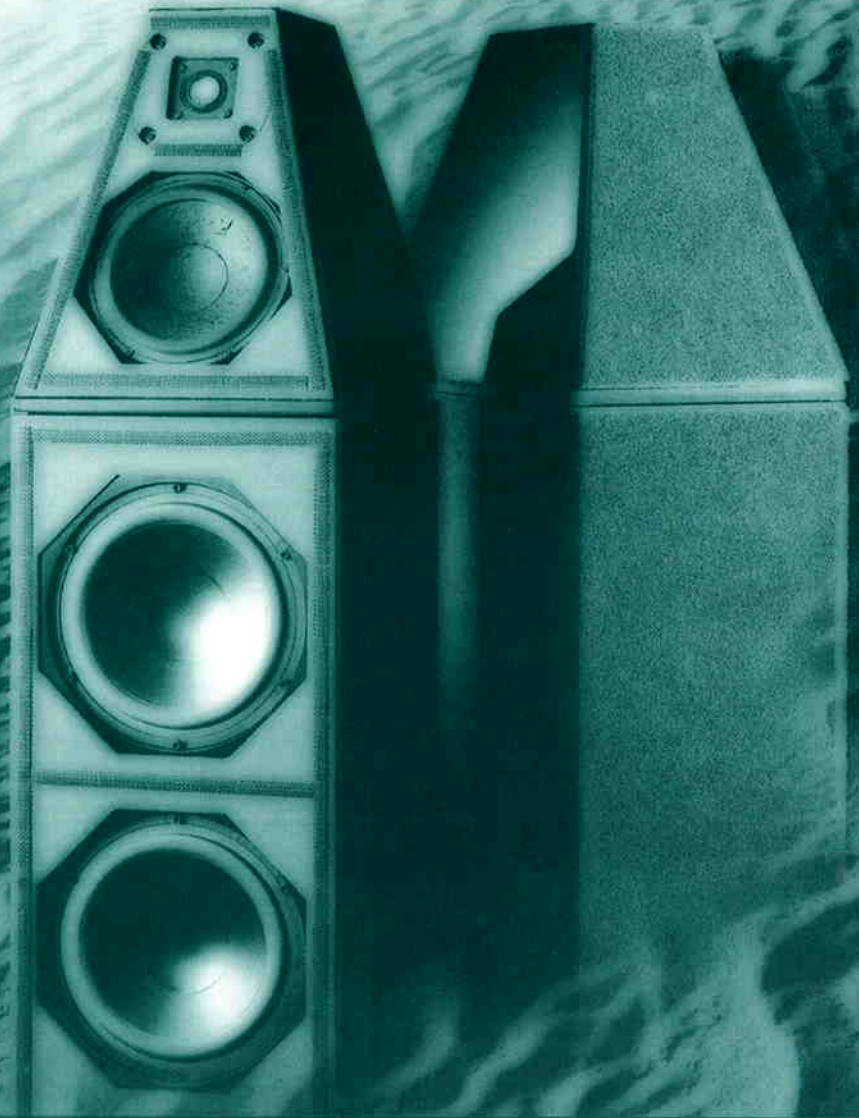
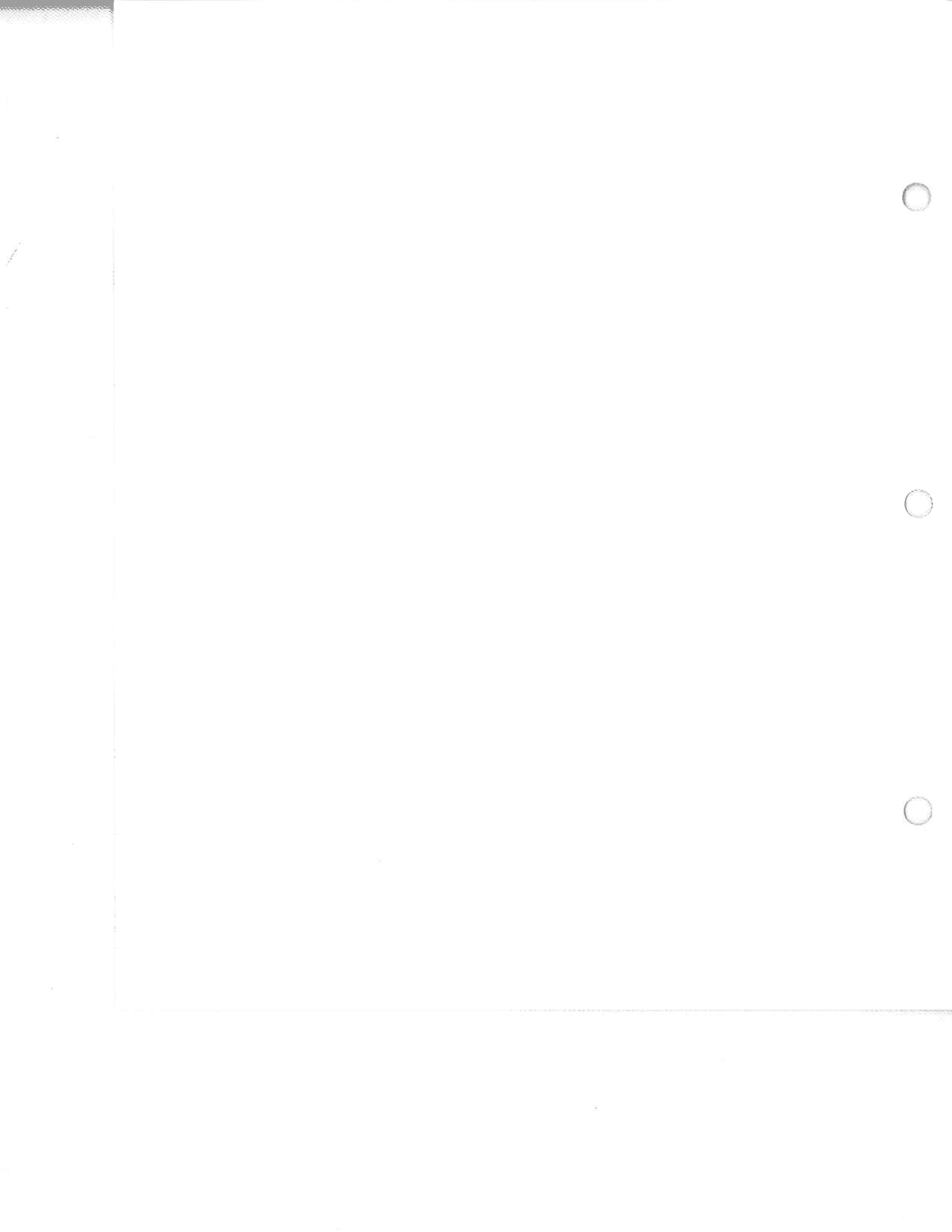


W A T T / P U P P Y

SYSTEM V



OWNER'S MANUAL



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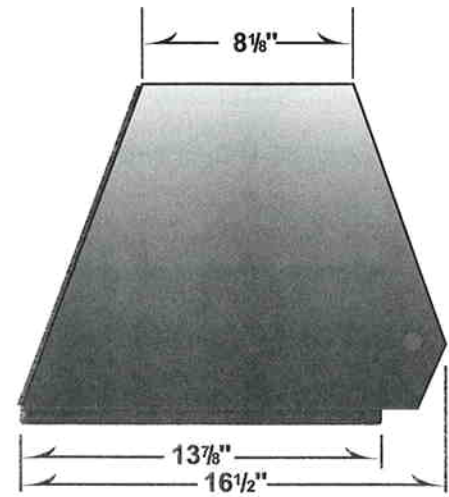
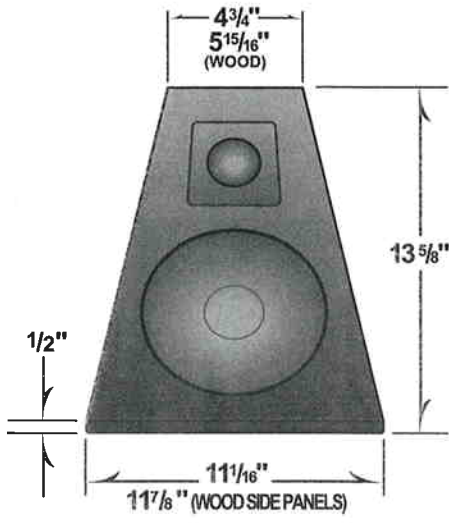
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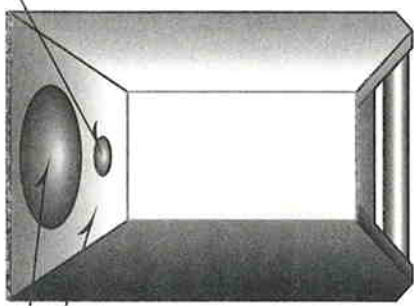
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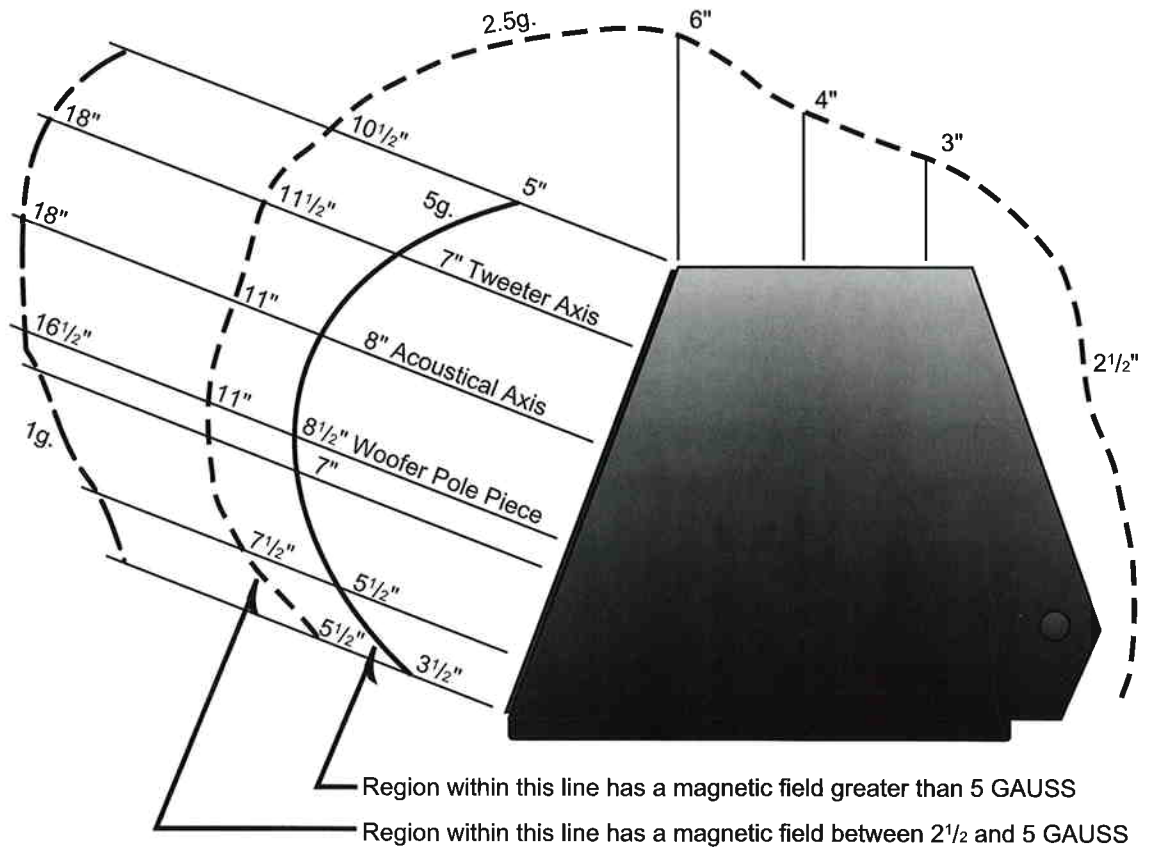


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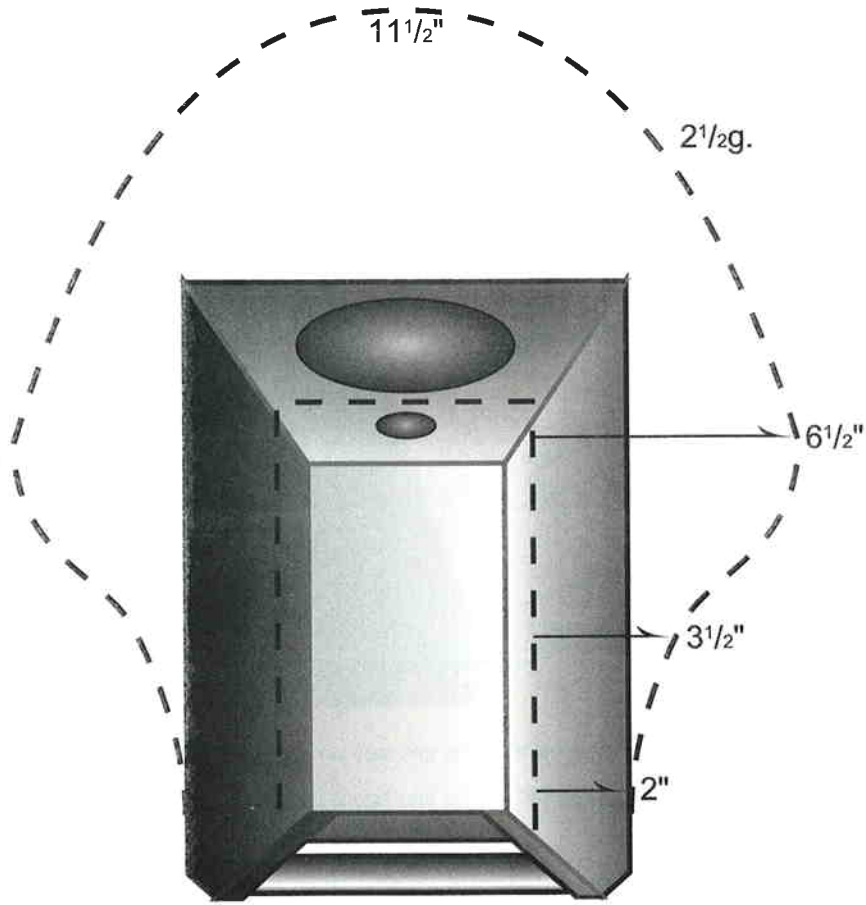
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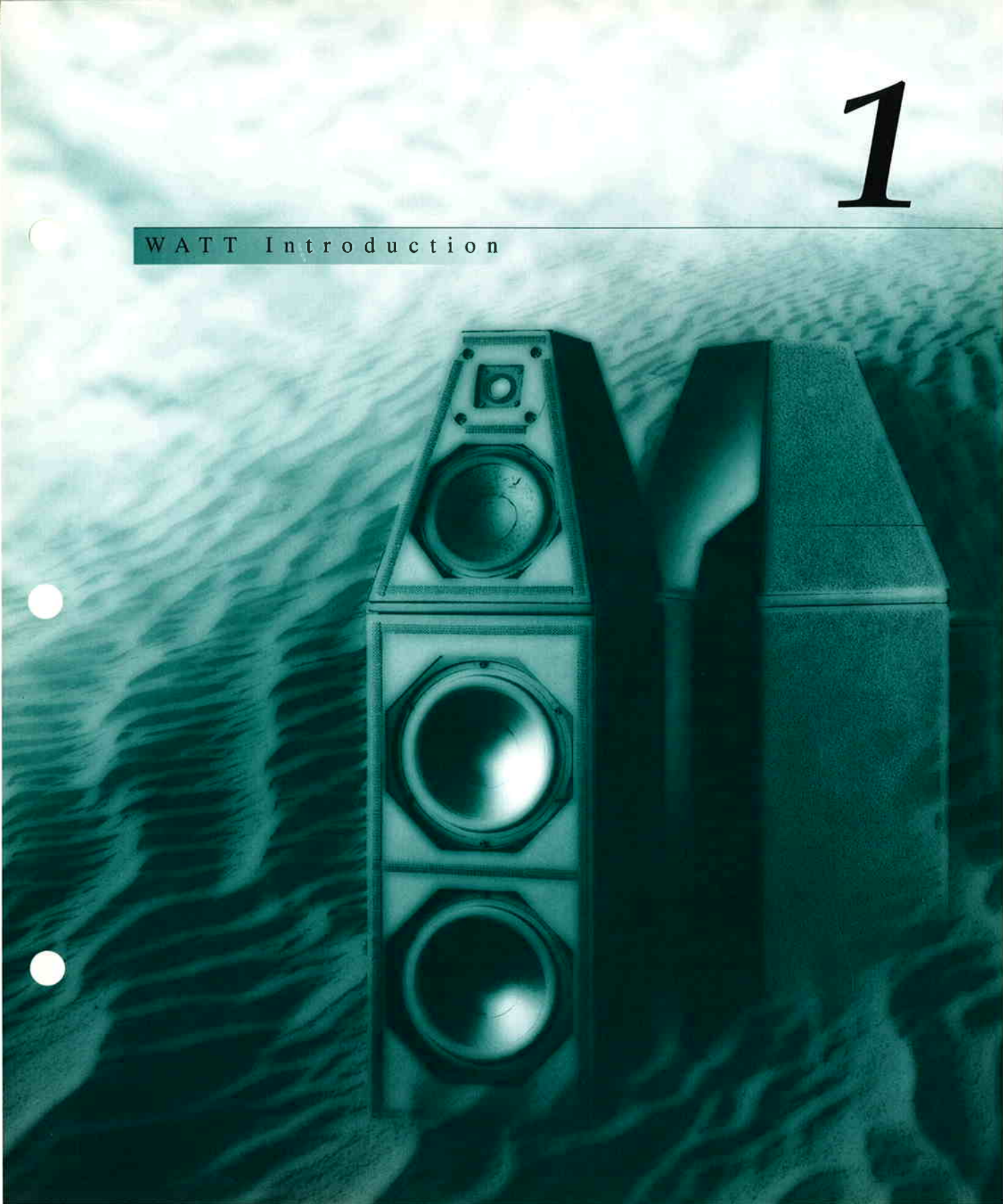
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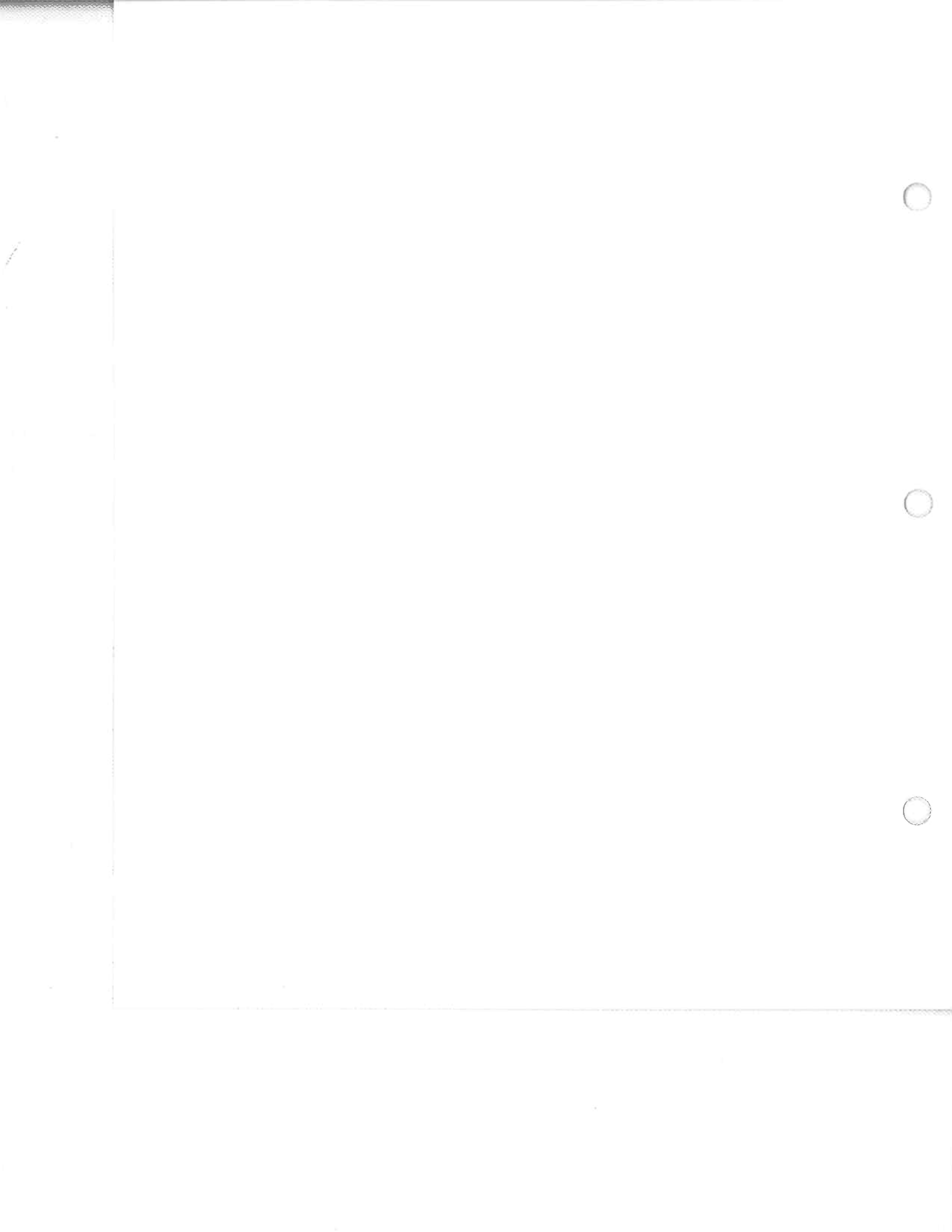


**WILSON AUDIO TINY TOT:
MAGNETIC FIELDS, TOP VIEW**



WATT Introduction





Although they are two separate products, the Wilson Audio WATT and Puppy are almost invariably used together. Thus, it seems appropriate to combine information regarding their use into one convenient manual.

APPLICATIONS

Your WATT (Wilson Audio Tiny Tot) precision loudspeaker system was designed and developed by David A. Wilson to serve as a highly accurate yet portable professional monitor for on-location recording work. Microphone pattern selection and placement as well as master tape evaluations may be quickly and correctly performed using the WATT. The extraordinary transparency, coherence, and dynamic linearity of the WATT also make it ideal for the sonic evaluation of audio hardware and software, including associated electronic audio equipment, D/A converters, passive circuit components, signal cables, solders, and contact treatments. Its capabilities of high resolution, accurate tonal and harmonic integrity, and unsurpassed sound-stage recreation make it an ideal system for the most demanding music lovers. In the application as a center channel for video systems the WATT (usually with A.V. Puppy), provides unrivaled dialogue intelligibility and convincing dynamics. The WATT's size and styling options allow it to be integrated harmoniously into a wide variety of fine interior decors.

DESIGN CONSIDERATIONS

The WATT is designed around a massive, yet compact, enclosure utilizing proprietary polymer materials technology. The enclosure material exhibits excellent internal damping and a correct mechanical impedance match to the frames of the drivers. Additional mechanical tuning is provided by null point placement of lead alloy ingot blocks, bituminous surface treatment and rigid cross-bracing. The acoustical tuning of the low frequency system is modeled after the quasi-third order Butterworth response, (see figure 1 below), which provides linearity in the upper-bass (without the usual mid-bass hump) with superior transient performance. The low-frequency range of the system is normally extended with a Wilson Audio Puppy high speed woofer. The crossover network uses multiple slopes to achieve acoustical phase linearity. Minimum energy/time-storage behavior in the crossover is achieved by using only the finest audio-

**WATT DESIGN CONSIDERATIONS:
THIELE & SMALL ALIGNMENTS**

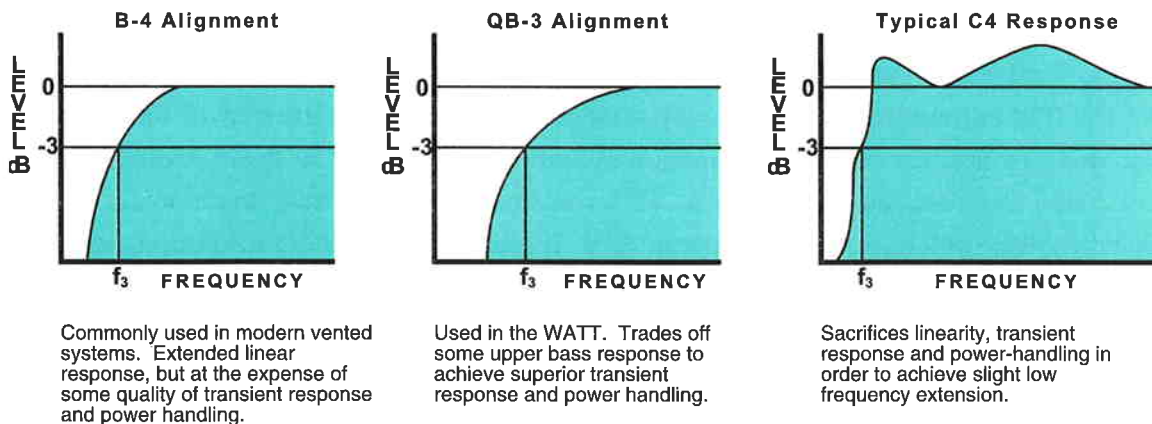


figure 1

grade propylene capacitors, OFC air-core inductors, and time coherent wire. The components are matched to better than 0.1% tolerance. The drivers were selected because of their frequency response linearity, impulse stability, and most important, their intrinsic musical quality.

ENCLOSURE MATERIALS TECHNOLOGY

The enclosure of your WATT loudspeaker system is machined from a unique material composed of ceramic and mineral filled methacrylate polymer. This material has been chosen because it provides a nearly ideal blend of rigidity, mass, and internal vibration damping. Ideally, an enclosure material should be infinitely rigid to preserve dynamic contrasts, while at the same time it should have infinite internal damping. To satisfy the first demand, the enclosure could be made out of diamond, which would of course be prohibitively expensive! To satisfy the second demand, the ideal enclosure could be made out of rubber, but such an enclosure would exhibit very poor dynamic linearity. Because of its brittleness, the WATT enclosure material is a much more demanding material to work with than wood or metal.



THE WATT ENCLOSURE MATERIAL SHOULD BE TREATED AS THOUGH IT WERE CERAMIC! THE MATERIAL WILL NOT BEND, BUT INSTEAD WILL CRACK. FOR THIS REASON USERS OF THE WATT SHOULD NOT TO ATTEMPT DISASSEMBLY OF THE SYSTEM.

THE WATT: A TEXTBOOK IDEAL

The following is an excerpt from Martin Colloms' book High Performance Loudspeakers , (4th Edition, pp.297-299. Pentech Press, London, 1991):

“Where price is no object, costly materials and techniques can be employed to generate the finest results. In one system example, the WATT by Dave Wilson, the enclosure benefits from many techniques to achieve a remarkably inert result. The following details are all considered influential, including the small size (approximately 9 liters) which naturally improves strength and also results in a small enclosure surface area with reduced acoustic radiation. The enclosure itself is a truncated pyramid; as a result the panels are non-rectangular and the internal surfaces anti-parallel. The latter minimizes internal standing wave modes while the former helps to disperse and moderate the usual plate resonances present in conventional enclosure panels. In addition the interior is lined with anechoic grade foam supplemented by a volume filling of polyester fiber.

The enclosure panels are cut from a dense, naturally inert composite - an acrylic, heavily loaded with ceramic and a mineral powder - which may be machined like marble. Higher frequency panel modes are controlled by a highly resistive bituminous laminate on the inner surface while the remaining fundamental resonances are handled by heavy, 20 mm thick lead slabs bolted into position with elastic mountings to provide tuned, seismic damping. Furthermore, the side panels are extended at the rear to form small triangular ‘wings’. A massive alloy bar is bolted up between these wings, horizontally disposed and providing a stressed reinforcement for these largest radiating surfaces. Finally the finished mass of approximately 25 kg provides a heavy inert foundation for the two-way driver lineup to perform at its best. The performance attained in this enclosure design is an object lesson in the continuing importance of enclosure coloration in box speaker design.

Both mechanical impulse tests and listening have shown that this quality of enclosure has a dramatic effect in improving sound quality, particularly with transients, subjective dynamics, stereo focus and depth; as such it shows that despite considerable improvements, we still have a long way to go in the field of commercial enclosure design. However, this performance is achieved at high cost, approximately 15 times that of a normal enclosure of this size.”

CARE OF THE FINISH OF YOUR WATTS

Your WATT loudspeaker enclosures are hand-painted with Wilsongloss™ paint and hand-polished to a high luster. While the paint seems quite dry to the touch, final curing and complete hardening takes place over a period of four weeks. To protect the finish of the WATTS during final manufacture, shipment, and setup in your listening room, we have installed a removable layer of protective film over the finish. We recommend that this film be left in place until the speakers are in their final location in your listening room. Once you have determined their final position, remove the film by peeling it off. Do not leave this film on indefinitely, as it will leave impressions on the paint. It is important that the delicate paint finish of the WATT be dusted carefully with the special dust cloth which has been provided with your loudspeaker. We recommend that the following procedure be observed when dusting the speakers:

- A. *Blow off all loose dust*
- B. *Using the special dust cloth as a brush, gently whisk off any remaining loose dust*
- C. *Shake out the dust cloth*
- D. *Dust the finish, using linear motions in one direction parallel to the floor. Avoid using circular or vertical motions.*

Because the paint requires a period of several weeks to fully cure, we recommend that no cleaning fluids such as glass cleaners be used during this initial period of time. When the paint is fully cured, heavy finger prints and other minor smudges may be removed with a glass cleaner. Always use the special cloth. Stronger solvents are not recommended under any circumstances. Consult your dealer for further information if required. Periodic polishing may be desired over the years to maintain the high luster of the finish. We recommend a non-abrasive carnuba-based wax and soft cloth.

WATT/PUPPY SYSTEM V COMPARED TO WATT III/PUPPY II: MODULUS OF IMPEDANCE

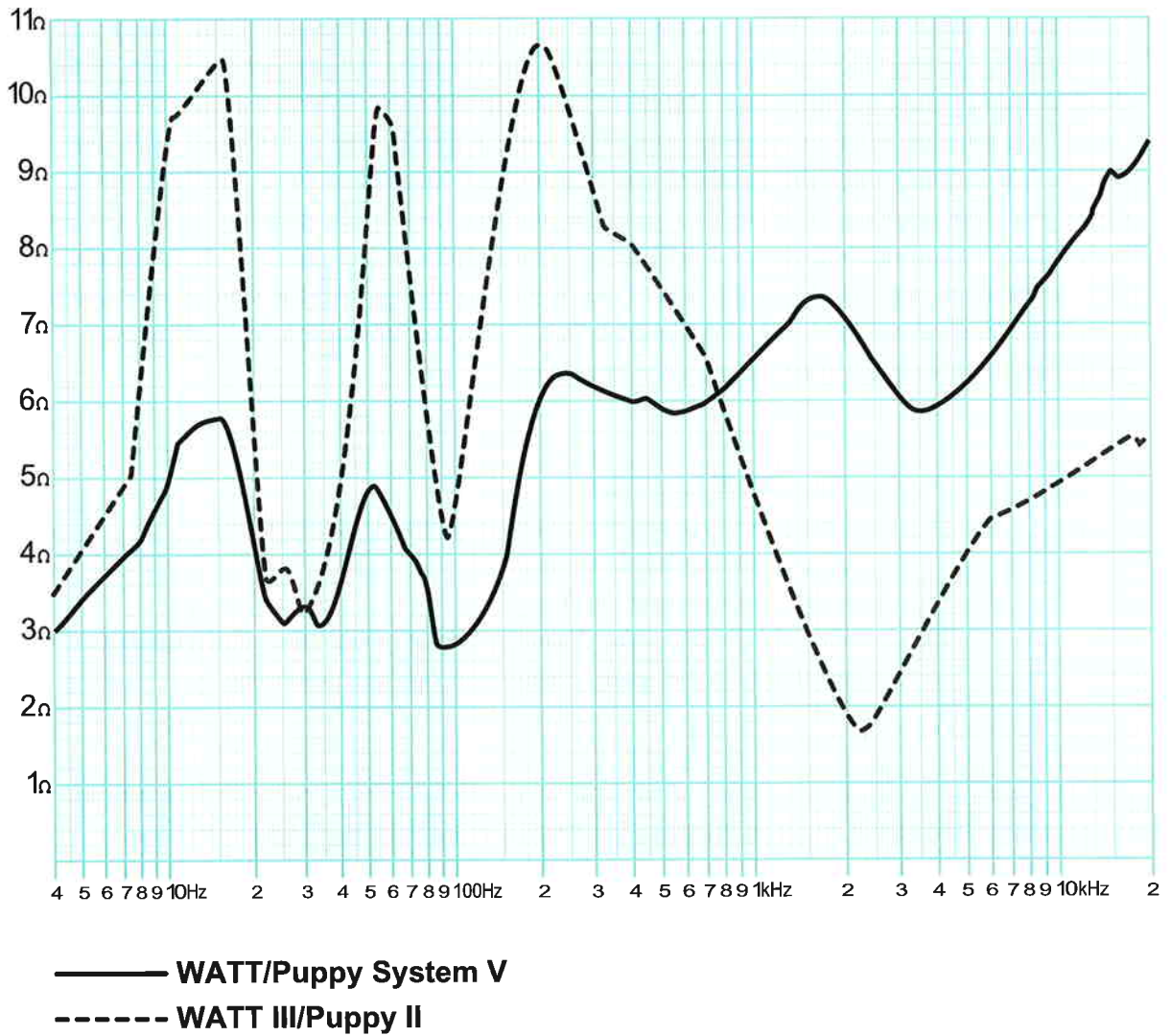


figure 2

IMPEDANCE

Figure 2 (facing page) shows the modulus of impedance of two generations of the WATT/Puppy loudspeaker system. Over most of the range from 200 Hz to approximately 100 KHz, the WATT III/Puppy II may be regarded a 4 ohm speaker. However, in the 2 KHz region it should be noted that the impedance drops to approximately 2 ohms. This does not present a problem with most modern high performance amplifiers. It does, however, contraindicate the use of certain amplifiers with vacuum tubes in their output stage, but no output transformer, such as the classic Futterman. This is not a reflection of the sound quality of the Futterman amplifier, which is in fact, superb. It is however, a consequence of the amplifier's high output source impedance and its greater efficiency when driving high load impedances.

From 200Hz on up to 100KHz, the impedance of the WATT/Puppy System V is higher than that of the WATT III/Puppy II, being generally 6 ohms and higher. This allows the System V to be used with OTL amplifiers. The impedance dips to 2 ohms between 90Hz and 100Hz.

Of course, there will be no difficulties when driving your WATTs with output transformer coupled vacuum tube amplifiers, or high performance solid state amplifiers. Contact your dealer for specific recommendations, which should be based on your listening tastes and system environment.

CONNECTION OF YOUR WATT SPEAKERS

The very high current input terminals located on the rear of you WATT V loudspeaker are color coded so that RED corresponds to positive and WHITE to negative, or common, or ground on the amplifier output. Be sure to connect the loudspeakers in phase with each other. We recommend the use of the very highest quality loudspeaker

interface cables, particularly those designed for high frequency propagation correction and phase linearity. Beware of “zip cord” type speaker cables which will smear the sound from your WATTs, and limit their effective bandwidth. Also do not use braided litz type loudspeaker cables as they will cause an unnatural brightness to the sound, compromise sound staging performance, and may cause instability, oscillation and damage in wide bandwidth solid state amplifiers.

The spade lugs of some of the high quality cables included with the WATT/Puppy are angled to reduce pressures on the cable during installation. Avoid the instinct to push the cable's spade lug ends all the way into the WATT/Puppy's very high current connectors; (see figure 3 below). **Partial insertion** of these angled spade lugs will actually improve the reliability of the connection.

W B T T E R M I N A L S :
P R O P E R L U G C O N N E C T I O N

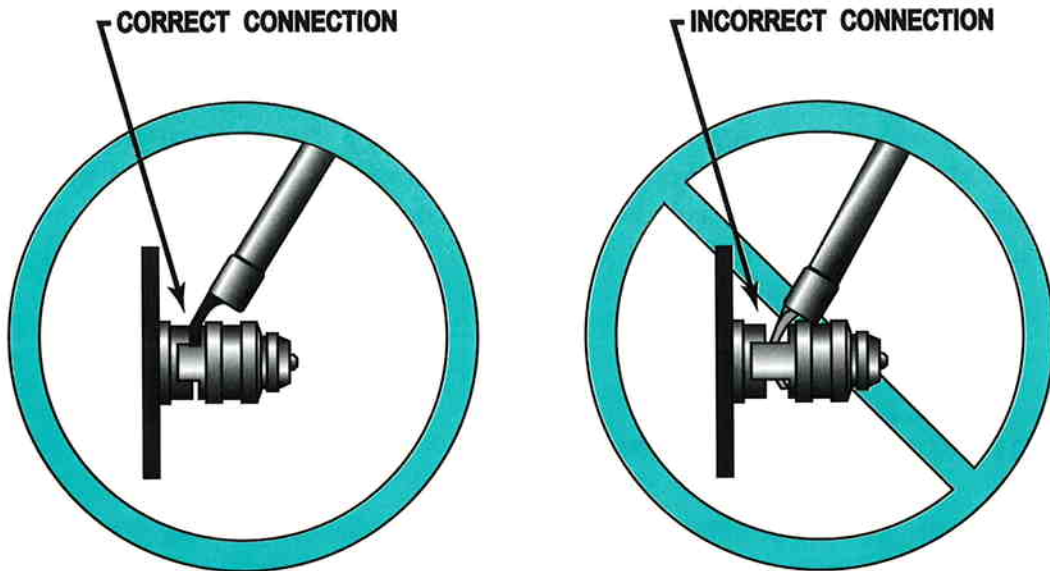


figure 3

SELECTION OF INTERCHANGEABLE TUNING PORTS

The damping factor of an amplifier is a function of the amplifier's output impedance into a given load impedance. Solid state amplifiers, due to their intrinsically low output impedance, tend to have a higher damping factor than vacuum tube amplifiers. Vacuum tube amplifiers typically are transformer-coupled in their output stage and the secondary windings of the output transformer present a relatively high source impedance. This source impedance is a parameter which must be considered in the tuning of the air volume of the loudspeaker enclosure. An interesting theoretical consideration is that if a loudspeaker is designed around a solid state amplifier and then used with a vacuum tube amplifier, it will tend to sound loose and tubby in the mid-bass regions. The WATT loudspeaker system allows you to precisely tailor the air volume tuning of the enclosure to the amplifier of your choice.

Your WATT loudspeaker comes equipped with two sets of interchangeable tuning ports. The ports connect on the back of the loudspeaker system and are affixed with three (3) button-head stainless steel screws. An allen key is provided which can be used to remove these screws to facilitate exchange of the ports. Typically, WATTs are shipped with the "D.F. 100-400" ports installed. This range encompasses the majority of high performance solid state amplifier types. Most vacuum tube amplifiers have damping factors of from 20 to 80, and we recommend the port which is labeled "D.F. 20-80."

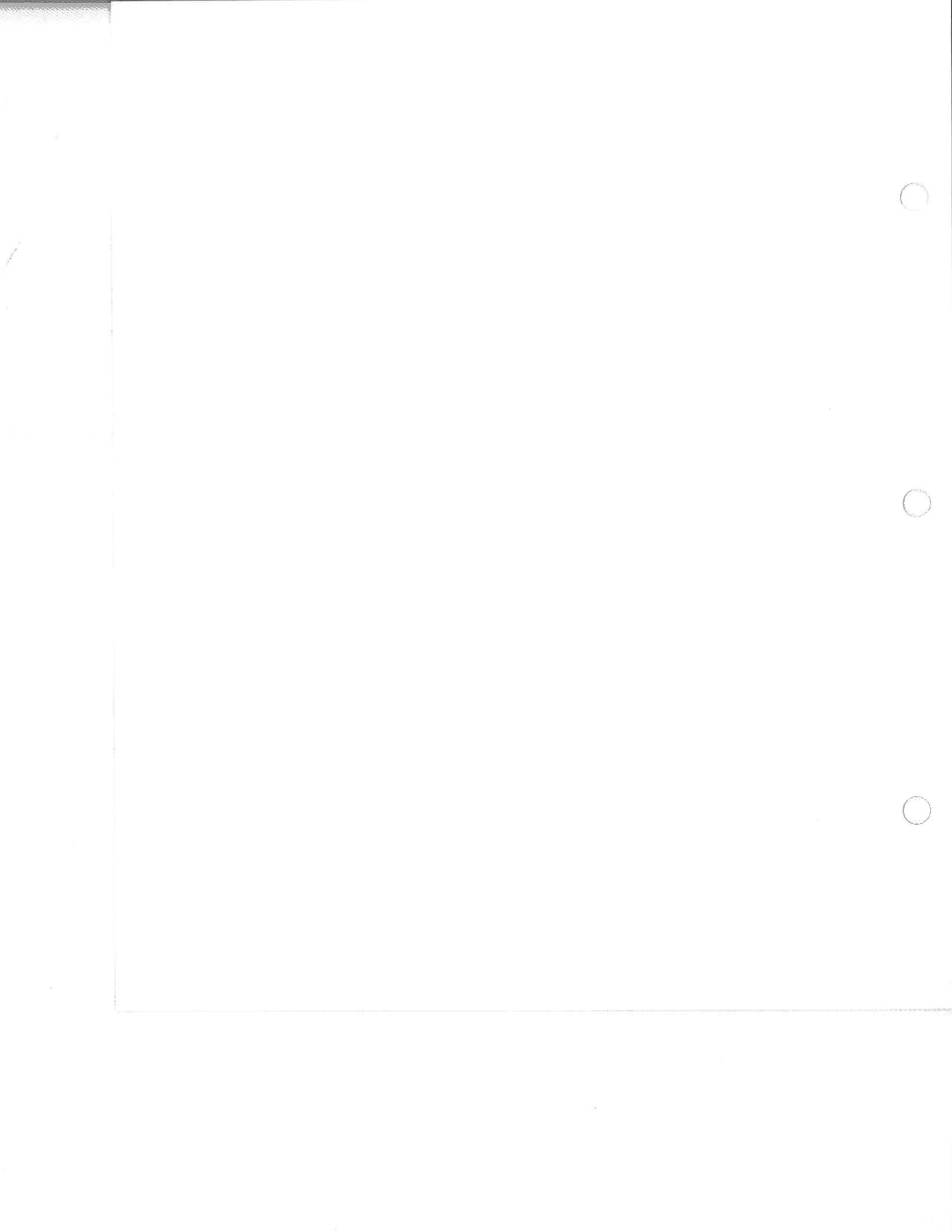
TECHNICAL NOTE

If the user wishes to test the polarity of the WATT V with a battery, connect the plus (+) terminal of the battery to the RED (+) input terminal of the WATT and the negative (-) terminal of the battery the WHITE (-) terminal of the WATT. The results of this test will show the WATT woofer to move inward. **This is the correct driver movement in response to a D.C. signal.**



Puppy Introduction





APPLICATIONS

The primary application for the Puppy is as a low frequency augmentation of the WATT. The Puppy series II may be used quite successfully with other upper range speakers, typically with an electronic crossover. The Puppy series V can be optimally used *only* with the WATT series V (see table).

PUPPY	COMPATIBLE WITH
Series V	Only WATT series V
Series I & II	WATT Series I, II, III, and V Other upper range speakers, using an electronic crossover at 70Hz to 125Hz

TECHNICAL NOTE

If the user wishes to test the polarity of the Puppy V with a battery, the plus (+) terminal of the battery is connected to the RED (+) input terminal of the Puppy and the negative (-) terminal of the battery is connected to the WHITE (-) terminal of the Puppy. The results of this test will show the Puppy woofers to move outward. **This is the correct driver movement in response to a D.C. signal.**

DESIGN CONSIDERATIONS

The Puppy high speed woofer was introduced in 1988, two years after the WATT. Prior to the Puppy, users of the WATT who desired more low frequency extension, would add various subwoofers from other manufacturers. The results were unpredictable and often compromised overall musical performance. It became clear to Mr. Wilson that none of these subwoofers provided the speed necessary to blend seamlessly with the lightning-quick WATT.

The Puppy was the result of very careful weighing of actual versus assumed performance requirements. For example, it has been generally assumed that woofers need to provide response down to 20Hz, and that low frequency extension is of primary importance. In other words, transient quickness in the woofer is of secondary importance. Wilson, however, realized that bass extension below 35-40Hz is of secondary importance to most sensitive listeners. Furthermore, the vain pursuit of acceptable 20Hz response from a system the size of the Puppy would result in the sacrifice of performance in those areas felt by Wilson to be of paramount importance.

Thus, in the initial design phase of the Puppy, Wilson concluded that what was needed was a highly articulate, low distortion, non-resonant, compact high-speed woofer with robust power handling and high sensitivity and excellent reliability. Two very high quality low-frequency drivers are driven in parallel in a rigidly cross-braced, tuned enclosure. Special enclosure materials are used to quickly dampen spurious resonances in the structure. The crossover network in the base of the Puppy is composed of the finest audio grade components, held to tolerances better than 0.1%.

CARE OF THE FINISH OF YOUR PUPPY

The standard finish of your Puppy is a durable medium-gloss laminate. Care of the laminate finish is very simple and no curing time is required. Smudges and dirt may be removed with mild glass cleaner and a soft cloth. Do not, under any circumstances, use organic solvents.

Puppy's may also be ordered in Wilsongloss™ paint. Painted Puppy's should be treated as described in the section on *Care of the Finish of Your WATTs* (page 1.5).

PUPPY PAWS

Included with your WATT/Puppy system V are two sets of Puppy Paws, which provide acoustical isolation as well as optimal height placement for your speakers. There are three ways of assembling the paws (without spacers, or with one or two spacers), and your choice will depend on your listening room and personal tastes. Wilson generally recommends no spacers, for simplicity and rigidity. However, the addition of spacers changes the driver-to-floor dimension, and can sometimes be used to reduce an objectionable upper-bass/lower mid-range standing wave.

ASSEMBLY:

1. Insert either the short or the long threaded bolt, depending on the desired height (*see figure 4 next page*) as far as it will go into the hole in the bottom of the Puppy.
2. If desired, place the corresponding number of spacer discs (*see figure 4 next page*) over the bolt.
3. Screw the acoustical diode onto the bolt until it butts up against the spacers or Puppy bottom.
4. Screw the spike (with nut) all the way in until it reaches the bolt. Do not tighten the nut at this time.
5. Repeat steps 1 through 4 with the other three paws.
6. To provide the proper mechanical coupling between the Puppy Paws and the floor, make sure that the Puppy is level by unscrewing individual spikes as needed until even contact is achieved by all four Paws. A bubble level is often helpful in this procedure.
7. Once all adjustments have been made, tighten the bolt on the spike to the diode with the $\frac{9}{16}$ " wrench provided. DO NOT OVERTIGHTEN! "Snug" is tight enough.

PUPPY PAWS: ASSEMBLY DIAGRAM

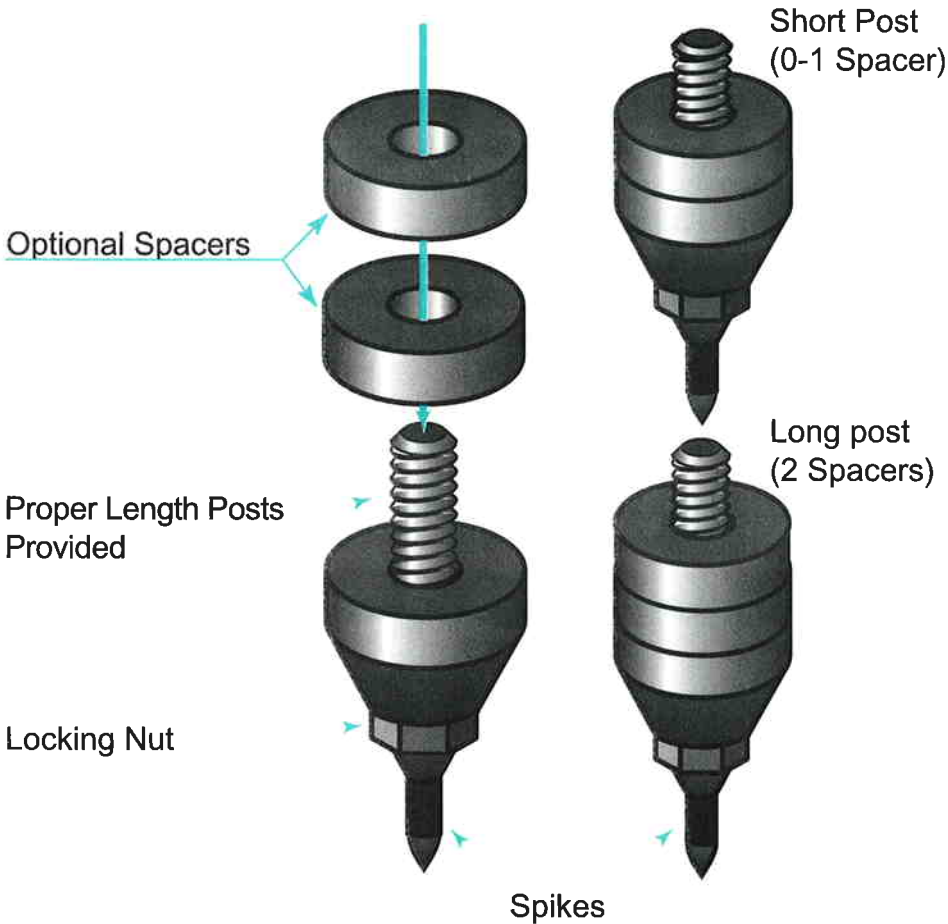


figure 4

PUPPY TAIL CONNECTION

- A. The correct connection of the Puppy Tail in the WATT/Puppy system V is:
1. Orient the load end of the tail such that the direction arrow is pointing toward the WATT. The arrows point to the load end of the tail.
 2. Insert the tail through the opening in the top back of the Puppy.
 3. Connect the RED lug of the source end of the tail to the top RED terminal on the Puppy connector plate.
 4. Connect the BLACK lug of the source end of the tail to the top WHITE terminal on the Puppy connector plate.
 5. Connect the other RED lug at the load end of the tail to the RED terminal on the WATT.
 6. Connect the other BLACK lug at the load end of the tail to the WHITE terminal on the WATT.

Please resist the temptation to invert the polarity of the Puppy Tail in the WATT/Puppy V system. Such an inversion will produce entertaining ambient effects, but destroys the linearity and harmonic structure of the system.

B. The correct connection of the Puppy Tail when a WATT V is used with a Puppy I or II is:

1. Orient the load end of the tail such that the direction arrow is pointing toward the WATT. The arrows point to the load end of the tail.
2. Insert the tail through the opening in the top back of the Puppy.
3. Connect the RED lug of the source end of the tail to the top BLACK terminal on the Puppy connector plate.
4. Connect the BLACK lug of the source end of the tail to the top RED terminal on the Puppy connector plate.
5. Connect the RED lug at the load end of the tail to the RED terminal on the WATT.
6. Connect the BLACK lug at the load end of the tail to the WHITE terminal on the WATT.

Thus the connection polarity of the Puppy I or II to the WATT V must be INVERTED.

It is also necessary to INVERT THE POLARITY of the amplifier to speaker cable connection.

7. Connect the positive (+) output of the amplifier output to the BLACK input connector on the Puppy I or II. If using a vacuum tube amp, the positive (+) output is usually marked with the impedance value... 4ohm, 8ohm, or 16ohm. We recommend 8ohm.

C. The WATT I, II or III cannot be used with the PuppyV.

BITUMINOUS DISC PLACEMENT

The main functions of these discs are to decouple mid-range and treble energy thus preventing their transfer from the WATT to the Puppy. They effectively couple lower frequencies through the appropriately tightened Puppy Paws to the floor while providing greater security of WATT positioning.

To place the bituminous discs, remove their backing and attach to the top of each Puppy as shown:

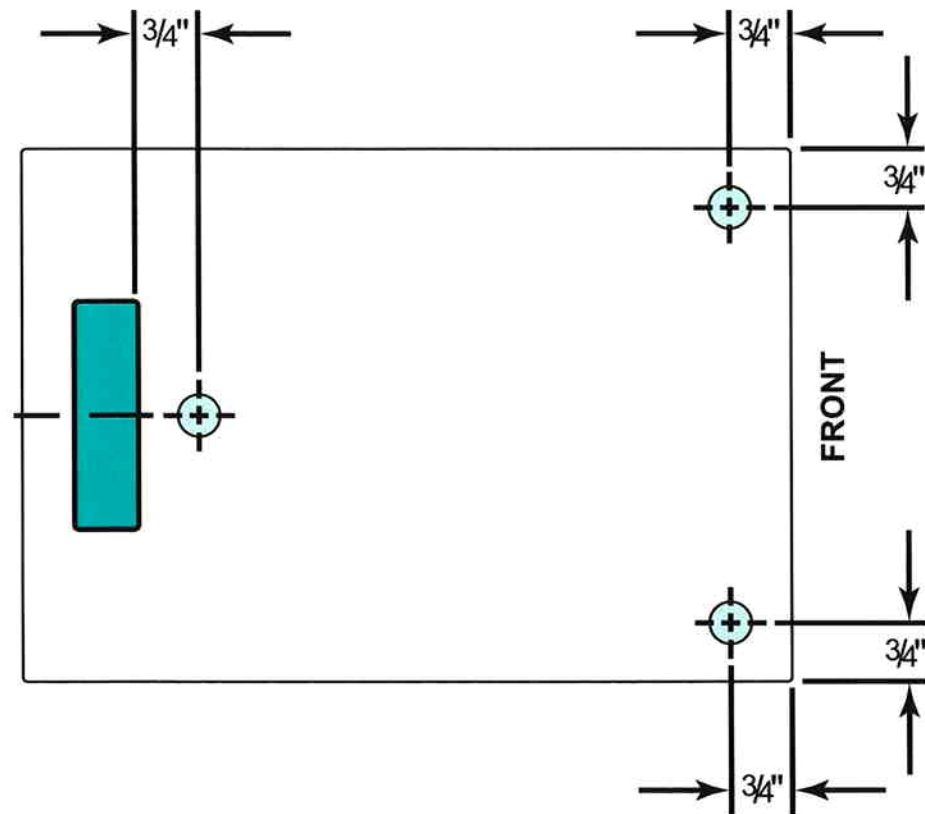
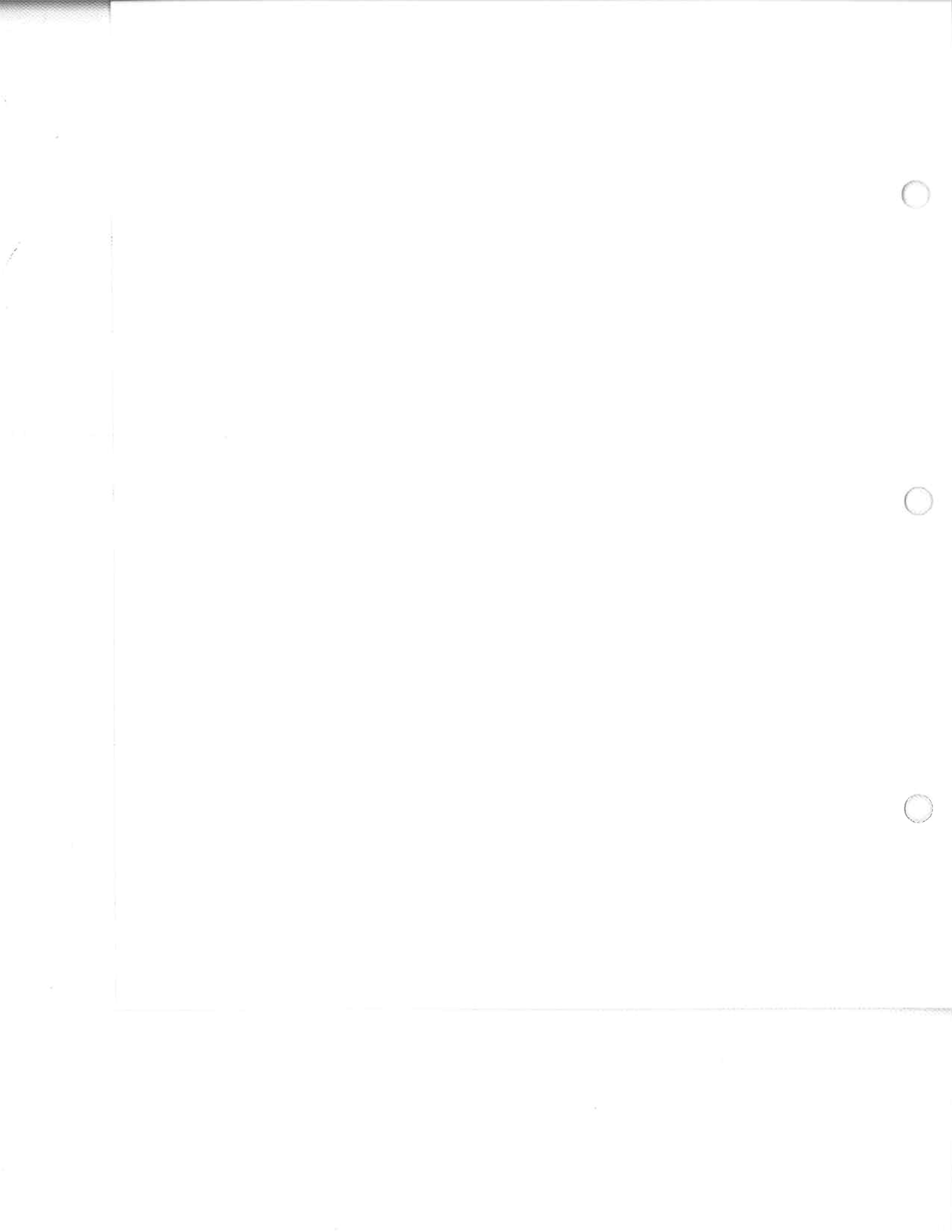


figure 5



In Your Room





ROOM ACOUSTICS

A. REFLECTIONS

Figure 6 (below) illustrates the 3 most commonly encountered room reflection problems. Probably the most obnoxious form of reflection is called “slap echo.” In slap echo, primarily mid-range and high frequency sounds reflect off of two parallel hard surfaces. The sound literally reverberates back and forth until it is finally dissipated over time. You can test for slap echo in any room by clapping your hands sharply in the middle of the room and listening for the characteristic sound of the echo in the mid-range. Slap echo destroys the sound quality of a stereo system primarily in two ways: by adding harshness to the upper mid-range and treble through energy time storage and by destroying the delicate phase relationships which help to establish an accurate sound stage. Non-parallel walls do not support slap echo, but rather allow the sound to diffuse.

3 COMMONLY ENCOUNTERED REFLECTION PROBLEMS

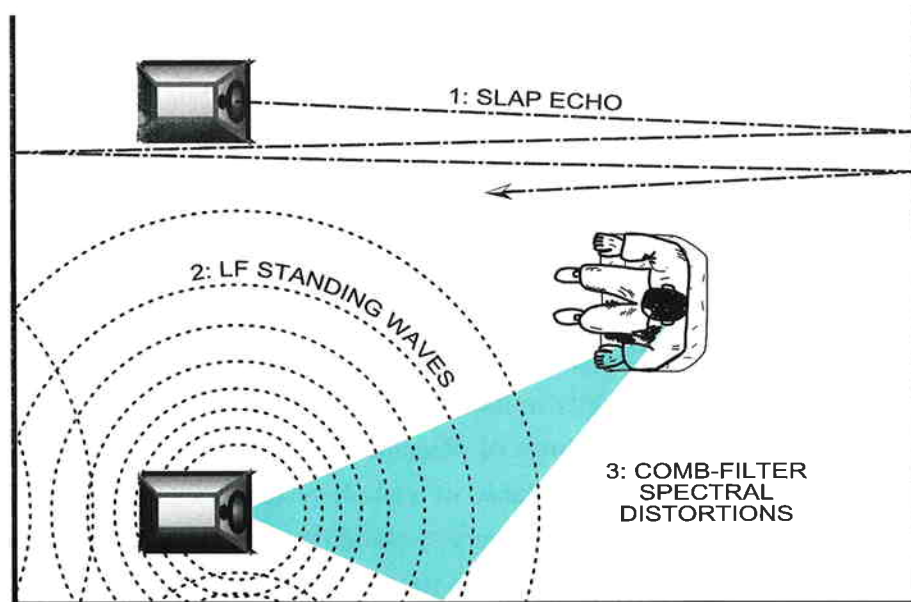


figure 6

Slap echo is a common acoustical problem in the typical domestic listening room, because most of these rooms have walls of a hard, reflective nature, usually being only occasionally interrupted by curtains or drapes. Slap echo can be controlled entirely by the application of absorptive materials such as Sonex, airduct board, or cork panels to the hard surfaces. Large ceiling to floor drapes are effective in controlling some high frequency slap echo, as is the application of carpeting to wall surfaces. In many domestic listening environments, heavy stuffed furnishings are the primary structural control to slap echo. Unfortunately, their effectiveness is not predictable. Diffusers are sometimes also used to very good subjective effect, particularly in quite large rooms. Sound absorbent materials such as described above will alter the tonal characteristic of the room by making it sound "deader," less "bright and alive" and "quieter." These changes also make the room more pleasant for conversation. Diffusers, on the other hand, tend to not change the tonal balance characteristic of the room, but make the sound smoother and more open.

Another type of reflection phenomenon is "standing waves" (*see figure 6*). Standing waves cause the unnatural boosting or accentuation of certain frequencies, typically in the bass, to be found at certain discreet locations in the room. A room generating severe standing waves will tend to make a loudspeaker sound one way when placed in one location and entirely different when placed in another. The effects of standing waves on a loudspeaker's performance are primarily in its tonal balance, although resolution of low-level detail, as well as sound-staging will also suffer. Standing waves are more difficult to correct than slap echo because they tend to occur at a lower frequency, whose wave length is long enough to be ineffectively controlled by absorbent materials such as Sonex. Moving speakers about slightly in the room is, for most people, their only control over standing waves. Sometimes a change of placement of as little as three or four inches can dramatically alter the tonal balance of a small system because of standing wave problems. Fortunately, minor low frequency standing waves are well controlled by positioning ASC tube traps in the corners of the room. Very serious low frequency accentuation usually requires a custom-designed bass trap system.

Low frequency standing waves can be particularly troublesome in rooms constructed of concrete or brick. These materials trap the bass in the room, unless it is allowed to leak out of the room, through windows and doors.

In general, placement of the speaker in a corner will excite the maximal number of standing waves in a room, and is to be avoided for most direct radiator, full range loudspeaker systems. Some benefit is achieved by placing the stereo pair of loudspeakers slightly asymmetrically in the listening room so that the standing waves caused by the distance between one speaker and its adjacent walls and floors are not the same as the standing wave frequencies excited by the dimensions in the other channel.

A special type of standing wave noticeable primarily at higher frequencies and shorter wave lengths is the so-called “comb filter effect” (*see figure 7*).

REFLECTIVE ACOUSTICAL COMB FILTER EFFECT

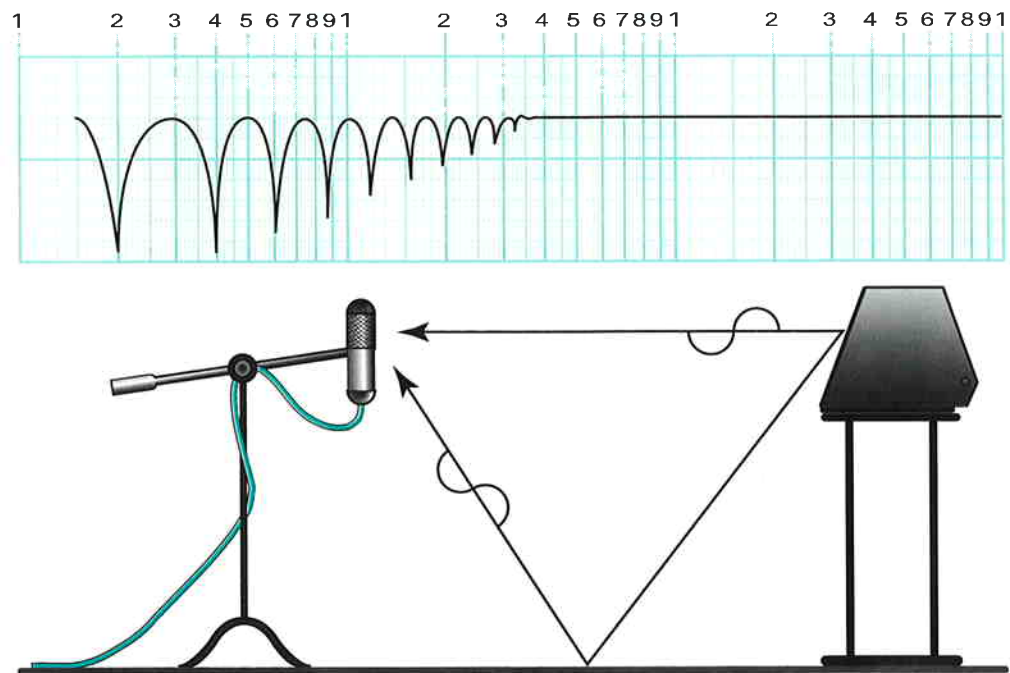


figure 7

Acoustical comb filtering occurs when sound from a single source, such as a loudspeaker, is directed toward a microphone or listener at a distance. The first sound to reach the microphone will be the direct sound, followed by delayed reflected sound. Because the reflected sound lags in phase relative to the direct sound, there will be cancellation at certain frequencies where the two are 180 degrees out of phase, and augmentation at other frequencies where the direct and the reflected sounds arrive in phase. Because it is a function of wave length, the comb filter effect will notch out portions of the audio spectrum at regular octave-spaced intervals. The subjective effect of comb filter effects, (such as is shown in *figure 4* and *figure 7*) is an added roughness to the sound, a reduction of harmonic richness and a smearing of lateral sound stage image focus and placement. The side wall reflections which cause the comb filter effects are best controlled by careful speaker placement and by the placement of Sonex or air duct panels applied to that part of the wall where the reflection occurs.

B. RESONANCES

Resonances in listening rooms are generally caused by two sources: (1) the structures within the listening room and (2) the volume of the air itself in the listening room.

Structural resonances are familiar to most people as buzzes and rattles, but this type of resonance usually only occurs at extremely high volume levels, and is usually masked by the music. In many wood frame rooms, the most common type of structural resonance problem is “booming” of walls and floors. You can test for these very easily by tapping the wall with the heel of your hand or stomping on the floor. If it is a wooden floor, this is done to detect the primary spectral center of the resonance. To give you an idea of what the perfect wall would sound like, imagine rapping your hand against the side of a mountain. Structural wall resonances generally occur in the low to mid-bass frequencies and add tonal balance fullness to any system played in that room. They too are more prominent at louder levels, but their contribution to the sound of the speaker is more progressive. Rattling windows, picture frames, lamp shades, etc. can generally be

silenced with small pieces of caulk or with blocks of felt. Short of actually adding additional layers of sheet rock to flimsy walls, however, there is little that can be done to eliminate wall resonances.

The volume of air in a given room will also resonate at a frequency determined by the size of the room. Larger rooms will resonate at a lower frequency than will smaller rooms. Air volume resonances, wall panel resonances, and low frequency standing waves, together, combine to form a low frequency coloration in the sound. At its worst, it is a grossly exaggerated fullness which tends to obscure detail and distort the natural tonal balance of the speaker system. Occasionally, however, there is just enough resonance to give a little added warmth to the sound... an addition some listeners prefer. Tube traps manufactured by the ASC corporation have been found to be effective in reducing some of these low frequency room colorations. Custom designed and constructed bass traps, such as perforated Helmholtz resonators, provide the greatest degree of low frequency control.

SHAPE OF THE ROOM

The diagrams of *figure 8* show the three most common room shapes: square, rectangular, and L-shaped along with generally favorable speaker location areas. A perfectly square room is probably the worst room shape for most loudspeaker applications. In a square room, standing wave production is most efficient, and hence objectionable. Long, narrow, rectangular rooms also pose their own special problems, creating several standing wave modes along their length. Slap echoes along the long axis of the room can be particularly disturbing to sound staging because of the relatively long time delay between echo intervals. These long rooms are often quite lean in the bass near the center of the room (where most listeners would prefer to sit). This mid-room bass leanness is made worse if there are large windows on the narrow walls. Although maximum low frequency

response would probably be achieved by placing the loudspeakers along the narrow wall of the rectangular room, (*figure 8A*) optimal stereo imaging and midrange clarity would be achieved by placing the loudspeakers along the long wall (*figure 8B*). L-shaped rooms would seem to present the same dilemmas as a long, rectangular room, however, the asymmetry of the acoustical space tends to break up standing waves and can provide a better listening environment (*figures 8A & B*).

**COMMON ROOM SHAPES:
OPTIMUM SPEAKER PLACEMENTS**

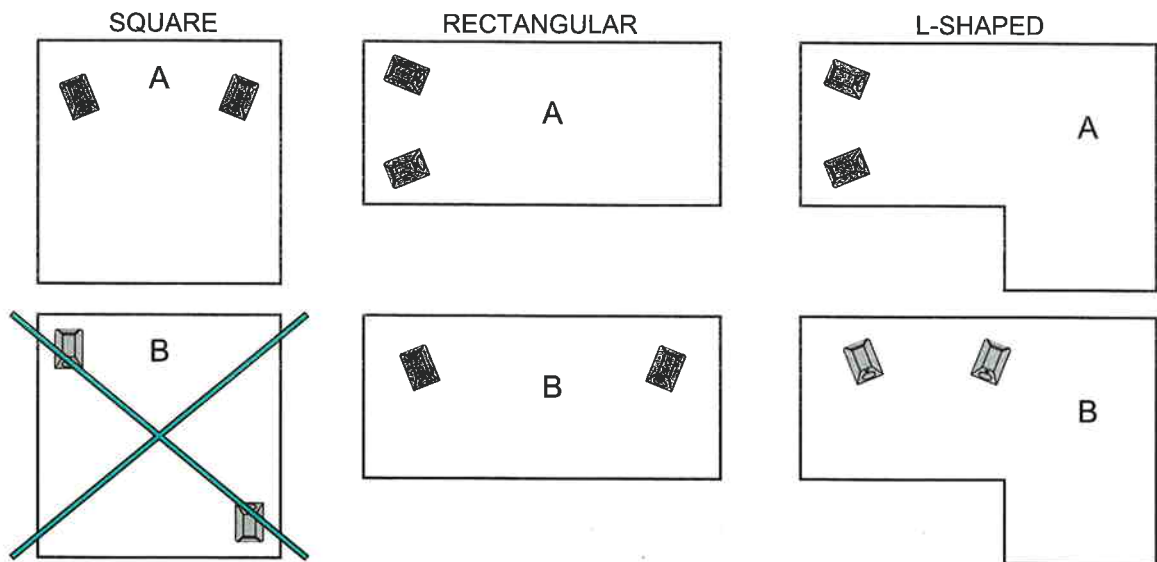
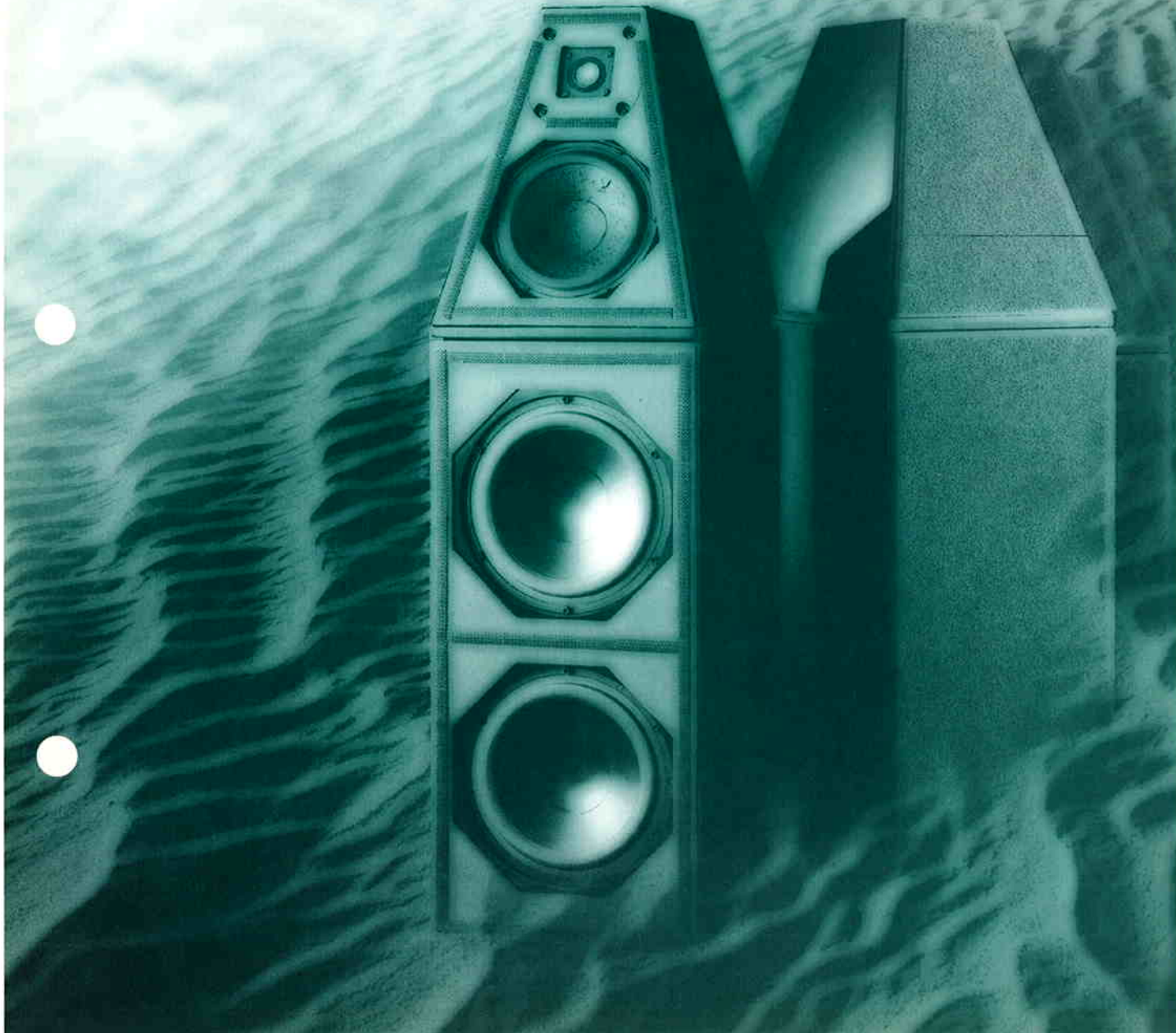
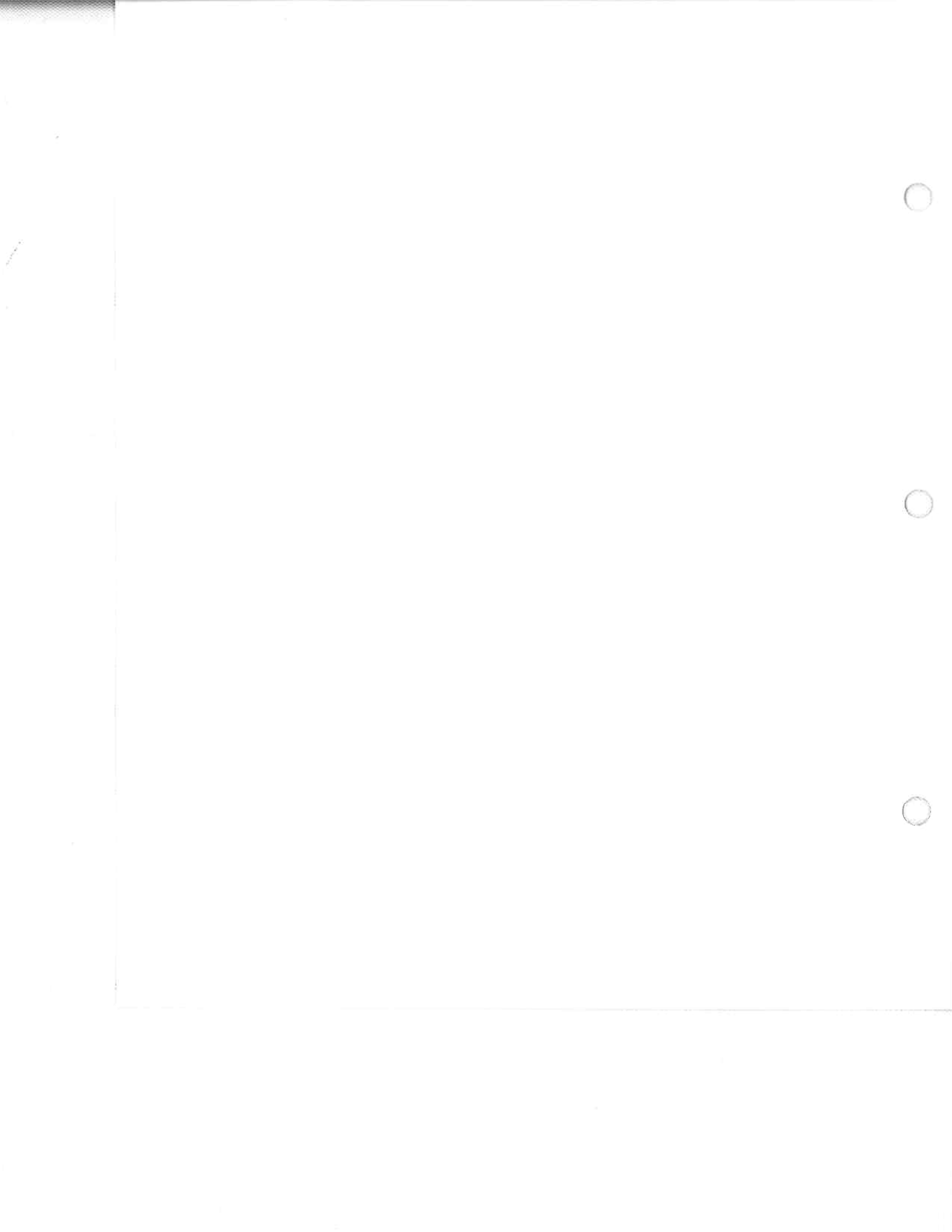


figure 8

Mounting Heights





MOUNTING HEIGHTS

The WATTs were designed to be aimed at the listener, which means that they will be toed-in prominently rather than facing straight ahead. Compare results of *figure13 (table 4)*, example 1B with *figure14 (table 5)*, example 2.

The acoustical center of the WATT speaker system is at a point near the top edge of the woofer, which we are referring to as “Point A.” The system’s phase coherence, as well as its upper midrange and high frequency amplitude response, are most linear when measured on axis with Point A. Placing the speakers above the listener’s head displaces the alignment of the woofers’ output in front of the tweeter. Such placement is possible, but ideally, the WATT should be angled down, toward the listener. Contact your Wilson Audio dealer for more information. The more common placement of the WATT is at or below ear level.

The effect of different mounting heights on the response of the WATTs is examined in *figures 9 through 11* and *tables 1 through 3*.

In the first example, (*figure 9, table 1*) we see the WATTs seated on the floor. In this configuration the WATT’s low frequency response will be quite linear down to its lower band pass limit. Midrange to upper bass response is particularly smooth. If the floor is carpeted, the high frequency response will be somewhat depressed in amplitude, but clean. The sound-staging performance of the system will be hampered by comb-filter effects in the upper midrange and lower treble, which will also create a somewhat hollow-sounding coloration. Some listeners will prefer the mellow over-all tonal balance of this configuration, and indeed, several WATT systems incorporate essentially this placement with the WATTs within consoles.

In the second illustration, (*figure10, table 2*) we see the WATTs elevated to 18 inches above the floor on an open frame stand. There is some loss of low frequency response because of the reduction in 2π steradian support of woofer output. The acoustical center of the WATT

is now closer to ear level, thus sound staging will be improved, and the high frequency response will be more linear than in the first example. Resolution of low level detail is improved in the midrange.



FOR BEST LOW FREQUENCY TRANSIENT RESPONSE AND CLEANEST MID-RANGE, ALWAYS USE SPIKED FEET ON THE STAND - BETWEEN THE STAND AND THE FLOOR, AND OPTIONALLY BETWEEN THE STAND AND THE SPEAKER. IF THE STAND HAS HOLLOW LEGS, FILL THEM WITH SAND OR LEAD BUCKSHOT TO ELIMINATE UPPER MIDRANGE RINGING IN THE STAND.

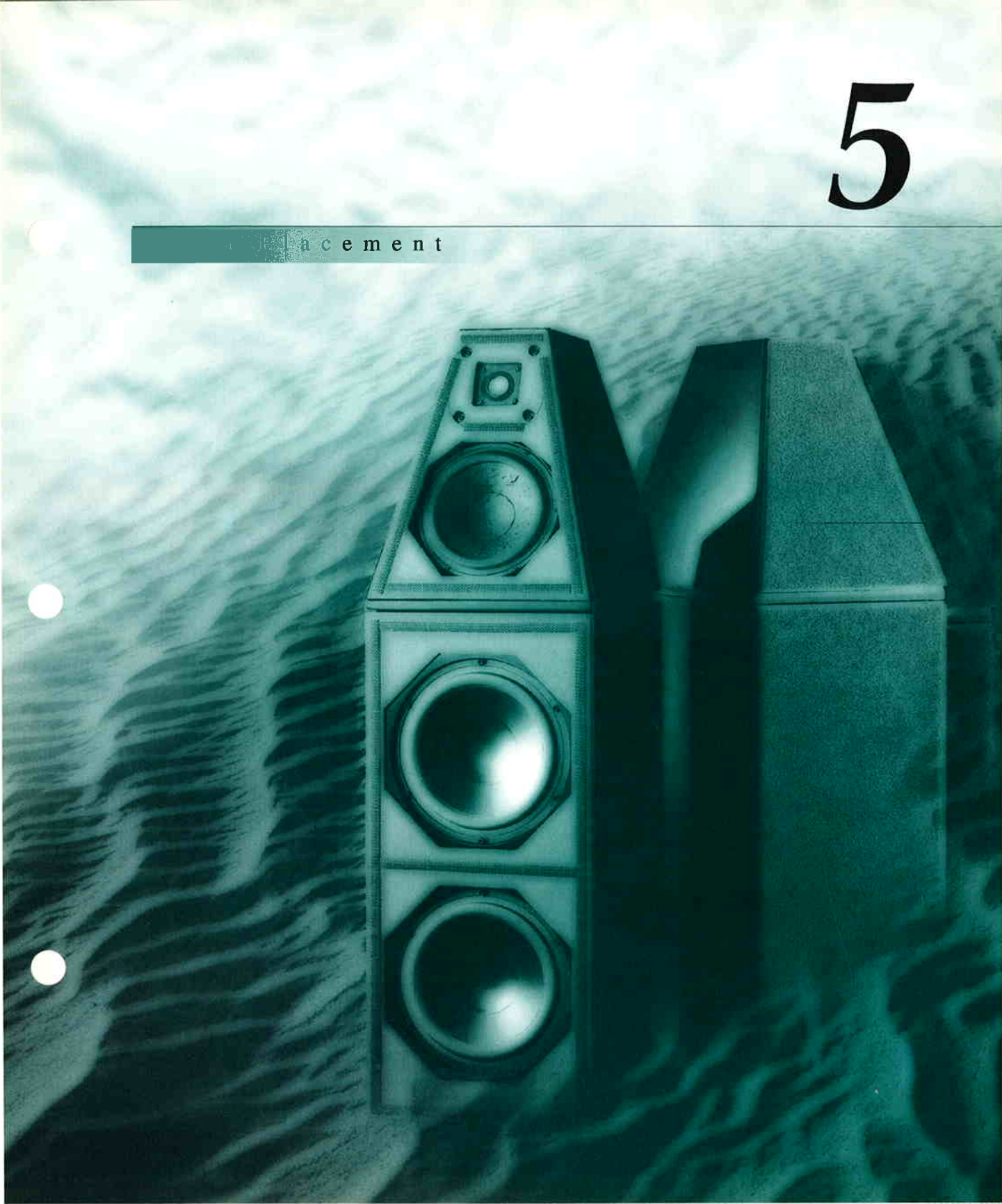
The third illustration (*figure 11, table 3*) shows the effects of the speaker being raised an additional 6 inches off the floor. Here the sound staging properties will be excellent as will high frequency linearity and overall lucidity of detail. There will, however, be a noticeable loss in bass and lower midrange response due to the lack of 2π steradian support of the direct output of the woofer. Generally, as the WATT is raised up off the floor, the sound becomes "lighter" in balance as the speaker's height is increased. The recommended range of mounting heights is from 18 inches to 28 inches. In the fourth example (*figure 12*) we see the effects of mounting the WATT on a 24-25 inch solid base such as the Puppy . This base provides the effect of 2π steradian support , and therefore results in a fuller, warmer, more rounded sound - even if the Puppy were not electronically connected.

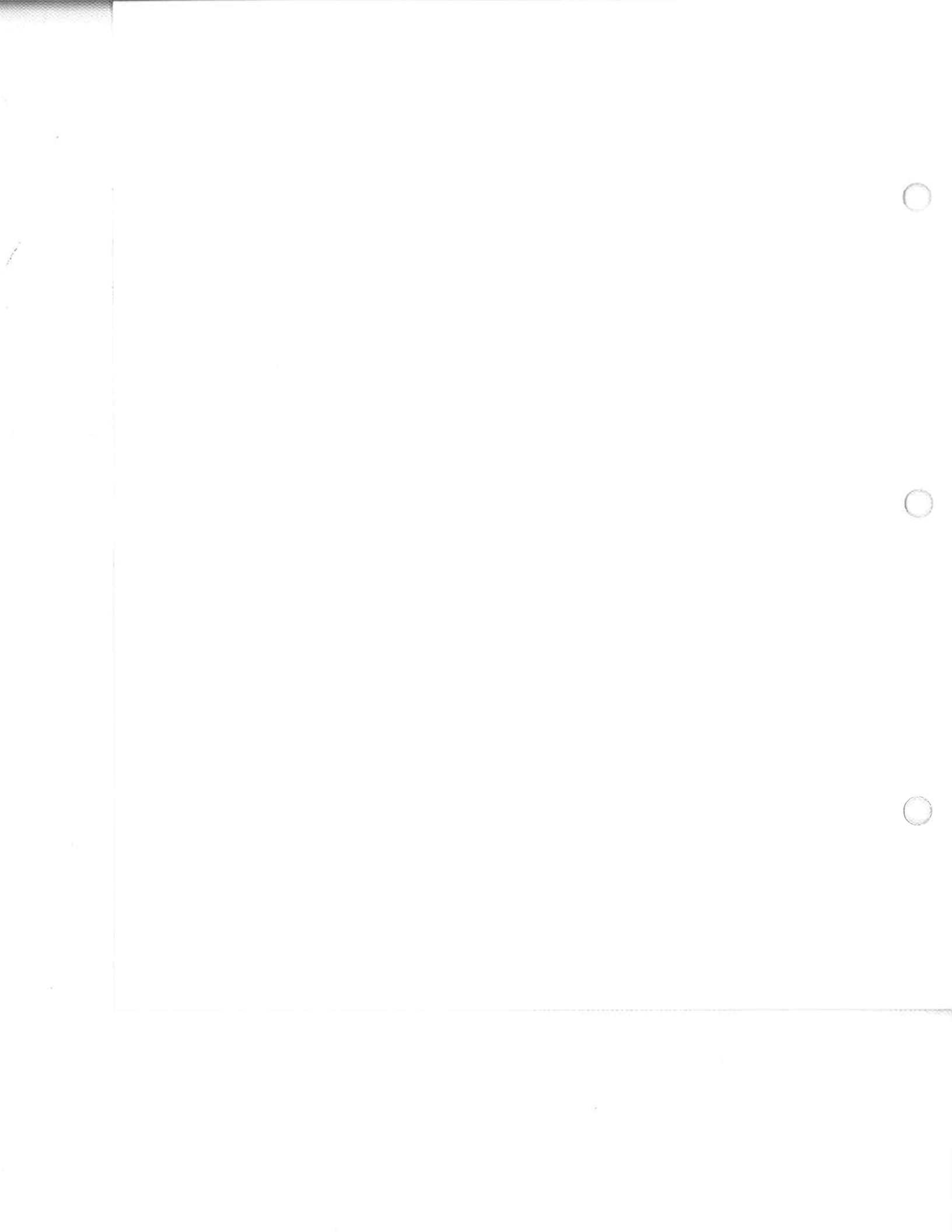


PLACING THE WATT ON PUPPIES WILL PROVIDE 2π STERADIAN SUPPORT, AND THE ATTENDANT WARMER TONAL BALANCE AS SEEN WITH OTHER SOLID STANDS. OF COURSE, THIS CROSSOVER AND DRIVER COMPLIMENT OF THE PUPPY DRAMATICALLY INCREASE DYNAMICS AND POWER-HANDLING. DISTORTION IS REDUCED, AND VERY USEABLE RESPONSE TO BELOW 30HZ IS PROVIDED.



Placement





THE EFFECTS OF ROOM PLACEMENT

The effect of room placement of the performance of the WATT is illustrated in *figures 13, 14, and 15, and tables 4, 5, and 6.*

Figure 13 examples 1A and 1B and *table 4* compare the performance of corner situated WATTs vs WATTs which are placed out in the room away from walls, but which are not toed-in. Placement of any direct full-range radiator loudspeaker in the corner results in numerous performance compromises. In one respect, however, corner placement of the speaker excels, and that is in low frequency augmentation. Looking at the tonal balance characteristic of the corner situated WATTs we can see an elevated lower midrange through mid bass region, the expected effect of corner loading, coupled with a gradual roll-off of the upper octaves, the result of any sound absorbing materials on adjacent walls, and the off-axis listening position. The corner placed speakers are also significantly further away from the listener than the speakers in example 1B. By its very nature, sound, when traveling through air, loses low-level detail with distance. Ideally, therefore, the listener should sit as close to the speakers as is comfortable. Moving the speakers out into the room at least three feet from the rear wall, and at least two feet from the side walls, provides a fairly dramatic level of improvement of sound staging performance and overall mid and upper octave balance. But still the example shows the speakers not toed in. The WATTs are designed for maximum phase coherence and pulse replication accuracy when they are aimed directly at the listener or microphone. *Figure 14, table 5* shows the effect of toeing in the WATTs. The speakers in example 2 are in the same general room location as the speakers in 1B, but are toed in. **When the WATTs are correctly toed in, the listener, when seated in the listening position, will just barely see the surface of the inner side panels of the WATTs.** We can see that toeing in the speakers provides dramatic improvements in resolution of low level detail in the midrange as well as dramatic improvements in sound staging performance. It should be noticed that in the tonal balance curve in *table 5* and the tonal balance curve in *table 6*, example B both reveal irregularities in response in the upper bass through

lower midrange which are caused by standing waves and adjacent wall comb filter effects. The performance indicated in *table 5* is very promising, and yet it is not really representative of the best performance of which the WATT is capable. Any speaker will benefit from appropriate acoustical room treatment.

Let us now go to *figure 15, table 6*, to see the benefits in performance which can be achieved by modest acoustical treatment of the room. With the speakers in the same location as in *figure 14*, we note the addition of tube traps in the corners of the listening room, as well as foam or Sonex panels placed between and behind the speakers, against the back wall, as well as along the wall behind the listener and over to the side next to the listener. The tube traps can be seen to smooth out the performance of the upper bass and lower midrange, while at the same time not compromising low frequency extension. Slap echo is controlled by the sound absorbing panel on the wall behind the speakers in the center of the sound stage and by the two panels on the back wall behind the listener. These two room treatments, namely tube traps and judicious placement of sound absorptive panels, can elevate the sonic performance of virtually any speaker system in a typical domestic listening room.

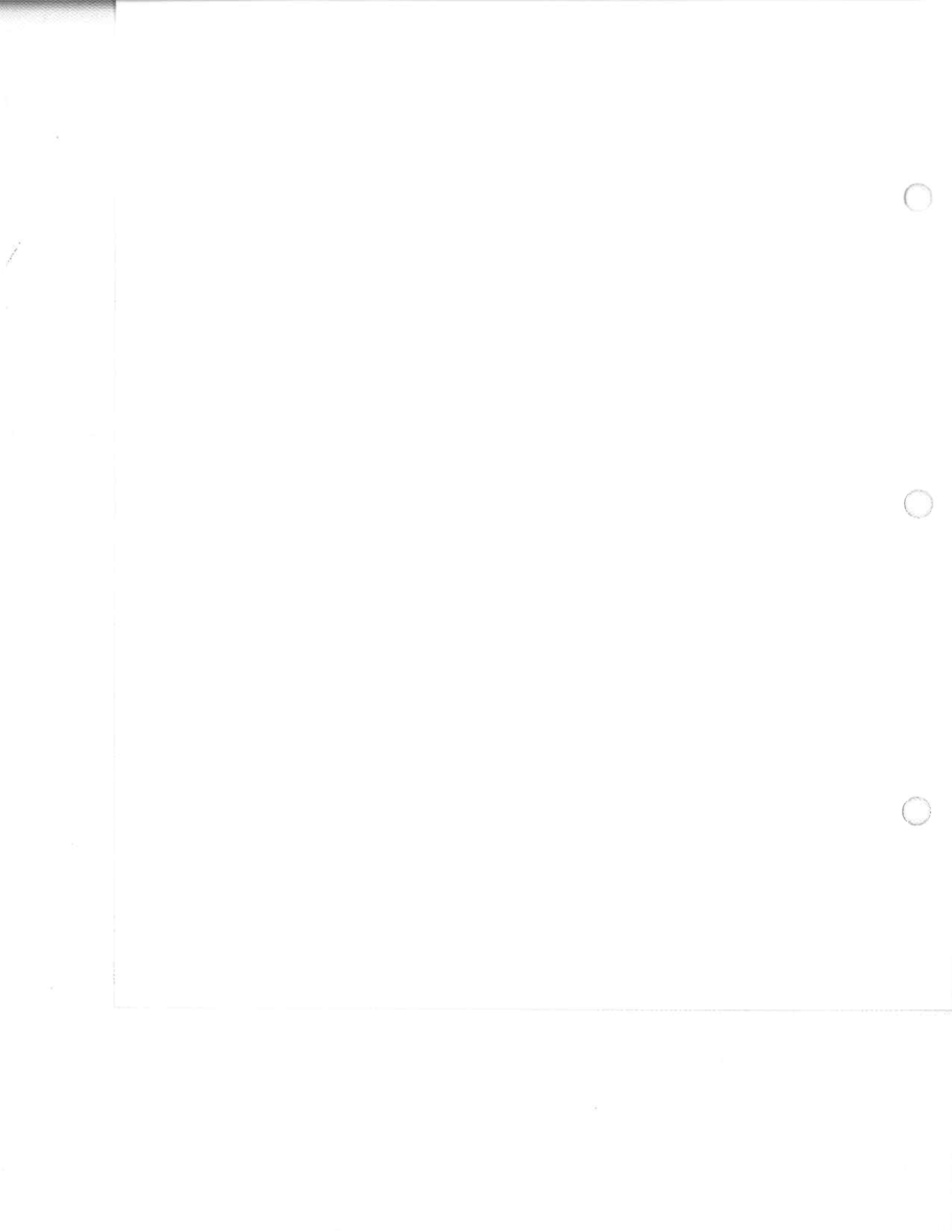
Should the listening position be as far from the speakers as possible, even up against a back wall? *Figure 15*, position B shows the effect of being seated near a back wall, some distance from the speaker. We can see a dramatic increase in upper bass and mid bass output of the system, actually due to standing wave reinforcement near the back wall, as well as the expected high frequency roll off resulting in the longer air path of the sound to the listener.

It should be noted that, in comparison to other speaker systems, even this compromised level of sound staging performance and resolution of low level detail still represents very good performance indeed.

6

Summary and Illustrations





SUMMARY

In summary, it is clear that, for optimal tonal balance accuracy, resolution of low level detail and sound staging performance, the WATT should be positioned at or slightly below ear level of the listener on a solid, non-resonant stand which in some way provides 2π steradian support. The Puppy is the ideal compliment to the WATT, in that it establishes a correct height, is non-resonant, its high-pass crossover protects the WATT woofer, and response is extended to below 30Hz. Ideally, the speakers should not be positioned too far from the listener, if maximum resolution of low level detail is required (near-field monitoring). If possible, the speakers should be positioned out into the room, slightly asymmetrically away from side and rear walls. The speakers should be toed-in toward the listener, preferably so that the listener at his seated position can barely see the surface of the inner side panel of the WATT as he faces the speaker. It is recommended that a distance of 2-3 feet, and possibly more, be maintained between the WATT and the rear walls and a distance of at least 2 feet be maintained between the front panel of the WATT and reflective side walls. Use of sound absorbent materials reduce the space requirement somewhat. Experiment for each room.

By following the guidelines in this manual and your own common judgement, your new WATT/Puppy speakers will provide you with a lifetime of pure music reproduction.

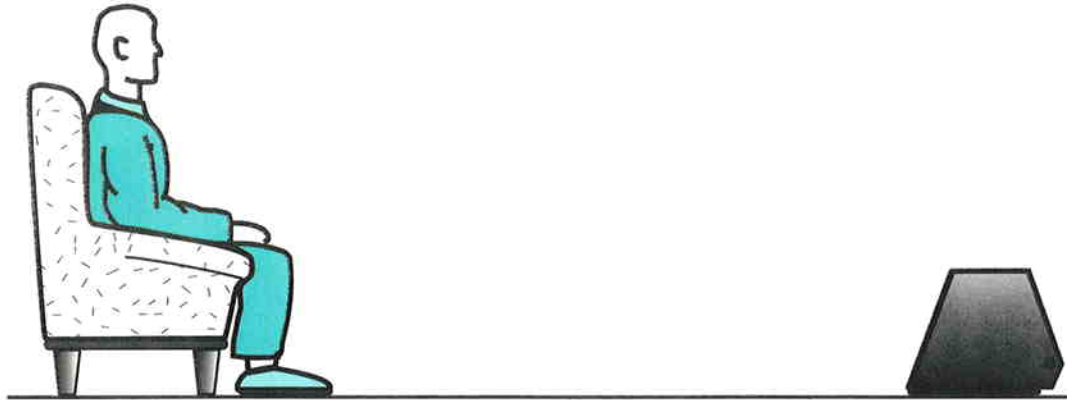
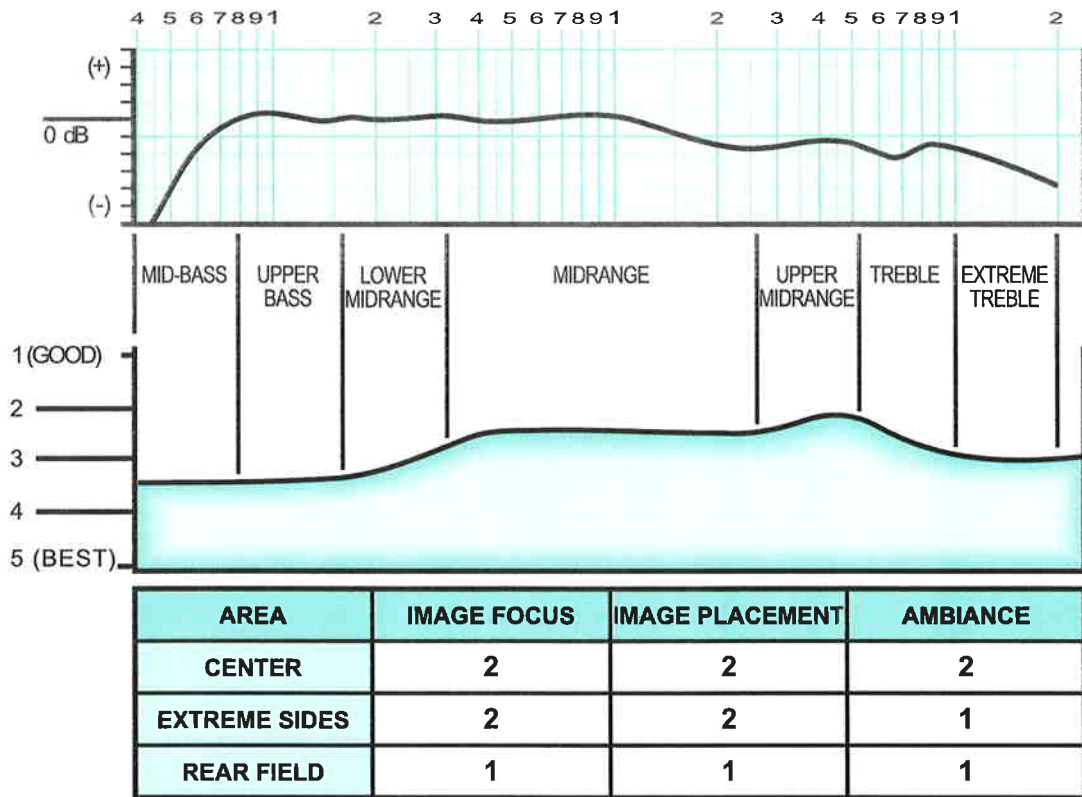


figure 9



1=GOOD 5=BEST

table 1

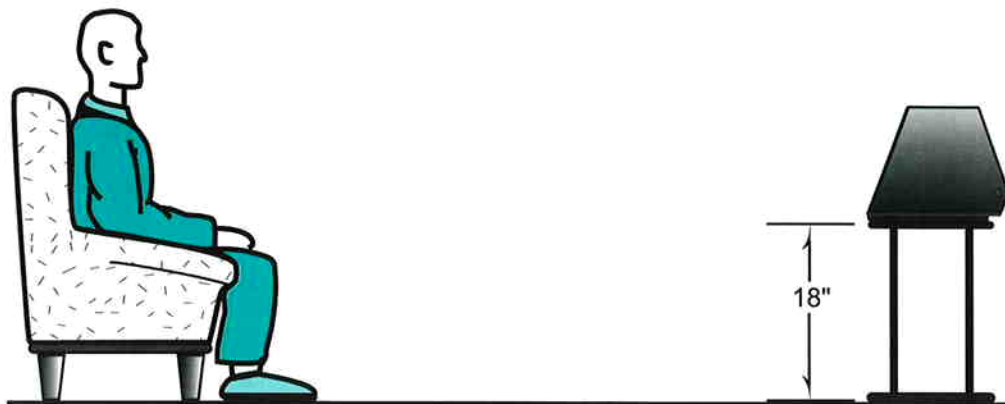
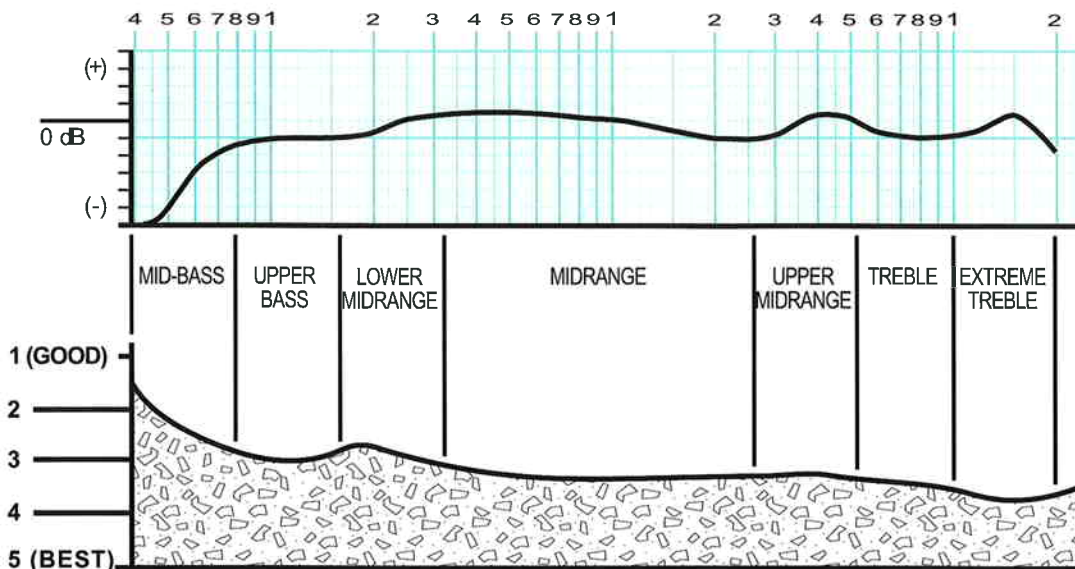


figure 10



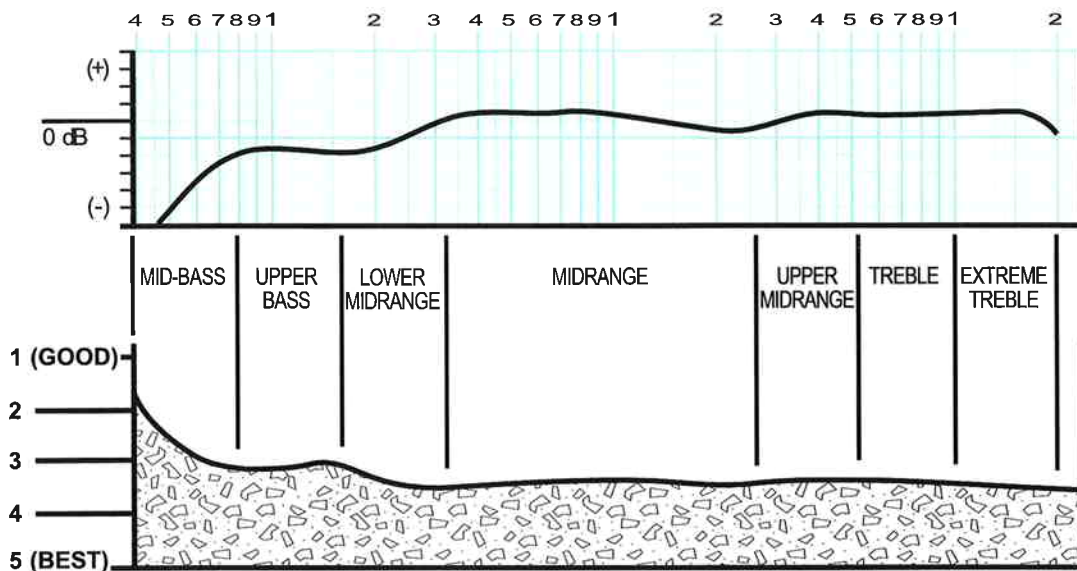
AREA	IMAGE FOCUS	IMAGE PLACEMENT	AMBIANCE
CENTER	3	3	4
EXTREME SIDES	3	3	3
REAR FIELD	2	2	3

1=GOOD 5=BEST

table 2



figure 11



AREA	IMAGE FOCUS	IMAGE PLACEMENT	AMBIANCE
CENTER	3 1/2	3 1/2	4 1/2
EXTREME SIDES	3 1/2	3 1/2	4
REAR FIELD	3 1/2	3	3 1/2

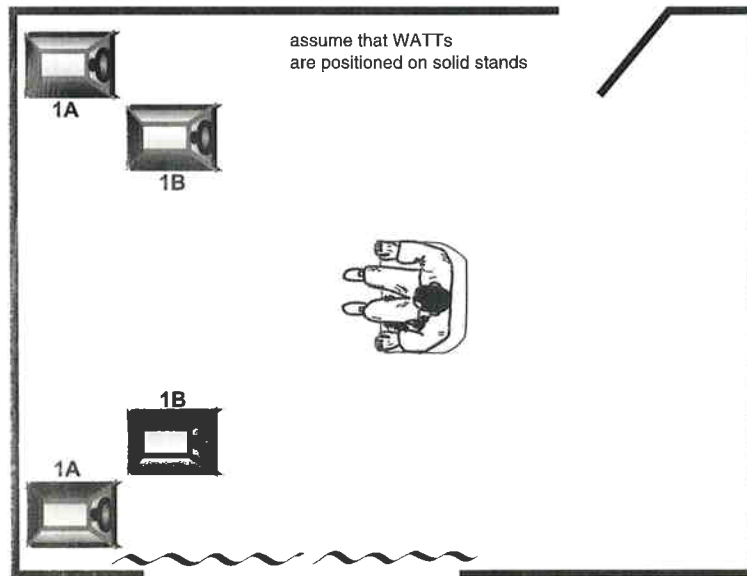
1=GOOD 5=BEST

table 3



figure 12

PERFORMANCE OF THE WATT:
EFFECT OF ROOM PLACEMENT



EXAMPLE 1A: Illustrates the performance of corner-situated WATTs

EXAMPLE 1B: Illustrates the performance of WATTs placed out in the room, away from walls, but not toed in.

figure 13

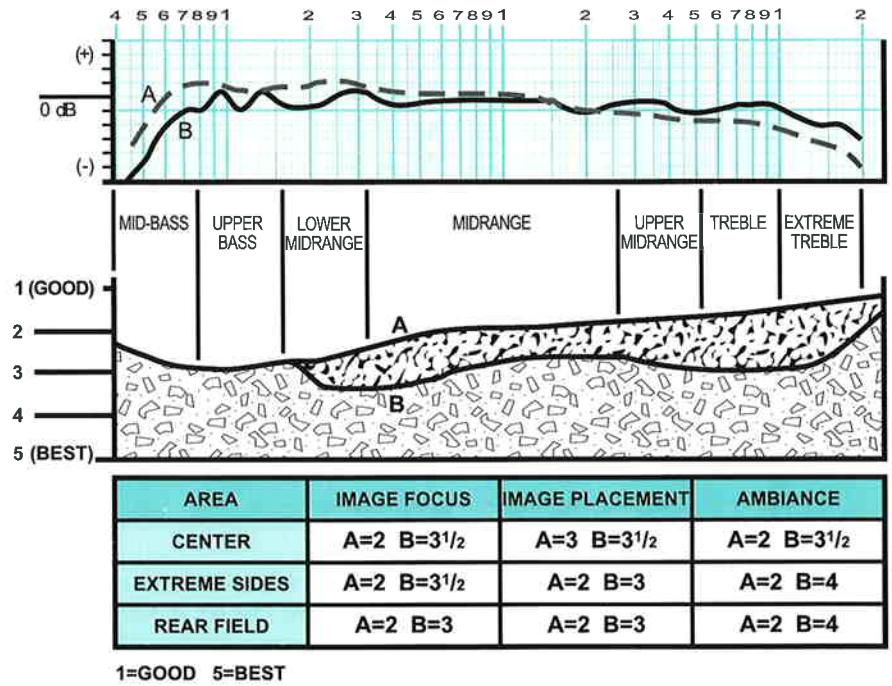
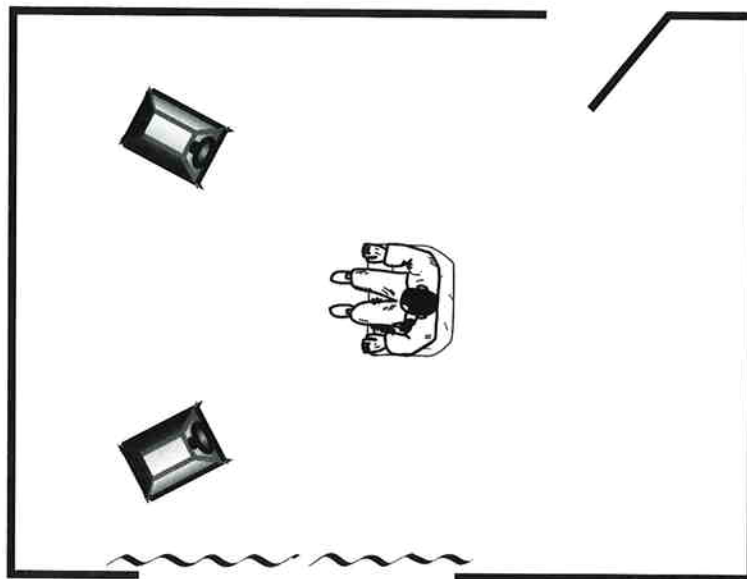


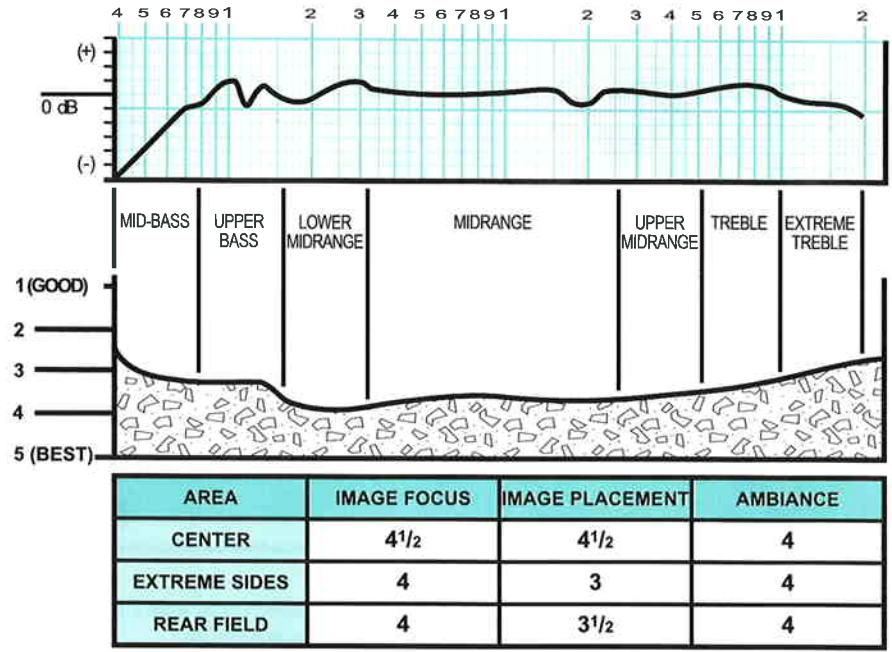
table 4

**PERFORMANCE OF THE WATT:
EFFECT OF ROOM PLACEMENT**



EXAMPLE 2: Illustrates the effect of toe-in on the WATTs. Units are in the same region of the room as in EXAMPLE 1B, except now are toed-in.

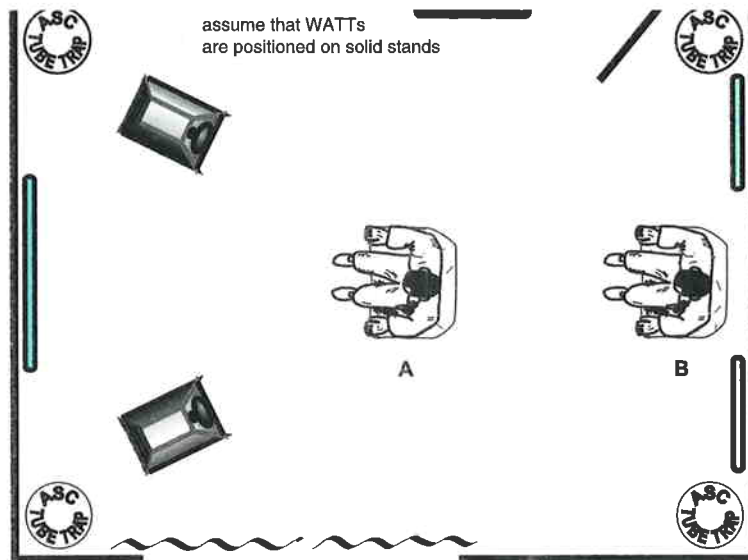
figure 14



1=GOOD 5=BEST

table 5

PERFORMANCE OF THE WATT: EFFECT OF MODEST ACOUSTICAL ROOM TREATMENT



EXAMPLE 3: Compare with WATTs in EXAMPLE 2, which differ from these only in room treatment. Also, compare listening positions A and B.

figure 15

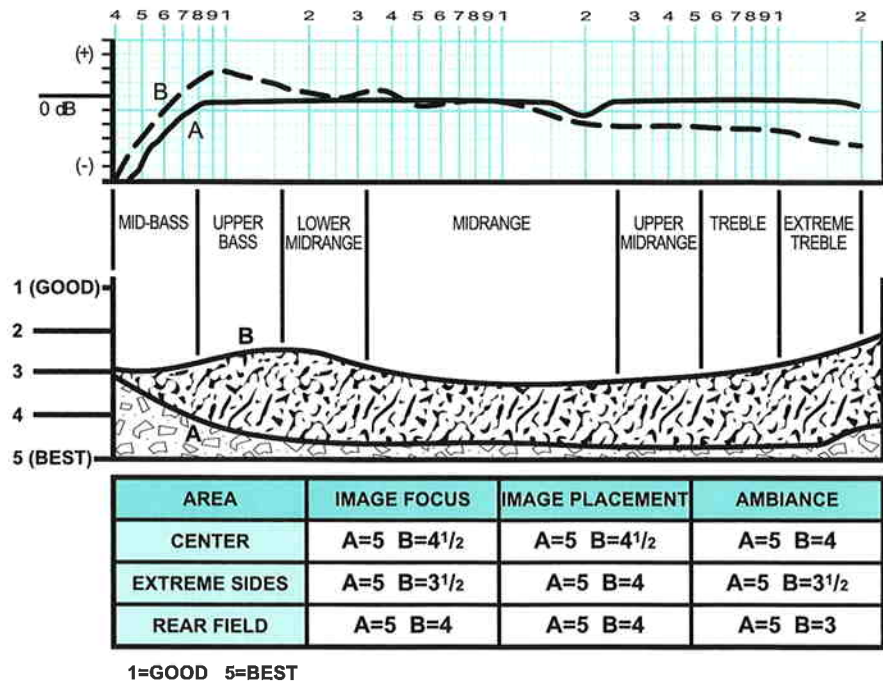


table 6



W A R R A N T Y

&

P R O D U C T

R E G I S T R A T I O N





Wilson Audio Specialties, Inc.
2233 Mountain Vista Lane
Provo, UT 84606

Tel: (801)377-2233

Fax: (801)377-2282

Dear WATT/Puppy customer,

Thank you for your purchase of the Wilson Audio WATT/Puppy loudspeaker. All of us at Wilson Audio desire that this precision instrument will provide you with many years of musical satisfaction.

Your 90-day basic warranty is enclosed. Please note the relevant information and retain the warranty for your records.

I M P O R T A N T !

If you desire the free extension of the warranty period to five (5) years, please immediately fill out the enclosed Warranty Registration Form and subsequent documents, and make certain that Wilson Audio receives them within 30 days from the date of product delivery to you. All information sent to us is confidential, and will not be released to any party outside of Wilson Audio without your written consent.

Sincerely,

A handwritten signature in black ink, appearing to read "David A. Wilson", with a large, stylized flourish underneath.

David A. Wilson

President

Wilson Audio Specialties, Inc.



WILSON AUDIO LOUDSPEAKER

L I M I T E D W A R R A N T Y

TERMS AND CONDITIONS

LIMITED WARRANTY

Wilson Audio warrants its loudspeakers to be free of manufacturing defects in material and workmanship, subject to the conditions hereinafter set forth for a period of 90 days from the date of purchase by the original purchaser, or five (5) years, if a Warranty Registration Form has been correctly filed at Wilson Audio, no later than 30 days after product delivery to the customer.

CONDITIONS

This warranty is subject to the following conditions and limitations. The Warranty is void and inapplicable if the product has been used or handled **other than** in accordance with the instructions in the owner's manual, abused or misused, damaged by accident or neglect or in being transported or the defect is due to the product being repaired or tampered with by anyone other than Wilson Audio, or an authorized repair center. Most repairs can be made in the field by an authorized Wilson Audio agent. In instances when return to Wilson Audio's factory is required, a return authorization must first be obtained by the dealer or customer. Wilson Audio will pay return freight of its choice. **A RETURNED PRODUCT MUST BE ACCOMPANIED BY A WRITTEN DESCRIPTION OF THE DEFECT.** Wilson Audio reserves the right to modify the design of any product without obligation to purchasers of previously manufactured products and to change the prices or specifications of any product without notice or obligation to any person.

REMEDY

In the event that the above product fails to meet the above Warranty and the above conditions have been met, the purchaser's sole remedy under this Limited Warranty shall be to return the product to Wilson Audio or to an authorized Wilson Audio repair center where the defect will be rectified without charge for parts or labor.

L I M I T E D W A R R A N T Y

LIMITED TO ORIGINAL PURCHASER

This Warranty is for the sole benefit of the original purchaser of the covered product and shall not be transferred to a subsequent purchaser of the product. Any subsequent purchaser should contact a Wilson Audio dealer to request a new warranty.

DEMONSTRATION EQUIPMENT

Equipment used by an authorized dealer for demonstration purposes is warranted to be free of manufacturing defects in materials and workmanship for a period of five (5) years from the date of shipment to the dealer. Demo equipment needing warranty service may be repaired on-site or, if necessary, correctly packed and returned to Wilson Audio by the dealer at his sole expense. Wilson Audio will pay return freight of its choice. A returned product must be accompanied by a written description of the defect. Dealer owned demonstration equipment sold at retail within two (2) years of date of shipment to the dealer is warranted to the first retail customer to be free of manufacturing defects in materials and workmanship for the same time periods as if the product had originally been bought for **immediate** resale to the retail customer. In other words, 90 Day basic warranty, unless extended to 5 years by return of a completed Warranty Registration.

MISCELLANEOUS

ANY IMPLIED WARRANTIES RELATING TO THE ABOVE PRODUCT SHALL BE LIMITED TO THE DURATION OF THIS WARRANTY. THE WARRANTY DOES NOT EXTEND TO ANY INCIDENTAL OR CONSEQUENTIAL COSTS OR DAMAGES TO THE PURCHASER. Some states do not allow limitations on how long an implied warranty lasts or an exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

WARRANTY REGISTRATION FORM

PLEASE **RETURN THESE FORMS TO WILSON AUDIO** WITHIN 30 DAYS OF PRODUCT DELIVERY TO YOU, ALONG WITH A COPY OF THE ORIGINAL SALES RECEIPT TO INSURE PROMPT REGISTRATION FOR THE 5 YEAR WARRANTY PROGRAM. KEEP ALL INFORMATION, DEALER NAME AND PHONE NUMBER, SERIAL NUMBERS, ETC., FOR FUTURE REFERENCE WHEN CALLING ABOUT SERVICE QUESTIONS.

DATE PRODUCT WAS DELIVERED TO YOU _____

DEALERSHIP WHERE PURCHASED _____

CITY _____ STATE _____ COUNTRY _____

SALES REPRESENTATIVE _____ DATE _____

CUSTOMER NAME _____

ADDRESS _____

CITY _____ STATE _____ COUNTRY _____

WOULD YOU LIKE TO BE PUT ON WILSON AUDIO'S MAILING LIST? YES NO

SERIAL NUMBERS _____ & _____

FINISH ON SPEAKERS _____

DID YOUR SPEAKERS ARRIVE IN EXCELLENT CONDITION? YES NO

IF NOT, PLEASE SPECIFY _____

USAGE PROFILE QUESTIONNAIRE

NAME _____

DATE OF PURCHASE _____

ADDRESS _____

COUNTRY _____

SERIAL NUMBERS

WATT _____ & _____

PUPPY _____ & _____

WHOW _____ & _____

FINISH

BLACK

WHITE

GRANITE

ROSEWOOD

WALNUT

OAK

OTHER _____

DID YOUR SPEAKERS ARRIVE IN EXCELLENT CONDITION?

YES

NO

IF NOT, PLEASE COMMENT _____

PRODUCT INTRODUCTION PROFILE

1. WHERE DID YOU FIRST FIND OUT ABOUT THIS WILSON LOUDSPEAKER?

- A. MAGAZINE WHICH ONE? _____
- B. DEALER WHICH ONE? _____
- C. FRIEND
- D. OTHER _____

2. WHERE DID YOU FIRST ACTUALLY HEAR THIS WILSON LOUDSPEAKER?

- A. DEALER
- B. FRIEND
- C. SHOW
- D. OTHER _____

3. PLEASE RATE THE IMPORTANCE TO YOU, OF THE FOLLOWING FACTORS
COMPONENT FACTORS

A. SOUND QUALITY	1	2	3	4	5
B. APPEARANCE	1	2	3	4	5
C. SIZE	1	2	3	4	5
D. CONSTRUCTION QUALITY	1	2	3	4	5

DEALER FACTORS - PLEASE RATE YOUR DEALER

A. SENSITIVITY TO YOUR NEEDS	1	2	3	4	5
B. STORE LOCATION-CONVENIENCE	1	2	3	4	5
C. QUALITY OF DISPLAY FACILITY	1	2	3	4	5
D. SPEAKER SOUND IN SHOWROOM	1	2	3	4	5

CREDIBILITY FACTORS

A. RECOMMENDATION OF					
DEALER	1	2	3	4	5
FRIEND	1	2	3	4	5
MAGAZINE	1	2	3	4	5
B. WILSON AUDIO REPUTATION	1	2	3	4	5

EQUIPMENT USAGE PROFILE

1. SIZE OF ROOM WHERE THE WILSON SPEAKER(S) ARE LOCATED

- A. SMALL LESS THAN 12 FEET BY 12 FEET
- B. MEDIUM GREATER THAN 12 FEET BY 12 FEET AND
LESS THAN 20 FEET BY 20 FEET
- C. LARGE GREATER THAN 20 FEET BY 20 FEET

2. HOW WOULD YOU DESCRIBE THE ROOM

- A. DEN OR STUDY
- B. FAMILY ROOM
- C. BEDROOM
- D. FORMAL LIVING ROOM
- E. OTHER, PLEASE SPECIFY _____

3. ARE THESE WILSON SPEAKERS USED IN A VIDEO SYSTEM? YES NO

4. WHAT TYPE OF SPEAKERS DID YOUR WILSON AUDIO
LOUDSPEAKERS REPLACE? _____

5. HISTORICALLY, WHAT OTHER SPEAKERS HAVE YOU ENJOYED?

6. WHICH OTHER EQUIPMENT ARE YOU USING WITH YOUR WILSON AUDIO LOUDSPEAKERS?

EQUIPMENT	BRAND	MODEL	WILSON COMPATIBILITY
PREAMP			
POWER AMPS			
TURNTABLE			
TOPEARMS			
CARTRIDGE			
CD PLAYER			
TAPE 1			
TAPE 2			
TUNER			
INTERCONNECTS			
SPEAKER CABLES			
SUBWOOFER			
SPEAKER STANDS			

OWNER PROFILE

1. HOW WOULD YOU DESCRIBE YOURSELF?

- A. I ENJOY THE FINER THINGS OF LIFE, BUT I AM NOT AN AUDIOPHILE.
- B. I LOVE MUSIC BUT AM NOT AN AUDIOPHILE.
- C. I HAVE A FAIRLY SERIOUS INTEREST IN AUDIO.
- D. I AM A SELF-PROFESSED RABID AUDIOPHILE.
- E. I AM AN AUDIO PROFESSIONAL.
- F. I AM A MUSICIAN.

COMMENTS? QUESTIONS? _____

2. WHAT IS YOUR OCCUPATION? _____

3. AGE RANGE

- 0-20 21-30 31-40 41-50
- 51-60 61-70 71-80 80 AND OVER

4. TO WHICH OF THE FOLLOWING AUDIO MAGAZINES DO YOU SUBSCRIBE, OR DO NOT SUBSCRIBE, BUT READ MONTHLY?

- | | |
|--------------------------------------------------------|-----------------------------------------------------|
| <input type="checkbox"/> ABSOLUTE SOUND | <input type="checkbox"/> AUDIO |
| <input type="checkbox"/> HI-FI NEWS & RECORD REVIEW | <input type="checkbox"/> INTERNATIONAL AUDIO REVIEW |
| <input type="checkbox"/> STEREOPHILE | <input type="checkbox"/> STEREO REVIEW |
| <input type="checkbox"/> STEREO SOUND (JAPAN OR KOREA) | <input type="checkbox"/> OTHER _____ |

