Transducer alignment

KONGSBERG

A new tool for ”HPR Calibration”

Introduction

After installation of a HiPAP / HPR system, it is necessary to determine a number of offsets between various sensor reference points and axes. These are:

- Vertical angular offset between transducer axes and roll / pitch sensor axes.
- Horizontal angular offsets between roll / pitch sensor and heading reference.
- Horizontal angular offsets between transducer axis and heading reference.
- Horizontal distance offsets between transducer location and the reference point.

The principles for these alignment adjustments are based on the position of a fixed seabed transponder relative to the vessel and the geographical position of the vessel.

In order to simplify and improve the quality of the alignment scenario, the alignment function in the APOS (Acoustic Positioning Operator Station) can be used. APOS is the HiPAP / HPR operator station. By logging the vessel position from DGPS along with the measured HiPAP / HPR position of a seabed transponder, the program computes the alignment parameters.

The normal procedure when doing the data acquisition, is to locate the vessel at four cardinal points and on top of the transponder with four headings.

Immediately, the alignment parameters can be computed and automatically transferred to the APOS alignment parameters. No manual transfer is needed. The results from the alignment are shown both numerical and graphically on the APOS.

Traditionally this has been a quite resource-demanding task requiring extra equipment on board. Using the integrated Transducer alignment utility in the APOS, this has become a more efficient way for the traditional “HPR calibration”. This utility is very adequate for proving and documenting the accuracy of the system prior to a survey task.

Calculating parameters

- Transducer inclinations
- Transducer offsets
- VRU / Gyro alignment
- Transponder “boxed-in” position
- Sound velocity scale

Benefits

- Integrated part of the APOS.
- The Alignment utility supports several existing procedures.
- Reports can easily be generated based on available plots and statistics.
- Handles several transducers / transponders in one scenario.
- Recalculation of the data selecting different calculating parameters.
- Automatic update of new parameters on operators request, eliminating the risk of typing errors.
- Computation time takes only a few seconds.
- Computes the “box-in” position of the transponder.
- Several graphical plots available.
- All data available in an ASCII file.
- Data file may be sent ashore for investigations and filing.

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Preparing for the transducer alignment

The alignment requires that a DGPS or similar surface navigation equipment is interfaced to the HIPAP / HRP system. A suitable transponder with floating collar and anchor weight, (sand bags), are available. Transponder with acoustic release mechanism is preferred.

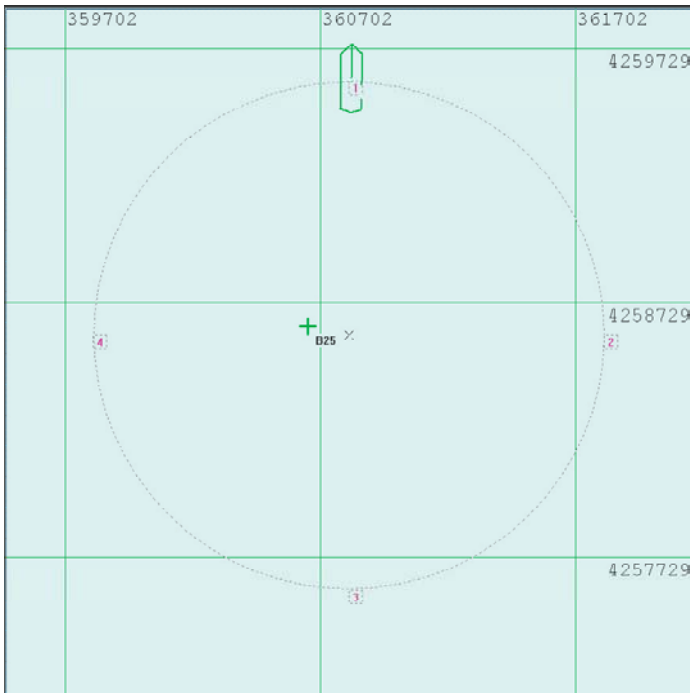
The various contractors have different procedures for how the data acquisition shall be done. The alignment utility does not require a specific procedure, but these are recommend:

- Four quadrant cardinal points with four headings on top of transponder.
- Sail on in an hour-glass pattern with extended run in lines.

A report regarding the properties of different procedures are available from Kongsberg Maritime

The APOS on-line help has a complete description of the Transducer alignment.

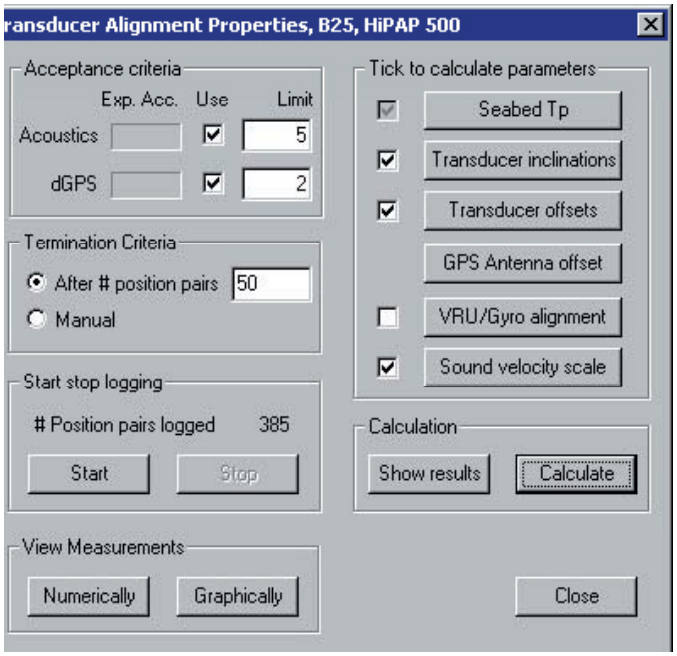
The APOS can support the operation by showing markers and lines on the UTM view. Markers can be given specific names. An example is shown in the figure below.



Data acquisition

The data acquisition is controlled from one dialog where acceptance criteria and number of position pairs to be logged, are defined. The operator can set the standard deviation limits individually for the DGPS and the HiPAP / HPR system.

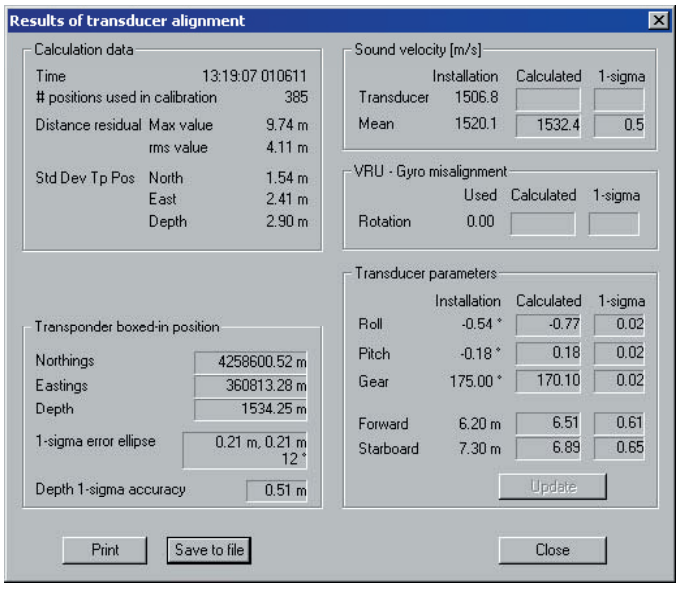
The number of position pairs to be logged can be preset or manually turned of. An example from the dialog is shown in the figure below.



Compute corrections

When the logging of all position pairs have been completed, the operator can press the **Calculate** button, and within seconds the result is available. The new correction values and their statistical information will then be displayed together with the old values. The operator may at this stage select other calculating parameters and calculate new correction values before deciding what to use.

The boxed-in position of the transponder is always computed and this utility can be used to determine the geographical position of a seabed transponder. An example from the Results dialog is shown in the figure below.

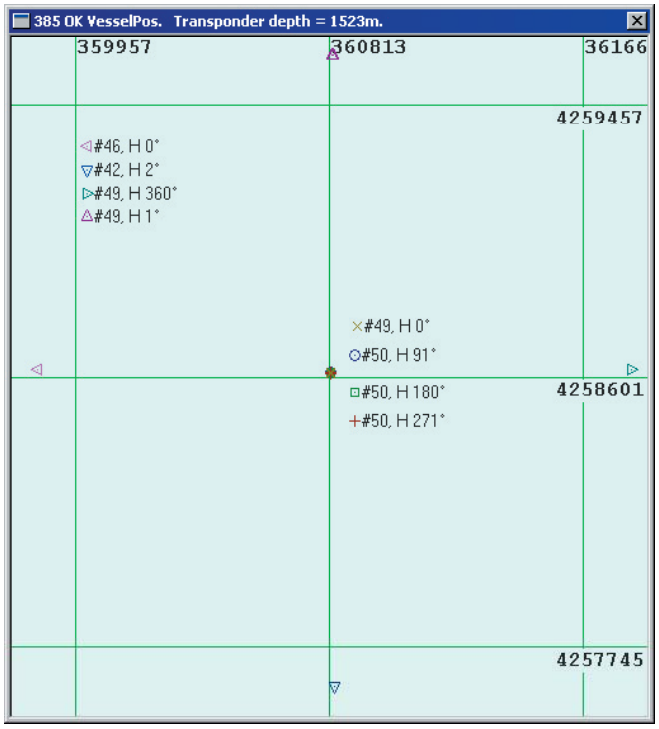


Graphical plots

The operator can select several graphical plots to be displayed. All the plots use the same symbol colour combinations for the different vessel positions and headings, enabling the operator to see the relation between the plots. The plots can also be used to exclude erroneous data.

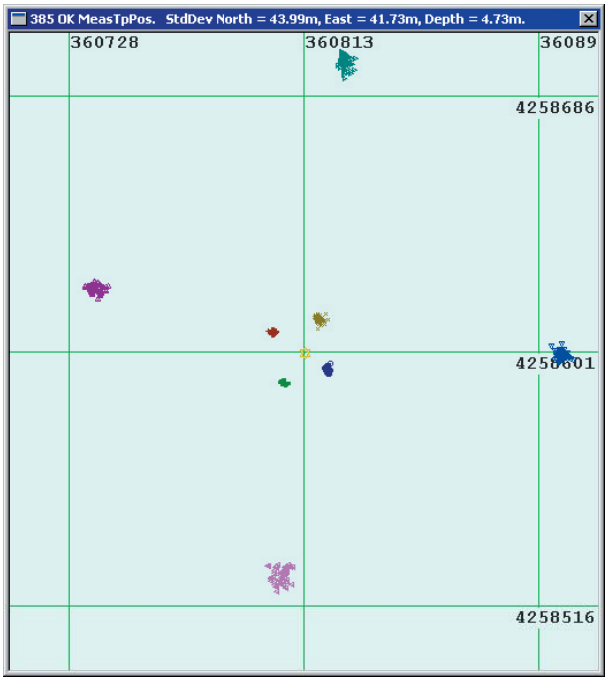
Vessel position plot

The Vessel position plots are shown in 8 difference colours corresponding to the 4 cardinal points and 4 different headings above the transponder. An example of Vessel position plots is shown in the figure below.
The table up to the left in the plot shows the symbols used for the cardinal points. The table in the centre shows the symbols used for the four headings on top of the transponder. The tables also show the number of measurements and the heading of the vessel when doing the data acquisition.



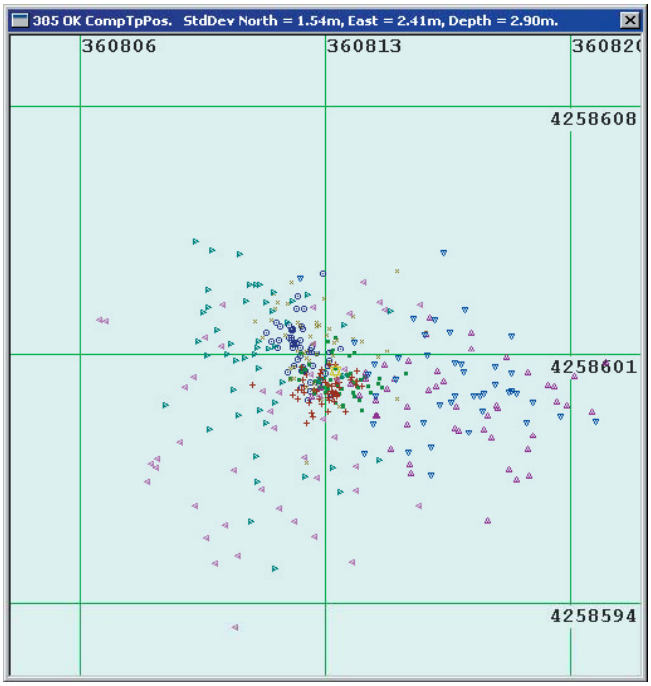
Transponder position plot – measured

The Transponder position plots in global co-ordinates as they were measured with existing correction values. An example of measured Transponder position plots is shown in the figure below.



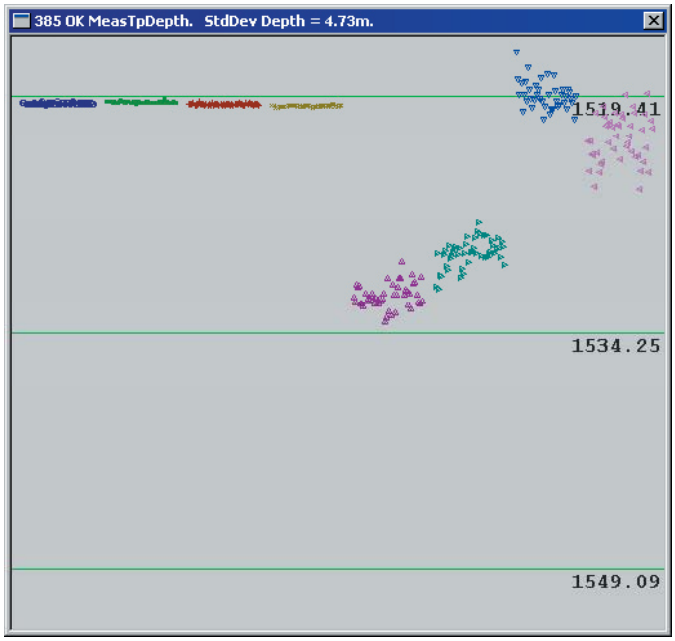
Transponder position plot - compensated

The Transponder position plots in global co-ordinates after the new correction values are applied on the present data. This enables a verification of the new correction values without doing a new data acquisition. An example of compensated Transponder position plots is shown in the figure below.



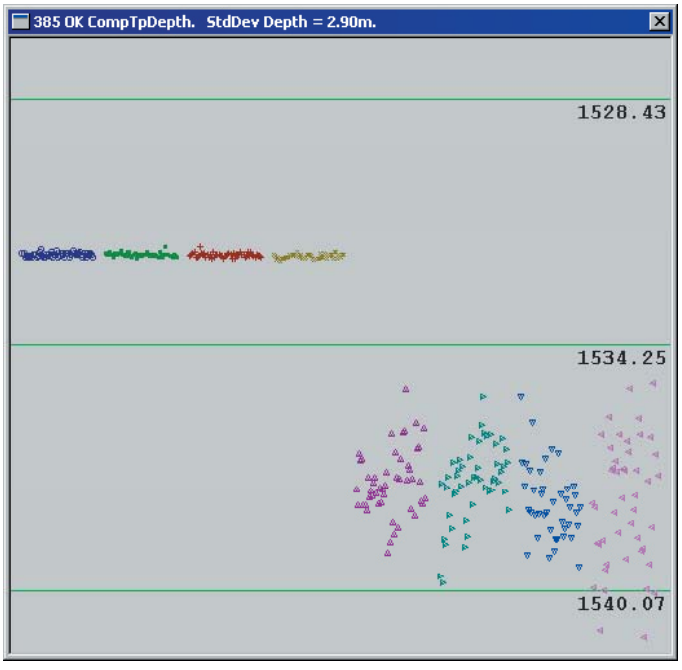
Depth plot - measured

Depth plots of the transponder as they were measured with existing correction values. An example of Transponder measured depth plots is shown in the figure below.



Depth plot - compensated

Depth plots of the transponder after that the new correction values are applied on the present data. An example of Transponder compensated depth plots is shown in the figure below. When comparing the measured and compensated depth plots, please bear in mind that the scale is quite different!

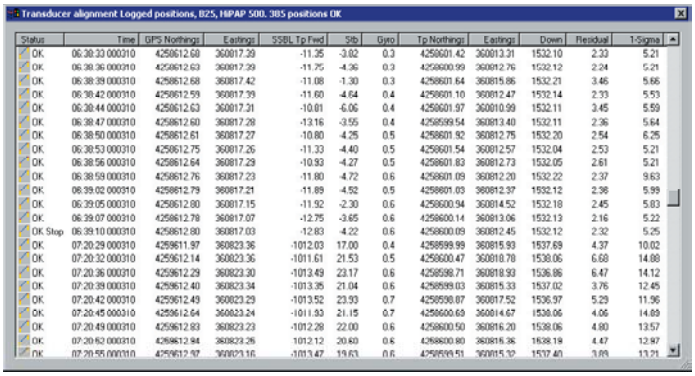


Detailed information

The operator can also select to see detailed information about the measurements, as shown in the figure below.

All measurements can be saved on a file in NMEA format. The NMEA formats are documented in the APOS On-line help.

The plots shown in this document can easily be used in reports.



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