GeoSDemo3® v3.02

User Manual

R&D Center “GeoStar navigation” Ltd.

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Scope

The document presents description of how to use demonstration software **GeoSDemo3®**.

The document contains 5 chapters as follow:

- Chapter 1: about program
- Chapter 2: abbreviations
- Chapter 3: installation guide
- Chapter 4: using software
- Chapter 5: how to connect software to the receiver.

1. About Program

1.1. Introduction

GeoSDemo3® is a demo software for GeoS-3® and GeoS-3M® modules. This is PC based software with intuitive and easy-to-use GUI that could be a helpful instrument for evaluating receiver modules and updating their firmware.

Features:

- Auto scan of connected PC COM ports or manual connection to the receiver serial ports
- Graphical presentation of output navigation data including user position on Google Maps
- Displaying receiver hardware status, tracking channels status and current operation mode
- Allows choosing and sending settings, queries and commands to the receiver
- Displaying responses to settings, queries and commands
- Logging output data (both binary and NMEA) to the files on PC hard disc
- Replay of log files that have been previously recorded
- Allows receiver firmware update.

The software is a Win32 application intended for running on PC with Windows XP™, Windows Vista™ and Windows 7™ operation systems.

GUI language: Russian/English.

2. Abbreviations

AGC:	Auto Gain Control
Az:	Azimuth
C/N0:	Carrier-to-Noise ratio (in 1Hz bandwidth)
DOP:	Dilution of Precision
DR:	Dead Reckoning
El:	Elevation
FW:	Firmware
GUI:	Graphical User Interface
HEE:	Horizontal Error Estimate
PC:	Personal Computer
PLL:	Phase Locked Loop
PPS:	Pulse Per Second
SNR:	Signal-to-Noise Ratio
SV:	Space Vehicle
SW:	Software
UTC:	Universal Time Coordinated
VEE:	Vertical Error (altitude) Estimate

3. Installation Guide

The installation file (in zip format) **setup_geosdemo_v3.02.zip** can be downloaded from the web site http://geostar-navigation.com. Before installation, the file should be unzipped.

To start installation, please run **setup_geosdemo_v3.02.exe**. The first step is selection of the language (Figure 1).

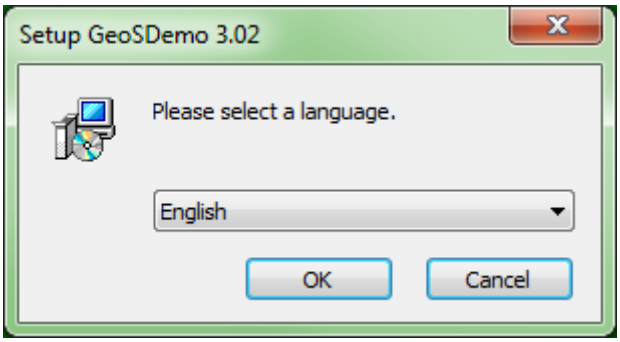

Figure 1: Installation language select

For further proceed, please follow the installer instructions (Figure 2).

Figure 2: Installer start window

Click **Next** (Figure 3) to choose install location (on default C:\Program files\Geostar-Navigation Ltd.\GeoSDemo3).

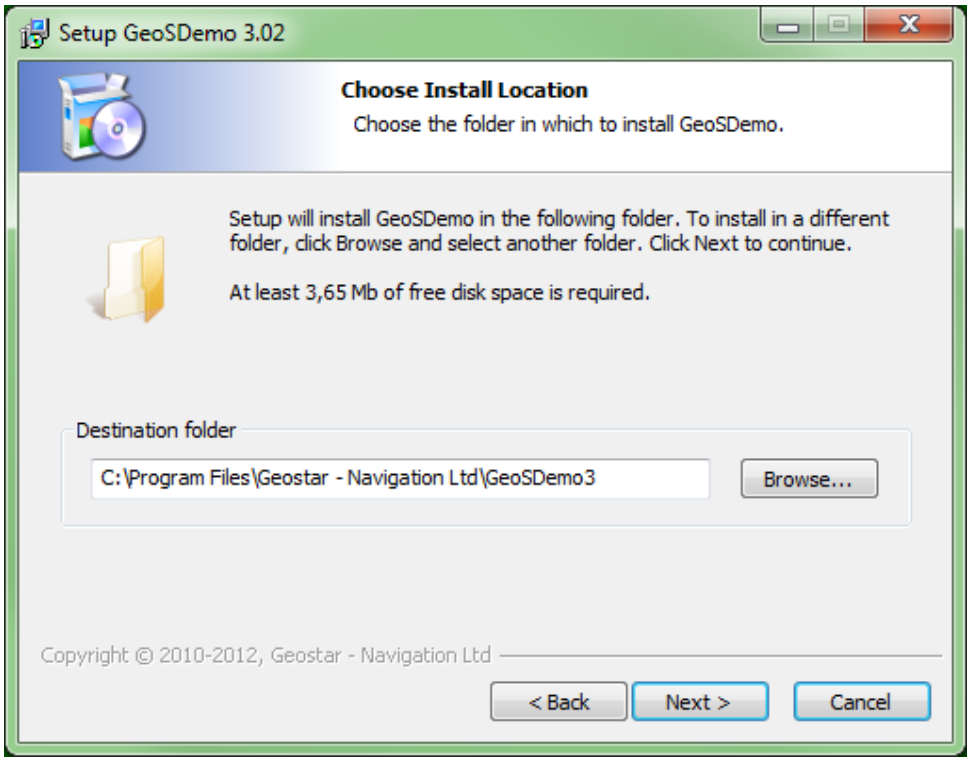

Figure 3: Choosing install location

In the next window (Figure 4) please select a start menu folder for **GeoSDemo3®** shortcut.

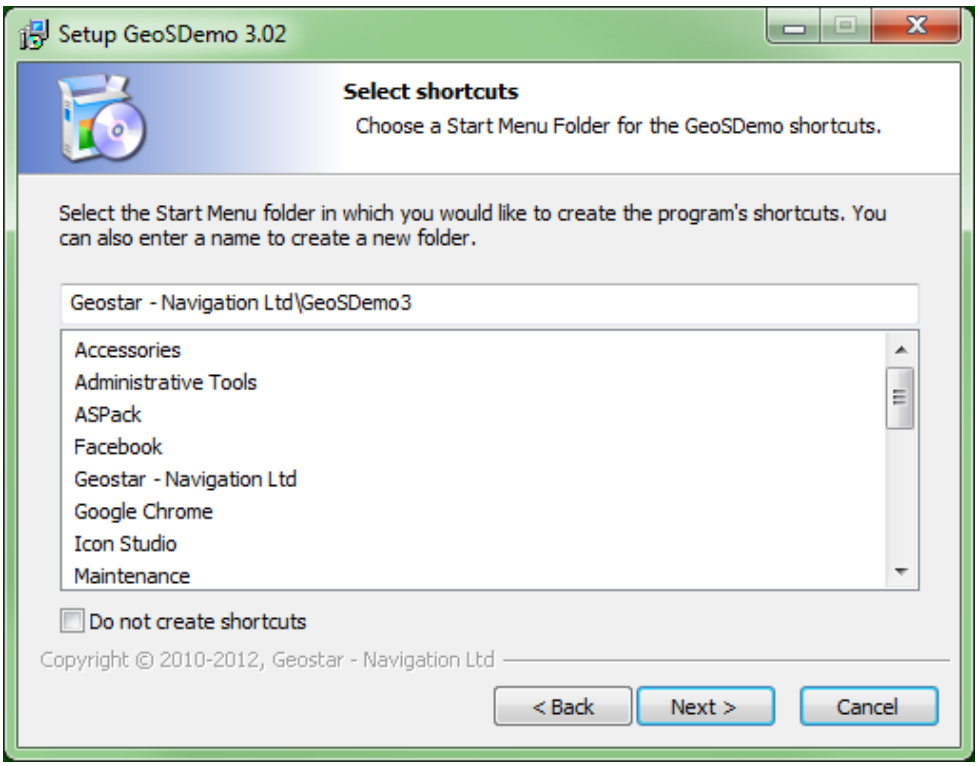

Figure 4: Selecting a start menu folder

Click **Install** in **Ready to Install** window (Figure 5) to start installation.

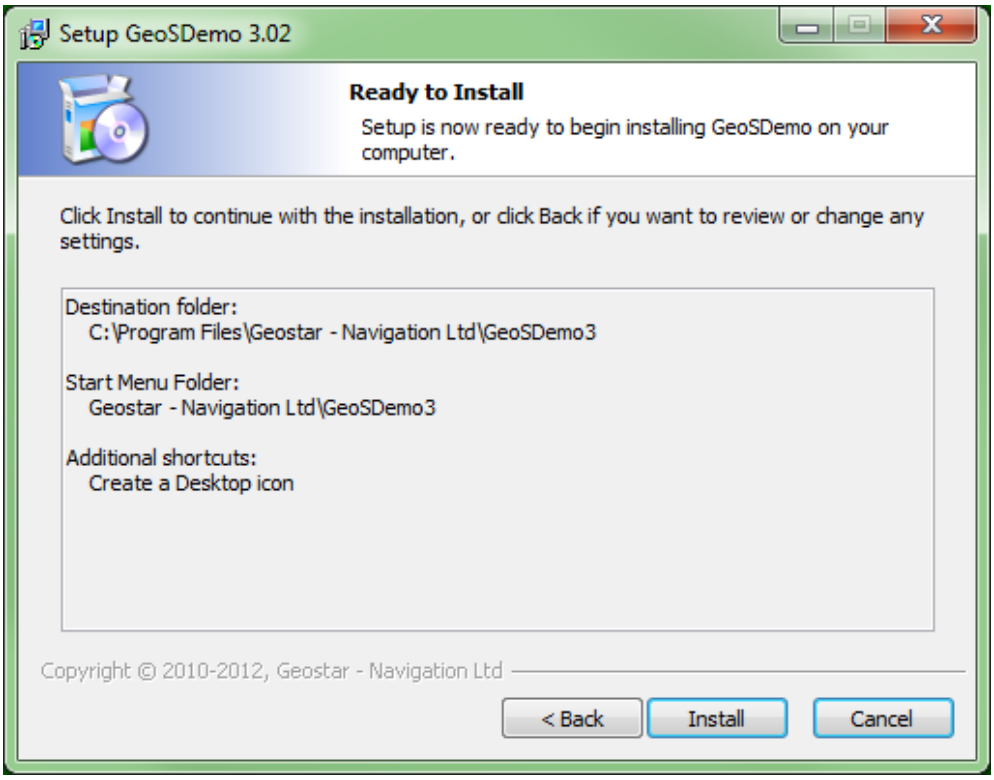

Figure 5: **Ready to Install** window

Figure 6 depicts progress of USB driver installation; the window will close automatically.

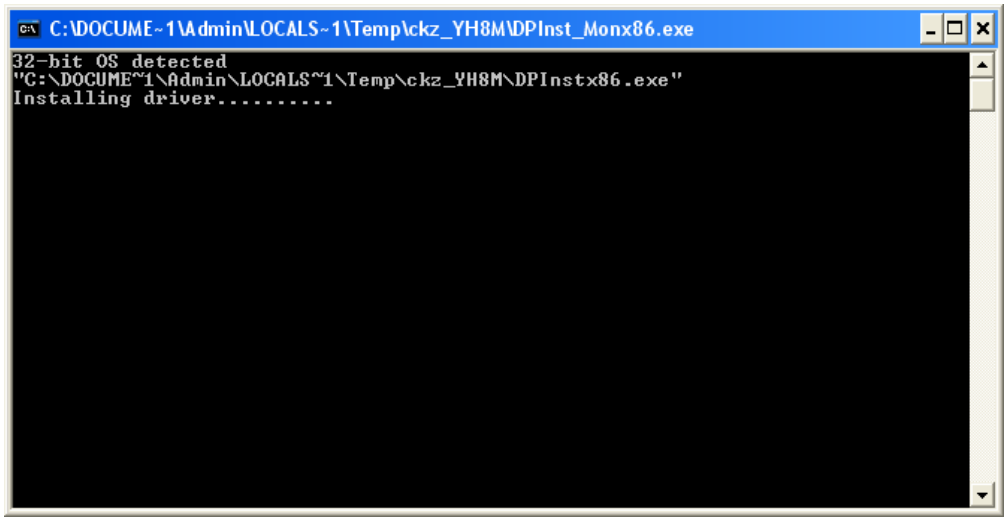

Figure 6: Installing USB driver window

As soon as installation is completed, click **Finish** (Figure 7).

Figure 7: Installation complete window

The following shortcut will be created on the PC's desktop:

To run program, double click on the shortcut or go to: **Start** → **Programs** → **Geostar – Navigation Ltd** → **GeoSDemo3**.

4. How to Use

4.1. Getting Connection with the Receiver

How to connect window (Figure 8) is the starting window that provides following options of connecting to the receiver:

1. Automatic scan of the active computer COM or virtual COM ports
2. Manual assignment of specific computer COM port
3. Use of the last active computer ports configuration.

In addition, the program can be set to read data from the log file that has been saved previously. This option can be selected by ticking off **Reading from file**.

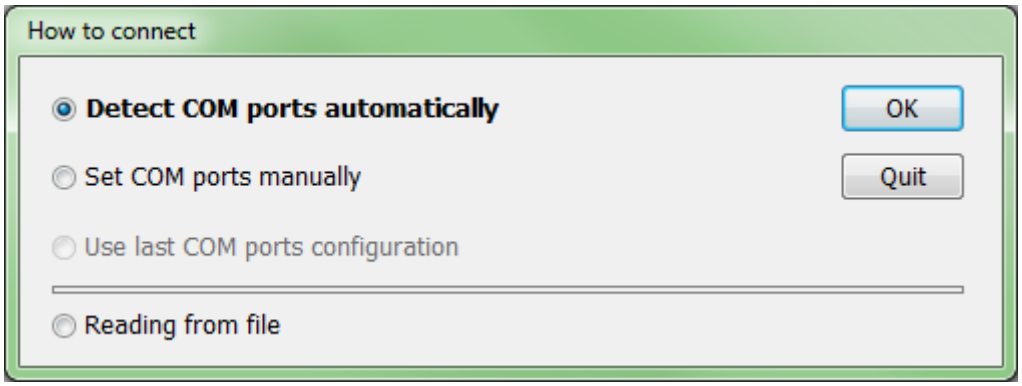

Figure 8: Choosing the way of connection to the receiver

4.1.1 Detect COM Port Automatically

After choosing this option, the program will scan all available computer COM ports automatically in order to detect the ports communicated with the receiver. In case the receiver is connected to PC via USB-to-Serial adapter, USB driver will generate virtual COM port. The number of available COM port or virtual COM port is displayed in the status bar (Figure 10).

4.1.2 Set COM Ports Manually

When choosing this option, COM port number and its settings could be set manually **Main settings** window (Figure 9).

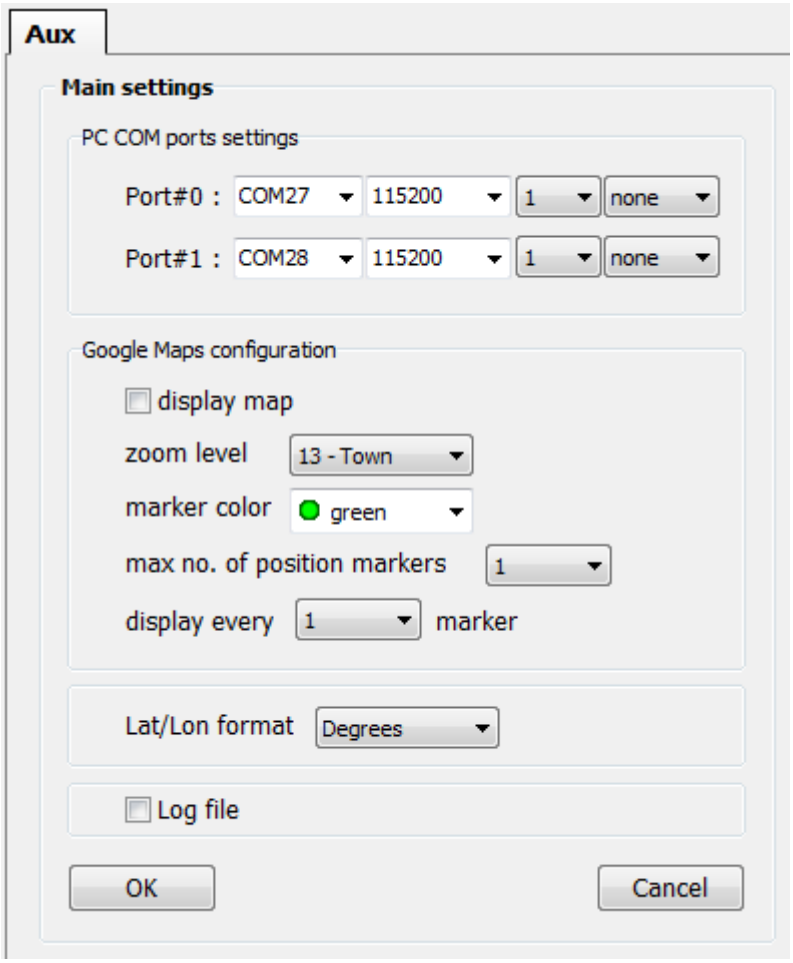

Figure 9: **Main settings** window

In addition, the window provides the options of selecting Google Maps configuration, Lat/Lon format, and enabling/disabling log file.

The software creates three types of log files as follows (yyyy – year, mm – month, dd – day, hh – hour, mm – minute, ss – seconds):

- *yyyymmdd-hhmmss.tim*
- *yyyymmdd-hhmmss.pr0* (Port #0 data)
- *yyyymmdd-hhmmss.pr1* (Port #1 data).

4.1.3 Use Last COM Ports Configuration

When choosing this option, the program will use COM ports configuration that has been already used at previous session.

4.1.4 Reading from File

When chosen, the program will be set for reading log files.

4.2. Main Window

Main program window (Figure 10) displays six data panels.

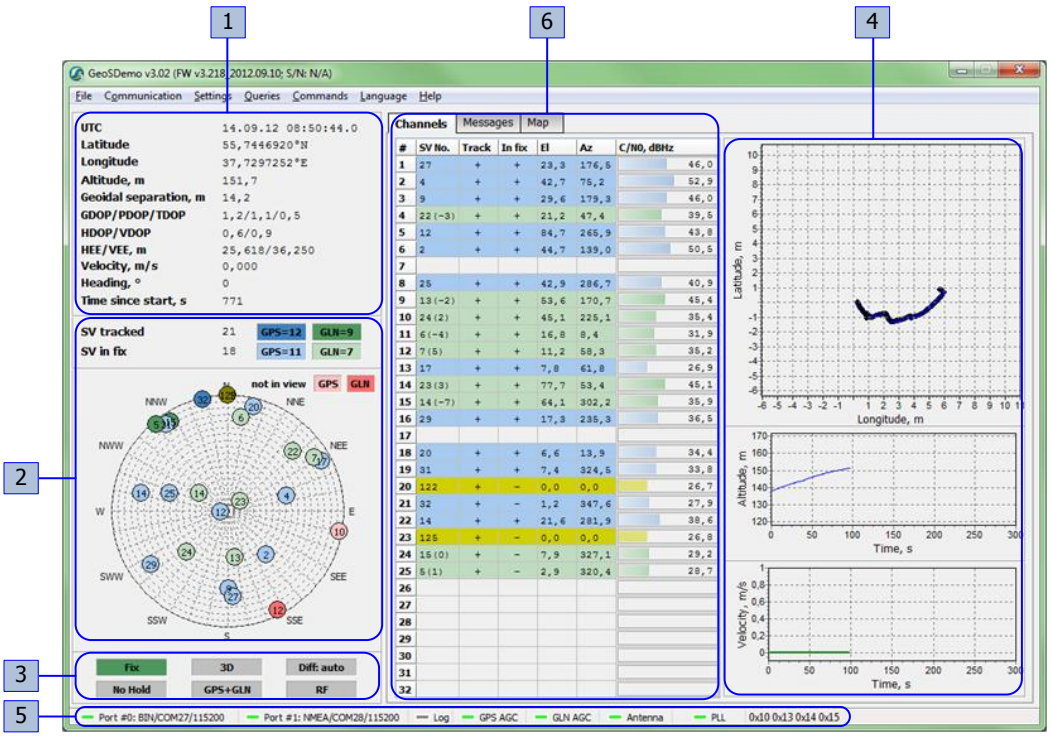

Figure 10: Main program window

1. Brief navigation data panel (Figure 11) displays UTC, Latitude/Longitude/Altitude, Geoidal separation, Ground speed, Heading, DOP factors, Horizontal Error Estimate (HEE) and Vertical Error Estimate (VEE).

UTC	14.09.12 08:50:44.0
Latitude	55,7446920°N
Longitude	37,7297252°E
Altitude, m	151,7
Geoidal separation, m	14,2
GDOP/PDOP/TDOP	1,2/1,1/0,5
HDOP/VDOP	0,6/0,9
HEE/VEE, m	25,618/36,250
Velocity, m/s	0,000
Heading, °	0
Time since start, s	771

Figure 11: Brief navigation data panel

2. Sky chart (Figure 12).

The number inside circle is system SV number. The circle color identifies the satellite system and SV status in following manner:

- GPS SVs are blue: dark blue identifies SV being tracked, light blue – used in fix
- GLONASS SVs are green: dark green identifies SV being tracked, light green – used in fix
- GPS SVs not in view are pink, GLONASS SVs not in view are red
- SBAS SVs are olive.

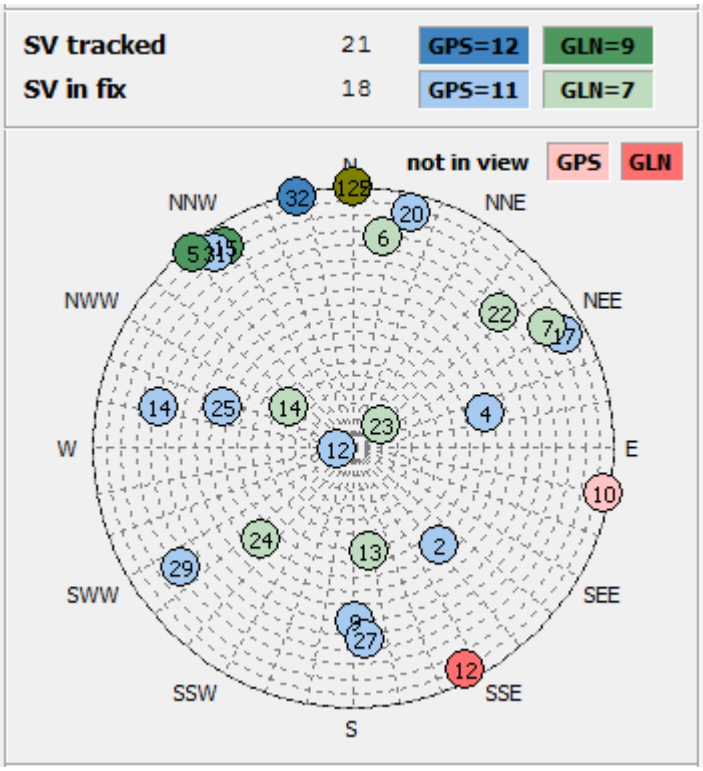

Figure 12: Sky chart

3. Receiver operation mode indicators panel (Figure 13).

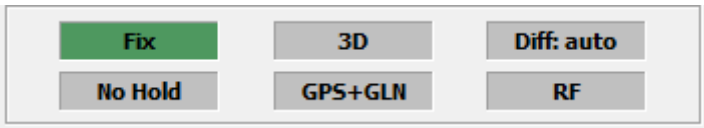

Figure 13: Receiver operation mode indicators panel

The panel consists of six indicators which are described in detail in Table 1.

Table 1: Description of receiver operation mode indicators

Type	View	Description
Fix indicator	No Fix	Fix not available
	Fix	Fix available and valid
	Fix	Fix available and extrapolated
Coordinates hold mode	No Hold	Coordinates hold mode disabled
	Hold	Coordinates hold mode enabled
Satellite system	GPS+GLN	GPS+GLONASS
	GLN	GLONASS only
	GPS	GPS only
3D/2D	3D	3D fix
	2D	2D fix
Diff mode indicator	Diff: auto	Receiver has been configured to auto select of diff corrections source and is operating in autonomous mode
	Diff: auto	Receiver has been configured to auto select of diff corrections source and is operating in differential mode
	Diff: SBAS	SBAS enabled; receiver is operating in autonomous mode
	Diff: SBAS	SBAS enabled; receiver is operating in differential mode
	Diff: RTCM	RTCM enabled; receiver is operating in autonomous mode
	Diff: RTCM	RTCM enabled; receiver is operating in differential mode
RELAXED FIX® indicator	RF	Receiver is operating in full-power mode (RELAXED FIX® enabled but switched off)
	RF - 4	RELAXED FIX® switched on, “SLEEP” state (the number indicates duration of the state in seconds)
	RF - 2	RELAXED FIX® switched on, “ACTIVE” state (the number indicates duration of the state in seconds)
FIX-BY-REQUEST® indicator	FBR	Receiver is operating in full-power mode (FIX-BY-REQUEST® enabled but switched off)
	FBR - 8	FIX-BY-REQUEST® switched on, “SLEEP” state (the number indicates duration of the state in seconds)
	FBR - 3	FIX-BY-REQUEST® switched on, “ACTIVE” state (the number indicates duration of the state in seconds)

4. Diagrams panel: Latitude/Longitude, Altitude, Ground speed (Figure 14).

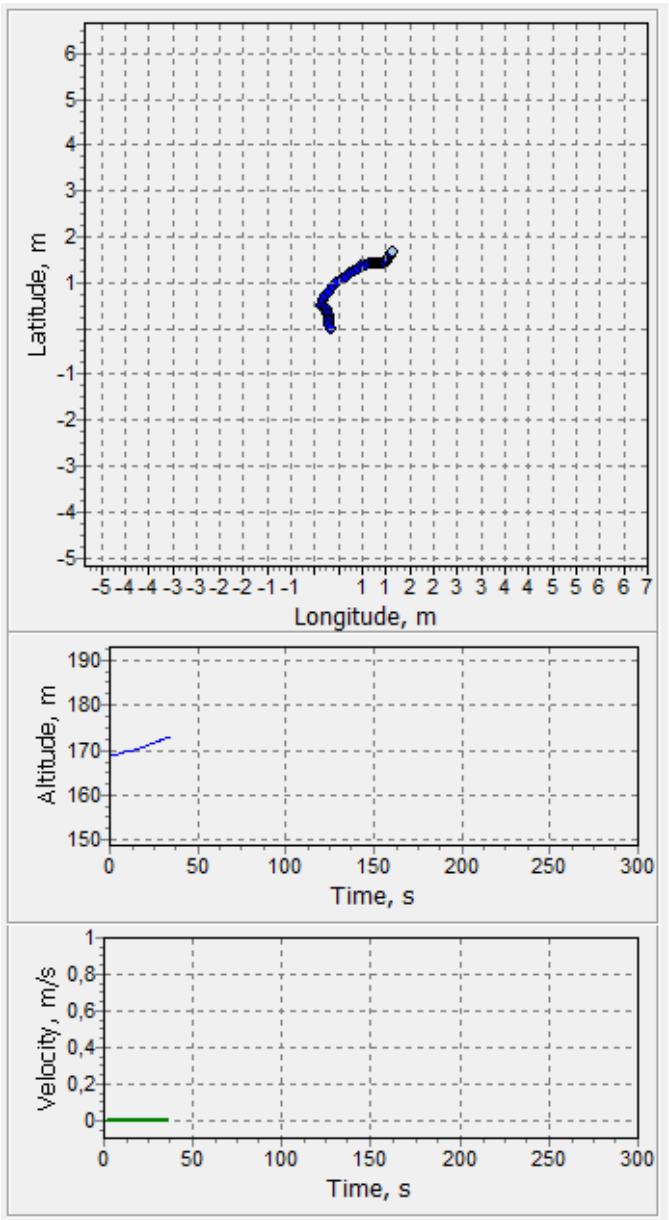

Figure 14: Diagrams panel

Each chart displays 300 points only, after that the data is cleared. To clear charts manually, double click Latitude/Longitude diagram.

5. Status bar (Figure 15).

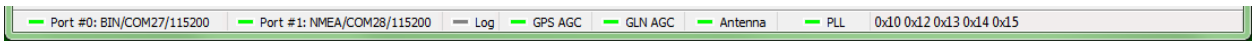

Figure 15: Status bar

There are eight indicators in the bar with functions described in Table 2.

Table 2: Functions of status bar indicators

Type	View	Description
Receiver's Port #0 status	Port #0: No data	No data on Port #0
	Port #0: BIN/COM6/115200	Communication on Port #0 active. Displayed: protocol type (binary)/COM port number/baud rate
Receiver's Port #1 status	Port #1: No data	No data on Port #1
	Port #1: NMEA/COM7/115200	Communication on Port #1 active. Displayed: protocol type (NMEA)/COM port number/baud rate
Logging data status	Log	Logging data off
	Log	Logging data on
GPS AGC status	GPS AGC	No data available
	GPS AGC	GPS AGC failure
	GPS AGC	GPS AGC OK
GLONASS AGC status	GLN AGC	No data available
	GLN AGC	GLONASS AGC failure
	GLN AGC	GLONASS AGC OK
Antenna status	Antenna	No data available
	Antenna	Not connected
	Antenna	Not measured
	Antenna	OK
	Antenna	Overloaded
PLL status	PLL	No data available
	PLL	PLL failure
	PLL	PLL OK
Enabled masked binary messages	0x13 0x14 0x15	Types of masked binary messages being enabled

6. The panel containing three bookmarks: **Channels**, **Messages**, and **Map**.

4.3. Channels

The bookmark **Channels** presents information about status of receiver tracking channels. The bookmark view depends on the type of data protocol and is shown in Figures 16 (for binary data) and 17 (for NMEA data). GPS SVs are blue, GLONASS SVs – light green, SBAS SVs – olive.

Channels | Messages | Map

#	SV No.	Track	In fix	El	Az	C/N0, dBHz
1	27	+	+	20,4	176,5	46,0
2	4	+	+	41,8	71,5	52,7
3	9	+	+	26,5	179,1	41,1
4	22(-3)	+	+	18,2	48,2	41,0
5	12	+	+	87,0	235,9	43,9
6	2	+	+	47,0	136,2	52,4
7						
8	25	+	+	45,8	287,2	39,5
9	13(-2)	+	+	49,8	171,0	41,2
10	24(2)	+	+	48,5	227,2	35,0
11						
12	7(5)	+	+	13,1	55,7	44,5
13	6(-4)	+	+	16,5	5,3	26,8
14	23(3)	+	+	74,1	50,3	42,0
15	14(-7)	+	+	66,8	296,2	35,9
16	29	+	+	19,9	236,5	39,8
17	20	+	+	5,8	11,7	35,4
18						
19	31	+	+	9,8	324,0	36,4
20	122	+	-	0,0	0,0	26,3
21	17	+	+	5,3	62,6	27,7
22	14	+	+	20,2	279,3	30,8
23	125	+	-	0,0	0,0	25,6
24						
25						
26						
27						
28						
29						
30						
31						
32						

Figure 16: **Channels** bookmark for binary data

Channels | Messages | Map

#	SV No.	Track	In fix	El	Az	C/N0, dBHz
1	2	+	+	47	135	50
2	4	+	+	41	71	53
3	9	+	+	26	179	48
4	10	+	-	4	98	27
5	12	+	+	87	229	45
6	14	+	+	19	278	39
7	17	+	+	5	62	24
8	20	+	+	5	11	39
9	25	+	+	46	287	39
10	27	+	+	20	176	44
11	29	+	+	20	236	30
12	31	+	+	10	323	29
13						
14	6(*)	+	-	16	4	28
15	7(*)	+	-	13	55	45
16	12(*)	+	-	0	154	45
17	13(*)	+	-	49	171	45
18	14(*)	+	-	67	295	38
19						
20	22(*)	+	+	17	48	40
21	23(*)	+	-	73	50	39
22	24(*)	+	-	48	227	36
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						

Figure 17: **Channels** bookmark for NMEA data

4.4. Messages

The bookmark **Messages** presents two text windows which display the data transmitted by receiver on both serial ports (Figure 18).

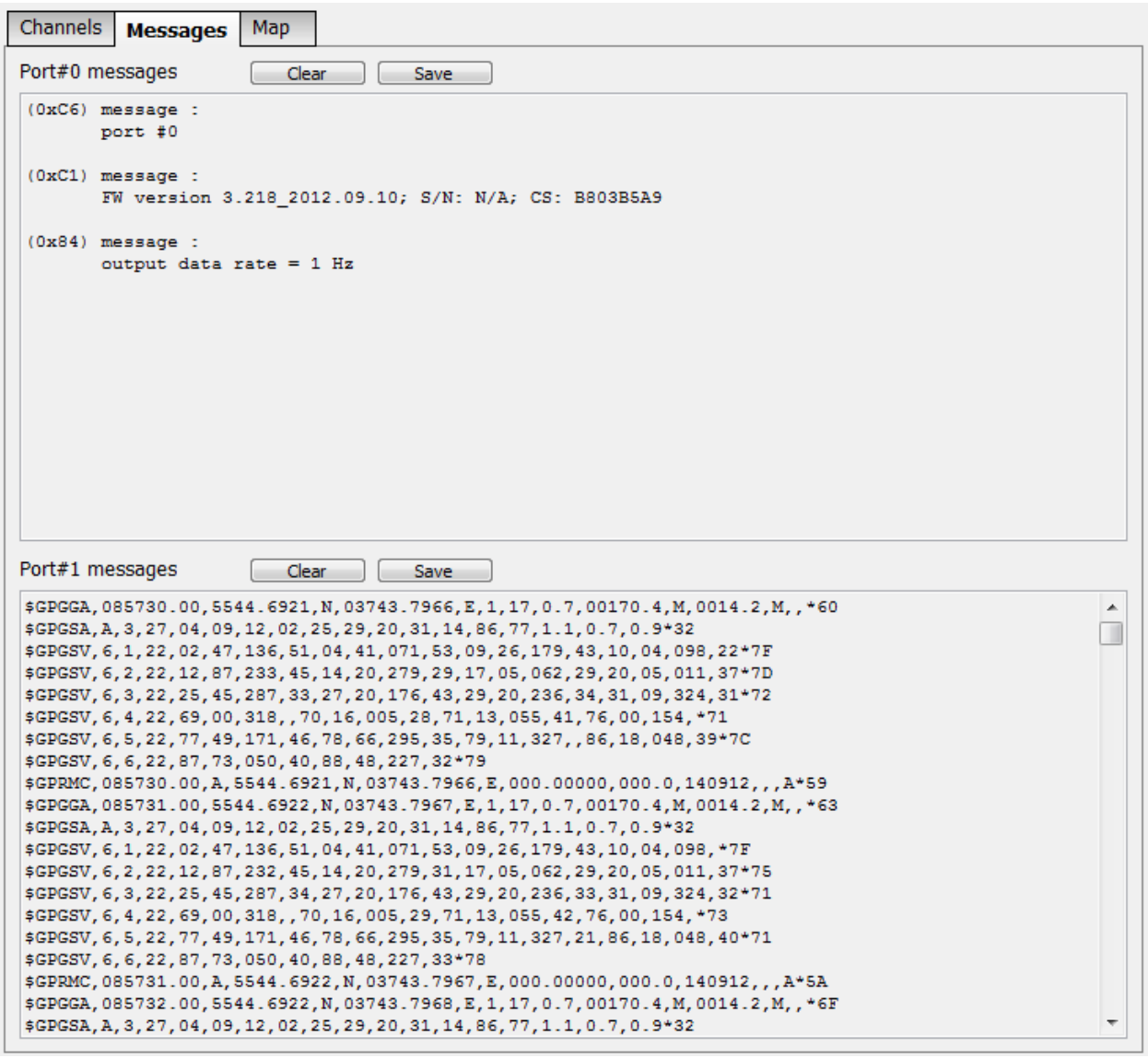

Figure 18: **Messages** bookmark

Upper window relates to Port #0, and bottom window – to Port #1. **Clear** bottom allows clearing displayed data in particular window. **Save** button allows saving displayed data in the files as follows:

Protocol_Port0_dd.mm.yyyy.txt, Protocol_Port1_dd.mm.yyyy.txt, where dd – day, mm – month, yyyy – year. The files are stored in the root folder.

4.5. Map

The bookmark **Map** displays user location on the world map provided that the receiver outputs position fix data. If computer has Internet connection then location appears on Google Maps (Figure 19). Parameters are configured in **Main settings** window (Figure 9).

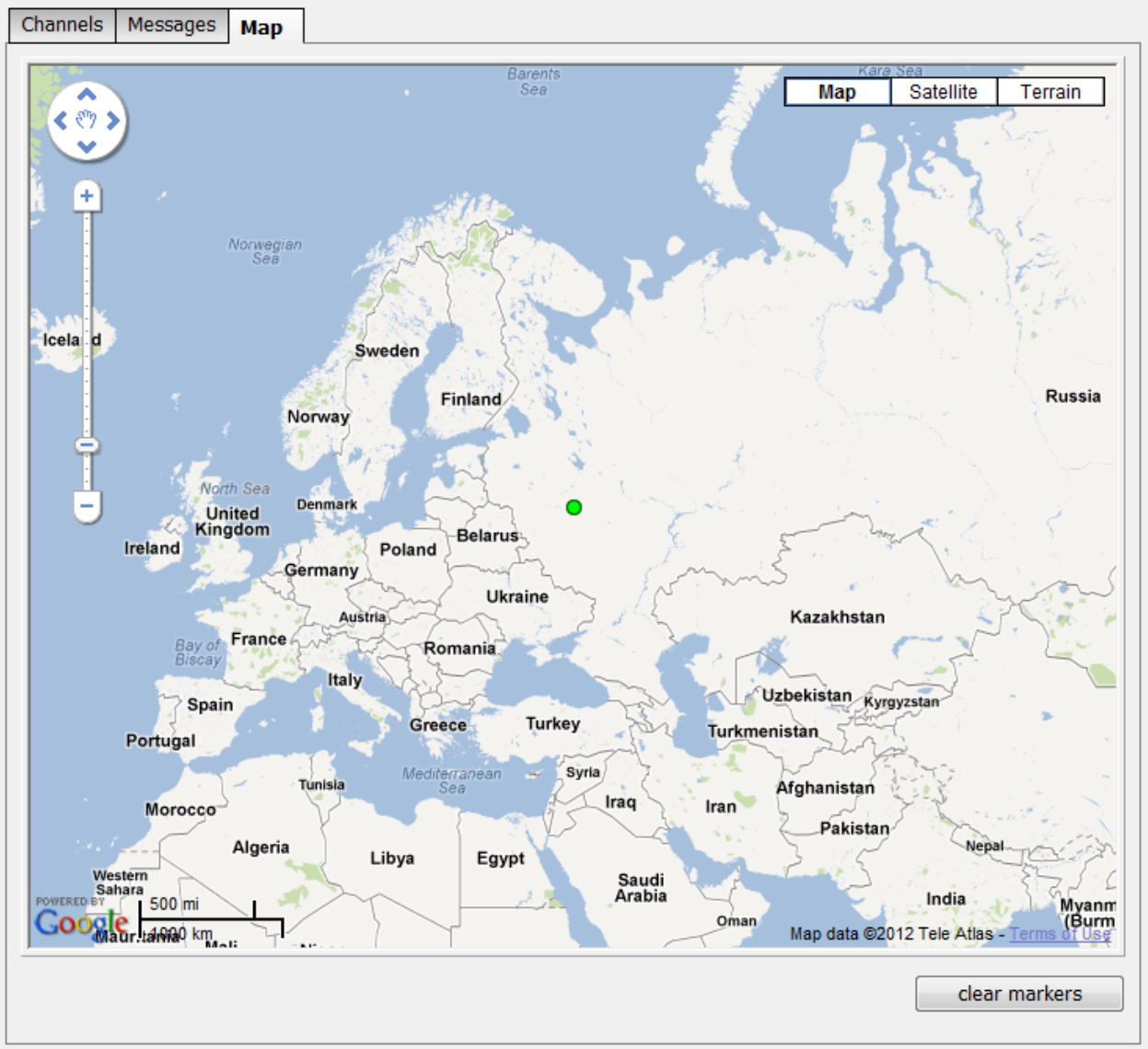

Figure 19: Displaying position fix on Google Maps

If computer is not connected to Internet then location is displayed on a simplified map as shown in Figure 20.

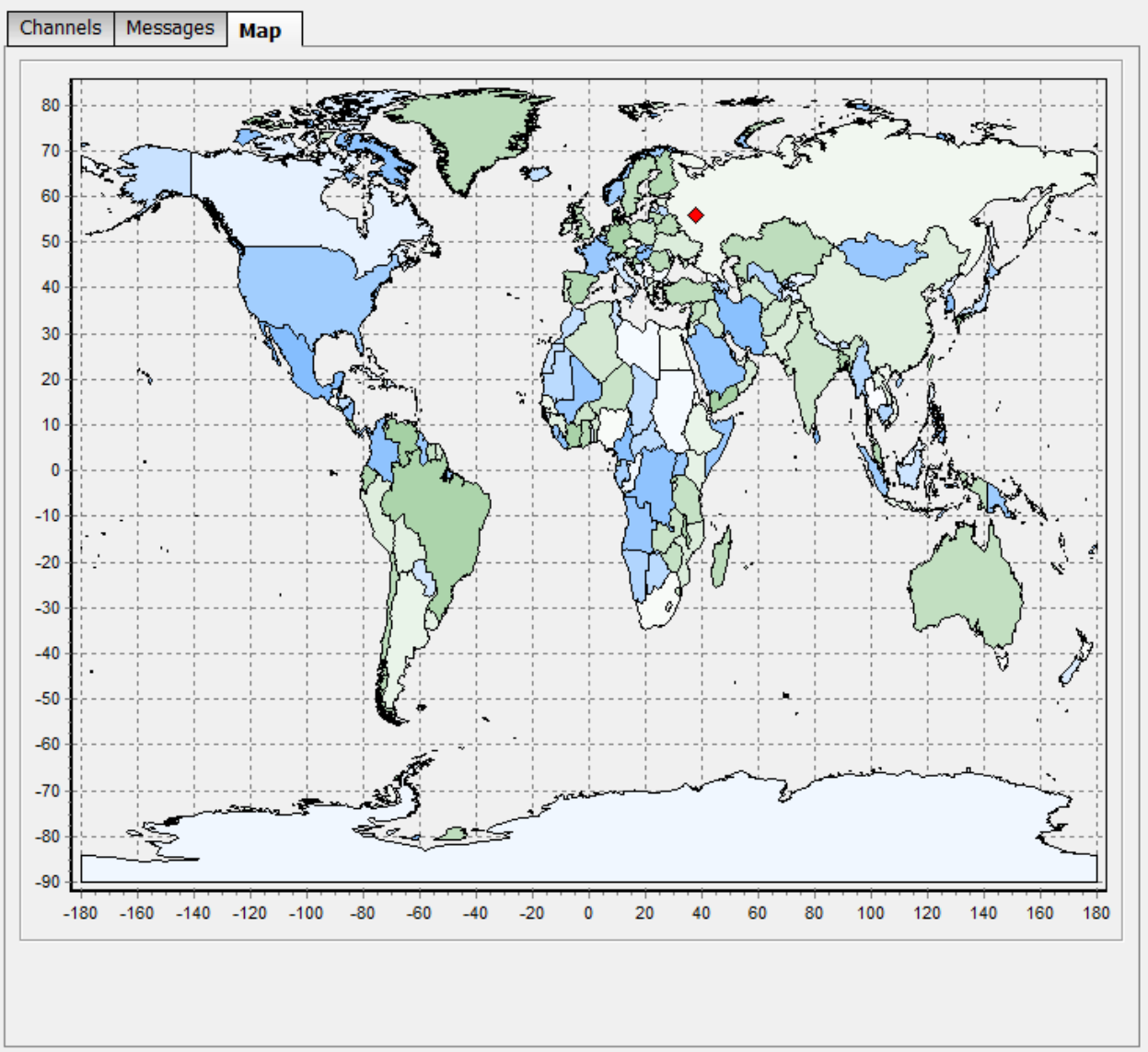

Figure 20: Displaying position fix on simplified map

4.6. Menu Bar

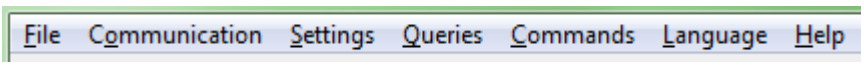

Figure 21: Menu Bar

4.6.1 File

File item has three options to choose from (Figure 22):

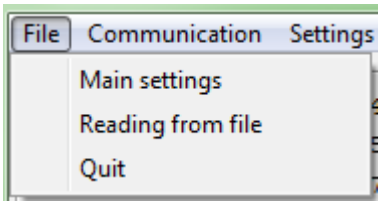

Figure 22: **File** item

1. **Main settings**: refer to 4.1.2.
2. **Reading from file**. When choosing this item, the additional panel **Reading from file** appears (Figure 23). In this panel browse log file (with *.tim extension) to be replayed; on default, the file is located in program root directory in folder **data/**. By using checkbox **repeat**, reading log file can be recycled. Press **Start/Stop** or **Pause** to control replaying. Use **Cancel** to resume normal operation mode.

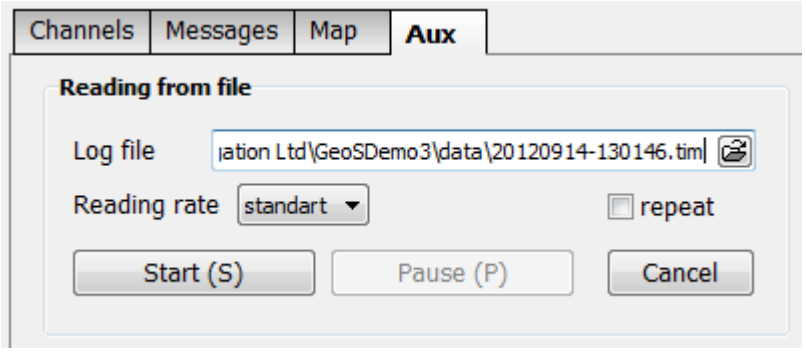

Figure 23: **Reading from file** parameters

3. **Quit**: quit the program.

4.6.2 Communication

By using **Communication** item (Figure 24), establish or break communication with the receiver.

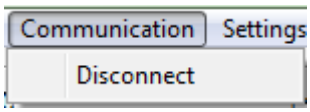

Figure 24: **Communication** item

4.6.3 Settings

Because the receiver supports different number of settings in binary and NMEA protocol, settings list for each protocol is different, as shown in Figures 25 and 26. Selecting each item in **Settings** list opens aux panel with parameters to define. Clicking **OK** sends parameters to the receiver. Pressing **Cancel** closes panel without sending data to the receiver. As soon as setting data is sent, the receiver returns back the reply which is displayed in **Messages** window.

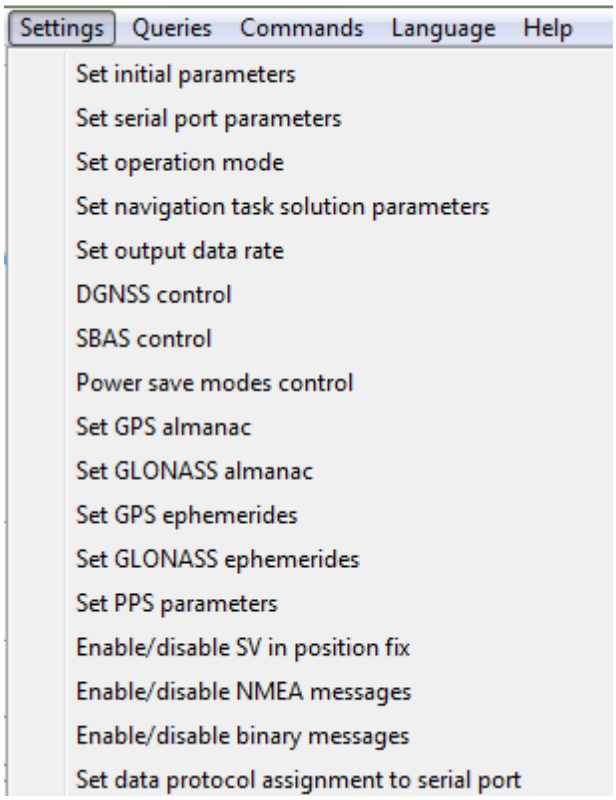

Figure 25: **Settings** list for binary data

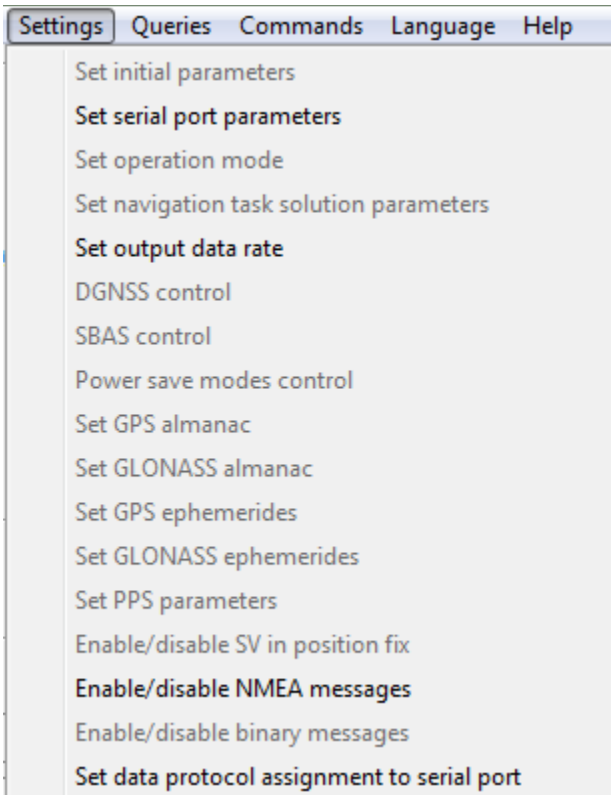

Figure 26: **Settings** list for NMEA data

4.6.3.1 Set Initial Parameters

Selection of **Set initial parameters** opens aux panel as shown in Figure 27. XYZ coordinates are used as reference coordinates for coordinates hold mode.

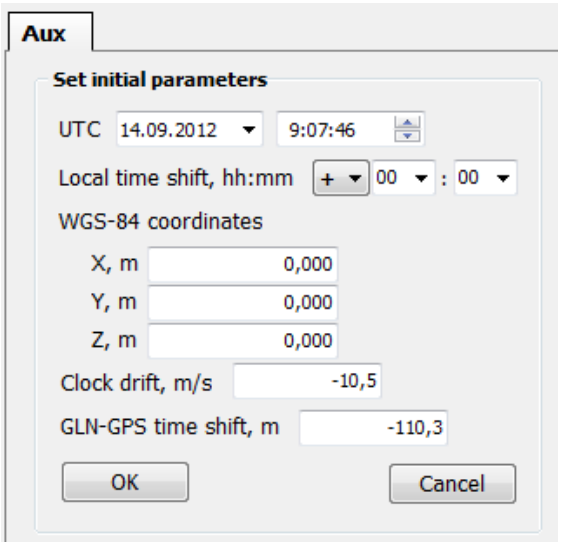

Figure 27: **Set initial parameters** panel

4.6.3.2 Set Serial Port Parameters

Selection of **Set serial port parameters** opens aux panel as shown in Figure 28.

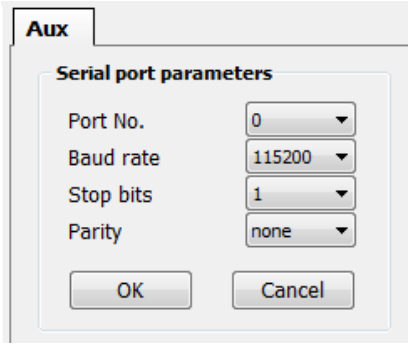

Figure 28: **Serial port parameters** panel

4.6.3.3 Set Operation Mode

Selection of **Set operation mode** opens aux panel as shown in Figure 29. Here user can set satellite system (GPS only, GLONASS only, GLONASS+GPS) and enable/disable coordinates hold mode.

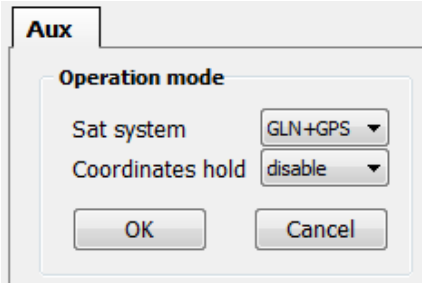

Figure 29: **Operation mode** panel

4.6.3.4 Set Navigation Task Solution Parameters

Selection of **Set navigation task solution parameters** opens aux panel as shown in Figure 30 where following parameters can be defined:

- GDOP mask, elevation mask, signal level mask
- Static navigation threshold
- DR duration (null value means disabling DR)
- User dynamics profile
- Filtering on/off
- 2D/3D control.

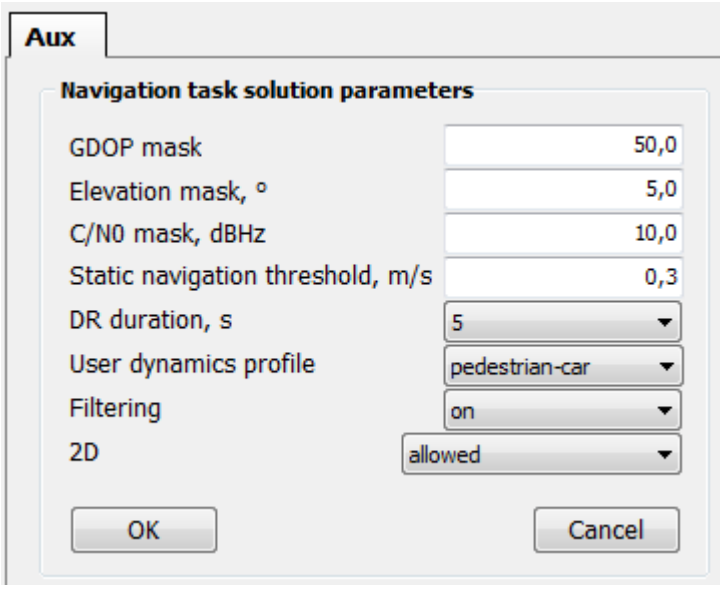

Figure 30: **Navigation task solution parameters** panel

4.6.3.5 Set Output Data Rate

Selection of **Set output data rate** opens aux panel as shown in Figure 31.

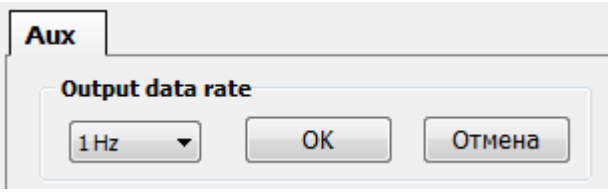

Figure 31: **Output data rate** panel

4.6.3.6 DGNSS Control

Selection of **DGNSS control** opens aux panel as shown in Figure 32. Here user can enable/disable diff mode as well as define the source of diff corrections data.

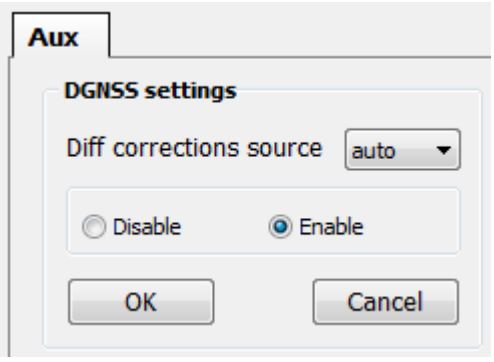

Figure 32: **DGNSS settings** panel

4.6.3.7 SBAS Control

Selection of **SBAS control** opens aux panel as shown in Figure 33. Here user can set auto search of all PRN codes or preset two PRN codes manually.

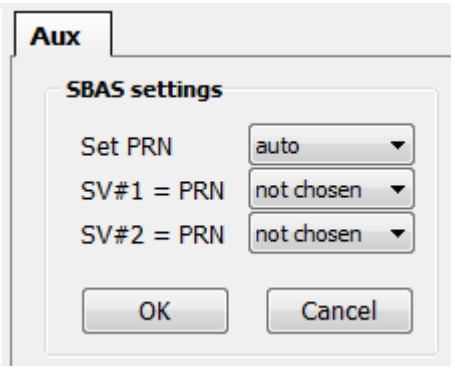

Figure 33: **SBAS settings** panel

4.6.3.8 Power Save Modes Control

Selection of **Power save modes control** opens aux panel as shown in Figure 34. Here user can choose specific power save mode and make its settings.

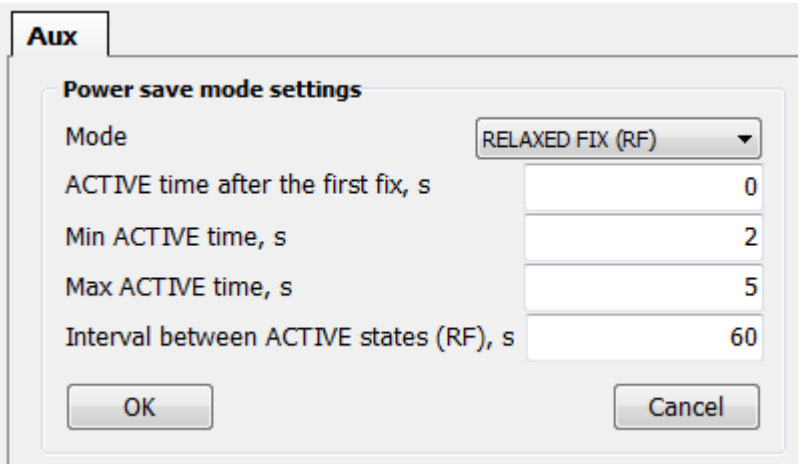

Figure 34: **Power save mode settings** panel

4.6.3.9 Set GPS Almanac

Selection of **Set GPS almanac** opens aux panel as shown in Figure 35. Here user can browse GPS almanac file **gpsAll.alm**; default file allocation is folder **data\gps** in program root directory.

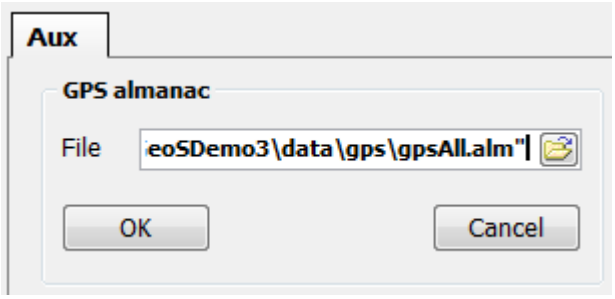

Figure 35: **GPS almanac** panel

4.6.3.10 Set GLONASS Almanac

Selection of **Set GLONASS almanac** opens aux panel as shown in Figure 36. Here user can browse GLONASS almanac file **glnAll.alm**; default file allocation is folder **data\gln** in program root directory.

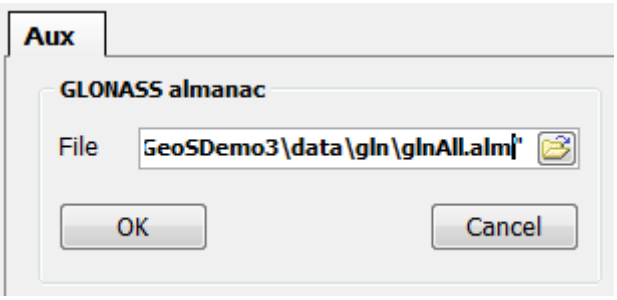

Figure 36: **GLONASS almanac** panel

4.6.3.11 Set GPS Ephemerides

Selection of **Set GPS ephemerides** opens aux panel as shown in Figure 37. Here user can browse GPS ephemerides files **gps_*.eph** for each of 32 SVs; default file allocation is folder **data\gps** in program root directory.

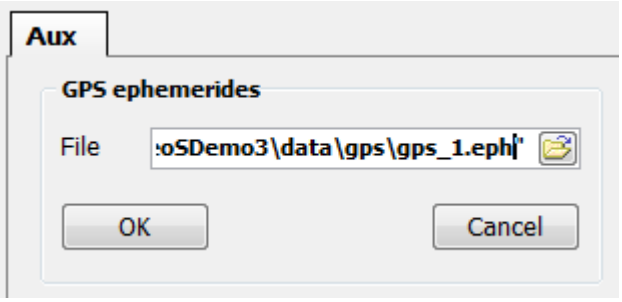

Figure 37: **GPS ephemerides** panel

4.6.3.12 Set GLONASS Ephemerides

Selection of **Set GLONASS ephemerides** opens aux panel as shown in Figure 37. Here user can browse GPS ephemerides files **gln_*.eph** for each of 24 SVs; default file allocation is folder **data\gln** in program root directory.

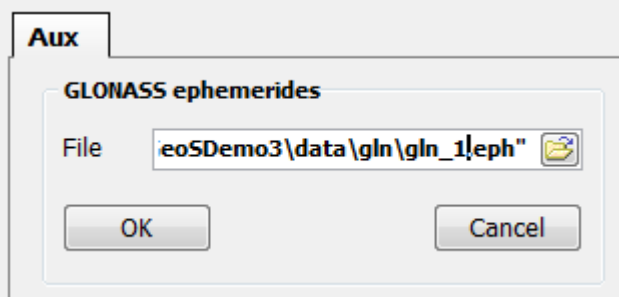

Figure 38: **GLONASS ephemerides** panel

4.6.3.13 Set PPS Parameters

Selection of **Set PPS parameters** opens aux panel as shown in Figure 39.

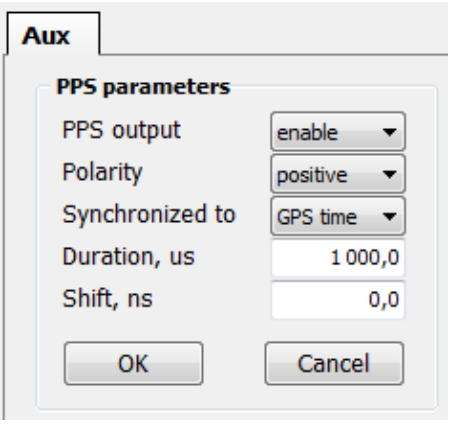

Figure 39: **PPS parameters** panel

4.6.3.14 Enable/Disable SV in Position Fix

Selection of **Enable/disable SV in position fix** opens aux panel as shown in Figure 40. Here user can disable (and enable it back) any SV of GPS or GLONASS constellation.

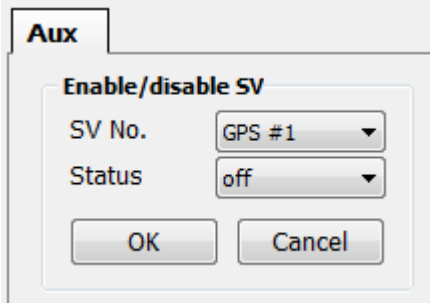

Figure 40: **Enable/disable SV** panel

4.6.3.15 Enable/Disable NMEA Messages

Selection of **Enable/disable NMEA messages** opens aux panel as shown in Figure 41 that allows user to:

- Enable/disable specific NMEA message: GGA/GNS, GSA, GSV, RMC, VTG, GLL, ZDA
- Choose NMEA 0183 standard version v2.x or v3.x
- Choose between GGA and GNS.

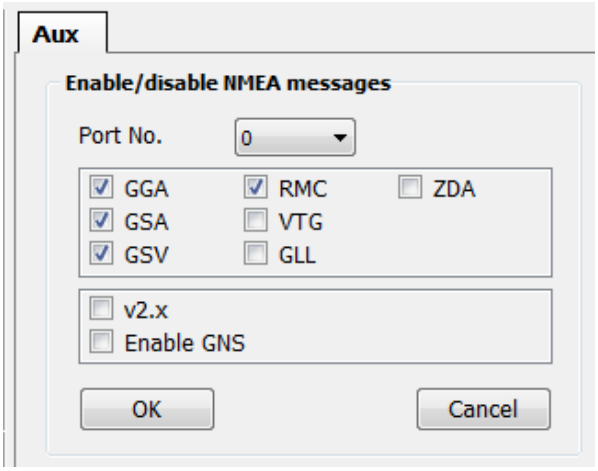

Figure 41: **Enable/disable NMEA messages** panel

4.6.3.16 Enable/Disable Binary Messages

Selection of **Enable/disable binary messages** opens aux panel as shown in Figure 42 that allows user to enable/disable masked binary message.

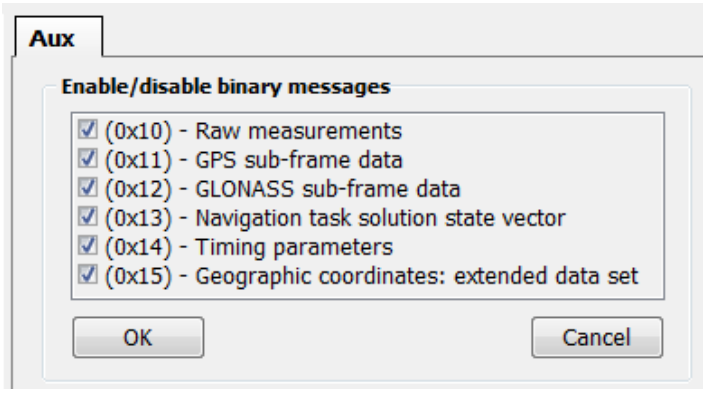

Figure 42: **Enable/disable binary messages** panel

4.6.3.17 Set Data Protocol Assignment to Serial port

Selection of **Set data protocol assignment to serial port** opens aux panel as shown in Figure 43. Figure 43 shows one of five possible combinations, others are shown in Figure 44.

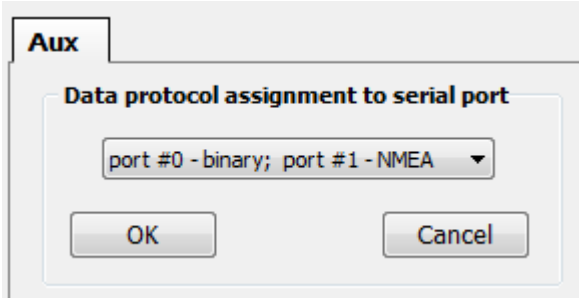

Figure 43: Data protocol assignment to serial port panel; Port#0 – binary, Port#1 – NMEA

Figure 44: Other data protocol options

4.6.4 Queries

The list of queries for binary and NMEA protocols is depicted in Figures 45 and 46. Selecting each item sends related query to the receiver. In response to the query the receiver sends back the reply which is displayed in **Messages** window.

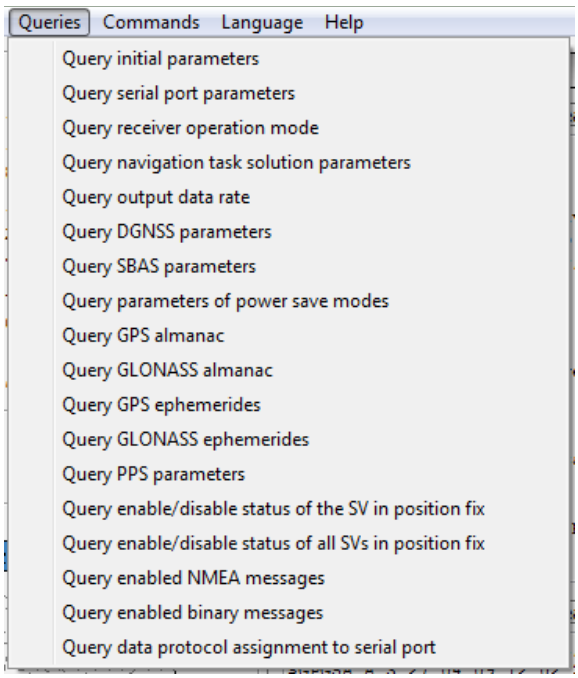

Figure 45: **Queries** list for binary data

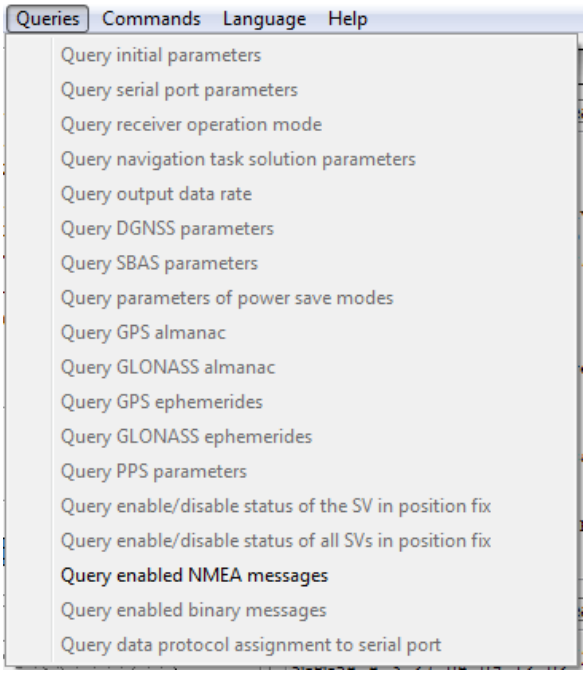

Figure 46: **Queries** list for NMEA data

4.6.5 Commands

The list of commands for binary and NMEA protocols is depicted in Figures 47 and 48.

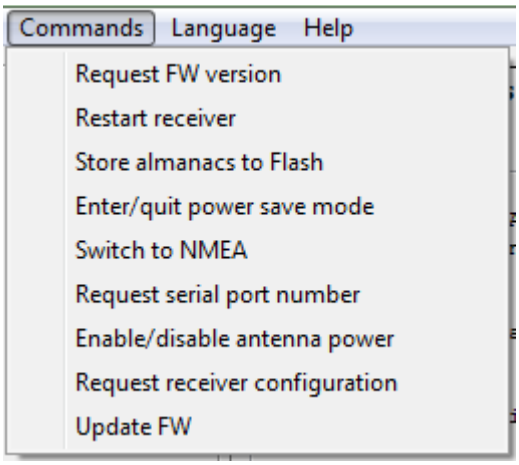

Figure 47: **Commands** item for binary data

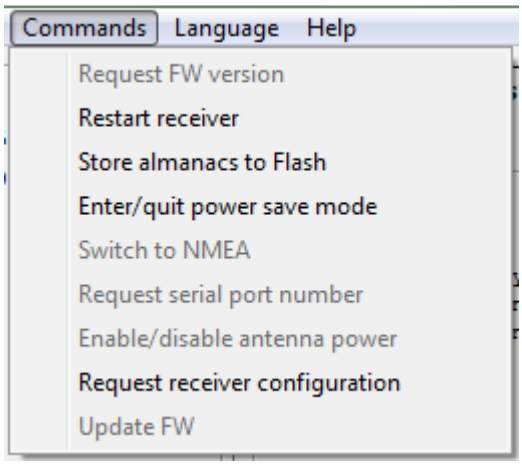

Figure 48: **Commands** item for NMEA data

4.6.5.1 Request FW Version

Selection of **Request FW version** sends related command to the receiver. The receiver's response is displayed in **Messages** window. The FW version and date as well as serial number are presented in the main window headline as shown in Figure 49.

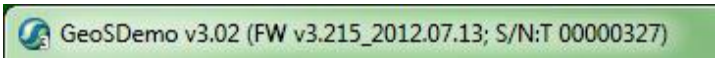

Figure 49: Displaying receiver FW version and serial number

4.6.5.2 Restart Receiver

Selection of **Restart receiver** opens aux panel as shown in Figures 50 (binary protocol) and 51 (NMEA protocol). **Restore default settings** feature is not available for NMEA protocol.

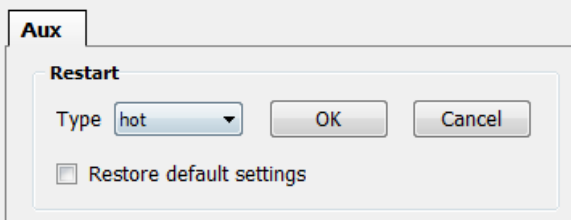

Figure 50: **Restart receiver** panel for binary data

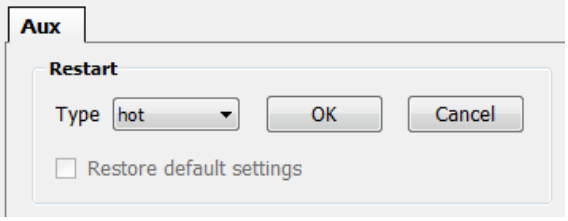

Figure 51: **Restart receiver** panel for NMEA data

4.6.5.3 Save Almanacs to Flash

Selection of **Save Almanacs to Flash** command initiates saving received almanacs to the receiver's Flash memory. As soon as the data is successfully stored, the receiver transmits related response message which is displayed in **Messages** window. For the related NMEA command, the receiver doesn't response any message.

Saving data to Flash memory takes about 1 second.

4.6.5.4 Enter/Quit Power Save Mode

Selection of **Enter/quit power save mode** opens aux panel as shown in Figure 52 that allows user to switch on/off power save modes.

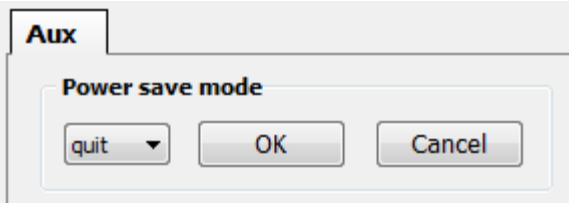

Figure 52: **Power save mode** control panel

4.6.5.5 Switch to NMEA

Selection of **Switch to NMEA** opens aux panel as shown in Figure 53 that allows user to:

- Set serial port parameters (baud rate, stop bits, parity)
- Enable/disable specific NMEA message: GGA/GNS, GSA, GSV, RMC, VTG, GLL, ZDA
- Choose NMEA 0183 standard version v2.x or v3.x
- Choose between GGA and GNS.

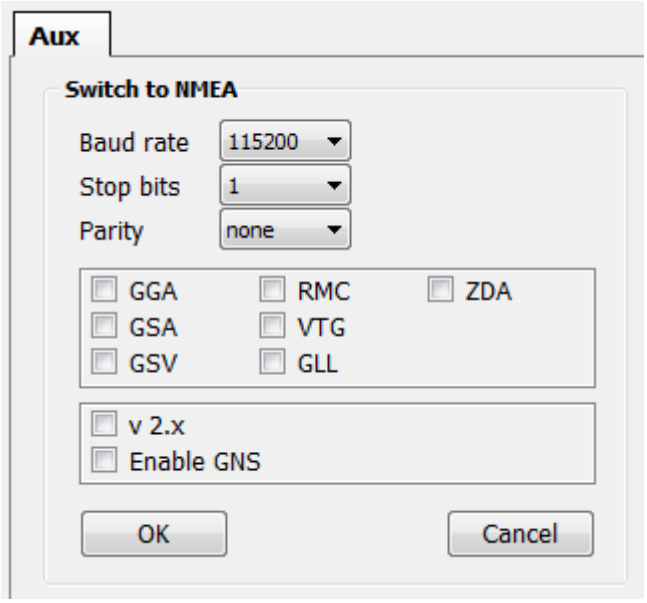

Figure 53: **Switch to NMEA** panel

4.6.5.6 Request Serial Port Number

Selection of **Request serial port number** sends related command to the receiver. The receiver's response is displayed in **Messages** window.

4.6.5.7 Enable/Disable Antenna Power

Selection of **Enable/disable antenna power** opens aux panel as shown in Figure 54 that allows user to switch on/off antenna power.

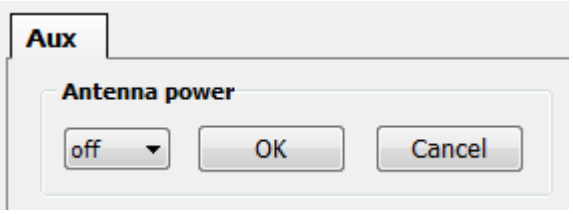

Figure 54: **Antenna power** control panel

4.6.5.8 Request Receiver Configuration

Selection of **Request receiver configuration** sends related command to the receiver. The receiver's response is displayed in **Messages** window.

4.6.5.9 Update FW

Selection of **Update FW** opens aux panel as shown in Figure 55 for browsing FW update file to download. The file should have following format: *geos3_215.bin*.

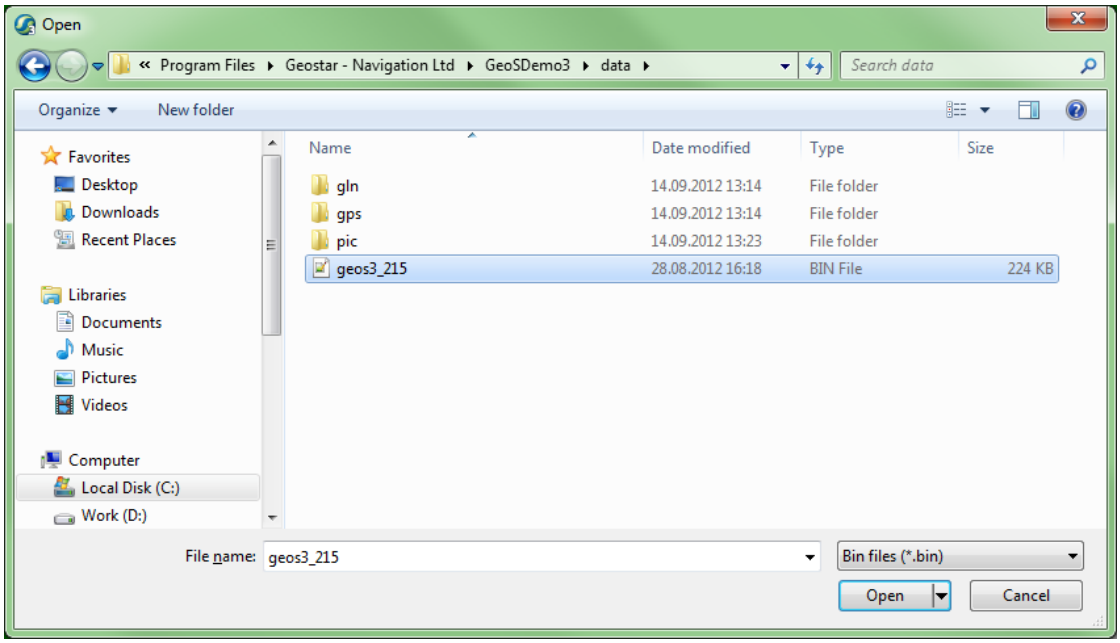

Figure 55: Browsing the FW file to download

After choosing the appropriate file, the program will start updating process as shown in Figure 56.

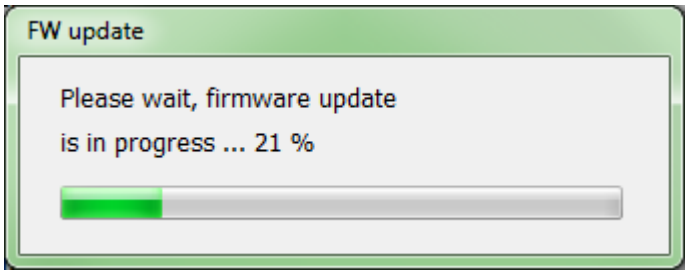

Figure 56: FW update progressing

If the file is corrupted, the program will display the following message (Figure 57).

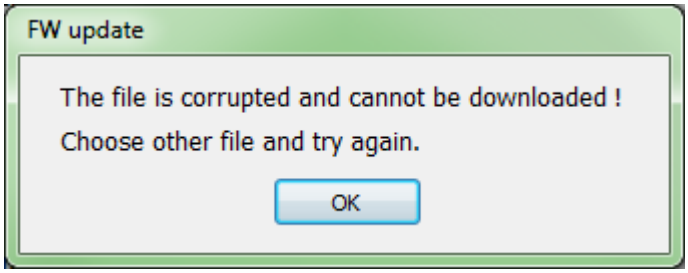

Figure 57: File failed message

If the error has been occurred during downloading, the program will display the following message (Figure 58).

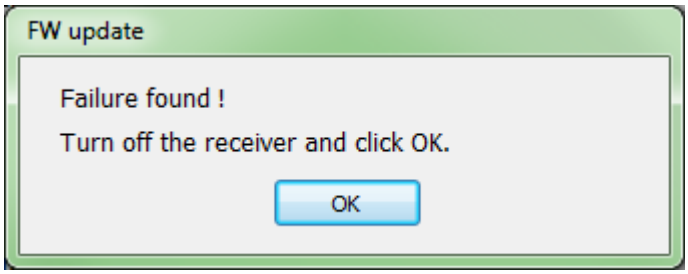

Figure 58: Download failure message

Figure 59 depicts the message the program will display after FW update is successfully finished.

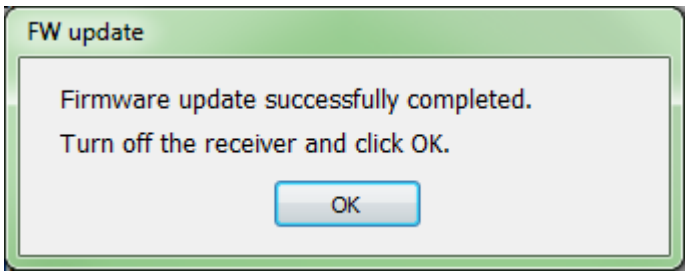

Figure 59: Update complete message

4.6.6 Updates Check

To check **GeoSDemo3®** or latest FW updates, please select **Help** → **Update check** (Figure 60). This should require Internet connection.

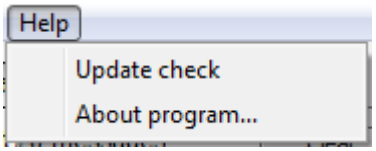

Figure 60: Updates check

If updates are available on the web site http://geostar-navigation.com, following window will be opened (Figure 61).

Figure 61: Info about available updates

In case of no updates available, the window will appear as shown in Figure 62.

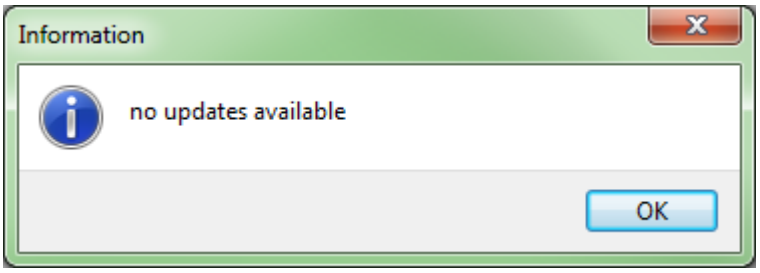

Figure 62: No updates available message

To download update, select it by checkbox and click **Load** and the program will start downloading (Figure 63).

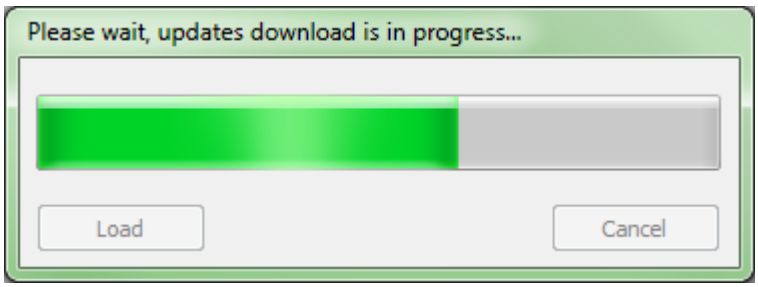

Figure 63: Downloading updates progressing

If download has been completed successfully, the message **Done** will be displayed (Figure 64). If not, message **Failed** will appear.

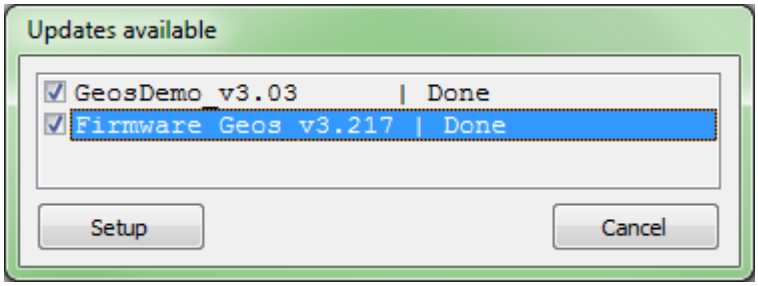

Figure 64: Download complete window

Further, if updates have been downloaded successfully, they can be setup by clicking **Setup**. If both updates (**GeoSDemo3®** and receiver FW) are chosen then FW update starts first followed by **GeoSDemo3®** setup.

5. Connecting Software to the Receiver

After program start, the way of getting connection with the receiver should be defined. As indicated in section 4.1, three ways are available as follows:

1. Automatic scan of the active computer COM or virtual COM ports
2. Manual assignment of specific computer COM port
3. Use of the last active computer ports configuration.

To start automatic COM port scanning, select **Detect COM port automatically** and click **OK** (Figure 65). The program will start searching for the binary data first, then for the NMEA data. As soon as ports have been detected, the program switches to the main window.

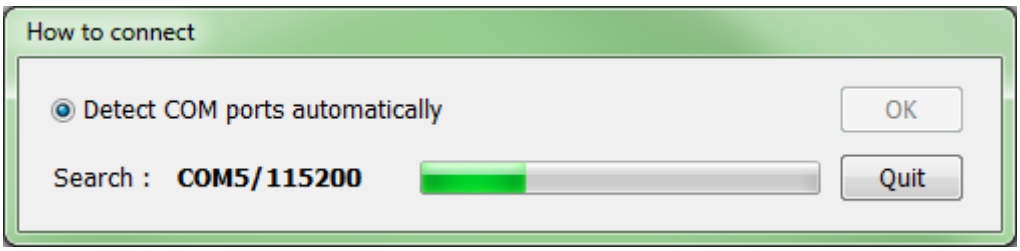

Figure 65: Automatic COM port scanning

To set COM ports manually, select **Set COM ports manually** and click **OK**. In the **Main settings** window (Figure 9), COM port parameters should be set. If the receiver is hardware connected through USB-to-Serial adapter, virtual COM port number can be defined in following way:

- Choose **Start** → **Control panel** → **System** → **Hardware** → **Device manager** and find **Ports (COM & LPT)**
- Open it by clicking **+**. Figure 66 illustrates the example with virtual port COM27.

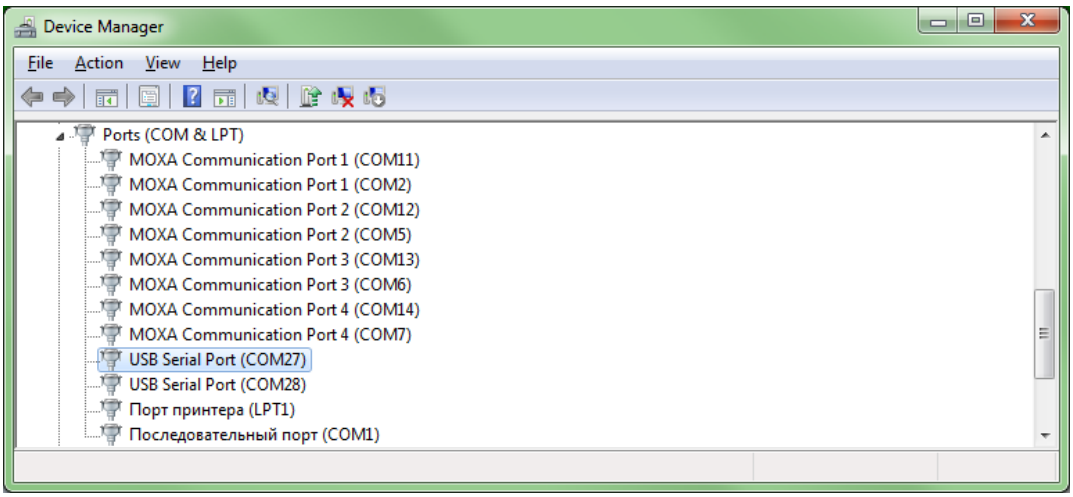

Figure 66: Finding virtual COM port

Select **USB Serial Port (COMXX)** to check COM port properties (Figure 67).

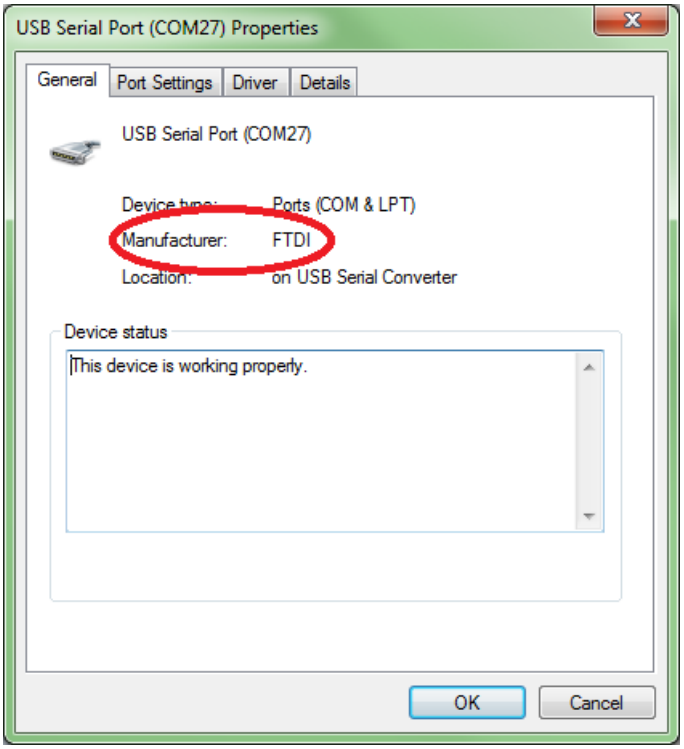

Figure 67: Virtual COM port properties

If **Manufacturer** is specified as **FTDI**, this port is a required port (provided that there is no any other device with FTDI USB controller has been connected to the computer). Virtual COM port number should be taken from **Device Manager** and set in **Main settings** window (Figure 9).

If the receiver has been already connected to the computer, user can choose **Use last COM ports configuration** and proceed without COM ports settings. The program will automatically establish connection using current COM ports configuration.