Subject: Electro-mechanical formulas (Thiele / Small)
Posted by Wayne Parham on Mon, 05 Jan 2009 00:31:33 GMT
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I stopped maintaining the VadCalc applet. It was written in a weird little language called CA Realizer (Computer Associates), which I also used to write tubing movement programs for the oil and gas industry. I do most of my programming in C++, but that language was easier to use for some things, so I gave it a go for a while.I assume you want to use it because you don't want to build a box to find Vas with the sealed box method. If that's the case, I suggest the added mass method. Then again, I understand the desire to have a method that works without two impedance sweeps. The VadCalc process was simple to do, and provided a pretty good estimate of Vas.Here's a formula that you can use to calculate Vas, knowing efficiency n0, Qes and fs:More woofers specs list the SPL output at 1W/1M than reference efficiency, so here's a converter:These days, I use Keith Larson's Woofer Tester and Speaker Tester products. They really make life easier. It has evolved a long way since the original Woofer Tester that he used to sell through Parts Express. You can use it to do acoustic measurements and make a digital crossover using Spice models to simulate passive crossovers. It's a great tool. And it still does the T/S measurements.Smith & Larson AudioIf you want to find T/S specs making measurements manually, or if you want to calculate values from other known values, here's a list of formulas that

constantSpeaker total Q at fsEfficiency/bandwidth productResonant frequencyElectrical QSystem resonant frequencySystem total Q at fcResonant frequencySpeaker total Q at fsHalf power frequency (-3dB point)System resonant frequencyInternal box volumeComplianceFree air reference efficiencySpeaker resonant frequencyComplianceSpeaker electrical QSound pressure levelFree air reference efficiencyMaximum air volume displaced by cone excursionPeak linear displacementDiaphragm radiating areaVolume displaced at XmaxDiaphragm effective radiating diameterDiaphragm radiating areaK1 constantAir densitySystem resonant frequencyVolume displaced at XmaxSpeed of soundK2 constantK1 constantAmax constantMaximum displacement limited power outputK1 constantAmax constantRequired electrical input to achieve ParMaximum displacement limited power outputFree air reference efficiencyPeak sound pressure levelMaximum power input