Subject: Re: Can't reproduce a square wave
Posted by Wayne Parham on Thu, 18 Mar 2004 04:18:07 GMT
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You wrote:>> "Radiating into space, the radiator motion (for a direct radiator) that produces an acoustic square wave is a triangle motion, not a physical square wave."That's my point. If you apply a square wave electrical signal to a loudspeaker cone, you will get movement of a physical square wave with constant displacement. Only if you modify the waveform, such that a constant displacement pump (loudspeaker) generates a constant volume can you generate an acoustic square wave.I am not sure if we are talking apples and oranges on the square wave thing or not. What I am saying seems fairly obvious to me. You can't pressurize an open space with a constant displacement pump. The pressure dissipates. So you can't maintain pressure on alternate half cycles either. You can only hope to get an approximation at high frequencies.An electrical square wave presented to a loudspeaker is the functional equivalent of a pump operating at a constant pressure in one direction, and then rapidly changing to the other. But loudspeakers energizing a large space are like a lossy system, in that you aren't able to maintain the increased atmospheric pressure on a compression cycle, nor can you maintain reduced atmospheric pressure on a vacuum or rarefaction cycle.Electrical square waves presented to a loudspeaker make positive pressure on one half cycle and negative pressure on the other. The problem is that the pressure isn't maintained. It rapidly falls off. So the top of the square wave trails off, modifying it so that it looks like it has passed through a differentiator. At high frequencies, you can approximate an acoustic square wave but not at low frequencies, because pressure dissipates before each half-cycle has passed.Modifying a square wave to create a triangular shaped signal will increasingly pressurize a room, so that the falloff from dissipation is counteracted by the increase from the rising wave. That sort of acts like pre-compensation by sending an integrated signal to the speaker, which pre-compensates for the differentiator formed by the dissipation falloff in pressure. The acoustic pressure can be made to resemble a square wave using this technique. But the signal presented to the speaker wouldn't be a square wave in this case.