



NTL104

CONNECTION AND SETTING UP

Getting Started Guide

2020



CONTENTS

1 CONNECTION TO PC	3
2 HEADING DETERMINATION MODE (SINGLE+HEADING).....	6
3 DGPS MODE.....	9
4 DIFFERENTIAL POSITIONING MODE (RTK+HEADING).....	15
5 GENERATION OF RAW RANGING DATA.....	18
6 NON-VOLATILE FLASH.....	26
CONTACTS.....	27

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.

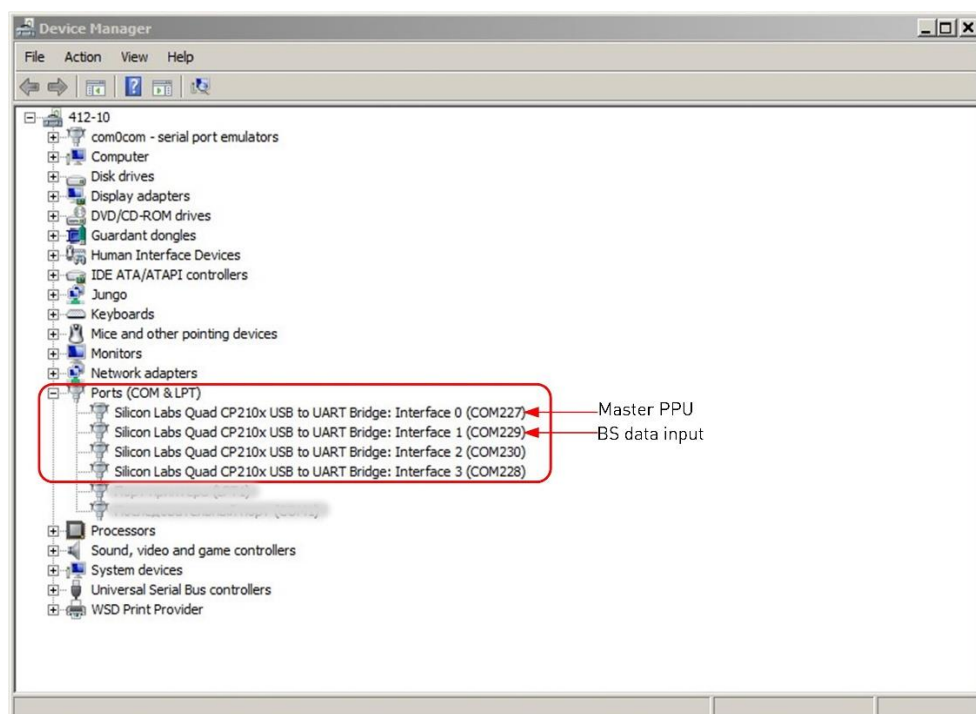
Follow to the next steps to connect NTL104:

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.

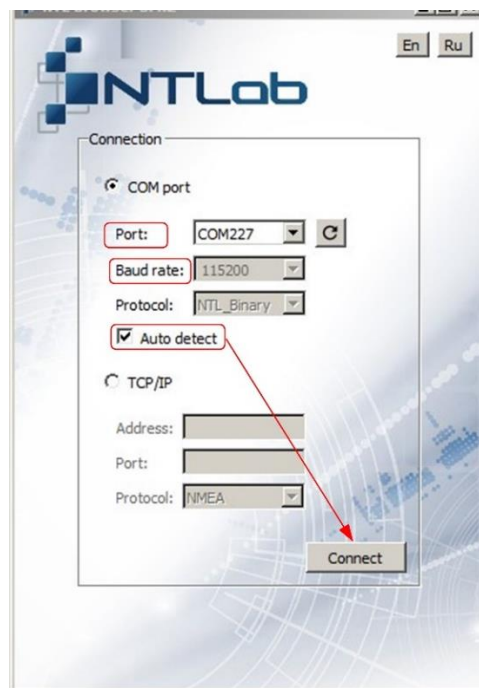
NTL104 UART outputs is available on PC via on-board 4xUART to USB converter (CP210x based) as virtual COM ports.

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**).

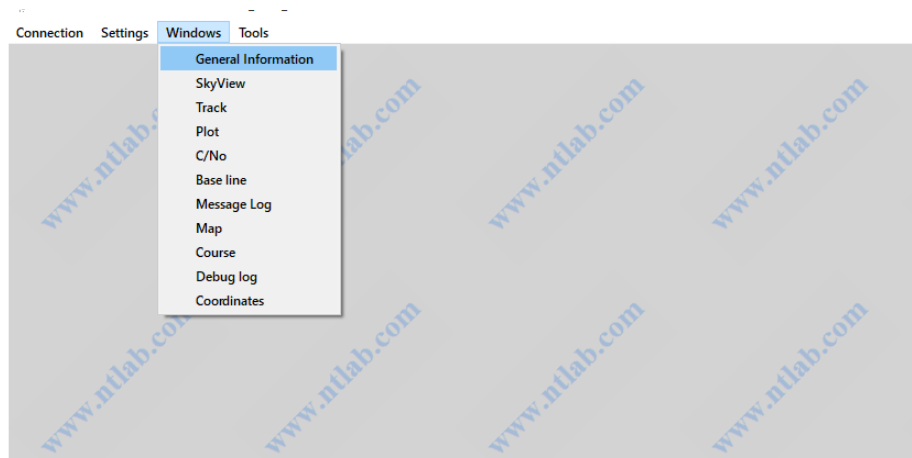


6. Run NTL Browser on computer. Then configure it:

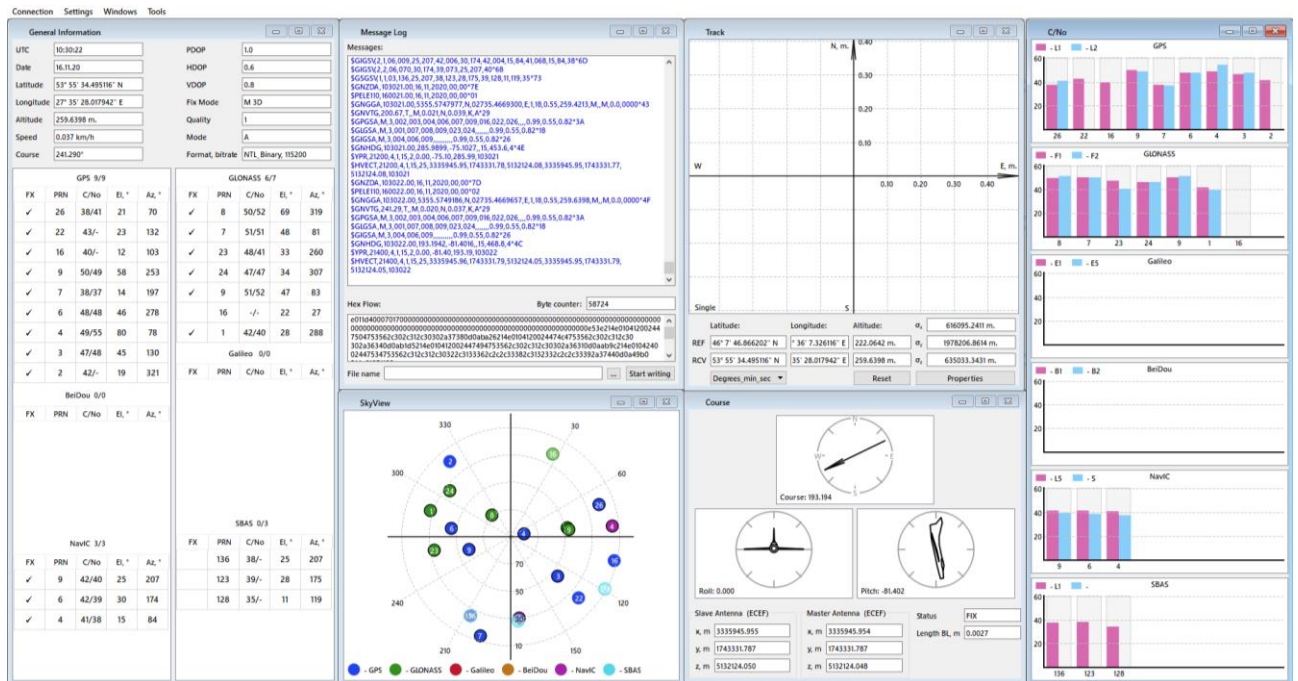
- Select interface language in the upper right corner of welcome page;
- Connect to the **COM227 Port**. Port number could be different for alternative PC;
- Set up **115200 Baud rate** and **NTL Binary Protocol** type or Set up **Auto detect** checkbox to define them automatically;
- Click on the **Connect**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



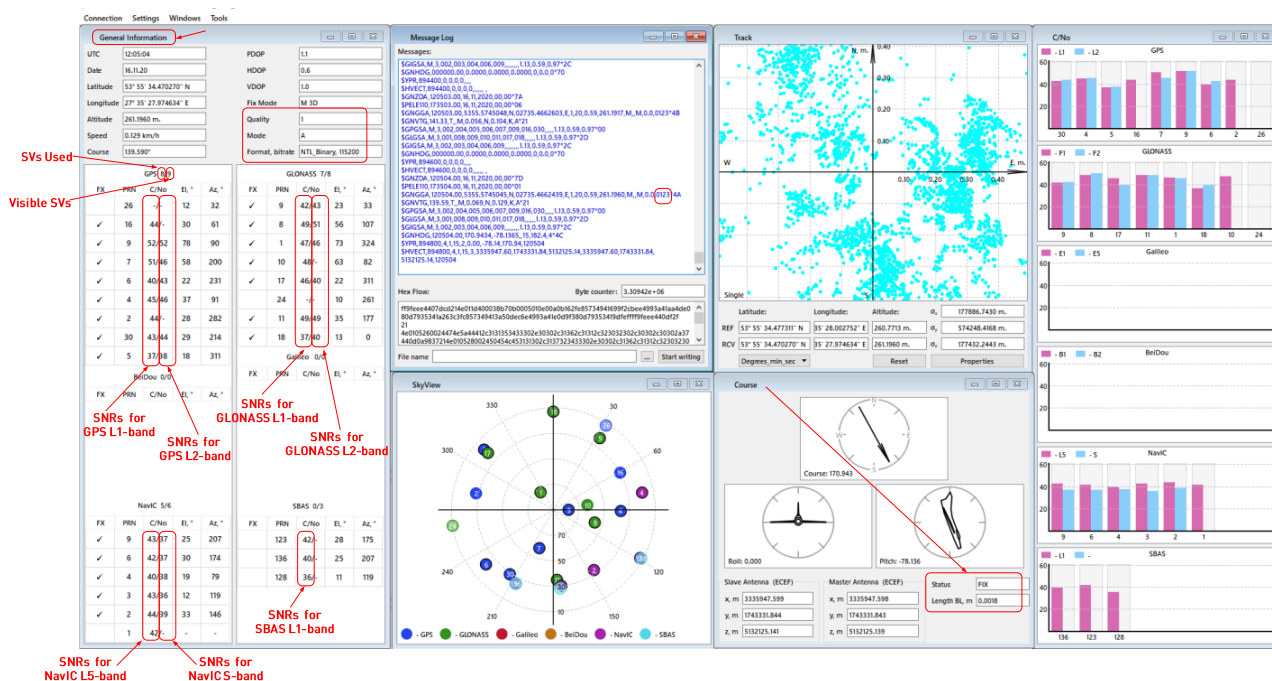
Windows display different navigational information and may be configured on demand (see example below).



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)

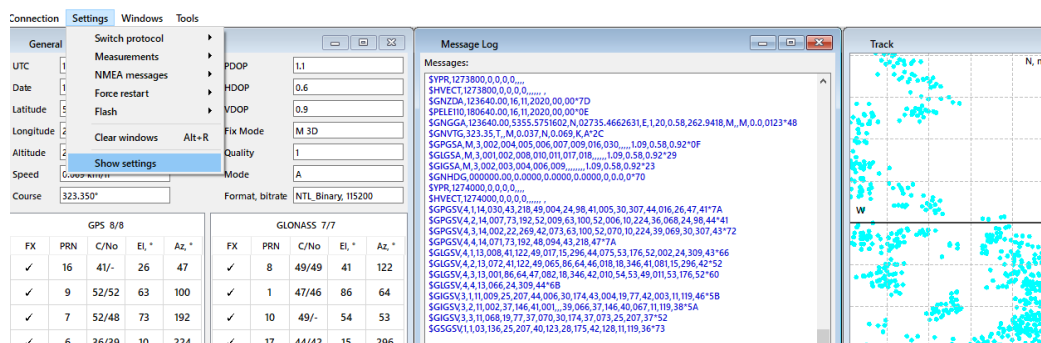
By default, master PPU channel operates in **Heading+SBAS+** mode (see Chapter 3, par. 2) and processes GPS L1, L2, GLONASS L1, L2, NavIC L5, S-band and SBAS L1 (EGNOS+GAGAN) signals. Navigation products and accompanying information is represented in **General Information** window as the table.



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

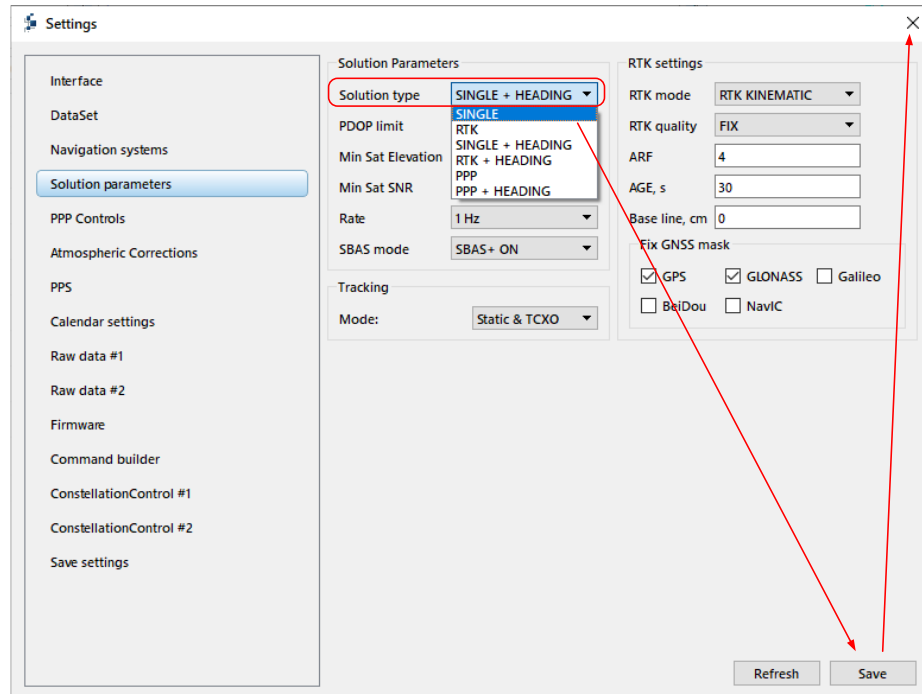
Heading determination mode can be switched on/off:

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.

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

Data Set

☐ TXT
☐ RPOS_ECEF
☐ POS_ACR_ECEF

☒ GGA
☐ RPOS_LLA
☐ POS_ACR_ENU

☒ GSA
☐ RVEL_ECEF
☐ VEL_ACR_ECEF

☒ GSV
☐ RVEL_ENU

☒ ZDA
☐ RSOL_FULL
☐ RSOL_ATR

☐ VTG
☐ RSOL_iFULL

☐ RMC
☐ BPOS_ECEF
☒ HVECT_DATA

☐ GST
☐ RTIME_RDATE
☒ YPR_DEG

☐ HDG
☐ GSV_FULL

☐ GNS
☐ GSV2_FULL

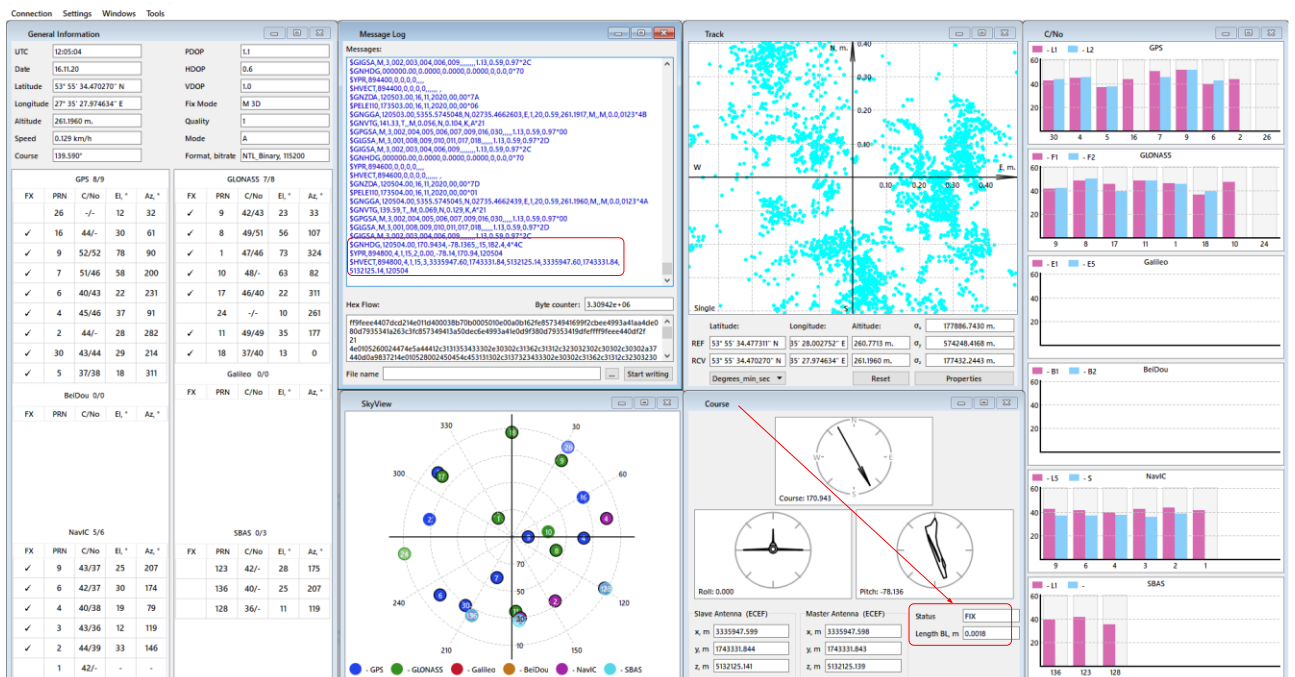
GSV period

5

Refresh

Save

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.

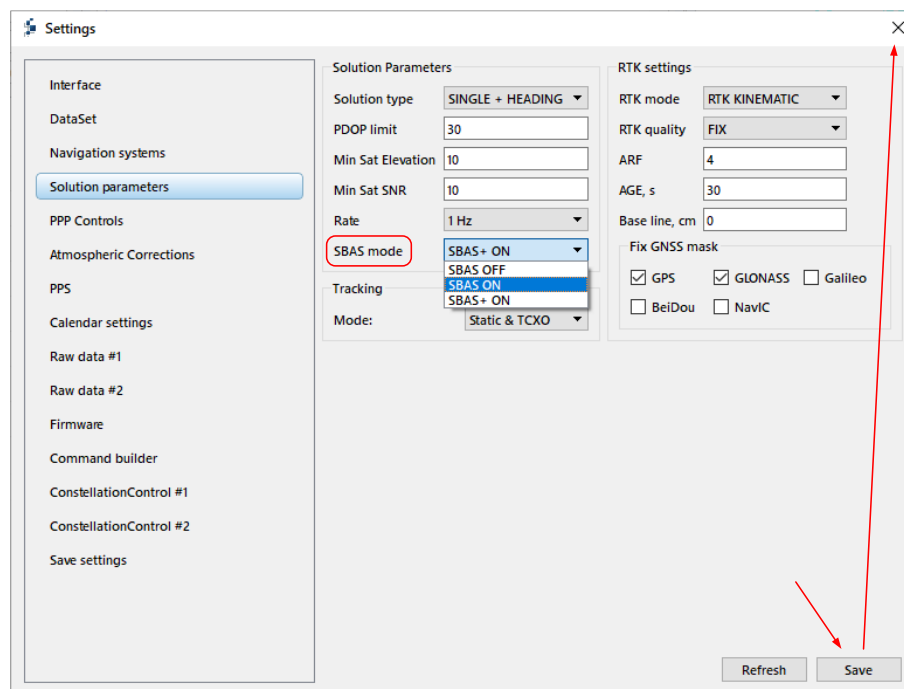
3 DGPS MODE

DGPS mode can be switched on:

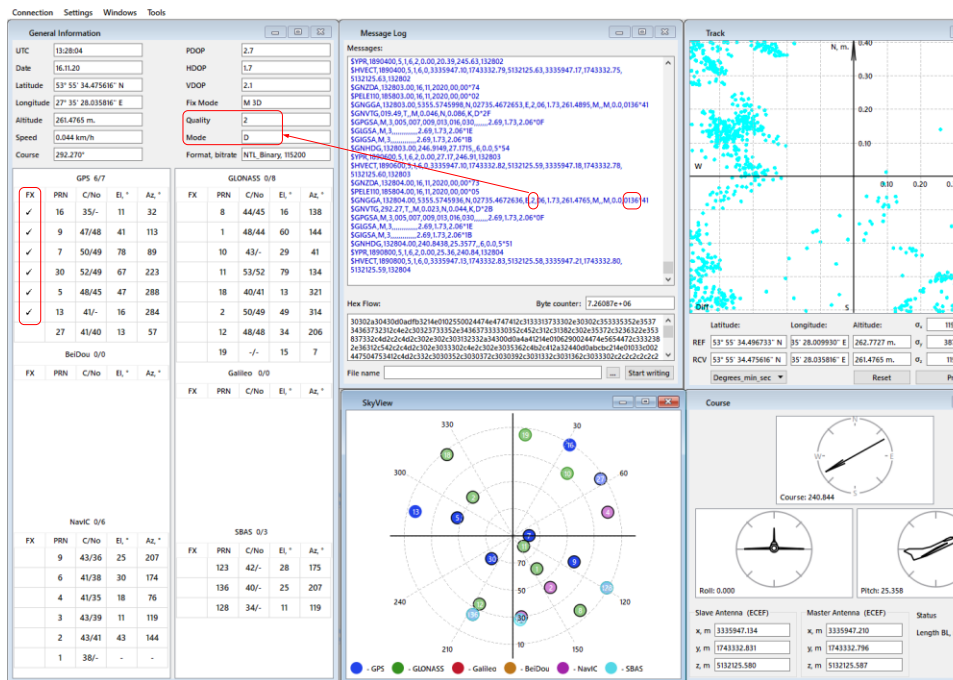
1. **SBAS ON** is DGPS mode where *only GPS+SBAS* satellites will be used for navigation solutions.

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.

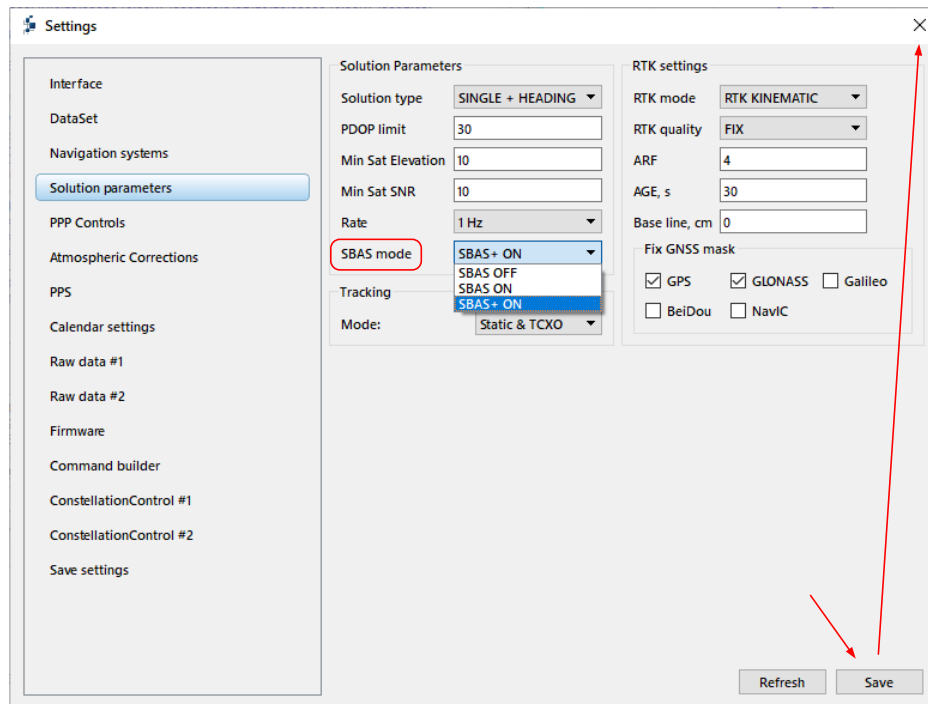


DGPS mode is indicated as '2' in the **General Information** window in **Quality** field and **Mode** field as 'D'. SBAS satellite number and mode are also indicated in the last field of GGA message (see the picture below).

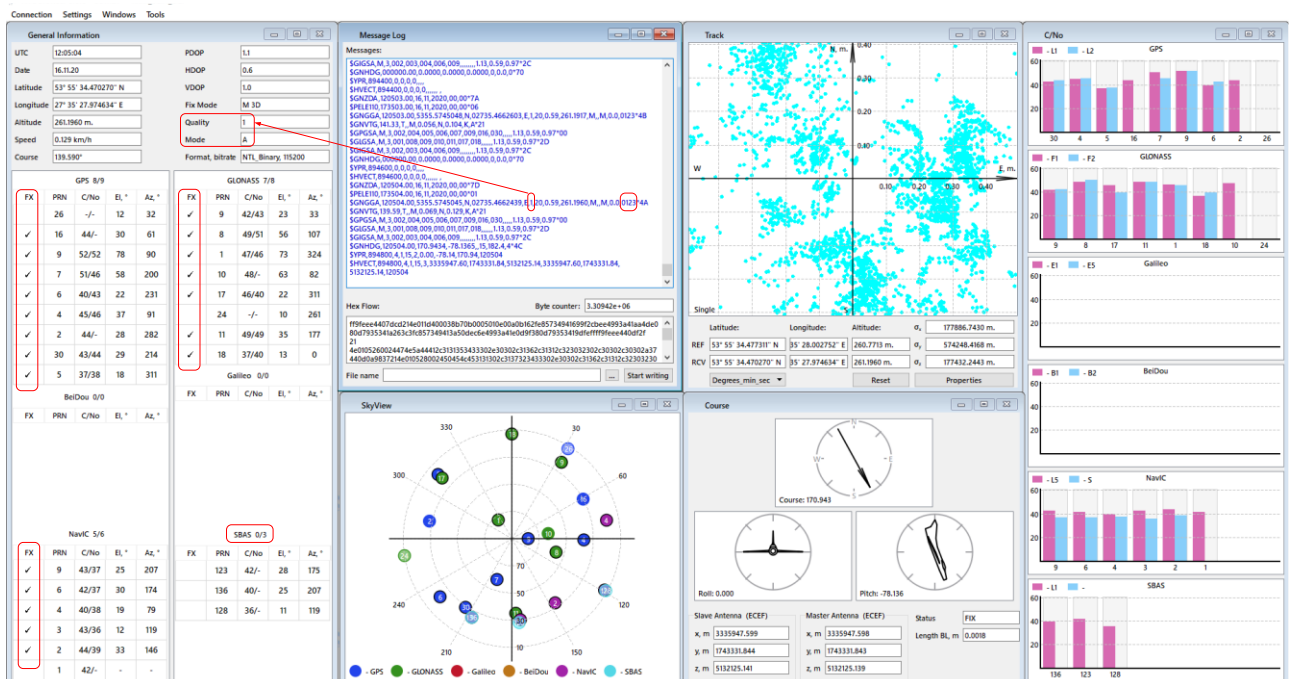


2. **SBAS+** is positioning mode where all available GNSS satellites will be used in navigation solutions. GPS satellites will get full set of SBAS corrections. Measurements based on the others GNSS systems will get only part of SBAS corrections (for ionospheric error correction). *Switch on **SBAS+** 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.

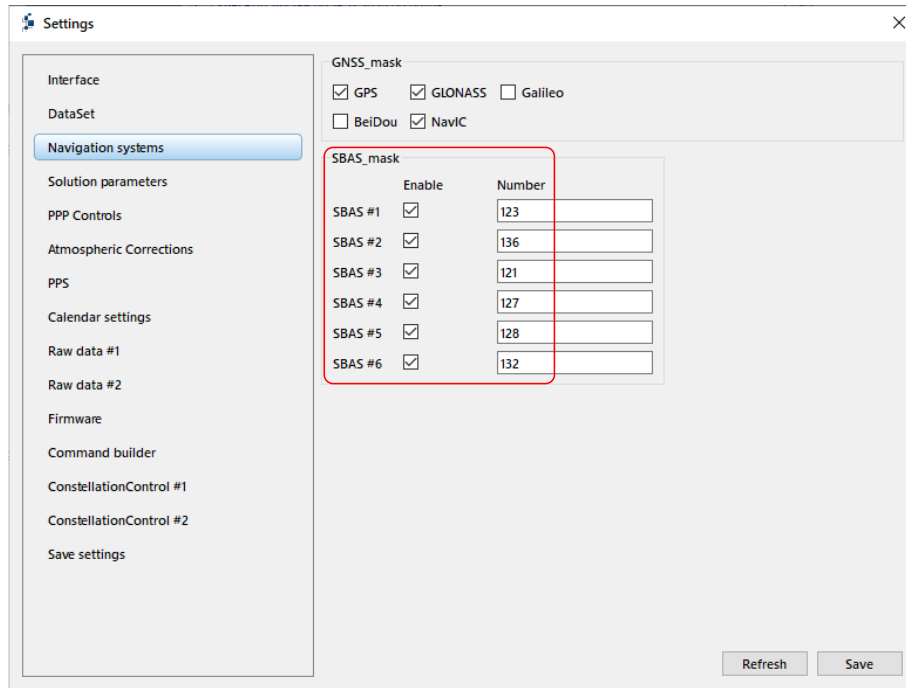


While we are in **SBAS+** mode SBAS satellite number is indicated in the last field of GGA message. GGA status field will remain '1' (displayed in the **General Information** window in the **Quality** field). See below.



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.

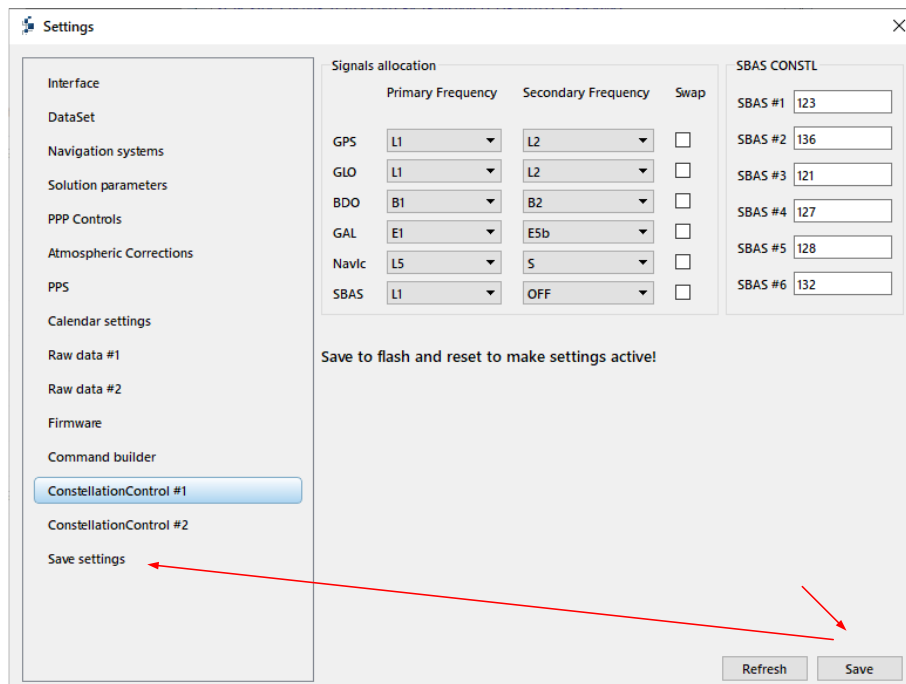


The screenshot shows the 'Settings' window with the 'Navigation systems' tab selected. The 'SBAS_mask' section is highlighted with a red box. It contains a table with columns 'Enable' and 'Number'.

	Enable	Number
SBAS #1	☒	123
SBAS #2	☒	136
SBAS #3	☒	121
SBAS #4	☒	127
SBAS #5	☒	128
SBAS #6	☒	132

Below the table are 'Refresh' and 'Save' buttons.

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



The screenshot shows the 'Settings' window with the 'ConstellationControl #1' tab selected. The 'SBAS CONSTL' section is highlighted with a red box. It contains a table with columns 'Primary Frequency', 'Secondary Frequency', and 'Swap'.

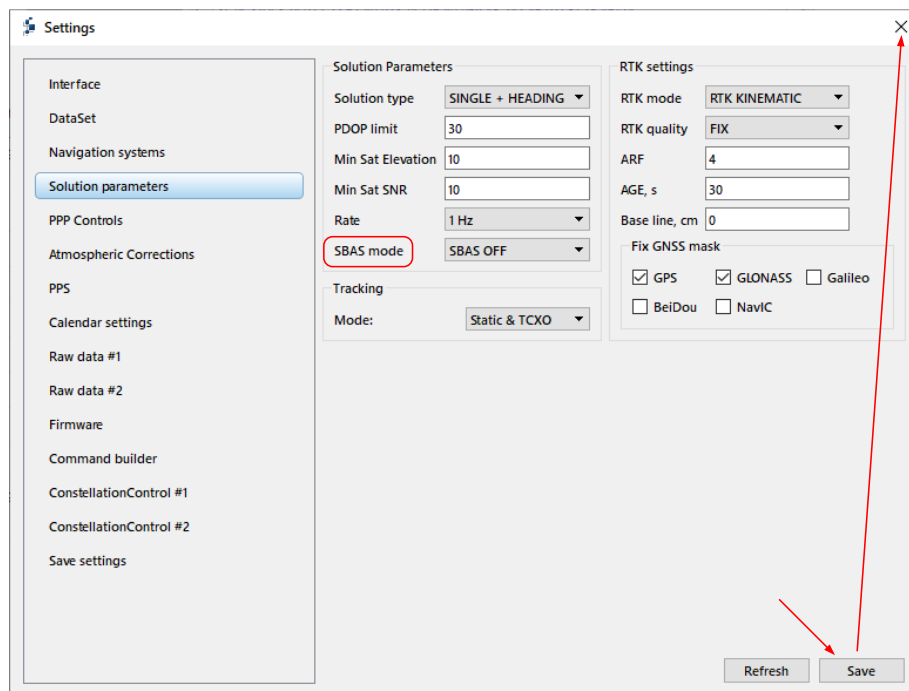
	Primary Frequency	Secondary Frequency	Swap
GPS	L1	L2	☐
GLO	L1	L2	☐
BDO	B1	B2	☐
GAL	E1	E5b	☐
Navic	L5	S	☐
SBAS	L1	OFF	☐

Below the table is a message: 'Save to flash and reset to make settings active!'. At the bottom right are 'Refresh' and 'Save' buttons. A red arrow points from the 'Save' button to the 'Save settings' option in the left sidebar.

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.



The screenshot shows the 'Settings' window with the 'Solution parameters' tab selected. In the 'Solution Parameters' section, 'SBAS mode' is set to 'SBAS OFF'. The 'RTK settings' section shows 'RTK mode' as 'RTK KINEMATIC' and 'RTK quality' as 'FIX'. The 'Fix GNSS mask' section has checkboxes for GPS, GLONASS, Galileo, BeiDou, and NavIC, with GPS and GLONASS checked. The 'Save' button is highlighted with a red arrow.

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

TROPO corrections

SBAS

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

Refresh

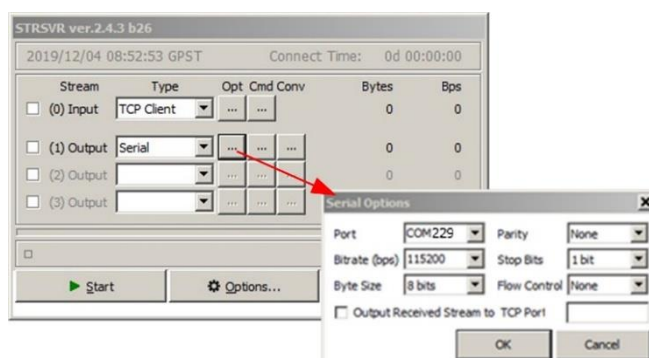
Save

4 DIFFERENTIAL POSITIONING MODE (RTK+HEADING)

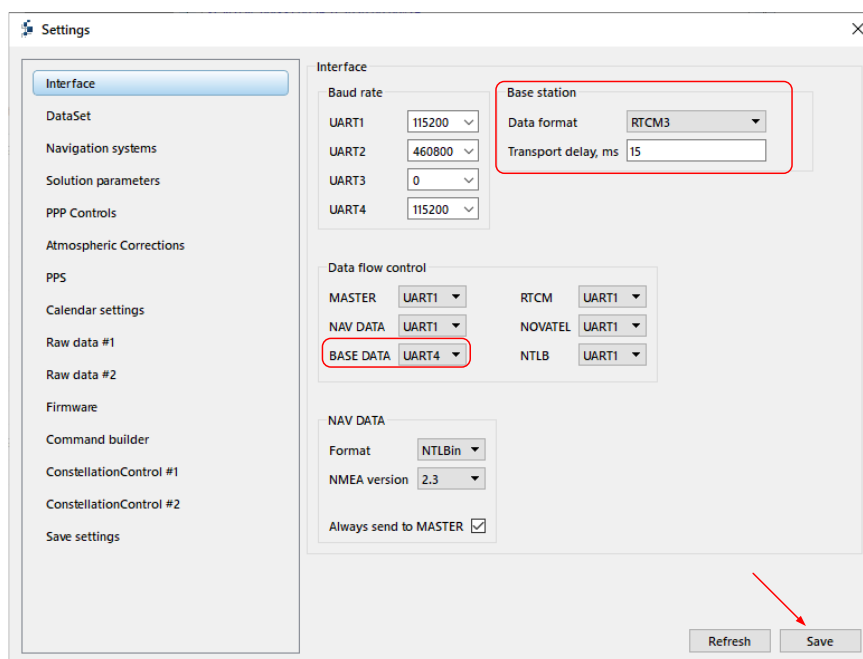
We should provide base station measurements data to make RTK positioning mode available. In this example we will receive base station data from local VRS network via Internet. STRTOSVR utility will be used to redirect data flow to COM229 (Interface1).

Differential positioning mode can be switched on:

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

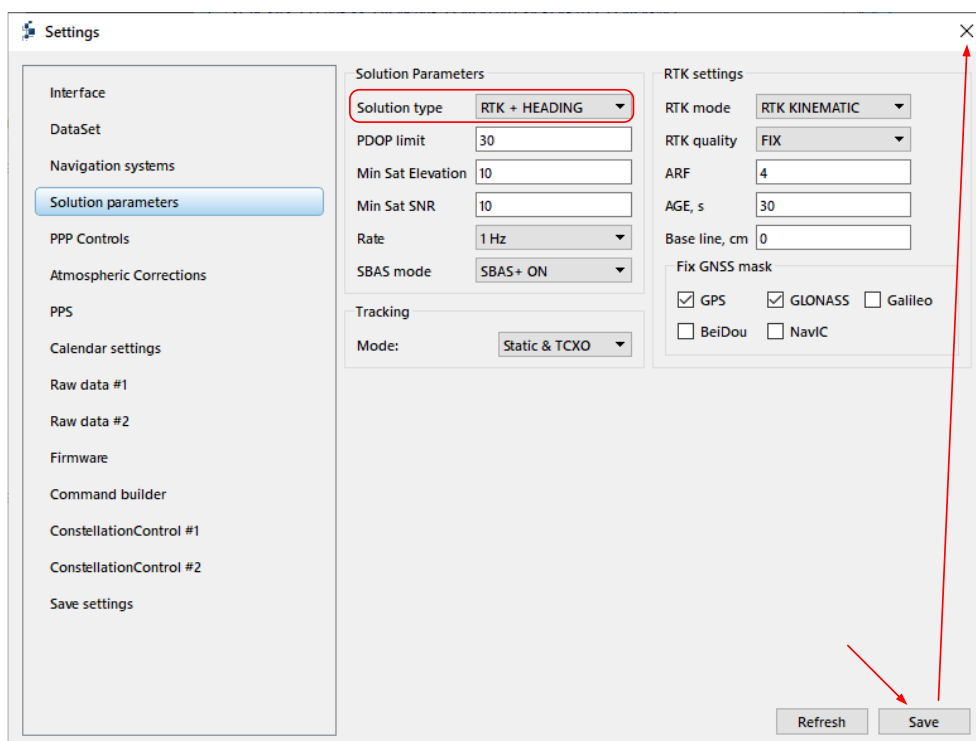


2. VRS network provides data in RTCM3 format. Novatel OEMv7 data format may be used as an alternative. Appropriate settings should be made in receiver:
 - Select the **Settings/Show settings/Interface** list box. Make sure UART4 is set up. Click on the **Save** button.



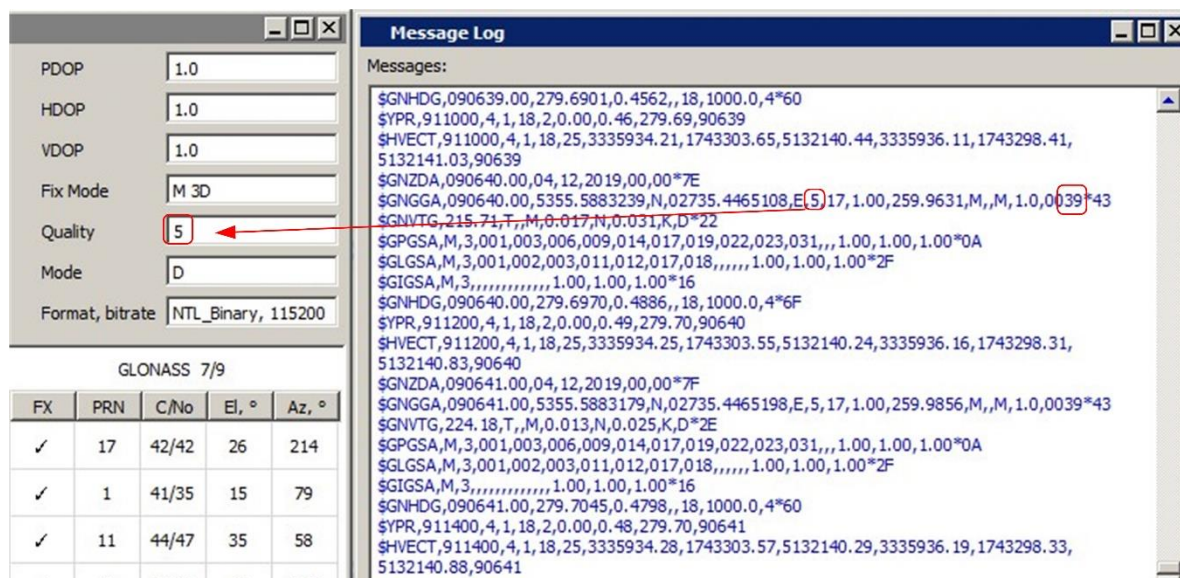
* Required tools can be available on NTLab company's FTP server. Link may be provided on request.

- 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.

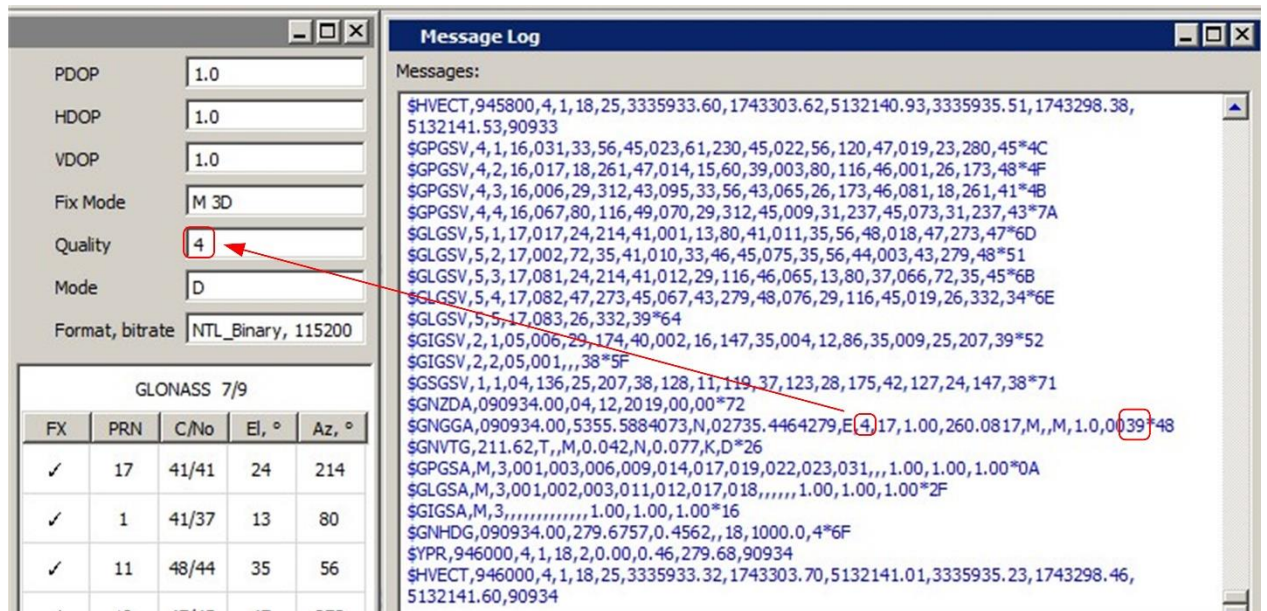


RTK settings sub-section contains some control parameters defining RTK positioning mode. Refer to «GNSS-PPU-SETUP-GUIDE-6-62-00.pdf» for details.

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.

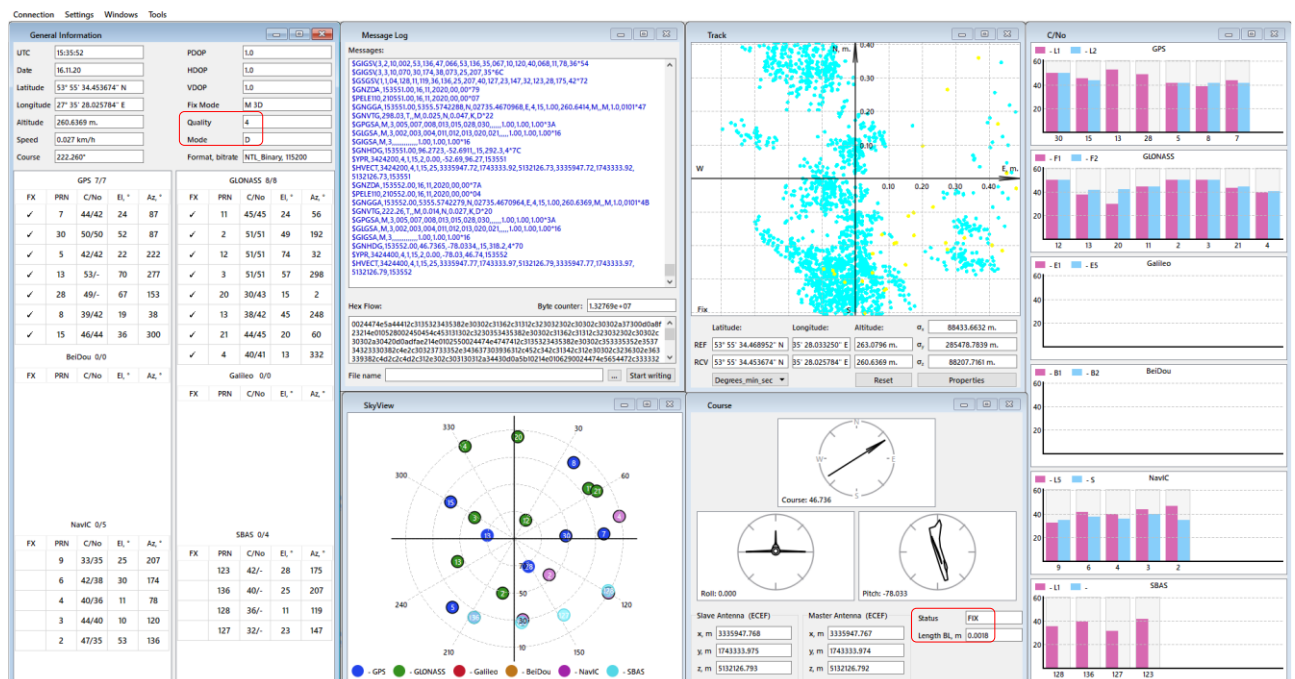


The screenshot shows the NTLab software interface. On the left, the 'Fix Mode' is set to 'M 3D' and 'Quality' is highlighted with a red box and the value '4'. Below this, a table for 'GLONASS 7/9' shows the following data:

FX	PRN	C/No	EL, °	Az, °
✓	17	41/41	24	214
✓	1	41/37	13	80
✓	11	48/44	35	56

The 'Message Log' on the right displays various messages, including GGA messages. A red arrow points from the 'Quality' field to the 'GGA' message in the log, which shows the following data:

```
$GGA,1,1,16,031,33,56,45,023,61,230,45,022,56,120,47,019,23,280,45*4C
$GPRSV,4,2,16,017,18,261,47,014,15,60,39,003,80,116,46,001,26,173,48*4F
$GPGSV,4,3,16,006,29,312,43,095,33,56,43,065,26,173,46,081,18,261,41*4B
$GPGSV,4,4,16,067,80,116,49,070,29,312,45,009,31,237,45,073,31,237,43*7A
$GPGSV,5,1,17,017,24,214,41,001,13,80,41,011,35,56,48,018,47,273,47*6D
$GPGSV,5,2,17,002,72,35,41,010,33,46,45,075,35,56,44,003,43,279,48*51
$GPGSV,5,3,17,081,24,214,41,012,29,116,46,065,13,80,37,066,72,35,45*68
$GPGSV,5,4,17,082,47,273,45,067,43,279,48,076,29,116,45,019,26,332,34*6E
$GPGSV,5,5,17,083,26,332,39*64
$GIGSV,2,1,05,006,29,174,40,002,16,147,35,004,12,86,35,009,25,207,39*52
$GIGSV,2,2,05,001,38*5F
$GSGSV,1,1,04,136,25,207,38,128,11,119,37,123,28,175,42,127,24,147,38*71
$GNZDA,090934.00,04,12,2019,00,00*72
$GNNGA,090934.00,5355.5884073,N,02735.4464279,E,4,17,1.00,260.0817,M,,M,1.0,0.0039*48
$GNVTG,211.62,T,M,0.042,N,0.077,K,D*26
$GPGSA,M,3,001,003,006,009,014,017,019,022,023,031,,,1.00,1.00,1.00*0A
$GPGSA,M,3,001,002,003,011,012,017,018,,,,,1.00,1.00,1.00*2F
$GIGSA,M,3,,,,,,1.00,1.00,1.00*16
$GNHDG,090934.00,279.6757,0.4562,,18,1000.0,4*6F
$YPR,946000,4,1,18,2,0.00,0.46,279.68,90934
$HVECT,946000,4,1,18,25,3335933.60,1743303.62,5132140.93,3335935.51,1743298.38,5132141.53,90933
$HVECT,946000,4,1,18,25,3335933.32,1743303.70,5132141.01,3335935.23,1743298.46,5132141.60,90934
```



The screenshot shows the NTLab software interface with multiple panels. The 'General Information' panel on the left displays the following data:

UTC	Date	Latitude	Longitude	Altitude	Speed	Course
15:35:52	16.11.20	53° 55' 34.453674" N	27° 35' 28.025784" E	260.6369 m	0.027 km/h	222.280°

The 'Message Log' panel shows various messages, including GGA messages. The 'Track' panel displays a map with a red line indicating the track. The 'C/No' panel shows bar charts for GPS, GLONASS, Galileo, and BeiDou. The 'SkyView' panel shows a circular plot of satellite positions. The 'Status' panel shows the current status of the receiver, including 'Fix' and 'Length BL, m'.

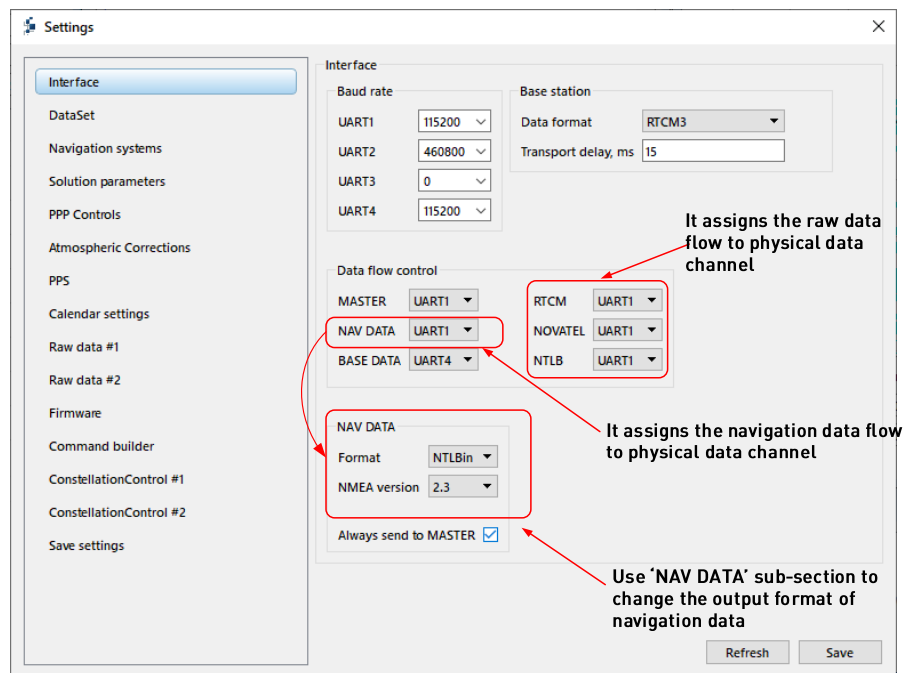
Another one NTL10X-series receiver may be used as a reference receiver instead of VRS network. Refer to Chapter 5 to setup receiver as a source of raw ranging data.

5 GENERATION OF RAW RANGING DATA

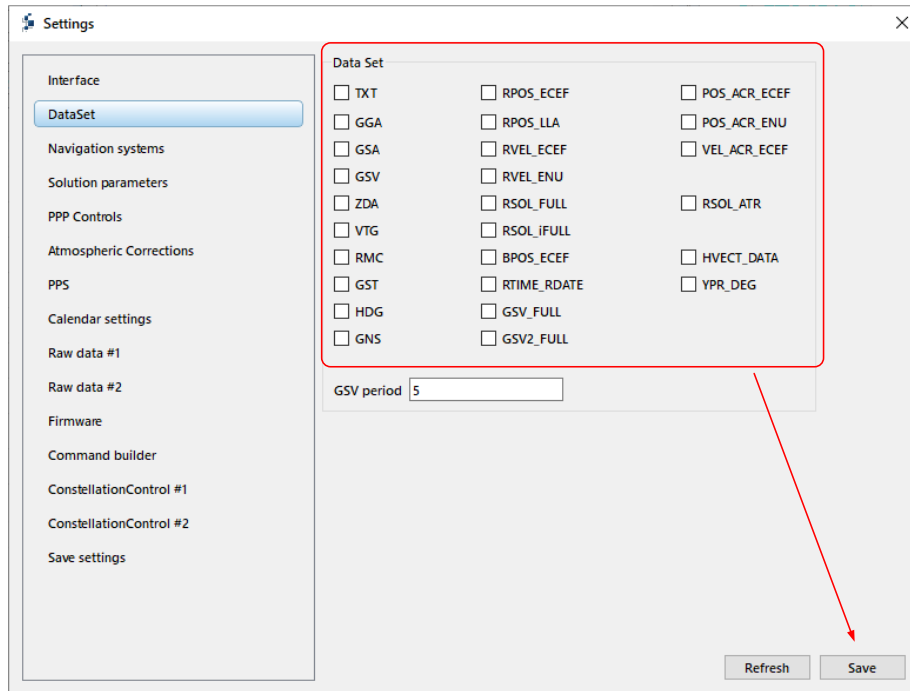
Navigation module can be used as a source of raw ranging data for further post processing or differential positioning.

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.



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

Data Set

☐ TXT ☐ RPOS_ECEF ☐ POS_ACR_ECEF

☐ GGA ☐ RPOS_LLA ☐ POS_ACR_ENU

☐ GSA ☐ RVEL_ECEF ☐ VEL_ACR_ECEF

☐ GSV ☐ RVEL_ENU

☐ ZDA ☐ RSOL_FULL ☐ RSOL_ATR

☐ VTG ☐ RSOL_iFULL

☐ RMC ☐ BPOS_ECEF ☐ HVECT_DATA

☐ GST ☐ RTIME_RDATE ☐ YPR_DEG

☐ HDG ☐ GSV_FULL

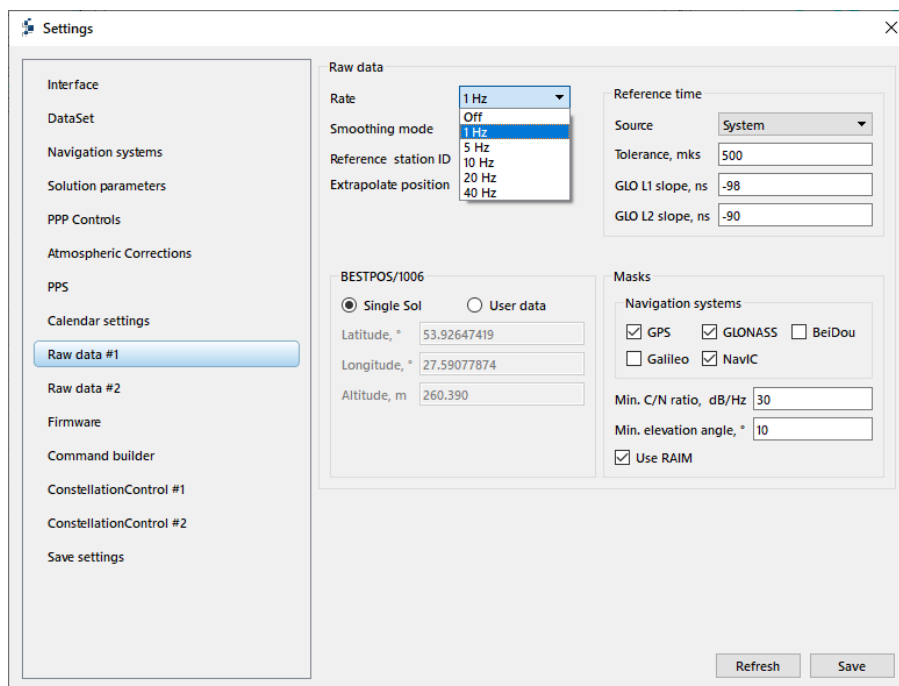
☐ GNS ☐ GSV2_FULL

GSV period 5

Refresh Save

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.



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

Raw data

Rate 1 Hz

Smoothing mode Off

Reference station ID 5 Hz

Extrapolate position 10 Hz

20 Hz

40 Hz

BESTPOS/1006

☒ Single Sol ☐ User data

Latitude, ° 53.92647419

Longitude, ° 27.59077874

Altitude, m 260.390

Reference time

Source System

Tolerance, mks 500

GLO L1 slope, ns -98

GLO L2 slope, ns -90

Masks

Navigation systems

☒ GPS ☒ GLONASS ☐ BeiDou

☐ Galileo ☒ NavIC

Min. C/N ratio, dB/Hz 30

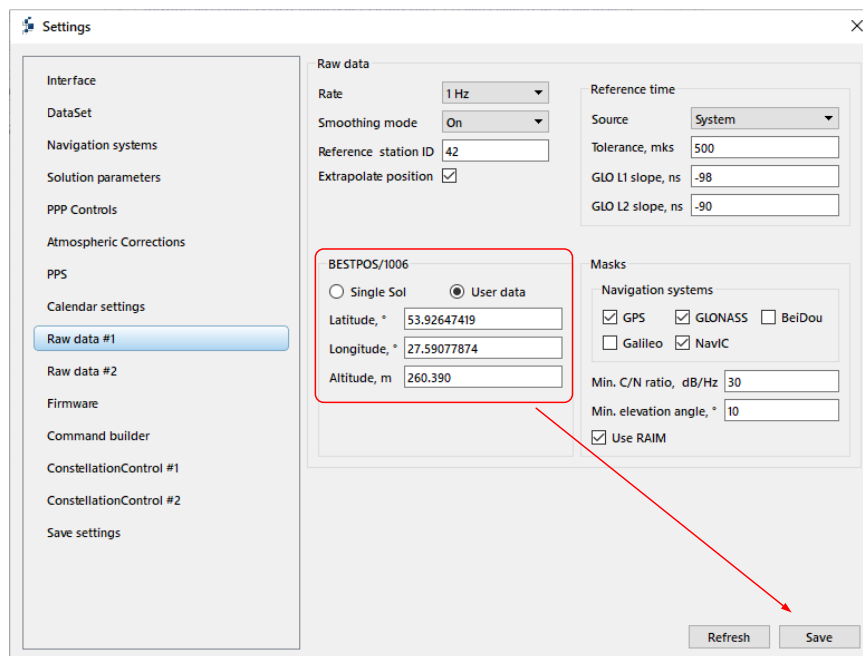
Min. elevation angle, ° 10

☒ Use RAIM

Refresh Save

- 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.



The screenshot shows the 'Settings' window with the 'Raw data #1' sub-section selected in the left sidebar. The 'Raw data' section contains the following settings:

- Rate: 1 Hz
- Smoothing mode: On
- Reference station ID: 42
- Extrapolate position: ☒

The 'BESTPOS/1006' sub-section is highlighted with a red box and contains the following settings:

- Single Sol: ☐ User data: ☒
- Latitude, °: 53.92647419
- Longitude, °: 27.59077874
- Altitude, m: 260.390

The 'Reference time' section contains the following settings:

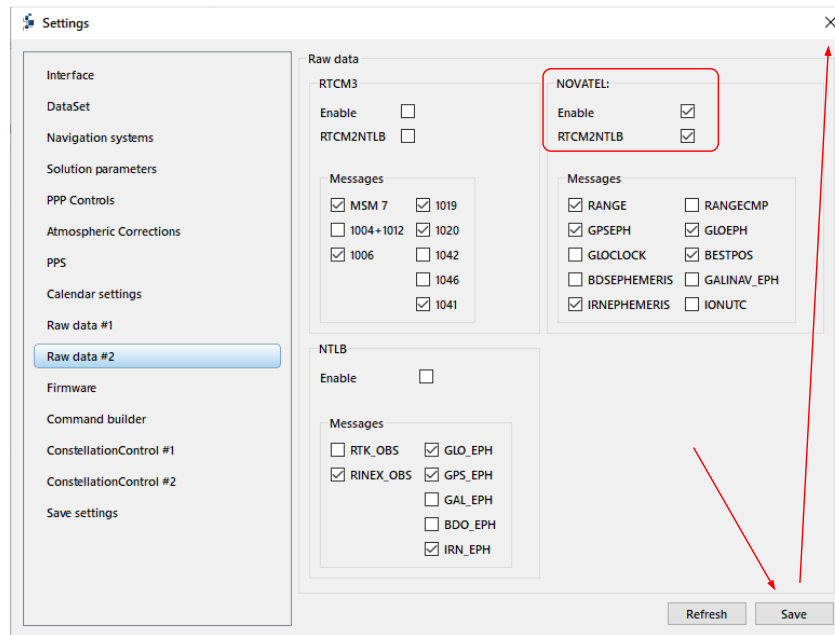
- Source: System
- Tolerance, mks: 500
- GLO L1 slope, ns: -98
- GLO L2 slope, ns: -90

The 'Masks' section contains the following settings:

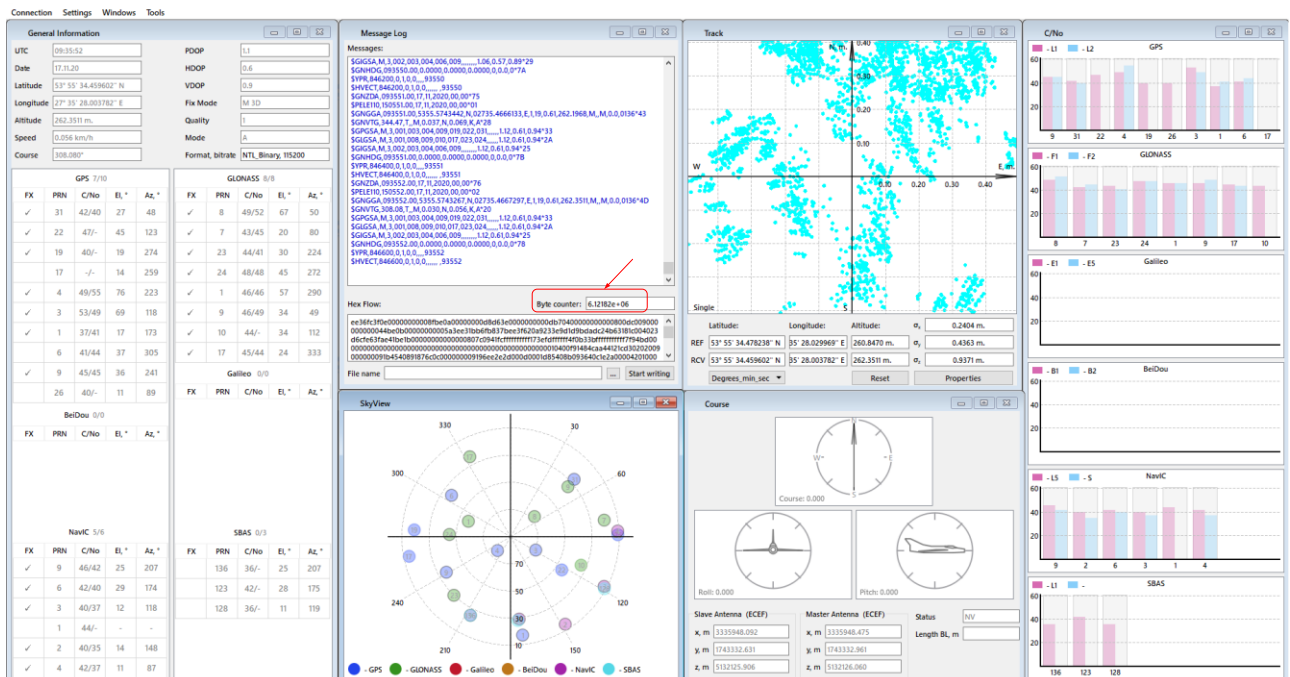
- Navigation systems: ☒ GPS, ☒ GLONASS, ☐ BeiDou, ☐ Galileo, ☒ NavIC
- Min. C/N ratio, dB/Hz: 30
- Min. elevation angle, °: 10
- Use RAIM: ☒

At the bottom right, there are 'Refresh' and 'Save' buttons. A red arrow points from the 'BESTPOS/1006' sub-section to the 'Save' button.

- 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

Connection	Settings	Windows	Tools
General Information		Raw_Data_Grabber	
UTC	09:35:52	PDOP	1.1
Date	17.11.20	HDOP	0.6
Latitude	53° 55' 34.459602" N	VDOP	0.9
Longitude	27° 35' 28.003782" E	Fix Mode	M 3D
Altitude	262.3511 m.	Quality	1
Speed	0.056 km/h	Mode	A
Course	308.080°	Format, bitrate	NTL_Binary, 115200
GPS, 7.140		GLONASS, 8.18	

Message Log

Messages:

```
$GIGSA,M,3,002,003,004,006,009,,,,,,,,,1.06,0.57,0.89*29
$GNHDG,093550.00,0.0000,0.0000,0.0000,0.0,0,0*7A
$YPR,846200,0,1,0,0,,,,,93550
$SHVCT,846200,0,1,0,0,,,,,93550
$GNZDA,093551.00,17,11,2020,00,00*75
$PEL110,150551.00,17,11,2020,00,00*01
$GNGGGA,093551.00,5355,5743442,N,02735,4666133,E,1
$GNVTG,344.47,T,M,0.037,N,0.069,K,A*28
$GPGSA,M,3,001,003,004,009,019,022,031,,,,,1.12,0.61,0
$GIGSA,M,3,001,008,009,010,017,023,024,,,,,1.12,0.61,0
$GIGSA,M,3,002,003,004,006,009,,,,,,,,,1.12,0.61,0.94*25
$GNHDG,093551.00,0.0000,0.0000,0.0000,0.0,0,0*7B
$YPR,846400,0,1,0,0,,,,,93551
$SHVCT,846400,0,1,0,0,,,,,93551
```

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

The screenshot displays the RTKLIB software interface. The 'General Information' tab is active, showing fields for UTC (09:35:52), Date (17.11.20), Latitude (53° 55' 34.459602" N), Longitude (27° 35' 28.003782" E), Altitude (262.3511 m), Speed (0.056 km/h), and Course (308.080°). Below these is a 'GPS 7/10' table listing satellite data. The 'Raw Data Grabber' dialog box is open, showing the 'Send raw data to:' section with 'TCP/IP port' selected. The 'Port number' is set to 5001. The 'TCP/IP clients:' field is empty. The 'Start writing' button is visible. The background shows the 'General Information' tab with various fields for UTC, Date, Latitude, Longitude, Altitude, Speed, and Course. The 'GPS 7/10' table is also visible, showing a list of satellites with their PRN, C/N0, El., Az., and other parameters.

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

1. Run the `rtnavi.exe*` utility.

* 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:

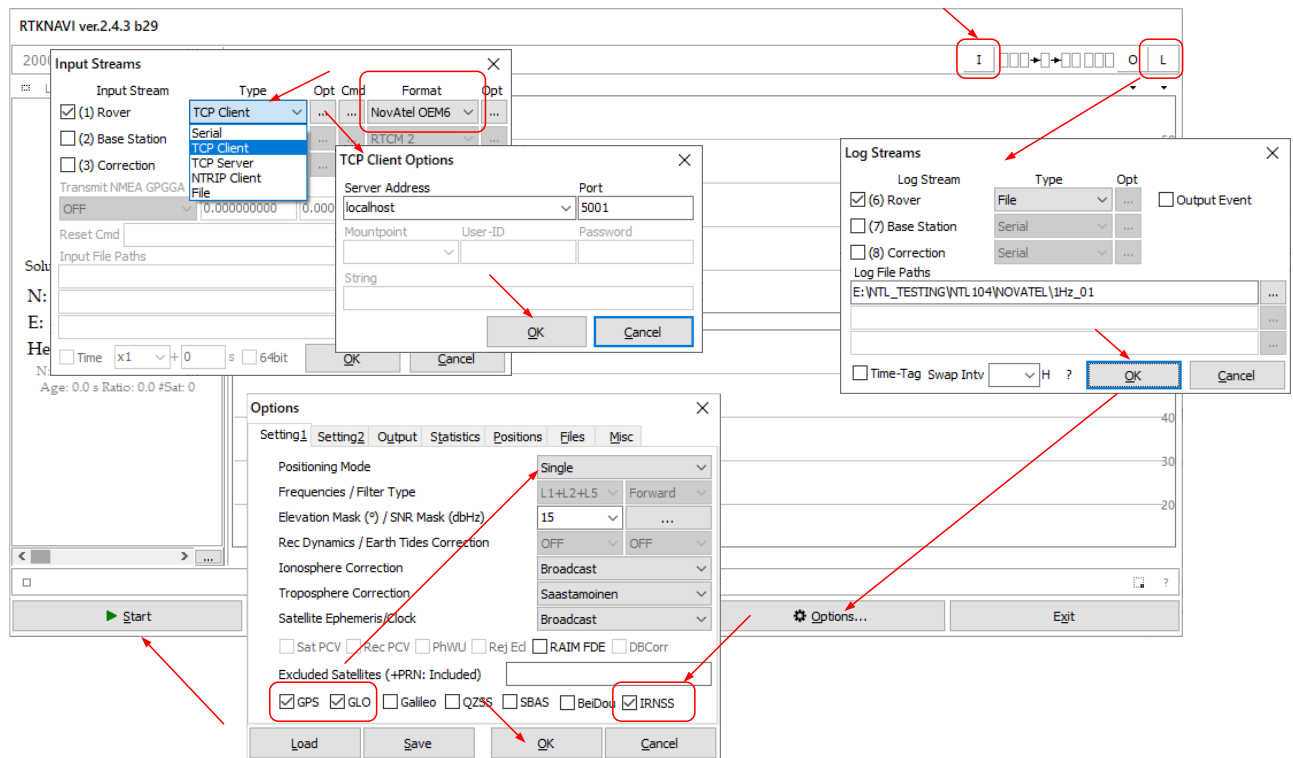
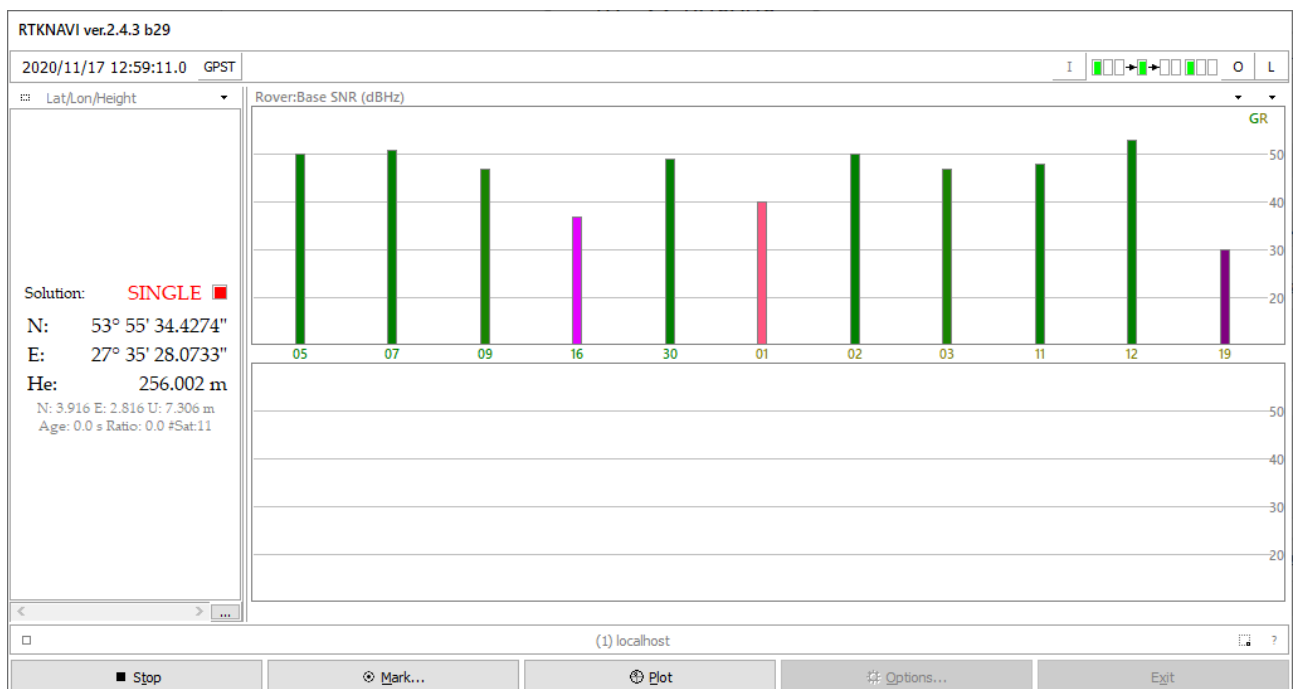
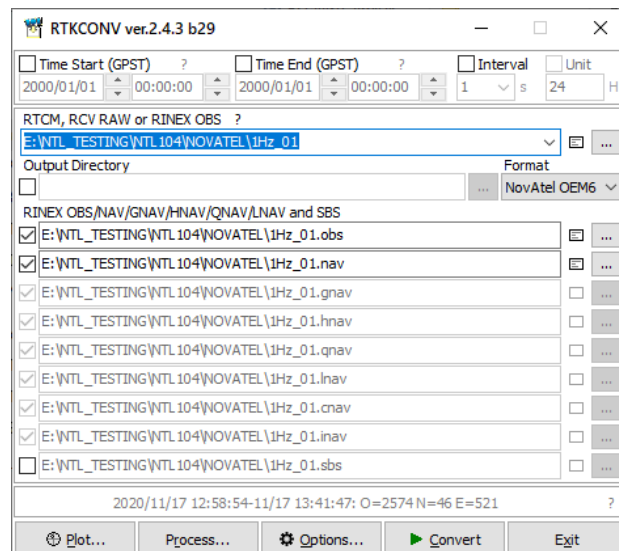


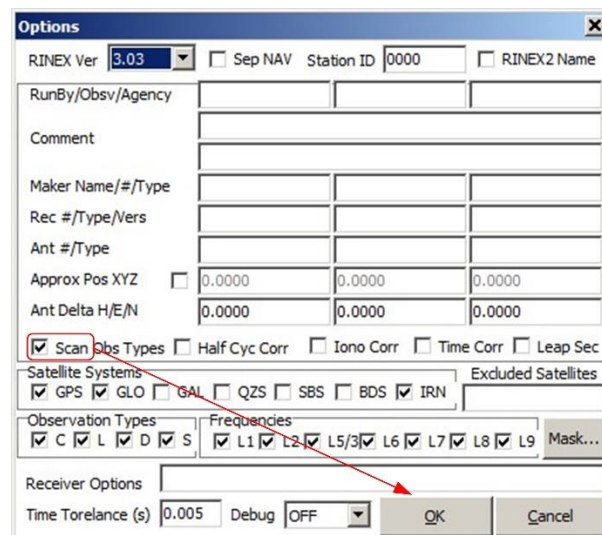
Figure below shows, the rtknavi.exe utility calculates the receiver position. So, raw ranging data is accepted and processed.



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 55.00000000 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 108998237.826 267.858 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 56.00000000 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 20564859.237 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 108997970.124 267.345 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

```

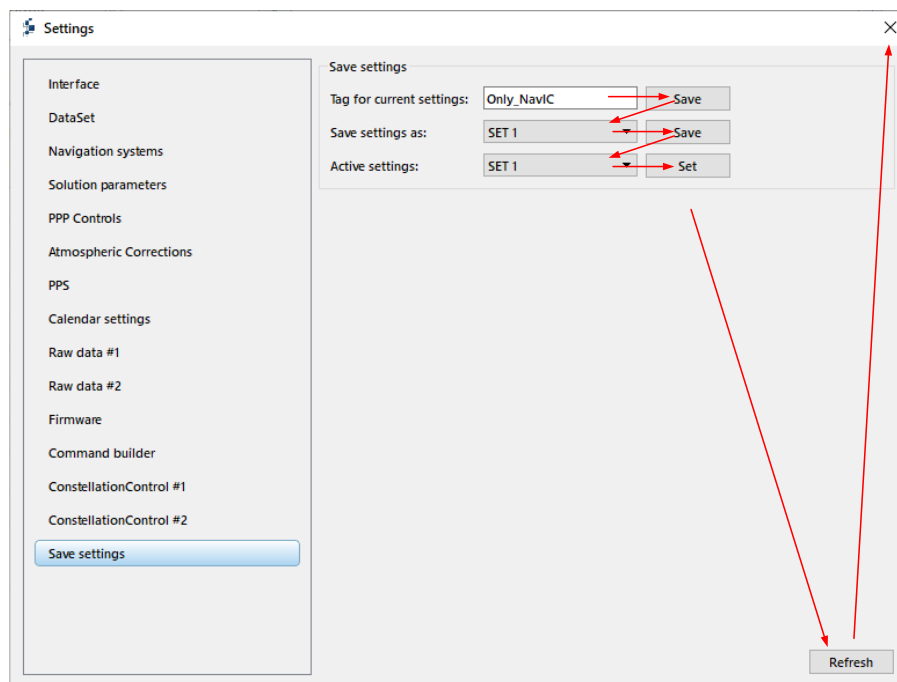
S-band measurements are not converted by RTKCONV. Some custom tools should be developed to get this data in RINEX format.

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

For complete contact information visit us at www.ntlab.lt

Head Office

4th floor, 41 Surganova str., 220013 Minsk, Republic of Belarus

Tel.: +375 17 290 09 99

Fax: +375 17 290 98 98

e-mail: ntlab@ntlab.com, sales@ntlab.com

EU Branch Office

NTLAB, UAB

Švenčionių g. 112, Nemenčinė, LT-15168 Vilniaus r., Lithuania

Tel.: +370 6 169 5418

e-mail: sales@ntlab.lt

