

# The Real Facts About Rolling Code Scramblers

## Hopping Code vs. Sweeping Code

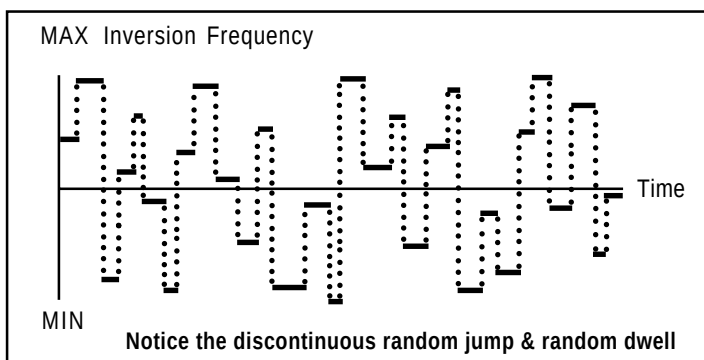
There are 2 types of rolling code scramblers, hopping code scramblers and sweeping code scramblers. Hopping code scramblers change codes 6-12 times per second (standard mode) or 12 to 25 times per second (advanced mode). Each hop is a minimum of 300 cycles in length. Sweeping code scramblers claim up to 1,000 hops per second thereby implying higher security. However, each of the “hops” of a sweeping code scrambler are approximately 1 cycle in length. A 1-cycle change, a 50-cycle change, and even a 100-cycle change can still be understood. It is necessary for each hop to be several hundred cycles in length so that the difference in hops cannot be understood. Furthermore, because of the minute continuous 1-cycle changes, frequency sweepers are vulnerable to attack with tracking phase lock loop (PLL) circuitry. Frequency sweepers have been broken in near real time (5-10 minutes).

Midian's TVS Series of rolling code scramblers is a true frequency hopping scrambler. The TVS-2 hops a minimum random distance of 25% and dwell at each frequency for a random period in standard mode from 6-12 hops per second, and in advanced mode from 12-25 hops per second. The hop rate, hop direction, hop frequency distance, and dwell time are pseudorandom to ensure security.

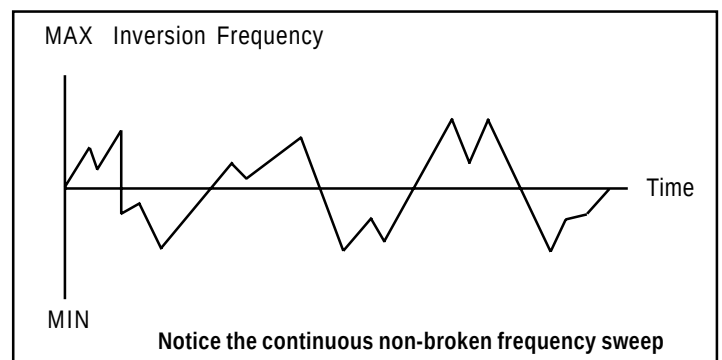
## What do these differences mean to you?

If there is any residual inversion tone on the radio channel the scrambler may be open to attack by tracking phase lock loop technology. Midian's TVS series of scramblers use an instantaneous change in frequency and instantaneous tracking filter to suppress any residual inversion tones so that a tracking PLL cannot readily follow it. See diagrams below.

Other competitors using variable split band scramblers are also at risk. They split the voice audio into the narrower bands. The width or ratio of the two bands are then hopped between 32 possible split points. The voice information is now present in both splits. By applying a single inversion scrambler or a fixed split band scrambler to just one of the narrower bands intelligibility is possible but with little or no speaker recognition.



**Midian's Frequency Hopper**



**Competitive Frequency Sweepers**

Unlike competitive units, Midian's TVS scramblers employ both an anti-aliasing input filter and an upper sideband 8-pole digital tracking output filter. These filters give Midian's scramblers the most outstanding recovered audio quality and speaker recognition in the industry. Our scramblers interface with most portable and mobile radios. They will work through standard repeaters with no degradation of usable operating range or audio quality.