



GeoS-3/GeoS-3R/  
GeoS-3M/GeoS-3MR/  
GeoS-E<sup>®</sup> EVK  
User Manual

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# Preface

This document provides the information needed to set up and start working with the Evaluation Kit for GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E GNSS modules. Basic operations and typical use examples are described. The manual includes also general information, e.g., safety instructions.

## Revision History

#	Updates	Notes
Rev1.0 28/03/2016		
1	Original release	

# Abbreviations

<b>AGC:</b>	Auto Gain Control
<b>DC-DC:</b>	DC-DC Converter
<b>ESD:</b>	Electro Static Discharge
<b>EVB:</b>	Evaluation Board
<b>EVK:</b>	Evaluation Kit
<b>FW:</b>	Firmware
<b>IO:</b>	Input Output
<b>LED:</b>	Light Emission Diode
<b>LDO:</b>	Low Drop-Out Linear Regulator
<b>OS:</b>	Operating System
<b>PLL:</b>	Phase Lock Loop
<b>PC:</b>	Personal Computer
<b>PC:</b>	Personal Computer
<b>RF:</b>	Radio Frequency
<b>SW:</b>	Software
<b>VCP:</b>	Virtual COM Port
<b>USB:</b>	Universal Serial Bus

# 1 Kit Contents

The GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E Evaluation Kit contains the following:

- GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E EVB
- USB-A plug to USB-B or mini USB to USB-B receptacle cable
- GLONASS/GPS Antenna
- GeoSDemo3® Software.

## 1.1 EVB Overview

For getting the detailed information about the EVBs, please read the technical description of associated evaluation board. Some brief information about EVBs is presented below.

The EVB is intended for evaluating performance of GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E GNSS modules and comprises the following main parts: GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E module, antenna connector, DC-DC voltage converters, USB port, dual RS232-to-USB data converter, voltage level translators, pushbuttons, switches, LED indicators, and signal pads (Fig. 1-3).

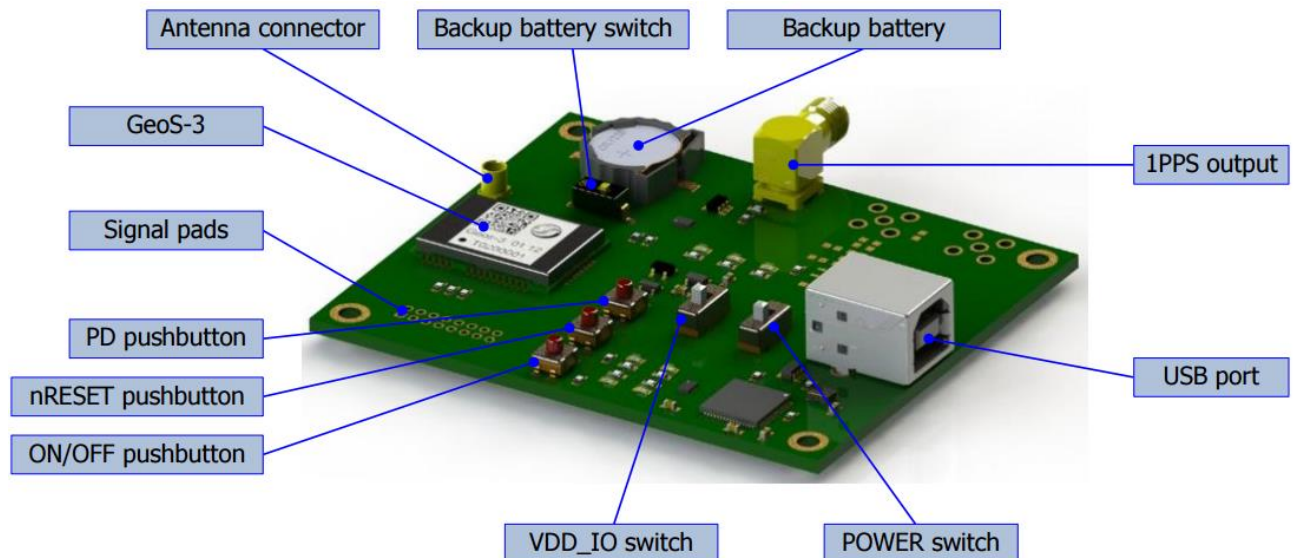


Fig.1. GeoS-3/GeoS-3R EVB overall view

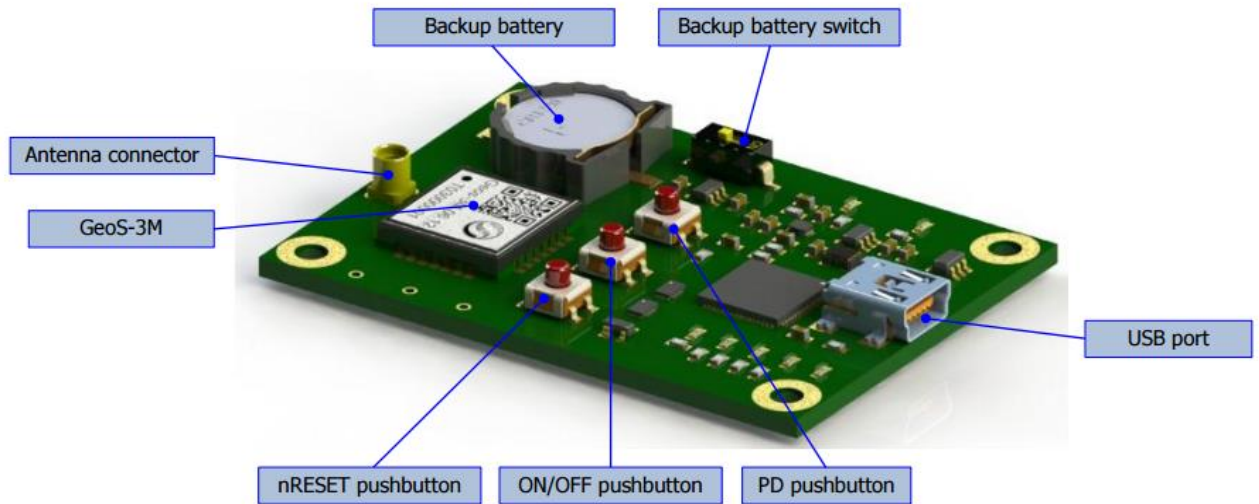


Fig. 2. GeoS-3M/GeoS-3MR EVB overall view

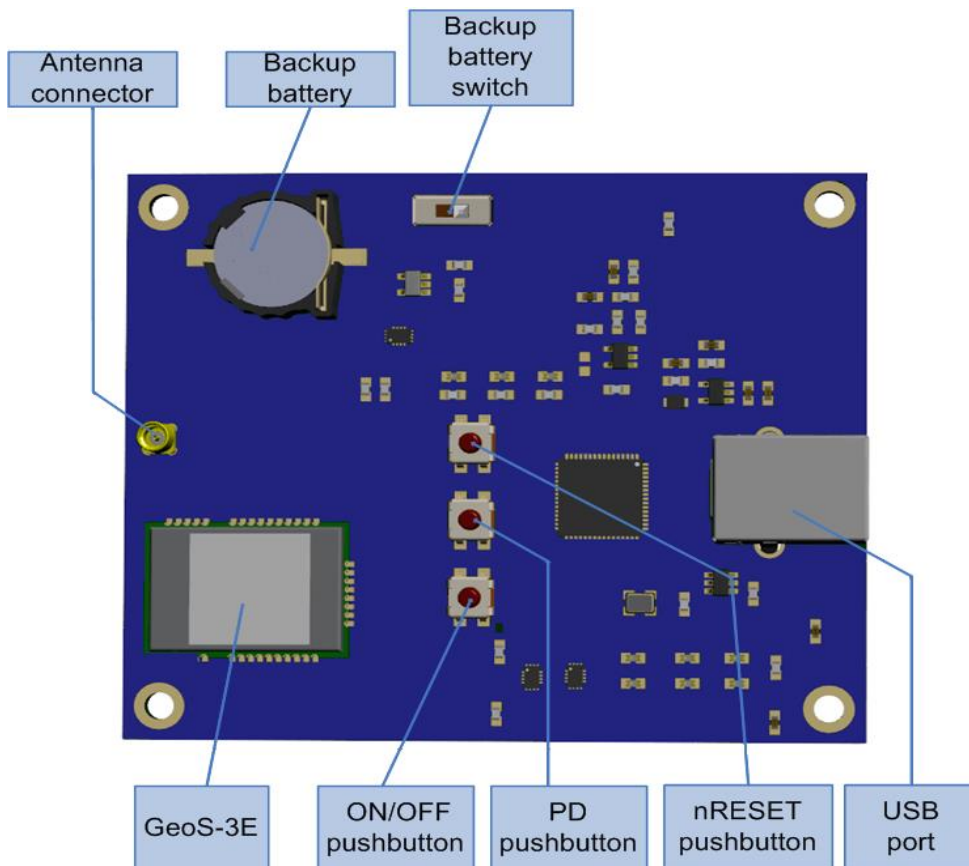


Fig. 3. GeoS-3E EVB overall view

The EVB accepts +5V DC provided by USB port. On-board DC-DC converters generate 1.8V/3.3V secondary voltages required to power the GNSS module and EVB circuits.



## 1.2 EVB Hardware Description

### 1.2.1 Switches

**POWER<sup>1</sup>:** The EVB's power turn on and off switch;

**Battery:** Backup battery turn on and off switch;

**VDD\_IO<sup>1</sup>:** VDD\_IO voltage select switch.

### 1.2.2 Pushbuttons

**ON/OFF:** Pushbutton that forces the module to the OFF state;

**nRESET:** Pushbutton that forces the module to the RESET state;

**PD:** Pushbutton that generates the PD pulse for waking the module up in FIX-BY-REQUEST<sup>®</sup> power-save mode.

### 1.2.3 LEDs

**3.3V:** Constantly lighting when the power is on;

**TX0, TX1:** Blinking whenever TX0 and TX1 serial port lines are active;

**RX0, RX1:** Blinking whenever RX0 and RX1 serial port lines are active;

**STATUS:** Indicates the status of the module (ACQUISITION, POSITIONING, or FAILURE);

**PD\_ACK:** Indicates **ACTIVE/SLEEP** state of the module.

### 1.2.4 Signal Pads<sup>1</sup>

Signal pads are necessary for direct connection of measuring equipment probes to GeoS-3 module pins. It can be helpful for viewing the signal waveforms and measuring the levels of voltages.

The following module pins can be directly connected via signal pads:

ON/OFF, PD, TX0, TX1, RX0, RX1, STATUS, nRESET, PD\_ACK, E\_PPS, E\_FRQ, 1PPS, VBAT, +3.3V.

<sup>1</sup> **Note: The feature applies only to GeoS-3/GeoS-3R EVB.**

### 1.2.5 Powering the EVB

The EVB accepts +5V DC voltage from USB port. The onboard DC-DC converters generate +3.3V and +1.8V secondary voltages required by GNSS module and EVB circuits.

## 1.2.6 Serial Port Default Parameters

On default, both ports (Port #0 and Port #1) are active and set to the following configuration:

- Baud rate, bit/s: 115200
- Stop bits: 1
- Parity: no parity.

The Port #0 operates in binary protocol, the Port #1 – in NMEA protocol.

## 1.3 ESD and Safety Precautions



It should be especially noted that the GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E EVB comes without any case and all components are exposed for finger touching. Therefore, special attention must be paid to electrostatic discharge precautions. Improper handling and use of EVB can cause damage to GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E GNSS module.

The EVB should be handled by the edges when possible. Avoid touching the component leads.

## 1.4 GLONASS/GPS Antenna

Each EVK includes the active antenna for receiving the GLONASS/GPS satellite signals. The active antenna has an embedded LNA that requires +3.3V DC voltage, which should be provided through inner conductor of antenna RF cable. The voltage is output by GNSS module.

# 2 Software

The PC based demo software is presented by a user-friendly Windows™ application GeoSDemo3® that can be downloaded on the following link [http://geostar-navi.com/software\\_geosdemo3.html](http://geostar-navi.com/software_geosdemo3.html). The software is intended for arranging communication with GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E module and evaluating its functionality. The software supports communication on both data protocols – binary and NMEA. The description of data protocols is available at [http://geostar-navi.com/navigation\\_06e.html](http://geostar-navi.com/navigation_06e.html).

To enable EVB operation with any software rather than GeoSDemo3®, the FTDI VCP driver should be installed first; it can be downloaded on [http://geostar-navi.com/en/software\\_geosdemo3.html](http://geostar-navi.com/en/software_geosdemo3.html).

## 2.1 Software Installation

To install the GeoSDemo3<sup>®</sup>, unzip and run **setup\_geosdemo\_v3.06.exe**. For getting more detail information about GeoSDemo3<sup>®</sup>, please read associated User Manual (available on [http://geostar-navi.com/file/geos3/User\\_Manual\\_GeoSDemo3\\_v3\\_02\\_eng.pdf](http://geostar-navi.com/file/geos3/User_Manual_GeoSDemo3_v3_02_eng.pdf)).

## 2.2 Hardware Connections

After software installation is completed, make following connections:

- Attach GLONASS/GPS antenna to EVB's MMCX RF port;
- Using USB cable, connect USB ports of EVB and PC. As soon as the EVB is connected to the PC, it will be detected and GeoSDemo3<sup>®</sup> can be run.

If you are using GeoS-3M/GeoS-3MR/GeoS-3E EVK, the module starts immediately after connection. If you are using GeoS-3/GeoS-3R EVK, turn power supply switch **ON/OFF** to **ON** position. **3.3V** LED indicator will be continuously lighting; **TX0, TX1, STATUS** LEDs will be blinking.

# 3 Getting Started

## 3.1 General

Run GeoSDemo3<sup>®</sup> by double clicking on dedicated icon (Fig. 4) located on the desktop. The first screen to appear (Fig. 5) provides options to connect receiver. At the first connection of EVB, it is strictly recommended to choose the first one (**Detection COM ports automatically**) that allows the PC to detect COM ports associated with EVB automatically.

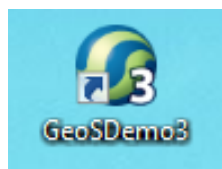


Fig. 4. GeoSDemo3<sup>®</sup> shortcut

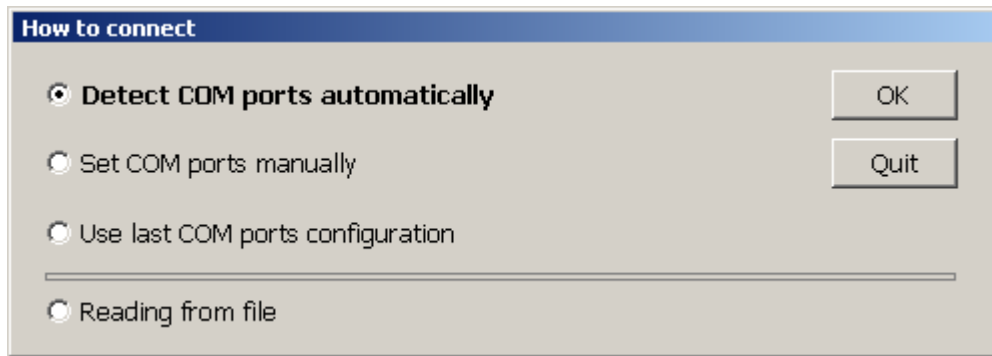


Fig. 5. How-to-connect screen

The next screen to appear is the Main program window (Fig. 6).

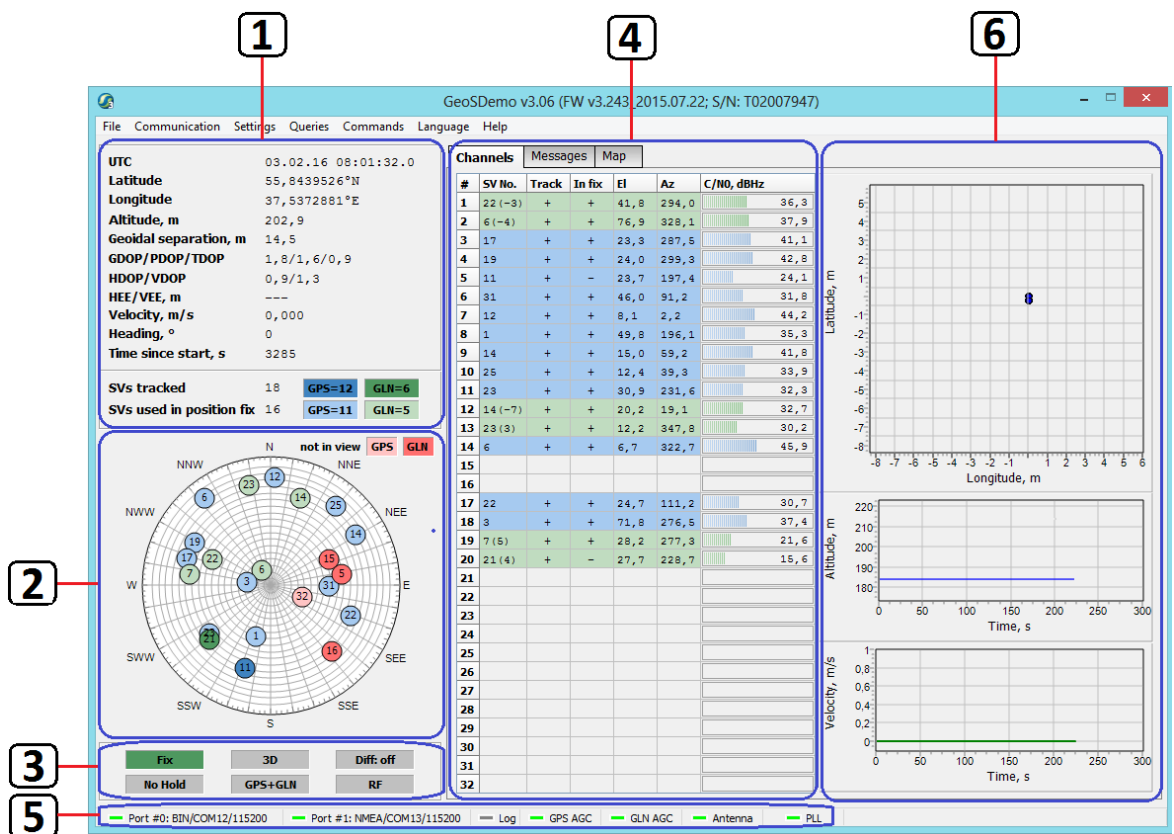


Fig. 6. Main program window

The main elements of this window are:

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

**2: Sky chart** that points out visible satellites. Satellites are shown as circles and the number inside of each circle is a system satellite number. The circle color identifies the satellite system and satellite status in following manner:

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

**3: Receiver operation mode indicator panel.** This panel consists of operation mode indicators. For more detail information about operation modes, refer to GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E User Manual.

**4: Diagrams panel** displays variation of the receiver navigation data:

- Latitude/Longitude
- Altitude
- Ground speed.

**5: Status bar indicator** displays status of the receiver's Port#0, Port#1, Data logging, GPS/GLONASS AGC, antenna and PLL. For more detail information about receiver hardware status, refer to GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E User Manual.

**6: Bookmarks** contain information about receiver's channels status, serial port messages and displaying the user's location on the map.

## 3.2 Channels

The GPS satellites are shown in blue, GLONASS satellites – in light green, SBAS satellites – in olive.

## 3.3 Messages

There are two windows for displaying the data transmitted on both receiver's serial ports.

## 3.4 Map

This tab shows user location either on the Google map or on simplified map embedded in GeoSDemo3<sup>®</sup> in case of the PC is not connected to the Internet.

# 4 Making Major Receiver Settings

## 4.1 General

GeoSDemo3<sup>®</sup> software allows the user to configure GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E module parameters, as well as display the current values of these parameters on PC screen. The **Settings** menu is available for two data formats – binary (Fig. 7) and NMEA (Fig. 8).

Immediately after sending the specific setting to the receiver, it saves it to internal Flash memory.

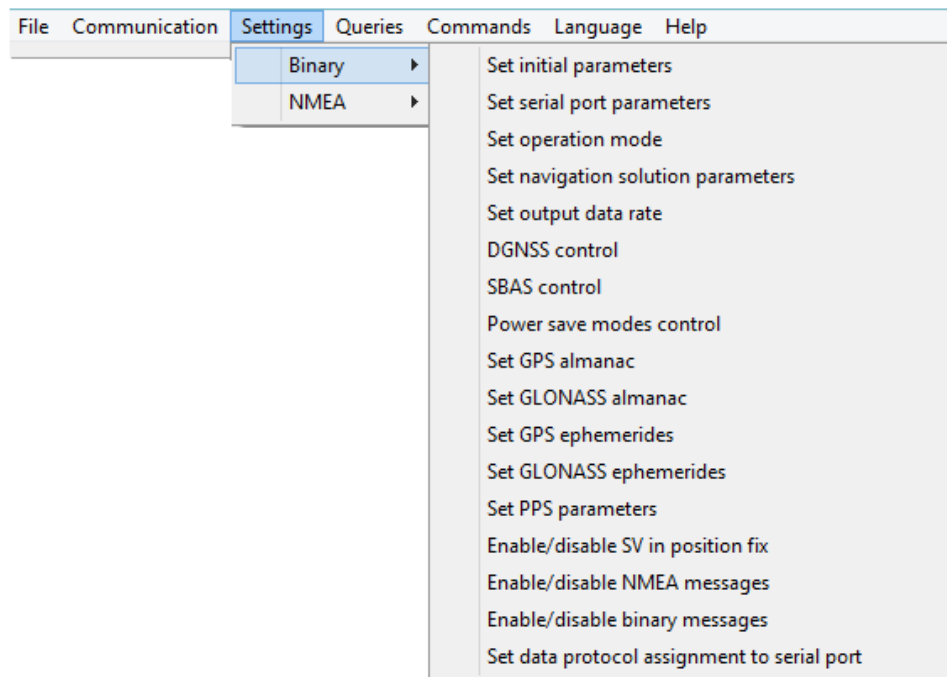


Fig. 7. Settings options available for binary data

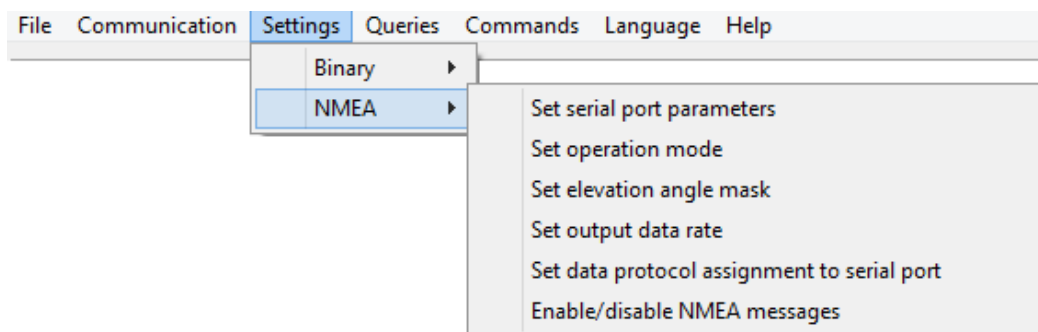


Fig. 8. Settings options available for NMEA data

## 4.2 About Making the Settings

In order to get complete instructions for setting the receiver parameters, refer to GeoSDemo3® User Manual. A brief guide for setting the main parameters is given below. To have a general idea of performing GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E basic settings, the following examples might be considered.

### 4.2.1 GNSS Selection

Select **Set operation mode** and the following menu shown in Fig. 9 will appear.

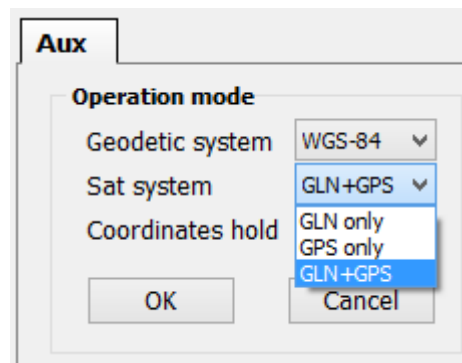


Fig. 9. Selecting GNSS system

### 4.2.2 Setting 1PPS Parameters

Select **Set PPS parameters** and the following menu shown in Fig. 10 will appear.

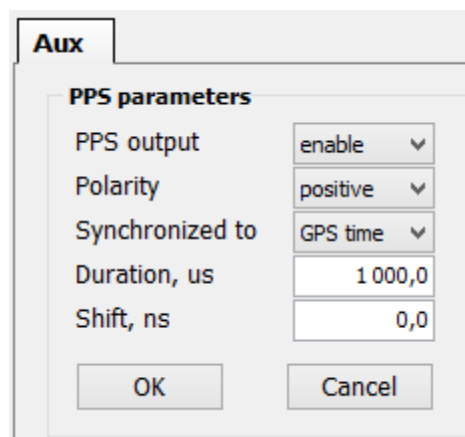


Fig. 10. Setting 1PPS parameters

### 4.2.3 Setting Data Protocols

Select **Set data protocol assignment to serial ports** option. There are five combinations of serial port number and data protocol to choose as shown in Fig. 11.

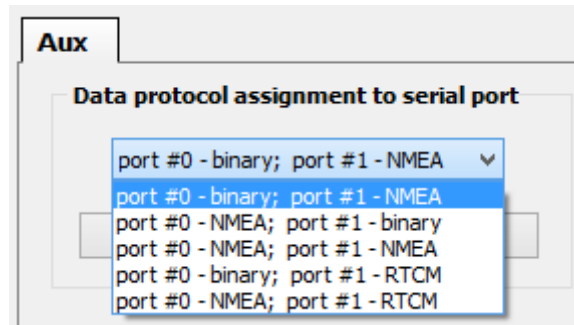


Fig. 11. Setting data protocol assignment to serial ports

### 4.2.4 Setting Serial Port Parameters

Select **Set serial port parameters** option (Fig. 12). The list of parameters include baud rate, number of stop bits, and parity.

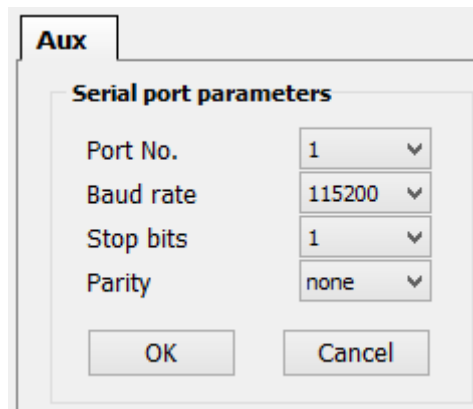


Fig. 12. Setting serial port parameters

### 4.2.5 Setting Output Data Rate

Select **Set output data rate** option and the following menu shown in Fig. 13 will appear. The data rate can be chosen 1, 2, 5 or 10Hz.

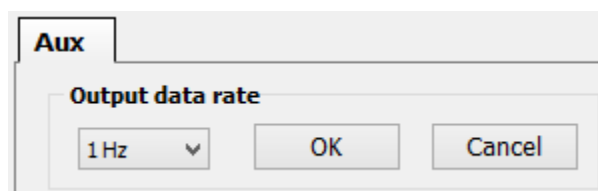


Fig. 13. Setting output data rate



## 4.2.6 Sending Commands

GeoSDemo3<sup>®</sup> software provides the ability of sending commands to GeoS-3/GeoS-3M/GeoS-3R/GeoS-3MR/GeoS-3E receiver. The list of commands for binary protocol is shown in Fig.14. A few examples of sending commands are shown below in chapters 4.2.7, 4.2.8.

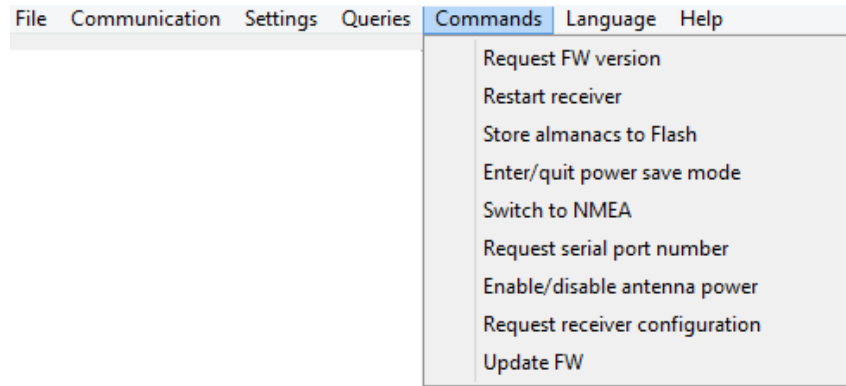


Fig. 14. Comands list

## 4.2.7 Restart Receiver

Select **Restart receiver** option and the following menu shown in Fig. 15 will appear. Three types of start can be chosen (hot, warm or cold) as well as **Restore default settings** feature.

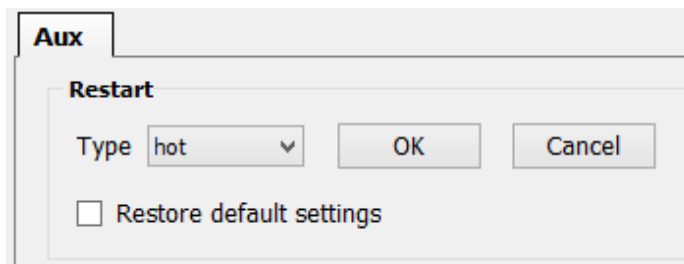
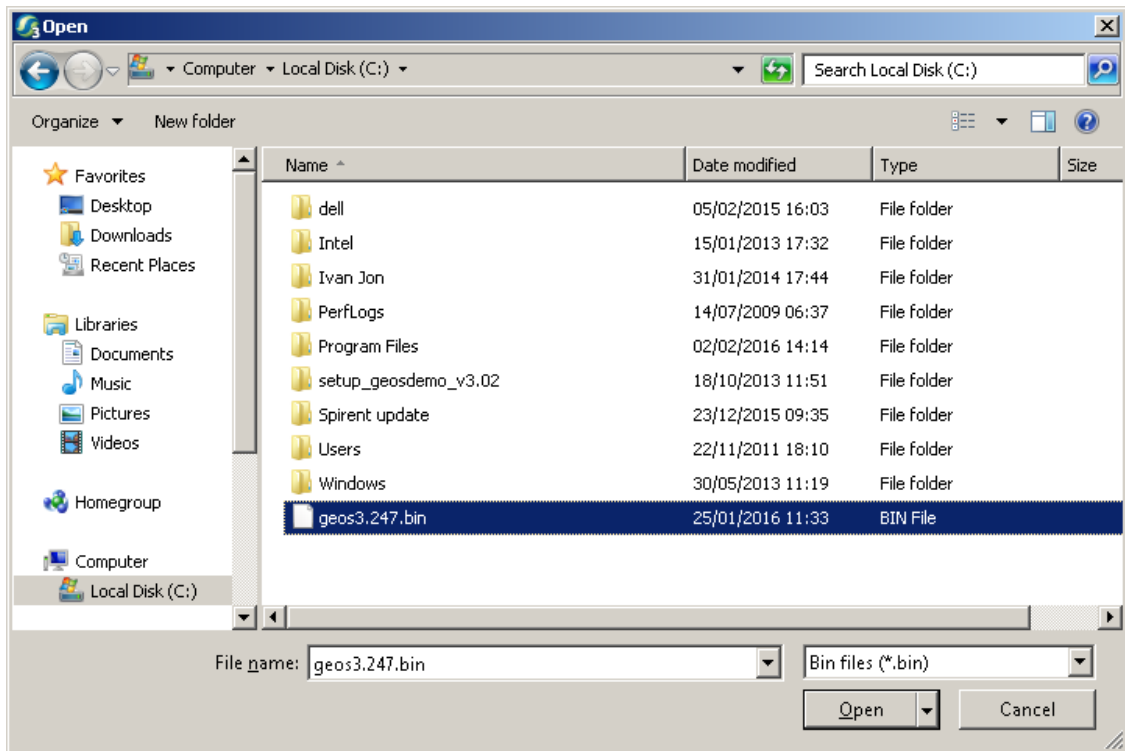


Fig. 15. Restarting the module panel

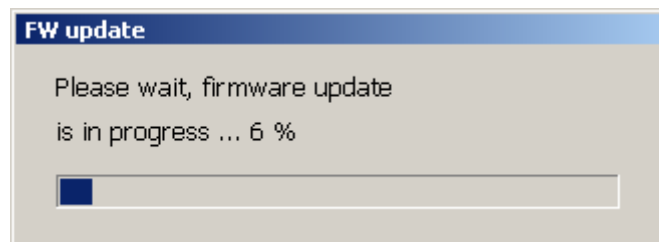
## 4.2.8 Receiver FW update

Selection of **Update FW** opens panel for browsing FW update file to download as shown in Fig. 16. The latest version of firmware is available for download on <http://geostar-navi.com/navigation.html>. The FW file has the following format: *geos3.xxx.bin*.



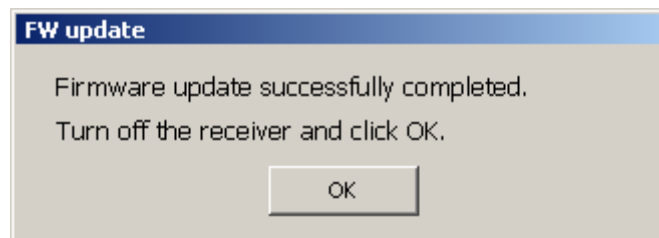
**Fig. 16. Browsing the FW file to download**

After browsing the FW file, the program will start updating process as shown in Fig. 17.



**Fig. 17. FW update progress**

As soon as the panel shown in Fig. 18 appears, cycle the EVB's power for activating new FW.



**Fig. 18. Firmware update complete**