Homemade 18" Subwoofer using a Peavey Low Rider 18" Speaker

# The Project

Recently I upgraded my JBL JRX118SP subwoofers to the JBL PRX618XLF subwoofers. I sold one of my JRX and have one left. I took the PRX subwoofer to a gig and the amps in the subs stopped working on the first night. They were under warranty so I took them to Winston Electronics (http://www.winstonorgan.com/) in St. Louis for repair. After two weeks, Winston Electronics received replacement amps from JBL. When they tested the new amps, they were dead on arrival. After another two weeks, JBL sent working amps and Winston Electronics repaired the subwoofers. This experience has left me a bit skittish about these PRX subwoofers and whether I can count on them. If they fail again, I'm left with one JRX118SP (300 W) subwoofer for bar gigs, bigger cooperate events and weddings. An inherent risk with powered speakers is failure of the amp making the entire subwoofer useless. If the amp fails with a passive speaker, one can simply replace the amp. Therefore, I decided to build my own passive subwoofer as a backup and possibly as an additional subwoofer for large events needing more bass.

I have found that Parts Express (<u>http://www.parts-express.com</u>) to be a good source for raw speakers and parts. After some research, I decided to buy the Peavey Low Rider 18 (<u>http://www.parts-</u> <u>express.com/pe/showdetl.cfm?Partnumber=294-301</u>) for my project. It was reasonably priced at \$214 and would have plenty of power (800 W continuous/ 3200 W peak) for my needs.

Peavey Electronics publishes detailed specs on their speakers and even provides recommendations and specs for building the speaker enclosure. The specs for the Low Rider speaker are available at <a href="http://www.peavey.com/assets/literature/specs/116625\_13679.pdf">http://www.peavey.com/assets/literature/specs/116625\_13679.pdf</a>. I tried to follow the enclosure recommendation as closely as possible although I had to make some modifications.

#### The Wood

Peavey recommended Baltic birch plywood of at least 7-ply and no less than  $\frac{3}{4}$ " thickness. When I went to St. Charles Hardwood (<u>http://www.stcharleshardwoods.com/</u>), they had just sold their last 5' x 5' sheet of 3/4" Baltic birch plywood but they had two sheets of 5/8" in stock. Because I wanted to complete this project while I was off work for Christmas, I bought two 5/8" thick sheets.

Now, I had to decide how big to make the cabinet. Peavey recommended a dual-ported enclosure with a net volume of either 5.0 (Small Vented Box), 6.75 (Medium Vented Box), or 9 (large Vented Box) cubic feet. Both the medium and large box used two 6" diameter ports 12 inches in length so I assume that any size between 6.75 and 9 cubic feet would work.

I started with the front and back panels. The speaker was 18" in diameter but I also wanted to use a grill cover that was secured by metal brackets. That would add about an inch on both sides of the speaker. To allow some room for error, I decided to make the front panel width 22". I was going to put the ports

on the front panel above the speaker so 18" for the speaker plus 6" for the port(s) would be a minimum of 24". I added an extra inch for comfort and made the front and back panels 22" x 25".

Cutting large sheets of plywood is not easy. My Craftsman table saw has a 24" fence so any cuts larger than 24" have to be done with a handheld circular saw. Fairly accurate cuts can be made if you clamp a fence onto the sheet of plywood and use that as a guide for cutting. There is a good video on Youtube for this technique. <u>http://www.youtube.com/watch?v=QvcCLIX2NK8</u>. Generally, when I cut the plywood with a circular saw, I cut it about an inch greater than the finished measurement. Then, I could put it up against the fence on the table saw and cut it to the final measurement.

# Making the Box

The box was made using two 26" x 26" panels and two 24" x 26" panels. The panels were joined using rabbit into dado joints, which were all cut using a router. This type of joint is rather easy to make and provides a very sturdy joint. Peavey recommends joining the box with dadoes. Because I'm using slightly thinner plywood than they recommended (5/8" instead of ¾"), I thought a stronger rabbit/dado joint could help compensate.

The panels were joined using wood glue. I drilled pilot holes and used drywall screws to hold the joints tight while the glue dried. This was easier than using bar clamps and also reduced any downtime waiting on the glue to dry. I also screwed blocks with 90 degree angles to each corner to help square the box. The blocks were removed after the glue dried.



#### **Cutting the Speaker Hole**

I decided to use my router to cut the speaker hole. According to the speaker specs from Peavey, the hole should be  $16 \frac{3}{4}$ " for the 18" speaker. I made a pencil mark two inches from the left and right of the front panel and then used the speaker as a template to draw a circle where the hole should be cut. I then found the center of the hole by drawing lines through tangents. Here is a video to explain. http://www.youtube.com/watch?v=n4nrzMPX5Uc. I found it really easy using a large square.

I made a jig to cut the circle with my router as explained at <a href="http://www.youtube.com/watch?v=RkMVM7Lukz8&feature=related">http://www.youtube.com/watch?v=RkMVM7Lukz8&feature=related</a>.

#### **Port Holes**

The next step was to make the 6" port holes. After reading the Peavey recommendations again, I noticed that the ports should be a port-diameter width from any internal wall. This would not be possible on the front panel. Therefore, I needed to put the port elsewhere. I found several discussion

forums on the internet that said placement of the port is not important. I decided to put the ports on the back panel. I placed them 6" from the outer panels. The plastic ports I bought were only 6" in length so I joined two of them using black Duct tape. This provided very sturdy 12" long ports.

I was going to use the router to make the holes but the radius of my router is 3", so it was not possible to cut a hole with the jig for circles with a diameter of 6" or less. Instead, I made a similar jig for my Dremel tool and used a multipurpose cutting bit to cut the holes.

# Dremel Tool Jig





#### Attaching the Front and Back Panel

I planned to recess the front and back into the cabinet enough to protect the speaker. The speaker with the grill cover extended about 1 ¾" above the wood so that would be the distance of the recess. I initially thought I would dado the front and back panels into the box with dadoes cut into the top, bottom and sides. That would require maybe more accuracy in woodworking than I was comfortable to perform. Therefore, I decided to glue 1 to 2" strips of hardwood (one piece for each side of the box) to form a frame inside the box. That would allow me some room for error. The front and back panels were then glued to that frame and secured with drywall screws until the glue dried.

The frame and all joints for the box were sealed with silicone caulk.

#### Bracing

Peavey recommended adding a brace to reduce flex in the cabinet. I found a scrap piece of oak of about  $1'' \times 2''$ . I cut it to fit the width of the cabinet. I placed the brace in between and perpendicular to the two ports. I drilled one hole on each side of the cabinet and glued the brace to the interior walls of the

cabinet using a screws from the outside of the cabinet to pull it tight. The brace will reduce flex in the cabinet and increase the overall bass output.

# Installing the Speakon Connectors

Holes were drilled to insert speakon connectors into the back panel. Speaker wire was connected to the 1+ and 1- poles of the speakon connectors. The positive wires and negative wires going to the speaker were twisted together and inserted into the speaker poles to create a parallel connection for the two connectors. This will allow me to connect two separate cabinets in parallel.

# **Adding Batting**

Polyester batting was attached using spray adhesive and staples to the interior of each panel.

# **Mouting the Speaker**

To mount the speaker, I drilled ¼" holes using the speaker as a template. On the backside of the panel, I inserted Hurricane T-nuts and pulled them flush against the front panel using the accompanying bolt. The first time I screwed the speaker to the panel, I used my cordless drill. Three of screws stripped and I had to cut them off with a Dremel tool. I highly recommend threading the screw into the T-nut by hand and then using a regular screw driver to tighten them.

#### **Installing Handles**

The metal handles were centered on the side panels and an outline was drawn for the hole. The holes were cut using a jig saw. An additional 1" around the hole was routed 3/32" so that the handle would sit flush with the cabinet.

#### **Final Touches**

All of the screw holes, used to hold the joint tight while gluing, were filled with wood putty and sanded flush. Corner braces were added. Here are photos of the project before the Line-X coating.







Here are some pics of the final Line-X finished cabinet.













# Parts List

Part	Source/Part No.	Cost
2 sheets of Baltic Birch	St. Charles Hardwood in Fenton, MO	\$110
piywood		4
Peavey Low Rider 18	Parts Express/ 294-301	\$214
speaker		
2 Dayton Audio MH111	Parts Express/262-821	\$11.60
Steel Bar Handle		
Dayton MC130-16 Metal	Parts Express/262-836	\$8.93
2-Leg Cabinet Corner		
Black 16 Pcs.		
Peavey 18" Metal Speaker	Parts Express/248-8804	\$29.98
Grill Kit		
#8 x 3/4" Deep Thread	Parts Express/081-422	\$2.45
Pan Head Screws Black		
100 Pcs.		
16 gauge speaker wire		Had some around the
		house

Neutrik NL4MPR Speakon	Parts Express/092-054	\$5.20
4 Pole Round Chassis		
Mount		
3/16" (16-14) Female	Parts Express/095-287	\$4.59
Disconnect 50 Pcs.		
20 pcs #10-32 x 1-1/2"	Parts Express/260-846	\$10
Black Machine Screw		
Button Head Security Hex		
#10-32 Hurricane Nuts 50	Parts Express/081-1082	\$5.75
Pcs.		
5/32" Security Allen Type	Parts Express/360-227	\$3.95
Bit 2"for the security		
screws		
Polyester batting	Hancock fabrics	\$8.00
Spray adhesive	Lowes	\$5.00
Silicone caulk	Lowes	\$5.80
Line-X coating	http://www.linexofstlouismo.com/warrant.php	\$143.00

- Total costs: \$567.25
- Total labor time: about 24 hours
- Net Volume of the cabinet: 22" x 22.5" x 25" = 7.16 cubic feet, not accounting for the volume of the brace, batting and speaker. My guess is that the total net volume is close to the 6.75 cubic feet recommended for the Medium Vented Box.

http://www.keithredingband.com/HomemadeSubwooferProject.pdf