



NTL104

CONNECTION AND SETTING UP

Getting Started Guide

2020

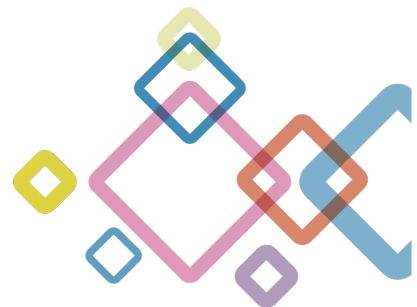


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1 CONNECTION TO PC

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

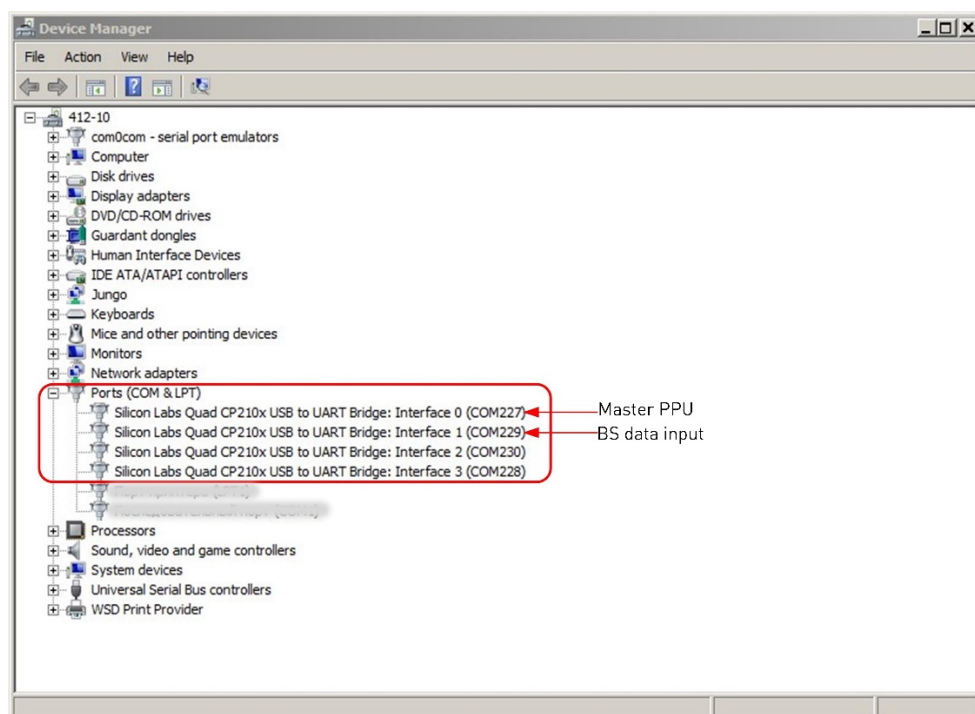
Follow to the next steps to connect NTL104:

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 X1 of the NTL Adp Board).

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

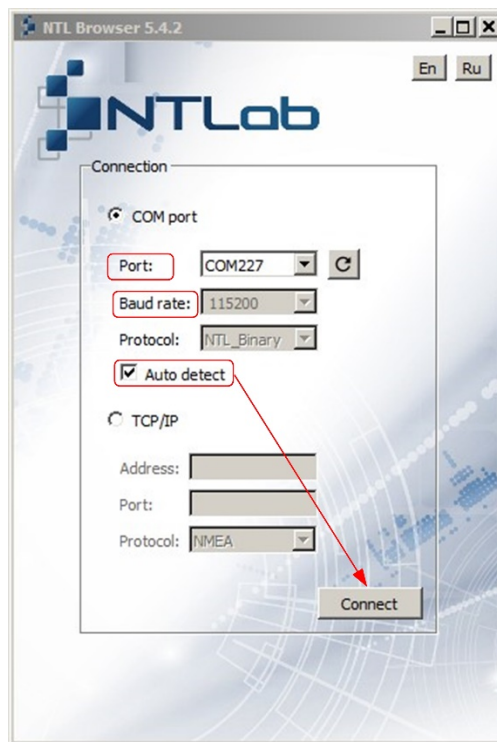
NTL104 UART outputs is available on PC via on-board 4xUART to USB converter (CP210x based) as virtual COM ports.

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

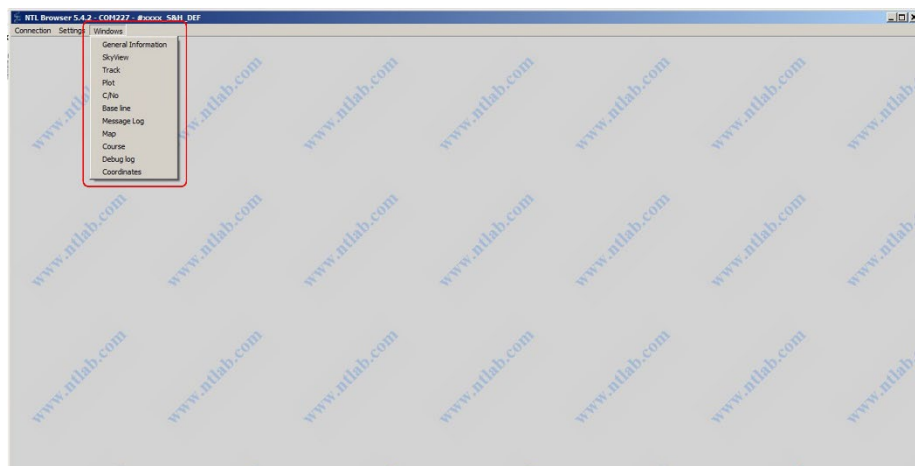


6. Run NTL Browser on computer. Then configure it:

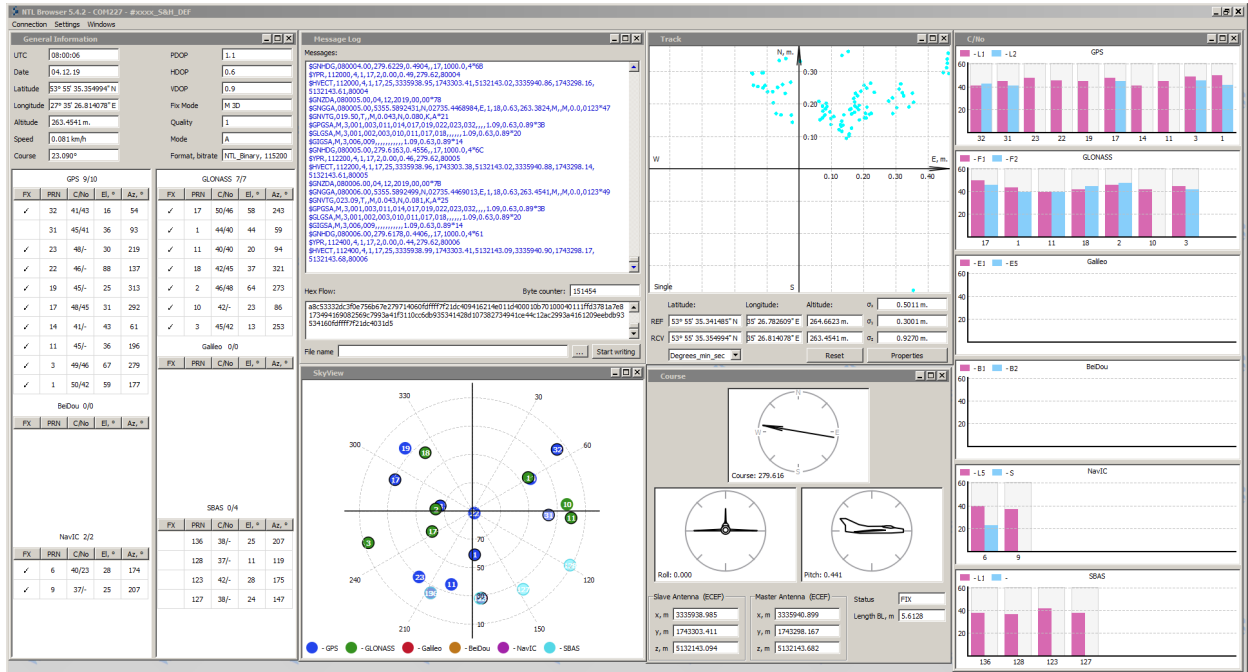
- Select interface language in the upper right corner of welcome page;
- Connect to the COM227 Port. Port number could be different for alternative PC;
- Set up 115200 Baud rate and NTL Binary Protocol type or Set up Auto detect checkbox to define them automatically
- Click on the **Connect** button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



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 *Single solution* mode and processes GPS, GLONASS and NavIC signals. While operating in NTL Binary mode, configuration settings are available in **Settings** menu.

Heading determination mode can be switched on:

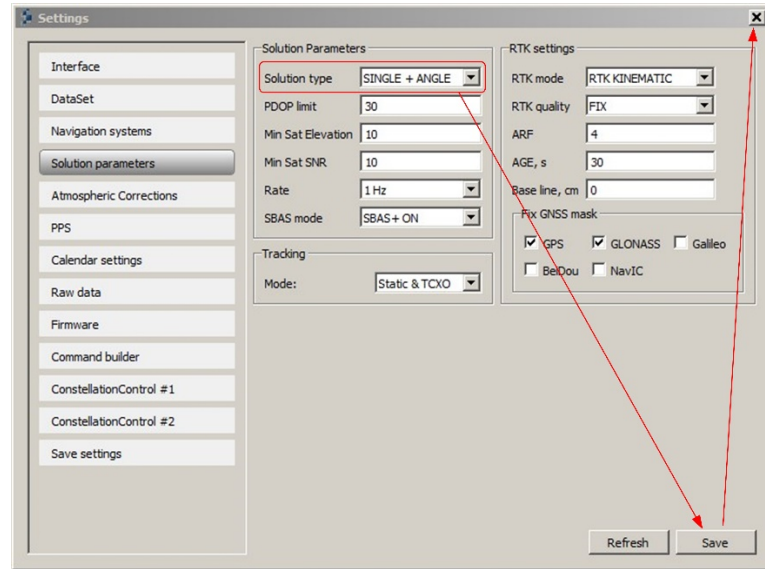
1. Select the **Settings/Show settings** section

The screenshot shows the NTL Browser 5.4.2 interface. The 'Settings' window is open, and the 'Solution parameters' section is selected. The 'RTK mode' is set to 'SINGLE + ANGLE', and 'RTK quality' is set to 'FIX'. Other visible settings include 'RTK KINEMATIC', 'ARF', 'AGE, s', 'Base line, cm', 'Fix GNSS mask', and 'Tracing' options for GPS, GLONASS, and Galileo. The background shows a track plot, a sky view, and various signal strength graphs for GPS, GLONASS, Galileo, Beidou, NavIC, and SBAS.

2. Then select the **Solution parameters** section

This screenshot is similar to the previous one but shows the 'Solution parameters' section expanded. The 'RTK mode' is 'SINGLE + ANGLE', 'RTK quality' is 'FIX', and 'RTK KINEMATIC' is also visible. The 'Solution parameters' section is highlighted, showing options for 'Solution type', 'PODOP limit', 'Min Sat Elevation', 'ARF', 'Min Sat SNR', 'Rate', 'SBAS mode', 'Calendar settings', 'Raw data', 'Firmware', 'Command builder', 'ConstellationControl #1', and 'ConstellationControl #2'. The background shows the same track plot, sky view, and signal strength graphs.

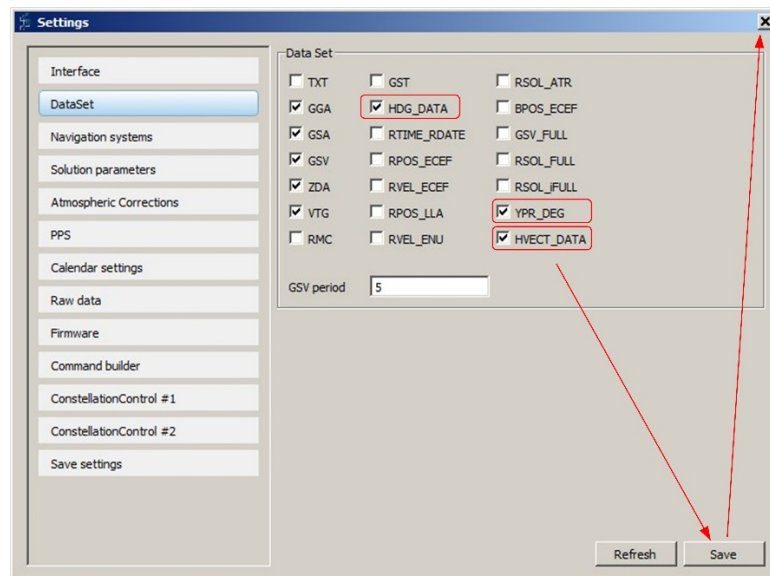
- In the **Solution Parameters** sub-section, select '**SINGLE+ANGLE**' as the **Solution type**;
- Click on the **Save** button. Exit the **Settings** section.



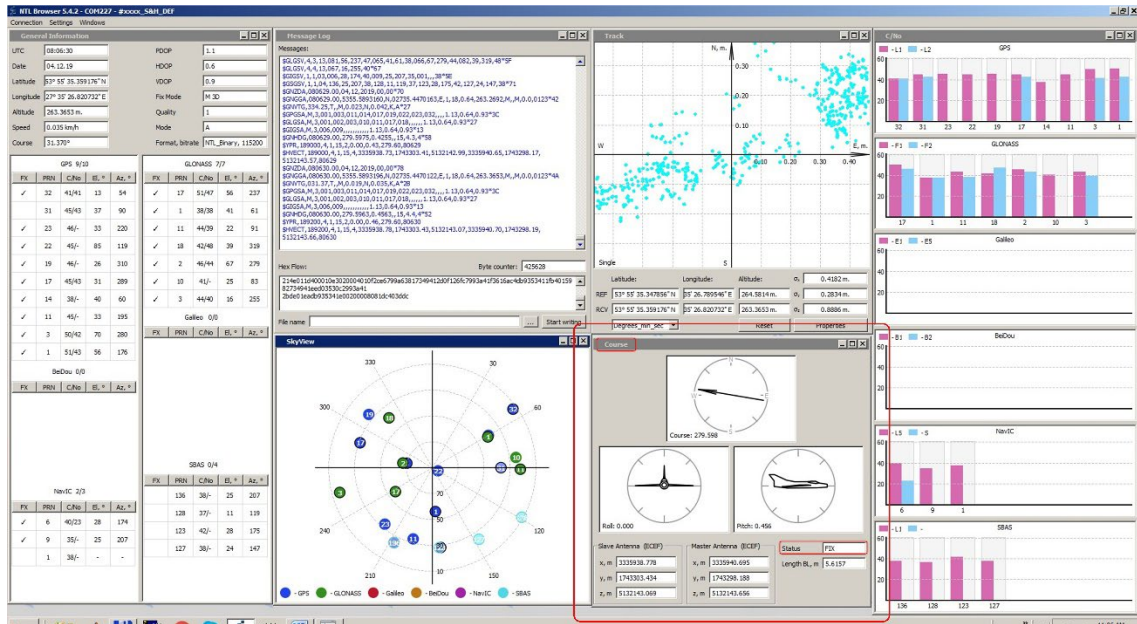
The information about 2D orientation (Heading) is displayed in the **Course** window, which represents information from HDG_DATA (it is available in NMEA mode to), YPR_DEG, HVECT_DATA messages.

3. Ensure that appropriate messages are switched on. To do this:

- Select the **Settings/Show settings/DataSet** section;
- Click on the **Save** button. Exit the **Settings** section.



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



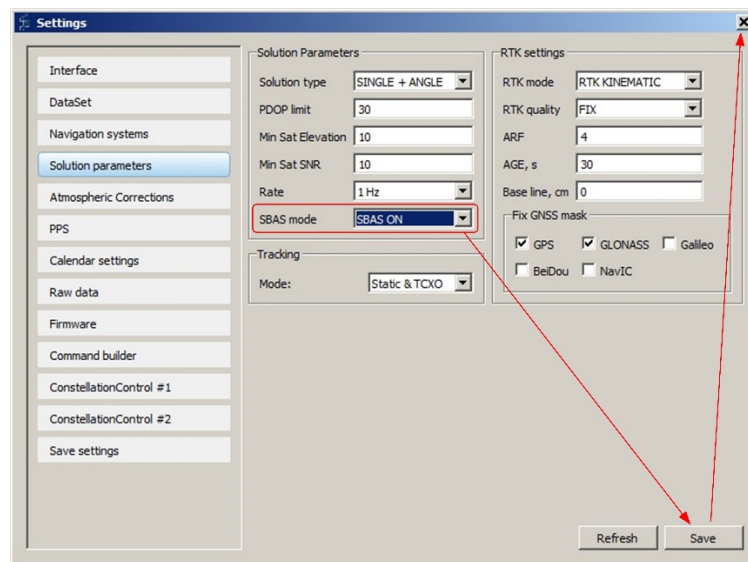
Positioning mode is standalone (Single). Orientation estimates are based on determination of mutual position of Master and Slave antennas (moving-base RTK mode).

3 DGPS MODE

DGPS mode can be switched on:

1. Switch on SBAS ON mode:

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



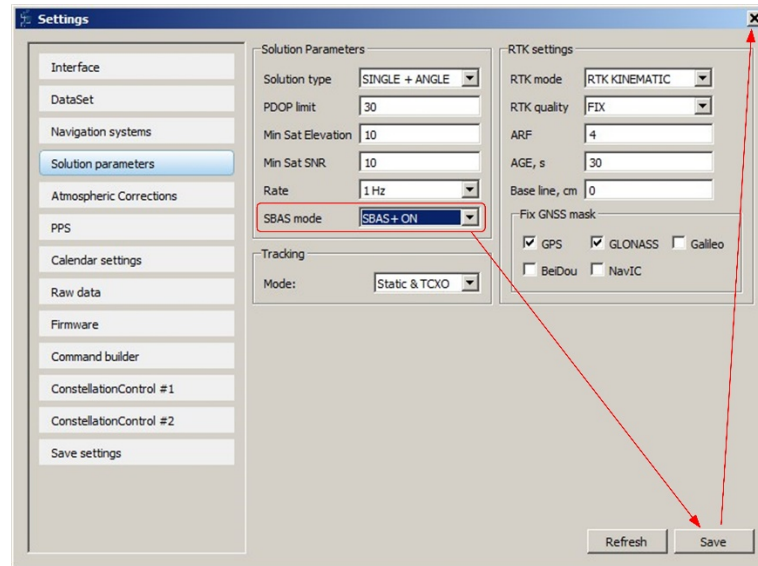
While we are in DGPS mode, only GPS+SBAS satellites will be used. DGPS mode indicated with '2' in the **General Information** window in the **Quality** sub-section (or status field of GGA message). See below.

The screenshot displays the RTI Browser S4.2 interface with several key windows:

- General Information:** Shows 'Quality' set to '2'.
- Messages Log:** Displays a GGA message: `$GPRMC,0.0,A,1.16,2.0,0.0,57.279,70.81222,E,0.0,0.0,0.0,1.16,25.333937,0.1,1740303.90,5.132140,34.333939,43.1743287,65,1.132140,96.81222`. The status field '2' is circled in red.
- SkyView:** A constellation diagram showing GPS satellites in green and SBAS satellites in blue.
- Track:** A 2D plot showing the relative positions of satellites.
- C/NO:** Signal-to-noise ratio for GPS, GLONASS, Galileo, and SBAS.
- Status:** Shows 'Slave Antenna (BCRF)', 'Master Antenna (BCRF)', and 'Status: FIX'.

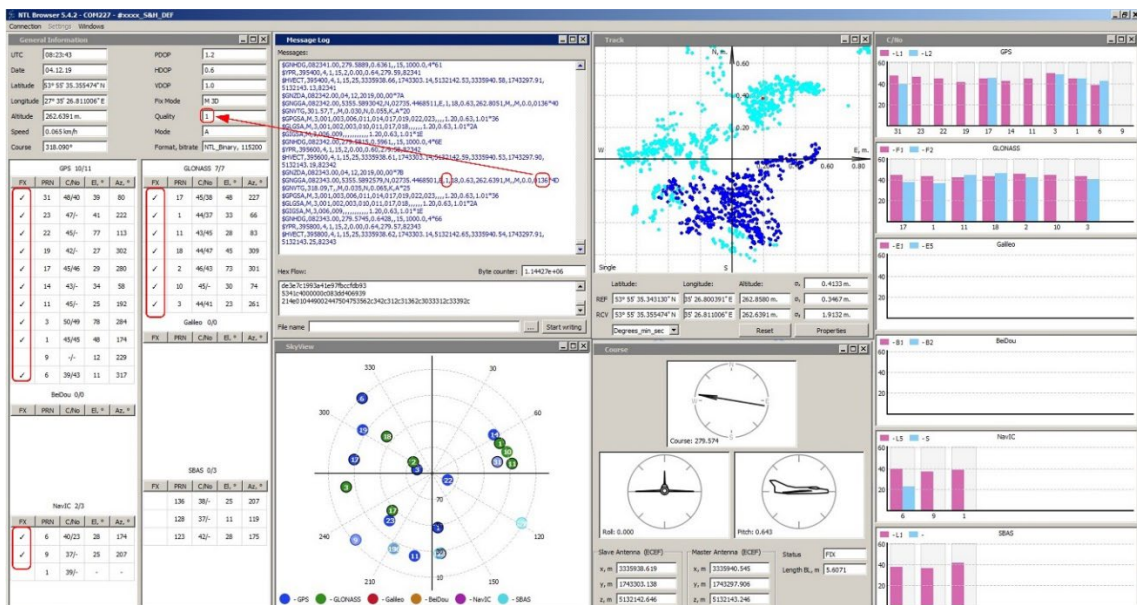
2. Switch on SBAS+ mode:

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



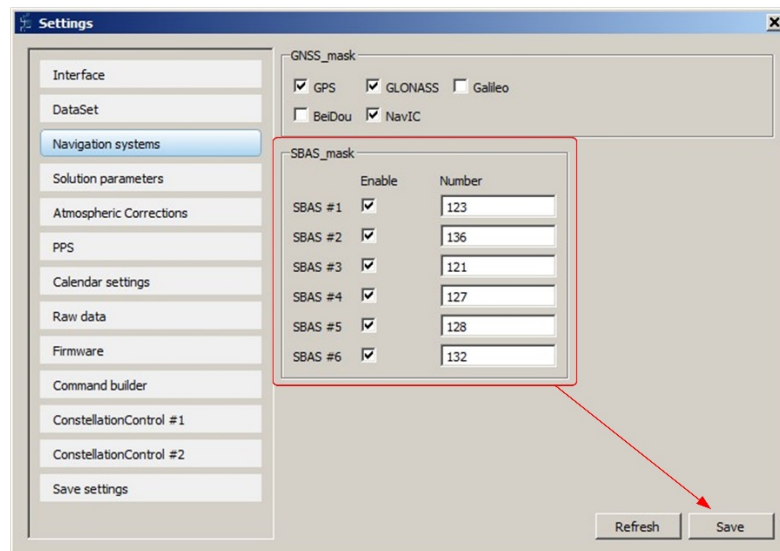
In this mode all available GNSS satellites will be included in navigation solution. GPS satellites will get full set of SBAS corrections. Measurements based on other GNSS systems will get only consistent part of SBAS corrections.

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** sub-section). See below.

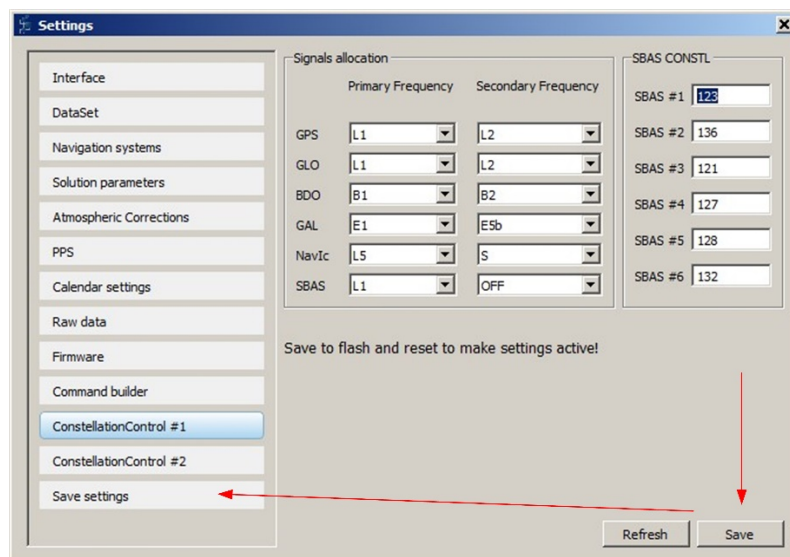


Internal logic of NTL104 selects the best SBAS satellite to be used in navigation solution. Up to 6 SBAS satellites may be tracked simultaneously.

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



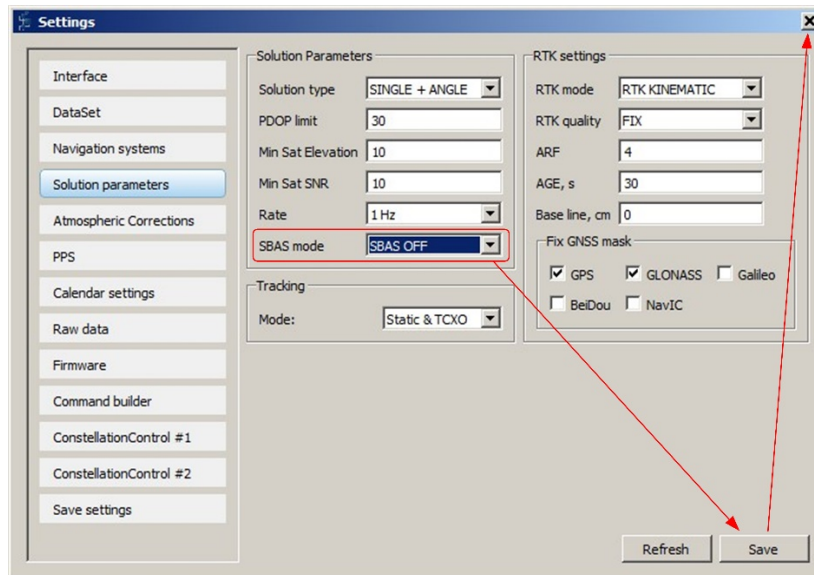
- Select the **ConstellationControl#1** section to change SBAS subsystems to be used



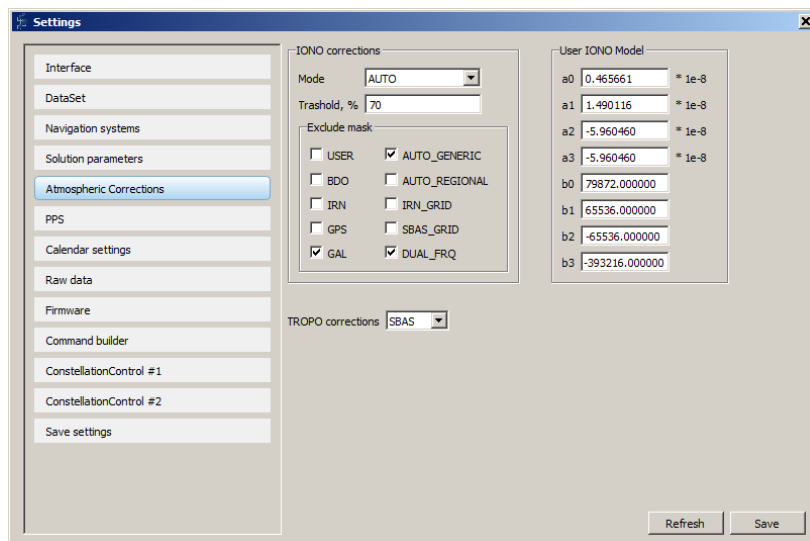
SBAS satellite numbers 120 ..158 may be programmed on this page. Settings would have become active only after they are saved into FLASH memory and receiver reloaded.

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

- Select the **Solution Parameters** section. 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.

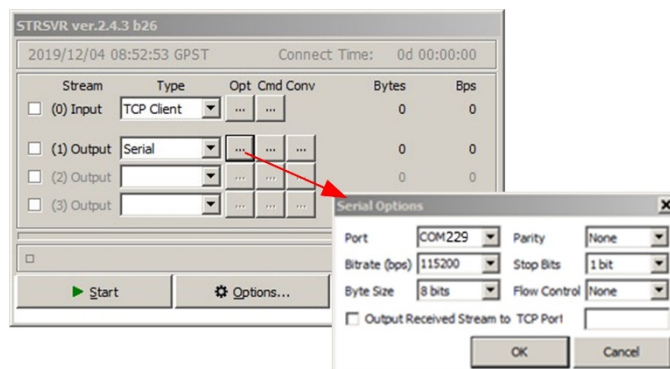


4 DIFFERENTIAL POSITIONING MODE (RTK+HEADING)

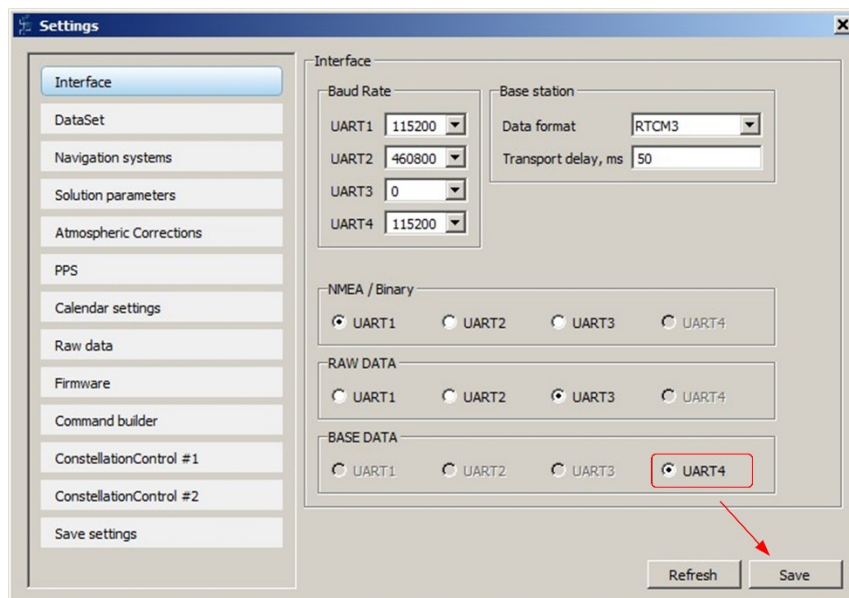
We should provide base station measurements data to make RTK positioning mode available. In this example we will receive base station data from local VRS network via Internet. STRTOSVR utility will be used to redirect data flow to COM229 (Interface1).

Differential positioning mode can be switched on:

1. Run `strsvr.exe`¹ utility from RTK LIB package

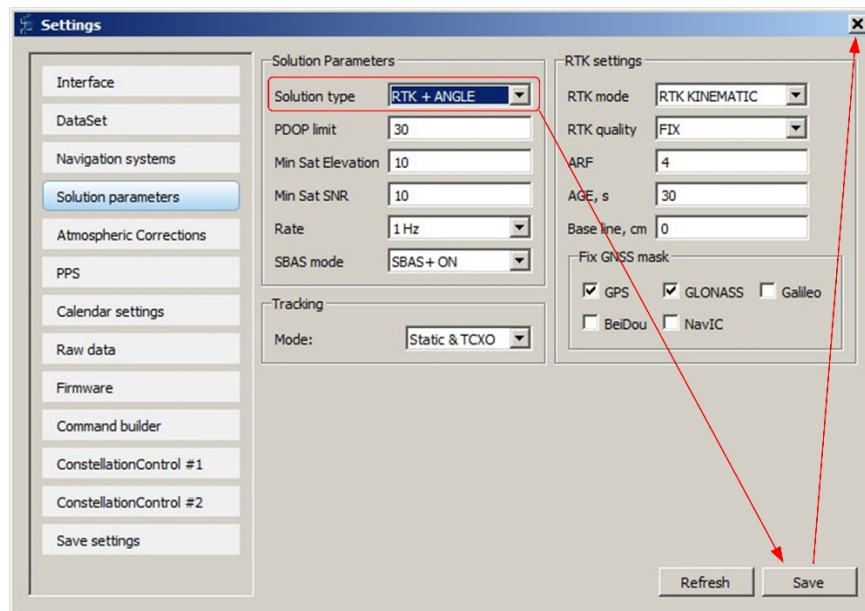


2. VRS network provides data in RTCM3 format. Novatel OEMv7 data format may be used as an alternative. Appropriate settings should be made in receiver:
 - Select the **Settings/Show settings/Interface** section. Make sure UART4 is set up



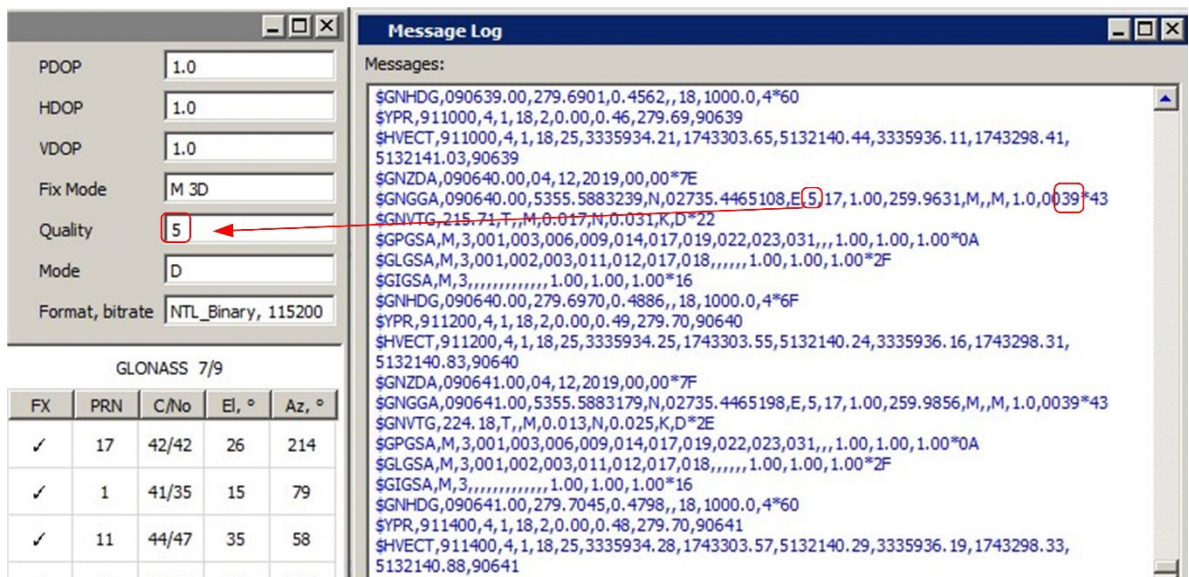
¹ Required tools are available on NTLab FTP server. Link (password and login) may be provided on request.

- Click on the **Save** button.
- Select the **DataSet** section. Make sure, the necessary messages are selected.
- Select the **Settings/Show settings/Solution parameters** section. In the **Solution type** sub-section, select 'RTK+ANGLE';
- Click on the **Save** button. Exit the **Settings** section.

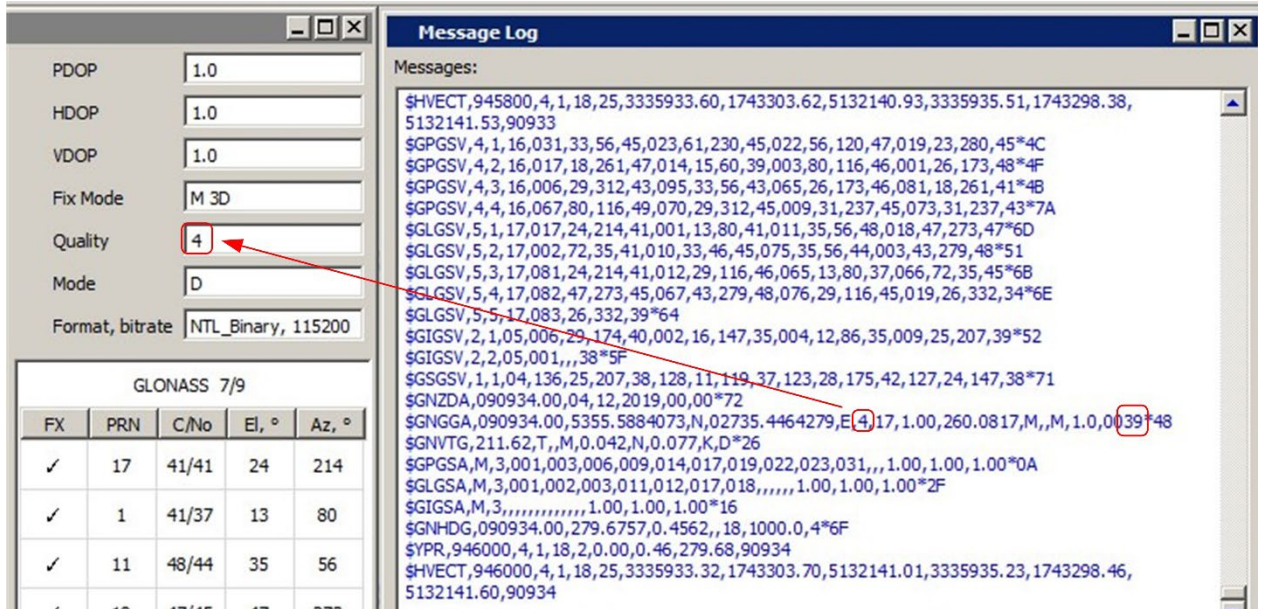


RTK settings sub-section contains some control parameters defining RTK positioning mode. Refer to «GNSS-PPU-SETUP-GUIDE-6-62-00.pdf» for details.

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 a software interface with a control panel on the left and a 'Message Log' window on the right. The control panel includes fields for PDOP, HDOP, VDOP, Fix Mode (M 3D), Quality (4), Mode (D), and Format, bitrate (NTL_Binary, 115200). Below these is a table for GLONASS satellites. The Message Log displays a list of NMEA messages, with a GGA message highlighted. A red box highlights the '4' in the Quality field of the control panel, and a red arrow points from this box to the '4' in the GGA message of the log. Another red box highlights the '39' in the GGA message.

GLONASS 7/9				
FX	PRN	C/No	EI, °	Az, °
✓	17	41/41	24	214
✓	1	41/37	13	80
✓	11	48/44	35	56

```

Message Log
Messages:
$HVECT,945800,4,1,18,25,3335933.60,1743303.62,5132140.93,3335935.51,1743298.38,
5132141.53,90933
$GPGSV,4,1,16,031,33,56,45,023,61,230,45,022,56,120,47,019,23,280,45*4C
$GPGSV,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
$GLGSV,5,1,17,017,24,214,41,001,13,80,41,011,35,56,48,018,47,273,47*6D
$GLGSV,5,2,17,002,72,35,41,010,33,46,45,075,35,56,44,003,43,279,48*51
$GLGSV,5,3,17,081,24,214,41,012,29,116,46,065,13,80,37,066,72,35,45*68
$GLGSV,5,4,17,082,47,273,45,067,43,279,48,076,29,116,45,019,26,332,34*6E
$GLGSV,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
$GNGGA,090934.00,5355.5884073,N,02735.4464279,E,4,17,1.00,260.0817,M,,M,1.0,0,0,39*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
$GGLSA,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,946000,4,1,18,25,3335933.32,1743303.70,5132141.01,3335935.23,1743298.46,
5132141.60,90934
    
```

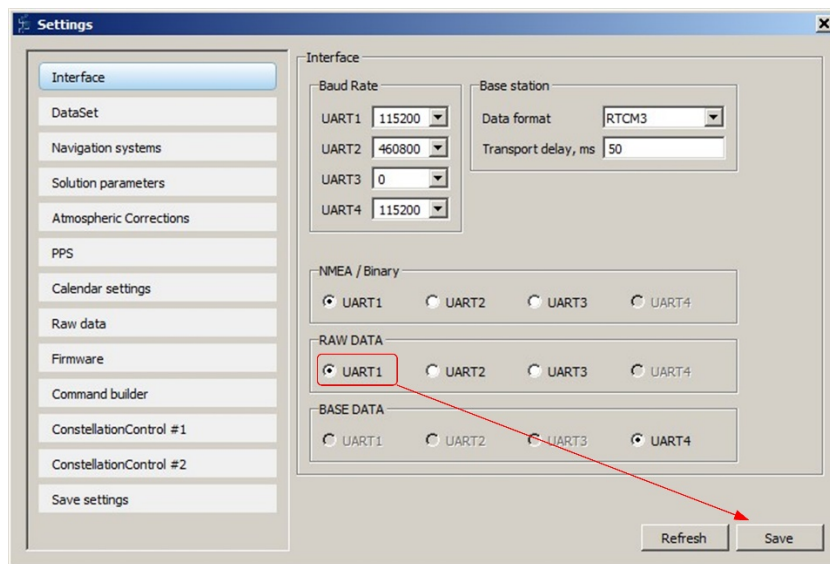
Another one NTL10X-series receiver may be used as a reference receiver instead of VRS network. Refer to Section 5 to setup receiver as a source of raw ranging data.

5 GENERATION OF RAW RANGING DATA

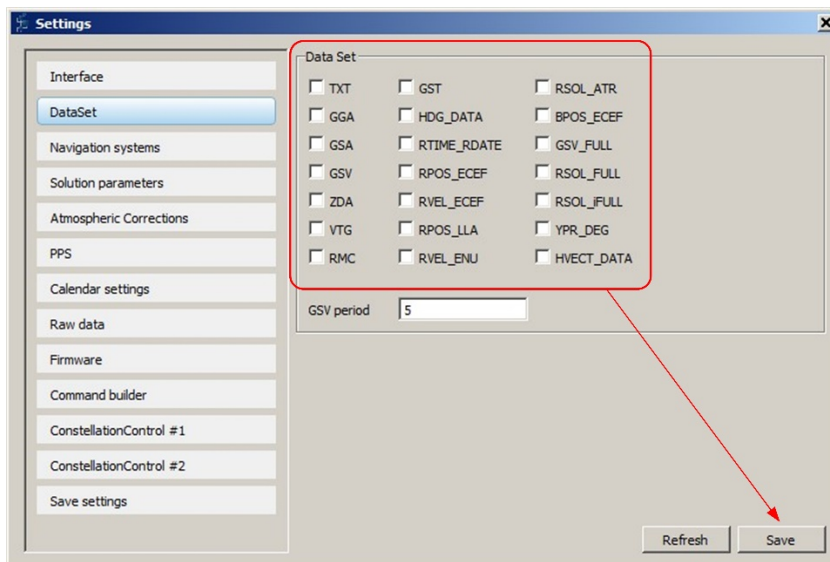
Navigation module can be used as a source of raw ranging data for further post processing or differential positioning.

This can be done as follows:

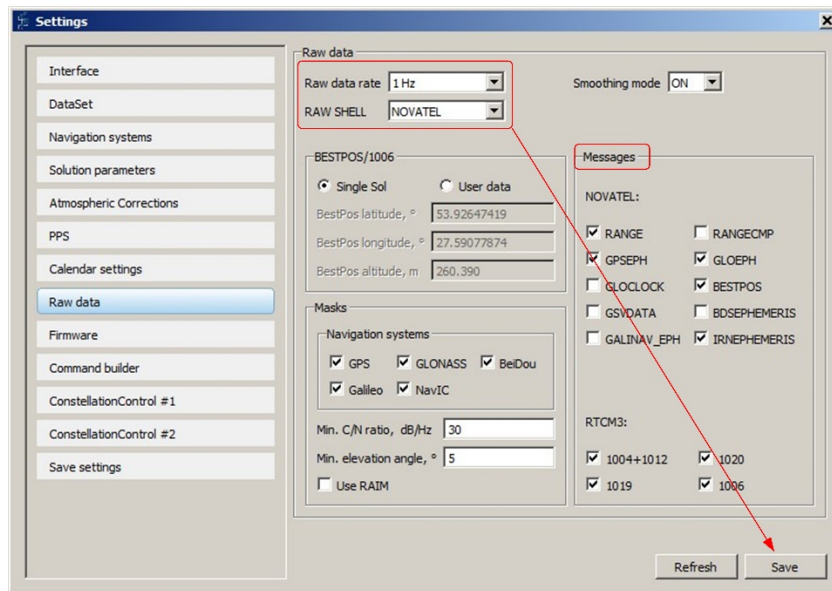
1. Select the **Settings/Show settings/Interface** section. In the **RAW DATA** sub-section set UART1. Click on the **Save** button.



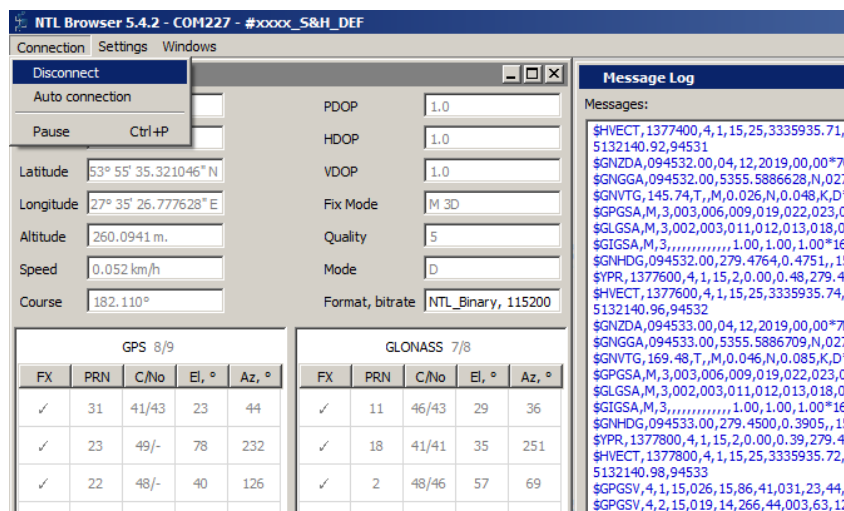
2. Select the **DataSet** section. In the **Data Set** sub-section deselect all checkboxes. Click on the **Save** button. After this action module stops NTL Binary periodic messages generation



3. Select the **Raw data** section. In the **Raw data rate** sub-section, select '1 Hz' and 'NOVATEL' as the **RAW SHELL**. In the **Messages** sub-section can be specified NOVATEL and RTCM3 messages type. Click on the **Save** button. Refer to «GNSS-PPU-SETUP-GUIDE-6-62-00.pdf» for other details.



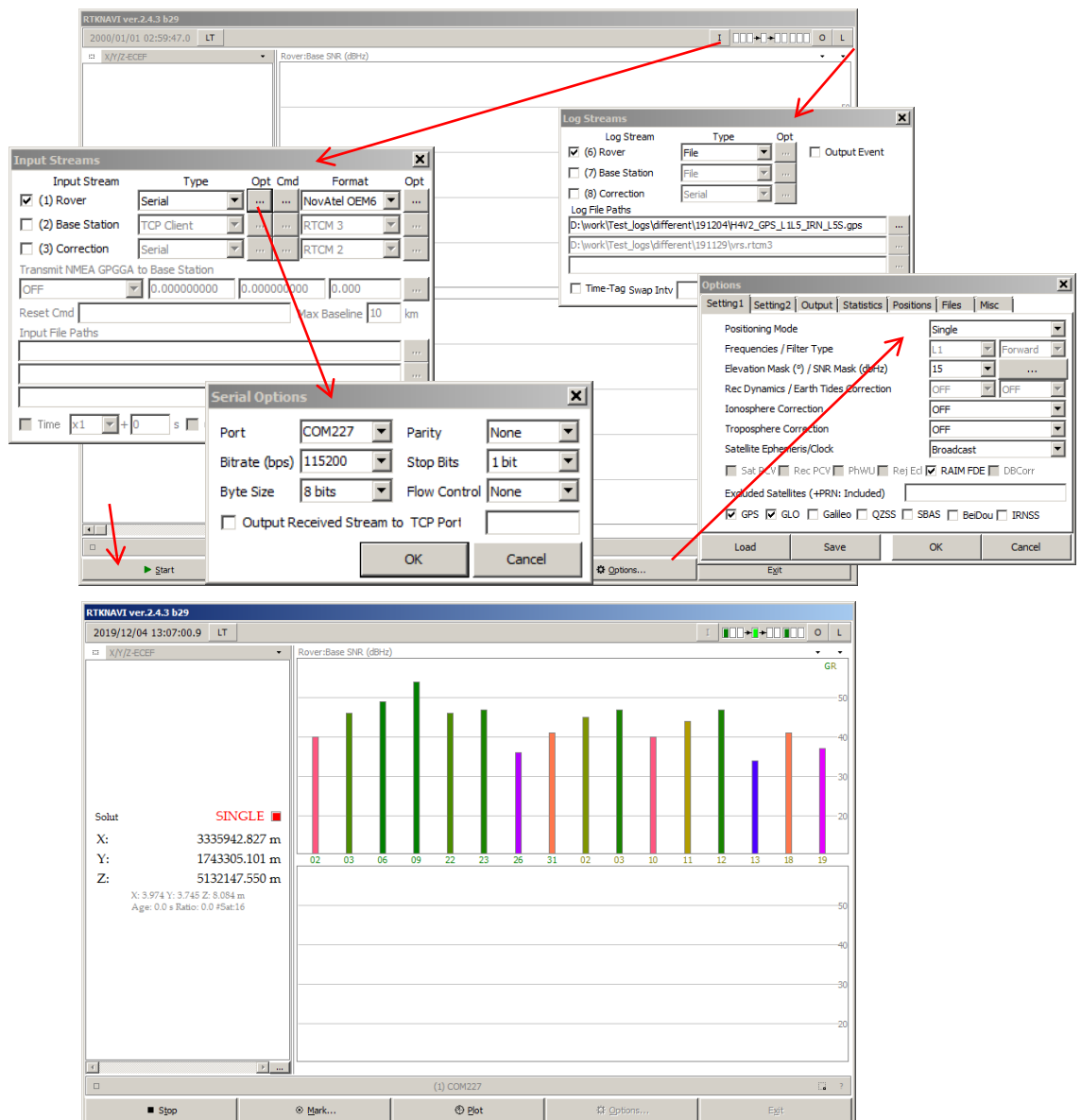
4. Exit the **Settings** section.
5. Exit NTL Browser to release COM port. To do this, select **Connection/Disconnect**.



Generation of raw data in Novatel format is shown on the picture below. RTCM3 is not suitable to transmit measurements made on NavIC signals. RTKNAVI tool may be used to visualize and write Raw data measurements.

6. Run the `rtk_navi.exe`² utility:

- Click on the 'I' button;
- In the **Format** sub-section select '**NovAtel OEM6**';
- In the **Opt** sub-section (**Serial Options** window) select '**COM227**' as the **Port**, and '**115200**' as the **Bitrate**. Click on the '**OK**' button;
- Click on the '**L**' button. Specify **Log File Paths**, to write raw data into. Click on the '**OK**' button;
- Click on the '**Options**' button. Set **Positioning Mode** to '**Single**'. Click on the '**OK**' button;
- Click on the **Start**.

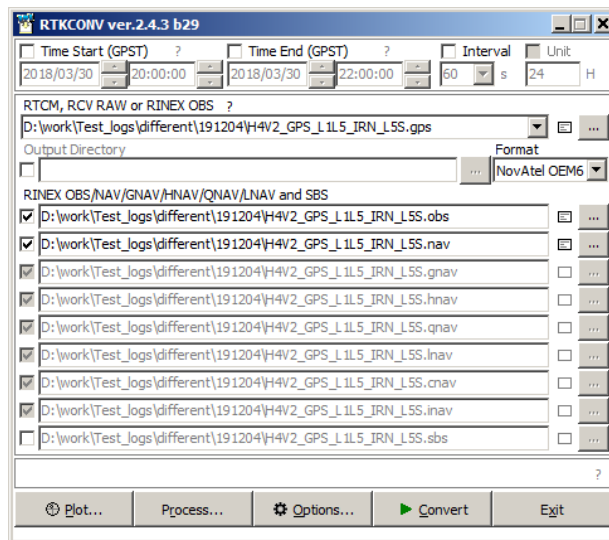


² Required tools are available on NTLab FTP server. Link (password and login) may be provided on request.

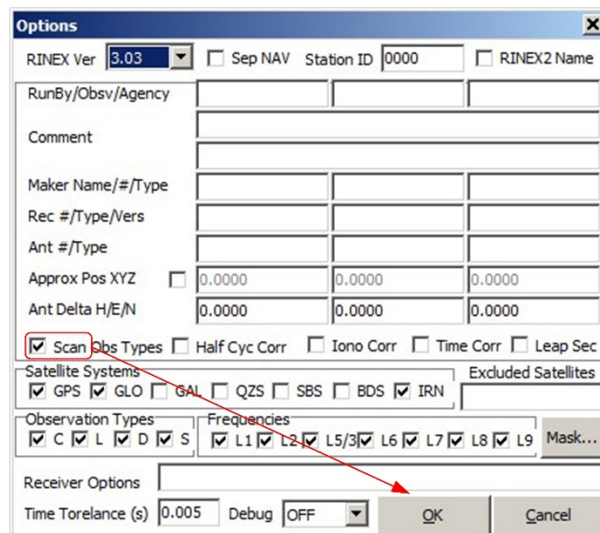
The `rtk_navi.exe` utility get receiver position, so raw data accepted and processed. But RTKNAVI can't visualize NavIC data.

7. Convert Novatel Raw data we have already written down into RINEX format to check ability of NavIC measurements:

- Run the `rtkconv.exe`³ utility

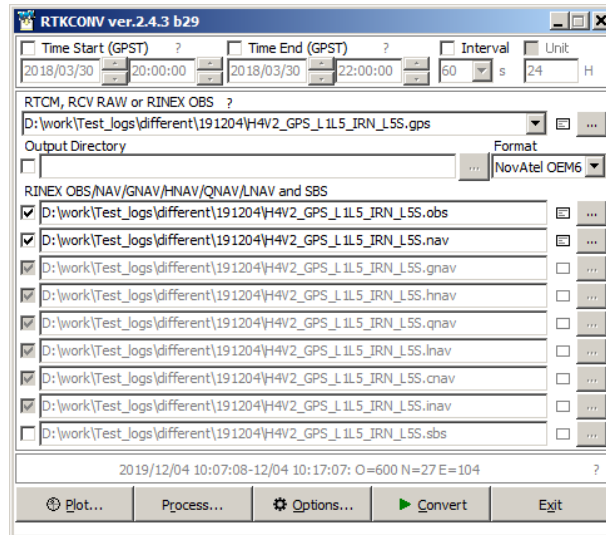


- Select source file and data format;
- Setup **Options** as on the picture below. Click on the 'OK' button.



- Click on the 'Convert' button.

³ Required tools are available on NTLab FTP server. Link (password and login) may be provided on request.



NavIC measurements present in resulting *.obs file:

> 2019 12 4 10 7 8.0000000 0 20									
I 6	38522313.570	151169828.197	69.335	40.000					
G 2	24630716.765	129435262.895	2572.844	41.000					
G26	23624243.771	124146245.069	1501.286	33.000	23624249.857	96737376.134	1169.861	39.000	
R11	22403606.853	119718101.054	-2960.565	44.000	22403606.908	93114053.369	-2302.530	43.000	
I 2	39306608.520	154247570.868	831.031	37.000					
R18	22083165.970	117881445.428	-3605.341	42.000	22083170.497	91685575.641	-2804.068	46.000	
R 2	20318455.936	108423181.073	-2319.539	45.000	20318460.177	84329159.829	-1804.028	45.000	
R10	22988150.773	122626067.580	-3475.146	41.000					
G31	24257878.030	127476010.358	-3418.558	40.000	24257881.611	99331969.997	-2663.750	38.000	
G23	20569294.053	108092363.974	224.816	46.000					
G22	23057366.475	121167269.238	-3020.985	46.000					
I 3	40314726.643	158203644.885	-42.358	35.000					
R13	22150554.420	118282615.452	4169.452	35.000	22150557.883	91997639.769	3242.372	31.000	
I 4	39960693.172	156814361.183	376.540	35.000					
G 3	21217036.341	111496272.946	-2265.922	46.000	21217041.075	86880231.915	-1765.889	43.000	
R 3	19548086.940	104642446.091	1218.198	47.000	19548087.689	81388555.405	947.588	45.000	
G 6	21828941.127	114711862.118	699.199	49.000	21828946.292	89385866.070	544.793	49.000	
R12	20439991.801	109186791.705	656.740	48.000	20439992.686	84923050.965	510.642	45.000	
G 9	21018769.902	110454384.309	1973.633	54.000	21018773.753	86068408.483	1537.971	48.000	
R19	21203156.737	113422577.826	-186.546	37.000	21203158.576	88217576.426	-145.262	39.000	

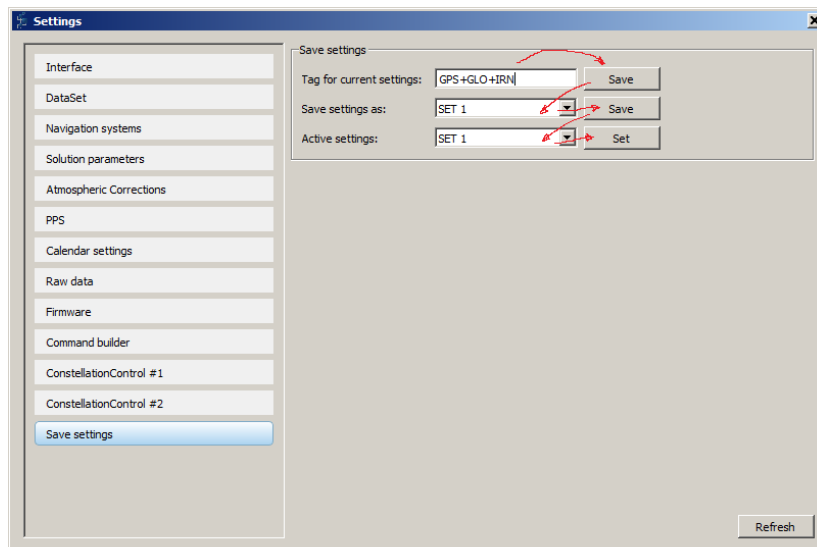
S-band measurements are not converted by RTKCONV. Some custom tools should be developed to get this data in RINEX format.

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 nonvolatile memory. NTL104 receiver allows two sets of controls to be saved into FLASH.

To do this:

1. Select **Settings/Show settings/Save Settings** section;
2. Enter textual tag for current scope of control parameters (optionally);
3. Select a name for current scope of controls: SET1 or SET2;
4. Select a set of controls to be loaded with (active set): DEFAULT or SET1 or SET2.



During the next power on saved setting will be restored and used during receiver start up.

CONTACT

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