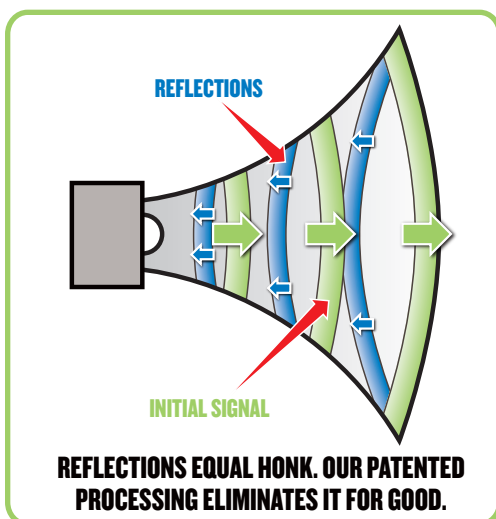


## HD EXPLAINED

# A look inside Mackie's High-Definition Audio Processing

Your audience doesn't care what makes your PA tick, as long as it sounds great. HD Series High-Definition Powered Loudspeakers mark the next major advancement for powered loudspeakers, incorporating all of the "Active" technology that has defined Mackie loudspeakers for years and adding an entire new level of processing that (dare we say it?) defies the very laws of physics. The resulting experience is not only high-definition, it is truly a moment of clarity for anyone within earshot.



### PATENTED ACOUSTIC CORRECTION

Transducers perform at their best when they are not interfered with. In the real world, however, there are many reasons why loudspeakers employ horns, baffles, phase plugs and all the other tools that make the modern loudspeaker what it is. Consider high-frequency drivers and the nature of the frequencies they re-produce. High frequencies are highly directional. If there was no horn in place, the high frequencies would only reach the people who are directly on axis. Take a look at Figure 1. You can see that the driver fits snugly within the throat of the horn, which flares outward to the mouth. The flare rate of the horn determines the dispersion of the high frequencies. Simply put, a horn allows a loudspeaker designer to provide maximum dispersion of high-frequencies, ensuring that everyone in the house hears those highs. Horn design is a complex task and Mackie has a long history of designing premium horns that drastically increase coverage. That being said,

introducing anything into the path of the compression driver's output causes inherent physical limitations that, until now, have been largely ignored by manufacturers.

Every audio professional is all too familiar with the "horn sound" — a megaphone-like "honkiness" with a smearing of transients. If you've forgotten, cup your hands in front of your mouth and speak loudly to remind yourself. This prominent resonance, caused by reflections between the compression driver diaphragm and the horn mouth (see figure 1), is responsible for the characteristic horn "honk."

Another problem is caused by a similar situation in the high frequency compression driver itself. Again, multiple arrivals from different propagation paths through the phase plug of the compression driver create a series of very high-frequency peaks occurring primarily within the first millisecond (see figure 2). This energy causes transient "smearing" that affects the quality of impulsive sounds, obscures the fine detail in instruments such as cymbals, and degrades imaging. Universally ignored by other PA loudspeaker designs, problems in this octave contribute substantially to the artificial sound quality.

Likewise, cone drivers have inherent resonances in their upper frequency range that result in "muddiness" in the middle of the vocal range. This is seen as delayed energy in the region between 300 Hz and 3 kHz that extends as late as 8 ms. These resonances, caused by reflections across the cone surface, introduce midrange coloration that is undesirable and intolerable.

The key to our High-Definition Audio Processing is the detailed measurement and analysis of these inherent problems. Only then can they be addressed. The EAW team's first step was therefore the development of proprietary measurement tools and software for acoustical analysis. These tools were used to investigate the unprocessed responses of HF and LF subsystems in various directions and at various levels.

The next step was to apply appropriate DSP (Digital Signal Processing) to these anomalies. The team undertook the development of custom (and rather radical) DSP algorithms specifically engineered to correct loudspeaker anomalies. The resulting processing had to possess the required precision and accuracy in both the frequency and time domains.

As can be seen in figure 3, the results in the HD series are astounding and must be heard to be believed.

These revolutionary patented acoustic correction algorithms, cannot be applied “as is” to just any loudspeaker, let alone be something that even the most astute of users can set up themselves. The

anomalies and resonance problems it cures are very specific to each loudspeaker design. Thus, the internal physical details must be known, the anomalies must be carefully analyzed and appropriate processing must be custom designed by EAW Engineers along with the rest of the loudspeaker system.

This may seem like a large amount of work. It was. But once you hear the results, we’re sure you’ll agree that the HD series is far and away the most accurate sounding PA loudspeaker in its class. Period. That’s why we’ve patented it.

