

# Fostex BK-16 Folded Horn Kit (Pair)



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## Welcome

Congratulations on your purchase of Madisound's Fostex BK-16 Back-loaded Folded Horn Kit!

The enclosure pieces have been cut from 11-layer Baltic birch plywood with a computer controlled router. The nominal thickness of this high-quality plywood is 15 mm (0.60").

This a kit of precision-cut pieces, fresh from the CNC router, which will require preparation and careful assembly.

These instructions will guide you in the step-by-step preparation and assembly of these pieces into a fine set of audio furniture that will provide many hours of listening enjoyment for years to come

## Unpacking

Carefully unpack the packages and check that there has been no shipping damage. Please contact us immediately if there are any issues and we will resolve them promptly.

If you ordered the full kit, set the box with the Fostex drivers aside in a safe space for now. Verify that there is no cosmetic damage to the outer surfaces of the cabinet pieces (please refer to Appendix A1 to identify these pieces). Take care not to intermingle pieces of the left and right cabinets. Do not be alarmed by fuzzy wooden "whiskers" on the edges of some cuts and pieces. These are the result of the action of the high-speed router and will be dealt with in the next preparation step. Save the foam wrapping and cardboard boxes for possible use in the work area.

## Initial Sanding

As noted above, some of the cabinet pieces may have wooden whiskers on their edges or on some of the slots cut into cabinet sides **12-R** and **12-L**. Remove these whiskers using either 80 or 100 grit abrasive paper. Your supplier may only sell fine, medium and coarse sandpaper, in which case, use medium.

Use a piece of abrasive paper wrapped around a small block of wood to remove whiskers along the straight edges. Take long gentle strokes with the block held at an angle to the edge. Try not to alter the contour of the edge at this point (heavier sanding may be required to mate pieces during the dry-fitting stage).

Whiskers around the curved edges of the slots are easily removed with a small piece of abrasive paper contoured to your finger.

## Work Station

A pair of sawhorses (Figure 1) makes an ideal working platform for dry fitting and assembling the cabinets. The sawhorses allow easy access to all sides of the cabinet when clamping becomes necessary during the glue-up phase.

Alternatively, a pair of 2x4s (raising the cabinet off the surface allows for clamp access) laid on the kitchen counter, or if available, the garage work bench, would suffice.

Finally, if the above options are not practical, there is always the floor as long as your back and knees are up to the task. The importance of a comfortable working environment can not be overstated.

## Getting Started – Dry Fitting

Each entire cabinet must be completely dry fitted before starting glue-up assembly. To say it slightly differently: you must first assemble the entire cabinet *without* the benefit of glue. Not to do so invites disaster.

You may wonder why, because after all, each piece was precision-cut by a computer controlled router. The reason is that we are working with wood and wood responds to its environment by possibly swelling or shrinking or bending slightly. This almost guarantees that all the pieces will not fit together perfectly — some pieces may seem too tight when being fitted into their mating slots. This is easily remedied with a fresh piece of sand paper and a sanding block.



**Figure 1** — A working platform for dry-fitting and assembly comprised of a pair of sawhorses. Tape strips of foam packing to the tops to protect the sides of the speaker enclosures.

Begin the dry fitting process by laying the two cabinet sides on your working platform: **12-R** on the left and **12-L** on the right as shown in Figure 2. Now is a good time to label all the pieces and their associated slots with penciled notations (take care not to write on surfaces visible from the outside).

A good place to begin test fitting is at the left of the assembly surface **12-R** with the inner back piece **3-B**. This is a situation that could easily be problematic where the long raw thickness of **3-B** must slide smoothly into the machined slot on **12-R**. Figure 3 shows that indeed this was a problem with a very tight fit as a result. We need loose sliding fits that will allow for adjustment during the glue-up phase. A loose sliding fit is one where the inserted piece will not tend to lift up assembly surface **12-R** when pulled from its slot.

The way to adjust the fit, of course, is to sand **3-B**'s tab portion at a slight angle. Figure 4 shows the inner surface of **3-B**'s tab being sanded with a small block and 80 grit abrasive paper. It is best to be methodical when sanding, so for example, sand in sets of 40 strokes with a test fit after each set. Use a new sheet of sandpaper for each piece (sandpaper is cheap) and your work will progress faster and your results will be more consistent. Figure 5 shows a tab's sanded edge.



**Figure 2** — The start of dry fitting. Place **12-R** on the left and **12-L** on the right of your work platform.



**Figure 3** — The dry fitting of the two pieces resulted in an extremely tight fit. An easy slip-fit is desired and this can be had by repeated sanding and test fitting of **3-B**'s projecting tab.



**Figure 4** — Sand the tab to be fitted with a fixed number of long strokes and then test fit. Repeat until a loose sliding fit is obtained. Use a fresh sheet of sandpaper for each piece.



**Figure 5** — A properly sanded edge. No need to go beyond the tab width.

After several rounds of sanding and test fitting, **3-B** now fits smoothly with **12-R** as shown in Figure 6. After establishing a loose sliding fit with **12-R**, test fit the opposite side with **12-L**. Chances are that this edge will also need to be sanded and fitted.

While dry fitting, compare the identical top and bottom pieces **1** and select the better piece for the top (Figure 7). Similarly, compare the two faces of **3** and tag the better surface to face outside during glue-up.

Also, during dry fitting while you have plenty of time and are not feeling the pressure of drying glue, make plenty of alignment notes and directions to yourself, which will come in handy during glue-up (Figure 8).

As a final preparation step for the glue-up phase, sand a small taper 1/16 inch in and down (Figure 9) along the tabs that mate with slots on **12-L**. The tapers will compensate for small misalignments and help guide the tabs into the slots during the final glue-up step.



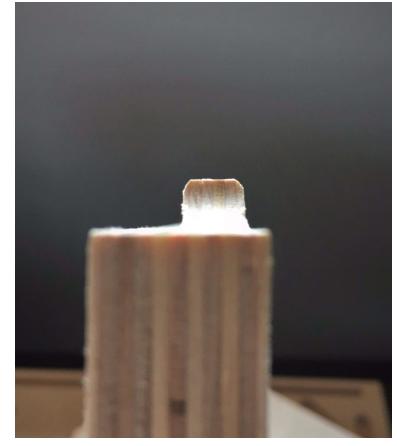
**Figure 6** — A proper loose fit between **3-B** and **12-R**.



**Figure 7** — One of the pair of identical top and bottom pieces has a patch (marked with an X). This piece will become the bottom.



**Figure 8** — During dry fitting, make notations on the pieces and their respective slots to reduce the chance of error during glue-up.



**Figure 9** — Sanding 1/16 inch tapers on the tabs that mate with **12-L** helps compensate for small misalignments that build up during the assembly process.

## Assembly — Glue-up

Be sure to have a fresh bottle of wood glue on hand. Elmer's wood glues come in a number of varieties, all of which are fine for this project. One, Elmer's Carpenter's Wood Glue Max has a longer "open" time before clamping is necessary. This can be advantageous in the final assembly step when **12-L** is attached to all the pieces that have been glued to **12-R**. Titebond III is also advertised to have a longer open time.

For glue application, many wood workers prefer to pour some glue into a small container and use a plumber's 3/8 inch acid brush to brush on the glue, rather than squirting it out of the bottle and smearing it around with their fingers. The brush is also advantageous for spreading the glue on the sides of the slots in pieces **12-R** and **12-L**.

When gluing a piece, spread a thin layer of glue in both the slot and on the tab. When the piece is clamped, a little bit of glue "squeeze out" is fine and it can be wiped away with a moist rag (do not use paper towel) while the glue is still wet. No squeeze out may indicate that an insufficient amount of glue was applied to both the piece and the slot.

If your clamps do not have pads on their faces, these can easily be improvised by sticking small squares of wood to the clamp faces with double-sided tape as shown in Figure 9. Clamping without pads runs the risk of denting the outside of the cabinet.

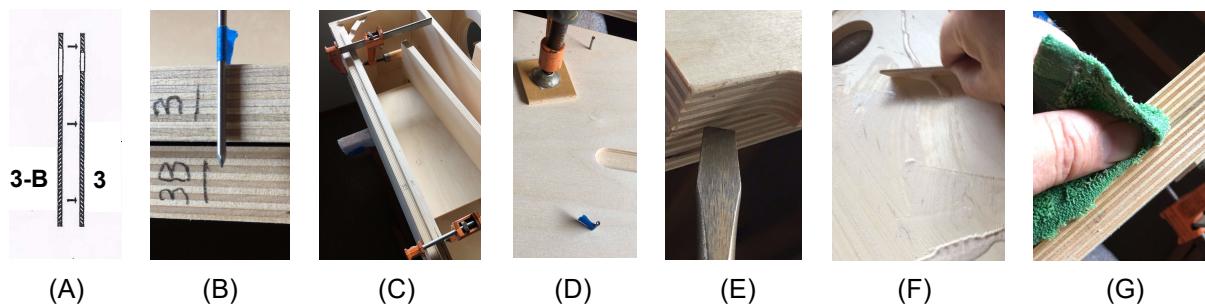
One final note before moving on to Step 1 of the glue-up: After each piece is glued to the assembly base **12-R**, dry clamp (i.e., *do not glue*) **12-L** to the freshly glued piece to assure its perpendicular alignment to **12-R** and proper relationship to the other pieces while the glue sets. Take care that there is no squeeze out that would accidentally glue **12-L** to the assembly. Use other dry-fitted pieces (e.g., **1** top and or bottom) for additional support and alignment gauges as needed.



**Figure 9** — Clamp pads improvised from small squares of wood stuck on to the clamp faces with double-sided tape.

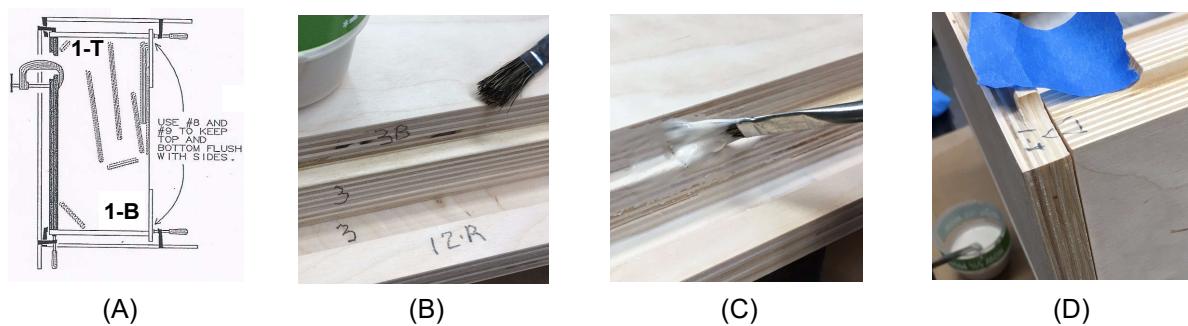
**Step 1** — Glue the outer rear panel **3-B** (square hole) to the inner rear panel **3** (round hole and slot) as shown in (A).

When gluing two panels together there is a tendency for one panel to slide across the other. Tacking the two panels together with finishing nails after alignment will mitigate this tendency. Drive four small nails through the inner panel **3** about 1/8 inch into the outer panel **3-B** after the two pieces have been clamped in alignment as shown in (B), (C) and (D). Next, pry them apart (E), spread glue on the two pieces (F) and then clamp them together with the nails projecting from **3-B** inserted into their original holes in **3** to maintain alignment. Remove any glue squeeze out with a damp rag (G) and set aside while the glue dries. Remove nails after glue has dried.



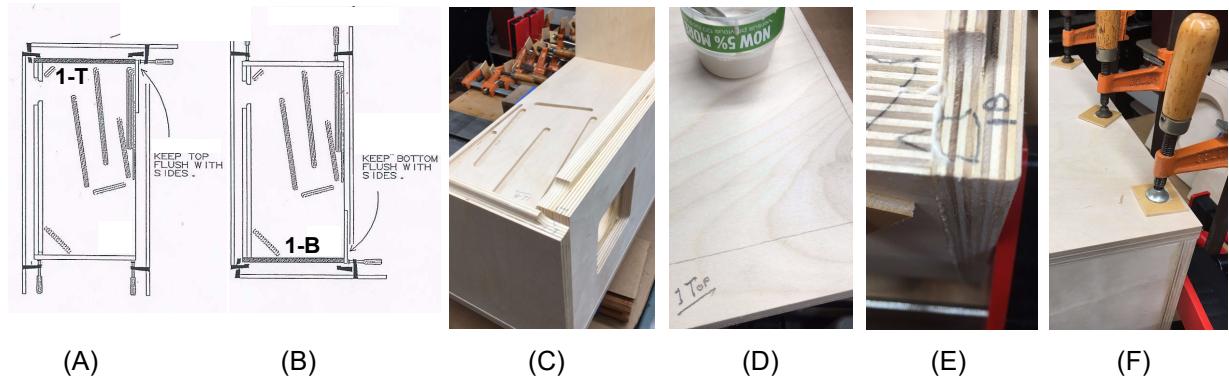
**Step 2** — Glue the composite rear panel (**3** and **3-B**) to its associated slot in **12-R** as shown in (A).

Spread glue on the rear panel and its associated slot and surface area on **12-R** as shown in (B) and (C). Use top and bottom pieces **1-T** and **1-B** to align the rear panel as shown in (D). Place and clamp **12-L** on the assembly to maintain the alignment while the glue sets up. Take care that glue squeeze out does not accidentally attach the dry-fitted pieces **1-T**, **1-B** and **12-L**.



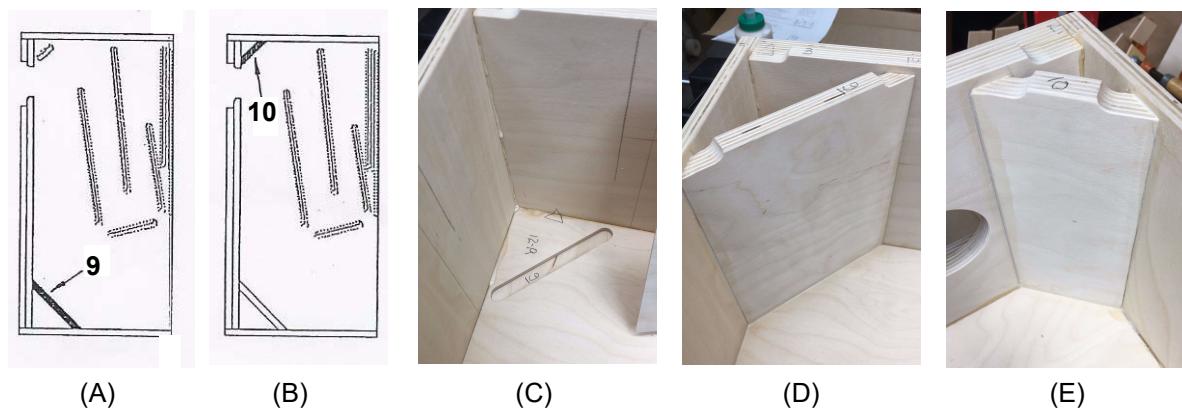
**Step 3 — Glue top 1-T and bottom 1-B to the composite rear panel 3/3-B and to their associated slots in 12-R as shown in (A) and (B).**

Identify **1-T** and **1-B** and dry fit them as shown in (C). Mark the areas to be glued as shown in (D). Apply glue to surfaces and tabs, align and clamp as shown in (E). Place and clamp **12-L** on the assembly (F) to maintain the alignment while the glue sets up. As before, take care that glue squeeze out does not accidentally attach the assembly to **12-L**.



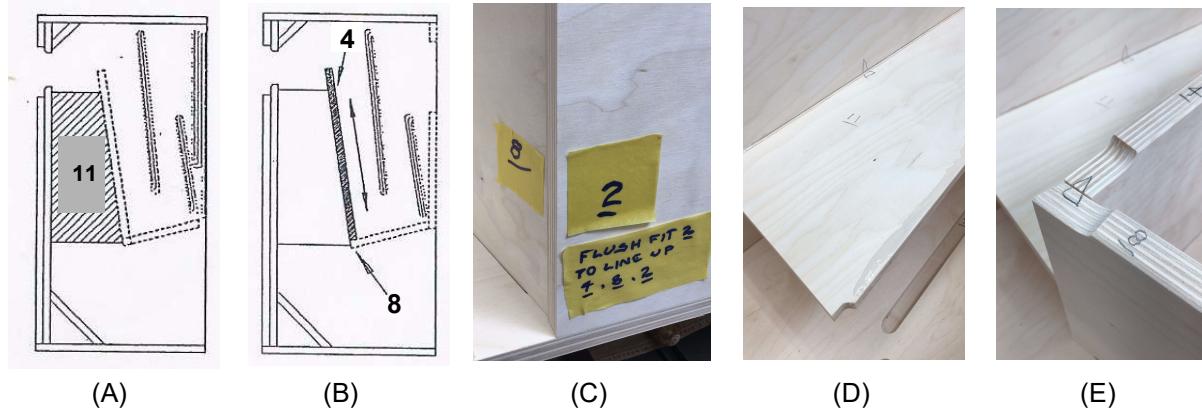
**Step 4 — Glue the bottom reflector 9 and the top reflector 10 into their respective slots in 12-R as shown in (A) and (B).**

Dry fit **9** and mark the surface glue areas on the rear panel and bottom as shown in (C). Spread glue on the tab, slot and surfaces to be mated (each of the reflector and marked areas of the bottom and rear). Press **9** firmly into its slot and against the bottom and rear as shown in (D). Quickly do the same for **10** as shown in (E) and then clamp **12-L** in place to hold the pieces in alignment until the glue sets.

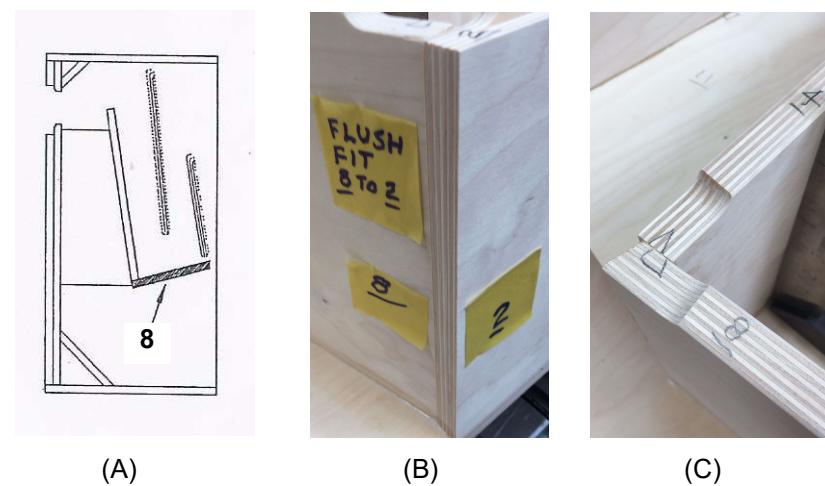


**Step 5 — Glue the brace 11 and slotted piece 4 as shown in (A) and (B).**

The position of sliding piece **4** must be adjusted in conjunction with **8** and **2** to obtain a flush fit between **8** and **4**, **8** and **2**, and the surface of **2** with the edges of **12-R** and **12-L** as shown in (C). Glue **11** and **4** to each other and to their respective slots in **12-R** as shown in (D) and (E). As before, dry clamp **12-L** to the assembly to maintain alignment until the glue sets.

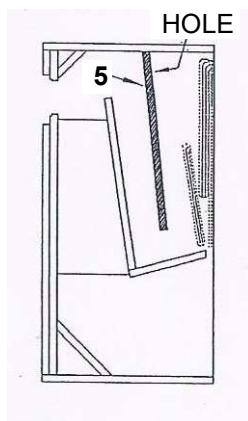
**Step 6 — Glue piece 8 as shown in (A).**

Glue piece **8** to both its slot in **12-R** and the edge of piece **4**, taking care again to for a flush fit with piece **2** while **2**'s face is flush with the front edge of **12-R** as shown in (B). Note that the dry-fitting alignment marks may no longer line up exactly as shown in (C). As previously, dry-clamp **12-L** to the assembly to maintain alignment until the glue sets.



**Step 7 — Glue piece 5 as shown in (A).**

Mark surface area on **1-T** to be glued as shown in (B) and (C). Apply glue to both the piece and mating surfaces. Taking note of the speaker lead hole and angled edge, place the piece and then fit and dry-clamp **12-L** as before to maintain alignment until the glue sets.



(A)



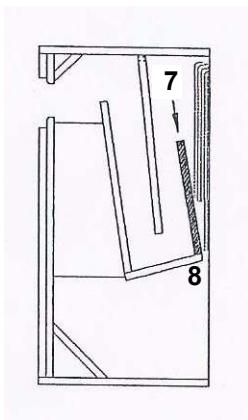
(B)



(C)

**Step 8 — Glue piece 7 as shown in (A).**

Mark surface area on **8** to be glued as shown in (B). Apply glue to both the piece and mating surfaces and fit together as shown in (C). Pull **7** to **8** with a clamp as shown in (D) and then fit and dry-clamp **12-L** as before to maintain alignment until the glue sets.



(A)



(B)



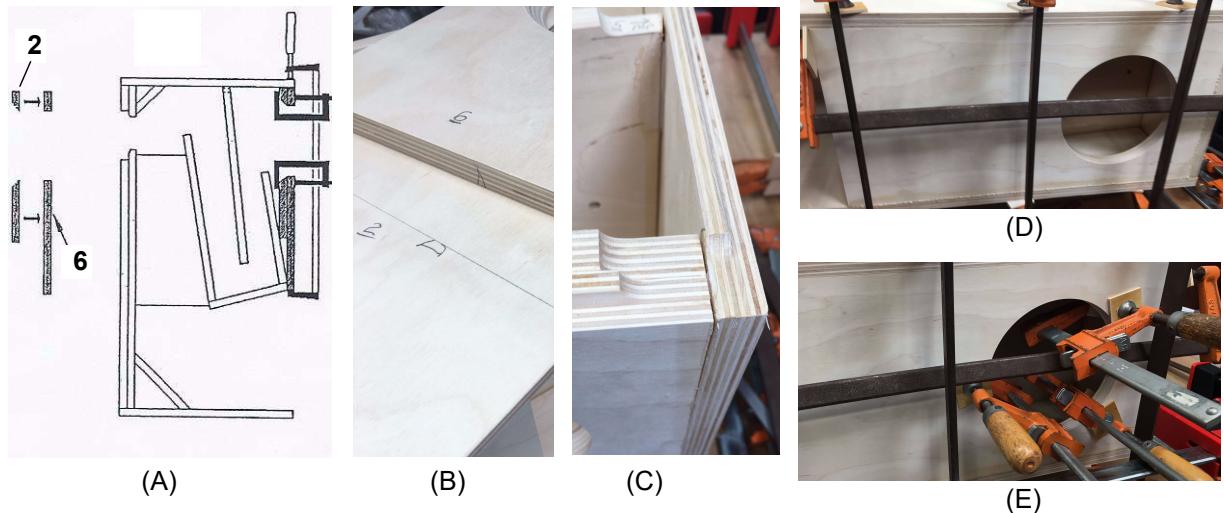
(C)



(D)

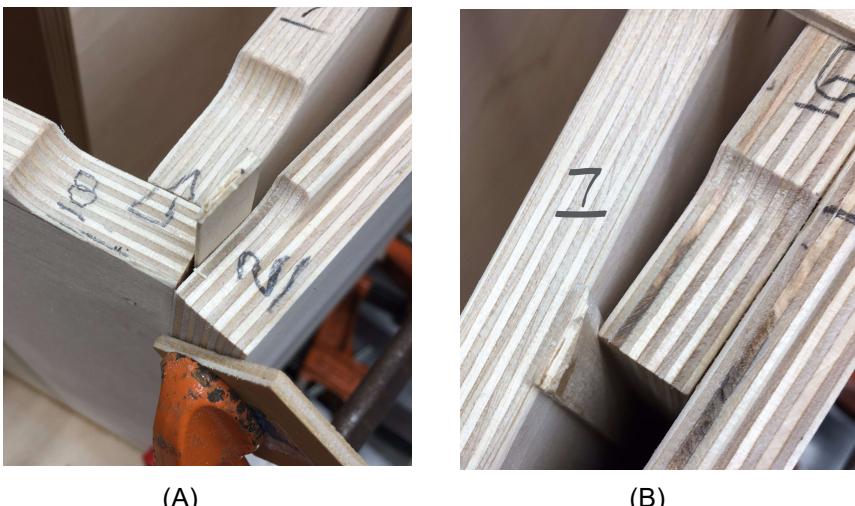
**Step 9** — Glue the speaker board comprised of pieces **6** and **2** as shown in (A).

Mark the area on **2** covered by **6** for gluing as shown in (B). Glue **2** and **6** together and then glue the assembly to **1-T** and **12-R** as shown in (C). Dry clamp **12-L** to the assembly to maintain alignment until the glue sets as shown in (D). Add clamps around the speaker opening to pull **6** to **2** while the glue sets as shown in (E).



**Step 10** — Close any gaps between **8** and **2** and between **7** and **6** as shown in (A) and (B).

If gaps exist, cut wedges to fit and glue in place. Trim the protruding parts so there is no interference with **12-L**.



**Step 11 — Finally, glue on the left side 12-L as shown in (A).**

First test fit **12-L**. If the fit is inordinately difficult, try increasing the tapers on some of the tabs or possibly chamfering some of the slots to ease insertion of the tabs. If possible, get an assistant to help in the application of the glue to both the tabs and the slots. A wood glue with extended open time such as Elmer's Carpenter's Wood Glue Max or Titebond III can be helpful if you are gluing by yourself.



(A)

**Step 11 — Install speaker and connection cup as shown in (A).**

The cabinet finish should be applied before starting installation of the speaker and connection cup.

**11.1** Pass the speaker leads through the hole in **5** and seal the hole.

**11.2** Solder the leads to the connection cup, observing polarity.

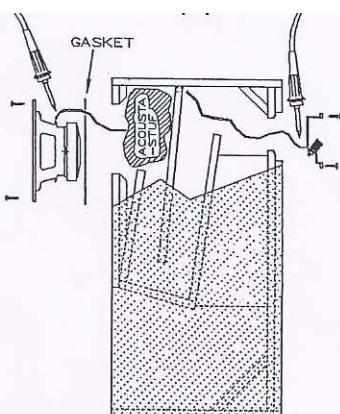
**11.3** Install the connection cup using four #6 x 3/4" oval head wood screws (predrill holes).

**11.4** Tease out 3 ounces of Acousta-Stuf and distribute it in the top, sides and rear of the speaker chamber. Take care not to obstruct the passage into the horn.

**11.5** Install speaker gasket.

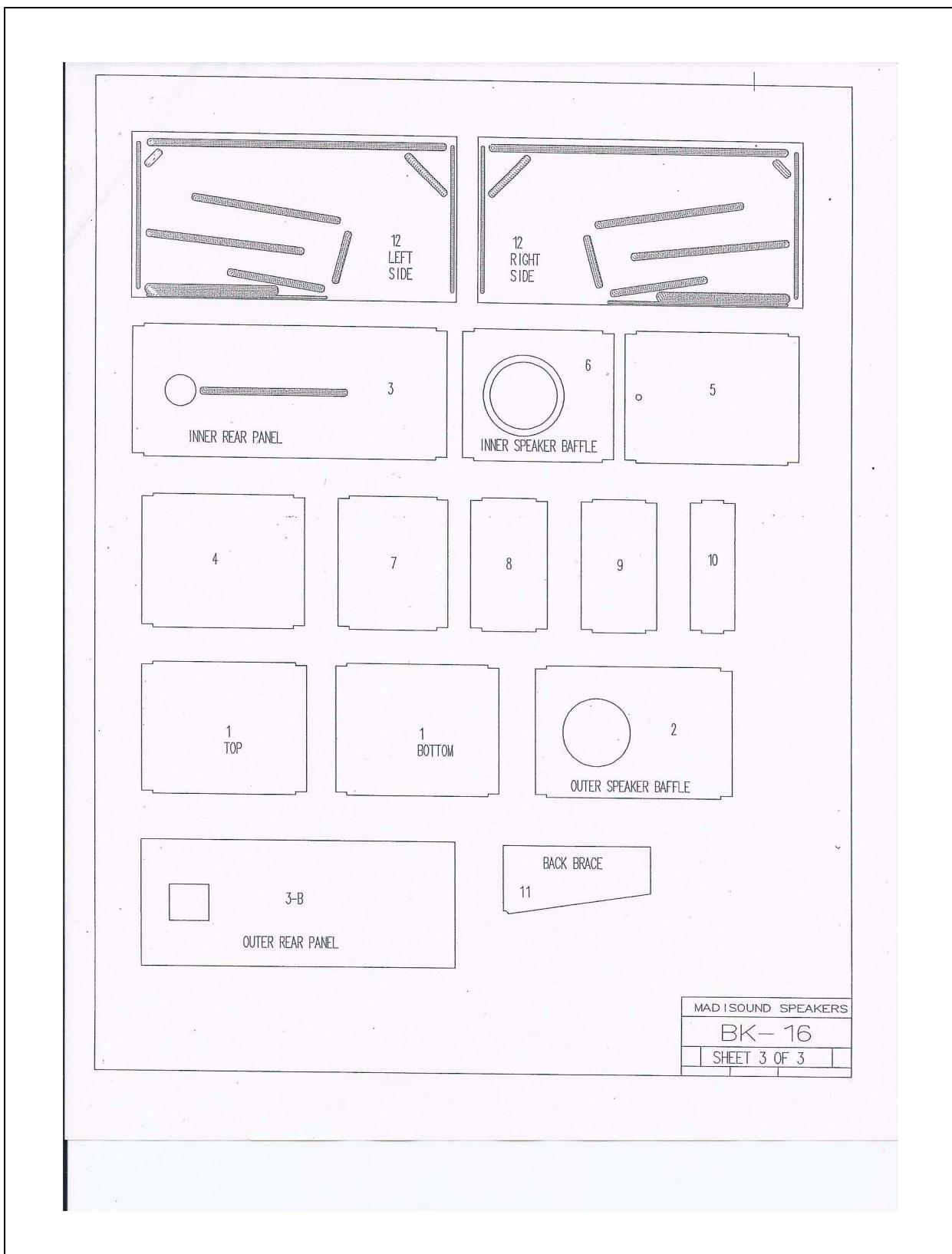
**11.6** Solder the leads to the speaker, observing polarity.

**11.7** Install the speaker using four #6 x 3/4" truss head wood screws (predrill holes).

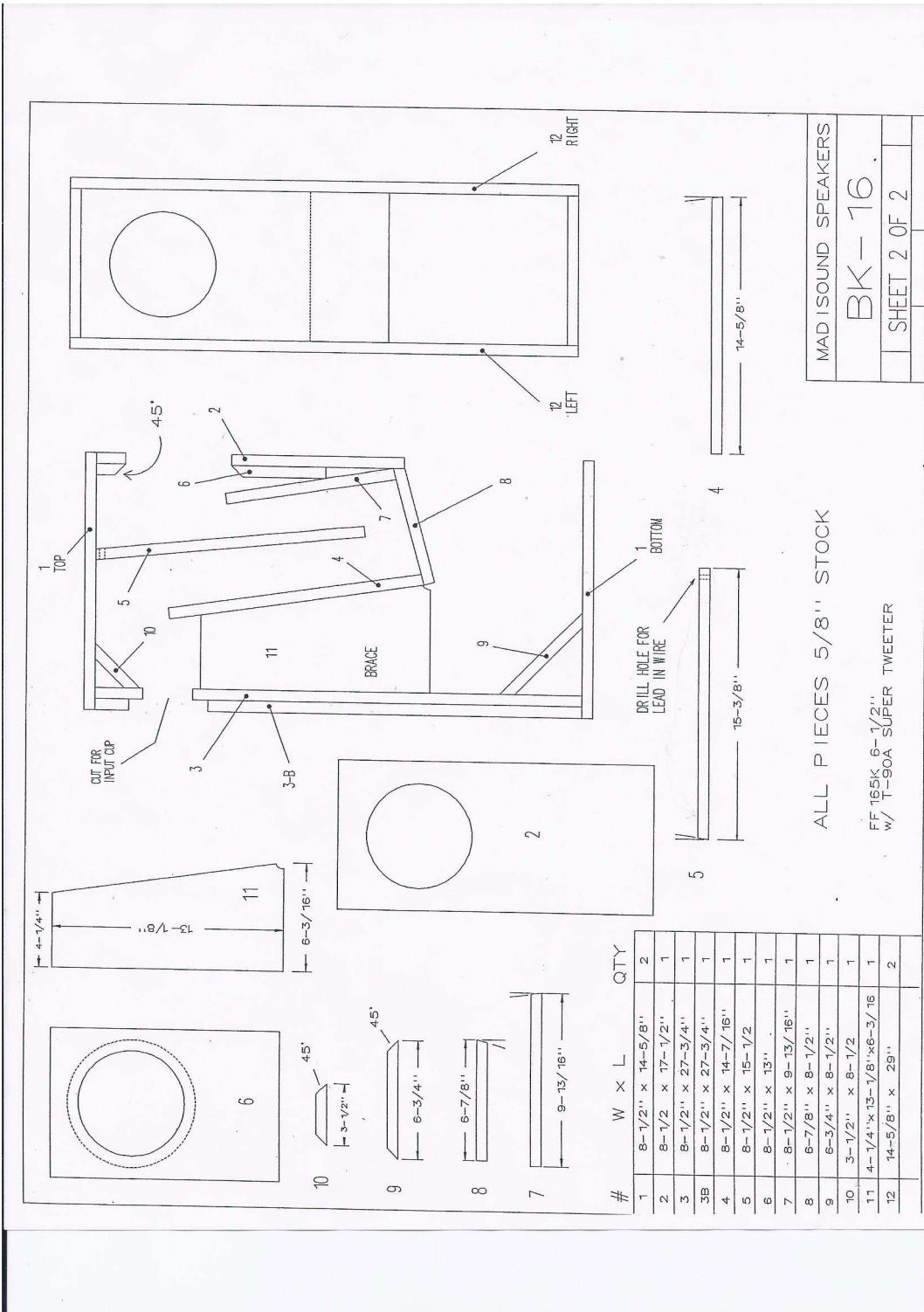


(A)

## Appendix A1 — Engineering Drawing: Pieces



## Appendix A2 – Engineering Drawing: Assembly



## Appendix A3 – Engineering Drawing: Sectional View

