Challenge Electronics Technical Report: Medical Applications

Powering Production Through Innovation

CHALLENGE ELECTRONICS

Challenge Electronics is a global supplier of audible components. Our goal is to be louder, smaller, more energy efficient, more rugged and more cost effective.

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Practicing Sound Medicine

Written by Challenge Electronics Engineering

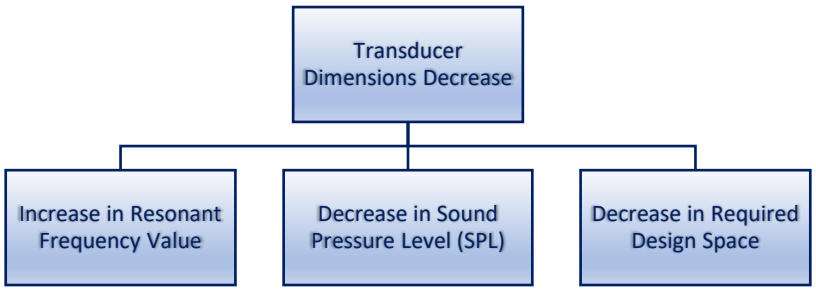
Introduction:

The use of sounding devices in medical instrumentation is ubiquitous to say the least. One can visit any wing or department of a health center and hear a range of electronic tones. Yet as the technology advances and becomes even more integral to patient care, there is a steady increase in the demand for devices that can generate specific tones to help medical personnel distinguish priorities. Studies show that the human auditory system is capable of sensing more complex alerts, enabling the human brain to process greater amounts of unrelated data simultaneously. The combination of both visual and auditory senses has been an essential part of the medical profession where immediate responses to warnings are essential to saving lives. This technical article will discuss multiple design parameters that Challenge Electronics incorporates when developing a product that is ideal for Medical Applications.

Portable or Hand-Held Devices

Portable and hand-held medical devices are a vital component of every hospital. During the full cycle of a surgical patient's stay in a hospital, they might encounter dozens of medical devices that involve scanning, monitoring, and verification. However, as portable devices become increasingly miniaturized, quality and reliability can become major concerns. Sound transducers allow the manufacturer to conserve space, power and cost. These devices are typically used for low power and higher operating voltage applications. When incorporating small-size components into products, the following takes effect:

Table 1: Audio Transducer Dimension-to-Output Ratio



Electronics utilizes Surface Mount Design (SMD) audio components that are ideal for miniature PCBA design layouts. Typical applications for SMD speakers include portable and wearable devices utilized in surgical suites, specialty labs, critical care facilities, home healthcare, and nursing homes.

Alarms for Stationery Instruments

Direct driven DC powered alarms are commonly recommended for medical instruments since the sound oscillator works independently of the external electronics and is more reliable for driving a piezoelectric disk to produce the desired tone and gives a consistent tone unit to unit. These alarms may be designed to produce any desired tone.

Loudness and Type of Sound

When specifying a sounding device, design engineers need to factor in the desired volume as well as the type of sound. A primary design parameter is to ensure the alarm signal can be heard above environments noise, but not be so loud as to drown out other audio signals. Audio Components from Challenge Electronics can produce a variety of unique tones, including chirp, siren, dual function, and PinPoint.

PinPoint Tone

PinPoint Tone is Challenge Electronics' patented proprietary audio tone (US Patent No. 10,522,008 B1) that "bends" audio signals based on the listeners location, aural system, and their environment. This is accomplished by using Sound Localization, which utilizes the following to create a crisp, distinguishable tone:

- *The differences in arrival time between each ear.*
- *The differences in loudness between each ear*
- *Repeatable patterns within a determined period from the same source*

PinPoint Tones are ideal for loud and spacious areas, where there is added value to the listener being able to easily determine the source of the sounding alarm. The tone is an entirely unique audio signal and can be set to different values to provide multiple unique tones. For example, this innovative audio tone allows medical personnel to distinguish the signal in an instant over the industry standard tones.

Siren Tone

A siren tone creates a gradual sweeping sound between the audio components frequency values, producing a very distinguishable sound over the environment. This type of audio signal is commonly utilized for noisy environments to alert personnel of a critical emergency. The sweep rate and frequency range can be defined to increase or decrease priority. For example, a tone which changes from 3,000 Hz to 5,000 Hz in 0.1 seconds will provide greater urgency a tone which changes from 3,000 Hz to 5,000 Hz in 0.5 seconds.

Chirp Tone

A chirp tone is quite unique as it delivers a noticeably short intermittent sound but reduces the output loudness over time. These options prove advantageous for systems that require a gentler audio signal to not be overly disruptive to the environment. This tone can be modified to reflect urgency by changing the interruption rate from a slow rate to a fast rate. This type of audio signal is ideal for medical equipment located in patient rooms, as well as routine dispensing alert systems.

Dual Function Tones

Dual function alarms combine two different sounds in one unit, minimizing the cost of the alarm. Another hard-to-find feature is a volume control to attenuate the sound level in special environments. In one product, a unit can generate a standard beep tone in case of a low urgency situation and then a PinPoint tone when high urgency is needed.

For additional information regarding Challenge Electronics' product design, innovative testing, and new products, please click here to visit our website.

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