

Home Theater Handbook

By Anthony Chiarella and Matthew Polk

How to select
and get the most
performance from
a home theater system



polkaudio[®]

Why Home Theater?

Ask Matthew Polk, The Speaker Specialist!

Dear Home Theater Enthusiast:

Home theater is one of the most exciting developments in the history of consumer electronics. Enjoying great movies, television shows and sporting events is an activity that brings family and friends together. Watching a movie or concert on a good home theater system will quicken your pulse, tug on your heartstrings and raise goosebumps on your skin.

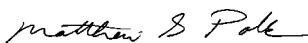
Unfortunately, the very words “home theater” seem to intimidate people. Too many movie lovers believe they’ll need a second mortgage to afford all the hardware, or a pilot’s license to install and operate it. It doesn’t have to be that way. Sure, there’s no shortage of expensive, complex gear; but for less than the cost of a week’s vacation you can own a fine system that will provide your entire family with years of pleasure.

We published this handbook to take the mystery and confusion out of home theater. To keep it unbiased, I asked noted audio/video critic and home theater expert, Anthony Chiarella, to help write it. Anthony has written for *Esquire*, *Home Theater*, *Audio/Video Interiors*, *Fi* and other leading magazines and is an acknowledged expert in advising how to choose and set up great home theater systems.

If you have any questions that are not answered in this Handbook, please call Polk Audio Customer Service during normal East Coast business hours. Call toll free, 800 377-7655, or visit the Polk Audio web site: www.polkaudio.com.

The information in this handbook will help you no matter what brands you’re considering. We’ve left self-serving commercial messages out, but allow me this one: I’ve been designing and building award-winning, critically acclaimed speakers for nearly 30 years and naturally I hope you will take the time to listen to some Polk Audio speakers before you make a buying decision. We’re rather proud of them and would love to hear what you think of their performance.

Happy Listening,



Matt Polk

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About Anthony Chiarella
and Matthew Polk

On the cover:

The Sanus Natural Foundations 3 shelf
video stand, end table and coffee table can
be purchased online at shop.polkaudio.com

What is Home Theater?

If you're currently watching movies on your television, congratulations! You're already enjoying home theater! You see, home theater is nothing more than the marriage of sight and sound, a blending of audio and video. Of course, by comparison to the local cinema, your television's small screen and dinky speaker will deliver a grossly inferior experience. The goal of home theater system is to bridge this quality gap; by employing a surround sound processor, amplifier and appropriate speakers, your system will approach—and in some ways surpass—the sound and image of a good commercial theater.

Bits and Pieces— What You Need

The essential parts of a home theater system are a display device and an audio/video source—just fancy terms for a television (display) and VCR or DVD player (sources). Add a receiver and speakers, and you're done! Since the subject of video could fill a book of its own, we'll focus our discussion on audio gear.

Components or Systems— What is Best for You?

There are two ways to get a home theater audio system: separate components or all-in-one integrated systems. Here's a brief comparison to help you choose what's best for you.

Integrated Systems

These all-in-one systems are often called “home theater in a box” (HTiB) or home theater “shelf systems.” Like their names imply, most, if not all, of the audio components you need for home theater are included in the package: speakers, preamp/processor, amplification and sometimes sources such as radio, CD player and even DVD player.



RTi4 System

HTiB Advantages

- ◆ *Easy to choose and buy.* Just listen to the various models on display, compare features and price, and buy the one that's best for you. Bingo bango, you got home theater.
- ◆ *Compatibility.* There's never a doubt whether the individual parts of the system match each other. These systems are built to work together.
- ◆ *Easy to hook up.* They come with all the cables you need (albeit really cheap ones, but we'll get to the whole "value equation" thing in a sec). Wires, connectors and jacks are usually color coded, with foolproof pre-attached connectors. Your Aunt Millie could probably hook one of these babies up.
- ◆ *Easy to use.* You probably won't even have to read a manual to make it work.
- ◆ *Compact size.* HTiB systems are usually very small and come with cute little teeny-weeny speakers.
- ◆ *Security.* They are generally offered by some of the biggest brand names in the business; Sony, Panasonic, JVC, etc and so on. You know these guys.
- ◆ *Coolness.* Some of them do look really cool.
- ◆ *Inexpensive.* They can be stunningly cheap, as low as \$199.

HTiB Disadvantages

- ◆ *Limited growth potential.* Most HTiBs have a limited number of inputs and other connection facilities with which to hook up additional sources. Typically, there may be only one input for an additional digital source, if that. With the rapid changes in digital and entertainment-delivery technologies these days, you may find yourself unable to connect a new entertainment source like DSS, a digital video recorder or a high-definition DVD player. HTiB is simply not "future-ready."
- ◆ *Prone to early obsolescence.* Built-in sources (like a DVD player built into a receiver unit) are just not a good idea. People who purchased HTiB systems with built-in DVD players just a year or two ago have experienced the painful limitations of built-in sources when better performance progressive scan DVD players came out shortly thereafter. Combined with their limited connection facilities, these systems simply couldn't accommodate the new improved DVD technology. And if the DVD player breaks...well, your whole system becomes just a cool-looking doorstop.
- ◆ *Limited upgrade path.* HTiBs don't grow with your needs. Let's say you move into a bigger house and need a more robust subwoofer to fill the room with bass impact. Sorry. With an HTiB system, you can't upgrade the subwoofer...or the speakers...or the DVD player...or the receiver. And those convenient wires they give you, with the unique connectors? Just wait till you try and get longer wires...

◆ *Cheap materials and poor construction.* There's a real good reason why HTiB systems are so inexpensive, folks. Pick them up. In the dictionary under "insubstantial" is a picture of your HTiB system. And that's not just sour grapes, because it results in . . .

◆ *Poor sound quality.* With very (VERY) few exceptions, HTiBs perform poorly. They simply don't come even remotely close to the performance of movie theater systems or decent component systems. The few HTiB systems that do perform well cost as much as component systems. Typical HTiB shortcomings include lack of deep bass, inability to play at a lifelike volume, lack of clarity and detail. Yes, you can hear the difference!

◆ *Weak speaker pedigree.* Call us biased, but most HTiBs are made by companies that are not very good at designing loudspeakers. Walk into the sound room where the "better" audio components are displayed. See any Sony, Onkyo or Panasonic SPEAKERS there? No, and for good reason. Better speakers, ones that are capable of really thrilling, lifelike sound quality, come from companies that have dedicated their lives to building loudspeakers. Like Polk Audio. (And a few others. But we can't seem to remember their names at the moment. Forgive us.)

◆ *Cheap speakers.* Beyond their questionable parentage, the speakers included in HTiB systems are generally low quality affairs. Most of the time, you can't even take the grille off to check the quantity and quality of the speaker

parts. If you could, you would find paper cones with foam surrounds, similar to what you'd find in cheap, cheesy computer speakers and OEM car stereos than what is typical in decent home audio speakers. Most of the time, you'd be surprised to note that there's no tweeter at all! No wonder they sound so muffled and indistinct.

"All-In-One" HTiB Systems Are A Good Choice For—

- ◆ People with limited budgets.
- ◆ Secondary rooms and homes.
- ◆ Small rooms (under 200 sq. feet).
- ◆ Systems with small screen TVs (under 30").
- ◆ Considerate apartment dwellers with sound-sensitive neighbors.
- ◆ People who don't watch big explosive shoot-em-up action/adventure movies.
- ◆ People who are uncomfortable with hooking up "high-tech" devices.
- ◆ People who have no intention of adding to or upgrading the system.

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Separate Components

This type of system includes a preamp/processor, amplifiers (or receiver), speakers and whatever source components you may like such as CD player, DVD player, VCR, etc. Each component is chosen separately and often come from different manufacturers.

Advantages

- ◆ *Flexibility.* Component systems offer tremendous flexibility and choice. You can mix and match components from various manufacturers to get the best product in each category and exactly meet your unique needs for style, size, and performance.
- ◆ *Style choice.* You can choose from a wider range of speaker types (floor-standing, bookshelf, compact, in-wall, etc.), styles and colors or finish choices when you build a component system than you could with pre-packaged HTiB systems. If you were looking for a brushed aluminum receiver (looks cool!) to combine with Cherry wood finish floorstanding speakers (to match your furniture), you'll be able to get that combo with components. You'd be out of luck with HTiB.
- ◆ *Extreme upgrade-ability.* Add or upgrade one component at a time as you build toward your ultimate system goal. Use as many connectors or as much speaker wire as your little heart desires, without being stuck with a finite amount of cheap speaker wire or having to find some obscure connector type.

- ◆ *Greater functionality.* Most component receivers have multi-room or multi-zone functions, allowing you to connect speakers in other rooms of the house. And usually, that's just the beginning.
- ◆ *Lowered obsolescence.* For you "commitment-phobes," building a component home theater system means you're not married to any one source-technology. Change sources and formats anytime as technology advances. Components mean never having to say you're sorry.
- ◆ *Better materials and better build quality.* Lift, touch, feel. You will notice the difference, as each manufacturer puts their all into their particular product.
- ◆ *High performance.* This is The Big Reason to build your system using components. Systems put together with complementary component parts sound a lot better than all-in-one systems. Many sound as good as, or better than, the surround sound system in your local cinema. Even a small component system will deliver the kind of sound that raises goose bumps on your arms; sound that gets your heart pounding and puts you on the edge of your seat. For realistic musical reproduction, and real movie theater thrills, "Once you go components you never go back."

Disadvantages

- ◆ *More difficult to choose.* Component systems are harder to choose than integrated (HTiB) systems. There's wider choice of component combinations, and it's often difficult to know what component works best with what. But you have a secret weapon to overcome these obstacles... this handbook! Read on and we'll show you how to make choosing, setting up and using a component system less daunting. The flip side is that it can be more fun and ultimately more satisfying to choose a system that is customized for your needs rather than settling for a cookie-cutter HTiB system.
- ◆ *More difficult to set up.* In order to give you the ability to optimize the electronics for the speakers and to optimize the system for your room, there are set-up controls and adjustments that may be complex and confusing. Instruction manuals can be difficult to understand. Fear not! This Home Theater Handbook and Polk's friendly Customer Service folks are here to help.
- ◆ *More difficult to use.* You may wind up with several remote controls on your coffee table. (But "universal learning remotes" are available, and getting easier to use, to overcome this "disadvantage").

◆ *More expensive.* There are HTiB systems that sell for well under \$200. You can buy a component for that kind of money, but you can't buy a component system for that kind of money. Cobble together a good system for \$500, a really good system for \$1000 and a blow-your-mind system for \$2000. Does that sound like too much to spend? So tell me, how much did you spend for that big-screen or that sexy Plasma TV? Putting a \$299 HTiB system on a \$2000 TV is like putting a dinky 4-cylinder engine in a full size Mercedes S Class sedan. Your neighbors might be impressed, but there will be no real excitement in it for you.

Component Systems

Are A Good Choice For:

- ◆ Larger rooms (over 200 sq. feet).
- ◆ Primary entertainment rooms.
- ◆ Systems with large screen TVs (30" and over).
- ◆ People who watch a lot of action/adventure movies.
- ◆ People who enjoy making their own choices.
- ◆ People using their system for realistic music reproduction as well as movie and TV viewing.
- ◆ People who are comfortable with hooking up "high-tech" devices.
- ◆ People interested in tailoring a system for their own unique needs.
- ◆ People who are looking for truly spine-tingling, gut-rumbling, tick-off-the-neighbors performance.



I-Sonic™ Entertainment System

Consider the Source—

A source is anything—music, movies, sports, etc. that you watch and hear in your home theater. The quality of your source will determine the performance of your system. Broadcast Sources are transmitted to your home from a remote destination by one of the following methods:

Cable

This is how most Americans receive their sports and movies. But while cable is popular, convenient, and offers a wide range of options, its quality is inconsistent. Standard analog cable often delivers poor audio and video quality. Newer digital cable systems offer higher quality video and audio performance. In many areas High Definition video and audio as well as "time shift" recording services are available.

Satellite Mini Dish (DSS)

These inexpensive 18" dishes mount almost anywhere, receiving hundreds of digitally-broadcast satellite channels whose quality is unsurpassed. This fast-growing medium is High Definition capable and "step-up" set-top receivers offer digital surround sound. When shopping for satellite broadcast hardware, be sure to look for ones with a digital audio output jack. The free entry level receivers usually do not offer this feature.

Antenna

If you have a functional antenna on your rooftop, use it! You'll only get a limited number of stations in most areas, but they can be received with superb quality, and at no cost. If you have a High Definition television, over-the-air broadcasts can actually deliver the best picture quality.

Digital Video Recorder (DVR)

These devices are considered by their fans to be the best invention since fire. A DVR is a computer hard drive that records and plays back TV programs. They are easier

to use and much "smarter" than VCRs and can even anticipate which programs you'd like to record. You can watch the programs you want to watch at the times you want to watch and you can fast forward past commercials, time outs and other wastes of your time. The major brands in DVRs are TiVo and ReplayTV. Some cable systems and satellite TV services such as Direct TV offer set-top receiver/DVR combination devices that make TV recording and watching ultra easy. The one downside to DVRs is the monthly program guide service fee. In our opinion it's worth every penny.

Digital Broadcast & High Definition TV

These exciting technologies are available in all major markets. While the hardware (HDTVs) commands a premium price over conventional TVs, the image and sound

quality are amazing! Be careful when you shop for HDTVs. Many sets are "HDTV Ready" and require a separate set-top box to receive High Definition signals which is fine if you have an HD set-top box from your digital cable or satellite provider. Other sets have HD tuners built in. While

these sets will cost a bit more at the outset, they may actually cost less in the long term.

Just like the disc drive in your computer or the tape deck in your car, software source components read data-in this case, audio and video information-stored on a tape or disc, and feed it to your

system. Some popular software choices for home theater include:

VCR/VHS Videotape

VHS is a dying format. Audio/video quality is mediocre and, thanks to tape wear, only gets worse with time. It is difficult to find VHS movie titles to rent or buy. Even as a "time shift" device for recording TV programs, the VCR has been superseded by the far superior Digital Video Recorder. If you're still using a VCR, it is time to buy a DVD player and/or a DVR.

DVD

These do-it-all discs are the ultimate format for movies, music and computer software. DVDs deliver amazing picture resolution, and digital surround sound on a convenient little disc. Both the discs and players are reasonably priced, and there



Monitor60 System

is a vast and growing library of software titles available for rent at your local video or mail order rental store. With the price of DVD players starting below \$100, there is no reason to resist the switch from tape to DVD. High Definition DVD player are just becoming available at the time of this writing (summer 2006) that promise life-like picture quality and a host of additional features. There are two competing formats: DVD -HD and Blu-Ray, each backed by different hardware manufacturers and movie studios. Hopefully by the time you read this a single standard will have emerged.

Media Servers & Centers

Computers are capable of storing large amounts of data—including movies and music—and organize them in easy-to-access databases. They are increasingly being used as sources for home theater and audio systems. Purpose-designed media storage devices such as the Audio ReQuest Music Server and the Kalaidescape Movie Server are single purpose devices—all they do is store, organize and retrieve music and movies. We think they are convenient high quality devices, albeit expensive. The alternative is a home PC that has been optimized for media storage, so called Media Centers. To date these devices have been prone to all the ills of PCs—software bugs, need for periodic reboot, non-intuitive interfaces and poor audio and video performance. Some PC makers claim that the latest generation units are better on all these fronts plus offer multi-functionality that single purpose devices can't equal (such as printing a label for a copied CD). Our feeling is that multipurpose media centers are like Swiss Army Knives—you could build a house with one if you had to but you really wouldn't want to.

Super Audio CD

Super Audio CD (SACD) is an audio delivery format developed by Sony and Phillips, the companies who brought us the CD. An SACD disc is the size of a CD but offers much higher sampling data rates than CD for significantly better sound and multi-channel sound when played through a special SACD player. This format failed to catch on as a mainstream format and is now being used mostly by small independent audiophile record labels.

DVD-Audio

DVD-audio is the long promised audio format delivered on a DVD platform. It is said to offer higher digital sampling rates than CD and better sound quality. The DVD-A format supports multi-channel audio and limited video (stills, short clips) on a DVD-sized disc. You will need a player specifically designed for DVD-A and a receiver or processor with 6 analog inputs to play DVD-A. Like SACD, DVD-A failed to catch on and is being offered by a small number of independent labels.



Surround Formats—

Surround sound didn't happen overnight. It grew out of stereo and evolved into today's state-of-the-art discrete digital multi-channel formats. Before building your dream system, you'll need to know the differences.

Dolby® Pro Logic® & Pro Logic II®

To accommodate surround information on two channel sources, Dolby Laboratories developed Pro Logic surround that “piggy-backed” the center and rear channels onto the analog stereo tracks. Dolby Pro Logic surround is found on nearly all movies made in the past twenty-five years, but it suffers from two major limitations. First, the rear channel is monaural: whether you use one, two or twenty speakers at the back of your theater, they all receive exactly the same signal. What's more, that signal has extremely limited frequency range, with no high treble or deep bass. Second, there is little separation between any two adjacent channels, which significantly compromises the “surround” effect.

The newer ProLogic II system is a vast improvement over original Pro Logic and can approach (but never equal) the performance of the two digital surround systems

Dolby Digital and DTS. For watching videotapes and analog broadcast or cable TV, the ProLogic II decoder built into every surround receiver is all you need. If, however, you'd like to hear your DVDs and digital cable and satellite broadcasts at their very best, you'll also want digital surround sound capability that is described in the next section.

Dolby Digital®

The most popular of the digital surround formats, Dolby Digital 5.1 features five full-frequency-range channels—left, center and right front, plus left and right rear—a sixth channel for Low Frequency Effects (bass). Digital surround sound is often referred to as “5.1;” 5 main channels plus the Low Frequency Effects (LFE or “.1”) channel. The advantage of the digital 5.1 surround format is the availability of storing six completely separate soundtracks, one for each speaker in the system. This allows sound designers to deliver much more exciting surround effects and imaging with lifelike impact and dynamic range. The difference in sound quality between Dolby Digital surround and original Pro Logic surround is similar to the difference between CD and cassette tapes.



RT78 Tower Loudspeakers

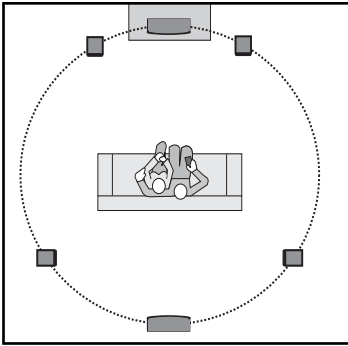


Fig. 1

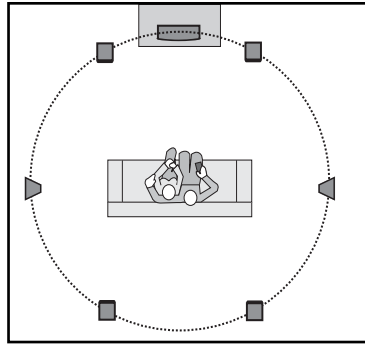


Fig. 2

Digital surround decoding systems such as Dolby Digital require digital sources such as DVD or the latest generation of Digital Satellite Systems (DSS) or Digital Cable. Most DVDs contain a 5.1 channel Dolby Digital soundtrack and all DVD players can play Dolby Digital discs.

DTS®: Digital Theater Systems

DTS (an acronym for Digital Theater Systems) is a digital 5.1 system that is competitive to Dolby Digital. In order to play a DTS DVD disc you must have a DTS surround compatible DVD player and processor. Some DVD titles were released in separate Dolby Digital and DTS versions. Make sure the one you're buying is compatible with your equipment. Lately, more DVD titles have been issued that contain both Dolby Digital and DTS 5.1 digital tracks on the same disc, which eliminates that worry.

Surround EX & ES

There are variations on Dolby Digital and DTS surround processing that offer an additional rear channel signal. Referred to as "Surround EX" (DD) and "Surround ES" (DTS), these systems add either a single center rear speaker, a 6.1 system (Fig. 1), or two back speakers to the standard left and right surround speakers, a 7.1 system (Fig. 2). In order to use surround EX or

ES you need a surround processor with the EX or ES circuitry (standard on many best-quality receivers) and DVDs that have been specifically mixed for EX or ES. These DVDs are backward compatible, meaning they will perform exactly like a standard DVD when played on non-EX or non-ES equipped processors.

A properly set up 6.1 or 7.1 system can sound amazingly lifelike, enveloping the listener in a seamless 360-degree sound-field. If you are a hard-core audio hobbyist, and have the freedom to set up a system as illustrated above, Surround EX may be for you. But many people will find it hard to properly integrate additional speakers into their rooms. A poorly set-up EX system may in fact sound worse than a standard 5.1 system. Rest assured that standard Dolby Digital and DTS 5.1 systems are capable of spine-tingling surround performance on their own. You'll still blow your neighbors away.

THX®

THX is a set of equipment specifications, compatible with all surround formats, intended to standardize the performance of any theater system. It does not compete in any way with Dolby Digital, Pro Logic II or DTS. Software (movies) certified by THX

may be played on any system and conversely, THX hardware can play all movie software whether or not it is THX certified.

There are actually three parts to the THX standard: one covers the mastering of home video software. All THX-certified software will work with any player, in any system. Part two is known as the Theater Certification Process, wherein a commercial movie theater can achieve THX status by complying with a series of hardware and setup guidelines. Part three deals with the gear consumers purchase for their home theaters, and is known as Home THX.

There Are Several Levels Of THX Certification For Home Theater Products:

- ◆ *THX Ultra* Certified Products are engineered and designed for top performing products that are not dependent on a specific room size. Product types include: Interconnects, Equalizers, Projection Screens and DVD Players.
- ◆ *THX Ultra2* Certified Products are engineered and designed for large home theaters. Viewing distance of approximately 12 feet (4 meters) from the display to the listening position. Product types include: Speakers, Receivers, Pre-Amplifiers, and Power Amplifiers.
- ◆ *THX Select* Certified Products are engineered and designed for superior performance and complement the presentation of THX Select2 Certified Receivers. Product types include: Speakers and DVD Players.
- ◆ *THX Select2* Certified Products are engineered and designed for small to medium sized home theaters.

Viewing distance of approximately 10 feet (3 meters) from the display to the listening position. This level applies only to Receivers.

Home THX components are not necessarily better or worse than other products: they have simply earned THX approval by conforming to THX-mandated specifications. Once the product has been submitted to Lucasfilm Ltd. (the company that developed and licenses the THX standard) and passed a battery of tests, it can wear a “THX Approved” badge. In order to be a true THX system, all the audio components in that system—processor, amplifier, speakers and subwoofer—must be THX-approved. But that does not mean that THX and non-THX components cannot be used together; they can.

Although THX guarantees minimum standards of certain aspects of performance, many of the best products are not THX-approved. Why? Audio manufacturers often choose to forego THX certification because either A—they believe THX specifications actually compromise performance (for example, many speaker manufacturers assert that THX-mandated dispersion patterns can negatively affect music sound quality) or B—they decline to pay, and pass on to their customers, the licensing fees.

So, should you buy THX-approved gear? That depends. For inexpensive, entry level gear, THX-approval guarantees a minimum standard of quality: a THX-approved receiver or amplifier will drive a variety of loudspeakers and, conversely, THX-approved speakers will work with most amps. So will most non-THX components! It would be foolish to ignore a product simply because it has or hasn't been THX certified. What's

more, most high quality “high end” products are not THX-approved. If you need an “official seal of approval,” THX might be worthwhile. But remember: you can build an excellent home theater independent of THX certification. When in doubt, trust your ears.

Digital Signal Processing (DSP)

Many surround receivers have “DSP” circuits that allow your surround system to mimic the acoustics of various locales such as a concert hall, church, jazz club, etc. The sound quality of these surround modes ranges from pretty darn good to simply awful. If this type of surround processing is important to you, listen before you buy. If not, ignore it. All units allow you to turn DSP modes off.

Power Up: Choosing Electronics— Receivers

Think of the receiver as the anchor of a home theater system. Receivers are actually several components in one chassis; they are easy to buy and represent very high value. The functions of a receiver are:

Tuner

Receives AM and FM radio stations. Some models can receive XM or Sirius satellite radio with a paid subscription. If radio is important to you, you’ll want to seek out a receiver with an HD radio tuner. HD Radio is the new digital radio standard that offers near CD-quality sound on FM, FM quality sound from AM, more stations on both bands and text data on the tuner’s display. For more information on HD Radio go to www.hdradio.com.

Preamp/Switching Center

The preamp section of the receiver controls volume, bass, treble and other basic operational functions. It also serves as a switching station for your whole home theater system, allowing you to switch audio and video sources. Make sure the receiver you are considering has enough audio and video inputs and outputs to handle all your current and future sources. Be especially aware of the number and type of digital inputs it provides. Are there enough for all your present and future digital sources such as DVD, DSS, Digital Cable? If your TV and DVD player have Component Video inputs and outputs (three wires), make sure the receiver has Component Video inputs and outputs. The latest audio/video connection method is HDMI—a single wire that connects audio and video sources to TVs and receivers with a single cable. Be careful to make sure that the receiver is equipped to handle the audio and video switching duties of your current and future source and display devices. Your receiver can act as the central “switching station,” allowing you to switch audio and video with a single remote command.

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com/education/index.php](http://www.polkaudio.com/education/index.php)**

Surround Processor

This part of the receiver “decodes” the surround sound information from the source and directs the channels of information to the proper speakers. The major types of surround formats are discussed on pages 12, 13 & 14. All receivers sold today have Dolby Pro Logic or Pro Logic II built-in so that you can get surround effects from broadcast and cable TV and videotape. Virtually all surround receivers sold today also feature built-in Dolby Digital and DTS processing in addition to Pro Logic II.

Power Amplifiers

The power amplifiers are the parts of the receiver that drive the speakers. The higher the power (watts) of the amplifier section, the louder and cleaner the speakers will play. Don't worry about small differences in power; in order to get an audible volume difference (a 3dB increase) you need to actually double your power. So if you are considering a 50 watt per channel receiver, the next significant step-up power-wise is 100 watts per channel.

But beware, not all Watts are created equal. It is not uncommon to have two receivers or amplifiers of equal rated power and find that one plays louder and sounds better than the other. Why? Some manufacturers measure power with only one channel operating at a time, rather than all channels driven simultaneously (as you would use it). Also, standard amplifier tests cannot mimic the same electrical conditions, or load, of an actual loudspeaker. But most of all, specifications cannot measure the quality of sound.

So How Do You Tell Which Receiver Has The Better Amplifier Section?

Here Are A Few Clues—

- ◆ *Look carefully at the power specifications.* A thorough and meaningful power spec would look something like this: “100W/ch @ 8 Ohms, with no more than 0.1% THD, from 20-20,000 Hz, all channels driven.” In this spec you can tell that the power was measured in the way you will use it: at low Total Harmonic Distortion (anything under .5% is low enough), through the whole audible frequency range (20Hz - 20kHz) and with all the speakers playing. A lesser quality receiver might quote power like this: “100W/ch @8 Ohms, at 1 kHz, one channel driven.” That's a lot like quoting a car's acceleration as “0-60 MPH, downhill with a stiff tail wind.”
- ◆ *Look for power ratings at lower than 8 Ohm loads* (Ohms are a measure of the electrical resistance of the speaker). Ideally the amp should be able to put out 50% more power into a 4 Ohm load as an 8 Ohm load. If there is no 4 Ohm power rating quoted, chances are that the amp will not drive a 4 Ohm speaker.



PSW505 Powered Subwoofer

Almost all speakers are less than 8 Ohms for some part of the frequency range (impedance varies with frequency) and many fine speakers are 4 Ohm speakers. Get a receiver that can safely drive a 4 Ohm speaker.

- ◆ *Beware of the super bargain.* If you see a receiver that seems to offer a lot of power for a ridiculously low price it is probably too good to be true—literally.

Separate Components

If you are a real audiophile and want the absolute best performance, you will be better off getting all of the above components as separate pieces. This approach will give you the greatest amount of flexibility and ultimately better performance than can be had from a receiver, but at greater cost and complexity.

Loudspeakers—

Loudspeakers have the toughest job in the home entertainment system. While source, processing and amplification components like players, receivers and amps simply have electrical signals with which to contend, speakers are transducers—devices which convert electrical energy (the audio signal supplied by the amp) into mechanical energy (the music and sounds we hear).

A good speaker will do this job accurately, reproducing sounds precisely as they were recorded and efficiently, squeezing the most volume from the least power. What's more, there's no single way to build a fine loudspeaker. Unlike amps, preamps and processors, which all employ the same basic circuits but differ in terms of features and construction quality, the diversity of speaker designs is nearly as limitless as the speaker designer's imagination.

All loudspeakers make sound by moving air. Your amplifier powers the speaker's drivers—woofers for bass, tweeters for treble, and midrange for everything in between—that vibrate at frequencies and volumes to match the original recording. Since they all work the same, why don't all speakers look the same? Because everyone's needs are different. Do you want to make your home theater the focal point of your living room, or do you believe that speakers should be heard and not seen? Are thunderous bass and lifelike volumes important, or is softer better? No matter: there's a perfect speaker for your room, budget and listening taste, once you know how to find it.



LSi25 Tower Loudspeakers

Loudspeaker Types

Floorstanding Speakers

Floorstanding or “tower” loudspeakers are audio’s equivalent of a big-block V-8 engine. Thanks to their large enclosures and increased size or number of drivers, floorstanders move enormous quantities of air, enabling them to have greater dynamic range (to play louder and cleaner) and produce deeper bass than other designs.

Advantages

Extremely wide frequency response and dynamic range make floorstanders the choice where performance is the primary purchasing criteria. And while they tend to be large, many current models feature slender cabinets with small footprints, minimizing visual impact. Also, since most of the world’s best loudspeakers are towers, their manufacturers often lavish better parts or build quality on these “flagship” products.

Disadvantages

When space is at a premium, such as in a small apartment or smartly decorated room, towers simply might not fit. What’s more, the prodigious output capabilities of such speakers means that placement can be more critical—floorstanders should be located 2-3 feet from nearby walls for best performance. Finally, beware of “bargains:” large cabinets are expensive to build. Unusually low pricing is often the result of construction shortcuts.



CSi3 Center Channel Speaker



LS17 Bookshelf Speakers

Floorstanders With Built-In Subwoofers

(Powered Towers) Powered towers are floorstanding speakers with the powered subwoofers built right in.

Advantages

For 5.1 channel digital systems, the chore of selecting the subwoofer disappears. Powered towers also conserve floor-space. Since the subwoofer and main speaker drivers are designed together, they can be optimized with each other for better performance and better “blending.” There is no sense of discontinuity between midrange and bass as there can be with separate main/subwoofer speaker systems. While not cheap, powered towers are often less expensive than purchasing separate speakers and subwoofers of comparable quality.

Disadvantages

The best room placement for the midrange and imaging of the main speakers (usually away from walls) may not be the best placement for the subwoofer’s bass output (usually close to walls). So a powered tower may force a compromise in placement and performance. Very large rooms and bass-craving listeners may require a separate subwoofer.

Bookshelf Speakers

With their compact cabinets, bookshelf speakers work where towers won't. Actually, the name "bookshelf" is unfortunate, since most such designs perform best when placed on sturdy stands, rather than tucked inside pieces of furniture. These speakers are not only more placement-friendly but, since small enclosures are more rigid, they produce less sonically degrading "box resonance" than all but the best towers.

Advantages

Usually modest in price as well as size, bookshelf speakers fit rooms and budgets that cannot accommodate a pair of expensive towers. The small, solid cabinets are both versatile—able to excel in bookcases, atop shelves or hung on walls—and feature excellent midrange clarity.

Caution:

Many bookshelf type speakers use air tunnels or "ports" to improve efficiency and bass output. If you plan on placing your speakers against a wall or inside a cabinet, choose a model whose port is located on the front panel, with the drivers. The exceptions to this caution are the Polk RTi and LSi Series bookshelf models that feature a rear mounted PowerPort. The PowerPort's unique design permits proper operation even under these conditions. (Couldn't resist the plug here!—Matt)

Disadvantages

Reduced cabinet volume and driver area limit the dynamic and bass frequency range of bookshelf speakers, and can also compromise power handling and efficiency. Fortunately, the addition of a separate subwoofer can overcome these problems.

Subwoofer/Satellite Systems

When even the smallest bookshelf speakers are too visible to fit your lifestyle, a satellite/subwoofer ("sub/sat") system is the answer. By combining small satellites with a subwoofer designed specifically to work with them, sub/sat systems have become one of the most popular categories in home audio.

Advantages

The big advantages here are size, placement flexibility and cosmetics. The satellites can be placed just about anywhere: on a shelf, on the wall, in a cabinet or on a table. Most are small enough to fit in the palm of your hand and are hard to spot when placed alongside books and bric-a-brac. Some satellite speakers are very handsomely styled so that even when they are seen, they complement rather than detract from the look of the room. The subwoofer section can be placed out of sight—in a corner, behind furniture or under a table.



Monitor60 Tower Loudspeaker



RM6900 Subwoofer/Satellite System

Sub/sats also have certain performance advantages over more traditional designs. The slender front baffles don't interfere with the drivers' dispersion, so imaging is absolutely first rate. The best of the genre produce a wide, deep soundstage that is in some ways superior to larger speakers. The subwoofer cabinet can be placed where bass performance is best, so bass response is often awesome. Most folks are agog when they hear such loud bass apparently coming from such tiny speakers.

Disadvantages

Those little satellites can't reproduce bass on their own, making it tough to achieve a completely seamless blend between satellite and sub. There is often a "hole" or weak response in the area where the satellite's response leaves off and the subwoofer takes over— lower midrange or the bottom octave of a male voice. When evaluating sub/sat systems listen closely to male voices, if they sound "thin" the system suffers from this midrange suck-out problem.

Small drivers and enclosures also compromise dynamic range and power handling. If you have a very large room to fill with sound, a sub/sat system may not be right for you.

Sound Bars

With the growing popularity of slim profile and wall-mounted LCD and Plasma TVs, a new category of speaker has emerged— so called sound bars, speakers that contain Left, Center and Right (LCR) channel speakers in a single enclosure.

Advantages

"Sound Bars" are very space efficient, look terrific wall mounted under a flat TV and are easy to hook up. They can be a great choice for bedroom or guest room systems or anyplace where space is at a premium.

Disadvantages

By concentrating the speakers for Left, Center and Right channels into a small package, the sonic image produced by these speakers is small and lacking in spaciousness. Small size and lack of bass makes a subwoofer an absolute necessity. If surround sound is your ultimate goal, you will still have to place, mount and connect rear channel speakers, which is a more daunting task than placing, mounting and connecting the front three channels.

Single Speaker Surround

A very few speakers contain speakers for all five main channels in one enclosure and are capable of generating surround sound from one or two speakers to eliminate the need for wiring and placing rear channel speakers. There are two basic methods to generate a surround experience from one or two front speakers. Each method has its own subset of advantages and disadvantages.



SurroundBar™

- ◆ The bounce-in this method the speakers are mechanically or electronically aimed toward side and/or rear walls to reflect the rear channel signal off of room surfaces.
- ◆ Electronic or acoustic signal processing in which the rear channel signal is altered to allow you to hear sound around and behind you.

Advantages

As with Left/Center/Right type sound bar speakers, these one or two-speaker surround models are space efficient and look right at home mounted under or above a TV. The elimination of rear surround speakers has obvious space conservation, decorating and convenience benefits. Single speaker surround solutions are usually very easy to hook up. If you are unable or unwilling to place and connect rear speakers, these products can be a simple and convenient solution.

Disadvantages

How well the surround experience works depends in part on your room acoustics and the type of system you choose. The “bounce sound” type products tend to require room layouts that are symmetrical with nearby side walls. The signal processing type models are less dependent on room acoustics/layout to work well, but some variations of this method can sound unnatural. As always, when evaluating any type of speaker, listen before you buy, paying close attention to basic fidelity and naturalness of sound. Long after the novelty of surround sound wears off, you’ll be far more concerned with clarity, even tonal balance and detail resolution.



PSW1000 Powered Subwoofer

For a more thorough discussion of single speaker surround solutions visit: www.polkaudio.com/homeaudio/products/surroundbar/

Subwoofers

Want big bass without big speakers? Add a subwoofer! A speaker that reproduces only the lowest frequencies, a subwoofer makes it possible to achieve true full-range performance with bookshelf or “satellite” speakers by taking over the responsibility for the lower frequencies which small speakers have trouble delivering. Subwoofers can augment the bass of all speakers in the system as well as serve as the “.1,” or LFE (low frequency effects) channel, in 5.1-channel digital systems. Listeners who seek the ultimate home theater experience will want to add a subwoofer even to full-range floorstanding towers!

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RC/65 In-Wall Speakers

Advantages

Subwoofers supply the low frequencies that small speakers lack, but that's only half the story. By relieving the other speakers of their bass burden, a subwoofer actually enhances midrange and treble quality. Most subs include their own amplifier, so adding a powered subwoofer also increases your total system power. And since bass frequencies are non-directional, your sub can be tucked out of sight and still shake the floor.

Disadvantages

A subwoofer is yet another box to find a place for in your room. If this is a problem for you, consider main tower speakers with built-in powered subwoofers custom installed in the floor. In the context of a 5.1-channel system, there are few downsides to a subwoofer—you need one to get the full impact potential of the home theater experience.

Built-In Speakers

For environments where box-type (tower or bookshelf) loudspeakers are unacceptable, built-in speakers mount in holes cut into the wall or ceiling. Most models feature paintable grilles so you can disguise them, enabling them to virtually disappear into your decor!

A new category of built-in speakers is that of built-in subwoofers that mount in walls, floors and ceilings. These subs usually come with outboard purpose-designed amplifier/crossover units.

Advantages

Since they consume no floor or bookshelf space and can be easily concealed, in-walls work when and where other speakers won't. If you plan on expanding your system throughout your home, built-in speakers are a wonderful way to bring sound to additional rooms. They are also useful as rear surround speakers when the room configuration makes it impossible to properly place box speakers. The very best examples of built-in speakers and subwoofers can rival or exceed the sound quality of free-standing speakers.

Disadvantages

Unless you are using a purpose-designed in-wall enclosure or have the ability to change the volume of space behind the speaker (by installing fire breaks), bass performance can be uneven and unpredictable. Built-ins that can deliver the dynamic range and bass response of box-type loudspeakers are more costly than free-standing models. Unless you are a do-it-yourselfer, professional installation will add to the cost of the system.

Choosing Home Theater Speaker Components— “Why Do I Need All Those Speakers?”

Art imitates life. In the real world, we don't just hear sounds in front of us, but from the back and sides as well. In their attempts to make movies as lifelike as possible, directors duplicate this experience by sending certain sounds to the sides and rear of the theater. For these reasons, modern soundtracks include additional channels that “surround” their audiences with sound. When movies are auditioned through a multi-speaker theater array, viewers are placed “in the center” of the action. That's why you need all those speakers!

Take A Balanced Approach

Your stereo, center, and surround speakers shouldn't just sound good, they should all sound the same. Using a technique known as “timbre matching,” top manufacturers achieve a consistent character of sound, or timbre, from main to center to surround speakers, assuring a seamless blend among all channels. Choose a brand that offers a wide range of timbre-matched models. Look at the drivers and tweeters used throughout the system. The tweeters should be the same. The midrange driver cones should be made of the same material, or better yet, the drivers themselves should be identical.

A chain is only as strong as the weakest link. This is as true in home theater systems as it is in tug-of-war and towing. With today's home theater systems, every speaker in the system has a vital job and must do it well. Strive for balanced performance when selecting home theater speaker components. It makes no sense to overspend on one speaker and skimp on others.

Here's a description of each speaker in a home theater system, its purpose and how you can choose the right one for your needs.

The Stereo Pair

In addition to playing music, the left and right “main” channels of a soundtrack carry most of a motion picture's special effects and orchestral score. In order to excel at these tasks, the stereo pair must encompass wide frequency and broad volume swings (dynamic range), reproduce subtle recorded details, and be able to create a convincing “soundstage” (the impression of musicians playing on a three dimensional stage).

When choosing main channel loudspeakers, play a handful of music and movie selections you know well. Listen to a solo vocalist: does the “image” of that performer seem to “float” at the center of the soundstage (good), or can you trace the singer to the speakers (bad) or does the singer seem to be 10 feet wide (even worse)? Next, try an acoustic guitar, violin or cello. You should hear natural, detailed string tone, as well as the resonance of the instrument's wooden body. Finish with an action flick. Are the effects—gunshots, explosions, etc.—clearly reproduced, or do they become hard, flat and generally unpleasant as the volume increases? A good pair of loudspeakers should never sound “fatiguing.”

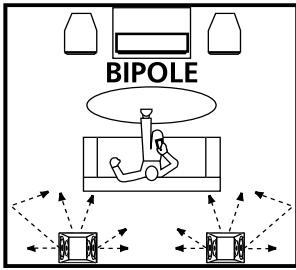


Fig. 3a

The Center Channel Speaker

Although the main purpose of a center speaker is to fix the actors' voices to the screen for off-center listeners, this channel also carries a good deal of the movie's special effects. In fact, more than 50% of a typical film's sound is routed to the center, and the speaker must be able to produce very high volumes without distortion or strain—so don't skimp! Audition a scene in which several actors speak. Is each voice unique and articulate? Male vocals should be deep, but never boomy or "chesty" (emphasizing the deep-chest sounds in spoken or singing voices). Higher-pitched women's voices shouldn't sound shrill, "spitty," or nasal. Finally, try a scene in which special effects "pan" from left to right—a car chase or airplane fly-by is ideal. Does the sound remain consistent, or does it become weak or lightweight as it passes through the center?

For a single listener sitting in the "sweet spot" (equidistant from two front speakers), a center channel speaker is sometimes not even necessary. Simply engage the "phantom center" control on your processor or receiver, and you'll hear a clearly localized central image. Of course, if you'd like to share the fun with friends or family, a good center channel speaker is a necessity.

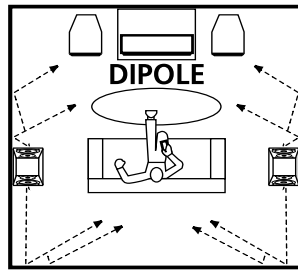


Fig. 3b

Do you need a center channel speaker with good bass performance? For most systems, the answer is no. All surround receivers and processors have "bass management" for the center speaker. They allow you to direct the center channel bass information into the main or subwoofer channels. Your processor's instruction manual will show you how to do it. The center speaker needs to reproduce sounds only from 100Hz and up. But if you want the ultimate home theater performance, there are a few center speakers that can reproduce bass with authority. If your main speakers are ultra-high performance, you'll appreciate the added dynamic range, kick, and imaging precision that a full range center speaker brings to the party.

The Surround Speakers

The next time you're in a movie theater, look around. See all those speakers lining the side and rear walls? They help the soundtrack encircle the audience. It's this "surround" effect that places viewers in the center of the action. Since it's usually impractical for homeowners to install multiple pairs of "effects channel" loudspeakers, manufacturers offer "bi-directional" (bipole or dipole) speakers, which place drivers on both the front and rear of the cabinet. This arrangement spreads the

sound along the side-walls, making it harder for the audience to identify the location of the surround speakers and delivering a more enveloping experience. This is especially important if your surround speakers need to be placed within a few feet of your listening position (Fig. 3a & 3b).

But bi-directional surrounds are not for everyone. With 5.1-channel systems, your rear speakers need to reproduce the same high frequency range as your front speakers and bass as low as 80 Hz, minimum. You'll probably be happier with high performance front-firing speakers than with a pair of cheap or mediocre bipoles or dipoles. Frankly, bi-directional speakers selling for less than \$300/pair are not a wise choice.

To choose the surround speakers that are best for you, first select a location and the type of speakers (floor, on-wall, in-wall, in-ceiling, etc.) that fit well in your room. This will help determine

whether you'll want bi-directional or front-firing surrounds.

In Dolby Digital and DTS-equipped systems, select surround speakers that are as close as possible in performance to your front speakers. Look for the same or similar driver and tweeters as your front speakers. Pick speakers made by the same manufacturer that made your main speakers. In-wall or in-ceiling speakers are an attractive option for surround channel use. They can offer high performance and take up no space at all.

The Subwoofer

A powered subwoofer is a speaker that reproduces only the lowest (bass) frequencies to provide a more exciting and lifelike movie experience. Since it has its own built-in amplifier, you don't need to be concerned about whether your receiver or amp has enough power to drive a powered subwoofer.

Tire Kicking— *How To Judge A Quality Speaker*

Although listening is the ultimate test of a loudspeaker, there are other clues to quality. Rap your knuckles on the sides of the cabinet: a hollow echo indicates a poorly made enclosure that will probably degrade the sound. The weight of a speaker will give you a clue as to the materials and construction quality. The best speakers have 5-way binding posts that offer the best possible connection with any type of cable.

Read the manufacturer's specifications to make sure your amplifier and speakers will work properly together. The efficiency (a.k.a. "sensitivity") rating tells you how much sound a speaker will produce when it's fed one watt of power. Choose a model rated at 86dB or higher—a low-powered system needs high efficiency speakers. Finally, check the "impedance" specification. If you've chosen an inexpensive receiver, your speakers' impedance should be at least 4 ohms, and preferably 6 Ohms or higher.

A highly recommended option for stereo or Dolby Pro Logic, subwoofers are an essential component of 5.1-channel digital systems since these formats assign additional low frequency effects to a separate subwoofer track. If you've chosen floorstanding speakers with built-in powered subwoofers for your stereo pair, this sixth speaker may be unnecessary. If you're looking to assemble a truly outrageous home theater system, adding a separate subwoofer to a set of powered towers will deliver an effortless, body-moving experience.

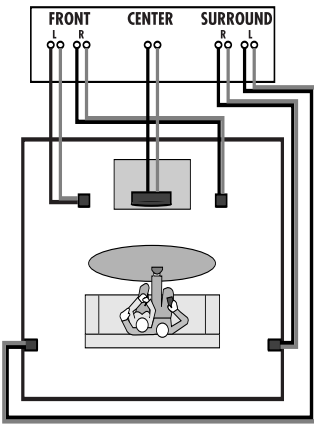


Fig. 4

There are a few things to keep in mind when selecting a powered subwoofer for your system. First, select a location for your subwoofer and measure the space to see what fits.

Next, keep in mind that the better your front main speakers, the better your subwoofer needs to be. If you have floorstanding speakers that already have good bass, select a subwoofer that is capable of reproducing very low frequencies so that it produces the bass that your main speakers

cannot reproduce efficiently. A small, inexpensive subwoofer added to a pair of large, high quality floorstanding speakers might do more harm than good.

The size of your room is also a factor. The bigger the room, the better the subwoofer you'll need. In very large rooms multiple subwoofers may be desirable.

But the best advice of all is to ignore the numbers and simply listen before you buy. Many people get overly concerned about inches and watts. They assume that the bigger the driver size and the higher the power amp rating, the better the subwoofer. This is simply not so. Bigger doesn't necessarily make better. Your dealer will let you listen to different subwoofers before you buy. If possible, listen with the front speakers you own or intend to get. Does the subwoofer add a deep bass foundation, or does it just "boom"? Listen with music as well as movie sources. Is the subwoofer tight and well defined with music, or does it just add a vague rumble? Trust your ears. Find the right subwoofer for your room with Polk's on-line subwoofer chooser:

www.polkaudio.com/homeaudio/subchooser/

System Setup—

Even the finest surround sound system won't sound its best unless it is set up properly. And while the subject of speaker placement could—and often does—fill an entire book, a few basic tips will help you obtain the best performance from your home theater system.

Common Mistakes

The three most common setup mistakes involve reversing channels, connecting speaker wires out of phase, and misunderstanding the subwoofer connection.

Channel Identification

On the back of your receiver or amplifier, you'll find a clearly labeled pair of terminals for each of the five speaker channels, plus a subwoofer or LFE output. When you're sitting in your listening position, facing the three front (left, center and right) speakers and the television, the left front and left rear speakers are on your left, and the right front and right rear speakers are on your right (Fig. 4). You can assure proper hookup by using your receiver or processor's built-in test tone. As the tone moves from one channel to the next, your receiver or processor will display which speaker is reproducing sound at that moment. If one or more test tones come out of the wrong speakers, it's time to rewire!

Phase

One of each pair of speaker terminals on the receiver's output panel is black, the other is red. These correspond to the "positive" (+) and "negative" (-) phases, or halves, of the audio signal. The connectors on the back of each speaker will be similarly color-coded (Fig. 5). Speaker wire pairs have some way of identifying the two conductors: they will be color coded, marked with "+" and "-", or one wire will have a rib, a stripe or printing. Be careful not to reverse the positive and negative wires, as incorrect phase will adversely affect sound quality by canceling bass and producing vague, unfocused images.

Subwoofer Hook-Up

This is another common stumbling block when setting up home theater systems. The subwoofer output jack of a processor or receiver may not be the best place to hook up your subwoofer. Why?

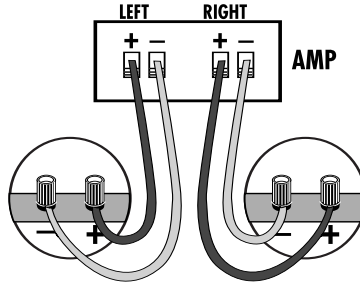


Fig. 5

- ◆ Many receivers or processors only direct bass to that output jack when in a surround mode and not in the stereo mode. That means you'll lose the benefit of the subwoofer when playing a stereo source! Your receiver or processor may not do this, check the manual or experiment.
- ◆ In the vast majority of receivers and processors, the subwoofer output jack is low-pass filtered. That means that there is a filter (sometimes referred to as a crossover) that blocks sounds above a given frequency (usually 100Hz-150Hz) from getting out of the sub-out jack. Your powered subwoofer also has a built-in low pass filter, and when the two filters combine the filter "slope" is increased. In plain English, you lose performance. Some receivers and processors allow you to turn off or adjust the filter. A very few have subwoofer outputs that are not filtered at all. Check the instruction book and specs to learn what type you have.
- ◆ In the case of many systems, particularly those with little satellite speakers (such as Polk RM Series products) the low-pass filter that is built-in to the receiver or processor is set to the wrong frequency.

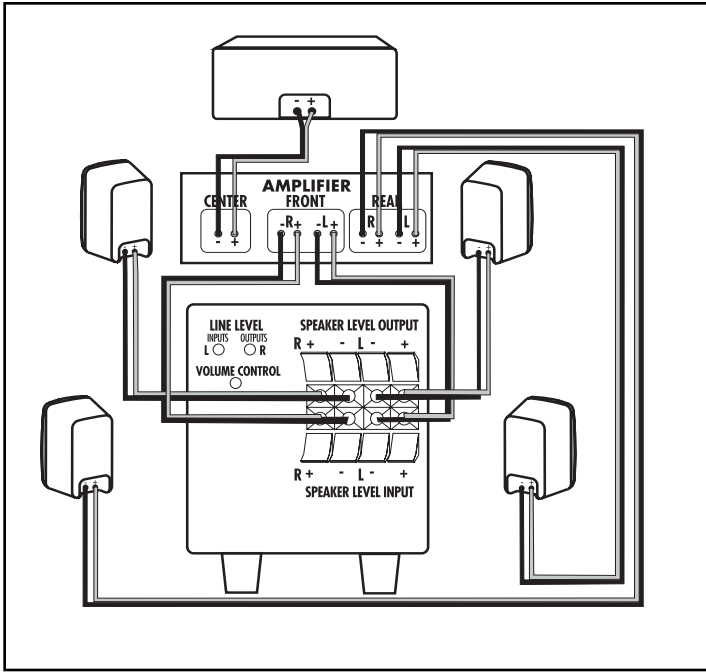


Fig. 6

- ◆ Additionally, the high-pass filter that the receiver imposes on the satellites' combines with the satellites built-in filter to weaken the lower-midrange response of the system -making male voices sound "thin."
- ◆ The variable low-pass filter (crossover) adjustment is one of the most useful tools for adjusting your subwoofer to "blend" with the rest of the system. By using a pre-filtered signal, you are defeating this excellent and useful feature.

Some subwoofers have "LFE" line inputs that bypass the subwoofer's built-in low-pass filter. This feature is great for avoiding the double-filter effect when using a filtered sub-out jack.

The Speaker Wire Advantage

Many people are worried that if they don't use the subwoofer output jack, they'll miss the Low Frequency Effects (LFE) channel on 5.1-channel DVDs. Not true. (We'll tell you the secret to getting every last bit of bass, regardless of which hook up method you use, in the "Setting Bass Management" section on page 37.)

If you have full size speakers, and if your electronics allow an unfiltered signal to go to the subwoofer output jack, and if the subwoofer plays in all modes (stereo as well as surround), go ahead and use the subwoofer output jack. Otherwise, there are better ways to hook up your subwoofer.

Almost all powered subwoofers allow you to connect them with speaker wire. In many cases, that is the best hook up method

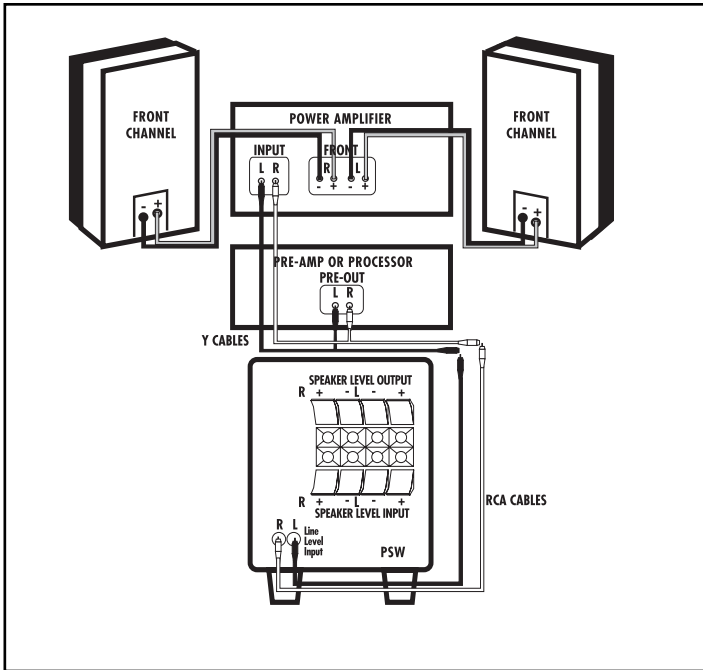


Fig. 7

(Fig. 6). If your receiver or processor has preamp output jacks, use those to feed the subwoofer using RCA cables (Fig. 7). When using either of these hook up methods with Dolby Digital and DTS systems, select subwoofer “off” in the bass management or “speaker set up” function of your receiver or processor (see “Processor Configuration and Bass Management” on page 39). This will direct all of the bass, including the Low Frequency Effects channel, to the left and right speaker outputs and avoid any problems that may arise from using a subwoofer output jack. If you have a satellite/subwoofer system with small satellites, or if you have tower speakers with built-in powered subwoofers, we strongly recommend either of these methods instead of the subwoofer output jack method.

Optimizing the Sound of Your Room—

The acoustic characteristics of your room and the placement of the speakers within it have a far greater effect on the quality of the sound you will hear than any single piece of electronic equipment. While acoustics can be a confusing subject, and extensive room treatments and alterations can run into the tens of thousands of dollars, there are a few simple, inexpensive things you can do to maximize the performance of your room and setup.

There Are Two Important Phenomena Of Room Acoustics: Standing Waves & Reflections

- ◆ *Standing Waves* create uneven bass response throughout a room. To hear the effect of standing waves for yourself, play a CD with deep, sustained bass.

Unless you are one of a lucky small minority, you will hear the bass loudness go up and down as you walk around the room. Where there is more bass and where there is less bass is a function of the dimensions of the room and your speakers' placement. The closer your room is to being a cube (equal length, width and height), the more uneven the bass response will be. If you live in a cube-shaped room—move. For the rest of you, keep reading for some speaker placement advice that will help you minimize standing wave problems.

- ◆ *Reflections* are just that: reflections of the sound off walls and other objects. Reflections are not bad per se. You just want to avoid strong, coherent (regular) reflections near the speakers. Strong coherent reflections will color the sound, make the system sound “bright,” and ruin any chance of getting lifelike imaging. If you’ve ever heard a sound system in an empty, hard-walled room, you know what we mean. The reflections you should concentrate on first are those that happen within a few feet of the speakers.

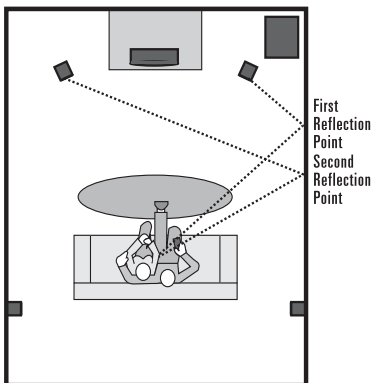


Fig. 8

Wall construction will also affect the sound of your system. Walls can act as resonating panels and add “boomy” coloration to sound. Using your fist, knock between studs on the center of a long wall in your listening room. Odds are good that the wall will vibrate and make a booming noise. Sound waves from your speakers will excite the natural resonance of the wall in much the same way. If your room walls are 1/2" drywall or wood paneling, the effect is even more pronounced.

Room Treatment

You can minimize bad reflections by judicious speaker placement, and by absorbing or diffusing the reflections.

The first thing to do to improve the sound of your room is fill it with “stuff.” Any kind of stuff: books, furniture, drapes, knick-knacks, paintings. The stuff can be soft, hard, big, little; it hardly matters as long as the stuff isn’t flat like the walls. The more irregular the room surfaces the greater the diffusion of reflections are and the better the sound. Do whatever you can to break up large expanses of bare, flat walls, especially the areas near the speakers.

The most critical areas to treat are the wall behind the speakers and at the first reflection points along the side walls. To find the first reflection point, sit in the main (center) listening position and have a friend slide a hand mirror along the side wall at tweeter height. When you can see the nearest speaker in the mirror, you have located the first reflection point. Treat that area, and the wall opposite, with either sound absorbing materials (drapes, tapestry, or professional materials like Sonex, and Echo Busters), sound-diffusing materials (irregularly surfaced furniture, broad-blade wood blinds, or, better yet, RPG diffusers).

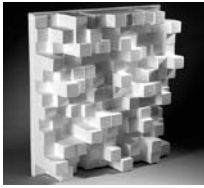


Fig. 9 RPG Dimensions



Fig. 10 Sonex Absorbing Foam

If you want to eke out a little more performance, treat the second reflection spot. Have your helper slide the mirror farther down the side wall until you can see the opposite speaker in the mirror. That's the second reflection point (Fig. 8). If your speakers are within three feet of the ceiling, treat the first reflection spot on the ceiling (in front of each speaker) with either diffusing or absorbing material (Fig. 9 & 10). If the wall behind you is a wide, flat, empty wall, treat it with diffusing material. Generally, you want to have absorbing materials in the front half of the room (the end your TV and front speakers are in) and diffusing materials in the back half of the room (Fig. 11).

If the knuckle test tells you that your walls are resonating, you have a couple of options. The first is to replace the original wall material with heavier material, but that involves a lot of work and money. Instead, Audio journalist Richard Hardesty recommends this easy and inexpensive solution for the do-it-yourselfer: "Absorptive material was applied to the walls from floor to ceiling beside and behind the speakers and along one side

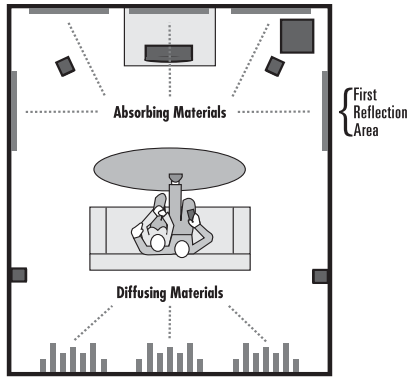


Fig. 11

wall. I used multiple 2'x 4' by 1" thick Owens #705-rigid compressed fiberglass panels glued directly to the wall surfaces between a stiffening frame made from 2"x 2" pine studs. The 2x2s were attached to the wall with drywall screws through the sheetrock and into the interior studs. Each of these 2x2 frames included two vertical and three horizontal studs to prevent the drywall from flexing. I covered these framed panels of compressed fiberglass with designer fabric and finished the edges using mahogany molding. This damping method serves a dual purpose: it absorbs reflected

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Room Treatment Resources

Materials:

Common household decorations and materials, such as drapes and bookcases, make effective sound-absorbing and diffusing tools. Professional, purpose-designed products are available as well. These materials can be expensive, but with judicious placement a little will go a long way toward giving you better sound. Some popular brands:

RPG—Specialists in sound treatment, RPG offers everything from home audio room treatment kits to professional materials found in concert halls and recording studios. Phone: (301) 249-0044, <http://www.rpginc.com>

Sonex—Maker of sound-absorbing foam sheets and ceiling panels. Phone: (612) 520-3620, www.illbruck-sonex.com

ASC—Makes room treatment products including Tube Traps (bass traps) and absorbing panels. Phone: (800) 272-8823, www.tubetrap.com

Echo Busters—Makers of absorbing and diffusing panels as well as bass traps: www.echobusters.com.

Information Sources:

"The Master Handbook of Acoustics"

(Third Edition) by F. Alton Everest (McGraw-Hill 4408). This book is very technical, but if you want to know nearly everything there is to know about acoustics, this is the book for you.

"Audio Perfectionist Journal"

by Richard Hardesty, (particularly issue #2) available by subscription from www.audioperfectionist.com.

"The Complete Guide to High-End Audio"

by Robert Harley (Acapella Publishing 800-848-5099).

energy at frequencies above 200Hz and prevents the storage and release of low frequency energy by the flexing of the drywall panels.”

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Speaker Placement— *Common Sense & Livability*

No matter what we say here regarding room treatment and speaker positioning, keep in mind that a home theater system is supposed to enhance your life, not take it over. If any of our advice conflicts with common sense, or with your sense of aesthetics, or would interfere with the normal function of the room, just ignore us. What difference does it make if your system sounds 5% better when you're always bumping into an ill-placed speaker? Do what makes sense.

General Home Theater

If possible, place the five mid/high (non-subwoofer) speakers on the circumference of an imaginary circle whose center point is the main (your) listening position

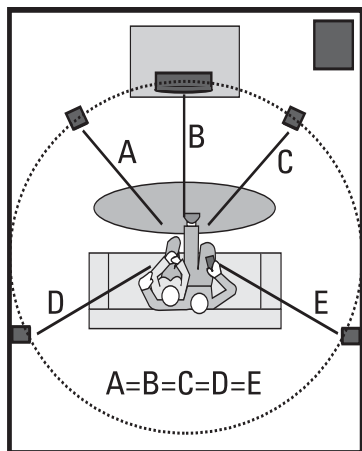


Fig. 12

(Fig. 12). At very least, left, right and center speakers should be the same distance from your main listening position. Find the placement that makes the main speakers sound best, then relocate the other components (seating position, center speaker/TV, and surround speakers) to fit the equal distance rule.

If you can make this work, fine. But if practical or aesthetic considerations get in the way, don't worry, the "time delay" or "speaker distance" function of your surround processor or receiver will compensate (see "Processor Configuration" in the next section).

Stereo (Main) Speakers

Since the left and right front channels are responsible for bringing music as well as movies to life, the "stereo pair" requires the most careful setup. For best performance, the speakers should be placed at least two feet from room boundaries, such as large pieces of furniture, walls and especially corners (Fig. 13). Placing a speaker closer to room boundaries increases bass, but may result in a "boomy" or bass-heavy

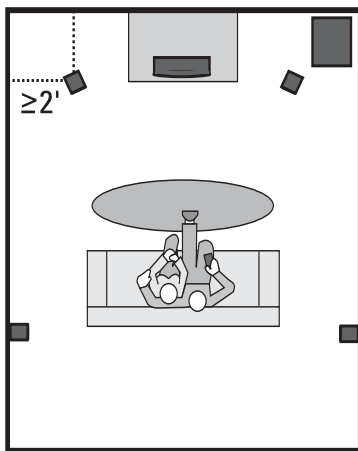


Fig. 13

sound and degradation of stereo imaging. Try varying the speakers' distance from the rear walls, side walls, and corners until the best balance between low frequency extension and clarity is achieved. If your system has a subwoofer, choose a main speaker placement that provides the best imaging and most natural midrange balance, usually far from room boundaries. If you cannot get the speakers at least two feet from the room boundary, treat the adjacent room boundaries with absorbing or diffusing material (see the section on Room Treatment, page 30).

Avoid symmetrical placement. A speaker's distance from the front wall should not be within 33% of the distance from the side walls. For example, if the speakers are 24" from the side walls, place them at least 32" from the front wall. Place the main speakers at least a few inches in front of the front of your TV. Unless a large projection screen monopolizes your wall, don't place the speakers too close to the sides of your televi-

sion, as such placement constricts the width of the stereo soundstage.

Small satellite speakers are designed to provide good sound when placed on a wall and often come with wall mounting brackets. But, as with other types of speakers, you should avoid placing the satellites within two feet of side walls. Since wall mounting satellites precludes placing them in front of the TV screen, place wall mounted satellites higher than the top of the TV (Fig. 14).

Speaker Height

With floor-standing speakers, the designers have mounted all drivers at the proper distance above the ground. Bookshelf and satellite systems, on the other hand, must be elevated to bring the tweeter to "seated ear level"; that is, the tweeters should be at the same height as the listeners' ears when those listeners are sitting. This can be accomplished either by placing the speakers on dedicated stands, or mounting them on a shelf or wall bracket. If the shelf is well

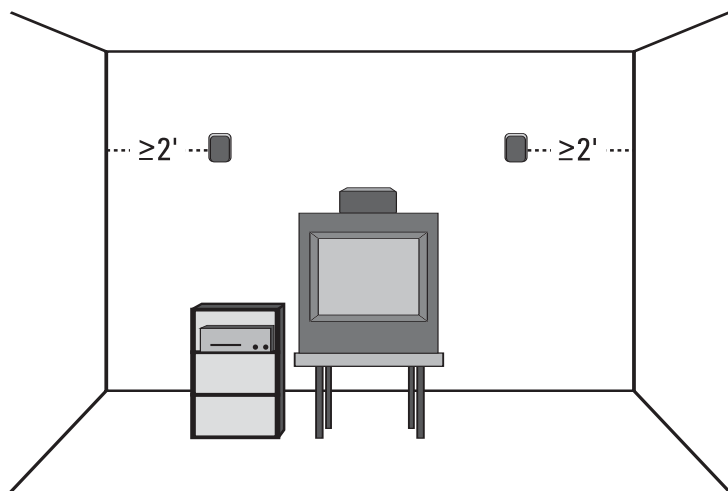


Fig. 14

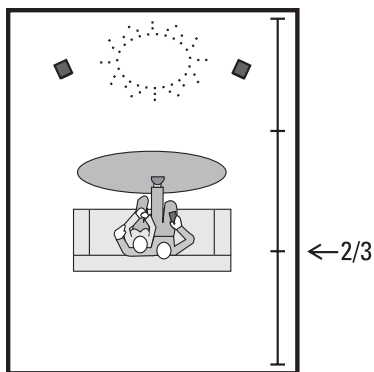


Fig. 15

above seated ear level, use a door stop wedge under the back edge of the speaker cabinet to point the speaker slightly downward (be careful not to make the angle so severe as to make the speaker unstable). On-wall speakers often have brackets (supplied or optional) that allow aiming of the speakers.

Aiming

Once the speakers have been properly positioned, they should be adjusted to provide the sharpest possible image. This is accomplished by a process known as “toe-in.” Your goal is to obtain the sharpest possible image by aiming the speakers at the listener, as if you were focusing binoculars on a distant object. Start with the speakers pointing straight ahead while listening to a CD of a solo vocalist. Rotate each speaker a couple of degrees inward, toward the listening position, until the voice seems to come from a point directly between the speakers, rather than from the speakers themselves. (Fig. 15) But beware: too much toe-in will compromise the natural width of the soundstage. Find the best balance between image focus and soundstage width.

Listening Position

Your listening position will also influence the sound of your system. Try to avoid placing your listening position against a wall. In many rooms, the main listening position is on a couch up against the back wall. This position will yield very loud, boomy bass. In this case, be sure to place your main speakers and subwoofer as far away from wall surfaces as is practical. If possible, place your main listening seat $2/3$ of the way into the room (Fig. 15).

Center Channel

Since the main purpose of a center channel loudspeaker is to fix all sounds associated with on-screen action to the screen, this speaker needs to be as close as possible to your television, either directly above or below it. Just like the stereo pair, the center channel sounds best when its tweeter is mounted at seated ear level; unfortunately, this position is normally occupied by the television itself. No problem: you can achieve proper treble balance by tilting



LS/9 Bookshelf speakers on Sanus 30"
Natural Foundation cherry stands

the speaker up (if it's below the screen) or down (if it's above) to aim the tweeter directly at the audience. Using rubber feet of different thickness, raise or lower the front of the speaker until you hear the most extended and detailed high frequencies.

Surround Speakers

Unlike the front three speakers, which must produce sharply focused images, the job of surround channels is to envelop the audience in diffused sound. To excel at this job, rear speakers should not call attention to themselves as sources of sound.

For these reasons, surround speakers work best when elevated at least two feet above the seated listeners' heads (six to seven feet above the ground is considered normal), and mounted on the side walls in line with or slightly behind the audience (Fig. 16).

If you are using front-firing speakers, they should face each other so that the sound is projected over the listeners' heads.

If your seating position abuts the rear wall or if you cannot place speakers on the side wall, you'll have to position the speakers on the rear wall (Fig. 17). In this case we recommend bi-directional (bi- or di-pole) speakers since they will produce the most diffuse effect. If you use front-firing speakers, do not aim them at the audience as one would a front speaker, but point them straight forward so the sound projects past the audience (Fig. 18a & 18b). Another option is to mount in-wall speakers in the ceiling behind or above the audience area.

If you opt for a 6.1 or 7.1 channel speaker system place the 'surround' channel speakers move forward on the imaginary circle and place the "Back" channel speakers behind you as shown in figures 1 and 2 on page 13.

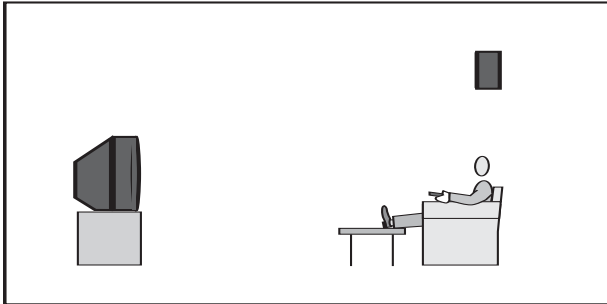


Fig. 16

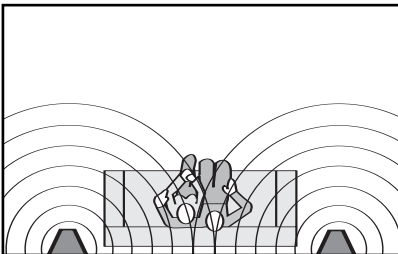


Fig. 17

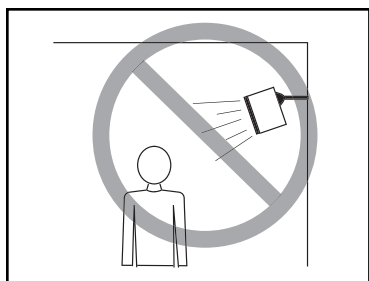


Fig. 18a

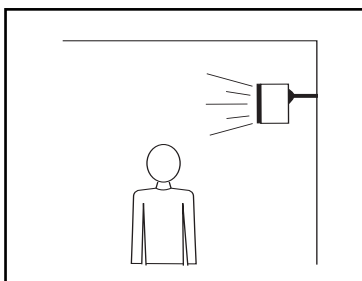


Fig. 18b

Subwoofer

Low frequencies (below about 80 Hz) are non-directional, which means that, in theory, a subwoofer should sound the same whether it is located at the front, rear or sides of the audience. In reality, however, bass quantity and quality are influenced by subwoofer placement. As with the stereo pair, moving the speaker closer to room boundaries increases bass, while moving it into the room reduces output.

Because the subwoofer's location affects how standing waves are created (see "Room Treatment," page 27), the first step to getting accurate bass response is to find the right spot for your subwoofer and your listening position. We'll share a few guidelines and techniques that may be helpful, but in the long run nothing beats trial, error and your own two ears

Stick It In The Corner

This is the advice most often given, and it certainly will yield loud bass. But we have found that a corner installation may make the woofer sound "one note-y," and boomy on music. But if lack of bass volume is your biggest subwoofer problem, this may be the answer for you. Avoid sitting up against the wall—Bass waves build up and "hang out" at room boundaries (walls). Your system will sound thick and heavy when your

listening chair is up against a wall. If you must sit against the wall because of furniture layout, place your subwoofer away from walls and corners.

Avoid Symmetrical Placement

Just like main speakers, a subwoofer's distance from the front wall should not be within 33% of the distance from the side wall. If the sub is 24" from the side walls, place at least 32" from the front wall.

Put the subwoofer as close to the main speakers as possible. Even though bass sounds are non-localizable, cabinet resonance and other factors conspire to make this less true in practice than it is in theory. It will be much easier to get seamless blending between sub and main speakers if they are on the same side of the room. If possible, put the subwoofer behind the plane of the main speakers. At very least, keep the subwoofer in the front half of the room.

Here's An Old Trick

Put your woofer in the same spot as your listening position. It's best to raise the subwoofer off the ground to seated-ear height (use a sturdy, non-resonant platform.) Play a CD with deep, sustained bass. Crawl around the front half of the room until you find the spot with the most

natural and well-balanced bass. Place the subwoofer there. Now you can have your chair back.

Use Two Subwoofers

Using two asymmetrically placed subs will minimize the effects of standing waves in your room, yielding smoother bass response (as well as better dynamic range). But don't run out and buy another sub just yet. Get the sub you have now to sound its best before spending more money. You may be perfectly happy with just one sub once you've tried our suggestions.

To some extent, you can compensate for room acoustics by adjusting the subwoofer's level control, but it's still advisable to experiment with various placements. Play CDs and movie soundtracks with extensive bass content, and fine tune the volume until you achieve a seamless blend with the main channels. If your sub is equipped with an adjustable crossover and your stereo speakers have sufficient low bass capability, try lowering the frequency to the 60-80 Hz region. Use the lowest frequency setting that combines powerful bass with the best stereo image and a smooth transition to the main speakers. Finally, use the phase control to maximize bass output and impact: if your subwoofer is placed along the same wall as your front channels, set the phase to 0 degrees, if it is behind the listening position, try 180 degrees. It helps to hear phase differences if you sit in your listening position while a friend switches back and forth. As always, experiment until you find the setting that delivers the clearest and deepest response.

Polk speaker owners are welcome to call Polk Customer Service at 800 377-7655 for more customized placement help. The rest of you are on your own.

One Note Of Caution

Not all subwoofers are magnetically shielded (exceptions include most Polk subwoofers) and may damage your TV if placed too close to the set. Select an unused video input on your TV to bring up a single color screen. If you see any color distortion anywhere on the screen, an unshielded speaker is too close to the set and should be moved away from the TV until the color distortion disappears.

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Processor Configuration and Bass Management—

Digital surround sound receivers, preamps or processors must be configured properly to get the best performance from your speakers. This involves “telling” the surround processor where to send each channel’s bass information. This is known as “bass management.” Most processors and receivers allow you to adjust these functions using an “on-screen” display. Check the user’s manual of your electronics to learn how to access these functions.

The good news is that once you’ve selected the bass management modes that you’re happy with, you can forget about it and just enjoy your system. The bad news is that bass management may be confusing at first. Take your time, read this section, and then experiment.

The bass management nomenclature and functions of Dolby Pro Logic are different than those of Dolby Digital. As most systems sold today are Dolby Digital we will only cover that setup here.



RM20

When a channel is selected as “Large” it means the bass information for that channel, will be directed to that speaker along with all the other frequencies. When “Small” is selected, the bass is filtered out of that speaker and directed to either the subwoofer output jack or to the Left and Right channels (depending on whether the subwoofer is selected as “on” or “off”). For example, if you select the center channel speaker as “Large,” the center channel bass will go to the center speaker. If you select “Small,” the center bass will go elsewhere.

Subwoofer

If you have connected your subwoofer to the subwoofer output jack, select subwoofer as “On.” The subwoofer will now play the Low Frequency Effects bass channel and the bass of any other speakers in the system selected as “Small.” If your subwoofer is connected to the system in any other way (such as L&R pre-outs or L&R speaker outputs), select subwoofer as “Off.” LFE and bass from channels selected as small will now go to the Left and Right front channels.

Left & Right Front Speakers

Sometimes the choice between “Small” and “Large” is not so clear-cut. These are the tradeoffs: When the main speakers are set to “Small” you will be increasing the top volume capability of those speakers and probably lowering their distortion as well. The downside is that the more speakers you select as “Small” the greater the workload on the subwoofer, increasing the odds that you will overtax it. Also, you will probably get better blending between main speakers and subwoofer if the main floorstanding or bookshelf speakers are run as “Large.” Experiment and see what works best for you. Here are some specific set-up suggestions:

Floorstanding

If your main front speakers are floorstanding models with good bass response, select “Large.” If your subwoofer is connected to the subwoofer output jack and you wish to limit the bass response of your main speakers for the sake of higher volume, select “Small.”

Bookshelf

Choose “Small” unless you are not using a subwoofer anywhere in the system, in which case choose “Large.”

Small Satellite (sub/sat) Systems

If the subwoofer is hooked up to the front left and right speaker or preamp outputs (highly recommended), select “Large.”

If the subwoofer is hooked up to the subwoofer output jack (not recommended), select “Small.”

Center Speaker

Very few center channel speakers can produce as much bass as a subwoofer or most main speakers. Unless you have a truly full-range (big) center speaker, set the center speaker as “Small.”

Surround Speakers

If you are using bookshelf, on-wall or in-wall speakers as surrounds, select “Small.”

If you have large floorstanding speakers with good bass response, or have a second subwoofer for the surround channels (a bass freak, eh?), select “Large.”

Time Delay

Dolby Digital processors have a “set speaker distance,” or time delay function, that ensures that all channel sounds reach your ears at the correct time to aid proper imaging and localization. In most units this is accomplished by simply selecting the distance from your listening position to each speaker via an on-screen display. In other units you must select the amount of delay in milliseconds. Consult your owner's manual for specific instructions. On most receivers, once this adjustment is set, you can forget about it.

“Dolby”
“Satellite”
“HDTV”

Balancing

Once your speakers have been properly installed, consult your receiver or processor's owner's manual for instructions on balancing the output levels for all channels.

Sitting in your normal listening position, engage the test tone on your remote handset and adjust the level until each channel produces identical volume.

We strongly recommend using a Sound Pressure Level (SPL) meter to set your channel balance. RadioShack stores have them for \$40 - \$60. Getting the channel balance within 1 dB accuracy (something that's hard to do by ear) makes an enormous difference in the quality of surround sound. An SPL meter is worth every penny of its modest cost.

It is always best to start out with balance set by SPL meter, but don't be afraid to make minor level corrections by ear. If the dialog seems unclear on a given movie, boost the output by a dB or two. Likewise, if the surround speakers are calling too much attention to themselves, turn them down a bit. But resist the temptation to over-fiddle with the levels. Instead, just sit back and enjoy the movie!

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Anthony Chiarella has been passionate about audio since the age of 13, when he complained to his parents that the family's new transistor receiver didn't sound as good as their old tube amp. Having worked in audio stores during high school and college, Anthony enjoyed a successful career on Wall Street before returning to his true love. Chiarella now lives in northern New Jersey, where he serves as a marketing and sales consultant to a number of high-end audio manufacturers (but not Polk Audio). He currently writes for many of America's leading consumer electronics and lifestyle magazines.



A life-long audiophile, **Matthew Polk** first started designing loudspeakers for friends while a physics student at the Johns Hopkins University. Matthew, and Hopkins roommate George Klopfer, founded Polk Audio in 1972. Despite humble beginnings, the company prospered and grew to its current position as one of the most successful and best known audio manufacturers in the world. Mr. Polk is responsible for the development of several patented loudspeaker technologies and many award-winning audio products.

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