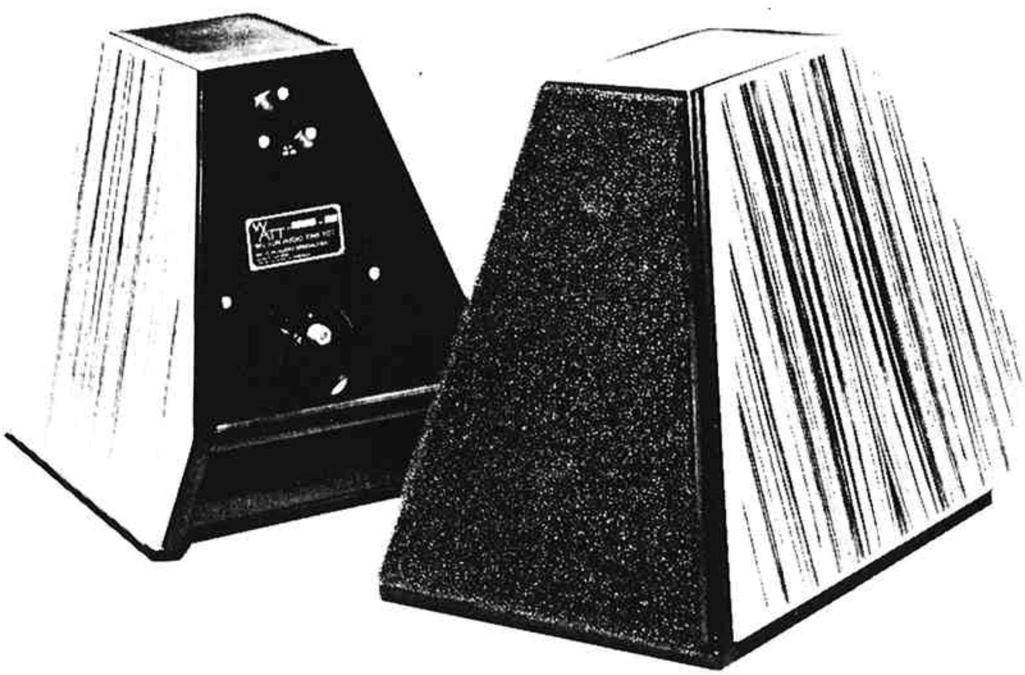
WATT™



OWNER'S MANUAL

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OWNER'S MANUAL

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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 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. 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 Fig. 2, which provides linearity in the mid-bass (without the usual mid-bass hump) with superior transient performance. The low-frequency range of the system is normally extended with a sub-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-grade propylene capacitors, imported OFC air-core inductors, and time coherent wire. The components are matched to better than 0.5% 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.

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

CARE OF THE FINISH OF YOUR WATTs

Your WATT loudspeaker enclosures are hand finished, then painted with a high-gloss automotive-type paint. While the paint is quite dry to the touch, final curing and complete hardening takes place over a period of several weeks. To protect the finish of the WATTs during final manufacture, shipment, and setup in your listening room, we have put a 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. This protective film is easily removed by peeling it off. 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 wisk off any remaining loose dust
C. Shake out the dust cloth
D. Dust the finish, using linear motions in one direction only. Avoid using circular 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 dust cloth. Stronger solvents are not recommended under any circumstances. Consult your dealer for further information if required.

IMPEDANCE

Fig. 16 shows the modulus of impedance of the WATT loudspeaker system. Over most of the range from 200 Hz to approximately 100 KHz, the WATT may be regarded as a 4 ohm speaker. However, in the 2 KHz region it should be noted that the impedance drops to approximately 1 ohm. 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. No difficulties should be encountered 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 TO YOUR POWER AMPLIFIER

The input terminals located on the rear of your WATT loudspeaker are color coded so that RED corresponds to positive and BLACK to negative, or common, or ground on the amplifier output. This means that, when connected in this way, a positive going input signal pulse will result in forward motion of the woofer and tweeter diaphragms. 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 and compromise sound staging performance. Use the half inch socket wrench provided with your WATTs to insure that input connections are very snug.

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 to 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."

I. HOW TO GET THE MOST FROM YOUR WATTs IN YOUR ROOM

1. ROOM ACOUSTICS

The acoustical characteristics of the typical domestic listening room conspire in numerous ways to compromise the sound quality of *any* loudspeaker played therein.

A. REFLECTIONS

Fig. 4 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 reverberating 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 midrange 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. 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 to the hard surfaces such as Sonex or Soundex panels . . . an attractive solution which some are, nevertheless unwilling to undertake because of decor considerations. Large ceiling to floor drapes are effective in controlling some slap echo as is the application of carpeting to wall surfaces. In many domestic listening enviroments, heavy stuffed furnishings are the primary structural control to slap echo. Unfortunately, their effectiveness is not great. 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.

Another type of reflection phenomenon is "standing waves." See Fig. 4. 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 location. The effects of standing waves on a loudspeaker's perfor- mance are primarily in its tonal balance, although resolution of low-level detail, as well as soundstaging 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 or Soundex. 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, many low frequency standing waves are well controlled by positioning ASC tube traps in the corners of the room.

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 waves noticeable primarily at higher frequencies and shorter wave lengths is the so called "comb filter effect." See Fig. 5. 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 Fig. 4, is an added roughness to the sound and a smearing of lateral sound stage image focus and placement. The side wall reflections which cause the comb filter effects are best controlled with Soundex or Sonex 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.

Sructural 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 most homes, 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, 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 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 control wall resonances.

The volume of air in a given room will also resonate at a frequency determined by the size of that volume. 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 these low frequency room colorations.

C. SHAPE OF THE ROOM

The diagrams of Fig. 3 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. Although maximum low frequency response would probably be achieved by placing the loudspeakers along the narrow wall of the rectangular room, (Fig. 3A) optimal stereo imaging and midrange clarity would be achieved by placing the loudspeakers along the long wall. (Fig 3B) 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 provide a better listening environment.

II. MOUNTING HEIGHTS OF YOUR WATTs

A. The WATTs were designed to be aimed at the listener, which will generally mean that they will be toed-in somewhat rather than facing straight ahead. Compare results of Fig. 11, example 1B with Fig. 12, example 2.

B. 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 (which would not be a very uncommon practice) displaces the alignment of the woofers' output in front of the tweeter. The more common placement of the WATT is at or below ear level.

C. The effect of different mounting heights on the response of the WATTs is examined in Figs. 6 through 10, and tables 1 through 5.

In the first example, (Fig. 6, 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 soundstaging 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, (Fig. 7, 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 2 pi 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. *Note:* 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 (Fig 8, 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 2 pi 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 (Fig. 9, table 4) we can see the very beneficial results of the addition of a 2 pi steradian support panel. (2 pi Panel™). This panel allows for the development of wave fronts down into the mid bass region. The tonal balance of the system, therefore, with the 2 pi panel is fuller, and more musically natural. Sound staging performance of the WATT is also improved by the addition of the 2 pi support panel.

In the fifth example we see the effects of mounting the WATT on a 24 inch solid base such as a "Gibralter Stand™." This base extends the effect of 2 pi steradian support even lower than the 2 pi panel, and therefore results in a fuller, warmer, more rounded sound. As long as the base is rigid and acoustically inert, sound staging performance and lucidity of detail are at least as good as the system on a stand with a 2 pi panel. Note: placing the WATT on certain subwoofers will also provide 2 pi steradian support, and the attendant warmer tonal balance as seen with the Gibralter stand. However, there will be an acoustical interaction between the subwoofer's driver and the woofer in the WATT which will cause some blurring of midrange detail. Note table 5, example B. The most elegant approach, then, is to have the WATTs on Gibralter Stands, with the sub woofers back, behind the WATTs, up against the back wall, preferably less than 6 feet behind the WATTs.

III. ROOM PLACEMENT OF THE WATTs

The effect of room placement on the performance of the WATT is illustrated in Figs. 11, 12, and 13, and tables 6, 7, and 8.

Fig. 11 example 1, compares 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 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 example B speakers. 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. Fig. 12, table 7 shows the effect of toeing in the WATTs. The speakers in example 2 are in the same general room location as the speakers in 1 B, 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 the speakers in 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 7 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 7 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 Fig. 13,table 8, 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 Fig. 2, we note the addition of tube traps in the corners of the listening room , as well as Soundex 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 provide dramatic improvements in midrange and upper octave resolution of low-level detail and sound stage performance. 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? Example 3B 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 perfomance indeed.

IV. 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 2 pi steradian support. Ideally, the speakers should not be positioned too far from the listener, if maximum resolution of low level detail is required (near-field monitoring). The speakers should be positioned out into the room, slightly asymmetrically away from side and rear walls. The speaker 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 at least 3 feet, and possibly more, be maintained between the WATT and the rear walls and the 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.

ADDING A SUB WOOFER TO YOUR WATTs

The WATT is non phase inverting. If you apply a positive going pulse to the input of the WATT, the WATT will generate a positive pressure wave across most of its frequency range. However, in the lowest part of its frequency range, the WATT, as is true of many ported loudspeakers, will generate the majority of its output from its port rather than directly from its driver. Specifically, down to about 80 Hz the majority of the output from the WATT is directly off the woofer, and is therefore positive, non-inverting phase. Below 80 Hz the WATTs output is progressively dominated by port output, until at 50 Hz the majority of the output of the WATT is from the port. The output of the port is 180 degrees out-of-phase with the output of the driver. Therefore, if you connect a WATT and a subwoofer, which is non-phase inverting and observe absolute polarity on the woofer, the woofer and the WATT will cancel in the 50 to 60 Hz region. This problem is corrected by inverting the polarity of the signal going to the sub woofer. Do not invert the polarity of the signal going to the WATTs. If your sub woofer is driven by a separate power amplifier, you will want to experiment to be sure to achieve the best results. This is accomplished by reversing the polarity going to the sub woofer (or woofers). Contact your dealer for assistance.

SPECIFICATIONS

Enclosure type:	Ported QB3
Nominal impedance:	4 ohms
Woofer diameter:	6 1/2 inches
Tweeter diameter:	1 inch
Frequency response:	+ 1, -3 dB, 58 Hz to 18 KHz
SPL, 1 watt at 1 meter:	91 dBA
Minimum amp power:	30 watts
Standard finishes:	Painted lacquer (white or black) Lacquer with decorative wood side panels (rosewood, oak, walnut, zebrawood) Granite
Dimensions:	11 1/16" wide (painted or Granite) 11 7/8" wide (wood paneled) 13 5/8" high 16 1/2" depth
Weight:	120 pounds per pair, Shipping weight 166 pounds per pair
Warranty:	5 Years Limited and transferable

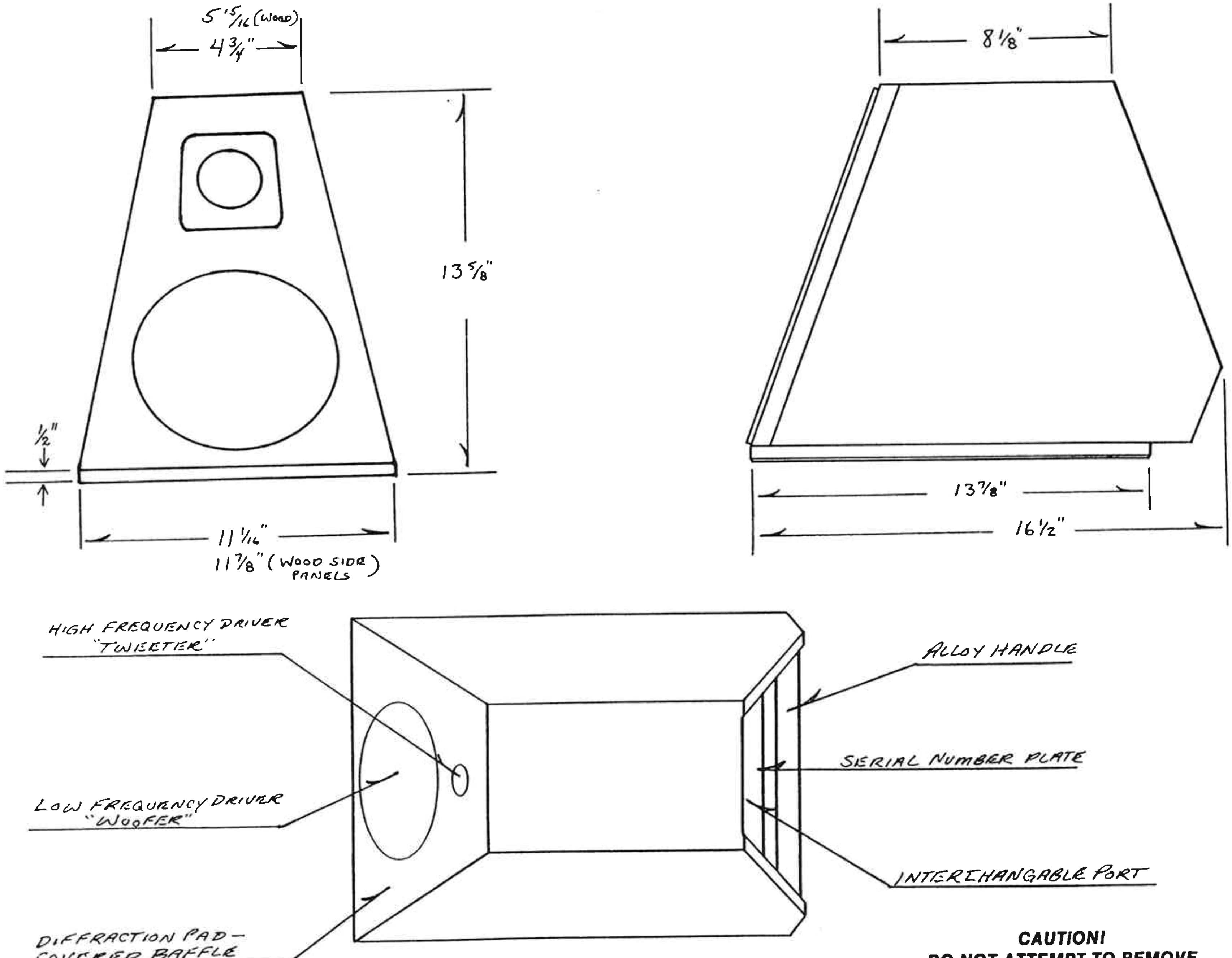
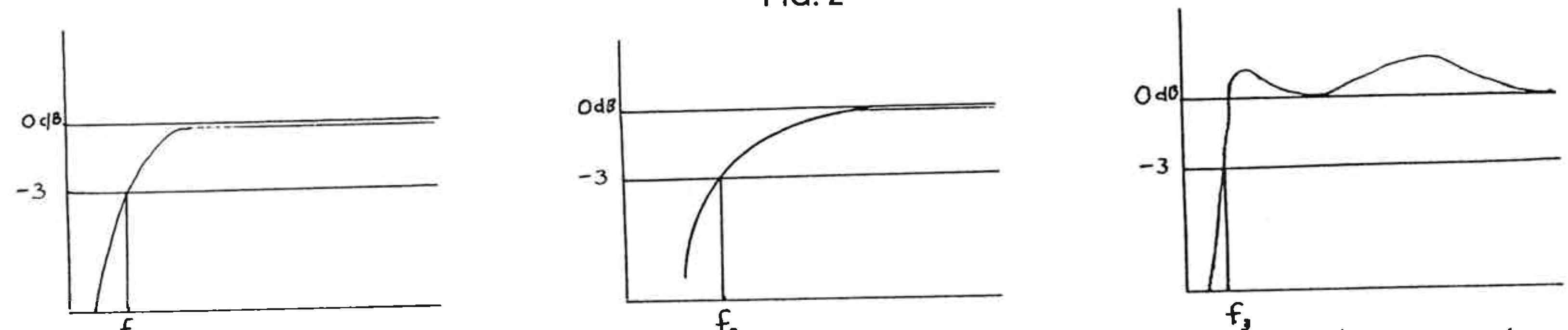


FIG. 1

CAUTION!
DO NOT ATTEMPT TO REMOVE THE BOTTOM PANEL OF THE WATT.

WATT DESIGN CONSIDERATIONS; THIELE & SMALL ALIGNMENTS

FIG. 2



B-4 ALIGNMENT, COMMONLY USED IN MODERN VENTED SYSTEMS. EXTENDED LINEAR RESPONSE; BUT AT THE EXPENSE OF SOME QUALITY OF TRANSIENT RESPONSE.

QB-3 ALIGNMENT; AS USED IN THE WATT. TRADES OFF SOME UPPER BASS RESPONSE TO ACHEIVE SUPERIOR TRANSIENT RESPONSE AND POWER-HANDLING.

TYPICAL C4 RESPONSE; SACRIFICES LINEARITY, TRANSIENT RESPONSE AND POWER-HANDLING IN ORDER TO ACHEIVE SLIGHT LF EXTENSION.

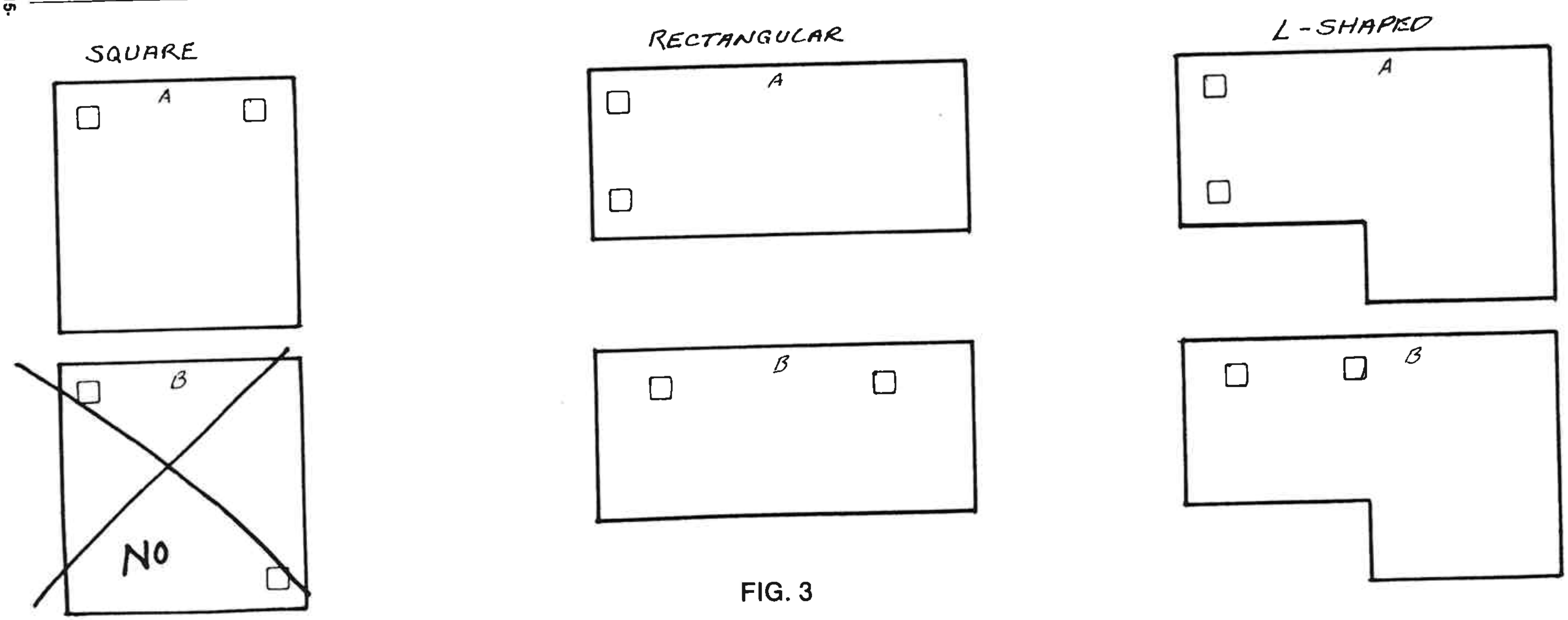
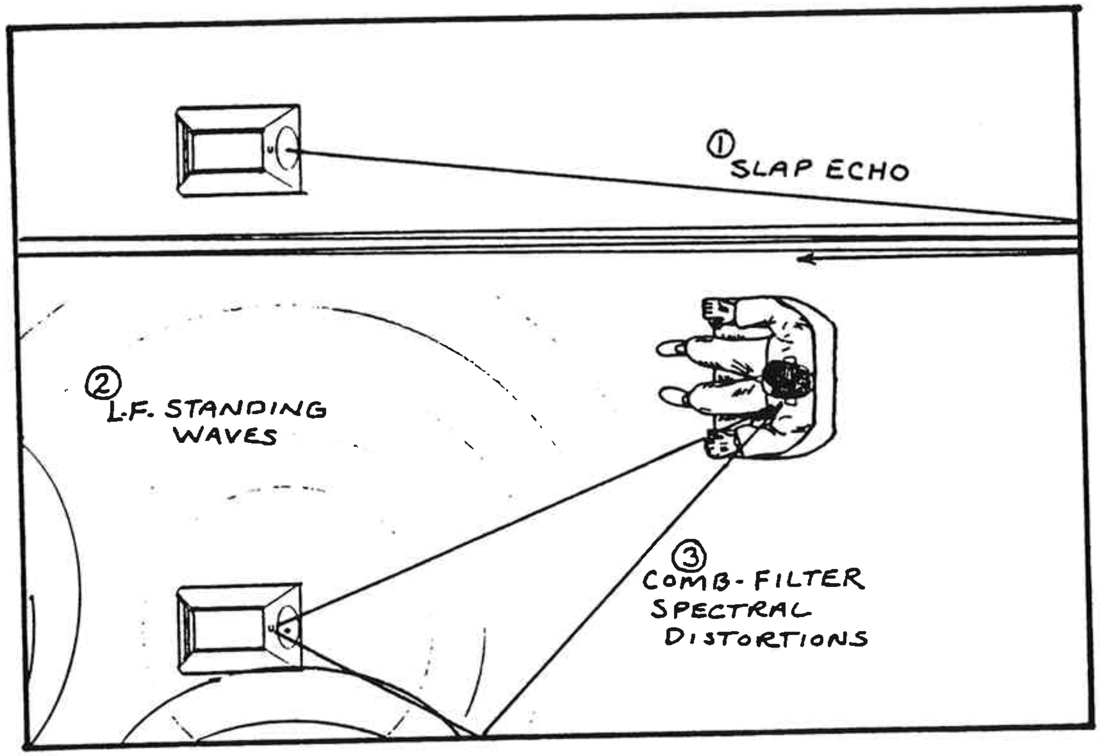
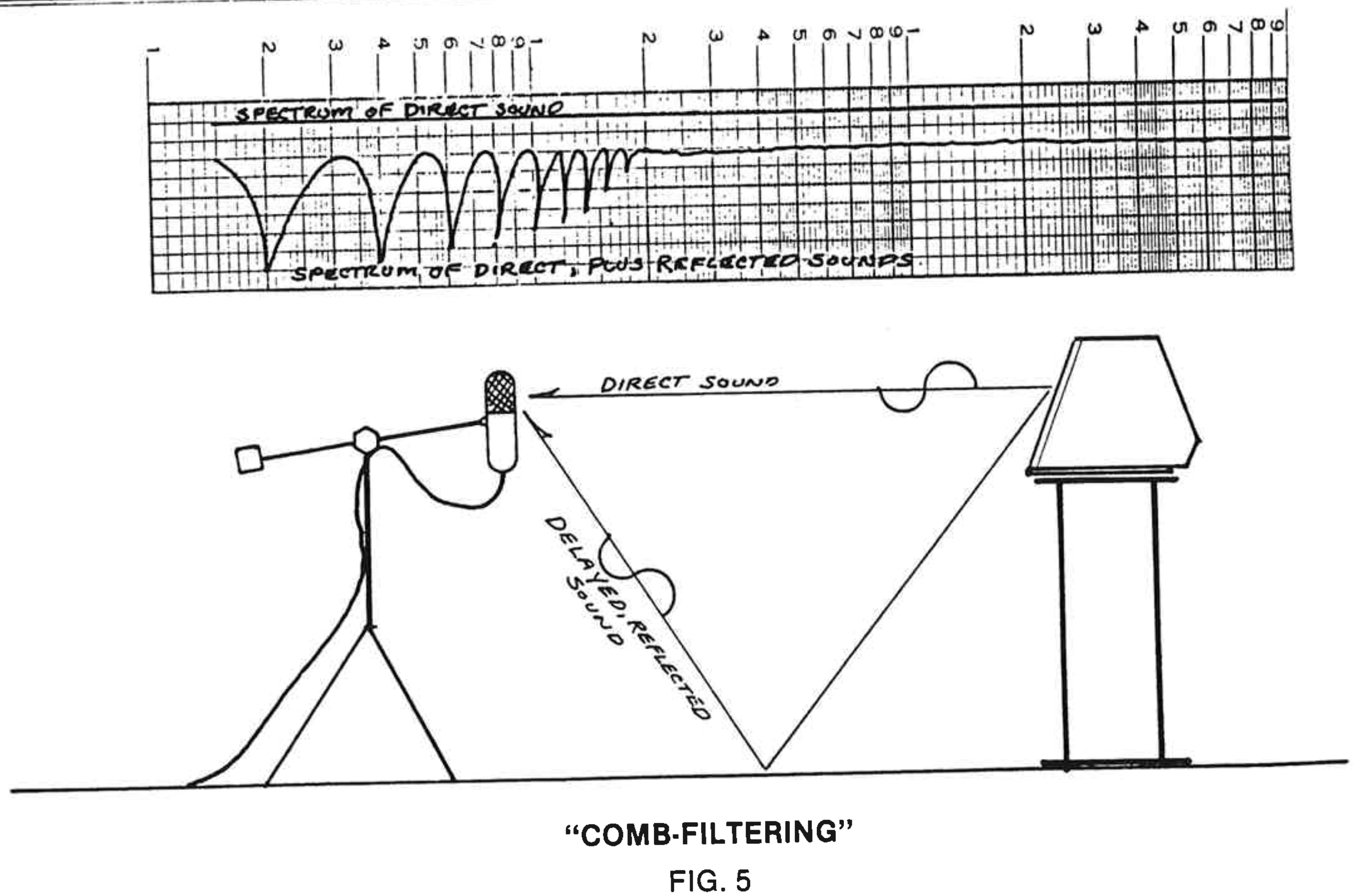


FIG. 3



3 COMMONLY ENCOUNTERED REFLECTION PROBLEMS

FIG. 4



"COMB-FILTERING"

FIG. 5

EFFECT OF HEIGHT ON PERFORMANCE OF WATT LOUDSPEAKER

FLOOR PLACEMENT

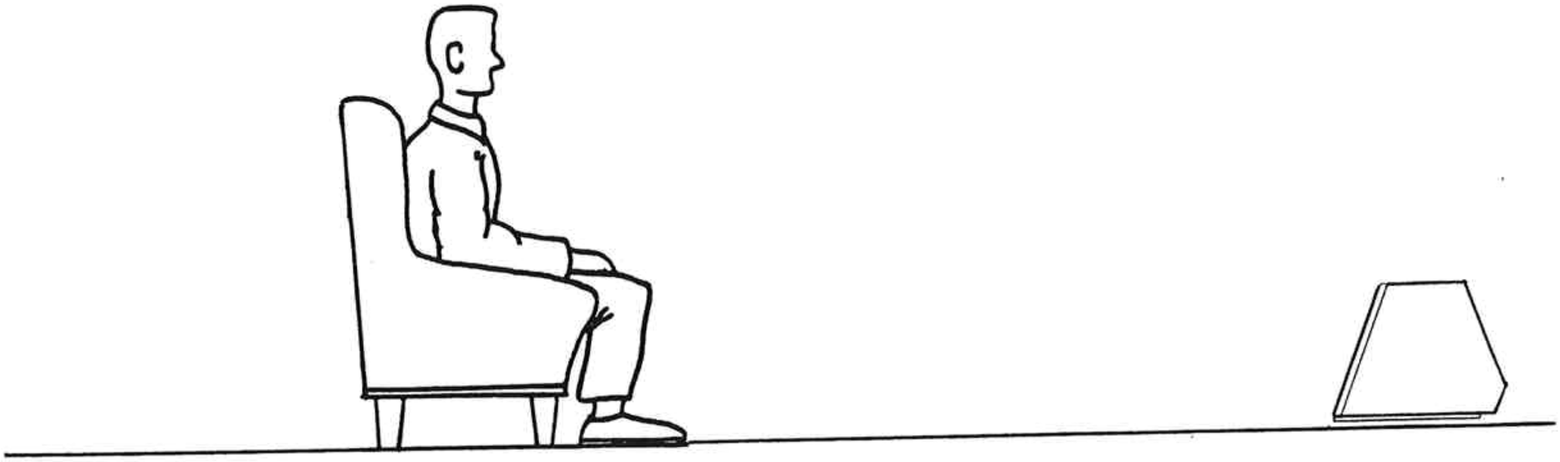
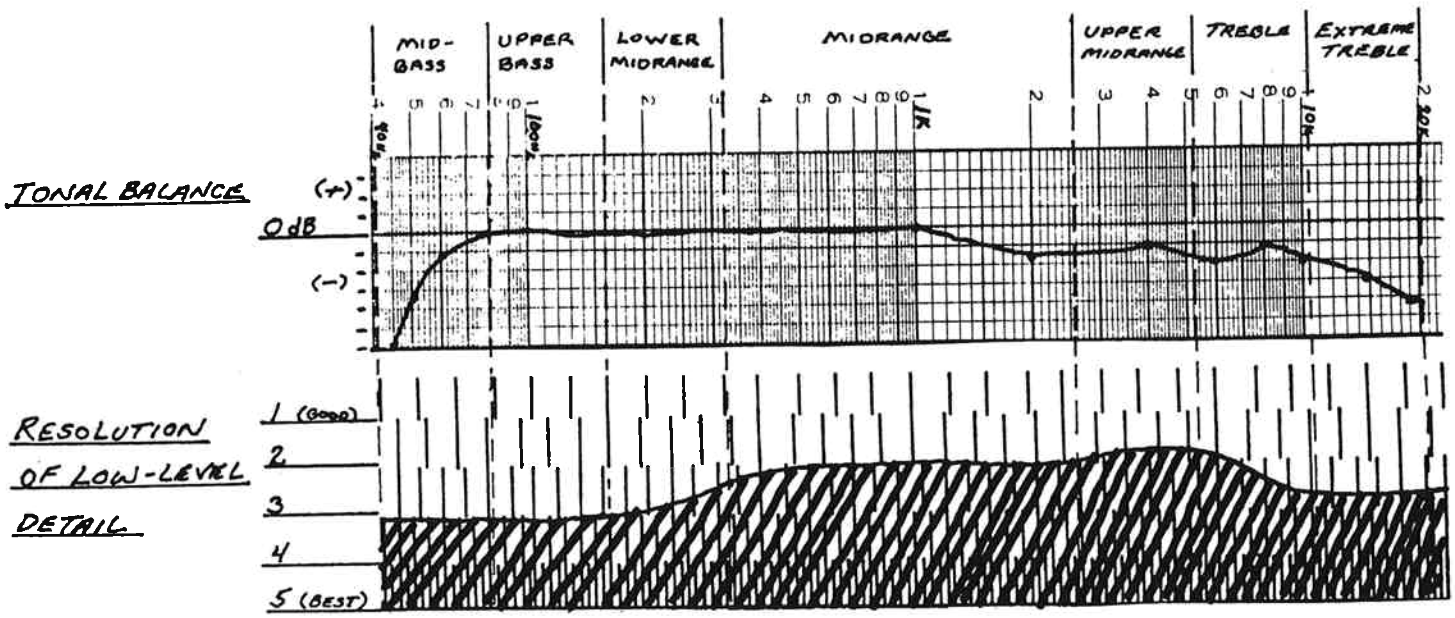


FIG. 6



SOUND-STAGING PERFORMANCE

AREA	IMAGE FOCUS	IMAGE PLACEMENT	AMBIENCE
CENTER	2	2	2
EXTREME SIDES	2	2	1
REAR FIELD	1	1	1

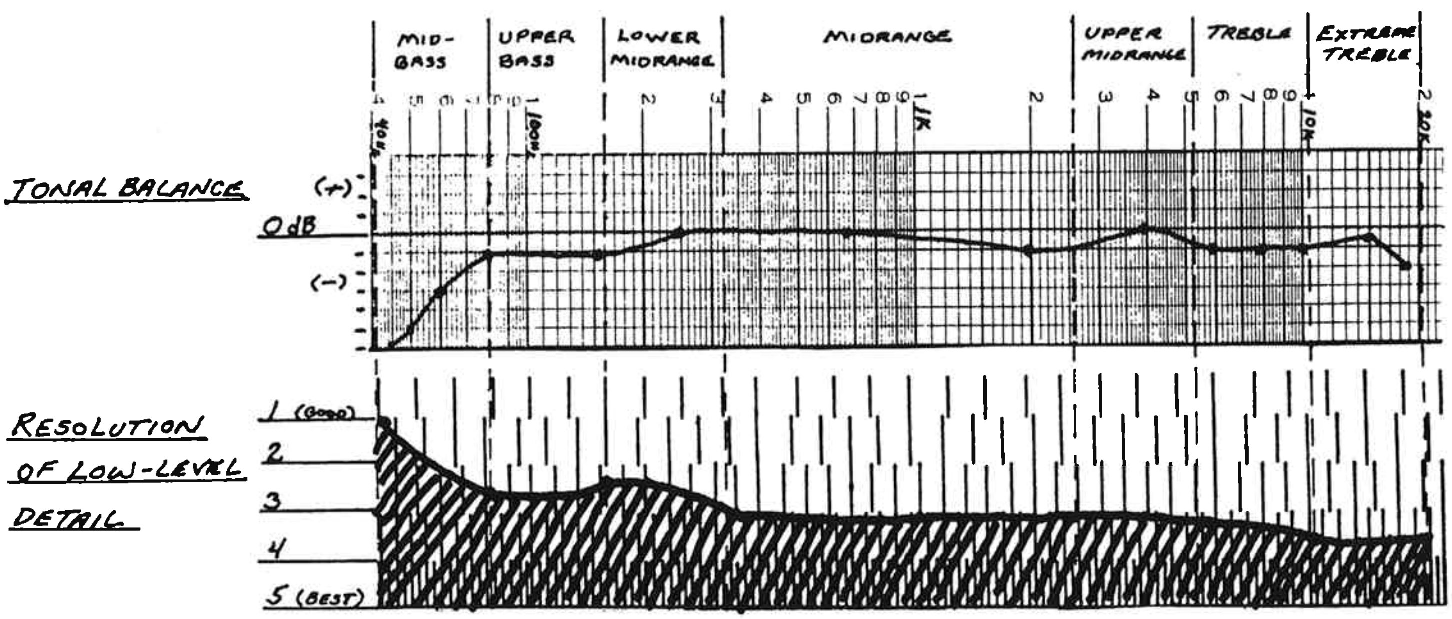
1 = GOOD 5 = BEST

TABLE 1

EFFECT OF HEIGHT ON PERFORMANCE OF WATT LOUDSPEAKER

SHORT, OPEN STAND

FIG. 7



SOUND-STAGING PERFORMANCE

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

1 = GOOD 5 = BEST

TABLE 2

EFFECT OF HEIGHT ON PERFORMANCE OF WATT LOUDSPEAKER

TALL, OPEN STAND

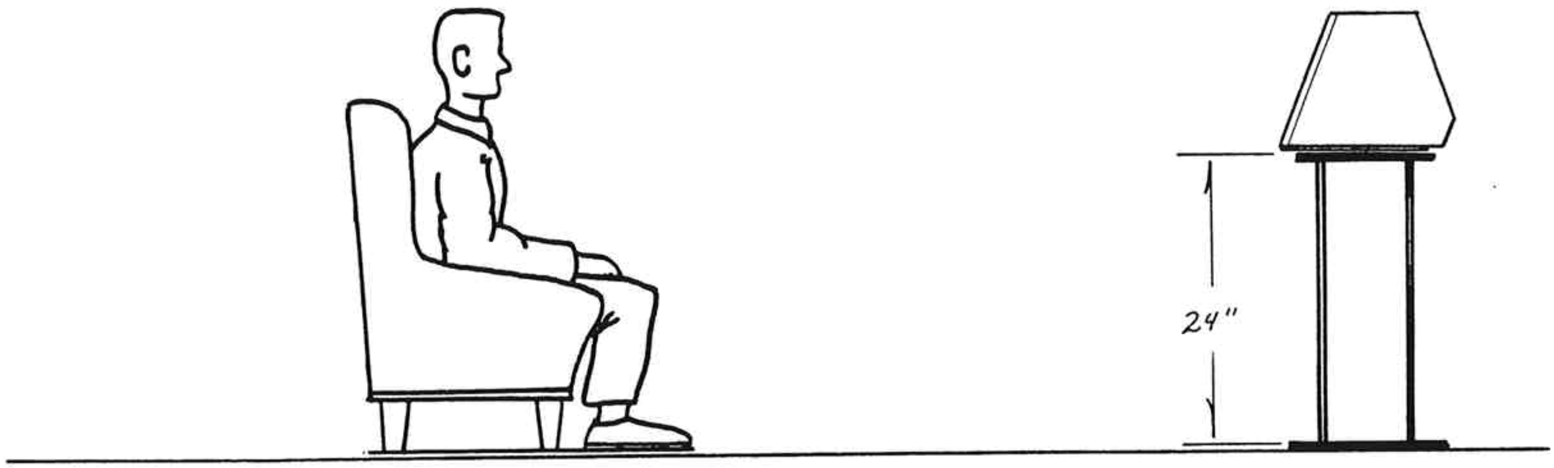
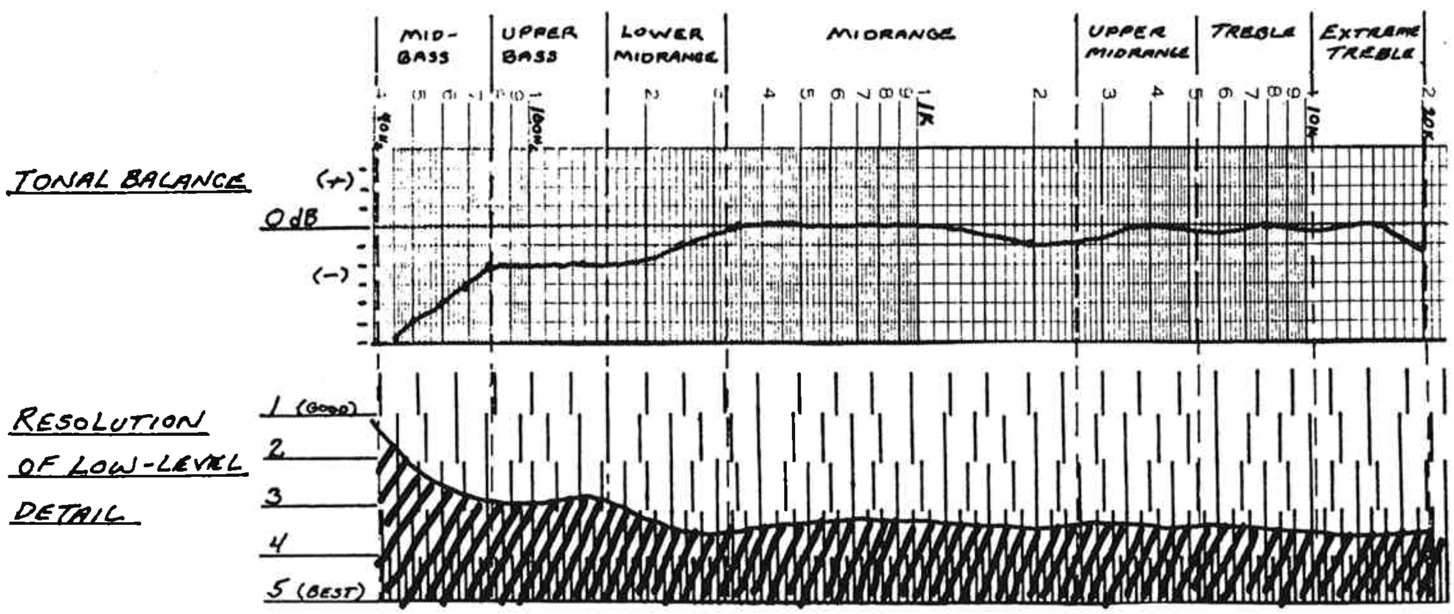


FIG. 8



SOUND-STAGING PERFORMANCE

AREA	IMAGE FOCUS	IMAGE PLACEMENT	AMBIENCE
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

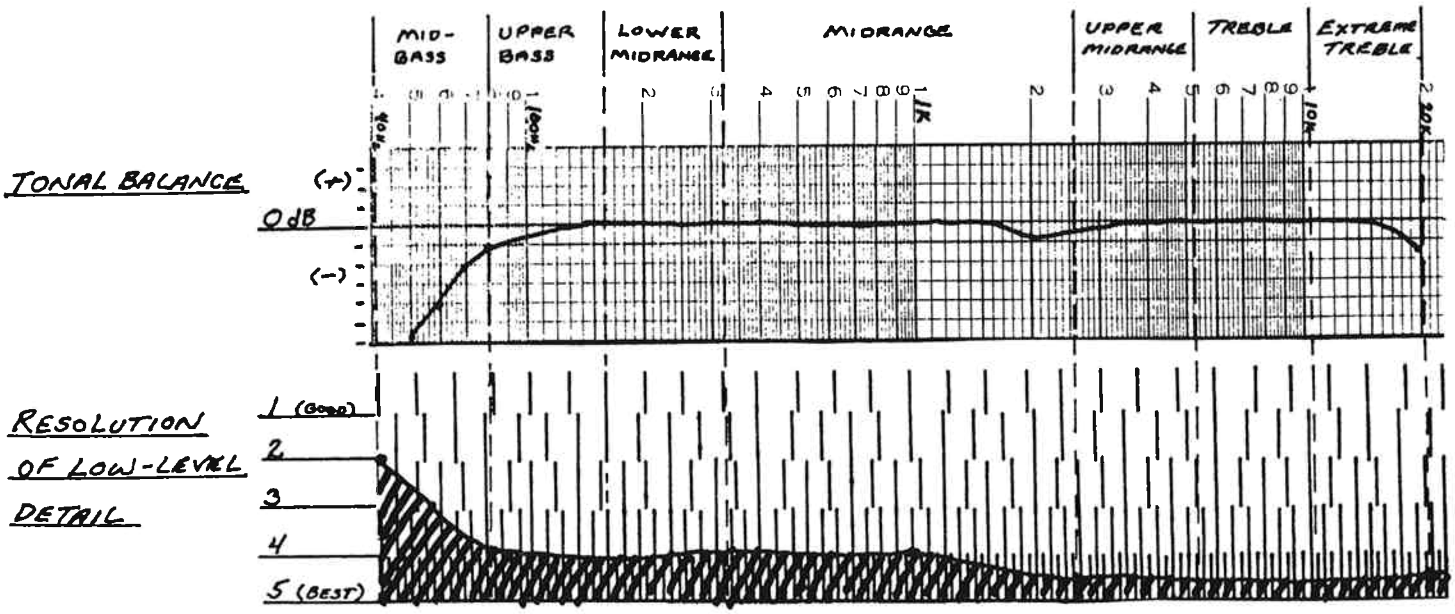
1 = GOOD 5 = BEST

TABLE 3

EFFECT OF HEIGHT ON PERFORMANCE OF WATT LOUDSPEAKER

TALL, OPEN STAND + 2 Pi PANEL

FIG. 9



SOUND-STAGING PERFORMANCE

AREA	IMAGE FOCUS	IMAGE PLACEMENT	AMBIENCE
CENTER	5	5	5
EXTREME SIDES	5	5	5
REAR FIELD	4	4	4

1 = GOOD 5 = BEST

TABLE 4

EFFECT OF HEIGHT ON PERFORMANCE OF WATT LOUDSPEAKER

WATT ON GIBRALTER STAND (A) — OR — ENTEC SW-5 (B)

(SEE NOTE BELOW)

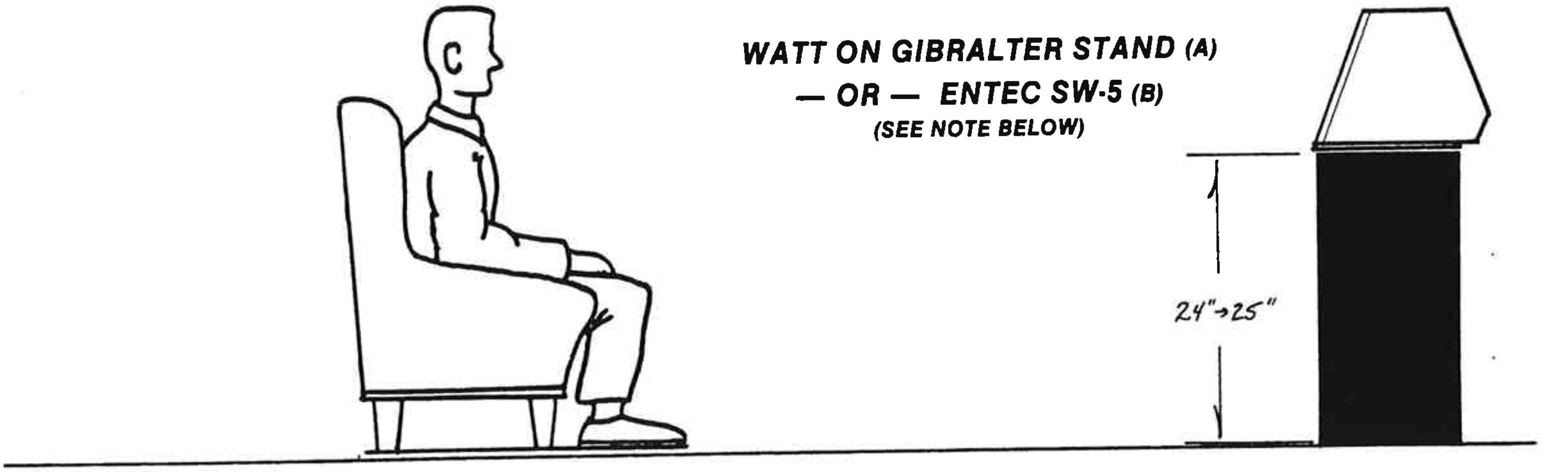
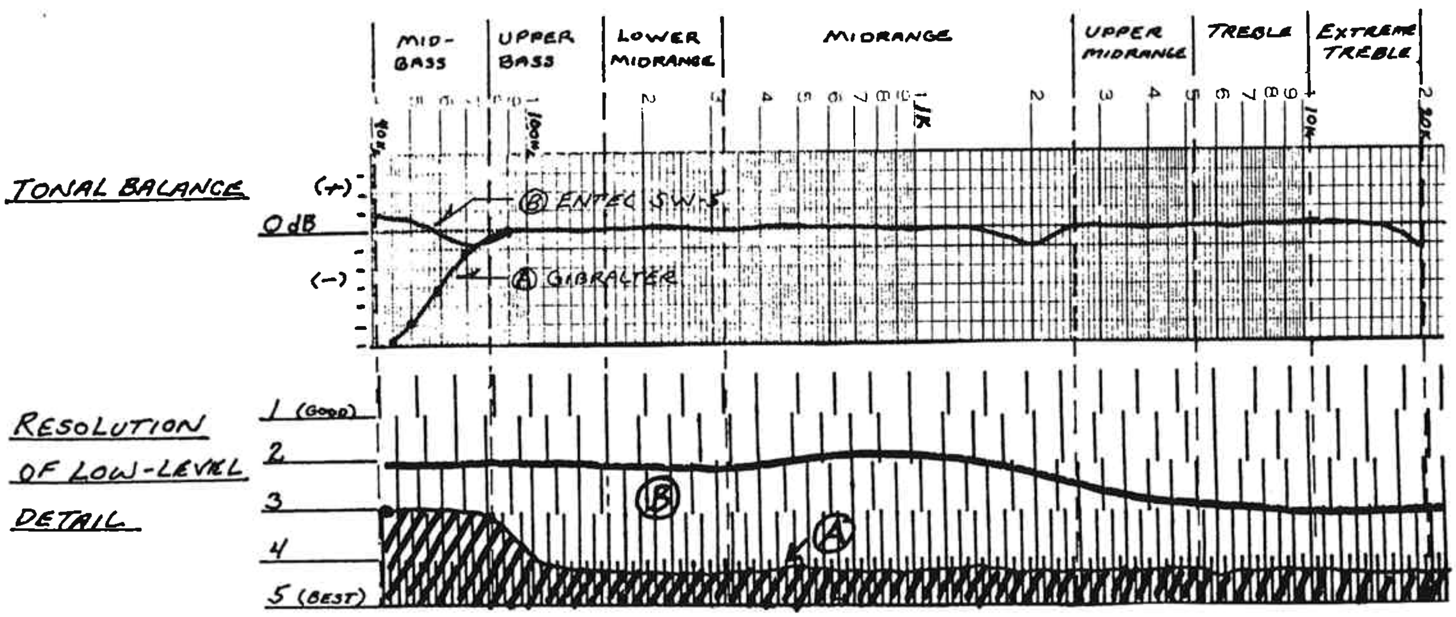


FIG. 10



SOUND-STAGING PERFORMANCE	AREA	IMAGE FOCUS	IMAGE PLACEMENT	AMBIENCE
	CENTER	Ⓐ = 5 Ⓑ = 3½	Ⓐ = 5 Ⓑ = 4	Ⓐ = 4½ Ⓑ = 3½
	EXTREME SIDES	Ⓐ = 5 Ⓑ = 3½	Ⓐ = 5 Ⓑ = 3	Ⓐ = 4½ Ⓑ = 3½
	REAR FIELD	Ⓐ = 4½ Ⓑ = 3	Ⓐ = 4 Ⓑ = 3	Ⓐ = 4½ Ⓑ = 3

1 = GOOD 5 = BEST

TABLE 5

NOTE ①: BECAUSE MOST OF THE OUTPUT OF THE WATT BELOW 80 Hz IS PORT OUTPUT, RATHER THAN DIRECT RADIATOR OUTPUT, IT IS NECESSARY TO INVERT THE POLARITY OF THE ENTEC WOOFERS. IF THIS IS NOT DONE, THE OVERALL SYSTEM WILL EXHIBIT A SEVERE FREQUENCY RESPONSE DEPRESSION FROM 50-70 Hz. CONTACT YOUR DEALER.

NOTE ②: PLACEMENT OF THE WATT DIRECTLY ON TOP OF THE SW-5, WHILE PRACTICAL AND ATTRACTIVE, RESULTS IN SOME COMPROMISE IN SYSTEM RESOLUTION AND SOUNDSTAGING PERFORMANCE. WE RECOMMEND USING A GIBRALTER STAND, AND PLACING THE SW-5 AWAY FROM THE WATT.

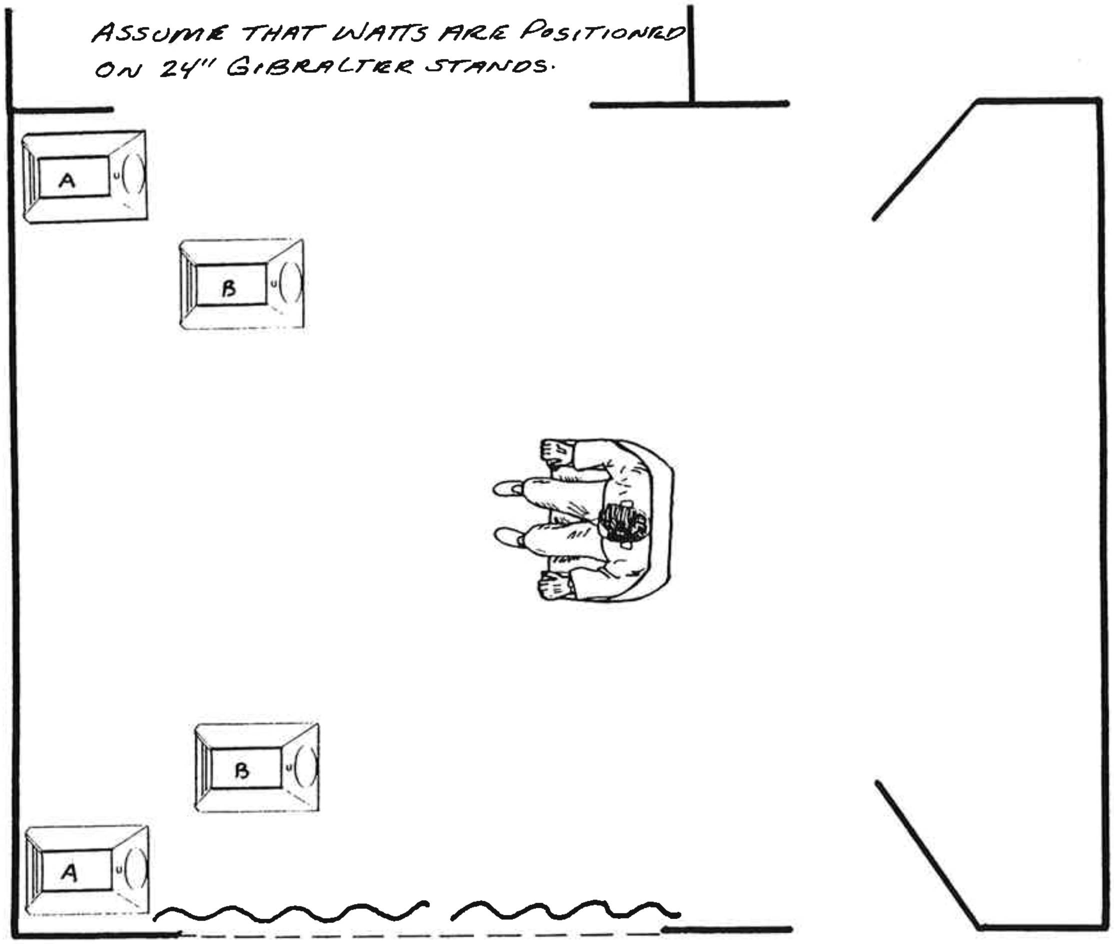
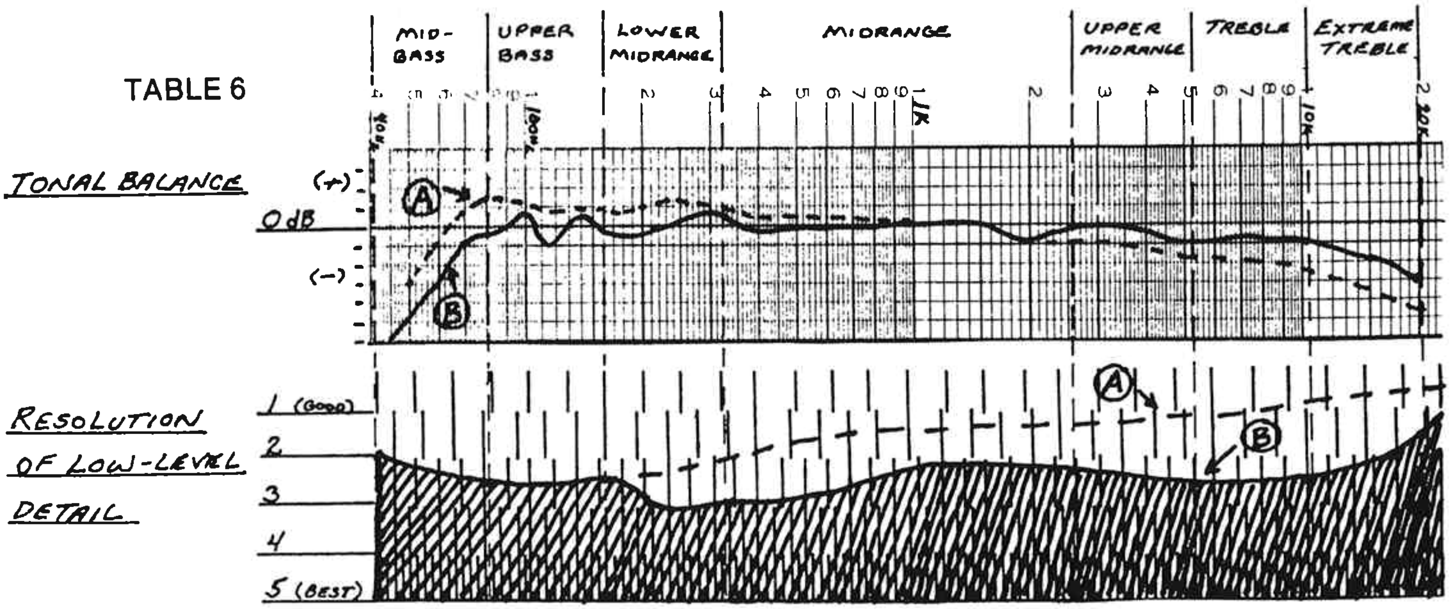


FIG. 11

EFFECT OF ROOM PLACEMENT ON THE PERFORMANCE OF THE WATT
EXAMPLE 1 COMPARES PERFORMANCE OF CORNER SITUATED WATTS Ⓐ VS. WATTS PLACED OUT IN THE ROOM, AWAY FROM WALLS... BUT NOT TOED-IN Ⓑ

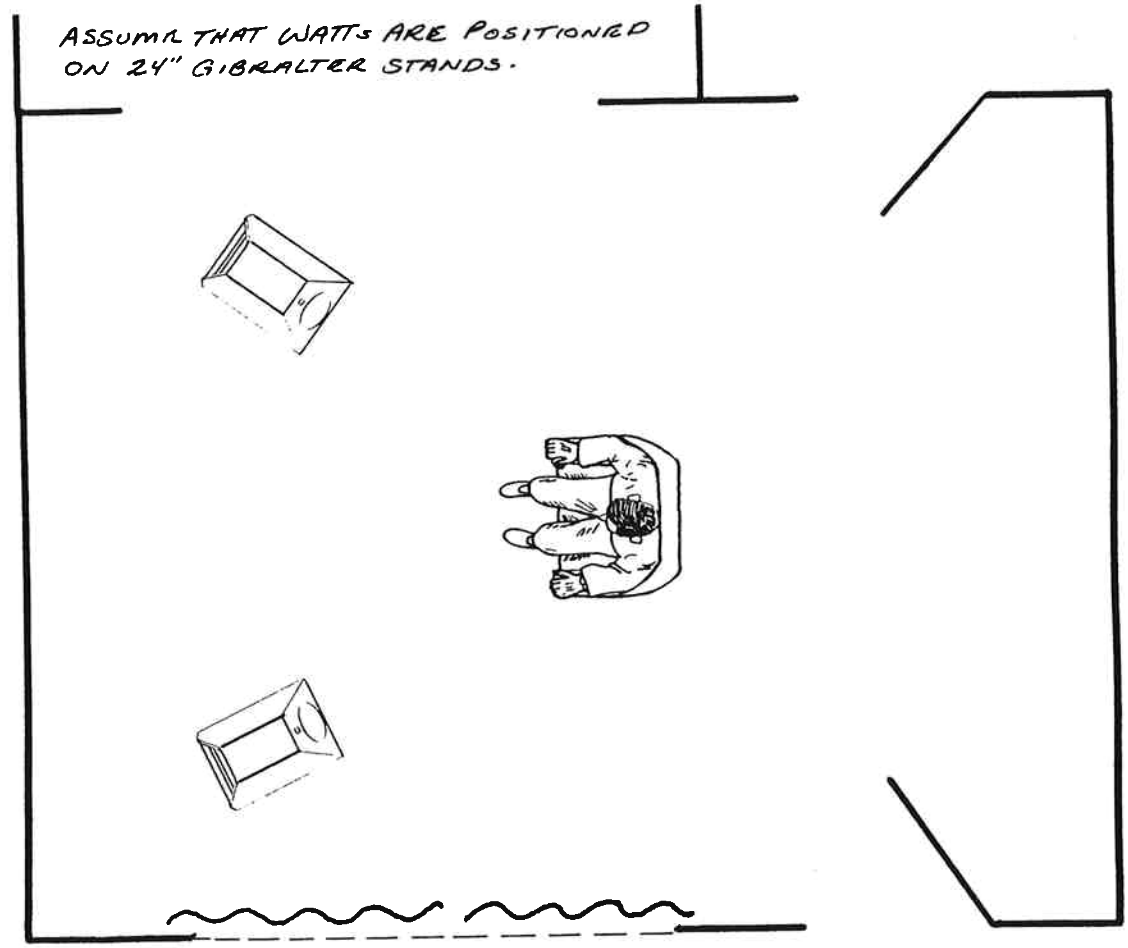
TABLE 6



SOUND-STAGING PERFORMANCE	AREA	IMAGE FOCUS		IMAGE PLACEMENT		AMBIENCE	
	CENTER	Ⓐ = 2	Ⓑ = 3½	Ⓐ = 3	Ⓑ = 3½	Ⓐ = 2	Ⓑ = 3½
	EXTREME SIDES	Ⓐ = 2	Ⓑ = 3½	Ⓐ = 2	Ⓑ = 3	Ⓐ = 2	Ⓑ = 4
	REAR FIELD	Ⓑ = 2	Ⓑ = 3	Ⓐ = 2	Ⓑ = 3	Ⓐ = 2	Ⓑ = 4

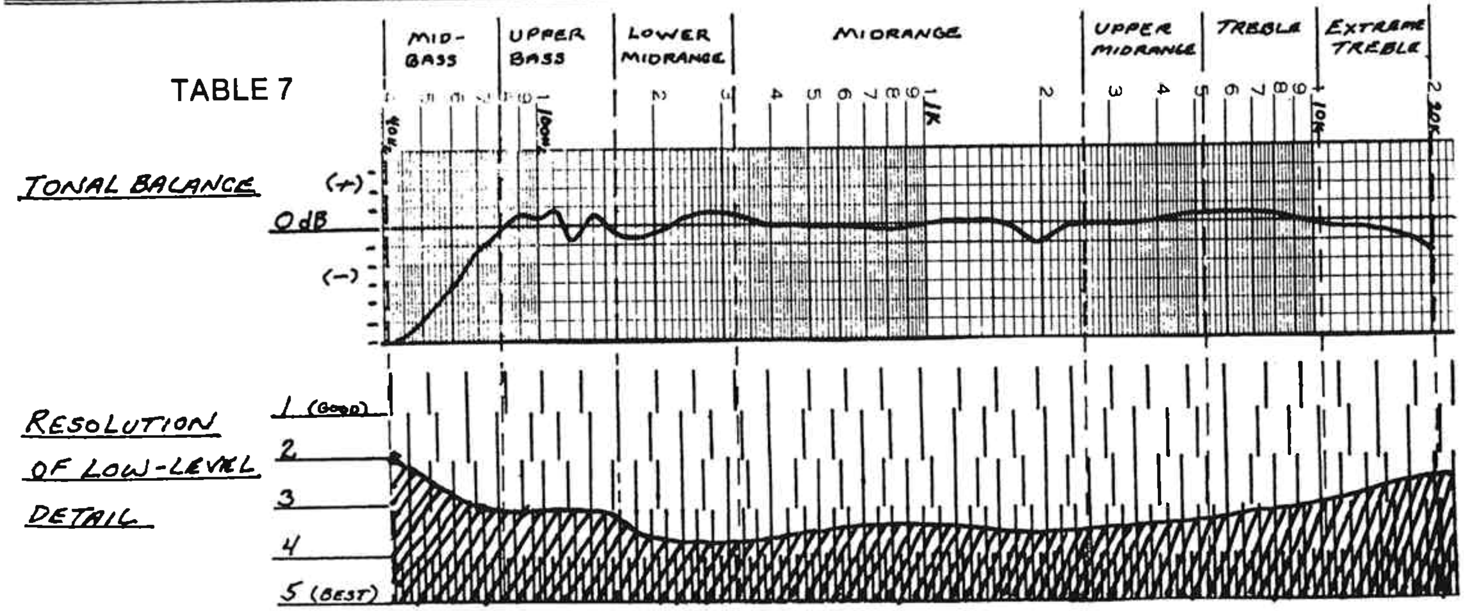
1 = GOOD 5 = BEST

FIG. 12



EFFECT OF ROOM PLACEMENT ON THE PERFORMANCE OF THE WATT
EXAMPLE 2, SPEAKERS IN SAME REGION OF ROOM AS UNITS IN EXAMPLE 1B, BUT ARE NOW TOE'D-IN. THIS EXAMPLE THUS ILLUSTRATES THE EFFECT OF TOE-IN ON THE WATTS.

TABLE 7



SOUND-STAGING PERFORMANCE AREA	IMAGE FOCUS	IMAGE PLACEMENT	AMBIENCE
CENTER	4½	4½	4
EXTREME SIDES	4	3	4
REAR FIELD	4	3½	4

1 = GOOD 5 = BEST