



HYPACK
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Sounding Better!

SBG / Velodyne Configuration

By Jerry Knisley

The purpose of this document is to describe the interface between the HYPACK® software, the SBG Ellipse and the Velodyne VLP-16. This hardware configuration is used in the HYPACK® Payload.

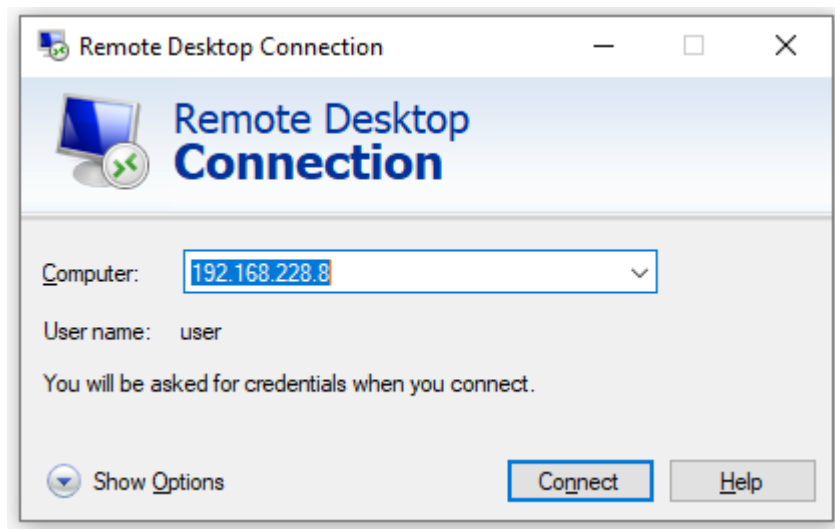
The IP Address may be different if it is configured for sharing the Internet connection. In that case, the IP Address will be set to 192.168.137.7 with a gateway of 192.168.137.1.

Using the Remote Desktop Connection allows you to have a controlling laptop (interfacing computer) to view the screen of the Payload computer.

Remote Desktop Connection



Remote Desktop Connection Interface



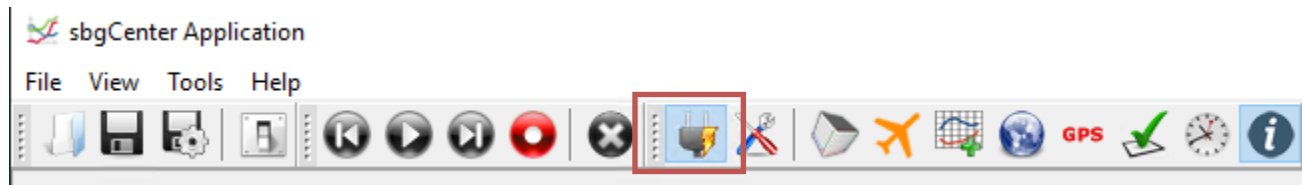
User Name: user

Password: password

SBG – SBG CENTER

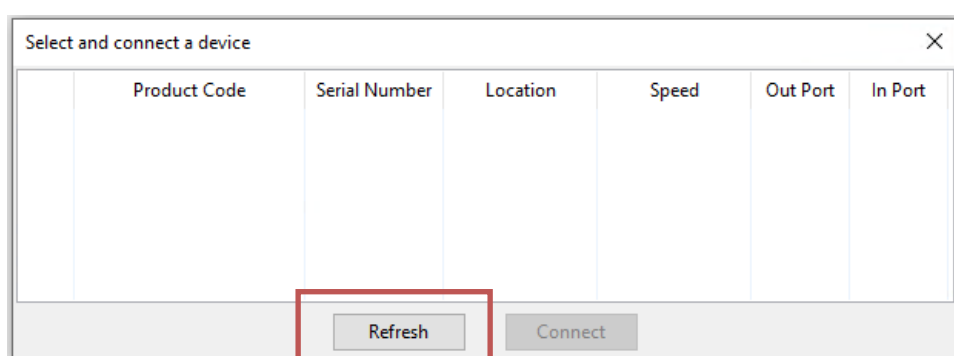
1. Connect to the SBG Ellipse.
 - a. Click the Connect icon.

Connect to the SBG Ellipse



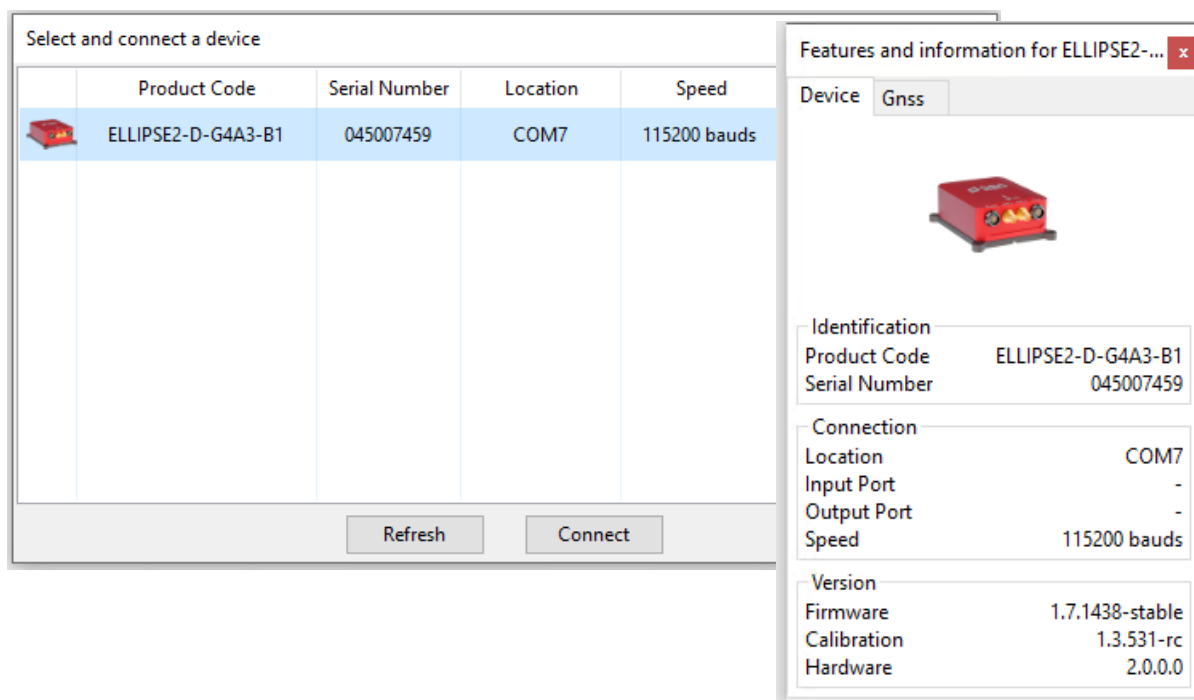
- b. Click [Refresh] to search for the SBG Units connected

Populating the List of SBG Devices



- c. Select your SBG unit and click [Connect]. The Features and Information display appears.

Connecting to your SBG



2. Configure the SBG.

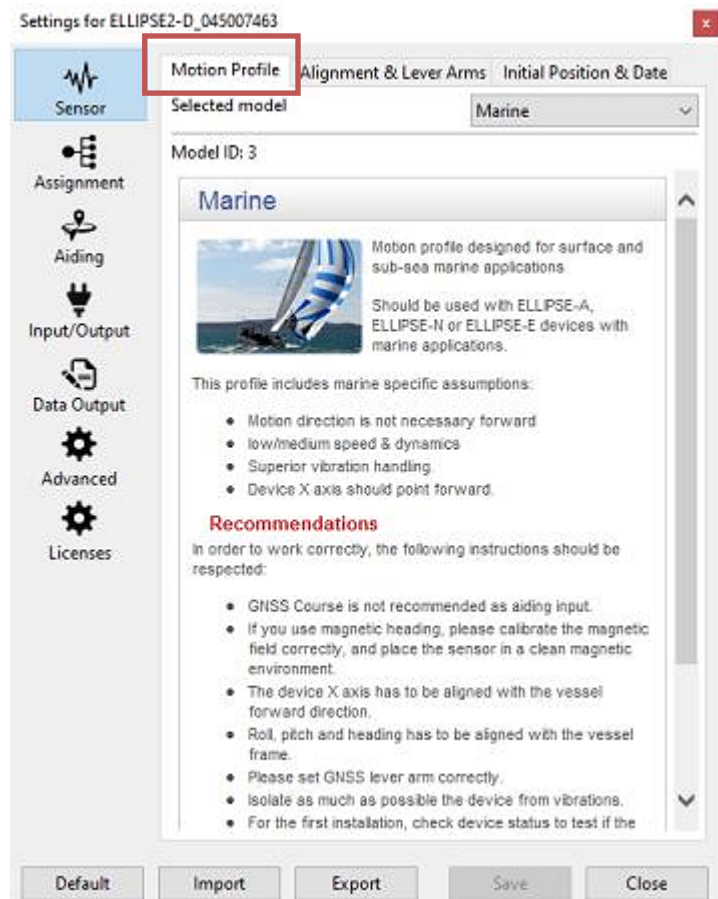
[Open the Settings Dialog](#)



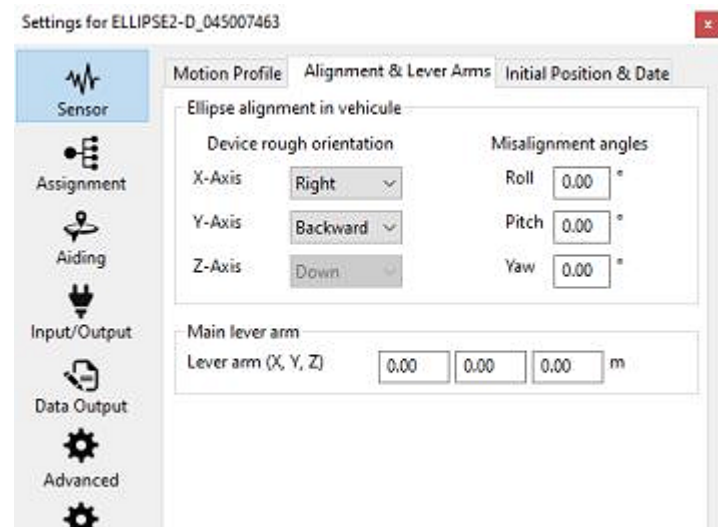
Sensor Tab

On the Sensor tab, the **Motion Profile** we choose is Marine or Airplane mode.

BEWARE! *Never use the Automotive mode.* In this mode the vehicle frame is expected to be very specific and will not work well with the Payload.

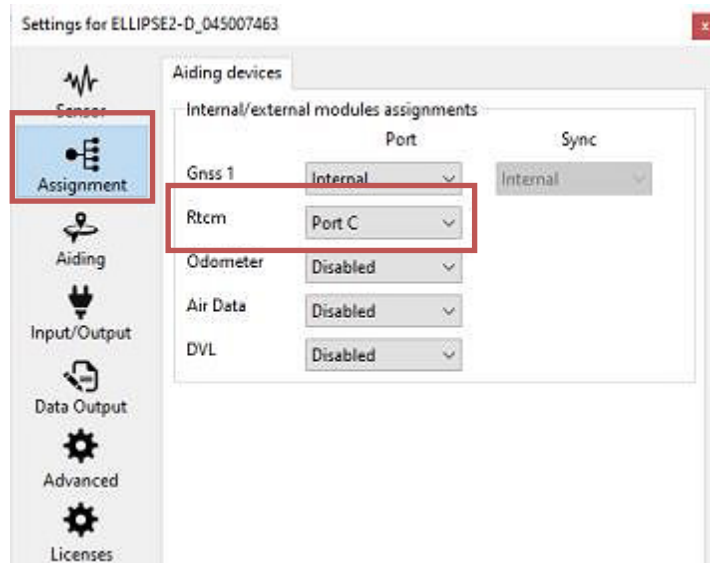


Alignment and **Lever Arms** should be set X-Axis to the Right and Y-Axis to the rear.



Assignment Tab

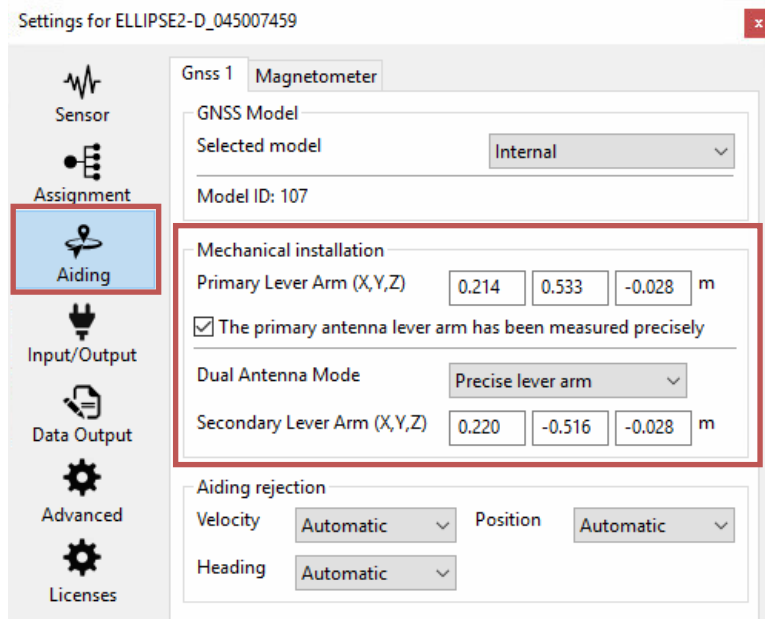
Assignment needs to be turned on to accept the **RTCM** corrections on port C.



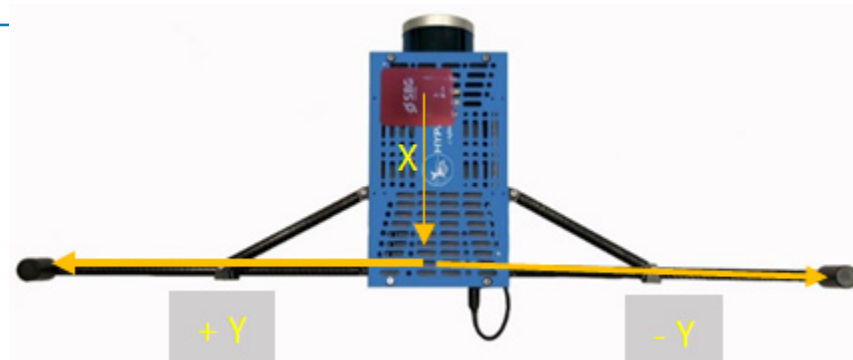
Aiding Tab

Aiding has two tabs:

- The **GNSS tab** is the measurements of the antennas between the antennas.
 - > **Lever Arm X** is from the SBG to the antenna arm axis.
 - > **Lever Arm Y** is from the intersection of the X Axis and the antenna arms.



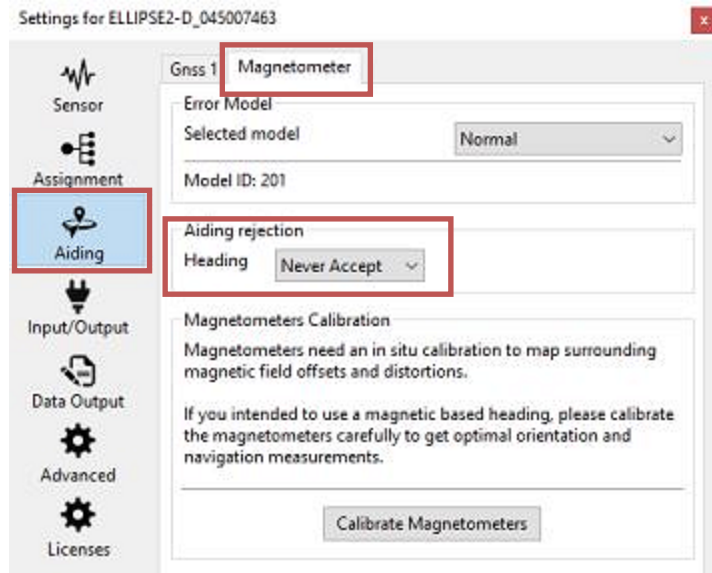
Antenna Offsets Only.



- **Aiding – Magnetometer**

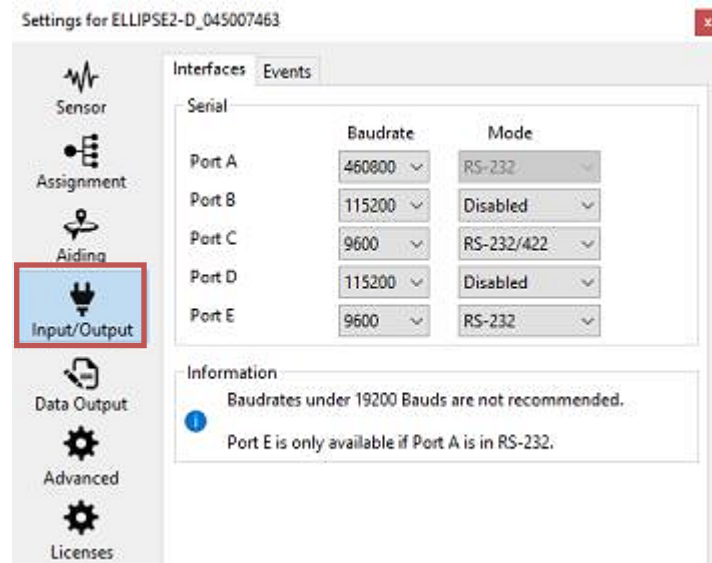
Set the **Magnetometer Aiding Rejection** to Never Accept, which means that it will never accept the magnetometer heading.

(It seems like it should be that it will never accept the rejection, but it really means it will never accept the magnetometer heading.)



The **Input/Output** tab controls the baud rate of the data.

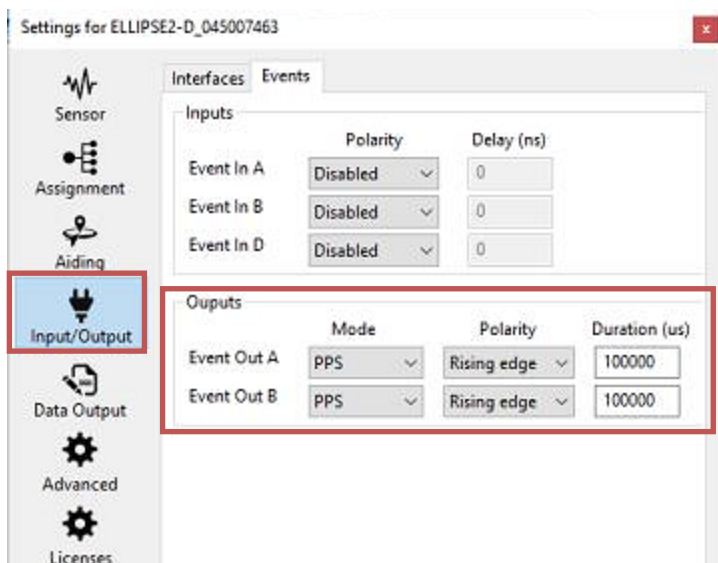
- **Port A** provides the motion and position data to HYPACK®. The baud rate needs to be set to 460,800 so that the motion required for Qinertia logging can be recorded at 200 hz.
- **Port B** is not used.
- **Port C** is used for RTCM and is wired into a serial port on the Payload. The baud rate is set to 9600 for NTRIP.
- **Port D** is not used.
- **Port E** is set to 9600 to send RMC messages to the VLP-16.



Input / Output Events

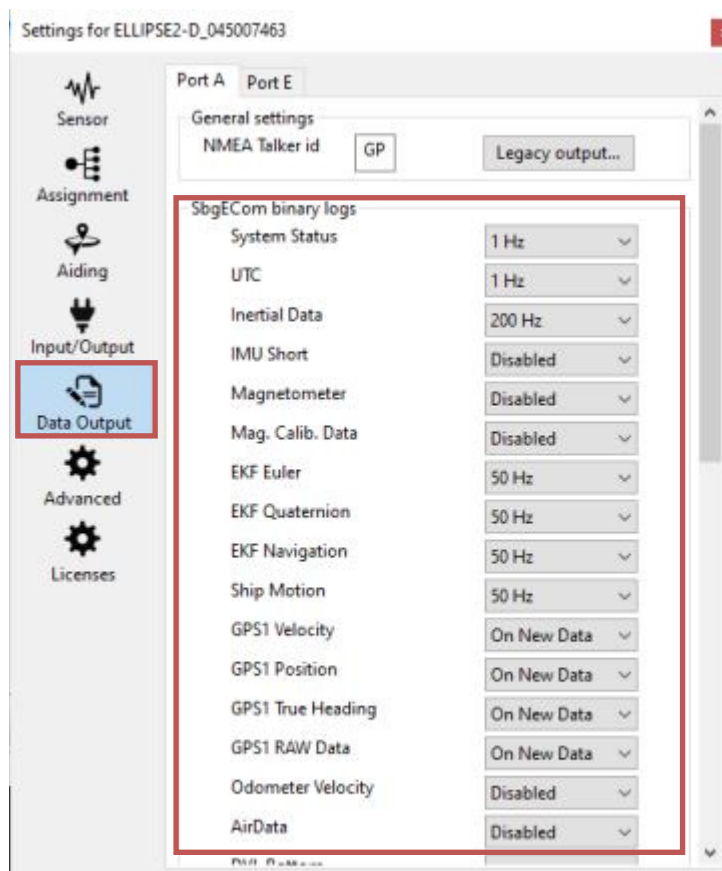
Port A sends the PPS signal to the VLP-16.

The PPS signal needs to be configured so the VLP has a time source.



Data Output

- **PORT A** – Output strings to the HYPACK software.
 - > **System Status:** 1 Hz
 - > **UTC:** 1Hz
 - > **Inertial Data:** 200 Hz
 - > **IMU Short:** Disabled
 - > **Magnetometer:** Disabled
 - > **Mag. Calib. Data:** Disabled
 - > **EKF Euler:** 50 Hz
 - > **EKF Quaternion:** 50 Hz
 - > **EKF Navigation:** 50 Hz
 - > **Ship Motion:** 50 Hz
 - > **GPS1 Velocity:** On New Data
 - > **GPS1 Position:** On New Data
 - > **GPS1 True Heading:** On New Data
 - Everything else:** Disabled

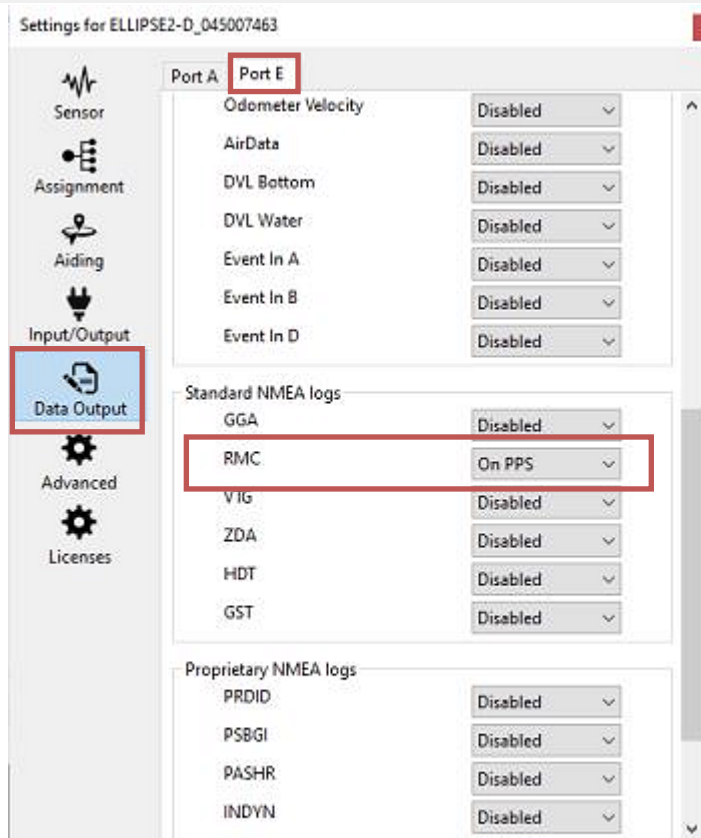


- **Port E – Output to VLP-16**

Everything is disabled except the RMC message.

The **RMC message** provides position and time to the VLP-16.

The RMC message must be set to ON PPS and not set to 1 Hz. At 1 Hz the synchronization between the SBG and the VLP does not work due to the gap in output of the messages.

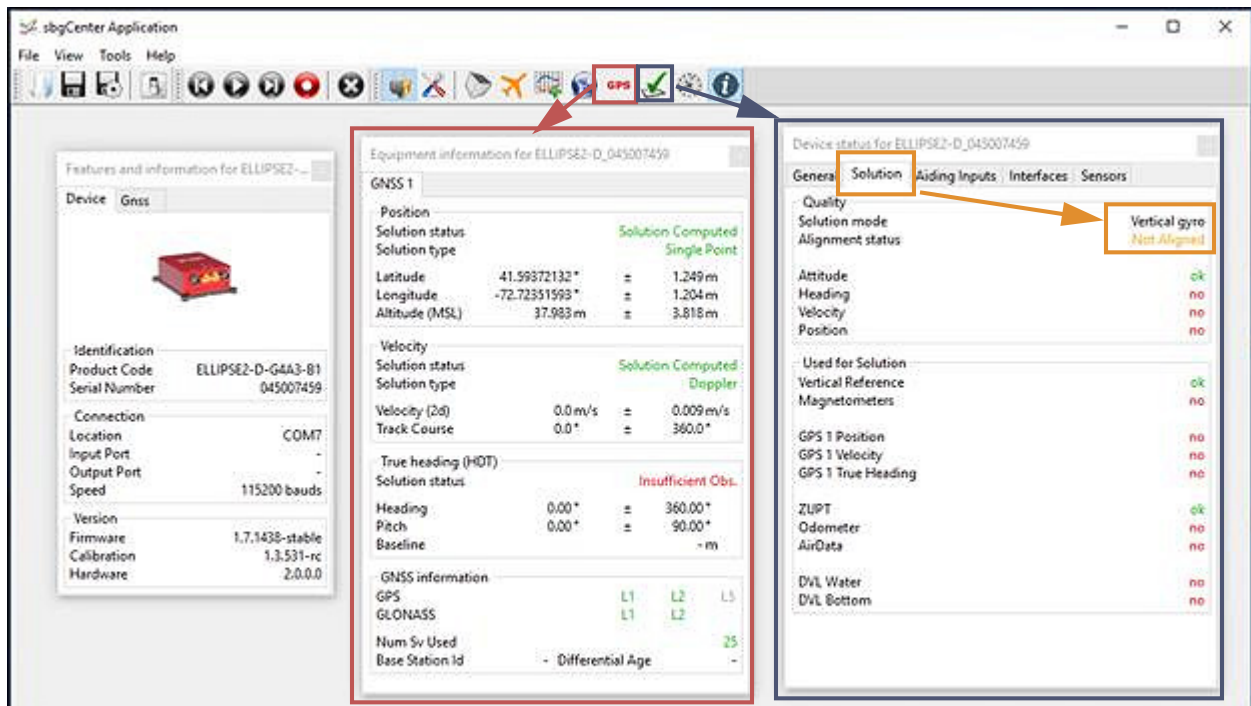


The GPS Icon allows you to see the current status of the SBG. Solution Status changes to RTK INTEGER for highest precision RTK.



The Green Check icon opens the Device Status window. On this window, select the Solution tab to check on the Solution mode and the Alignment Status.

SBG Solution Status



Solution of Vertical Gyro is the initial state. The Vertical Gyro is not a good survey solution. To survey the Solution Mode should be Full Navigation.

Alignment Status initially is in Not Aligned. The status of Not Aligned refers to the IMU Calibration. To calibrate the IMU the unit must be moved in a figure 8 pattern for several minutes to move the IMU through the various headings and motion. Once the IMU calibration is complete the Alignment Status will show Aligned.

VELODYNE VLP-16

To check the Velodyne VLP-16, open a web browser. The IP address (192.168.1.201) will be programmed into the web browser as the initial page that should open.

To verify that the SBG is providing proper timing to the Velodyne, the GPS Position must be updating and the PPS must indicate that it is LOCKED.

Velodyne VLP-16: real-time,...

Velodyne® LiDAR

Sensor Model: VLP-16Lite-A S/N: 11001192518774 MAC: 60-76-88-38-2e-aa Factory MAC: 60-76-88-38-2e-aa

VLP-16 USER INTERFACE

[Configuration](#)
[System](#)
[Info](#)
[Diagnostics](#)

Laser: ☒ On ☐ Off
Return Type: Strongest
Motor RPM: 600 + - Set
FOV Start: 0 + - End: 359 + - Set
PPS Qualifier
Require GPS Receiver Valid: ☐ On ☒ Off
Require PPS Lock: ☐ On ☒ Off
Delay: 5 + - Set
GPS Qualifier
Require GPS Receiver Valid: ☐ On ☒ Off

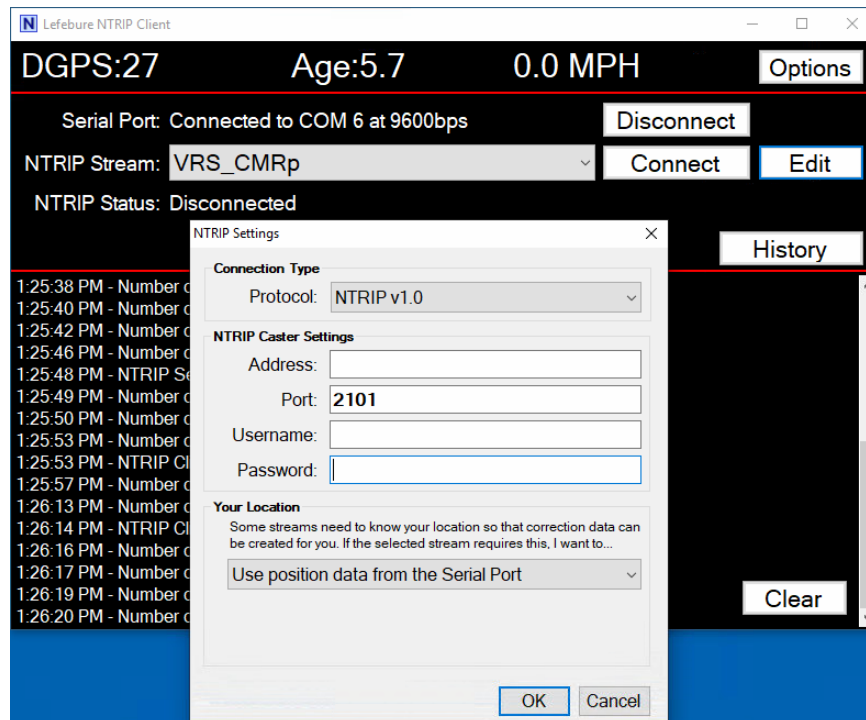
GPS Position: 48 58.282131N 002 15.957682E PPS: Locked
Motor State: On RPM: 600 Lock: Off Phase: 204.39
Laser State: On

RTK CORRECTIONS

The SBG provides RTK corrections using NTRIP data.

The Internet connection is not provided with the LiDAR Payload. You can tether an air card or cell phone to the Payload to provide the Internet connection. Alternatively, you can share the connection with the interface laptop.

HYPACK tests used the Lefebure NTRIP Client for NTRIP corrections.



SBG DRIVER IN HYPACK

The latest SBG driver from HYPACK® includes all of the information that the SBG Center provides. The critical items are Inertial Mode and Alignment.

The initial status for **Inertial Mode** is Vertical Gyro. *This mode cannot be used to survey.* The Inertial Mode changes to Full Navigation when the system has good position information.

The **Alignment** must be Aligned to have good motion information. Without alignment, the system will not produce good data.

To align the system move the Payload so that the heading keeps changing until the system aligns.

Tip: The typical process is to fly, drive or maneuver in a figure 8 pattern.

SBG Ellipse/Ekinox INS-NET:127.0.0.1:5656,UDP,0			
Item	Value	Item	Value
General			
Inertial Mode	Vertical Gyro	Speed	0.06 ft/s
WGS84 Latitude	48°55.0441 N (3...	Sync Error	10.13 ms
WGS84 Longitude	002°05.7251 E (3...	Alignment	Not Aligned
WGS84 Height	118176.58 ft (32...	Internal Logging S...	N/A
Tide Corr	N/A	Time source	SBG
GNSS 1 Solution			
GNSS 1 Solution M...	Float RTK	GNSS 1 Lat Accur...	0.80 ft
GNSS 1 Solution M...	Floating RTK ambi...	GNSS 1 Long Accu...	1.01 ft
Diff Correction Age	2.4 s	GNSS 1 Height Ac...	2.32 ft
# Sats	6		
RTK GPS			
Elevation	N/A	D= Draft	N/A
A= WGS84 height	N/A	K-N= Ellipsoid Ht ...	N/A
H= Z offset	N/A		
Motion			
Heading	357.35° (180.00°)	Yaw	-2.65° (180.00°)
Roll	0.91° (0.12°)	Heave	0.00 ft
Pitch	0.38° (0.12°)	Heave Solution St...	Valid

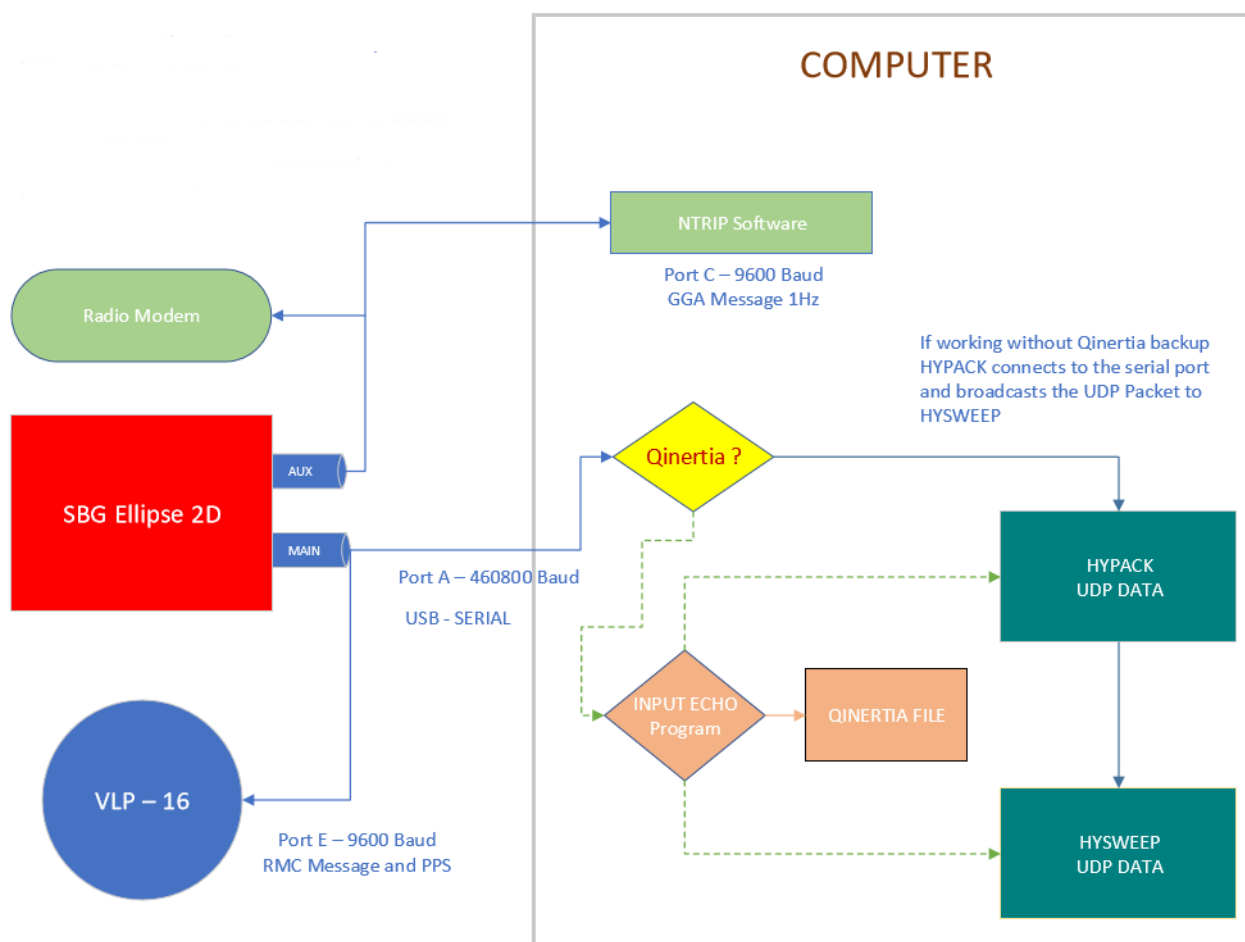
INTERCONNECTION DIAGRAM

The SBG Main cable sends the data used by HYSWEEP®, HYPACK® and, INPUT ECHO. INPUT ECHO receives the SBG data and broadcasts a UDP message to the network. It also generates a binary data file for post-processing in Qinertia. INPUT ECHO *is required only if you are post-processing your data in Qinertia*.

NOTE: Qinertia can read the HYPACK® binary file and generate an SBET file, which can then be used in the HYPACK® 64-bit HYSWEEP® EDITOR to recalculate position. The recalculated positioning usually has a higher degree of accuracy not possible in real-time calculations during data acquisition. *Qinertia is not included in the LiDAR Payload package*. You must purchase it separately from SBG Systems.

The following diagram helps visualize the interconnection of hardware and software. The SBG has two output connectors: The Main Connector has several serial ports. If the Qinertia data is not required, the HYPACK® SBG driver can be substituted to pass the data to HYSWEEP®.

SBG Interconnection Diagram



HYPACK WORKFLOW

To begin a survey do the following:

1. **Start the Input Echo Program.**

Input Echo Interface

- a. **Name your output file.** Click the file location icon to give a file name. If no Output File is specified, the program writes a *date.bin* file in the RAW folder.
- b. **Click [Start]** to begin routing the data to the UDP port.

IMPORTANT: Input Echo must run for at least 5 minutes before you begin logging data in HYPACK®.

2. **Start HYPACK®.**
3. **Make sure the geodesy is correct.**
4. **Launch the HYPACK® SURVEY/ HYSWEEP® programs.** (Click the Smart Survey Icon.)
5. **Conduct the survey.**

