



EIVA

QUICK GUIDE

BLUEROV2 IMU CALIBRATION

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1 How to navigate this Quick Guide

- [Introduction to IMU calibration in NaviSuite Mobula](#) – describes the overall procedure as a whole
- [Accelerometer and gyro calibration](#) – describes user interactions in details when calibrating accelerometer and gyro, including:
 - Checking accelerometer calibration
 - Visualisation of standard vehicle calibration steps
 - Board orientation estimation is included under [Board orientation](#)
- [Compass calibration](#) – for technical suggestions, check Calibration Process
- [Notes and FAQ](#) – If you have a problem with calibration or a question regarding this procedure, look at the items in this section. If your issue is not addressed here, please submit it to support@eiva.com.
 - Each issue is handled as a separate item in the content table.

2 Introduction to IMU calibration in NaviSuite Mobula

The IMU Calibration feature in NaviSuite Mobula allows users to calibrate the onboard controller's accelerometer, gyroscope, and compass. As an integral part of accelerometer calibration, the IMU board orientation is also estimated.

By default, the **IMU Calibration** interface is docked to the **left sidebar**. The window is shown on the figure below:

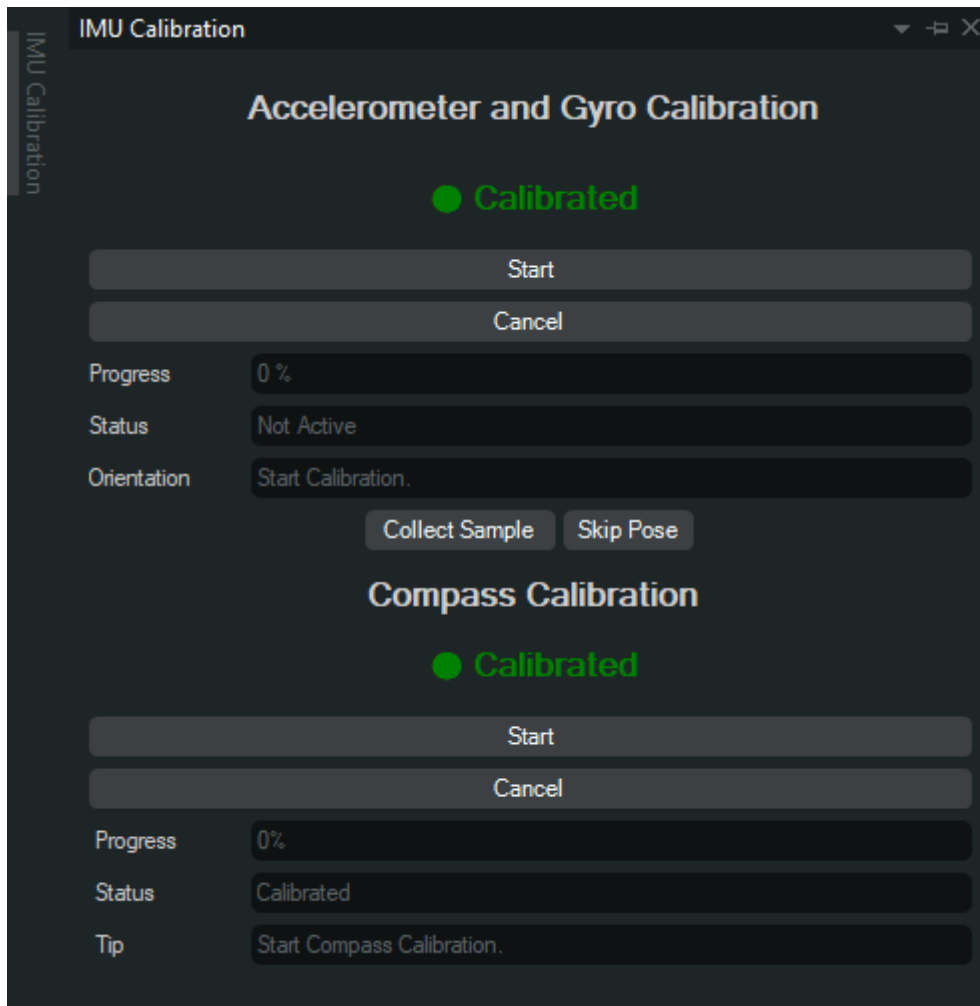


Figure 1 IMU Calibration window

Note: The accelerometer and gyroscope calibration are performed simultaneously.

2.1 Basic use procedure

In the case that the IMU sensors are not calibrated, the status will show *Calibration required*:

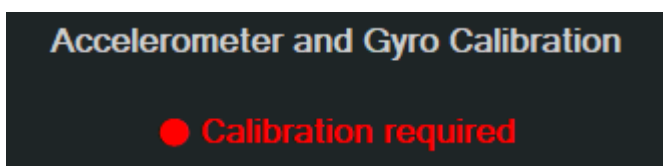


Figure 2 Accelerometer and Gyro Calibration status

For first time use, it is necessary to calibrate sensors to have optimal performance of the onboard AHRS algorithm.

It is especially important to calibrate the accelerometer in the case where the user has not configured a board orientation in the original board software. It is not possible to independently change this setting without recalibrating the accelerometer through NaviSuite Mobula.

If the board IMU is already calibrated before use in NaviSuite Mobula, it is not required to recalibrate it.

In version 4.7.2. if the accelerometer is not calibrated, it is not possible to calibrate compasses.

3 Accelerometer and gyro calibration

3.1 Calibration window

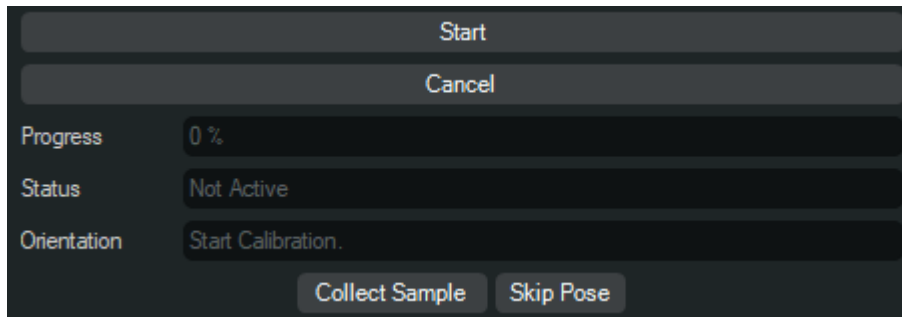


Figure 3 Accelerometer and Gyro Calibration window

The possible actions in the calibration window are:

- **Start** – Starts the calibration
- **Cancel** – Cancels the current calibration
- **Collect Sample** – Starts collecting samples for calibration
- **Skip Pose** – Changes the current proposed orientation

The information texts will display the following:

- **Progress** – Shows the percentage of samples that have currently been sampled
- **Status** – Shows the current state that the calibrator is in
 - *Not Active* – The calibrator has not been started.
 - *Cancelled* – The calibrator is currently not active due to being cancelled.
 - *Failed* – The calibrator is currently not active due to failing during calibration.
 - *Successfully calibrated* – The calibrator is currently not active due to being completed successfully.
 - *Sampling* – Hold the vehicle still, press **Collect Sample** and keep holding the vehicle still while the display shows *sampling*.
Note: This is important as moving during sampling will cause the calibration to become worse or even fail.
 - *Waiting* – The calibration is waiting for the next sample and can be moved without disturbing the calibration process
- **Orientation** – Shows the orientation the vehicle should be held in when pressing **Collect Sample**

The calibration consists of two phases, calibrating along the principal axis and calibrating in arbitrary orientations. To achieve the best possible calibration, the instructions on the

screen should be followed. However, if any of the orientations are hard to achieve, the **Skip Pose** button gives the option to skip the current orientation. Skipping an orientation will add an additional arbitrary position to the calibration.

Not all orientations are skippable; the first orientation, and the second or third are required orientations.

Note: The calibration is more prone to failure if all the samples are done in a similar orientation. A total of 9 samples is required to complete the calibration.

3.2 Accelerometer calibration

The accelerometer is calibrated by collecting samples in the orientations described in the [Calibration window](#). For reference, look at the images below to better understand the vehicle's orientation in each step (opposite views compared left to right).

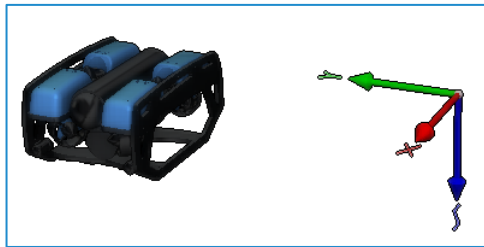


Figure 4 Bottom downwards



Figure 8 Top downwards

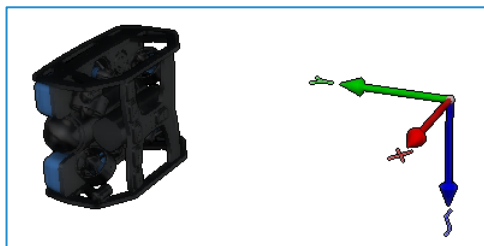


Figure 5 Starboard downwards



Figure 9 Portside downwards

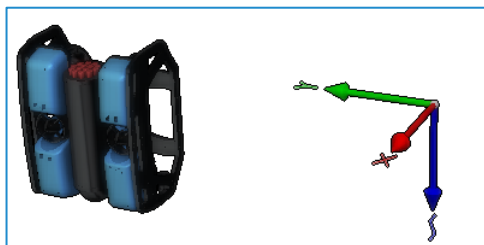


Figure 6 Front downwards

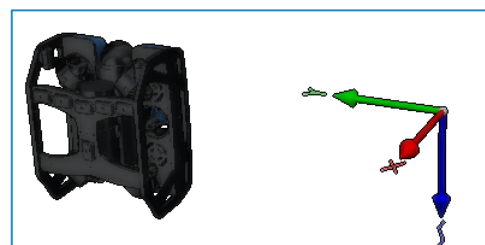


Figure 10 Back downwards

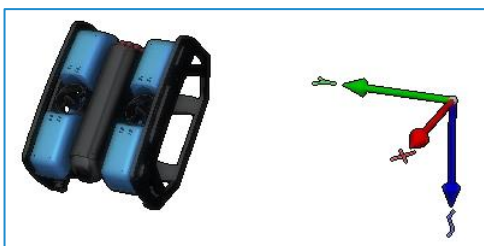


Figure 7 Arbitrary example 1

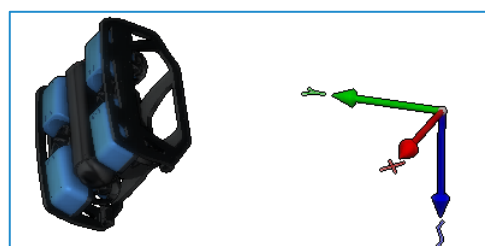


Figure 11 Arbitrary example 2

3.3 Board orientation

When calibrating the accelerometer in NaviSuite Mobula, the board orientation will be estimated automatically. This is only possible if the first two samples are gathered along at least 2 out of 3 of the vehicle's principal axes.

Because of this, it is only possible to skip certain steps during calibration. It is currently not an option to skip the board orientation estimation when calibrating in NaviSuite Mobula.

3.4 Gyroscope calibration

Calibrating the gyroscope requires no extra steps and will happen as part of the accelerometer calibration.

The calibration is done during the same steps as the accelerometer and so it is important that the vehicle is moved as little as possible during sampling.

4 Compass calibration

The compass calibration process allows the user to calibrate an onboard controller's compasses and magnetometers.

4.1 Calibration window

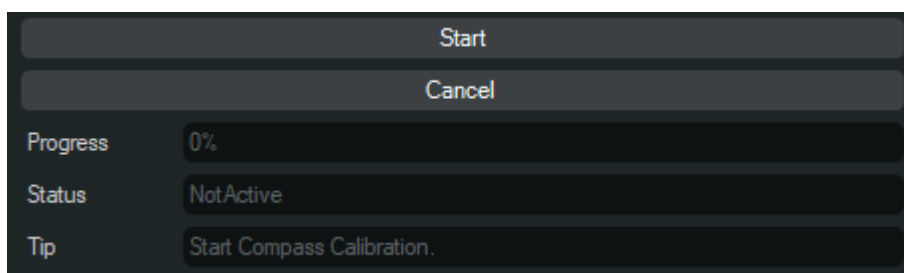


Figure 12 Compass Calibration window

The actions in the calibration window are:

- **Start** – Starts the calibration
- **Cancel** – Cancels the current calibration

The information texts will display the following:

- **Progress** – Shows the percentage of samples that have currently been sampled

- **Status** – Shows the current state that the calibrator is in:
 - *Not Active* – The calibrator has not been started
 - *Cancelled* – The calibrator is currently not active due to being cancelled
 - *Failed* – The calibrator is currently not active due to failing during calibration
 - *Successfully calibrated* – The calibrator is currently not active due to being completed successfully
- **Tip** – Shows *Brush the sphere with an ROV*. once the calibration is started

4.2 Calibration Process

Once the calibration is started, the calibration algorithm starts sampling the magnetic field. The **Progress** indicator updates whenever new satisfactory samples are collected. At 33%, the algorithm begins running the calibration procedure.

Technical Note 1 – If the progress is stuck below 33%, it is very likely that one of the magnetic sensor axes is aligned with the magnetic field vector. In that case, tilt the ROV by 45 degrees in roll and pitch and try brushing the sphere again.

Technical Note 2 – Mounting the controlling board at a pitch offset of 45 degrees improves the sensitivity of the magnetic sensor in respect to Note 1.

Technical Note 3 – Compass calibration is influenced with surrounding magnetic fields and passive metals.

Failure in calibration can result from poor sampling, very disturbed magnetic field, or malfunctioning compass.

5 Notes and FAQ

5.1 Persistence of calibration parameters

Calibration parameters are saved on the controller board. This applies for board orientation as well. None of these parameters are saved with your NaviSuite Mobula project or Configuration project.

On NaviSuite Mobula application start up (which includes both project loading and reconnection of the vehicle), parameters are read from the board and stored for that NaviSuite Mobula session.

5.2 Is it required to do a sensor calibration in Mobula?

No, it is not required but it is recommended. It is especially important to perform the calibration procedure in the cases where the IMU board orientation on the vehicle is not properly set up.

5.3 Calibration parameters not retrieved

This means that calibration parameters are not successfully retrieved from the board. If this state is not automatically resolved after 1-2 minutes, try power-cycling the board and / or restart NaviSuite Mobula.

In this state, calibration is not allowed, even if the vehicle is connected.

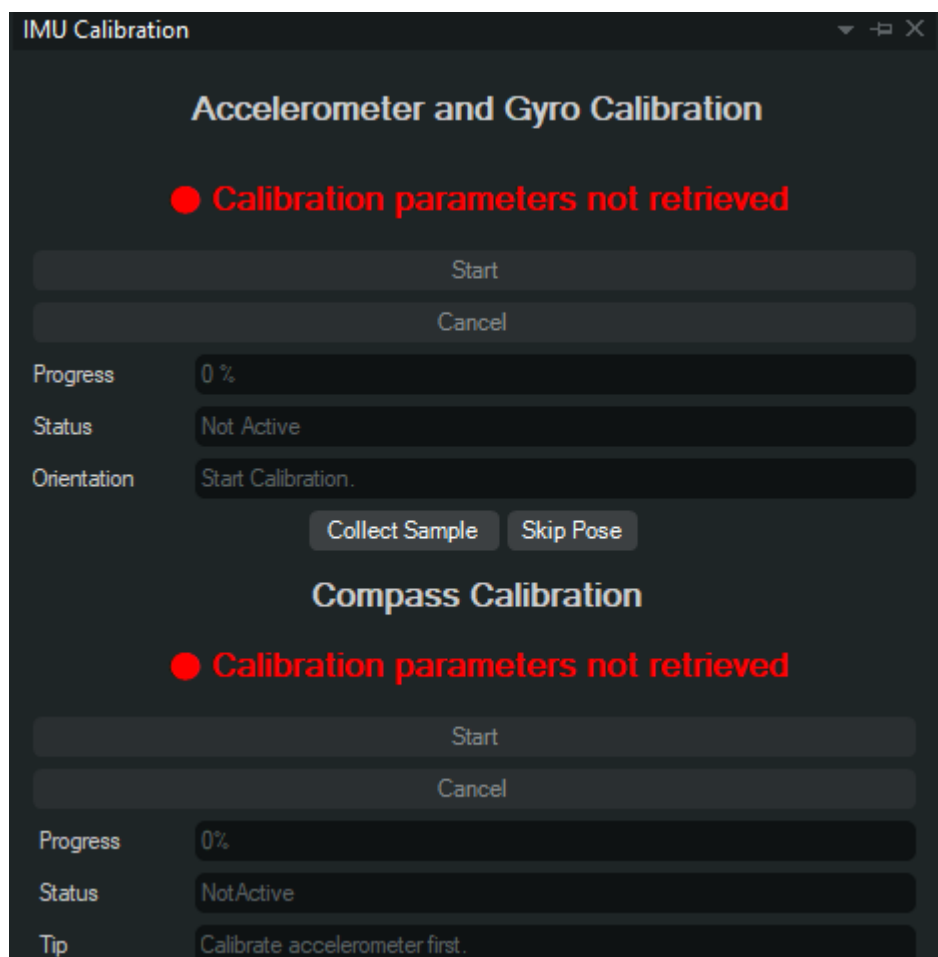


Figure 13 IMU Calibration window with Calibration parameters not retrieved

5.4 Is it required to recalibrate the compass after accelerometer recalibration?

Compass parameters are automatically updated after the accelerometer is calibrated, but in general it is a good idea to recalibrate the compass as well, in case the system configuration has changed from the last calibration, or the vehicle is being operated in a relatively different location.