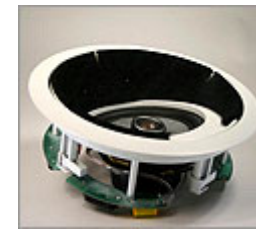


Quality Components for Sound Solutions



Loudspeakers that are architecturally and technically correct

System Design & Installation Guide



In-Wall / In-Ceiling Audio Products

We will help you design your system by sharing simple principles about sound, style and installation. The following dialog is intended to give you a fundamental understanding of loudspeaker and volume control placement, mounting procedures and simple directions on how to wire your system for both new and existing construction.

Are you a “DIY” (Do It Yourself) type of person?

If you are not, please consider hiring a professional or “DIY” friend to install your system for you. However, before you decide, please let us suggest that you read through the installation instructions and dialog portions in this manual.



In-Wall / In-Ceiling Audio Products



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NOTES

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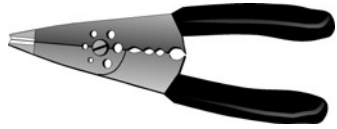


Installing loudspeakers in walls and ceilings is a straightforward and basically simple process.

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Figure 20

Other Useful & Necessary Tools



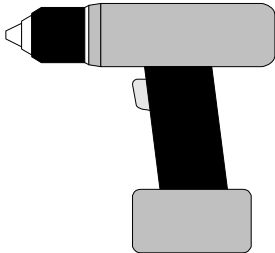
Wire Stripper



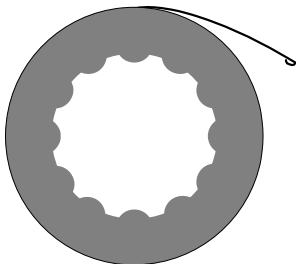
Tape Measure



Phillips Screw Driver



Electric Drill
preferably cordless



Electrician's Fish Tape

Part I – Understanding Loudspeakers and Determining Placement

Which loudspeakers are right for you?

The Angstrom rectangular loudspeakers look and work great on walls and on vaulted ceilings. They feature a small “knock-out” on the baffle. This may be used to place an industry standard infrared receiver-repeater for carrying remote control commands to the stereo equipment center.

The Angstrom round loudspeakers are great on ceilings and of course may be used on walls if so desired. These loudspeakers have been designed with an aluminum (powder coated white) grille and other stainless parts to stand up well outdoors and in humid environments such as bathrooms, laundry rooms, outdoors in eaves, etc.

The Angstrom indoor-outdoor cabinet loudspeakers are very versatile and attractive. Available in white and black, their cabinets are made of high-grade polypropylene composite with a powder coated aluminum grille and include brackets that enable the loudspeakers to be pointed up and down or side to side. The brackets may be removed for bookshelf placement. These loudspeakers are capable of weathering the storm and the heat. They are rated for a -50° F to $+200^{\circ}$ F temperature range and high humidity. They are covered by a 5-year unconditional corrosion guarantee.

Use on surfaces which cannot be penetrated or for areas where it is preferable that they not be penetrated. Concrete walls and outside ceilings are examples of surfaces which cannot be penetrated. Exterior walls are an excellent example of walls which may be penetrated, but it is preferable that they not be.

Cabinet style loudspeakers are excellent for use under eaves for delivering music to outdoor activities. They are also very useful for placement on the ceiling or high on a wall, as they can be pointed downward or down and across to cover listening positions with a full sound field.

Call 905-686-0777 for technical assistance with installation or wiring.

Keep the two colours in mind when deciding how to lay out your system when using cabinet loudspeakers. The black loudspeakers are virtually invisible when placed high on dark coloured ceilings. The white models will fare better than the black if in frequent exposure to the sun as white reflects heat and black absorbs it.

Where are you going to locate your loudspeakers and volume controls?

There is flexibility in loudspeaker placement. Factors governing loudspeaker placement include:

- Listening positions
- Wall/ceiling construction
- Aesthetic considerations:
- Location of furniture and objects located on walls and ceilings
- Architectural concerns

Where your loudspeakers and volume controls are placed may depend on whether your house is “new construction”, with walls and ceilings that have yet to be dry-walled, or “existing construction”. Obviously new construction makes it much easier, BUT existing construction is easier than you may think.

Determine a location for your audio equipment center, (amplifier-receiver, CD player, etc.) In many households this equipment is located together with the video equipment in the room where your Home Theatre- Surround Sound system is. It is from this point that all the wires driving your loudspeakers will head-out to their respective locations.

Determine the range of activities which will occur in each room. This, together with room layout considerations, will help determine the best location to mount your loudspeakers. Keep in mind that walls are frequently used to hang items – pictures, art objects, mirrors, etc. Also, consider where window treatments will hang when placing in-wall loudspeakers close to windows.

Ceiling loudspeakers have to fight for space with far fewer constituents, primarily light fixtures.

Your loudspeakers should be located in either the ceiling or walls in such a manner that the individual left and right loudspeakers are at relatively equal distances from the listener(s). Ideally, they should be approximately the same distance from each other as they are from the listener(s).

Figure 12

Flexi-bit Method

Method may be used to drill up or down provided you have an adequately long flexi-bit.

Read printed instructions page 20!

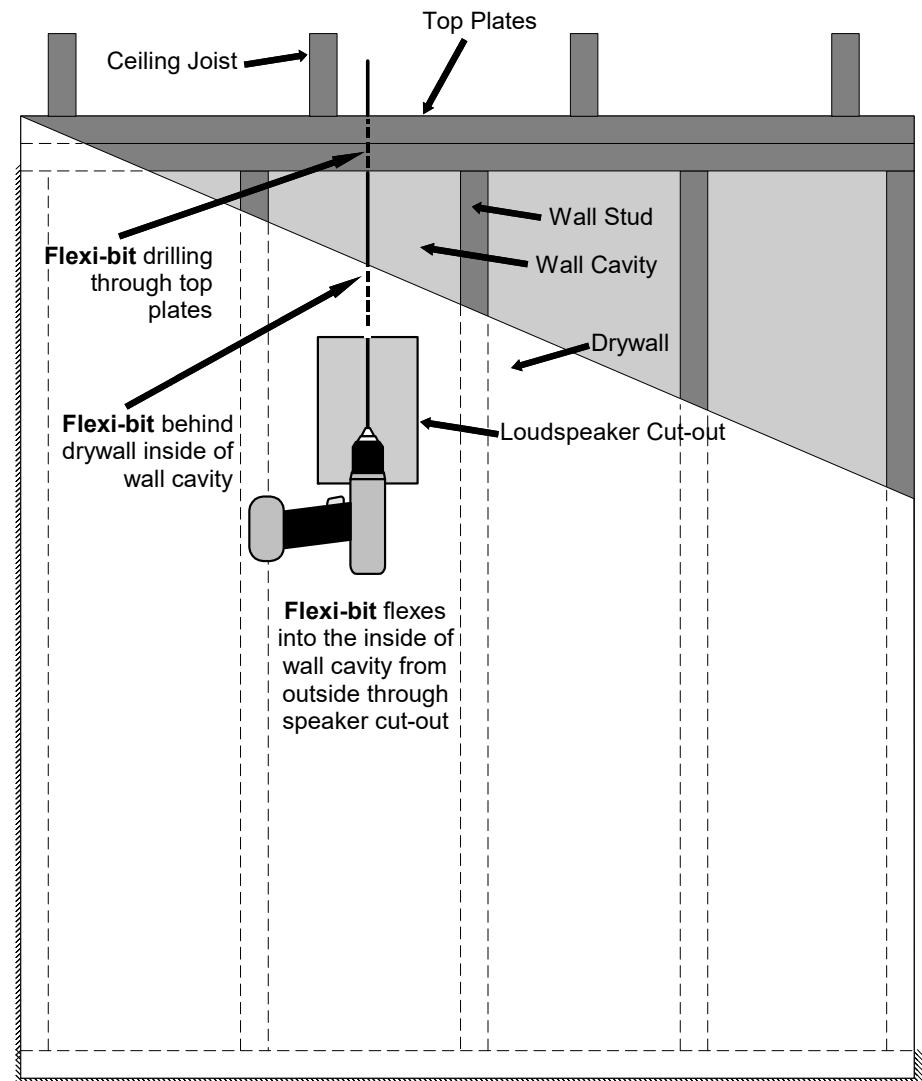


Figure 14



16/4 Loudspeaker Wire
UL Approved or cUL
Check local codes applicable to low voltage wire

Figure 15



Stud Finder
Simple model shown here
More elaborate electronic models available at moderate cost

Figure 16



Keyhole or Drywall saw

Figure 17



Paddle Bit or Speed Bore

Figure 18



Utility Knife

Figure 19



Level

It is very simple. The gist is – place the loudspeakers so an even sound dispersion is experienced by the listener(s) and so that the volume controls are located within easy reach.

The Home Office offers great examples of the process of choosing between in-wall or ceiling loudspeakers. An office environment can be anywhere from very open, airy and uncluttered to just the opposite.

Let's say that in your home office, your desk is situated so that your back is close to a wall and you look across the room to a blank wall. Let's also say that you enjoy music when you work. This is a good scenario to place in-wall loudspeakers in the wall facing you at ear level (when seated). If your walls are covered with pictures, memorabilia, diplomas, etc. and your desk is situated so you look out through a window, then ceiling loudspeakers are probably better for you.

You will want to place the volume control in a location you can reach while sitting at your desk taking and placing telephone calls.

The Dining Room is an example of a room where many people join together. The challenge here is positioning your loudspeakers so that everyone at the table experiences the music at an equal volume level. You want to achieve the "perfect" background volume level so that everyone can hear the music without it interfering with anyone's ability to hear and participate in the banter.

The best location for loudspeakers in a dining room is usually in the ceiling over the dining table. It is convenient to place the volume control in a location where the seated person who controls the volume can reach it with a minimum of hassle.

In the Garage, many times you will have a work bench – a place where you are stationed most times – this is the place for the volume control. In many cases, the best place for your loudspeakers is at either side of your garage door pointing into the garage instead of another location pointing toward the outside. This assumes you have neighbors within earshot. If your preference is to have sound out in your driveway, then do the opposite.

Bathrooms have become very popular locations to have loudspeakers. Most of us spend a fair amount of time in the bathroom in the morning getting ready for work and find it convenient to listen to the news while doing so.

The Family Room is usually where the Home Theatre System is located, unless you have a dedicated room. These loudspeakers will serve to play the great sound effects of the movies you watch. They

also will be the loudspeakers you will listen to when you choose music over movies, video, TV, etc. Since the Home Theatre System equipment directly controls the volume, the loudspeakers generally do not use wall mounted volume controls. Placement of the loudspeakers will depend on room layout. They should be located where an even sound dispersion will be experienced by the listener(s).

The Living Room is a great place for either in-wall or ceiling loudspeakers because it is generally more formal with a concentration on style and design. As with the family room, the location of the loudspeakers will vary depending on the room layout and listening preferences.

In Bedrooms, if there is no seating, presumably the listening and TV watching will be done from the bed. In which case the loudspeakers should be positioned so that an even sound field of left and right cover the bed. The volume control should be located within reach from the bed, such as next to the bed, above the nightstand.

Outdoors, round loudspeakers may be flush mounted in eaves.

The Angstrom indoor-outdoor cabinet loudspeakers may be mounted virtually anywhere.

When your system includes outdoor loudspeakers you may choose to locate the volume control inside, near a doorway or outside. If you choose to locate it outside you will need to use outdoor volume control for the job. These may be placed in either a flush or surface mounted J-box.

Part II – Installation

Once you have determined the general locations of all the loudspeakers, volume controls and the stereo equipment center, you are ready to begin the installation process.

We will start by defining the materials needed. Then we will describe both the new construction and the existing construction installation processes.

Materials

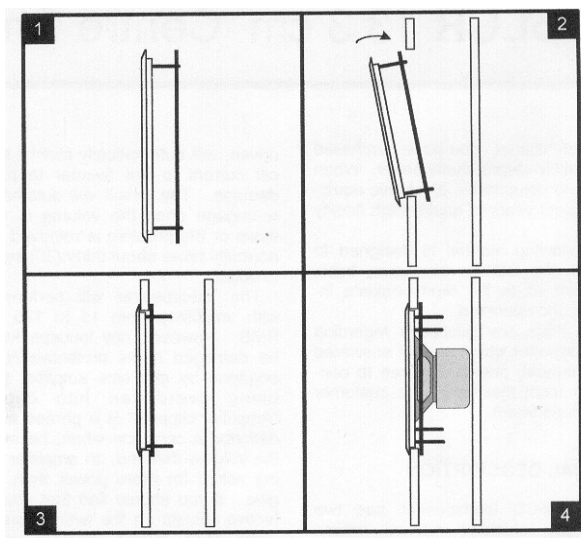
'J-boxes' & 'Jack Plates'

A multi-gang J-box with up to eight (8) conductor jack plates may be

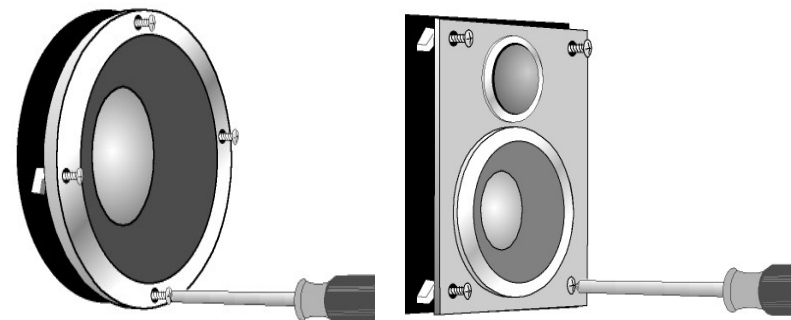
Figure 13

Mounting Loudspeakers

Read printed instructions page 21!



This installation technique is descriptive of a rectangular loudspeaker. The installation is similar for the round Angstrom Ambient loudspeakers except that they have a dual clamp system as the loudspeaker is round.



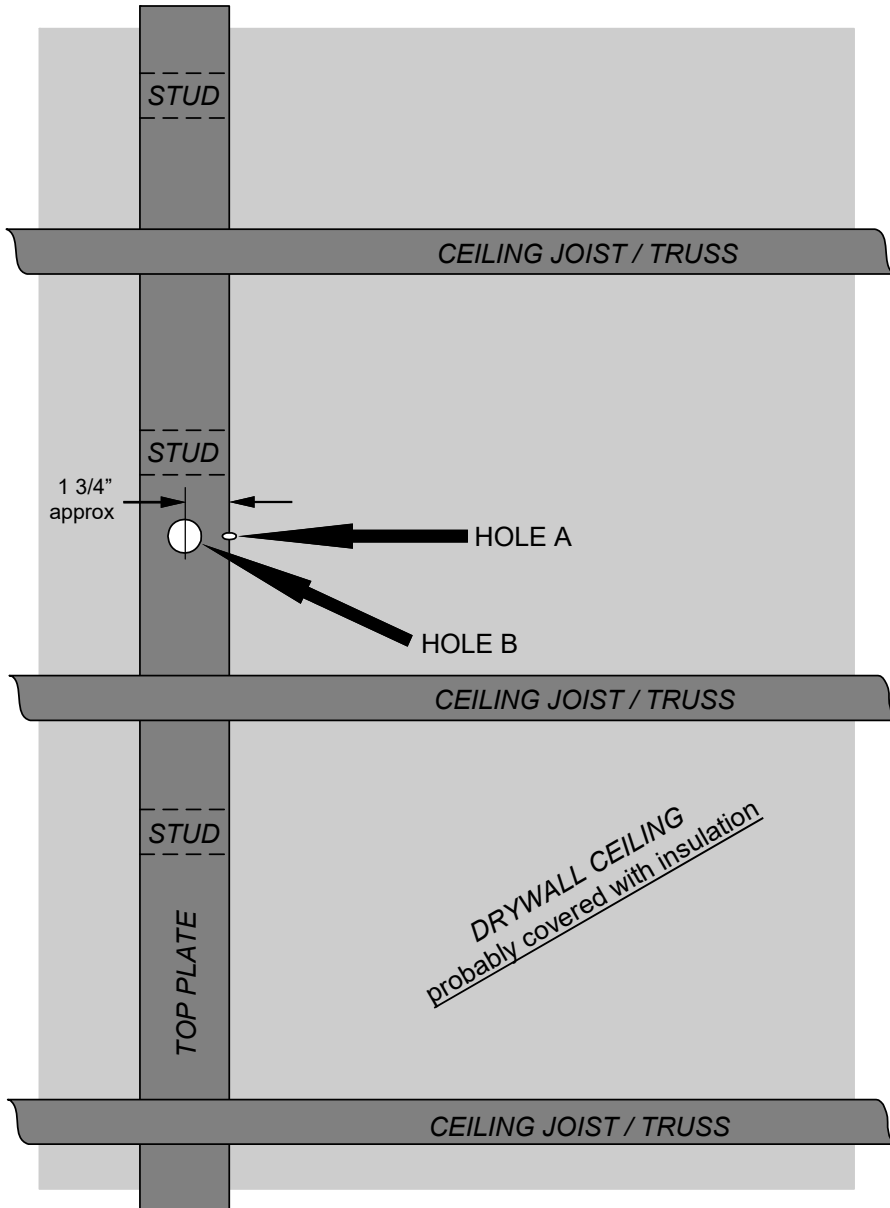
This illustration shows the 'Dog Ear' / cam nut installation technique.

Figure 11 (also see figure 10)

Top View (looking down from attic crawl space at wall top plate)

45 degree method

Read printed instructions page 19!



used to transition the wires from the audio equipment center into the wall in a neat and organized manner. We call this the 'head-out' because it is from here that the wire paths 'head-out' on their way to the various rooms.

Basic aspects describing J-boxes include J-box size (1, 2, 3, or 4 gang etc. and depth) and material (plastic or metal). "Gang" refers to the number of switches, jack plates, etc. the J-box will accommodate. For example, if used for a light switch, a single gang would hold one, a 2 gang would hold two, and so on. Each gang will accommodate two pairs of loudspeakers when '2 pair' jack plates are used. So, for example, a 3 gang J-box will provide termination for six rooms or six pairs of speakers using three 2 pair jack plates.

For the most part it is difficult to find readily available J-boxes larger than 4 gang. Angstrom offers a special 8 gang In Wall Media Panel and labeling System called the ADP-8 that clamps to drywall.

In addition to the multi-gang J-box, you will need to accommodate the volume controls.

For new construction, a single gang J-box will be needed for each room with a volume control. Make sure these J-boxes are large enough to hold the volume controls.

For existing construction a single gang "old work" mounting ring will be needed for each room with a volume control.

Wire

There are several manufacturers of quality loudspeaker cable in various grades and gauges (sizes).

Generally, the most practical wire for the money is generically referred to as 16/2. That means two 16 gauge insulated conductors in a single jacket or sheath (**figure 14**).

Today, building codes rate loudspeaker wire or stipulate minimum quality. Also check if any locally applicable codes further govern wire for sound systems when you are ready to buy.

Some people opt for 14/2 or 14 gauge. 14 gauge is thicker, will carry higher wattages and technically does better over longer distances. We find 16 gauge to be well suited for nearly all applications. 14 gauge is more difficult to work with at the volume control because of the tight clearances that exist between the volume control and the inside of the J-box.

New Construction

Pre-construction brackets and J-boxes

1. Are you going to use **PRE-CONSTRUCTION BRACKETS** or are you going to cut the loudspeaker mounting holes in the drywall after it is installed?

Pre-construction brackets are somewhat similar to “Mud Rings” used by electricians to mark a spot where the drywall installers are to cut a hole.

Pre-construction brackets are position-able and designed to span up to 24” centers. The mounting hole cut-out can be placed at any point between studs, joists or trusses.

If you use pre-construction brackets, the installation of your loudspeakers will be easier and much faster because the drywall installers will do the cutting for you .

There are several Angstrom Pre-construction bracket models available. Take a look at figure 6 and figure 7 to give you an idea.

2. Fasten the pre-construction brackets in their respective locations. After fastening the mounting straps to the studs or trusses, slide the mounting hole cut-out portion of the bracket into the desired position.
3. Choose a location in the wall close to the stereo equipment center (ideally within 15 cm / 6”) to mount a multi-gang “J-box” (**figure & 5**) for the head-out. Preferably, this location will be easily accessible and will not be visible once the equipment is in place.
4. *What Size “J-boxes”?*

Each “gang” when ‘2 pair’ jack plates are used will accommodate two pairs of loudspeakers. So a 3 gang J-box will provide termination for six rooms or six pairs of loudspeakers at the head-out point.

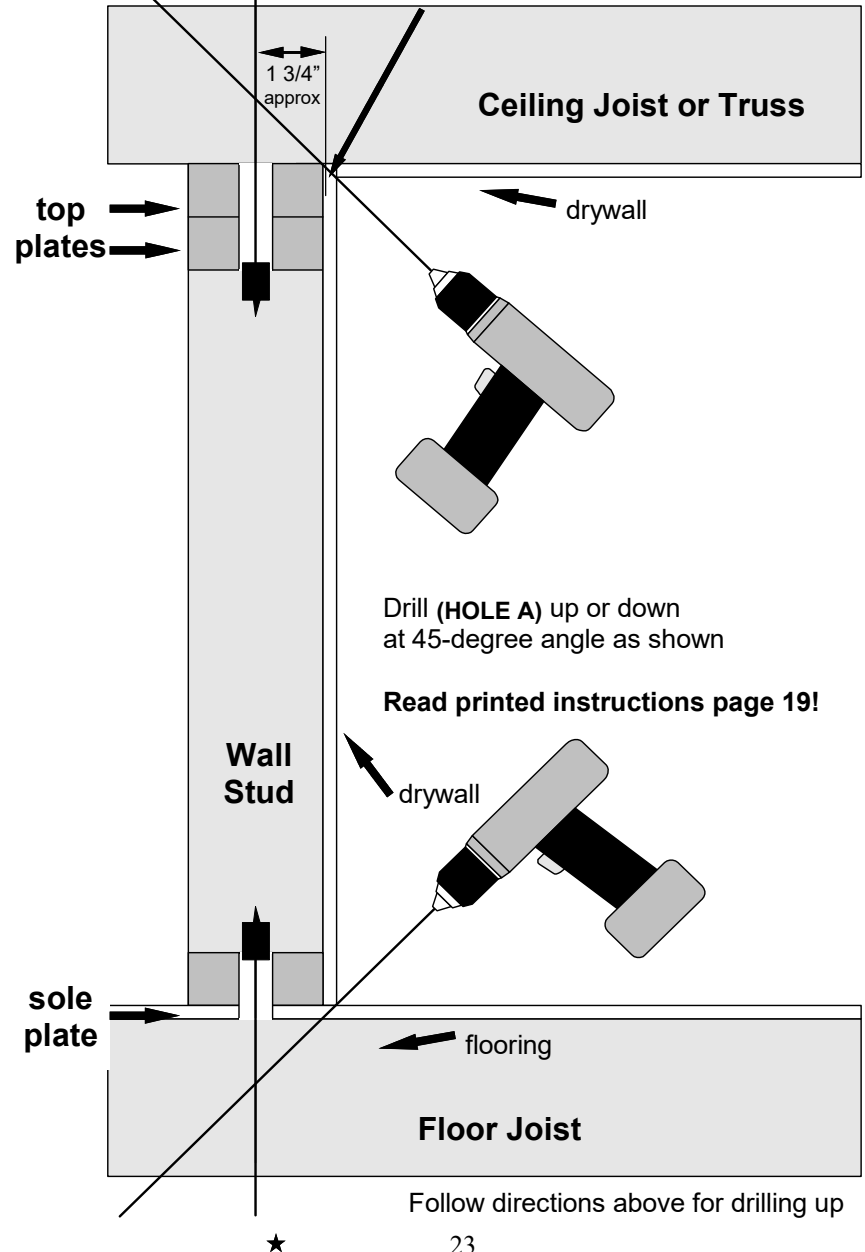
Following the example of six rooms, obtain:

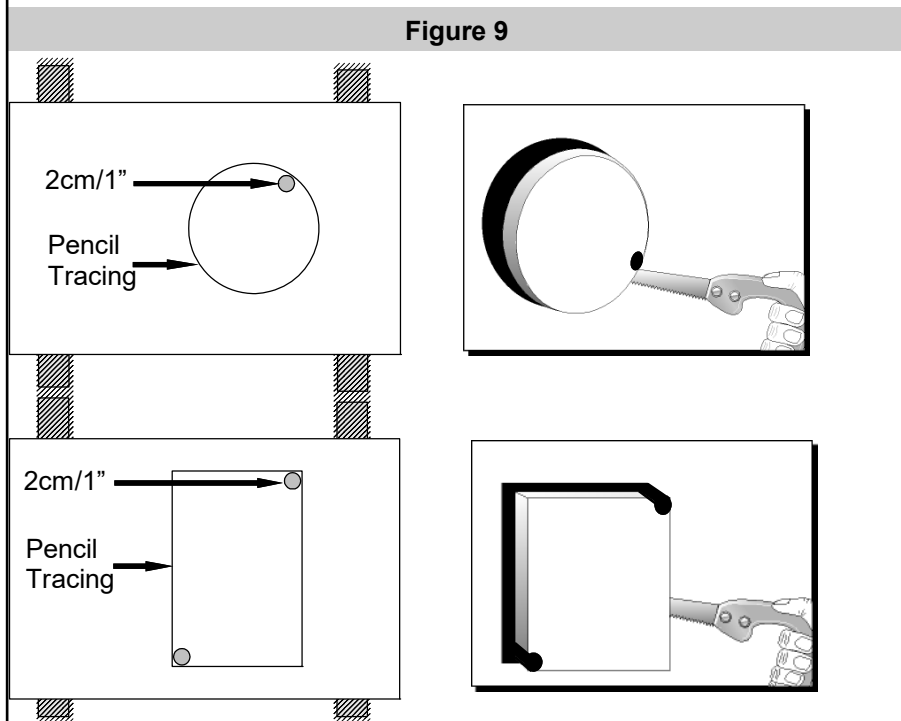
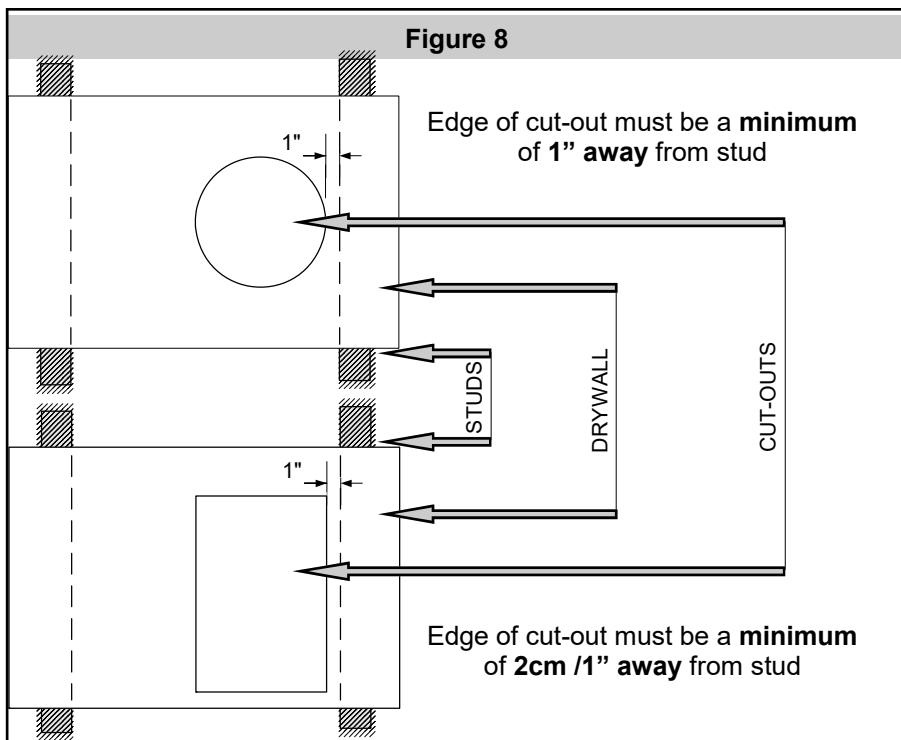
- One 3 gang J-box for the head-out termination *new construction nail-on type*.

Figure 10 (also see figure 11)

Side View

45 degree method





- Six 22.5 cubic inch 3 5/8" deep single gang J-boxes for the volume controls *new construction nail-on type*.

5. Fasten the head-out J-box.
6. Fasten the volume control J-boxes in their respective locations, usually at light switch height.

Now you are ready to run the wire.

Running the Wire

The best time to run your loudspeaker wire is after the electrical rough-in is complete and before the insulation and drywall go up.

1. From the multi-gang J-box head-out at the stereo equipment center, run the 16/2 to each volume control J-box location.
2. After you have made the run to the J-box, pull a 12-inch loop of the 16/4 into the J-box from behind. **Do not cut the wire.**
3. Continue running the 16/2 to the loudspeaker which is located closest to the volume control. **Do not cut the wire.**
4. Coil up approximately 1 metre / 3 feet of slack of the 16/2 at the location of the closest loudspeaker. **Do not cut the wire.**
5. Staple the coil of slack up between the studs or trusses in such a way that it will not interfere with the drywall or insulation.
6. Then, continue running the 16/2 to the location of the other loudspeaker. Coil up approximately 1 metre / 3 feet of slack at the loudspeaker location and **CUT the wire now**. Again, tie up the slack between the studs or trusses in such a way that it will not interfere with the drywall or insulation.

At this point you will NOT be installing any loudspeakers or volume controls.

You are simply running the wires while the walls are open. Not until after the drywall is installed, taped and textured will you actually install volume controls and speakers. See **Painting Your Loudspeakers (page 19)**.

Existing Construction

Surveying for access

It is **absolutely necessary** in an existing construction installation that you **perform a “survey”** to determine access to all volume control locations from the head-out J-box and access from each volume control location to the respective loudspeaker locations. This is because you will have to drill and cut holes through walls, below floors and above ceilings for the wire paths.

Access means not restricted by blocking or complicated with electrical, plumbing, ducting, etc.

First, choose the desired location for your audio equipment center head-out. This is usually against a wall.

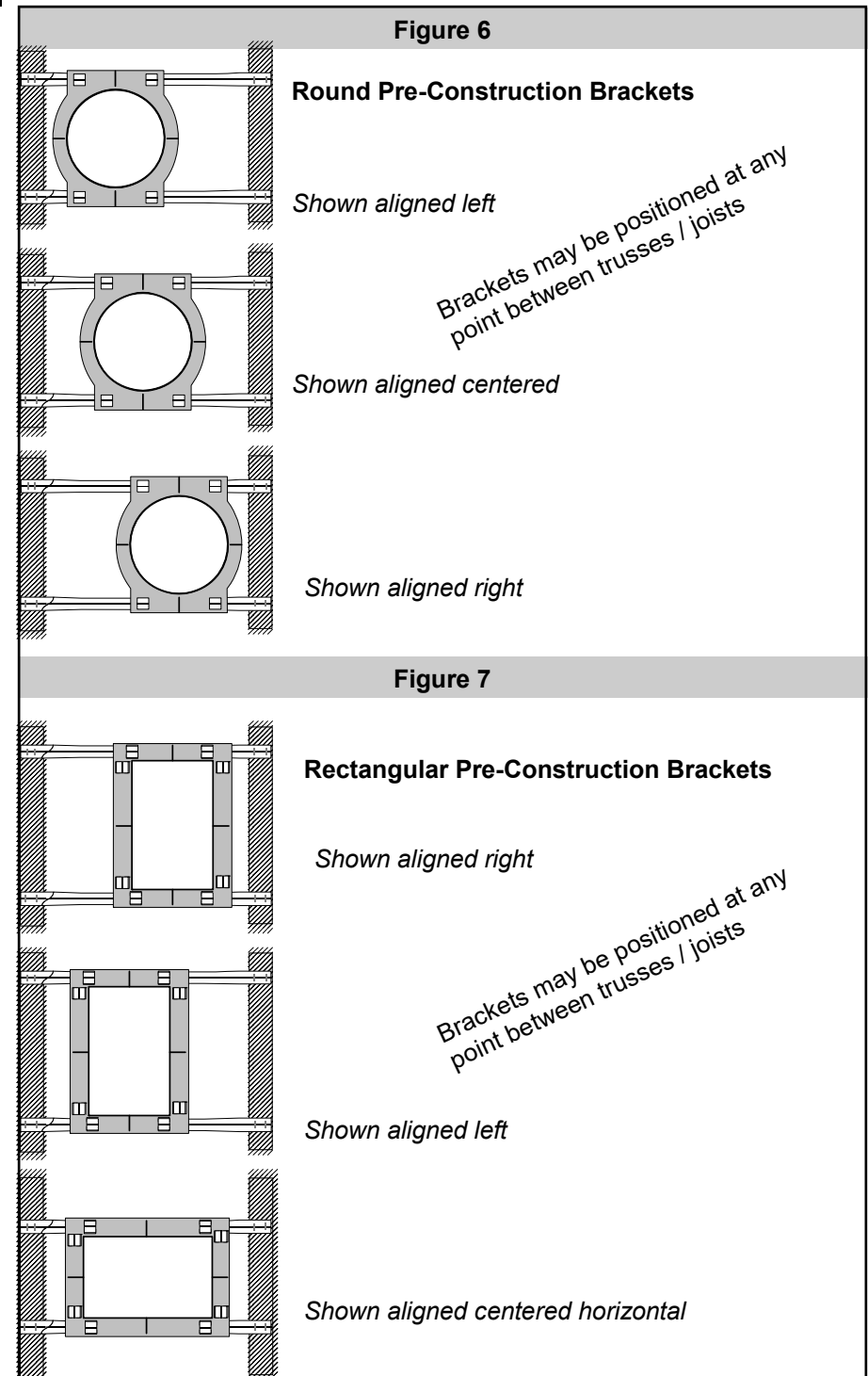
Ascertain that there is access from the head-out location either up to an attic or crawl space or down to a basement crawl space. Depending on the scope of the installation and various access aspects, you may want to, or have to, gain access to the volume control/loudspeaker locations via both the upper attic and the lower crawl space areas. Check them both.

The major part of this is to go up into the attic space and down into the basement space. Once up and down into these areas, you will have to find the area above or below the desired head-out location. Look for wires, plumbing, ducting, etc., anything that will complicate or preclude access into the wall where the head-out J-box is to be located. **Remember where these potential obstructions are so you do not drill or cut into them at any time during the installation process.**

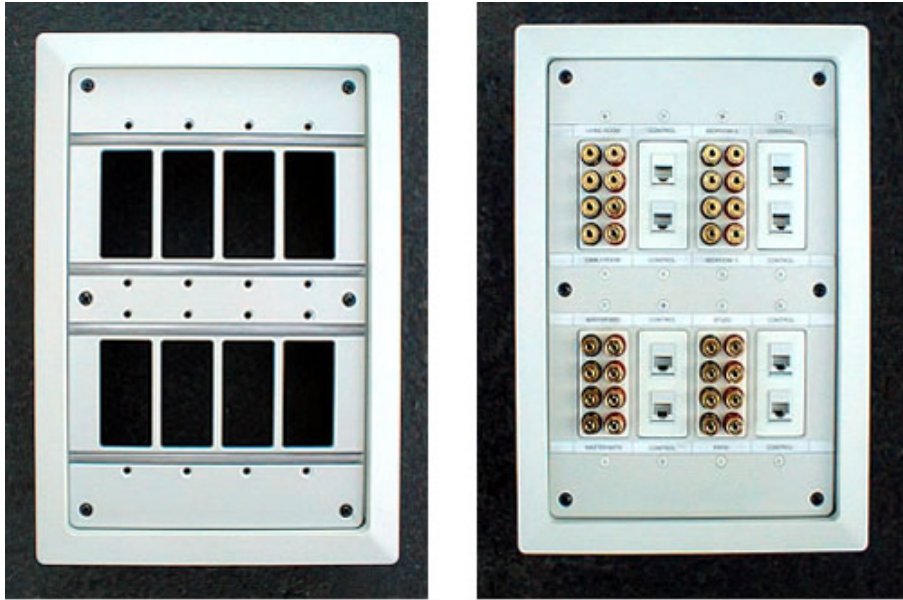
Insulation may impede your ability to see all of what you need to determine access. It is advisable that you **wear a respirator** so as not to breathe in insulation fibers that are hazardous to your health.

In most single story frame construction homes, there will be differing circumstances between the upper attic and lower crawl space areas.

In the **upper attic area**, you should have a fairly clear view of the ceiling joists or roof trusses to which the ceiling drywall is fastened. You should also have a reasonably good view of the top plates of the various walls throughout the structure. If the home has “blown-in” type insulation, you may have to brush it aside to see the top plates of the walls you are looking for. Likewise, if you have insulation “batting”, you may have to lift it up in various areas to reveal the wall top plates. You should also have a clear view of any ducting.



The Angstrom ADP-8 In-Wall Media Panel & Labeling System



A solid stamped Aluminum panel that is 5 mm thick. Complete with mounting hardware including our Clamp Ring mounting system. It holds up to 8 Decora plates offering an almost never ending combination of terminations.

Included is a label system, 9mm Brother P-Touch , compatible with 378 individual labels.

As you navigate around the upper attic area, you must be very careful not to step or place any weight on what is the topside of the ceiling dry-wall. If you do, you may damage the ceiling and may possibly fall through it causing serious bodily harm.

As you make your way to the area above the desired head-out location, you will have to step on the topside of the ceiling joists, the topside of the lower member of the roof trusses, and/or the tops of the various walls.

The tops of walls are very strong and can support your full weight without any worry of collapse or flexing. The ceiling joists are quite strong and can usually take your full weight although they may flex somewhat; the same goes for roof trusses although they can be prone to more flex than joists.

It is the walls that hold the joists and trusses up, so when stepping on the joists or trusses, it is best to do so at a point close to a wall. It is possible to flex a joist or truss to the point where the fasteners holding the ceiling drywall to the bottom side of the member can “pop”. If this happens you may have to perform cosmetic repair to the ceiling drywall where a small screw head size void or tear appears. As long as the point of the joist or truss you step upon is within 2 metres / 6’ of a supporting wall, you should have no flex problems whatsoever.

You should keep the foregoing in mind throughout the entire process of navigating the attic crawl space when locating volume control loud-speaker location access and when running wires to their respective destinations.

In the **lower crawl space area**, insulation “batting” will impede your ability to see all of what you need to see to determine access. Again, it is advisable that you **wear a respirator**.

Presumably, in the lower crawl space area you will be navigating around on earth as opposed to construction framing in the attic area, so you will not have to use the same level of care when moving about.

In the attic area, the tops of the walls are relatively easy to see. This is not the case in the lower crawl space area. The reason for this is that there is a layer of sub flooring directly above the floor joists. The walls are fastened to the top of this sub flooring.

To find the walls from the basement, you will have to look for electrical wires and plumbing and determine a pattern from them as to where they transition from below the floor up into the various walls. Sometimes you may be able to find wall locations from nailing patterns where the wall was nailed to the floor. Usually, the nails used are longer than the com-

bin thickness of the sole plate and the sub flooring and hence appear as a rough line of nail points piercing through the sub floor.

Cutting drywall for the “old work” J-box, volume control mounting rings and loudspeakers

1. After determining that the wire head-out location you have chosen has access up and/or down to a crawl space, basement or attic, you will determine the exact location for the head-out J-box.

Use an “old work” J-box. Each “gang” when ‘2 pair’ jack plates are used will accommodate two pairs of loudspeakers. So a three gang “old work” J-box will provide termination for six rooms or six pairs of speakers at the head-out point. For the volume controls use “old work” single gang mounting rings.

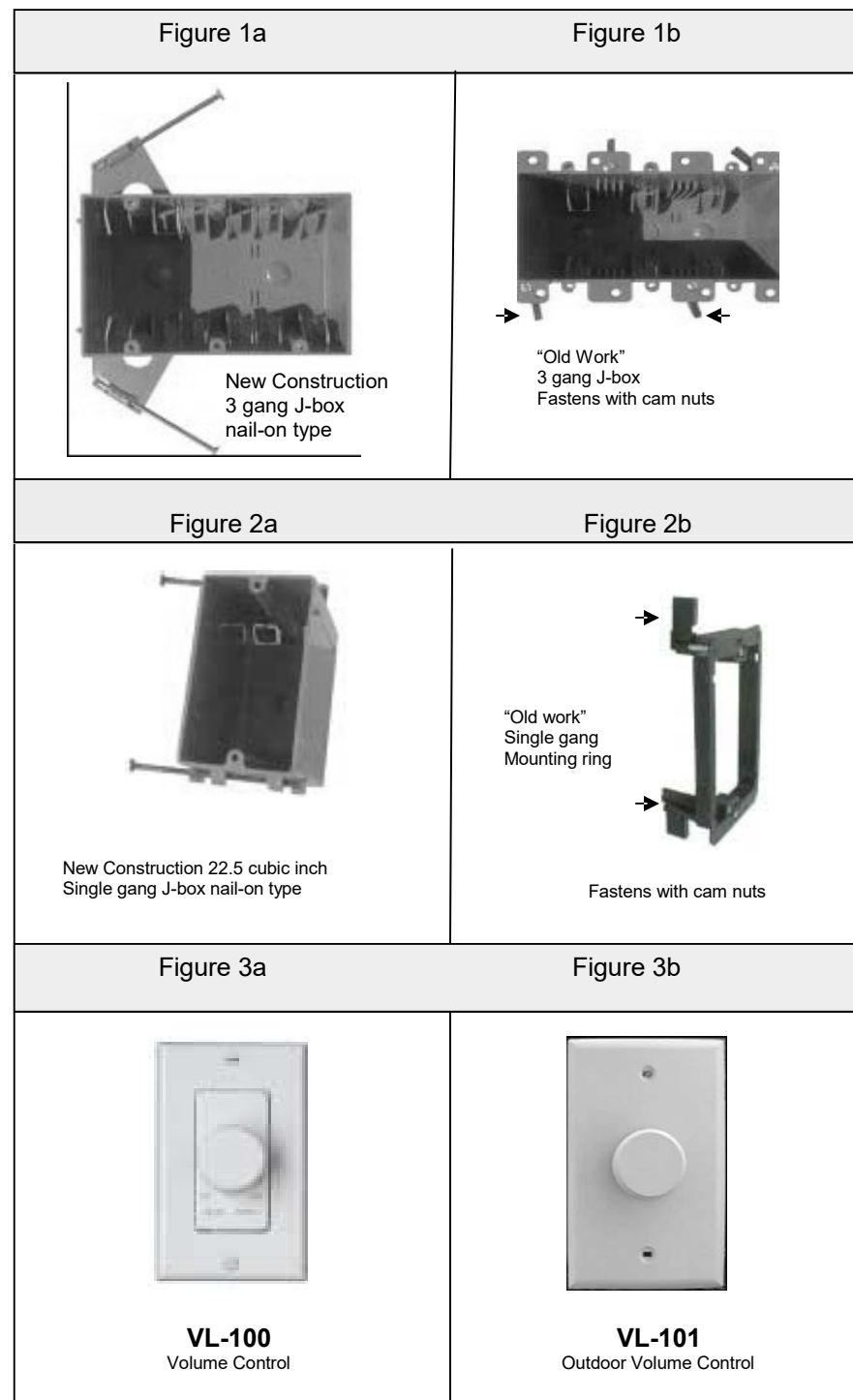
Following the example of six rooms, obtain:

- One 3 gang “old work” J-box for the head-out
- Six “old work” single gang mounting rings for the volume controls

2. Use a stud finder (**figure 15**) to locate the wall studs.
3. Cut a hole in the drywall the proper size to accept the “old work” J-box.
4. Determine the approximate locations for volume controls and loudspeakers in each room. Each time you evaluate locations for volume controls and loudspeakers, you must determine access.

Be sure to ascertain the access between all wire paths (head-out to volume controls and volume controls to both respective speakers). It is quite possible that an obstruction could be present at some point between them, such as a concrete wall, etc. If you do encounter a concrete wall as an obstacle, you should be able to core or drill it.

5. Once you determine access room by room from the head-out to the desired **APPROXIMATE** volume control and loudspeaker locations, you must then determine their **EXACT** locations.
 - a. Use a stud finder (**figure 15**) to locate the exact locations of the studs, joists or trusses, whichever the case may be. You do not want to cut the hole in a location where the stud, truss, etc. intersects the hole. The hole you cut for the speakers must be a minimum of 2 cm / 1” away from the stud, joist or truss (**figure 8**). This is to accommodate the flip-out cam nuts that secure the



times before you snug it into place. If you tighten any single screw all the way into place you have difficulty knowing how tight or how much further you have to go on the remaining screws and it is possible to damage the assembly if it is over-tightened.

When mounting rectangular loudspeakers use the level to square them up perfectly before you put the final tightening.

If your loudspeakers have a 'Dog Ear' or 'cam Nut' design push the loudspeaker into the hole and begin screwing the mounting screws in (clockwise). This will flip the cam nuts outward into position to clamp to the drywall and mount the loudspeaker firmly. Again please be careful and do NOT over tighten as you may damage the cam nut assembly.

Once you have mounted your loudspeakers, gently press the grille into the recess with the spun cellulose insert in place behind the grille. The grilles are held by "friction fit".

Painting Your Loudspeakers

The off-white finish of your loudspeakers nicely matches typical off-white paint used today. It will stand as a finish on its own or will serve nicely as a primer base to put the desired paint finish on the frames and grilles without any additional preparation.

If you plan to paint your loudspeakers you will have to determine when and how you will paint them, before or after they are mounted in the wall.

YOU MUST NOT apply any paint to the areas behind the loudspeaker grilles. Your loudspeakers come with paint guards that mask the vulnerable parts.

Painting loudspeakers is a little tricky so heed the following advice:

- Whether you are painting your loudspeakers in the wall or out of the wall, **paint the grilles and the frames separately**. Remove the grilles, mask the portion of the loudspeaker that is under the grille and paint the frame. Let it dry completely before attaching the grille.
- Be careful not to get too much paint in the recesses of the frame where the grille attaches. If these recesses become clogged with paint, the grilles will not attach properly.
- Be careful that you do not clog the grille perforations when painting

loudspeaker to the drywall. If the mounting hole is any closer, the cam nuts will not be able to flip outward into position.

- b. Then use the cut-out template supplied with your loudspeakers to stencil the cut-out on the drywall with a pencil. Use a level (**figure 19**) to ensure template is not askew. Two thumbtacks per template can be used to hold it in place while you trace around it. If you use only one thumbtack the template will rotate, so use two.
- c. To cut the hole you may use a drywall saw (**figure 16**) or a razor utility knife (**figure 18**), whichever is more comfortable for you. It is usually easier and safer to use a drywall saw.

For round loudspeakers drill one hole (**figure 9**) along the inside of the pencil tracing, preferably with a 2 cm / 1 inch "paddle bit" (**figure 17**). Then carefully saw around the pencil tracing.

For rectangular loudspeakers drill two holes, one in the top right corner and the other in the bottom left corner. From the top hole, saw across the top pencil tracing to the left and then down the right pencil tracing. From the bottom hole, saw up along the left tracing and then right across the bottom tracing (**figure 9**).

For the head-out "old work" J-box and the "old work" single gang mounting rings, use the same technique as for the rectangular loudspeakers.

If you choose the utility knife, begin by scoring the drywall lightly using very little force. Slowly trace the pencil tracing with a fresh sharp blade. Apply only enough force to cut into the paper face of the drywall. After completing the entire trace with a precise shallow cut, repeat it over and over, deeper and deeper. As the cut gets deeper and well defined you may use more pressure. Continue this patiently until you cut all the way through the drywall. If you are not careful, you may slip and cut a score across the drywall that will require cosmetic repair.

6. Once you complete cutting the holes in the drywall for the head-out, volume controls and loudspeakers, you will need to drill either the top plates or the sole plate/sub floor for the wire paths.

*Earlier in **Section 1 of Existing Construction** (surveying for access), you were advised to locate any wires, plumbing, ducting, etc. that could complicate or impact the wire paths. We also covered methods of finding walls from below the floor in the basement*

crawl space and from above the ceiling in the attic crawl space. Before you do any drilling whatsoever, you must be certain that you will not drill into any wires, plumbing, ducting, etc.

Angstrom Loudspeakers Corporation assumes absolutely no responsibility for accidental damage or bodily harm connected in any way with installations of these products.

PLEASE BE CAREFULL!

If you are certain no wires, plumbing, ducting, etc. are present you may proceed.

There are differing methods of drilling the top/sole plates. The two methods we will cover are referred to as the “45 degree method” and the “flexi-bit method”.

The “**45 degree method**” is illustrated in **figures 10 & 11**. Use a long (12” or so) drill bit (twist drill type) about 1/8” in diameter and drill a hole up/down at a 45-degree angle (**figure 10**). When the bit is visible coming in at the 45-degree angle above the ceiling or below the floor, you should be able to judge the approximate middle of the 2” x 4” plate. This method is most often used for finding sole plates or the bottoms of interior walls for access up from the basement crawl space area. This is because the sole plates are not visible from below the floor as the top plates are generally visible from above the ceiling.

The “45 degree method” may also be used as shown in **figure 10** to locate the top plates or tops of walls if access will be via the upper attic crawl space. However, because the top plates are generally visible from above and because it leaves a small hole (which is easily filled with a dab of spackle) the “45 degree method” is not as popular above as it is below.

Using the “45 degree method” on top plates is used mostly for volume control wire paths.

The “45 degree method” does not work for exterior walls however it is quite simple to determine the location of exterior walls.

The “**flexi-bit method**” is a popular way of drilling the top sole plates. This method uses an extra long bit to drill up through the top plates or down through the sole plates by gaining access to the inside of the wall via the loud speaker-mounting hole (**figure 12**). Special long drill bits generically referred to as “**flexi-bits**” are available in various lengths from 1 foot to 8 feet. These come in various bore sizes and with various “tip patterns”. Professionals, while drilling about to fully pierce through the sole plate/sub floor or the top of the

top plate (there are two top plates). The professional feels this by the decrease in spin resistance to the drilling or boring of the wood. Once this is “felt”, the drilling stops and is later continued once the pierce is found from above or below and it is confirmed that there is no wiring, plumbing, ducting, etc. in a path of damage. Professionals use “glow rods”, plastic rods 1/8” or so in diameter that have fiber optic properties. The glow rod is pushed through small holes and then “lit” with a light source such as a flashlight. They glow in the dark and are easy to see in a poorly lit attic or basement crawl space. You can use a coat hanger or other stiff wire to locate from above or below the pilot or exploratory hole you drilled from the living space. It will help if you spray paint the end of the wire a bright color.

Do not drill any hole larger than 1 1/4” in diameter. It is advisable that you drill multiple smaller holes rather than one large hole. Also, do not drill the holes too close together or too close to the edge of the top plate. Keep the holes in the middle of the 3 1/2” wide top plate. Keep multiple holes at least as far from one another as the diameter of the holes themselves and away from the edges of the top plate.

Running the wire

When all the holes are cut and drilled for head-out J-box, loudspeakers, volume controls and wire paths, you may run the wire. Use 4-conductor wire from the head-out J-box to each volume control and two 2-conductor wires from the volume controls, one to each speaker. To fish the wires through the walls, you can use an electrician’s fish tape or a stiff wire of sufficient length.

Mounting Your Loudspeakers

Once the mounting holes are present, either cut for you by the drywall installers or cut by you, mounting the loudspeakers is very simple.

Connect the speaker wires observing polarity (connecting the positive lead to the positive terminal and the negative to the negative).

For ceiling mounted loudspeakers where insulation is present, it is a good idea to shield the back of the loudspeaker from the tiny abrasive insulation fibers, which can find their way into the moving parts of speakers and cause problems. *A very good way of doing this is to use our optional vapour domes.*

Then angle the loudspeaker into the mounting hole allowing the clamp rings to slide under the dry wall. Adjust the other side to fit and begin screwing the mounting screws in (clockwise). Mount the loudspeaker firmly (**figure 13**). **Do not** over tighten. Tighten each screw about 1/3 of the way then rotate to the next. This way you will visit each screw 3