
GPS Simulators

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1. Why the effort?

You cannot ignore GPS in our day-to-day life any more. Navigation systems in cars, planes and ships, small devices for hiking, plenty of PC software, independent alarm systems and even the controversial German toll charge system use GPS to position and depict objects anywhere on the planet. Anybody who develops his own applications – and that includes every member of the BASIC-Tiger® family – is often confronted with the following situation.

You plan to experimentally feed a device or PC software with GPS data, you even have a GPS receiver at your disposal, but in your laboratory or workshop there is no satellite reception. You need GPS for troubleshooting – so what to do? Carry the construction outside, find some power supply, possibly connect a PC and waiting for the GPS receiver to set up (which can take minutes!)? Even if it worked, you would hardly be able to move the construction, so you would lack data which depict movements, for example in map software. This application shows you how to generate GPS data yourself to solve laboratory problems and to develop software which needs GPS data.

2. Simulation via PC

We do not give up hope, since there is PC software which generates GPS data. Data are simply transferred to a serial interface and read in using a null-modem cable (pins 2 and 3 crossed) via a further COM interface. That interface serves as a receiver for e.g. route planners, which finally depicts the simulated journey on a map. GPSsim by Horst Lichtenheld is such a program (fig. 1). You can download this software on

<http://www.lichtenheld-mch.de/>

This software will make you almost perfectly happy and can be customised to virtually every problem that you wish to solve with a GPS simulator. You can manually enter single position data and also adopt routes already travelled in reality. The output record can be chosen for most parts, so you can decide which lines from the NMEA protocol are needed for your application.

You need, however, a Windows PC, in order to generate data. This can be especially tricky under way. Here a small portable device would be helpful.

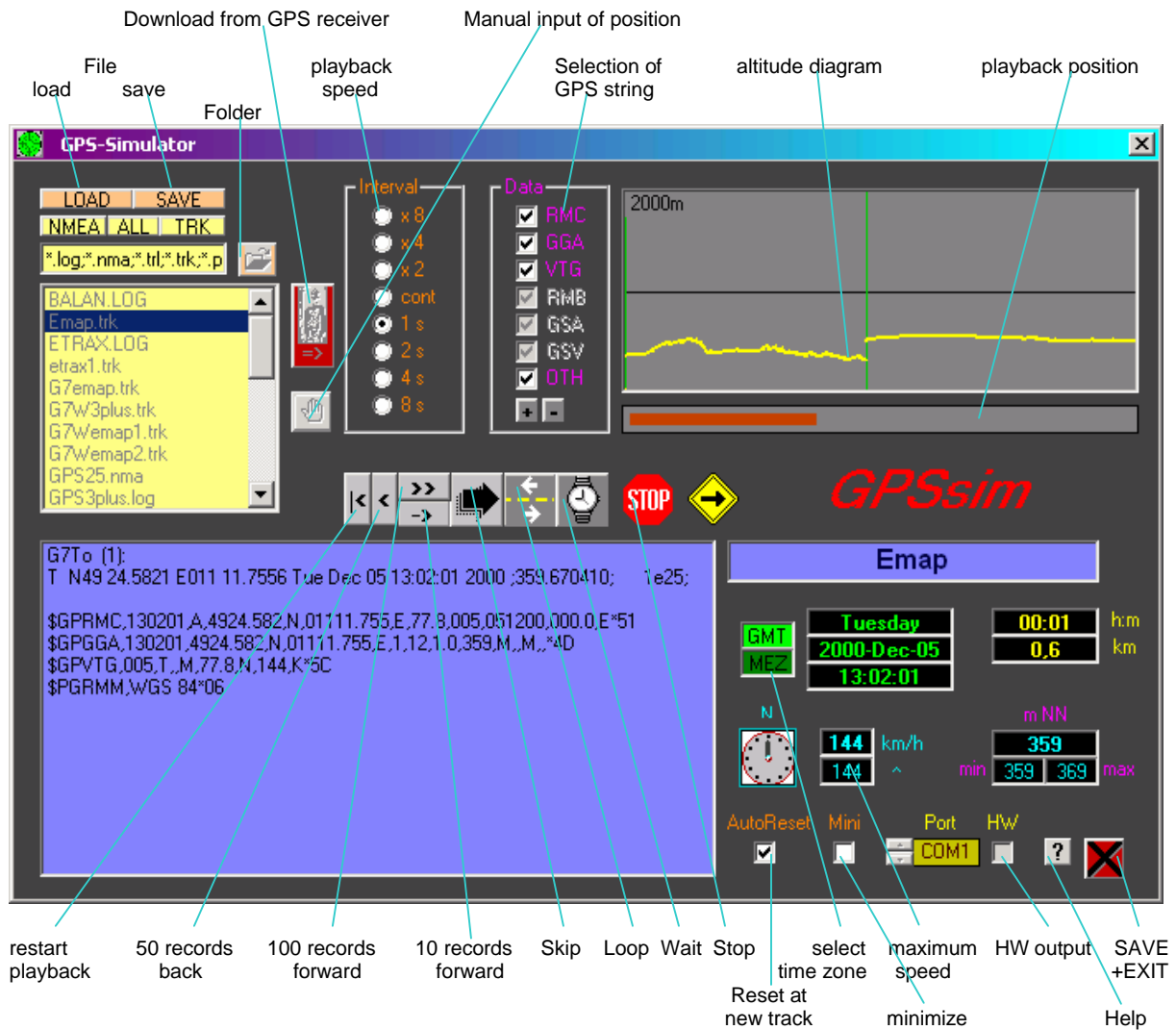


Fig. 1 This is how GPSsim presents itself – a good choice if a PC is on-hand. (picture taken from GPSsim documentation)

3. A handy solution using Economy-Tiger®

For those cases when a PS is not on-hand or cannot be used, we will develop a GPS simulator with a small Economy-Tiger®, which generates GPS data everywhere, even in totally shielded rooms. It has almost the same size and will be connected and used almost like the original GPS device. Thanks to a free access via BASIC programming the simulator can be adapted to an arbitrary system. It does not matter which data from the NMEA protocol or if different protocols are needed and how they are output via serial interfaces. The GPS simulator can be built and set up easily.

4. Hardware

In the underlying model we will simulate a LC-HI-203 GPS mouse, which handles its power supply as well as the data transfer via a plug similar to a PS/2.

Under

<http://www.landolt.de/info/lc-hi-203.htm>

you can order this reasonable LC-HI-203 GPS mouse. You can download a manual on

<http://www.haicom.com.tw/driver/203E.zip>

Things are kept simple, if you provide the original primary cable and already stabilised +5 V for your application with the GPS mouse. See figure 2 for the circuitry of this system. You can either connect your GPS mouse or your new simulator, both will work.

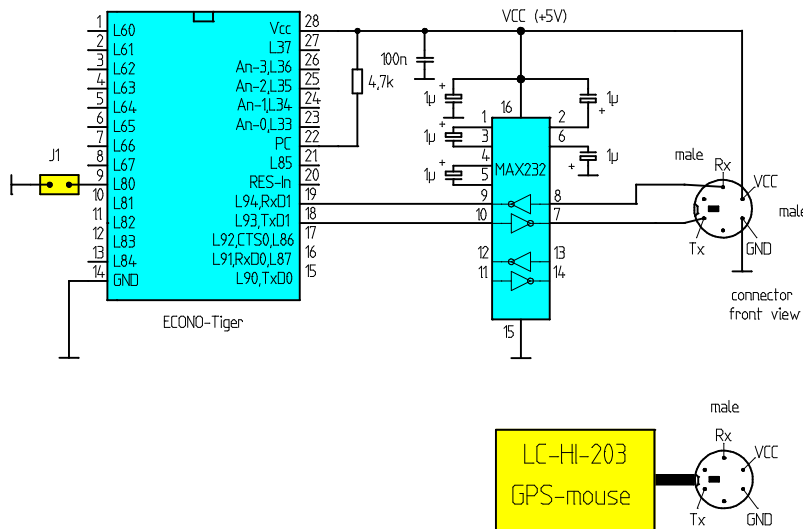


Fig. 2 GPS simulator with Economy-Tiger® (“replaces” a LC-HI-203 GPS mouse in this case)

If you would like to replace different GPS systems you need to make one or two matching adapters (power supply and data line). For e.g. PC applications a connection to its COM interface as well as an external stabilised +5 V supply for the Economy-Tigers® are always required. It is also important at first to think about how the power supply and the serial connection work in original. Then the GPS simulator is customised to the problem.

5. Software GPS_SIM1.TIG

We can choose from the following versions for our simulation.

- A simulated straight movement from one starting point with default latitude and longitude (set to somewhere in Erfurt, Germany) with a randomly starting but then continuous time indication (date and time). The movement is independent from traffic routes, i.e. cross country by beeline. Altitude rises continuously. Because there is no relation to traffic routes it only makes sense to follow the movement on a topographical map (e.g. TOP 50 maps issued by the land surveying departments). Road maps (e.g. in route planners) usually only accept coordinates and directions which are positioned nearby depicted routes.
- A course taken on real roads (also in Erfurt) with corresponding dates which are accepted by both road maps and topographical maps. This data is extracted from a real journey and can be modified if needed. Because of the comparatively large amount of data we use Economy-Tiger[®] ENN-4/4 in this case. If you leave out road data in the software you will be fine with the smallest Tiger.

The requested version can be set by a jumper at L80. Without a jumper you chose a simulation independent from road maps, with a jumper you chose a simulation related to a road map.

By the way - this simple system can be used as a general data origin and with a few modifications generally for lots of different purposes. Where a continuous serial data stream is needed for controlling, calibrating and repairing purposes, a tiger can step in and simulate the original device.