



VIDSONIX TRANSDUCER PRIMER

Full-Range, Hidden Tactile Transmission Audio Basics



www.vidsonix.com

INTRODUCTION

Tactile transducers have been around since the late 1940's. A tactile transducer is an electro-mechanical device, very similar to a traditional audio speaker (sans cone), that is intended to be mounted to a solid object (substrate) and driven by an amplifier, transferring its energy into the substrate. The substrate is "pushed" into motion, vibrating at the same frequencies, thereby radiating (distributing) the sound and/or intended vibrations. Tactile transducers can be bandwidth limited (such as Bass Shakers), or relatively full-range.

The best substrates to mount tactile transducers to are medium density materials, such as Plywood or Douglass fir. If the material is too dense or rigid, then you will need an unrealistic amount of power to get it vibrating. If the material is too elastic, the sound quality will be compromised due to damping and vibration modes. The best substrates are ones with a Young's modulus (modulus of elasticity) of around 10 Gpa (Rubber: 0.1, Plastic: 1.5, MDF: 3.8, Douglass fir: 11, Plywood: 12.4, Glass: 46, Drywall: 50, Concrete and Metals: 30-150). Many materials have a wide range of this value depending on their composition (eg. Fiber-Glass).

Another component that affects transmission quality is the thickness of the material. The lower the Young's Modulus, the thicker the substrate will need to be. Similarly, using a rigid material such as glass will require using thinner dimensions. However, using very thin substrates becomes subject to vibrating modes resulting in increased distortion. Trial and error testing will provide the optimum results. As an example, using Douglass Fir, a 3/4" thick board has been found to work best.

The final component is how well the transducer is mounted, or coupled, to the substrate. Better coupling will give you a more efficient transfer of the vibrational energy to the substrate. A tactile transducer needs to be solidly mounted to the substrate, either

by bolts or adhesive (2-part epoxies recommended). Loosely mounted transducers will result in lower, muddled sound.

Different substrate baffle configurations and shapes will have a significant effect on the sound also, just as in a traditional speaker. You will be exciting vibrational modes along the substrate piece, some constructively and some destructively depending on the geometry of the baffle. Various studies can be found around the internet and discuss possible configurations in more detail.

APPLICATIONS

Tactile transducers require significantly more amp power to obtain equivalent SPL of a traditional speaker; they are not very efficient; they typically have a poor transient response due to their high resonance (Q); And, they don't have very much dynamic headroom.

Why use a tactile transducer then? Well, in many applications, simply because they are tactile. You can FEEL them. Bass shakers are an example of a tactile transducer, meant to be mounted to seating furniture so that you can feel the vibrations of sound. These are meant to SUPPLEMENT (usually) a high-fidelity sound system. They have also been used in game chairs and hand-held game pads. These bass shakers are limited in bandwidth, optimized for lower bass frequencies.

The Vidsonix brand of tactile transducers are full-range, or full-frequency, tactile transducers. They are used in a broad range of applications that include tactile stimulation/message therapy (bone/tissue/muscle therapy), spas/hot tubs (underwater sound), museum exhibits (hidden sound), and plate reverbs.

There are many competing brands of tactile transducers on the market, each having their particular niche and design points. A thorough search of the internet will provide many design papers, facts and specs, how-to videos,

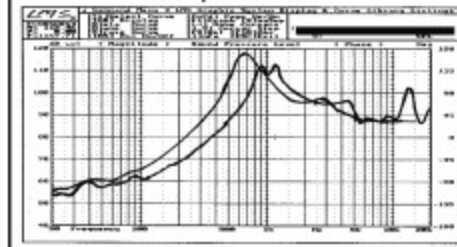
SPECIFICATIONS

VX-GH72 3" [GHOST]

IMP. 6.4ohms @ 400Hz1v
Res. Freq.: 1KHz
Response: 1000Hz ~ 17KHz
Response (Mounted):
550 ~ 17KHz
Magnet: 430g
Max power: 50W

VX-GH92 4.25" [PHANTOM]

IMP. 6.9ohms @ 400Hz1v
Res. Freq.: 650 Hz
Response: 650Hz ~ 16KHz
Response (Mounted):
350 ~ 16KHz
Magnet: 1205g
Max power: 70W



and application tips regarding these companies and their products.

ADDITIONAL TIPS

To compensate for the tactile transducer's shortcoming mentioned in the last section, you will need a good amplifier (must be stable down to at least 4 ohms) with plenty of power to push your transducers. If the power handling of each transducer is not sufficient for the amp power or the desired loudness, you will need to use multiple transducers on each channel of the amp (or single channel if your application is mono). These should preferably be wired in parallel, but caution must be noted not to create a resulting impedance less than the rating of the amplifier. Our minimum recommendation is a 100W per channel amplifier with 2 transducers per channel.

Because of their typically high resonance, an EQ or crossover may sometimes be necessary for best results. However, this can lower the loudness (SPL) per amplifier watts, effectively lowering the system efficiency even further. You can also install a peak limiting device such as a limiter or compressor to improve the dynamic range.

Tactile transducers should always be used in a well ventilated area. The transducers will normally become warm or hot just like a traditional loudspeaker when driven fully. They should not be mounted in congested or tight areas because of this. - C.