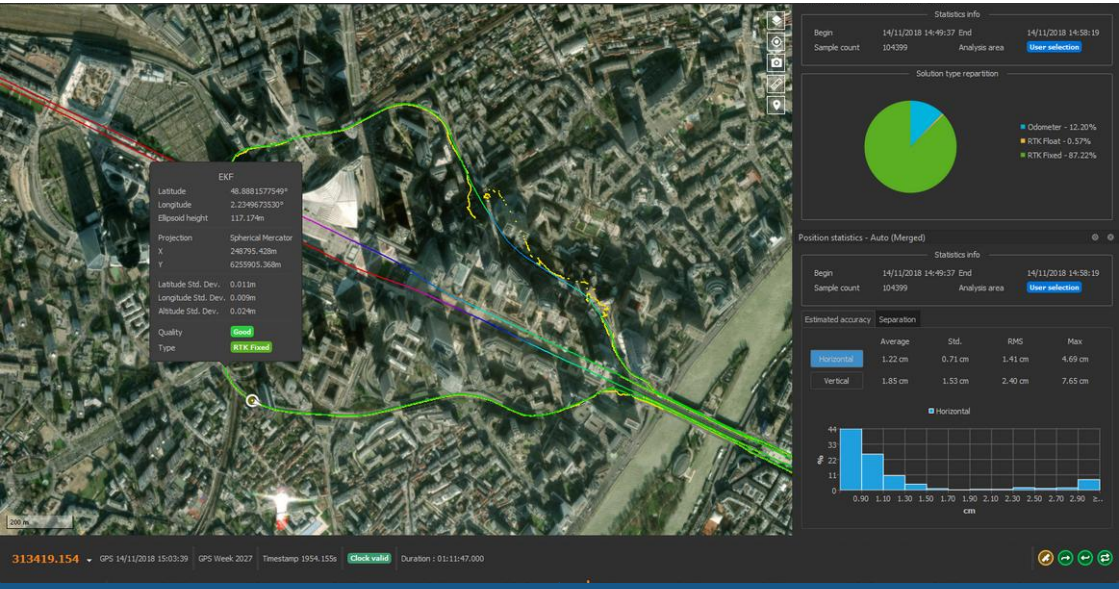
Ellipse Series

Post Processing guide

Operating handbook



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

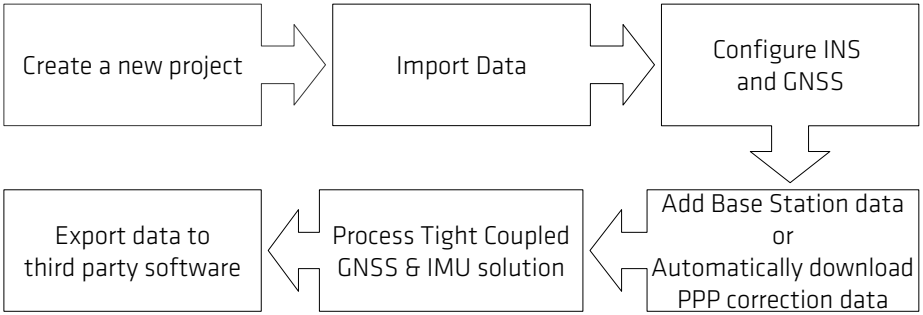
Post Processing Workflow

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

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

Data acquisition

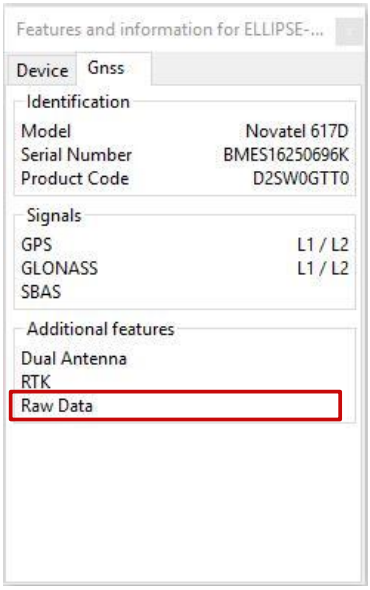
Post-Mission workflow



Before you start

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

You can easily check if your internal receiver (valid for Ellipse-D only) supports post processing by accessing the information panel in sbgCenter. The Master GNSS should include the RAW option as you can see on the screenshot below:



For external receiver, you should check permissions directly on the receiver

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

Step 1: Sensor configuration

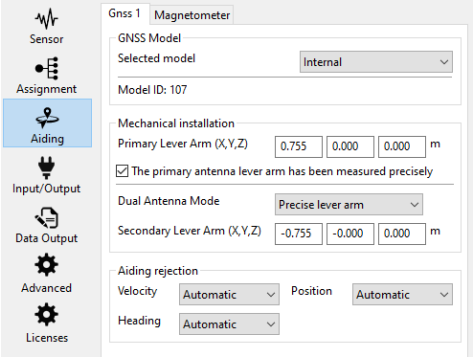
Set Aiding Assignment

If you are planning to compute tightly coupled post processed solution, the ELLIPSE has to get and store RAW GNSS observable. A binary protocol from Novatel, Septentrio or Trimble is mandatory to be able to log raw GNSS data.

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 but they will not be used in the post processed solution (corrections should be logged on the base station).



Output Logs configuration

All messages needed to compute a post processed solution can be output from the ELLIPSE directly including RAW GNSS observable.

You can also log RAW GNSS data separately either in Rinex or binary format and import the data in Qinertia.

Serial Port Configuration

Post processing requires a large amount of data to be output over the serial port.

Please set the baudrate to **921600 bps** if possible and monitor serial port Tx status for potential overflow.

As a minimum and for reference, the following messages must be output and logged to enable the post-processing capability:

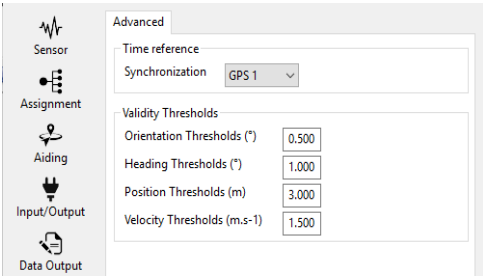
- **System Status** @ 1 Hz
- **UTC** @ 1 Hz
- **IMU Short** @ New Data
- **EKF Euler** @ 50 Hz (*)
- **EKF NAV** @ 50 Hz (*)
- **GPS 1 Velocity** @ New Data
- **GPS 1 Position** @ New Data
- **GPS 1 True Heading** @ New Data
- **GPS 1 Raw data** @ New Data
- **Odometer** @ New Data
- **Ship motion** @ 50 Hz (*)

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.

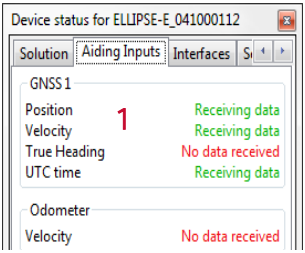
Set Clock alignment

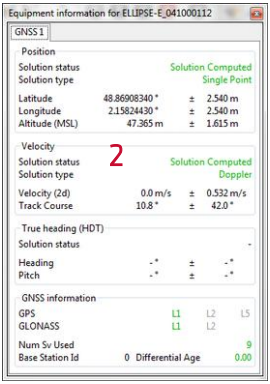
Finally, you should make sure that the GPS 1 is used to align the internal clock and provide UTC time data.

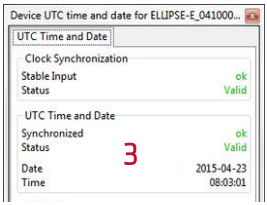
The post-processed solution can **only** be computed if data are correctly aligned and time stamped to the GPS time.



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 Ellipse.

Step 3: Lever arms, alignments & data acquisition

Lever arms

Configuring lever arms in the Ellipse will not impact post-processed results. Indeed, this configuration is only used by the Ellipse 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 Ellipse 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 Ellipse or in Qinertia.

SBG Systems recommend that you enter the alignment corrections on the Ellipse 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 Ellipse 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.

Step 4: Logging output messages

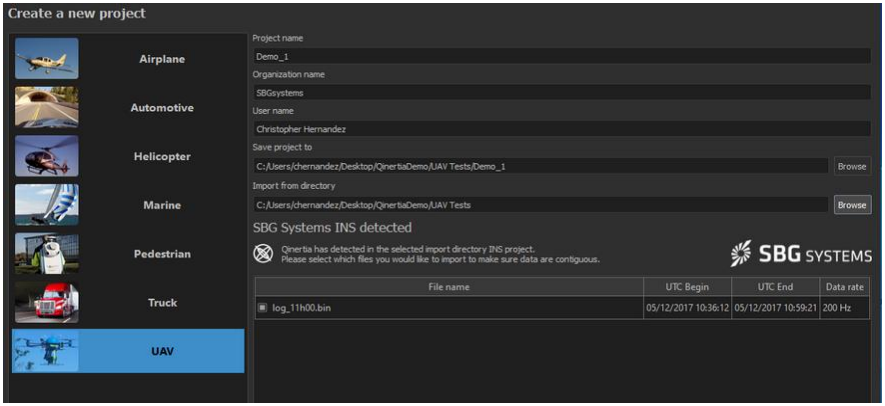
Ellipse series does not embed data logger, so output messages should be logged by storing a binary stream directly out of the serial port.

The data-logger solution should be able to handle a large amount of data and before starting a production acquisition, make sure you don't have missing data.

If you do not have logger or logging capabilities, please contact the support desk for recommendations.

Step 5: Configure your Qinertia Project

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



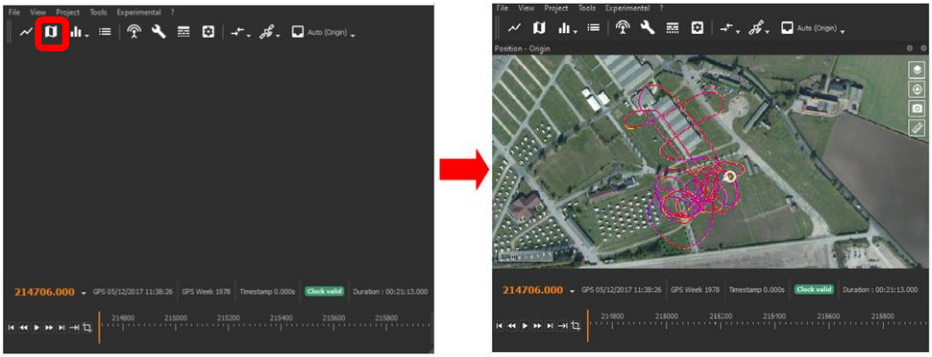
Caution: Qinertia will merge data from multiple binary logs, but you should make sure they are continuous in time with no data gap.

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

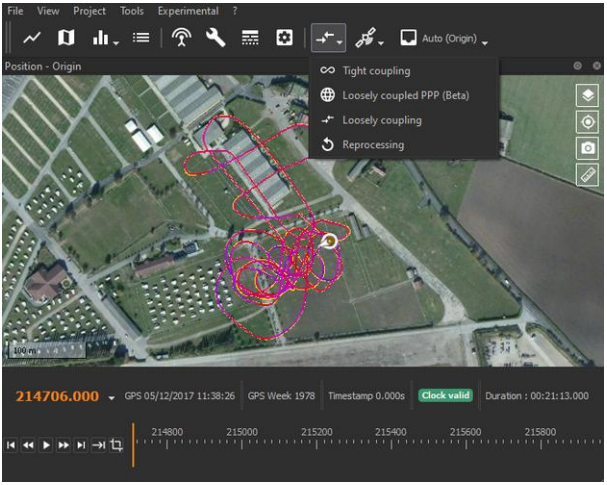
Caution: If IMU misalignment corrections were already applied in the Ellipse configuration, make sure to leave it to default (zero) in Qinertia, otherwise you will apply twice the corrections.

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.



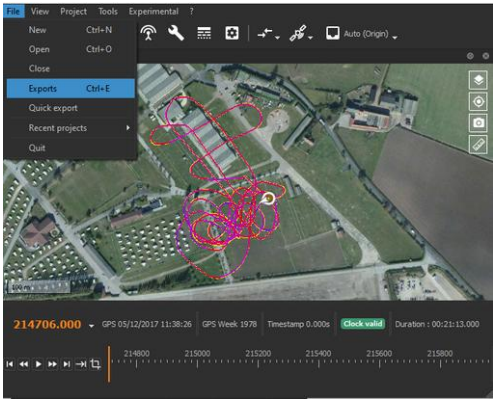
You can then press the Tight coupling option to launch the post-processing:



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

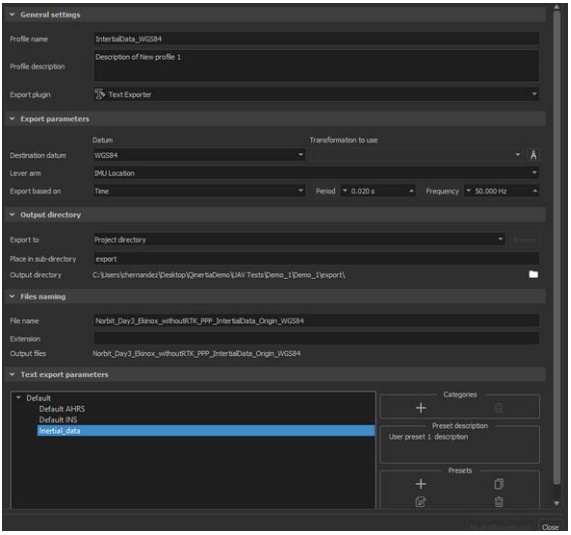
Step 7: Export Data

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.



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In particular, the text export allows you to create your own formats by dragging and dropping the data fields in a very intuitive way. Click on the fields to change the units or data format.

The beginning of the exported file is shown to help verifying the format.