



# HF2000

## AUTOMATED HF NETWORK SOLUTION

**HF2000 is a versatile, fully automatic High Frequency (HF) network solution that uses advanced technology to deliver low cost and reliable communications to both military and commercial users.**

The HF2000 solution significantly reduces both operator workload and the training level required to operate HF networks. It also provides transparency to the subscriber, who requires no knowledge of radio communications technology to operate the system. As the system is based on the universal Internet Protocol (IP), it will support IP over HF and easily integrate into any IP-based communications infrastructure or network.

Designed to work in the strategic, tactical, naval or airborne environments, HF2000 is compliant to NATO and US military

standards to ensure optimum interoperability with legacy systems. It is fully software programmable to enable future changes in requirements to be accommodated.

Complete solutions can be provided or, as an alternative, HF2000's Radio Station Control Unit (RSCU) can be used, cost-effectively, to update and automate existing communications infrastructures and legacy HF radio equipment, thereby, negating expensive system replacement.

With an unrivalled pedigree in HF communications, SELEX Communications has developed the HF2000 system to provide advanced frequency management, whilst simplifying operational processes.

## HF 2000

### Range of Traffic Types

HF2000 is a network enabled communications system allowing connection into an IP-based communications architecture. A wide range of traffic types can be supported to enable future growth, while supporting legacy systems. These include:

- > IP – data packets (TCP or UDP)
- > E-mail (supported by SMTP and POP3)
- > Analogue Voice Calls
- > Synchronous and asynchronous data
- > Encrypted digital voice and data

To support inter-working between legacy and future systems, three modes of HF link establishment are supported:

- > Synchronous (3G ALE to STANAG 4538)
- > Asynchronous (2G ALE to Mil Std-188-141B)
- > Manually configuration

### Automated features

HF2000 fully automates the complex task of operating a modern HF communication system through the application of a standards-based solution for Automatic Link Establishment (ALE) and traffic protocols. Advanced propagation prediction algorithms select 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 past experience to automatically react to the propagation conditions.

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 station down-time.

Inbuilt redundancy within the design architecture enables automated or manual reconfiguration of the system, significantly improving availability.

### Features

- > Seamless user-to-user communication of a wide range of traffic types
- > Fully automatic link establishment and data transfer
- > Rapidly deployable stations
- > Enables unattended nodes (radio sites)
- > HF spectrum optimisation

- > Includes Internet Protocol applications to support a range of user needs
- > Compliant with NATO and US military standards
- > Interoperable with other HF systems
- > Flexible architecture scaleable to operational needs and expandable to include new systems
- > Interfaces with legacy subscriber and radio equipment

### Benefits

- > Subscriber-oriented access
- > Reduced training cost
- > Low acquisition cost
- > Low cost of ownership
- > Support for legacy upgrades
- > Flexible and adaptable architecture
- > Support for multi-station, multi-site operation
- > Standards compliance
- > Integrated asset management
- > Advanced propagation prediction and frequency selection model
- > Integrated traffic management

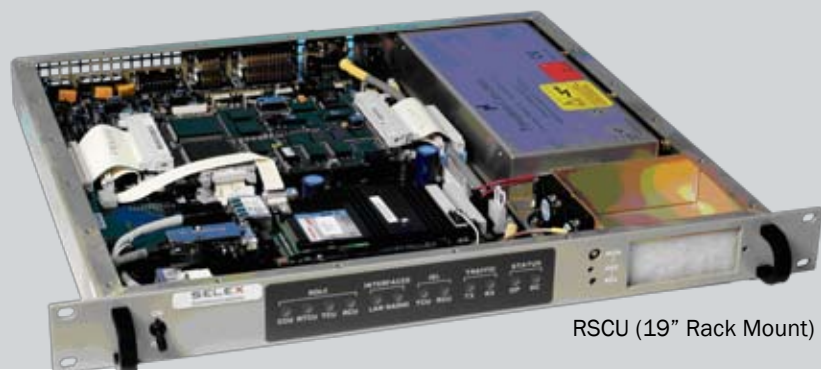
## RADIO STATION CONTROL UNIT

The Radio Station Control Unit (RSCU), effectively the heart of HF2000, provides the interfacing for the radio station. It provides interfaces for subscribers, radios and split site working. It also contains the HF modem for both link establishment and traffic transfer.

The RSCU, a multi-role unit, can be configured with one or more of the roles of Central Control Unit (CCU), Transmitter Control Unit (TCU) or Receiver

Control Unit (RCU), thereby reducing the number of different components as well as spares holding. All that is required to

upgrade legacy systems is the RSCU, along with HF2000 software running on commercial off-the-shelf (COTS) PCs.



RSCU (19" Rack Mount)

## TECHNICAL OVERVIEW

HF2000 consists of two basic equipments that can be configured to support many different network architectures. These are the Radio Station Control Unit (RSCU) and the Node Control Terminal (NCT).

### NCT

The Node Control Terminal (NCT) permits entry of network configuration information and provides complete feedback on the operation of the Node. NCT functions can be hosted on a laptop or PC.

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

### Features

- > Nodes scalable in size
- > Station allocated for each traffic session not dedicated to a communications path
- > Split-site architecture supported
- > Fully automated node able to cope with the failure of equipment or interconnections

### Dedicated Control Terminal

A Dedicated Control Terminal (DCT) can be used when manual operation is desired to control a specific radio station on the node, e.g., setting specific frequencies. The DCT runs as an application on a Windows XP platform.

### System operation

The system allows operators to setup and manage different network configurations.

Messages can be carried across dedicated links, which are set up for the duration of the message only.

These resources are then available for other subscribers. In other instances, all informed nets can be created and held open to permit free use by data applications and to support broadcasts.

Links are constantly monitored for viability and automatically recreated, if necessary, using alternative frequencies or data rates to match propagation conditions.

### Node structure

A HF2000 node may incorporate up to 32 stations. Each station can be a transmitter/receiver pair, capable of supporting a traffic transfer session.

Stations can be dynamically allocated to support link requests to provide network diversity.

The system supports traffic encryption prior to entry into the system, allowing the use of black networks and thus ensuring end-to-end security of traffic content.

### Frequency management

A powerful frequency management tool integrated within the HF2000 system can automatically manage frequency assignments for the system.

These assignments can be either a predetermined set of frequencies or the system can use Dynamic Frequency Selection (DFS) to assign the frequencies to the nets.

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.

### Bandwidth management

The system will automatically manage data bandwidths across the system changing the data rates to maximise the data throughput that the link conditions allow. It also has the ability to establish multiple links to the same destination and load balance the data throughput between the links.

### HF RADIOS

SELEX Communications offers a wide range of HF radios and antennas for the deployment of HF nodes in a range of locations and platforms. The following are examples of available radios:



*Navy Cabinet designed for ships and submarines*



*HF radios 100W to 10 KW for land and air use*

## 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. Includes FTP file transfer
- > Open channel (analogue signal)
- > Plain text messages
- > Bit transparent data (synchronous bit stream)
- > E-mail
- > External serial voice

### Managed frequency spectrum

- > 1.6MHz to 30MHz on transmit
- > 100kHz to 30MHz on receive
- > Extended spectrum management optional

### Transmission modes

- > Simplex, broadcast, half-duplex, full duplex and repeated transmissions

### Modes of operation

- > Synchronous ALE to STANAG 4538 Fast Link Set-Up (FLSU)
- > Asynchronous ALE to MIL-STD-188-141B Annex A
- > Manual

### 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
- > Automatic pool update to track variations in HF propagation
- > Up to 64 channels per frequency pool
- > Operator entry of allowable frequency bands
- > Operator entry of mandatory frequencies
- > 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 modes

### 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