SonarWiz 7.00.0012 Norbit iLiDAR Laser configuration and usage notes (DRAFT)

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1 Overview

The Norbit iLiDAR Laser is a turnkey mobile laser scanner designed for terrestrial mapping. The iLiDAR consists of a Velodyne LiDAR Puck (VLP-16) sensor mounted to a custom bracket that orients the VLP-16 vertically for mobile scanning. The system can integrate with other NORBIT sensors such as the MBES and forward-looking sonars.

SonarWiz supports real-time simultaneous data acquisition and editing of the iLiDAR laser and MBES system. SonarWiz also supports post-processing of iLiDAR data and simultaneous NORBIT MBES collected in Hypack.

This document describes how to configure and process the iLiDAR system in SonarWiz.

2 Platform Configuration

The SonarWiz Vessel Editor uses the Sensor Class **Laser Scanner** to indicate a LiDAR (Laser Detection and Ranging) instrument. In order to import and process LiDAR data you must have a laser scanner sensor configured on your platform.

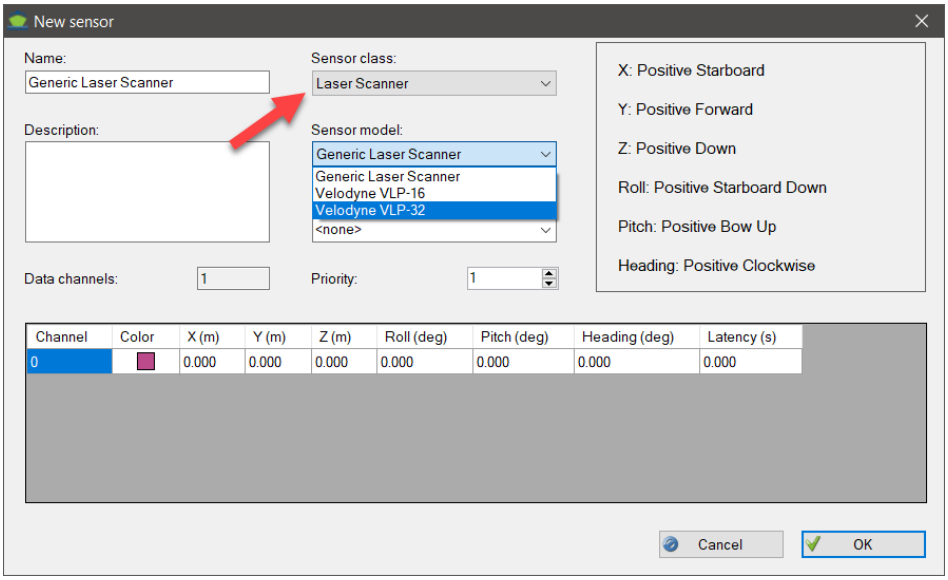


Figure 1: Laser scanner configuration

SonarWiz assumes that the iLiDAR system is oriented with the laser puck forward of the mounting bracket and the mounting bracket beneath the puck as shown in Figure 2. To indicate a change of the iLiDAR orientation, apply Heading, Roll and Pitch rotations using the conventions shown in Figure 3.

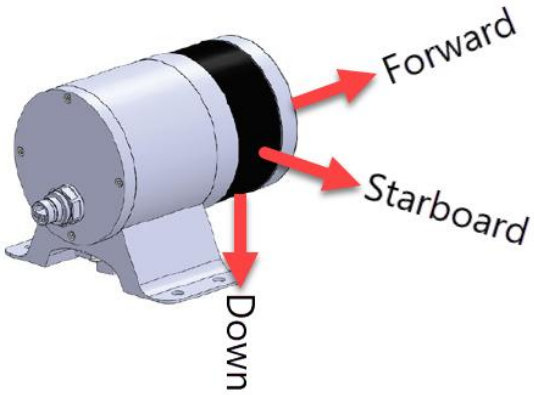


Figure 2: iLidar installation conventions (arrows indicate positive direction)

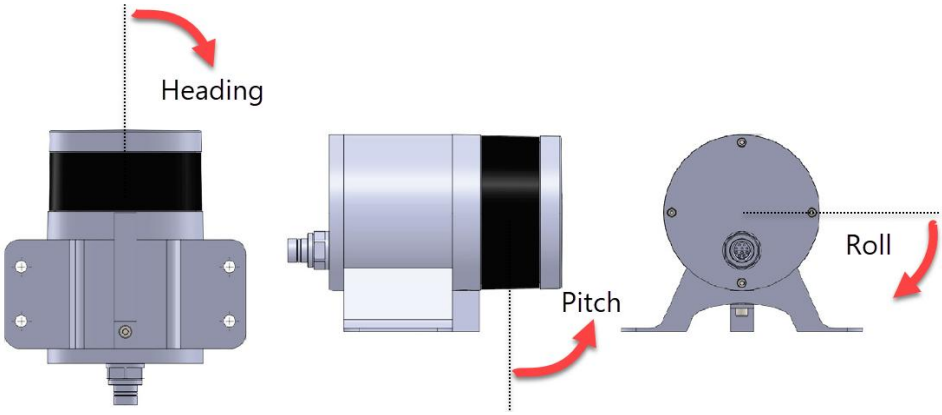


Figure 3: iLiDAR installation orientation conventions (arrows indicate positive rotation direction)

Note that in the SonarWiz Vessel Editor the vertical (Z) offset is positive down. Therefore, if the iLiDAR is located above the vessel reference point, it should have a negative z-offset as shown in Figure 3.

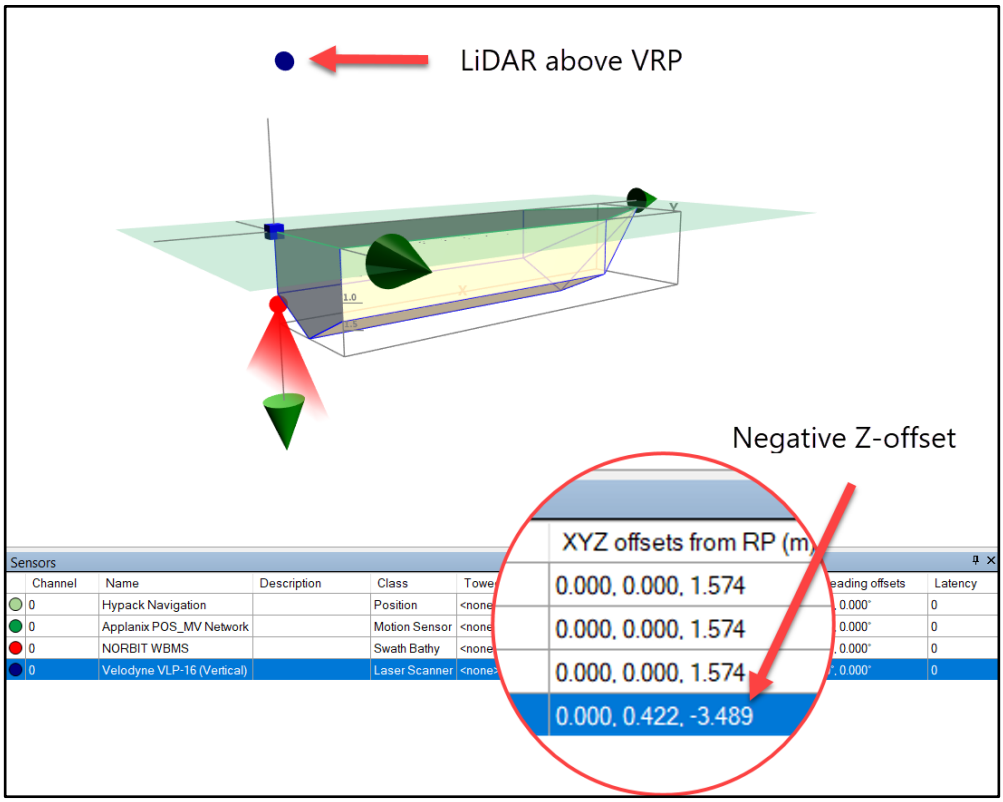


Figure 4: SonarWiz vessel configuration with LiDAR above the VRP

2.1 Configuration for Post-Processing Hypack HSX data

SonarWiz supports post-processing of iLiDAR data collected in Hypack and saved in Hypack HSX format. In order to maintain compatibility with the HSX format, the vessel configuration should be set to match the device offsets found in the appropriate device offset (OF2) message found in the HSX file. The only significant difference is that Hypack assumes that the laser is mounted backwards, that is, with a 180-degrees heading rotation, compared to SonarWiz. So you will need to include this 180-degree rotation in the SonarWiz configuration as well.

The easiest way to load the offsets is to import the sensor offsets directly from the HSX files in the vessel editor using the **File > Import Sensors** menu item. SonarWiz will then configure the iLiDAR sensor to match the values detected in the HSX file (it will also configure a companion multibeam system if it was installed).

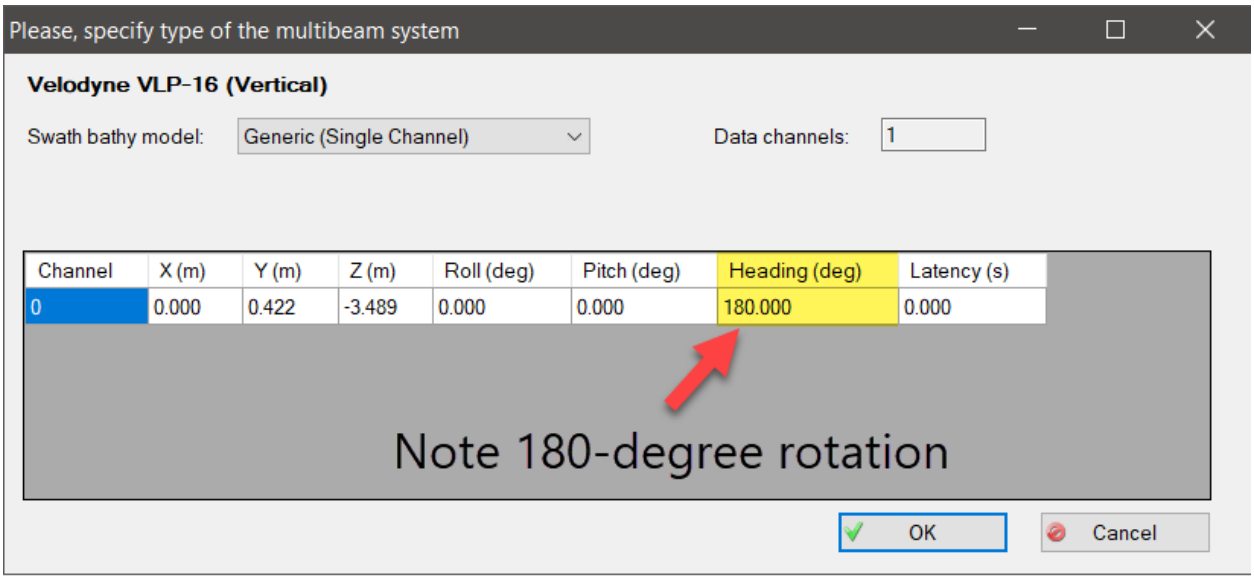


Figure 5: Importing iLiDAR device offsets from the HSX file.

3 Real-time LiDAR Data Acquisition

3.1 Prerequisites

To acquire the LiDAR data from the Velodyne VLP-16 you need to install the latest Multibeam Server from the CTI support site. The minimum version of the Multibeam server is 7.00.0011. You must also have the latest SonarWiz 7 installed. The minimum version of SonarWiz 7 is 7.00.0013. A valid multibeam bathymetry acquisition license is required to acquire LiDAR data.

3.2 Vessel Configuration

To acquire LiDAR data, you must add the appropriate LiDAR sensor to the vessel using the SonarWiz Vessel Editor. When acquiring data with SonarWiz, enter the offsets as described above in the Platform Configuration section with one exception. When acquiring data with SonarWiz, it is NOT necessary to add the 180 degree heading rotation.

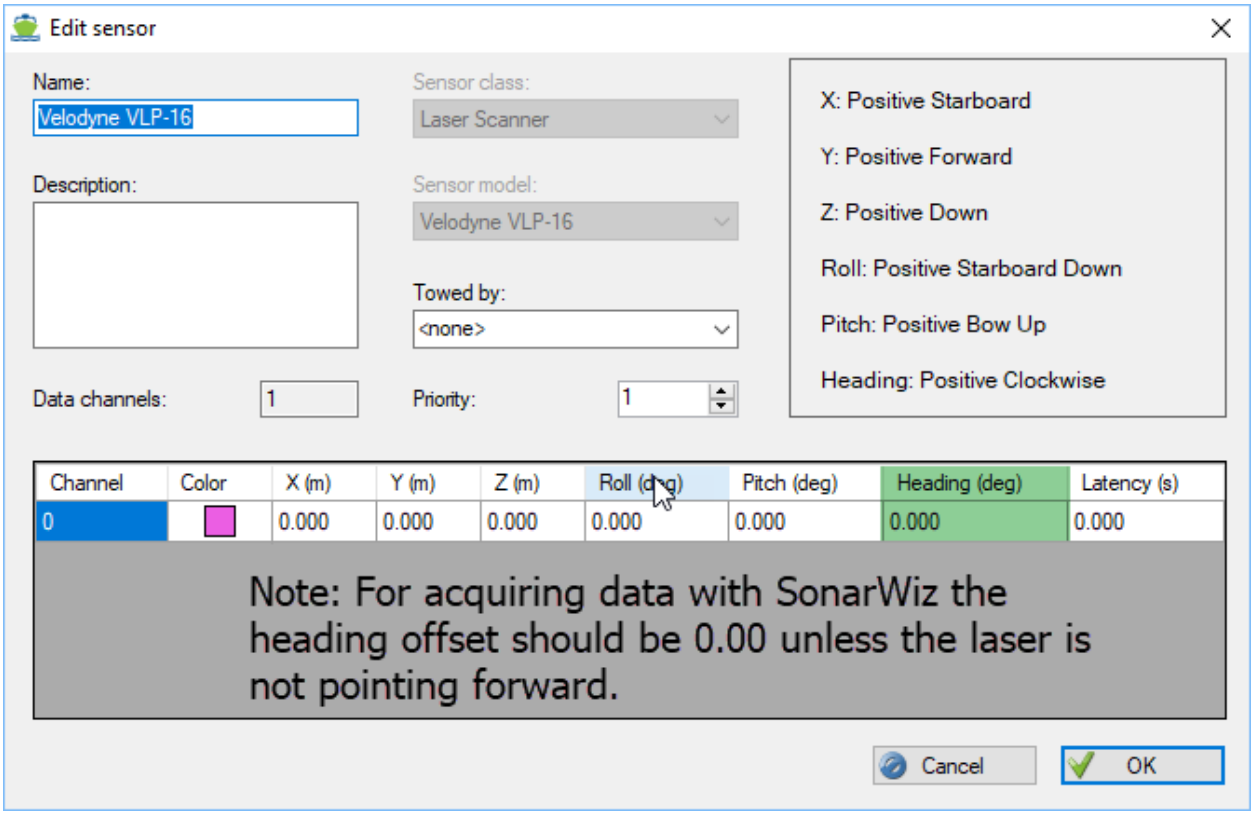
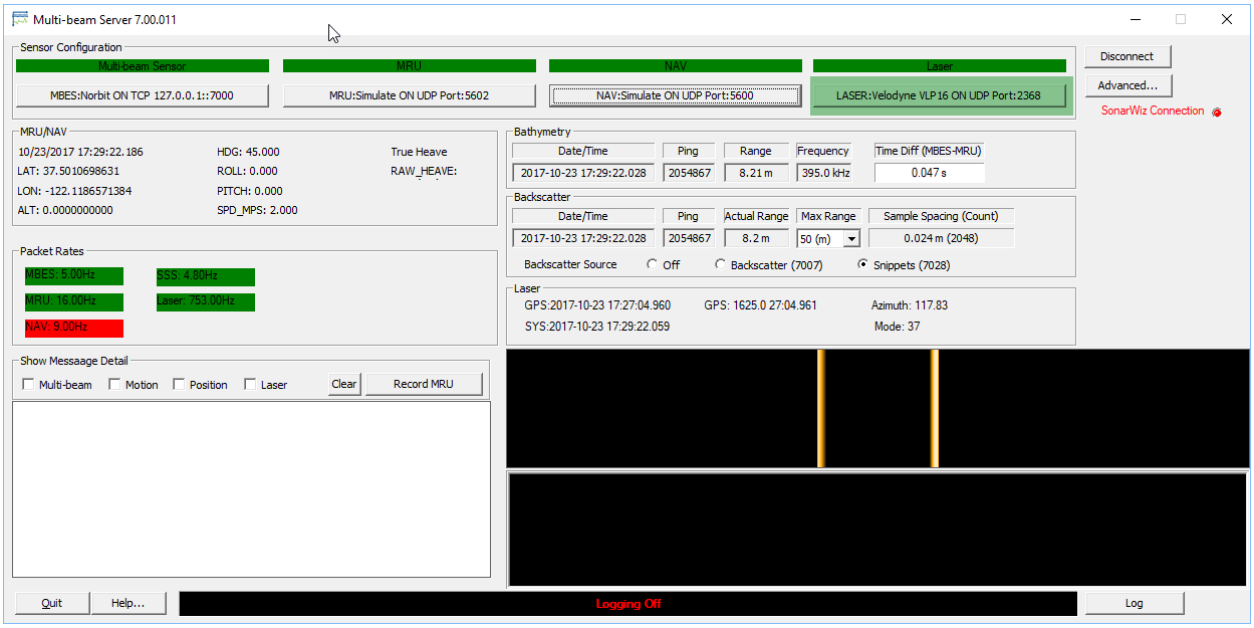


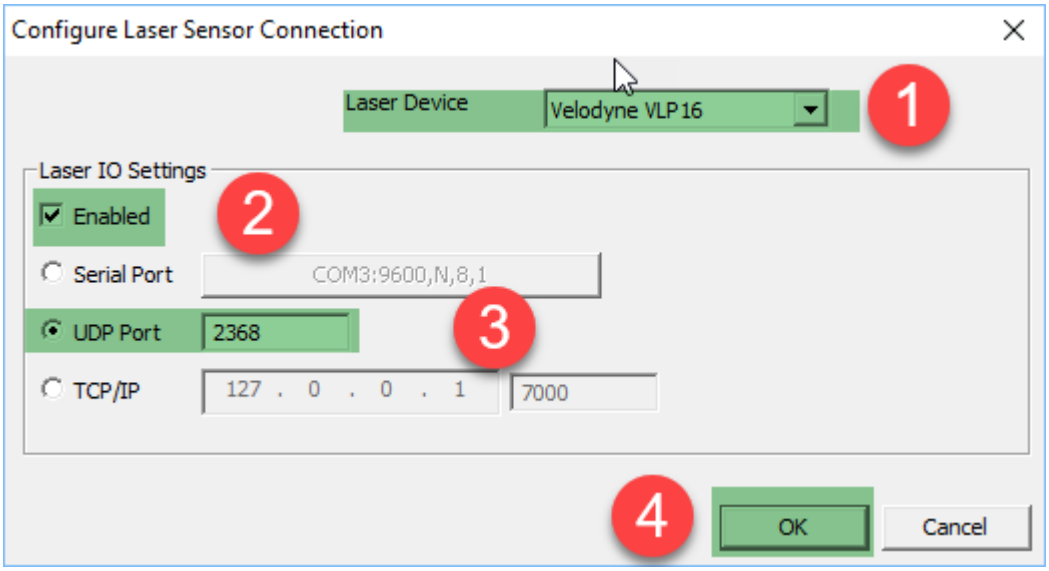
Figure 6: Configuring the LiDAR sensor for data acquisition in SonarWiz.

3.3 Server Application Configuration

To configure the Multibeam server to acquire LiDAR data some additional one-time configuration is needed. Start by configuring the IO setting for the LiDAR interface by clicking the Laser button highlighted below:



This action will display the IO configuration window for the LiDAR system ash shown below:

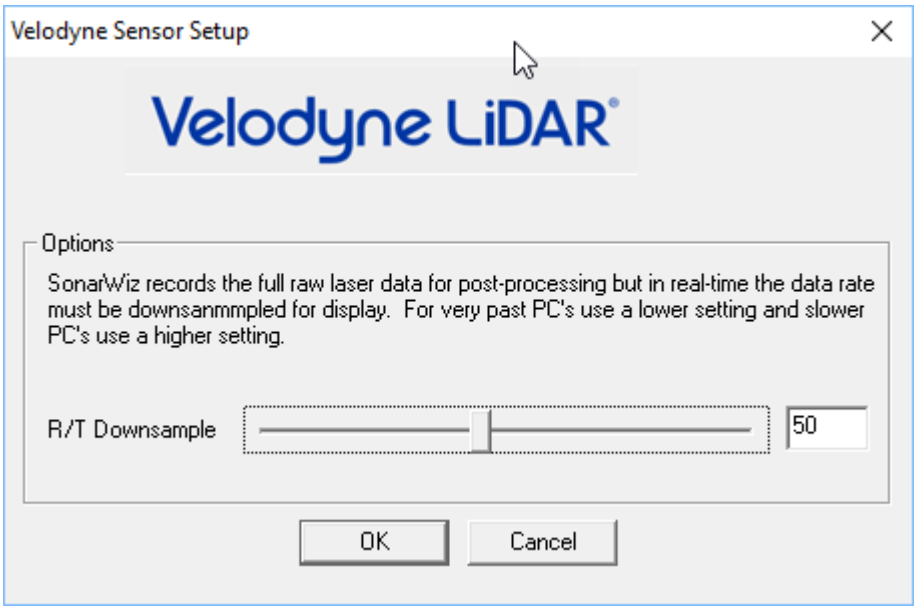


Select the laser model in the Laser Device drop down window.

Set the Enabled checkbox to turn the sensor logic on.

Set the UDP port radio button to configure the electrical interface type and set the port number to 2368 which is the default UDP port number.

Press OK to start the acquisition logic and also to launch the custom VLP-16 configuration window shown below:



Currently, there is only a single setting for the Velodyne LiDAR setup. This setting controls the downsampling of data from the server to SonarWiz. The acceptable range of values allowed is currently 10 to 100. Smaller value produce lower downsampling. Larger values produce more downsampling.

NOTE: SonarWiz records ALL of the raw data from the iLIDAR system. This setting only controls the downsampling used for display purposes in SonarWiz. The recorded XTF file will contain the full resolution LiDAR data.

When you press OK, the server application will begin processing LiDAR packets and your settings will be saved to the Windows registry and will appear the next time you

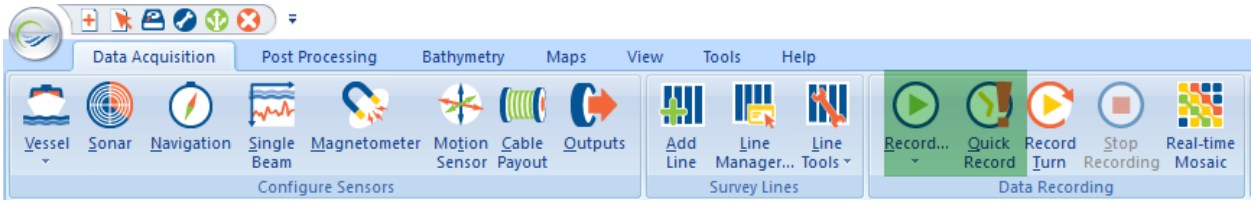
start the server. This step can be skipped next time you start the server, unless you need to change the configuration.

3.4 Configuring All Sensors

After the one-time LiDAR sensor configuration you can start all of the active sensors by clicking the Connect button. The Connect button will initialize the Multibeam Sonar, Motion Sensor, Navigation System and LiDAR sensors if they are enabled.

3.5 Configuring SonarWiz for Acquisition

Once the server is configured correctly, you can begin recording data in SonarWiz using the Quick Record or Record Sonar Data… buttons on the Data Acquisition tab shown below:



LiDAR data is treated like multibeam bathymetry data in SonarWiz 7. If you are recording the Norbit and the LiDAR data at the same time, a single XTF file will contain both the bathymetry and the LiDAR data.

SonarWiz stores the raw LiDAR data as a user defined XTF data packet type 254. The full raw data packet from the LiDAR system is embedded in the XTF file and SonarWiz 7 can import these packets during post-processing.

4 Post-Processing

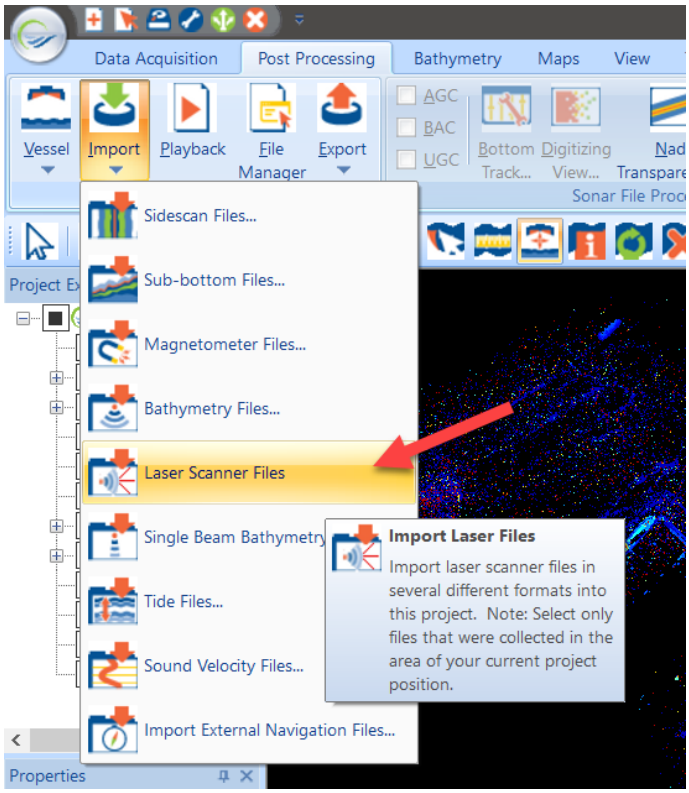
To post-process iLiDAR data collected by SonarWiz:

4.1 Define a Vessel and Add Sensors

Set up the vessel as described in the Platform Configuration above (note the difference between SonarWiz native data and Hypack data)

4.2 Select to Import Laser Scanner Files

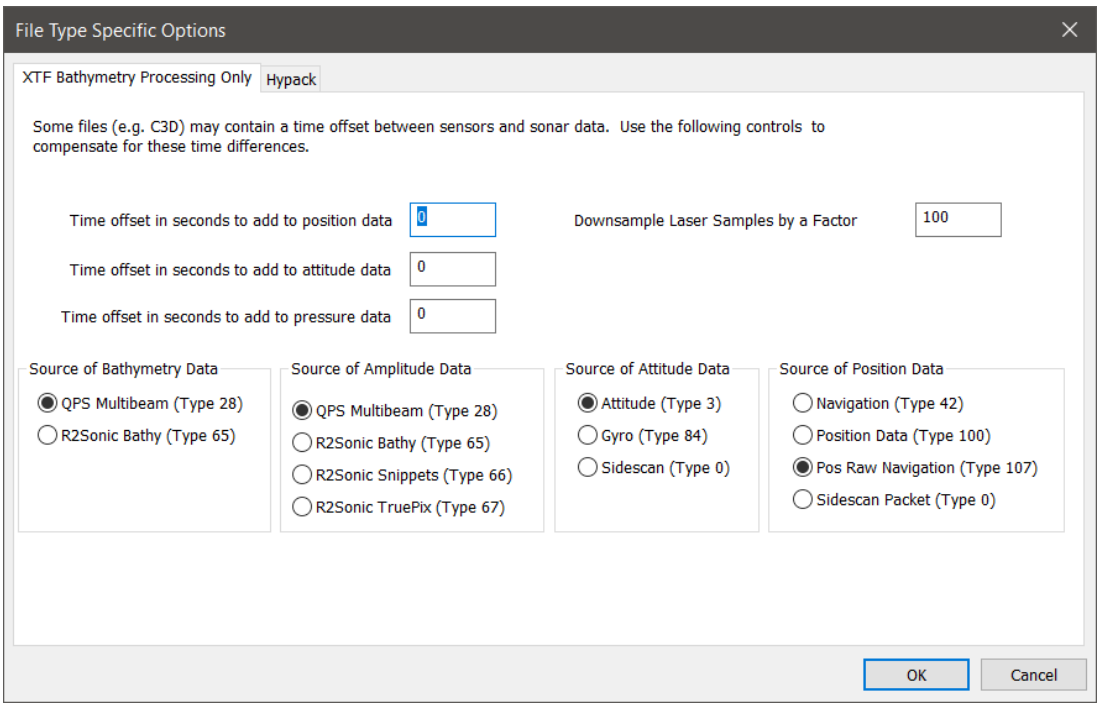
Select Post Processing > Import > Laser Scanner Files



4.3 Open the File Type Specific Options

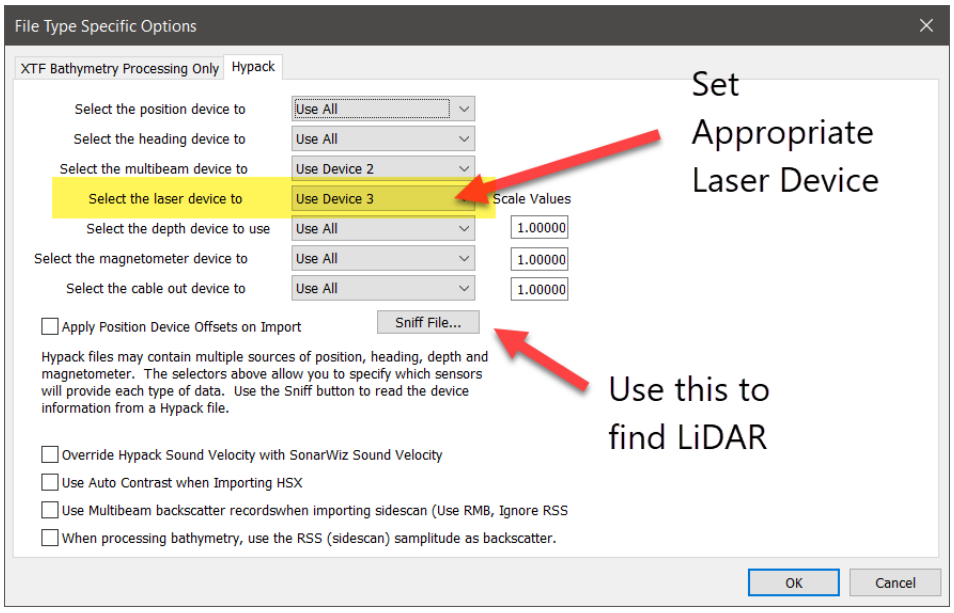
<u>For XTF files:</u>

This is changing, more to come, but the following settings worked during testing:



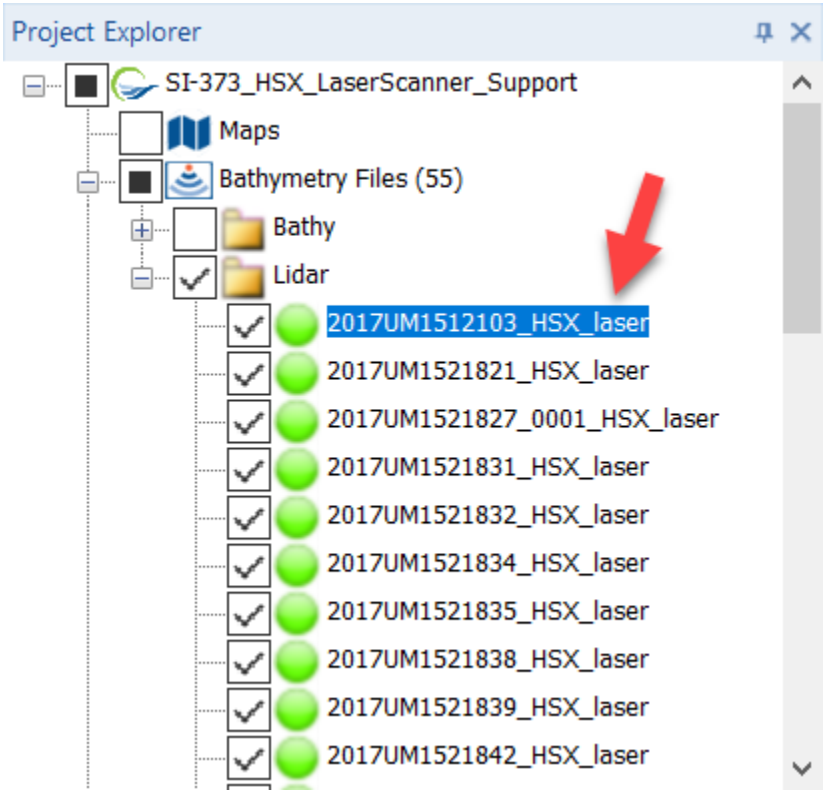
For Hypack HSX files:

Select the lidar device number in the Hypack options tab (Use the Sniff file to find it)



4.4 Click OK to Import the LiDAR Files

Laser files will be imported with the "_laser" extension shown in the Project Explorer in order to distinguish them from MBES data collected in the same XTF or HSX file. Note, if desired, you must import the multibeam data separately, using the Bathymetry import option.



4.5 Next, Merge the LiDAR Files

From this point forward, laser scanner data is treated almost identically as swath bathymetry data, with the following exceptions:

1. Pressure sensor and Sound Velocity settings are ignored (Tides, GPS heights, etc are applied as expected)
2. Many filters have not been tested and may not work as expected (will come soon)
3. Error model settings are ignored (CUBE is not functional for laser data)

4.6 Edit Files in the Swath and Area Editors

4.7 Visualize the Files in SonarWiz using the 3DViewer

4.8 Make Products (Export images, etc).

It doesn't make much sense to Grid laser data, since so much of the information is vertical in nature and grids can't represent vertical surfaces. However, if you have the Norbit MBES data loaded into the same project. It looks great to plot the lidar point cloud over the top of the Norbit gridded bathymetry as shown here: