

BoxCad

Version 3.31

Recommended System: Win98™

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Bodzio Software Pty. Ltd
P.O. Box 223
Glen Iris, 3146 VIC.
AUSTRALIA

Phone: +613-9-755-7708, Fax: +613-9-755-7708

Mail: bodzio@interdomain.net.au

Web: <http://www.interdomain.net.au/~bodzio>

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Chapter 1. Introduction

Program Overview

Having used computer simulation programs for some time, the user may find, that enclosure modeling could be expanded and accuracy improved by moving the modeling concept away from fixed formulas to a true diagrammatic representation of elements involved in the physical enclosure.

Accepting the above, Bodzio Software developed a **companion (to SoundEasy) program**, called BoxCad. The program is designed to compliment SoundEasy and is primarily aimed at very advanced designers and audio engineering students. Here are the most important characteristics of the new software:

1. This program solely focuses on enclosure design. SoundEasy provide the user with the fixed choice of **9 types of enclosures**. If the user wants to model 4,5,6-chamber (and more) box, this is not possible with the main programs, but will be possible with the BoxCad. SoundEasy uses fixed function formulas to model the box by plotting transfer functions.
2. The name of the program reflects just what it does. It uses CAD system to create (1) full acoustic impedance model of the enclosure and all radiation impedances and (2) full electrical impedance model. User can independently plot output from the port(s) and from the cone(s) and also the combined system output. The user is now free to include or exclude as many minor acoustic components of the model as he/she wishes. The user can create simplified models or large complex models of multichamber boxes. Also, passive radiator and transmission line systems can be modelled.
3. Other functions include: Phase Response, Impedance Phase, Group Delay, Cone Excursion and Velocity. All these functions are based on the CAD models.
4. For convenience, the program has the 9 enclosure models built-in (just like SoundEasy), and they are all represented by CAD schematics, which can be used as provided or can be edited by the user.
5. BoxCad has several calculators built-in. They have dual function: (1) provide the user with a data entry fields and (2) convert from Small/Thiele parameters to mechanical and acoustical parameters for the driver, box and port. There is also Power Compression calculator. Very complex calculating/modelling tasks can be all accomplished on BoxCad.
6. The theory behind enclosure modelling is complex and as a minimum requirement it is recommended to become familiar with Beranek's "Acoustics". This textbook has been used extensively during program development.
7. BoxCad is a free-standing program, but in the future, it will become a part of SoundEasy. Currently datafiles are not compatible.

8. The program comes with its own manual and is Windows 98™ compatible. The manual contains all theoretical background necessary to understand the process of modelling the enclosure. It contains detailed (1) mechanical mobility models, (2) acoustic impedance models and (3) electrical impedance models of all 9 enclosures. This is sufficient for the user to learn, understand and then go and design his/her own models. The manual also describes the duality or “dot” method for transforming from one model to another.

9. BoxCad is a mouse/menu driven software which requires Windows 98™ to be installed on your computer. The program takes advantage of the *SVGA* graphics capabilities of your computer (1024x736 pixels).

General Program Specifications

Environment.....: Windows 98
User interface.....: Mouse, Keyboard, Windows.
Program control.....: Mouse, Menus, Buttons.
Mass storage.....: SAVE and LOAD menu options.
Hard copy.....: Graphics Printer, eg: LaserJet 5L
Screen output.....: SVGA, 800x600 pixels, 16 colors, 256 max.
Processor.....: PentiumPro200MHz recommended.
RAM.....: 16.0 Mb minimum.
Hard Disk required.....: 700 kb min. + 1 Mb to install.

Software functions performed

1. Calculators/Entering Data.

There are eight calculators provided with BoxCad. Calculators required for their input several basic Small/Thiele parameters and provide the user with acoustical and electrical component representation. Also, Power Compression calculator is provided.

2. Loudspeaker enclosure design.

The function is implemented by means of creating a CAD representation of the complete acoustical impedance model of driver and associated enclosure. The software will then plot the frequency response, relative cone excursion, the system (driver + enclosure) impedance for a specified driver, system phase response and group delay (five curves in total).

Sealed, vented, double-chamber and triple-chamber, sealed-vented and vented-vented enclosures are supported as build-in models. The user is however free to enter as CAD schematic any other complex model of his/her design.

3. Thermal analysis.

The program accepts thermal resistances of the driver's voice coil and magnetic structure and enables the user to examine all six curves and structure temperatures at all input power levels from 1mW to 1000W. "Power compression" effect can be clearly observed on the frequency response and all other plots.

4. Time domain responses.

Enclosure response to a rectangular wave can be observed in time domain. This enables the designer to determine the amount of tolerable "ringing" generated by some specific alignments. This analysis is available for all seven enclosure types. Frequency of the rectangular wave can be adjusted between 1 and 500 Hz and FFT and IFFT techniques are employed.

5. Bandpass Subwoofer design.

Enclosure frequency response can be combined with an active (OPAMP based) equaliser, correcting total system frequency response. Useful filter and its calculator are also discussed.

Installation.

BoxCad program is supplied with SoundEasy and installation of the program is performed automatically with SoundEasy.