

Digital Voice Protection

Sorting out the Pros and Cons of Coding Communications

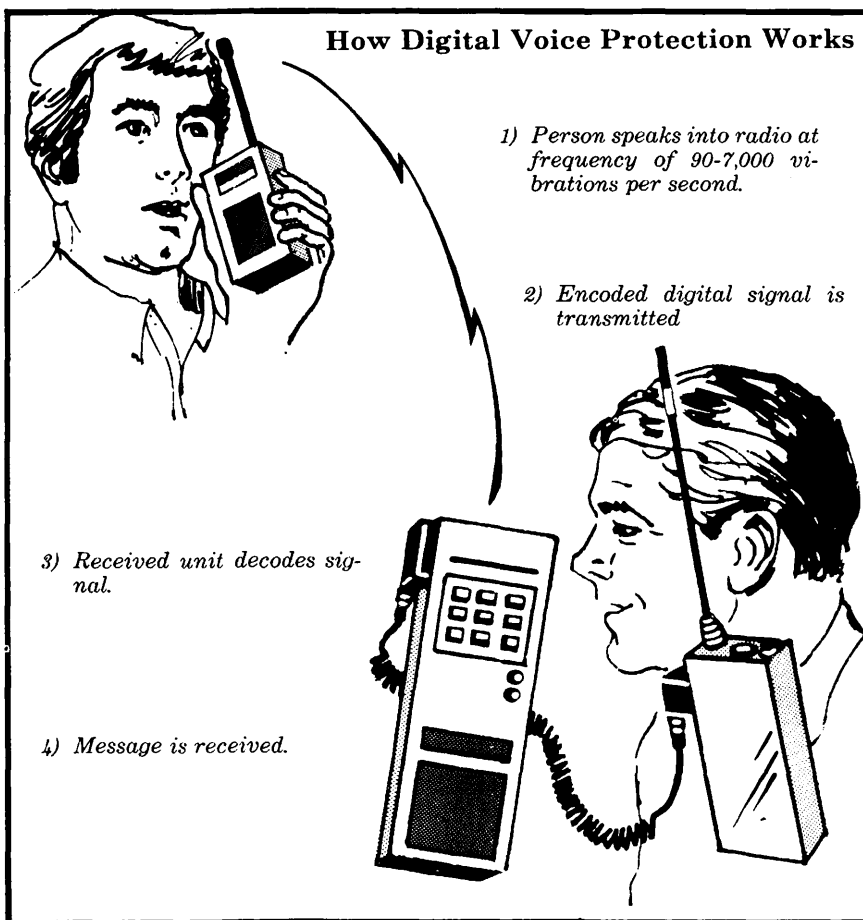
(Editor's Note: Digital coding systems are the latest development in radio message scrambling, but the basic concept of coding messages has existed for years. Many SCAN members have written to us asking for information on how digital voice protection (DVP) systems work. A recent article by Len Ackland for the Chicago Tribune provides an excellent overview of DVP, while raising some important issues that affect all of us as VHF/UHF monitoring enthusiasts.

We hope you find this article informative. Please keep us informed if you notice a police or fire department in your area changing over to a coding system.

Anyone listening to the Chicago Police Department's radio calls with one of the many commercially available scanning devices often hears the rushing crackle of static. While most of the time that sound denotes the absence of transmissions, the static occasionally will be a message that has been coded to prevent eavesdropping.

"We use radio coding in some of our units for things like narcotics surveillance," said William Miller, the police department's chief communications officer. Specifically, he said, the department uses 'digital voice protection' (DVP) equipment that Motorola Corp. makes to transform human speech into the kind of digital signals produced by computers.

"DVP is highly secure," Miller said. "The reason is that this radio coding system uses tiny computer circuits to transform a voice message into one of a billion trillion potential codes that must be deciphered before it can be heard by the intended receiver."



Digital coding systems are the latest development in radio message scrambling efforts that began in earnest during World War II. Although they are not new—Motorola introduced its standard system in 1976—these digital systems are getting more attention because of changes in communications technology and concern about the privacy of transmissions.

"Voice security has been an extremely fast-growing type of business," said Tony Hennen, production manager for voice security systems at Schaumburg-based Motorola. The major customers so far have been the military, law enforcement and intelligence agencies.

The Federal Bureau of Investigation, for example, in 1981 placed a \$13 million order for Motorola DVCP radios, and additional funding has been sought to outfit the agency completely with secure devices for its radio communications. Apart from confirming the FBI contract, Motorola officials refuse to provide other sales or client information.

"We never speak to numbers, quantities or customers like the CIA or NSA (National Security Agency) in this security area," said a company spokesman. He also declined to give figures for what he described as a broader commercial market for DVP equipment.

Some industry sources as well as

potential users are skeptical that there is much of a market today for digital voice devices apart from the military and related intelligence operations.

"The major market for secure-voice and encrypted-voice systems is the military," said Joseph Huie, vice president of long-range radio operations for Harris Corp.'s communications subsidiary in Rochester, N.Y. Harris, a major exporter of two-way radio equipment, also manufactures a digital voice security system.

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—Chief Edwin Nelson,
Chicago Fire Department

"In a broad sense, the voice encryption market has always been 'right around the corner,'" said Huie. "People say they want it, but it hasn't taken off, primarily because of poor quality and significant cost."

The cost of Motorola's DVP raises the price of its military-like radios to about \$3,000 from \$2,000 apiece, Hennen said. Prices for DVP devices, however, including small units to transmit codes to portable and mobile radios, have been dropping as production volume increases and technological improvements occur, he said.

However, lower prices may not open up all the markets foreseen by Motorola. For instance, a company advertising brochure promotes DVP for fire departments by describing a scene that could occur without encoded radio transmissions: "Fire service equipment from all over the city has been called in to help put out a 5-alarm fire raging uncontrolled in a crowded downtown area. Radio eavesdroppers could be attracted in large numbers to the fire scene, causing traffic problems and blocking access streets."

Chief Edwin Nelson, director of fire communications for the Chicago Fire Department, said he knows of no instance in which people monitoring the department's radio frequency have caused any problems.

Moreover, Nelson said that if the department coded its radio messages, it could cause all kinds of trouble with the media's right to know what's going on. He said it

is "ridiculous" to advocate coding of fire department messages.

Nelson said that if fire department officers want to send confidential messages, instead of using the open radio frequency they either call by telephone or use teleprinters linking the fire stations.

The Chicago Police Department also makes relatively limited use of DVP, according to communications chief Miller. He estimated that fewer than 2 percent of the department's 4,000 portable radios are used for coded messages.

Miller discredits as an advertising gimmick the idea that burglars regularly escape by carrying a scanner with them tuned to police frequency, which is at the high end of the FM radio band. "We respond so quickly that we don't need DVP," Miller said. "We have actually made arrests of burglars who have radios tuned to our frequency."

He added that citizens listening to the police band can actually aid the department. He said that on occasion a citizen will hear something such as a mistaken location sent out by a dispatcher and phone in the correct information.

Asked about these comments from police and fire officials that DVP is seldom needed, a Motorola spokesman replied, "I don't know; some say DVP is the answer to a prayer," and he cited the system's use by a Georgia town's police department.

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For customers who want to code their radio transmissions, the digital technique is a significant advance over the kinds of scrambling initially done to protect messages.

Human speech is generated by air and vibrating vocal chords emitting audible sounds generally in the range of 90 to above 7,000 cycles, or Hertz, per second. The sounds travel in waves that can be converted to electrical signals to be carried in "analog" transmission over the air or through telephone wires.

"Early analog radio scramblers inverted high and low frequencies in the voice or split frequency bands into four or five sub-bands to give a few more code combinations," explained Motorola's Hennen. He noted that Motorola has

offered the simple inverter scrambler for more than 20 years and said there are some 30 manufacturers of such devices.

A major advantage of digital coding techniques, Hennen said, is the potential for 2.36 times 10 to the 21st power (a 1 with 21 zeros behind it) different codes. These codes are determined by a programmer punching the keys of a hand-held, microprocessor-controlled device that then is attached to a radio to enter the code.

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