Technical Note 001

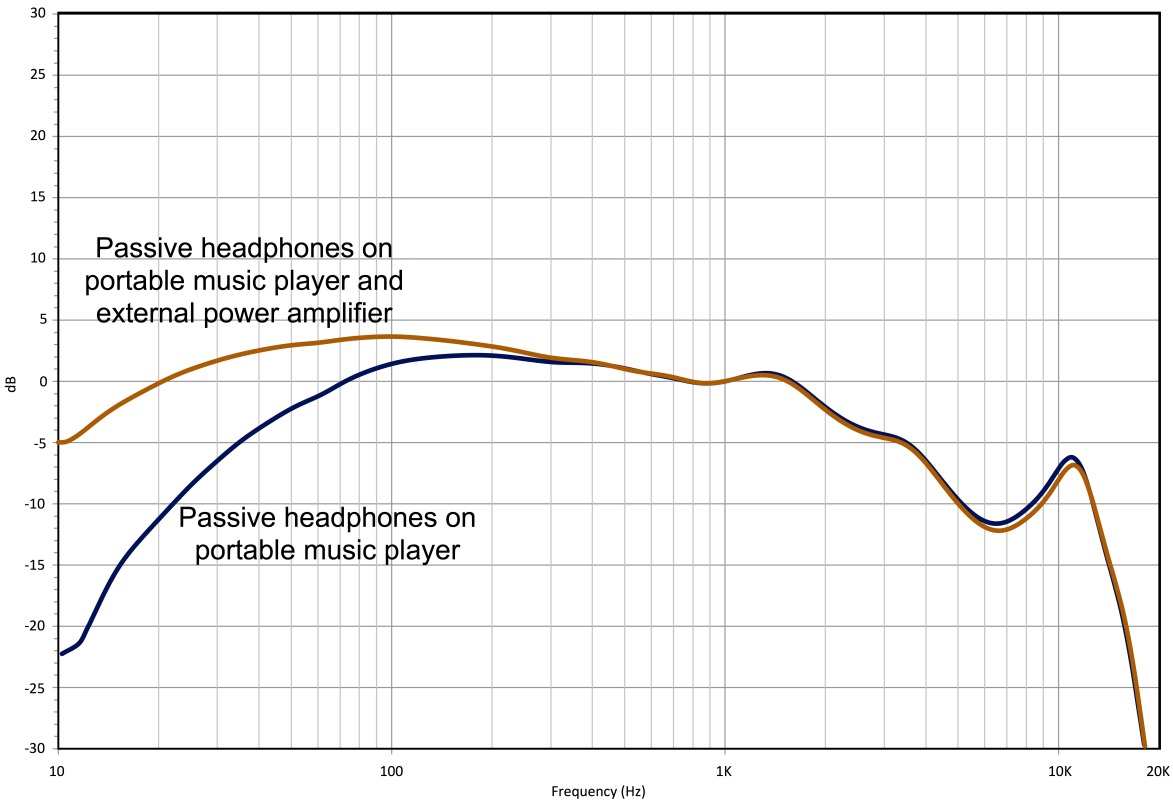
10/4/2016

Why do I need a power amplifier for my portable headphones?

Many people have asked why we included an amplifier with the SC1000 headphones. There are a number of reasons why we did this but there is one that may not be obvious to most people.

Most headphone users are connecting to a mobile music source (iPhone, iPod, etc.) or a laptop. These devices use amplifiers that are just barely adequate to drive most headphones. If you're using low cost ear buds you may never notice a problem. If however, you're looking for a higher fidelity sound, these built in amplifiers are not adequate.

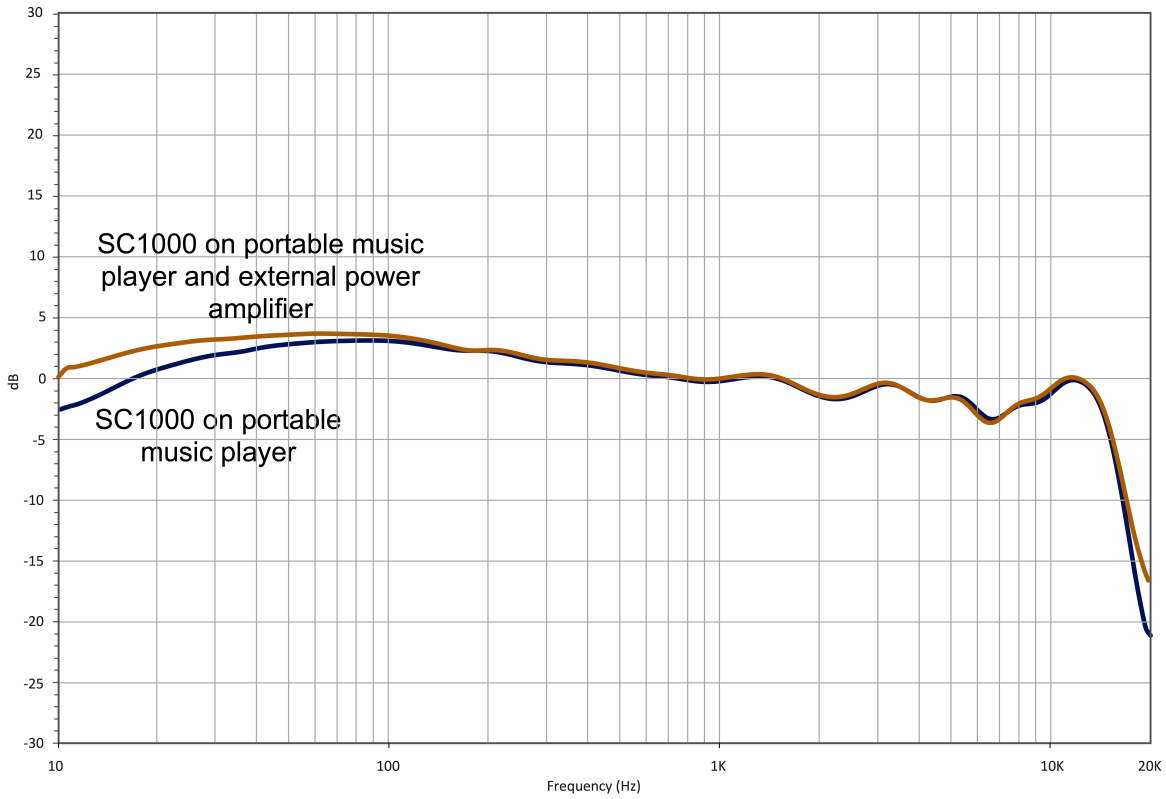
The biggest issue is output impedance. There are two areas that present a problem for headphone listeners. One is high output impedance from the amplifier that interacts with the complex impedance of the headphones and alters the frequency response. The other is an output impedance that varies with frequency, which can have a significant impact on the bass response of headphones. Let's look at some frequency responses with and without the headphone amplifier to see what this means.



In this example we see a typical hi-end balanced armature headphone with a 25 ohm impedance.

The upper trace is the headphone through an external power amplifier. The lower trace is connected directly to a MacBook Pro. The level has been adjusted to make it easier to see the 10dB loss in bass at 20Hz. Tests on two different iPods show the same loss.

Now here's the SC1000 with its built in power amplifier connected to the same two sources.



The power amplifier in the SC1000 has a very low output impedance and it is virtually the same at all frequencies. The small, 2 dB loss at 20Hz is a result of the portable player trying to drive the 150 ohm input impedance of the SC1000's pre-amplifier.

This should illustrate why the high-quality amplifier included in the SC1000 is essential when listening to portable players.