

APOS LBL and MULBL Course

Sections

- 1 Course descriptions, details, evaluation etc.
- 2 LBL introduction
- 3 Planning a LBL array
- 4 LBL runtime calibration
- 5 The screen and views
- 6 LBL Properties
- 7 LBL wizard
- 8 LBL Array data
- 9 LBL Troubleshooting
- 10 Leaving the location
- 11 MULBL
- 12 Appendix



Document logistics

A 15 okt 04 kgr

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

Training Manual



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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KONGSBERG MARITIME AS

Strandpromenaden 50, P.O.Box 111 N-3191 Horten Norway Telephone: +47 33 02 38 00 Telefax: +47 33 04 76 19 www.kongsberg.com E-mail: subsea@kongsberg.com



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Chapter 1

APOS LBL and MULBL Course

COURSE DESCRIPTIONS

COURSE DETAILS

TIME TABLE

COURSE EVALUATIONS

SUBSCRIPTIONS

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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 $HiPAP^{\ensuremath{\mathbb{R}}}/HPR400$ 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

KONGSBERG MARITIME AS PO Box 483, N-3601 Kongsberg, Norway Telephone +47 32 28 50 00 Telefax +47 32 28 50 10 e-mail: km.training@kongsberg.com, **www.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)	Chapter 2	
	Markers	Chapter 3	
10:15 - 11:15	Telemetry	Chapter 4	
	Planning a LBL array	Chapter 5	
11:15 - 12:00	Lunch		
12:00 - 13:00	LBL Baseline Calibration	Chapter 6	
13:15 - 14:15	LBL quality control	Chapter 7	
	LBL runtime calibration	Chapter 8	
	LBL troubleshooting	Chapter 9	
	Leaving the location	Chapter 11	
14:30 - 15:45	MULBL	Chapter 12	

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Course Evaluation



Course name:	_ Course date:	
Student name:	Instructor:	
General observations on the cou	irse as a whole	
Complete waste of tim	ne	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:		j i

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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LBL introduction

Purpose

2

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
А	15 okt. 2004	kgr

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

Contents

- 2 LBL introduction
 - 2.1 Abbreviations LBL
 - 2.2 LBL Help
 - 2.3 LBL introduction
 - 2.4 The LBL calibration result
 - 2.5 Start LBL Positioning
 - 2.6 The 'LBL Numeric View'
 - 2.7 LBL properties (introduction)
 - 2.8 LBL accuracy
 - 2.9 LBL calibration
 - 2.10 Baseline
 - 2.11 Transponder modes

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

Opera	ating 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 b	oy step		
1)	Open the training file	:: LBL POSITIONING	
2)	Start positioning		
	Observe the new vess	sel symbol, and 'Left click' on it.	
2)	Calcateritable (D. C		

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'.

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

0\$1	:Master Controller	HiPAP 500
<u>F</u> ile ⊻ie	w Positioning LBL Array Control System User Configure	Utility <u>H</u> elp
6		
■ ■	Filtered Position data: Item Range Bearing Depth KS 0.1 42.9 0.0 LBL: Tot. Done Used RMS resid 13 13 0.8 Loc Range Residual Status 1 1 655.0 0.2 0K 2 655.0 -0.1 0K 3 655.6 0.1 0K 4 655.2 -0.2 0K Dpt 0.0 -0.1 0K	
	Transc. Head Roll Pitch	
	HIPAP 29.5 -0.9 -0.4	
	HPR400 29.5 -0.8 -0.5	800

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.

LBL :	Tot. D	one Used	RMS r	esid	
Loc	13 Paper	13 13 Posidu	ں +ءا ت+	./	
100	Kange	- Restuc	IAI SU	atus	17
1	655.3	 Position valu 	es		V
2	655.6	Position <u>s</u> etu	р 🕨		
-	655.0	— 🗸 LBL range v	alues		
3	655.2	💶 🗸 Gyro/VRS 🗸	alues		
4	655.4	Show Senso	r Values		
Dpt	0.0	<u>R</u> esolution	•		
Tran: HiPAI	sc. He ? 2	Cart. View Polar View UTM View ✓ Numeric View Inclination View	w	ch 0.5	
HPR4	00 2	9 Stack angle Inclinometer/	/Tension	0.5	8
Head:	~	- <u></u>	~		

Figure 2.3

2) 'Left click' on 'Position values', what happens?

Leave a check mark (\mathcal{V}) at 'Position values'.

3) Select 'Position setup' and observe the changes.





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...'.

Positioning Vessel Image: Activate Interrog. Image: Array Iansducer Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array Image: Impact of the strenger Image: Array Image: Array Image: Array	LBL Positioning			X
Transmit ✓ Default Receive Image: HPR400 Image: HPAP Image: HPAP Image: HPAP Image: HIPAP Image: HIPAP Image: HIPAP Image: HIPAP Image: HIPAP	Positioning Vessel 💌	🔽 Activate	Interrog. Interval	Array 🕂 Array 1
Calculation data Manual exclude ✓ Auto exclude Loc 1 Loc 2 ✓ Deskew Loc 3 Loc 4 ✓ Loc 5 ✓ Loc 6 ✓ Free (calculated) ✓	Transducer Transm Wide/Mec HiPAP HiPAP Transmit Power C Max Mini- C Mini- C Mini-	nit C D fium Beam 30 kHz, T j imum mum mum	efault Receive	Hz, Td1 Locations All available ranges Ranges Angles Loc 1 V Loc 2 V Loc 2 V Loc 3 Loc 4 Loc 4 Loc 5 V Loc 5 V Loc 6 Loc 6
	Calculation data Image: Auto exclude Image: Deskew	Manual exclude Loc 1 Loc 2 Loc 3 Loc 4 Loc 5 Loc 6 Loc 6	Depth Depth measurement Transducer parameters External sensor Free (calculated)	Manual depth / Sensor

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)

4

Below is shown an example with:

- Water depth: 1200 meters
- Number of transponders:
- 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?

Тр 2 🔿

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

^{Tp 1} ()

тр 3 🔘

How many baselines do we have in an LBL array with 4 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.



Chapter 3

Planning a LBL array Deploying transponders



Revision A

This section was updated 15.10.04

Planning and Deploying - slide 1

DOCUMENT LOGISTICS

Revision A Date 15 okt. 2004 Written by kgr

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

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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

This section was updated 15.10.04

Planning and Deploying - slide 3

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?



Revision A





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 $\pm 22.5^{\circ}$ in narrow beam and $\pm 80^{\circ}$ in wide beam. Wide beam is more affected by noise than narrow beam.

HPR418 systems with medium/wide transducer (so-called standard transducer) covers $\pm 55^{\circ}$ in medium beam and $\pm 80^{\circ}$ 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.

Revision A

This section was updated 15.10.04

Planning and Deploying - slide 5

SURFACE FOOTPRINT - WIDE BEAM

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



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

Revision A

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SURFACE FOOTPRINT - NARROW BEAM

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



MPT 331/DuB vertical Source level = 206 dB 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

Revision A

This section was updated 15.10.04

Planning and Deploying - slide 7

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-ofsight between transponder and vessel) or interference from other transponders (used by other vessels nearby).

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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

Revision A

This section was updated 15.10.04

Planning and Deploying - slide 9

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.

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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.

Revision A

This section was updated 15.10.04

Planning and Deploying - slide 11

ARRAY GEOMETRY



Normally the transponders are evenly spaced around the circle (as seen here with 6 transponders). The transponders need "line-ofsight" 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.

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TRANSPONDERS WITH CLUMP WEIGHT

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

Fixing bolts

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.

Revision A

This section was updated 15.10.04

Planning and Deploying - slide 13

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)

Revision A

This section was updated 15.10.04

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Planning and Deploying - slide 14

APOS LBL and MULBL Course



Deploying transponders



Revision A

This section was updated 15.10.04

Planning and Deploying - slide 15

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 Array radius $\approx 500 \text{ m} \approx 200 \text{ m}$
- MPT339/DTR transponders
 - B61 Serial no.: 5061
 - B62 Serial no.: 5062
 - B63 Serial no.: 5063
 - B65 Serial no.: 5065
 - B67 Serial no.: 5067



This section was updated 15.10.04

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Planning and Deploying - slide 16
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

Revision A

This section was updated 15.10.04

Planning and Deploying - slide 17

INTERROGATE SSBL TRANSPONDER



5 1 5 5

ENABLE SENSOR FUNCTION



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Planning and Deploying - slide 20

DEPLOY AND MONITOR TRANSPONDER



SSBL POSITIONING

Exercise

 Use Cartesian View

 Use North-East-Depth presentation in the Numeric View

Notice the vessel symbol when only SSBL positioning





Revision A

This section was updated 15.10.04

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Planning and Deploying - slide 22

APOS LBL and MULBL Course

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LBL runtime calibration

Preface

4

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
А	15 okt. 2004	kgr

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

Contents

- 4 LBL runtime calibration
 - 4.1 'LBL runtime calibration' introduction
 - 4.2 LBL Wizard for RunTime
 - 4.2 LBL Runtime Calibration

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.

WinHPR	
2	Set current GPS position as global origo?
[Yes No

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.

Location	Turn Around	Transponder	Suggested			
name 1	Delays	channel	channel			
2	0.94 s	861 BCD	BOI			
2	0.24 \$	D02 DC0	862			
3	0.40 %	B65	Res			
5	0.06%	B67	867			
Ŭ	0.000	201	001			
				LBL interro	gation channel:	B87
Now it's possibl later verify the o lf a better accu the baselines b	e to start LBL positior co-ordinates by use of racy is wanted immed etween the locations.	ning by using the init if the RunTimeLBL-c diately, continue this	al co-ordinates, and alibration. calibration by meas	d then uring		
🗖 Conti	inue with measuring b	paselines				
			< Back	Next >	Cancel	F
			< Back	Next >	Cancel	H
What is a LIG	C channel?		< Back	Next >	Cancel	ŀ
What is a LIO	C channel?		< Back	Next >	Cancel	
What is a LIC	C channel?		< Back	Next >	Cancel	H
What is a LIG	C channel?		< Back	Next >	Cancel	ŀ
What is a LIG	C channel?		< Back	Next >	Cancel	ŀ
What is a LIG	C channel?	 lays'?	< Back	Next >	Cancel	F
What is a LIG	C channel?	lays'?	< Back	Next >	Cancel	ŀ
What is a LIC	C channel?	lays'?	< Back	Next >	Cancel	ŀ
What is a LIG	C channel?	lays'?	< Back	Next >	Cancel	F
What is a LIO	C channel?	lays'?	< Back	Next >	Cancel	H
What is a LIG What is 'Tur What will yo	C channel?	lays'?	< Back	Next>	Cancel	F
What is a LIG	C channel? n Around De ur approxima Press the 'Ca	lays'?	< Back	Next>	Cancel	n the

10) Press the 'Help' button and read about 'LBL channels'

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

0\$1	Master Co	ntroller		
File Vie	w Positioning	LBL Array	System L	lser Configure
	/ <u>*</u> * /	LBL Arra	ay data L Array wizar	
	Filt	LBL Run LBL Geo	Time calibrat ographic calib ogitic	ration
Traini	Item	North	Eas	t Dept
B61	B61	148.74	-152.	06 499.
	B63 -	148.82	149.	<u>59 500.</u> 38 500.
B62	DGE	150 24	150	001 00

- 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

LBL RunTime calibration		
Measurement logging # measurement sets logged: 0	Time oldest Time youngest	
Start Log Stop Log	Delete all	Read from file
Calculate		
Advanced settings		Do calculate
Results and measurements # measurement sets: Improve factor:		
View Numerically View Graphically	Update LBL Array	Save to file
Last update Time		
# measurement sets: Improve factor:	Close	Help

- 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.

LBL RunTime calibration		
Measurement logging # measurement sets logged: 250 Start Log Stop Log	Time oldest Time youngest Delete all	13:26:20 13:34:09 Read from file
Calculate		Do calculate
Results and measurements # measurement sets: Improve factor:		
View Numerically View Graphically	Update LBL Array	Save to file
Last update Time # measurement sets:		
Improve factor:	Close	Help

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.

		Time oldest	13:26:20
# measurement sets	logged: 250	Time youngest	13:34:09
Start Log	Stop Log	Delete all	Read from file
Calculate			
	Advanced colling:		Do calculate
Results and measurem	ents		
# measurement sets Improve factor:	237 1.22		
and a state of the first of the	0.47, after 0.38		
rms residuais before			
rms residuais berore View Numerically	View Graphically	Update LBL Array	Save to file
rms residuais berore View Numerically	View Graphically	Update LBL Array	Save to file
View Numerically	View Graphically	Update LBL Array	Save to file
View Numerically Last update	View Graphically	Update LBL Array	Save to file

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.

Blank page

The screen and views

Preface

5

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 positionig.

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
А	15 okt. 2004	kgr

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

Contents

- 5 The screen and views
 - 5.1 Positioning window
 - 5.1a Show locations
 - 5.1b UTM view
 - 5.2 Error ellipses
 - 5.2a Examine the error ellipses
 - 5.3 Describe the 'LBL Numeric View'
 - 5.3a Vessels coordinates
 - 5.3b Number of measurement
 - 5.3c Range measurement
 - 5.3d 'Dpt' range
 - 5.3e 'Dpt' residual
 - 5.3f 'Dpt' status

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?



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





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

LBI	. Array d	ata								×
Lo	ocations]]	[p Array & T	p parameters	Measure	d baselines	Position set	up Geogr	aphical cali	ibration]	
	Location	Tp Serial	Tp Chan	North	East	Depth	Ell Major	Ell Minor	Ell Direction	EllDep
	<u>1</u> 1	5061	B61	152.56	-152.25	500.82	4.00	4.00	0.00	2.3
	<u> </u>	5062	B62	152.11	149.69	501.66	5.78	5.48	139.84	1.8
	📋 З	5063	B63	-152.93	151.69	500.26	6.34	4.00	135.15	2.8
	<u> </u>	5065	B65	-157.28	-155.27	497.46	6.49	5.68	131.39	3.1
	<									
	⊂ Positior	ns ial ibrated	Presentat © Loca © Geog	ion I graphic	Ge Sł	eographic orig	gin Isis		Insert active TPs	
						OK				Help

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.

LBI	. Anay d	ala								2
L	ocations)	Тр Анау № Т	p paramete	rs Measure	ed baselines	Position selu	P Go	hical calibra	ation	
	Location	Tp Serial	Tp Chan	North	East	Dept	Ell Major	El Minor N	Diest	Ell Depth
	ï٦	5061	B61	150.94	-153.47	500 JB	Z.83	2.66	30.48	1.38
	12	5062	B62	151.07	151.88	50 21	2.79	2.68	140.25	1.17
	ŭз	5063	B63	-153.37	151.16	50.52	2.84	2.63	57.68	1.52
	14	5065	B65	-153.42	-152.95	49 61	2.92	2.64	131.64	1.67
	115	5067	B67	217.79	-1.69	500 94	2.76	2.63	61.19	1.21
	16	506B	B6B	-219.85	0.13	499.3	2.90	2.63	95.37	1.67
(Posilik © in		- Presenta	stion	Ge	ographic orig	'n	In	seri active	TP:
			<) liei	graphic		OK				Нер

Figure 5.5

LB	L Array da	ta								x
ī	ocations]]	Γρ Ariay & Ti	p palameter	* Measure	d baselines P	osition setu		ipine Lealibre	ntion	
	Location	Tp Serial	To Chan	North	East	Derni	Ell Major	El Minor N	II Direct	Ell Depth
	ĽΊ	5061	861	150.62	-153,15	50 58	0.05	0.04	51.37	1.38
	1 2 Z	5062	B62	150.B1	151.56	50 .21	0.05	0.04	130.81	1.17
	11 3	5063	B63	-153.03	150.85	51 1.52	0.05	0.04	53.4D	1.52
	1 A	5065	865	-153.15	-152.66	49_61	0.05	0.04	130.59	1.67
	Ü 5	5067	867	217.33	-1.66	50. 94	0.05	0.03	90.26	1.21
	1 11 6	5068	868	-219,44	Q 10	459.5	0.05	0.04	88.35	1.66
	-		_							
	Posilio	18	Presente	tion						
[🛛 🖸 🛛 Inili		S Loo	51	Geog	graphic olig	in	In	sert active 1	íPa 📔
L	🧉 Ca	brated	C G60	graphic 👘						
	-									
-										
						DK.				Help

Figure 5.6

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'

Filt	tered Pos	ition d	ata:
Item	North	East	Depth
KS	-0.1	-0.0	-0.1



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

LBL:	Tot.	Done	Used	RMS	resid
	13	13	13		0.9

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'?

Range measurement

5.3c

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
А	15 okt. 2004	kgr

Revision	Comments
А	This is a new part

Contents

- 6 LBL Properties
 - 6.1 Transmit power
 - 6.2 Locations
 - 6.3 Calculation data
 - 6.4 Depth

6.1 Transmit power



Figure 6.1

Were is the change taking place?



Figure 6.2

6.2 Locations

LBL Positioning	х
Positioning Vessel T IZ Activate Interval 2 Array Array Array 1	
Transmit IV Default Peceive Imp HPR400 Imp HPR400 Imp HPAP Wide/Medium Beam 30 kHz. T Imp Imp HPAP HiPAP Imp Imp HPAP Imp HiPAP Imp HiPAP Imp HiPAP Imp Imp Imp Imp Imp HiPAP Imp Imp Imp Imp Imp	
Calculation data Manual exclude Image: Constraint of the sector of the sect	
OK Cancel Apply Help	

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?
Calculation data

6.3

Vessel 💌	🔽 Activa	te Inter	val 2 💌	Arraj	, Array i
	nsmit 1edium Beam 30 k 500	Hz, T	Receive R400 Wide/Medium Beam 30 k AP HiPAP 500	:Hz, Td1	Locations All available ranges
Transmit Power	faximum ligh cw	Max Range ✓ Default Range 750	Receive Bea	am m 💌	Hanges Ang Loc 1 P Loc 2 P Loc 3 F Loc 4 F Loc 5 P Loc 6 F F
Calculation data	Manual excluc Loc 1 Loc 2 Loc 3 Loc 4 Loc 5 Loc 6 Loc 6 Loc 6		pth lepth measurement Transducer parameters External sensor Free (calculated)	Manua Extern	al depth / Sensor 0 al sensor: 1anual

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'.

LBL Wizard

Preface

7

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
А	15 okt. 2004	kgr

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

Contents

7 LBL Wizard

- 7.1 Plan and deploy the transponders
- 7.2
- PowerPoint presentation New LBL Array wizard 7.3

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



New LBL array wizard



Revision A

This section was updated 15.10.04

LBL Baseline Calibration - slide 1

NEW LBL ARRAY WIZARD APPROACH

OS1:Master Controller						
<u>File V</u> iew P <u>o</u> sitioning	LBL Array	<u>C</u> ontrol	<u>S</u> ystem			
	LBL <u>A</u> rra	y data				
	New LBL Array wizard					
	LBL <u>R</u> un	Time calib	pration			
- H-	LBL <u>G</u> eo	graphic c	alibration			

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

Revision A

LBL Baseline Calibration - slide 2

APOS LBL and MULBL Course

Exercise

 Notice the size of the error ellipsis when SSBL positioning



- Start the New LBL Array wizard

U	IST:	Master (Controllar		HI II	ΡН
<u>F</u> ile	⊻iev	v P <u>o</u> sition	ing <u>L</u> BL Array	<u>C</u> ontrol <u>S</u> yst	em <u>D</u> er Co <u>n</u> figu	re
6			BL Arr	ay data)	
-	-		<u>N</u> ew LB	L Array wizard	────≓	
			LBL <u>R</u> u	nTime calibratior	۱ <u>ا</u>	
J.			LBL <u>G</u> e	ographic calibral	ion	
<i>c</i> ≫r≊ Vess	el I	Fil	Ltered 1	POSITIO:	n data:	
Π		Item	North	h Eas	t Depth	
B6	1	•B61	151.8	8 -152	.8 498.	8
1		DS=	496.30			
B6	2	•B62	151.3	3 151	.0 499.	5
		DS=	496.16			
B6	3	•B63	-154.3	3 152	.2 497.	7
		DS=	495.80			
B6!	5	•B65	-153.0	0 -153	.4 497.	7
		DS=	496.11			
B6	7	•B67	217.3	1 -0	.4 499.	4
		DS=	496.16			
86	8	•B68	-219.0	5 -1	.7 497.	3
		DS=	496.03			

Revision A

This section was updated 15.10.04

LBL Baseline Calibration - slide 3

PREPARE LBL CALIBRATION

Exercise

- Notice the message
- Continue with the wizard

Prepare LBL-calibration	X	WinHPR X
This wizard should guide You through a new start of a Recommended to start SSBL positioning on all wanted	LBL - array. I transponders before start of this wizard.	Set current GPS position as global origo?
There exist 6 MPT transponders with SSBL positioning pressing Next will start on a new array with these as ne Any existing setup will be removed.	g active, ew initial positions.	
	<back next=""> Cancel Help</back>	
Revision A	This section was updated 15.10.04	LBL Baseline Calibration - slide 4

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

Vessel	Fil ⁴ Item	tered Po North	sition o East	lata: Depth	
861					
1 862					
1 863					
1 865					
B67					
1 868					







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

name	Turn Around Delavs	Transponder channel	Suggested		
1	0.70 s	B61	861		
2	1.06 s	B62			
3	0.06 s	B63			
4	0.44 s	B65			
5	0.88 s	B67			
6	0.26 s	B68	868		
			al oo ordinatoo an	d then	
ow it's possibl iter verify the o a better accu ne baselines b Cont	e to start LBL positior co-ordinates by use of racy is wanted immed etween the locations. inue with measuring b	ing by using the initi the RunTimeLBL-c iately, continue this aselines	alibration. calibration by meas	suring	

LBL Baseline Calibration - slide 6

MEASURE BASELINES OR NOT

Exercise

- Notice the message
- Continue with measuring baselines

				<u> </u>	
Location name	Turn Around Delays	Transponder channel	Suggested channel		
1	0.70 s	B61	861		
2	1.06 s	B62	B62		
3	0.06 s	B63 DCE	B63 BCE		
4	0.44 s 0.88 s	B65 B67			
6	0.26 s	B68			
				LBL interrogation channel: B87	
Now it's possit later verify the If a better acc the baselines I	ve to start LBL positio coordinates by use of uracy is wanted imme between the locations tinue with measuring	ning by using the init if the RunTimeLBL-c diately, continue this - - 	ial co-ordinates, and alibration. calibration by measu < <u>B</u> ack.	l then uring <u>Next > Cancel Help</u>	
Revision	A		This sect	ion was updated 15.10.04	LBL Baseline Calibration - slide 7
SET L	BL CAI	LIBRAT	ΓΙΟΝ Μ	IODE	
SET L Exerci – N	BL CAI	LIBRAT	FION M	10DE	
SET L Exerci – N – O	BL CAI se Notice the Continue	LIBRAT e message with the	FION M e wizard	10DE	
SET L Exerci – N – (BL CAI SE Notice the Continue	LIBRA e message with the	FION M e wizard	IODE	X
SET L Exerci – î – î Measuring ba	BL CAI SE Notice the Continue	LIBRA e messag with the	FION M e wizard	10DE	X
SET L Exerci – î – î Measuring ba	BL CAI SE Notice the Continue refines	LIBRA e messag with the Me	FION M e wizard	10DE Ita: ange Expected #M Std Resid	X
SET L Exerci – N – O Measuring bas Location 1 name 1 2	SE Notice the Continue	LIBRA e messag with the Me	FION M e wizard	IODE	X
SET L Exerci – N – O Measuring bas Location 1 name 1 2 3	SE Notice the Continue	LIBRA e messag with the	FION M e wizard	ADDE	×
SET L Exerci – N – O Measuring bar Location 1 2 3 4 5	SE Notice the Continue	LIBRA e messag with the	FION M e wizard	10DE	×
SET L Exerci – N – O Measuring ba	SE Notice the Continue	LIBRA e message with the r Slave Status	PION M e wizard assured baselines da Time R2	IODE	X
SET L Exerci – N – O Measuring bar Location 1 2 3 4 5 6	BL CAI	LIBRA e message with the r Slave Status	PION M e wizard assured baselines da Time Ra e set in LBL calibration	ta: ange Expected #M Std Resid on mode by use of telemetry.	
SET L Exerci – N – O Measuring bas Location 1 2 3 4 5 6	SE Notice the Continue	LIBRA e messag with the r Slave Status : all 6 locations will b ders in positioning m	PION M e wizard assured baselines da Time R2 e set in LBL calibration CK ode by telemetry con	IODE	

Revision A

This section was updated 15.10.04

LBL Baseline Calibration - slide 8

APOS LBL and MULBL Course

SET LBL CALIBRATION MODE - TELEMETRY

Exercise

- Wait for the telemetry to finish

Telemetry : HPR400-> Set Frequenc	Channel and Mode Message	
B	Transceiver: Data message sent.	
1		
	Gancel Hetry	
 Notice the t 	transceiver status when the system i	s performing
telemetry		
HPR400: Telemetry	HiPAP: Navigation	
Revision A	This section was updated 15.10.04	LBL Baseline Calibration - slide 9
MEASURE BA	SELINES	
Exercise		
 Notice the 1 Continue w 	nessage /ith the wizard	
Measuring baselines		×
Location Transponder name Mode	Measured baselines data:	
2 LBL Calib 3 LBL Calib	nave status nine nange expected #m., stu., nesiu	
4 LBL Calib 5 LBL Calib 6 Job Calib		
	w measuring baselines from all 6 locations will be started. total of 15 baselines will be tried.	
Next will set the used transponders	in positioning mode by telemetry commands	
	<back next=""> Cancel Help</back>	-
Revision A	This section was updated 15.10.04	LBL Baseline Calibration - slide 10

LBL Baseline Calibration - slide 10

MEASURED BASELINE RESULT

Exercise

- Wait for the telemetry to finish

	Telemetry status	nessage sent.	Base	sline accept		X
			В	aseline measurement:	Telemetry OK	Apply to all
– Eval	uate the bas	eline measu	rement	Master: Slave: Measured range: No of measurements: Standard deviation	1 2 304.69 8 0.03	Accept Accept/Continue Cancel
– Con	tinue with th	ne wizard		Flepeat	Continue	Stop
Revision A		This section v	was updated 15.1	0.04	LBL Baseline Cali	bration - slide 11
MEASURI	ED BASEL	INES OVI	ERVIEW			
MEASURI Exercise – Eval – Cont	ED BASEL uate the base inue with th	JNES OVI eline measur e wizard	ERVIEW rement			
MEASURF Exercise — Evali — Cont	ED BASEL uate the base inue with th	JNES OVI eline measur e wizard	ERVIEW			

<u>N</u>ext >

Help

Cancel

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LBL Baseline Calibration - slide 12

Revision A

SET LBL POSITION MODE

Exercise

- Notice the message
- Continue with the wizard

Set position mode Location name Transponder channel Transponder Mode 1 B61 LBL Calib 2 B62 LBL Calib 3 B63 LBL Calib 4 B65 LBL Calib 5 WinHPR 6	er Turn Around Delays 0.70 s 1.06 s 0.06 s 0.44 s	Telenaty : 197400 > LBL pozicim mode menange
The LBL array should now be prepared for po If none defined enter the menu "Positioning - I	sitioning. Start the positioning by activating the wanted object. LBL Positioning" and define one.	Image: Second
FINISH THE WIZ	ARD	
 Notice the info Finish the wiza Set position mode Location Transponder name B61 LBL Pos B62 LBL Pos B63 LBL Pos LBL Pos B65 LBL Pos LBL Pos LBL Pos LBL Pos LBL Pos LBL Pos 	Turn Around Delays 0.70 s 1.06 s 0.06 s 0.44 s 0.88 s	
6 B68 LBL Pos The LBL array should now be prepared for posi If none defined enter the menu "Positioning - LI	0.26 s itioning. Start the positioning by activating the wanted object. BL Positioning'' and define one.	

Rev. A

LBL Baseline Calibration - slide 14

	Save the file
G	vive the file a suitable name
Here at the simulator:	Give the file a name, starting with a number

New LBL Array wizard

7.3

1) The valid operational area is visible if you select '<u>L</u>BL Array' on the menu bar, 'LBL <u>Array Data...</u>' 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'.

LBL array data

Preface

8

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
А	15 okt. 2004	kgr

Revision	Comments
А	This is a new part

Contents

- 8 LBL array data
 - 8.1 Introduction
 - 8.3 Disable a Transponder in an LBL array
 - 8.4 Tp Maintenance in an LBL array
 - 8.4aa Battery change in the transponder
 - 8.4b Reading the Transponder battery

8.1 Introduction

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

0\$1:	OS1:Master Controller							
File Viev	v Positioning	LBL Array	System	User	Configu	ire l		
	1 1/ 18 1	LBL Arra	ay data					
		New LBL	. Array wix	zard				
	LBL RunTime calibration							
0.40		LBL Geo	graphic ca	alibratio	n			
Traini	Filt€	ered Po	ositi	on	data:	4 		
	Item	North	Ea	\mathbf{st}	Dep	\mathbf{pth}		
B61	Tra	0.07	-0	. 26	().03		

LBL Array d	lata										
Locations 1	Tp Array & T	p parameter:	Measured	l baseline	es Position	setup	Geogra	ohical calib	ration		
Transponde											
riansponde	or array.			iecteu ai	lay						
📑 Array 1	1	Location	Last upd	Cha	Mode	LIC	Tel.P	Nav.P	Pul	Rx G	Turn.
		1	10/18/04	B61	LBL Pos	B87	High	High	10 ms	High	0.2
		1 2	10/18/04	B62	LBL Pos	B87	High	High	10 ms	High	0.4
		1 3	10/18/04	B63	LBL Pos	B87	High	High	10 ms	High	0.6
		1 4	10/18/04	B65	LBL Pos	B87	High	High	10 ms	High	0.9
		1 5	10/18/04	B67	LBL Pos	B87	High	High	10 ms	High	0.0
		<									>
Set all in LBL Calibration mode Read battery											
ОКНер											

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



Set the transponder to 'SSBL Tp' mode.

Set transponder mo	de 🛛 🔀
Location 3 Mode C SSBL Tp C LBL Calib. C LBL Pos. C LBL Tp Pos.	Turnaround delay 0.68 LBL interrogation channel (LIC) 887
Set	Next location Close

Were is this change taking place?



What will happen to your DP telegrams during disabling?

What will happen to the battery consumption?

LBL Array data				×
Locations Tp Array &	Tp parameters	Measured ba:	selines Position setup	Geographical calibration
	· · · · ·			
Transponder array:	Turnaround d	lelays for select	ted array	Collisions
Array 1	Location	Mode	Array TAD	Basilian dapth 12
	1	LBL Pos	0.24	
	1 2 L	LBL Pos	0.46	
	1 3 B	LBL Pos	0.68	
	<u>1</u> 4	LBL Pos	0.90	Show
	115	LBL Pos	0.06	
	🗖 Multio	ser arrau	L DL Julian and San Char	Suggest Turnaround delays
	- Hunde	oor anay	LBL Interrogation Cha	nnei:
			(LIC) B87	Set all in LBL pos mode
				Set all in SSBL position mode
			or 1	Halo
				Пер

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 %'.





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

	Fil	Ltered	l Pos:	ition	data	a:	
	Item	Nor	th	East	De	epth	
B61	Ves	s C	0.0	0.0)	0.0	
] B62	LBL :	Tot.	Done	Used	RMS	resid	L
		4	4	0		0.0	1
B63	Loc	Rang	je l	Residu	al s	Status	
	1	533.	2			OK	
B65	2	519.	4		Ma	aEx	
	5	521.	4			OK	
B67	Dpt	2.	0			OK	
E68							

Event view					
Time	Description	Source			
12:50:16.96	Few replies	LBL			
12:50:19.03	Few replies	LBL			
12:50:21.06	Few replies	LBL			
12:50:23.12	Few replies	LBL			
12:50:25.13	Few replies	LBL			
12:50:27.22	Few replies	LBL			
12:50:29.27	Few replies	LBL			
12:50:31.33	Few replies	LBL			
12:50:33.39	Few replies	LBL			
12:50:35.45	Few replies	LBL			
12:50:37.50	Few replies	LBL			

28	Alarms				
۷	↓ ↑	⇒ 🎗 🔊 🖉	AI	arm filters Default	
	Orig.	Time	Prior	Text	
*	HPR	02/03/01 12:50:11	Alarm	Position timeout	Vessel

Revision A

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LBL troubleshooting - slide 2

LBL TROUBLE SHOOTING SOLUTION





Chapter 10 Leaving the Location



Leaving the location - slide 1

SET TRANSPONDERS IN SSBL MODE

Exercise

Revision A

- Set all transponders in SSBL mode

LBL Array data	Tp parameters Measured	baselines Position setup Geog	raphical calibration		
Transponder array:	Turnaround delays for sel Location Mode 1 LBL Multi 2 LBL Multi 3 LBL Multi 4 ABL Multi 5 SSBL Tp	ected array <u>Array TAD</u> Mu Master 0.14 0.34 0.70 0.90 0.10 Backup m	Collisions Position depth 12 Show	Location Mode 1 SSBLTp 2 SSBLTp 3 SSBLTp 4 SSBLTp 5 SSBLTp 5 SSBLTp	Array TAD Mu Master 0.14 0.34 0.70 0.90 0.10 Backup m
Change Master Master changed Master Activate Deactivate	☐ 6 LBL Multi ✓ Multiuser array Master LIC Tx Power- ○ Maximum ○ High ○ Low ○ Minimum	0.16 Master	Suggest Turnaround delays Set all in LBL position mode Set all in SSBL position mode	₩6 SSBLTp	0.16 Master
		OK	Help	1	

Revision A

Leaving the location - slide 2

ACTIVATE TRANSPONDERS IN SSBL MODE



Revision A

This section was updated 15.10.04

Leaving the location - slide 4

APOS LBL and MULBL Course

MONITOR RELEASED TRANSPONDERS



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



Revision A

Blank page

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
А	15 okt. 2004	kgr

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

Contents

- Multiuser LBL 11
 - 11.1 Introduction
 - 11.2
 - MULBL accuracy MULBL PowerPoint 11.3

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.



The following factors will contribute to the total uncertainty:

0.15 meter
0.10 meter
0.20 meter
0.15 meter
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.



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

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MULBL - slide 2



APOS LBL and MULBL Course

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

Revision A

- Stop LBL positioning



Revision A

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MULBL - slide 6

MULTIUSER ARRAY CHECK BOX

Exercise

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

LBL Array data Locations Tp Array & Tp parameters Transponder array: Array 1 Cocation M 2 L 3 L 4 L 5 L 6 L Master Activate Deactivate	Measured baselines Position setup Geographical calibration Adde Array TAD Mu Mas BL Pos 0.70 BL Pos 0.06 BL Pos 0.06 BL Pos 0.44 BL Pos 0.44 BL Pos 0.26 Suggest Turnaround delays LBL Interrogation Channel : I Power I (LIC) B87 Set all in LBL position mode I Set all in SSBL position mode I Master Interrog I Master	LBL Array Control System LBL Array data New LBL Array wizard LBL BunTime calibration LBL Geographic calibration LBL Geographic calibration
Revision A	This section was updated 19.11.03	MULBL - slide 7
Exercise – Select Ma	ster and Backup master	
LBL Array data	X	
Transponder array: Turnaround de Array 1 Cocation N 1 2 4 4 5 6	Adde Array TAD Mu Master BL Pos 0/0 BL Pos 0.06 BL Pos 0.44 BL Pos 0.25 Backup m	
Change Master Master changed Master Activate Deactivate Master C Maximu C Maximu C High Minimu	ser array LBL Interrogation Channel : Tx Power (LIC) B87 m Position Interval 3 Master Interrog. 3 Set all in LBL position mode	
	UK Help	
Revision 4	This section was updated 19.11.03	MULBL - slide 8
MASTER LIC TX POWER

- Exercise
 - Select master LIC Tx Power

Transponder array:	Turnaround delays for select Location Mode 1 LBL Pos 2 LBL Pos 3 LBL Pos 4 LBL Pos 4 LBL Pos	ted array vray TAD Mu Master 0.70 1.06 0.05 0.44 0.99 Master	Collisions Position depth 12 Show		
Change Master Master changed Master	6 LBL Pos	0.26 Backup m	Suggest Turnaround delays		
Activate Deactivate	C Maximum C High C Low C Minimum	Position Interval 3 Master Interrog. 3 Interval	Set all in SSBL position mode		
Revision A		This section w	as updated 19.11.03		MULBL - slide 9
POSITIO	N INTERV	ALS			
POSITIO Exercise – Sele	N INTERV	ALS	er Interrogation Inter	val	
POSITIO Exercise – Sele 1. Array data Locations Tp Array & 1	N INTERV	YALS erval and Maste	er Interrogation Inter raphical calibration	val	
POSITIO Exercise – Sele 3L Array data Locations Tp Array & 1 Transponder array:	N INTERV	VALS	er Interrogation Interv vaphical calibration) Collisions Position depth 12	val	
POSITIO Exercise – Sele Locations Tp Array & 1 Transponder array:	N INTERV ect Position Intervention (p parameters) Measured bar Turnaround delays for select Location Mode A 1 LBL Pos 2 LBL Pos 3 LBL Pos 3 LBL Pos 4 LBL Pos 5 LBL Pos 6 LBL Pos	YALS erval and Master selines Position setup Geog ed array uray TAD Mu Master 0.70 1.06 0.06 0.44 0.88 Master 0.26 Backup m	er Interrogation Interv raphical calibration) Collisions Position depth 12 Show	val	
POSITIO Exercise – Sele Locations Tp Array & 1 Transponder array: Array 1 Change Master Master changed	N INTERV ect Position Intervention Intervention Intervention Turnaround delays for select Location Mode A 1 LBL Pos 2 LBL Pos 3 LBL Pos 4 LBL Pos 5 LBL Pos 5 LBL Pos 6 LBL Pos	YALS erval and Master selines Position setup Geog ed array uray TAD Mu Master 0.70 1.06 0.06 0.44 0.88 Master 0.26 Backup m	er Interrogation Interv raphical calibration) Collisions Position depth 12 Show Suggest Turnaround delays	val	
POSITIO Exercise – Sele BL Array data Locations Tp Array & 1 Transponder array: Array 1 Change Master Master changed Master Activate	N INTERV ect Position Intervention (p parameters) Measured base Turnaround delays for select (Location Mode) (2 LBL Pos) (2 LBL Pos) (3 LBL Pos) (4 LBL Pos) (4 LBL Pos) (5 LBL Pos) (6 LBL Pos) (6 LBL Pos) (6 LBL Pos) (7 Maximum) (7 High)	YALS erval and Maste selines Position setup Geog ed array uray TAD Mu Master 0.70 1.06 0.04 Master 0.26 Backup m LBL Interrogation Channel : [LIC] B87 vosition Interval 2	er Interrogation Interv raphical calibration Collisions Position depth 12 Show Suggest Turnaround delays Set all in LBL position mode	val	
POSITIO Exercise – Sele Locations Tp Array & 1 Transponder array: Array 1 Change Master Master changed Master Activate Deactivate	N INTERV ect Position Intervention parameters Measured base Turnaround delays for select Location Mode A 1 LBL Pos 2 LBL Pos 3 LBL Pos 4 LBL Pos 4 LBL Pos 4 LBL Pos 5 LBL Pos 6 LBL Pos 6 LBL Pos	YALS erval and Master selines Position setup Geoged array uray TAD Mu Master 0.70 1.06 0.44 0.88 Master 0.26 Backup m	er Interrogation Interv raphical calibration Collisions Position depth 12 Show Suggest Turnaround delays Set all in LBL position mode Set all in SSBL position mode	val	

Revision A

APOS LBL and MULBL Course

LIC & TAD

Exercise

Locations To Array &		
coodione i pixinay a	parameters Measured baselines Position setup Geographical calibration	Location name: Turnaround delay:
Transponder array:	Turnaround delays for selected array	1 0.14
• • Array 1	Location Mode Array TAD Mu Master Position depth 12 .	2 0.34
	2 LBL Pos 1.06	3 0.7
	4 LBL Pos 0.44 Show	4 0.9
	M 5 LBL Pos 0.88 Master M 6 LBL Pos 0.26 Backup m	5 0.1
Change Master		6 0.16
Master changed	Suggest Turnaround delays	
- Master	Multiuser array LBL Interrogation Channel	
Activate	Maximum Encition Interval IZ Set all in LBL position mode	OK Cancel
Deactivate	C Low Master Interrog. 12 Set all in SSBL position mode	
	0K Help	1
Revision A	This section was updated 19.11.03	MULBL - slide 11
ULBL P	OSITION MODE	
ULBL P Exerci	OSITION MODE	
ULBL P Exerci	OSITION MODE Se Set all transponders in MULBL position mode	
ULBL P Exercia – S	OSITION MODE se Set all transponders in MULBL position mode	X
ULBL P Exercia – S L Array data	OSITION MODE Se Set all transponders in MULBL position mode Parameters Measured baselines Position setup Geographical calibration	×
ULBL P Exercia – S L Array data Locations Tp Array &	OSITION MODE Se Set all transponders in MULBL position mode parameters Measured baselines Position setup Geographical calibration	×
ULBL P Exerci – S Locations Tp Array & Transponder array:	OSITION MODE Se Set all transponders in MULBL position mode parameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master Collisions	×
ULBL P Exerci – S LArray data Locations Tp Array & Transponder array:	OSITION MODE Se Set all transponders in MULBL position mode Set all transponders in MULBL position mode I unaround delays for selected array Location Mode Array TAD Mu Master I LBL Pos 0.14	×
ULBL P Exerci – S L Array data Locations Tp Array & Transponder array: Array 1	Se Set all transponders in MULBL position mode reparameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master 1 LBL Pos 0.14 2 LBL Pos 0.34 1 LBL Pos 0.70 Collisions Position depth 12 Position depth 12 Posit	×
ULBL P Exerci – S L Array data Locations Tp Array & Transponder array:	Se Set all transponders in MULBL position mode parameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master Turnaround delays for selected array Location Mode Array TAD Mu Master Turnaround delays for selected array Location Mode Array TAD Mu Master Position depth 12 Collisions Position depth 12 Show Show	× 1
ULBL P Exerci – S L Array data Locations Tp Array & Transponder array:	Set all transponders in MULBL position mode reparameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master 1 LBL Pos 0.14 2 LBL Pos 0.34 3 LBL Pos 0.70 4 LBL Pos 0.10 Master 5 LBL Pos 0.116 Backun m	×
ULBL P Exerci – S Laray data Locations Tp Array & Transponder array: Array 1	Set all transponders in MULBL position mode parameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master 1 LBL Pos 0.34 3 LBL Pos 0.34 3 LBL Pos 0.116 4 LBL Pos 0.10 Master 6 LBL Pos 0.16 Backup m	×
ULBL P Exerci – S L Array data Locations Tp Array & Transponder array: Array 1	Se Set all transponders in MULBL position mode reparameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master 1 LBL Pos 0.14 2 LBL Pos 0.14 3 LBL Pos 0.10 Master 5 LBL Pos 0.10 Master 6 LBL Pos 0.16 Backup m Suggest Turnaround delays	×
ULBL P Exerci – S LArray data Locations Tp Array & Transponder array: Array 1 Change Master Master changed	Se Set all transponders in MULBL position mode parameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master Lucation Mode Array TAD Mu Master Lucation Mode Array TAD Mu Master Lucation Mode Array TAD Mu Master Collisions Collisions Position depth 12 Show Show Show LBL Pos 0.10 Master 6 LBL Pos 0.16 Backup m Multiuser array LBL Interrogation Channel:	X
ULBL P Exerci _ S BL Array data Locations Tp Array & Transponder array: Transponder array: Change Master Master changed Master Activate	SE Set all transponders in MULBL position mode reparameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master 1 LBL Pos 0.14 2 LBL Pos 0.14 3 LBL Pos 0.70 4 LBL Pos 0.10 Master 6 LBL Pos 0.16 Backup m Multituser array Multituser array Multit	X Set LBL position mode
ULBL P Exerci _ S <u>L Array data</u> Locations Tp Array & Transponder array: Transponder array: Change Master Master changed Master Activate	Se Set all transponders in MULBL position mode Set all transponders in MULBL position mode To parameters Measured baselines Position setup Geographical calibration Turnaround delays for selected array Location Mode Array TAD Mu Master Location Mode Array TAD Mu Master Location Mode Array TAD Mu Master 1 LBL Pos 0.34 3 LBL Pos 0.70 4 LBL Pos 0.10 Master 5 LBL Pos 0.116 Backup m Multiuser array Multiuser array Mu	Set LBL position mode Location 1 Transponder: B61 LBL interrogation UBL interrogation UBL interrogation
ULBL P Exerci – S Laray data Locations Tp Array & Transponder array: Array 1 Change Master Master changed Master Activate Deactivate	SE Set all transponders in MULBL position mode Turnaround delays for selected array Location Mode Array TAD Mu Master Location Mode Array TAD Mu Master Set all in LBL position mode Set all in LBL position mode Set all in SSBL position mode	Set LBL position mode Location 1 Transponder: B61 LBL intercogation turnaround delay Charmet (LIC) 0.14 B87
ULBL P Exerci – S LArray data Locations Tp Array & Transponder array: Array 1 Change Master Master changed Master Activate Deactivate	Se Set all transponders in MULBL position mode Example 2 all transponders in MULBL position setup Example 2 all transponders in MULBL position mode Example 2 all transponders in MULBL position mode Example 2 all transponders in MULBL position mode Example 2 all transponders in MULBL position setup Example 2 all transponders in MULBL position setup Example 2 all transponders in MULBL position mode Example 2 all transponders in MULBL position mode Example 2 all transponders in MULBL position mode Example 2 all transponders in transponders Example 2 all transponders in MULBL position mode Example 2 all transponders in transponders Example 2 all transponders in transponders Example 2 all transponders	Set LBL position mode ▼ Location 1 Transponder: B61 Location 1 Transponder: B61 Turnaround delay B77 B77 ♥ Apply to all Set ■ Next location

- Select LBL Interrogation Channel and Turnaround delays

Revision A

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ACTIVATE MASTER TRANSPONDER

Exercise

- Activate the master transponder

	reasured baselines in osmon scorp deographical calibration	
Transponder array: Array 1 Array 1 Cocation M 1 L 2 L 1 2 1 3 1 4 1 4 1 4 1 5 L 2 6 S Change Master	lays for selected array ode Array TAD Mu Master Collisions Collisions Position depth SL Multi 0.34 SL Multi 0.70 SL Multi 0.10 Master SBL Tp 0.16 Backup m	12
Master changed Master Activate Deactivate C Maximu C High C Low C Minimur	suggest Turnaround suggest Turnaround x Power (LIC) B87 Position Interval 2 Master Interval 12 Interval 12 OK	Help
Revision A	This section was updated 19.11.0	3 MULBL - slide 13
ACTIVATE MU	LBL POSITIONING	
ACTIVATE MU	LBL POSITIONING	
ACTIVATE MU Exercise – Activate MU positioning – Notice that Interrogation missing	LBL POSITIONING	Array Array 1 Perature Receive T Receive T HPAP Wide/Medium Beam 30 kHz, Td1 HPAP HPAP 500 All available angles Ranges Angles Loc I I
ACTIVATE MU Exercise – Activate MU positioning – Notice that Interrogation missing – Decide if you use angles no – Notice that th Master is not	LBL POSITIONING	Array Ar

Revision A

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LBL positioning...

This section was updated 19.11.03

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OK

Cancel

Apply

Help

MULBL POSITION, RANGES AND RESIDUALS

Exercise

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

	Fil	tered H	osi	tion	data	a:
	Item	North	1	East	De	∋pth
B61	Vess	-0.3	3	-0.1	L	2.0
] B62	LBL :	Tot. Do	one	Used	RMS	resid
		6	6	6		0.1
B63	Loc	Range	F	Residu	al S	Status
	1	532.8		0.1		OK
B65	2	518.7		-0.0		OK
	3	544.6		0.1		OK
B67	4	557.7		-0.1		OK
	5	521.2		-0.1		OK
B68	Dpt	2.0		0.0		ОК

Revision A

This section was updated 19.11.03

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ERROR ELLIPSIS FOR MULBL POSITION

Exercise



CHANGE MASTER TRANSPONDER

Exercise

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

Array 1 Imatcation delays for Select Imatcation delays for Select Imatcation delays for Select Ima	Leted array Collisions Array TAD Mu Master 0.14 Position depth 0.70 Show 0.90 Show 0.10 Master 0.15 Backup m LBL Interrogation Channel : Suggest Turnaround delays LBL Interrogation Channel : Set all in LBL position mode Position Interval 2 Master Interrog. 12 Desition Interval 2 Master Interrog. 12 DK Help	Location Mode Array TAD Mu Master ¹ 1 LBL Multi 0.14 ¹ 2 LBL Multi 0.34 ¹ 3 LBL Multi 0.70 ¹ 4 LBL Multi 0.90 ¹ 5 SSBL Tp 0.10 ¹ 5 LBL Multi 0.16 ¹ 5 LBL Multi 0.16
Revision A	This section was updated 19.11.03	MULBL - slide 17

Revision A

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MULBL POSITION, RANGES AND RESIDUALS

Exercise

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

Vessel	Fil	ltered	Posi	ition	dat	a:
	Item	Nort	th	East	D	epth
B61	Vess	s –0	.1	0.1	_	2.0
] B62	LBL:	Tot. I	Done	Used	RMS	resid
		6	6	6		0.1
B63	Loc	Range	e E	Residu	ıal	Status
	1	531.8	3	0.1		OK
B65	2	517.9	9	-0.1		OK
	3	544.3	3	0.2		OK
B67	4	557.3	1	-0.0		OK
	6	556.9	9	-0.2		OK
B68	Dpt	2.0	0	0.0		OK

Revision A

This section was updated 19.11.03

MULBL - slide 19

ERROR ELLIPSIS FOR MULBL POSITION

Exercise



APOS LBL and MULBL Course

DUAL MULBL POSITIONING

Situation

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





Revision A

This section was updated 19.11.03

MULBL - slide 21

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

Positioning Vessel 2 Image: Array 1 Image: Transmit Default PHPR400 Image: Array 1 Image: HPR400 Image: Array 1 Image: Array 1 Image: Array 1	BL Poster and						
Transmit Default Receive Image: Prevaluation of the	Positioning Vessel 2 💽	R	ctivate		Array	Array 1	
Calculation data Manual exclude Loc 6 Image 750 Calculation data Manual exclude Loc 1 Loc 2 Image 750 Image 750 Manual exclude Image 750 Loc 6 Image 750 Image 750 Image 750	Transducer Transmit Power Transmit Power Transmit Power	nsmit fedium Beam 500	Default 30 kHz, T	Receive PR400 Wide/Medium Beam 30 kH; PAP HiPAP 500 Receive Beam		ocations All available ra Ranges oc 1 oc 2 oc 3 oc 4 oc 5	anges ngles Angles
Loc 2 C Loc 3 C Loc 3 C Loc 5 C External sensor External sensor C Free (calculated)	Calculation data	laximum ligh ow linimum Manual e: Loc 1	Kolude	epth		oc 6 🔽	
	Deskew	Loc 2 Loc 3 Loc 4 Loc 5 Loc 6		Depth measurement Transducer parameters External sensor Free (calculated)	Manual External	depth / Sensor 0 I sensor: anual	-

Revision A

This section was updated 19.11.03

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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



Revision A

Polar View

<u>U</u>TM View <u>N</u>umeric View

Inclination View

Stack angle Inclinometer/Tension

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0

MULBL - slide 24

-100

-150

-200

READ BATTERY STATUS

Exercise

- Read battery status for all transponders in the array



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Appendix

Revision	Date	Written by
А	15 okt. 2004	kgr

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

Contents

13 Appendix

- A Service Mode
- B Transducer configure
 - B.1 Offset rel. CG
 - B.2 Vertical Depth
- C UTM view
- D Telemetry
- E Telemetry problems
- F Help for Markers
- G Set Markers for a LBL array

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 hav will change it back It is therefore impo- Mode' after the nec- done.	we a timer on the 'Service Mode', which to 'Operator Mode' after a certain time. rtant to switch APOS back to 'Operator essary configuration change has been
NB!	APOS have no indic that Service Mode i	cation on the main display to tell you s 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:	
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.

Transducer: HiPAP 500	8	×
Offset rel. CG Forward 0.00 Starboard 0.00 Below 0.00	_	
Inclination Roll 0.00 Pitch 0.00		
Rotation Gear 0.00 Depth 0.00		
CK. Cancel Help		

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.

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.



Datum	poortioning	5 occup					
Name	Major	Flattening	X Offset	Y Offset	Z Offset	X Rotati	Y Rol 🔨
ARAT	637838	297.00	158.00	-307.00	149.00	0.00	
👁 ARAT	637838	297.00	158.00	-315.00	148.00	0.00	
🔿 ARAT	637838	297.00	158.00	-309.00	151.00	0.00	
🐵 Austr	637816	298.25	133.00	48.00	-148.00	0.00	
🐵 Brazil	637816	298.25	60.00	2.00	41.00	0.00	
🐵 Cape	637824	293.46	136.00	108.00	292.00	0.00	
🔮 ED50	637838	297.00	89.50	93.80	123.10	0.00	~
<)		>
atum input:	WGS84				⊢GPS /	Antenna	
atum present	ated: WGS8	4			Forw	vard 🛛	
UTM Auto sele	ect UTM Zone	• Vi	ew presental	tion	Starl	board 0	
Zone	31		Lat/Lon "d	ld mm.mm''	Heig	iht 🕛	
C North	C South	0	Lat/Lon "c	ld mm ss''	F F	ioll/Pitch co	rrection
пк	7	Cancel		Ann	Ju I		Help

С

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.





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.





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.

Help for Markers

Step by step

F

- 1) Go to 'Help' on the menu bar and select 'Help'
- 2) Select the 'Index' tab and open help for 'Markers'.
- 3) Close 'Help'

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

G

- 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

APOS Markers
Properties
Name Array radius 🔽 Visible 🗖 Local
□ <u>N</u> ame Visible
Centre Position 6216877.97 North 577953.20 East
Radius 220 Relative LBL-Origin 💌
Number of tags 6 Tags Visible
Rotation of tags 0
Linetype Color
OK Cancel Help

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

