

7 Steps to Better Home Theater Sound

1. Cable Tests

Poor quality cables can ruin a sound system. The Toolbox checks cables for shorts and opens, and then runs audio through the cable at 1000Hz and 20,000Hz, to make sure there is no drop-off as frequency increases. All types of cables are supported, RCA, $_$, and XLR balanced and unbalanced.

2. Speaker Polarity Tests

Absolute speaker polarity is very important. You must be sure that the speaker cone moves out when the system is presented with a positive input. Having a driver out of phase, anywhere in the system, can throw off all of the other tests. And, the more drivers, the more chance for error. The Toolbox uses DSP technology to make testing easy, accurate, and reliable.

3. Speaker THD (Total Harmonic Distortion) Tests

Measuring a speaker driver's distortion is like taking its blood pressure – it can indicate problems that may not yet be noticeable. All similar speakers in a system should have similar THD, and the lower, the better. If you find a speaker that has significantly higher distortion than others of the same model, it is likely that the speaker has been damaged, or is defective. A high level of THD in a speaker will cause “smearing” of the audio that it outputs, resulting in poor imaging and possibly a “muddy” sound. The Toolbox can measure THD+N down to 0.02%, a number far beneath what a typical speaker produces.

4. Speaker Level Balance

It is important in any system to have good level balance between speakers, but especially in today's multi-speaker formats. Use the ANSI-accurate Toolbox as a digital SPL meter to accurately set the levels between the speakers in the system. If you want to have your system levels match those in the motion picture sound studio that recorded the movie, set each channel's reference level to 85dB SPL, A-weighted, using pink noise as the sound source. In Dolby 5.1 systems, set the sub-woofer 10dB hotter than the other speakers (per Dolby recommendations). All measurements should be made from the actual listening position.

5. Noise Criteria

Noise Criteria is a loudness level defined by an ANSI specification (S12.2-1995) that quantifies a method for measuring the background noise level in a room. Basically, the lower the number, the quieter the room. Today's digital sound systems typically supply >90dB dynamic range (the difference between the loudest sound and softest sounds they can play), but in almost every case the noise level in the room itself will exceed the sound level for the softest sounds the system can play. This causes masking of the subtle details in the audio track, and possibly loss of comprehension of dialog during quiet parts of the film. To meet THX criteria, you must be at NC 30 or below. Rooms with levels significantly higher than this should be corrected. The Toolbox can be used both to measure the NC level and to pinpoint what frequency ranges are causing the problem to try to isolate the source of the noise.

6. Room Reverberation Time

Room reverberation time effects the listening environment greatly. A room that is too “live” will cause many problems that cannot be fixed by the sound system, no matter how much it costs. And a room that is too “dead” will be uncomfortable to be in, whether the sound system is playing or not. The time it takes sound to decay 60dB in a room is called the RT60 time. This is the value that is typically used to measure room reverb time. Using the Toolbox, the actual sound decay curve for the room can be shown on the screen, and the RT60 computed from this curve. Recommendations on acoustic treatment can be made from this information.

7. Equalization

In a perfect world, no equalization would be needed. Speakers would perfectly reproduce every frequency, and the room would not color the sound by reinforcing some frequencies and absorbing or canceling others. But in reality, some method of correcting the frequency balance in the room is required. The tools available to accomplish this will vary from system to system, but in any case, you need a way of measuring the levels by frequency. The Toolbox includes a sophisticated Real Time Analyzer, that splits the audio spectrum into 120 bands (1/12th octave) and displays the acoustic levels within each band. Then, by optimizing speaker placement, adjusting crossover points, and using any available equalizers, the overall frequency response of the room is corrected.