

Westlake Audio

OWNER'S MANUAL

BBSM-F Series
BBSM-VNF Series
Concert Series

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REMOVAL OF SPEAKERS FROM BOX

To Remove Speakers from Packing Carton:

1. Cut tape on top of box
2. Fold back flaps on open end of carton
3. Turn open end upside down so open end is on the floor
4. Make certain foam packing stays in place
5. Slide carton up off speaker
6. Remove foam packing
7. Stand speaker upright

When Repacking:

1. Make certain grille frames are in place and leveling spikes are removed
2. Replace foam packing around speaker
3. Slide carton onto speaker
4. Turn open end up
5. Seal carton

Keep packaging in case speakers need to be moved or shipped in the future.

EQUIPMENT SELECTION

Because of the low impedance nature of the Westlake Audio crossover network, care must be taken in the selection of the associated equipment used in the system. Some amplifiers and speaker cables may perform adequately with higher impedance loudspeakers but are unable to handle the load requirements of the Westlake Audio loudspeaker. The perceived sound quality of the system will vary dramatically with the selection of associated equipment.

Westlake Audio loudspeakers have been designed for the lowest amounts of distortion possible. Used with the proper equipment, the Westlake Audio loudspeaker will produce a well defined soundstage with excellent stereo imaging and clean, tight bass.

Amplifiers:

Westlake loudspeakers have a nominal input impedance of 4 ohms (varies with model) with a minimum impedance of 2 ohms (varies with model) at certain frequencies:

Use only amplifiers rated for 2 or 4 ohms and amplifiers that have high current operation.

Presuming similar distortion specifications between different solid state amplifiers, choose the amplifier with the lowest output impedance available; a high power rating may or may not be an indicator of a low output impedance. The above applies only to solid state amplifiers and does not apply to tube amplifiers.

Amplifiers can give off stray magnetic fields that can enter the speaker crossover network through the air core inductor and likewise, crossover inductor may feed back to the amplifier:

Place your amplifier at least 3 feet from the speakers to avoid interaction.

Specific brands of amplifiers have different operational characteristics that will affect the perceived sound quality. Auditioning as many amplifiers as possible with your loudspeakers will help to obtain the best sound possible. In general, your amplifier should have the widest possible power bandwidth, lowest distortion and noise (both mechanical and electrical) and lowest output impedance.

For recommendations of specific brands of amplifiers, contact your Westlake dealer or the Westlake Audio technical staff.

Speaker Cables:

Use the shortest cable length possible while maintaining a safe distance between speaker and amplifier.

Do not coil excess cable together.

Use the largest gauge speaker cable that is practical to reduce the amount of cable resistance.

Determining the Proper Speaker Cable Assembly:

Determine how the amplifier(s) will be connected to speakers (see section below on speaker cable wiring options)

Measure the length of speaker cable needed

Order speaker cable based on these parameters

Westlake Audio offers a complete line of speaker cable assemblies for

both single wire, bi-wire, and passive biamplication connections - see speaker cable product sheet.

Speaker Cable Wiring Options:

Westlake Audio loudspeakers have separate terminals for high frequency (HF) and low frequency (LF) which allow for three different options for connecting the loudspeakers to the amplifier(s).

The speakers can be wired with a single speaker cable using the supplied jumper wires for HF and LF, the speakers can be biwired using a biwire cable assembly with separate leads for HF and LF, or the speakers can be passively biampified using two stereo amplifiers and single wire cable assemblies for HF and LF of each loudspeaker.

For the Maximum Level of Performance, Westlake Audio Recommends Passive Biamplication Whenever Possible

Single Wire Configuration:

Single-wiring uses one amplifier channel to power each loudspeaker. A single wire carries both HF and LF information. Jumpers connect the high frequency and low frequency sections of the speakers' crossover network at the loudspeaker.

With this method of connection, care should be taken to assure that the jumper spade lugs remain directly under the terminal strip while the terminal strip screw is being tightened on the jumper spade lug and the speaker cable spade lug.

Although simple and cost effective, the single-wire configuration is not the recommended connection as one wire must carry both HF and LF information. These two sections of the band interact causing small but audible distortions.

(See Figure "A" for Diagram)

Bi-Wire Configuration:

Bi-wiring uses one amplifier channel to power a loudspeaker while having separate speaker cables leads for the high frequency (H.F.) and low frequency (L.F.) sections of the speakers' crossover network.

Bi-wiring should not be confused with passive biamplification which requires the use of additional amplifier channels. See section of instruction manual on passive biamplification.

(See Figure "B" for Diagram)

Passive Biamplification:

Passive Biamplification uses two stereo amplifiers to power a single pair of speakers.

One amplifier is used for the right speaker and one amplifier is used for the left speaker. Separate amplifier channels are used to power high frequencies (H.F.) and low frequencies (L.F.) of each speaker.

No active crossover is needed.

(See Figure "C" for Diagram)

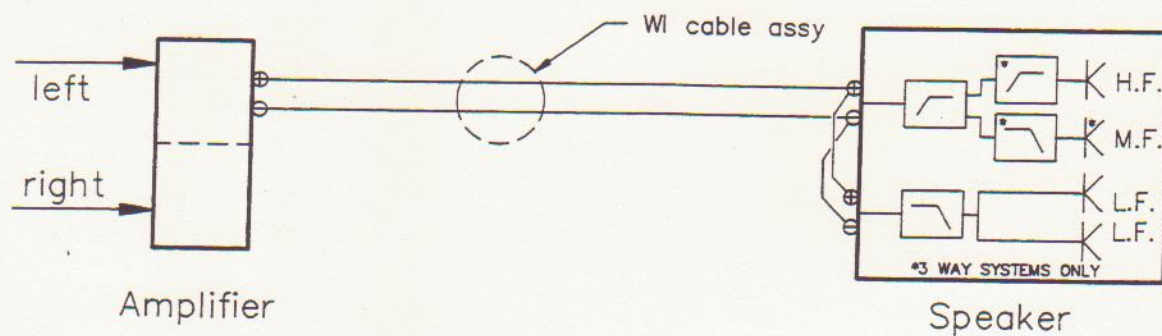


Figure A - Single Wire Configuration

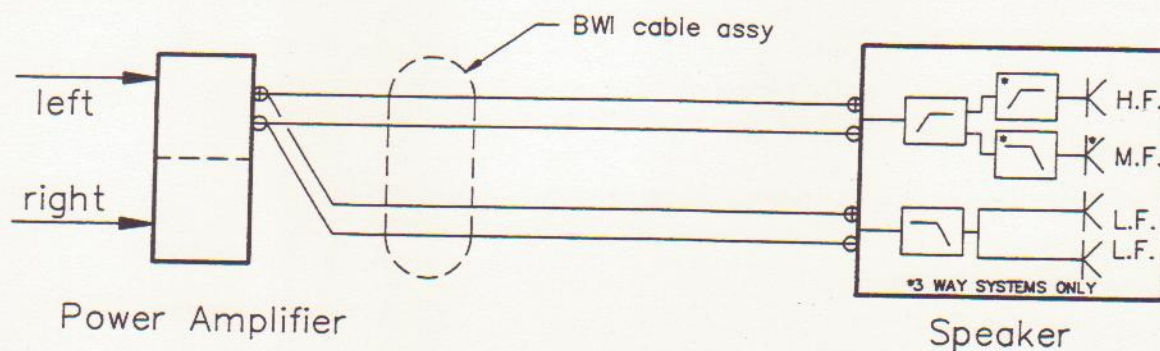


Figure B - Bi-Wire Configuration

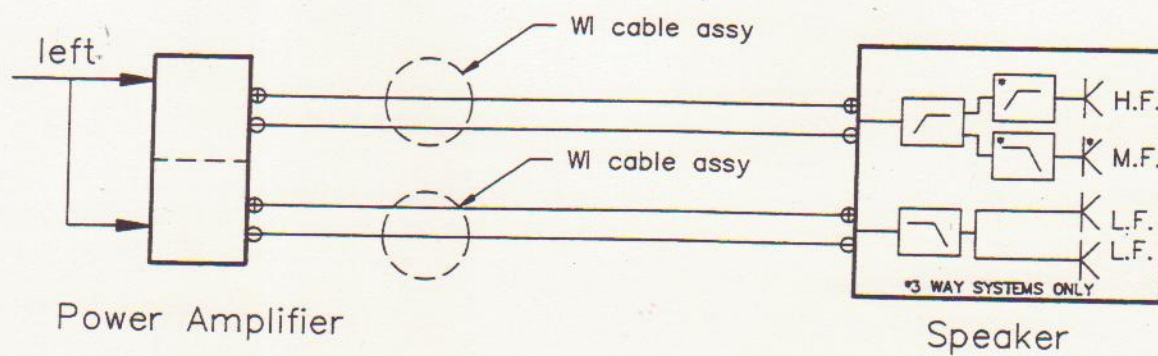


Figure C - Passive Biamplication

What Are the Benefits of a Single Wire Configuration?

A single wire configuration has no benefit other than cost. While cost effective, significant improvements can be obtained by bi-wiring with no additional cost other than the bi-wire assembly itself.

Equipment Required for Single Wire Configuration

One stereo amplifier or two mono-block amplifiers

One pair of single wire (WI) cable assemblies

What Are the Benefits of a Bi-Wire Configuration?

All speaker cables have a magnetic field that surrounds the cable as well as a specific electrical impedance. There is a tendency for the high and low frequencies to interact causing distortion of the original signal.

Bi-wiring reduces interaction in the speaker cable by physically separating high and low frequency information into two separate cable leads. This physical separation of the signal reduces the magnetic / electrical interaction that would occur if the whole signal were carried on a single cable.

A bi-wire cable assembly also has twice as much conductor which reduces the common or shared resistance of the cable assembly.

Equipment Required for a Bi-Wire Configuration

One stereo amplifier or two mono-block amps

One pair of bi-wire (BWI) cable assemblies

What Are the Benefits of Passive Biamplication?

Passive biamplication extends the benefits of biwiring into the amplifier. Biwiring reduces interaction in the speaker cable only. H.F. and L.F. information travels along the same path inside the amplifier.

With passive biamplication, high and low frequencies are physically separated from each other in different amplifier channels reducing interaction of high and low frequencies inside the amplifier as well as in the cable assemblies.

Due to the low impedance nature of the Westlake crossover network, passive biamplication will produce better sonic results than a mono bridged installation with the same amplifiers.

Equipment Required for Passive Biamplication

Two stereo amplifiers or four monoblocks having the same gain ± 0.1 dB (Using identical amplifiers will ensure each amplifier channel has the same gain)

Four single wire (WI) speaker cable assemblies

Additional interconnect for second amplifier ("Y" cable or equivalent)

Additional Connection Guidelines:

Do not attempt to connect speakers to system without all power in system turned off and unplugged from A.C. outlets.

All Westlake loudspeakers use terminal strips or five way binding posts for the best electrical connection between the loudspeaker and the speaker cable available - speaker cables with spade lug terminations should be used with the terminal strips.

Speaker terminal strips, cable connections, and amplifier binding posts should be cleaned prior to each cable being installed to ensure the best possible electrical connection. Westlake Audio SDPR contact cleaner, alcohol or other contact cleaners are suitable for this task.

Speaker cables should not rest on A.C. power cords or interconnects.

For bi-wire or passive biamplication, high and low frequency leads should be separated from one another as far apart as practical.

Speakers should be disconnected from system periodically and the terminations cleaned to remove any oxidation that may have formed. Double check all connections after installation for proper tightness of screws and/or binding posts.

PEDESTAL ASSEMBLY AND MOUNTING OPTIONS

Pedestal Assembly:

All BBSM-VNF Series and Concert Series products have a separate isolation pedestal that serves to isolate the main speaker body from the floor. With the exception of the BBSM-4VNF, BBSM-5VNF and the C-6, all of the speakers are shipped with the pedestal already attached with bolts and rubber isolation washers.

The BBSM-4VNF and BBSM-5VNF pedestals come disassembled with a separate pedestal body and base. The pedestal base needs to be attached to the pedestal body with the supplied screws. If desired, before the pedestal base is attached to the main body of the pedestal, the foam inside the pedestal body can be removed and replaced with sand for added rigidity and stability.

Mounting Options:

Carpet

The isolation pedestal of the BBSM-VNF and Concert Series speakers allows the speakers to stand on carpet without the aid of other mounting devices.

Although the speaker body appears to be rigidly attached to the pedestal, the speaker body is actually isolated from the pedestal with a layer of felt and then attached to the pedestal by means of four bolts with rubber washers to reduce energy transmission between the speaker body and the pedestal.

The combination of the isolation pedestal and a layer of carpet between the pedestal and the floor serves to eliminate almost all transmission of energy from the speaker to the floor. If needed, the speaker can be leveled using small wood shims.

Some popular aftermarket items such as cones or spikes serve to rigidly couple the speaker to the floor. These products may be beneficial by adding a degree of mass or rigidity to the speaker although they also provide a second transmission path through the floor to the listener. The floor may serve as an energy storage device which, when fed with a higher level of direct vibration, may cause coloration of the sound. Before any aftermarket mounting item is purchased, it should be determined whether the item will help or hurt the sound of the loudspeaker.

Hard Flooring

Self-adhesive carpet strips are supplied with the speakers to fit on to the bottom of the isolation pedestal for hard floor surfaces (wood, tile, stone, etc.). These carpet strips replace the isolation that a carpeted floor provides and helps to avoid scratching the floor surface.

POSITIONING LOUDSPEAKERS IN THE ROOM

We will attempt to show you an easy method of obtaining the best sound possible from your new loudspeakers. While positioning your loudspeakers will take some time, this is the most critical step (apart from source and component selection) in determining the sound quality of your system.

Because listening preferences and room environments vary, there is no "ideal" speaker position. Slight variations in placement can have a profound affect on the sound of the speakers. In the end, it is the listener who must decide what position best suits their personal tastes and listening environment.

Before you begin to set up your loudspeakers, read these set up guidelines carefully.

Loudspeaker / Listening Position Relationship:

First, let's consider the relationship between the separation of the two speakers and the distance between the speakers and the listener:

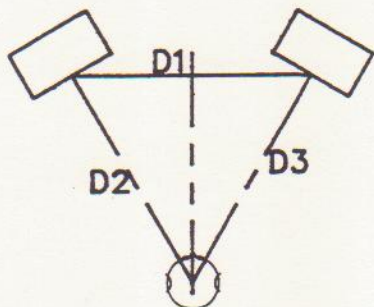


Figure D

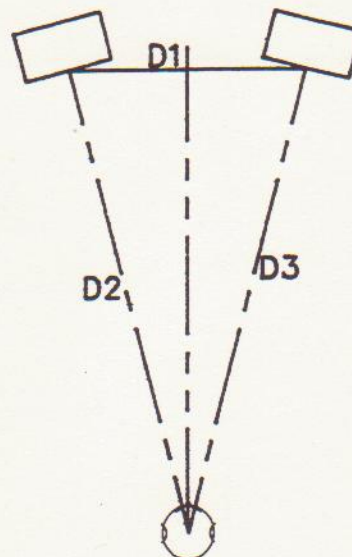


Figure E

Figure D:

In figure D, the distance between the left and right speakers equals the distance to the listener.

In this position, the stereo image will be emphasized with a heightened sense of the musician location in the sound stage. Shortening D2 and D3 is not recommended as even small amounts of head movement will produce large shifts in the stereo image.

Figure E:

In figure E, the distance to the listener is twice the distance between the left and right speakers.

With this configuration, the movement of the listener's head is less restricted and the image is more homogeneous. The sound stage is reduced, however, in width. Lengthening D2 and D3 is not recommended as the image will become monophonic for all but the most emphasized right and left pan locations.

Recommendations

Depending on the number of people that will be listening to the system at any one time, the ideal relationship between the loudspeakers and the listening position will be somewhere in between the positions outlined in figures D and E. Some listening rooms, by limitations of their physical dimensions, may need to have the loudspeakers set up in one of these positions regardless of the listening habits of the owner.

Loudspeaker / Side Wall Relationship:

Distance from Loudspeaker To Side Wall

Each loudspeaker should be an equal distance from the side wall. If the speakers are not equal, the image will not be centered between the speakers.

Side Wall Construction

Sound waves that travel towards the side walls will be partially absorbed and partially reflected by the wall; the amounts of absorption and reflection will depend on the construction of the wall.

In order to have a correct stereo image, the right and left side walls should be constructed of the same material. If, for example, the right wall is a highly reflective surface (a glass window) and the left wall is a more absorptive surface, then the reflections off the glass will alter the perceived stereo imaging of the speakers.

The relative absorption/reflection/diffusion characteristics of the side walls will have a profound effect on the imaging characteristics of the loudspeakers.

Highly reflective side walls will artificially increase the perceived width of and depth of the soundstage. Reflective side walls create a reverberant environment (long RT60). The slow decay of the previous musical notes in the room creates an echo which an inexperienced listener may perceive as additional width or depth of the soundstage.

The system will always have a characteristic "listening room sound" that will not vary with different recordings rather than accurately recreating the natural acoustics of the original performance which change from recording to recording.

Proper depth and width of the soundstage are created within the recording and then reproduced by the loudspeaker. All Westlake loudspeakers are designed to faithfully reproduce the soundstaging information contained in the original recordings.

Sidewalls should be dampened to minimize side wall reflections and achieve a correct stereo image - see section of owner's manual on creating a dampened stereo environment.

Loudspeaker / Front Wall Relationship:

Speaker Location Relative to Front Wall

The left and right speakers should be equal distances from the front wall. If the speakers are not equal distances from the front wall, there will be a power imbalance between the right and left speakers.

Distance from Front Wall to Loudspeakers

As sound waves travel in all directions, some sound waves from the loudspeakers will reflect off the front wall back into the listening position - These front wall reflections will arrive at the listener displaced in time with the direct signal from the loudspeakers.

Because this reflected signal is delayed, it will cancel out some portions of the direct sound and reinforce other parts - the frequency and level of this cancellation being dependant on the location of the loudspeakers relative to the front wall and the absorptive/reflective/diffusive characteristic of the front wall.

There are two locations of the loudspeakers relative to the front wall where the front wall reflection problem can be most easily dealt with:

The loudspeakers can be placed far enough away from the front wall so that the ratio of direct sound to reflected sound is high (the speakers positioned out from the front wall approximately 1/3 of the total length of the room)

In this location, the out of phase reflection is substantially attenuated due to the long distance between the loudspeaker and the front wall (the sound waves need to travel the distance from the loudspeaker to the front wall, be reflected off of the front wall, travel back the distance from the front wall to the loudspeaker before continuing on to the listening position).

The loudspeakers can be placed as close to the front wall as possible (mounting the speakers in the wall, in soffits, being ideal) so that there is no front wall reflection to be dealt with

When the loudspeakers are mounted in soffits, the front wall is flush with the front baffle of the loudspeaker. The front wall acts as an extended baffle of the loudspeaker (Users should consult with their Westlake dealer or the Westlake Audio technical staff for soffit mounting guidelines).

When the loudspeakers have a free standing location near the front wall, the speaker should be placed as close to the front wall as possible and absorptive material should be placed on the front wall to attenuate the front wall reflection as much as possible (see section on creating a dampened acoustical environment).

Changes in Bass Response Relative to Loudspeaker Position:

The loudspeaker positioning relative to the front wall will alter the perceived bass response. All enclosed rooms have pressure zones along room boundaries where the bass energy is higher. Small changes in the loudspeaker positioning relative to the front wall will allow the listener to fine tune the bass response.

Moving the loudspeaker closer to the front wall will increase the perceived bass response as the front wall will reinforce the bass energy of the loudspeaker - The problem of too little bass can be partially remedied by moving the speaker closer to the rear wall.

Moving the speaker away from a front wall will decrease the perceived bass response - The problem of boomy bass or lack of midbass can be partially solved by moving the speaker away from the front wall.

Listener / Rear Wall Relationship:

The same laws of physics that apply to the relationship between the loudspeaker position and the front wall apply to the selection of the listening position relative to the rear wall. Because of the pressure zones surrounding room boundaries, the distance from the listening position to the rear wall also affects the perceived bass response of the loudspeakers.

As with the relationship between the loudspeakers and the front wall, care must be taken to ensure that the listener does not hear out of phase reflections off the rear wall. The easiest solution is to locate the listening position as close to the rear wall as possible.

While the listening position can be moved 1/3 of the way out into the room to mitigate excessive bass build-up, the possibility of out of phase reflections can be problematic. Near the rear wall, the direct and reflected low frequency energy are in phase.

Listener / Loudspeaker Relationship:

Because a loudspeaker is constructed of multiple transducers, there is a minimum distance at which the individual transducers "sum up" to form what appears to the listener to be a single sound source. The listening seat should not be located closer to the loudspeakers than the following recommended minimum distances as the sound will not appear to come from a single speaker otherwise:

Recommended Listening Distances

	Minimum Distance in Feet (cm)	Maximum Distance
BBSM-4F	2' (61)	12' (366)
BBSM-6F	3' (92)	18' (549)
BBSM-8F	4' (122)	20' (610)
BBSM-10F	5' (153)	22' (671)
BBSM-12F	6' (183)	25' (762)
BBSM-15F	8' (244)	28' (853)
BBSM-4VNF	4' (122)	12' (366)
BBSM-5VNF	5' (153)	15' (457)
BBSM-6VNF	6' (183)	18' (549)
BBSM-8VNF	8' (244)	20' (610)
BBSM-10VNF	10' (305)	22' (671)
BBSM-12VNF	12' (366)	25' (762)
C-6	3' (92)	12' (366)
C-8	4' (122)	14' (427)
C-10	6' (183)	18' (549)
C-12	8' (244)	22' (671)

Listening Height:

The ideal listening height is to have the listener's ear level with the midpoint between the midrange and tweeter. In the case of two-way speakers, the listener's ear should be half way between the tweeter and the closest woofer.

When possible, a listening chair or couch should be chosen that can accommodate this listening position. If needed, the speakers can be tilted forward or backward slightly as needed to accommodate this position if changing the listening seat is not an option (care should be taken to ensure that the speakers are stable and will not fall over). Cones and other devices that can be placed under the loudspeaker will change the height required at the listening position and should be considered when determining the height of the listening position.

Evaluation of Different Loudspeaker Positions:

Before any listening position is evaluated, care should be taken to ensure that the speakers are equidistant from the listener (D_2 and D_3 are equal). Small variations in D_2 and D_3 will cause the signal to be out of phase at the shorter HF wave lengths.

A simple way to determine if D_2 and D_3 are equal is by using a tape measure:

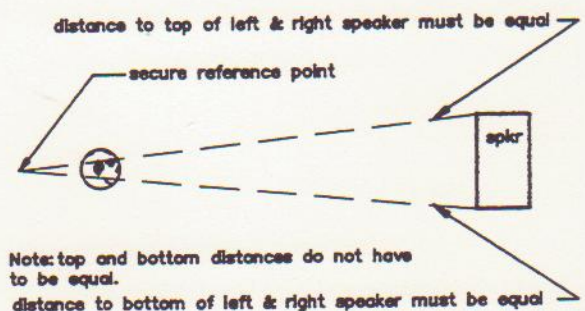
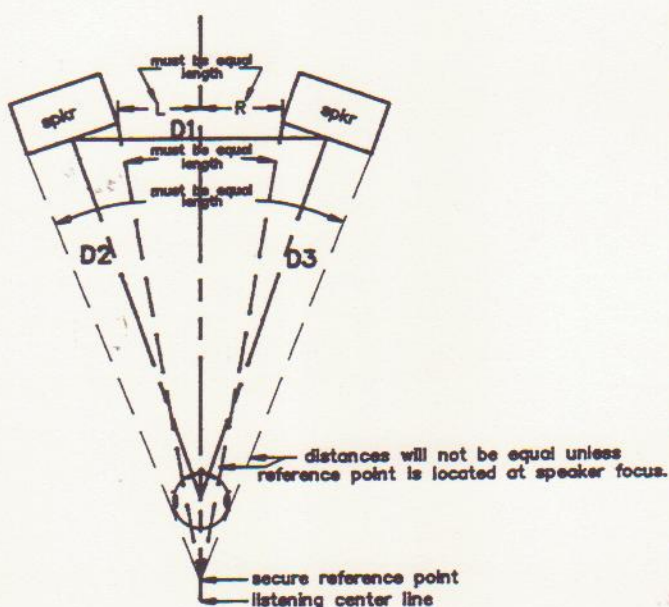


Figure F - Measuring to Ensure Speakers are Equal Distances From Listener

Figure F:

1. **Determine the center of the room (D1) - Mark this line with a string**

The listening center line will ensure that both speakers are equal distances from the center of the room. The string can be used to measure the speakers from the center of the room for each position evaluated.

2. **Establish a secure reference point directly behind the listening position**

A thumb tack or nail in the wall directly behind the listening position is the best reference point as it will not move when tension is applied to the tape measure.

3. **Using a metal tape measure with a slotted right angle end, measure from the reference point behind the listener to the right and left edge of each speaker**

(This is why a nail or thumb tack that can hold the slotted end of the tape measure is extremely helpful)

4. **Measure and move the loudspeakers until both speakers are equal distances from the listener**

After you have measured to ensure that both speakers are equal distances from the listening position, you can begin to listen to various speaker locations.

Remember that after you move the speakers to a new position, you must measure them again to make sure each speaker is an equal distance away from you.

Some Additional Points to Consider:

The best sound and imaging will usually occur when the speakers are focused directly at the listener. The speakers may be angled outward to accommodate additional listeners in a less focused but larger "sweet spot".

LISTENING ROOM ACOUSTICS

The listener's evaluation of speaker performance can be greatly influenced by the general room acoustics, the placement of the speaker in the room, and interaction of the room and speaker.

Many theories exist as to the ideal listening environment. It is Westlake Audio's design philosophy that the loudspeaker should be as close to a point source as possible and that the environment should not interfere with the observation of the source by the listener.

WESTLAKE AUDIO RECOMMENDS A DAMPENED ACOUSTICAL ENVIRONMENT FOR CRITICAL STEREO LISTENING.

Creating a Dampened Acoustical Environment:

To create a dampened acoustical environment, the reverberation time (RT60) should not be excessive (less than .5 seconds). Additionally, the travel paths from the loudspeaker to the listener should be controlled to attenuate or direct reflections away from the listener.

Controlling reverberation requires that the room have as many objects and/or varied geometry for diffusion and a considerable amount of absorptive material. **It is difficult to have too much LF absorption/diffusion and easy to not have enough.**

Absorptive Household Furnishings:

Furnishings within your room can provide some amount of absorption:

Cloth Couches
Overstuffed Chairs
Carpets
Heavy Drapes
People!

Furniture covered in leather or vinyl will not provide as much absorption as a fabric or other porous material as the covering is not porous enough to allow air to penetrate the surface. These items will, however, provide a degree of diffusion due to their irregular shape.

Additional Absorptive Materials:

While furnishings can and should be utilized for their absorptive characteristics, often more absorption is required in addition to household furnishings.

Insulation such as fiberglass, polyester foam, and mineral wool are all good absorptive materials. These materials can be placed in troublesome places with protective coverings to provide additional absorption and dampening.

Guidelines for Placement of Absorptive Materials:

A point to keep in mind is that some amount of absorption must occur in each room axis to prevent discrete echoes from developing as the environment is dampened down.

It should be noted that material less than 4" thick is ineffective at low frequencies. The effectiveness of the absorptive material can also be greatly enhanced by placing the material 12-18 inches off of the treated surface. This is especially true for concrete and plaster surfaces.

The following section on problem areas in listening rooms will discuss the specific locations that absorption will be highly effective.

Diffusion:

Irregular Household objects can provide some level of diffusion. Examples of these items are:

Bookcases
Irregular Wall Finishes (Rocks, Wood Slats)
Furniture

In addition to household furnishings, there are a number of commercially available diffusion products.

It is important to note that diffusive items alone are not a substitution for both absorption and diffusion in the listening room as diffusive items alone will not generally lower the RT-60 to the proper level.

For additional help with creating a dampened acoustical environment, Westlake Audio offers complete acoustical design services.

PROBLEM AREAS IN LISTENING ROOM

Certain areas in all listening rooms are prone to acoustical problems. These are areas where absorptive/diffusive furnishings and room treatment products will be more effective at controlling common acoustical problems.

Direct Sidewall Reflections:

Reflections that originate between the front of the speaker and the listening position are particularly damaging to the perceived imaging of the loudspeakers and need to be dealt with.

To locate the exact area of these reflections, place a small mirror on the suspected wall location. If you can see a loudspeaker in the mirror from the listening position, then you need to treat this surface with some absorptive/diffusive material.

Note:

Sometimes, simply choosing a different set-up can go a long way towards minimizing a particular acoustic problem. In the case of sidewall reflections, consider the two basic set-up variations in a typical rectangular room (see below):

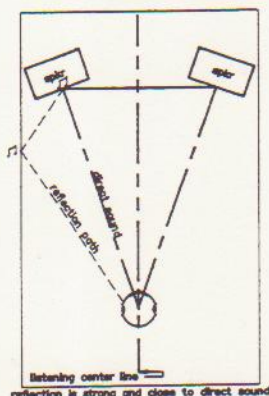


Figure G

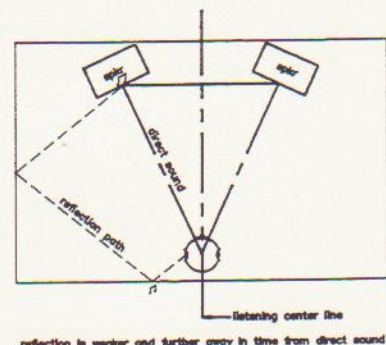


Figure H

In figure G, the speakers and listener are located on the shorter wall. In some cases (depending on the particular model of speakers and the listening preferences) it may be preferable to locate the speakers on the longer wall (figure H).

As can be seen in the diagrams above, to do this requires a model of loudspeaker that can be listened to at closer distances. Generally speaking, Horizontal speakers (BBSM-F series speakers) will be better suited to listening at closer distances than vertical speakers (BBSM-VNF series speakers) although either configuration may be suited to this arrangement depending on the specific distances and loudspeakers involved.

WESTLAKE AUDIO INC. LIMITED WARRANTY

The products of WESTLAKE AUDIO, INC., a California corporation, are warranted to be free from defects in materials and workmanship of a period of **FIVE YEARS** from the date of sale. Only the original purchaser of a new WESTLAKE AUDIO product sold in the United States is protected by this warranty.

WESTLAKE's sole obligation during the warranty period is to provide, without charge, parts and labor necessary to remedy covered defects appearing in products returned to WESTLAKE AUDIO, INC., 2696 Lavery Ct, Unit 18, Newbury Park, California, 91320. This warranty does not cover any defect, malfunction or failure caused beyond the control of WESTLAKE, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the Owner's Manual, defective or improper associated equipment, professional usage, attempts at modification and repair not authorized by WESTLAKE, and shipping damage. Products and their serial numbers removed or effaced are not covered by this warranty.

To obtain warranty service, return the defective product along with the original bill of sale as proof of purchase to any WESTLAKE AUDIO dealer, or ship, freight prepaid to the WESTLAKE AUDIO factory, 2696 Lavery Ct, Unit 18, Newbury Park, California, 91320. Contact the factory for the name of the nearest WESTLAKE AUDIO dealer.

This warranty is the sole and exclusive express warranty given with respect to WESTLAKE products. It is the responsibility of the user to determine before purchase that this product is suitable for its intended purpose.

Any and all implied warranties, including the

Some states do not allow limitation on how long an implied warranty lasts so the above limitation may not apply to you.

Neither WESTLAKE AUDIO, INC. nor the dealer who sells WESTLAKE products is liable for incidental or consequential damages of any kind.

Some states do not allow the exclusion of incidental or consequential damages, so the above exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights. These vary from state to state.

Floor Reflections:

Carpet, while apparently absorptive, is not effective at attenuating low frequency reflections. Floor reflections are as damaging to the perceived soundstage and bass response as sidewall reflections. Again, a mirror can be used to spot the location of these reflections. Large throw pillows made of a porous cloth material will help control floor reflections and can be moved when the system is not in use.

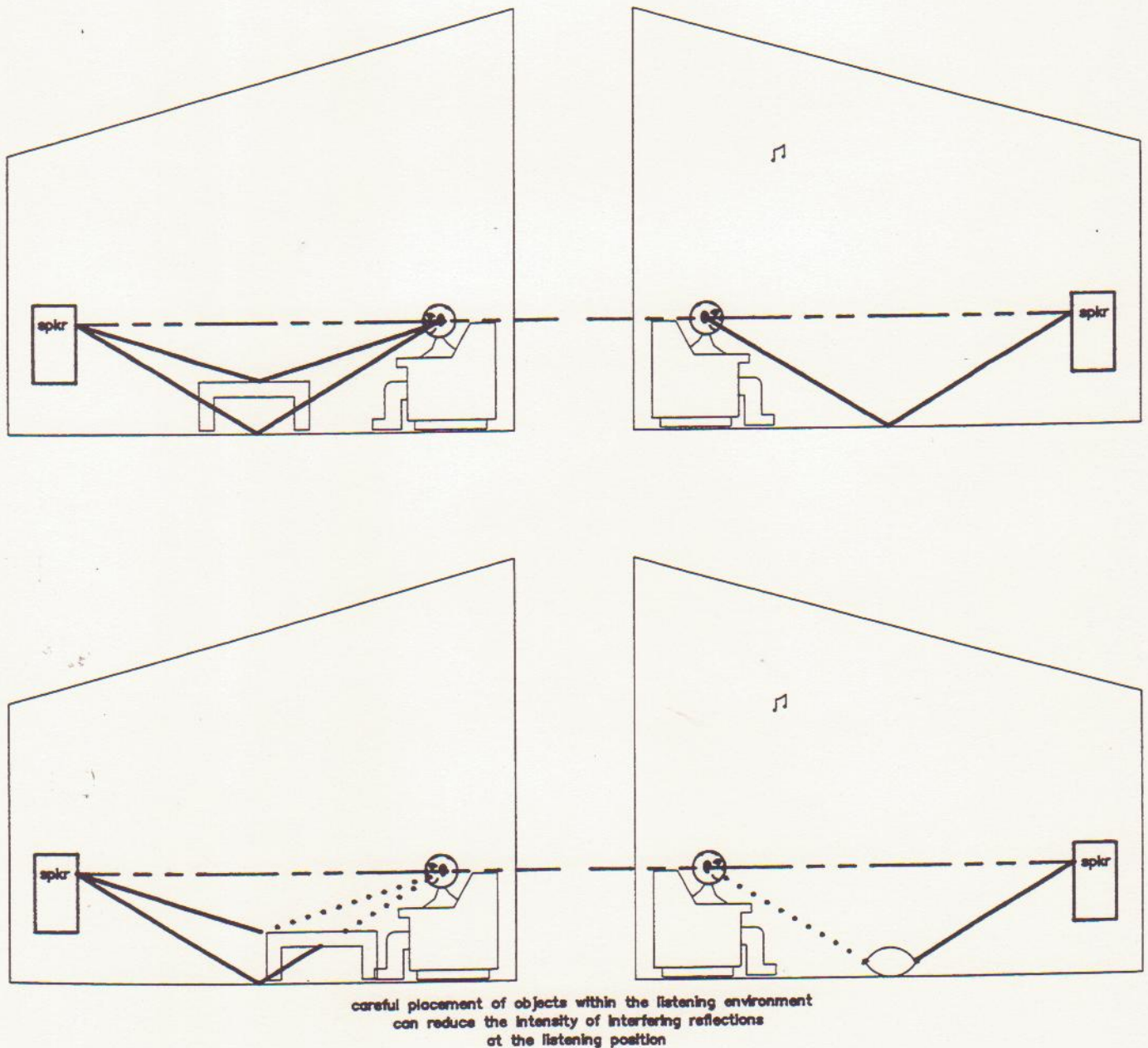


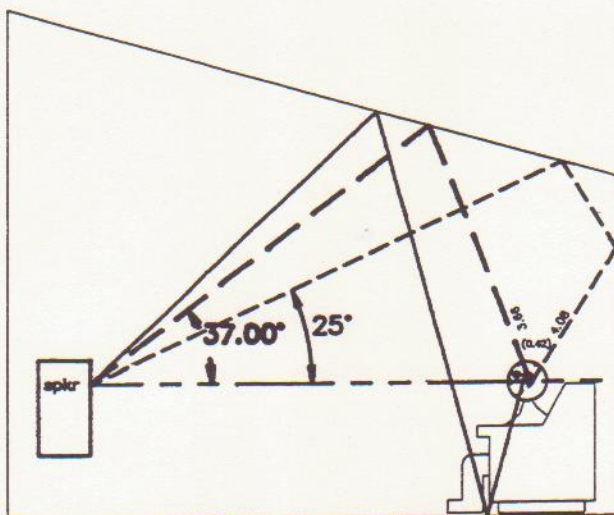
Figure 1

Ceiling Reflections:

Because of the height and potential angles of ceilings, reflections off the ceiling are often moved further out in time making them less problematic than other reflections although these reflections can still cause some potential problems. The lower the ceiling, the more these reflections will cause early, and therefore more damaging, audible effects.

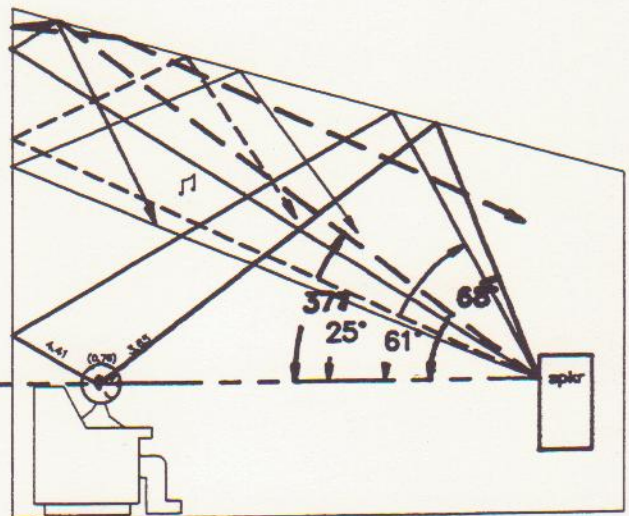
Note:

Again, sometimes altering the basic speaker / listener / room relationship can alter the audibility of ceiling reflections. Consider the diagrams below:



ceiling slopes toward listener, reflections are close in time, high in amplitude

Figure J



ceiling slopes away from listener reducing amplitude of first and 2nd order ceiling reflections due to their off axis origination

Figure K

Figure K has the speaker / listener relationship rotated 180 degrees within the room. Rotating the speaker / listener relationship only 90 degrees would produce an asymmetrical listening space and is less desirable for a proper left / right balance

Corners:

Corners are places where low frequency sound pressure will be potentially very high. Placing absorption material in or in front of the corners can help alleviate the problem of low frequency buildup (long RT60) that occurs due to a lack of absorption in the room.

ADVISE ABOUT SOUND PRESSURE LEVEL AND POSSIBLE HEARING DAMAGE

Facts:

Most speaker systems are capable of generating sound pressure levels, that can under some listening conditions, cause short term hearing loss and or ringing in the ear.

Prolonged exposure to such conditions can lead to permanent hearing loss and a mild to severe case of tinnitus (ringing of the ear).

Listening Safety:

The first rule of safe listening is to be aware of the conditions you and your guests are exposed to. Although reasonably priced sound level meters are available to the general public, a little common sense and noting the following points will go a long way towards assuring your days of hearing are not ended prematurely.

Keep the level as low as possible while still presenting the full audio picture. To accomplish this, pay attention to the audibility of the noise floor in the quiet passages of the music. Adjusting the volume control up and down will bring the noise floor from inaudibility to overbearing. Find the setting that you feel best about considering the overall piece of music at hand.

Do this before you have listened any length of time as even short term high levels can bring the ear's safety mechanisms into play which will reduce the ear's sensitivity to quiet passages.

Turning the volume up past audibility of the noise floor will usually result in both power compression (distortion) to the loudspeaker as well as exposure to unnecessary amounts of acoustic energy. Be aware that this excess energy may build up at low frequencies where the ear is not as sensitive and thus may not give as much warning through discomfort or recognizable distortion. By the time midrange hearing is distorted, levels are well past the danger zone and immediate volume reduction and/or listening termination is mandatory.

Reducing the level below which the noise floor can not be heard can result in low level information being masked by the noise floor and thus a reduction in the dynamic range. Whether this reduction is significant or not depends on the listener's expectations, which can vary from time to time and with the conditions at any particular listening area. **A very important point to consider here is that the lower the noise floor of the listening area, the lower the sound levels can be without losing low level information.**

Another point to consider is that sound levels are generally thought to be lower the further the listener is from the loudspeaker. But, in an enclosed space, sound is reflected from room boundaries thereby causing high pressure zones in the room. These zones are often at the corners of the room where mid and high frequency levels are reduced.

Hearing loss is a result of more than just the level component. Duration and frequency content of the exposure are also key points to consider. As such, the relative length of the listening sessions, the type of music, and normal sound level exposure must be taken into account.

Some music has a higher average level than others and thus a limited level and time of exposure is recommended. As individual recordings can vary considerably, no specific recommendations can be given. In general, rock music has a high average level and a low peak to average ratio. In contrast, classical music has a high peak to average ratio. Loud crescendos in classical music may in fact have a higher peak level than that found in the average rock recording but the low average level does not warn the listener of the impending loud passage. Similarly, some hip-hop music may not sound loud but, in fact, may have an elevated bass level which, depending on the repetition of the bass notes, may present exposure problems.

Perception of dynamic range is the contrast between soft and loud sounds; in this area, our ear/brain combination has little competition in differentiating sounds. In perceiving the differences between loud and soft passages, reverberant listening environments are the enemy. Because quiet passages get filled with the decaying trail of previous sounds, the listener is tempted to raise the level of the sound in an effort to mask the sound of these decaying passages. Some times, a partial improvement is made as some parts of the audio band where the decay time is shorter gain level whereas the overall reverberant field may increase to a lesser extent due to its lack of coherence. In any case, the reverberant listening room can promote higher average listening levels than would be found in a well dampened environment.

A final point to remember is that each individual has a different tolerance level for loud sound. These differences can be a result of gender, age, or physical nature. Even the same individual can exhibit intolerance to loud sound exposure occasionally and not at other times. Being sensitive to someone who asks for the sound level to be turned down is a recommended courtesy as the sound is probably too loud for them. And please, reconsider your own personal sound exposure limits.

CARE AND MAINTENANCE OF LOUDSPEAKERS

Cleaning of Hardwood Finishes:

All Westlake Audio loudspeaker wood finishes are made of solid and veneer hardwoods with a protective satin top coat. No oiling of the finish is necessary as the wood grain is permanently sealed.

A non-abrasive spray cleaner should be used to clean off dust and fingerprints from the wood finish and painted front and back boards. No other type of cleaner should be used.

Cleaning of High Gloss Finishes:

High Gloss finishes need to be treated gently so as to avoid scratching the surface. **NEVER DUST OR WIPE A HIGH GLOSS FINISH WITH A DRY CLOTH.**

To clean a high gloss surface, use a soft cloth (polishing cloth preferred) with a liberal amount of liquid, non-abrasive cleaner applied to the cloth. Gently wipe the finish using circular motions. Do not wipe the finish in a straight line as this may scratch the finish. Allow the finish to dry.

Replacement Transducers:

Care has been taken in the selection and application of the transducers for the Westlake Audio loudspeakers. During production, the transducers have been matched to produce left/right pairs that have both matched phase and amplitude response within their ranges.

Matched drivers contribute greatly to the superior stereo imaging and transient response of the system. To maintain this performance, the following points should be considered when replacing damaged transducers:

1. Replace both left and right transducers at the same time (even if only one transducer is damaged)
2. Use only Westlake Audio matched and tested transducers
3. Have new transducers installed only by a Westlake Audio dealer or the Westlake Audio repair department

COMMONLY ASKED QUESTIONS ABOUT WESTLAKE AUDIO LOUDSPEAKERS

"WHAT AMPLIFIERS DO YOU RECOMMEND WITH MY LOUDSPEAKERS?"

This is the most commonly asked question we receive at Westlake. Because we are the ones who have designed the loudspeakers, we should have a good idea of what amplifiers work best with our loudspeakers. This assumption is only partially true for a number of reasons.

Yes, we do design the loudspeakers and yes, we do use specific brands of amplifiers in the design, production and testing of our loudspeakers. Westlake has very specific parameters of what to look for in an amplifier. These parameters, mentioned above in the section regarding amplifiers, are wide power bandwidth, low distortion, good signal to noise ratio, high dampening factor, low output impedance for solid state amplifiers, and the most accurate sound possible. But these parameters by themselves are not an endorsement for one particular brand of amplifier.

Amplifiers need to be auditioned by the listener. Because each person has his own idea of what "good sound" is, the right amplifier for one person may not be the right amplifier for another. There are a number of excellent amplifiers, both solid state and tube, that will work well with the Westlake Audio Loudspeakers.

We do not know how every amplifier will react with our products. Because of the large number of companies that sell amplifiers, it would be practically impossible for us to listen to every amplifier available. Part of the reason a dealer is selected to become an authorized Westlake Audio dealer is because he stocks a selection of high quality amplifiers. Some of these amplifiers will be better suited than others for use with the Westlake loudspeaker.

It should be noted that there are a number of amplifiers that are not suitable for use with the Westlake loudspeakers. Your Westlake Audio dealer has the experience to help you select an amplifier that meets your requirements for good quality sound.

"HOW MUCH POWER DO MY SPEAKERS REQUIRE?"

The continuous power rating (RMS) rating for your speaker system is shown on the enclosed specification sheet. It should be noted that the power ratings for the low frequency drivers are higher than those for the high frequency drivers as it takes more power to create long wavelengths versus short ones at a given SPL.

Most speakers, Westlakes included, can absorb temporary short term power inputs 2-3 times in excess of the continuous power rating (RMS) of the system. It is not unreasonable, and in fact can be necessary for unrestricted and accurate sound reproduction, for this extra power reserve to be available. However, over the long term, the continuous power rating (RMS) should not be exceeded or failure will ultimately occur.

By looking at the rather high efficiency ratings of your loudspeakers, you may be tempted to use less power than the Westlake loudspeakers actually require. While the Westlake loudspeakers are efficient, their low impedance crossover network dictates an amplifier capable of driving a low impedance load without current limiting.

Because of the low impedance nature of the crossover, the current output at low impedances of the amplifier is very important. Many inexpensive amplifiers have high nominal load wattage ratings but do not deliver high levels of current to the loudspeakers. Be cautious of amplifiers that say "high current" but do not, in reality, offer a high current output. Again, your Westlake Audio dealer is a good source of information as to which amplifiers are high current designs.

In general, it is better to have a modest wattage amplifier that does not limit current availability at a 2-4 ohm loading than one that offers more power but limits that power when driving a complex speaker load (as in the case of the Westlake). An amplifier that meets this criteria will generally have a low output impedance. The lower the output impedance, the better the applied dampening and potential sound. Be aware that most amplifiers have a varying output impedance with frequency; usually the output impedance increases with increasing frequency in the 20 Hz to 20 kHz range.

You and your authorized Westlake Audio dealer can discuss the particular requirements for sound level and suggest a wattage level for your specific model of loudspeaker.

"HOW MUCH POWER CAN MY SPEAKERS HANDLE WITHOUT DAMAGE?"

Damage to loudspeakers can be caused by being driven with too little power as well as too much. When an amplifier runs out of voltage, the amplifier goes into clipping. Clipping sends a distorted signal to the speaker that, by changing the spectral content of the signal, can easily cause damage to the speaker.

Care must be taken to ensure that the amplifier does not clip when in operation in the system (many amplifiers provide clipping lights for a visual indication that clipping is occurring). To assure reproducing a clean sound and staying out of clipping, an amplifier with a continuous power rating of 2-3 times the RMS or continuous power rating of the loudspeaker should be employed. As amplifiers have varying power capacity that varies with frequency and load impedance, this may be somewhat difficult to determine. Again, your authorized Westlake Audio dealer can help in this matter.

Higher power amplifiers can be used but at the risk that an unexpected loud passage will damage the speaker. Westlake does not provide fuse protection in our loudspeakers to protect against overpowering the loudspeaker as this can sonically degrade the system.

Should damage to the tweeter occur, Westlake Audio offers replacement tweeter diaphragms for most models of speakers. Your Westlake Audio dealer can install new tweeter diaphragms should the need arise. It should be noted that Westlake Audio loudspeakers come with matched right/left drivers and therefore replacement diaphragms should also be matched for the left and right speaker which will necessitate the purchase of a new, matched pair of diaphragms.

"WHAT SUBWOOFERS DO YOU RECOMMEND FOR THE WESTLAKES?"

What makes the sound of a Westlake speaker so good is the integration of all the parts of the speaker together; transducers, crossover, and cabinet. Integrating a subwoofer into ANY stereo system is difficult at best if quality sound is the primary goal.

Westlake makes over thirty different models of loudspeakers; many of which offer realistic reproduction of the lower octaves. Unfortunately, the laws of physics dictates that to reproduce the lower octaves accurately, the transducers must have a large surface area.

For aesthetic as well as financial reasons, many people would like to combine a smaller Westlake loudspeaker with a subwoofer that can be placed out of the way to create a full range stereo system. With great care, this can be accomplished however Westlake would recommend that you purchase an integrated full range Westlake Audio loudspeaker.

A purpose built subwoofer may exist for some models of loudspeakers; consult your authorized Westlake Audio dealer for current availability.

"WHAT TYPE OF MUSIC ARE THE WESTLAKE SPEAKERS DESIGNED FOR?"

Westlake Audio products are designed to accurately reproduce the source recording. They have not been artificially equalized to reproduce any type of music "better" than any other.

Although the Westlake Audio products are designed to be as accurate as possible, the laws of physics dictate the ultimate performance of our loudspeakers. For example the smaller Westlake models with 4" or 5" woofers are not going to have as much bass extension as those with 15" or 18" woofers. Music with significant lower octave information such as pipe organ music will be better reproduced with the larger systems.

Other than the constraints imposed by the laws of physics, Westlake loudspeakers will be suitable for all types of music.

"WHY ARE WESTLAKE AUDIO LOUDSPEAKERS SO EXPENSIVE?"

In today's society, compromise is a required reality. Manufacturers often sacrifice quality and sonics for corporate profits and large scale production. This is true not only in mass-market items but in many "High End" audio products as well.

Westlake rarely compromises on sonics. Our goal has been the accurate reproduction of sound for over twenty years. This dedication to quality is seen in all of our products; from our entry level two way loudspeakers to our top of the line SM-1 systems.

All of our loudspeakers, regardless of price, use the highest grade parts available. Each part in the speaker, whether it be a transducer, capacitor, or inductor coil is matched for assembly into a right and left pair of speakers. Every part is tested and matched together by hand. Parts that do not meet our specifications are either returned to their manufacturer or thrown away.

Our products are hand made; from cabinet construction to crossover to final assembly and testing. In addition to over a dozen measured tests, each pair of speakers is played and listened to. Before any product reaches the end consumer, it must satisfy us first. The results of these efforts are easy to see and hear. Westlake products provide a level of performance that is not found in other loudspeakers at any price. Our pedigree is well earned.

Yes, our products are expensive. They are also an exceptional value.

Happy Listening!