HiPAP® system
Setting up 2 LBL arrays in APOS

KONGSBERG

Cymbal wideband rules
- The M-channels uses unique address codes which do not have limitations/rules for the setup when it comes to transponder channels numbers. The array(s) can contain any M-channel number.
- Cymbal has 6 dedicated LBL interrogation channels (LIC): M57-M62.
- The M-channels are in the same frequency band as the B-channels.

FSK (Tone) rules
- In a LBL array all transponder channels must be either B2x, B4x, B6x, B8x or B1x, B3x, B5x, B7x.
- All transponders must have different second digit (the second digit corresponds to the reply frequency).
- The LBL interrogation channel (LIC) must come from the same channel group as in paragraph 1.
- The LIC channel can be the same as one of the array reply channels.

Common rules
- Maximum eight (8) transponders in and LBL array.
- Each HiPAP can only handle one LBL array at a time.
  - Therefore LBL1 is activated on HiPAP1 and LBL2 on HiPAP 2.

ACS Considerations
FSK channels B76 and B86 as well as Cymbal channels M53-M56 should be avoided in your LBL array when using a Kongsberg acoustic control system (ACS) installed on the BOP as these channels will wake up the ACS system and reduce the battery lifetime.

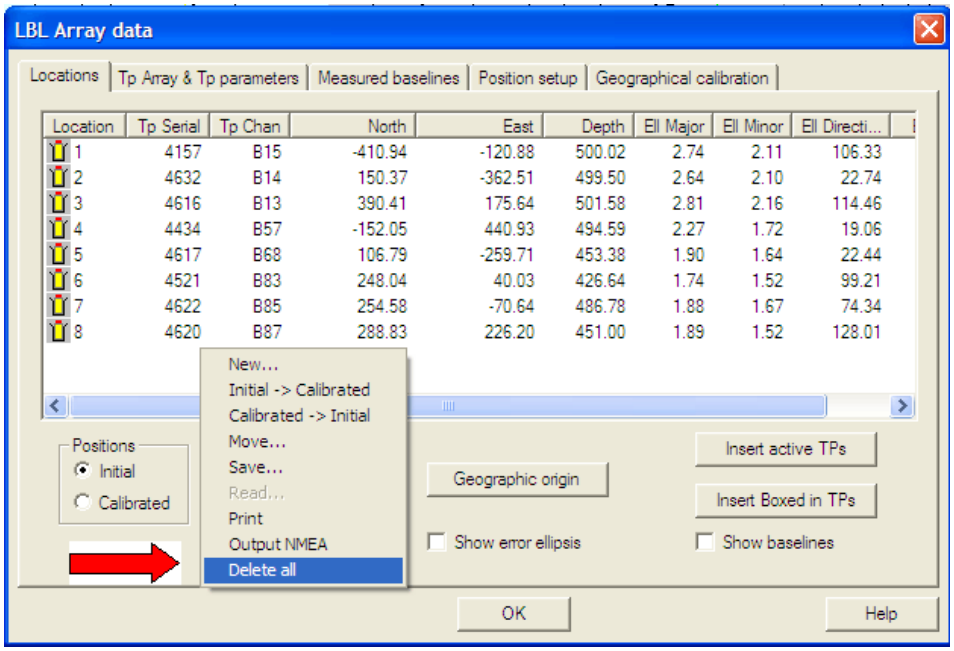
Methods of calibration
The LBL arrays can be calibrated either by measuring baselines or only use run-time calibration. This is valid for both B- and M-channels.
- You need to measure baselines if you are going to position a ROV in LBL mode with a subsea transceiver or if you are running multi-user LBL (MuLBL).
- If you are only going to position the vessel on the surface, the quickest way is to use the LBL wizard without baseline measurements.
- Both methods above should be followed by a run-time calibration which will optimize the LBL position quality by adjusting the transponder positions/depths to minimize residuals.

Example of array configurations

HiPAP1 Function	Channel	Reply frequency (kHz)	HiPAP2 Function	Channel	Reply frequency (kHz)
LBL1 interrogation channel (LIC)	B56	TX 23.000/23.500	LBL2 interrogation channel (LIC)	B24	TX 21.500/22.500
LBL1	B16	27.250	LBL2	B26	27.000
LBL1	B17	27.750	LBL2	B27	27.500
LBL1	B18	28.250	LBL2	B28	28.000
LBL1	B31	28.750	LBL2	B21	28.500
LBL1	B14	30.250	LBL2	B64	30.000
Inclinometer/Diff. Inclinometer 1-1	B32	29.250/29.750/ 30.250	Inclinometer/Diff. Inclinometer 2-1	B42	29.000/29.500/ 30.000
Inclinometer/Diff. Inclinometer 1-2	B52	29.250/29.750/ 30.250	Inclinometer/Diff. Inclinometer 2-2	B62	29.000/29.500/ 30.000
ROV1-1	B13	29.750	ROV2-1	B23	29.500
ROV1-2	B53	29.750	ROV2-2	B43	29.500
ROV1-Backup	B73	29.750	ROV2-Backup	B63	29.500
ACS ACS	B76 B86	Reserved Reserved	ACS ACS	B76 B86	Reserved Reserved

Preparing to start

1) Delete the old LBL data from the previous location in LBL ARRAY DATA-LOCATIONS (right-click in the white menu area and select DELETE ALL.



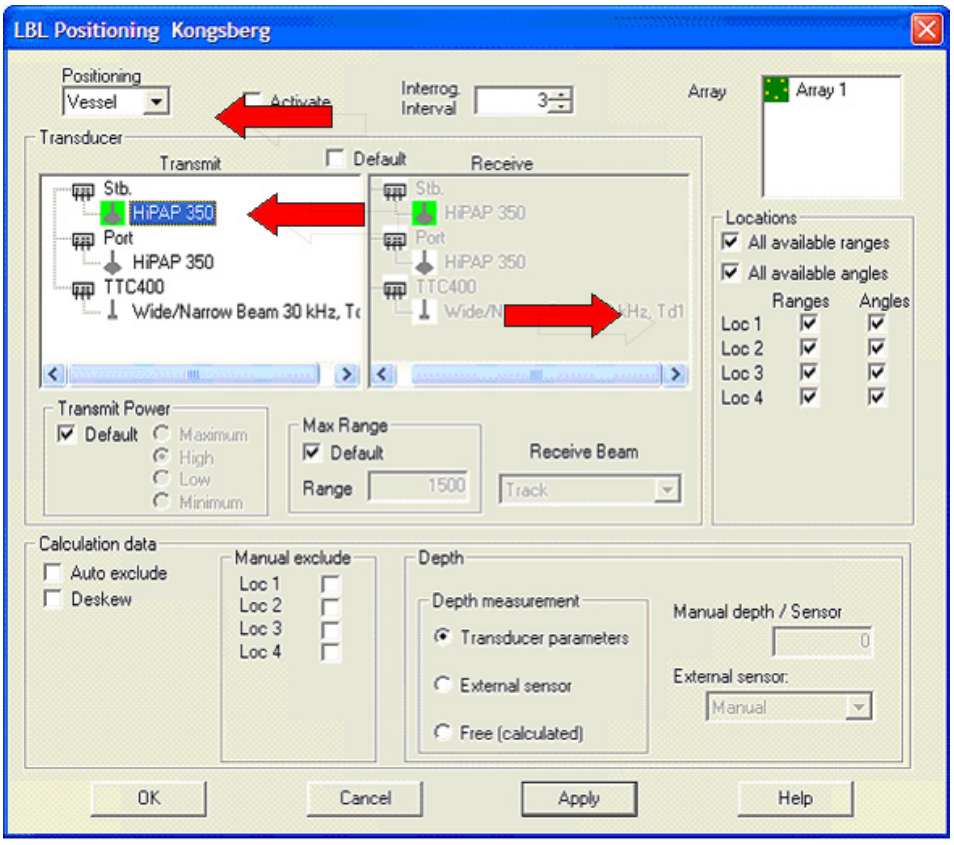
Preparing to start

Setup in APOS

When all the transponders have been deployed and the transponder channels match the requirements the new LBL array wizard can be started.

Array1

1) Activate all the transponders you want to use in Array1 in SSBL mode.
2) Start the “New LBL array wizard” and press NEXT.
3) Select NEXT (**do not** tick “continue with measuring baselines”).
4) The transponders will automatically be switched to LBL positioning mode by telemetry.
5) Press FINISHED when all telemetry commands are finished.
6) In LBL positioning properties select VESSEL and verify the correct transceiver is selected.
7) Also confirm in LOCATIONS all angles/ranges are being used.
8) Activate LBL.



Setup in APOS

Runtime calibration of Array1

1) Start runtime calibration (LBL ARRAY-LBL RUNTIME CALIBRATION).
2) Stop logging and calculate corrections after 250 samples.
3) Update LBL array.
- The complete operation takes normally 10-15 minutes.
- The array is now ready for use.

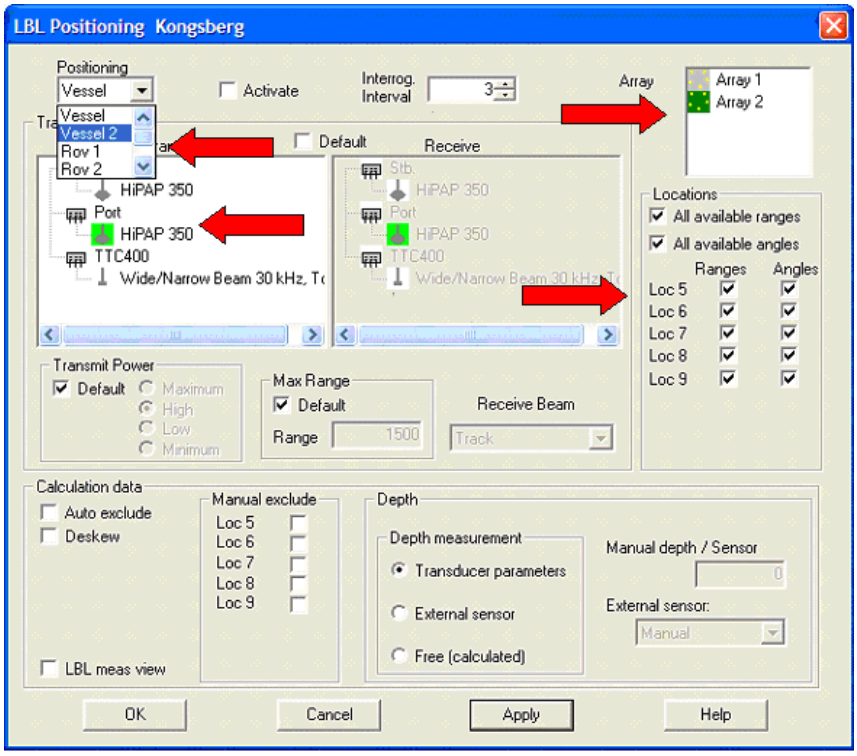
Array2

1) Stop LBL positioning of Array1.
2) Activate all the transponders you want to use in Array2 in SSBL mode.
3) Start the “New LBL array wizard” and press NEXT.
4) When prompted “One LBL array already exist, use this” select NO.
5) Select NEXT (do not tick “continue with measuring baselines”).
6) The transponders will automatically be switched to LBL positioning mode by telemetry.
7) Press FINISHED when all telemetry commands are finished.
8) In LBL positioning properties, verify the correct transceiver is selected.
9) Select ARRAY2 in the upper right menu.
10)Also change POSITIONING = VESSEL2 in the upper left part of the menu.

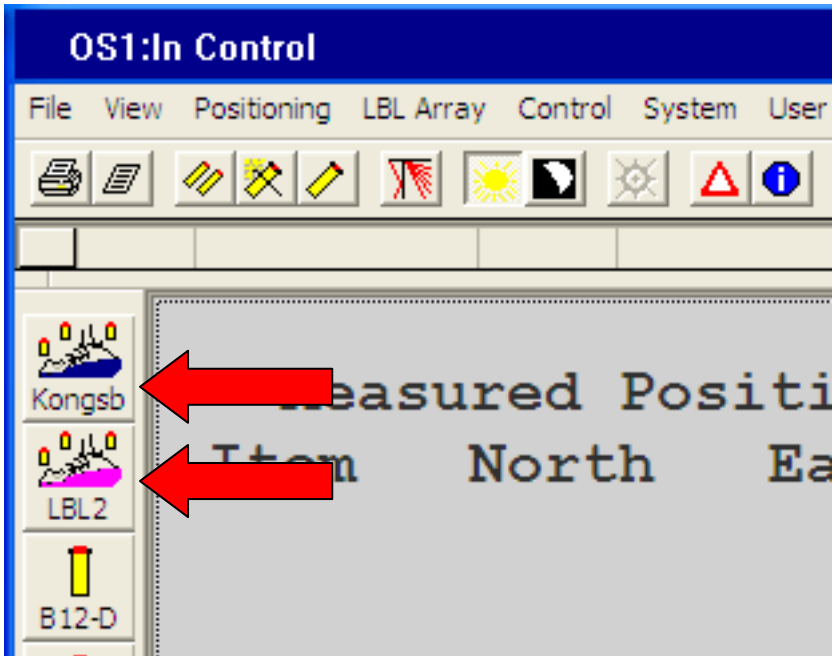
11) Verify all transponders are selected in the LOCATIONS menu.
- When the setup is complete the APOS screen contains the two LBL icons (the blue vessel=LBL1 and the pink vessel=LBL2)

Runtime calibration of Array2

APOS can only do a runtime calibration when using VESSEL (not VESSEL2). You need to change the array used by VESSEL from Array1 to Array2.
1) Right-click on the VESSEL icon (blue) and select PROPERTIES.
2) Click on Array2 in the upper right-hand corner and confirm all angles/ ranges are selected in LOCATIONS just below.
3) Activate LBL (VESSEL).
4) Select runtime calibration (LBL ARRAY-LBL RUNTIME CALIBRATION).
5) Select DELETE ALL (old data) before logging is started.
6) Start logging.
7) Stop logging and calculate corrections after 250 samples.
8) Update LBL array.
- The complete operation takes normally 10-15 minutes.
- The array is now ready for use.
9) Stop LBL positioning on VESSEL.
10) Change back to Array1 for VESSEL (VESSEL-PROPERTIES-ARRAY).
11) To activate LBL, simply press the icons.



Array2



Runtime calibration of Array2

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