

Long Baseline Systems

With the offshore oil and gas industry shifting its attention to increasingly deeper waters, the request for accurate subsea positioning systems is also rising. Long Baseline (LBL) systems can provide an accuracy that is virtually independent of water depth.

LBL has already been used for over three decades, mainly in the offshore construction business, where ROV and structure positioning requirements are often too strict, for example, for vessel-mounted ultra-short baseline positioning. With LBL, the reference frame is placed on the seabed, thus providing a depth-independent positioning accuracy. By measuring the ranges to at least four acoustic beacons on known locations on

the seabed, a 3D position of a transducer can be calculated by means of the intersection principle. Such ranges are determined by measuring the time of flight of the acoustic signal. The network of known transponders is usually called an 'array' and the baselines in such an array can be several kilometres long, depending on the frequency in use. Technical development of LBL has been relatively slow, until recently, when spread-

spectrum signalling was introduced in underwater acoustics. This significantly improved the ranging accuracy and increased the maximum baud rates for acoustic data telemetry. Most manufacturers now provide spread spectrum on their systems.

Hydro International is greatly indebted to all manufacturers who contributed to this product survey.



Manufacturer	LinkQuest Inc.	LinkQuest Inc.	Nautronix	Sonardyne International
<i>General specifications</i>				
Name of Product	PinPoint 1500	PinPoint 10000	NASNet®	Fusion Wideband LBL
Year of initial development	2004	2004	2000	2004
<i>Acoustic Processing Transceiver</i>				
Operating frequency range	26-45KHz	7.5-10KHz	10KHz	18-36KHz
Model (Surface/Subsea)			Surface	Both
Acoustic interrogator / Transceiver beam pattern	omni	omni	210 deg	Omni-directional
Transmit Frequency Band (kHz-kHz)	26-45KHz	7.5-10KHz	10KHz with 3KHz spread	18-36KHz
Acoustic source level (dB re.(1µPa@1metre)			176 - 202	185-195
Transmit pulse width (ms)			Proprietary	Variable
Receiver Sensitivity / MDS (1) (dB re.(1µPa)			SNR < 1	90dB-120dB
Receive frequency Band (kHz-kHz)	26-45KHz	7.5-10KHz	10KHz with 3KHz spread	18-36kHz
AGC / TVG capability (Y/N)	Y	Y	Automatic	Y
Number of simultaneous receive channels	32	32	Unlimited	14
Signal technique (Tonal, Chirp, Wide Spread Spectrum)	Broadband Spread Spectrum	Broadband Spread Spectrum	Acoustic Digital Spread Spectrum	Wideband spread spectrum
Receiver bandwidth (kHz)	19KHz	5KHz	Not disclosed	Variable
Multiple Range detection per channel			n/a	Y
Distance Time gating filter per receiving channel				Y
Range resolution at 1500 m/s sound velocity	1 cm	5 cm	Not disclosed	1.5mm
Range accuracy at 1Δ [m] @20db SNR, in receiver bandwidth	0.05 m	0.3 m	< 0.5 m	0.01m
Typical/Proven Range Capabilities	1000 meters	10000 meters	5 km (3.1 miles)	3000m / 4800m
Telemetry/Telecommand Transmitter Functionality	Y	Y		Y
Telemetry Receiver Functionality	Y	Y		Y
Telemetry principle (PPT,FSK,PSK) (2)	Broadband Spread Spectrum	Broadband Spread Spectrum	Proprietary	PPT, FSK, Broadband
Operating power voltage	18-28 V DC	18-28 V DC	220 V	24-48V
Average/Transmit Electrical power consumption (Watts)	1.5 / 6	6 / 50	Proprietary	6W/30-50W
Control communication port	RS422/232	RS422/232		Serial RS232/RS485
Data Output Format	Proprietary	Proprietary	As required, typically GGA	Proprietary
Front panel Display /Graphic User Interface	Y	Y	Y	Fusion LBL Software
<i>Transponder series</i>				
Receiving Frequency Range (kHz-kHz)	27-45KHz	7.5-10KHz	10KHz with 3KHz spread	(MF) 18-36kHz
Transmit Frequency Range (kHz-kHz)	27-45KHz	7.5-10KHz	10KHz with 3KHz spread	(MF) 18-36kHz
Depth rating (m)	1500 or 4000 m	2000, 4000 or 7000 m	3.000	3000 / 5000 / 7000m



	LinkQuest Inc.	LinkQuest Inc.	Nautronix	Sonardyne International
Transducer Beampattern	omni	omni	210 deg	Omni Directional & Directional variants
Acoustic Source Level (dB re. (1µPa@1metre)			175-196	186-202
Transmit pulse width (ms)			Proprietary	Variable
Receive Sensitivity MDS(1) (dB re. (1µPa)			SNR < 1	80dB
Telemetry/Telecommand principle (PPT,FSK,PSK) (2)	Broadband Spread Spectrum	Broadband Spread Spectrum	Proprietary	PPT,FSK,Wideband
Number of Configurable Interrogator Channels	32	32	31 unique IDs	210
Number of Configurable Reply Channels	32	32	31 unique IDs	210
Internal battery type	Alkaline	Alkaline	Alkaline or Lithium	Alkaline or Lithium
Listening life	2 years	2 years	2-9 years	Alk 2.2years or Li 3.8years
Number of transmit repliers	112 hours	140 hours	Continuous range pulsing for 324 days (at 180 dBµPa with a 6 second ping rate and Alkaline battery)	Alk 8 Million or Li 13.6 Million
Acoustic Release Mechanism (Y/N)			Y	Y
Depth Telemetry (Y/N)	Optional	Optional	Y	Y
Optional Temperature/Soundvelocity Sensor (Y/N)	Y	Y	Y	Y
LBL Software and User Interface				
Operating System for navigation Computer	Windows	Windows	UI runs on Windows	Windows XP
Planning and Configuration Functionality	Y	Y	Y	Y
Self/Auto Calibration functionality (Y/N)	Y	Y	Y	Y
Absolute Georeferenced Calibration (Y/N)			Y	Y
Relative Calibration functionality (Y/N)			Y	Y
Interactive calibration Data Processing (Y/N)	Y	Y	Y	Y
Tracking Navigation functionality (Y/N)	Y	Y	Y	Y
Remote transponder tracking functionality (Y/N)	Y	Y	Y	Y
Compensation for Sound velocity and ray-bending (Y/N)	Y	Y	Y	Y
Multi User LBL functionality (Y/N)	Y	Y	Y	Y
Compatibility with Inertial navigation sensor (Y/N)	Y	Y	Y	Y
Compatibility with DVL Navigation sensor (Y/N)	Y	Y		Y
Data Output Telegrams	Y	Y	Y	Y (Industry standard)
Compatible with USBL systems (Y/N)				Y (Fusion / Ranger USBL)
Geodesy functionality (Y/N)			Y	Y
Multisensor input (GPOS,Gyro,MRU) (Y/N)	Y	Y	Y	Y
Configurable user interface (Y/N)	Y	Y	Y	Y
Access-all logged data (Y/N)	Y	Y	Y	Y
Configurable survey QC reports (Y/N)	Y	Y	Y	Y
Remote sensor monitoring (depth, temp) (Y/N)	Y	Y	Y	Y
Application Notes				
Typical application	Navigation and tracking of AUVs, ROVs, manned subsersibles, divers and towed systems	Navigation and tracking of AUVs, ROVs, manned subsersibles, divers and towed systems	Multi Vessel Field Development including Drilling, ROV positioning, Construction and flowline Installation. Please note NASNet is a flexible positioning tool and is applicable-all subsea positioning tasks.	Sonardyne Wideband is the leading high accuracy deep water survey LBL system. It is used widely for a variety of applications due-its flexibility, scaleble architecture and USBL compatibility.
(1) MDS= Minimum Detectable Signal (2) PPT= Pulse Position Telemetry FSK=Frequency Shift Keying PSK=Phase Shift Keying				