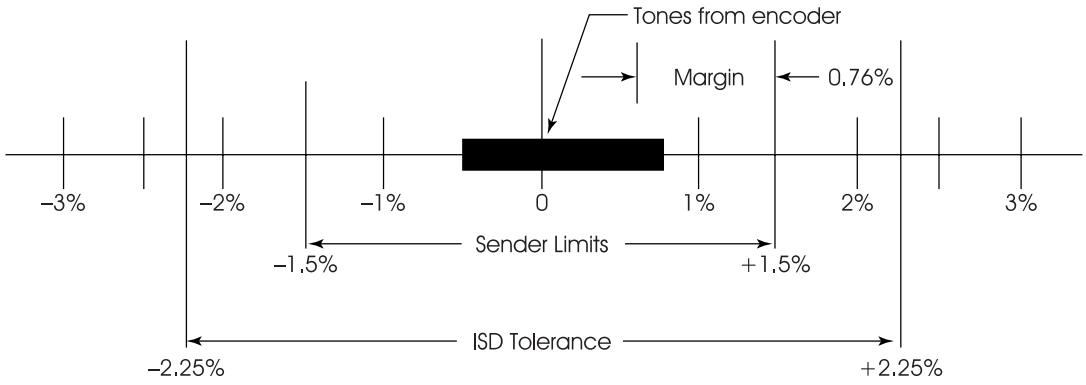
APPLICATION BRIEF 2 — SENDING & STORING DTMF WITH ISD DEVICES

Many people have asked about using the ISD devices to store and send DTMF dialing digits. This seems practicable since they are using the devices to store the message that will be sent when the telephone connection is made. By doing this they may eliminate an additional DTMF dialer chip in the product. The DTMF digits are "In-Band Signaling" as they are in the same frequency range as the voice passed through the telephone or radio network.

Figure 3: DTMF versus ISD Frequency Tolerance



Much of the time this idea will work well, especially if the voltage or temperature is not varied on the ISD device between record and playback. To be confident that this idea will always work, the ISD devices must be clocked from external clock sources with a tolerance of less than ±0.25 percent (refer to Figure 3).

This is because of the following facts:

- The Bell Telephone DTMF sending tolerance is ±1.5 percent of the nominal values.
- DTMF encoder chips are crystal controlled but, because of their divider chains, are actually creating tones that are +0.74/–0.54 percent, for example, when the crystal is exactly 3.579545 MHz.
- The internal oscillator specification for most ISD devices is ±2.25 percent over voltage and temperature.

Dividing the margin in half to allow for the worst case variation between Record and Play Modes gives 0.38 percent. This suggests a tolerance of better than ±0.25 percent is needed on the external clock signal provided to pin 26 of the ISD devices. It can be either TTL or CMOS levels. Using the ISD2560 as an example, the internal clock frequency is 1.024 MHz for the 8 KHz sampling rate.

In a typical application that utilizes a microprocessor or microcontroller there is a crystal oscillator to provide the system clock. This is often 2, 4, or 8 MHz. By using the necessary divider stages a 1 MHz signal could be made available to the ISD2560. This is close enough to 1.024 MHz to use without any problem. The requirement is not so much exact frequency as it is constant or repeatable frequency. The main system crystal can provide that.