

Maritime Communications



A world leader in VLF communications

Drumgrange has been actively involved in the design, development, installation and commissioning of VLF and LF communication technologies, products and systems across the globe since the 1980s. With over 40 years of experience, we are widely recognised as one of the world leaders in this niche communication technology.

Our equipment spans the whole VLF broadcast chain including OTAM – from communications centres, transmitter sites, maritime platforms, and reference systems. Our product portfolio has maintained compatibility with the latest NATO STANAGs from the original 5030 to the current 4724 and upgrade options for 5065 (LF) standards.

Today, we continue to support, refine, and refresh those systems via long-term contracts with national governments, NATO and Prime Contractors.



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VLF Demodulator Equipment

Part No. DG-457-7-100 (Dual) or DG-457-7- 101 (Single)



FRONT & REAR VIEW



MSK DEMODULATOR MODULE



POWER SUPPLY UNIT

Key Features

- Demodulation Modes: FSK, MSK1, MSK2 or MSK4 at 50 baud
- IF input: 600 ohm, 0dBm, 1KHz IF signal
- Four Data Output Channels + Strobe per demodulator
- Data Formatting: NATO STANAG 5030/MIL-STD-188- 140A
- Local or Remote Control: Serial Connection
- Dual Demodulator Configuration: Two independent VLF Demodulators with separate IF feeds
- Dual power supplies, one per demodulator
- Audible Alarm with Mute Facility
- Time of Day input: PTFE (Station Standard)
- 1MHz and 1PPS inputs: PTFE (Station Standard)
- Extensive Built in Test Facilities
- Alarm relay contact outputs for external system
- STANAG 4724 RED REM compliant
- Available as a single or dual demodulator configuration

Technical Specifications

Interfaces

| | |
|-------------------------|--|
| IF Input | 1 KHz, 0dBm, 600 ohm |
| 1 MHz Input | 1MHz, 13dBm +/- 2dBm, Sinewave, 50R, Harmonic Distortion < 40dB below fundamental |
| Data Output | V.11/RS422 or V.28/RS232 Standard |
| Audio Output | 600 ohm (Headset compatible) |
| Fault Output | Fault relay changeover contacts (volts free) |
| External Remote Control | Individual RS-232 standard (V.28) serial remote control interfaces are provided for each Demodulator |

Electromagnetic Compatibility

| | |
|----------------|---|
| Radiated | CE, EN 60945, MIL-STD-461F CE101, CE102 and CS114 |
| Conducted | CE, EN 60945, MIL-STD-461F RE101 and RE102 |
| Susceptibility | CE, EN 60945, MIL-STD-461F RS101, RS103 and CS109 |

Power

| | |
|------------|---|
| Rack Mount | Voltage: 83-253 VAC Frequency: 47-63 Hz Power Factor: <25 W in all modes of operation |
|------------|---|

Compatibility

| | |
|-----------|---|
| Standards | NATO STANAG 5030 Edition 4 and 4724 RED REM |
|-----------|---|

Physical Properties

| | |
|--------------|---|
| Size (HxWxD) | 2U x 482mm x 413mm |
| Weight | Rack mount: 12 kg |
| Cooling | Natural convection |
| Climatic | Operating Temperature: 0°C to +55°C Storage Temperature: -20°C to +70°C Relative Humidity: 95% (non-condensing) |

Upgradable Options

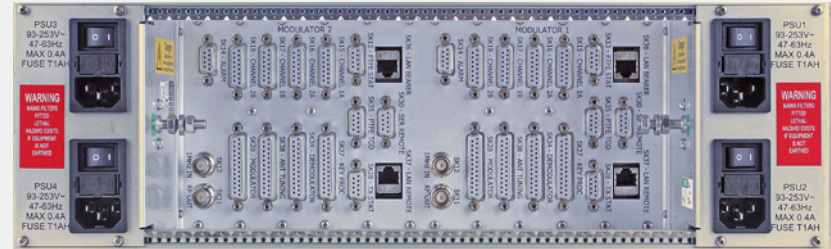
| | |
|-------------------------|---|
| Demodulation Modes | FSK, MSK1, MSK2 or MSK4 at 75 baud |
| Data Output | Ethernet |
| External Remote Control | Common Remote Control V.28/RS232; Common or Individual Ethernet |
| Standards | NATO STANAG 5065 4724 RED BLACK REM |
| Power Supplies | Dual Redundant |
| Time of Day input | V.11/RS422 (1 PPS/TOD TD1 Format), NTP |

VLF Modulator Equipment

Part No. DG-478-7-100



FRONT VIEW



REAR VIEW

Key Features

- Modulation Modes: FSK, MSK1, MSK2 or MSK4
- Baud Rate: 50/100/200 baud
- Keystream Input Channels: 4 Synchronous
- Keystream Data Control: 4 Status lines, Strobe
- Data formatting: NATO STANAG 5030 and 4724 RED REM Compliant
- Frequency Range: 10KHz – 160KHz in 10Hz Steps
- 1MHz: PTFE (Station Standard)
- Clock Output: Key Stream Source Synchronization
- Internal Clock: Stability 3x10-9 Per Day
- Emergency Key Input: Synchronous or Asynchronous
- Local or Remote Control: Serial Connection
- RF Output level adjustment
- RF Output Curbing: Selectable from a number of curves
- Dual Modulator Configuration: 2 independent Modulators in a 19" Sub-Rack
- Dual Redundant Current Sharing Power Supplies
- Audible Alarm with Mute Facility and volume control
- Alarm relay contact outputs for external system
- Extensive Built in Test Facilities including a variety of test messages

Technical Specifications

RF Output

| | |
|--------------------------|--|
| Power Output | 1Vpp – 10Vpp, Adjustable via front or remote control (Maximum 250mW into a 50Ω load) |
| Phase Jitter | Less than $\pm 0.5^\circ$ in a 50Hz bandwidth |
| Amplitude | Symmetrical about the centre frequency within ± 0.5 dB |
| In Band Noise | Better than -42dB relative to un-modulated carrier in a 240Hz bandwidth centred on carrier |
| Out of Band Noise | Better than -72dB relative to un-modulated carrier in 100Hz bandwidth outside the range $f_c \pm 500$ Hz |
| Hum | The individual, discrete hum sidebands is at least 48dB below the un-modulated carrier |
| Harmonics | Better than -55dB down relative to the carrier at any carrier frequency setting |

Data Management Unit Interface

| | |
|---------------------|--|
| Channels | 4 Data and 4 Status lines V.24 synchronous |
| Data Rate | 50/100/200 baud |
| Strobe Input | 50 Hz |
| Fault Output | Relay changeover contact (volt free) |

Electromagnetic Compatibility

| | |
|-----------------------|---|
| Radiated | CE, EN 60945, MIL-STD-188-140A, ITU-R SM.329-12 |
| Conducted | CE, EN 60945, MIL-STD-461 |
| Susceptibility | CE, EN 60945 |

Power

| | |
|-------------------|--|
| Rack Mount | Voltage: 93-253 VAC; Frequency: 47-63 Hz; Power Factor: >0.6 |
|-------------------|--|

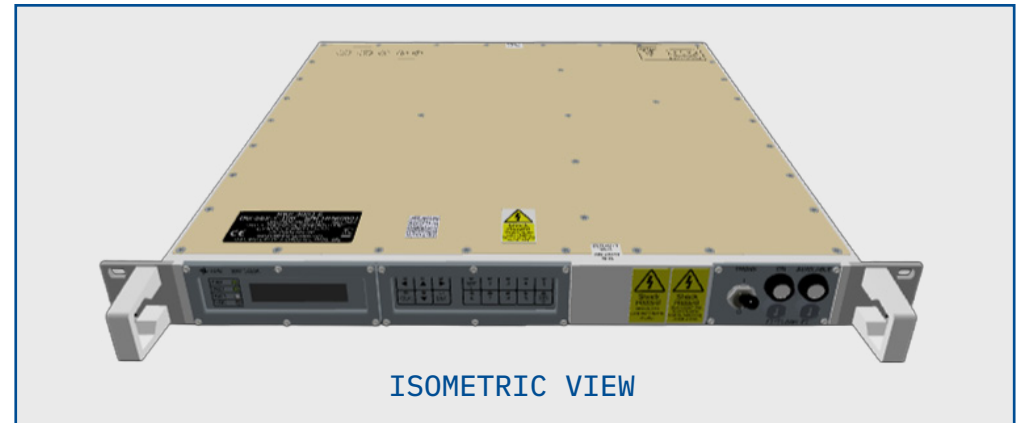
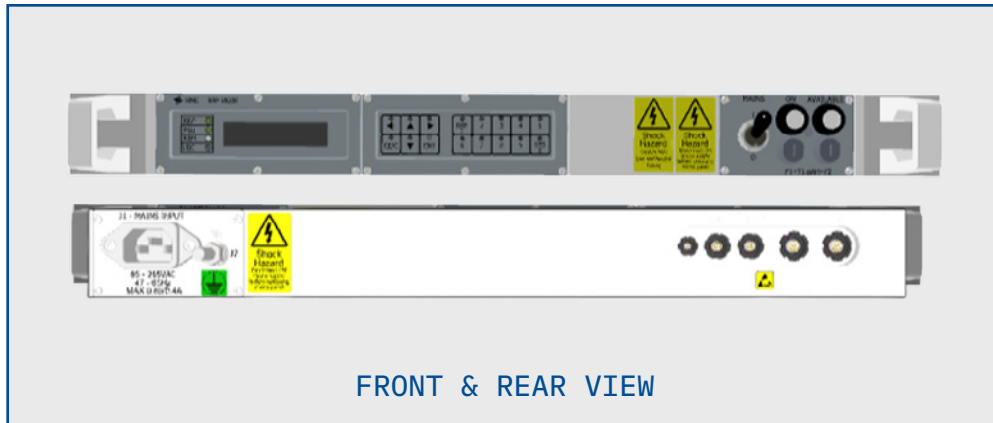
Physical Properties

| | |
|---------------------|---|
| Size (HxWxD) | 2U x 482mm x 413 mm |
| Weight | Rack Mount: 12 kg |
| Cooling | Natural convection |
| Climatic | Operating Temperature: 0°C to +55°C Storage Temperature: -20°C to +70°C Relative Humidity: 95% (non-condensing) |

Upgradable Options

| | |
|--------------------------------|--|
| Expansion Capability | Demodulator (OTAM), Keystream Interface and Aerial Tuning Unit |
| External Remote Control | LAN |
| Strobe Input | 75 Hz |
| Time of Day input | V.11/RS422 (1 PPS/TOD TD1 Format), NTP |

RED REM Processor (RRP)



Key Features

- Functions as both a RED REM Encoder at headquarters and Decoder on receive platforms
- Supports legacy traffic and the new REM modes
- Works with existing Modulator and Demodulator equipment
- Four independent channels
- Data Formatting: NATO STANAG 5030/4724
- Works with KIV-7M Cryptos or similar
- Local or Remote Control (RS422)
- Time of Day input: STANAG 4430 (XHQ Message, 1PPS and 1MHz)
- Extensive Built in Test Facilities
- TEMPEST: SDIP-27 Level B

Technical Specifications

Interfaces

| | |
|-------------------------|--|
| Terminal | 4 x RS422, Message Data Input in Encoder mode, Message Data Output in Decoder Mode |
| Crypto | 4 x V.28 Channels, Encoded Data Output to Crypto in Encoder Mode, Encoded Data Input from Crypto in Decoder Mode |
| TOD Input | V.11 STANG4430 XHQ Message, V.11 1PPS, V.11 or Analogue 1MHz (13dBm +/- 2dBm, Sinewave, 50R, Harmonic Distortion < 40dB below fundamental) |
| External Remote Control | RS422 |
| SW/FW Update | JTAG |

Electromagnetic Compatibility

| | |
|----------------|--|
| Radiated | CE, EN 60945, MIL-STD-461G CE101, CE102 and CS114 |
| Conducted | CE, EN 60945, MIL-STD-461G RE101 and RE102 |
| Susceptibility | CE, EN 60945, MIL-STD-461G RS101, RS103, CS101, CS109, CS118 |

Rack Mount Power

| | |
|-----------|---------------------------------|
| Voltage | 98 - 253 VAC |
| Frequency | 47 - 63 Hz |
| Power | < 30W in all modes of operation |

Physical Properties

| | |
|--------------------|---|
| Size (HxWxD) | 1U x 482mm x 414 mm |
| Weight | Rack Mount: < 6.0 kg |
| Cooling | Natural convection |
| Climactic | Operating Temperature: -15°C to +55°C Storage Temperature: -30°C to +70°C Relative Humidity: 95% (non-condensing) |
| Shock & Vibration | MIL-STD-810H |
| Pressure | MIL-STD-810H |
| Inclination Angles | Operating quasi-static angles Heel: +15° ; Trim: +10° Dynamic angles Heel: +15° ; Trim: +30°; Period 8s Non-operation constant angles Heel: +60°; Trim: +45° |
| Sealing | IP 23 |
| Salt Fog | MIL-STD-810H |
| Noise | < 45 dBA |

A large submarine is shown on the surface of the ocean. The sun is setting in the background, creating a dramatic sky with orange and yellow hues. The submarine's conning tower and various antennas are visible. The water is dark and choppy.

The partner of choice
for your VLF projects

VLF studies for system performance analysis

Our proprietary numerical computer simulation model can provide users with an interactive graphical environment to evaluate the communications performance of various VLF systems.

Our model was developed in Matlab, implemented in Simulink (running within Matlab) and validated using actual sea trials data.

How it works

- The model measures communication performance by measuring the character error rate for a given system configuration and signal to noise environment.
- Decoded characters are compared with the original characters transmitted and a record of the number of characters tested in a trial.
- The model logs the number of errors detected and the associated character error rate.
- Users can adjust various parameters to conduct parameter sensitivity assessments. Examples of adjustable parameters include signal timing delays and atmospheric noise, introduced via a Gaussian Noise model.

The partner of choice for your VLF projects

Consultancy services based on significant technical understanding of the overall VLF systems.

In addition to the provision of critical technical guidance, subject matter advice and Design Authority advice on the overall VLF system, we specialise in picking up communications issues and constraints which might not be immediately apparent to the design team.

How we can contribute

- As a VLF communications advisor supporting the programme team.
- By providing critical technical guidance during the project design and testing phases.
- By providing modulators, demodulators and inter-connectivity equipment to meet specific programme requirements.
- By supporting experimentation and sea trials activities that would be needed to demonstrate performance of the system, for example by providing:
 - Guidance on test plans.
 - VLF communications performance measurements.
 - Provision of specialist test equipment.
 - Analysis of communications performance.



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.

Drumgrange 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

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