Make the most of your data

Fit File Repair Tool

User Manual

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Fit File Repair Tool

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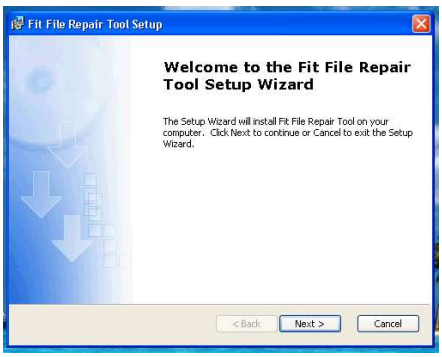
1. Installation

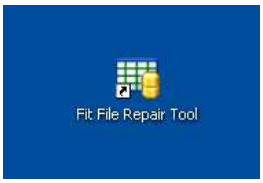
1.1. Installation using MS Access

If MS Access 2010, Access 2013, Access 2016 or Access as part of Office 365 is installed on your computer you don't have to install a MS Access runtime version.

Download the file **FFRTsetup.msi** from http://fitfilerepairtool.info/download onto your PC. Now execute **repairfitfile.msi** and click Next, then choose "Typical Installation".



At the end of the installation the setup tool will create shortcuts for the Fit File Repair Tool in the Windows Start Menu and on the Desktop of your PC.



1.2. Installation using MS Access Runtime

Step 1: Download and install Microsoft Access Runtime Version

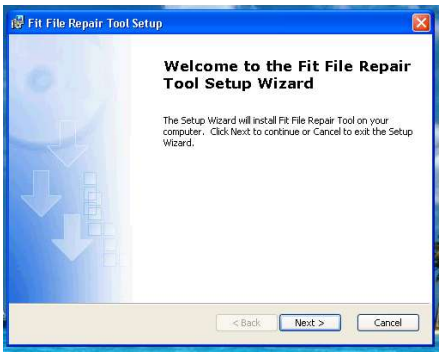
If you don't own Microsoft Access you can download a (free) runtime version of MS Access 2010.
Please choose the file **AccessRuntime.exe** from the following website:

http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=10910

Step2: Download and install the Fit File Repair Tool

Download the file **FFRTsetupForAccessRuntime.msi** from http://fitfilerepairtool.info/download onto your PC.

Now execute **repairfitfile.msi** and click Next, then choose “Typical Installation”.



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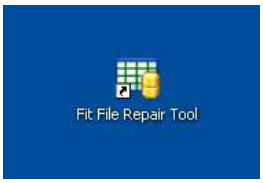


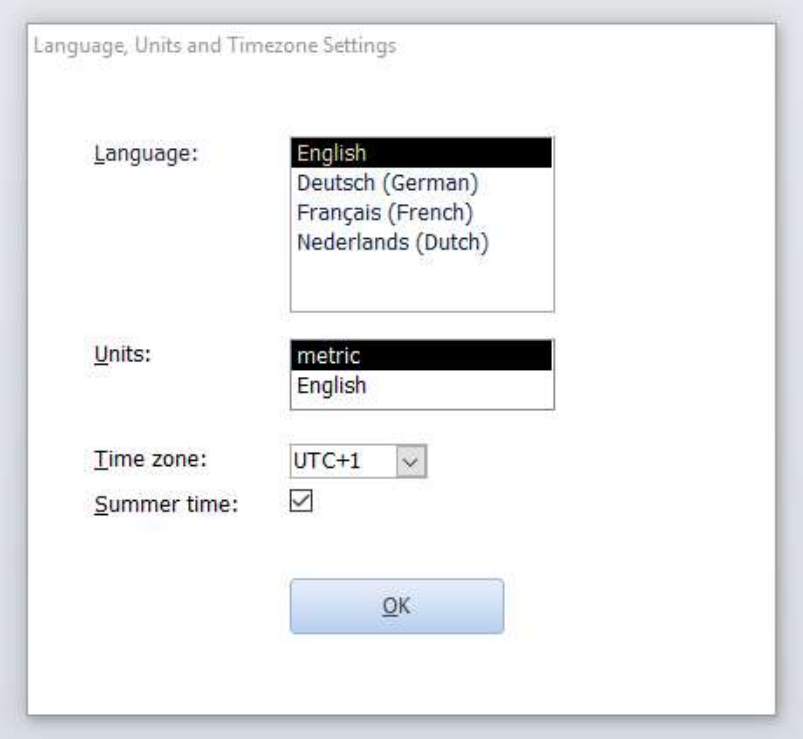
2. Starting the Program

Double click the shortcut “Fit File Repair Tool” in the Windows Start Menu or on the Desktop.

If Microsoft Access displays the below Security Notice, please choose “Open“.

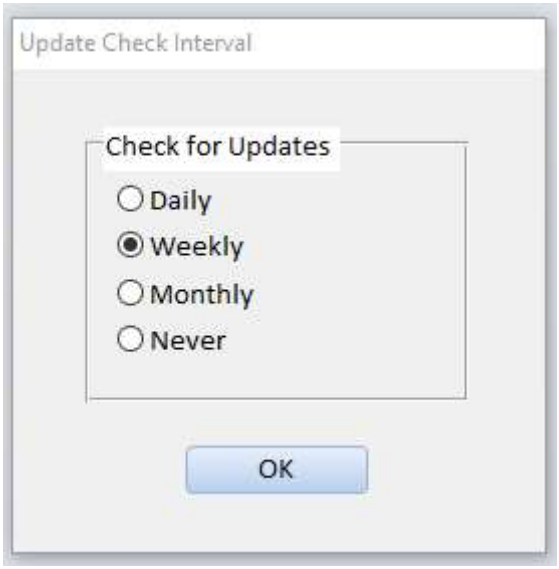
If you run the tool using MS Access 365 as part of a **MS Office 365** installation under MS Windows 10 you might get a security warning (“Proteced View”) and the execution of macros might stop. In this case re-start MS Access, then select “Options”, “Trust Center”, “Settings for the Trust Center” and add the folder where you installed Fit File Repair Tool to the list of trustworthy locations. You will find details here: https://support.office.com/en-us/article/add-remove-or-change-a-trusted-location-7ee1cdc2-483e-4cbb-bcb3-4e7c67147fb4?ui=en-US&rs=en-US&ad=US.

The following screen should then be displayed when you start Fit File Repair Tool the first time:



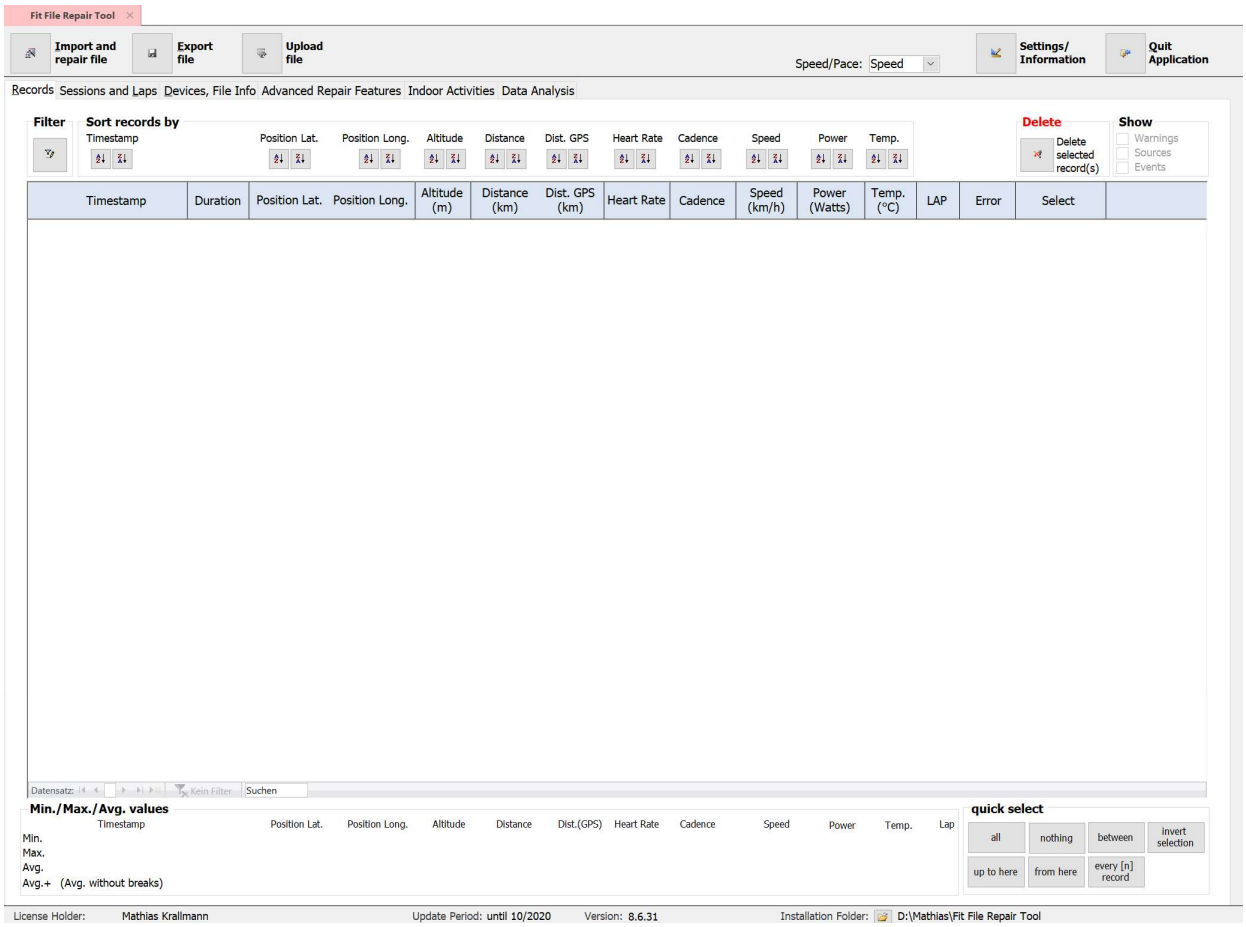
Please select your preferred language, units and time zone. These settings (along with all other settings) will be stored in the file **RepairFitFile_PersonalSettings.txt** in your installation folder.

In the next window you will be asked how often the tool is supposed to check the Update Server for available updates:

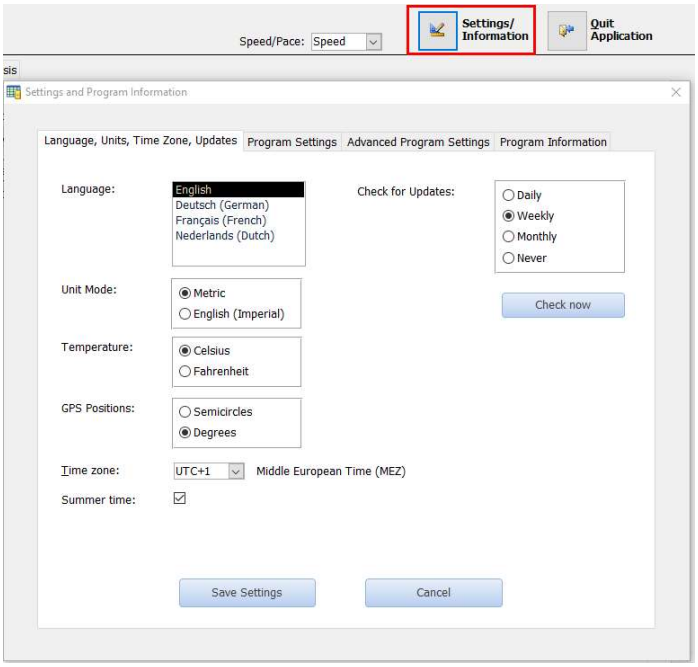


The check will require 1-5 seconds during the program start. Please choose “Never” if you bought a license without Update Service.

Now you should see the main form of the Fit File Repair Tool:



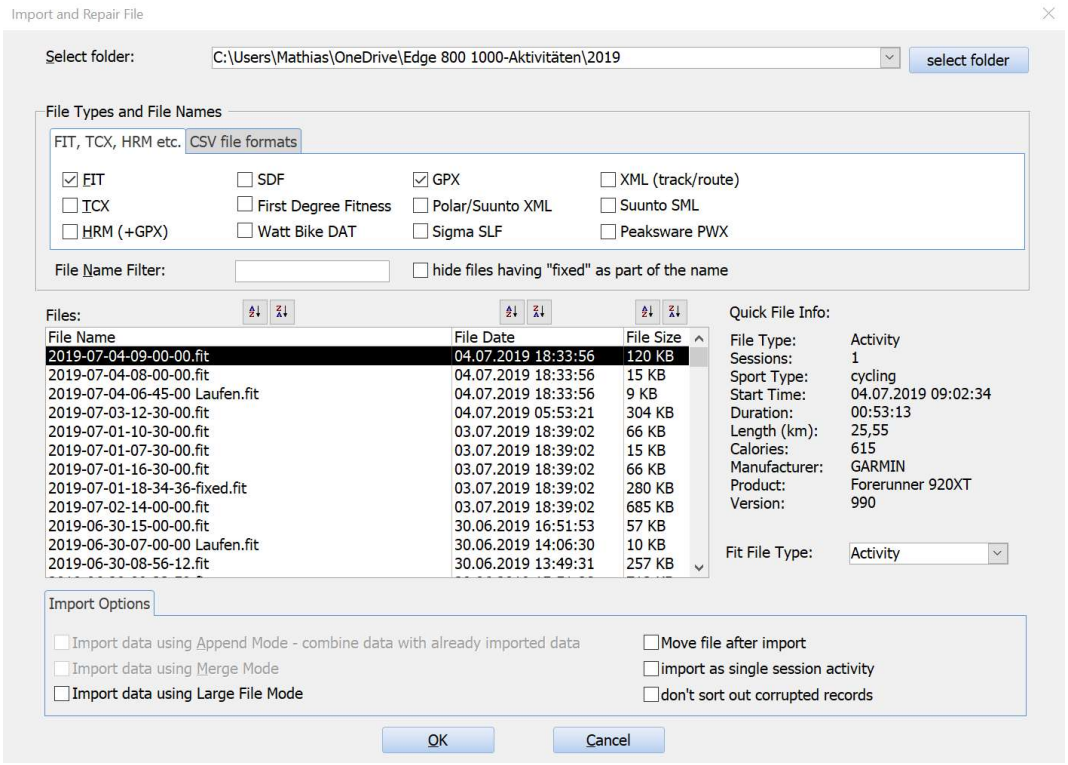
If you wish to change settings (language, units, check for updates etc.) please click on the command button “Settings/Information” in the top right:



3. File Import and Automatic File Repair

Click on the button “Import and repair file”, select the folder that contains your activity file(s) and then select the file which you would like to import.

Please note that the stupid folder selector doesn’t show individual files that are stored in the folder you are about to select. Therefore your folders seem to be empty (except for subfolders)!
After choosing the folder which contains your sport files, the file list should be updated and display all selected sports files (.fit, .tcx etc.). Sorry for these irritations!



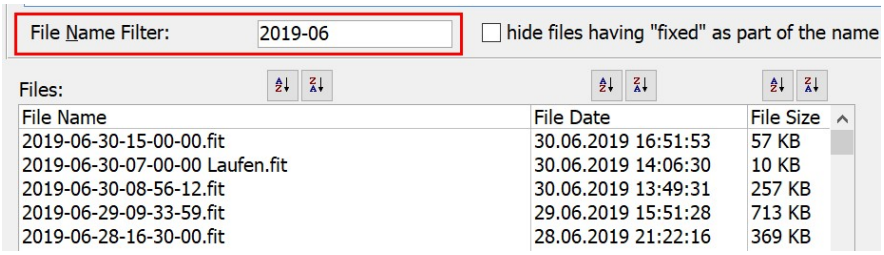
The following file formats are supported and can be imported:

- FIT
- TCX
- HRM (+GPX + HRM <R R values>)
- GPX
- Tanita weight data (CSV)
- PoolMate
- SDF
- Polar XML
- XML (track or route data)
- Suunto (SML)
- Peaksware (PWX)

- many CSV file formats

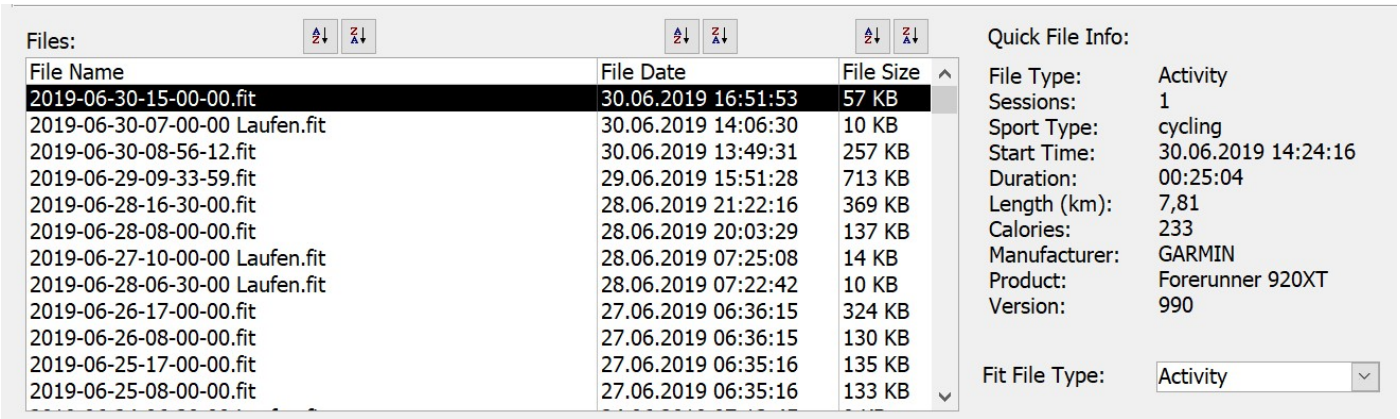
The folder field contains a history of the previously selected folders – so instead of retyping the folder name a second time you can open the list and click on the entry you need.

File Name Filter: You can enter wildcard text which is part of the filename, for example “2019-06” – this will ensure that only files that contain “2019-06” are listed.



Hide files which have “fixed” as part of the name: Files which are exported from the Fit File Repair Tool normally have ‘fixed’ appended to the filename e.g. “xyz-fixed.fit”. If you don’t want to see the repaired and exported files, activate this option.

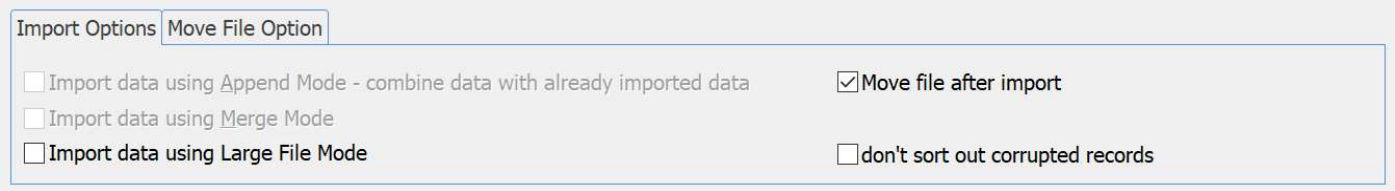
Quick File Info: Once you select a file from the list, the Repair Tool starts a quick background vanalysis of it and will provide you some basic information of that file. The data shown here depends on the file type. Fit Files contain more information than .tcx or .gpx files for instance.



Fit File Type: if you select a Fit File the file type is automatically specified. If your file is corrupt a wrong file type might be chosen. In such a case you can manually change the Fit File type.

Import Options: You can combine multiple files into one activity – for example, if you accidently have hit the “stop” button on your device and one activity is split into two recordings. In this case you would import the first file, then select the second file to be imported, select the “**Import Data using Append Mode**” option and then click “OK”. The

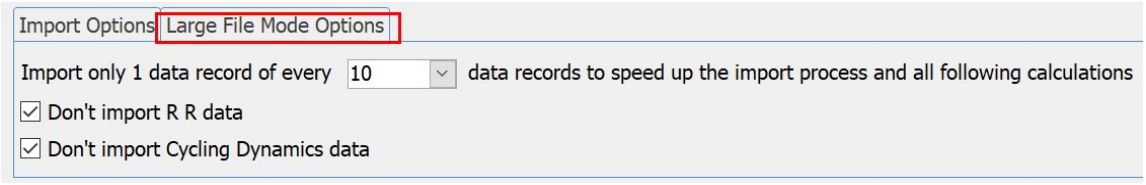
contents of the second file will then be imported without deleting the previously imported data and all statistics (total distance, average speed etc.) will be updated based on the data of both files. More information about this option can be found in Chapter 12.



If you use two separate devices to record ONE activity you can combine data using the "**Merge Mode**" option.

In this case you would import the first file, select the second file to be imported, select the "**Merge Mode**" option and then click on "OK". Data can be synchronized either by timestamps or by distance values. More information about this feature can be found in Chapter 13.

Import data using Large File Mode: If your fit file is larger than 200 KB the import process might require several minutes and require a lot of system resources. If your file is larger than 1 MB it might be too large to be imported with Fit File Repair Tool. For these cases this option has been developed. If you activate this option an additional register page will become visible which allows you to specify in which way you want to "optimize" the import:



Even if you import only one data record of 2/5/10/100 data records in your file total data will be correct (exception: max speed/max cadence etc. might be too low). If your file contains R R data or Cycling Dynamic data then excluding this data from the import will speed up the import process significantly.

Move file after import: If you want to move the file after you imported it you can select this option and specify a folder. In this case the tool will move the file from the import folder to the selected archive folder after successful importation.

Don't sort out corrupted records: Normally data records with more than 2 obviously incorrect values will be sorted out and displayed in a register page "Corrupted Records". If you prefer to see such corrupted data records in register page "Records" (together with not corrupted data records) then activate this option before the import starts.

NOTE - the import process can take a few minutes, depending on the size of the file and the number of errors that the file contains.

Special note regarding HRM files:

During the import process the Fit File Repair Tool looks for a GPX file (contains GPS position data) that has the same file name as the selected HRM file and also a HRM file with the next file number (contains R R values). If it finds these files it imports them automatically together with the selected HRM file.

Example:

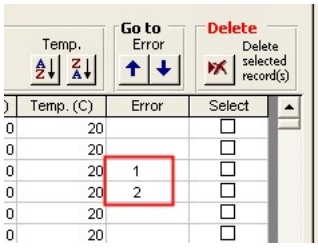
If you select the file 2013011201.hrm for import, the Repair Tool will automatically look for a file 2013011201.gpx and 2013011202.hrm from within the same folder and import these files as well.

The repair tool does **not stop** the import process once it detects corrupted data. The tool will continue to try to find the start of readable data records and then continue the import process from there.

4. Manual Edit Functions

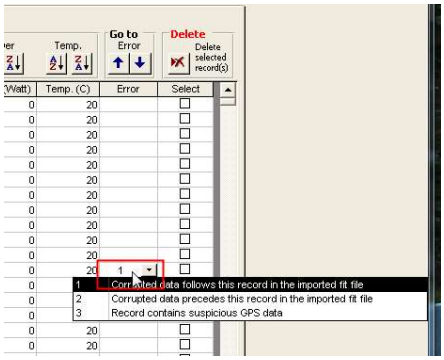
4.1. Basic Edit Functions

As previously stated, corrupt records are being deleted automatically during the import process. The codes “1” and “2” in the “**Error**” column show where data has been automatically deleted during the import process.



In the “**Error**” column the following error types can be displayed:
1 - corrupted data follows the current record (line) in the imported fit file
2 - corrupted data precedes the current record (line) in the imported fit file
3 - the current record contains suspicious GPS position data

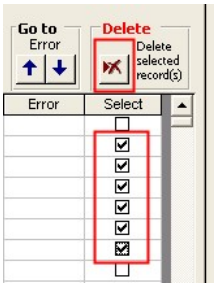
Click into the “error” field and open the error list to get more information about the error code.



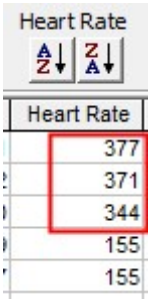
You can use the up and down arrows in the “Go To” box to jump to the next or previous error in the records list.

In the bottom part of the form **min, max and average values** are shown. You can use them in connection with the **sorting buttons** in the upper part of the form to identify, select and delete suspicious records. After each deletion the min/max/average values are recalculated.

You can mark several corrupt records by clicking into the “**select**” column and then delete those selected records by clicking the “**delete selected record(s)**” button.

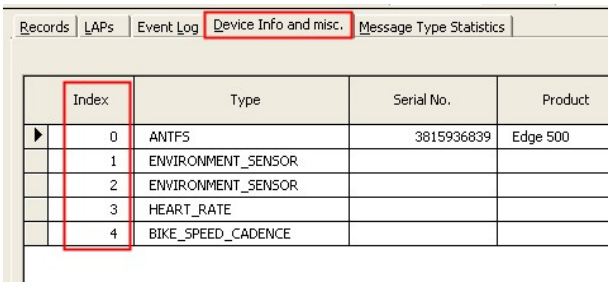


Corrupt **position, heart rate, cadence, speed, power etc.** values can be easily corrected by clicking into the field and **editing** the value.



All average, min and max values are automatically recalculated after manual changes. After editing a GPS Position value (lat/long) the "Distance (GPS)" field is automatically recalculated.

The option "**Show Sources**" on register page "Records" allows you to see which device has provided the displayed values. This information might be helpful if, for example, your speed could be measured either by your training device (via GPS data) or by a speed & cadence sensor. The number which is shown beside the numeric values (for example [1]) is the **device index** and refers to the device list on the page "Device Info and misc.".



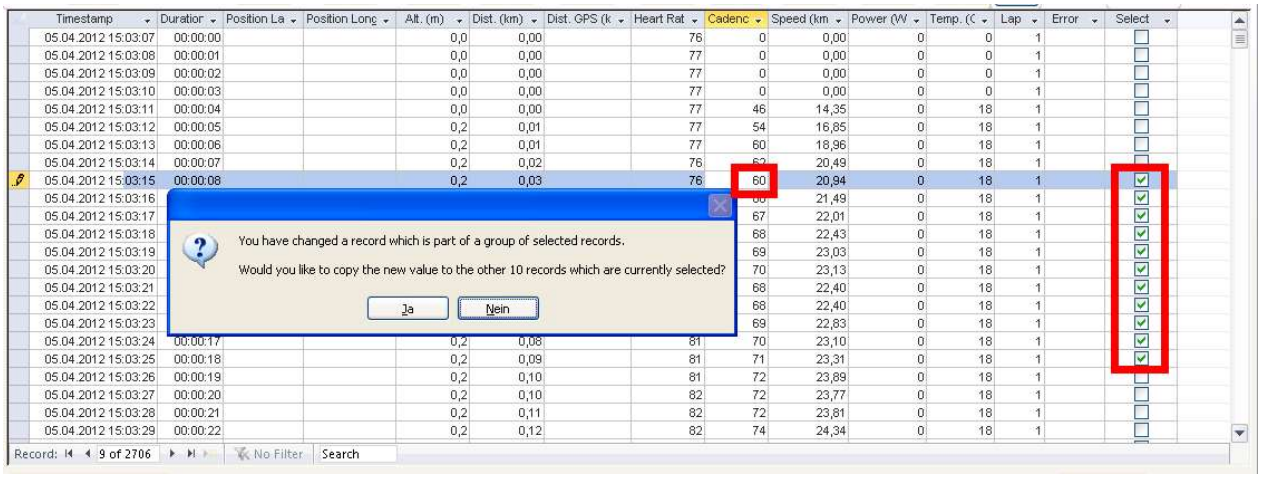
This option will not be active if your file doesn't contain data source information (tcx/hrm/csv files don't contain this information for instance) or if the "Large File Mode" has been activated when a fit file with such data is imported.

4.2. Editing Multiple Data Records at the same time

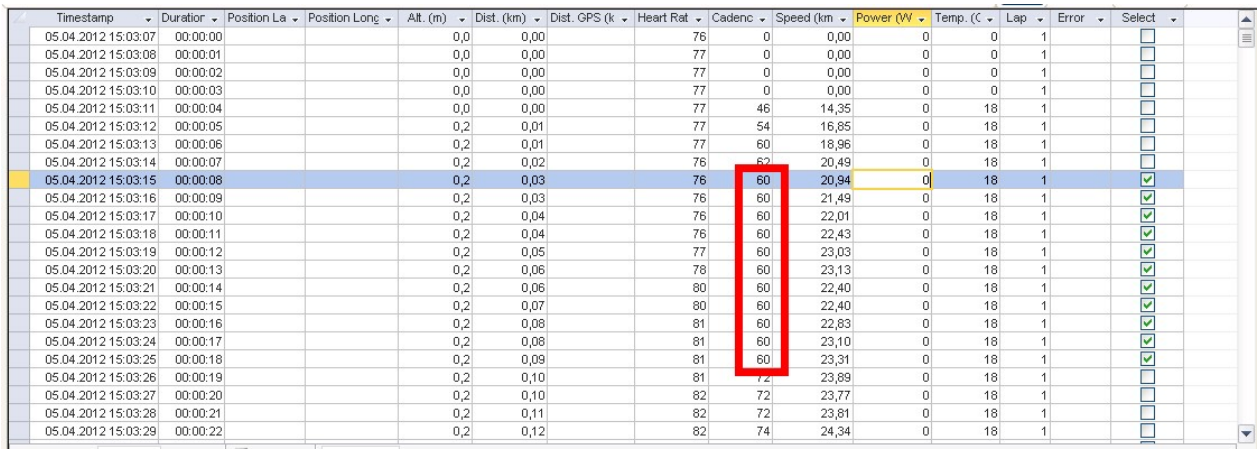
If you wish to edit a field of more than one record at the same time, proceed as follows:

(1) select the records by clicking into the last column of the rows.

(2) change/correct the value in any one of the selected records and then press the TAB key – the tool will offer to copy the new value into the other selected records.



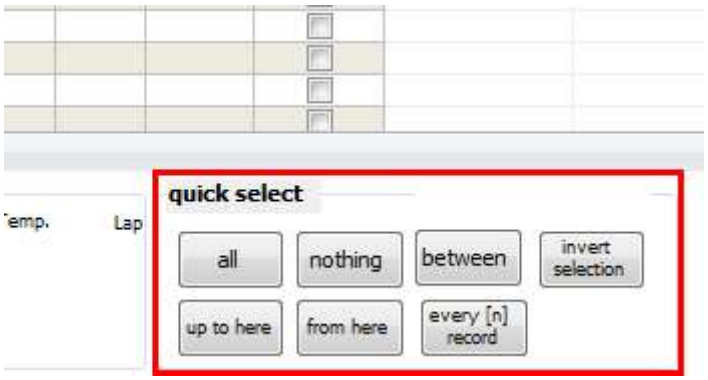
If you answer “Yes” then the new value will be copied into the corresponding fields of all the selected records.



4.3. Selecting Multiple Records

If you want to edit or delete multiple records in one step you need to select the records first by clicking into the column “select”. Selection several hundred records will cause many clicks if you use this method.

To simplify selecting records you can use the “quick select” functions which the Repair Tool offers.



"**all**": select all records of the current activity (or session, if your activity contains more than one session).

"**nothing**": unselect all records

"**between**": manually select the first and the last record in the list you want to select, then click unto "between"

"**up to here**": manually select the last record in the list you want to select, then click unto "up to here"
-> the Repair Tool will select all records up to the manually selected one

"**from here**": manually select the first record in the list you want to select, then click unto "from here"
-> the Repair Tool will select all records staring with the manually selected one

Example 1: you want to select all records with a heartrate value above 200 and exchange it by 180.

(1) Click unto the symbol "Z->A" beside heartrate to sort the records list according to heartrate values descending
(2) Search for the last record in the list having a heartrate value above 200 and click into the column "select"
(3) Click unto the quick select command "up to here"
-> all records up to the current record will be marked as selected
(4) Edit ONE record and change the heartrate value to 160
-> the Repair Tool will change all other selected records likewise

Example 2: you want to delete all records without a GPS position.

(1) Click unto the symbol "A->Z" beside "Position Lat". to sort the records list according to GPS position values ascending
(2) Search for the last record in the list having no GPS position and click into the column "select"
(3) Click unto the quick select command "up to here"
-> all records up to the current record will be marked as selected
(4) Click unto the command "Delete"
-> the Repair Tool will delete all selected records

"**invert sel.**": inverts the current selection

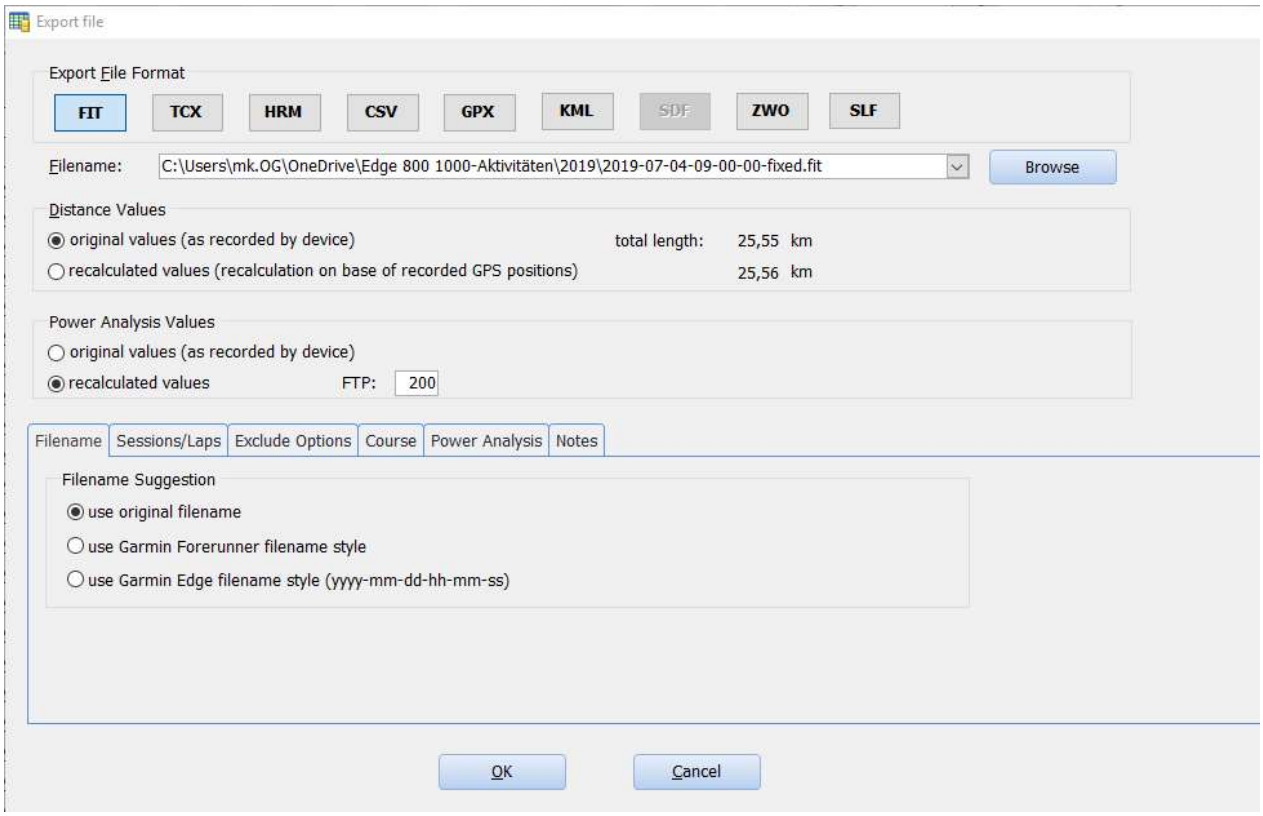
"**every [n]**": selects every 2nd, third etc. record. Use this command if you want to delete every [n]th record in the next step to make your file smaller. This needs to be done if your file is too large to be imported / uploaded to your training software

Example: you imported a file with a recording time of 8 hours. Then you imported a second file having a recording time of 6 hours using the “Append Mode” option. Now you have created an activity with a recording time of 14 hours. If your device uses one second recording this operation will result in an activity consisting of 50,400 records. This file might be too large to be processed by your training software. Therefore you might choose “every [n] record”, assign the value 2 to n and click unto “delete” afterwards. This will delete 25,200 records and leave you with a file size that can be handled by your training software.

5. File Export

5.1. File Formats (FIT, TCX, HRM, CSV, GPX)

You can export the activity data in one of the following formats: **FIT, TCX, HRM, CSV, GPX, KML, ZWO (Zwift Workout) or SLF**. RR data (HRV) can be exported in the **SDF** file format.



The FIT file format is about 10 - 15 times smaller than the TCX file format and has no disadvantages compared to the TCX file format. The following table shows what data is included within the most popular file formats:

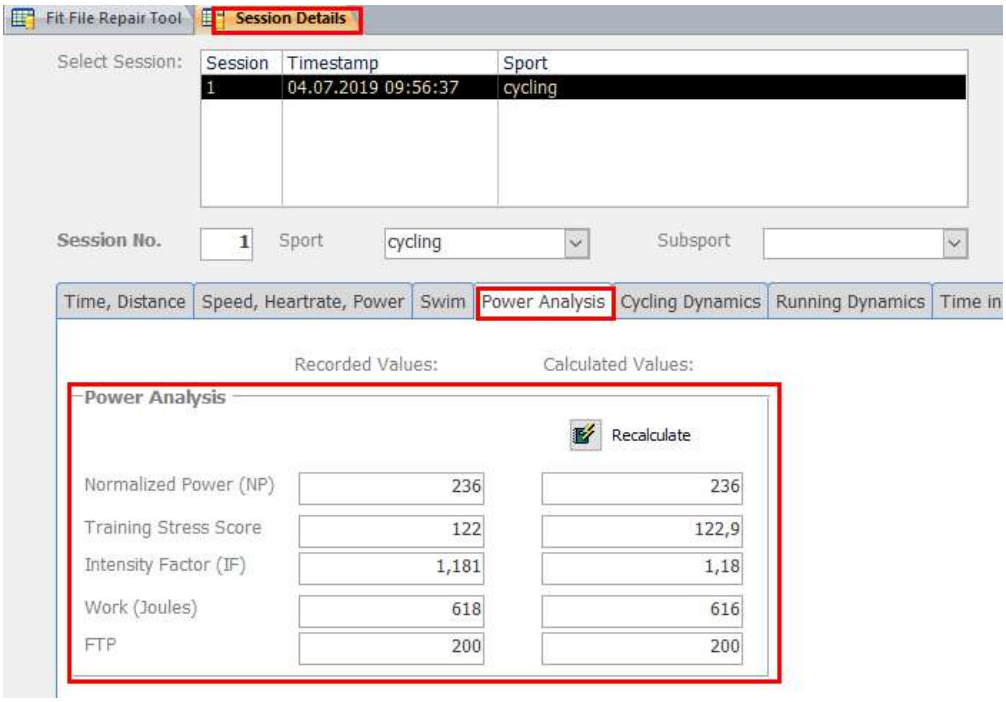
Data	FIT	TCX	HRM	CSV	GPX
Speed, Cadence, Heart rate, Power	Yes	Yes	Yes	Yes	No

Data	FIT	TCX	HRM	CSV	GPX
Data records (GPS data)	Yes	Yes	Yes (*.gpx file)	Yes	Yes
R R values (HRV)	Yes	No	Yes (*2.hrm file)	No	No
Temperature Values	Yes	No	No	Yes	No
LAP data	Yes	Yes	No	No	No
Events	Yes	No	No	No	No
Calories	Yes	Yes	Yes	No	No
Manufacturer, Product, Serial Number, Software Version	Yes	Yes	No	No	No
Sport Type	Yes	Yes (3 values: running, cycling, other)	No	No	No

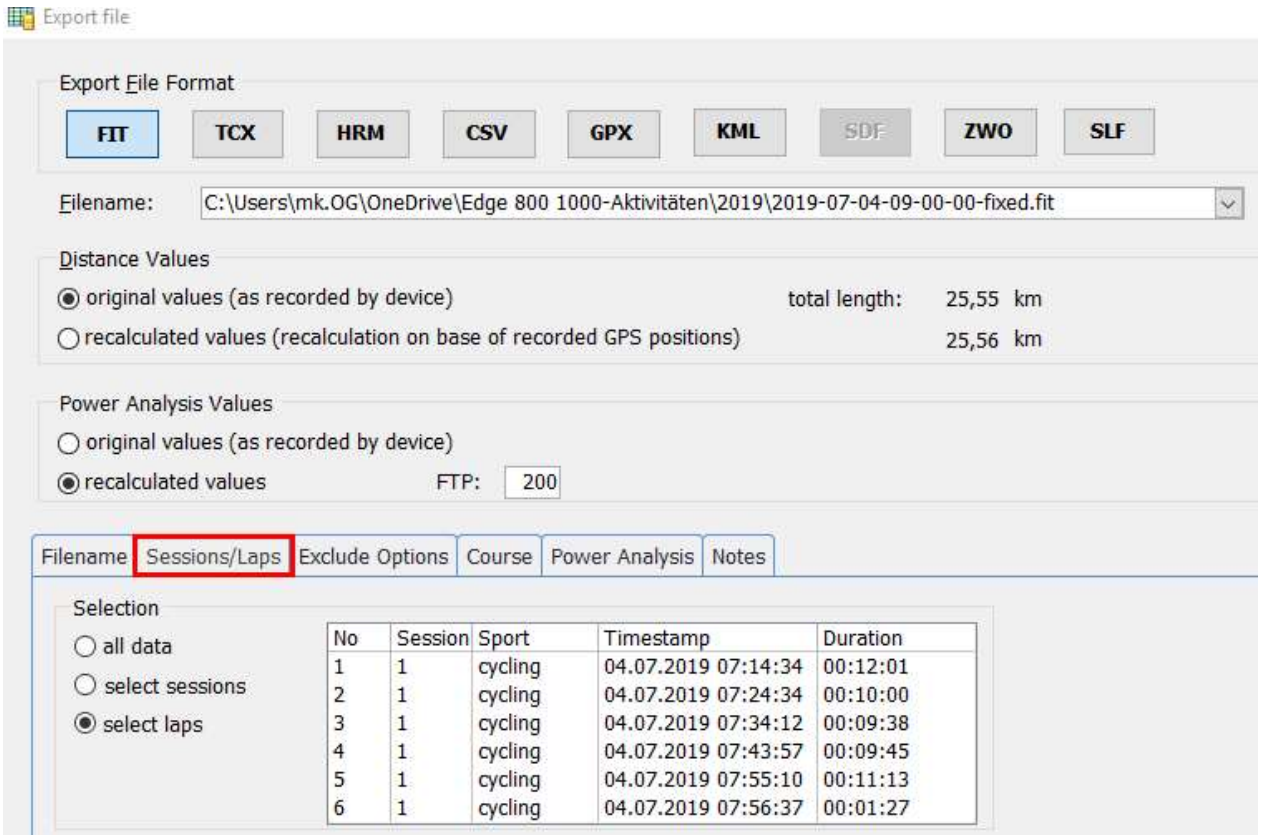
Distance Values: You can choose if original distance values or recalculated distance values will be written into the export file.

Power Analysis Values: You can choose between writing original power statistics values or recalculated power statistics values. Please enter your FTP if you want power statistics values to be recalculated.

Power statistics values are the following ones: Normalized Power (NP), Training Stress Score, Intensity Factor (IF), total work (Joules). You will see original and recalculated values on register page “Sessions and Laps” -> Session Details:



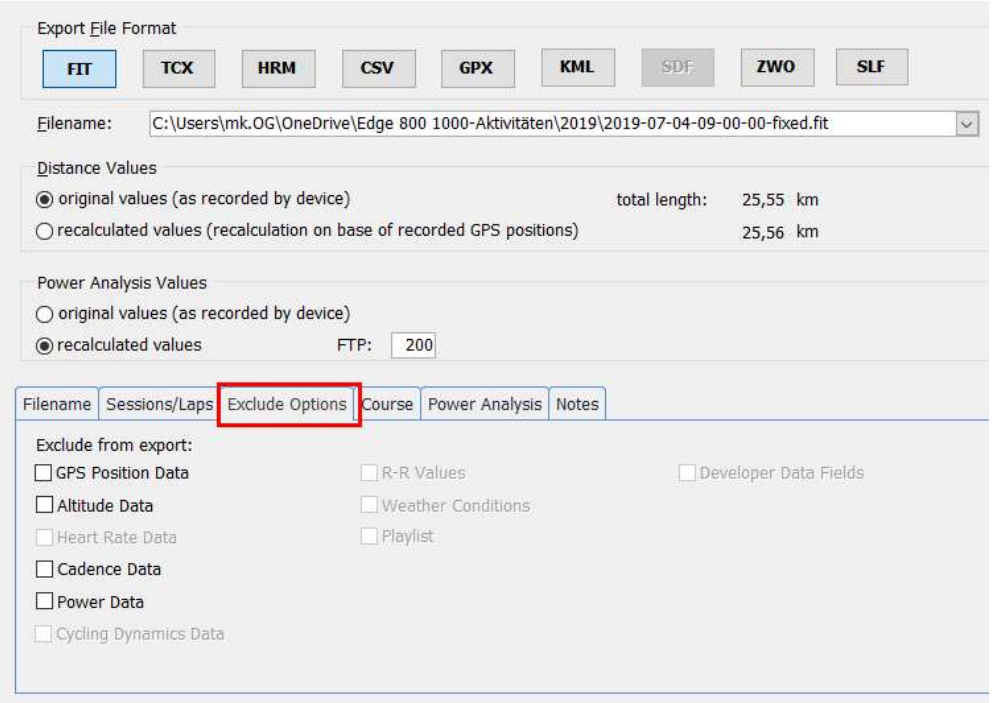
Sessions/Laps:



Normally all data of the imported file is exported. On this register page you have the option to select one or more sessions or one or more laps to be exported into the specified file. You might import a triathlon with 5 sessions and split it into 5 fit files, each one with one session.

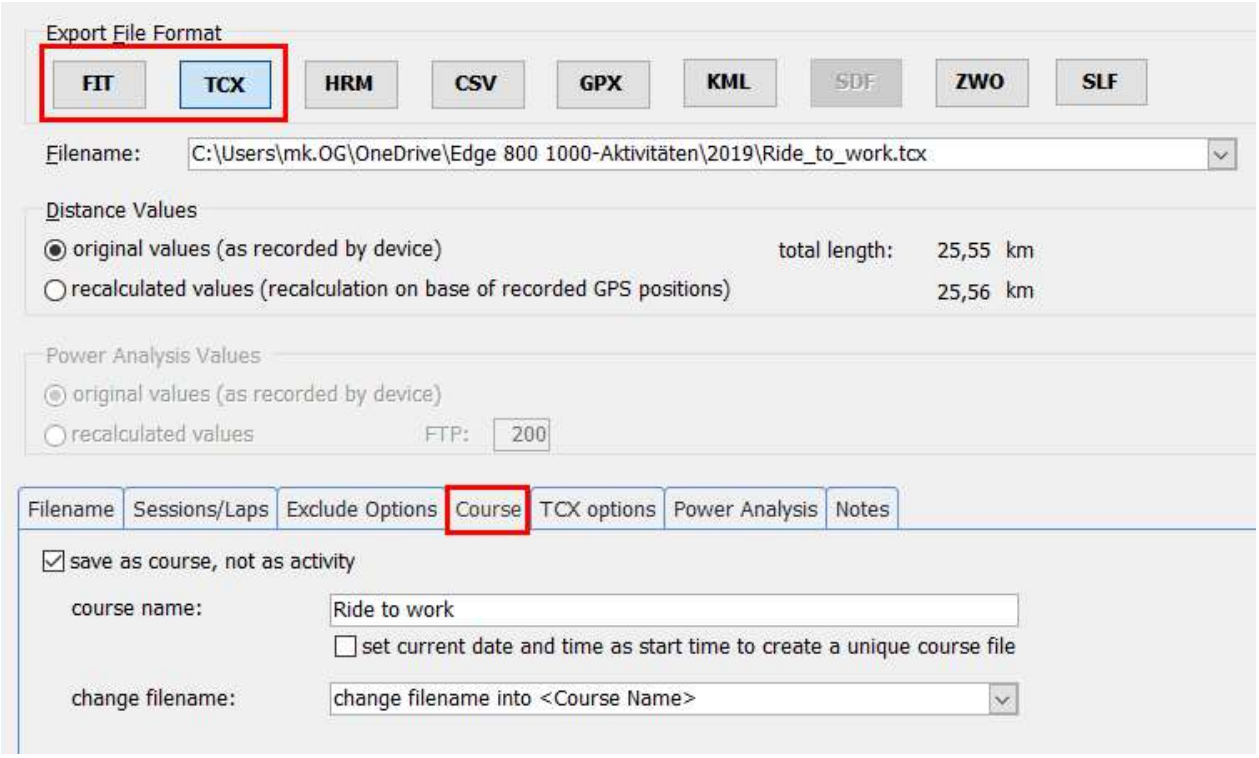
Exclude Options:

If you want to exclude some data of your original file from being exported please activate the options on register page “Exclude Options”:



You might create a file without power values or without heart rate values to share it with people but keep power/heart rate data confidential this way.

Course:



When you select fit or tcx file format you can activate the option “save as course” on register page “Course”. Then the fit/tcx file will contain the flag “course” and a course name can be added.

Export as **HRM file**:

If your activity includes **GPS data**, a second file is created and based on the filename you selected but with .gpx as file extension.

Example: you selected filename 20130101-fixed.hrm. GPS data will be exported into the file 20130101-fixed.gpx.

If your activity includes R R values (HRV data), a third file will be created and R R values will be exported into it. If your hrm filename contains numerals only then this additional file will get the next file number.

Example: you selected filename 2013010101.hrm. R R data will be exported into the file 2013010102.hrm.

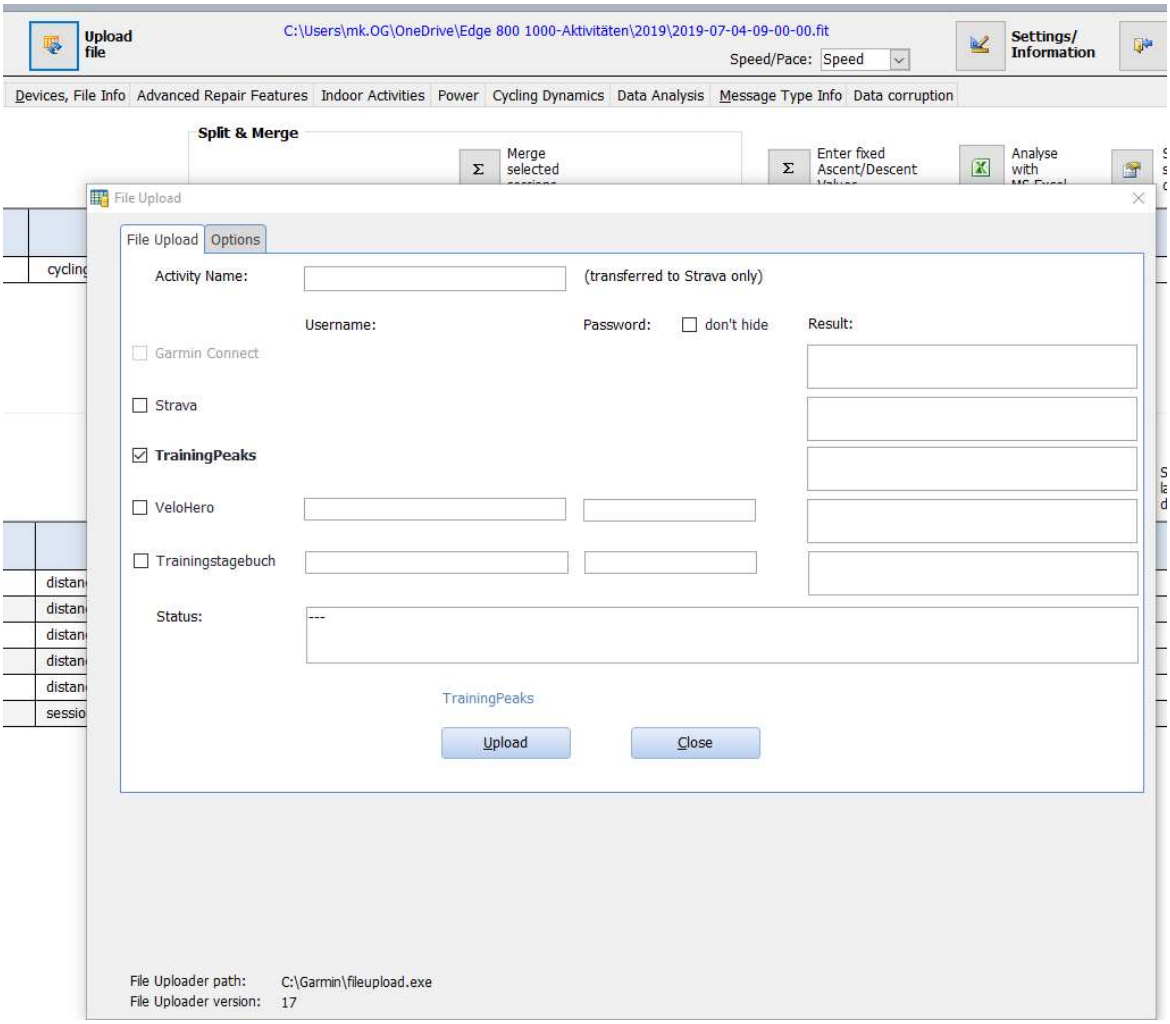
If your chosen filename contains letters (20130101-fixed.hrm) then the file will appended with “-rr” (20130101-fixed-rr.hrm).

6. File Upload

The Fit File Repair Tool has an external component which is able to upload your activity directly to the following websites:

(a) ~~Garmin Connect~~ (hopefully available again soon!)
(b) Strava
(c) TrainingPeaks
(d) Velo Hero
(e) Trainingstagebuch

The external component requires the use of Microsoft .NET framework version 3.5. This version of the framework is installed on PCs with Windows 7 and above. If you have another Windows version you can search the internet using the keywords “Microsoft .NET framework version 3.5” and download the correct version for your PC.

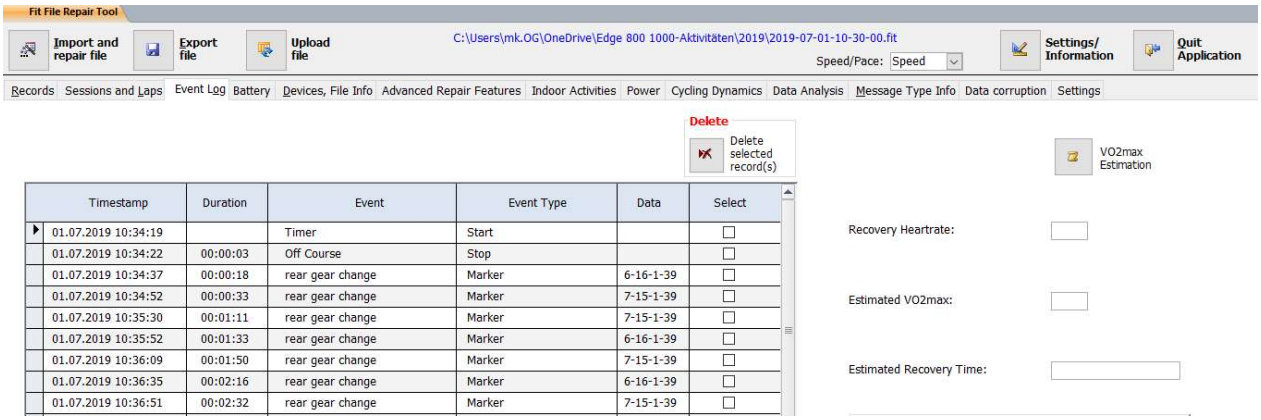


Usernames and passwords are saved in the configuration file of the Fit File Repair Tool (passwords are encrypted), so you will only have to enter them once.

This feature is especially helpful if you are used to upload your data on several websites. With this feature the upload to all selected websites is performed with just one click!

7. Event Log

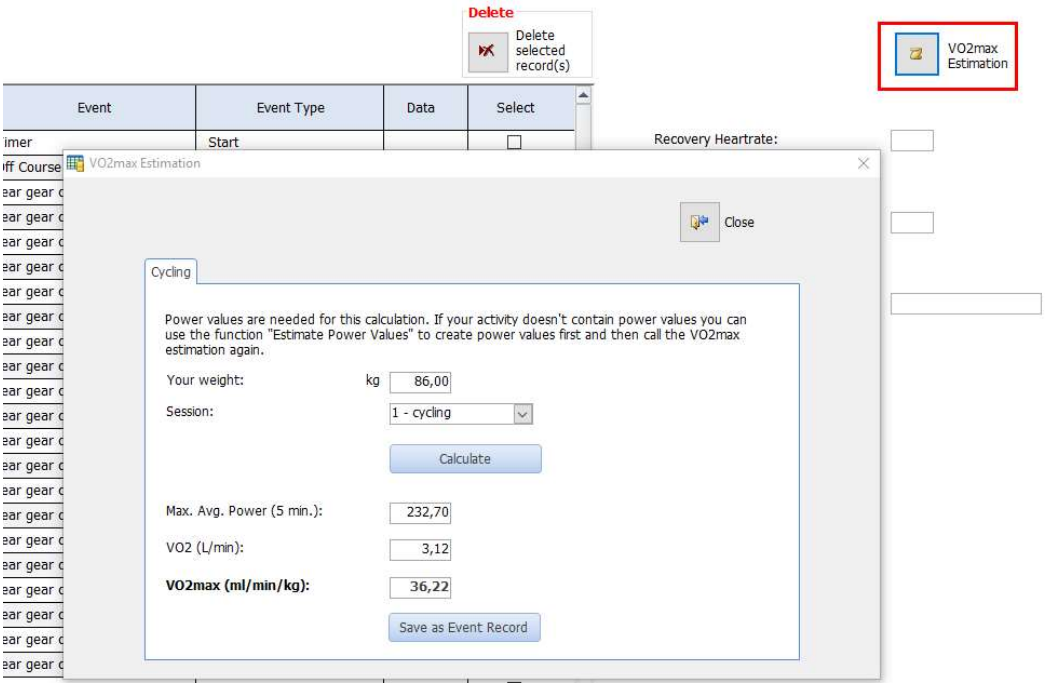
The “**Event Log**” page shows specific events recorded during your activity.



The most important entries in regard of calculation total values are the timer events. Events that are imported and exported are:

- Timer On, Timer Off
- Off Course, On Course
- Front Gear Change, Rear Gear Change
- Markers
- Workout, Workout Step
- Power Up, Power Down
- Course Point
- Battery
- Heartrate High Alert, Heartrate Low Alert
- Speed High Alert, Speed Low Alert
- Cadence High Alert, Cadence Low Alert
- Power High Alert, Power Low Alert
- Recovery Heartrate
- VO2max
- Recovery Time
- Recovery Check
- Rider Position Change
- FTP Setting
- Performance Condition

You will find a little VO2max calculator here and can use it to produce a special event log entry at the end of your recording containing your VO2max value. This “VO2max event” at the end of a fit file is imported by some training apps and websites.

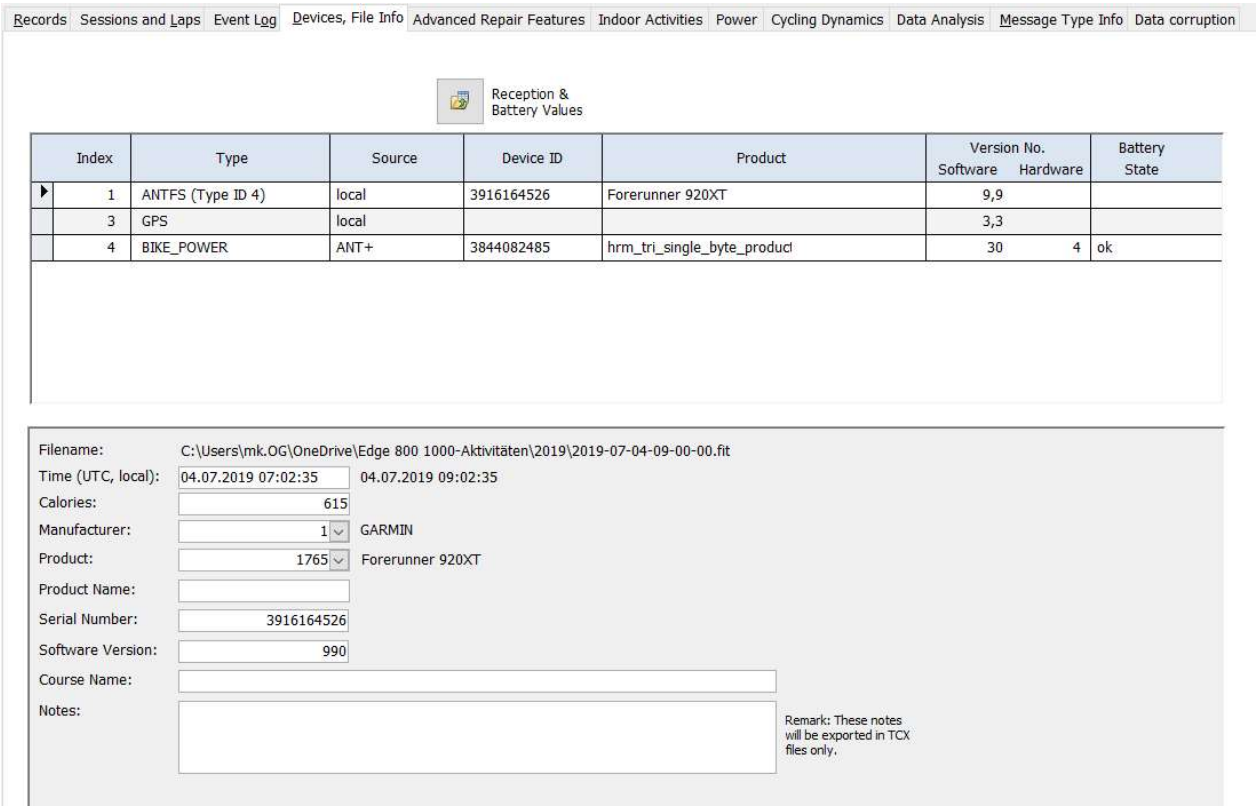


Timestamp	Duration	Event	Event Type	Data	Select
01.07.2019 11:00:59	00:26:40	rear gear change	Marker	4-18-1-39	☐
01.07.2019 11:01:34	00:27:15	VO2 max	Marker	41	☐
01.07.2019 11:01:34	00:27:15	Timer	Stop All		☐
01.07.2019 11:01:56	00:27:37	rear gear change	Marker	4-18-1-39	☐
01.07.2019 11:01:56	00:27:37	Timer	Stop All		☐

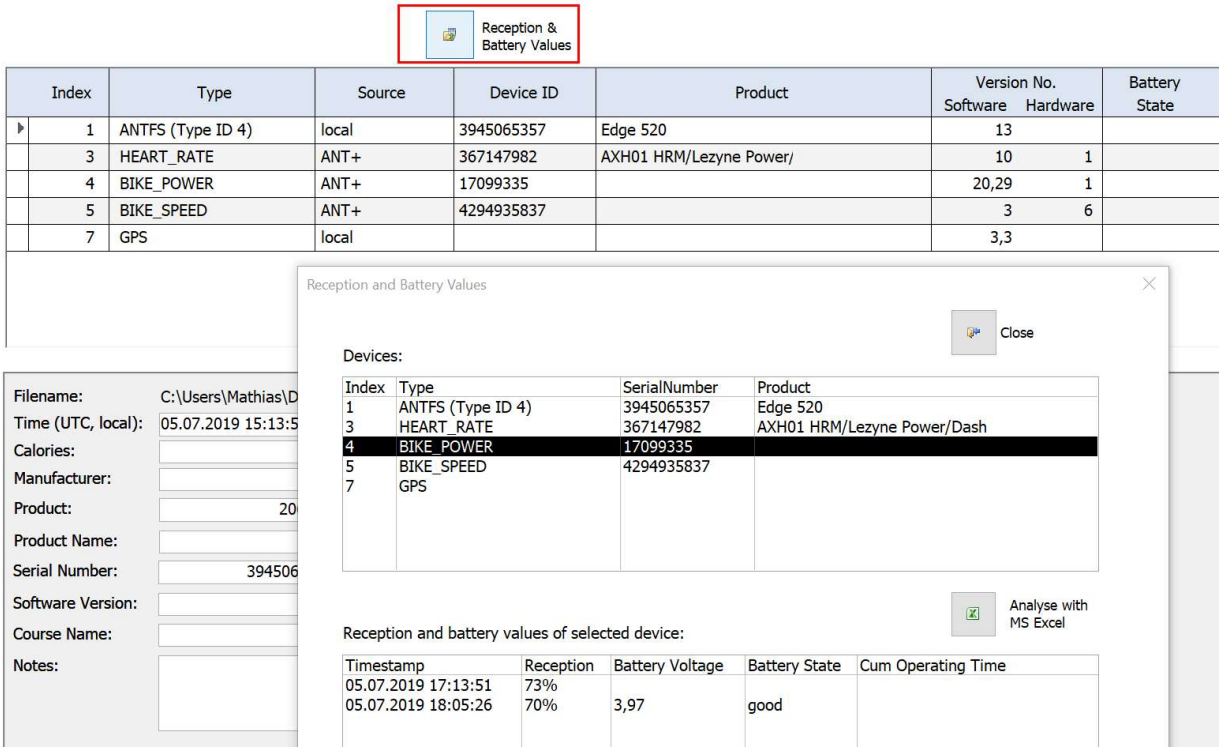
8. Devices, File Info

The "**Devices, File Info**" page shows you information about the training devices as recorded in the fit file. The information in the bottom half of the page (time, calories, manufacturer, product, serial number, software version and sport type) can be edited – and should be edited if they are obviously corrupt.

Fit files contain device data (depending on the creator of the fit file), tcx/hrm/csv files don't contain such data.

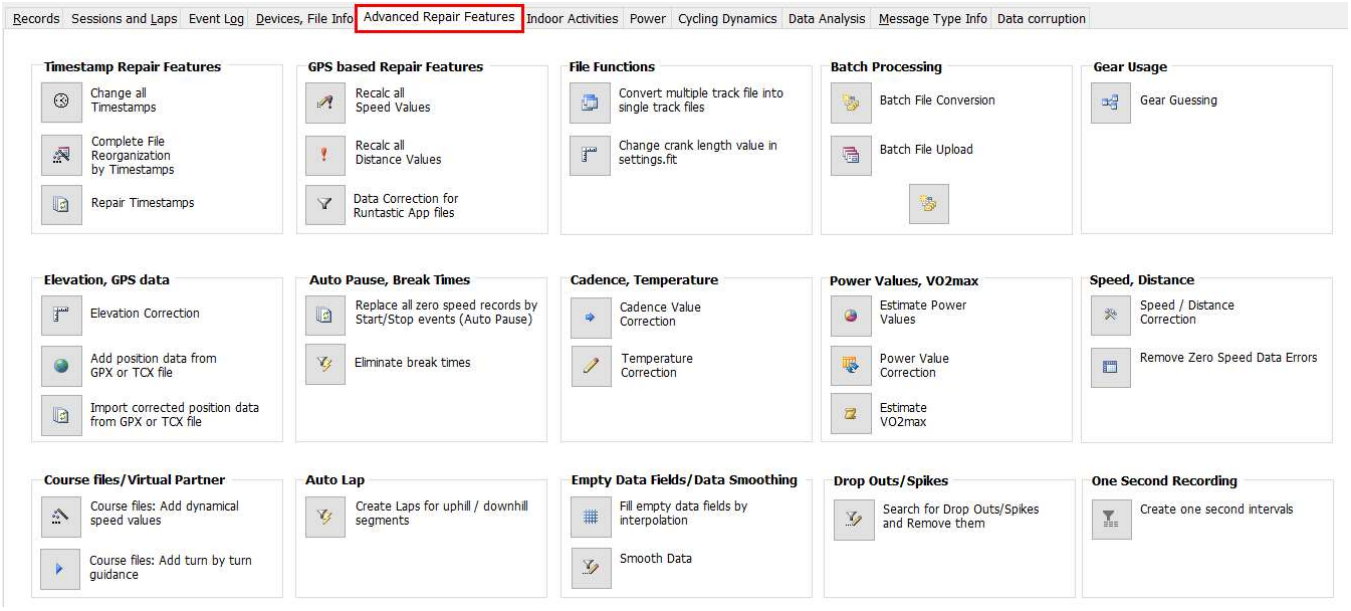


A click on the button "Reception & Battery Values" will open a new window and show details about reception and battery data of connected devices (sensors). No or incomplete data for a certain device (sensor) is normally caused by the fact that the sensor doesn't broadcast the missing information – or your head unit doesn't store the information in activity files.


Reception & Battery Values
Index
Type
Source
Device ID
Product
Version No. Software
Version No. Hardware
Battery State
1 ANTFS (Type ID 4) local 3945065357 Edge 520 13
3 HEART_RATE ANT+ 367147982 AXH01 HRM/Lezyne Power/ 10 1
4 BIKE_POWER ANT+ 17099335 20,29 1
5 BIKE_SPEED ANT+ 4294935837 3 6
7 GPS local 3,3
Filename: C:\Users\Mathias\D
Time (UTC, local): 05.07.2019 15:13:5
Calories:
Manufacturer:
Product: 20
Product Name:
Serial Number: 394506
Software Version:
Course Name:
Notes:
Reception and Battery Values
Close
Devices:
Index Type SerialNumber Product
1 ANTFS (Type ID 4) 3945065357 Edge 520
3 HEART_RATE 367147982 AXH01 HRM/Lezyne Power/Dash
4 BIKE_POWER 17099335
5 BIKE_SPEED 4294935837
7 GPS
Analyse with MS Excel
Reception and battery values of selected device:
Timestamp Reception Battery Voltage Battery State Cum Operating Time
05.07.2019 17:13:51 73%
05.07.2019 18:05:26 70% 3,97 good

9. Advanced Repair Features

On the register page “Advanced Repair Features” you will find some special repair and additional features.



9.1. Timestamp Repair Functions

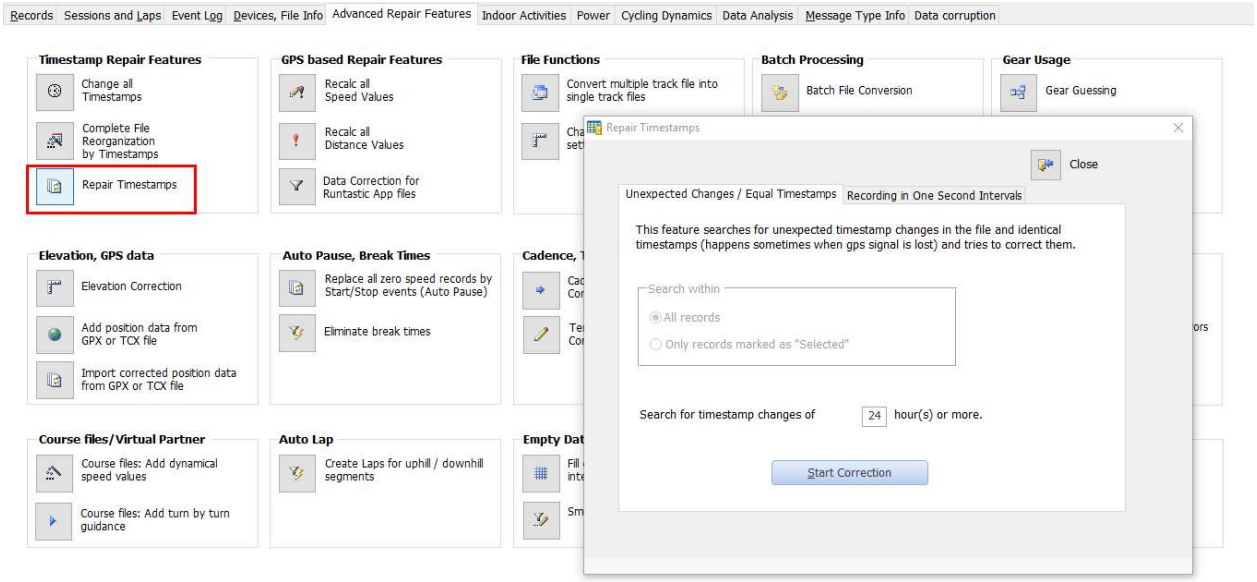
9.1.1. Change all Timestamps

“**Change all Timestamps**” allows you to change all the timestamps of the activity at once. You can for instance shift the whole activity one day into the past or into the future. This makes sense for instance if your watch was set to the wrong date when the recording took place.

9.1.2. Complete File Reorganization by Timestamps

“**Complete File Reorganization by Timestamps**” starts a complete reorder of the data records of the currently loaded activity. This feature is helpful if the sequence of the data records of the activity is corrupt. Existing lap and session data will be deleted during the execution of this operation.

9.1.3. Repair Timestamps



This function can handle two kinds of timestamp errors:

(1) unexpected change of the recorded timestamps

Such timestamp errors are often caused by a temporary loss of the GPS signal and a misinterpretation of the received GPS data. In such a case the recorded data might look like this:

Timestamp
28/08/2014 10:00:00
28/08/2014 10:00:01
31/04/2016 07:35:14
31/04/2016 07:35:15
31/04/2016 07:35:16

Using this function this will be corrected as:

Timestamp
28/08/2014 10:00:00
28/08/2014 10:00:01
28/08/2014 10:00:02
28/08/2014 10:00:03
28/08/2014 10:00:04

(2) identical timestamps

This error might be caused by a lost or misinterpreted GPS signal. In such a case a large number of the timestamps may be identical:

Timestamp
28/08/2014 10:00:00
28/08/2014 10:00:01
28/08/2014 10:00:02

28/08/2014 10:00:02
28/08/2014 10:00:02

Using this function this will be corrected as:

Timestamp
28/08/2014 10:00:00
28/08/2014 10:00:01
28/08/2014 10:00:02
28/08/2014 10:00:03
28/08/2014 10:00:04

This feature should be able to fix such errors if one data record is written per second.

If your device doesn't record data records every second, i.e. Smart Recording, but depends on changes of the GPS position, speed, heart rate etc. this correction might not work perfectly. In such a case the tool tries to calculate the timestamps based upon the recorded speed and distance values (it takes the distance of the previous record and the distance of the current record as well as the speed recorded in the current record and then calculates the timestamp of the current record).

9.2. GPS based Repair Features

9.2.1. Recalculate all Speed Values

"**Recalc all Speed Values**" starts a recalculation of ALL speed values contained in the current file based on the time and distance between recorded GPS positions.

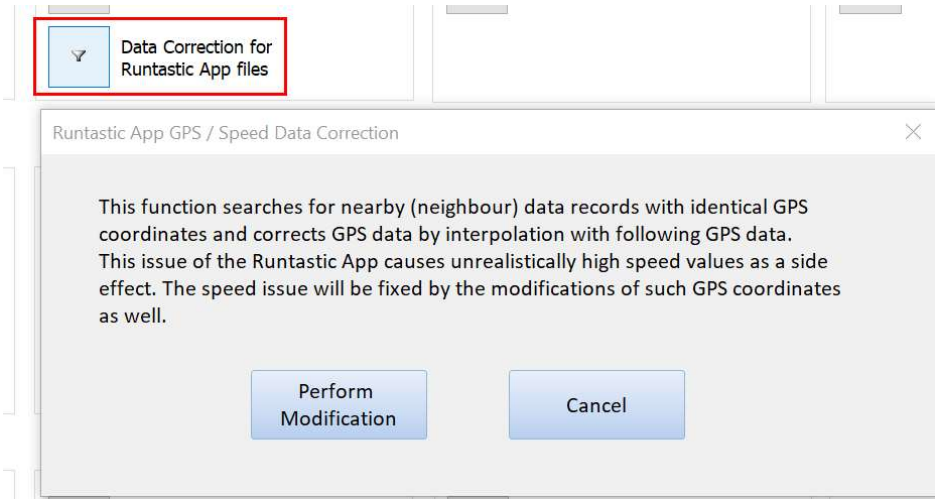
This function can be used if your activity contains no speed values at all or if the speed values are not correct (for instance because of an incorrectly set wheel circumference).

9.2.2. Recalculate all Distance Values

"**Recalc all Distance Values**" starts a recalculation of ALL distance values contained in the current file based on the distances between recorded GPS positions.

This function can be used if your activity contains no distance values at all of if distance values are not correct.

9.2.3. Data Correction for Runtastic App files

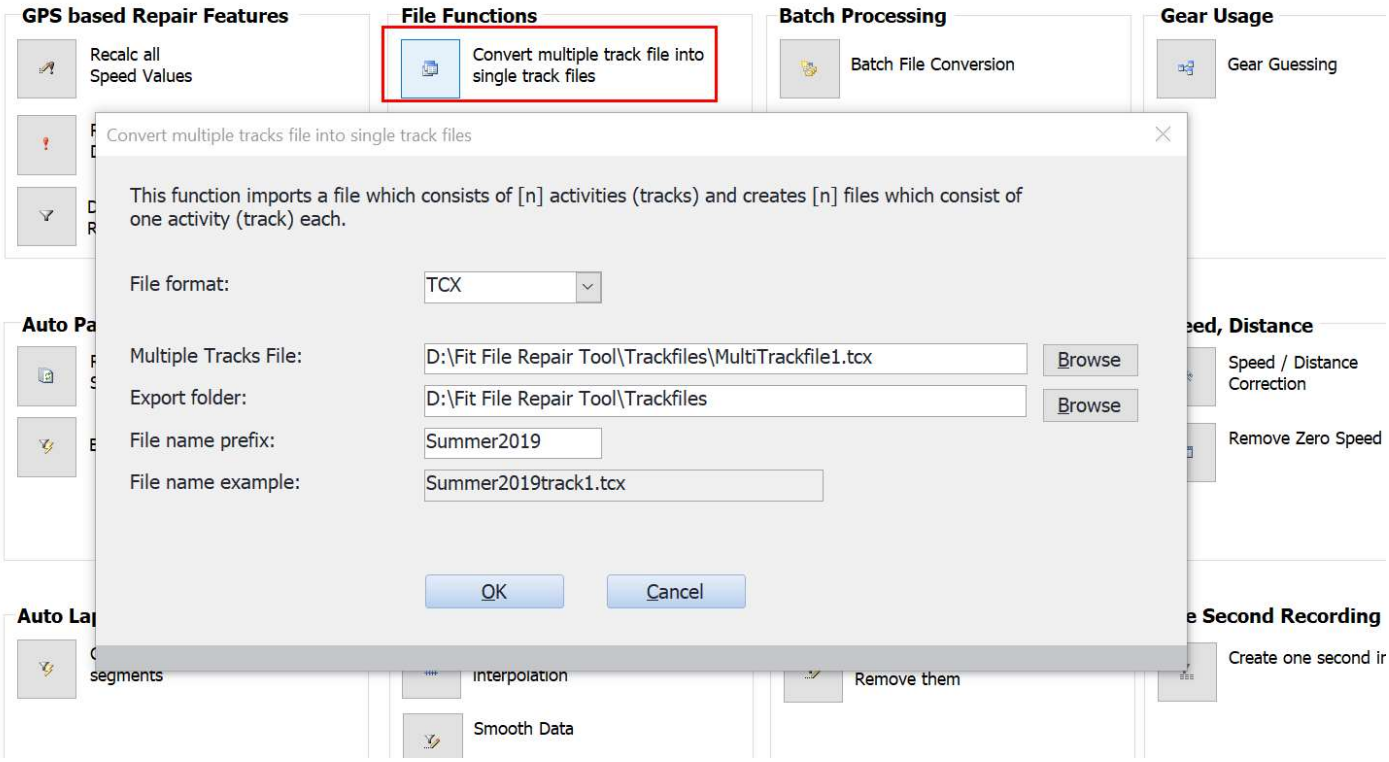


This kind of issue is caused by the fact that the Runtastic App does not receive GPS data per second but creates a data record every second. Maybe this issue has been fixed in an update of the Runtastic App in the meantime – but maybe this correction function is helpful for other user cases, therefore the function remained in the Repair Tool.

9.3. File Functions

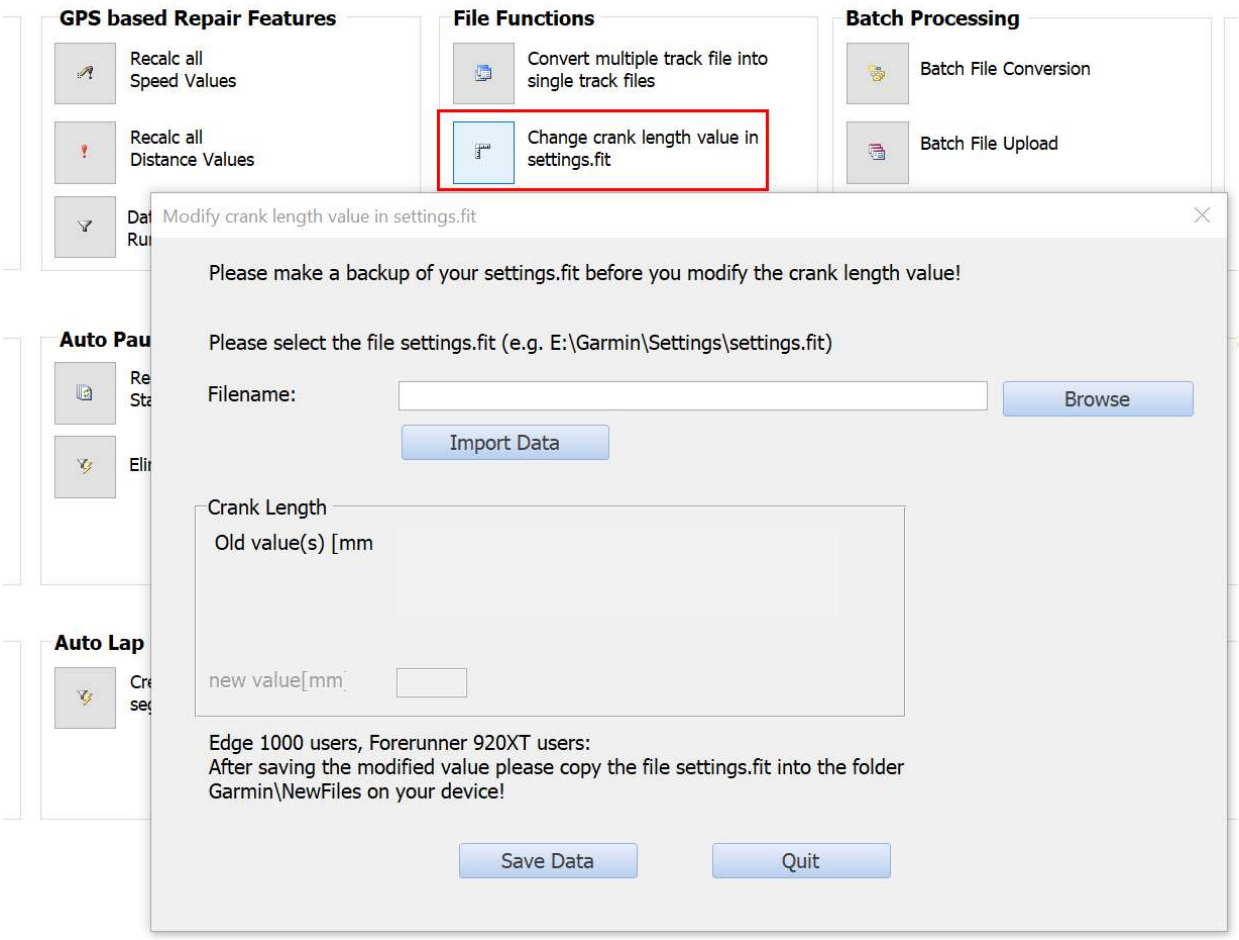
9.3.1. Convert multiple track file into single track files

This function allows you to specify a tcx file which contains more than one track and a destination folder. The tcx file will be imported and each track will be saved as individual track file in the destination folder.



9.3.2. Change crank length value in settings.fit

Some Garmin devices store the crank length value (needed for the calculation of power values) in the file Garmin\Settings\settings.fit. You can use this function to check and modify the value.



As far as I know this value is no longer of any importance since Garmin's firmware versions being published in 2017.

9.4. Batch Processing

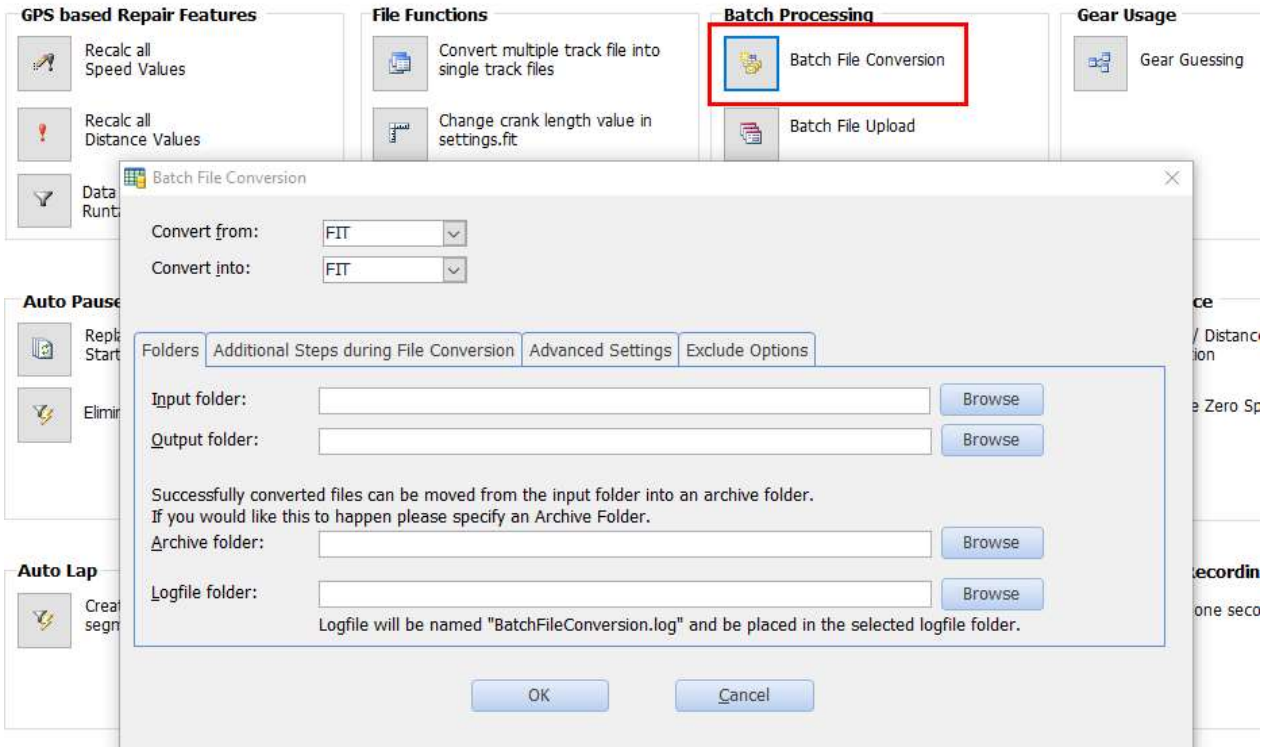
9.4.1. Batch File Conversion

This function can be used to convert multiple files with one user action between different file formats (fit, tcx, gpx, hrm). Depending on the file size and the power of your computer, hundreds of files can be converted using this function within one hour.

This function is intended for those who switch from one device to another and wish to convert their previously recorded activities into the file format of the new device with very little effort.

All files that you wish to convert have to be stored in one folder (input folder) on your computer. The files will be converted into the selected file type and be stored in another folder (output folder). Successfully converted files can be moved from the input folder into an archive folder. Files, which could not be converted, remain in the input folder.

Specify the source and destination file formats, the file folders and then click OK.



All files that have the specified file extension (.fit, .tcx, .hrm) in the input folder are processed. If the conversion process is successful the original file is moved from the input folder into the archive folder and the converted file is stored in the output folder.

Example: you want to convert 3 hrm files into fit files.

Situation before the conversion process:

Your input folder contains 3 files:

20140401.hrm
20140501.hrm
20140601.hrm

Your output folder is empty.
Your archive folder is empty.
Your log file folder is empty.

Situation after the conversion process:

Your input folder is empty.
Your output folder contains 3 files:

20140401.fit
20140501.fit
20140601.fit

Your archive folder contains 3 files:

20140401.hrm
20140501.hrm

20140601.hrm
Your log file folder contains 1 file:
BatchFileConversion.log

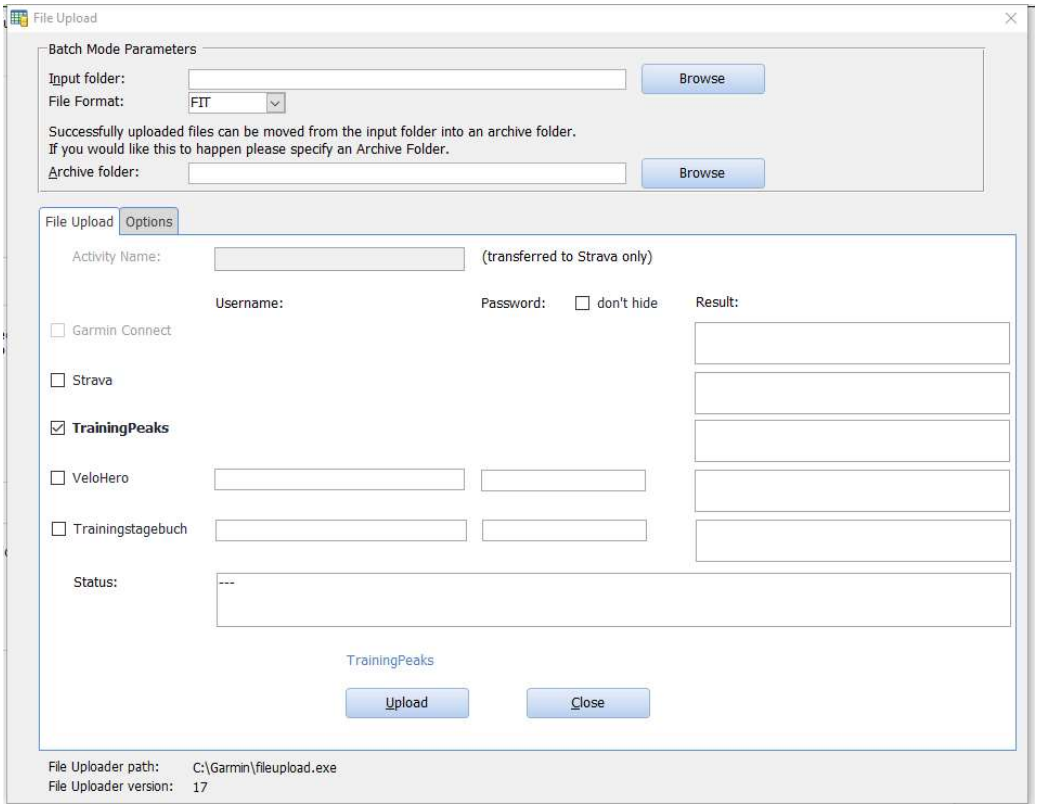
9.4.2. Batch File Upload

This function enables you to upload multiple files with one user action to Garmin Connect, Strava, Trainingpeaks etc.

Please store all the activity files you wish to upload into one folder on your computer. These files may have one of the following file formats: .fit, .tcx

Prior to using this batch function for hundreds of files please use the standard upload feature (Chapter 6) to upload one activity to your training diary and check afterwards if it has been successfully inserted there.

Specify the file format, the file folder s, enter your user names and passwords and click Upload.



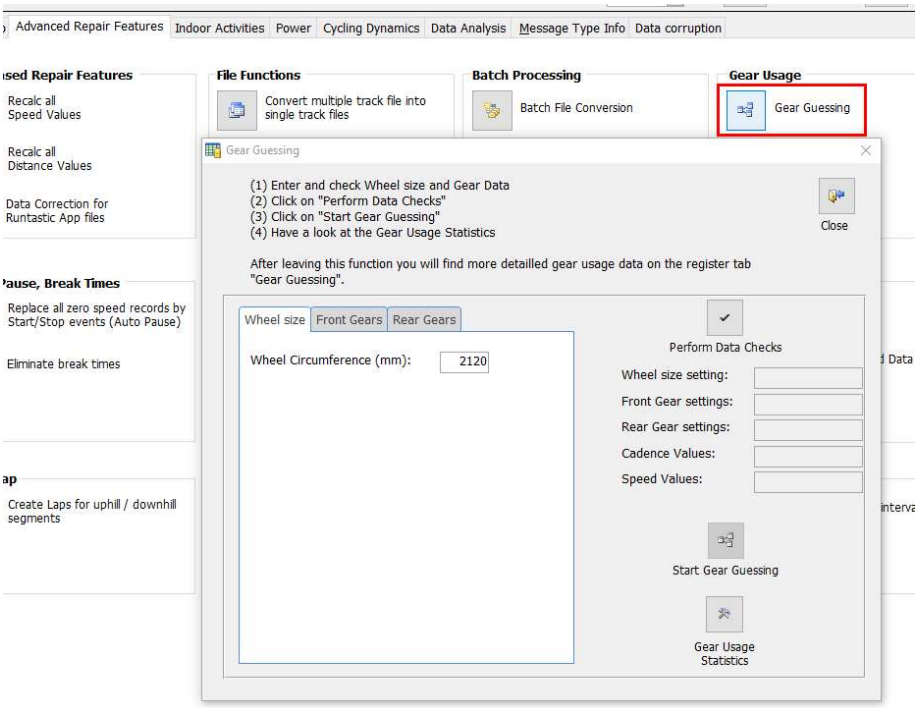
Now all files found in the input folder and having the file extension specified by the file format (.fit or .tcx) are uploaded to the websites you selected.

After a successful file upload the uploaded file(s) are moved from the input folder into the archive folder.
Files that remain in the input folder could not be uploaded. In the “Result” column you will find reasons why these files could not be uploaded.

9.5. Gear Usage

After importing a bike activity which contains reliable speed and cadence data you can make use of the function “Gear Guessing”.

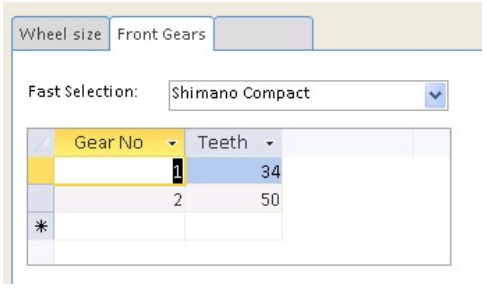
You will find this function on the register tab “Advanced Repair Features”.

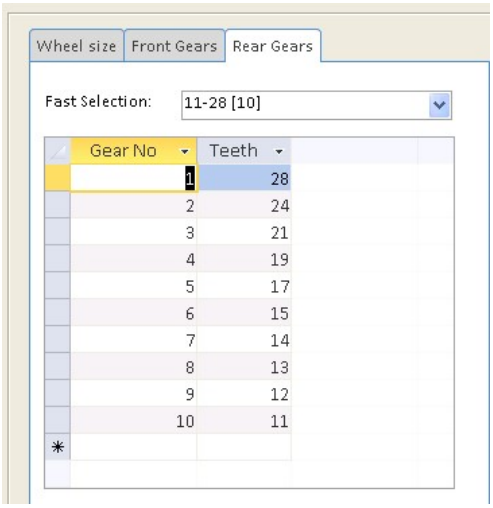


Please enter some bike data the first time you use this function (or after modifying your gear set).

Wheel circumference is measured in mm (millimeters) – I hope this is the common unit for wheel circumferences in the UK and other countries that measure in miles, yards etc. If I’m wrong please inform me about the unit that is common in your country for this data. Thanks!

The next step is to enter information about the front and rear gears of your bike:

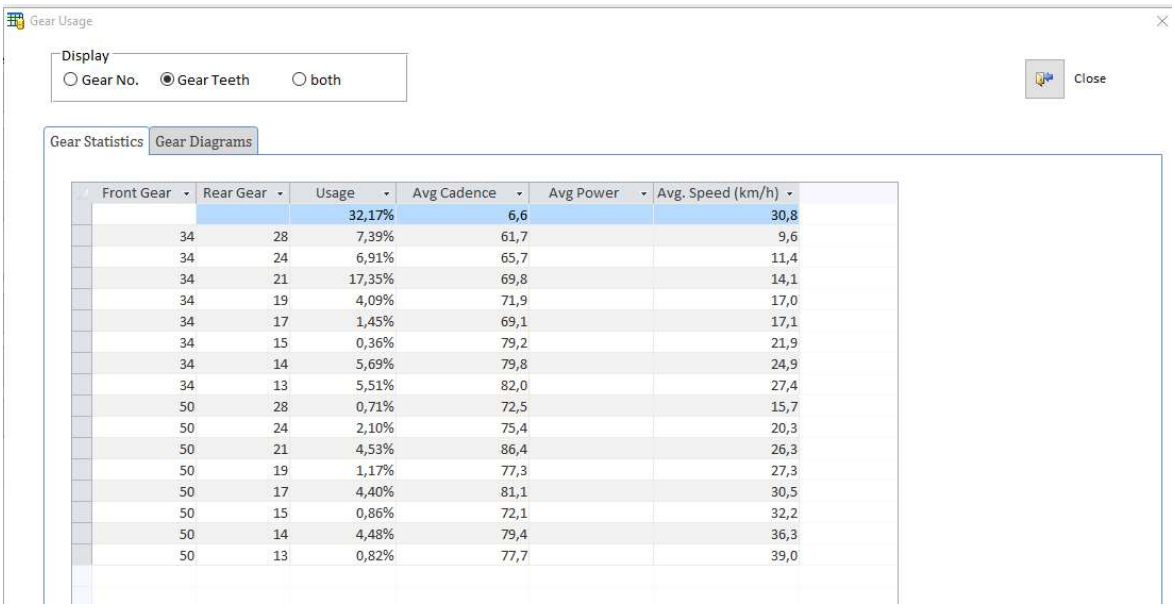




Opening the “Fast Selection” list you can pick your gear set or enter all data in the table manually line by line.

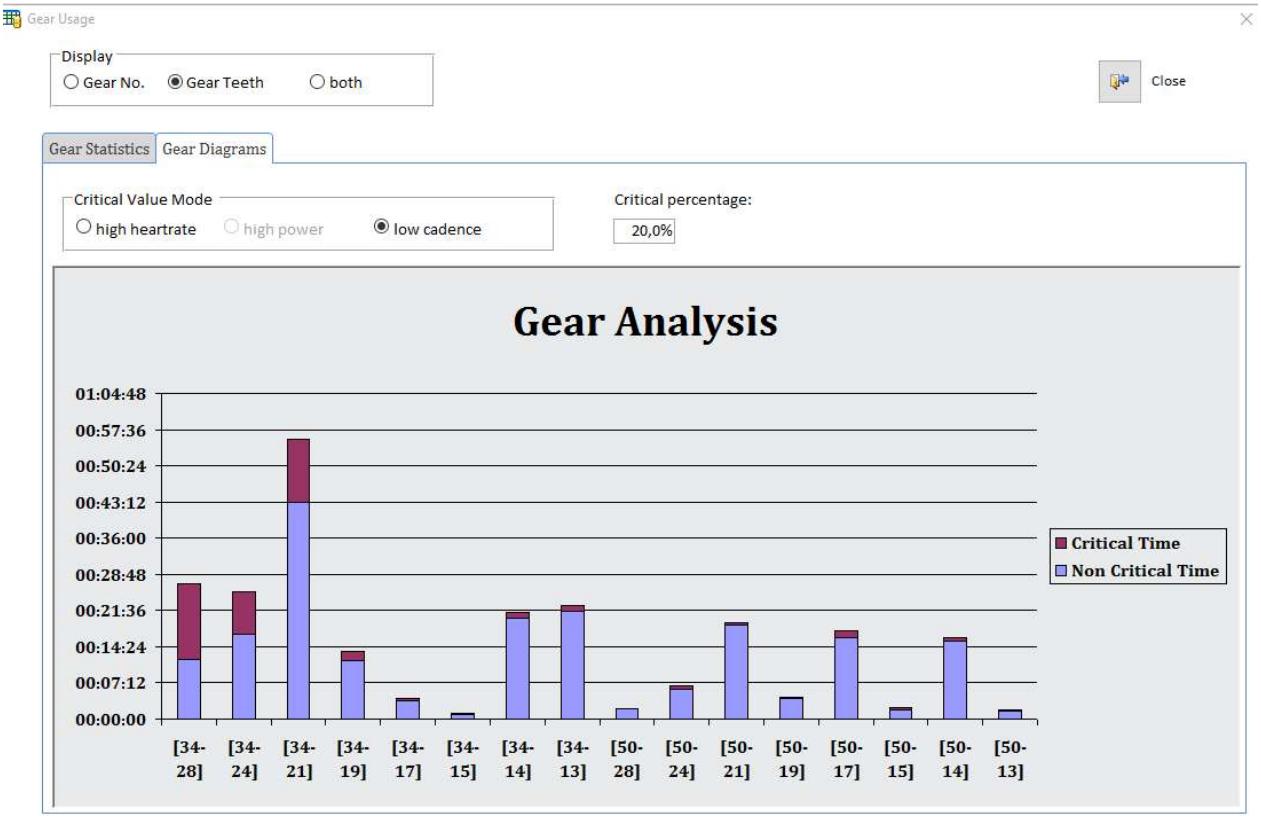
Now it’s time to let the computer do some work: click on the command button “Start Gear Guessing” and let the computer calculate. After a minute or so you should see the message “Gear Guessing finished”.

If you click on the command button “Gear Usage Statistics” you will get a summary of the result of the computations.



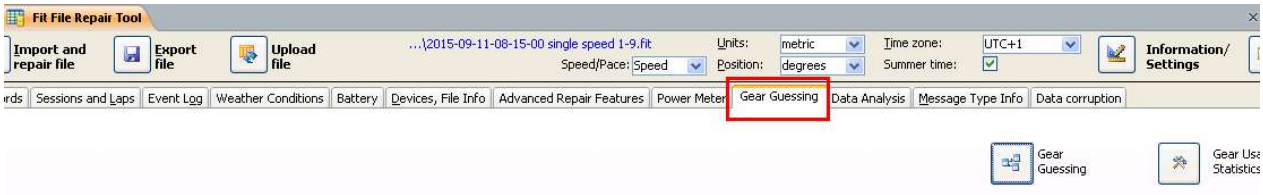
Front Gear	Rear Gear	Usage	Avg Cadence	Avg Power	Avg. Speed (km/h)
		32,17%	6,6		30,8
34	28	7,39%	61,7		9,6
34	24	6,91%	65,7		11,4
34	21	17,35%	69,8		14,1
34	19	4,09%	71,9		17,0
34	17	1,45%	69,1		17,1
34	15	0,36%	79,2		21,9
34	14	5,69%	79,8		24,9
34	13	5,51%	82,0		27,4
50	28	0,71%	72,5		15,7
50	24	2,10%	75,4		20,3
50	21	4,53%	86,4		26,3
50	19	1,17%	77,3		27,3
50	17	4,40%	81,1		30,5
50	15	0,86%	72,1		32,2
50	14	4,48%	79,4		36,3
50	13	0,82%	77,7		39,0

On the second register tab (“Gear Diagrams”) you will find several diagrams which highlight “critical values” and are intended to help you to analyze and improve your personal gear usage. You could for example view which gears you used with the lowest 20% cadence values or with the highest 10% of heart rate values:



Please close the Gear Usage Statistics window and the Gear Guessing form.

Now you should see a new register tab entitled “Gear Guessing” which contains more detailed information on the computations during the “Gear Guessing” process:



For each data record you will find up to three calculations on the gear usage:

Timestamp	Speed (km/h)	Cadence	Power	Gear Front	Gear Rear	1. guess Gears	1. guess %	2. guess Gears	2. guess %	3. guess Gears	3. guess %	Group No.
11.09.2015 08:43:43	20,52	62		1	8	1-8	99,50%	2-4	98,88%	1-7	93,32%	1
11.09.2015 08:43:44	22,87	67		1	9	2-4	98,05%	1-8	97,44%	1-9	94,44%	1
11.09.2015 08:43:46	26,64	84		1	8	1-7	97,42%	2-3	95,51%	1-8	95,09%	1
11.09.2015 08:43:48	32,65	94		1	9	2-4	96,38%	1-9	96,24%	1-8	95,78%	1
11.09.2015 08:43:49	33,49	103		1	8	1-8	97,69%	2-4	97,05%	1-7	95,01%	1
11.09.2015 08:43:50	33,35	103		1	8	1-8	97,27%	2-4	96,63%	1-7	95,40%	1
11.09.2015 08:43:52	32,65	34				2-10	60,21%	2-9	55,19%	2-8	50,95%	1
11.09.2015 08:43:53	32,65	34				2-10	60,21%	2-9	55,19%	2-8	50,95%	1

The column “Gear” displays the calculation that has been selected by the algorithm.

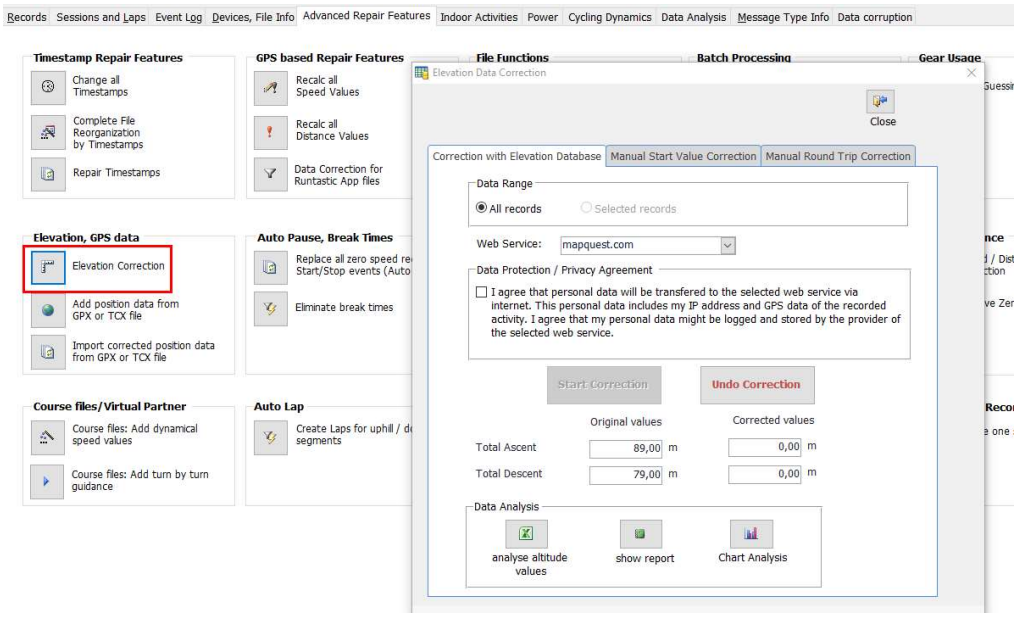
The algorithm looks at a group of 15 records at the same time and tries to find the best combination of gears for this group. Therefore not always the gear combination displayed as “1. guess” will be chosen.

The algorithm in the background is not perfect – please don’t expect a correctness of more than 80%.

9.6. Elevation, GPS data

9.6.1. Elevation Correction

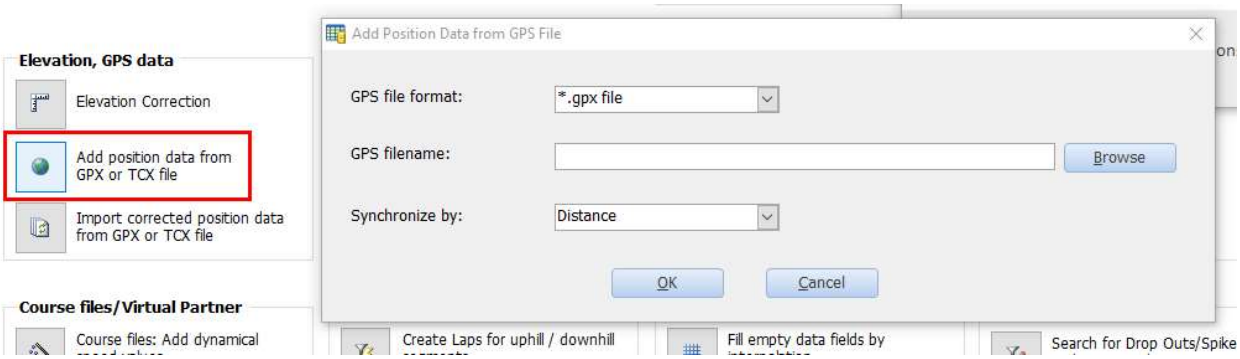
"**GPS Elevation Correction**" allows you to correct elevation data through the comparison of a public GPS / Elevation database. An internet connection is needed to perform this operation.



After the correction process is finished you can analyze the recorded and the corrected elevation data in MS Excel, show a report with differences between these values or illustrate the differences in a chart. If you don't wish to store the corrected values but wish to restore the recorded values you can do so by an "undo" function.

9.6.2. Add GPS position data from GPX or TCX file

If your activity contains distance but no (or corrupted) GPS position data you can use this feature to add GPS position data from an additional file which must be in the .tcx or .gpx file format.



If you wish to add GPS position data to your activity then please proceed as follows:

(1) Use a GPS editor of your choice to create a GPX track of the activity you did. Examples for such GPX track creators are ridewithgps.com, Strava Route planner, gpsies.com etc.
(2) Export the planned route as a GPX track and save the file on your computer
(3) Import your activity into the Fit File Repair Tool (if not done yet)
(4) Click on the "Add position data from GPX or TCX file" button, select the GPX file and then click "OK".

Now the Fit File Repair Tool will synchronize your previously imported activity and the selected GPS data file based on distance values.

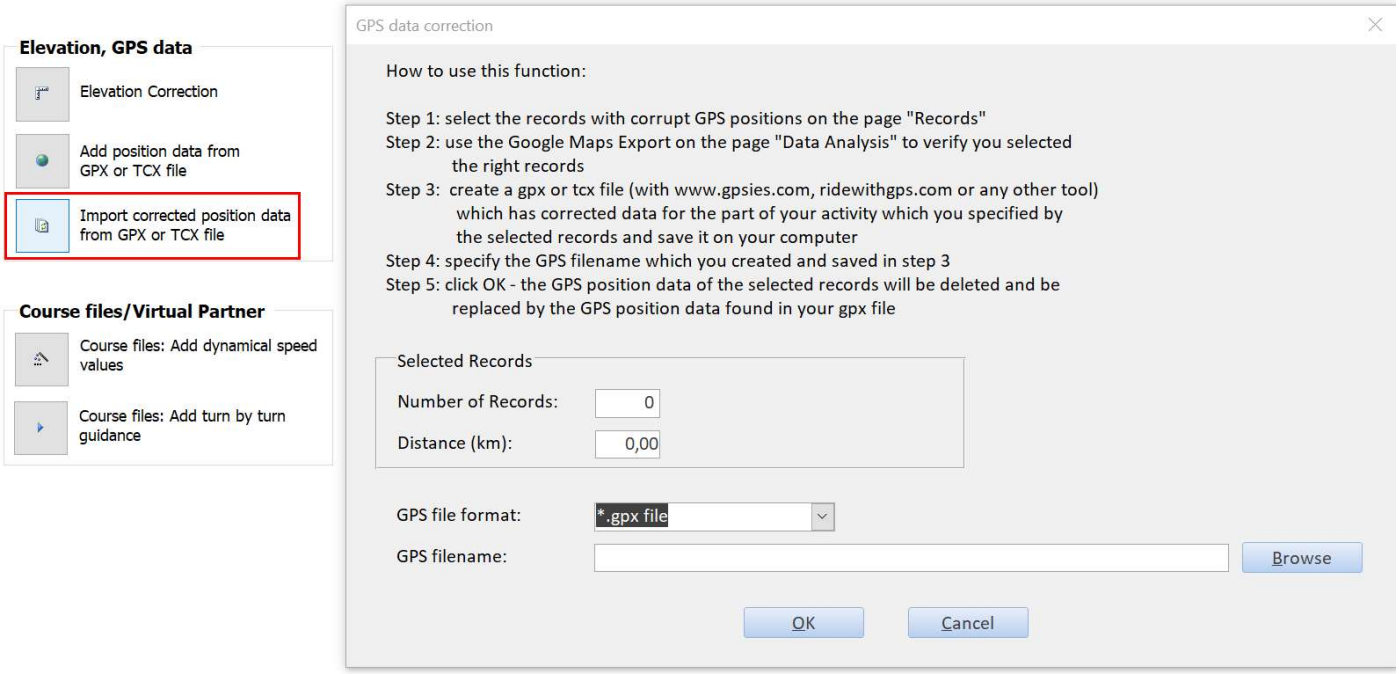
Please note: if the distance values in your recorded activity are of bad quality (because they were calculated based on incorrect GPS positions by your device) this correction might not work perfectly.

If the distance values of your recorded activity are of good quality (because they were calculated based on a speed and cadence sensor or a power meter rather than on faulty GPS measurements) then this correction should provide good results.

9.6.3. Import corrected position data from GPX or TCX file

The idea of this function is to replace a part of GPS position data of the activity file which you imported earlier.
If for instance your complete ride is 50 km long and contains a section with a length of 5 km through a valley with bad GPS reception then you could create a GPX file with any GPX creator of these 5 km, select the data records and replace GPS position data of these data records by GPS position data included in the GPS file.

The dialog form describes the steps needed to apply this function in detail.



The more GPS position data your GPX file contains the better the correction process can work.

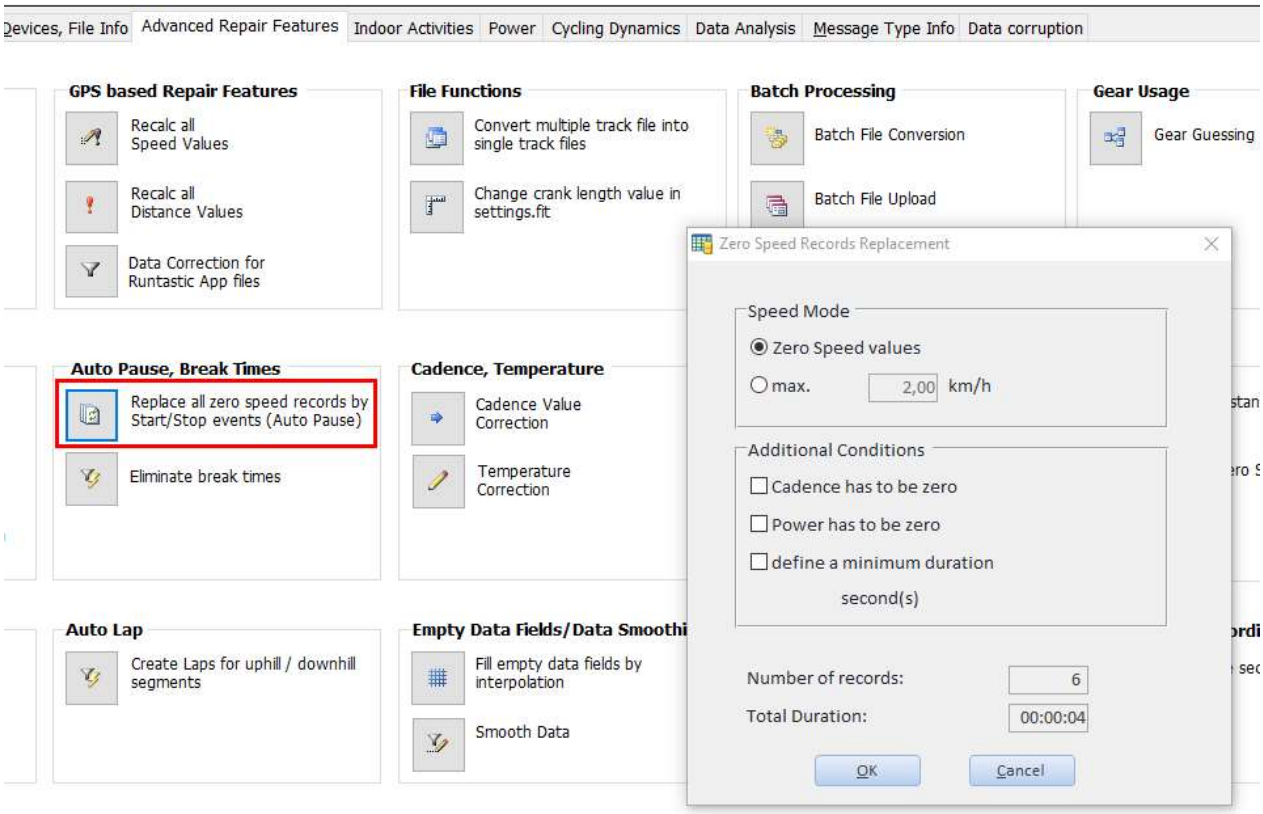
9.7. Auto Pause, Break Times

9.7.1. Replace zero speed values by Start / Stop events

Many devices offer an “Auto Pause” option depending on the current speed.
If your device doesn’t offer this option or if you accidently didn’t activate this option during the recording of your activity you can use this correction function.

All records of your recorded activity having a speed of zero or up to the defined max. speed value will be replaced by Stop and Start events.

Please note that events will only be included into files having the .fit file format. Using this correction feature might be useful for other file formats (tcx, gpx, hrm etc) as well.



Example:

Before:

Timestamp	Speed
28/08/2014 10:00:00	10.0
28/08/2014 10:00:02	1.0
28/08/2014 10:00:04	0.0
28/08/2014 10:00:06	1.5
28/08/2014 10:00:08	8.0

After replacing zero speed records (with a max. speed of 2.0):

(1) Records

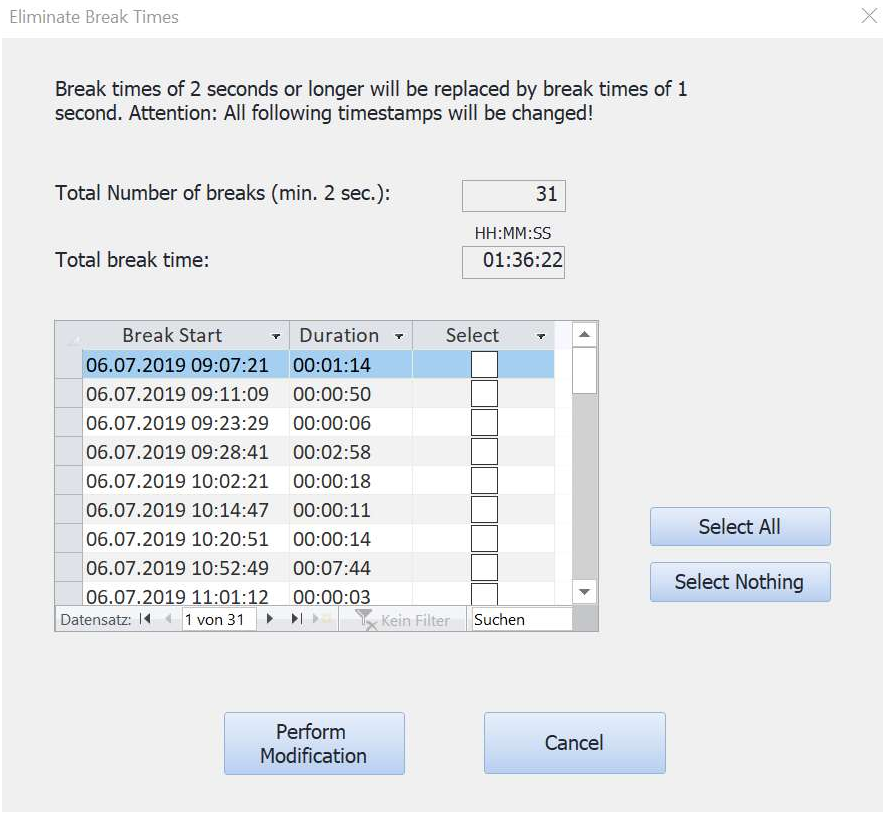
Timestamp	Speed
28/08/2014 10:00:00	10.0
28/08/2014 10:00:08	8.0

(2) Inserted Events

Timestamp	Event
28/08/2014 10:00:02	Timer Stop
28/08/2014 10:00:08	Timer Start

9.7.2. Eliminate break times

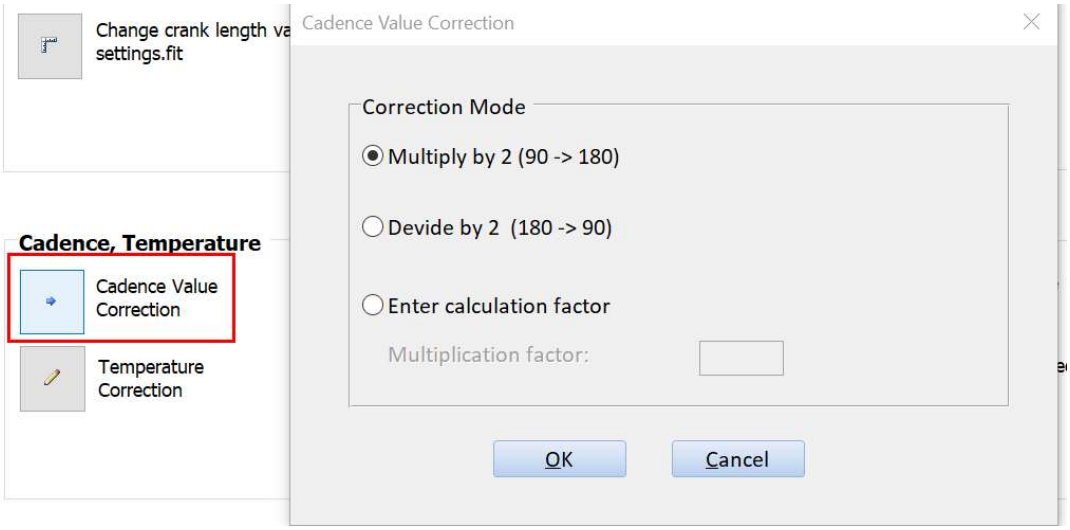
If your recorded and imported activity contains break times you can use this function to eliminate them by modifying all timestamps following the break. This is intended to modify indoor activities. Some websites cannot handle indoor activities with break times correctly. Please be fair and don't use this function for manipulating outdoor activities.



9.8. Cadence, Temperature

9.8.1. Cadence Value Correction

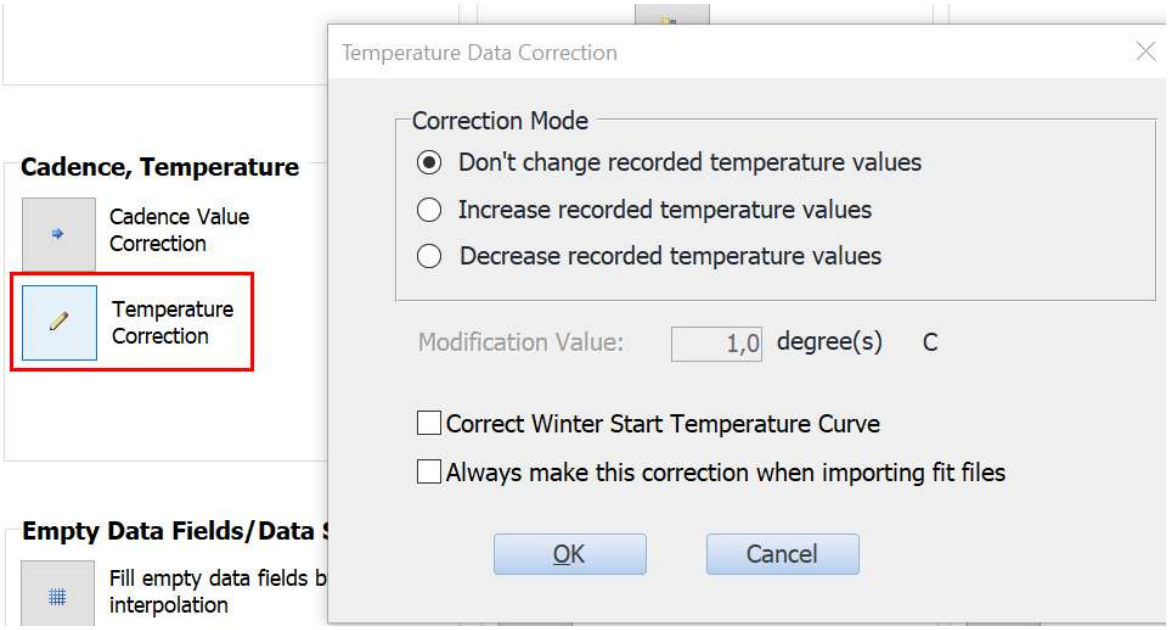
This function is intended to multiply or devide recorded cadence data by two.
If your head unit (sports computer) recorded your running activity in the wrong sports mode (cycling) your cadence values will have to be multiplied by two to gain correct running cadence values.



9.8.2. Temperature Correction

This function offers several ways to modify incorrect temperature data of your activity file.

You can increase/decrease as temperature data by a given fixed correction value (for instance +/- 2 degrees).

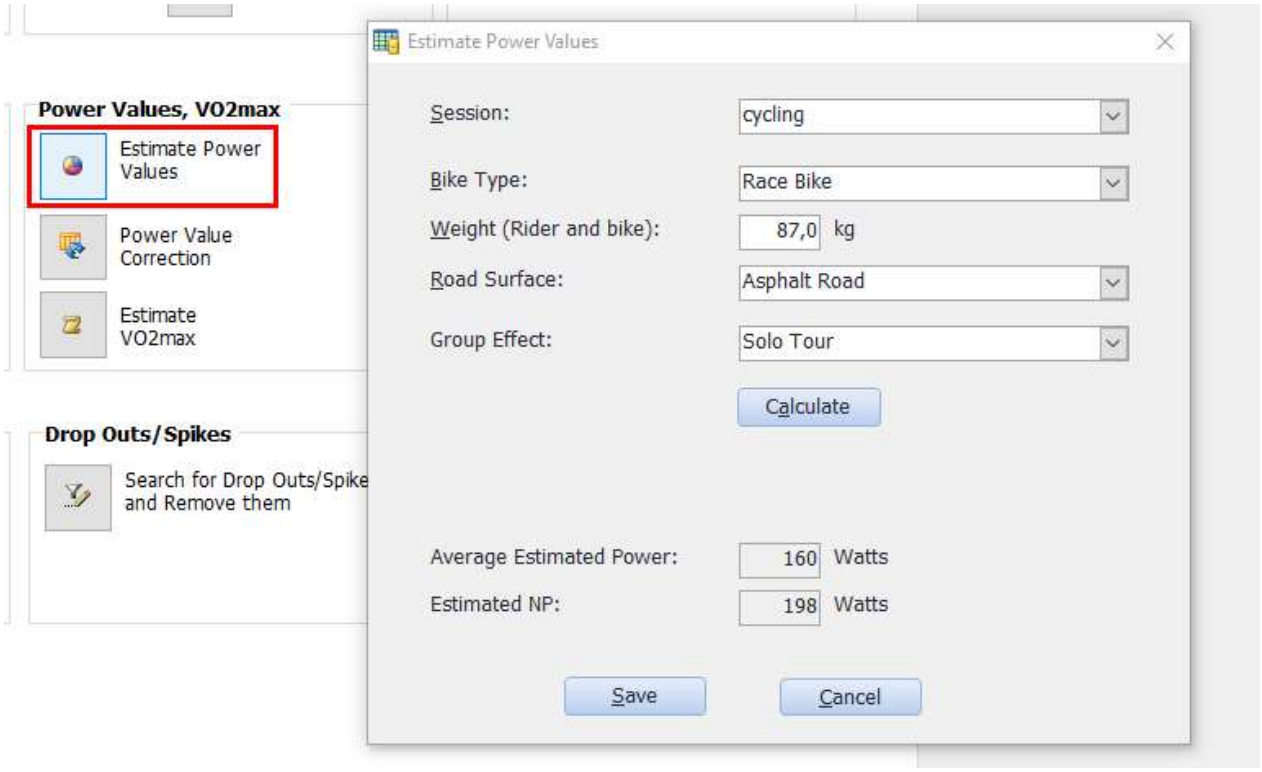


Another method to correct temperature data is called “Correct Winter Start Temperature Curve”.
The tool will try to correct temperature data recorded during the first 15 minutes of your recording by the

temperature data of the remaining data records. This makes sense when your sports computer measures wrong temperature data during the first minutes of your recording because it was stored inside your warmed building and didn't switch to outdoor temperature fast enough.

9.9. Power Values, VO2max

9.9.1. Estimate Power Values



If your activity doesn't contain recorded power values then you can use this function to calculate estimated power values. Based upon these estimated power values you can calculate power statistics (NP, TSS, IF etc.) in a second step (use the "recalculate" command on the "Power" page after calculating the power values). If you export your activity as a .fit file, the calculated power statistics (NP, TSS, IF etc.) can be included into the file.

Estimated power values are calculated based upon

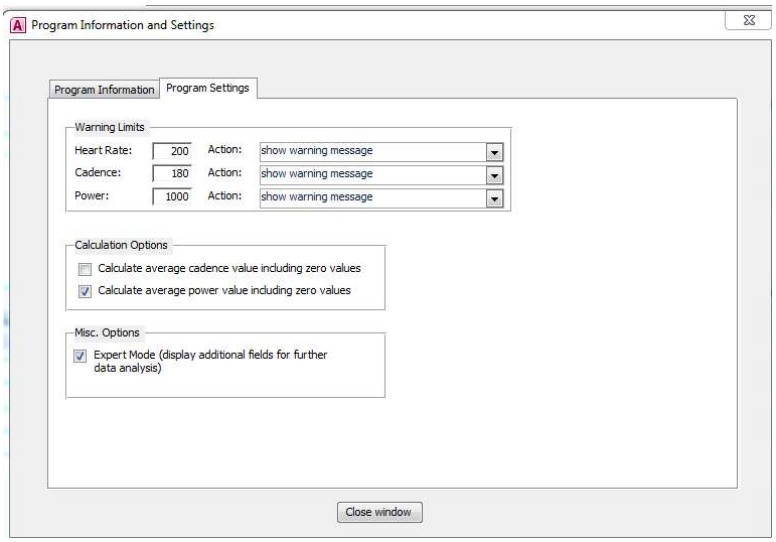
- total weight of rider and bike
- pavement
- speed
- elevation (influences wind and gravity resistance values)
- grade
- cadence (if cadence is zero then estimated power will be set to zero)

After choosing the total weight and selecting the type of pavement you can click on "Calculate". This will cause the repair tool to calculate power values for all data records of the activity.

Based on the calculated power values the Repair Tool will show the average power and an NP value.

If you select “Save” the calculated power values will be transferred into the data records. Selecting “Cancel” will not transfer the power values into the data records.

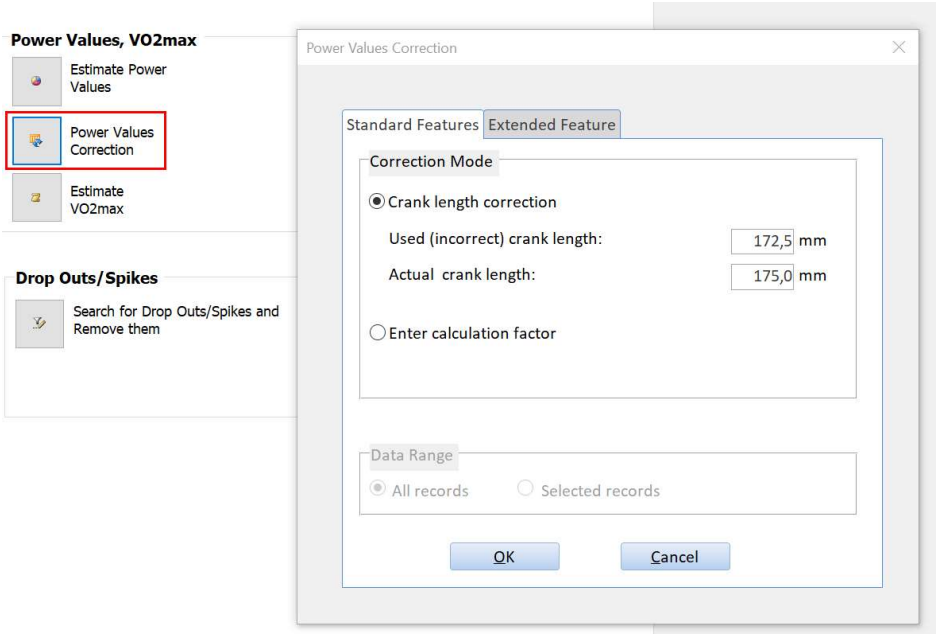
NOTE - the average power displayed here is influenced by the “Calculate average power including zero values” setting which can be found under “Information / Settings → Program Settings”.



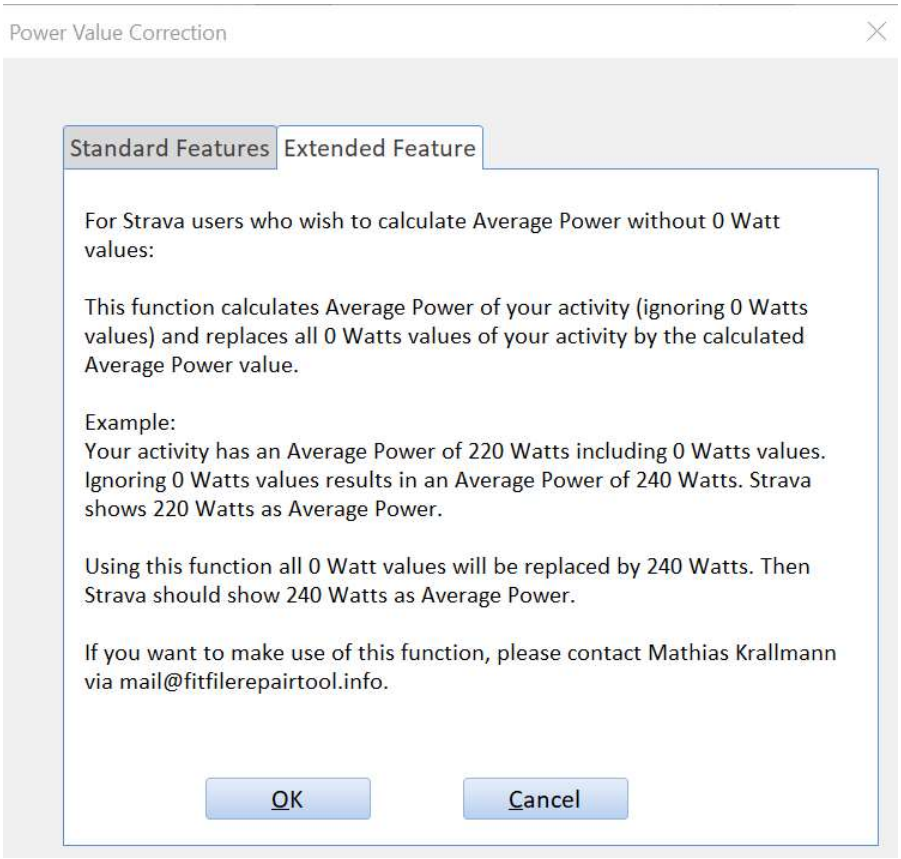
9.9.2. Power Values Correction

This function supports you in the correction of wrong power values caused by an incorrect crank length setting.

After entering the used and the correct crank length a correction factor is calculated and used to modify power values of your activity.



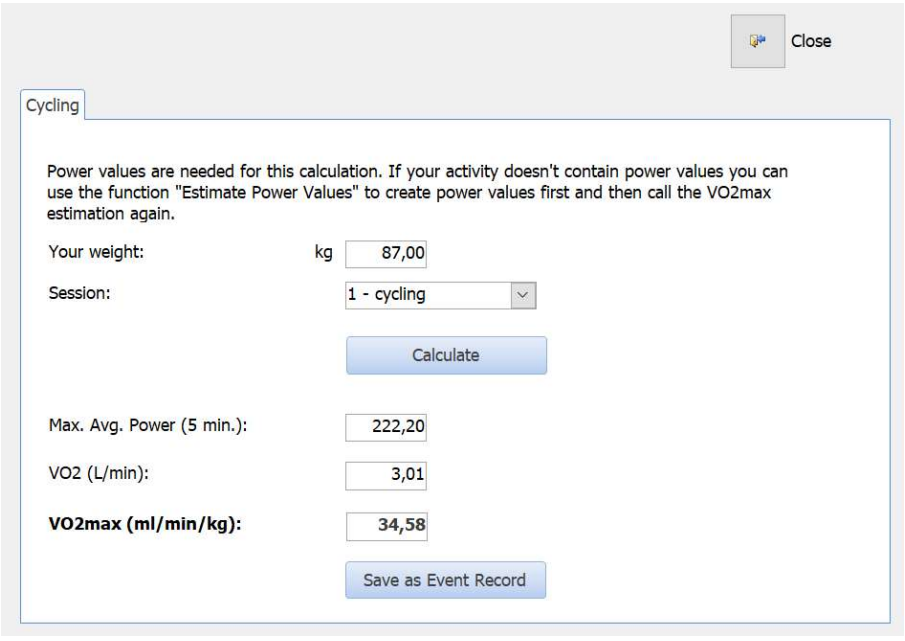
An additional feature can be found on the register page “Extended Feature” and is intended for (some) Strava users:



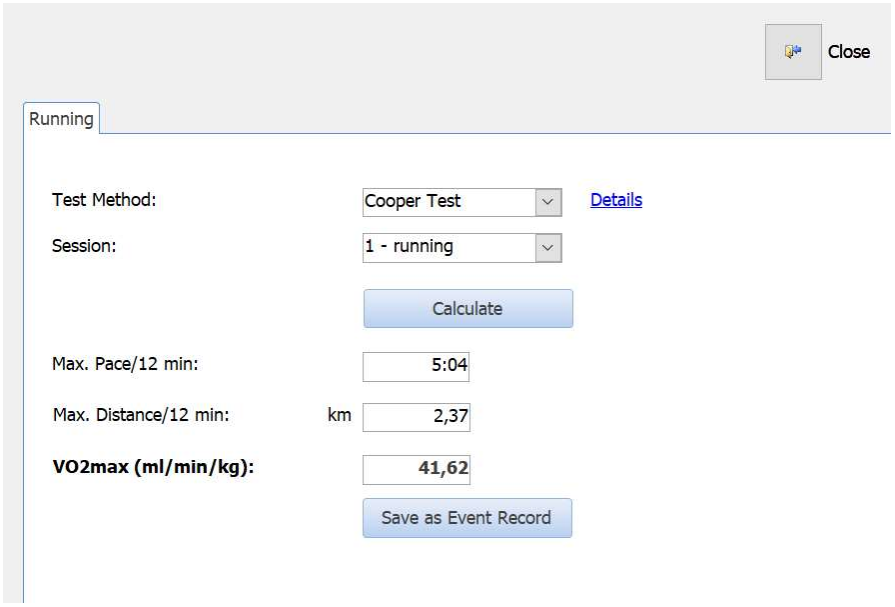
9.9.3. Estimate VO2max

The VO2max calculator distinguishes between cycling and running events.

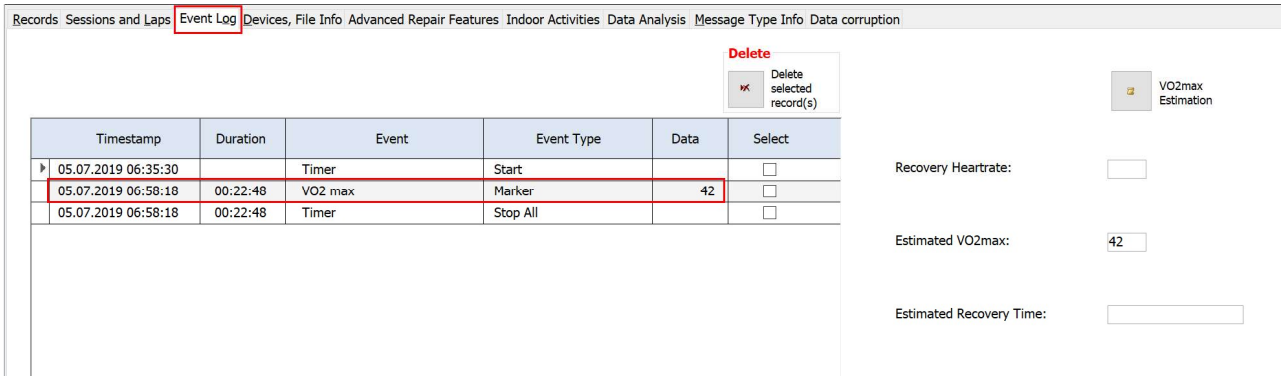
Cycling:



Running:



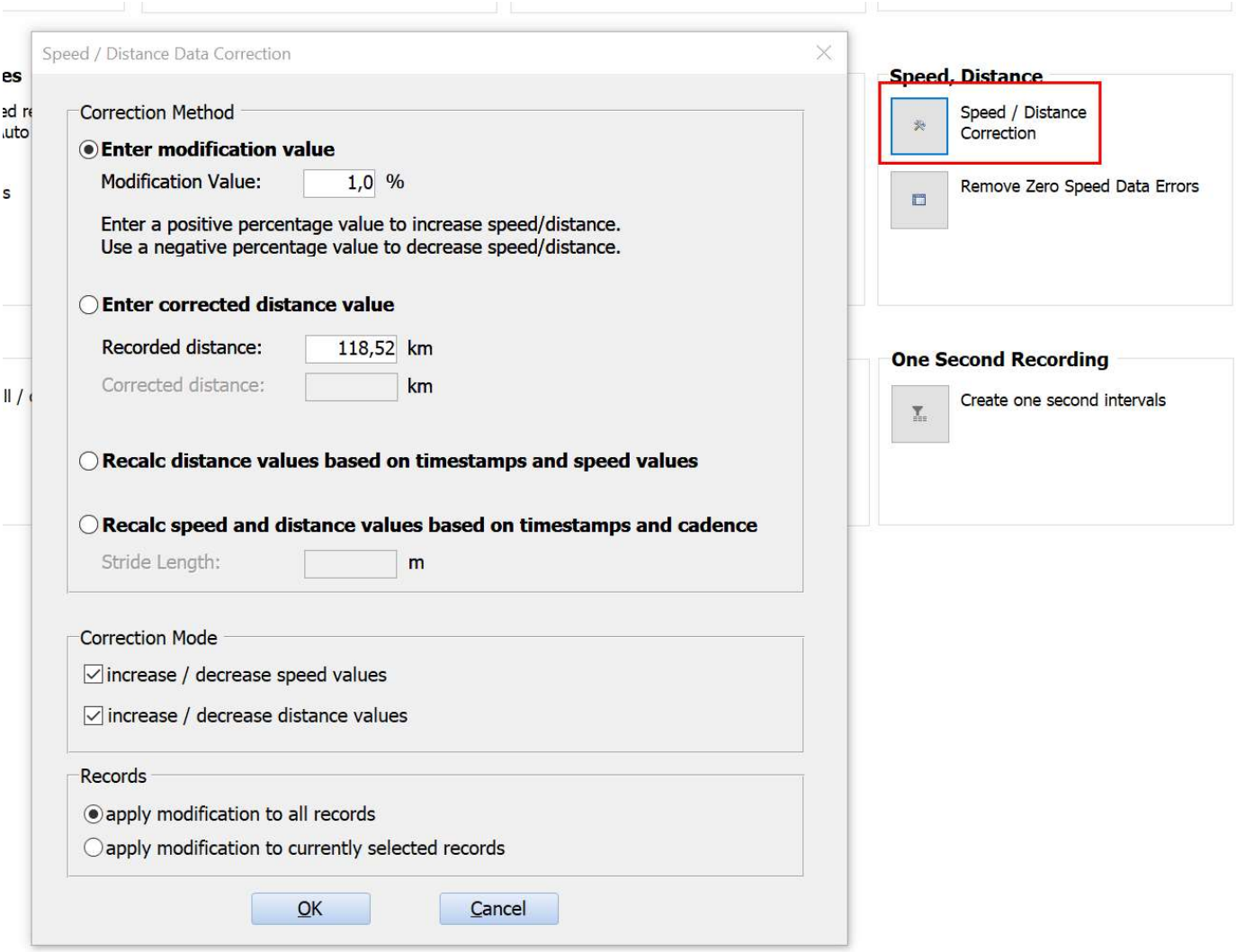
At the bottom of both register pages you will find the command button “Save as Event Record”. Use this button to create an event in the event log of your activity which contains the calculated VO2 max value:



Please note: Events are only exported when using the fit file format (not when using tcx/hrm/csv and other file formats).

9.10. Speed, Distance

9.10.1. Speed/Distance Correction



9.10.2. Remove Zero Speed Data Errors

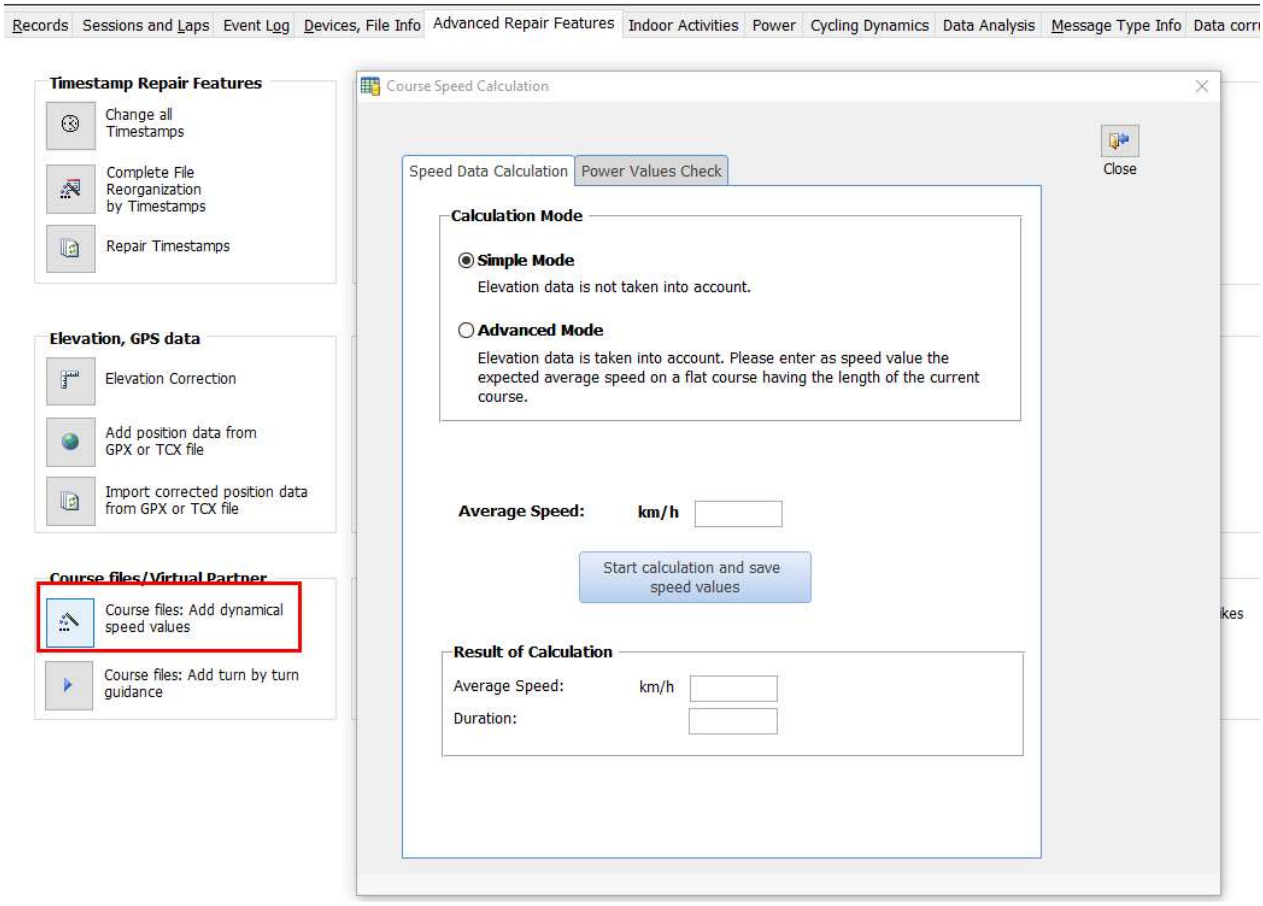
This function searches for data records with a zero speed value (0.00 km/h / 0.00 mph) and a cadence or power value greater than zero. It then replaces the zero speed values either by blank values or calculates a proper speed value by interpolating of correct speed values in neighbor data records.

9.11. Course Files, Virtual Partner

9.11.1. Adding Speed Data to Courses (for use with the "Virtual Partner")

Overview

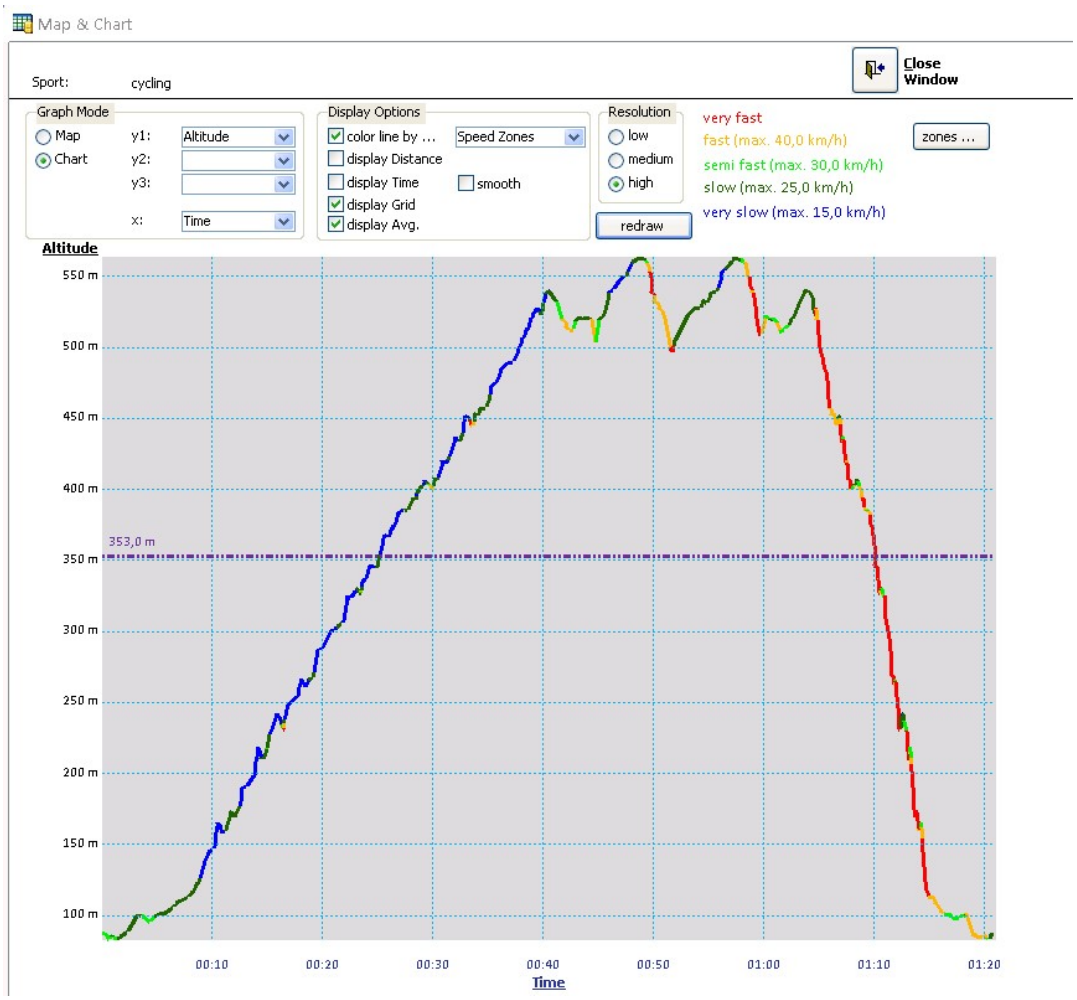
The Fit File Repair Tool allows you to calculate speed data and create a course file including speed data which you can store on your bike computer. If your device supports a "Virtual Partner" mode you will see the Virtual Partner riding with the calculated speed value ahead or behind of you while you follow the course.



The tool offers two calculation modes:

The "**Simple Mode**" allows you to enter an average speed value. This speed value is added in all records of the currently loaded course / activity.

The "**Advanced Mode**" takes elevation data into account during the speed data calculation:
Downhill segments of your course will receive a relatively high speed value while uphill segments will receive a small speed value as shown in the following diagram (blue = slow, red = fast):



After performing the speed value calculation in one of the two modes you can create estimated power values and check if the resulting power data (average power value, NP etc.) are within your limits.

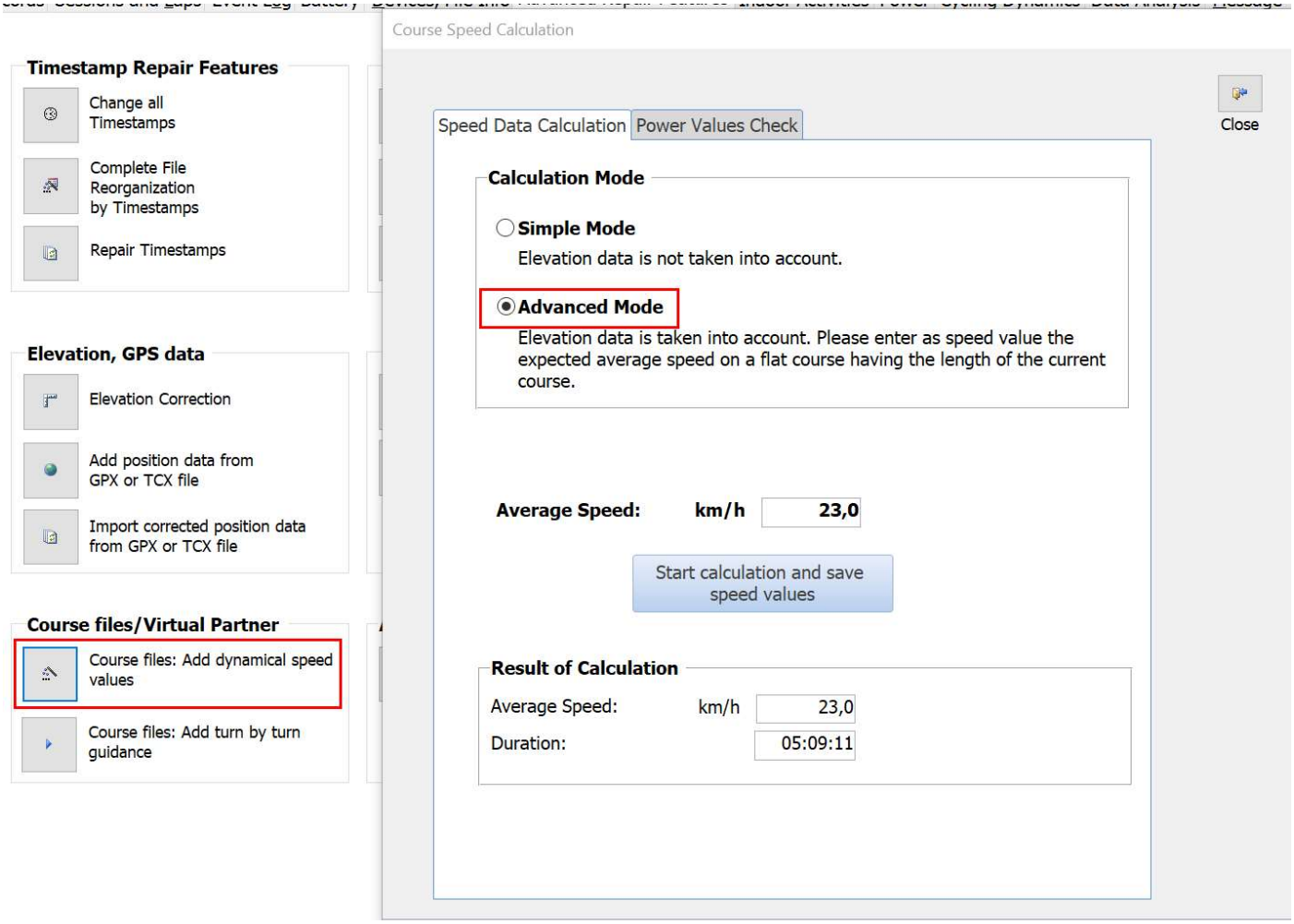
If the resulting power values are too low / too high you can repeat the speed calculation with a modified average speed value and check the resulting power values until you are satisfied.

Step by Step guide

Step 1: Please import a course (or an activity)

Step 2: If your course doesn't contain altitude / elevation data then use the function "Elevation Correction" on register tab "Advanced Repair Features" to add altitude / elevation data

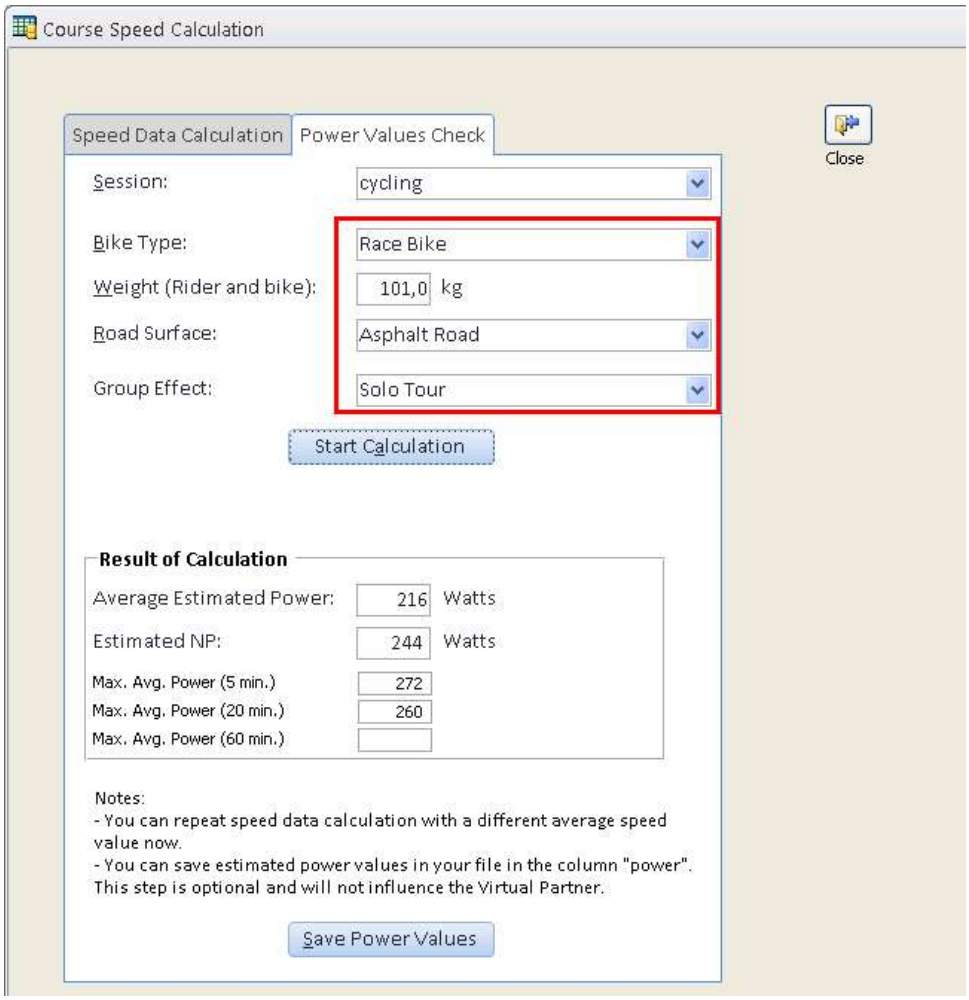
Step 3: Call the function "Course files: Add dynamically calculated speed values" on register tab "Advanced Repair Features" and select the Advanced Calculation Mode:



Please enter a realistic average speed for a **flat** course of the length of the current course and press OK to start the calculation of speed values and timestamps.

Depending on the elevation data of your course the calculated average speed differs from the average speed parameter you entered. This is not a mistake but a consequence of the calculation formula which takes uphill and downhill segments of the course into account during the calculation.

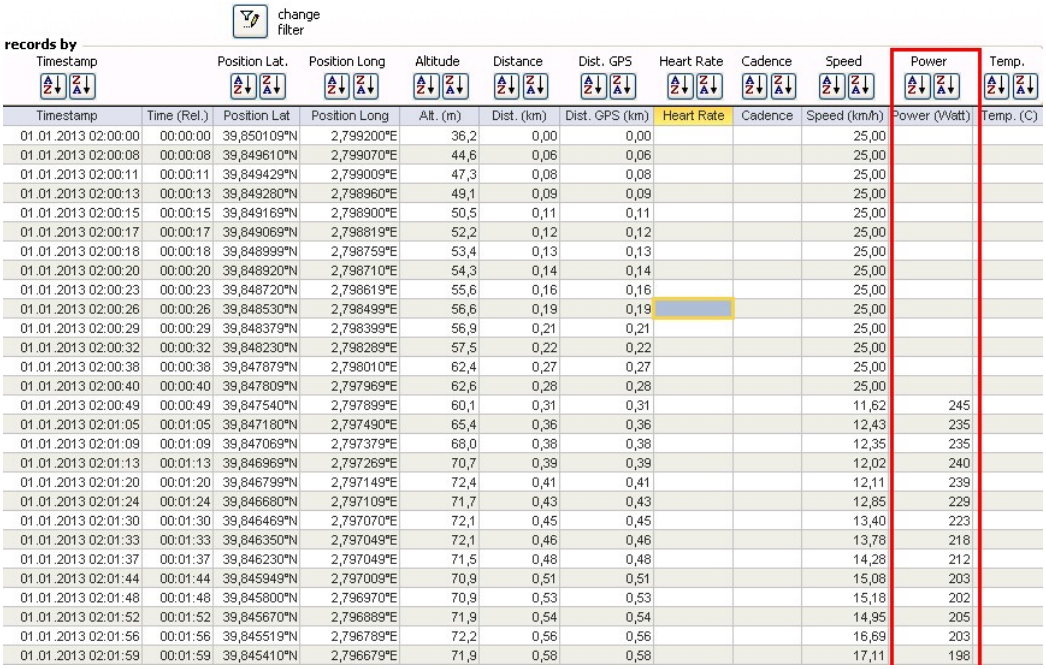
Step 4: Now turn to the register tab “Power Values Check” and enter the parameters which the tool needs to calculate power data:



Press “Start Calculation” and have a look at the calculated values. If you think they are beyond your ability or don’t challenge you enough you might turn to the register tab “Speed Data Calculation” any time and repeat the calculations with a modified average speed value.

Once you found a proper average speed value you might close the window, the speed values are already saved in the data records.

As an option you can select the command “Save Power Values” which stores the estimated power values in the data records:

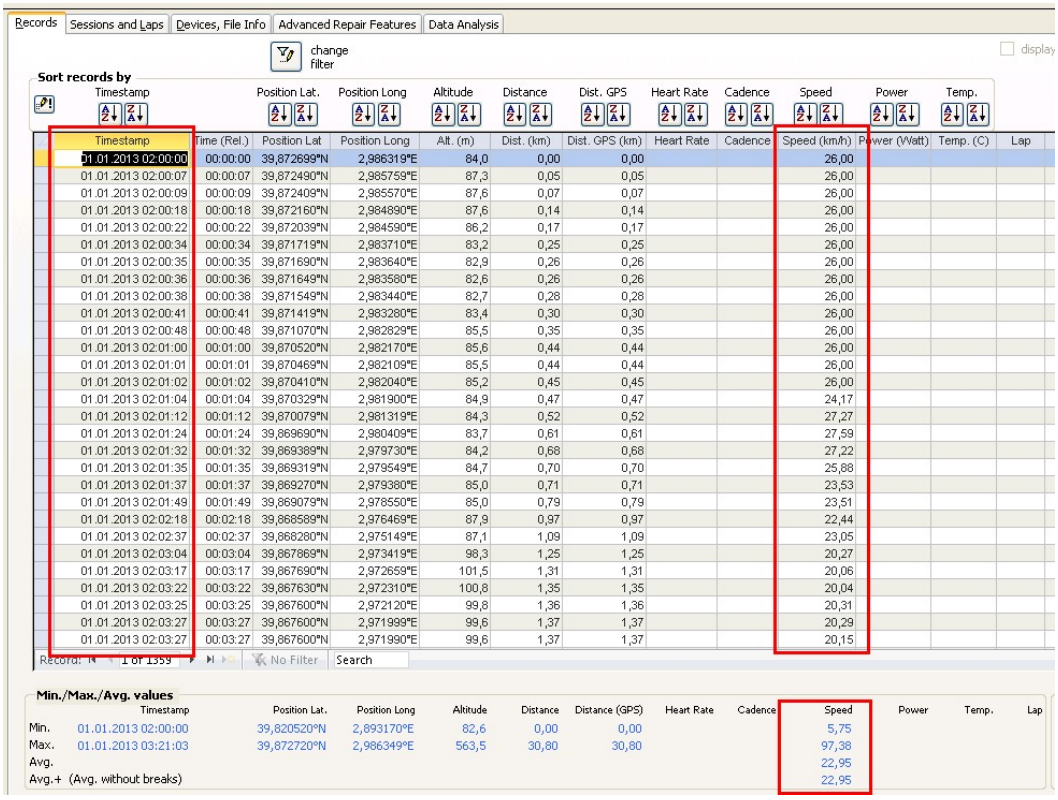


records by

Timestamp	Time (Rel.)	Position Lat	Position Long	Alt. (m)	Dist. (km)	Dist. GPS (km)	Heart Rate	Cadence	Speed (km/h)	Power (Watt)	Temp. (C)
01.01.2013 02:00:00	00:00:00	39,850109°N	2,799200°E	36,2	0,00	0,00			25,00		
01.01.2013 02:00:08	00:00:08	39,849610°N	2,799070°E	44,6	0,06	0,06			25,00		
01.01.2013 02:00:11	00:00:11	39,849429°N	2,799009°E	47,3	0,08	0,08			25,00		
01.01.2013 02:00:13	00:00:13	39,849280°N	2,798960°E	49,1	0,09	0,09			25,00		
01.01.2013 02:00:15	00:00:15	39,849169°N	2,798900°E	50,5	0,11	0,11			25,00		
01.01.2013 02:00:17	00:00:17	39,849069°N	2,798819°E	52,2	0,12	0,12			25,00		
01.01.2013 02:00:18	00:00:18	39,848999°N	2,798759°E	53,4	0,13	0,13			25,00		
01.01.2013 02:00:20	00:00:20	39,848920°N	2,798710°E	54,3	0,14	0,14			25,00		
01.01.2013 02:00:23	00:00:23	39,848720°N	2,798619°E	55,6	0,16	0,16			25,00		
01.01.2013 02:00:26	00:00:26	39,848530°N	2,798499°E	56,6	0,19	0,19			25,00		
01.01.2013 02:00:29	00:00:29	39,848379°N	2,798399°E	56,9	0,21	0,21			25,00		
01.01.2013 02:00:32	00:00:32	39,848230°N	2,798289°E	57,5	0,22	0,22			25,00		
01.01.2013 02:00:38	00:00:38	39,847879°N	2,798010°E	62,4	0,27	0,27			25,00		
01.01.2013 02:00:40	00:00:40	39,847809°N	2,797969°E	62,6	0,28	0,28			25,00		
01.01.2013 02:00:49	00:00:49	39,847540°N	2,797899°E	60,1	0,31	0,31			11,62	245	
01.01.2013 02:01:05	00:01:05	39,847180°N	2,797490°E	65,4	0,36	0,36			12,43	235	
01.01.2013 02:01:09	00:01:09	39,847069°N	2,797379°E	68,0	0,38	0,38			12,35	235	
01.01.2013 02:01:13	00:01:13	39,846969°N	2,797269°E	70,7	0,39	0,39			12,02	240	
01.01.2013 02:01:20	00:01:20	39,846799°N	2,797149°E	72,4	0,41	0,41			12,11	239	
01.01.2013 02:01:24	00:01:24	39,846680°N	2,797109°E	71,7	0,43	0,43			12,85	229	
01.01.2013 02:01:30	00:01:30	39,846469°N	2,797070°E	72,1	0,45	0,45			13,40	223	
01.01.2013 02:01:33	00:01:33	39,846350°N	2,797049°E	72,1	0,46	0,46			13,78	218	
01.01.2013 02:01:37	00:01:37	39,846230°N	2,797049°E	71,5	0,48	0,48			14,28	212	
01.01.2013 02:01:44	00:01:44	39,845949°N	2,797009°E	70,9	0,51	0,51			15,08	203	
01.01.2013 02:01:48	00:01:48	39,845800°N	2,796970°E	70,9	0,53	0,53			15,18	202	
01.01.2013 02:01:52	00:01:52	39,845670°N	2,796889°E	71,9	0,54	0,54			14,95	205	
01.01.2013 02:01:56	00:01:56	39,845519°N	2,796789°E	72,2	0,56	0,56			16,69	203	
01.01.2013 02:01:59	00:01:59	39,845410°N	2,796679°E	71,9	0,58	0,58			17,11	198	

Now you can turn to the register tab “Records” and see the results of the calculation:

- Speed values have been calculated based on grade values (grade values were calculated internally on the base of distance and elevation)
- Timestamps have been modified based on distance and speed data
- Power values have been added if you used the command button “Save Power Values” to do so



Records | Sessions and Laps | Devices, File Info | Advanced Repair Features | Data Analysis

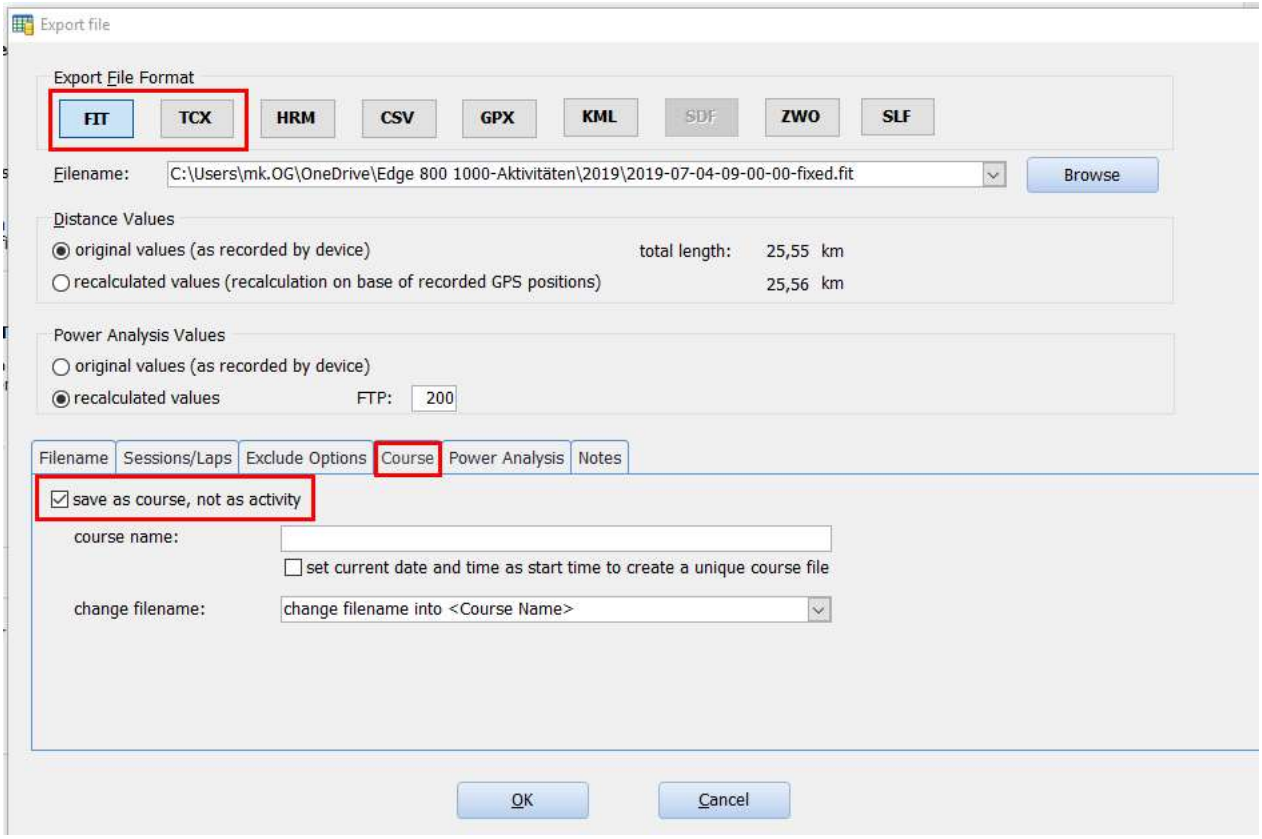
Sort records by

Timestamp	Time (Rel.)	Position Lat	Position Long	Alt. (m)	Dist. (km)	Dist. GPS (km)	Heart Rate	Cadence	Speed (km/h)	Power (Watt)	Temp. (C)	Lap
01.01.2013 02:00:00	00:00:00	39,872699°N	2,986319°E	84,0	0,00	0,00			26,00			
01.01.2013 02:00:07	00:00:07	39,872490°N	2,985759°E	87,3	0,05	0,05			26,00			
01.01.2013 02:00:09	00:00:09	39,872409°N	2,985570°E	87,6	0,07	0,07			26,00			
01.01.2013 02:00:18	00:00:18	39,872160°N	2,984890°E	87,6	0,14	0,14			26,00			
01.01.2013 02:00:22	00:00:22	39,872039°N	2,984590°E	86,2	0,17	0,17			26,00			
01.01.2013 02:00:34	00:00:34	39,871719°N	2,983710°E	83,2	0,25	0,25			26,00			
01.01.2013 02:00:35	00:00:35	39,871690°N	2,983640°E	82,9	0,26	0,26			26,00			
01.01.2013 02:00:36	00:00:36	39,871649°N	2,983580°E	82,6	0,26	0,26			26,00			
01.01.2013 02:00:38	00:00:38	39,871549°N	2,983440°E	82,7	0,28	0,28			26,00			
01.01.2013 02:00:41	00:00:41	39,871419°N	2,983280°E	83,4	0,30	0,30			26,00			
01.01.2013 02:00:48	00:00:48	39,871070°N	2,982829°E	85,5	0,35	0,35			26,00			
01.01.2013 02:01:00	00:01:00	39,870520°N	2,982170°E	85,6	0,44	0,44			26,00			
01.01.2013 02:01:01	00:01:01	39,870469°N	2,982109°E	85,5	0,44	0,44			26,00			
01.01.2013 02:01:02	00:01:02	39,870410°N	2,982040°E	85,2	0,45	0,45			26,00			
01.01.2013 02:01:04	00:01:04	39,870329°N	2,981900°E	84,9	0,47	0,47			24,17			
01.01.2013 02:01:12	00:01:12	39,870079°N	2,981319°E	84,3	0,52	0,52			27,27			
01.01.2013 02:01:24	00:01:24	39,869690°N	2,980409°E	83,7	0,61	0,61			27,59			
01.01.2013 02:01:32	00:01:32	39,869389°N	2,979730°E	84,2	0,68	0,68			27,22			
01.01.2013 02:01:35	00:01:35	39,869319°N	2,979549°E	84,7	0,70	0,70			25,88			
01.01.2013 02:01:37	00:01:37	39,869270°N	2,979380°E	85,0	0,71	0,71			23,53			
01.01.2013 02:01:49	00:01:49	39,869079°N	2,978550°E	85,0	0,79	0,79			23,51			
01.01.2013 02:02:18	00:02:18	39,868589°N	2,976469°E	87,9	0,97	0,97			22,44			
01.01.2013 02:02:37	00:02:37	39,868280°N	2,975149°E	87,1	1,09	1,09			23,05			
01.01.2013 02:03:04	00:03:04	39,867869°N	2,973419°E	98,3	1,25	1,25			20,27			
01.01.2013 02:03:17	00:03:17	39,867690°N	2,972659°E	101,5	1,31	1,31			20,06			
01.01.2013 02:03:22	00:03:22	39,867630°N	2,972310°E	100,8	1,35	1,35			20,04			
01.01.2013 02:03:25	00:03:25	39,867600°N	2,972120°E	99,8	1,36	1,36			20,31			
01.01.2013 02:03:27	00:03:27	39,867600°N	2,971999°E	99,6	1,37	1,37			20,29			
01.01.2013 02:03:27	00:03:27	39,867600°N	2,971990°E	99,6	1,37	1,37			20,15			

Min./Max./Avg. values

	Timestamp	Position Lat.	Position Long	Altitude	Distance	Distance (GPS)	Heart Rate	Cadence	Speed	Power	Temp.	Lap
Min.	01.01.2013 02:00:00	39,820520°N	2,893170°E	82,6	0,00	0,00			5,75			
Max.	01.01.2013 03:21:03	39,872720°N	2,986349°E	563,5	30,80	30,80			97,38			
Avg.									22,95			
Avg.+	(Avg. without breaks)								22,95			

Step 5: Export the course / activity as gpx file, as tcx file or as fit file. If you export it as fit file then make sure you select the option “save as course” on the register tab “fit files options” during the export and enter a course name or your choice:



Step 6: Copy the exported file into the proper folder on your device.

If you use a Garmin Edge 520 or Garmin Edge 1000, please copy the course file into the folder Garmin\NewFiles on your device. During the next start your Edge will process the file and move a modified file version to Garmin\Courses.

9.11.2. Course Files: Add turn by turn guidance

This function adds “Turn Left” and “Turn Right” commands to the currently loaded file. GPS position data is taken to calculate where a left or right turn takes place. Because this is done without map data in the background the result will not be perfect in any way. Actually I added this function as a test and a programming challenge for myself 😊 But some people liked it and made use of it and therefore I kept it as part of the tool.

Left and right turn commands will be stored as “Course Points”.

Records | Sessions and Laps | Event Log | Course Points | Battery | Devices, File Info | Advanced Repair Features | Indoor Activities | Power | Cycling Dynamics | Data Analysis

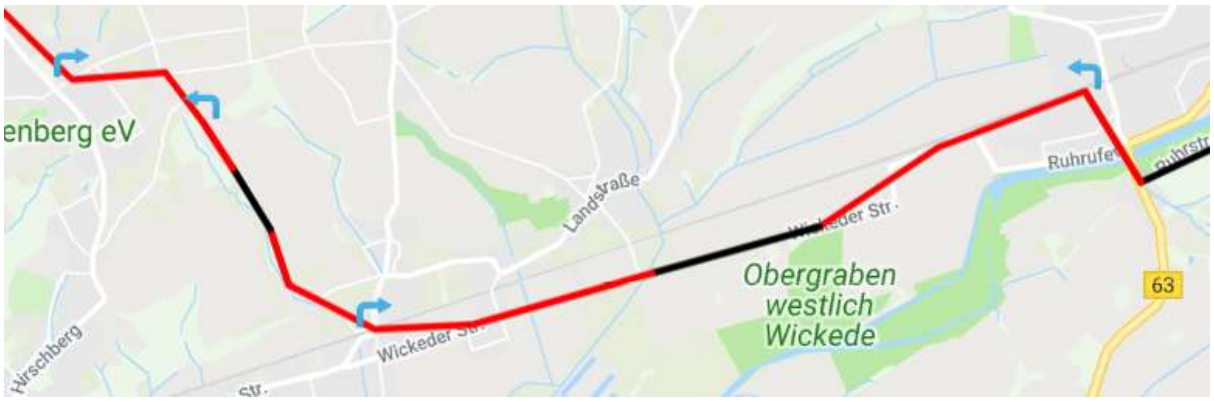
Google Maps (including course points)

Delete

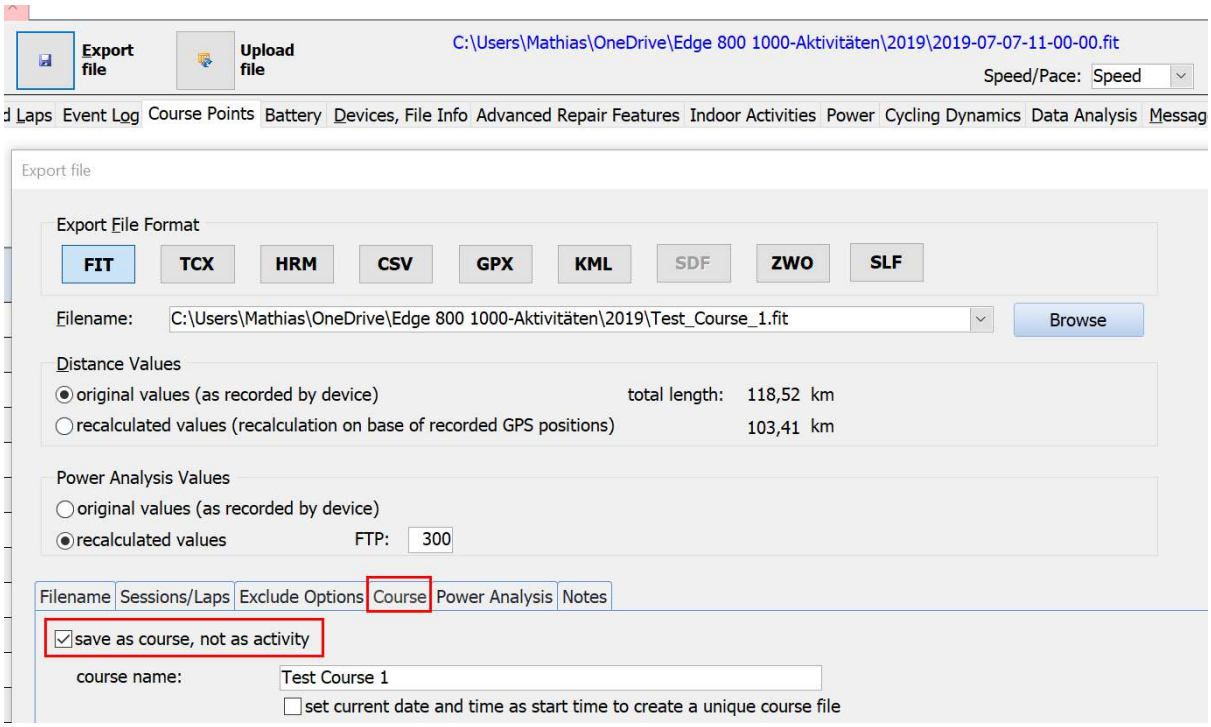
Delete selected record(s)

Name	Timestamp	Position Lat.	Position Long.	Distance (km)	Point Type	Select
Turn Left	07.07.2019 11:06:46	51,533154°N	7,696434°E		generic	
Turn Right	07.07.2019 11:17:39	51,508266°N	7,736751°E		generic	
Turn Left	07.07.2019 11:21:06	51,498189°N	7,739453°E		generic	
Turn Left	07.07.2019 11:41:14	51,507877°N	7,836840°E		generic	
Turn Right	07.07.2019 11:45:37	51,519388°N	7,849749°E		generic	
Turn Right	07.07.2019 11:55:20	51,519798°N	7,902166°E		generic	
Turn Left	07.07.2019 11:58:36	51,516343°N	7,914616°E		generic	
Turn Right	07.07.2019 12:07:21	51,513644°N	7,958935°E		generic	
Turn Left	07.07.2019 12:11:49	51,505230°N	7,971986°E		generic	
Turn Right	07.07.2019 13:10:22	51,510956°N	8,287369°E		generic	
Turn Right	07.07.2019 13:14:09	51,499229°N	8,283942°E		generic	
Turn Right	07.07.2019 13:21:39	51,484071°N	8,258026°E		generic	
Turn Right	07.07.2019 13:36:12	51,477660°N	8,196524°E		generic	
Turn Left	07.07.2019 13:46:12	51,492282°N	8,156380°E		generic	
Turn Right	07.07.2019 13:49:16	51,485025°N	8,160463°E		generic	
Turn Right	07.07.2019 14:01:47	51,456324°N	8,153308°E		generic	
Turn Right	07.07.2019 14:07:36	51,440082°N	8,144587°E		generic	
Turn Left	07.07.2019 14:15:12	51,448045°N	8,107956°E		generic	
Turn Right	07.07.2019 14:18:35	51,438332°N	8,102204°E		generic	
Turn Left	07.07.2019 14:23:13	51,438007°N	8,084579°E		generic	

You can click on the command button “Google Maps” and will see a Google Maps display of your course/activity plus turn left/turn right sympols as they have been calculated based on the GPS position data of your course/activity.



The Course Points will be exported to fit and tcx when you save data as course.



If your sports computer supports the import of fit / tcx files with course points then these "turn left"/"turn right" commands will be displayed during following the course.

As I mentioned before: I'm not sure if this feature is helpful, I used it programming challenge to myself.

9.12. Auto Lap

9.12.1. Create Laps for uphill / downhill segments

This function calculates uphill and downhill segments of your activity and creates a lap record for each uphill and for each downhill segment (and for each flat segment between uphill/downhill segments).

9.13. Empty Data Fields, Data Smoothing

9.13.1. Fill empty data fields by interpolation

Some training diary apps / websites have problems with empty data fields in activity files and do some miscalculations of total values (average speed etc.).

You can use this function to fill empty data fields by algorithms based on interpolation.

Before:

Speed

Speed (km/h)
23,00
23,00
23,00
23,00
23,00
26,00

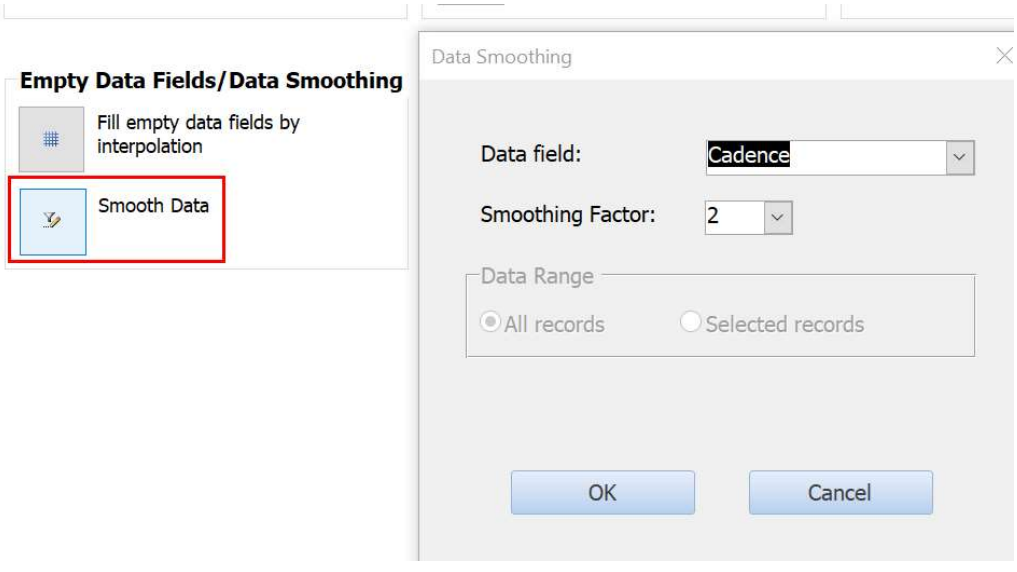
After:

Speed

Speed (km/h)
23,00
23,00
23,00
23,00
23,00
23,75
24,50
25,25
26,00

I recommend to use this function only if the tool (App, Website) you use for analyzing your activity data has issues with empty data cells.

9.13.2. Smooth Data



This function is available for

- Altitute

- Heart rate
- Cadence
- Speed
- Power

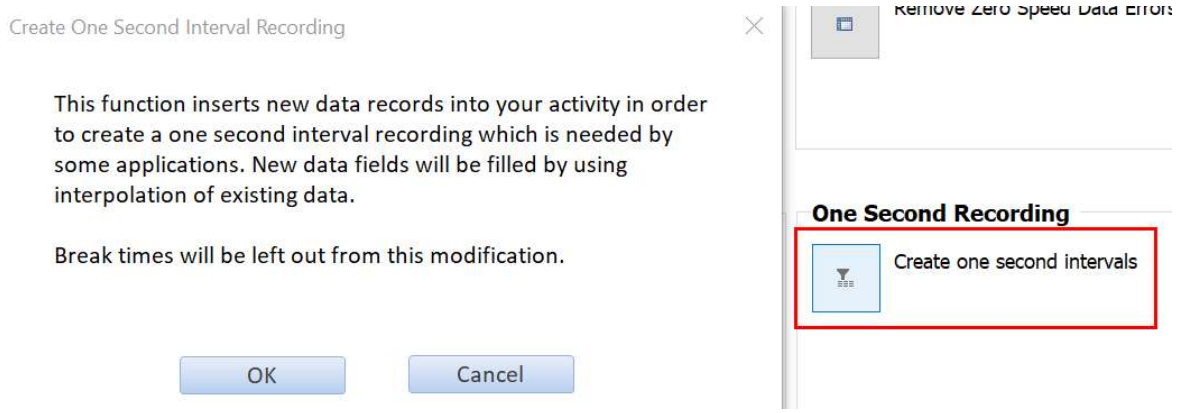
and can be applied to previously selected data records or the whole activity.

9.14. Drop Outs, Spikes

This function is intended to search for Sensor drop outs and/or spikes and to support you to remove them from your file. A more detailed description will follow …

9.15. One Second Recording

If your activity was recorded using the “Smart Recording Interval Method” rather than a “One second recording interval method” you can use this function to create addition data records.



Smart recording means your sports computer decides when to create a new data record. It will create a new record when GPS position, speed, cadence, power etc change – or after a maximum interval size (about 10 seconds, probably depending on the manufacturer and product). This reduces the file size of your activity and requires less memory of the sports computer.

This is how “smart recording” looks after the import into Fit File Repair Tool (note the flexible interval lengths between 1 and 6 seconds):

Timestamp	Duration	Position Lat.	Position Long.	Altitude (m)	Distance (km)	Dist. GPS (km)	Heart Rate	Cadence	Speed (km/h)	Power (Watts)
05.07.2019 08:21:51	00:00:35	51,545794°N	7,695690°E	64,0	0,11	0,11		0	21,54	0
05.07.2019 08:21:52	00:00:36	51,545794°N	7,695601°E	64,4	0,11	0,11		20	20,43	178
05.07.2019 08:21:53	00:00:37	51,545779°N	7,695520°E	64,4	0,12	0,12		20	19,25	34
05.07.2019 08:21:54	00:00:38	51,545749°N	7,695445°E	64,4	0,13	0,13		35	19,32	34
05.07.2019 08:22:00	00:00:44	51,545442°N	7,695088°E	64,6	0,17	0,17		80	22,93	124
05.07.2019 08:22:05	00:00:49	51,545200°N	7,694810°E	65,4	0,20	0,20		79	22,49	119
05.07.2019 08:22:11	00:00:55	51,544943°N	7,694465°E	65,6	0,24	0,24		77	21,58	141
05.07.2019 08:22:15	00:00:59	51,544785°N	7,694224°E	65,4	0,26	0,26		77	21,41	129
05.07.2019 08:22:20	00:01:04	51,544581°N	7,693913°E	65,8	0,29	0,29		82	23,90	296
05.07.2019 08:22:21	00:01:05	51,544538°N	7,693846°E	65,8	0,30	0,30		84	23,97	179
05.07.2019 08:22:22	00:01:06	51,544495°N	7,693777°E	66,0	0,31	0,31		84	24,10	191

The flexible length of intervals between 2 data records causes issues with some analysis software/websites.

You can use the function “Create one second intervals” to create additional data records and modify your activity in a way that it consists of exactly one data record per second. Data fields of the inserted data records will be filled by interpolating data of the neighbor data records:

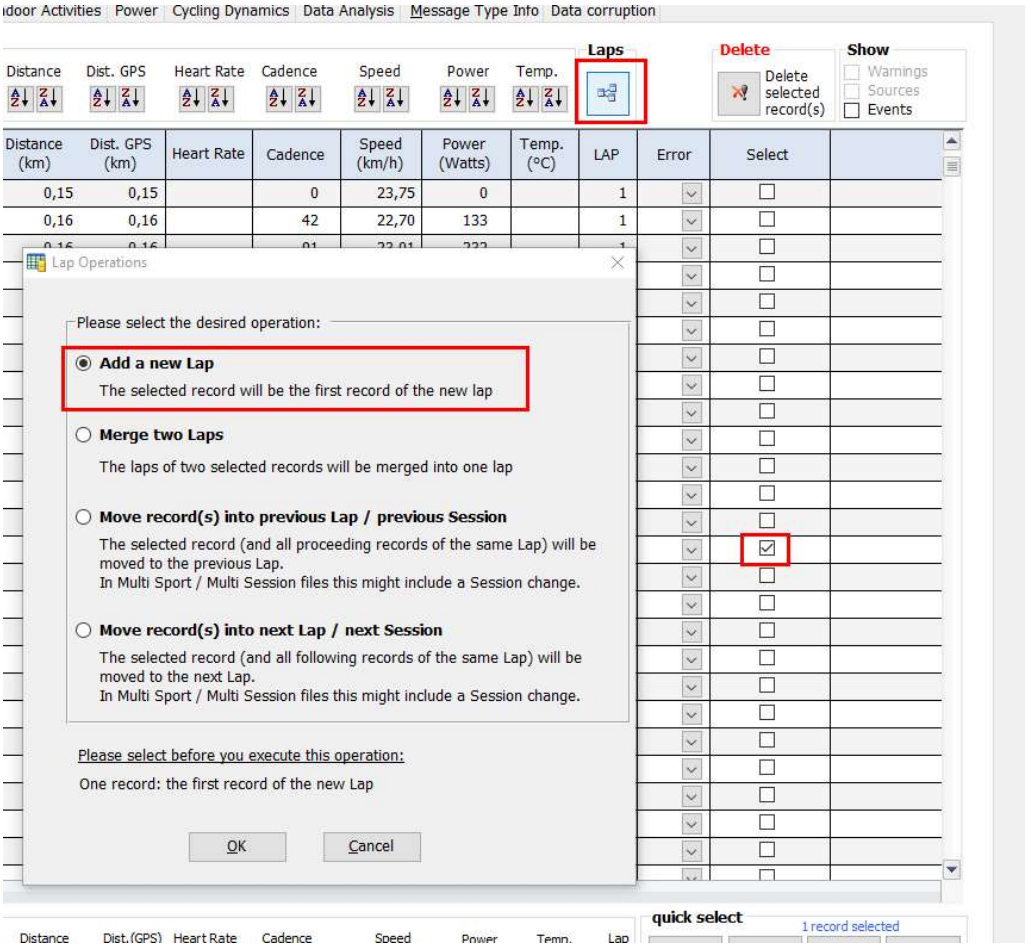
Timestamp	Duration	Position Lat.	Position Long.	Altitude (m)	Distance (km)	Dist. GPS (km)	Heart Rate	Cadence	Speed (km/h)	Power (Watts)
05.07.2019 08:21:51	00:00:35	51,545794°N	7,695690°E	64,0	0,11	0,11		0	21,54	0
05.07.2019 08:21:52	00:00:36	51,545794°N	7,695601°E	64,4	0,11	0,11		20	20,43	178
05.07.2019 08:21:53	00:00:37	51,545779°N	7,695520°E	64,4	0,12	0,12		20	19,25	34
05.07.2019 08:21:54	00:00:38	51,545749°N	7,695445°E	64,4	0,13	0,13		35	19,32	34
05.07.2019 08:21:55	00:00:39	51,545698°N	7,695386°E	64,4	0,13	0,13		42	19,92	49
05.07.2019 08:21:56	00:00:40	51,545647°N	7,695326°E	64,5	0,14	0,14		50	20,52	64
05.07.2019 08:21:57	00:00:41	51,545596°N	7,695267°E	64,5	0,15	0,15		58	21,12	79
05.07.2019 08:21:58	00:00:42	51,545545°N	7,695207°E	64,5	0,15	0,15		65	21,72	94
05.07.2019 08:21:59	00:00:43	51,545493°N	7,695148°E	64,6	0,16	0,16		72	22,32	109
05.07.2019 08:22:00	00:00:44	51,545442°N	7,695088°E	64,6	0,17	0,17		80	22,93	124
05.07.2019 08:22:01	00:00:45	51,545394°N	7,695033°E	64,8	0,17	0,18		80	22,84	123
05.07.2019 08:22:02	00:00:46	51,545345°N	7,694977°E	64,9	0,18	0,18		80	22,75	122
05.07.2019 08:22:03	00:00:47	51,545297°N	7,694922°E	65,1	0,19	0,19		79	22,66	121

10. How to fix a triathlon (multi session) file

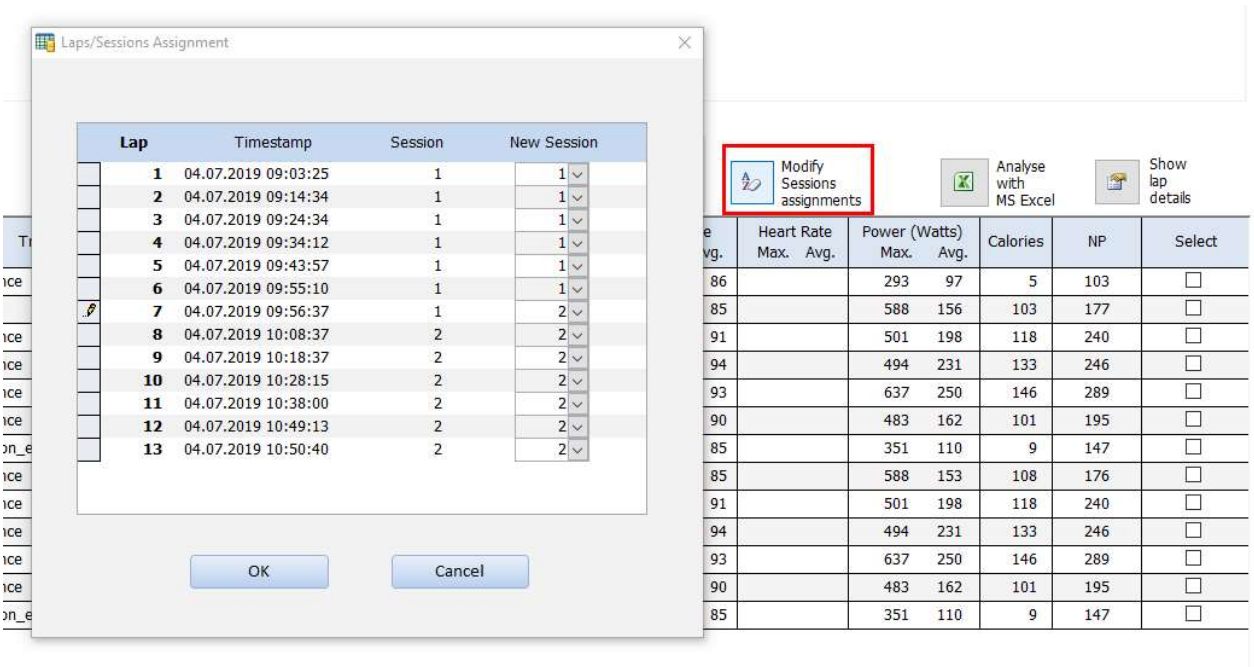
Typical issue is that the “next session” key on the device was pressed at a wrong moment during the recording of a triathlon/multi session activity. Now all data is present, your activity consists of 5 sessions, but a part of the records are assigned to a wrong session and need to be shifted to the right session.

I want to suggest the following 2 steps strategy to fix the issue:

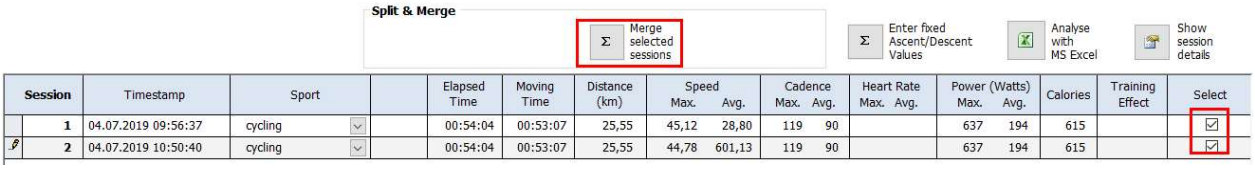
1.) Place a new lap marker at the positions where a new session is supposed to start.
You can do this by scrolling in the data records in register page “Records”, then select the first record which is supposed to be assigned to the next session, and then click on the button“lap” and now select the command “Add a new Lap”.



2.) Select register page “Sessions and Laps” and click on the button “Modify Sessions assignments”. Here you can modify the lap/session structure of your activity.



In addition you can make use of the function “Merger selected sessions” if your activity contains 6 sessions instead of 5:



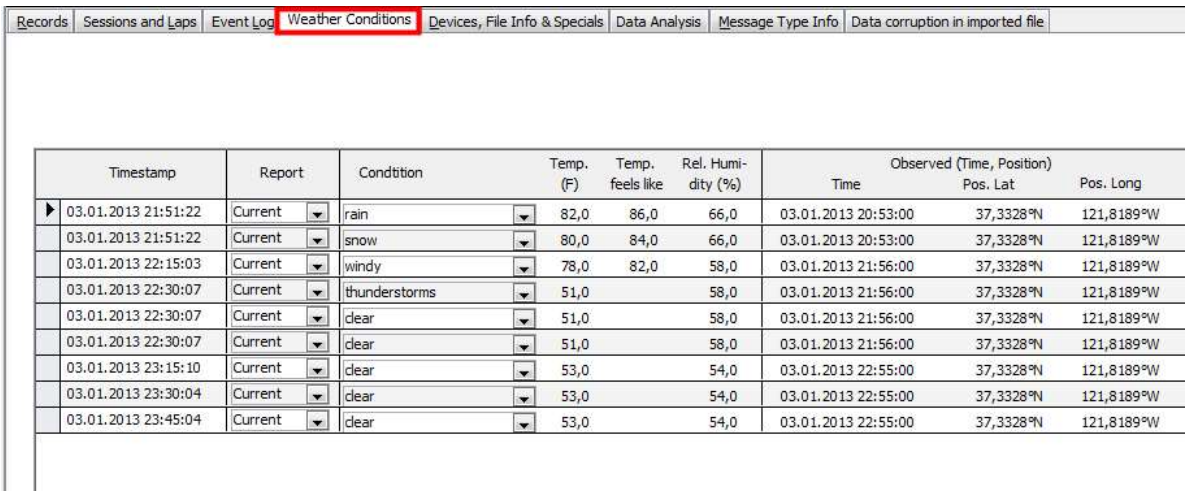
Session	Timestamp	Sport		Elapsed Time	Moving Time	Distance (km)	Speed Max.	Speed Avg.	Cadence Max.	Cadence Avg.	Heart Rate Max.	Heart Rate Avg.	Power (Watts) Max.	Power (Watts) Avg.	Calories	Training Effect	Select
1	04.07.2019 09:56:37	cycling		00:54:04	00:53:07	25,55	45,12	28,80	119	90			637	194	615		☑
2	04.07.2019 10:50:40	cycling		00:54:04	00:53:07	25,55	44,78	601,13	119	90			637	194	615		☑

11. Message Type Info

The “**Message Type Info**” page gives you a summary of the records which have been imported from the fit file. It might be interesting to you that the message type 34 (“Activity”) normally appears exactly 1 time and is one of the final records in fit files. If your fit file contains no activity record then this is a hint that the final part of the fit file is missing – this includes the possibility of missing data records (data records contain GPS data/speed values, heart rate values) etc. at the end of your activity.

12. Weather Conditions

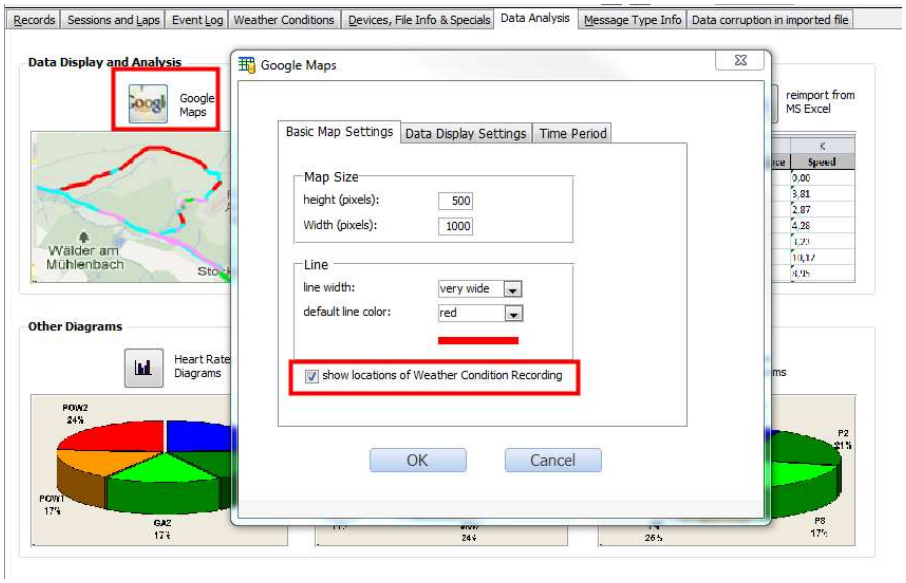
If a fit file contains Weather Conditions data then this information will be displayed on the **“Weather Conditions”** page.



Timestamp	Report	Condition	Temp. (F)	Temp. feels like	Rel. Humidity (%)	Observed (Time, Position) Time	Pos. Lat	Pos. Long
03.01.2013 21:51:22	Current	rain	82,0	86,0	66,0	03.01.2013 20:53:00	37,3328°N	121,8189°W
03.01.2013 21:51:22	Current	snow	80,0	84,0	66,0	03.01.2013 20:53:00	37,3328°N	121,8189°W
03.01.2013 22:15:03	Current	windy	78,0	82,0	58,0	03.01.2013 21:56:00	37,3328°N	121,8189°W
03.01.2013 22:30:07	Current	thunderstorms	51,0		58,0	03.01.2013 21:56:00	37,3328°N	121,8189°W
03.01.2013 22:30:07	Current	clear	51,0		58,0	03.01.2013 21:56:00	37,3328°N	121,8189°W
03.01.2013 22:30:07	Current	clear	51,0		58,0	03.01.2013 21:56:00	37,3328°N	121,8189°W
03.01.2013 23:15:10	Current	clear	53,0		54,0	03.01.2013 22:55:00	37,3328°N	121,8189°W
03.01.2013 23:30:04	Current	clear	53,0		54,0	03.01.2013 22:55:00	37,3328°N	121,8189°W
03.01.2013 23:45:04	Current	clear	53,0		54,0	03.01.2013 22:55:00	37,3328°N	121,8189°W

Some of these values can be edited here.

If you use the GoogleMaps display feature of the Fit File Repair Tool you can decide if the weather observation positions should also appear in the display of your activity.

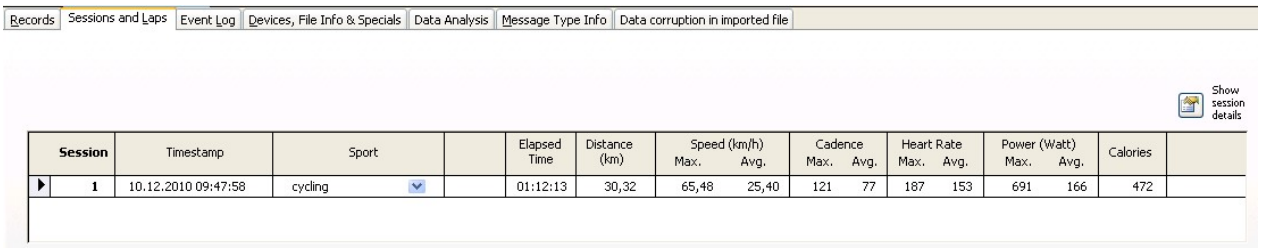


They will be displayed by markers on the map.

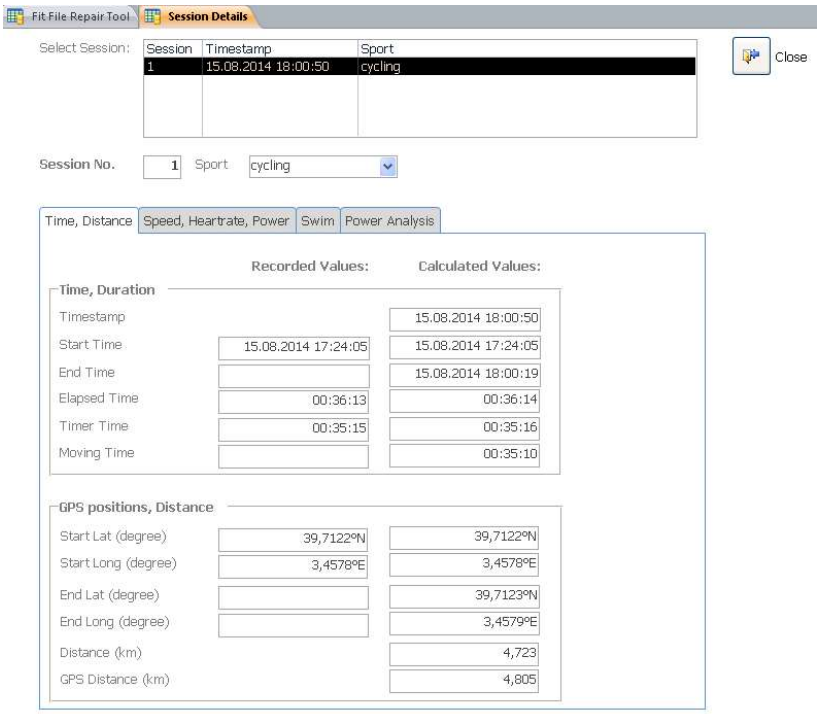
13. Editing Session and Lap Data

13.1. Session Data on the page “Sessions and Laps”

Here you get a list of the sessions contained in the current activity. If required you can change the sport type of each session but all other values are non-editable.



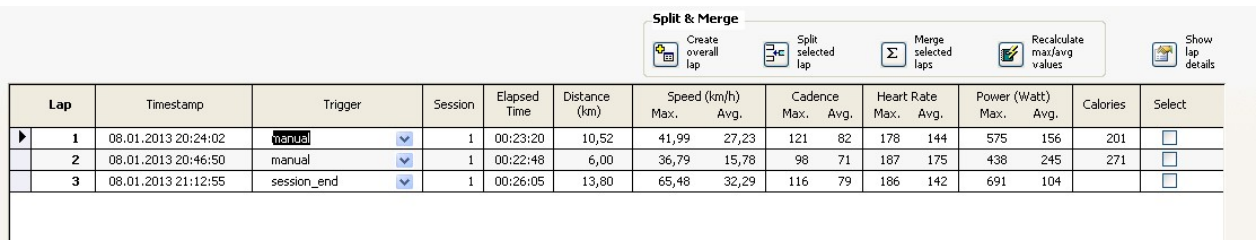
"**Show session details**" opens a new window with many min, max, avg and total values of the sessions.



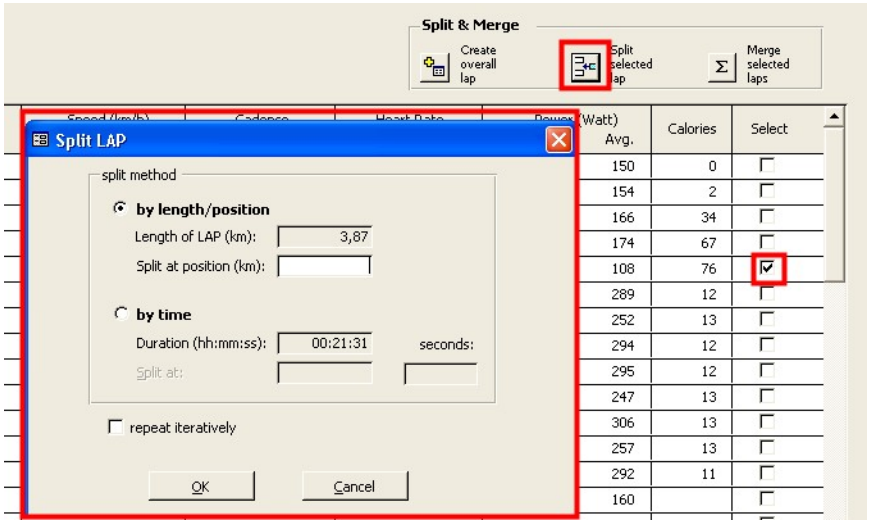
13.2. Lap Functions on the page "Sessions and Laps"

The "**Sessions and Laps**" page gives you information about the lap data imported from the fit file. Don't worry about corrupted data here: all lap values (except calories values) are being recalculated during the export process - just make sure that all corrupted data records are deleted and the exported lap values will be ok.

If your activity contains no laps you can create an initial lap by clicking on the "**create overall lap**" button on the "Lap" page.



“Split selected lap” – this function allows you to split a selected lap at a certain point. The splitting point can be selected by distance (length/position) or by time.

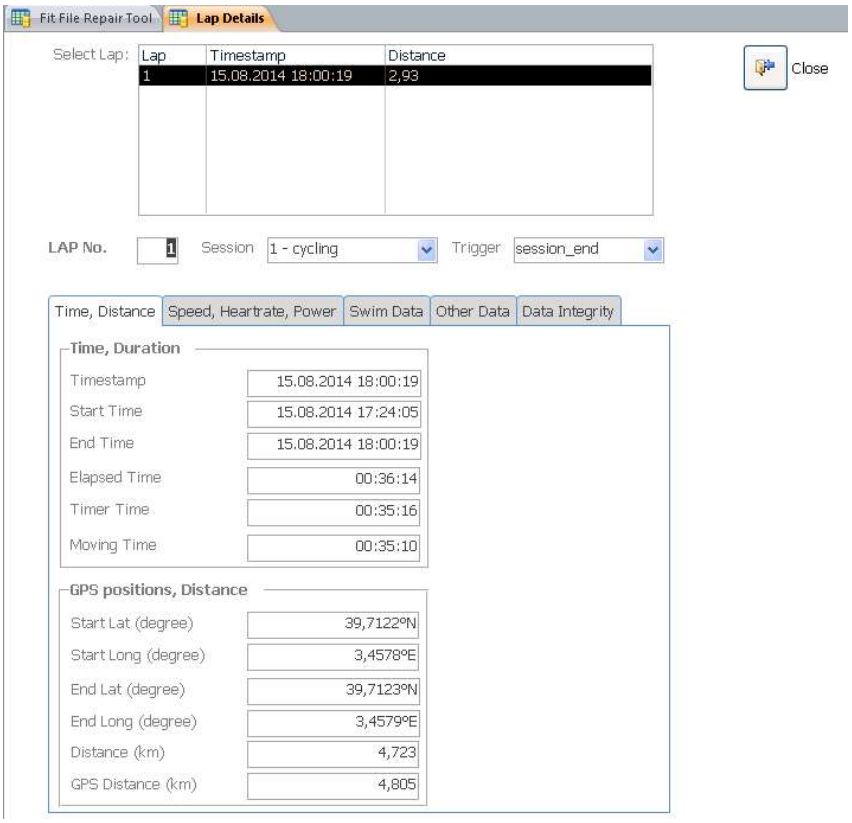


The “repeat iteratively” option enables you to perform several splits at once.

Example: your 30 minute activity doesn’t contain any laps and you want a lap calculated every 5 minutes. First you use the “Create Overall Lap” to create a lap which covers the entire activity period, next you use the “Split selected lap” function, select the option “by time”, fill in 00:05:00 and select the “repeat iteratively” option. The result is the splitting of your activity into 6 laps of 5 min.

“Merge selected laps” – this function merges two or more selected laps into one lap.

“**Show lap details**” – this function opens a new window and informs you about many min, max, average and total values of each lap.



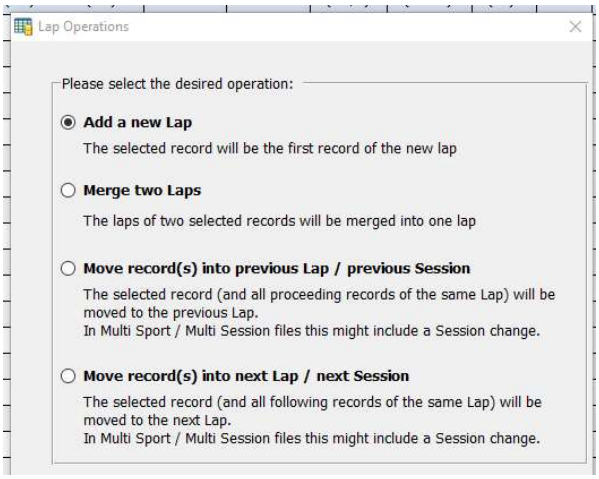
13.3. Lap Functions on the page "Records"

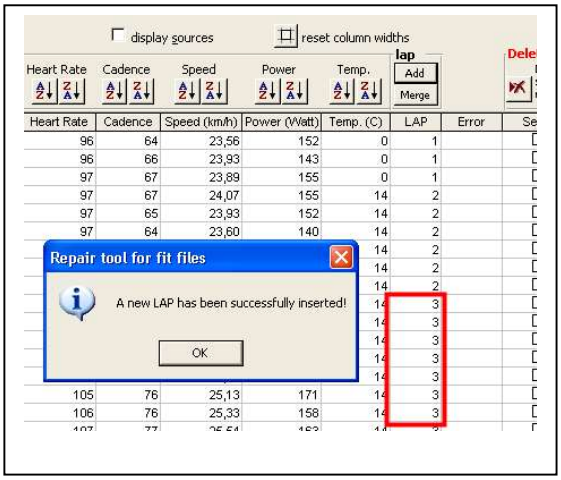
If your activity contains at least one lap then additional lap functions are available on the "Records" page. For each data record the corresponding lap is displayed.

Timestamp	Duration	Position Lat.	Position Long.	Altitude (m)	Distance (km)	Dist. GPS (km)	Heart Rate	Cadence	Speed (km/h)	Power (Watts)	Temp. (°C)	LAP	Error	Select
04.07.2019 09:02:34	00:00:00			54,8	0,00							1		
04.07.2019 09:02:36	00:00:02			54,0								1		
04.07.2019 09:02:42	00:00:08	51,545156°N	7,697176°E	53,8		0,00			6,37			1		
04.07.2019 09:02:48	00:00:14	51,545287°N	7,697134°E	52,8	0,01	0,01			11,25			1		
04.07.2019 09:02:52	00:00:18	51,545368°N	7,697009°E	52,6	0,03	0,03			12,06	0		1		
04.07.2019 09:02:53	00:00:19	51,545382°N	7,696961°E	52,6	0,03	0,03			12,09	93		1		
04.07.2019 09:02:54	00:00:20	51,545402°N	7,696916°E	52,4	0,03	0,03			12,60	93		1		
04.07.2019 09:02:55	00:00:21	51,545423°N	7,696871°E	52,2	0,04	0,04		39	12,97	94		1		
04.07.2019 09:02:56	00:00:22	51,545445°N	7,696819°E	52,2	0,04	0,04		73	14,35	175		1		
04.07.2019 09:02:57	00:00:23	51,545471°N	7,696759°E	52,0	0,05	0,05		73	17,55	167		1		
04.07.2019 09:02:58	00:00:24	51,545495°N	7,696688°E	52,0	0,05	0,05		80	19,00	167		1		
04.07.2019 09:02:59	00:00:25	51,545520°N	7,696612°E	52,0	0,06	0,06		87	20,58	293		1		
04.07.2019 09:03:00	00:00:26	51,545546°N	7,696531°E	51,8	0,07	0,07		96	21,93	243		1		
04.07.2019 09:03:01	00:00:27	51,545573°N	7,696447°E	51,8	0,07	0,07		102	22,67	235		1		
04.07.2019 09:03:02	00:00:28	51,545602°N	7,696362°E	51,8	0,08	0,08		102	23,82	0		1		
04.07.2019 09:03:03	00:00:29	51,545631°N	7,696276°E	51,6	0,09	0,09		102	24,25	0		1		
04.07.2019 09:03:04	00:00:30	51,545659°N	7,696191°E	51,6	0,09	0,09		0	23,28	0		1		
04.07.2019 09:03:05	00:00:31	51,545686°N	7,696110°E	51,4	0,10	0,10		0	22,60	0		1		
04.07.2019 09:03:06	00:00:32	51,545705°N	7,696025°E	51,4	0,10	0,11		0	21,73	0		1		
04.07.2019 09:03:07	00:00:33	51,545729°N	7,695945°E	51,2	0,11	0,11		0	22,00	0		1		
04.07.2019 09:03:08	00:00:34	51,545757°N	7,695871°E	51,2	0,12	0,12		0	21,80	0		1		
04.07.2019 09:03:09	00:00:35	51,545801°N	7,695810°E	50,8	0,12	0,12		0	22,74	0		1		

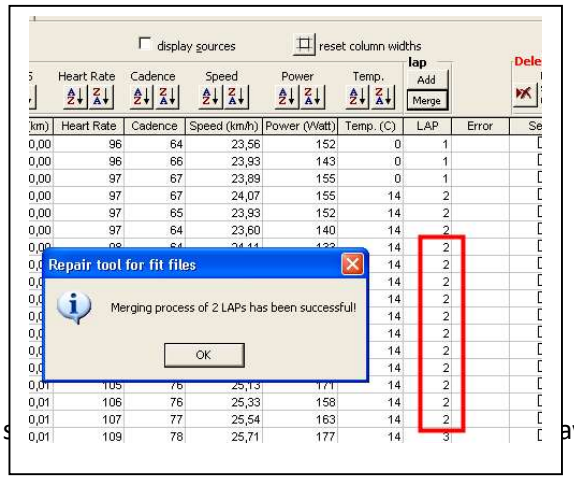
The following Lap functions are available here:

"**Add**" – adds a new lap which starts at the selected position. To use this function, select ONLY the first record for where you want the new lap to commence and then choose the "Add" option.



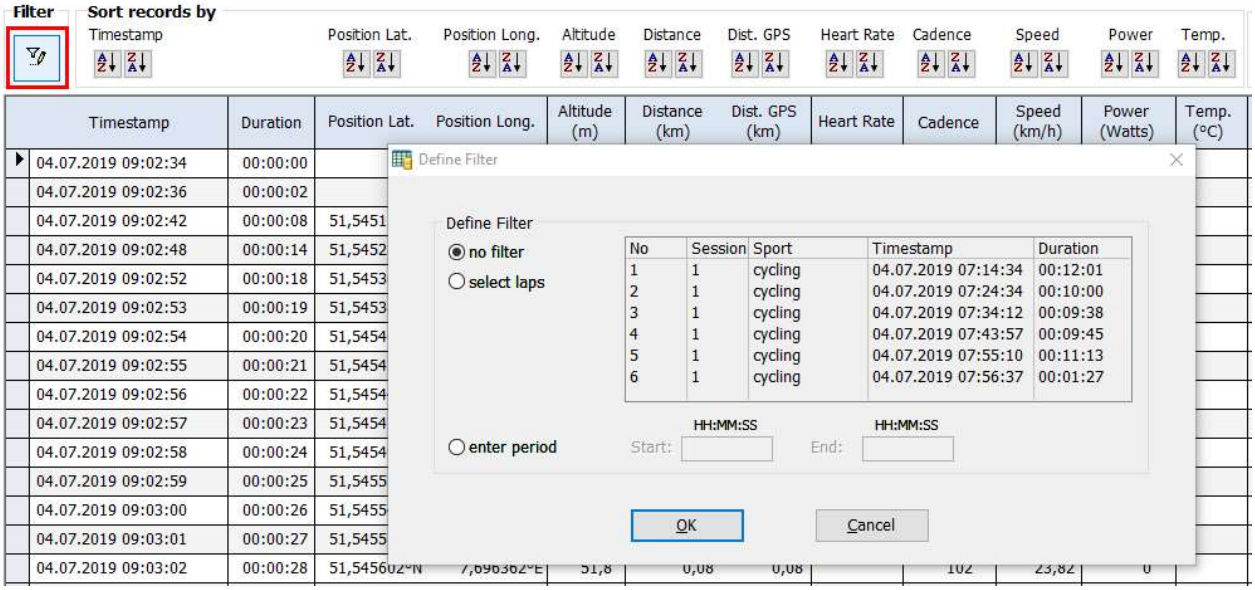


"**Merge**" – merges two laps. Select the last record of the lap AND then the first record of the next lap, then click the "Merge" button.



"Change filter" – this function allows you to s ay.

NOTE - All min/max/avg. values in the form are calculated on the basis of the selected records.

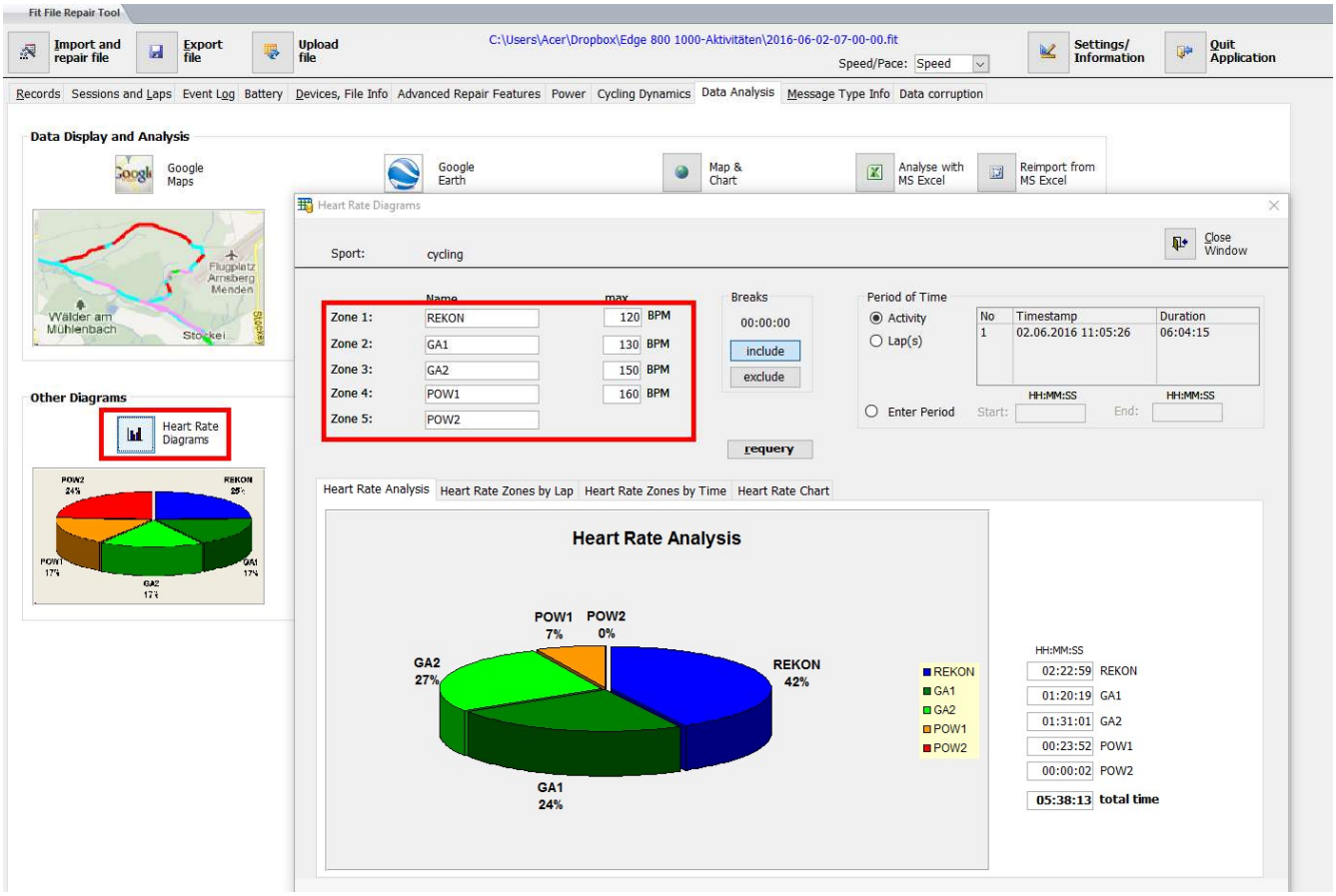


14. Adding “Time in Heart Rate Zone” / “Time in Power Zone” data

This function is intended to add “Time in Heart Rate Zone” data, “Time in Power Zone” data and even “Time in Speed Zone” data to your FIT files.

I will explain this feature for adding “Time in Heart Rate Zone” data, but you can use the same method to add power and speed zone data to your FIT files.

Import any activity file into Fit File Repair Tool, then choose „Heart Rate Diagram“ on Register Tab „Data Analysis“, fill in zone names and BMP values:



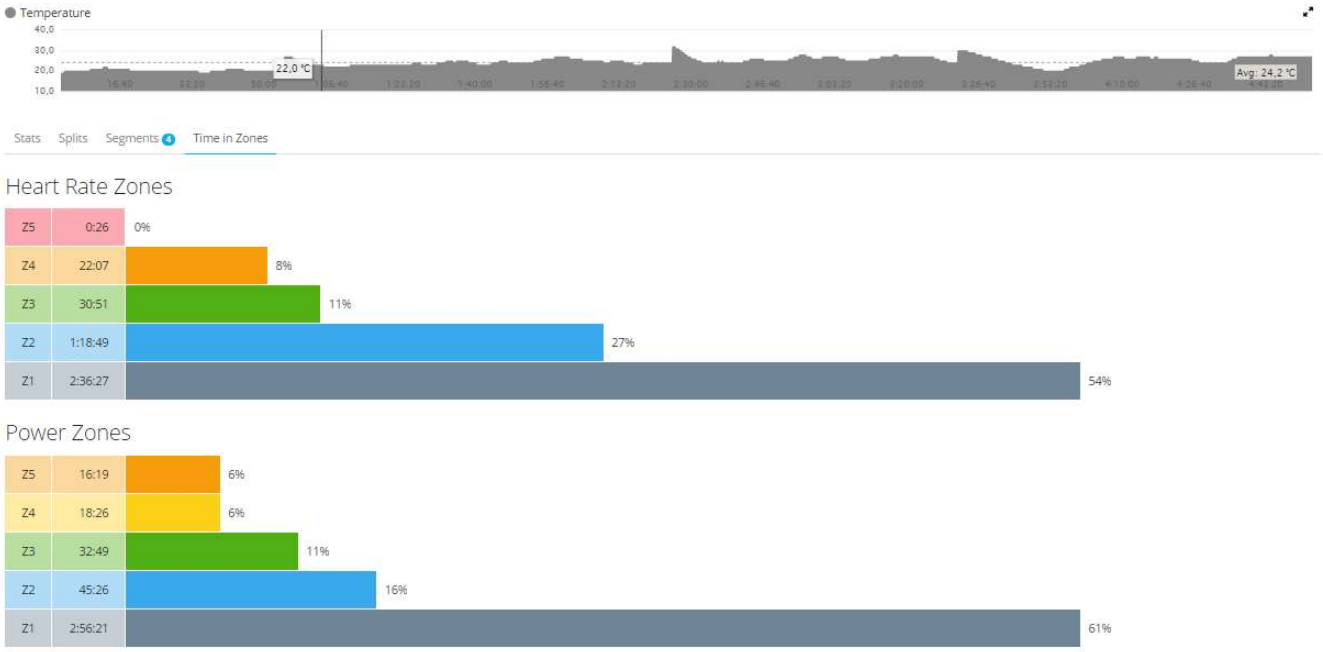
Now choose “Close Window”. Your heart rate zone settings will be saved in a file named “RepairFitFile_PersonalSettings.txt” in your installation folder. That’s all!

Whenever you export data as fit file with Fit File Repair Tool in the future, heart rate zone data will be added to the fit file.

After exporting and (manually) uploading your fit file to Garmin Connect you should be able to select “Time in Zones” and see the diagram which shows the time (absolute and as percentage value) which you spent in the 5 Heart Rate Zones. Please note that using the built In File Uploader transfers this data to Garmin Connect but Garmin

Connect's import function ignores it. The only way to transfer this data to Garmin Connect is export and (manual) upload to Garmin Connect at the moment.

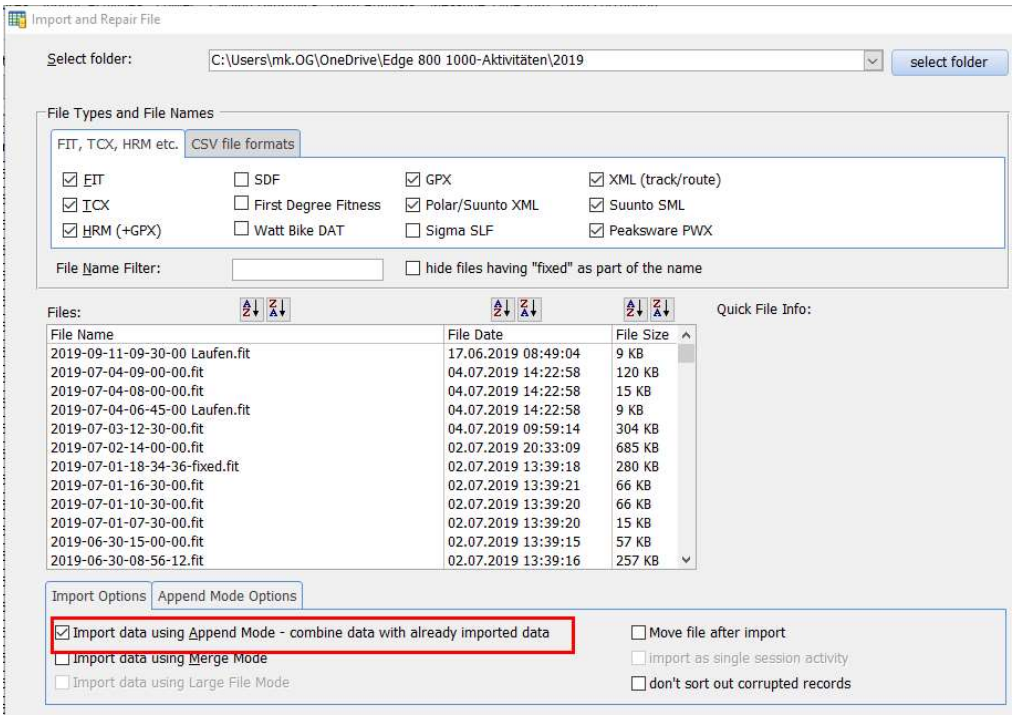
This is an example of how it looks like in Garmin Connect:



Please note that you can use the same way to add "time in power zone" data to your FIT files – and even "Time in Speed Zone" data which is currently NOT displayed in Garmin Connect.

15. Import Using Append Mode

This option is able to be utilised during the import process.

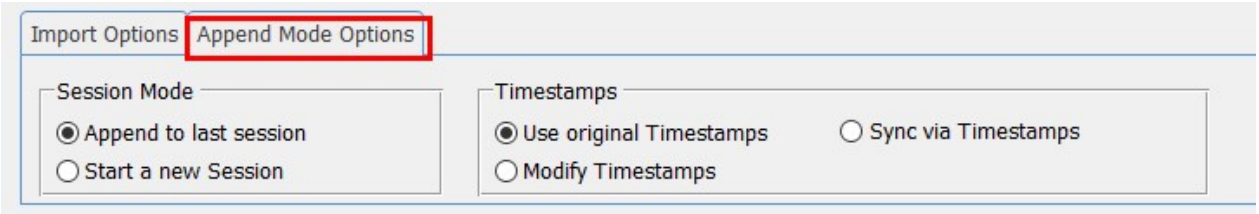


Use this option if you wish to combine the data of two or more activities into one activity. Please make sure you import the activities in the order of their timestamps! Records from the second, third and any follow-on files are attached to the end of the records which you have already imported!

Example: You did an 8 hour ride. The first 5 hours are recorded in a file named “2014-08-20 **10**-00-00.fit”, the final 3 hours are recorded in a file named “2014-08-20 **15**-00-00.fit”. If you want to combine data from these two files into one file, then

(1) Import “2014-08-20 **10**-00-00.fit”
(2) Import “2014-08-20 **15**-00-00.fit” and select the “Append Mode” option
(3) Export your data into a new file

The following options can be chosen:



Session Mode: Please specify if the contents of the file you are going to import should be saved in the session of the first file or if a new session should be created.

Timestamps: Please select how timestamps should be handled:
(a) **Use original Timestamps**: All data of the selected file will be imported. Timestamps are imported without change.

Example:
File 1 contains 500 records with timestamps from 28/8/2014 10:00:00 to 28/8/2014 **10:30:00**
File 2 contains 400 records with timestamps from 28/8/2014 **10:40:00** to 28/8/2014 11:00:00.

After the import of files 1 and 2 there will be 900 records having timestamps from 28/8/2014 10:00:00 to 28/8/2014 11:00:00 with a gap of 10 minutes between 28/8/2014 10:30:00 and 28/8/2014 10:40:00.

(b) **Modify Timestamps**: All data of the selected file will be imported. Timestamps in the file which is going to be imported are modified. The Repair Tool looks for the last timestamp in the records already imported and modifies timestamps in the file which is going to be imported so that they start where the previously imported records end.

Example:
File 1 contains 500 records with timestamps from 28/8/2014 10:00:00 to 28/8/2014 **10:30:00**
File 2 contains 400 records with timestamps from 28/8/2014 **10:40:00** to 28/8/2014 11:00:00.

During the import of file 2, the timestamps will be changed by -10 minutes to close the gap between 10:30:00 and 10:40:00. After the import of files 1 and 2 there will be 900 records having timestamps from 28/8/2014 10:00:00 to 28/8/2014 10:50:00 (without any gap).

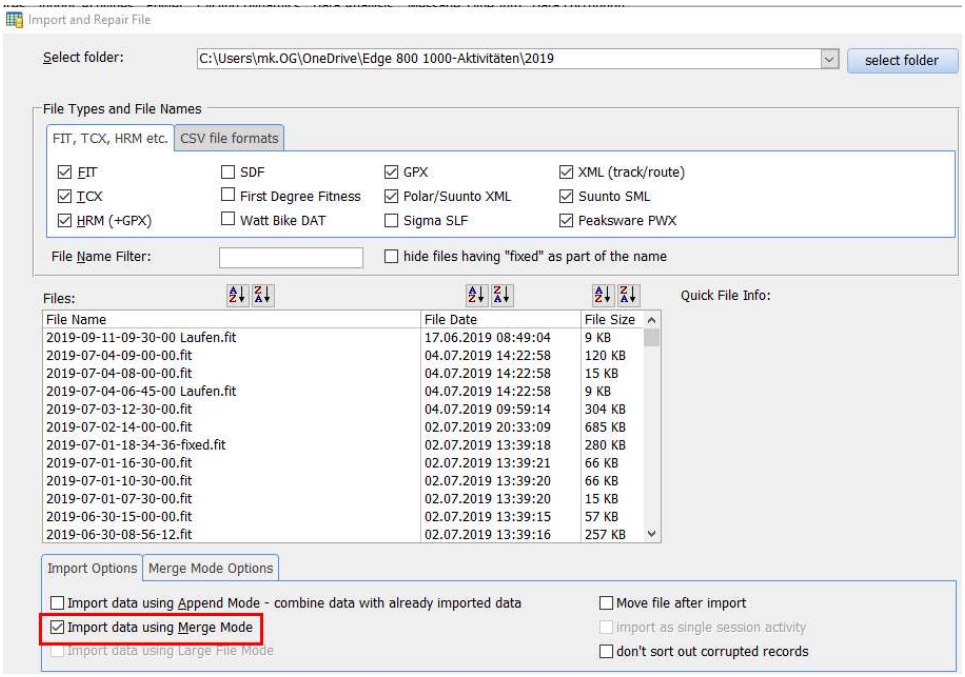
(c) **Sync via Timestamps**: Not all data of the selected file will be imported. The Repair Tool compares the already imported data with the data in the selected file and imports only records which have a timestamp AFTER the last timestamp of the previously imported records.

Example:
File 1 contains 500 records with timestamps from 28/8/2014 10:00:00 to 28/8/2014 **10:30:00**
File 2 contains 100 records with timestamps from 28/8/2014 **10:20:00** to 28/8/2014 11:30:00
and 300 records with timestamps from 28/8/2014 10:30:01 to 28/8/2014 11:00:00.

During the import of file 2 all data with timestamps between 10:20:00 and 10:30:00 will NOT be imported. After the import of files 1 and 2 there will be 800 records with timestamps from 28/8/2014 10:00:00 to 28/8/2014 11:00:00. The 100 records of file 2 having timestamps between 10:20:00 and 10:30:00 will not be imported.

16. Import Using Merge Mode

This option is able to be utilised during the import process. Use this option if you recorded ONE activity with multiple devices and want to combine data from two recordings which cover the same activity.

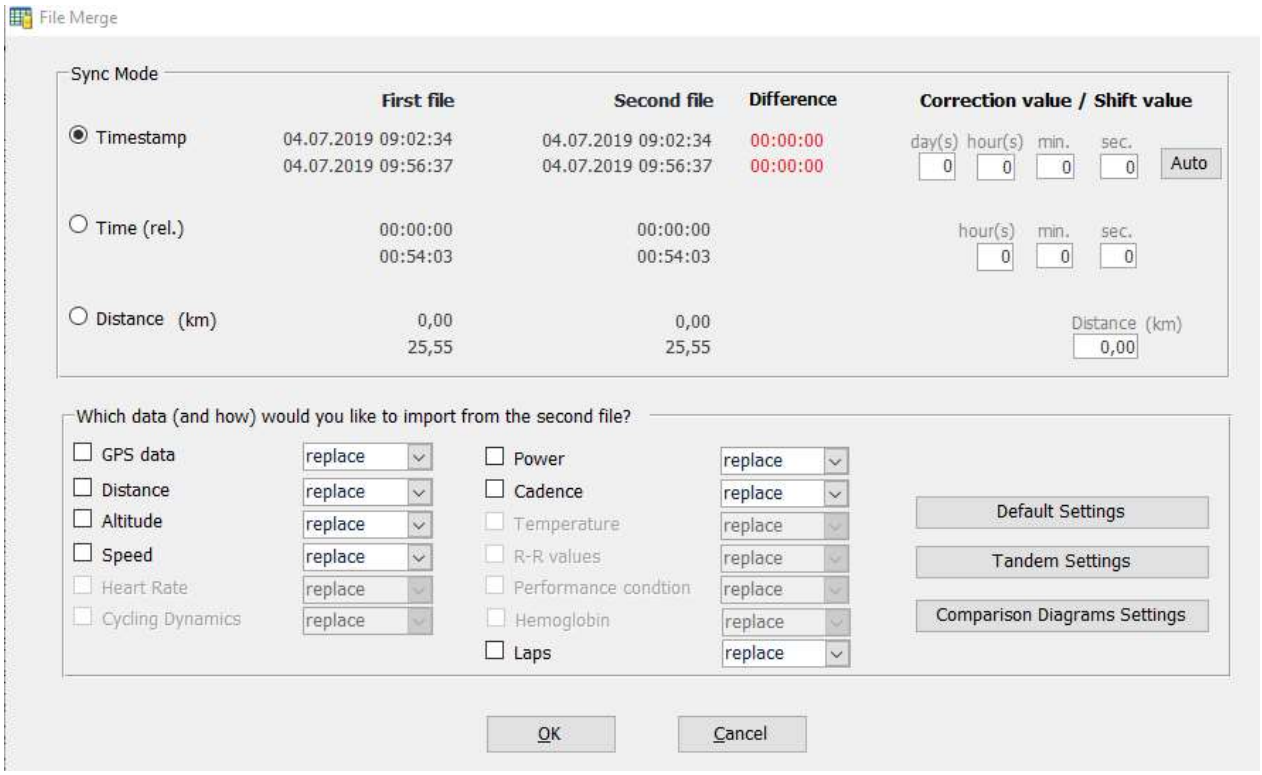


Please use this option if you want to merge the data from two activity files. This makes sense if you used two training devices during your activity, for instance one device for recording GPS data, Cadence, Speed etc. and a second device to record power and/or cadence values. If the data values are stored in FIT, TCX or HRM file format they can be merged with this feature.

To merge data please do the following:

(1) Import the first file
(2) Import the second file and activate the option “Merge Mode”

The following form will appear after the import process with Merge Mode and allow you to synchronize the two files in different ways:

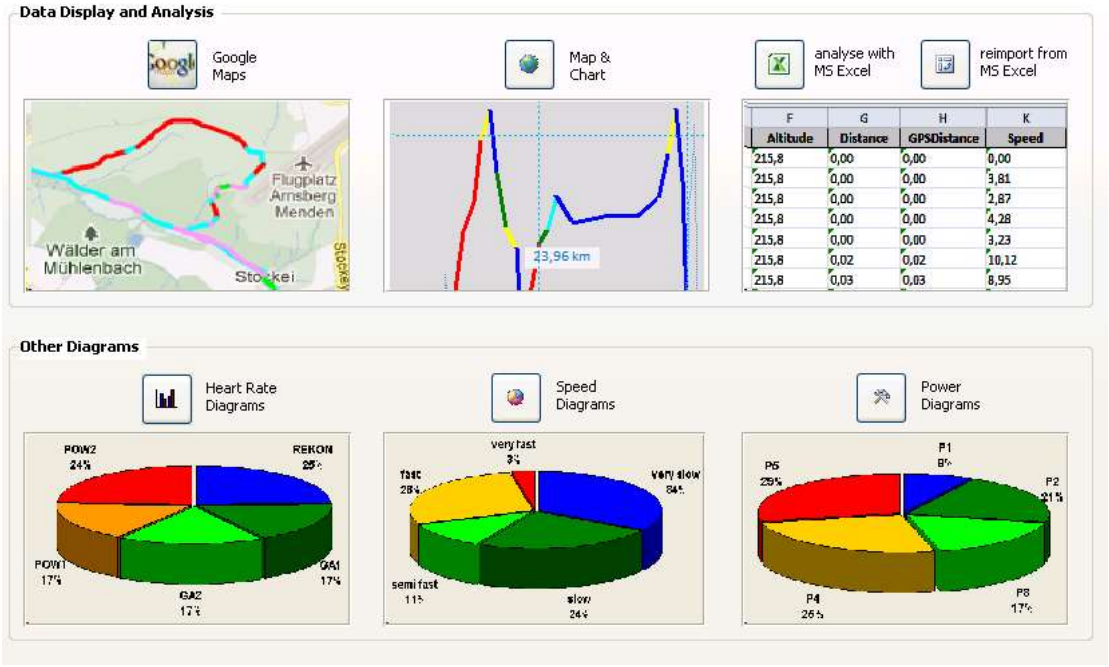


If both files contain **timestamps** the synchronization via timestamps will be the best solution. Otherwise you could use the fields **Time (relative)** or **Distance** for synchronization of the two files. **Time (relative)** will not be a good option if your devices handle break times in different ways.

Select the data which you would like to import from the second file and then click OK.

17. Data Analysis

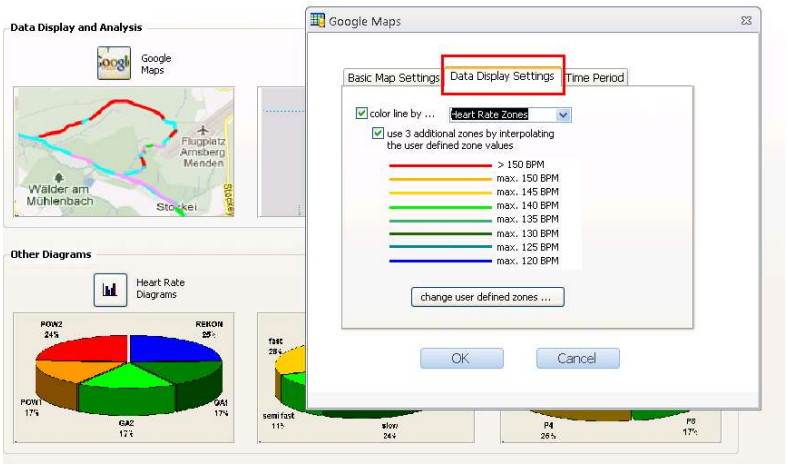
The Diagram functions including a Google Maps Export feature are located on the “Data Analysis” page.

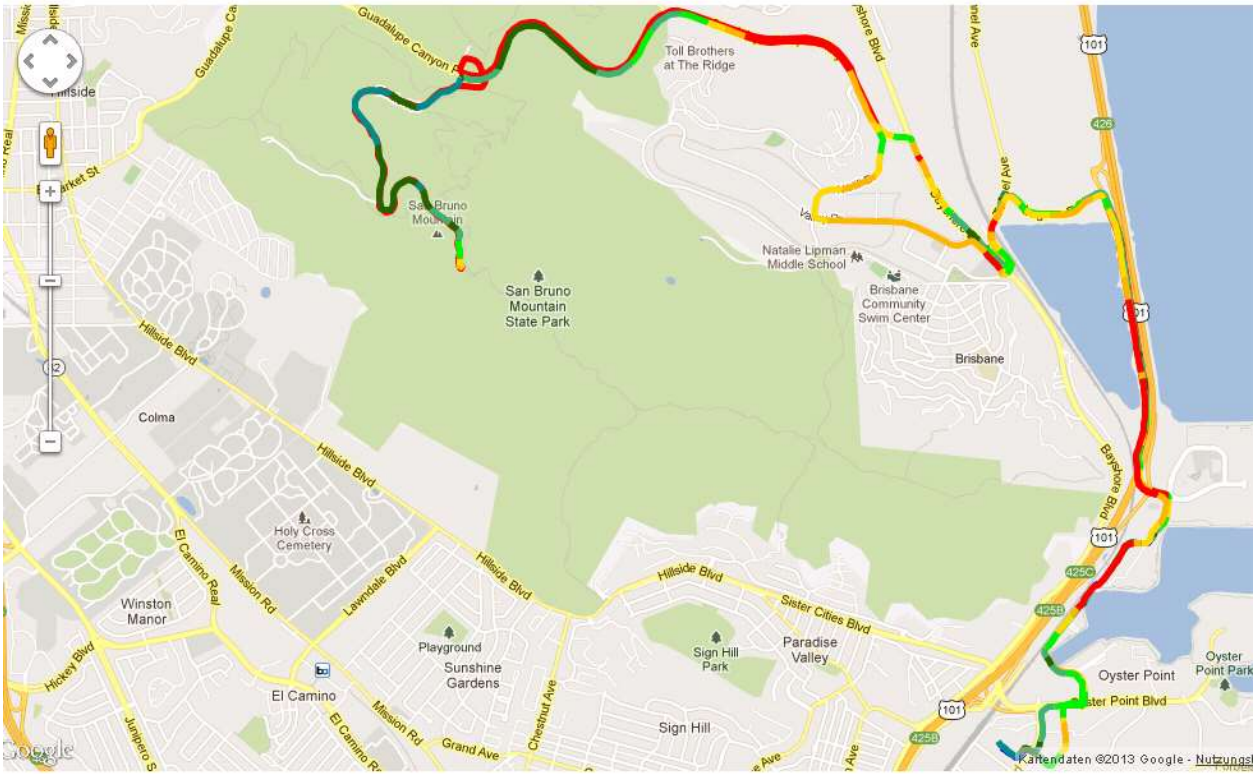


17.1. Google Maps

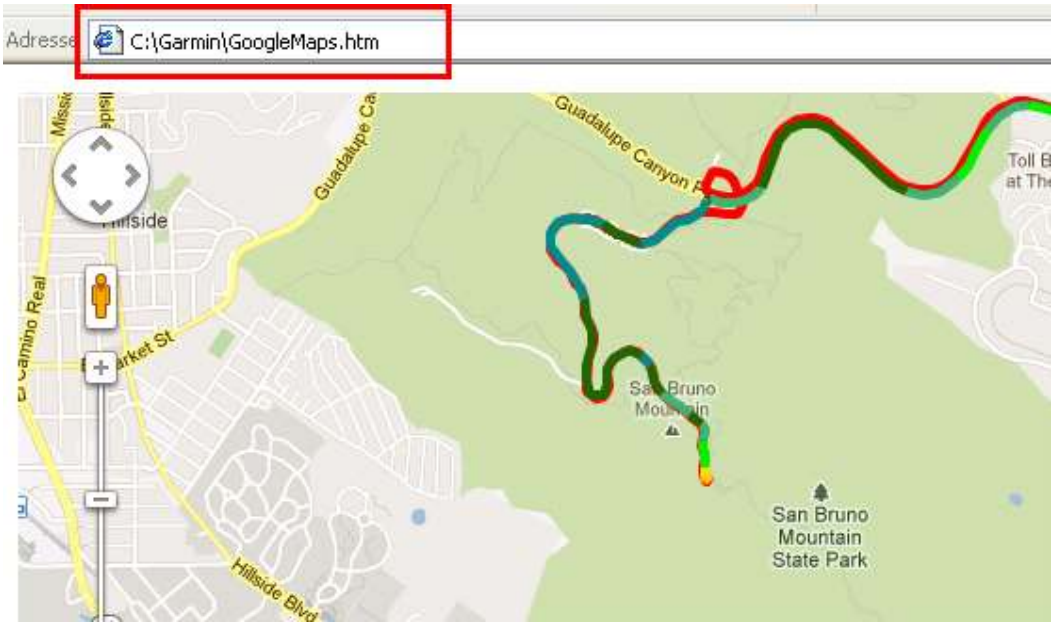
“**Google Maps**” enables you to display the track of your current activity via Google Maps.

Optionally you can create a colored line and select a data type (speed zone, heart rate zone, power zone) for the color display.



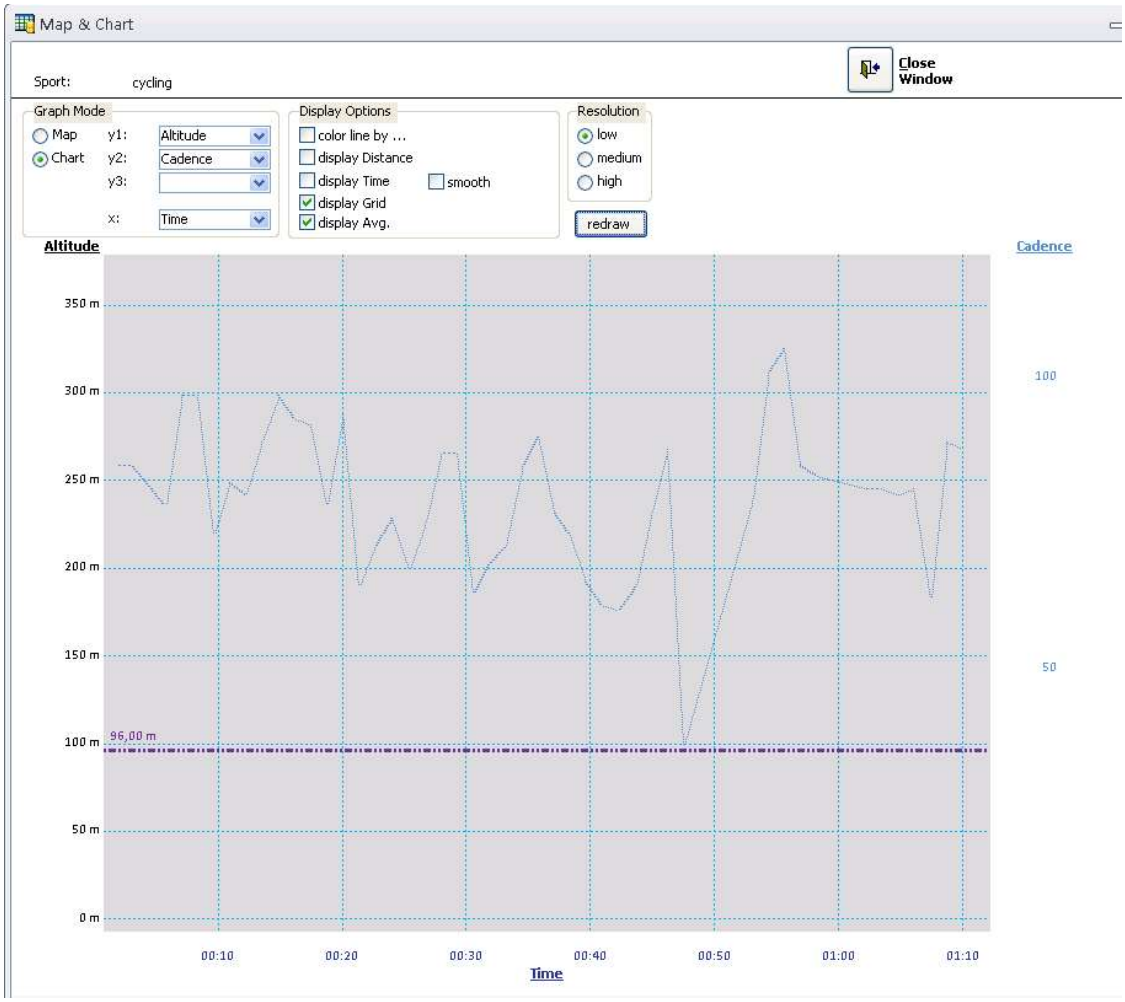


NOTE - the Repair Tool creates an html file using Java Script. The file is named “GoogleMaps.htm” and is stored in the Fit File Repair Tool installation folder. You will see the full path in your browser as soon as it is opened by the Repair Tool. This file can be used independently from the Repair Tool – you can send this file to your friends via e-mail and it will display on their computer (even a Mac, Linux etc.) without them having to install the Repair Tool first.



17.2. Map and Chart

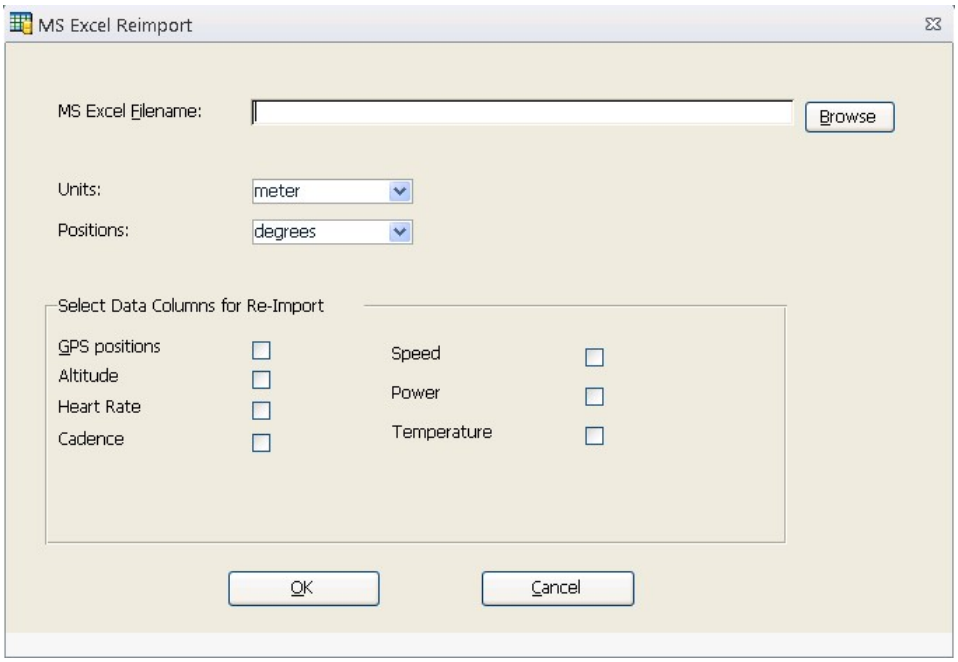
"**Map and Chart**" enables you to create Maps (without Google Maps) and Charts with various data from the current activity.



Some of them may be helpful to you – just play around with this feature!

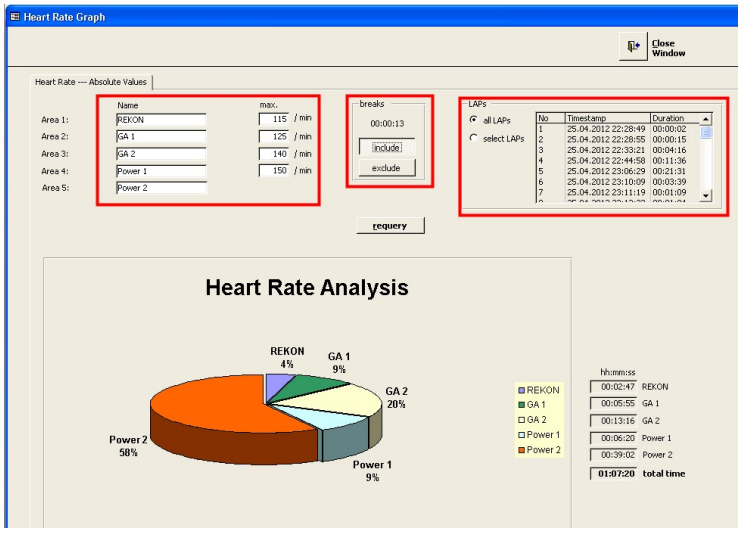
17.3. MS Excel (export and re-import)

"Analyse with MS Excel" exports the data from the current activity into MS Excel for analysis and editing. Provided you don't change the spreadsheet structure in MS Excel, you can reimport the edited data back into the Repair Tool later on using the "Reimport from MS Excel" button.

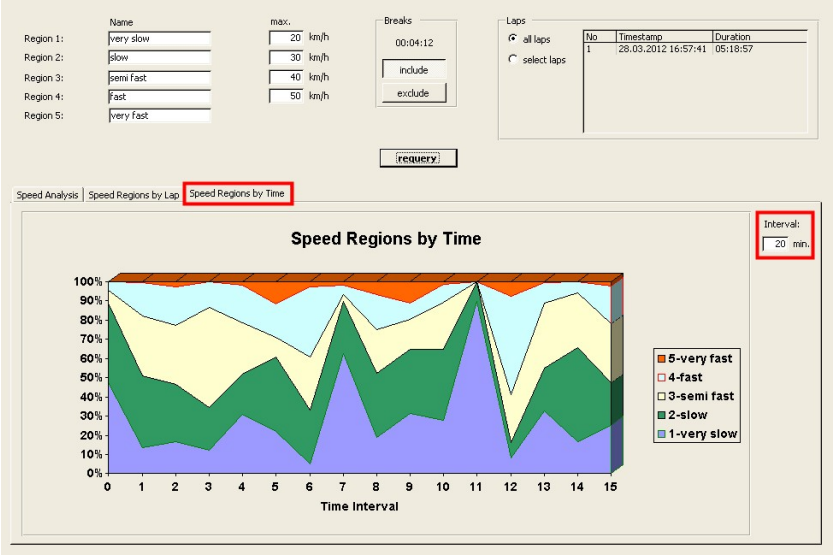


17.4. Heart Rate / Speed / Power Diagrams

Diagrams allow you to create heart rate/speed/power diagrams. You can define up to 5 heart rate/speed/power zones and do calculations including
- with or without break times
- for the whole activity, for selected laps or a specific period of time



Diagrams can be drawn as either pie or bar charts in dependence on laps or time periods whose length you can specify (default: 10 min.).

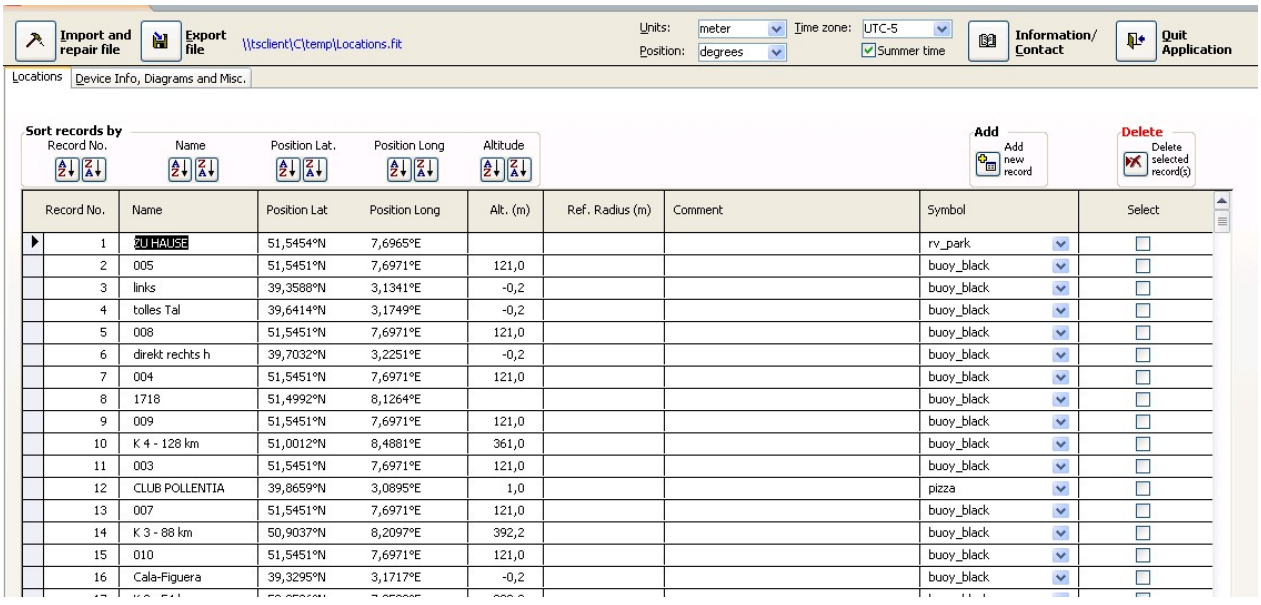


18. Edit Locations.fit

Importing the file which contains locations is done the same way as if you are importing an activity .fit file – the only difference is that you will select the “locations.fit” file.

The import function will recognize the file type correctly provided the file is not corrupt.

After the end of the import process the “Locations” page will be shown.



Record No.	Name	Position Lat	Position Long	Alt. (m)	Ref. Radius (m)	Comment	Symbol	Select
1	ZU HAUSE	51,5454°N	7,6965°E				rv_park	
2	005	51,5451°N	7,6971°E	121,0			buoy_black	
3	links	39,3588°N	3,1341°E	-0,2			buoy_black	
4	tolles Tal	39,6414°N	3,1749°E	-0,2			buoy_black	
5	008	51,5451°N	7,6971°E	121,0			buoy_black	
6	direkt rechts h	39,7032°N	3,2251°E	-0,2			buoy_black	
7	004	51,5451°N	7,6971°E	121,0			buoy_black	
8	1718	51,4992°N	8,1264°E				buoy_black	
9	009	51,5451°N	7,6971°E	121,0			buoy_black	
10	K 4 - 128 km	51,0012°N	8,4881°E	361,0			buoy_black	
11	003	51,5451°N	7,6971°E	121,0			buoy_black	
12	CLUB POLLENTIA	39,8659°N	3,0895°E	1,0			pizza	
13	007	51,5451°N	7,6971°E	121,0			buoy_black	
14	K 3 - 88 km	50,9037°N	8,2097°E	392,2			buoy_black	
15	010	51,5451°N	7,6971°E	121,0			buoy_black	
16	Cala-Figuera	39,3295°N	3,1717°E	-0,2			buoy_black	

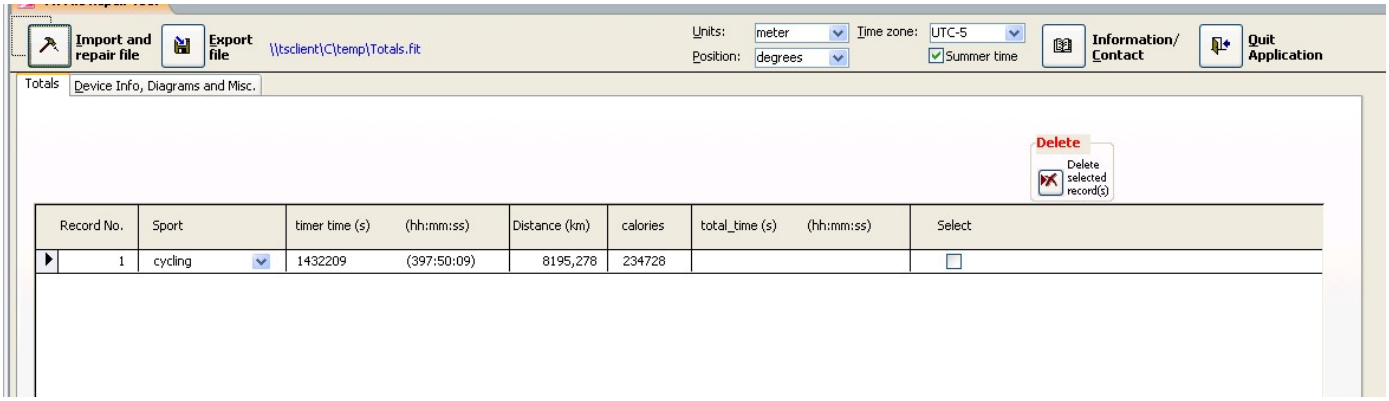
You can edit almost all values, add new records and delete records. After editing you can save the file on your PC or your fitness device by using the “Export File” button.

19. Edit Totals.fit

Importing the file which contains total values is done the same way as if you are importing an activity .fit file – the only difference is that you will select the “totals.fit” file.

The import function will recognize the file type correctly provided the file is not corrupt.

After the end of the import process the page “Totals” will be shown.



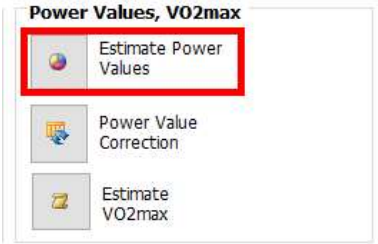
You can edit almost all values and delete records if required. After editing you can save the file on your PC or your fitness device by using the “Export File” button.

20. Creating a ZWIFT Workout from a “Real World Activity”

Step 1: Import a recorded Activity into Fit File Repair Tool

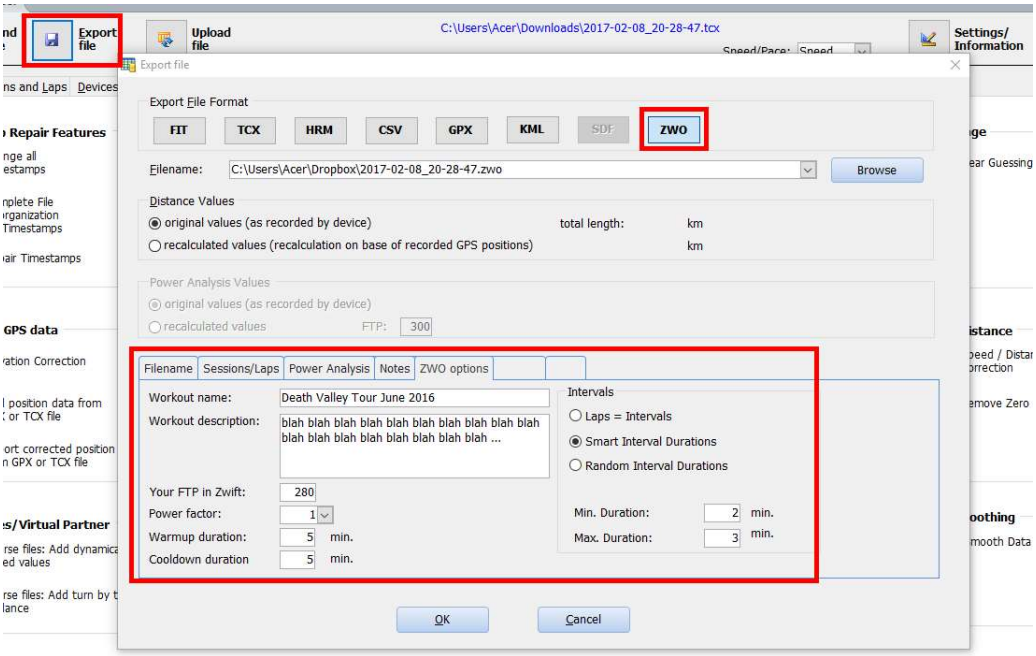
Import your activity as FIT/TCX/HRM file into Fit File Repair Tool.

If your activity doesn’t contain power values you have to use the function “Estimate Power Values” on register tab “Advanced Repair Features” to add Power Values.



Step 2: Export your Activity as ZWIFT Workout

Use the command “Export File” to save your data as ZWIFT workout in the ZWO (**Z**WIFT **W**ork**o**ut) file format:



You can define a Workout Name, add a description (be careful with special characters like ÄÖÜ, Zwift doesn’t import them properly), specify your FTP value in Zwift and define the length of the warmup and cooldown phase.

There are three ways to define how intervals will be calculated:

Laps = Intervals:

This option is available if your activity contains more than one lap. Every lap is turned into an interval of your workout.

Smart Intervals:

Given a minimum and a maximum length the Repair Tool will try to calculate best splits of your activity. The algorithm tries to build intervals of your activity which have similar power values and to start a new interval when power data changes (and the minimum duration is reached).
This is a difficult algorithm, requires some time of calculation and will be improved in the next versions. Feedback to this option is welcome!

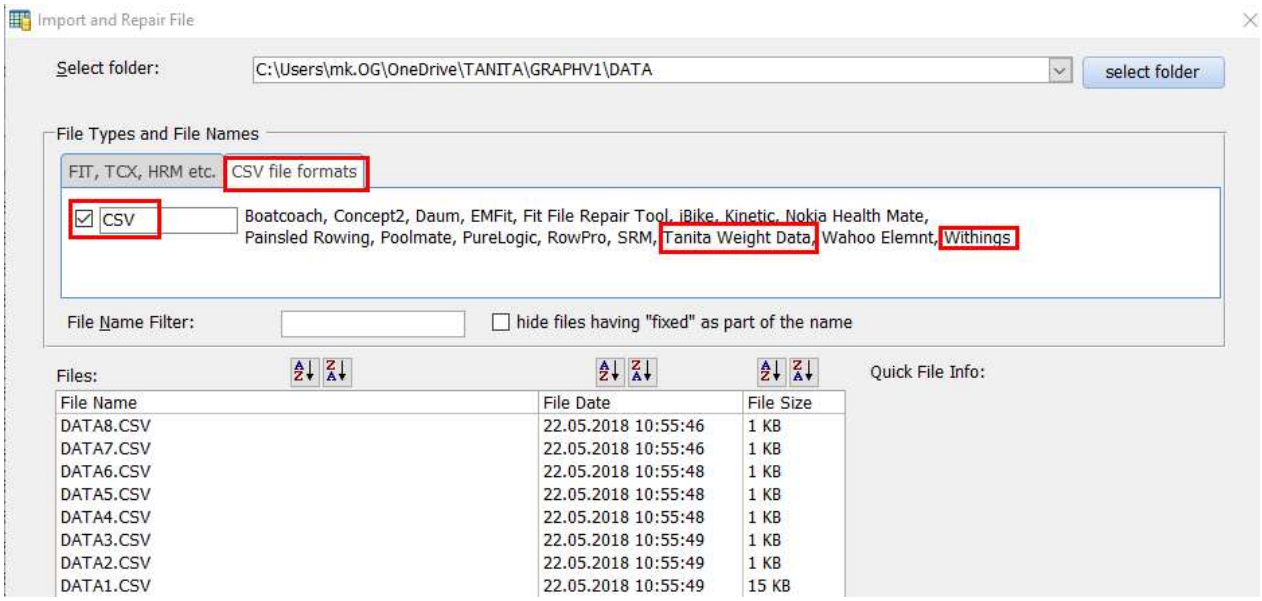
Random Intervals:

Given a minimum and a maximum length the Repair Tool will calculate intervals with random durations. The average power of the intervals is calculated and passed to Zwift as power value for the interval.

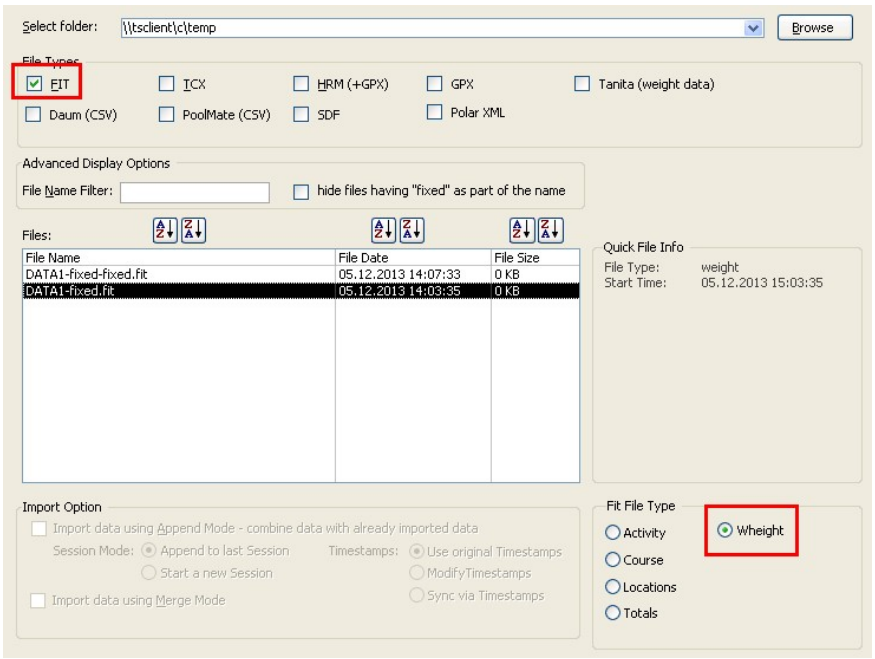
21. Tanita/Withings and .FIT Weight Files

21.1. Import weight data files

You can import weight files in the TANITA or Withings file format:



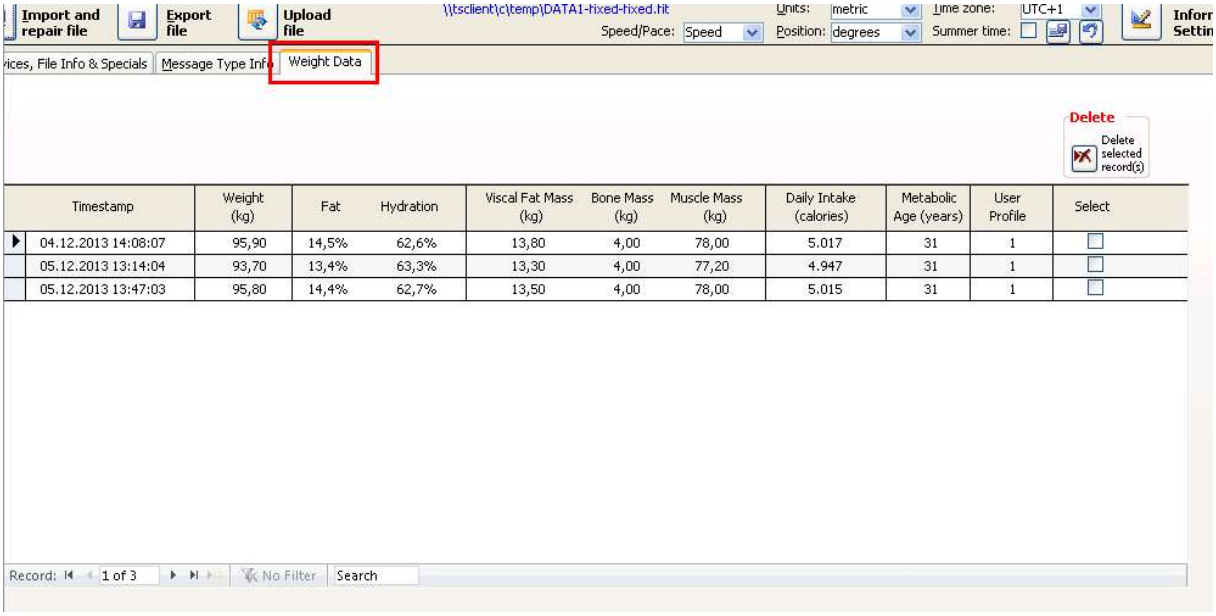
You also can import weight files in the .fit file format (for instance from G:\Garmin\Weight where “G:” stands for the device letter of your Garmin device):



The Fit File Type should be recognized automatically after selecting a fit file.

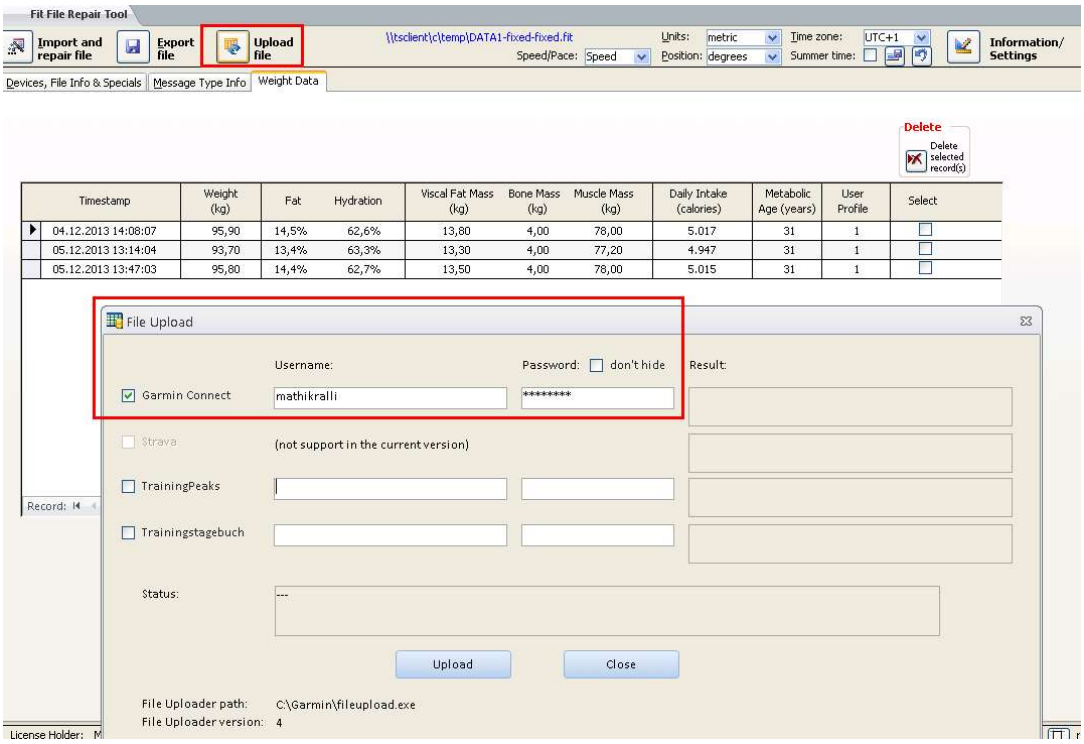
21.2. Display and Edit Data

After the import the weight data should be shown on the screen and can be edited:



21.3. Export or upload weight data

Please use the export function to export the weight data into a fit file – or use the upload feature to upload data directly to Garmin Connect.

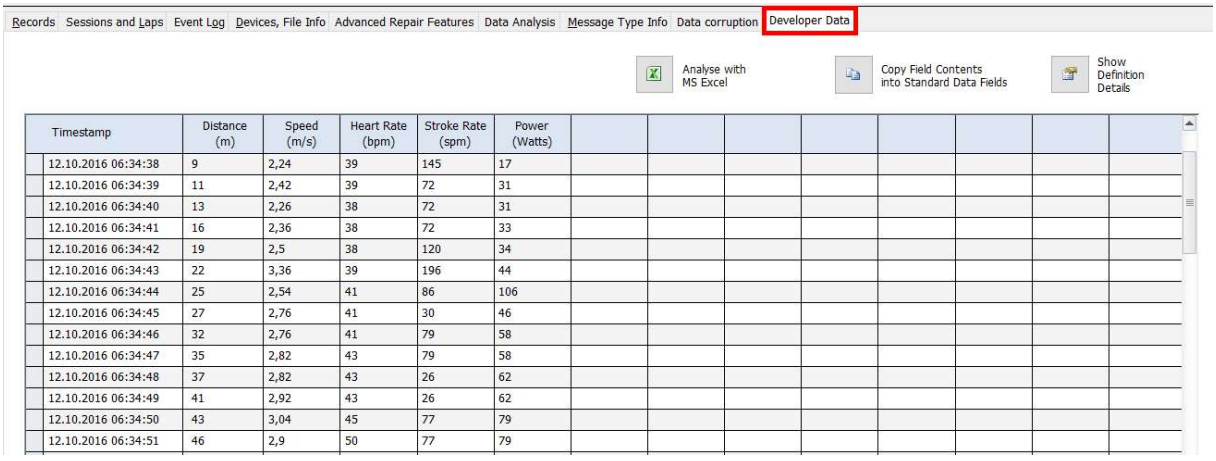


22. CIQ Data Fields / Developer Data Fields / FIT 2.0 file format

In 2016 the FIT file format was modified, the new file format is named “FIT 2.0”. The difference to “FIT 1.0” is the existence of “Developer Data Fields” in FIT files which causes a major change of the file structure.

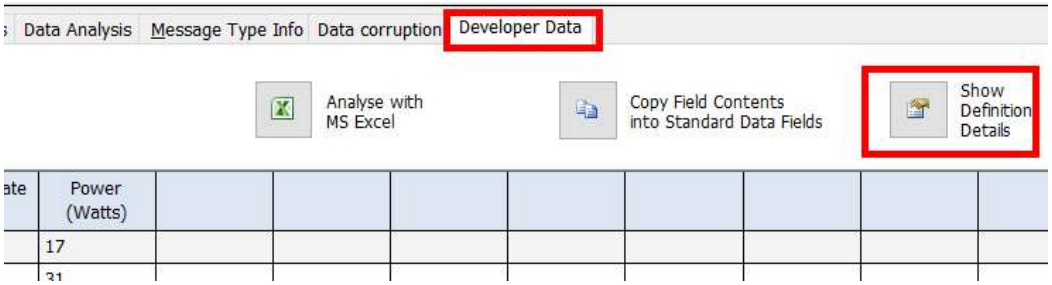
If your device supports CIQ Apps or CIQ Data Fields, your fit files might contain the new Developer Data Fields. Version 8 of the Fit File Repair Tool is the first version which supports FIT 2.0 in regard of import, export and display the contents of Developer Data Fields.

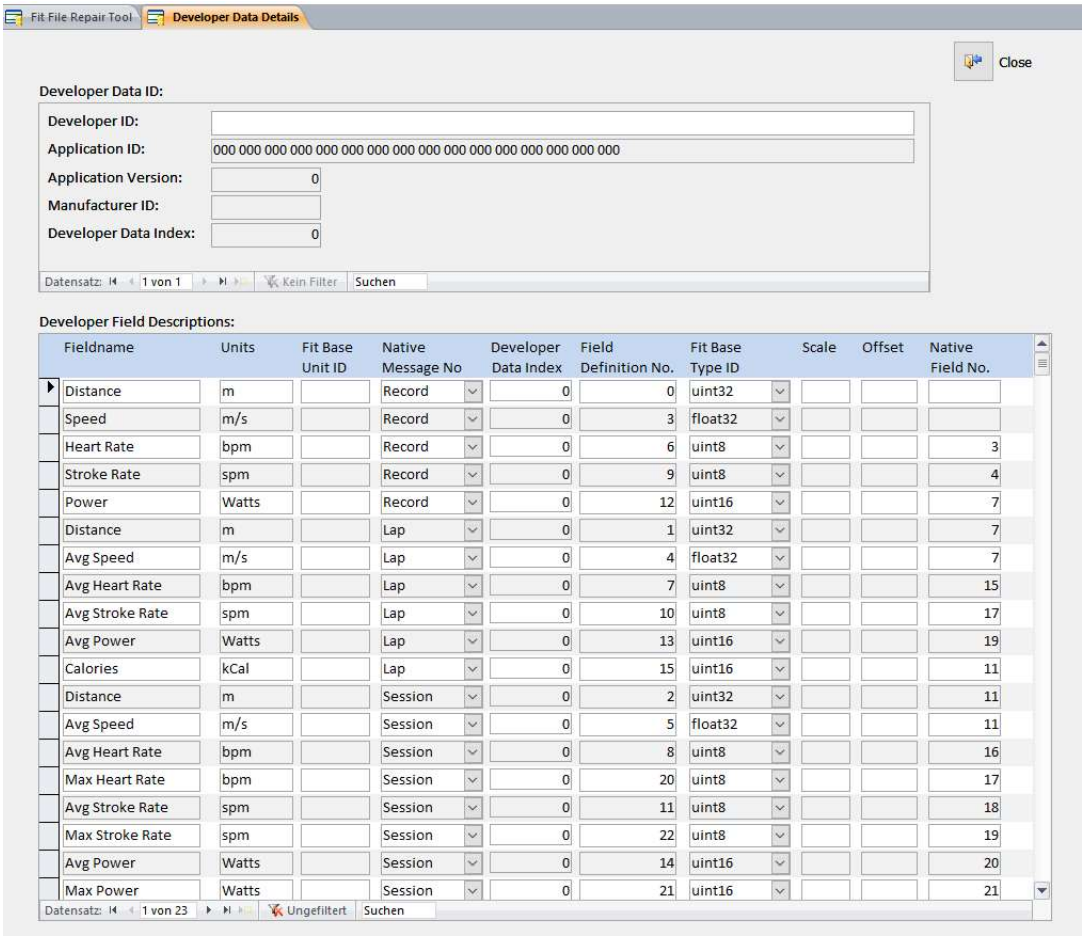
22.1. Register tab “Developer Data”



Note: this register tab will only become visible if your file contains Developer Data Fields which are part of the message type “Record”.

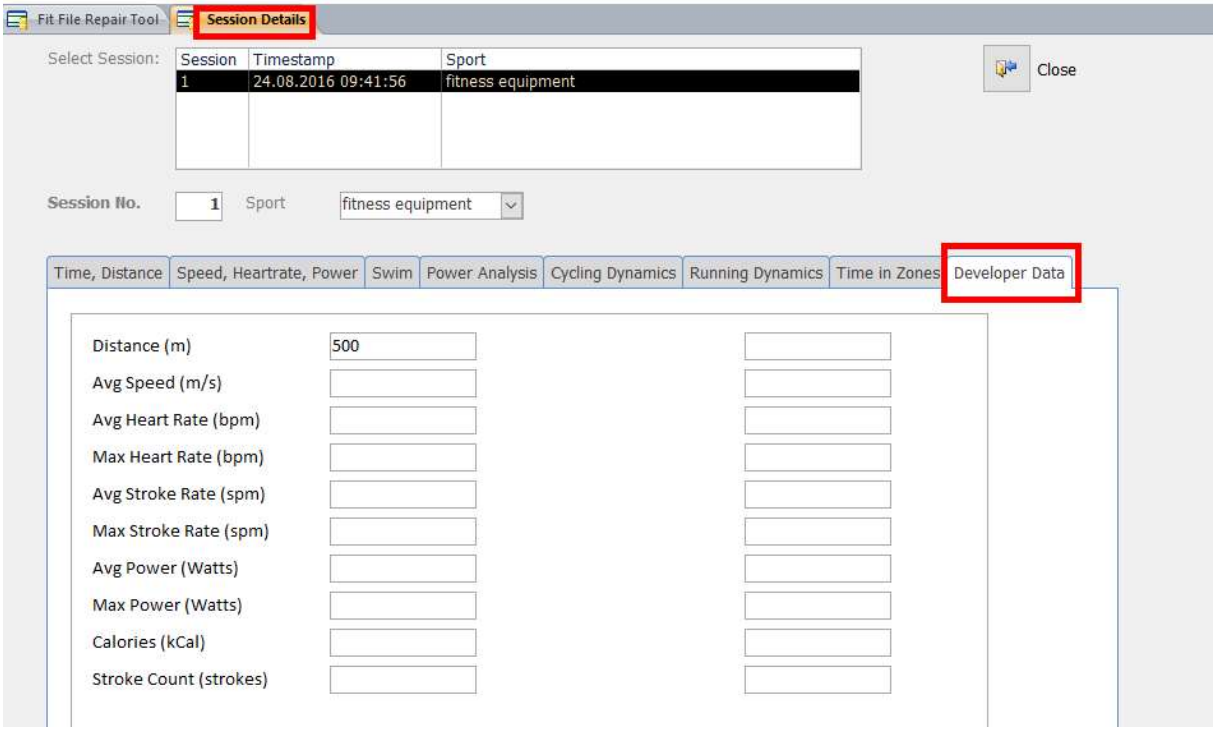
22.2. Data Fields Definition Details



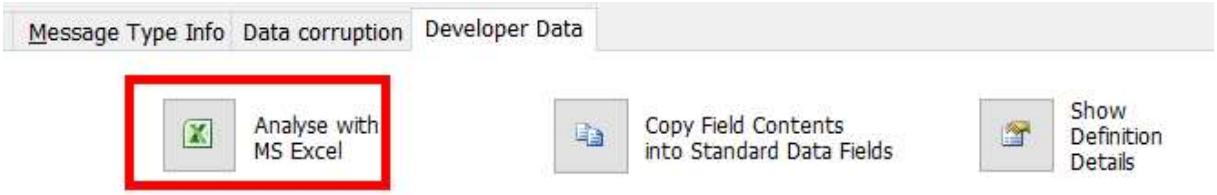


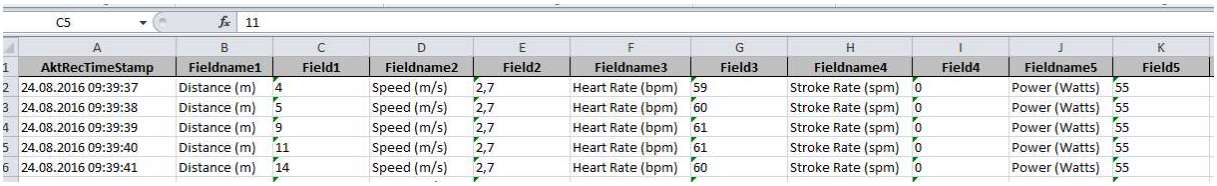
22.3. Session / Lap Details

On the forms “Session Details” and “Lap Details” (commands to show these forms are placed on register tab “Sessions and Laps”) you will find new register tabs which contain Session / Lap Developer Data Fields:



22.4. Analyse Developer Data Fields with MS Excel





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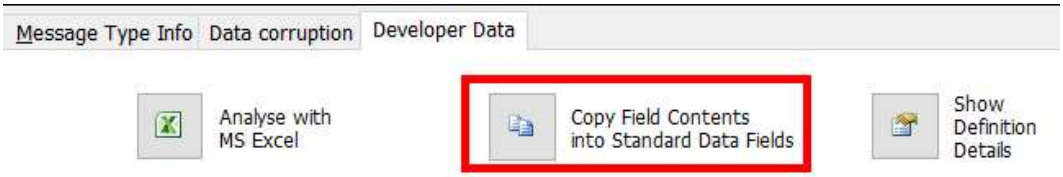
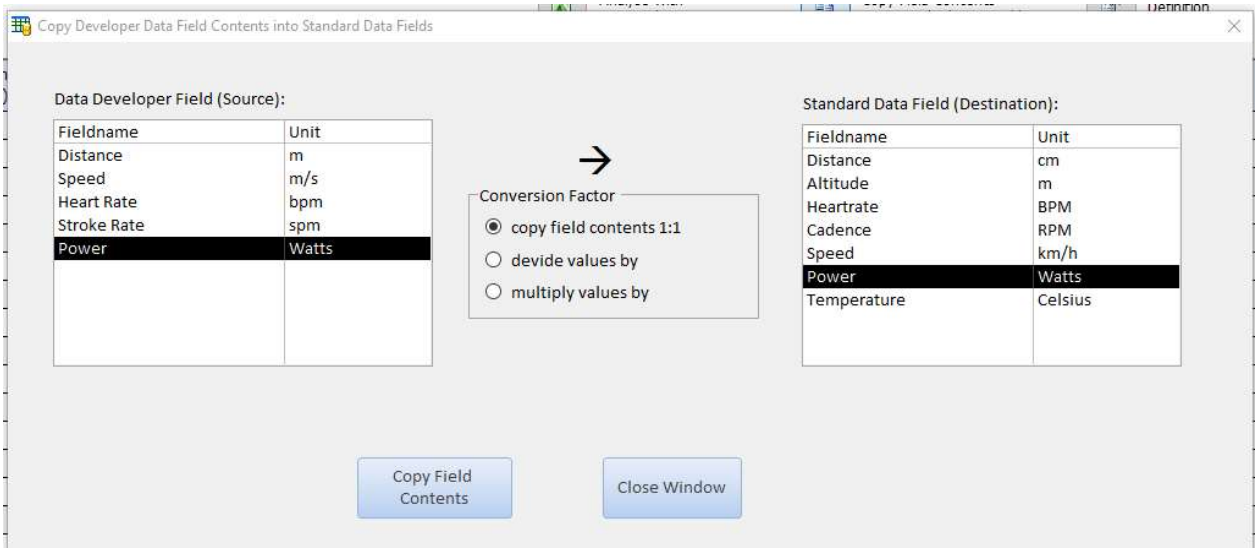
	A	B	C	D	E	F	G	H	I	J	K
1	AktRecTimeStamp	Fieldname1	Field1	Fieldname2	Field2	Fieldname3	Field3	Fieldname4	Field4	Fieldname5	Field5
2	24.08.2016 09:39:37	Distance (m)	4	Speed (m/s)	2,7	Heart Rate (bpm)	59	Stroke Rate (spm)	0	Power (Watts)	55
3	24.08.2016 09:39:38	Distance (m)	5	Speed (m/s)	2,7	Heart Rate (bpm)	60	Stroke Rate (spm)	0	Power (Watts)	55
4	24.08.2016 09:39:39	Distance (m)	9	Speed (m/s)	2,7	Heart Rate (bpm)	61	Stroke Rate (spm)	0	Power (Watts)	55
5	24.08.2016 09:39:40	Distance (m)	11	Speed (m/s)	2,7	Heart Rate (bpm)	61	Stroke Rate (spm)	0	Power (Watts)	55
6	24.08.2016 09:39:41	Distance (m)	14	Speed (m/s)	2,7	Heart Rate (bpm)	60	Stroke Rate (spm)	0	Power (Watts)	55

22.5. Copy Field Contents into Standard Data Fields





This function enables you to copy the contents of Developer Data into Standard fields of your fit file.
This can be helpful if you want to analyse / display your data with a tool which doesn't support Developer Data Fields in the way it supports Standard Data Fields.

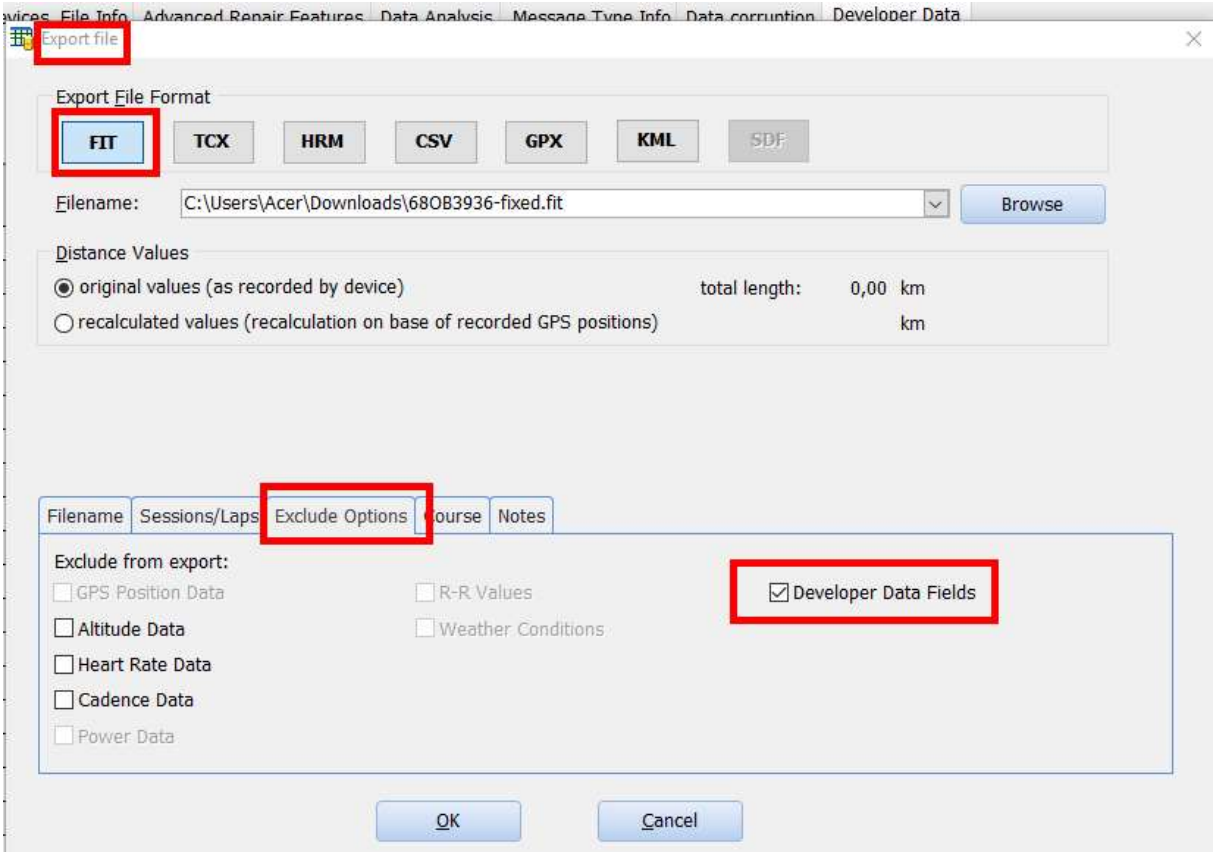
22.6. Export of Developer Data Fields into FIT files

If you import a fit file with Developer Data Fields and export this file as .fit file the Data Developer Fields will be exported as well. If you upload such an exported file to Garmin Connect etc. graphs for Developer Data Fields should be visible in exactly the same way as after uploading the original fit file. Garmin Connect marks such graphs as "CIQ".

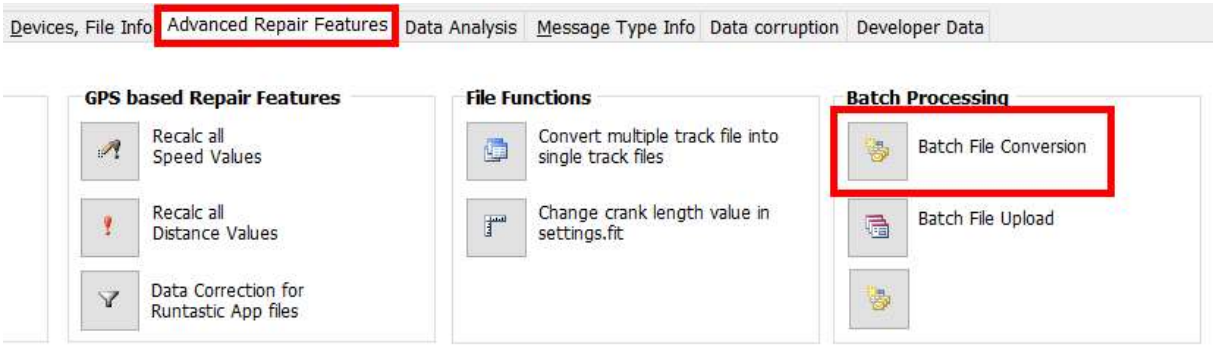
Only .fit files are able to contain Developer Data Fields. If you select any other file format during the export (.tcx, .hrm, .csv etc) the contents of Data Developer Fields will not be part of the export file.

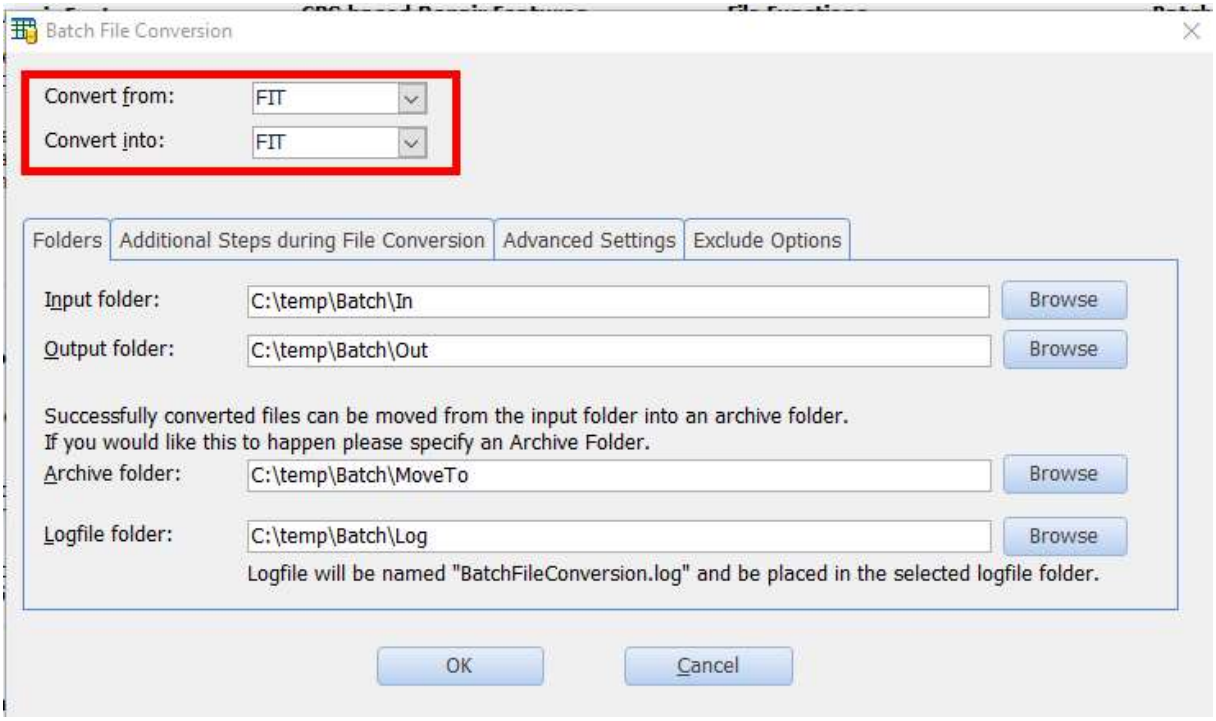
22.7. Remove Developer Data Fields from FIT files

If you import a file with Developer Data Fields and want to create a file without Developer Data Fields (for instance to use this file with an application which doesn't support fit 2.0 files) simply choose the proper Exclude Option when you run the File Export:

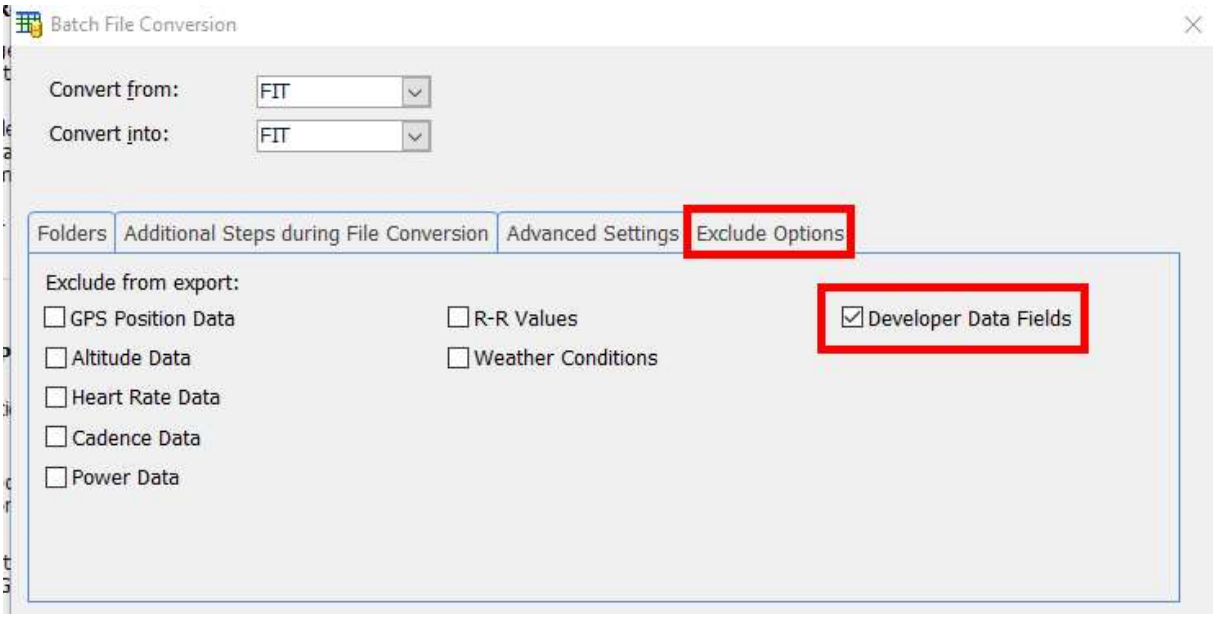


Note: if you want to convert more than one fit 2.0 file into fit 1.0 files you can use the “Batch File Conversion” function:





Choose “FIT” as source and as destination file format. Then specify your input folder, output folder etc. and change to register tab “Exclude Options”:



If you activate the option “Developer Data Fields” the resulting files will not contain any developer data field contents and be written in the fit 1.0 file format.

23. Questions, Comments, Updates

If you have questions or comments please feel free to contact me. My email address is

mail@fitfilerepairtool.info

Updates of this tool will be published from time to time, depending on the number of users and the further development of the fit file format.

Thank you for any encouragement and support!