Defence Communications Systems

AUTOMATED HF NETWORK SOLUTION

AUTOMATED HF NETWORKING

HF radio communications continues to offer a viable and autonomous solution to a range of specialist communications requirements. Compared with bespoke SATCOM solutions, HF offers a lower cost of ownership and is immune to the loss of satellites which are often owned by third-party nations, thus providing a secondary long-range communications solution.

Conventional HF systems have a high degree of dependency on skilled and specialist operators to provide reliable communications links in ever changing atmospheric conditions.

Versatile and feature-rich, HF2000 empowers users who have no knowledge of HF radio communications technology. It uses proven advanced automation software to deliver a reliable service through a user-friendly interface, thus eliminating the dependency on skills and experience. HF2000 provides full automation, removing the need for a radio operator.

With an unrivalled pedigree in HF communications, Leonardo has developed Third Generation Automatic Link Establishment (3G ALE) algorithms that ensure that links are automatically established and maintained to achieve successful traffic transfer without operator intervention.

HF2000 monitors link quality and selects the best transmission frequency. It is also able to learn from experience to ensure optimal performance under all conditions.

LEGACY COMPATIBILITY

In addition to the benefits which 3G ALE and automatic operation brings, HF2000 provides legacy operation through asynchronous Second Generation Automatic Link Establishment (2G ALE) and manual, fixed frequency modes to ensure interoperability with existing systems.

HF2000

APPLICATIONS

Addressing the needs of both military and commercial users, HF2000 is designed for both new systems and the upgrade of legacy systems. HF2000 includes a family of HF radios to support both tactical and strategic communications. Installations range from large fixed ground sites through to mobile shelters, ships, submarines and aircraft.

A flexible and scalable system architecture, compatible with existing standards, enables cost-effective upgrade of current radio systems to include the latest advances in HF technology. Its automatic traffic management optimises the use of HF assets, typically reducing the quantity of transmit and receive stations required to maintain communications capability.

Backed up by a team of technical experts, HF2000 continues to evolve, providing support to new communications protocols and capabilities into the future, implemented through software upgrades and enhancements.

AUTOMATED FEATURES

HF2000 fully automates the complex task of operating a modern HF communication system through the application of Automatic Link Establishment (ALE) standards and traffic protocols.

An advanced propagation prediction algorithm selects the optimum frequency for every link. It is based on signal feedback, time of day, seasonal variation, sunspot activity, geographic location and the requirements of a pre-determined management plan. In addition, the system learns from experience for improved reaction to propagation conditions.

SYSTEM OPERATION

A Windows-based user interface allows operators to configure and monitor all aspects of the system. This includes the operational states of all system equipment, even at remote sites; simplifying logistics and minimising down-time.

Once configured, the system runs unattended, requiring very little operator intervention:

- HF2000 optimises the use of the HF spectrum automatically
- Frequency management is far less time consuming
- User traffic is transferred over HF links that are automatically established and maintained
- Training requirements and crew skill levels are much reduced.

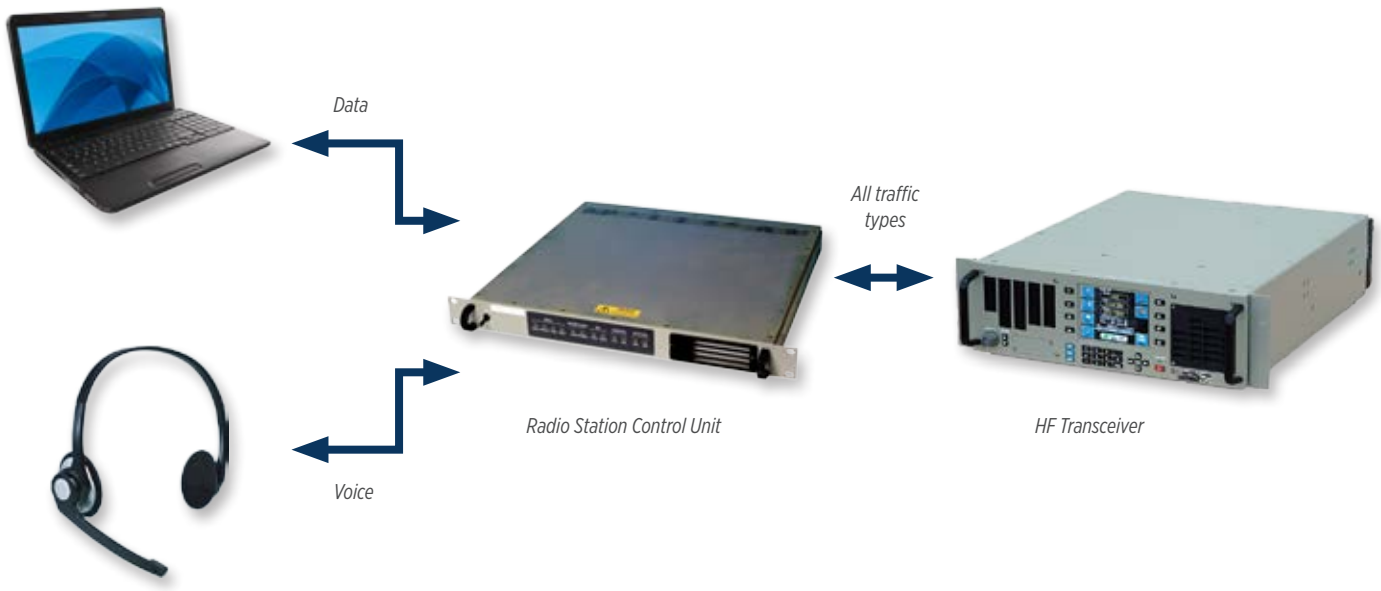
In-built redundancy within the design architecture enables automated or manual reconfiguration of the system, significantly improving availability over legacy systems.

FEATURES

- Fully automatic link establishment and data transfer
- Advanced propagation prediction and frequency selection model
- HF spectrum optimisation
- Integrated asset and traffic management
- Internet Protocol applications support a range of user needs
- User-oriented access
- Flexible architecture scalable to operational needs
- Rapidly deployable
- Cost-effective upgrade for legacy systems
- Compliant with NATO and US military standards for HF systems.

BENEFITS

- Easy to use system runs with little or no operator intervention
- Seamless user-to-user communication of a wide range of traffic
- Supports multi-station, multi-site and unattended site operation
- Interoperable with allied and coalition systems
- Complete system autonomy
- High system availability and fewer HF channels required
- Scalable and expandable to meet operational needs
- Existing HF equipment does not need to be replaced
- Significantly reduced repair times and costs
- Low acquisition cost
- Reduced training cost
- HF has a lower cost of ownership than SATCOM systems and is not affected by loss of satellites.



NODE STRUCTURE

The system is based on a number of 'nodes', each of which may incorporate up to 32 transmitter/receiver pairs. Each transmitter/receiver pair is termed a Station, with each Station able to support all traffic types. This simplifies operation and leads to significantly greater utilisation of equipment. Stations create links, nets and broadcast groups on frequencies drawn from a frequency pool shared by all allocated nodes.

Messages can be carried across dedicated links or over all-informed nets. The all-informed nets are created and held open to permit free use by data applications and to support broadcasts. Links are constantly monitored for viability and recreated, if necessary, to take account of propagation conditions.

Frequency pools provide spectral diversity to ensure reliable communications, managing daily and seasonal variations in HF propagation. They also include spectral redundancy to ensure that sufficient multiple simultaneous links are possible at any time.

MESSAGE SECURITY

Encryption is applied to signals prior to entry into the system, ensuring end-to-end security of traffic content. Frequency pools for 3G ALE links are changed on a regular, scheduled basis to take account of daily variations in HF propagation but also to prevent hostile systems from learning the set of frequencies being used.

Message transfer over the HF links is monitored and if transfer fails due to jamming or poor propagation, message transfer continues on a new frequency from the point of disruption.

UPGRADE OF LEGACY SYSTEMS

Existing HF radio systems can be upgraded to provide user-friendly services for a range of voice and data traffic types.

There is no need to replace existing HF radios so long as they have a remote control interface. Other equipment, such as antennas (including log rotatable log periodic antennas) and antenna matrix controllers, can also be retained.

HF2000 COMPONENTS

A single compact unit, the Radio Station Control Unit (RSCU), is all the equipment required for the provision of managed HF services. The RSCU serves multiple functions associated with the interface of subscriber signals with the radio transmitter and receivers.

In addition to the RSCU, HF2000 includes two PC-compatible software applications:

- The Node Control Terminal (NCT) enables an operator to configure and monitor all aspects of the system;
- The Dedicated Control Terminal (DCT) can be used when manual operation is desired.

Leonardo offers HF radios and antennas for the deployment of HF nodes across a comprehensive range of locations and platforms. A common set of modular equipment is used to create nodes varying from single station to multi-station with up to 32 stations spread over several split sites.

HF2000

TECHNICAL SPECIFICATION

Users
- Naval ships and submarines
- Land fixed
- Land mobile
- Land tactical
- Airborne.

Traffic types
- IP datagrams supporting traffic from any Ethernet-enabled device.
- Open channel voice (analogue signal)
- Plain text messages
- Serial data (Both synchronous and asynchronous supported)
- E-mail (supported by SMPT and POP3 services).

Managed frequency spectrum
- 1.6MHz to 30MHz on transmit
- 100kHz to 30MHz on receive.

Transmission modes
- Simplex, broadcast, half-duplex, full duplex and repeated transmissions.

Modes of operation
- Synchronous 3G ALE to STANAG 4538 Fast Link Set-Up (FLSU)
- Asynchronous 2G ALE to MIL-STD-188-141B Annex A
- Manual, fixed frequency.

Number of nodes/radio pairs
- Typically 256 per net
- Typically up to 32 per node.

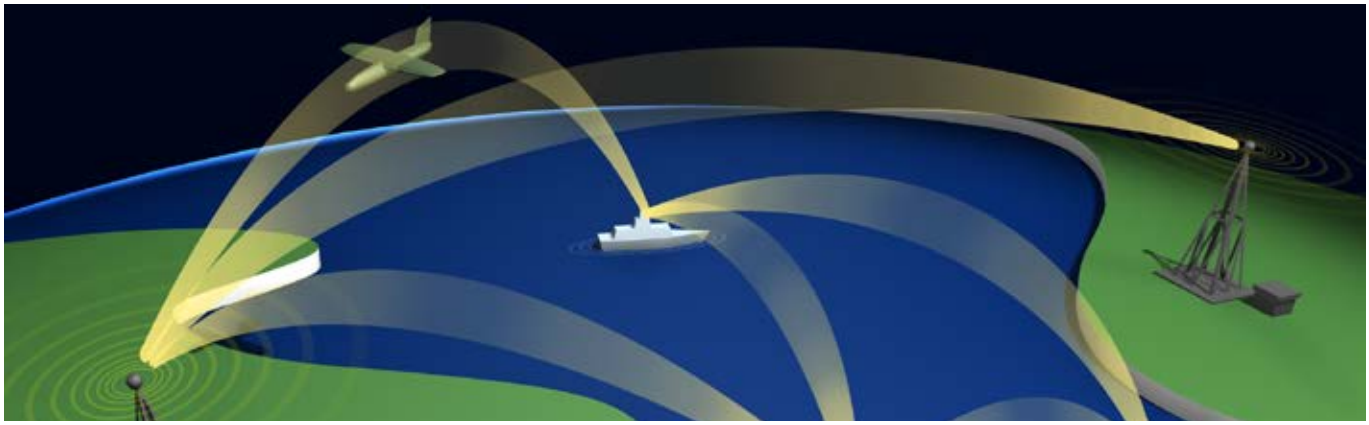
Data rates
- Up to 9,600bps SSB
- Up to 19,200bps ISB
- Multi-link data bandwidth aggregation with load balancing.

Frequency management
- Integrated frequency management
- Automatic generation of frequency pools
- Operator entry of mandatory frequencies
- Operator entry of allowable frequency bands
- Automatic pool update to track variations in HF propagation
- Up to 64 channels per frequency pool
- Link quality assessment based on propagation prediction
- Link quality update based on real-time channel measurements
- Automatic and manually initiated frequency sounding
- Use of geographical location data for fixed and slow-moving nodes.

Time synchronisation
- GPS time input
- Supports manual time entry for non-GPS nodes
- Operator initiated time synchronisation.

Traffic initiated time synchronisation
- Supports active late net entry
- Synchronisation maintained for 72 hours during radio silence.

Applicable standards
- STANAG 4538 (FLSU) Synchronous ALE
- STANAG 5066 Data Link Protocol
- STANAG 4285 HF Modem Waveform
- STANAG 4539 HF Modem Waveform
- MIL-STD-188-110B HF Modem Waveform
- MIL-STD-188-141B Annex A Asynchronous ALE
- ITU-R, P533 HF Skywave Prediction
- ITU-R, P368 Groundwave Prediction
- ITU-R, P372 HF Noise Prediction.



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