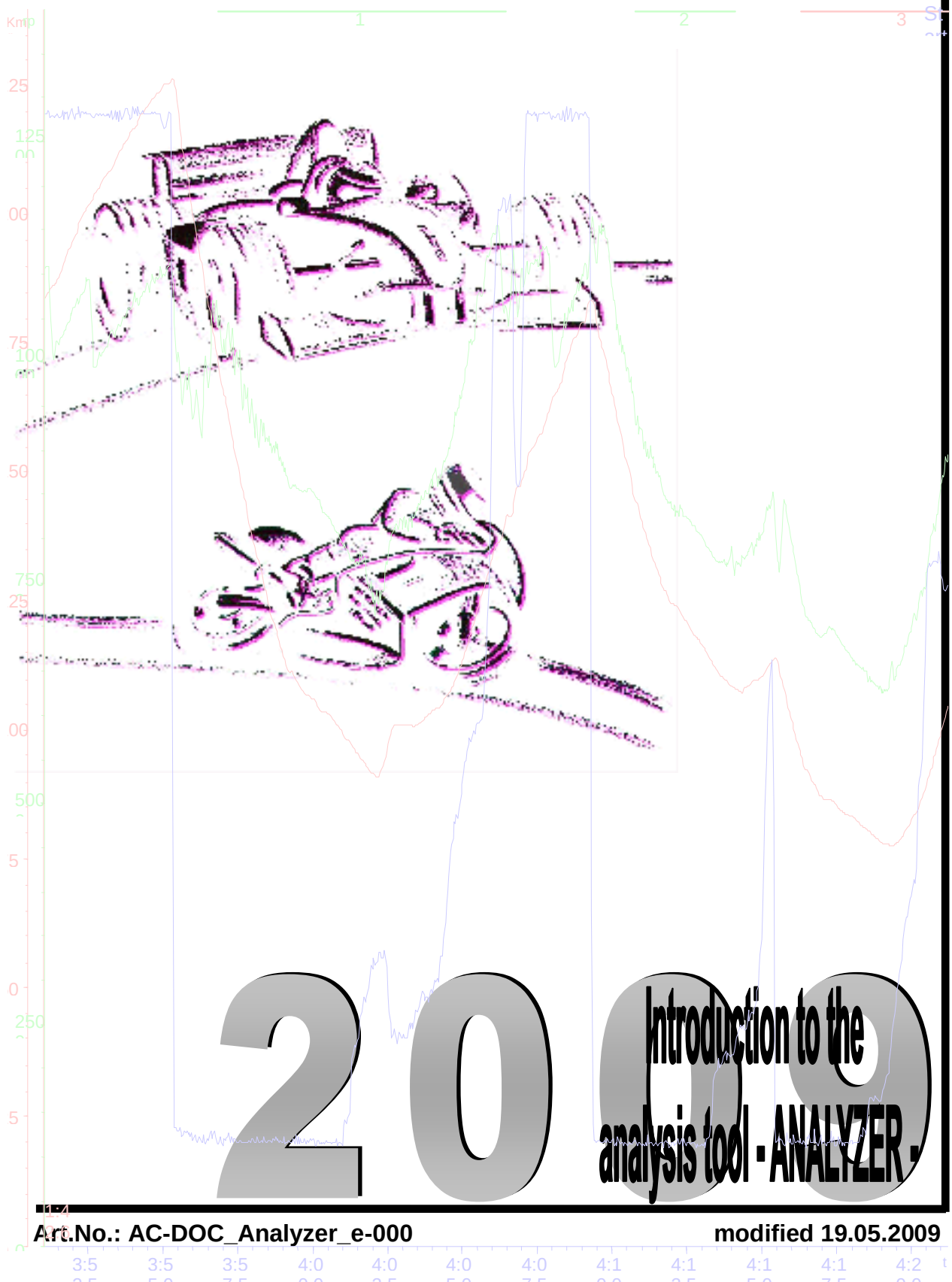


- English -





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
2.1.1 Functions	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).....	76
3.15 REAL TIME PLAYER.....	76
3.16 TEMPLATES.....	78
3.17 QUICK KEY.....	79
3.17.1 Categories.....	79
3.17.2 Examples.....	80
3.18 QUICK CHANNELS.....	80
4. TUTORIALS.....	81
5. OPTIONS.....	82
5.1 GENERAL.....	82
5.2 PROGRAM START.....	83
5.3 FILE LOAD.....	84
5.4 COLORS.....	85
5.5 KEY ASSIGNMENT.....	86
6 KEYBOARD HELP.....	87
6.1 COMPLETE LIST OF SHORTCUTS.....	87
6.2 KEYS IN THE "MOVING WINDOW".....	88
6.3 KEYS IN THE "MOVING MODE" & "MEASURING MODE".....	89
7. FREQUENTLY ASKED QUESTIONS (FAQ).....	90
8 GLOSSARY.....	91
APPENDIX A: LICENSE RESTRICTIONS.....	95

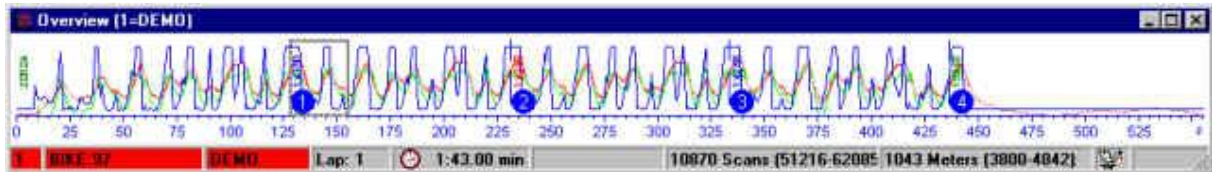
1. Desktop appearance

A typical Analyzer desktop mainly consists of 5 windows:

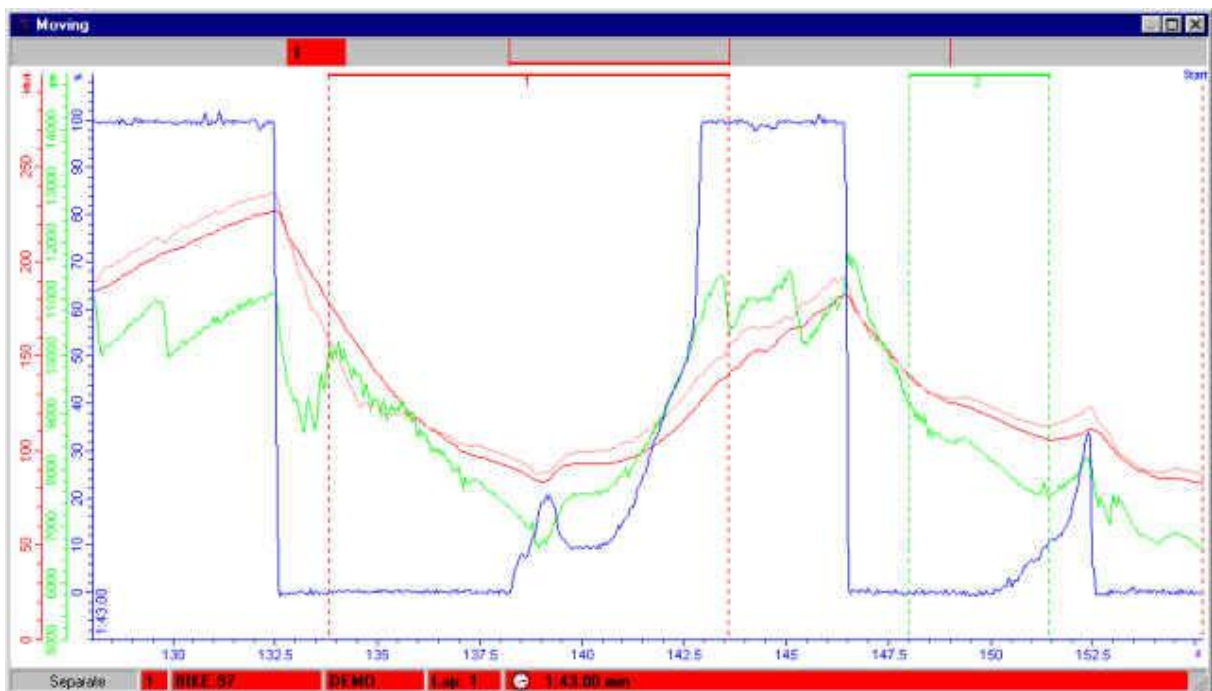
- On top of the screen is the header bar with main menu & toolbar.



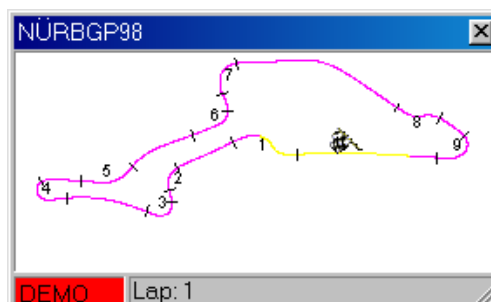
- On bottom of the screen is the Overview window in which certain channel curves of the complete measurement are shown.



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

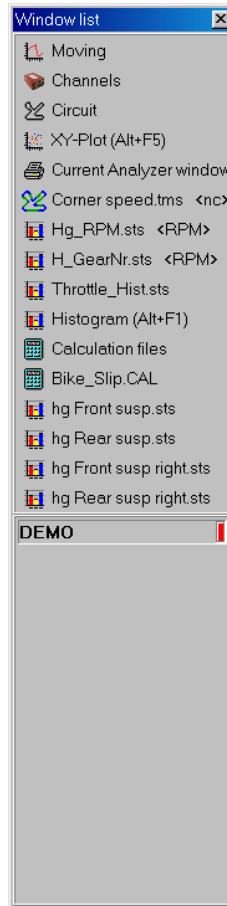


- The small Circuit window shows the track map and the track position for the section currently displayed in the Moving window.





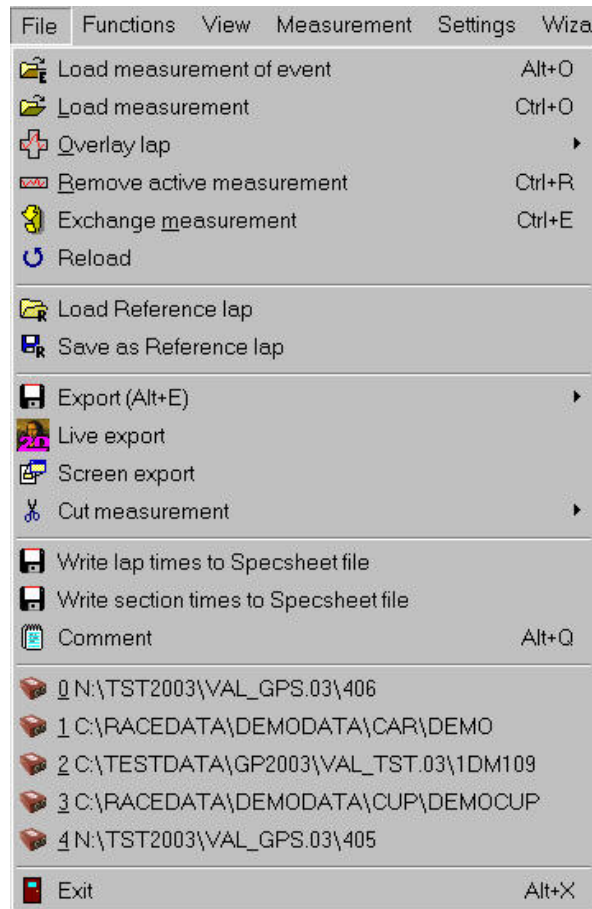
- The Window list at the right of the screen is helpful for fast access to common functions. These functions are user defined as any main menu item may be selected to be shown here. This window may be closed to gain space on the screen.



1.1 Main menu items

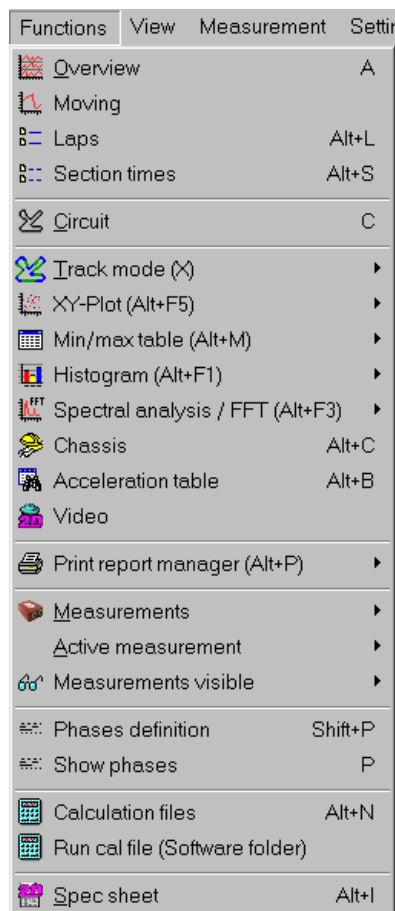
- The [File](#) menu contains functions to load and modify 2D measurement files
- The [Functions](#) menu allows access to basic and advanced analysis functions
- The [View](#) menu controls the layout of the Analyzer desktop
- The [Measurement](#) menu contains commands to view the measurement(s) in 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"



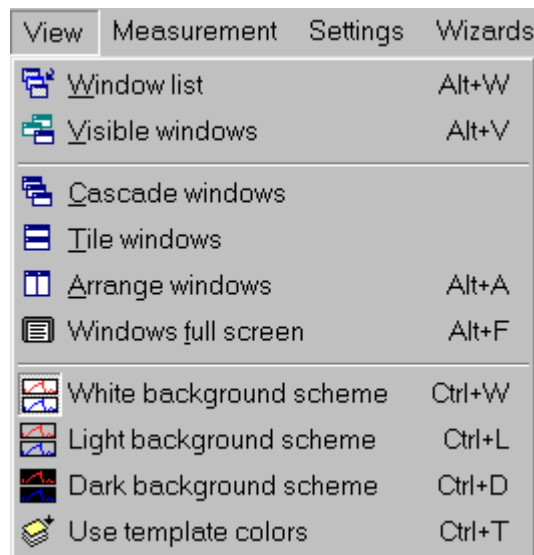
- **Load measurement of event:** Shows browser of measurements inside current event
- **Load measurement:** Shows browser of measurements together with a directory tree
- **Overlay lap:** List of lap times of current measurement to overlay another lap
- **Remove active measurement:** Unloads the currently 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 Specs sheet file:** Insert lap times of measurement into spec sheet
- **Write section times to Specs sheet 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"



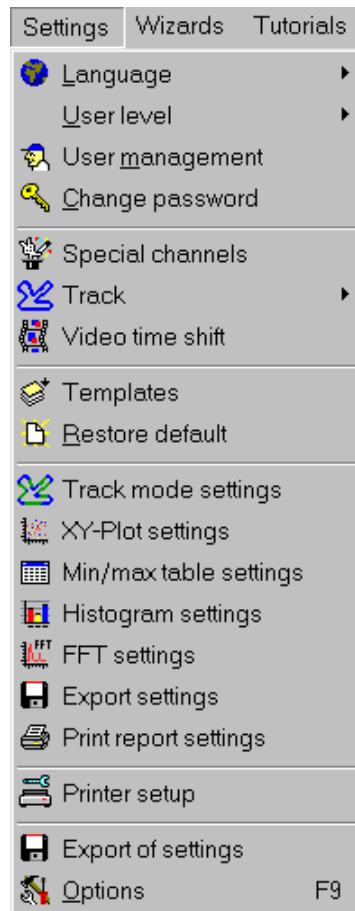
- **Window list:** Toggle visibility of the Window list which offers access to common functions
- **Visible windows:** Show list of currently opened Analyzer windows
- **Cascade windows:** Re-position the Moving and Overview windows in a cascading form
- **Tile windows:** Re-position the Moving and Overview 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"

Measurement	Settings	Wizards	Tutorials
 <u>L</u> inked			V
 Measure			Space
 Measure (active run)			
 Measure (active special)			Shift+Enter
 <u>D</u> istance plot			S
 <u>T</u> ime plot			T
 Previous selection			BkSp
 <u>Z</u> oom			Alt+Z
 Zoom full lap			Shift+Home
 Zoom full section			Shift+Ctrl+Home
 Jump to lap start			Home
 Previous lap			PgUp
 Next lap			PgDn
 Jump to fastest lap			Ctrl+Home
 Synchronize			Ctrl+S
 Synchronize lap triggers			Ctrl+Alt+S

- **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"

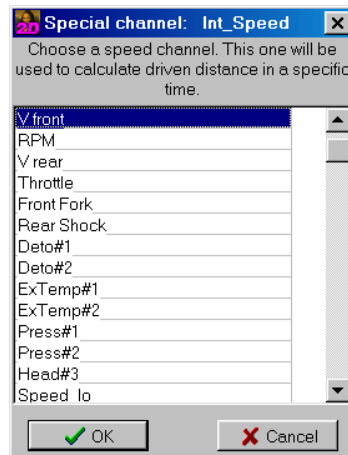


- **Language:** Select language from German, English, French, Italian, Spain and Japanese
- **User level:** Professional level shows all menu items, even if they are not available in the licence level
- **User management:** Administration of separate user settings with individual options and channel 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

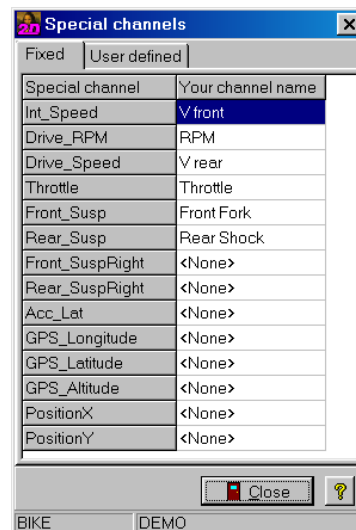
1.1.5.1 Special channels



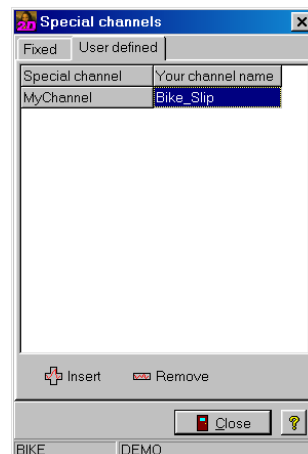
Special channels are defined as assignments of recorded channels to certain meanings. There are fixed and user defined special channels. Fixed channels are needed by Analyzer whilst both types may be used in cal files by typing the @ identifier.



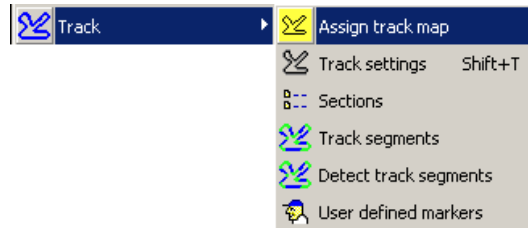
1. Fixed special channels: Analyzer needs information about certain channels to e.g. calculate distance from speed or feed the chassis module.



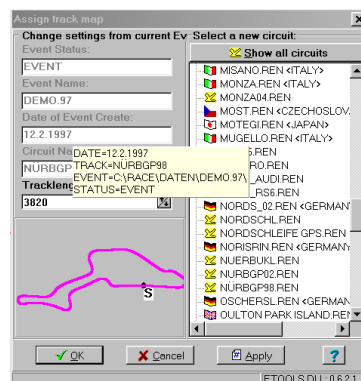
User defined special channels: Assignment of recorded channel to a free defined special channel.



1.1.5.2 Track

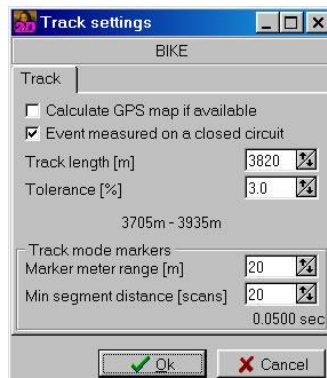


- Assign track map



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

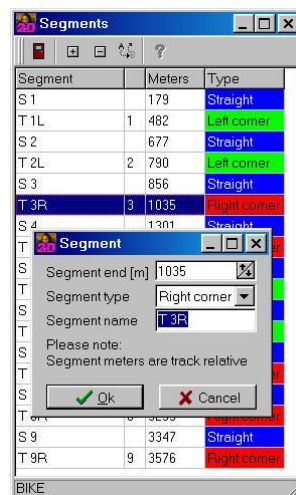
Min segment distance: Min/max markers which are closer than this value to the segment edge are not created.

- 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



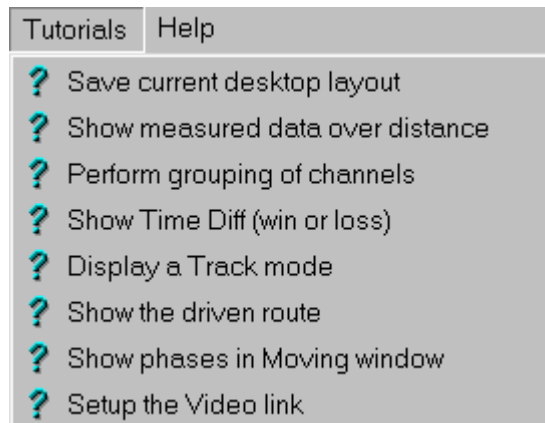
The track offset gives meter distance between lap trigger position and start/finish line. The value can't be changed manually as it is calculated automatically by speed-to-radius correlation.

1.1.6 The main menu item "Wizards"



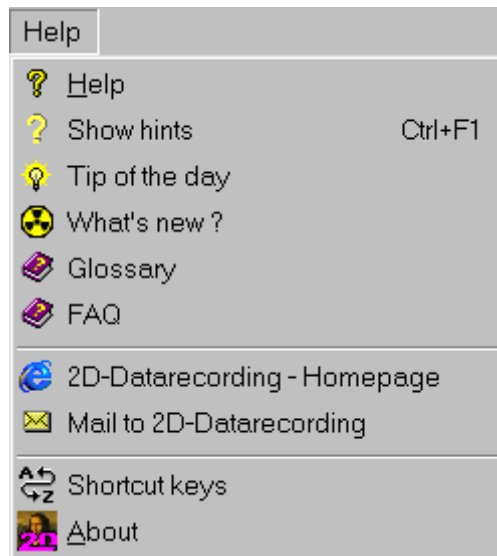
- **Gear calculation:** Calculates a gear channel out of RPM and speed or using a gear box sensor channel
- **Route calculation:** Calculates 2 channels containing geographic x/y data of the covered distance
- **Create track map:** Generates track map out of either speed + lateral acceleration or GPS 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](#) accessible 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
	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
	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
	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.

2.1.1 Functions

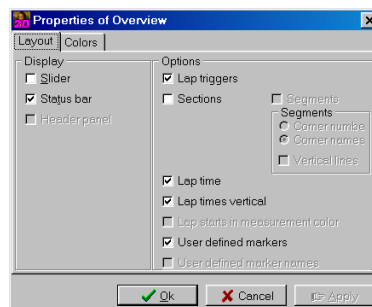
2.1.1.1 Print

- 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 Quick 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.

Measuring values	
Lap	1
Time tot	1:43.00 min
m total	2:13.06 min
Time Lap	4112
m Lap/Track	5.02 sec
V front [km/h]	292/144
RPM [rpm]	204.9
V rear [km/h]	8983
Throttle [%]	193.8
	0.16

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

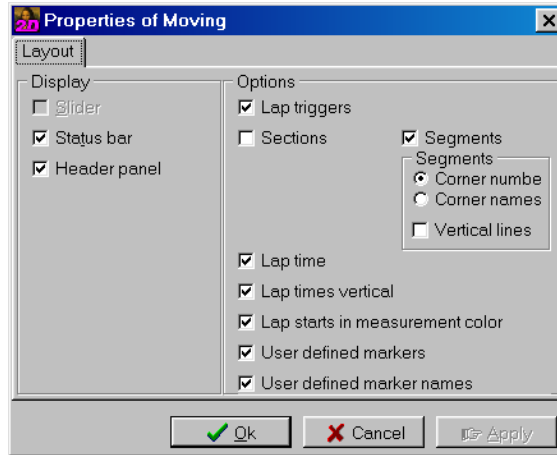
A loaded measurement can be made invisible. This helps focussing on another, visible measurement in the Moving window. Measurement m is made invisible by pressing <Ctrl+M> where m stands for the measurement number.

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.

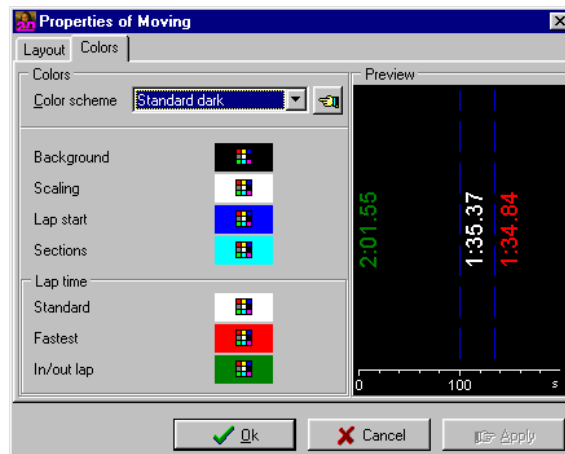
2.2.2 Properties

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



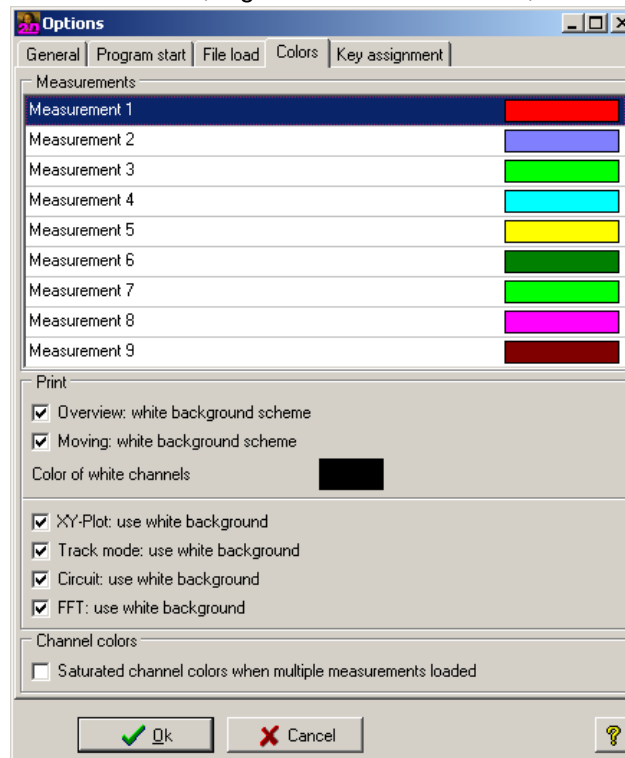
The properties are stored in the current Template which may be saved to disk to make the modifications permanent.

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

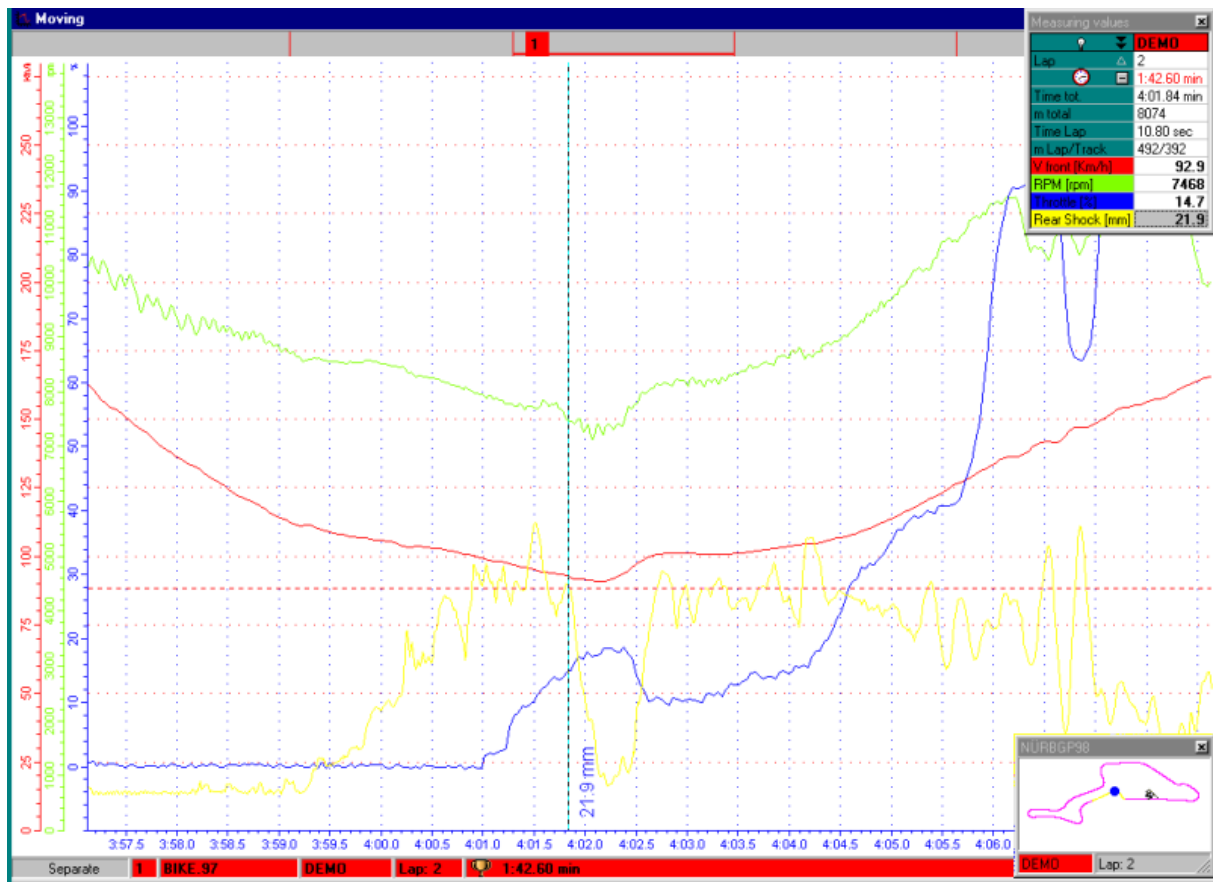
The following are some 'step-by-step' instructions to help new 2D users to master some common operations in the Analyzer software. Most of these are referred to in the context-sensitive Help files, but here we can go into a little more detail.

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:

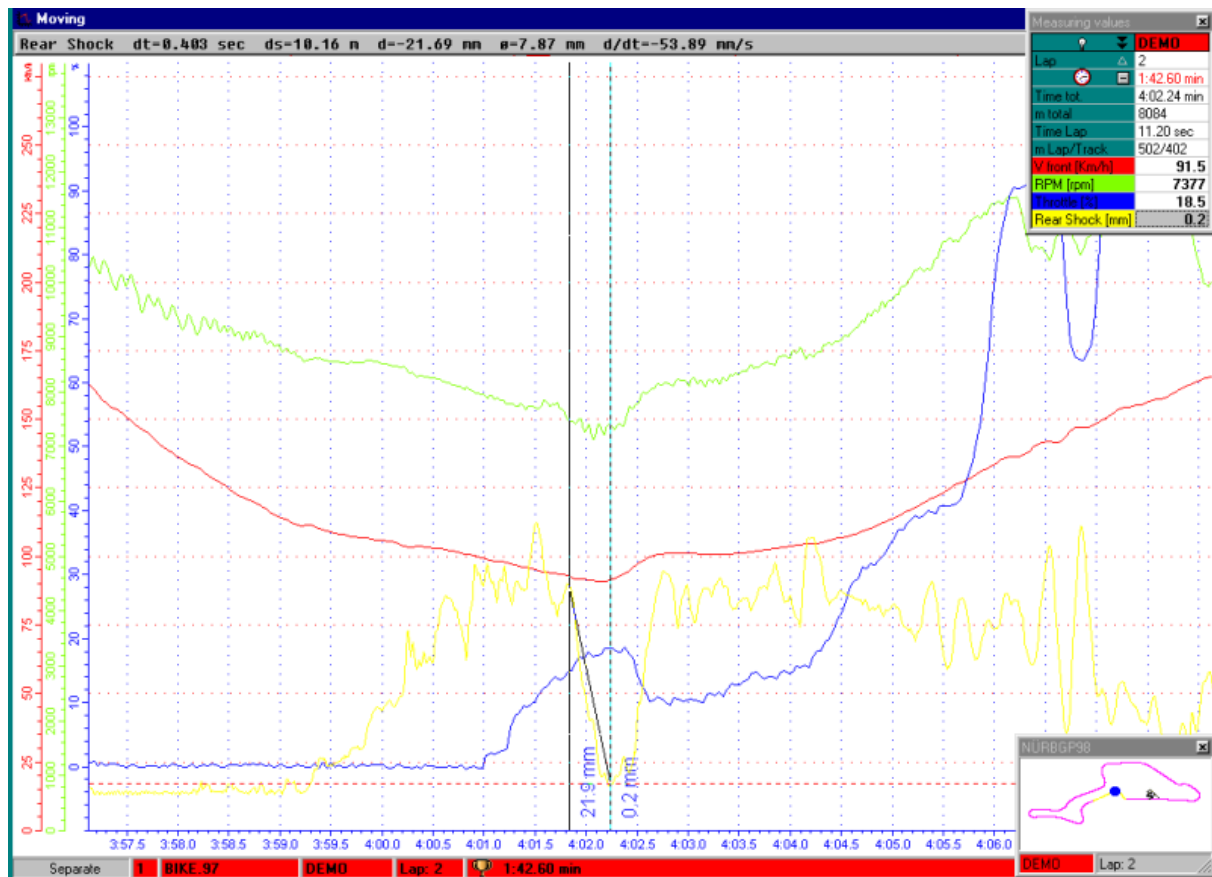
In this example, we will check the rear shock piston speed, so we can determine in what piston speed range to make the appropriate damping adjustments:

- 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.



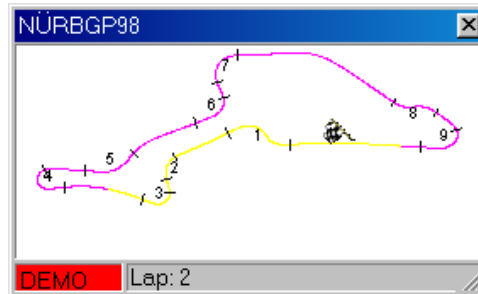
Please ensure that you are dealing with the same units when referring to your suspension damping charts; many damping charts are in m/sec, whereas the Analyzer measure mode numbers above are in mm/sec; the rebound speed shown here of -53.89mm/sec will often be shown on a damping chart as 0.054m/sec.

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

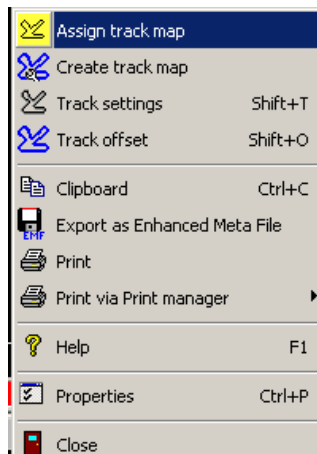
The circuit window shows the track map with the current selection of the active measurement highlighted. The circuit window may be turned off or on.



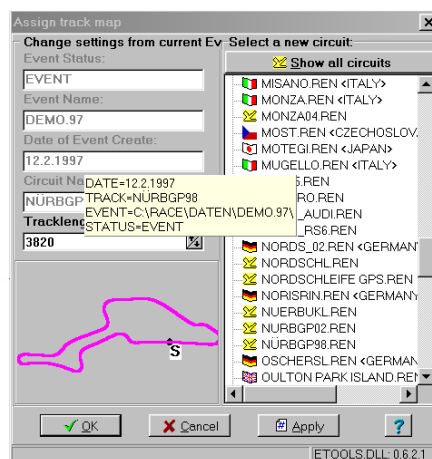
2.3.1 Functions



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



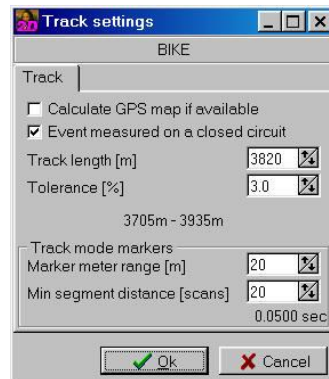
Choose the correct track map to your event.



- **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**

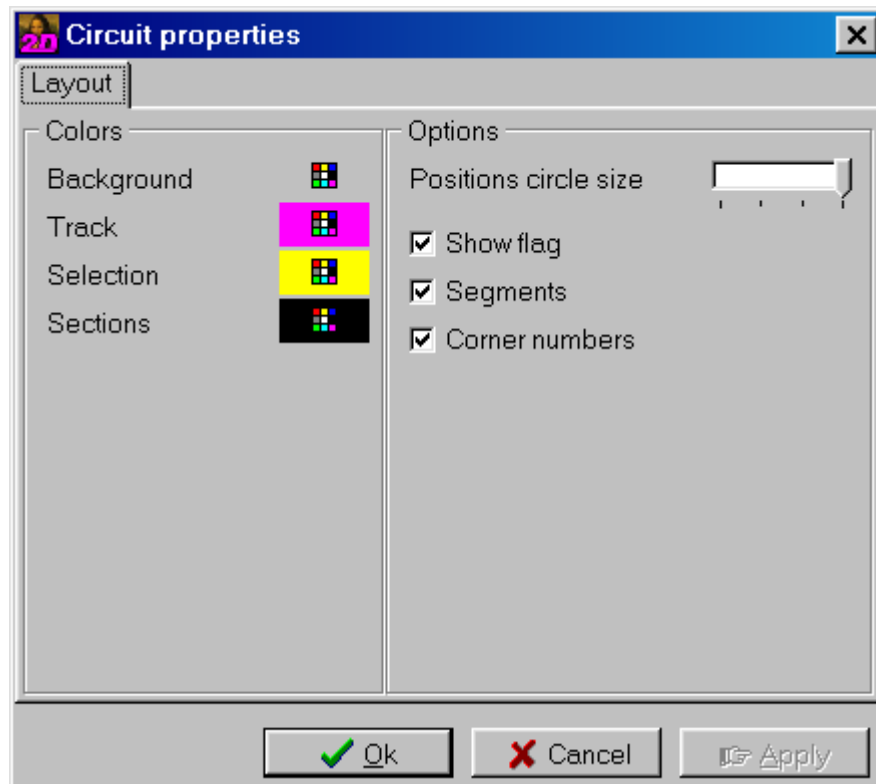
The Circuit map graphic may be exported and printed in several ways:

- 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.

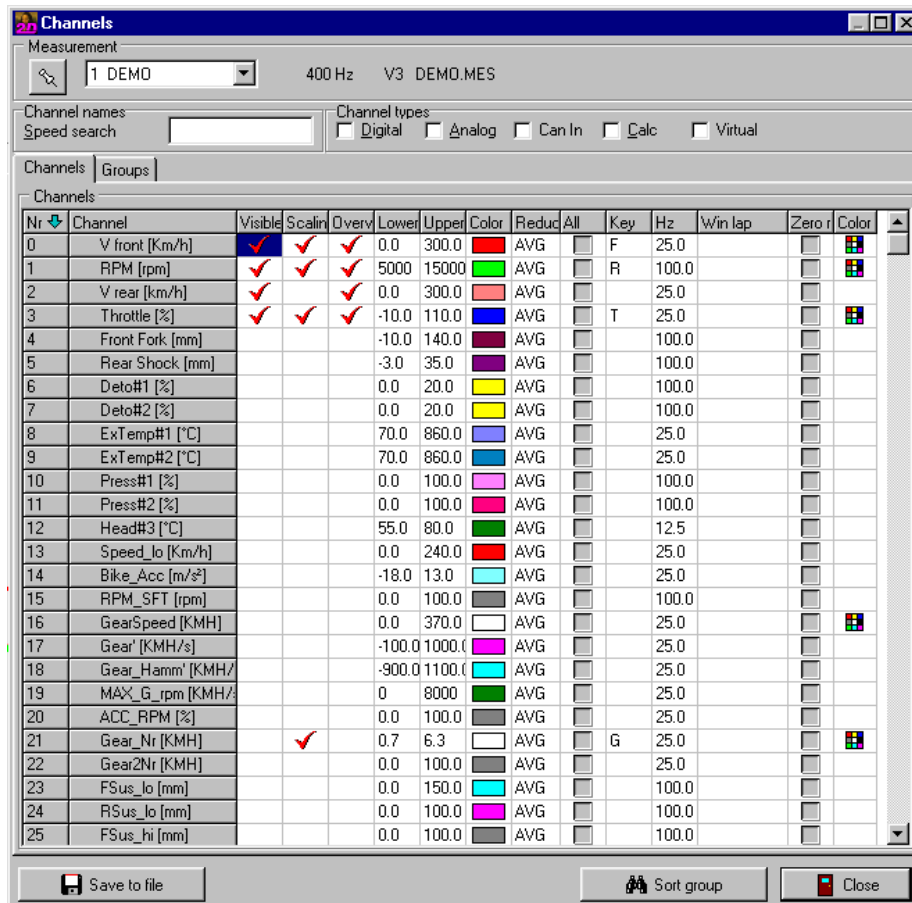


Optionally shown are start/finish flag, segment borders and corner numbers.

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 screenshot shows the 'Channels' dialog box in the 2D software. It features a 'Measurement' section with a dropdown set to '1 DEMO', a frequency of '400 Hz', and a version 'V3 DEMO.MES'. Below this is a 'Channel names' section with a 'Speed search' field. The 'Channel types' section includes checkboxes for 'Digital', 'Analog', 'Can In', 'Calc', and 'Virtual'. The main part of the dialog is a table with columns: 'Nr', 'Channel', 'Visible', 'Scaling', 'Overv', 'Lower', 'Upper', 'Color', 'Reduc', 'All', 'Key', 'Hz', 'Win lap', 'Zero', and 'Color'. The table lists 25 channels, including various speed, RPM, throttle, and temperature measurements. At the bottom, there are buttons for 'Save to file', 'Sort group', and 'Close'.

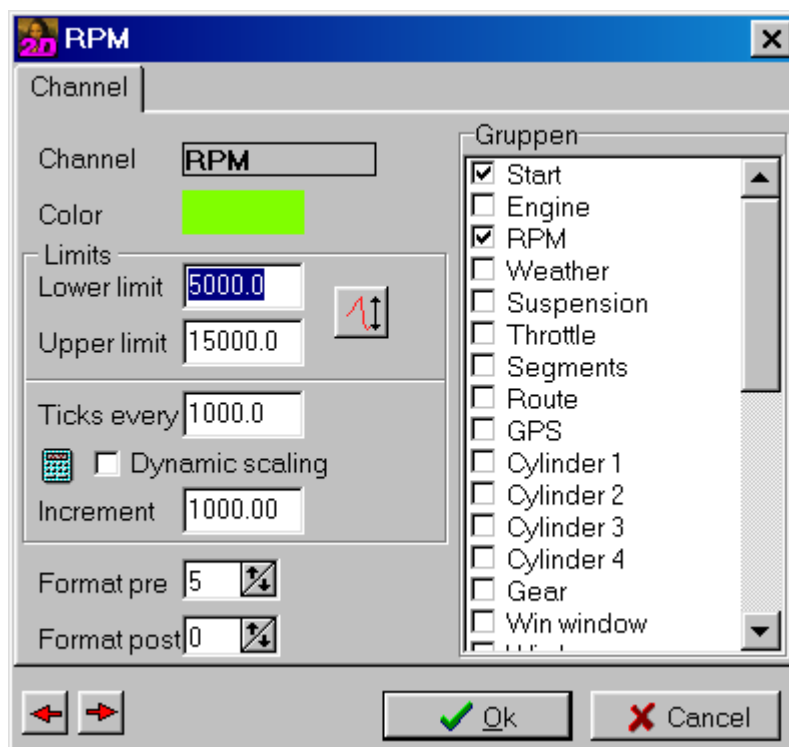
Nr	Channel	Visible	Scaling	Overv	Lower	Upper	Color	Reduc	All	Key	Hz	Win lap	Zero	Color
0	V front [Km/h]	✓	✓	✓	0.0	300.0	Red	AVG		F	25.0			
1	RPM [rpm]	✓	✓	✓	5000	15000	Green	AVG		R	100.0			
2	V rear [km/h]	✓		✓	0.0	300.0	Red	AVG			25.0			
3	Throttle [%]	✓	✓	✓	-10.0	110.0	Blue	AVG		T	25.0			
4	Front Fork [mm]				-10.0	140.0	Blue	AVG			100.0			
5	Rear Shock [mm]				-3.0	35.0	Purple	AVG			100.0			
6	Deto#1 [%]				0.0	20.0	Yellow	AVG			100.0			
7	Deto#2 [%]				0.0	20.0	Yellow	AVG			100.0			
8	ExTemp#1 [°C]				70.0	860.0	Blue	AVG			25.0			
9	ExTemp#2 [°C]				70.0	860.0	Blue	AVG			25.0			
10	Press#1 [%]				0.0	100.0	Pink	AVG			100.0			
11	Press#2 [%]				0.0	100.0	Pink	AVG			100.0			
12	Head#3 [°C]				55.0	80.0	Green	AVG			12.5			
13	Speed_lo [Km/h]				0.0	240.0	Red	AVG			25.0			
14	Bike_Acc [m/s²]				-18.0	13.0	Cyan	AVG			25.0			
15	RPM_SFT [rpm]				0.0	100.0	Grey	AVG			100.0			
16	GearSpeed [KMH]				0.0	370.0	White	AVG			25.0			
17	Gear [KMH/s]				-100.0	1000.0	Pink	AVG			25.0			
18	Gear_Hamm* [KMH/				-900.0	1100.0	Cyan	AVG			25.0			
19	MAX_G_rpm [KMH/				0	8000	Green	AVG			25.0			
20	ACC_RPM [%]				0.0	100.0	Grey	AVG			25.0			
21	Gear_Nr [KMH]		✓		0.7	6.3	White	AVG		G	25.0			
22	Gear2Nr [KMH]				0.0	100.0	Grey	AVG			25.0			
23	FSus_lo [mm]				0.0	150.0	Cyan	AVG			100.0			
24	FSus_lo [mm]				0.0	100.0	Pink	AVG			100.0			
25	FSus_hi [mm]				0.0	100.0	Grey	AVG			100.0			



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

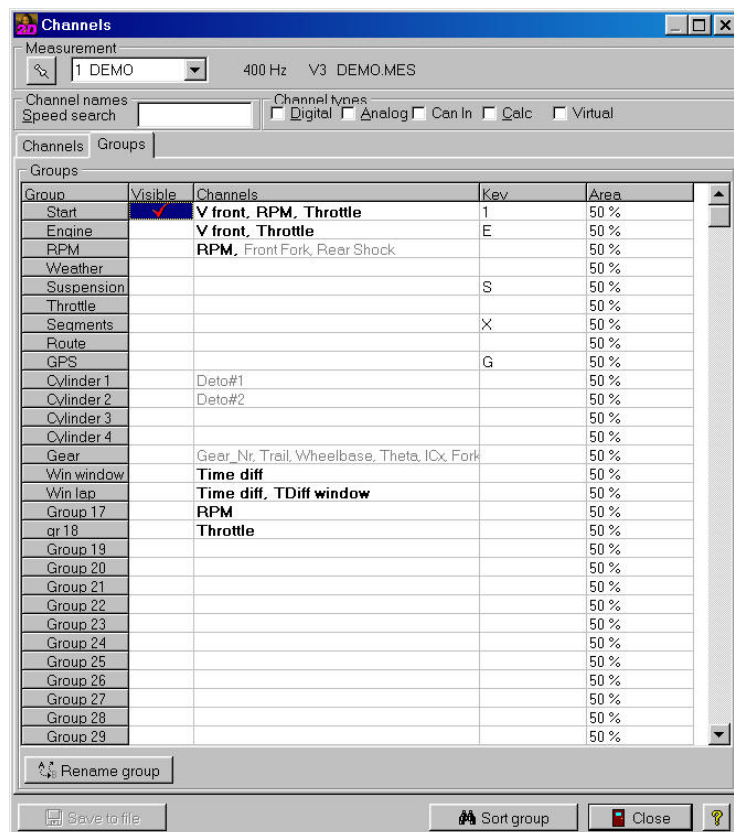


Channels can be organized (collected) in groups which each represent one topic. The group names may be edited freely. The channels inside the first group will be shown at Analyzer program start.

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.

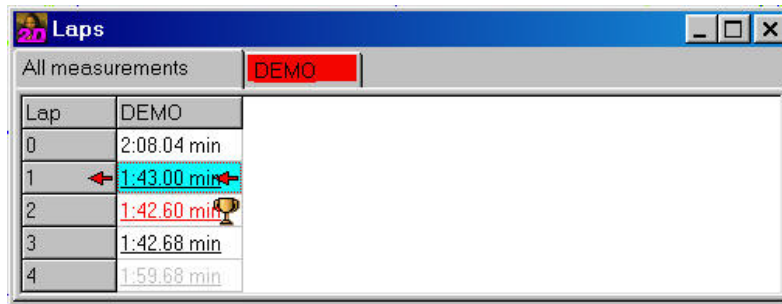
The selection of a sort group makes it easy to sort up all channels inside one certain group

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.



Lap	Time
0	2:08.04 min
1	1:43.00 min
2	1:42.60 min
3	1:42.68 min
4	1:59.68 min

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

20

Laps

X

All measurements

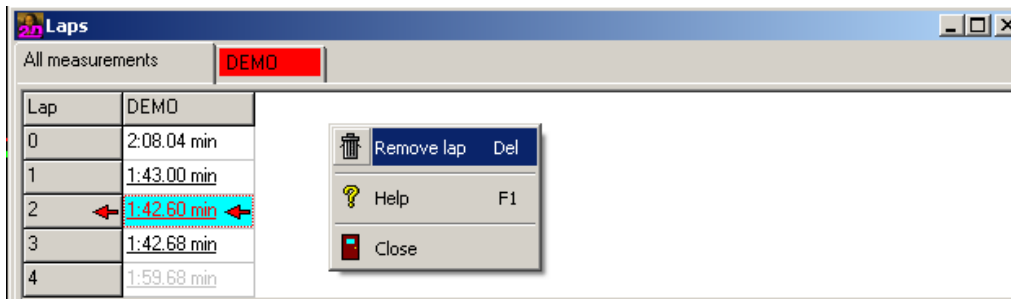
DEMO

Lap	Time	from	to	Meters	from	to
0	2:08.04 m 0.00 sec	2:08.04 mir	3820 (3729)	0	3819	
1	1:43.00 m	2:08.04 mir	3:51.04 mir	3820 (3821)	3820	7639
2	1:42.60 m	3:51.04 mir	5:33.64 mir	3820 (3822)	7640	11459
3	1:42.68 m	5:33.64 mir	7:16.32 mir	3820 (3730)	11460	15279
4	1:59.68 m	7:16.32 mir	9:16.00 mir	1022	15280	16301

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.



Lap	Time
0	2:08.04 min
1	1:43.00 min
2	1:42.60 min
3	1:42.68 min
4	1:59.68 min

Remove lap Del

Help F1

Close

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.

Section times (DEMO)					
Lap	Lap time	1: T1	2: T2		
	m Lap	148-1348m	1348-2848m	2848-148m	
	m Track	0-1200m	1200-2700m	2700-3820m	
0	2:08.04 min	40.30	42.28	29.14	
1	1:43.00 min	32.86	41.20	28.95	
2	1:42.60 min	32.51	40.85	29.18	
3	1:42.68 min	32.20	40.87	30.24	
4	1:59.68 min	112.56	0	0	
Ideal time	1:42.00 min	32.20	40.85	28.95	

BIKE DEMO

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.

Sections	
Section	Meters
T1	1200
T2	2700

BIKE.97

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

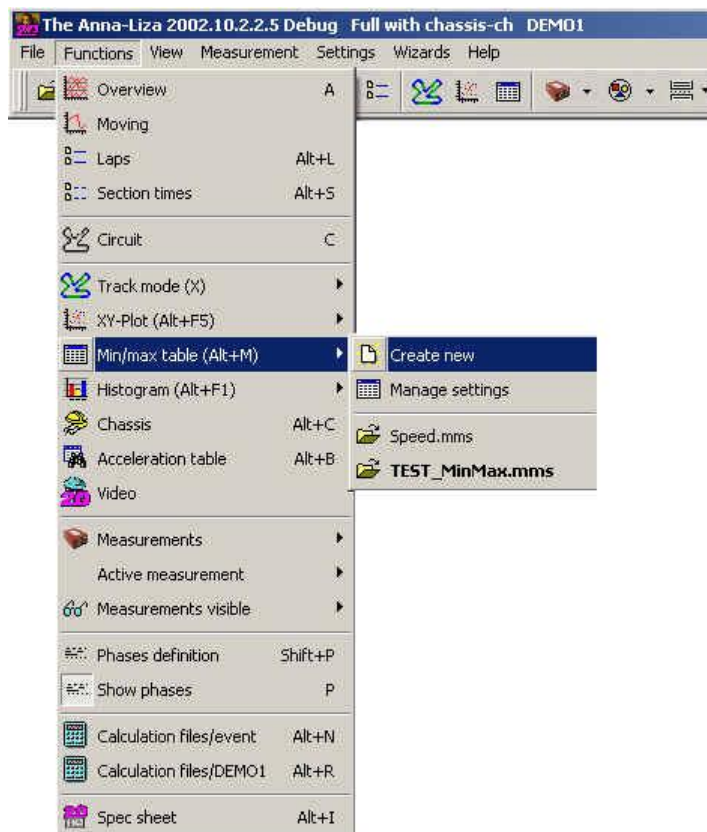
Overview of lower, upper and average values of channels

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

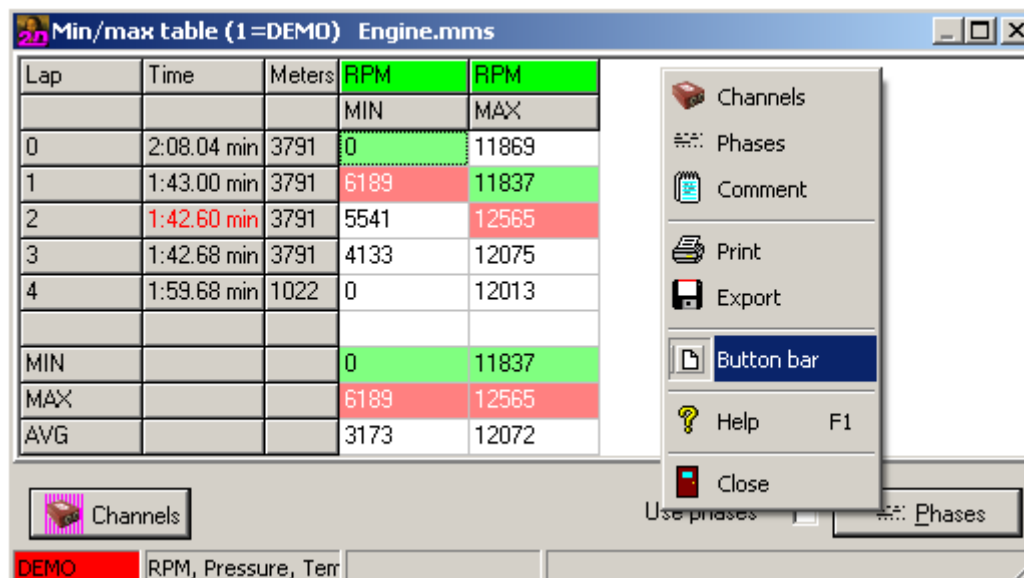
By clicking on a minimum or maximum value of a channel the corresponding position in the measurement is selected and centered inside the Moving window. If the channel was not visible it will be switched on and activated in the Moving window.

Print

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

2.7.4 Properties

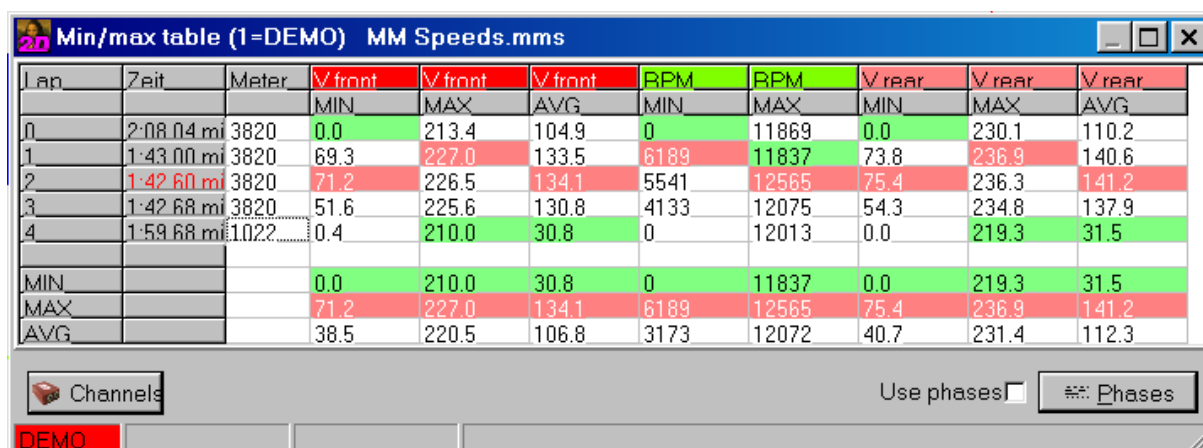
The only property of a Min/max table is the choice to blank out the button bar what can be done via context menu.



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".

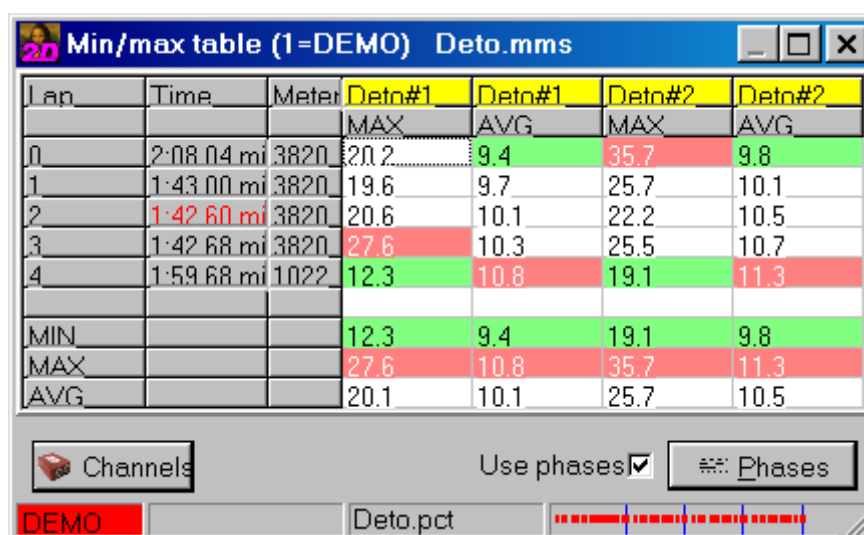


Lap	Zeit	Meter	V front	V front	V front	RPM	RPM	V rear	V rear	V rear
			MIN	MAX	AVG	MIN	MAX	MIN	MAX	AVG
0	2:08.04 mi	3820	0.0	213.4	104.9	0	11869	0.0	230.1	110.2
1	1:43.00 mi	3820	69.3	227.0	133.5	6189	11837	73.8	236.9	140.6
2	1:42.60 mi	3820	71.2	226.5	134.1	5541	12565	75.4	236.3	141.2
3	1:42.68 mi	3820	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	Deto#1	Deto#2	Deto#2
			MAX	AVG	MAX	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

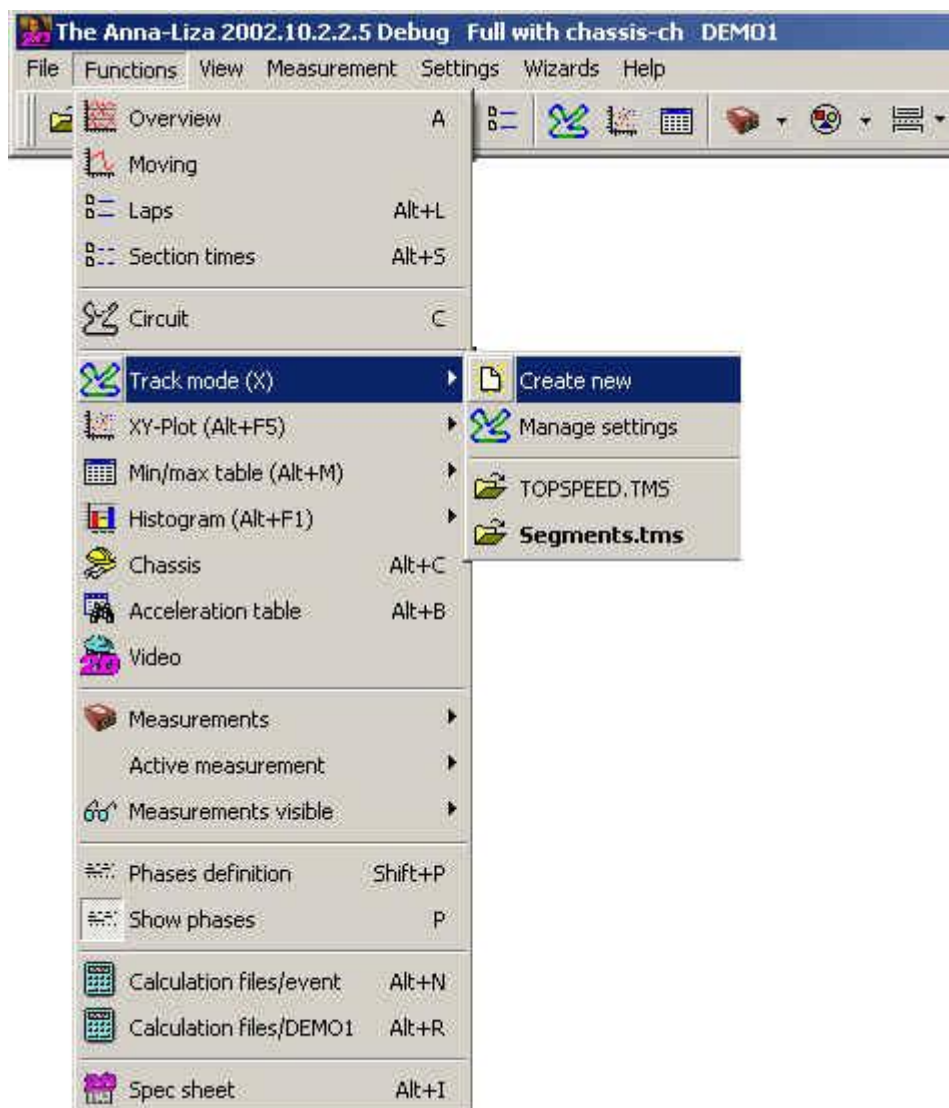
Graphical presentation of track with channel values at defined positions

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.

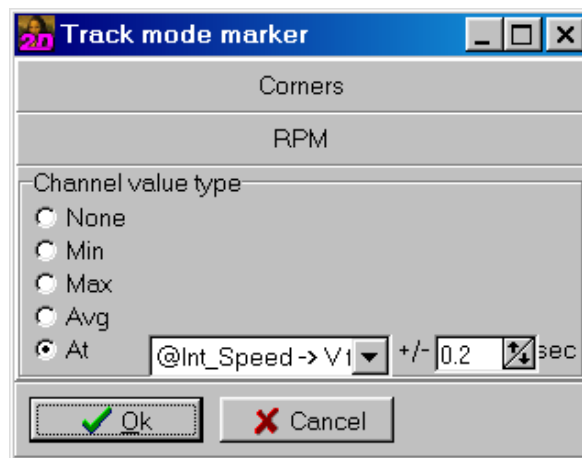
You can create a new Track mode or edit an existing setting via the shortcut <X>



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:

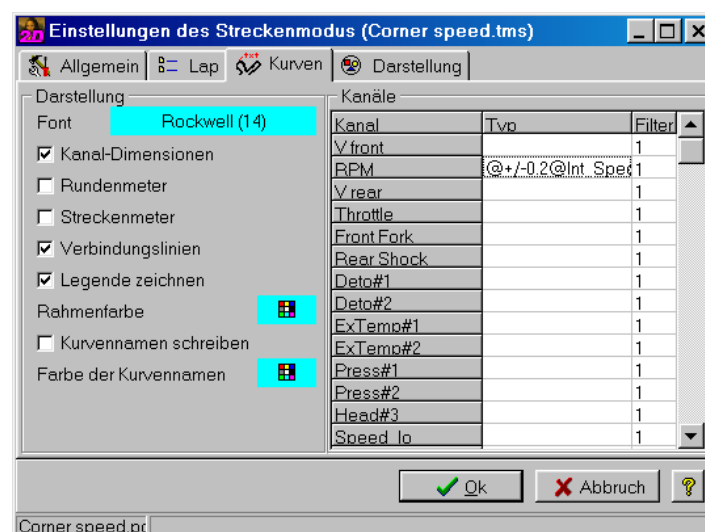
- lap
- sections
- corners
- straights
- gear change (not yet available)
- user defined
- start of phases
- end of phases



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

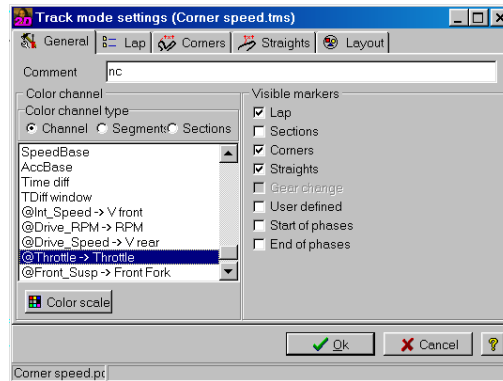
A marker of type lap/sections/corners or straights may contain the minimum, maximum or average value of channels in this marker's range or the value at the minimum resp. maximum of another inscribed channel.

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

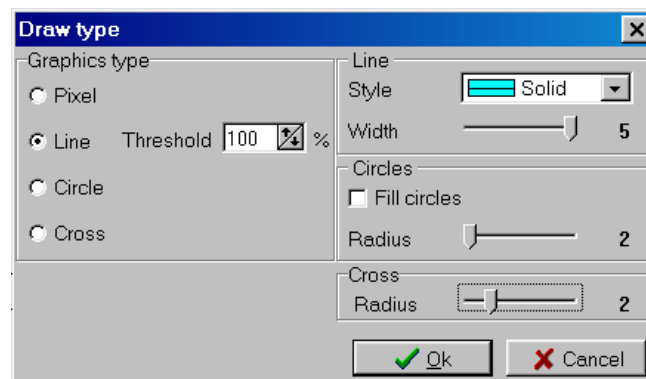


2.8.1.2 Graphic settings

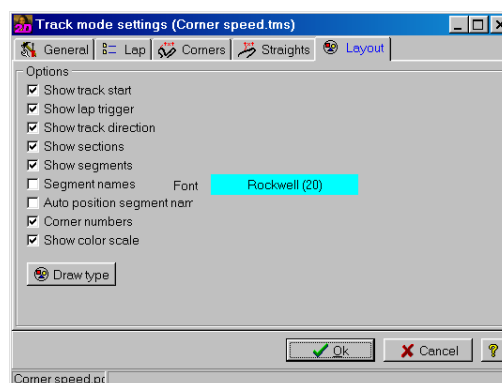
The Track mode graphic settings (refer the figure below) control the layout of the track map. The color channel may represent just the existing sections, the segments or a measured channel. When a real measured color channel is chosen its color scale defines the mapping of the measured values to colors.



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.

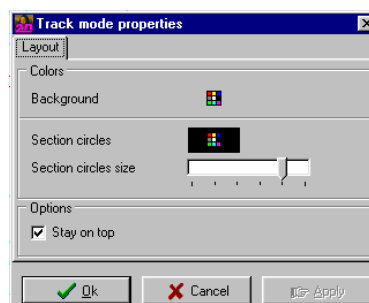
Lap report (1=DEMO) Corner speed.tms										
	T 1L (1)	T 2L (2)	T 3 (3)	T 4 (4)	T 5L (5)	T 6L (6)	T 7 (7)	T 8 (8)	T 9 (9)	
V front [Km/h] MIN										
Lap 0: 2:08.04 min	56.4	86.1	71.0	67.1	122.6	88.7	95.5	81.8	76.9	
Lap 1: 1:43.00 min	83.4	105.6	76.7	69.3	129.1	96.6	95.5	81.0	78.9	
Lap 2: 1:42.60 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.

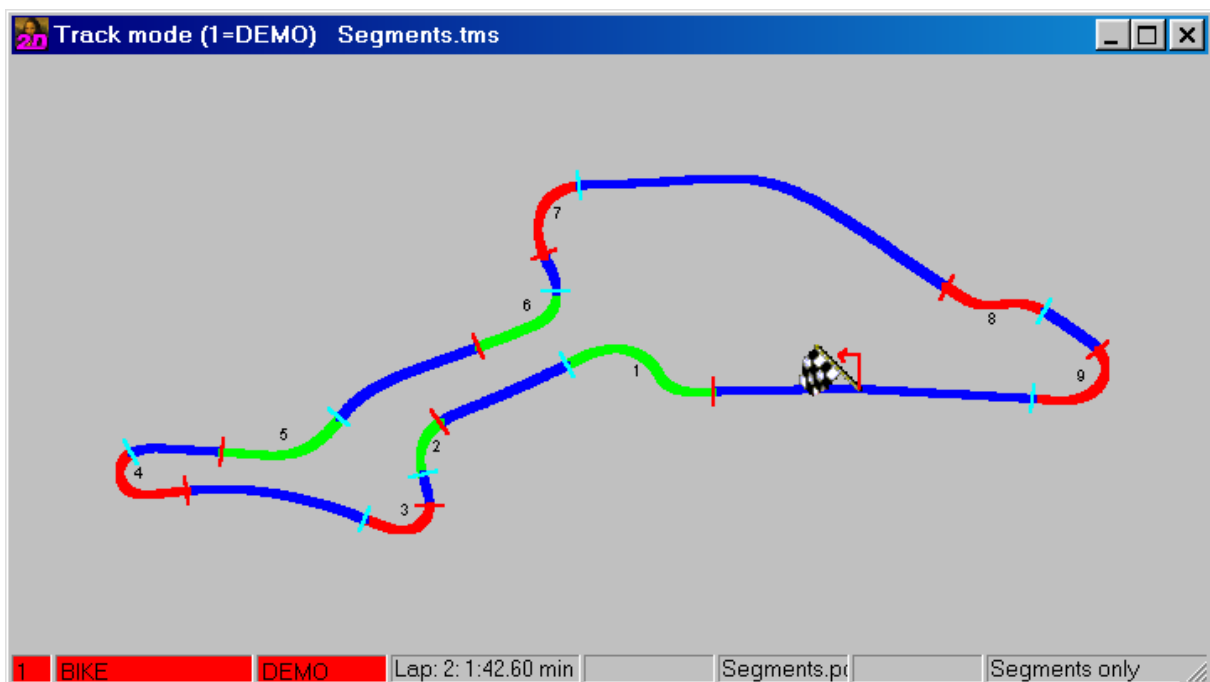
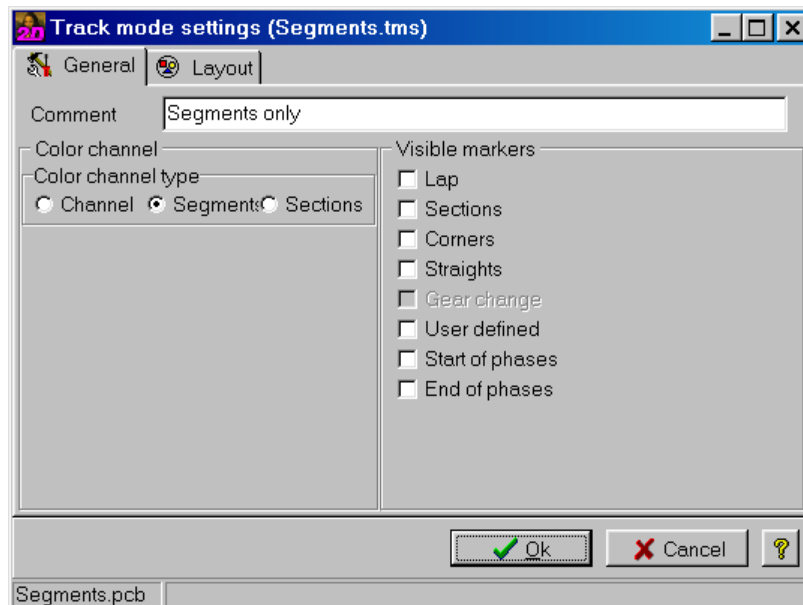


2.8.5 Examples

2.8.5.1 Example 1



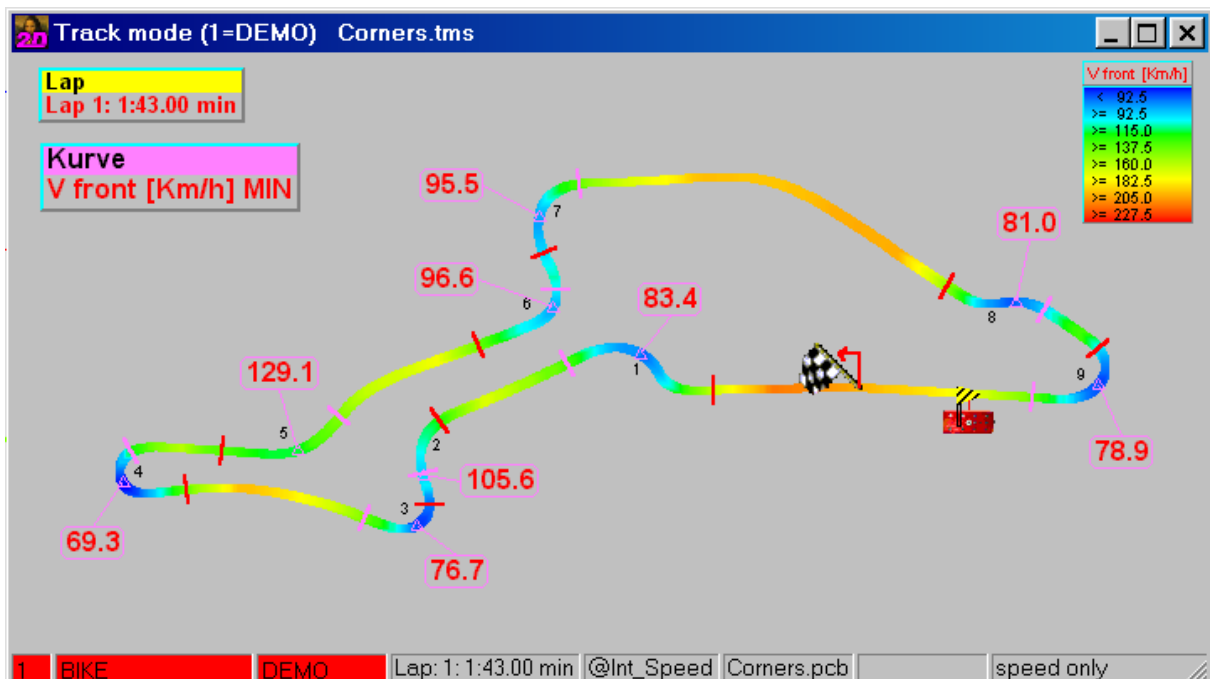
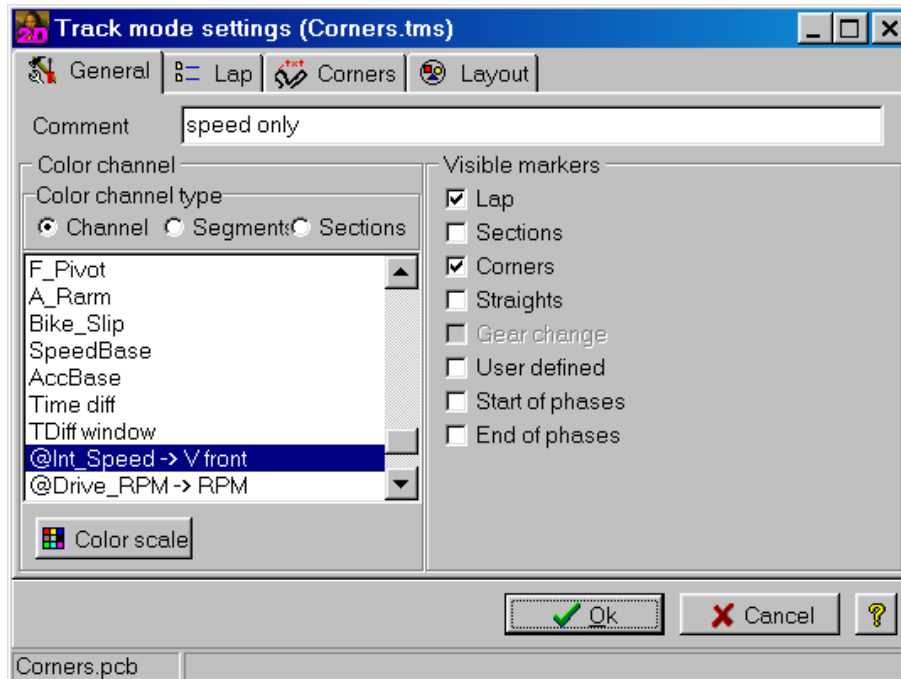
A simple Track mode setting called "Segments" without markers which uses the sections as color channel.



2.8.5.2 Example 2



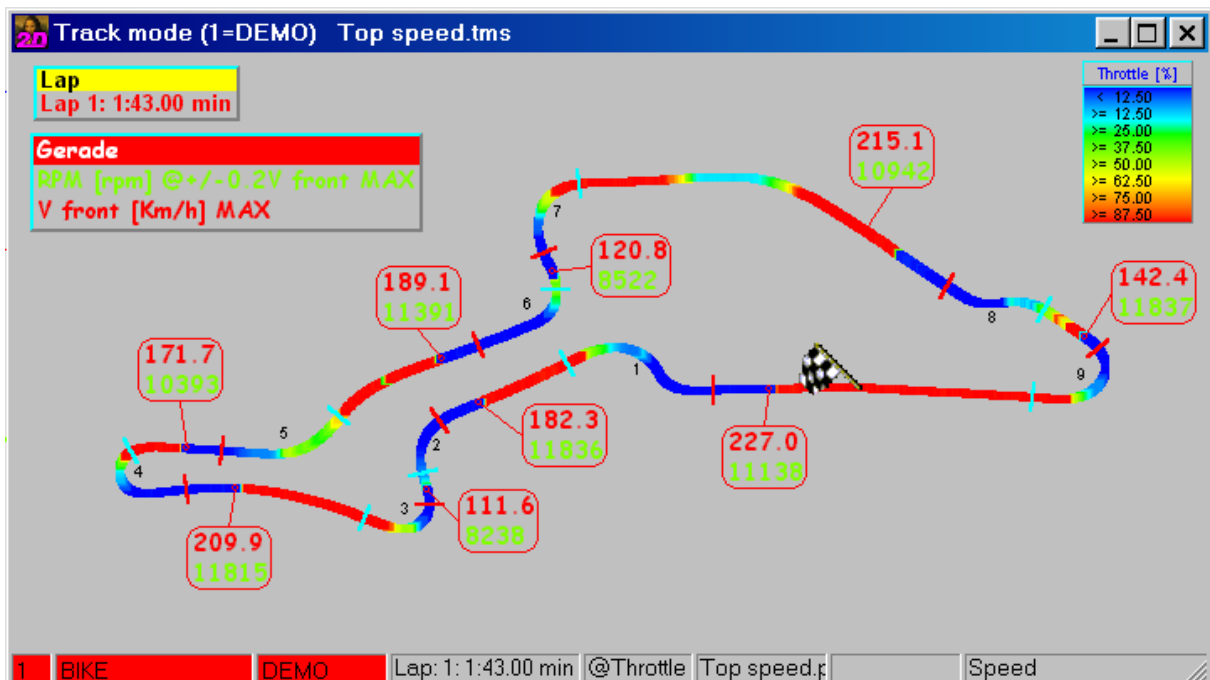
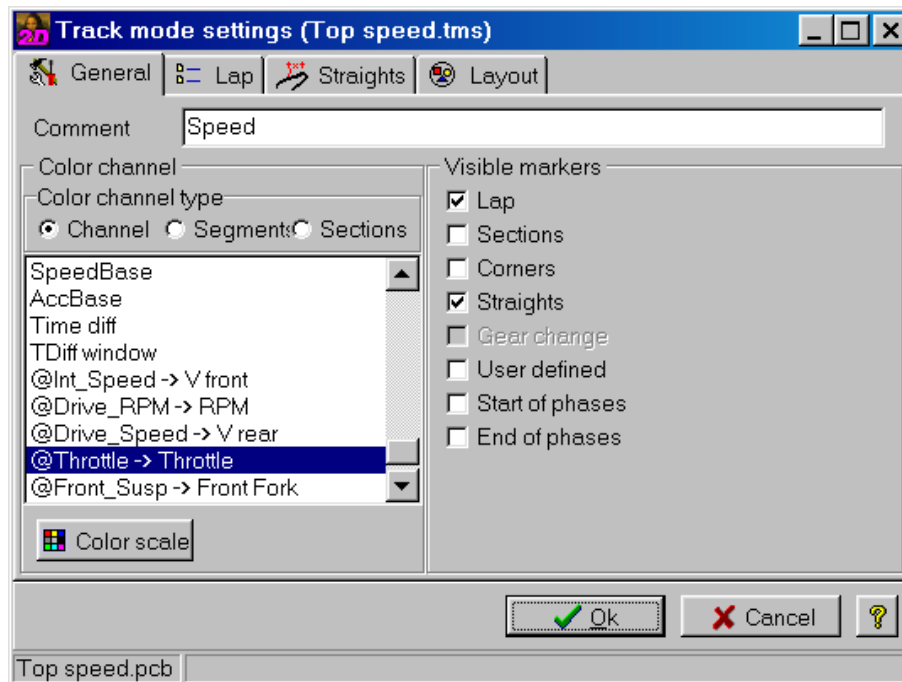
A Track mode setting "Corners" with color channel "Speed". Markers of type Corners with channel "Speed" as minimum value are inscribed.



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

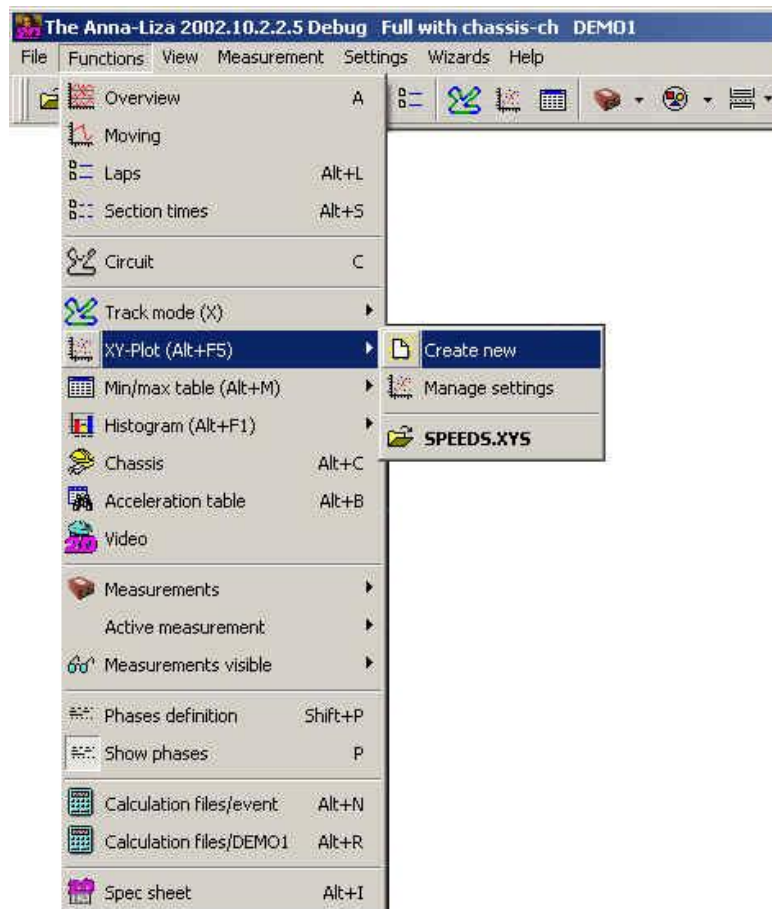
2-dimensional presentation of relationship of 2 channels

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

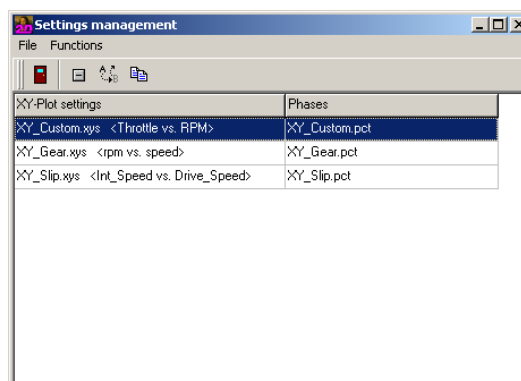
- The standard print function simply prints the content of the selected window.
- The [Print via Excel](#) function embedded the selected window into a chosen Excel sheet together with data out of the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via 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

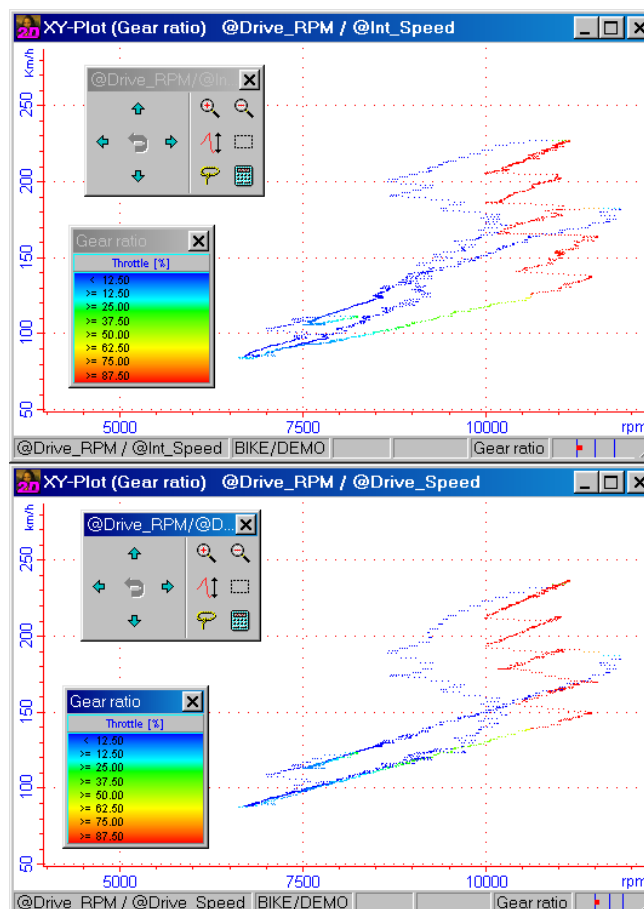
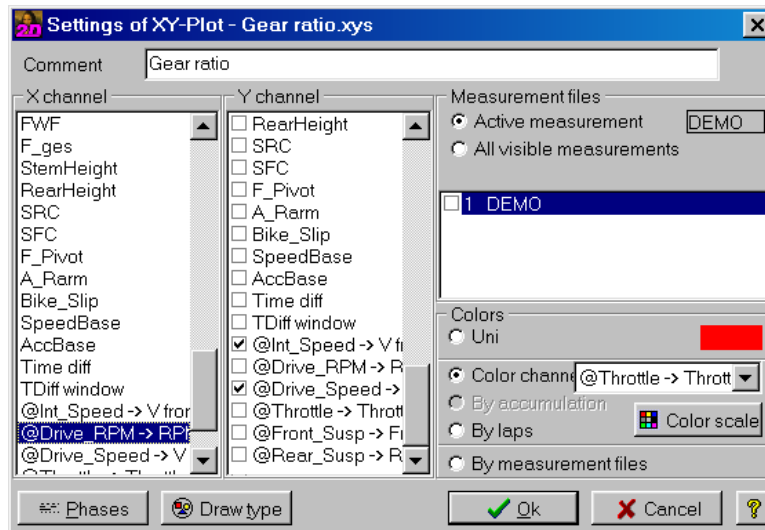
The XY-Plot's editable properties include window background color. The option "*Highlight phases with mouse*" affects the reaction of a XY-Plot window when moving then mouse over it. If several phases are defined by the Phase conditions then all graphic items belonging to the same phase as the item under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

2.9.5 Examples

2.9.5.1 Example 1



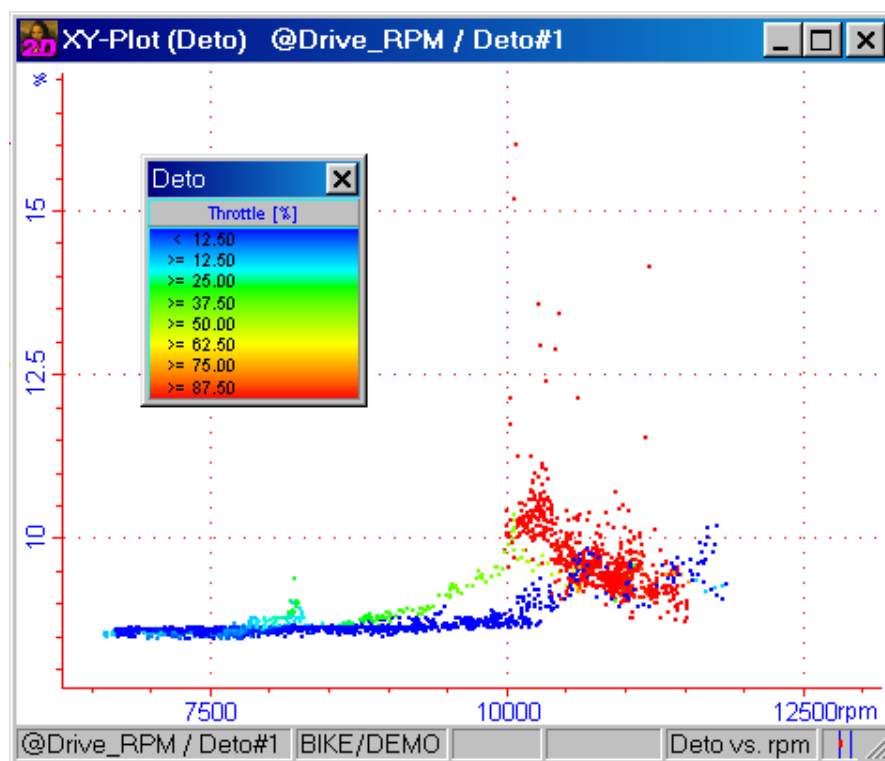
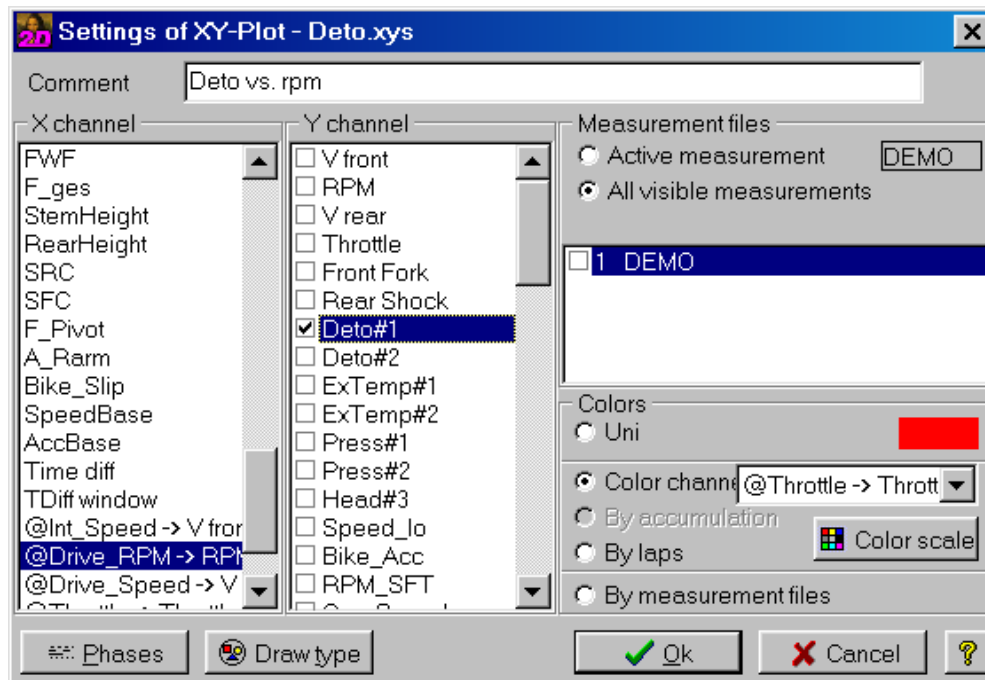
An XY-Plot "Gear ratio" shows channel "RPM" vs. channels "V_Front" and "V_rear". As color channel "Throttle" may be used. A phase condition (L) of type "Laps/selection" -> "Current selection" with option "Follow selection" is defined to show the gear ratio of the current selection in the Moving window.



2.9.5.2 Example 2



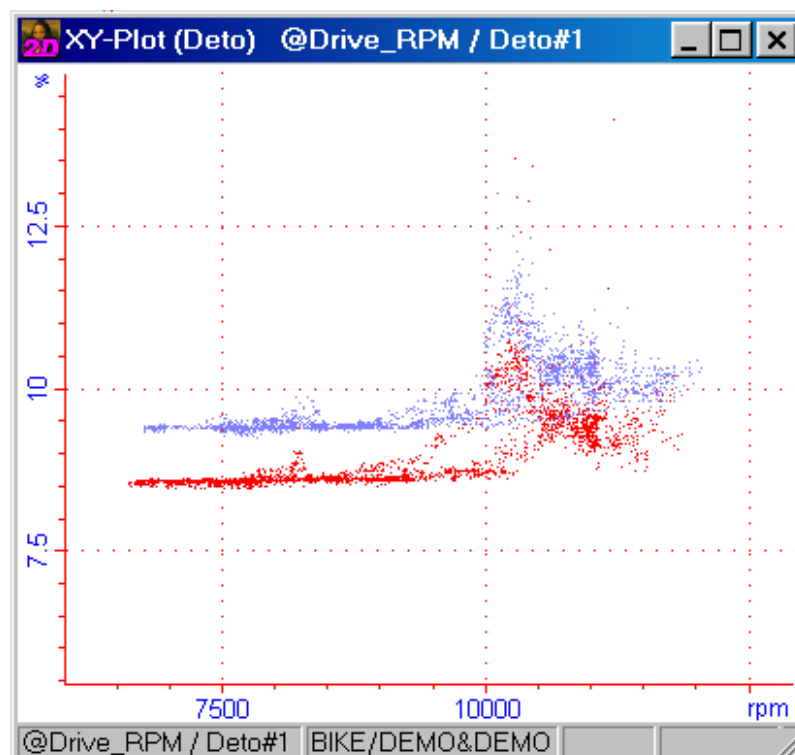
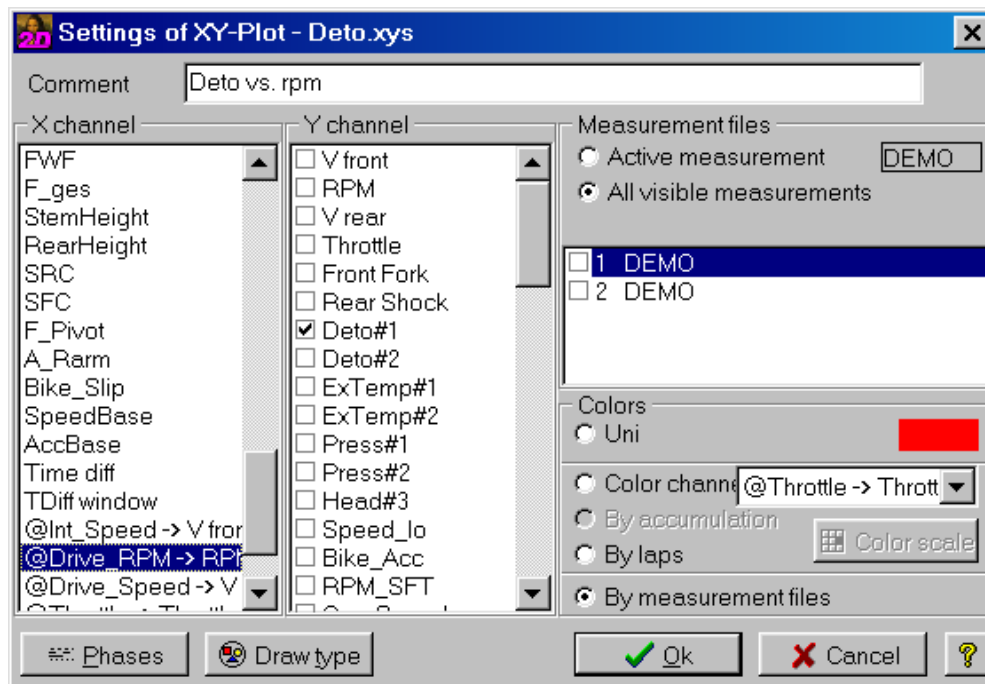
Examine 2-stroke detonation by showing channels "RPM" vs. "Deto" with color channel "Throttle".



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.

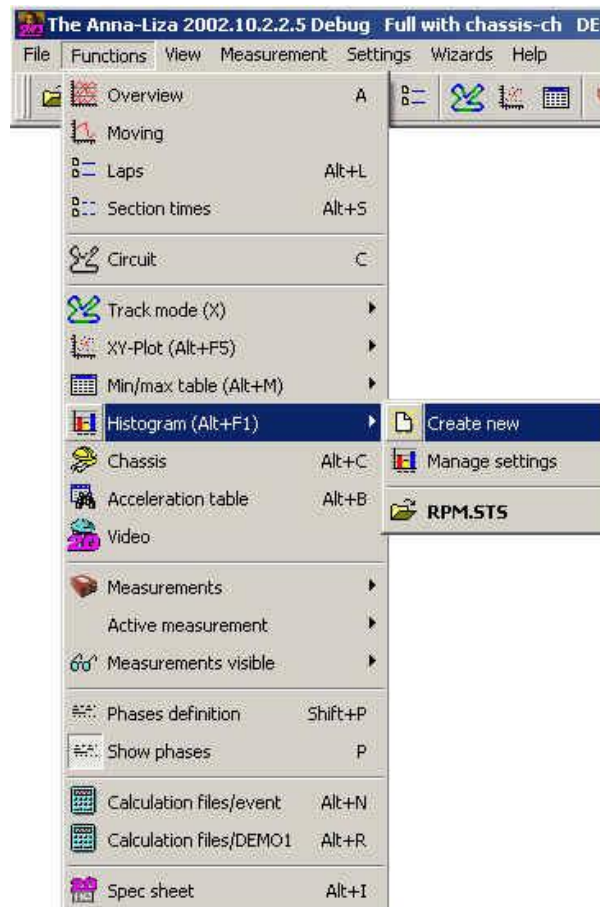


2.10 Histogram

Statistics about measuring values of a channel.

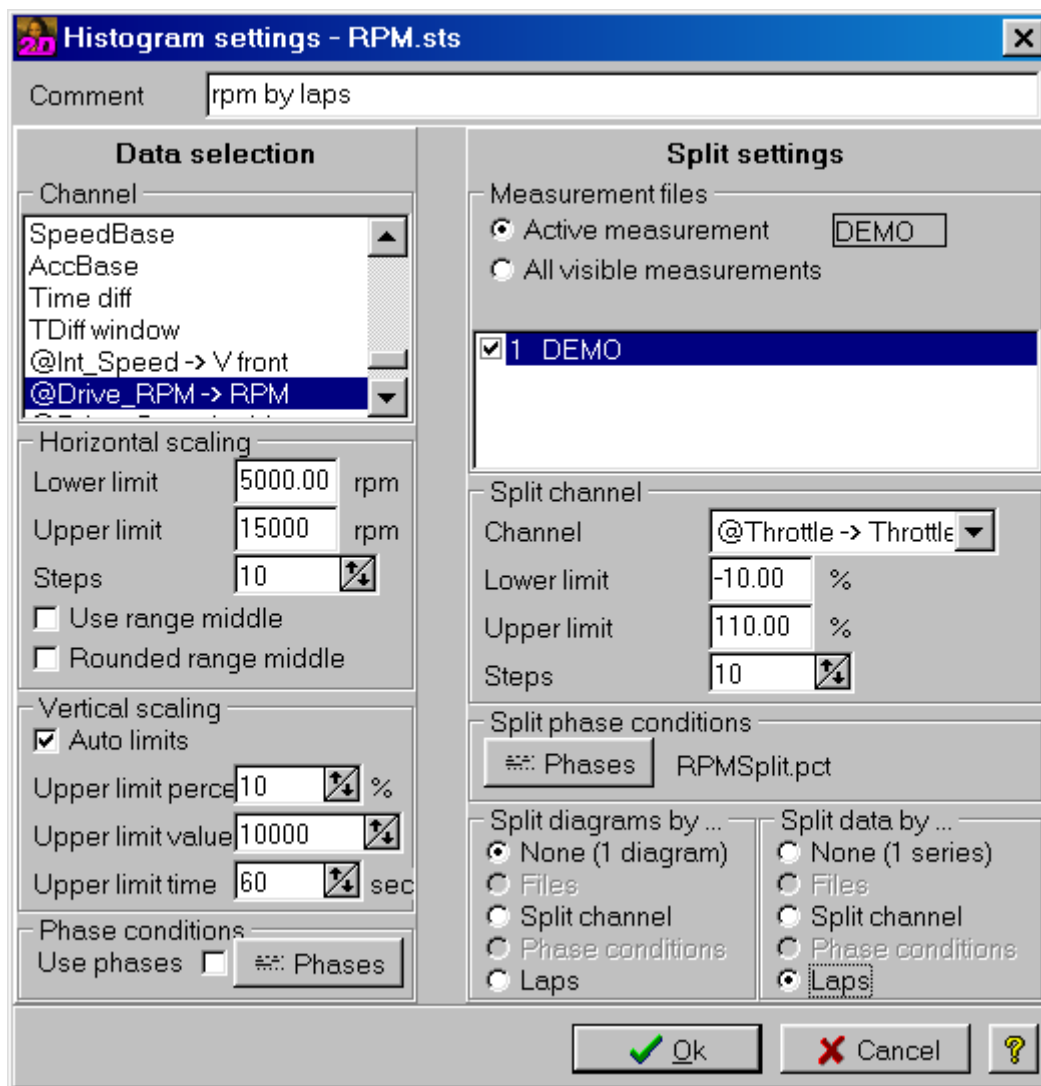
2.10.1 Creation and setup

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



Histogram settings - RPM.sts

Comment: rpm by laps

Data selection

Channel: SpeedBase, AccBase, Time diff, TDiff window, @Int_Speed -> V front, **@Drive_RPM -> RPM**

Horizontal scaling: Lower limit: 5000.00 rpm, Upper limit: 15000 rpm, Steps: 10. Use range middle, Rounded range middle.

Vertical scaling: ☒ Auto limits. Upper limit percent: 10%. Upper limit value: 10000. Upper limit time: 60 sec.

Phase conditions: Use phases ☐ Phases

Split settings

Measurement files: ☒ Active measurement (DEMO), ☐ All visible measurements. List: ☒ 1 DEMO

Split channel: Channel: @Throttle -> Throttle. Lower limit: -10.00%, Upper limit: 110.00%, Steps: 10.

Split phase conditions: Phases RPMSplit.pct

Split diagrams by: ☒ None (1 diagram), Files, Split channel, Phase conditions, Laps.

Split data by: ☐ None (1 series), Files, Split channel, Phase conditions, ☒ Laps.

Ok Cancel ?

2.10.2 Functions

2.10.2.1 Export

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

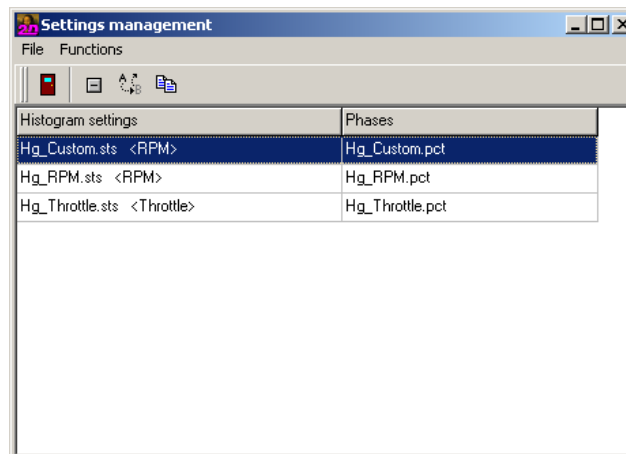
2.10.2.2 Print

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

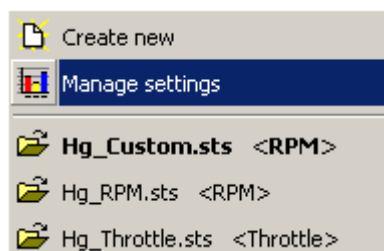
Print via Print manager starts the high-end print page layout module.

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 open the editor is to use the shortcut key <Alt + F1>. Afterwards select the menu item "Manage settings"



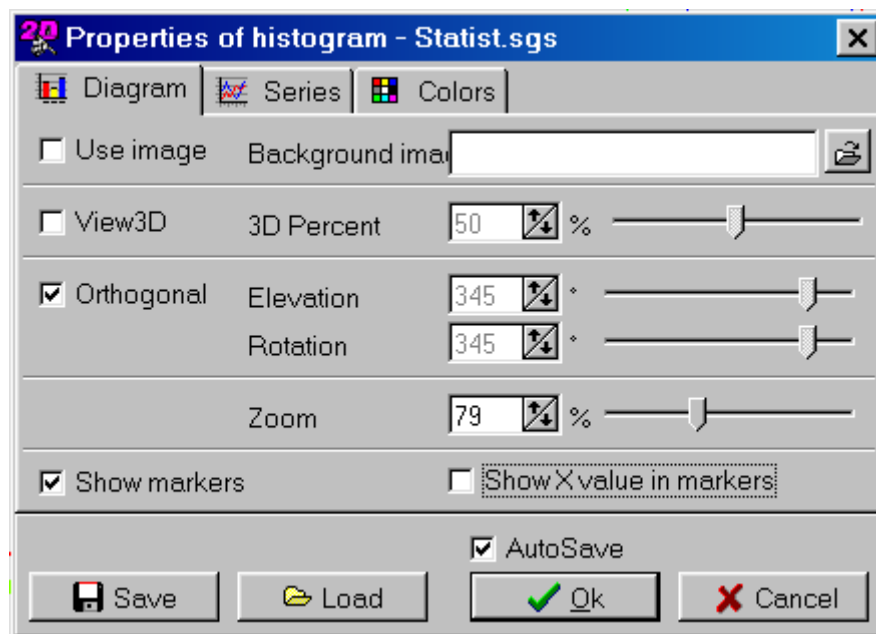
2.10.4 Properties

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

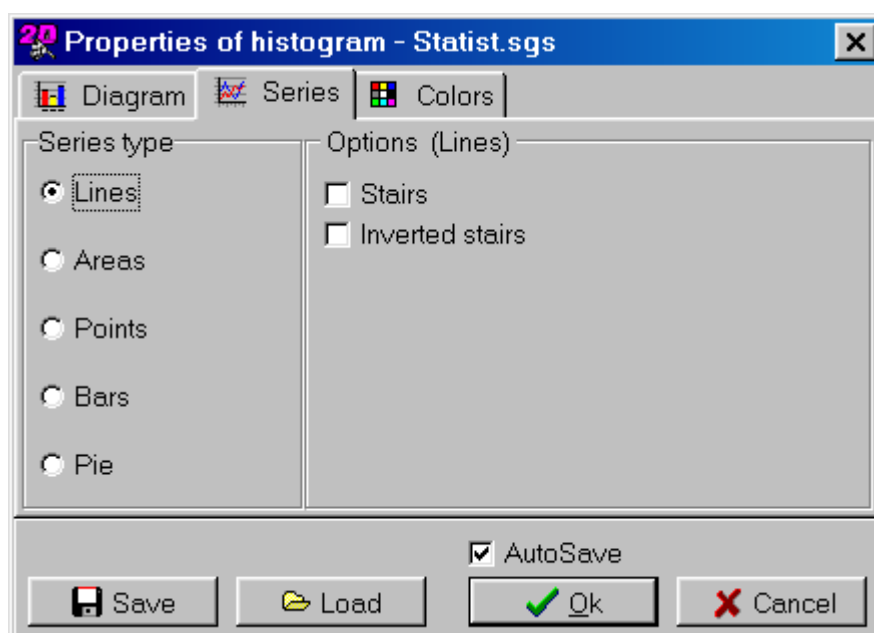
The presentation may be 2- or 3-dimensional, where various geometric options may be set.



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

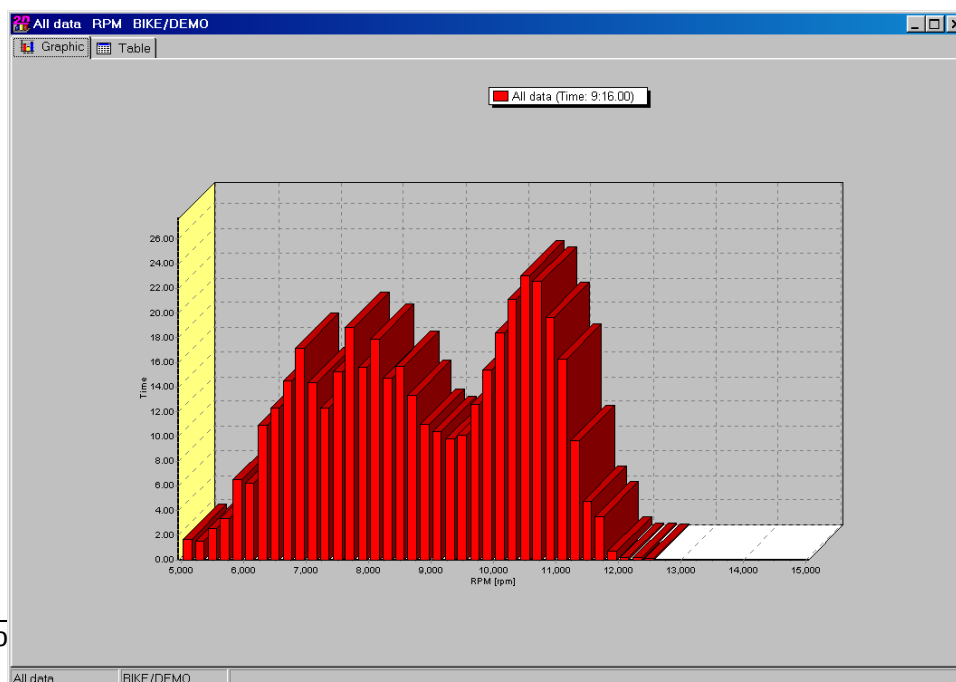
2.10.5.1 Example1



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

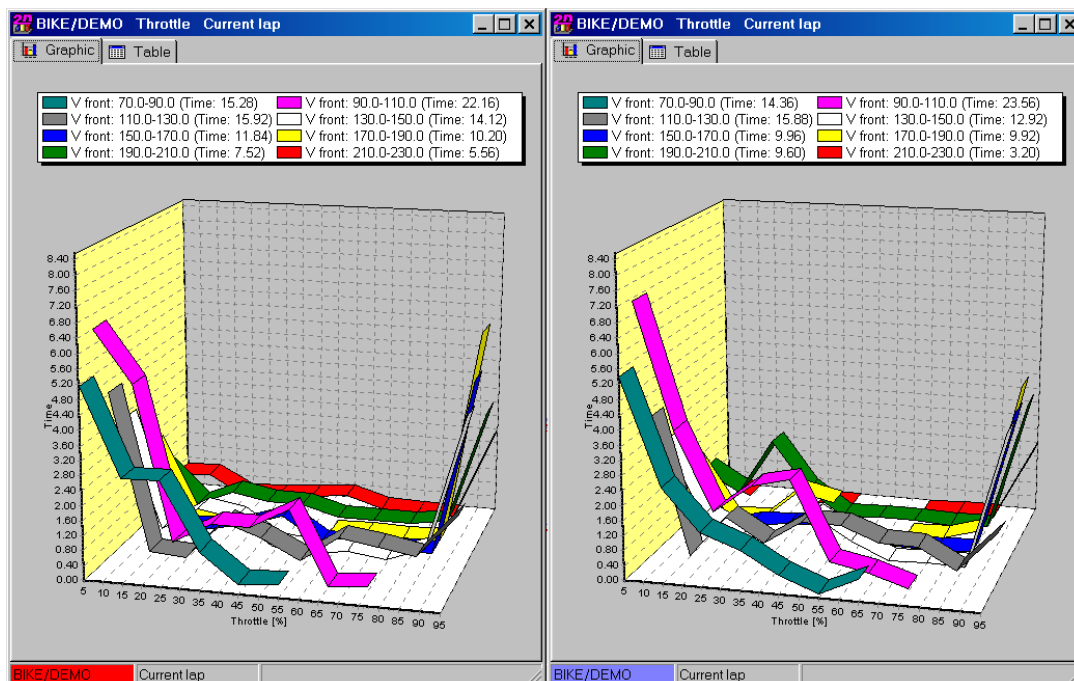


Comparison of throttle usage of two riders. Channel "Throttle" is selected, the phases cover the fastest lap, both measurements are selected. The diagrams or alternatively the data are split by measurements.

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.



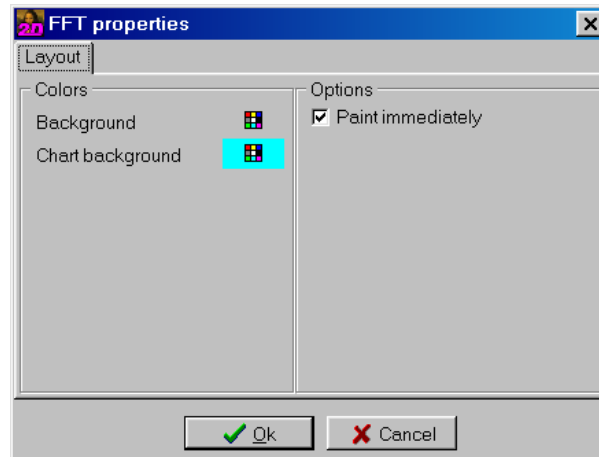
Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer [Options Dialog](#).

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.

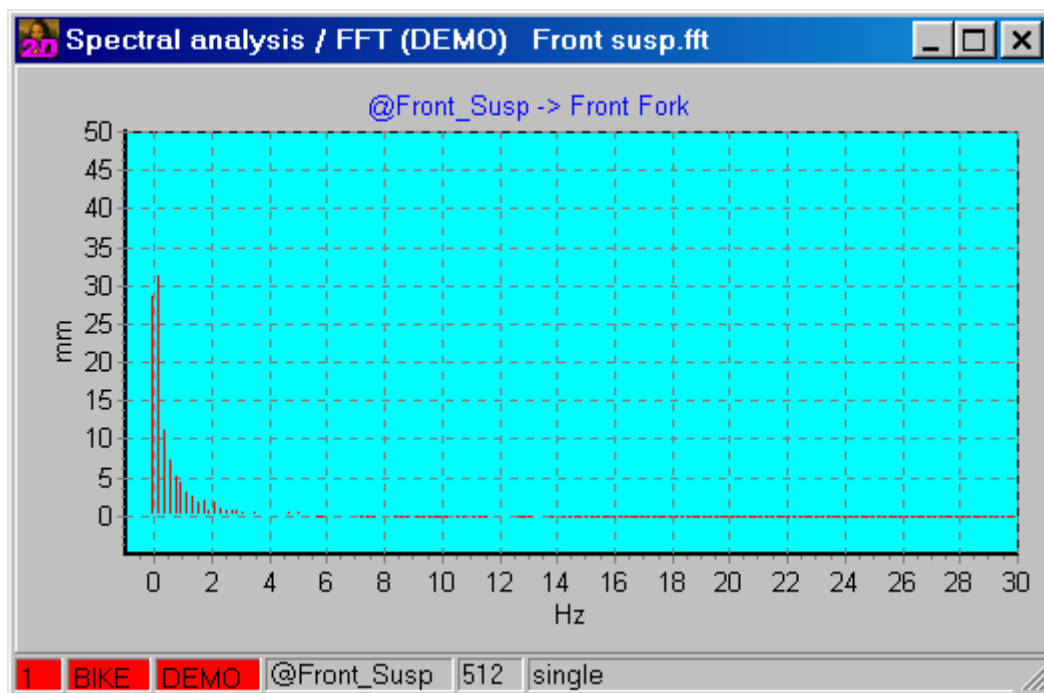
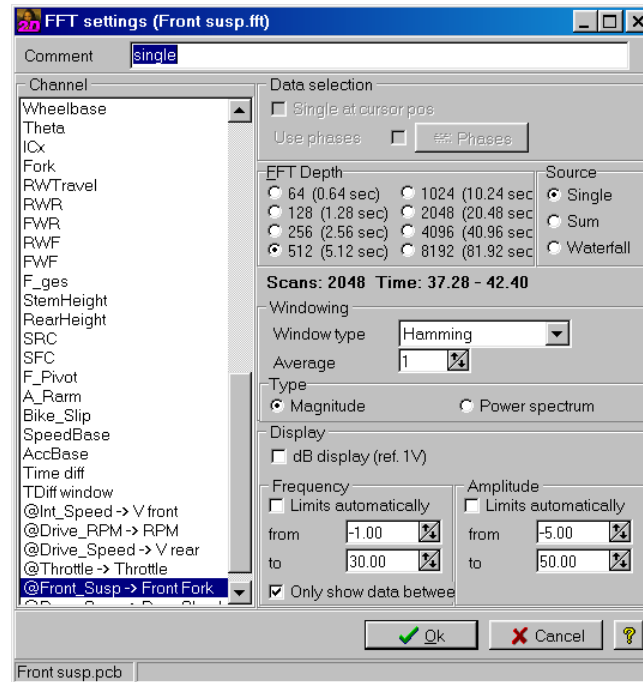


2.11.5 Examples

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

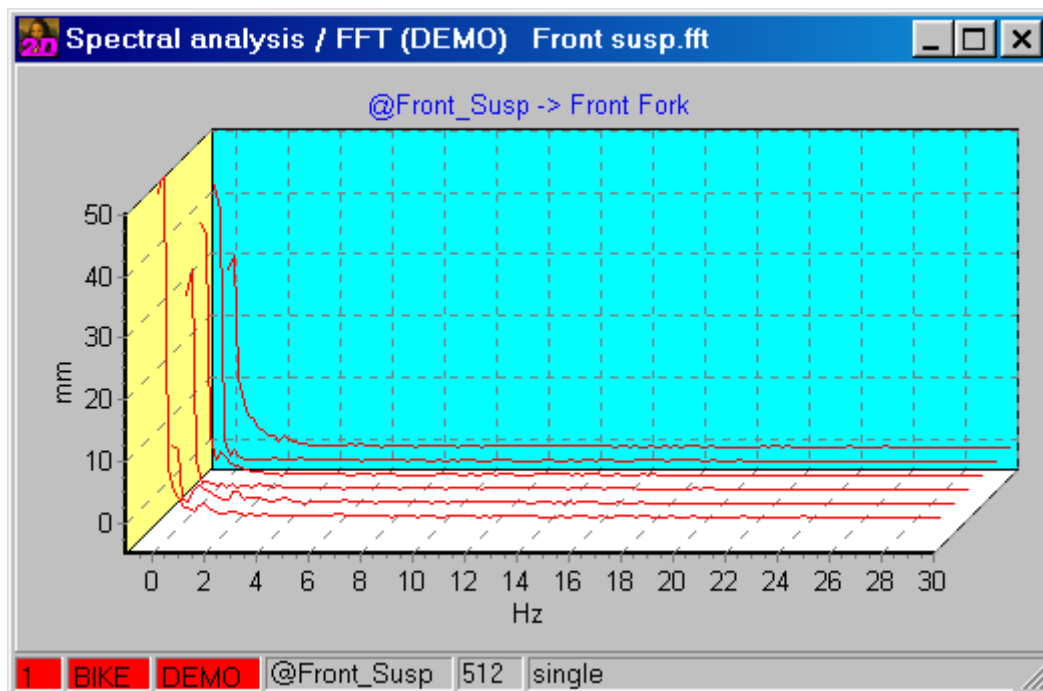
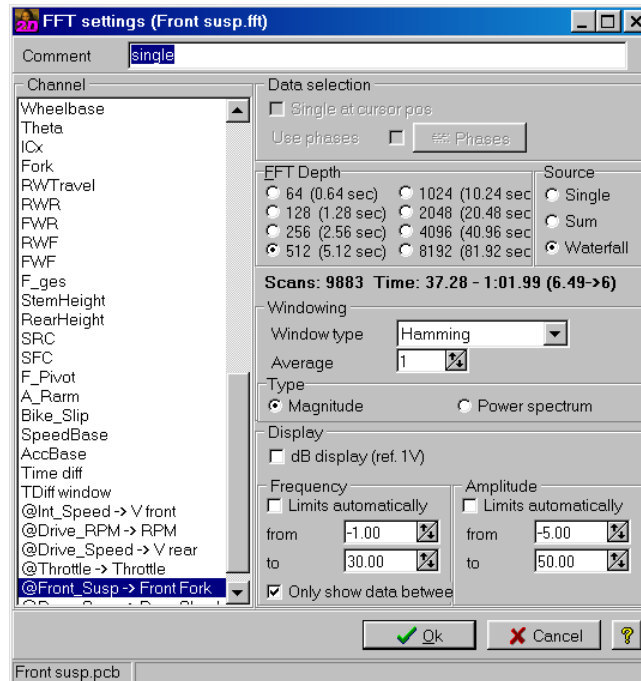


2.11.5.2 Example 2



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)"

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.

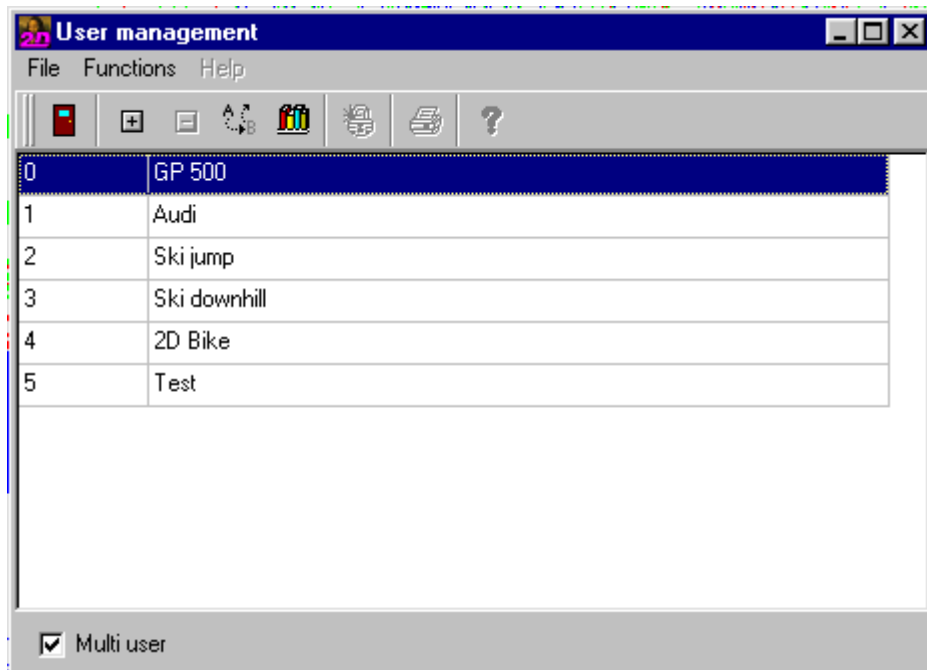


3.2 User management

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

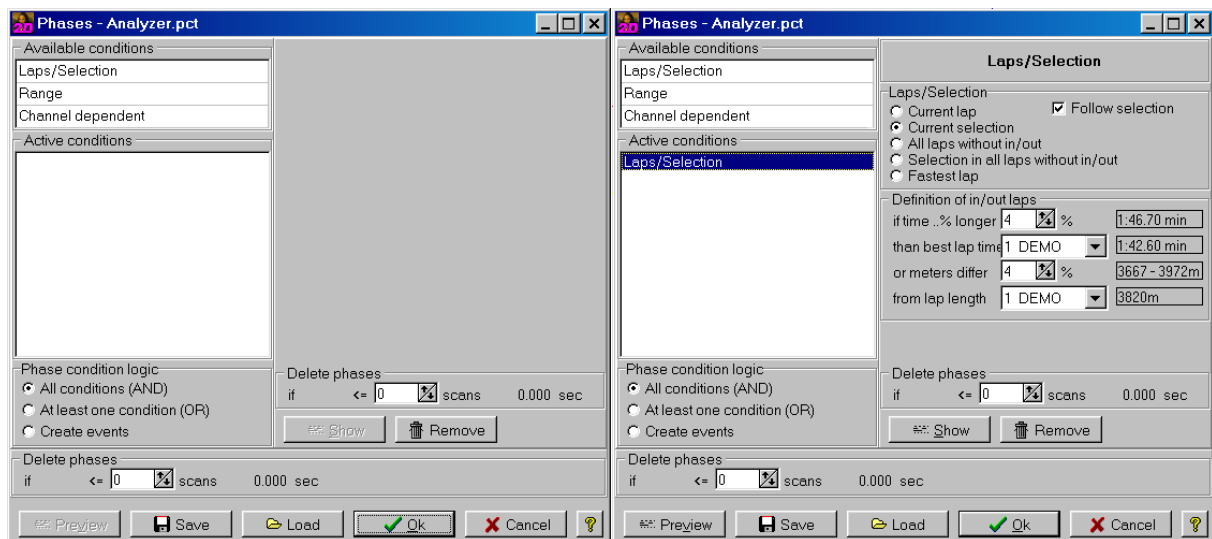
Subset of measured data defined by Phase conditions.



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.

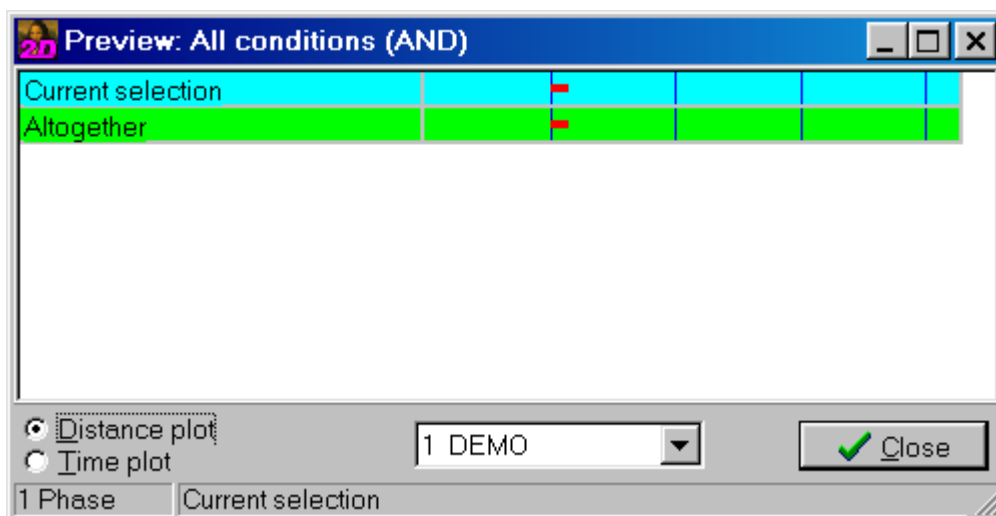
3.3.1 Definition



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 disturb 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.

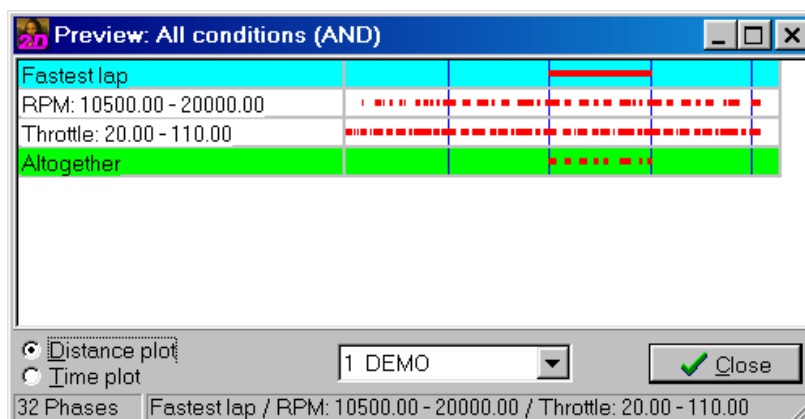
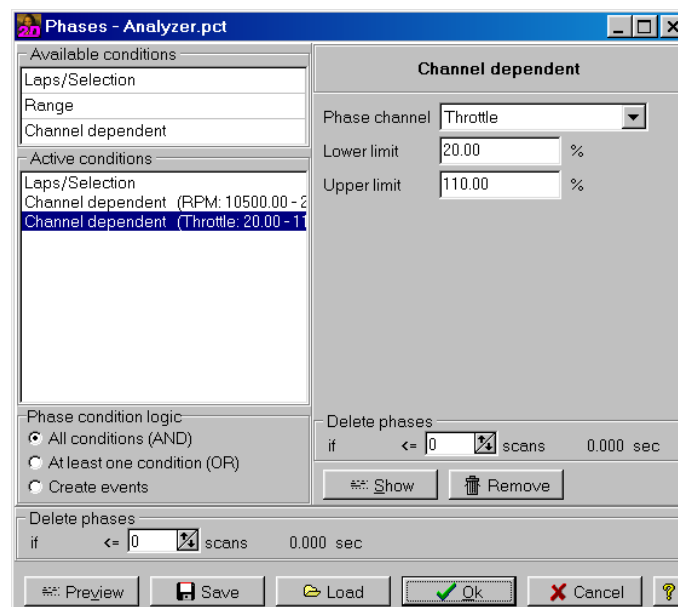
3.3.3 Examples

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.



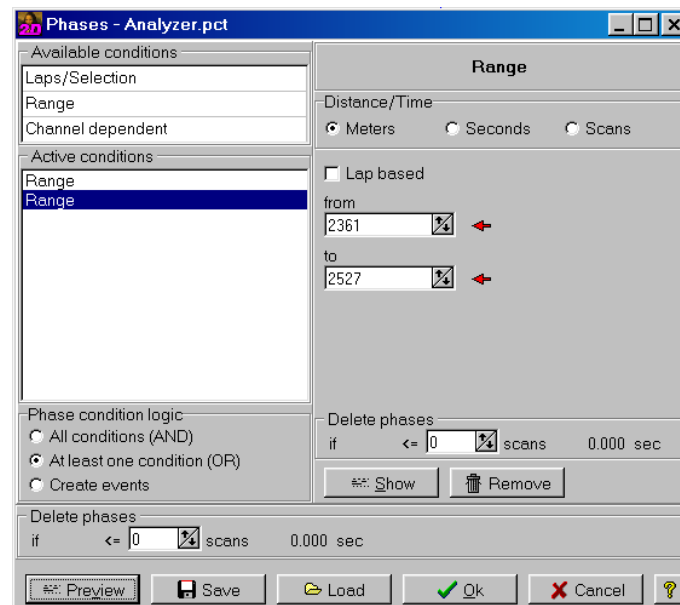
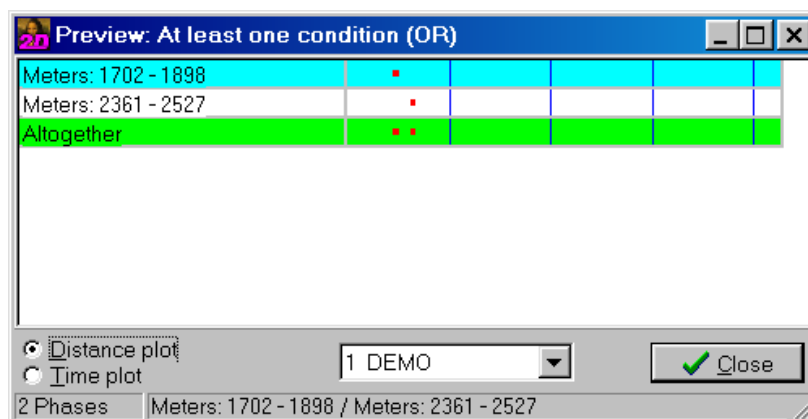
3.3.3.2 Example 2

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.

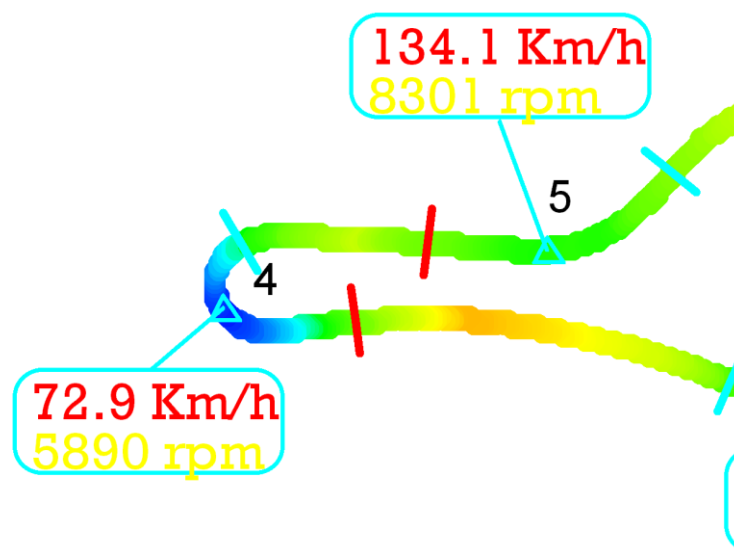
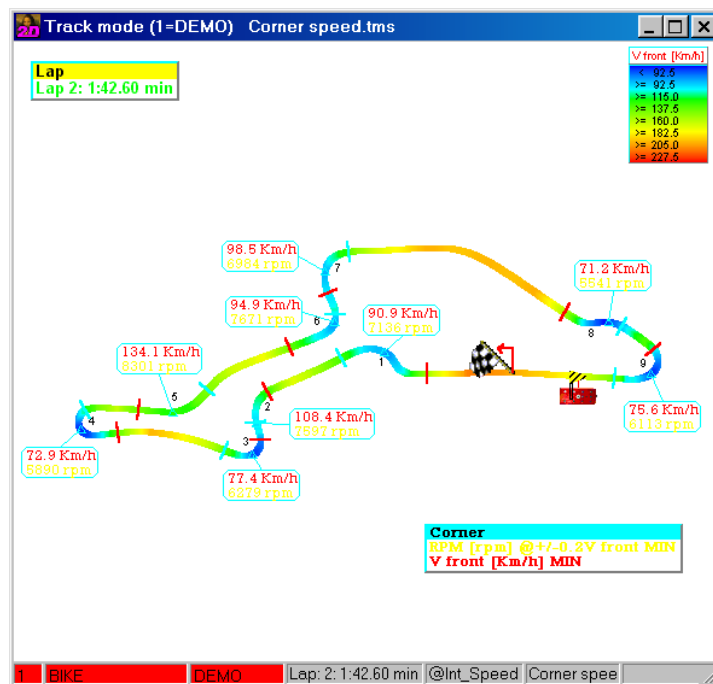
Meters: 1702 - 1898	•			
Meters: 2361 - 2527	•			
Altogether	• •			

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 losing 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.

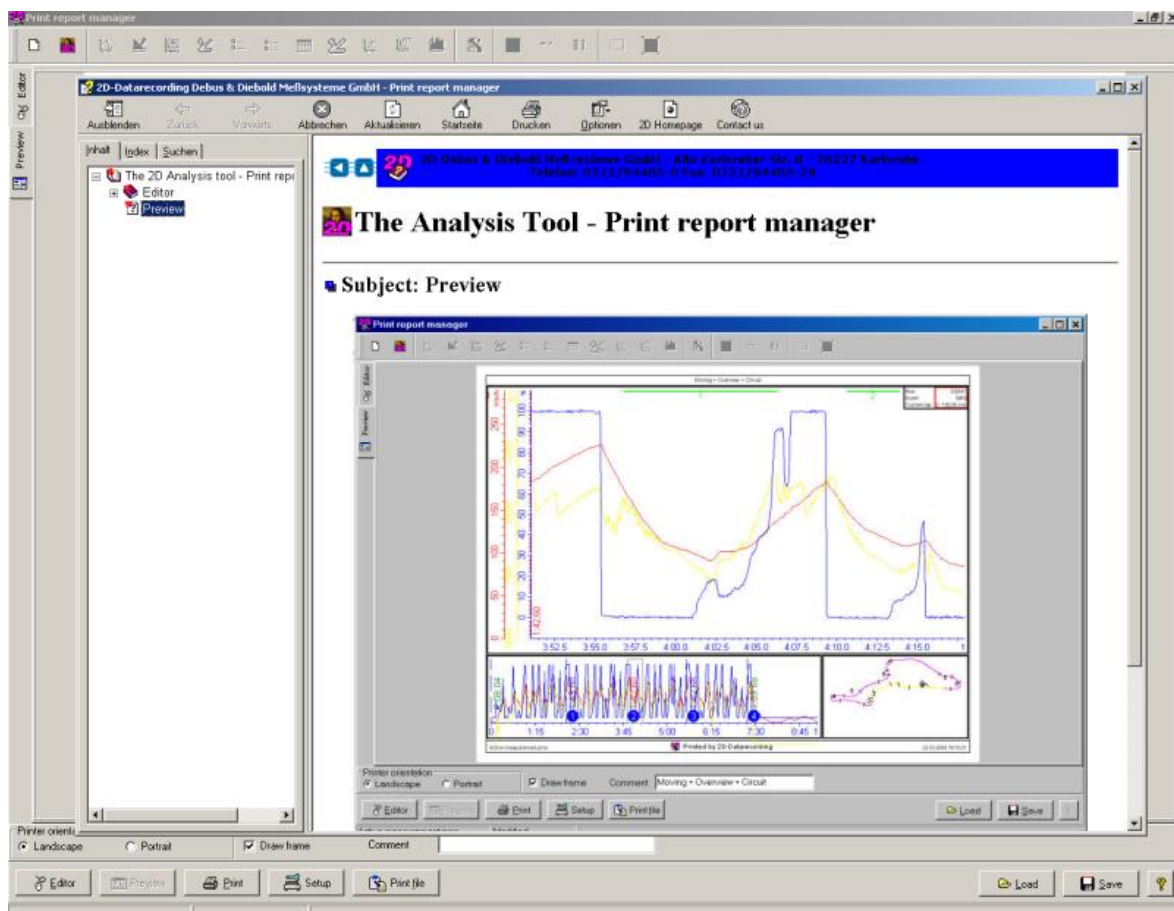
An image of the current Print manager page may be saved to disk or clipboard.

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.

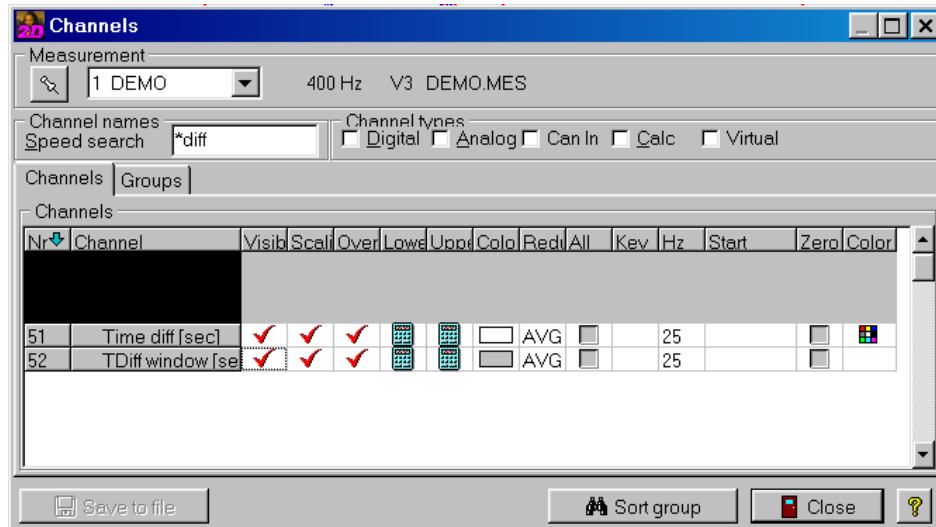
3.7 Time Diff

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

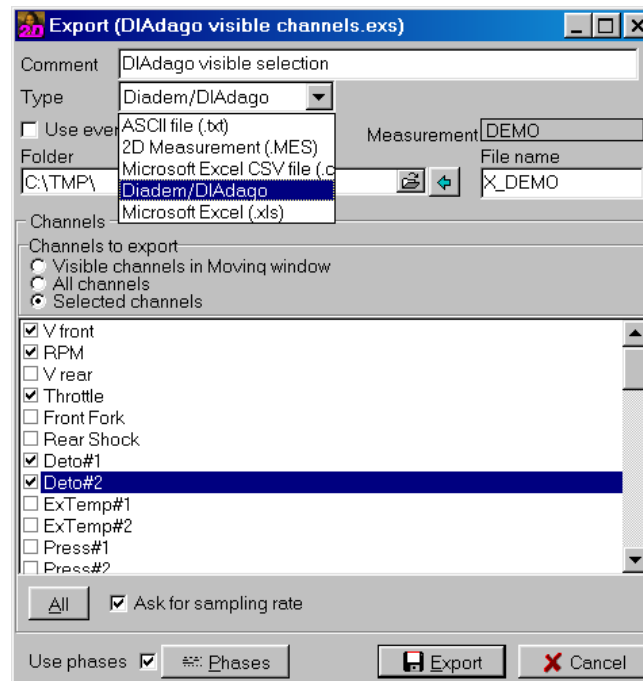
Select a suitable lap of the run and save this lap as reference lap.

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



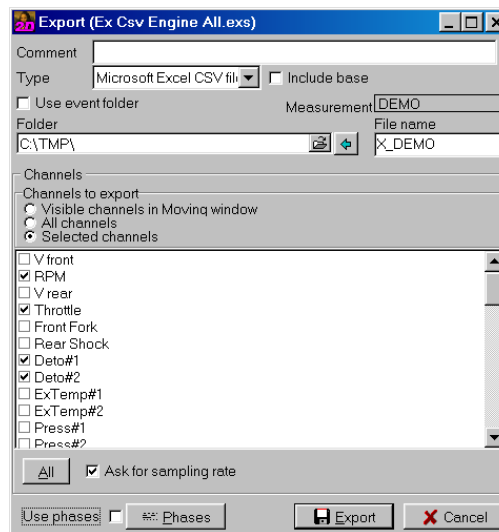
If no phases are used then the channel data over the complete measurement will be exported. With the use of phases it is possible to export only a certain subset of the data.

3.10.2 Channels



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

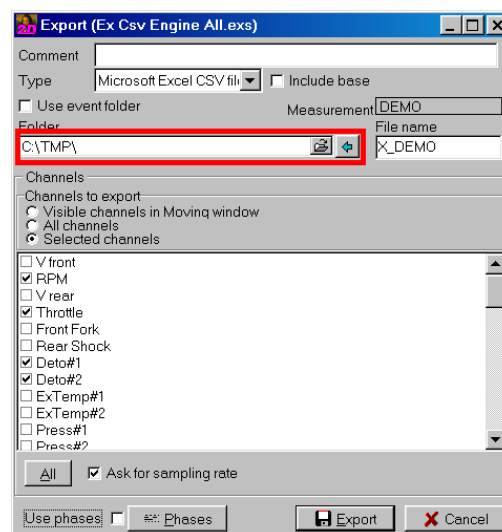
1. Visible channels in Moving window: Just the channels of the active measurement currently visible in Moving window
2. All channels: All channels (including hidden ones when exporting into 2D format)
3. Selected channels: Select individual channels to be exported



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

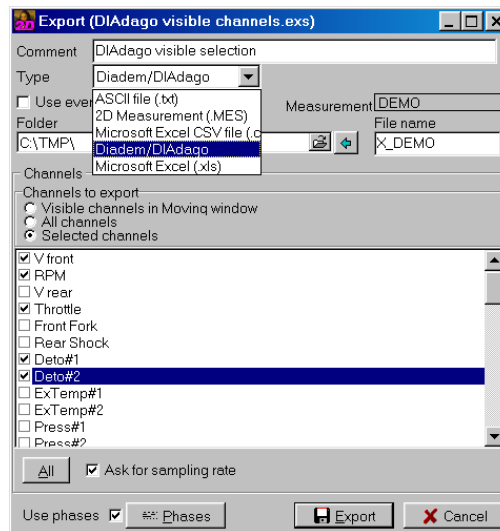


3.10.4 Type



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

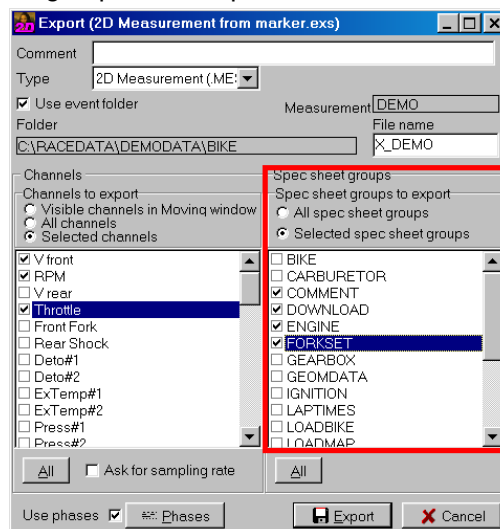


3.10.5 Spec sheet groups



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

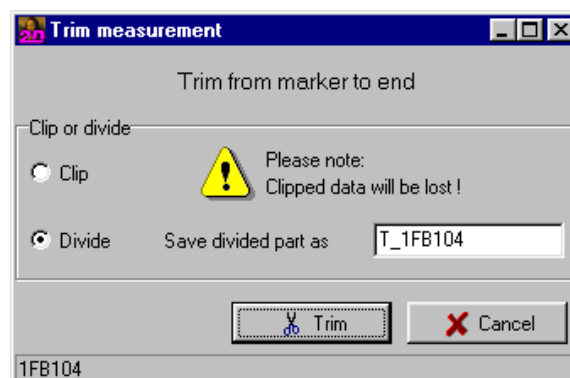
The data between the marker and the end of the measurement is saved. Optional the first part of the measurement can be saved under another name.

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

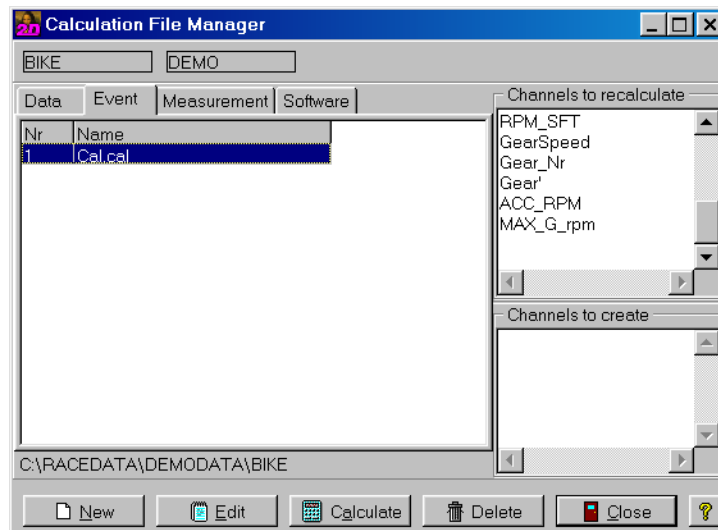
The data inside the two markers is saved, losing the data outside the markers.



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 successful 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:

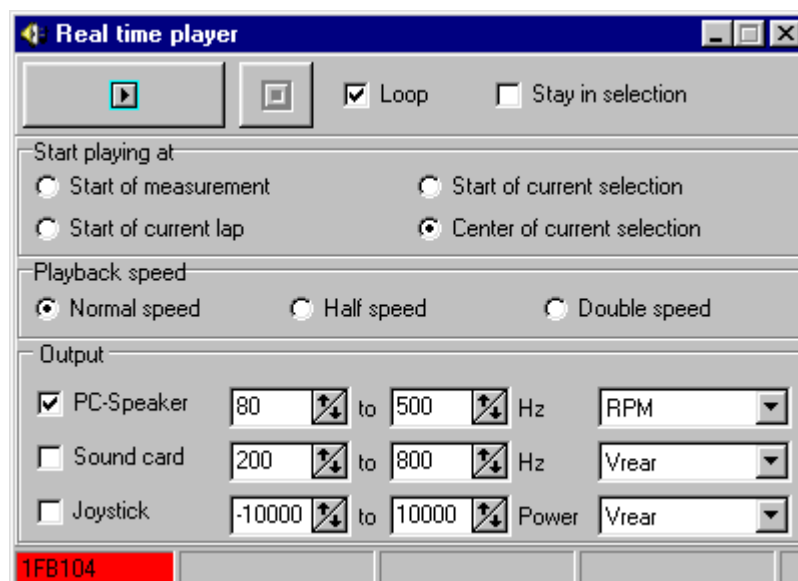
- Start of measurement
- Start of current lap
- Start of current selection
- Center of the current selection



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

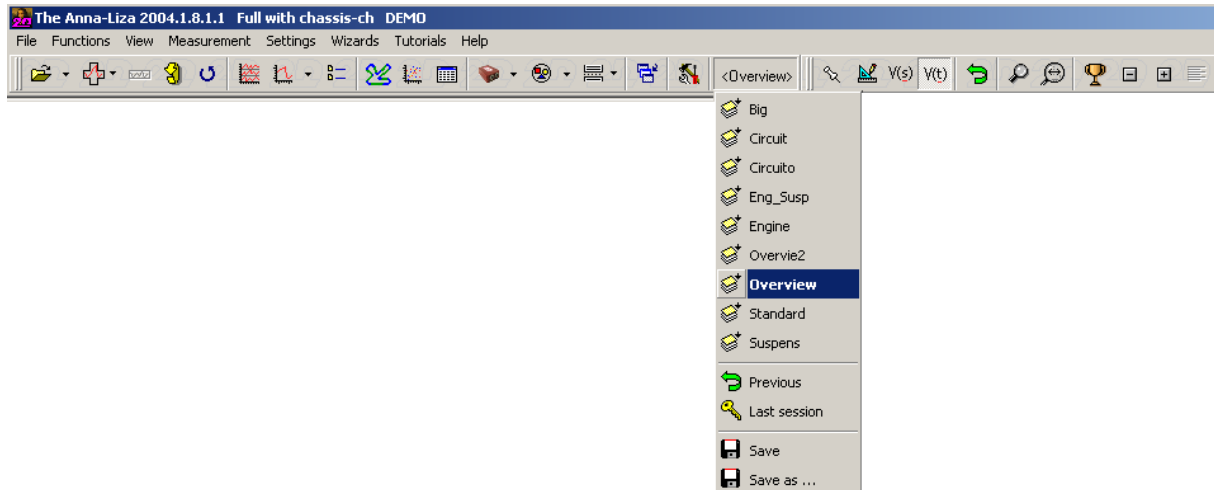


3.16 Templates

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.



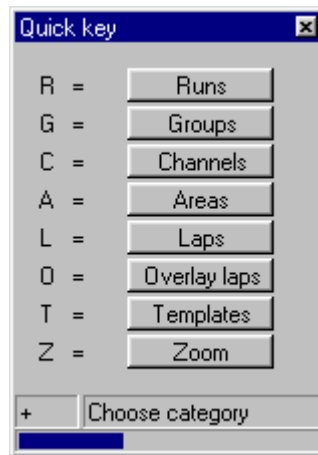
Restore a previous saved template by clicking on the Template button in the main toolbar and selecting the desired template.

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

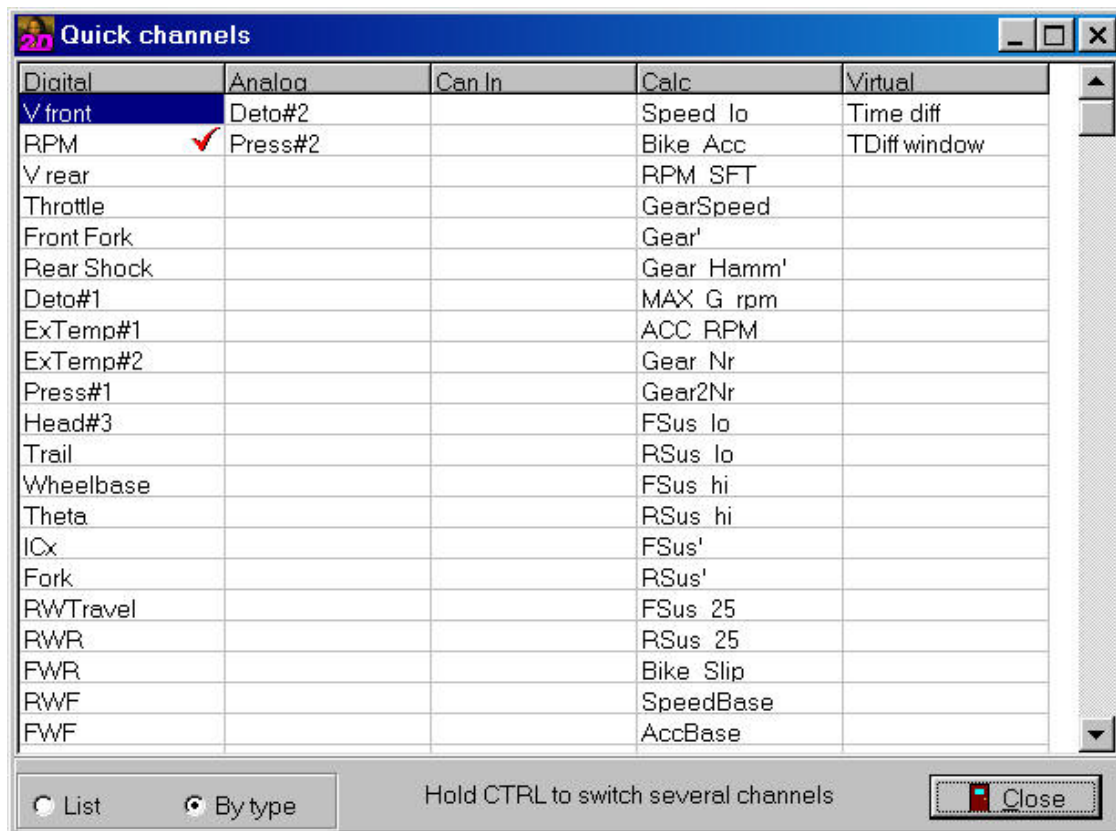
3.18 Quick Channels

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.



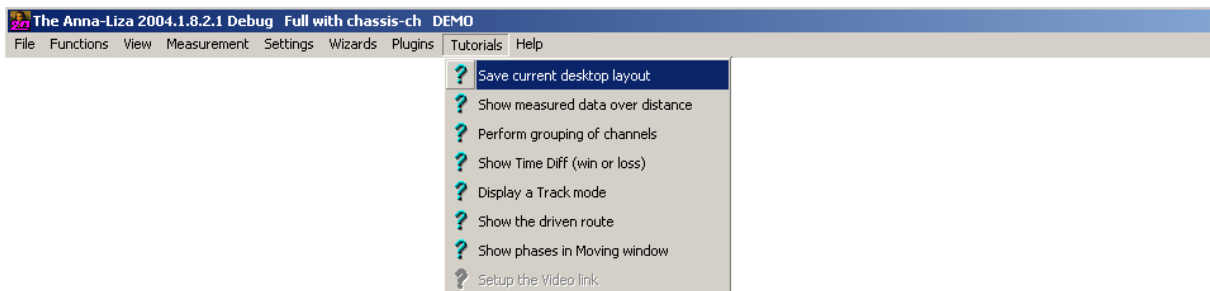
4. Tutorials

Available analysis tutorials:

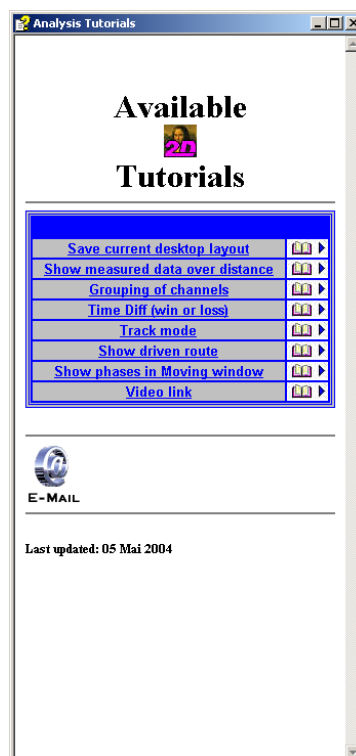
- Save current desktop layout
- Show measured data over distance
- Grouping of channels
- Time Diff (win or loss)
- Track mode
- Show driven route
- Show phases in Moving window
- Video link



For detailed informations start the 2D analysis tool and enter the main menu item "Tutorials"



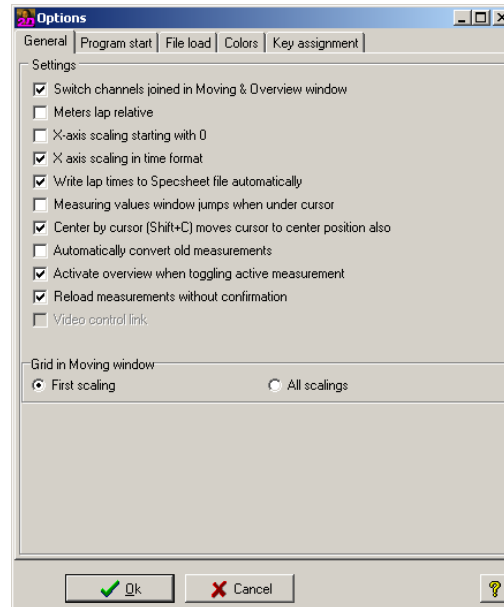
- Select a tutorial and perform it step by step



5. Options

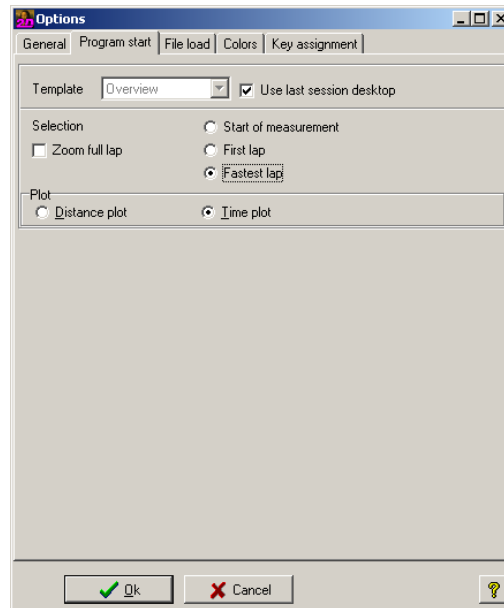
Options are stored user dependent, which means that each Analyzer user has his own Options set.

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.

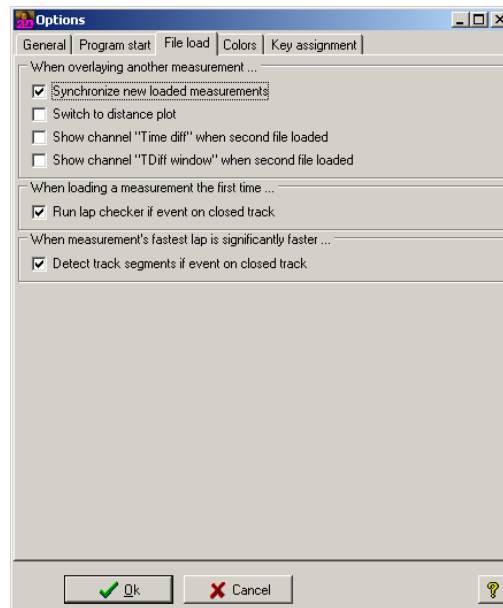
5.2 Program start



- **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



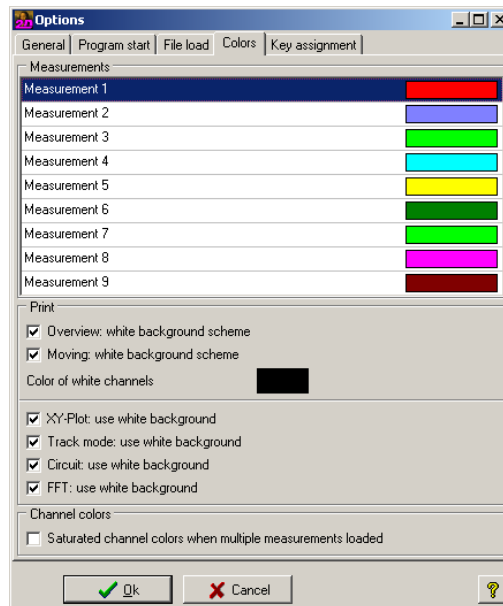
5.3 File load



- **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.



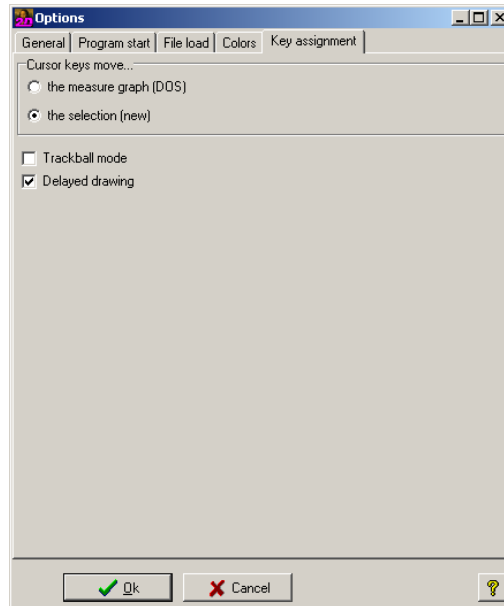
5.4 Colors



- **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 >	Show 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”

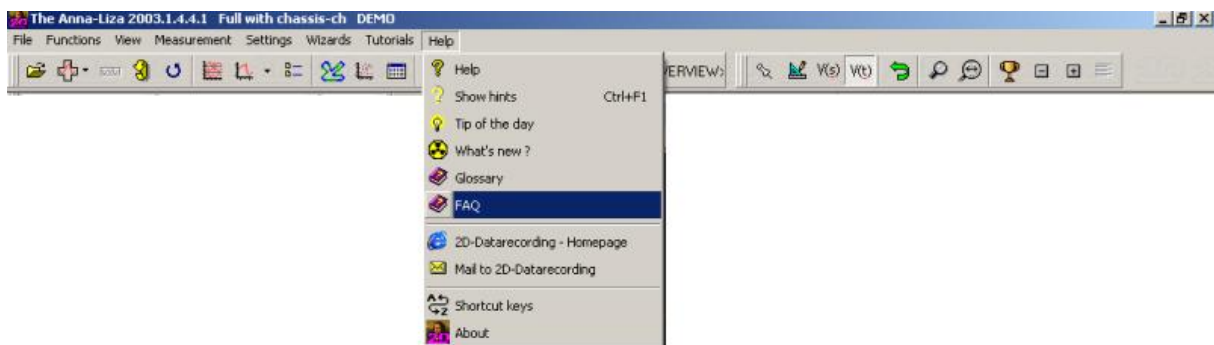
Shortcut / Mouse	Action	
< SPACE >	Start measuring mode	Moving mode
< ENTER >	Start measuring mode with active measurement only	
< SHIFT + ENTER >	Start measuring mode with active measurement in channel colors	
< Mouse left button > On vertical channel scaling	Adjust channel display vertically	
Mouse: 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)

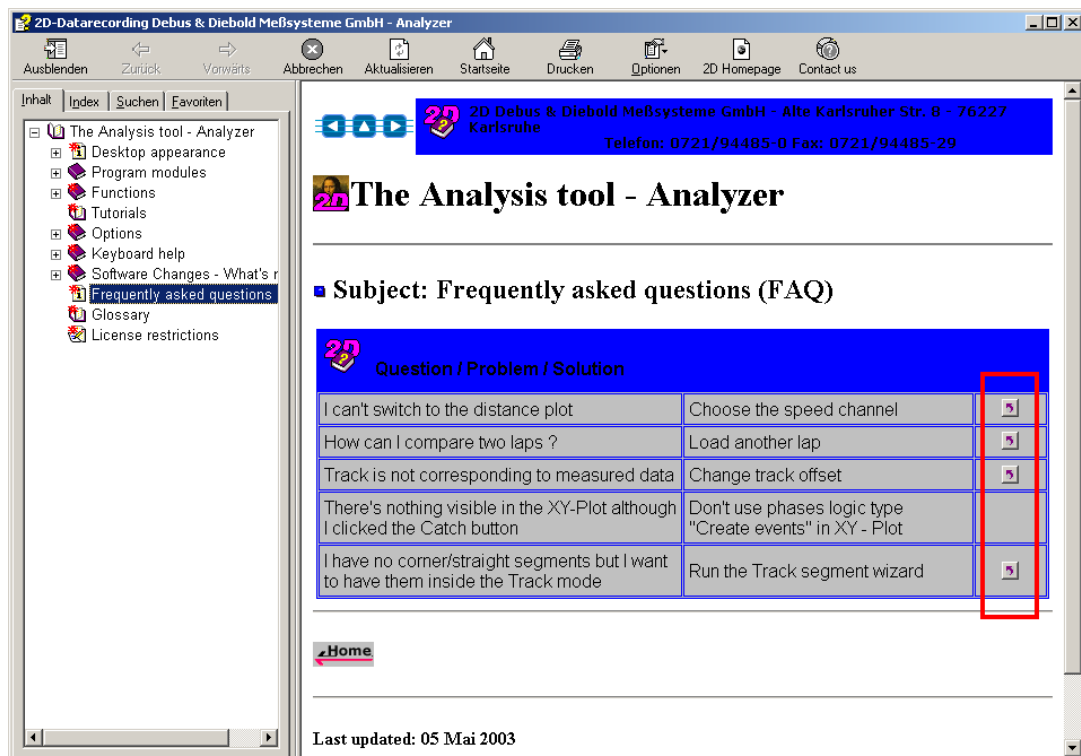
Question / Problem	Solution
I can't switch to the distance plot	Choose the speed channel
How can I compare two laps ?	Load another lap
Track is not corresponding to measured data	Change track offset
There's nothing visible in the XY-Plot although I clicked the Catch button	Don't use phases logic type "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 (<i>Autocal.cal</i>) 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

functionality	license type	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	•	•	•	•

functionality	license type	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	•