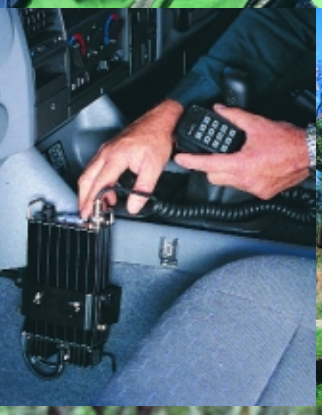
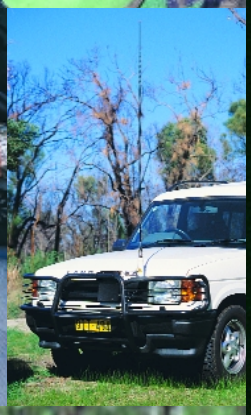
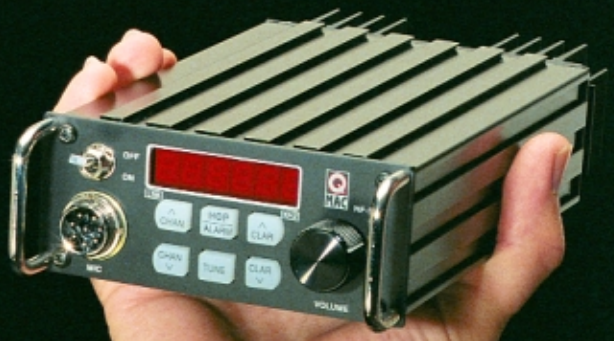
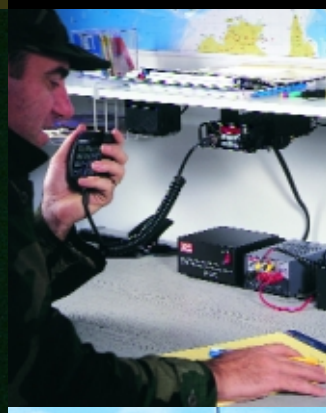
Q-MAC HF-90 FREQUENCY HOPPING OPTION









The HF-90 Frequency Hopping Option is an integral module within the HF-90 Transceiver. This option enables secure, jam-resistant HF communications to a military standard.

The development of the HF-90 Frequency Hopping Option represents a significant breakthrough in the field of military HF communications. For the first time, end users have access to a product which is affordable, yet offers a very high grade of voice security.

This new option builds on the HF-90's established reputation as the world's smallest high specification HF SSB transceiver. The addition of the frequency hopping option makes the HF-90 an attractive alternative to full Mil-Spec HF transceivers which can cost around 4 to 5 times more.

A detailed description of the HF-90 Transceiver, together with technical specifications, is provided on a separate brochure.







WHAT IS FREQUENCY HOPPING AND HOW DOES IT WORK?

Conventional fixed frequency radios are designed to transmit and receive on a single channel. This fact makes them vulnerable to Electronic Warfare (EW) techniques such as interception and jamming. Interception is the unauthorized monitoring of radio traffic, which may place the operator at a severe disadvantage. Jamming is the deliberate disruption of communication, by operating a transmitter (jammer) on the same frequency as the radio traffic. Whilst scramblers and speech encryption devices may provide some degree of resistance to the threat of interception, they are ineffective against jammers. Frequency hopping is the only effective counter measure to both forms of electronic attack.

A frequency hopping transceiver is capable of hopping its operating frequency over a given bandwidth several times a second. Synchronization data is periodically transmitted and decoded to ensure that the transmitter and receiver keep hopping in synchronism with each other, thereby maintaining intelligible communication whilst under severe electronic attack. The hopping sequence follows a pseudo random pattern, which has an extremely long repeat time. This renders the hopping network virtually impossible to intercept or jam. Only the network users who have programmed their radios with the same frequency, sideband, and hopping code can communicate.

In a frequency hopping network, one station is designated as Master (or Base). This station is responsible for transmitting the synchronization data to the Slave stations. There can be any number of Slaves within a network.

APPLICATIONS

Military and paramilitary users who require HF communications for Long Range Reconnaissance Patrol (LRRP) and Rear Link applications, are frequently faced with enemies which are capable of deploying EW systems.

Aid/relief organizations and peace-enforcement agencies may be seriously compromised in their operations, through interception and jamming of radio traffic from elements within a technically aware population.

A growing problem for military and aid organizations alike is the proliferation of low cost amateur HF radios, which can be easily modified for interception and jamming.

The HF-90 Transceiver, fitted with the frequency hopping option, presents an immediate, cost effective solution to these problems.

FEATURES

HOPPING RATE AND BANDWIDTH

The HF-90 Frequency Hopping Option has a hop rate of 5 hops per second and operates within a 256kHz bandwidth (hop band). There are 103 contiguous hop bands within the range 2 – 30MHz. The reference frequency which is selected for use by the operator determines which of the hop bands is selected. Several individual hopping networks can operate effectively (and with minimal interference to other networks) within the same hop band.

The hop speed and bandwidth have been rigorously tested and optimized for the following parameters: voice security, voice clarity, antenna bandwidth and propagation.

PSEUDO-RANDOM HOPPING

A pseudo-random (DES) frequency hopping algorithm provides the user with 7.2×10^{16} different hopping codes. This results in a sequence repeat time of 457 million years, ensuring a high level of security.

ROBUST ANTI-JAM ALGORITHM

All EW techniques (such as detection, direction finding, unauthorized monitoring and jamming) are effectively countered by the HF-90's frequency hopping algorithm. Even in the presence of badly corrupted synchronization data, the demodulation algorithm, combined with the FEC coding and time frequency diversity, provides a robust anti-jam capability.

RAPID SYNCHRONIZATION

The HF-90 Frequency Hopping Option offers rapid synchronization on late entry – ie. where a network is already communicating in frequency hopping mode and an additional operator wishes to join the network. Synchronization time varies between 6 and 53 seconds (with an average of 26 seconds). Synchronization time on start-up is even more rapid, given that between 3 and 4 synchronization bursts are transmitted within the first 60 seconds of start-up. Synchronization time varies due to the pseudo random time and frequency allocation of synchronization data (bursts) sent from the Master to the Slaves.

SECURE CODE ENTRY

A unique hopping code, comprising 11 digits, must be entered by the operator from the DTMF microphone/handset keypad. The same code must be entered for each HF-90 Transceiver operating within the network. The same reference frequency and sideband (USB/LSB) must also be selected. Once entered, there is no way to retrieve the 11-digit code, thus making the code fully secure. Typically this code would be changed on a regular basis (eg. once every month during peace time and once every week during combat).