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## **ADVISE ABOUT SOUND PRESSURE LEVEL AND POSSIBLE HEARING DAMAGE**

Most speaker systems are capable of generating sound pressure levels that can, under some listening conditions, cause short-term hearing loss and or ringing in the ear. Prolonged exposure to such conditions can lead to permanent hearing loss and a mild to severe case of tinnitus (ringing of the ear).

### **LISTENING SAFETY**

The first rule of safe listening is to be aware of the conditions you and your guests are exposed to. Although reasonably priced sound level meters are available to the general public, a little common sense and noting the following points will go a long way towards assuring your days of hearing are not ended prematurely.

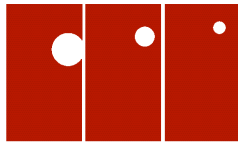
Keep the level as low as possible while still presenting the full audio picture. To accomplish this, pay attention to the audibility of the noise floor in the quiet passages of the music. Adjusting the volume control up and down will bring the noise floor from in audibility to overbearing. Find the setting that you feel best about considering the overall piece of music at hand. Do this before you have listened any length of time as even short term high levels can bring the ear's safety mechanisms into play which will reduce the ear's sensitivity to quiet passages.

Turning the volume up past audibility of the noise floor will usually result in both: power compression (distortion) to the loudspeaker as well as exposure to unnecessary amounts of acoustic energy. Be aware that this excess energy may build up at low frequencies where the ear is not as sensitive and thus may not give as much warning through discomfort or recognizable distortion. By the time midrange hearing is distorted, levels are well past the danger zone and immediate volume reduction and/or listening termination is mandatory. Reducing the level below which the noise floor cannot be heard can result in low-level information being masked by the noise floor and thus a reduction in the dynamic range. Whether this reduction is significant or not depends on the listener's expectations, which can vary from time to time and with the conditions at any particular listening area.

A very important point to consider here is that the lower the noise floor of the listening area, the lower the sound levels can be without losing low level information.

Another point to consider is that sound levels are generally thought to be lower the further the listener is from the loudspeaker. But, in an enclosed space, sound is reflected from room boundaries thereby causing high-pressure zones in the room. These zones are often at the corners of the room where mid and high frequency levels are reduced.

Hearing loss is a result of more than just the level component. Duration and frequency content of the exposure are also key points to consider. As such, the relative length of the listening sessions, the type of music, and normal sound level exposure must be taken into account.



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Some music has a higher average level than others and thus a limited level and time of exposure is recommended. As individual recordings can vary considerably, no specific recommendations can be given. In general, rock music has a high average level and a low peak to average ratio. In contrast, classical music has a high peak to average ratio. Loud crescendos in classical music may in fact have a higher peak level than that found in the average rock recording but the low average level does not warn the listener of the impending loud passage. Similarly, some hip-hop music may not sound loud but, in fact, may have an elevated bass level which, depending on the repetition of the bass notes, may present exposure problems.

Perception of dynamic range is the contrast between soft and loud sounds; in this area, our ear/brain combination has little competition in differentiating sounds. In perceiving the differences between loud and soft passages, reverberant listening environments are the enemy. Because quiet passages get filled with the decaying trail of previous sounds, the listener is tempted to raise the level of the sound in an effort to mask the sound of these decaying passages. Some times, a partial improvement is made as some parts of the audio band where the decay time is shorter gain level whereas the overall reverberant field may increase to a lesser extent due to its lack of coherence. In any case, the reverberant listening room can promote higher average listening levels than would be found in a well-dampened environment.

A final point to remember is that each individual has a different tolerance level for loud sound. These differences can be a result of gender, age, or physical nature. Even the same individual can exhibit intolerance to loud sound exposure occasionally and not at other times. Being sensitive to people who asks for the sound level to be turned down is a recommended courtesy as the sound is probably too loud for them. And please, reconsider your own personal sound exposure limits.

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