

Purpose

The purpose of this guide is to provide technical guidance and best practice information on GNSS antenna installations specifically when used for GNSS heading determination. This guide should be used in conjunction with the [Antenna and Coaxial Cable installation guide](#)

Background

GNSS heading systems determine where an object is pointing with respect to true north on the horizontal plane. GNSS heading is a vector calculation between two separated GNSS antennas. The calculation is performed at the range level. As most errors are common for both GNSS antennas, RTK level accuracy of the vector measurement can be attained.

As with all GNSS measurements satellite visibility is the primary consideration, however other factors still need to be considered: -

- Antenna separation
- Common satellite visibility
- Height
- Orientation

Antenna Separation

The antenna separation is the distance between the primary and the auxiliary antennas. The table below is an example of how the specified GNSS heading accuracy for Veripos Heading receivers improves as the antenna baseline separation increases.

Antenna Separation	Heading Accuracy (RTK fixed)
1m	0.3 degrees
3m	0.1 degrees
10m	0.03 degrees

If Veripos Technicians are mobilising the system and 3-meter separation cannot be achieved, this shall be discussed with the customer to advise the expected accuracy.

Common Satellites Visibility

The heading computation requires common GNSS ranges measurements so it is important to ensure that both GNSS antenna are tracking as many common satellites as possible. Both antennas should ideally have the same satellite visibility, coaxial cable types and cable lengths. The GNSS antennas should also be of the same make/manufacturer and model.

Height

Install both GNSS antennas at the same height as this will help to ensure similar satellite visibility and will aid alignment along a known vessel orientation. The figure below illustrates the effect of vessel roll on GNSS antenna installed at different heights.

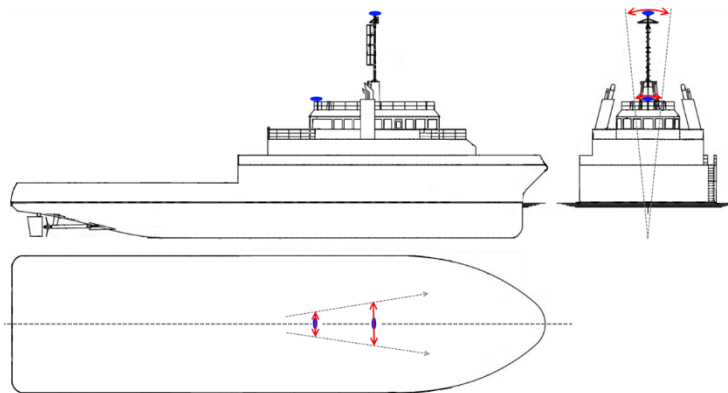


Figure 1 GNSS Antenna Height Mismatch

Orientation

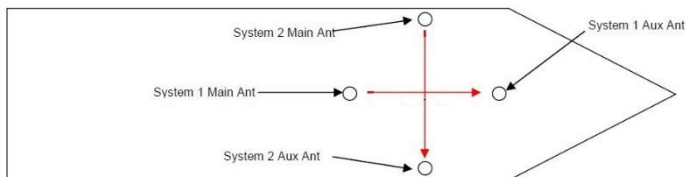


Figure 2 GNSS Antenna Installation

Ideally the baseline between the installed GNSS antenna will be orientated along the vessel centre line (along ship). If this is not practical the GNSS antennas should be installed perpendicular to the centreline (across ship). These two scenarios are illustrated in the figure above.

Calibration values (c-o) should be applied within Survey or DP software. Avoid storing the calibration factor within the GNSS system if possible.

The heading vector is calculated **from** the Position GNSS antenna **to** the Heading GNSS antenna. In the figure above the System 1 heading is 90 degrees and the system 2 heading is 180 degrees.

Summary

When planning the GNSS heading antenna installations all the above factors need to be considered. To ensure a good heading measurement keep GNSS antenna separation at least three metres whilst maintaining the best possible visibility. Install the GNSS antennas at the same height and orientate ideally along-ship otherwise across-ship. Calibration should be applied in DP or Survey systems.