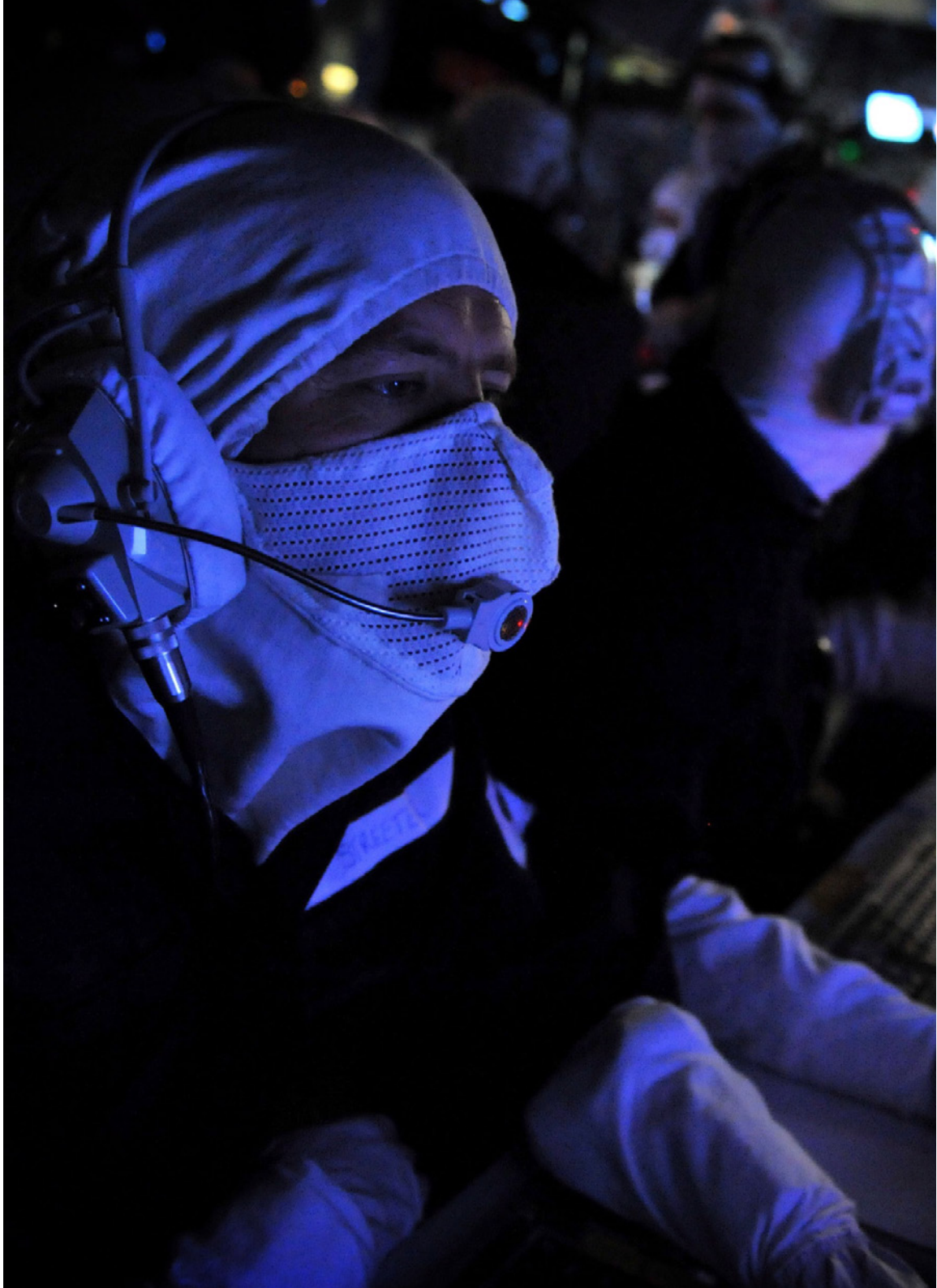
Maritime Mission Systems

Over 45 years of experience

Drumgrange has been actively involved in the design, development, installation and commissioning of maritime mission systems technologies since 1979. Over the years, we have built up an enviable reputation for rapid, cost-effective realisations of innovative technological solutions to suit demanding applications, for the quality of our products, and for delivering solutions and services on time, to specification, and to customer's satisfaction.

We specialise in creating complex, high-performance solutions that are certified to meet functional, environmental, shock and information assurance requirements. Our expertise spans the niche areas of sonar systems and signal processing, acoustic signature management, positioning and precise timing systems, platform and system integration services, as well as research and consultancy services.

Our products are in service with the UK Armed Forces, NATO Forces and foreign militaries.



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Signature Management Systems

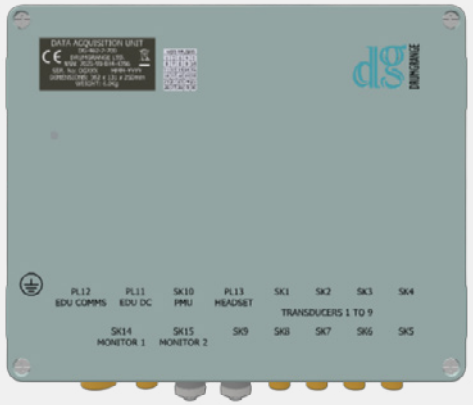
For organically monitoring the radiated acoustic emissions of warships and submarines, aiding the localisation of noise sources.

The standalone Signature Management System comprises transducer arrays, data acquisition subsystem, data distribution subsystems and PC-based operator workstation. Alternatively, we can offer the transducers with network-based telemetry and embed the software application within the platform's existing sonar or combat system.

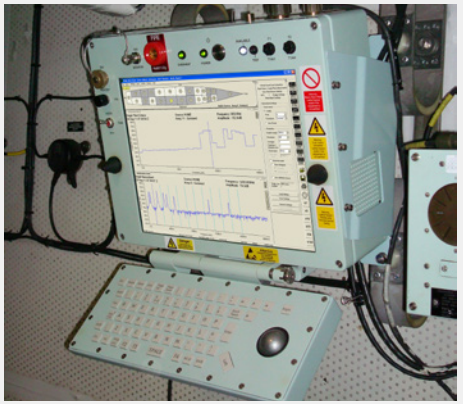
The transducers comprise arrays of hull internally-mounted accelerometers and external hydrophones, which can be populated throughout the platform or localised in particular compartments to provide real-time radiated noise estimates.

The software provides a modular acoustic analysis toolkit and an equipment database which allows the operators to customise the system to suit the platform configuration.

We can also provide fully-customised solutions to suit bespoke requirements.



DIGITAL ACQUISITION UNIT



HULL VIBRATION MONITORING EQUIPMENT

Key Software Features

- Windows-based application, operated independently or within a networked combat system
- Single transducer, compartment or whole platform acoustic measurements
- Narrowband or third octave analysis
- Single or summed Lofargram displays
- Frequency coverage depending on transducers
- Raw data capture for post-processing

Technical Specifications

Signature Management System Features

Monitoring and Analysis Displays

- Channel Analysis: 3rd Octave, Lofargram, Wideband
- Compartment Scan
- Whole Vessel Scan
- User-populated machinery database
- User-populated calibration factors
- Narrowband zoom
- Peak find function
- Save and restore scan results data
- Comparison function to overlay current scan results with previous scans
- User annotation of scan results

User Tools

- Line cursor identifying a single frequency and its associated amplitude
- Sideband cursor identifying a frequency and selected sidebands
- Harmonic cursor identifying a frequency and its harmonics
- Crosshair cursor identifying a frequency, amplitude and time on a lofargram display
- Machinery cursor identifying machinery frequencies from an operator-entered database of known frequencies

Aural Facilities

- Baseband operation
- Wideband and narrowband modes
- Can be slaved to analysis or scan channels

Alarms

Operator-controlled alarms on exceeding configured noise level limits

Data Logging

- Operator-controlled signal, signature and screen data logged to encrypted removable media
- Readout of disk space used

BITE Reporting

- BITE Reporting to LRU
- BITE Reports logged to removable media
- Serial PMS status reporting

Hardware Specifications

- Compact bulkhead-mountable console
- Rack-mounted processing enclosure
- COTS processing hardware
- Low noise signal conditioning and acquisition electronics
- EMC: DEF STAN 59-411 for below decks
- Environmental: DEF-STAN 00-035
- CE Marking: LVD2006/95/EC, EMC 2004/108/EC

Naval GPS Systems (Navfix)

Military and differential GPS solutions to provide the primary location and timing information for a platform's navigation, communications and combat systems.

Navfix uses both the Standard Positioning Service (SPS) and encrypted Precise Positioning Service (PPS). Its Rockwell Collins MPE-S Type ii Receiver incorporates a Selective Availability Anti-Spoofing Module (SAASM), providing robust navigation warfare capabilities. The system has also been designed to be agnostic to the GPS receiver so that any ICD-GPS-153-compatible receiver could be used.

Navfix is in service across the majority of the Royal Navy's surface and sub-surface platforms. It will also be installed across the Royal Navy's future fleet.

FRONT VIEW

Key Features

- ICD-GPS-153 compliant SAASM based military GPS receiver
- EMC compliant to Def Stan 59-411 (Above Decks)
- Battery back-up
- Compliant to environmental conditions Def Stan 00-035
- Interfaces to ships sensors (Gyro, SINS, log, synchros, etc.)
- Interface to Precise Timing and Frequency Equipment (PTFE)
- Lever arm corrections based on antenna offset from the platform's datum
- NMEA & NEC Messages/RS232/RS422 output interfaces
- 10 programmable ethernet ports for network connectivity
- 5.7" LCD colour sunlight readable display and tactile keyboard
- IMO compliant
- Compatible with standard analog Fixed Reception Pattern Antenna (FRPA) and Controlled Reception Pattern Antenna (CRPA)

Optional Upgrades

- DGPS Corrections to provide sub-metre accuracy
- M-code receiver (when available)
- Enhanced anti-jamming performance using a digital Controlled Recept ion Pattern Antenna (CRPA)

Technical Specifications

Connectivity

Outputs	20 x RS-232/RS-422 Serial Ports 10 x Ethernet 2 x STANAG 4156 (NATO SINS) 2 x 1PPS Out2 x 1PPM Out 2 x Havequick 2 x BCD 1 x Time Mark
Serial Output Message Formats	50/100/200 baud
Aiding Inputs	2 x Synchro (Log, Heading) 2 x STANAG 4156 (NATO SINS) 1 x RS-422 SDDS 1 x RS-422 RTCM 194-93/SC104 Differential GPS Correction Data 1 x 1PPS In 1 x 5MHZ In 1 x Crypto (DS-102)
Aiding Message Formats	PDM2/3/4/5, PIDS, Synchro 36, 48, 64, 72, 96 kn/rev

Compliance

EMC	DEF STAN 59-411, IEC 60945
Environmental	DEF STAN 00-035, IEC 60945
Cooling	EN 61108 IMO Compliant
Shock	DEF STAN 08-120 (NES 814), BR8470 100% Grade D

Performance

Frequency	L1/L2 dual frequency tracking (C/A, P(Y) Code)
Acquisition Times	< 10 sec (hot start), (probability > 95%) < 70 sec (warm start), (probability > 95%)
Positioning Accuracy	DGPS: < 4m (NATO 95%) WAGE: < 8m (NATO 95%) PPS: < 21m (NATO 95%) (< 3m typical)
Velocity Accuracy	0.4 m/sec steady rate (3D 95%
GPS Time Accuracy	< 100 nanoseconds (typical)

System

Dimensions (H x W x D)	258 x 342 x 388 mm
Weight	21.1 kg
Power Consumption	< 50W
Operating Temperature	-15° to +55° C
Battery Backup	3 hours with all interfaces followed by 3 hours standalone
Security	CESG accredited for all platform classes GPS receiver unclassified when keyed Receiver zeroise and system sanitise function

Precise Time & Frequency Equipment (PTFE)

Both the Caesium and Rubidium-based PTFE maintain precise time in the temporary absence of GPS satellite received time by using the US Naval Observatory-maintained coordinated Universal Time (UTC), obtained using the NAVSTAR GPS. Both are highly reliable due to self-arbitration and redundancy.

Caesium-based PTFE Key Features

- Will maintain precise time to an accuracy of less than 50μsec after 90 days without GPS
- Equipped with an integral 4th generation GPS receiver module to discipline a secondary Rubidium
- Caesium tube primary oscillator; Rubidium tube secondary oscillator
- Highly stable phase-lock-loop control circuit for the secondary rubidium source
- Automatic and instantaneous switching to internal source in the case of GPS signal loss or degradation
- Supports the NATO PTTI interface in accordance with STANAG 4430

Rubidium-based PTFE Key Features

- Will maintain precise time to an accuracy of less than 250μsec after 45 days without GPS
- Dual-redundant internal Rubidium frequency source
- Highly stable phase-lock-loop control circuit for each RB oscillator
- GPS interface in accordance with ICD-GPS-060
- Supports the NATO PTTI interface in accordance with STANAG 4430
- Currently in service with the Royal Navy as Outfit FSF, fitted to some twenty-five operational ships including Type 45 destroyers
- Currently being fitted to Type 26 and Type 31

Technical Specifications

Caesium-based PTFE

Frequency Accuracy	3 x 10-12
Short-term Frequency Stability	better than 5 x 10^{-12} per day
Long-term Frequency Stability	better than 8 x 10^{-14}
Ageing	-
Time Accuracy (GPS accessible)	within 100ns
Time Accuracy (GPS lost)	less than 50μs after 90 days
Electrical Power Source	115V AC 60Hz / 240V AC 50Hz
Electrical Consumption	250W
Back-up Batteries	optional
Physical Characteristics	• Weight: 23kg • Height:(5U) 222mm • Width: (19”) 482mm • Depth: 460mm

Rubidium-based PTFE

Frequency Accuracy	5 x 10^{-11}
Short-term Frequency Stability	better than 2.5 x 10^{-12} per day
Long-term Frequency Stability	-
Ageing	5 x 10^{-11}/month
Time Accuracy (GPS accessible)	within 100ns
Time Accuracy (GPS lost)	less than 250μs after 45 days
Electrical Power Source	115V AC 60Hz / 240V AC 50Hz
Electrical Consumption	250W
Back-up Batteries	optional
Physical Characteristics	• Weight: 50kg** • Height:(8U) 355mm** • Width: (19”) 482mm • Depth: 460mm

** Including integral battery modules

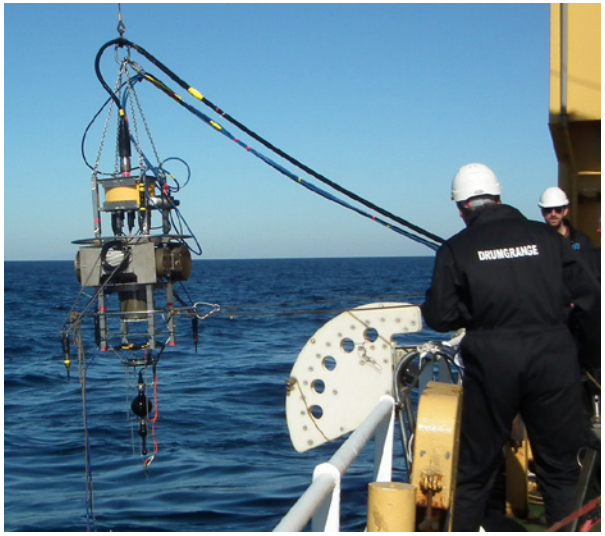
Options

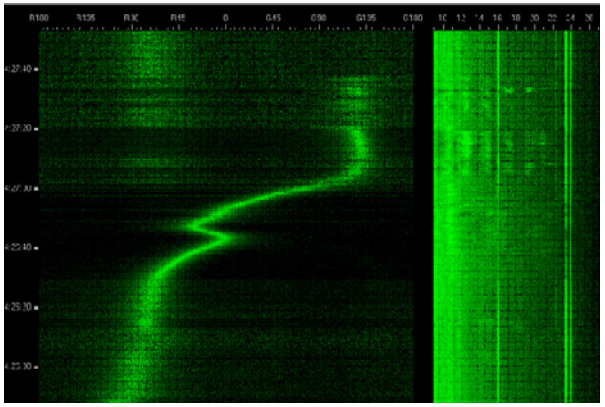
- Custom interface and output signal requirements implemented (frequency outputs, time messages, fibre optic interfaces) via Interface Modules, as required, including customised distribution
- Alternative levels of redundancy available with marginal decrease in reliability
- Back-up battery available in separate shelf unit providing more than one hour at full load

Sonar Systems

Active Intercept Sonar

- High-performance wideband intercept sonar processors in service with the Royal Navy
- Can be provided as complete hardware and/or software solutions using single arrays or multi-site architectures, covering low to very high frequencies
- Fully digital solutions, allowing for easy integration within an integrated sonar suite by a third party.





Sonar Research, Development & Trials

Drumgrange has a highly capable sonar modelling and simulation capability to support algorithm development and system performance modelling using simulated or recorded data. Most recently, the team has been involved in the development of a number of novel signal processing algorithms, helping ensure that threats can be detected and localised more reliably.

We also have specialist facilities to support sonar trials, static or underway calibration and sonar recording for data analysis.

Sonar Design & Integration

The development, installation and testing of numerous components, and algorithms across a number of sonar types and platforms. This includes:

- Upgrades and novel processing for Submarine Conformal Arrays
- Development of inboard hardware to interface to legacy arrays
- Integration of software within third party systems
- Acoustic communications system development, including new protocol implementation
- Novel Processing and error analysis for Surface Ship and Submarine Towed Arrays
- Performance Assessments of Hull Arrays
- Development of solutions for unmanned vessels
- Novel algorithms for array health monitoring

We have also developed guidance to support operators and data analysts in the applicability of novel signal processing techniques.

Throughout the development process, we aim to engage consistently with the end users to ensure that they are appropriate for the environment and use.

Key Features

Generic Intercept Sonar

Surveillance Display

- Vertically scrolling history presentation
- Bearing, frequency and amplitude displays vs. time
- Fast and slow update areas (operator configurable)
- Optional frequency filters (display in different colours)
- Cursor readout of all parameters
- Tote presentation of contact parameters

Classification Display

- A-scan presentation
- Amplitude and frequency vs. time
- Operator selectable update rates
- Cursor, pause and zoom controls
- Comb cursor for repetition rate readout

Relay Facility

- Real-time random access and fast replay

Aural Facilities

- Baseband and heterodyned operation
- Wideband and narrowband modes
- Can be slaved to classification display

Warning Alarms

- Alarms on selected frequency filters
- Operator controlled

Data Logging

- All contacts can be logged to magnetic media
- Operator controlled
- Readout of disk space used

BITE Reporting

- BITE reporting to LRU
- BITE reports logged to magnetic media

In-house Sonar System Development Facilities

- Large test tank used for research and system testing
- Acoustic models
- Bespoke algorithm design and software development capabilities
- Sonar stimulators and simulators
- Large workshop space for system development and integration

Throughout the years, we have maintained a track record of successfully providing acoustic metrology and calibration services. Our solutions are fitted to or in development for platforms across the Royal Navy fleet.

Drumgrange at a glance

Established in 1979, Drumgrange is an independent, family-owned British engineering company specialising in the multidomain integration of electronics and communications systems. We deliver end-to-end solutions in operationally critical areas of defence and security, with expertise that spans the entire engineering lifecycle; from concept, research, design, development, testing, manufacture, integration, installation, in-service support through to obsolescence management.

Drumgange in numbers

45+	years of experience
80+	active projects
170+	employees
4	business streams
2	sites
>25M	turnover per annum

Areas of expertise

- Prime contract management
- System engineering and integration
- Electronic hardware and PCB design
- Software development, including real-time embedded
- Mechanical design and ruggedisation
- Simulation and 3D modelling
- Documentation and technical publications, including the provision of a handbook
- Technical studies and consultancy services
- Security accreditation and application of Secure by Design (SbD) principles
- Safety management, safety case production and Independent Safety Advisor
- In-service support
  - Integrated Logistics Support (ILS)
  - Contractor Logistics Support (CLS) and Contracting for Availability (CFA)
  - Post-Design Services (PDS)
  - Obsolescence Management & Resolution

Drumgrange Ltd © 2025
Unit A, The Forum, Hanworth Lane
Chertsey, Surrey, KT16 9JX
+44 (0) 1932 581100
info@drumgrange.com
www.drumgrange.com

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