

## **2 & 5 Tone Decoders and Encoders**

### **Tone Signaling**

Analog signals employing single or multiple tone frequencies that are transmitted over a radio channel or phone line for signaling and control.

### **Two Tone Sequential**

This format utilizes two sequential tones for calling a paging receiver or monitor. Depending on the manufacturer, either tone can run from 150 msec to about 3 seconds. Several manufacturers have developed different versions of this format, including Motorola Quick Call, General Electric Type 99, Reach and Plectron.

Motorola's Quick Call 2 supports 870 calls and approximately 3500 user codes when using the cap code prefixes in the extended code plan. The first tone is 1 second and the second tone is 3 seconds and no gap. Motorola supports group call by sending the second tone for 7-8 seconds. This is accomplished by using certain cap codes that employ double digits where the first and second tones are the same. Example: 122, 277, 444, 533 etc. There is another form of two tone sequential made by Motorola called Quick Call 1. Quick Call 1 provides a 1 second dual tone pair interrupted by a 200 msec gap time followed by another 1 second dual tone pair. The Quick Call 1 format is still employed in the aviation industry for calling aircraft. Quick Call 1 is virtually obsolete and has been replaced by Quick Call 2.

GE Type 99 supports 900 user codes, but does not employ group call. Tone timing is 1 second for the first and 1.5 seconds for the second tone with no gap. This format replaces the second number of a double-digit sequence with a diagonal tone producing a larger number of individual codes. The Reach format supports 1000 user codes in either a fast or slow sequence. A 5 second first tone adds group call capability. Plectron also provides a fast and slow format but does not employ a code plan, therefore the coding is "created" for each customer. See Midian's Tone Signaling Chart.

### **Five Tone Sequential (Five, Six and Seven Tone)**

A signaling format generally employing five single frequency sequential tones with no gap time between the tones. In addition, if there are any repetitive numbers in the sequence (e.g. 12234), the second digit is replaced with an **R** repeat tone (e.g. 12R34). This format also can employ a sixth tone as a status digit or a C tone for remote close or command reset of the radio and its call light. The first five digits are generally used as an ANI or selective call encode/decode number. Five Tone was originally developed in Europe and there are several versions available. Each of these formats have different timings that run from 33 msec per tone to 100 msec per tone. Midian's UED-1 series of products are capable of working down to 20 msec per tone.

EEA is the British format using 40 millisecond tones. ZVEI 1, ZVEI 2, ZVEI 3, and DZVEI are German formats. PZVEI is a Pye/Phillips version of ZVEI that may employ one of the A, B, C, D, E, F tones for an alert feature as well as the ability to increase the first tone length to use it as a preamble tone. All ZVEI formats use 70 millisecond tones. Depressed ZVEI uses a lower frequency tone set due to narrow band radio systems. NATEL is another format used by the Swiss National Telephone Company utilizing 70 millisecond tones. CCIR1 is used throughout several countries in Europe. CCIR1 employs 100 millisecond tones, and CCIR2 employs 70 millisecond tones. PCCIR is a Pye/Phillips version. In general, the European systems may employ a 2-5-digit sequence to open a repeater, another 5-digit sequence to identify the radio user and yet another 5-digit sequence to call a mobile or portable radio. The last two sequences may be reversed in some cases. The gap time between these two sequences is generally 200 msec. In some Scandinavian countries, a gap tone (B tone) may be inserted instead of the 200 msec gap time. This is sometimes referred to as three by five or three salve (trois salves) signaling. In some systems, the first two digits of the repeater ANI can be used to identify the manufacturer of the radio equipment. In some smaller systems, the repeater ANI can be seven digits with the last two digits identifying the calling mobile instead of additional sequences. Many systems

in Europe eliminate the first 5-tone sequence to open the repeater and instead use CTCSS. This is also two by five signaling. Five tone formats also support a group call capability by using a G tone to replace the last or next to last digit. This permits group calling in powers of 10. Two other formats, which are predominately used as paging formats, are Eurosignal, which is a 6 to 7-tone format used in high power AM wide area coverage paging systems, and the EIA Motorola Metropage format uses 33 millisecond tones and employs a preamble tone for battery saving and a sixth tone or "X" tone for emergency call alert. Another seldom seen format is the Reach 11<sup>th</sup> Root of 2 which employs from four to six tones for selective call and status. MODAT<sup>®</sup> is a Motorola seven tone mobile data and status format which is similar to five tone signaling.

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