

# GPS Generator PRO

## User manual

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### 1. Introduction

The GPS Generator PRO application is designed for providing assistance in developing, testing and debugging programs and equipment working with the NMEA-0183 protocol. This application can also be used for learning and testing navigation applications and equipment before purchasing.

This virtual GPS receiver can work without visible GPS satellites, thus it's much more efficient when used indoors. Besides, purchasing the program costs less, than purchasing a GPS receiver.

The program emulates the operation of a GPS receiver (position, speed of relocation, reception quality, and satellite constellation) and gives out GPS data based on the NMEA-0183 protocol v. 2.0, 2.1, 2.3 or 3.0. The program can be configured for getting certain NMEA protocol messages in a certain sequence with a certain frequency.

The output NMEA protocol can be written to a file or transmitted via COM port. Any program or equipment working with the NMEA protocol will recognize transmitted messages, created by the GPS Generator, as data from a real receiver. A certain amount of parity errors (CRC) can be introduced in the generated protocol. This could be used to test consistency of operation in navigation programs.

The program supports several operation modes, and it can give out output data to a COM port (including a virtual one) or save to a file. The saved file can also be re-played providing an opportunity for creating repeatable work scenarios, which would be difficult to do with an actual GPS receiver.

Our application is one of the most convenient and functional among the currently available applications at the market.

### ***Program features***

- Support for \*.mif and \*.shp files as maps.

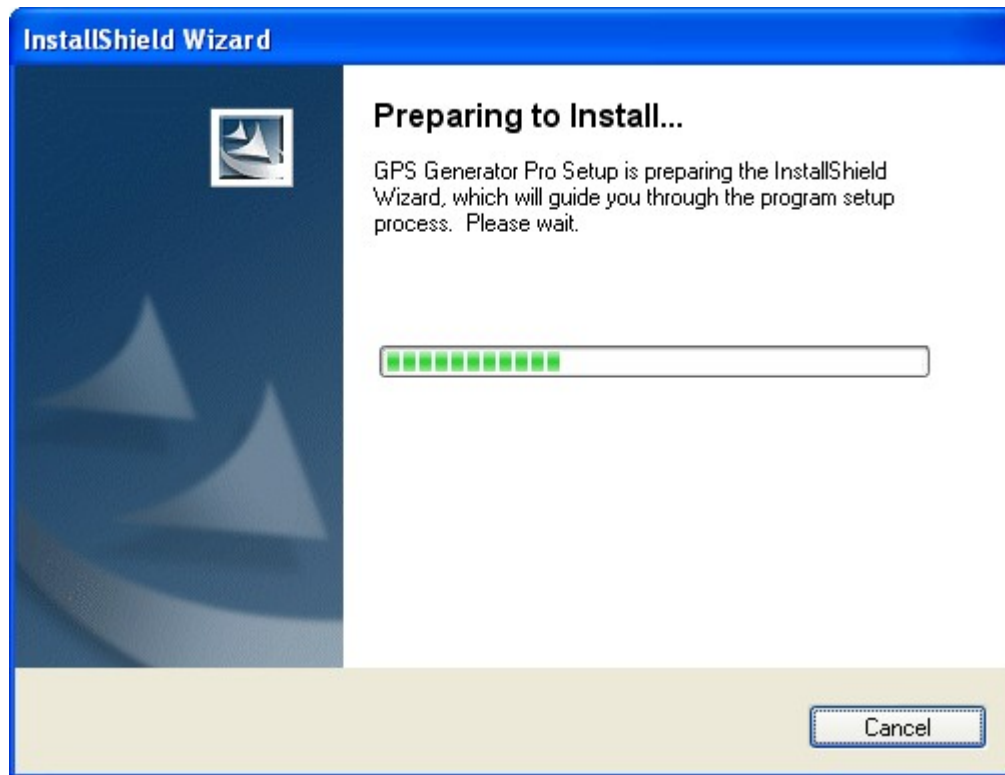
- Coordinates, speed (kph, knots or mph) and altitude parameters configuration.
- Satellite constellation setup and observation (PRN, azimuth, elevation, SNR).
- Configurable dilution of precision factors (PDOP, HDOP, VDOP).
- Toggling between 2D/3D selection modes (manual/automatic).
- Position fix mode (2d/3d/not defined).
- Generation of the following NMEA messages: GGA, GLL, RMC, GSA, GSV, VTG.
- "Moving map" mode.
- Toggling between different NMEA-0183 releases (2.0-3.0).
- Packet data transmission mode (NMEA messages are grouped in packets. All messages in one packet are sent at the same time).
- Route generation mode.
- GPS Fix modes (Invalid, GPS Fix, DGPS Fix, PPS Fix, RTK, Float RTK).
- High\low speed selection (affects the speed setting precision).
- Random data transmission mode (random NMEA message is generated).
- Send data via Bluetooth to other devices (currently only the BlueSoleil driver is supported).
- Writing the NMEA protocol to a COM port (including a virtual one).
- Writing the NMEA protocol to a file.

## 2. Program Installation

To download the GPS Generator PRO program (hereinafter referred to as "program"), go to the following web-page:

<http://avangardo.com/files/gpsgen/avGPSGenPro.zip>

To install the program, download the archive using the link given above. Extract the setup file from the archive and run the setup.

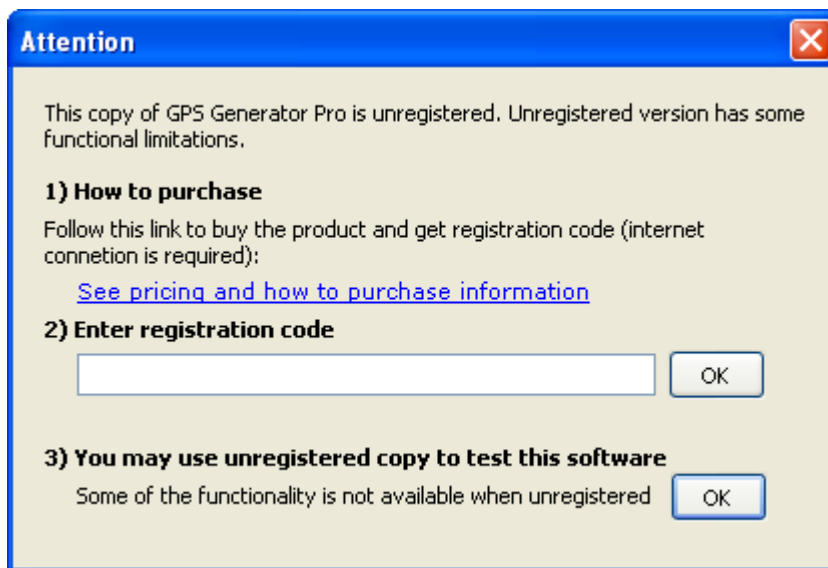


During the installation the user can read the license agreement and specify the installation path.

### 3. Purchasing and registering the program

If you haven't yet purchased a program license, visit the program web-site to complete your purchase. Use the "Buy Online" link in the lower part of the page to go to the purchasing page. After providing necessary information and paying the cost of the license, please wait for an email confirmation. The email will confirm the purchase and provide the **license key**. The license key is necessary for accessing all program fetures.

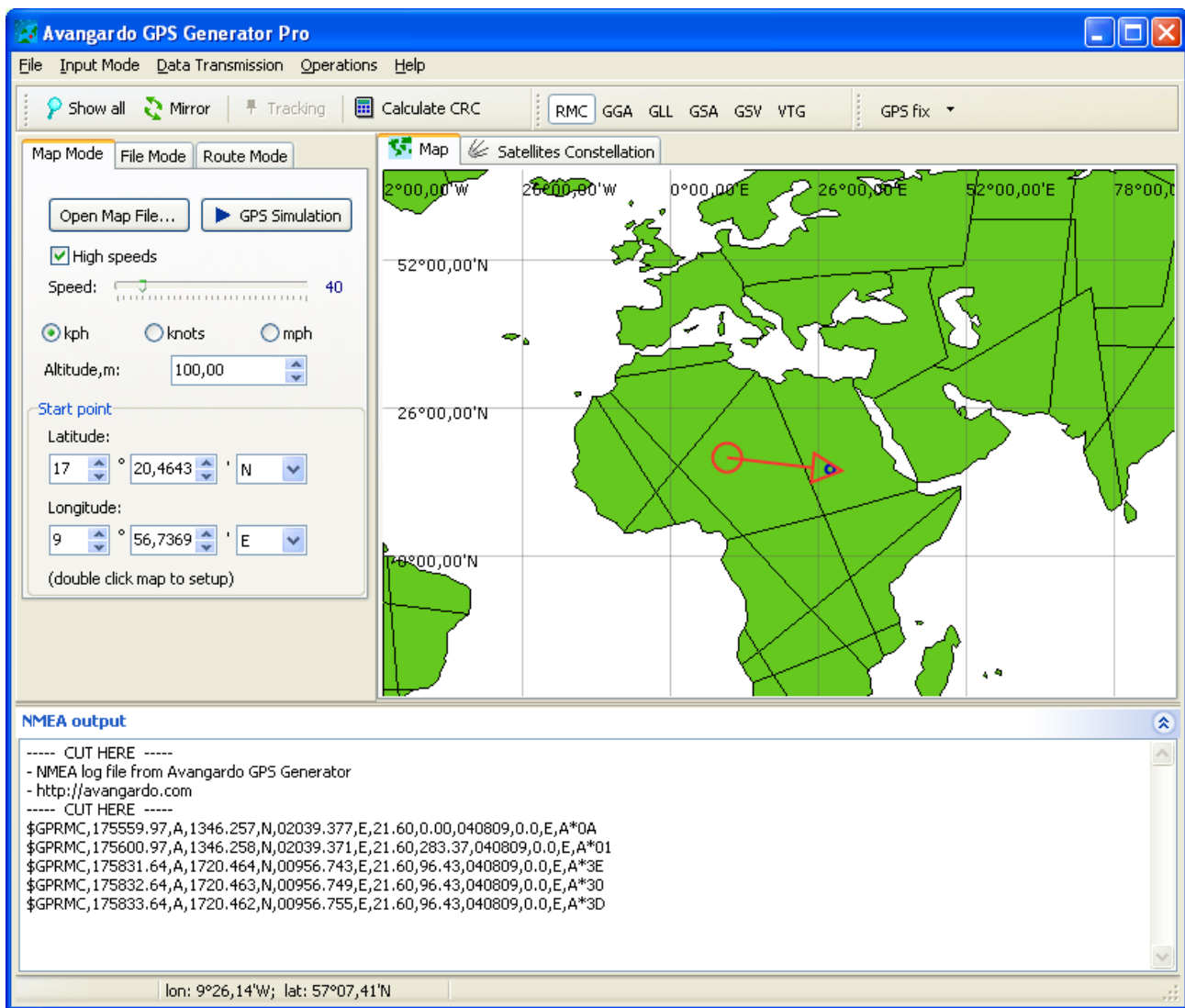
After receiving the email you can run the program. Unregistered program version has some functional limitations, and at the program start the following message is displayed:



Please enter the license key received in the email into the *Enter Registration code* field and press OK. After that it's necessary to restart the program. If the key was entered correctly, the program is considered registered and can be used without any limitations.

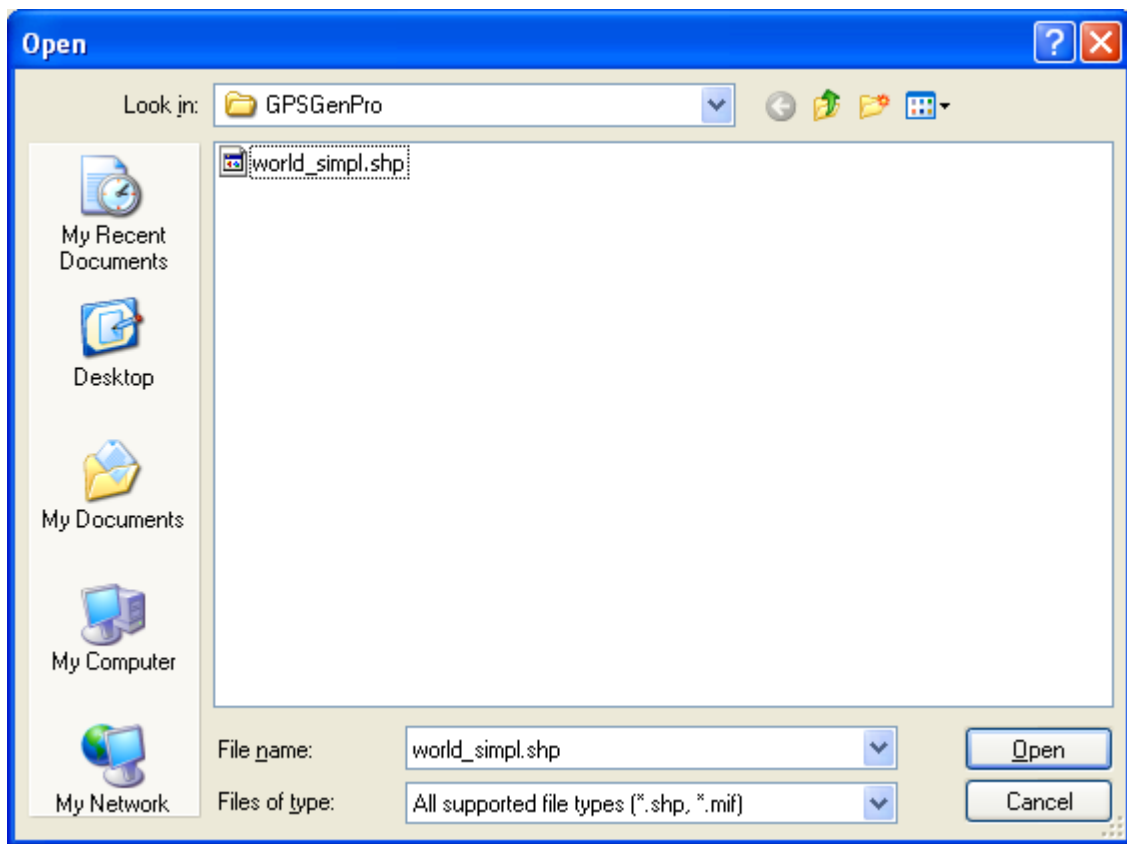
#### 4. The main program window

The top part of the window contains the main menu and the toolbar. The bottom part contains the NMEA protocol output. The biggest part of the window is reserved for the map. On the left there are operation mode tabs (map mode, file mode and route mode).



## 5. Opening and reviewing a map

To open a map, in the main menu select the *Open Map* option under the *File* menu. At that the *Open* dialog is displayed.



You can select files with \*.shp (ESRI shape files) or \*.mif (MapInfo) extensions. Select the file and press *Open*. The selected map will be loaded for displaying in the main window.

Use the following functions to facilitate map preview:

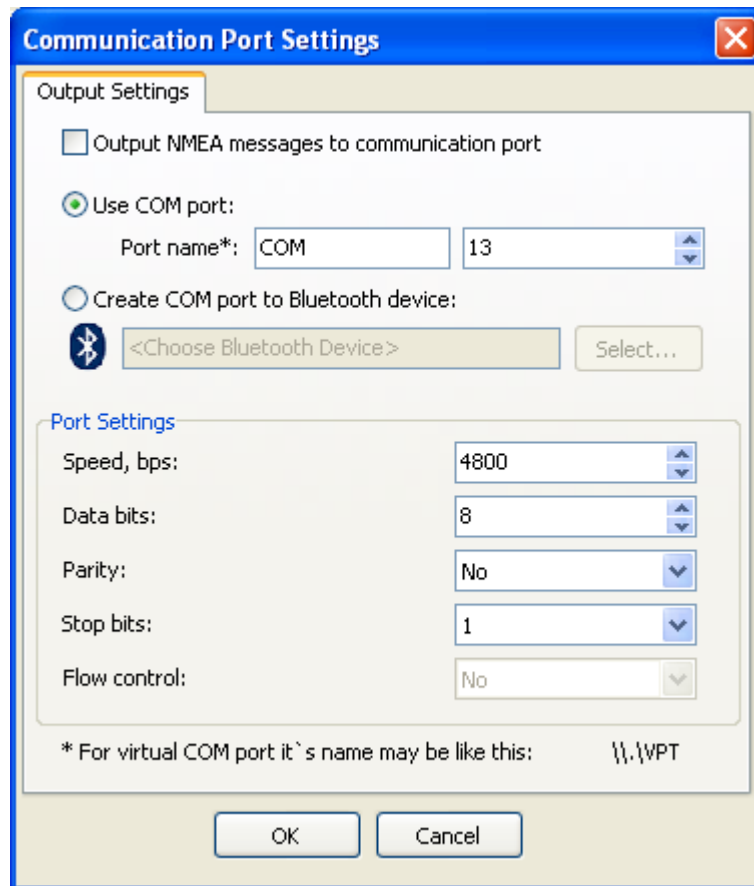
**Map Zoom** – use the mouse wheel to zoom the map in or out.

**Panning** – use the right mouse button to move the map (press and hold the button while dragging the map in a desired direction).

**Show all** – to see the whole map, press *Show all* on the toolbar.

## 6. Setting up a COM port for the NMEA protocol output

To set up a COM port, in the main menu select the *Communication Port Settings* option under the *Data Transmission* menu. The port settings dialog window will be displayed:



If the *Output NMEA messages to communication port* checkbox is selected, the generated data will be transmitted to the indicated COM port; otherwise the messages will just be recorded in a log in the lower part of the main window. If the program is unable to open the port for recording, the corresponding message will be given out.

In the *Port name* box enter the name and number for the output COM port. On the image above, according to the settings made, the output will be carried out to the COM13 port. When using a virtual COM port, you may need to indicate a special port name, for example "\\.\VPT".

In the *Port Settings* group the COM port settings are displayed. The settings on the picture above are the default NMEA-0183 standard settings.

If you have a Bluetooth device with the BlueSoleil driver installed, you can open a COM port for the device by selecting the *Create COM port to Bluetooth device* option. This feature can be used, for instance, when transmitting GPS data to a cell phone, laptop or a PDA device.

## 7. Setting up output data

Two data output modes are provided in the program:

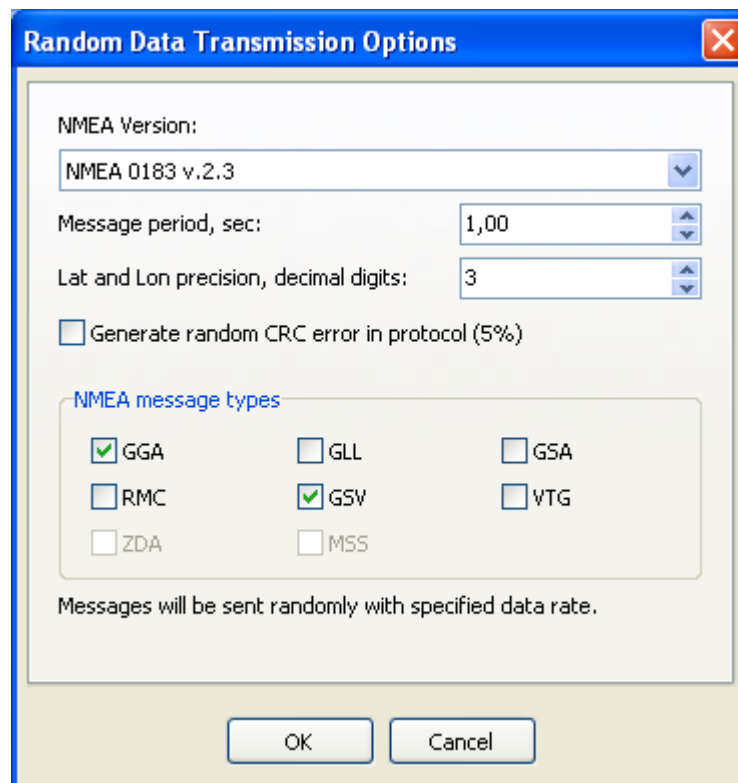
**Random NMEA messages** – when using this mode one of the selected NMEA messages is randomly sent at a set frequency.

**Packet mode** – when using this mode, NMEA messages are grouped into packets. All messages from one packet are sent at the same time, one after another in a set sequence. The packets are sent in a set order and at a set frequency.

The program can emulate the GPS receiver operation with the output of the NMEA-0183 protocol v. 2.0, 2.1, 2.3 and 3.0.

### *Setting up the random NMEA messages mode*

To activate this mode, in the main menu select the *Random NMEA Sentences* option under the *Data Transmission* menu. To set up the mode, in the main menu select the *Choose Messages to Generate Randomly* under the *Data Transmission* menu. The following dialog window will be displayed:



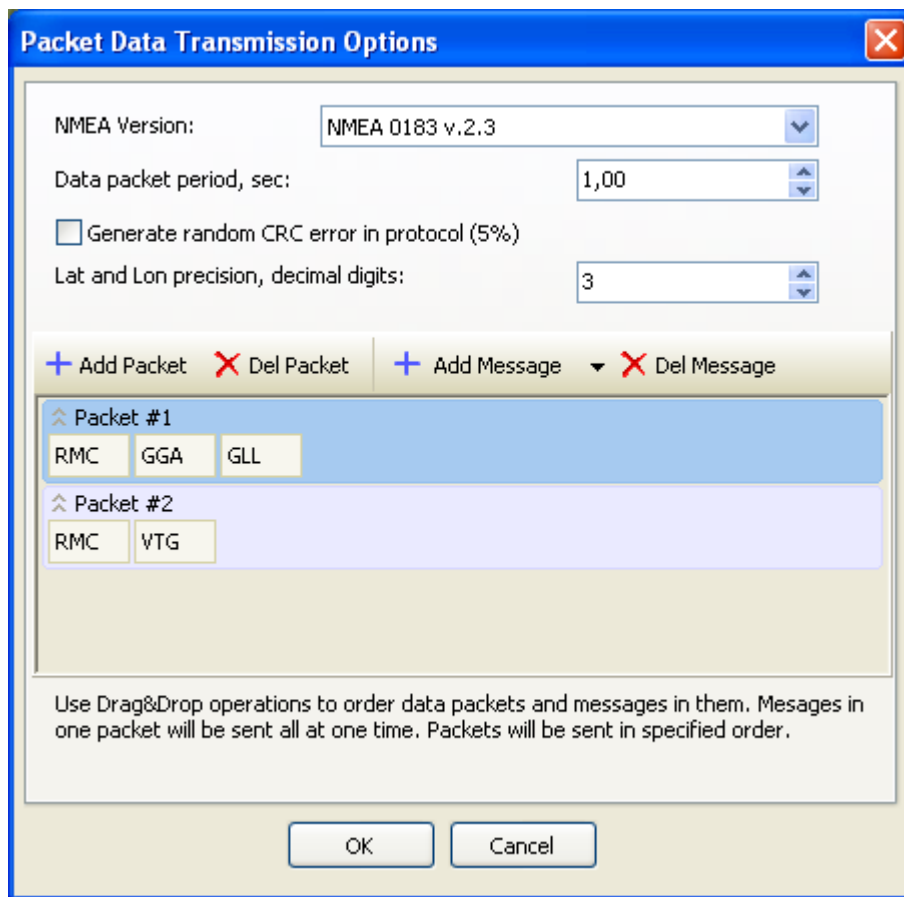


In this window you can select a protocol version, message period, coordinates precision in the generated protocol (number of decimal digits) and a set of messages. The messages will be selected randomly from the set list.

If the *Generate random CRC error in protocol (5%)* checkbox is selected, then, when generating the protocol, in 5% of message a random character will be inserted into a random location.

### ***Setting up the packet mode***

To activate this mode, in the main menu select the *Packets of NMEA Sentences* option under the *Data Transmission* menu. To set up the mode, in the main menu select the *Form Packets of Messages* option under the *Data Transmission* menu. The following dialog window will be displayed:



In this window you can select a protocol version, message period, coordinates precision in the generated protocol (number of decimal digits) and a set of message packets. To move the messages between the packets, use the Drag&Drop function.

According to the settings made on the picture above 2 packets will be created. The first packet will contain 3 messages (RMC, GGA, GLL), and the second packet will contain 2 messages (RMC, VTG). From the example it can also be observed that the message dispatch period is set to 1 second.

In this case, when running the program, 3 messages from the first packet will be sent to the COM port (without delays between the messages and in the set order), followed by a 1 second delay, then 2 messages from the second packet will be sent, followed by a 1 second delay, and then again the first packet will be sent, and so on.

## **8. Operation modes**

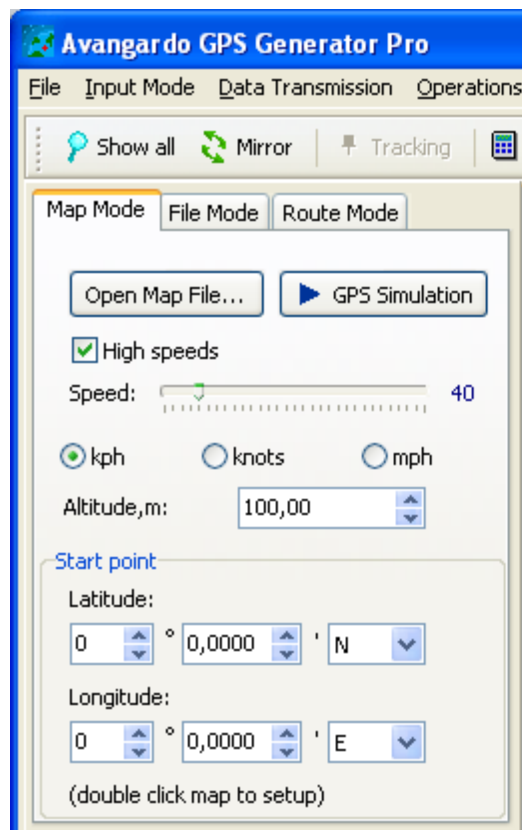
The program can work in the following modes: map mode, file mode and route mode. You can toggle between the modes using the *Map Mode*, *File Mode* and *Route Mode* tabs in the main window. Switching between the modes is disabled during the emulation process.

### ***The Map mode***

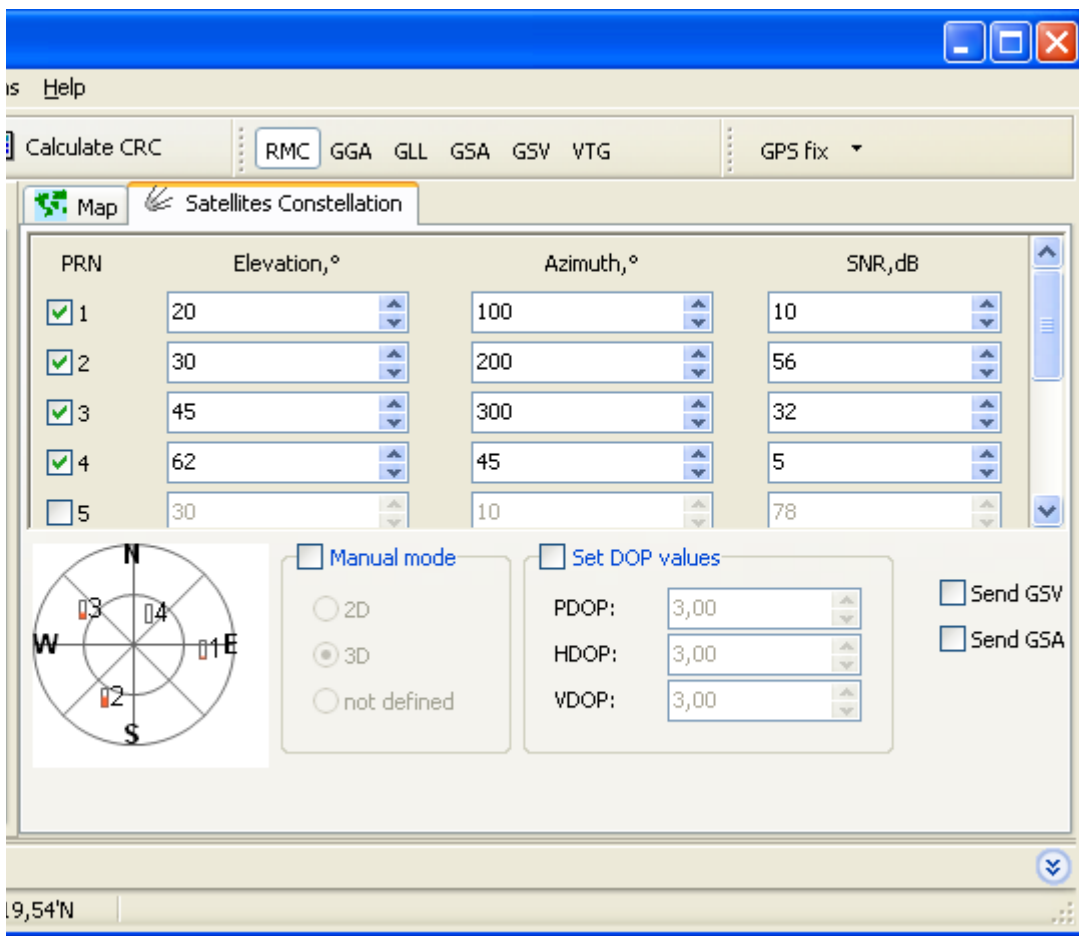
In this mode the user can interactively set the object coordinates, altitude, speed and course, as well as the reception conditions (satellite constellation and their signal strength).

#### **1. Setting up initial conditions**

To set up the start point, enter the required coordinates in the *Start point* group or double-click on the map. The point will be marked on the map with a blue circle.



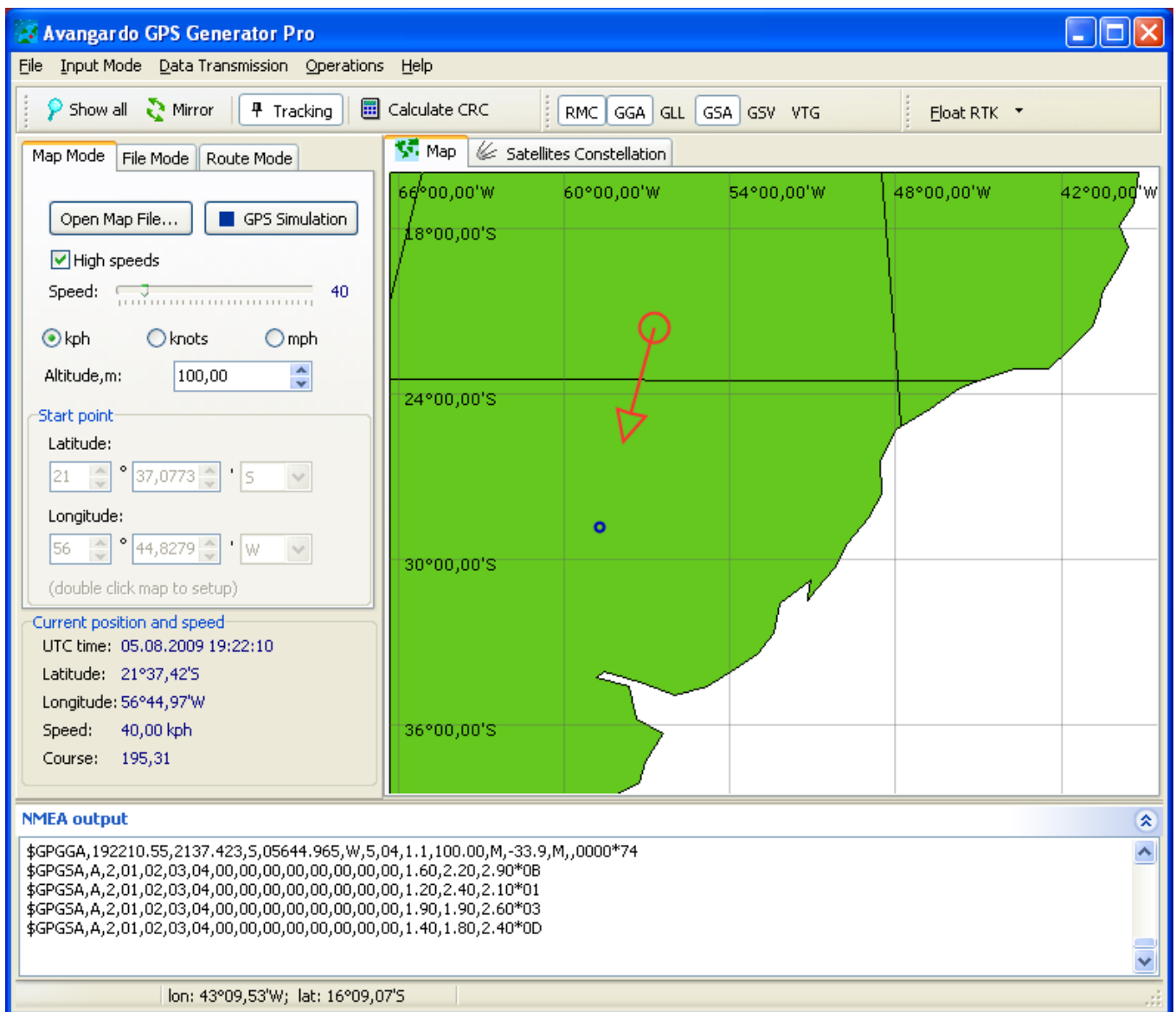
On the *Map mode* tab it's necessary to set up the initial speed of travel. The speed can later be changed during the emulation.



To set up a satellite constellation and reception conditions, switch from the *Map* tab to the *Satellites Constellation* tab. Satellites marked with flags will be considered visible (GSV message). For visible satellites it is possible to set the *Elevation*, *Azimuth* and *SNR* parameters. The selection in the *Manual Mode* and *Set DOP Values* checkboxes will affect the corresponding GSV and GSA message fields. If the *Set DOP Values* checkbox is not selected, random DOP values will be generated. If the *Manual Mode* checkbox is not selected, the 2D/3D mode will be selected automatically depending on the number of visible satellites (up to 3 visible satellites for the 2D mode, more than 3 visible satellites for the 3D mode).

## 2. Emulation

To start emulation, press the *GPS Simulation* button on the *Map Mode* tab. If the COM port error message is displayed, it is necessary to set up the COM port following the instructions given above. The window in the emulation mode is shown on the following picture.



To select NMEA messages that should be displayed in the protocol, press the corresponding buttons on the toolbar. They can also be selected under the *Data Transmission* option in the main menu. The GSV and GSA messages can also be enabled/disabled on the *Satellites Constellation* tab. A required Fix Mode (Invalid, GPS fix, DGPS fix, PPS fix, RTK fix, Float RTK) can be selected from the dropdown list box on the toolbar on the right from the message list. The selection will affect the content of the GGA message.

In accordance with the selected mode (random, packet) the selected messages will be written to the COM port and in the log in the lower part of the window.

During the emulation it is possible to modify the object speed, its current coordinates (double click on the map), satellite constellation, set of message and the course. The course can be changed by clicking on the map or pressing the Right, Left, Ctrl+Right, Ctrl+Left keys on the keyboard.

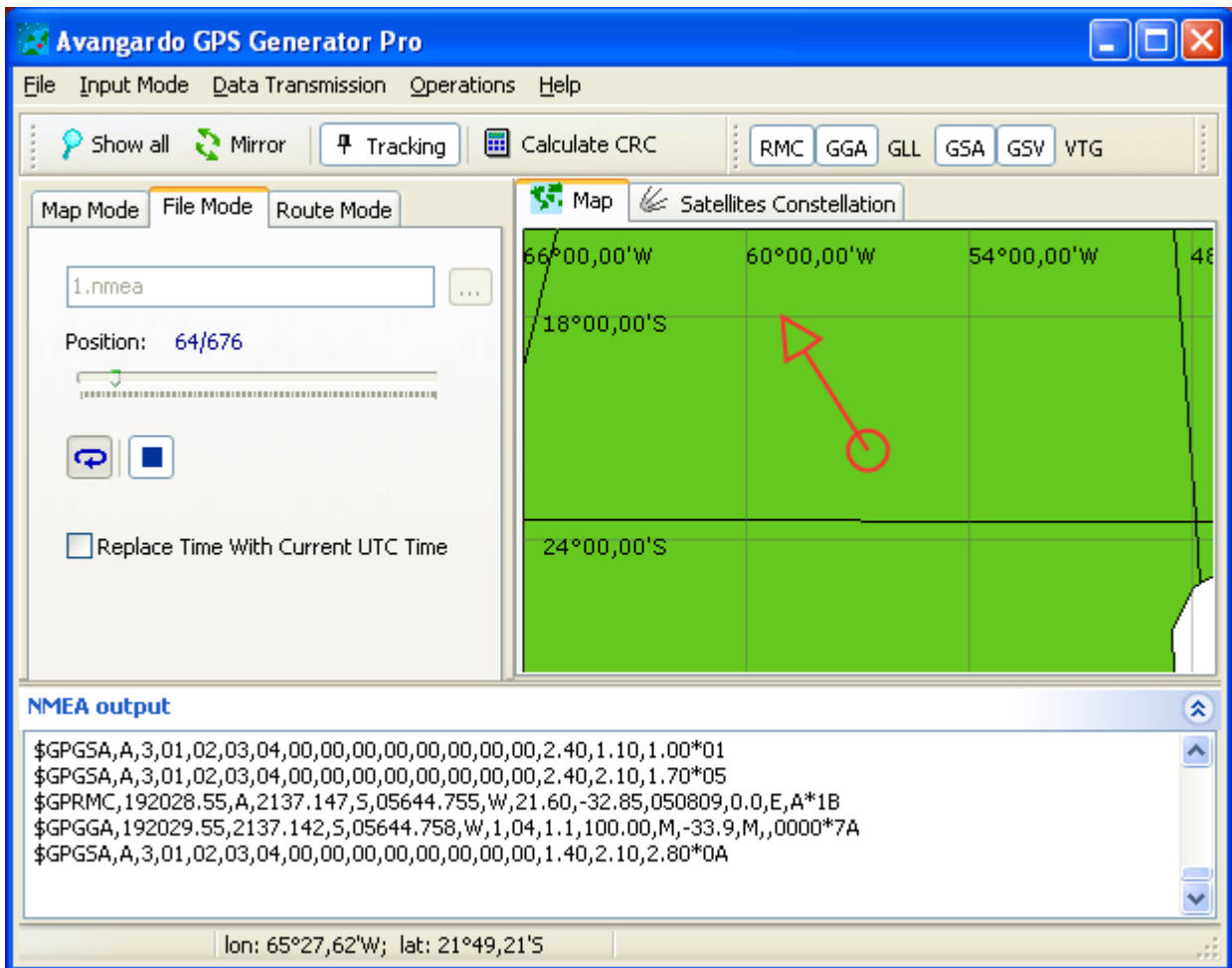
The NMEA log can be recorded into a file using the contextual menu.

To stop the emulation, press the *GPS Simulation* button.

### ***The File mode***

To activate the file mode, go to the *File Mode* tab. To select a file, press the "..." button. For example, you can load a file recorded in the map mode.

After pressing the *Play* button, the emulation starts.



The NMEA messages contained in a file will be written to the COM port. During the emulation process you can change the current position in the file.

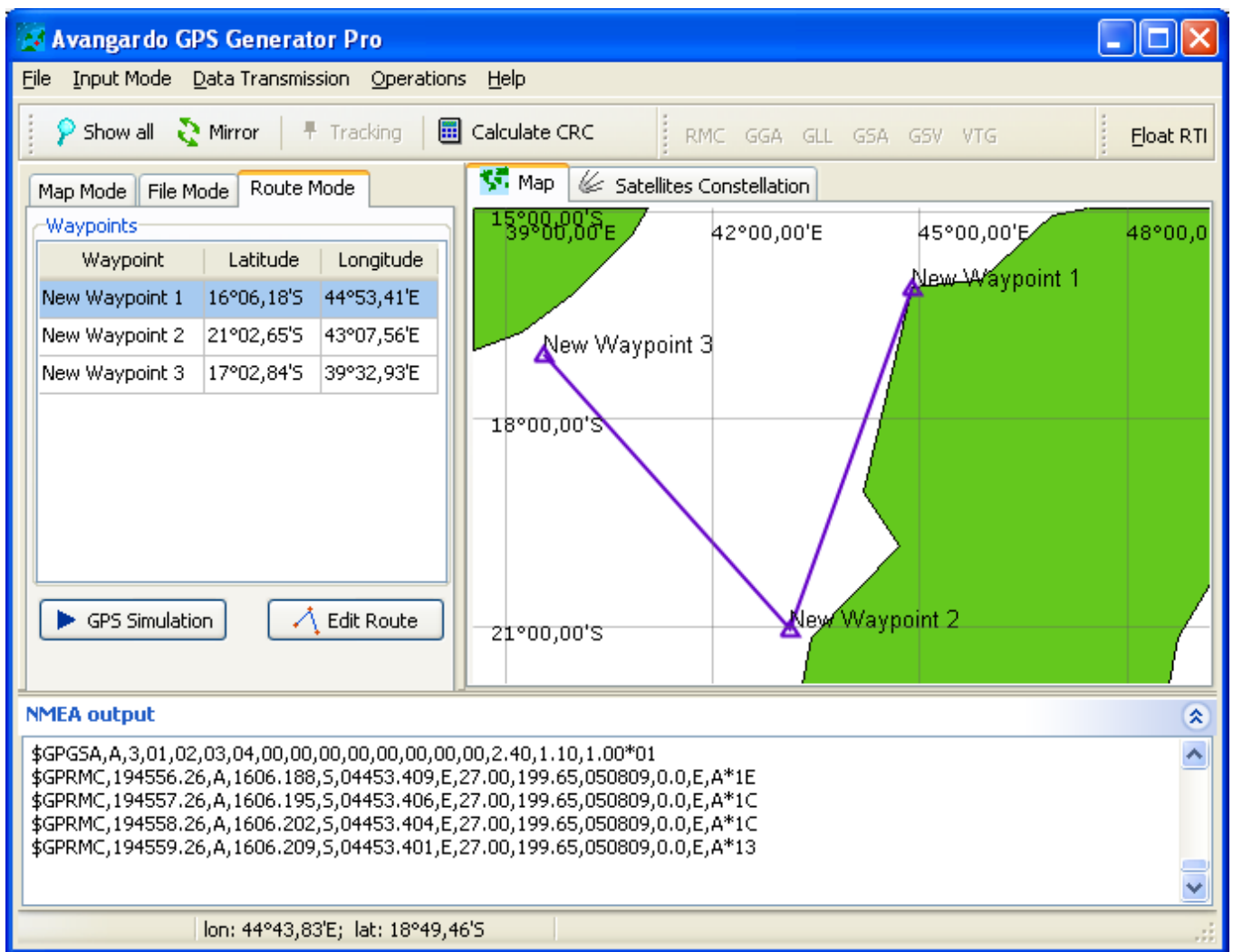
If the *Cycle* checkbox is selected, upon reaching the end of the file, the file will be played over again. If the *Replace Time With Current UTC Time* checkbox is selected, then, instead of time written in the file, the current UTC time value will be used.

To stop the emulation, press the *Stop* button.

### ***The Route mode***

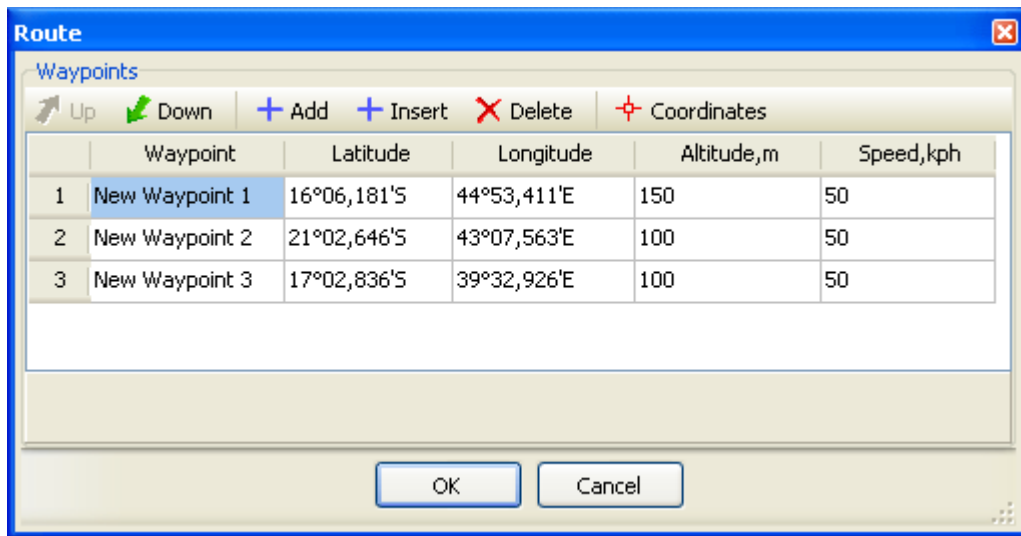
Being similar to the map mode, this mode allows the user to set the route. The route consists of waypoints. Each waypoint has its coordinates and altitude values. The speed of travel is set for the intervals between the waypoints.

To activate the route mode, go to the *Route Mode* tab.



The route is displayed on the map as a line with signed waypoints. To form the route, press the *Edit Route* button. The dialog window will be displayed.





Using this dialog window, the user can add and delete waypoints, set their name, altitude, speed on the interval to the next waypoint and change the order of waypoints.

To set a waypoint coordinates, select the waypoint in the list and press the *Coordinates* button. For your convenience the dialog window will be zoomed out. By clicking on the map, indicate necessary waypoint coordinates on the map and confirm your selection.

To run and stop the emulation, use the *GPS Simulation* button.