# ALLISON

## ROOM-MATCHED LOUDSPEAKER SYSTEMS

# ROOM AND LOUDSPEAKER—ONE SYSTEM

Unlike many recently developed loudspeaker systems which depart from the conventional box format, the Allison models One through Six are not clever solutions to trivial problems. Instead they were developed as rational answers to real problems that are important and audible to anyone. Every aspect of their design is functional, and they are uniquely accurate sound reproducers in the only environment that really matters: a room for listening to music.

The design of these loudspeakers follows research* by Roy Allison on the room-loudspeaker interaction, which shows how reflected impedance from the room boundaries increases a conventional loudspeaker's power output at very low frequencies, but decreases it significantly in the middle-bass range.

The mechanism by which this effect occurs can be understood as follows. Consider a typical box loudspeaker system positioned in a room so that its woofer cone is about two feet from each of the three nearest room surfaces—say, the floor and two intersecting walls. When the speaker is radiating a very low frequency the cone moves relatively slowly and over a relatively long distance. If the radiated frequency is 40 Hz, for example, it takes 1/40 second (25 milliseconds) for the cone to execute one complete forward-and-backward cycle. Each half of the cycle takes 12½ milliseconds.

As the cone begins a forward movement it generates the start of a compression wave. This impulse travels at the speed of sound (1,130 feet per second) to each of the three room boundaries and is reflected back toward the woofer cone, arriving there some 3½ milliseconds after it left, while the woofer is still generating the compression half of the sound cycle. The reflected waves increase the instantaneous pressure seen by the woofer and enable it to radiate more power than it could in free space—a maximum of 9 dB more power at extremely low frequencies, for which the reflected pressure is virtually in perfect phase coincidence with the woofer's motion.

But as the woofer tries to radiate higher frequencies, it must reverse its motion more quickly. At 140 Hz, for example, the cone reverses direction every 3½ milliseconds. It begins its inward half-cycle of motion (attempting to create a rarefaction) just as the three compression-wave reflections begin to arrive back from the room boundaries two feet away. In this case the reflected pressure is completely out of phase with the cone motion, decreasing its radiation efficiency some 11 dB below the anechoic output. That is the worst case: a 20-dB variation in power output (from +9 dB to −11 dB) when the woofer is equidistant from the three nearest room surfaces, from a loudspeaker system which measures flat in an anechoic chamber.

Usually the boundaries are not equally distant from the woofer and the effect is not as intense. Typically, the variation in power delivered by the speaker to a listening room is 6 to 12 dB within the woofer range. These effects simply do not exist in anechoic chambers, where loudspeakers are commonly tested, because there are no reflections from the chamber walls. And measurements made in "live" rooms are complicated by the standing-wave resonances. Consequently a room's influence on the actual power output of a loudspeaker system, as a factor separate from other room effects, has not been well understood until recently.

An uncontrolled variation in system response of this magnitude would be considered intolerable if it originated in a phono pickup cartridge or an amplifier. But it is just as audible when it originates in a loudspeaker. If it could be eliminated, or if its severity could at least be reduced appreciably, an improvement should be expected in the accuracy of the reproduced sound field.

*A copy of the resulting technical paper, together with other relevant papers and articles by Roy Allison, is available on request.

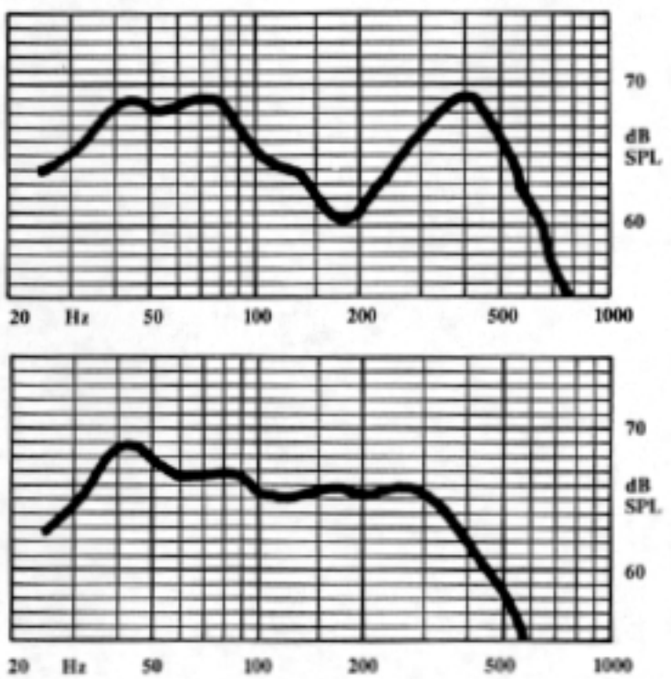



**Figure 1.** Averages of two sets of 28 reverberant-field frequency response curves taken at actual listener positions in five real rooms. The curve above is for an excellent conventional box system, with only the woofer operating, placed at locations of original speaker systems in these rooms. The curve below is for the woofer section of an ALLISON ONE system placed at the same locations. Data reproduced from "The Sound Field in Home Listening Rooms II," *Journal of the Audio Engineering Society*, Vol. 24, No. 1, Jan./Feb. 1976. A reprint of the complete paper is available on request.

How can this be accomplished? The most elegant solution is exemplified in the **ALLISON:THREE** corner loudspeaker system. The cabinet is designed so as to place the woofer as close as possible to three room surfaces (the floor and two intersecting walls), with the result that the reflections arrive back at the woofer in a very short time (about 1 millisecond). The woofer's operating range is restricted by a crossover network to an upper limit of 350 Hz; at that frequency, the woofer spends 1½ milliseconds on each half-cycle in one direction. Therefore the reflected pressure is essentially in phase with the woofer's motion, and increases its power output, over its entire operating frequency range. Flat power output from the system is thereby made possible. Put another way, the woofer's radiation loading has been stabilized.

An **ALLISON:THREE** should be used in a room corner. If it were to be moved away from the corner along one wall, the missing side wall could be replaced by another **THREE** system placed side-to-side against the first one. The radiated sound pressure from each system would have the same effect on the other system as would its own reflected pressure from a corner side wall, and the performance of the pair along one wall would be the same as that of a single system in the corner. The **ALLISON:ONE** loudspeaker system is exactly that: a pair of model **THREE** systems in one cabinet, operating as one system, which can be located anywhere along a room wall except in a corner. Figure 1 documents the success of this design in actual living room use.

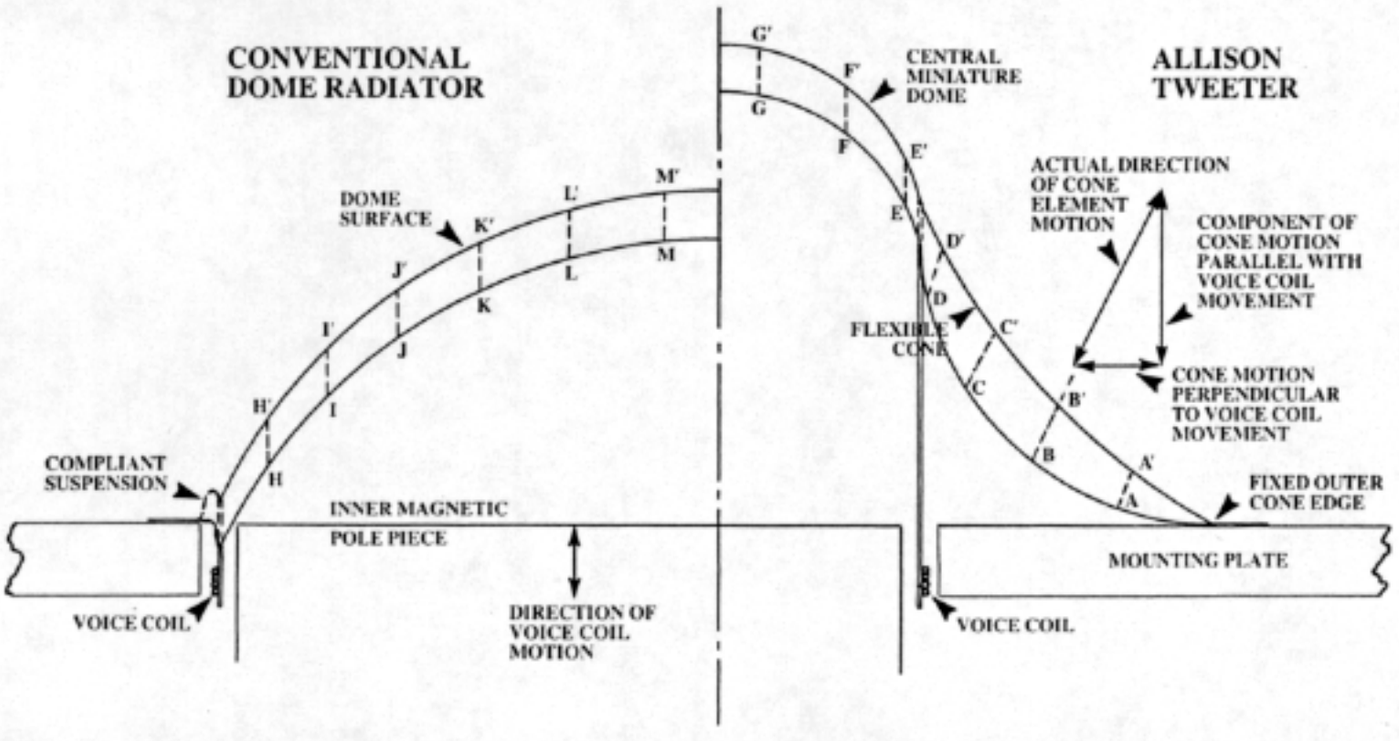
An **ALLISON:TWO** system is equivalent in concept to a model **ONE.** Its size and price are smaller, and its power output below 50 Hz is 2 dB less than that of a model **ONE.** Otherwise the systems are identical. In practice this compromise is seldom audible; the **TWO** is very much a full-range loudspeaker system.

A hole in the woofer power output curve caused by out-of-phase reflections is avoided in Allison models **ONE, TWO,** and **THREE** by placing the frequency at which it occurs above the woofer crossover point. But in order to do this the crossover frequency must be quite low—not above 400 Hz or so—even with a woofer as close as possible to the room-surface intersection. This requires a three-way loudspeaker system design with separate mid-range and tweeter units, because it is not practical to operate a high-quality tweeter down to a 400-Hz crossover point. Consequently, in a less expensive two-way system with the woofer operating up to 1 or 2 kHz, the reflections from nearby room surfaces will be out of phase with the woofer motion at some frequencies within its range. There is no way to avoid this.

There is a way to minimize the severity of the problem, however, and that is simply to place the out-of-phase reflections from the three nearest room surfaces at frequencies as far apart as possible, so that within any fre-

**Figure 2.** Comparison cross-sectional views of a dome radiator (left) and an Allison tweeter (right). In each case the diaphragm is shown at both the maximum inward and the maximum outward position. Letters A through G denote points on the surface of the Allison tweeter diaphragm at the maximum inward position of the voice coil. A' through G' denote the same points on the surface at the maximum outward position. A dashed line shows the locus of each point. Letters H through M, and H' through M' represent points on the surface of the dome radiator diaphragm at its extreme positions.

It is evident that all surface points on the dome radiator travel in axial alignment with the voice coil. Ideally the dome moves as a rigid piston. But because the outer edge of the Allison tweeter's cone diaphragm is not permitted to move freely, the cone section is forced to flex and to change its curvature as the voice coil moves axially. The cone surface therefore has a significant component of sidewise motion all around the axis. The result is a combination of high output level and uniform dispersion of the highest audio frequencies that establishes a new standard of tweeter performance.



quency region the adverse effects are not cumulative. This is equivalent to saying that the distances from the woofer to these surfaces should be as different as possible.

In the Allison models **FOUR, FIVE,** and **SIX,** this placement is facilitated by location of the woofer in the top panel of a bookshelf-size cabinet, rather than in the normal front-panel location. The distance to one room boundary (the wall behind the cabinet) is thus held to the absolute minimum, which maximizes the possible ratios of distances. The smoothness of bass output in practical use of these systems is significantly better than it is for any conventional bookshelf design. Only the larger Allison systems are better in this respect.

Another unique aspect of all these systems is the nondirectional dispersion of middle and high frequencies from drivers with relatively high output level. This is accomplished with a new type of diaphragm, convex in over-all profile, which is superior to small dome radiators in dispersion, yet equals the efficiency of ordinary cone speakers of comparable size.

Figure 2 shows the Allison tweeter's convex diaphragm in cross-section. The voice-coil diameter is only ½ inch; the side of the cone curves inwardly, and the outside edge is fastened securely, at a diameter of 1 1/16 inch, to a mounting plate. Because there is no compliant suspension at the outer edge the entire cone surface is forced to flex as the voice coil moves axially. As it does so, each point on the surface of the cone moves with a velocity that has an in-phase component of motion perpendicular to the voice-coil direction as well as a component parallel with it.

The tweeter thus simulates to a remarkable degree the motion of an expanding and contracting hemisphere. There are other tweeters which generate cylindrical wave fronts; they have excellent dispersion in one plane (the horizontal). But no other design even approaches the Allison tweeter's dispersion at all angles, vertical and horizontal, in the forward hemisphere.

This uniformity of output in all directions is not merely a technical *tour-de-force* of no audible significance. It provides a convincing illusion of space around a reproduced sound source, without distortion of its natural size, and it generates a stereo image that is maintained even for listeners located outside the area defined laterally by the speakers. The tweeter is used in all Allison loudspeaker systems and is unique to them alone.

In 1954 Edgar Villchur, by means of his revolutionary acoustic suspension design, demonstrated the advantages of treating the woofer and its enclosure as a system rather than as separate components. Today, nearly all loudspeakers embody this concept. Roy Allison (a professional associate of Mr. Villchur for many years) has now extended the "system" one logical step further, to include the listening room itself. The result is an improvement by one order of magnitude in the accuracy of the reproduced sound field.

# Distortion and Clarity

Smooth, flat acoustic power output *vs.* frequency is necessary for resolution of fine detail in reproduced music. Resolution is a property often called transparency or clarity, and without it no illusion of reality is possible. But a flat power output curve alone is not sufficient to achieve this quality. At least two other performance factors are just as important: low distortion and wide dynamic range.

A loudspeaker with an appreciable amount of nonlinear distortion generates audible spurious tones in addition to those it is supposed to reproduce. Some of these "extra" sounds alter the original balance of harmonic overtones, thus modifying the music's timbre. Others are harmonically unrelated to the original tones; their effect is to add new frequency components which amount to a dissonant noise, masking subtle details of the desired program material. Very low distortion at normal listening level is, therefore, essential for clarity.

A good recording contains occasional peak sound levels that are 10 to 15 dB higher than the average. If this dynamic range is to be reproduced faithfully by the loudspeaker system, it must be able to respond linearly to such peak inputs without any obvious strain or effort. Consequently, the speaker's ability to handle very high power input levels is of importance.

The distortion *vs.* power input curves shown in the following pages for Allison loudspeaker systems are, to the best of our knowledge, the first to include either

**A.** Data for power inputs higher than 20 watts, or
**B.** Information enabling the reader to translate electrical power input level to acoustic power output and reverberant sound pressure level (SPL) in a large listening room.

The lowest distortion in each group (for 2.8 watts input and 90 dB reverberant SPL) represents a distinctly loud average listening level and distortion is insignificant. The other curves give some idea of the enormous dynamic range of these systems. Even at the extremely high input levels shown, distortion of music within the normally recorded frequency range is low enough to be inaudible.

# ALLISON:ONE

An **ALLISON:ONE** system should be used with its back close to a room wall (but not in a corner), and with the bottom resting on the floor or close to the ceiling. Full design performance will be maintained if the cabinet is placed within three inches of these two room boundaries (thus allowing for baseboards and recessed radiators) and if the center of the cabinet is more than two feet from a side wall. Because the system is nondirectional in the forward hemisphere there is no requirement that it be "aimed" at listeners. A stereo pair of these systems can be used on the same wall, on a pair of adjacent walls, or even on opposite long walls at the end away from the primary listening area.

The **ALLISON:ONE** system is our flagship, combining flexibility in placement with maximum frequency range and power output capability.

## Distortion vs. Frequency

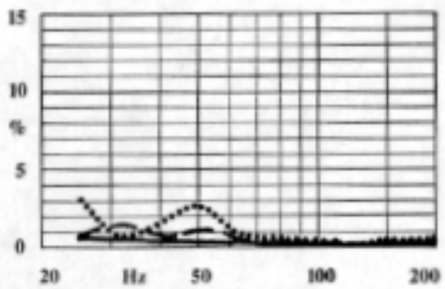
**Near-field measurements, ⅓-octave frequencies.**

——— Input 2.8 watts. Acoustic power output .02 watt. 90 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

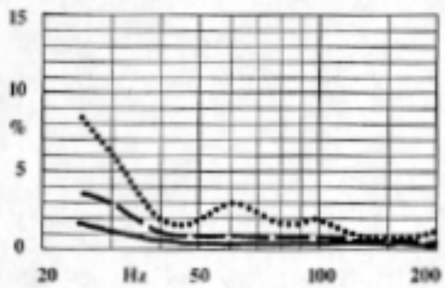
— — Input 14 watts. Acoustic power output 0.1 watt. 97 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

●●●●●● Input 70 watts. Acoustic power output 0.5 watt. 104 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

MODEL ONE
THIRD HARM. DIST.




MODEL ONE
SECOND HARM. DIST.




*U.S. Patent 3,983,333. Foreign patents pending or issued.
Specifications subject to change without notice.

## Specifications

**Speaker complement:** two 10-inch (25.4 cm) woofers, two 3½-inch (8.9 cm) Convex Diaphragm mid-range units, two 1-inch (2.5 cm) Convex Diaphragm tweeters.

**Crossover frequencies:** 350 and 3,750 Hz.

**Crossover network:** LC half-section at both crossover frequencies. Air-core chokes and non-polar computer-grade capacitors are used. Two control switches (accessible from front) provide a choice of four acoustic power response curves, to allow for differences in music taste and room characteristics. Two linked sets of input terminals permit simple biamplification if desired.

**Impedance:** 8 ohms nominal (7 ohms minimum at any setting of balance switch).

**Efficiency:** better than 0.7% when placed at floor-wall intersection.

**Minimum amplifier power:** 30 watts per channel to produce 100 dB sound pressure level in most domestic room environments.

**Power handling capability:** At least 40 watts continuous or average, at any frequency. At least 140 watts peak at resonance frequency. Over most of frequency range, at least 1,500 watts for 0.1 second; 375 watts for 1 second; 175 watts for 10 seconds. (To calculate acoustic power output, multiply input power by .007).

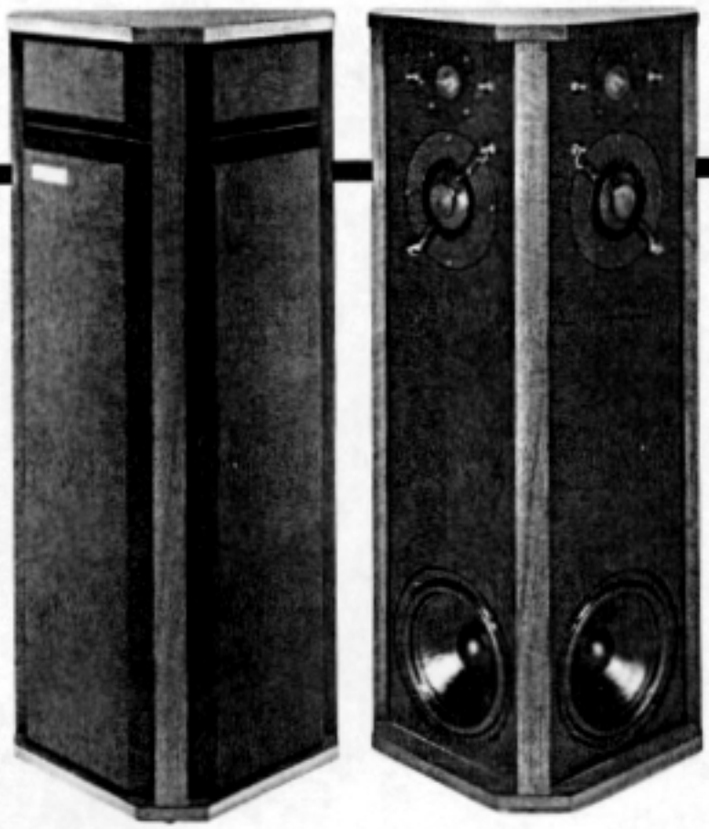
**System resonance frequency:** 45 Hz, nominal.

**Effective system Q:** 1.0. Low-frequency response −3 dB at 35.5 Hz, −6 dB at 29.5 Hz. Can be extended flat to 20 Hz with **THE ELECTRONIC SUBWOOFER™** equalizer.

**Enclosure:** Stabilized Radiation Loading* sealed acoustic suspension design. Outside dimensions 40 inches high by 19 inches wide by 10¾ inches front to back (1.02 meters by 48.3 cm by 27.3 cm). Internal volume, 2,550 cubic inches (41.8 liters). Material: particle board veneered with walnut, oiled finish.

**Weight:** 67 lbs. (30.4 kg).

**Warranty:** Full Warranty for Five Years.



# ALLISON:TWO

The **ALLISON:TWO** loudspeaker system has performance identical with that of the **ALLISON:ONE** system down to 50 Hz. Below that frequency its power output is 2 dB less. The cabinet is 30% smaller but has the same shape. The crossover network, mid-range and tweeter units are identical. Thus, the same dispersion of high-frequency energy, power-handling capability, and placement flexibility of the larger system are provided at a substantially lower price. The systems are so audibly alike that a small difference can be detected only with music containing the lowest fundamental frequencies.

As with all **ALLISON®** systems, the grille panels are formed of sturdy perforated ABS plastic—a cover material which does not absorb extremely high-frequency energy. It is far more acoustically transparent than cloth or open-cell foam.

## Distortion vs. Frequency

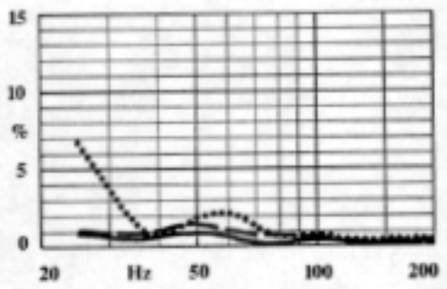
**Near-field measurements, ⅓-octave frequencies.**

——— Input 2.8 watts. Acoustic power output .02 watt. 90 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

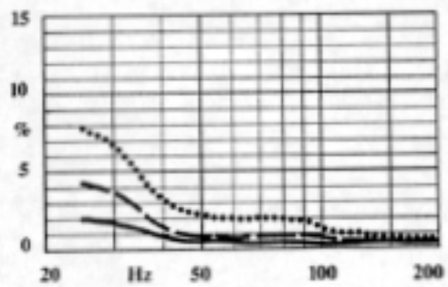
— — — Input 14 watts. Acoustic power output 0.1 watt. 97 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

●●●●●● Input 70 watts. Acoustic power output 0.5 watt. 104 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

MODEL TWO
THIRD HARM. DIST.




MODEL TWO
SECOND HARM. DIST.




*U.S. Patent 3,983,333. Foreign patents pending or issued.
Specifications subject to change without notice.

## Specifications

**Speaker complement:** two 8-inch (20.3 cm) woofers, two 3½-inch (8.9 cm) Convex Diaphragm mid-range units, two 1-inch (2.5 cm) Convex Diaphragm tweeters.

**Crossover frequencies:** 350 and 3,750 Hz

**Crossover network:** LC half-section at both crossover frequencies. Air-core chokes and non-polar computer-grade capacitors are used. Two control switches (accessible from front) provide a choice of four acoustic power response curves, to allow for differences in music taste and room characteristics. Two linked sets of input terminals permit simple biamplification if desired.

**Impedance:** 8 ohms nominal (7 ohms minimum at any setting of balance switch).

**Efficiency:** better than 0.7% when placed at floor-wall intersection.

**Minimum amplifier power:** 30 watts per channel to produce 100 dB sound pressure level in most domestic room environments.

**Power handling capability:** At least 40 watts continuous or average, at any frequency. At least 100 watts peak at resonance frequency. Over most of frequency range, at least 1,500 watts for 0.1 second; 375 watts for 1 second; 175 watts for 10 seconds. (To calculate acoustic power output, multiply input power by .007).

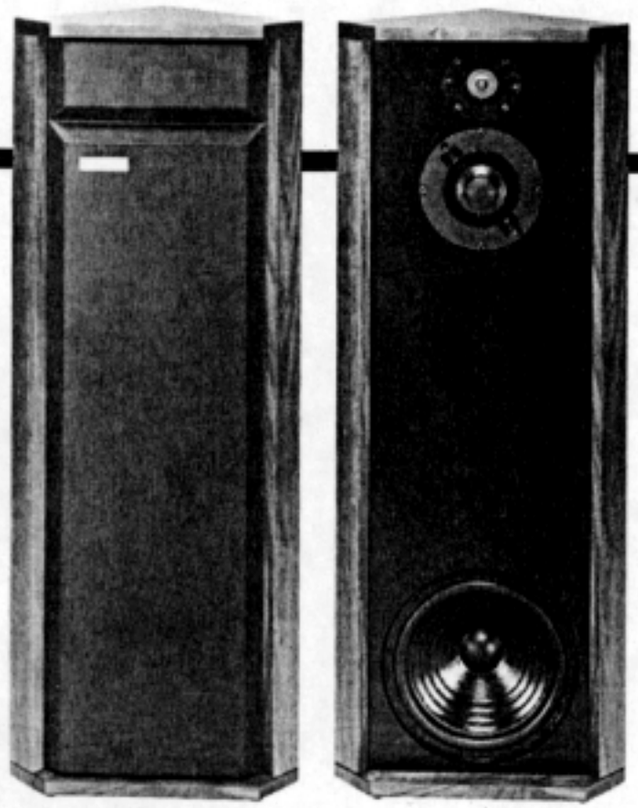
**System resonance frequency:** 52 Hz, nominal.

**Effective system Q:** 1.0. Low-frequency response −3 dB at 41 Hz, −6 dB at 34.5 Hz. Can be extended flat to 20 Hz with **THE ELECTRONIC SUBWOOFER™** equalizer.

**Enclosure:** Stabilized Radiation Loading* sealed acoustic suspension design. Outside dimensions 36 inches high by 16 inches wide by 9⅜ inches front to back (91.4 cm by 40.6 cm by 23.8 cm). Internal volume, 1,775 cubic inches (29.1 liters). Material: particle board veneered with walnut, oiled finish.

**Weight:** 57 lbs. (25.8 kg).

**Warranty:** Full Warranty for Five Years.



# ALLISON:THREE

**ALLISON:THREE** systems have flat bass power output in room corners, a capability shared only by huge corner horn systems. The cabinet should rest on the floor or, with the system inverted, it can be put close to the ceiling.

A pair of these systems can be used with considerably greater separation than is common. Because of the extremely wide dispersion the stereo image will be maintained even when the angle from a listener to the two speaker systems is very wide. Alternatively, one **ALLISON:THREE** system can be used as a main stereo speaker with an **ALLISON:ONE** system as the other main speaker—a combination that solves many practical placement problems. Finally, a pair of **THREE**s have unique advantages as back speakers in ambience-synthesis systems of all kinds.

## Distortion vs. Frequency

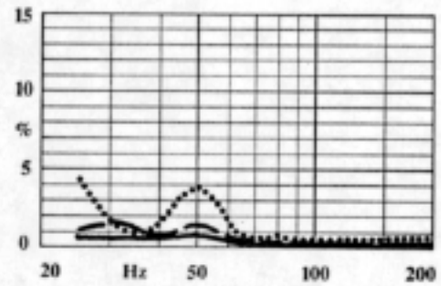
**Near-field measurements, ⅓-octave frequencies**

——— Input 2.8 watts. Acoustic power output .02 watt. 90 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

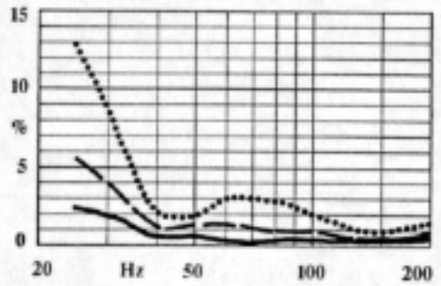
— — Input 14 watts. Acoustic power output 0.1 watt. 97 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

●●●●●● Input 70 watts. Acoustic power output 0.5 watt. 104 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

MODEL THREE
THIRD HARM. DIST.




MODEL THREE
SECOND HARM. DIST.




*U.S. Patent 3,983,333. Foreign patents pending or issued. Specifications subject to change without notice.

## Specifications

**Speaker complement:** one 10-inch (25.4 cm) woofer, one 3½-inch (8.9 cm) Convex Diaphragm mid-range unit, one 1-inch (2.5 cm) Convex Diaphragm tweeter.

**Crossover frequencies:** 350 and 3,750 Hz.

**Crossover network:** LC half-section at both crossover frequencies. Air-core chokes and non-polar computer-grade capacitors are used. Two control switches (accessible from front) provide a choice of four acoustic power response curves, to allow for differences in music taste and room characteristics. Two linked sets of input terminals permit simple biamplification if desired.

**Impedance:** 4 ohms nominal (3.5 ohms minimum at any setting of balance switch).

**Efficiency:** better than 0.7% when in room corner location.

**Minimum amplifier power:** 30 watts per channel to produce 100 dB reverberant sound pressure level in most domestic room environments.

**Power handling capability:** At least 20 watts continuous or average, at any frequency. At least 70 watts peak at resonance frequency. Over most of frequency range, at least 750 watts for 0.1 second; 190 watts for 1 second; 90 watts for 10 seconds. (To calculate acoustic power output, multiply input power by .007).

**System resonance frequency:** 45 Hz, nominal.

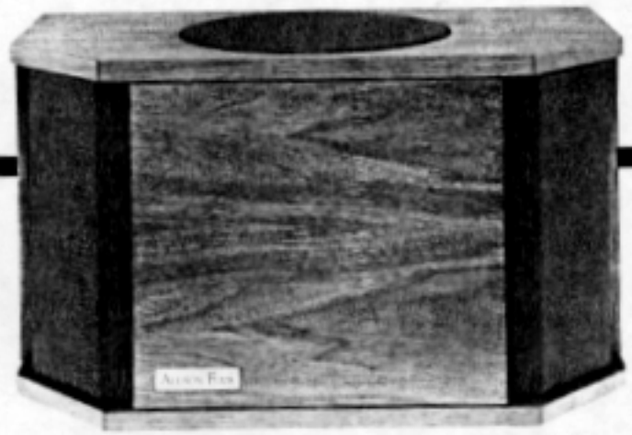
**Effective system Q:** 1.0. Low-frequency response −3 dB at 35.5 Hz, −6 dB at 29.5 Hz. Can be extended flat to 20 Hz with THE ELECTRONIC SUBWOOFER™ equalizer.

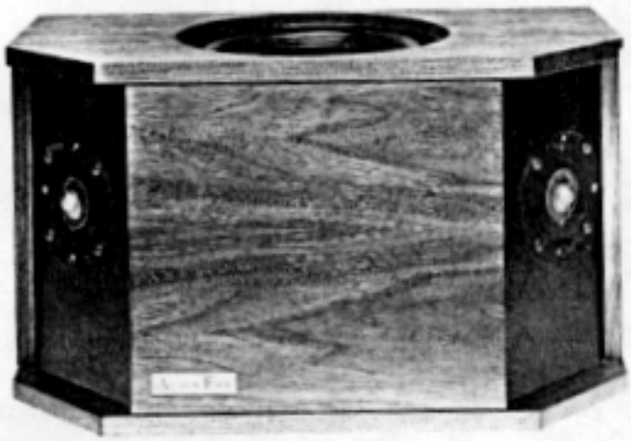
**Enclosure:** Stabilized Radiation Loading* sealed acoustic suspension design. Outside dimensions 40 inches high by 15¼ inches wide by 10 inches front to back (1.02 meters by 38.7 cm by 25.4 cm). Occupies 10⅞ inches (27.6 cm) of wall space minimum. Internal volume, 1,275 cubic inches (20.9 liters). Material: particle board veneered with walnut, oiled finish.

**Weight:** 45 lbs. (20.4 kg).

**Warranty:** Full Warranty for Five Years.

# ALLISON:FOUR





**ALLISON:FOUR, FIVE** and **SIX** loudspeaker systems are all of moderate size. They are the only "bookshelf" systems with Stabilized Radiation Loading. In uniformity of bass power delivered to a real listening room, their only peers are the larger **ALLISON®** three-way systems.

The **FOUR** is a two-way system with a single woofer and two tweeters. But its extreme low-frequency response is the same as that of the **ALLISON:TWO** system, and it is also the same in high-frequency range, smoothness, and omnidirectional dispersion in the forward hemisphere. Therefore it does not "aim" in any direction, increasing its placement flexibility.

The system should be used with its back close to a room wall and with the woofer (mounted in the top panel) radiating upward into at least 10 inches of unobstructed space. It can be put on a table or a shelf, or hung on a wall using the wall-mounting hardware supplied.

## Distortion vs. Frequency

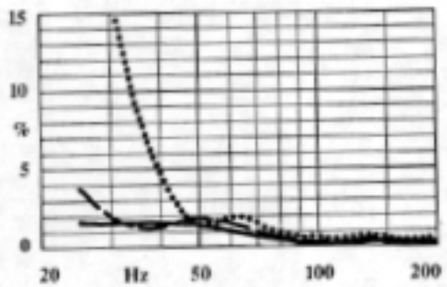
**Near-field measurements, ⅓-octave frequencies.**

——— Input 2.8 watts. Acoustic power output .02 watt. 90 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

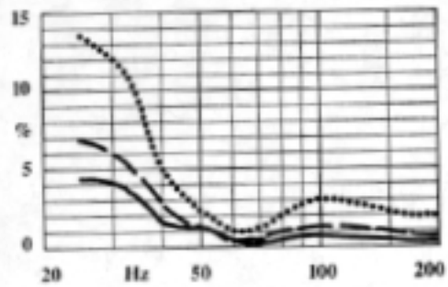
— — Input 8.75 watts. Acoustic power output .063 watt. 95 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

●●●●●● Input 35 watts. Acoustic power output 0.25 watt. 101 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

MODEL FOUR
THIRD HARM. DIST.




MODEL FOUR
SECOND HARM. DIST.




*U.S. Patent 3,983,333. Foreign patents pending or issued.
Specifications subject to change without notice.

## Specifications

**Speaker complement:** one 8-inch (20.3 cm) woofer, two 1-inch (2.5 cm) Convex Diaphragm tweeters.

**Crossover frequency:** 2 kHz.

**Crossover network:** LC quarter-section. Air-core tapped choke and polyester capacitor are used. Three-position control switch (accessible from front) supplied for selection of system acoustic power response, from nominally flat to concert-hall balance slope.

**Impedance:** 8 ohms nominal (6.5 ohms minimum in any setting of balance control).

**Efficiency:** better than 0.7% when placed with back against wall.

**Minimum amplifier power:** 30 watts per channel to produce 100 dB sound pressure level in most domestic room environments.

**Power handling capability:** At least 30 watts continuous or average, at any frequency. At least 35 watts peak at resonance frequency. Over most of frequency range, at least 680 watts for 0.1 second; 220 watts for 1 second; 110 watts for 10 seconds. (To calculate acoustic power output, multiply input power by .007).

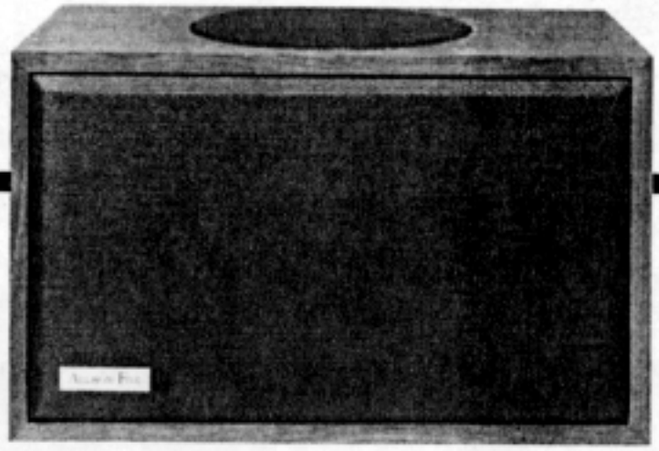
**System resonance frequency:** 52 Hz, nominal.

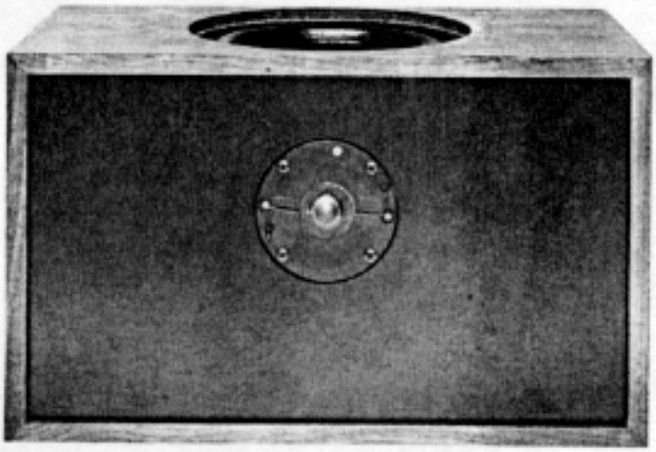
**Effective system Q:** 1.0. Power response −3 dB at 41 Hz, −6 dB at 34.5 Hz, when placed close to center of large wall. Low-frequency output increases when system is placed in typical positions with respect to side wall and floor or ceiling. Can be extended flat to 20 Hz at reasonable sound levels with **THE ELECTRONIC SUBWOOFER™** equalizer.

**Enclosure:** Stabilized Radiation Loading* sealed acoustic suspension design. Outside dimensions 11 inches high by 19⅜ inches wide by 10 inches front to back (27.9 by 49.2 by 25 cm). Internal volume, 1,265 cubic inches (20.73 liters). Material: particle board veneered with walnut, oiled finish.

**Weight:** 23½ lbs. (10.7 kg).

**Warranty:** Full Warranty for Five Years.





# ALLISON:FIVE

Introduced in 1976, the **ALLISON:FOUR** loudspeaker system established a new standard of performance for "bookshelf" systems of its size. It has still not been fully equalled. But the **ALLISON:FIVE** system now offers very nearly the same performance as the **FOUR** at a significantly lower price. Low-frequency performance is identical; Stabilized Radiation Loading design enables the systems to deliver bass power to a listening room that is essentially flat (−3 dB) to 41 Hz.

The **ALLISON:FIVE** system has a single Convex Diaphragm tweeter. With only one tweeter the cabinet is a simple rectangular shape, less costly than that of the **FOUR**. The only performance compromises are a slight reduction in high-frequency power-handling capability and slightly less high-frequency dispersion.

Balanced for use close to one room wall, the **ALLISON:FIVE** cabinet can be put on a table or a shelf, or mounted on the wall. It can be oriented with its long dimension either horizontal or vertical.

## Distortion vs. Frequency

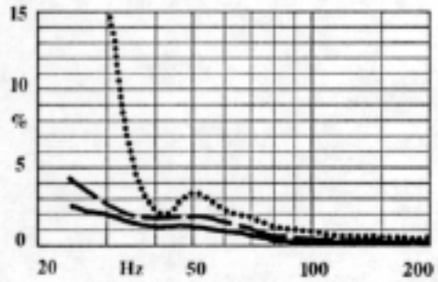
**Near-field measurements ⅓-octave frequencies.**

——— Input 2.8 watts. Acoustic power output .02 watt. 90 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

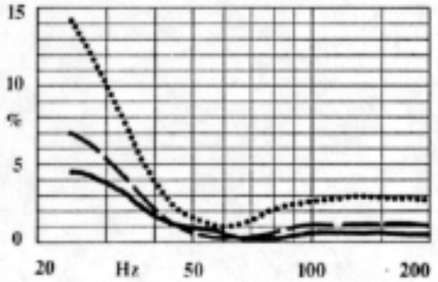
— — Input 8.75 watts. Acoustic power output .063 watt. 95 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

●●●●●● Input 35 watts. Acoustic power output 0.25 watt. 101 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

**MODEL FIVE THIRD HARM. DIST.**




**MODEL FIVE SECOND HARM. DIST.**




*U.S. Patent 3,983,333. Foreign patents pending or issued.
Specifications subject to change without notice.

## Specifications

**Speaker complement:** one 8-inch (20.3 cm) woofer, one 1-inch (2.5 cm) Convex Diaphragm tweeter.

**Crossover frequency:** 2 kHz.

**Crossover network:** LC quarter-section. Air-core choke and polyester capacitor are used. Two-position control switch (accessible from front) supplied for selection of system acoustic power response, from nominally flat to gentle HF rolloff.

**Impedance:** 4 ohms nominal (3.5 ohms minimum in any balance control setting).

**Efficiency:** better than 0.7% when placed with back against wall.

**Minimum amplifier power:** 15 watts per channel to produce 97 dB sound pressure level in most domestic room environments; 30 watts per channel for 100 dB SPL.

**Power handling capability:** At least 15 watts continuous or average, at any frequency. At least 35 watts peak at resonance frequency. Over most of frequency range, at least 350 watts for 0.1 second; 125 watts for 1 second; 60 watts for 10 seconds. (To calculate acoustic power output, multiply input power by .007).

**System resonance frequency:** 52 Hz, nominal.

**Effective system Q:** 1.0. Power response −3 dB at 41 Hz, −6 dB at 34.5 Hz, when placed close to center of large wall. Low-frequency output increases when system is placed in typical positions with respect to side wall and floor or ceiling. Can be extended flat to 20 Hz at reasonable sound levels with **THE ELECTRONIC SUBWOOFER™** equalizer.

**Enclosure:** Stabilized Radiation Loading* sealed acoustic suspension design. Outside dimensions 11 inches high by 18¼ inches wide by 10 inches front to back (27.9 by 46.4 by 25.4 cm). Internal volume, 1,265 cubic inches (20.73 liters). Material: Particle board veneered with walnut, oiled finish.

**Weight:** 21 lbs. (9.5 kg). **Warranty:** Full Warranty for Five Years.

# ALLISON:SIX

In the **ALLISON:SIX** ("Le Cube"), the Stabilized Radiation Loading design principle is carried to just about its practical limit for an 8-inch woofer. The cabinet is reduced in size to ½ cubic foot, yet the system's low-frequency output is basically flat to below 50 Hz (−3 dB at 46.5 Hz) while maintaining reasonable efficiency.

The same Convex Diaphragm tweeter as those used in all **ALLISON** loudspeaker systems is also used in the model **SIX**. Therefore it has the equivalent high-frequency range, smoothness, and wide dispersion in the forward hemisphere.

The model **SIX** is intended for use with its back close to one room wall: on a shelf, table, or bookcase, or mounted on the wall. The woofer panel can be oriented horizontally or vertically.

Because of the small cabinet size and the walnut-grain vinyl finish, the **ALLISON:SIX**'s price is substantially below that of the model **FIVE**.

### Distortion vs. Frequency

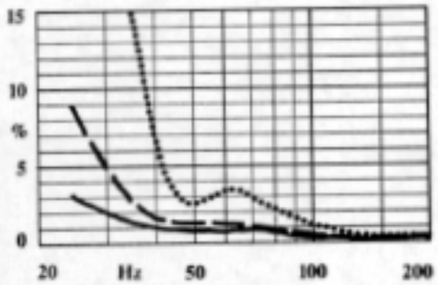
**Near-field measurements.⅓-octave frequencies.**

——— Input 2.8 watts. Acoustic power output .02 watt. 90 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

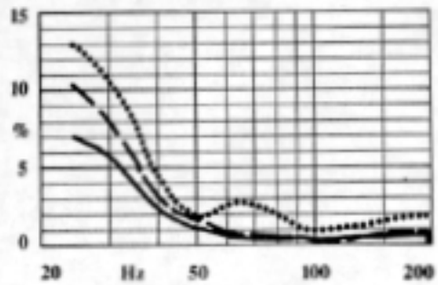
— — Input 8.75 watts. Acoustic power output .063 watt. 95 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

●●●●●● Input 35 watts. Acoustic power output 0.25 watt. 101 dB reverberant sound pressure level in 2,600 cu. ft. room from two stereo speakers.

**MODEL SIX THIRD HARM. DIST.**




**MODEL SIX SECOND HARM. DIST.**




*U. S. Patent 3,983,333. Foreign patents pending or issued. Specifications subject to change without notice.

## Specifications

**Speaker complement:** one 8-inch (20.3 cm) woofer, one 1-inch (2.5 cm) Convex Diaphragm tweeter.

**Crossover frequency:** 2 kHz.

**Crossover network:** LC quarter-section. Air-core choke and polyester capacitor are used. Two-position control switch (accessible from front) supplied for selection of system acoustic power response, from nominally flat to gentle HF rolloff.

**Impedance:** 4 ohms nominal (3.5 ohms minimum in any balance control setting).

**Efficiency:** better than 0.7% when placed with back against wall.

**Minimum amplifier power:** 15 watts per channel to produce 97 dB sound pressure level in most domestic room environments; 30 watts per channel for 100 dB SPL.

**Power handling capability:** At least 15 watts continuous or average, at any frequency. At least 35 watts peak at resonance frequency. Over most of frequency range, at least 350 watts for 0.1 second; 125 watts for 1 second; 60 watts for 10 seconds. (To calculate acoustic power output, multiply input power by .007).

**System resonance frequency:** 59 Hz, nominal.

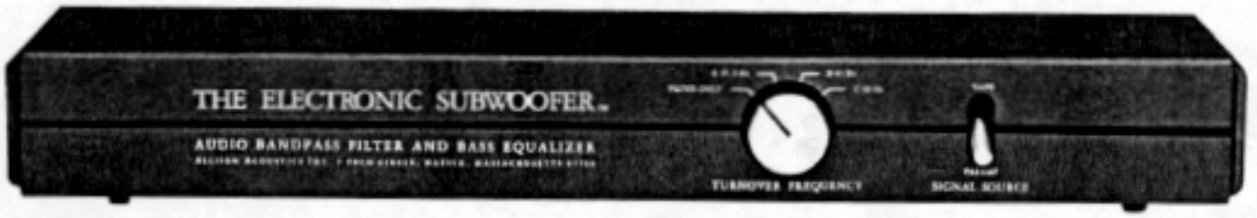
**Effective system Q:** 1.0. Power response −3 dB at 46.5 Hz, −6 dB at 39 Hz, when placed close to center of large wall. Low-frequency output increases when system is placed in typical positions with respect to side wall and floor or ceiling. Can be extended flat to below 30 Hz at moderate sound levels with **THE ELECTRONIC SUBWOOFER™** equalizer.

**Enclosure:** Stabilized Radiation Loading* sealed acoustic suspension design. Outside dimensions 11¼ inches high by 11¼ inches wide by 11¼ inches front to back (28.6 by 28.6 by 28.6 cm). Internal volume, 860 cubic inches (14.1 liters). Material: Particle board with walnut-grain vinyl; white or black lacquer finish optional.

**Weight:** 17 lbs. (7.7 kg).

**Warranty:** Full Warranty for Five Years.

# THE ELECTRONIC SUBWOOFER




## AUDIO BANDPASS FILTER AND BASS EQUALIZER

The Electronic Subwoofer (ESW) is a signal processor with two functions. First, it is an equalizer with three selectable amounts of extreme-bass boost, designed to compensate accurately for the naturally falling response of closed-box (acoustic suspension) loudspeaker systems below resonance. This compensation is exact for **ALLISON®** loudspeakers, making the over-all system acoustic power flat to 20 Hz. The ESW can be used with certain other closed-box systems as well.

Second, the ESW is a bandpass filter, attentuating system response rapidly below 20 Hz and above 20 kHz. This filter has flat output within the audio range. It can be used alone, if desired, with the selector switch in the "Filter Only" position. Response curves for the four selector-switch settings of the ESW are shown in the Specifications.

The ESW can be used between a preamp/control unit and a separate power amplifier. It can also be connected in a tape monitor loop or an EPL circuit of a preamp/control unit, an integrated amplifier, or a receiver. The ESW has a tape monitor circuit built in to replace the one it occupies if it is used in a monitor loop.

In the three equalization positions of the selector switch, low-frequency boost at 12 dB per octave is provided. The frequency at which the boost begins is adjustable, with +3-dB response points at 35.5, 41, or 48 Hz. The "A-35.5" setting is for **ALLISON: ONE** or **ALLISON:THREE** loudspeakers placed normally in an average room. It is also the proper choice for other suitable closed-box systems having resonance frequencies in the 40 to 47-Hz range.

The "B-41" position is for **ALLISON:TWO, FOUR,** and **FIVE** loudspeakers in recommended room positions, and for other high-quality closed-box systems with resonance frequencies from 48 to 56 Hz.

"C-48," the final switch position, is intended to equalize closed-box systems having resonance frequencies in the 60-Hz range (such as the **ALLISON: SIX**). It may also be the best choice for systems with lower resonance frequencies when they are used in rooms with more than normal bass energy loss because of thin walls or large areas of glass.

### LOUDSPEAKER REQUIREMENTS

The equalization curves provided in the ESW are unlike those obtainable from conventional tone controls or general-purpose equalizers. Equalization is carried down to 20 Hz, at which frequency the input to the loudspeakers is increased by 11 to 14 dB (depending on the boost curve chosen) above the level without equalization. This is a substantial boost at a very low frequency, and is suitable for application to only one kind of loudspeaker system: closed-box systems of high quality, with woofers of appreciable size and linear long-excursion capability.

Only closed-box systems have response that falls off at 12 dB per octave below resonance, and so only they are correctly equalized by the ESW. *And only closed-box systems maintain control of the woofer at very low frequencies.* Vented-box systems should not be driven hard below the box resonance. Systems of this kind—bass reflex, passive radiator, "aperiodic," transmission line, and so on—should not be used with the ESW. Neither should full-range electrostatic speakers or other panel-type radiators. SUCH SYSTEMS MAY BE SERIOUSLY DAMAGED.

Not *all* closed-box systems are capable of handling the increased power in the lowest octave caused by use of the ESW. Those of miniature size are not suitable. Inexpensive units may have woofers with limited excursion capability or small voice coils incapable of handling much power.

If there is any question as to whether or not a particular model of loudspeaker system will tolerate 14 dB of boost at 20 Hz from the ESW, the loudspeaker's manufacturer should be asked, and his recommendation followed. All Allison loudspeakers can be used with the Electronic Subwoofer system.

## Specifications

**Frequency response:** As shown by response curves. Tolerance, ±1 dB.

**Total harmonic distortion:** Less than 0.1% at any frequency from 20 to 20,000 Hz, in any switch position, at any output level up to 1.2 volts RMS.

Less than 0.1% for frequencies between 20 and 5,000 Hz, at any output level up to 3.0 volts RMS. Above 5,000 Hz, less than 0.3% at 3.0 volts RMS.

**Transient IM distortion (TIM):** Input, 3.18-kHz square wave low-pass filtered to 100 kHz (TIM 100), at 2.91 volts RMS, added to 15-kHz sine wave at 0.73 volt RMS; composite input 3.0 volts RMS. Output level also 3.0 volts RMS. Measured distortion components less than .075%.

**Signal-to-noise ratio:** Referred to 1.0 volt output, better than 80 dB unweighted; better than 93 dB A-weighted. Referred to 3.0 volts output, better than 90 dB unweighted; better than 103 dB A-weighted.

**Input impedance:** 100 kilohms, resistive, in all modes, shunted by less than 40 picofarads. If a tape machine or other device is connected to the "To Tape Rec" output jacks, its impedance will be in parallel with these values.

**Output impedance:** 470 ohms.

**Recommended load impedance:** 10 kilohms or higher. With a 10-kilohm load, output amplitude is 0.4 dB below open-circuit output. Load can be as low as 470 ohms with no change in audio-band frequency response and no increase in distortion; attenuation will be 6 dB.

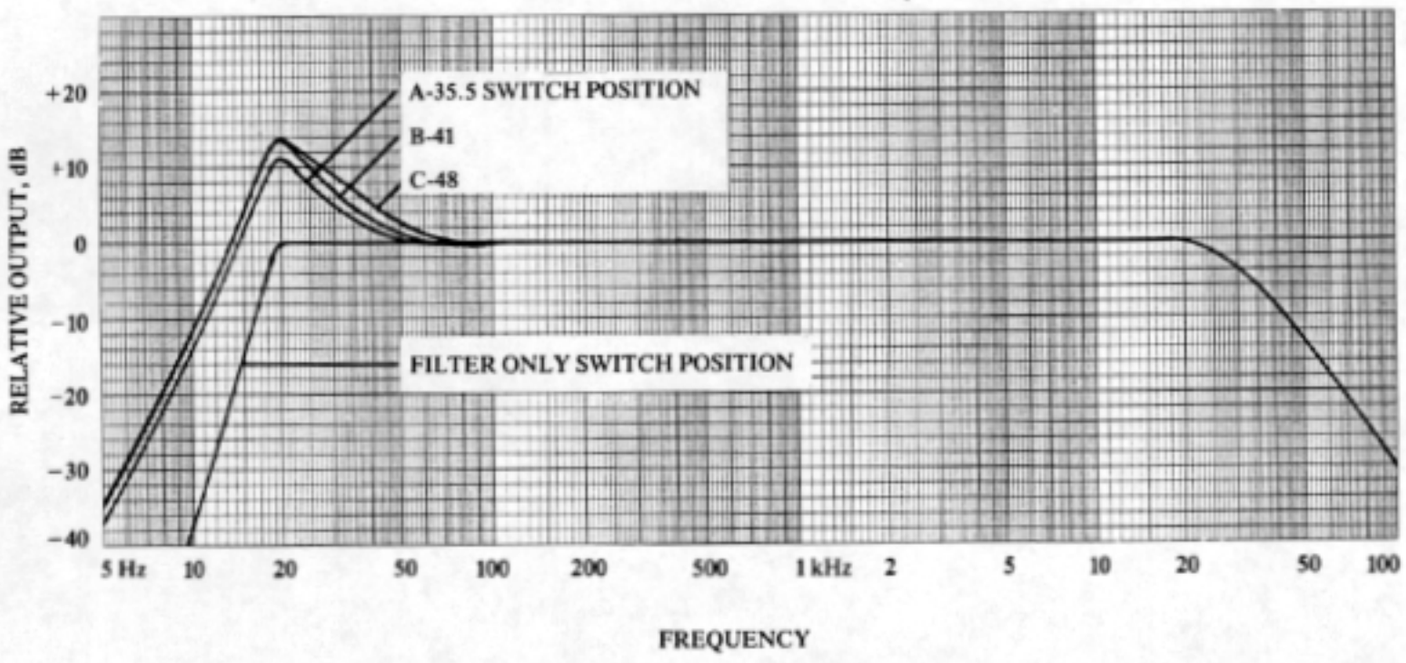
**Power requirements:** Domestic model, 110/120 volts AC, 50/60 Hz, 2 watts. Overseas model, 220/240 volts AC, 50/60 Hz, 2 watts.

**Dimensions:** 14⅜ in. long by 1¾ in. high by 4¾ in. deep, including knobs (36.5 by 4.5 by 12.1 cm). Can be installed in standard 19-inch rack with optional rack-mount adaptors, available at $15 per set.

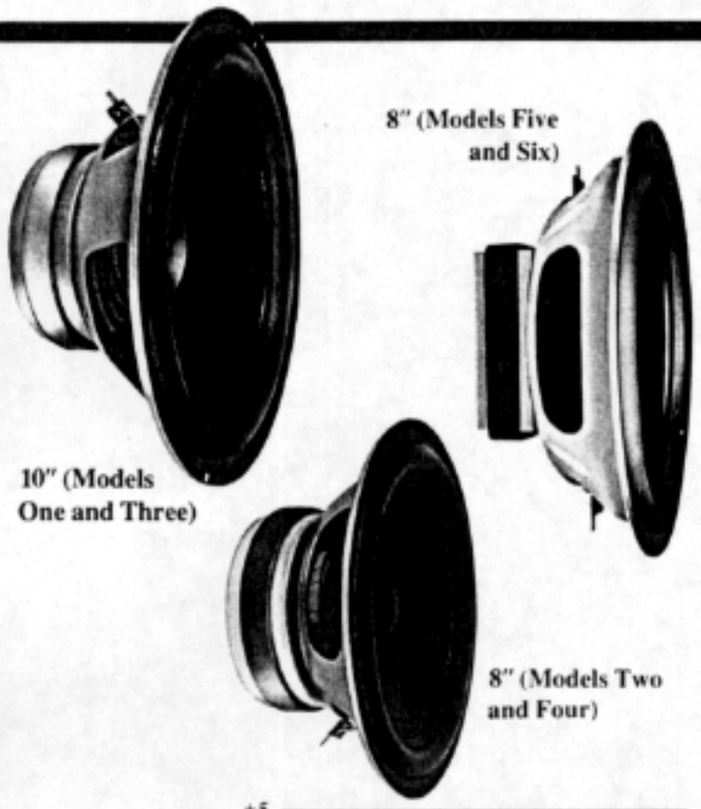
**Case:** Aluminum plate, painted charcoal gray with silver paint lettering.

**Weight:** 2 lb. 5 oz. (1.05 kilograms).

**Warranty:** Full Warranty for Five Years.



# TECHNICAL NOTES

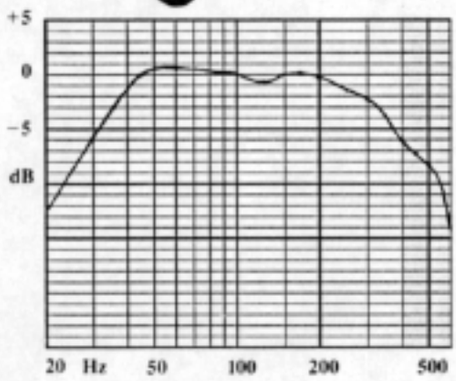



## Low Frequency Power Output

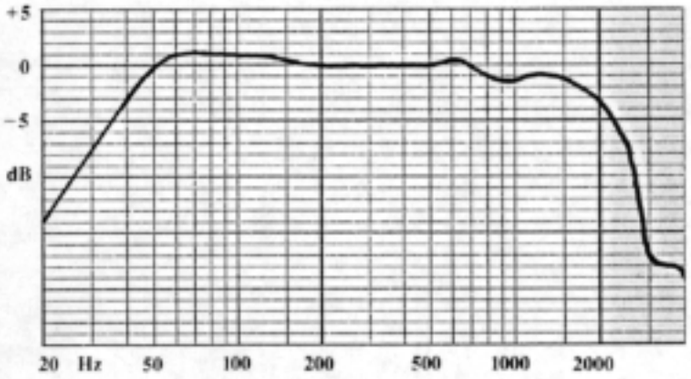
Low-frequency power output of ALLISON® loudspeaker systems in real-room environments, obtained by integrating response at all angles around the system in each case. For ALLISON:ONE and ALLISON:TWO systems, the cabinet was placed at a floor-wall intersection six feet (1.8m) from a side wall. Moving the system closer to a side wall will increase output at low frequencies. The ALLISON:THREE system was measured with the cabinet in a room corner. ALLISON:FOUR, FIVE, and SIX systems were located at the center of a large wall (with the cabinet back against the wall) for this measurement. Moving the systems closer to other room surfaces will increase the output at low frequencies.

Shaded areas shown in crossover-limited frequency regions depict typical performance but are not part of our specifications.

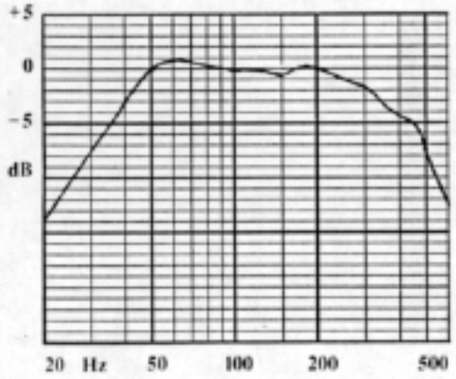
Response curves taken in anechoic chambers are invalid at low frequencies because reflective room surfaces have a major effect on the speaker's power output. The curves shown here include this effect.



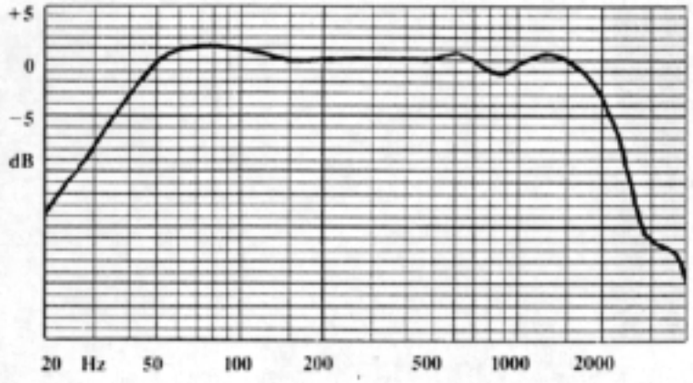

**Models One, Three**
10" (25.4 cm) Woofer




**Model Four**
8" (20.3 cm) Woofer

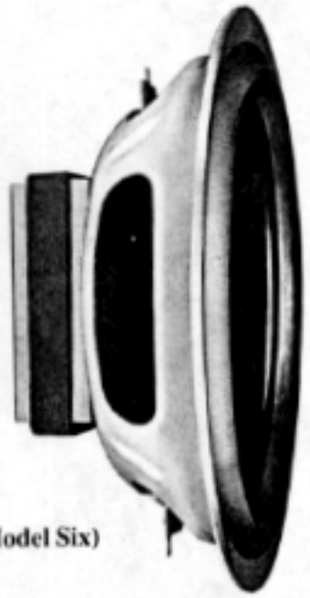



**Model Two**
8" (20.3 cm) Woofer



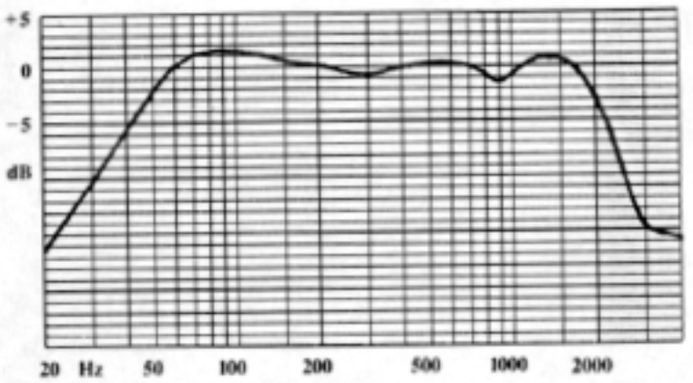

**Model Five**
8" (20.3 cm) Woofer

# TECHNICAL NOTES



8" Woofer (Model Six)

## Low Frequency Power Output




**Model Six**
**8" (20.3 cm) Woofer**

Mid-Range

Tweeter

## Middle and High Frequency Response

Direct radiation output from each of the Convex Diaphragm 3½-inch (8.9 cm) mid-range units and 1-inch (2.5 cm) tweeters in **ALLISON®** loudspeaker systems. Curves are at 15° increments from 0° (on axis) to 90° off axis (the 90° tweeter curves fall between the 60° and 75° curves). The larger angles represent larger solid-angle increments and so are more representative of radiated power than are angles closer to the axis.

Response curves are shown for each driver individually so as to eliminate interference patterns which have little to do with true power output, and which are inaudible in the reverberant field of a listening room.

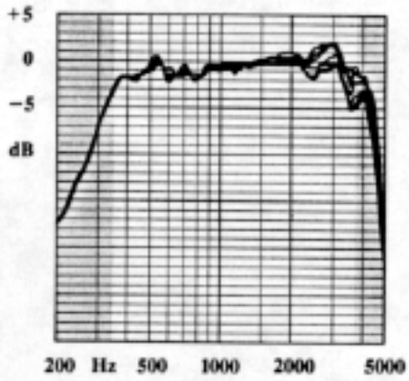
Measurement conditions: Sine-wave input signal applied through system's crossover network. Driver flush-mounted off center on baffle 1 meter square. B & K model 4135 microphone 10 in. (25.4 cm) from center of driver. Recorder paper speed 3 mm/sec. Pen writing speed 50 mm/sec.

Shaded areas in crossover-limited frequency ranges depict typical performance but are not part of our specifications.

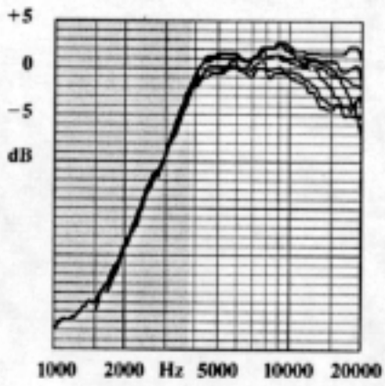
Speakers become increasingly directional at high frequencies. A family of curves taken from 0° to 90° off axis reveals the severity of this effect.

All drivers used in **ALLISON** loudspeaker systems are designed, manufactured, and tested by Allison Acoustics Inc., using proprietary materials and techniques.

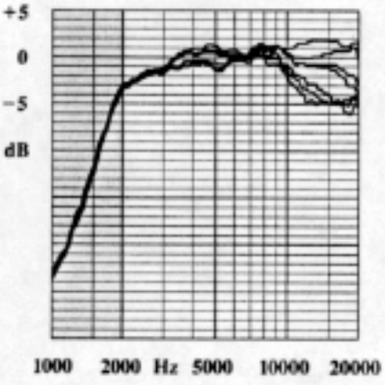
## Middle and High Frequency Response




**Models One, Two, Three**
**3½" (8.9 cm) Mid-range**




**Models One, Two, Three**
**1" (2.5 cm) Tweeter**

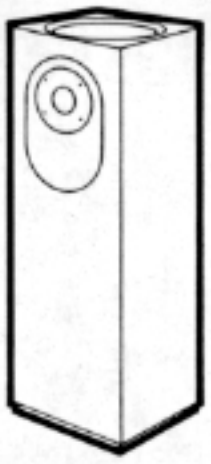



**Models Four, Five, Six**
**1" (2.5 cm) Tweeter**

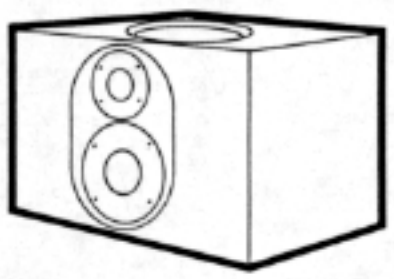
## Notes:

# SPECIFICATIONS

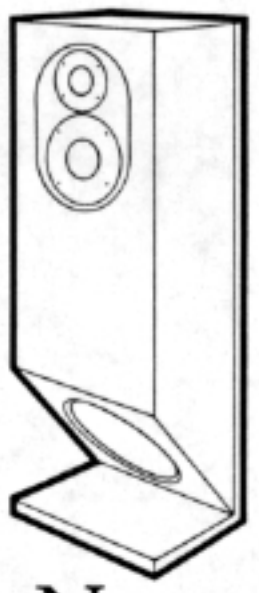
*Models One through Six are described in our main catalog, available on request.*



## SEVEN



## EIGHT



## NINE

| | SEVEN | EIGHT | NINE |
|---|---|---|---|
| ***Speaker Complement*** *(All drive units are manufactured and tested individually by Allison Acoustics)* | ***Woofer:*** *8" (20.3 cm)* ***Tweeter:*** *1" (2.5 cm) Allison Convex Diaphragm with Ferrofluid damping/cooling material* | ***Woofer:*** *8" (20.3 cm)* ***Mid-range Unit:*** *3 1/2" (8.9 cm) Allison Convex Diaphragm with Ferrofluid damping/cooling material* ***Tweeter:*** *1" (2.5 cm) Allison Convex Diaphragm with silicone damping/cooling material* | ***Woofer:*** *10" (25.4 cm)* ***Mid-range Unit:*** *3 1/2" (8.9 cm) Allison Convex Diaphragm with Ferrofluid damping/cooling material* ***Tweeter:*** *1" (2.5 cm) Allison Convex Diaphragm with silicone damping/cooling material* |
| ***Crossover Frequencies*** | *2000 Hz* | *450 Hz and 3750 Hz* | *350 Hz and 3750 Hz* |
| ***Crossover Network*** | *LC quarter-section. Air-core choke and computer-grade non-polar capacitor are used.* | *LC half-section at both crossover frequencies. Air-core chokes and non-polar computer-grade capacitors are used.* | *LC half-section at both crossover frequencies. Air-core chokes and non-polar computer-grade capacitors are used.* |
| ***Bi-Amp Connections*** | *No* | *Yes* | *Yes* |
| ***Level Controls*** | *None* | *Mid-range and Tweeter* | *Mid-range and Tweeter* |
| ***Impedance*** | *4 ohms* | *4 ohms* | *4 ohms* |
| ***Resonance Frequency*** | *52 Hz* | *52 Hz* | *45 Hz* |
| ***Low-frequency Performance*** | | | |
| ***-3 dB*** | *41 Hz* | *41 Hz* | *35.5 Hz* |
| ***-6 dB*** | *34.5 Hz* | *34.5 Hz* | *29.5 Hz* |
| ***Internal Volume*** | *1775 cu. in. (29.1 liters)* | *1700 cu. in. (27.9 liters)* | *2800 cu. in. (45.9 liters)* |
| ***Sensitivity, SPL*** | *87 dB, 1w/1m* | *87 dB, 1w/1m* | *87 dB, 1w/1m* |
| ***Amplifier Power*** | *15-150 watts per channel* | *30-200 watts per channel* | *30-200 watts per channel* |
| ***Weight*** | *22 lbs. (10 kg.)* | *29 lbs. (13.2 kg.)* | *55.5 lbs. (25.2 kg.)* |
| ***Dimensions (H x W x D)*** | *27 1/2 x 9 5/8 x 9 5/8 (70 x 24 x 24 cm)* | *12 1/4 x 20 x 10 (31 x 51 x 25 cm)* | *37 1/4 x 12 1/2 x 10 3/4 (95 x 32 x 27 cm)* |
| ***Finish*** | *Oak or Walnut* | *Oak or Walnut* | *Oak or Walnut* |
| ***Suitable for use with The Electronic Subwoofer™*** | *Yes* | *Yes* | *Yes* |
| ***Franchised Dealer*** | | | |



ALLISON ACOUSTICS INC. *Seven Tech Circle, Natick, MA 01760 USA/617-237-2670/Telex: 94 8448 ALLISON NTIK*