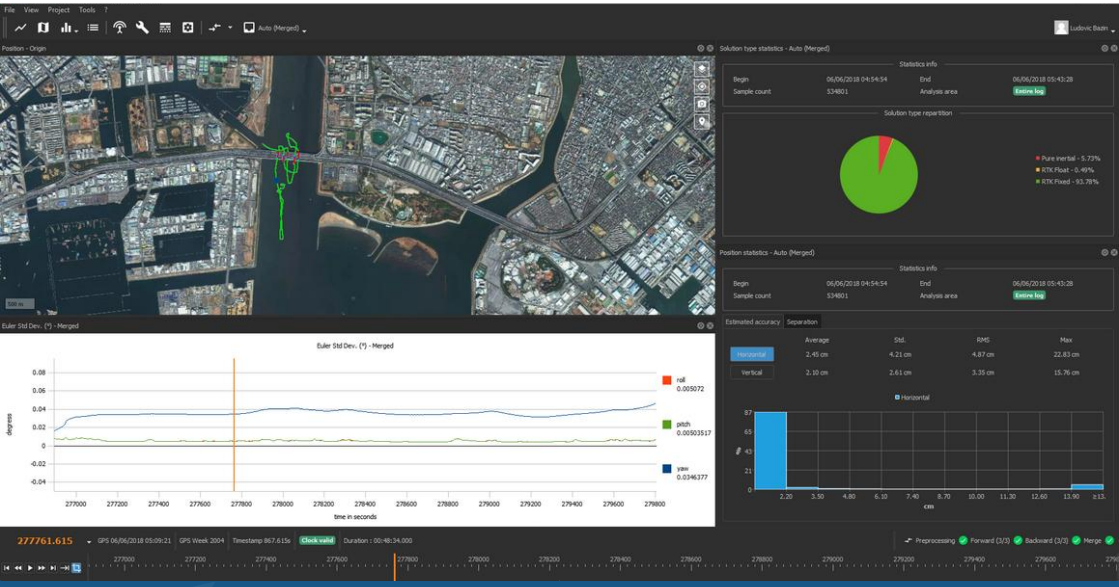
High Performance INS

Post Processing guide

Operating handbook



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SBG SYSTEMS

This brief document explains how to setup the INS for post processing with Qinertia and details the workflow from data acquisition to post processed results.

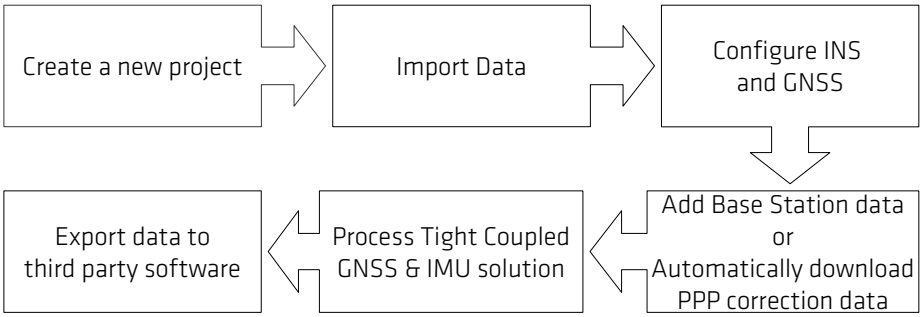
Post Processing Workflow

The processing workflow can be divided into two parts. The first one consists of configuring the sensor correctly and acquiring data thanks to the internal data-logger.

The second one is the post-mission part that is basically, getting the data from the INS, creating a project in Qinertia, computing a post processed GNSS + IMU tight coupled solution and exporting data to the desired format.

Data acquisition

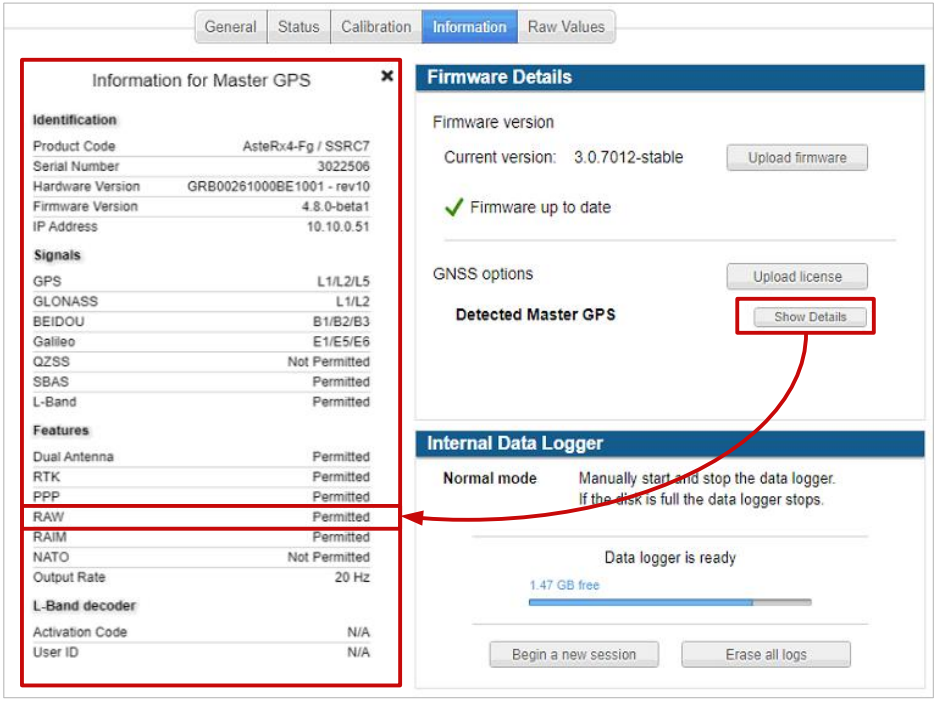
Post-Mission workflow



Before you start

Post processing is officially supported on all SBG INS when used with the internal GNSS receiver. To be used for post processing operations, the GNSS receiver connected to the INS should be able to output RAW data.

You can easily check if your internal receiver supports post processing by accessing the information panel on the embedded web interface. The Master GNSS should include the RAW option as you can see on the screenshot below:



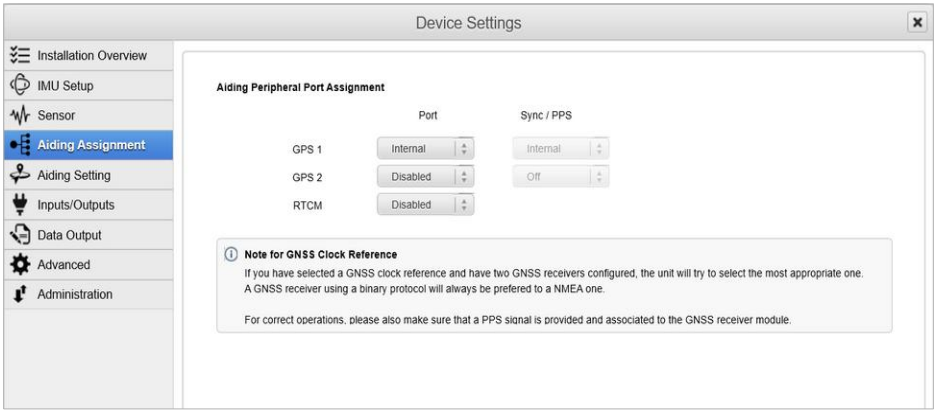
Note: If your GNSS doesn't support RAW GNSS data logging, please contact your sales representative to discuss available options.

Step 1: Sensor configuration

Set Aiding Assignment

Binary protocol from Novatel, Septentrio or Trimble are mandatory to be able to log raw GNSS observables. All products with an internal GNSS receiver are able to provide RAW data for post processing.

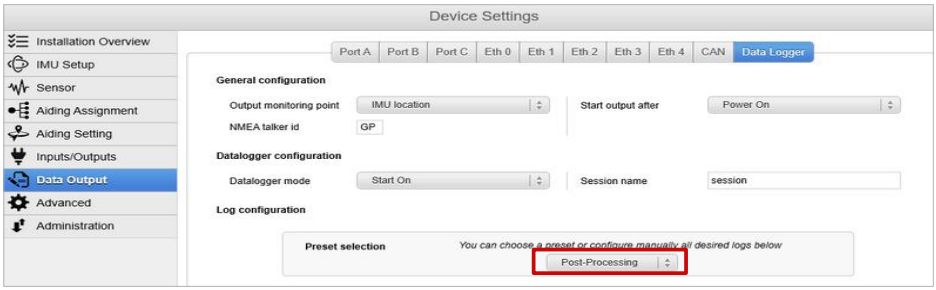
In this window, please make sure that the GNSS receiver is set properly as GPS 1 module (right protocol or internal selected):



You can also enable the odometer if your are planning to use a DMI.

Any differential corrections sent to the Device (RTCM data) will only improves the real time solution. They will not be used in the post processed solution (corrections should be logged on the base station.

Data-logger configuration



All messages needed to compute a post processed solution can be logged into the sensor internal data-logger.

Please select the "Post-Processing" output preset for quick output configuration.

Alternatively, and for reference, the following messages must be set to enable the post-processing capability:

- **System Status** @ 1 Hz
- **IMU Short** @ New Data
- **UTC** @ 1 Hz
- **GPS 1 Velocity** @ New Data
- **GPS 1 Position** @ New Data
- **GPS 1 True Heading** @ New Data (*)
- **GPS 1 Raw data** @ New Data
- **Odometer** @ New Data (*)
- **Heave** @ New Data (*)
- **Delayed Heave** @ New Data (*)

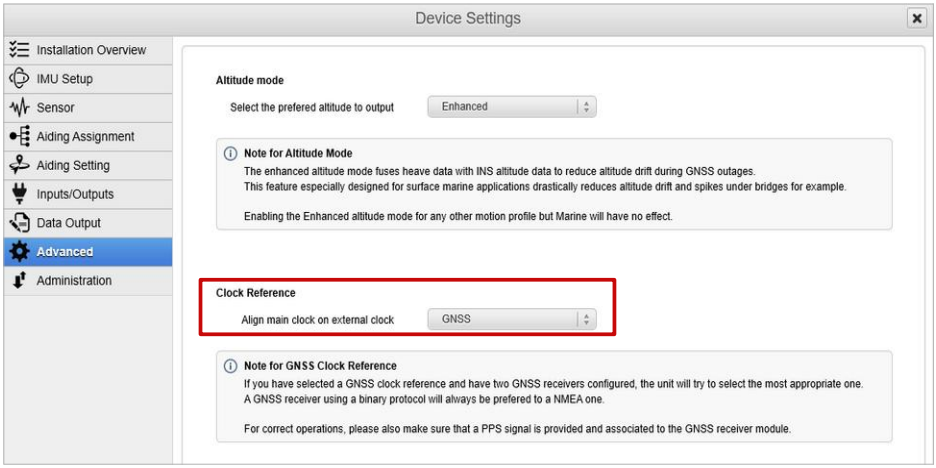
Note: All output logs marked with an * are not mandatory for correct post processing operations. You can freely enable or disable these logs according to your setup.

Note 2: If you have several GNSS receivers sending data to the INS, you should also set GPS 2 on New Data to allow Post Processing with one or with the other.

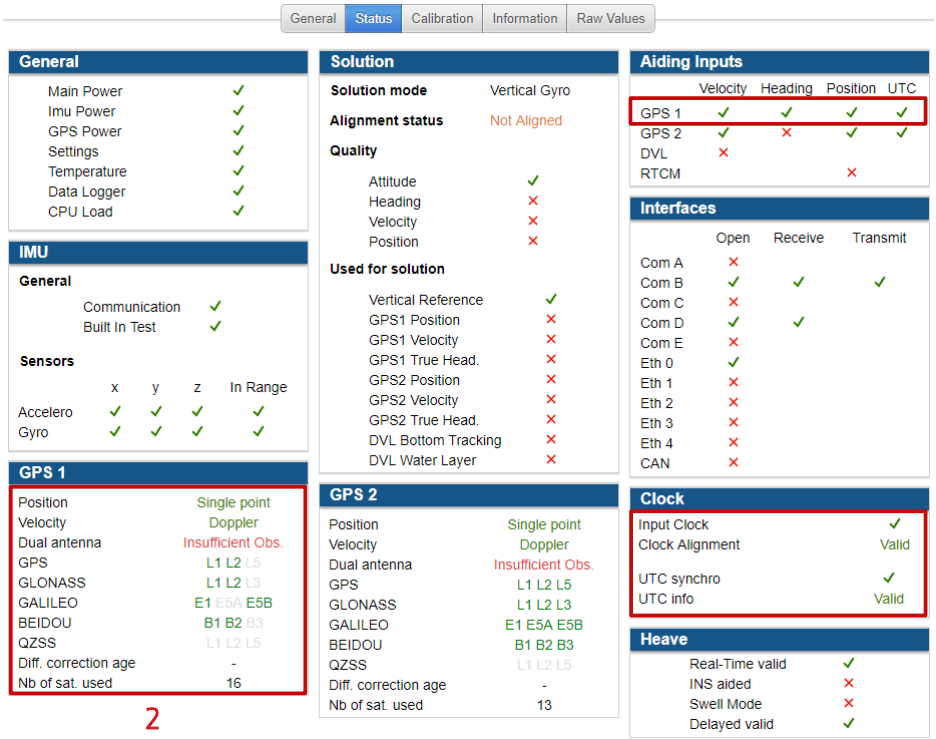
Set Clock alignment

Finally, you should make sure that the GPS 1 is used to align the internal clock and provide UTC time data.

The post-processed solution can only be computed if data are correctly aligned and time stamped to the GPS time.



Step 2: Checking status



Once fully configured, the global status must be checked:

1. GPS 1 line in “Aiding Inputs” section must show that valid data are being received from the internal GNSS. The Heading status can be in red if your are not using a dual antenna unit.
2. You should then check if a valid GNSS solution has been calculated. If you are using a dual antenna system, the heading status should also be checked.
3. Finally, make sure that the internal clock is aligned and valid UTC time information is being received by the INS.

Step 3: Lever arms, alignments & data acquisition

Lever arms

Configuring lever arms on the INS web page will not impact post-processed results. Indeed, this configuration is only used by the product to compute the real time solution.

You will have to re-enter the lever arms setup in Qinertia to compute a correct post processed solution.

You should thus measure them accurately and keep this information for later post-processing.

Alignments

Unlike for lever arms, if you configure a specific alignment between the INS and the vehicle, it will affect directly the IMU data used by the post processing software. You will obviously have to enter alignment correction only once; either in the INS or Qinertia.

SBG Systems recommend that you enter the alignment corrections on the INS rather than in Qinertia so you can use the same workflow for both real time and post-processed operations.

Note: Even if you enter an incorrect miss-alignment in the INS configuration, you can still fix this issue in the post processing software.

Data acquisition

As for real time operations, you will get better results if you can perform good calibration runs with vehicle dynamics at the beginning and ideally at the end of the log.

These calibration runs help the Kalman filter (either real time or post processed one) to observe and correct for mechanical installation parameters (lever arms) and sensors errors.

Please also make sure that the first and last parts of the log are in a **clear view of sky** to ensure correct and easy initial alignment procedure.

Finally, it's only possible to re-process ONE session as the logged data should be contiguous so don't split your run into multiple sessions or you will not be able to post process the data. You can't combine different sessions as you will have missing data between two different sessions.

Caution: Don't split logged data into multiple sessions or you will not be able to post-process the data correctly.

Step 4: Retrieve data from the INS

The INS will log all data needed for post processing operations within its internal data-logger.

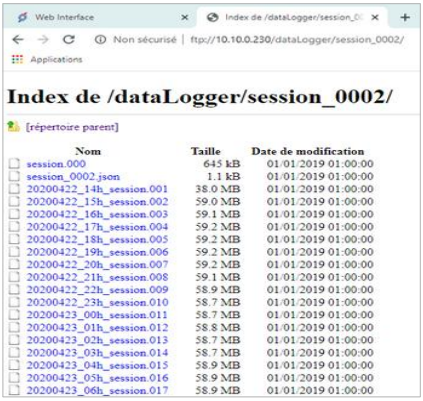
To access the files stored in the internal data-logger, please use a dedicated FTP client such as FileZilla, Transmit or Cyberduck.

To read the INS ip address, connect to the embedded webpage and browse to the information page as shown on the screenshot.

No password is required for the anonymous FTP access.

The window on the right shows the data-logger files tree structure. You will typically retrieve a whole session (session_0002 in this case).

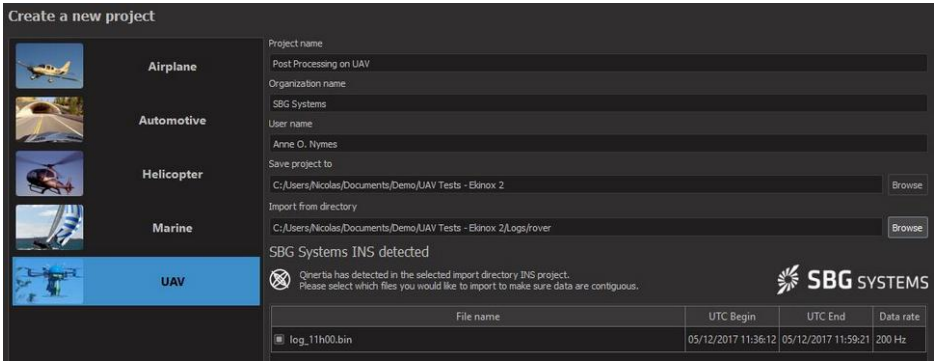
To find more information on the FTP and on the internal data-logger, please refers to the Technical Reference Manual.



Note: Data-logger directory contains a *.json file that is the configuration file generated during acquisition (feature available from version 3.0 for High Performance INS products). If this file is kept in the same directory as raw data *.bin files, Qinertia will then automatically load configuration as configured during real time acquisition.

Step 5: Configure your Qinertia Project

Start up Qinertia, then select New Project from the Dashboard.



Caution: Qinertia will merge data from multiple binary logs, but you should make sure they are continuous in time with no data gap.

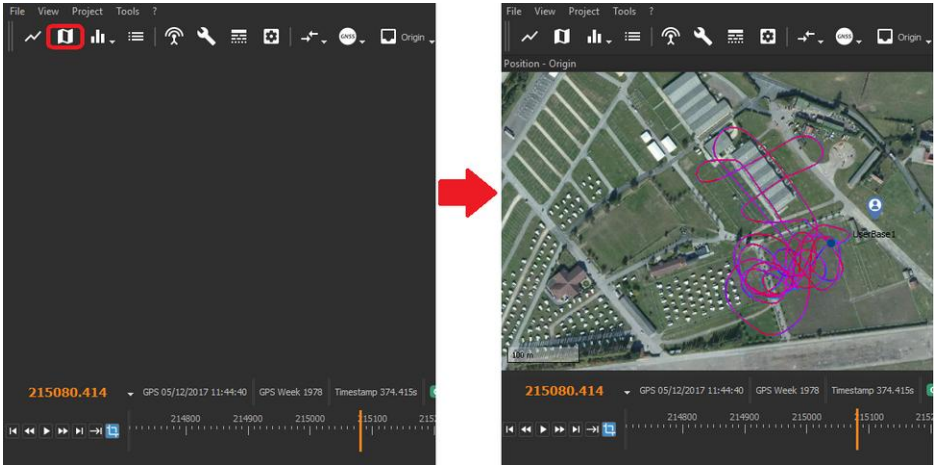
Select the data to be Post-Processed, configure the IMU model, import base station data, then enter the GNSS lever arms.

Caution: If the IMU alignment setting were already applied in the INS configuration, make sure to leave it to default (zero) in Qinertia, otherwise you will apply twice the alignment setting.

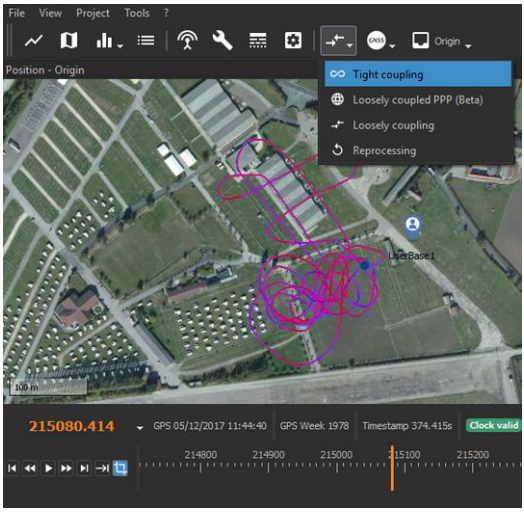
If *.json configuration file is in the directory together with corresponding raw data (feature available from version 3.0 for High Performance INS products), then configuration described above is done automatically by Qinertia.

Step 6: Process the tightly coupled solution

Now you finished creating your project you may start by displaying the 2D plot, this will show you the GNSS and real time fused trajectory on the map.



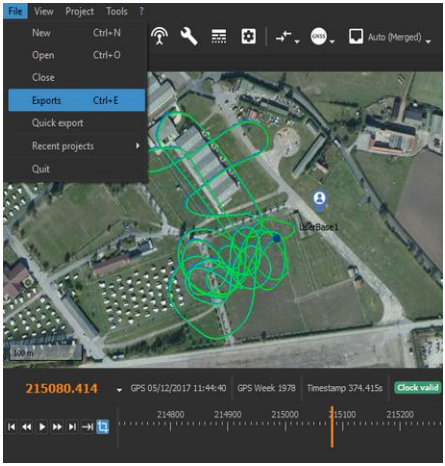
You can then press the Tight coupling option to launch the post-processing:



You will see on the time bar the forward and backward computation being realized at the same time, then the merge.

Step 7: Export Data

When the Post-Processing is done, you may export the data in a customizable text format, in SBET compatible file or Google Earth KMZ file.



The export window will give you the option to create your own export profile, and export presets.

The export preset menu is extremely versatile and give you a true customizable export format.