Survey Grade INS

External Septentrio GNSS integration

Operating handbook

Document SGPOHSEPTENTRIO
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SBG SYSTEMS

This brief document guides you in the process of connecting a SplitBox-S or an external Septentrio GNSS receiver to your SBG device

Step 1: GNSS and Sensor connections

In case you are using a SplitBox-S, including an embedded Septentrio receiver, the receiver COM3 is connected to the All-in-One Ekinox or Apogee PORT D internally. In addition, the PPS signal is connected to the device Sync IN D.

In case you are using an external Septentrio receiver, connect GPS Tx signal(s) to one of the following Rx pins on Sensor connectors: PORT A, B, C, D, E.

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

Also connect the GPS PPS signal to one of the Sync In signals A, B, C, D or E.

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.

Note 2: Septentrio PPS signal strength is usually very weak (3V pulse with a few microseconds duration). If the PPS cable is too long or split, this signal may require pre-amplification using third party hardware to work properly.

Step 2: GNSS module configuration

In case you are using a SplitBox-S, the receiver is already pre-configured, so you can skip this step.

Septentrio configuration can be performed using RxControl, or the embedded web interface. The following section details how to access the web interface.

Accessing the Septentrio web interface

In order to access the Septentrio web interface, you will need to know the IP address of the receiver. By default, it is set in DHCP mode and a running DHCP server has to run on the network to let the Septentrio receiver acquire a valid IP address.

A serial connection can be used to retrieve the current IP address of the receiver.

The following command will ask the receiver its current IP configuration.

```
>lif, IPParameters
```

In case a different IP setup must be entered, you will need to use the following command:

>	sips,	Mode,	IP,	Netmask,	Gateway,	Domain,	DNS1,	DNS2
Details:		static dhcp	192.168.2.2	255.255.255.0	192.168.2.1		8.8.8.8	8.8.4.4

Example:

sips, static, 192.168.1.123, 255.255.255.0, 192.168.1.255, domain.local, 192.168.100.3, 192.168.100.4

Once the IP is defined, and you can access the web interface through your default web browser.

Warning: Septentrio GNSS receivers can't acquire an IP address in DHPC mode without a proper working DHCP server on the Network.
To connect directly a Septentrio receiver to your computer you first have to setup a static IP address.

Basic Messages output configuration

Configure the following outputs and output rates on your GPS receiver:

- **PVTGeodetic** @ 5 Hz
- **PosCovGeodetic** @ 5 Hz
- **VelCovGeodetic** @ 5 Hz
- **AttEuler** @ 5 Hz (if applicable, on dual antenna systems)
- **AttCovEuler** @ 5 Hz (if applicable, on dual antenna systems)
- **ReceiverTime** @ 1Hz
- **xPPPOffset** @ 1Hz
- **AuxAntPositions** @ 1Hz

Configuration for post-processing

The output set "**PostProcess**" must be enabled at 1Hz as well for post-processing operation, It contains the following output:

- **MeasEpoch, MeasExtra** @ 1Hz
- **GEORawL1** @ 1Hz
- **GPSNav, GPSIon, GPSUtc** @ 1Hz
- **GLONav, GLOTime** @ 1Hz
- **GALNav, GALIon, GALUtc, GALGstGps, GALSARRLM** @1 Hz
- **CMPNav** @ 1Hz

- **QZSNav** @ 1Hz
- **DiffCorrIn** @ 1Hz
- **ReceiverSetup** @ 1Hz
- **Commands** @ 1Hz

Other GNSS Configuration:

Datum is set to WGS84.

Receiver dynamics should be set to:

- Acceleration / Jerk: **High**
- Motion: **Unlimited**

Smoothing options must be disabled

In addition, the GPS **PPS** signal must be sent at 1 Hz for proper operation.

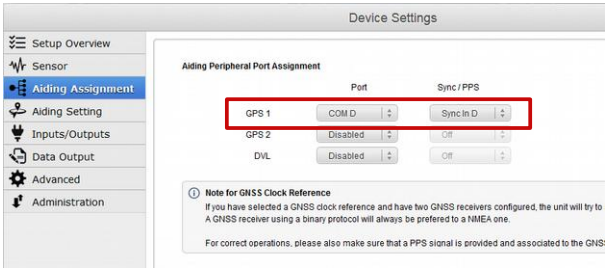
Step 3: Sensor configuration

In order to configure the Inertial device, 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.

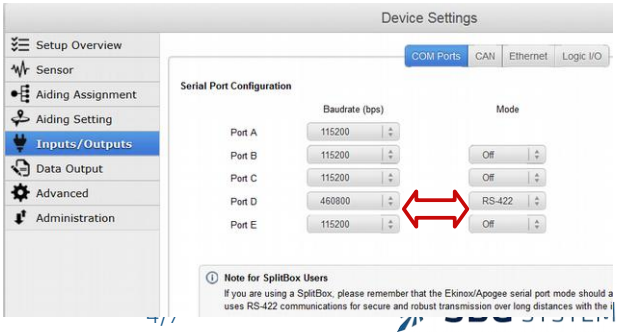
Both communication port **and** Sync In pin must be set.



Set correct baudrate and mode for serial port

In our example we configured the GPS to be connected on PORT D in RS-422 mode.

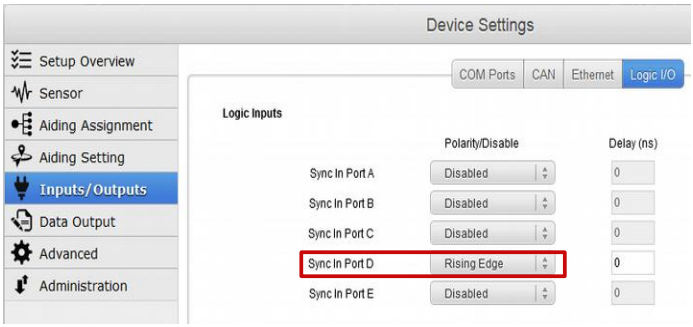
Set corresponding baudrate, that has been configured on GNSS receiver board



Set Logic input configuration for PPS signal

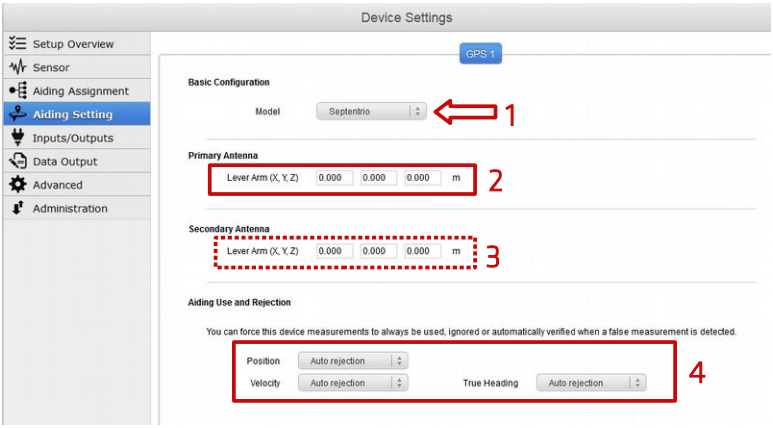
In order to use correctly PPS signal information, you must enable the corresponding logic input. Here we configured PPS on Sync D.

Polarity should be set accordingly with the actual GPS signal.



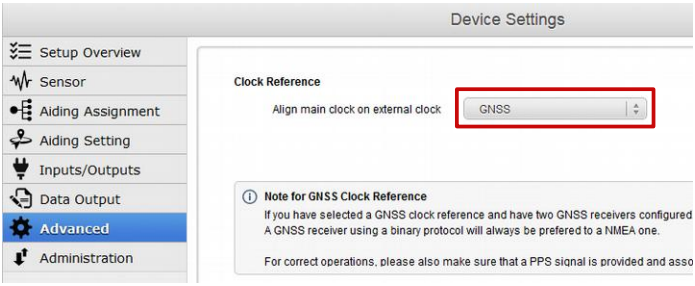
Set correct GPS model and configuration

1. GPS model should be set to **Septentrio**.
2. GPS lever arm is measured within 5 cm **FROM** the IMU, **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 Auto Rejection mode.



Set Clock alignment

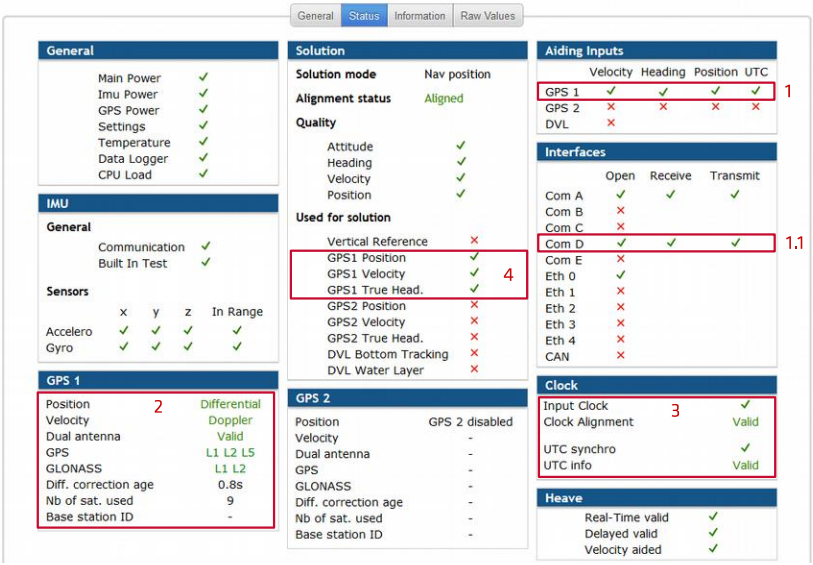
Finally, you should define which Source (GNSS, External Sync, Off) should be used to align the internal clock and provide UTC time data. This is done into the advanced settings section:



Note: If you have two connected GPS receivers, the Sensor 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:



1. 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
2. GPS solution is reported in that section. Check if there is a good GPS fix here.
3. 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.
4. 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.