

# JW HRM & GPX Tool

## User Manual



Application Version: 1.07

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# 1 Introduction

Many sports tracking applications and web portals require exercise information within one data file. However, often heart rate monitor data and GPS data are recorded with different devices or at least separate data files.

JW HRM & GPX Tool merges information of HRM (Polar Heart Rate Monitor format) and GPX (GPS Exchange format) files of a sports exercise and exports data into several file formats (like GPX, TCX, CSV) for further usage with common sports applications and web portals.

The application is optimized to its special purposes and so offers more functionality and settings than other common applications. It runs on multiple platforms like Windows, Mac or Linux given that Java Runtime Environment (JRE) is installed. No advertising is included and no internet access is used or even required.

## 2 Features

- Import HRM and GPX file data: header information, lap times/waypoints, data records/trackpoints
- View data: header information, lap times/waypoints, data records/trackpoints, merged record data
- Export data: header information, lap times/waypoints and data records/trackpoints to GPX, CSV and TCX files.
- Several preferences for data im- and export (e.g. time zone settings, data field in-/exclusion settings) as well as time adjustments for synchronization and correction purposes
- GPS Adjustments: possibility to filter out or interpolate GPS Latitude/Longitude data with zero values or resulting in unrealistic local peaks of speed (e.g. due to bad satellite connection).
- File Repair: application might be able to import also files that are often rejected by other applications because they don't meet strict (XML-) standards, are incomplete or corrupt.
- Multiple merge modes incl. GPS stretching/shrinking functionality: especially useful to add GPS information of a previous exercise in case the same track had been used.
- Console mode and batch operations: execute conversions out of the command line interface without using the GUI. Processes whole directories and sub-directories automatically if desired.

## 3 Requirements

- Java compatible Operating System (e.g. MS Windows, Mac OS, Linux)
- Java 2 Runtime Environment (JRE) Release 5 or higher installed. Please see <http://java.oracle.com> for further details.

## 4 Installation

Just copy all files of this distribution to a directory of your choice on your hard disk.

For some features (e.g. saving preferences) it might be necessary that write rights to the application directory exist.

This application does not need any own registry settings or internet access.

Following files should be included within the distribution:

- Manual PDF file ( doc-file ; this file )
- Application Java JAR file

In case you recognize something different, it is not recommended to install and use this software. Please contact author first.

## 5 Starting Application

Start application simply by double-clicking the *JWHrmGpx.jar* file (e.g. on operating systems like MS Windows with a standard Java installation and file type settings).

Or execute the file out of a console window. E.g. by using command "*java -jar JWHrmGpx.jar*" from within the application directory.

As result, the application main window will open. For usage of the console mode please read the respective chapter within this manual.

## 6 Usage

### 6.1 Main Window

After start of the application, the main window appears. From there on you can go to different application parts and windows by clicking on the respective buttons. Close opened additional windows in order to return to the main window.

### 6.2 Import Data

Within this application part you can import HRM and/or GPX file information. Depending on which of the two file types, or both at a time, is imported, miscellaneous view and export features are available. There are some settings within *Preferences* window you might want to check already before actually importing files (e.g. different import time zone setting might lead to shifted GPX timestamps).

Within the *Import Data* window, select HRM and/or GPX import files by using their specific file requesters.

Start the import process by clicking the *Run* button for the respective file type. A status window appears showing information about the import progress and its results.

In case a warning message appears which says that no GPX end tag could be read, it might be that the GPX import file is incomplete, corrupt or extremely big so the available import buffer might be not sufficient. The application will import data records in this case, but only until the limit (if the general Java heap memory is sufficient for this at all). However, the limit should be practically big enough to import files containing about at least 10 hours of one-second-interval-records along with all kind of already included information (like HR, speed, altitude, cadence, temperature).

In case import results mention that one record less could be parsed successfully than being processed: some HRM files (especially on Mac systems) contain an “additional empty line” at the end. The application can't parse it into a meaningful HRM record, but practically no data is lost by not importing this line.

Furthermore, with some Polar devices, there are e.g. 2 records more included in the HRM than in the GPX file. This application assumes that the first HRM record belongs to the first GPX record in these cases.

**Import Data**

HRM Source File:  
U:\example\15100301.hrm Select HRM

Run HRM Import

GPX Source File:  
U:\example\15100301.gpx Select GPX

Run GPX Import

Close

**Import Results**

**Import Status**

Lap times.  
Lap Time 1: 00:00:55 ; Temperature: 290  
Lap Time 2: 00:58:39 ; Temperature: 290  
Lap Time 3: 01:58:34 ; Temperature: 270

Temperature Values: true

HRM Header parsed successfully.

Start parsing HR data records.

Total processed records: 7115  
Successfully parsed records: 7115

Total Training Time: 01:58:34  
Approx. Total Distance (Speed Values): 20814 m  
Approx. Average Speed: 2.93 m/s | 10.53 km/h | 05:41 min/km

HR data records parsed successfully.

HRM file import finished successfully.

Close

## 6.3 View Data

Depending on which file types (HRM, GPX) had been imported before, it is possible to have miscellaneous views on the imported record data and header information within this window.

Use the selection box on top of the window in order to switch between the HRM record/header data, GPX record/header or merged data.

In case of at least one GPS Adjustment feature was activated within *Preferences* window, there is an additional view available showing original vs. adjusted GPS values along with calculated approximate distance and speed values.

The screenshot shows the 'View Data' window with a dropdown menu set to 'Merged HRM/GPX Data'. The menu also lists 'HRM Header Data', 'HRM Record Data', 'GPX Header Data', 'GPX Record Data', and 'GPS Adjusted Data'. The main table displays merged data with columns for Date, GPX Rec., Latitude, HRM Date, HRM Rec., and HR.

Date	GPX Rec.	Latitude	HRM Date	HRM Rec.	HR
2015-10-03 14:00:19	1750	49.4569333330	2015-10-03 14:00:19	1752	176
2015-10-03 14:00:20	1751	49.4569316670	2015-10-03 14:00:20	1753	175
2015-10-03 14:00:21	1752	49.4569300000	2015-10-03 14:00:21	1754	176
2015-10-03 14:00:22	1753	49.4569316670	2015-10-03 14:00:22	1755	176
2015-10-03 14:00:23	1754	49.4569350000	2015-10-03 14:00:23	1756	176
2015-10-03 14:00:24	1755	49.4569333330	2015-10-03 14:00:24	1757	176
2015-10-03 14:00:25	1756	49.4569283330	2015-10-03 14:00:25	1758	175
2015-10-03 14:00:26	1757	49.4569216670	2015-10-03 14:00:26	1759	175
2015-10-03 14:00:27	1758	49.4569183330	2015-10-03 14:00:27	1760	176
2015-10-03 14:00:28	1759	49.4569133330	2015-10-03 14:00:28	1761	176
2015-10-03 14:00:29	1760	49.4569100000	2015-10-03 14:00:29	1762	176
2015-10-03 14:00:30	1761	49.4569050000	2015-10-03 14:00:30	1763	176
2015-10-03 14:00:31	1762	49.4568983330	2015-10-03 14:00:31	1764	176
2015-10-03 14:00:32	1763	49.4568916670	2015-10-03 14:00:32	1765	176
2015-10-03 14:00:33	1764	49.4568816670	2015-10-03 14:00:33	1766	176
2015-10-03 14:00:34	1765	49.4568733330	2015-10-03 14:00:34	1767	176
2015-10-03 14:00:35	1766	49.4568716670	2015-10-03 14:00:35	1768	175
2015-10-03 14:00:36	1767	49.4568700000	2015-10-03 14:00:36	1769	175
2015-10-03 14:00:37	1768	49.4568666670	2015-10-03 14:00:37	1770	175
2015-10-03 14:00:38	1769	49.4568633330	2015-10-03 14:00:38	1771	176
2015-10-03 14:00:39	1770	49.4568583330	2015-10-03 14:00:39	1772	175

The screenshot shows the 'View Data' window with a dropdown menu set to 'GPS Adjusted Data'. The main table displays adjusted GPS data with columns for Date, Rec ID, Orig Latitude, Orig Longitude, Dist, Speed, Adj Latitude, Adj Longitude, Adj Di, and Adj Sp.

Date	Rec ID	Orig Latitude	Orig Longitude	Dist	Speed	Adj Latitude	Adj Longitude	Adj Di	Adj Sp
2015-10-03 14:07:40	2191	49.4502150000	11.0974700000	1.52	1.52	49.4502150000	11.0974700000	1.52	1.52
2015-10-03 14:07:41	2192	49.4502216670	11.0974500000	1.63	1.63	49.4502216670	11.0974500000	1.63	1.63
2015-10-03 14:07:42	2193	49.4502283330	11.0974300000	1.63	1.63	49.450228892	11.0974072222	3.25	3.25
2015-10-03 14:07:43	2194	49.4502333330	11.0974083330	1.66	1.66	49.4502041114	11.0973644444	3.25	3.25
2015-10-03 14:07:44	2195	49.4502416670	11.0973883330	1.72	1.72	49.4501953336	11.0973216666	3.25	3.25
2015-10-03 14:07:45	2196	49.4502483330	11.0973683330	1.63	1.63	49.4501865558	11.0972788888	3.25	3.25
2015-10-03 14:07:46	2197	49.4502550000	11.0973483330	1.63	1.63	49.4501777780	11.0972361110	3.25	3.25
2015-10-03 14:07:47	2198	49.4502633330	11.0973283330	1.72	1.72	49.4501690002	11.0971933332	3.25	3.25
2015-10-03 14:07:48	2199	49.4502700000	11.0973066670	1.73	1.73	49.4501602224	11.0971505554	3.25	3.25
2015-10-03 14:07:49	2200	49.4502766670	11.0972883330	1.52	1.52	49.4501514446	11.0971077776	3.25	3.25
2015-10-03 14:07:50	2201	49.4502833330	11.0972683330	1.63	1.63	49.4501426668	11.0970649998	3.25	3.25
2015-10-03 14:07:51	2202	49.4502316670	11.0968233330	32.71	32.71	49.4501338890	11.0970222220	3.25	3.25
2015-10-03 14:07:52	2203	49.4502000000	11.0968750000	5.14	5.14	49.4501251112	11.0969794442	3.25	3.25
2015-10-03 14:07:53	2204	49.4501766670	11.0968666670	2.67	2.67	49.4501183334	11.0969366664	3.25	3.25
2015-10-03 14:07:54	2205	49.4501483330	11.0968566670	3.24	3.24	49.4501075556	11.0968938886	3.25	3.25
2015-10-03 14:07:55	2206	49.4501183330	11.0968333330	3.74	3.74	49.4500987778	11.0968511108	3.25	3.25
2015-10-03 14:07:56	2207	49.4500900000	11.0968083330	3.64	3.64	49.4500900000	11.0968083330	3.25	3.25
2015-10-03 14:07:57	2208	49.4500750000	11.0967733330	3.03	3.03	49.4500750000	11.0967733330	3.03	3.03
2015-10-03 14:07:58	2209	49.4500616670	11.0967383330	2.94	2.94	49.4500616670	11.0967383330	2.94	2.94
2015-10-03 14:07:59	2210	49.4500600000	11.0967033330	2.54	2.54	49.4500600000	11.0967033330	2.54	2.54
2015-10-03 14:08:00	2211	49.4500583330	11.0966683330	2.54	2.54	49.4500583330	11.0966683330	2.54	2.54

## 6.4 Export Data

Depending on which file types (HRM, GPX) had been imported before, it is possible to export certain information (e.g. header data, record data, merged record data) into different file formats (CSV, GPX, TCX).

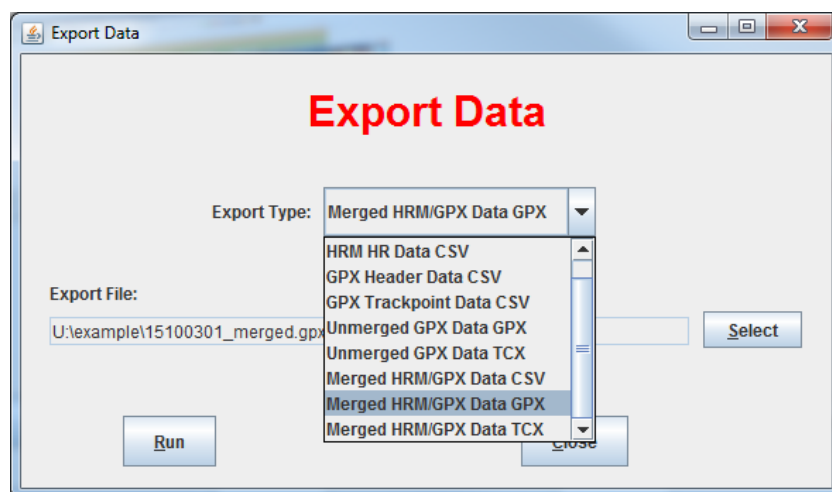
Within the *Export Data* window, select the kind of information and the target file format to use for the export.

You can also export unmerged HRM or unmerged GPX data. Exporting a GPX input file to a GPX output file is e.g. useful in case you just want to remove or adapt certain information without converting to a different file format.

Please note especially in this context that only data used by this application is imported and exported. Most of other possible available data in the GPX import file (like special metadata of certain applications or data that is saved in a special different way) won't be transferred to the exported GPX file.

Afterwards, select the file path and file name and start the export process by clicking on *Run* button. After the export process, a confirmation message should appear.

Within *Preferences* window (see also below) a lot of settings can be done to customize the exported content accordingly to your specific needs.





## 6.5 Preferences

Within this window it is possible to adjust several settings in regards to the application functionalities.

It is possible to save the preferences into a config file. As result, the settings will be the default ones right after start of the application (even when working in console mode!). By clicking the *Apply* button the settings are not saved into the config file and will only be used as long as the application is closed.

### 6.5.1 Import/Export Default Directory

In case valid directories are selected and saved, they will be the initial directories for import or export file choosers right after application start. When choosing different import directories during usage of the application, they are remembered until the application gets quit.

### 6.5.2 Import/Export Time Zone

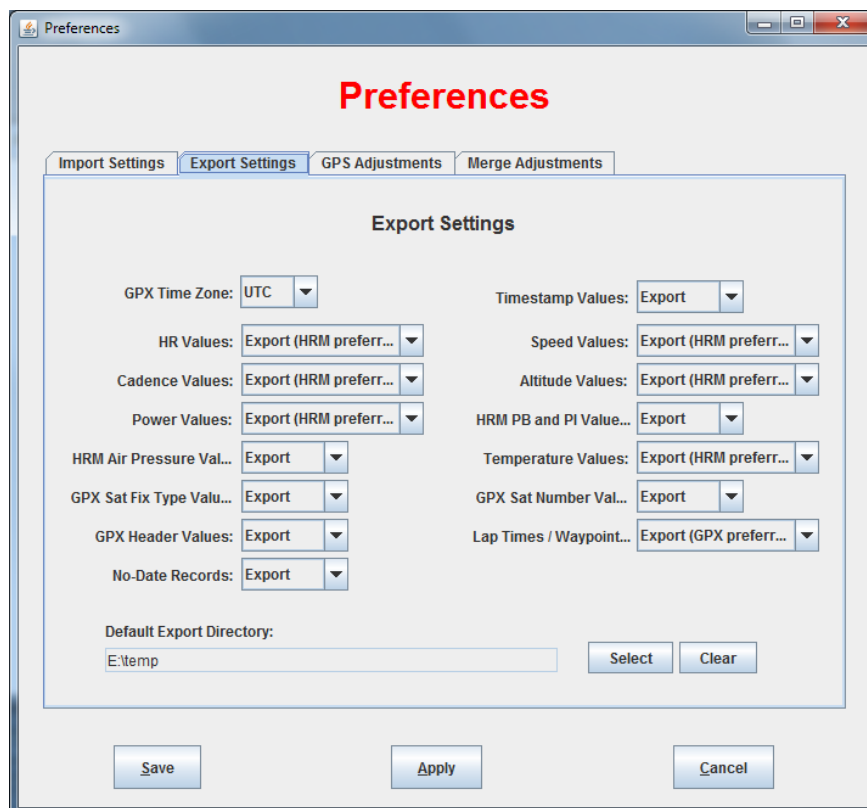
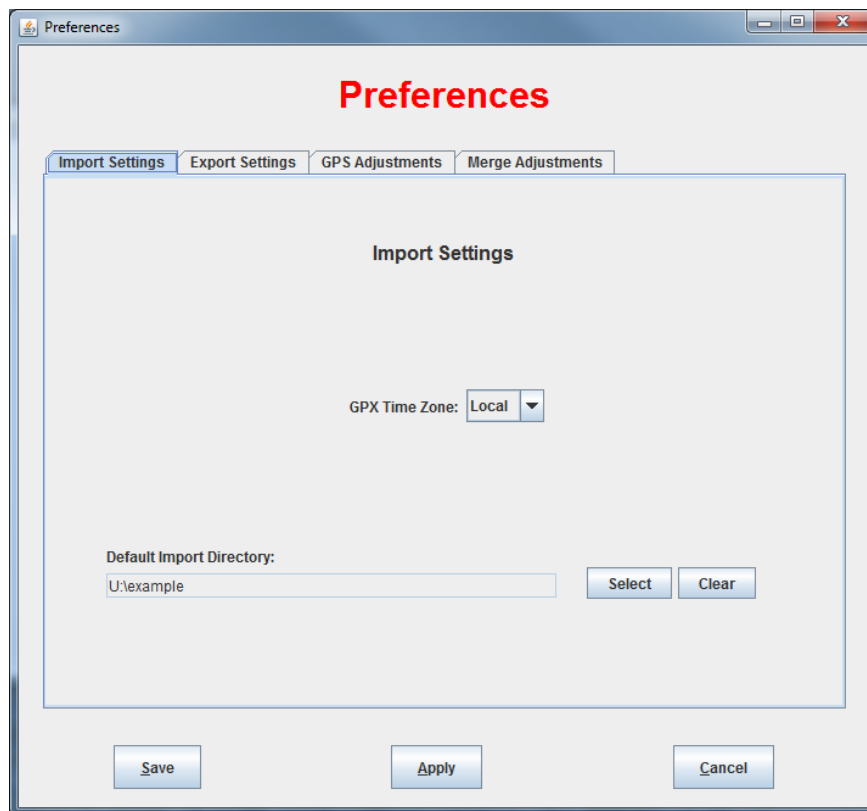
This setting defines the time zone to be used for import or export. Regarding GPX file format, it should theoretically be UTC. However, some devices or applications don't distinguish between different time zones and values are saved and should be imported in the “local” time zone. Since this is typically also the case for Polar devices the default *import* time zone is *Local* though not following the standards. In cases none of these settings result in the correct time values you can additionally specify time corrections in this application (see also below). The default *export* time zone is *UTC* following the standards.

### 6.5.3 Export Data In-/Exclusion

You can define which kind of available data (timestamps, heart rate, speed, ...) shall be included or not be exported into the export file. For data that can be taken out of either HRM or GPX files, you can as well individually select the preferred source of information. In cases the selected data is not available in the *preferred* source file, the data still will be taken and exported from the other source file as long as it's available there. If *no export* is selected the data is not exported in any case.

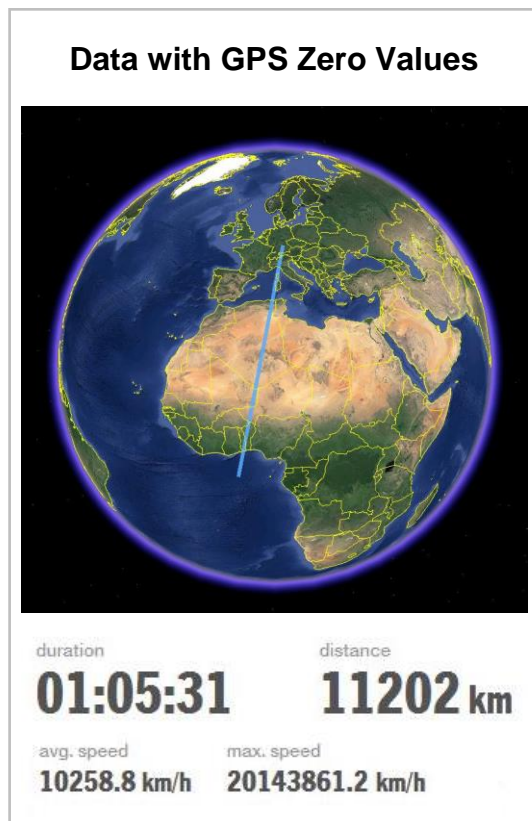
It is not recommended to remove timestamp information for TCX files as most sports tracking applications require at least basic date/time information. In contrast to the GPX file format, primary usage of TCX files is to handle concrete exercises rather than just store location based information.

In case there were already in the input file records without a date/time information you can prevent these from being exported by using the *No-Date Records* setting.



#### 6.5.4 GPS Adjustments of Zero Value Records

Some devices save GPS records with zeros as latitude and longitude values in case of a bad satellite connection. However, target applications often consider these as valid GPS coordinates (as they in fact will be if your position is really there) without doing any checks or corrections (in case your exercise is totally far away) and suddenly the track is extended across half of the world and there might be “a little” deviation within statistical figures like distance or speed. By this setting such records can be filtered out, exported as they are or exported with interpolated latitude/longitude values. The interpolation is done based on the last available and next available GPS coordinates not being zero values. Depending on the time frame of unavailable real GPS coordinates a simple linear interpolation is of course not super accurate. However, in contrast to filtering out the records completely (and along with that other information like e.g. heart rate as well) this method is sometimes the better solution.



### 6.5.5 GPS Smoothing Adjustments

Bad satellite connection might not only lead to zero values for GPS latitude and longitude, but also to values that are “stuck” for a certain period within a small region and suddenly jump over to a quite distant position. In many target applications there is no check and correction done and as result there are unrealistic values (e.g. for max. speed) and charts with a curve scaling to such a max. value show basically in general a flat line without any detailed differences elsewhere. The GPS Smoothing feature of this application can at least help to limit such extreme peaks.

What is a maximum realistic speed value of course depends on the individual exercise characteristics. For instance, valid cycling speed values are different to those of a walking exercise. Therefore, the definition of such a maximum realistic speed is not done by an absolute number, but as a *Threshold Factor* based on the calculated average speed of the exercise. For example, in case the calculated average speed (based on GPS values) of the exercise is 2 m/s, a *Threshold Factor* of 3 results in an acceptable top speed value of 6 m/s. In case this speed value is exceeded, the GPS coordinates within a certain time range before and after get interpolated on base of the GPS location of the record before and after that time range. Especially in cases of extreme speed differences (e.g. cycling in mountains) this value must be carefully set so neither too much or too less is adjusted.

The *Preceding Period* and *Subsequent Period* settings define how many seconds before and after the exceeding value the interpolation range starts or ends. This follows the assumption that a certain time before, and even after (though typically less time), the GPS location is not precise enough. The number of seconds shall be on the one hand selected as high as required to cover the whole period of at least very inaccurate GPS information. On the other hand, it should be selected as short as possible in order to avoid the loss of too much real detailed information.

It will be not always possible setting up all the parameters in order to get a 100% perfect result across the whole exercise. For example, at certain places a sudden significant peak might be valid in case of overtaking a person or a short downhill section. However, with a good selection the results should be at least much better as leaving completely wrong extreme values within the data.

Though the GPS location of a record is possibly altered multiple times (depending whether the record is within the time range of another record exceeding the threshold value) the check for validity is done only once per record. Therefore, it is not ensured that at the end no single value exceeds the threshold value. However, along with increasing period values this gets more and more unlikely. And at least very extreme values are limited to an acceptable deviation.

In general, the default values of this application are good ones to start with, but you might want to adjust them in detail to get more optimized results accordingly to the specific exercise characteristics.

Preferences

## Preferences

Import Settings Export Settings **GPS Adjustments** Merge Adjustments

### GPS Adjustments

GPS Zero Records: Interpolate ▼

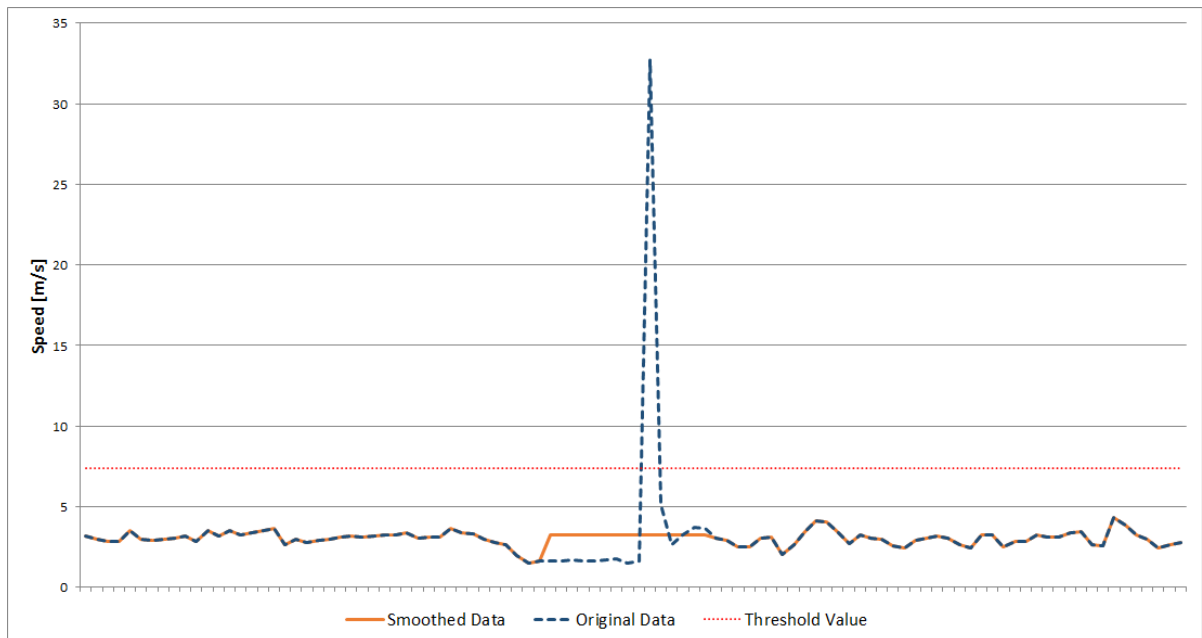
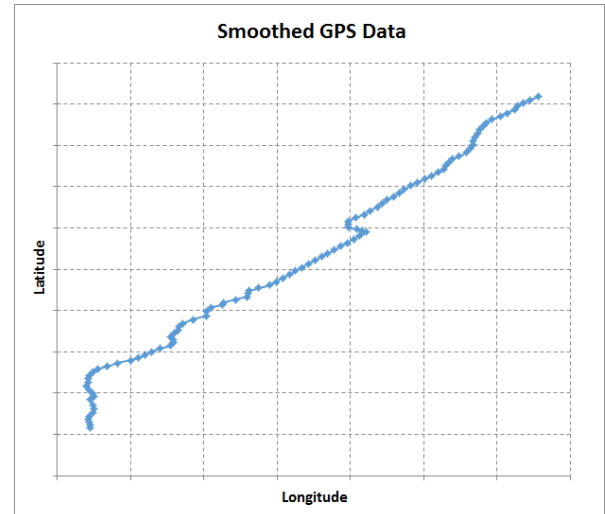
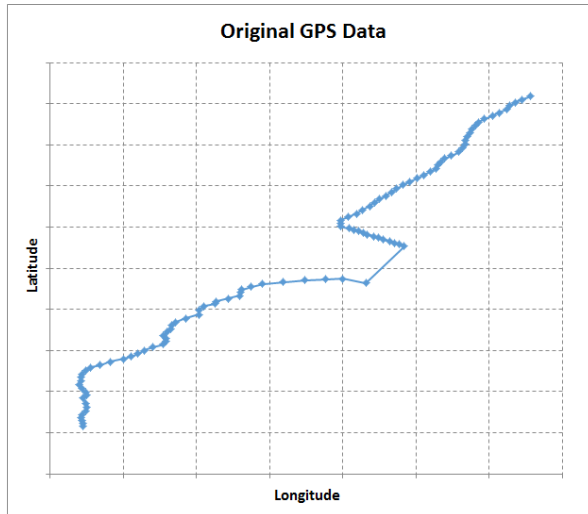
GPS Smoothing: Yes ▼

GPS Smoothing Threshold Factor: 2.50

GPS Smoothing Preceding Period (sec): 10

GPS Smoothing Subsequent Period (sec): 5

Save Apply Cancel



It is possible to combine *GPS Adjustments of Zero Value Records* and *GPS Smoothing Adjustments*. In this case the *GPS Adjustments of Zero Value Records* are done first. This allows e.g. to filter out GPS zero records before including them into the *GPS Smoothing Adjustments* interpolation calculations.

The effects of the GPS adjustments in total can be seen within the *Data View* window first before exporting the exercise to a file.

### **6.5.6 Merge Modes**

The Merge Mode defines accordingly to which criteria HRM data records and GPX data records are matched together in detail.

#### a) *Timestamp (default mode):*

HRM and GPX records are combined accordingly to the time value of both records as imported from GPX files and calculated in case of HRM files (based on exercise start time, record number and interval time). Additionally, HRM and GPX time adjustments (see below) get considered.

#### b) *Record Number (no GPS Stretching/Shrinking):*

By using this setting, HRM data is simply added to the GPX data record-by-record, not considering any time values for merging process itself.

#### c) *Record Number (with GPS Stretching/Shrinking):*

This setting is especially useful to add GPS information of a previous exercise in case the same track had been used.

In contrast to the other merge modes, the HRM time values get the “leading” time information and GPX time values are more or less ignored.

For each HRM record a “best fitting” GPX record is assigned. Depending on whether there are more or less GPX data records than HRM records, some GPX records might be ignored or are used multiple times. The GPS latitude/longitude values of the GPX records are taken “as is” and there is no interpolation done.

### **6.5.7 Time Adjustments**

It is possible to define additionally time adjustments for the HRM start time and GPX time stamp values. This has an effect on merging the records as well as viewing and exporting time information. Enter a positive number value to increase the time values by the respective amount of seconds. Or a negative value to decrease the time values.

By clicking on the *Adjust to GPX (Adjust to HRM)* button, the *HRM (GPX) Time Adjustment* value is calculated automatically so that the HRM (GPX) start time matches the GPX (HRM) start time. A previously entered GPX (HRM) time adjustment value gets considered in this calculation.

Preferences

## Preferences

Import Settings Export Settings GPS Adjustments **Merge Adjustments**

### Merge Adjustments

Merge Mode:

HRM Time Adjustment (sec):

GPX Time Adjustment (sec):



## **6.6 About**

This window shows some basic application, author and version information.

## **6.7 Quit**

Click on *Quit* button in order to exit application.

## 7 Console Mode

Beside the typical operation through a graphical user interface (GUI) the application offers as well a console mode.

It allows the execution of file conversions out of the command-line interface and is especially useful in cases a lot of files shall be processed at a time. As result, it is possible to have at least a kind of semi automation for tasks that would require several manual steps by using the GUI (e.g. file selection, export file type,...).

Additionally to single-file-operations it is also possible to process all relevant files within a certain directory (and even their sub-directories if desired) automatically.

Nearly all of the relevant application settings can be specified by parameters as well.

For usage of the application in console mode, run the application JAR file with java command and add "-con" as argument. If you add no further arguments than "-con", or use the "-help" argument, you will get a list of all possible arguments and parameters.

### Example:

```
java -jar JWHrmGpx.jar -con -extype hrmgpx2gpx -ifhrm "myexercise.hrm" -ifgpx  
"myexercise.gpx" -of "myexercise_merged.gpx"
```

The file names will require the full path included if they are not referring to files within the same directory.

### Directory Mode:

Instead of specifying single input/output files it is possible to process all relevant files within a specified directory (and if desired its sub-directories) automatically.

This is done by using the *-idir* argument along with the directory name (similar like input/output files including full path if not within the same directory).

Depending on the export type (and its mandatory input files) the application will search for existing HRM, GPX or both files (that need to match based on the file name!). The file names need to have an *.hrm* or *.gpx* suffix (not case sensitive). If both, an HRM and a GPX file, is required, the file names without the suffix must be identical (e.g. *myexercise.hrm* and *myexercise.gpx*) in order they can be matched together.

By default, only the specified directory will be processed. If also sub-directories (and their sub-directories etc...) should be processed, use additionally the *-subdir* argument.

Some additional remarks:

- Most of the settings are identical with those available via the GUI. Please see also the respective chapters within this manual for further information.
- For arguments that belong to the user preferences: also in console mode user preferences from the application's config file are loaded and used as default values if nothing else is specified via the arguments. That means, if you previously had saved your preferences via the GUI, you'd only need to specify those preferences arguments that shall be different for the respective operation.
- The user preferences parameters have following meaning: *no* = no export ; *ex* = export ; *exhrm* = export (HRM value preferred) ; *exgpx* = export (GPX value preferred)
- Overwrite Output Files: By default, the application will not overwrite any already existing output files. Please use the *-overwrite* argument in order to enforce overwriting existing output files.
- Export Type: The export type parameters use following logic: Characters in front of the "2" specify the source files and information, those behind the export format. Examples:
  - ⇒ *hrmgpx2gpx*: exports merged information of an HRM and a GPX file to a GPX output file
  - ⇒ *gpx2tcx*: exports information of the GPX source file only to a TCX output file.
  - ⇒ *hrmh2... / gpxh2...:* exports HRM or GPX header data
  - ⇒ *hrmr2... / gp xr2...:* exports HRM or GPX record data
- Merge Mode: The parameters have following meaning: *ts* = Timestamp ; *rnogst* = Record Number (no GPS Stretching/Shrinking) ; *rgst* = Record Number (no GPS Stretching/Shrinking)

## 8 Hints and Background Information

### 8.1 Keep Your Original Files!

In any case keep your original HRM and GPX files even after having im- and exported them!

This application only works with parts of the information available within these files and data will be lost storing only the exported files of this application.

### 8.2 Compatibility

GPX and TCX files created by this tool should basically be compatible to all common target applications making use of such files. And vice versa this application should also be able to import their files. However, in case something does not work as expected, following remarks might be interesting.

Regarding the GPX file format, there is currently no official standard in terms of how other exercise data than altitude (e.g. heart rate, speed, cadence, temperature) is integrated. This application makes use of the Garmin Trackpoint Extension format (at least a kind of de facto standard for this purpose) when im- and exporting these data. Regarding Power values, there is not even such an extension available and the strava.com specific extension is used (there are currently anyway nearly no other common applications loading this data out of GPX files).

Regarding the TCX file format, the additional Garmin TCX extensions for Speed and Power values are supported as well.

Though above are the de facto standards, it might still be that other applications don't support these GPX/TCX extensions or even don't import or export such data at all. Even speed values are often ignored in GPS related applications and calculated by themselves based on GPS coordinates.

Furthermore, some applications seem to be very demanding in terms of the awaited data values.

A common sports tracking portal for example won't accept a file with heart rate values of 0 within. And will also only accept files with extension fields (e.g. heart rate, speed, cadence, temperature) if heart rate is included (however, heart rate is anyway the only supported value beside the non-extension-field altitude).

Therefore, within *Preferences* window you can select for each data field whether it should be exported at all. And for some data additionally perform adaptations to the data values (e.g. time and GPS adjustments).

If your application still has problems with certain data values of the file it might help as last option doing some "search & replace" within a text editor. For example replacing the expression "<gpstpx:hr>0</gpstpx:hr>" with "<gpstpx:hr>100</gpstpx:hr>" for replacing heart rate values of 0 with a different one. Or something like ".0</gpstpx:atemp>" to "</gpstpx:atemp>" in case of only integer values are supported.

### 8.3 Time Synchronization and Different Recording Devices

When importing HRM and GPX files from different devices or applications, there might be time differences between the HRM and GPX records. These might result from different time zone or clock settings, a different start time, recording breaks or other reasons. It is recommended to use as far as possible the same settings and start times (best down to second level) though time adjustments are possible within this application to a certain degree (see also *Preferences Window*).

However, especially as HRM files don't record a time stamp for each record, but only for the start time, it is crucial that the different devices don't get out of synchronization. This might happen e.g. if one device is paused (e.g. Polar devices "auto start-stop" function is activated) while the other device continues to record. Otherwise, it is not possible anymore to assign the right HRM values to their corresponding GPX records! By using only one recording device (e.g. only the heart rate monitor records values although an external GPS receiver is used), usually HRM and GPX recording is started and stopped at the same time and stay synchronized. However, even then as result the exported GPX files might not include real time stamps (not counting seconds up during a pause while of course real time moves ahead) and statistics get distorted.

So in best case during recording there are no stops and the "auto start-stop" function is inactivated.

### 8.4 Polar „Euro“ vs. „US“ Units

HRM files include certain values either in "Euro" units (km, km/h, m, °C) or in "US" units (miles, mph, ft, °F) depending on the setting of the respective device or application. Furthermore, some values are not stored in a common unit (like for speed not directly in km/h or mph) and additional conversions are necessary.

This application imports HRM data values basically as is and regarding HRM-only data also shows and exports these values like this.

However, as soon as HRM data is merged up with GPX data, the respective HRM values get converted into the units specified for GPX or TCX files (e.g. m/s, m, degree Celsius).

## **8.5 Merge Mode with “GPS Stretching/Shrinking” Functionality**

This kind of merging data is not really very accurate.

First of all, for good results not only the track would have to be the same, but also recorded in exactly the same way. For example relevant settings (e.g. starting time, record interval) and synchronization of the HRM and GPS recording devices need to fit together. Remember that merging works basically just record-by-record not considering timestamps! Furthermore, GPX records are just removed or duplicated as they are. This method does not interpolate or even make use of possibly available speed information in order to calculate a more exact GPS position.

This said, the feature might be quite useful for some purposes. Maybe during an exercise no GPS device was available and working, but still GPS data (from a previous exercise on the same track) shall be included for certain reasons. Some target applications even require GPS information within the files.

## 8.6 Waypoint Identification and Export

The way how waypoints get defined and exported depends on the source of information, the Merge Mode and whether GPS Adjustments are activated:

		Merge Mode and GPS Adjustments Settings	
		<ul style="list-style-type: none"> <li>• <b>A Merge Mode without GPS Stretching/Shrinking is selected</b></li> <li>• <b>No GPS Adjustments are activated</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>A Merge Mode with GPS Stretching/Shrinking is selected and/or GPS Adjustments are activated</b></li> </ul>
Source of Information	GPX File Waypoints	<p>The waypoints are more or less exported as they had been imported before from the original GPX file. No checks are done like whether the waypoint information matches the information of the GPX records.</p> <p>If no waypoint information is included within the GPX import file, the application tries to create waypoint information on base of the HRM import file lap time information (see also there).</p>	<p>Even if waypoints basically already had been included in the original GPX file, the activated adjustments might have lead to the situation that exact matching GPX records got filtered out or the GPS location information was changed.</p> <p>So for each of the original file's waypoints an exact or "best fitting" (within a certain time range) GPX record (with possibly adjusted information) is tried to be identified and its data taken as waypoint information.</p>
	HRM File Lap Times	<p>For each of the original file's lap time dates an exact or "best fitting" (within a certain time range) GPX record is tried to be identified and its location data (with possibly adjusted values) taken as waypoint information.</p> <p>If no lap time information is included within the HRM import file, the application tries to export waypoint information on base of the GPX import file waypoint information (see also there).</p>	

## 9 Application Related Notes

JW HRM & GPX Tool is entirely **free** for you and doesn't include any advertisements (or making otherwise any money), limitations, spy functionality or harm someone's system.

If you're satisfied with it, and want to give back a little bit of contribution like inviting me to a coffee or two :-), please **donate** an amount of your choice by simply using the *Donate* button on the Download Software page of my homepage:

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**Please consider that software development takes a lot of (leisure-) time, especially if an application shall not just be a quick-and-dirty solution for self-usage only, but fulfil all kinds of general requirements, user requests and quality aspects!**

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Feel free to contact me for reports, feedback, bugs or any other nice reasons.

Download new versions or find other software.

**Last, but not least, many thanks to all those who helped so far with e.g. giving feedback, interesting ideas and testing beta versions!**

# 11 History

V0.06 (2011-06-12)

First alpha version released.

V0.07 (2011-06-12)

Experimental HRM and GPX merge in View Data Window.

V0.08 (2011-06-24)

- HRM and GPX time adjustments
- Merged CSV and Merged GPX export incl. unit conversions (e.g. k/mh or mph to m/s ; ft to m)
- Data View Layout optimizations
- General enhancements

V0.09 (2011-07-02)

- Export of GPX start date metadata
- HRM Lap Times and GPX Waypoint import and data view
- GPX Waypoint export out of HRM Lap Times or GPX import file waypoints
- HRM Temperature value support
- HRM import improvements
- HRM and GPX Time Adjustment Preferences now have also an effect on viewing and exporting unmerged HRM (respectively GPX) data
- General enhancements

V0.10

- Application was renamed to "JW HRM & GPX Tool"
- Multiple merge modes are now available. E.g. for including GPS information of a different exercise when same track, but no GPS device, was used
- Merge, view and export functionalities were re-coded in major parts
- Included compatibility for older HRM file versions like 1.02 and 1.05

- HRM import compatibility to other systems than MS Windows improved
- Added TCX export
- Some minor improvements

#### V0.11 (2012-10-05)

- GPX files with no XML declaration are now accepted for import.
- Fixed bug preventing import of GPX files with an XML declaration not including version or encoding information.
- Merged Data is now the default view and Merged Data GPX the default export type if both, HRM and GPX data, is available.
- GPX altitude is now shown and exported with decimal number accuracy (HRM altitude however is defined as integer numbers by Polar and their devices).
- Import and Export Windows won't dispose anymore when closing and retain their settings (e.g. the selected directory and file).
- It is now possible to save the preferences so they will be the default settings when starting the application.
- Java 2 Runtime Environment (JRE) Release 5 or newer is now required.

#### V1.00 (2013-01-18)

- Creation of PDF manual
- Upgraded version to 1.00 since now includes all planned features and seems to run very stable

#### V1.01 (2013-10-09)

- Improved TCX file export (e.g. files are now compatible with Strava.com)
- Import Heart Rate-, Speed-, Cadence- and Temperature- data also out of GPX files. Possibility to export these instead of the HRM file values.
- Possibility to export unmerged GPX file data into GPX or TCX files (e.g. to just remove certain information from GPX files like Timestamps, Heart Rate, ...)
- Possibility to export data without timestamp information

#### V1.02 (2014-04-14)

- Console Mode and batch operations: execute conversions out of the command line interface without using the GUI.
- View Data window now also shows columns for GPX HR, Speed, Cadence and Temperature if data is included in the GPX input file.
- Enhanced GPX file import: speed, special character handling, improved tolerance for non-compliant or even corrupt XML/GPX file contents
- GPX Header CSV export includes now also exercise name, description and author name.
- General changes in application design for improved separation of application logic and GUI.

#### V1.03 (2014-07-06)

- Import/Export Power values from/to GPX files. However, since there is no official GPX tag or a common GPX extension for power data, the compatibility is limited. The tag used is compatible with Strava uploads.
- Export of Speed and Power values to TCX files by usage of Garmin TCX extensions.
- Added “Adjust to GPX” and “Adjust to HRM” buttons for automatic calculation of the time adjustment value so that the HRM (GPX) start time matches the GPX (HRM) start time.

#### V1.04 (2014-10-10)

- Improved GPX input file special character import.
- Possibility to filter out or interpolate GPS records/values in case of latitude and longitude is zero.
- Possibility to define default import- and export- directories within Preferences.
- Bugfix: under certain circumstances some GPX file header metadata contents could get loaded out of the wrong GPX metadata tag in case the tag's name was similar (and e.g. belonged to a different mother tag)
- Enhanced GPX file size limit which allows now to import about at least 10 hours of one-second-interval-records along with full trackpoint information. A warning message will appear in case of no GPX end tag could get read and something possibly is incomplete.

#### V1.05 (2015-09-05)

- Default Export GPX Time Zone is now UTC accordingly to GPX standard. However, default Import GPX Time Zone stays “Local” as this is the correct setting for Polar files though not following the standard. In case of GPX files are taken from a different source it’s likely the Import GPX Time Zone needs to be switched to “UTC”.

#### V1.06 (2015-12-08)

- New “GPS Smoothing”: in case of GPS location values “hang” (e.g. in case of bad satellite connection), and later on suddenly jump over to a big distance position, some applications don’t correct such values good enough and so huge unrealistic Maximum Speed values are calculated along with charts showing a curve with huge peaks and otherwise only small value differences. The new feature can smooth such cases along with individually configurable parameters for speed threshold and time range to consider.
- In case of GPS adjustments are used, resulting values are shown in a special view within Data View window, and compared to the original values, rather than being just exported.
- Approximate Total Distance and Average Speed (along with Total Training Time) are calculated for GPX files (based on GPS Latitude/Longitude values) and HRM files (in case of HRM speed values are available) and shown in Import Status and Data View windows.
- In Import Window there are now two separate file requesters and Run buttons for HRM and GPX import files.
- TCX export: calculation of Distance Meters information now based on GPS Latitude/Longitude values (since available more often and usually more precise than based on speed values).
- GPX export: Improved match methods and export of waypoints from HRM or GPX input files, especially in case of GPS adjustments done.
- Major internal code overwork and clean-up.
- Several minor improvements.

#### V1.07 (2016-01-10)

- Import, display and export of GPX (file) header date.
- Improved handling of records without date/time information and new export No-Date Records setting.
- Export of certain numeric data fields (e.g. altitude) is no longer done with thousands separators which lead to compatibility issues with some target applications.
- Several minor improvements.