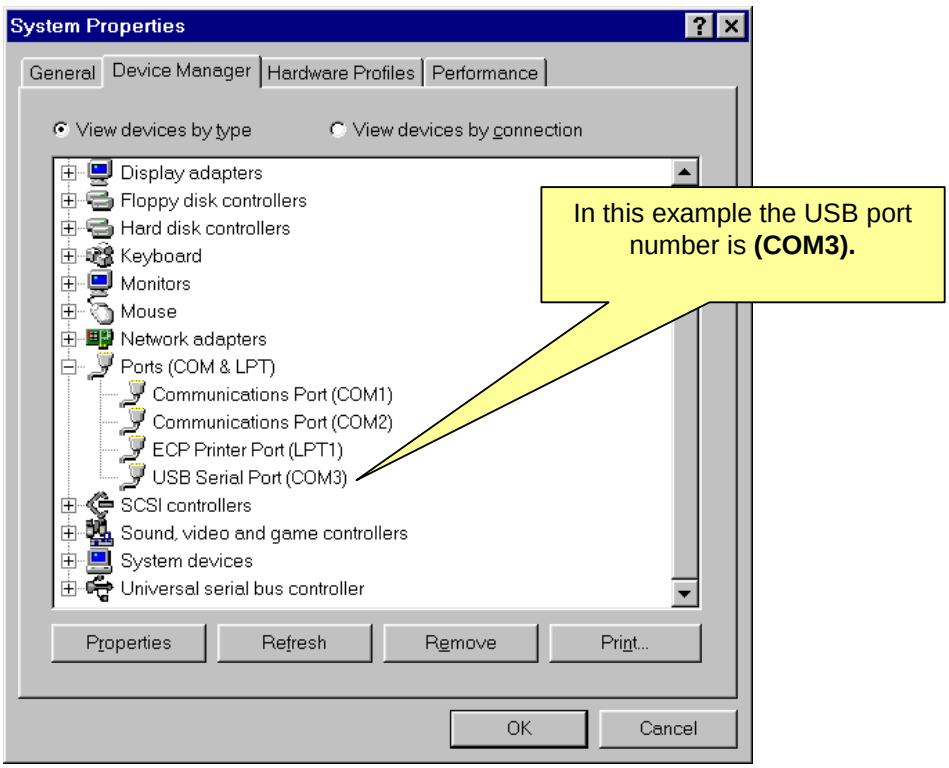
1.1 What to keep in mind when install the 2D USB drivers from our CD ?

Before starting with the 2D USB driver installation please check if it's necessary. You must install the 2D USB drivers only once. You can check this easily and quickly via the *device manager*. If necessary you must remove the USB drivers if you want to update them.

To start the device manager follow the next instructions.

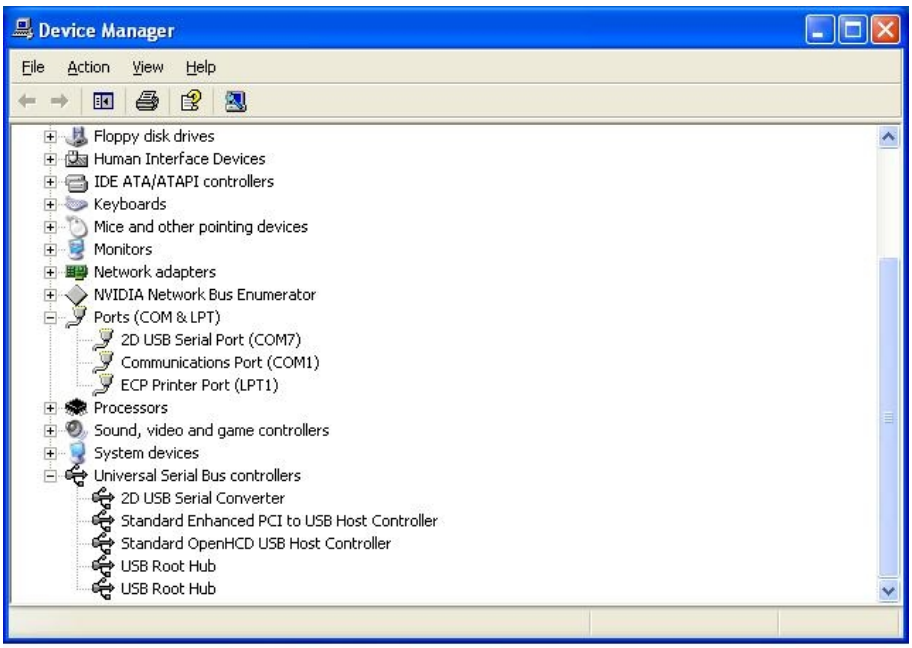
1.1.1 Enter the device manager under Window 98SE systems

- Right mouse click at My Computer
- Choose Properties from the context menu
- Select the rider with the caption Device – Manager
- Examine in the tree the item ”Ports COM & LPT”. Check if any sub-item with the caption “USB Serial Port” exist.



1.1.2 Enter the device manager under Window 2000 & XP systems

- Right mouse click at My Computer
- Choose Properties from the context menu
- Select the rider with the caption Hardware. Click at the button with the caption Device – Manager
- Examine in the tree the item ”Ports COM & LPT”. Check if any sub-item with the caption ”USB Serial Port” exist.



In the figure above you can recognize previously installed 2D USB drivers at COM Port 7. In this example we recommend to deinstall the drivers first. Afterwards you should install the new 2D USB drivers. You find detailed informations how to deinstall the 2D USB drivers correctly in chapter 2 of this manual.

Take notice of: You can't influence the allocation of the COM port number. These will be assigned automatically from the operating system !

Important: If you install the complete 2D software package by selection the button <Race> (from 2D CD start window) you can ignore the following steps. Then the USB driver installation is unnecessarily because this is part of the complete 2D software installation.
The driver installation is finished if the user is connecting 2D hardware for the first time with an USB cable. He must uniquely confirm some dialogs.



Do you have no entry for a 2D USB driver (in the device manager window / refer the previous page), you can directly start with the USB driver installation. Take notice of: All figures in the several examples can differ from the appearance at your system. It depends of the current operating system. To start with the driver installation following the next explanations step by step:

Preparation:
Unplug the 2D USB cable (=if connected) from the USB ports of your computer !

Step1:
First of all insert the 2D CD in your CR-ROM drive. The CD should start automatically . If the CD does not start automatically, start the program "D:\AUTORUN.EXE" manually. (Given D:\ is the drive letter of your CD-ROM drive. Choose your CD-ROM drive by first double clicking the icon "My Computer" on the desktop, then the program "AUTORUN.EXE". Choose the button <Enter> below “Homepage (offline)“

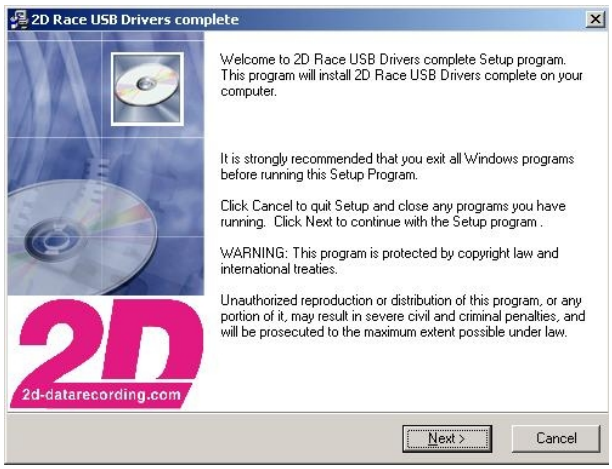
Step2:
The front-end of the 2D CD-ROM appears. At the left side you will get some main buttons (refer the figure below)

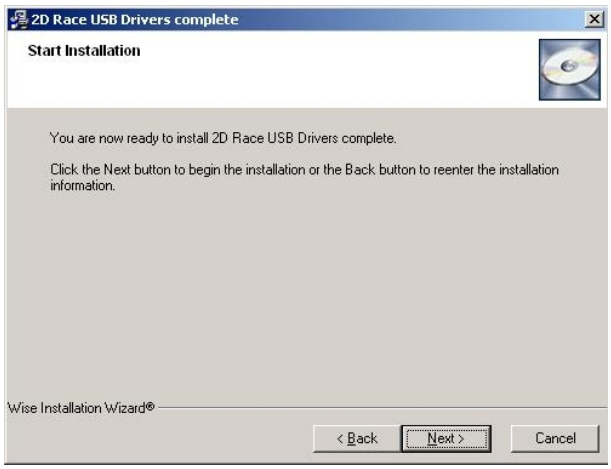


Select the button <Support><Download>.

Step3:

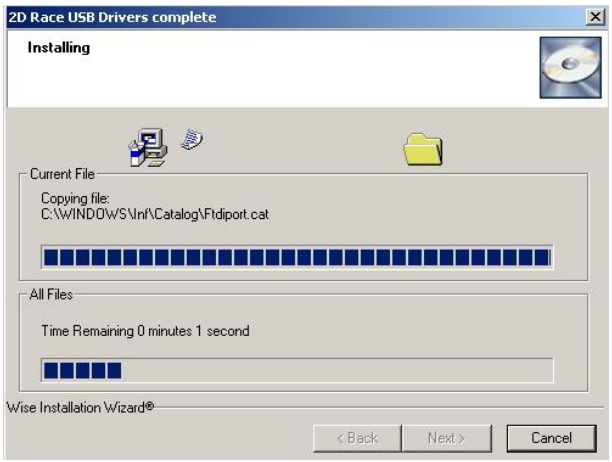
Take a look for ”2D USB drivers”. Choose the link beside of “Installation (Version 2162.906)“ named with “Setup file size...“. Afterwards a Setup Wizard will be started. He will help you to install the USB drivers correctly.





Step4:

Confirm always with button <Next> until the following window appears. The Installation will be start.



Step5:

Afterwards connect 2D hardware which requires USB drivers (=refer chapter 3.1 for details)

After connecting the 2D hardware your System detects the new hardware and you must uniquely confirm some dialogs to final the USB driver installation.

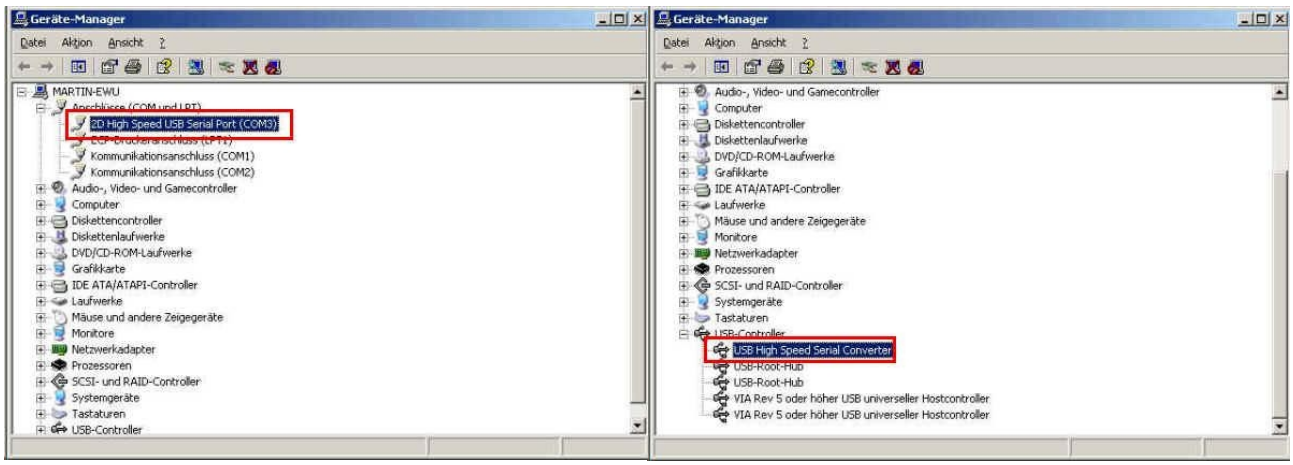
Step5.1:
This step is only for Windows XP systems relevant ! If you use Windows2000 or Windows98SE you can ignore this step !

Take notice of: The operating system Windows XP take a compatibility check of the selected USB drivers. You will get always the following message. This compatibility test will not be passed ! Ignore this message and continue the driver installation with the button <continue installation>. In the filgure below named as <Continue Anyway>



Step6:
Check the corresponding entries in the Device Manager window refer chapter1.1.1 and chapter1.1.2

- At the tree node Ports (COM & LPT) you should find the item **2D High Speed USB Serial Port (COM x)**
- At the tree node USB Controller you should find the item **USB High Speed Serial Converter**



2. 2D USB Driver update

2.1 How can I remove the current 2D USB drivers via 2D CD-ROM ?

Before you can start with the USB driver installation you must remove the old drivers from your system. The easiest and quickest way to remove all drivers in one step is to start a “special program”. For this you must select a link onto the 2D CD-ROM. To do so following the next instructions step by step:

- First of all insert the 2D CD in your CR-ROM drive.
- After the language selection you will see the start window of our CD-ROM.



- Select the button with the caption <Support><Download>
- Choose one of two possible links:
  1. “Removing USB drivers (=FTDI)“
  2. “Removing USB drivers (=SLABS)“

  Your selection depends on the used 2D hardware (=refer the table at the end of this document)

- Afterwards your will get the following information window. Before confirm this window with the button <Continue> unplug the 2D USB cable if its plugged at your USB port !



- Finally confirm the driver removing with the button <Finish>



2.2 How can I update the USB drivers manually via the device manager ?

Step 1: Open the device manager



Windows XP and Windows 2000:

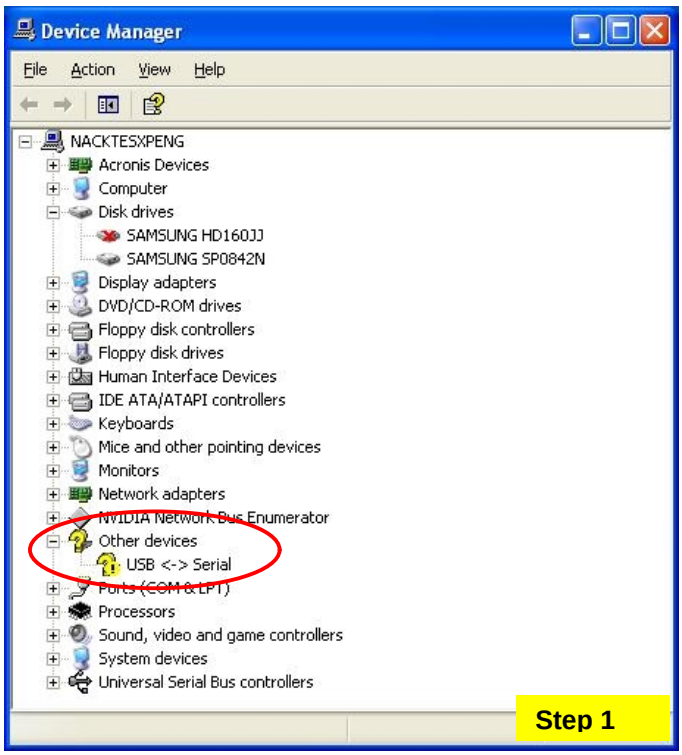
- Right mouse click at <My Computer> (=icon at your desktop)
- Choose <Properties> from the context menu
- Select the rider with the caption <Hardware>
- Click at the button with the caption <Device Manager>

Windows 98SE:

- Right mouse click at <My Computer>
- Choose <Properties> from the context menu
- Select the rider with the caption <Device Manager>



During the software installation the 2D USB driver files are copied into the windows system directory. For this the user must be announced on the respective PC with "administrator rights". An absence of these rights can lead to an incomplete installation of these files. An exclamation mark in the "device manager" points then on an incomplete installation. In this case you can update 2D USB driver files manually. Follow for this the following guidance step by step.



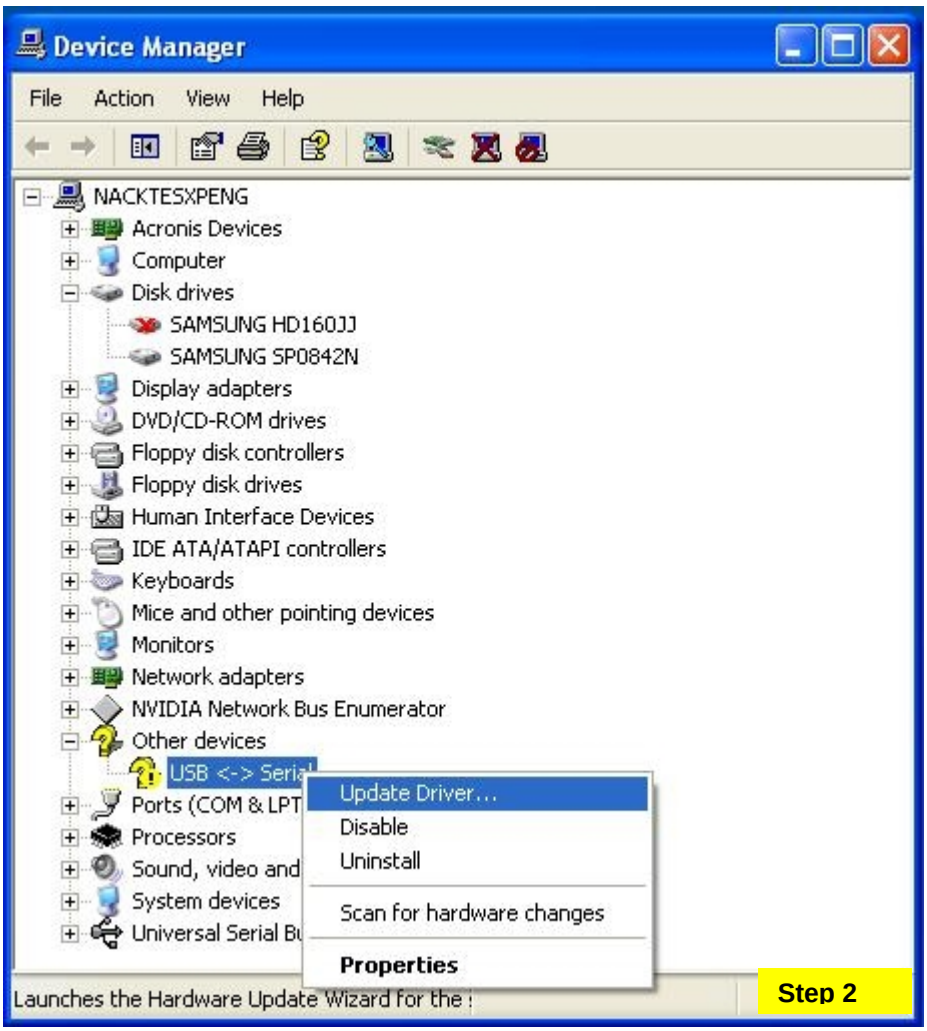
Step 2: Starting the manual USB driver actualization

Pre-condition: A logger or a memory add-on module was attached to the USB interface !

Preparation: Insert first of all the 2D CD into your CD-ROM drive

- Select the corresponding USB port (= the port with a exclamation mark)
- Select afterwards over the context menu (= right mouse click) the entry: <driver update >
- The actualization of the drivers always run in two steps.

1. Update the USB driver for the **<USB Serial Port>** (entry "Ports (COM & LPT)" in the device manager)
2. Update the USB driver for the **<USB Serial Converter>** (entry "Universal Serial Bus controllers" in the device manager)

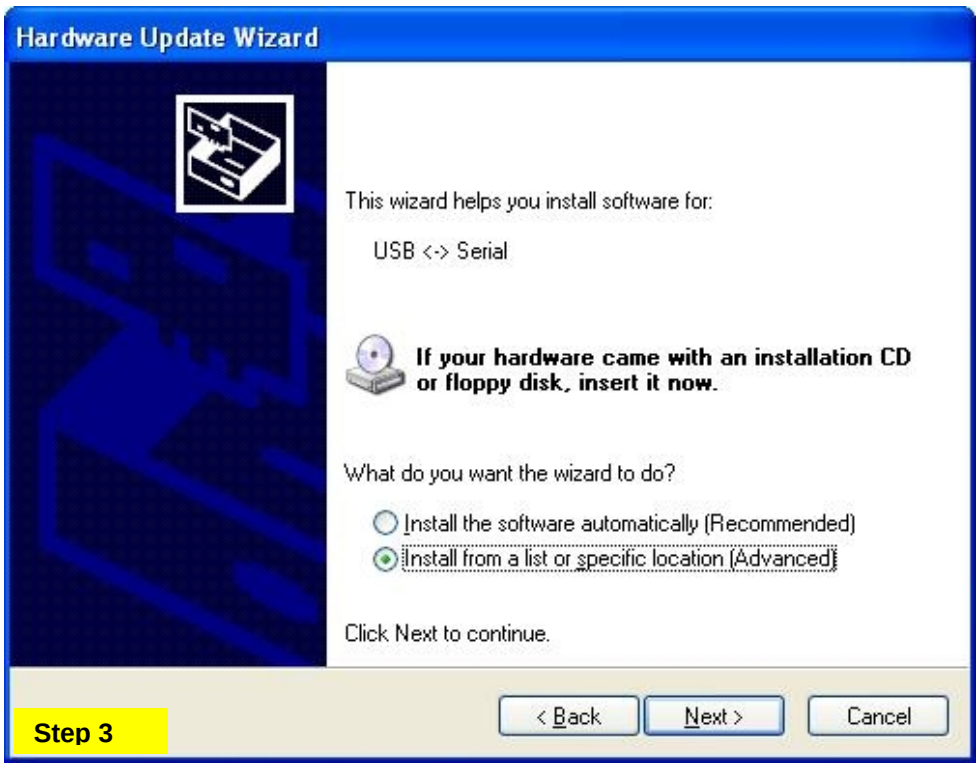


Step 3: Configure the "Hardware assistant"

The "Found New Hardware Wizard" will be helpful during the installation

- Take the presetting "No, not this time" and confirm this step with button **<Next>**
- Select afterwards the option **<Select from a list or specific location (Advanced)>** and finalize this step with the button **<Next>**





Step 3

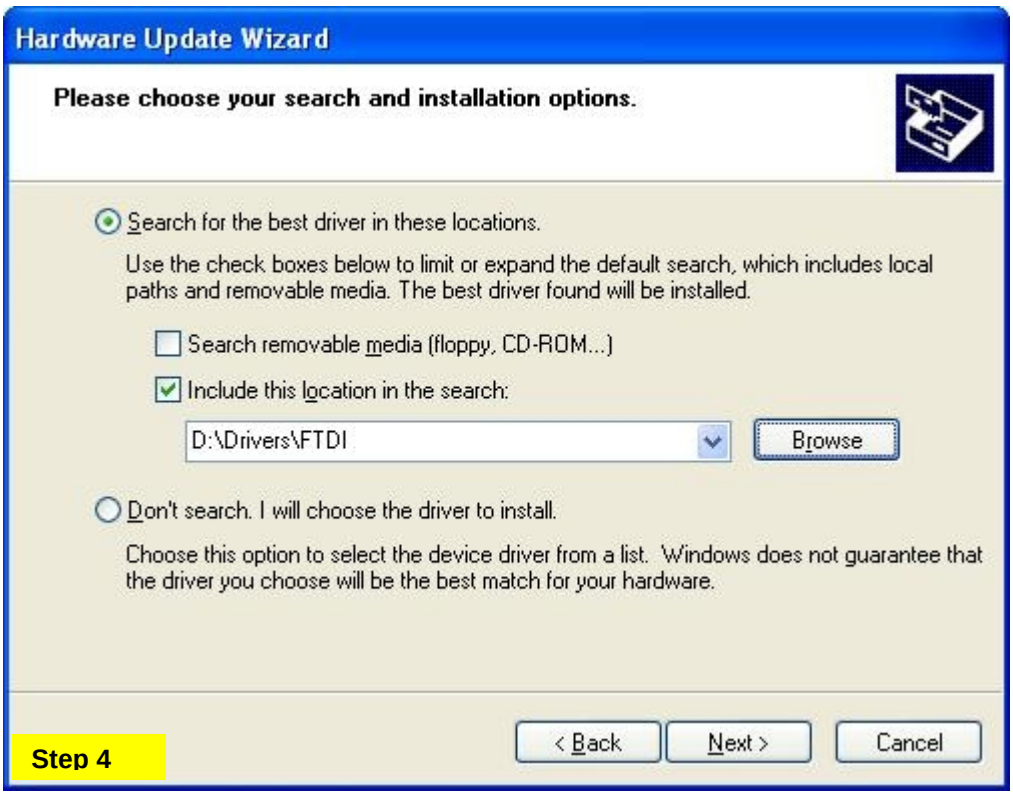
Step 4: Assign the directory of the 2D USB driver files

2D modules which communicate via USB uses different chip sets and needs therefore different USB drivers. These are on the 2D CD-ROM accordingly in different directories.
All 2D USB drivers are located on the CD-ROM into following main directory:
à D:\Drivers (Presupposed D:\ is the drive letter of your CD-ROM drive)

In this directory are different sub-directories (according to the different 2D hardware)

- **..\FTDI**
  LG-CANMEM1Cxx/128-000 (=memory module)
  LG-CANMEMxCyyy/zzz-000 (=memory module)
  LG-CANMEMxxyyyzzzz-000 (=memory module)
  WC-COM01USB-000 (USB highspeed COM cable)
- **..\SLABS**
  WC-COM02USB-000 (=USB COM cable 230Kbaud)
  LG-KIT_µC05-000 (=Kit Logger)
- **..\ATM**
  = GPS memory modules

- Select the appropriate directory over the button **<Browse>**. In the example shown down the USB drivers of a memory add-on kit are updated.
- Confirm your selection over the button **<Next>**

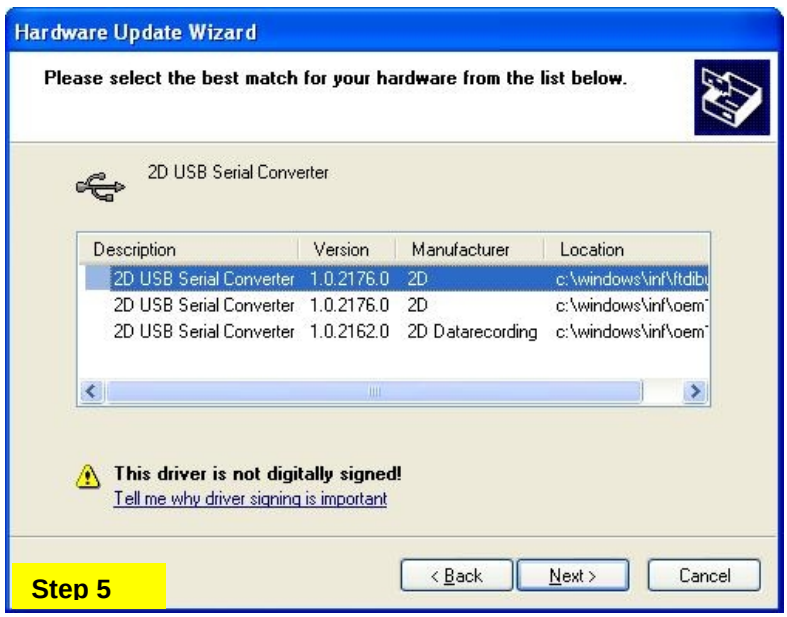


Step 5: Selecting the USB driver

The hardware assistant looks for suitable driver files. Subsequently, these are offered in a selection list (see second figure below).



Attention: In the selection list several entries are indicated, if the 2D software were installed before. Select always the assigned driver file from Step 4 ! (= USB driver from the 2D CD-ROM)



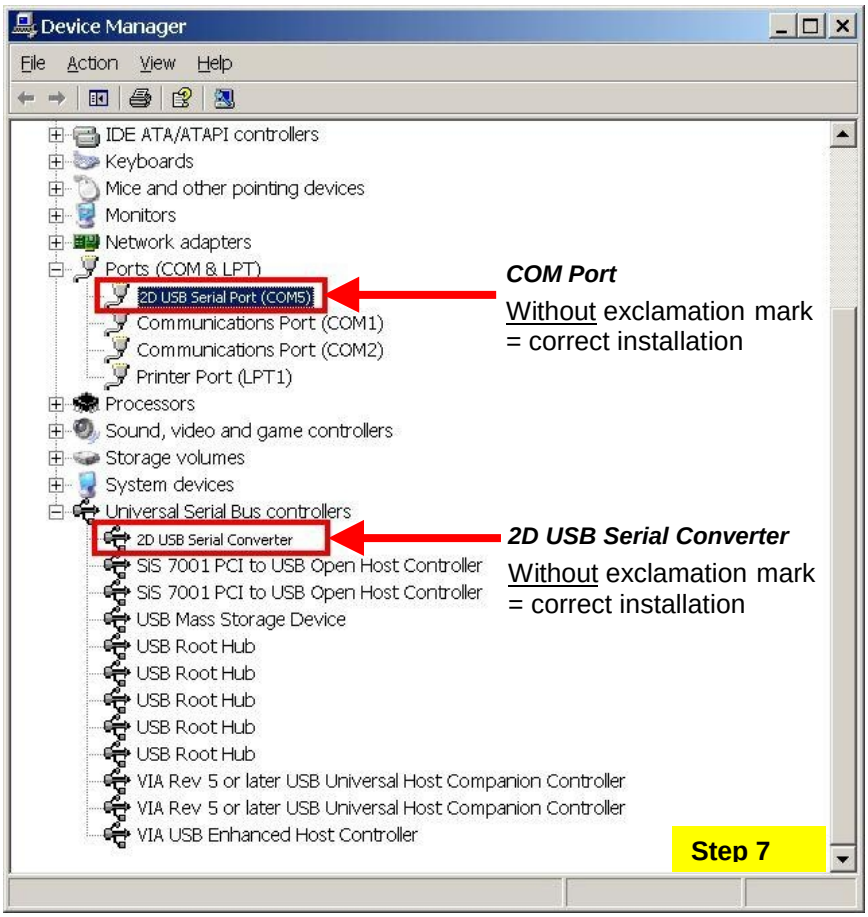
Step 6: Windows XP compatibility test

This step is only relevant if you uses the operating system Windows XP !
Under Windows98SE or Windows2000 step 6 is void – Continue in this case directly with step 7 !

- Confirm the compatibility test always via the Button **<Continue Anyway>**



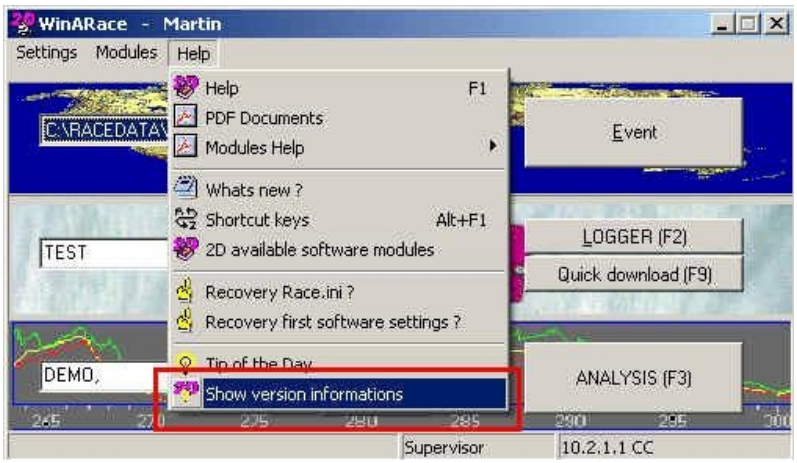
Step 7: Examination of the correct USB driver installation in the "device manager"



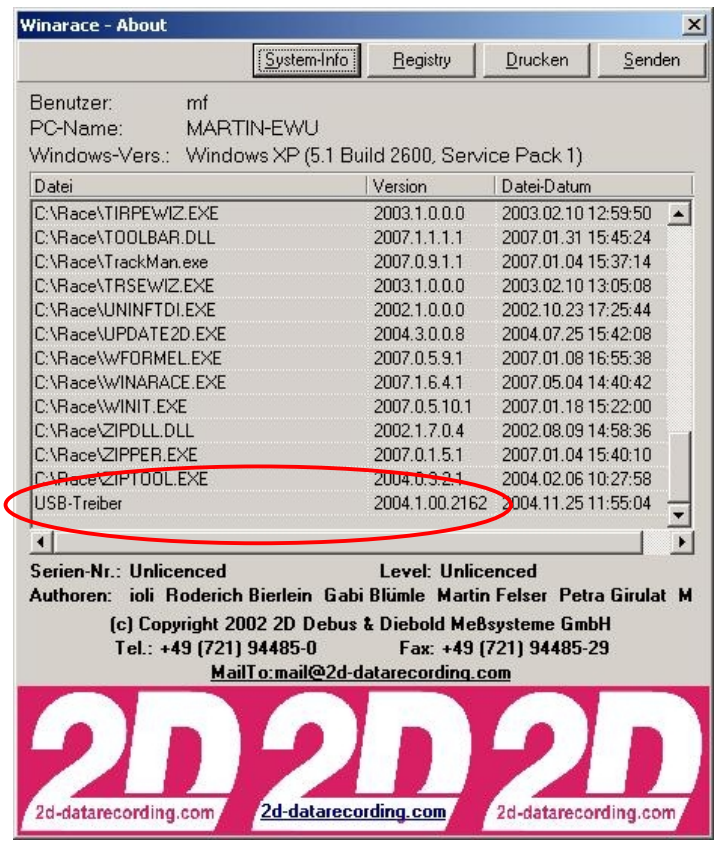
3. Where can I get version informations of the current installed USB drivers ?

The supplier of the USB–drivers updates these drivers in regular time intervals. Therefore it is recommended to update your USB–drivers regularly. Before this is done, you should make sure that a USB–driver installation is necessary on your computer. You can locate the current USB–driver version on your computer very easily:

- First of all start our front-end tool WinaRace
- Open the main menu entry Help / show version informations



- You will get version informations of all 2D software modules and additionally from the installed 2D USB drivers. refer the figure below.



3.1 Where is the 2D USB driver location on the 2D CD ROM ?

On the 2D CD-ROM exist 3 sub-directories for the 2D USB drivers. The selection depends on the used 2D hardware. The following table should help to find out for which 2D hardware which USB driver is to be used

Directory on CD?	Suitable for which 2D hardware ?
E:\DRIVERS\ATM*	GPS memory modules with "ATM chipset" (=complete list ASAP)
E:\DRIVERS\FTDI*	• LG-CANMEM1Cxx/128-000 (=memory module) • LG-CANMEMxCyyy/zzz-000 (=memory module) • LG-CANMEMxxyyyzzzz-000 (=memory module) • WC-COM01USB-000 (=download cable)
E:\DRIVERS\Slabs*	• WC-COM02USB-000 (=download cable) • LG-KIT_µC05-000 (=Kit Logger)

* Given E:\ is the drive letter of your CD-ROM drive

3.1.1 Which 2D hardware requires USB drivers ?

Sub-directory

..\ATM



LG-GPSMEM-000

..\FTDI



LG-CANMEM1Cxx/128-000



LG-CANMEMxCyyy/zzz-000



LG-CANMEMxxyyyzzzz-000



WC-COM01USB-000

..\Slabs



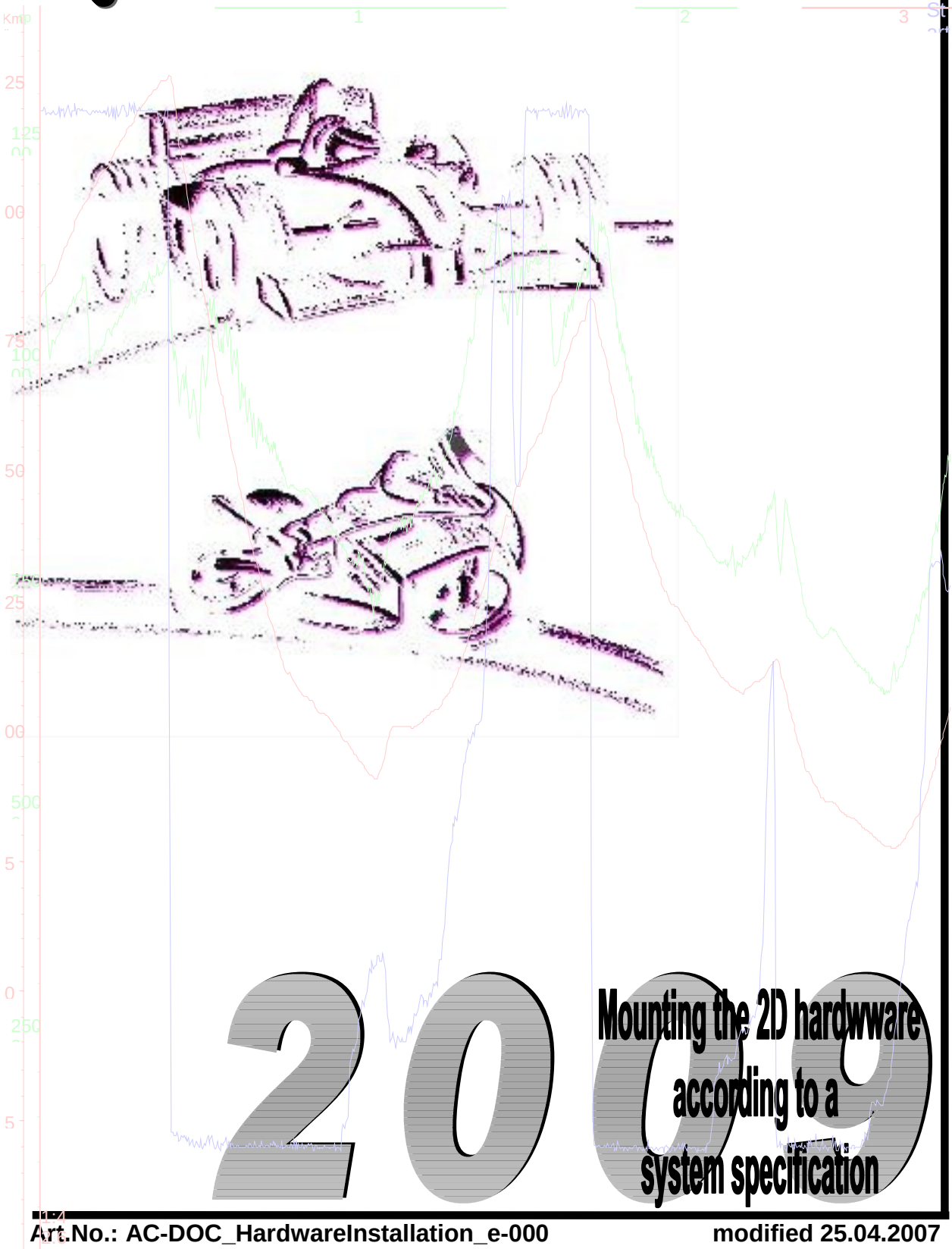
LG-KIT_µC05-000



WC-COM01USB-000

2d-datarecording.com

- English -



2009

Mounting the 2D hardwware according to a system specification

Art.No.: AC-DOC_HardwareInstallation_e-000 modified 25.04.2007

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

2D Logging System Scheme

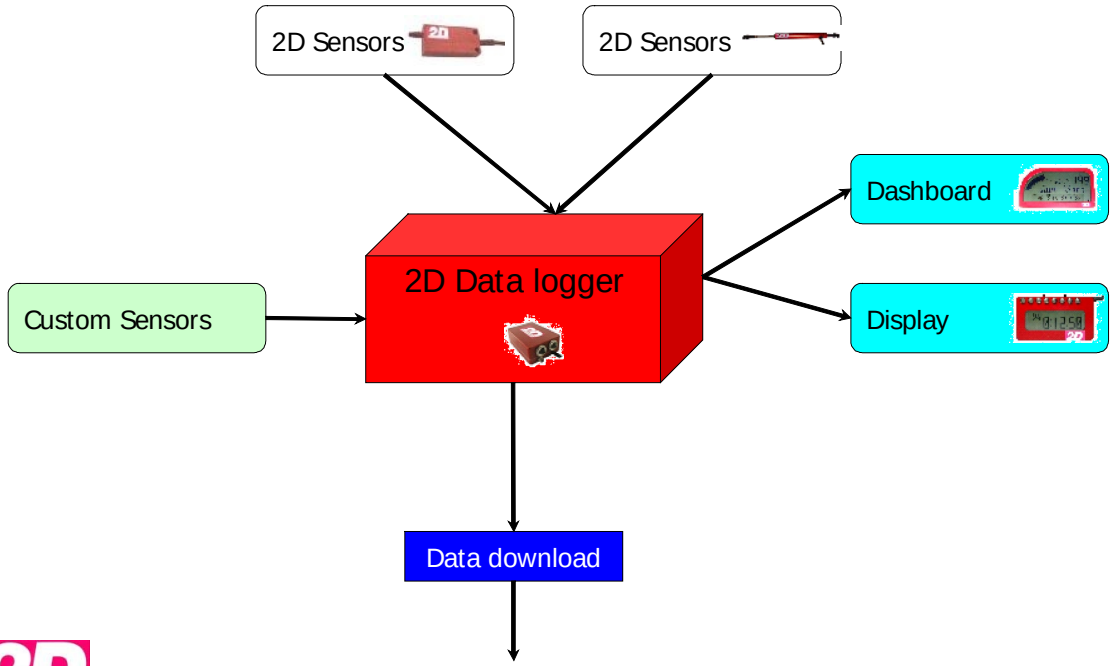


Table of Contents

1. MOUNTING THE HARDWARE ACCORDING TO THE SYSTEM SPECIFICATION 3

1.1 MOUNTING AND CONNECTING THE HARDWARE 4
1.1.1 Mounting and connecting the Datalogger 5
1.1.2 Mounting and connecting the system junction the 2D Box1 6
1.1.3 Mounting and connecting the inductive front speed sensor (digital) 8
1.1.4 Mounting and connecting the RPM sensor (digital) 9
1.1.5 Mounting and connecting the temperature sensor (analog) 10
1.1.6 Mounting and connecting the LAMBDA sensor (analog) 11
1.1.7 Mounting and connecting the THROTTLE Position sensor (analog) 12

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

1. Mounting the hardware according to the system specification

The descriptions in this chapter refer to a *2D Standard MINI System*. All the information you need to work quickly and efficiently with a 2D measurement system can be seen in this example. The system includes the following hardware components:

Name / datasheet:	Standard MINI system
	2D software
	2D serial COM cable – you can also order a USB COM cable
LG-L4-56-000	56 channel CAN – DATALOGGER (incl. power supply cable)
WB-1sys-000	2D box 1 standard (connects 4 analog + 2 digital sensors)
SD-RPM01-000	RPM sensor (digital)
SD-VI0206-000	Inductive speed sensor (digital)
SA-NTCx-yy-00	Oil / water sensor (analog)
SA-LSU4.2-000	Lambda sensor (analog)
	Throttle position sensor (analog)



The following pages give you several useful tips how to mount and connect the hardware, especially the sensors to your bike. Special information like sensor specifications and connector pins is listed in the *appendix* of this manual.

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

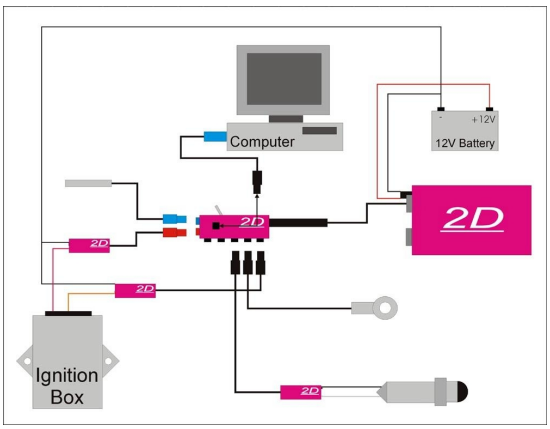
1.1 Mounting and connecting the hardware

In this chapter you will get general information tips how to mount, connect and place the hardware especially the sensors on your motorcycle. The descriptions used here specifically relate to motorcycles, but of course the sensors can also be used on cars, and in general the instructions apply.

For these hardware mounting instructions, we must assume that the user has some knowledge of the technology of motorcycles and cars, and some practical experience in working on them.

Please take care that all components are mounted securely and pay attention to minimising vibration if possible when choosing mounting locations. Avoid bending cables too much, especially at acute angles, as this can lead to a failure in the system.

This manual relates to a specific hardware arrangement – the *2D Standard Mini system*. For each component of this system there are instructions on the best way to mount it and how to connect it with he junction of the system, the *2D Box1* – for connection information refer to the figure system junction



Please note: By following exactly these instructions for hardware mounting, all sensor components will be assigned a fixed connection number in the system. In the 2D software, there exists a file for each 2D system and so configuring your system correctly to match this file allows you to quickly and easily program your Datalogger.

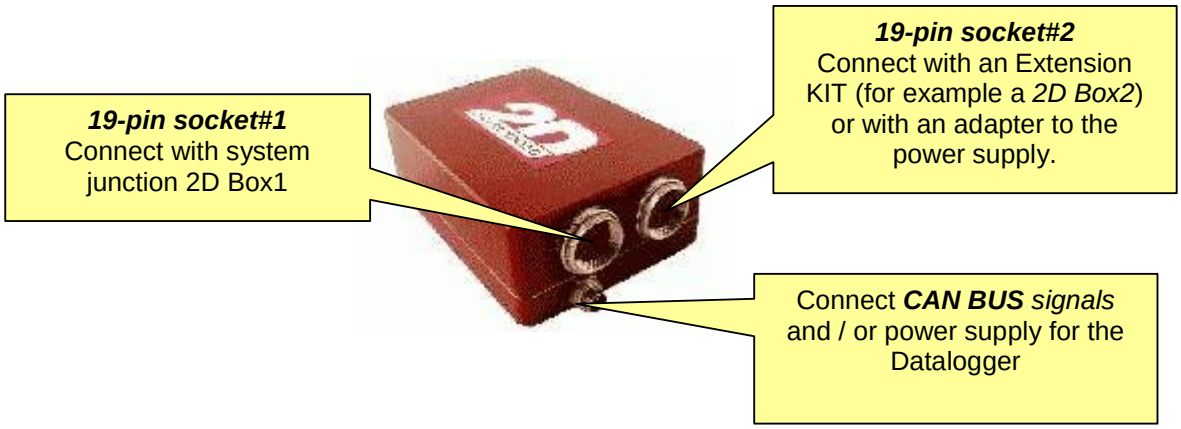
In the software you have a file named *STDMINI.LDD*. This file exists in the *SYSTEM \ LDDFILES directory* below your current *WinaRace directory*. All information about the connected sensor is inside the file to guarantee correct communication with the *Datalogger*. You can load this file in the communication tool WinIt. You will get detailed help informations in the chapter 4.1 (Load Standardsystem) of the WinIt manual.

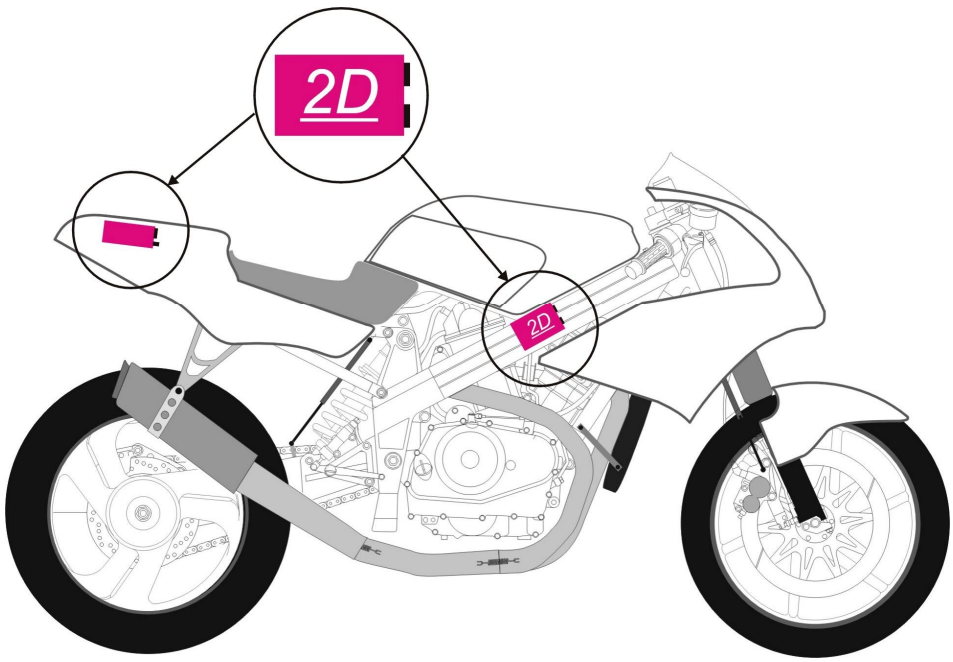
Sensor name:	Connected to system junction 2D Box1	Sensor Type:
Inductive speed sensor (S-V01)	Vfront	Digital
RPM sensor (I-RPM02)	RPM	Digital
Oil- / Water temperature Sensor (S-NTC)	A1	Analog
LAMBDA Sensor (S-AF01 / I-AAF01)	A2	Analog
Throttle position sensor S - AP01 /S-APS01/S-APS02	A3	Analog

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

1.1.1 Mounting and connecting the Datalogger

The *Datalogger* is the most important part of the system. It can be mounted to a hidden and secure place, e.g. in the back of the motorcycle under the seat/fairing, because all variable and external connections - to the computer and the sensors - are handled with the *2D Box1*. The logger has two 19-pin sockets (female) for the connection to *2D Box1* and *2D Box2* and and a *5-pin CAN-socket* (male) that is used for connection to the electric system of the motorcycle for power supply. Pay attention to the position and the length of the connecting cable of the box – see figure below.





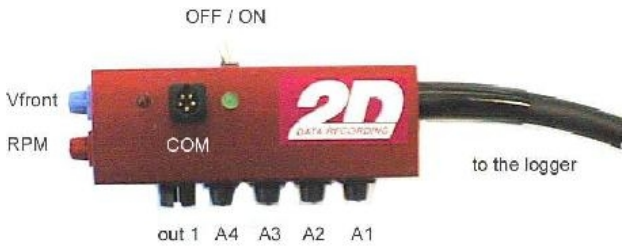
2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

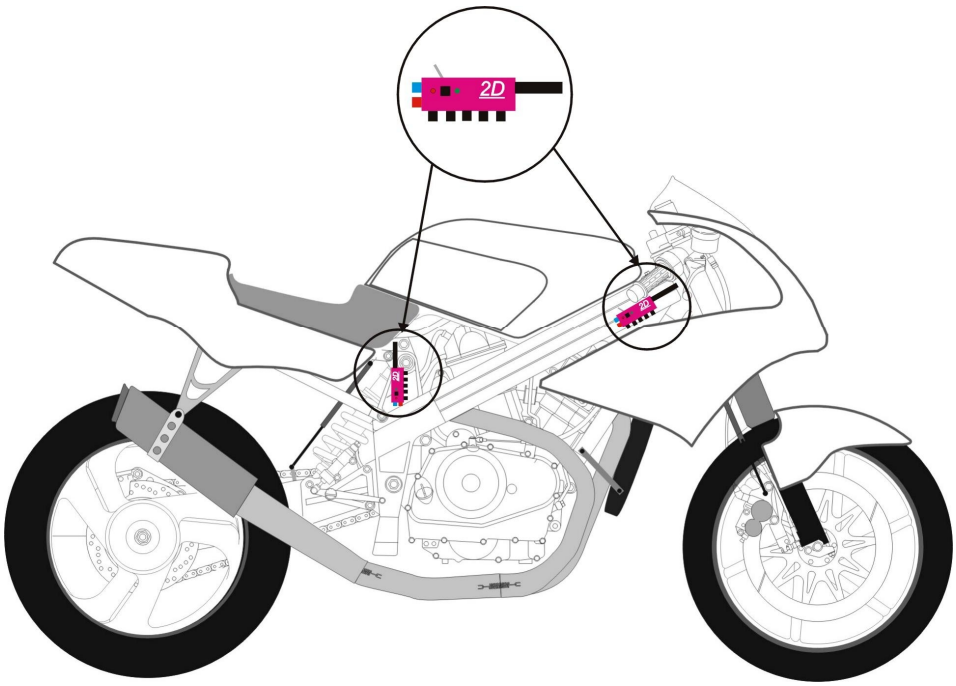
1.1.2 Mounting and connecting the system junction the 2D Box1

This box is the junction of the system, all connecting cables meet here. The box includes the on/off switch for the whole system, two control- LED´S , the connecting cable to the box and the sockets for two digital and four analog sensors, the switch channel and the communication cable. Because of this it is important to mount the box in a place where it can be reached easily.

It is recommended to mount it in the front of the bike, e.g. on the chassis under the fuel tank. An additional advantage of this position is the short distance to most of the sensors.

Connection: Fix the *19-pin connector (male)* of the cable of the *2D Box1* to the socket#1 of the *Datalogger*





2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

Located on the side of the *2D Box1* next to the *COM cable connector* there are two *status LED's* (light emitting diodes). The red light shows the current condition of the *Datalogger*. The following table shows a list of the red LED states and their meaning:

Blink interval of the red light diode	Operating mode / Status of Datalogger
The red LED lights permanently	The Datalogger contains measurement Data.
The red LED is blinking slowly in regular time intervals.	System is on but no start conditions were programmed. The system will not record the sensor signals ! **à** The system will not record the sensor signals
The red LED is blinking fast in regular time intervals.	The system was correctly programmed and is ready to record the sensor signals.
The red LED is blinking very fast in regular time intervals.	The system is recording sensor signals at the moment.
he red LED is blinking in irregular time intervals and becoming faster	The system has recorded Data and is now in stand-by mode. (Therefore the system was able to record RPM or speed impulses to start logging a measurement)

If you have purchased an Extension Kit1 from us you get an additional *2D Box2* for connecting more sensors (four analog and two digital sensors + one switch channel) – see figure below.



Connection: Fix the *19-pin connector (male)* of the cable of the *2D Box2* to the *socket#2* of the *Datalogger*.

This box is principally the same as the 2D Box1, except that it does not have a power switch and a COM-connector.
The *2D Box2* can be mounted in the same way as the *2D Box1*. You can also mount the *2D Box2* in a more secure place, since it is not needed to communicate with the system from your computer like the *2D Box1.*

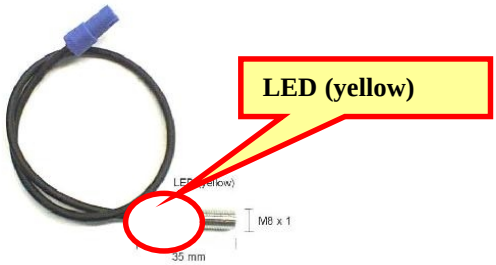
2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

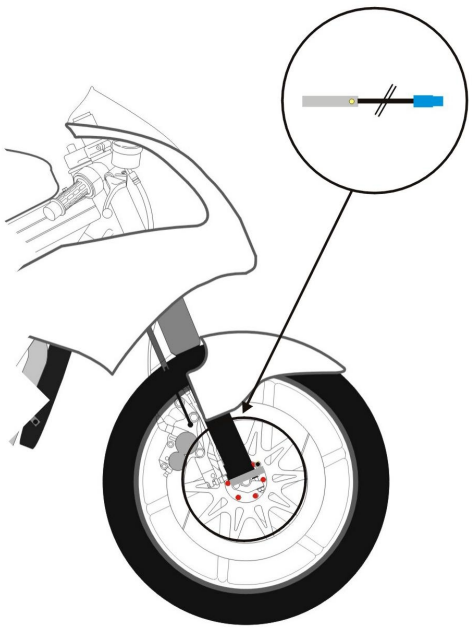
1.1.3 Mounting and connecting the inductive front speed sensor (digital)

The front speed sensor reacts to closely-passing metal parts which change it's magnetic field. These generated impulses are detected by the sensor and counted by the logger. Together with other factors the logger calculates the momentary speed and stores it.

Appropriate signal donors for the sensor are the brake disc or parts of it, disc fixing bolts or other steel parts specially fitted for this purpose. The optimal distance to the sensor is 1 – 2 mm. The use of aluminium, magnesium or titanium reduces this distance to 1 mm. To ensure a clear signal, use only objects with sharp edges and a flat surface (no concave-head bolts eg. Allen-cap screws) and all signal donors must be equally spaced apart.

Connection with the system junction (2D Box1)
Connect the *blue 4-pin socket (male)* of the sensor to the *blue 4-pin socket (female)* on the *2D Box1* – this socket is named *VFront*. For connection to *2D Box1* use the extension lead delivered with the system - for connection information refer to the figure *system junction*





2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

1.1.4 Mounting and connecting the RPM sensor (digital)

In most cases it is possible to connect the sensor with the primary ignition driver of the motorcycle. Connect the red wire of the sensor to an ignition signal wire, (e.g. in the adapter plug of the ignition box), and fix the black wire to ground. The sensor itself is galvanically isolated from the main electric and ignition system of the bike or car and receives only the pulses.

Connection with the system junction (2D Box1)
Connect the **red 4-pin socket (male)** of the sensor to the **red 4-pin socket (female)** from the *2D Box1* – this socket is named *RPM* - for connection information refer to the figure *system junction*



The following figure shows the connection of the RPM sensor to the ignition box (in this case the ECM of the Suzuki GSX-R series). Depending on the RPM sensor, locate the RPM signal of the ignition box and connect the red cable to this signal. Connect the black cable to GND

1.1.5 Mounting and connecting the temperature sensor (analog)

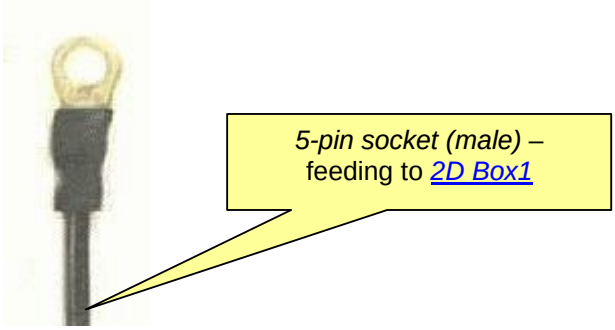
With this sensor it is possible to measure several temperatures in the range of 0 - 150°C. You can measure for example the following temperatures:

- The cooling water temperature
- The engine housing temperature
- The gearbox temperature

The position to fix the sensor depends on it's use. You can fasten it with a screw (see figure 9) on the water radiator, the engine housing, the gearbox or any other place you want to know the temperature. Other sensor designs are described in the appendix of this manual.

2D delivers the connection cable in a fixed length of about 50cm. Do not cut this cable to change the length because this will definitely destroy the sensor function !

Connection with the system junction (2D Box1)
Connect the *black 5-pin socket (male)* of the sensor with the *first 5-pin socket analog input (female)* on the *2D Box1* – this socket is named *A1* - for connection information refer to the figure *system junction*



.

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

1.1.6 Mounting and connecting the LAMBDA sensor (analog)

In this system the LAMBDA sensor is the most difficult to fix, as it is mounted directly in the exhaust of your motorcycle. The sensor is related to the air/fuel controller of your motorcycle.

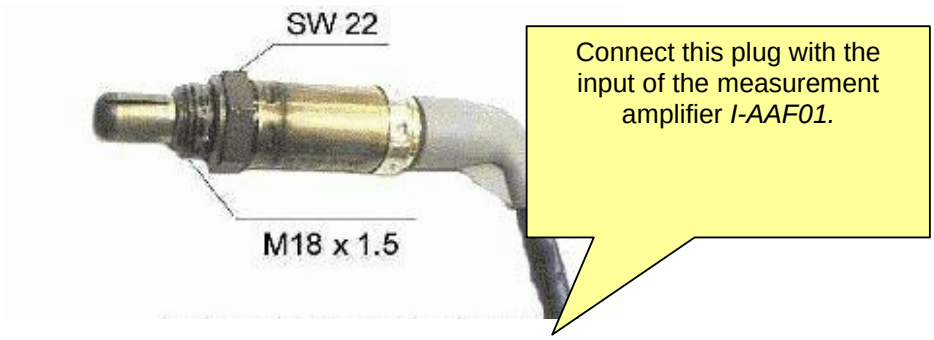
The most race-only exhausts have a connection to fix the lambda sensor. If your exhaust has no connection, you must construct your own connection.

The sensor itself measures a mV-output-signal and is delivered with an additional measurement amplifier I - AAF01. This sensor indicates the air-fuel mixture of the exhaust gas.

The sensor has following specifications:

- non-linear output signal
- no heating control of the sensor
- interface with a buffered amplifier

Connection with the system junction (2D Box1)
Connect the *black 5-pin socket (male)* of the measurement amplifier to the *second 5-pin socket analog input (female)* on the *2D Box1* – this socket is named *A2* - for connection information refer to the figure of the *system junction*



2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

1.1.7 Mounting and connecting the THROTTLE Position sensor (analog)

The Throttle position sensor itself consists of a small junction box. Inside this box there is a small amplifier which has a galvanic isolated input and output. You can mount the box to a hidden and secure place, e.g. in the back of the motorcycle.

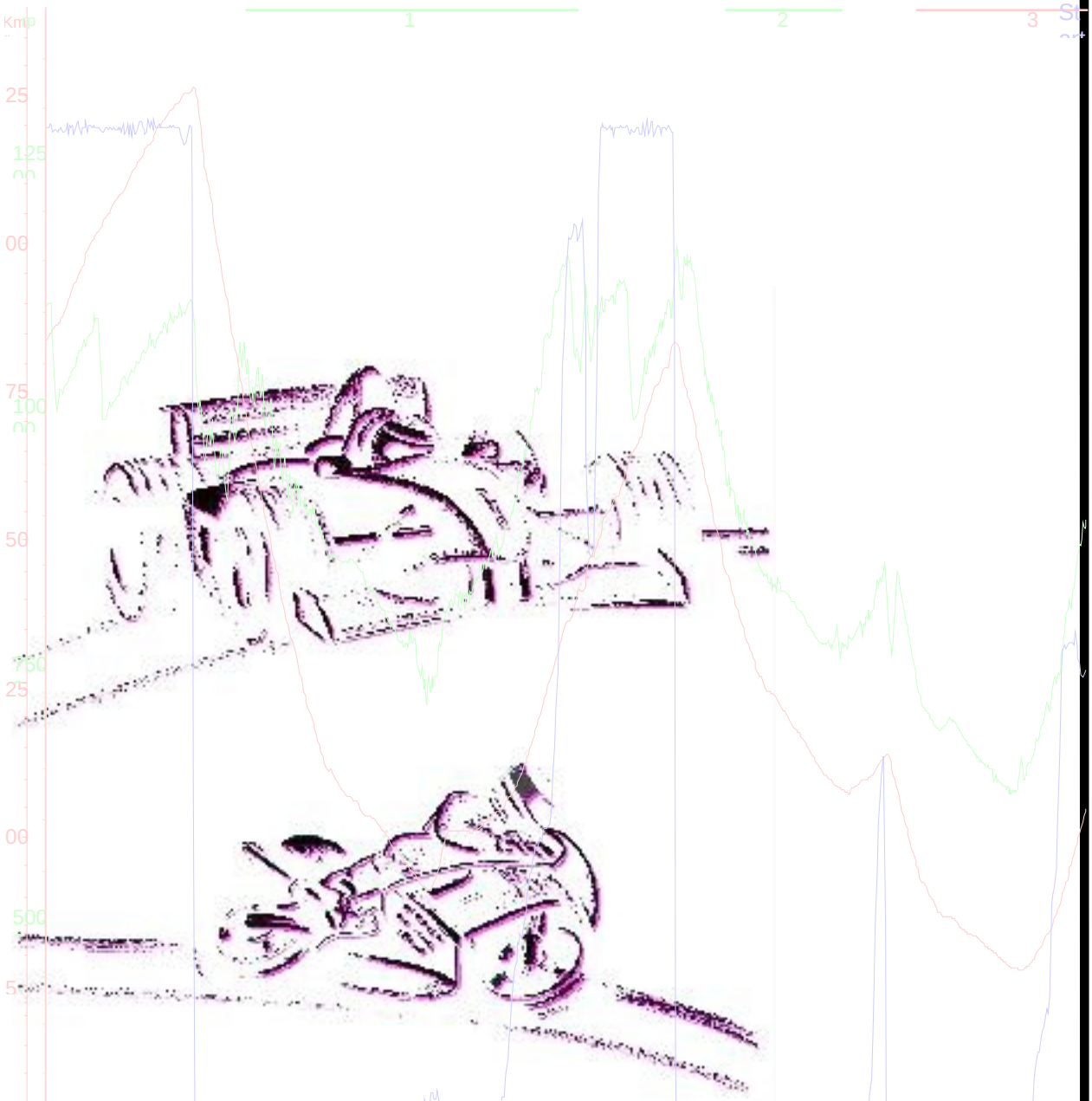
You must connect the red signal wire with the corresponding electrical Throttle signal on your motorcycle, and connect the black wire with ground. Please refer to the wiring scheme of your motorcycle to check if there is a junction where you can tap into the Throttle signal.

Connection with the system junction (2D Box1)
Connect the *black 5-pin socket (male)* of the measurement amplifier to the *third 5-pin socket analog input (female)* on the *2D Box1* – this socket is named *A3* - for connection information refer to the figure of the *system junction*



2d-datarecording.com

- English -



2009

Introduction to the 2D Front-end tool - WinARace -

Art.No.: AC-DOC_WinARace_e-000 modified 18.07.2008

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

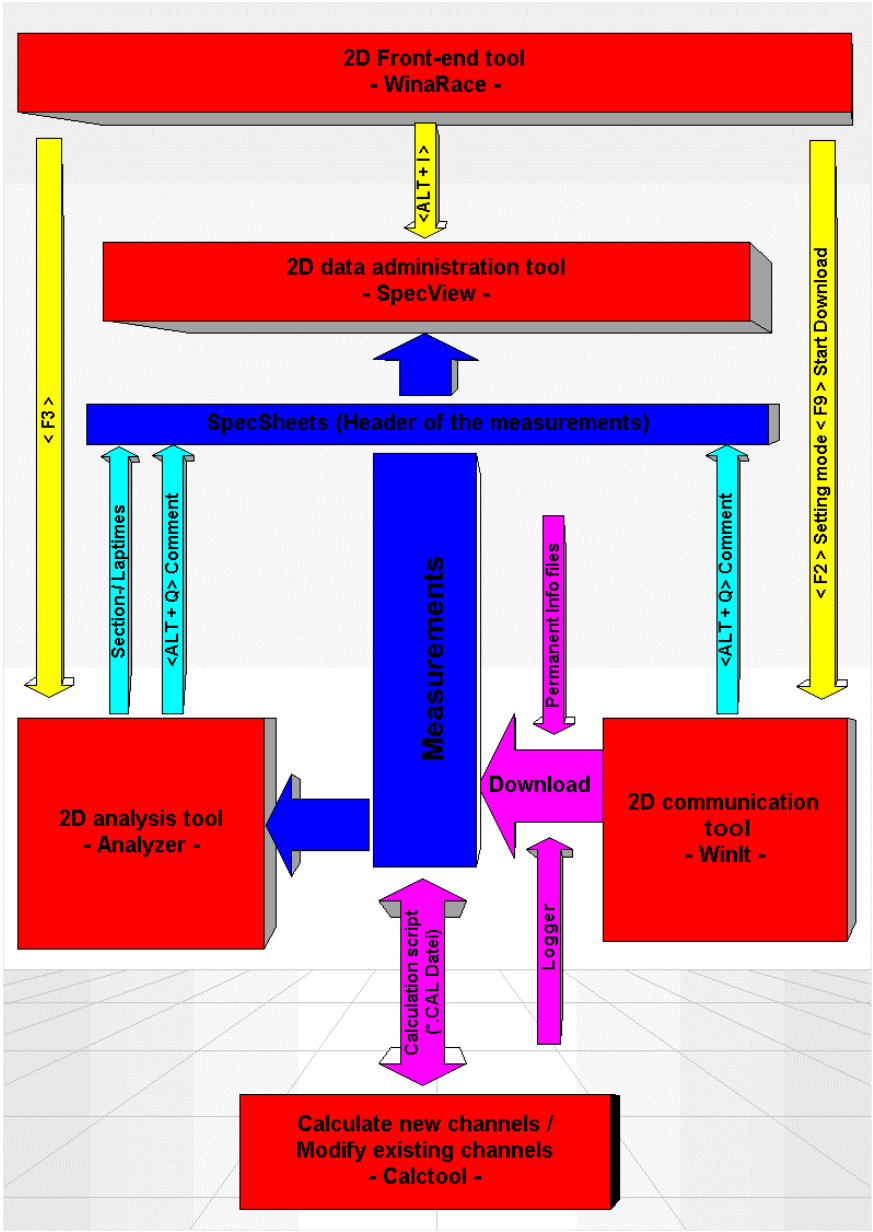


Table of contents

1. INTRODUCTION TO FRONT-END TOOL - WINARACE 4

1.1 GENERAL DESKTOP APPEARANCE OF THE START-UP WINDOW 4
1.1.1 Restricted Logger Mastername - the "Cup" or the "Small" license 7
1.2 THE 2D TOOLBAR – THE QUICK START DEVICE OF WINARACE 9
1.2.1 Desktop appearance of the 2D toolbar device 9
1.2.2 How can I link a program at the variable toolbar device ? 10
1.2.3 Configure the 2D toolbar device 11
1.3 EASY AND QUICK EVENT SELECTING (CHANGING) - THE 2D EVENT EXPLORER WINDOW 13
1.3.1 Shortcut keys of the 2D Event Explorer window 15
1.4 EASY AND QUICK MEASUREMENT SELECTING - THE 2D FILE EXPLORER WINDOW 16
1.4.1 Shortcut keys of the 2D File Explorer window 17
1.5 THE FUNCTIONS OF THE 2D EVENT EXPLORER 18
1.5.1 Create a new Event 18
1.5.2 Compress a complete Event 20
1.5.3 Decompress a compressed (=closed) Event 23
1.5.4 Assign a new track map 24
1.5.5 Copying of a complete Event 25
1.5.6 Protect a complete Event 26
1.5.7 Delete a complete Event 27
1.5.8 Fade in of the analysis overview window 28
1.5.9 Check (and change) the current measurement formulas - Start the formula editor 29
1.5.10 Copy single 2D measurements 30
1.5.11 Compress single 2D measurements 31
1.5.12 Decompress compressed 2D measurements 33
1.5.13 Convert (old) 2D measurements into new data structure 35
1.5.14 Deleting single 2D measurements from the current Event 36
1.5.15 Rename single 2D measurements 37
1.5.16 Starting the program CalcTool with selected 2D measurements – calculate new channels 38
1.5.17 Search and replace into 2D measurements (channel renaming) 41
1.6 THE MAIN MENU ITEM SETTINGS 45
1.6.1 Choose the software language 46
1.6.2 Check the folder structure of the software 47
1.6.3 Access to the protocol function 48

2. SHORTCUT LIST 49

3. GLOSSARY 50

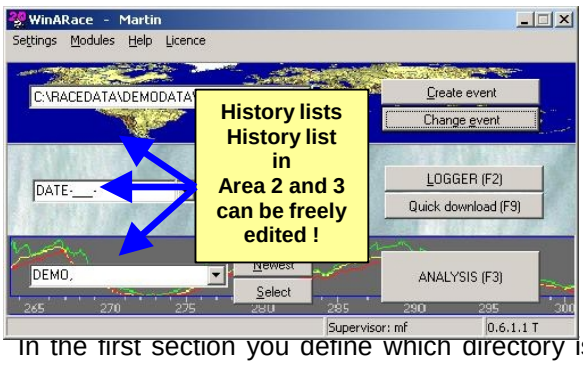
1. Introduction to front-end tool - WinaRace

The program *WinaRace* is the Front-end tool of 2D. From here you can start other software modules, like WinIt (communication tool), SpecView (data administration) or the analysis tool (Analyzer).

The main functions of WinaRace are:
Here you can define and change the current *Event* via the *2D Event Explorer*
The start measurements for the analysis tool via the *2D File Explorer*
The *Logger mastername* (how to create the measurement name during the download operation)
The Folder structure of the complete software
The Software language
The Userlevel
Some important communication settings (same window as in WinIt – main menu item Settings / Options)
Activate / deactivate the Protocol function
The configuration of the 2D Toolbar device
Get version information of the various software modules
Software changes - what's new ?

1.1 General desktop appearance of the start-up window

You can split up the starting window of the front-end tool *WinaRace* into three sections (refer the next figure)



Event selection \ Event creation (1. Area)

Communication level (2. Area)

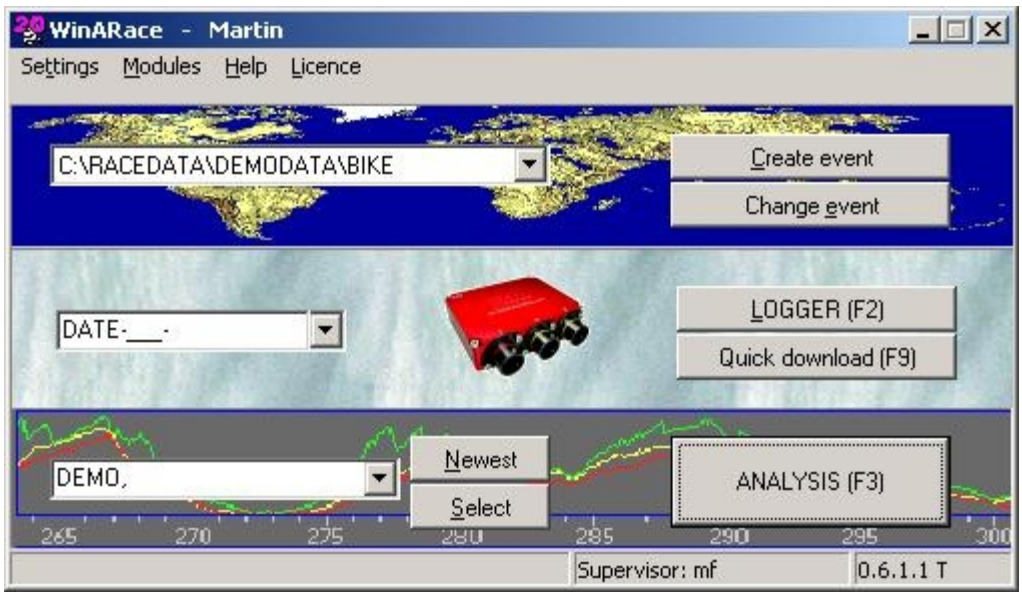
Measurement selection (3. Area)

- In the first section you define which directory is the current one. It is called the *Event*. You can change the current Event in two different ways. The first way is to select a directory directly from the history list where you can choose from the last eleven directories used. The second way is to load a new directory by a tree view selection (like the windows explorer). Open our integrated *Event Explorer* with the Shortcut <ALT + E> or by pressing the corresponding button named as <Change event> in the figure above. Select a new directory in the left tree view and confirm new directory with the button <OK> - afterwards the new directory is displayed in the history list.
- The second section represents the communication level. Here you also get a history list where you can choose from eleven entries. After the first software installation the program offers eleven default entries. The selected name in the list defines the directory name your measurement files will be stored in. You get detailed information in the file about the meaning of these entries and what points you should take notice of. From this section you can also access our communication tool WinIt – please press <F2> or the corresponding button <LOGGER [F2]>.If you want to start directly the download operation after the program WinIt has started press the key <F9>.
- The third section lets you define with which measurement our analysis tool Analyzer is started. Similar to section one - the event selection - you have several different ways to change the current measurements. The first way is to select a previous measurement from the history list. The second way is to start our integrated *File Explorer* with the shortcut <ALT + S> (for selecting) or <ALT + O> (for opening) or by clicking the button <Select> in the window. The third way is to enter a new measurement name directly – confirm with <*Enter*>. Use the button <*Newest*> to insert automatically the last downloaded measurement.

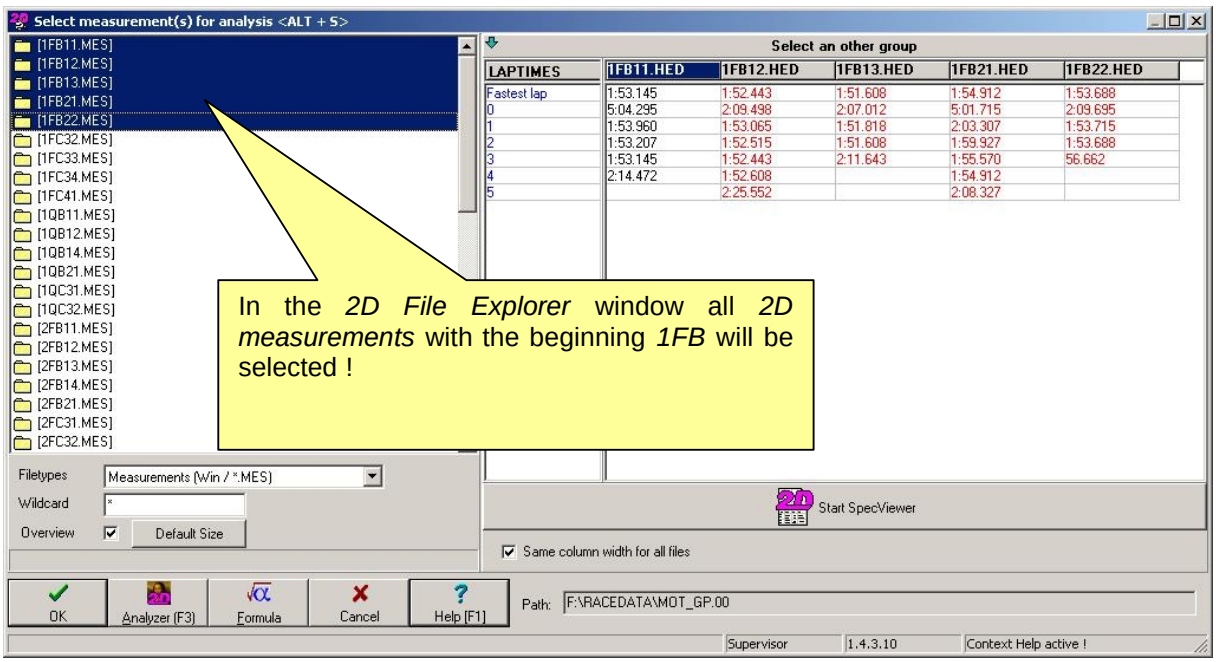


Note: Use the button <Newest> to insert automatically the newest 2D measurement in the historylist from the third area (measurement selecting)

You can change the entry from the history list in section two and three directly with the keyboard of your computer. Therefore select a new value / name and confirm it with the key <Enter>. Only in section three you have the chance to enter a wildcard character. That means a measurement name + an * character. For example if you enter *"1F*"* and press afterwards *<Enter>* you will automatically get all measurements in the current Event folder which start with *"1F"* at the beginning - refer the following both figures.



After insert the wildcard (in the example 1FB*) confirm it with the button <Enter>. Afterwards the *2D File Explorer* will be automatically started.



The second section represents the communication level. Here you also get a history list where you can choose from eleven entries. After the first software installation the program offers eleven default entries. The selected name in the list defines the directory name your measurement files will be stored in. The table below has detailed information about the meaning of these entries and what points you should take notice of. From this area you can also access our communication tool *WinIt* for this please press *<F2>* or the corresponding button *<LOGGER [F2]>.* If you will start the download operation directly after the program started press the button *<F9>.*

Overview of the default entries (Logger mastername) from the history list in area 2.

Entry	Meaning
1F__	Measurements first free practice
1Q__	Measurements first timed practice
2F__	Measurements second free practice
2Q__	Measurements second timed practice
WU__	Warm up measurements
LAP__	Measurements of the first timed lap
GP__	GRAND PRIX race measurement
TST__	Test measurements
1D__	First download
2D__	Second download
3D__	Third download

As an example we look at the first default entry with the name 1F_ _. Besides the name 1F you can recognize two underscore characters (_ _). These characters are called suffix characters and have the follow meaning.

The complete name of the directory with the extension *MES* where the Datalogger stores his measurements is created in following way.

First, the characters *1F* and in addition for each underscore character (_) one character from the current Datalogger name, beginning at the end, are used for the measurement name. The system automatically extends this name with an increasing number at the end. For example the Datalogger default name (factory setting) is “ATA”. After a download operation from the Datalogger the system generates the following measurement folders in your current Event:

1FTA01.MES, 1FTA02.MES, 1FTA03.MES and so on.

You have the following advantages if you use the default entries:

- This is very useful if your team has more than one Datalogger (bikes) and more than one drivers.
- So you can see from the name of the current measurement from which time period this measurement is
- Additional the driver information and the information which Datalogger recorded the data.



You can change the current *Logger name* in the communication tool WinIt

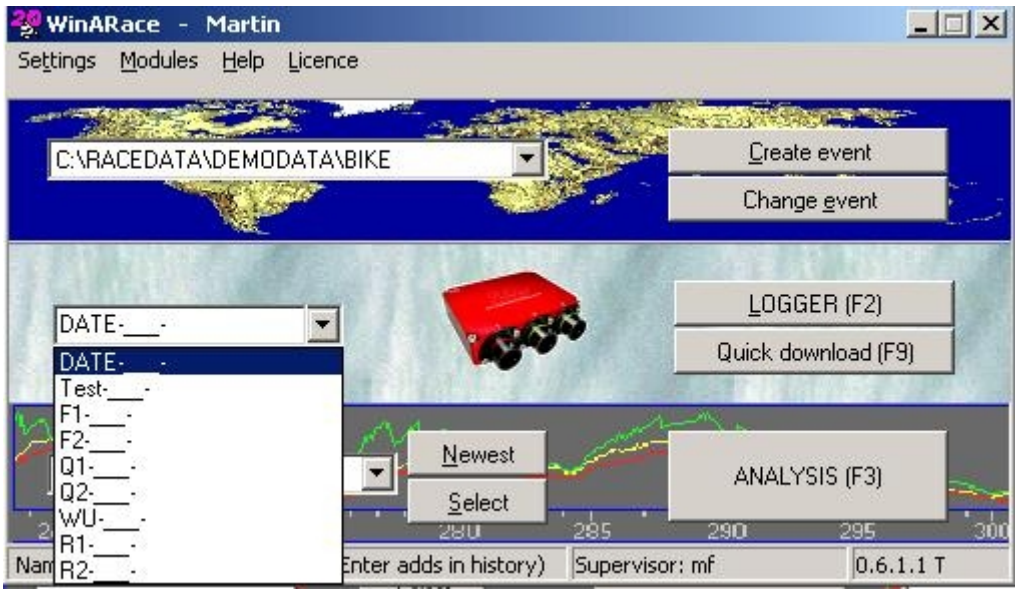
1.1.1 Restricted Logger Mastername - the "Cup" or the "Small" license

The Mastername selection is restricted from the current software license.

2D distinguish general between four different license levels.

	Available license levels
•	Small
•	Cup
•	System
•	Full

If the license of the 2D-Software is "Small" or "Cup", then the giving of names for measurements is restricted. The field for the naming of measurements of WinARace is limited on a list of nine available master names (refer figure below):



	Restricted Logger Mastername	
•	DATE-___-	(current date information, see detailed informations)
•	Test-___-	(Test)
•	F1-___-	(Free Practice)
•	F2-___-	(Free Practice)
•	Q1-___-	(Qualifying)
•	Q2-___-	(Qualifying)
•	WU-___-	(WarmUp)
•	R1-___-	(Race)
•	R2-___-	(Race)

With these licences the naming of devices with the communication tool WinIt is restricted. Devices, which record data, have to be named eiter with the **starting number** or **the initial of the driver**. If a logger is connected the first time with the communication tool, it prompts the user to enter a valid logger name. You have to change the name of the logger.

We suggest the use of starting numbers of your vehicles !

Device name	Replacement (underscores)	Possible values
Starting numbers:	NNc	N possible values 0..9
		C possible values a..f
Driver intitials:	BBc	B possible values A..Z
		C possible values a..f

"DATE-___-" is a special mastername. It is used to create measurement names containing information about the date, the measurement was downloaded. The software replaces the part "Date" of the mastername by the month and day at which the measurement was created. The format is MMDD, that means the first two characters are replaced by the month and the next two by the day.

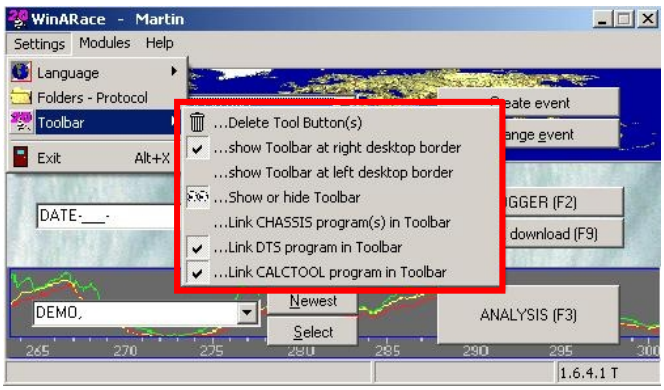
Examples:

- If the master name "Test-___-" is selected and and the logger has the name “22a” (Starting number 22 and “a“ for the first vehicle of two drivers with the same number), the the first measurement name will be "Test-22a-01".
- The mastername "DATE-___-" is selected and the name of the logger is “MH”. Today is the 14.04. The resulting measurement name for the first download is "0414-MH-01".

1.2 The 2D toolbar – the quick start device of WinaRace

The *2D toolbar device* gives you the option to start internal software functions and external programs quickly. The toolbar opens automatically each time you launch the program *WinaRace*, and by default the toolbar is docked to the right side of your desktop.

You also have the option to dock the toolbar to the left side if you like. You can change the various settings of the toolbar in the main menu item *Settings / Toolbar* of the program *WinaRace* - see the figure below.



1.2.1 Desktop appearance of the 2D toolbar device

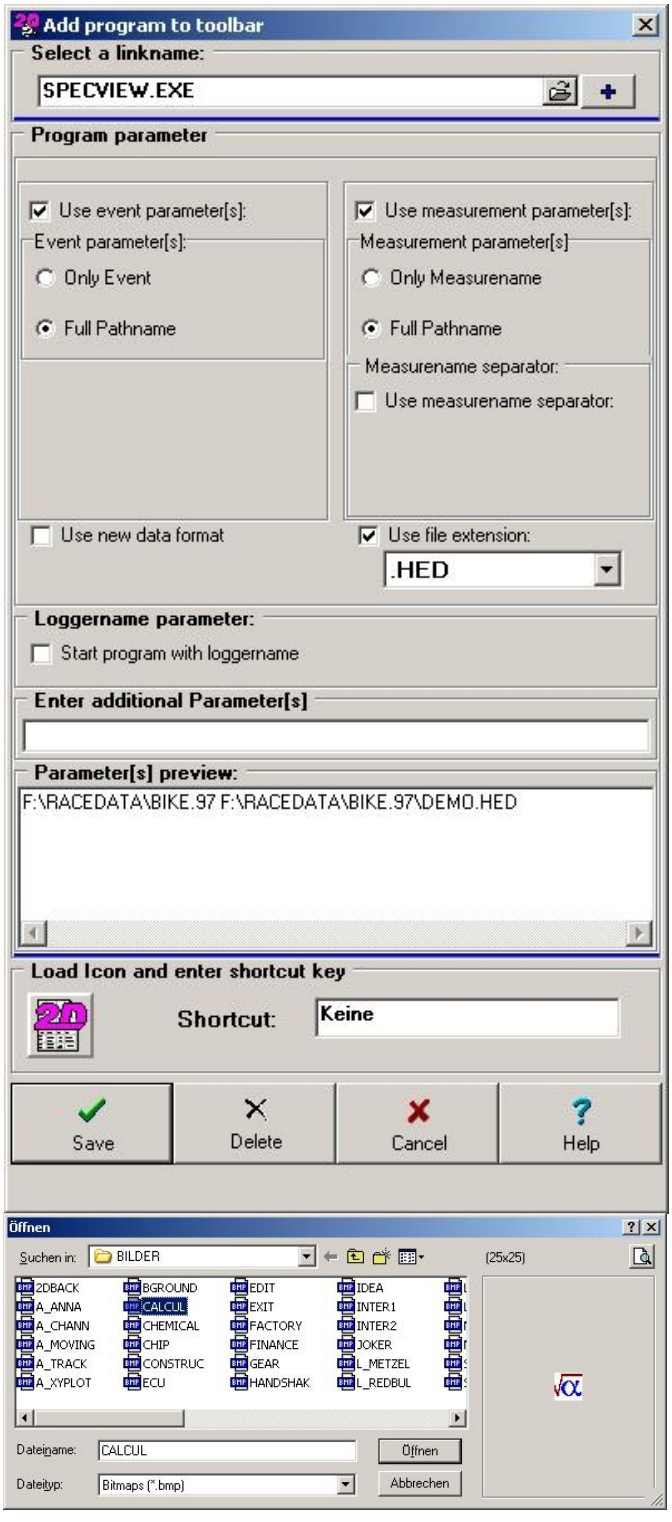
The toolbar device is divided into a *fixed* and a *variable* section

Please note: You can't change the functions behind the first 6 fixed toolbar buttons !

		Starts 2D data administration tool – SpecView
		Starts the context sensitive help file to this subject. At the moment you get only the help files in English and German language.
		Enter a comment for the selected 2D measurements. – The group [Comment] will be modified in the corresponding header files *(SpecSheets)*
		Load and change Weather information from the current Event. All information is saved into the file *Weather.ini* in your current *Event*.
		Search function for specified parameters in the header files (SpecSheets) of the current Event (GREP searching)
		Show the current circuit.
		Starts the program SpecView (data administration) and automatically loads all *Permanent Info files* from the current Event. *(Named P_*.HED files.)*
		Starts the program *WFormel* – to load and edit formula files for each selected measurement.
		Starts the program *CalcTool* with parameters – to calculate and create new channels.
		Starts the Tire Perimeter Wizard. Necessary if you want to re-calibrate your speed channel if you change the tire circumference.

1.2.2 How can I link a program at the variable toolbar device ?

You have the option to enter limitlessly count of file links in the variable toolbar device, depending on the graphic resolution of your computer. If you want to enter a new file link or delete an existing link you can use the window shown in following figure. After you select an empty tool button with the right or left mouse button you will get the following window:



Enter in the first section your individual file link. Use the history list (small plus button) to select from a list of the last 10 links.

We distinguish between two kind of parameters.

1. Event Parameter
2. Measurement Parameter

Use the checkbox <*Use new data format*> if you work exclusively with the new 2D measurements (*MES directories).

In case you need the current logger name as additional parameter check this checkbox.

-
- Enter any additional parameter you like.

You will get a detailed parameter preview for each selection in the toolbar link window.

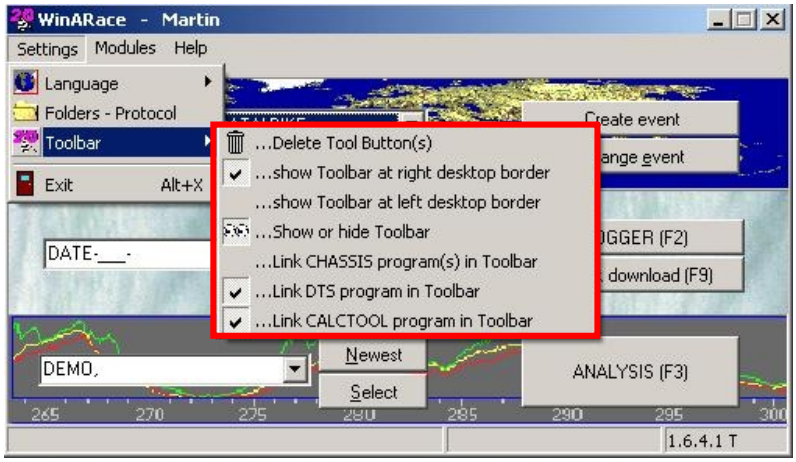
Allocation of a individual shortcut key and a link icon. Note: We support only the both graphic formats *.bmp and *.gif.

Confirm all selections with the button <Save>

Take a mouse click at the button beside the caption <Shortcut>.Afterwards you will get a standard windows open dialog to allocate a individual icon for your selected link !

1.2.3 Configure the 2D toolbar device

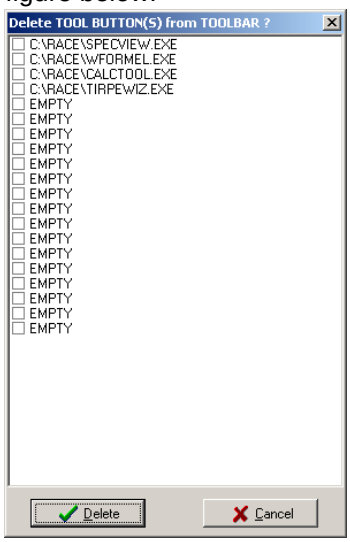
To configure the toolbar device, enter menu item *Settings / Toolbar* in the *Front-end tool WinARace*. You will see several sub-menu items that allow you to customise your desktop configuration.



The sub-menu items are described in the following:

- ***...Delete Tool Button(s)***

If you want to delete file links use the <*Delete Tool Button(s)*> function. Select the file links you want to delete and press *Delete*. Refer to the figure below:



- ***Arrange toolbar at right or left desktop border.***
  You can dock the toolbar to the right or left desktop border. The new position will be saved automatically after *WinaRace* is terminated.

- ***Show or hide toolbar.***
  If you want to hide (blank out) the *2D toolbar device* at the program start of *WinaRace* you need to select this menu item.

- ***Link MS-DOS program(s) in Toolbar***
  If you want to work with the *old MS-DOS programs* in the future, you can link the programs *ANALYSE*, *SPEC* or *PROGIT* directly to the toolbar device. See below:



- ***...Link DTS program in Toolbar.***
  Automatically link the program *DTS (Dynamic test system)* into the *2D toolbar device.*

Optional feature (additional software module): Only possible if you have the program *DTS* in your execute directory !

- ***...Link Chassis program(s) in Toolbar***
  The *CHASSIS add-on program* is an add-on not included in the normal scope of delivery of our software. It is exclusively targeted towards high-end professional users !.
  We distinguish between three kind of starting modes – they are:
  - Start the program with the parameter *Force*
  - Start the program with the parameter *Bike*
  - Start the program with the parameter *Movie*



Optional feature (additional software module): Only possible if you have the program *Chassis* in your execute directory !

- ***...Link CALCTOOL in Toolbar.***
  Automatically link the program *CalcTool* (calculating of new channels) into the *2D toolbar device*.

1.3 Easy and quick Event selecting (changing) - The 2D Event explorer window

With our Front-end tool *WinaRace* you can define the current Event and the start measurements for the analysis tool Analyzer. Both functions are implemented in our software into two windows, the *2D Event Explorer* and the *2D File Explorer*.

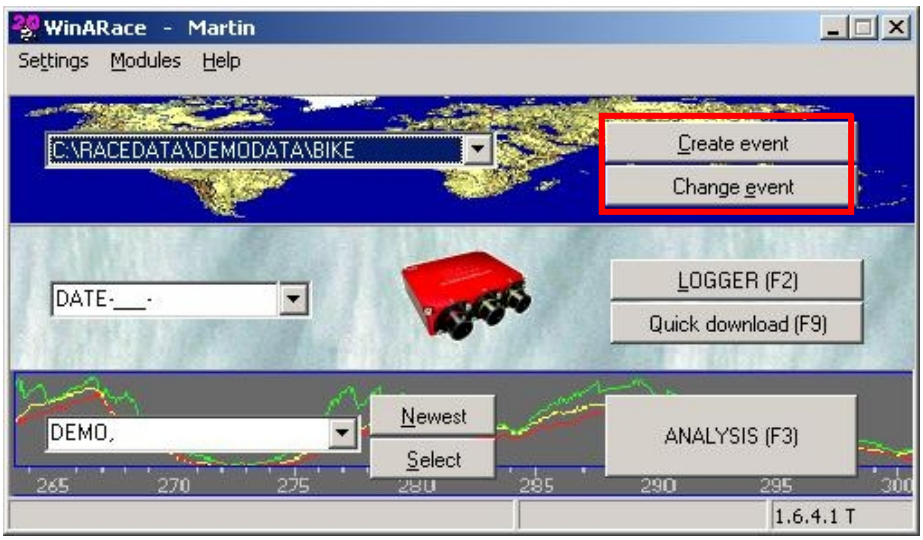
The structure of our software is divided into several separate software modules. It means:

Some of these software modules (like Analyzer, WinIt, WinaRace or SpecView) are stand alone executable programs. Other functions were implemented into windows library files *DLL (Dynamik link library)* – including the *2D Event Explorer* and the *2D File Explorer*.

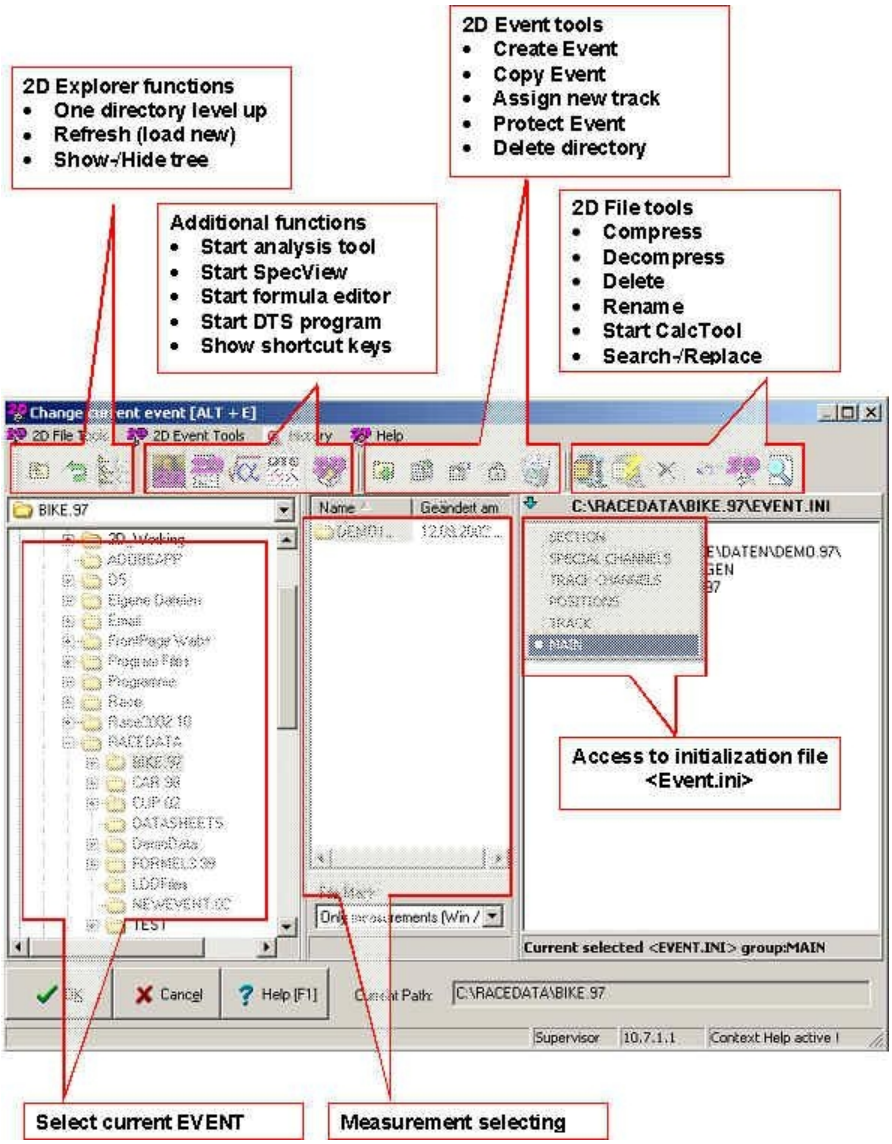
The DLL files you needed are called *FileSel.dll* and *EFsel.dll* Both are located directly in your program directory. The main function is to select the current Event and measurements and it is the same for all software modules which use this function. Therefore all software modules have the same window appearance – for software beginners it is very easy to use the 2D software.

The *2D Event Explorer* offers only some additional Event information which are read directly from the file <*Event.ini*> in the current Event. On the other hand the *2D File Explorer* offers additional measurement information (header file information – the same function as in the program SpecView).

You can access the *2D Event Explorer* via the start window of our Front-end tool *WinaRace* by pressing the shortcut keys <*ALT + E*> or by clicking the <*Change event*> button (refer the next figure)



You will get the following start window of the *2D Event Explorer*:



The window of the *2D Event Explorer* is tiled into three areas:

- The current Event selecting (left panel)
- Measurement selecting (middle panel)
- Access to initialization file *EVENT.INI* (right panel) if you selecting a 2D Event or otherwise *SpecSheet i*nformations if you select 2D measurements !

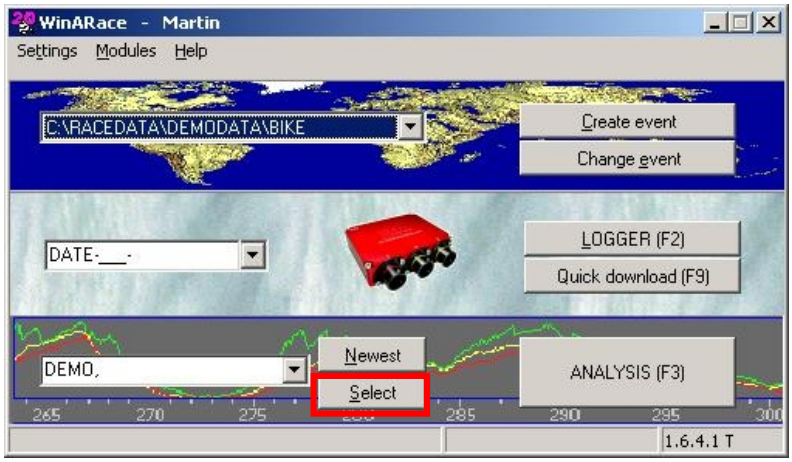
You can reach all Event and measurement specific functions (like new event creating for example) via the main menu, the context menu (right mouse click) or a corresponding shortcut key. The following table show you all available functions and the related shortcut keys.

1.3.1 Shortcut keys of the 2D Event Explorer window

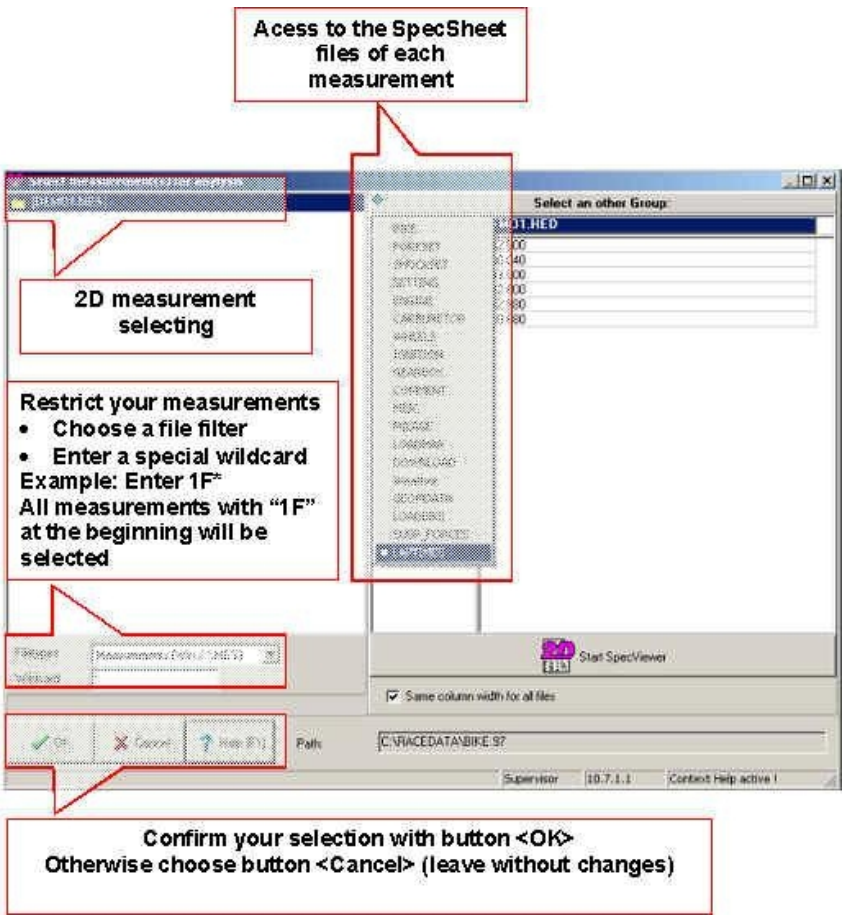
2D Event specific functions	Shortcut
Assign new track map to the current Event	< Ctrl + H >
Compress a complete Event (close it)	< Shift + C >
Copying a complete Event	< Ctrl + O >
Create a new Event	< Ctrl + C >
Decompress a complete Event (open it)	< Shift + D >
Delete a complete Event	< Ctrl + D >
Protect a complete Event	< Ctrl + P >
2D measurement specific functions	**Shortcut**
Convert old 2D measurements into the new data format	< Alt + C >
Copy single 2D measurements	none (enter main menu or context menu item)
Compress single 2D measurements	< Ctrl + Alt + C >
Decompress single 2D measurements	< Ctrl + Alt + D >
Delete single 2D measurements	< Alt +D >
Rename single 2D measurements	< Alt + R >
Search and replace into 2D measurements (channel renaming)	< Ctrl + F >
Start formula editor	< Alt + F >
Start the program Calctool with single 2D measurements	< Alt + T> + <Alt + M >
Starts the analysis tool with selected measurements	< F3 >
Starts program DTS with selected measurements Optional feature (additional software module)	< F4 >
Starts program SpecView with selected measurements	< ALT + I >
General / Explorer specific functions	**Shortcut**
Automatic window arrangement of the analysis overview window and the Explorer window	< Alt + A >
Enter main menu item *History*	< ALT + H >
Enter main menu item *2D File Tools*	< ALT + O >
Enter main menu item *2D Event Tools*	< ALT + V >
Enter main menu item *Help*	< ALT + L >
Fade in the analysis overview window	< Alt + 1 >
Close 2D Event Explorer and take selected Event / measurements	< ALT + K >
Close 2D Event Explorer and take selected Event	< Enter >
Close 2D Explorer without taking selected event <Cancel>	< ALT + X >
Close 2D Explorer without taking selected event <Cancel>	< ALT + F4 >
Double click at selected measurements	Same as <Enter> key
Keep < CTRL > key pressed (at file list view) + left mouse double click	Select single measurements + close *2D Event Explorer*
Keep < SHIFT > key pressed (at file list view) + left mouse double click	Select complete blocks of measurements + close *2D Event Explorer*
Refresh file and directory list view	< F5 >
Start context sensitive help module	< F1 >

1.4 Easy and quick measurement selecting - The 2D File explorer window

You can access the *2D File Explorer* via the start mask of *WinaRace* by pressing the shortcut keys <*ALT + S*> (for selecting) or <*ALT + O*> (for opening) or by clicking the <*Select*> button.



You will see following start window:



The 2D File Explorer window is divide into two areas - the are:

- The measurement selecting (the left panel)
- Access to the *SpecSheet* files of each 2D measurement. (special files which belong to each 2D measurement)

1.4.1 Shortcut keys of the 2D File Explorer window

Functions at the 2D File Explorer	Shortcut
Start formula editor	< ALT + F >
Starts program SpecView with selected measurements	< ALT + I >
Close 2D File Explorer same as <Cancel>	< ALT + X >
Close 2D File Explorer same as <Cancel>	< ALT + F4 >
Close 2D File Explorer without taking selected 2D measurements – same as Cancel	< ALT + E >
Start context sensitive help module	< F1 >
Starts program Analyzer with selected measurements	< F3 >
Close 2D File Explorer and take selected measurements	< Enter >
Double click at selected measurements	Same as < Enter >
Keep < CTRL > key pressed (at file list view) + left mouse double click	Select single measurements + close 2D File Explorer
Keep < SHIFT > key pressed (at file list view) + left mouse double click	Select complete blocks of measurements + close 2D File Explorer

1.5 The functions of the 2D Event Explorer

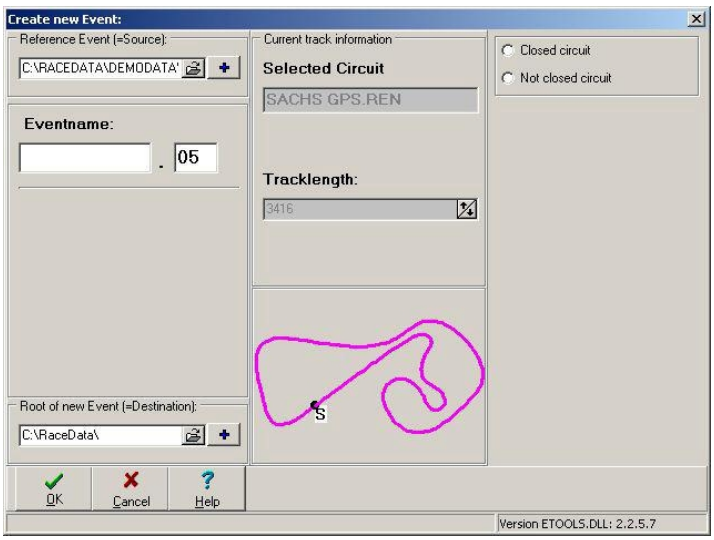
1.5.1 Create a new Event

Before you start to download the data from the *Datalogger* you should define the current *Event* at which your data will be saved !

- Step1:
  Start WinARace
- Step2:
  Select the button <Change event>
- Step3:
  Click on the symbol in the toolbar or select the option Create a new Event in the menu 2D Event Tools



- Step4:
  The following start window appears:



The window above is tiled into three areas (=panels):

First area:
At the first panel you can define the following settings:
The Reference Event (=Source) the directory from which you want to copy all necessary files.
The Eventname
The Root of the new Event (=Destination)

Second area:
General information about the current selected circuit. E.g. the name of the selected circuit and the Tracklength for example. The (default) tracklength will be read from the corresponding "Circuit.ini" file. The correct track length will be calculated automatically by the Analysis software based on the measurement data.

Third area:
First of all select one of the option "Closed circuit" or "Not closed circuit". "Not closed circuit" is e.g. then meaningfully if you measuring data over a 2D GPS system and you are not on a closed race track ! If you are otherwise on a race track, select these from the list.

If you select the option "Closed Circuit", the LapChecker is always started (=from the 2D analysis software). The software calculate the Tracklength based on the measurement data and tries to determine the track characteristic (e.g. track segments). Select the option "Not closed circuit" if you "jump over" this step in the 2D analysis software. (e.g. meaningfully if you use a GPS System on a not closed race track).

- **Step5:**
  If you choose the option "Not closed circuit" you can jump over step 5. Continue in this case directly with step 6

  Select a circuit from the list on the right hand side.
  The software distinguish between two different circuit sub- directories. They are:
  1. The sub- directory called '\Circuits'. This directory exist directly in your current WinARace folder. This is the default directory for all important circuits especially for all GP circuits. The software will be create this directory automatically during the software installation of WinARace.

  2. The sub- directory called '\MyCircuits'. This directory exist also directly in your current WinARace folder. If you starting the "Track Manager" (from the Analysis tool) the software will be saved all calculated race tracks into this special user directory.





Use this button to show all available circuits.



Use this button If you liked to limit the list. Only the tracks of one country are then indicated. Which country is indicated, depends on the selection of the track before this Button is pressed !



Use this button, if the searched track should not be specified in the list. An appropriate circuit is then registered according to standard by the software (=Base.ren from the "\Circuits" folder)

- **Step6:**
  The box Destination root of new Event shows you where your data is saved. The directory can be changed.



Use this button to open a standard directory dialog.
Use this directory to choose the directory from a historylist (=last ten directories).

- Step7:

Confirm your input with <OK>. Also confirm the following dialog box with <OK>. The event directory in which your data is saved, is now listed in the tree on the left hand side and selected automatically !

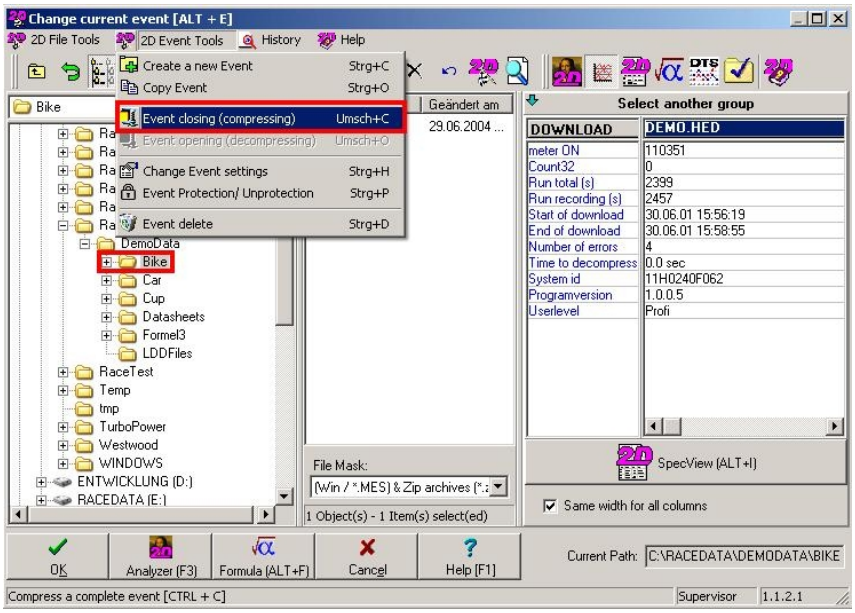
- Step8:

Click <OK> to return to the start page.

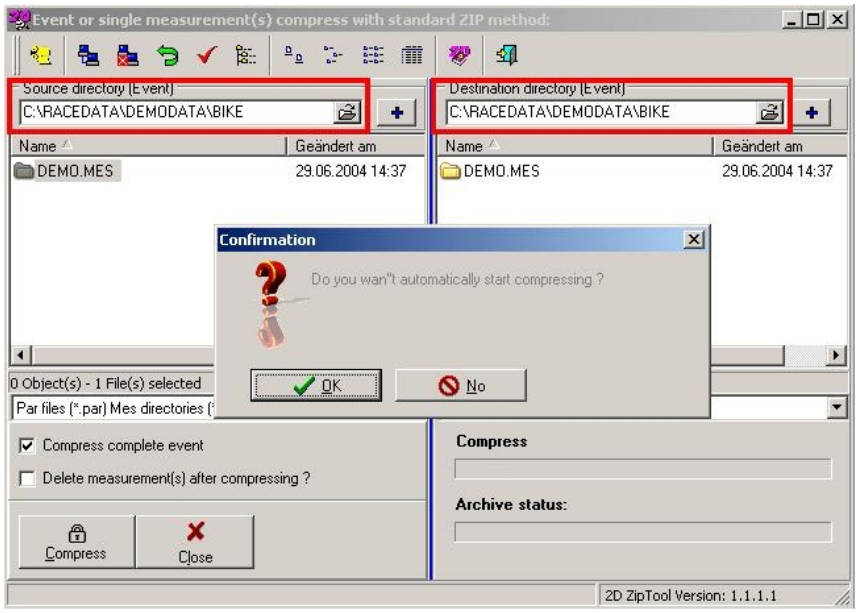
1.5.2 Compress a complete Event

The *2D Event Explorer* allows you to compress a complete *Event* (to save hard disk space). First of all start the *2D Event Explorer window*. Therefore select the *button <Change event>* or press *<ALT + E>* in our *Front-end tool WinaRace.*
Afterwards select the *Event* you want to compress. Now you can start the compression tool in the following ways:

1. Enter the main menu item *2D Event Tools / Event closing (compressing)* or open the context menu (right mouse click) and select the same menu item. Alternatively you can also use the shortcut key *<Shift + C>.*



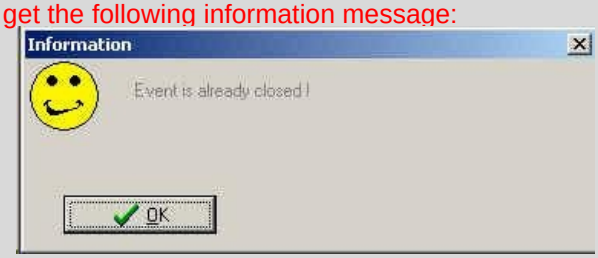
2. We have automate the compress operation. It means the user must confirm only one single confirmation dialog. If you press the button *<OK>* the software automatically compress the selected *Event* (close it) . Otherwise press the button *<No>*. In this case you have the possibility to change some settings - they are:
   - Change the *Source directory* (choose another *Event*) for compressing
   - Change the *Destination directory*. So it is possible to copy + compress an *Event* in only one step !
   - Maybe check *Delete measurements* if you want to delete the original files after compressing.



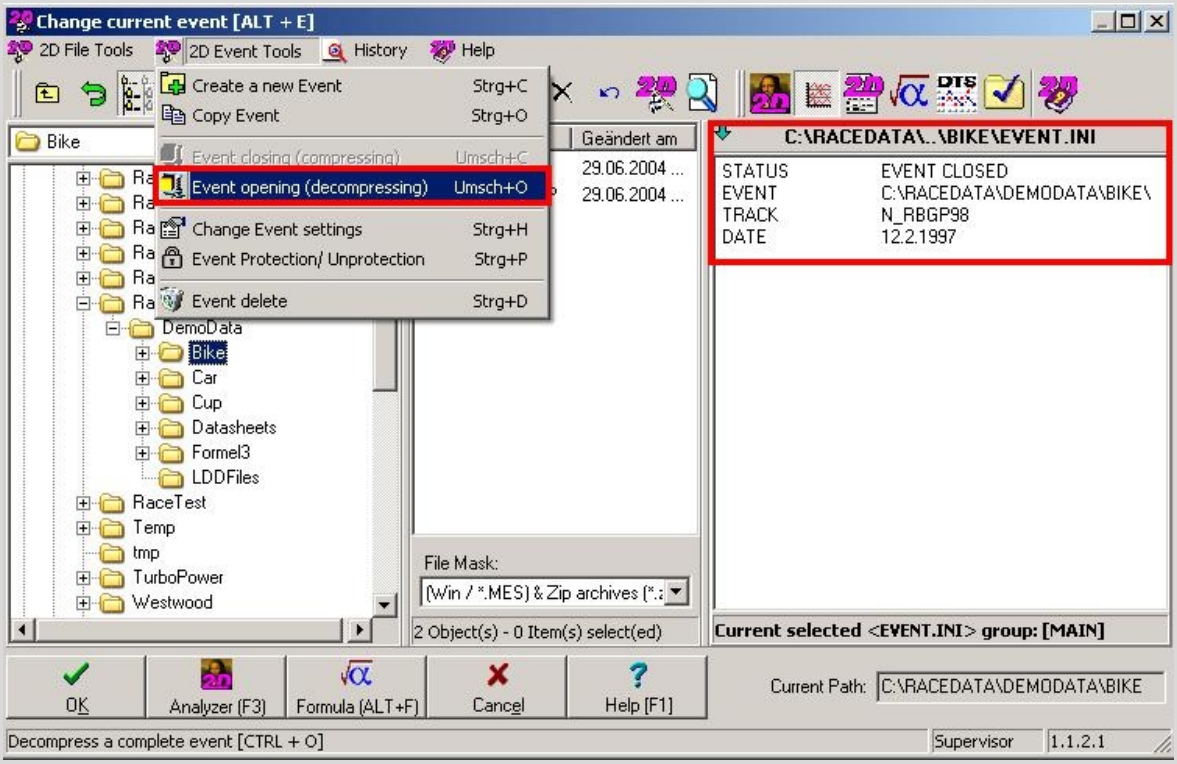
3. The software compress all measurements inside the selected *Event* automatically. You get for each measurement an single zip archive. The prefix character *M_* in the archive name references a *MES directory* – our new data format. If you compress our old files *PAR* (our old data format) you get the prefix character *F_* Additional you get for each zip archive a single zip logging file in standard text format. You can read these files directly in the *ZipTool window*. Therefore change the file filter from the right panel at filter *Zip logging files (*.TXT).*

After the compress operation is finished you will automatically return to the *2D Event Explorer window*. You can detect an closed (compressed) Event at the following properties:

- The main menu item *Event closing (compressing)* is disabled. If you press the shortcut key <SHIFT + C> you will get the following information message:



- At the group [Main] in the corresponding *Event.ini* file you will get the *Event status Event closed* !



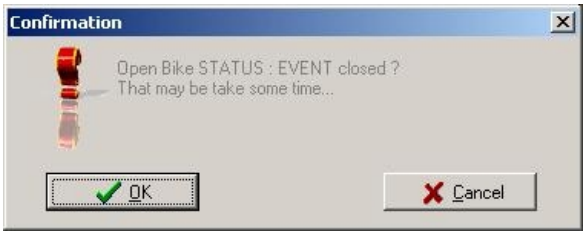
1.5.3 Decompress a compressed (=closed) Event

You can open (decompress) a complete Event with our software module called as *ZipTool* directly in your program directory. Follow the instructions step by step.
First of all start the program *WinaRace* and start the *2D Event Explorer window*. Therefore select the *button <Change event>* or press the shortcut key <*ALT* + *E*>.

1. Select the Event you want to decompress (=opening) from the tree view. You can recognize a compressed Event at the following two properties:

   - You will get in the group [Main] from the corresponding *Event.ini* the current Event status: *Event closed*
   - The menu item *2D Event tools / Event closing (compressing)* is disabled.
     refer step 3 at chapter 1.5.2

2. Select the main menu item *2D Event tools / Event opening (decompressing)* or press the shortcut key <*SHIFT* + *O*>. Confirm the confirmation dialog with <*OK*>. During the Event – decompression you are updated with a status information view.



The software propose a decompress directory. This directory is the same where the compressed archives exists.
We recommend to use the current Event directory for compression (=default directory). So the compressed archives do not loose the reference to the related Event at any time !



- After the decompress operation you will get this message !



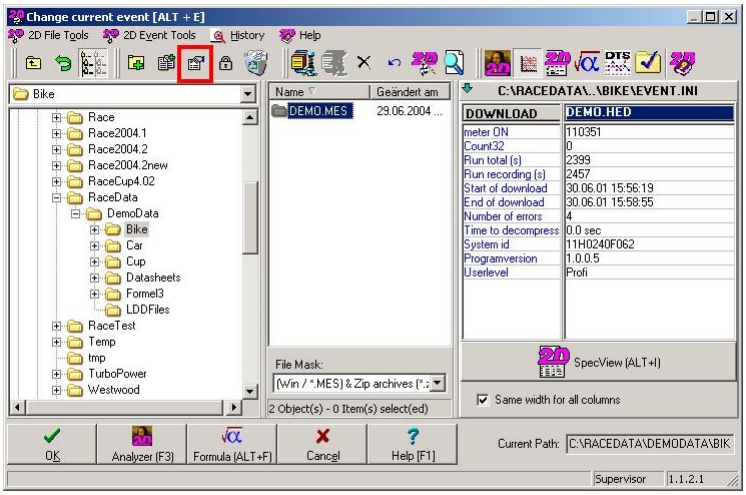
1.5.4 Assign a new track map

If you *create a new Event* you have the option to assign a new circuit to this Event. If you want to change this circuit later in time (update it) you can start this function from the *2D Event Explorer* window. All necessary information about the current Event will be saved into the corresponding *EVENT.INI* file. It exist in each Event.

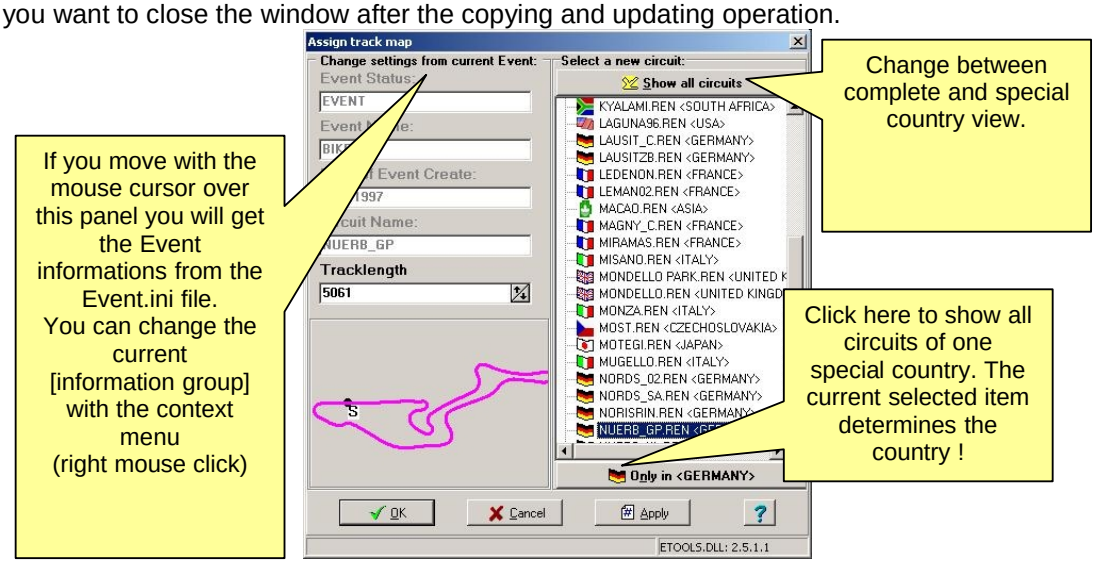
Change the current track by following the instructions step by step:

- First of all start the *2D Event Explorer window*. Therefore Select the *button <Change event>* or press the shortcut key <ALT + E>.

1. Afterwards press the shortcut key <*CTRL + H*> or select the corresponding button from the toolbar device.



2. Select the new circuit you want to use in the current Event from the default circuit list (tree view) and enter the correct track length (if you known it – you can also enter this value later in the analysis tool). Confirm with <*Apply*> if you want to keep the window open or with button <*OK*> if you want to close the window after the copying and updating operation.



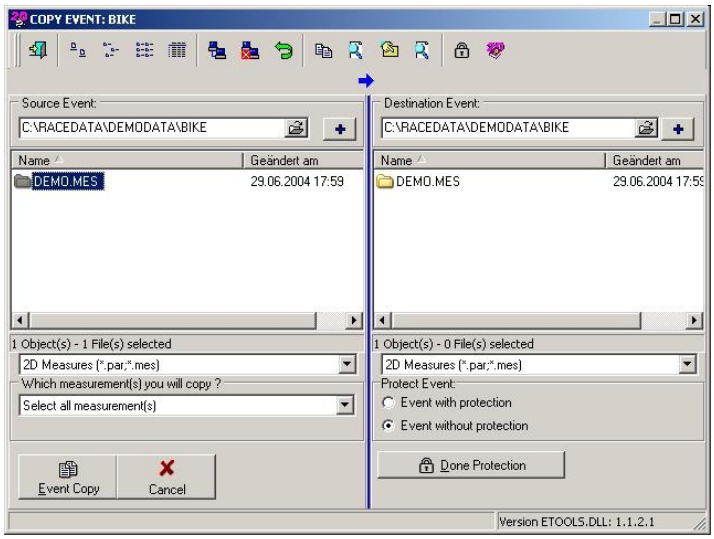
If you confirm with the button <OK> or <Apply>, the current race track will be replaced by the new circuit file which is copied from your current *CIRCUIT directory*. You must confirm an additional warning dialog (loose current track settings) with <*OK*>.

1.5.5 Copying of a complete Event

1. First of all start the *2D Event Explorer window*. Select the *button <Change event>* or press <*ALT + E*> at our *Front-end tool WinaRace*.
2. Afterwards press the shortcut keys <*CTRL+ O*> or click on the corresponding button on the toolbar device of the Explorer - press the button marked in the red circuit.



3. You get following start window:



4. On the left side select the Event you want to copy and on the right side the destination directory. Directly after the starting all measurements inside the current event were selected (refer the left panel). Change at the right panel the destination directory at which place you will copy the new Event. Afterwards you have the change to protect the complete Event while selecting the radio button <*Event with protection*>. If you directly confirm with the button <*Event copy*> the copy operation starts immediately.



If you want to change the source Event or the destination Event you can do this comfortable with an standard dialog box which appears if you select the open directory button. If you want to enter a new (not existing) directory, you can directly enter a complete new directory path at the corresponding fields.

5. Start the copy operation by selecting the button <*Event Copy*>.

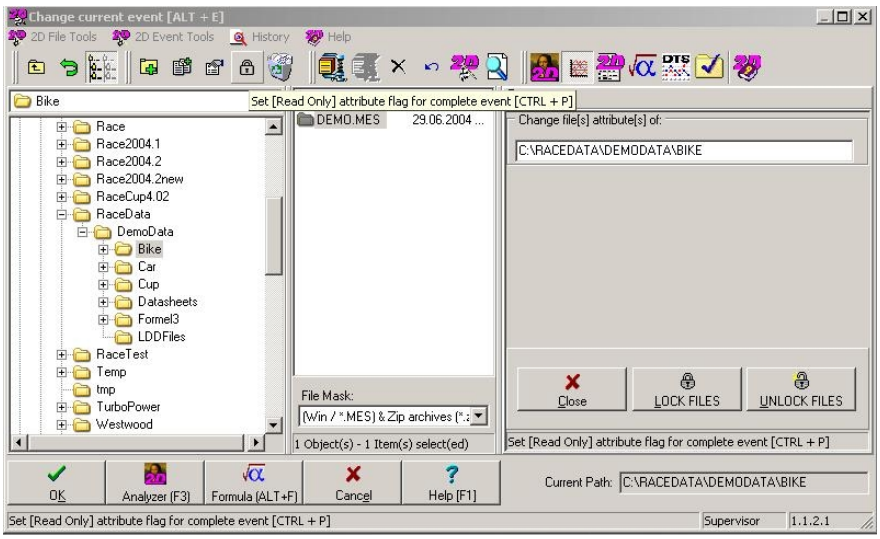
1.5.6 Protect a complete Event

You have the option to protect a complete directory. All files inside this directory will be read-only and can't be changed. You can also remove the file protection any time you like.

You protect a complete directory like this:

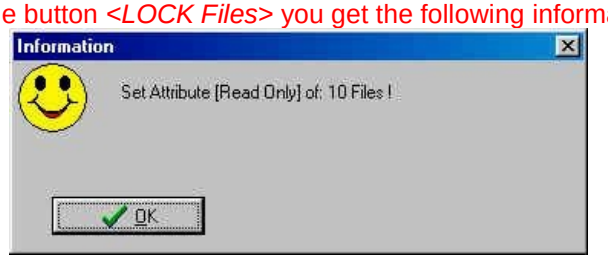
- First of all start the *2D Event Explorer window*. Select the *button <Change event>* or press <ALT + E> at our Front-end tool WinaRace.

- Then press the shortcut keys <*CTRL + P*> or click the corresponding button on the toolbar device of the Explorer. (refer the next figure)

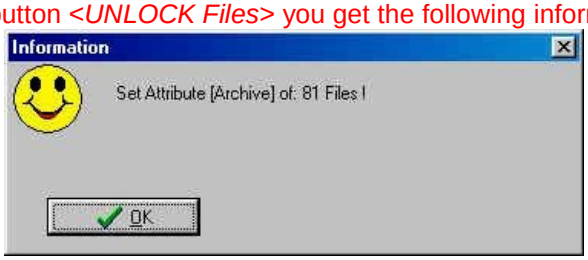


- The according window is directly "docked" into the ***2D Event Explorer window*** (see the right panel at the figure above). In the window above you can recognize three additional buttons at the left panel. They are <*CLOSE*>, <*LOCK FILES*> *and* <*UNLOCK FILES*>. If you press *the button* <*LOCK FILES*> all files into the current Event will been protected – by setting the *Read only flag*. If you press the *button* <*UNLOCK FILES*> all files will been unprotected – by setting *the Archive flag*. You can close the additional protection panel with the button <*Close*>
- After you press the button <*LOCK Files*> you get the following information message:

After you press the button <*LOCK Files*> you get the following information message:



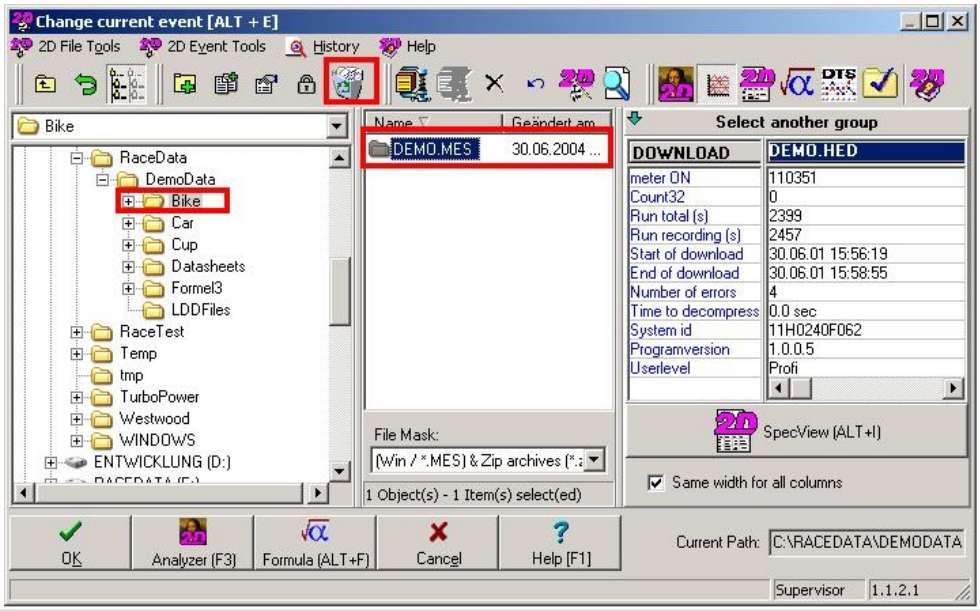
If you press the button <*UNLOCK Files*> you get the following information message:



1.5.7 Delete a complete Event

You have the option to delete a complete *Event*. If you delete the selected Event at the *2D Event Explorer window* all files are moved to the *Windows Recycle Bin place*. From the *Recycle Bin* directory of the operating system files are not yet deleted and you may restore all deleted files or directories in the further time.

- First of all start the *2D Event Explorer window*. Select the *button <Change event>* or press *<ALT + E>* at our *Front-end tool WinaRace*.
- Afterwards select the directory (from the tree view) you want to delete. Then press the shortcut keys *<Ctrl + D>* or click on the corresponding toolbar device button - press the button marked in the red circuit (refer the next figure).



You can use this function only if you select a *2D Event* (in the left tree view).

- You must confirm the deleting operation in the following message dialog. In the following example we have selected the *2D Demo Event Bike* at the tree view of the *2D Event Explorer window*.



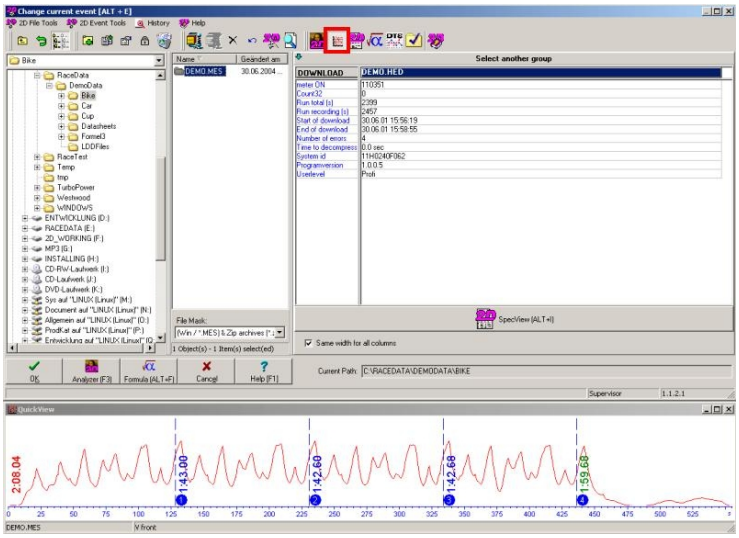
- Confirm with *<Yes>* if you want to move the selected directory to *Recycle Bin place*. Otherwise cancel the operation with *<No>*. In the figure above named in German language as *<Ja>* and *<Nein>.*

Note: If you delete 2D Events with this method you can restore these directories from *Recycled Bin* in further time (if it's necessary)

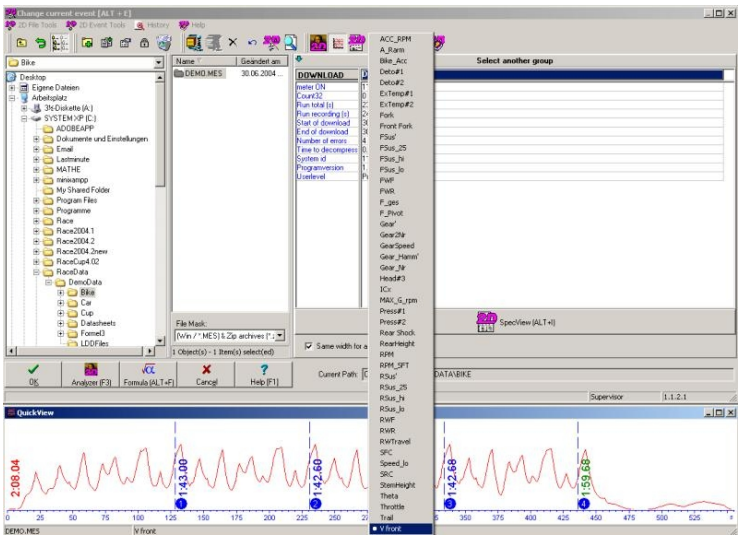
1.5.8 Fade in of the analysis overview window

You have the possibility to fade in (or fade out) an analysis overview window for the current selected 2D measurement. To do so following the next instructions step by step.

- First of all start the ***2D Event Explorer window***. Select the ***button <Change event>*** or press <ALT + E> at our Front-end tool WinaRace
- Afterwards select a 2D measurement (only **.MES directory* possible !) from the middle list view or from the tree view. Use the key up-/dows keys or the left mouse button to select a single measurement. If you select more than one measurements (Multiselect) the last selected measurement will be used !. Afterwards select the corresponding toolbar button or use the shortcut key *<ALT + 1>*. You will get the following desktop appearance.



- Via the context menu (right mouse click) at the *analysis overview window* you can change the displayed channel. Refer the next figure.

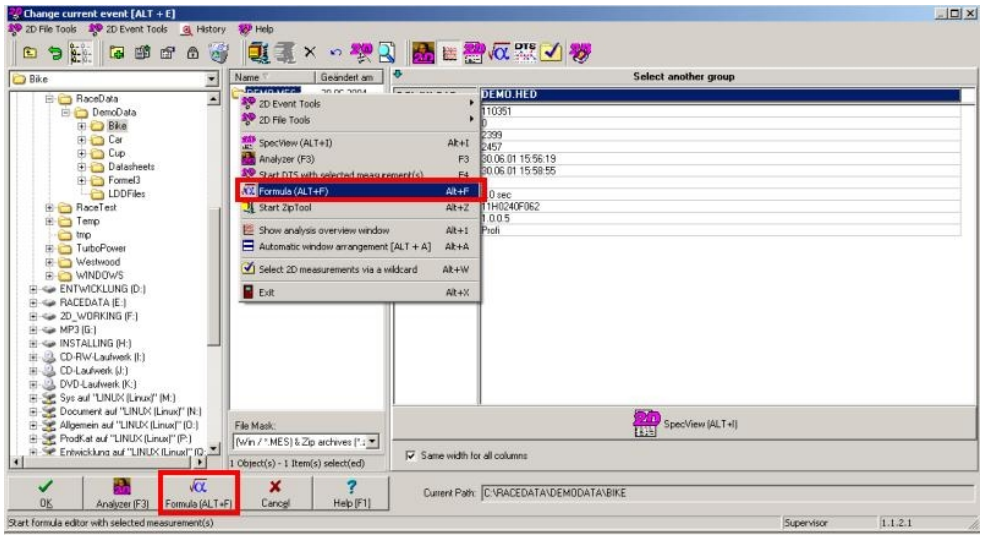


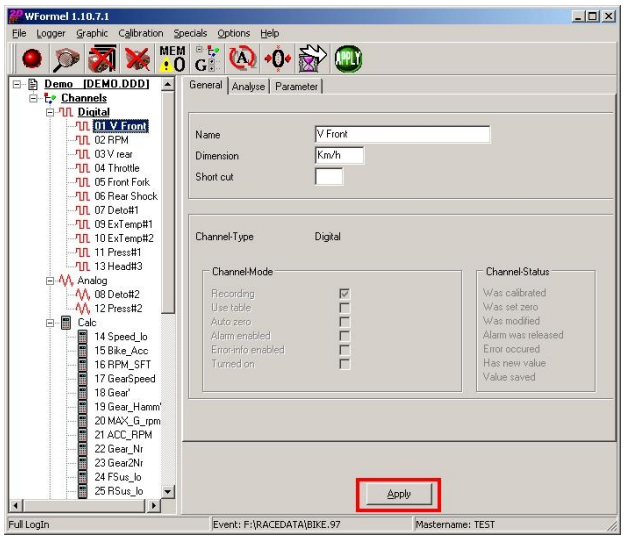
Take notice of: After the first 2D software installation this function is always enabled. It means you will get always the analysis overview window If you wan't disable this function (no overview window at the next explorer start) you must select the button again (or *<ALT+1>*) and afterwards close the explorer window via the button *<Ok>* or *<Cancel>*

1.5.9 Check (and change) the current measurement formulas - Start the formula editor

You have the possibility to start directly from the *2D Event Explorer window* the *2D formula editor*. The *2D formula editor* is a special part of the communication tool WinIt. With this editor you can comfortably check (and change) the current formulas of each *2D measurement*. The *formula editor* grab special files which belongs to each 2D measurement !

- First of all start the*2D Event Explorer window*. Select the *button <Change event>* or press <ALT + E> at our Front-end tool WinaRace.
- Select all *2D measurements* you want to compress directly from the *2D Event Explorer window* (at the middle list view (panel) Use the <*SHIFT*> (keep it pressed) and the *arrow up / down keys* if you want to select more than one file. If you want to select a single measurement in the list view located at various positions keep the <*CTRL*> key pressed and select all measurements after one another with the left mouse button.
- Use the shortcut key <Alt + F> to start the formula editor. Alternatively you can enter the context menu (right mouse click at the middle list view) and select the corresponding menu item.





- The editor display all formula files (of each selected measurement) in the left tree view. You can recognize the several channels (different sensors) of the measurements.

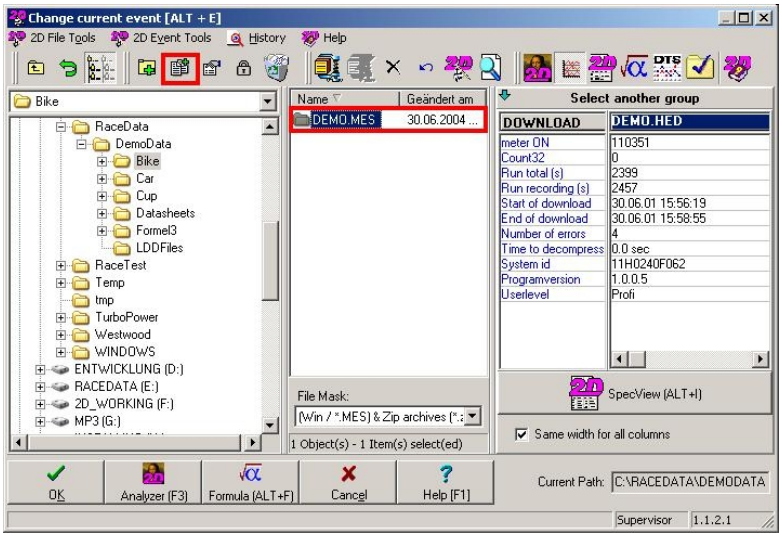


Note: You must confirm all changes at the formulas with the button *<Apply>*

1.5.10 Copy single 2D measurements

You can copy single *2D measurements* into another *Event* directly and easily with our software.

- First of all start the*2D Event Explorer window*. Select the *button <Change event>* or press <ALT + E> at our Front-end tool WinaRace.
- Preselect all measurements you want to copy in a another directory in the middle list view.
- Click on the according toolbar button in the *2D Event Explorer window* - refer the figure below.

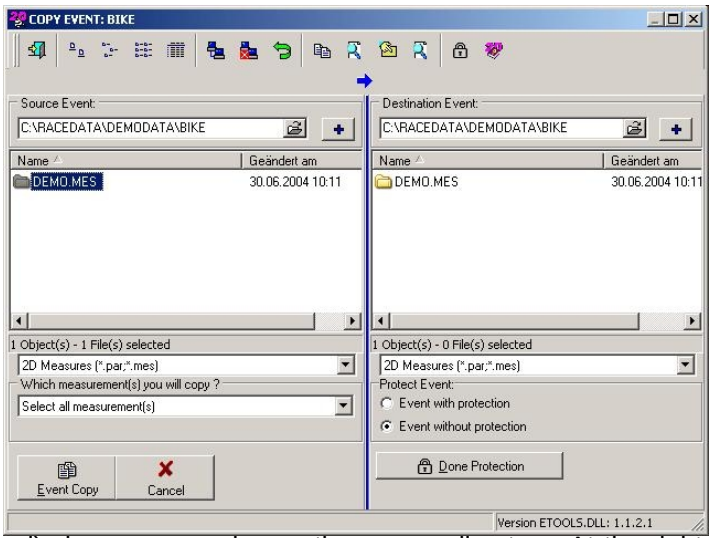


- In the example we want to copy the 2D demo measurement *DEMO.MES* located at*: C:\RACEDATA\DEMODATA\BIKE\DEMO.MES*.



Suppose C:\ is the installation drive of your current operating system !

- You get the following start window:

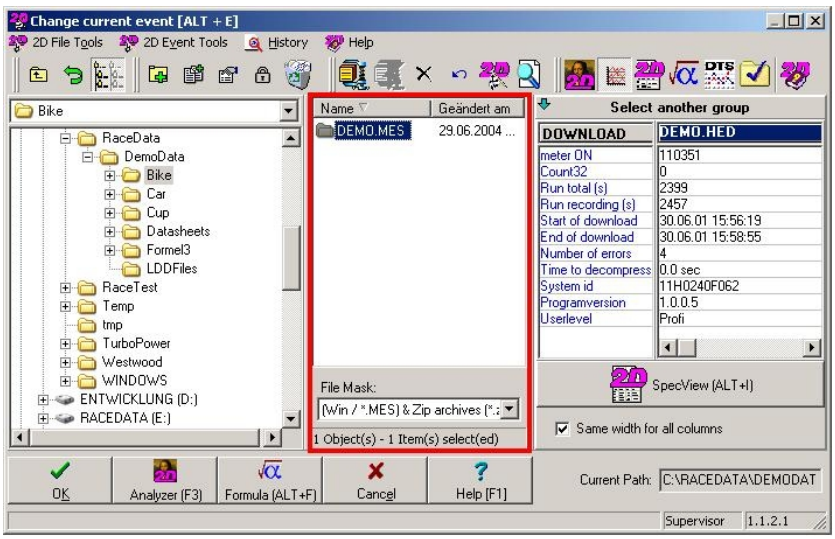


- At the left list (panel) view you can choose the source directory. At the right list view (panel) you can choose the destination directory. Please note: The default destination directory directly after the program launch is the same as the source directory. Start the copy operation with the button <*Copy*> or cancel operation and close window with <*Cancel*>. If you press <*Copy*> all measurements which are selected in the left list view are copied to the destination path (look at the right side top). After copying is finished the window is automatically closed and the *2D Event Explorer* window will be updated if necessary.

1.5.11 Compress single 2D measurements

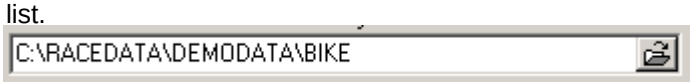
You have the option to compress single 2D measurements. You can use this function to send 2D measurements via email (small file size) for example. Follow the instructions step by step:

- First of all start the *2D Event Explorer window*. Select the *button <Change event>* or press <ALT + E> at our Front-end tool WinaRace.
- Select all *2D measurements* you want to compress directly from the *2D Event Explorer window* (at the middle list view (panel) Use the <*SHIFT*> (keep it pressed) and the *arrow up / down keys* if you want to select more than one file. If you want to select a single measurement in the list view located at various positions keep the <*CTRL*> key pressed and select all measurements after one another with the left mouse button.
- If you have selected all measurements you want to compress, press the shortcut *keys <CTRL + ALT + C>* or the corresponding toolbar device button. In the following figure you will see the toolbar device of the *2D Explorer window.*



- In the next dialog you must enter a destination directory (for compressing). To do so you have the following three possibilities:

1. Enter directly a new (=not existing directory) in the edit field or select an existing directory from the list.



2. Use the history list (last ten used directories) 

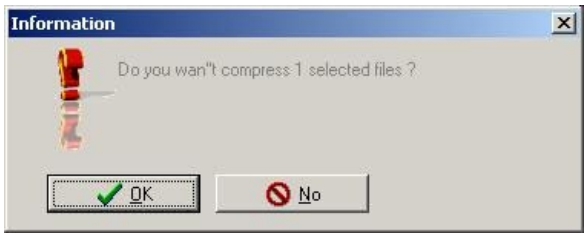
3. Select an existing directory from a standard open dialog. To do so use the dialog open button 



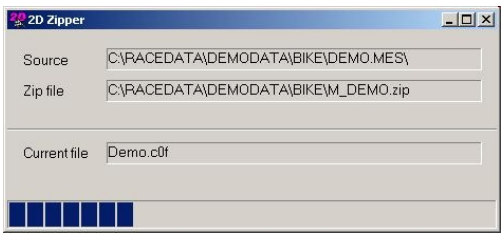


We recommend to use the current Event directory for compression (=default directory). So the compressed archives do not loose the reference to the related Event at any time !

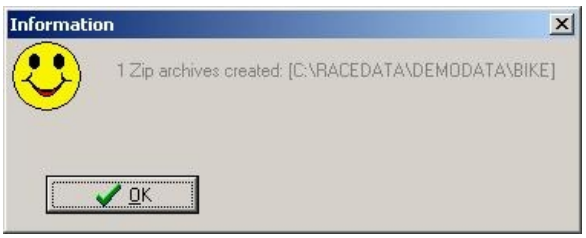
- At least confirm all settings with the button <Ok>. The compression operation starts automatically. Afterwards you get a corresponding message.



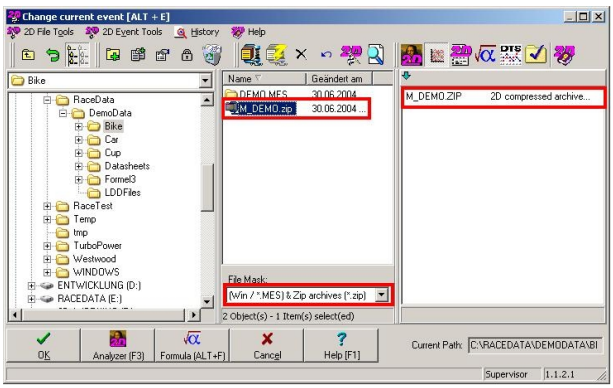
- During the compress operation you will get a status window.



- Close the information window via the button <OK> and return automatically to the *2D Event Explorer window*



The file mask of the *2D Event Explorer window* will be automatically enlarged. So it is possible to select and choose ZIP archived if you want to decompress them in further time. At the right panel of the explorer window you will a small information about the ZIP archive.





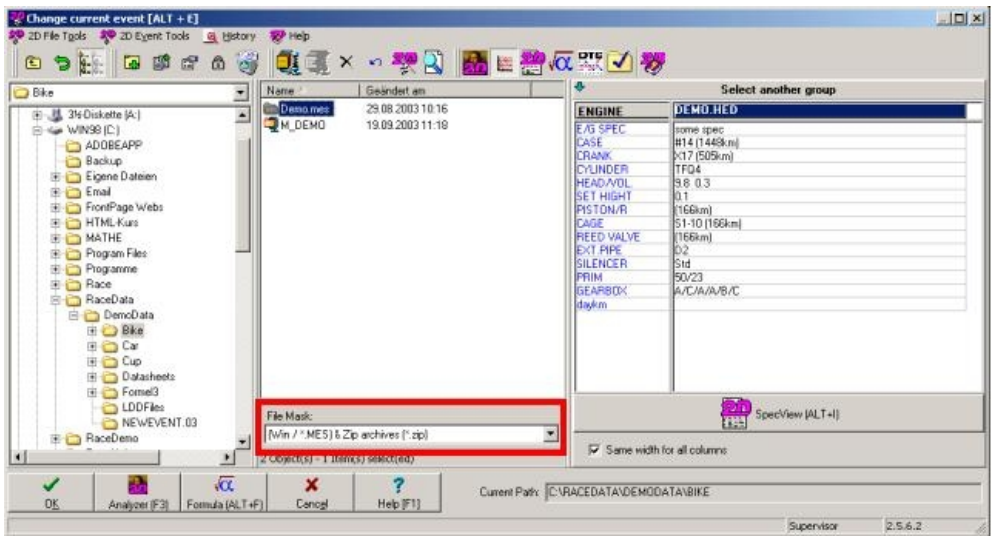
Important: You get for each compressed measurement an single zip archive. The prefix character "M_" in the archive name references a "MES" directory – our new data format. If you compress our old files "PAR" you get the prefix character "F_" Do not rename this zip archive if you want to send it via email !

1.5.12 Decompress compressed 2D measurements

All single 2D measurements you have compressed (zip archives) with our software you can decompress with the same software module. You can start this function from the *2D Event Explorer* window using the shortcut keys <*CTRL + ALT + D*> or directly as stand-alone application.

- First of all start the*2D Event Explorer window*. Select the *button <Chang event>* or press <ALT + E> at our Front-end tool WinaRace.
- Select all compressed zip archives you want to decompress directly from the 2D Explorer window (at the middle list view (panel) Use the <SHIFT> (keep it pressed) and the arrow up / down keys if you want to select more than one file. If you want to select a single archive in the list view located at various positions keep the <CTRL> key pressed and select all archives after one another with the left mouse button.

Tip: If you can't select or see any archives you must change the file mask of the 2D Explorer window.



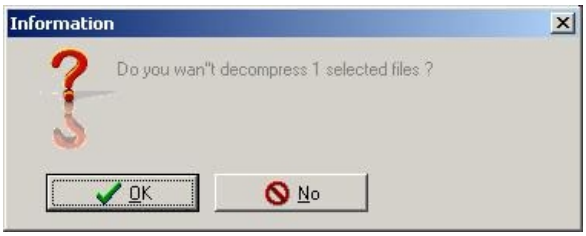
- In the next dialog you must enter a destination directory (for decompressing). To do so you have the following three possibilities:

1. Enter directly a new (=not existing directory) in the edit field or select an existing directory from the list. C:\RACEDATA\DEMODATA\BIKE.97
2. Use the history list (last ten used directories) +
3. Select an existing directory from a standard open dialog. To do so use the dialog open buttor



We recommend to use the current Event directory for decompression (=default directory). So the decompressed measurements do not loose the reference to the related Event at any time !

- At least confirm all settings with the button <Ok>. The decompression operation starts automatically.



- During the compress operation you will get a status window.



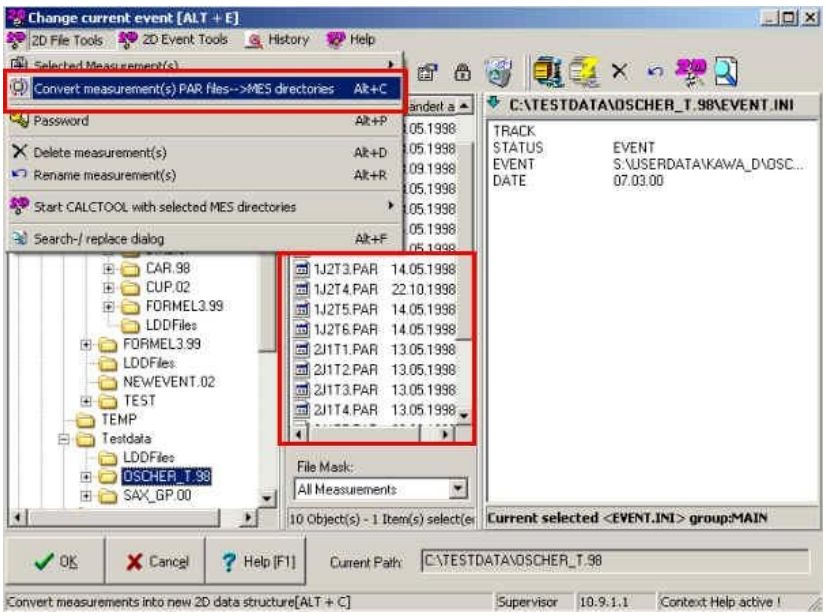
- Close the information window via the button <OK> and return automatically to the *2D Event Explorer window*.

1.5.13 Convert (old) 2D measurements into new data structure

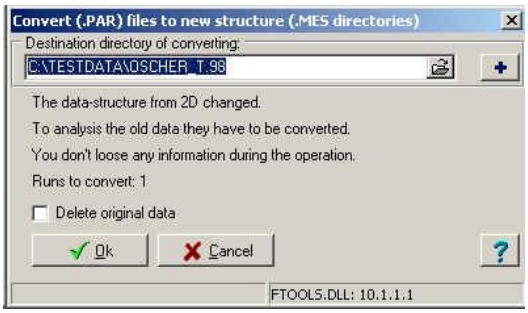
Measurements you have created under the operating system MS-DOS (with the program *ProgIt*) has the *file extension PAR*. This function gives you the possibility to convert all *MS-DOS measurements* into our new window format *MES directories*.

The converting operation runs automatically. For each selected *PAR file* the program *ParToDDD* is launched with additional parameters. This program is located directly in your current race directory. Follow the next instructions step by step:

- First of all start the *2D Event Explorer window*. Select the *button <Change event>* or press <ALT + E> at our Front-end tool WinaRace.
- Select all measurements (at the middle list view) you wan't convert. Look for measurements with the *file extension PAR*.



- Enter the main menu and select the item *2D File Tools / Convert measurements...* or press the shortcut key *<ALT + C>.* Refer the figure above.
- This window gives you information about the measurement count to be converted. You have the option to delete the "old" files after the conversion. If you want to do so check the checkbox *<Delete original data>.*

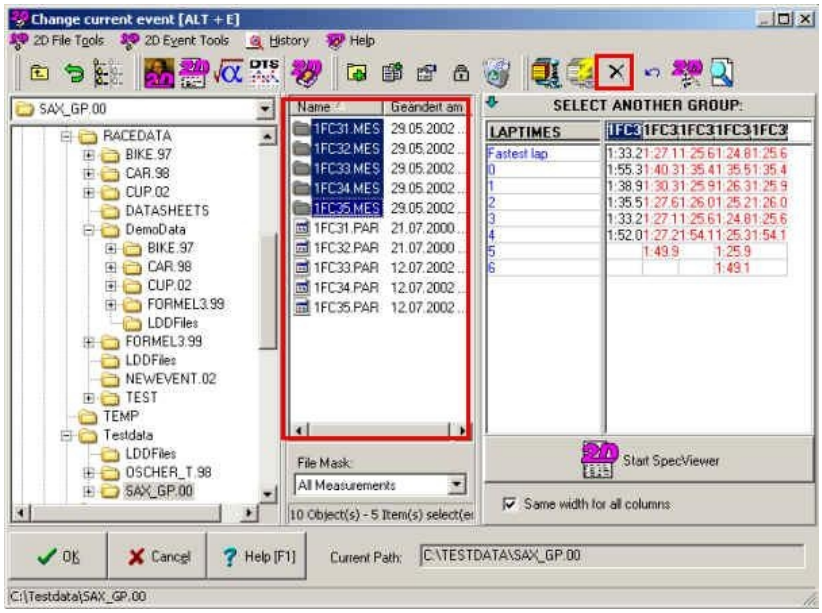


The converting time depends on the number of measurements you have selected. Directly after converting is finished the window you see above is automatically closed. The *2D Event Explorer* window is updated automatically and you will see the new created *MES directories* in the middle list view (panel) at the *2D Event Explorer window*.

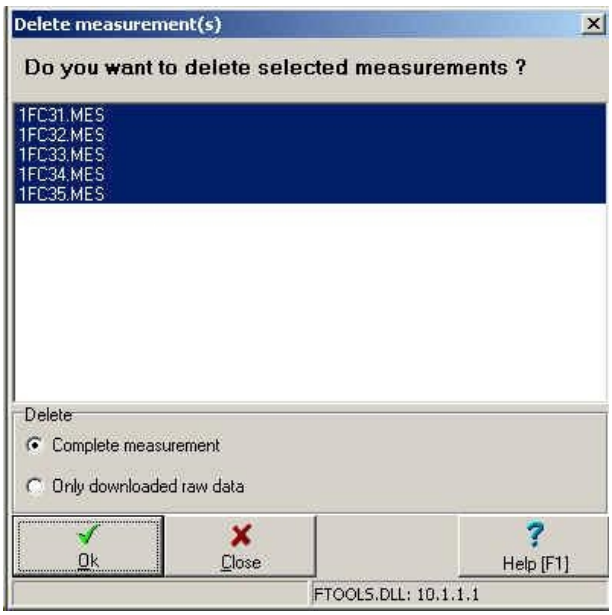
1.5.14 Deleting single 2D measurements from the current Event

You have the option to delete single 2D measurements from the current *Event*.

- First of all start the *2D Event Explorer window*. Select the *button <Change event>* or press <ALT + E> at our Front-end tool WinaRace.
- Afterwards select all *2D measurements* you want to delete (at the middle list view (panel).



- After the measurement selection press the shortcut keys *<ALT+ D>* or click at the corresponding toolbar button (see figure above)
- As next step you have the option (if you select *MES directories*) to select the kind of measurement deleting. This option lets you choose if you want to delete the complete measurement or only the directory called Download inside the *.MES directory. The Datalogger will be stored his data in this Download directory before he decompress and divide it into **.MES directories*.



- The default setting is to delete the complete measurement. Confirm the deleting process with *<OK>* or press *<Cancel>* if you want to cancel the operation and close the deleting window.

1.5.15 Rename single 2D measurements

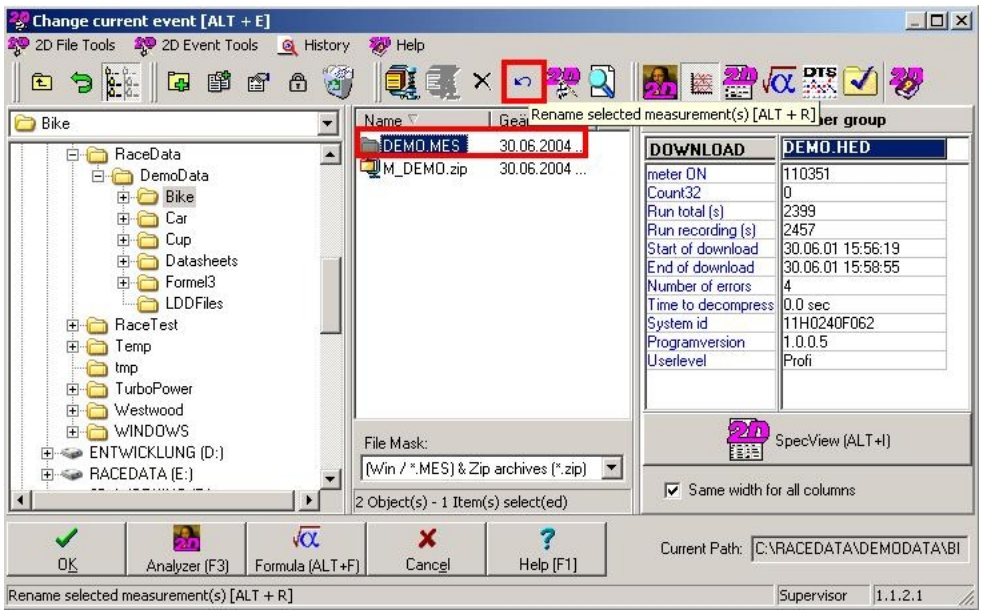
If you want to rename a single measurement use the corresponding function in the *2D Event Explorer window*.



You should rename measurements (especially the data created under MS-DOS *PAR files*) only with our software. Special information is stored in several files of the measurement. So if you rename the files using the standard windows explorer or another program you loose this information and you can not analyse the Data in the future!

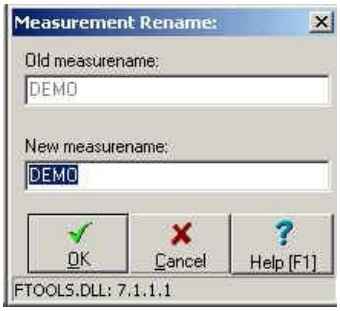
Follow the instructions step by step:

- First of all start the *2D Event Explorer window*. Select the *button <Change event>* or press <ALT + E> at our Front-end tool WinaRace.
- You can select only one measurement after another. Next select the measurement you would like to rename.



- Click the rename button on the toolbar device of the *2D Event Explorer window* or press the shortcut keys *<ALR + R>.*

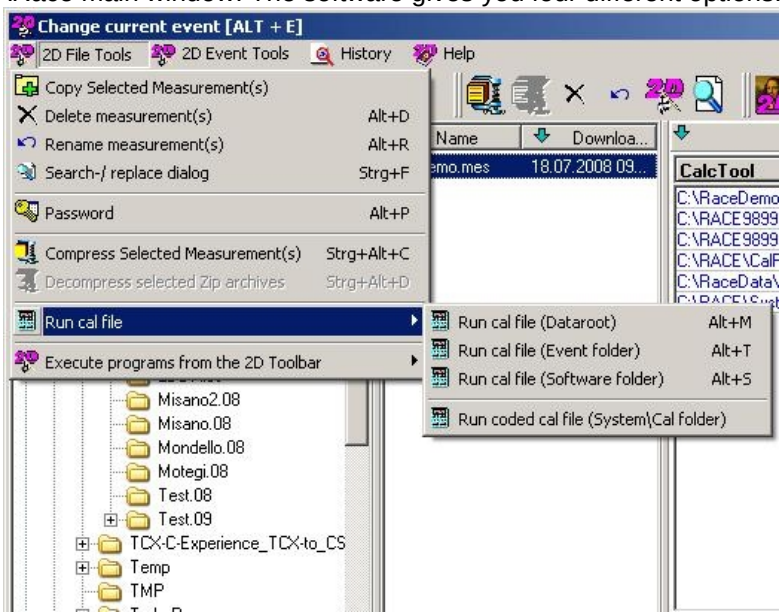
- In the example we want to copy the 2D demo measurement *DEMO.MES* located at*: C:\RACEDATA\DEMODATA\BIKE\DEMO.MES*. The first box shows the old (original) measurement name and below the new measurement name. Please enter a new name and confirm with *<OK>.* Otherwise press button *<Cancel>* if you want to cancel the operation and close the window.



- During the rename operation a small window shows all files which were renamed automatically.

1.5.16 Starting the program CalcTool with selected 2D measurements – calculate new channels

You can start the software module "CalcTool" with additional parameters for calculating additional channels from the 2D Explorer window. Therefore open the explorer by press the button <Change event> at the WinARace main window. The software gives you four different options. They are:



Option1:
Start the program CalcTool with selected measurements and using any cal file (by selection) from the Dataroot. **Shortcut: <ALT + M>**

Option2:
Start the program CalcTool with selected measurements and using any cal file (by selection) from the current Event folder. **Shortcut: <ALT + T>**

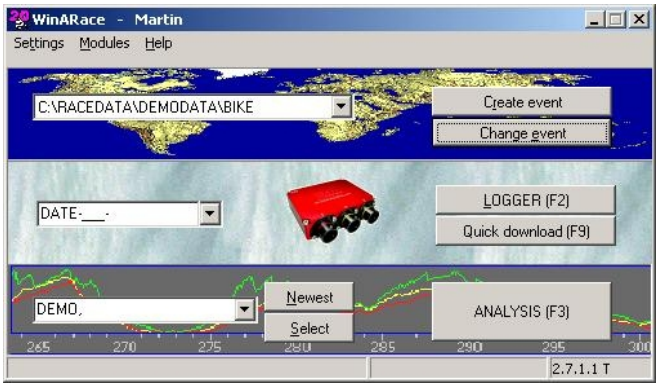
Option3:
Start the program CalcTool with selected measurements and using any cal file (by selection) from the software folder. This folder corresponds with the sub-directory called as "CalFiles" located into your current Race version. **Shortcut: <ALT + S>**

Option4:
Start the program CalcTool with selected measurements and using any coded cal file (by selection) from "System\Cal folder". This folder corresponds with the sub-directory called as "System\Cal" located into your current Race version.

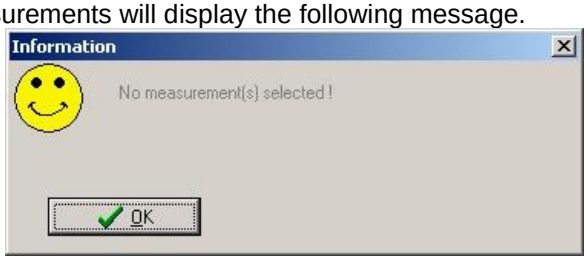
The user can't edit coded cal files. The dialog shown in step3 (Start/Edit) does not appear for this reason; the cal file is started thus directly to all selected measurements !

You can start all functions via the 2D Explorer window:

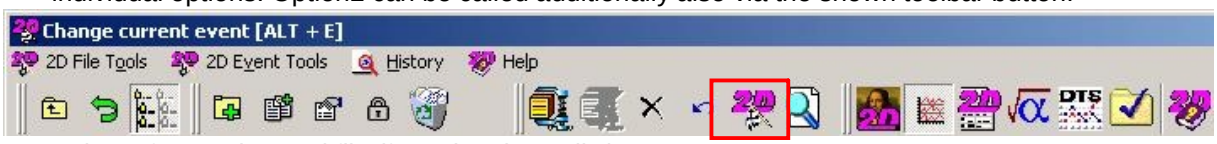
1. Start the 2D Explorer from "WinARace". Press the shortcut keys <ALT + E> or click the button <Change event> at the window.



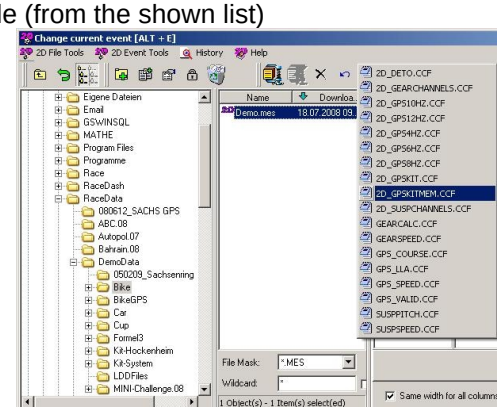
2. It is only possible to select the new 2D Data format (MES directories). If you start the function without selected measurements will display the following message.



3. If you have decided on an options enter the menu item "2D File Tools\Run cal file" (shown in figure1) or use one of the possible shortcut key (<ALT+M>, <ALT+T>, <ALT+S>), according to the individual options. Option2 can be called additionally also via the shown toolbar button.

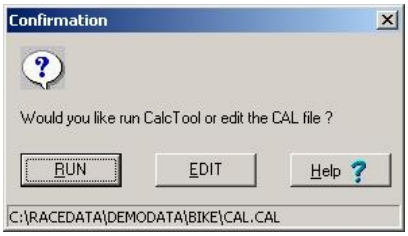


4. Select afterwards a Cal file (from the shown list)

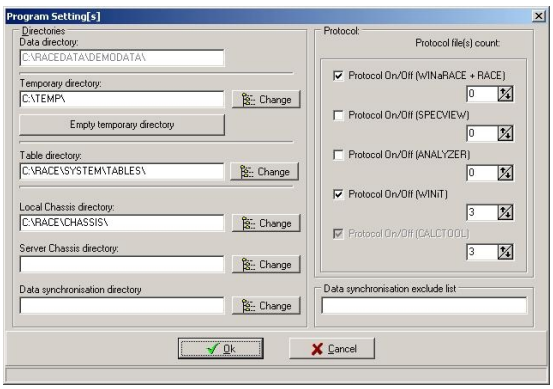


The user has always the possibillity to edit the selected CAL file or to start it directly <u>with exception of option 4</u>

5. The calculation runs full automatically. The program "CalcTool" give you a information if a error occurs.



The program "CalcTool" save all errors in special protocol files. The protocol file exists directly in your current race directory and is called "Calcshow.txt" or "Calctool.txt". The last updated protocol file is the file with the name "Calctool.txt". You can check if the protocol function for the program "CalcTool" is enabled. To do so start our front- end tool WinARace and enter the following main menu item: <Settings / Formula – Protocol>. You will get the following start window:



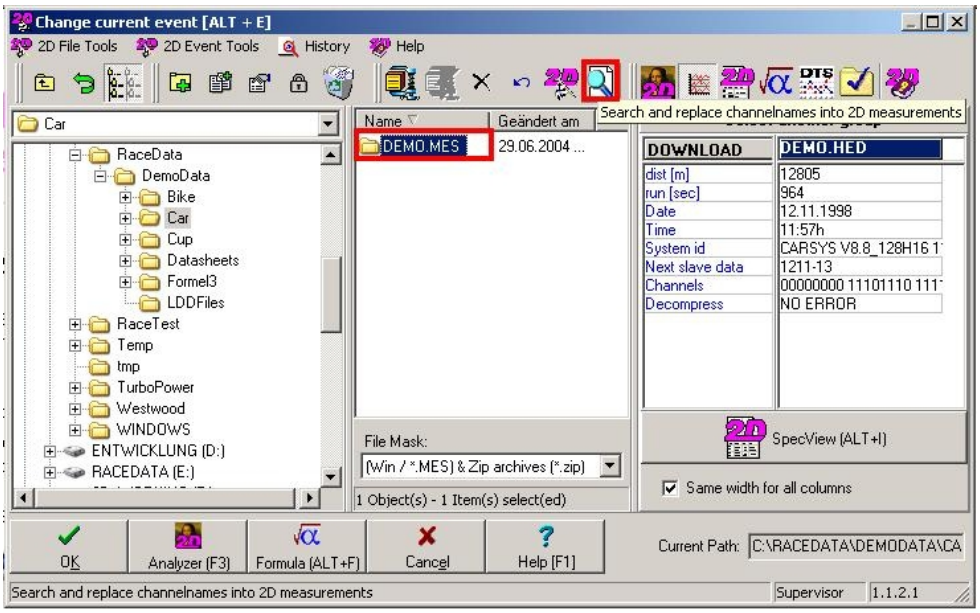


At the window above you can see that the protocol function for the program "WinIt" and "CalcTool" were enabled (First software delivery - preadjustement). In the example above both programs creates three protocol files with the same name as the program plus an additional file number and with the file extension "txt" directly in your current execute directory !

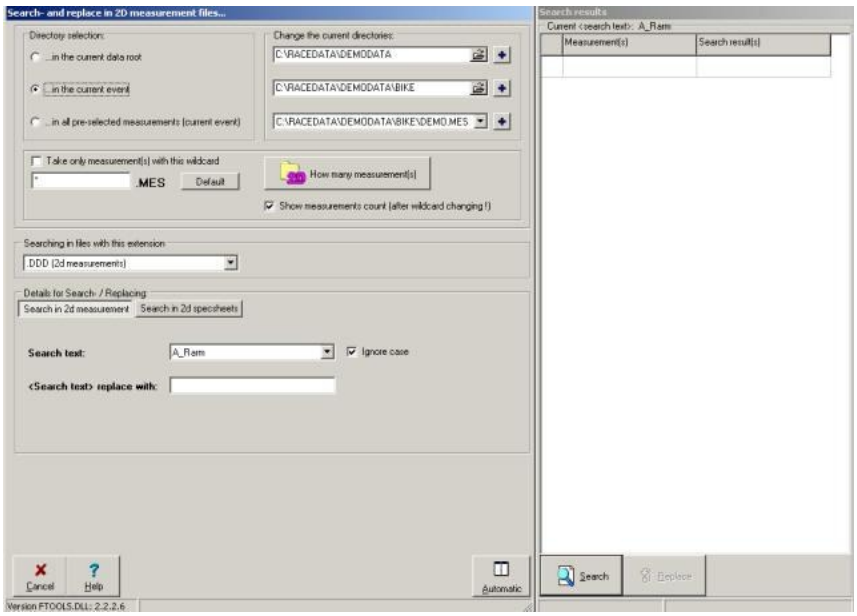
1.5.17 Search and replace into 2D measurements (channel renaming)

You have the option to search and replace strings in files which belongs to each 2D (e.g. using for channel name renaming) Follow the instructions step by step:

- First of all start the *2D Event Explorer window*. Select the *button <Change event>* or press *<ALT + E>* at our *Front-end tool WinaRace.*
- Select all 2D measurements you want to use into the search / replace dialog. Use the *<Shift>* (keep it pressed) and the arrow up / down keys if you want to select more than one file. If you want to select a single measurement in the list view located at various positions keep the *<CTRL>* key pressed and select all measurements after one another with the left mouse button.



- If you have selected all measurements press the shortcut key *<Ctrl + F>.* You can choose also the corresponding menu items (main or context menu). Search for *2D File Tools \ Search \ Replace* dialog You will get the following start window:



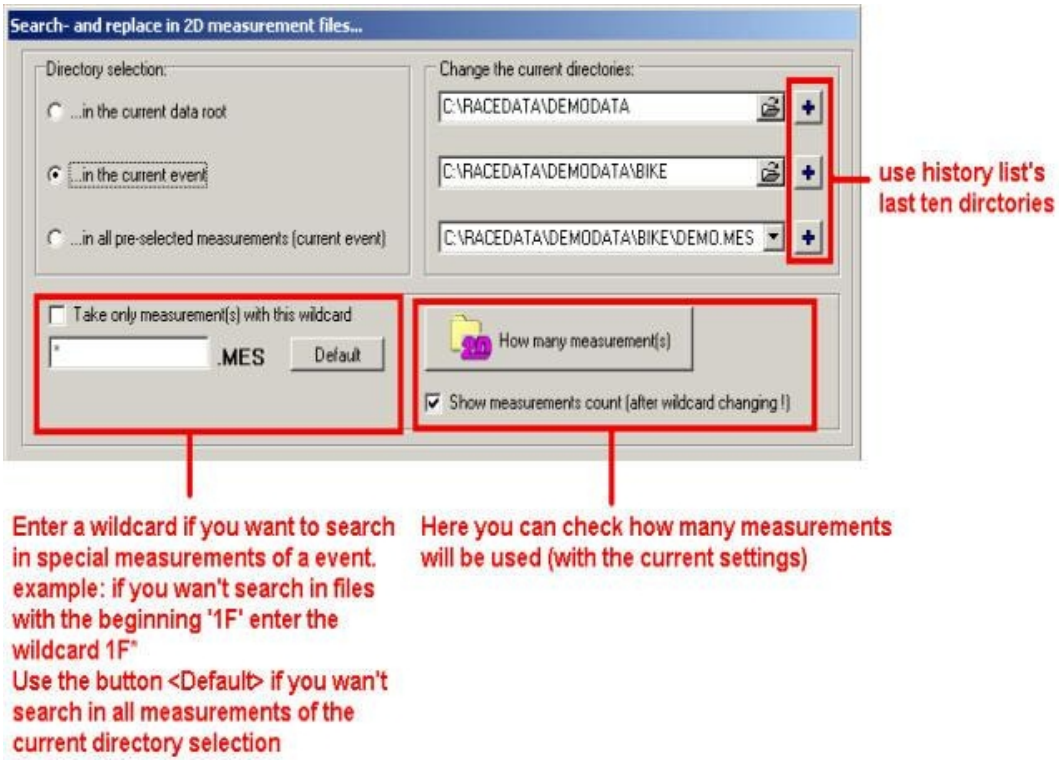
The window is divided into two different windows:

- The settings windows on the left
- The search result window on the right

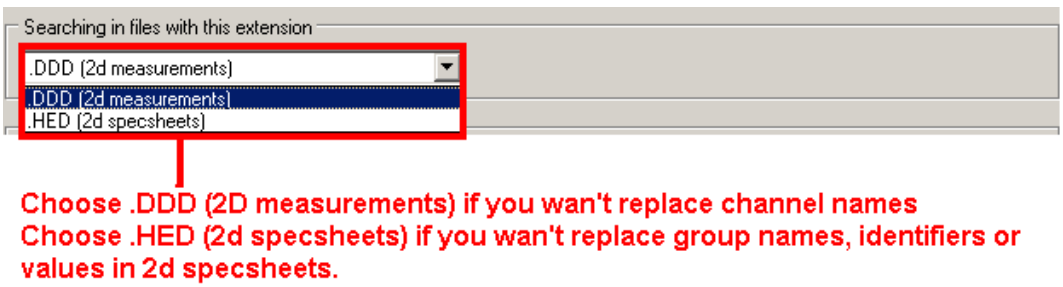
Both windows will always be arranged side by side at start-up.

The setting window will be divided into three sections - they are:

Directory selection:



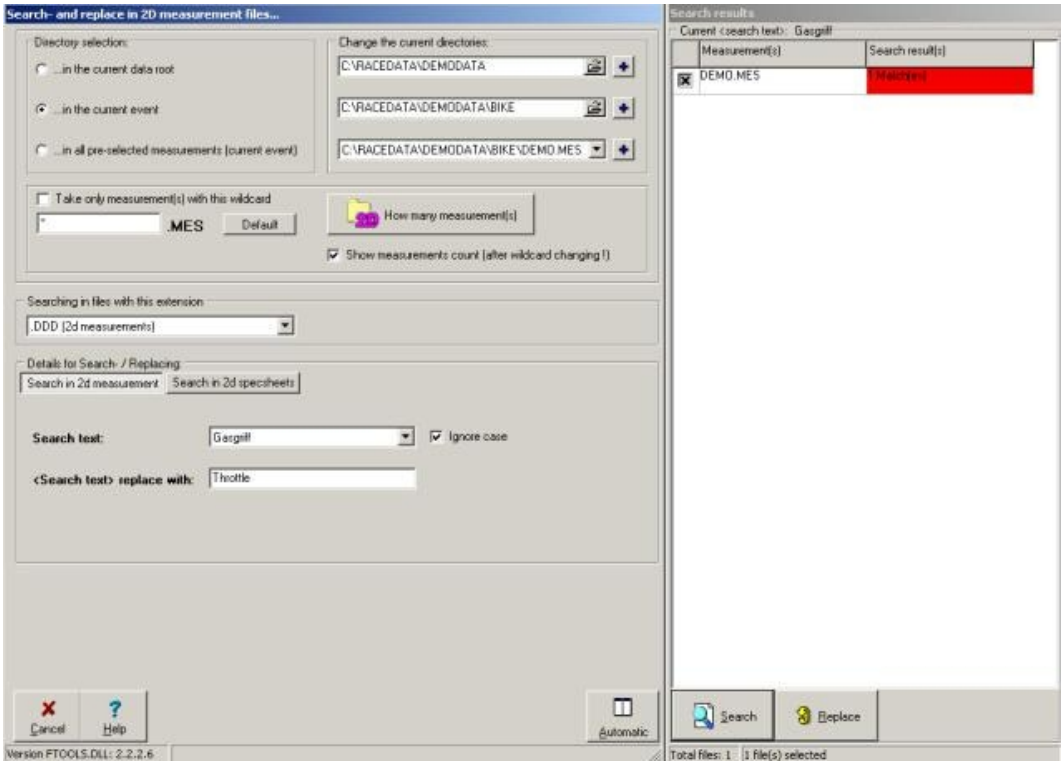
Choose the kind of files you will search in (DDD files or SpecSheets)



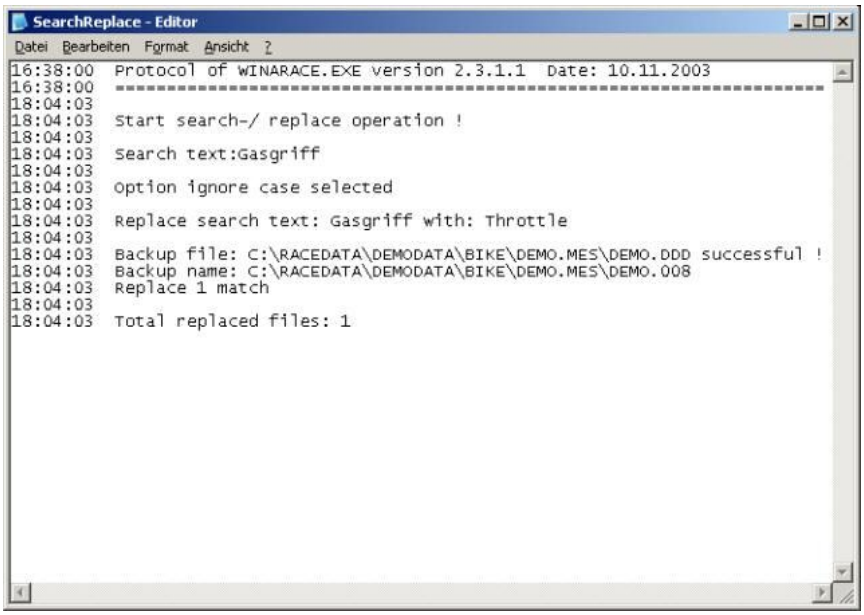
The search results window will display all measurements matching the current settings in the setting window.

Use the button <Search> at the bottom of the search results window to start the search operation or to update the search results. Some changes in the setting window will update the search window automatically. Other changes will require the update to be done manually. To do so use the button <Search>.

- If you start the "Search / Replace" function directly after the first software installation, the window will open with the demo event "..\RaceData\DemoData\Bike" (refer to the figure below).
- By default the software will search in 2D measurements (.DDD files)
- For example; you want to replace the channel name "Gasgriff" (German word for "Throttle") with "Throttle"
- To do so enter beside "<Search text> replace with:" the new channel name "Throttle"



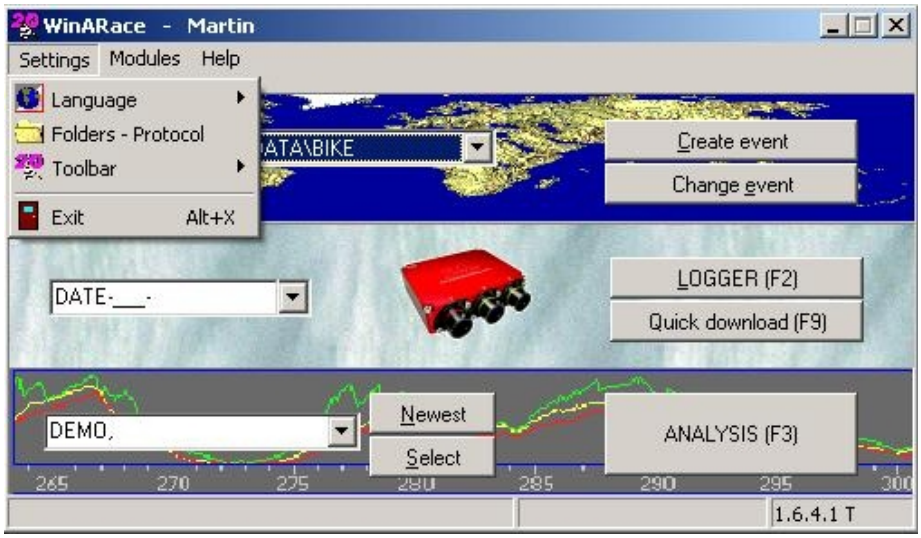
- Select in the search results window the button <Search>. The search window will show you all matches in all chosen measurements.
- Note that: In the search results window you can only select measurements with a definite search result. This means measurements with only 1 matching result of the current <search text>. If you have more then one match you can't select the corresponding measurement.
- Start the replace operation with the button <Replace> (in the footer of the search results window).
- The software will first create a backup file of your original DDD file in the same [*.MES] directory with the same name and the extension *.001 (for the first time). Starting the window again with the same measurement means you get another backup file with the extension *.002, and so on.
- After the backup operation the software checks if the backup exists. If it exists the program searches for the "Search text" and replaces the text with the text specified in "Replace search text with" string. At the end of the operation you get information of how many files were changed.
- The software activates the protocol function automatically and creates it's own protocol file. This protocol file will be shown at the end of the Search / Replace operation.



- The software will create the first protocol file in the following directory of your current race directory: "..\Protocol\"
  The name of the current protocol file is always "SearchReplace.txt". All protocol files will be automatically backed up.This means that you get another backup file with the extension *.001. If you start the Search / Replace operation again

- After closing the Search / Replace window, you can check the changed channel name in the analysis overview window (small window below the 2D Event Explorer).
- Use the small analysis overview window in the 2D Explorer window to check the channel renaming. You will get a list of all channel names if you press the right mouse button (context menu) in the analysis overview window.

1.6 The main menu item Settings



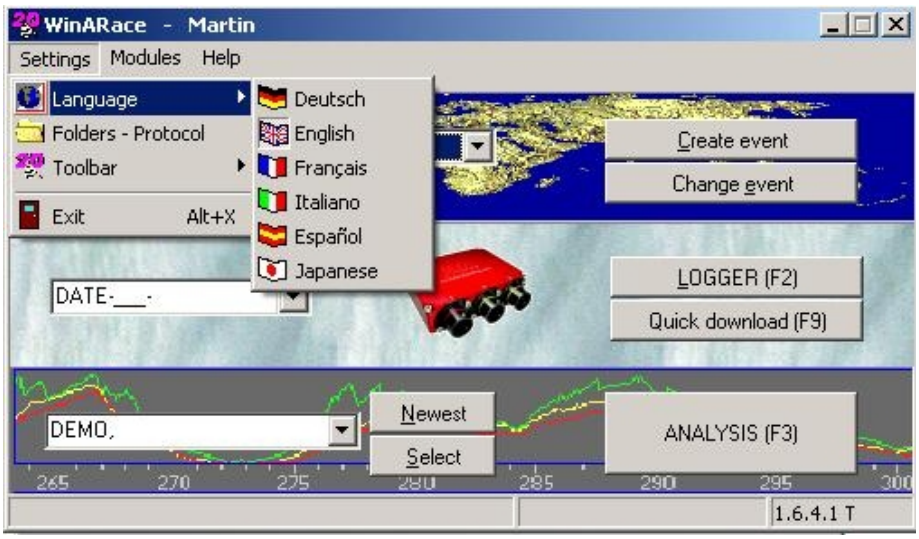
Sub-menu items	Meaning
Language	Change the software language
Folders - Protocol	Check the folder structure and the protocol function of the software
Toolbar	Configure the 2D toolbar device – refer the chapter 1.2.3

1.6.1 Choose the software language

All software modules of 2D like *WinARace, Analyzer, SpecView or WinIt* are implemented with multiple languages. The language files needed exist in a sub directory named as *Landir* in your current race directory. Currently this directory has the language files for all software modules in five different languages:

German, English, Spanish, Italian and Japanese.

Choose your own language via the main menu item *Settings / Language* . You can choose your language from a list of five different languages. If you choose a language different from German, English, Spanish or Italian you get the English language as default.



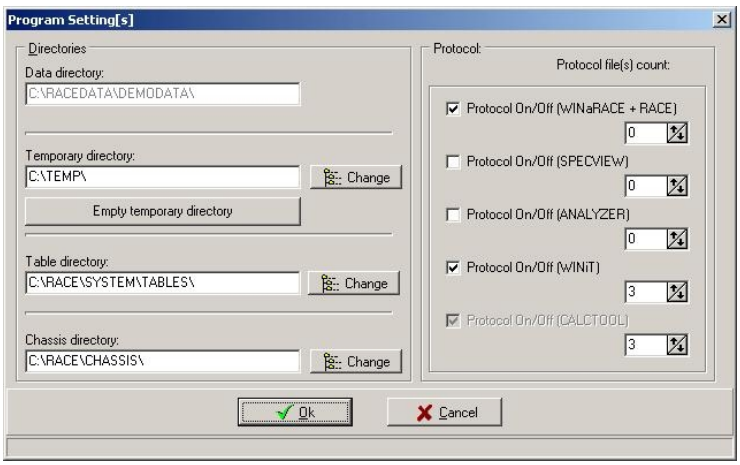
1.6.2 Check the folder structure of the software

If you select the menu item *Folders* you can check and change the folder structure of the complete software. The various software modules have access to the main setting *file Race.ini*, located in your race directory.



The folders you can change are – refer to the figure below:

- The current *Data directory*
- The current *Temporary directory*
- The current *Table directory*
- The current *Chassis directory*



You can change the various paths if you select the corresponding *Browse button*. Afterwards you get a standard windows open dialog to select the new directory - refer to the figure below.

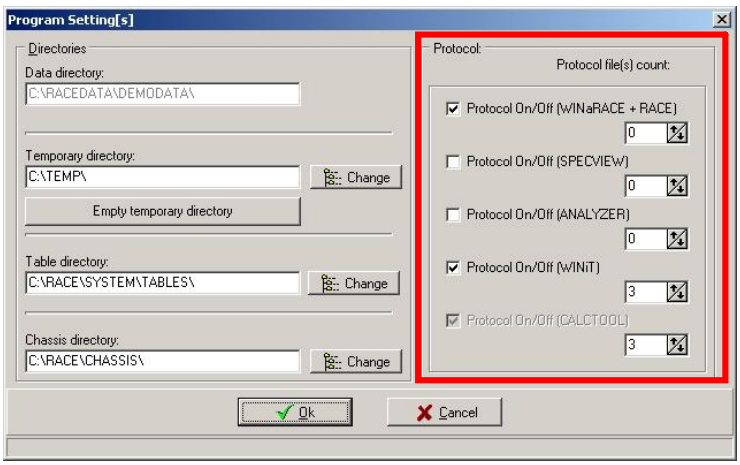


1.6.3 Access to the protocol function

The protocol function is very important for 2D as manufacturer to detect software problems and fix software errors.



If you activate the protocol function you will get a separate protocol file for each software module you selected in the window above. The protocol files have the same name as the software modules themselves. For example if you activate the protocol function for the program *SpecView* the corresponding protocol tool generates protocol files called *SpecView.txt*, *SpecView1.txt, SpecView2.txt* in your current race directory. These files are in standard text format. The number at the end of the name depends on the number you entered in the window above.



You can activate the protocol function for the following software modules:

- WinARace (the front-end tool)
- SpecView (the data administration tool)
- Analyzer (the analysis tool)
- WinIt (the communication tool)
- CalcTool (the calculation tool)

In the various fields for the *Protocol files count* you can define for each software module the number of protocol files you want to create.



The most recent protocol file is the one without a number !.

2. Shortcut list

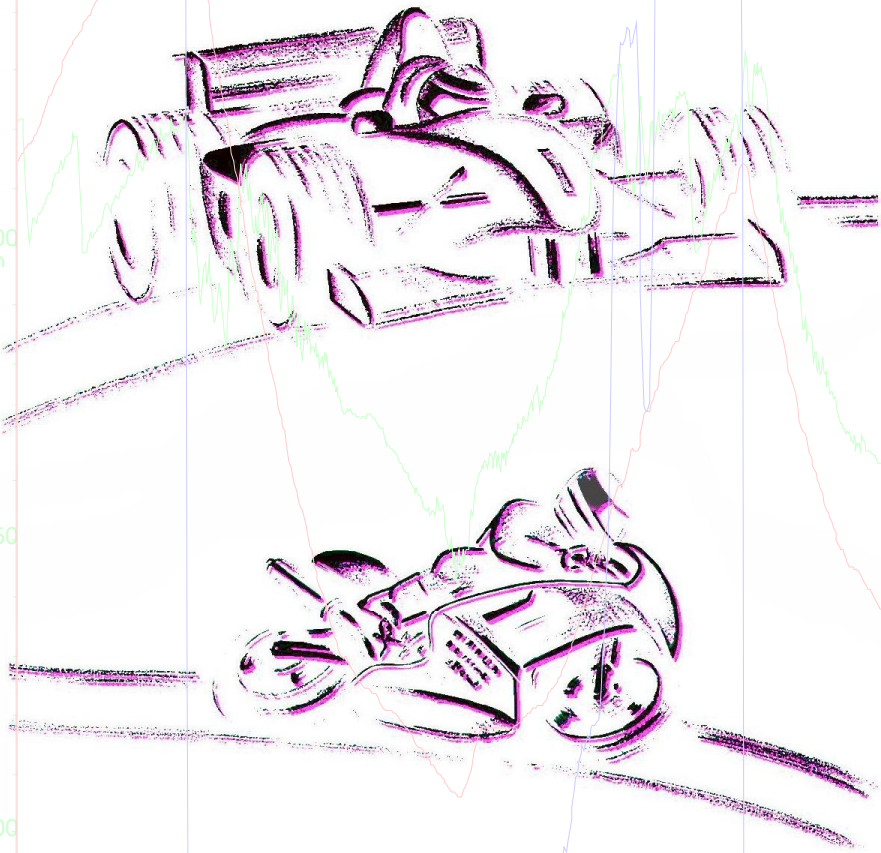
Tastenkürzel	Funktion
< F1 >	Show context sensitive help module.
< F2 >	Start the communication tool – WinIt (Setting mode)
< F3 >	Start the Analysis tool – Analyzer
< F9 >	Start the communication tool and begin automatically with the download operation.
< ALT + F1 >	Show you the complete shortcut list of our Front-end tool WinaRace
< ALT + C >	Starts the program CalcTool - use the calculation file Cal.cal from the current Event.
< ALT + D >	Starts the program DTS (Dynamic test system)
< ALT + E >	Start the 2D Event Explorer tool for easy and quickly Event selecting (changing)
< ALT + F >	Start the formula editor tool WFormel
< ALT + G >	Start searching in SpecSheets (Files used from SpecView)
< ALT + H >	Enter the main menu item *Help* at WinaRace
< ALT + I >	Starts program SpecView
< ALT + M >	Enter the main menu item *Modules* at WinaRace
< ALT + N >	Automatically find the newest 2D measurement of the current Event and insert into the history list.
< ALT + O >	Start the 2D File Explorer tool for easy and quickly 2D measurement selecting.
< ALT + P >	Starts the program and load directly all You can find the permanent info files one directory level up of your current Event (P_*.HED).
< ALT + Q >	Write a comment to the current measurement file. The comment was saved into the group [COMMENT] from the corresponding SpecSheet.
< ALT + S >	Same as shortcut <ALT + O>
< ALT + T >	Enter the main menu item "Settings" at WinaRace
< ALT + W >	Load and modify the weather info file named as "Weather.ini" directly at your current Event.
< ALT + X >	Terminate WinARace
< ALT + F4 >	Same as shortcut <ALT + X >
<STRG + ALT + C>	• Starts the add-on program Chassis in the “Movie mode” Only possible if you have buy the add-on program Chassis and a valid 2D chassis license !.
<STRG + C>	• Starts the add-on program Chassis in the “Bike mode” Only possible if you have buy the add-on program Chassis and a valid 2D chassis license !.
<UMSCHALT + F>	• Starts the add-on program Chassis in the “Force mode” Only possible if you have buy the add-on program Chassis and a valid 2D chassis license !.

3. Glossary

Expression	Meaning
2D File Explorer	The easiest and quickest way to define the start measurements for the analysis, the program *SpecView* or other programs which require the 2D measurements as special parameters. Please note: Via the 2D File Explorer you can only select start measurements from the current Event !
2D Event Explorer	The easiest and quickest way to change the current Event and also to choose the start measurements for the various programs (like the analysis tool)
Event	Specify the name of the directory which contains the 2D measurements (in Windows system directories with the extension ".MES"). Normally you should choose for the Event name the location name of the current race plus the year. For example "Suzuka.02"
Language selection	All software modules of 2D like WinARace, Analyzer, SpecView or WinIt are implemented with multiple languages. The language files needed exist in the sub directory named as “Landir” in your current race directory. Currently this directory has the language files for all software modules in three different languages
Mastername	Defines the link with the current Loggername for how a 2D Datalogger will save the measurements.
PDF documents	A special file format which requires the additional program "Acrobat Reader", which is freely downloadable and also included on the 2D software CD.
Protocol function	Each 2D Software module supports a special "Protocol" function, which means it can report some important steps of the software operations. For example, the protocol function of the program CalcTool, which records the proceedings of the individual calculations. In WinARace you can turn on or turn off the protocol for the most important software modules - they are: • The communication tool - WinIt • The data administration tool - SpecView • The analysis tool - Analyzer • The front-end tool - WinARace • The calculation tool - CalcTool • To do so enter the following main menu item: **à** *Settings / Formula - Protocol*
Quick download	The quickest way to get data from a connected Datalogger. You can use also the shortcut <F9> in the WinARace start window. The program WinIt will be automatically started and begin with the download operation.
Recovery function	Via our front-end tool WinARace you can recover the initial software settings. To do so you must enter the main menu *Help / Restore first software settings ?* Also you can recover the main setting file *Race.ini* for all software modules. You should use this special function only if your current *Race.ini file* is damaged or deleted ! Look for the main menu item *Help / Recovery Race.ini*
2D Toolbar device	A simple way to start the various 2D software modules with different parameters. For example, start the formula editor with the current measurement parameters. Also you can link any program you like to the toolbar (a maximum of 14 programs - depending of the resolution of your graphics card)
Version informations – What’s new ?	Via WinaRace you can start a single window inside of the help module which gives you detailed version information about our various software modules, including the current version number of each module. This is important if you have problems with our software and you want to contact us. Enter the main menu and select the item: **à** *Help / Show version informations*

2d-datarecording.com

- English -



2009

Introduction to the 2D communication tool WinIt

Art.No.: AC-DOC_WinIt_e-000 modified 19.04.2007

Your NOTES:

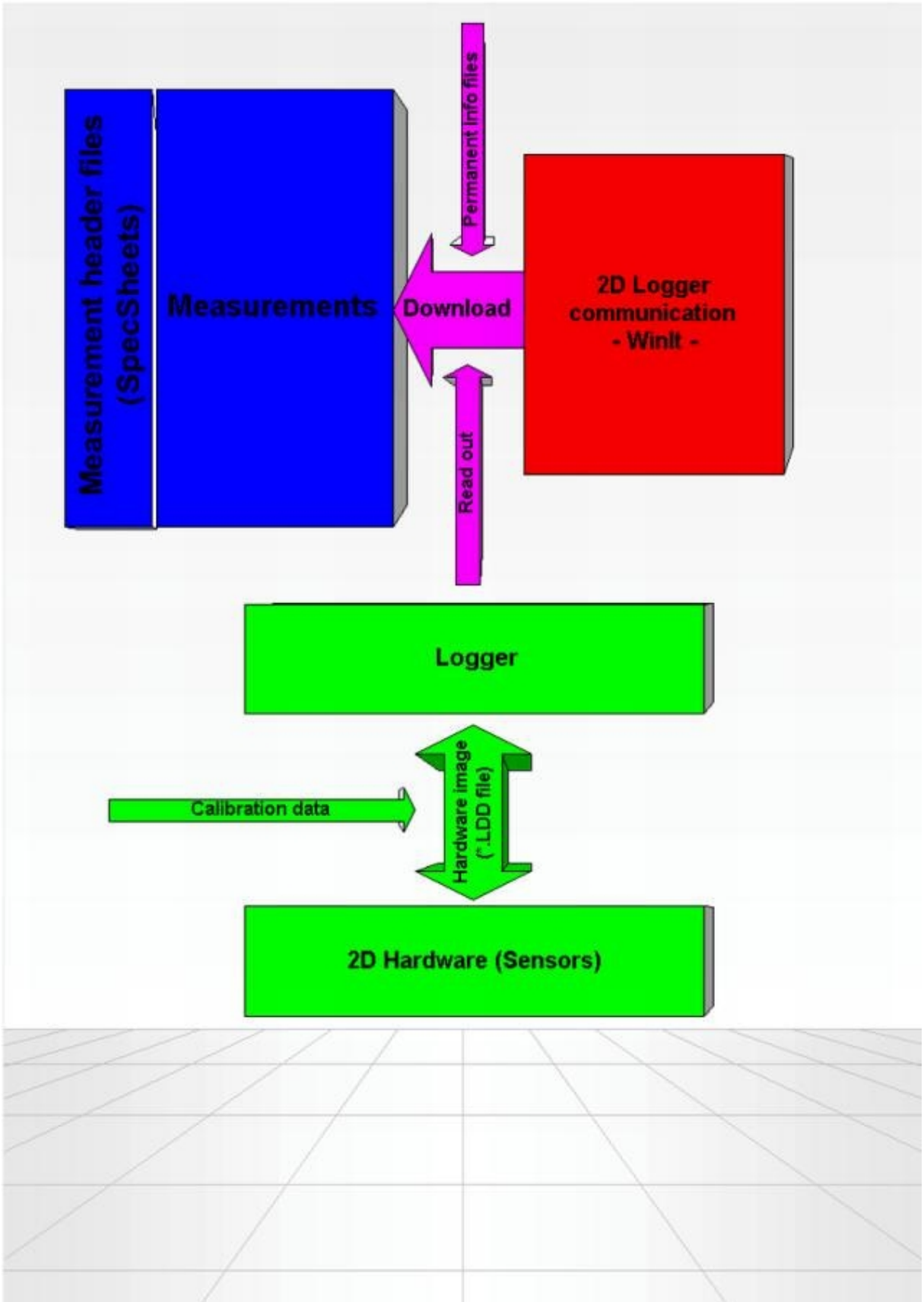

Permanent info files
Measurement header files (SpecSheets)
Measurements
Download
2D Logger communication - WinIt -
Read out
Logger
Calibration data
Hardware image (*.LDD file)
2D Hardware (Sensors)

Table of contents

TABLE OF CONTENTS 4

1. INTRODUCTION 5

1.1 WHAT TO DO WITH...? 5
1.2 SETTING MODE - AUTODOWNLOAD MODE 5

2. ENSURE A FAULTLESS COMMUNICATION 6

2.1 SETTING UP THE COMMUNICATION 6
2.1.1 Automatic (at first start) 6
2.1.2 Manually 7
2.1.2.1 The options dialog 7

3. THE MAIN WINDOW 13

3.1 TREE (ICONS AND THEIR MEANING) 14
3.2 DETAIL INFORMATIONS FOR THE WINIT MAIN WINDOW 17
3.2.1 Logger, Dashboard 17
3.2.1.1 Logger / The detail page General 18
3.2.1.2 Logger / The detail page Channels 19
3.2.1.3 Logger / The detail page Status 20
3.2.1.4 Logger / The detail page Memory 21
3.2.1.5 Logger / The detail page Version 22
3.2.1.6 Logger / The detail page Communication 22
3.2.1.7 Logger / The detail page Debug 23
3.3 INTERFACE CAN 24
3.4 CHANNELS / CHANNELGROUP 26
3.4.1 Channels: The page General 28
3.4.2 Channels: The page Analyse 29
3.4.3 Channels: The page Parameter 31
3.4.4 Channels: The page Additional 33
3.5 TABLES 33

4. THE MAIN MENU 35

4.1 THE SUB-MENU ITEM FILE 35
4.2 THE SUB-MENU ITEM LOGGER 36
4.3 THE SUB-MENU ITEM GRAPHIC 37
4.3.1 Example: Software Dashboard 39
4.4 THE SUB-MENU ITEM CALIBRATION 41
4.5 THE SUB-MENU ITEM SPECIALS 42
4.6 THE SUB-MENU ITEM OPTIONS 44
4.7 THE SUB-MENU ITEM HELP 45

5. THE TOOLBAR DEVICE 46

6. THE POP-UP MENU 47

7. DOWNLOADING DATA FROM SYSTEM 50

7.1 NAMING OF THE MEASUREMENT 50

8. SHORTCUT KEYS OVERVIEW 52

APPENDIX: GLOSSARY 53

1. Introduction

WinIt is the communication tool of the 2D data-acquisition system. It's main purpose is the communication between a computer and the measuring-hardware.

1.1 What to do with...?

WinIt is designed for two main tasks.

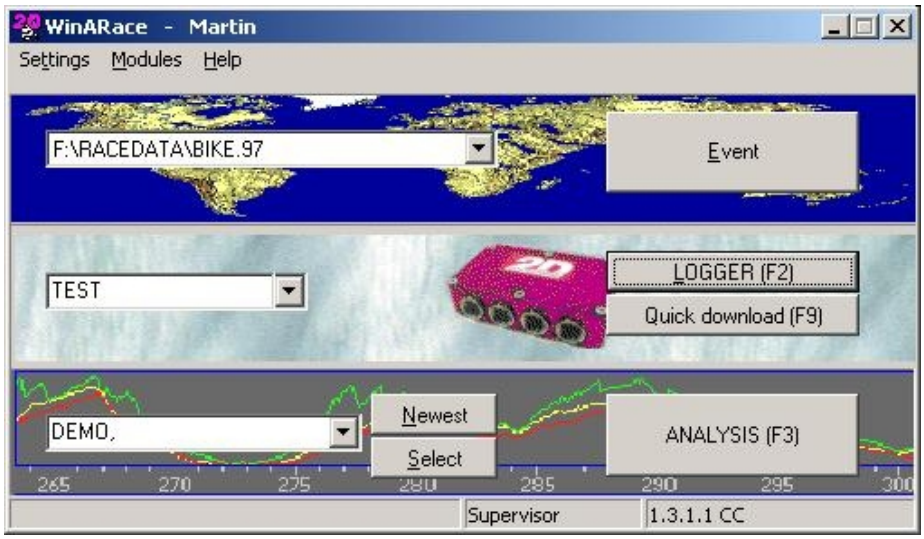
→	The first is to set up the measuring-hardware like loggers, displays, CAN-nodes etc.
→	The second is to download the recorded data from the hardware and to prepare it for the analysis.

1.2 Setting Mode - Autodownload Mode

WinIt can be used in two different modes: the Setting Mode and the Autodownload Mode.

⏩	The setting mode is the default mode. It is used to set up the measuring-hardware. The setting of the devices is read via a communication port and displayed in a tree (like the tree in the Windows-Explorer). The user may select any detail in the tree and manipulate the settings represented by the icons in the tree. (For detail see: Setting up a system)
⏩	Whilst in autodownloadmode the software polls the selected communication ports looking for devices to download. If a device is connected, WinIt tries to download data from it at once.

The two different modes can be accessed by starting WinIt using two different buttons from the Front-End-Tool *WinARace*.



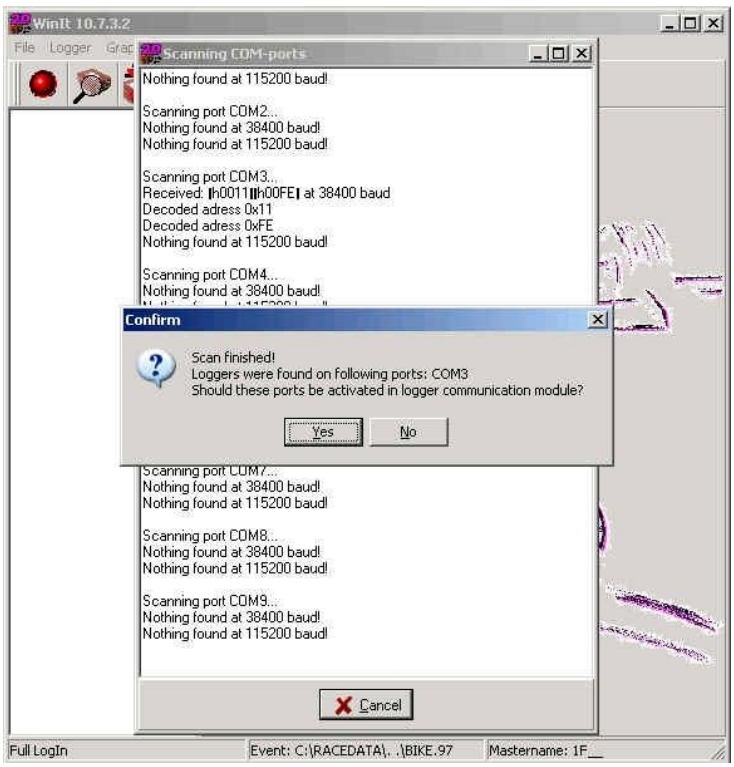
2. Ensure a faultless communication

2.1 Setting up the communication

Before using the system it is necessary to set up the communication between the computer and the logging device. This can be done either manually or automatically.

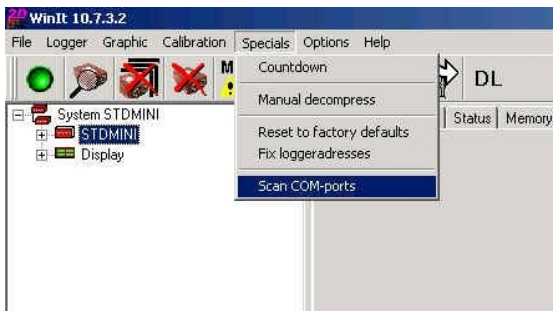
2.1.1 Automatic (at first start)

When WinIt is started the very first time, it automatically tries to set up the communication. The software tries to open the serial ports COM 1 to COM 9 looking for 2D devices. If your system is connected and running, the devices will be found and you will be asked, if you want to activate the ports for the communication.



If you confirm this message clicking on <Yes>, the port is set and the software is ready to be used.

The scan of valid ports can be started at any time from the main menu.



2.1.2 Manually

If you know which port you will use or if you want to manipulate other settings concerning the communication like the download speed, you may set up the communication manually.



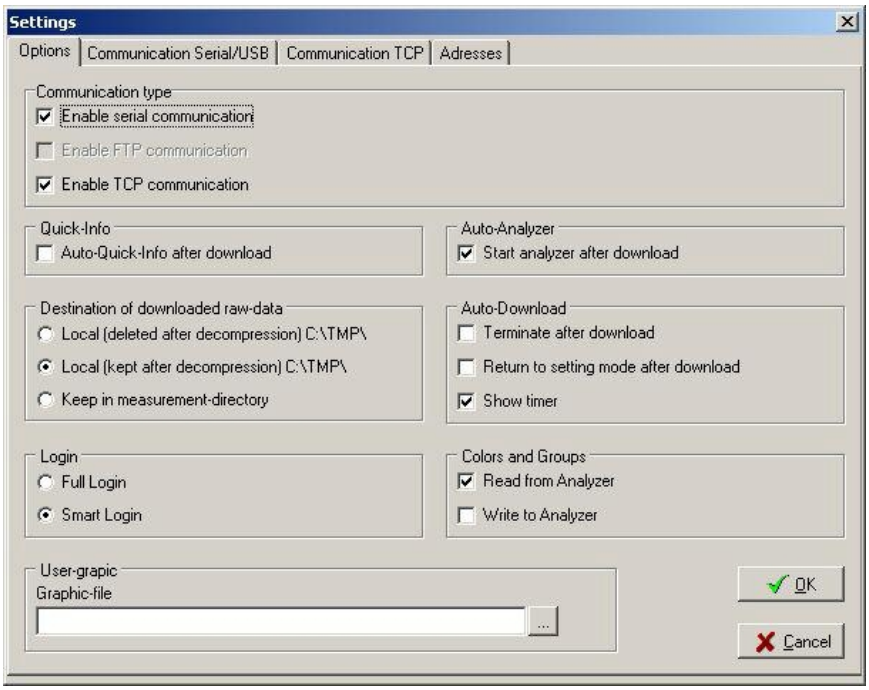
Select Options / Settings from the main menu to start the dialog for the software-settings.

2.1.2.1 The options dialog

The settings-dialog of WinIt is divided in four pages:

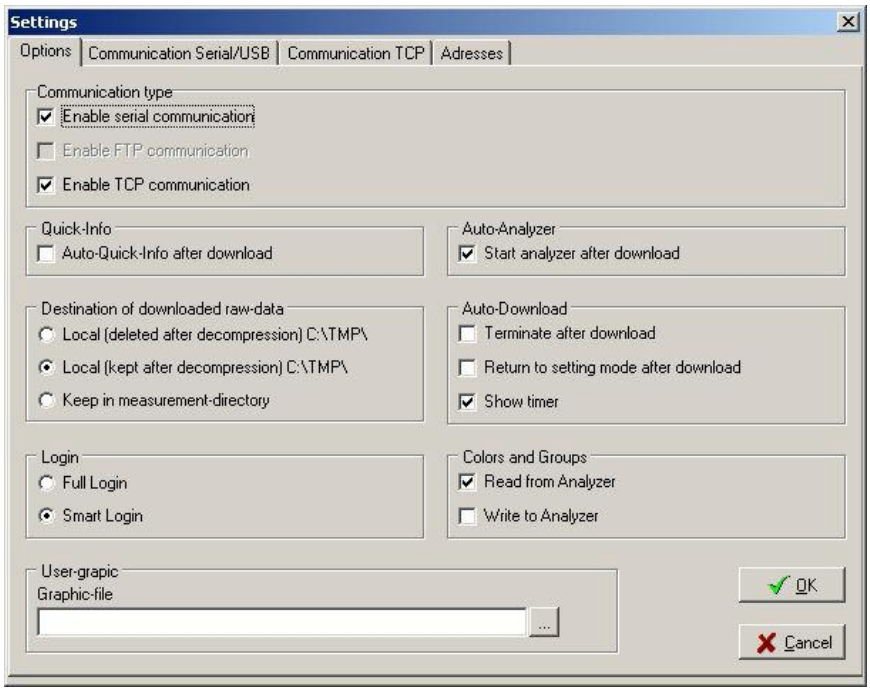
- Options
- Communication Serial/USB
- Communication TCP
- Adresses

Not all pages are always visible, The pages "Communication Serial/USB" and " Communication TCP" are only visible, if the corresponding communication type is activated in the options page.



- ***Options***

The first page of the setting-dialog summarizes the miscellaneous options of the program.



Communication type

This box defines which kind of communication WinIt is using.
The fist entry enables or disables the communication over serial cable (a 2D USB-cable is a serial cable too)
The second entry enables the communication over FTP. It is not possible to activate this option at the moment.
The last entry enables the communication over Ethernet using TCP/IP.
Enabling one of the options activates the correspondig options-page for the selected kind of communication.

Quick-Info

If the field *Auto-Quick info after download* is checked, after each download a dialog opens, where the user may enter additional information to the measurement as a comment to the *SpecSheet* of the measurement.

Auto-Analyzer

Check "Start Analyzer after download", if you want to run the analysis software immediately after the download has finished.

Destination of downloaded raw-data Auto-Download

In this group it is defined where the raw data from the logger is stored after download.
There are three possibilities:

- ***Local temporary***
  The files are downloaded to the temporary Race-directory (See WinaRace).
  If the download and the decompression of the data is ok, the files are deleted after the creation of the measurement files for analysis.
- ***Local keeping files***
  The files are downloaded to the temporary Race-directory too, but they will not be deleted. The User has to empty the temporary directory manually.
- ***Measurement directory***
  The files are downloaded directly into the measurement directory and will not be deleted. This Option should not be used, if the measurement directory is located on a network drive.

Auto-Download

The two checkboxes in this group define the behaviour of WinIt in autodownload mode. If "Return to setting mode after download" is checked, the program returns to setting mode after each download. Otherwise it will stay in autodownload mode looking for devices to download.
If "Terminate after download" is checked, WinIt will terminate after a download is completed.

Login

WinIt has two different login modes:

- Full Login
  The setting of all found devices is read completely.
- Smart Login
  WinIt does only read the complete setting of a master logger, all other devices are only read partly. The channels and tables are only read when needed. This makes the login procedure faster for systems containing more than one device.

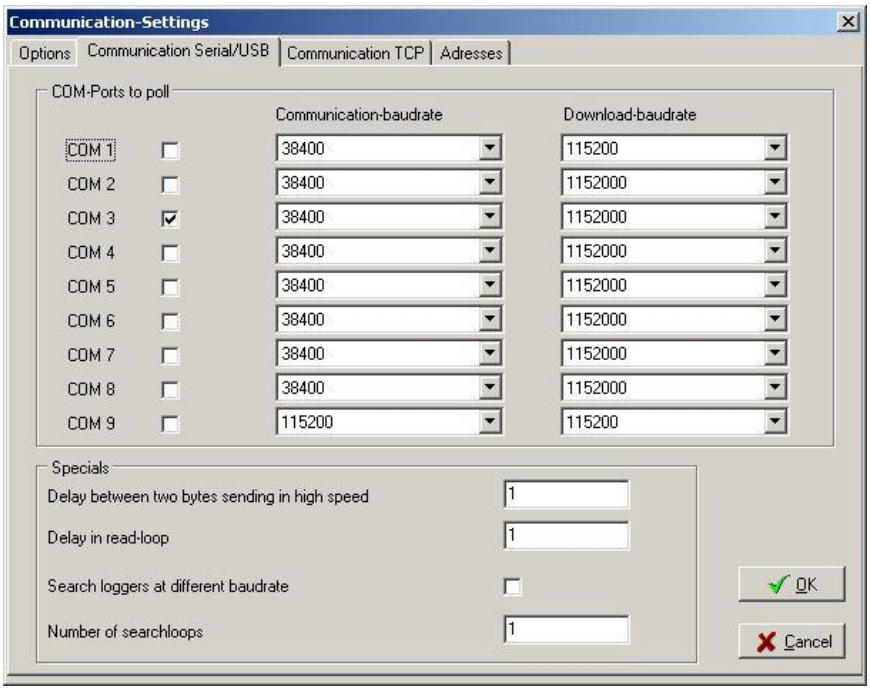
Groups and Colours

To each channel a colour is assigned, this colour is used in the analysing software and in the *Software Dashboard* of WinIt. A channel can be added to so called “groups”. The tree can show the channels sorted by this groups. It is possible to read the colours and groups of the channels from the analysis software. To do so, check *Read from Analyzer*. If you check *Write to Analyzer* the software writes changes in the colours or groups of channels back to the Analyzer.

User-Graphic

In the field "GraphicFile" the user may enter the filename of a graphic file. This graphic is shown in the main window if nothing is selected in the tree on the left side of the window.

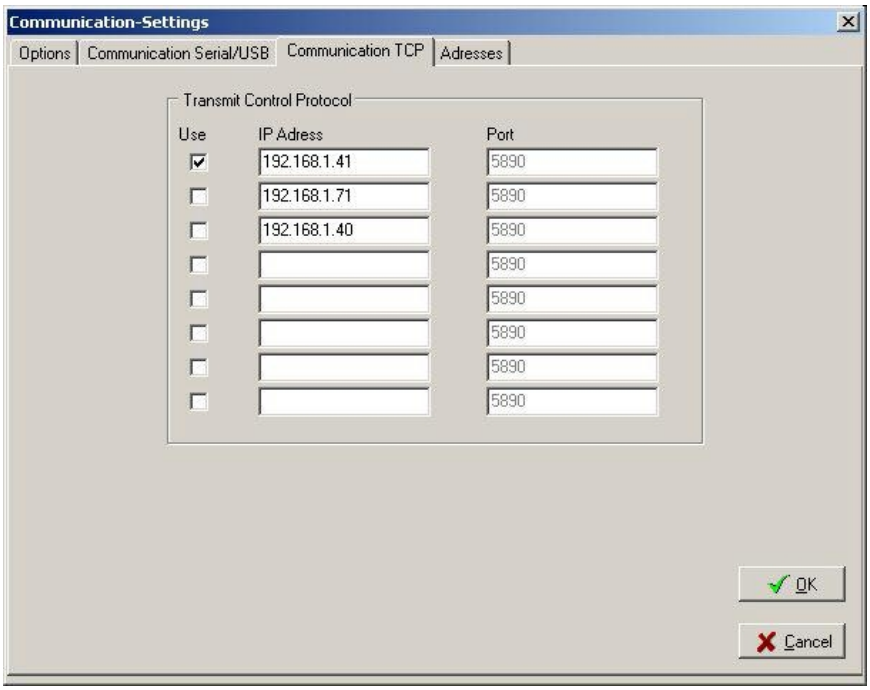
- ***Communication Serial/USB***
  On the second page of the settings-dialog are all options for the communication over serial cable are available. (A 2D USB cable is a serial cable too)



- In the first group *COM-Ports to poll* there are nine lines. Each line represents one COM-port (from COM 1 up to COM 9). For each port three options are available. The first is, if the software should poll the port for logging devices. The port is used, if the box behind the port number is checked. It is possible to use more than one (up to nine) port at a time.
- The second option is the communication-baud rate. This is the speed in bit per second with which the devices and the computer send and receive commands. Only two different speed settings are possible:
- 38400 baud or 115200 baud. The default communication-baud rate is 38400. A new 2D device, connected via serial or USB-cable is always using this speed. It is possible to change the communication speed to 115200. To do so change the communication-baud rate AND check the field *Search loggers at different baud rate* in the group *Specials.*
- The last option for a single port is the download-baud rate. This is the speed in bit per second with which the stored data is downloaded from the logger. The maximum possible speed depends on the hardware represented by the port. For a normal serial port (RS232) the maximum speed is 115200. For a 2D USB High Speed port the download rate may be set to 1152000 (10 times faster than normal port). **With loggers of generation 6 1500000 baud are possible !**

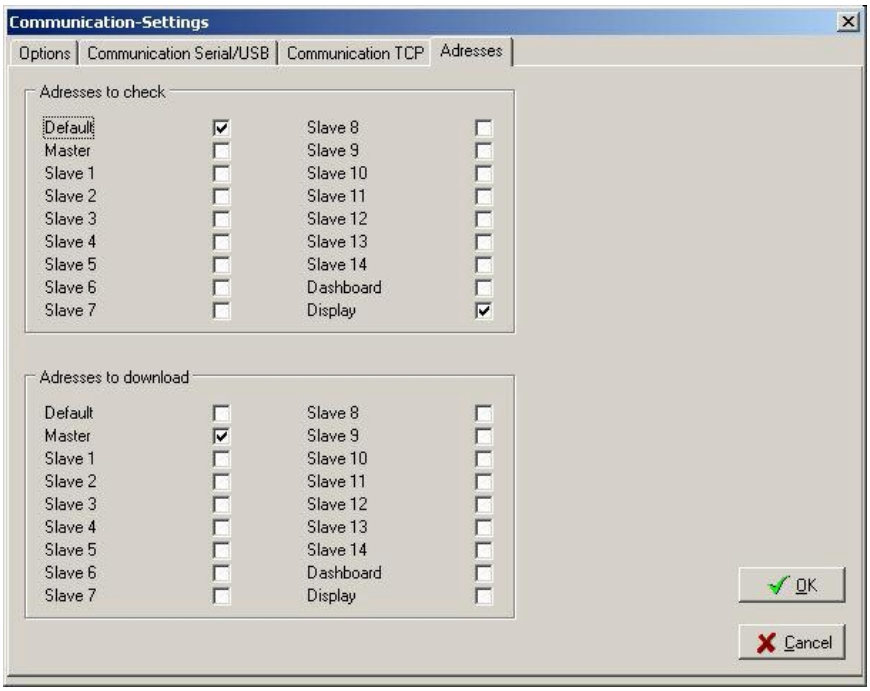
- The second group on this page, named *Specials* contains settings, which normally should not be changed. Change the two delay-values only if instructed by an employee of 2D.
- If the checkbox *Search loggers at different baud rate* is checked, the software tries to find devices not only with the currently selected communication-rate but in the other. If a device is found with the speed, which is not selected for that port, the device is forced to change it's baud rate to the selected one.
- The last value *Number of search loops* should be 1 in most cases. If you have problems finding your devices because of a bad or noisy communication you may enter a higher value. The value represents the number of tries for finding a logger.

- ***Communication TCP***
  This page of the settings dialog summarizes all options for the communication over Ethernet using TCP/IP.



You may enter up to eight IP-adresses with a correspondig TCP-port (at the moment 5890 not changeable).
With the checkboxes in front of the IP- adresses the user may define, which of the IP-adresses should be polled for logging devices.
It is possible to use more than one adresse at a time.

- ***Adresses***
  On the fourth page of the settings-dialog you may change for which devices the software should look and which devices should be downloaded.



Each 2D device has an address out of: Master, Slave1 to Slave14, Dashboard or Display. The default address is a special address, because every 2D device will respond to commands written to their default address.

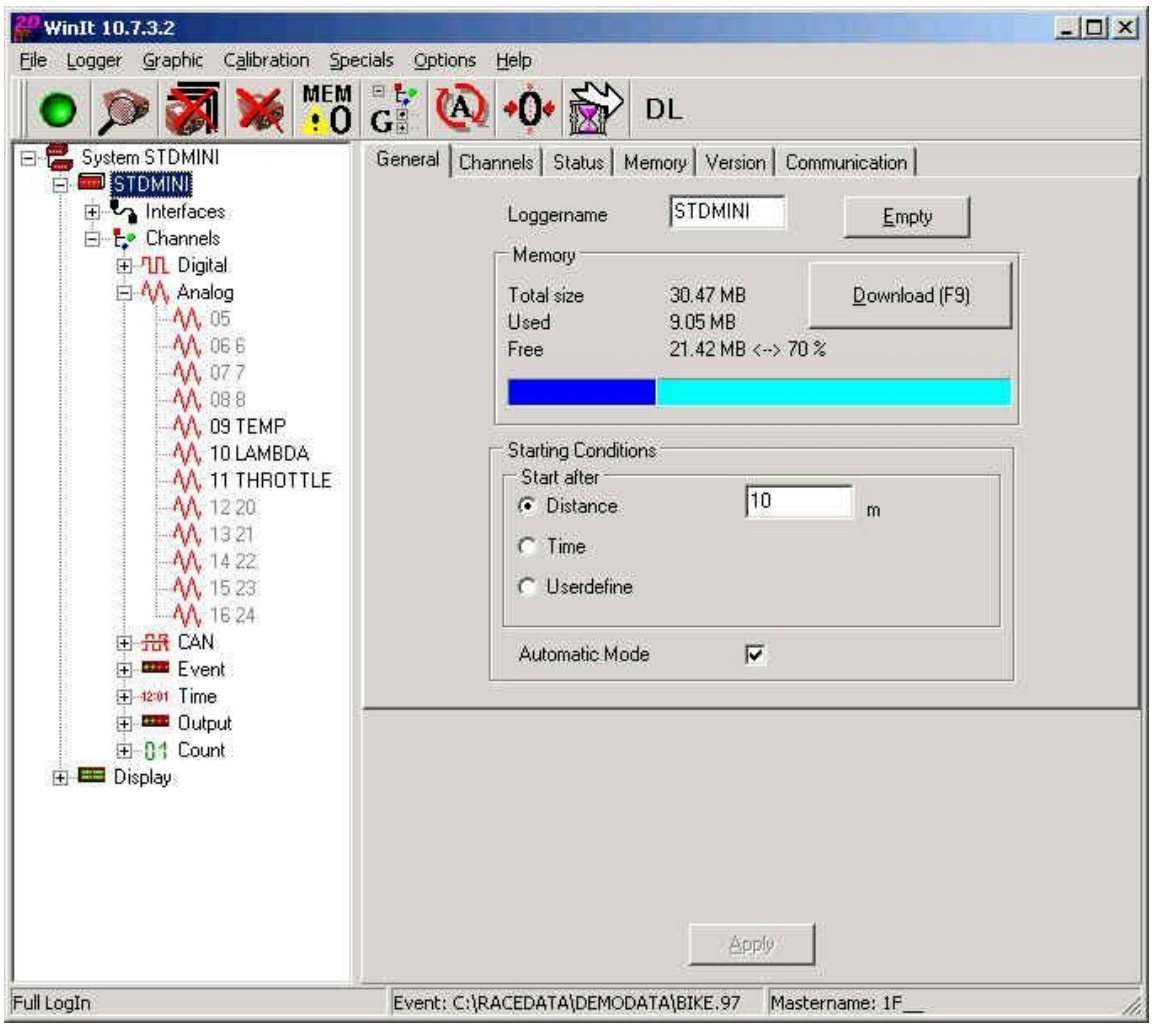
	In the first group the user defines for which addresses WinIt should look in the login-procedure. If the address *Default* is set all connected devices will be found, so in this case it is not necessary to select an other address. If you use a system of several 2D devices (which all have different addresses) and you do not want to read all devices in the login-procedure, uncheck the default address and select the address you want to read.
	The second group defines the addresses which WinIt tries to download data from. Normally the recording device has the address "Master". The address "Default" should not be used and is only working if only one device is connected. Before the download is started the software checks to see if, for every selected download address, a device with that address is connected, and if not the download is aborted.

3. The Main window

The main window is divided in two parts.

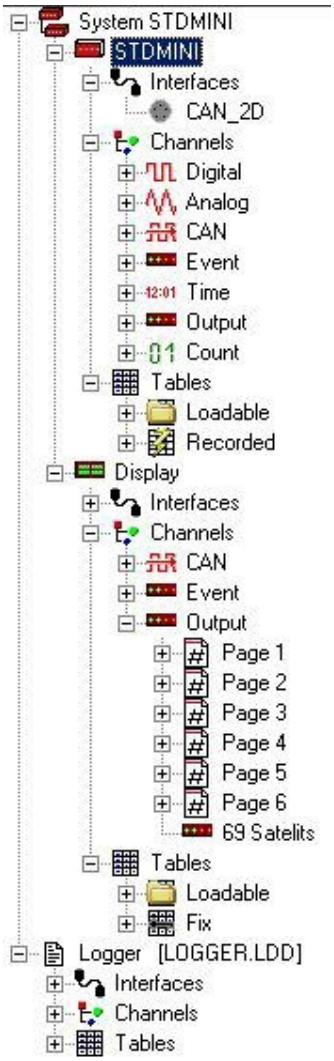
- On the left is a tree view showing a graphical representation of a logging system in a Windows-Explorer style.
- The right part of the window is used to show and manipulate the details of the item selected in the tree.

If nothing is selected a graphic is shown (either the 2D default graphic or the user defined graphic; see options)



3.1 Tree (Icons and their meaning)

In the tree view WinIt shows a graphical representation of a logging system. Select an item in the tree to see the corresponding details on the right. Click on the "+" in front of an icon to expand it's sub tree. Closing the sub tree is done by clicking on a "-".



This is a typical view of the tree showing a system of a logger and a display and a loaded logger file. In the following we list all icons that could appear, along with their meaning. The following icons may appear in the tree view, if a system is loaded. The icons representing channel types are used twice. All channels of a device are shown as sub tree of the channel-icon. They are grouped by their channel type. These groups are sub nodes of the channel-node and have an icon representing the channel type. All channels of the logger with the same channel type are shown as sub nodes from the groupnodes with the same icon.If a channel group is selected in the tree, the channels of this group are shown in a grid in the detail-part of the window.

	If more than one 2D device are connected to a logging system, this icon is used to represent the whole system. If a *system-node* is selected the settings of *the master logger* are shown in the detail part of the window. (See master)
	This icon represents a master logger. A master logger is a 2D logging device with the master address. Normally the master is the recording device. If this icon is selected the right part of the window shows information about the logger divided in several pages. Use this view to change the starting conditions, the sampling rate and the name of the logger. (See: Setting up a system)
	This icon represents *a slave logger*. A *slave logger* is a 2D device with any address but master. Normally a *slave logger* does not record data. The detail-information is the same as for master loggers except the starting conditions.
	A 2D dashboard is shown in the tree with this icon. A 2D dashboard is a freely programmable device used to show any measured data sent via CAN-bus. If this icon is selected the software shows the same information as for slave loggers plus an additional page with dashboard properties.
	This icon should never appear. It is used when WinIt receives an answer to his login-request, but is unable to read the setting of the device. No detail is shown.
	If WinIt looses the connection to a logger or display, the normal icon is replaced by this one. if such an icon is selected the same detail is shown like for the original icon.
	The setting of logger could be stored in a file. If you load such a file, it is shown in the tree with this icon. Since the file corresponds to a logger, the details shown are the same as for a logger.
	Most 2D devices have one ore more interfaces. They are summarized under this icon. No detail information is shown.
	If you select this icon, you may see and change the settings of a serial interface of the logger.
	This sub-item of interfaces represents a CAN-interface. In the detail part of the window you can see and change the settings of the CAN interface of the logger.
	This icon represents all channels of a 2D device. If you select this icon, all channels of the device are shown in a grid.
	This icon is used for digital channels and the group of digital channels. If a single channel is selected all settings of this channel can be seen and changed in the detail section of the window. If the digital group is selected, all digital channels are shown in a grid.
	Analog channels and the group of analog channels use this icon.
	Some 2D logging devices have a CAN bus interface (CAN: Controller Area Network). Often electronic devices in a car or bike use this bus type to send and receive sensor data. The 2D device collects this information from the bus and stores it in a channel. These channels, which collect data from the CAN bus are represented by the CAN-In-icon.
	In some cases it would be useful not only to collect data from the CAN-bus but also to send data to the bus. This is done by CAN-Out channels represented by this icon.
	This icon represents an event channel. The difference between a normal and an event channel is the time of recording. The values of a normal channel are stored with equal time distance depending on the sampling rate of the channel. An event channel only stores it values, if a certain event occurs (when the channels receives a signal peak) such as a lap trigger.
	This icon is used for time channels. A time channel counts a time, like the runtime or the recording time of a logger.

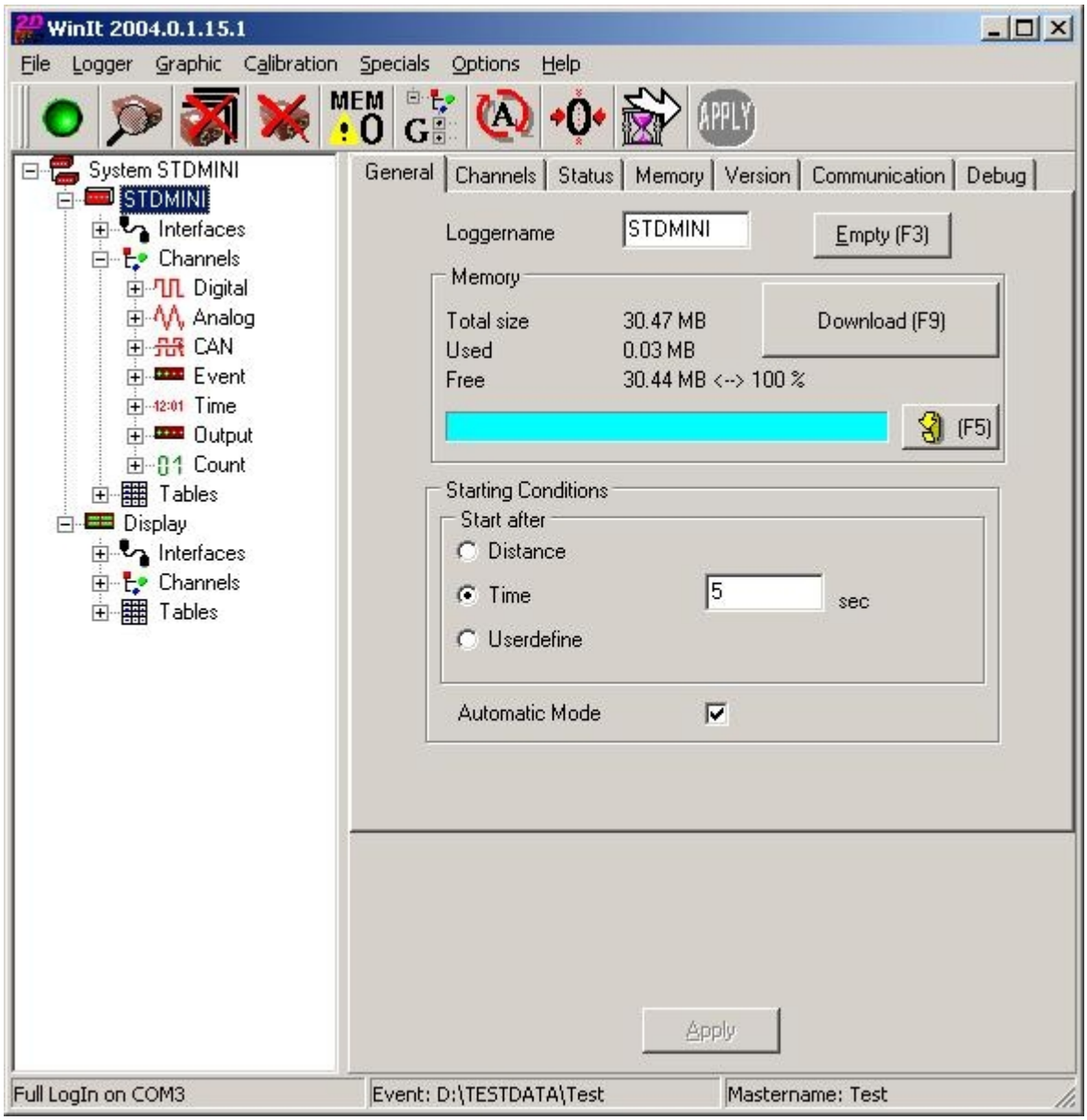
	Output channels are shown with this icon. An output channel in a logger is a switching channel. That means it may either turn on or of a signal depending on the value of an other channel. An output channel in a display is any channel shown on the display. (See setting a display)
	This icon is used for counter channels. In a 2D logging device there exists at least one count channel for each digital channel. The first count channel 'counts' the first digital channel, the second the second and so on. 'Counts' means, if the first digital channel records the speed of the vehicle the first count channel gives the distance resulting from this speed. If the digital channel records the revolutions per minute, the count channel counts the revolutions.
	This icon is used for calculated channels. The 2D system provides a program called CalcTool. With this tool it is possible to generate new channels out of the recorded ones. If you load the calibration file of a measurement the calculated channels are shown with this icon.
	The information on a 2D display is separated in pages. The pages can be changed by pressing a button. The output channels of a display are organised in these pages. To make this visible, the output channels are grouped with this icon.
	A 2D device may have or use tables. There are two kinds of tables. First the laptime or sectiontime tables, these are empty at the beginning of a measurement and are filled by the logging device. When the software downloads a measurement, these tables are downloaded too. The second kind of tables are used to linearize values from sensors, that do not have a linear formula. These tables have to be in the logger or display before the measurement starts.
	Recorded tables, like laptime or sectiontime are shown with this icon.
	This icon represents table which can be freely used by the user. The user may load and unload a table file for this kind of tables.
	Some 2D devices come with tables which are in the device by firmware. These tables may be used to linearize channel values, but it is not possible to unload or overwrite these tables.

3.2 Detail informations for the WinIt main window

In the following we give a short description of the possible detail masks shown in the right part of the main window depending on the selection in the tree. The masks may look different depending on the type of hardware you have represented. We give examples for all possible options.

3.2.1 Logger, Dashboard

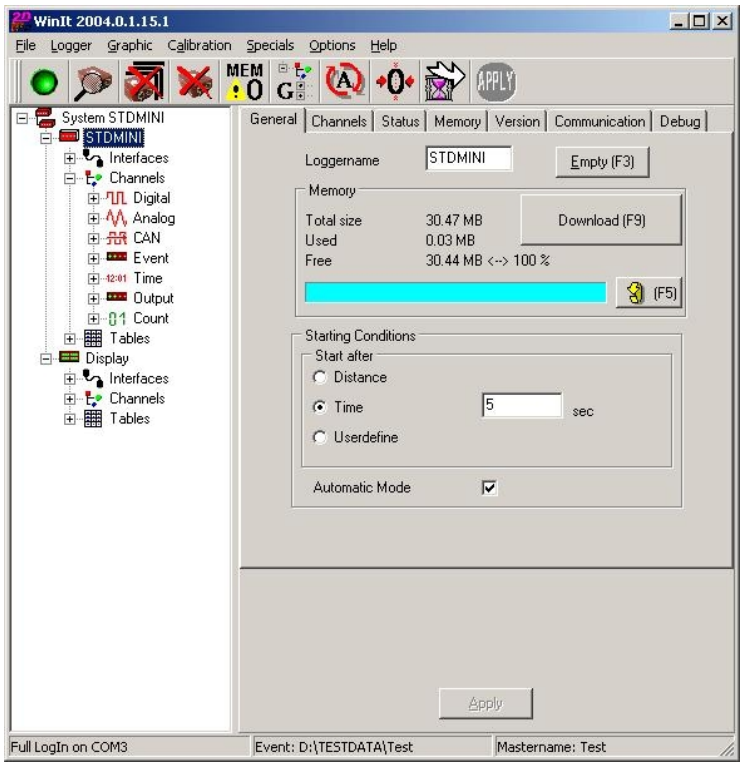
When WinIt finds a logging device during the login procedure a symbol is added to the tree and selected. The selection of the node makes the program show the detail mask for the logger.



The dialog is divided in seven pages: General, Channels, Status, Memory, Version, Communication.

3.2.1.1 Logger / The detail page General

The first page is the most important. It contains a button to download the data from the recording device. This button is only enabled if the device contains data. The memory size and the usage of the memory can be seen in the *Memory* - box. The other button *Empty* is used to clear the memory of a logger. The name of the logger is shown in the first edit field of the dialog. To change the name of the logger just overwrite the current name and send the change to the device by clicking on the button *Apply* on the bottom of the window.

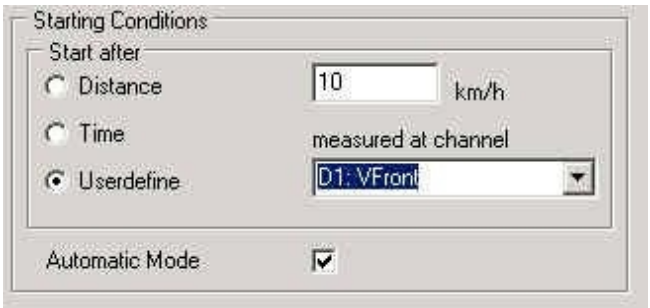


Another very important part of the first page is the box with the starting conditions of the logger. This box is only visible if a logger with the master address is shown. With the starting conditions the user can define under which conditions the logger would start to record data.

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

1. The first is to start after a certain distance. Click on *distanc*e and enter the distance in meter after which the device should start recording.
2. The second possibility is to start after a certain runtime of the logger. Click on *time* and enter the time in seconds after which the logger should start recording.

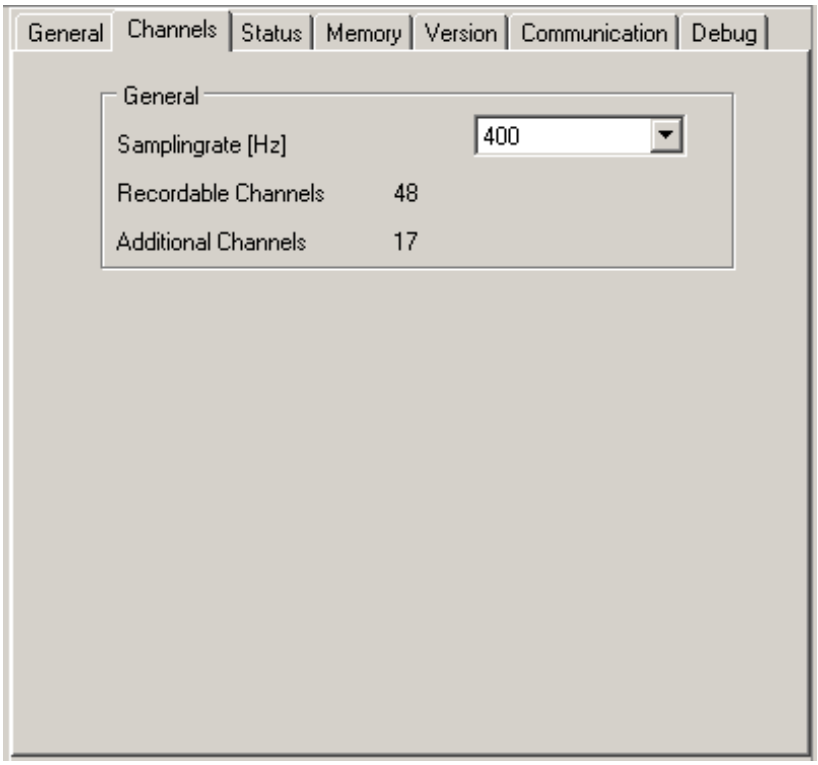
The minimum time here is 5 seconds !



3. The last option is to start depending on any channel. Click on *user define* and select a channel which should trigger the recording. Enter the starting value. The logger would start after the selected channel reaches the starting value.
   In the above example the logger would start recording after the speed channel *VFront* reaches a value of 10 km/h. In the starting conditions is a checkbox *Automatic Mode*. if this box is checked the logger will only record, if the starting conditions meet and the logger receives either a speed or a RPM-signal (or both). That means, the logger will stop recording, if it receives no signal.
   If the box is not set, the logger will stop recording when the memory is full.

3.2.1.2 Logger / The detail page Channels

The second page of the dialog gives information about the number of channels and the maximum sampling rate of the logger.

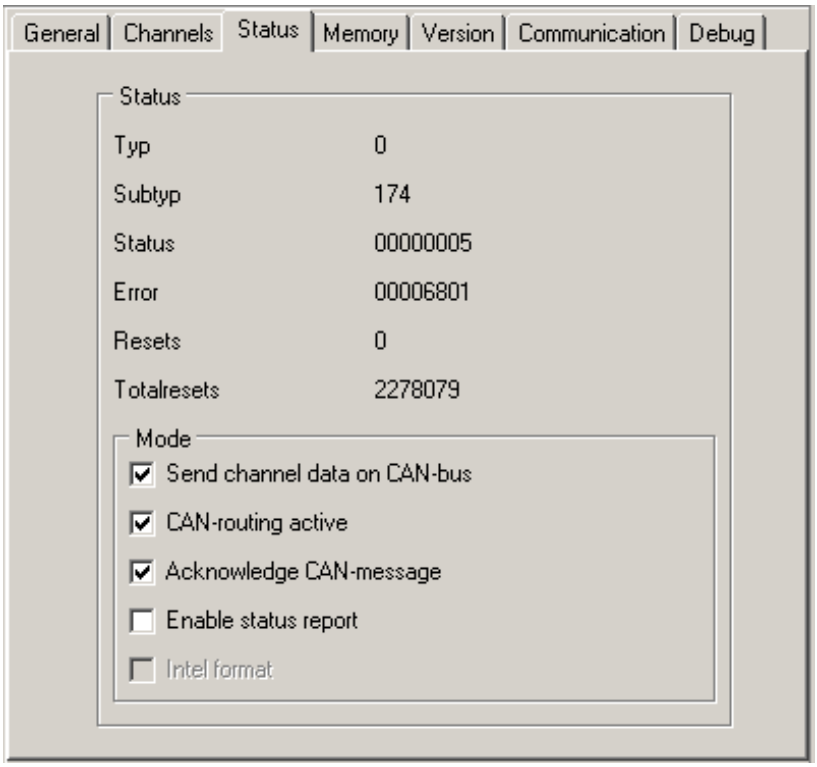


If you want to change the maximum sampling rate of the logger just select one in the box by clicking on the arrow on the right. Click *Apply* to send the change to the device. But keep in mind, the higher the sampling rates of the recorded channels, the shorter the maximum recording time of the logger.

Select the highest needed and lowest possible sampling rate !

3.2.1.3 Logger / The detail page Status

This page gives information about the status of the logger. These values normally are not of interest for the user, but in case of problems with your logging hardware this information could be helpful for the 2D support.

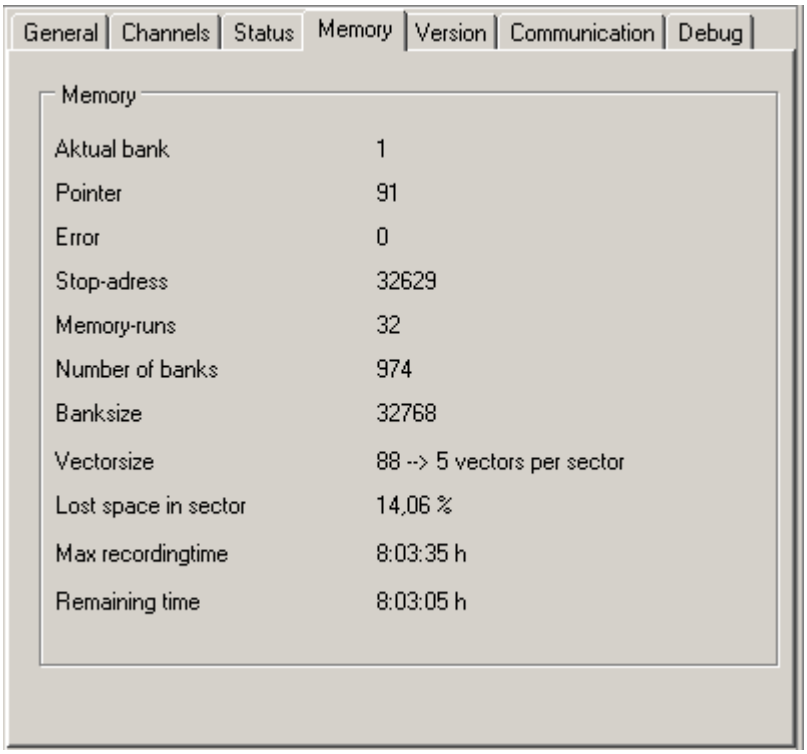


The group *Mode* contains several checkboxes which are not changeable by the user. If *Send channels on CAN-bus* is checked, the logger puts the values of recorded channels on the *CAN-bus*. This is necessary if the values should be shown on a *2D dashboard display*. If you find this box unchecked and you need the values to be put on the *CAN-bus*, call the 2D support.

The second box *CAN-routing active* has to be checked if your system consists of more than one device and the current device is the only one with a direct connection to the computer. If you find this box unchecked and you cannot access your whole system, even though it is properly connected via CAN, call the 2D support.

3.2.1.4 Logger / The detail page Memory

The fourth page of the dialog provides information about the memory of the logger.



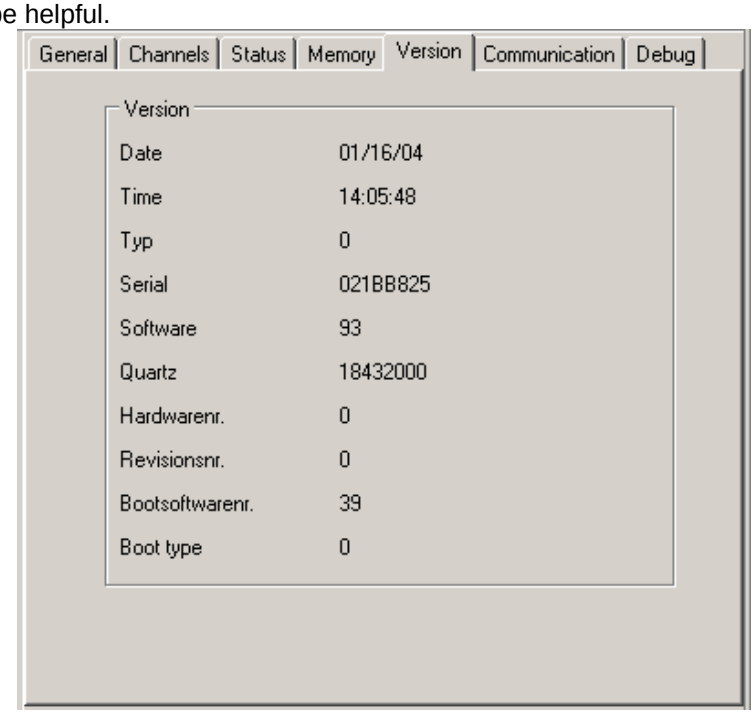
The most interesting values on this page are the maximum and remaining recording time. This time is dependant on the memory size and the sampling rate of the logger.

Another interesting value is the *Lost space in sector*. This is a percentage between 0 and 49 %. Due to the storing algorithm of the logger you might lose up to 49% of your memory.

The higher the difference in the sampling rates of the channels, the higher the loss of space ! Loggers of the generation 6 use an other storing algorithm. No memory is lost.

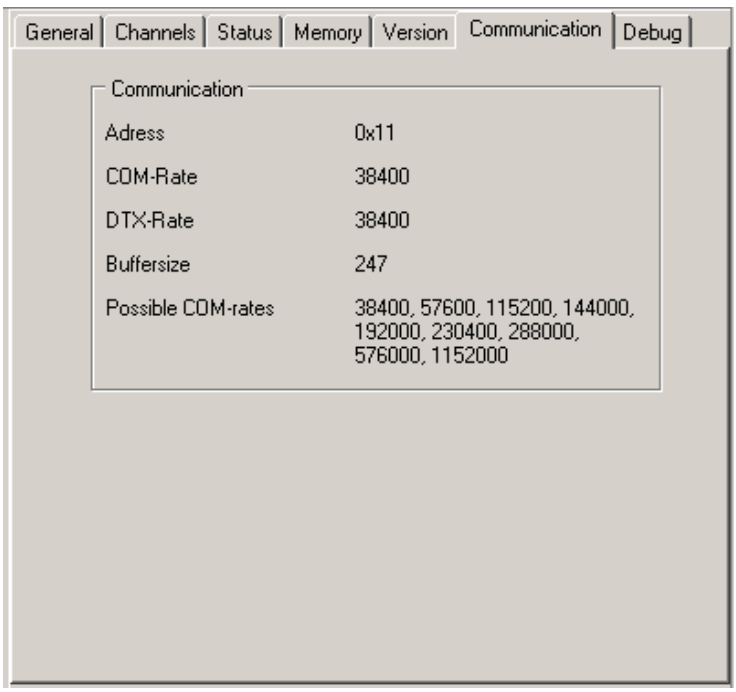
3.2.1.5 Logger / The detail page Version

On this page you see a summary of the *firmware version*. If you need to contact 2D support this information would be helpful.



3.2.1.6 Logger / The detail page Communication

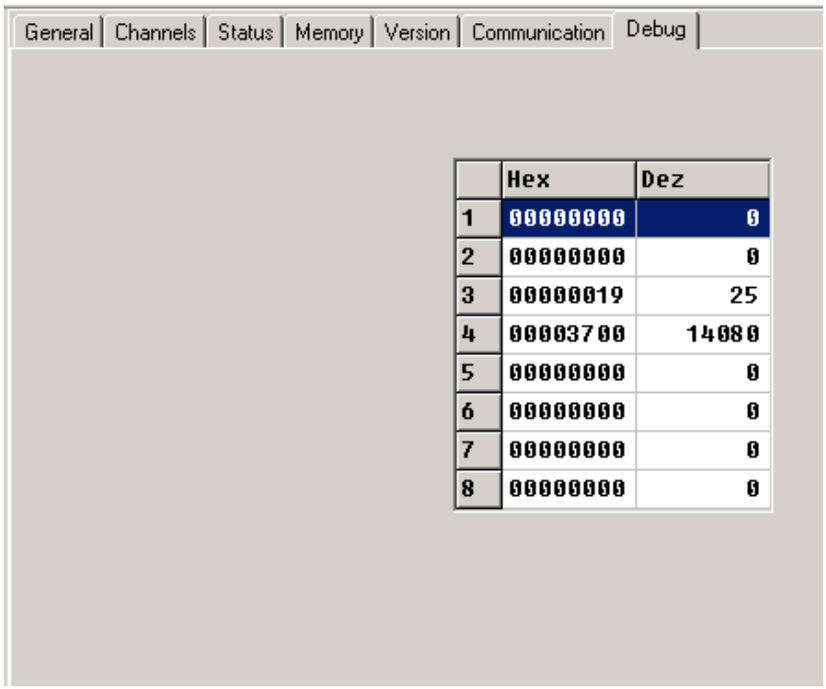
This page provides information about the communication settings of the logger. The value of most interest is the logger address.



3.2.1.7 Logger / The detail page Debug

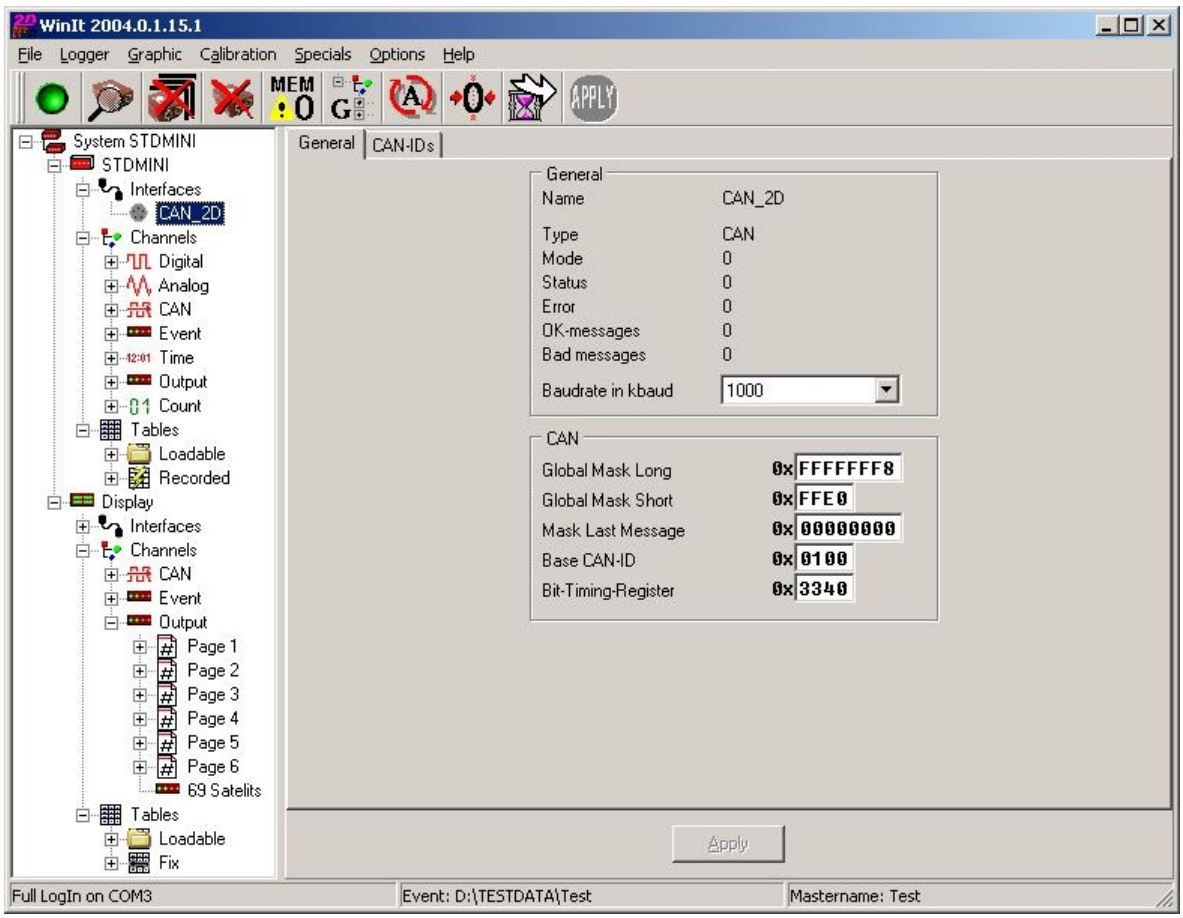


This page contains several hexadecimal values which may be of interest for the 2D support.



3.3 Interface CAN

If you select a CAN-interface in the tree WinIt will show the following dialog.

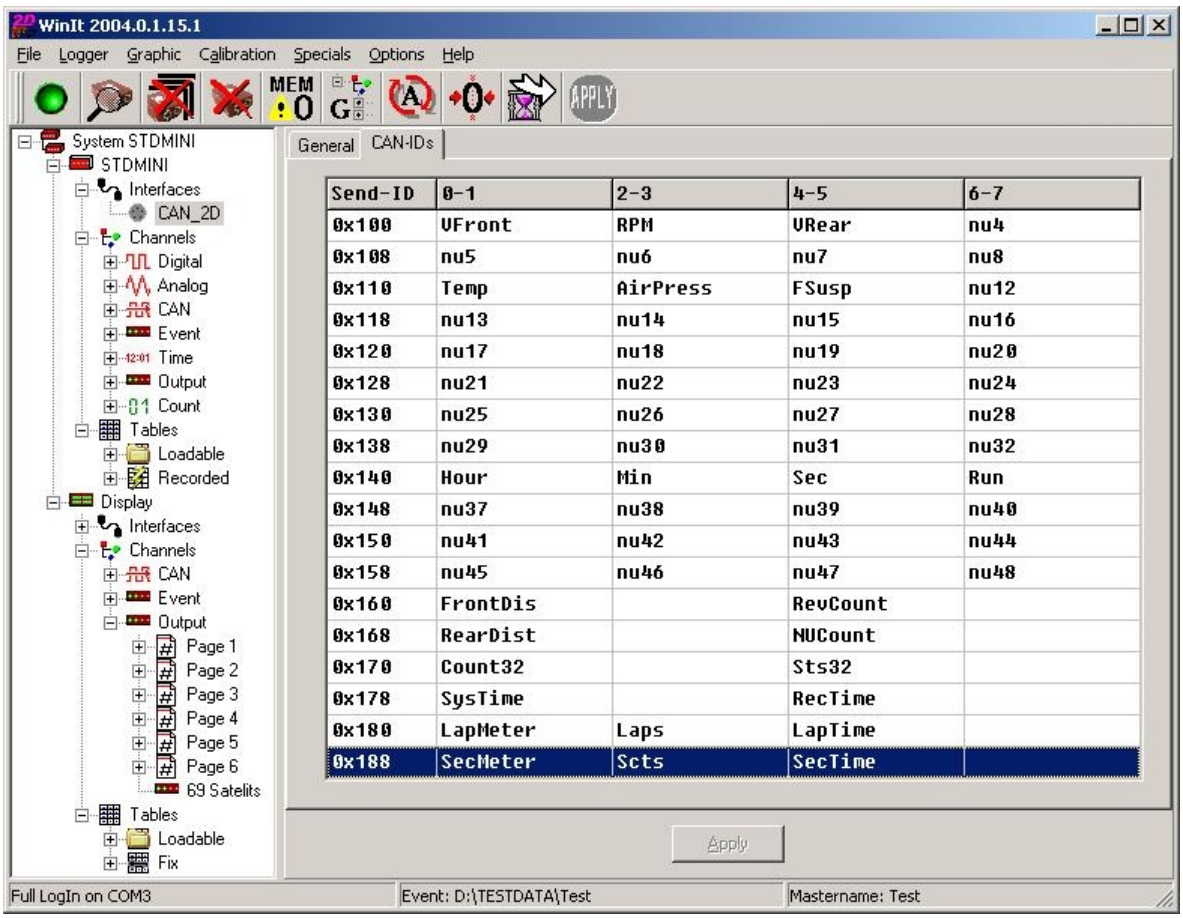


The detail information of the *CAN-interface* is divided in two pages. The first page provides general information about the *CAN-interface*. In the first group is a combo box with the baudrate of the *CAN-interface*. If you want to change this speed, click on the arrow on the right and select a speed from the list. Click on *Apply* so send the changes to the logger.

ATTENTION:
If you change the speed of the CAN-interface and your system consists of more than one device, connected via CAN, you might lose the connection to the rest of the system. The reason is that the rest of the system is read via CAN, but you changed speed of one CAN-interface but not of the rest of the system. Data could only be transferred via CAN if both, the sender and the receiver, use the same interface speed.

The values in the group *CAN* normally should not be changed except the *Base Can-ID*. A *CAN-ID* (ID for identifier) is a hexadecimal number. The base *CAN-ID* is the *CAN-ID* from which a logger creates the identifiers to put his measured values on the bus. With one *CAN-identifier* the data of two up to four channels could be put on the bus.

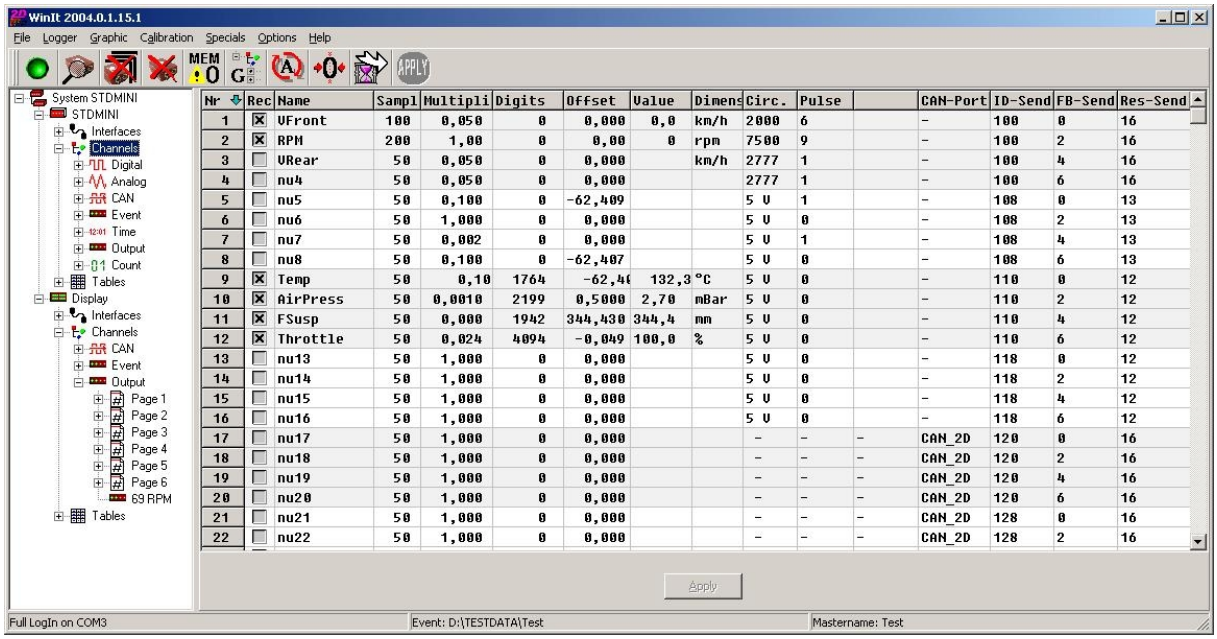
On the second page of the *CAN-interface* dialog you'll find a list of *CAN-ID's*. These IDs are the IDs with which the logger puts his data on the bus. *(See CAN-send data in grid*) If you change the *base-CAN-ID* the logger will create a new list of *CAN-ID's* based on this ID. If you want to change only one ID you can change it in the list.



Send-ID	0-1	2-3	4-5	6-7
0x100	VFront	RPM	VRear	nu4
0x108	nu5	nu6	nu7	nu8
0x110	Temp	AirPress	FSusp	nu12
0x118	nu13	nu14	nu15	nu16
0x120	nu17	nu18	nu19	nu20
0x128	nu21	nu22	nu23	nu24
0x130	nu25	nu26	nu27	nu28
0x138	nu29	nu30	nu31	nu32
0x140	Hour	Min	Sec	Run
0x148	nu37	nu38	nu39	nu40
0x150	nu41	nu42	nu43	nu44
0x158	nu45	nu46	nu47	nu48
0x160	FrontDis		RevCount	
0x168	RearDist		NUCount	
0x170	Count32		Sts32	
0x178	SysTime		RecTime	
0x180	LapMeter	Laps	LapTime	
0x188	SecMeter	Scts	SecTime	

3.4 Channels / Channelgroup

The detail part of the window will show a grid with all channels, if you select the "channels" node in the tree. If you select a channel group like digital or analog only the channels, which belong to this group will be shown in the grid. The grid gives a quick overview over the channels. If the system is online the current values of all recording channels can bee seen.



In this example all columns are activated. It is possible to hide the columns for channel parameters and for *CAN-send information* (see properties).
The green arrow in the top row indicates the sorting of the grid. In this example the channels are sorted ascending by their number.
You might sort the grid by any column you like, just click on the header of the column. After the first click the sorting is changed to the column, ascending. If you click again at the same column the sorting will be changed to descending (and the direction of the arrow changes).
The sub sorting, if necessary, is done by the last selection. That means if you sort by sampling rate and several channels have the same sampling rate, your last sorting column was the channel name, the sub sorting is done by the channel name.

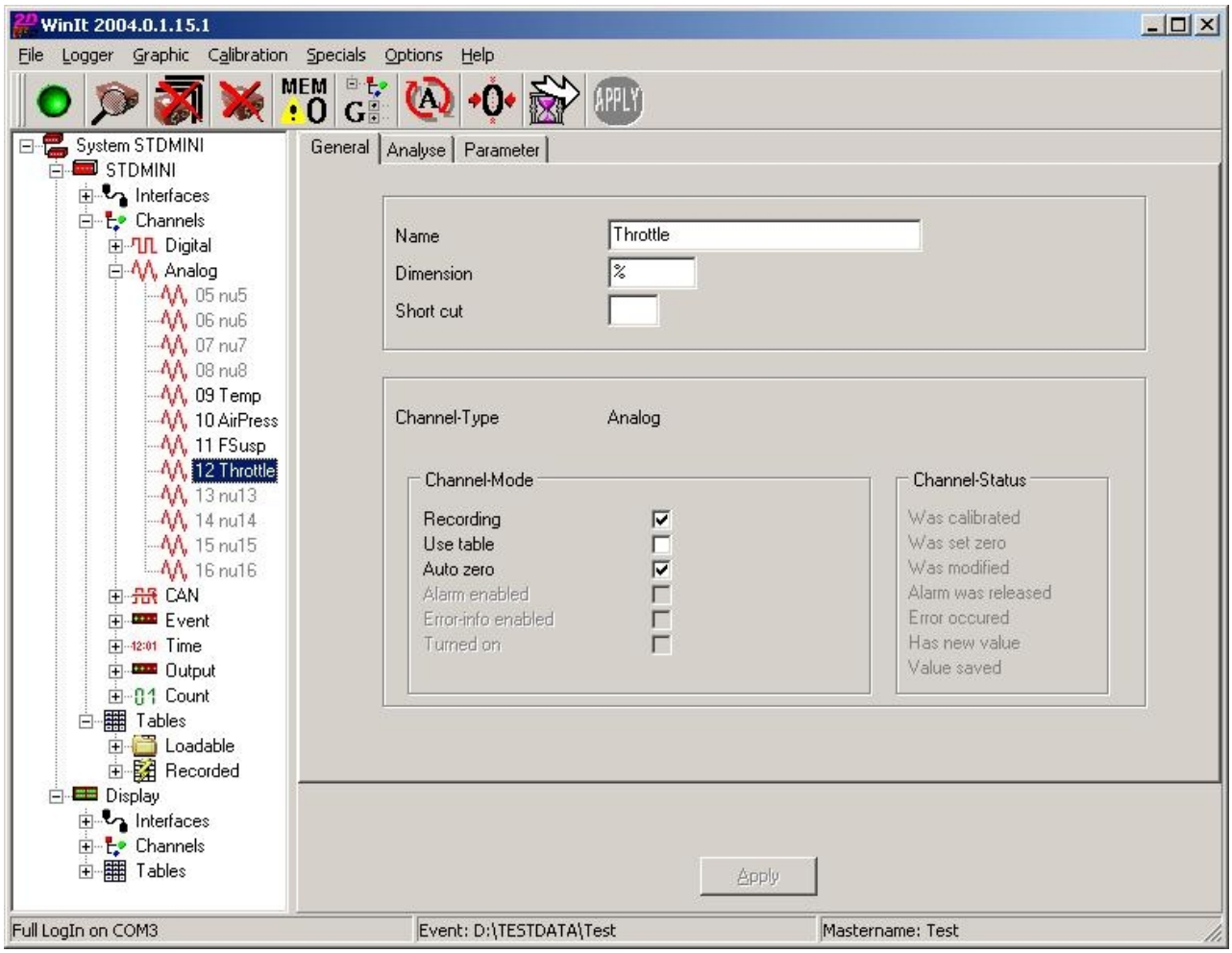
If you do not like the order of the columns in the grid, you may change it. Just click on the header of the column you want to move, keep the mouse button pressed, move the cursor to the position you want to move the column to and release the mouse button.



But this change is only temporary. If you restart the program, the order of the columns is like before. To change the order permanently, select “properties“ from the popup menu of the grid !

In the example above you see that the background of some channels are grey and of the rest white. This should illustrate the user which channels are put together in one identifier on the bus. You can verify this with a look at the *CAN-Send-info*-columns, *CAN-ID*, *CAN-FB* and *Res*. The first four channels use the CAN-ID 0x100, the second four 0x108 and so on.

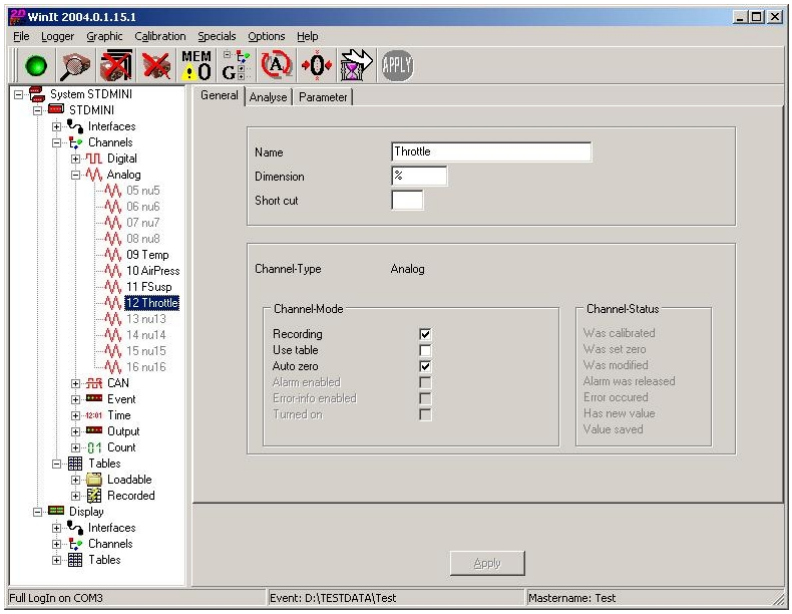
A double-click on a row in the grid will open a dialog with the settings of the corresponding channel. This dialog is the same as the details shown on the right part of the main window if a single channel is selected.In the following we give a description of this mask.



The dialog is divided in three pages: General, Analyse and Parameter.

2D dashboards have a special output channel, which is used to trigger the LEDs of the dashboard. When such a channel is selected in the tree, an additional page is shown.

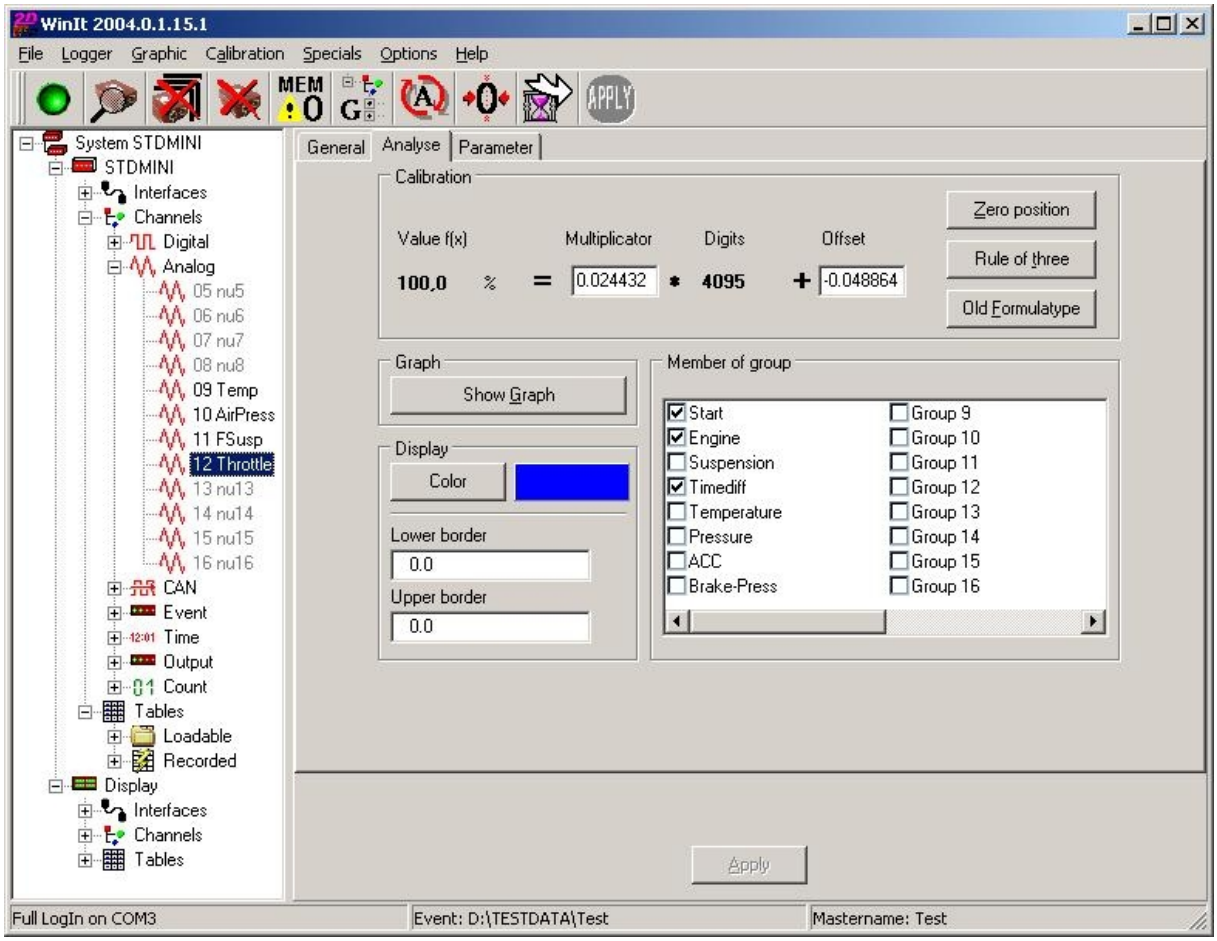
3.4.1 Channels: The page General



Channel Name	On the first page of the dialog the user can change the name, dimension and shortcut of a channel. The shortcut is only used if the channels is shown on a 2D display. It is shown in front of the value on a display.
Channel Type	In the second group you see the type of the selected channel. Depending on this type the checkboxes in the *Channel-Mode-group* are disabled. The checkboxes have the following function: • *Recording* — If this box is checked the logger will record this channel. (Same like record *in grid*) • *Use Table* — Some sensors do not have a linear behaviour, like temperature sensors. For this channels it is necessary to linearize the values by using a table. 2D provides table files for all 2D non linear sensors.If you want to use a non linear sensor from an other company, you can create your own table files with the 2D *table editor TablEd*. After checking the box a combo box appears. Choose the table you want to use. If the table needed is not in the list, you have to select a loadable table in the tree, and load the table needed. • Auto Zero — Some channels need to be set to zero before the measuring can begin. With a 2D display it is possible to send a command over the CAN-bus to set channels zero. In the moment when the command is sent from the display all channels with this flag set will change the offset of their formula to set the current value of the channel to zero. • Alarm enabled — For some channels it is possible to check if the value is always between a lower and an upper limit. If the value leaves that range an alarm is shown on the display.
Channel Status	The last group on this page gives information about the current status of the channel.

If you change any value on this page, the *Apply-button* gets activated and the channel is shown in the tree with a bold and underlined font. Every part of the tree with bold and underlined font represents a part of the setting that was changed but not jet sent to the logger. After clicking on *Apply* normal font is used.

3.4.2 Channels: The page Analyse



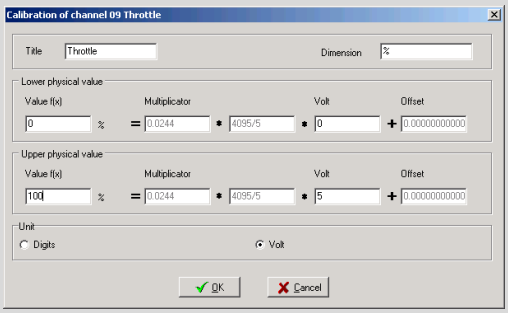
The second page of the channel dialog is divided into three groups.

Calibration

The *Calibration group* summarizes the functionality for the formula of a channel.
A physical value measured with a 2D system is stored in so called digits. The system receives a voltage from the sensor (i.e. 0 V to 5 V). This voltage is transformed into a number by the logger. These numbers are called digits. The range of the numbers depend on the resolution of the channel. (i.e. 12 bit -> 0 to 4095) The formula is necessary to calculate the physical value from the recorded digits.
In WinIt two kinds of formulas are possible:

- ***Old formula type:*** Physical Value = (Multiplicator / Divisor) * (Digits - Offset)
- ***New formula type:*** Physical Value = Multiplicator * Digits + Offset

You can change the type of formula by clicking the button *Old Formula* or *New Formula*. An other button of the calibration-group is Rule of three. After clicking this button the following dialog appears.



With this dialog the formula of a channel can easily be calculated. Normally a sensor comes with a datasheet giving information about the measuring range of the sensor and the corresponding voltage output. Enter these values, click on OK and the formula of the channel is set.

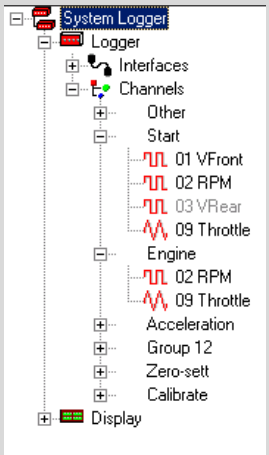
Some sensors need to be set to zero before starting the measurement. Click on the button *Zero position* to set the value of the channel at the current sensor position to zero.

Display

The *Display-group* contains values which influence the graphical representation of a channel. The color is used in the *Software Dashboard* and in the analysis software (if the option is set. See options) The lower and upper limits are used in the software dashboard too. This is the normal working range that should be displayed from a sensor. (See Software Dashboard)

Member of group

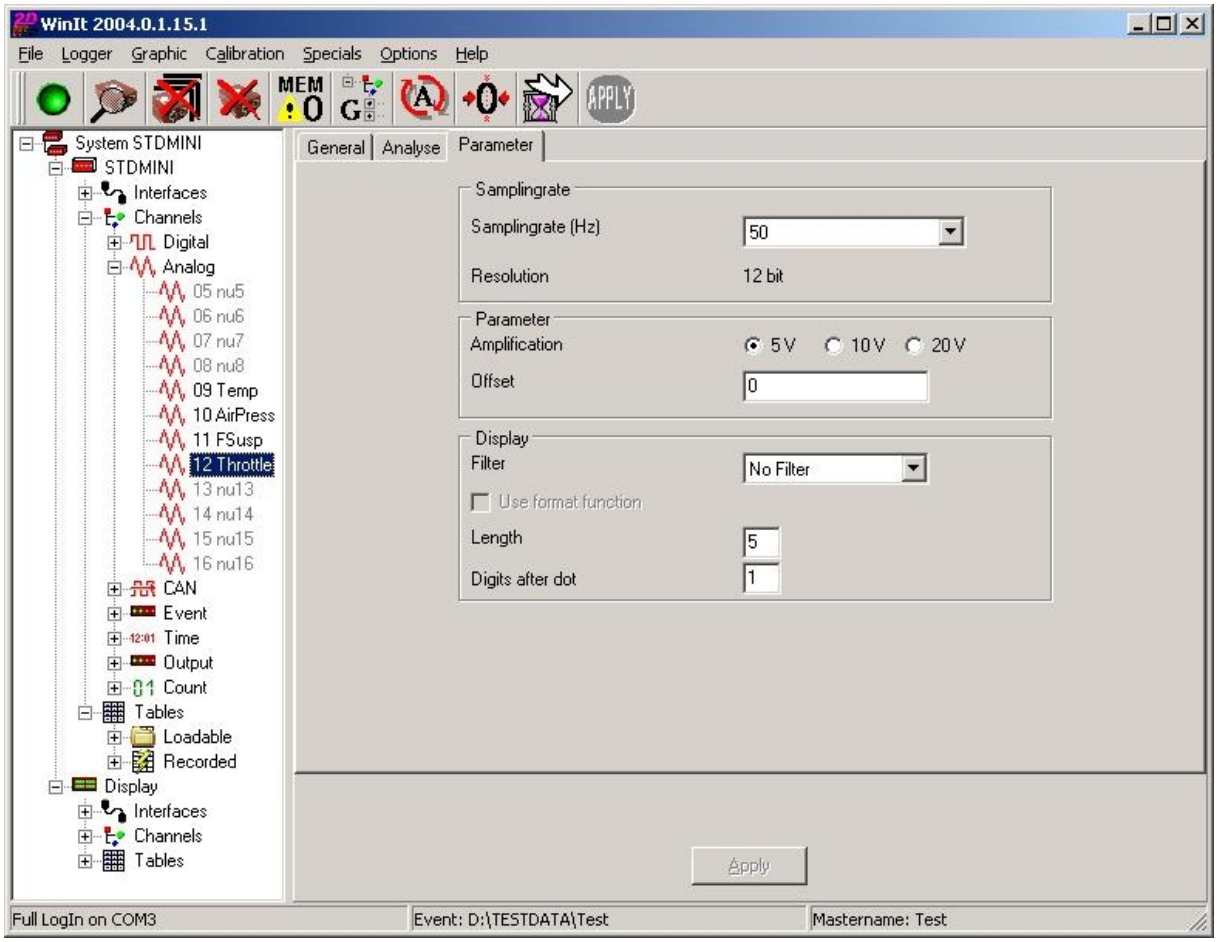
The last item of the analyse page of the channel dialog is a list with 32 *checkboxes*. Each checkbox represents a group. A channel could be member of 0 to 32 groups. To add a channel to a group check it's checkbox. But why using groups ?
WinIt provides the possibility to sort the channels in the tree by their groups. In normal view the channels are sorted by their type (analog, digital,...). If you click on the "Group"-speed button (see Toolbar) or select *Show Groups* from the popup-menu, the views is changed to group view.



Channels that are members of more than one group are shown in each group. Channels that are not members of a group are shown under the node "Other" (if no such channels exists, this node is not shown).

3.4.3 Channels: The page Parameter

The last page of the channel dialog provides information about the parameters of a channel.

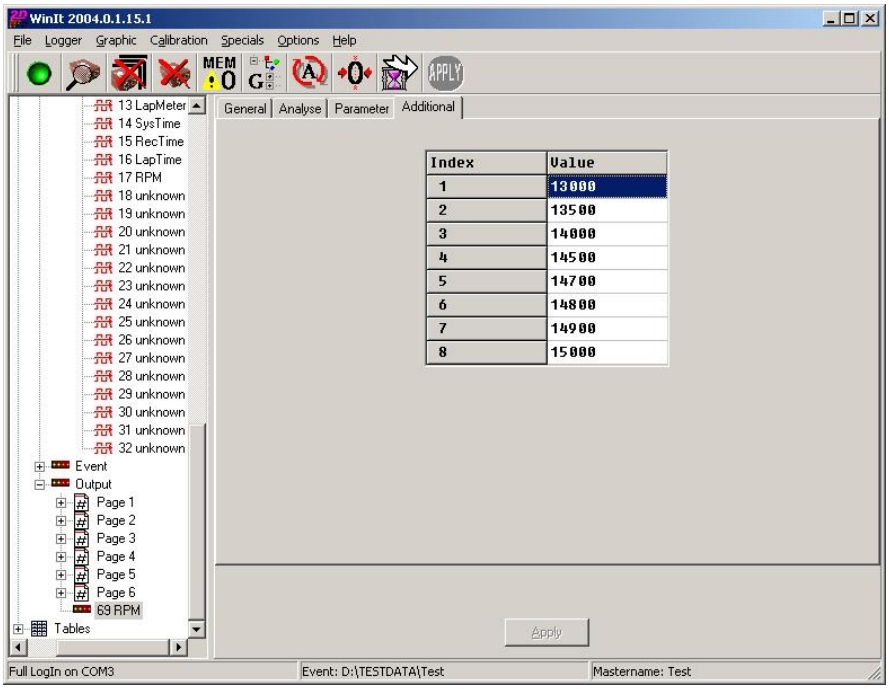


This page of the channel dialog is divided into three groups.

Sampling rate		**The most important parameter of a channel is the sampling rate.** This value in hertz (1/sec) defines the frequency with which a sample is taken from the sensor. The higher the sampling rate the more memory is needed to store the data. Below the sampling rate you find the resolution of the channel.
Parameter		**The second group on this page is the parameter group.** A channel has zero to three different parameters. The number and the meaning of the parameters depends on the channel type. In the following we give a description of the parameters for each channel type.
	Digital	***Circumference*** If you use a digital channel to measure the speed of a vehicle, enter the circumference of the wheel, where the speed sensor is mounted. ***Pulses*** Enter here the number of pulses for one complete turn of the wheel. If you measure a RPM-signal do not change the default setting of 7500 mm and 9 pulses !!!
	Analog	***Amplification*** you may select from three different amplifications: 5V, 10V and 20V. Select here the correct amplification depending on the output-voltage of your sensor. ***Offset***
	CAN	***ID*** Enter here the CAN-identifier of the data you want to catch from the CAN-bus. ***Data*** A CAN-packet contains eight byte of data. Click on the number on the bar to select one or more byte from the packet.
	Event	***Timeout*** This value defines a time for which the channel does not recognize a new event. The unit of this value is ticks. If the logger has a main sampling rate of 400 Hz one tick is 1/400 s.
	Output	***Channel-number*** An output channel switches a signal depending on the value of another channel. Select here the channel, that should trigger the output channel. ***Turn on at*** Enter here the physical value at which the output channel should toggle the signal.
	Count	***Counted channel*** A count channels summarises the values of a digital channel. In this field you see, which channel is counted by the current counter channel.
Display		**The last group on this page is the *Display-page*.** You may select a filter for channels of a display. This values does not have an effect on loggers. Important are the two values *Length* and *Digits after dot*. These two values define how the physical value of the channel is shown in the software. If you see in the grid or the channel dialog something like "***.**" the reason is, that the number is to large to fit in the given format. Enter a higher number for the length !

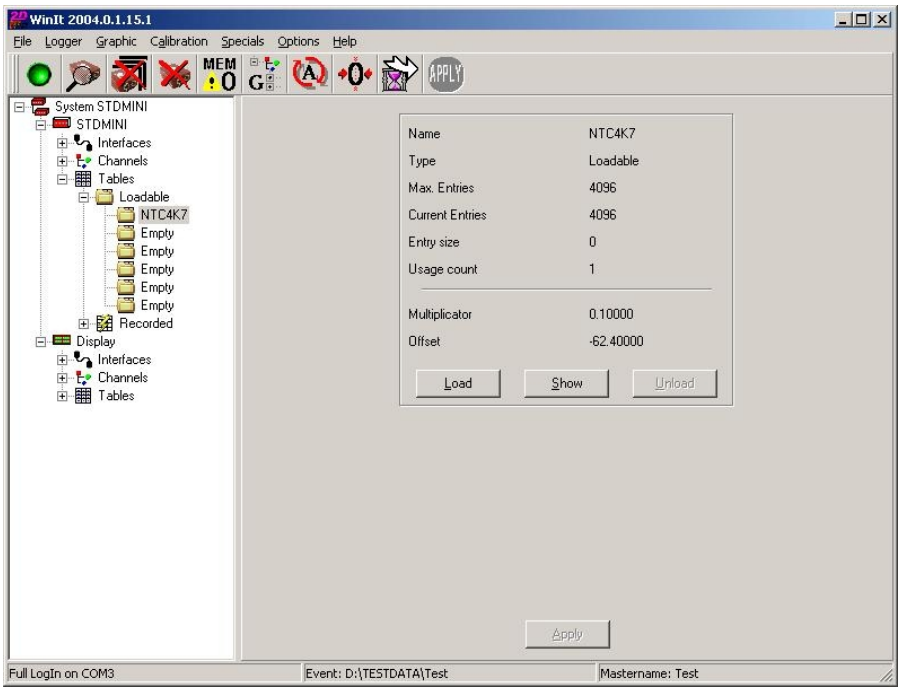
3.4.4 Channels: The page Additional

2D dashboards have a special output channel, which is used to trigger the LEDs of the dashboard. When such a channel is selected in the tree, an additional page is shown.



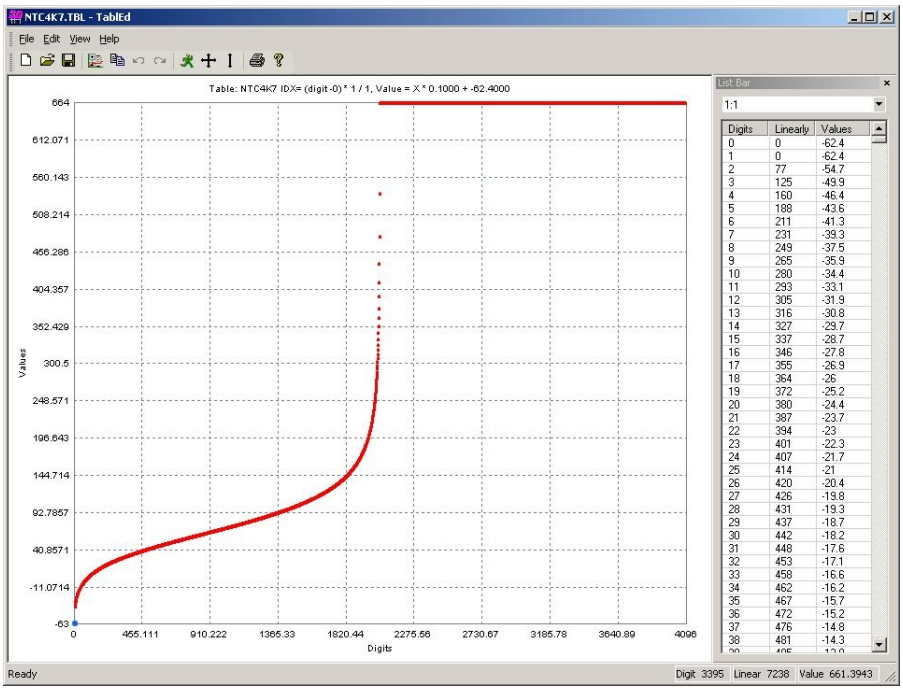
3.5 Tables

When a table is selected in the tree you see the following detail:

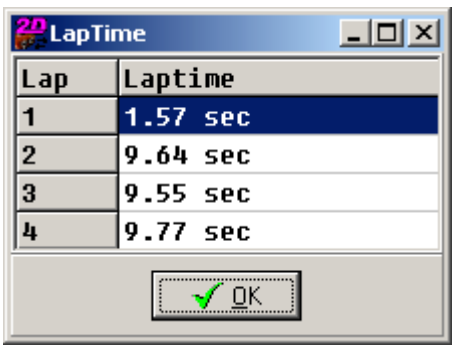


In the box you see some information about the table. The most important is the usage count. When a loadable table is selected, the "Load" button is active.
Use this button to load a table you want on that position. If the table is in use by any channel, these channels are shown and you will be asked if you are sure what you are doing. With a click on "Show" the content of a table is shown. If a loadable table is selected clicking on "Show" starts the 2D Table-Editor with the table.

This example shows the table NTC4K7 in the Table Editor.



In Case a recorded table is selected the recorded values are shown in a dialog:



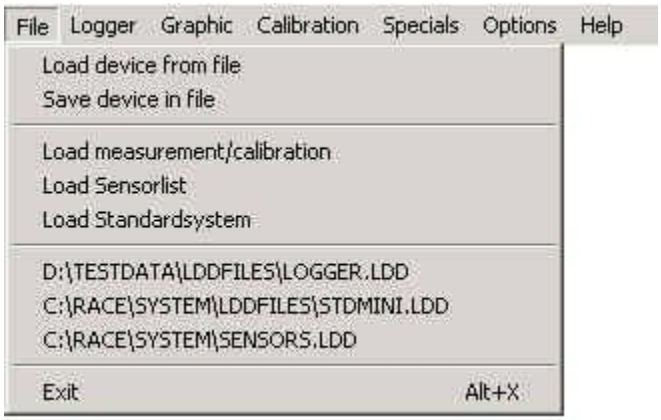
In this example a laptime table with four laptimes is shown.

4. The main menu

This chapter is a step-by-step introduction to the main menu of WinIt.

4.1 The sub-menu item File

After clicking on the first item *File* of the main menu the following sub-menu appears:



- ***Load device from file***
  Use this item to load a previously saved setting. A file select dialog is opened. When it is opened the first time the dialog shows the contents of the default setting directory (Which is located in your data directory). When you open the dialog the second time the directory is that one you used last. After the selection of a file WinIt adds a node in the tree with the file icon. The sub nodes depend on the stored data. The filename is inserted at the top of the file history.

- ***Save device in file***
  Select this item to save the setting of a 2D device in a file. A file dialog is shown. The initial directory is the default setting directory. Select a filename or enter a new one and click on *OK*. The filename is inserted at the top of the file history.

- ***Load measurement / calibration***
  With this menu item the user can load the calibration of a measurement. The calibration is loaded like a normal logger, but it only contains channel-information. You may change the formula and other values of the channels, what will have direct influence the drawing of channels in the analysis software.

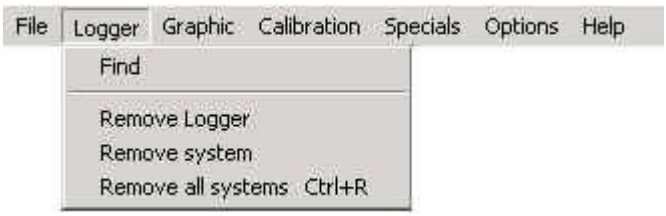
- ***Load sensor list***
  2D provides a file with predefined channels for the 2D sensors. After a click on this menu item a new node with the file-icon is added with sub nodes for each predefined channel. The names of the channels are the names of the 2D sensors. If you want to set a channel the first time, using a 2D sensor you might select the sensor from this list and copy it on your channel.

- ***Load Standard system***
  2D provides some setting files for standard loggers as examples for setting files. With this menu item you can select from these files.

- ***Exit***
  The last menu item terminates the software. Above this item you see the history list of the previously used files. Clicking on one of the filenames loads the file.

4.2 The sub-menu item Logger

The menu item *Logger* opens the following sub-menu.



- ***Find***
  The first item makes WinIt check all activated ports for 2D devices. If something is found, the setting is read and the devices are drawn in the tree.

- ***Remove Logger***
  Select this menu item to remove a device from the tree. You can unload a file or a connected device.

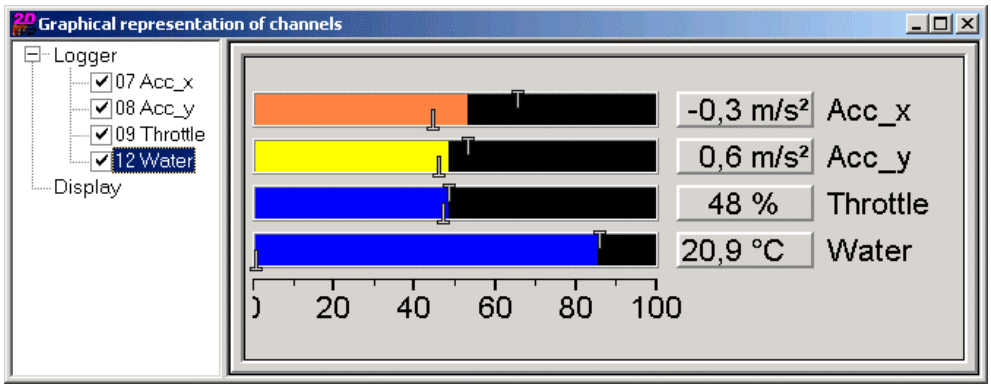
- ***Remove system***
  A system contains more than one device, which are all connected on one port. Normally one device is connected to the PC through a COM-port. The rest of the system is only connected over CAN with this device. With this menu item you remove a whole system from the tree.

4.3 The sub-menu item Graphic

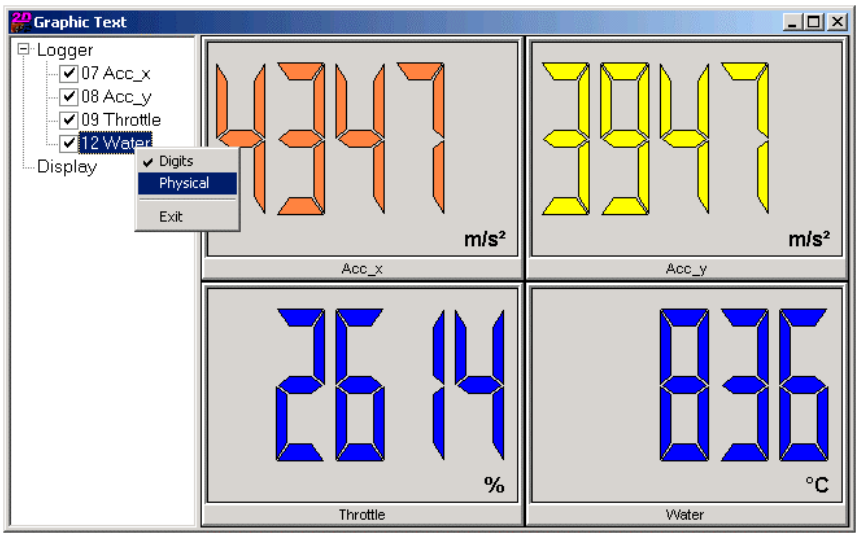
Under the menu item *Graphic* all functions to visualize channel-values are summarized.



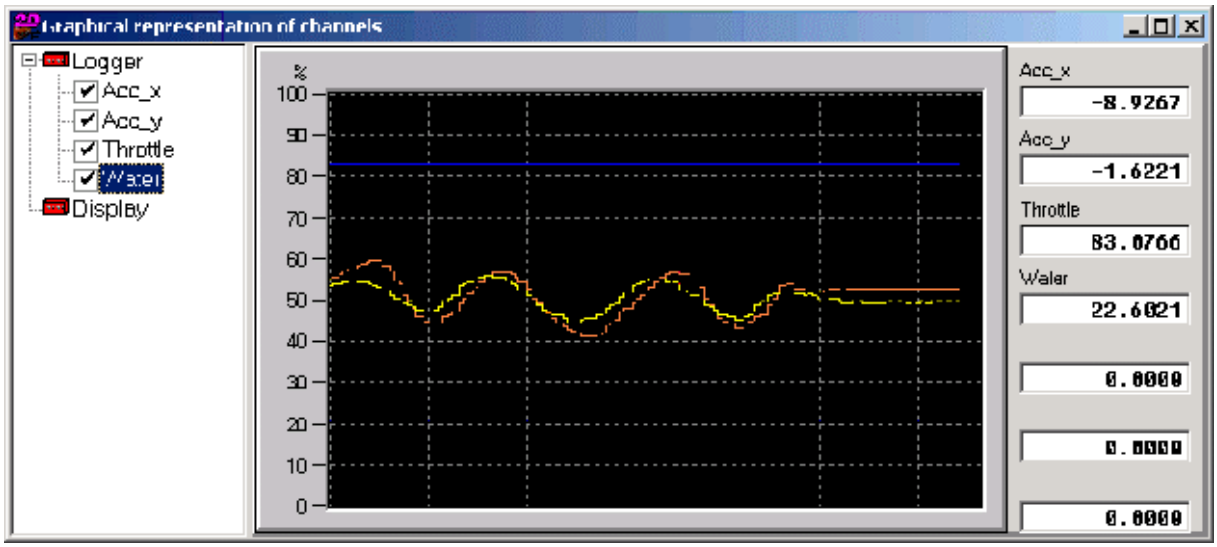
- ***Graphic***
  The first sub-item *Graphic* opens a dialog which is divided in two parts. On the right is a tree containing all recording channels from the current system. To activate a channel check it in the tree. For each checked channel one graphical bar appears in the right part of the window. The bars are painted in the color of the channel.



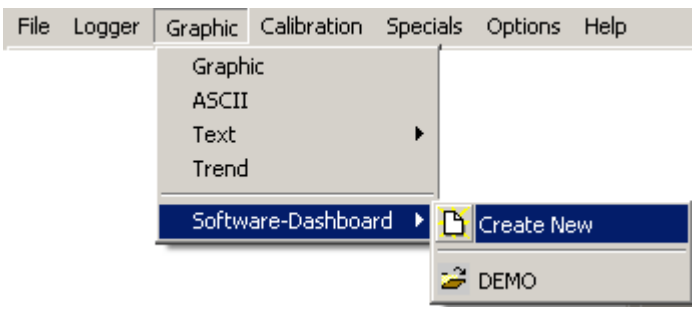
- ***Text***
  With the menu item *Text* you have the possibility to visualize channel values with *7 segment display* instruments. You can either see the values in digits the real physical value. The view can be changed with the popup-menu.



- ***Trend***
  Graphic / Trend opens an oscilloscope like graphic. In the tree on the left you can activate up to eight channels, that should be drawn. Each channel is drawn in it's color. If you move the mouse over the graph in the values of the channels at the mouse position are shown in the fields on the right.



- ***Software-Dashboard***
  If you select *Graphic / Software-Dashboard* from the main menu a submenu opens (A logger has to be selected in the tree). This submenu has one entry for each previously saved software-dashboard. Just click on one to load and show it. If you want to start with a new empty sheet select the first item *Create New*.

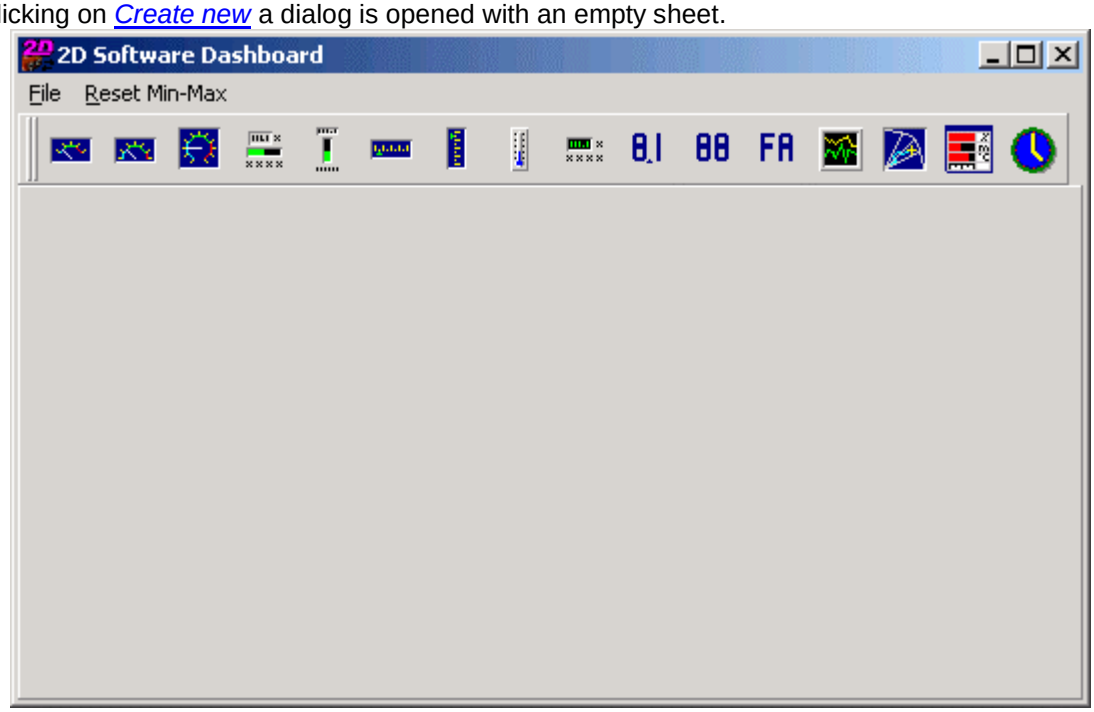


In the following we give a short introduction how to create a new *software dashboard*. After clicking on *Create New* a dialog is opened with an empty sheet.

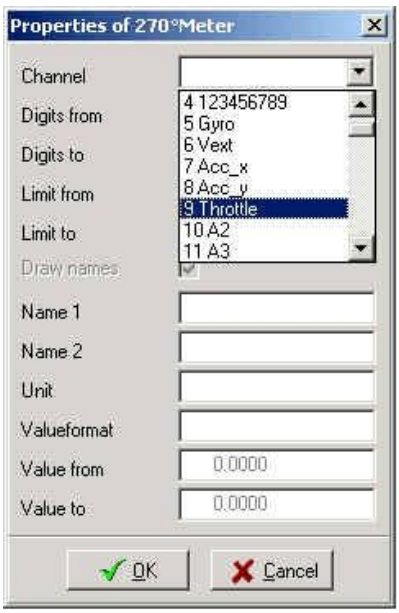
4.3.1 Example: Software Dashboard

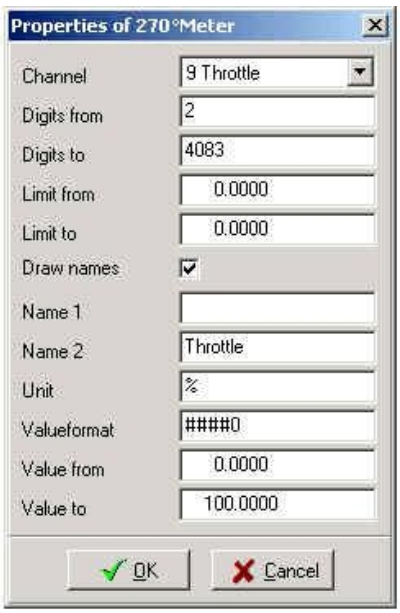
If you select *Graphic / Software-Dashboard* from the main menu a submenu opens (A logger has to be selected in the tree). This submenu has one entry for each previously saved software-dashboard.

- Just click on one to load and show it. If you want to start with a new empty sheet select the first item *Create new*.
- In the following we give a short introduction how to create a new software dashboard. After clicking on *Create new* a dialog is opened with an empty sheet.



- On the top of the window is a toolbar with 16 icons. Each represents one type of instrument. The instruments are placed on the sheet by drag and drop. Click on an icon, keep the mouse button pressed move to the position where the instrument should appear and release the mouse button. A dialog is opened where you have to enter the properties of the instrument. Some instruments show two channels, their property-dialog has two sets of the fields of single channel instruments. The property-dialog is the same for all single channel instruments, but not all values are used for all instruments.



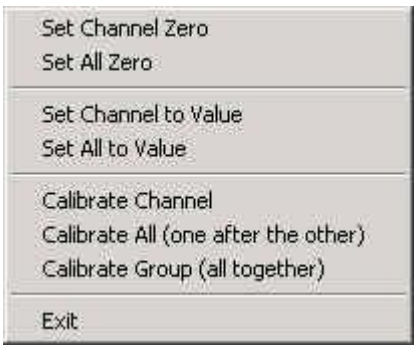


- The first thing you have to do is to select a channel from the list. After the selection WinIt fills the other fields with values from the channel setting.

Digits from / Digits to	These values define the range in digits which should be shown with the instrument. If you change this values WinIt changes automatically the values in the fields *Value from* or *Value to*, which define the range of the instrument in physical values.
Limit from / Limit to	Some of the instruments have the ability to check the values if they are in a defined range. If the value leaves the range the instruments starts to blink red. Enter in this fields the range in physical values in which the signal is OK.
Draw names	If this checkbox is disabled the instrument is painted without a name in its border.
Name 1 / Name 2	The names written in these fields are shown in bottom of the instrument.
Unit	This field receives the dimension that should be shown with the physical value.
Value format	Enter here a format string to define how the physical value is drawn. Every character in the format string is used for a *digit* of the resulting number-string. A "#"-character is replaced by a space if this *digit* is not used for the number. A "0"-character is replaced by a 0. That means '###0.00' will show " 0.00" if the value is zero. '####.##' will only show " . " for zero, what makes no sense. The character before and all behind a dot should be '0'.
Value from / Value to	Enter here the range that the instrument should show. Example: You have a channel measuring the temperature of water. The sensor has a range from -200 to +200 °C. But as you know, water (at least liquid) has a temperature from 0 to 100 °C. So it would be good to reduce the range of the instrument to 0 up to 100 °C. If you have entered the lower and upper border in the display-group on the analyse-page of the channel the range is filled in automatically.

4.4 The sub-menu item Calibration

The fourth item in the main menu is "*Calibration*". That means the manual calibration of channels. The dialog looks the same as the normal graphic-dialog. (See Graphic / Graphic) The difference is that, when you place the mouse over the channel to be calibrated and right-click the mouse, a Pop-up menu appears on the right part of the window. The selected channel is highlighted.



- ***Set Channel Zero***
  Use this function to set the value of the selected channel to zero at the current sensor position. The offset of the formula is changed.

- ***Set All Zero***
  This function sets all values of the activated channels to zero at their current sensor position.

- ***Set Channel to Value***
  These function are the same like the zero-setting with the difference, that WinIt asks for the value to set the channel to.

- ***Set All to Value***
  These function are the same like the zero-setting with the difference, that WinIt asks for the value to set the channel to.

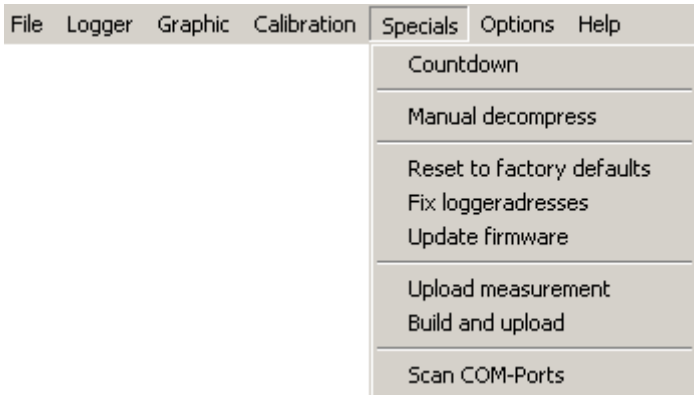
- ***Calibrate channel***
  This function is used to calibrate a channel by two defined sensor positions. The software prompts you to move the sensor of the current channel to the minimum position. After clicking *OK* WinIt samples the channel for several seconds and builds an average value. Then you have to move the sensor to it's maximum position. Click on *OK* and WinIt starts to sample again. Now the rule of three dialog is opened with the two sensor positions entered in the digits-field. Enter now the physical values for this positions.

- ***Calibrate All (one after the other)***
  This function is the same like above, but all channels are calibrated one after the other.

- ***Calibrate Group (all together)***
  With this function you can sample all channels at one time. The rule-of-three dialog is shown for each channel.

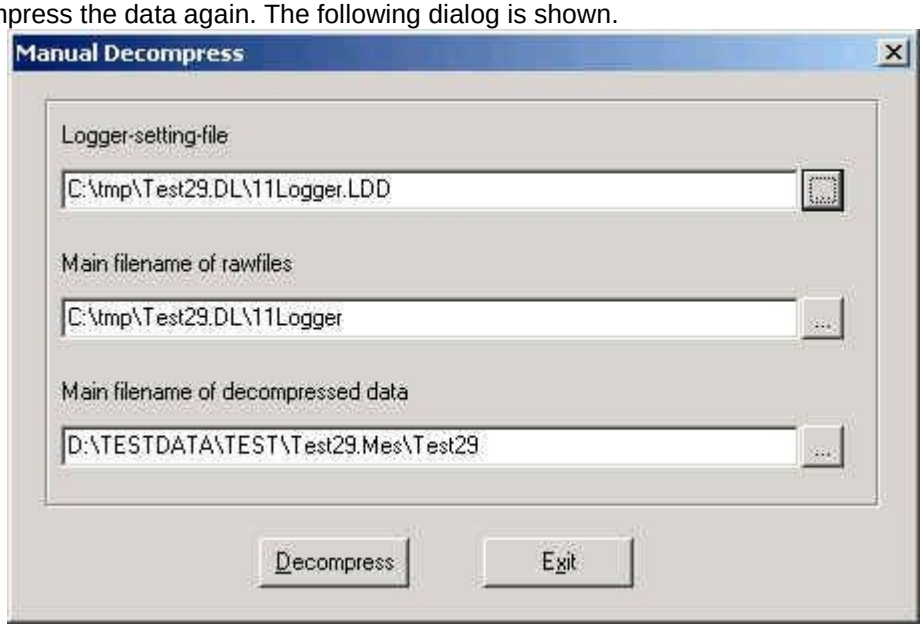
4.5 The sub-menu item Specials

The fifth menu item, *Specials*, summarizes functions that did not fit to any other menu item.



- ***Countdown***
  Select this menu item to start a dialog with a *countdown-timer*. The *timer* starts with a *countdown-time* of 60 minutes. To change the time double-click on the dialog and enter the new time. If you close the *timer* and reopen it, the *timer* continues.

- ***Manual decompress***
  The data in the logging device is raw data, which has to be decompressed and divided into channel files. In the download procedure the raw data is collected from the logger and stored as raw files on the hard disk. After the last data block was transmitted, WinIt starts to decompress the raw data to channel files which are stored in the measurement directory. If something goes wrong, i.e. the measurement directory is located on a network that is not available, it might be necessary to decompress the data again. The following dialog is shown.



You have to select the setting file, which is stored in the download directory. A click on the first button opens a file dialog. It's current directory is the directory where WinIt stores it's raw data (see options). Open the download directory from the measurement you want to decompress again and select the setting file (*.LDD) which is located in this directory. After the selection WinIt fills automatically the other two fields depending on your event-settings. Now you can click on "Decompress" and the decompress is started.

- ***Reset to factory defaults***
  This function sets a device to factory defaults. Recorded data is lost ! The setting of the device is stored in a file and the file is loaded automatically. The user does not loose his settings.

- ***Fix loggeradress***
  Each 2D device of one system has to have a unique address.
  Any command sent always contains the address of the device that should react. If more than one device has the same address, they would all answer at the same time and the PC would not be able to decode the answer. If WinIt recognizes that an address is not unique it tries to solve this problem by changing the address of one device. With this function the user has the possibility to change the addresses manually.

- ***Update firmware***
  For professional users only - please contact the 2D support

- ***Upload measurement***
  For professional users only - please contact the 2D support

- ***Build and upload***
  For professional users only - please contact the 2D support

- ***Scan COM-Ports***
  Use this function to make WinIt detect the COM-Port at which a 2D device is connected. (See Setting up the communication)

4.6 The sub-menu item Options

The menu item *Options* opens the following sub-menu.



The first three items are switches, that can be on or off.

- ***Poll communication ports***
  With this item it is possible to deactivate the communication of WinIt. If the polling is activated and a system connected, WinIt checks once a second, if a device is still connected. If not the icon in the tree is changed. A second thing that depend on the polling is the update of channel values. When polling is active and a channel or a group of channels is selected in the tree, WinIt receives the current values of the channels and shows them either in the grid or the channel dialog. With Polling inactive the values are not updated.

- ***Auto-Update***
  The memory usage shown by WinIt is the usage at the moment of the login procedure. If the device is still recording the memory usage is not updated. When this function is enabled, the software checks once a second the memory usage of the device and updates the memory bar.

Attention:
Since sending the memory usage to the pc takes a little time the logging device might loose some channel values if the logger does not have enough time. That is the case when the logger is working with a high base sampling rate and a lot of channels are recorded at high speed !

- ***Auto-Download***
  This menu item is used to change from setting mode to autodownload mode. (See introduction) While in *autodownload mode*, WinIt periodically checks all active ports for 2D devices. If devices are found, the download starts immediately.

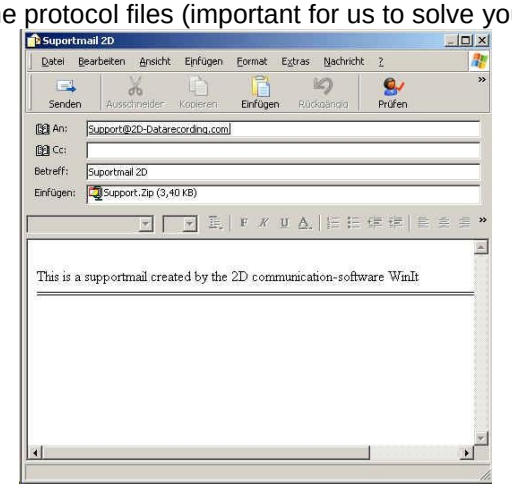
- ***Language***
  WinIt uses the same language as *WinARace.* If you want to change the language only for WinIt and only temporary you can uses this submenu.

- ***Settings***
  Starts the options-dialog of WinIt as described in Setting up the communication manually.

4.7 The sub-menu item Help



- ***Help***
  Starts the context sensitive help module of WinIt (shortcut key <F1>).
- ***Keyboard-commands***
  Show you a complete table of the WinIt shortcut keys (start of the help module and show you the corresponding page).
- ***What's new***
  Give you a complete overview of the software changes of WinIt over all software revisions. (start of the help module and show you the corresponding page).
- ***Send supportmail to 2D***
  With this menu item you can contact quick and easy the 2D support. At the email attachment you will get automatically some protocol files (important for us to solve your WinIt problems).



Please note: You need a correct working email account !

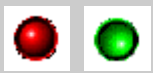
- ***About***
  Get version informations of all 2D software modules (printable !)



5. The Toolbar device

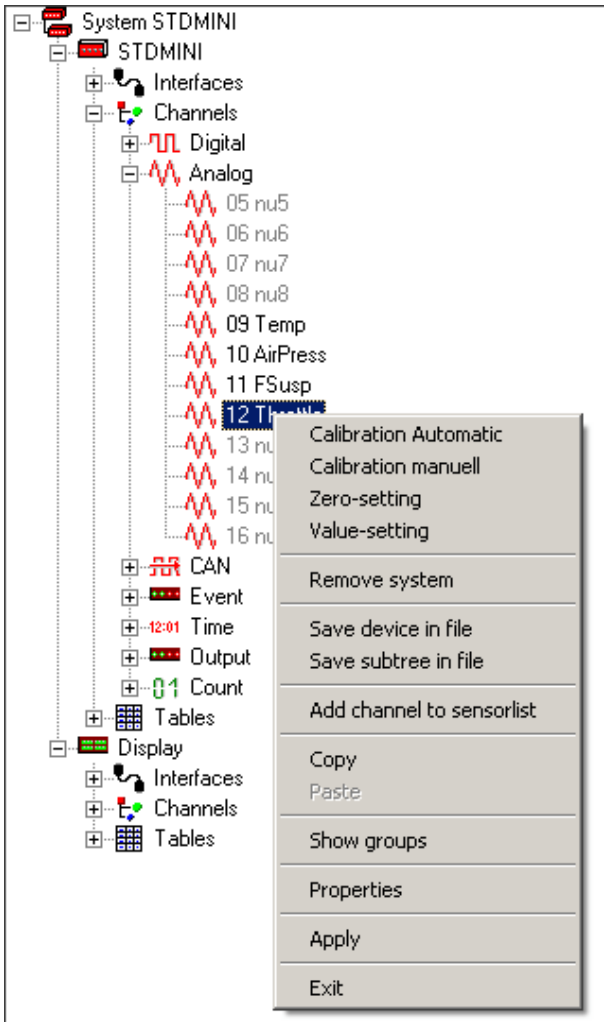
In this chapter we give a description of the toolbar and it's buttons.



	The first tool button activates or deactivates the communication. (See main menu options) The color of the button indicates the current state. A green button means the polling is active and a red one means it is inactive.
	A click on this button starts the search routine. Use this to make WinIt read a newly connected system.
	This button unloads all devices and files, but the software tries to find and read devices afterwards. Attention: You will lose changes to the settings if the changes were not already sent to the devices!
	With this button only the currently selected device or file is unloaded. Attention: Changes to the settings of the device are lost !
	Click on this button to clear the memory of the currently selected device. Attention: All recorded data will be lost!
	Use this button to toggle between *normal* and *group view*. In normal view the channels are sorted in the tree by their type. In group view they are sorted by their group membership.
	This button turns the *auto - update mode* on or off. In *auto -update mode* the usage of memory is read and updated periodically. (See Mainmenu / Options AutoUpdate)
	With this button you can send the auto-zero command to all devices of the selected system. If a device receives this command all channels with the auto-zero flag are set to zero. (See: Channel-dialog)
	With this button you can toggle between full login and smart login. In full login the complete setting of all connected devices is read. The smart login only reads the complete setting of the master logger. Other devices are only read partially. The rest, for example the channels, are read only when needed. You can see this in the tree. A partially read logger has a sub-node for channels. But this sub-node has no "+", which means no sub-nodes. If you click on the channel node, the cursor changes to an hourglass and the channels are read. After several seconds the cursor becomes normal and the "+" appears in front of the channel node. For large systems the smart login could save time.
	This button is only active if something is changed on a loaded or connected logger. Clicking the button makes WinIt write the changes to the device or file.

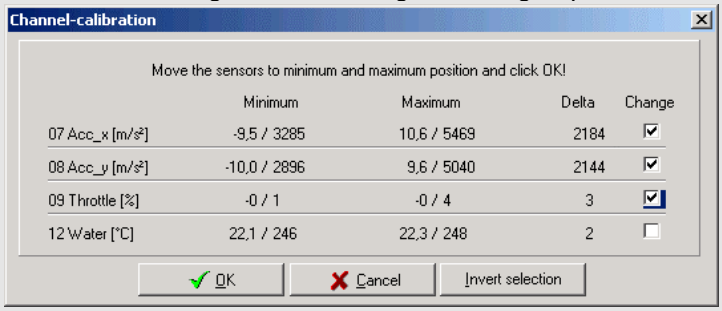
6. The Pop-up Menu

Another way to access functions of WinIt is the Pop-up menu which appears after a mouse right-click on the tree. Some items of the menu are only visible if a certain type of node is selected.

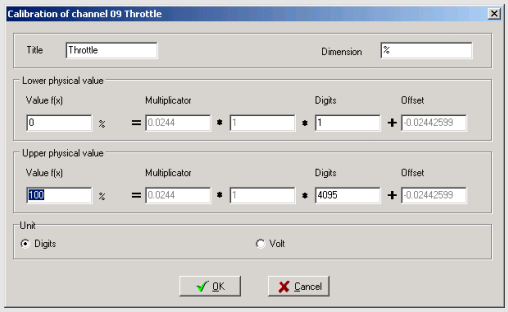


Calibration automatic

This menu item gives access to a second method of calibrating channels, the automatic calibration. You can use it to calibrate a single channel or a group of channels. That depends on the selection in the tree. The following example shows the calibration dialog with the analog channel group selected.



The calibration dialog is opened with all recording channels from the selected analog group. The software samples the channels for minimum and maximum values. You must move the sensors to define minimum and maximum positions. For each channel you see one line in the dialog. At the end of the line is a checkbox *Change*. The button *invert selection* checks all unchecked checkboxes and vice-versa. After a click on *OK* for each channel with that box checked, a rule of three dialog is opened with the found minimum and maximum positions.



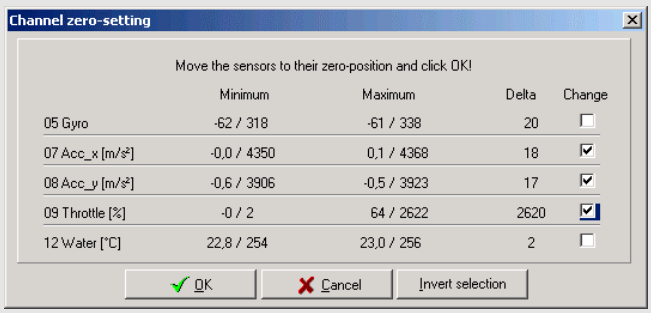
Now enter the physical values corresponding to the minimum and maximum digit values and click *OK*. Now this sensor is calibrated.

Calibration manual

Starts the same calibration dialog as the calibration available from the main menu. (See: Mainmenu / Calibration)

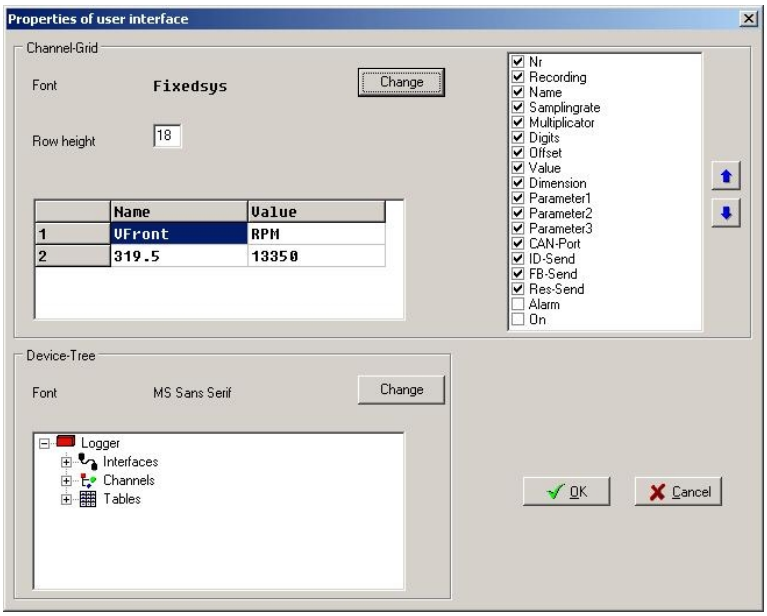
Zero-setting

With this function you can set one or more channels to zero by moving the sensor to it's zero-position. After selecting this menu item a dialog appears that looks similar to the automatic calibration.



The behaviour is the same as in the automatic calibration, WinIt samples the channels to find minimum and maximum values. Check the *Change* checkbox behind the channel name to manipulate the formula of the channels. The software uses either the minimum or the maximum value, depending on the formula, to recalculate the offset in the formula.

Value-Setting	This menu item provides a function to set the physical value of a channel to a certain value at the current sensor position. Only the offset of the formula is changed.
Remove system	Unloads the currently selected system. See Mainmenu/Logger/ Remove System
Save device in file	Stores the setting of the currently selected device in a file. (See Mainmenu / File / Save device in file)
Save sub-tree in file	Stores a part of a setting in a file, depending on the selection in the tree. Only the data of the selected node and it's sub-nodes is stored. If the selected node is a logger-node, the saved setting contains a whole logger setting. If only a channel is selected, the saved setting contains only one single channel.
Add channel to sensor list	The 2D software comes with a predefined setting file which contains a list of channels with typical settings for 2D sensors. This file should help the user to set up his system by copying the predefined channels to his logger setting. This menu item gives you the possibility to add the channels you defined to this sensor list. If you have to create another setting, you can copy your channel from the sensor list to your new setting.
Copy	With this menu item the current selection of the tree is copied to the Windows clipboard. Use it to copy and paste settings or parts of settings. If you select *copy* on a single channel, only the channel is stored in the clipboard. If the selected node in the tree is a logger-node the complete setting is stored.
Paste	Use this menu item to paste the previously copied data from the tree. Use it to copy and paste settings or parts of settings. It is not necessary that the source and destination nodes are from the same type.
Show groups	Toggle between normal and group view. See Toolbar / Groupview
	Starts a dialog to customize the appearence of the tree and the grid. Refer the figure below. The dialog is devided in two parts. The first group is used to change the properties of the channel grid, the second for the device tree. By clicking on the "Change"-button you can select the font you want to use for the tree and the grid. The default fonts are: Grid: Fixedsys, size 9 Tree: MS Sans Serif, size 8. With the field "Row height" you can customize the height of a row in the grid. The box on the right is used to define which columns should be shown in the channel grid. The order can be change by selecting a line of the box and moving it up or down with the arrow buttons besides the box.
Exit	Terminates the program.



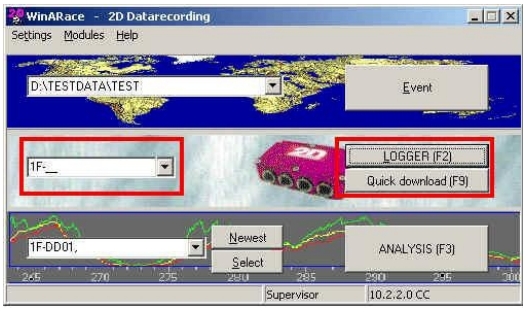
7. Downloading data from system

There are two possibilities to start the download of the data. The first and faster one is to start WinIt in autodownloadmode (See setting mode / autodownloadmode) by pressing the key <*F9*> in the front-end-tool *WinaRace*. The second possibility is to press the key <*F9*> in WinIt while running in setting mode.

The first thing WinIt does after the download process started is to check the download addresses. The software tries to determine if for each address marked as a download address in the communication options (See options) a device with that adress is connected. If not, a message is shown and the download terminated.

After the address-check WinIt creates the name and the directory of the new measurement. These depend on the settings in the main window of WinaRace.

7.1 Naming of the measurement



The second combo box (left of the button *Logger*) contains the *mastername* for the creation of new measurements. When WinIt creates a new measurement the name is build from this *mastername*. If the *mastername* does not contain wildcard-characters (the underscore "_") the name of a new measurement is build by adding two characters for a number (00 to 99) to the *mastername*. WinIt takes the first number that does not exist.

Example:
Mastername is *WarmUp* and it is the second measurement with this *mastername* in this *event*. The resulting name of the new measurement is *WarmUp02*, because *WarmUp01* already existed.

If you download the data of more than one vehicle, it would be helpful, if you could see to which vehicle a measurement belongs. For this we provide the possibility to use wildcard-characters. The wildcard-character is the underscore ("_"). Each underscore in the mastername is replaced by a character from the *loggername* beginning at the end. That means one underscore is replaced by the last character of the *loggername*, two underscores by the last two characters and so on.

Example:
The mastername is *1F-__*, we have two vehicles to download, one *loggername* is *Log_DD* and the other *Log_MH* where the last two characters are the initials of the names of the drivers. It is the first measurement with this mastername.
WinIt creates a measurement with the name *1F_DD01*. The two underscores are replaced by the last two characters of the *loggername ("DD")* and the number *"01"* is added. For the other vehicle the measurement receives the name *1F-MH01*.

"Date-_" is a special mastername. It is used to create measurement names containing information about the date, the measurement was downloaded. The software replaces the part "Date" of the mastername by the month and day at which the measurement was created. The format is MMDD, that means the first two characters are replaced by the month and the next two by the day.

Example:

If the master name "Car-_" is selected and only one logger is used, the name "A" is assigned to the logger and the first measurement name will be "Car-A01".
The mastername "Date-_" is selected and a second logger is used. The logger received the name "B". Today is the 14.04. The resulting measurement name for the first download is "0414-B01".

After the creation of the new measurement directory the real download is started. WinIt shows following dialog to indicate the download progress.



The dialog provides information about the download process. In the first line you can the the current download speed and the current port. The second line shows the current block and the maximum number of blocks. In the fourth line you can see the estimated remaining download time.

If the option *Auto quickinfo after download* is set in the options *(See Options)*, after the download of the last block a dialog appears where the user can add additional information to this measurement as a comment in the *SpecSheet-file.*
Information about the download itself and the current weather conditions are added to the *SpecSheet* automatically.

The last thing to do with the logger is to clear it's memory.
Since the download of the raw data is finished now and the logger is no more needed to be connected a window appears with the message: *Ready to drive*. The recording system now can be unplugged. It is now ready for the next measurement.
But WinIt has not finished the last measurement. The raw data has to be prepared for the analysis.
A new progress bar is shown while WinIt decompresses the data.
After the decompression WinIt starts the *2D Calculation Tool*, which linearizes all channels using tables.

If the option *Start Analyzer after download* is set *(See Options)* WinIt starts the analysing software with the new data.

8. Shortcut keys overview

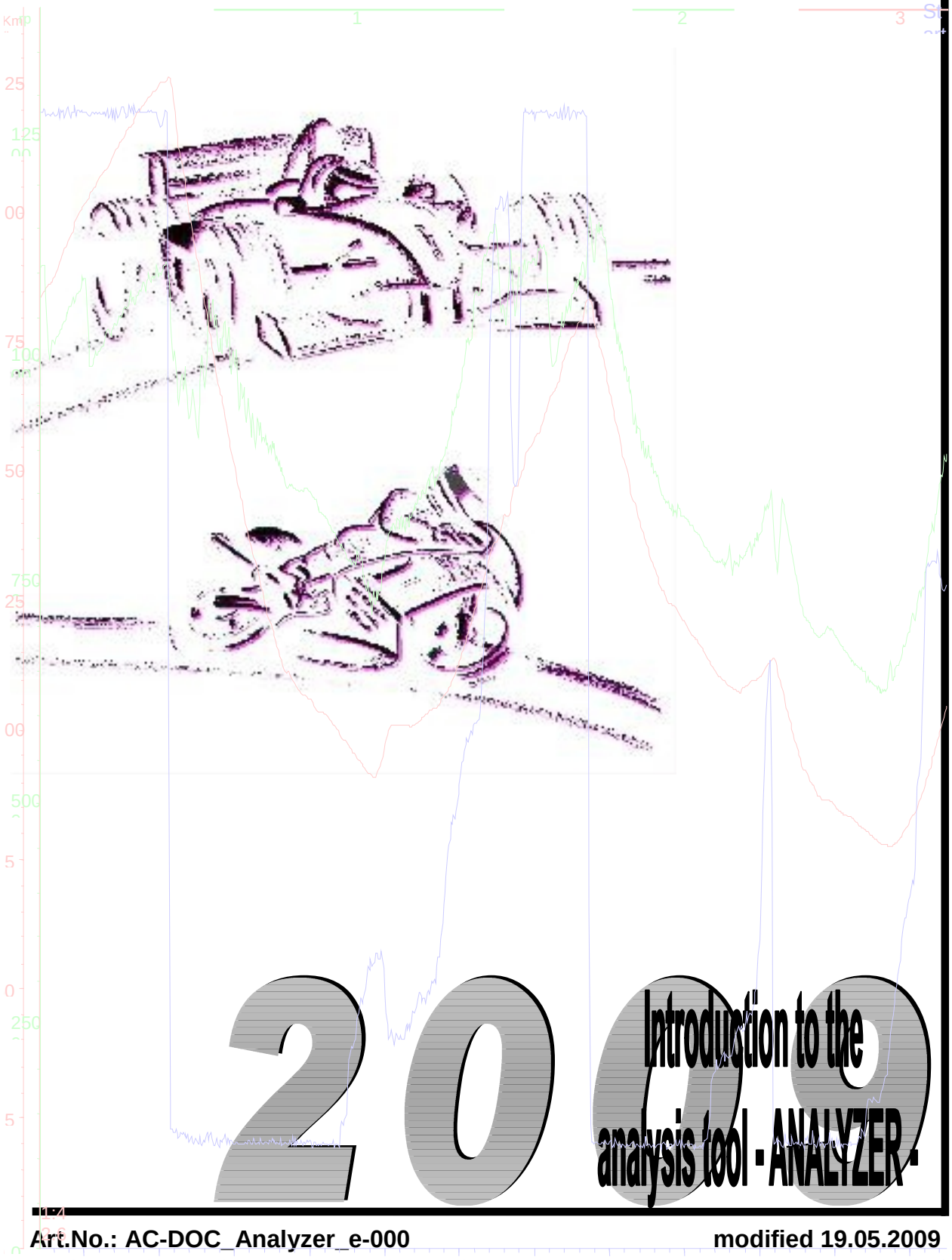
Shortcut	Action
<F2> or <CTRL + G>	Toggle between normal and group-tree display
<F4>	Read rest of logger Settings of all loggers, which are not already read complete. Only available if smart login is selected.
<F5> or <CTRL + L>	Refresh of logger setting (used memory, etc. same as <F1> in DOS-software)
<F6> or <CTRL + R>	Remove all systems and start search for loggers again
<F7> or <ALT + Z>	Zero setting of one or more channels depending on selection
<F8> or <ALT + C>	Calibration of one or more channels depending on selection
<F9>	Start of download followed by decompression of data
<CTRL + C> or <CTRL + INSERT>	Copy actual node in tree
<F6> or <CTRL + F>	Find loggers
<CTRL + I>	Toggles display of channel parameters on and off.
<CTRL + P>	Toggles display of channel CAN send info on and off.
<ALT + Q>	Insert quick-info in HED-file of last download
<CTRL + V> or <SHIFT + INSERT>	Paste copied node at actual position in tree
<ALT + X>	Terminate program
<CTRL + ALT + D>	Activate / Deactivate memory dump
<ENTER>	Pressed on channel grid, the channel dialog with the selected channel is opened
<DEL>	Pressed on a logger in the tree deletes this logger. Pressed on a system in the tree deletes this system.

Appendix: Glossary

Expression	Explanation
Automatic Mode	Define if the *Datalogger* will interrupt the recording if neither a rpm or a speed signal incoming even the starting conditions reached or not.
BAUD	Bits / Second (rate of transfer)
COM – Port	Abbreviation for "Communication Port" Defines the port you communicate with the *Datalogger*.
Communication Baudrate	The speed in bits per second (Baud) at which the PC and the *Datalogger* pass commands to each other.
Create measurements hybrid	Define if data should additionally be saved in old DOS - structure. Only at the new 2D data structure (for each measurement a single directory with the extension "MES". You can also create "hybrid" data in order to further analyse Windows data under MS-DOS ! - Files with the extension "PAR".
Datalogger	"Black Box" to save the arrival sensor signals.
Digits	Direct value from the sensor before recalculating the physical value from the corresponding formula file. A sensor supply a voltage value at the entry of the *Datalogger.* A analog - digital converter transforms this voltage in a digital integer value - the digits.
Download	Reading operation of the measurement values from the *Datalogger.*
Download Baudrate	The speed in bits per second (Baud) at which data from the *Datalogger* is transferred to your computer
Drag & Drop	Quick and easy programming of the *Datalogger* via the standard windows "drag and drop" method of single channels, channel groups or complete settings. Corresponds the shortcut keys: <Ctrl + C> and <Ctrl + V>
RPM	Rounds per minute
Calibration	Some sensors have a fixed calibration or use a fixed table function and need no calibration. The calibration has the following function: it gives the software the necessary information about the measurement limits of a sensor – you could say a minimum- \ maximum investigation. The table below shows which sensors need to be calibrated:
LDD File (Logger Definition Datei)	All settings of the connected 2D hardware were saved into this file. Used in the program WinIt to adjust the *Datalogge*r at different measurement adjustments.
Starting conditions	Set the starting parameters at which the *Datalogger* begins recording data. The Starting condition can be subdivided into: • Distance • Time • User define
USB (Universal Serial Bus)	Communication port at your PC which make a transfer rate of 2MBaud possible.

2d-datarecording.com

- English -



2009

Introduction to the analysis tool - ANALYZER -

Art.No.: AC-DOC_Analyzer_e-000 modified 19.05.2009

The 2D software module Analyzer allows the analysis of measurement data in many graphical and mathematical ways.

Table of Contents

1. DESKTOP APPEARANCE 5

1.1 MAIN MENU ITEMS 7
1.1.1 The main menu item "File" *8*
1.1.2 The main menu item "Functions" *9*
1.1.3 The main menu item "View" *10*
1.1.4 The main menu item "Measurement" *11*
1.1.5 The main menu item "Settings" *12*
1.1.5.1 Special channels 13
1.1.5.2 Track 14
1.1.6 The main menu item "Wizards" *16*
1.1.7 The main menu item "Tutorials" *16*
1.1.8 The main menu item "Help" *17*
1.2 TOOLBAR BUTTONS 18
1.2.1 File Functions *18*
1.2.2 Basic analysis *18*
1.2.3 Advanced analysis *18*
1.2.4 Channel visibility *19*
1.2.5 Other Functions *19*
1.2.6 Measurement Functions *19*

2. PROGRAM MODULES 20

2.1 OVERVIEW WINDOW 20
2.1.1Functions *20*
2.1.1.1 Print 20
2.1.2 Properties *20*
2.1.3 Keys *20*
2.2 MOVING WINDOW 21
2.2.1 Functions *21*
2.2.1.1 Areas 21
2.2.1.2 Measuring 21
2.2.1.3 Print 22
2.2.1.4 Visibility of measurements 22
2.2.2 Properties *23*
2.2.3 Channel colors *24*
2.2.4 Keys *24*
2.2.5 Examples *25*
2.3 CIRCUIT 28
2.3.1 Functions *28*
2.3.2 Properties *30*
2.4 CHANNELS 31
2.4.1 Settings *32*
2.4.2 Groups *33*
2.4.3 Functions *33*
2.5 LAP TIMES 34
2.5.1 Functions *34*
2.6 SECTION TIMES 35
2.6.1 Definition of Sections *35*
2.6.2 Functions *35*
2.7 MIN-/MAX TABLES 36
2.7.1 Creation and setup *36*
2.7.2 Management *37*
2.7.3 Functions *37*
2.7.4 Properties *37*

2.7.5 Examples *38*
2.7.5.1 Example 1 38
2.7.5.2 Example 2 38
2.8 TRACK MODE 39
2.8.1 Creation and setup *39*
2.8.1.1 Marker settings 40
2.8.1.2 Graphic settings 41
2.8.2 Functions *42*
2.8.2.1 Print 42
2.8.2.2 Lap report 42
2.8.3 Management *42*
2.8.4 Properties *42*
2.8.5 Examples *43*
2.8.5.1 Example 1 43
2.8.5.2 Example 2 44
2.8.5.3 Example 3 45
2.9 XY-PLOT 46
2.9.1 Creation and Setup *46*
2.9.1.1 Settings 46
2.9.2 Functions *47*
2.9.2.1 Limits 47
2.9.2.2 Grid 47
2.9.2.3 Print 47
2.9.3 Management *47*
2.9.4 Properties *47*
2.9.5 Examples *48*
2.9.5.1 Example 1 48
2.9.5.2 Example 2 49
2.9.5.3 Example 3 50
2.10 HISTOGRAM 51
2.10.1 Creation and setup *51*
2.10.1.1 Settings 52
2.10.2 Functions *53*
2.10.2.1 Export 53
2.10.2.2 Print 53
2.10.3 Management *53*
2.10.4 Properties *54*
2.10.5 Examples *55*
2.10.5.1 Example1 55
2.10.5.2 Example 2 56
2.11 FFT (FAST FOURIER TRANSFORMATION) 57
2.11.1 Creation and setup *57*
2.11.1.1 Settings 57
2.11.2 Functions *57*
2.11.2.1 Export 57
2.11.2.2 Print 57
2.11.3 Management *57*
2.11.4 Properties *58*
2.11.5 Examples *59*
2.11.5.1 Example 1 59
2.11.5.2 Example 2 60
2.12 ACCELERATION TABLE / DYNAMIC TEST SYSTEM (DTS) 61

3. FUNCTIONS 62

3.1 USER DEFINED WINDOW LIST 62
3.2 USER MANAGEMENT 63
3.3 PHASES 64
3.3.1 Definition *64*
3.3.1.1 Preview 64
3.3.1.2 Deletion of small phases 65
3.3.1.3 Phase conditions 65

3.3.2 Usage *66*
3.3.3 Examples *66*
3.3.3.1 Example 1 66
3.3.3.2 Example 2 67
3.4 PRINT (VIA ENHANCED META FILE) 68
3.5 PRINT REPORT MANAGER 69
3.6 PRINT VIA EXCEL 70
3.7 TIME DIFF 70
3.8 TIME DIFF WINDOW 70
3.9 REFERENCE LAPS 71
3.9.1 Creation *71*
3.9.2 Comparison with runs *71*
3.10 EXPORT 71
3.10.1 Data subset *71*
3.10.2 Channels *72*
3.10.3 Destination *72*
3.10.4 Type *73*
3.10.5 Spec sheet groups *73*
3.11 LIVE EXPORT 74
3.12 SCREEN EXPORT 74
3.13 CUT MEASUREMENT 74
3.14 CALCULATION FILE MANAGER 75
3.14.1 Cal file folders *75*
3.14.2 Preview recalculate *75*
3.14.3 Preview create *75*
3.14.4 Creating and editing a cal file *75*
3.14.5 Running a cal file *75*
3.14.6 Run cal file (software folder) *75*
3.15 REAL TIME PLAYER 76
3.16 TEMPLATES 77
3.17 QUICK KEY 78
3.17.1 Categories *78*
3.17.2 Examples *79*
3.18 QUICK CHANNELS 79

4. TUTORIALS 80

5. OPTIONS 81

5.1 GENERAL 81
5.2 PROGRAM START 82
5.3 FILE LOAD 83
5.4 COLORS 84
5.5 KEY ASSIGNMENT 85

6 KEYBOARD HELP 86

6.1 COMPLETE LIST OF SHORTCUTS 86
6.2 KEYS IN THE "MOVING WINDOW" 87
6.3 KEYS IN THE "MOVING MODE" & "MEASURING MODE" 88

7. FREQUENTLY ASKED QUESTIONS (FAQ) 89

8 GLOSSARY 90

APPENDIX A: LICENSE RESTRICTIONS 94

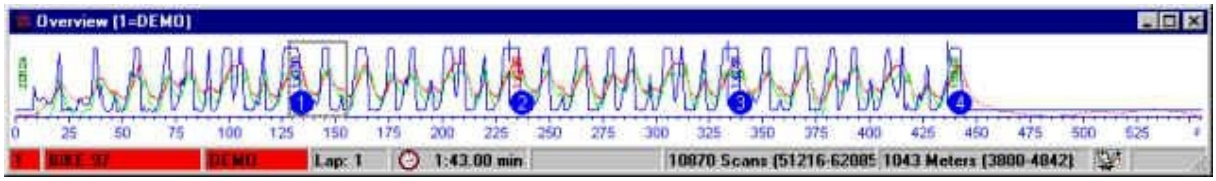
1. Desktop appearance

A typical Analyzer desktop mainly consists of 5 windows:

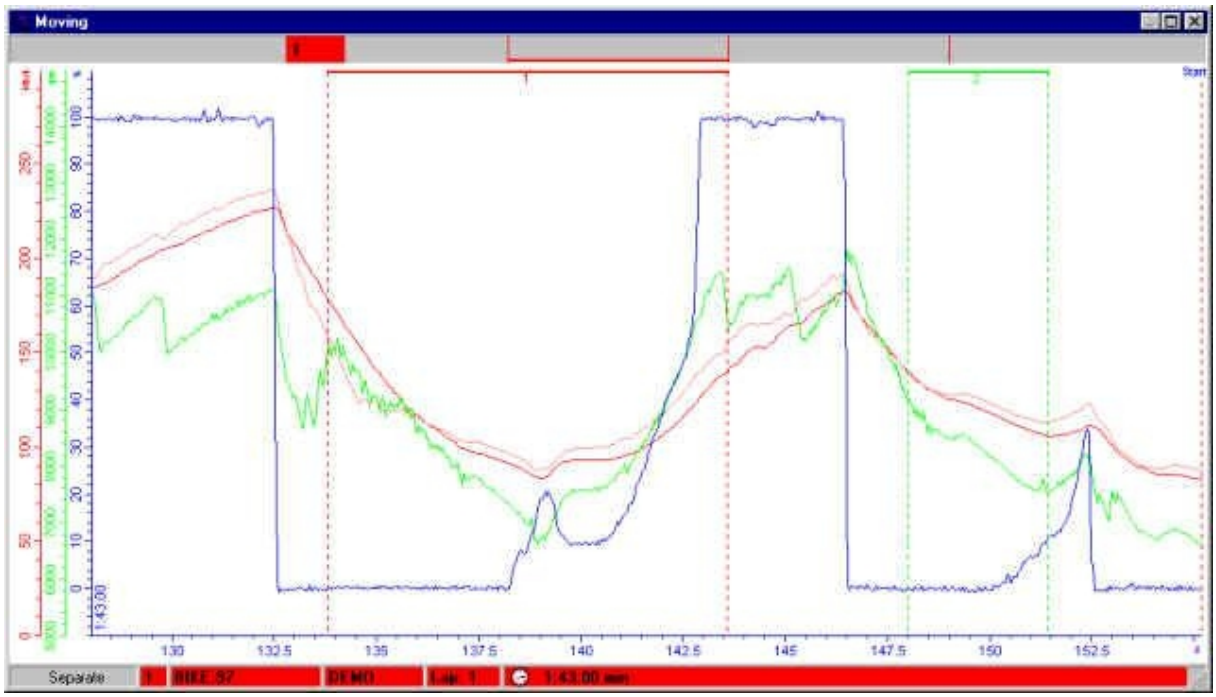
- On top of the screen is the header bar with main menu & toolbar.



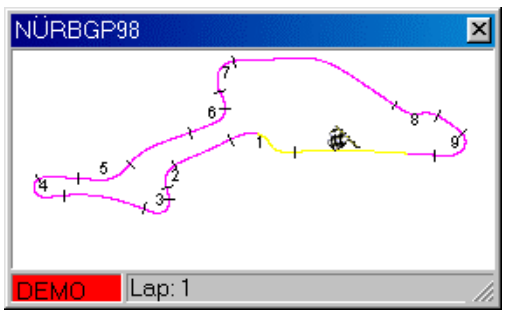
- On bottom of the screen is the Overview window in which certain channel curves of the complete measurement are shown.



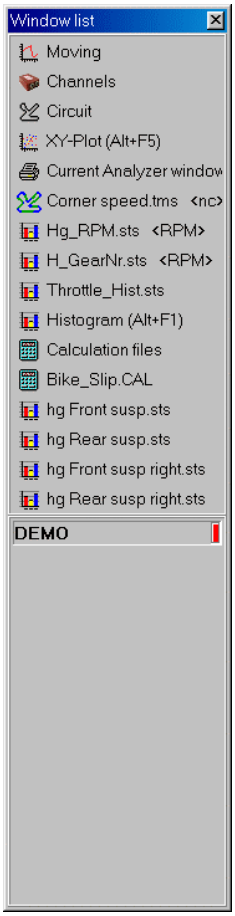
- The biggest window centered on the screen is the Moving window. This window contains a selected detail of the channel curves of the measurements.



- The small Circuit window shows the track map and the track position for the section currently displayed in the Moving window.



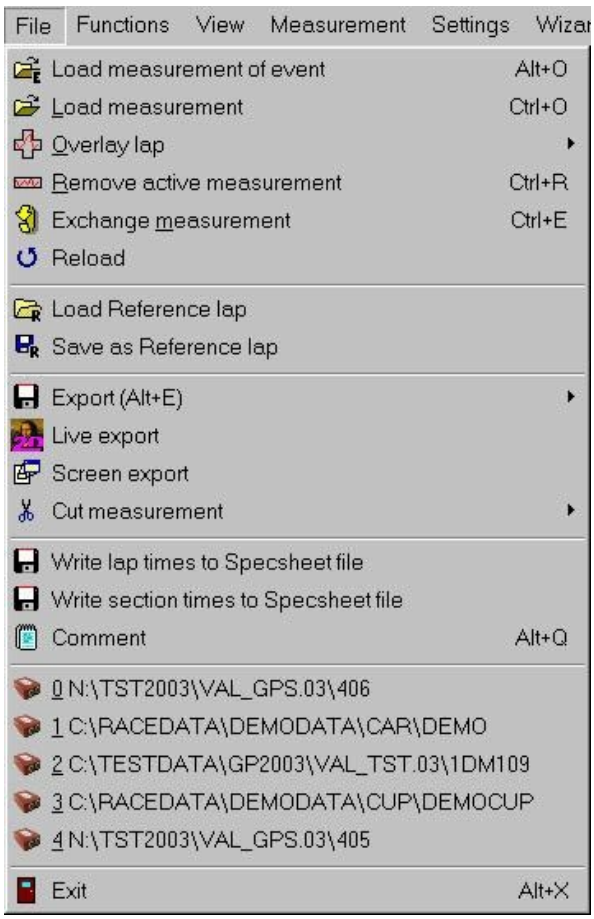
- The Window list at the right of the screen is helpful for fast access to common functions. These functions are user defined as any main menu item may be selected to be shown here. This window may be closed to gain space on the screen.



1.1 Main menu items

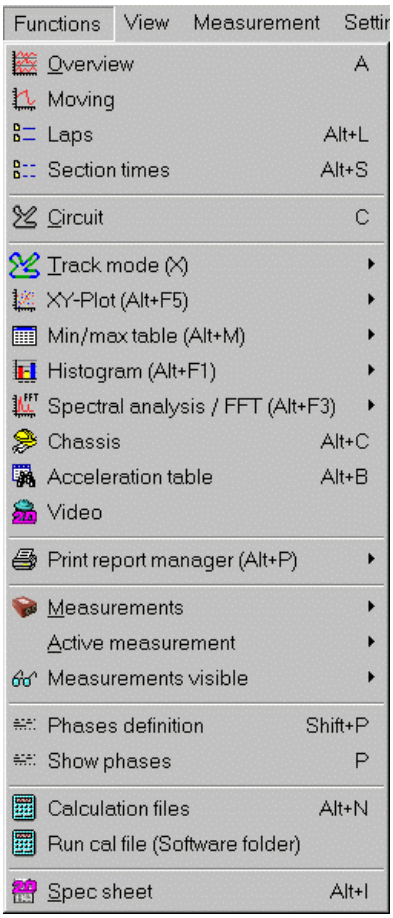
- The File menu contains functions to load and modify 2D measurement files
- The Functions menu allows access to basic and advanced analysis functions
- The View menu controls the layout of the Analyzer desktop
- The Measurement menu contains commands to view the measurement(s) in different ways
- The Settings menu contains functions to administrate both Analyzer and measurement settings
- From the Wizards menu several Wizards may be run to achieve common tasks
- Inside the Help menu online help for the 2D software is available

1.1.1 The main menu item "File"



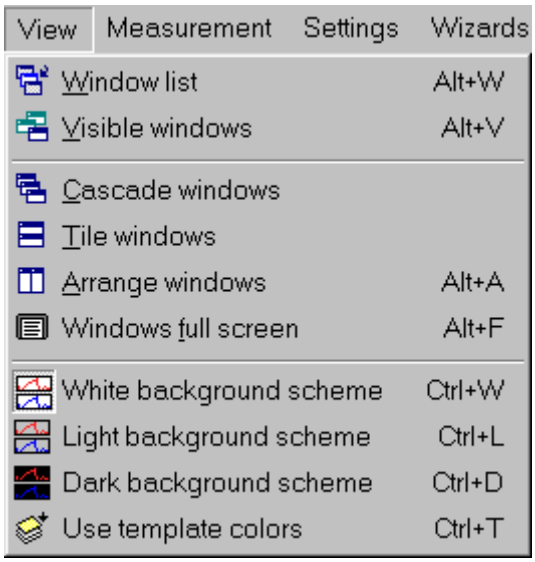
- **Load measurement of event:** Shows browser of measurements inside current event
- **Load measurement:** Shows browser of measurements together with a directory tree
- **Overlay lap:** List of lap times of current measurement to overlay another lap
- **Remove active measurement:** Unloads the currently active measurement
- **Exchange measurement:** Replaces the active measurement with another one which can be selected in a browser
- **Reload:** Forces reloading of the active measurement to re-initialize it
- **Load Reference lap:** Load a previously saved reference lap
- **Save as Reference lap:** Save the current lap of the active measurement as reference lap
- **Export:** Exports measurement data partially or complete in different formats
- **Live export:** Create packed .exe file containing Analyzer together with measurement
- **Screen export:** Exports visible channels inside the current selection and "zip"s them
- **Cut measurement:** Trim off parts of the measurement
- **Write lap times to Specsheet file:** Insert lap times of measurement into spec sheet
- **Write section times to Specsheet file:** Insert section times into spec sheet
- **Comment:** Editor to quote (enter a comment of) the active measurement
- **0-9: History list** of previously loaded measurement files
- **Exit:** Terminates the Analyzer program

1.1.2 The main menu item "Functions"



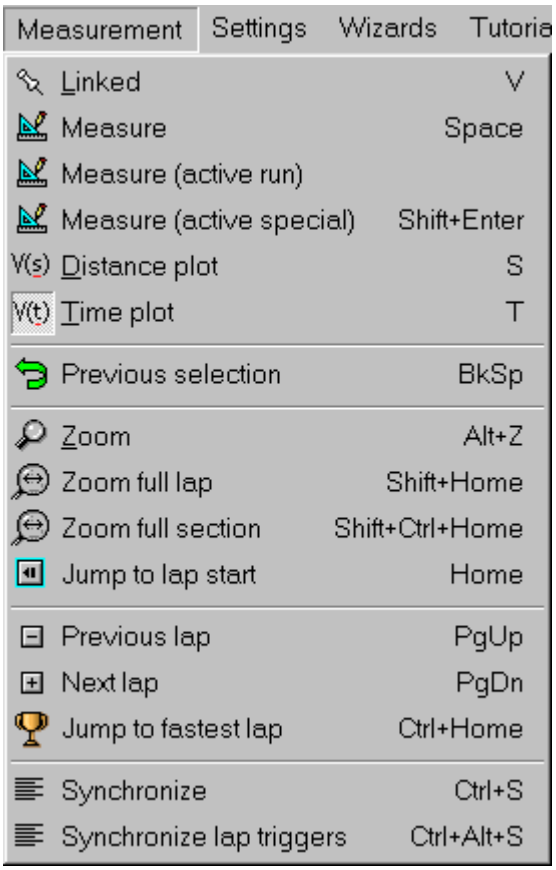
- **Overview:** Shows the Overview window of the active measurement
- **Moving:** Shows and activates the Moving window
- **Laps:** Shows a window containing the lap times of the current loaded measurements
- **Section times:** List of section times of the current loaded measurements
- **Circuit:** Small track map window with current selection highlighted
- **Track mode:** Detailed track map with inscription of channel values
- **XY - Plot:** 2-dimensional representation of the relationship of two channels
- **Min/max table:** List of minimum, maximum and average values of channels lap by lap
- **Histogram:** Statistics of a channel with various split conditions
- **Spectral analysis / FFT:** Fast fourier transformation analysis of a channel
- **Chassis:** Additional module for graphical chassis analysis
- **Acceleration table:** Additional module for car acceleration/deceleration/elasticity analysis
- **Video:** Additional module for video link
- **Measurements:** Channel settings editor
- **Active measurement:** Set one of the loaded measurements the active one
- **Measurements visible:** Toggle visibility of the channels of a measurement inside the Moving window
- **Phases definition**: Editor of the phase conditions which may made visible inside the Moving/Overview window
- **Show phases:** Toggle visibility of phases inside the Moving and Overview windows
- **Calculation files:** Manage cal files in different folders to run the 2D Calc tool on
- **Run cal file (software folder):** Show list of cal files in Race folder to run 2D calc tool on
- **Spec sheet:** Run the SpecView program to show the spec sheets of the loaded measurements

1.1.3 The main menu item "View"



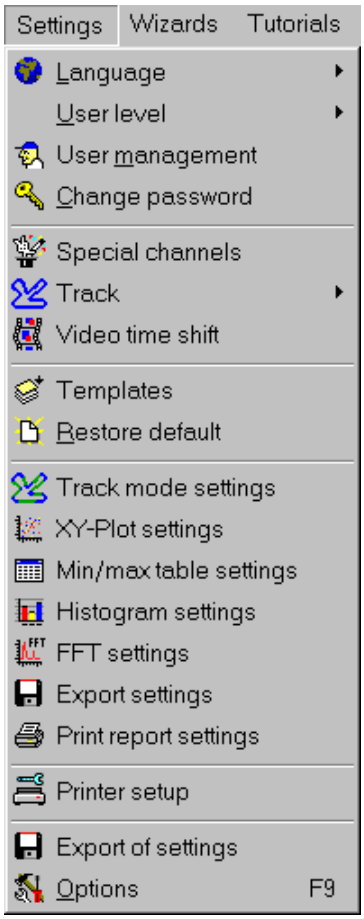
- **Window list:** Toggle visibility of the Window list which offers access to common functions
- **Visible windows:** Show list of currently opened Analyzer windows
- **Cascade windows:** Re-position the Moving and Overview windows in a cascading form
- **Tile windows:** Re-position the Moving and Overview windows in a tiled form
- **Arrange windows:** Re-position the Moving and Overview windows by arranging them in two lines
- **Windows full screen:** Size Moving and Overview windows to maximum suitable size
- **White background scheme:** Apply colors to some windows with a white background color
- **Light background scheme:** Apply colors to some windows with a light background color
- **Dark background scheme:** Apply colors to some windows with a dark background color
- **Use template colors:** Apply the individual settable colors to some windows

1.1.4 The main menu item "Measurement"



- **Linked:** Several loaded measurements are moved together in the Moving window
- **Measure:** Start/stop measuring mode to show the channel values at the mouse cursor position
- **Measure (active run):** Special measuring mode which shows only the active measurement in channel colors
- **Measure (active special):** Very special measuring mode which shows the active measurement in channel colors and the other measurement in measurement colors
- **Distance plot:** Show channel values curves over distance in meters
- **Time plot:** Show channel values curves over time in seconds
- **Previous selection:** Show previous selection in Moving window
- **Zoom:** Editor to zoom in/out the selection visible in the Moving window
- **Zoom full lap:** Show the current complete lap in the Moving window
- **Zoom full section:** Show the current complete section in the Moving window
- **Jump to lap start:** Moves the selection to the start of the current lap
- **Previous lap:** Jump one lap back
- **Next lap:** Jump one lap forward
- **Synchronize:** Align the other measurements to the active one to achieve the same lap position
- **Synchronize lap triggers:** Temporarily adjust lap trigger offset to active measurement in case of different lap trigger sender positions

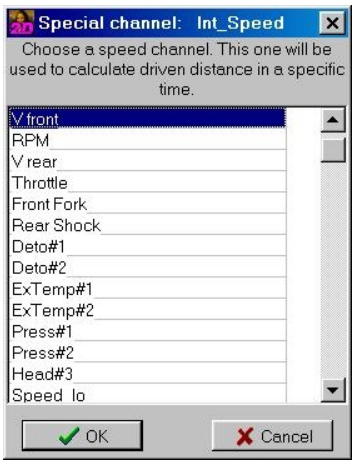
1.1.5 The main menu item "Settings"



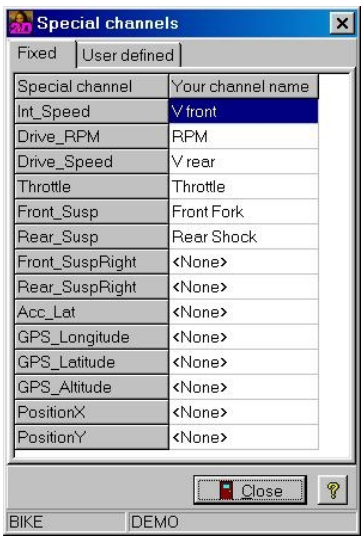
- **Language:** Select language from German, English, French, Italian, Spain and Japanese
- **User level:** Professional level shows all menu items, even if they are not available in the licence level
- **User management:** Administration of separate user settings with individual options and channel settings
- **Change password:** Each user can supply a password which will be prompted for at login
- **Special channels:** Assignment of measured channels to predefined functionalities
- **Track:** Administration tools for the used track of the current event
- **Video time shift:** Offset of the video file to the start of the measurement
- **Templates:** Administration of the available templates
- **Restore default:** Resets the positions and properties of all windows of the current template to default values
- **Track mode settings:** Administration of the existing Track mode setting files
- **XY-Plot settings:** Administration of the existing XY-Plot setting files
- **Min/max table settings:** Administration of the existing Min/max table setting files
- **Histogram settings:** Administration of the existing Histogram setting files
- **FFT settings:** Administration of the existing Spectral analysis/FFT setting files
- **Export settings:** Administration of the existing Export setting files
- **Print report settings:** Administration of the existing Print report setting files
- **Printer setup:** Options of the currently active printer
- **Export of settings:** Function to export settings of the current user to import them somewhere else
- **Options:** User defined options of the current user

1.1.5.1 Special channels

Special channels are defined as assignments of recorded channels to certain meanings. There are fixed and user defined special channels. Fixed channels are needed by Analyzer whilst both types may be used in cal files by typing the @ identifier.



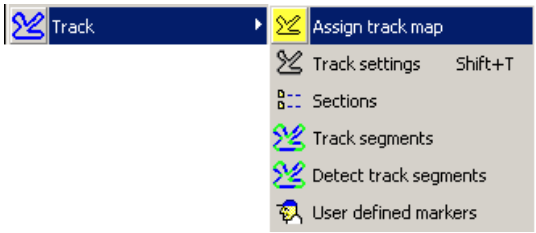
1. Fixed special channels: Analyzer needs information about certain channels to e.g. calculate distance from speed or feed the chassis module.



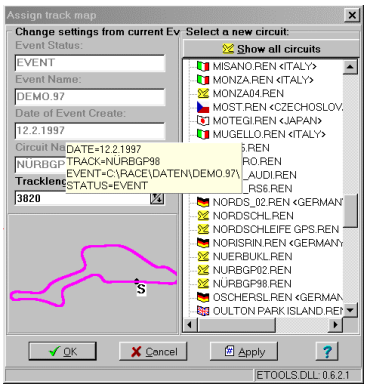
User defined special channels: Assignment of recorded channel to a free defined special channel.



1.1.5.2 Track



- **Assign track map**



Choose the correct track map to your event

- **Track settings**



Dialog to manage event specific track settings

Calculate GPS map if available: If checked the software will look for channels named "Longitude" and "Latitude", and -if present- generate the track map from them. To filter out invalid GPS data a channel named "GPSValid" will be used as selector (0=invalid, 1=valid).

Event measured on a closed circuit: If checked all lap-specific logic will be applied like LapChecker wizard, offset detection, segment detection.

Track length & tolerance: Laps whose lap length (= integrated speed) differ more than |Tolerance| from Track length are treated as invalid resp. incomplete laps.

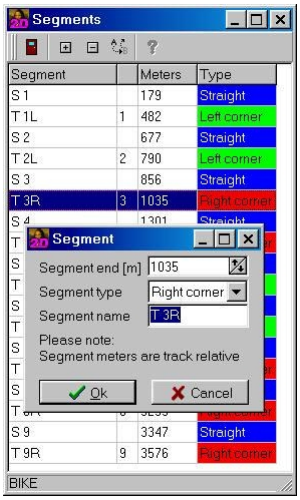
Track mode markers: Control of markers in Track mode window
Marker meter range: Markers whose position differs at most this value from user position are placed to the same position
Min segment distance: Min/max markers which are closer than this value to the segment edge are not created.

- **Sections**

Overview of the section times of each loaded measurement lap by lap. The sum of the best section times gives an idea of a possible ideal lap time.

- **Track segments**

Editor to manage the track segments (straights and corners) of the current event. Track segments normally are detected and inserted automatically. Segment names may be edited by the user to give the official names.



- **Detect track segments**

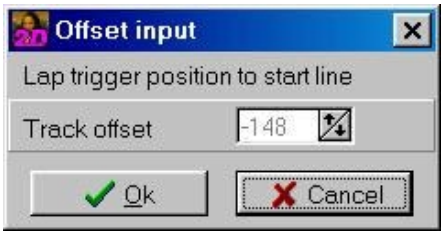
Track segments are detected and saved automatically each time when the fastest lap time of a loaded measurement is more than 3 seconds faster than the previous one on which segments have been detected. This feature shall ensure correct corner segments when track conditions like weather have changed substantially.

Running this function manually will cause re-detecting segments in case of an incomplete segment list by the automatic detection. If the detection did not find all wished segments the user can insert or modify them manually in the track segments editor or in the Moving window.

- **User defined markers**

Editor to modify the list of user defined markers in the active measurement. Normally user defined markers are placed in Moving window in measuring mode by right-clicking and adding an user defined marker.

- **Track offset**



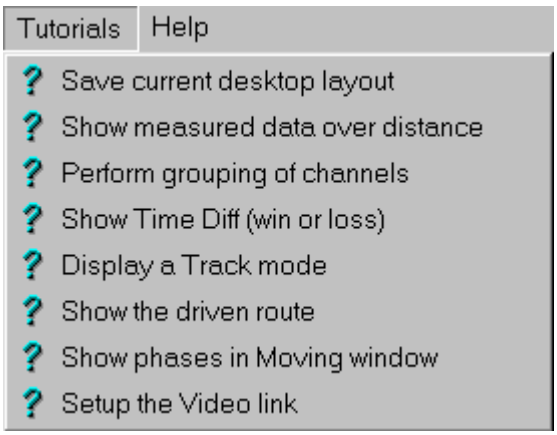
The track offset gives meter distance between lap trigger position and start/finish line. The value can't be changed manually as it is calculated automatically by speed-to-radius correlation.

1.1.6 The main menu item "Wizards"



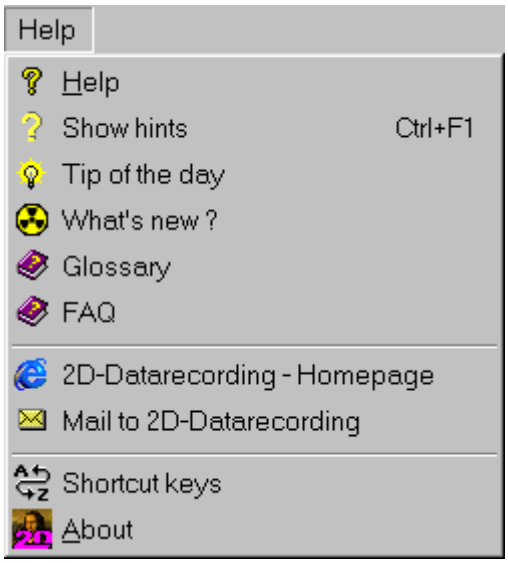
- **Gear calculation:** Calculates a gear channel out of RPM and speed or using a gear box sensor channel
- **Route calculation:** Calculates 2 channels containing geographic x/y data of the covered distance
- **Create track map:** Generates track map out of either speed + lateral acceleration or GPS coordinates
- **Tire perimeter:** Wizard to recalculate speed by changing tire perimeter and/or impulses
- **Wheelie correction:** Interpolates wheelies at the bike front speed signal
- **Lap checker:** Wizard to check track length and lap triggers

1.1.7 The main menu item “Tutorials”



- **Save current desktop layout:** Shows how to store a template containing the current windows
- **Show measured data over distance:** Shows how to switch to distance plot
- **Perform grouping of channels:** Guide to managing and showing channel groups
- **Show Time Diff (win or loss):** Explanation how to display win/loss channel
- **Display a Track mode:** Guide for displaying a detailed track map
- **Show the driven route:** Tutorial to display driven car route
- **Show phases in Moving window:** Explanation how to setup and highlight logical phases
- **Setup the video link:** Guide how to link the Video module

1.1.8 The main menu item "Help"



- **Help:** Show online help about the 2D software modules
- **Show hints:** Show Tips close to mouse cursor in certain windows
- **Tip of the day:** Show a window with a (maybe) useful tip
- **What's new ?:** List of changes since the last software version
- **Glossary:** Index of common used terms
- **FAQ:** List of frequently asked questions with answers and tips
- **2D-Datarecording Homepage:** Opens Internet browser with the 2D homepage
- **Mail to 2D-Datarecording:** Opens the mail client with an empty mail to 2D
- **Shortcut keys:** List of available keys in the Analyzer
- **About:** Shows a version and system info window

1.2 Toolbar buttons

- File functions are functions to load and modify 2D measurement files
- Basic analysis functions include Moving and Overview windows and lap times
- Advanced analysis functions include Track mode, XY-Plot and Min/max table
- Visibility of channels in the Moving window can be switched separate, groupwise or via areas
- Other functions acccessible via toolbar buttons are Window list, Options Dialog and Templates
- The measurement functions include commands to view the measurement(s) in different ways

1.2.1 File Functions



	Load measurement: Shows browser of measurements together with a directory tree
	Overlay lap: List of lap times of current measurement to overlay another lap
	Remove active measurement: Unloads the currently active measurement
	Exchange measurement: Replaces the active measurement with another one which can be selected in a browser
	Reload: Forces reloading of the active measurement to re-initialize it

1.2.2 Basic analysis



	Overview: Shows the Overview window of the active measurement
	Moving: Shows and activates the Moving window
	Laps: Shows a window containing the lap times of the current loaded measurements

1.2.3 Advanced analysis



	Track mode: Detailed track map with inscription of channel values
	XY-Plot: 2-dimensional representation of the relationship of two channels
	Min/max table: List of minimum, maximum and average values of channels lap by lap

1.2.4 Channel visibility



	Channel settings editor / Switching of the visibility of channels in the Moving window
	Channel group editor / Switching of the visibility of channel groups in the Moving window
	Switching of the visibility of areas containing channel groups in the Moving window

1.2.5 Other Functions



	Window list: Toggle visibility of the Window list which offers access to common functions
	Options: User defined options of the current user
<Overview>	Templates: List of available Analyzer desktop schemes with a function to save the current desktop

1.2.6 Measurement Functions



	Linked: Several loaded measurements are moved together in the Moving window
	Measure: Start/stop measuring mode to show the channel values at the mouse cursor position
V(s)	Distance plot: Show channel values curves over distance in meters
V(t)	Time plot: Show channel values curves over time in seconds
	Previous selection: Show previous selection in Moving window
	Zoom: Editor to zoom in/out the selection visible in the Moving window
	Zoom full lap: Show the current complete lap in the Moving window
	Jump to fastest lap: Move the selection into the fastest lap of the measurement
	Previous lap: Jump one lap back
	Next lap: Jump one lap forward
	Synchronize: Align the other measurements to the active one to achieve the same lap position

2. Program modules

2.1 Overview window

Quick overview of complete measurement

Each loaded measurement in Analyzer is displayed in a separate Overview window. In the Overview window the measured values of certain channels are shown. The position of the lap triggers are displayed accordingly. This allows a quick overview of possible problems concerning vehicle or data recording.
The position of the selection visible in the Moving window is marked inside the Overview window by a rectangle. You can move this rectangle with the mouse easily. If you press the <Ctrl> key simultaneously you can change the size of the rectangle - so will see a higher fragment inside the moving window of the current measurement.

2.1.1Functions

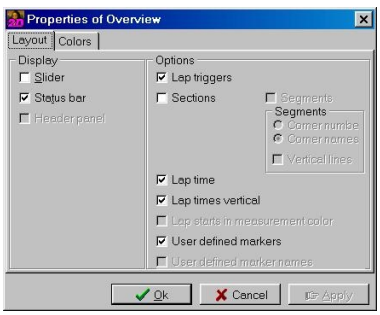
2.1.1.1 Print

- The standard Print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a chosen Excel sheet together with data out of the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager starts the high-end print page layout module.



Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer Options Dialog.

2.1.2 Properties



The Overview window's editable properties include the printout and formatting of the Lap triggers, Segments, Sections and the Color scheme of the window.
The properties are stored in the current Template which may be saved to disk to make the modifications permanent.
The color page in the properties editor is only available when template colors are used.

2.1.3 Keys

Shortcut / Mouse	Action
Mouse: Left button	Offset moving
Mouse: Double click	Activate moving window
< 1 > – < 9 >	Activate measurement
< ALT 1> - < ALT 9 >	Show overview
< CTRL + HOME >	Fastest lap
< SHIFT > + < HOME >	Entire lap
< F11 >	Maximum / Restore window size

2.2 Moving window

Precise comparison of several measurements including measuring functions

All loaded measurements in Analyzer are displayed together in the Moving window. In contrast to the Overview window here is shown not the complete measurement but only a selected partial range. This allows precise overlaying of measurements for comparison purposes.



The position of the displayed detail data is marked in the Overview window by a rectangle.

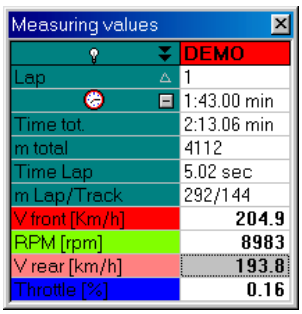
2.2.1 Functions

2.2.1.1 Areas

The Moving window can be split vertically to display additional sub windows which each contains channels of another group. The visibility of the areas can be toggled with the mouse via Moving window's context menu, via the areas button in the toolbar device or with Ouick key input via keyboard.
The visible areas are stored inside the current Template.

2.2.1.2 Measuring

An analyzing mode which shows physical values of channels at the mouse position in a small extra window.



Available are 3 fundamental different measuring modes:

- ***Standard measuring mode***

  Standard measuring mode displays the channel curves in the same colors as in normal Moving mode.
  It is started with mouse double click in the Moving window or <Space> key. It is stopped with mouse double click in the Moving window or <Space> key or <Esc> key.

- ***Measuring of active measurement***

  Measuring mode of active measurement displays only the channel curves of the active measurement in the individual channel colors.
  It is started with <Enter> key is stopped with mouse double click in the Moving window or <Enter> key or <Esc> key.

- ***Special measuring of active measurement***

  Special Measuring mode of active measurement displays the channel curves of the active measurement in the individual channel colors and the other measurement's channels in their measurement colors.
  It is started with <Shift + Enter> key. It is stopped with mouse double click in the Moving window or <Shift + Enter> key or <Esc> key.

During measuring mode all Analyzer functions are available, i.e. it is possible to change the selection, to load another measurement or remove a measurement.

The Measuring values window shows the measured value of each channel at the mouse position. Either only the values of the visible channels are shown or the values of all channels. You can toggle both modes by clicking on the black double arrow in the upper left cell.

With more than one measurement loaded there is a function to show not only the absolute physical channel values but the relative channel values of the other measurements compared to the first measurement. You can toggle both modes by clicking on the black triangle symbol on the left in the second row.



Clicking on a channel name toggles the visibility of the channel, as well as double clicking a measured value. Clicking a measured value makes this channel active. Holding down the mouse button lets the channel's curve blink inside the Moving window to help identification.

2.2.1.3 Print

- The standard print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a chosen Excel sheet together with data out of the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager starts the high-end print page layout module



Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer Options Dialog.

2.2.1.4 Visibility of measurements

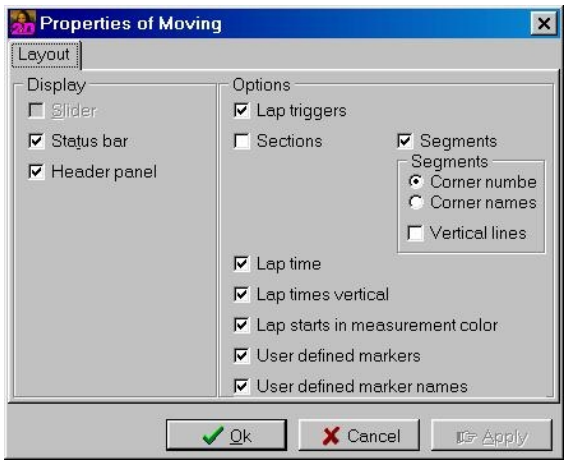
A loaded measurement can be made invisible. This helps focussing on another, visible measurement in the Moving window. Measurement m is made invisible by pressing <Ctrl+M> where m stands for the measurement number.

Example:

2 measurements are loaded. In the Moving window all channels of measurement 1 are red, all channels of measurement 2 are blue. Now measurement 2 is made invisible (<Ctrl+2>). The channels of the remaining visible measurement 1 are displayed in their individual channel colors. Pressing <Ctrl+2> once again makes measurement 2 visible again to show both measurements in their measurement colors.

2.2.2 Properties

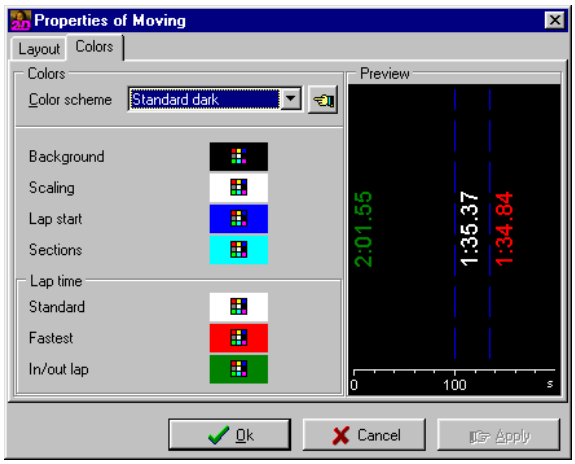
The Moving window's editable properties include the printout and formatting of the Lap triggers, Segments, Sections and the Color scheme of the window.





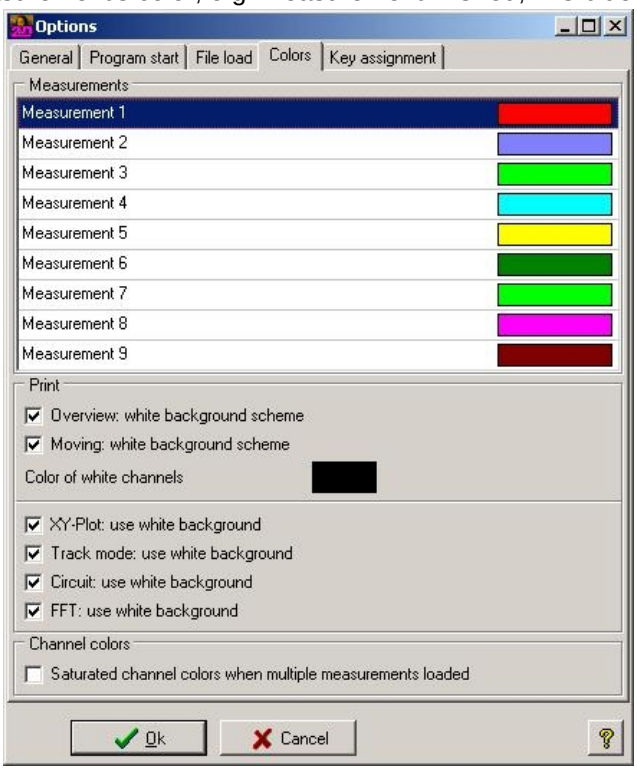
The properties are stored in the current Template which may be saved to disk to make the modifications permanent.

The color page in the properties editor is only available when template colors are used.



2.2.3 Channel colors

With one measurement visible the channel curves are displayed in their individual channel colors. When several measurements are visible in the Moving window then each measurement's channels are displayed in the measurement's color, e.g. measurement 1 is red, 2 is blue and so on.



2.2.4 Keys

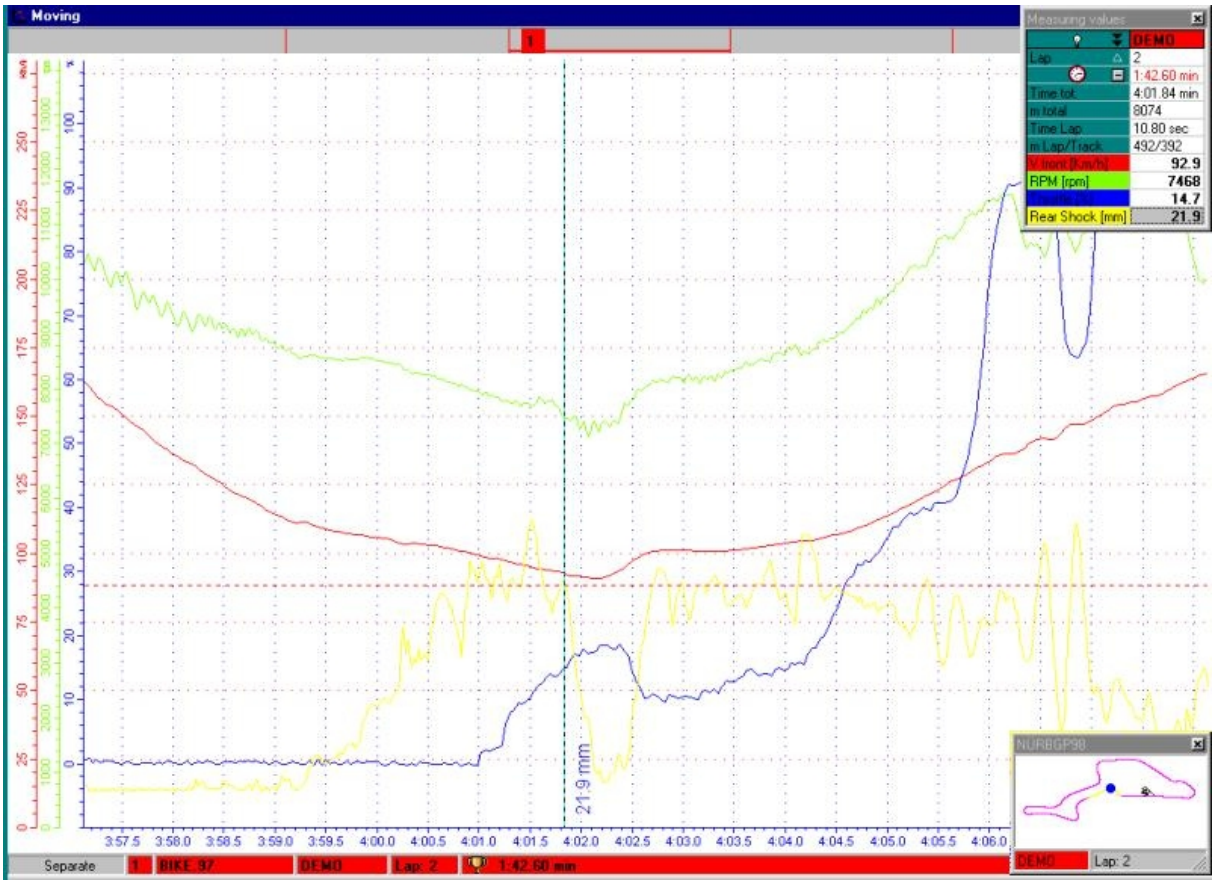
Shortcut / Mouse	Action
Mouse: Left button	Offset moving
Mouse: Double click	Start measuring mode
< s >	Change to Distance plot
< t >	Change to Time plot
< 1 > – < 9 >	Activate measurement
< ALT 1 > - < ALT 9 >	Show overview
< CTRL + HOME>	Fastest lap
< SHIFT + HOME >	Entire lap
< F11 >	Maximum / Restore window size
- MOVING MODE -	
< SPACE >	Start measuring mode (all)
< ENTER >	Start measuring mode (active run)
<SHIFT + ENTER>	Start special measuring mode
- MEASURING MODE -	
Mouse: Left button	Set marker
Mouse: < CTRL > + left button	Choose active channel
Mouse: Left button in measuring values	Choose active channel
Mouse: Left button on channel name in measuring values	Toggle channel' s visibility
Cursor left / right	Move aiming cross
< CTRL > + cursor left	Set left marker
< CTRL > + cursor right	Set right marker
< SPACE >	Stop measuring mode
< ESC >	Stop measuring mode
< or >	Toggle active channel

2.2.5 Examples

The following are some 'step-by-step' instructions to help new 2D users to master some common operations in the Analyzer software. Most of these are referred to in the context-sensitive Help files, but here we can go into a little more detail.
Rate of Change Measurement – to individually check the amount of change in a channel over a specific time. Commonly used to check deceleration rate on braking (V_Front over time), front or rear suspension piston speed (F_Sus or R_Sus over time).
In this example, we will check the rear shock piston speed, so we can determine in what piston speed range to make the appropriate damping adjustments:

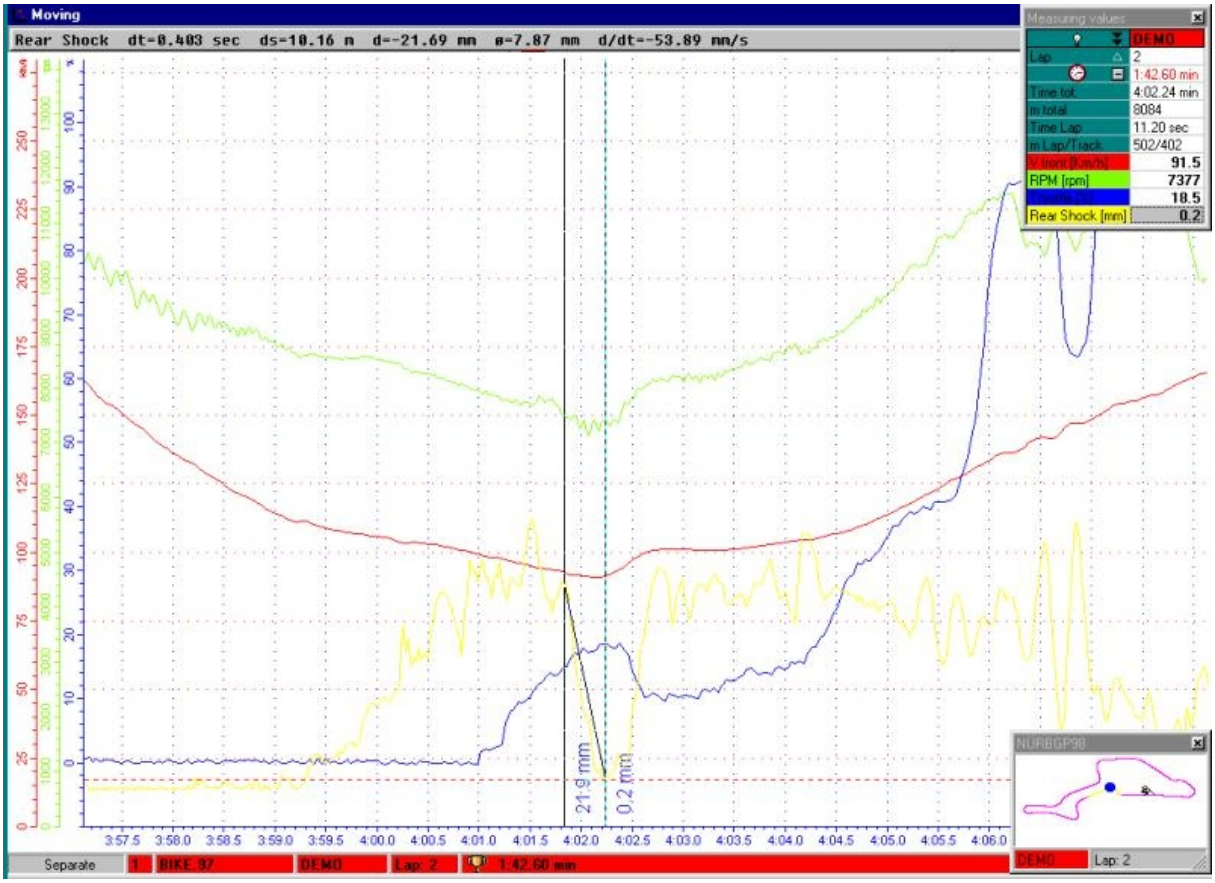
In this example, we will check the rear shock piston speed, so we can determine in what piston speed range to make the appropriate damping adjustments:

- Load the rear suspension channel in Analyzer screen; Main menu *item "Functions / Measurement / Channel"* or *"Channels"* icon in toolbar or shortcut *"Alt + U"*, and then Left-click on the channel name to select the rear suspension channel (called Rear Shock, in this example using the Bike.97 demo data).
- In Moving Mode (the default mode when you first open Analyzer), move the Analyzer screen view to the point on the track you are interested in (move it with Up – Down or Left – Right arrow keys or L-click-and-drag with the mouse). In the example we have chosen the first chicane after the start-finish on the fastest lap (choose fastest lap by clicking on the *"Trophy"* icon on the toolbar).
- Start the Measuring Mode by pressing the *"Spacebar"* or main menu *item "Measurement / Measure"* or *"Measure"* icon in toolbar. The screen has gridlines and a cursor now, and remember that the last channel you loaded (in this case, Rear Shock) is the one that the cursor will follow. If you want the cursor to follow another channel, Left-click once on the numerical value displayed for that channel in the small pop-up Measuring Values window (careful! L-click on the channel name removes that channel from the screen).
- Choose the area you are interested in and use the mouse or Left – Right arrow keys to place the cursor on the appropriate point of the graph and L-click. In the example we are concerned about the rear rebound speed as the bike changes direction. So the cursor is positioned on the peak just before the rear suspension becomes almost fully extended, and then L-click once – which will display a vertical line through that point, with the Rear Shock channel value written near the bottom (in this case, 21.9mm). See figure 1 below.



Position cursor and L-click

Move the cursor to the next minimum peak and L-click again. The two points you clicked are displayed with vertical lines through them and their values noted on the bottom of the screen (in this case 21.9mm and 0.2mm). See figure 2 below.



Select next point and L-click

- Along the top of the screen is displayed the channel name, the time interval between the two points, the distance between the two points, and d/dt which is the average speed over that distance, in mm/sec. That is, Rear Shock speed at that point. So, in our example the channel Rear Shock has moved a distance of -21.69mm over 0.403sec, giving an average shock piston speed of –53.89mm/sec for that movement. Note that the Shock distance and speed are negative numbers because we are measuring in the rebound direction.

Maybe the original problem we were looking at was difficulty in changing direction at this chicane, and from this data we conclude that this rebound speed is too slow, making the bike pitch too slowly. So we want to adjust the rear rebound damping, and now we can refer to the damping charts knowing which speed range to make the adjustments in.

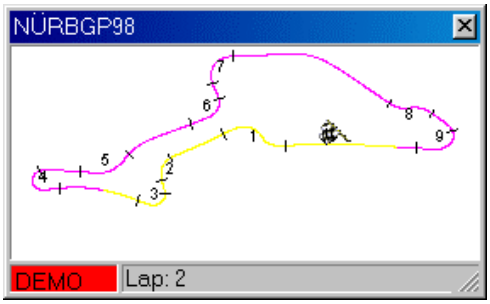
Please ensure that you are dealing with the same units when referring to your suspension damping charts; many damping charts are in m/sec, whereas the Analyzer measure mode numbers above are in mm/sec; the rebound speed shown here of –53.89mm/sec will often be shown on a damping chart as 0.054m/sec.

Also realise that this is one specific measurement only, you should be checking many points on many laps before coming to a conclusion about adjustments.

2.3 Circuit

Map of track with information about current selection

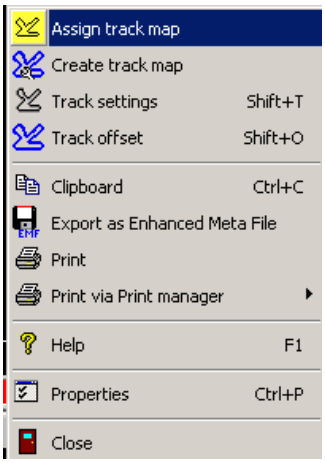
The circuit window shows the track map with the current selection of the active measurement highlighted. The circuit window may be turned off or on.



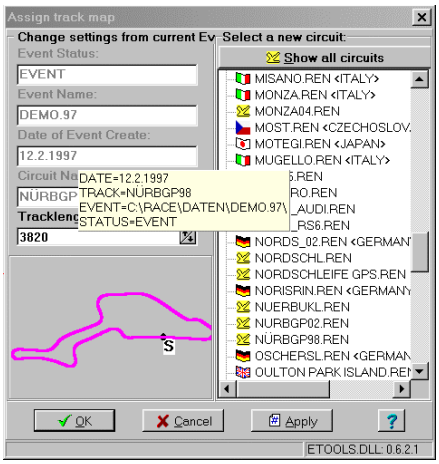
2.3.1 Functions



You can start all functions from the context menu. To show this menu click with the right mouse button at the small circuit window (default: right bottom corner)



- ***Assign track map***



Choose the correct track map to your event.

- ***Create track map***

Generates track map out of either speed + lateral acceleration or GPS coordinates

- ***Track settings***



Dialog to manage event specific track settings

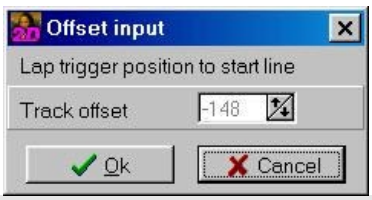
Calculate GPS map if available: If checked the software will look for channels named "Longitude" and "Latitude", and -if present- generate the track map from them. To filter out invalid GPS data a channel named "GPSValid" will be used as selector (0=invalid, 1=valid).

Event measured on a closed circuit: If checked all lap-specific logic will be applied like LapChecker wizard, offset detection, segment detection.

Track length & tolerance: Laps whose lap length (= integrated speed) differ more than |Tolerance| from Track length are treated as invalid resp. incomplete laps.

Track mode markers: Control of markers in Track mode window
Marker meter range: Markers whose position differs at most this value from user position are placed to the same position
Min segment distance: Min/max markers which are closer than this value to the segment edge are not created

- ***Track offset***





The track offset gives meter distance between lap trigger position and start/finish line. The value can't be changed manually as it is calculated automatically by speed-to-radius correlation.

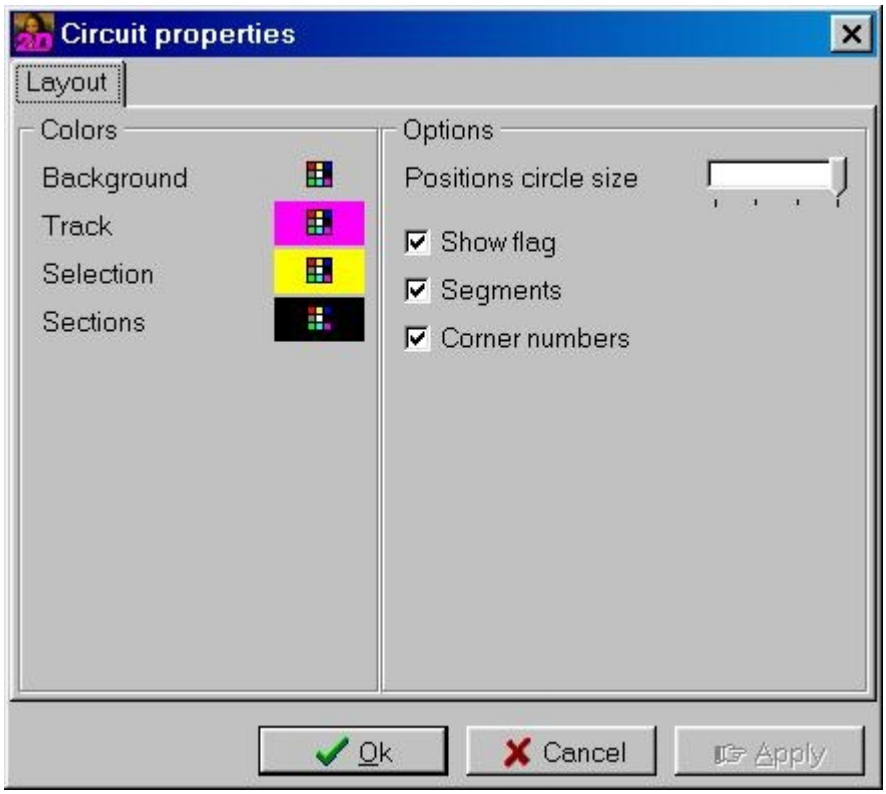
- ***Export and printout***

The Circuit map graphic may be exported and printed in several ways:
- Clipboard: Circuit is copied in Windows Clipboard using EMF vector format
- Export as Enhanced Meta File: Circuit is saved to disk in EMF vector format
- Print: High-quality print fitting the print page with circuit inner/outer line
- Print via Print manager: Fully-featured print layout module

2.3.2 Properties

The Circuit window's editable properties include color options like window background etc.

Additionally the size of the position circles inside the Circuit window can be adjusted.

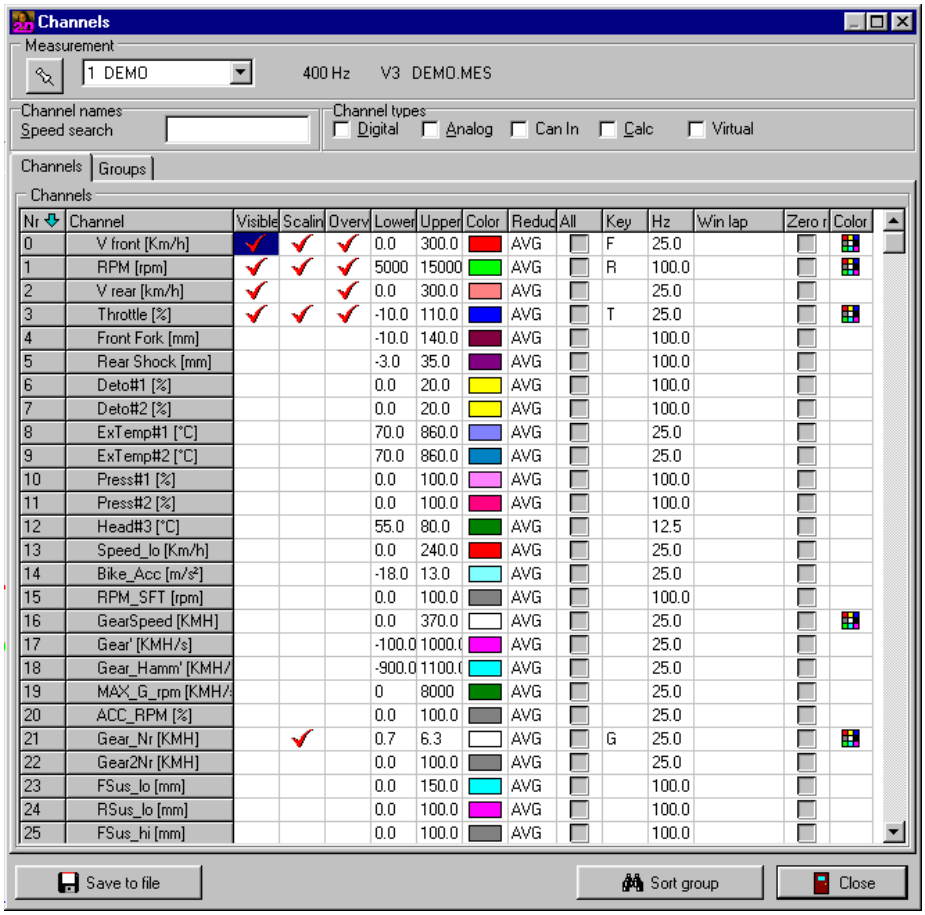


Optionally shown are start/finish flag, segment borders and corner numbers.

2.4 Channels

Editor of channel settings

Each sensor whose data is downloaded results in a channel of the measurement.
Additional channels can be calculated and stored with the by the use of calculation files.

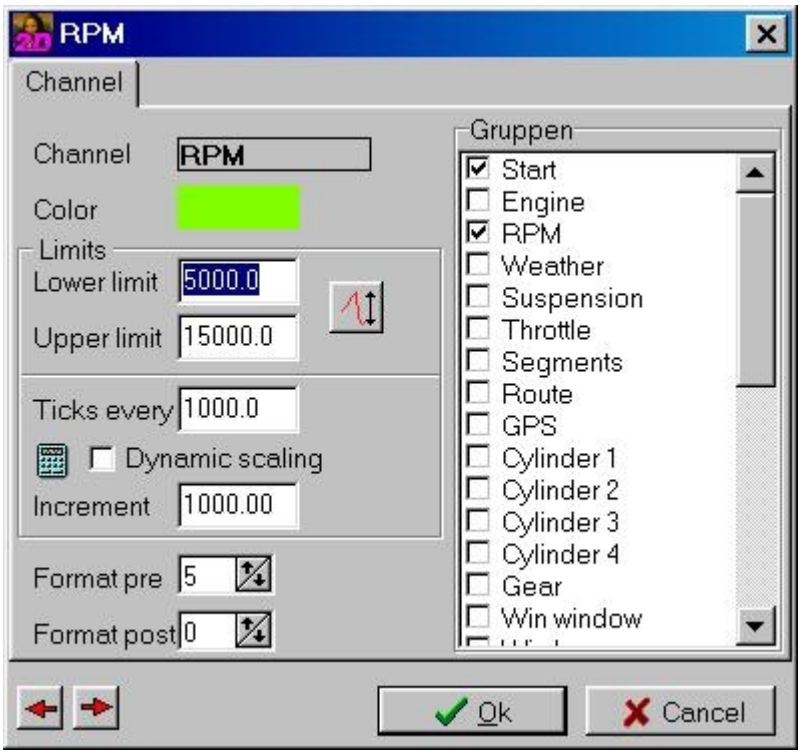




The Analyzer adds virtual channels which are available at run time. Each channel has its own settings which can be edited. The management of channels is supported by functions. Channels can be organized in groups.

2.4.1 Settings

Expression	Meaning
Visibility	Switch channels on/off
Scaling	Show scaling beside the channel curves
Color	Individual channel color
Limits	Lower and upper limits for physical channel values
Autoscale for limit	Automatic calculation of suitable limits
Dynamic autoscale for limits	Limits are calculated depending on selection in Moving window
Format	Number of digits after decimal separator
Reduce in Overview	Type of data reduction of several measured values into one value
All in Moving	All measured values are displayed graphically
Key	Short key to switch a channel's visibility
Zero ruler	Horizontal line at physical 0 position
Color scale	Mapping of physical values onto colors in defined steps
Group assignment	Collection of channels in topics



2.4.2 Groups

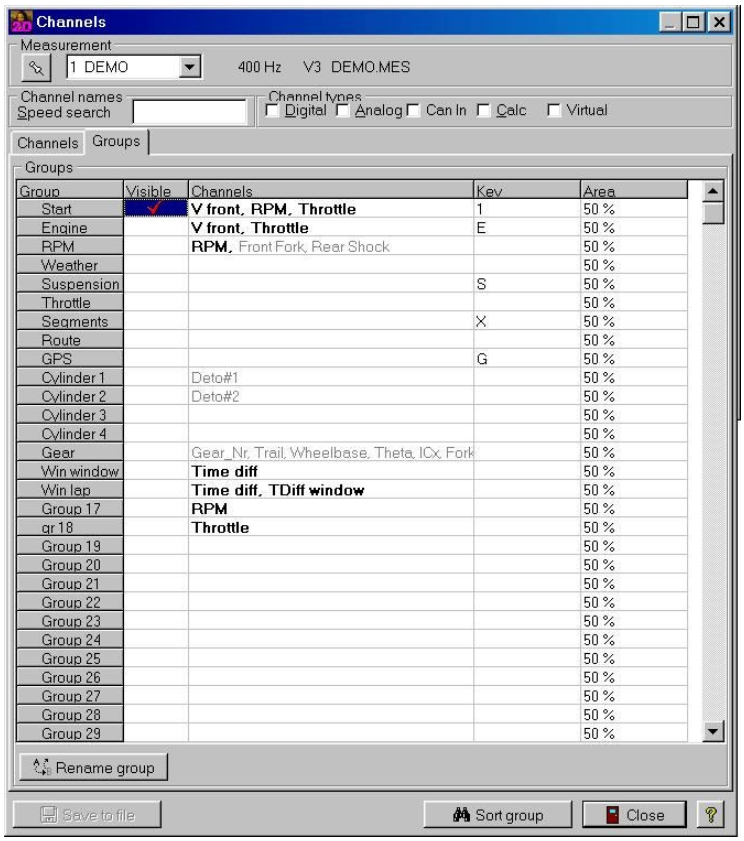


Channels can be organized (collected) in groups which each represent one topic.
The group names may be edited freely. The channels inside the first group will be shown at Analyzer program start.

Examples:

- A channel *"Speed"* may be assigned to many groups like *"Start"*, *"Engine"*, *"Suspension" and "Time Diff".*
- A channel *"Spring"* may be assigned to group *"Suspension"* only.
- A group *"Engine"* may contain channels like *"Speed", "RPM", "Throttle"* etc.
- A group *"Temperature"* may contain *"RPM", "OilTemp", "WaterTemp"* etc.

By switching on/off a group all channels assigned to this group are switched on/off.
Each group may be assigned a short key to switch it fast via keyboard.
The Areas each display the channels of one group.

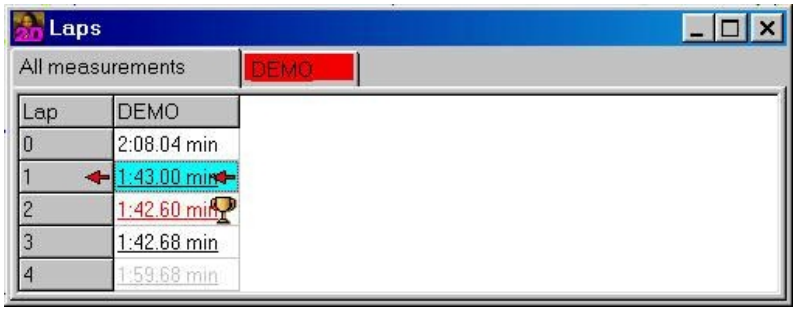


2.4.3 Functions

There are several functions to manage the channels list conveniently:
The Speed search edit field allows searching for channels with a defined name mask. For example typing *"V_"* finds all channels with names starting with *"V_"*. Typing *"*susp"* finds all channels which names contain the string *"susp".*
To display all channels with a certain channel type like *"Digital"* check the appropriate channel type.
Clicking on a field in the header row of the channel list sorts the channels up/down by this field. This works for the columns where sorting makes sense, e.g. number, name or frequency etc.
The selection of a sort group makes it easy to sort up all channels inside one certain group

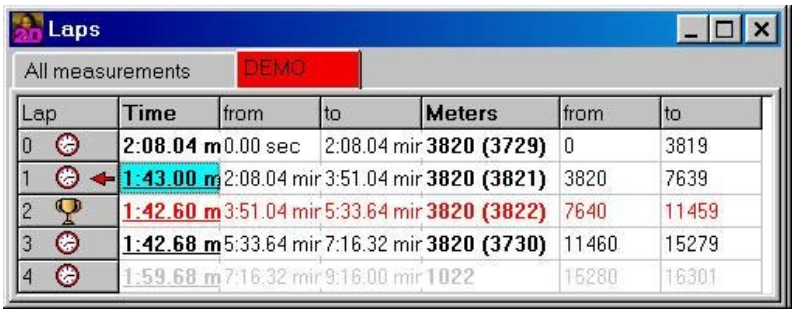
2.5 Lap times

Table with lap times of all loaded measurements.
The first page shows an overview of the lap times of each loaded measurement.
Each loaded measurement has its own page with detail information about the lap length in meters and start/end of the laps.



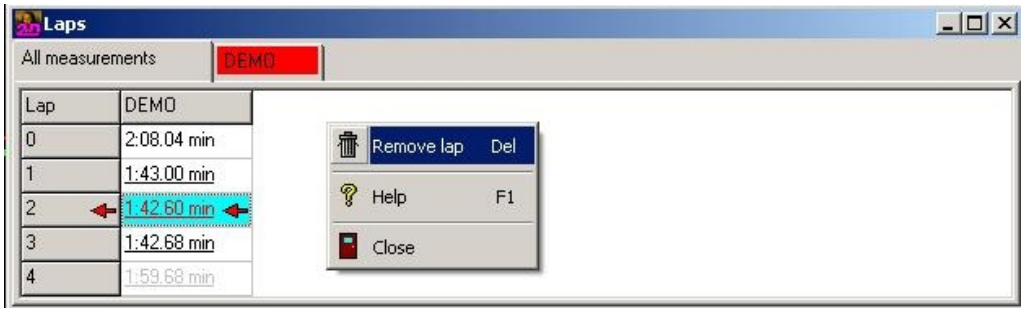
A lap which appears to be invalid is written in light grey color to tell it apart from valid laps in which lap length fits the defined track length.

Manually inserted laps are underlined



2.5.1 Functions

By clicking on a table entry the selection of the clicked measurement is set to the corresponding lap. A not-wanted lap may be removed via context menu or with *"Del"* key. Be careful with that function as the chosen lap trigger will disappear.

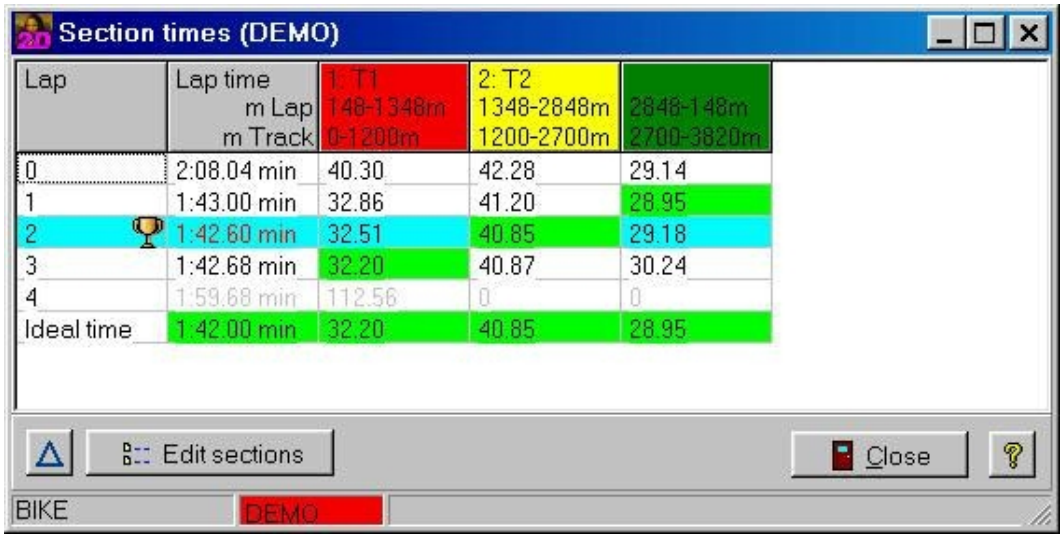


2.6 Section times

Table with section times of a measurement



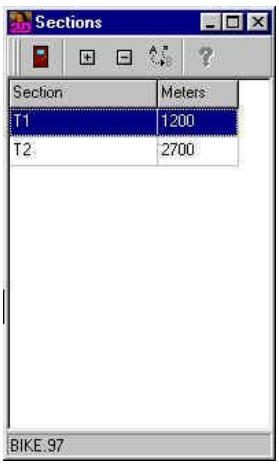
Overview of the section times of each loaded measurement lap by lap. The sum of the best section times gives an idea of a possible ideal lap time.



2.6.1 Definition of Sections



The track may be divided into up to 6 Sections which are defined by a distance from start/finish line. Each section can be named.



2.6.2 Functions

Print

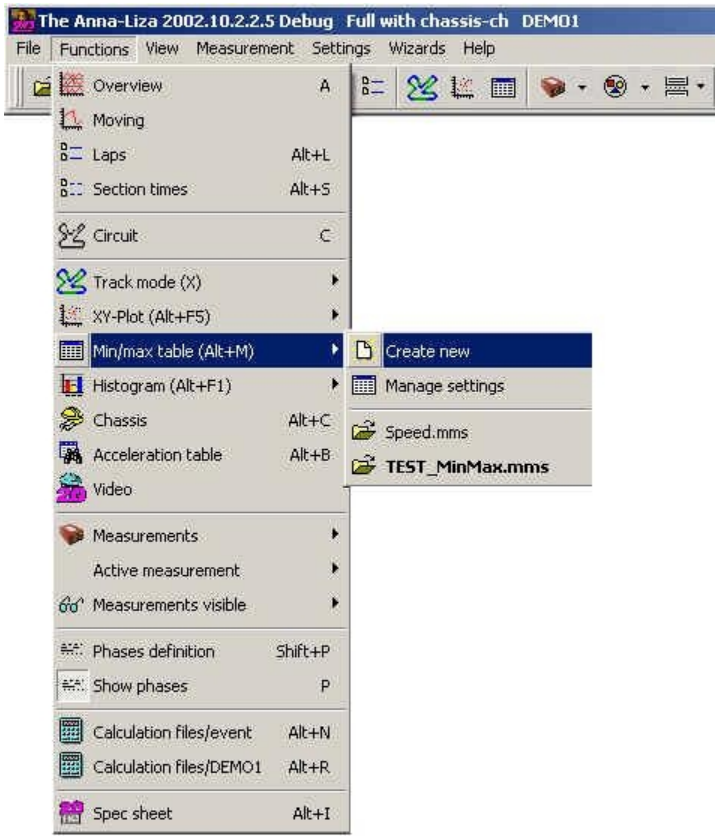
The print function simply prints the content of the current Section times window. *The "Print all section tables"* function opens one Section times window for each loaded measurement and prints their content using Notepad.

2.7 Min-/Max tables

Overview of lower, upper and average values of channels
A Min/max table serves as a quick overview of minimum, maximum and average values of some channels of a measurement lap by lap.

2.7.1 Creation and setup

A Min/max table setting can be created and saved to disk to re-use it later.
You can create a new Min/max table or edit an existing setting via the shortcut **<Alt + M>**



Phases
Without using phases the min/max/avg values of each channel are displayed lap by lap. With the use of phases the channel values are calculated per lap where the phases apply.

Channels
Each channel may be chosen to be analyzed inside a Min/max table. For each chosen channel it is possible to select minimum, maximum and/or average value. Additionally a filter value can be provided to apply an average filter to the channel.



You will get detailed informations about the creation of a new Min/Max tables at the help files examples.

2.7.2 Management

The saved Min/max table settings may be renamed or deleted inside the management editor. The editor shows also the name of the used Phase settings files.

2.7.3 Functions

Exports
The contents of the table may be exported in Ascii or Microsoft Excel readable format.

Find position
By clicking on a minimum or maximum value of a channel the corresponding position in the measurement is selected and centered inside the Moving window. If the channel was not visible it will be switched on and activated in the Moving window.

Print
The print function simply prints the content of the current Min/max table.

2.7.4 Properties

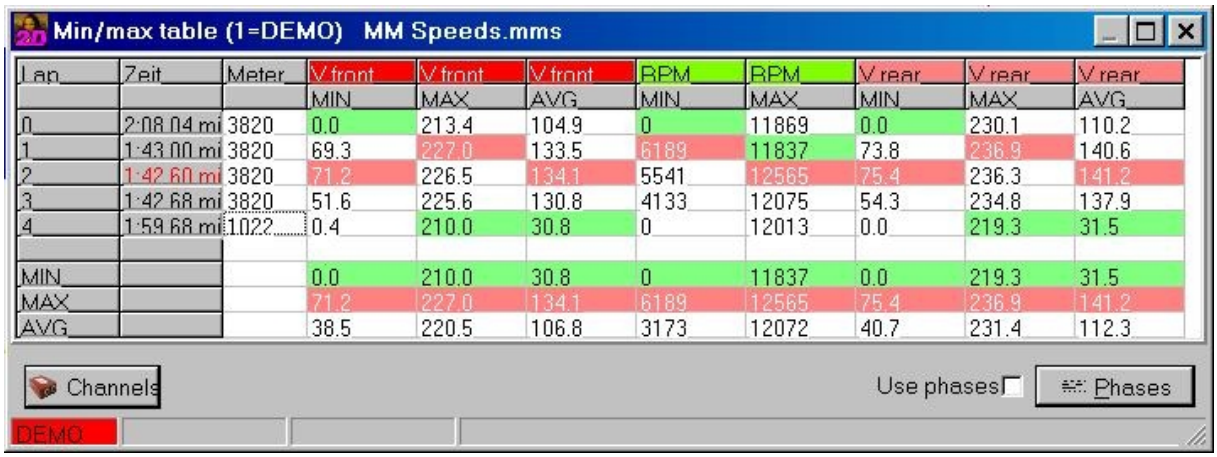
The only property of a Min/max table is the choice to blank out the button bar what can be done via context menu.



2.7.5 Examples

2.7.5.1 Example 1

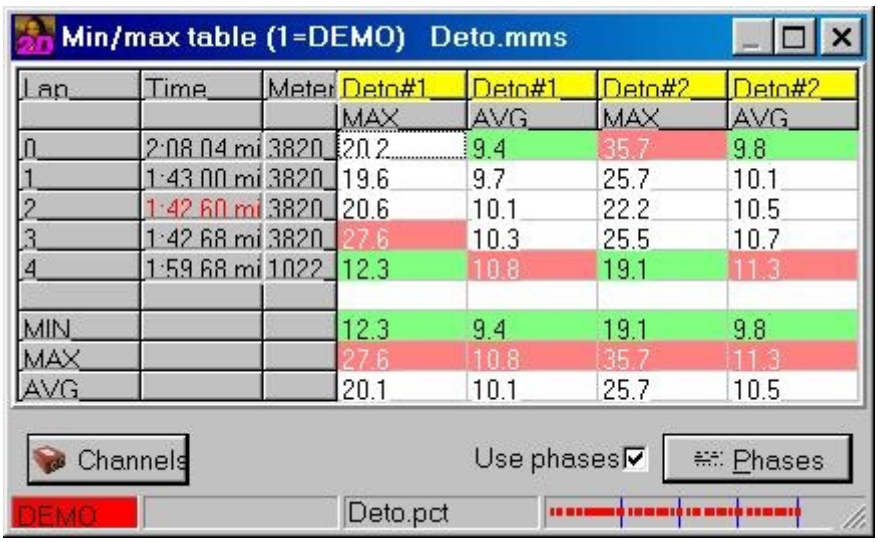
A Min/max table called *"Speeds"* contains each minimum, maximum and average of channels *"V_Front"* and *"V_Rear"* and minimum and maximum of channel *"RPM".*



Lap	Zeit	Meter	V front MIN	V front MAX	V front AVG	RPM MIN	RPM MAX	V rear MIN	V rear MAX	V rear AVG
0	2:08.04 mi	3820	0.0	213.4	104.9	0	11869	0.0	230.1	110.2
1	1:43.00 mi	3820	69.3	227.0	133.5	6189	11837	73.8	236.9	140.6
2	1:42.60 mi	3820	71.2	226.5	134.1	5541	12565	75.4	236.3	141.2
3	1:42.68 mi	3820	51.6	225.6	130.8	4133	12075	54.3	234.8	137.9
4	1:59.68 mi	1022	0.4	210.0	30.8	0	12013	0.0	219.3	31.5
MIN			0.0	210.0	30.8	0	11837	0.0	219.3	31.5
MAX			71.2	227.0	134.1	6189	12565	75.4	236.9	141.2
AVG			38.5	220.5	106.8	3173	12072	40.7	231.4	112.3

2.7.5.2 Example 2

A Min/max table called *"Deto"* contains maximum and average of each 2-stroke cylinders detonation channel.
Additionally a phase condition is active which defines phases where the throttle channel has values of at least 30 %.



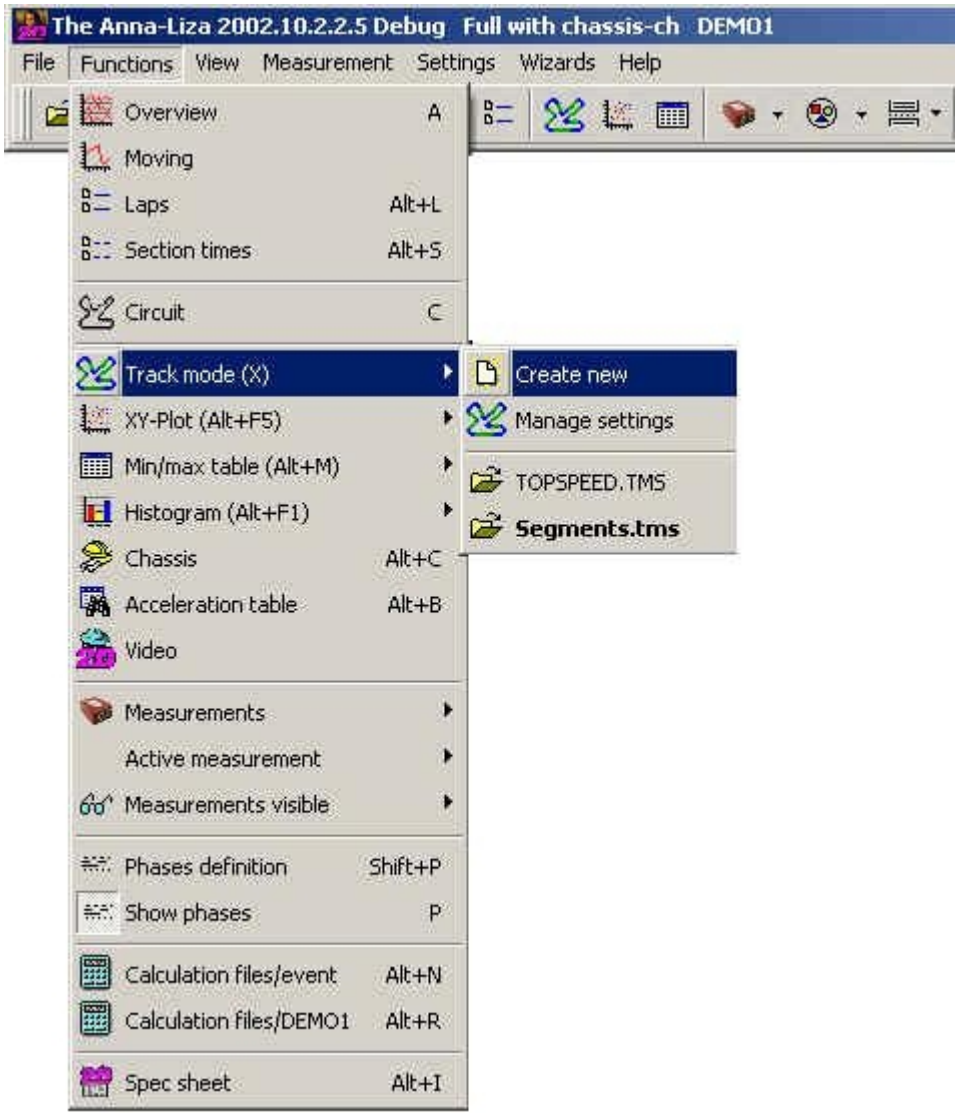
Lap	Time	Meter	Deto#1 MAX	Deto#1 AVG	Deto#2 MAX	Deto#2 AVG
0	2:08.04 mi	3820	20.2	9.4	35.7	9.8
1	1:43.00 mi	3820	19.6	9.7	25.7	10.1
2	1:42.60 mi	3820	20.6	10.1	22.2	10.5
3	1:42.68 mi	3820	27.6	10.3	25.5	10.7
4	1:59.68 mi	1022	12.3	10.8	19.1	11.3
MIN			12.3	9.4	19.1	9.8
MAX			27.6	10.8	35.7	11.3
AVG			20.1	10.1	25.7	10.5

2.8 Track mode

Graphical presentation of track with channel values at defined positions
A window with a graphical presentation of the track with channel values at defined positions. A 3rd dimension is achieved by selecting a color channel.

2.8.1 Creation and setup

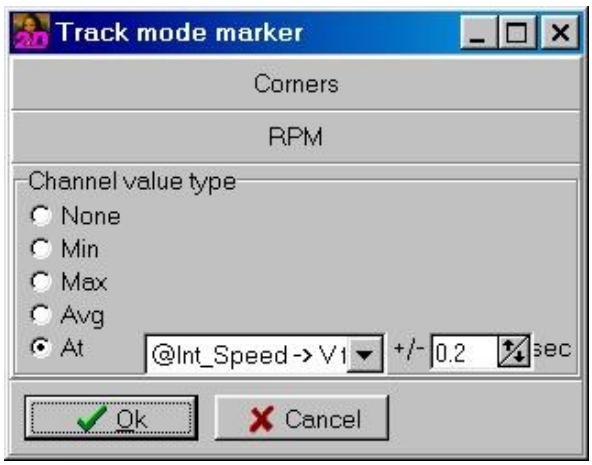
A Track mode setting can be created and saved to disk to re-use it later. A Track mode setting consists mainly of 2 parts: settings concerning the graphical layout of the track and settings of the inscribed markers.
You can create a new Track mode or edit an existing setting via the shortcut <X>



2.8.1.1 Marker settings

At certain positions on the track markers are placed containing channel values at these positions. The calculation of the channel values depends on the marker type which can be:

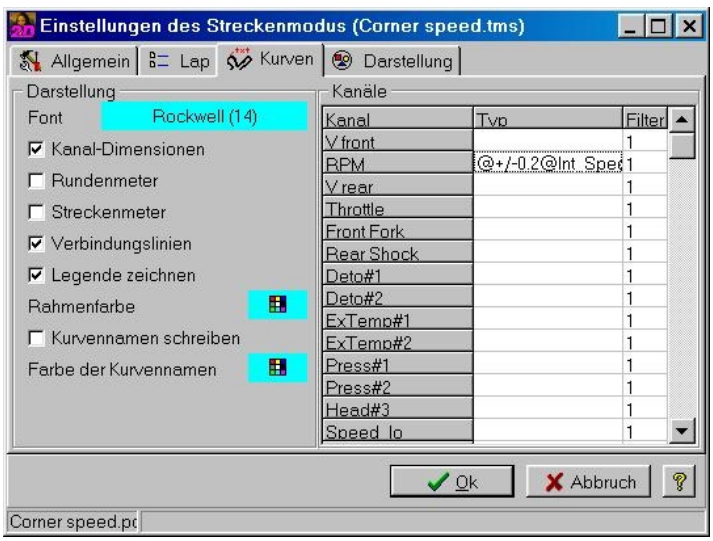
- lap
- sections
- corners
- straights
- gear change (not yet available)
- user defined
- start of phases
- end of phases



All markers of a certain type have options like text font, additional inscription of channel's dimensions, display of a legend etc.

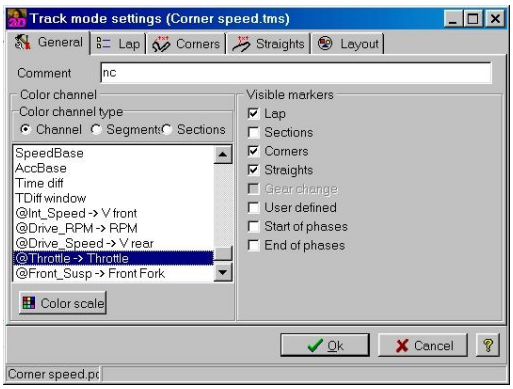
A marker of type lap/sections/corners or straights may contain the minimum, maximum or average value of channels in this marker's range or the value at the minimum resp. maximum of another inscribed channel.

A marker of type gear change/user defined/start of phases or end of phases contains channel values at this defined point.



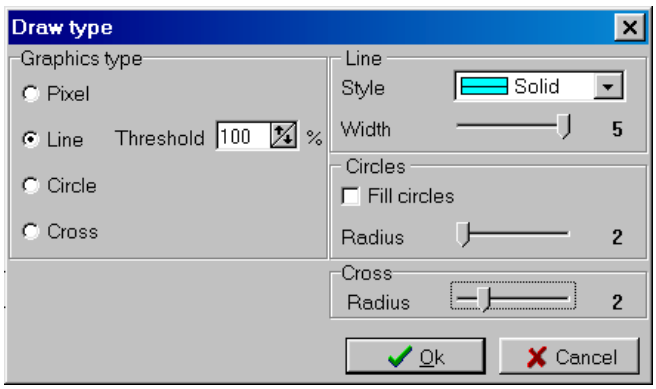
2.8.1.2 Graphic settings

The Track mode graphic settings (refer the figure below) control the layout of the track map The color channel may represent just the existing sections, the segments or a measured channel. When a real measured color channel is chosen its color scale defines the mapping of the measured values to colors.



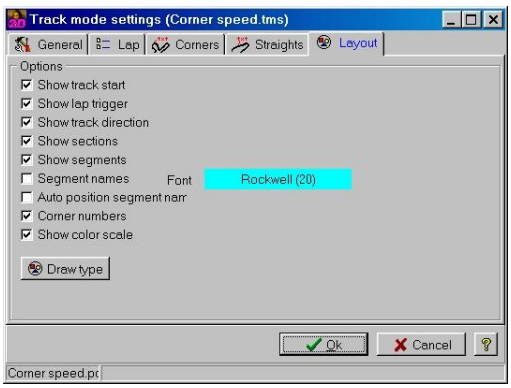


The draw type of the track can be pixels, lines, circles or crosses in chosen thickness.





Check and change your individual track mode layout



On the track map the graphic symbols for the lap trigger, the sections, the segments etc. can be shown.

2.8.2 Functions

2.8.2.1 Print

- The standard print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a chosen Excel sheet together with data out of the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager starts the high-end print page layout module.



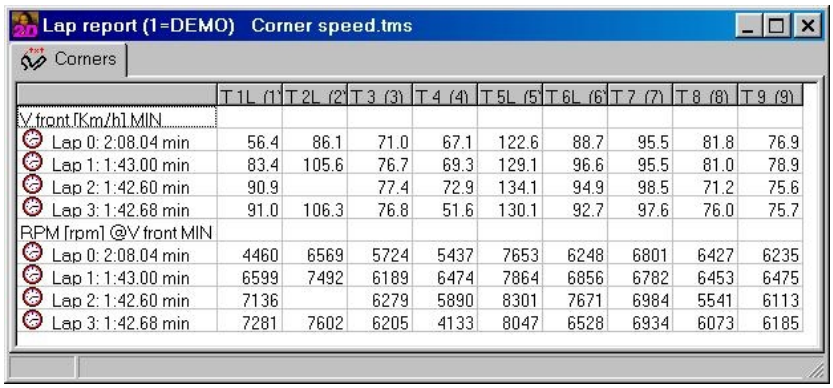
Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer Options Dialog.

2.8.2.2 Lap report

The lap report creates a table out of the Track mode settings which contains the channel values of each marker of the Track mode lap by lap.

The content of the lap report window can be printed by the print function.
The "Print via Notepad" function embeds the complete lap report table into a text file and prints it.

The lap report table may be exported to an Microsoft Excel (*.xls) file.



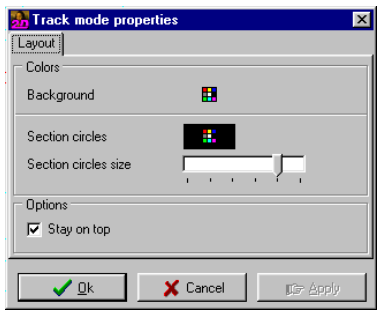
	T 1L (1)	T 2L (2)	T 3 (3)	T 4 (4)	T 5L (5)	T 6L (6)	T 7 (7)	T 8 (8)	T 9 (9)
V front [Km/h] MIN									
Lap 0: 2:08.04 min	56.4	86.1	71.0	67.1	122.6	88.7	95.5	81.8	76.9
Lap 1: 1:43.00 min	83.4	105.6	76.7	69.3	129.1	96.6	95.5	81.0	78.9
Lap 2: 1:42.60 min	90.9		77.4	72.9	134.1	94.9	98.5	71.2	75.6
Lap 3: 1:42.68 min	91.0	106.3	76.8	51.6	130.1	92.7	97.6	76.0	75.7
RPM [rpm] @V front MIN									
Lap 0: 2:08.04 min	4460	6569	5724	5437	7653	6248	6801	6427	6235
Lap 1: 1:43.00 min	6599	7492	6189	6474	7864	6856	6782	6453	6475
Lap 2: 1:42.60 min	7136		6279	5890	8301	7671	6984	5541	6113
Lap 3: 1:42.68 min	7281	7602	6205	4133	8047	6528	6934	6073	6185

2.8.3 Management

The saved Track mode settings may be renamed or deleted inside the management editor. The editor shows also the name of the used Phase settings files.

2.8.4 Properties

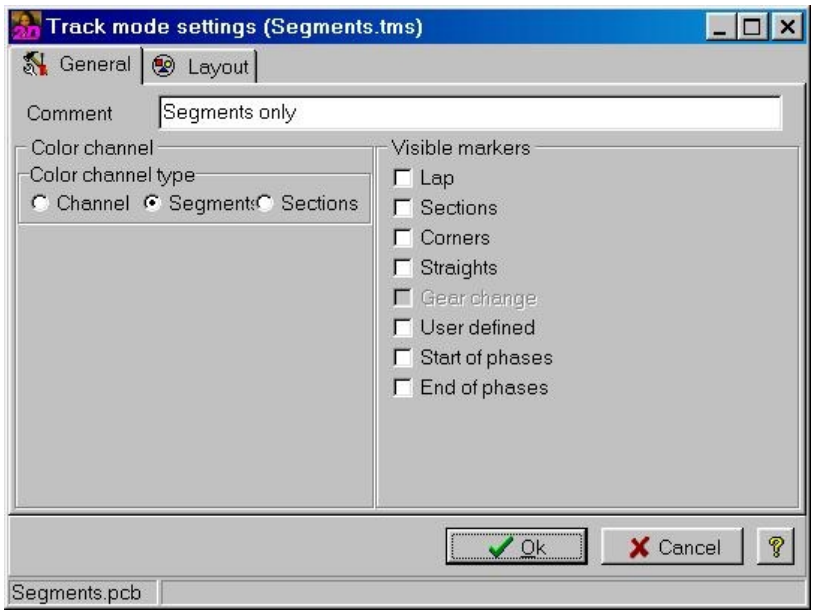
The Track mode's editable properties include color options like window background etc. Additionally the size of the position circles inside the Track mode window can be adjusted.

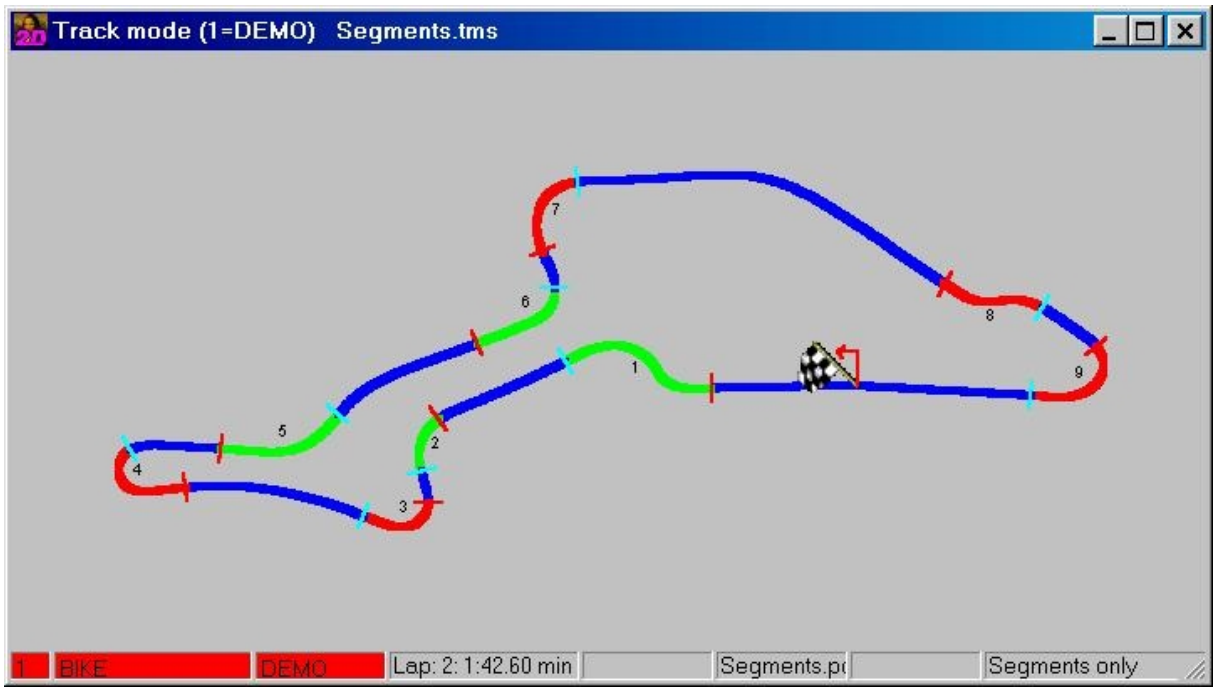


2.8.5 Examples

2.8.5.1 Example 1

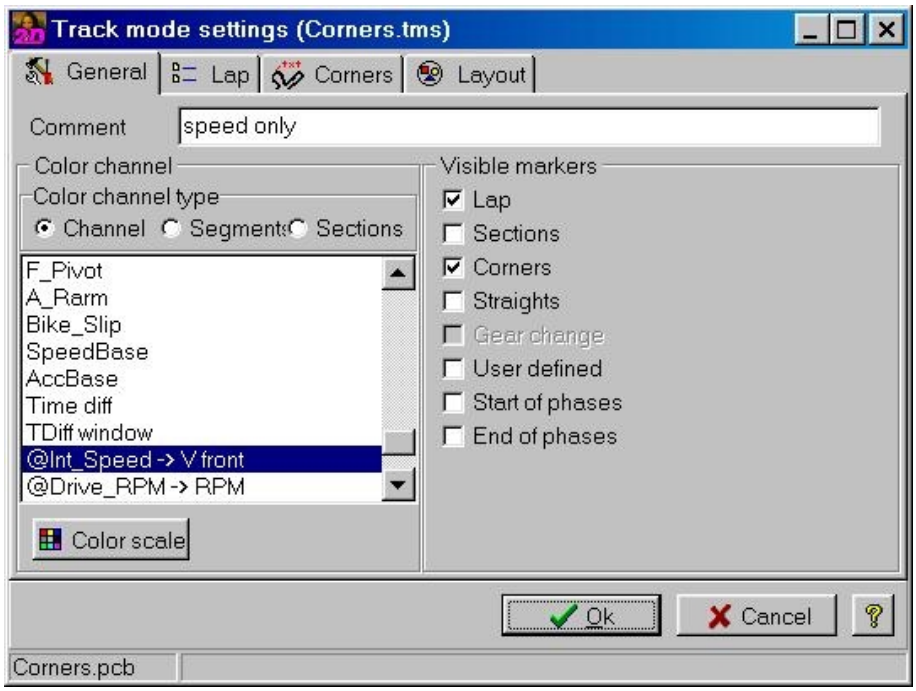
A simple Track mode setting called *"Segments"* without markers which uses the sections as color channel.

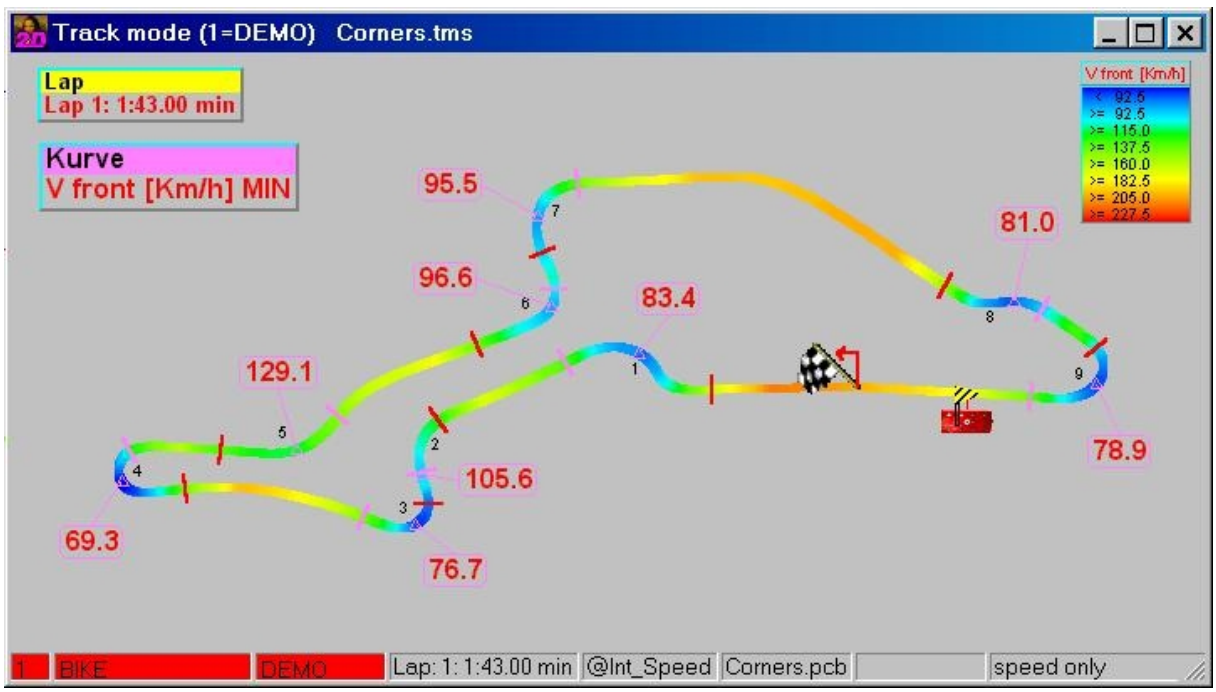




2.8.5.2 Example 2

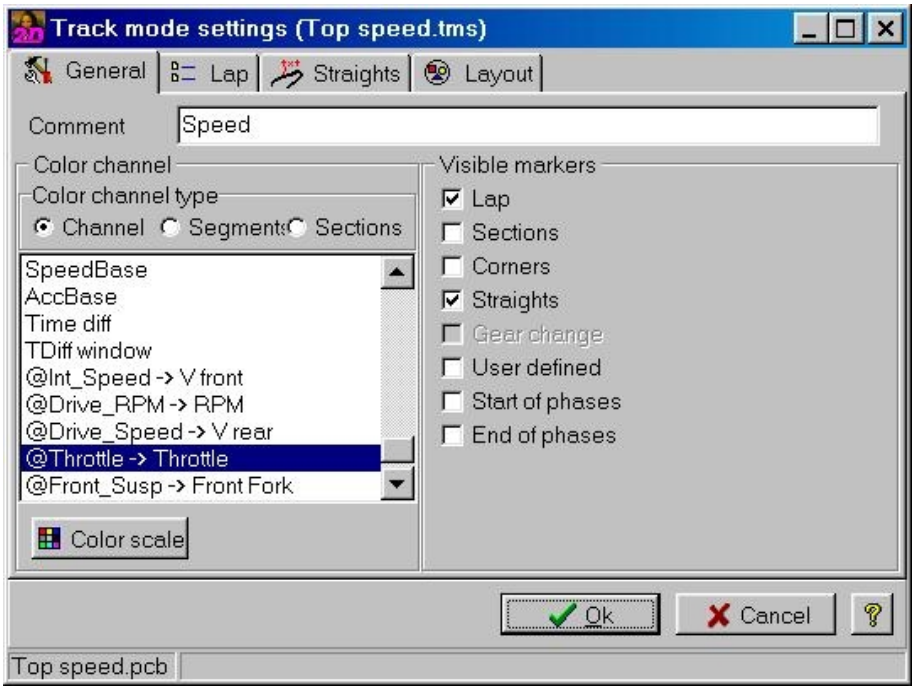
A Track mode setting *"Corners"* with color channel *"Speed"*. Markers of type Corners with channel *"Speed"* as minimum value are inscribed.

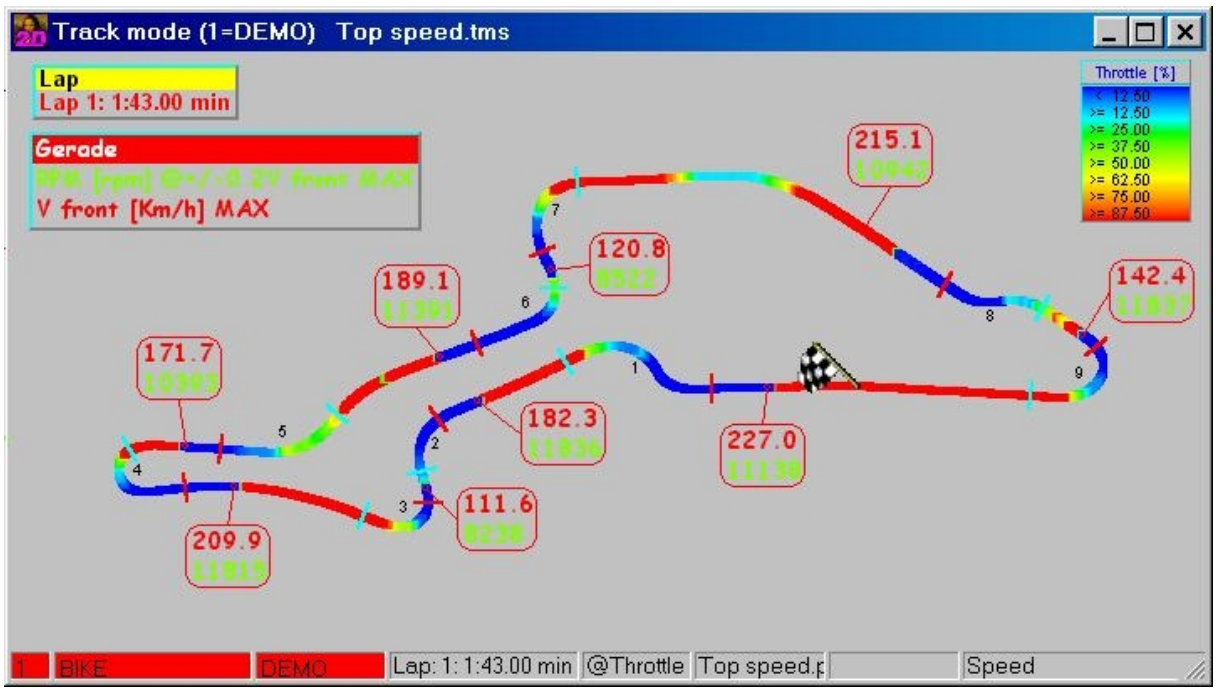




2.8.5.3 Example 3

A Track mode setting *"Top speed"* with color channel *"Throttle".* Markers of type Straights with channel *"Speed"* as maximum value and channel *"RPM"* at the Speed's maximum are inscribed.



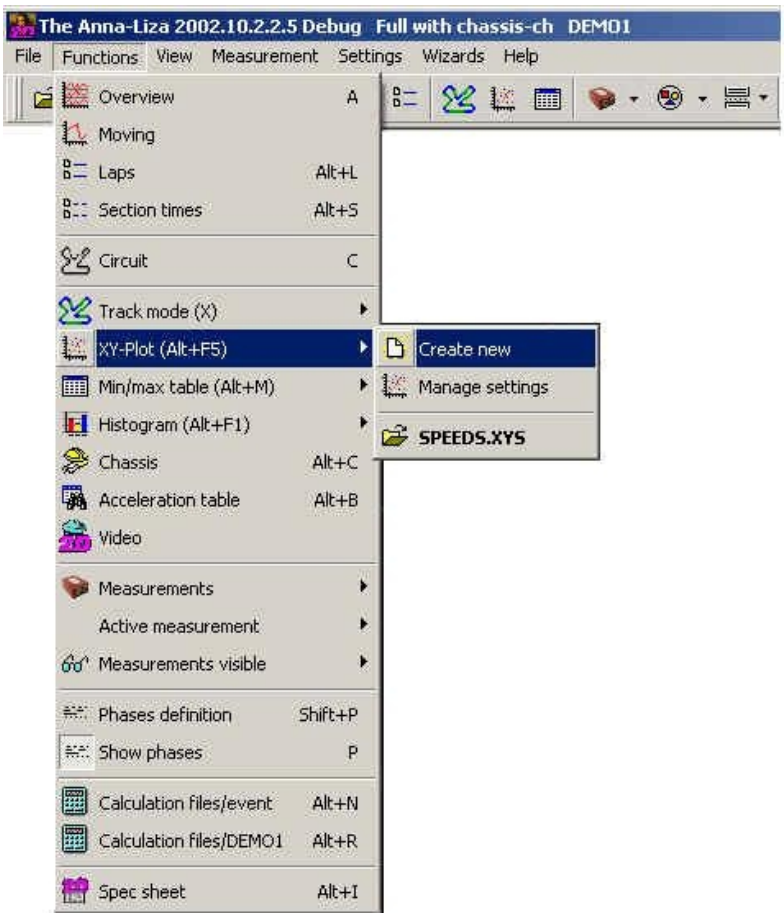


2.9 XY-Plot

2-dimensional presentation of relationship of 2 channels
Function to display a 2-dimensional graphical presentation of the relationship of 2 channels. A 3rd dimension is achieved by selecting a color channel.

2.9.1 Creation and Setup

An XY-Plot setting can be created and saved to disk to re-use it later.
You can create a new XY-Plot or edit an existing setting via the shortcut <Alt + F5>



2.9.1.1 Settings

The relationship of one selectable channel (X) to several (Y) other selectable channels is shown. The data of channels of one or more measurements can be selected.

With the use of phases the displayed data can be restricted to a data subset. The color channel's color scale defines the mapping of the measured values to colors. Alternatively the color of the plot may be divided by measurements or by laps. The draw type of the track can be pixels, lines, circles or crosses in chosen thickness.

2.9.2 Functions

2.9.2.1 Limits

The lower and upper limits of X and Y channel in an XY-Plot window can be set in different ways.

Manual input of the limits can be done via context menu.

In the scaling tools window the limits can be moved or zoomed in and out. The catch function calculates suitable limits to display all graphic items in the window. The dynamic autoposition function performs catching automatically when the XY-Plot data must follow the selection and the selection (displayed window) has changed.

2.9.2.2 Grid

The grid consists of regular horizontal and vertical lines. This helps classifying the graphic items as physical values.

2.9.2.3 Print

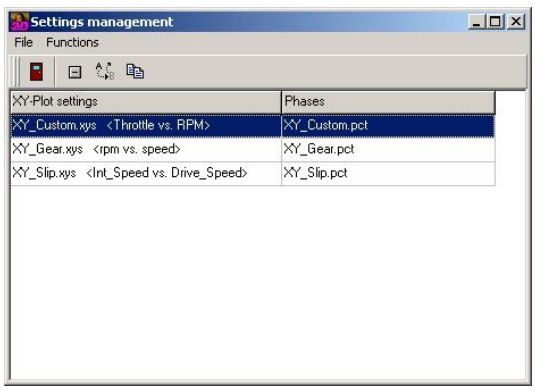
- The standard print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a chosen Excel sheet together with data out of the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager starts the high-end print page layout module.



Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer Options Dialog.

2.9.3 Management

The saved XY - Plot settings may be renamed or deleted inside the management editor. The editor shows also the name of the used Phase settings files. The quickest way to open the editor is to use the shortcut key <ALT + F5>.



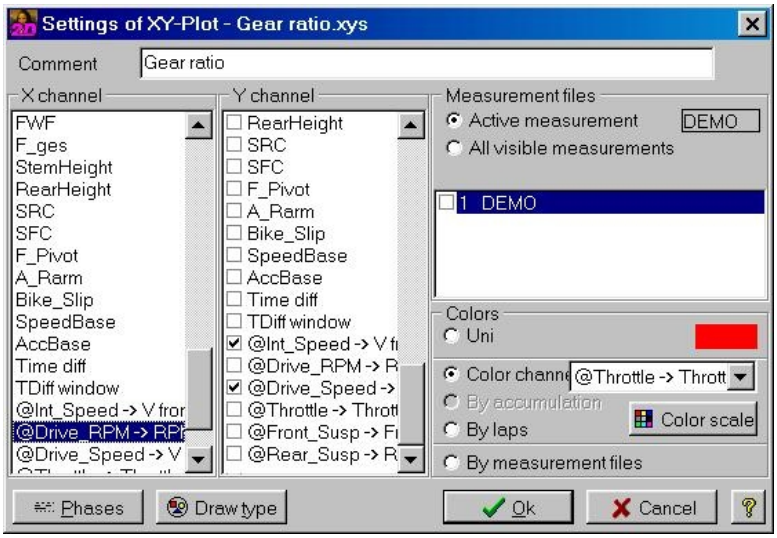
2.9.4 Properties

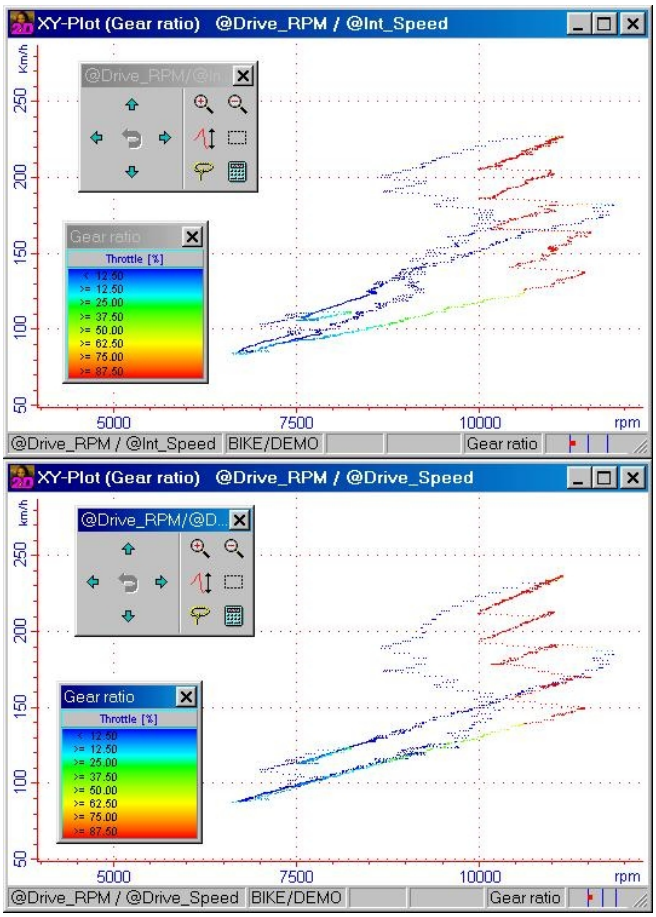
The XY-Plot's editable properties include window background color. The option *"Highlight phases with mouse"* affects the reaction of a XY-Plot window when moving then mouse over it. If several phases are defined by the Phase conditions then all graphic items belonging to the same phase as the item under the mouse are highlighted.

2.9.5 Examples

2.9.5.1 Example 1

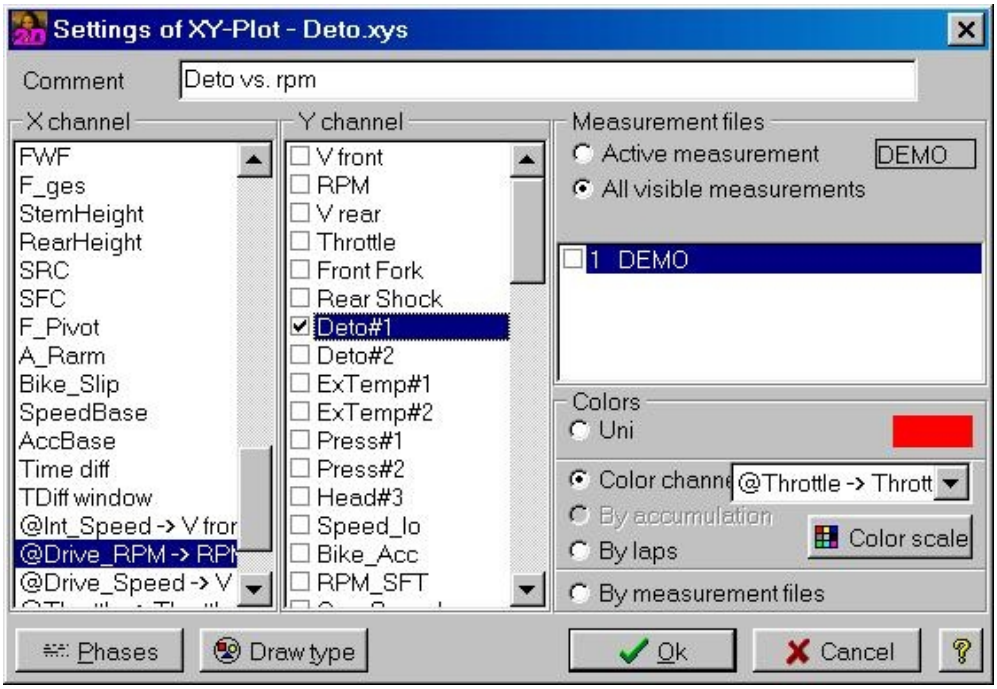
An XY-Plot "Gear ratio" shows channel "RPM" vs. channels "V_Front" and "V_rear".
As color channel "Throttle" may be used. A phase condition (L) of type "Laps/selection" -> "Current selection" with option "Follow selection" is defined to show the gear ratio of the current selection in the Moving window.

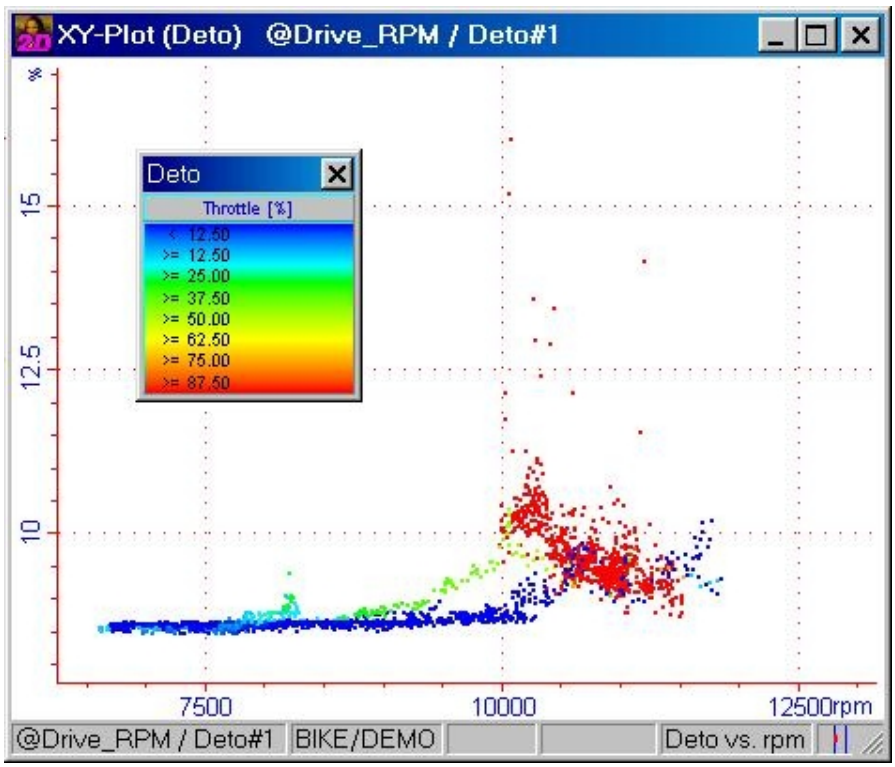




2.9.5.2 Example 2

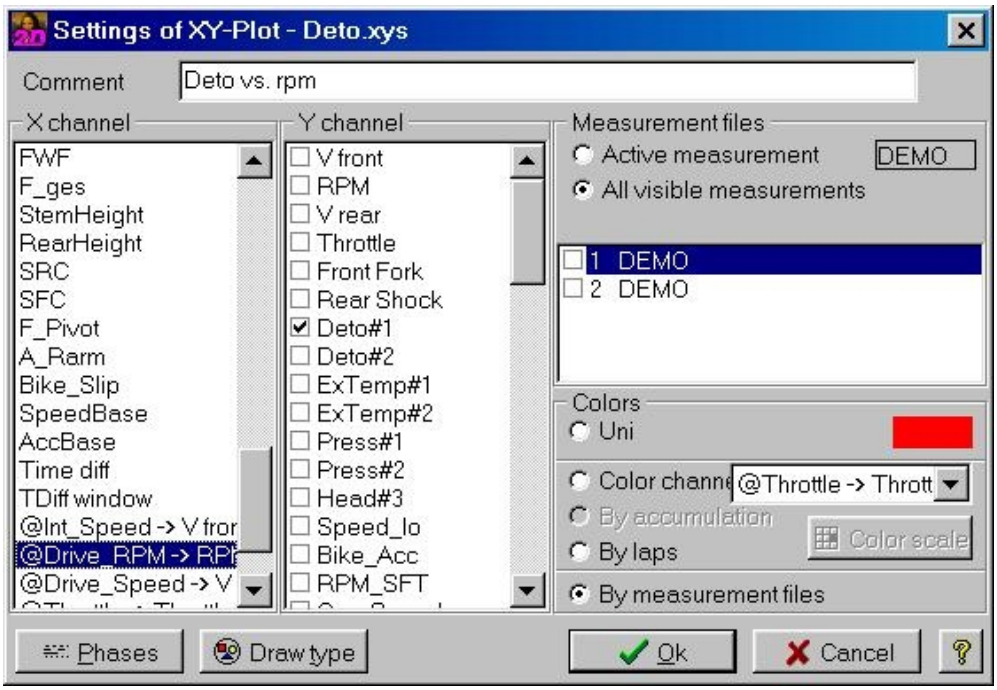
Examine 2-stroke detonation by showing channels "RPM" vs. "Deto" with color channel "Throttle".

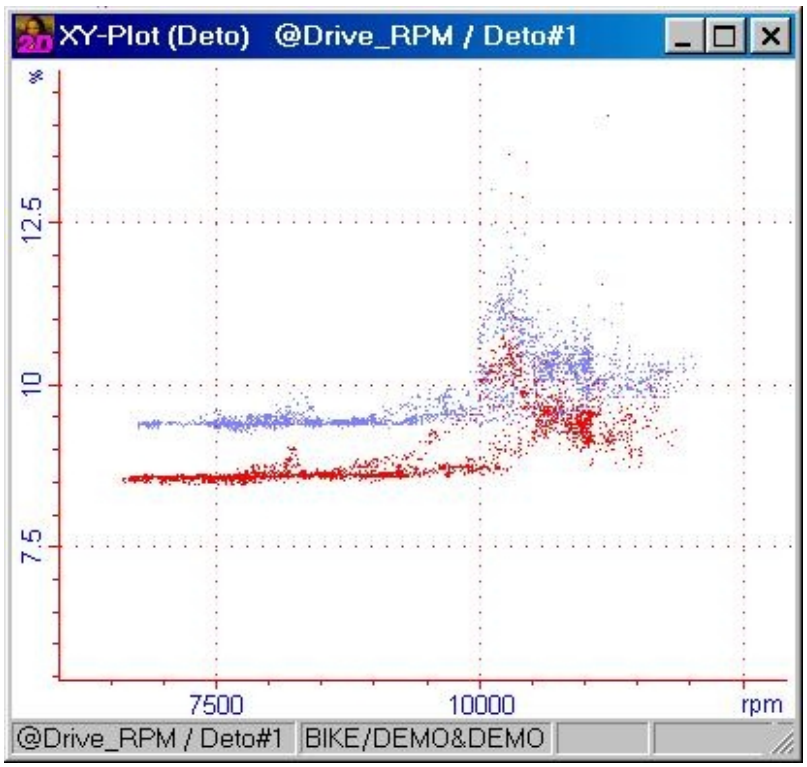




2.9.5.3 Example 3

Examine 2-stroke detonation of two different engine settings or laps. The XY-Plot shows *"RPM" vs. "Deto"* of two loaded measurements. The colors of the measurements is selected as color of the XY-Plot items to separate both measurements.



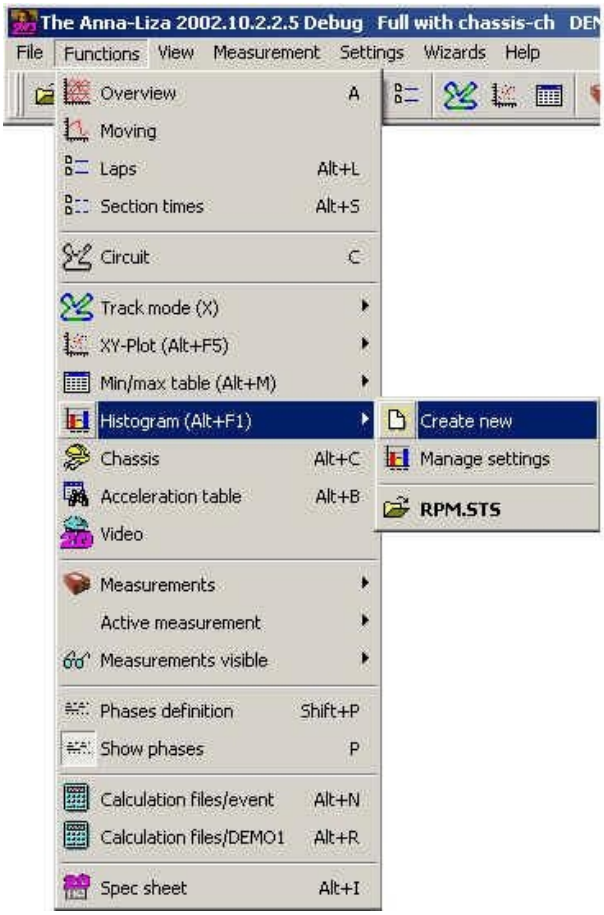


2.10 Histogram

Statistics about measuring values of a channel.

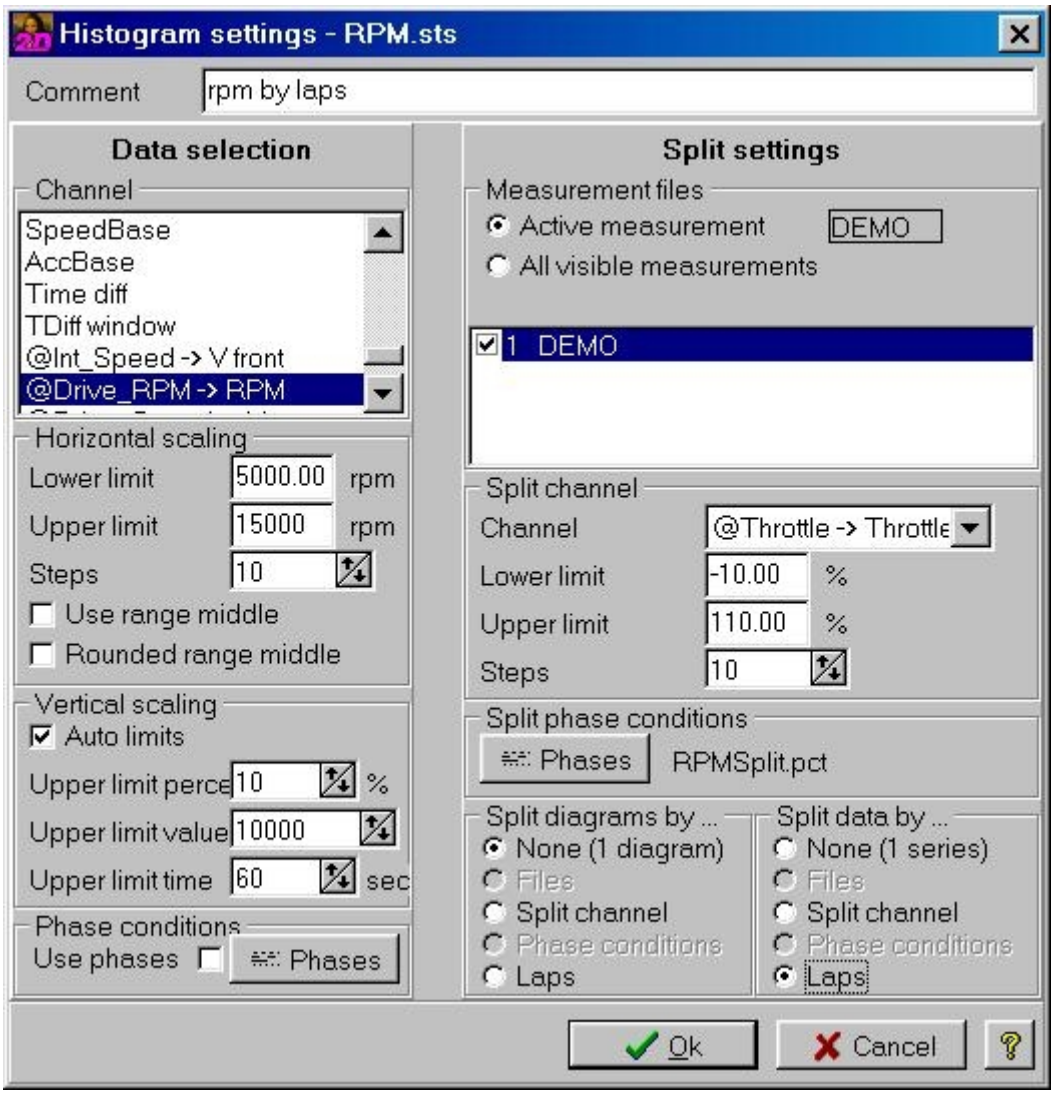
2.10.1 Creation and setup

A Histogram setting can be created and saved to disk to re-use it later.
You can create a new Histogram or edit an existing setting via the shortcut <Alt + F1>



2.10.1.1 Settings

Expression	Meaning
Channel	Choose your histogram channel
Horizontal scaling	Choose the steps of the channel
Vertical scaling	Select auto limits or choose manually separate limits
Phases	Restrict your data selection by phases
Files	Select the files you want to display
Split channel	Divide diagrams or series by a channel in several steps
Split phases	Divide diagrams or series by single phase conditions
Split	Select separation of diagrams and data series



2.10.2 Functions

2.10.2.1 Export

The contents of the table may be exported in Ascii or Microsoft Excel readable format.

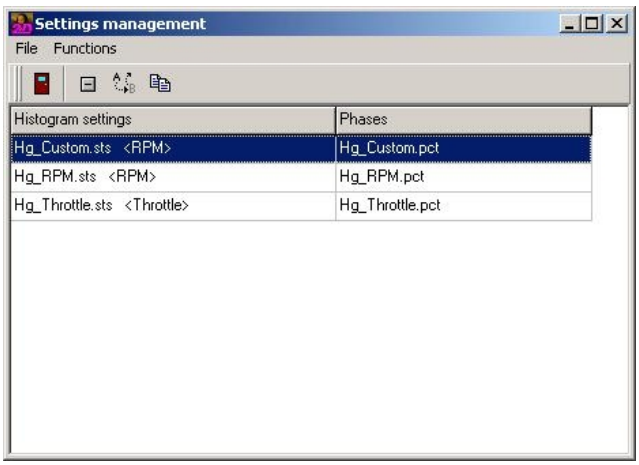
2.10.2.2 Print

The print function prints the content of one or all Histogram windows. When printing several windows, the layout of the printout can be managed.

Print via Print manager starts the high-end print page layout module.

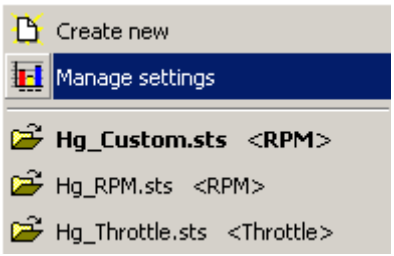
2.10.3 Management

The saved Histogram settings may be renamed or deleted inside the management editor. The editor shows also the name of the used Phase settings files.





The quickest way to opnen the editor is to use the shortcut key <Alt + F1>. Afterwards select the menu item “Manage settings“



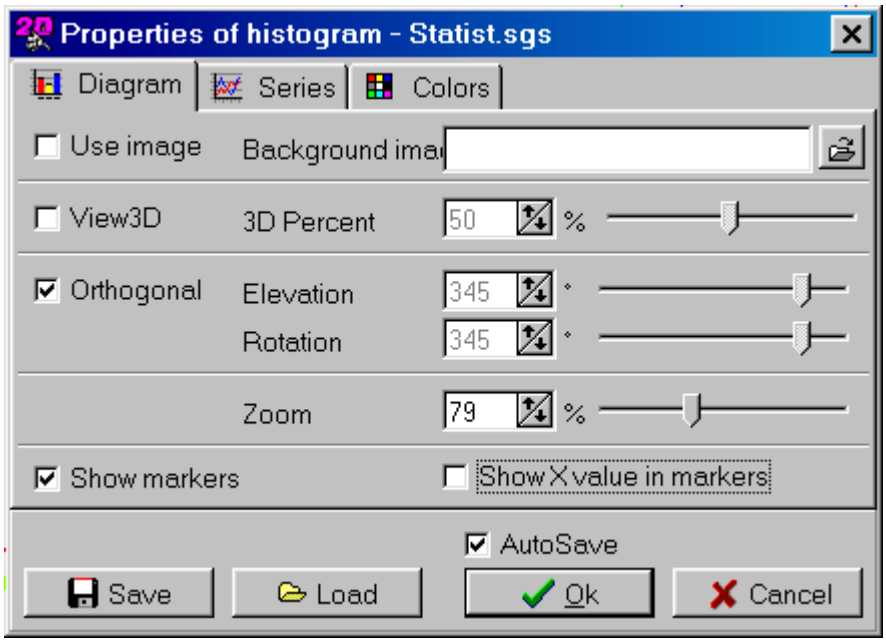
2.10.4 Properties

The Histogram properties include many graphical options to display the statistics.

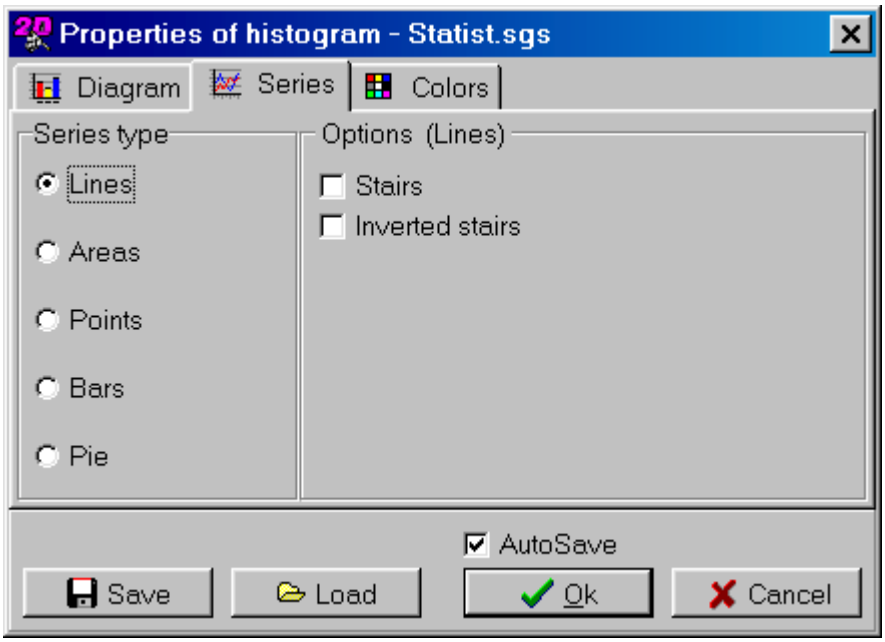
The presentation may be 2- or 3-dimensional, where various geometric options may be set.



To enter the Histogram properties dialog use the context menu (right mouse click) in a opened Histogram setting.



The type of the series can be Lines, Areas, Points, Bars or Pie

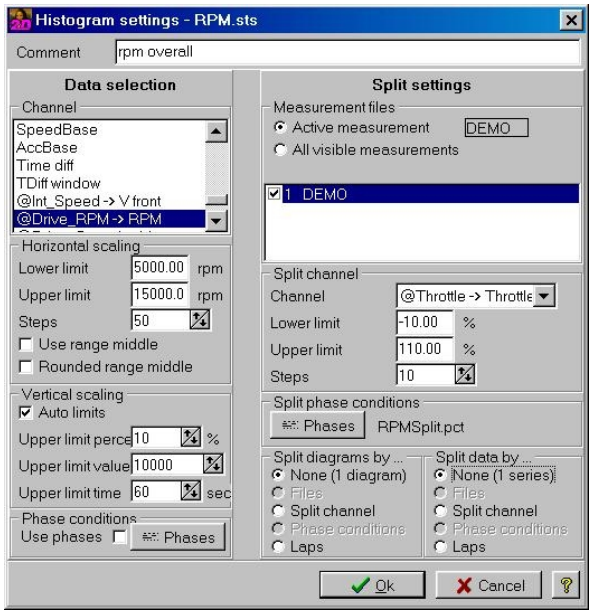


2.10.5 Examples

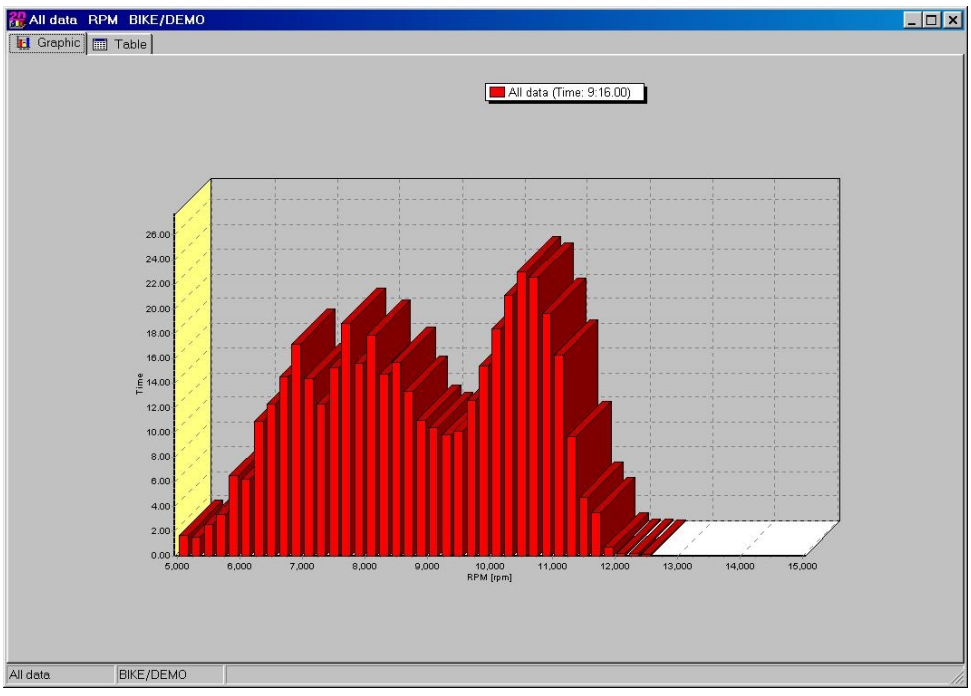
2.10.5.1 Example1

Simply show the overall distribution of RPM: Channel *"RPM"* is selected, no phases are used, active measurement is selected. No splitting of diagrams nor data.

- Start the analysis tool and enter the menu item *"Functions / Histogram / Create new"*. You can also use the shortcut key *<ALT + F1>*.
- Enter a name for the new Histogram. At the example the name *"RPM"*
- Take the following settings.



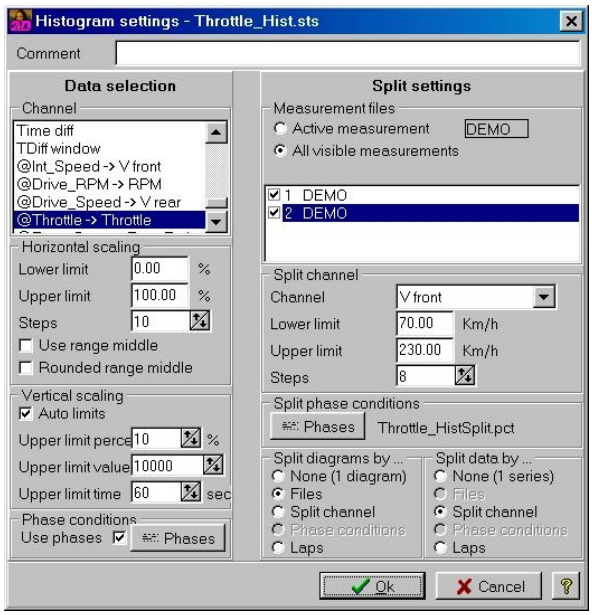
- Select the button <OK>. Afterwards you will see the following result



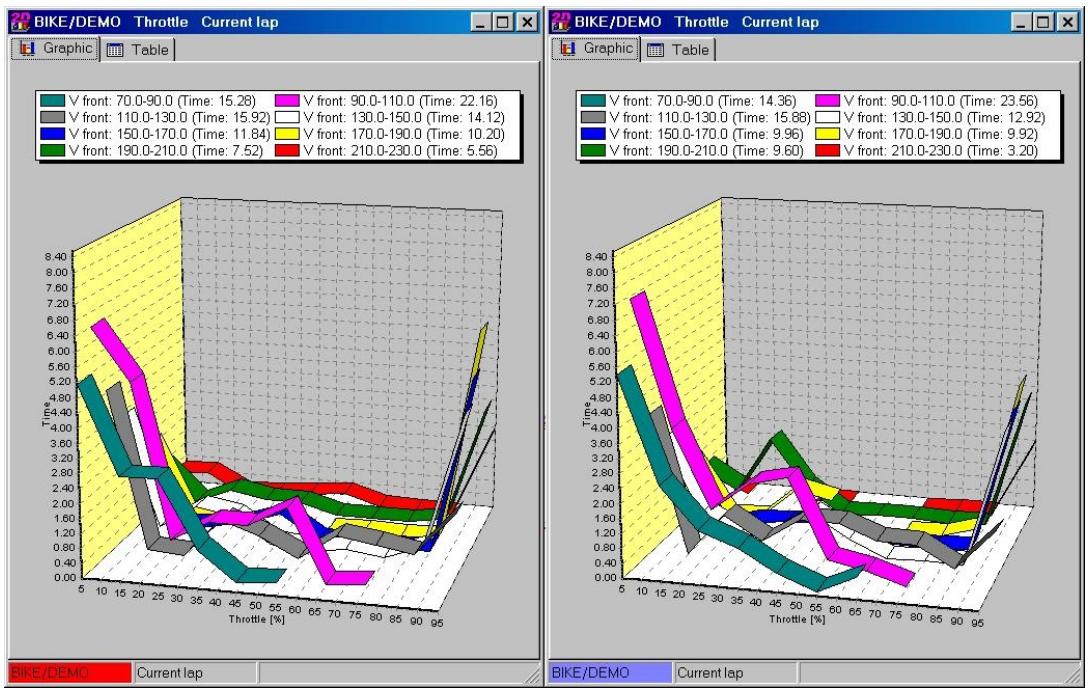
2.10.5.2 Example 2

Comparison of throttle usage of two riders. Channel *"Throttle"* is selected, the phases cover the fastest lap, both measurements are selected. The diagrams or alternatively the data are split by measurements.
Additionally a split channel (e.g. *"Speed"*) or split phase conditions could be used to examine throttle usage in certain ranges of the speed etc.

- Start the analysis tool and enter the menu item *"Functions / Histogram / Create new".* You can also use the shortcut key *<ALT + F1>.*
- Enter a name for the new Histogram. At the example the name *"Throttle_Hist*".
- Take the following settings.



- Select the button <OK>. Afterwards you will see the following result.



2.11 FFT (Fast Fourier Transformation)

Graphical output of the spectral analysis of a channel.

2.11.1 Creation and setup

A FFT setting can be created and saved to disk to re-use it later.

2.11.1.1 Settings

The Data source can be Single, Sum or Waterfall:
- Single: One series of measured values
- Sum: Average of several series of measured values
- Waterfall: Several series of measured values displayed as a waterfall diagram

The FFT Depth controls the number of measured values to be analyzed

The Window type controls the handling of each data series prior to calculation

The Average function and Magnitude/Power spectrum apply to the calculated FFT data

dB display controls the display of the spectral analysis

The limits can be calculated automatically or set manually

2.11.2 Functions

2.11.2.1 Export

The FFT diagram may be exported in *Windows Meta File* format which can be imported e.g. in Microsoft Word.

2.11.2.2 Print

- The standard print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a chosen Excel sheet together with data out of the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager starts the high-end print page layout module.



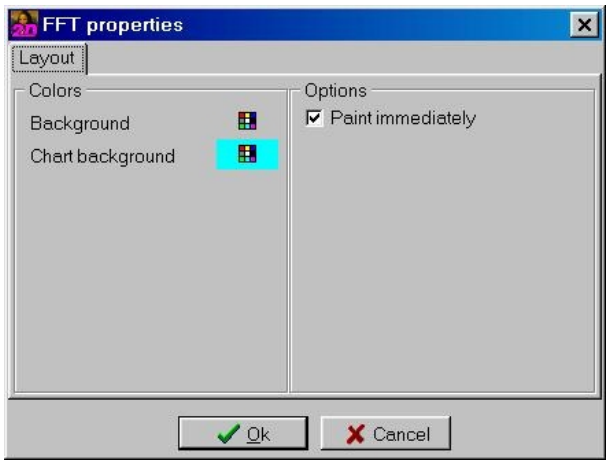
Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer Options Dialog.

2.11.3 Management

The saved FFT settings may be renamed or deleted inside the management editor. The editor shows also the name of the used Phase settings files.

2.11.4 Properties

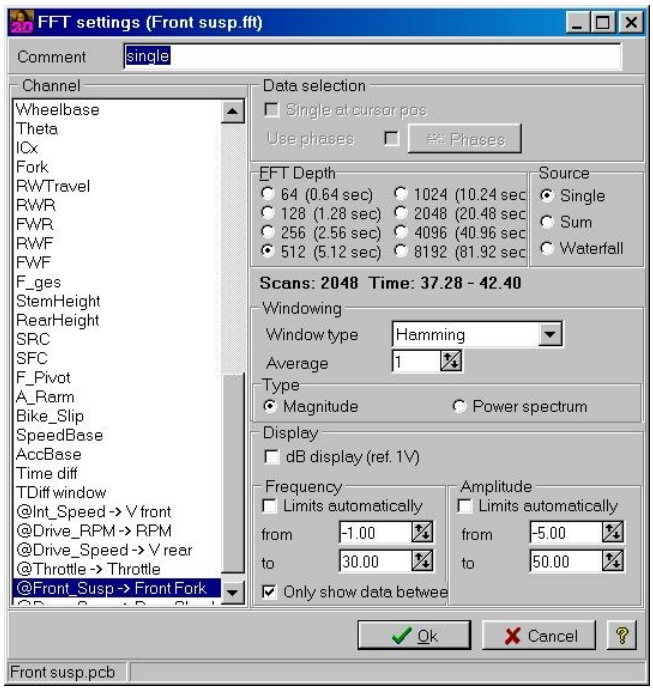
The FFT properties include background color and options to control FFT window and graphics handling.

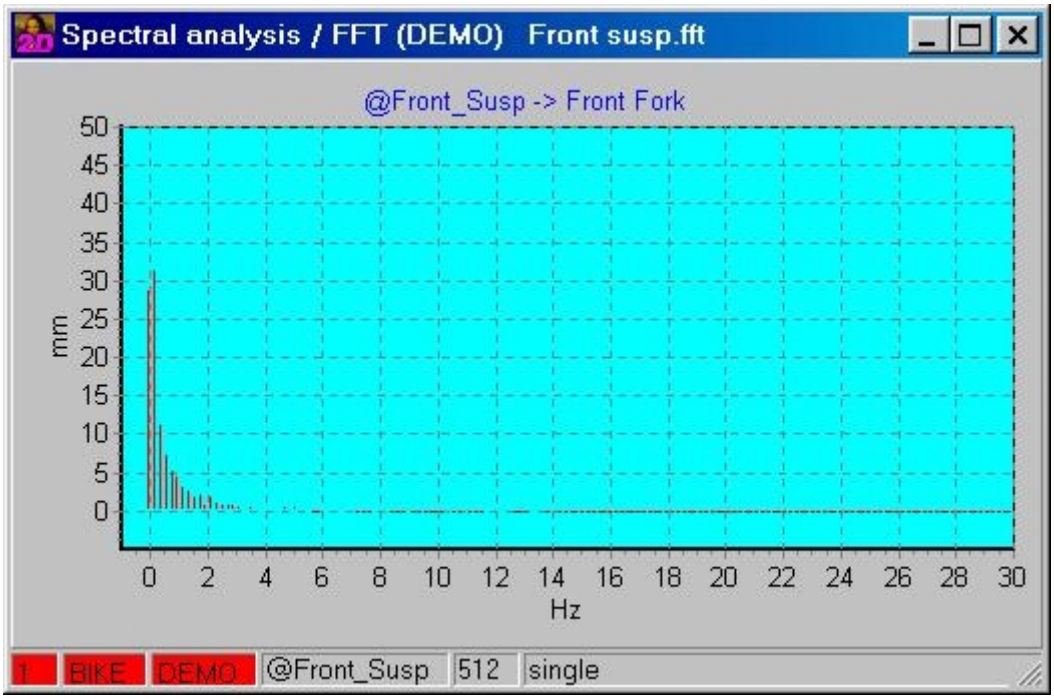


2.11.5 Examples

2.11.5.1 Example 1

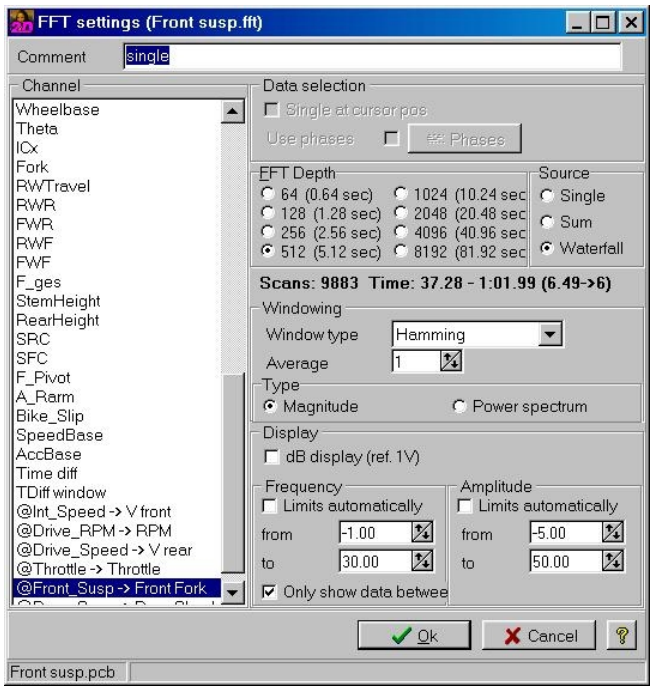
Show bike front suspension chattering. Channel *"F_Susp"* is selected.
One single data series of 512 measured values is analyzed

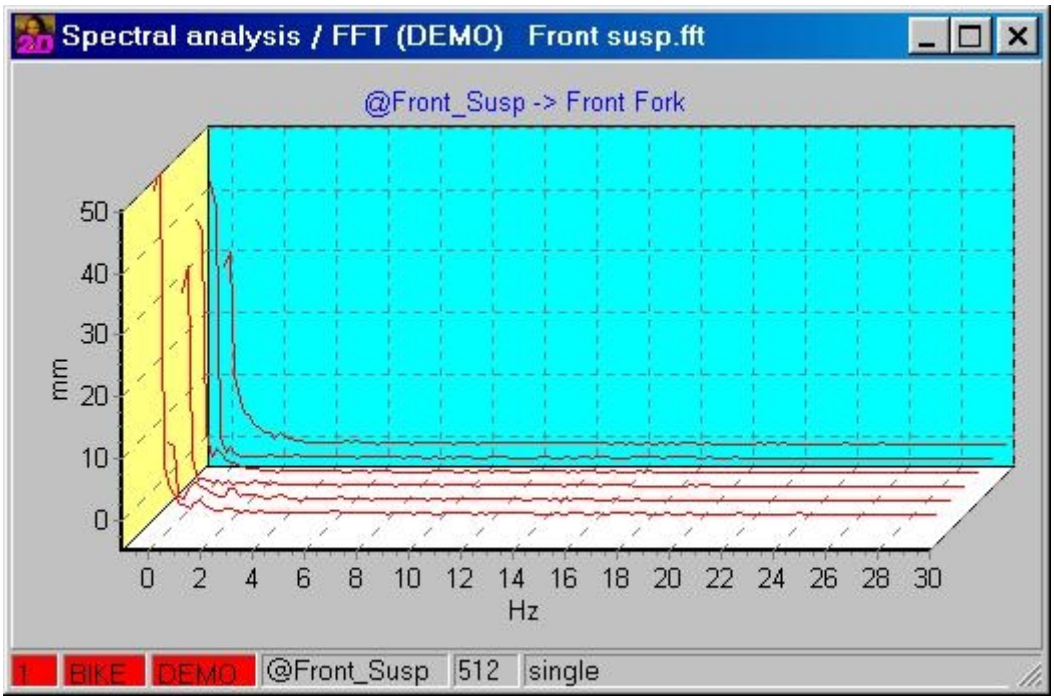




2.11.5.2 Example 2

Show bike front suspension chattering. Channel "F_Susp" is selected.
All visible data series inside the Moving window of 512 measured values are analyzed and displayed in a waterfall diagram.





2.12 Acceleration table / Dynamic test system (DTS)



Dynamic test system software module to evaluate acceleration, elasticity and braking tests. Output parameters include dimensions for speed [km/h, mph], distance [meter/feet] and acceleration [m/s², G, ft/s²] as well as various data formatting.
Single test setups may be collected in reports.

You will get detailed informations in a special manual. To open the manual following the next steps.

1. Enter the 2D CD-ROM into your CD drive.
2. The CD should start automatically (if Autoplay function is enabled)
3. If the CD not start automatically please start the program “Autorun.exe” at the CD-ROM manually
4. Choose your language
5. Search for the button “2D Documentations” (at the bottom of the start window)



6.
7. Select the button “Technics” from the left



8. Finally choose the hyperlink “Dynamic test system (DTS”



3. Functions

3.1 User defined window list

Adding user defined main menu items.



Adding user defined main menu items:
Open main menu, optionally select sub-menu item. Right-click and answer "yes" when prompted to add to user defined menus. A new button will be created in the Window list which is linked to the selected menu item.



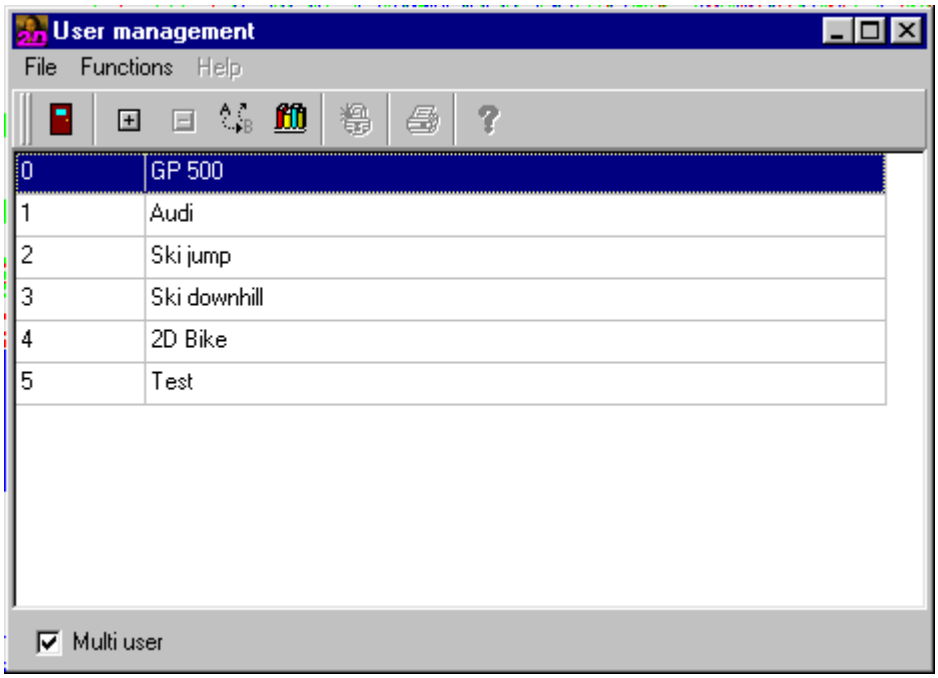
Sorting and deleting
Right-click on a button in the Window list. You can change the order of the buttons by moving them up or down. Also there is a function to remove one or all user defined buttons from the Window list.



3.2 User management

Different users serve for different staff or different purposes

A user setting includes his channel settings, channel group settings and options. An unlimited number of users may be created and managed by the supervisor user. Existing users can be deleted, their names changed and their settings exchanged with other users both of the same installation or another 2D software installation.

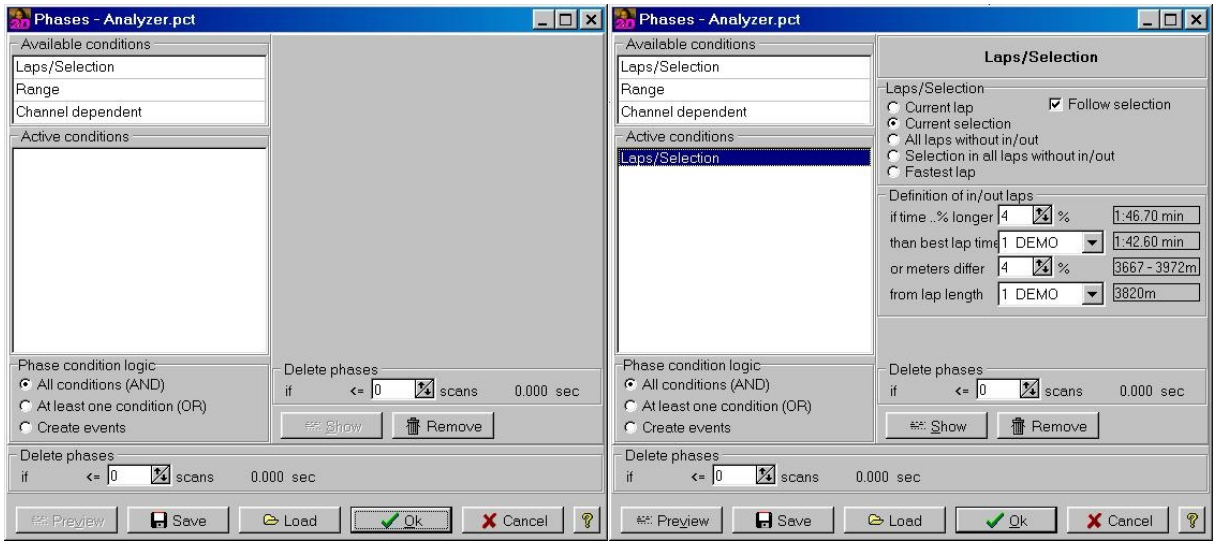


3.3 Phases

Subset of measured data defined by Phase conditions.

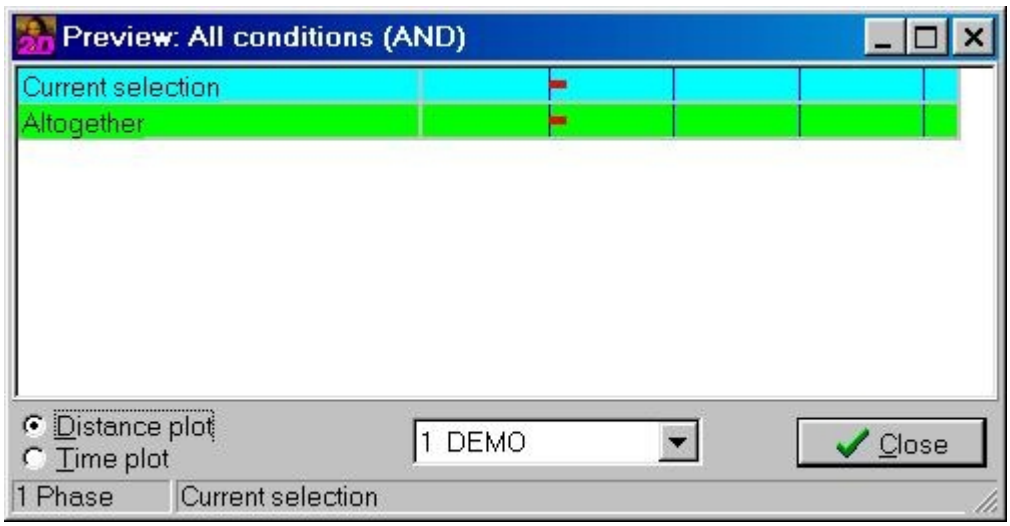
Phases serve to restrict measured data for a special analysis of certain parts of the data. Sometimes it is not of interest to look at the complete outing but instead e.g. only at the fastest lap or a certain corner, or just the parts where measured values are between defined ranges.
A data subset (=phases) is defined by the combination of one or more phase conditions.

3.3.1 Definition



3.3.1.1 Preview

The phases defined by a single phase condition can be shown via button *"View"*.
The phases defined by the combination of all chosen phase conditions can be shown via button *"Preview"*.



3.3.1.2 Deletion of small phases



Deletion of small phases or small gaps makes sense especially when a phase condition of type "Channel dependent" is used. A very noisy signal which is varying around the chosen limits could create many very short phases until finally its values are constant between the limits. Those short phases may disturbed the analysis, therefore optionally they may be ignored.

3.3.1.3 Phase conditions

Logic Type:

- "AND": Data is selected when all of the selected conditions are true.
- "OR": Data is selected when (at least) one of the selected conditions is true.
- "Create Events": Each condition creates several data points:
- One at the beginning, one at the end of each single phase.

Available Conditions:

There are 3 different condition types:

- Lap
- Range
- Channel

Several of them can be selected and combined via the logic type.

Active Conditions:

Those are the phase conditions you selected from the available conditions.

Delete Phases:

To reduce the number of resulting phases you can eliminate very short phases as well as small gaps inside of the phases.

Create Events:

Only selectable when logic type *"Create Events*".
Choose whether to accept starts or ends of the events created by this phase condition.

Delete Phases condition:

Similar to option *"Delete phases"* of the combination of all conditions, but here you can delete small phases defined by each single condition.

Show Remove:

- *"Show":* Examine the resulting data selection (=phases) defined by this phase condition.
- *"Remove":* Remove this single phase condition from your set of active conditions

Phase Laps:

- *"Current lap":* Selects from beginning to end of current lap.
- *"Current selection":* Selects which is currently shown in Moving window.
- *"All laps without in/out":* Selects all laps which are not in/out laps.
- *"Selection in all laps without in/out":* Like "current selection", but applies to all laps without in/out.
- *"Fastest lap":* Like current lap, but uses fastest lap.

Follow selection:

Applies to Min/max table and XY-Plot. The phases are updated immediately when:
1.*"Current selection"* is used.
2.Selection in Moving window is changed.

Definition of in/out laps:

A lap which time differs more than x% from best lap time is treated as an in/out lap.

Phase Range:

- Define a range (in meters or time).
- Enter manually or get various input by clicking on arrow buttons.
- *"Lap based"* creates many ranges (one for each lap).

Phase Channel:

Choose a channel and its lower/upper limit.
Resulting phases cover all periods where this channel's values are between the chosen limits.

3.3.2 Usage

Phases are used in Min-/Max tables, XY-Plots, Track mode or Histograms. Additionally phases can be displayed inside the Moving window.
The phase conditions are saved and can be re-used later. It is possible to use the phase conditions which have been defined e.g. for an XY-Plot in another context, for example in a Histogram.

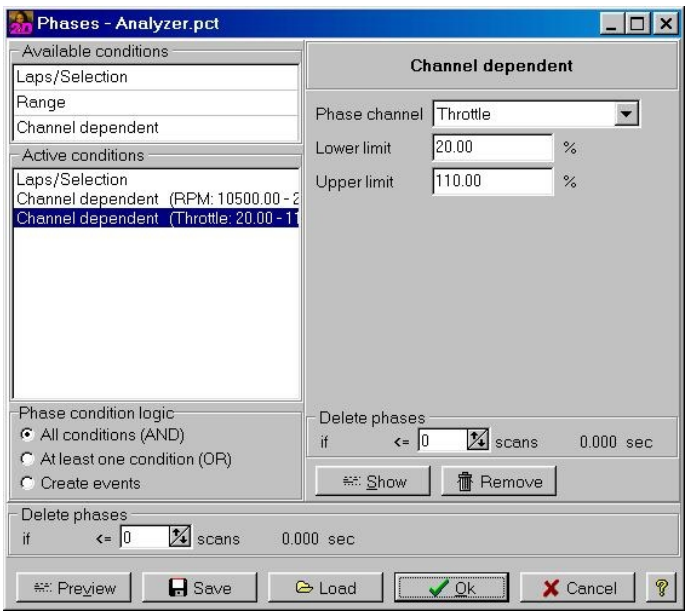
3.3.3 Examples

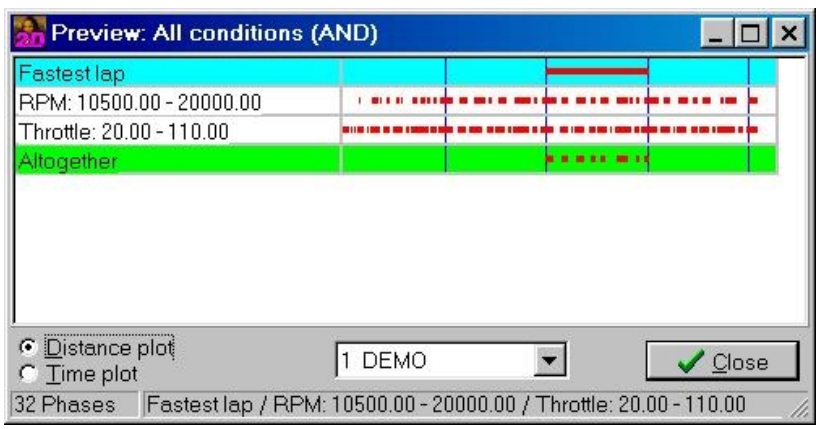
3.3.3.1 Example 1

You want to examine data out of the fastest lap, where the RPM was higher than 13500 and the throttle was open. You have to select:

- Logic type All conditions (AND).
- One condition of type Laps and subtype *"Fastest lap"*.
- One condition Channel dependent with channel *"RPM"* from 13500 to 20000 (should be enough).
- One condition *"Channel dependent"* with channel "Throttle" from 20% to 110%.

As a result many phases are generated, i.e. all positions in the fastest lap where RPM and throttle signals have been as defined.





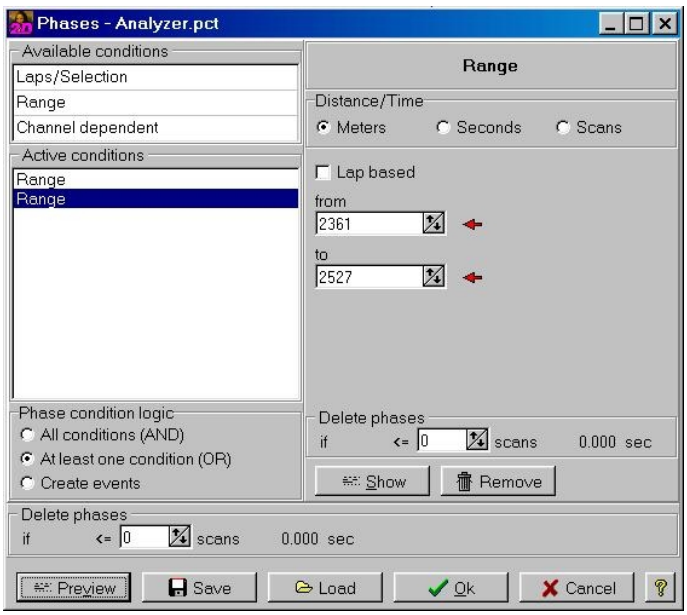
3.3.3.2 Example 2

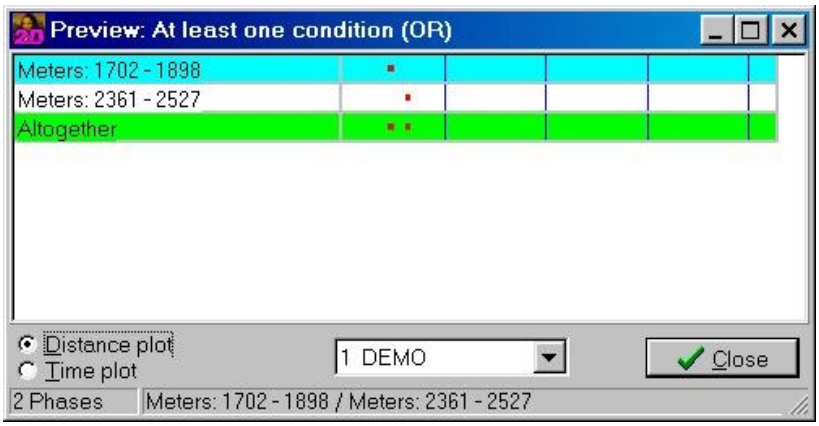
You want to look at data of two certain corners. You have to select:

- Logic type at least one condition (OR).
- One condition of type Range where you select the meter range of the first corner.
- One condition of type Range where you select the meter range of the other corner.



As a result 2 phases (optionally per each lap) are generated.

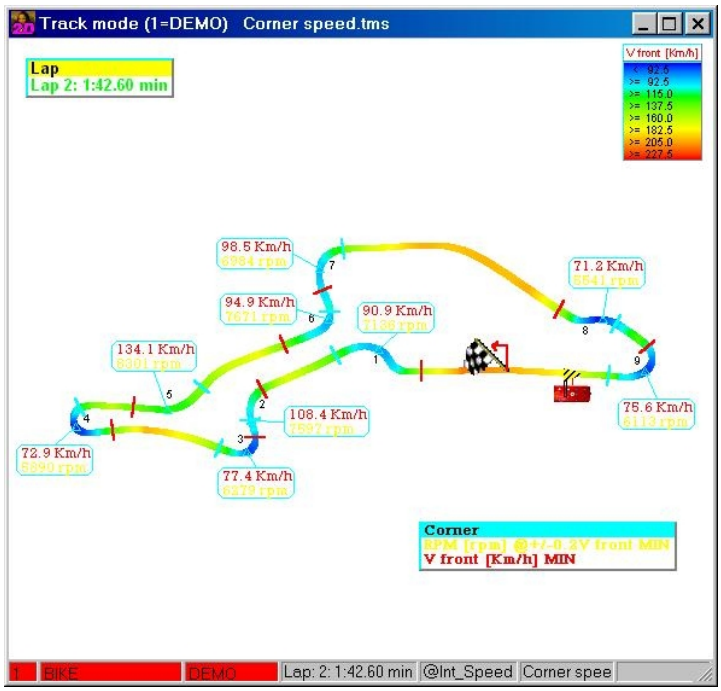


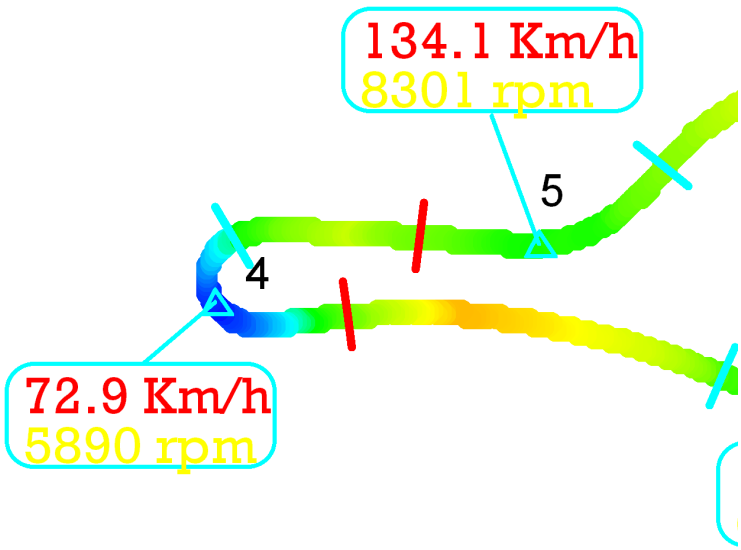


3.4 Print (via Enhanced Meta File)

Vector format provides powerful features to utilize the high printer resolution.
The Print function which is available at all Analyzer graphic windows uses EMF (Enhanced Meta File) techniques. EMF as an Windows vector format provides powerful features to utilize the high printer resolution when printing lines. EMF exported as file may be scaled without loosing image quality to any size e.g. in Microsoft Word or Excel (see example).

Example: A Track mode graphic in EMF format in regular screen size





3.5 Print report manager

The Print report manager can be accessed via main menu as well by any graphic window.

This high-end print page layout module allows user defined page setup. All current visible Analyzer graphic windows may be selected and placed freely on the page. Additionally header entries and complete groups may be selected as well as measurement specific data, own free texts or images.

The graphics are printed with high printer resolution instead of screen resolution.

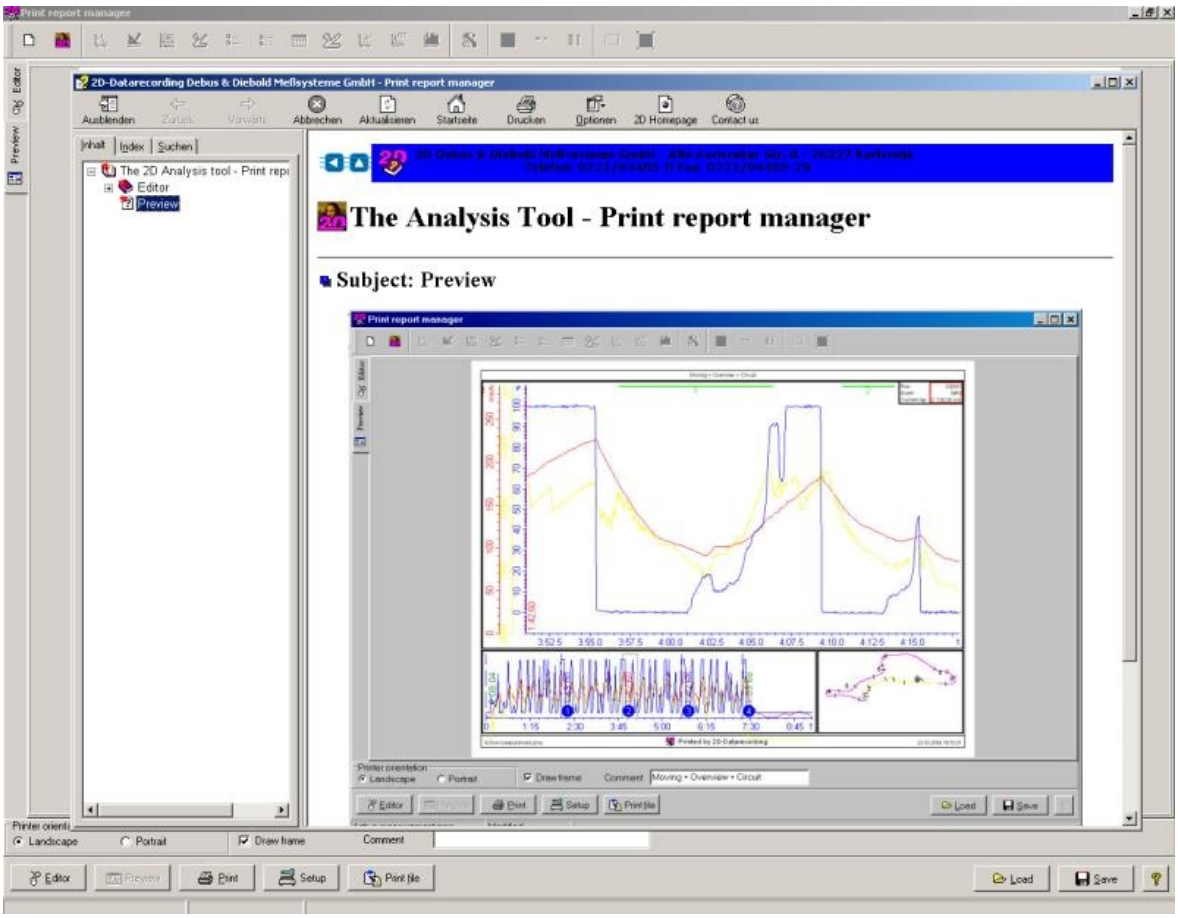
The function "Get current Analyzer windows" retrieves the current screen from Analyzer and places the individual graphic windows on the Print report page.

An image of the current Print manager page may be saved to disk or clipboard.

Also the known "Print via Excel" functionality is available.
A Print manager setting can be saved to disk to re-use it later.



For detailed help informations you can open the context sensitive help module. To do so press the button <F1> in the opened Print report manager window



3.6 Print via Excel

Extended print function to print a graphic window together with Spec data.

- For detailed informations insert the 2D CD-ROM.
- After the language selection look for the *button "2D Documentations".*
- Choose from the left side the button with the caption *"Software"*
- Select the hyperlink *"Print via Excel"*



You will get a file in *PDF format* with all necessary informations.

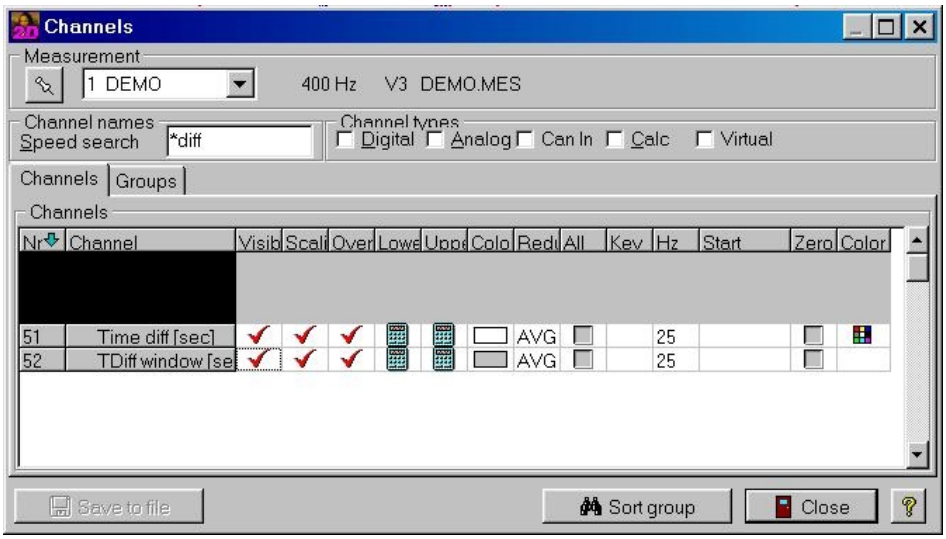
3.7 Time Diff

Virtual channel which shows the time win/loss by lap

The Time Diff function creates a virtual channel (L) which contains the time difference of one measurement's lap compared to another measurement's lap. This difference is cumulative over the entire lap.

Changing the current lap of one of the two measurements will automatically update the Time Diff channel.

Each measurement has its own Time Diff channel which is relative to measurement 1. So the Time Diff channel of measurement 1 is always zero as it is relative to itself.



3.8 Time Diff window

Virtual channel which shows the time win/loss by selection

The TDiff window function creates a virtual channel (L) which displays the time difference between two loaded measurements which are both currently visible in the Moving window. The time difference displayed refers to just that selection visible in the Moving window and is not cumulative over the full lap.

Changing the selection visible in the Moving window will automatically update the TDiff Window channel.

Each measurement has its own TDiff window channel which is relative to measurement 1. So the TDiff window channel of measurement 1 is always zero as it is relative to itself.

3.9 Reference laps

Comparison of runs with ideal reference laps saved from another run

3.9.1 Creation

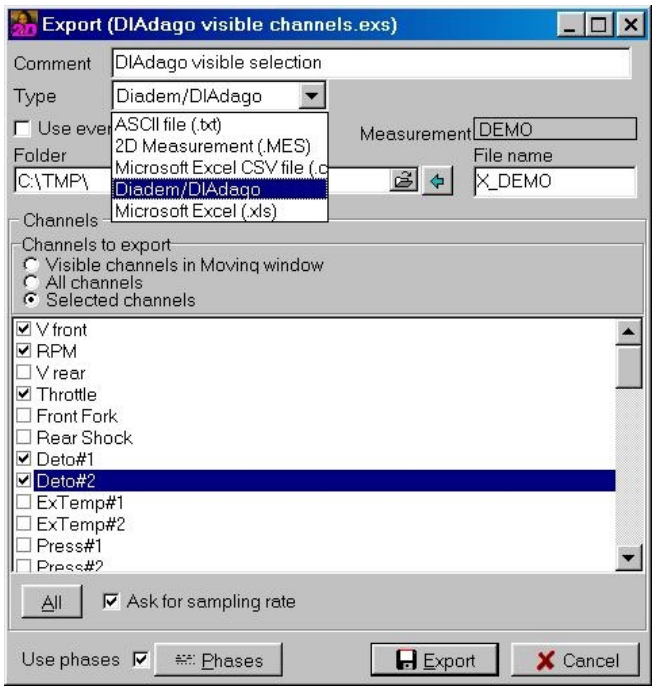
Select a suitable lap of the run and save this lap as reference lap.

3.9.2 Comparison with runs

Load a measurement and additionally a previously saved reference lap of the same event. A reference lap measurement contains the lap twice and provides wrap-around functionality to allow linked moving along the complete run. That is, the reference lap is looped so that the same reference lap measurement is always being used for comparison with other loaded measurements.

3.10 Export

Function to extract and save parts of a measurement



3.10.1 Data subset



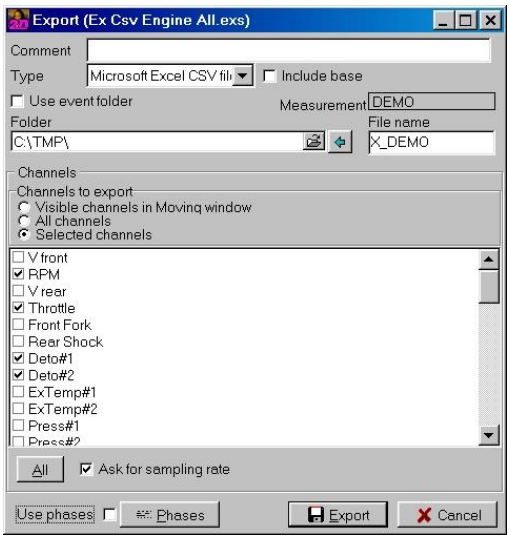
If no phases are used then the channel data over the complete measurement will be exported. With the use of phases it is possible to export only a certain subset of the data.

3.10.2 Channels

Choose one or more channels whose measured data are to be exported.

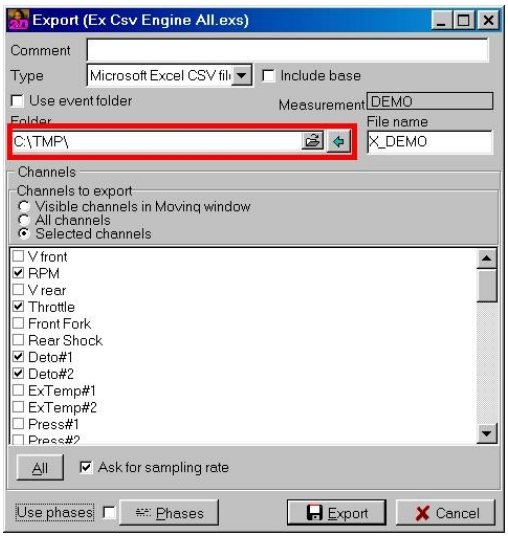
1. Visible channels in Moving window: Just the channels of the active measurement currently visible in Moving window
2. All channels: All channels (including hidden ones when exporting into 2D format)

3. Selected channels: Select individual channels to be exported



3.10.3 Destination

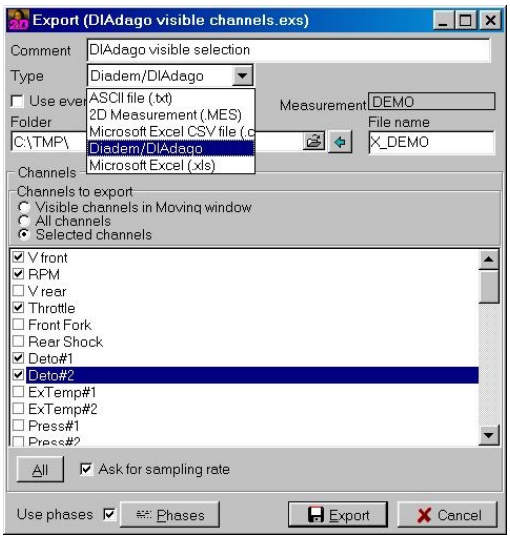
The destination drive and directory can be chosen. This destination is remembered to perform more exports to this destination path later.
Option "Use event folder" will save the output file inside of the current event



3.10.4 Type

The export of a measurement's channel data can be done in different formats:

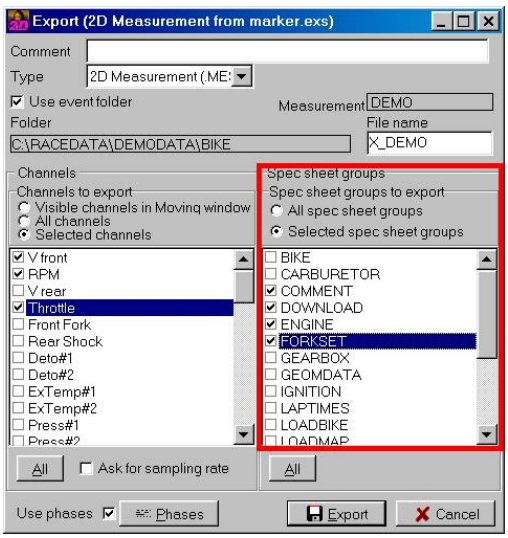
- Ascii format will create a plain text file which can be edited by any text editor like Notepad.
- CSV format can be imported by Microsoft Excel.
- The 2D-Measurement format creates a regular measurement which can be loaded by the Analyzer.
- Diadem/DIAdago format is used by National Instruments Diadem software
- xls is the standard Microsoft Excel format



3.10.5 Spec sheet groups

This option is only available when exporting into 2D format.

Choose one or more spec sheet groups to be exported.



1. All spec sheet groups: The complete header (.hed) file containing all spec sheet groups

2. Selected spec sheet groups: Select individual groups to be exported

3.11 Live Export

Special export function to create a stand-alone executable (.exe).

Special export function to create a stand-alone executable (.exe). This file is named e.g. LiveExport_BIKE_DEMO.exe (with event name "Bike", measurement name "Demo"). It contains a self-extracting launcher, the Analyzer software plus the current measurement.

You can run this stand-alone .exe file on any PC even without a 2D Race installation to look at this run only. Starting this executable will automatically extract the Analyzer.exe and the measurement contained inside into a temporary folder. After closing Analyzer all temporary files will be cleaned up.

3.12 Screen Export

Special export function to create a 2D measurement which contains

1. The visible channels of the active measurement
2. Only the part of the data shown in Moving window

After the screen export the resulting .MES folder is compressed in zip format which can be sent e.g. via Email to another user.

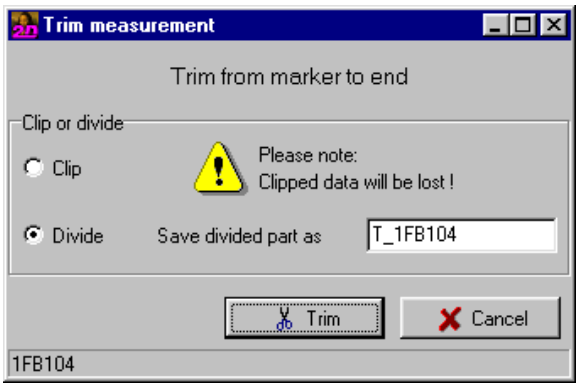
3.13 Cut measurement

There are 3 functions to cut a measurement. To use them one or two markers have to be set in measuring mode.

1. Trim to marker
The data between the marker and the end of the measurement is saved. Optional the first part of the measurement can be saved under another name.

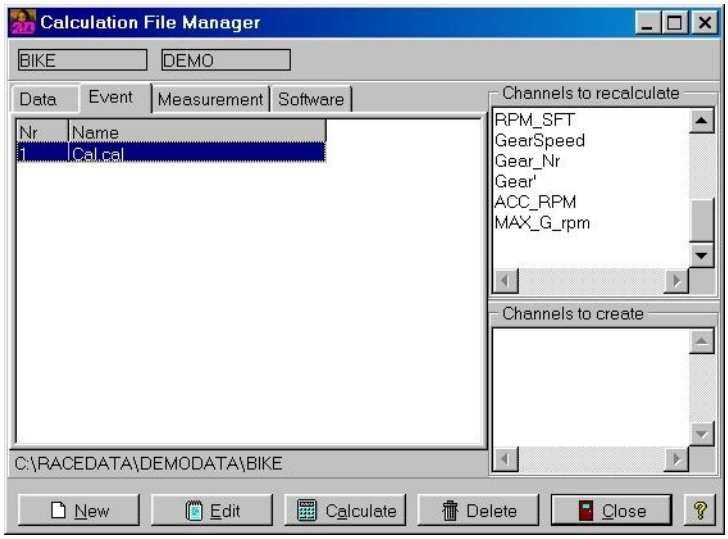
2. Trim from marker
The data between the start of the measurement and the marker is saved. Optional the last part of the measurement can be saved under another name.

3. Trim both markers
The data inside the two markers is saved, loosing the data outside the markers.



3.14 Calculation file manager

Administration of special calculation files for the 2D program CalcTool.



3.14.1 Cal file folders

Cal files may be organized in 4 different folders to provide easy handling

1. Data root folder: The folder containing your event folders, e.g. GP2004
2. Event folder: The folder of your current event, e.g. Val_GP.04
3. Measurement folder: Your current measurement folder, e.g. 1DX13.MES
4. Software folder: Folder "CalFiles" inside your Race software folder

3.14.2 Preview recalculate

The box called "Channels to recalculate" gives a preview about the already existing channels which would be recalculated upon execution of the highlighted cal file on the active measurement.

3.14.3 Preview create

The box called "Channels to create" gives a preview about the channels which would be newly created upon execution of the highlighted cal file on the active measurement.

3.14.4 Creating and editing a cal file

Click on "New" resp. "Edit" to create or modify a cal file. The Cal file editor will be started with the cal file to work on. The Cal file editor incorporates features like syntax check, code completion and function / channel names proposals.

3.14.5 Running a cal file

Click on "Calculate" to run the highlighted cal file on the active measurement. After successfull cal file execution the measurement will be reloaded.

3.14.6 Run cal file (software folder)

This menu item contains a list of all cal files (*.cal) in the folder "CalFiles" inside your 2D Race software folder. Selecting one of those entries will run this cal file on the active measurement. With this function you can quickly execute your common used cal files.

3.15 Real time player

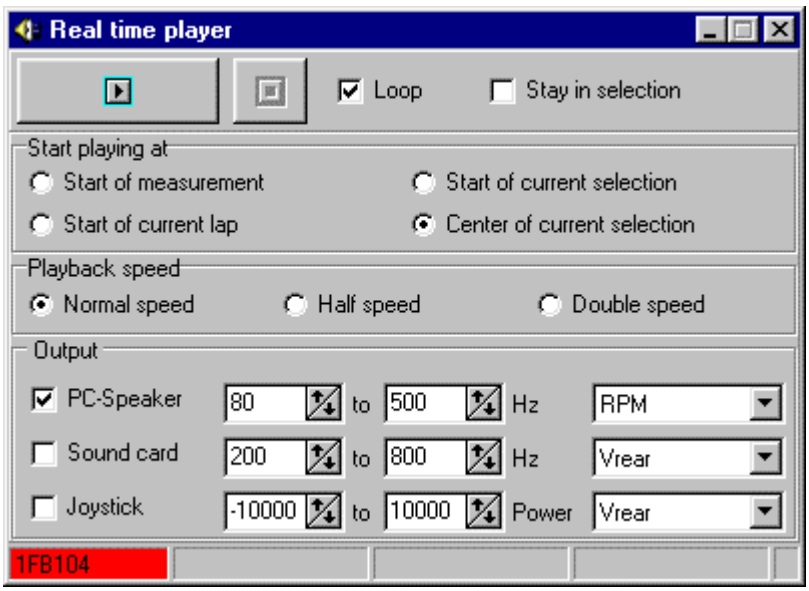
The Real time player allows play back of recorded data.
Play back may be looping when reaching the end.

With the option "Stay in selection" the current Moving window selection will not be changed.

The start of the playing range may be:
- Start of measurement
- Start of current lap
- Start of current selection
- Center of the current selection

Play back speed may be 50%, 100% or 200%.

The recorded values of up to 3 channels may be directed to an output device:
- To the built-in PC-Speaker
- To the Sound card
- To an force feedback Joystick

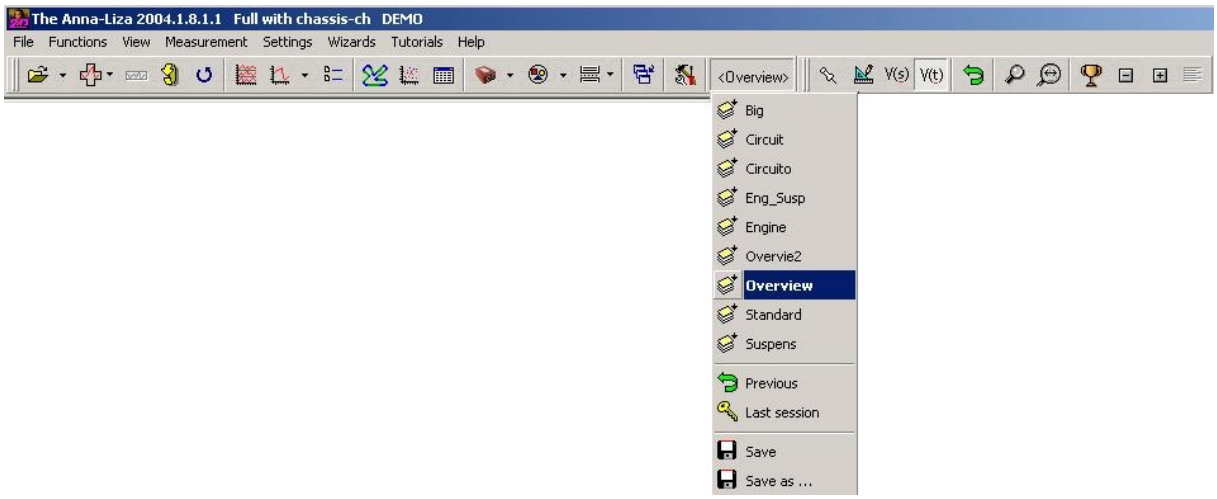


3.16 Templates

Storage of desktop layouts of the Analyzer windows.

A template contains the definitions of the desktop layout of several Analyzer windows. This desktop layout may be saved to disk under a unique name and restored later by choosing this template once again.

Save your current Analyzer windows layout into a template by clicking on the Template button in the main toolbar. Select *"Save as"* and accept the name or enter an own name.



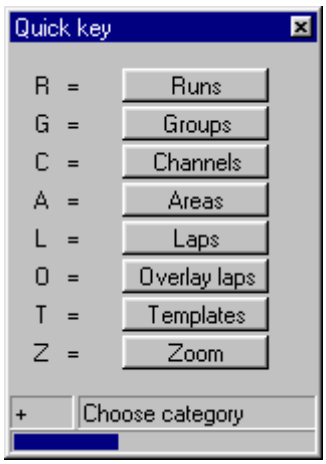


Restore a previous saved template by clicking on the Template button in the main toolbar and selecting the desired template.

3.17 Quick Key

Structured command input via keyboard to achieve common functions

The Quick key function allows execution of common functions via fast keyboard input. Items like Channels or Groups can be added, removed or exchanged quickly.



3.17.1 Categories

A quick key command consists of the input of a series of predefined and variable keys:

1. The type: Add, remove or exchange
a) Key [+] or [Ins] adds something
b) Key [-] or "Del" removes something
c) Key [#] exchanges something
2. The category (what to handle)
a) Key [R] means a run (measurement)
b) Key [G] means a group
c) Key [C] means a channel
d) Key [A] means an area
e) Key [L] means a lap
f) Key [O] means the overlay of another lap
g) Key [T] means a template
h) Key [Z] means zooming of the selection in the Moving window
3. The item to work with
a) Run (measurement): the item key represents the measurement to remove or exchange
b) Group: the item key represents the short key of a group
c) Channel: the item key represents the short key of a channel
d) Area: the item key represents the short key of a group to handle in an area
e) Lap: the item key represents the lap number to jump into, "F" means fastest lap
f) Overlay lap: the item key represents the lap number to load and overlay, "F" means fastest lap
g) Template: the item key represents the short key of a template to apply
h) Zoom: the item key represents the factor to zoom in or out, "L" means whole lap

After pressing the type key the Quick key window opens. After a short period of no input it will close automatically.

3.17.2 Examples

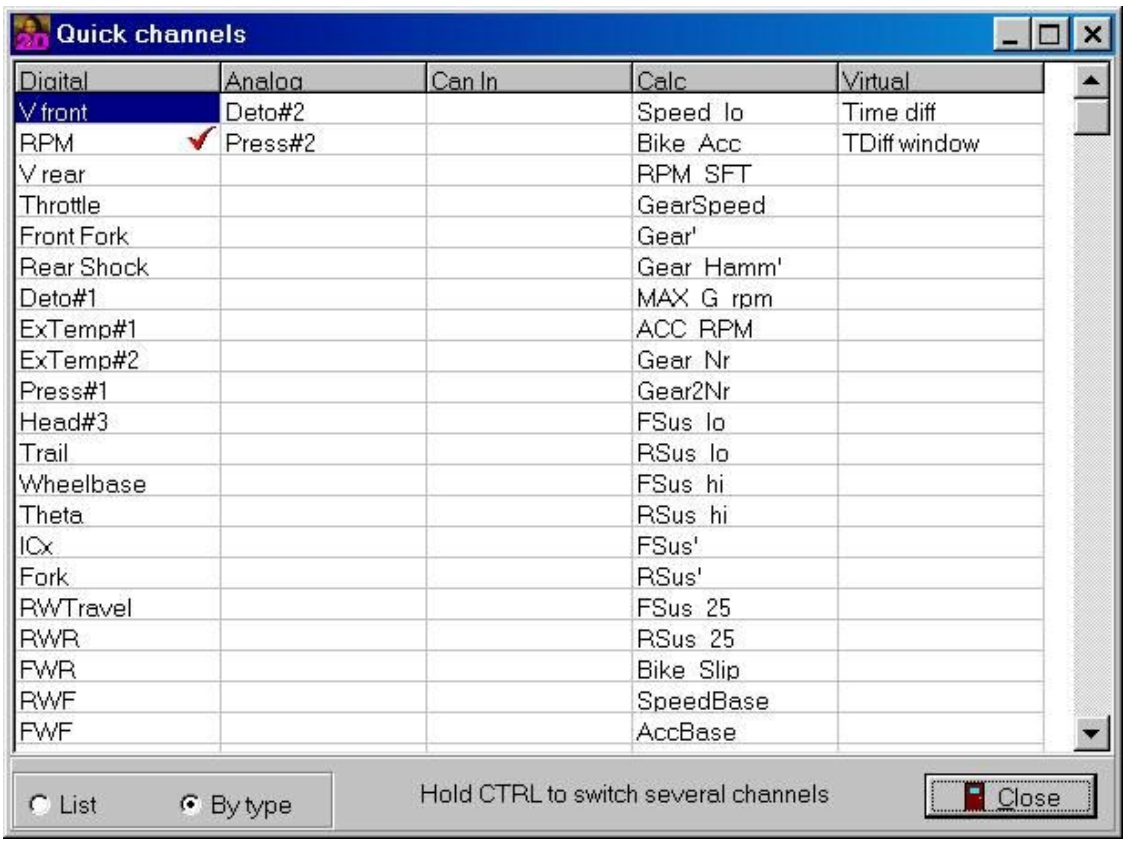
Action	combination
Switch off channel *"V_Front"* (assumed V_Front has short key "F"):	**- cf**
Switch on group *"Engine"* (assumed Engine has short key "E"):	**+ge**
Switch off group *"Engine"* and replace by group "Suspension" (assumed Suspension has short key "S"):	**#gs**
Compare current lap with fastest lap by overlaying it:	**+of**
Zoom in twice:	**+z2**
Zoom out whole lap:	**-zl**

3.18 Quick Channels

Open the Quick channels window by clicking on the arrow right of the logger icon in the tool bar, then select "Channels"

The Quick channels window lists all channels of the active measurement.
The channels may be shown either sorted (by current sorting) or grouped by channel types (digital, analog, CAN, calculated or virtual).

Channels may be switched on or off by mouse click on them. Simple mouse click closes the window after channel switching. By pressing the CTRL key together with mouse click the window stays open thus allowing to switch several channels after each other.

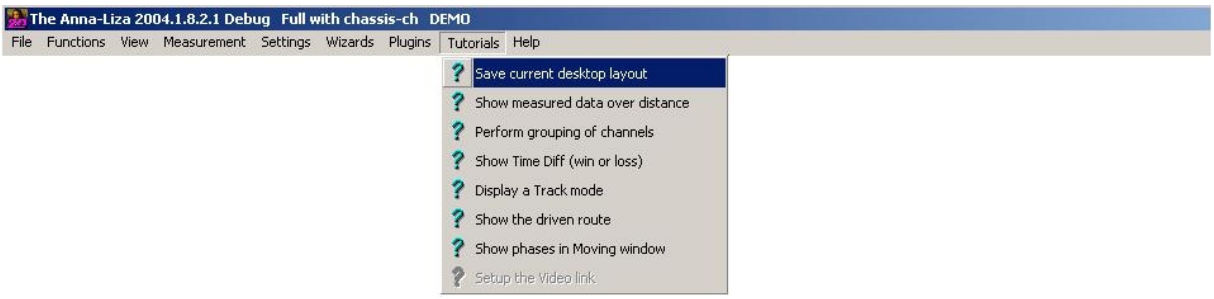


4. Tutorials

Available analysis tutorials:

- Save current desktop layout
- Show measured data over distance
- Grouping of channels
- Time Diff (win or loss)
- Track mode
- Show driven route
- Show phases in Moving window
- Video link

For detailed informations start the 2D analysis tool and enter the main menu item *"Tutorials"*



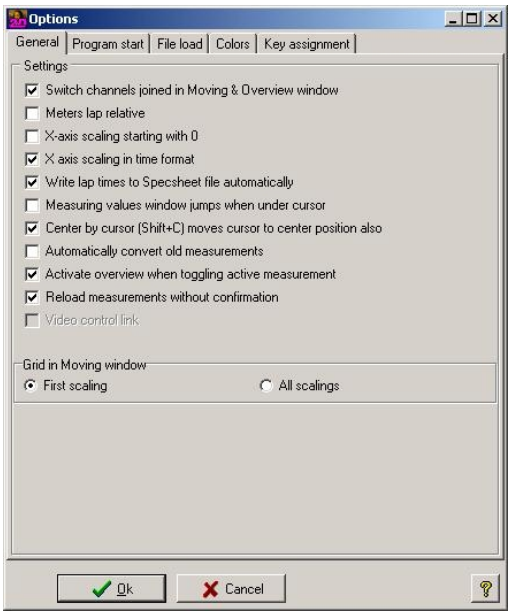
- Select a tutorial and perform it step by step



5. Options

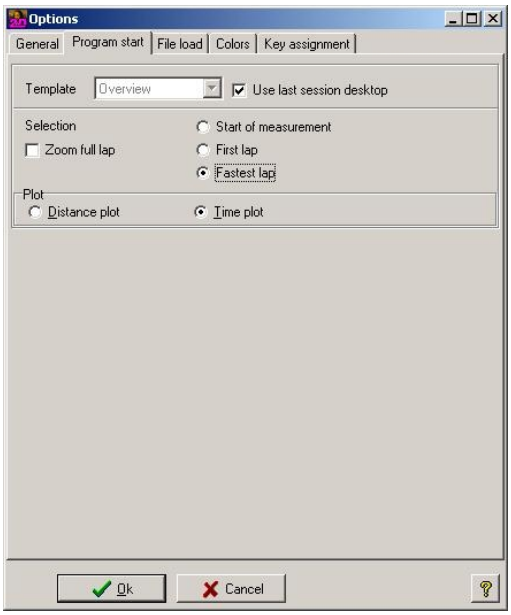
Options are stored user dependent, which means that each Analyzer user has his own Options set.

5.1 General



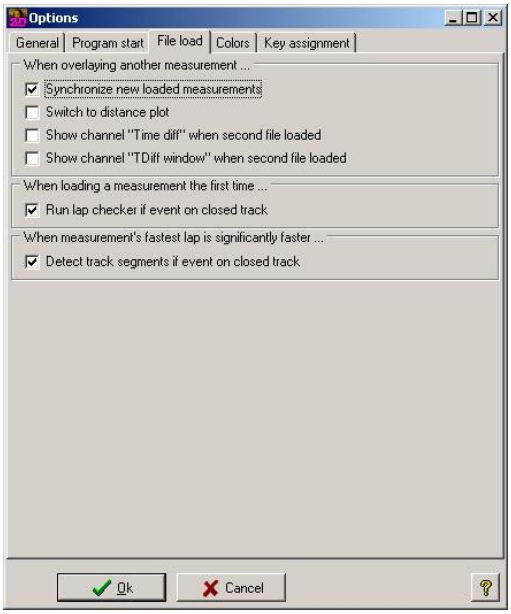
- **Switch channels joined in Moving & Overview window**
  Switching on/off a channel in the Moving window also switches on this channel in the Overview window.
- **Meters lap relative**
  X axis scaling in distance plot starts at 0 at the current lap's start.
- **X-axis scaling starting with 0**
  X axis scaling starts at 0 at the start of the selection in the Moving window.
- **X-axis scaling in time format**
  h:mm:ss format or just seconds in scaling of time plot.
- **Write lap times to SpecSeet file automatically**
  Any time a lap trigger is changed (inserted or removed) the lap times are written into the SpecSheet
- **Measuring values window jumps when under cursor**
  With this option enabled a mouse move during Measuring mode near the measuring values window causes the window to jump out of the way to the other side of the screen.
- **Center by cursor (Shift+C) moves cursor to center position also**
  With this option enabled the mouse cursor is cantered in the Moving window after selection centering.
- **Automatically convert old measurements**
  A measurement of format V1 (*.par) will be converted into current 2D measurement format (V3), which handles all files of a measurement together in one folder with .MES extension.
- **Activate overview when toggling active measurement**
  When a measurement is activated its corresponding Overview window will be shown and made active.
- **Reload measurements without confirmation**
  Skip query of reloading after fundamental changes in the measurement, e.g. execution of CAL files
- **Video control link**
  Enable communication with the 2D Video module.
- **Grid in Moving window**
  Controls whether a scaling is shown for the first displayed scaling only or for all visible scalings.

5.2 Program start



- **Template**
  The desktop layout template to be applied at Analyzer start.
- **Use last session desktop**
  The desktop layout of the last Analyzer session is applied.
- **Selection/Zoom full lap**
  Choice whether to show a complete lap at Analyzer start, together with the option which lap to be shown.
- **Plot**
  Start with Moving window showing distance plot or time plot

5.3 File load



- **Synchronize new loaded measurements**
  If a measurement is already loaded, each following loaded measurement is placed at the same position in the track.

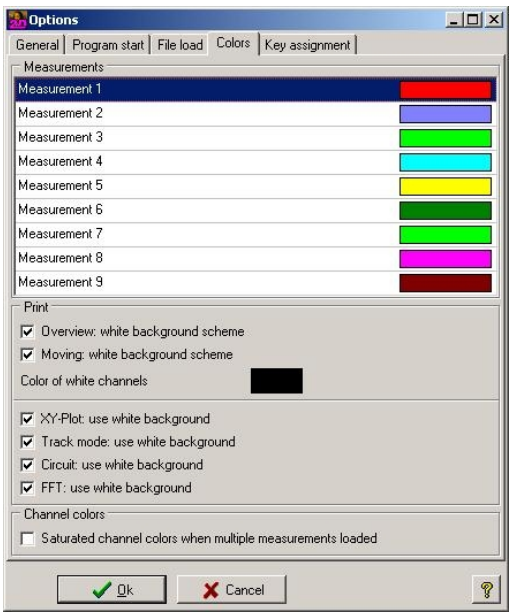
- **Switch to distance plot**
  When loading another measurement, Analyzer switches to distance plot to make comparison of the measurements easier.

- **Show channel *"Time Diff"* when second file loaded**
  After loading the second measurement, the virtual Time Diff channel will be created and assigned to the first measurement's channels.

- **Show channel *"Time Diff window"* when second file loaded**
  After loading the second measurement, the virtual TDiff Window channel will be created and assigned to the first measurement's channels.

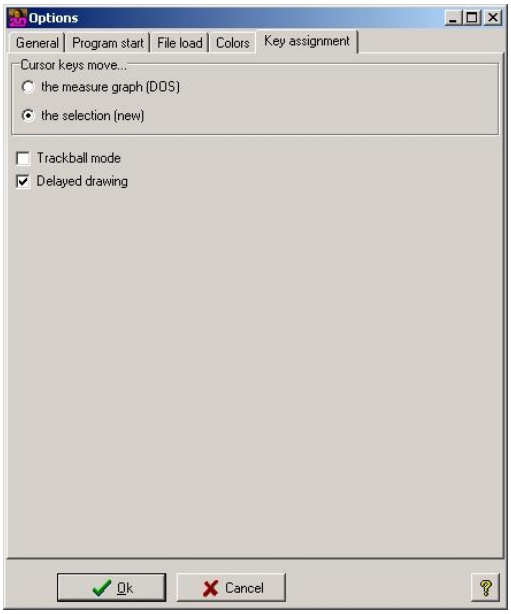
- **Run lap checker if event on closed track**
  Depending on track settings state (event on closed track or not) each time a measurement is loaded which has not been checked before, the lap checker wizard will check track length and lap triggers.

5.4 Colors



- **Each measurement has its unique color by which it can be identified.**
  This measurement color is applied to all channels of the measurement in the Moving window when more than one measurement is visible.
- **Print/White background**
  Before printing a window its background color or complete color scheme will be switched to a suitable white background to save the amount of printer link.
- **Channel colors/Saturated channel colors**
  Instead of displaying all channels in their measurement colors this option causes a slight color saturation to help separating the channel curves.

5.5 Key assignment



- **Cursor keys move...**
  Choose whether pressing the cursor keys move the curves or the selection window.

- **Trackball mode**
  An option to reposition the mouse cursor after moving the selection. This makes the use of a notebook's trackball easier in Moving window.

- **Delayed drawing**
  This option controls drawing of channels in Moving window: moving the selection with cursor keys left/right will just draw the active channel until key released, after that the full graphics will be drawn. This helps fine tuning of the selection on slower computers.

6 Keyboard help

6.1 Complete list of shortcuts

Shortcut	Action
<1-9>	Activate this measurement in the “Moving window”
<ALT + 1-9>	Show “Overview window” of this measurement
<CTRL + 1-9>	Show or hide this measurement in the “Moving window”
< A >	Show "Overview window" of active measurement
< C >	Show / hide "Circuit window"
< M >	Show / hide MultiCircuit window
< P >	Shows the phases in the "Moving window"
< SHIFT + P >	Edit the phase conditions of the "Moving window"
< S >	Change to distance plot
< T >	Change to time plot
< V >	Link measurements, when more than one loaded
< SHIFT >	Invert “link status” when moving several measurements
< CTRL + S >	Synchronization of measurements
< SPACE >	Start measuring mode
< ENTER >	Start measuring mode with active measurement only
< SHIFT ENTER>	Start measuring mode with active measurement in channel colors
<CTRL + ALT + H>	Show measured values in hex mode
<CTRL + ALT + B>	Show measured values in binary mode
< Escape >	Terminate the "Measuring mode"
< + / - / # >	Activates the "QUICK KEY" key function
< Home >	Move to the beginning of the current lap
< Page Up >	Show next lap
< Page Down >	Show the previous lap
< CTRL + Home >	Move to the fastest lap
< SHIFT + Home >	Select complete lap
< SHIFT + CTRL + Home >	Select complete section
< Back Space >	Undo last selection
< ALT + Z >	Define the zoom factor
< F1 >	Activates the context sensitive help
< CTRL + F1 >	Show / hide hint window
< F9 >	Show the "Options" window
< F10 >	Access the main menu of the analysis tool
< F11 >	Toggle the active window’s size between "normal" and "maximized" size
< ALT + L >	Show the lap times of the loaded measurements
< ALT + S >	Show the section times of the active measurement
< ALT + E >	Export measurement data
< ALT + M >	Show list of available "Min/max table" settings
< X >	Show list of available "Track mode" settings
< ALT + F1 >	Show list of available "Histogram" settings
< ALT + F3 >	Show list of available "FFT" settings
< ALT + F5 >	Show list of available XY–Plot settings
< Alt + P >	Start print report manager
< ALT + U >	Show a list of all available channels
< ALT + N >	Start the "Calculation file manager" – Administrate your "CAL" files
< ALT + I >	Start the SpecSheet module (=2D data management tool)
< ALT + B >	Show dynamic test module "DTS"
< ALT + Q >	Enter a comment of the active measurement
< ALT + V >	Show a complete window list of the current active windows
< ALT + W >	Show / hide "Quick bar" with access to common used functions
< CTRL + ALT + Q >	Save screen shot of desktop

Shortcut	Action
< CTRL + C >	Copy active form into windows clipboard
< CTRL + E >	Exchange the active measurement with another one
< CTRL + R >	Remove the active measurement
< CTRL + G >	Show the "Groups" administration of the channels
< SHIFT + S >	Edit special channels
< SHIFT + T >	Edit track settings
< ALT + O >	Load another measurement of current event
< CTRL + O >	Load another measurement
< CTRL + M >	Link to GoogleEarth
< CTRL + ALT + S >	Swap (interchange) 2 loaded measurements
< CTRL + P >	Shop properties of the currently active window
< ALT + R >	Restore window positions out of the current Template
< CTRL + ALT + D >	Display measurements in Moving window vertically separated
< CTRL + W >	White background
< CTRL + L >	Light (grey) background
< CTRL + D >	Dark (black) background
< CTRL + T >	Use individual (template) color scheme
< ALT + X >	Terminate the program “Analyzer”

6.2 Keys in the “Moving window”

Shortcut / Mouse	Action
Mouse: Left button	Offset moving
Mouse: Double click	Start measuring mode
< s >	Change to Distance plot
< t >	Change to Time plot
< 1 > – < 9 >	Activate measurement
< ALT 1 > - < ALT 9 >	Show overview
< CTRL + HOME>	Fastest lap
< SHIFT + HOME >	Entire lap
< CTRL + ALT + F >	Open filter module with currently active channel
< ALT + Z >	Define the zoom factor
< CTRL + ALT + M >	Show magnifier window
< F11 >	Maximum / Restore window size
< CTRL + C >	Copy Moving window graphic content to clipboard
< g >	Show / hide grid lines
< CTRL + ALT + D >	Display measurements vertically separated
< CTRL + P >	Show properties of the currently active window

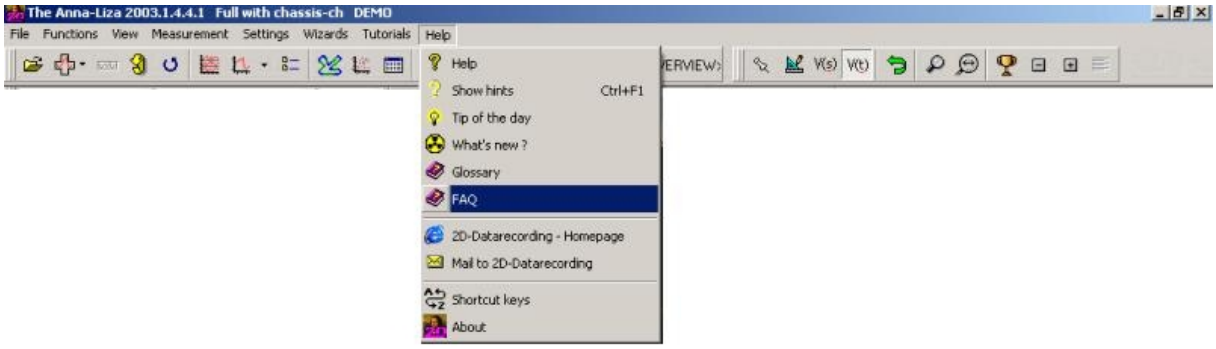
6.3 Keys in the "Moving mode" & "Measuring mode"

Shortcut / Mouse	Action	
< SPACE >	Start measuring mode	Moving mode
< ENTER >	Start measuring mode with active measurement only	
< SHIFT + ENTER >	Start measuring mode with active measurement in channel colors	
< Mouse left button > On vertical channel scaling	Adjust channel display vertically	
Mouse: Left button	Set left or right marker	Measuring mode
Mouse: < CTRL > + left button	Choose active channel	
Mouse: Left button in measuring values number	Choose active channel	
Mouse: Left button on channel name in measuring values	Toggle channel' s visibility	
Cursor left / right	Move aiming cross	
< CTRL > + cursor left	Set left marker	
< CTRL > + cursor right	Set right marker	
< SPACE >	Stop measuring mode	
< ESC >	Stop measuring mode	
< "<" or ">" >	Toggle active channel	
< Z >	If 2 markers have been placed : Zoom by markers	
<CTRL + ALT + I>	If 2 markers have been placed: Interpolate values if visible channel	
< CTRL + Z >	If 1 marker has been placed: Redefine offset of active channel	
< CTRL + V >	If 2 markers have been placed: Redefine formula of active channel	
< SHIFT + L >	Add lap trigger at mouse cross position	
< ALT + Y >	Add section at mouse cross position	

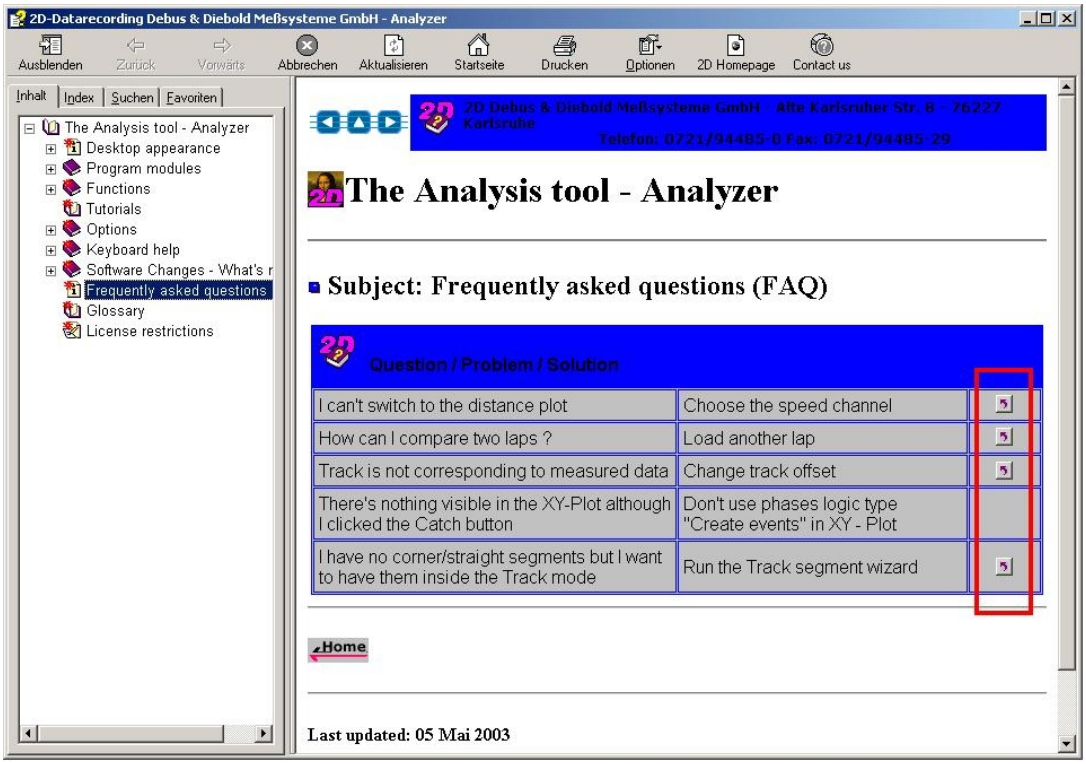
7. Frequently asked questions (FAQ)

Question / Problem	Solution
I can't switch to the distance plot	Choose the speed channel
How can I compare two laps ?	Load another lap
Track is not corresponding to measured data	Change track offset
There's nothing visible in the XY-Plot although I clicked the Catch button	Don't use phases logic type "Create events" in XY - Plot
I have no corner/straight segments but I want to have them inside the Track mode	Run the Track segment wizard

For detailed informations start the 2D analysis tool and enter the main menu item *"Help / FAQ"*



In the online help module you can directly select a link button. This button perform the necessary step in the analysis tool – refer the next figure !



8 Glossary

Expression	Explanation	Reference
Acceleration table	A table with acceleration, deceleration and elasticity data. This table is calculated out of measured data and displayed in an extra window.	Chapter6.1
Active channel	The channel where the cross is running on in measuring mode. Some special measuring can be performed on this channel. The active channel can be selected separately for each loaded measurement.	Chapter2.2.4
Active measurement	The measurement in foreground on which most functions are performed. Each loaded measurement can be activated.	Chapter2.2.1.2
Area	Additional sub window in Moving window which contains channels of a group. More than one area may be displayed.	Chapter2.2.1.1
Calculation file	A file (*.cal) with calculation formulas for channels. One special calculation file (*Autocal.cal*) can be executed automatically after a download from the logger.	Chapter 3.1.4
Channel	Each sensor whose data is downloaded results in a channel of the measurement.	Chapter2.4
Channel sampling rate	The recording frequency of a single channel.	none
Chassis	External module to show chassis geometry. Chassis geometry output can be either graphically or in text form depending on the software licence level.	Chapter 1.1.2
Circuit window	A window which shows the track map with the current selection of the active measurement highlighted. The circuit window may be turned off or on.	Chapter1
Clipboard	A Microsoft-Windows function which allows exchange of text or graphic between programs.	Chapter6.1
Color channel	The selection of a channel for graphical purposes to define a 3rd dimension. The physical values of the channel are mapped to colors.	none
Color scheme	A bundle of suitable colors for one window. The chosen color scheme will be applied to this window in future Analyzer runs.	Chapter2.1.2
Comment of measurement	A free editable text stored together with the measurement. This text may consist of several lines and can be printed out together with a window.	Chapter 1.1.1
Distance plot	The display of the measured values over distance (X-axis in dimension "meter"). The distance is calculated internally by integration of a speed channel.	Chapter2.2.4
Export	Function to extract parts of a measurement by time or channels and save to disk. Different export formats are supported up to a Microsoft Excel readable format.	Chapter2.10.2.1
Export of settings	A function to save Analyzer settings into a specific folder. This allows interchange of setting with another 2D software user.	Chapter 1.1.5
Grid	A graphical aid with horizontal and vertical lines. It is available for each visible scaling in a window.	Chapter2.9.2.2
Group	Definition of a group of channels which are handled together. This arrangement of channels allows a fast analysis of a topic like engine or suspension.	Chapter2.4.2
Histogram	A statistical examination of a channel under various constraints. The statistical result can be presented in many graphical forms.	Chapter2.10
Ideal lap time	The sum of best section times.	Chapter2.6

Expression	Explanation	Reference
Joined switching of channels	Option to switch a channel's visibility together in Moving and Overview window.	none
Lap trigger	A marker which shows the position of the lap time signals. Information of lap triggers are downloaded together with channel data. Lap triggers may be modified manually.	Chapter2.8.1.2
Link measurements	A function to move all loaded measurements together in moving window.	Chapter6.1
Main sampling rate	The recording frequency of the data logger from which measurement was downloaded. Mathematically it is a factor of power of 2 of each channel sampling rate.	none
Measuring cross	A cross horizontally at the mouse position and vertically at the active channel's value in Moving window during Measuring mode.	none
Measuring mode	An analyzing mode which shows numerical values of the visible channels inside the Moving window. Alternative to the Moving mode.	Chapter2.2.1.2
Min-/Max table	A table with the minimum/maximum/average values of channels per lap. Additionally a subset of the data may be defined using phases.	Chapter2.7
Moving mode	The selection inside Moving window can be moved with the mouse. Alternative to the Measuring mode.	Chapter2.2.4
Moving window	The main analyzing window with channel curves of selected part of the measurement. The selected part of the measurement can be zoomed in and out or moved.	Chapter2.2
Overlay of lap	A function to compare several laps of one measurement or another measurement. Up to 9 measurements can be loaded and overlaid.	Chapter3.10.1
Overview	A window which displays some channel curves of the complete measurement in reduced resolution. Each loaded measurement has its own Overview window.	Chapter2.1
Phase condition	A logical condition to define a subset (Phases) of the measured data. Several Phase conditions can be combined with AND resp. OR logic.	Chapter3.2.1.3
Phases	The subset of measured data defined by one or more Phase conditions. This subset can be used for different purposes like Export, Histogram, XY-Plot etc.	Chapter3.2
Quick key window	A function to achieve common functions via fast keyboard input. Items like Channels or Groups can be added/removed or exchanged.	Chapter3.10
Real Time player	A function to move Measuring cross over data in real time and playback channel values. Playback output may be the PC-Speaker, the sound card or a force feedback joystick.	Chapter 3.15
Reference lap	An user defined lap which is extracted and saved from the measured data. It is handled like a normal measurement but has wrap-around functionality to allow comparison with regular laps.	Chapter3.6
Route	2-dimensional data which contains driven position. This allows an XY-Plot which shows the geographical route of the measurement.	Chapter4
Saturated color	The blending of color scaling from one color to another color in smooth steps. This allows graphical display of channel values as 3rd dimension.	none

Expression	Explanation	Reference
Scaling	Text area besides graphics to give information about physical values at certain steps. One of the most important scalings are the Time resp. distance scaling in Moving and Overview windows.	Chapter2.4.1
Section	The division of the track in up to 6 parts with distance information. The definition of the sections is used for the section times table.	Chapter2.6.1
Segment	The division of the track in straights and corners. This is used for the Track mode window, where the minimum resp. maximum of channel values inside each segment is shown Selection	Chapter2.8.1.2
Short key	The assignment of a char to an item (e.g. channel or function) for fast access via keyboard by the Quick key window function.	Chapter3.10
SpecSheet	The database with additional information about each measurement. It is the interface from Analyzer to other software modules like Specview.	Chapter 1.1.1
Special channel	A channel with defined intention which is used for internal functions. Each channel of a measurement can be assigned to any one of the special channels. The list of special channels applies to all measurements of the Event.	Chapter 1.1.5.1
Synchronize	Function to place the other measurement's selection close to the active measurement's selection in their respective laps.	Chapter5.3
Template	The definition of desktop layout of several windows. The desktop layout may be saved inside a template and restored later by choosing this template once again.	Chapter3.9
Time plot	The display of the measured values over time (X-axis in dimension "time"). Always on in Overview windows, but selectable in the Moving window.	Chapter2.2.4
Time diff	A virtual channel which shows the time win/loss of one measurement's lap compared to another one's lap. The Time diff channel is available only for the measurement 1. The second measurement to compare is selectable.	Chapter3.4
TDiff window	A virtual channel which shows the time win/loss of one measurement's selection compared to another one's selection. The TDiff window channel is available only for the measurement 1. The second measurement to compare is selectable.	Chapter3.5
Trackball mode	An option to reposition the mouse cursor after moving the selection. This helps the use of a notebook's trackball in Moving window.	Chapter5.5
Track length	The length in meters for one lap of a track. All laps of a measurement whose lap length differs from the Track length not more than Track tolerance are treated as Valid laps.	Chapter2.5
Track mode window	A graphical display of one lap with the inscription of defined channel values at certain points. The inscription of the channel values is organized in rectangled markers which may be placed freely.	Chapter2.8.4
Track offset	The distance in meters between lap trigger position and start/finish line of the track. This value has to be defined precisely to create a correct relationship between the measured data and the track map.	Chapter7
Track tolerance	The percentage of the lap length to Track length deviation which defines a Valid lap.	Chapter 1.1.5.2

Expression	Explanation	Reference
User defined markers	A set of markers placed by the user to highlight some user defined positions in a measurement. It may be used to show defined channel values at certain points at the Track mode window.	Chapter 1.1.5.2
User management	The management of several Analyzer users with individual channel, group and options settings. The creation of more than one user causes a login prompt at program start.	Chapter3.1
Valid lap	A lap whose calculated lap length differs from the Track length not more than Track tolerance. If a lap is not valid several functions and displays are not available for this lap.	Chapter2.5
Video link	An external module to play and synchronize a video footage along with the measured data. The video link function is available depending on the licence level.	Chapter5.1
Visible windows	A list of all Analyzer windows which are currently open. Each entry represents one window and may be closed or forced to foreground.	Chapter 1.1.3
Visibility of measurement	A function to temporary hide the data of a loaded measurement. This is helpful to focus on another loaded measurement by reducing visual information.	Chapter2.2.1.4
Window list	A window with buttons linked to the most common functions. It may be closed permanently to gain screen space.	Chapter 1
Wizard	An "intelligent" external module with an extra specialized purpose. Wizards are used mainly to create additional calculated channels.	Chapter7
XY-Plot	A function to show the relationship of 2 channels graphically. XY-Plots may include several measurements and use a Color channel as 3rd dimension.	Chapter2.9
Zoom	A function to enlarge or reduce the data selection in the Moving window. Zoom functionality can be achieved via the Quick key window, keyboard or mouse.	Chapter3.10.1

Appendix A: License restrictions

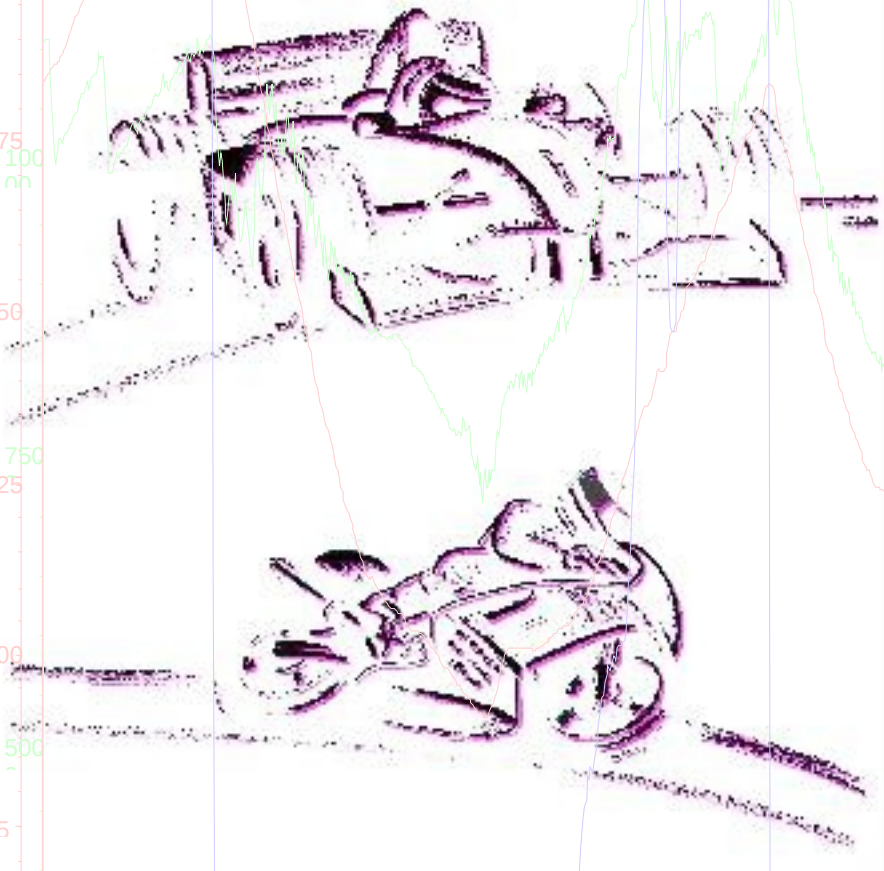
license type / functionality	*Small*	Kit-System	*System*	Full	Net	*Team*
# of loadable measurements	2	2	3	4	9	9
# of channel groups	8	8	16	32	32	32
# of desktop templates	1 fix	2 fix	3	free	free	free
Overview window per measurement	•	•	•	•	•	•
Moving- / circuit- and laptime window	•	•	•	•	•	•
Editor for channel properties	•	•	•	•	•	•
Zoom of selection in Moving window	•	•	•	•	•	•
Measuring mode	•	•	•	•	•	•
Measuring started with channel values	all	all	optional	optional	optional	optional
Measuring mode with relative values	X	X	•	•	•	•
Magnifier window	X	X	X	•	•	•
Sorting of channels	X	X	•	•	•	•
Channel graphic type “All“ selectable	X	fix	•	•	•	•
Channel value reduce type selectable	X	fix	•	•	•	•
Distance plot	•	•	•	•	•	•
Representation of track via GPS	•	•	•	•	•	•
Creation of track map from lateral acceleration	X	•	•	•	•	•
Creation of track map from GPS coordinates	X	•	•	•	•	•
Virtual laptrigger and sections via GPS	X	X	•	•	•	•
Automatic laptrigger control	•	•	•	•	•	•
Automatic segment detection	X	•	•	•	•	•
Lap synchronization	X	•	•	•	•	•
Reload of measurements	X	X	•	•	•	•
Commenting of measurements	•	•	•	•	•	•
User defined markers	•	•	•	•	•	•
Standard print function in vector quality (EMF)	X	•	•	•	•	•
Print report manager	X	•	•	•	•	•
Print via Excel	X	X	•	•	•	•
Excel print sheets	X	X	2+1	free	free	free
Vector graphics export in EMF format	X	X	•	•	•	•
Areas in Moving window	X	X	•	•	•	•
Quick key Interpreter	X	X	•	•	•	•
Language switchable during runtime	•	•	•	•	•	•
Color scheme white/ light / dark	•	•	•	•	•	•
Separate color schemes per template	X	X	•	•	•	•
Saving of templates	X	X	•	•	•	•
Section times over distance	X	3	•	•	•	•
Circuit window	•	•	•	•	•	•
MultiCircuit window	X	fix	fix	•	•	•
GoogleMaps images displayed in MultiCircuit	X	•	•	•	•	•
GoogleMaps images loadable in MultiCircuit	X	X	X	•	•	•
GoogleEarth™ link	X	•	•	•	•	•
Export function	fix CSV	X	4	free	free	free
Phases in export	X	X	•	•	•	•
Screen export	X	•	•	•	•	•
Dynamik test module (DTS)	•	X	•	•	•	•
Min/Max tables	X	fix	4	free	free	free
Phases in Min/Max tables	X	fix	•	•	•	•

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

license type / functionality	Small	Kit-System	System	Full	Net	Team
Min/Max table export	X	X	•	•	•	•
Min/Max table link to Moving window	X	•	•	•	•	•
Time diff (win function)	X	•	•	•	•	•
Reference laps	X	X	•	•	•	•
Automatic gear calculation	X	•	optional	optional	optional	optional
Wizards for gear and tire perimeter calculation	X	X	•	•	•	•
Wizards for “Wheelies“ and “Track segments“	X	X	•	•	•	•
Special channels	Speed	Speed	•	•	•	•
Phases in Moving and Overview windows	X	X	•	•	•	•
Link to SpecView module	X	X	•	•	•	•
Live export	X	X	•	•	•	•
Temporary function settings	X	X	X	•	•	•
Blanking out measurements	X	X	X	•	•	•
MultiCircuit Measuring of GPS position	X	X	X	•	•	•
MultiCircuit Zoom, move, follow of position	X	•	•	•	•	•
Channel values optionally displayed hex/binary	X	X	X	•	•	•
XY-Plots	X	fix	4	free	free	free
XY-Plot regression lines	X	X	•	•	•	•
XY-Plot accumulation	X	X	•	•	•	•
Track mode windows	X	fix	4	free	free	free
Histograms	X	fix	4	free	free	free
Video link	X	X	•	•	•	•
Spectral analysis (FFT)	X	X	X	free	free	free
Interpolation of channel values	X	X	X	•	•	•
Window frames switchable	X	X	X	•	•	•
Measurements optical vertical separable	X	X	X	•	•	•
“Unstretched” distance plot function	X	X	X	•	•	•
“Squared” drawing function	X	X	X	•	•	•
Real time player	X	X	X	•	•	•
Cutting of measurements	X	X	X	•	•	•
Access on measurement data in the network	X	X	X	•	•	•
Saving/reloading of desktop	X	X	X	•	•	•
Telemetry server and -clients	X	X	X		•	•
Scripting via automation interface	X	X	X	X	•	•
Import Plugins	X	X	optional	optional	optional	optional
Channel filter Plugins	X	X	•	•	•	•
Adding of channels via filter Plugins	X	X	X	X	•	•
Additional Plugins	X	X	X	X	•	•
Merger: Combining of measurements	X	X	X	X	•	•
Simultaneous (shared) access on measurement data in a network	X	X	X	X	X	•
Multi-user administration	X	X	X	X	X	•
Multiple track settings in a network	X	X	X	X	X	•
Export and import of user settings	X	X	X	X	X	•
Export and import of function settings	X	X	X	X	X	•
Coding of measurements	X	X	X	X	X	•
Chassis module	X	X	X	X	X	•
SW update authorization (develop cycle)	X	X	X	X	X	•

2d-datarecording.com

- English -

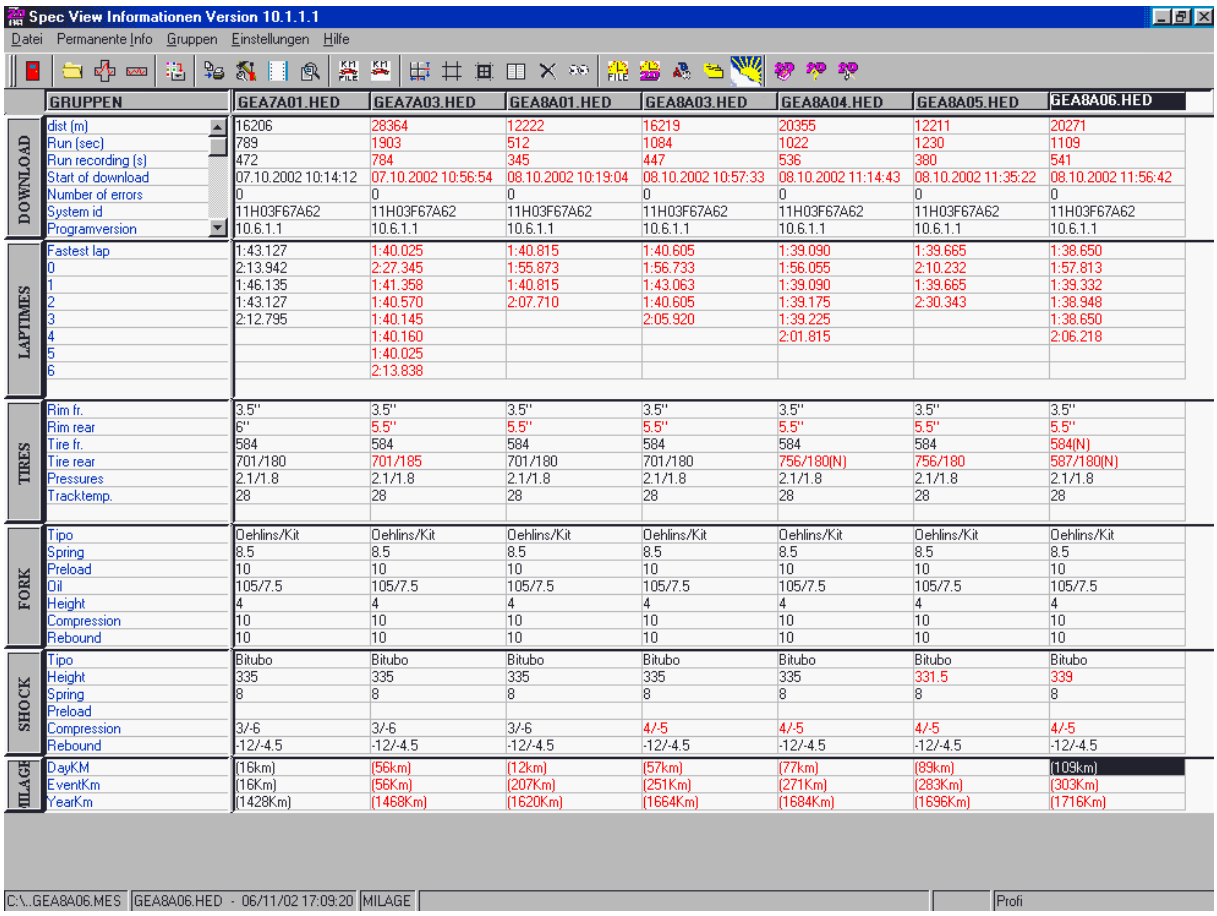


2009

Introduction to the 2D data administration - SpecView -

Art.No.: AC-DOC_SpecView_e-000 modified 18.07.2008

Your NOTES:



	GRUPPEN	GEA7A01.HED	GEA7A03.HED	GEA8A01.HED	GEA8A03.HED	GEA8A04.HED	GEA8A05.HED	GEA8A06.HED
DOWNLOAD	dist (m)	16206	28364	12222	16219	20355	12211	20271
	Run (sec)	789	1903	512	1084	1022	1230	1109
	Run recording (s)	472	784	345	447	536	380	541
	Start of download	07.10.2002 10:14:12	07.10.2002 10:56:54	08.10.2002 10:19:04	08.10.2002 10:57:33	08.10.2002 11:14:43	08.10.2002 11:35:22	08.10.2002 11:56:42
	Number of errors	0	0	0	0	0	0	0
	System id	11H03F67A62	11H03F67A62	11H03F67A62	11H03F67A62	11H03F67A62	11H03F67A62	11H03F67A62
	Programversion	10.6.1.1	10.6.1.1	10.6.1.1	10.6.1.1	10.6.1.1	10.6.1.1	10.6.1.1
LAPTIMES	Fastest lap	1:43.127	1:40.025	1:40.815	1:40.605	1:39.090	1:39.665	1:38.650
	0	2:13.942	2:27.345	1:55.873	1:56.733	1:56.055	2:10.232	1:57.813
	1	1:46.135	1:41.358	1:40.815	1:43.063	1:39.090	1:39.665	1:39.332
	2	1:43.127	1:40.570	2:07.710	1:40.605	1:39.175	2:30.343	1:38.948
	3	2:12.795	1:40.145		2:05.920	1:39.225		1:38.650
	4		1:40.160			2:01.815		2:06.218
	5		1:40.025					
	6		2:13.838					
TIRES	Rim fr.	3.5"	3.5"	3.5"	3.5"	3.5"	3.5"	3.5"
	Rim rear	6"	5.5"	5.5"	5.5"	5.5"	5.5"	5.5"
	Tire fr.	584	584	584	584	584	584	584(N)
	Tire rear	701/180	701/185	701/180	701/180	756/180(N)	756/180	587/180(N)
	Pressures	2.1/1.8	2.1/1.8	2.1/1.8	2.1/1.8	2.1/1.8	2.1/1.8	2.1/1.8
	Tracktemp.	28	28	28	28	28	28	28
FORK	Tipo	Oehlins/Kit	Oehlins/Kit	Oehlins/Kit	Oehlins/Kit	Oehlins/Kit	Oehlins/Kit	Oehlins/Kit
	Spring	8.5	8.5	8.5	8.5	8.5	8.5	8.5
	Preload	10	10	10	10	10	10	10
	Oil	105/7.5	105/7.5	105/7.5	105/7.5	105/7.5	105/7.5	105/7.5
	Height	4	4	4	4	4	4	4
	Compression	10	10	10	10	10	10	10
	Rebound	10	10	10	10	10	10	10
SHOCK	Tipo	Bitubo	Bitubo	Bitubo	Bitubo	Bitubo	Bitubo	Bitubo
	Height	335	335	335	335	335	331.5	339
	Spring	8	8	8	8	8	8	8
	Preload							
	Compression	3/-6	3/-6	3/-6	4/-5	4/-5	4/-5	4/-5
	Rebound	-12/-4.5	-12/-4.5	-12/-4.5	-12/-4.5	-12/-4.5	-12/-4.5	-12/-4.5
MILAGE	DayKM	(16km)	(56km)	(12km)	(57km)	(77km)	(89km)	(109km)
	EventKm	(16Km)	(56Km)	(207Km)	(251Km)	(271Km)	(283Km)	(303Km)
	YearKm	(1428Km)	(1468Km)	(1620Km)	(1664Km)	(1684Km)	(1696Km)	(1716Km)

CONTENTS

INTRODUCTION 4

1 – GETTING STARTED WITH THE 2D DATA-ADMINISTRATION TOOL – SPECVIEW 9

1.1 HOW TO START THE PROGRAM 9
1.2 THE CONFIGURATION OF THE DESKTOP 10
1.2.1 The toolbar - the main control element 10
1.2.2 The first look at SpecView 11
1.3 HOW TO ACCESS QUICKLY AND EFFECTIVELY THE REQUESTED INFORMATION 12
1.3.1 Administration of permanent info files 13
1.3.1.1 Read permanent info files 13
1.3.1.2 Creating permanent info files 15
1.3.1.3 Delete permanent info files 17
1.3.2 Administration of reports 18
1.3.2.1 Creating own reports 18
1.3.2.2 Printing reports 19
1.3.2.3 Deleting reports 20
1.3 3 Saving and restoring of your individual profile – the layout function 21
1.3.3.1 Creating a new layout 21
1.3.3.2 Saving your layout 22
1.3.3.3 Define your individual start layout 23
1.3.4 The MILEAGE function – counting kilometres 24
1.3.5 The SECTIONTIMES and the GEAR groups 24
1.3.7 Simultaneous change of a SpecSheet of 2 different users 26
1.4 WORKING EFFICIENTLY WITH THE FUNCTION KEYS 27
1.4.1 The function key <F1> – Online help and information about the version 27
1.4.2 The function key <F2> – Editing the active cell 28
1.4.3 The function key <F3> – the print mode 29
1.4.4 The function key <F4> – Quick info measurement/group 30
1.4.5 The function key <F5> – Direct access to report files 31
1.4.6 The function key <F6> – Modify your own reports 32
1.4.7 The function key <F7> – Delete reports 33
1.4.8 The function key <F8> – Modify group height 34
1.4.9 The function key <F9> – change the position of groups 35
1.4.10 The function key <F10> – the direct way to the main menu 35
1.4.11 The function key <F11> – toggle window size 35
1.5 LOAD ADDITIONAL MEASUREMENTS 36
1.5.1 Load header files from the actual event 36
1.5.2 Load measurements from a different EVENT (change EVENT) 36
1.6 GETTING HELP – USING CONTEXT SENSITIVE HELP MODULES 38

2 - EXTENDED FUNCTIONS 39

2.1 PRINTING VIA EXCEL 39
2.2 OPTIMISE YOUR MOTORBIKE SETTING – THE CHASSIS ADD-ON PROGRAM 39

APPENDIX A: LIST OF KEY SHORT-CUTS 40

APPENDIX B: GLOSSARY 42

APPENDIX C: THE DIFFERENT SOURCES FOR THE GROUPS OF A SPECSHEET 43

Introduction

The program SpecView helps you to deal with special documentation files that belong to every measurement done with the 2D equipment. These files are generated for every download (=reading the data from the datalogger).
The different steps the user should take previously you may find in the overview flowchart at page 7.

In the following we will refer to the files as "**SpecSheet**-" or "**Header**-" files.

In the files you can gather all the information that is relevant for the circumstances and special set-up for your measurements and events (e.g. the settings of a bike during a race weekend or testing). The user of the program – the engineer, the data recording man, or the mechanic, is in charge of the maintenance and integrity of the data. And you are able to eliminate a good part of additional paperwork for documentation.
Groups organize the details of the information**.**

The communication tool WinIt generates the files automatically at download time - in the moment the user decides to read the stored data from the 2D datalogger. The files have the identical name as the corresponding measurement with the file extension *.HED. (from "Header").

You define the name of a measurement by three parameters. They are:

- The name of the logger (set in the program WinIt)
- The "Logger Mastername" (defined at the start page of WinaRace)
- And a consecutive number (attached automatically by WinIt)

Detailed information about the generation of the name of a measurement you may find in chapter 1.5 about WINIT.

Downloading is done in three steps:

1. Reading of the compressed raw data
2. The pre-processing (Separation of the data blocks)
3. The generation of the final measurement data for the analyse tool and the creation of the header files for SpecView (Names are generated as described). On page 7 you find a flowchart resuming the creation of the header files and the **previous** preparing steps the user should take!

In the following lessons about SpecView we usually will make reference to one of the three demo data sets, which are generated automatically with every installation of the 2D software. You will find them in the directory <C:\Racedata\Demodata>.


Please note: By default the demo data are installed on the same disk where the operating system is!

Having a look at the demo data sets you will find the following directory structure:

- <..\RACEDATA\DEMODATA\BIKE.97>
- <..\RACEDATA\DEMODATA\CAR.98>
- <..\RACEDATA\DEMODATA\FORMEL3.99>

Initially those directories define your active directory for your actual event. Data generated by a download therefore will be written to it. The user should take care to create for every event its own directory. We recommend this procedure to help to organize your data. At racing it is most common to use the name of the track or event plus the year.
In the following we will refer to the data organized in that way as an **EVENT**.

Please note:

Don't create the event directory manually. Use exclusively our software to create an EVENT as explained in the chapter 1.4.1 about WINARACE. By that mean you assure to generate really all the necessary files for a consistent data set.

The measurement data are located within the EVENT directory. They are organized as sub-directories with the extension [MES]. The analysing software will use those data files.

Note:

1. Former generations of 2D data loggers can only communicate with the MS-DOS communications tool "ProgIt". For the analysis you can use the programs under the two operating systems indistinctively. However we do recommend using the Windows tool due to its higher comfort, ease of use and wider range of functions. To use the MS-DOS data under Windows you have to convert them into the new data structure in [MES]-directories. The conversion tool is described in chapter 1.5.4 of WINARACE.

2. Customers with recent data loggers should always work with our Windows software suite.

Please observe the restrictions the used operating system is setting in respect with the hardware you are using: Windows XP for example is very ill behaving with our 2D MS-DOS software and hence with older loggers. On the other hand we cannot recommend Windows ME or Windows NT if you plan to use the USB download facility with the actual generation of loggers.

Let us have a look at the file <DEMO.HED> from the EVENT directory <Bike.97>. Please open the file with SpecView or with a simple text editor as Notepad. You will find the data organized by groups. One of them has the name [DOWNLOAD].

```
[DOWNLOAD]
meter ON=110351
Count32=0
Run total (s)=2399
Run recording (s)=2457
Start of download=30.06.01 15:56:19
End of download=30.06.01 15:58:55
Number of errors=4
Time to decompress=0.0 sec
System id=11H0240F062
Programversion=1.0.0.5
Userlevel=Profi
```

Observation: The first entries (here "meter ON" and "count32") are generated from the active counter channels of the logger. The first counter channel refers to the digital channel1 (D1) and is usually used for the speed and by default for the distance. So you might name the first counter channel for example "dist. m" and the third one "dist. m. rear" if it is gathering the data from the rear wheel. You program the names with WinIt. The first counter channel is also used for the MILEAGE function.

The program WinIt generates this group during the download and writes it into the corresponding header file. Here you find quick information about the last run and the download process.

As mentioned previously the program WinIt generates the SpecSheet files that our program SpecView will use. Initially it generates by default the following four groups

1. [DOWNLOAD] ß Overview about the run and the download
2. [LAPTIMES] ß Lap times and quickest lap.
3. [WEATHER] ß Actual weather data.
4. [COMMENT]

You can generate quick comments relating to the measurement from any of the software modules (SpecView, WinIt or Analyzer) with the shortcut <ALT + Q>.

The rest of the groups will be copied from a PERMANENT INFO file the user has created – and hopefully maintained – for every single datalogger! (See also the flowchart on the next page). Additional data will be generated by the 2D Analyzer (see chapter 1.3.5) on user request.

Note:
Information out of the groups of our SpecSheet file as for example from the group [FRONTSUSPENSION] (all items related to the front suspension) can also be used in the program CalcTool. This program forms part of the 2D software suite (scope of delivery depends on your software version) and generates additional calculated channels. Use any entry in a group to define the parameters you want to use as a variable in the CalcTool.

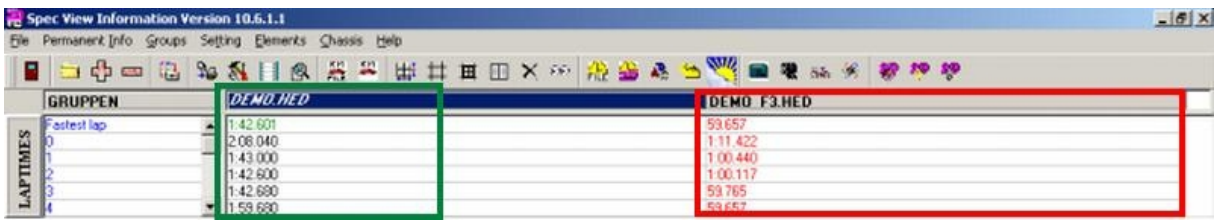
The following table gives an overview about some existing groups that might be used by the CalcTool:

Groupname:	Reference \ Descripction:
[BIKE]	See file *C:\RACEDATA\DEMODATA\P_ATA.HED
[FORKSET]	See file *C:\RACEDATA\DEMODATA\P_ATA.HED
[SHOCKSET]	See file *C:\RACEDATA\DEMODATA\P_ATA.HED
[SETTING]	See file *C:\RACEDATA\DEMODATA\P_ATA.HED

* Please note that the letter of the drive depends on your actual installation!

Example:
Here you put the actual spring stiffness of your front fork. Have a look at chapter 3.2 of the handbook about the CALCTOOL to see how you can take advantage from the feature to understand quickly the impact of the different settings and to approach an optimal one.

You can load up to 15 different files at once and can see up to 7 different groups at a time from the different *.HED files. The loaded files are compared to first *HED file (1St from the left) as the reference and differences are then highlighted with a **red font**. All the manual modifications of the data are shown in **green font**. The names of corresponding modified header files are additionally shown in ***italics***.



In addition to the header files belonging to the individual measurements exists a second type of *-HED files: **the permanent info files.** The user creates these files according to his needs. They contain all the information and settings that should be documented to assure to analyse his data thoroughly. Therefore you should design them previously to any measurement or at the start of the season. We call them “permanent” files because they contain the information that has to be **always-up-to-date.**

These data are used to generate the user-defined part of the header files.

There are some naming conventions for the creation of the permanent files.

The following flowchart explains the procedure:

Bigger organizations usually use more than one vehicle. In the following example we suppose a team running 2 bikes. Each of the bikes is equipped with a logger for data recording. The user defines by the logger name (in WinIt) and the master name (main page WinaRace) how the measurement will be called. More details in the WINIT manual, chapter 1.5.

To organize us:
We name the logger of the first bike within WinIt : **<BikeA>** and the other one is: **<BikeB>**.
As master name we choose at the WinaRace main menu from the list the entry **<1F_>** (Stands for **1**st **f**ree practice!). The **underscore(s)** "_" will be replaced by the last letter(s) of the logger name.

Downloading data, WinIt will create in the actual EVENT directory the following *.MES directories:
1st. Download:
For bike 1: <1FA01.MES> ***1F à*** *Mastername,* ***A à*** *Last letter from the logger,* ***01 à*** *1st download*
For bike 2: <1FB01.MES>
2nd. Download:
For bike 1: <1FA02.MES>
For bike 2: <1FB02.MES>

Please note:
WinIt will generate a consecutive number for every new instance of a download with the same mastername/loggername combination!

Now WinIt checks the availability of permanent info files for the used loggers. The permanent files need to comply with the following naming conventions:
Prefix "**P_** "+ "***logger name***" + file extension "**. HED**"
For bike 1: <P_BIKEA.HED>
For bike 2: <P_BIKEB.HED>
These files **have always to be** located in the parent directory of the actual EVENT!

With the two different source files as input WinIt generates the header files for each of the downloads:

At the 1st download:

- The content of **<P_BIKEA.HED>** will be copied into **<..1FA01.MES\1FA01.HED>**
  And for the 2nd. Bike from **<P_BIKEB.HED>** into **<..1FB01.MES\1FB01.HED>**
- WinIt generates the group [DOWNLOAD]
- Analyzer generates the group [LAPTIMES]
- If there is a Weather.ini file the group [WEATHER] will be created.
- The MILEAGE entries are updated

At the 2nd Download:

- The perhaps modified groups from **<P_BIKEA.HED>** go into **<..1FA02.MES\1FA02.HED>**
  And the same game for bike 2: **<P_BIKEB.HED>** to **<..1FB02.MES\1FB02.HED>**

The user has the additional possibility to generate a [COMMENT] group with information about the measurement using the shortcut <ALT+Q> from WinIt, Analyzer or SpecView.

Now you can load the generated header files into SpecView for comparing, analysing, printing or also modifications!

Please note:
The user should prepare previously to the race season or other measurements the permanent info files tailored to his individual needs. You can do that using either SpecView (more comfortable and safer –supported -, see also chapter 1.3.1.2) or a simple text editor like Notepad.

If you use a text editor to create the permanent info file you should know:

- The group name has to be put in square brackets [ ]
- Entry identifier and entry value are separated by ”=“ !
- Identifier have to be unique within one group

As example see the [DOWNLOAD] group

The semicolon “;” indicates a comment. All that follows the semicolon in a line will be skipped by SpecView and not be shown!

You should include into the permanent info files all the groups of information and the environmental factors, which are relevant to understand the set-up of the vehicle. The files have to be present before the first download. They determine the quantity and quality of the data SpecView will use in the future.
You find an example for an info file in the standard software installation at:
<..:\RACEDATA\DEMODATA\P_ATA.HED>

If you want to use the information as a reference, for example to compare with former years or different tests take care to maintain the information as complete and up-to-date as possible. If possible you should document all information instantaneously. SpecView will give you an optimal support for that task.
Please study the following chapters carefully to get optimal, quick and efficient results.

2D Debus & Diebold Meßsysteme GmbH Alte Karlsruher Str.8 76227 Karlsruhe
Tel.: +49(0)721 944850 Fax: +49(0)721 9448529

1 – Getting started with the 2D data-administration tool – SpecView

1.1 How to start the program

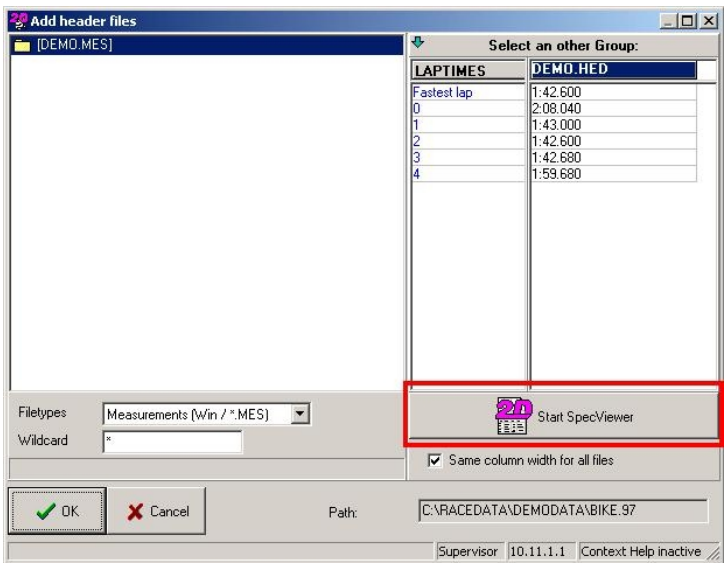
You have several possibilities to run the program SpecView:



- From the top of the 2D toolbar with the actual measurement:

- Run SpecView showing all permanent info files

- With the shortcut **<ALT + I>** at the main menu of 2D WinaRace
- At the select-measurement-window of WinaRace.
  Push the button **<Select>**. You find the following window:



1.2 The configuration of the desktop

1.2.1 The toolbar - the main control element

Before working with the program SpecView please read the following chapters carefully. We will explain the most important functions and options the program is giving you to maintain your data fast and efficiently. As in all the other 2D software modules you can start all the important functions from the main toolbar. You find the toolbar at the upper margin of the window. But if you like you dock it also to the right or left margin – put the mouse pointer on the toolbar, keep the left mouse button pushed and drag the toolbar to the position you wish.
Other functions you reach – depending on the context - with a pop-up menu right-clicking the mouse.
Next you find the windows with a short explanation for the different buttons and also the most important short-cut keystrokes.



Overview of the toolbar buttons from left to right:

1. Close SpecView. Confirm modifications before storing them!
2. Read additional file **<CTRL + O>**
3. Add active file again (duplicate, compare) **<CTRL + A>**
4. Remove active file **<CTRL + DEL>**
5. Save all files after confirmation **<ALT + S>**
6. Print selected groups **<ALT + P>**
7. Change printer – the default printer will not be changed
8. Report administration **<F6>**
9. Load all permanent info files **<ALT +R>**
10. Modify MILAGE of actual file **<ALT + M>**
11. Modify MILAGE of actual group
12. Change table view: Equal column width and equal group height **<ALT + A>**
13. Change table view: Expand all groups completely **<CTRL + S>**
14. Change table view: Show all group text in full width <**CTRL + D>**
15. Change table view: Same column width for all loaded files!
16. Hide active group
17. Show all hidden groups again
18. Sort files by file date/time
19. Sort files by 2D download date/time (data from group download)
20. Sort files alphabetically (file name)
21. Load all files that match the wildcard name
22. Load the <Weather.ini> file – Update the actual weather data

---

 The next functions require: 
The program CHASSIS + valid CHASSIS data files + a CHASSIS software license.
Please note: assign the correct path for the CHASSIS data **à** at the main menu of WinARace under Settings / Folders

---

23. Run the CHASSIS program with the active file in the <CALCULATION >mode
24. Run the CHASSIS program with the active file in the <MOVIE> mode
25. Run the CHASSIS program with the parameter <BIKE>.
26. Run the CHASSIS program with the parameter <FORCE>.

---

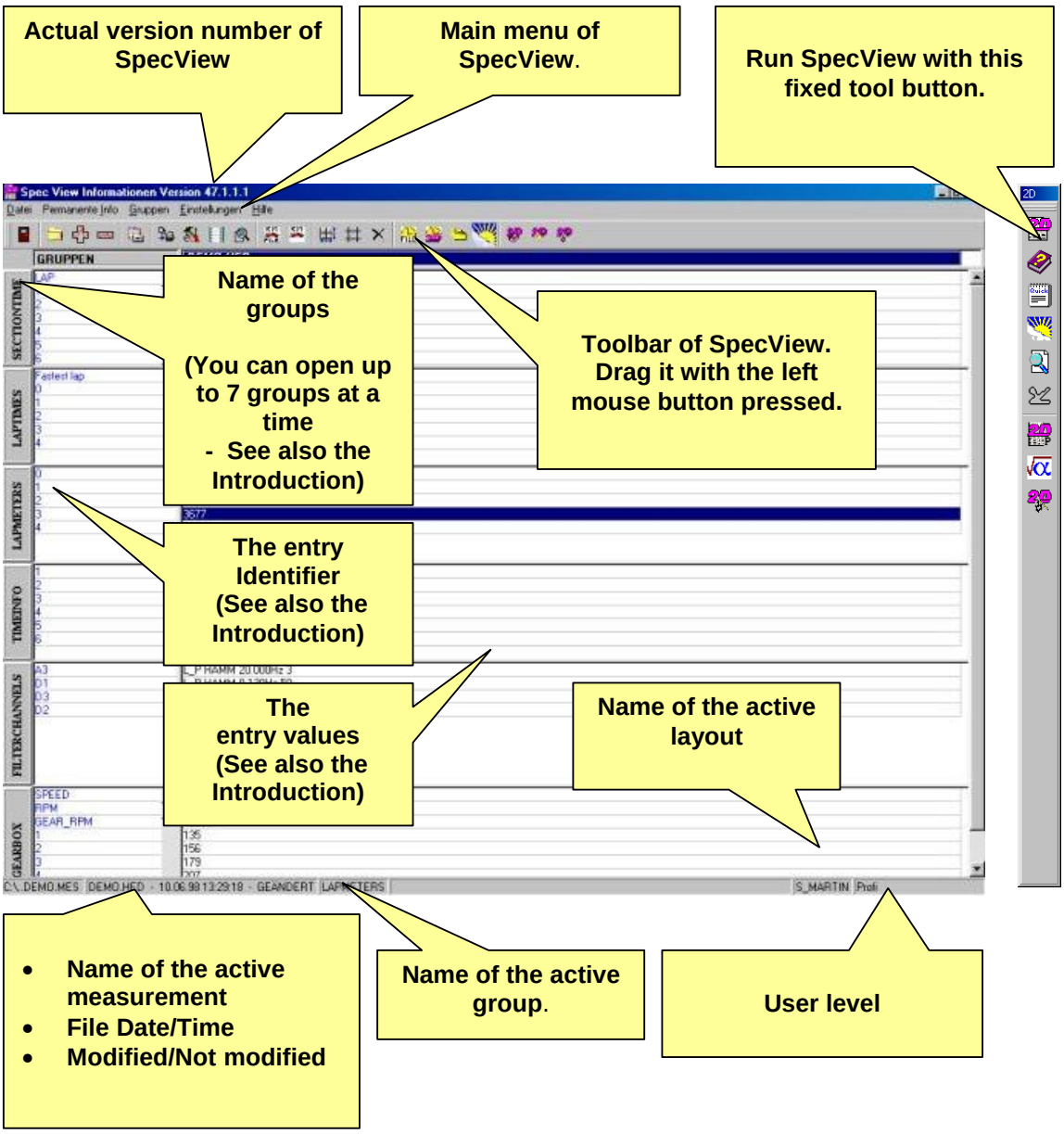
27. Information about SpecView + Complete list of shortcuts (printable) + 2D help file (PDF format) + information about the version of SpecView
28. WHAT'S NEW in SpecView? – Change log
29. ALWAYS Up2Date... Information about the system, the software and 2D.

1.2.2 The first look at SpecView

Start the program SpecView as described in chapter 1.1(How to start the program).

If have installed the program the first time the desktop will have the default format shown below. From that moment the software will keep all your settings of positions, geometry, columns and rows in the windows registry and will show at program start always your **most recent layout** of the desktop.

Tip: In the chapter 1.3.3.3 (Define your start layout) you find how to start SpecView always with your individual layout.



1.3 How to access quickly and effectively the requested information

- To work efficiently SpecView provides a “report function”. It opens you a quick and focussed access to the data required at a given moment. You can prepare your special reports previously to the event, tailored to your needs.


The chapter 1.3.2 (Administration of report files) gives detailed information

- You find a layout function to define which groups and number of entries of that group you want to see for a special purpose. Look only at the elements you need at that moment!


Closer information in chapter 1.3.3 (Load and save individuals profiles – the layout function)

- Prepare your permanent info files. Here you gather all the information about the set-up and parameters of your vehicle and the test. These files contain the basic information to create the SpecSheet files at download time.


Chapter 1.3.1 (Administration of permanent info files) tells the details

- The number of groups within a SpecSheet file can be very big. The printing function allows you to print just the groups you need right now. You can use either a previously defined report file or you select manually the groups to be printed. This concept is targeted towards different user groups (as technician, engineers or test-personnel) to focus on their individual information needs.


The chapters 1.3.2.2 (Printing reports) and 1.4.3 (The function key <F3>–Select print mode) provide the details.

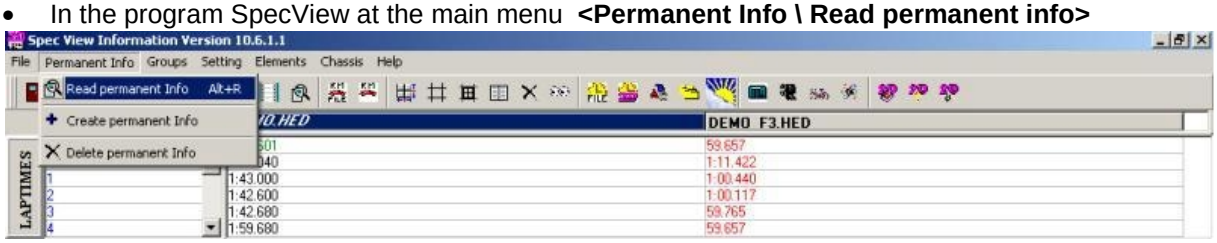
1.3.1 Administration of permanent info files

The permanent info files have to be located at the parent directory of the actual data directory (also called the EVENT directory). To be recognized correctly by SpecView they need the ”P_“ prefix in their filename. The file extension is the same as the rest of the SpecSheet files:(*.HED).

1.3.1.1 Read permanent info files

You have the following ways to load a permanent info file:

- In the program SpecView at the main menu **<Permanent Info \ Read permanent info>**



- Or in the program SpecView with the shortcut key **<Alt + R>**

- Clicking on the icon at the 2D toolbar



Tip: In all this cases you will load all existing permanent info files (of that directory). If you are running at the same time a greater number of vehicles or you have different user groups working with the same database you might wish to load only some selected permanent info files. You can specify them with help of wildcards as follows:

- Right-click the permanent info icon of the tool



- In the window that opens you modify the entry: **<Enter additional parameter(s)>**

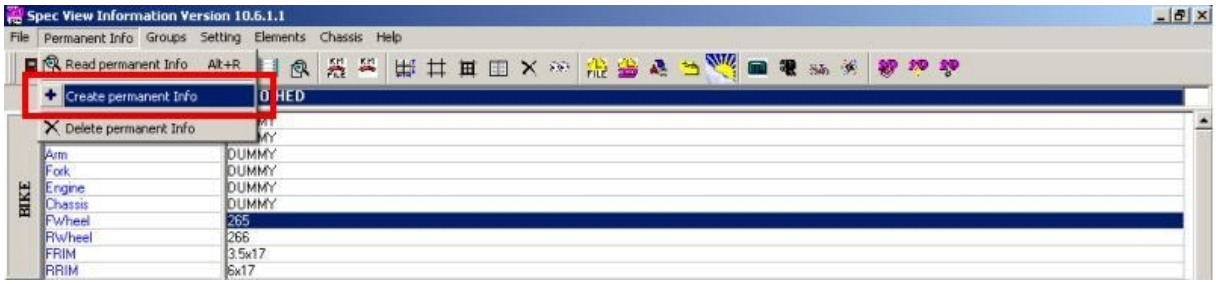


Example: You want to load only all the permanent info files that contain the string ”P_Y1“ in their filename. Just enter **/P_Y1*** and confirm with the button **<Save>**.

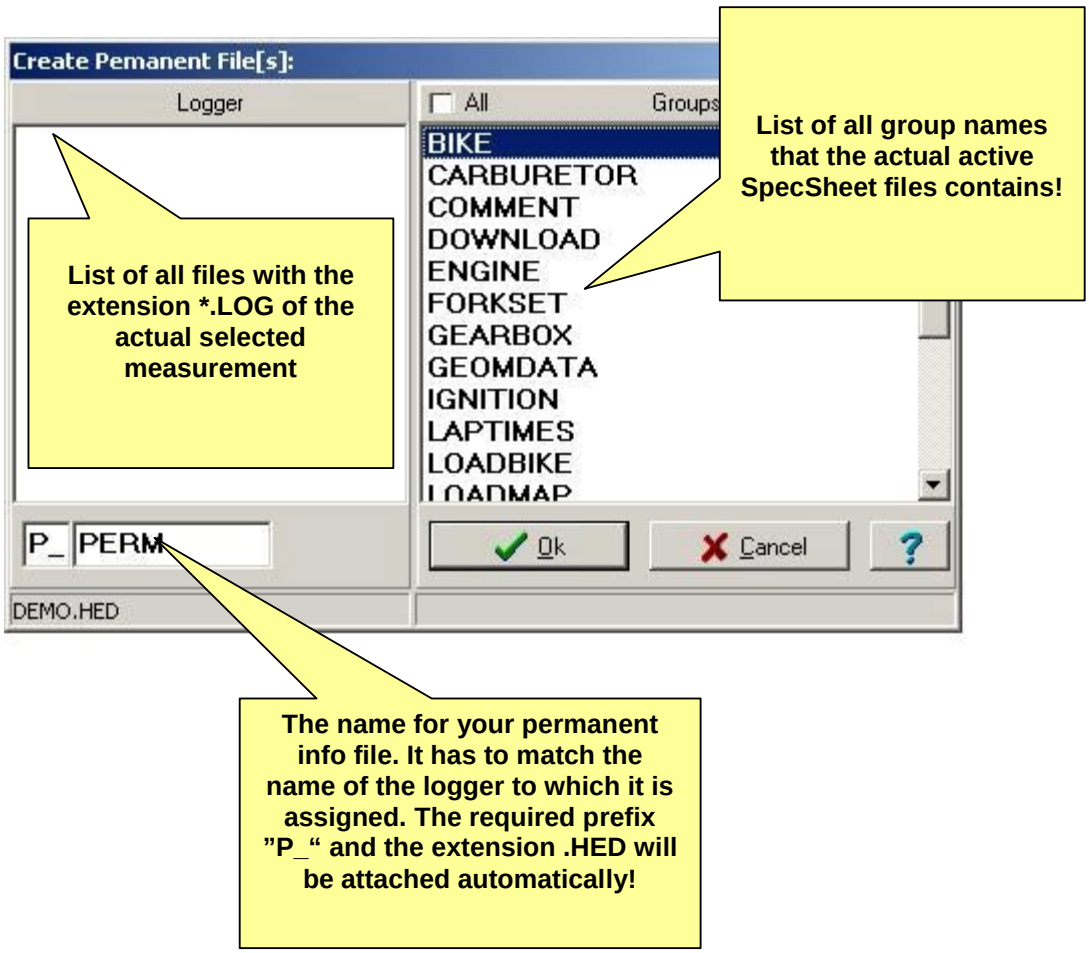
1.3.1.2 Creating permanent info files

You can create permanent info files directly from SpecView.

- Select from the main menu of SpecView: **<Permanent Info / Create permanent Info>**



- You get the following window:

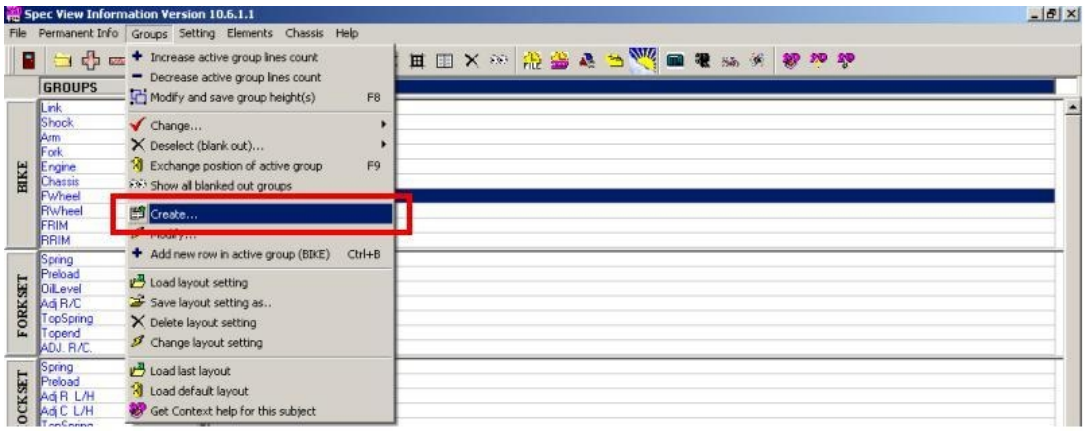


- Confirm your selections with the **<OK>** button

Attention: The list of the groups (right) contains exactly the groups of the actual active SpecSheet file. Check if you really have all the groups that you need.
Before creating a new permanent file select first the file that includes all the groups you will require!!

If you need an additional new group you can add it directly into your permanent info file:

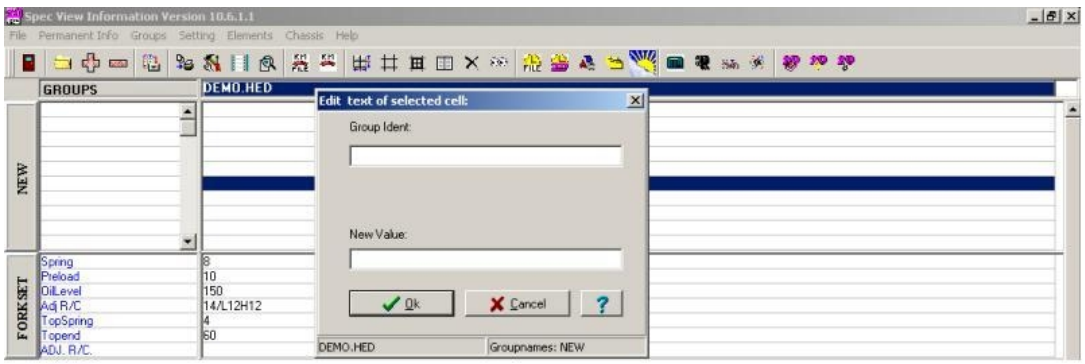
- Read the permanent info file you want to modify. See chapter 1.3.1.1 (Read permanent info files)
- Select then from the main menu **<Groups / Create>**



- Enter the name of the new group and confirm with **<OK>**



- Now you design your new group. Leftclick on the new group or use the <**Tab>** keys. Select a cell with a double-click or with **<F2>**, **<RETURN>** or **<SPACE>**.

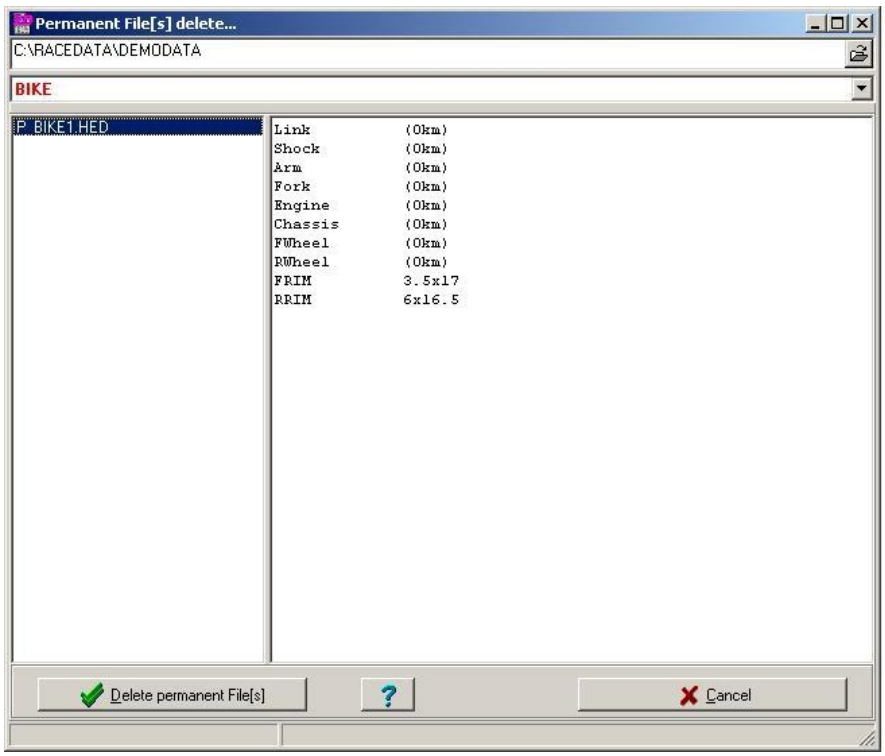


- Now you can enter the new entry identifier (group ident) and a new value. Confirm with **<OK>**

1.3.1.3 Delete permanent info files

If you don't need a permanent file any longer you can delete it:

Select from the main menu **<Permanent Info / Delete permanent Info>**
You will see the following window. After the first installation you find just one permanent info file **<P_ATA.HED>**. For a quick check about the file to be deleted you find an overview about the content of the selected file (on the left panel)



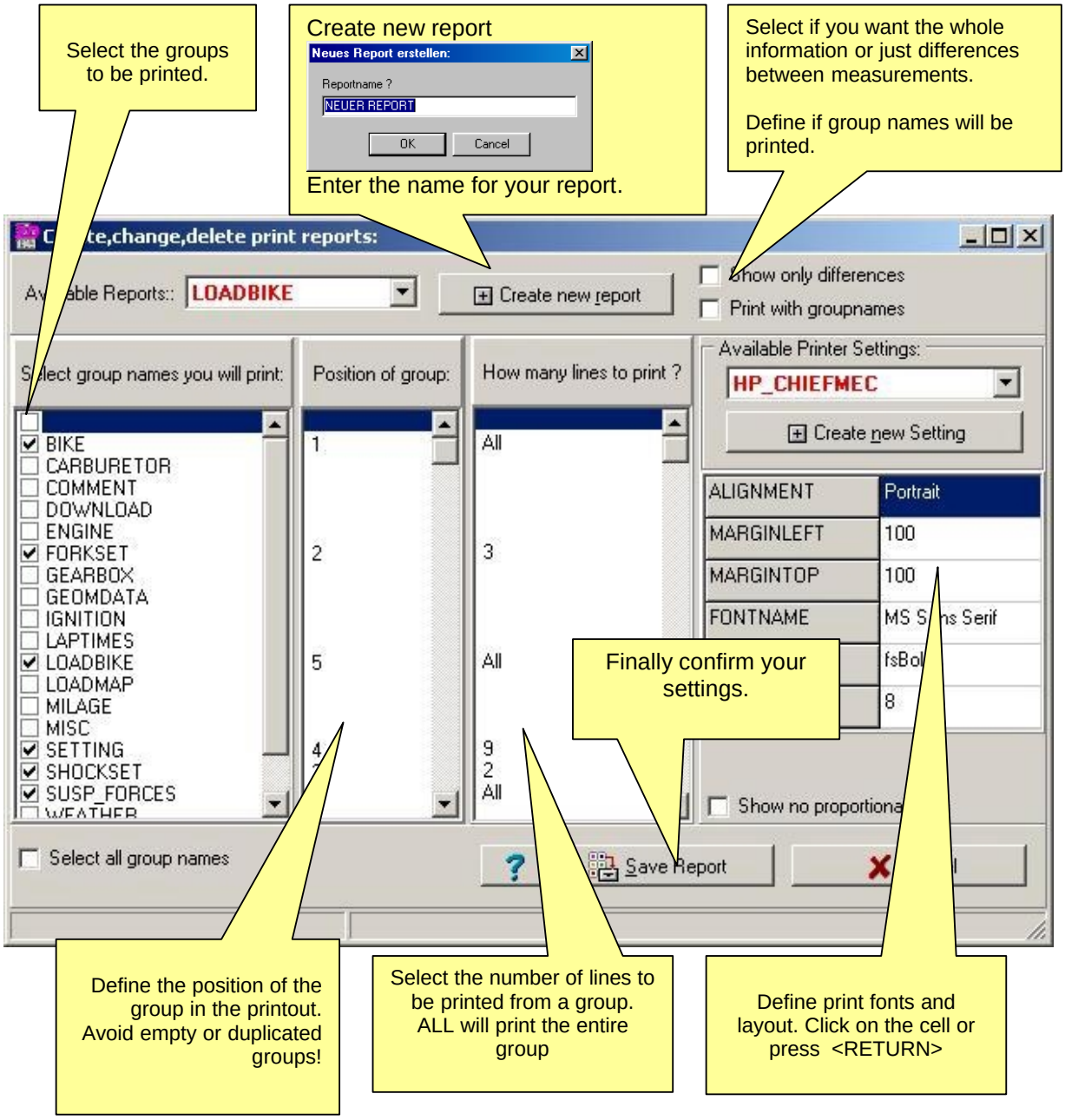
1.3.2 Administration of reports

The report function provides an easy way to print information targeted to specific users. For example a race mechanic might be only interested in the groups he is working on (take the groups BIKE, FORKSET, SHOCKSET, ENGINE or SETTING)

1.3.2.1 Creating own reports

With the software we deliver eight standard reports. Take them as examples to define the reports you find most valuable.
That is done this way:

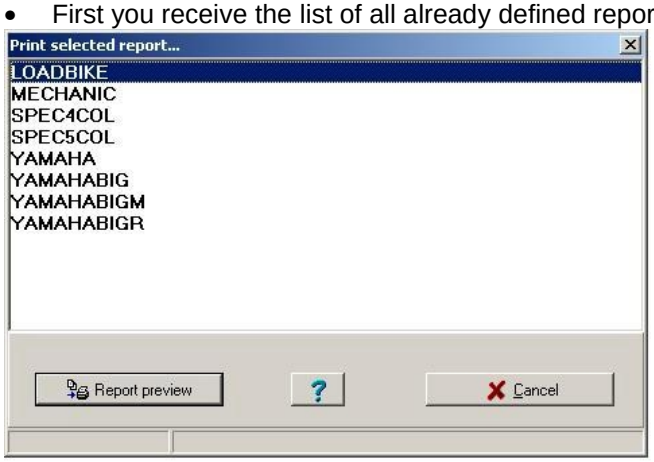
- Select from the main menu **<File / Report[s] ...>** or use the key **<F6>.**You will find the following window:
- Define your settings und confirm them with **<Save report>**



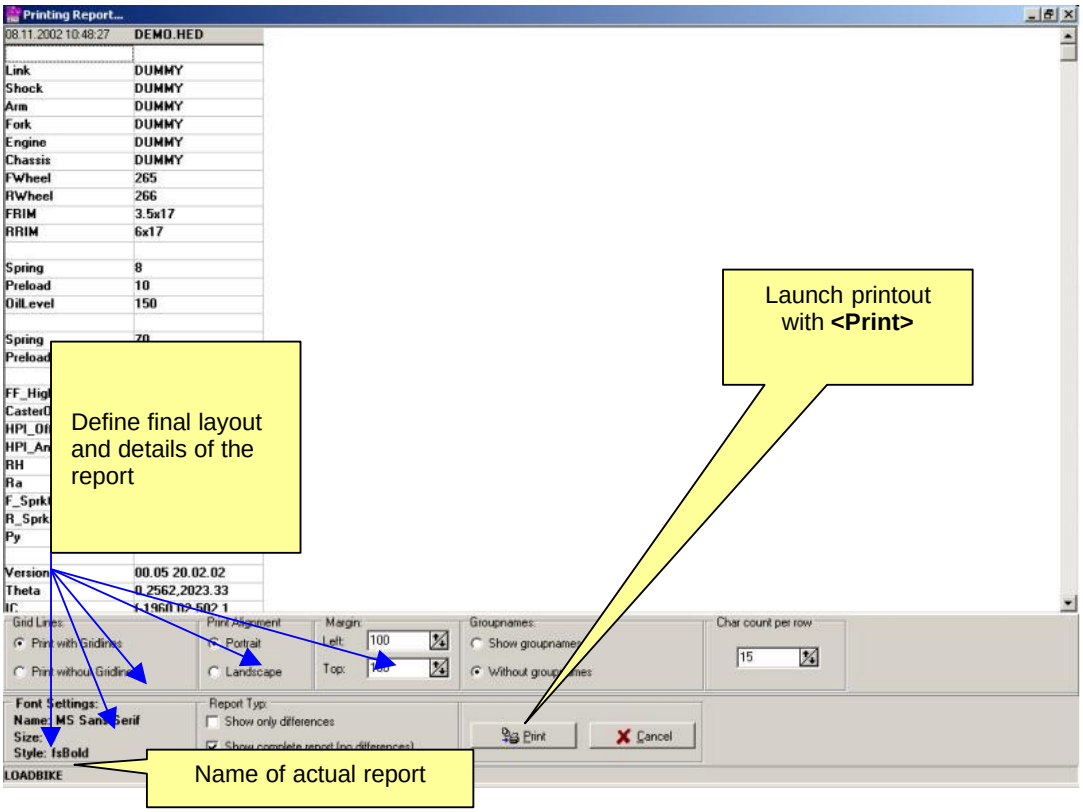
1.3.2.2 Printing reports

Predefined Reports you can print directly from the main menu of SpecView:

- Select from the main menu **<File / Report[s] / Show available reports...>** or just use **<F5>**.
- First you receive the list of all already defined reports



- Select one from the list and confirm with **<Report preview>**

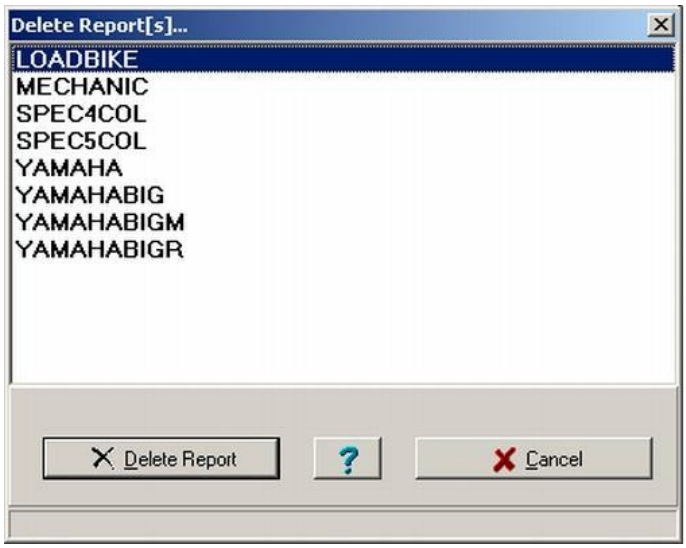


All the basic settings for the report are saved to **<Spec.ini>** and **<WPrinter.ini>** at your main WinaRace directory. If you have modified the configuration to your needs the 2D setting wizard will help you in the case of installing a new software version or after re-installing the programs to import your settings from the old version.

1.3.2.3 Deleting reports

Existing reports you can erase with **<File / Report[s] / delete...>** or with the short-cut **<F7>**

You will see the following window:



- Select the report and confirm with **<delete report>**.
- The program will ask you a second time before actually deleting the report.

1.3 3 Saving and restoring of your individual profile – the layout function

The program stores your last desktop automatically every time you leave SpecView. This includes the name of the groups, column width and the height of the groups. For the different users we offer – similar to the <TEMPLATE> function of the Analyzer – the feature to define individual profiles. With the layout function you define the up to 7 groups with the "look" you want to use.

1.3.3.1 Creating a new layout

You define the groups you need and the number of visible lines for each of them. The table gives you an overview about the easiest way to change the given settings.

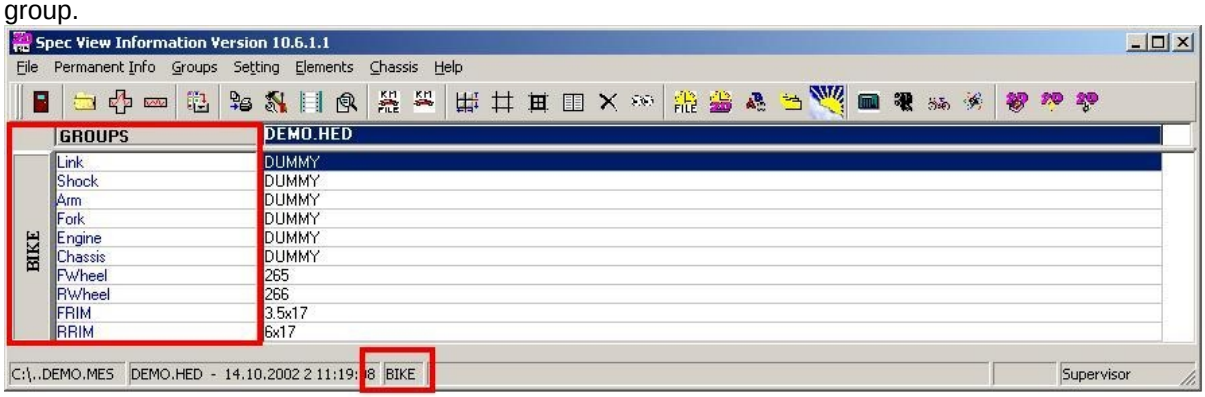
Shortcut:	Function:
[CTRL +]	Increase number of lines of the active group by one
[CTRL -]	Reduce number of lines of the active group by one
[ALT + A]	Fir all groups into the desktop
[CTRL + S]	Maximize height of all groups (depends on number of entries of the group)
[CTRL +B]	Maximize height of the active group only
[CTRL +D]	Set height of the group according its namespace (completely readable)

The editing functions you find on the toolbar as well. These are the corresponding buttons.



You activate a group either by clicking on it or travelling through the groups with the **<TAB>** key.

The active group is shown at the bottom of the SpecView window. In the example is it the [BIKE] group.



You can also select the groups 1..7 with the shortcuts **<ALT 1 – ALT 7>**:

1.3.3.2 Saving your layout

All the settings for the layout of your SpecSheet are saved to the file **<SpecSet.ini>** in your actual WinaRace directory.

Tip: Remember to use the import function of the <2D Setting Wizards> when you wish to save your personal settings into an updated version of the 2D software.

Let's se now how to create and save a new layout:

- From the main menu choose **<Groups./ Modify and save group height(s)>** or use the key **<F8>**.
- You will find the following window:

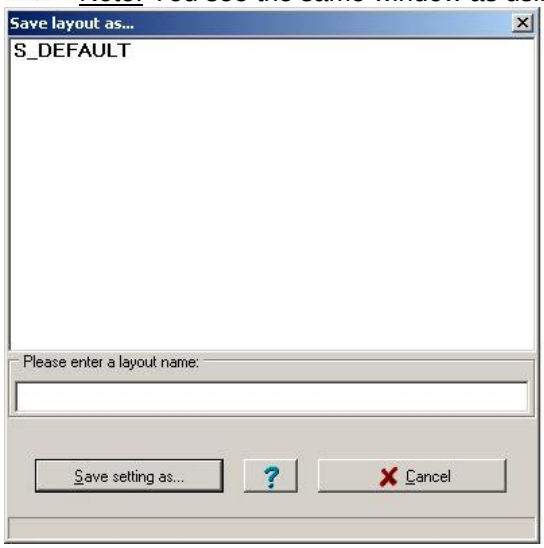


- The groups loaded at this moment (actually maximal 7) (left side)
- Number of visible lines for the selected group (at the right side). Modify it

1. with the mouse
2. entering a number
3. with a cursor key

- Finally save your new layout with **<Save settings as...>**

Note: You see the same window as using from the main menu **<Groups / Save Layout as...>**



1.3.3.3 Define your individual start layout

You can define the initial layout for. By default is it the last setting you used leaving the program the last time.

This default option you modify with:

- Select **<Settings / Options>** from the main menu or use the shortcut **<Alt + F9>**.
- The actual setting is identical with the default one: Loading always the last layout and the layouts are sorted alphabetically:



- Unselect **<Use last layout>** if you want a different one. Now pick your layout from the pull down list of the layouts. In the other case the default **<S_DEFAULT>** will be used.

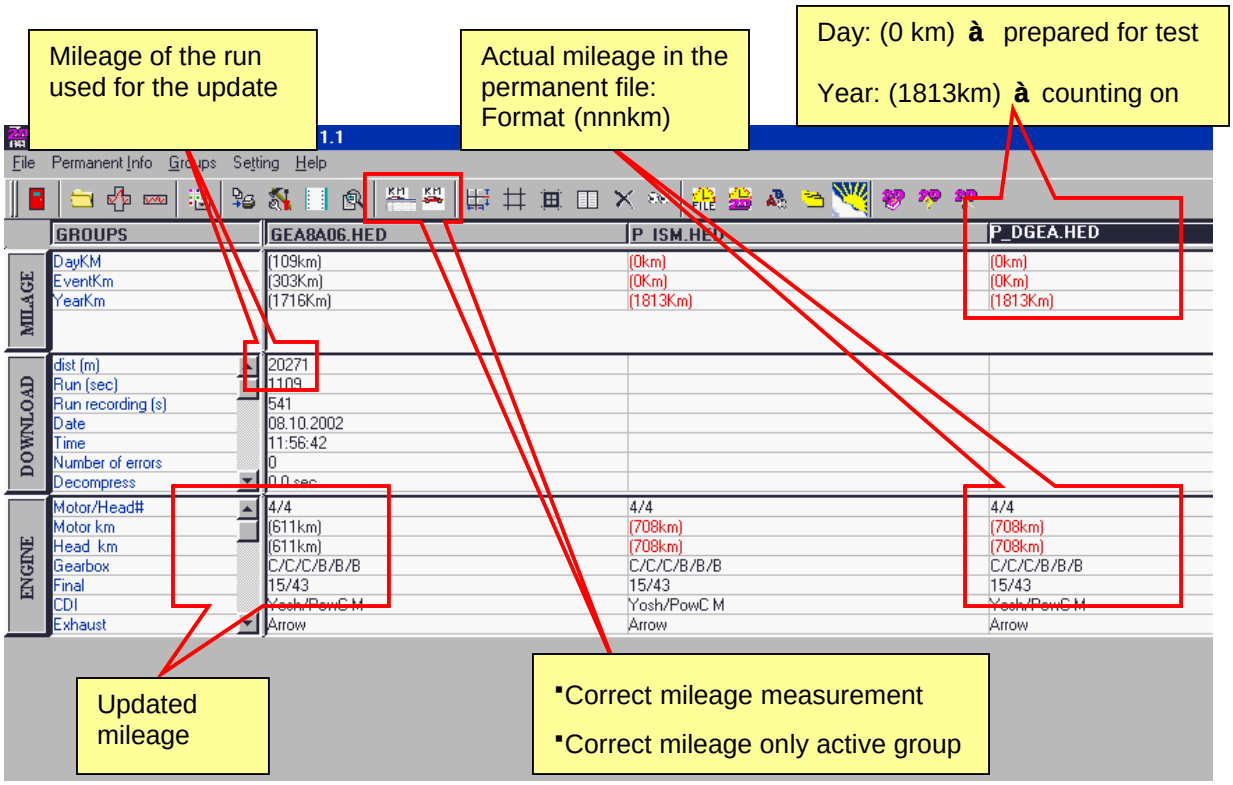
It has the following entries:
[S_DEFAULT]
BIKE=8
FORKSET=7
SHOCKSET=7
SETTING=8
LOADBIKE=26
CARBURETOR=1
WHEELS=1

Or: the 1st. group <BIKE> with 8 visible lines, the 2nd. Group is <FORKSET> with 7 lines etc.

1.3.4 The MILEAGE function – counting kilometres

SpecView includes a function to make an automatic follow-up of the mileage of single parts or automatic statistics about the kilometres done.

Just include MILEAGE entries (Format **"(*n*Km)**"), where "***n***" stands for the kilometres to start from counting) in your groups in the permanent header files and SpecView will update them a download time with the data gathered by the logger, copying them as well into the *.HED files of the measurement.



NOTE:
If you make changes to your permanent info file be sure to save them before the next download and read them every time after a download from the saved file. If you miss that, WinIt will update the MILEAGE entries in the saved file and the data on the screen will be different from the modified file or you will overwrite the corrected MILEAGE data with a later save!

1.3.5 The SECTIONTIMES and the GEAR groups

From the Analyzer you will create additional groups for your actual measurement with the **<File / Write section times to the spreadsheet>** command or making use of **<Wizards / Gear calculation>**.
In the SECTIONTIMES group you find the data from the **<Alt-s>** function (Lap time, section times, ideal lap).

The gear groups document the calculated gear speeds and the parameters used for the calculation.
It creates the groups GEARBOX, GEAR_WIZARD and SPECIAL CHANNELS.

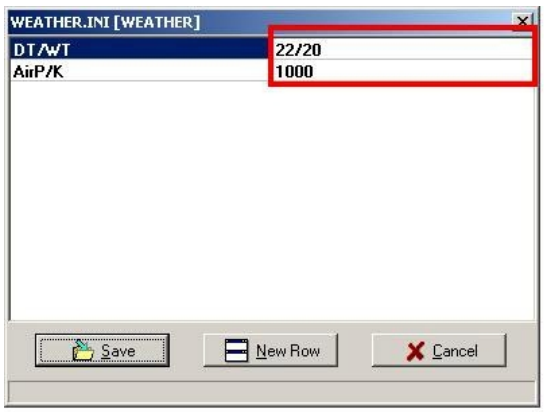
1.3.6 Actual weather data – The file ”Weather.ini“

With the file ”Weather.ini“ you have the possibility to calculate correction factors automatically from the wet/dry temperatures and the atmospheric pressure.

The ”Weather.ini“ file has to be placed in the parent directory of the actual EVENT to be recognized by the program!

The program provides two ways to maintain the data of Weather.ini:

1. In View with **<ALT + W>**. Update the values for DT/WT



2. Or via its button at toolbar of WinaRace



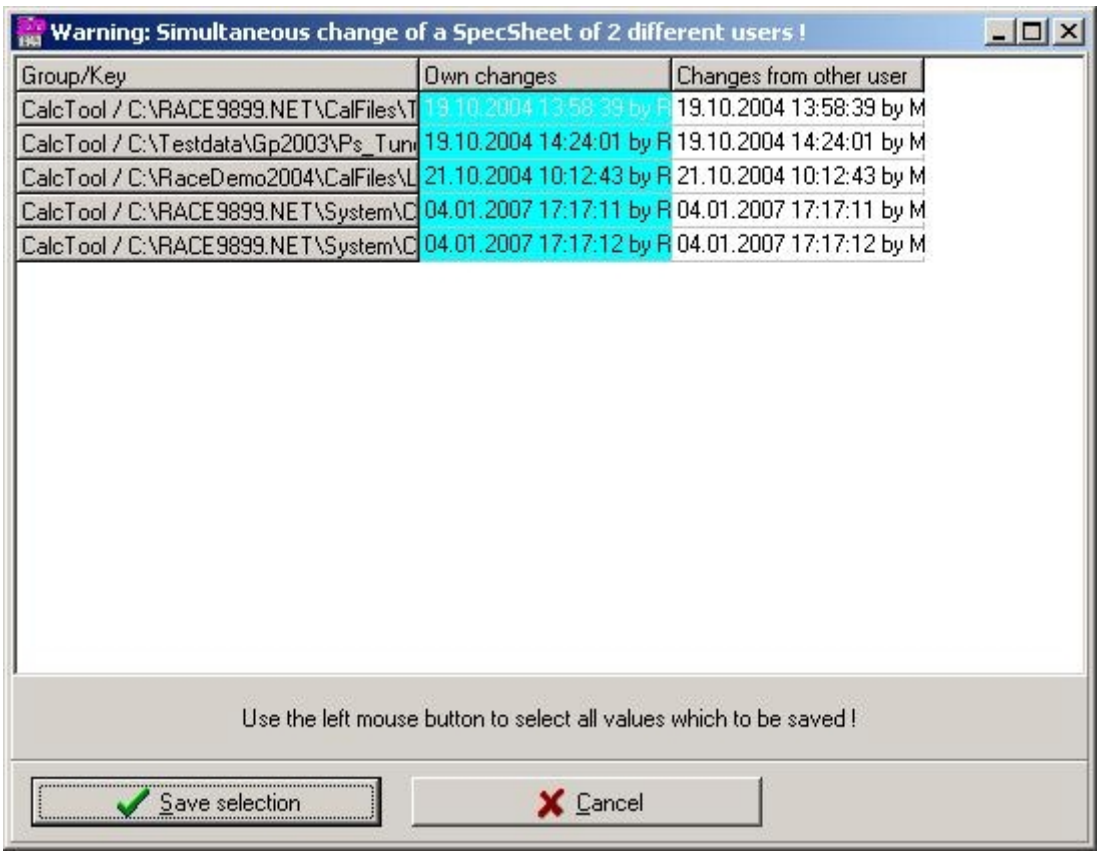
1.3.7 Simultaneous change of a SpecSheet of 2 different users

In particular in a network it is possible that more than one user load and change SpecSheets at the same time. That network access in SpecView is possible starting from the “Full license"
Around to prevent the changed SpecSheet data by several users to be mutually overwritten, a function was integrated into the software, which prevented this overwriting.

The examination whether SpecSheet data by 2 different users were made at the same time, is done by the following actions of the user:

1. If SpecSheet changes to be stored (=shortcut [ALT+S])
2. If SpecSheets to be removed (=shortcut [CTRL+R])
3. If SpecSheets to be exchanged (=shortcut [CTRL+E])
4. If the program SpecView is terminated and changes of the user were made.

If simultaneous changes of 2 different users were recognized by the software, the following window is shown.



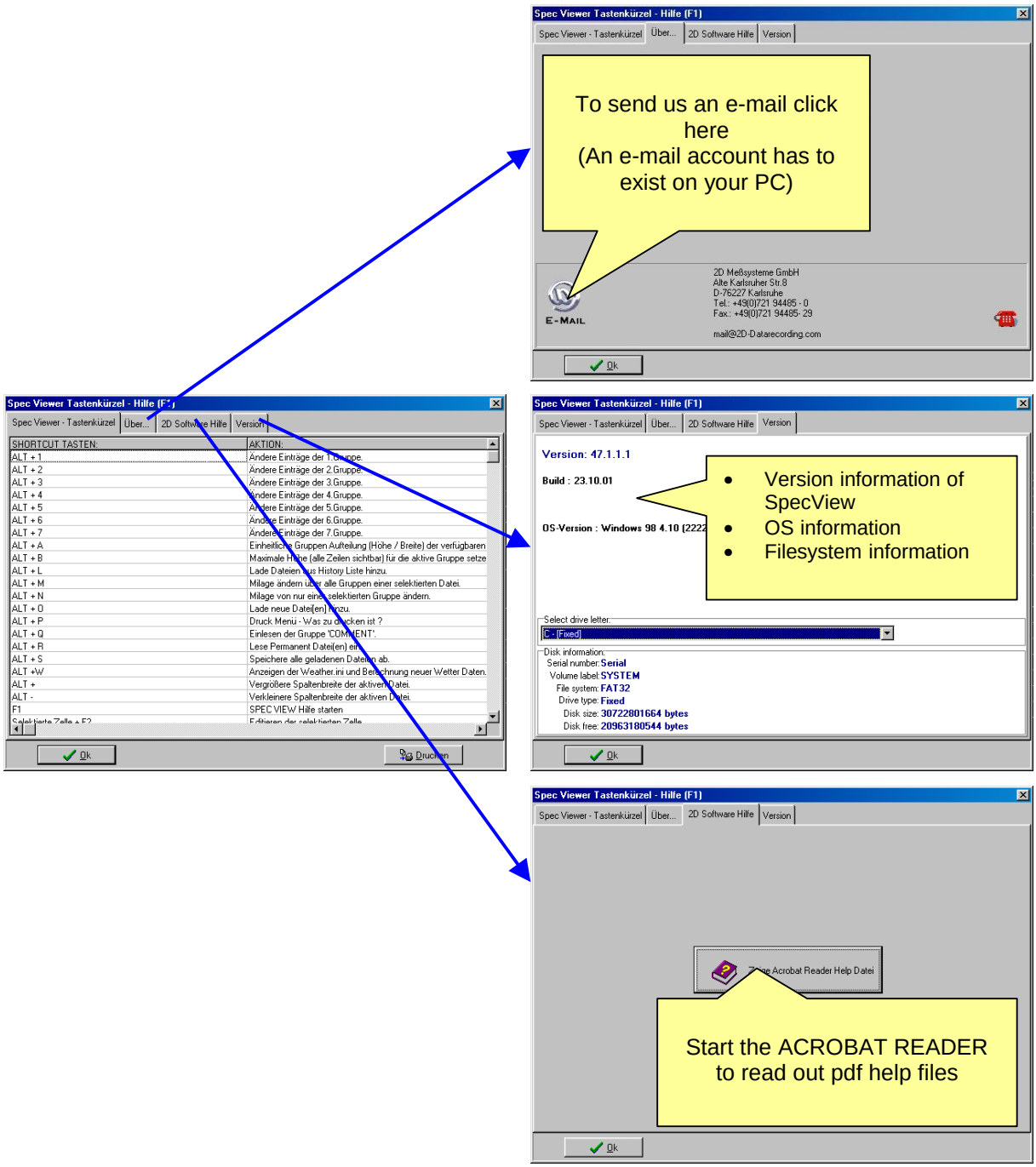
All changes in all groups were displayed. Whether the own changes to be taken or the changes from the other user must decide by the user. Own changes are indicated in the second column (=named with own changes), changes from the other user accordingly in the third column (=named with changes from other user).
Which changes to be stored finally is be decide by the “turquoise selection” from the user.
The storing of the appropriate selection must be done by the user finally with the button <Save selection>

1.4 Working efficiently with the function keys

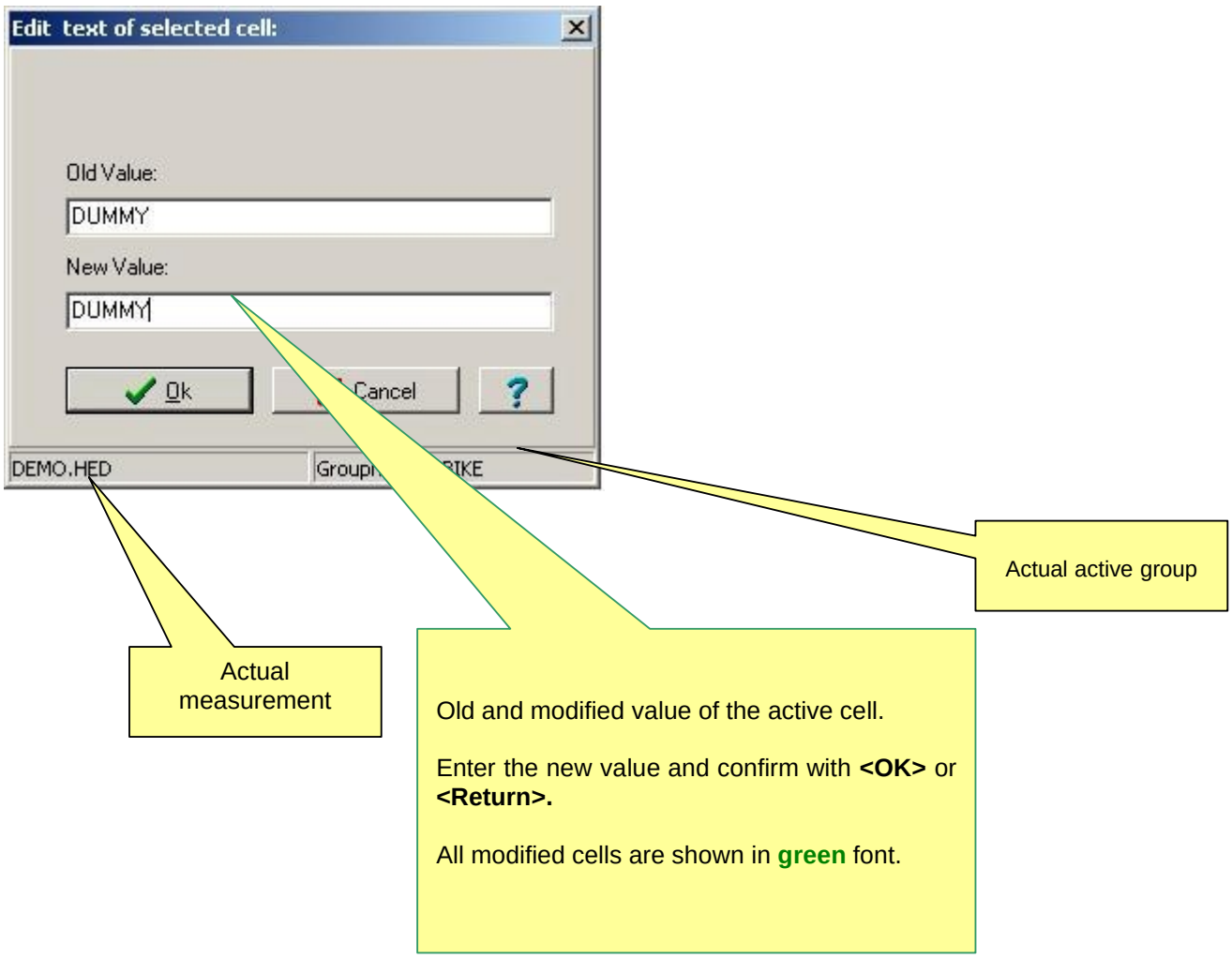
1.4.1 The function key <F1> – Online help and information about the version

Pushing **<F1>** you receive information about:

- The key short cuts for SpecView
- Information about 2D (how to contact).
- Help files in PDF format (Acrobat Reader required)
- Information about your SpecView version and your actual PC configuration



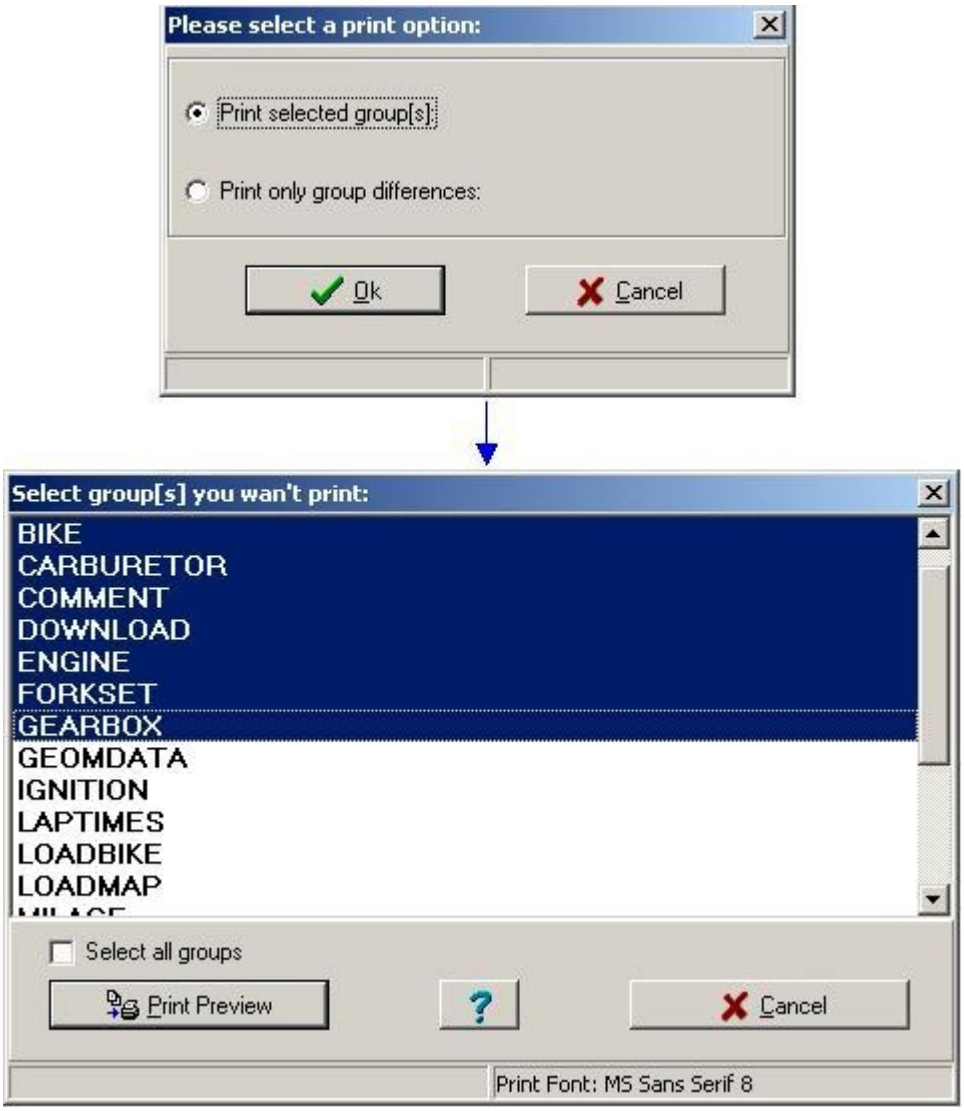
1.4.2 The function key <F2> – Editing the active cell



1.4.3 The function key <F3> – the print mode

Direct printing of selected groups.
Choose between:

1. **<Print selected group(s)>** – print the complete information of the selected groups
2. **<Print only group differences>** - Only meaningful with more than one group loaded! All entries are compared with the values of the first measurements – the leftmost - and only different entries are printed.

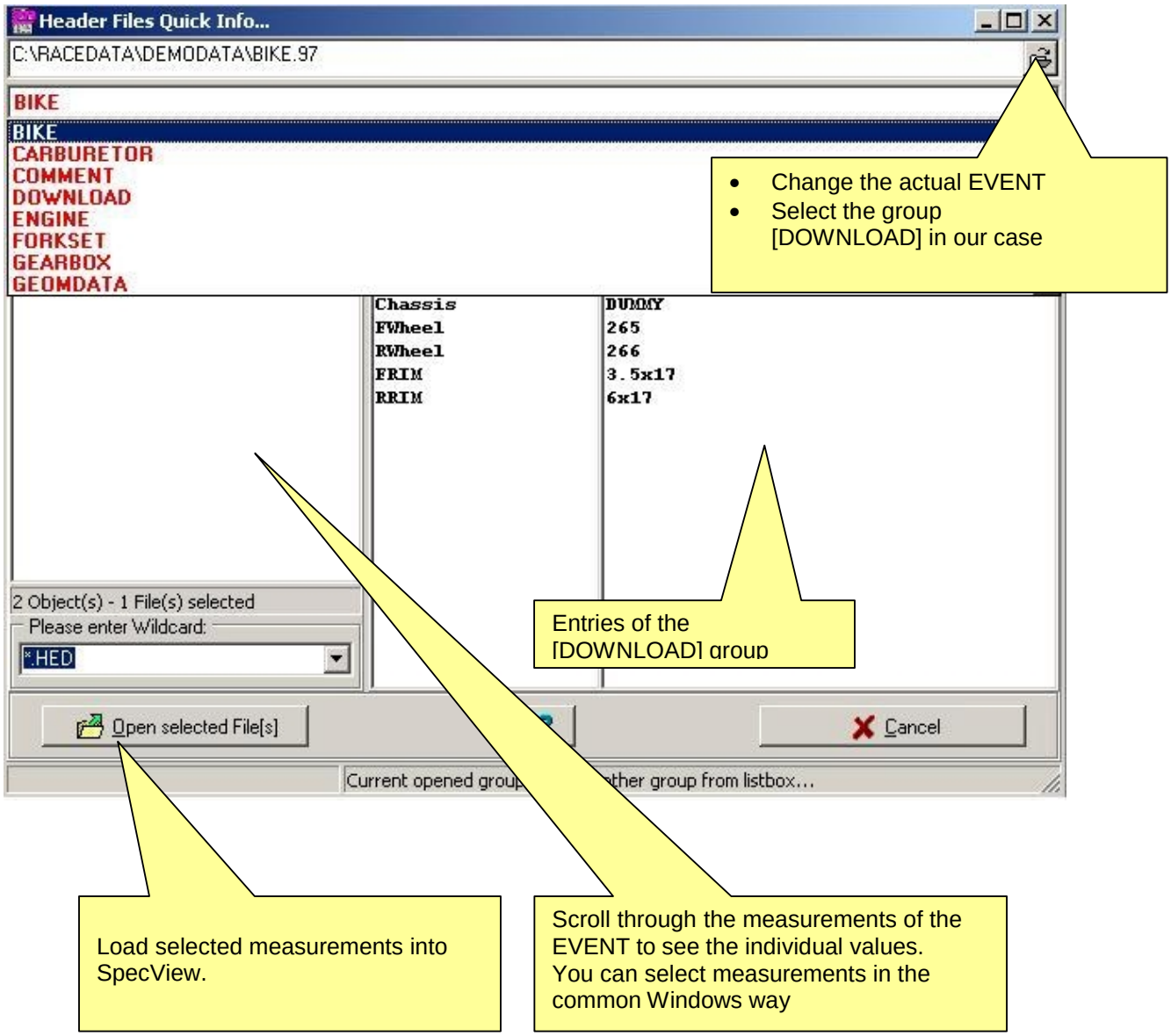


3. Confirm your selection with the button <Print Preview> to get a detailed print preview.

1.4.4 The function key <F4> – Quick info measurement/group

To have a quick look on one special group for all SpecSheet files of the EVENT you have a dedicated function:

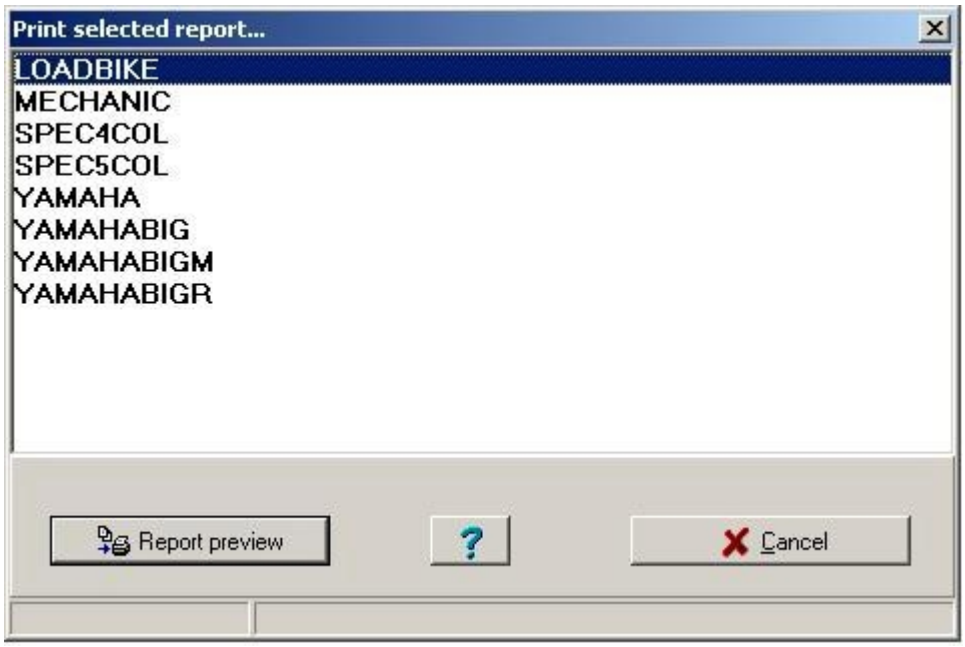
1. From the main menu you select **<File / Quick info>** or push just **<F4>**.
2. Now you can go to the EVENT your are interested in, select from the different groups, see the content of a specific measurement and you mark the measurements you want to load into SpecView



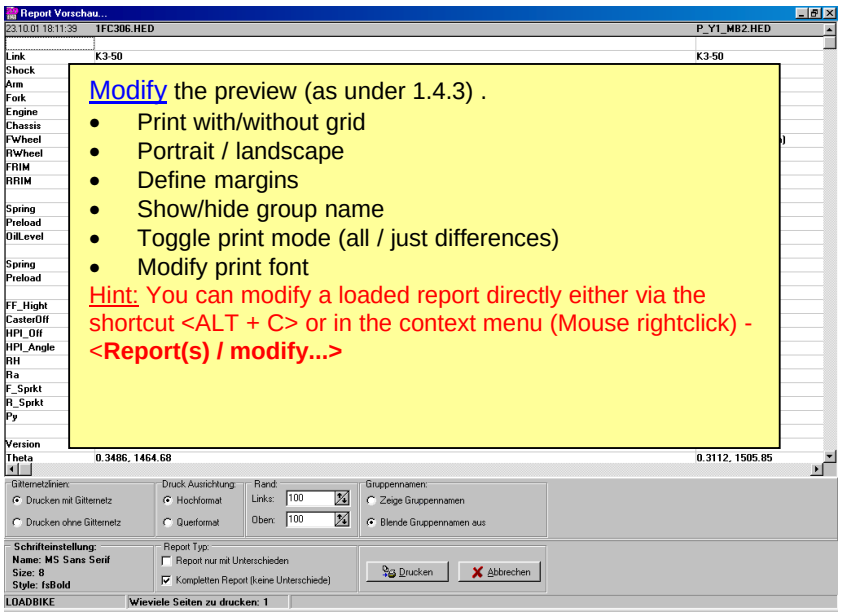
1.4.5 The function key <F5> – Direct access to report files

You access your report files with the shortcut key **<F5>**:

1. Select a report from the list



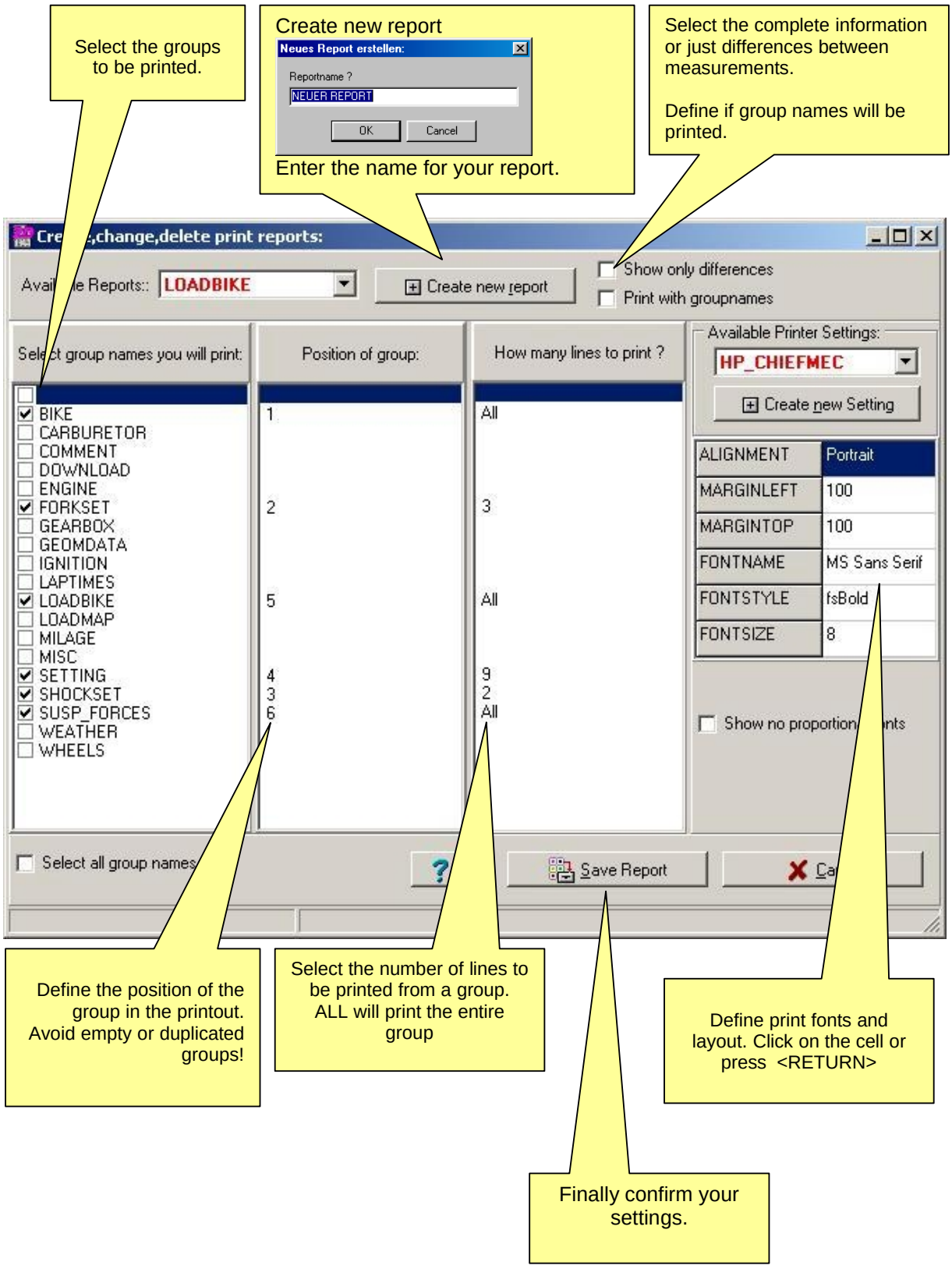
2. Select **<Report preview>.**



3. Print the selected report with **<Print>**.

1.4.6 The function key <F6> – Modify your own reports

With **<F6>** you can easily modify existing reports or create new ones:

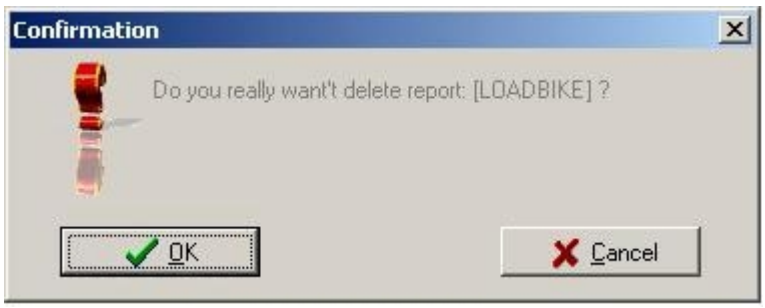


1.4.7 The function key <F7> – Delete reports

To delete a report you use the function key **<F7>** from SpecView:



Select the report you want to delete and push **<Delete report>.**

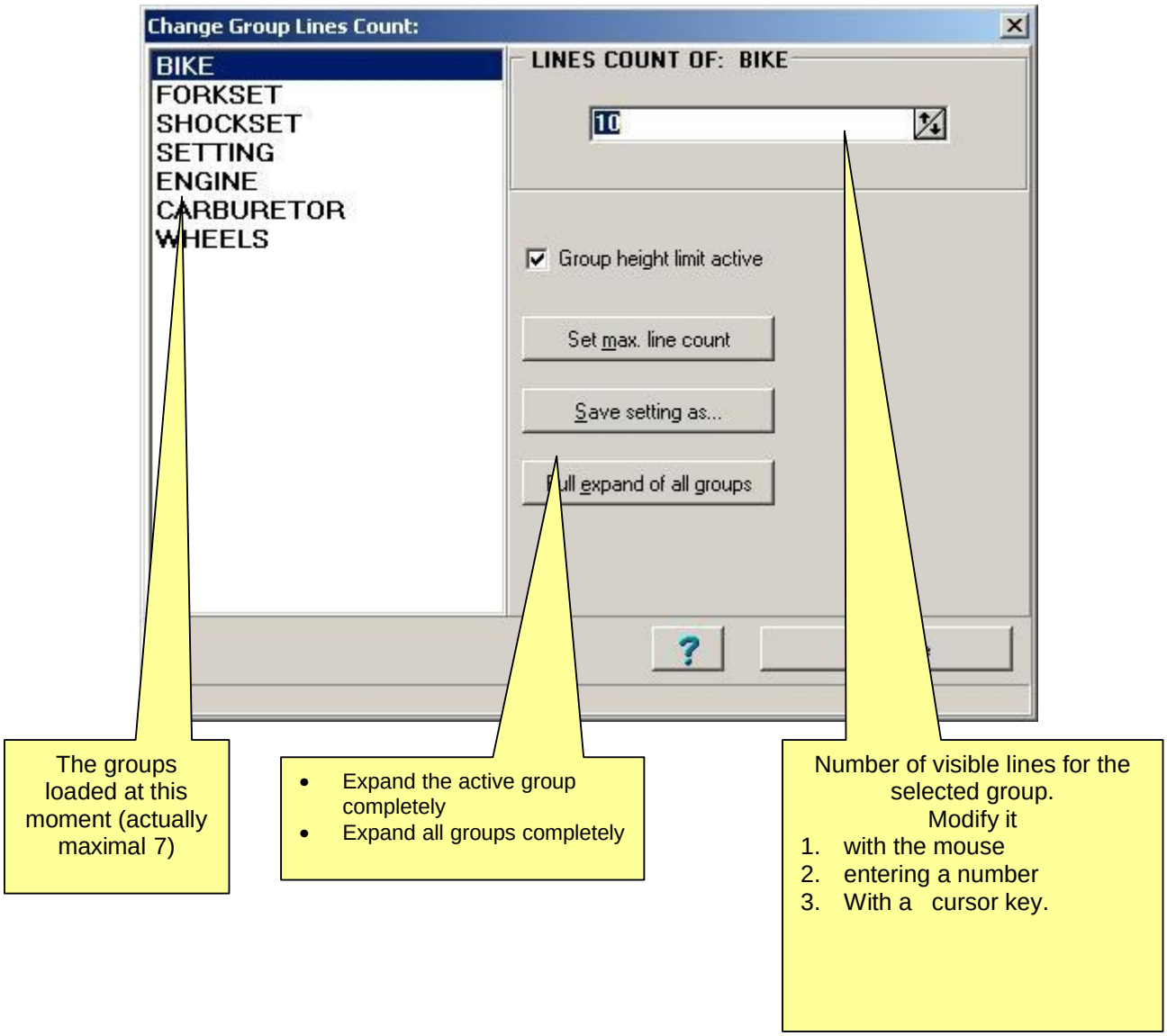


The program asks you to confirm your selection. The deletion becomes effective with **<OK>.**

1.4.8 The function key <F8> – Modify group height

The easiest way to change the number of visible lines of a group is using **<F8>**.

Select from the list the group where you want to modify the number of lines as shown in the window.

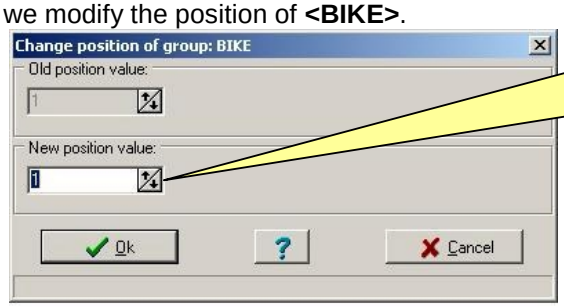


1.4.9 The function key <F9> – change the position of groups

Sometimes you need to interchange the position of two groups in the SpecSheet.
Select the group you want to modify with a mouse click or with the **<Page UP>** & **<Page Down>** keys.
Use from the main menu **<Groups>** the entry **<Exchange position of active group>** or key **<F9>.**



In our example we modify the position of **<BIKE>**.



Enter the new position directly, use the mouse, or the **[+ / -],** or the **[Page Up / Page Down]** keys!

Confirm the new position with **<OK>.**

1.4.10 The function key <F10> – the direct way to the main menu

With **<F10>** you access directly the main menu of the program. The first entry **<File>** is selected and you can navigate through the menus with the cursor keys (up/down/left/right) to reach the function you want.

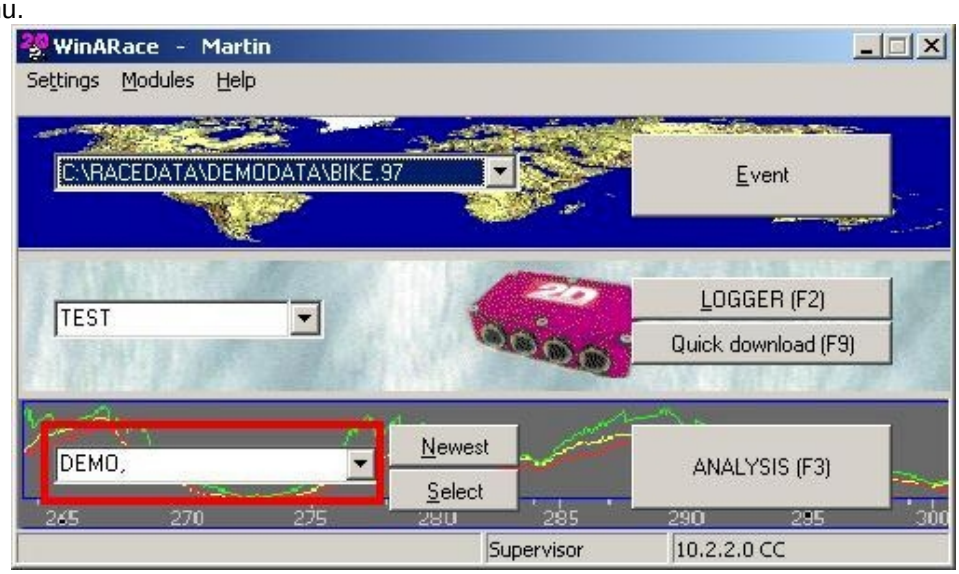
1.4.11 The function key <F11> – toggle window size

With **<F11>** you can change the actual window size of SpecView from maximum to small. If you modify the size of the small window with the mouse, the new setting will be memorized for the future. Pushing <F11> another time will restore the maximum size.

1.5 Load additional measurements

1.5.1 Load header files from the actual event

The SpecSheet file SpecView will use initially is defined as the “actual measurement” at the WinaRace main menu.



Once you have started the SpecView (see also chapter1.1: How to start the program) you can load additional SpecSheet files from the actual event with the shortcut **<CTRL + O>,** the main menu entry **<File / Load header file>** or with this toolbar button.



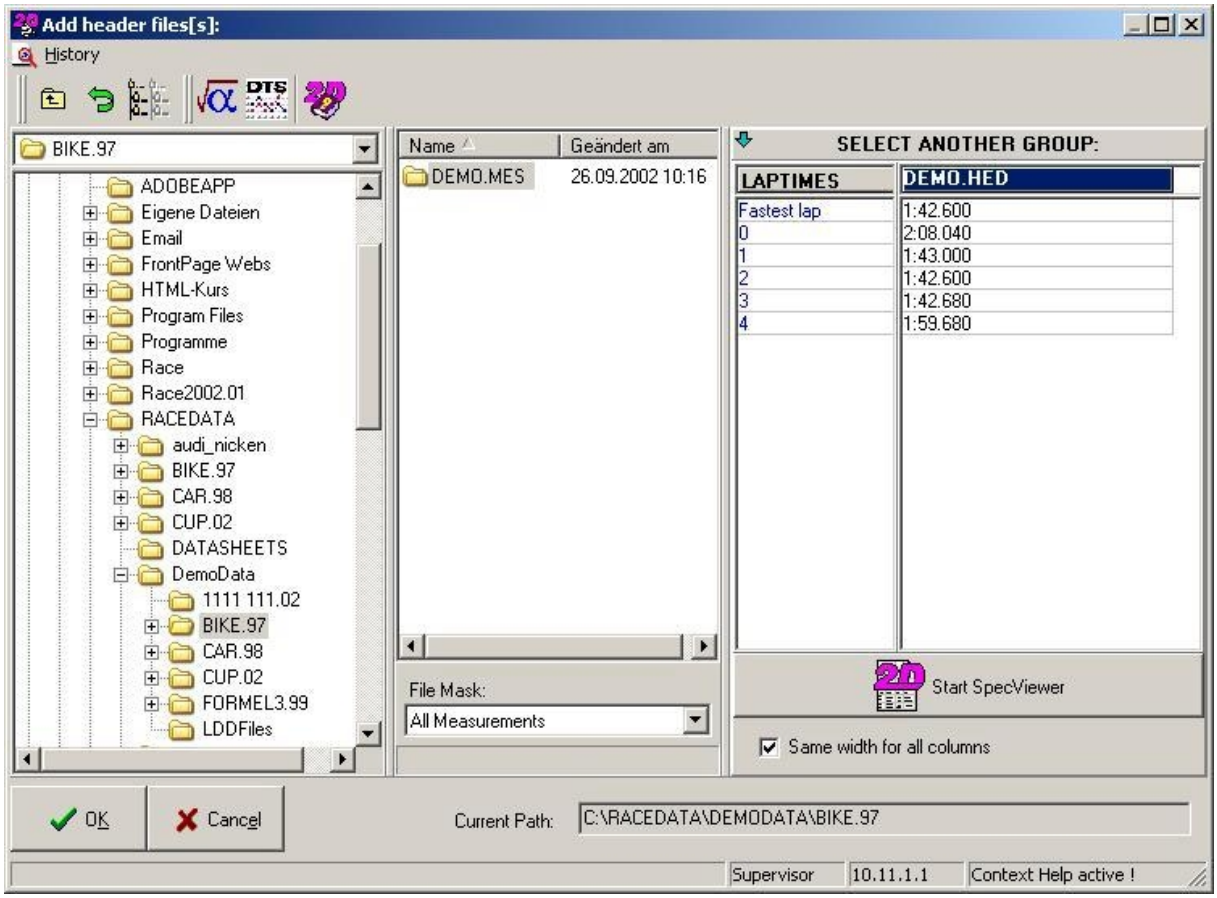
The window to be shown is perhaps already familiar to you from the option **<Select>** at the main menu of WinaRace

1.5.2 Load measurements from a different EVENT (change EVENT)

To compare data from different events (for example from the race last year at the same place) you select from the main menu **<File / Quick info>** or you use directly the function key **<F4>** to open the quick info window. Here you change the actual event clicking on **<...Parent>**



An alternative way is using **<File / Load header file (Change event)>** from the main menu.
You get the same window as selecting the **<Event>** at the main menu of WinaRace. The information is shown from the <Event.ini> file.



The window is divided into three areas:

- The tree view at the left side for event changing
- The panel in the middle for choosing the 2D measurements (SpecSheets)
- The panel at the right side for general information. If you select a 2D Event you will get special event information. If you select a 2D measurement you will get SpecSheet information for each selected measurement.

Tip: You can select more than one measurement at a time using the same technique as working with the Windows Explorer: To select a whole block maintain <SHIFT> pressed while marking the start and the end of the block with the mouse. To select non-continuous entries maintain the <CTRL> key pressed and mark the measurements one by one with the mouse.

1.6 Getting help – using context sensitive help modules

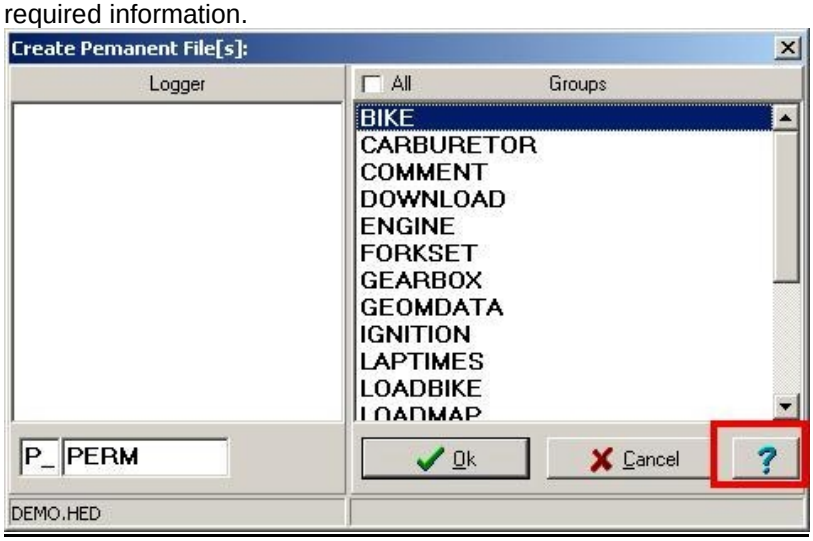
From Software version 2002.xy the principal 2D software modules contain context sensitive help functions. You start them with the function key **<F1>**.
"Context sensitive" means that the help function will try to give you the information that is relevant in your actual context of work.

Please note: Not for every component a specific help is available. We try to focus on the most important ones.
We provide three different access methods to select a quick help:

1st.: Select the specific menu entry
Select an entry from the menus, for example **<Setting / Exchange position of active group>** and then push **<F1>**. The help for this function will be shown.



2nd.: using the help icon
In many windows you will find a help button with a small blue **< ? >** icon. Press it and you get the required information.



3rd:

Just press **<F1>** at any moment. If the active component is linked to help content it will be shown. In the other case you get to the start page of the help module for the program.

2 - Extended functions

2.1 Printing via Excel

In SpecView and also the analysis tool Analyzer you can easily export data to Excel and print them from there. An inexperienced user will find predefined Excel formats. They are part of the standard scope of the 2D software packages.
An advanced user can create his individual Excel formats. In our help-files you find how to proceed and which syntax to use. Therefore select **<File / Get context help for printing via Excel>.**

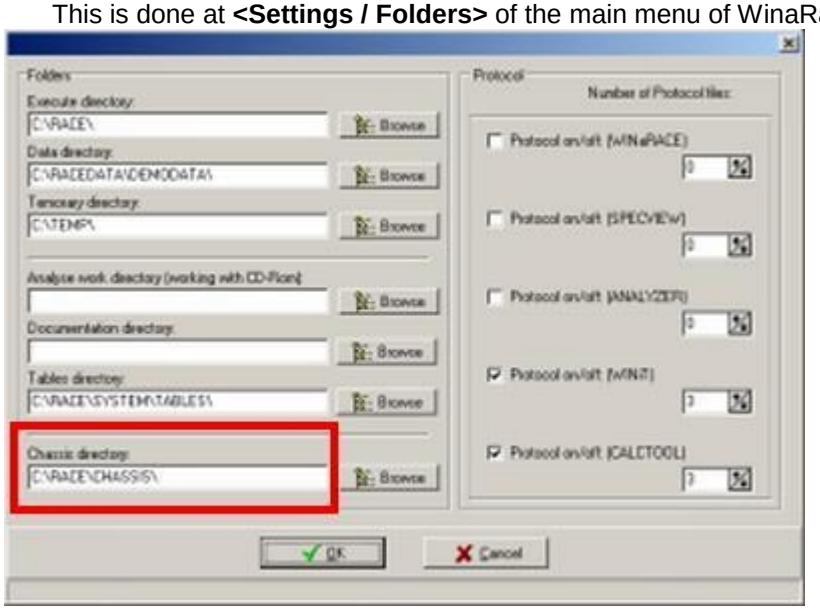
The functions you can use are:
- **<File / Print Excel direct>**
- **<File / Get Excel preview>**

The first function will print the selected format directly.
Use the second function if you prefer a preview with the possibility to modify the format and start printing manually from Excel.

Our CD-ROM contains under the selection **<Show pdf files / Short introduction>** an additional help file about the topic.

2.2 Optimise your motorbike setting – The CHASSIS add-on program

The CHASSIS program is an add-on not included in the normal scope of delivery of our software. It is exclusively targeted towards high-end professional users !.
To be able to work with CHASSIS the following points are supposed:
- The program requires an additional CHASSIS software license from 2D
- You need complete and valid CHASSIS data sets.
- Assign the correct directory for your CHASSIS data.
  This is done at **<Settings / Folders>** of the main menu of WinaRace



The CHASSIS user will find two additional main menu entries **<Elements>** and **<Chassis>** and four complementary toolbar buttons.



Appendix A: List of key short-cuts

Shortcut	Action:
ALT + 1	Modify name of the 1.group
ALT + 2	Modify name of the 2.group
ALT + 3	Modify name of the 3.group
ALT + 4	Modify name of the 4.group
ALT + 5	Modify name of the 5.group
ALT + 6	Modify name of the 6.group
ALT + 7	Modify name of the 7.group
ALT + A	Same layout (height / width) for all shown groups
ALT + B	Expand the active group (all rows visible).
ALT + C	Open the <CHASSIS> program – optional! Requirements: see chapter 2.2 The Chassis program
ALT + D	Open the menu: **<File>**
ALT + E	Open the menu: **<Settings>**
ALT + G	Open the menu: **<Groups>**
ALT + H	Open the menu: **<Help>**
ALT + I	Open the menu: **<Permanent Info>**
ALT + L	Read files from the HISTORY
ALT + M	Modify MILAGE active file (all groups)
ALT + N	Modify MILAGE active group only
ALT + O	Load additional SpecSheet file
ALT + P	Print menu – select items to be printed (all- / just differences and the groups)
ALT + Q	Modify group [COMMENT] (Add comments to measurement)
ALT + R	Load permanent info files. (All files with P_*.HED at the parent directory of the actual EVENT directory)
ALT + S	Save all loaded files. To be confirmed by the user!
ALT + T	Open the <CHASSIS> program – optional! Requirements: see chapter 2.2 The Chassis program
ALT + W	Show and edit the <WEATHER.INI> file. This file has to be in the parent directory of the actual EVENT directory.
ALT + X	Exit program – save modifications after confirmation
ALT +	Increase column width of the active SpecSheet file
ALT -	Decrease column width of the active SpecSheet file
F1	View sensitive help for this module.
F2 + active cell	Edit active cell Note: You can only change the value of a cell and not the cell identifier (Left at the group identifier). Only in the case of a new empty group (<CTRL + B>) you can edit the identifier as well!
F3	Print preview: All loaded files and the selected groups. Print all / Print differences: All files are compared with the first one and only the differences are shown.
F4	Show overview SpecSheet files
F5	Show existing reports and start the print preview with the selected report.

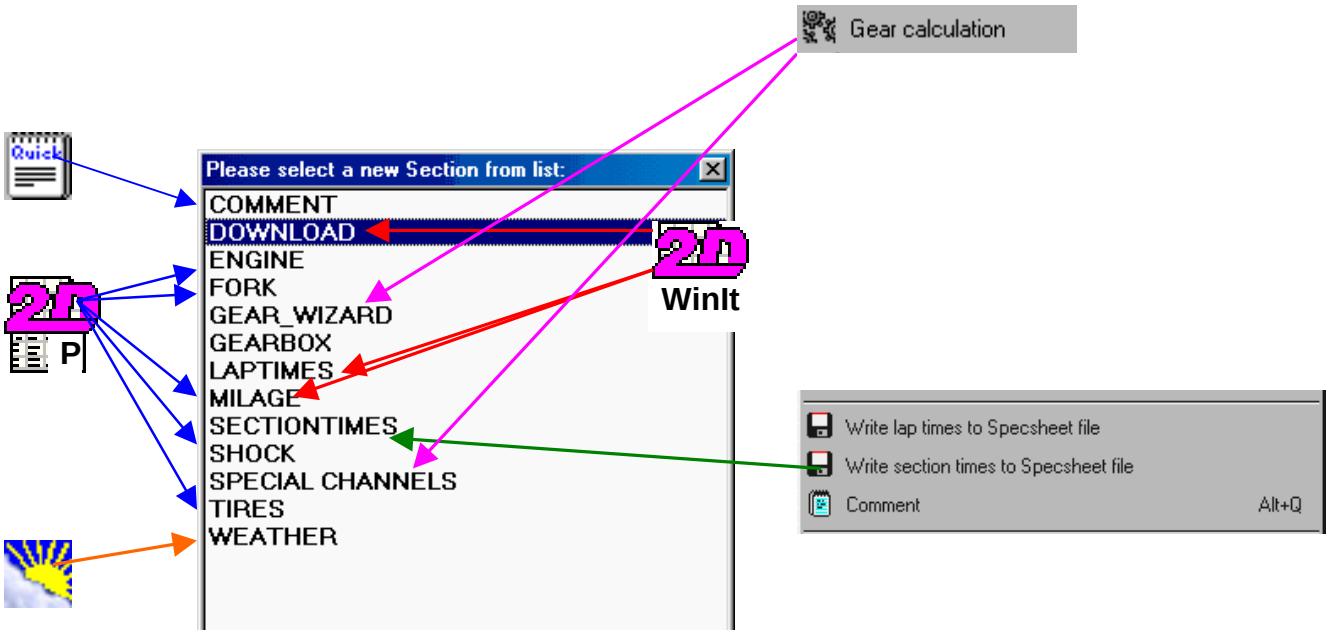
F6	Modify or create new report
F7	Delete report after confirmation
F8	Modify and save number of lines of the groups.
F9	Modify position of the active group
F10	Open main menu of SpecView. Navigate with the cursor keys through the different menu entries.
F11	Toggle window size: Reduce main window/Maximize main window
CTRL + DEL	Unload active SpecSheet file with confirmation of saving of modifications
CTRL +	**Modify group height:** Show an additional line of the active group Note: If the <Group height limited> is activated (menu <Settings>) only a maximum of lines to be shown is allowed!
CTRL -	**Reduce group height:** Show one line less of the active group!
CTRL + A	Load the active file again
CTRL + B	Add a new empty line to the active group. Modify with <F2>!
CTRL + C	**COPY function.** Copy text from the active cell to the clipboard
CTRL + D	**Modify all group heights:** Expand all groups to show **the complete name**. Note: The new height depends on the length of the its name
CTRL + E	Exchange the active SpecSheet file by another selected one.
CTRL + O	**OPEN function:** Load an additional file
CTRL + R	**REMOVE function:** Remove the active file (with confirmation in case of modifications)
CTRL + S	**Modify group height:** Show all the groups (max. 7 at this time) with all their entries. The number of lines depends on the number of entries
CTRL + V	**PASTE Function:** Paste the text from the clipboard (see <STRG + C>) into the active cell
CTRL + TAB	**Combined COPY + PASTE function:** Copy the content of the active cell into its right neighbour cell.
CTRL + ALT + TAB	**Combined COPY + PASTE function:** Same as <CTRL+C> and <CTRL+V> in series; but simultaneous) The "copy + paste" action (related to the current value) is done here line by line in difference to function <CTRL+Tab> which is processed cell by cell.
RETURN + active cell	**Edit active cell** Note: You can only change the value of a cell and not the cell identifier (Left at the group identifier). Only in the case of a new empty group (<CTRL + B>) you can edit the identifier as well!
Page Up Page Down	Change active cell
Home End	Change active cell
Cursor left Cursor right	Change active cell
ALT + F4	Exit program– to be confirmed in case of modifications
Any character or number	**Edit active cell** Direct modification of the active cell Note: Also this first character will be entered!

Appendix B: Glossary

Topic:	Comment:	Help:
CHASSIS Programm	Graphical and analytical add-on to improve chassis settings for motorbikes. Requires the program Chassis.exe and chassis data sets for your bike	Chapter 2.2 - The Chassis add-on program
Download	Reading data stored in the 2D datalogger into the PC. Done by the program WinIt.	
EVENT directory	Directory for a group of measurements (actual data directory)	Introduction – How to create a EVENT directory
Header file	Files the program SpecView is using. The files are created at Download time and have the same name as the measurement itself. The file extension for these SpecSheet files is - *.HED.	Introduction
Layout	View of the actual loaded data groups in SpecView. Modify them with <Alt 1 - Alt 7>. The layout defines the groups to be shown (max.7 actually) and the number of visible lines per group. Use the functions <Load layout> and <Save layout> from the main menu entry <Groups> to administer layouts.	Chapter 1.3.3 – administrating Layouts
Permanents info files	Permanent info files contain the information you want to maintain permanently to be able to understand and analyse your data (vehicle settings, environment). They have the same structure as the header files and are used to merge the download data with the setting data to create the SpecSheet file for a specific measurement. They need to have the prefix “P_” and are located in the parent directory of the actual event.	Chapter 1.3.1 Administration of Permanent info files
Report function	Quick method to load and print predefined formats for up to seven groups from various measurements. Use <F6> to create and modify reports, <F5> to load them and <F7> to delete reports.	Chapter 1.3.2 Administration of Reports

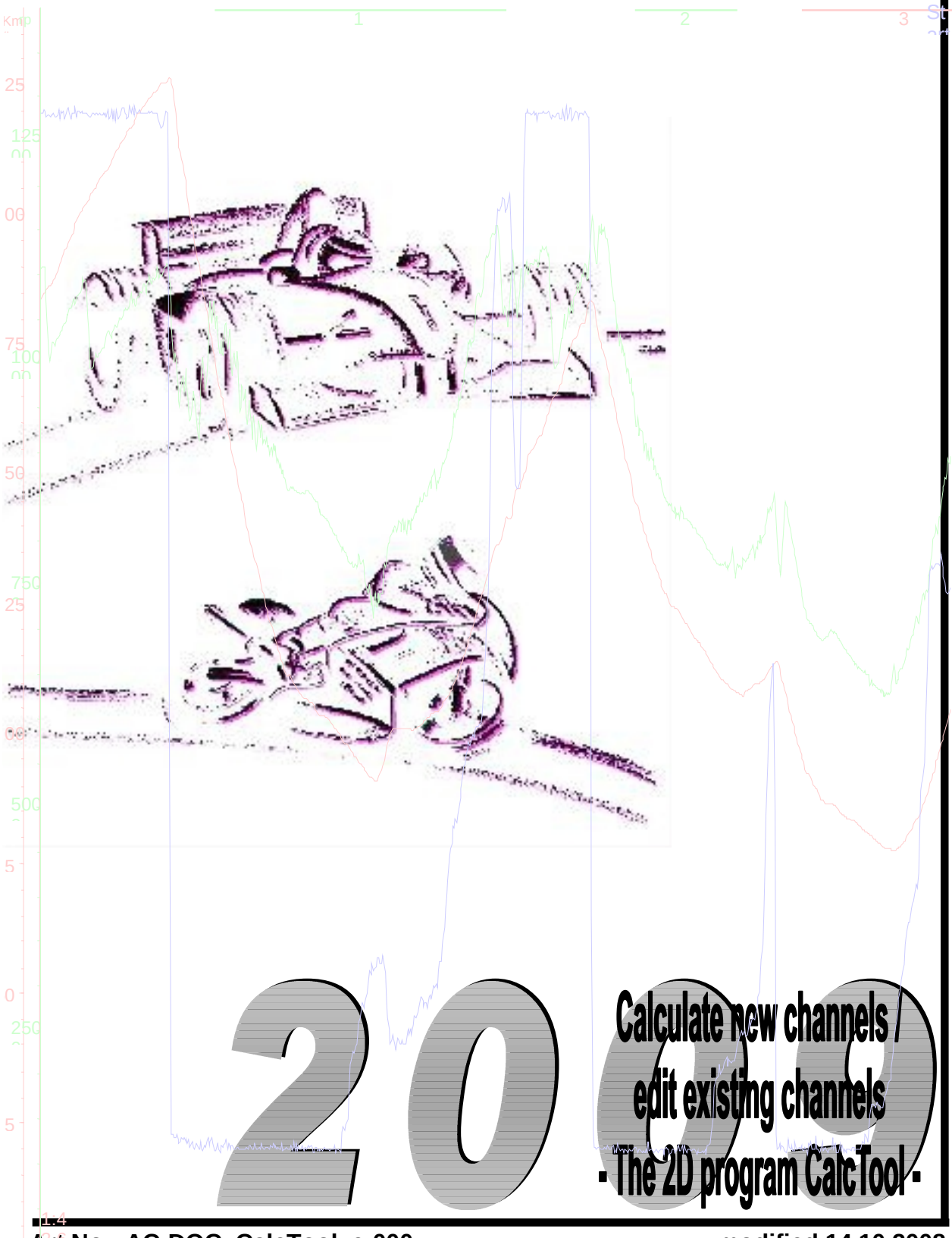
Appendix C: The different sources for the groups of a SpecSheet

Group	Created	Modified	From	When
COMMENT	User	User	SpecView/Analyzer/WinIt	Anytime
DOWNLOAD	WinIt		WinIt (<F9>)	At download
Engine/Fork/Tires…	User	User	SpecView Permanent Info	Previous download
Mileage	User	WinIt	SpecView Permanent Info	Modified at download
WEATHER	System	User	Weather button	
SECTIONTIMES	User triggered		Analyzer	
GEARBOX/SP.CH.	User triggered		Gear wizard at Analyzer	



- English -

2d-datarecording.com



2009

Calculate new channels / edit existing channels

- The 2D program CalcTool -

Art.No.: AC-DOC_CalcTool_e-000 modified 14.10.2008

0. INTRODUCTION 4

1.PRE- AND POSTPROCESSOR 10

1.1 PRE-PROCESSOR-FUNCTIONS 10
1.1.1. Include-files 10
1.1.2. Conditional execution 10
1.1.2.1. Condition IfExists 10
1.1.2.2. Condition IfNotExists 10
1.1.2.3. Condition IfLaptimesExist 11
1.1.2.4. Condition IfNotLaptimesExist 11
1.1.2.5. Condition IfSpecValueExists 11
1.1.2.6. Condition IfNotSpecValueExists 11
1.1.2.7. Condition IfSpecValueContains 12
1.1.2.8. Condition IfNotSpecValueContains 12
1.1.3. Entering values at runtime 13
1.1.3.1. Entering a channel name: EnterChannel-function 13
1.1.3.2. Entering a numeric value: EnterValue-function 13
1.1.4. Substitution of place holders 13
1.1.4.1. Special channels 14
1.1.4.2. Predefined constants 14
1.1.4.3. Specsheet-variables 15
1.1.4.4. Variables 17
1.1.4.5. Channel properties 17
1.1.5. Calculated mileage 18
1.2 POSTPROCESSOR-FUNCTIONS 18
1.2.1. Deleting channels 18
1.2.2. Hiding channels 18
1.2.3. Unhiding hidden channels 18

2. AVAILABLE FUNCTIONS 19

2.0 FORMAT OF NUMERIC PARAMETERS 19
2.1. STANDARD MATHEMATICAL FUNCTIONS 19
2.1.1. Addition 19
2.1.2. Subtraction 19
2.1.3. Multiplication 20
2.1.4. Division 20
2.1.5. Modulo 20
2.1.6. Integer division – DIV 21
2.1.7. Rounding to whole numbers 21
2.1.7.1. The Round function 21
2.1.7.2. The Floor function 21
2.1.7.3. The Trunc function 22
2.1.8. The Const function – CONST 22
2.1.9. The minimum value function – MinValue 22
2.1.10. The maximum value function – MaxValue 22
2.1.11. The first value function – FirstValue 22
2.1.12. The last value function – LastValue 23
2.1.13. The average value function – AvgValue 23
2.2. LOGICAL FUNCTIONS 23
2.2.1. AND function 23
2.2.2. OR function 23
2.2.3. XOR function 24
2.3. TRIGONOMETRIC FUNCTIONS 25
2.4. ADVANCED MATHEMATICAL FUNCTIONS 27
2.4.1. Square Root 27
2.4.2. Logarithms 27
2.4.3. Absolute value 27
2.4.4. Minimum function 27
2.4.5. Maximum function 27
2.4.6. Derivation 28
2.4.7. Integration 28

2.4.8. SUM-function....29
2.4.9. Power-function....29
2.4.10. Exp-function....29
2.5. IF-FUNCTION....30
2.6. ADDITIONAL FORMULAS....30
2.6.1. Formula Integer....30
2.6.2. Formula Real....31
2.6.3. Table function....31
2.6.4. Table 2 function....31
2.6.5. 2D-Table function....32
2.6.6. 2D-Table search function....33
2.6.7. 3D-Table function....34
2.6.8. Filter function....35
2.6.8.1. Simple filter interface....35
2.6.8.2. Full filter interface....36
2.6.8.3. Filter with variable depth....37
2.6.9. Frequency reduction/increase....38
2.6.10. Sampling rate adjustment for non 2D samplingrates: FreqBase....38
2.6.11. Demultiplexing a multiplexed channel: MUX-function....39
2.6.12. Masking out used bits: UseBits-function....39
2.6.13 GPS Shift....40
2.7. BIKE AND CAR PHYSICAL FORMULAS....41
2.7.1. Speed....41
2.7.2. Speed2....42
2.7.3. Slip....42
2.7.4. Banking....43
2.7.5.BANK2ACC function....43
2.8. CHANNEL MANIPULATION....44
2.8.1. Shifting a channel....44
2.8.2. Combining two 16-bit channels....45
2.8.3. Combining two 32 bit channels....46
2.8.4. Changing the storage type....47
2.8.4.1. WORD-function....47
2.8.4.2. BINARY-function....48
2.8.4.3. Signed function....48
2.8.5. SWAP-function – Changing the byte-order of a channel....49
2.8.6. Changing dimension....49
2.9. SPECIAL FUNCTIONS FOR PHASE-CALCULATION....49
2.9.1. MaxHold - function....50
2.9.2. MinHold – function....52
2.9.3. FillFromBool – function....52
2.10. STOPPING EXECUTION....52
2.10.1. Abort calculation of group when an error occurred: OnErrorExitGroup....52
2.10.2. Abort whole calculation when an error occurred: OnErrorExitTotal....53
2.10.3. Abort whole calculation: ExitTotal....53
2.11. CALLING EXTERNAL PROGRAMS....53

3. HOW TO USE THESE FUNCTIONS IN ANALYZER....54

3.1. NAMING CHANNELS....55
3.2. REPLACING CHANNELS....55
3.3. THE LINK BETWEEN CALCULATION AND SPECSHEETS....56
3.3.1. Partial reading of SpecSheet values....57
3.4. AUTOMATIC CHANNEL-CALCULATION....57

4. TABLE OF ALL CALCULATION FUNCTIONS....58

APPENDIX A: – EXAMPLE OF A CAL FILE....63

APPENDIX B: THE LINK BETWEEN CALCTOOL AND SPECSHEETS....65

APPENDIX C: WHAT'S NEW ?....66

0. Introduction



CalcTool is part of the 2D software WinARace. It is used to create calculated channels from channels measured and recorded by a 2D Data Acquisition System.
CalcTool is called automatically from the communication software WinIt to linearize non linear channel data.
The user can define the channels to be calculated by writing a so called CAL-file, which is a simple text file containing the instructions for the calculation.

In the following we describe the set of functions of the software and their syntax. We try to demonstrate the use of each function with an example.
In the Appendix we will give you one practical example for a calculation file (CAL – file).



Take notice of: Some functions of the program CalcTool depends of the software license you have bought. The following table shows you the differences between the several licence types.

Licence type	Licence differences
• **Small**	You can only linearize table channels (called from program WinIt)
• **System**	• Additional to the linearization you can calculate new channels. • You can save only 10 calculation channels. (Intermediate results and temporary channel were not disregarded)
• **Full**	• No Restrictions.

How can I start the program CalcTool manually ?

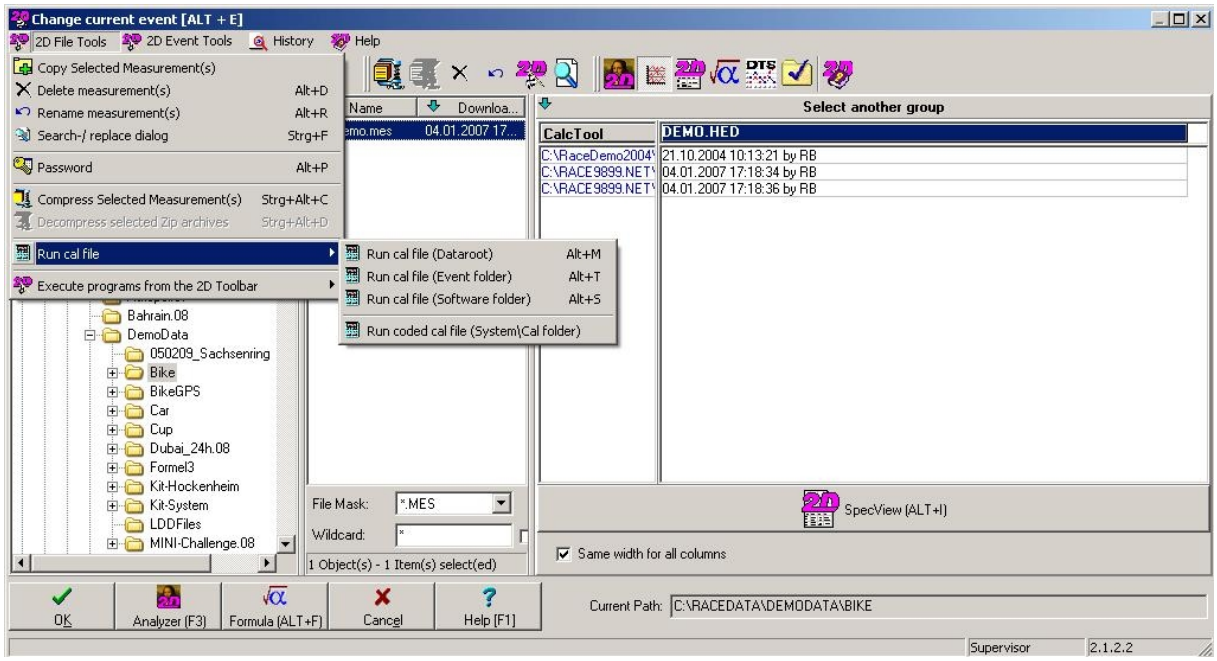
They are many different ways to start the program CalcTool with before selected CAL files.

In principle we distinguish into two different kind of CAL-files, they are:

- No coded CAL files (= files with extension * cal)
- Coded CAL files (=files with extension *.ccf)

First possibility

- Via the 2D Event Explorer
- Use the button “Change Event” in WinARace
- Select menu item “2D File Tools / Run cal file”



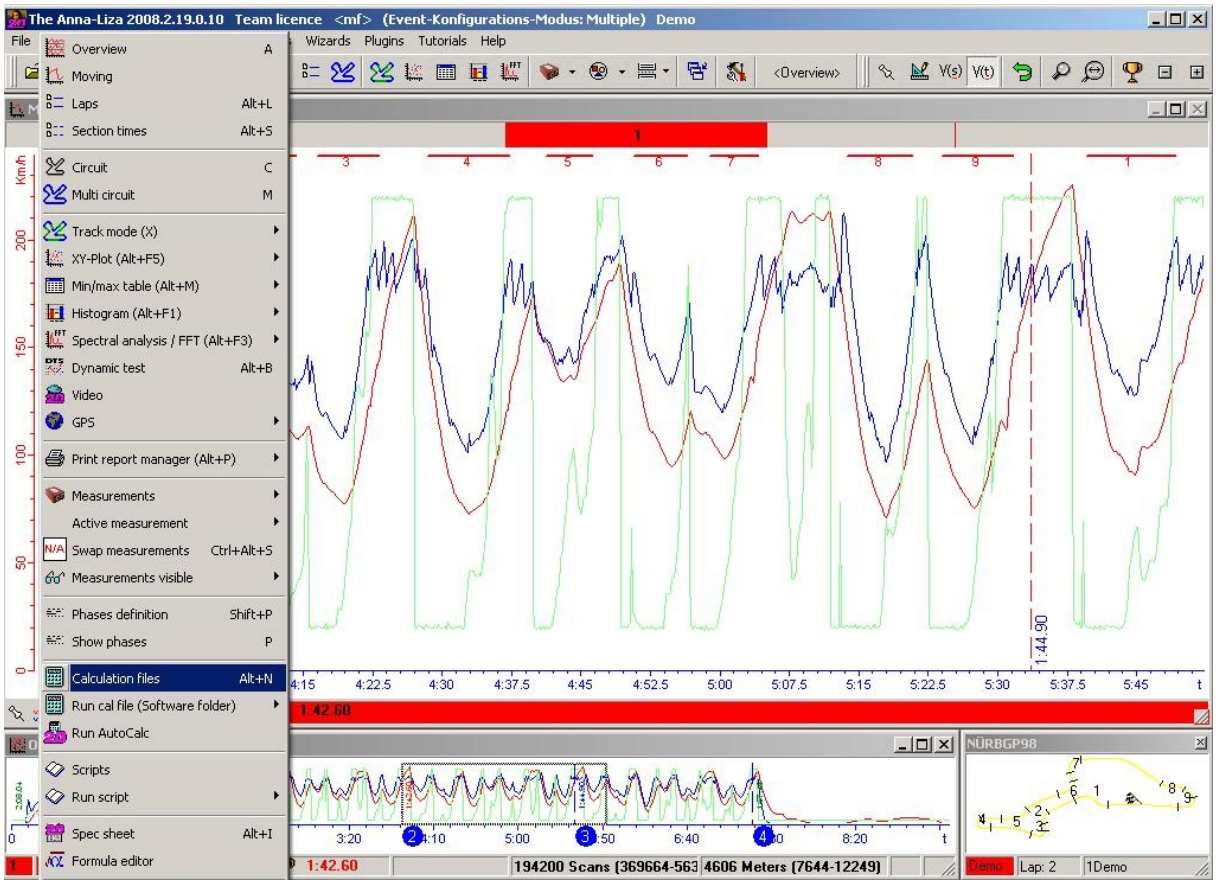
The user can choose from 4 different options, these are:

1. Start the program CalcTool with selected measurements and using any CAL-file (by selection) from the Dataroot **à** shortcut <Alt+M>
2. Start the program CalcTool with selected measurements and using any CAL-file (by selection) from the current Event folder. **à** shortcut: <ALT + T>
3. Start the program CalcTool with selected measurements and using any CAL-file (by selection) from the software folder. This folder corresponds with the sub-directory called as "CalFiles" located into your current Race version. shortcut: <ALT + S>
4. Start the program CalcTool with selected measurements and using any coded CAL-file (by selection) from "System\Cal folder". This folder corresponds with the sub-directory called as "System\Cal" located into your current Race version.

Second possibility

From the Analysis software “Analyzer”

- “Functions / Calculation files” **à** shortcut <Alt + N>
- “Functions / Run cal file (Software folder)





Via the first menu item (Functions / Calculation files) you can select any CAL-file from the current Event.
The second menu item search for CAL-files into a special folder. The folder is named “CalFiles” and must be exist directly into your current WinARace directory !

Over the first menu item (=shortcut <Alt+N>) the “calculation file manager window” will be opened. From there you can open all CAL-files which offered also in the 2D Event explorer window described in chapter before (refer first possibility).
Thus CAL-files from the current data root, the current event and from the software folder (“\CalFiles”).

As additional possibility the analysis software offers the selection of CAL-files from the current measurment directory. Use for this the tab “Measurement” within the “Calculation file manager window”

How can I create own CAL files ?



The software offers an own CAL-file editor named as " CalcEdit.exe". All CAL files are linked according to standard with this editor. That means a double click (with left mouse button) to a CAL file opens these in the editor.

To change/create new CAL files this editor should be always used, because this offers the following advantages:

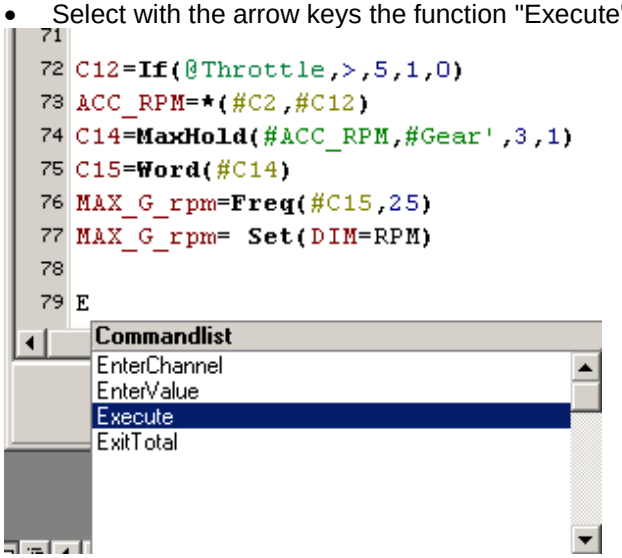
- Examination of the function regulations on correctness (= syntax examination)
- Autocompletion

How do I use the "autocompleting function" correctly ?

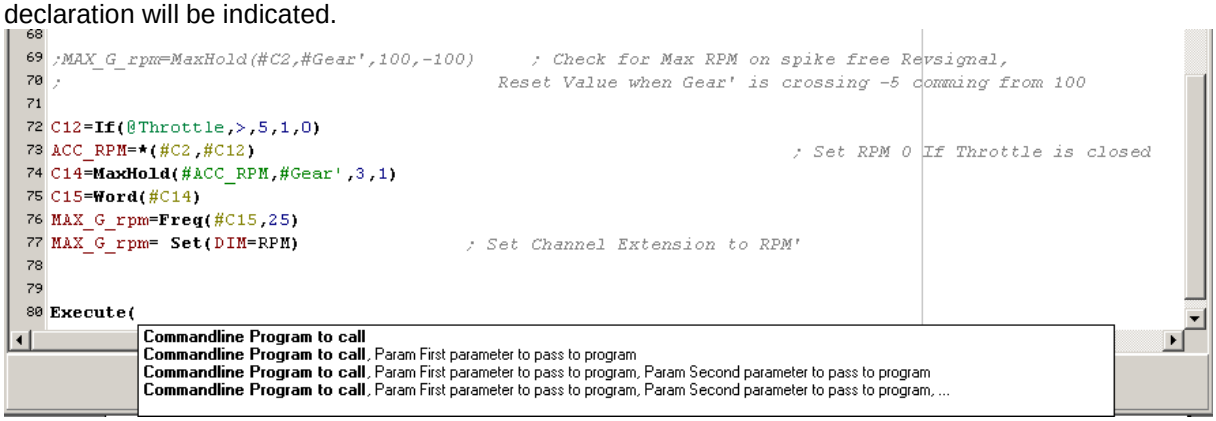
The user avoids input errors as it uses the "autocompletion" of the editor. This indicates the correct syntax to a function.

Example:
The user would like to use the function "Execute" (refer chapter 2.11). Proceed as follows:

- Open first the CAL file in the "calculation file manager" by using the button <Edit> or if you would like to create a new file use button <New>
- Enter the initial letters of the function **à** "E"
- Confirm your input with the keys <CTRL> + <Space Bar>
- The software will display a "command list" window
- Select with the arrow keys the function "Execute" and confirm with <Return>



A function call is always followed by a "(" character. Enter this ! After a short delay the correct function declaration will be indicated.



- On the basis of the function declaration you can recognize to call the function "Execute" with one or more parameters separated by a comma.

- The coloured distinction helps you to enter a correct syntax.

Automatic processing of the measurement data by configure the “AutoCalc Configurator”



You can start the AutoCalc-Configurator directly from WinARace

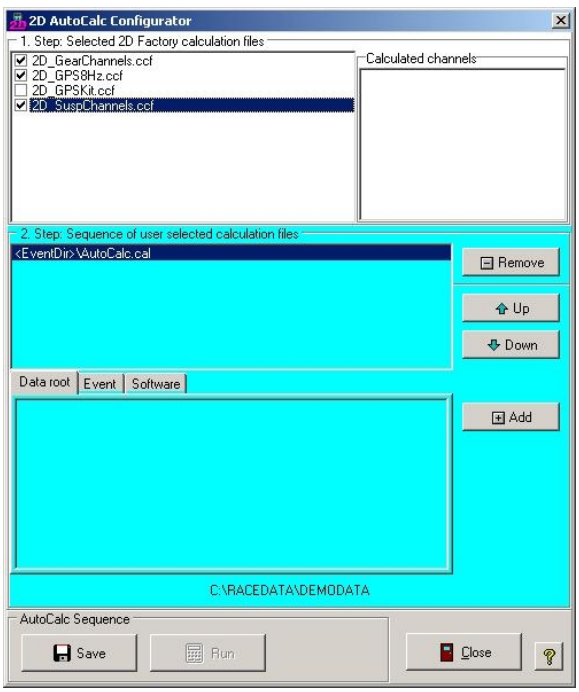


Define the sequence of channel calculations:

- automatically after download
- manually in Analyzer (**à** refer chapter 2.2.2)

1. Step: Selected 2D Factory calculation files

Choose from a predefined list of delivered 2D Factory calculation files.
Factory calculation file names always start with "2D_".
Calculation files having the following 3 characters equal after "2D_" are forming a group. Those



calculation files can only be selected exclusively inside their group, e.g. you can select "2D_GPS8Hz.ccf" or "2D_GPS4Hz.ccf" or "2D_GPSKit.ccf", but only one of them.

The Factory calculation files are coded and thus cannot be modified by the user.

2. Step: Sequence of user selected calculation files

User calculation files are located in 3 different locations, named inside data root, event or software folder.
The user calculation files are managed by the user, e.g. in Cal file manager inside Analyzer.
Add a calculation file to the AutoCalc sequence by clicking on the "Add" button or by right-click on the list
Change the order of the user calculation sequence by moving an entry up or down.
Each entry of the user calculation sequence can be removed by clicking on the appropriate button.

Save the sequence after set-up and optionally run it to check proper calculation.

1.Pre- and Postprocessor



Besides the instructions for calculation CalcTool provides a set of functions which are performed before or after the real calculation. These functions are done either by the so called pre-processor (function before calculation) or the postprocessor (after the calculation). This chapter describes the use of the pre- and postprocessor.

1.1 Pre-processor-functions

The Pre-processor functions are done before the calculation of the channels.

1.1.1. Include-files

It is possible to include files in a calculation file by using the Include-command.

Syntax:	*Meaning*
{$I FileName}	Paste the content of the file FileName at the current position.

1.1.2. Conditional execution

In some cases it could be helpful to execute a calculation only if a certain channel or Spec Sheet value exists (or if it not exists). For this reason CalcTool provides the conditional execution of calculation groups.
It is possible to use more than one condition for a group, but the condition lines have to be one after the other at the start of the group.

1.1.2.1. Condition IfExists

With this condition the user has the possibility to calculate a single group only if a channel exists.

Syntax:	*Meaning*
[MYCALC]	Start of group
IfExists(#CheckChannel)	Condition
Result = ...	This calculation is only done if CheckChannel exists.



Example:
Refer chapter 1.1.3.3 (Specsheet variables)

1.1.2.2. Condition IfNotExists

This condition is the opposite of the one above. A single calculation group is only calculated if a certain channel does not exist.

Syntax:	*Meaning*
[MYCALC]	Start of group
IfNotExists(#CheckChannel)	Condition
Result = ...	This calculation is only done if CheckChannel does not exist.

1.1.2.3. Condition IfLaptimesExist



With this condition the user has possibility to calculate a single group only if the measurement contains laptimes.

Syntax:	*Meaning*
[MYCALC]	Start of group
IfLaptimesExist **Result = ...**	Condition This calculation is only done if the measurement contains laptimes.

1.1.2.4. Condition IfNotLaptimesExist



This condition is the opposite of the one above. A single calculation group is only calculated if the measurement does not contain laptimes.

Syntax:	*Meaning*
[MYCALC]	Start of group
IfNotLaptimesExist **Result = ...**	Condition This calculation is only done if the measurement does not contain laptimes.

1.1.2.5. Condition IfSpecValueExists



With this condition the user has possibility to calculate a single group only if the Spec Sheet of the measurement contains a certain entry.

Syntax:	*Meaning*
[MYCALC]	Start of group
IfSpecValueExists(Group.Entry) **Result = ...**	Condition This calculation is only done if the Spec sheet of the measurement contains group “Group” with the entry “Entry”.

1.1.2.6. Condition IfNotSpecValueExists



This condition is the opposite of the one above. A single calculation group is only calculated if the Spec Sheet of the measurement does not contain the entry “Entry” in the group “Group”.

Syntax:	*Meaning*
[MYCALC]	Start of group
IfNotSpecValueExists(Group.Entry) **Result = ...**	Condition This calculation is only done if the Spec Sheet of the measurement does not contain an entry “Entry” in the group “Group”.

1.1.2.7. Condition IfSpecValueContains



With this condition the user has possibility to calculate a single group only if the Spec Sheet of the measurement contains a certain entry and if the entry contains a certain string.

Syntax:	*Meaning*
[MYCALC]	Start of group
IfSpecValueContains(Group.Entry, SearchStr) **Result = ...**	Condition This calculation is only done if the Spec sheet of the measurement contains group “Group” with the entry “Entry” and the entry contains the searchstring.

1.1.2.8. Condition IfNotSpecValueContains



This condition is the opposite of the one above. A single calculation group is only calculated if the Spec Sheet of the measurement does not contain the entry “Entry” in the group “Group” or if the entry exists but does not contain a certain searchstring.

Syntax:	*Meaning*
[MYCALC]	Start of group
IfNotSpecValueContains(Group.Entry, SearchStr) **Result = ...**	Condition This calculation is only done if the Spec Sheet of the measurement does not contain an entry “Entry” in the group “Group” or the entry exists but does not contain a certain search string.

1.1.3. Entering values at runtime

To make calculation files more flexible, CalcTool provides two functions to enter information by the user at runtime.

1.1.3.1. Entering a channel name: EnterChannel-function

Syntax:	*Meaning*
C1=EnterChannel('Text shown in dialog')	Opens a dialog to ask the user for a channel name. The text in the parameter is shown in the dialog.
C1=EnterChannel('Text', #Channel)	Like above, but with a default channel name, which will be selected in the shown dialog

This function opens a dialog to ask the user for the name of a channel to use in further calculation. The use may choose from a list of channels available in the specific measurement.

It is possible to add the name of a channel as second parameter. When the dialog opens and a channel with the given name exists, it is selected in the dialog.

When the user cancels the dialog the calculation will stop at this line. Channels which where calculated in lines before will be stored, lines and groups after this line will be ignored.

1.1.3.2. Entering a numeric value: EnterValue-function

Syntax:	*Meaning*
@Name=EnterValue('Text shown in dialog')	Opens a dialog to ask the user for a numeric value. The text in the parameter is shown in the dialog.
@Name=EnterValue('Text', Value)	Like above, but with a default value, which will be selected in the shown dialog

This function opens a dialog to ask the user to enter a numeric value to use in further calculation. The dialog shows the text parameter of the function. The entered value is stored in a variable with the name which is given on the left side of the "=". The name has to start with a "@"-character.

The variable can be used in the following calculation like any variable. (See variables)

It is possible to add a number as second parameter of the function. When the dialog opens this value is already entered in the dialog. To use this default value you simply have to push the <ENTER>-Button, otherwise overwrite the value with the one you want to use.

When the user cancels the dialog the calculation will stop at this line. Channels which where calculated in lines before will be stored, lines and groups after this line will be ignored.

1.1.4. Substitution of place holders



A place holder starts with the @-character.

There are four kinds of place holders possible.
1. The first are special channels read from the Event.Ini.
2. The second are often used constants.
3. The third is the possibility to replace identifier of the spec-sheet by variable names out of this sheet.
4. And the last is replacing variable names by their value.

1.1.4.1. Special channels

In the analysis - module, the user may define special channels (Such as the speed channel to integrate the distance). These are stored in the file Event.ini. This gives the user the possibility, to use one calculation file on different systems even if channels with the same meaning do not have the same name. Simply use the place holders, CalcTool will replace them with the corresponding channel name.

Example:
If the special channel Front_Susp is defined as FSusp in the Event.Ini (Menu of Analyzer: "Settings"-"Special Channels").

FSus_lo = F(@Front_Susp, F(L_PHAMM3HZ77))
is replaced by
FSus_lo = F(#FSusp, F(L_PHAMM3HZ77))

Following special channels are possible:	*Meaning*
Int_Speed	Speed channel used for integration of the distance
Drive_RPM	Channel with the rpm
Drive_Speed	Speed channel used for gear calculation
Throttle	Channel with the throttle signal
Front_Susp	Signal of front suspension (cars front left)
Rear_Susp	Signal of rear suspension (cars rear left)
Front_SuspLeft	Signal of left front suspension
Acc_Lat	Signal of lateral acceleration

1.1.4.2. Predefined constants



The name of a constant starts with the @-character.

Following constants are available in CalcTool:	
@PI	3.1415...
@2PI	6.283....
@PI/2	1.5707..
@E	Eulerconstant 2.71828...
@G	Gravity-constant 9.80665
@LN2	Logarithms naturalis of 2
@RAD2DEG	180/PI constant to calculate radiant to degrees
@DEG2RAD	PI/180 constant to calculate degrees to radiant

1.1.4.3. Specsheet-variables



The user has the possibility to use values from the Specsheet as constants for calculation. In some cases it would be good, if not only a constant value is possible but a variable. This function uses the value read from the Specsheet as a variable name for further use. (See next chapter variables)

Example:
The following example shows, how to recalculate the speed channel of a BIKE if the circumference of the tyre was not set correct before the measurement.



We assume, that the user has written the name of the used tyre in the Specsheet of the measurement in the group [Tyre] with the identifier “Front”.

In this example the name of the tyre is “Soft05”.

There is an entry inside the Specsheet (File *.HED) of the run
...
[Tyre]
...
Front = Soft05
...
Additionally a file called Tires.HED exists inside the race directory.

In this file (TIRES.HED) we find the following entries:
[Variables]
Soft05 = 1885
Hard05 = 1885
another = 1885
M4124C = 1887
DefaultCircumference=1890

Then the expression @Tyre.Front is replaced by 1885.
First: @Tyre.Front is replaced by @Soft05
Second: @Soft05 is replaced by 1885



(If you want to use values from the Specsheet directly refer chapter 3.3. The Link between Calculation and Specsheets.)

Example:
The following example extends the previous example with a condition.
The recalculation of the speed is done in one group. The next group replaces the values of the original measured speed channel ”VFront” with the result of a recalculation via a different tire diameter from the variable list. If the value does not exist in the variable list, nothing is calculated.

Syntax	*Meaning*
[VFRONT]	; Group for calculating a new speed channel
C1=/(#VFront, @DefaultCircumference)	; CalcTool reads the value for ; “DefaultCircumference” from the variable file ; in this example the value is 1890 ; C1 receives the values from VFront divided by 1890
C2=*(#C1, @Tyre.Front)	; CalcTool replaces “@Tyre.Front” by “@Soft05” ; what is read from the Specsheet group “Tyre” ; with the identifier “Front” ; In the next step “@Soft05” is replaced by the ; value 1885, read from the variable-file. ; The result-channel C2 receives the product ; of the values of C1 and the new circumference
RESULT=WORD(#C2, 0, 16XX)	; Store the resulting channel in word-format
[VFront]	; Group for substitution of the speed channel by ; the recalculated one. The name of the group has
IfExists(#SpeedRecalc)	; to be the name of the original speed-channel ; Condition. Rest of the group will only be ; computed if a channel with the name ; “SpeedRecalc” exists (if the previous calculation ; was OK)
NewResult= Word(#SpeedRecalc, 0, 500)	; Convert the recalculated speed channel to word ; using the borders 0 and 500 km/h ; If the keyword “NewResult” is used, the ; calculated channel will replace an original ; measured channel.



If an original channel is replaced by a calculated one using the keyword “NewResult”, the original channel is **not** deleted. It is only invisible for the analysing software. If you use a channel for calculation, which is originally recorded by the logger, always the original channel is used even if it is replaced by a calculation with “NewResult”.

1.1.4.4. Variables



It is possible to use variables in calculation files.
Like all placeholders a variable starts with “@” followed by any characters.

When CalcTool finds an identifier with the leading “@”, which is neither the
1. name of a special channel
2. nor the name of a Constant (refer chapter 1.1.3.2)
3. nor the name of a Specsheet-variable (refer chapter 1.1.3.3), it reads from the variable file the value corresponding to that identifier.

The user can define, which variable-file should be used. The syntax to define the use of a variable-file is:

Syntax:	*Meaning*
{$V FILENAME}	Read variables from file FileName.

The filename has to contain the full path information. It is possible to use four predefined directories:

<DataDir>	Datadirectory of race
<EventDir>	Directory of the current event
<RaceDir>	Directory of the race installation
<MesDir>	Directory of the current measurement

Example:
{$V <EventDir>\MyVars.Hed}. Use the file “MyVars.Hed” in the event-directory as variable-file.



If no variable-file is specified, CalcTool uses the default filename, which is “CalcVars.Hed” located in the current event, but only if the files exists.

An other predefined filename placeholder could be used to load a variable file depending on the name of the current logger:

<LoggerName>	Will be replaced by the name of the logger with which the measurement was recorded.

Example:
{$V <DataDir>\<LoggerName>.Hed}.
Assumed that the name of the logger is “Log1”, CalcTool will load the file “Log1.Hed” from the data directory.

1.1.4.5. Channel properties

In some cases it could be helpful to use channel properties like samplingrate for calculation.
These properties are replaced by their corresponding values before the calculation is started.
CalcTool allows to use the following channel properties:
Syntax:
#Channel.Rate **à** Samplingrate of the channel (i.e. 100 for a channel sampled with 100Hz)
#Channel.DT **à** Samplingtime of the channel (i.e. 0.01 for a 100 Hz channel)
#Channel.P1 **à** First of the three parameters of a channel. Meaning depends on channel type
#Channel.P2 **à** Second of the three parameters of a channel. Meaning depends on channel type
#Channel.P3 **à** Third of the three parameters of a channel. Meaning depends on channel type

1.1.5. Calculated mileage

The 2D software system provides a possibility to document, for which distance several parts of a vehicle were used.
Normally this is done by the communication tool WinIt. When the software downloads a measurement from a logging device, it tries to find a channel giving the distance of the run. This distance is added to the mileage values of the permanent Specsheet corresponding to the downloaded logger.
When a part is replaced by a new one, you have to set the mileage value of that part to zero in the permanent file. With this you can always see in the permanent Specsheet file of the logger, for how many kilometers parts of your vehicle were used.
If you use a logging device, which does not have a distance channel, WinIt can not determine the distance of the run. In this case you can use the Mileage-function of CalcTool. This function integrates a given speed channel to the distance of the run and adds it to the mileage values in the permanent file corresponding to the given logger name.

Syntax:	*Meaning*
Mileage(#SpeedChannel, LoggerName)	Calculate the distance of a run using the channel “SpeedChannel” and update the mileage in the permanent file (Specsheet) of the logger with the name “LoggerName”



For more information about permanent files and Specsheets see the documentation of SpecView.

1.2 Postprocessor-functions



Postprocessor functions are done after the calculation of the channels.

1.2.1. Deleting channels



Function to delete channels, which were created by a previous calculation.
It is not possible to delete channels, which were measured by the data acquisition system

Syntax:	*Meaning*
DELETE(#CHANNELNAME)	It is possible to use the “*” as a wildcard character. Delete(#*) deletes all channels created by CalcTool.

1.2.2. Hiding channels

Syntax:	*Meaning*
HIDE(#CHANNELNAME)	Function to hide a channel. A hidden channel is a channel, which is present but not visible in the analysing software.

1.2.3. Unhiding hidden channels

Syntax:	*Meaning*
UNHIDE(#CHANNELNAME)	Function to unhide a channel. If you want a hidden channel to become visible in the analysing software use this command.

2. Available functions



In the following chapters we will describe which functions are available and how to use them.

2.0 Format of numeric parameters

Some functions of CalcTool require one or more numbers as parameter.
There are three different possibilities to write a numeric parameter:

- **Decimal:** The number is written in normal decimal syntax; i.e. 350 or 17.5
- **Hexadecimal:** This notation starts with “0x” or “0h” and is followed by hexadecimal digits (0..F); i.e. 0xFF or 0hFF for the decimal value of 255. Only integer numbers can be written in this notation.
- **Binary:** This notation starts with “0b” and is followed by binary digits (0 and 1) i.e. 0b11111111 for the decimal value of 255. Only integer numbers can be written in this notation

2.1. Standard mathematical functions

2.1.1. Addition

With this function you can add both, a channel with a channel and a channel with a constant.

Syntax:	*Meaning*
+ (#CHANNEL_1, #CHANNEL2)	(#Channel_1) + (#Channel_2)
+ (#Channel, Constant)	(#Channel) + Constant

Practical examples:

- Add the preload to a suspension movement.
- Geometry calculations (Height of the vehicle ...).

2.1.2. Subtraction

With this function you can do three types of subtraction:

- Channel minus another channel
- Channel minus a constant
- Constant minus a channel

Syntax:	*Meaning*
- (#CHANNEL_1, #CHANNEL_2)	(#Channel_1) - (#Channel_2
- (#Channel, Constant)	(#Channel) – Constant
- (Constant, #Channel)	Constant – (#Channel)

Practical examples:

- Subtract rear right suspension to the left one to know the rear roll of the car.
- Geometry calculations (Height of the vehicle ...).
- Calculation of the rear roll angle of the car by subtracting right angle and left angle calculated with arctan of (Suspension travel / rear track of the car).

2.1.3. Multiplication

As the addition, you can multiply both, two channels and a channel with a constant.

Syntax:	*Meaning*
*** (#CHANNEL_1, #CHANNEL_2)**	(#Channel_1) * (#Channel_2)
*** (#Channel, Constant)**	(#Channel) * Constant

Practical example:

- Multiply the suspension movement with the stiffness of the spring in order to give you an idea of the load on the suspension.
- Do the square of the speed (Speed²=Speed*Speed) to do special calculations (See the end of this chapter).

2.1.4. Division

Here you have 3 different sorts of formulas:

- Division of a channel by a channel
- Division of a channel by a constant
- Division of a constant by a channel

Syntax:	*Meaning*
/ (#CHANNEL_1, #CHANNEL_2)	(#Channel_1) / (#Channel_2)
/ (#Channel, Constant)	(#Channel) / Constant
/ (Constant, #Channel)	Constant / (#Channel)

Practical example:

- Convert speed from km/h into m/s (Speedm = / (#Speedk , 3.6)).
- Convert speed from km/h into mph (Speedmph = / (#Speedk , 1.62))

2.1.5. Modulo

The result of the modulo function is the rest of a division (i.e. 10 modulo 4 is 2)
CalcTool support three kinds of modulo functions:

- Channel modulo channel
- Channel modulo constant
- Constant modulo channel

Syntax:	*Meaning*
MOD (#CHANNEL_1, #CHANNEL_2)	(#Channel_1) Mod (#Channel_2)
Mod (#Channel, Constant)	(#Channel) Mod Constant
Mod (Constant, #Channel)	Constant Mod (#Channel)

Practical example:

- Mask out the lowest 5 bit of a channel (Lo5Bit=Mod(#Channel, 32)).

2.1.6. Integer division – DIV

The result of the DIV-function (integer division) is the quotient of a integer division without a rest (i.e. 10 DIV 4 is 2)

CalcTool support three kinds of DIV-functions:

- Channel div channel
- Channel div constant
- Constant div channel

Syntax:	*Meaning*
DIV (#CHANNEL_1, #CHANNEL_2)	(#Channel_1) Div (#Channel_2)
Div (#Channel, Constant)	(#Channel) Div Constant
Div (Constant, #Channel)	Constant Div (#Channel)

2.1.7. Rounding to whole numbers



CalcTool provides three different functions to round fractional numbers to whole numbers.

2.1.7.1. The Round function

The Round function goes to the next higher whole number if the fraction of the number is bigger or equal 0.5.
If the fraction is smaller than 0.5 it goes to the next smaller whole number.

Syntax:	*Meaning*
ROUND (#CHANNEL)	Calculates a channel with whole numbers

Example:

1.5 **à** 2
-1.5 **à** -1
1.49 **à** 1

2.1.7.2. The Floor function

The Floor function goes always to the next smaller whole number.

Syntax:	*Meaning*
FLOOR (#CHANNEL)	Calculates a channel with whole numbers

Example:

1.5 **à** 1
-1.5 **à** -2
1.99 **à** 1

2.1.7.3. The Trunc function

The Trunc function simply cuts the fractional part of the number.

Syntax:	*Meaning*
TRUNC (#CHANNEL)	Calculates a channel with whole numbers

Example:

1.5 **à** 1
-1.5 **à** -1
1.01 **à** 1

2.1.8. The Const function – CONST

The result of the Const-function is a channel with a constant value.

Syntax:	*Meaning*
CONST (CONST VALUE)	Creates a channel with constant value (=const value)

2.1.9. The minimum value function – MinValue

The MinValue-function searches all values of a given channel to find the minimum. It creates a channel with the constant value of this minimum.

Syntax:	*Meaning*
MinValue(#Channel, Rate)	Creates a channel with constant value. The value is the minimum value of channel “Channel”. Rate defines the samplingrate with which the channel is stored.

2.1.10. The maximum value function – MaxValue

The MaxValue-function searches all values of a given channel to find the maximum. It creates a channel with the constant value of this maximum.

Syntax:	*Meaning*
MaxValue(#Channel, Rate)	Creates a channel with constant value. The value is the maximum value of channel “Channel”. Rate defines the samplingrate with which the channel is stored.

2.1.11. The first value function – FirstValue

The FirstValue-function reads the first value of a given channel and creates a constant channel using this value.

Syntax:	*Meaning*
FirstValue(#Channel, Rate)	Creates a channel with constant value. The value is the first value of channel “Channel”. Rate defines the samplingrate with which the channel is stored.

2.1.12. The last value function – LastValue

The LastValue-function reads the last value of a given channel and creates a constant channel using this value.

Syntax:	*Meaning*
LastValue(#Channel, Rate)	Creates a channel with constant value. The value is the last value of channel "Channel". Rate defines the samplingrate with which the channel is stored.

2.1.13. The average value function – AvgValue

The AvfValue-function calculates the average value of a given channel and creates a constant channel using this value.

Syntax:	*Meaning*
AvgValue(#Channel, Rate)	Creates a channel with constant value. The value is the average value of channel "Channel". Rate defines the samplingrate with which the channel is stored.

2.2. Logical functions

Logical functions are binary logical calculations.



These functions only work with original channels measured by the system (which are stored as word) or with channels, which were converted to a word channel in a previous calculation or line (see WORD-function).

2.2.1. AND function

There are two different formulas possible with the AND function:

- Channel AND channel
- Channel AND Constant

Syntax:	*Meaning*
AND(#Channel_1,#Channel_2)	(#Channel_1) And (#Channel_2)
AND (#Channel, Constant)	(#Channel) And Constant

Practical example:

- Mask out the lowest 8 bit of a channel (Lo8Bit=And(#Channel, 0xFF)).

2.2.2. OR function

Like the AND function, the OR function may be used with two channels or a channel and a constant:

- Channel OR channel
- Channel OR Constant

Syntax:	*Meaning*
Or (#Channel_1, #Channel_2)	(#Channel_1) Or (#Channel_2)
Or (#Channel, Constant)	(#Channel) Or Constant

2.2.3. XOR function

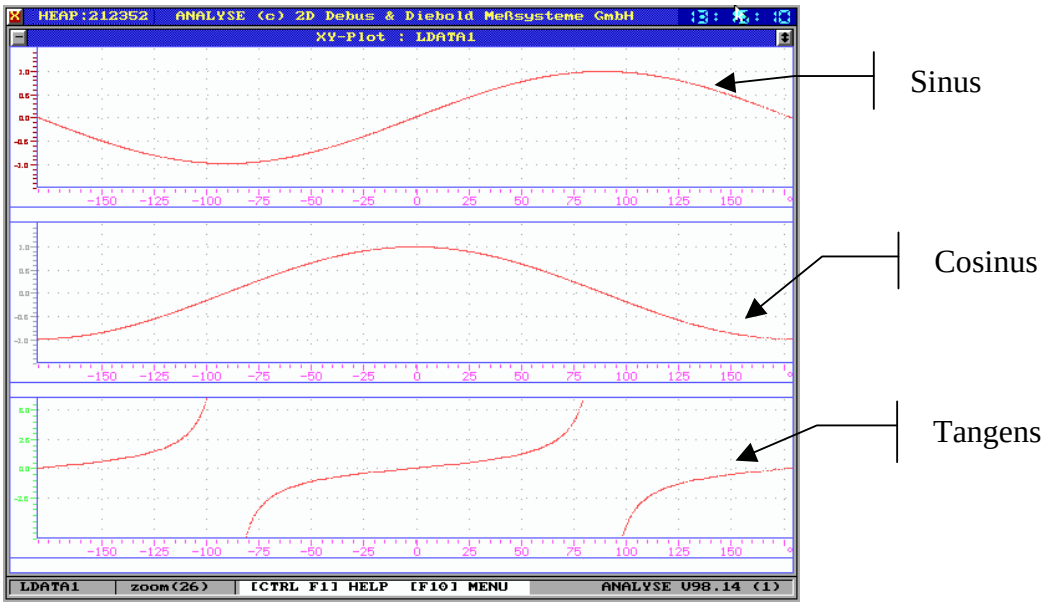
The Xor function supports two kinds of formulas:

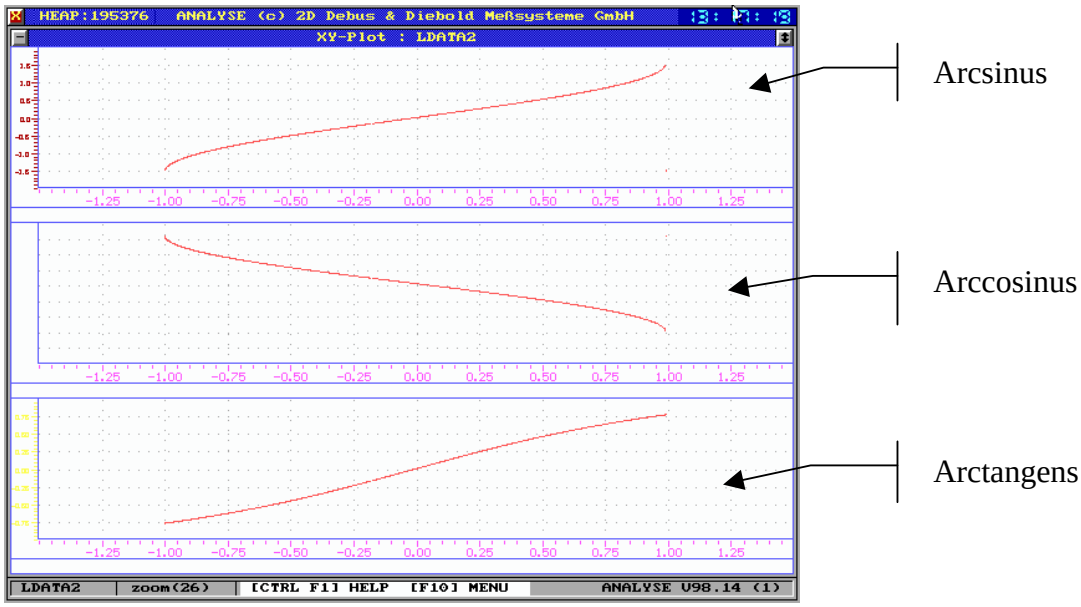
- Channel XOR channel
- Channel XOR Constant

Syntax:	*Meaning*
Xor (#Channel_1, #Channel_2)	(#Channel_1) Xor (#Channel_2)
Xor (#Channel, Constant)	(#Channel) Xor Constant

2.3. Trigonometric functions

These functions allow you to calculate the sinus, cosinus, tangens, arcsinus, arccosinus and arctangens of a channel. The input for sinus, cosinus and tangens will be in radians or degrees, but the result for arcsinus, arccosinus and arctangens will be only in radians.

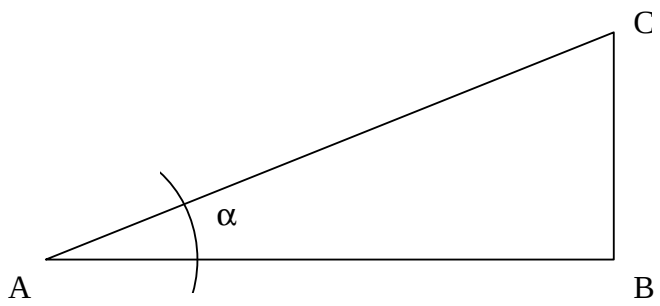




Syntax	*Meaning*	*Comment*
dsin(#Channel)	Sinus(#Channel)	(**#Channel is in degrees**)
dcos(#Channel)	Cosinus(#Channel)	(**#Channel is in degrees**)
dtan(#Channel)	Tangens(#Channel)	(**#Channel is in degrees**)
sin(#Channel)	Sinus(#Channel)	(**#Channel is in radians**)
cos(#Channel)	Cosinus(#Channel)	(**#Channel is in radians**)
tan(#Channel)	Tangens(#Channel)	(**#Channel is in radians**)
arcsin(#Channel)	ArcSinus(#Channel)	(**Result is in radians**)
arccos(#Channel)	ArcCosinus(#Channel)	(**Result is in radians**)
arctan(#Channel)	ArcTangens(#Channel)	(**Result is in radians**)

Practical examples:

- Calculation of a distance knowing a length and an angle.
- Calculation of an angle knowing 2 lengths.
- Calculation of the Rear roll angle (e.g. subtraction practical examples).



Sin (a) = BC / AC
Cos (a) = AB / AC
Tan (a) = BC / AB
a (in radians) = Arcsin (AC / BC) = Arccos (AC / AB) = Arctan (BC / AB)
(a in degrees) = 57,29 * (a in radians)

2.4. Advanced mathematical functions

2.4.1. Square Root

This function calculates the square root of any channel. The calculation is made with the absolute value of the channel (This means it also works with negatives values !!!).

Formula: sqrt(#Channel) **ç è** $\sqrt{|\#\ Channel\ |}$

Practical example:
Calculation of combined G´s for a car to define the total tractive effort available for braking while turning:

$$CombinedG`s = \sqrt{(LateralG`s)^2 + (LongitudinalG´s)^2}$$

2.4.2. Logarithms

This function allows you to calculate the logarithms from any channel to the base of 10.

Formula: Log(#Channel) **ç è** Log_{10}(Channel)

2.4.3. Absolute value

This function gives the absolute value of the calculated channel.

Syntax:	*Meaning*
abs(#Channel)	| #Channel |

Practical example:
Compare 2 channels without considering the sign of these channels (e.g. KUS example at the end of the chapter).

2.4.4. Minimum function

Syntax:	*Meaning*
min(#Channel_1,#Channel_2)	The result of this function is the minimum of 2 compared channels.

Practical example:
- Comparing car left and right rear suspension and take the minimum of these 2 channels.

2.4.5. Maximum function

Syntax:	*Meaning*
max(#Channel_1,#Channel_2)	The result of this function is the maximum of 2 compared channels.

Practical example:
- Comparing car left and right rear suspension and take the maximum of these 2 channels.

2.4.6. Derivation

It allows you to derive a channel to measure its speed or its acceleration.

Syntax:	*Meaning*
Derivate(#Channel)	d(#Channel) / dt

Practical example:

- Measure the longitudinal acceleration by deriving the speed of the vehicle.
- Measure the speed of a fork movement by deriving the travel of the fork.



Warning
Each time you derive a channel which unit is km/h, the result is automatically in m/s².

2.4.7. Integration

It allows you to integrate a channel to measure its speed, its motion or its energy.

Formula: Integrate (#Channel, P1) **ç è** $\int (\#Channel)dt$

Parameter:	*Meaning*
P1:	Start value, if this value is present the resulting function is set to this value every lap trigger. If this value is not present, the resulting is the integration over the whole measurement

Practical example:

- Make a counter on a channel (Combination of Integration and If functions) such as detonation or over rev. (See example at the end of the chapter)
- Calculate energy of a channel (e.g. on brake signal to know energy spent by lap).



When you integrate a function, the result is the integration of this function plus a constant. That's why there could be a little difference within the result. The best example of this is to derive the speed then integrate this acceleration. Normally you should get back to the speed, but if you look at the result, there is a small travel of your recalculated speed due to this integration's constant.(if you wish to do this exercise, do not forget to multiply the result of your integration by 3,6 to get back to a speed in km/h.)

2.4.8. SUM-function

This function calculates the sum of all values of a channel.

Formula: Sum (#Channel, P1) **ç è** $\sum Channel[i]$

Parameter:	***Meaning***
P1:	Start value, if this value is present the resulting function is set to this value every lap trigger. If this value is not present, the resulting is the sum over the whole measurement

Practical example:

- Counting events: Create a calculation channel with the if-function, that receives the value 1 when a channel has a value greater than a border otherwise the value 0.
- Use the SUM function to count these events.

2.4.9. Power-function

Power raises a base to any power.

Here you have 3 different sorts of formulas:

- Raise a channel as base to power from an other channel
- Raise a channel as base to a constant power
- Raise a constant base to a power from a channel

Syntax:	***Meaning***
Power (#Base, #Exponent)	#Base ^ #Exponent
Power (#Base, Exponent)	#Base ^ Exponent
Power (Base, #Exponent)	Base ^ #Exponent

2.4.10. Exp-function

Exp calculates the value of e (euler-constant) raised to the power of a channel.

Syntax:	***Meaning***
Exp (#Exponent)	2.71828 ^ #Exponent



This function can be replaced by the previous function Power and the use of the preprocessorconstant @E: Power(@E, #Exponent)

2.5. If-function

This function is used to compare one channel with a constant or an other channel (or a constant with a constant). The result of this comparison is a constant (channel with constant value) or a channel.

Formula:	
IF(#CHANNEL, OPERATOR, COMPARATOR, TRUERESULT, FALSERESULT)	
#CHANNEL	Name of the channel to compare
Operator	Compare function: >, >=, <, <=, =
Comparator	Name of channel to compare #Channel with constant to compare with
Or	constant
TrueResult	Name of channel. It's value is taken, when the comparison is true
FalseResult	Name of channel. It's value is taken, when the comparison is false
Or	constant

Theoretical examples:
If (#Channel_1, <=, #Channel_2, A, B)
If (#Channel_1, <=, #Channel_2, #Channel_3, #Channel_4)
If (#Channel, =, C, A, B)
If (A, =, B, C, D)

Practical example:
Put conditions on a channel and get a logical one (1 or 0) for further calculations (e.g. Kus, radius, speed2 examples)

.

2.6. Additional formulas

2.6.1. Formula Integer

With this function, you can use any channel with another formula. Here the integer formula is used:
F(x) = M * (x – O) / D

Syntax:	***Meaning***
F(#Channel, I(M,D,O))	set integer formula of channel #Channel
M	multiplicand
D	divisor
O	Offset

Practical examples:
- Use channel #Channel with another offset if zero position was not correct.
- Use channel #Channel with another formula if channel calibration was not correct.

2.6.2. Formula Real

As the above formula, you can use any channel with another formula. Here the float formula is used:
F(x) = F * x + O

Syntax:	*Meaning*
F(#Channel, R(F,O))	set real formula of channel #Channel
F	Factor (Multiplicand / Divisor)
O	Offset

Practical examples:

- Use channel #Channel with another offset if zero position was not correct.
- Use channel #Channel with another formula if channel calibration was not correct.

2.6.3. Table function

This function allows you to connect a table to a channel knowing the formula between the channel you want to use and digits. The result is the calculation of a channel before the formula is used on this channel. Indeed, the calculation is made from the digits or the voltage of the table.

Syntax:	*Meaning*
F(#Channel, T(Name))	#Channel will be connected to the table ″Name″
Name	name of the table file

Practical examples:

- Obtain the power of the engine with RPM due to a table linking the power with RPM (e.g. Rforce example at the end of the chapter).
- Generate a linear channel from a non-linear one with the calibration sheet you get from the manufacturer.(e.g. Lambda sensor)

2.6.4. Table 2 function

With this function, you can connect a table to a channel like the table function above. The difference with the other table function is that the calculation is made with the result of the channel's formula. In fact, this table is linked directly to the data that are on your screen in the analysis mode whereas, with the table function above the table, is linked to the data recorded on the vehicle before they are translated in physical values by the channel's formula.

Syntax:	*Meaning*
F(#Channel, 2(Name))	#Channel will be connected to the table ″Name″
Name	name of the table file

2.6.5. 2D-Table function

Sometimes it could be necessary to use a table not only depending from one channel but two.
For this use the 2D table function.

Syntax:	*Meaning*
F(#Channel1, #Channel2, T(TableName.Ext, IntType))	#Channel1 and #Channel2 will be connected to the table ″TableName.Ext″
TableName.Ext	name of the table file with extension
IntType	Type of interpolation (i.e. LIN)



Attention:
If you do not write the extension of the table file in the line, CalcTool tries to read a .CSV – file.

This function needs a table file in the format CSV (comma separated values). This is a simple textfile where the single values are separated by a certain character. The separation character has to be a "**;**".
The decimal separator for the numbers in the file has to be a "**.**" (1/2 is 0.5 not 0,5 like in Germany).
This format can be created with Microsoft Excel™.

Practical example:
The radius of a wheel of a motorcycle is dependant from the banking angle of the bike and it's speed. The higher the banking angle is the lower is the radius of the wheel (in fact the size of the wheel is the same, but radius to the point where the wheel touches the ground becomes smaller).
The faster a wheel turns the bigger gets the wheel by the rotation power.

The formula for this calculation is:

Result = F(#Speed, #Banking, T(WheelRadius.CSV, Lin))

	0	50	100	150	200	250	300	350
0	315	317	320	322.5	325	327	329	330
10	309	311	314	316.4	318.8	320.7	322.7	323.7
20	301	302.9	305.8	308.2	310.5	312.5	314.4	315.3
30	295	296.9	299.7	302	304.4	306.2	308.1	309
40	288	289.8	292.6	294.9	297.1	299	300.8	301.7
50	285	286.8	289.5	291.8	294	295.9	297.7	298.6
60	283	285.5	288	290	392.5	394.3	296.1	297

This is an example for a table giving the radius of a wheel from the speed and the banking angle of a bike.
This is the view like inside Microsoft Excel ™.
In a texteditor the file would look like this:

```
;0;50;100;150;200;250;300;350;
0;315;317;320;322.5;325;327;329;330;
10;309;311;314;316.4;318.8;320.7;322.7;323.7;
20;301;302.9;305.8;308.2;310.5;312.5;314.4;315.3;
30;295;296.9;299.7;302;304.4;306.2;308.1;309;
40;288;289.8;292.6;294.9;297.1;299;300.8;301.7;
50;285;286.8;289.5;291.8;294;295.9;297.7;298.6;
60;283;285.5;288;290;392.5;394.3;296.1;297;
```

In the first row are the column headers with the different speed values in km/h.
The first column contains the row headers for the different banking angles of the bike in °.
In this example the distance between two row or column headers is the same. This is not needed.

Finding the radius at a speed of 100 km/h and a angel of 20° is easy. We have to look in the field where the column is 100 and the row is 20. The result is 305.8.
When CalcTool tries to find a value depending on speed and banking angle it searches for the columns where the speed is between and for the rows where the banking angle is between and makes a linear interpolation.

Example:

Radius for banking angle 33° at a speed of 110 km/h.
The columns for the interpolation are 100 and 150.
The rows are 30 and 40.
The resulting value would be 298.03.

When the input values are outside the table, for example a speed of 360 km/h, CalcTool uses the values from the edge. In the example it would use the column of 350 km/h.

2.6.6. 2D-Table search function

CalcTool provides a kind of inverse function for the 2D-Table function. It uses the same type of table files like the function above.
The function T2DSearch needs two channels as input parameters. The first is the Y-channel and is giving values in Y-direction of the table. The second is the value-channel giving values from the inner area of the table.
The values of the resulting channel are the values in X-direction, which would lead to the Value channel when used together in the 2D-Table function.
The T2DSearch function interpolates linearly between given values.

Syntax:	*Meaning*
T2DSearch(#YChannel, #ValueCh, T(TableName.Ext, IntType) [, SearchDirection])	#YChannel and #ValueCh will be used to find the X-values in the table ”TableName.Ext”
TableName.Ext	name of the table file with extension
IntType	Type of interpolation (i.e. LIN)
SearchDirection	Optional parameter to define the search Direction: LeftToRight or RightToLeft. If no search direction is given LeftToRight is used

Example:

For the example we use the same table as in the chapter before (Even if it does not make much sense).
For the banking angle of 33° and a wheel radius of 298.03 mm the corresponding vehicle speed is 110 km/h.

2.6.7. 3D-Table function

Similar to the 2D-Table function CalcTool provides a 3D-Table function.
This function can be used, when a resulting channel is dependant from three channels.

Syntax:	***Meaning***
F(#Ch1, #Ch2, #Ch3, T(TableName.Ext, IntType))	#Ch1, #Ch2 and #Ch3 will be connected to the table ″TableName.Ext″
TableName.Ext	name of the table file containing an “*” with extension
IntType	Type of interpolation (i.e. LIN)

Since a normal table like inside Excel can only be used for two dimensions (channels) more than one table file is needed.
The third dimension is done by using several .CSV-files. Each file is for one value of the third channel. The value for which the file should be used has to be part of the filename of the channel.

Practical example:
The torque an engine delivers to a wheel is dependant on the selected gear, the engine revolutions and the throttle position.
Result = F(#Gear, #RPM, #Throttle, T(Torque_at_*.CSV, Lin))

You can see in the example that the filename of the table contains an asterisk (“*”). At this position of the filenames has to be the throttle value for which this file should be used.
Torque_At_0.CSV, Torque_At_20.CSV, Torque_At_40.CSV, Torque_At_50.CSV, Torque_At_60.CSV, Torque_At_70.CSV, Torque_At_80.CSV, Torque_At_90.CSV and Torque_At_100.CSV would be the tablefiles for the throttle position of 0, 20, 40, 50, 60, 70, 80, 90 and 100 %.
CalcTool makes a linear interpolation for each value of throttle, gear and rpm.

2.6.8. Filter function

Filters are used to smoothen a noisy signal or to adopt information about the dynamic movement of a signal (suspension, etc.). With this function you can calculate filtered channels.
CalcTool provides two modes of defining a filter. The first is a short form where the user only has to define the filter-frequency, for the other values of the filter definition, default values are taken. In most cases these values lead to the wanted result.
If you do not receive the result you wanted and you are familiar with FIR (finit impulse response) filters you may use the full filter interface of CalcTool.

2.6.8.1. Simple filter interface

With this interface you define a FIR-filter (finit impulse response) with the following default settings.
The type is a lowpass filter.
The windowtype is a hamming window.
The number of iterations is either 20 times the quotient of the samplingrate and the crossfrequency (given by the user) or a default value of 401, the smaller value is taken. (401 or 20 * Samplingrate / CrossFrequency)

Syntax:

F(#Channel, F(CrossFrequency))

Example:
F(#Channel, F(2.0))
Assuming a samplingrate of 25 Hz, the speed channel #Channel is filtered with a Hamming window, a crossfrequency of 2.0 Hertz and the number of iterations is 251 (calculated: 250 but the iterations have to be odd).

2.6.8.2. Full filter interface



The full filter interface of CalcTool gives you the possibility to define all parameters of a filterfunction.
If you want to use a default value as described above, you can leave away that part of the definition. Here is the formula with all possible parameters.

With the full filter interface the number of iterations (dept of the filter) can be given directly as a number or as a time. When CalcTool finds a number followed by “Sec” or “s” at the position of the iterations, it calculates the iterations from the given time value using the current sampling rate of the channel.
Example:
F(#Channel, F(AVG 0.5 Sec))
Will calculate an center average filter with 50 iterations for a 100 Hz channel.

Syntax:

F(#Channel, F(FilterType \ WindowType \ CrossFrequency \ Number Of Iterations))

***Filter Type*:**

L_P	Lowpass filter
H_P	Highpass filter
B_P	Bandpass filter
AVG	Center average filter (Average built from NumberOfIterations of values, half left of the current value and the other half right of the value
AVG+	Look ahead average filter (Average built from NumberOfIterations of values from the current value to the right)
AVG-	Look back average filter (Average built from NumberOfIterations of values from the current value to the left)
MED	Median filter
TOP	Maximum filter (like median, but using the maximum value from the given interval)
MAX	Same as TOP
BOT	Minimum filter (like median, but using the minimum value from the given interval)
MIN	Same as BOT
TAU	Tau filter according to formula XFiltered(t) = XFiltered(t-1) + 1/Iterations * (X(t) – XFiltered(t-1))

***Window Type*:**

None	Rectangle
Hann	Hanning
Hamm	Hamming
Blck	Blackman
Kaib	Kaiser Bessel
Parz	Parzen
Wlch	Welch
***Cross frequency*:**	2 Hertz will be written in the formula: 2.0Hz
***Number of iterations*:**	Select the numbers of elements for the FIR (Finite Impulse Response) algorithm.

Practical example:

- If you want to make calculation with filtered data, just insert a calculation channel in your string group. By this way, you don’t have to go to filter module in the analysis mode before your calculations. So, you can gain time.
- Handling both raw and filtered data at same time in analysis mode.

Example:

F(#Channel, F(L_P Hann 2.0Hz 100))
The speed (channel #Channel) is filtered with a lowpass filter with a Hanning window, a cross frequency of 2.0 Hertz and the number of iterations is 100.

2.6.8.3. Filter with variable depth

In some cases it might be useful not to use a fix depth for filtering but a variable.
For this cases it is possible to define a filter with a variable filter depth. The depth of the filter is given as a channel. This is not defined for finit impulse response filters.

Syntax:

F(#Channel, F(FilterType #DepthChannel))

Filter Type:

AVG	Center average filter (Average built from NumberOfIterations of values, half left of the current value and the other half right of the value
AVG+	Look ahead average filter (Average built from NumberOfIterations of values from the current value to the right)
AVG-	Look back average filter (Average built from NumberOfIterations of values from the current value to the left)
MED	Median filter
TOP	Maximum filter (like median, but using the maximum value from the given interval)
MAX	Same as TOP
BOT	Minimum filter (like median, but using the minimum value from the given interval)
MIN	Same as BOT

Example:

C1 = /(#RPM, 250)
Result = F(#Susp_F, F(AVG #C1))

The example shows an center average filter, where the depth of the filter is dependant on the temporary channel “C1”. This channel is calculated to 1/250 of the RPM-signal of the vehicle in the first line. The higher the RPM signal of the engine the deeper is the filter.

2.6.9. Frequency reduction/increase



This function allows you to change the sampled frequency of a channel. You can reduce the sampled frequency (You will lose information) or increase the frequency (You will not get more information).

Syntax:	*Meaning*
Freq(#Channel, NewRate)	Change samplingrate of Channel #Channel to NewRate
#Channel	channel name
NewRate	new sample rate

Practical example:
To make complicated calculations you need normally a lot of memory. If this memory is not available you can reduce the channel-size. For NewRate not every value is possible. Valid values are basic samplingrate (bs), bs divided by 2, divided by 2 ....

2.6.10. Sampling rate adjustment for non 2D samplingrates: FreqBase

If you use a 2D device to record data from a can bus, it might be that the refresh rate of the device sending the data is not one of the possible recording rates of the logger.
For example a GPS sends data with 4 Hz, but the logger recording this channel has only the following samplingrates to select from: 400 Hz, 200Hz, 100 Hz, 50 Hz, 25 Hz, 12.5 Hz.
If the channel is recorded with 50 Hz and the GPS sends data with 4 Hz, the resulting channel should have always 12.5 times the same value (50 / 4 = 12.5). Since it is not possible to have a value a half time, the channel has 12 or 13 identical values. If such a channel is used for further calculation, the results will show some aliasing.
To solve this use the function FreqBase.
This function changes the samplingrate of a channel and provides a channel where the number of identical values is always the same.

Syntax:	*Meaning*
FreqBase(#Channel, NewRate, GPSRate)	Changes samplingrate of channel #Channel to NewRate
#Channel	Name of the channel
NewRate	New samplingrate
GPSRate	Rate at which the GPS sends new data



Attention:
The value for NewRate has to be less or equal to the main samplingrate of the logger.
The second restriction is, that NewRate has to be divisible by the GPSRate without rest.

Practical example:
The GPS sends speed data (V_SAT) with 4 Hz. The data is recorded with a samplingrate of 50 Hz.
The new rate has to be a samplingrate of the logger and has to be divisible by 4, the lowest possible rate here is 100:

FreqBase(#V_SAT, 100, 4)

2.6.11. Demultiplexing a multiplexed channel: MUX-function

To reduce the traffic on the can bus sometimes more than one channel is sent on a single identifier on the same byte position. On an other position of the identifier there are some bits defining how to interpret the current value. Record the bits containing the data as one channel (DataChannel), and the bits defining how to interpret the value as the second channel (MuxChannel).

Syntax:	*Meaning*
MUX(#DataChannel, #MuxChannel, MuxVal)	Extracts the values of DataChannel when MuxChannel has the value MuxVal
#DataChannel	Name of the channel containing the multiplexed data
#MuxChannel	Name of the channel containing the multiplex values
MuxVal	Value at which the data should be taken

Practical example:
The channel “DataChannel” contains multiplexed data for water- and oil-temperature.
The “MuxChannel” contains either 0 for water- or 1 for oiltemperature.

WaterTemp=MUX(#DataChannel, #MuxChannel, 0)
OilTemp=MUX(#DataChannel, #MuxChannel, 1)

2.6.12. Masking out used bits: UseBits-function

To use as few identifiers as possible it is usual to aggregate more than one channel in a 8, 16 or 32 bit value on the CAN bus. With 2D devices it is only possible to record one or two bytes from the CAN bus.
Sometimes it is necessary to mask out only several bits from the recorded channel, this can be done by using the UseBits-function.

Syntax:	*Meaning*
UseBits(#DataChannel, MaskValue)	Extracts the values of DataChannel using MaskValue to mask out the used bits.
MaskValue	Value to mask out used bits

Practical example:
The channel “DataChannel” is a 16 bit channel recorded from the CAN bus. The four least significant bits represent the selected gear of the vehicle. The 12 most significant bits represent the speed.

Gear=UseBits(#DataChannel, 0b1111)
Speed=UseBits(#DataChannel, 0b1111111111110000)

written in hexadecimal notation:
Gear=UseBits(#DataChannel, 0hF)
Speed=UseBits(#DataChannel, 0hFFF0)

2.6.13 GPS Shift



Usable for all GPS modules which records additionally the channel named as “T_Shift” (besides the usual used channels).
This channel indicates, how much milliseconds ago the values of the other channels were valid.



To use this function you must have the following software releases:
Software **à** CalcTool.exe (version 2008.2.8.2.11 or higher)
Editor **à** Calcedit.exe (version 2008.2.4.5.6 or higher)

Syntax:	*Meaning*
GPSShift(#GPSChannel, #ShiftChannel, NewFreq)	**#GPSChannel:** The first parameter of this function represents a GPS channel like V_Sat, Lat_Dez... (for example) **#ShiftChannel:** The second parameter is the channel "T_Shift" (mentioned above). **NewFreq:** The last parameter represents the frequency (sampling rate) with which the result channel is to be created.



Note:

- The higher the frequency is, the Shift function works more exactly (it must be always rounded on whole scans).
- A value larger then the main sampling rate resulted in a warning in the protocol file; in this case the main sampling rate will be used.
- Result channels are always channels of type float (double if the GPS channel was double, otherwise channels with a single precision)
- Between the "shifted" GPS values an linear interpolation will be done.

2.7. Bike and Car physical formulas

2.7.1. Speed

The logger calculates the speed by using the digital signal from the speed sensor, the tire-dimension and the number of pulses for this wheel. If the wheel turns very slow, the logger can not calculate the correct speed because of the big time-distance between two pulses.
This becomes a problem when you wish to measure speed up to 0. For example to make breaking tests. The signal looks very raw and the values close to 0 are wrong.
The solution for this is a speed post calculation.
In this case the formula is

Syntax:	*Meaning*
Speed_L4 (#Channel)	**#Channel:** input channel (Normally a speed channel)

Practical example:
Speed_L4(#VRear)



Restrictions:

- Do not use this function on filtered values.
- Do not use this function in combination with tables.
- To measure speed till 0 means also that the car or bike must stand still some seconds at 0 km/h, so wait some seconds before you continue to accelerate. In some cases (without RPM channel) it's better not to start logger with 'AUTO MODE' because in this case the logger does not record when the speed is 0.

2.7.2. Speed2



This function is used to calculate a major speed-channel from two separately measured speeds. The result is the average of the two speeds. If the difference between the two channels is greater than 10%, the resulting value is the greater signal.

Syntax:	*Meaning*
Speed2 (#Channel_1,#Channel_2)	**#Channel_1, #Channel_2:** input channels (Normally two speed channels)

Practical example: Speed2(#VFront, #VRear)



Restrictions:

- Do not use this function on filtered values.
- Do not use this function in combination with tables.
- Use this function only with speed-channels.

2.7.3. Slip



This function allows you to calculate the percentage of the vehicle's slip. For this it is necessary to measure both rear and front speed.

Syntax:	*Meaning*
Slip (#V_Front, #V_Rear)	
#V_Front	Name of front speed channel
#V_Rear	Name of rear speed channel

2.7.4. Banking



This function has to be used to calculate the banking angle of the bike with the Gyro channel.

As you know the gyro measures the banking angle speed of the bike. So, if you integrate this signal, you should get the inclination of the bike. But with this kind of sensor, a small error can lead to a totally wrong result.
For example, considering we've got a gyro measuring a range of 300° (from –150° to 150°) with 4095 bits. So 0° will be at 2047 or 2048 bits. This means there is an error of ½ bit. Your lap lasts 2 minutes and your sampling rate is 50 Hz. Therefore, you have 6000 samples per lap. Each sample, you have, as we said, an error of ½ bit. So your total error is ½ * 6000 = 3000 bits. But for 1 bit you have approximately 0,1° (300/4095) of error. Finally your error will reach 300° by lap.
To correct this, the function integrates the gyro's signal with a linear regression to avoid that the result is modified by the error explained above.

Syntax:	*Meaning*
Banking (#AGyro, P1)	
#Agyro	Channelname of the gyroscope channel.
P1	Angle of the bike on the start/finish line. (0.0 if the bike is straight). If you think the bike is not straight on this part of the circuit, you will have to estimate the banking. For example you can do some measurements with 0.0. Then you have to make an average on the same type of corners but with opposite directions : You can have one at 76° and the other one at –40°. So you will get a difference in absolute of 36°. Therefore P1 can be 18 (36/2). This parameter is important because, as you have seen with the integration, the calculation is reset to P1 each lap.

Practical example:

- Calculation of the inclination of the bike.

2.7.5.BANK2ACC function

As you know it is not worth measuring lateral acceleration on a bike. However to use the racetrack calculation function, you will need a ″virtual″ lateral acceleration. This function calculates the lateral acceleration of the bike from the inclination of the bike calculated with banking function.

Syntax:	*Meaning*
BANK2ACC (#Abanking)	#Abanking is the channel where the inclination of the motorcycle is calculated with the banking channel

Practical example:

- Calculation of the racetrack.

2.8. Channel manipulation

2.8.1. Shifting a channel

This function allows to shift a channel on the time-axis. The unit for the shift may either be seconds or scans. One scan is the time between two measured values of the channel. That means if the channel is recorded with 50Hz one scan is 1/50Hz **ç è** 0.02 sec. Use a positive value to shift the channel to the right and a negative for the other direction. If you want to shift by time, simply add the unit “sec” to the number of the second parameter.

Syntax:	*Meaning*
Shift(#Channel, ShiftCount)	
#Channel	input channel to shift
ShiftCount	Number of scans or seconds to shift the channel

Example:
Shift(#VFront, -2 sec) Channel VFront is shifted two seconds to the left
Shift(#VFront, 100) Channel VFront is shifted 100 values to the right (Assumed that the samplingrate is 50 Hz that means 2 sec)

2.8.2. Combining two 16-bit channels

Some 2D Data Acquisition Systems provide the possibility to record channels, which are read from CAN-bus. This bus is often used in cars and motorcycles to connect sensors to the motor electronic. With 2D systems it is possible to record the values from this bus. CAN-channels in a 2D system have a maximum resolution of 16 bit but the data of the motor electronic may have a resolution of 32 bit. The solution for this problem is to store a 32 bit channel divided in two 16 bit channels. After the data is read from the recording device these two channels are combined to one 32 bit channel using the function Make32, MakeGPS or MakeSingle. If the data read from the CAN-bus originally was a 32 bit integer use Make32 or MakeGPS to create a integer channel, if it was a 32 bit float (IEEE) then use MakeSingle to create a single precision float channel.
The functions Make32 and MakeGPS are very similar. The difference is that MakeGPS changes the range of the values from 0 to 360 to -180 to +180 by subtraction, if the values of the original channel were in the range 0 to 360.
First we have a look at the integer function Make32:
The resulting channel receives the formula of the channel with the lower 16 bit.

Syntax:	***Meaning***
MAKE32(#ChannelHi, #ChannelLo)	
#ChannelHi	input channel containing the high 16 bit
#ChannelLo	input channel containing the low 16 bit

Practical example:
Combining two 16 bit channels from a GPS to the global latitude:
MAKE32(#LatituHi, #LatituLo)

If you want to create a 32 bit channel with automatic change of the value range to fit in –180° to +180° use the function MakeGPS.
Again the resulting channel receives the formula of the channel with the lower 16 bit.

Syntax:	***Meaning***
MakeGPS(#ChannelHi, #ChannelLo)	
#ChannelHi	input channel containing the high 16 bit
#ChannelLo	input channel containing the low 16 bit

Practical example:
Combining two 16 bit channels from a 2D GPS to the global longitude:
MakeGPS(#Long_deHi, #Lon_deLo)

The formula to create a single precision float channel from two 16 bit channels is MakeFloat:

Syntax:	***Meaning***
MakeSingle(#ChannelHi, #ChannelLo)	
#ChannelHi	input channel containing the high 16 bit
#ChannelLo	input channel containing the low 16 bit

2.8.3. Combining two 32 bit channels

If channels are recorded from the CAN-bus (see chapter before), it might be possible, that the data sent by a CAN-device has a resolution of 64 bit. Since 2D systems store information from the CAN-bus in 16-bit channels, you have to combine four of these to one 64 bit channel. This has to be done in two steps, the first is to combine four 16 bit to two 32 bit channels, using the Make32-function, the second is, to combine these two channels to one with 64 bit. The 64 bit number on the bus can be either a integer number or a double precision float. For integer use the function Make64 for the float use MakeDouble.

Syntax:	*Meaning*
MAKE64(#ChannelHi, #ChannelLo)	
#ChannelHi	input channel containing the high 32 bit
#ChannelLo	input channel containing the low 32 bit

Syntax:	*Meaning*
MakeDouble(#ChannelHi, #ChannelLo)	
#ChannelHi	input channel containing the high 32 bit
#ChannelLo	input channel containing the low 32 bit

Practical example:
Combining four 16 bit to a double precision channel:
[Double]
C1=Make32(#LoHi, #LoLo)
C2=Make32(#HiHi, #HiLo)
Result=MakeDouble(#C1,#C2)

2.8.4. Changing the storage type

Most channels in a 2D system are recorded as 16 bit integer values (what is called a word) combined with a multiplier and an offset. Channels created by the calculation tool are stored as float values (single precision with 32 bit) which need the double space on the harddisk of the computer. With the Word- and the Binary-function it is possible to change the store type of a channel to word, to reduce the storing space of a measurement. But do not forget, that this lowers the precision of the channel.
A second reason to use these functions is that some other functions expect a word channel for input. If the channel you want to use in such a calculation is the result of a previous calculation, you have to change the store type before using the Word- or the Binary-function.

2.8.4.1. WORD-function

If the Word-function is used with only one parameter (a channel), CalcTool determines the minimum and the maximum value of the original channel. The formula is calculated that the minimum is transformed to 0 and the maximum to 65535 (maximum word).

In some cases it would be helpful if other values would be used. If the signal has spikes you might use your own border values.
Values lower than the lower border are set to this border.
Values higher than the upper border are set to the upper border value.

The third possibility to use the Word-function is to give the step (the accuracy) which should be used for one digit. The minimum value for the resulting channel is 0 and the maximum 65535 multiplied with this step.
Example: Word(#Speed, 0.01)
The resulting channel has a accuracy for 0.01, the minimum value is 0 and the maximum is 655.35

Syntax:	*Meaning*
Word(#Channel)	
#Channel	channel to change the store type
Word(#Channel, LowerBorder, UpperBorder)	
#Channel	channel to change the store type
LowerBorder	All values of the original channel which are lower than this border are set to this border,
UpperBorder	All values of the original channel which are higher than this border are set to this value
Word(#Channel, Step)	
#Channel	Channel to change the storage type
Step	Step representing the value of one digit

2.8.4.2. BINARY-function

The Binary-function is very similar to the Word-function. The difference is the parameter Range. The Range gives the maximum number of different values in the resulting channel.
A binary-function with the range 65536 has the same result as a word function would have.

Syntax:	*Meaning*
Binary(#Channel, Range)	
#Channel	channel to change the store type
Range	Maximum number of different values in resulting channel
Binary(#Channel, Range, LowerBorder, UpperBorder)	
#Channel	channel to change the store type
Range	Maximum number of different values in resulting channel
LowerBorder	All values of the original channel which are lower than this border are set to this border
UpperBorder	All values of the original channel which are higher than this border are set to this value

.

Practical example:
Binary(#Acc_x, 4096, -50, 50)
The resulting channel is a word channel with a formula that calculates 0 digits to –50 (so the offset will be –50) and 4095 digits to +50 (so the multiplier will be 100/4095 **à** 0.02442)

2.8.4.3. Signed function



The source channel has to be a unsigned Integer channel, that means Byte, Word or Double Word (=DWord) format

Syntax:	*Meaning*
Signed(#Channel)	Channel to change the data format
#Channel	The function changes the data format from unsigned to signed.

Example:

Byte:	0..255	**à**	-127..128
Word:	0..65535	**à**	-32767..+32768
DWord	0..4294967295	**à**	-214748367..+214748368

2.8.5. SWAP-function – Changing the byte-order of a channel

Some 2D Data Acquisition Systems provide the possibility to record channels, which are read from CAN-bus. This bus is often used in cars and motorcycles to connect sensors to the motor electronic.
The user has to define in the communication software which bytes should be taken from a single CAN-identifier to build the channel data. If the byte order is incorrect the resulting channel will be unusable.
The SWAP-function was designed to change the byte order of such channels.
It expects a word or longint channel as input. (16 or 32 bit integer)

Syntax:	*Meaning*
Swap(#Channel)	
#Channel	channel to change the byte order

Practical example:

- Swap the bytes of a CAN-channel, that was recorded with the wrong byte order

2.8.6. Changing dimension

Normally CalcTool does not calculate the dimensions of channels, except integration and derivation of speed and distance. A resolution channel receives the dimension of the first input channel. In some cases this dimension is not correct. To change the dimension of a channel use the Set-function.

Syntax:	*Meaning*
SET(DIM=Value)	
DIM	Name of the property to set (in the moment only DIM is possible)
Value	Value to set the property to

Practical example:
Set the dimension of a calculated gear channel to ‘Gear’:
C1=...
C1=Set(DIM=’Gear’)

2.9. Special functions for phase-calculation

In the analysing software it is necessary to reduce the volume of the data to make special analysis (e.g. MinMax-tables, XY-plots, etc.). Often not all data is of interest, but the fastest lap, a special corner or when the values of a channel are in a special range. The reduction of the data is defined by so called phase-conditions. It is possible to combine several phase-conditions. A phase is one part of the measurement where the phase-conditions meet.
The following functions are used to calculate channels, which are used for phase conditions.

2.9.1. MaxHold - function



This function stores the maximum of a channel. The maximum is kept until the value of an other channel (the trigger channel) goes below one border value after it was above an other border value.

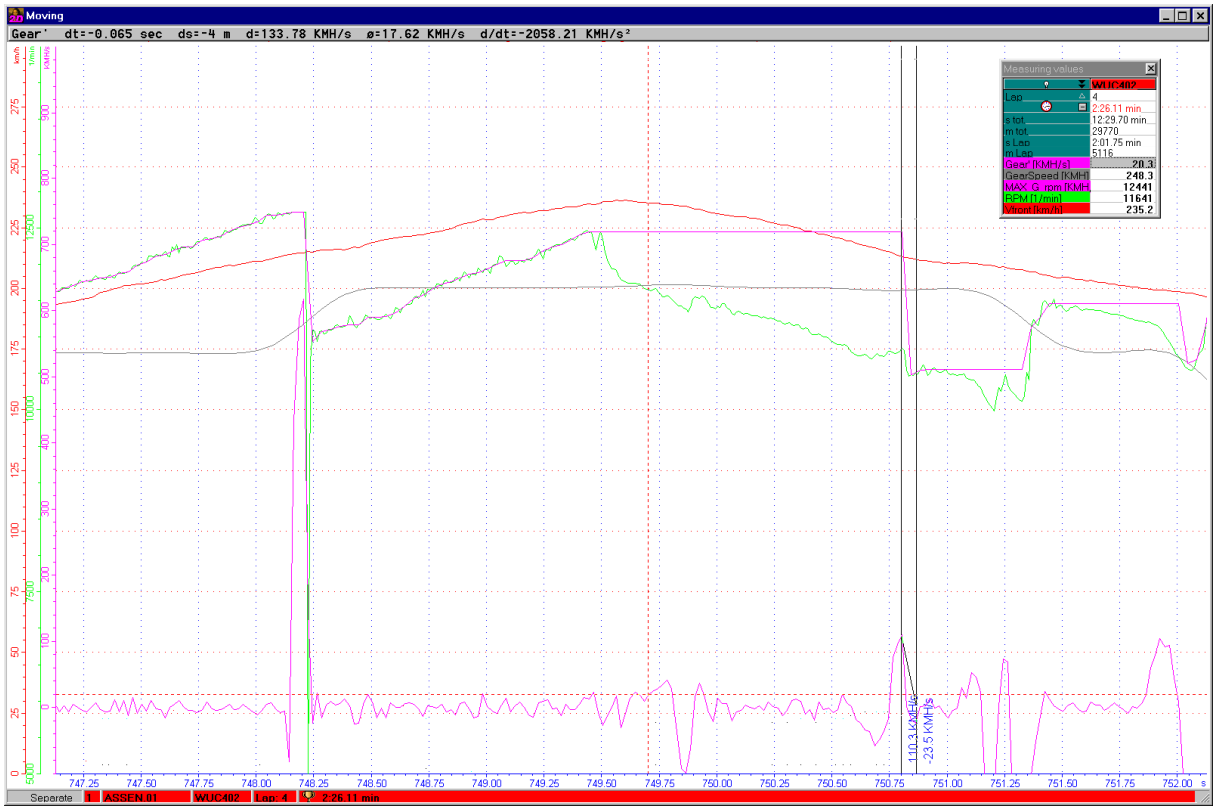
Syntax:	*Meaning*
MaxHold(#CheckChannel, #TriggerChannel, Border1, Border2)	
#CheckChannel	Channel to check for the current maximum
#TriggerChannel	Channel that triggers the reset of the maximum
Border1, Border2	Constants for the trigger conditions When the value of the trigger channel goes below Border2 after being above Boder1, the maximum is reset to the current value of the channel CheckChannel

Practical example:

Syntax:	*Meaning*
[MAX_RPM]	; The Result Channel Gets The Name MAX_RPM
C1 = F(#Vrear, F(med 5))	; get rid of spikes (median filter with 5 samples)
C2 = F(#RPM, F(med 5))	; get rid of spikes (median filter with 5 samples)
C4 = *(12000,#C1)	; Rear Speed * 12000 / RPM
	; = Speed at 12000 revs (Gearbox Speed)
C5 = /(#C4,#C2)	
C5 = SET(DIM=KMH)	; Set Channel Extension to 'KMH'
C6 = WORD(#C5,0,350)	; generate Word Channel with limits 0 and 350
GearSpeed = F(#C6,F(L_PHAMM3Hz33))	
C7 = F(#C6,F(AVG 3))	
Gear' = Derivate(#C7)	C8=MAXHOLD(#C2,#Gear',100,-5) ; Take filtered RPM Channel (without spikes)
RESULT=FREQ(#C8,25)	

- This example calculates a speed- and RPM-channel without spikes (C1,C2) .
- Then the quotient speed/RPM * 12000 is calculated (C4,C5) (which is the gearboxspeed).
- The dimension of this channel is set to “KMH” and a WORD channel is created (C6), which uses less memory than the default single precision result channels.
- This channel is filtered with a 3Hz Hamming low pass filter and stored as channel “GearSpeed”.
- Now the unfiltered GearSpeed channel (C6) is derived and stored as “Gear‘”.
- This channel is used now in the MaxHold Function, to trigger the found Maximum after every Gear Change. (C8). with the Parameters 100 and –5 the reset condition is defined. To reset the Maximum, the Gear‘ channel needs to become 100 first. Than, after dropping back to below –5, the Value of the MaxHold Function is set to the value of C2.
- To save Memory, the MaxHold Channel is stored as 25 Hz channel.

MaxHold function



2.9.2. MinHold – function



This function stores the minimum of a channel. It works like the MaxHold function but with the minimum. The minimum is kept until the value of an other channel (the trigger channel) goes above one border value after it was below an other border value.

Syntax:	*Meaning*
MaxHold(#CheckChannel, #TriggerChannel, Border1, Border2)	
#CheckChannel	Channel to check for the current minimum
#TriggerChannel	Channel that triggers the reset of the minimum
Border1, Border2	Constants for the trigger conditions When the value of the trigger channel goes above Border2 after being below Boder1, the minimum is reset to the current value of the channel CheckChannel

2.9.3. FillFromBool – function

This function stores values from a source channel, when an other channel has a value unequal to zero. If the second channel has the value zero, the function keeps the old value of the source channel.

Syntax:	*Meaning*
FillFromBool(#SourceChannel, #BoolChannel)	Take value from SourceChannel when BoolChannel <> 0 otherwise keep old value
#SourceChannel	Channel to take values from
#BoolChannel	Boolean-channel. When zero old values are kept otherwise value from SourceChannel is taken

2.10. Stopping execution

When an error occurs in the calculation it sometimes makes no sense to continue calculating after the error, because all following calculations depend on the error free result of previous lines.
For this CalcTool provides three different abort functions.

2.10.1. Abort calculation of group when an error occurred: OnErrorExitGroup

Syntax:	*Meaning*
OnErrorExitGroup	Stop executing the calculation of the current group if an error occurred in lines before.

Calculating the current group is aborted when an error occurred in the lines before.
Channels calculated before this line will be stored.
CalcTool continues with the next group.

2.10.2. Abort whole calculation when an error occurred: OnErrorExitTotal

Syntax:	*Meaning*
OnErrorExitTotal	Stop executing the calculation of the whole CAL-file if an error occurred in lines before.

Calculating the current group is aborted when an error occurred in the lines before.
Channels calculated before this line will be stored.
CalcTool does not continue with the next group.

2.10.3. Abort whole calculation: ExitTotal

Syntax:	*Meaning*
ExitTotal	Stop executing the calculation of the whole CAL-file at this line.

Calculating the current group is aborted even if there was no error in the lines before.
Channels calculated before this line will be stored.
CalcTool does not continue with the next group.

2.11. Calling external programs

Sometimes it is useful, to start an external program after the download of a measurement is completed. This can be done by using the Execute-function.

Syntax:	*Meaning*
Execute(Commandline [, Param1][, ...])	Start external program defined by Commandline. Parameters to pass to the program are given seperated by commas.

Example:
[RunExternal]
Execute(c:\Race\CopyEcuFile.bat, <MesDir>)

After each download the current definition file of the ECU should be copied into the measurement directory. The copying is done by a batch file “CopyEcuFile.Bat”. The parameter is a placeholder for the current measurement directory. CalcTool replaces it with the path of the measurement and passes it as a parameter to the batch file. Inside the batch file the first parameter can be accessed by using “%1”, the second by “%2” and so on.
The command in the batch file could look like this:

copy C:\ECU\CurrentSetting.dat %1

Further placeholders can be:

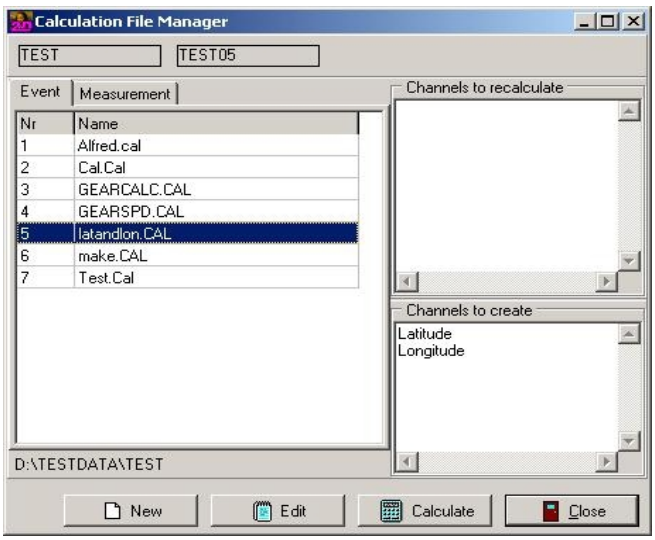
<RaceDir> = The current software directory
<EventDir> = The current event directory
<DataDir> = The current data root

3. How to use these functions in Analyzer

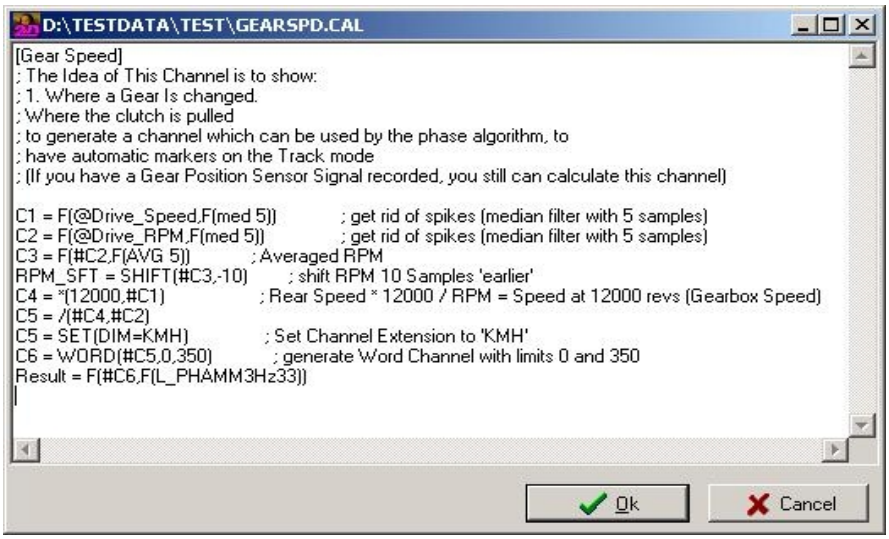
In the analysing software Analyzer are two menuitems for calculation channels available:

- “Functions” – “Calculation files/event”
  Editing and calculating of CAL-files, which are located in the event, that means which are available from all measurements in that event.
- “Functions” – “Calculation files/run”
  Editing and calculating of CAL-files, which are located in the measurement-directory (and only available for this run)

When one of the menuitems is selected, the Calculation File Manager appears (here with the CAL-files of the event):



In this dialog the user can create, edit and calculate one or more CAL-files.
For editing a simple texteditor is used (here with an example of a gear calculation):



3.1. Naming channels



A CAL-file must contain minimum one group. A group has to start with a name, which is written in brackets: [GroupName].

If the instructions of a group contain a line beginning with “Result=”, the result of the calculation of this line is stored as a channel with the name of the group.
Each instruction starts with the name of a variable. If you do not want a channel to be stored on your computer, because it is a temporary channel for further calculation, use a so called temporary channel name. A temporary channel name starts with a “C” followed by a number.
Variables with other names are stored and can be used for analysing.

Example:

Syntax:	*Meaning*
[TEST]	; Name of the group
C1 = /(#Channel_1,#Channel_2)	; temporary channel C1
C2 = ...	; temporary channel C2
Temp = +(#C1,#C2)	; calculates a calculation channel Temp from temporary channels C1 and C2
A8 = Sin(#Temp)	; calculates a calculation channel A8 from the calculation channel Temp
RESULT = +(#A8,#C2)	; Result is addition of the temporary channel C2 and the calculation ; channel A8. It is stored under the name “TEST” because of the ; groupname.

In this example, three results of the calculations can be used as normal channels. This means that the software considers them as regular channels and so you have the same possibilities as with ones directly recorded. These results are Temp, A8 and Test (Result). On the other hand, the temporary channels can’t be used as normal ones. The main use for them is to be steps of the calculation that we don’t need to analyse.

3.2. Replacing channels

In some cases it might be useful, to replace a measured channel by a calculated one.
Perhaps the signal of the speed sensor is noisy and you want to work with a filtered speed signal in the analysis tool. To replace an existing channel with a calculated channel with the same name use the keyword “NewResult” instead of “Result”

Example:
[Speed]
NewResult = F(#Speed, F(Med 7))

This would create a channel filtered by a median filter with 7 iterations and store it under the same name as the input channel.
Note:

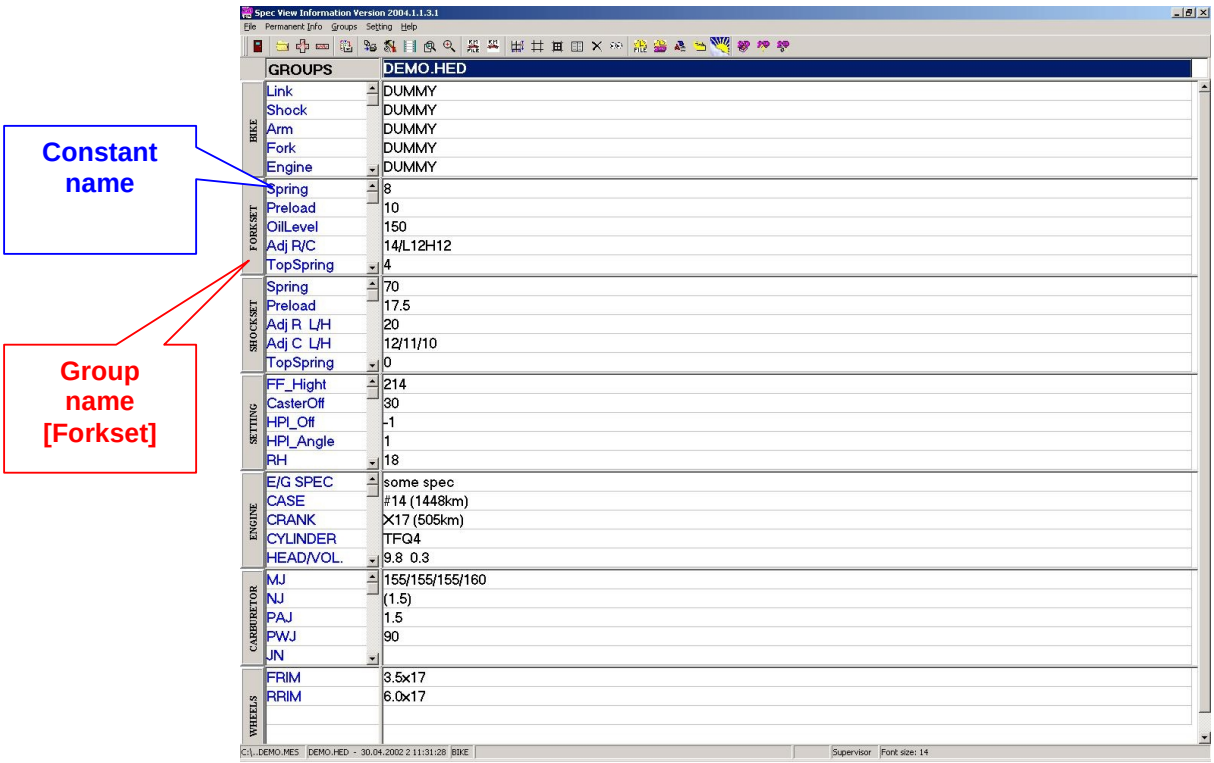
- The name of the group has to have the name of the channel, that should be replaced.
- It is not a true replacement, the original channel is still present but not visible for the user. That is done to provide the possibility to recalculate the channels. If the original channel is deleted, a recalculation is impossible.

3.3. The link between calculation and Specsheets

Many times you want to do some calculations with constant parameters depending of your vehicle's set-up (e.g. Springs of suspensions). Now it is possible to link the constants used in the calculation channels to the ones written in the Specsheets of the same file. The following formula can be used for any variable within the info file (Specsheet).

Formula:
constant (for calculation) = 'name of the group where constant is' . 'constant name in Specsheet'

Practical example::
Considering we've got this kind of info file:



We want to use in our calculation the value of the front suspension's spring stiffness for this file. The calculation is the multiplication of spring stiffness with channel #F_Susp. So due to the formula, you just have to write :

C1 = * (#F_Susp, Forkset.Spring)

Therefore the computer will use the value contained in Spring of the group FrontSusp (In this example it will be 8). Now each change in your settings will be directly linked to your calculations.

Warning
Be careful with the unit of the value in the Specsheet and the one you have to use in the calculation file. In fact sometimes they are not the same. For example your spring stiffness is in lb/mm and you want your final result in kg. So don't forget to convert in your calculation file the stiffness in kg/mm.

3.3.1. Partial reading of SpecSheet values



In some cases it might be useful not to read a complete SpecSheet but a part of it.

Syntax:	*Meaning*
Group.Name	Retrieves the complete value of the entry “Name” in the group “Group”
Group.Name.%N	Retrieves the Nth part of the value of the entry “Name” in the group “Group”. The parts have to be separated by a space character.

Practical example:
The value of the entry “FWheel” in the group “Bike” is “X-Z 439”.
“Bike.FWheel” is resolved to “X-Z 439”
“Bike.FWheel.%1” is resolved to “X-Z”
“Bike.FWheel.%2” is resolved to “439”

3.4. Automatic channel-calculation



If you want to make always the same channel-calculation after each download of data you may take advantage from the automatic channel calculation feature.

To use it simply put your calculations in a file **“AUTOCALC.CAL”** located in the current event-directory. After downloading and decompressing the data the communication tool WinIt looks in the event-directory for the file AUTOCALC.CAL and calls the calculation tool with this file.

4. Table of all calculation functions

The following table will give you an overview of available functions and the syntax to use them.

NAME	COMMAND	EXAMPLE	DESCRIPTION
Standard mathematics			
Addition	+	+(#Channel, Constant)	addition of channel #Channel and constant
		+(#Channel1, #Channel2)	addition of channel #Channel1 and #Channel2
Const function	Const	**CONST (#CONST VALUE)**	Creates a channel with a constant value (=#const value)
Division	/	/(#Channel, Constant)	channel #Channel divided through constant
		/(#Channel1,#Channel2)	channel #Channel1 divided through #Channel2
		/(Constant, #Channel)	constant divided by a channel
Floor	**FLOOR (#CHANNEL)**		Calculates a channel with whole numbers
Integer division	DIV	**DIV (#CHANNEL_1, #CHANNEL_2)**	Channel div channel Channel div constant Constant div channel
		Div (#Channel, Constant) Div (Constant, #Channel)	
Multiplication	*	*(#Channel1,Constant)	multiplication of #Channel1 with constant
		*(#Channel1, #Channel2)	multiplication of #Channel1 with #Channel2
Modulo	Mod	**MOD (#CHANNEL_1, #CHANNEL_2)**	Channel modulo channel Channel modulo constant Constant modulo channel
		Mod (#Channel, Constant) Mod (Constant, #Channel)	
Round	Round (#Channel)		Calculates a channel with whole numbers
Subtraction	-	-(#Channel, Constant)	subtracts a constant of channel #Channel1
		-(#V_Front, #VRear)	difference of rear and front speed
		-(C, #Channel)	subtracts a channel from a constant
Trunc	**TRUNC (#CHANNEL)**		Calculates a channel with whole numbers

Advanced mathematics			
NAME	**COMMAND**	**EXAMPLE**	**DESCRIPTION**
Square root	Sqrt	sqrt(#A2)	square root of channel #A2
Logarithms	Log	log(#Channel)	logarithm's from #Channel to the base of 10
Sinus Trigonometric	Sin	sin(#A3)	sinus of channel #A3 (in rad) values
Sinus Trigonometric	DSin	dsin(#A3)	sinus of channel #A3 (in deg) values
Cosinus Trigonometric	Cos	cos(#A3)	cosinus of channel #A3 (#A3 in rad)
Cosinus Trigonometric	DCos	dcos(#A3)	cosinus of channel #A3 (#A3 in deg)
Tan Trigonometric	Tan	tan(#A3)	tangens of channel #A3 (#A3 in rad)
Tan Trigonometric	DTan	dtan(#A3)	tangens of channel #A3 (#A3 in deg)
Arctan, arcsin,arccos Trigonometric	Arctan, arcsin ...	arctan(#A4)	Arcus tangens of channel #A4; result of all functions in rad
Derivation	Derivate	Derivate(#D1)	Derivation of front speed = acceleration
Integration	Integrate	I(#A3) I(#A3,M)	Integrated channel #A3 Integrated Middle value M
SUM-function	Sum	Sum(#Event)	Calculates the sum of all values of channel #Event
Minimum	Min	min(#D1,#D3)	Result is the min from the 2 channels
Maximum	Max	max(#D1,#D3)	Result is the max from the channels
Absolute value	Abs	abs(#A5)	Absolute values |#A5|
Signum function	Sig	sig(#gyro)	If (gyro < 0) then sig(#gyro) = -1 If (gyro = 0) then sig(#gyro) = 0 If (gyro > 0) then sig(#gyro) = 1
If-function	If	If (#Ax,P1,P2,P3, P4)	If channel #Ax is P1 than P2 then result is P3 else result is P4 P1 is >, <, >=, <= or = P2 is #Ay or constant P3 is #Aw or constant P4 is #Az or constant

Bike / car physical formulas			
NAME	**COMMAND**	**EXAMPLE**	**DESCRIPTION**
Speed_L4	Speed	Speed_L4(#V_Front)	Improves speed-signal of channel #V_Front
Speed2	Speed2	Speed2(#V_Front, #V_Rear)	Calculates the average of two speed-signals.
Slip	Slip	slip(#V_Front, #V_Rear)	Slip function front/rearspeed in %
Banking	Banking	Banking(#Gyro,0.0)	Calculates the inclination of the bike with the gyro's signal (channel #Gyro) considering that the inclination of the bike in the start/finish line is 0.0 .
BANK2ACC	BANK2ACC	BANK2ACC(#Channel17)	Calculates the lateral acceleration of a bike with the calculated banking angle (channel #Channel17).

Additional formulas of existing channels as new channel		
NAME	**COMMAND**	**DESCRIPTION**
Formula Integer	F(#Channel,I(M,D,O)) M multiplicand D divisor O offset	integer formula of channel #Channel e.g. to use same channel data as #Channel1, but use another formula. For example to see digits use F(#Channel1,I(1,1,0))
Formula Real	F(#Channel, R(F,O)) F factor (multiplication/divisor) O offset	real formula of channel #Channel e.g. to use same channel with different Offset
Table	F(#Channel, T(name) name = table filename	another table of channel #Channel e.g. to use same channel with another table
Table 2	F(#Channel, 2(Name)) name = table filename	#Channel will be connected to the table ″Name″
3D-Table	F(#Channel1, #Channel2, T(TableName.Ext, IntType)) TableName.Ext IntType	#Channel1 and #Channel2 will be connected to the table″TableName.Ext″ name of the table file with extension Type of interpolation (i.e. LIN)
Filter	F(#Channel, F(L_P Hann 1.0Hz 99)) L_P Hann 1.0Hz 99 AVG 21 MED 33	Filter #Channel with low pass hanning window 1 Hz 99 Iterations. Average filter 21 values Median 33 Iterations
Frequency	Freq(#D1,25)	Channel D1 but with 25 Hz sampled
FreqBase	FreqBase(#Channel, NewRate, GPSRate) #Channel = Name of the channel NewRate = New samplingrate GPSRate = Rate at which the GPS sends new data	Changes samplingrate of channel #Channel to NewRate
Mux function	MUX(#DataChannel, #MuxChannel, MuxVal) #DataChannel = Name of the channel containing the multiplexed data #MuxChannel = Name of the channel containing the multiplex values MuxVal = Value at which the data should be taken	Extracts the values of DataChannel when MuxChannel has the value MuxVal

Channel manipulation		
NAME	**COMMAND**	**DESCRIPTION**
Shifting	Shift(#Channel, Scans)	Shifting a channel to the right for Scans. Use a negative value to shift to the left
Combining two 16 bit channels	MAKE32(#ChannelHi, #ChannelLo) #ChannelHi: Channel with the upper 16 bit #ChannelLo: Channel with the lower 16 bit	Combines two 16 bit channels to one 32 bit channel
Combining two 32 bit channels	MAKE64(#ChannelHi, #ChannelLo) #ChannelHi = input channel containing the high 32 bit #ChannelLo = input channel containing the low 32 bit	Combines two 32 bit channels to one 64 bit channel
Changing the storage type	Word(#Channel) Word(#Channel, LowerBorder, UpperBorder) #Channel = channel to change the store type LowerBorder = All values of the original channel which are lower than this border are set to this border. UpperBorder = All values of the original channel which are higher than this border are set to this value	Changes the store type of a channel to word
	Binary(#Channel, Range) Binary(#Channel, Range, LowerBorder, UpperBorder)	The Binary-function is very similar to the Word-function. The difference is the parameter Range
Swap function	Swap(#Channel) #Channel = channel to change the byte order	Changing the byte-order of a channel
Changing dimension	Set(DIM='Km/h')	Changes the dimension of a channel

Special functions for phase-calculation		
NAME	**COMMAND**	**DESCRIPTION**
MaxHold	MaxHold(#CheckChannel, #TriggerChannel, Border1, Border2)	Stores the maximum of a channel. The maximum is kept until the value of an other channel (the trigger channel) goes below one border value after it was above an other border value.
MinHold	MinHold(#CheckChannel, #TriggerChannel, Border1, Border2)	Stores the minimum of a channel. The minimum is kept until the value of an other channel (the trigger channel) goes above one border value after it was below an other border value.



If you need additional functions which are not included in RACE yet, please contact 2D. It is possible to extend the function library on request.

Appendix A: – Example of a CAL file



You will get this CAL–file if you install our full software package WinARace. In this case you will get three different demo measurements. You can find those demo measurements at the fixed directory "C:\RaceData\DemoData".
Presuppose C: is the system drive of you operating system (windows).

The CAL – file at the table has the name "CAL.CAL" and exists at the "Bike" directory. You can load and edit a Cal-file with a simple text file editor – for example NotePad.exe.



Take notice of: For a better understanding of a calculation statement you should write comments in the Cal – files. To do so you must write a semicolon as a fixed prefix character for a comment.

Example:
Calculate hi and low speed suspension signal

Syntax	**Explanation / Link**
[Suspension]	
FSus_lo=F(@Front_susp,F(L_PHAMM3HZ77))	; FIR Low Pass Hamming Filter with 3 Hz and 77 iterations – refer Filter function
RSus_lo=F(@Rear_susp,F(L_PHAMM3HZ77))	
FSus_hi=F(@Front_susp,F(L_PHAMM25HZ77))	; 25 Hz Finit Impulse Response Low Pass Filter with Hamming Window - refer Filter function
RSus_hi=F(@Rear_susp,F(L_PHAMM25HZ77))	
; generate suspension movement speed	
FSus' = Derivate(#FSus_hi)	; Derivation of the FSus_hi Channel
RSus' = Derivate(#RSus_hi)	refer Derivation
; generate 25 Hz channel to get finer resolution for FFT!!!	
FSus_25 = FREQ(#FSus_lo,25)	; Reduce sampling rate of a channel, here result frequency will be 25 Hz
RSus_25 = FREQ(#RSus_lo,25)	refer Frequency
[Bike_acc]	; result Channel will be Bike_acc
C1=F(@Int_Speed,F(med 5))	; get rid of spikes (median filter with 5 samples) refer Filter function
C2=F(#C1,F(L_PHAMM3Hz55))	; get down to mass acceleration refer Filter function
Speed_lo=WORD(#C2,0,500)	; save memory, convert float channel to Word Channel, ; with limits 0 and 500 refer changing the store type
C3=Derivate(#C2)	; Derivate Speed Signal refer Derivation
C4=WORD(#C3,-30,30)	
C5=F(#C4,F(AVG 5))	; make output looking more smooth (average with 5 samples) refer Filter function
;C5=F(#C4,F(L_PHAMM2Hz55))	; make output looking more smooth (average with 5 samples) refer Filter function

[GearSpeed]	**; The Idea of This Channel is to show:** **; 1. Where a Gear Is changed.** **; Where the clutch is pulled** **; to generate a channel which can be used by the phase algorithm, to have automatic markers on the Track mode** **; (If you have a Gear Position Sensor Signal recorded, you still can calculate this channel)**
C1 = F(@Drive_Speed,F(med 5))	; get rid of spikes (median filter with 5 samples) refer Filter function
C2 = F(@Drive_rpm,F(med 5))	; get rid of spikes (median filter with 5 samples) refer Filter function
C3 = F(#C2,F(AVG 5))	; Averaged RPM refer Filter function
RPM_SFT = SHIFT(#C3,-10)	; shift RPM 10 Samples 'earlier' refer Shifting a channel
C4 = *(12000,#C1)	; shift RPM 10 Samples 'earlier' refer Shifting a channel
C4 = *(12000,#C1)	; Rear Speed * 12000 / RPM = Speed at 12000 revs (Gearbox Speed) refer Multiplication
C5 = /(#C4,#C2)	
C5 = SET(DIM=KMH)	; Set Channel Extension to 'KMH' refer change dimension
C6 = WORD(#C5,0,350)	; generate Word Channel with limits 0 and 350 refer changing the store type
GearSpeed = F(#C6,F(L_PHAMM5Hz33))	refer Filter function
;C7 = F(#C6,F(AVG 3))	refer Filter function
;Gear' = Derivate(#C7)	
C22 = if (#GearSpeed,>,GearBox.1,1,0)	refer If-function
C23 = if (#GearSpeed,>,GearBox.2,1,0)	
C24 = if (#GearSpeed,>,GearBox.3,1,0)	
C25 = if (#GearSpeed,>,GearBox.4,1,0)	
C26 = if (#GearSpeed,>,GearBox.5,1,0)	
C27 = if (#GearSpeed,>,GearBox.6,1,0)	
C28 = +(#C22,#C23)	refer Addition
C29 = +(#C28,#C24)	
C20 = +(#C29,#C25)	
C21 = +(#C20,#C26)	
Gear_Nr = +(#C21,#C27)	refer Addition
Gear_Nr= SET(DIM=.)	; Set Channel Extension to . refer change dimension
C30 = F(#Gear_Nr,F(AVG 5))	
Gear' = Derivate(#C30)	
;MAX_G_rpm=MAXHOLD(#C2,#Gear',100,-100)	; Check for max RPM on spike free Revsignal, Reset Value when Gear' is crossing -5 comming from 100 refer MaxHold
C12=if(@Throttle,>,5,1,0)	refer If-function
ACC_RPM=*(#C2,#C12)	; set RPM 0 if Throttle is closed - refer Multiplication
C14=MAXHOLD(#ACC_RPM,#Gear',3,1)	refer MaxHold
C15=WORD(#C14)	refer changing the store type
MAX_G_rpm=FREQ(#C15,25)	refer Frequency
MAX_G_rpm= SET(DIM=RPM)	; Set Channel Extension to RPM' refer Frequency

Appendix B: The link between CalcTool and Specsheets



In the following example you will see the Specsheet group [CalcTool]. Specsheets are special documentation files that belong to every measurement done with the 2D equipment. These files are generated for every download (=reading the data from the datalogger).
A Specsheet file has the same name as the measurement but with the file extension "*.HED". The corresponding Specsheet for each measurement must be exist directly in the "MES- directory".

In the files you can gather all the information that is relevant for the circumstances and special set-up for your measurements and events (e.g. the settings of a bike during a race weekend or testing). The user of the program – the engineer, the data recording man, or the mechanic, is in charge of the maintenance and integrity of the data. And you are able to eliminate a good part of additional paperwork for documentation.

[Groups] organise the details of the information.

If you start CalcTool with any CAL-file (refer chapter "How can I start the program CalcTool manually ?") the program will be write the name of this CAL-file into the group [CalcTool] of the related Specsheet. Additionally you will get date and time information of the CalcTool starting.

Take a look at this Example:

A Specsheet may have this look.

[CalcTool]
D:\TESTDATA\ZuLoeschen\Test.CAL=07.06.2004 16:05:21
D:\TESTDATA\ZuLoeschen\XDel.CAL=07.06.2004 16:05:00
D:\TESTDATA\ZuLoeschen\MedTest.CAL=08.06.2004 10:07:13
D:\TESTDATA\ZuLoeschen\TEST-01.MES\LoggerNameInclude.CAL=08.06.2004 10:10:25
D:\TESTDATA\ZuLoeschen\TEST-01.MES\Include.CAL=08.06.2004 10:21:19

[Tyres]
FrontTyre_K1=GPZ25806_K1
FrontTyre_K2=GPZ25806_K2
FrontTyre_K3=GPZ25806_K3

[DOWNLOAD]
FrontDis (m)=0
RevCount (Refs)=0
Run total (s)=8075
Run recording (s)=8070
Start of download=02.06.2004 09:27:48
End of download=02.06.2004 09:32:05
Number of errors=0
Time to decompress=0.0 sec
System id=11H021BB825
Programversion=2.2.2.1
Userlevel=Supervisor

[Weather]
Condition=dry
DT/WT=25/20/61.2%
AirP/K=1000/1.027
track=anything
time=now

Appendix C: What's new ?

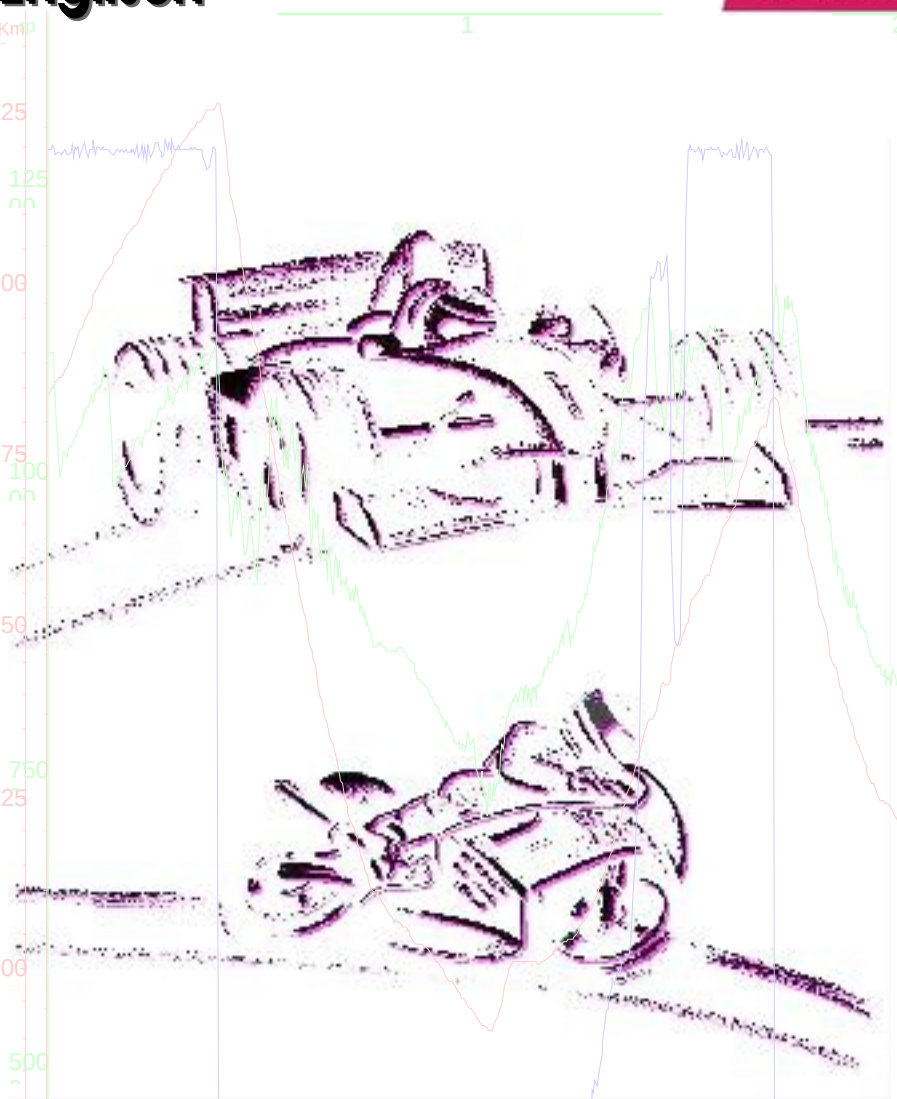
NAME	COMMAND / FUNCTION	Function since when available?
Combining two 16 bit channels chapter 2.8.2 page 30	**MAKEGPS(#ChannelHi, #ChannelLo)** **#ChannelHi:** input channel containing the high 16 bit **#ChannelLo:** input channel containing the low 16 bit	06.06.2005
chapter 2.6.6 page 24	**F(#Ch1, #Ch2, #Ch3, T(TableName.Ext, IntType))** **TableName.Ext;** name of the table file containing an ' with extension **IntType;** Type of interpolation (i.e. LIN)	28.10.2005
Condition IfLaptimesExist chapter 1.1.2.3	**If LaptimesExist** **Result = ...**	28.11.2005
Condition IfNotLaptimesExist chapter 1.1.2.4	**If NotLaptimesExist** **Result = ...**	28.11.2005
Condition IfSpecValueExists chapter 1.1.2.5	**IfSpecValueExists**	28.11.2006
Condition IfNotSpecValueExists chapter 1.1.2.6	**IfNotSpecValueExists**	28.11.2006
Entering values at runtime chapter 1.1.3	**Entering values at runtime**	28.11.2006
Filter with variable depth chapter 2.6.7.3	**Filter with variable depth**	28.11.2006
UseBits-function chapter 2.6.11	**Use Bits-function**	11/28/2006
Stopping execution chapter 2.10	**Stopping execution**	28.11.2006
Word-function chapter 2.8.4.1	**Word(#Channel, Step)**	22.01.2007
Calculated mileage chapter 1.1.5	**Mileage(#SpeedChannel, LoggerName)**	11.04.2007
2D Table search function chapter 2.6.7	**T2DSearch(#YChannel, #ValueCh, T(TableName.E** **[, SearchDirection])**	11.04.2007
Partial reading of SpecSheet values chapter 3.3.1	**Group.Name** **Group.Name.%N**	30.05.2007

Appendix C: What's new ?

NAME	COMMAND / FUNCTION	Function since when available?
MinValue	**MinValue(#Channel)**	30.05.2007
MaxValue	**MaxValue(#Channel)**	30.05.2007
FirstValue	**FirstValue(#Channel)**	30.05.2007
LastValue	**LastValue(#Channel)**	30.05.2007
Signed	**Signed(#Channel)**	13.06.2007
Round	**ROUND (#CHANNEL)**	13.12.2007
Floor	**FLOOR (#CHANNEL)**	13.12.2007
Trunc	**TRUNC (#CHANNEL)**	13.12.2007
FillfromBool	**FillFromBool(#SourceChannel, #BoolChannel)**	19.03.2008
TAU filter	**Refer chapter** Full filter interface	19.03.2008
MinValue MaxValue FirstValue LastValue	**Changed (additional) syntax declaration of the four functions:** • **MinValue(#Channel,Rate)** • **MaxValue(#Channel,Rate)** • **FirstValue(#Channel,Rate)** • **LastValue(#Channel,Rate)**	11.06.2008
AvgValue	**The Average value function AvgValue(#Channel, Rate)**	11.06.2008
EnterValue	**EnterValue('Text shown in dialog')** **EnterValue('Text', Value)**	30.07.2008
EnterChannel	**EnterChannel('Text shown in dialog')** **EnterChannel('Text', #Channel)**	30.07.2008
Calling external programs	**Execute(Commandline [, Param1][, ...])**	06.08.2008
GPSShift	**GPSSHIFT(#GPSCHANNEL,#SHIFTCHANNEL, NEWFREQ)**	14.10.2008

- Englisch -

2d-datarecording.com



2009

2D software licence types

Art.No.: AC-DOC_LicenceTypes_e-000

modified 17.04.2009

The 2D software

-Analysis Software on highest level for new and experienced users -

2D Debus & Diebold Meßsysteme GmbH
Alte Karlsruher Str. 8, 76227 Karlsruhe Tel.: +49(0)721 94485-0 Fax.: +49(0)721 94485-29



Analyzer: Licence differences

license type / functionality	Small	Kit-System	System	Full	Net	Team
# of loadable measurements	2	2	3	4	9	9
# of channel groups	8	8	16	32	32	32
# of desktop templates	1 fix	2 fix	3	free	free	free
Overview window per measurement	•	•	•	•	•	•
Moving- / circuit- and laptime window	•	•	•	•	•	•
Editor for channel properties	•	•	•	•	•	•
Zoom of selection in Moving window	•	•	•	•	•	•
Measuring mode	•	•	•	•	•	•
Measuring started with channel values	all	all	optional	optional	optional	optional
Measuring mode with relative values	X	X	•	•	•	•
Magnifier window	X	X	X	•	•	•
Sorting of channels	X	X	•	•	•	•
Channel graphic type “All“ selectable	X	fix	•	•	•	•
Channel value reduce type selectable	X	fix	•	•	•	•
Distance plot	•	•	•	•	•	•
Representation of track via GPS	•	•	•	•	•	•
Creation of track map from lateral acceleration	X	•	•	•	•	•
Creation of track map from GPS coordinates	X	•	•	•	•	•
Virtual laptrigger and sections via GPS	X	X	•	•	•	•
Automatic laptrigger control	•	•	•	•	•	•
Automatic segment detection	X	•	•	•	•	•
Lap synchronization	X	•	•	•	•	•
Reload of measurements	X	X	•	•	•	•
Commenting of measurements	•	•	•	•	•	•
User defined markers	•	•	•	•	•	•
Standard print function in vector quality (EMF)	X	•	•	•	•	•
Print report manager	X	•	•	•	•	•
Print via Excel	X	X	•	•	•	•
Excel print sheets	X	X	2+1	free	free	free
Vector graphics export in EMF format	X	X	•	•	•	•
Areas in Moving window	X	X	•	•	•	•
Quick key Interpreter	X	X	•	•	•	•
Language switchable during runtime	•	•	•	•	•	•
Color scheme white/ light / dark	•	•	•	•	•	•
Separate color schemes per template	X	X	•	•	•	•
Saving of templates	X	X	•	•	•	•
Section times over distance	X	3	•	•	•	•
Circuit window	•	•	•	•	•	•
MultiCircuit window	X	fix	fix	•	•	•
GoogleMaps images displayed in MultiCircuit	X	•	•	•	•	•
GoogleMaps images loadable in MultiCircuit	X	X	X	•	•	•
GoogleEarth™ link	X	•	•	•	•	•
Export function	fix CSV	X	4	free	free	free
Phases in export	X	X	•	•	•	•
Screen export	X	•	•	•	•	•
Dynamik test module (DTS)	•	X	•	•	•	•
Min/Max tables	X	fix	4	free	free	free
Phases in Min/Max tables	X	fix	•	•	•	•

The 2D software

-Analysis Software on highest level for new and experienced users -

2D Debus & Diebold Meßsysteme GmbH
Alte Karlsruher Str. 8, 76227 Karlsruhe Tel.: +49(0)721 94485-0 Fax.: +49(0)721 94485-29



Analyzer: Licence differences

license type / functionality	Small	Kit-System	System	Full	Net	Team
Min/Max table export	X	X	•	•	•	•
Min/Max table link to Moving window	X	•	•	•	•	•
Time diff (win function)	X	•	•	•	•	•
Reference laps	X	X	•	•	•	•
Automatic gear calculation	X	•	optional	optional	optional	optional
Wizards for gear and tire perimeter calculation	X	X	•	•	•	•
Wizards for “Wheelies“ and “Track segments“	X	X	•	•	•	•
Special channels	Speed	Speed	•	•	•	•
Phases in Moving and Overview windows	X	X	•	•	•	•
Link to SpecView module	X	X	•	•	•	•
Live export	X	X	•	•	•	•
Temporary function settings	X	X	X	•	•	•
Blanking out measurements	X	X	X	•	•	•
MultiCircuit Measuring of GPS position	X	X	X	•	•	•
MultiCircuit Zoom, move, follow of position	X	•	•	•	•	•
Channel values optionally displayed hex/binary	X	X	X	•	•	•
XY-Plots	X	fix	4	free	free	free
XY-Plot regression lines	X	X	•	•	•	•
XY-Plot accumulation	X	X	•	•	•	•
Track mode windows	X	fix	4	free	free	free
Histograms	X	fix	4	free	free	free
Video link	X	X	•	•	•	•
Spectral analysis (FFT)	X	X	X	free	free	free
Interpolation of channel values	X	X	X	•	•	•
Window frames switchable	X	X	X	•	•	•
Measurements optical vertical separable	X	X	X	•	•	•
“Unstretched” distance plot function	X	X	X	•	•	•
“Squared” drawing function	X	X	X	•	•	•
Real time player	X	X	X	•	•	•
Cutting of measurements	X	X	X	•	•	•
Access on measurement data in the network	X	X	X	•	•	•
Saving/reloading of desktop	X	X	X	•	•	•
Telemetry server and -clients	X	X	X		•	•
Scripting via automation interface	X	X	X	X	•	•
Import Plugins	X	X	optional	optional	optional	optional
Channel filter Plugins	X	X	•	•	•	•
Adding of channels via filter Plugins	X	X	X	X	•	•
Additional Plugins	X	X	X	X	•	•
Merger: Combining of measurements	X	X	X	X	•	•
Simultaneous (shared) access on measurement data in a network	X	X	X	X	X	•
Multi-user administration	X	X	X	X	X	•
Multiple track settings in a network	X	X	X	X	X	•
Export and import of user settings	X	X	X	X	X	•
Export and import of function settings	X	X	X	X	X	•
Coding of measurements	X	X	X	X	X	•
Chassis module	X	X	X	X	X	•
SW update authorization (develop cycle)	X	X	X	X	X	•

2D Debus & Diebold Meßsysteme GmbH
Alte Karlsruher Str. 8, 76227 Karlsruhe Tel.: +49(0)721 94485-0 Fax.: +49(0)721 94485-29

Communication software WinIt: Licence differences

license type / functionality	Small	Kit-System	System	Full	Net	Team
Import of CAN database files	X	X	X	•	•	•
Download into the network	X	X	X	X	•	•
Software dashboard in communication module	temporary	temporary	temporary	save	save	save

2D Debus & Diebold Meßsysteme GmbH
Alte Karlsruher Str. 8, 76227 Karlsruhe Tel.: +49(0)721 94485-0 Fax.: +49(0)721 94485-29

CalcTool: Licence differences

license type / functionality	Small	Kit-System	System	Full	Net	Team
Calculation channels	X	fix	10	free	free	free

2D Debus & Diebold Meßsysteme GmbH
Alte Karlsruher Str. 8, 76227 Karlsruhe Tel.: +49(0)721 94485-0 Fax.: +49(0)721 94485-29

SpecView: Licence differences

license type / functionality	Small	Kit-System	System	Full	Net	Team
Access on SpecSheet data in a network	X	X	X	•	•	•