

## ***Seriatim***

Designed for Ludicrousity InDIYana, April 2014 by John Hollander

This project is a retro book shelf cabinet using the HiVi RT1.3 tweeter and RS180P-8 woofer.

The purpose of the design is gain experience with series crossovers and experiment with steep crossover slopes to reduce distortion and improve off axis performance.

Driver selection started with using the HiVi RT1.3 planar tweeter and then picking the RS180P-8 woofer to get to the 3,000+ Hz crossover point in a stand mounted sized cabinet. Driver cost total about \$185 The HiVi RT1.3 WE (round face plate) is a direct replacement.

The enclosure design is 14.5 liters vented, tuned to about 50Hz. The slot port has an area of 17 cm<sup>2</sup> and is 8.5 cm long with flares on both ends. The cabinet is lined with 1 inch Roxul covered with ¼ poly batting on the sides. The back has a “pillow” made from 2 ½ inches of Roxul and ¼ inch poly batting.

The cross over transfer functions are shaped similar to the Neville Thiele Method™ (NTM). The slopes are 48dB /octave, eighth order. The crossover is an elliptical filter with ripple in the stop band.

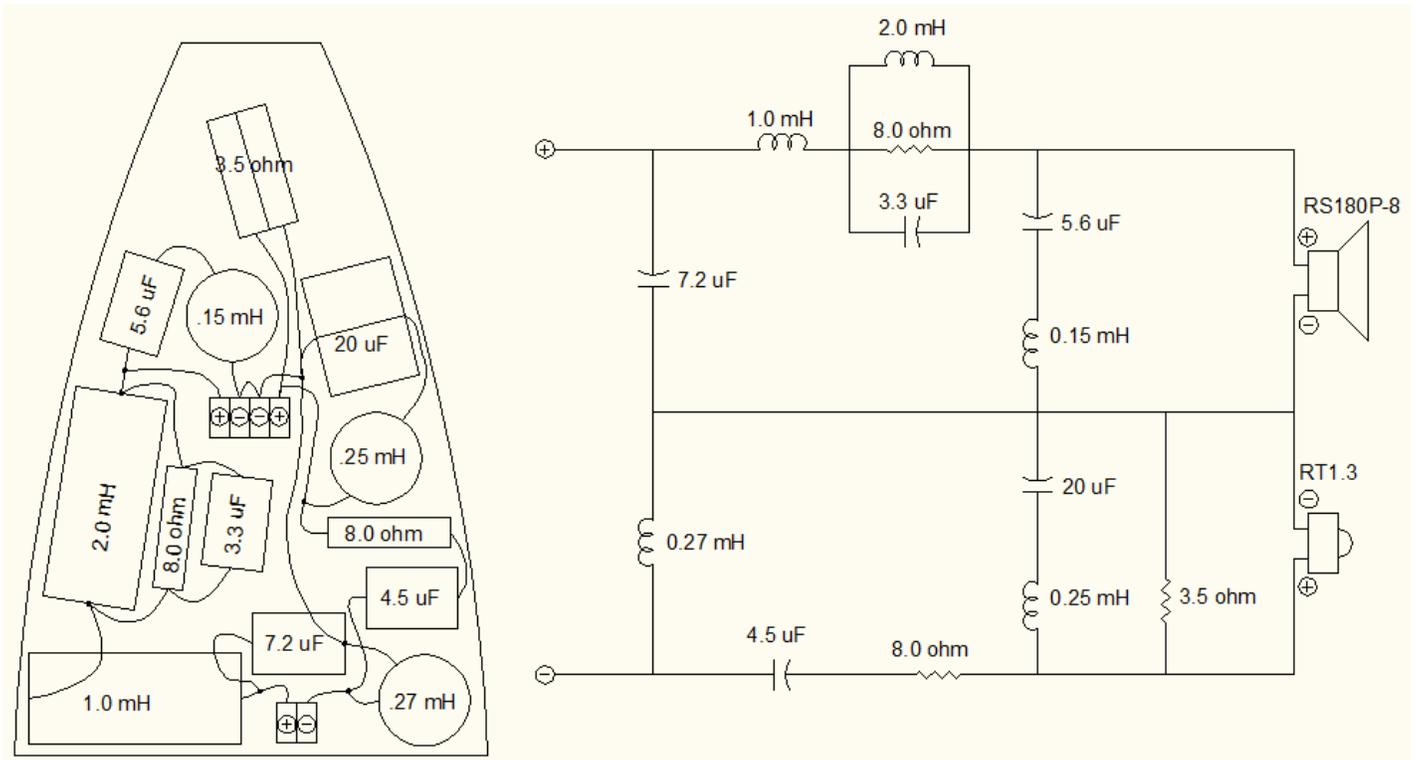
There are two crossovers. The original was found to have excessive bass below 200 Hz when positioned close to a wall or on a book shelf and has been “tweaked” to improve performance.

The HiVi tweeter sounds best with decent quality capacitors.

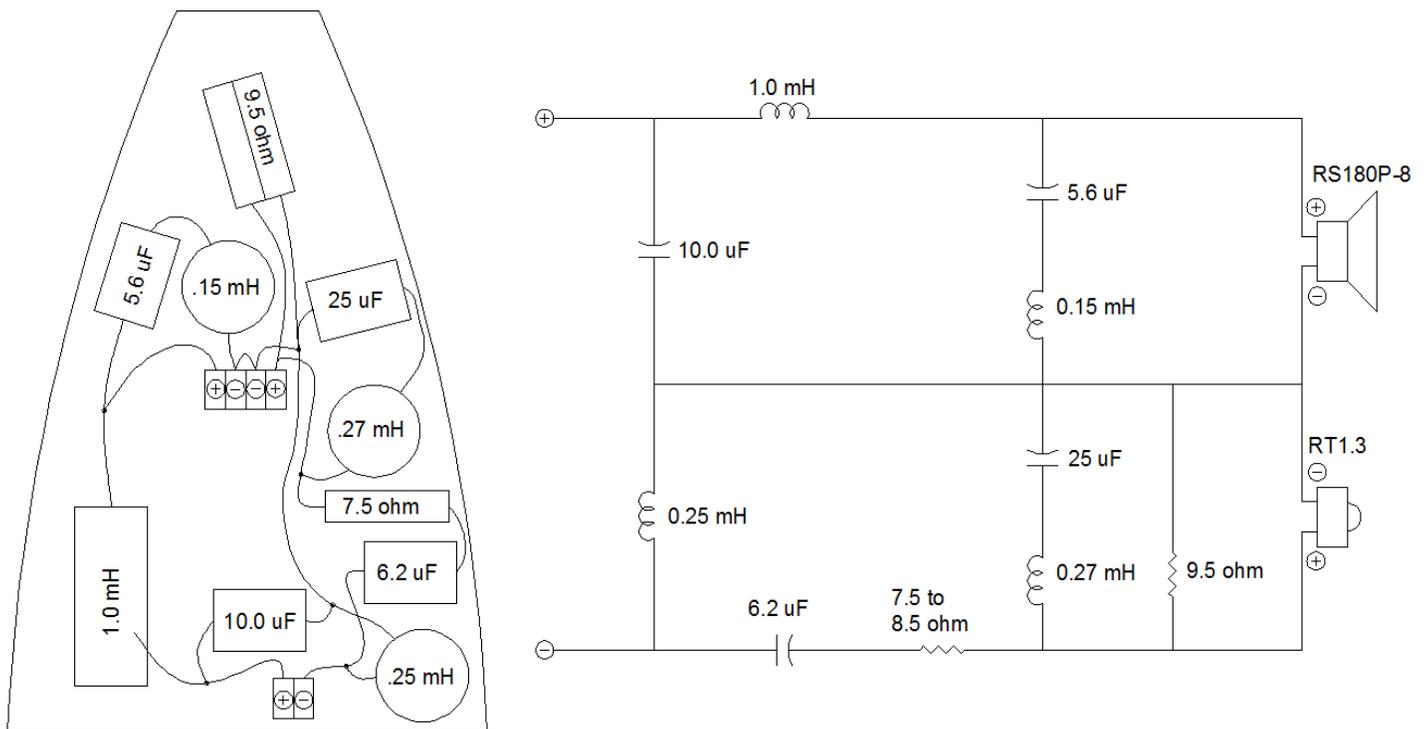
The enclosure is ½ inch MDF with a separate hardwood baffle. The sides are kerfed ½ inch MDF glued to a frame made from the front, back, top, and bottom. The MDF cabinet is spray painted black with a satin gloss clear coat. The hardwood baffle is made from oak and mahogany. The grain is filled with natural color filler. The baffle is stained with Minwax Early American. The baffle is top coated with Deft rattle can semi-gloss lacquer. The hardwood baffle is attached to the MDF box with two screws at behind the woofer frame sides and two behind the tweeter at the top and bottom. There are also 2 pocket screws at the bottom under the port.

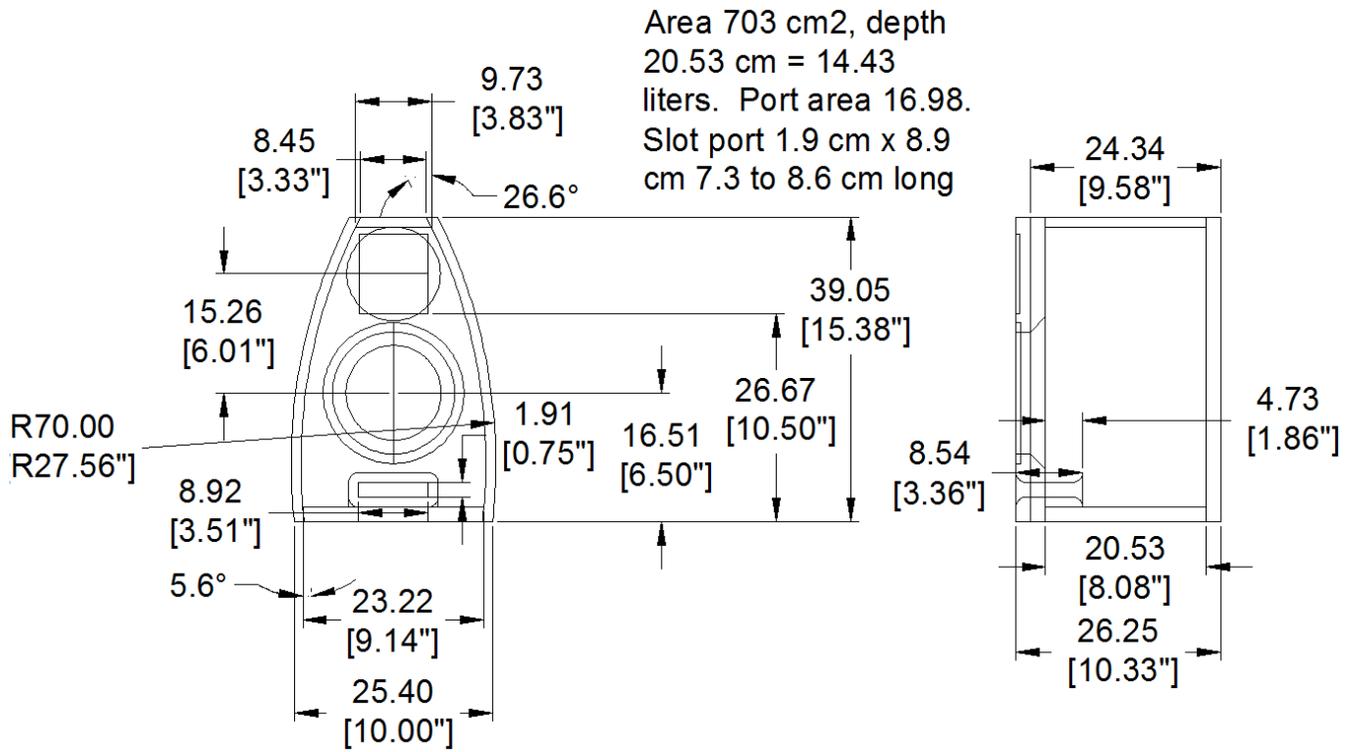


### Original crossover

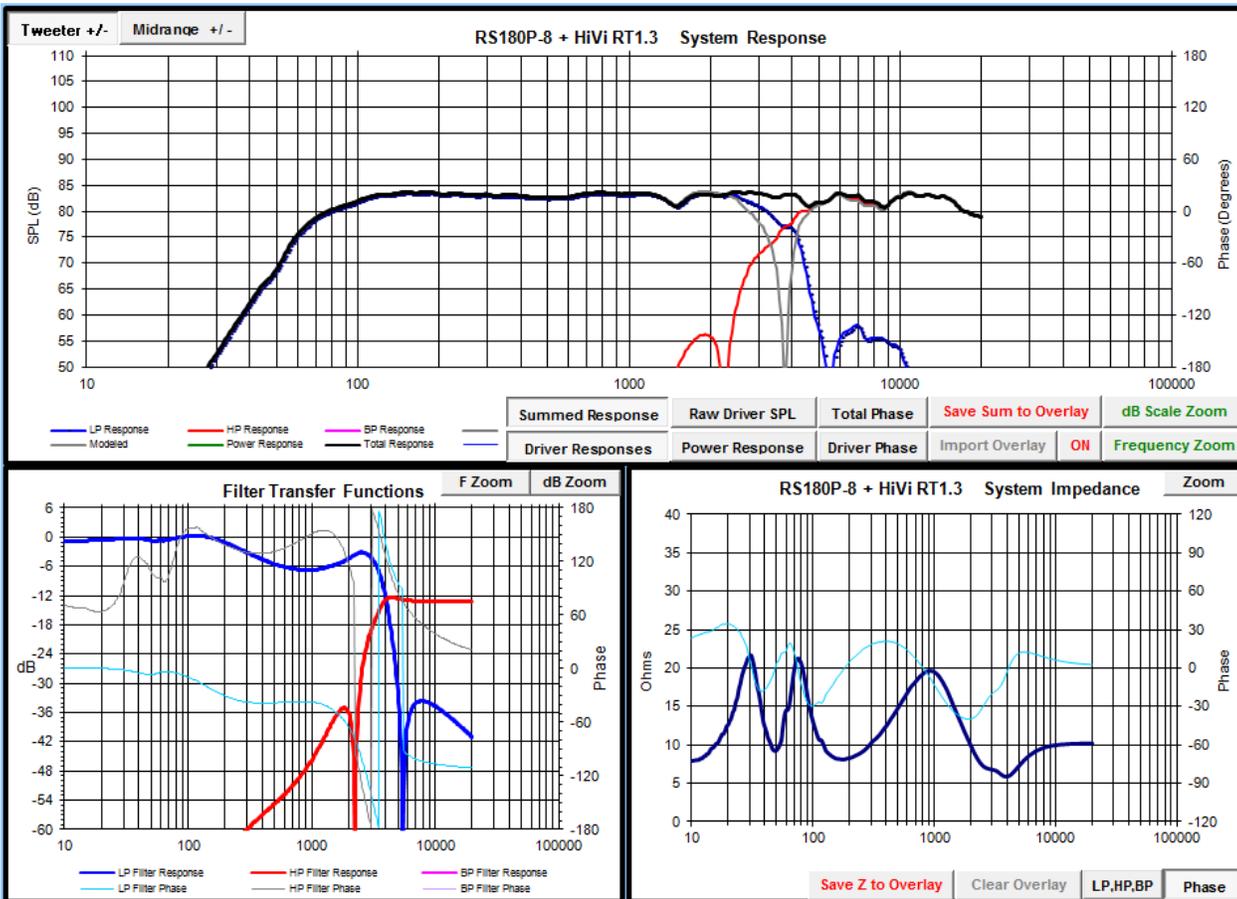


The “tweaked” crossover has less baffle step for bookshelf mounting. The 7.5 ohm padding resistor can be increased to 8 or 8.5 ohms for less sparkle. The 1.0 mH inductor is a steel laminate inductor with a DCR value of .15 ohms (or less)





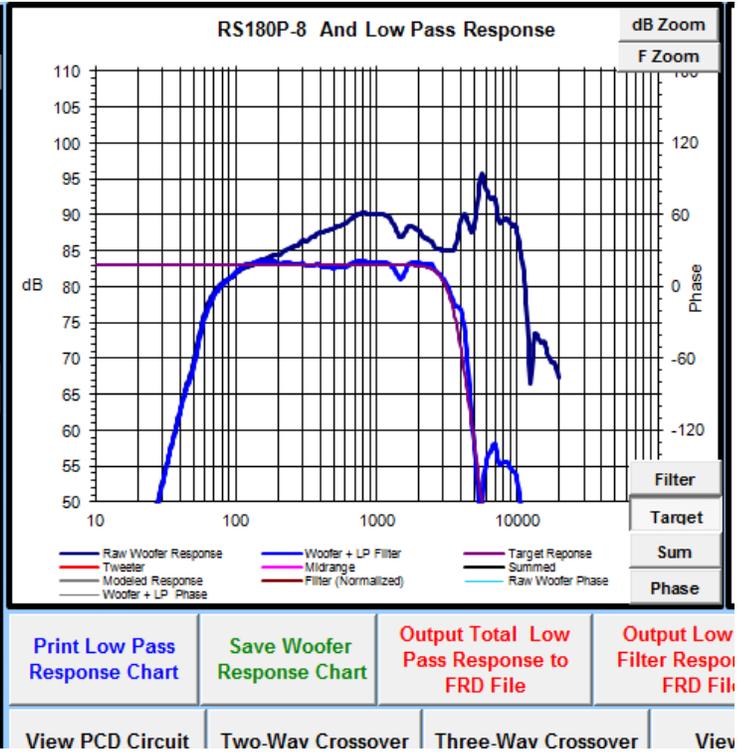
Original crossover details



Original crossover details

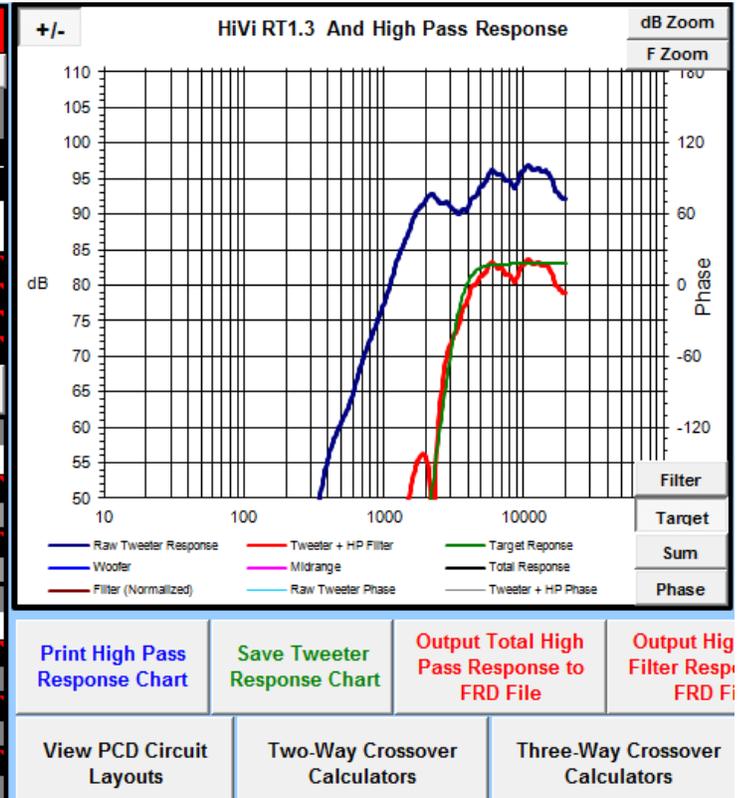
### Woofers Low Pass Crossover Design Section

Target Transfer Function		Import Target Response	
Select Desired Response Shape			
Target Transfer Function	Enter Frequency	Enter dB Level	
Eighth Order Linkwitz-Riley Target	3,500 Hz	83.0	
Woofers Low Pass Circuit Selections and Component Values			
Select Low Pass Crossover Order	Crossover Component Values in mH, uF, & Ohms		DCR or Series R
Selected Filter:			
Second Order Series	C2 uF	7.20	0.00
Selected Electrical Frequency:	L3 mH	1.00	0.50
3,500 Hz			
Initialize Textbook Values		Clear Crossover Values	
Select Topology to be in Series Before or After LP Filter			
		Enter Appropriate Values for Circuit	
	L mH	C uF	R Ohm
Before Crossover - Selected Circuit:			
No Series Elements			
After Crossover - Selected Circuit:			
Parallel RLC Notch Filter	2.00	3.30	8.00
Select Topology to be in Parallel With Woofer			
		Enter Appropriate Values for Circuit	
	L mH	C uF	R Ohm
Parallel Leg 1 - Selected Circuit:			
No Parallel Elements			
Parallel Leg 2 - Selected Circuit:			
Series RLC	0.15	5.60	0.00



### Tweeter High Pass Crossover Design Section

Target Transfer Function		Import Target Response	
Select Desired Response Shape			
Target Transfer Function	Enter Frequency	Enter dB Level	
Eighth Order Linkwitz-Riley Target	3,500 Hz	83.0	
Tweeter High Pass Circuit Selections and Component Values			
Select High Pass Crossover Order	Crossover Component Values in mH, uF, & Ohms		DCR or Series R
Selected Filter Order:			
Second Order Series	L9 mH	0.27	0.20
Selected Electrical Frequency:	C10 uF	4.50	0.00
3,500 Hz			
Initialize Textbook Values		Clear Crossover Values	
Select Topology to be in Series Before or After HP Filter			
		Enter Appropriate Values for Circuit	
	L mH	C uF	R Ohm
Before Crossover - Selected Circuit:			
No Series Elements			
After Crossover - Selected Circuit:			
Series Resistor	8.00		
Select Topology to be in Parallel With Tweeter			
		Enter Appropriate Values for Circuit	
	L mH	C uF	R Ohm
Parallel Leg 1 - Selected Circuit:			
Series RLC	0.25	20.00	0.00
Parallel Leg 2 - Selected Circuit:			
No Parallel Elements			
Parallel Leg 3 - Selected Circuit:			
Parallel Resistor	3.50		



<b>Series Two-Way</b>	Woofer Piston Dia. (mm)	0.0 mm	
	Tweeter Piston Dia. (mm)	0.0 mm	
<b>Load Wiring Configuration</b>	Midrange Piston Dia. (mm)		
<b>Enter All Dimensions In Meters</b>	<b>Vertical</b>	<b>Horizontal Panning</b>	
Listening / Measuring Distance	2.000	0.000	
Relative Listening Height	0.000	0.00 Deg	
Vertical Off Axis Angle (degrees)	0.00	L	R
<b>Enter x,y,z Driver Geometry</b>	<b>Tweeter</b>	<b>Woofer 1</b>	<b>Mid 1</b>
Driver Horizontal Offset (x)	0.000	0.000	0.000
Driver Vertical Offset (y)	0.000	-0.153	0.000
Driver Z Offset (z)	0.000	-0.028	0.000

<b>Vented Box</b>	
<i>Port</i>	
No of ports	1
Inside port dia.	4.65 cm
Port area	16.98 cm <sup>2</sup>
Port end correction	0.732
<i>Standard Design</i>	
Vb	11.7 l
Fb	55.25 Hz
F3	59.93 Hz
Port min dia. !	6.77 cm
Port length	10.92 cm
<i>Design by Vb, Fb and Q</i>	
Physical Vb	14.4 l
Absorption, Qa	80
Leakage, Ql	15
Port, Qp	80
Alpha, a	1.492
Vb	14.7 l
Fb	55.96 Hz
F3	52.48 Hz
Response peak	0.51 dB
Peak at	71.78 Hz
Port min dia.	4.25 cm
Port length	7.73 cm
Port 1. resonance	1556 Hz

