

— Survey Grade INS

External Novatel GNSS integration

Operating handbook



Document
Revision

SGPNOVATEL
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This brief document guides you in the process of connecting an external Novatel GNSS receiver to your SBG Device.

Step 1: GNSS and Sensor connections

Connect GPS Tx signal(s) to one of the following pins on device connectors: PORT A, B, C, D, E Rx pins.

You can also use an Ethernet connection if required – not covered by this document.

Connect GPS PPS signal to Sync A, B, C, D or E input.



Note 1: Only the physical PORT A is available for the All-in-One Ekinox / Apogee-A. You can still use Eth 1 to Eth 4 virtual serial ports to input GPS data.

Step 2: GNSS module configuration

Basic operation

In addition to set a proper baudrate according to the sensor configuration, the following messages configuration should be done. Any other message should be disabled as the inertial device expects only binary protocol as input.

```
LOG COM1 BESTPOSB ONTIME 0.2
LOG COM1 PSRXYZB ONTIME 0.2
LOG COM1 HEADINGB ONNEW
LOG COM1 TIMEB ONTIME 1.0
SAVECONFIG
```

Adding Post-processing capability

The following message configuration is required for post-processing.

```
LOG COM1 RANGECPMB ONTIME 1
LOG COM1 RAWEPHEMB ONCHANGED
LOG COM1 GLOEPHEMERISB ONCHANGED
SAVECONFIG
```



Note: The Novatel Binary protocol must be used as it provides the fastest transfer rate and lowest CPU consumption for data handling.

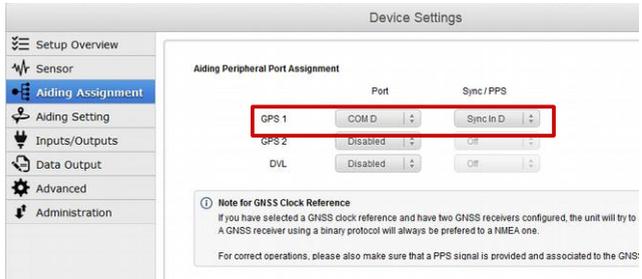
Step 3: Sensor configuration

In order to configure the Sensor, you need to connect to the Web interface and open the configuration window. Simply follow those instructions:

Set Aiding Assignment

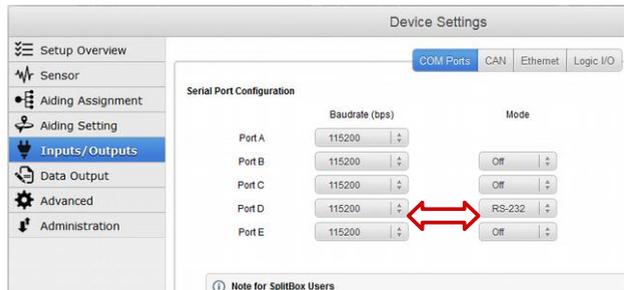
In this window, you just indicate where you connected your GNSS receiver.

Both communication port and Sync In pin must be set.



Set correct baudrate and mode for serial port

In our example we configured the GPS to be connected on PORT D in RS-232 mode.



Set Logic input configuration for PPS signal

In order to use correctly PPS signal information, you must enable the corresponding logic input. Here we configured PPS on Sync D. Polarity should be set accordingly with the actual GPS signal.



Set correct GPS model and configuration

1. GPS model should be set to Novatel.
2. GPS lever arm is measured within 5cm **FROM** the Sensor, **TO** the antenna.
3. In case of Dual antenna system, offset for the secondary one (providing heading) must also be entered.
4. Finally, each available measurement (position, velocity and true heading if available) should be configured to be used or not. Typically, leave it to Automatic rejection mode.

The screenshot shows the 'Device Settings' window for 'GPS 1'. The left sidebar contains a menu with options: Setup Overview, Sensor, Aiding Assignment, Aiding Setting (highlighted), Inputs/Outputs, Data Output, Advanced, and Administration. The main content area is divided into sections:

- Basic Configuration:** The 'Model' dropdown menu is set to 'Novatel', indicated by a red arrow and the number '1'.
- Primary Antenna:** The 'Lever Arm (X, Y, Z)' fields are set to '0.000', '0.000', and '0.000' m, enclosed in a red box with the number '2'.
- Secondary Antenna:** The 'Lever Arm (X, Y, Z)' fields are set to '0.000', '0.000', and '0.000' m, enclosed in a red dashed box with the number '3'.
- Aiding Use and Rejection:** This section contains three dropdown menus: 'Position', 'Velocity', and 'True Heading'. All three are set to 'Auto rejection', indicated by a red box and the number '4'.

Below the 'Aiding Use and Rejection' section, there is a note: "You can force this device measurements to always be used, ignored or automatically verified when a false measureme".

Set Clock alignment

Finally, you should define which GPS should be used to align the internal clock and provide UTC time data. This is done into the advanced settings section:

The screenshot shows the 'Device Settings' window for the 'Advanced' section. The left sidebar has 'Advanced' highlighted. The main content area shows the 'Clock Reference' section with the 'Align main clock on external clock' dropdown menu set to 'GNSS', indicated by a red box. Below this, there is a note:

Note for GNSS Clock Reference
If you have selected a GNSS clock reference and have two GNSS receivers configured, a GNSS receiver using a binary protocol will always be preferred to a NMEA one.
For correct operations, please also make sure that a PPS signal is provided and asso



Note: If you have two connected GPS receivers, the INS doesn't need a PPS signal for the second GPS receiver to accurately time stamp the data.

Step 4: Checking status

Once fully configured, the global status must be checked:

The screenshot shows the 'Status' window with the following sections and data:

General	
Main Power	✓
Imu Power	✓
GPS Power	✓
Settings	✓
Temperature	✓
Data Logger	✓
CPU Load	✓

IMU				
General				
Communication	✓			
Built In Test	✓			
Sensors				
	x	y	z	In Range
Accelero	✓	✓	✓	✓
Gyro	✓	✓	✓	✓

GPS 1		
Position	2	Differential
Velocity		Doppler
Dual antenna		Valid
GPS		L1 L2 L5
GLONASS		L1 L2
Diff. correction age		0.8s
Nb of sat. used		9
Base station ID		-

Solution	
Solution mode	Nav position
Alignment status	Aligned
Quality	
Attitude	✓
Heading	✓
Velocity	✓
Position	✓
Used for solution	
Vertical Reference	✗
GPS1 Position	✓
GPS1 Velocity	✓
GPS1 True Head.	✓
GPS2 Position	✗
GPS2 Velocity	✗
GPS2 True Head.	✗
DVL Bottom Tracking	✗
DVL Water Layer	✗

Aiding Inputs				
	Velocity	Heading	Position	UTC
GPS 1	✓	✓	✓	✓
GPS 2	✗	✗	✗	✗
DVL	✗			

Interfaces			
	Open	Receive	Transmit
Com A	✓	✓	✓
Com B	✗		
Com C	✗		
Com D	✓	✓	✓
Com E	✗		
Eth 0	✓		
Eth 1	✗		
Eth 2	✗		
Eth 3	✗		
Eth 4	✗		
CAN	✗		

Clock	
Input Clock	✓
Clock Alignment	3 Valid
UTC synchro	✓
UTC info	Valid

Heave	
Real-Time valid	✓
Delayed valid	✓
Velocity aided	✓

- GPS 1 or 2 line in “Aiding Inputs” section must show valid data. Check next items otherwise:
 - Check interface configuration (1.1): Corresponding COM port must be opened and Rx flag OK. Baudrate should be the same in the GPS and the SBG unit configuration
 - Check for hardware wiring issues
- GPS solution is reported in that section. Check if there is a good GPS fix here.
- Then you can check at the Clock section. Input clock must be OK and UTC time should be set to valid after a few minutes in alignment mode.
- Once the GPS acquired a solution, the Kalman filter should pass in Full Navigation mode and show active items in the “Used for Solution” field.



Note: The Kalman filter will run into navigation mode once a correct heading could be estimated (requires magnetometers, true heading or some accelerations).



Note 2: Position data should be used in solution in good GNSS environments. In case of RTK fix, the velocity aiding is automatically disabled for optimal performance.