The introduction of BuoyLink 4DX significantly enhances the precise positioning capabilities required for 3D and 4D surveys. The system has been designed to be the most functional and advanced RGPS system in the Seismic industry to date.

Source Module

Tailbuoy/Master Module

- Advanced RTK processing capability providing centimeter level accuracy with minimal convergence time.

- Improved accuracy in a dynamic kinematic environment, with no limitation on baseline length. Maintains solid lock under high shock and vibration conditions.

- Simple FiberLink upgrade to unlock full integration with GunLink 4000.

- Single master radio provides RF communication to all in-water remotes (900MHz spread spectrum), with option to add a second redundant Master Module, with auto-switching capability in the event of a failure with the primary unit.

- Source Module L1/L2 GPS and GLONASS, Tailbuoy Module L1/L2 GPS.

- Multiple units (3) possible per gun array using 1 telemetry and power pair.

Seamap has developed a new generation of BuoyLink RGPS modules using the latest advances in GNSS receiver technology to provide sub meter positioning for Gun floats and Tailbuoys.

The design incorporates an array of functionality providing the end user with an extremely field-reliable product capable of surviving the harsh offshore environment. With internal radio antenna, Source and Tailbuoy Module, there are no external components, thus improving reliability and signal integrity (less signal attenuation), without increasing the physical size.

All modules communicate bi-directionally within a network utilizing both RF and Hardwire telemetry technology. Taking advantage of the very latest improvements in radio telecommunications, Seamap have been able to make a vast increase in the volume of telemetric data supported by the system. This dramatic increase in available bandwidth means that the end-user, with a single master radio unit, can significantly increase the number of GNSS modules allowed within a Seismic spread.

In the future, you can also consider enhancing the 4DX with the addition of an Integrated Inertial Measurement (IMU) to provide an additional layer of data integrity insurance, for example in inclement weather where waves may be swamping GNSS reception. This also allows for height, heave, swell, tilt, roll and pitch measurements only requiring two satellites to maintain high level accuracy.

Master Module:

Mechanical	
Dimension	Ø 180mm D x 365mm H
Weight	5kg
Enclosure Sealing	Double O-Ring
Rating	IP68
Shock	Mil-Std 810G 50G 10ms
Mounting	Double Delrin Clamp

* This relates to number of modules per gun string. See 'Performance Characteristics' table.

\# Full receiver capability listed; not all functionality utilised configuration dependent).

Electrical	
Power Supply	9-36v dc
Consumption	30W
I/O Data Radio FREQ	RS422, 230400bps 900MHz ISM Spread Spectrum (902-928MHz)
Radio Range	12km (for >12km see options)
RF Data Rate	230400bps
Radio Antenna	5dBi Internal, Omni-directional. (Optional External antenna, selectable via software. Supports high gain directional or Sector Antennae.)
Connector	SubCon, mini-series, 8 contact
RF Tx Power	1W-10W, selectable from software
Broadcast Information	RTCA Pseudo Ranges, to Remotes
GNSS Receiver #	24Ch (up to 120) GPS L1/L2/L2(C), GLONASS L1/ L2. L5, Galileo E1/E5, SBAS
GNSS/ISM Combination Antenna	GPS L1/L2, GLO L1/L2, L5, Galileo, LNA gain 33-35dB ISM 5dBi
Radio Transmission Method	TDMA, FHSS
Dual Master Option	*Auto switching Spare Master Module, to provide full auto redundancy*

Remote Module:

Mechanical	Source Module	Tailbuoy Module
Dimension	Ø 150mm D 200mm H	Int. Antenna: Ø 150mm D, 295mm H
Weight	2.5kg	4.5kg
Enclosure Sealing	Double O-Ring	Double O-Ring
Enclosure	Delrin	Delrin
Rating	IP68 (10m submersion)	IP68 (10m submersion)
Shock	Mil-Std 810G, 50G 10ms	Mil-Std 810G, 50G 10ms
Mounting	Quick release shock clamp	Quick release shock clamp
Safety	Option to add lanyard for carrying and securing or tethering	Option to add lanyard for carrying and securing or tethering

Electrical	Source Module	Tailbuoy Module
Power	18-75Vdc	9-36Vdc
Consumption	4W Wire Com. 6W Radio	6W
Data Format	Range/Bearing/Pitch/QC	Range/Bearing/Pitch/QC
Wire Data	RS485	RS485
Radio Data	TDMA	TDMA
Radio Frequency	900MHz ISM Spread Spectrum	900MHz ISM Spread Spectrum
Radio Range	2km	12km (for >12km, see options)
RF Tx Power	1W	1W
Radio Antenna	Internal 0dBi (integrated with GNSS antenna)	Internal 5dBi (Integrated with GNSS antenna, optional external connector)
GNSS Receiver #	24 Ch (up to 120) GPS L1/L2/L2(C), GLONASS L1/L2,L5, Galileo E1/E5, SBAS	24 Ch (up to 120) GPS L1/L2/L2(C), GLONASS L1/L2,L5, Galileo E1/E5,
GNSS Antenna	GPS L1/L2, GLO L1/L2, L5, Galileo, LNA gain 33-35dB	GPS L1/L2, GLO L1/L2, L5, Galileo, LNA gain 33-35dB
Update Rate *	1, 5 or 10Hz	1 sec
Connector	4 Contact AGP	4 Contact AGP (8 pin to allow access to Seamap Tailbuoy Charger interface)
Accelerometer	3-axis, 50g	3-axis, 50g
Input Protection	Reverse polarity, over-current	Reverse polarity, over-current

Inboard Equipment:

Data Acquisition PC	
Dimension	19" x 2U high
Weight	Approx. 4Kg
OS	Windows Embedded, WS7
Motherboard	AIMB-781
Processor	Core™i7 2600
Memory	4GB DDR3 1333
HDD	SSD 40GB
Supply	115Vac - 240Vac, 50/60Hz, 500W

Module Power Supply Unit (MPU)	
Dimension	19" x 2U high
Weight	Approx. 2kg
No. of Channels	11 Channel - 8x Gun Strings (up to 3 modules per string), 2x Auxiliary, 1x Test Port
Output	55Vdc output (to Gun Strings and Aux), 24V Test Port. Redundancy built in. Voltage and Current monitoring. Outputs are user remotely switchable. Fully controllable from software, via Ethernet. Power supply monitoring from the user interface software. Redundant internal power supplies, both operating independently.
Supply	115Vac - 240Vac, 50/60Hz, 350W

Portable Test Unit (PTU) (optional)	*To configure, interrogate and verify module functionality on back deck or from a work boat*
Dimension	240mm x 190mm x 110 mm
Weight	2Kg
Screen	4x40 Monochrome LCD
User Input	Large format key pad, easy to operate wearing gloves
Range	25m, Omni-directional
Frequency	2.4GHz
Rating	IP68
Power	Internal Li-on battery, 7.2V, 6.2Ah
Connectors	1x Input, 12-24Vdc to charge internal battery. 1x Output, to provide power to modules under test (24Vdc). 1x USB, for data upload to PC or thumb drive.

USB Programming Module	*To configure, interrogate and verify module functionality in the instrument room*
Dimension	120mm x 80mm
Weight	300g
Range	4m, Omni-directional
Frequency	2.4GHz

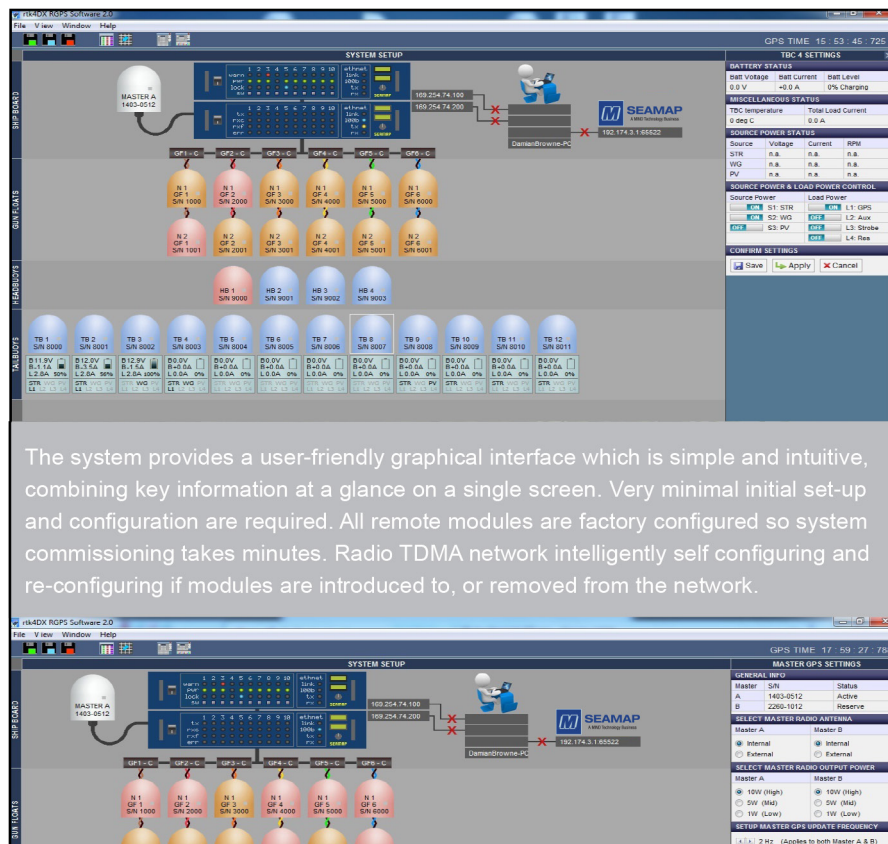| Module Interface Unit (MIU)	
Dimension	19" x 2U high
Weight	Approx. 2Kg
No. of Comms Channels	10 Interchangeable channels - either Gun String or Auxiliary - e.g. configuration: 6x Gun String RS485 with up to 3 modules per channel. 2x Master Module RS422 channels. 4x Auxiliary RS485 channels.
Power Outputs	2x 24Vdc for Master Modules. 1x 24Vdc Test Port at rear panel
Supply	115Vac - 240Vac, 50/60Hz, 250W. Internal independent redundant power supply
Monitoring & Control	via Ethernet from the User Interface 115Vac - 240Vac, 50/60Hz, 500W

Performance Characteristics:

Max No. of Modules	*Forward RTK*
Radio	45, with 12 tracked satellites (GPS L1/L2, GLONASS) with 1Hz update rate
Wire up to 1.5km	>50, with 12 tracked satellites (GPS L1/L2, GLONASS) with 1Hz update rate
Wire up to 1 km	12 (2 per sub-array), with 12 tracked satellites (GPS L1/L2, GLONASS) with 5Hz or 10Hz update rate
Wire / Fibre - GL4K	18 (3 per sub-array), with 12 tracked satellites (GPS L1/L2, GLONASS), accelerometer and IMU data. 20Hz update rate. Unlimited umbilical length (fibre)

Example Accuracy	Source Module					
OEM615. GPS L1/L2/ GLONASS, Fwd RTK FIRMWARE	Condition: 3km baseline, open sky					
	HORIZ ERROR (m)			HEIGHT ERROR (m)		
	MAX	MEAN	RMS	MAX	MEAN	RMS
	0.051	0.011	0.013	0.245	0.000	0.018

Example Accuracy	Tailbuoy Module	
	Condition: 15km baseline, open sky	
	Secs of Convergence	Horiz Error RMS, (m)
	0	0.53
	300	0.43
	600	0.35
	900	0.32
	1200	0.28
	1500	0.27
	1800	0.22
	2100	0.2
	2400	0.19
	3000	0.12

SEAMAP BUOYLINK 4DX

RGPS TRACKING SYSTEM FOR OFFSHORE APPLICATIONS

The system provides a user-friendly graphical interface which is simple and intuitive, combining key information at a glance on a single screen. Very minimal initial set-up and configuration are required. All remote modules are factory configured so system commissioning takes minutes. Radio TDMA network intelligently self configuring and re-configuring if modules are introduced to, or removed from the network.

- BuoyLink 4DX permits a greater number of modules in a network.

- Multi-vessel capable system, allowing up to 4 vessels.

- Fully integrated to the Seamap Tailbuoy Charger to allow Tailbuoy monitoring and QC functionality.

- Features a fully integrated 3-axis accelerometer for source monitoring (shock severity).

- Master Module incorporates Master GNSS receiver and 900MHz transceiver enabling simplified installation with 1 cable.

- Optional hand-held unit available for module interrogation and diagnostics. Omni-directional, range up to 25m, ruggedized and weather proof.

Seamap has built upon their successful track record, with BuoyLink EX having been in the field for a decade. Seamap's latest smaller, lighter modules are internally shock mounted making them even more robust.

When compared to their predecessor, the new module construction has minimal internal cabling providing improved reliability and enabling quick and easy servicing while offshore. The modules are also easier to mount on the Tailbuoy and Gun Floats, with external shock mounting available as an option.

The BuoyLink 4DX Portable Test Unit (PTU) provides the operator with a quick and simple means to fully test all functionality of a single module, or multiple modules consecutively, with the press of a single button. The display will report PASS or FAIL, with the option to diagnose the exact fault. All results and logs are stored internally and can be uploaded to a PC via USB. In addition, the PTU can be used to configure any aspect of the module, as well as provide advanced options for shock logging, dock side calibration and many more features.

The Portable Test Unit (PTU)