



Black Rhodium

11

**Highly Essential Steps
To Take Before You Buy Cables
For Your Music and AV System**

Graham Nalty MA

*“Getting the very best out of your Music
or AV system without breaking the bank”*

“Your speakers and electronics will determine how your music system will look

Your cables will determine how well it will reproduce music”



About the author

Graham Nalty has designed audio equipment over several decades and is passionately committed to improving sound quality via highly innovative design and advanced technologies.

For the last 12 years, Graham has concentrated on the design of cables sold via the Black Rhodium brand.

Black Rhodium supplies audio and video cables to music lovers throughout the world via a team of professional audio distributors and retailers.

Black Rhodium cables have won many highly prized awards from audio magazines for their quality. The company has also received many testimonials from customers who appreciate the added enjoyment and insight into their music that they have experienced with Black Rhodium cables.

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Introduction

Let your hi-fi system sing by choosing the right cable

Imagine you are hearing your favourite music sounding more real and natural than ever before!

The music becomes clearer, individual voices become more distinct, instruments reveal more of their natural timbre, the acoustic of recording becomes more natural, and the emotion and excitement in the music can be experienced with greater realism.

It may seem a bold statement that cables determine the sound of your music system more than the source, amplification and speakers, but my long experience in delivering high-quality cabling solutions to music lovers for more than 20 years truly supports that view.

By reading this book you will learn many of the secrets about how the very best audio and video cables are designed.

By applying the eleven steps described in this book you will be very confident of choosing the best possible cables for your music system that will transform your listening experience into pure rapturous joy.



Black Rhodium SAMBA loudspeaker cable

1. Make a list of all the types of cables you need

Home entertainment systems require many different types of cable to connect between the various pieces of equipment:

- **Stereo Interconnect Cables** to connect between your sources of music (portable players, media system, CD player, turntable, radio, etc.) and amplifier
- **HDMI and other Video Cables** to connect to your TV screen
- **Interconnect cables** to connect between your preamplifier and power amplifier
- **Loudspeaker Cables** to connect between your power amplifier and loudspeakers
- **Mains Power Cables** to power the equipment



Stereo Interconnect cables



Video cables



Cables for Portables



Loudspeaker cables



Power cables

New systems

A manufacturer selling a complete system as a single package may include all the cables so the purchaser can take it out of the box and play music straight away.

Manufacturers of high-end separates (all pieces of equipment sold separately in separate boxes) will usually provide a basic mains power cable, but no other cables.

When you buy separates, you not only need to list all the cables you require to connect between each piece of equipment, but you should also consider upgrading the mains power cables that are supplied with your purchase.

Existing systems

If you are buying cables to upgrade the sound of your existing music system, I recommend examining not only all the cables through which the music passes but also all the mains power cables powering the equipment.



2. Prepare a budget

There's no hard and fast rule on how much of your system budget you should allocate to your cables. In the past, many experts have suggested you allow about 10% of the total budget for a complete system on the cables. However, I've experienced many inexpensive systems that have been transformed almost out of recognition by using cables that cost as much as the hardware.

If you're buying a complete music system at, for example, £1000 then perhaps you should start by auditioning a system with hardware costing about £500 and cables costing around £250. Then audition the effect of increasing the value of the hardware by £250 with that of increasing the cable cost by £250.

A good retailer should be able to advise you on the best way to allocate your budget and make this much easier for you.

Make sure you set aside a sufficient budget for mains cables and mains filtering.

The mains supply is the fuel of your music system. If you supply it with poor quality electricity, your music will not sound good.

Your mains power supply has two important distinct requirements:

1. It needs to be clean. It should not contain the random interference and noise that can be picked up from radio signals, computers or the voltage transients caused by switching of high-current electrical loads such as refrigerators.
2. It must respond quickly and accurately to deliver the power your amplifier requires for playing music through your speakers.

Just as some people lose out by setting their budget on the cost of their hardware and leaving insufficient for their cables, you will not enjoy the best sound if you don't allow a sufficient budget for good-quality power cables and filtering.

3. Prepare a shopping list

There are two ways to discover which cables are worth putting on your shopping list:

1. By studying all the different specifications of cables, measurements of their electrical performance and studying the design techniques from manufacturers' brochures.
2. By reading published product reviews in the main hi-fi publications. In the UK we have a good range including *Hi-Fi World*, *Hi-Fi Choice*, *Hi-Fi News*, *Hi-Fi+* and *What Hi-Fi? Sound and Vision*. Many of these titles are also available in countries outside the UK.

Specifications alone will not tell you how a cable will sound, but they will give you good pointers towards the products you should audition before buying.

Although an audio or video cable might appear to be very simple in technical engineering terms, there are very many aspects of design that will affect its performance. In this booklet, we cover some of the more important factors affecting your final sound quality, which you should consider when choosing a cable.

Every cable will be a different mix of all these factors. It is not too different from baking a cake. Some recipes you like more than others. But getting the best combination is always a challenge as new technologies often change the goal posts.



Black Rhodium
Black Rhodium ACE and STAR USB cables



4. Examine electrical specifications

The electrical properties of cables will tell you accurately how that cable will respond to an electrical signal voltage, but give only very limited information on how the cable will perform:

- **Resistance**

Electrical resistance, which is the ability of a wire to *resist* the flow of current when a voltage is applied at its ends, is most critical in loudspeaker cables and power cables. A low resistance loudspeaker cable helps the amplifier to control the movement of the loudspeaker's bass cone, giving you cleaner bass notes and better stereo imagery in your music. A low resistance power cable delivers higher current to re-charge reservoir capacitors in the power supply. This has the effect of making the amplifier sound more powerful. In general, on a like-for-like basis, thicker speaker and power cables will improve sound quality.

- **Capacitance**

All cables exhibit capacitance between the conductor wire carrying the electrical music signal and the return earth conductor. The value of capacitance varies depending on the dimensions of the cables. Do not use high capacitance cables for long cable runs from the output of a high resistance / impedance valve preamplifier as this can attenuate high frequencies in the music.

- **Inductance**

Although cable inductance varies, there does not appear to be any evidence of problems with excessive or insufficient inductance.

One factor to bear in mind is that the capacitive and inductive characteristics of some cables can cause some solid-state amplifiers to become unstable, though this is not very common.

5. Compare the different options of conductor wire

- **Conductor wire material**

Each metal used in cables sounds different. Whereas copper and silver are very popular because of their high conductivity, some low current interconnect cables may be made of very expensive precious metals such as palladium on account of their superlative sound quality.

- **Conductor wire gauge**

Thicker cables have less resistance and are particularly popular for speaker cables where they deliver a more powerful bass sound. They also give a sharper location of the stereo image. This is owing to their lower impedance allowing the amplifier to control the bass unit drive cone more tightly. Heavier gauge power cables can deliver improved sound quality due to the higher current delivery to amplifier circuitry.

- **Conductor wire stranding**

Some cables are made from a single core of wire, whereas others are made from multiple strands. There are benefits from either approach and while some people may have a personal preference for one option, differences in performance are relatively small compared with other design factors.

- **Conductor wire purity**

There are many cables that are made from very high purity copper or silver wire refined to very high standards in order to improve sound quality by reducing the impurities in the wire.

Bi-wiring

Bi-wiring of loudspeaker cables is the use of separate connecting wires from the amplifier to the separate drive units of the loudspeakers.



In many systems the sound is clearer than using a single wire connection.



6. Study the importance of cable insulation and cable geometry

- **Insulation quality**

The insulation quality is very important so as to avoid distortion caused by dielectric absorption loss. A voltage applied to a wire causes a small electrical charge within the insulation. As this voltage reduces or becomes negative, the charge returns to the conductor at a small time interval later. When the voltage in the wire is a music signal, very small currents of electrical charge are absorbed into the insulation and later released. This causes time smearing of the sound which particularly distorts leading edges and decays in music. PTFE and silicone rubber insulations are very popular in audio cables due to low dielectric loss.

- **Cable geometry**

The many different cable geometries used in audio cables include:

- Two cores twisted together
- Coaxial (a single core insulated and screened by a braided cover that shields the inner wire from interference)
- Screened and unscreened multiple core cables

Some coaxial cables are designed with a 'characteristic impedance' of 75 Ohms to match the electronic circuits at either end so as to prevent wave reflections of high-frequency signals. Twisting cables can reduce the pick-up of external electrical interference. Twisting both channels of a stereo interconnect pair prevents the return wires of both cables combining to form a loop radio aerial that picks up high-frequency noise – which adds audible distortion on all types of cable geometry.

- **Thickness of insulation**

Many cables are designed with the minimum thickness of insulation consistent with meeting electrical safety requirements. Thicker insulation can increase the distance between conductors. This reduces the 'transient phase distortion' caused by the magnetic field from the current in one conductor affecting the current flow in the other (known as the 'proximity effect').

7. Appreciate the effects of electrical noise and mechanical vibration

Mechanical vibration

Mechanical vibrations can change the electrical characteristics of cables by changing the physical relationship between conductors. These changes in electrical characteristics affect the passage of complex music signals through the cable and causes audible distortion.

Microphonic cables generate electrical noise by movement within the cable with the effect of reducing the dynamic range of music.

Even the very best equipment supports do not eliminate all the vibration. Loudspeakers vibrate to produce sound which can be transmitted back to your amplifier via the cable. Amplifiers also vibrate from the electric fields generated by high currents needed to drive the speakers and these can be transmitted to the speaker via the cable. Mains cables and interconnects can also transmit vibration between different parts of the system.

Controlling these vibrations is essential to enjoying music at home. The vibration stabiliser shown attached to the cable below does this.



Graham Nalty vibration stabiliser

Electrical noise

The recent exponential growth in electrical devices has massively increased high-frequency interference signals everywhere. Interference radiates from many different devices. Noise is transmitted back from digital devices through the power supplies to audio equipment. Electrical noise, even at very high frequencies, distorts your music by intermodulation effects.

Twisting wires closely together or covering the wires with a closely braided screen of fine wires can greatly reduce the noise induced in cables. In high-quality systems mains power filters are installed between the power sockets and the equipment to remove mains borne noise.



8. Consider the effects of cable processing

Manufacturing processes can affect the sound quality of cables:

- **Drawn direction wire**

If you use a pair of wires to connect, for example, an amplifier and loudspeaker then the noise floor behind the music appears to lower if you take the second wire from the same reel as the first and connect it in the opposite direction.

- **Deep cryogenic treatment**

The low temperature slows down the molecules so that when the cable returns to room temperature the molecules reset in more natural positions. Cryogenic processing of audio cables makes a small change in all aspects of sound quality in almost equal amounts. The overall improvement in the listening experience is quite dramatic. The effects of cryogenic processing do not appear to deteriorate with age.

- **Burn-in**

All cables improve in sound quality from the time they are first used. It is wise to use cables for a 'burn-in' period before listening critically to music or making a comparison with other cables that may (or may not) have been burnt-in. The burn-in period in which cables progressively improve their sound quality can be as long as 150 hours of playing music. It is possible to buy fast burn-in machines that create the same effect in much less time than by playing music. However, it is not clear whether this should be considered as a manufacturing process that, if applied to one cable, should be applied equally to all cables made to the same specification.

9. Make a good connection between your cable and equipment

All cables are fitted with specially designed connectors to make the important electrical connections from the cable to your music system.

There are three basic types of connector:

- **Mains connectors** are fitted to power cables and carry the power for your music system from the socket to the equipment. Their design has to meet stringent safety requirements for your personal safety.
- **Loudspeaker connectors** are fitted to the cables that run between your amplifier and loudspeakers. These operate at low voltages, but can carry high current. Common types are 4mm 'banana' plugs and spades.
- **Low-voltage signal connectors** as fitted to interconnect cables are used for almost every other function in a music system. The many different types include RCA, XLR, DIN, BNC, 'F', and jacks of several sizes.



Cables are normally supplied with their correct connectors, so you don't have to worry about buying connectors unless you're a DIY enthusiast.

Be aware of the differences in the sound quality of different types of the same connector. Cable manufacturers fit high-quality connectors to their cables because a better connector gives better sound quality to their cables. A high-value appearance of a connector also adds perceived value to a high-end cable.

I have found by experience that connectors with moving parts between the cable and the equipment do not sound as good as those made from a single machined piece of metal. Many high-end cable manufacturers offer rhodium-plated connectors to improve the sound.

Interest in the effect of connectors on the sound of cables is increasing. Many new connectors are being designed to improve sound quality and they are increasingly being featured in magazine reviews.

You may not need to choose the connectors for your cable, but remember that good connectors are still an important part of the cable design.



10. Listen to good advice, but remember the choice is yours

Cables do not transmit perfect sound. Many different engineering factors affect how your cable sounds in your system playing your music. Each time the design of the cable is improved, a layer of distortion to the sound is removed, bringing you closer to the musicians. The more different types of cable distortion that are engineered to a low level, the more you'll enjoy your music.

Good cable design costs money. All cables are a compromise that reflects the designer's priorities. So the only way to buy your cables is to listen to them in your own music system playing your favourite music. Having the assistance of a good experienced dealer will make your choice much easier.

Recommendations and reviews

Good reviews in magazines, Internet audio forums, and the recommendations of friends will always guide towards the better products to include in your shopping list, but never choose cables based other people's opinions.

Magazine reviews are based on listening to the cables in the magazine demonstration room or the home of the reviewer. The acoustics of the room will most likely be very different from your own listening room. Also, the reviewer may have different tastes in music. If your taste is the same as the reviewer then you're in with a chance: but then only if the reviewer is using similar equipment to your own. The same applies when well-meaning friends suggest you choose their preferred products.

Different people will disagree on what are the best cables. Internet forums thrive on challenging opinions. At Black Rhodium we have received a 'cable of the year' award for a cable that in another magazine had a very poor review.

What's important is that a cable lets you enjoy your music to the fullest. Let others, who have been in the position you are in now, guide you but remember that your listening pleasure is your ultimate goal in choosing cables.

Do this by listening firstly in the shop, then at home, making your own decision solely based on your enjoyment of your favourite music.



11. Choose your dealer and choose wisely

A good dealer removes the customer's risk of buying the wrong product

For most people, the hi-fi market is highly technical and complex and many different products essentially do the same job. The difference between a good product and an outstanding one may be small in detail, but it can have a big effect on how many hours you play your music and how many new recordings you can add to the list of those you play regularly.

The benefits of choosing a good dealer

Well-established hi-fi dealers have had a great deal of experience in demonstrating different equipment and cables to customers. They often know from experience which combinations of amplifiers, speakers and cables work well together and those that do not. The dealer will also know pretty well how each product in the shop will sound in a system. "If you find the sound too bright in the treble, why not try this cable instead" or "If you want to hear more of the bass notes, try a more powerful amplifier." A very experienced dealer will also know that, once in a while, a particular cable in a particular system will not sound the way that might be expected.

The wide experience of professional retailers in selling 'better sound quality', as opposed to boxes of goods, also enables them to advise on other ways you can benefit. These may be ways you may not have considered. As an example, a dealer may advise a customer to upgrade the mains cables or install a filter rather than replacing valuable equipment or cables. Alternatively the dealer might advise you to reduce vibration transmitted to your equipment from the base on which it sits.

Your dealer can not only give very good advice on the items you're planning to purchase, but has wide experience to be able to recommend other solutions that could be more cost-effective.

Put simply, a good dealer can remove your risk of buying the wrong product.



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Highly Essential Steps To Take Before You Buy Cables For Your Music and AV System

Reminders

1. Make a list of all the types of cables you need.
2. Prepare a budget.
3. Prepare a shopping list.
4. Examine electrical specifications.
5. Compare the different options of conductor wire.
6. Study the importance of cable insulation and cable geometry.
7. Appreciate the effects of electrical noise and mechanical vibration.
8. Consider the effects of cable processing.
9. Make a good connection between your cable and equipment.
10. Listen to good advice, but remember the choice is yours.
11. Choose your dealer and choose wisely.

Your Dealer



If you would like any further information to help you choose your cables, or anything else related to audio and video cables, please contact our team of experts at Black Rhodium who will be very happy to assist.

For further Top Tips and new product information
Sign up to our Newsletter on www.blackrhodium.co.uk/newsletter - Today!

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