



Owner's Manual

**Wisdom Audio SAS
Subwoofer**

Important Safety Instructions

Please read all instructions and precautions carefully and completely before operating your Wisdom Audio equipment.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this equipment near water.
6. Clean only with a dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade of the third prong are provided for your safety. If the provided plug does not fit into your socket, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer.
12. Unplug this apparatus during lightning storms or when unused for long periods of time.
13. Refer all servicing to qualified personnel. Servicing is required when the apparatus has been damaged in any way, such as a power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
14. ALWAYS disconnect your entire system from the AC mains before connecting or disconnecting any cables, or when cleaning any component.
15. NEVER operate this product with any covers removed.
16. NEVER wet the inside of this product with any liquid.
17. NEVER pour or spill liquids directly onto this unit.
18. NEVER bypass any fuse.
19. NEVER replace any fuse with a value or type other than those specified.
20. NEVER operate this product in an explosive atmosphere.
21. ALWAYS keep electrical equipment out of the reach of children.

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Introduction

Congratulations on purchasing your Wisdom Audio SAS subwoofer. The Regenerative Transmission Line™ technology used in the SAS delivers tremendous bass performance in terms of depth, dynamics, and low distortion resulting in articulate bass that integrates seamlessly with high-resolution main speakers.

About this manual

This manual focuses on the SAS subwoofer itself. While we expect your local Wisdom Audio dealer to take care of the setup and calibration of the system, we still recommend that you at least briefly review this and the other Wisdom Audio manuals relevant to your system to understand the system's full capabilities.

Description

Your Wisdom Audio SAS subwoofer uses a modern implementation of an old idea for high quality, low distortion bass reproduction. While the roots of the Regenerative Transmission Line™ go back to the 1950's, it is the combination of modern computer modeling and the vastly more powerful motors of contemporary driver design that make the RTL™ so special.

Regenerative Transmission Line™

There is a class of bass enclosures that has been around since the 1950's, which can be described generically as "low frequency tapped waveguides" or "tapped pipes." It was an idea that was a bit ahead of its time then, since fully optimizing its use required both powerful drivers and computer modeling. But if you are into such things, check out US Patent 2,765,864 (filed in 1955), and an AES paper published in 1959, "*Analysis of a Low Frequency Loudspeaker System.*" We have published both on our website for your convenience, at

http://www.wisdomaudio.com/support_documents.php

We have utilized sophisticated modeling software in order to fully optimize our enclosures, and have developed drivers that are specifically optimized for this application. We call our unique implementation of this relatively old idea a "Regenerative Transmission Line™" subwoofer, or "RTL™" sub for short.

All dynamic drivers develop energy on both sides of the diaphragm, with the rear energy being 180° out of phase with the front energy. If you allow the driver to operate in free space (no enclosure), the front and rear energies largely cancel each other out — especially at low frequencies.

In our Regenerative Transmission Line™ subwoofer, the energy from the back side of the driver is sent along a long, folded path in such a way that its lowest frequencies arrive back at the front side of the driver in phase, effectively summing to an increase of 6 dB in output. Thus, the energy from both sides of the woofer cone is used in a productive way, resulting in a substantial reduction in distortion and an effective surface area that is twice what you would otherwise expect.

The results are quite stunning. Low frequencies are strikingly dynamic and responsive, and integrate quite seamlessly with the fast and detailed Wisdom Audio planar magnetic hybrids.

Unpacking the SAS

The Wisdom Audio SAS subwoofer is a substantial piece of equipment. Please exercise caution when unpacking your SAS to ensure that you do not strain yourself from its (perhaps unexpected) weight.



Caution!

Do not attempt to lift your SAS while bending or twisting from the waist. Use your legs for lifting, not your back.
Always stand as straight as possible and keep the SAS close to your body to reduce strain on your back.

Room Acoustics & Placement

Wisdom Audio believes in equalization. Assume for a moment that you had a “perfect” loudspeaker: as soon as you place it in your room, its perfection is gone. In fact, even *good* rooms can introduce deviations of 20 dB to the response of the system. This is particularly true in the bottom two octaves, where a subwoofer operates.

It seems strange to us to worry about tenths-of-a-decibel differences between one component and another when there are 10-20 dB problems right there in the room with you.

At the same time, room equalization is not a panacea. It does not solve all problems. In fact, and somewhat paradoxically, EQ works best when it has the least to do. It is best used as the “finishing touch” on an otherwise good system. Unfortunately, most people do not understand that the most important component in their system is their listening room.

This manual does not have the space for a full description of everything that goes into creating excellent room acoustics; doing so would require a textbook of several hundred pages. Instead, we will give you some ideas, and some references to pursue should you want to learn more.

Start With the Room

There are many myths floating around pertaining to what a “good room” should be like. One of the most common is that it should have non-parallel walls. Without going into the details, we recommend staying with rectangular rooms whose dimensions do *not* share common divisors.

Thus a room with dimensions of 8’ by 16’ by 20’ would be quite poor (since the dimensions are all divisible by a length of 4’, and 16 is also a multiple of 8). By contrast, a room whose dimensions are 9’ by 16’ by 29’ would be much better, since none of the dimensions are mathematically related to one another.

There are infinite variations on this idea. If you have the flexibility to choose (or modify) your room dimensions to avoid such problems, do so. Either way, capable room optimization will be a big help making the most of what you have.

Rigid Walls

Another myth that should be dispelled is the notion that the walls (and ceiling and floor) of the room should be extremely rigid in order to reproduce good bass. Rigid, inflexible walls reflect energy extremely well; thus you will keep more of the bass energy in the room. This much is true. However, those rigid walls will only increase the amplitude of the standing waves that your room naturally supports. In simple terms, you will have *more* bass, but it will also be *more irregular*, with larger peaks and valleys in the response.

Walls that flex a bit (but do not rattle) are much better. Coincidentally, traditional American residential construction standards (sheet rock on wooden studs) are not a bad place to start. You can do better still with professional help, but studs and sheet rock are better than poured concrete. (If your listening room is in the basement, a false wall can easily be built in front of the concrete. You probably need something like this for insulation and aesthetics anyway.)

The ultimate in dedicated listening room construction involves the design and construction of floating walls, ceiling and floor. This approach yields the added benefit (when done properly) of providing outstanding acoustic isolation from adjacent spaces as well as superb bass reproduction. This approach goes well beyond the scope of an owner's manual; if you are interested, you should contact a professional acoustician who has specialized in this sort of domestic room design.

Speaker Placement

Within the room itself, placement of the speakers and the listener will have a profound effect on the performance of the system, particularly below 300 Hz or so. There is no "perfect" position that will solve all problems, but finding the best compromise will make it easier to solve the remaining problems with good room optimization such as in the Wisdom Audio SC-1.

Your Wisdom Audio dealer can help you with optimizing your speaker placement, which is never quite as simple as it seems it should be. The characteristics you should listen for are several:

Left & Right Speakers

Goal #1: Stable, 3-dimensional stereo imaging

This usually requires reasonable symmetry within the room. Mono (correlated) pink noise can help here, though it does not replace listening to music. With pink noise playing in both speakers, you should hear a tightly-defined little "ball" of pink noise floating in space exactly halfway between the speakers.

Goal #2: Smooth, consistent bass

Oft-cited rules of thumb for smoother bass reproduction include both "placing the speakers at different distances from the side walls vs. the wall behind them," and "placing them at 'odd fractions' of the room's dimensions" (e.g., fractions in which the denominator is an odd number, like $\frac{1}{3}$, $\frac{2}{5}$, $\frac{2}{7}$, etc.). But nothing replaces your experience in your room, combined with your dealer's experience in a variety of rooms. Playing pink noise through the woofer sections of your Wisdom Audio speakers (with the microphone at the listening position, and prior to doing any equalization) and watching the results on a Real Time Analyzer (RTA) will let you see the results of your labors.

Center Channel

Center channel height

Once you have a solid stereo image up front (when listening only to the Left and the Right speakers), you need a center channel speaker for multichannel reproduction. It should be centered between the Left and Right, and centered on the screen's location, preferably at the same height as the Left and Right speakers. This presents an obvious problem: you cannot place a speaker in front of your television screen.

Ideally, a center channel speaker would be behind an acoustically transparent front projection screen and would match the Left and Right speakers. Doing so would ensure the best possible consistency of tonal balance, image height, and dynamic capabilities for the critical center channel. This is how it is done in all good commercial theaters.

Another possibility that works well in certain instances is to use the "phantom center channel" feature of your surround processor. This works best when the room is reasonably symmetrical and the listeners are more-or-less directly in front of the TV. It uses the natural stereo imaging ability of the speakers to create

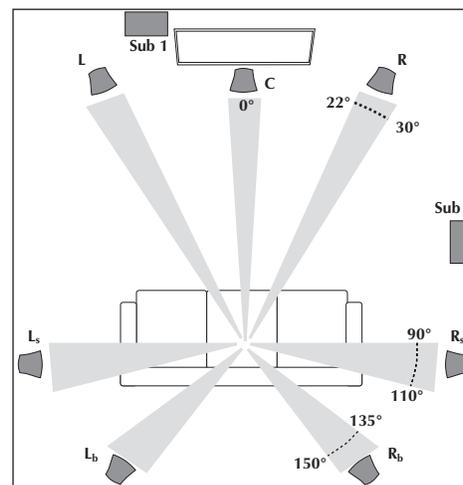
a center image where it belongs. Of course, if people are sitting well off to one side in the room, the image tends to fall into the nearest speaker.

Failing an acoustically transparent screen or a phantom center channel approach, the important thing is to match the tonal and dynamic capabilities of the Left and Right speakers while minimizing the change in image height as a sound is panned across the front stage. Wisdom Audio has designed horizontally-oriented planar magnetic hybrid speakers that will match your Sage loudspeakers superbly; place them as close to the edge of the screen as is practical.

Surround Speakers

Surround channel geometry

In a 5.x channel system, the surround should be placed either directly to the sides of or slightly behind the listening area (90° – 110° from the center channel, as seen from above). In a 7.x system, the surround speakers should be closer to 90° from the center speaker, and the surround back speakers should be at approximately 135° – 150° from the center speaker. This conforms to industry standards, and ensures that you hear what was intended from a spatial placement point of view. (Too often, the surround speakers are all behind the listeners, creating a big “hole” in the soundfield between the front and the back.)



a 7.2 channel system layout

One possible exception to these guidelines: if you have a THX®-certified processor and are using the THX Advanced Speaker Array™ circuitry, you should follow the guidelines in your owner’s manual for the processor. Using this technology, it can actually be more effective to have the rear speakers in a 7.x system directly behind you and immediately adjacent to each other.

Subwoofer Placement

Subwoofers offer somewhat greater flexibility in placement, since the frequencies they reproduce are not readily localizable by the human ear. This is due to the fact that the wavelengths they reproduce are more than ten feet (3 meters) long, but our ears are located only about 6-7 inches (17 cm) apart. Thus these extremely long waves do not contribute meaningfully to the imaging that the main speakers create.

However, this fact does not mean that the placement of the subwoofers has no effect on the sound quality in the room. Far from it. The subwoofers are the

most likely to suffer from the response irregularities introduced by the room itself, operating as they do below approximately 80 Hz in most systems.

Recent research into the behavior of rooms as a function of speaker placement has concluded that — if you have the freedom to do so — there are significant advantages to placing several smaller subwoofers around the room, rather than relying on a single large woofer. Moreover, the optimum placement is usually at 25% and 75% of the room width, or deep in the corners of the room. If you have the luxury of doing so, this simple placement strategy can reduce the size of the room's response irregularities from 20 decibels down to perhaps as little as 6-8 decibels—a tremendous improvement.

Reducing the room's inherent problems to this degree provides a huge advantage. It allows products like our own SC-1 System Controller to put their considerable abilities to work on *perfecting* your system's response, rather than on trying to perform major corrective surgery.

Room Treatment

Rectangular rooms have six reflecting surfaces (four walls, ceiling and floor) that reflect sound to the listener, after various delays introduced by the indirect routes the sound take on their way. These first reflections are particularly damaging to sound quality. Looking at the simplest case of stereo reproduction, you have a minimum of *twelve* first reflection points in your room that deserve some attention.

Unfortunately, it is often difficult to do much about the ceiling and floor reflections, even though they are arguably the most destructive. (The minimization of these reflections is one of the strongest arguments for the tall, line source loudspeakers that Wisdom Audio builds.) This leaves you with eight "first reflections" that you should consider minimizing somehow. These points are easily found by having an assistant slide a small mirror along the four walls of the room, while you sit at the listening position. Any place on the wall where you can see a reflection of *any* speaker is a first reflection point. Concentrate on the first reflections for the Left and Right speakers first.

If you can, arrange to apply either absorption or diffusion at these eight points (don't forget the wall behind you). Absorption can be as simple as heavy, insulated drapes; diffusion can be provided by a well-stocked bookcase with books of varied sizes. Alternatively, you can buy purpose-designed room treatments (some sources listed under References, below).

The important things to remember are these: a good room should have a balance of absorption and diffusion; and if you are going to treat only a few areas of the room, the first reflection points are the most important ones to treat.

Professional Acoustic Design

Does this all sound too complicated? For good reason: it *is* complicated.

The difference between the average listening room and one that is professionally designed and implemented is huge. A great listening room will disappear to an astonishing degree, letting the experiences captured in your recordings speak to you directly. A well-designed room is also quieter and more comfortable. It can easily become a favorite retreat for peace and rejuvenation.

If you decide to investigate the possibility of improving your room with the help of a professional, it is important to find someone who focuses on residential spaces. Most acousticians are trained to deal with large spaces — airports, au-

ditoriums, lobbies in commercial buildings, etc. The problems seen in “small” rooms (residential spaces) are quite different, and outside the experience of most acousticians. Find someone who specializes in and has a great deal of experience designing home studios, home theaters, and the like. Your Wisdom Audio dealer may be such a person; failing that, he/she can help you find such a professional.

References

Books on Acoustics:

The Master Handbook of Acoustics, F. Alton Everest, TAB Books

Sound Reproduction: The Acoustics and Psychoacoustics of Loudspeakers and Rooms by Dr. Floyd Toole, Focal Press

Suppliers of Acoustic Treatments:

Acoustic Innovations, <http://www.acousticinnovations.com/>

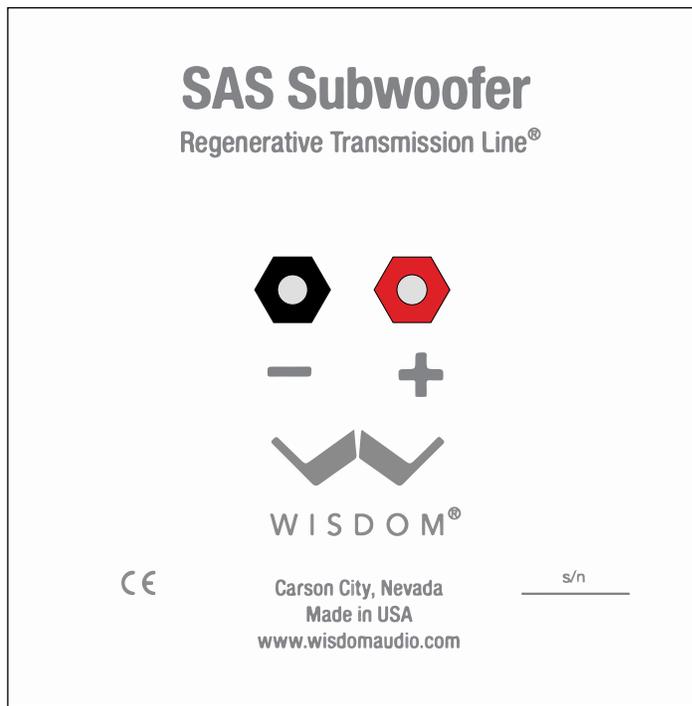
Acoustic Sciences Corporation, <http://www.acousticssciences.com/>

Echo Busters, <http://www.echobusters.com>

MSR Acoustics, http://www.msr-inc.com/home_theater/hometheater.html

RPG Diffusor Systems, <http://www.rpginc.com/>

Connections



1. Speaker Terminals

Connect the + and – terminals of the power amplifier that is driving the SAS to the corresponding + and – terminals of the SAS, located in the recessed input cup.

Note that while Wisdom Audio amplifiers are all non-inverting, some other brands of power amplifiers do invert polarity. It is always best to check the polarity of all your speakers with a polarity checker such as can be found in the [AudioTools](#) suite from Studio Six Digital, or with dedicated hardware such as the [Galaxy Cricket Test Set](#).

Setting Up the SAS

The unusual form factor of the SAS allows it to be used effectively in many situations where a more conventional “bass cube” would be either cumbersome or impossible. Examples include locating it behind a couch, in the small space between the couch and the wall, or laying flat under a set of risers in a home theater with multiple rows of seating.

The SAS also includes two locations for the exit of the Regenerative Transmission Line™. As shipped from the factory, the vent is located on the end of the SAS enclosure. However, if your location would be better served by the vent being on the side, your dealer can easily swap the grille for the solid aluminum plate that covers that location. There is no difference in performance, but often a great difference in application flexibility.

As with most subwoofers, the SAS requires equalization for fully optimizing its performance. This EQ may be provided by any of the following the Wisdom Audio products:

- SC-1 System Controller (if one exists in the system)
- SW-1 Subwoofer Amplifier (which includes on-board DSP-based EQ)
- MiniDSP-1 Signal Processor

When properly adjusted and listening to music, you should not be aware that the SAS is active in the system (until you turn it off and realize how much it has been contributing). The proper level setting will allow the SAS to integrate quite seamlessly into a high quality system.

North American Warranty

Five Year Warranty

When purchased from and installed by an authorized Wisdom Audio dealer, Wisdom Audio® loudspeakers are warranted to be free from defects in material and workmanship under normal use for a period of five years from the original date of purchase.

During the warranty period, any Wisdom Audio loudspeaker exhibiting defects in materials and/or workmanship will be repaired or replaced, at our option, without charge for either parts or labor, at our factory. The warranty will not apply to any Wisdom Audio loudspeaker that has been misused, abused, altered, or installed and calibrated by anyone other than an authorized Wisdom Audio dealer.

Any Wisdom Audio loudspeaker not performing satisfactorily may be returned to the factory for evaluation. Return authorization must first be obtained by either calling or writing the factory prior to shipping the component. The factory will pay for return shipping charges only in the event that the loudspeaker is found to be defective as mentioned above. There are other stipulations that may apply to shipping charges.

There is no other express warranty on this loudspeaker. Neither this warranty nor any other warranty, express or implied, including any implied warranties of merchantability or fitness, shall extend beyond the warranty period. No responsibility is assumed for any incidental or consequential damages. Some states do not allow limitations on how long an implied warranty lasts and other states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. This warranty is applicable in North America only. Outside of North America, please contact your local, authorized Wisdom Audio distributor for warranty and service information.

Obtaining Service

We take great pride in our dealers. Experience, dedication, and integrity make these professionals ideally suited to assist with our customers' service needs.

If you develop a problem with your Wisdom Audio subwoofer, please contact your dealer. Your dealer will then decide whether the problem can be remedied locally, or whether to contact Wisdom Audio for further service information or parts. The Wisdom Audio Service Department works closely with your dealer to solve your service needs expediently.



Important!

Return authorization must be obtained from Wisdom Audio's Service Department BEFORE a unit is shipped for service.

It is extremely important that information about a problem be explicit and complete. A specific, comprehensive description of the problem helps your dealer and the Wisdom Audio Service Department locate and repair the difficulty as quickly as possible.

Specifications

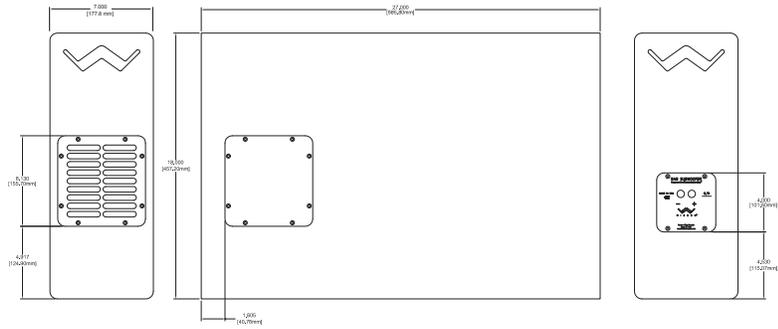
All specifications are subject to change at any time, in order to improve the product.

■ Frequency Response	30 – 80 Hz ± 3dB relative to the target curve
■ Impedance	8Ω
■ Sensitivity	90 dB SPL/2.83V/1m
■ Maximum Output (at one meter in 1/4 space)	115 dB @ 30 Hz
■ Power Handling, Peak	450W
■ Dimensions	see dimensional drawing on next page
■ Shipping weight	45 lbs. (20.5 kg)

For more information, see your Wisdom Audio dealer, or contact:

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SAS Dimensions





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