The DR300

This speaker designer's latest effort is suitable for use in the largest venues, smaller and lighter than you should have a right to expect, yet still offers uncompromised sonic quality.

By Bill Fitzmaurice

PHOTO 1: The DR300.

A few years back I designed the DR250a (Jan. '04 *aX*), now widely recognized as one of the best pro-sound cabs out there. It's small, lightweight, powerful, and sounds great. But it is a cabinet intended for small to medium venues. The recent explosion of large concert sound facilities—both nationwide and worldwide—has produced demand for ever larger and more powerful loudspeakers.

My response to many requests for a DIY pro-sound top box that is unsurpassed in wideband SPL by any other (DIY or manufactured), is the DR300 (**Photo 1**). With average sensitivity of 108dB/2.83V/1m from 80 to 16kHz (**Figs. 1** and **2**), this is one loud box, but at less than 11ft^3 and about a hundred pounds, it's far smaller and lighter than many speakers that don't even come close to this level of performance.

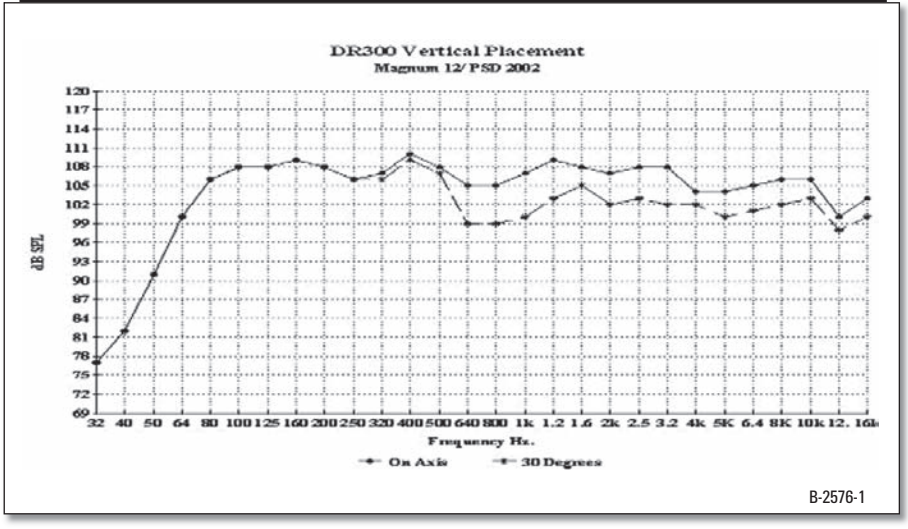
FEATURES

What you first notice on the DR300 are the dual HF horns. Sufficient power handling and a line-arrayable high-frequency section for this concert-grade speaker require a pair of compression drivers and HF horns. The horns are modified to fit the box dimensions and to allow the HF drivers to straddle the woofer. A cutaway view explains more than is possible with the proverbial thousand words. Take a close look at **Photo 2**.

As you can see, the HF drivers come quite close to the woofer frame, actually nestling into the gaps between the frame spokes, while the HF horns have been trimmed at one end to fit into the cabinet. Not so obvious is that the frames of the horns have also been trimmed in the middle of the cabinet, placing the mouths of the two horns as close to each other as possible without having the drivers hit the driver frame. When two horn mouths are placed close enough—ideally actually melding—the two horns will act as one. When there is space between the mouths, comb filtering occurs at higher frequencies.

In the case of the DR300 prototype, that space measures about 1.25″, and combing occurs above about 8kHz. That combing is hardly detectable, especially if the HF horns are vertically arrayed, as is the case when DR300s are stacked as shown in **Photos 3** and **4**. (In **Photo 3** note the diffusers in front of the HF horn mouths, which improve horizontal dispersion when the horns are vertically aligned.) When used singly, the cabinet is placed with the lon-

FIGURE 1: SPL, cabinet vertical.



ger cabinet dimension on the vertical plane to deliver the widest possible dispersion. When stacked, the boxes are placed horizontally to vertically align the HF horns (**Fig. 3** tracks the woofer-only off-axis response of a single cabinet horizontally versus vertically aligned).

I loaded the prototype with an Eminence Magnum 12HO woofer. The pertinent T/S specs are fs 43Hz, SPL 95dB, Qts 0.29, Vas 80 ltr, Xmax 4.8mm, and Pe 600W.

Other drivers with similar specs will work just fine. An inexpensive driver that will do well is the Eminence Kappa 12, which has less power handling and excursion than the Magnum 12HO, but also has better high-frequency

PHOTO 2: DR300 cutaway view.

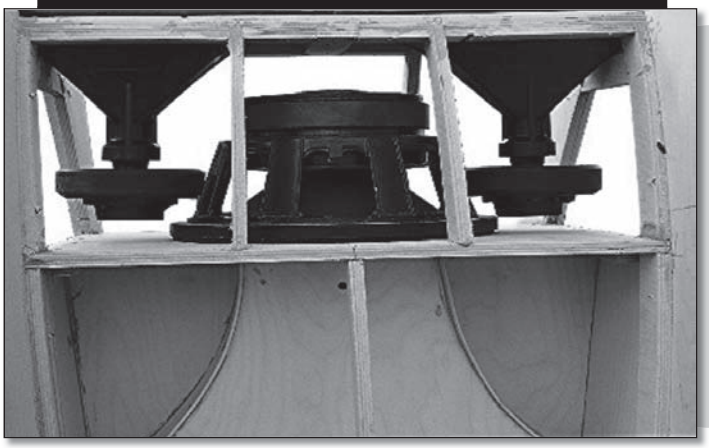


PHOTO 3: A pair of DR300s in a vertical line array.

performance. When shopping for drivers, give serious consideration to those with neodymium magnets, which are less than half the weight of ferrite magnet drivers, and also have more compact frames.

The HF drivers of the prototype are Eminence PSD-2002s, which offer high power handling at a very reasonable price. Their performance is somewhat marred by a response dip around 12.5kHz, but it's nothing that can't be easily corrected with EQ. Their diameter is 5.25″, about the maximum allowable in this cabinet. When choosing your HF drivers, also consider drivers with neodymium magnets and smaller frames.

The HF horns are generic models, Parts Express #270-099. Their overall size is about 15″ wide by 5″ high by 6″ deep. Should you use a different horn, keep the dimensions as close to these as possible.

Make sure your horns have flat mounting flanges with no extension of the horn beyond the flange. Do not use a CD horn. The PE horns are plastic, but aluminum is also OK. You can also find Eminence drivers, as well as the rest of the hardware, at **www.partsexpress.com.**

MATERIALS

The cabinet is primarily constructed from ½″ plywood. I recommend using Baltic birch for its strength and numerous plies. Be sure your birch is actually Baltic, i.e., Russian, Finnish, and so on. Northern birch from the US and Canada is also good.

However, some major retailers are selling "birch" plywood sourced from Asia that isn't actually birch. This product has a thin veneer outer layer that easily chips, and uses inferior glue that leads to delaminating. Quality Baltic birch has equal ply thicknesses and uses marine-grade glue. Baltic is usually found in 5 × 5′ sheets; you'll need two sheets per DR300.

The bent throat horn sheaths and back halves are made from 1/8″ birch, while the bent mouth horn sheaths are ¼″ spruce or pine. Look for three equal thickness plies, because ¼″ plywood with two thin plies over one thick ply, or four plies, doesn't bend very well. You also may need some ⅜ birch, depending on how you decide to configure the rear of the cabinet. A single sheet of each size will be more than sufficient for a pair of DR300s.

Bond all joints with drywall screws—piloted and countersunk—and adhesive. Be sure to deeply countersink screws along the cabinet edges so you don't hit the heads when rounding the edges over. Use 1.25″ screws jointing ½″ parts, 1″ screws with the thinner materials. As the joints must be absolutely airtight, I highly recommend using caulking-gun applied polyurethane base construction adhesive, which expands as it cures to fill gaps and makes caulking joints unnecessary. You also will need a hot-melt glue gun and a couple of feet of 6″ schedule 40 PVC water pipe, which actually measures close to 6½″ outside diameter.

If you're going to build a pair of these cabinets, or an array, you'll need to make tracing patterns of all the parts. Laying parts out is one of the more time-consuming aspects of the project. I suggest that you read the instructions and look at the photos three or four times before starting the job. If you have any qualms at all, log onto my forum at **http://www.audioroundtable.com/BillFitzmaurice/**, where you can chat with me and other builders who'll guide you through the process.

Note that all the measurements provided are somewhat approximate. The sizes of the finished parts can be influenced by the actual thickness of the materials used and by the accuracy of

FIGURE 2: SPL, cabinet horizontal.

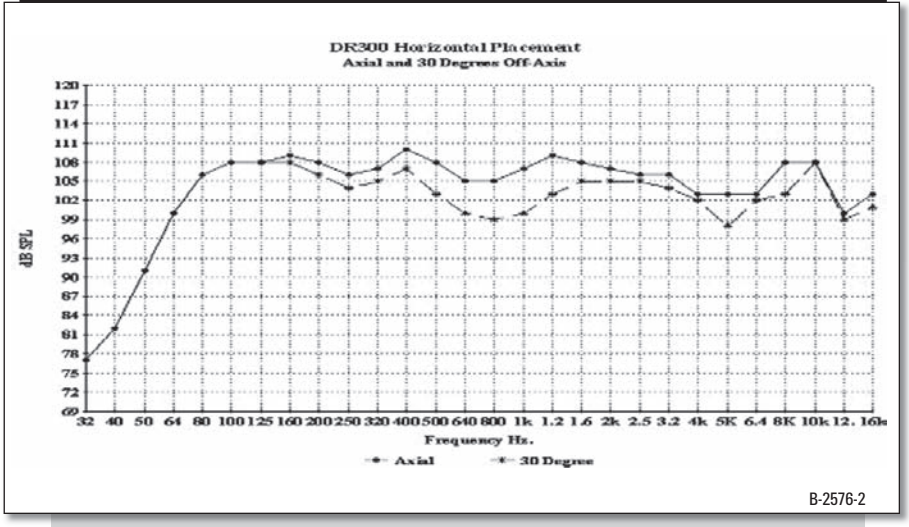
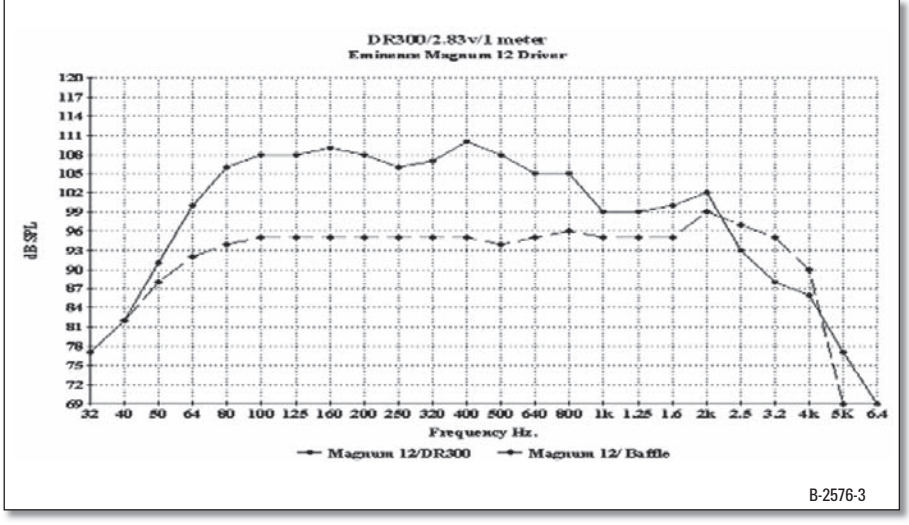


FIGURE 3: Woofer SPL horn-loaded versus plain baffle.



your construction. This isn't a problem, because the design is very forgiving of minor errors. However, until you are comfortable building DRs, you should not attempt to cut out all the parts ahead of time, because a very small size deviation in the early stage of construction can be magnified to a fairly large deviation by the end. Cut out each part as it is installed, trimming as required to actual finished size.

CONSTRUCTION

Start by cutting out the two throat horn sides and the throat horn divider. **Figures 4, 5**, and **6** show the blank that the throat horn side is cut from, the finished throat horn side dimension (and location of the divider), and the throat horn divider, while **Fig. 7** shows a full side cutaway view of the cabinet.

To trace the radii, make a compass (**Photo 5**) out of a strip of plywood, insert a screw or nail at one end, and at the radius distance make a hole through which you can insert a pencil point to draw the line. The center of the radius may fall off the piece of wood you're cutting, so have another piece of plywood handy for the compass point to rest on. When you cut on the radii, you'll end up with semi-triangular cutoffs, as shown in the before and after pictures. Save two of the cutoffs.

Attach the throat horn sides to the divider, with the extra ½″ of material

FIGURE 4: Throat horn side blank.

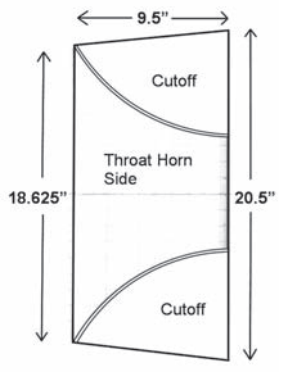


FIGURE 5: Throat horn side.

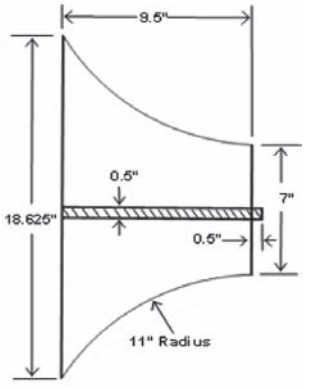


FIGURE 6: Throat horn divider.

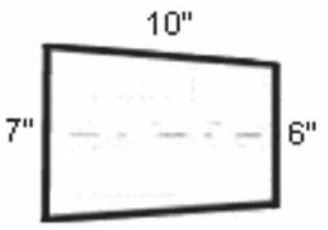


FIGURE 7: Side cutaway view.

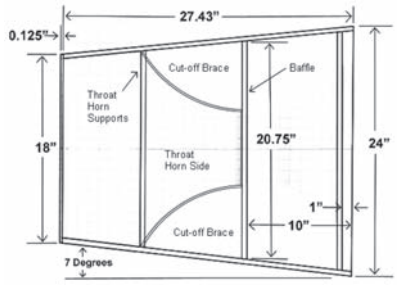
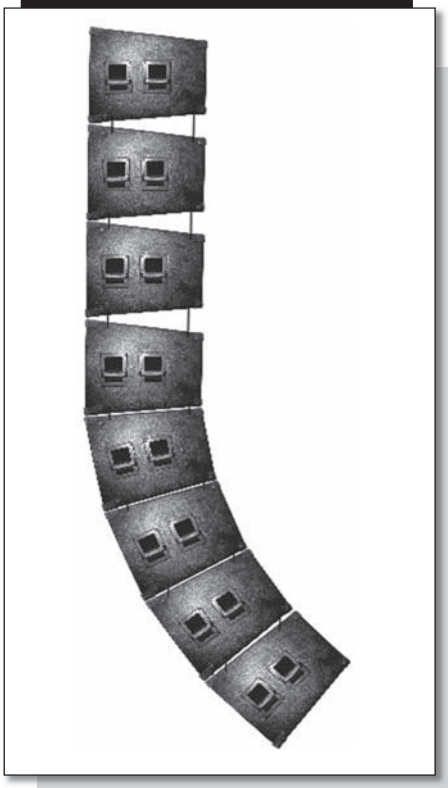


PHOTO 4: Eight DR300s in a "J" array.



protruding on the driver end. The narrow end of the divider goes toward the driver. Temporarily screw the assembly to a piece of scrap plywood (**Photo 6**)—squaring the sides—to stabilize the assembly.

Cut the throat horn sheaths from ⅛″ plywood. But first, flex the plywood to determine the easier-bending axis. Cut the sheaths oversize at 9″ wide by 12″ long; you will later trim them to final size. Attach one of the triangular cutoffs to a sheath—down the middle—with the driver end of the sheath flush to the end of the cutoff (**Photo 7**).

Attach this to the throat horn assembly, with the sheath flush at the driver end, hanging over on the other. Repeat the process for the other side. Avoid putting screws within 2″ of the end of the parts, or you may split the wood. Use long clamps to hold the gaps at the ends of the joints closed until the adhesive has set. At the mouth end of the assembly, trim and sand the sheaths flush to the sides.

Cut the throat horn supports, again oversized at 20″ by 6″, with one long side at a 3° angle. Attach the horn supports to the throat horn, the 3° angled side to the horn. Make sure the angles face the proper direction so that the resulting assembly is flat. You must drive the screws from inside the horn, which is easy if you have a right-angle or short-bladed screwdriver. While the adhesive is setting up, cut out the top and bottom according to **Fig. 8**.

PHOTO 6: Throat horn attached to assembly jig.

When you cut the excess from the rear, save the semicircle scraps, which you'll need later. Onto the top and bottom draw all parts intersections and porthole cut lines according to **Figs. 9** and **10**. Cut out the driver access portholes only when you're positive that you have everything properly laid out. Save them.

Draw on either the top or bottom where your woofer and HF horns and drivers will be going. The prototype's Magnum 12 has a very large frame and magnet, so you should be OK, but larger drivers do exist and you need to be sure that yours will fit. If you've ended up with a combina-

PHOTO 5: Tracing radii.

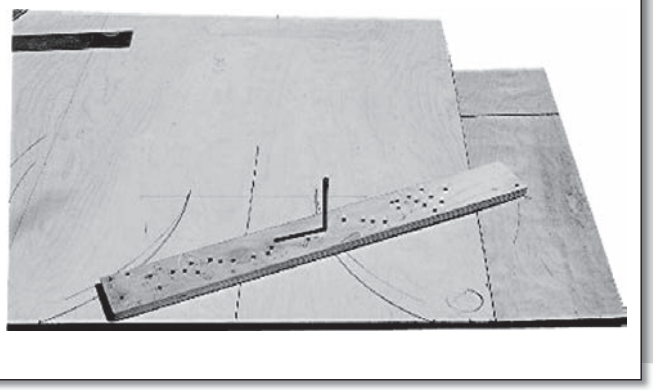


PHOTO 7: Throat horn sheath/brace.

tion of drivers that won't fit, you can make the front of the box as much as 2″ higher without ill effect, but you're on your own as far as how to adjust the parts sizing.

WOOFER AND TWEETER BAFFLES

The woofer baffle is very tricky if you don't pay close attention to what you're doing. The rough dimensions are 20.75″ high by 16.5″ wide. The top and bottom edges are cut at a 7° angle, the sides at a 20° angle. Refer to the diagrams to be sure you get the angles right. One set pitches to the front of the box, the other to the rear. Next cut a 6″ wide × 7″ high throat hole, centered vertically and horizontally on the baffle.

Using the woofer to determine their locations, drill holes in the baffle for T-nuts and install them. As large as this cabinet is, there's not much room in the driver chamber, so I highly recommend that you use Allen socket-head mounting bolts, which you can drive by feel. Don't locate the bolts at the baffle edges. You also will need to either rout away about ⅛″ of material from the baffle or add ⅛″ or ¼″ plywood spacer to prevent cone slap in long excursions.

FIGURE 8: Top/bottom layout.

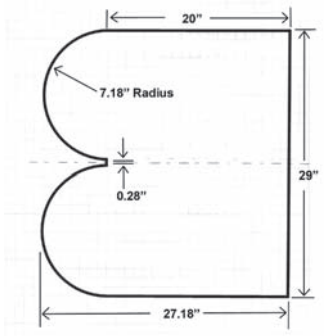


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FIGURE 9: Internal parts, top view.

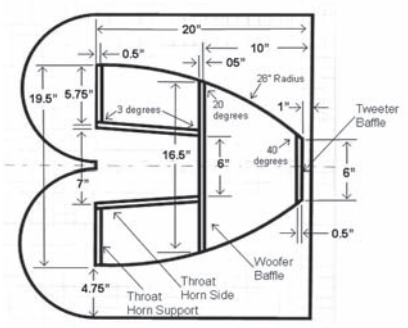

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FIGURE 10: Driver access port hole detail.

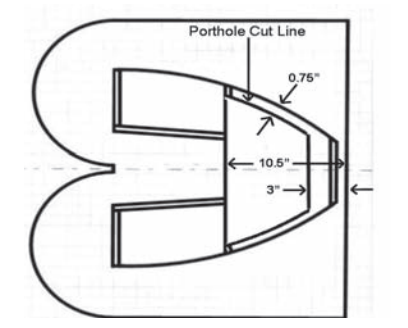

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PHOTO 8: Aligning the baffle.

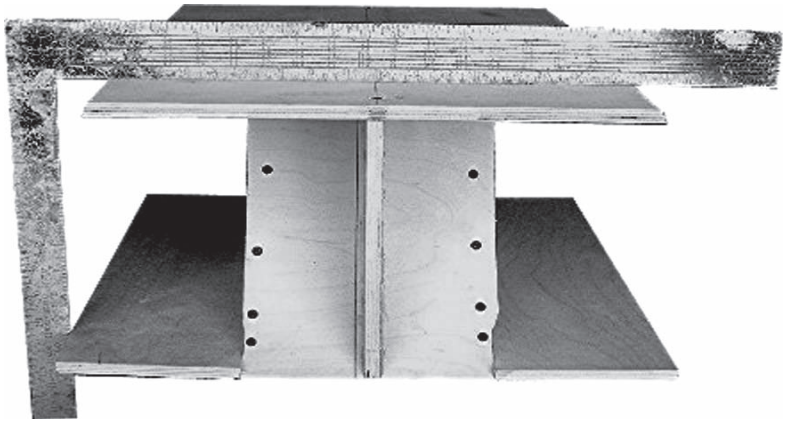
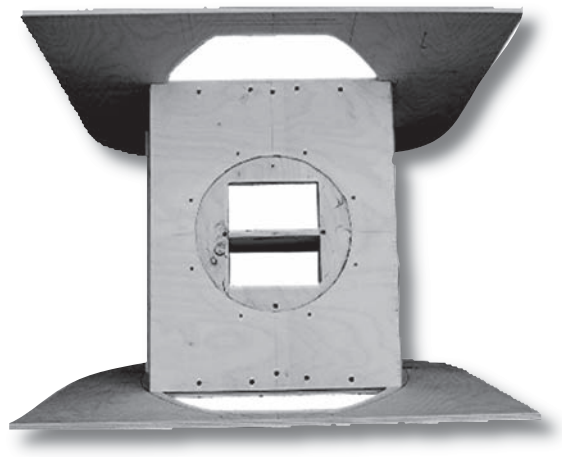


PHOTO 9: Glue blocks on the baffle rear.

PHOTO 10: The throat horn/top/bottom assembly.



Be sure to check the baffle edge angles to determine which side of the baffle faces the throat horn before installing the T-nuts or routing the baffle. (I messed up the baffle on the prototype twice before I got it right, and I should have known better.)

Attach the baffle to the throat horn assembly, using a T-square to check the alignment (**Photo 8**), with equal overhang on both sides. No screws are possible at the joints with the sheaths, so use plenty of adhesive. Sand the sheath braces as required for a proper fit to the baffle.

Run the entire assembly across the table saw atop a panel-cutting jig to trim and square the horn and supports to final size. The finished size of the assembly is 18.625″ high, with a 7° bevel at the top and bottom, and 19.5″ wide, with the sides cut square. Make sure the bevel faces the right way! After the trimming assembly, sand the sheath braces as required so that they don't stand proud.

The woofer baffle serves as one of the mounting flanges for the driver access porthole covers and doesn't join to the top and bottom except on the ends, so add some plywood scraps (**Photo 9**) to the inner side of the baffle to serve as glue blocks. Don't make them so wide that they'll later interfere with the horn braces. Attach the throat horn assembly in turn to the top and bottom, squaring it all up (**Photo 10**).

The tweeter baffle is made in two halves, with a connector plate in the middle. Nominally it is a bit less than 23″ high, but measure to be sure. The actual size of the space between the two halves of the tweeter baffle depends on your horns. With mine, a gap of 3.75″ was required. The width of your horns determines how wide your tweeter baffle halves must be to achieve a total face measurement of 6″.

Start with two pieces of plywood about 4″ wide, 24″ long. Rip them with the blade set at 40° to end up with four strips, two as wide as your horns require, and two somewhat wider. You'll later use the wider set of strips to reinforce the first. If you have horns that are too wide to allow at least a 1″ wide front face of the baffle halves, use a second set of reinforcing strips to give the baffle adequate strength. Cut the ends of the tweeter baffle halves at a 7° angle and install them.

Next cut out the horn braces, per **Figs. 11** through **13**. You need to make eight front braces and six rear braces. Cut both the inside and outside of the braces to the same 28″ radius, allowing you to make copies with minimal sawing by having the inside of one brace be the outside of the one adjacent to it.

FIGURE 11: Horn brace locations.

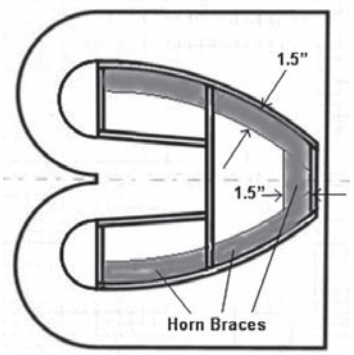


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FIGURE 12: Front horn brace.

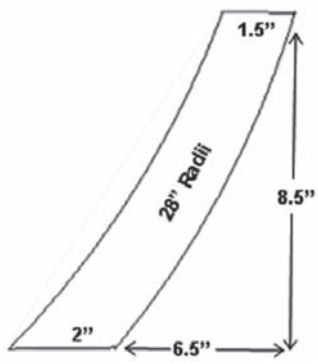

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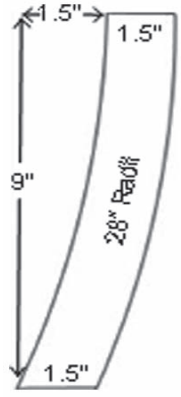
FIGURE 13: Rear horn brace.



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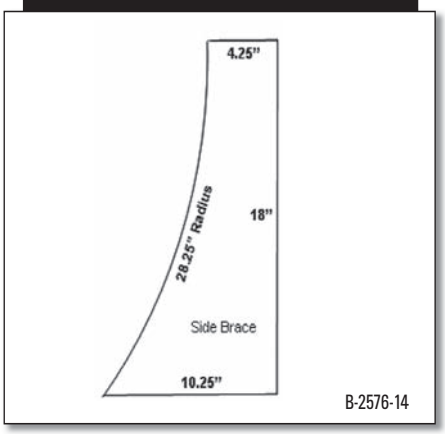
Four of the rear braces install on the top and bottom, between the throat horn supports and the woofer baffle. The remaining two connect the throat horn supports and woofer baffle at the midpoint of the box. Four of the front braces attach to the top and bottom between the woofer and tweeter baffles, the other two are evenly spaced between the top and bottom. The supports attached to the top and bottom serve as mounting flanges for the driver access porthole covers. Don't do anything about the remaining triangular brace near the tweeter baffle just yet.

Use a piece of scrap plywood about an inch wide to connect the two halves of the tweeter baffle at their midpoint. Cut the ends of this piece at 40°, making it long enough to fit across the rear of the two tweeter halves. Then add another piece of plywood to the face of the first, flush to the face of the tweeter baffle halves **(Note: If your HF horns end up trimmed sufficiently to allow their mouths to meld, this piece may not be required.)**

From the front the baffle will now appear as the letter "H" (**Photo 11**). Cut and install the remaining strips to fill the gaps in the back of the tweeter baffle so that you end up with a baffle a full inch thick. In the case of very narrow baffle halves (less than an inch on the front face), use a second set of strips to make the baffle 1.5″ thick.

Now trim the HF horns to fit into the tweeter baffle. With the woofer in place, secured with a couple of bolts, put a HF driver as close as it will go to the woofer to determine how tightly the two HF horns will fit. Ideally you want

FIGURE 14: Side brace.



to trim off all of the mounting flanges between the horns, and up to ½″ or so more to truly marry the two horn mouths into one.

With that accomplished, trim enough material from the other end of the horns to allow the two horns to fit into place, making sure you do so at a 7° angle. Cut the horns on a table saw equipped with an abrasive metal-cutting blade and a panel-cutting jig. With plastic horns there will be some flash, easily scraped off with a utility knife.

Use plywood scraps to produce the remaining triangular sections of the driver access port flanges. Make sure that these don't interfere with the HF horns; trimming the end toward the horns at an angle will help. Remove the drivers and horns for now.

Make two back braces, which are semicircles the same size as the semicircular sections on the top and bottom. Install these braces midway on the throat-horn supports, with one end mating with the throat horn divider. Use a clamp and a couple of scrap plywood cauls to hold them in place (**Photo 12**) while you screw them to the supports from the inside of the cabinet. Before attaching them, use a straightedge spanned from the top to the bottom to be sure everything aligns properly, trimming the support as required. Round over the edges facing into the mouth horn.

Cut the mouth horn sheaths from ¼″ plywood. Before cutting the plywood, flex it to determine the easier-bending axis. The nominal size of the sheaths is a trapezoid 18.5″ wide at the rear, 22.75″ wide at the front, and 20.75″ long. As always, measure your cabinet to be sure of the actual size before cutting. Attach the sheaths starting at the throat horn supports and screw them to the supports, the horn braces, and both baffles. Use a clamp or two to help pull the sheaths into place.

Fill all of the screw heads and any other glitches in the plywood. I use polyester auto body filler, which grips tenaciously, doesn't shrink, is ready to sand in a half-hour, and is very in-

PHOTO 11: The assembly with HF baffle and horn braces.

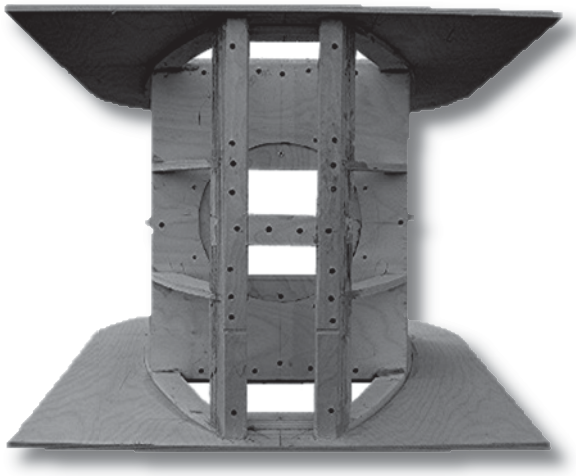


PHOTO 12: Attaching a back brace.

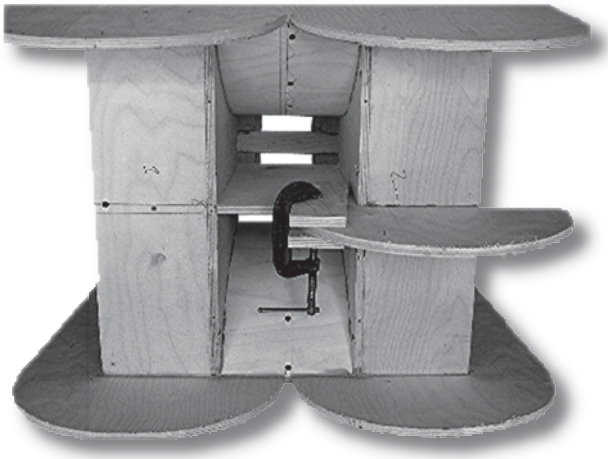


PHOTO 13: Slicing PVC with a panel jig.

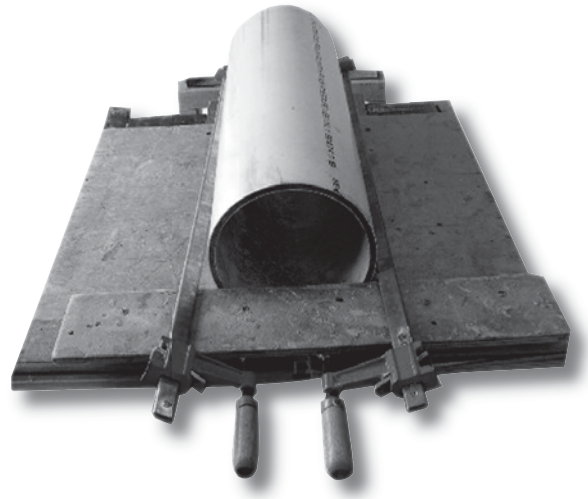
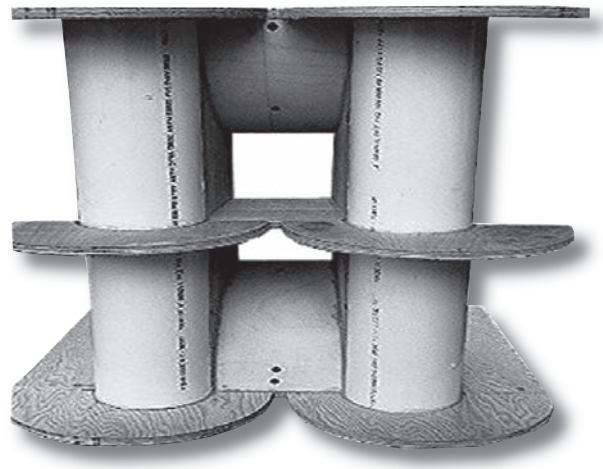


PHOTO 14: PVC reflectors in place.



expensive (or you can buy exactly the same product, save for the color and the name "High Performance Wood Filler," for three times the price). Sand it all smooth when it sets, slightly rounding over the joint at the tweeter baffle.

ASSEMBLY

Halve lengthwise a 20″ long piece of 6″ ID schedule 40 PVC pipe. To do this, use the abrasive blade and securely clamp the pipe to a panel-cutting jig (**Photo 13**). Be careful when finishing the cut, because the pipe may have a tendency to close on the blade.

Cut the PVC sections to fit between the top and bottom and the back braces; one end will be squared, one will be at a 7° angle. Attach these to the cabinet (**Photo 14**) using a hot-melt glue gun. Sand a bit of a chamfer on the edges and ends of the PVC, and on the cabinet where the PVC joints it, producing shallow troughs to hold the glue.

Cut out four side braces, using **Fig. 14** as a guide for the rough dimensions. These braces divide the horn into three roughly equal sections and extend from the PVC reflectors to about 2″ back from the tweeter baffle. Round over their leading and trailing edges. Do not install them parallel to each other, nor parallel to the top and bottom. They should be about 6″ apart at the rear and about 7″ apart at the front.

When determining their locations, shift them about as may be required to drive at least one screw into them from the inside of the cabinet without interference from the horn supports. Before attaching, run a straightedge from the cabinet top to the bottom to make sure of their finished size. After you screw them into place, screw some scrap plywood strips running from the top to the bottom on both sides. Square the braces and screw the strips to the braces (**Photo 15**) to hold them true until the adhesive sets. Use adhesive to fill gaps in the joints and let the adhesive set before proceeding.

Remove the plywood strips from the box. Drill a hole through one horn sheath, large enough to run a pair of speaker wires through to the driver chamber. Seal it airtight with hot-melt glue. Cut the back halves from ⅛″ Baltic birch, again flexing first to determine the easy-bending axis. The nomi-

nal size of these is 21 by 24″, which should allow them to extend at least 2″ onto the sides of the cabinet. Attach first one and then the other to the cabinet; clamping is probably not required, because the plywood bends easily on this fairly large radius.

After the adhesive has set, trim and sand them flush to the top and bottom. Rough-trimming them is a snap using a saber saw or reciprocating saw equipped with a fine-tooth blade at least 6″ long. Drill a hole in one of the back pieces, as close as you can to the center of the box, and run the speaker wires through (**Photo 16**), again sealing it tight with hot-melt.

FINISHING TOUCHES

This is a good time to put a finish on the inside of the horn. I recommend DuraTex (available from Acry-Tech at 800-771-6001). This water-based urethane acrylic goes on with a standard paint roller, drying quickly with a lightly textured finish that's very durable and easily re-coated if you ding it up. It costs not much more than paint, coverage is quite good, and you can finish a cabinet of this size in about 15 minutes exclusive of drying time. Use a small trim roller to reach tight spots.

Cut out the sides, roughly 24.5 × 19″. At one end dado a ⅛″ relief where the side overlaps the back. You won't easily be able to sand the inner surfaces of the sides later, so do it now. Attach the sides, but don't trim them just yet. If you want to use flush-mounted handles, drill holes for them, making sure not to hit any braces. Locate the handles so that you can drive some long mounting screws right through them into the braces, with the remaining fastening done with bolts and T-nuts.

If you wish, you can leave the back of the cabinet as it is; there's no sonic requirement to change it. But with a cabinet as large and heavy (100 lbs on average with ferrite magnet drivers) as this one, additional protection for the thin back halves is a good idea. Not shown in the diagrams are extensions to the cabinet sides and a cover for the back.

PHOTO 15: Strips of wood align the side braces.

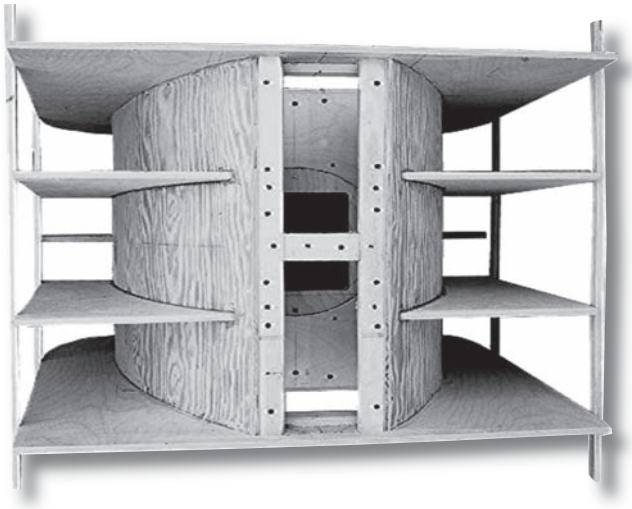


PHOTO 17: Side extensions and back cover.

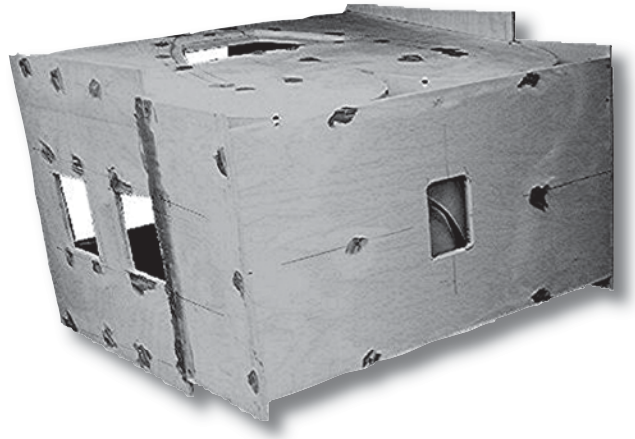


PHOTO 16: Completed back halves.

PHOTO 18: Using a caul to align filler.

These are made from ⅜″ plywood.

Cut the back cover to the exact height of the back (those edges at a 7° angle to match the taper of the top and bottom) and to the exact width of the cabinet less ¾″ (to account for where the side extensions will overlap it). Cut a rectangular hole, about 4 × 6″, centered in the back sheath. Install the back sheath, being sure it is centered and true to the cabinet, with the speaker wires reachable through the hole.

Rough-cut the side extensions about 20″ high by 8.5″ wide, leaving just a smidge of selvage beyond where they overlap the back sheath. Attach the extensions to the assembly (**Photo 17**). The ⅜″ plywood laminated over where the 8″ back halves extend onto the sides will result in a total thickness of ½″, and the joint to the sides will be flush. Fill the screw heads and the joint between the sides and side extensions.

Rough-cut the excess off the sides and side extensions. Trim the semicircular cutoffs (saved from the top and bottom) to fit the gaps at the top and bottom rear of the box, cutting where they will joint to the back sheath at a 7° angle. To install, slather the joints with plenty of adhesive, hold the filler piece in place by screwing a scrap plywood caul to both it and the cabinet (**Photo 18**), and secure the filler in place with screws through the side extensions and back cover. Remove the caul and fill the joint gaps with adhesive. Repeat until all the fillers are installed. Let the adhesive cure.

Sand the whole shebang down, fill any remaining imperfections, and then sand it all again. Use a round-over bit and router and/or sander to round all the exterior edges. Complete applying the finish. Install protective corners and feet. Put the porthole covers in place, drill and countersink for the attaching screws, remove them, and apply a finish. Fully line the driver chamber and porthole covers with an inch-thick layer of either acoustic foam or polyester batting.

Install the woofer, horns, and horn drivers. Attach one wire to the woofer, the other to the HF drivers. It's critical that the horns have an airtight fit, so use a silicone sealant to caulk all the joints between them, the cabinet, and each other. Gasket the access cover flanges with weather stripping foam and attach the covers.

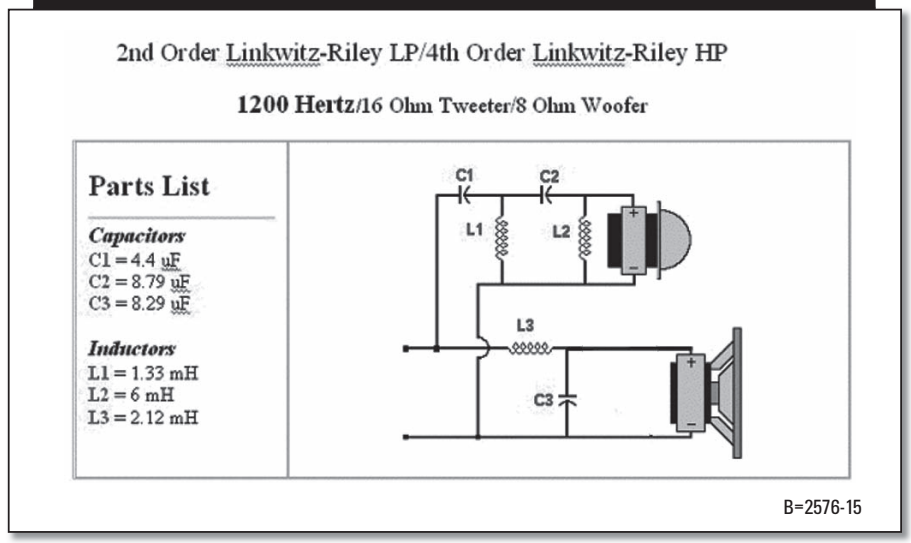
The HF horn diffuser is optional, required only if you choose to stack cabinets in a vertical line array. While the term "diffuser" sounds impressive, it's actually just a length of 1″ PVC pipe, painted to match the cabinet color. To install it use a spade or Forstner bit to drill a 1.25″ diameter blind hole ¼″ deep in the cabinet top and bottom just forward of the HF horns.

Cut the PVC long enough to bend and snap into these sockets. If it touches the joint of the two HF horns, add a bit of foam weather strip to the joint so it won't vibrate. You can also put foam in the sockets to prevent vibration there, and easily attach or remove the pipe depending on how you're going to use the cabinet.

HOOKING IT UP

Now add jacks. I used a pair of 4 terminal Speakons and a pair of phone jacks (the second set is for daisy chaining) all parallel wired, using the 1+ and 1- terminals of the Speakons (when bi-amping, wire the woofer to the 1+,

FIGURE 15: Crossover schematic.



1- lugs of Speakon jacks, the horns to the 2+, 2- lugs). You may also use binding posts/bananas if you wish. Attach the jacks to a piece of ⅛″ plywood or plastic, cut an inch larger than the hole on the cabinet back, and screw it to the back cover. I also put my crossover on the jack plate, though if you wish you may put yours inside the driver chamber.

The crossover is optional, only used if you want to run the box with a single amp channel instead of bi-amping. I used a 4th-order high-pass filter on the horns, a 2nd-order low pass on the woofer (**Fig. 15**).

You could use a higher order filter on the woofer, but 2nd-order electrical rolloff along with the acoustic rolloff is adequate. I put the crossover at 1.2kHz. In theory you could use a crossover as high as 2.5kHz, because the 30° off-axis response is still within 6dB of on-axis. However, the 6dB drop in SPL from average occurs around 900Hz with the Magnum 12. With the HP filter at 1.2kHz, the HF horns contribute enough at 900Hz to raise response there back up to -3dB from average.

The recommended crossover for the PSD-2002 drivers is 1.5kHz with a 3rd-order filter, so with a 4th-order filter the drivers are still well protected at 1.2kHz. If you bi-amp you probably have 4th-order filtering provided by your electronic crossover, but if it is at least 3rd-order it is still OK, because you still need to use a 10μF DC protection cap on the horn drivers anyway, and that will give the additional HP filtering required to safely run to 1.2kHz.

I used 8Ω PSD-2002s wired in series for a 16Ω load to minimize the values required of the crossover components. Wiring them in parallel for a 4Ω load would give 3dB additional sensitivity, but the crossover components would

PHOTO 19: Splayed cabinets. Not recommended.

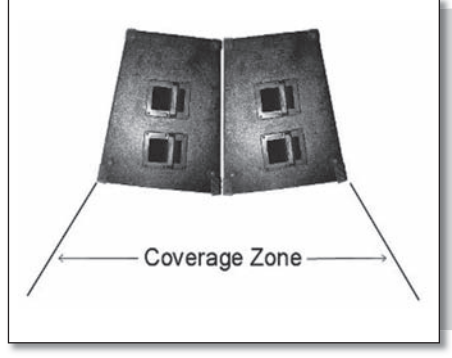


PHOTO 20: Cross-firing cabinets. Highly recommended.

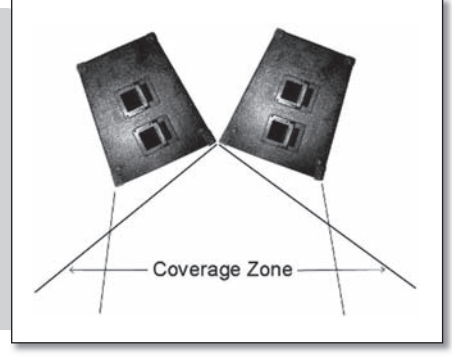


TABLE 1 DR300 frequency vs. Gain

Hz	80	100	125	160	200	250	320	400	500	620	800	1k	1.25	1.6	2k	2.5
dB Gain	12	13	13	13	13	11	12	15	14	10	11	4	4	5	3	-3

cost a lot more. If you want an 8Ω HF load, use 16Ω PSD-2002s wired parallel.

With different drivers you can use different crossover points. For instance, the Magnum 12 has an average base sensitivity of 95dB. At 1.25kHz the SPL is down only 1dB for the raw driver, but in the DR300 it is down 9dB relative to the cabs 108dB average (Woofer SPL Chart). A Kappa 12 also has a base average sensitivity of 95dB. However, at 1.25kHz the Kappa 12 base SPL at 99dB is 4dB above average. Because the 1.2kHz raw sensitivity of the Kappa 12 is 5dB higher than that of the Magnum 12, in the DR300 it would be only 4dB down from average, and that means a crossover at 1.2kHz is OK.

In fact, the Kappa 12 could cross over as high as 2.5kHz without having either the average or the 30° off-axis response more than 6dB down. This midrange performance is gained at the expense of lower power handling and less Xmax than the Magnum 12, but on the other hand the higher crossover also offers the ability to use a less expensive, and smaller framed, HF driver.

Table 1 charts the potential frequency versus gain of a woofer loaded in a DR300 (potential, as driver specs other than SPL also will affect gain) based upon measured results with the Magnum 12 driver. Note that at 2.5kHz this is -3dB, but as in the case of the Kappa 12 driver, which has a 7dB response spike at 2.5kHz, this doesn't rule out a crossover that high. If you go with different drivers and want to use a different crossover point, you can get the component values at **http://www.lalena.com/audio/calculator/xover/.**

With respect to cabinet placement, the DR300 is intended for medium- to long-throw applications, with nominal 60° (-6dB) horizontal dispersion. The preferred placement when using multiple boxes is vertically stacked, the HF horns vertically aligned. However, there might arise circumstances in which you would want to use DR300s in a wide dispersion horizontal cluster array.

Photo 19 shows a pair of DR300s splayed, their faces tight to minimize comb filtering, with a resulting dispersion angle (-6dB) of about 75°. This is how most soundmen intuitively place cabinets, being encouraged to do so by the trapezoidal shape of most PA cabinets. It's not the best way to place them.

Instead, have the cabinets cross-fire (**Photo 20**). Doing so minimizes the distance between the HF elements on the horizontal plane, which reduces comb filtering far more effectively than a splayed alignment. Moreover, the -6dB dispersion angle is increased to about 100°, and dispersion uniformity within the coverage zone is greatly enhanced. *aX*