



Owner's Manual For The

# Whisper

Loudspeaker System



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Thank you for selecting a Legacy Loudspeaker System. These hand-crafted instruments will provide you with many years of listening enjoyment. Please take a few moments to read this brief manual to insure maximum benefit from your speaker system.

### **Limited Warranty**

Legacy Audio, Inc. extends to the original owner coverage of defects in materials and workmanship for a period of 90 days from the date of purchase. To extend this warranty to 10 years, please fill out the enclosed warranty card and return to Legacy Audio.

This warranty does not include a) damage in shipment, b) damage caused by accidental or intentional misuse or abuse, c) units not registered with Legacy Audio, d) damage resulting from unauthorized modifications or repairs. Liability is limited to the repair or replacement, at our option, of any defective component and shall not include property or consequential damages which may result from the failure of this product.

### Customer Record

Model No. \_\_\_\_\_

Serial No. \_\_\_\_\_

Date of Purchase \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Owner \_\_\_\_\_

Street Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_ Zip \_\_\_\_\_

# Designer's Note from Bill Dudleston

## The Design Criteria

1. Minimize room 'noise' (early reflections) that normally masks the ambient information and spatial cues of the actual recorded event while maximizing channel separation.

2. Minimize low frequency room resonances that mar transient detail and cause coloration in tonal response.

3. Provide proper radiating surface as a function of frequency to control dispersion and minimize THD.

4. Provide broad dynamic range and high efficiency.

5. Provide a sweetspot large enough for multiple listeners:

*Whisper's radiation pattern is computer optimized to provide a wide horizontal sweetspot without interaction with the sidewalls. Its highly controlled directivity pattern results in gradual, linear, and wideband attenuation as the listener moves off axis; i.e. as the listener moves off-center, the near speaker gently drops in the SPL allowing the far speaker to retain its audibility.*

### Differential technology:

Whisper's compound alignment is rooted in Harry Olsen's early papers twenty-five years ago. (Olsen is legendary for his mathematical and acoustic modeling of microphones).

Olsen suggested such an alignment as a way to effectively steer low frequencies.



Whisper is the first broadband realization of this differential technique and includes a few proprietary twists in the free air driver design and crossover execution by transforming the impedance. Whisper also takes advantage of a sophisticated room algorithm that also allows the user low frequency adjustment capabilities.

The drivers operate in phase with each other and combine acoustically as a pair of figure-of-eights, one behind the other. The result: higher directivity due to the compound null formed to the sides of the enclosure.

## WHISPER — The Technology

The Whisper loudspeaker system utilizes Field Optimized Convergent Source® technology to maintain clarity in the reverberant field by minimizing early reflections. In a sense, the Whisper is an “acoustic gun.”

Why is the Whisper system considered an “acoustic gun?” First, consider the unique open air design of the 15” woofers. This open air system is able to deliver an extremely satisfying and well damped bass response due to the differential design. The two woofer diaphragms provide an air load (acoustical impedance) for one another, resulting in a tightened figure 8 directivity pattern which reduces reverberant energy and standing waves. Off-axis energy is attenuated by up to 20 decibels. What this all boils down to is better in-room transient behavior.

The next advancement from the Whisper system is the unique arrangement of the four double layered 7” Kevlar Hexacone® drivers. Like the differential design of the 15” woofers, the layout of the Kevlar drivers provides greater directivity, increased power handling, and greater clarity. Heard as a ‘single oval driver’ at the listening position, this quad array also minimizes floor/ceiling reflections as well as side wall reflections. This reduction of early reflections allows fragile, low-level ambient information found in recordings to be heard over the listening room's sonic signature. Images are clearly defined and localization is consistent with frequency.

The Kevlar Hexacone® drivers used in Whisper are among the most expensive and elaborate ever developed. The cone material is magnitudes stiffer than polypropylene and paper cones, yet weighs 30% less. An enormous motor structure and a vented pole piece assure unsurpassed dynamics and clarity. These special midrange drivers are mounted into rigid PVC subenclosures, which are filled with polyester fiberfil to absorb the backwave energy.



The treble region is handled precisely by a specially treated 1.25" woven dome tweeter with a 48 ounce magnet structure. This dome hands off to a 4" ribbon supertweeter outfitted with a custom designed waveguide faceplate for controlled dispersion. A specialized variable density foam waveguide for the two drivers helps improve the acoustic impedance and controls the forward radiation pattern.

You will also notice a single 12" polypropylene woofer located on the back of the speaker. This driver passively reduces low frequency energy coming off of the rear room boundaries.

The crossover network has been optimized using the most sophisticated software available. The highest quality film capacitors, air core inductors, and ferrite bobbins are hand-tuned and point to point wired with fine solder. The low frequency crossover is isolated from the satellite section to prevent magnetic interactions.

Outfitted with two pair of gold-plated binding posts, the Whisper system is biwirable and biamp capable. All internal wiring is our own premium Oxygen Free Copper speaker cable.



## The Cabinetry

Beneath the surface of Whisper's elegant exterior lies rigid MDF construction. Interlocking joinery maximizes the strength of the cabinet parts. Polyester fiberfill is selected for internal damping. A sharp rap on the enclosure will leave you with little more than bruised knuckles.

Each cabinet is impeccably finished on all exposed surfaces with select veneers. The exquisite finish is hand-rubbed several times to assure a patina at home with the most elegant decor.

## Our Commitment

A great deal of forethought, love and satisfaction is instilled in each piece of Legacy workmanship. We take pride in getting to know many of our customers on a first name basis.

Your purchase of this product is backed by the renowned "Legacy Satisfaction Guarantee". We continue to stand behind it with a solid ten year warranty, more than twice the industry standard.



# Specifications

**System Type:** 10 driver, 4-way.

**Tweeter:** 4" Ribbon.

**Midrange:** 1.25" soft textile dome.

**Midwoofer:** (4) 7" Kevlar Hexacone®.

**Subwoofer:** (4) 15" carbon fiber/pulp composite.

**Low Frequency Alignment:** 6th order differential.

**Sensitivity:** 95 dB @ 2.83V/1m.

**Frequency response:** 22 Hz - 30 kHz,  $\pm$  2 dB.

**Crossover frequencies:** 300, 3k, 10k.

**Impedance:** 4 ohms.

**Recommended Amplification:** 10-600 watts.

**Binding Posts:** 2 pair Biampable.

**Dimensions:** 63" H x 17" W x 13" D.

**Weight:** 210 lbs.

# Placement of Whisper

Positioning Whisper for good performance is quite a bit easier than for most speakers. Remember that Whisper is actually an acoustic gun with a highly controlled directivity pattern. Corner placements are actually quite workable though not necessarily optimal. Whisper will not become “boomy” like a conventional system and it will not interact strongly with the sidewalls of your room.

*Simple guidelines:*

1. You may position the Whisper speakers farther apart than most other speakers. This will help to acoustically shadow the head properly and maintain better channel separation. Experiment with what works best in your room.
2. Toe speakers in more than with other speakers. In most circumstances, crossing speaker axis just in front of the listener’s head works best. This will broaden your sweetspot horizontally. If dispersing into an L shaped seating arrangement, you might find the best results by aiming the left speaker at the right-most seating position, and the right speaker at the left-most seating position.
3. Hearing natural ambience present in recordings while minimizing effects from your room favors a listener position that is no farther from the plane of the speakers than the geometric width of your room. More simply, if the room is 16 feet wide, then sitting closer than 16 feet will allow you to hear more of the recording and less of your room.

# Using the Whisper Processor

The Whisper processor is an essential part of the Whisper system. The processor allows you to control the proper amount of bass for your room.

When hooking up the Whisper processor in your system, please observe one of the following hookup sequences.

## *Unbalanced Uni-amplification*

### Option 1:

Pre-amplifier Processor Output to Whisper Processor Unbalanced Input  
Whisper Processor Unbalanced Variable Output to Processor Input  
Engage Processor Loop on Pre-amplifier

### Option 2:

Pre-amplifier Output to Steradian Unbalanced Input  
Steradian Unbalanced Variable Output to Amplifier Input

## *Balanced Uni-amplification*

Pre-amplifier Balanced Output to Steradian Balanced Input  
Steradian Balanced Output to Amplifier Balanced Input

## *Unbalanced Bi-amplification*

Pre-amplifier Unbalanced Output to Steradian Unbalanced Input  
Steradian Unbalanced Fixed Output to High Frequency Amplifier Input  
Steradian Unbalanced Variable Output to Low Frequency Amplifier Input

Be sure your entire system has been turned off for at least 3 minutes before making connections. After connections are made:

1. Turn on sources
2. Turn on pre-amplifier
3. Turn on Steradian
4. Turn on Amplifier(s)

Always observe this turn-on sequence!

## Speaker Connections

At the rear of each of your loudspeakers you will find a terminal plate housing two rows of jumpered binding posts. The upper row is the input to the "satellite" portion of the speaker. The lower row is the input to the "subwoofer" portion of the speaker. When left in place, the factory-installed jumper bars allow the speaker to be driven with a single channel of amplification. (If biamping, or biwiring, be sure to remove the jumper bars. More on this later!).

Connect each channel of your amplifier to a loudspeaker via the five-way gold binding posts provided. Dual banana plugs or gold plated spade lugs are recommended means of termination.

Be sure that you observe polarity when making the connections. The positive (+) terminal of the amplifier should be connected to the positive terminal of the loudspeaker. The negative (-) terminal of the amplifier should be connected to the negative terminal of the loudspeaker.

## Adjusting Low-Frequency Level on the Whisper Processor

One of the most exciting features of the Whisper system is its flexibility. No matter what size your listening room, no matter what sensitivity differences may exist between your amplifiers, no matter how far you sit from your speakers, the Whisper processor will allow you to adjust the low frequency balance until it is spectrally correct. Simply rotate the large knob on the front panel clockwise to increase low frequency output. Trust your ears to tell you when it is right.

Due to the very quick low frequency attack and decay of the Whisper loudspeaker, it is not uncommon for the listener to initially set the knob a bit higher than necessary. As the listener becomes more experienced with the speaker they usually return to a slightly lower bass level setting. This phenomenon occurs because the slower decay of conventional speakers provide (more area under the curve,) implying that there is more bass in the program material than there should be.

After a few weeks of listening to Whisper, conventional speakers will seem extremely slow with a thick, boomy or sodden characteristic.

## Finishing Touches

Now that all equipment is connected and the speakers are positioned where you want them, go ahead and unbox the remaining items.

Put tape marks on the floor to help locate the positions for the Whispers, then position the pedestal bases accordingly (brass cones downward to floor). With the help of a friend, tip the Whisper speaker until the base overhangs the pedestal and slide it into position. Sliding is much easier than lifting. You can get a good handhold by gripping between the two baffles of the speaker.

Next install the two slender side grills (the grills which you removed from the back of the crate) between baffles.

Finally, install the large marquis shaped front grills. Be sure to remove these anytime you reposition the speaker.

If you have any questions or concerns, just call!

## Hook-up Cables

The ideal conductor would have negligible resistance, inductance and capacitance. The table below shows how a few actual speaker cables measure up.

Cable	$\Omega$ s/ft	pF/ft	$\mu$ H/ft
12 ga.	0.0033	24	0.21
14 ga.	0.0048	17	0.13
16 ga.	0.0079	16	0.18
18 ga.	0.0128	28	0.21

Capacitance is considered insignificant in each cable because its effect is well out of the audio bandwidth; inductance can be decreased (at the expense of increased capacitance) by keeping the conductor pair closely spaced.

How long would a cable have to be before inductance effects would impinge on the audio spectrum? Approximately 300 feet of 12 gauge would be required to establish a corner frequency of 20 kHz with an 8 Ohm loudspeaker. As you see, inductance is not a problem for most of us.

What about phase shift due to frequency dependent travel times down the speaker cable? Measurements show that 100 Hz waves will be delayed about 20 billionths of a second behind 10 kHz waves when traveling to the end of a 10 foot speaker cable. Since the cilia of the ear requires 25,000 times longer than this just to transmit phase information, phase shifting is obviously not the primary concern when considering speaker cables.

What about resistance? Finally we are getting somewhere. Resistance is the controlling factor of the amplifier/loudspeaker interface.

Excessive resistance can cause major shifts of speaker crossover frequencies. The lower the impedance of the loudspeaker, the greater the effects of series resistance. A run of 20 feet of 18 gauge can cause up to 10% deviations of crossover center frequencies. That same 20 feet can undamp your damping factor and reduce your systems' output by one-half decibel.

In summary, there are no perfect cables. The best way to approximate the ideal would be to keep loudspeaker leads as short as is practical.

# The Amplifier

Ideally the loudspeaker would be among the first components selected when assembling a playback system. This would allow the user to choose an amplifier capable of delivering adequate amounts of current into the frequency dependent load presented by the loudspeaker. However, when upgrading a system, audiophiles may find themselves matching their new loudspeakers to their existing amplification. For this reason, extensive measures have been taken to ensure that each Legacy speaker system represents a smooth, non-reactive load to virtually any amplifier.

Often there is much confusion regarding amplification and loudness levels. It should be understood that the role of the amplifier goes beyond that of driving loudspeakers to a given sound pressure level. The amplifier should be able to CONTROL the loudspeakers across the entire music spectrum. This means that parameters such as damping factor (values greater than 60 are acceptable) and dynamic headroom should not be overlooked when comparing amplifiers.

How much power will your new speakers need? That ultimately depends on your listening environment and musical tastes. As little as five watts per channel should drive them to a level satisfactory for background music. A typical 45 watt per channel receiver may fill a room with the compressed mid-band energy of “heavy metal,” but seem to lack weight or control with classical recordings. Some audiophiles feel that 200 watts per channel is the bare minimum to avoid audible clipping distortion when reproducing music at “live” playback levels. Your Legacy speakers are designed to take advantage of “high-powered” amplifiers, so don’t be afraid to put them through their paces.

How much is too much power? Rarely is a drive unit damaged by large doses of music power. More often than not the villain is amplifier clipping distortion. Even through decades of refinement, loudspeakers are still notoriously inefficient transducers, requiring huge amounts of power to recreate the impact of the live performance. Typically less than 1% of electrical power is converted into acoustic output. (For example, an omni-directional transducer with an anechoic sensitivity of 90 dB @ 1w/1m has a full space efficiency of only 0.63%) When an amplifier is unable to fulfill your loudspeakers demands, a damaging harmonic spike may be leaked to the high frequency drivers.

Another important point regarding loudness is that the dB scale is a logarithmic one. This means that a 150 Watt amplifier will potentially sound only twice as loud as a 15 Watt amplifier.

If all of this discussion of power and loudness seems a bit abstract, consider the the example to the left:

*The average acoustical power developed by a person speaking in a conversational tone corresponds to a mere 0.00001 Watts. The power that would be developed by the entire population of the city of New York speaking at once would barely illuminate a single 100 Watt light bulb.*



## For the Tweakers

Your Legacy loudspeaker is a true reference monitor designed to reproduce all program material with an absolute minimum of coloration. Occasionally we encounter a customer who simply has a characteristic sound that he or she desires to achieve. Rather than take on the close-minded position that this customer is wrong and simply has one oar in the water, we would prefer to offer our assistance.

We have found that the human ear is incredibly sensitive in the range of 3 kHz. In fact, at some listening levels the ear is as much as 15 dB more sensitive than at neighboring frequencies. Therefore, a peaky studio microphone may occasionally raise the hair on one's neck. (One needs only to listen to the Stereophile microphone test CD to find out just how bad some microphones really are).

It seems that the presence band of 3 kHz to 8 kHz effectively dictates the degree of forwardness, depth, detail, brightness, or sweetness of a recording. Because of the sensitivity of this range, we allow you one extra tweak.

If you wish to attenuate the energy in this range, simply contact Legacy Audio and we will exchange or modify your dome drivers with a resistor network that allows several soft steps of attenuation.

Another situation frequently encountered is the "one speaker in the corner, the other speaker open to the dining room" syndrome. Don't panic, we build high quality passive resonance trap circuits that will take the drone out of corner placements. These circuits may be placed in series with the woofer section of your speaker and will not effect your midrange of treble frequencies.

Even greater flexibility can be achieved with the Classic's by implementing the Steradian Environmental Processor (STEP One) into your system..

# **Biamplication**

Your Legacy speakers offer the options of conventional wiring, biwiring, passive biamplication or active biamplication. The following is a summary of these options.

## *CONVENTIONAL WIRING*

This format is the simplest way to connect your loudspeakers to your amplifier. A single twin-conductor cable is used to link the loudspeaker to a single channel of amplification. Jumper wires must be left in place on the loudspeaker.

## *BIWIRING*

Biwiring allows one to minimize the cable losses between the amplifier and the loudspeaker. This is accomplished with a single stereo amplifier by running separate sets of cables to the satellite section and the subwoofer section from the same channel of amplification.

This technique allows one to “play” with wire parameters a bit (such as heavy gauge wire on the sub sections and light gauge solid core on the satellites).

When biwiring, the use of gold spade lugs or dual banana plugs can make the task much easier and safer than bare wire connections. Again, the major reasons for biwiring over conventional wiring are greater power transfer (improved efficiency) and tighter control over the drivers (better damping).

## *PASSIVE BIAMPING*

This option can yield even better results than biwiring due to broader distribution of power requirements.

Passive biamplication allows low frequency current demands to be routed to a separate channel of amplification, thus reducing strain on the satellite amplifier and preventing subwoofer back-EMF from modulating with the upper frequencies. There are two types of passive biamplication; Vertical biamping (which requires two identical stereo amplifiers or four monoblocs) and Horizontal biamping (which does not require identical amplifiers).

### **1. Vertical Biamping**

Vertical biamplication requires the dedication of a single stereo amplifier for the left speaker, and another stereo amplifier for the right speaker. This configuration improves channel separation and can improve imaging slightly. If your preamp does not have two sets of left/right outputs, you will need a pair of Y-adapters or a signal splitter, such as a dual amp balancer, which will also allow adjustment of subwoofer/satellite input levels.

## 2. Horizontal Biamping

Any two stereo amplifiers may be utilized in horizontal biamplification. Many audiophiles prefer the "sweetness" of tubes on the satellite portion of the loudspeaker while favoring the "control and weight" of solid state amplifiers on the subwoofer section.

The biggest drawback of such a marriage of amplification is that the two amplifiers may have different input sensitivities or output polarities. Differences in the input sensitivities may be overcome by using a dual amp balancer. This unit allows independent balancing of the left subwoofer/satellite ratio and right subwoofer/satellite ratio.

It's also a good idea to check the owner's manuals to establish if the amplifiers are inverting or non-inverting. If the two amplifiers are of opposite polarity, then you should reverse the polarity at the inputs of either the subwoofer or satellite binding posts.

*NOTE: The above only applies to loudspeakers that incorporate the subwoofer and satellite section in a single enclosure. It does not apply towards the separate powered subwoofer/satellite configuration. You must always observe the polarity when connecting the speaker wire to a powered subwoofer.*

### ACTIVE BIAMPING

This option requires the utilization of an electronic (powered) external crossover. Active biamplification is the most appealing means of interfacing a subwoofer/satellite system due to the control possibilities offered, but can also be the most costly.

An active crossover is inserted between the preamplifier outputs and the inputs of two stereo amplifiers. Vertical or horizontal biamping considerations are also applicable here.

A well designed active crossover will offer the user independent high pass / low pass turnover frequencies for optimally blending the satellites with the subwoofer sections of the speaker system. Other features usually found are separate level controls for the high pass or low pass sections and a choice of inverted or non-inverted low frequency outputs (needed when strapping an amplifier to mono). Also helpful is bass equalization and subsonic filtering.

When cascading active filters with the existing passive filters within the speaker system, be sure to allow for adequate frequency overlap. For instance, if the passive crossover is set at 500 Hz, select a low pass corner frequency of 600 Hz and a high pass corner frequency of 450 Hz to prevent a suck-out in the response at 500 Hz.

The controlled distribution of power afforded by the active crossover results in less amplifier strain (better clarity), greater dynamics, and lower intermodulation distortion. However, a basic understanding of crossover slopes and crossover frequencies within your loudspeaker will be needed to implement the active crossover successfully.