

JBL

LOUDSPEAKER ENCLOSURE CONSTRUCTION MANUAL



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This publication was prepared by JBL's Technical Service Department to assist you in constructing loudspeaker enclosures designed to bring out the full potential of your JBL loudspeakers. Questions concerning enclosure requirements for special applications should be directed to this department. Additional information on wood finishes should be obtained from firms specializing in this type of work.

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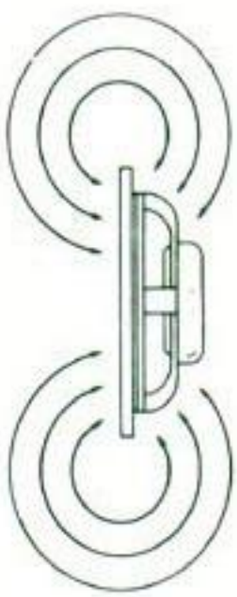
CONSTRUCTION NOTES FOR BUILDING LOUDSPEAKER ENCLOSURES

THE PROPER ENCLOSURE

A properly designed acoustical enclosure increases a loudspeaker's dynamic range, improves its tonal quality, and reduces distortion and chance of overload. For proper reproduction of bass tones, an enclosure built to the following recommendations will provide greater power-handling capacity and better sound than will open-back cabinets or infinite baffles.

WHY A LOUDSPEAKER NEEDS AN ENCLOSURE

If you lay a loudspeaker on a table and feed a low frequency signal to it, you will see the cone vibrate, but will hear no sound. There are two reasons for this:



1. At very low frequencies, the cone is not large enough to couple its energy to the air.

2. The sound generated by the loudspeaker is produced with equal intensity on both sides of the cone. Unless the front of the loudspeaker is acoustically isolated from the back, the two sets of sound waves tend to cancel each other at low frequencies. Air washes back and forth around the edge of the loudspeaker instead of generating sound.

These problems can be solved in any one of several ways, all of which have their advantages and disadvantages. For example, the cone of the loudspeaker can be made larger in diameter. Beyond a certain point, however, it becomes too massive to follow musical waveforms with accuracy.

Another approach is to make a cone of moderate diameter move farther and farther at progressively lower frequencies. All loudspeakers intended for use in home music installations make use of this principle to some degree. But if we depend entirely upon greater cone travel to compensate for decreased coupling at low frequencies, a number of new problems arise . . . doppler distortion, restricted dynamic range, and greatly reduced efficiency, for example. These problems become serious in small loudspeaker systems, especially if played at levels approaching the loudness of a live performance. Where maximum dynamic range and minimum distortion are desired from a small loudspeaker, JBL does not recommend the use of closed cabinets or infinite baffles.

A better method is to use a group of identical loudspeakers, all operating in unison. Such an array increases low frequency coupling by increasing the radiating area, yet without degrading high frequency or transient capabilities of the individual speakers. Unfortunately, there are certain problems here, too. We find that an array of loudspeakers has different directional characteristics than a single speaker. Above 500 cps or so, this can become quite noticable and is usually undesirable in a home system. Also, the array is an expensive design approach because of all of the loudspeakers must be high-quality units if fidelity is not to be sacrificed.

Still another design approach is to make the loudspeaker as efficent as possible and then use it to drive a horn. If the horn is large enough, it will provide the necessary acoustic loading all the way down to the lowest musical fundamentals. But such a horn must be very large, is complicated to build, and sometimes imparts its own distinctive coloration to reproduced sound.

THE PORTED ENCLOSURE

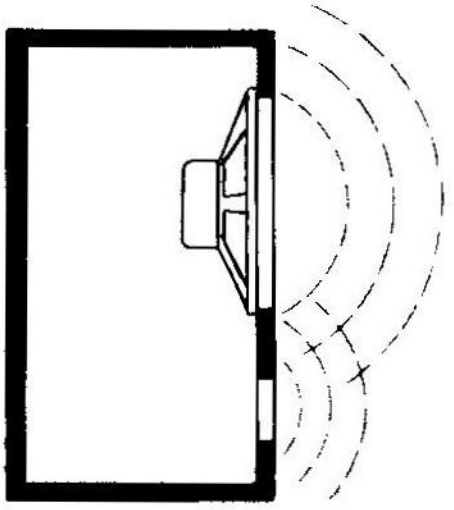
The ported enclosure (sometimes called a reflex enclosure or an acoustical phase inverter) is a practical solution to both problems mentioned at the beginning of this discussion. It can be adapted for use with almost any loudspeaker, it extends bass response while improving fidelity, and it can be designed as an attractive furniture piece of moderate size.

The ported enclosure is a strong cabinet with airtight joints and a heavy baffle board for mounting the speaker or speakers. A port – a hole of carefully calculated area – is cut into the baffle. The sound produced by the back of the loudspeaker cone excites the air inside the cabinet in such a way that at low frequencies sound from the port reinforces that from the front of the loudspeaker. When a ported enclosure is properly designed in relation to the loudspeaker installed, the movement of air in and out of the port takes place in the frequency range where the loudspeaker, without help, is incapable of coupling its energy efficiently to the air.

A properly designed ported enclosure does three things:

First, it prevents sound from the rear of the cone from cancelling that produced by the front.

Secondly, sound from the port, since it is in phase with sound from the front of the loudspeaker, reinforces low notes by providing a second source of energy.



Thirdly, when the loudspeaker causes air to move in and out of the port, it is forced to work harder. This loads the speaker far better than does an infinite baffle. Because of this acoustic loading, the speaker cone does not have to move any farther at 40 cycles than it does at 200 cycles to produce the same loudness, whereas a loudspeaker mounted in an infinite baffle must move many times farther at 40 cycles than it does at 200 cycles. This loading imposed by the ported enclosure improves transient response and increases power-handling ability while reducing distortion.

There are two variations of the simple ported enclosure that may be recommended in certain instances. The first uses a **ducted port** instead of a simple baffle cutout. By adding a duct or tunnel to the port opening, it is possible to better match the requirements of some loudspeakers that are designed for use in small enclosures, yet require a port tuned to a very low frequency.

A more sophisticated variation of the acoustic phase inverter is not a ported enclosure at all. JBL engineers have pioneered the use of **passive radiators** to make use of all the advantages of ported enclosures, plus a number of benefits obtainable in no other way. A passive radiator consists of a freely suspended cone assembly whose mass and mechanical suspension are controlled to supply the optimum acoustic loading for a given loudspeaker. To operate properly, a passive radiator must be used together with the specific loudspeaker for which it was designed, and must be installed in an enclosure of recommended internal volume. Further information about passive radiators will be found later in this publication.

CONSTRUCTING THE ENCLOSURE

Whether the enclosure is a complicated horn or a relatively straightforward ported cabinet, it must be well built and joints should be true and tight. Lock-mitre joints glued under clamps are ideal if you have access to the necessary milling machinery. Otherwise, all joints should be reinforced with glue blocks running the entire length of the joint and these should be screwed at 4-inch intervals to each surface to insure that the enclosure will be airtight. An accumulation of small air leaks can affect performance significantly and they can introduce objectionable whistles or hisses. All large panels should have 1 x 3 or 2 x 4 braces glued on edge about every 10 inches and fastened securely with screws to prevent any vibrations. Reproduction of bass notes particularly benefits from rigid enclosure construction.

Your enclosure should be constructed of 3/4-inch material throughout, either plywood or particle board (pressed wood). Exact dimensions are not overly critical, but no dimension should be more

than three times any other dimension. For example, an enclosure measuring 1' x 2' x 4' is undesirable because of the 4- foot dimension (which is 4 times greater than the one foot dimension).

Various speakers require different cabinet sizes to function properly. For example, a very efficient speaker such as the D130 can be installed in an enclosure as small as 2.5 cubic feet, but optimum performance in the low bass region can only be achieved if a cabinet measuring 4.5 cubic feet or more is used. On the other hand, a less efficient speaker like the LE14A can be used in an enclosure having as little as 1.5 cubic feet of internal volume without noticeable loss of bass. The individual characteristics of a particular speaker dictate the type and size cabinet required to deliver maximum performance. For this reason, it is impossible to give specific dimensions and instructions for building "all-purpose" cabinets for all types of loudspeakers. If speakers of another firm are used, the advice of the manufacturer should be obtained to achieve best results.

At least 50% of the surface area of the loudspeaker chamber should be lined with soft, fluffy, absorptive material. The exact amount and placement of acoustic damping material can be varied over wide limits depending upon the particular sound you are trying to achieve. The only purpose of the absorptive padding is to eliminate any midrange reflections which might otherwise introduce unwanted coloration into the reproduced sound. Generally, the less padding used, the brighter and more "live" the midrange. Experimentation with the amount and placement of damping material will enable you to achieve the tonal characteristic which best suits your own personal preferences. The absorbent lining is usually arranged to cover half of the interior surface so that a padded wall faces an unpadded wall. The lining can be attached to the cabinet walls by using spots of glue, upholstery tacks or staples.

Ordinary one-inch acoustic glass wool works very well for this purpose, although any other soft, fluffy, absorptive material (such as Kimsul, Tufflex or felt rug padding) will do equally well. These can be purchased from any of the larger hi-fi dealers in your vicinity or any firm specializing in insulation materials. We do **not** recommend that you use Celotex, foam rubber, styrofoam, rock wool, acoustic tile, cork, cotton, rubberized rug padding or kapok.

The most important thing is to make sure that the enclosure is solidly built and that all large panels have additional bracing attached, so that there is no excessive vibration even when the system is played very loudly. The more rigid and non-resonant the enclosure, the firmer and clearer low bass performance will be.

FRONT MOUNTING VS. REAR MOUNTING THE SPEAKER

For maximum enclosure strength and rigidity, and for ease in installation, it is preferable to front-mount the loudspeakers. Front-mounting JBL 15-inch loudspeakers requires the MA15 kit which consists of four small cast clamps and necessary gasket material. This can be purchased through any franchised JBL dealer at $3.90 per set. One set is required for each 15–inch

speaker or passive radiator. If you intend to rear-mount the loudspeaker in the conventional manner, the back panel must be removable to allow insertion of the speaker. Wood screws spaced no more than six inches apart, will hold the back panel firmly in place.

POSITIONING THE LOUDSPEAKER SYSTEM ON THE BAFFLE PANEL

In a two-way loudspeaker system, the high frequency transducer can be located in either upper corner depending upon the amount of stereo separation you need. If the enclosures must be close together, you can position the high frequency units in the upper left and right hand corners respectively as you face your system. If the enclosures must be located fairly far apart, the tweeters can be located in the inner corners of each enclosure if you wish. Always try to position the high frequency transducer as close to ear level as possible and no more than 10-inches from the low frequency loudspeaker. On the other hand, avoid mounting the high frequency unit closer to the woofer than two inches as this tends to weaken the baffle panel.

LOUDSPEAKER WIRING CONNECTIONS

If you are using a two-way JBL speaker system, simply follow the instructions in the JBL owner's manual supplied with the components.

If your JBL system does not require a dividing network, small holes can be drilled in the back of the enclosure to allow wiring from the speaker terminals to come out and be connected to the amplifier. Make sure that the wires fit snugly in the holes, otherwise a "whistling" or "hissing" sound may occur due to air leakage. A standard terminal strip can be used to make a neater, more professional installation. A phone plug or other connector is equally acceptable.

INSTALLING THE SPEAKERS

To protect the cone assembly, the speaker should be kept **face down** on a clean, flat surface until installed. The shiny aluminum center dome on JBL extended range speakers (2 – 3 thousandths of an inch thick) is particularly fragile and should not be touched. Avoid moving the cone assembly by hand. In JBL speakers, the clearance between the voice coil and the pole pieces is so small that any attempt to move the cone assembly manually can easily force it far enough out of alignment to cause the voice coil to rub against the pole pieces.

Eight holes are provided in the speaker frame to allow you to place the speaker in the direction which permits the most convenient connection of the lead wires to the terminal post. However, only four screws are required for mounting.

Screws should be tightened just enough to seal the gasket firmly to the front panel so that there are no air leaks around the speaker flange. Be very careful not to tighten the mounting screws excessively. Overtightening forces the frame out of alignment (warping it so slightly that you cannot see it) just enough to cause the voice coil to rub against the pole pieces.

Make sure that the baffle panel is flat and true, or the speaker will be warped as the screws are tightened. Tighten the screws evenly, a little at a time, moving around the circle as many times as necessary until they are snug.

TESTING THE SYSTEM

After the enclosure is built and the speaker is installed, test the system carefully, **before** you install the grille assembly, by playing program material having good low notes. Operate the system at high volume and run your hand over the outside surfaces of the cabinet, noting any areas which vibrate noticeably. If any are found, they will have to be additionally braced. It may be necessary to go through this procedure more than once to achieve satisfactory rigidity. When this has been done, the enclosure will bring out the full low frequency capabilities of its loudspeaker system.

While testing the system, observe the motion of the speaker cone. MAKE SURE THAT THE CONE DOES NOT TRAVEL MORE THAN 1/4–INCH OR SO. If the speaker is used any length of time under conditions which result in excessive cone movement, it can be expected to break down short of its normal useful life. If the speaker cone is traveling too far, it may be that your amplifier is unstable or that subsonic signals (turntable rumble, etc.) are being fed to the speaker at high power levels. Excessive bass boost at high volume also can result in using the full power of the amplifier at frequencies too low to be heard, and thereby overdriving the loudspeaker.

THE PROPER PORT AREA

If the system you are installing does not require a passive radiator, the enclosure should have a port opening to help protect the loudspeaker and increase efficiency through the bottom octave.

The chart on pages 10 and 11 will enable you to determine the proper port size for your loudspeaker cabinet.

The top row of figures indicates **internal** cabinet volume in cubic feet. (When computing volume, do not include space taken up by acoustical padding, bracing or the loudspeakers themselves. Simply multiply **internal** height x depth x width and divide by 1728.)

Ducted (tunneled) ports are those designated as having a combined cross-sectional (open) area in square inches and a specific tunnel length in inches. For example, 20 SQ. IN. 5" TUNNEL.

If a ducted port is not specified, then a simple cutout on the front baffle panel is all that is required.

The port can consist of any configuration (circular, square or rectangular) so long as the total open area and the length of the duct (if specified) equal our recommendation. For example, a ducted port can be made with thin stock so that it looks like a small box open at both ends. The length of the box and its cross-sectional area should then match our recommendations. If round cardboard tubing having the recommended dimensions is available, this can also be used as a ducted port.

Once the necessary port size has been determined, it is easy to arrive at the proper dimensions. Simply multiply the height and width of the port opening and you will have the cross-sectional or total open area in square inches. For example, a simple port requiring an opening of 12 square inches could measure 6" x 2", 4" x 3", etc. Any combination of figures can be used so long as you arrive at the recommended area. If a circular port is desired, you can use the formula $A = \pi r^2$ (Area = 3.14 x radius squared) to determine the cross-sectional area of the tube in square inches.

Whatever type of port opening is used, a difference of 10% in the total open area or duct length will not affect the performance significantly. For example, if a circular port requires a cross-sectional area of 12 or 13 square inches, you can use a port diameter of 4-inches and the formula will give you a port opening measuring 12.56 square inches, which is satisfactory.

In instances where the chart gives you a choice between a ducted port, an infinite baffle (closed box) or a passive radiator, you may find that one will permit better performance than another for your particular installation. A ported enclosure allows for firmer, more emphatic bass response than an infinite baffle. Compared to a ported cabinet, a passive radiator will improve low frequency performance and in addition will impart a somewhat "warmer" characteristic through the midrange. Whenever it is possible, a passive radiator (PR) is recommended over a ported cabinet. The passive radiator must be used in a completely air-tight cabinet. In other words, a cabinet will never have a port and a passive radiator at the same time.

Because of the many variations in room acoustics, you may find that between a ported cabinet and an infinite baffle, one is preferred over the other. If the chart shows a choice between the two, we recommend that you construct a ported enclosure and if bass performance in your room is unnaturally prominent or "boomy", you can experiment with additional acoustical fiberglass inside the cabinet or with a block covering the port opening.

The port can be positioned anywhere on the front baffle panel so long as it isn't any closer to the woofer than three inches. We do not recommend that it be located on any surface other than the baffle panel unless absolutely necessary.

Make sure that all enclosure panels are solid and well braced, that all joints are true and tight and that there are no air leaks. If a ported cabinet is used, the entire enclosure must be completely airtight with the exception of the port opening. If a ducted port is used, the tube or tunnel must fit snugly into its receptacle on the baffle panel so that no air leakage occurs around its outer edge and the port cutout on the baffle panel.

The port tunnel fits into the receptacle so that one end is flush with the front of the baffle panel. The tunnel length includes the total distance from the front of the baffle panel to the opposite end inside the cabinet.

NOTE

There is no scientific basis for the belief that a ported enclosure should be tuned to the free air resonance of the loudspeaker. Years ago, when all loudspeakers were made with light cones and resonances in the 40–60 cps region, this was a conventional rule of thumb, but such is no longer the case. The minute a loudspeaker is installed in an enclosure, the system resonance changes, and unless you know the efficiency, mass, compliance and radiating area of the loudspeaker, there is no way to compute the optimum port size.

If you are using JBL construction blueprints, complete information concerning the port opening is fully illustrated in the prints. If you are not using JBL construction blueprints, consult the chart on pages 9 and 10.

INTERNAL VOLUME OF CABINET IN CUBIC FEET

JBL SPEAKER MODEL	0.5 – 0.76	0.76 – 1.0	1.1 – 1.5	1.6 - 2.0	2.1 – 3.0	3.1 – 4.0	4.1 – 5.0
D208	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	12 SQ. IN. 5 IN. TUNNEL	20 SQ. IN. 5 IN. TUNNEL	18 SQ. IN. NO TUNNEL	25 SQ. IN. NO TUNNEL
LE8T D280	NOT RECOMMENDED	PR8	PR8 OR 6 SQ. IN. 7½" TUNNEL	PR8 OR 13 SQ. IN. 7½" TUNNEL	13 SQ. IN. 5½" TUNNEL	13 SQ. IN. 3" TUNNEL	15 SQ. IN. 3" TUNNEL
LE10A	NOT RECOMMENDED	NOT RECOMMENDED	PR10 OR 6 SQ. IN. 7" TUNNEL	PR10 OR 13 SQ. IN. 7½" TUNNEL	PR10 OR 13 SQ. IN. 5½" TUNNEL	13 SQ. IN. 3" TUNNEL	15 SQ. IN. 3" TUNNEL
LE14A LE14C	NOT RECOMMENDED	NOT RECOMMENDED	6 SQ. IN. 7" TUNNEL	13 SQ. IN. 7½" TUNNEL	13 SQ. IN. 5½" TUNNEL	13 SQ. IN. 3" TUNNEL	15 SQ. IN. 3" TUNNEL
LE15A	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	SOME BASS LOSS 13 SQ. IN. 3" TUNNEL	15 SQ. IN. 3" TUNNEL
D123	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	20 SQ. IN. 5" TUNNEL	18 SQ.-IN. NO TUNNEL	25 SQ. IN. NO TUNNEL
D131 D130 130A 130B	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	SOME BASS LOSS 20 SQ. IN. 5" TUNNEL	SOME BASS LOSS 18 SQ. IN. NO TUNNEL	25 SQ. IN. NO TUNNEL
LE12C	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	7 SQ. IN. 10" TUNNEL	CLOSED BOX OR 7" SQ. IN. 6" TUNNEL	CLOSED BOX OR 10 SQ. IN. 6" TUNNEL	CLOSED BOX OR 15 SQ. IN. 6" TUNNEL

INTERNAL VOLUME OF CABINET IN CUBIC FEET

JBL SPEAKER MODEL	5.1 – 6.0	6.1 – 7.0	7.1 · 8.0	8.1 – 9.0	9.1 – 10.0	10.1 – 11.0	11.1 – 12.0
D208	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
LE8T D280	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
LE10A LE14A LE14C	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
LE15A	CLOSED BOX OR PR15 OR 20 SQ. IN. 3" TUNNEL	CLOSED BOX OR PR15 OR 25 SQ. IN. 3" TUNNEL	CLOSED BOX OR PR15 OR 32 SQ. IN 3" TUNNEL	CLOSED BOX or 36 SQ. IN. 4" TUNNEL	CLOSED BOX OR 40 SQ. IN. 5" TUNNEL	CLOSED BOX OR 38 SQ. IN. 3" TUNNEL	CLOSED BOX or 38 SQ. IN. 2½" TUNNEL
D123	35 SQ. IN. NO TUNNEL	50 SQ. IN. NO TUNNEL	65 SQ. IN. NO TUNNEL	80 SQ. IN. NO TUNNEL	90 SQ. IN. NO TUNNEL	100 SQ. IN. NO TUNNEL	115 SQ. IN. NO TUNNEL
D131 D130 130A 130B	35 SQ. IN. NO TUNNEL	50 SQ. IN. NO TUNNEL	65 SQ. IN. NO TUNNEL	80 SQ. IN. NO TUNNEL	90 SQ. IN. NO TUNNEL	100 SQ. IN. NO TUNNEL	115 SQ. IN. NO TUNNEL
LE12C	CLOSED BOX OR 20 SQ. IN. 5" TUNNEL	CLOSED BOX OR 25 SQ. IN. 5" TUNNEL	CLOSED BOX OR 32 SQ. IN. 5" TUNNEL	CLOSED BOX OR 40 SQ. IN. 5" TUNNEL	CLOSED BOX OR 40 SQ. IN. 4" TUNNEL	CLOSED BOX OR 44 SQ. IN. 3" TUNNEL	CLOSED BOX OR 48 SQ. IN. 2½" TUNNEL

INSTALLING THE GRILLE ASSEMBLY

After you are satisfied that you are receiving optimum performance, the front of the enclosure should be covered with a grille assembly to protect the speaker from accidental damage. Standard speaker grille cloth is ideal. However, any sturdy, loose-weave cloth can be used. The grille cloth should have at least a 50% open area and it should be fairly porous and acoustically transparent to allow the speaker to deliver extended high frequency performance. It is a good idea to mount the decorative grille cloth on a separate thin frame so that the cloth is at least 1/8–inch away from the front of the baffle panel. This method of mounting keeps the loudspeakers and port from showing through the grille. The grille fabric should be stretched tightly over the grille frame; otherwise, the cloth will vibrate against the front panel on certain notes. Magnetic catches or friction clips can be used to secure the grille assembly to the cabinet. If you are building a simple utility enclosure, you can use oval-head screws and cup washers to mount the grille assembly.

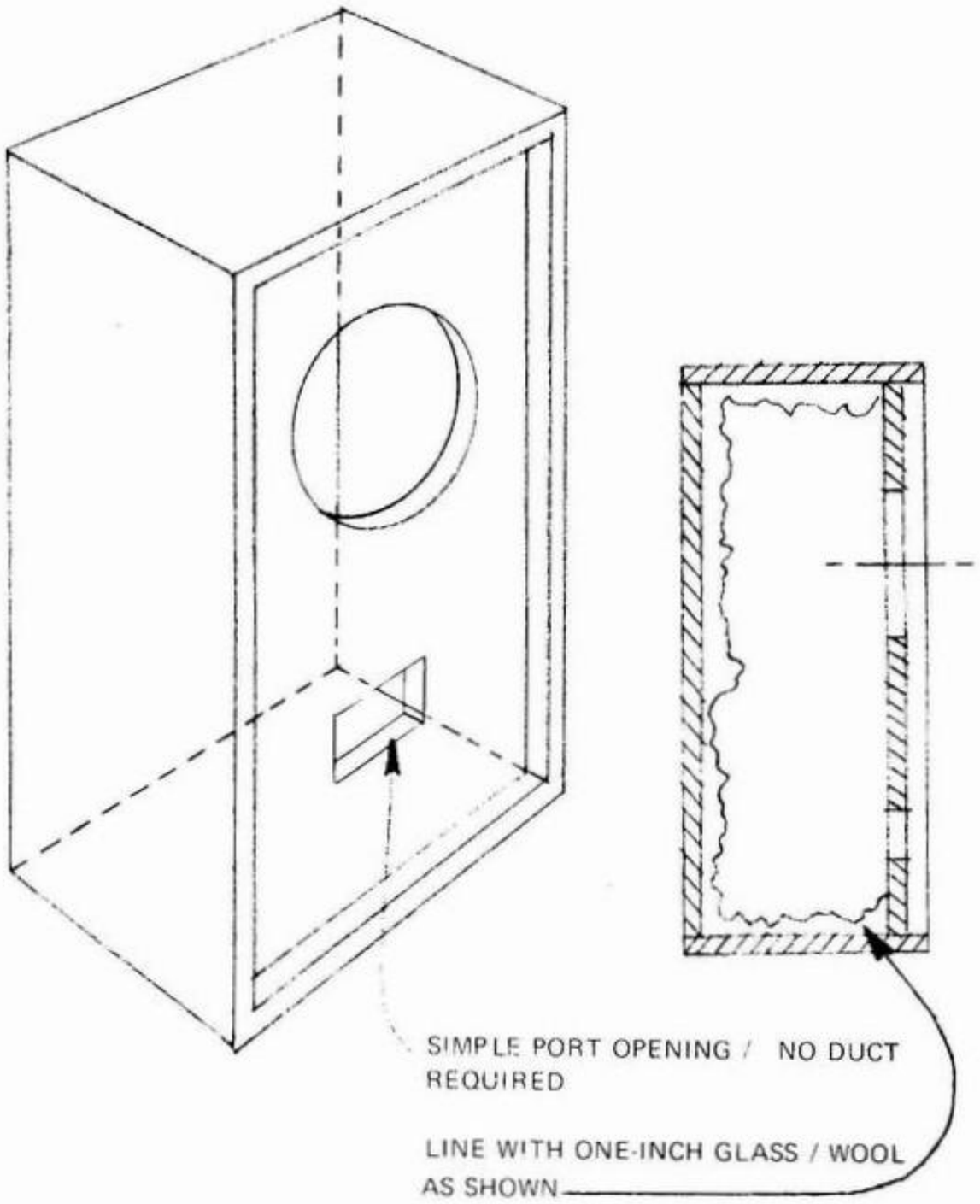
If you are going to mount the speaker system behind a wall, in a closet, in the ceiling or in an attic, we recommend that you use a simple, but well made utility cabinet. The speaker cabinet should be located behind the contemplated speaker opening, and it should form an airtight seal with the wall or ceiling.

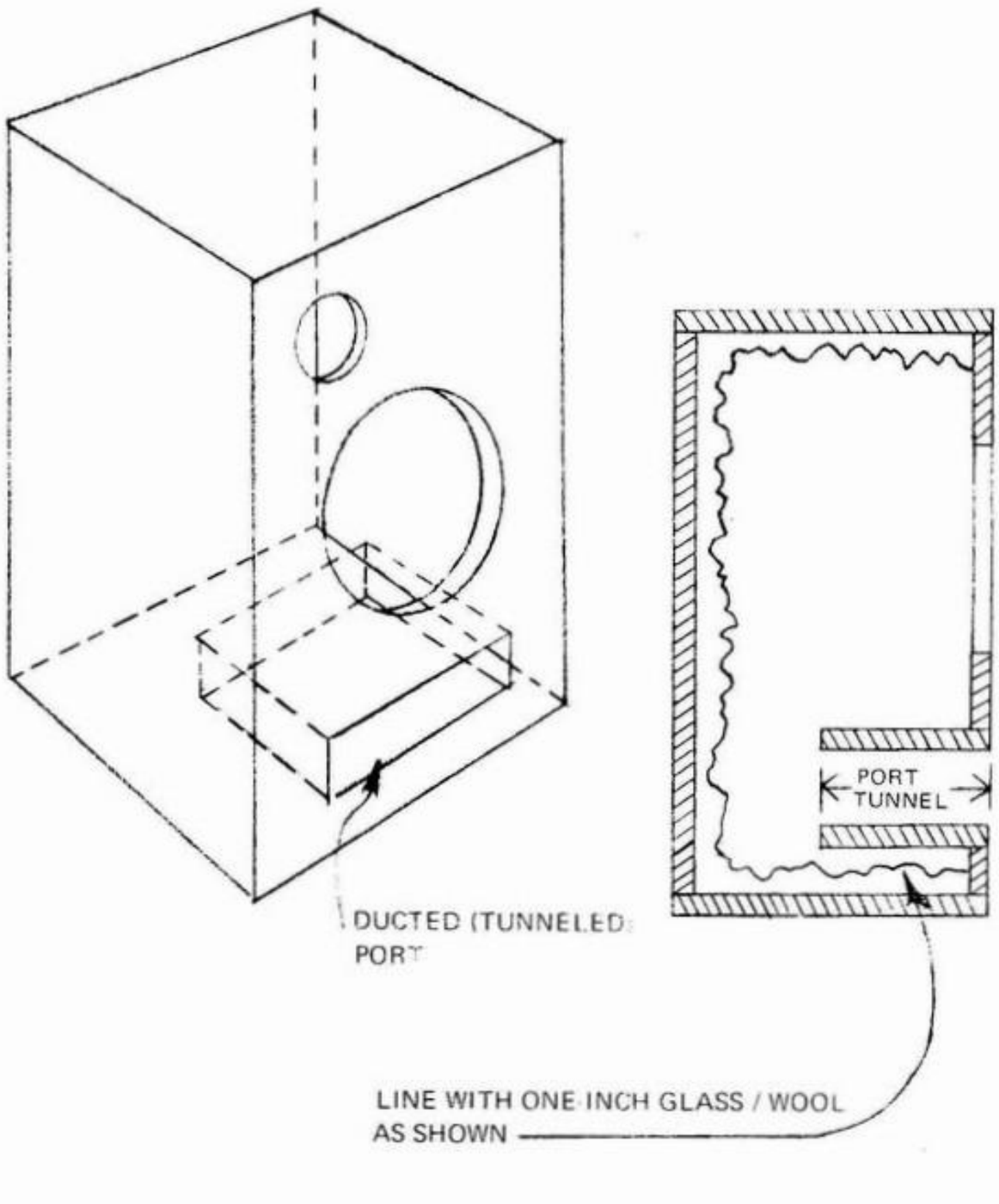
We are sorry, but we cannot supply precut panels, hardware, port tubes or component parts for the construction of loudspeaker enclosures. We realize that certain parts of enclosure designs may be quite difficult for the home builder to duplicate. However, because our furniture factory assembles cabinets from complete, matched sets of basic parts, it is not possible for us to produce individual items on a special-order basis. We are sure that you can understand our problem, and we hope that this does not result in a serious inconvenience to you.

Items such as T-nuts, screws and cabinet hardware can be purchased from hardware or builder's supply stores in your area. MA15 front-mounting kits can be ordered through your JBL dealer only. They cannot be ordered directly from the factory.

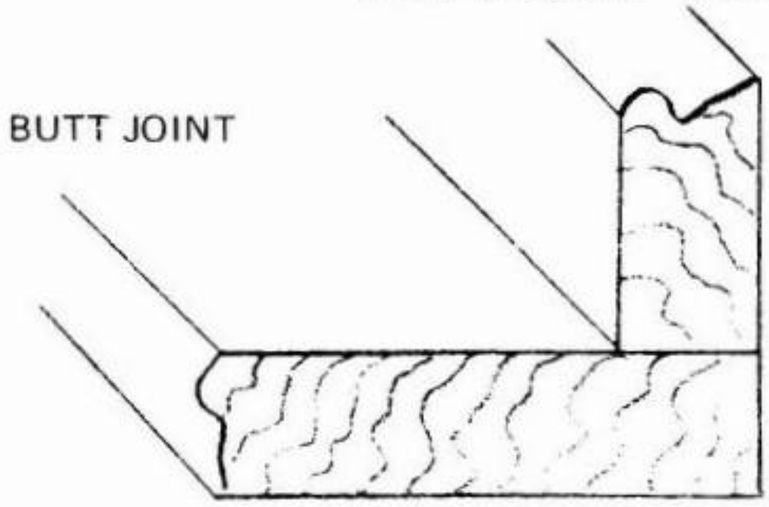
If you want to duplicate the exact styling and construction of one of the standard JBL enclosures, you can obtain blueprints through your JBL dealer or from JBL. Our current catalog lists the drawings which are available and the prices. To order blueprints, please specify the model number and enclose a check or money order for the full amount. (California residents, please add 5% California sales tax.)

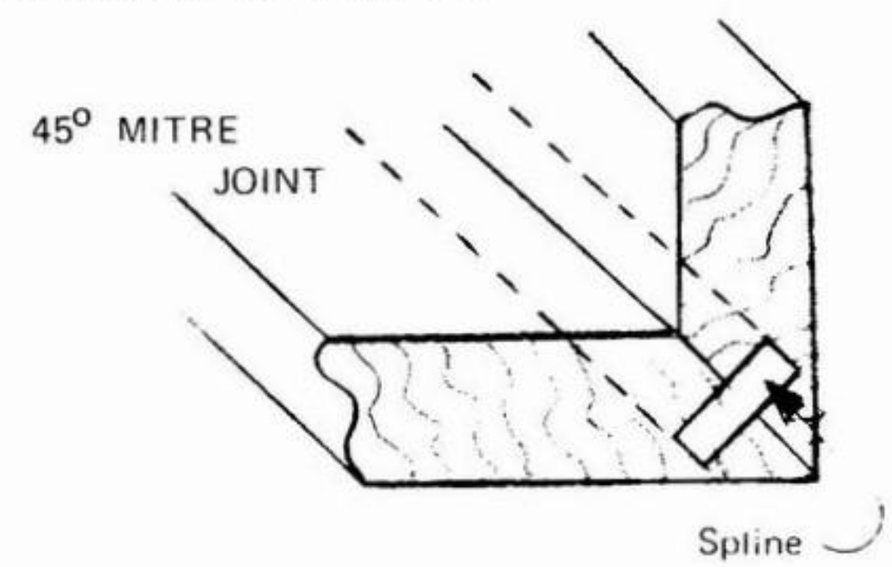
TYPICAL CABINET CONSTRUCTION

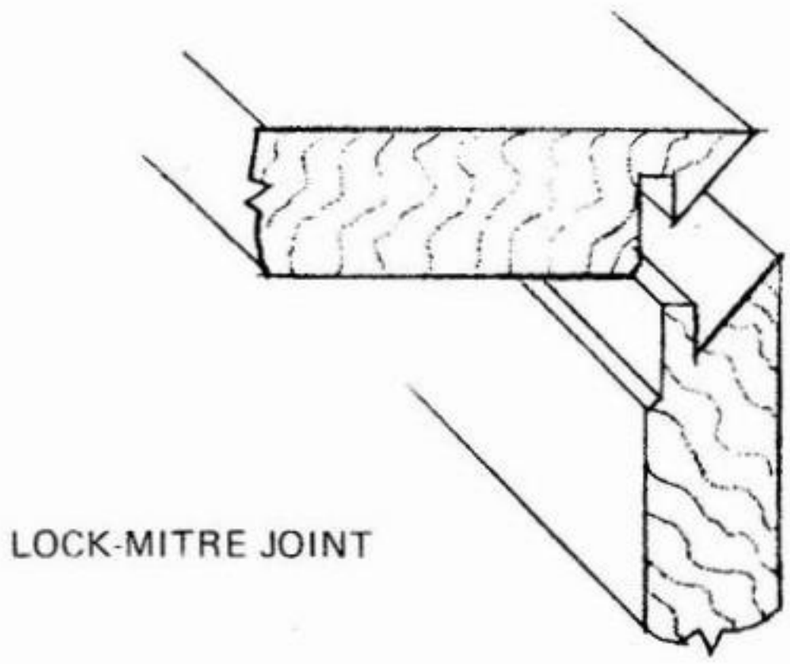


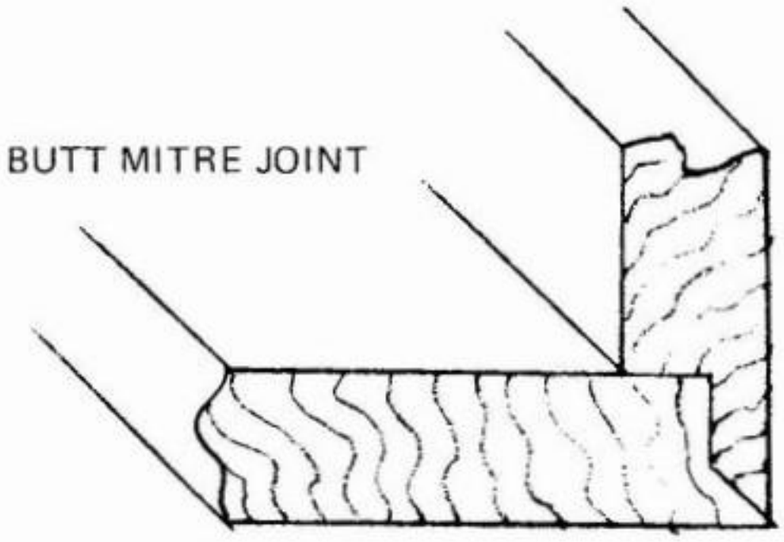


TYPICAL CONSTRUCTION JOINTS

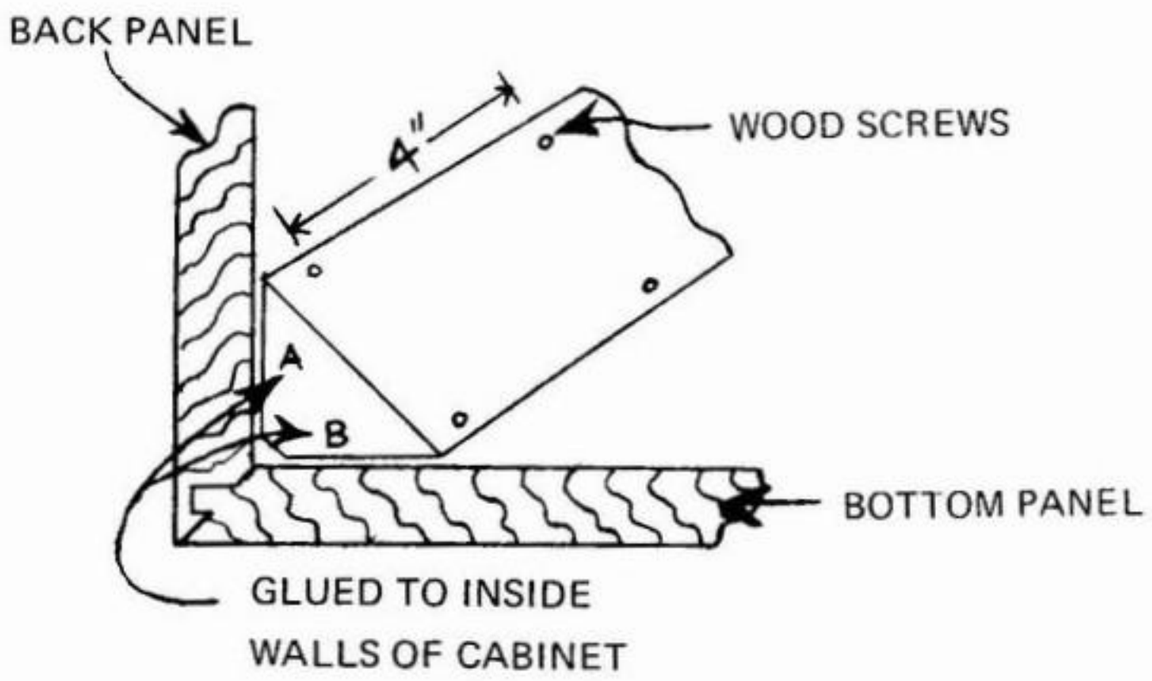








TYPICAL GLUE BLOCK CONSTRUCTION

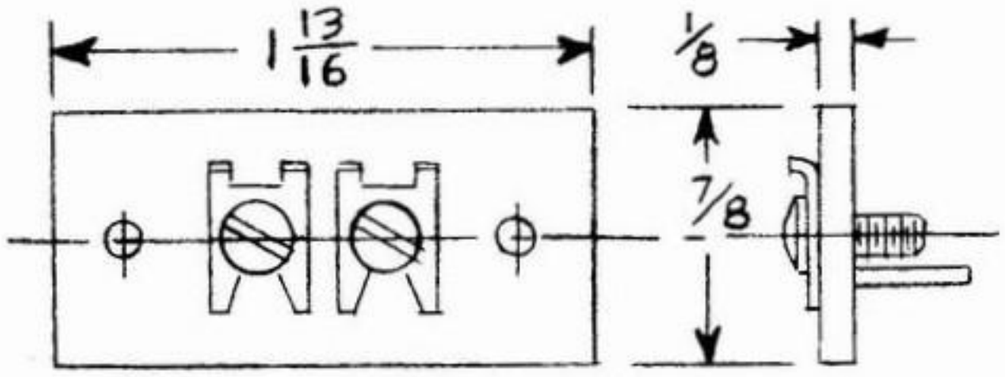


All interior joints should be reinforced with glue blocks running the entire length of the joint. Glue block is held in place by glue applied to surfaces A and B and then screwed at 4–inch intervals.

NOTE: When building the enclosure, we recommend that white "Wilhold" glue be used whenever gluing is specified.

TYPICAL TERMINAL PAD

STANDARD SIZE

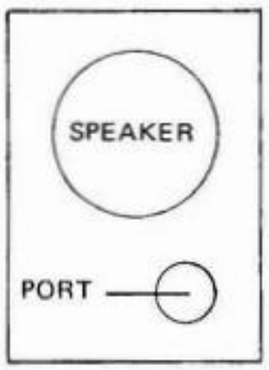


This is the standard terminal strip described on page five. It can be purchased from most hardware stores and parts houses.

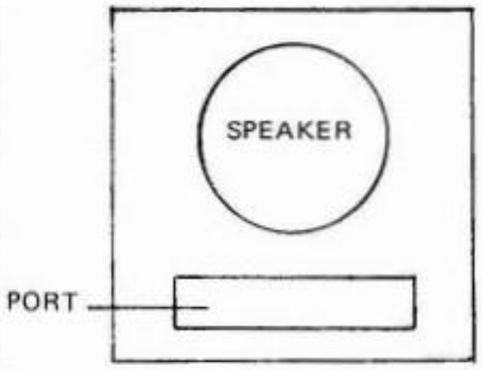
SOME TYPICAL LOUDSPEAKER BAFFLE ARRANGEMENTS

SINGLE EXTENDED RANGE SPEAKER

A

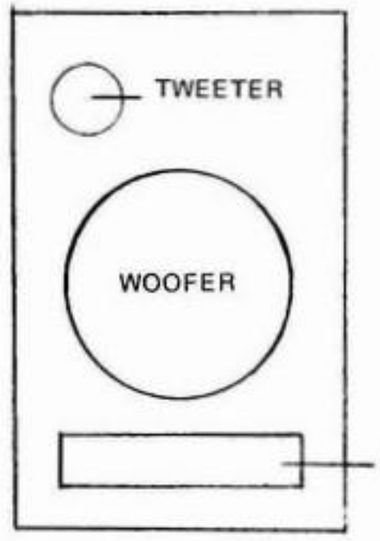


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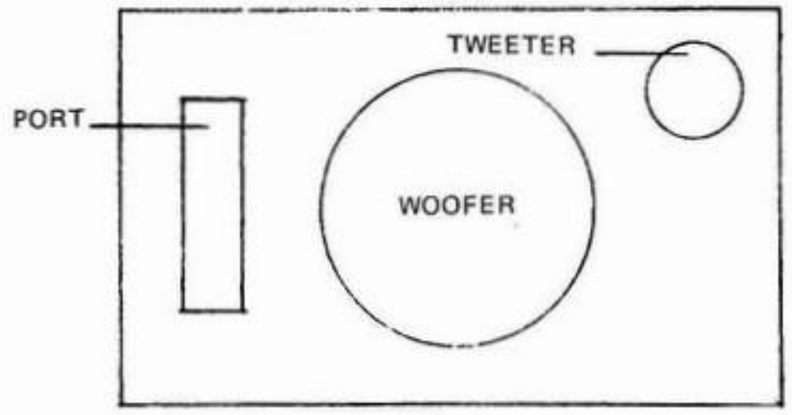


TWO-WAY (WOOFER-TWEETER) SPEAKER SYSTEM

C

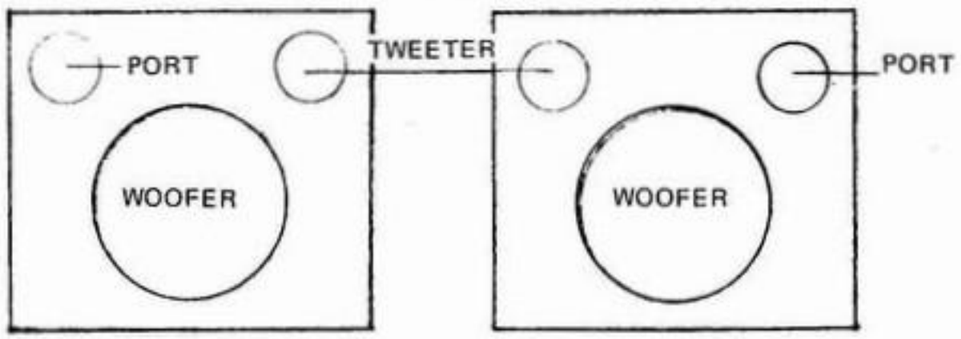


D



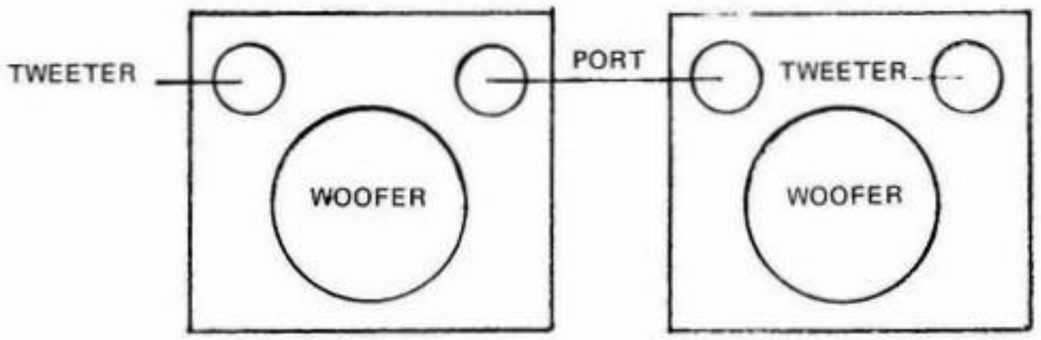
TWO-WAY (WOOFER-TWEETER) SPEAKER SYSTEM

(E) STEREO PAIR



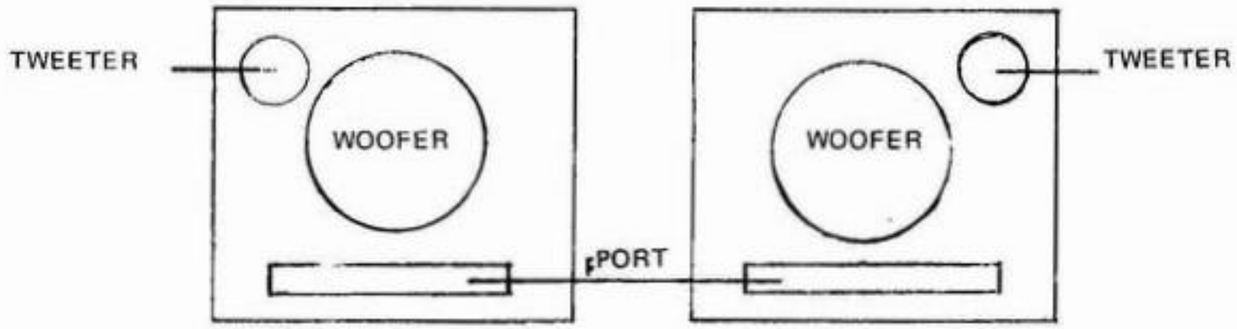
TWO-WAY (WOOFER-TWEETER) SPEAKER SYSTEM

(F) STEREO PAIR

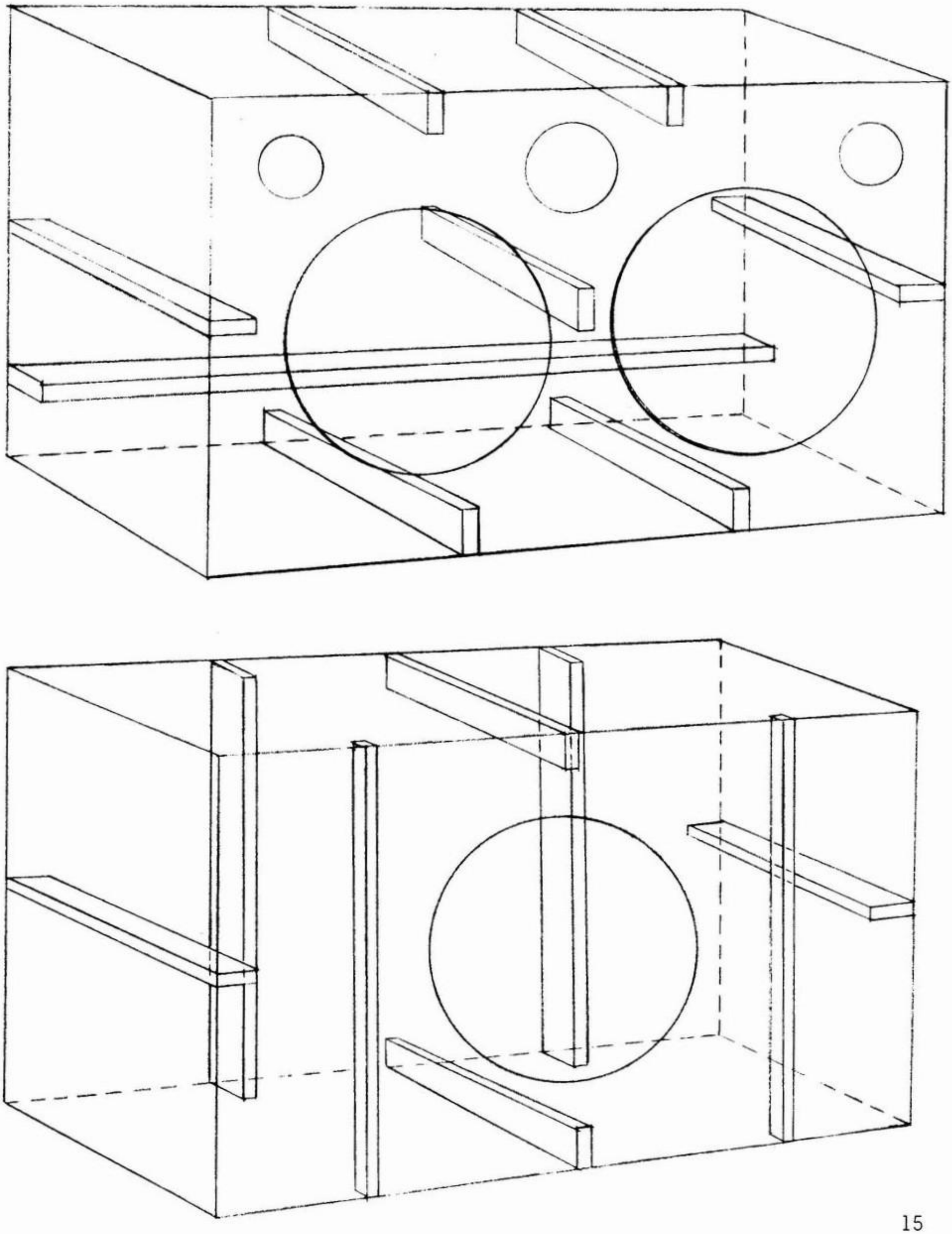


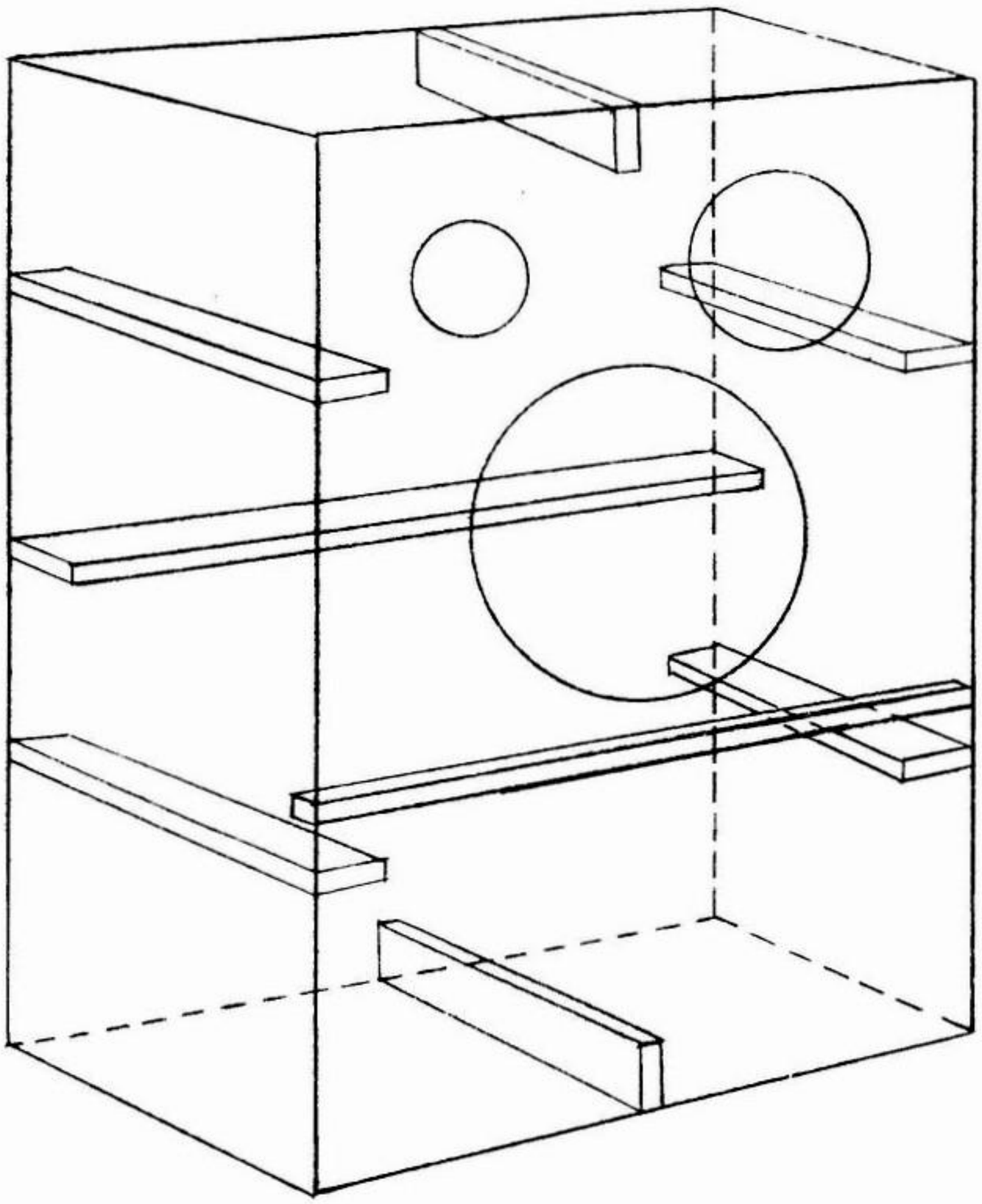
TWO-WAY (WOOFER-TWEETER) SPEAKER SYSTEM

(G) STEREO PAIR



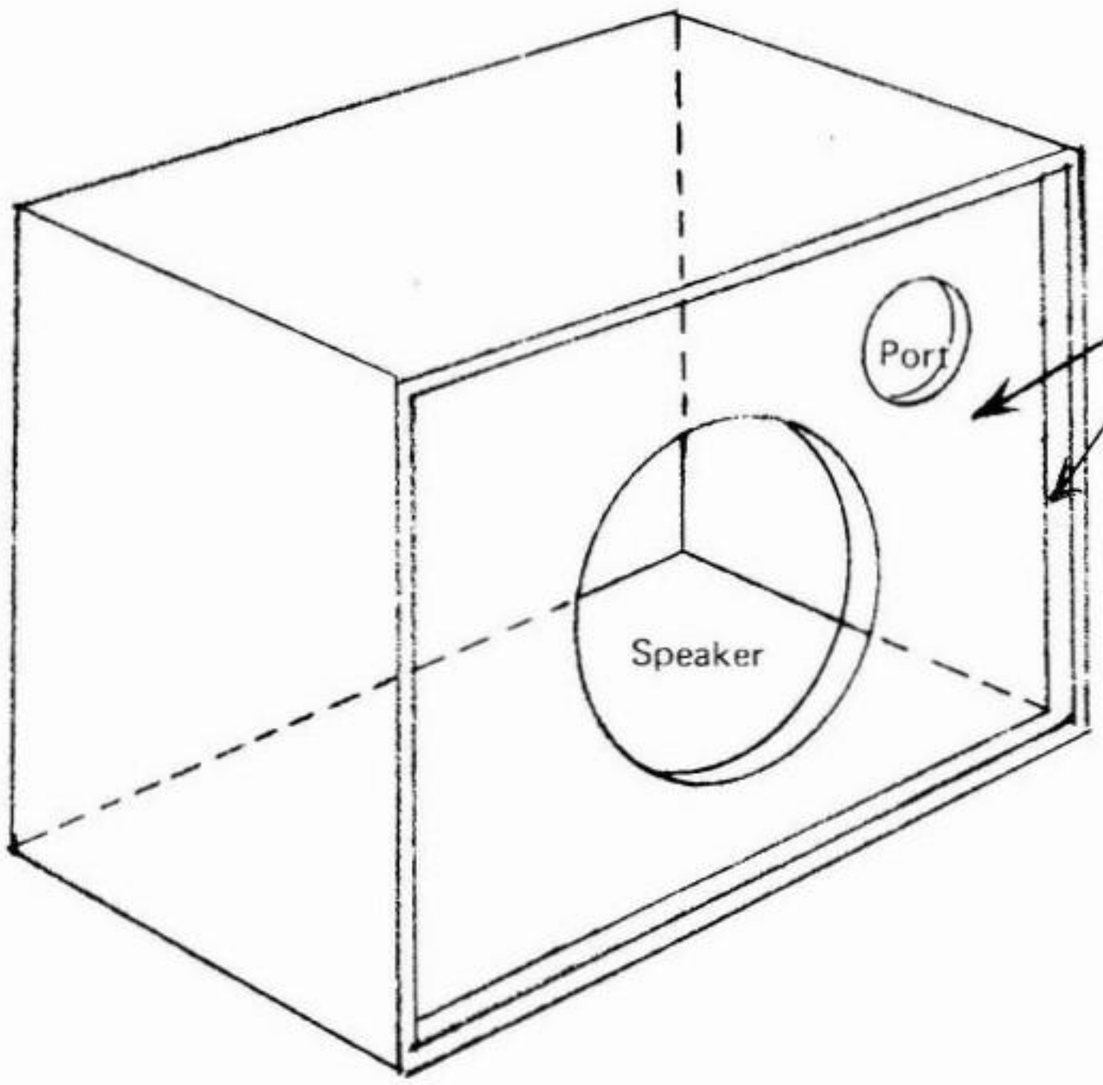
TYPICAL CABINET BRACING



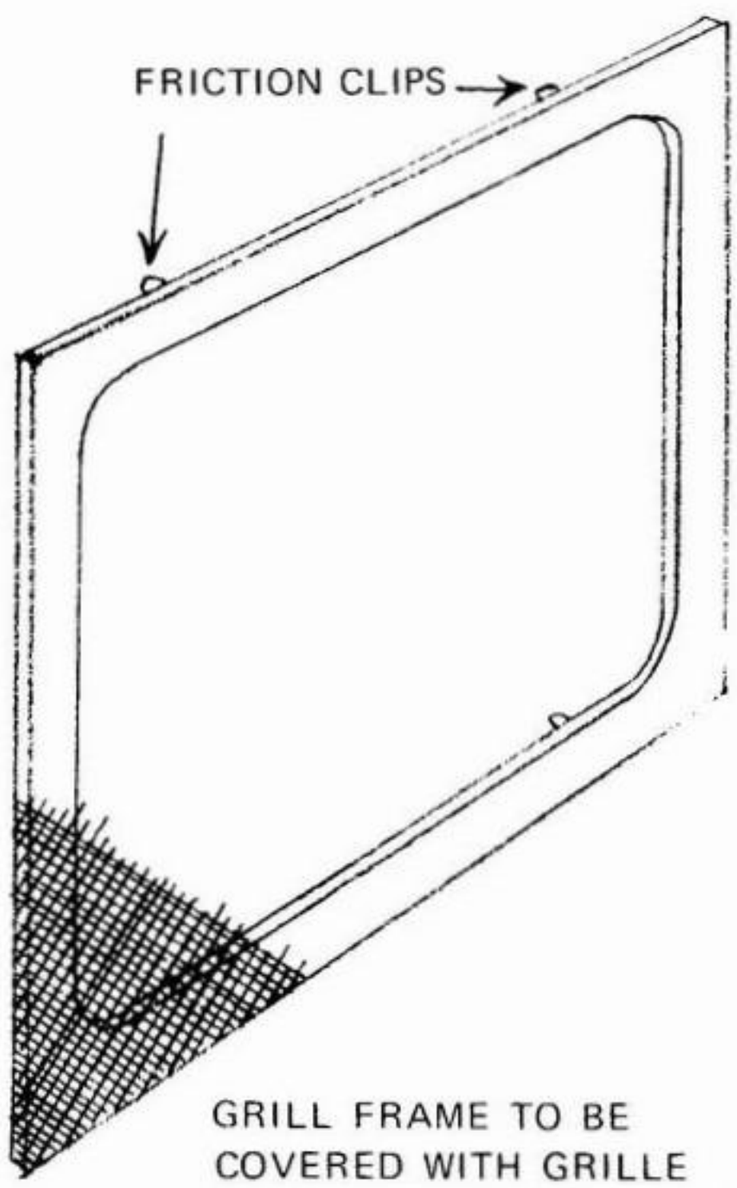


Bracing can consist of any combination of vertical and horizontal reinforcement so long as all large panels are **solidly** braced. We recommend that bracing be made of 2"x4" stock (usually soft pine), although 1"x3" or 1"x4" stock can be used if the enclosure must be made as light as possible. You may or may not have to use as much bracing as illustrated in the drawings. It depends on the size of the cabinet and what kind of program material the speaker system will be reproducing. For instance, if a home organ is used, the system will be constantly subjected to strong, low frequency pulses that will increase the possibility of panel resonance. In this case, more bracing will prevent this from occurring. Smaller cabinets having 1.5 to 2.5 cubic feet of internal volume probably will not require bracing if the joints are true and tight and if glue blocks are used. Any panel measuring 15" x 20" or more must be braced. A fairly large cutout or several cutouts on a single panel tend to weaken it. A panel of this type will have to be braced regardless of its size. Also, the larger the cabinet; the more the bracing. Be sure to position bracing so that it does not interfere with the proper placement of the speaker components.

TYPICAL GRILLE FRAME ASSEMBLY



FINISH ALL FOUR SIDES AND FRONT EDGES (IF REQUIRED) AS DESIRED



GRILL FRAME TO BE COVERED WITH GRILLE CLOTH, STRETCHED OVER AND STAPLED TO BACK SIDE. CONTACT CEMENT CAN BE USED FOR ADDITIONAL STRENGTH.

We are sorry, but we cannot supply JBL emblems for use on loudspeaker enclosures constructed by the consumer. The emblem is used exclusively to identify factory-built JBL cabinetry.

PROFESSIONAL

FINISHING TECHNIQUES

STYLING AND FINISHING THE ENCLOSURE

Unless it is "built-in", the loudspeaker enclosure serves a decorative function as an integral part of the room decor, and as such, is further subject to your critical eye and taste. It should, therefore, possess a luxurious appearance in addition to excellent acoustical properties.

Varieties of pre-shaped moulding are easily obtainable, which permit the home builder to construct the enclosure in Traditional, Early American, Contemporary or any other style he wishes. Pre-finished or finished veneered wood panels and trimmings are available in a wide variety of finishes and can be used according to the particular style you have in mind. Some lumber yards and hobby shops will pre-cut the lumber to your requirements, mitre and prepare edges for joining.

OILED FINISH

A fine oil finish can be readily obtained by sanding the surface with 6/0 sandpaper (being careful not to sand through any thin veneer) until it is mirror smooth. The quality of the final finish depends upon the care and thoroughness with which this initial sanding is done. Make sure that the surface is completely free of oil, grit and dust. A liberal coat of oil consisting of three (3) parts boiled linseed oil and one (1) part pure gum turpentine should be applied over the entire surface with a thoroughly soaked rag. In ten to fifteen minutes, wipe off the remaining oil with a clean, dry cloth. Make sure that the cloth has no buttons, pins, etc.

Apply two more coats in the same manner and allow 24 hours to dry between each coat. Immediately before applying each coat, sand the surface lightly with 8/0 sandpaper. After the third coat has penetrated the wood, the surface may be rubbed down with clean, soft, dry rags.

It is natural for this type of finish to appear as though it were drying out. This results because the oil is penetrating deeper and deeper into the grain. Consequently, it becomes necessary to re-oil the enclosure (with the same mixture described above) once or twice a year for the first year or two. With each application, the beauty of the finish increases, and a warm, rich patina will eventually be obtained. If small scratches are incurred, they can usually be removed by gently rubbing them out with 4/0 steel wool and then re-oiled. Very deep scratches, dents and more serious damage should be repaired only by a qualified cabinetmaker.

SATIN FINISH (GLOSSY LACQUER)

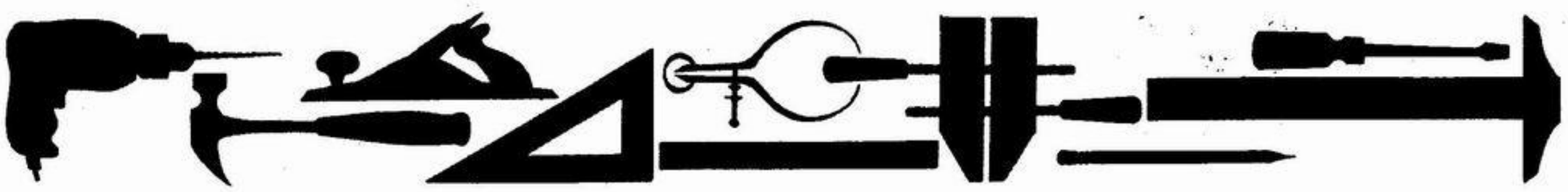
Sand all surfaces until they are absolutely smooth and level with 6/0 sandpaper. All surfaces should be free of oil, grit and dust. A coat of stain filler is then applied according to the instructions furnished with the product. After it has thoroughly dried, apply a coat of sealer (thinned lacquer). When it dries, sand lightly with 5/0 to 6/0 sandpaper. Apply one coat of clear lacquer and allow it to dry overnight. Now level the surface with 400 then 600 wet-or-dry paper. Apply a second coat of clear lacquer and allow at least 24 hours to dry, making sure the surface is hard. Level it again with 400 then 600 wet-or-dry paper, using rubbing compound. The surface should then be lightly rubbed to a satin finish with 4/0 steel wool. When finishing with steel wool, be sure to rub with the grain, using long, even strokes across the entire surface.

If small surface scratches are incurred, they can usually be removed by gently rubbing them out with 4/0 steel wool. Lacquer finishes are extremely difficult to work with and only small scratches should be repaired in this manner. No attempt should be made to remove any scratches that go through the lacquer finish. Deep scratches can only be repaired by skilled craftsmen, and competent professionals in your area should be engaged to do this kind of work.

If desired, an occasional coating of any good furniture polish or wax can be applied to lacquer finishes. In extreme climates, it is also a good idea to give the cabinet interior a sealer coat of paint or lacquer.

Ebony, Antique White and other special finishes can be obtained by using wood finishing kits. These kits come in a wide variety of finishes for most types of wood veneer and solid paneling and can be purchased from most lumber dealers, hobby shops, paint stores, do-it-yourself shops, hardware and department stores. Further questions concerning cabinet styling and wood finishing should be directed to these sources.

CAUTION: *The wood finish mixtures described in these pages are extremely inflammable and should be kept away from open flame or cigarettes. After the wiping cloths are used, they should* **immediately** *be burned or spread out to dry in a well-ventilated area, preferably on concrete or some other non-burning surface.* CARELESS DISPOSAL OF RAGS CONTAINING INFLAMMABLE LIQUIDS CAN RESULT IN SPONTANEOUS COMBUSTION.



JBL

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