



Owner's Manual

**Sage STS
High Output Subwoofer**

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Introduction

Congratulations on purchasing your Wisdom Audio subwoofer. The STS's Regenerative Transmission Line™ technology delivers tremendous bass performance in terms of depth, dynamics, and distortion resulting in articulate bass that integrates seamlessly with high-resolution main speakers such as Wisdom Audio's Sage Series.

About this manual

This manual focuses on the STS subwoofer itself. In order to fully understand the system, we recommend you also review the manual for the SC-1 System Controller.

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 manuals (SC-1, SA-series amplifiers) to understand the system's full capabilities.

Please register your system

To register your warranty, please complete the form at the following address on the internet:

<http://www.wisdomaudio.com/registration/>

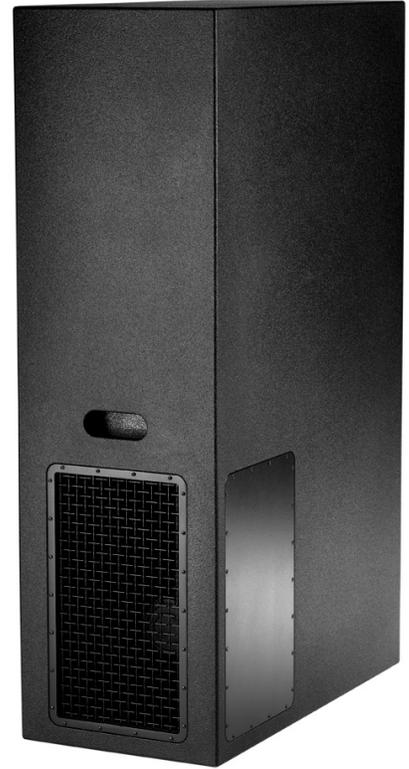
Doing so will ensure that there will be no delays should you ever require warranty service. If accessing the internet is inconvenient, you can send a copy of the sales receipt (showing your name, address and the products purchased) to the address shown in the North American Warranty section of this manual.

Wisdom Audio does not and will not ever share its mailing list with other companies. Nor do we expect to contact you frequently, since you are buying a product that should last a lifetime. However, we would like to be in a position to contact you should a software update become available for the system controller (as an example).

Lastly, please keep your sales receipt in a safe and easily found place. If you do not register your purchase with the company, it is your only proof of warranty.

Description

Your Wisdom Audio STS 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 double compared to what you would otherwise expect. As an example, the effective radiating surface area of the two 15" woofers in the STS is equivalent to *four* 15" woofers in more conventional enclosures.

The results are quite stunning. Low frequencies are strikingly dynamic and responsive, and integrate quite seamlessly with the fast and detailed Sage Series planar magnetic hybrids. As an example, the STS is only -3 dB at 15 Hz and can output in excess of 130 dB at 20 Hz.

Uncrating the STS

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



Caution!

Do not attempt to lift your STS by yourself. Unpacking this subwoofer is clearly a two person job. It is unwise for a single person to attempt doing so.

Do not attempt to lift your STS while bending or twisting from the waist. Use your legs for lifting, not your back.

Always stand as straight as possible and keep the STS close to your body to reduce strain on your back.

The STS is fully assembled on delivery, and comes in a large wooden crate.

The serial number for the STS can be found on input connector plate on the rear of the speaker. Record this serial number below for easy reference should you need it in the future.

s/n: _____

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 often introduce deviations of as much as 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, our room correction will be a big help.

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 also 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 the 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, and a bit of space between the speakers and adjacent side walls (to minimize the adverse effects of early first reflections). 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.

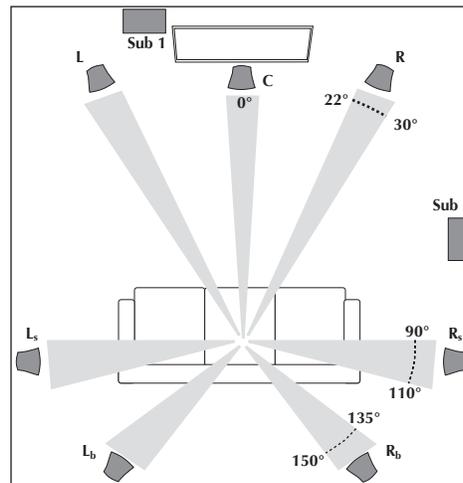
Failing an acoustically transparent screen or a phantom center channel approach, the important thing is to match the tonal and dynamic capabilities of the Left and Right speakers while minimizing the change in image height as a sound is panned across the front stage. Wisdom Audio has designed horizontally-ori-

ented 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 centered on each of the four walls, 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 the SC-1 System Controller to put its 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 to the listener. 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, auditoriums, 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/>

Setting Up the STS

There is no escaping the fact that the STS is a *large* subwoofer. That being said, it is designed to have remarkable installation flexibility for something so large. It may be used standing upright, or laying down on its broad side, in which case it can be built into a set of risers or as part of a “stage” in front of the screen.

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

The STS is a passive subwoofer, meaning that it does not come with a “plate” amplifier or internal crossover. The crossover function is normally provided by the surround preamplifier in the system, or by the SC-1 (which is a required part of any system that uses an STS). Similarly, the amplifier is one channel of whatever is being used for the rest of the system, or perhaps a dedicated, high power amplifier, depending on your application.

The sensitivity of the STS is quite high, at 101 dB/2.83V/1m (2.83V is one watt at 8Ω). So you do not necessarily have to have a huge, powerful amplifier to drive the STS. However, if you want to fill an unusually large space, the STS can handle 5000 watts of power and deliver in excess of 130 dB at 20 Hz (again, measured at one meter).

We recommend a powerful amplifier for the best results, since the STS sounds so good that you will be inclined to turn it up. You cannot go wrong by having too much power.

Making the STS Connections

As with any system, you should make changes to the connections only when the power is turned off to avoid any chance of inadvertently causing a problem (such as a short-circuit).

We recommend using heavy-gauge speaker wire, particularly when the installation forces you to use longer wires than you might otherwise. A good rule of thumb is to keep the “loop resistance” below 0.1 ohms.

The loop resistance can be easily measured with an inexpensive volt-ohm meter. Simply twist the two conductors at one end of the cable together, and then measure the DC resistance across the two conductors at the other end of the speaker wire. Doing this measures the total resistance going down one side and back the other, hence the term “loop resistance.” If this figure is at or below 0.1 ohms, you are in good shape.

For the purposes of this manual, we will assume that you have already connected the SC-1 System Controller as per the instructions found in its manual. As such, you should have signal coming from your source component(s) to a preamp/processor that provides bass management (to create the subwoofer channel(s), and then on to the SC-1; following the SC-1, the signal for the subwoofer is sent to a high quality amplifier such as the Wisdom Audio SA-series amplifiers.

Connect the outputs of your amplifier to the subwoofer, taking care to get the polarity correct. Connect the positive (+) terminals on your amplifier to the positive (+) terminals on the STS; likewise, connect the negative (–) terminals on the amplifier to the negative (–) terminals on the STS.

Optimizing the System

A Wisdom Audio loudspeaker system is just that: a *system*, designed to provide the highest calibre of performance, in the widest variety of possible settings. As such, simply connecting all the wires does not mean the system is optimized.

The SC-1 System Controller manual has the pertinent details on precisely how to use it to optimize the performance of the system. For the purposes of this manual, a quick overview of the process is sufficient.

1. **Tell the SC-1 which speakers are in the system**

The software application that configures the SC-1 for your specific system has a series of menus that allow your installer to designate which model of Sage loudspeaker is used in each channel of the system. This allows you to mix and match freely, based on the best speaker for a given location.

2. **Measure the room**

Your installer will use a calibrated reference microphone to accurately measure the performance of each speaker at multiple locations in the listening area. This process ensures that the entire listening area is optimized, rather than optimizing only one location at the expense of others.

3. **Select an appropriate target curve**

Music and movies generally need slightly different target curves for the best results. Your dealer can select the appropriate curve for different applications, and the SC-1 can easily switch between them.

4. **Calculate the necessary room correction**

The software then uses the power of the PC to calculate the correction filters your room requires, and downloads them into the SC-1 for you to audition.

5. **Listen and save the result**

You can listen to each set of correction filters prior to deciding whether it meets your expectations. Once you are satisfied, you can permanently save the results to the SC-1 (eliminating the need for the PC).

This process can be repeated if necessary, and a total of up to three independent setup memories can be saved for different needs. For example, you might want different setup memories for different conditions such as drapes open vs. closed, or perhaps different target curves for different content (music, movies, gaming). Each of these setup memories can be saved to the SC-1 and then selected as needed, with from the SC-1's front panel, or via RS-232 and a control system your installer would create for you.

North American Warranty

Standard 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.

Furthermore, the transducers (“drivers”) in your Wisdom Audio speakers are warranted to be free from defects in material and workmanship under normal use for a period of twenty years from the original date of purchase.

Harsh Conditions Use

The Sage Series loudspeakers are designed for installation and operation in environmentally controlled conditions, such as are found in normal residential environments. When used in harsh conditions such as outdoors or in marine applications, the warranty is three 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.

If the drivers in your STS have been damaged (as, for example, by direct DC current being applied from an amplifier that failed), the enclosure is designed to provide for servicing in place, without having to uninstall the enclosure. Wisdom Audio will work closely with your dealer to resolve the problem.

Specifications

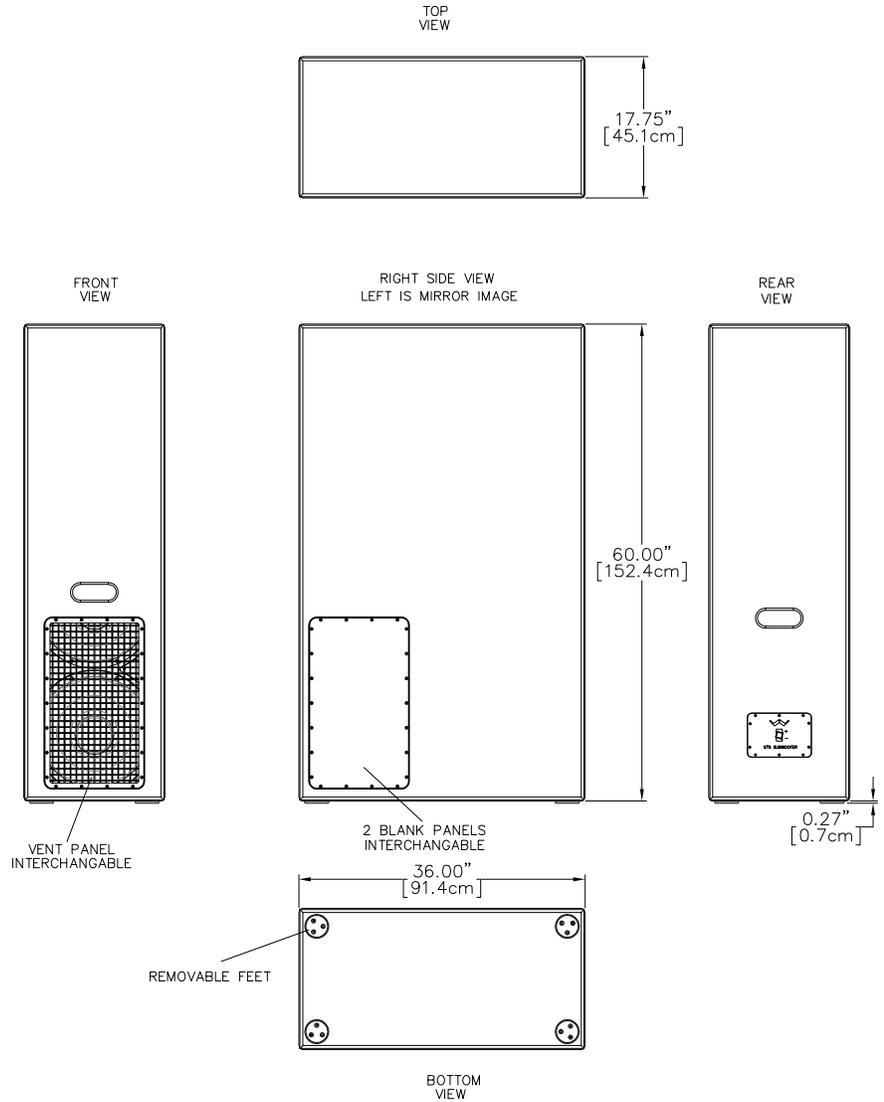
All specifications are subject to change at any time, in order to improve the product.

■ Frequency response	15Hz – 80 kHz ± 3dB relative to the target curve
■ Nominal Impedance	4Ω
■ Sensitivity	101 dB/1w/1m
■ Power handling, peak:	5000W
■ Dimensions	see appropriate Dimensions drawings on next page
■ Shipping weight	350 lbs. (160 kg)

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

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STS Dimensions





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