

— Survey Grade INS

External NMEA GNSS integration

Operating handbook



Document
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Support

EMEA +33 1 80 88 43 70
support@sbg-systems.com

Americas: +1 (657) 549-5807
support@sbg-systems.com

This brief document guides you in the process of connecting an external NMEA GNSS receiver to your SBG INS (All-in-One or Navsight).

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

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

- RMC @ 5 Hz
- GGA @ 5 Hz
- GST @ 5Hz
- HDT @ 5 Hz (if applicable, on dual antenna systems)
- ZDA @ 1Hz

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

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.

Device Settings

Aiding Peripheral Port Assignment

	Port	Sync / PPS
GPS 1	COM D	Sync In D
GPS 2	Disabled	Off
DVL	Disabled	Off

Note for GNSS Clock Reference
If you have selected a GNSS clock reference and have two GNSS receivers configured, the unit will try to use 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 associated to the GNSS.

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.

Device Settings

Serial Port Configuration

	Baudrate (bps)	Mode
Port A	115200	Off
Port B	115200	Off
Port C	115200	Off
Port D	115200	RS-232
Port E	115200	Off

Note for SplitBox Users

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.

Device Settings

Logic Inputs

	Polarity/Disable	Delay (ns)
Sync In Port A	Disabled	0
Sync In Port B	Disabled	0
Sync In Port C	Disabled	0
Sync In Port D	Rising Edge	0
Sync In Port E	Disabled	0

Set correct GPS model and configuration

1. GPS model should be set to NMEA (select the NMEA Trimble/Ashtech if it is one of these receivers as the heading is referenced the other way around with those GNSS receivers)
2. GPS lever arm is measured within 5cm **FROM** the IMU, **TO** the antenna.
3. In case of Dual antenna system, offset for the secondary one (providing heading) must also be entered, from the IMU, To the antenna.
4. Finally, each available measurement (position, velocity and true heading if available) should be configured to be used or not.

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 panel is titled 'Basic Configuration' and includes a 'Model' dropdown set to 'NMEA' (indicated by a red arrow and the number 1). Below this, the 'Primary Antenna' section has a 'Lever Arm (X, Y, Z)' field with three input boxes set to '0.000' and a unit dropdown set to 'm' (indicated by a red box and the number 2). The 'Secondary Antenna' section has a similar 'Lever Arm (X, Y, Z)' field with three input boxes set to '0.000' and a unit dropdown set to 'm' (indicated by a red dashed box and the number 3). The 'Aiding Use and Rejection' section has a note: 'You can force this device measurements to always be used, ignored or automatically verified when a false measurement'. Below this, there are three dropdown menus for 'Position', 'Velocity', and 'True Heading', all set to 'Auto rejection' (indicated by a red box and the number 4).

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 'GPS 1', specifically the 'Advanced' section. The left sidebar is the same as in the previous screenshot, with 'Advanced' highlighted. The main panel is titled 'Clock Reference' and includes a section 'Align main clock on external clock' with a dropdown menu set to 'GNSS' (indicated by a red box). Below this, there is a 'Note for GNSS Clock Reference' section with the following text: '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 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:

The screenshot displays the 'Status' tab of the SGPNMEA software interface. It is divided into several sections, each with a table of parameters and their status (indicated by checkmarks or crosses).

- General:** Main Power, Imu Power, GPS Power, Settings, Temperature, Data Logger, CPU Load. All are checked.
- IMU:**
 - General:** Communication, Built In Test. Both are checked.
 - Sensors:** Accelerometer (x, y, z), Gyro (x, y, z, In Range). All are checked.
- GPS 1:** Position (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 (-). All are checked.
- GPS 2:** Position (GPS 2 disabled), Velocity (-), Dual antenna (-), GPS (-), GLONASS (-), Diff. correction age (-), Nb of sat. used (-), Base station ID (-). All are disabled or have no data.
- Solution:**
 - Solution mode:** Nav position.
 - Alignment status:** Aligned.
 - Quality:** Attitude, Heading, Velocity, Position. All are checked.
 - Used for solution:**
 - Vertical Reference (x)
 - GPS1 Position (checked)
 - GPS1 Velocity (checked)
 - GPS1 True Head. (checked)
 - GPS2 Position (x)
 - GPS2 Velocity (x)
 - GPS2 True Head. (x)
 - DVL Bottom Tracking (x)
 - DVL Water Layer (x)
- Aiding Inputs:**
 - Velocity, Heading, Position, UTC.
 - GPS 1 (checked), GPS 2 (x), DVL (x).
- Interfaces:**
 - Open, Receive, Transmit.
 - Com A (checked), Com B (x), Com C (x), Com D (checked), Com E (x), Eth 0 (checked), Eth 1 (x), Eth 2 (x), Eth 3 (x), Eth 4 (x), CAN (x).
- Clock:**
 - Input Clock (checked), Clock Alignment (checked), UTC synchro (checked), UTC info (checked).
- Heave:**
 - Real-Time valid (checked), Delayed valid (checked), Velocity aided (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.