



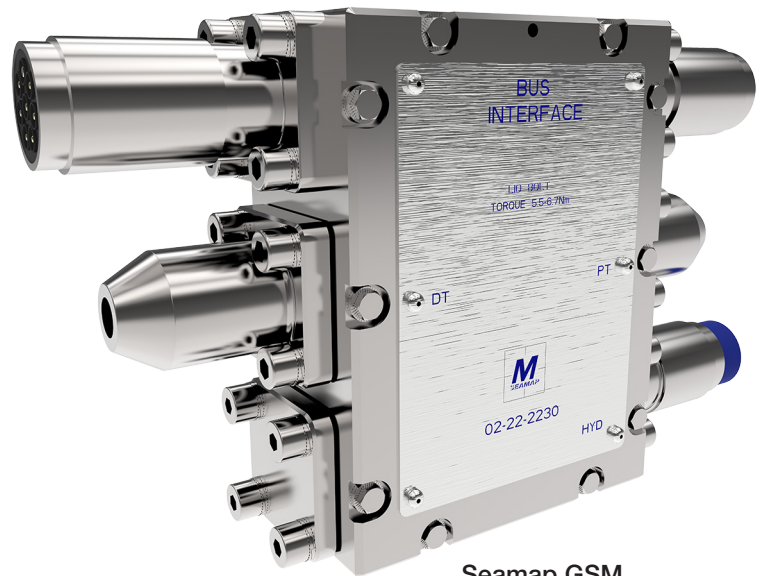
SEAMAP
A MIND Technology Business

SEAMAP GUNLINK™ 2500

ONBOARD SOURCE CONTROLLER AND
IN-WATER HYDROPHONE DATA ACQUISITION SYSTEM

GunLink is the world's leading real-time seismic acquisition and source control system. Ranging from the GunLink 2000, which resides as an onboard analogue system to the GunLink 4000 fully distributed in-water digital system, the GunLink 2500 system sits comfortably in the middle of the existing product range. With an onboard source controller and in-water hydrophone data acquisition, this is the perfect solution for those customers who require digital inputs but are using shorter umbilical lengths (less than 600m).

- Gun Capacity: Firing and Sensor Circuits for up to 256 guns (128 GI Guns). 16 Guns per GCU.
- Up to 256 near field phone 24 bit inputs sampled continuously at 0.1mS.
- Up to 16 depth and 16 high pressure inputs per GCU. One atmospheric pressure input and up to 11 additional compressor / manifold pressure inputs accommodated via the Timing Control Unit.
- Twin screen Graphical User Interface allows for simple operator monitoring and control as well as indicating any deterioration of gun performance.
- Direct interface to vessel's MOB system to disable gun firing if an MOB incident occurs.
- Fault Detection & Self Diagnosis: System software provides a full suite of on-line help, internal fault detection and diagnosis.



Seamap GSM

The system provides onboard firing control and sensor timing monitoring of up to 256 standard guns (128 GI guns) and is capable of receiving in-water hydrophone data from up to 256 near field hydrophones using the Seamap GSM.

GunLink 2500 offers true quality control of the array with 24 bit A/D converter sampling at 0.1mS, hydrophone signal acquisition, and recording available as a SEG-D file for post analysis.

New Gun Sensor Modules (GSM's) and telemetry units enable this semi-distributed system to transmit digitised GSM component inputs - hydrophone, depth transducer (DT) and pressure transducer (PT) - locally to the seismic source. The GunLink 2500 therefore offers customers better signal integrity and improved reliability.

The GunLink 2500 system comprises of a Host Computer, Timing Control Unit (TCU) and a number of Gun Control Units (GCU), each capable of controlling up to 16 guns. The TCU generates the system timing signals. Timing is derived from an internal GPS receiver and distributed to the GCUs.

The GCU provides the firing pulse to each gun at the calculated time for a programmable period and voltage. Each GCU contains circuitry to monitor individual gun fire times, near field phone data, gun depth, air line pressure and solenoid coil current.

The GunLink 2500 system does not use the analogue hydrophone GCU card from GunLink 2000. Instead, by using the very latest in-water digital data acquisition, each near field phone and firing sensor is monitored continuously providing increased gun firing accuracy and auto-fire detection.

When compared to the GunLink 2000 system, customers will notice additional dry end transceiver and power modules are installed, together with a separate bottle for the wet end transceiver module.

New system installations will include an independent Power Supply Unit (PSU) with wet end module, new backplane on the GCU to accommodate the new configuration, new umbilicals, deck leads designed for digital signals and a new communications termination module (CTM).

Specifications:

General System Features	
Total Number of Guns	256 (128 GI Guns)
Monitored Variables	• Gun Fire Time • Near field phone signals • Depth sensor and air line pressure • Up to 48 inputs per channel • Solenoid coil current
Controlled Variables	• Gun fire time • Gun firing pulse length and voltage
Ancillary Monitored Variables	• Atmospheric Pressure • Up to 11 compressor and umbilical line pressure inputs
Remote Parameter Displays (RPD II's)	Large format digital pressure displays to display umbilical pressures and other system parameters on the gun deck.
Supported Guns	• Bolt 1500 and 1900 series Guns • Seamap Sleeve Guns • Sercel G and GI Guns
Safety Features	• Key controlled remote and local system disable • Bleed resistors on each solenoid output dump charge at system disable • Interface to vessel's MOB system

System Performance	
Timing Resolution	0.1 mS
Fire Detect Window	Up to 1024 mS
Synchronization Modes	Automatic (Additional algorithms available as required)
Fire Detect Method	Sensor or Hydrophone selectable
Fire Time Pick Method	Zero crossing, level detect, peak detect or combinations of all three
Data Time Stamping	All date time stamped to GPS time

Software	
Graphical at-a-glance status screen	Continuous update for each gun to indicate errors (faults); auto fire; double pops; depth; pressure and timing performance
Text Based Status in Tabular Format For Each Gun	Physical addressing; volume; timing error value; gun fire delay value; aim point offset value; depth value; array assignment; operational status and fault indication
Input Power/Voltage	110 to 240 Volt AC, 50/60 Hz
Mounting Heights	19" Rack Mount in Instrument Room; TCU = 2U; GCU = 7U

Additional Hardware:

- Utilise existing GunLink 2000 hardware. With minimal changes, this upgrade adds digital sensor data over existing umbilicals.
- Increased number of acquisition devices on the gun string. Capacity for 2 digital near field hydrophones, 2 digital DT and 2 digital PT per GSM.
- Phones, PTs and DTs multiplexed on cables along the array. Reduced umbilical wiring requirements for new builds and reduced array wiring requirements.
- System features a pre-emphasising driver and equalizing receiver to provide 'auto-tuning' of signal enhancement for the umbilical used.
- GunLink offers unrivaled superior quality of phone data in terms of;
 - Sample rates
 - Record lengths
 - Acquisition times
 - Number of bits
- Less electrical leakage between fire lines onto hydrophones.
- Dual Bus architecture comparative to GunLink 4000 for up to 8 near field hydrophones on a single gun-string.
- Triple Bus architecture for up to 12 near field hydrophones on a single gun-string.
- Quad Bus architecture for up to 18 near field hydrophones on a single gun-string.

Gun Sensor Modules (GSM)	New interface with digital hydrophone, Depth Transducer (DT), and Pressure Transducer (PT)
Depth Transducer	Digital - up to 8 GSM's per gun-string.
Pressure Transducer	Digital - up to 2 per GSM
Hydrophone	Digital - up to 2 per GSM
Dry End Module (DEM)	Contains driver and receiver circuits for umbilical transmission (Dry End) within a winch mounted enclosure
Wet End Module (WEM)	Contains driver and receiver circuits for umbilical transmission (Wet End). Mounted inside a separate subsea enclosure
Drop Down Cables	Quantity specified by array layout
Array Interconnect Cables	Quantity specified by array layout
GunLink 2500 Interface Board	Replaces the analogue hydrophone board in a GCU

Reviewed on a vessel-by-vessel basis:	
Digital Patch Panel	
Digital Patch Cables	
Digital Deck Leads	Specified for digital signals

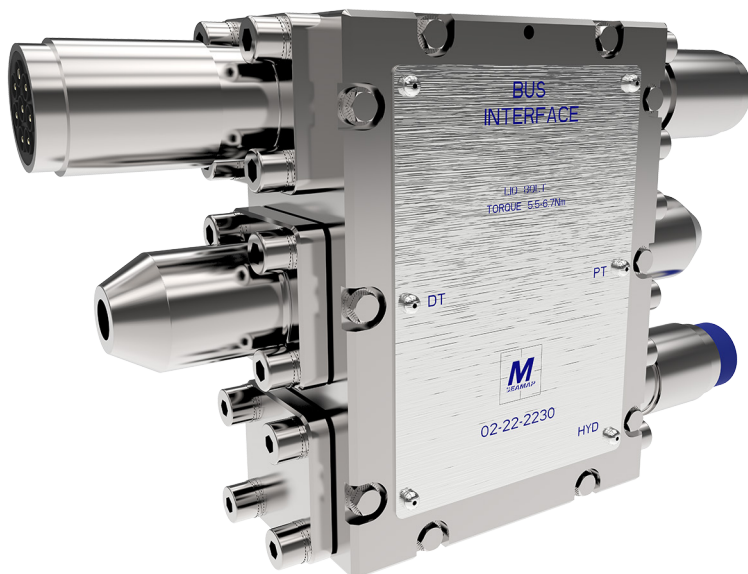
With all the improvements GunLink brings of increased sample rates and enhanced QC software, GunLink has established itself as a market leader with sales exceeding one hundred systems..

The GunLink 2500 is offering a further development of the 2000 system using a customer's existing umbilical copper conductors to transfer digital inputs. With minimal changes, this in-water digital upgrade achieves some of the benefits of the GunLink 4000 fully distributed system but targets smaller configurations and operations on a reduced budget.

Each GSM on the 2500 system will have the capacity for 2 x digital near field hydrophones, 2 digital PTs and 2 digital DTs. The GunLink 2500 system is fully compatible with Seamap's new hydrophone which can be re-calibrated onboard using integral traceability features. Using a powerful telemetry unit, inputs from the gun plate module are transferred to a similarly matched unit on the vessel without the use of fiber optics.

The GunLink 2500 has an in-water dual bus architecture with a redundant loop – ensuring that any physical damage to an interconnecting cable or failure of an individual GSM does not render the rest of the data on the gun-string unrecoverable. The Triple Bus and Quad Bus architecture does away with the redundant loop and instead minimises the number of affected GSMs to a maximum of two for any given interconnect cable or GSM failure.

The Host Computer runs the main operating and control software under a LINUX operating system. This provides the main system control and display functions. The software has been designed to be both intuitive and simple to use, providing the operator with real-time data and easily recognizable indications of deteriorating gun performance.



GunLink 2500 is further enhanced by the optional use of Far Field synthesis. This option requires a special license allowing for PP and PPBBR values to provide real-time quality control on a shot by shot basis.

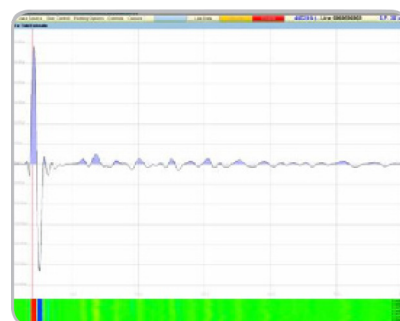
GunLink 2500 incorporates a pre-emphasising driver and equalising receiver designed to increase (within a frequency band) the magnitude of some frequencies with respect to the magnitude of other frequencies in order to improve the overall signal-to-noise ratio. Existing umbilicals will need to be a maximum length of 600m. Pre-emphasis can be disabled for umbilicals shorter than 200m.

GSM Specifications:

Note that the top half of this table is on the previous page...

Connectors	8 way
Depth Transducers	Digital - up to 2 per GSM
Pressure Transducers	Digital - up to 2 per GSM
Hydrophone*	Connector - up to 2 per GSM
Sensor	Water Temperature Sensor
Memory	Housing Serial Number EEPROM
No. of GSM's per Gun-string	Up to 8

*Fully compatible with Seamap flying lead or bulkhead hydrophones which can be re-calibrated onboard using Seamap's Recalibration Unit.



Shot by shot far field signatures for source monitoring and data deconvolution using notional source.

Notional source is the near field hydrophone signature with the sound signal of neighbouring guns removed.

To discuss the GunLink 2000 upgrade path to 2500, contact Seamap sales staff by email: seamapsales@mind-technology.com

One of our team will be happy to discuss the specification of your existing umbilicals and how the upgrade can benefit your future operations. Seamap's philosophy is to determine a customer's needs and use our strong in-house engineering team to progress with technological advances that benefit seismic operations at all levels.

Seamap (U.K.) Ltd.

Unit 34, The Maltings, Charlton Estate
Shepton Mallet, Somerset, BA4 5QE, U.K.
Tel: +44 [0] 1749 342223
Fax: +44 [0] 1749 347588
Email: seamapsales@mind-technology.com

MIND Technology

2002 Timberloch Place, Suite 400
The Woodlands, TX 77380
United States of America
Tel: +1 281-353-4475

Seamap Pte Ltd.

51 Changi North Crescent
Singapore 499626
Tel: +65 6545 1054
Fax: +65 6545 0585