



# **Project K2 S9900**

## **Product Commentaries and User Guide**

Thank you for purchasing the JBL® Project K2 S9900 loudspeaker system.

Before using the system, please take the time to read through this user guide to understand this product well and also to use it properly.



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# Project K2 S9900

## PREFACE

Thank you for selecting the Project K2 S9900 loudspeaker system. It represents the culmination of extensive research and development in sound reproduction over the last half century. JBL engineers have labored to create a loudspeaker system with no acoustical or electrical limitations whatsoever. While the Project K2 S9900 is itself a new development, the goal that it achieves goes back to the earliest days of the original James B. Lansing Sound Company.

However, it is the level of your listening pleasure that ultimately determines how successful this endeavor is. To ensure a perfect listening experience, you are asked to carefully follow the setup and operation procedures outlined in this Project K2 S9900 user guide.

This manual serves several purposes. It contains all necessary background information and detailed instructions for setting up your Project K2 S9900 loudspeaker system, including unpacking the loudspeaker, selecting the correct location, speaker wire, wiring method and amplification, and connecting it to its associated electronics. This information will be found in Chapters 3 through 8. In addition, a detailed description of your Project K2 S9900 loudspeakers is included (Chapter 2) so that you may become thoroughly acquainted with the unique design and technical features.

Despite the formidable nature of the Project K2 S9900, the setup procedure for this loudspeaker system is relatively simple. Again, you are strongly urged to read this manual thoroughly before you begin, and then consult it frequently throughout the process. Certain considerations must be made in placing the speakers; their physical characteristics make it imperative that you become familiar with the entire setup process in advance.

Also, the historical and technical information included will add immeasurably to the complete enjoyment of your system. Project K2 S9900 is unparalleled in the field of sound reproduction. The story and principles behind it are an interesting, informative and fitting start to a lifetime of musical enjoyment.



## CHAPTER 1

### **Legacy – the Historical Development of the JBL Project Loudspeakers**

Of those who have sought perfection in sound reproduction, only a few have actually come close. For one thing, it is a costly process. It is rare indeed when an individual or group is able to triumph over the constraints of economic and technological realities even once.

At JBL, Inc., this has happened eight times. In each case, JBL engineers were told to build the speaker system they had always wanted to build. Whatever resources were required would be made available. Thus began an ongoing search for new frontiers in sound reproduction, beginning in the mid-1950s and continuing to the present day.

The results of this venture are now known as the JBL Project loudspeakers. Each model represents the absolute peak of every technological, material and engineering innovation available at the time, combined into a single system. They are the Hartsfield, Paragon, Project Everest DD55000, K2 S9500/7500, K2 S5500, K2 S9800, K2 S5800 and, most recently, Project Everest DD66000.

Although differing in performance details and physical attributes, all of the Project loudspeakers have shared a common objective – to elevate sound reproduction to levels defined only by the limitations of existing materials and technology. The fact that all Project speakers have many common features – despite a spread of nearly 60 years – is a testimony to the excellence of the technology and manufacturing techniques upon which the JBL brand was built. The K2 S9900 continues this trend.

### **Defining the Project Concept**

The Hartsfield began a JBL tradition that continues today. First, engineer a product as close to perfection as possible. When it reaches that level, make it better.

In 1954, the Hartsfield was significant in representing not new technology, but rather a new level of technical manufacturing, in the spirit of the approach pioneered by James B. Lansing some 20 years before. Like its Project series successors, it was a high-efficiency system incorporating compression driver technology and combining the qualities of high-output, low-distortion,

exceptional stereo imaging and fatigue-free listening. Most important, it was the first loudspeaker system available to consumers to do all this.

Project K2 S9900, one of the most advanced and sophisticated loudspeakers in the world today, is the latest expression in technology that is deeply rooted in more than 60 years of tradition. William Thomas, JBL president in 1954, described the Hartsfield as the “speaker system we have always wanted to build [with] the finest components ever made available to serious listeners.”

He went on to describe the process behind the creation of the Hartsfield: “Most people who own and appreciate fine sound reproduction equipment look forward to the day when they will be able to assemble a system without limitation in just exactly the way they think it should be done. Periodically, a manufacturer gets this same feeling.... The science of acoustics has provided us with the basic principles available to all for achieving precision reproduction. It is only a matter of incorporating these methods into a system design, and then taking every bit of trouble necessary to build a system precisely to the design.”

He added, “It isn’t easy, but that’s the way it is done.”

The Ranger-Paragon, the second JBL Project system, was the first serious attempt at a reflecting speaker system, and broke ground in the new concept of stereo imaging. Basically two independent full-range speaker systems installed in a handsome, curved cabinet nearly 9 feet (2.7 meters) long, the Paragon’s enclosure was treated as an extension of its transducers. In essence, the system had its own “built-in acoustics.” In many respects, the Paragon anticipated loudspeaker developments that would occur years, and even decades, later. This “built-in acoustics” concept is present in the Project K2 S9900.

For nearly 30 years, the Paragon, along with the Hartsfield, remained among the most sought-after speakers in the world. In 1986, a new Project system was introduced that retained the Paragon’s overall sense of musicality while upgrading its character by incorporating three decades’ worth of continuous development in every facet of its design. Its name – Project Everest – reflected the pinnacle of achievement it represented. This was the original Project Everest DD55000.



## Project K2 S9900

For the first time, the rest of the sound reproduction chain – and not the loudspeaker or its transducers – would impose limits on overall system performance. Like the Paragon and Hartsfield, the K2 S9900 was built around compression driver technology and addressed a more refined stereo image than was previously considered technically feasible.

Since the original Project Everest was introduced, sound recording and playback technology has undergone a revolution of its own. With the advent of the CD, extremely demanding recorded signals became the rule rather than the exception; the typical source material used by the average audio enthusiast was superior to the best demonstration material of even just a few years prior. In overall dynamics and transient response, transducers became once again a potentially weak link in the high-end audio reproduction chain.

It was in this environment that JBL engineers set out to create the fourth and fifth Project loudspeakers, K2 S9500 and K2 S5500. As with the Hartsfield, the simplicity of a two-way system was considered the most promising design track. Advances in transducer design and low-frequency alignment would make possible the construction of a two-way system of unprecedented physical and acoustical scale. JBL engineers took the core components – the low- and high-frequency drivers – and optimized them by redesigning their magnetic structures, diaphragms and framework for greater linearity, dynamic capability and transient response.

In the years following the introduction of the K2 S9500 and K2 S5500, sound reproduction technology underwent another series of revolutionary changes, with the introduction of DVD-Video, Dolby® Digital, DTS®, DVD-Audio and Super Audio CD (SACD™) media. Frequency responses to 50kHz, as well as three-digit dynamic range and signal-to-noise ratios, have now become commonplace. In order to faithfully reproduce such robust sonic properties, the loudspeaker needed to undergo drastic improvements to its transducer, network and enclosure technologies.

The K2 S9800 employed a three-way design, incorporating an ultrahigh-frequency (UHF) compression driver and horn to reproduce high frequencies up to 50kHz. With the UHF driver handling the higher frequencies, the high-frequency (HF) transducer could then be upgraded to a new design using a 3-inch (75mm) diaphragm for better reproduction of lower frequencies and to blend better with the woofer than the older-generation 2-inch (50mm)

diaphragm did. Both compression drivers utilized newly developed beryllium diaphragms to provide the lowest distortion and flattest frequency response possible.

In order to re-create the extremely high dynamic range provided by today's audio sources, a brand-new low-frequency transducer was developed from the ground up, utilizing an alnico magnet, a 4-inch (100mm) edge-wound voice coil, and a 15-inch (380mm) cone. Extensive computer-aided engineering and design effort were necessary to develop the optimized port tuning used in Project K2 S9800, and has resulted in a significant advance in the concept of state-of-the-art acoustic reproduction. As a result of the K2® efforts, a speaker system with higher sensitivity and a wider dynamic range became a reality without power compression or distortion, even at extremely high drive levels.

The K2 S9900 continues the tradition of the K2 S9800 and also incorporates key design elements from the DD66000. Despite its 21st century power and sophistication, Project K2 S9900 is a synthesis of tradition and technology. It reflects the design, material, engineering and manufacturing expertise developed and refined through nearly six decades of experience that are the exclusive legacy of one loudspeaker brand – JBL.

## CHAPTER 2

### The Project K2 S9900 Loudspeaker – a Triumph in Acoustics and Technology

The following sections describe the primary features and components of the Project K2 S9900 loudspeaker system.

The basic system configuration is what has been referred to historically as an augmented two-way. In the 1950s and 1960s, JBL engineers primarily built two-way systems with a 12- or 15-inch (300mm or 380mm) woofer crossed over to a large-format compression driver/horn combination. Some of the systems would be “augmented” by a UHF device, usually the 075 ring radiator which would operate above 8kHz. These systems would have only a single crossover point in the middle of the audio range, to minimize any sonic degradation caused by the dividing network. The K2 S9900 has a single midrange crossover at 900Hz, blending one 1500AL-1 woofer to the 476Mg compression driver and horn combination. The 045Be-1 UHF driver is brought in at 15kHz to cover 2 octaves of ultrasonic frequencies. Above 900Hz, the HF compression driver and horn combination operates unassisted, all the way to 20kHz (Fig. 1).

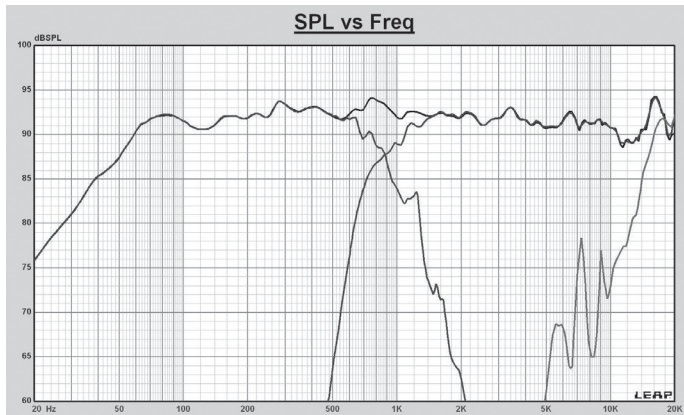


Figure 1. On-axis response of the K2 S9900 system and of each of the transducers through its crossover network (2.83V @ 1m).

The transducers, horns and crossover networks are housed in a visually stunning enclosure that is reminiscent of both the DD66000 and K2 S9800 systems. The specially curved baffle provides the sidewalls for the main horn. The top and bottom horn flares are accomplished by the attachment of precision-molded SonoGlass® horn “lips” to the upper enclosure surface. The UHF driver is mounted to a SonoGlass horn which is itself mounted to the back of the die-cast aluminum housing.

The entire enclosure is constructed with 1-inch (25mm) MDF. The complex bracing is used to precisely hold the curved panels in exactly the correct shape, allowing exceptional fit and consistency.

The woofer baffle is 1-inch thick and is tied into perimeter bracing, constituting an extremely rigid and secure structure. A painted outer baffle is then applied, surrounding the woofer frame, giving the total combined woofer baffle a thickness of 1-3/4 inch (45mm). The outer baffle is removable to enable repair or replacement of the painted surface, should that ever be necessary.

The system is ported on the rear with a tuning frequency of 35Hz. A large 4-inch (100mm)-diameter flared port is combined with the input connections on a massive die-cast aluminum structure. The entire enclosure rests on four stainless-steel foot assemblies. Stainless-steel coasters are included to protect wood and tile floors from damage from the spike feet. The grille assembly is constructed of fiberglass-reinforced ABS to provide the curved shape. The grille is securely attached to the enclosure with metal pins and rubber cups.

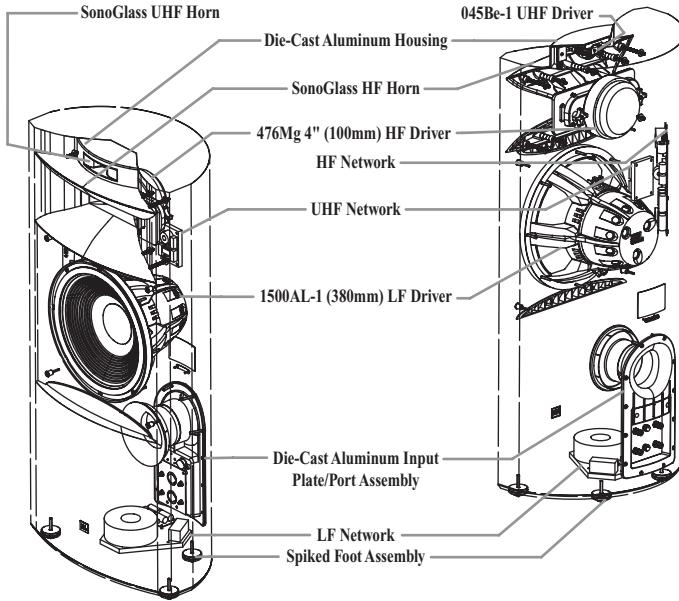


Figure 2.

The 1500AL-1 and 476Mg are both designed to be absolute-minimum-distortion drive units. Although they are capable of tremendous acoustic output, they are designed to be completely linear in every way, up to a reasonable drive level. This enables the system to sound the same, regardless of playback level.

## *TRANSDUCERS*

### **The 1500AL-1 Low-Frequency Driver**

The 1500AL-1 low-frequency driver is very similar to the 1500AL used in the K2 S9800 system. The voice coil length has been increased to 25.4mm (from 20.3mm) and its milling width has been reduced slightly. This was done to allow greater clearance from the outer diameter of the coil to the laminated top plate and to provide a larger surface area of coil surface for heat dissipation. The coil former perforations have been eliminated to allow greater forced convection cooling from the pumping action of the diaphragm assembly. These coil improvements allow the 1500AL-1 to handle up to 25 percent more power than the 1500AL (Fig. 3).

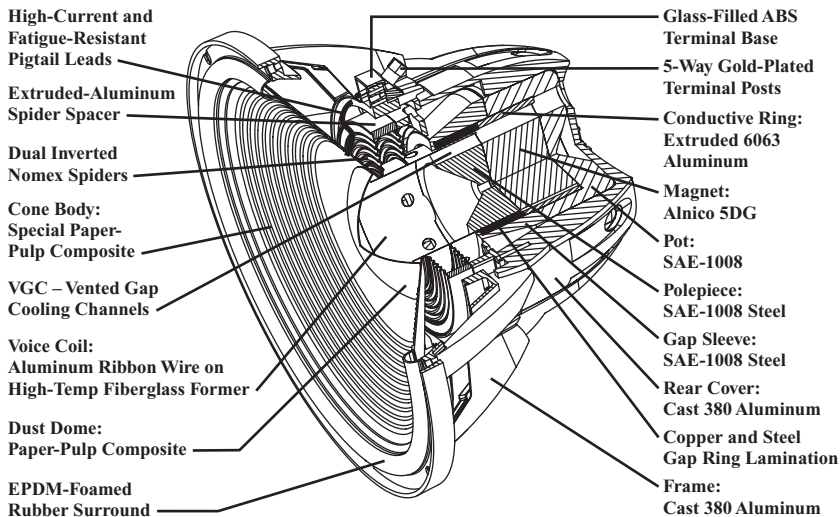


Figure 3. 1500AL-1 section view.

The 1500AL-1 low-frequency driver is a 15-inch (380mm)-diameter device with a 4-inch (100mm) voice coil completely immersed in a radial field generated by an alnico 5DG magnet. Alnico was chosen because of its stable operating point. This material is insensitive to temperature changes and back EMF from the coil. JBL engineers have overcome the tendency of alnico to demagnetize with high drive, by utilizing a massive shorting ring at the base of the motor assembly. The top plate is constructed of alternating copper-steel laminations. The presence of the copper rings linearizes the magnetic properties of the gap to all but eliminate eddy current distortion.

The outer suspension is made of EPDM-foamed rubber, which has the longevity and frequency response characteristics of traditional rubber surrounds, but with a low density very close to that of foam surrounds. Low-loss EPDM material was chosen so that the transient detail of musical signals could be preserved. Dual inverted Nomex® spiders are employed for the cancellation of even-order distortion components. All suspension elements are tailored for maximum mechanical displacement linearity.

The cone consists of a special layered paper-pulp matrix with proprietary Aquaplas damping, which offers more piston-like behavior throughout the woofer's operating bandwidth, and controlled cone breakup beyond it.

A thick-wall, cast-aluminum frame is used to rigidly support the motor structure. This fully vented frame and motor design also serves to minimize the back pressure under the dome and spider, helping to reduce harmonic distortion to even lower levels. Proprietary JBL Vented Gap Cooling™ (VGC) is incorporated within the motor structure, and lowers the operating temperature of the coil during moments of high-power operation.

All together, these design factors provide reduced harmonic distortions at very low and very high acoustic output, improved power handling, reduced power compression and more consistent spectral balance, with varying input drive level.

### 476Mg High-Frequency Compression Driver and Bi-Radial® Horn

The 476Mg high-frequency compression driver makes use of a 4-inch (100mm)-diameter, magnesium-alloy diaphragm with a 4-inch (100mm) aluminum edge-wound coil, operating into the JBL existing rapid-flare-type, coherent-wave phasing plug. The use of an efficient neodymium rare-earth motor structure with a new copper-sleeved polepiece maintains maximum gap flux and reduced coil inductance at a minimal size and weight. The combination of these features has resulted in a driver that can deliver superior sound quality, regardless of acoustic power output, with very little distortion and power compression (Fig. 4).

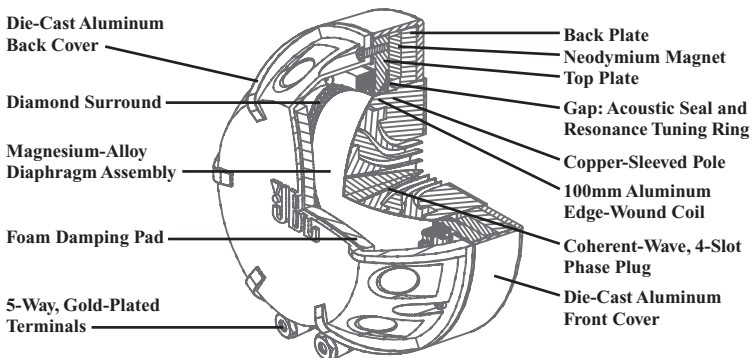


Figure 4. 476Mg section view.

A high-purity copper sleeve is used for the polepiece. This greatly improves the electrical conductivity of the copper sleeve for lower coil inductance and thus greater high-frequency output at 15kHz and above. The copper-sleeved pole quickly wicks away heat generated by the coil, thereby contributing to a reduction in dynamic power compression. To compensate for the higher resistance caused by the use of a copper-sleeved polepiece, a large magnet area has been used, in conjunction with special high-grade and high-temperature-grade neodymium.

The phasing plug is a traditional JBL rapid-flare, coherent-wave four-slot design. This coherent-wave design shapes the wave output, producing a truly coincident wave front as the sound enters the Bi-Radial horn. The diaphragm is formed of magnesium-alloy foil and is the first JBL large-format 100mm compression driver to use this special material. Magnesium alloy is essentially 95 percent pure magnesium with small percentages of aluminum, zinc and other alloys added to improve characteristics such as diaphragm forming, fatigue strength, corrosive and acoustic properties. A proprietary thermal process is used to form the thin sheets of magnesium alloy into the 100mm diaphragm shape of exacting dimensions. This new process even enables the integrated JBL Diamond surround to be formed as one piece with the dome. Forming the diaphragms out of sheets of this magnesium-alloy foil yields greater reliability and resistance against fatigue and corrosive failures than diaphragms formed with 100 percent pure magnesium or aluminum.

Magnesium has very low density, slightly lower than even that of beryllium. With such a low density, the thickness of the magnesium-alloy diaphragm could be greatly increased while still maintaining an equivalent diaphragm mass of approximately 3.4 grams, similar to previous designs using aluminum and titanium. Based on this, the new magnesium-alloy diaphragm was increased to 130 micron, about 1.7 times thicker than the standard 76-micron-thick aluminum diaphragm. When compared to the titanium diaphragm used in the original K2 S9500 and M9500 systems, this new magnesium-alloy diaphragm is 2.5 times thicker. This is beneficial because a thicker diaphragm creates a much stiffer diaphragm, which pushes piston behavior to higher frequencies than current aluminum or titanium diaphragms (given the same moving mass). Better piston behavior means less diaphragm modal breakup at the critical mid-band frequencies, and so the upper frequency response will be smoother with minimal distortion spikes. The effects of this will be less distortion, and improved and extended frequency response (Fig. 5).



Another benefit of the magnesium alloy is the greater internal loss, or damping, when compared to titanium or even aluminum. This greater internal loss quickly minimizes the amplitude of resonances when the diaphragm is asked to reproduce frequencies beyond its pistonic limit. To further augment this damping, a very light application of JBL Aquaplas is also used. Combining the greater internal loss with the stiffer characteristics of the thicker, low-density material, this new 100mm magnesium-alloy dome sonically performs close to the beryllium diaphragm used in the 476Be high-frequency Project Everest drive unit, but at a fraction of the cost. In the end, careful optimization of this new magnesium-alloy diaphragm's characteristics, along with the application of Aquaplas damping, has maintained the enhanced detail of musical transients and microdynamic nuances to which JBL listeners have become accustomed.

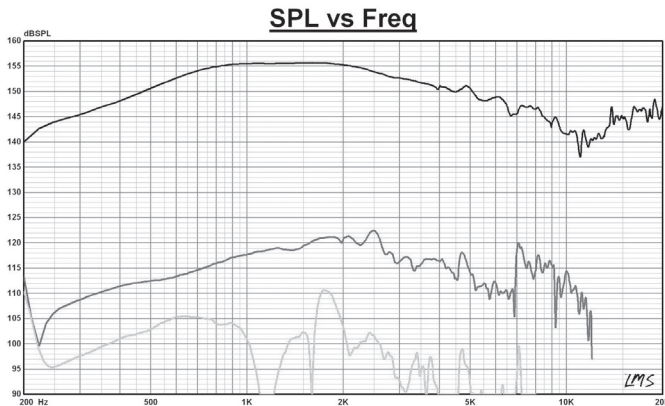


Figure 5. Terminated tube measurement of 476Mg with distortion products. The measurement was made with 7.5V applied to the driver. This equates to about 120dB @ 1m when mounted in the system.

## 045Be-1 Ultrahigh-Frequency Compression Driver and Bi-Radial Horn

Like the original 045Be, the 045Be-1 uses a 1-inch (25mm) beryllium diaphragm and 2-inch (50mm) neodymium magnetic structure. The pure-beryllium diaphragm is less than 0.04mm thick and has a mass of only 0.1 gram. The single-layer aluminum-ribbon voice coil is wound without a former and is attached directly to the diaphragm. The driver employs the smallest annular-slit phasing plug that JBL engineers have ever designed. The 045Be-1 has been designed to improve manufacturing yield and consistency. Small changes have



been made to the top plate, and some significant improvements were made to the surround shape and clamping methodology. As a result, the driver has picked up nearly 5dB of increased output above 30kHz. A section view of the 045Be-1 driver is shown in Figure 6.

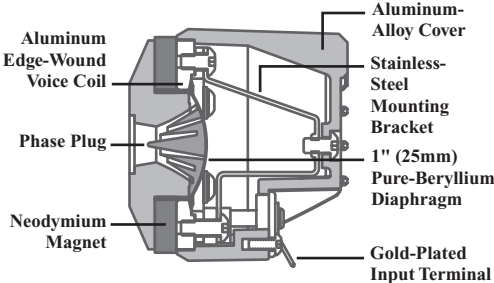


Figure 6. 045Be-1 section view.

The extremely low mass of the moving system, high magnetic-flux density and high rigidity of beryllium produce response that is very smooth from below 8kHz to beyond 50kHz.

The response curve has a slight downhill tilt, due to the constant-directivity nature of the horn used in this system. The Bi-Radial horn is properly scaled to maintain a coverage angle of 60 degrees in the horizontal plane and 30 degrees in the vertical plane over the frequency interval from 10kHz to 50kHz.

## Internal Crossover Network

The circuit topology, combined with the acoustic behavior of the 1500AL-1 and 476Mg, provides a 24dB-per-octave transition at 900Hz. This is the primary crossover point of the system. Additionally, the 045Be-1 is turned on above 15kHz to provide extended response to beyond 50kHz.

All of the electrical components are of the highest quality and exhibit the lowest internal loss. The inductors used are “air core” so as not to introduce nonlinear hysteresis effects. Capacitors are constructed using polypropylene foil, which is known for having minimal distortion caused by dielectric absorption nonlinearities. The low-, high- and ultrahigh-frequency networks employ battery bias to operate the capacitors effectively in a Class A mode. Every attempt is made to present as smooth a system impedance as possible to the driving amplifier. This design element is often overlooked in many loudspeaker systems, yet amplifiers work their best when they are given smooth, level load impedance in which to deliver current (Fig. 7).

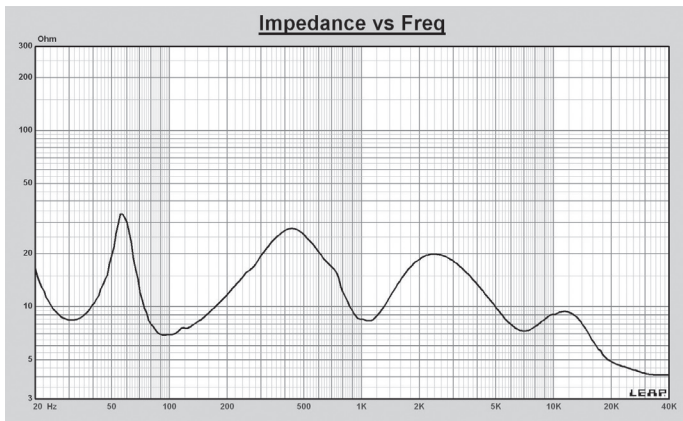


Figure 7. K2 S9900 system impedance.

The aggregate of these attributes allows the K2 S9900 system to translate the electrical signal from source material into an accurate and unencumbered three-dimensional sound field. The system can do this at any desired listening level, from whisper-quiet to big-band loud, while at the same time maintaining unchanged acoustic characteristics.



## CHAPTER 3

### Unpacking the Project K2 S9900 System

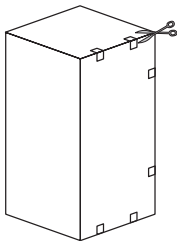
All components of the K2 S9900 system have been very carefully packed for maximum protection against damage. As with any superior audio product, it is advisable to keep the original packing materials, in case it is necessary to transport the Project K2 S9900 system. Because of the bulk and weight of this loudspeaker, it is recommended that at least two people unpack it in the following manner. Stainless-steel round feet are installed on the bottom of the speaker cabinet. In order to avoid damage to the floor, unpacking on a well-protected surface, such as a thick carpet or cardboard, is strongly advised. (Your loudspeaker system is packed with protective wrapping, but this is omitted in drawings below.)

I. With a knife, carefully cut the tape securing the carton. Tape cutting is required on only three of the four sides of the front flap.

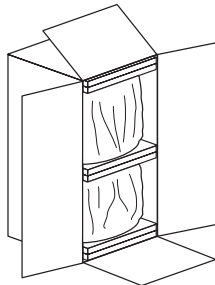
II. Open the flaps and remove the two side filler sleeves by pulling them straight forward.

III. Step on the lower flap and carefully rock the system and packing back and forth. Pull outward while doing this, and the system and packing can be “walked” out of the carton. It helps to have a second person hold the carton steady from the back side.

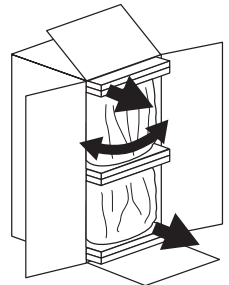
I.



II.



III.



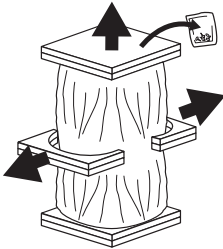


IV. Once out of the carton, remove the upper and middle pads. Accessories are packed on the top side of the upper end pad, so be careful not to discard them.

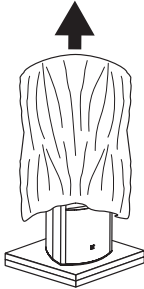
V. Carefully remove the cloth bag covering the enclosure.

VI. Lift the enclosure out of the bottom pad. It helps to remove the grille and use the port opening and top edge of the baffle recess as holding points. **DO NOT LIFT THE SYSTEM BY THE HORN LIP.**

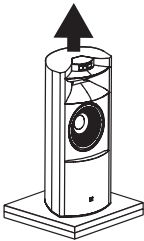
IV.



V.



VI.



Products are shipped with round-tipped spikes on the bottom of the cabinet. If you would like to use pinpoint spikes, remove round-tipped spikes and replace them with pinpoint spikes. In case they are difficult to loosen, please use an 11/16-inch (18mm) wrench.

Four metal coasters are also provided. These are to be placed between the foot and the floor, should further protection of the floor coverings be required.

## CHAPTER 4

### Selecting Cable

Speaker wire and interconnecting cables are important components in any audio system. With a system such as the K2 S9900, they assume a new level of importance.

The K2 S9900 loudspeakers are internally wired with high-quality oxygen-free copper cables. The same care that was given to the selection of the internal system wiring should be afforded to the selection and application of the cables that will connect the K2 S9900 loudspeakers to other system components.

It is advisable to use high-quality wire and to select the highest grade wire available from the manufacturer. Many manufacturers produce audiophile cables which are worth considering for the K2 S9900. As with all electronics and associated components, however, every manufacturer offers products of varying quality to suit a range of budgets and applications. Using an audiophile-quality speaker wire of not less than 16-gauge for connections of up to 15 feet (5 meters) is recommended as a minimum requirement. K2 S9900 specialist dealers have the experience and knowledge to recommend suitable speaker wire to best complement a particular system. For maximum signal purity, it is advisable to place the amplifier(s) as close as possible to the loudspeakers, even if this means that a longer distance will be needed between the amplifier(s) and preamplifier.

The left and right speaker/amplifier connections should be the same length. If the distance between one speaker and the amplifier(s) is greater than the other speaker and amplifier(s), use the longer length of wire for both connections. For bi-wire connections, the same type of wires may be used for both low-frequency and high-frequency sections to reduce wire effects (resistance, inductance, etc.) and to avoid intermodulation of low and high frequencies in the wires. Specialized wires for low-frequency and high-frequency sections may yield excellent results. Whatever wires are used, be sure that the low-frequency wires are as short as possible, and the left and right wires for each section are the same length.

To ensure a secure connection, Y- or U-type plugs are recommended.





## CHAPTER 5

### Amplifier Recommendations

No single type of amplifier is specified for use with the Project K2 S9900 system. The speakers are highly efficient and will operate adequately with an amplifier or receiver of 70–100 watts.

However, the transient response and audio definition of a high-end system such as the K2 S9900 will pick up all the inefficiencies and distortion in an amplifier system. For full-range operation, the Project K2 S9900 system should not be used with an amplifier/receiver of less than 100 watts. High-quality amplifiers/receivers of 100–500 watts will ensure optimal system performance. There is no effective limit to the power handling capabilities of the Project K2 S9900 loudspeakers when driven by consumer audio amplifiers. No damage will occur when used with high-powered components. Source impedance is an important criterion in selecting an appropriate unit; the selected amplifier(s) should have a very high current capacity and must be capable of driving a low-impedance load.

For bi-wiring or bi-amplification applications, four identical amplifiers or two dual-channel units may be used, although specialized low-frequency and high-frequency amplifiers offer clear advantages. (If four amplifier channels are used, the high-frequency amplifier may be up to 6dB less powerful than the low-frequency amplifier. Due to the power-versus-frequency distribution of the music, the low-frequency section requires approximately four times the power of the high-frequency section.)

Project K2 S9900 dealers can recommend amplification to best suit individual needs. In all cases, the left and right amplifiers for each section must be identical. Make sure that the input sensitivity of the two amplifiers is equal or that input level controls are provided to maintain the proper low to mid/high balance. If two identical stereo amplifiers are chosen, each amplifier may be located near a loudspeaker and drive low-frequency and high-frequency sections through short wire runs.

A separate crossover network (not included) can be connected directly to the low- and high-frequency amplifiers driving this system, and is required if the system is to be bi-amplified, although this is not recommended for the K2 S9900 system.



## CHAPTER 6

### Placement and Setup Considerations

The Project K2 S9900 loudspeaker system is designed to be less affected by room acoustics than conventional imaging systems. However, it is still sensitive to overall symmetry and proximity to walls, ceilings and corners.

Ideally, any listening room should contain a combination of live surfaces (e.g., walls and windows) and absorbent surfaces (e.g., drapes, carpets, upholstery). If the distance between the floor and ceiling is minimal, it is preferable that one surface has an absorbent covering. With Project K2 S9900, it is very important to be able to accommodate the optimal listening area that is defined by the 100-degree horizontal/60-degree vertical coverage pattern of the horn.

In order to obtain the best stereo effect, the speakers should be placed at an equal distance from the listening position.

- The distances to the right and left speakers are determined by the relationship between the distance from the listening position to the speakers and the angles of the speakers. The imaging qualities enable the speakers to be placed relatively far apart from each other, but this weakens center imaging, such as vocals. Increasing the inward angle of the speakers toward the listener will improve the center imaging.
- The listener should be centered in front of the speakers, and furniture should be of an appropriate height so that when the listener is sitting, the ear level is about the same height as the high-frequency horn (approximately 36-inch/90cm), as illustrated below.

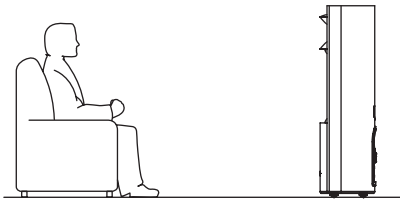


Figure 8.

- The surrounding environment for the speakers affects bass quality. Placing the speakers closer to the wall behind them or to the side walls will result in an abundance of bass, but placing them too close will result in dull bass. On the other hand, too much distance will reduce the bass output but result in fast and sharp bass. The low-frequency alignment feature enables placing the speakers near (or even in) a corner without producing an overabundance of bass. This corner placement allows optimal performance, even in small rooms. Find the most suitable location by using various source materials.
- The floor at the location selected for setting the K2 S9900 speakers must be capable of supporting a load of 180 pounds. Because of the coupling effect of the stainless-steel feet, a flat, hard surface such as wood or linoleum is preferable. However, the design of the loudspeakers' coupling system, along with the speakers' substantial weight, should result in excellent performance on any surface, even on carpets. To prevent indentations on wood or linoleum floors caused by the weight of the loudspeakers, always utilize the enclosed coasters. Be sure to use the coasters on tile surfaces to prevent cracking.

## CHAPTER 7

### Project K2 S9900 Switch Operations

In addition to the input binding posts and connecting straps on the die-cast input plate, the K2 S9900 has two level-adjustment controls, a bi-amp switch and a 9V battery for biasing the signal capacitors. The battery is mounted under an access cover which is held in place by two Phillips-head screws.

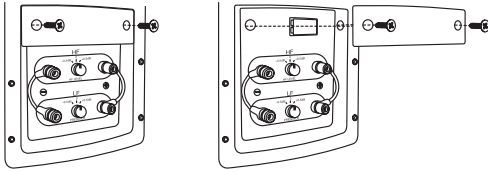


Figure 9.

### HF Level

This switch adjusts the attenuation applied to the 476Mg (high-frequency unit) by approximately 0.5dB over the range of 1,000Hz to about 15,000Hz. Midrange and high-frequency sounds become softer by reducing the level and stronger by increasing the level. This action is accomplished by trimming the main attenuation resistors. No additional parts are inserted in the signal path and there is no sonic deterioration caused by use of the control (Fig. 10).

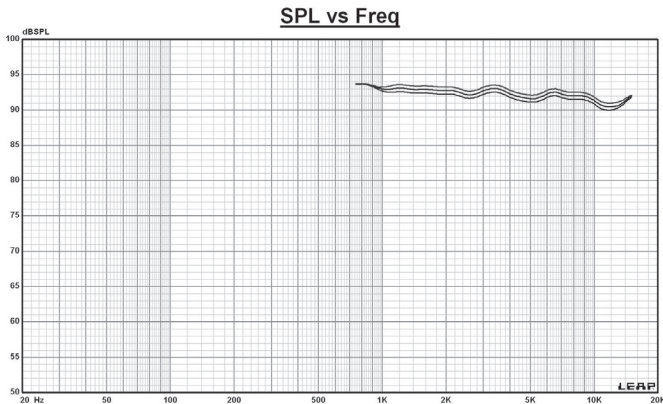


Figure 10. Adjustment range of the high-frequency level control. Upper band indicates +0.5dB and lower band indicates -0.5dB.



## Presence Level

This switch adjusts the attenuation applied to the 476Mg driver by approximately 0.3dB over the range of 1,500Hz to 3,000Hz. The vocal presence range is made softer by reducing the level and stronger by increasing the level. This action is accomplished by trimming attenuation resistors. No additional parts are inserted in the signal path and there is no sonic deterioration caused by use of the control (Fig. 11).

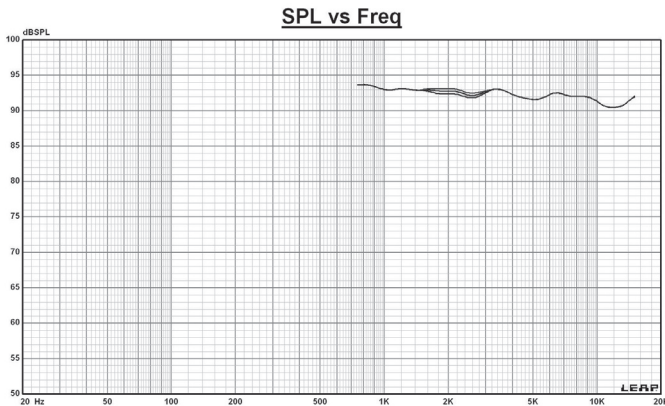


Figure 11. Adjustment range of the presence-level control. Upper band indicates +0.5dB and lower band indicates -0.5dB.

## Bi-Amp Switch

The bi-amp switch is located under the battery access cover and allows the system to be set up for the use of an external low-level crossover. This switch removes the passive components in the low- and high-frequency networks that have to do with the actual crossover blending of the low-frequency and high-frequency transducers. Level attenuation and equalization circuits remain active. In the case of the K2 S9900, the voltage drive required from an external crossover network is very unusual and, in most cases, is not likely to be achievable with standard crossover networks. It is for this reason that active bi-amplification of the K2 S9900 is not advised (Fig. 12).

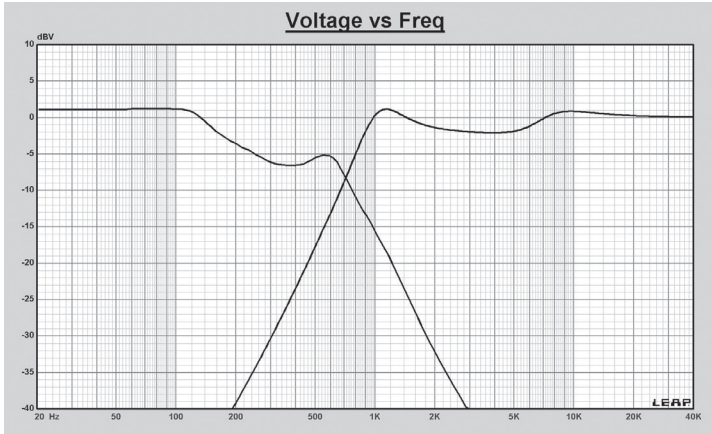


Figure 12. Required voltage drive function from an external electronic crossover for bi-amplification of a K2 S9900 system.

## Battery Installation

The network of this system utilizes the proprietary JBL “charge-couple method” to activate capacitors by applying DC bias using battery power; this eliminates unwanted distortions. Please refer to procedures below and install the supplied battery in the battery holder.

### Battery Installation Procedures:

1. Remove the battery access cover that is located above the input binding posts. Use a small- or medium-tip Phillips screwdriver. Refer to Figure 9.
2. Remove the packaging film from the battery, and place the battery into the holder. The connector is the snap type and has polarities. Snap the battery down after making sure that the polarity orientation is correct.
3. Reinstall the access cover. Only 006P rectangular 9V alkaline batteries may be used. This battery can be easily found at electronic/appliance stores and convenience stores.

### Please Note:

- Bias is applied to reduce distortion from the components. In the event of a flat battery, there is no effect on the network circuitry, and there is no symptom (e.g., no sound or intermittent sound from the system). However, you will notice an effect on the level of distortion reduction in the bias network circuitry after new batteries are installed. The batteries provide a voltage bias

to each of the capacitor positions in the various networks. The biasing of the capacitors is done through a large value resistor (2.2 megohm) and thus draws no appreciable current. The expiration date printed on the battery generally coincides with the need to replace the batteries. Each capacitor position is actually made up of two capacitors connected in series. The battery voltage is applied to the center connection of the two capacitors. This produces a voltage potential between the two plates within the capacitor. When the two parts are taken as a whole, there is no DC voltage that appears across them, but individually they are each biased. The sonic result of the biasing is an increase in detail, increased smoothness and considerably more natural resolution of sounds within the music.



## CHAPTER 8

### Project K2 S9900 Connections

**Caution:** Turn all amplifiers off before connecting or disconnecting the K2 S9900 loudspeakers. Making connections while an amplifier is operating could seriously damage the loudspeaker system and void the warranty. All amplifiers must also be turned off before connecting or disconnecting cables at the amplifier or preamplifier inputs. All connections between the amplifier(s) and the K2 S9900 loudspeaker system are made at the terminals located on the back of the enclosure. The left-hand terminals (black insulator) are negative, and the right-hand terminals (red insulator) are positive. These correspond to the negative and positive conductors in the speaker wire.

Assign one of the two conductors as the negative conductor and the other as the positive conductor. Use these same designations for all system wiring. Always connect the conductors of the speaker wire appropriately to the corresponding negative and positive terminals on all system components. This will ensure that all components will work together (“in phase”). Connecting the speakers out of phase will not damage them, but will result in reduced low-frequency output and impaired stereo effect.

Speaker wires may be fastened to the terminals by several methods. The most positive connection is often made by directly connecting clean, bare connectors (exposed by stripping the ends of the wire) to the terminal posts.

For this type of connection, loosen the knobs on the terminals and insert the exposed (bare) end of each speaker wire into the hole exposed on the terminal shaft (+ to +, – to –). Retighten the knob on each terminal so that a snug positive connection is achieved. Do not apply excessive force and do not overtighten. To avoid a short circuit, trim off any excess wire that is not in contact with the binding post contact surfaces.

K2 S9900 terminals are also designed to accept spade- or banana-type connectors, which are fastened to the ends of the wires and, in turn, are attached to the terminal posts.

Two sets of input terminals on the K2 S9900 are designed for use with bi-wire and bi-amp connections. Read the following explanations and use the suitable method.

## **I. Passive Connection Method**

The passive method requires one amplifier and one set of wires. Connections are made to either the upper terminals or the lower terminals. Do not remove the shorting straps.

## **II. Bi-Wire Connection Method**

The bi-wire connection method requires one amplifier and two sets of speaker wires. By removing the shorting straps, connections may be made to the individual network sections using four connectors, high-frequency wires to the upper terminals and low-frequency wires to the lower terminals.

## **III. Active Bi-Wire Connection Method**

This connection method uses two amplifier channels and two sets of speaker wires. Each amplifier input is fed from the same preamplifier output. In this case, the shorting straps must be removed and separate speaker cables are run from each amplifier channel, one to the high-frequency posts and the other to the low-frequency posts.

## **IV. Bi-Amp Connection Method**

The bi-amp connection method requires two amplifiers, one for the low-frequency unit and one for the high-frequency unit, and an external electronic crossover network. By removing the shorting straps, connections may be made in the following way. Wires from the high-frequency amplifier are connected to the upper terminals, and wires from the low-frequency amplifiers are connected to the lower terminals. The bi-amp switch must be set to the bi-amp position to disable the internal crossover function. Internal level adjustment and high-frequency equalization circuitry remain active.

The amplifiers are fed from the output of an electronic crossover unit (not included). This crossover must be configured to produce the electrical drive illustrated in Figure 8. These curves are very unusual and will be difficult for a commercially available crossover unit to properly emulate. It is for this reason that bi-amplification of the K2 S9900 is not recommended.

## Project K2 S9900

K2 S9900 is shipped with a twisted pair of shorting straps installed. In case the bi-wire or bi-amp connection method is to be employed, remove the straps from the terminals (referring to Figure 13) and retighten the terminals. If the amplifiers are connected to the K2 S9900 loudspeakers in the bi-wire or bi-amp mode with the shorting straps still on, the amplifier outputs will be shorted, which could result in costly amplifier damage when power is switched on.

### Final Checklist:

- Connect and plug in all other system electronics.
- Check all connections. In case of bi-amping or bi-wiring, make sure both shorting straps are removed.
- Make sure the system orientation and HF/LF drive switching in the control panel are correctly set.

The system is now ready for use. The K2 S9900 loudspeaker system is fully functional as soon as it is set up. There may be subtle tonal changes in bass output over the first week to 10 days of operation. These are caused as the movement of the low-frequency drivers becomes more fluid and the parts settle in. This process is completely normal and natural with transducers of this caliber. Even during this initial period, there is no restriction on the amount of amplification that may be applied. Enjoy!

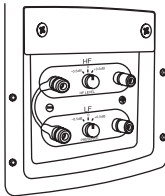


Figure 13.



## CHAPTER 9

### **K2 S9900 Care and Maintenance**

The Project K2 S9900 loudspeaker system requires no maintenance other than occasional dusting with a soft, dry, lint-free cotton cloth. The horns may also be wiped with a soft cloth. Treat the lacquered surface very carefully to avoid scratching the finish. To remove fingerprints and smudges, apply a small amount of diluted ammonia-free or alcohol-free neutral detergent to the cloth and gently clean the surface.

Never use any abrasive cleaners or chemicals to clean the enclosure. If the enclosure becomes noticeably scratched or otherwise damaged, consult a qualified furniture repair shop.

All wiring connections should be inspected and cleaned or remade periodically. The frequency of maintenance depends on the metals involved in the connections, atmospheric conditions and other factors. Consult your K2 S9900 dealer for specific recommendations.



## CHAPTER 10

### Troubleshooting and Service Guide

Project K2 S9900 loudspeakers are designed to provide years of trouble-free service. No maintenance, aside from occasional battery replacement, is required.

If a problem occurs, make sure that all connections are properly made and clean. If a problem exists in one loudspeaker, reverse the speaker wires to the left and right speakers. If the problem appears in the opposite speaker, the cause is in another component or cable. If the problem remains in the same speaker, then the fault is in the loudspeaker. In this event, consult your K2 S9900 dealer for assistance.

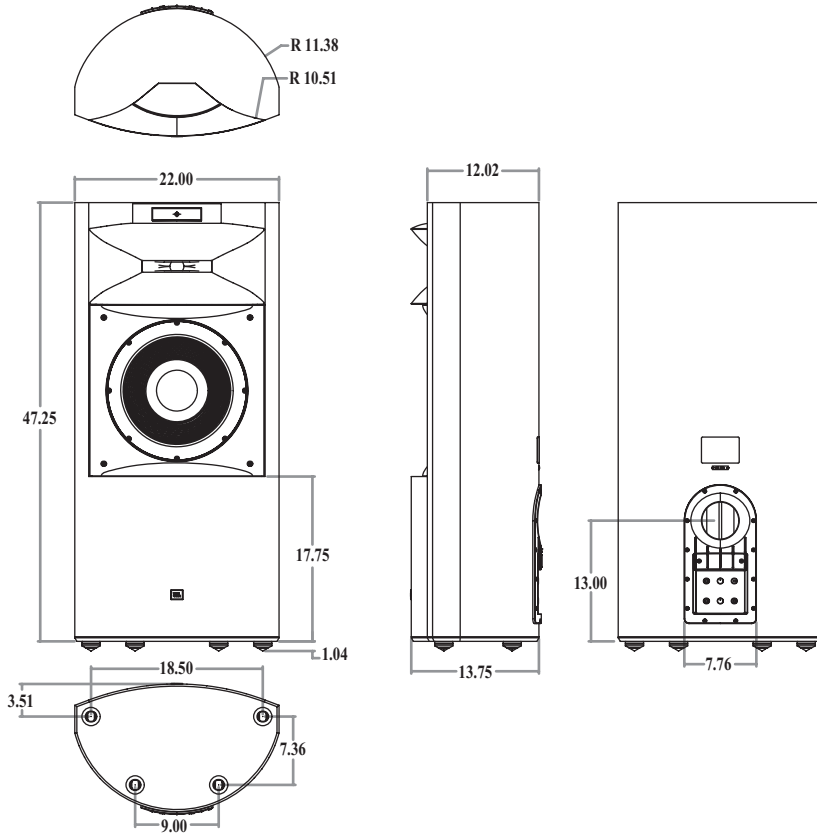


Figure 14.



# Project K2 S9900

## Project K2 S9900 System Specifications

Low-Frequency Driver:	15" (380mm) Pulp-cone woofer (1500AL-1)
High-Frequency Driver:	4" (100mm) Magnesium compression driver (476Mg)
Ultrahigh-Frequency Driver:	1" (25mm) Magnesium compression driver (045Be-1)
Sensitivity (2.83V at 1m)	93dB
Nominal Impedance:	8 Ohms, 7 ohms minimum at 100Hz, 4 ohms minimum at 40kHz
Maximum Recommended Amplifier Power:	500 Watts
Frequency Response (-6dB):	48Hz - 50kHz
Low-Frequency Extension (-10dB):	33Hz
High-Frequency Coverage:	100° Horizontal by 60° vertical
Ultrahigh-Frequency Coverage:	60° Horizontal by 30° vertical
Crossover Frequencies:	900Hz (24dB/octave) 15kHz (24dB/octave, high-pass only)
HF-Level Control:	-0.5dB, 0dB, +0.5dB
Presence-Level Control:	-0.5dB, 0dB, +0.5dB
LF/HF Drive Mode Switch:	Normal, bi-amp
Dimensions (W x H x D):	22" x 47-5/16" x 13-13/16" (560mm x 1200mm x 350mm) plus 0.8" (20mm) for feet
Weight:	182 lb (82.7kg)
Package Weight:	192 lb (87kg)



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