

# HOME THEATER CABLE AND CONNECTION GUIDE

By John Coleman

Home Theater is a concept that has had explosive growth in the past few years. The whole idea of being able to recreate the cinema experience at home is an alluring one. Consumer electronics have been advancing at an incredible rate during all of this, and it is now possible to not only recreate the cinema experience at home, but to actually improve upon it. It is a great feeling to be able to enjoy cinema quality entertainment at home, while never having to worry about having the back of your seat kicked, and being able to pause and resume the film at your complete discretion.

However, for the average home theater shopper, one of the first encounters they have when looking at equipment is the deluge of acronyms and a seemingly endless array of technical sounding connection and processing abilities. Whether it is the alphabet-soup of connection options, or understanding what options will allow you to maximize the performance of your electronics, it is no easy task to choose equipment and know how to hook everything up correctly.

So, I have compiled a guide of the most common connections the average home theater shopper will run into, as well as some practical advice for what to look for and how to make the best decisions every day. At *Cobalt Cable*, we have helped countless people wade through the task of connections, and with a little understanding, you will be a cable and connection guru in no time.

## GLOSSARY OF COMMON CABLE AND CONNECTION TERMS

**Signal:** The signal is the audio or video information sent down a wire.

**Channel:** A Channel is a segmented part of a full audio or video connection. For example, stereo audio connections use two channels for all of the audio information, which is then played through two loudspeakers. Mono audio connections, on the other hand, simply use a single channel for all audio information.

**Multi-Channel:** An audio or video signal consisting of more than two channels. This includes popular surround sound formats such as Dolby Digital 5.1 or DTS 5.1. The “5.1” in these formats stands for 5.1 channels worth of audio information, which is then played back through 5 loudspeakers and a subwoofer. The subwoofer is “.1” due to the fact that its signal is only a partial channel (low frequencies, or bass, only).

**Noise:** Noise is any audible or visible interference picked up from the outside on any audio or video connection. Common sources of noise are AM/FM radio signals, wireless communication signals, and home electrical wires and outlets. An example of noise is an

audible hum in audio reproduction, or a visible ghost or snow in a video image.

**Shielding:** Shielding blocks noise from an audio or video signal by creating a barrier between the noise source and the signal wire. Shielding is comprised of layers of metal braided or foil sleeving around a wire inside of a cable.

**Insulation:** Insulation separates the signal wire from the shielding inside of a cable, or from being exposed to the outside.

## ANALOG AUDIO CONNECTIONS

Audio connections come in two basic forms, analog and digital. In this first section, we will discuss analog audio connections. One analog audio cable can transfer one channel of audio information (e.g. stereo, or two channel, audio connections require two analog audio cables).



### RCA

These are by far the most common type of audio connection. These connections use a single RCA connector (sometimes also called a “phono” connector) per channel. For stereo (two-channel) connections, the color-coding is typically red for the right channel, and white for the left channel. With multi-channel connections, though, there really is no standard color code for the additional channels.

**What to look for:** RCA connections are susceptible to noise, so you should look for cables that are well shielded, while still being flexible, and provide a tight fit.



### XLR (Balanced)

XLR connections use a round, three-pin connector (which is the same connector used on most microphones). With consumer electronics, XLR connections are used to transfer “balanced” audio. Balanced connections use two wires to send signals, vs. RCA connections, which only use a single wire, and can be thought of as being “unbalanced.” Balanced audio uses a mechanism called common mode rejection to eliminate noise from the connection. One wire sends the original signal, and the other wire

sends the inverse of that signal. At the destination of the connection, the two signals are compared, and anything that is the same on both lines is rejected. This rejects noise because the noise should be equal in both lines, vs. the actual signal, which should be the exact opposite in both wires.

**What to look for:** Since XLR connections reject noise by their very design, issues such as shielding are not as critical as with unbalanced (RCA) audio connections. However, since balanced connections are most often found on high-performance stereo and home theater electronics, it makes sense to choose XLR Cables with excellent durability and quality.



### SUBWOOFER

Powered (or Active) subwoofers use a mono, partial-channel (bass only) audio connection. Subwoofers typically come with both low-level (RCA) as well as high-level (loudspeaker connector) connections. However, in order to get the “.1” in either

Dolby Digital or DTS (e.g. Dolby Digital 5.1), you MUST use the RCA connection from your A/V Receiver or processor.

**What to look for:** Since powered subwoofers are coming with larger and larger amplifiers on them clean signal transfer is a must. Look for a cable with excellent shielding, while still being low profile enough to say as inconspicuous as possible.

**Note:** Many powered subwoofers come with stereo (red and white) RCA inputs. Since subwoofers only use a mono signal, it is NOT required to plug into both of these inputs. If you want to plug into both inputs, to get a stronger source signal, simply use an RCA splitter.

## DIGITAL AUDIO CONNECTIONS

For almost all consumer audio equipment, digital audio connections come in two forms, Toslink (Optical) or Coaxial (Coax). Unlike analog audio connections, one digital audio cable can transfer several channels worth of audio. For example, for multi-channel connections, only one digital audio cable is needed to transfer all audio information for all channels (e.g. 5.1).

Digital audio cables do not suffer from the same vulnerability to noise that RCA analog audio connections do.



### TOSLINK (Optical)

Toslink or Optical connections use a fiber optic cable to transfer a digital audio signal with a beam of light. Toslink cables use a special hexagonal connector, which must be inserted right side up to make a connection. Since Toslink cables are digital, they

can transfer either a stereo (e.g. CD) or multi-channel (e.g. Dolby Digital or DTS) audio signal down a single cable.

**What to look for:** Since Toslink (Optical) cables are typically made out of fiber optic cable with plastic fibers, they are inherently fragile. Also, since the connector can only be inserted one way, cables with plastic tips can warp and not provide an aligned connection if

inserted the wrong way. Look for Toslink cables with a thick outer jacket and metal connection points to provide maximum durability.



### DIGITAL COAX

Digital Coax cables use a standard RCA connector as well as 75-Ohm coaxial cable to transfer a digital audio signal. Like a Toslink cable, a single Coax Digital Audio Cable can transfer either a stereo (e.g. CD) or multi-channel (e.g. Dolby Digital or DTS) audio signal. Coax cables are also sometimes called S/PDIF cables, which stands for Sony/Philips Digital Interface Format.

**What to look for:** The most critical element for digital coax connections is the use of true 75-Ohm cable. Also, coax cables are less fragile than Toslink cables, and since they use a simple RCA connector, are easier to work with.

## VIDEO CONNECTIONS



### COMPONENT

Component video uses three video cables to transfer a high-quality video signal. However, even though the cables are red, green and blue, this cable is not typically used to transfer an RGB signal (and it not called an RGB cable). More on RGB signals later.

Component video splits the color information into two separate channels, and the brightness information into its own dedicated channel. The three channels are designated as Y (brightness), Cr or Pr (Color Red), and Cb or Pb (Color Blue).

Component video is the highest quality video connection available, however, it is not available on all sources. Currently, component video is only an option on DVD players, high definition set top boxes, and high-definition satellite receivers.

**What to look for:** Component video needs a well-insulated cable with robust shielding, as well as little signal loss as possible. Also, look for a cable that has excellent bandwidth characteristics to make sure it can pass HDTV without a problem.



### S-VIDEO

S-Video is the baby brother of component video. S-Video uses a single, four-pin connector, which connects to two very small video cables. One of these video cables is used to transfer all of the brightness information (abbreviated as “Y”) of the video

image, while the other is used to transfer all of the color information (abbreviated as “C”) of the image. Unlike component, S-Video uses only one channel for all color information (vs. two), and much smaller cables to transfer all of the video information. S-Video is a great connection to use when component video is not available.

**What to look for:** Since S-Video connections use small cables to transfer the video information, look for cables with excellent loss characteristics, especially when making runs longer than 20’. Also, all-metal connectors provide better durability than plastic connectors.

**Note:** However, there is a twist. Some TV's do not actually have true component inputs. These TV's actually convert the component input to S-Video, which results in video quality looking exactly the same with component video as it does with S-Video. This is not as common as it used to be, though (apparently, it was less expensive to retrofit component video rather than adding the functionality to the TV). Component video should look significantly better than S-Video, but unfortunately, with TV's that lack true component video inputs; this is simply not the case.



### COMPOSITE

Composite video uses a single cable to transfer all brightness and color information. This is the lowest quality video connection available. S-Video is a significant upgrade from composite video, and should be used whenever possible.

**What to look for:** Composite connections are pretty basic, and do not require anything extravagant to make them work.

## HDTV CONNECTIONS

### COMPONENT

This is the same component video as on page 69. However, it is important to note that even though the colors used for component are red, green and blue, this is NOT an RGB connection. Only the RGBHV and SVGA connections are RGB-based, and RGB and component are not compatible.



### RGBHV

RGBHV is an RGB based signal with two "sync" channels that are labeled "H" (for horizontal) and "V" (for vertical) which uses either RCA or BNC connectors. RGB is simply a video format where all video information is split into the Red portion, the Green portion, and the Blue portion. Even though RGBHV uses five cables for the video connection, only three of them are used for actual video.

**What to look for:** Much like component, RGBHV requires a video cable with good bandwidth, shielding and loss characteristics to minimize signal loss and noise interference.

**Note:** It is important to note that neither component nor RGBHV is better for transferring high-quality video. Both of these formats accomplish the same level of connection quality.



### SVGA

SVGA connections with consumer electronics are actually somewhat of a misnomer. SVGA, or Super Video Graphics Array, is actually a computer video term for 800x600 pixel resolution. VGA connections are simply RGBHV video connections that use a 15-Pin (called either HD15 or D-Sub-15) connector (which is completely identical to the connectors used on computer monitors).

**What to look for:** Since VGA cables are simply RGBHV cables that use 15-pin connectors (rather than RCA's or BNC's) the individual cables must be fairly small to fit inside of the 15-pin connector shell. So, it is important to look for cables that still have excellent bandwidth, shielding, and loss characteristics to make sure the video connection is of as high quality as possible.

**Note:** It is possible to mix and match RGBHV and SVGA connections (since they both are used for RGBHV signals). A "half and half" cable is called an SVGA Breakout Cable. This type of cable has a 15-pin connector on one side, and either RCA or BNC connectors on the other side.

## LOUDSPEAKER CONNECTIONS

Loudspeaker connectors for any audio or home theater system typically come in two forms, either five-way binding posts or spring terminals. Both connectors send the exact same signal over speaker wire.

**What to look for:** The most important quality of speaker cable is the size of the wire used (in the U.S., this is measured as Gauge which can be abbreviated AWG). As the wire gets larger, the Gauge gets smaller. Also, for every three Gauge you go down, you double the amount of wire (e.g. 10 AWG is twice as much wire as 15 AWG).

For most home theater applications, 14 AWG wire is sufficient for the back/surround loudspeakers, while up to 10 AWG is preferable for the front three loudspeakers (especially if this system will be used for stereo or multi-channel music as well as home theater).

Speaker wires come either in bulk without connectors, or in finished lengths with connectors. As far as connectors go, banana plugs work great with almost all five-way binding posts, while spring terminals will only accept pin connectors (recommended) or bare wire.

**Note:** Despite the myths that you may hear, it is not important to keep your speaker cables the same length. Without getting into the actual math, it would take length discrepancies of 100 feet or more of a fairly low-gauge speaker cable to hear a difference between them.

When running speaker cables (or any other cable for that matter) through your walls make sure to check with your local building code for minimum in-wall cable rating. For most locales, a UL-CL3 cable will work just fine. It is important to use cabling that is rated for in-wall use to make sure building codes are not being violated.

## CONCLUSION

This has been a brief discussion of the most common connections used in home theater systems. With some basic knowledge of audio and video connections, you can improve your home theater experience to rival the best Cineplex theater. ■

*Cobalt Cable offers an entire line of premium audio video cables, and is more than happy to assist you with friendly, real world advice about how to get the most out of your home theater experience. You can visit Cobalt Cable's website at <www.cobaltcable.com>, call them toll-free in the U.S. at (877) 6-COBALT, or e-mail them directly at info@cobaltcable.com.*