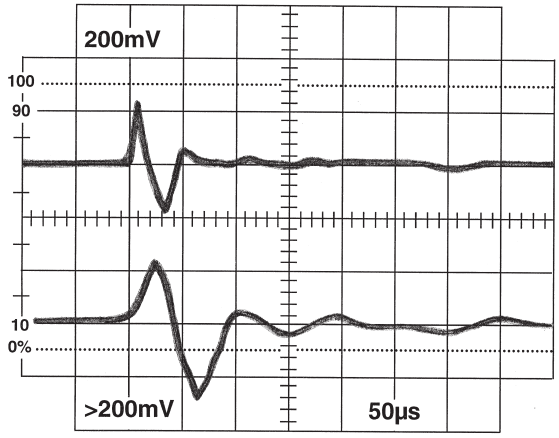
Appendix B: Transient Response

The ability of a microphone to respond to a rapidly changing sound wave.

A good way to understand why dynamic and condenser mics sound different is to understand the differences in their transient response.

In order for a microphone to convert sound energy into electrical energy, the sound wave must physically move the diaphragm of the microphone. The speed of this movement depends on the weight or mass of the diaphragm. For instance, the diaphragm and voice coil assembly of a dynamic microphone may have up to 1000 times the mass of the diaphragm of a condenser microphone. The lightweight condenser diaphragm starts moving much more quickly than the dynamic's diaphragm. It also takes longer for the dynamic's diaphragm to stop moving in comparison to the condenser's diaphragm. Thus, the dynamic's transient response is not as good as the condenser's transient response. This is similar to two vehicles in traffic: a truck and a sports car. They may have engines of equal power, but the truck weighs much more than the car. As traffic flow changes, the sports car can accelerate and brake very quickly, while the semi accelerates and brakes very slowly due to its greater weight. Both vehicles follow the overall traffic flow but the sports car responds better to sudden changes.

The picture below is of two studio microphones responding to the sound impulse produced by an electric spark: condenser mic on top, dynamic mic on bottom. It is evident that it takes almost twice as long for the dynamic microphone to respond to the sound. It also takes longer for the dynamic to stop moving after the impulse has passed (notice the ripple on the second half of the graph). Since condenser microphones generally have better transient response then dynamics, they are better suited for instruments that have very sharp attacks or extended high frequency output such as cymbals. It is this transient response difference that causes condenser mics to have a more crisp, detailed sound and dynamic mics to have a more mellow, rounded sound.



Condenser/dynamic scope photo