Training Manual

KONGSBERG

APOS LBL and MULBL Course

Sections

Document logistics

Revision	Date	Written by
A	15 okt 04	kgr

Revision	Comments
A	First version, were this is a stand alone manual.

Training Manual

KONGSBERG

Note

Kongsberg Maritime AS makes every effort to ensure that the information contained within this document is correct. However, our equipment is continuously being improved and updated, so we cannot assume liability for any errors which may occur.

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Chapter 1

APOS LBL and MULBL Course

COURSE DESCRIPTIONS

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APOS LBL and MULBL Course

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Acoustic Positioning Operator Station (APOS)

Objective
Give the participants in-depth understanding of Long Base Line (LBL) and Multiuser LBL (MULBL) operation and calibration.

Target audience
Surveyors, navigators, DP operators or other persons with a particular training request for APOS and HiPAP®/HPR400 operational subjects that are not covered in the basic course.

Entry requirements
APOS Basic Operator Course.

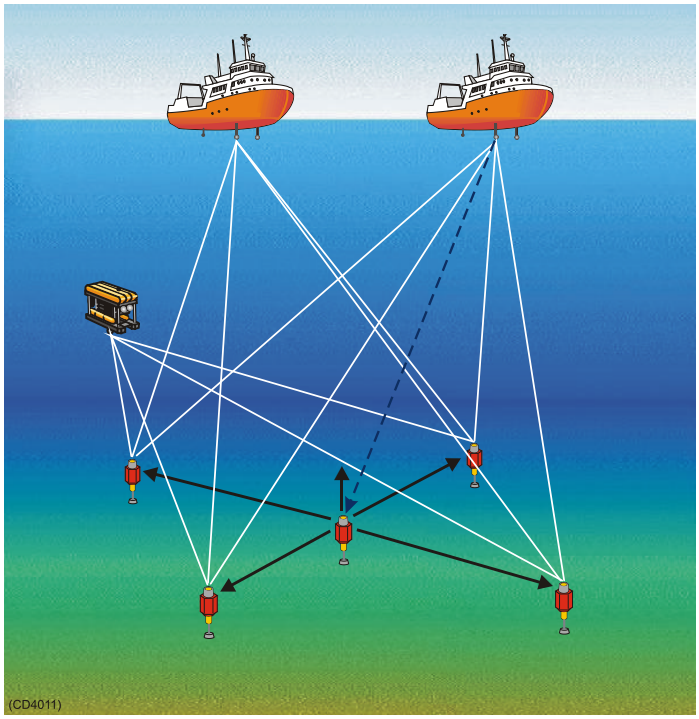
Content of course
- LBL planning
- Markers
- LBL calibration
- LBL positioning
- LBL runtime calibration
- MULBL
- Troubleshooting

Teaching method
The teaching will be presented in a combination of theoretical lessons and practical exercises.
The participants will train on system operation on their own demo computer with generic APOS, Windows operated, software.

Teaching medium
The course documentation is written in English and the course will be held in English, unless otherwise agreed.

Duration
1 day

Venue
The participants will together with the training centre agree on the venue of the course.



Standard conditions

To enquire for information or enrol for a course, please contact the training centres. The course coordinator will assist with hotel reservation.

Confirmation
The course coordinator confirms the enrolment in writing, which is then considered binding.

Course documentation
The course documentation is written in English, and the courses will normally be held in English.

Course diploma
The participants receive a course diploma when the course is successfully completed.

Cancellation
Cancellation has to be in writing.

Cancellation fee
Cancellation more than four (4) weeks before starting date of course: None

Cancellation from two (2) to four (4) weeks before starting date of course: 50% of course price

Cancellation less than two (2) weeks before starting date of course: 100% of course price

Cancellation of courses
We reserve the right to cancel courses for which less than four participants have enrolled.

Booking
Please contact:

The Course Coordinator
Kongsberg Maritime AS
Strandpromenaden 50
P.O. Box 111
3191 Horten - Norway
Tel.: +47 33 03 41 00
Fax: +47 33 04 76 19
e-mail: km.training.horten@kongsberg.com

Course details

The ‘APOS LBL and MULBL Course’ is a 1 day course. This manual will normally contain more subjects than what will normally be covered in one day. The instructor together with the participants will choose the subjects. If one or more of the participants is using MULBL, this will then be mandatory.

Timetable

09:00 – 10:00	LBL positioning (basic) Markers	Chapter 2 Chapter 3
10:15 – 11:15	Telemetry Planning a LBL array	Chapter 4 Chapter 5
11:15 – 12:00	Lunch	
12:00 – 13:00	LBL Baseline Calibration	Chapter 6
13:15 – 14:15	LBL quality control LBL runtime calibration LBL troubleshooting Leaving the location	Chapter 7 Chapter 8 Chapter 9 Chapter 11
14:30 – 15:45	MULBL	Chapter 12

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Course Evaluation

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Course name: _____ Course date: _____

Student name: _____ Instructor: _____

General observations on the course as a whole

Complete waste of time ☐☐☐☐☐ Worthwhile and interesting

Remarks: _____

Objective of the course

Not at all applicable ☐☐☐☐☐ Very relevant to my work

Not achieved at all ☐☐☐☐☐ Fully achieved

Remarks: _____

Subject matter

Too little material ☐☐☐☐☐ Too much material

Too theoretical ☐☐☐☐☐ Too practical

Exercises badly set up ☐☐☐☐☐ Exercises clearly set up

Simulation poor ☐☐☐☐☐ Simulation good

Exercise debrief poor ☐☐☐☐☐ Exercises debrief good

Remarks: _____

Course duration

Too short ☐☐☐☐☐ Too long

Remarks: _____

Teaching methods

Poor presentation ☐☐☐☐☐ Good presentation

Remarks: _____

Kindly note what was most appreciated

Kindly note what was least appreciated

Please make any suggestions that will improve the quality and content of the course or the system itself

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2 LBL introduction

Purpose

The LBL dialog boxes in APOS are designed so the user needs to understand both LBL calibration and LBL positioning, to be able to operate all the functions.

The purpose of this chapter is to give you an overview of LBL positioning basics, and we will revert to details in the remaining chapters.

Revision	Date	Written by
A	15 okt. 2004	kgr

Revision	Comments
A	This is a new part, based on Chapter 9 in the previous version and handouts

Contents

2.1 Abbreviations – LBL

LIC	LBL interrogation channel
TAD	Turn around delay

2.2 LBL Help

1) Select ‘Help’ on the ‘Menu bar’, and then ‘Help’ again.

2) Select the ‘Contents’ tab, and double click on ‘Positioning’.

3) Double click on ‘LBL Positioning’.

4) This is the part of help where LBL and LBL calibration is described.

The ‘LBL Calibration description’ handed out by the instructor (if you are lucky and have received one) is a printout of this ‘Help’

Observe: Onboard your vessel, you may find a different APOS Help, due to a different APOS software version.

2.3 LBL introduction

The basic LBL theory was introduced in the ‘APOS Basic Operator Course’, chapter 3.6 and 3.7.

With your own word, describe how SSBL positioning is working for one transponder

_____

_____

_____

Describe how SSBL positioning is working for two or more transponders

_____

_____

_____

What is the minimum number of transponders in an LBL array? _____

What is the maximum number of transponders in an LBL array? _____

What is the baseline in an LBL array?

_____

_____

_____

What is the TAD?

_____

_____

Describe how LBL positioning is working

_____

_____

_____

_____

_____

_____

2.4 The LBL calibration result

An LBL array may be available to several vessels, but only one vessel can use it at a time.

If your vessel is arriving to a location were the already is deployed transponders in an array, and this array is then calibrated for LBL positioning, the result of that calibration as well as the information about the transponders may be available on a file.

This file will have a filename with a file-extension HPR.

The LBL calibration file will contain the following information:

1) The North, East and Depth coordinates from the origin of the array to each of the transponders
2) The configuration data for the transponders
   i) Channel No, TAD and LIC
   ii) transponders S/N
   iii) transponder type
   iv) transponder setting
3) The baselines and data from the calibration

Only the information in item 1 and 2 is necessary for doing LBL Positioning

The picture below shows an array in open sea. Observe the origin of the array, which is supposed to be at the sea level.

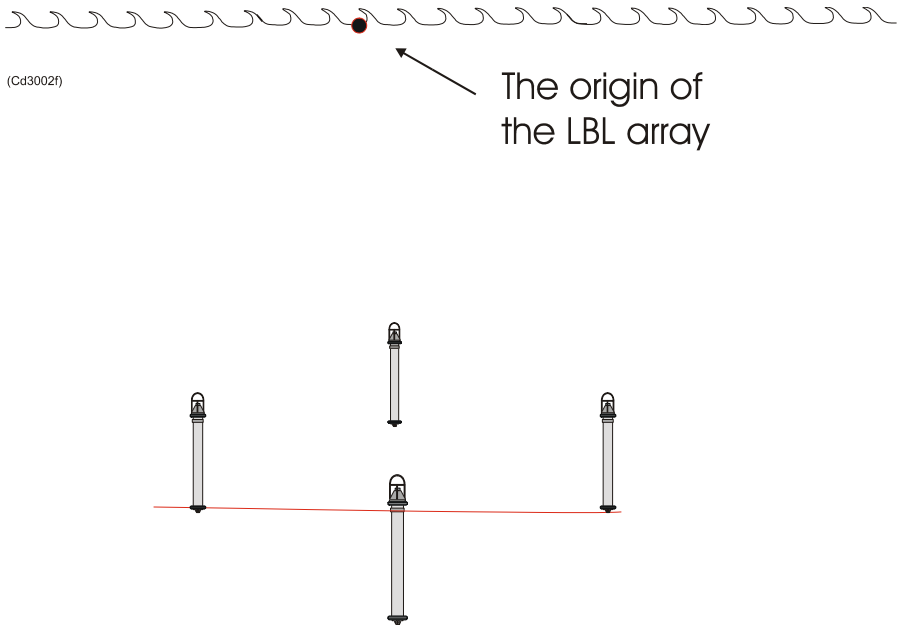


Figure 2.1

Control question

If you got a ‘High tide’, what will happen to the ‘LBL origin’?

_____

2.5 Start LBL Positioning

Operating Situation

Your vessel is approaching a location were there is already deployed 6 transponders in a circular fashion, and calibrated as a LBL array.

You have received the LBL configuration onboard your vessel as an e-mail and copied the file into your APOS operator station.

Your vessel will use this LBL array for DP positioning.

Water depth is approximately 500 meters

Step by step

1) Open the training file: LBL POSITIONING

2) Start positioning

   Observe the new vessel symbol, and ‘Left click’ on it.

3) Select suitable ‘Default parameters’. What will you recommend as:

   Max range: _____

   Nav. Tx Power: _____

4) Make sure that you are using this ‘Default parameters’.

   ‘Right click’ on the vessel symbol, and select ‘Properties’.

2.6 The ‘LBL Numeric View’

When you are LBL positioning, the following numeric view is available.

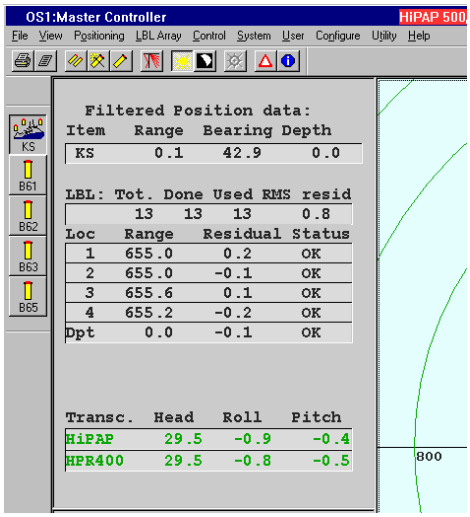


Figure 2.2

As you already know, by ‘right clicking’ in the view, you can manipulate it.

1) ‘Right click’ in the numeric, and observe the dialog box as shown in the next picture.

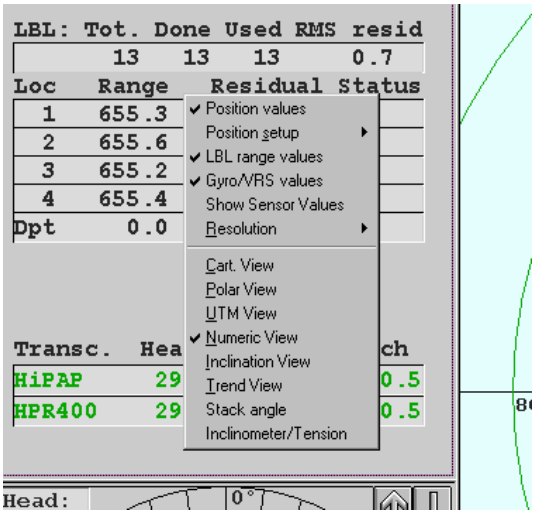


Figure 2.3

2) ‘Left click’ on ‘Position values’, what happens?

_____

Leave a check mark (✓) at ‘Position values’.

3) Select ‘Position setup’ and observe the changes.

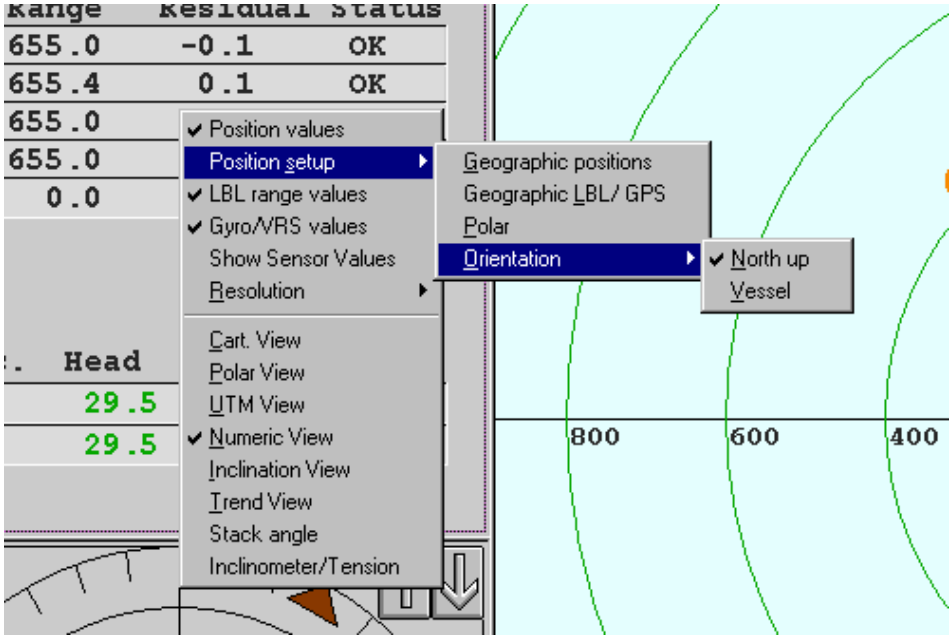


Figure 2.4

4) ‘Right click’ in the ‘Numeric View’ and deselect ‘LBL range values.

2.7 LBL properties (introduction)

Goal

Introduce you to ‘LBL Properties’ dialog box and ‘Help’. The idea here is to just browse through help. A more detailed description will be done in Chapter 10

Operating Situation

Your vessel is at the same location as in Exercise 2.5

Step by step

1) ‘Right click’ on the vessel symbol, and select ‘Properties…’.

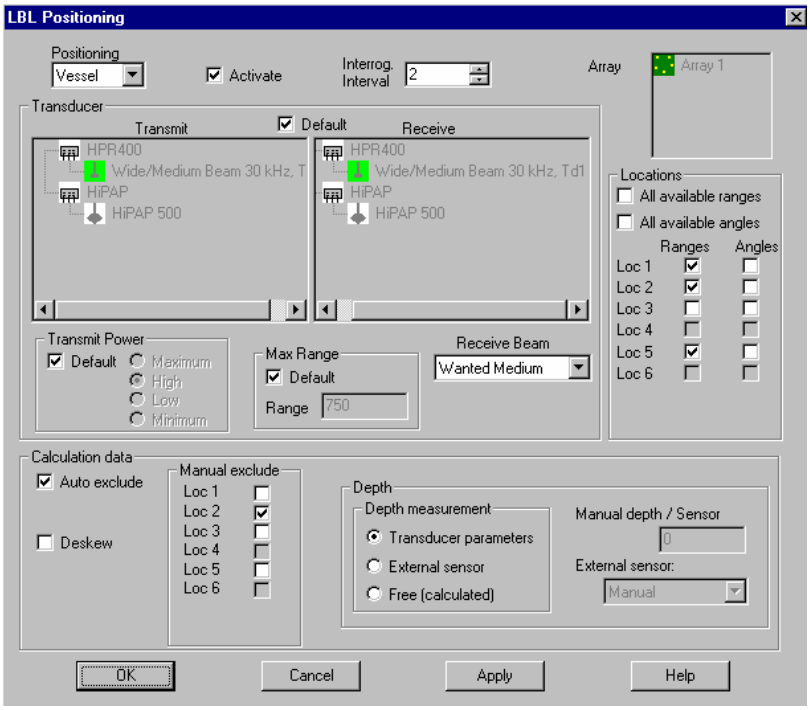


Figure 2.5

2) Press the ‘Help’ button, and browse quickly through the subject.

2.8 LBL accuracy

LBL positioning is a more accurate positioning system, compared to SSBL and SBL, particularly on deep water and with the vessel in the center of an array with transponders in a good constellation (Evenly spread around in a circle. Think of satellite constellation for GPS positioning)

Below is shown an example with:

- Water depth: 1200 meters
- Number of transponders: 4
- Array radius: 636 meters
- S/N 20 dB
- Sound velocity error: 1 m/s

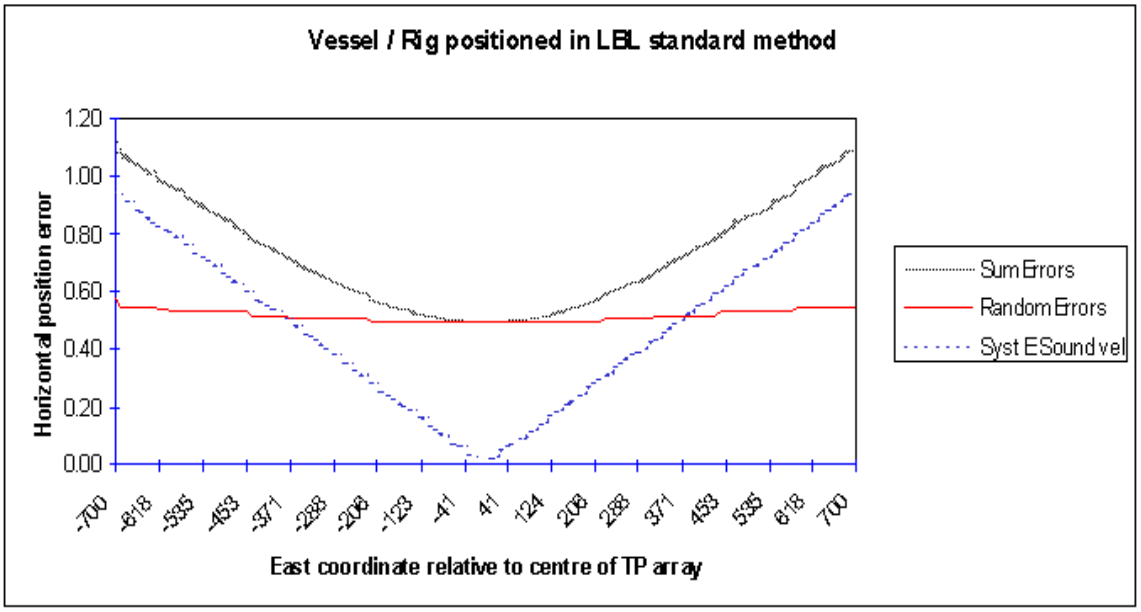


Figure 2.6

2.9 LBL calibration

APOS offers different ways of doing a LBL calibration. The 2 most commonly:

i) Baseline calibration

ii) Runtime calibration

If you use a pure LBL system, the origin and the rotation of the local North is not revealed. A pure LBL system is not able to display the transponders depth either. If it is required to know the origin and rotation, you will need to do a:

iii) Geographical calibration

Baseline calibration is the traditional way of doing LBL calibration. Quite often you will have a LBL system, combined with a SSBL system. When APOS is showing the arrays rotation and transponder depths, it is based on the initial SSBL positions.

If you need to determine the exact position of the origin as well as the array rotation the Geographical calibration feature in APOS will help you. For further details see Help.

For vessels using the LBL for DP positioning, and equipped with a HiPAP® system, we recommend you to use Runtime calibration. This calibration is based on the SSBL positions of the transponders, and gives a more robust position.

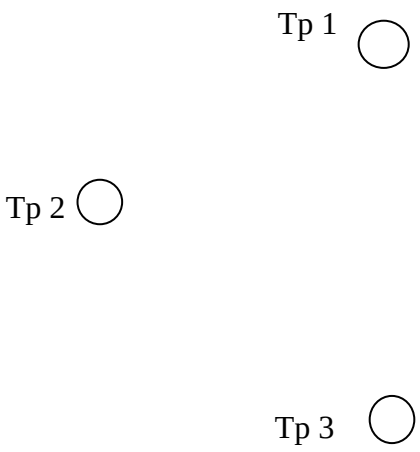
By robust we mean the vessels position is not so sensitive to loss of ranges. A vessel positioned based on baseline calibration is more sensitive to loss of ranges, particularly if the error associated with that position is great.

2.10 Baseline

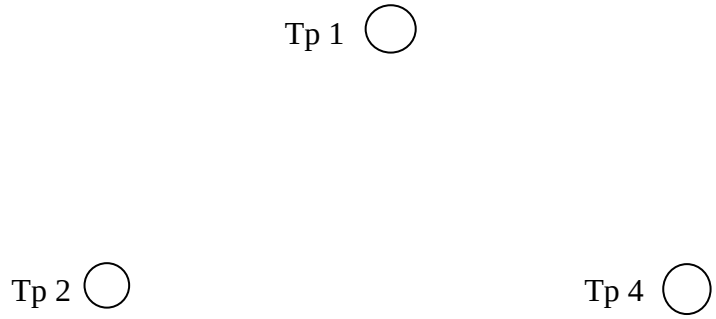
What is a LBL baseline?

_____

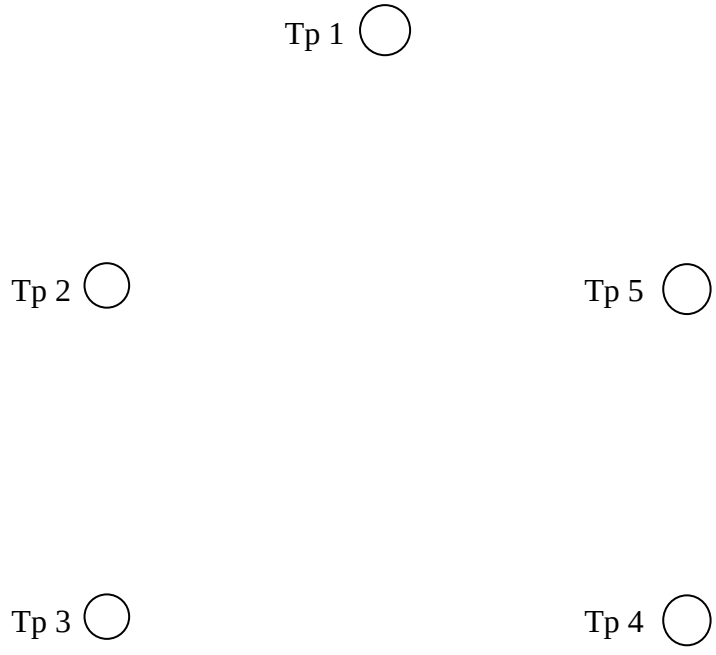
How many baselines do we have in an LBL array with 3 transponders? _____



How many baselines do we have in an LBL array with 4 transponders? _____



How many baselines do we have in an LBL array with 5 transponders? _____



2.11 Transponder modes

A MPT transponder can be configured into different modes. Some of this modes were discussed earlier, see Chapter 10.7 in ‘APOS Basic Operator Course’ manual.. Transponder modes with special interest for LBL positioning is as follow:

Note The radio buttons in figure 2.7 is only displaying the transponder mode. Selecting any of the other modes will not change the transponder mode. Changing transponder modes has to be done elsewhere.

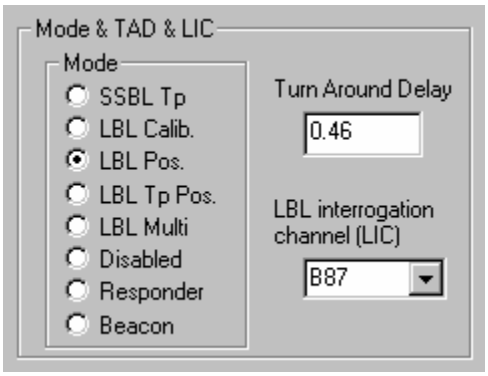


Figure 2.7

LBL Calibration The transponder must be set in this mode during baseline calibration.

LBL Positioning The transponder must be set in this mode during standard LBL positioning. In this mode each transponder will have an individual ‘Turn Around Delay’ an all transponders in the array will have a common LIC.

LBL Multiuser The transponder must be set in this mode during MULBL positioning. Details will be presented in Chapter 10.

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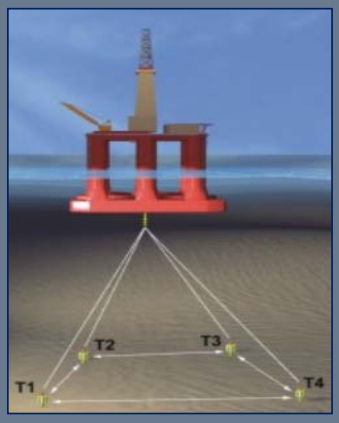
Chapter 3

Planning a LBL array
Deploying transponders



DOCUMENT LOGISTICS

Revision	Date	Written by
A	15 okt. 2004	kgr

History	Changes
A	First edition as separate chapter, based on Chapter 10 in 'APOS Basic with LBL rev. B'

PLANNING A LBL ARRAY

When planning an array, there are a few things to consider:

- operation area
- ships system/seabed footprint
- transponder type/surface footprint
- LBL transponder channels
- number of transponders
- array radius
- transponders with clump weight
- pre-deployment checks of transponders
- check list prior to deployment

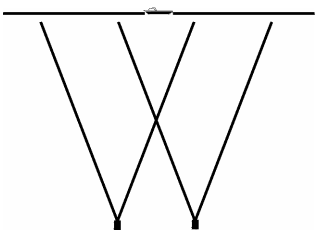
OPERATION AREA

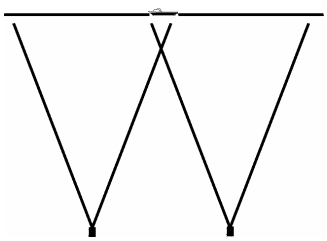
The area the vessel needs to manoeuvre in defines the operation area.

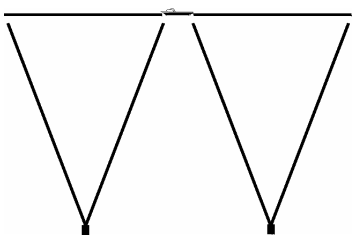
This might also influence on the choice of transponder type, number of transponders and array radius.

You should have a good coverage (contact) from the transponders throughout your operation area.

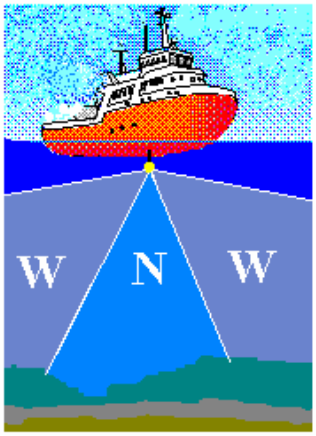
Take also the vessel heading into consideration when planning an array. Do risers/parts of the hull obstruct certain directions?







SEABED FOOTPRINT - TRANSDUCER BEAMS



The transducer footprint on the seabed is determined by the system/transducer on board. This picture shows a narrow/wide beam transducer coverage area. The narrow beam area is indicated by a "N", and the wide beam area indicated by "N"+"W".

HPR418 systems with narrow/wide transducer (so-called narrow beam transducer) covers ± 22.5° in narrow beam and ± 80° in wide beam. Wide beam is more affected by noise than narrow beam.

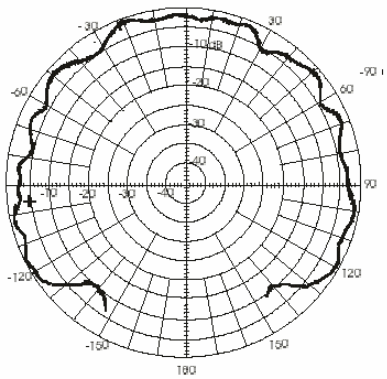
HPR418 systems with medium/wide transducer (so-called standard transducer) covers ± 55° in medium beam and ± 80° in wide beam. Wide beam is more affected by noise than medium beam.

HiPAP500 systems will cover ± 100° from the vertical. The HiPAP500 will always make ± 5° narrow beams within the whole coverage area, since this is controlled electronically.

HiPAP350 systems will cover ± 60° from the vertical. The HiPAP350 will always make ± 15° narrow beams within the whole coverage area, since this is controlled electronically.

SURFACE FOOTPRINT - WIDE BEAM

The transponder footprint on the surface is dependent on the type of transponder used.



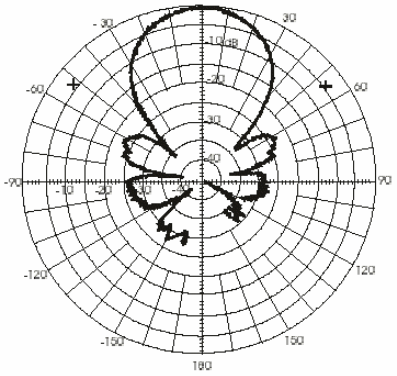
MPT 339 series
Source level = 195 dB

MPT319/MPT339:

The opening angle (cone) of these transponders is ± 90° (hemispherical).

SURFACE FOOTPRINT - NARROW BEAM

The transponder footprint on the surface is dependent on the type of transponder used.



SPT 331 series
MPT 331/DuB vertical
Source level = 206 dB

MPT331DuB:

This transponder type has got dual beams (DuB). One beam pointing upwards during positioning, while there is a horizontal beam during base line measurements. The opening angle (cone) for the vertical beam is ± 15°. The horizontal cone (doughnut) is also ± 15°.

Choosing the transponder type:

In general, transponders with narrow beam transducers are more powerful than transponders with wider beam transducers, but the drawback is a reduced footprint on the surface.

Normally the water depth determines the type of transponder to use.

-1000m: MPT319 transponder if the ambient noise level on the vessel is low. If the noise level is high, a MPT339 or MPT331DuB might be used.

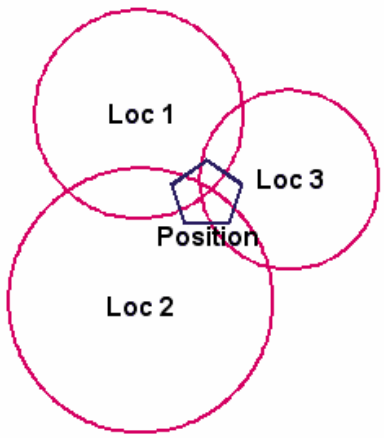
Note: The MPT331DuB might restrict the operation area due to the narrow beam of the transponder.

-3000m: MPT339/MPT331DuB transponders. For drilling units with azimuth thrusters (high noise level) MPT331DuB is recommended, as these have higher source level (output) than MPT339.

As you can see from the lobe diagram, the MPT331DuB transponder has a very distinct and powerful beam.

NUMBER OF TRANSPONDERS

The LBL system works as a range-range system. The transponders on the seabed have known positions when the local calibration is successfully completed.



When positioning in LBL, the range measured from each transponder is the radius of a sphere. The vessel position is where the spheres from the different locations intersect. In order to establish a position on the surface, a minimum of 3 ranges must be measured.

However, using only 3 transponders in an array is not recommended. The user has to consider possible "blind spots" from the transponders caused by raisers or structures/hull.

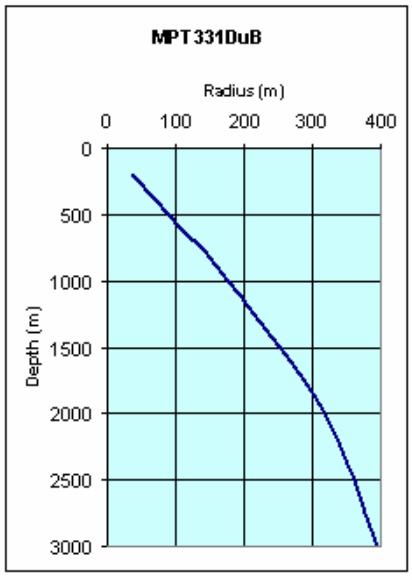
Using 4 transponders, or preferably 5, gives redundancy in the range measurements. When using 5 or more transponders, a special software function can be used (auto-exclude), which will process the range measurements and remove incorrect ranges. These ranges can be caused by reflections (not line-of-sight between transponder and vessel) or interference from other transponders (used by other vessels nearby).

LBL TRANSPONDER CHANNELS

The last digit of the channel numbers of the transponders in the LBL array must be different, and the first digit of all transponders must be either even or odd. If the channel numbers of the transponders do not obey these rules, some of the channels must be changed. It is either done by changing the internal switches in the transponder before deployment, or with telemetry during the pre-deployment check using telemetry. Make a note of all channels/serial numbers as they are needed later.

Example of an array that follows the rules: B13, B38, B51, B72, B14

ARRAY RADIUS - NARROW BEAM TP



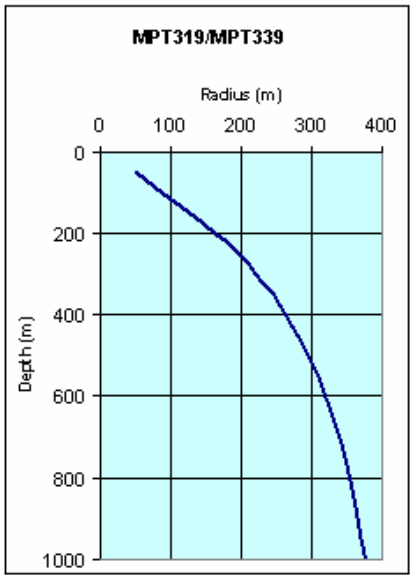
Deep water:

For deepwater operations, the radius is determined by the beams of the transponders. This gives a radius equal to about 10° from the centre for the MPT331DuB type.

The reason for choosing 10° instead of 15° (which is the opening angle for MPT331DuB transponders) is to have some overlap for vessel movements on the surface. Also the transponders might "lean over" from current or soft seabed depending on the type of installation.

The graph shows the water depth/array radius using a 10° array, which is reduced somewhat below 1500-2000m depth.

ARRAY RADIUS - WIDE BEAM TP



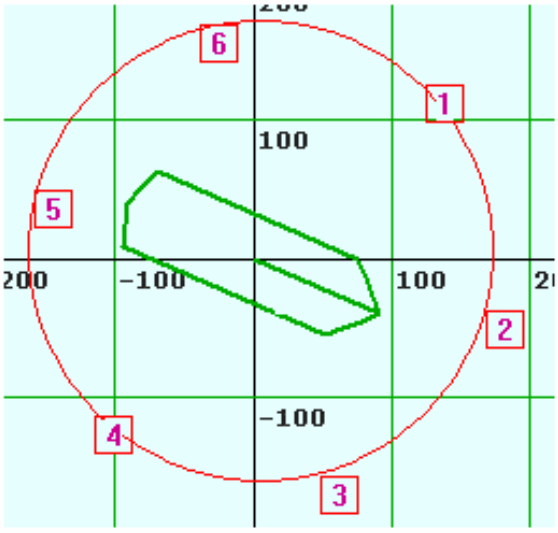
Shallow water:

For shallow water/less noisy environment the MPT319/MPT339 (1000m/3000m depth rating) transponders can be used. The beam patterns of these transponders are wider, which allows the user to make a wider array. The baselines are much depending on what type of transducer is used on the vessel (refer to the paragraph "Ships system/seabed footprint"). The system should work inside the narrow/medium beam.

You might encounter other problems having a wide array. The topography of the seabed might be blocking the direct line between the transponders, making baseline measurements difficult, or even impossible.

The graph shows the water depth/array radius for MPT319/339 transponders, starting at 45° and reduced to 20° at 1000m. This to avoid the long baselines.

ARRAY GEOMETRY

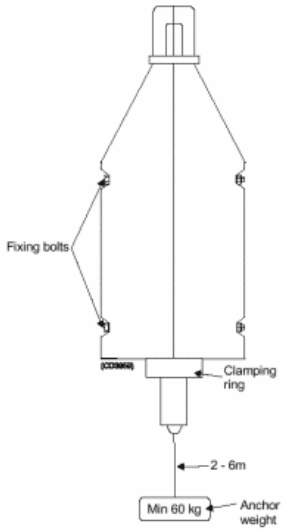


Normally the transponders are evenly spaced around the circle (as seen here with 6 transponders). The transponders need "line-of-sight" between them to do the baseline measurements. Adjust the positions if necessary if structures/templates etc. is already placed on the seabed.

Once the calibration is done, objects on the seabed will not cause any problems.

TRANSPONDERS WITH CLUMP WEIGHT

Transponders used in LBL arrays might be deployed in transponder stands or with flotation collar and clump weight.



When deploying transponders with clump weight, they can either be dropped over the side or launched by ROV, winch or drill string.

Normally the clump weight should be 60-70kg. The rope or wire attached between the clump weight and transponder can be 2-6m. The buoyancy of a MPT331DuB transponder and flotation collar is 23kg and for MPT319 transponder and flotation collar 17kg.

If dropping transponders over the side, also take the current into consideration as the transponders might drift off and land far away from the intended position. Increasing the clump weight might decrease the drift-off.

When the seabed topography is "bumpy", longer ropes/wires between the clump weight and transponder might be considered to ensure "line-of-sight" between the transponders.

NOTE! The transponder AND clump weight should NOT be lifted by the transponder cage, as the cage is certified for the weight of the transponder and flotation collar only.

Attach the lifting gear directly to the clump weight.

PRE DEPLOYMENT CHECK LIST

After having decided which transponders to use, make sure they are all ready for use.

Check the last ping-count (either on the APOS operator station or in a separate transponder logbook) to ensure the transponder batteries will last for the whole period of intended use. If in doubt, change the batteries.

If you are using a HPR418 system equipped with a test transducer, check the ping count and to do telemetry/release checks on deck. If not, the best way to do a check in advance is to put the transponders in a basket (secure them to the basket!) and lower the basket by crane to a position below the hull near the ships transducer. Test the transponders, both in navigation mode and telemetry. As a check, read the ping count and execute the "release" command if the transponders are going to be released acoustically later.

Serial numbers/channels noted

Channels comply with requirements

Transponder data entered in the APOS database

Planned array depth/radius ratio (operation area/footprint) OK

Remaining battery capacity OK/battery changed

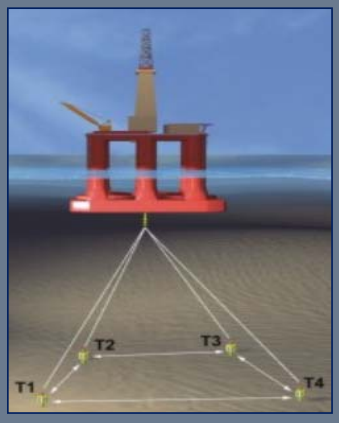
Navigation/telemetry check to each transponder OK

Clump weight/wire attached

Transponders ready for deployment (winch/ROV/free-fall)

KONGSBERG

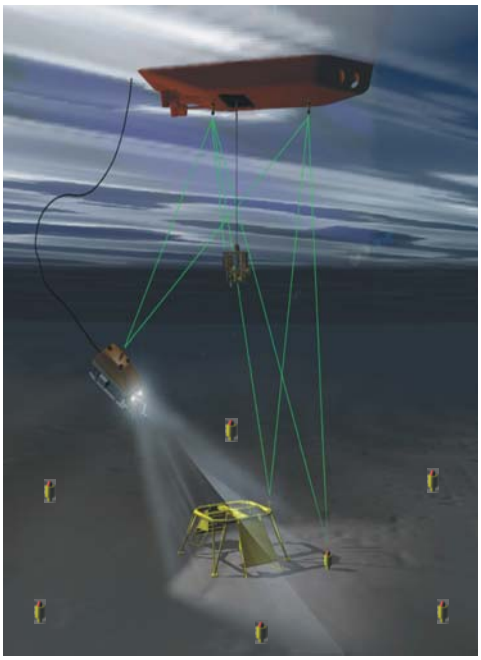
Deploying transponders



LBL ARRAY CALIBRATION EXAMPLE

Situation

- An LBL array is needed around a seabed template already deployed in the North Sea
- Template UTM position WGS84 Zone 31
  N: 6216878.0
  E: 577953.2
- Water depth ≈ 500 m Array radius ≈ 200 m
- MPT339/DTR transponders
  - B61 Serial no.: 5061
  - B62 Serial no.: 5062
  - B63 Serial no.: 5063
  - B65 Serial no.: 5065
  - B67 Serial no.: 5067



INSTALL ARRAY TRANSPONDERS

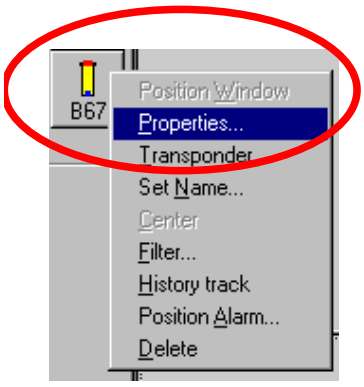
Exercise

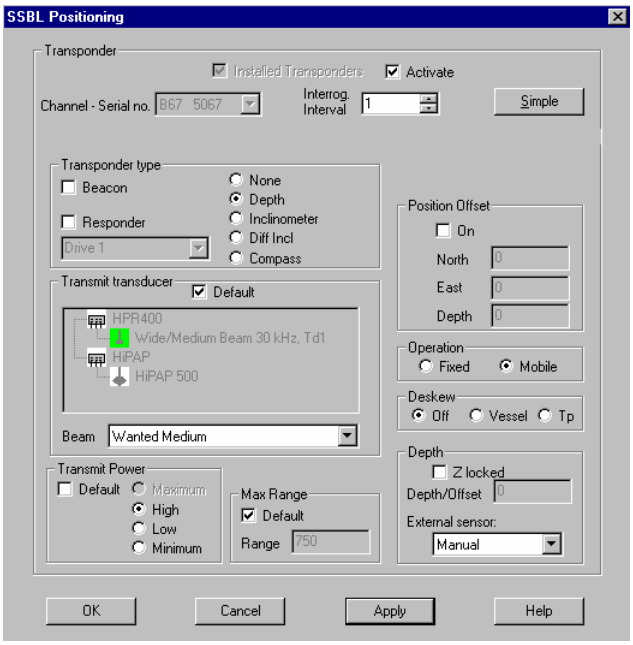
- Start with a new file
- Set up markers
- Configure the array transponders into APOS
- Save the settings you have made using a suitable name as the file name (to days date)
- Check default parameters

INTERROGATE SSBL TRANSPONDER

Exercise

- Interrogate one of the array transponders in SSBL mode and monitor the position

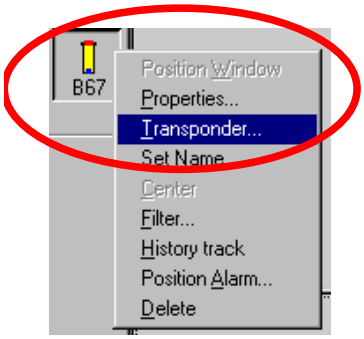


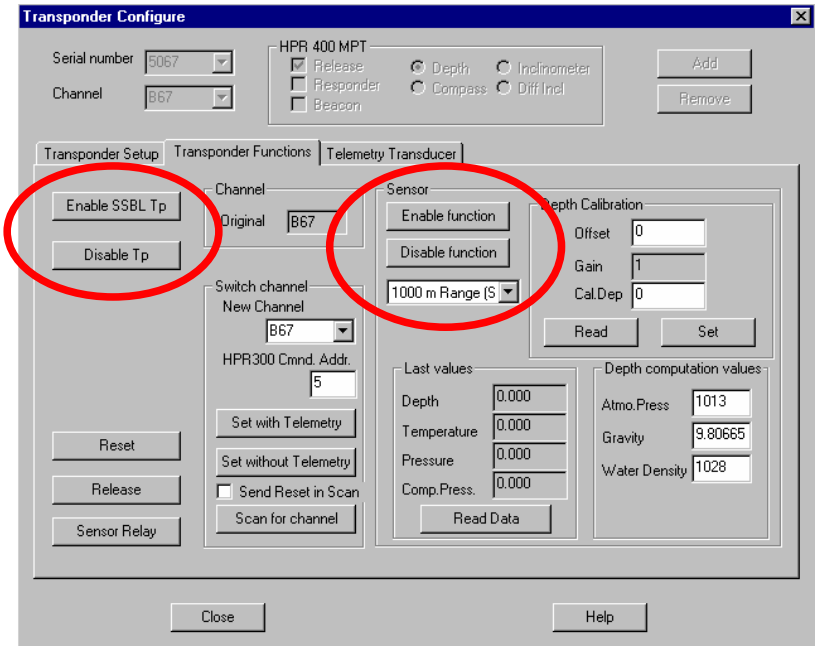


ENABLE SENSOR FUNCTION

Exercise

- Enable the transponder or depth sensor of the array transponder if needed

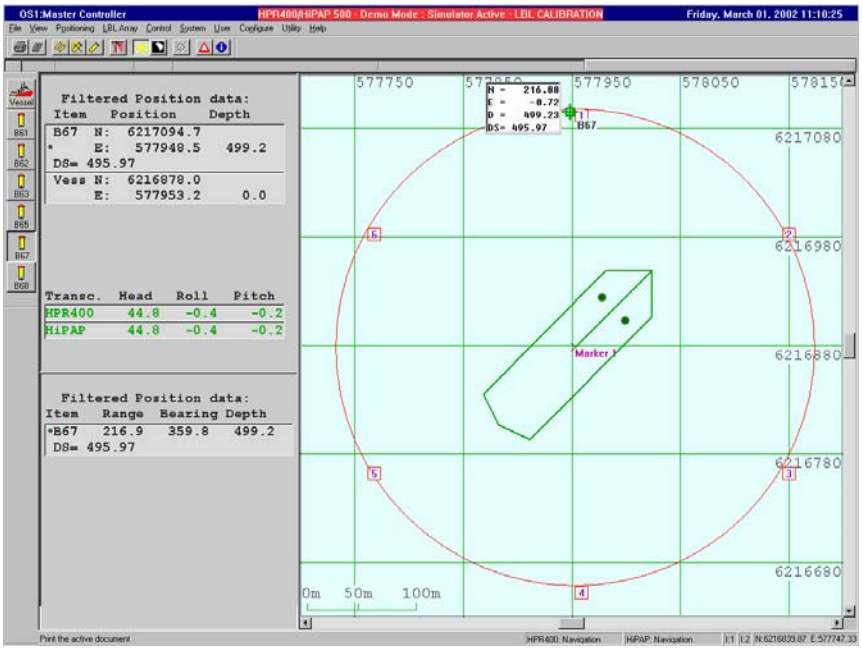




DEPLOY AND MONITOR TRANSPONDER

Exercise

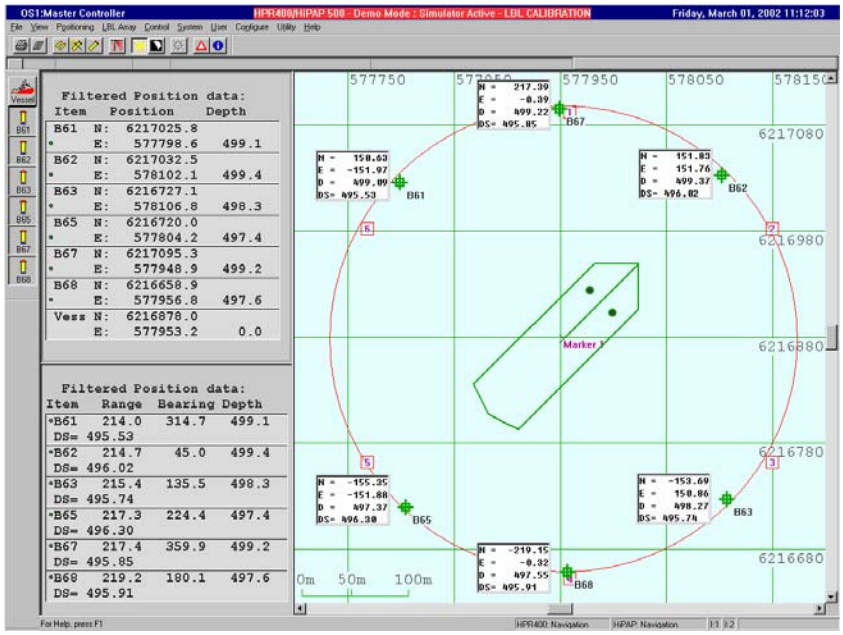
- Monitor the position
- Consider if you need to move the transponder



DEPLOY AND MONITOR TRANSPONDER

Exercise

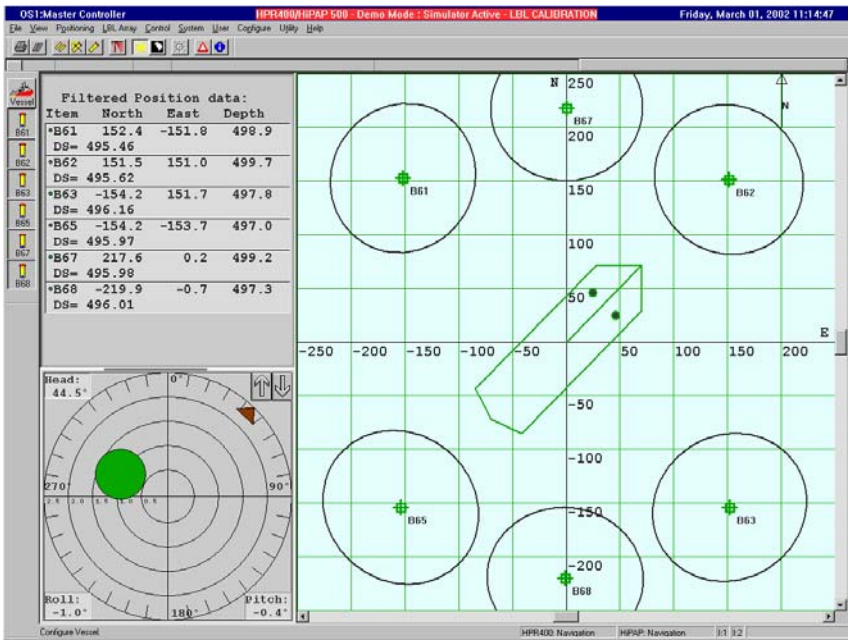
- Interrogate the rest of the array transponders in SSBL mode and monitor the positions
- Consider if you need to move one or more of the transponders



SSBL POSITIONING

Exercise

- Use Cartesian View
- Use North-East-Depth presentation in the Numeric View
- Notice the vessel symbol when only SSBL positioning



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4 LBL runtime calibration

Preface

Traditionally the ‘LBL baseline calibration’ has been the introduction subject to LBL calibration. But with the increasing use and experience of ‘LBL runtime calibration’ with the HiPAP® system, we recommend using this approach for DP positioning. Therefore we also start the introduction to LBL calibration with this subject.

At present we still recommend to use the ‘LBL baseline calibration’ approach for HPR 400 systems. This is based on the higher accuracy of angle measurement for the HiPAP® system.

Finally, ‘LBL runtime calibration’ and ‘LBL baseline calibration’ can be combined to achieve a higher degree of accuracy. This will be described in a later chapter.

Revision	Date	Written by
A	15 okt. 2004	kgr

Revision	Comments
A	This is a new part, based on Chapter 10 in ‘APOS Basic with LBL rev. B’ and handouts

Contents

4.1 ‘LBL runtime calibration’ introduction

General

In LBL positioning we use the knowledge of the transponders baselines to position our vessel. In SSBL positioning we know the transponders position in 3 dimensions and the HiPAP® system is quite good at determine this position accurately. By reading a lot of these positions, typically 250, we are able to determine the baselines with an acceptable accuracy.

This has some great advantages:

- Faster
- Don’t need ‘line of sight’ between transponders
- Use less telemetry
- Gives a more robust position (good for DP)

4.2 LBL Wizard for RunTime

Operating situation Your vessel is at a location with 5 transponders at the seabed, and you will use this transponders for LBL positioning.

Serial no.	Channel	Type + sensor
5068	B61	MPT 319 DTR
5069	B62	MPT 319 DTR
5070	B63	MPT 319 DTR
5071	B65	MPT 319 DTR
5072	B67	MPT 319 DTR

1) Start with a new file and configure the transponders into APOS. Don't use the depth sensors.

   You have configured yourself 5 new depth transponders. Do you see a blue dot in the bottom of the transponder symbol? _____

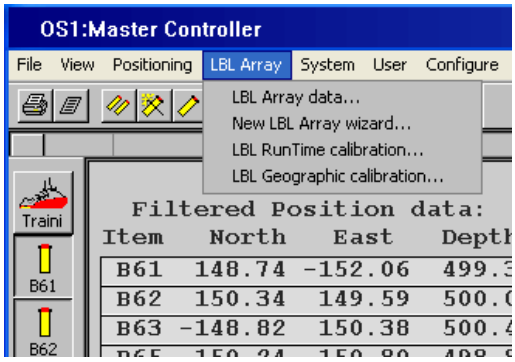
   Why? _____

2) Save the file

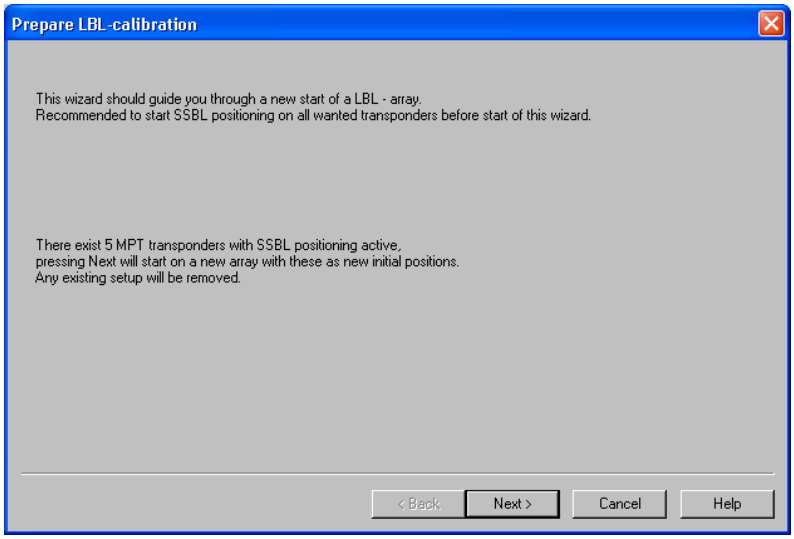
3) Make sure you are positioning on all the transponders. Also notice that the error ellipses has reduced the size.

4) 'Right click' in the 'Positioning window' and select 'Polar view'. 'Right click' again and select 'Show locations'.

5) Select the 'New LBL Array wizard…'.



6) Notice the dialog box is telling you that you that you are positioning with 5 MPT transponders in SSBL mode

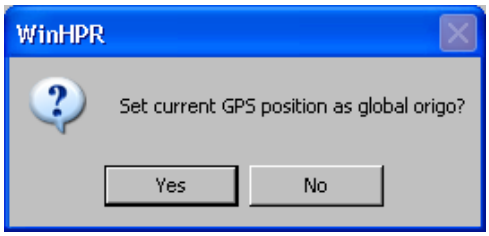


7) Press the ‘Cancel’ button. Position on only 2 transponders and repeat step 5. Press the ‘Help’ button and read about ‘Prepare LBL-calibration

In an ordinary ‘LBL runtime calibration’ we will not do step 7.

8) Let’s start over again. Press ‘Cancel’, position on all 5 transponders and repeat step 5. Press the ‘Next>’ button.

9) The origin of the array is the vessels position when you pressed the ‘Next>’ button. If you have a GPS receiver connected to the APOS Operator station, you can also present the origin in global coordinates.

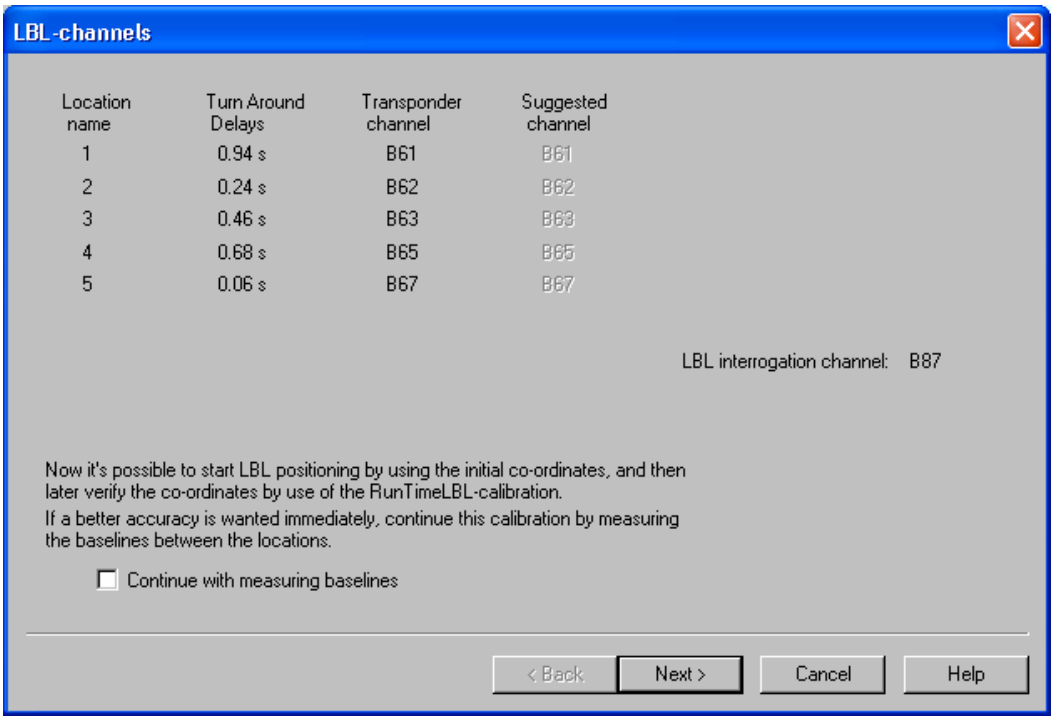


Even if your vessel is not in the center of the array at present time, you can later on set a new origin.

The center may typically be when a drilling vessel is straight above the BOP.

The above question will only appear if you have a GPS receiver connected to APOS.

10) Press the ‘Help’ button and read about ‘LBL channels’



11) What is a LIC channel? _____

_____

_____

12) What is ‘Turn Around Delays’? _____

_____

_____

13) What will your approximately update rate to the DP be? _____

14) Just for fun. Press the ‘Cancel’ button, and notice the LBL locations in the ‘Positioning window’. Start positioning on all transponders again. Notice how the transponders are jumping around, but the LBL locations are fixed.

The LBL locations presented in the ‘Positioning window’ is the initial positions, and are based a single set of SSBL measurements.

The whole idea with LBL calibration is to establish the LBL positions as accurate as possible.

In an ordinary ‘LBL runtime calibration’ we will not do step 13.

15) You are asked whether or not to ‘check mark’ the ‘Continue with measuring baselines’?

What does it mean? _____

_____

16) What will you select? _____

17) Press ‘Next>’ to set all transponders in ‘LBL positioning mode’.

18) Details about the ‘LBL Positioning’ box will be discussed in Chapter 10.

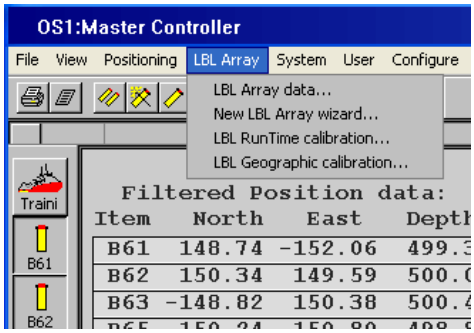
Press ‘OK’ to start positioning, and notice the change of the vessel symbol.

4.2 LBL Runtime Calibration

General As you noticed in step 14 above, our locations are based on the initial positions. We need to establish the baseline with a higher degree of accuracy.

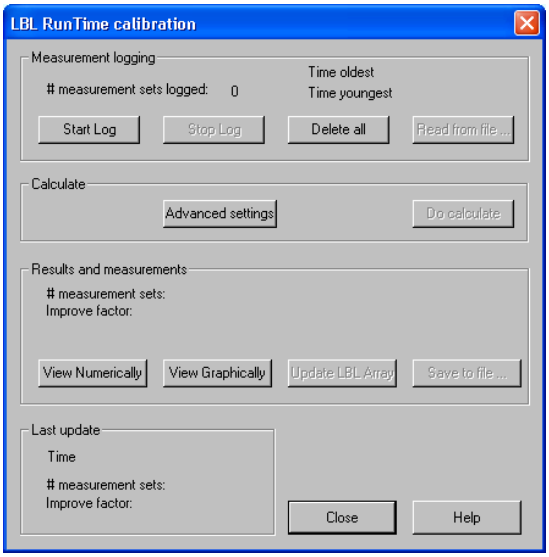
Step by step

1) Select the ‘LBL RunTime calibration…’ dialog



2) Press the ‘Help’ button and familiarize yourself with the content.

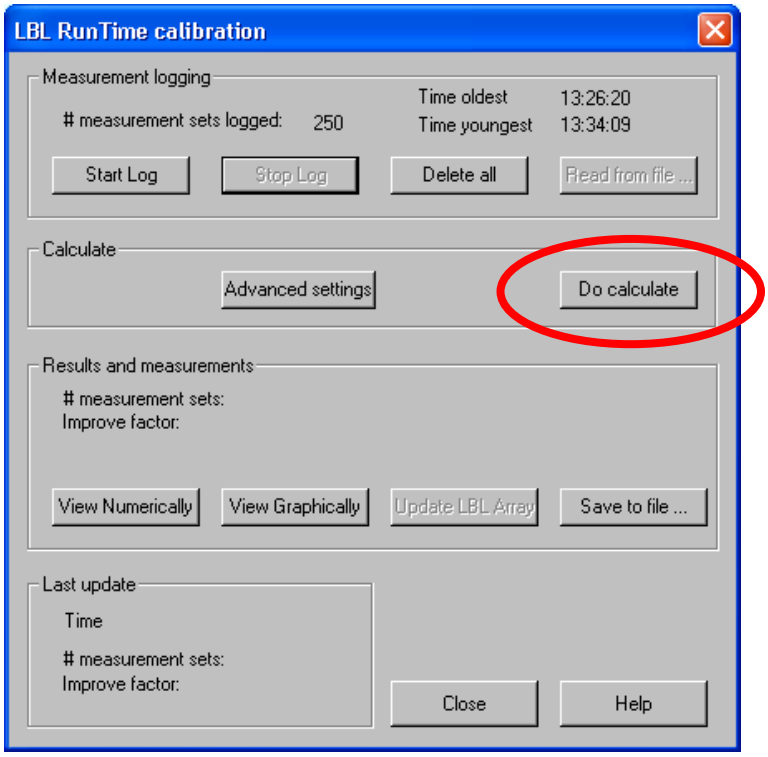
3) Start logging, and the stop the logging after you have reached 250 measurements



4) You can close the ‘LBL RunTime calibration’ dialog box, while the program collects data.

5) When 250 measurements sets are logged, you can stop the logging, and you will notice the ‘Do calculate’ button is available.

Note! Unless you have done a baseline calibration, you don’t need to worry about the ‘Advanced settings’ button.



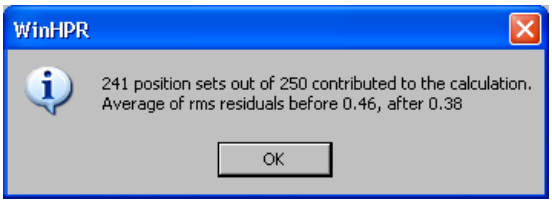
Should you do a calculation when the HiPAP® system is the only reference system (see ‘Help’)?

_____

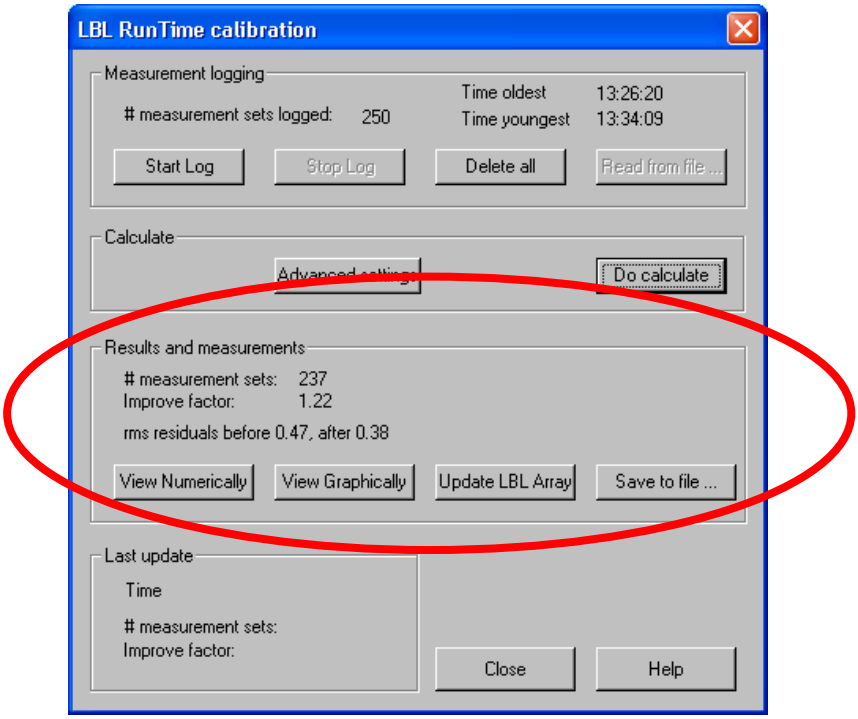
Why? _____

_____

6) Press the ‘Do calculate’ button



7) The result from the calculation is available.



The answer to the remaining questions is available in ‘Help’.

8) What is the limit for the ‘Improve factor’ before you need to ‘Update LBL Array’ data.

9) When you select the ‘View Graphically’ button, how is the vessel displayed?

_____

How is the transponder displayed? _____

What is the color of the present transponder position? _____

What is the color of the suggested position? _____

10) Zoom in on the vessel position, and observe the excluded positions

11) What is the color of the excluded positions? _____

12) Before you ‘Update LBL Array’, save the logging to a file.

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5 The screen and views

Preface

This chapter is a continuation of Chapter 8 in ‘APOS Basic Operator Course’ manual. Everything (or at least most of it) which was covered there applies also for LBL positioing.

In this chapter we will focus on those configuration changes which most commonly apply for a LBL positioned vessel.

Once again I will strongly emphasize what was said in the preface to Chapter 8 in the Basic course.

Revision	Date	Written by
A	15 okt. 2004	kgr

Revision	Comments
A	This is a new part, based on Chapter 9 in ‘APOS Basic with LBL rev. B’ and handouts

Contents

5.1 Positioning window

5.1a Show locations

By ‘right clicking’ in this view we notice a new option, called ‘Show locations’. Try the feature.

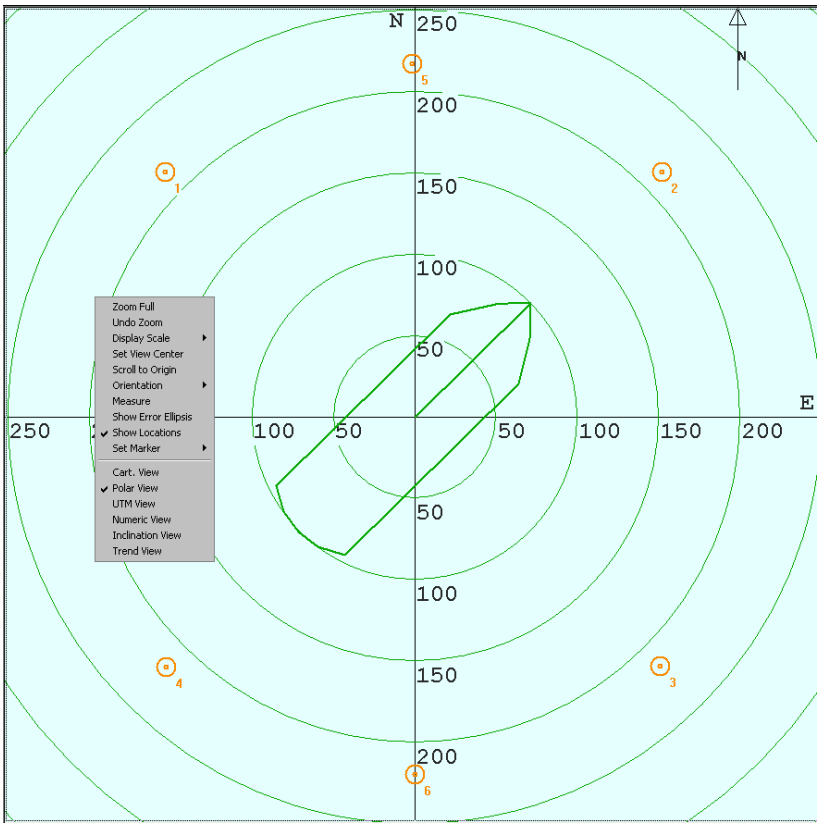

Figure 5.1

What is the ‘Show locations’ circles indicate?

_____

5.1b UTM view

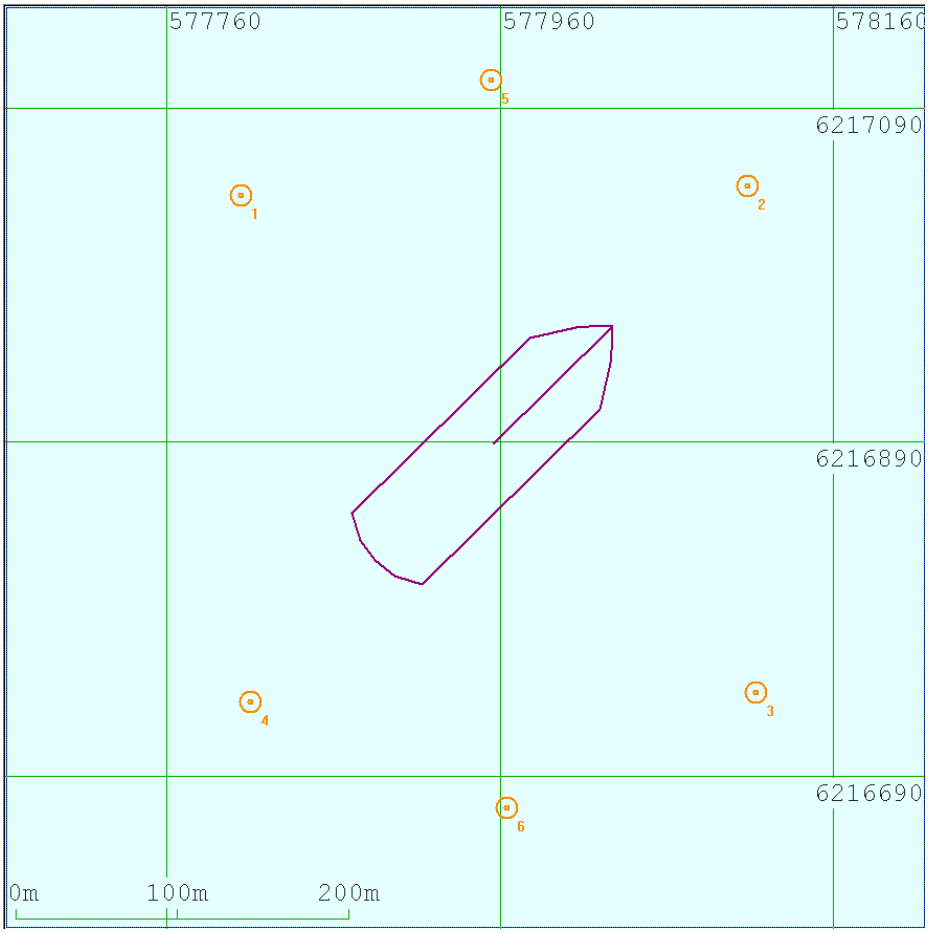

Figure 5.2

To be able to see the locations in the UTM view, you need to have a ‘Geographic origin’ set.

Details about changing the Datum is presented in Appendix C

5.2 Error ellipses

General

In the ‘APOS Basic Operator Course’ we studied the error ellipses for SSBL positioning. In that case the error ellipses changed continuously with varying S/N ratio.

In the case of error ellipses for LBL, the ellipsis depends on the transponder constellation plus the expected accuracy of the position.

A HiPAP® system includes the S/N ratio in the expected accuracy of the position, but the HPR 400 system will have fixed values, depending on the transducer type (i.e. a Narrow beam transducer will have a higher expected accuracy compared to a standard transducer).

For further information on ‘Error ellipses’, go to:

Help and select the Contents tab:

Positioning – LBL Positioning – Advanced – Error ellipses in Local Calibration

As you noticed, this is considered an advanced subject, and further details will not be discussed here.

For DP positioning, you shall use approach 1, as described in Help.

5.2a Examine the error ellipses

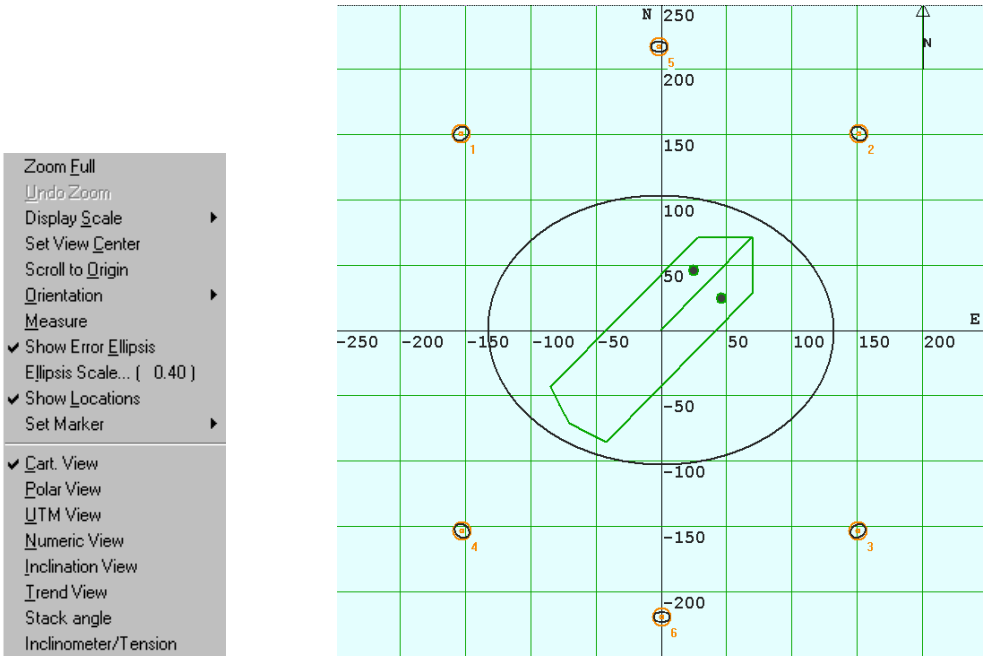

Figure 5.3

If you don't see the error ellipse for the locations, go to 'LBL array' on the menu bar, and select 'LBL array data…'.

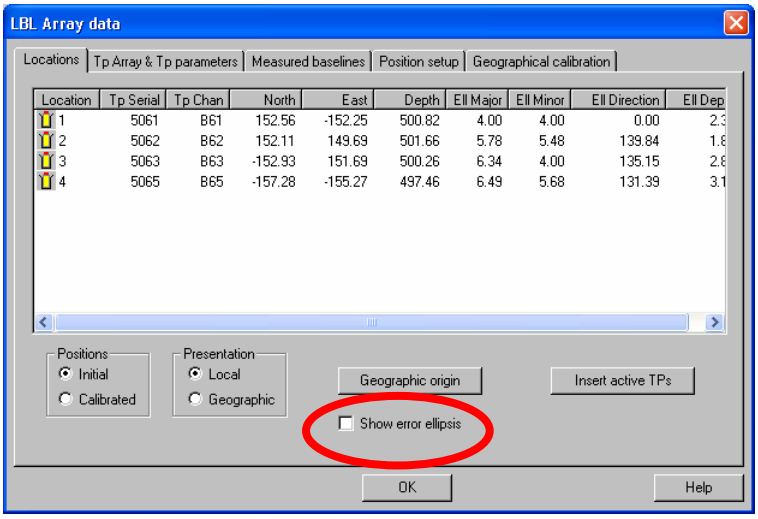

Figure 5.4

Make sure 'Show error ellipses' is selected

It may also be useful to compare the major and minor axes on the error ellipse before (initial) and after the calibration. The initial locations will typically be based on the SSBL positions, but may also be a ‘box in’ position or a transponder located on a template etc.

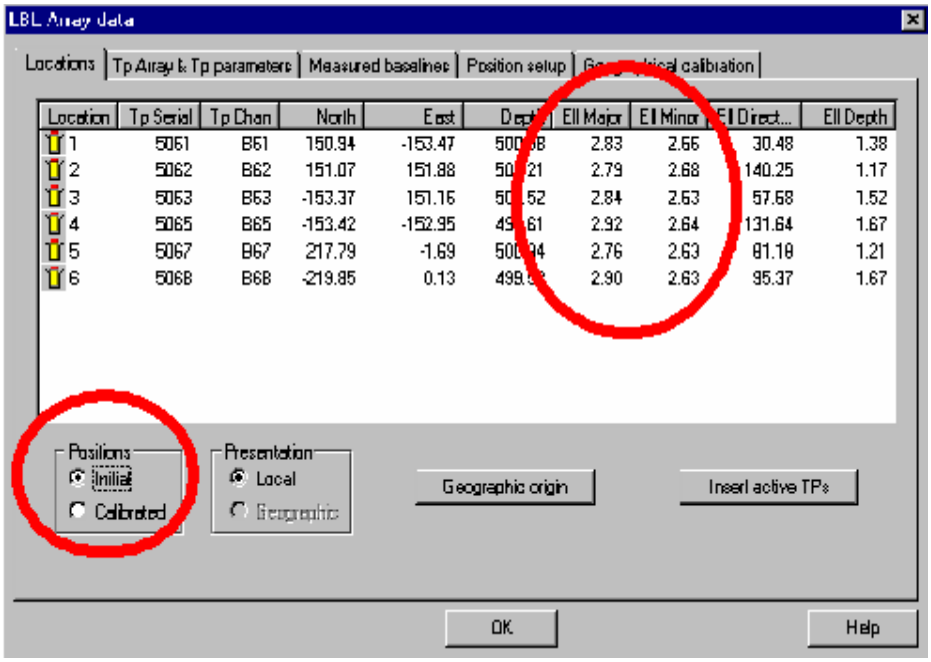

Figure 5.5

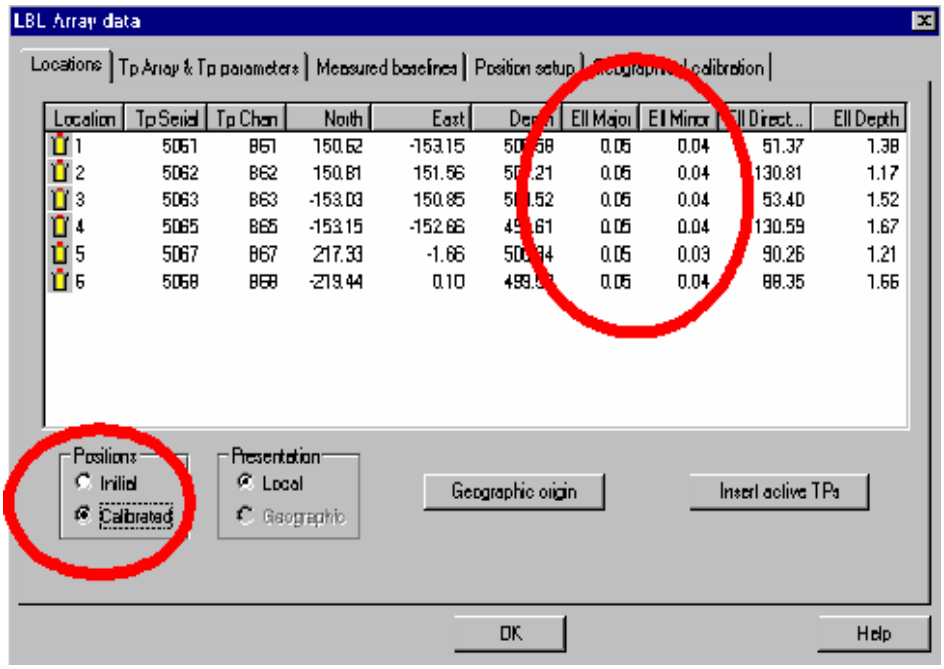

Figure 5.6

5.3 Describe the ‘LBL Numeric View’

When you are LBL positioning, the following numeric view is available.

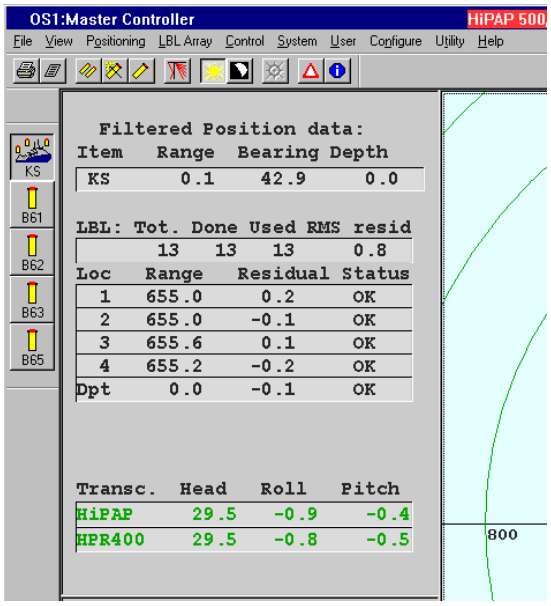

Figure 5.7

A detailed description of this view is available in ‘APOS Help’: Select the ‘Contents’ tab, and then ‘Positioning’, ‘LBL Positioning’ and ‘Positioning’. The description is at the end of that ‘Help’ page.

We will focus on each part of the ‘Numeric View’.

5.3a Vessels coordinates

During LBL Positioning, APOS is presenting the vessel position (that is the position of the 'Reference point' or 'CG'), relative the LBL Array origin.

These values can be presented as

i)	'North', East' and 'Depth'	See figure 5.8
ii)	'Range', 'Bearing' and 'Depth'	See figure 2.2
iii)	Geographical coordinates	See 'Help'

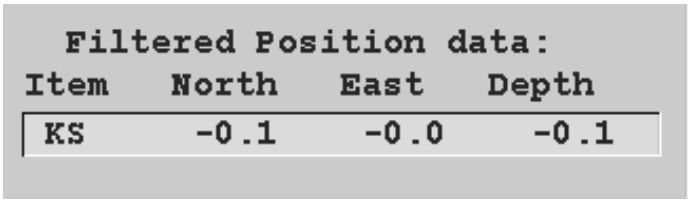

Figure 5.8

1) The first line reads: 'Filtered Position data'.

Basic operation of the system does not require any changes of the filter settings, and we consider this an advanced subject. We recommend however to select the 'Numeric view' to show 'Filtered Position data'.
See Exercise 8.6 for a description of 'Filtered' versus 'Measured Position data' ('APOS Basic Operator Course' manual - not included).

2) a) What is the meaning of 'Item'? _____

b) What is the meaning of 'North' and 'East'?

_____

c) What is the meaning of 'Depth'?

_____

The drawing below shows the vessel, placed in the same coordinate system as shown in Figure 2.1.

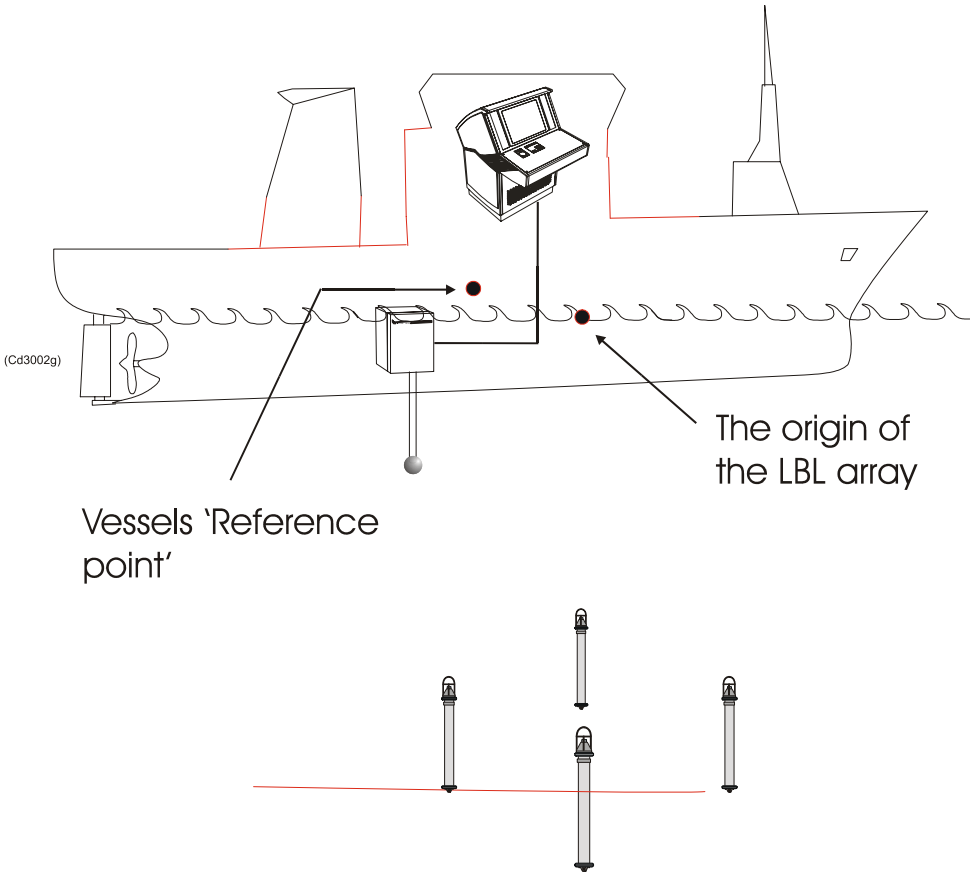

Figure 5.9

Exercise 1 Indicate 'Depth' on the drawing above

Exercise 2 Make a sketch were you see the vessel from above, and indicate North and East.

5.3b Number of measurement

The next line displayed in the numeric view is shown below

Figure 5.10

a) What is the meaning of ‘Tot.’?

_____

b) What is the meaning of ‘Done’?

_____

c) What is the meaning of ‘Used’?

_____

d) What is the meaning of ‘RMS resid’?

_____

5.3c Range measurement

Loc	Range	Residual	Status
1	654.9	0.1	OK
2	655.2	-0.1	OK
3	655.4	0.1	OK
4	654.9	-0.0	OK
Dpt	0.0	-0.2	OK

Figure 5.11

a) What is the meaning of ‘Range’?

_____

b) What is the meaning of ‘Residual’?

_____

c) We will revert to Status in Chapter 5.3f

5.3d ‘Dpt’ range

1) On the drawing below, indicate ‘Below’. See Appendix B.

2) On the drawing below, indicate ‘Vertical Depth’. See Appendix B.

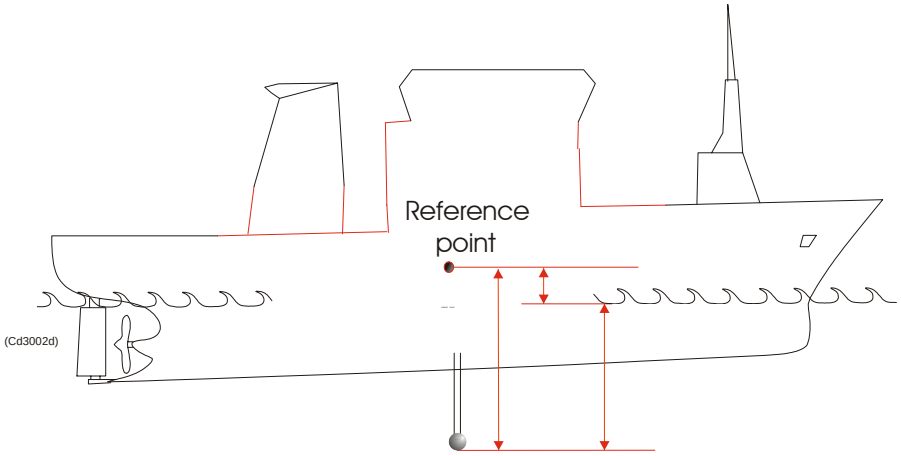

Figure 5.12

3) Dpt = Below – Vertical Depth

Indicate ‘Dpt’ on the drawing above.

4) If the values making up ‘Dpt’ is correct, it means ‘Dpt’ is showing the through distance from the vessels ‘Reference point’ to the sea level.

Enter transducer configure (see Appendix B), and play around with ‘Vertical Depth’ and ‘Below’ to see ‘Dpt’ is changing. You need to be in service mode (see Appendix A)

5) ‘Dpt’ and ‘Depth’ will then be almost equal if the measurement from the LBL array is good.

6) Negative ‘Dpt’ values indicate that the reference point is above sea level.

Note: The ‘Vertical Depth’ is not provided as any real time information about how deep the vessel is floating.

We don’t recommend putting any effort into adjusting the ‘Vertical Depth’ when i.e. a shuttle tanker is loading oil, but just use an average value.

Example: We will use as an example a shuttle tanker.

Reference point, empty tanker:	5 meter above the sea level
Reference point, full tanker:	2 meter below the sea level
‘Vertical Depth’ in APOS:	8 meter below the sea level
‘Below’ in APOS:	13 meter
‘Dpt’ in Numeric View:	-5 meter

You will then observe that ‘Depth’ will change during loading, It will start with –5 meter (negative values are above the sea level) for the empty tanker, and increasing until 2 meters when the tanker is fully loaded.

5.3e ‘Dpt’ residual

Equation: Residual = Dpt - Depth

You will normally see a deviation between ‘Dpt’ and ‘Depth’, and some of the reasons are mentioned below.

a) when your vessel is experiencing a tide change
b) a change in the VoS
c) a change in the draft
d) the settings in the ‘Transducer configure’ are wrong, see Appendix B.
e) errors in calculating the ‘Depth’

5.3f ‘Dpt’ status

The available ‘Status’s are listed in the ‘Help’ page. Write down the different types, in the order presented in ‘Help’.

a) _____

b) _____

c) _____

d) _____ The number of measurements as shown in ‘Tot’ will be reduced with one.

e) _____

6 LBL Properties

Preface

The changes you do in this dialog box takes place in the transceiver(s) and may have direct consequence for DP positioning.

It is also important to observe that nothing happens on the transponder(s).

Redo Chapter 2.7 LBL properties (introduction)

Revision	Date	Written by
A	15 okt. 2004	kgr

Revision	Comments
A	This is a new part

Contents

6.1 Transmit power

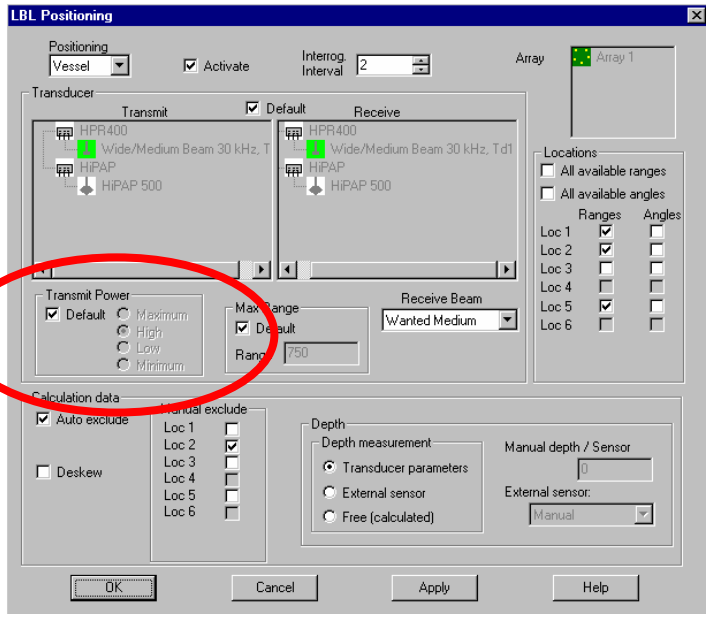

Figure 6.1

Were is the change taking place?

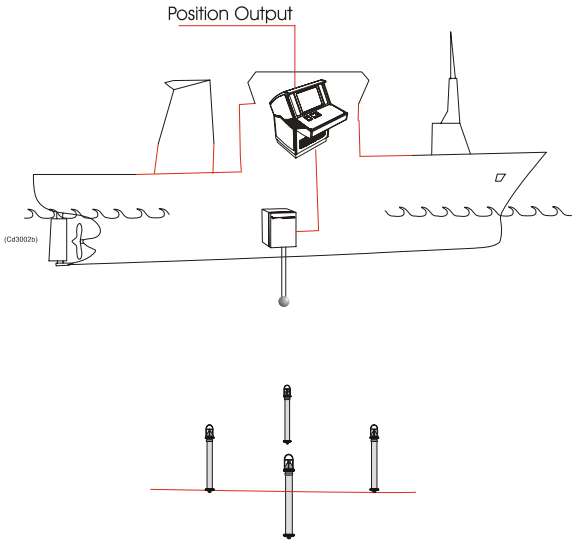

Figure 6.2

6.2 Locations

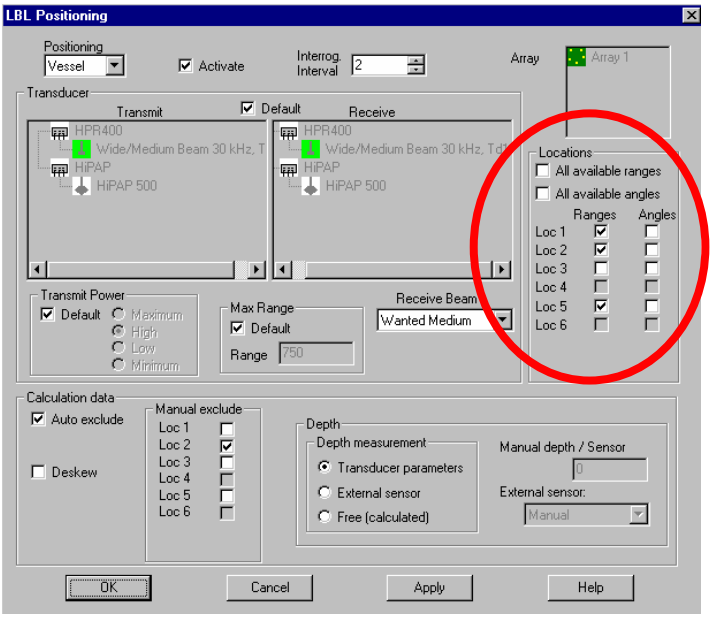

Figure 6.3

Go to ‘Help’ and read about Locations

Generally speaking

HiPAP® system: We recommend to always use both angle and ranges measurements

HPR 400 system: We recommend to use only range measurements

If you unselect both the Range and Angle measurement on Loc 1, will the transponder continue to send reply pulses?

6.3 Calculation data

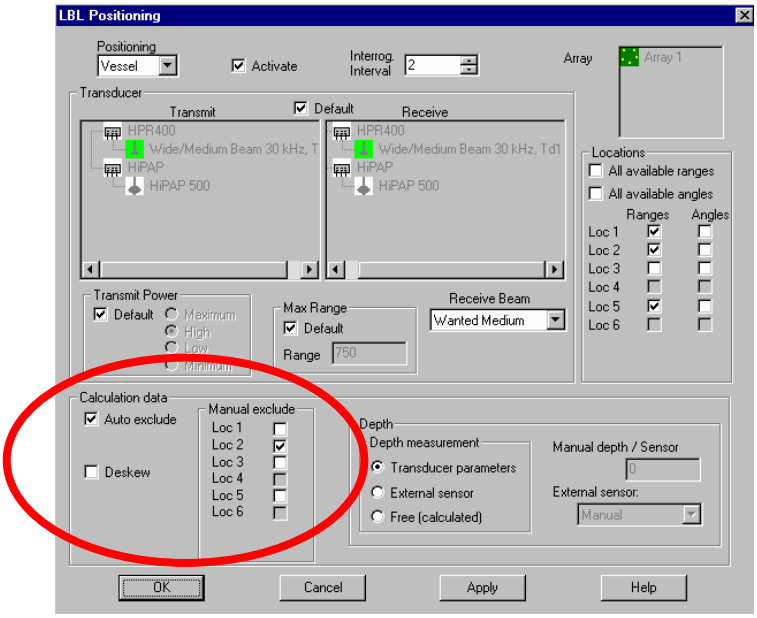

Figure 6.4

Go to ‘Help’ and read about ‘Auto exclude’

If you use the ‘MaEx’ function, you will also have to select ‘Free (calculated) in the ‘Depth measurement’ group.

OBSERVE Normally we will recommend using the ‘automatic exclude’ function.

6.4 Depth

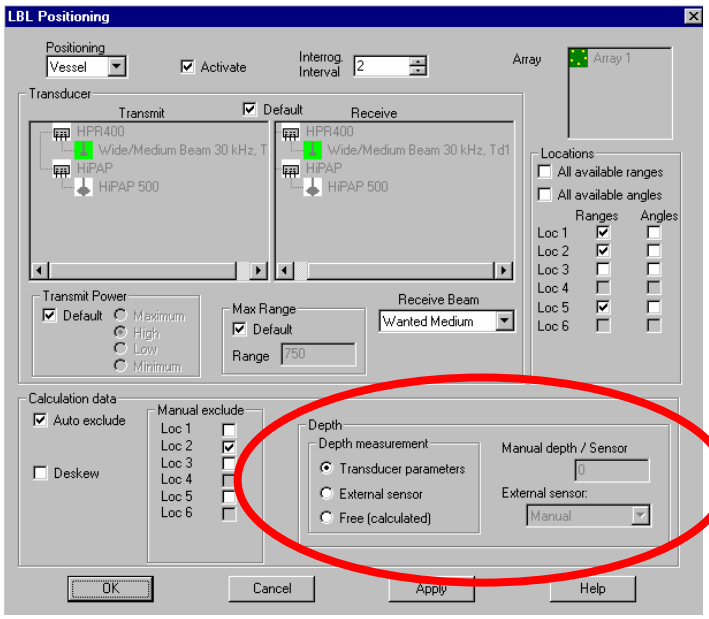

Figure 6.5

Go to Appendix B and read about ‘Offset rel. CG’ and ‘Vertical Depth’.

7 LBL Wizard

Preface

Traditionally baseline calibration was the foundation for LBL positioning, and still is if a high accuracy is needed.

When APOS was first introduced with LBL positioning, the ‘LBL Array data’ dialog box was the tool for managing the calibration. This tool required the user to have a ‘step by step’ procedure at hand, during the calibration.

In order to simplify this process, the ‘New LBL Array wizard’ was introduced. For standard users this was a big improvement, but the advanced user (surveyor) will still need to use the ‘LBL Array data’ dialog box. During operation you need to use the ‘LBL Array data’ dialog box for special functions, like change transponder modes etc.

Revision	Date	Written by
A	15 okt. 2004	kgr

Revision	Comments
A	This is a new part, based on Chapter 9 in ‘APOS Basic with LBL rev. B’ and handouts

Contents

7.1 Plan and deploy the transponders

Operation: We are at same location as in Chapter 3

Step by step

1) Plan the array
2) Make markers in APOS
3) Deploy transponders
4) Start positioning
5) Start the ‘New LBL Array wizard…’ see next page

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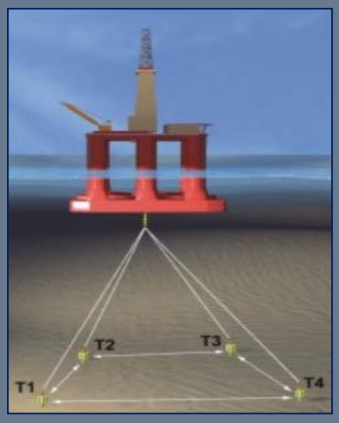
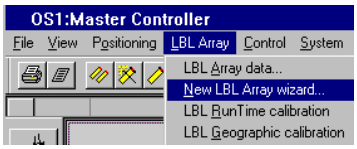
New LBL array wizard



NEW LBL ARRAY WIZARD APPROACH



The purpose of the wizard is to:

- Define and prepare a new LBL array ready for positioning (any existing information may be removed).

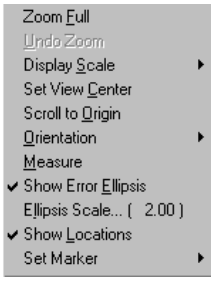
The wizard has following pages:

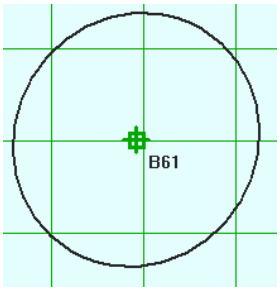
- Prepare LBL-calibration
- LBL channels
- Measuring baselines
- Set position mode

OPEN NEW LBL ARRAY WIZARD

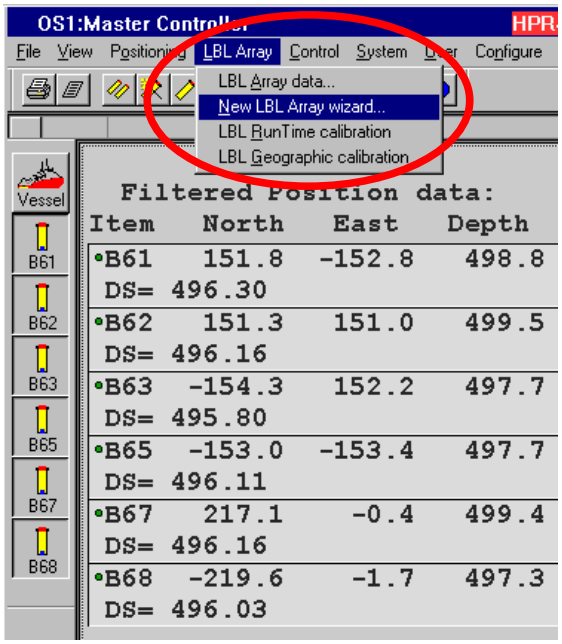
Exercise

- **Notice the size of the error ellipsis when SSBL positioning**





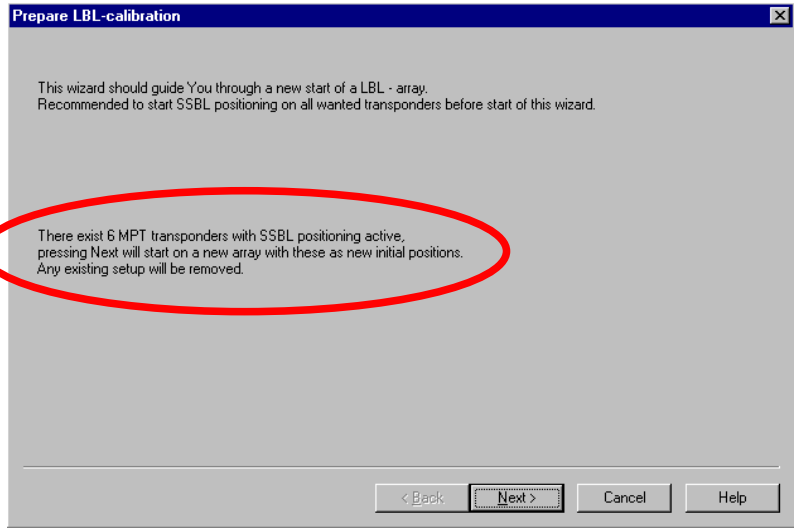
- **Start the New LBL Array wizard**

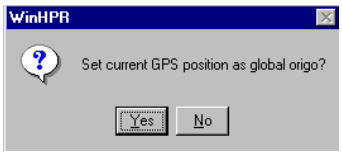


PREPARE LBL CALIBRATION

Exercise

- **Notice the message**
- **Continue with the wizard**

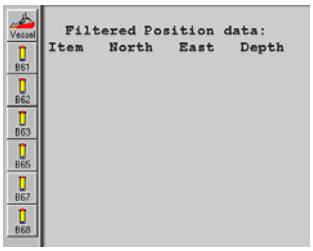


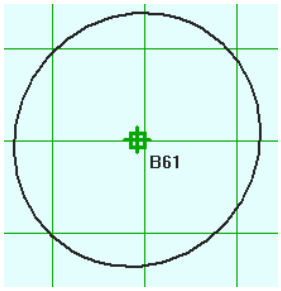


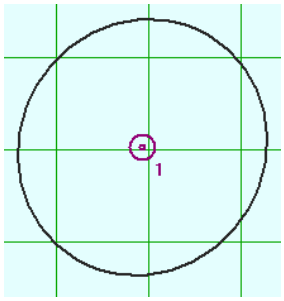
PRESENTATION LBL LOCATIONS

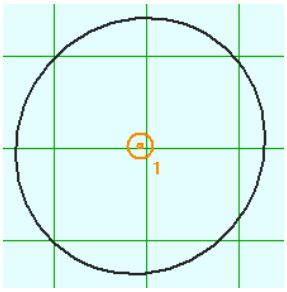
Exercise

- **Notice that the system automatically stopped SSBL positioning**
- **Notice how the presentation of transponder locations changed in the Cartesian View from SSBL positioning through the first step of the wizard**







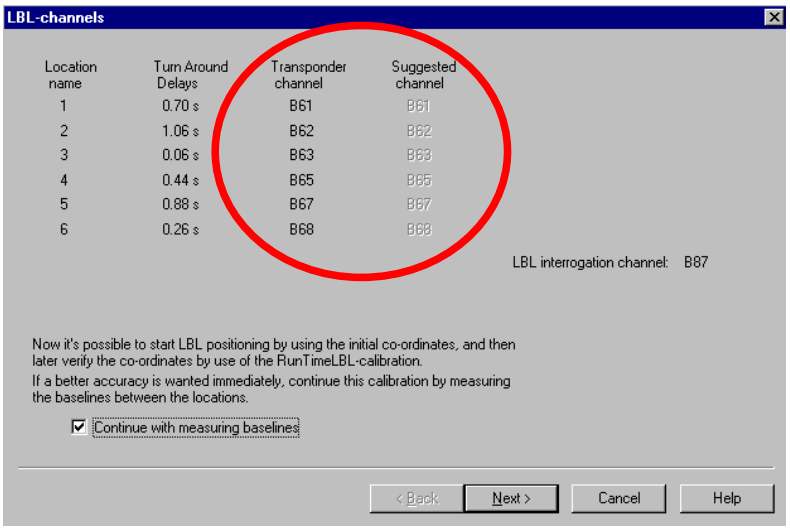


Revision A | This section was updated 15.10.04 | LBL Baseline Calibration - slide 5

LBL CHANNELS

Exercise

- **Check if the system accepts the transponder channel numbers**

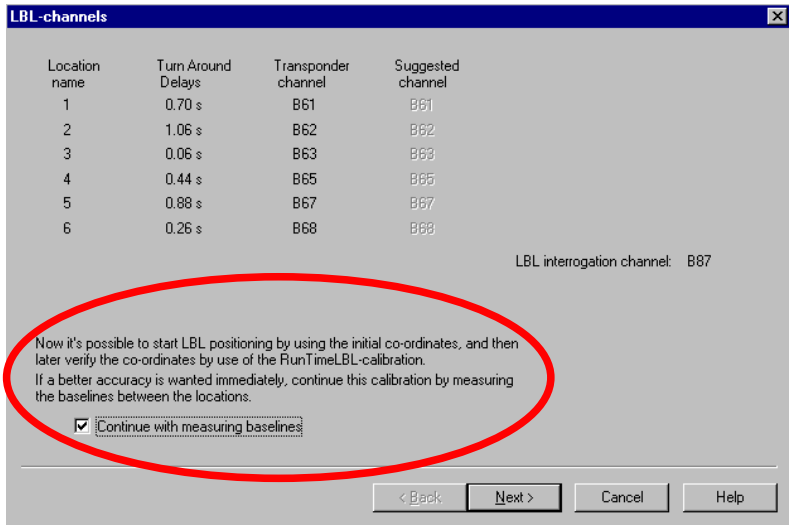


Revision A | This section was updated 15.10.04 | LBL Baseline Calibration - slide 6

MEASURE BASELINES OR NOT

Exercise

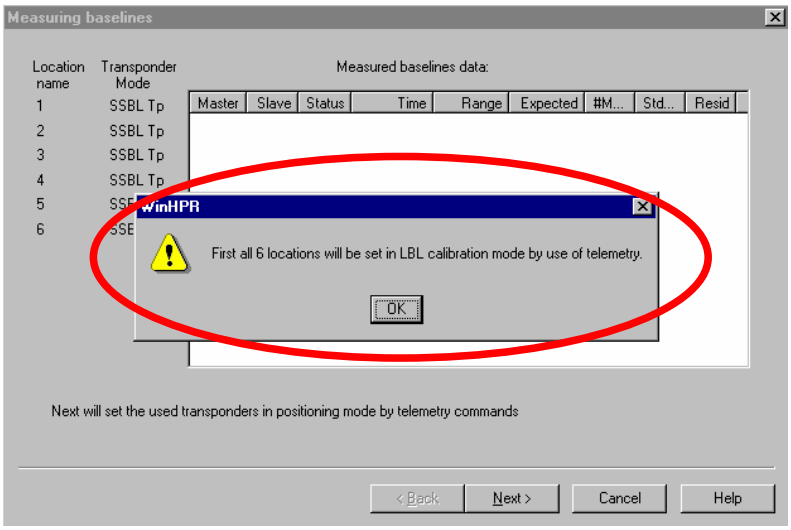
- **Notice the message**
- **Continue with measuring baselines**



SET LBL CALIBRATION MODE

Exercise

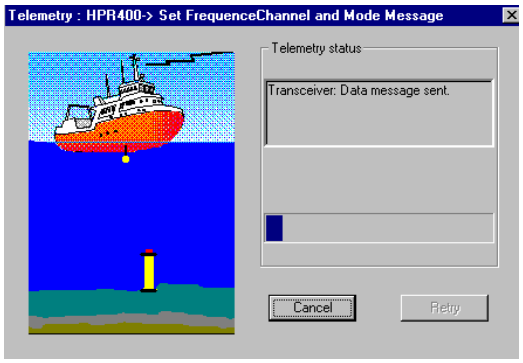
- **Notice the message**
- **Continue with the wizard**



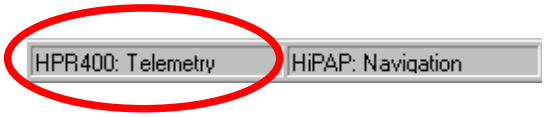
SET LBL CALIBRATION MODE - TELEMETRY

Exercise

- **Wait for the telemetry to finish**



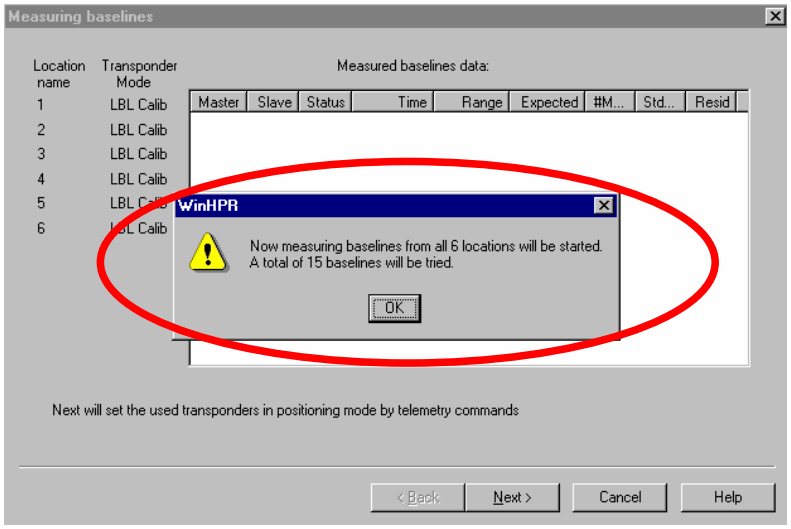
- **Notice the transceiver status when the system is performing telemetry**



MEASURE BASELINES

Exercise

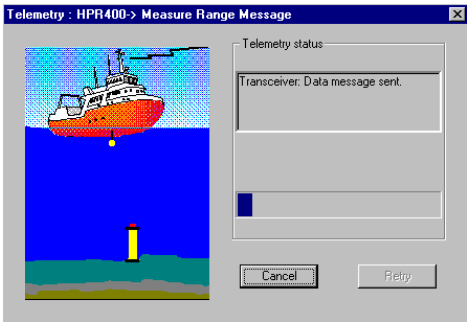
- **Notice the message**
- **Continue with the wizard**



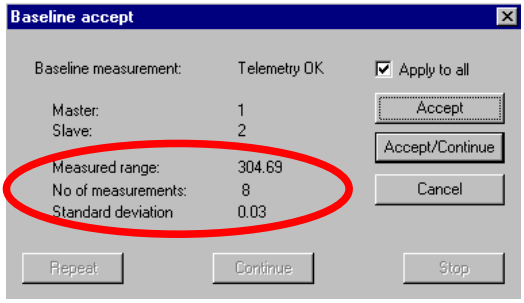
MEASURED BASELINE RESULT

Exercise

- **Wait for the telemetry to finish**



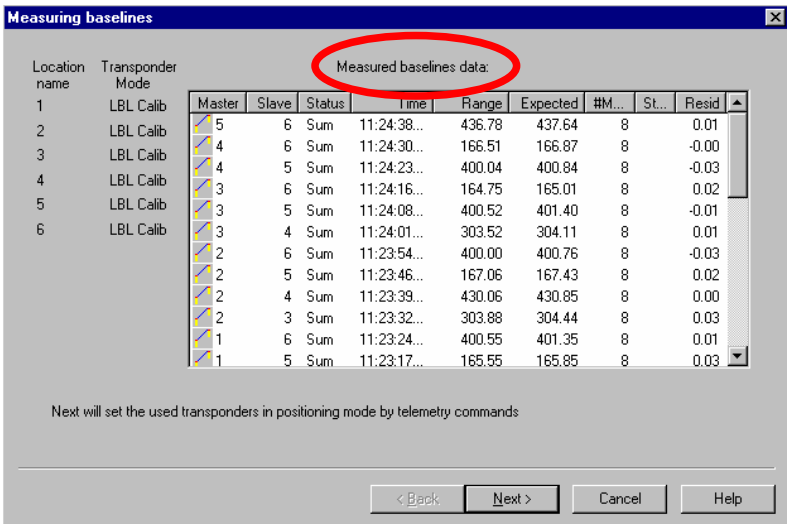
- **Evaluate the baseline measurement**
- **Continue with the wizard**



MEASURED BASELINES OVERVIEW

Exercise

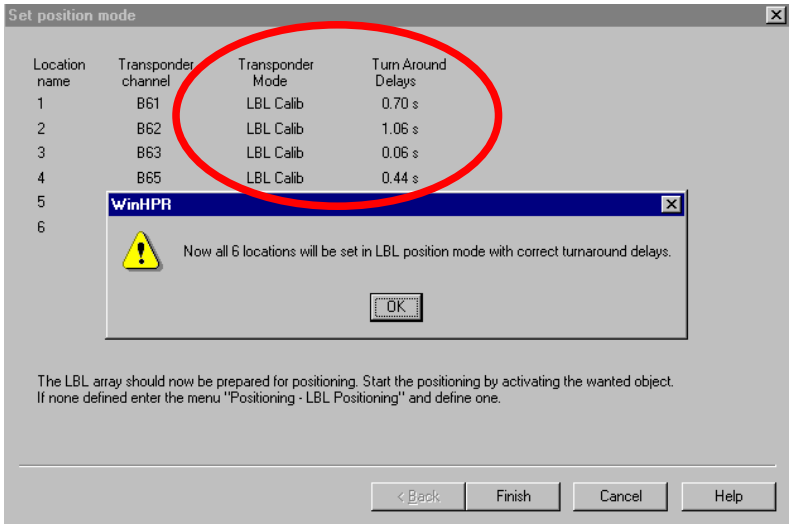
- **Evaluate the baseline measurement**
- **Continue with the wizard**



SET LBL POSITION MODE

Exercise

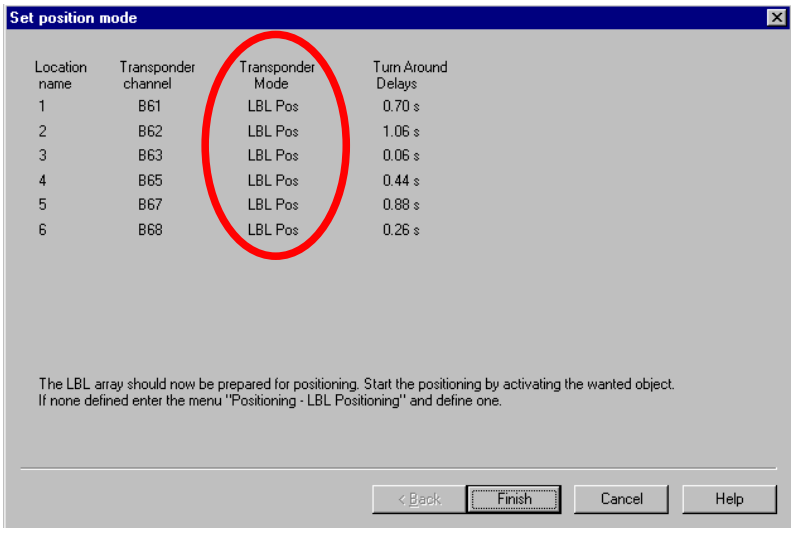
- **Notice the message**
- **Continue with the wizard**



FINISH THE WIZARD

Exercise

- **Notice the information on the page**
- **Finish the wizard**



SAVE THE FILE

Save the file

Give the file a suitable name

Here at the simulator: Give the file a name, starting with a number

7.3 New LBL Array wizard

1) The valid operational area is visible if you select ‘LBL Array’ on the menu bar, ‘LBL Array Data…’ and then select the ‘Position’ tab.

   Press the ‘Show’ button, and the dotted area is forbidden.

2) To start positioning, select ‘Positioning’ on the menu bar, and then ‘LBL positioning…’.

   ‘Check mark’ the ‘Activate’ box, and the press ‘OK’.

8 LBL array data

Preface

This dialog box gives you advanced possibilities for LBL calibration, as well as configuring the transponders.

In this training course we will only go into those details necessary for operating the LBL positioning for a DP vessel.

In ‘Help’ you will find a detailed ‘step by step’ procedure for using the ‘LBL Array data’ for a LBL baseline calibration.

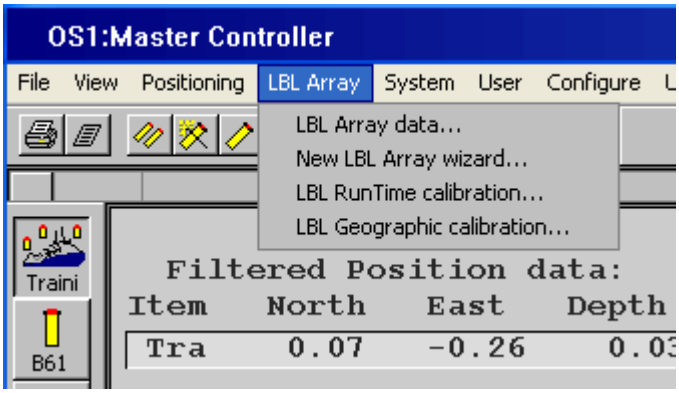
Revision	Date	Written by
A	15 okt. 2004	kgr

Revision	Comments
A	This is a new part

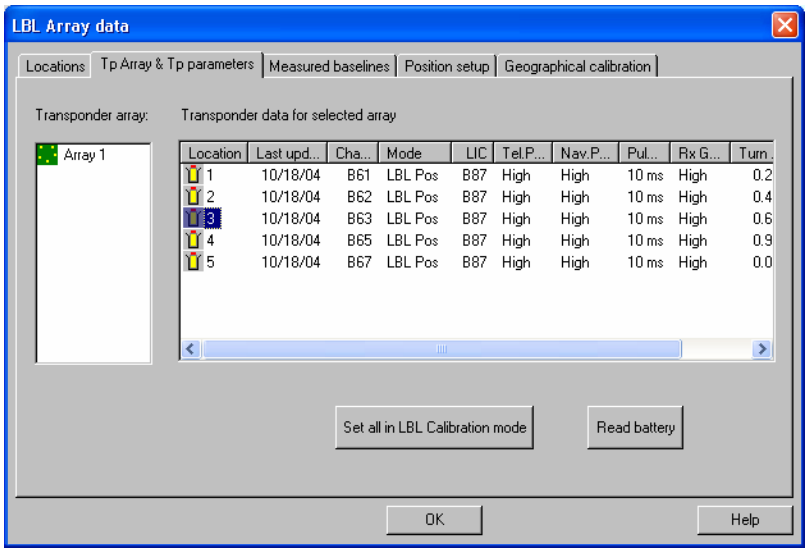
Contents

8.1 Introduction

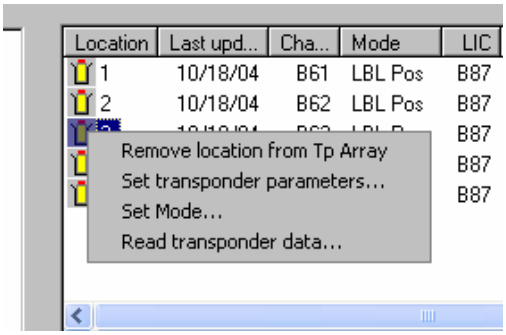
You will get access to the ‘LBL Array data’ from ‘LBL Array’ on the menu bar.



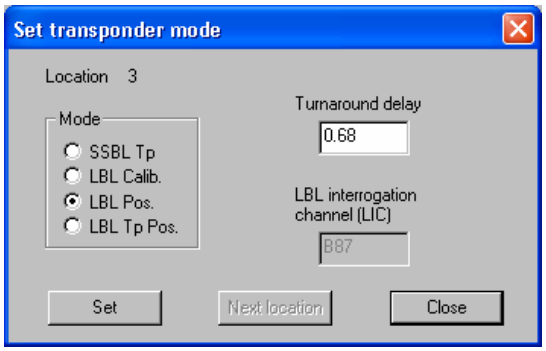
8.2 Disable a transponder from the array



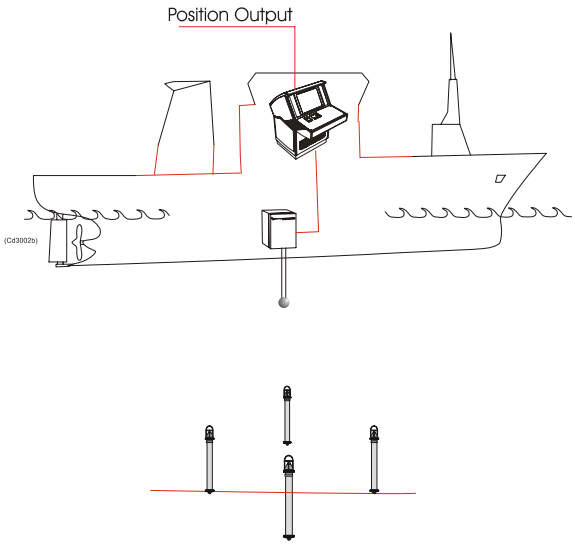
'Right click' on the transponder you want to disable and select 'Set Mode…'.



Set the transponder to 'SSBL Tp' mode.



Were is this change taking place?



What will happen to your DP telegrams during disabling?

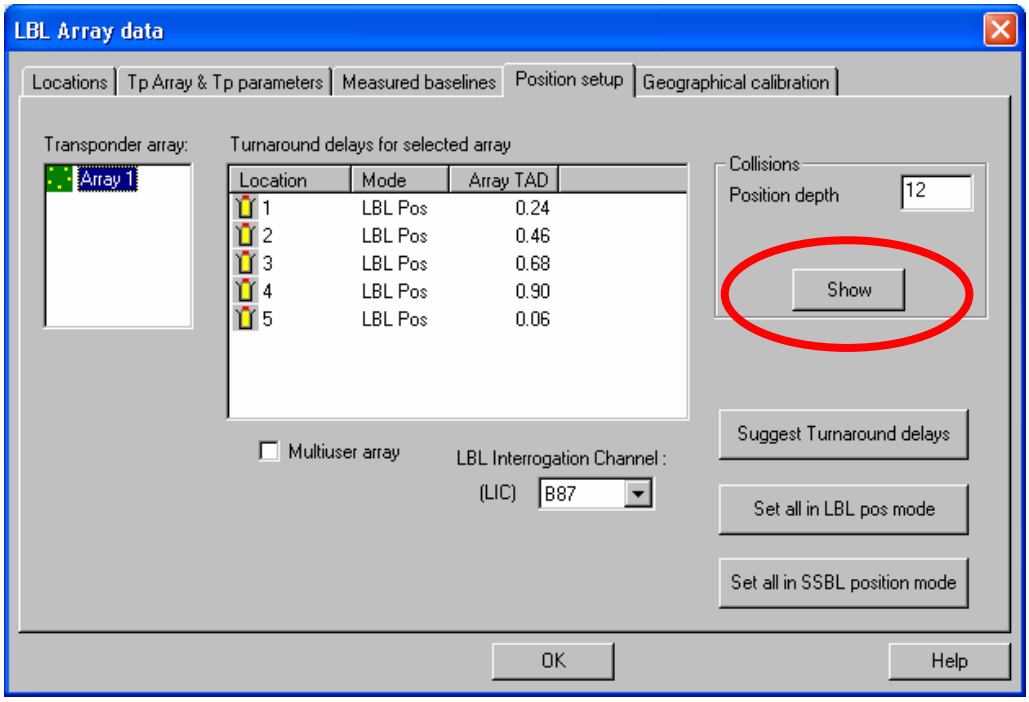
_____

_____

What will happen to the battery consumption?

_____

8.3 Collisions



Press the Show button to see the operation area for the array. Dotted area indicates collisions of the reply frequency

8.4 Tp Maintenance in an LBL array

8.4a Battery change in the transponder

General

If you have your transponders in a transponder stand, it is possible to remove the transponder for maintenance, like changing battery, cleaning etc. When you put the transponder back into the transponder stand, after the maintenance, the baseline in the LBL calibration will be maintained.

You can do this maintenance, also during LBL position, as long as you will have at least 3 active transponders in the array.

Hint: We strongly recommend doing maintenance on one transponder at the time. This is to make sure that you are not interchanging the transponders within the array.

Step by step.

1) Disable the transponder from the LBL array (see Handouts 20.09).

2) Raise the transponder

3) Follow the transponder safety procedure

4) Do the necessary maintenance

5) Put the transponder back into the transponder stand

6) Set the transponder into LBL mode

8.4b Reading the Transponder battery

You have two options to read the battery in a transponder in ‘LBL mode’.

Step by step

1) Select ‘Configure’ on the ‘menu bar’, and select ‘Transponder…’

2) ‘Left click’ on actual transponder to highlight it. Press the Read button in the Battery box

3) Press ‘Check Capacity’.

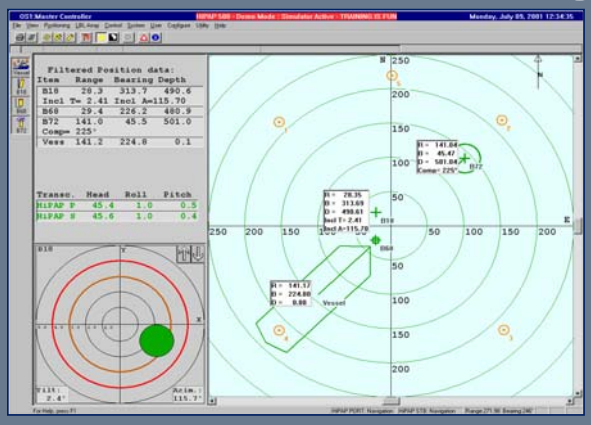
4) Check SW version

5) Choose transponder type

6) Read ‘Tx %’ and ‘Rx %’.

Chapter 9

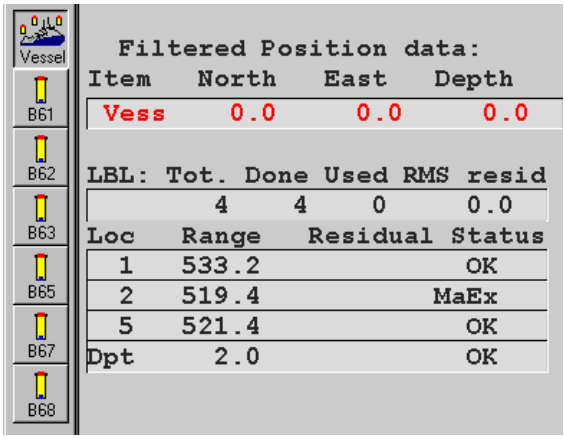
LBL troubleshooting

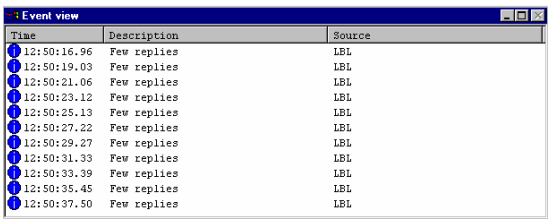


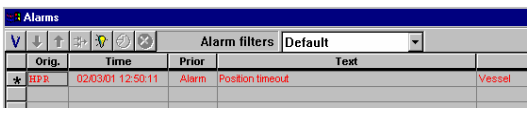
LBL TROUBLE SHOOTING

Exercise

- Open the training file
  - LBL TROUBLE SHOOTING
- Start LBL positioning
- Get the system back to normal operation as on the next slide
  - B28-B62-B63-B65-B67 are all used in LBL positioning in the same array

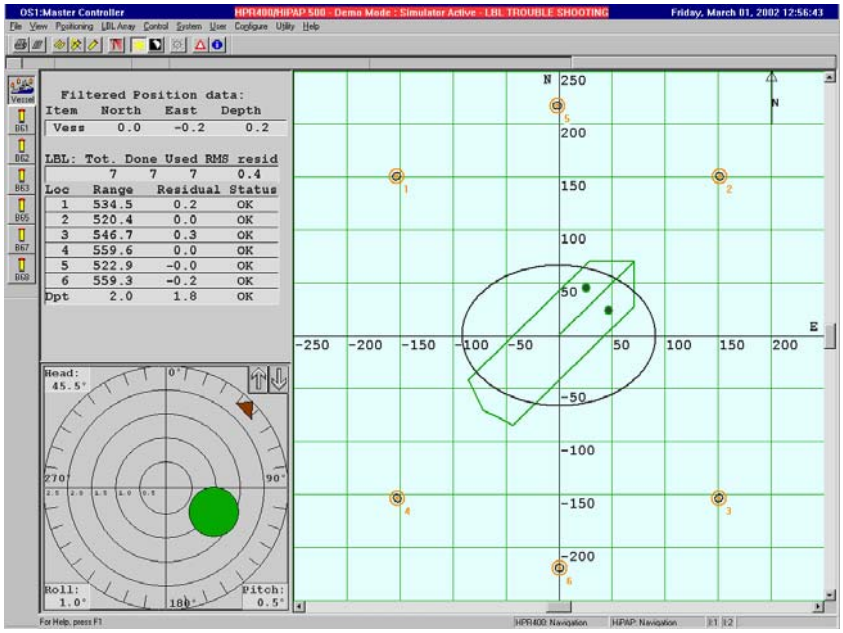






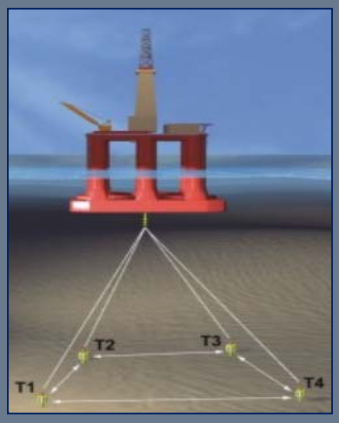
LBL TROUBLE SHOOTING SOLUTION

- Vessel position
  - North
  - East
  - Depth
- Slant range to locations
  - Range
  - Residual
  - Status
- Attitude sensors
  - Heading
  - Roll
  - Pitch



KONGSBERG

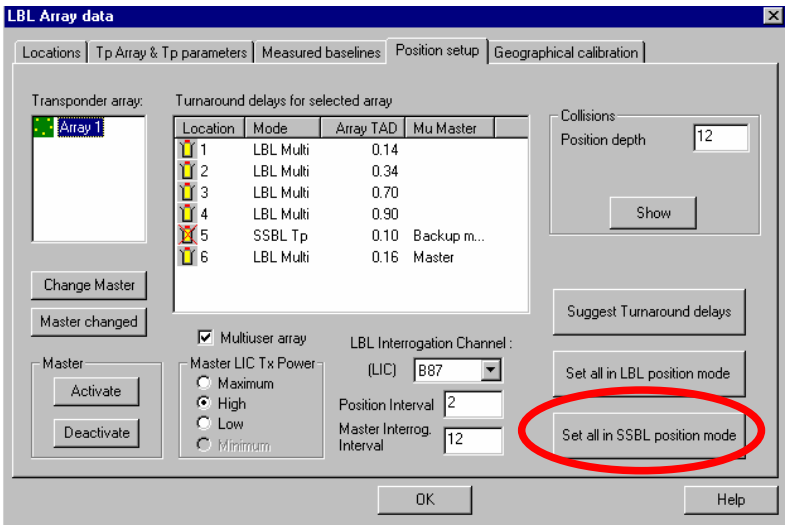
Chapter 10
Leaving the Location

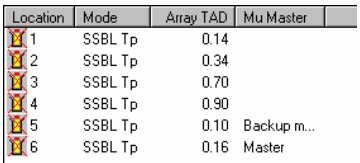


SET TRANSPONDERS IN SSBL MODE

Exercise

– **Set all transponders in SSBL mode**

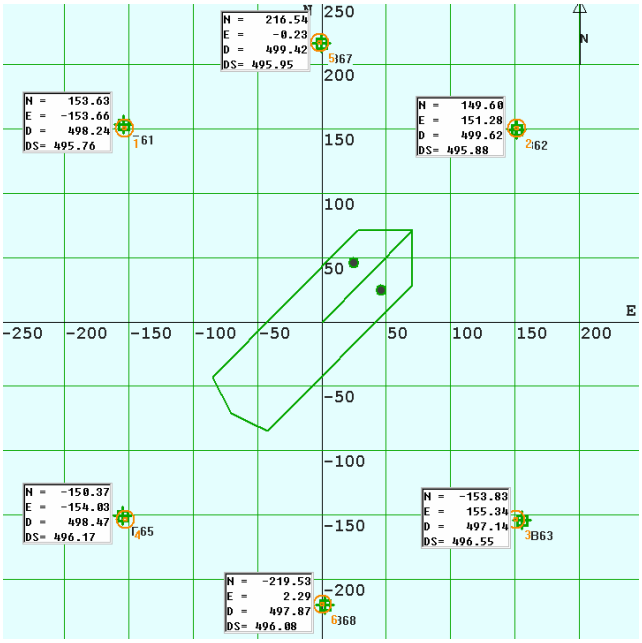




ACTIVATE TRANSPONDERS IN SSBL MODE

Exercise

- **Activate all transponders in SSBL mode and mobile operation**

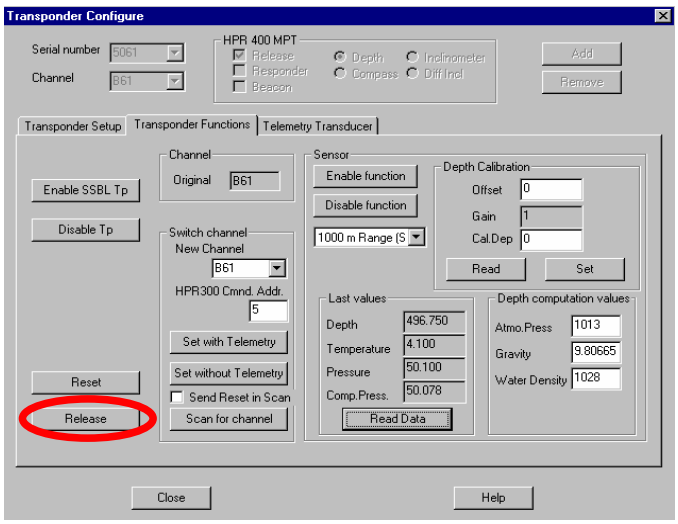


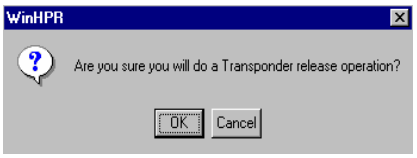
Revision A | This section was updated 15.10.04 | Leaving the location - slide 3

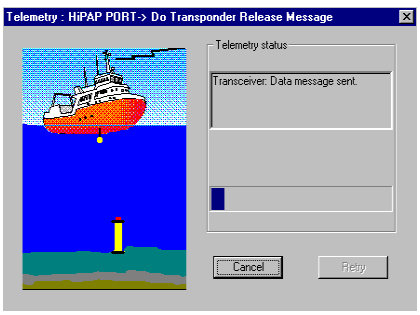
RELEASE ARRAY TRANSPONDERS

Exercise

- **Release the transponders one by one**





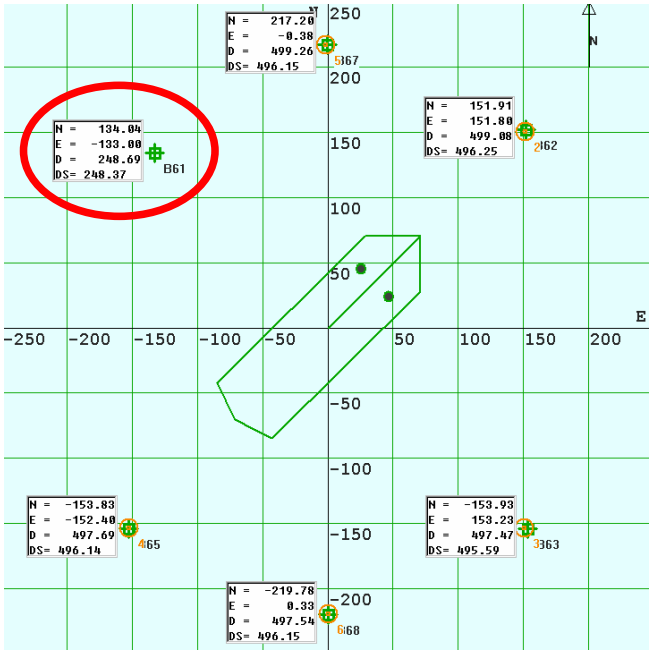


Revision A | This section was updated 15.10.04 | Leaving the location - slide 4

MONITOR RELEASED TRANSPONDERS

Exercise

- **Monitor the position as it floats up to the surface - it might drift off**



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11 Multiuser LBL

Preface

This dialog box gives you and advanced possibilities for LBL calibration, as well as configuring the transponders.

In this training course we will only go into those details necessary for operating the LBL positioning.

In ‘Help’ you will find a detailed ‘step by step’ procedure for using the ‘LBL Array data’ for a LBL baseline calibration.

Revision	Date	Written by
A	15 okt. 2004	kgr

Revision	Comments
A	This is a new part, based on Chapter 11 in ‘APOS Basic with LBL rev. B’ and handouts

Contents

11.1 Introduction

OBSERVE On older versions of the APOS sw (preceding 3.7.0) we recommend not to use ‘Default’ for ‘Transducer’ selection in LBL ‘Properties…’ (LBL Positioning…) dialog box.

APOS may contain an error.

An MULBL calibration contains the 4 major steps:

1) Measure the VoS as accurate as needed (at least on the seabed)

2) Make LBL baseline calibration (‘fine tune’ the baselines)

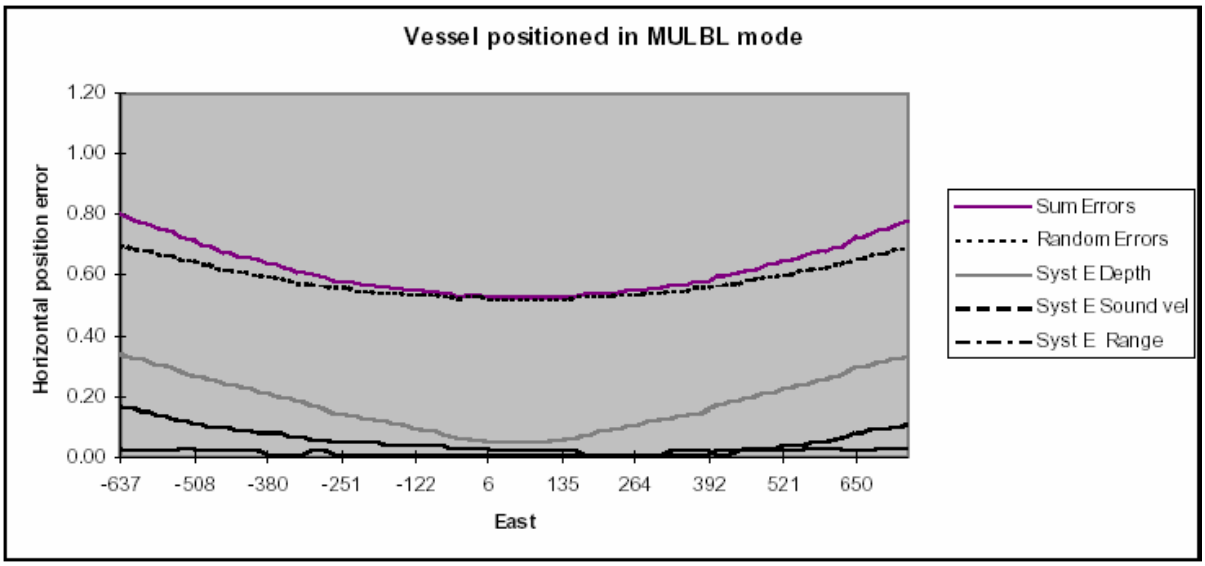
3) Make LBL runtime calibration (‘fine tune’ the depth)

4) Set up MULBL configuration and start positioning

OBSERVE Transponders are designed to operate in the upper frequency range.

To achieve maximum output power we recommend to use the channels in the upper frequency range.

11.2 MULBL accuracy



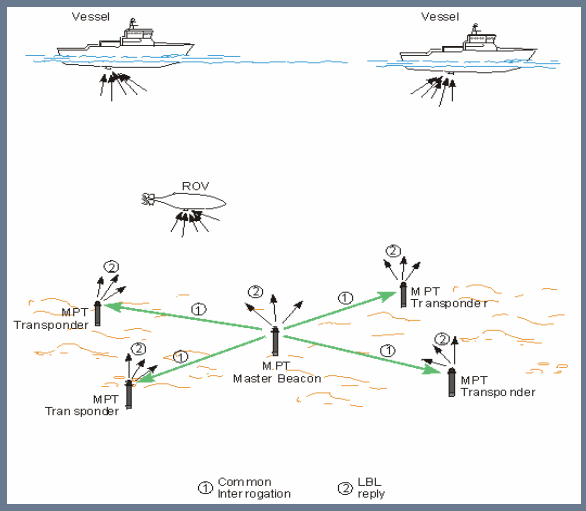
The following factors will contribute to the total uncertainty:

Range reception in the transponder	0.15 meter
Range error due to transponder movements	0.10 meter
Range error due to rig movements	0.20 meter
Range reception with 20 dB S/N	0.15 meter
Sum	0.60 meter

In addition an error in sound velocity contributes with an horizontal position error when the rig moves away from the MULBL origin.

KONGSBERG

MULBL



INTRODUCTION

The purpose of these exercises is to lead you through most of the menus, buttons and functions needed for MULBL positioning from the APOS system in a safe way

The exercises are written for general operation and you might therefore find exercises not relevant for your use of the system

Note that file names, water depths, channel numbers, values in default parameters, interrogation intervals, offsets and other settings might be different in live operations than in the screen dumps in this section

Note that the file screen dumps in this training manual are taken with different APOS software versions and not necessarily fit the software you have on-board or in a standard APOS Trainer

Use APOS Online Help active when working with the exercises

Special simulator and setting files must be installed on an APOS Trainer to get the same screen dumps as in this section

DOCUMENT LOGISTICS FOR INTERNAL USE

Revision	Date	Written by
– A	18.11.03	KGR

Revision	Comments
– A	First edition, based on 64614 Rev E

THE LBL CALIBRATION RESULT

An MULBL array may be available to several vessels, and all the vessels can use it at a time.

If your vessel is arriving to a location were the already is deployed transponders in an array, and this array is then calibrated and configured as a MULBL array, the result of that calibration as well as the information about the transponders may be available on a file.

This file will have a filename with a file-extension HPR.

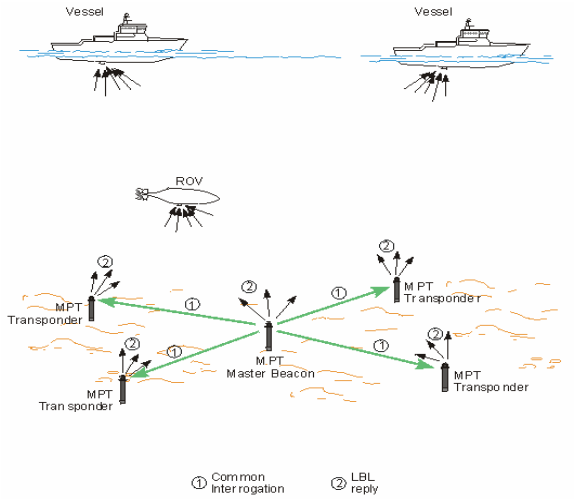
MULBL POSITIONING

Situation

- Several vessels wants to use the same array for positioning or a faster update rate is wanted
- The LBL array needs to be setup as a MULBL array

Exercise

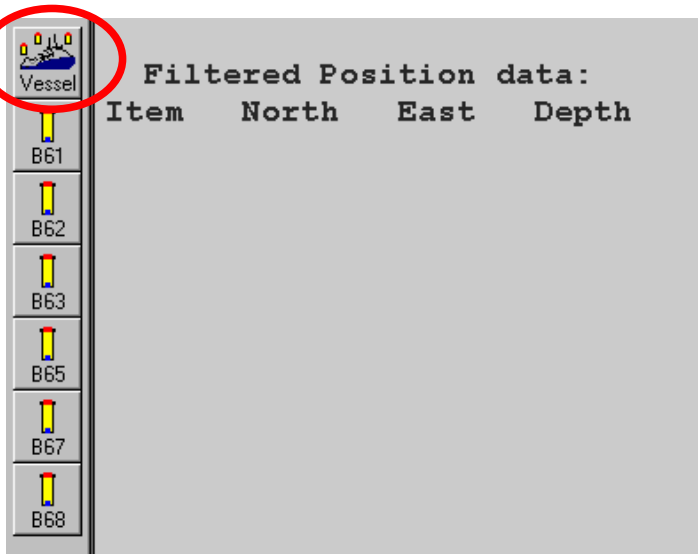
- Use Online Help and find the explanation of the MULBL principle



STOP LBL POSITIONING BEFORE MULTIUSER SETUP

Exercise

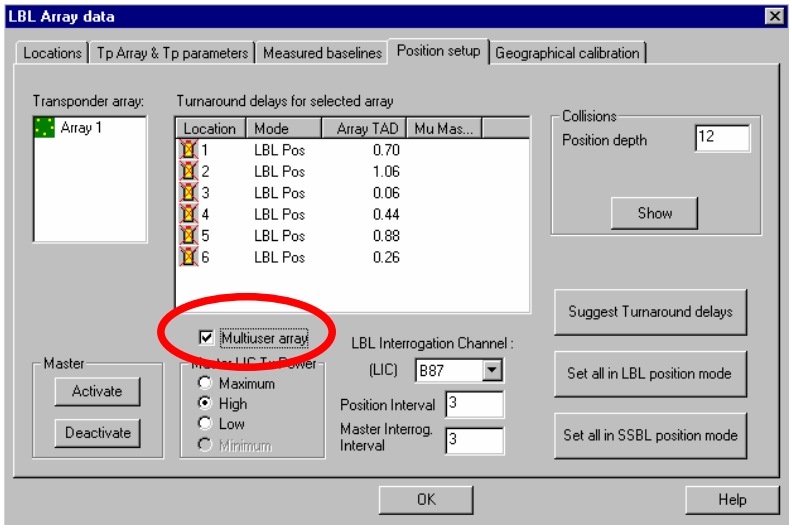
- Stop LBL positioning

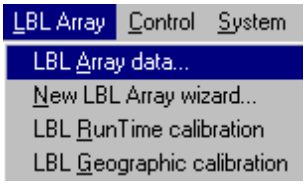


MULTIUSER ARRAY CHECK BOX

Exercise

– Enter the LBL Array data dialog and select the Multiuser array check box

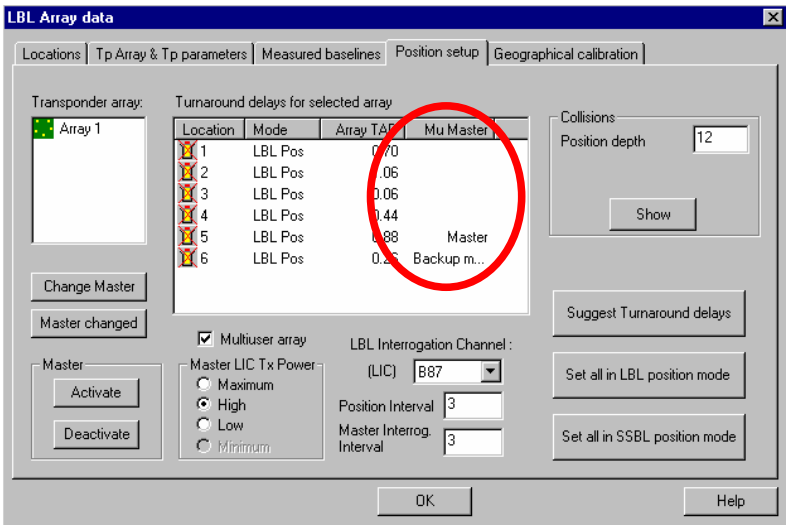




MASTER AND BACKUP MASTER TRANSPONDER

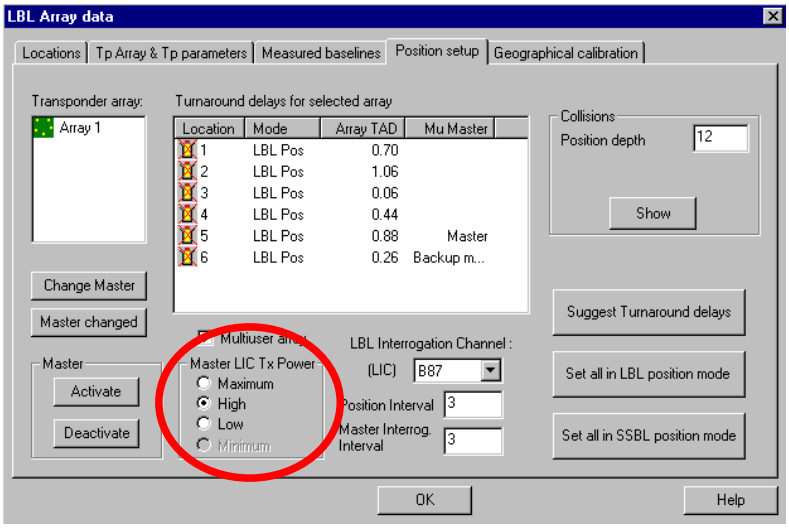
Exercise

– Select Master and Backup master



MASTER LIC TX POWER

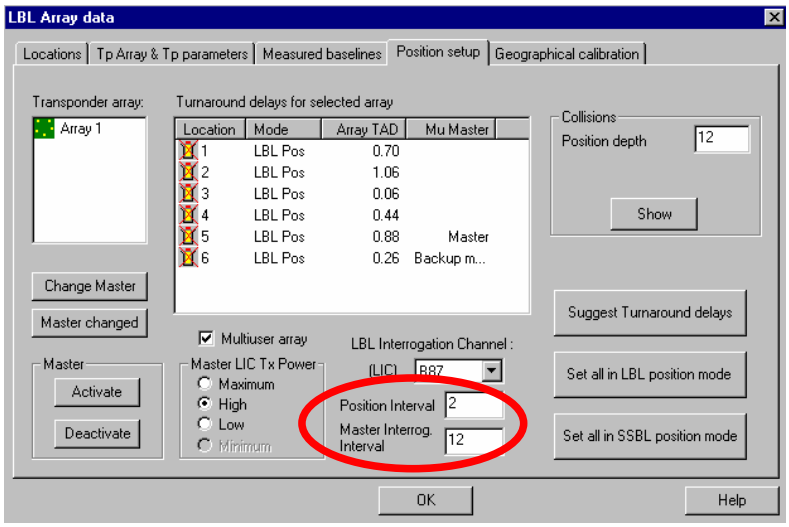
- Exercise
  - Select master LIC Tx Power



POSITION INTERVALS

Exercise

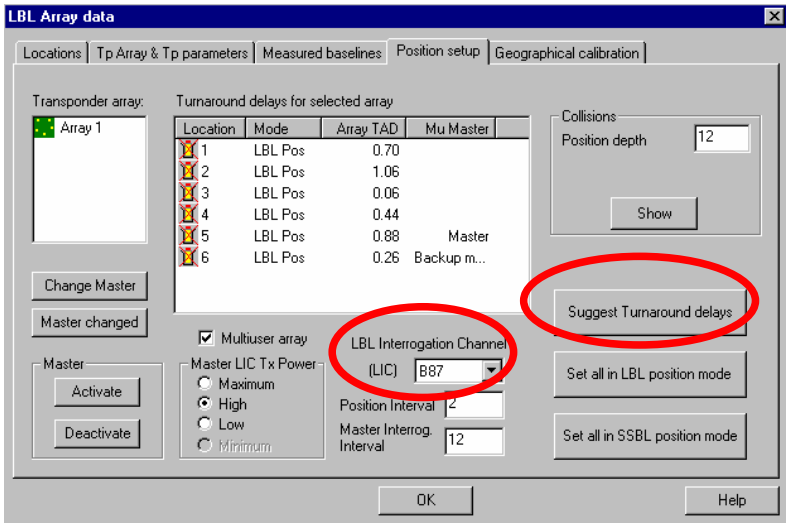
- Select Position Interval and Master Interrogation Interval

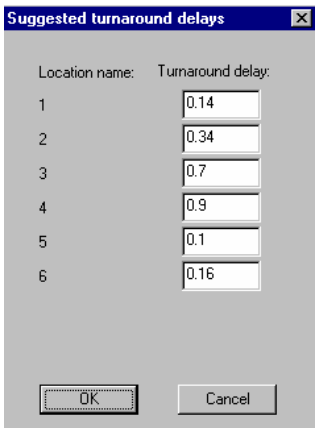


LIC & TAD

Exercise

- Select LBL Interrogation Channel and Turnaround delays

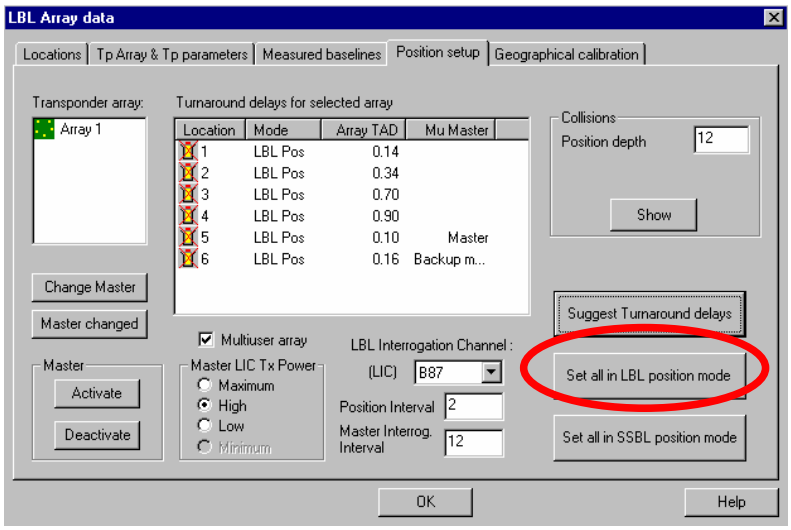


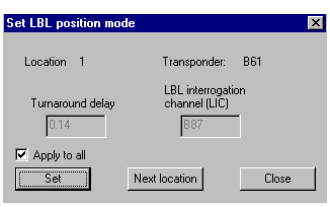


MULBL POSITION MODE

Exercise

- Set all transponders in MULBL position mode

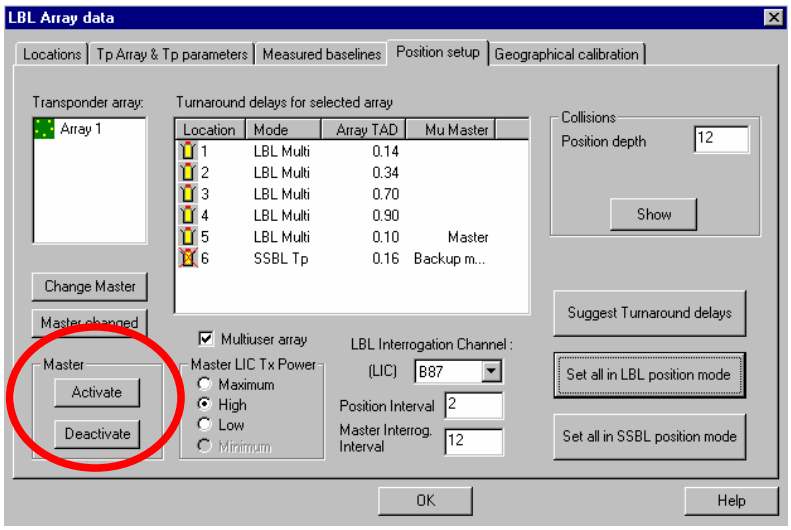


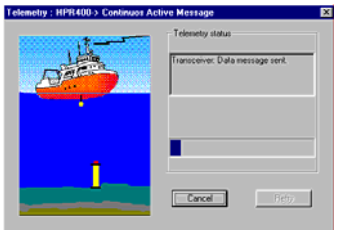


ACTIVATE MASTER TRANSPONDER

Exercise

- Activate the master transponder

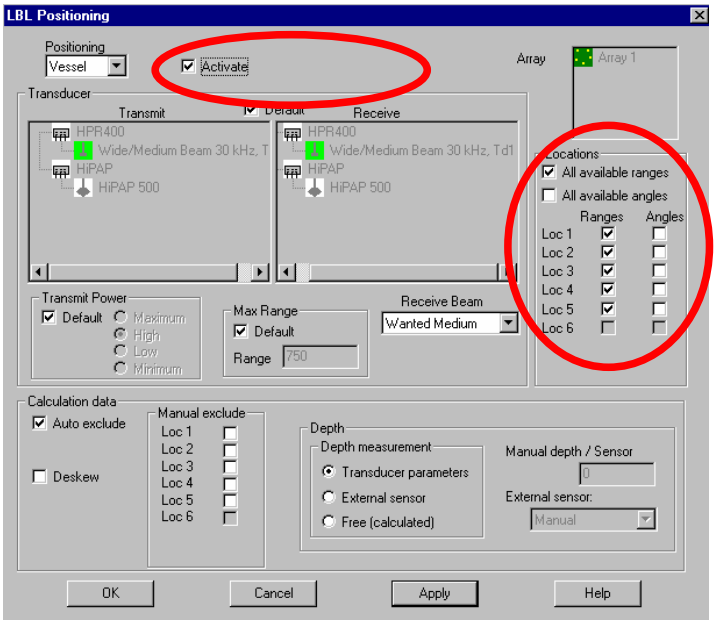




ACTIVATE MULBL POSITIONING

Exercise

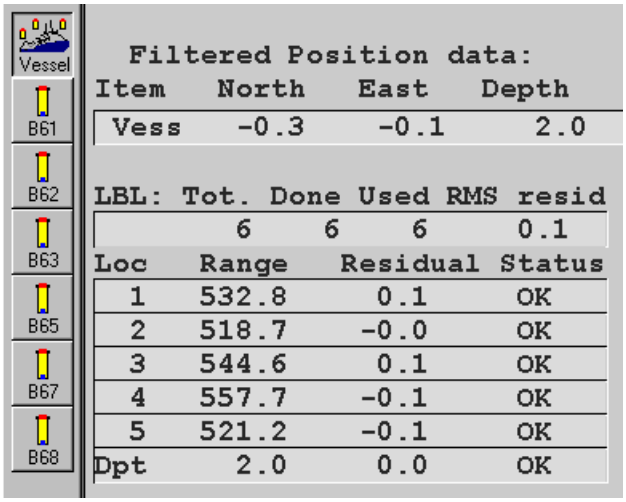
- Activate MULBL positioning
- Notice that Interrogation Interval is missing
- Decide if you should use angles not
- Notice that the Backup Master is not in use



MULBL POSITION, RANGES AND RESIDUALS

Exercise

- Examine how the position and ranges are presented
- Notice that the Backup Master is not in use



Filtered Position data:

Item	North	East	Depth
Vess	-0.3	-0.1	2.0

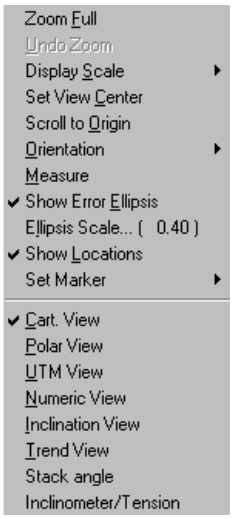
LBL:	Tot.	Done	Used	RMS resid
	6	6	6	0.1

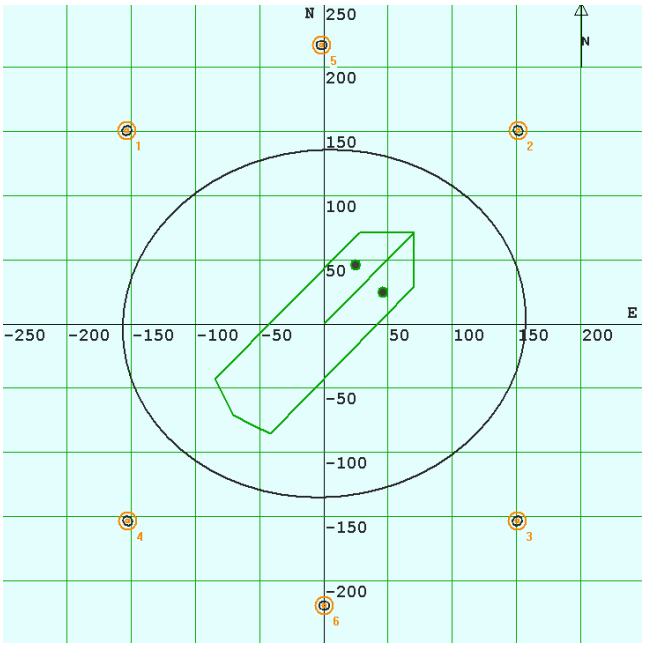
Loc	Range	Residual	Status
1	532.8	0.1	OK
2	518.7	-0.0	OK
3	544.6	0.1	OK
4	557.7	-0.1	OK
5	521.2	-0.1	OK
Dpt	2.0	0.0	OK

ERROR ELLIPSIS FOR MULBL POSITION

Exercise

- Examine the expected accuracy of the MULBL position

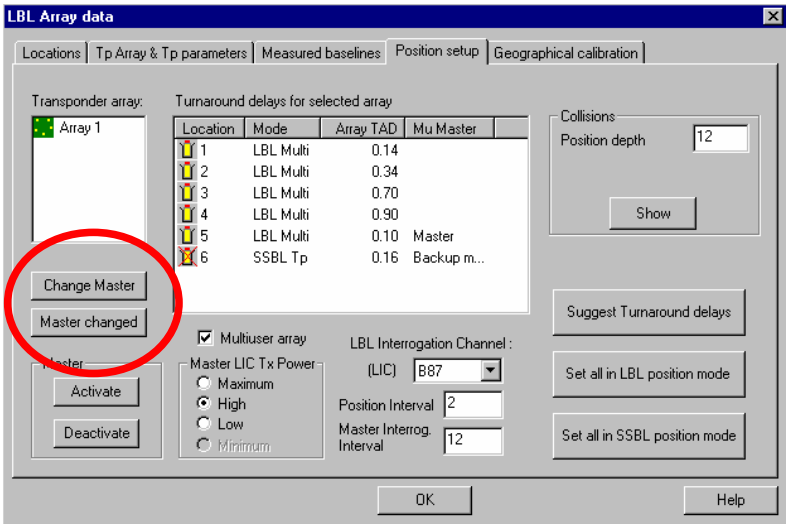


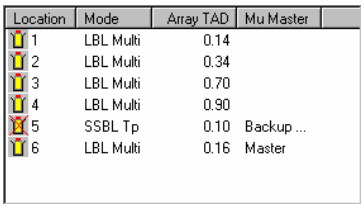


CHANGE MASTER TRANSPONDER

Exercise

- Stop MULBL positioning
- Change master transponder and notice the changes

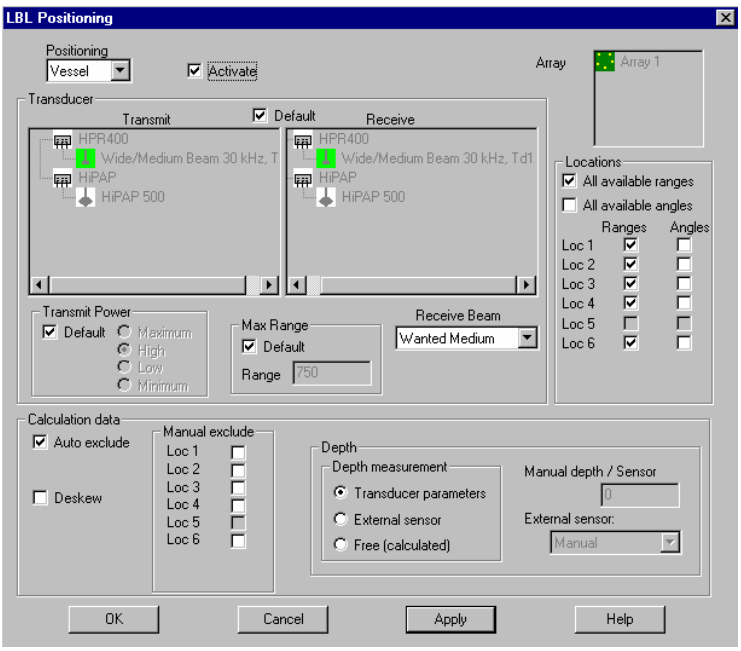




ACTIVATE MULBL POSITIONING

Exercise

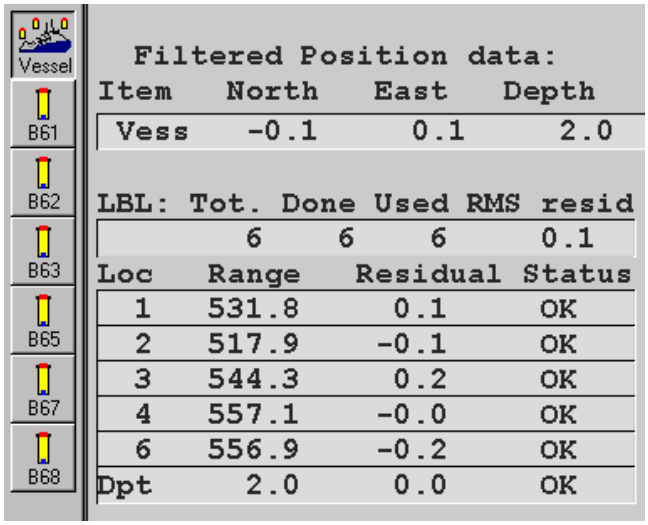
- Activate MULBL positioning
- Notice the missing selection of Interrogation Interval
- Decide if you should use angles not
- Notice that the Backup Master has changed and is not in use



MULBL POSITION, RANGES AND RESIDUALS

Exercise

- Examine how the position and ranges are presented
- Notice that the new Backup Master is not in use



Filtered Position data:

Item	North	East	Depth
Vess	-0.1	0.1	2.0

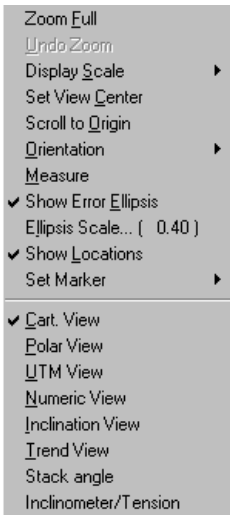
LBL:	Tot.	Done	Used	RMS resid
	6	6	6	0.1

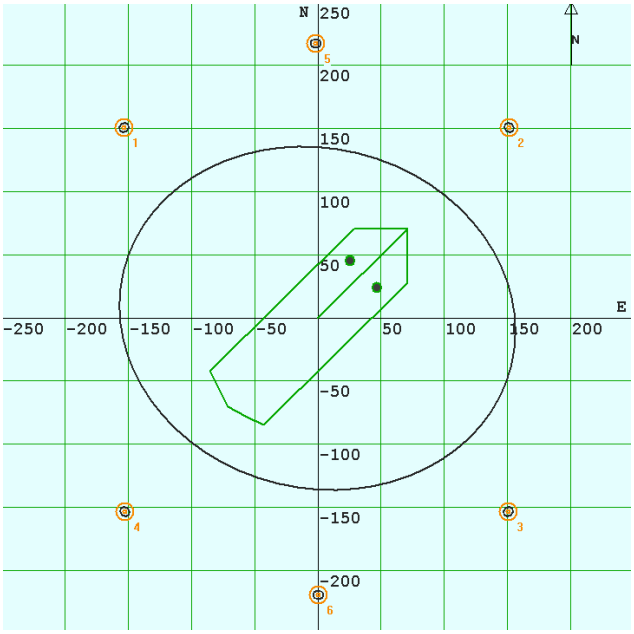
Loc	Range	Residual	Status
1	531.8	0.1	OK
2	517.9	-0.1	OK
3	544.3	0.2	OK
4	557.1	-0.0	OK
6	556.9	-0.2	OK
Dpt	2.0	0.0	OK

ERROR ELLIPSIS FOR MULBL POSITION

Exercise

- Examine the expected accuracy of the MULBL position

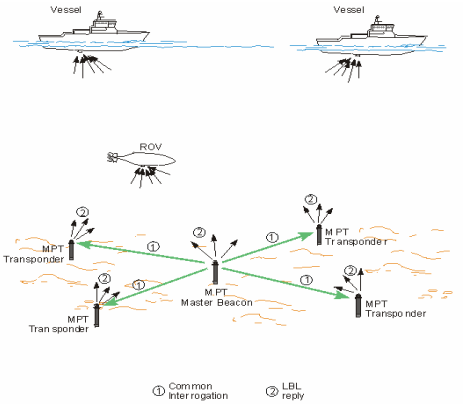


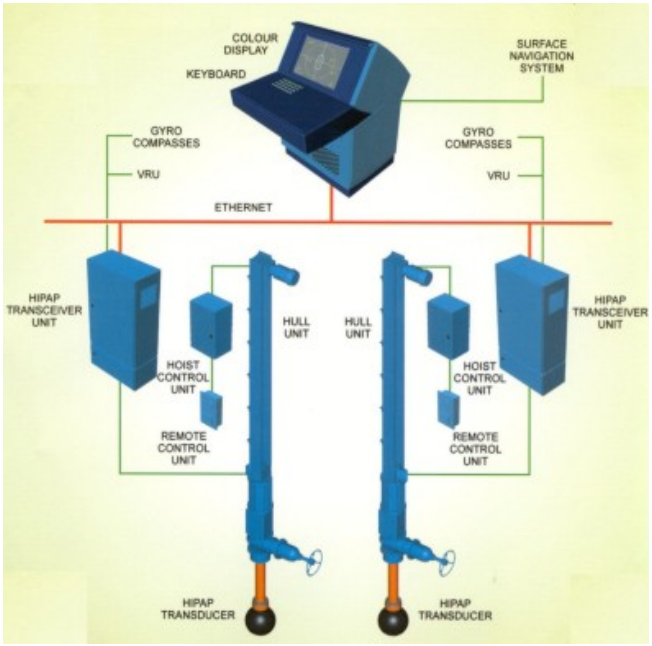


DUAL MULBL POSITIONING

Situation

- The vessel has two transceivers and transducers
- You want each to calculate a MULBL position





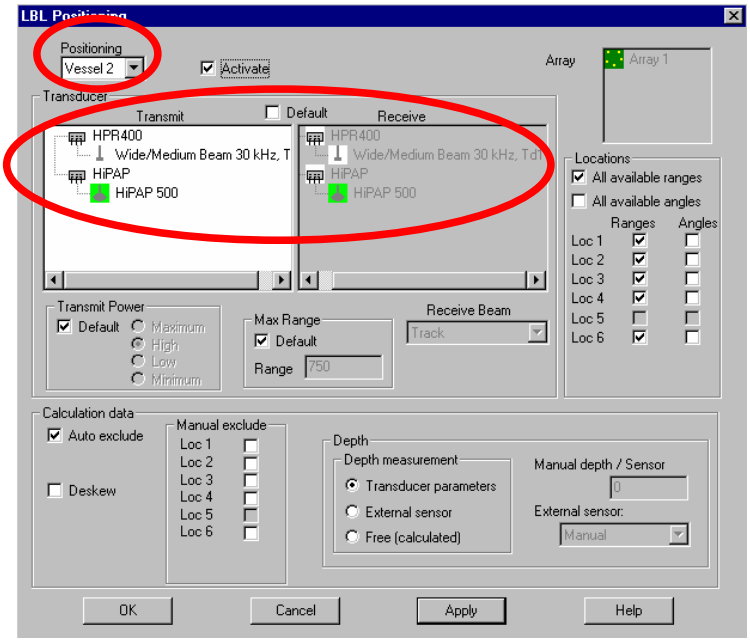
DUAL MULBL POSITIONING

Situation

- The vessel has two transceivers and transducers and you want each to calculate a MULBL position

Exercise

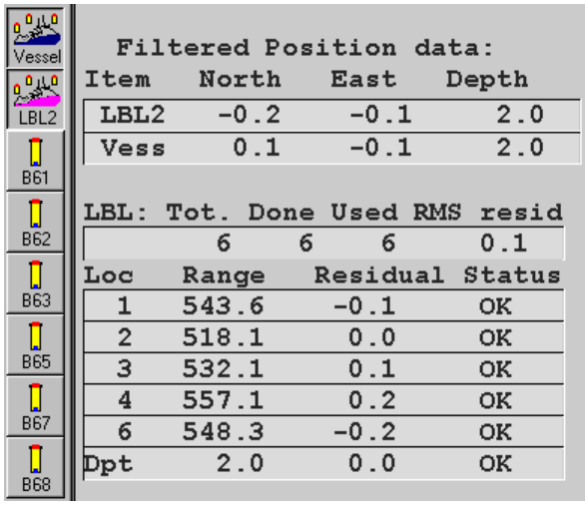
- Activate MULBL positioning on Vessel2 using the other transceiver and transducer to receive signals from the array transponders



DUAL MULBL POSITIONS, RANGES AND RESIDUALS

Situation

– If you experience jumpy LBL2 positions in the demo program, please let the instructor synchronize the simulator files

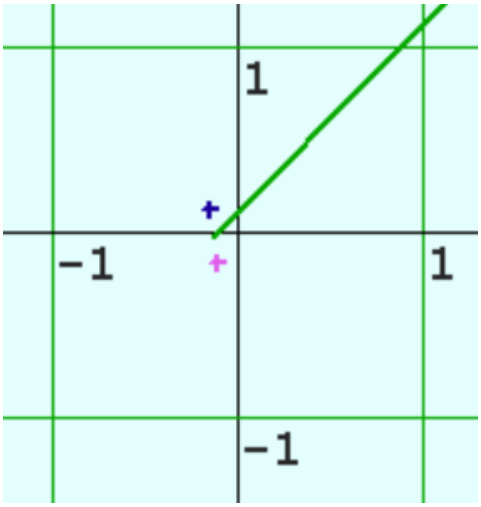


Filtered Position data:

Item	North	East	Depth
LBL2	-0.2	-0.1	2.0
Vess	0.1	-0.1	2.0

LBL: Tot.	Done	Used	RMS resid
6	6	6	0.1

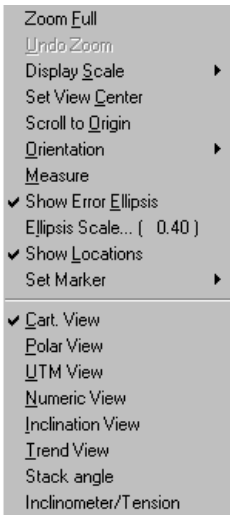
Loc	Range	Residual	Status
1	543.6	-0.1	OK
2	518.1	0.0	OK
3	532.1	0.1	OK
4	557.1	0.2	OK
6	548.3	-0.2	OK
Dpt	2.0	0.0	OK

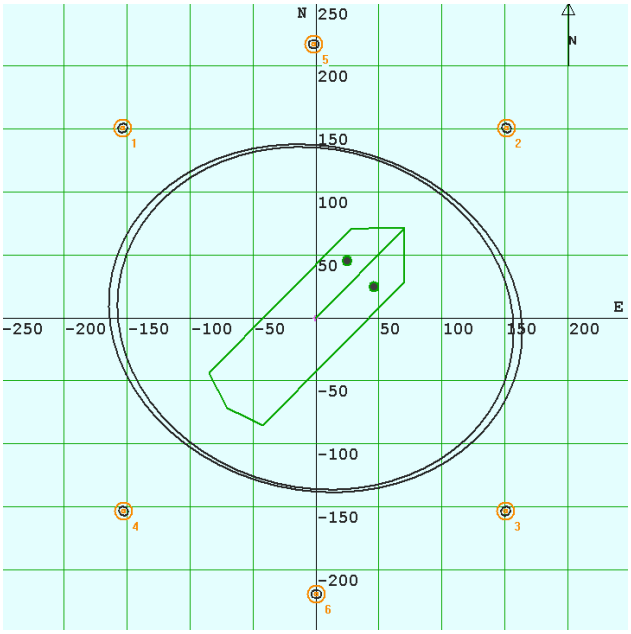


ERROR ELLIPSIS FOR DUAL MULBL POSITION

Exercise

– Examine the expected accuracy of the dual MULBL position

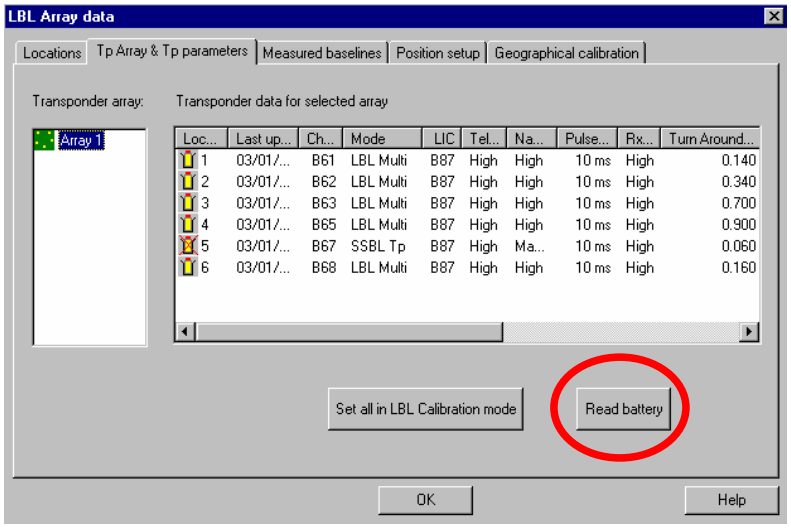




READ BATTERY STATUS

Exercise

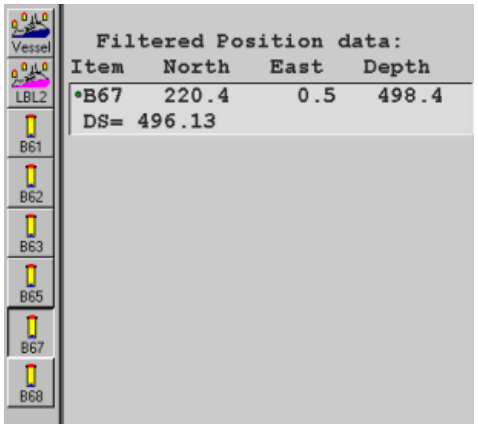
- Read battery status for all transponders in the array

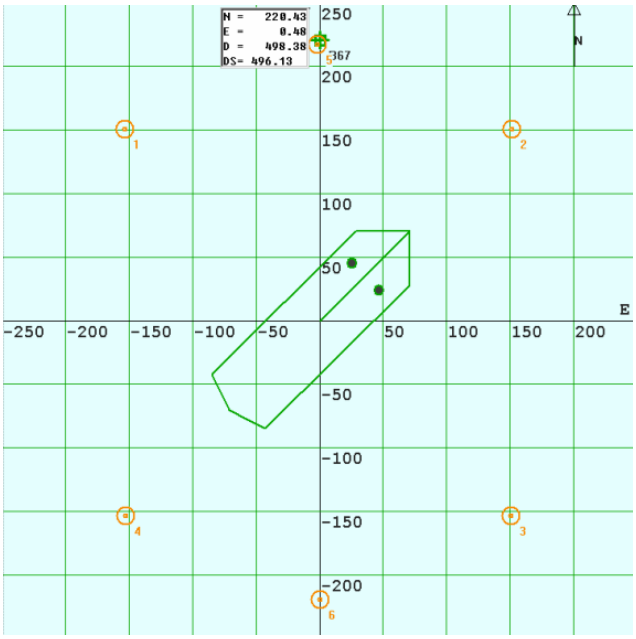


ACTIVATE BACKUP MASTER IN SSBL MODE

Exercise

- Stop LBL/MULBL positioning
- Position the Backup Master in SSBL mode if a reference position is wanted





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Appendix

Revision	Date	Written by
A	15 okt. 2004	kgr

Revision	Comments
A	This is a new part based on previous handouts

Contents

A Service Mode

General: APOS is protecting some of the configurations with passwords. Some passwords are available only for the Kongsberg Simrad personnel, and one is available for the crew on the vessel.

The reason we are using passwords is to protect the user from doing unintended configurations.

For the crew, APOS can be in two modes:

1) Operator Mode, this mode is giving the minimum configuration possibilities, and is considered to be the normal mode.

2) Service Mode, this mode is giving the Operator extended configurations. Use this mode only in special circumstances, and it may be a good idea to contact Kongsberg Maritime's service department, before any use.

3) Administrator Mode, no use

NB! APOS does not have a timer on the ‘Service Mode’, which will change it back to ‘Operator Mode’ after a certain time.

It is therefore important to switch APOS back to ‘Operator Mode’ after the necessary configuration change has been done.

NB! APOS have no indication on the main display to tell you that Service Mode is enabled

You will have to enter the dialog box to see which mode is enabled.

Operating situation: You need to change a parameter in a dialog box, where the 'OK button' is grayed.

Step by step

1) Select 'User' on the 'Menu line', and then 'Logon…'
2) Select 'User' as 'Service'
3) Enter 1997 as the password
4) Verify that APOS are in 'Service Mode'

   How can you do that: _____

5) After the necessary configuration change has been done, set APOS back to 'Operator Mode'.
6) Verify That APOS are in 'Operator Mode'

   How can you do that: _____

Control Questions

1) Mark the two **NB**s and the **OBSERVE** in this Exercise.

2) How long will APOS stay in Service Mode? _____

OBSERVE: Not all configurations in APOS are PASSWORD protected by the Service Mode. You must therefore be careful when operating. I will list a few, where you will have to be careful:

1) Changing COM ports
2) Setting the transceiver in Training Mode

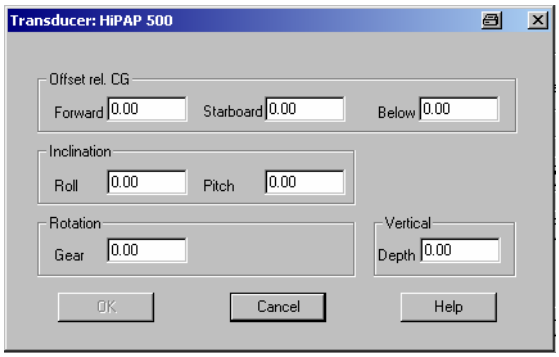
B Transducer configure

To enter the ‘Transducer’ dialog box in APOS:

1) Select ‘Configure’ on the ‘Menu bar’.

2) Select ‘Transceiver…’, and then the appropriate transceiver if your vessel has more than one transceiver.

3) Press the ‘Configure’ button in the ‘Transducer’ group box.



Don’t change any values in this dialog box, unless you are 100% certain of what you are doing.

You must be in ‘Service Mode’ to do any changes, see Appendix A

B.1 Offset rel. CG

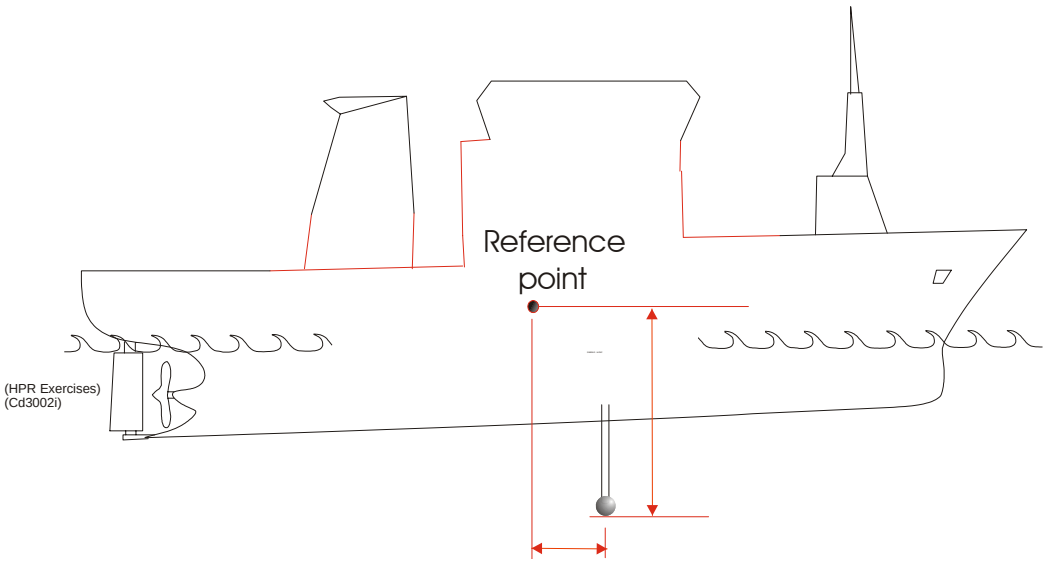
Offset relative CG (Center of Gravity) is quite often also called the Reference point.

All measurement done by the HiPAP/HPR 400 system, and presented to other computers by APOS, is referring the ‘Position data’ to a common reference point used by the DP system. The value ‘Forward’, ‘Starboard’ and ‘Below’ describes the reference point

1) Press the ‘Help’ button in the dialog box, and read about the ‘Offset rel. CG’.

2) On the drawing below, indicate ‘Forward’

3) Indicate ‘Below’



4) Make a sketch of the above vessel seen from above. Place the transducer on port side, and indicate ‘Starboard’.

5) Will ‘Starboard’ have a positive or ‘Negative’ value.

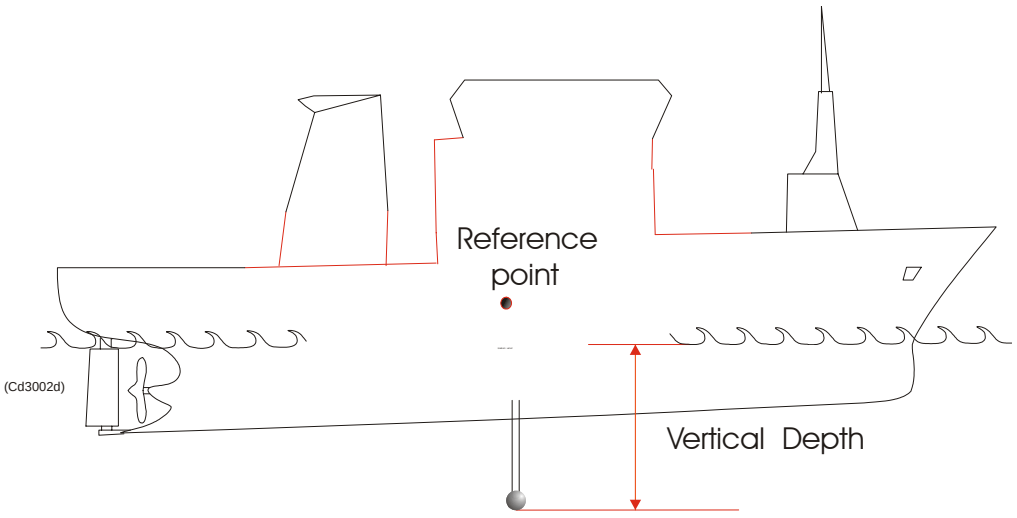
B.2 Vertical Depth

This value is used by APOS in 3 functions

1) LBL positioning.

2) Setting the transducer into the VoS profile

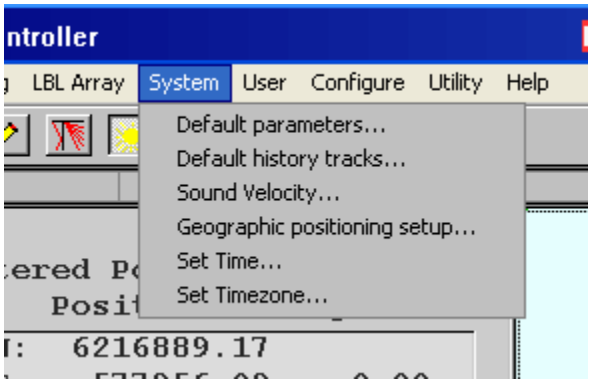
3) ‘Z locked’

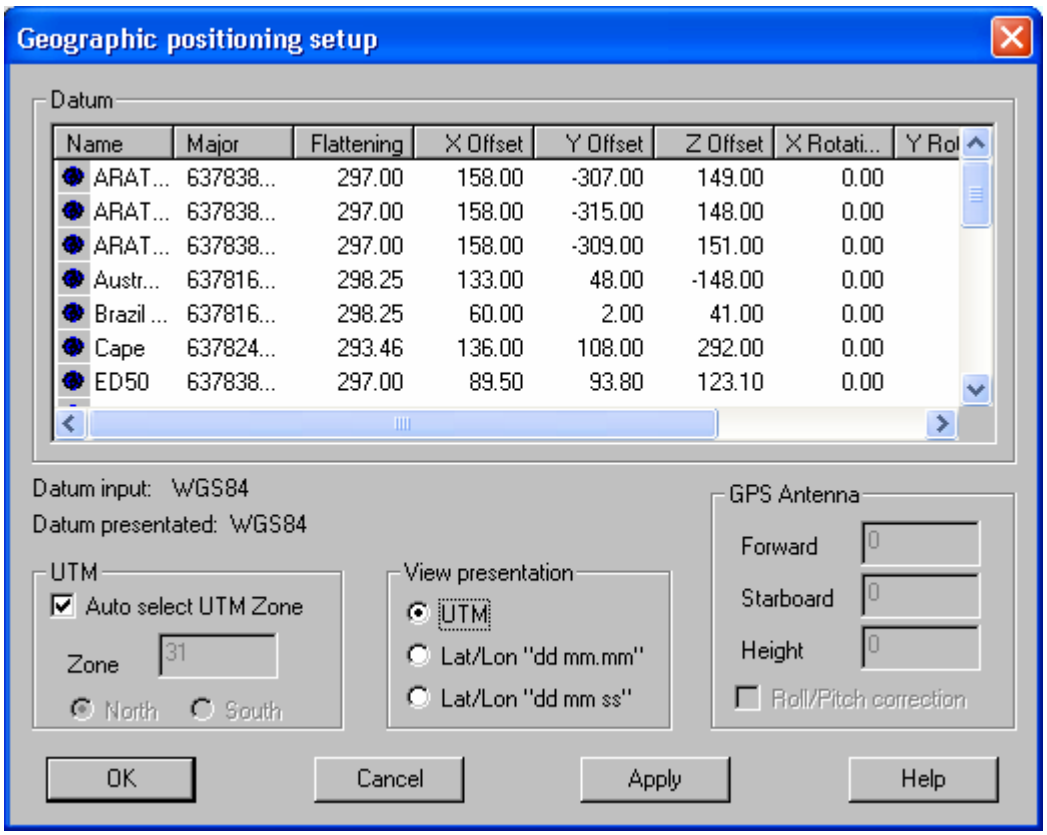


Vertical Depth: The vertical distance from the transducer to the sea level.

C Geographic positioning setup

When planning an array and creating markers the UTM view is useful. To adjust the view to a different datum or use Lat/Lon, select ‘Geographic positioning setup…’ on the menu bar.





D Telemetry

During LBL calibration and transponder configuration we use Telemetry to transmit information, or give commands. Typical information transmitted from the transponder to the vessel will be i.e. baseline information. The vessel will also command the transponder to go from SSBL mode to Calibration mode, and at the end of calibration into LBL position mode.

A typical telegram from the vessel to the transponder (down telegram) will looks like what you see in figure 4.1.

Figure 4.1

The first peak is the ‘wake up’ pulse, and the followed by up to 9 messages. The ‘wake up’ pulse is the standard interrogation pulses or what we also call the transponder channel, like B12, B13 etc.

The number of messages will depend on the telegram. Some telegrams need more messages than others.

The time delay from the wake up pulse to the first message is minimum 1 second, and can be as long as 60 seconds. After 60 seconds we know that the transponder fall asleep again. We also know that the transponder is blocked for receiving in 0.8 seconds after the interrogation (wake up).

Each telegram will also contain the transponders Serial Number. Without the correct serial number, telemetry is not available.

A typical telegram from the transponder and up (up telegram) to vessel will looks like what you see in Fig. 4.2.

Figure 4.2

It is quite similar to the ‘down telegram’, except the ‘wake up’ pulse is missing

E Telemetry problems

We have previously mentioned telemetry problems during transponder release. See chapter 10.8e in ‘APOS Basic Operator Course’.

Here we will discuss a different type of problem. We will anticipate the subject of the transponders ‘LBL positioning mode’.

During a LBL calibration process, we will command the transponder into ‘LBL positioning mode’. This means that the transponders in the LBL array, will be interrogated by a common LIC, and will reply after individual TAD with their own reply frequency.

If for some reason, the transponder received the command to go into ‘LBL positioning mode’, and returned an acknowledge message to vessel. For unknown reasons, the vessel never received this acknowledge message. APOS will display a ‘telemetry error’ message. We have now a situation, were the transponder expects to be interrogated by the LIC, but APOS will not use LIC when communicating to this transponder due to the ‘telemetry error’. Telemetry will not work either.

Solution

You will have to go into ‘Transponder configure’ dialog box and make a ‘Scan for channel’ were a reset command is included. The transponder will go back to SSBL position mode, with channel as specified by the switch setting in the transponder.

F Help for Markers

Step by step

1) Go to ‘Help’ on the menu bar and select ‘Help’

2) Select the ‘Index’ tab and open help for ‘Markers’.

3) Close ‘Help’

G Set Markers for a LBL array

Operating situation

Your vessel is going to deploy 6 transponders for an LBL array around a template in the North Sea.

Template UTM position: WGS 84 Zone 31
N: 6216878.0
E: 577953.2

Water depth: 500 meters

Transponder radius: 220 meters

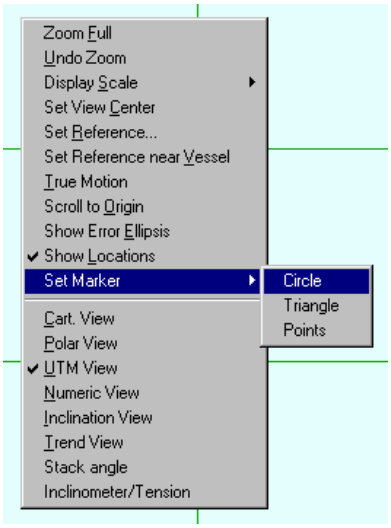
Step by step

1) Select ‘UTM view’

2) Select a scale of 100 meters

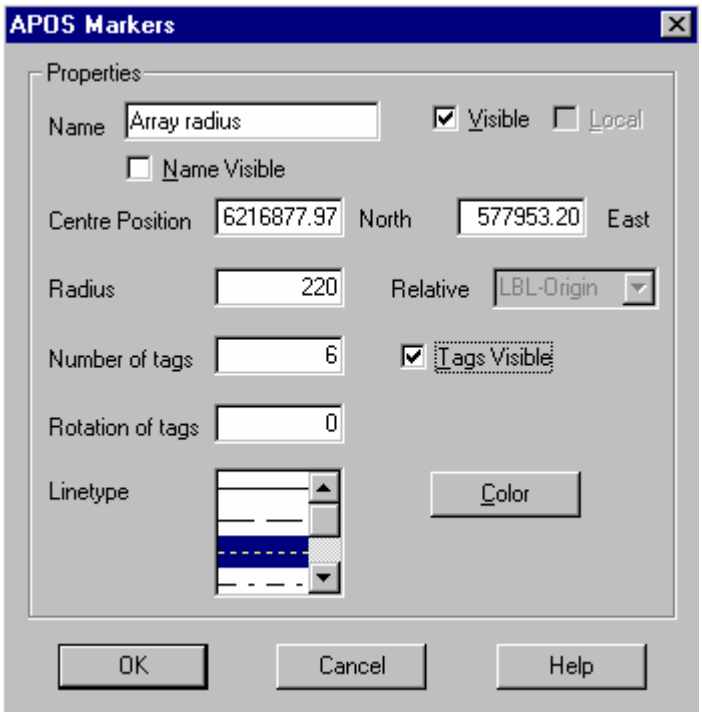
3) ‘Right click’ on the spot you want to have the center of the marker circle

Look into the left part of the ‘Status bar’, were cursor position is displayed



4) Select ‘Circle’.

5) In the ‘APOS Markers’ dialog box, make sure that ‘Centre Position’, Radius and ‘Number of tags’ is according to the requirements



6) The circle will be a useful tool when deploying the transponders.