NTL104

CONNECTION AND SETTING UP

Getting Started Guide

2020

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1 CONNECTION TO PC

NTL Browser is a software tool designed to communicate with NTL104 through NTL Adp Board. It is provided as a zip file. It is available on NTLab company FTP server. Link (password and login) may be provided on request.

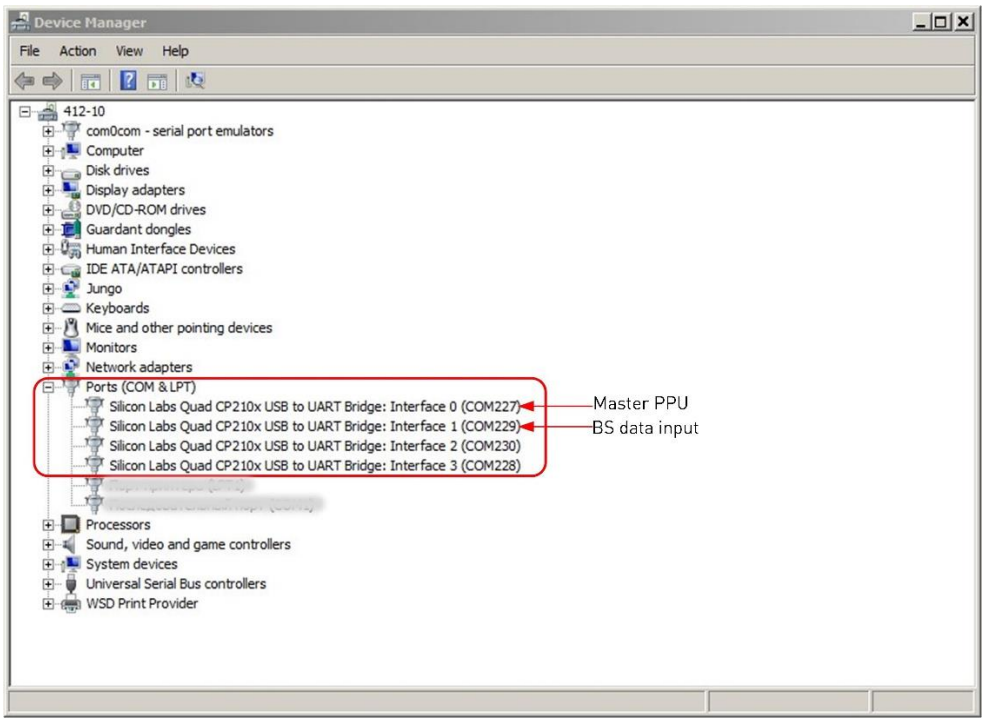
Follow to the next steps to connect NTL104:

1. Install NTL Browser on computer.
2. Install CP210x drivers on computer. Utility software downloadable from: https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers
3. Connect NTL104 to the NTL Adp Board.
4. Connect Master and Slave antennas to NTL104 (connector X1 and X2 of the NTL104, respectively).
5. Connect NTL Adp Board to PC through mini USB cable (connector X2 of the NTL Adp Board).

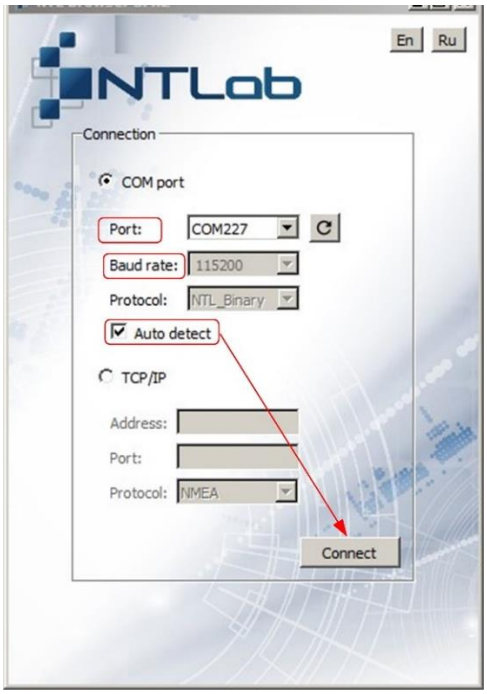
NTL Adp Board provides +5V supply voltage for navigation module and simplifies connection to host computer.

NTL104 UART outputs is available on PC via on-board 4xUART to USB converter (CP210x based) as virtual COM ports.

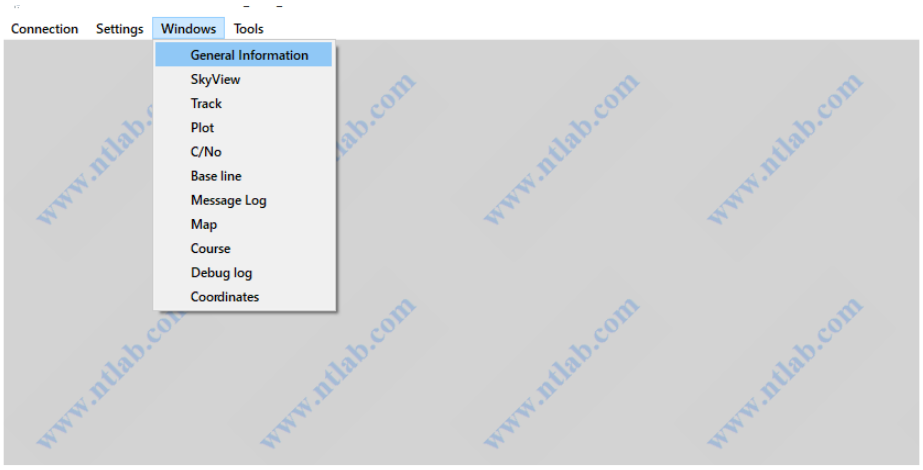
At this stage, four virtual COM ports should be detected on operating system. See example below. Two of four virtual COM ports provide the access to Master PPU (**Interface 0**) and Base Station (BS) data input (**Interface 1**).



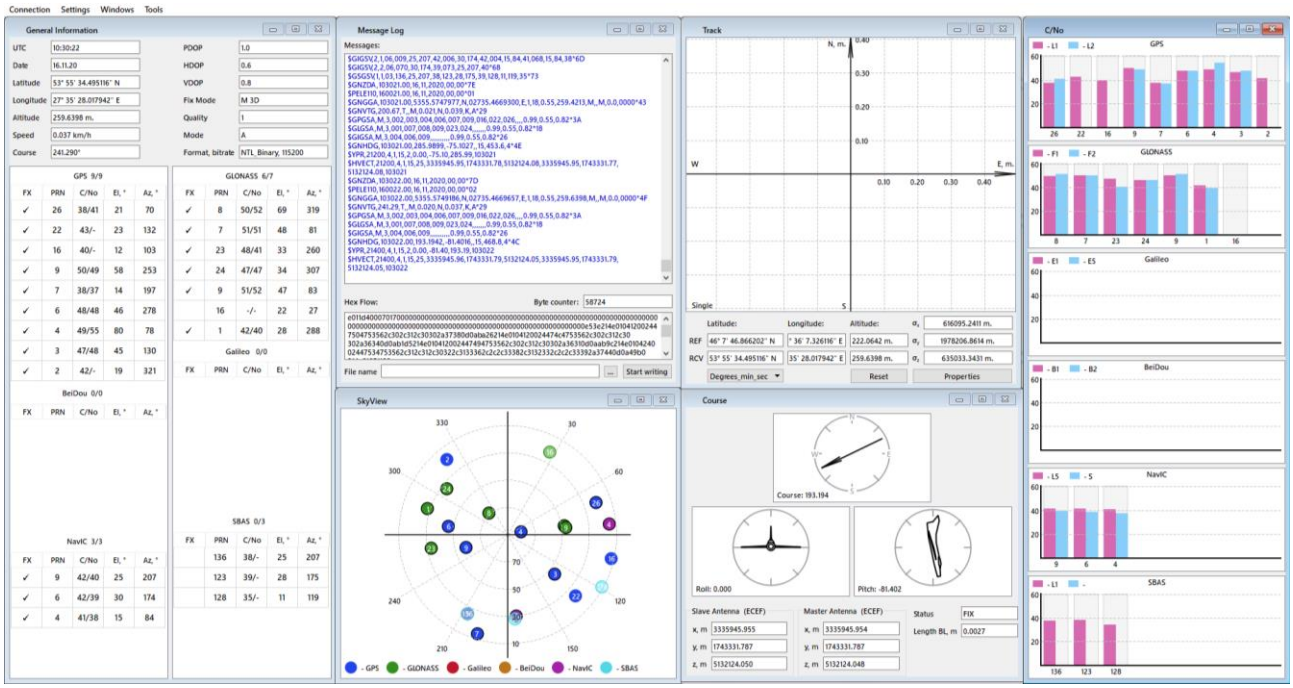
6. Run NTL Browser on computer. Then configure it:
   - Select interface language in the upper right corner of welcome page;
   - Connect to the COM227 **Port**. Port number could be different for alternative PC;
   - Set up 115200 **Baud rate** and NTL Binary **Protocol** type or Set up **Auto detect** checkbox to define them automatically;
   - Click on the **Connect** button to continue.



NTL Browser Main page consists of the multiple windows, that can be switched on/off in **Windows** toolbar. Select necessary windows for your work (*e.g., General information, Message Log, Sky View, Track, Course, C/No*).



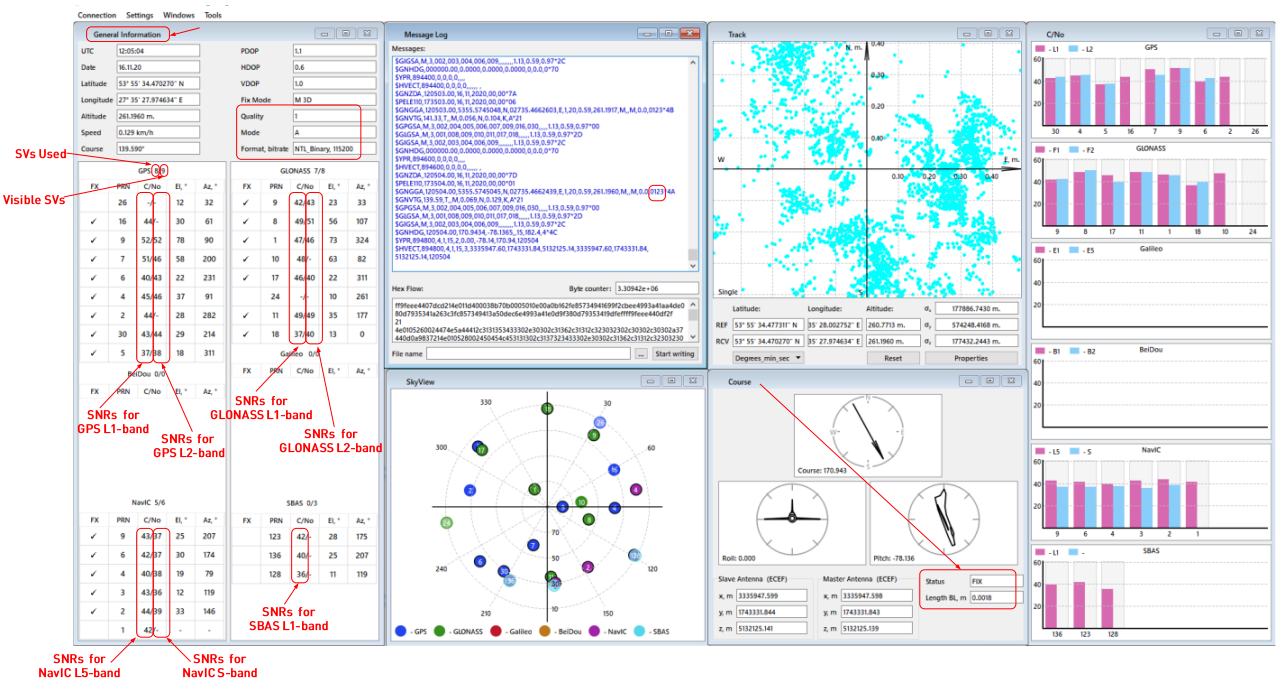
Windows display different navigational information and may be configured on demand (see example below).



Message Log window displays periodical messages coming from the receiver. While the interface mode is *NTL Binary*, messages have binary format. You can see textual interpretation of their content in **Message Log** window printed in *blue color*. If the interface mode is *NMEA*, received data is printed directly in **Message Log** in *black color*.

2 HEADING DETERMINATION MODE (SINGLE+HEADING)

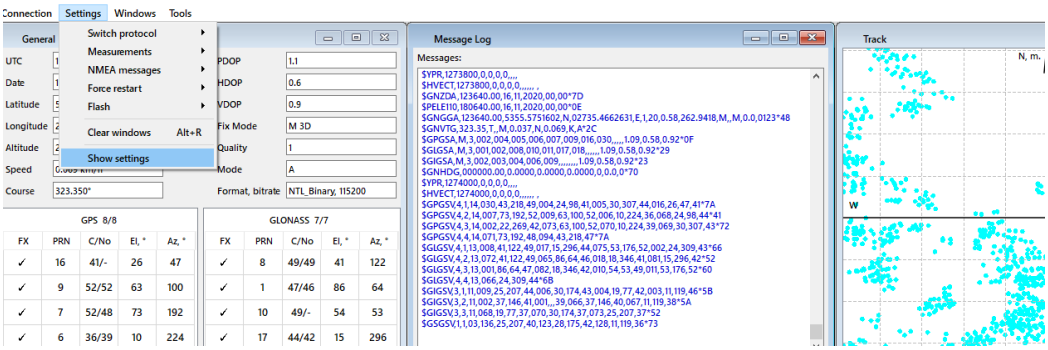
By default, master PPU channel operates in ***Heading+'SBAS+'*** mode (see Chapter 3, par. 2) and processes GPS L1, L2, GLONASS L1, L2, NavIC L5, S-band and SBAS L1 (EGNOS+GAGAN) signals. Navigation products and accompanying information is represented in **General Information** window as the table.



While operating in *NTL Binary* mode, configuration settings are available in **Settings** menu.

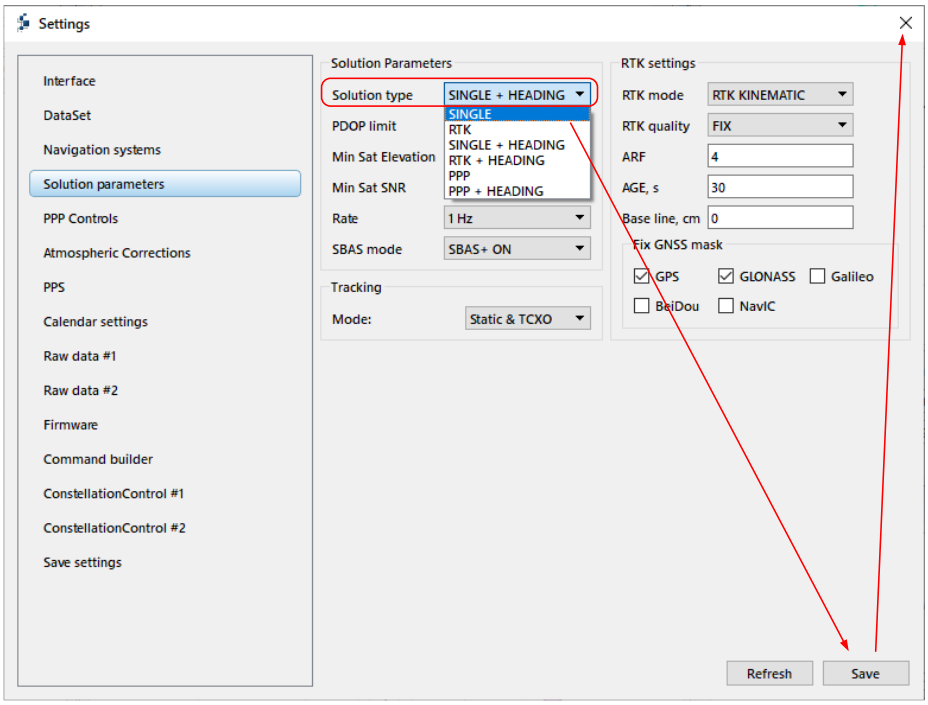
Heading determination mode can be switched on/off:

1. Select the **Settings/Show settings**



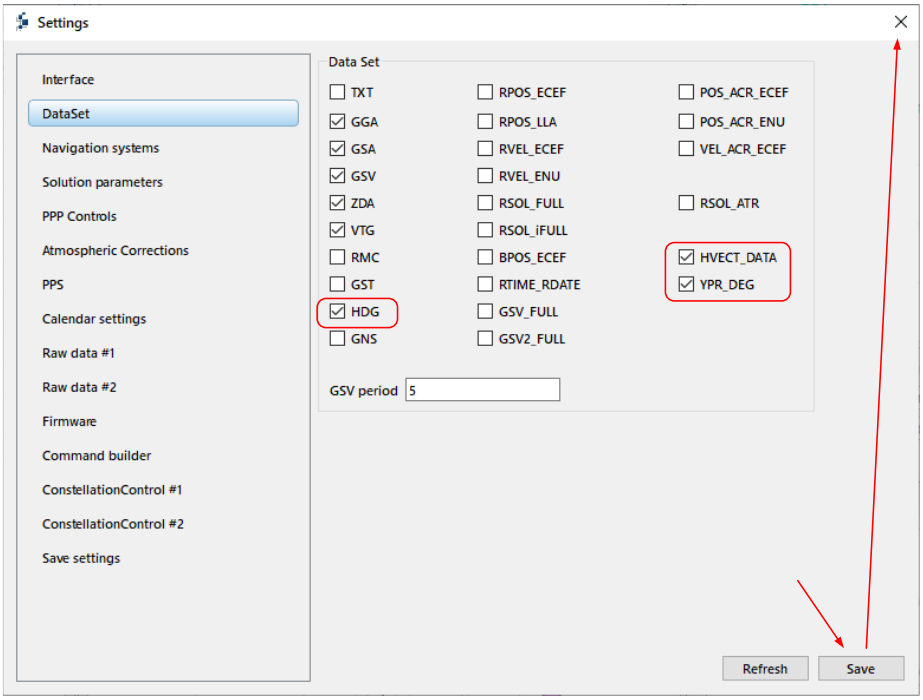
2. Then select the **Solution parameters** list box:

- In the **Solution Parameters** sub-section, select '**SINGLE**' as the **Solution type** to switch OFF Heading determination or select '**SINGLE+HEADING**' as the **Solution type** to switch ON Heading determination;
- Click on the **Save** button. Exit the **Settings** section.

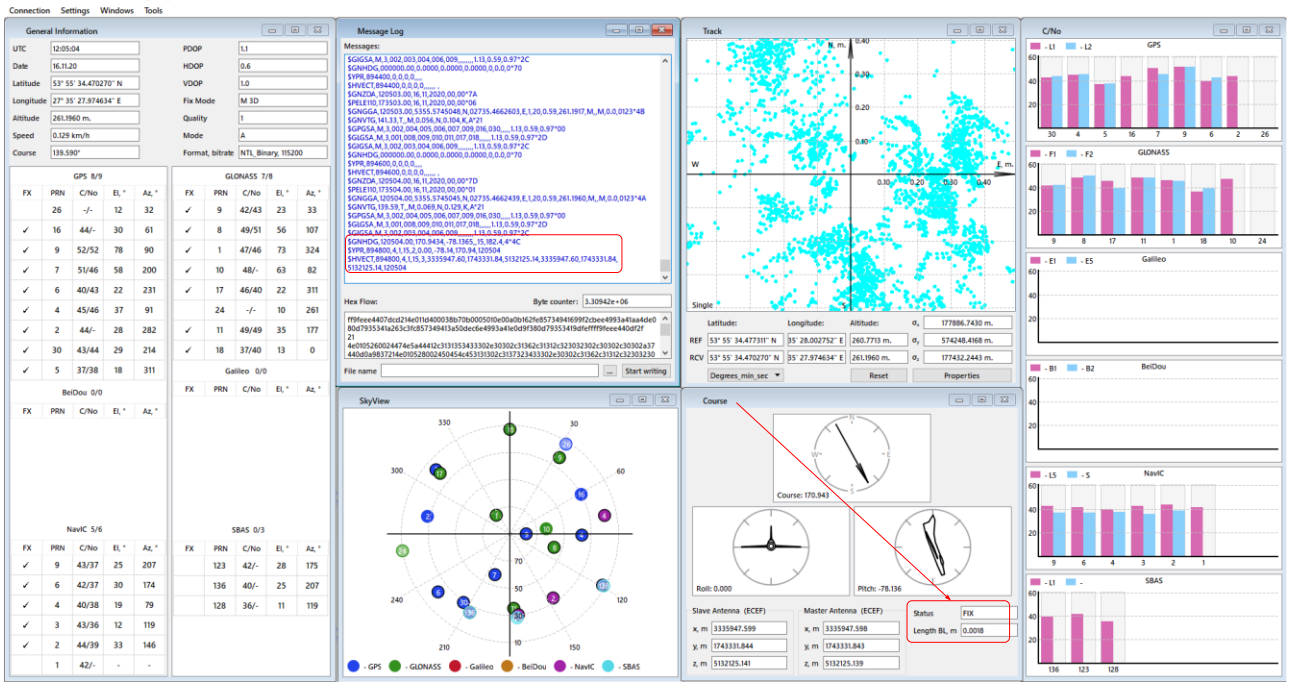


The information about 2D orientation (Heading) is displayed in the **Course** window, which represents information from HDG_DATA (it is available in NMEA mode to), YPR_DEG, HVECT_DATA messages.

3. After selecting '**SINGLE+HEADING**', ensure that appropriate messages are switched ON. To do this:
   - Select the **Settings/Show settings/DataSet** list box;
   - Click on the **Save** button. Exit the **Settings** section.



4. Wait for the FIX **Status** in **Course** window (maximum accuracy mode).



The positioning mode is autonomous. Orientation estimates are based on determination of mutual position of Master and Slave antennas.

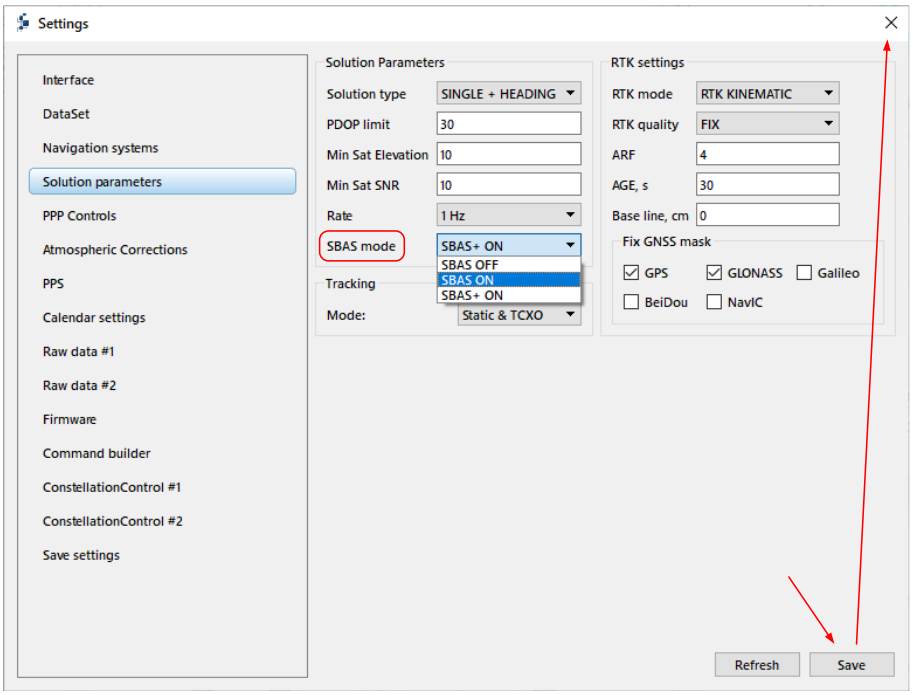
3 DGPS MODE

DGPS mode can be switched on:

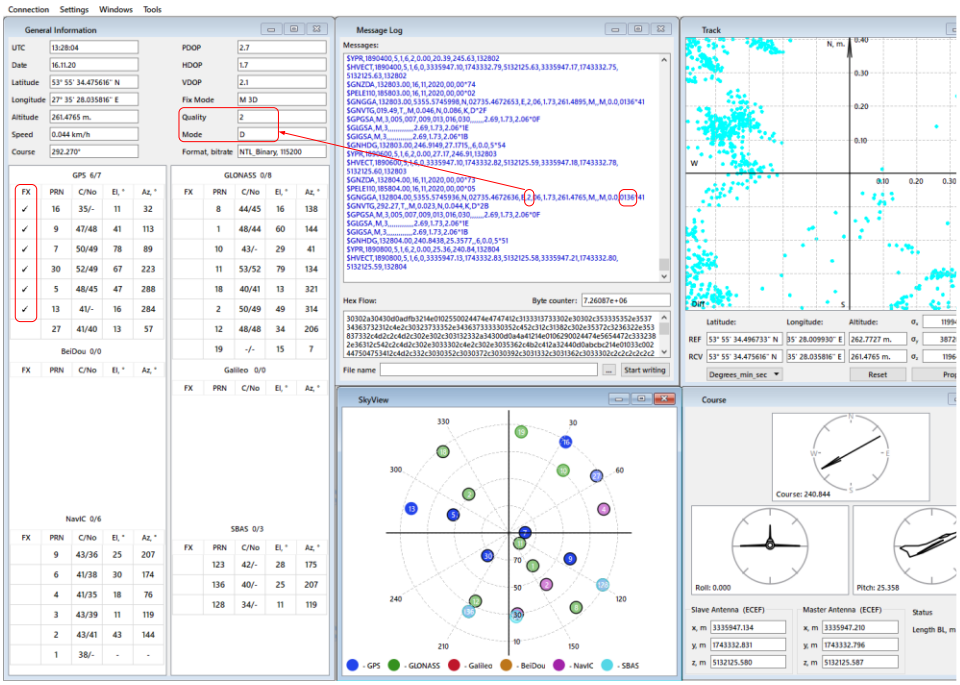
1. ***SBAS ON*** is DGPS mode where *only GPS+SBAS* satellites will be used for navigation solutions.

   Switch on **SBAS ON** mode:

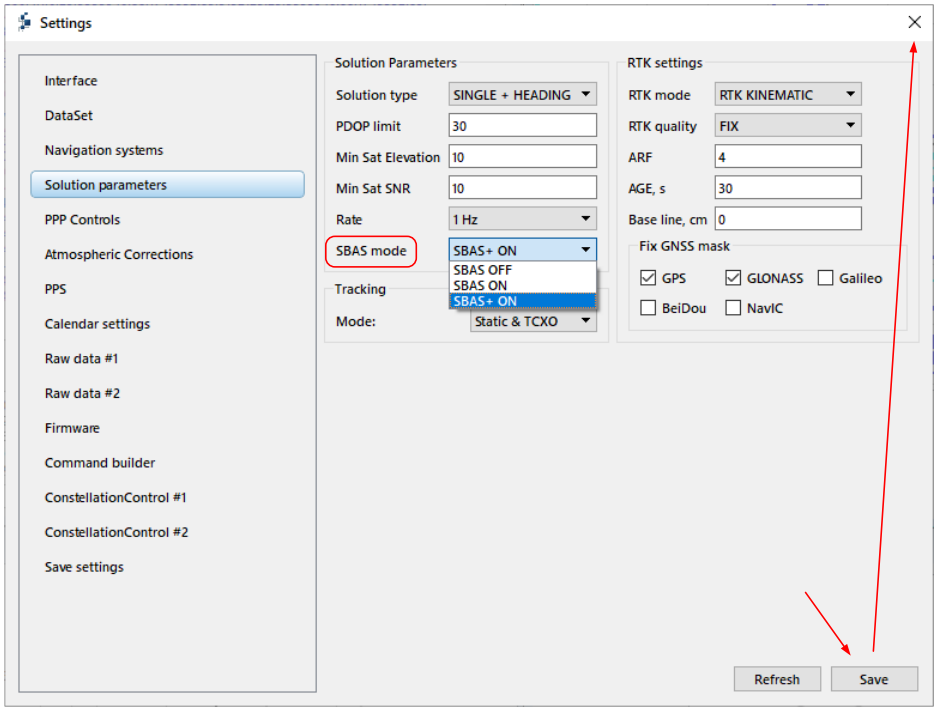
   - Select the **Settings/Show settings/Solution Parameters** list box. In the **Solution Parameters** sub-section select '**SBAS ON**' as the **SBAS mode**;
   - Click on the **Save** button. Exit the **Settings** section.



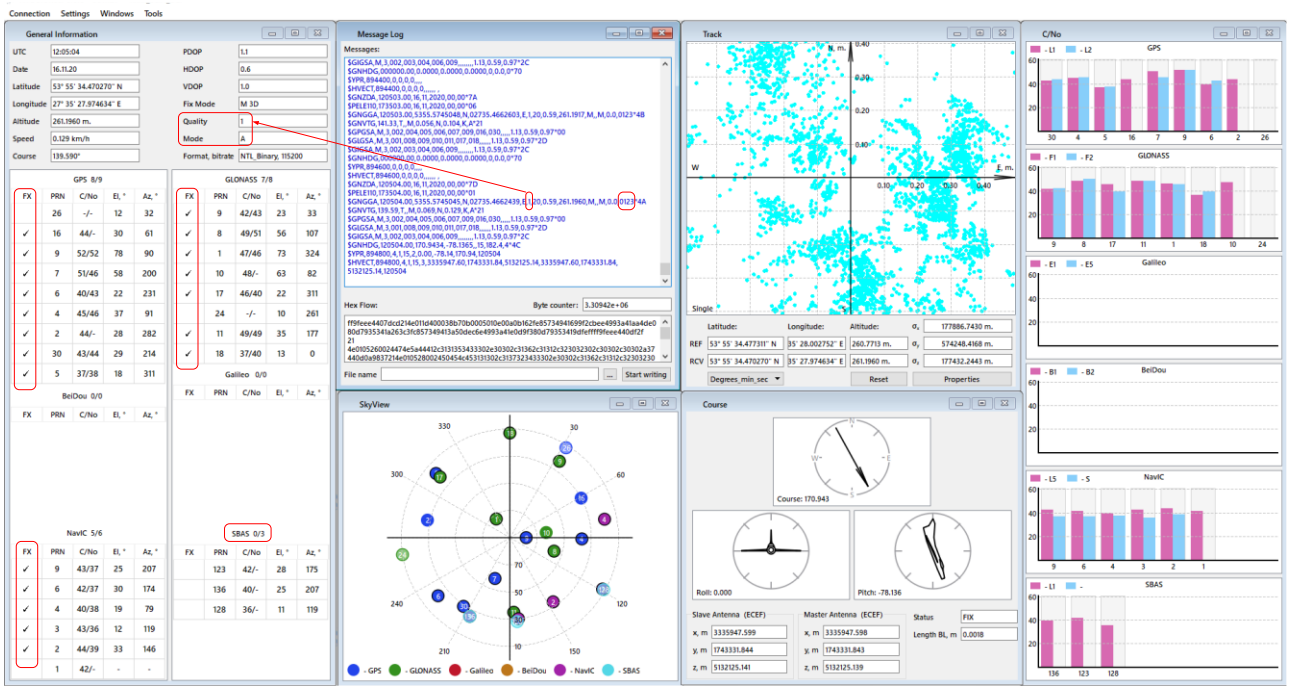
DGPS mode is indicated as '**2**' in the **General Information** window in **Quality** field and **Mode** field as '**D**'. SBAS satellite number and mode are also indicated in the last field of GGA message (see the picture below).



2. **SBAS+** is positioning mode where all available GNSS satellites will be used in navigation solutions. GPS satellites will get full set of SBAS corrections. Measurements based on the others GNSS systems will get only part of SBAS corrections (for ionospheric error correction). *Switch on **SBAS+** mode*:
   - Select the **Settings/Show settings/Solution Parameters** list box. In the **Solution Parameters** sub-section select '**SBAS + ON**' as the **SBAS mode;**
   - Click on the **Save** button. Exit the **Settings** section.

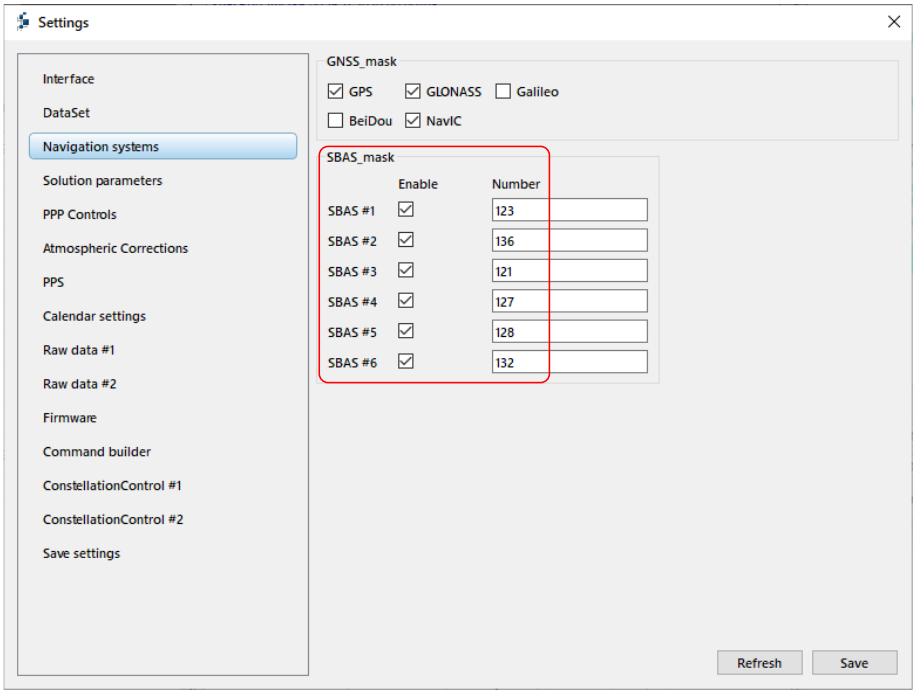


While we are in **SBAS+** mode SBAS satellite number is indicated in the last field of GGA message. GGA status field will remain '**1**' (displayed in the **General Information** window in the **Quality** field). See below.

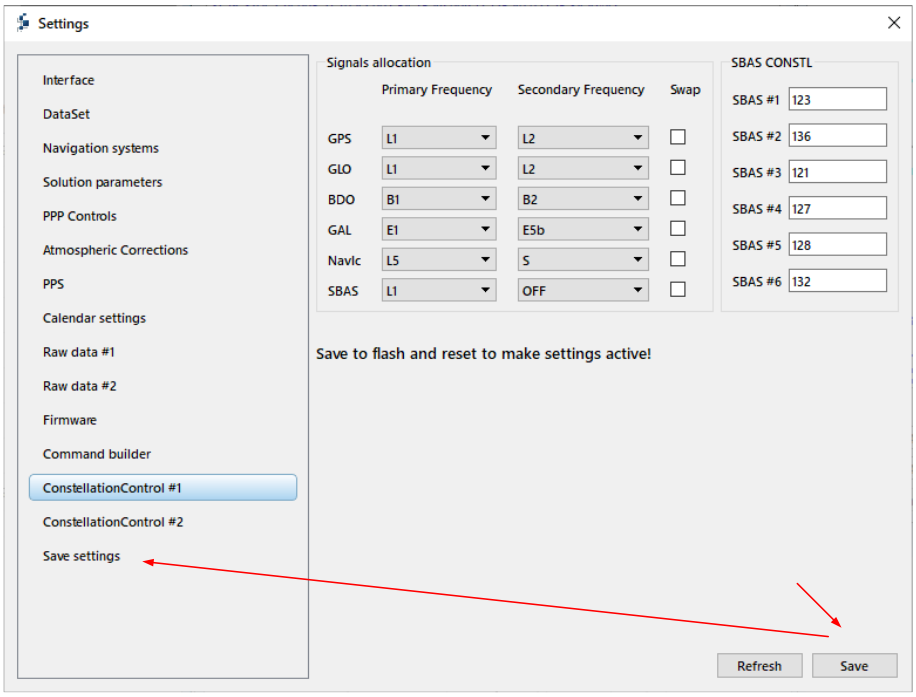


Internal logic of NTL104 selects the best SBAS satellite to be used in navigation solution. Up to 6 SBAS satellites may be tracked simultaneously.

- Select the **Settings/Show settings/Navigation systems** list box to control SBAS satellites manually. By default, NTL104 module tracks EGNOS and GAGAN satellites;
- Click on the **Save** button.



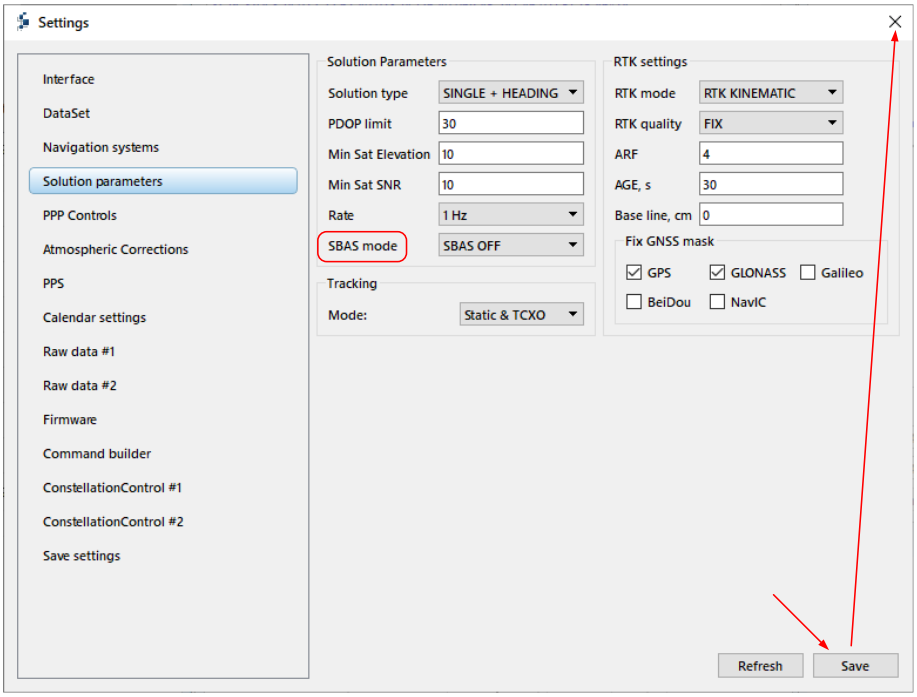
- Select the **ConstellationControl#1** list box to change SBAS subsystems to be used



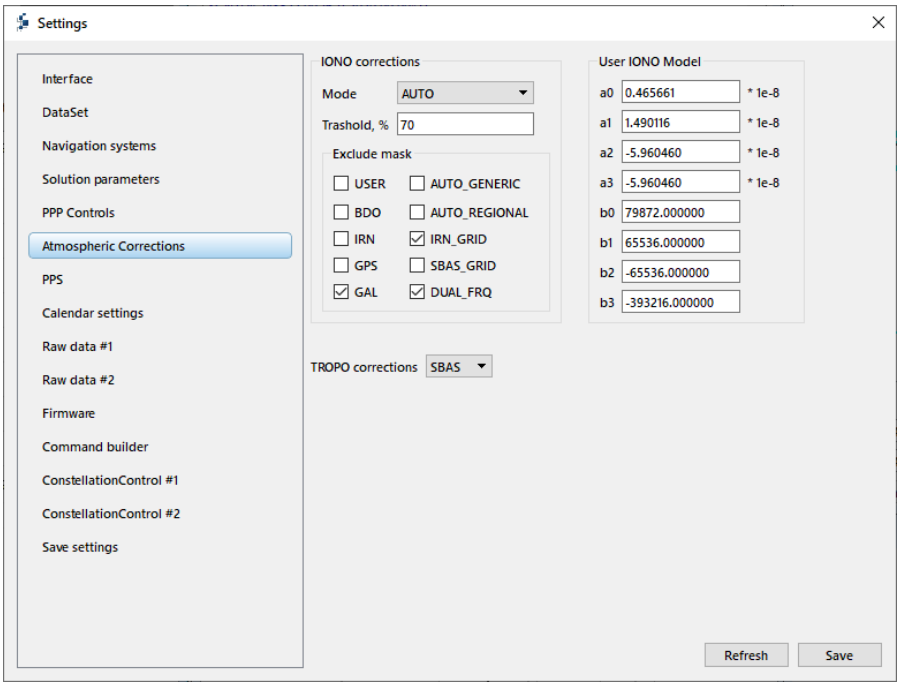
SBAS satellite numbers 120...158 may be programmed on this page. Settings would have become active only after they are saved into FLASH memory (see Chapter 6) and receiver reloaded.

3. Switch off SBAS mode (**SBAS OFF**) to enter regular SINGLE positioning mode:

- Select the **Solution Parameters** list box. In the **Solution Parameters** sub-section select '**SBAS OFF**' as the **SBAS mode;**
- Click on the **Save** button. Exit the **Settings** section.



While you are in SINGLE positioning mode, tropospheric and ionospheric corrections are performed in accordance with GNSS ICDs. Due to multi constellation support there is a variety of available correction modes. Parameters in section **Settings/Show settings/Atmospheric Corrections** allow control over correction methods. Recommended parameters are on the picture below. Refer to «GNSS-PPU-SETUP-GUIDE-6-62-00.pdf» for details before making modifications.

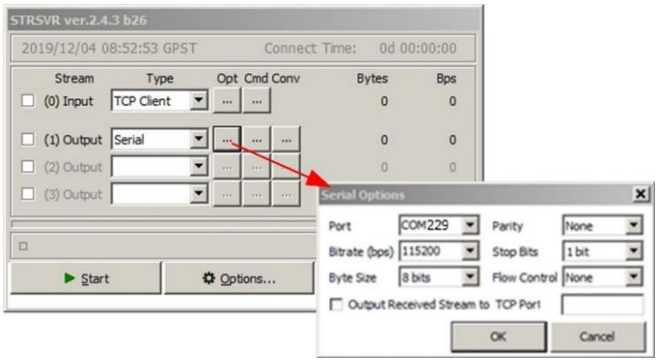

Settings
Interface
DataSet
Navigation systems
Solution parameters
PPP Controls
Atmospheric Corrections
PPS
Calendar settings
Raw data #1
Raw data #2
Firmware
Command builder
ConstellationControl #1
ConstellationControl #2
Save settings
IONO corrections
Mode
AUTO
Trashold, %
70
Exclude mask
USER
AUTO_GENERIC
BDO
AUTO_REGIONAL
IRN
IRN_GRID
GPS
SBAS_GRID
GAL
DUAL_FRQ
User IONO Model
a0
0.465661
* 1e-8
a1
1.490116
* 1e-8
a2
-5.960460
* 1e-8
a3
-5.960460
* 1e-8
b0
79872.000000
b1
65536.000000
b2
-65536.000000
b3
-393216.000000
TROPO corrections
SBAS
Refresh
Save

4 DIFFERENTIAL POSITIONING MODE (RTK+HEADING)

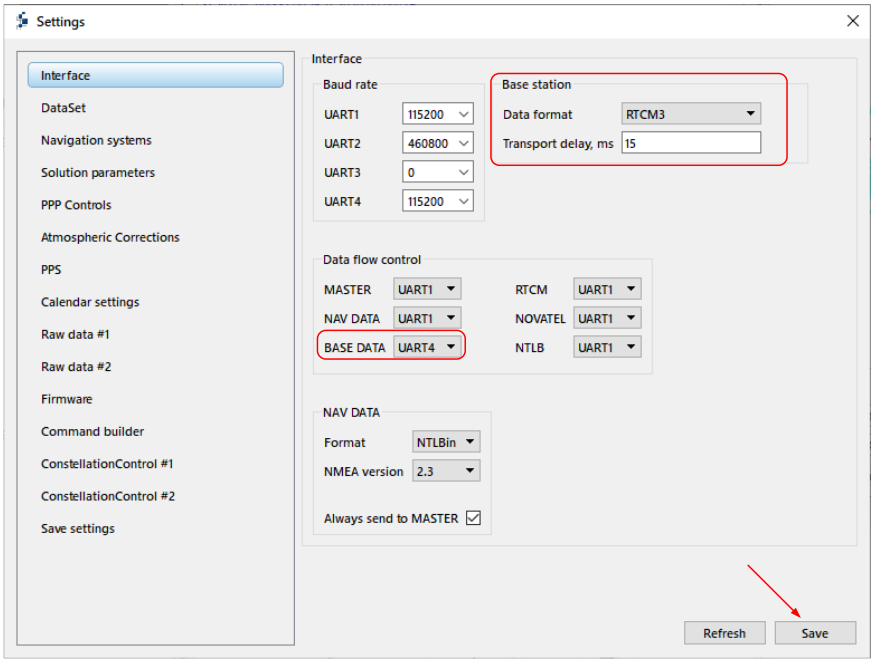
We should provide base station measurements data to make RTK positioning mode available. In this example we will receive base station data from local VRS network via Internet. STRTOSVR utility will be used to redirect data flow to COM229 (**Interface1**).

Differential positioning mode can be switched on:

1. Run **strsvr.exe*** utility from RTK LIB package (http://www.rtklib.com/)

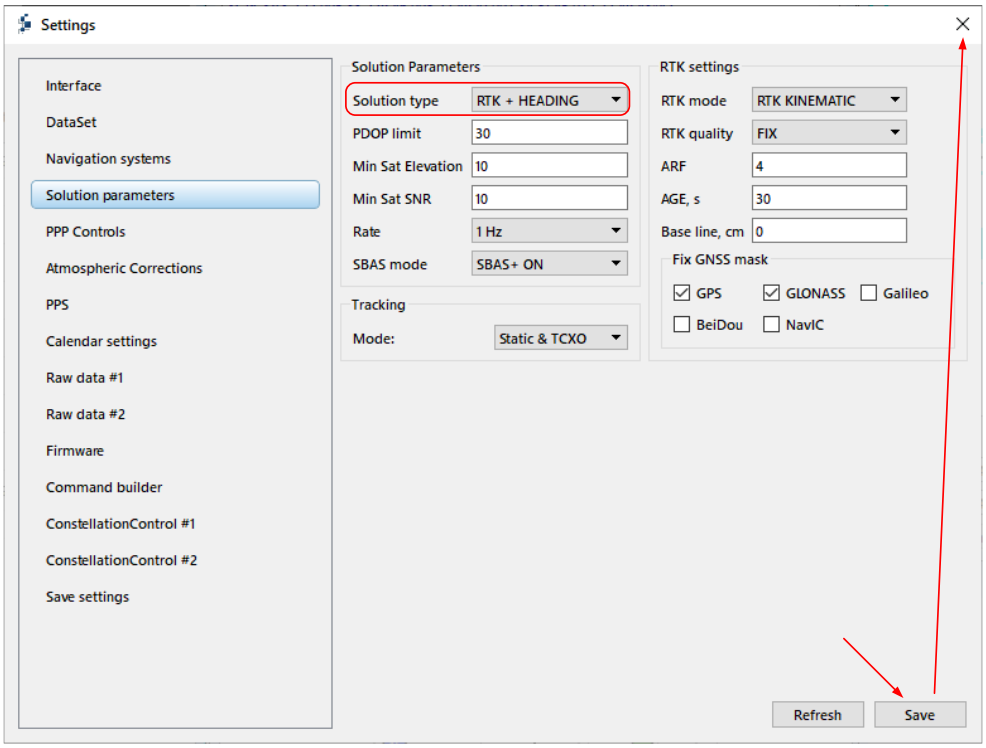


2. VRS network provides data in RTCM3 format. Novatel OEMv7 data format may be used as an alternative. Appropriate settings should be made in receiver:
   - Select the **Settings/Show settings/Interface** list box. Make sure UART4 is set up. Click on the **Save** button.



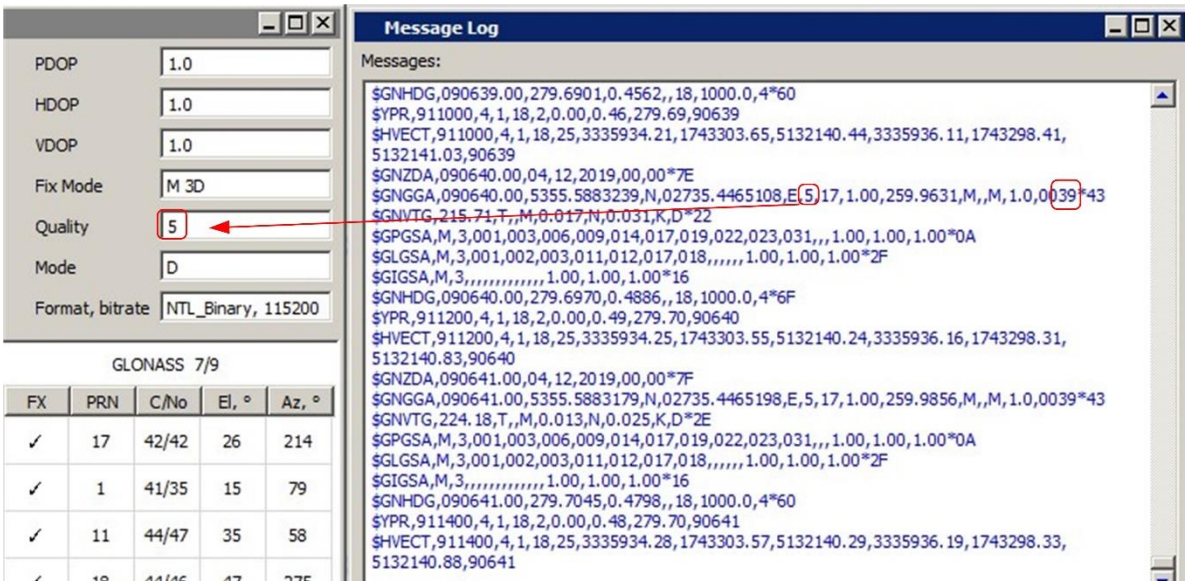
* Required tools can be available on NTLab company's FTP server. Link may be provided on request.

- Select the **Settings/Show settings/Solution parameters** list box. In the **Solution type** sub-section, select **'RTK+HEADING';**
- Click on the **Save** button. Exit the **Settings** section.

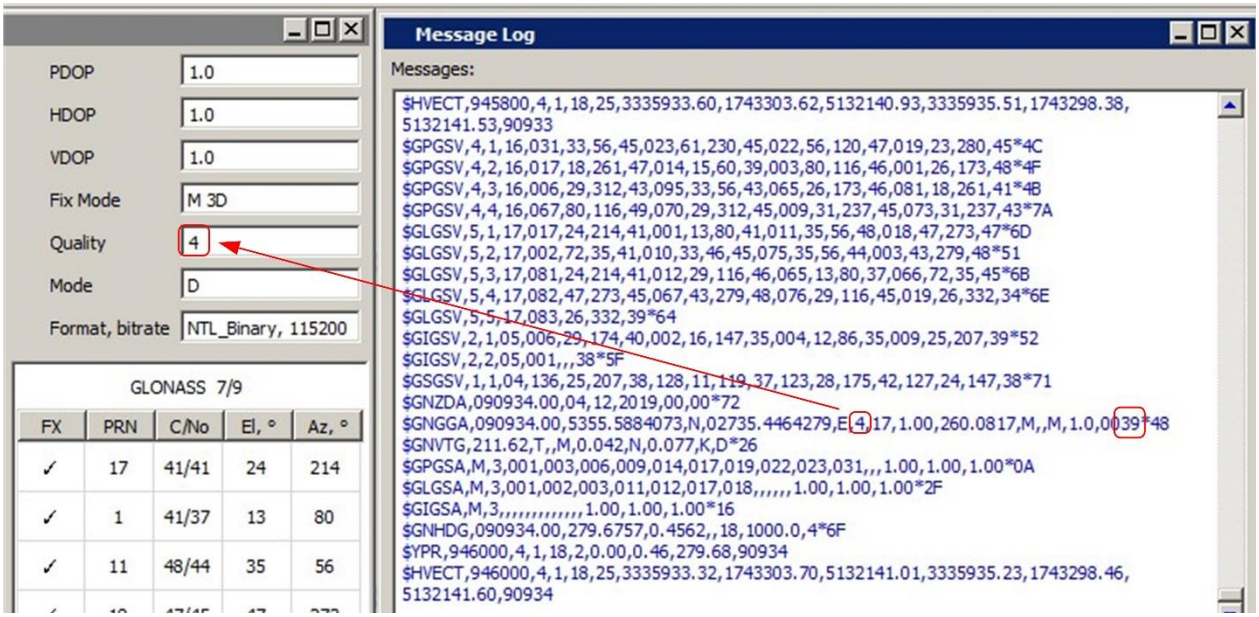


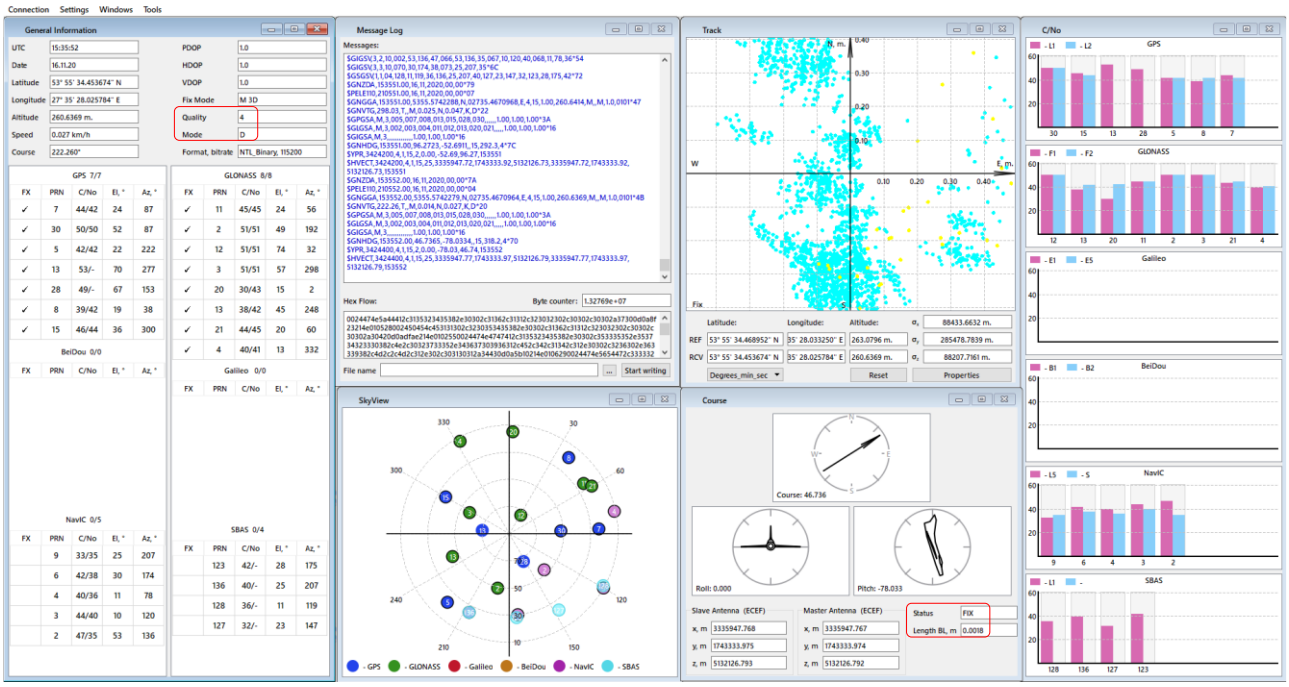
RTK settings sub-section contains some control parameters defining RTK positioning mode. Refer to «GNSS-PPU-SETUP-GUIDE-6-62-00.pdf» for details.

At first, receiver enters RTK FLOAT mode (**Quality '5'**):



In some time, receiver enters RTK FIX mode (**Quality '4'**) - the most accurate positioning mode. Base station number, corrections age and solution status are indicated in GGA messages.





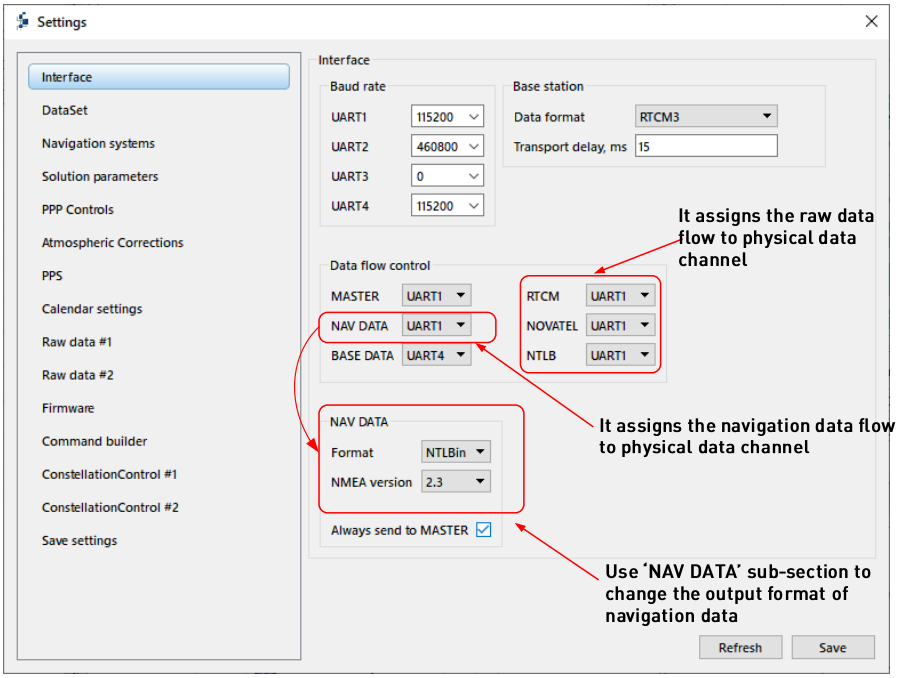
Another one NTL10X-series receiver may be used as a reference receiver instead of VRS network. Refer to Chapter 5 to setup receiver as a source of raw ranging data.

5 GENERATION OF RAW RANGING DATA

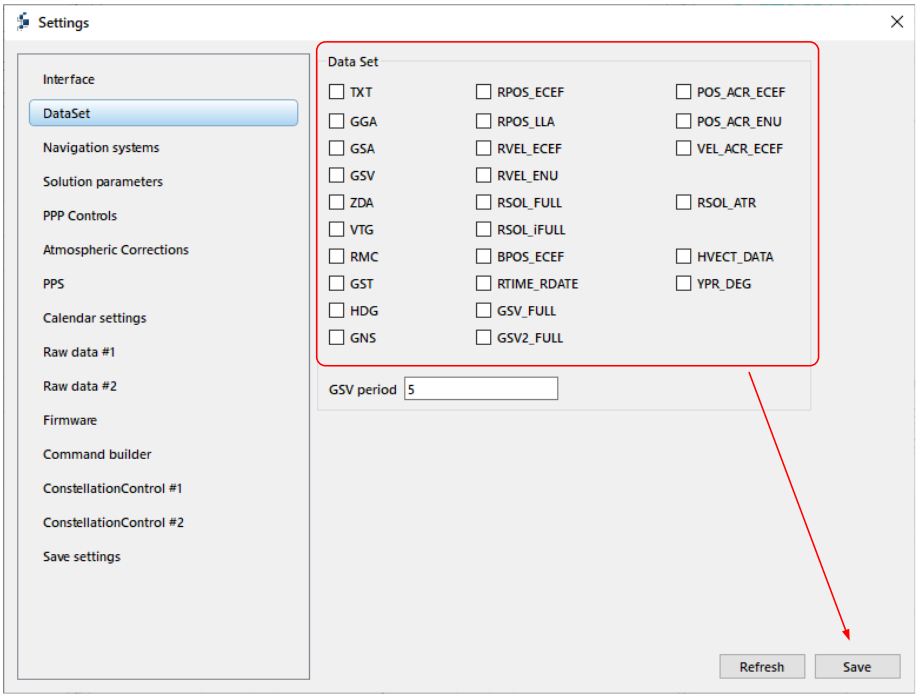
Navigation module can be used as a source of raw ranging data for further post processing or differential positioning.

This can be done as follows:

1. Select the **Settings/Show settings/Interface** list box. Make sure, UART1 is selected in **Data flow control** sub-section beside the required raw ranging data format (RTCM/NOVATEL/NTLB), otherwise click drop-down list and select UART1. Click on the **Save** button.

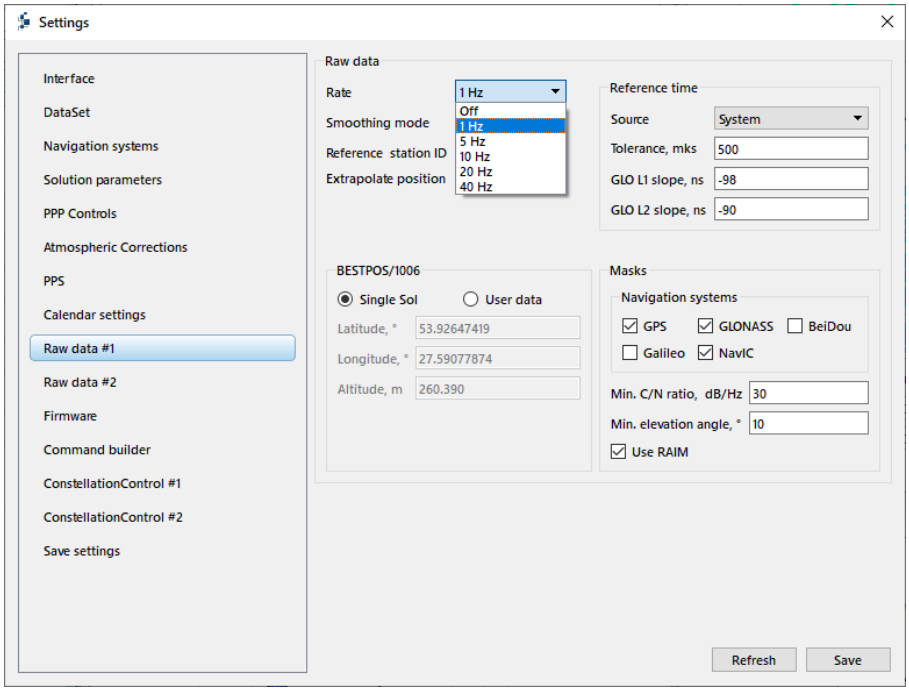


2. Select the **DataSet** list box. In the **Data Set** sub-section deselect all checkboxes. Click on the **Save** button. After this action module stops NTL Binary periodic messages generation.



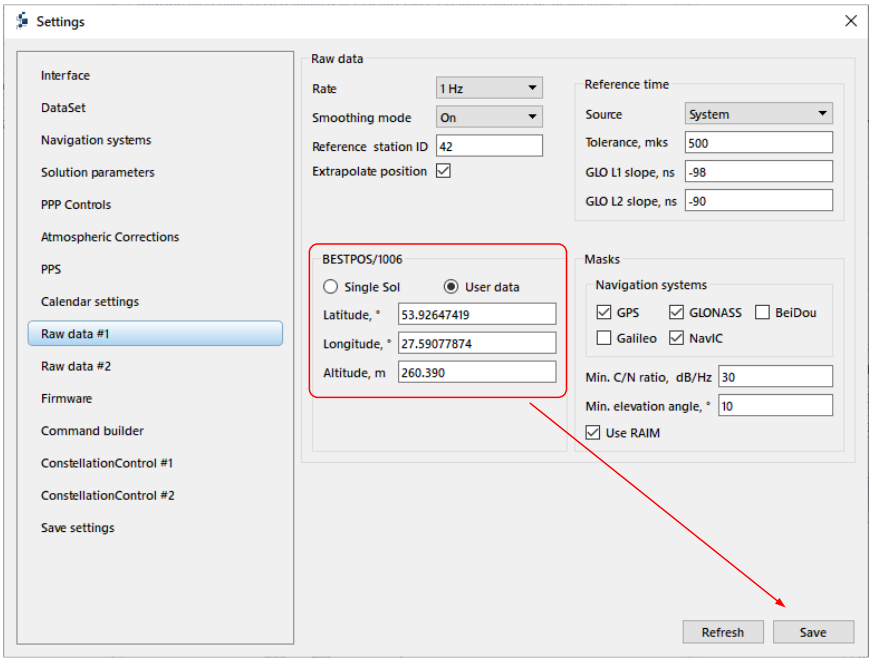
3. Select the **Raw data #1** list box.

- In the **Raw data** sub-section, click the **Rate** drop-down list and select, for example '1 Hz', or make sure it does. Click on the **Save** button.

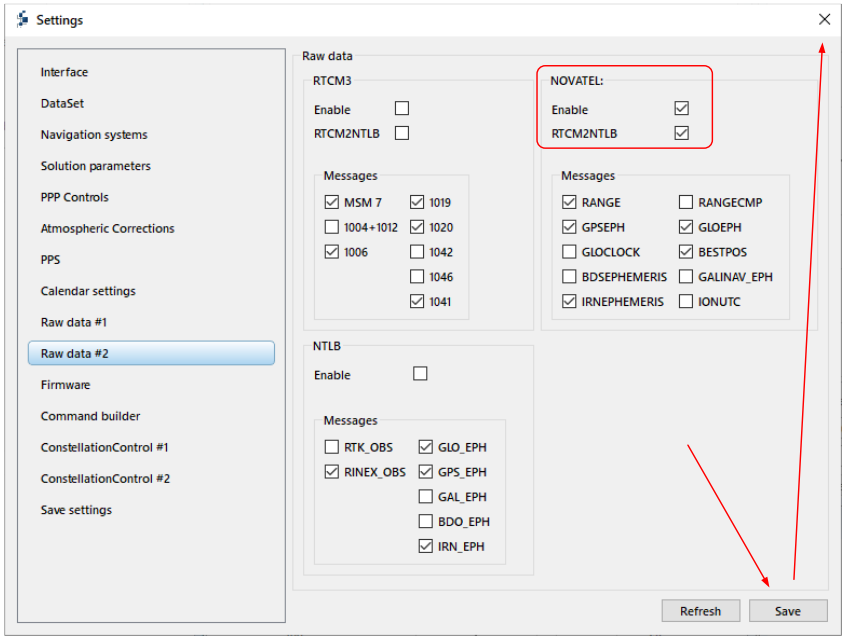


- Switching receiver to Base mode must be accompanied by the setting of the base antenna coordinates. Antenna coordinates can be set either automatically (run-time position), or manually (by entering the known antenna coordinates).

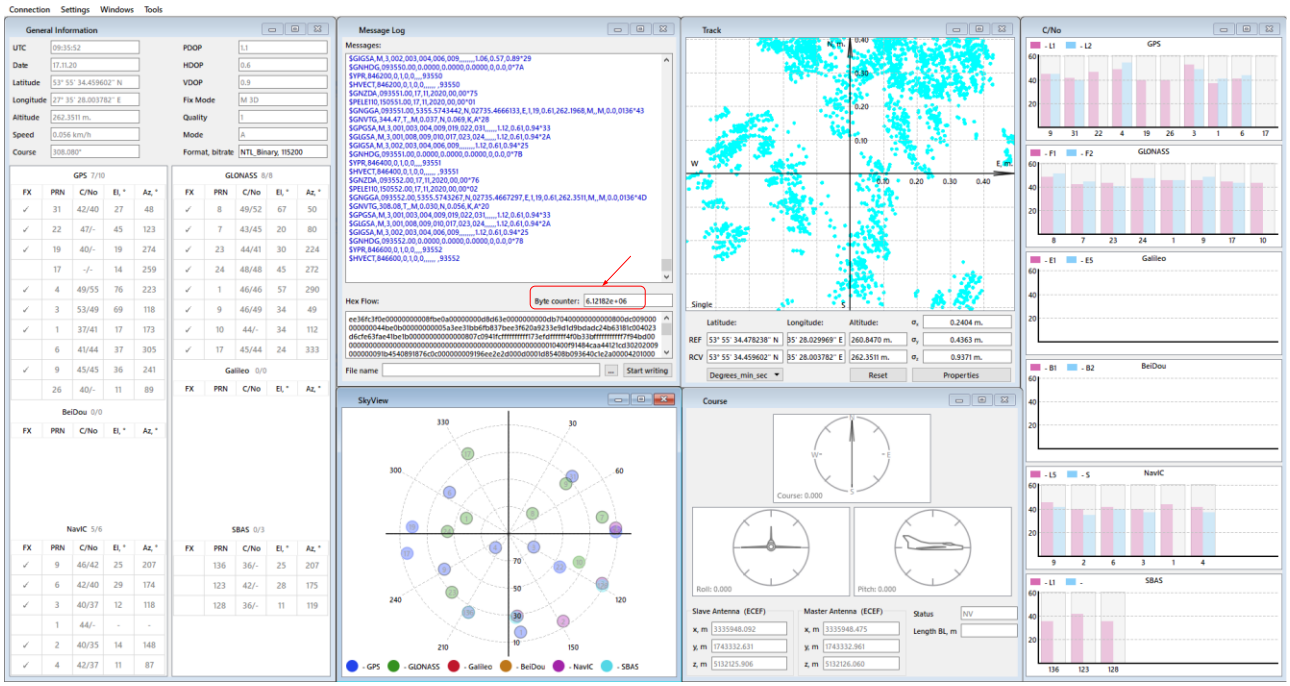
  To enter antenna coordinates manually, set the **User data** and enter known antenna coordinates in the **BESTPOS/1006** sub-section. Click on the **Save** button.



4. Select the **Raw data #2** list box. In the **Raw data** sub-section, set both **Enable** and **RTCM2NTLB** checkboxes for the required data output format. Click on the **Save** button. Exit the **Settings** section.



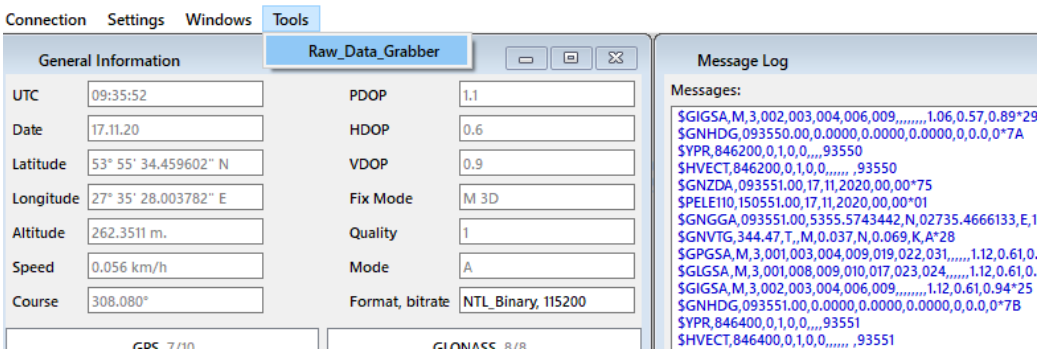
After these actions, module stops the NTL Binary periodic messages generation and starts the raw data flow generation into the physical data channel (UART1 COM227). This can be seen by the changing **Byte counter** in **Message Log** window.



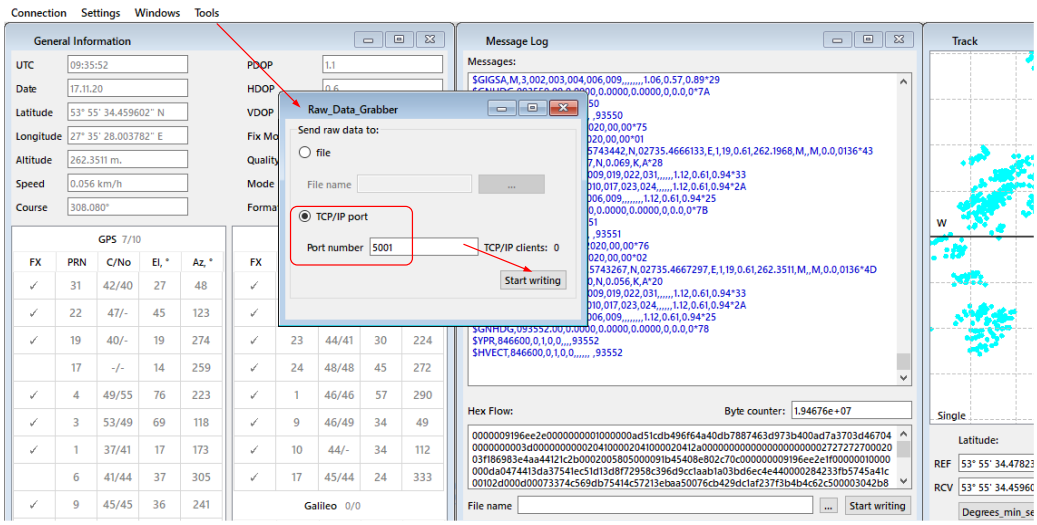
RTKNAVI tool from RTKLib package (**http://www.rtklib.com/**) may be used to visualize and write raw ranging measurements. **RTKNAVI** does not support standard and precise positioning algorithms with NavIC signals (*RTKNAVI can't visualize NavIC data*).

Below is an example of **NTL104** configuration for transfer NOVATEL data from **COM227** to **TCP/IP port** by NTL Browser.

1. Select the **Tools/Raw_Data_Grabber** section



2. Enter **Port number** in **TCP/IP port** sub-section. For example, number 5001. Click on the **Start writing** button.



When configuring RTKNAVI to receive and record NOVATEL data from the TCP/IP port, it is recommended the following steps:

1. Run the **rtknavi.exe*** utility.

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* Required tools can be available on NTLab company's FTP server. Link may be provided on request.

2. Then configure it, as shown in Figure below:

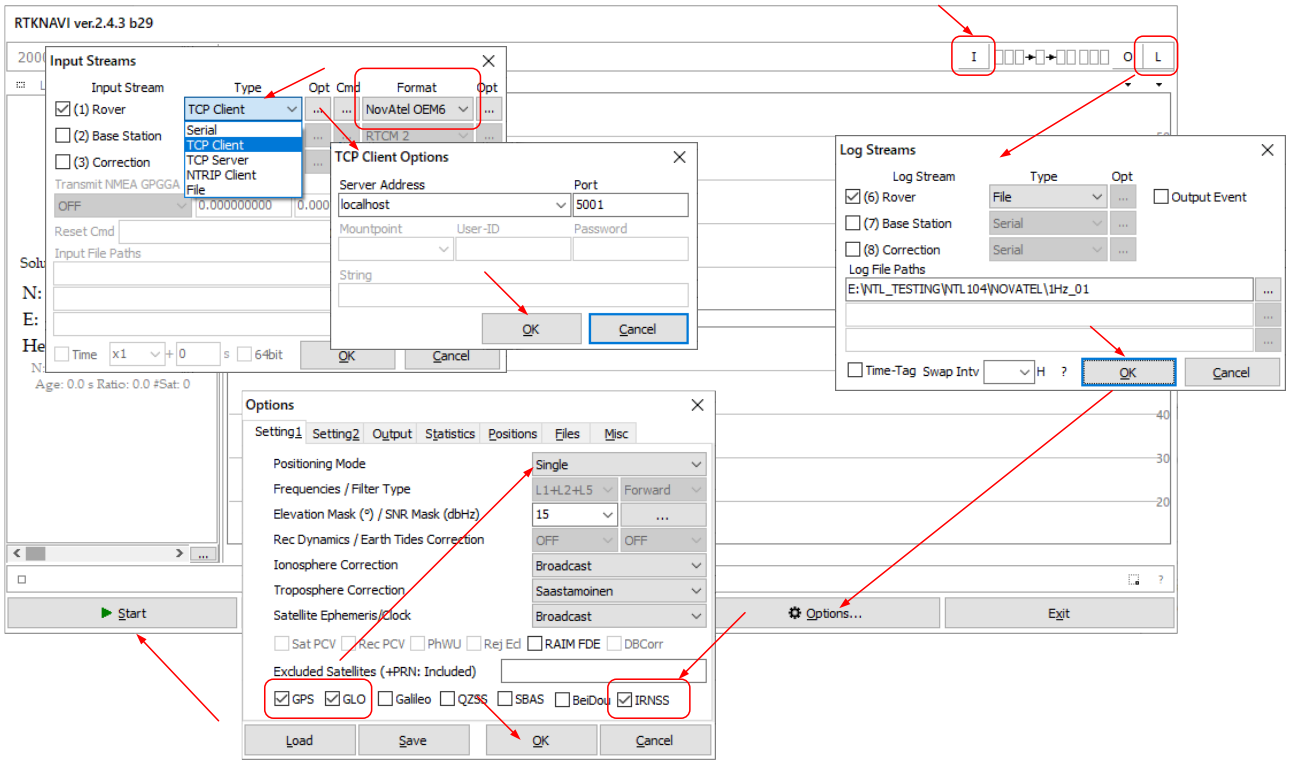
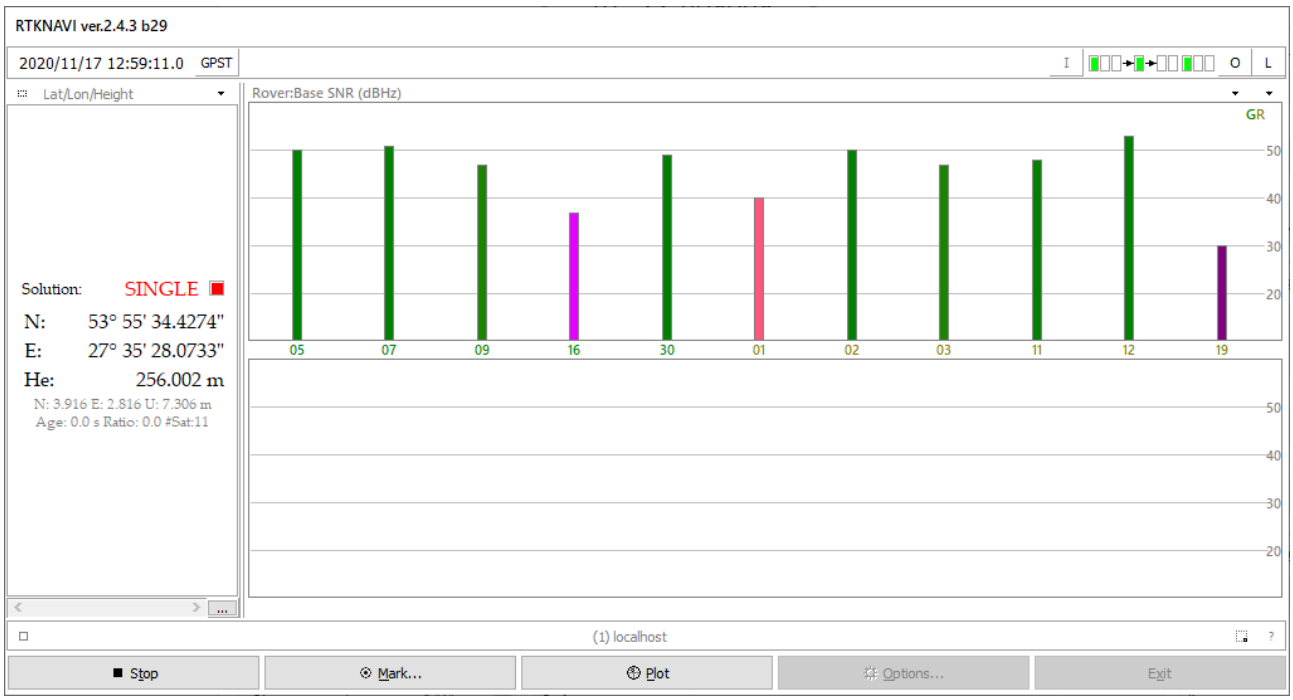
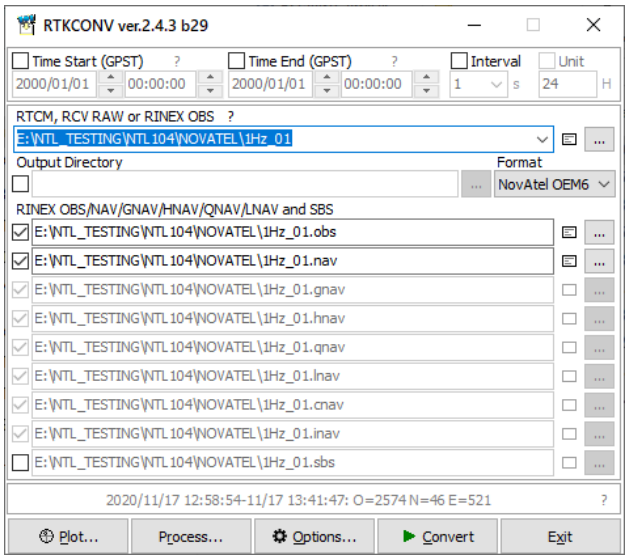


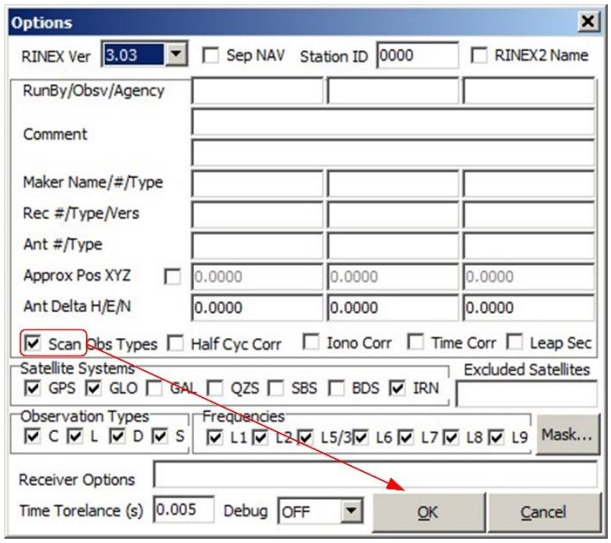
Figure below shows, the rtknavi.exe utility calculates the receiver position. So, raw ranging data is accepted and processed.



3. Convert the NOVATEL raw ranging data we have already written into RINEX format to check ability of NavIC measurements:
   - Run the **rtkconv.exe*** utility;
   - Select source file and data format;



   - Setup **Options** as on the picture below. Click on the '**OK**' button.



   - Click on the '**Convert**' button.

* Required tools can be available on NTLab company's FTP server. Link may be provided on request.

NavIC measurements present in resulting ***.obs** file:

```
I 4  39844294.635   156357581.681       -101.429         41.000
I 3  40450715.555   158737298.211        -56.321         46.000
I 2  37629347.169   147665639.482        593.535         44.000
R 1  22675266.669   121212282.968      -3956.401         39.000   22675270.029   94276290.838      -3077.207         40.000
R12  19378941.032   103518827.751       1336.411         53.000   19378941.567   80514611.023       1039.453         52.000
G16  23704282.667   124566835.544      -2711.733         37.000
R19  22868709.585   122332289.459      -1051.357         31.000   22868710.581   95147331.607       -817.090         34.000
> 2020 11 17 12 58 55.0000000  0 16
R 3  21239869.842   113698675.981       3380.613         48.000   21239868.361   88432288.345       2629.378         47.000
R11  20564356.683   109889696.862      -2676.160         48.000   20564357.395   85469769.224      -2081.443         51.000
R 2  19026725.641   101530256.253       -188.361         47.000   19026726.737   78967969.530       -146.525         53.000
G30  21285011.446   111853504.586       2118.853         50.000
G 9  21313340.621   112002355.546      -2200.695         48.000
G 7  20722646.311   108898237.826        267.858         51.000
G 5  21944917.036   115321321.756       1982.150         49.000
G 2  24531261.845   128912669.172      -2275.898         32.000
I 6  38592592.743   151445629.166         33.510         42.000
I 4  39844320.506   156357683.209       -101.444         42.000
I 3  40450729.903   158737354.506        -56.280         46.000
I 2  37629195.876   147665045.774        593.488         44.000
R 1  22676006.803   121216239.361      -3956.604         39.000   22676010.140   94279368.020      -3077.622         41.000
R12  19378690.926   103517491.729       1335.584         53.000   19378691.465   80513571.899       1038.767         52.000
G16  23704798.735   124569547.491      -2712.336         38.000
R19  22868906.083   122333340.703      -1051.819         32.000   22868907.096   95148149.216       -817.787         33.000
> 2020 11 17 12 58 56.0000000  0 16
R 3  21239238.358   113695295.598       3380.268         47.000   21239236.872   88429659.167       2629.122         47.000
R11  20564857.526   109892373.225      -2676.790         49.000   20564858.237   85471850.843      -2081.901         50.000
R 2  19026761.002   101530444.939       -189.095         48.000   19026762.100   78968116.285       -147.113         53.000
G30  21284608.279   111851385.939       2118.415         49.000
G 9  21313759.422   112004556.362      -2201.056         47.000
G 7  20722595.369   108897970.124        267.345         51.000
G 5  21944539.904   115319339.914       1981.544         49.000
G 2  24531694.947   128914944.740      -2276.459         32.000
I 6  38592584.164   151445595.495         33.560         42.000
```

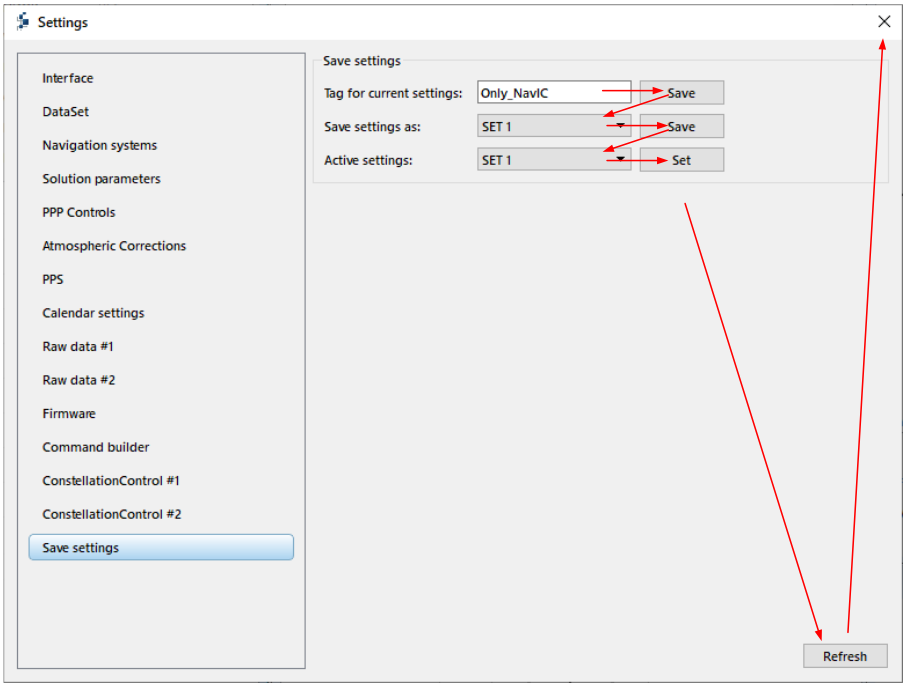
S-band measurements are not converted by RTKCONV. Some custom tools should be developed to get this data in RINEX format.

6 NON-VOLATILE FLASH

All receiver settings made in NTL Browser will be lost after the next power off if they are not saved into non-volatile memory. NTL104 module allows two sets of controls to be saved into FLASH.

Follow these steps:

1. Select **Settings/Show settings/Save settings** list box;
2. Enter textual tag for current scope of control parameters (optionally). Click on the **Save** button.
3. Select a name for current scope of controls: SET1 or SET2. Click on the **Save** button.
4. Select a set of controls to be loaded (active set): SET DEFAULT or SET1 or SET2. Click on the **Set** button.



The saved settings will be restored the next power on of the module and will be used when the receiver is started.

Note:

To recover factory settings, select **SET DEFAULT** as **Active settings**. Click on the **Set** button, then **Refresh** button. Exit the **Settings** section. Select **Settings/Force restart/Hardware** to restart the **NTL104** module.

CONTACTS

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