

THE EGO

Focal 5W4252 / Hiquphon OWII
Loudspeaker Design Plans

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Thank you for choosing the Dillon Acoustics “Ego” as you DIY project. The Ego is a true audiophile quality loudspeaker. Over one hundred hours were devoted to its design. The Ego is simple to build. By following the basic guidelines in this manual, you will be able to recreate the remarkable sound that these loudspeakers produce.

Geoffrey Dillon
Dillon Acoustics

Please Note:

Dillon Acoustics has made every attempt to ensure that our design plans are as accurate as possible although Dillon Acoustics will not guarantee the performance of the completed product. Dillon Acoustics will not be responsible for any damages, injuries or financial losses associated with the use of these design plans.

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Specifications

System:

System description	2-Way Bookshelf
Woofers	Focal 5W4252 / 5.25" Mid-Bass
Tweeter	Hiquphon OWII, 20 mm (3/4") Dome Tweeter
Bass Alignment	Sealed
Frequency Response	85 Hz – 20 kHz +2 dB / -2 dB from 100 Hz –20 kHz
Power Handling	60 Watts RMS / 150 Watts Peak
Efficiency	85dB (2.83V) 1W / 1M
Nominal Impedance	8 ohms / 6 ohms min.

Crossover:

Crossover Frequency	2200 Hz
Woofers Crossover	4 th order acoustical slope
Tweeter Crossover	Transitional 4 th to 6 th order acoustical slope
Number of Components	10
Recommended Capacitors*	Polypropylene or better / 100 Volts or greater
Resistors	10 – 15 Watt
Inductors*	Air core

*See schematic for details

Recommended Enclosure

External dimensions	12" H x 7.5" W x 7" D (based on 3/4" material)
Gross Internal Volume	.2 cu. ft. Gross
Internal Damping Material:	1/2" - 1" Acoustical Foam

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Design features:

- High quality drivers were chosen not only for their specifications, they were also subjectively compared to many other brands.
- Defraction loss compensation circuitry. Diffraction loss is a -6 dB “step” in frequency response, which starts to occur below a frequency whose wavelength is approximately $\frac{1}{2}$ the length of the largest front baffle dimension. This “loss” will only occur when a speaker is placed away from a wall or other boundary. Systems without defraction loss compensation will sound lean in the mid-bass and lack soundstage width. The Ego has 3 dB of compensation. This is the correct amount for most speakers.
- To ensure a good off axis frequency response, a crossover point no higher than 2200 Hz. A low crossover point helps reduce vertical lobing. The center to center, inter-driver spacing must also be shorter than the wavelength of the crossover frequency. A crossover point that is too high or driver spacing that is too wide, will create vertical lobing. The coherency of the system will suffer
- To keep the Hiquphon tweeter from being overdriven an attenuation rate greater than 24 dB per octave was used.
- In-phase, low "Q", 24dB per octave acoustical slopes were chosen for both the high pass and low pass sections of the crossover. This allows high attenuation rates, avoids vertical lobing “tilt”, minimizes group delay and rapid phase shift. Below the crossover point, the tweeter has a higher attenuation rate of 36dB per octave. It is actually an asymmetrical crossover but behaves as a classic 24 dB, Bessel filter at the crossover point.
- When each of these design elements are properly combined, the result is a smooth on and off axis frequency response, the elimination of vertical lobing and a very coherent sound source. The Ego is a true performer.

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Construction Techniques:

Enclosure:

I suggest using the enclosure drawings included with these plans but other construction methods are expectable as long as the driver placement and front baffle size are not changed.

- 1) A stiffer box is better. I suggest a minimum material thickness of .75 inches. If you decide to use thicker material or more bracing, make up for any lost volume by increasing the depth of the enclosure. If the front baffle size or driver placement is changed by more than 1", the system performance may suffer.
- 2) To minimize diffraction, both the woofer and tweeter should be flush mounted into the front baffle.
- 3) 1" acoustical foam or other damping material should be placed on at least three of the internal surfaces of the enclosure. Always cover the rear of the enclosure with a damping material. Loosely stuff the enclosure with Dacron (Polyester) or a similar type of damping material.
- 4) The enclosure edges may be rounded if desired. Rounding will not improve the sound quality but may be visually desirable.
- 5) If you desire to make the front baffle thicker, I recommend chamfering the backside of the woofer thru-hole in order to minimize internal reflections from the thru-hole sidewalls. Make sure to increase the enclosure depth to make up for the thicker baffle material
- 6) To prevent air leakage, use gaskets on both drivers and the input cups.

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Crossover Construction:

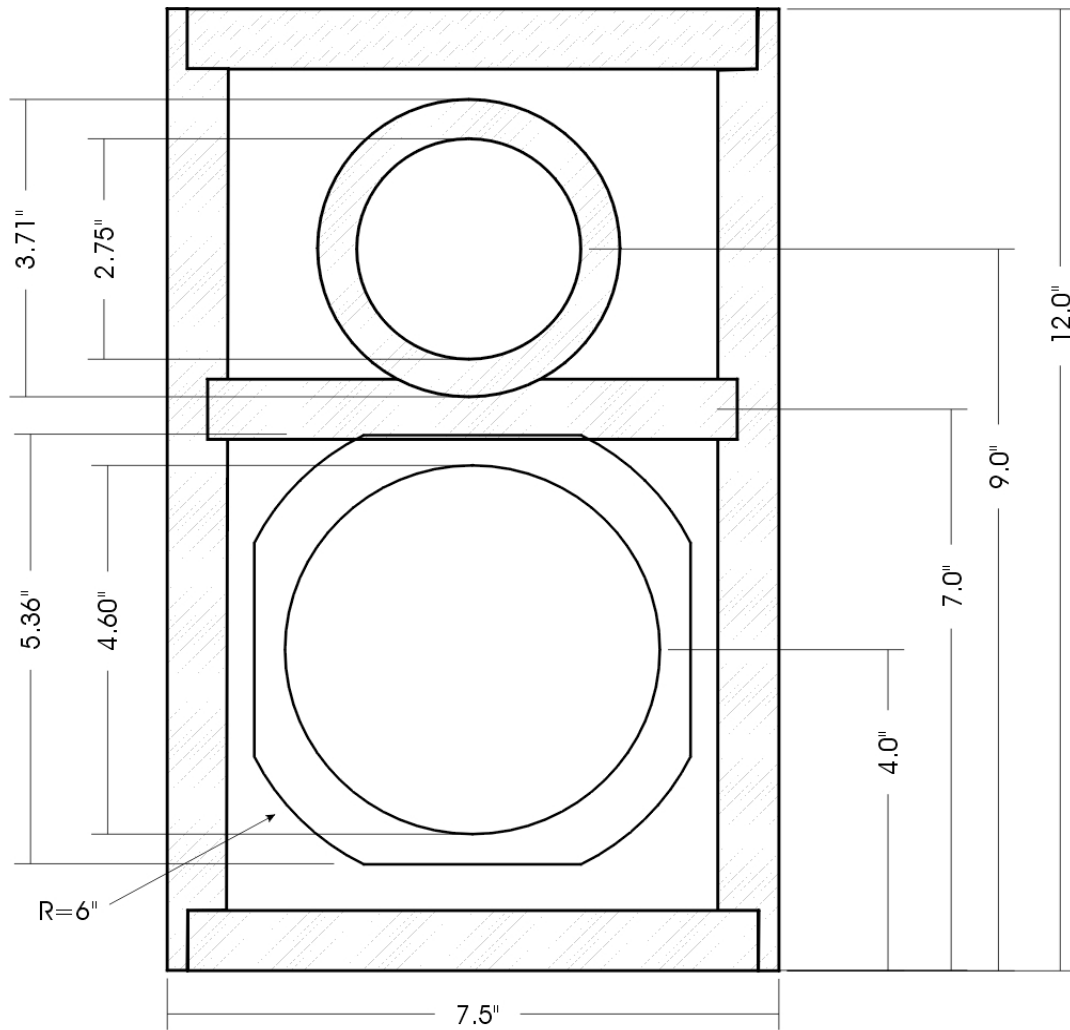
- 1) Use high quality components. Inductors should be air core types. Note the DC resistance (DCR) stated in the schematic. Higher DCR values will alter performance.
- 2) Capacitors should be 100V polypropylene or better. If cost is an issue, you may want to use electrolytic capacitors in the parallel branch of the woofer and tweeter circuit.
- 3) To reduce magnetic coupling, place the inductors as far apart from each other as possible or at 90 degree angles to each other.
- 4) Solder your connections. Do not use push-on type connectors. Unsoldered connections will reduce performance and degrade over time.
- 5) Use good quality internal wiring. I recommend a minimum thickness of 18-gauge wire. High purity copper or silver wire works well.
- 6) If you are new to building crossovers, it may be easier to layout and connect the crossover components as pictured in the schematic.
- 7) The crossover components can be wired, "point to point" or a printed circuit board may be used.
- 8) Make sure the polarity is correct for the woofer, tweeter and input terminals.

Design Modifications:

1. Since everyone has different listening tastes, the Ego can easily be adjusted to suit your needs. If the tweeter sounds too dull or too bright, simply lower or raise the resistance of the 5.6 ohm series resistor in the tweeter circuit. I suggest subtracting up to 1 Ohm if you want a brighter sound and adding 1 Ohm for a more laid back sound, use your ears!
2. The crossover was designed using a specific driver placement and baffle size. Because of baffle edge diffraction, as well as baffle diffraction loss, any dimensional changes greater than 1" may affect the performance of this system. If you wish to change the enclosure volume or use a material thickness greater than $\frac{3}{4}$ ", I recommend that you adjust only the depth of the enclosure.

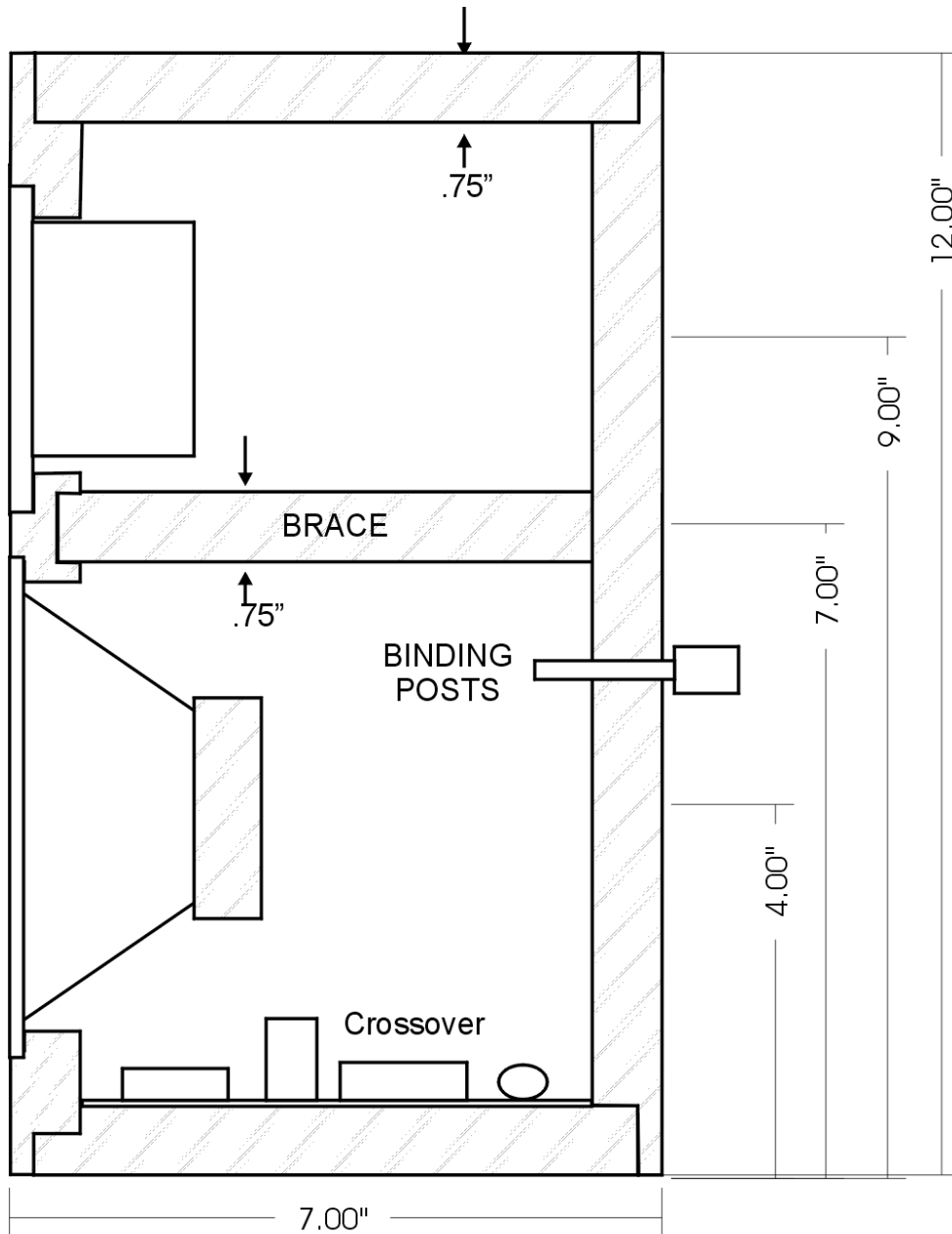
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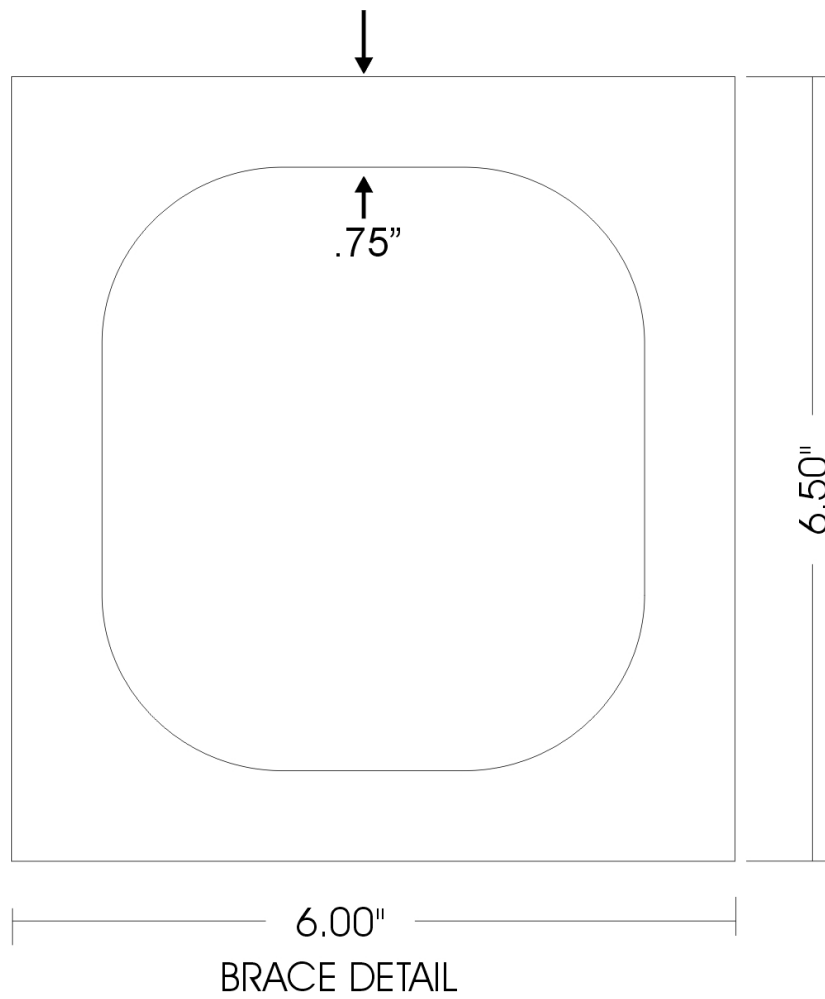
Front View

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7.00"
Side View

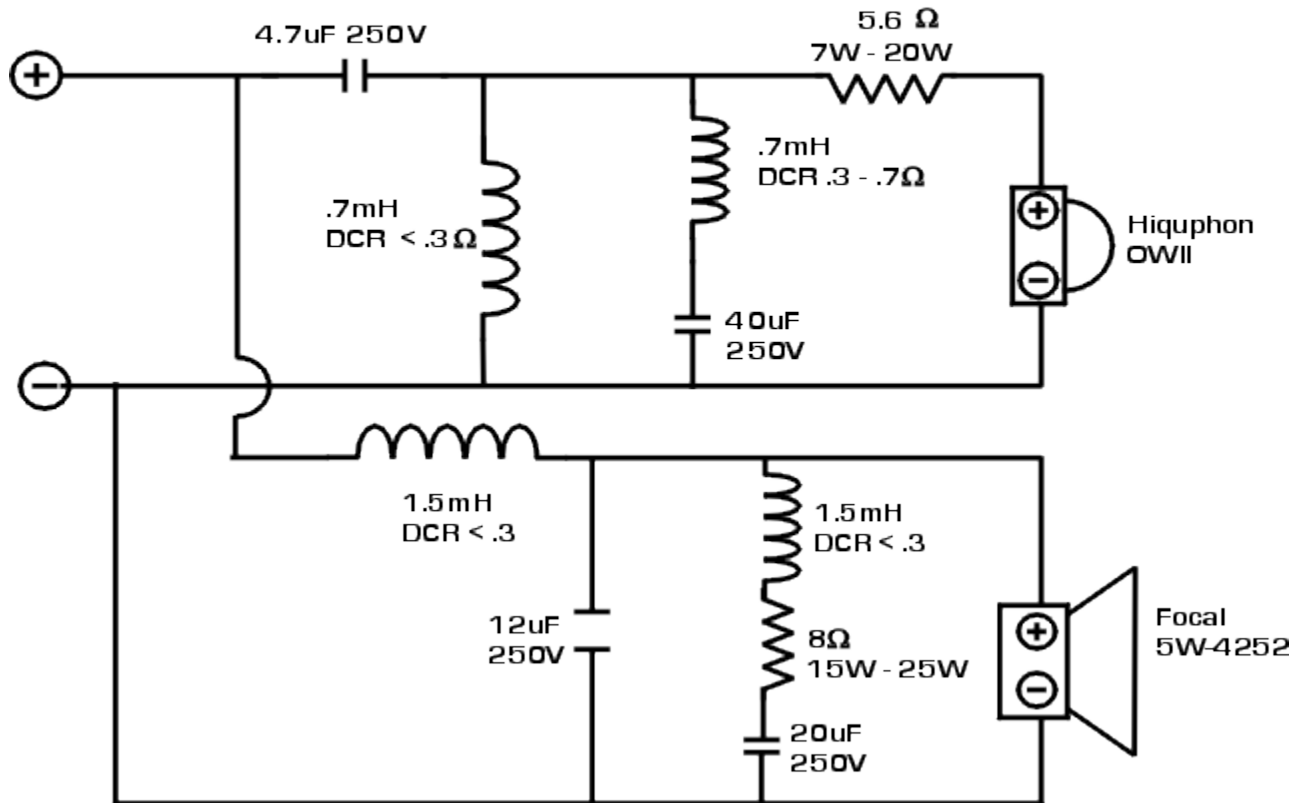
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"The Ego"
7-21-01 Rev. A
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Ego System On axis response

