

SCIENCE OF SOUND

BY KICKPORT

THE SOUND OF SCIENCE

It is often said that **Art** and **Science** are completely different subjects. The fact is, however, that **Music** is actually a closely-related combination of the two. No matter how creative the music making process may be, the Art of Music could not exist without the Science of Sound. Therefore, understanding sound from a scientific perspective as well as a musical one is a fundamental part of being a complete, well-rounded musician.

This is especially true for drummers and percussionists not only because sound matters in every playing situation, but because a quality drum sound is the mark of a professional. While every drummer has their own theories and beliefs about drums and drum sounds, few are fully aware of the principles of acoustics and how they can be applied to improve their drumming. The more a drummer is knowledgeable about sound, the easier it will be for him or her to develop, control, optimize and enhance their sound—and consistently produce a great one.

The basic characteristics of musical sounds are **Pitch** (high/low), **Duration** (long/short), **Volume** (loud/soft) and **Tone** (dark/bright). During recording or performing with a sound reinforcement system, these factors can be electronically equalized, filtered, modified and enhanced. But even in situations where a drum is mic'd, the better it sounds acoustically, the better it will sound when recorded or amplified.

Below is a glossary of the acoustical terms and concepts with which modern drummers should be familiar. As discussed above, understanding the Science of Sound is an integral part of being a serious musician. It can help every musician become a better musician... and every drummer become a better drummer.

Sound is created by changes in the condition of the air. When a drum is struck with a stick, brush, finger or mallet, it causes the drum head membrane to vibrate sending **sound waves** traveling through the air. When the waves reach our ears, we perceive them as sound. **Cross-Sensing** or “hearing with our eyes” or “tuning by touch” are a common phenomena but ones that skilled musicians are careful to avoid.

Pitch (aka Frequency/Amplitude) is measured in **Hertz** (Hz) or cycles per second. The greater the frequency or number of cycles per second, the higher the pitch or note. The human ear is capable of hearing sound within a wide range of frequencies, ranging between approximately 20 Hz to 20,000 Hz. Dogs can hear from 40 Hz to 60,000 Hz.

The **Fundamental** is the lowest frequency a musical instrument produces. Musical instruments simultaneously generate a series of **Overtones** also known as “harmonics”. The fundamental along with relative strength and balance of these overtones make up each instrument’s **Frequency Spectrum**.

Resonance, the fullness (quantity and quality) of a sound, is related to its Frequency Spectrum.

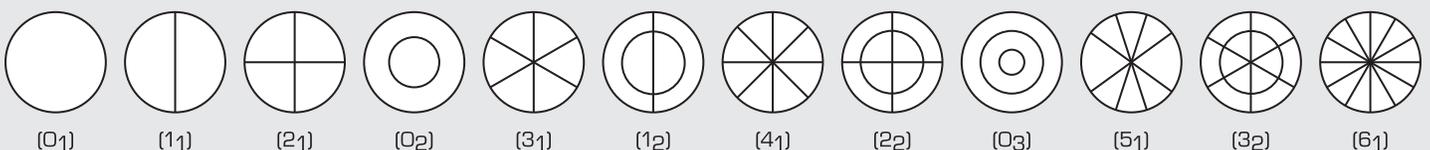
Tone Quality (aka Timbre) is also known as the “character” or “color” of a sound. Every type of instrument has a unique Tone Quality based on its Frequency Spectrum and the way it produces and transmits its sound. This explains why a violin sounds different from a clarinet, trumpet or guitar and why a snare drum sounds different than a bass drum.

Volume (aka Intensity/Magnitude) is measured in **Decibels** (dB) and denotes the relative power of a sound wave. Silence is rated as 0 dB, a normal conversation is 60 dB and a jet engine is 120 dB.

Projection is a composite of several sonic factors and is relative to the context of the music being played. In a modern rock band, for example, the acoustic drums are expected to project or “cut-through” the amplified instruments and vocals.

Duration refers to the length of a sound. Terms like **Dry** (short) and **Wet** (long) are used to describe Duration, which can be modified through various **dampening** and **muffling** methods and materials. In most cases, however, shortening the decay of a sound in order to increase its attack also reduces other parameters such as projection and resonance.

Musicians wouldn't think of performing without first checking their **tuning**. While tuning a drum is more subjective than tuning for fixed-pitch instruments, it's also more involved than just tightening or loosening the heads. Since the vast majority of a drum's sound is produced by the drum head, maximizing the head's vibration through precise, even tuning is critical in creating a professional quality of sound. Leaving the discussion about tuning techniques, and drumshell and drumhead material and construction, aside, a thin head will be higher, brighter and drier than a thick head (all other factors being equal). Shown here are the Nodal Lines of a drumhead's first 12 vibrational modes.



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The result of over 10 years of research and development, KickPort's patented drum accessories are engineered to optimize and enhance the sound of virtually any drum. KickPorts, CajonPorts and FX Ports complement the scientific principles of sound and work organically to improve natural acoustics of drums.

Kickport's unique designs effect the elements that determine a drum's quantity and quality of sound. Using a KickPort lowers the **Fundamental Pitch** and naturally EQ's the **Frequency Spectrum**. This not only provides a fuller, fatter, more musical **Tone**, it also significantly decreases the need for additional Equalization and effects processing. The Kickport also adds clarity and punch without compromising the **Duration** or requiring extensive muffling. This allows the drum to **Resonate** and **Project** more fully and more naturally.

KICKPORT

KickPort releases the bass drum's untapped potential by sonically enhancing and projecting its natural tone, warmth, resonance, volume, power and articulation. The proprietary design of the Kickport boosts subsonic

bass drum frequencies below 20 Hz, increases the harmonics between 50 and 80 Hz and reduces the presence of upper partials from 100 to 200 Hz. The impact of these KickPort-derived tweaks can be heard as well as felt in the bass drum's lower, deeper sound.

FX PORTS

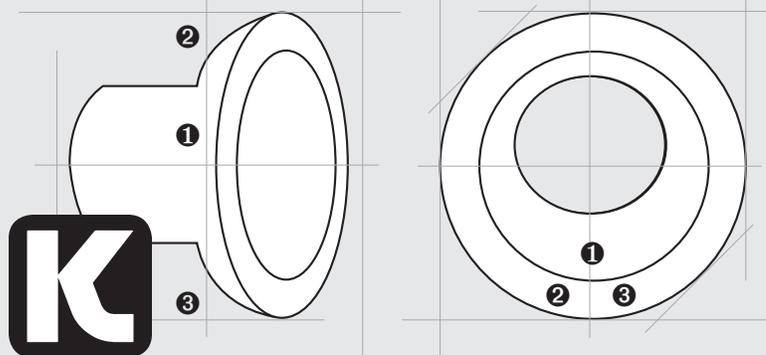
Following the same 3-point design formula as the Original KickPort (shown below), KickPort's FX Series Ports can be used on the top or bottom heads of bass drums, snare drums and tom-toms to extend and enhance the drums' low end while eliminating unwanted high overtones and over-ring. This provides a more natural form of equalization and tone control for all drums— reducing the need for internal and external muffling as well as effects processing— while providing a studio-quality level of sound right out of the box.

CAJONPORT

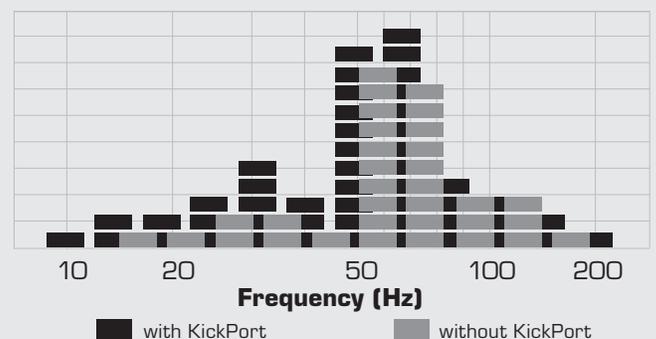
The CajonPort takes advantage of the same acoustic principles as the KickPort to add significant low end, clarity and separation to the bass and snare sounds of all types and models of Cajons.

The Sound Of Science

① The KickPort tube slows down air flow leaving the bass drum; lowering the pitch by as much as an octave. ② The Firm-Flex™ Collar attaches the Kickport to the head; adding mass, lowering the fundamental and further enhancing the low frequencies. ③ The foam rubber gasket on the back side of the Flare dampens the head and removes unwanted high overtones and frequencies; naturally equalizing and focusing the drum's sound. Shown below: Sound spectrum of a bass drum with and without KickPort.



22" Bass Drum With And Without KickPort



Visit KickPort.com to learn more about the Science Of Sound as well as installation tips, instructional videos, audio examples and further information on all of the currently available Kickport models.

Check out the full range of KickPorts, CajonPorts and FX Ports at your local music store or shop online at Kickport.com

KICKPORT®

SOUND MATTERS.

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