

GUIDE TO AUDIO CABLES & POWER PRODUCTS 2017



HI-FI+ GUIDE TO AUDIO CABLES & POWER PRODUCTS

CONTENTS

FROM THE EDITOR

WHAT'S NEXT?

Learn all about the latest audio cables of every type and about new power products that can help your system sound its best.

- What's Next in Interconnects? (23 new entries)
- What's Next in Digital/Network Cables? (22 new entries)
- What's Next in Speaker Cables? (20 new entries)
- What's Next in Headphone/Personal Audio Cables? (11 new entries)
- What's Next in Power Cables? (23 new entries)
- What's Next in Audio Power Products? (21 new entries)

MAKING AFFORDABLE AUDIO CABLES GREAT AGAIN

Hi-Fi+ talks with six leading designers who have turned the design of affordable audio cables into an art form.

- Paul Speltz (ANTICABLES)
- John McDonald (Audience)
- George Cardas (Cardas Audio)
- Ray Kimber (Kimber Kable)
- Joe Reynolds (Nordost)
- Caelin Gabriel (Shunyata Research)

TWELVE CREATIVE AUDIO 'POWER BROKERS'

Hi-Fi+ interviews twelve of today's best and brightest creators of high performance audio power products.

- Michael Børresen (Ansuz)
- Garth Powell (AudioQuest)
- Mark Schifter (Core Power Technologies)
- Nic Poulson (Isol-8)
- Keith Martin (IsoTek)
- Bjorn Bengtsson (Nordost)
- Paul McGowan (PS Audio)
- Mike Lester (Puritan)
- Wolfgang Meletzky (Stromtank)
- Ted Denney (Synergistic Research)
- Kevin Main (Torus Power)
- Steve Elford (Vertex AQ)

FEATURE ARTICLES

AUDIO CABLE UPGRADES: WHAT DO THEY DO AND HOW MUCH DO THEY COST?

Hi-Fi+ contributor Nicholas Ripley explores the 'hows' and 'whys' of audio cable upgrades, sharing thoughts on how to get the best results for your money.

AUDIO POWER SYSTEM UPGRADES

Some think audio power products are of little if any benefit, while others think they might offer the shortest paths to better sound. *Hi-Fi+* contributor Nicholas Ripley investigates.

POWER AND SIGNAL CABLE UPGRADE STRATEGIES

Let's say you're interested in upgrading your audio system's cables. Where should you start and in what order should you proceed? *Hi-Fi+* Editor Alan Sircom offers several strategies that can bring great results.

HI-FI+ CABLE REVIEW INDEX (2012 – PRESENT)

- Interconnects
- Digital Cables
- Loudspeaker Cables
- Headphone/Personal Audio Cable
- Mains Cables/Power Cords
- Power Products

ENCYCLOPAEDIA CABLEXICON

The complicated 'alphabet soup' of audio cable and power product terminology made plain.



EDITOR, HI-FI+ GUIDE TO
AUDIO CABLES & POWER PRODUCTS
PUBLISHER, HI-FI+

Chris Martens
Tel: +1 (512) 419-1513 Office
Tel: +1 (512) 924-5728 Mobile
Email: cmartens@nextscreen.com

EDITOR, HI-FI+ MAGAZINE

Alan Sircom
Email: editor@hifiplus.com

CONTRIBUTING WRITERS

Alan Sircom
Nicholas Ripley

GRAPHIC DESIGNER

Jenny Watson
Fonthill Creative, Salisbury

ADVERTISING

Tom Hackforth
Tel: +44 (0)1425 655255
Email: tom@hifiplus.com

ASSOCIATE PUBLISHER

Pete Collingwood-Trewin
Tel: +44 (0)1425 655699
Email: pete@hifiplus.com

THE EDITORIAL OFFICE CAN BE
CONTACTED AT:

Hi-Fi+ Editorial
Absolute Multimedia (UK) Ltd
Unit 3, Sandleheath Industrial Estate,
Sandleheath, Hampshire SP6 1PA
United Kingdom
Tel: +44 (0)1425 655255
Fax: +44 (0)1425 655477
Web: www.hifiplus.com

Absolute Multimedia (UK) Ltd is a
subsidiary of TMM Holdings LLC,
2601 McHale Court, Suite
Austin, Texas 78758, USA

CHAIRMAN AND CEO

Thomas B. Martin, Jr.
All Rights Reserved.

Copyright 2017. All rights reserved.

Not one word of *Hi-Fi+* may be reproduced
without the written consent of the Publisher.
We are perfectly happy to co-operate, but
we don't want quotations to appear out
of context.

Hi-Fi+ product-themed Guides are published
in digital format only, four times per year by:
Absolute Multimedia (UK) Ltd.

FROM THE EDITOR

WELCOME to the *Hi-Fi+ Guide to Audio Cables & Power Products 2017*.

Most of us grew up in a world where the working assumption was that wire was simply wire and AC mains power was simply mains power. No muss, no fuss, no worries, and no questions or points of debate. If you plugged in an audio component and the pilot light came on when you pushed the 'On' switch, then everything was good, right? Ah, but those were simpler times...

Now days, most audiophiles and even a number of laymen who have bothered to try a few comparative listening tests have accepted the fact that audio cables and the components through which power is distributed to our system do have an impact on sound quality—a truly substantial impact, as it happens.

So, the question isn't so much whether we need cable and power product upgrades, but rather what kinds of upgrades we should pursue and in what order, so as to achieve maximum sonic benefits.

In a search for answers this Guide provides several key elements:

A truly massive **What's Next?** section that provides highlights and technical details on 120 (!) new audio cables and power products of all types.

A section called **Making Affordable Audio Cables Great Again** where we talk with six veteran designers who have mastered the art of creating sonically superb cable systems that don't cost the proverbial arm and a leg.

An in-depth section called **Twelve Creative Audio 'Power Brokers'** where we interview twelve expert designers of audio power products that take very different approaches to providing clean, pure, and ample power for our audio systems.

Three feature articles that talk about **Audio Cable Upgrades**, then about **Audio Power Product Upgrades**, followed by a piece from *Hi-Fi+* Editor Alan Sircom on formulating a logical, strategic plan for your next upgrades.

To help you find the resources you need, we include a **Hi-Fi+ Audio Cable & Power Product Review Index** (from 2012 to present).

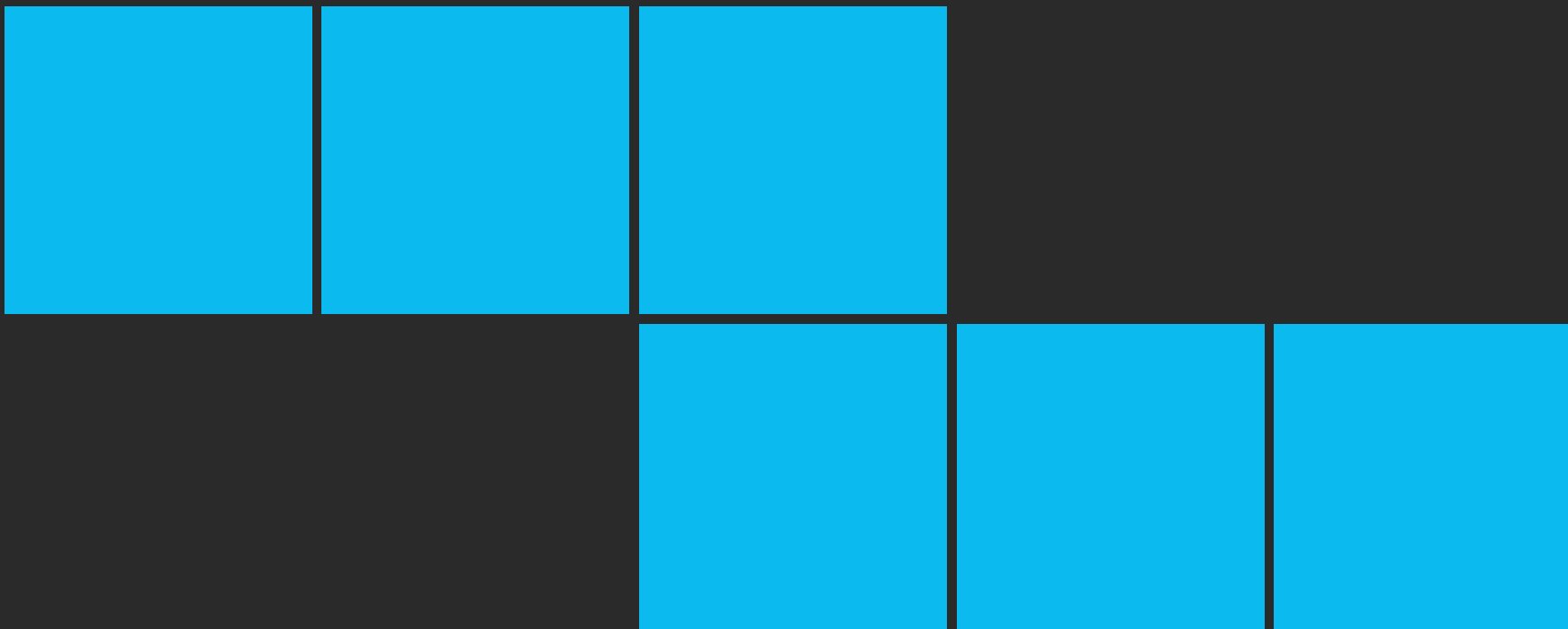
Last but not least, we include **Encyclopaedia Cablexicon**, which is a glossary of commonly used cable lingo and terminology explained in layman's terms.

Setting up your audio system with the right cables and power products can pay huge dividends in sound quality, and we recognise there are an awful lot of options out there. With that thought in mind, we hope this Guide not only leads you to answers that will benefit your system, but that—more importantly—it will show you how to ask the right questions, which will help you make wise system upgrade decisions now and in the future.

We wish you happy listening.

Chris Martens
Publisher, *Hi-Fi+*

WHAT'S NEXT IN AUDIO CABLES & POWER PRODUCTS?



COOL AUDIO CABLES & POWER PRODUCTS COMING SOON

WHAT'S NEXT IN INTERCONNECT CABLES?



COOL INTERCONNECT CABLES COMING SOON

Ansuz Acoustics ApS Ansuz d·tc interconnects

The Ansuz d·tc-series cables are handmade in Denmark. The whole idea is to combine simple physics with the best materials available – and nothing else, seeking best value for capacitance and inductance, resulting in the best and most authentic performance. This goes for Ansuz cables as well as our power distributors and resonance controls. The Ansuz d·tc interconnects need a separate power box to supply low current for the Tesla technology. It connects up to 14 interconnects and will contribute to the entire loop of cables with stellar performance. Michael Børresen, one of the owners of Ansuz, developed the Ansuz family of cables. Ansuz has received considerable recognition from the most well known specialists in the high-end field.

www.ansuz-acoustics.com



Technical Specifications

Type: Interconnect cable

Conductors: Ground wire: Double shielding silver-plated copper+double Inverted Helix Coils.
Conductors: 1mm Ø_shielded, silver-plated copper

Dielectrics: Charged Dielectric technology, Active Tesla Coil Technology, Active Noise Suppression Coil Technology

Jacket & Shielding: See Dielectrics, above

Available configurations: Single-ended RCA, balanced XLR, and Tonearm RCA/DIN

Available terminations: RCA or XLR

Standard lengths: Custom-made, minimum 1.0m

Pricing: Starting at USD\$20,000

Audience Au24 SX interconnect cables

In addition to offering a new unbalanced interconnect cable Audience has designed a completely new true differential balanced interconnect. It is very important to realize ... not all circuits are created equal, regardless of their nomenclature. For instance, what many circuit designers label as “balanced” is, in fact, not balanced at all, but is a single-ended topology using XLR inputs and outputs implementing a phase splitter. There is no sonic benefit to this method as it is only a marketing trick. The new Audience Au24 SX balanced cable is engineered to take advantage of a differential circuit, from the ground up, which optimizes the benefits of the sonic characteristics inherent in a balanced circuit topology.

www.audience-av.com



Technical Specifications

Type: Interconnect cable

Conductors: Double coaxial, stranded 6 nines purity OCC (mono crystal) copper, double cryogenically treated

Dielectrics: High quality, flexible, cross linked polyethylene (XLPE)

Jacket & Shielding: XLR is soft PVC jacket – braided OCC copper shield

Available configurations: Balanced

Available terminations: Low mass tellurium copper XLR connectors

Standard lengths: Any length

Pricing: USD\$2,400 @ 1.0m, USD\$800 for additional metres or portions thereof

SOLID GROUND

Ansuz Mainz8 Power Distributor can be seen as the heart of an optimized system. The Mainz8 features star grounding and the unique Ansuz Sparkz and NSC technologies. The Mainz8 will definitely improve your listening environment.

MAINZ8 POWER DISTRIBUTOR

Ansuz Mainz8 Power Distributor is a Mains and Ground distribution unit. It has 8 Dedicated mains outlets and features an extremely low impedance star grounding system. When using the Mainz8 try to connect the Main Ground to your pre- or integrated amplifier where your sources are connected. Doing this will minimize the ground potential between your devices and thus minimize ground current and signal induced fluctuations.

ANSUZ MAINZ8
POWER DISTR.

ansuz^o
ACOUSTICS

ANSUZ DARKZ
CABLE LIFTER

ANSUZ SPARKZ
HARMONIZER

ANSUZ MAINZ
POWER CABLE



ANSUZ D-LEVEL

Audio Acoustics Wow Resonance Platted

The Wow Resonance was the first resonance controlled cable system in the world.

After three decades in production, it's still executed the same identical way as in the beginning. There are no compromises in the finite attention to detail nor in the painstaking hundreds of hours of hand craftsmanship we apply mm by mm. Neither do we compromise in the face of ever-increasing execution costs and material complexities in manufacturing. This bespoke artisan product reflects our love for producing cables that are truly a labour of love and that stand as true works of art, with resonance so low that it gives new meaning to the term "nothingness".

www.audioacoustics.co.uk



Technical Specifications

Type: Hand made interconnect cables in analogue and digital formats

Conductors: 7-nines silver Litz

Dielectrics: Teflon-coated/ Silicon 4KV/ Resonance Membranes

Jacket & Shielding: Resonance membranes

Available configurations: Single-ended, balanced, and digital EMC

Available terminations: RCA, EMC XLR, XLR digital. What's next in Inter

Standard lengths: 0.83m, 1.6+m, 2.4+m

Pricing:
Stereo 0.83m Platted £19,000;
1.6m Platted £38,000;
Digital 1m £11,400;
Mono 1m Digital £5,700

Audio Acoustics ORB WEAVER DIAMOND CABLE SYSTEM

The Orb Weaver Diamond cable system is offered as a complete 'solution product' with the Orb Weaver Diamond loudspeaker.

The system represents the pinnacle of our product range—a true state of the art cable system that pushes the boundaries for what is achievable today when constraints of production time, price, and sales quotas are set aside, enabling us to produce something special, unparalleled, and unique. In this series, a set of 1.6m and 2.4m RCA interconnects alone would take 19 months of solid daily commitment to produce, in what can only be described as a true labour of love to create limited production art. A whole cable system (or loom) is available with delivery times of 32–36 months.

www.audioacoustics.co.uk

Product image not available.

Technical Specifications

Type: Ultra high-end cable system, comprising loudspeaker, interconnect, digital, and mains power cords, plus a related distribution block and/or wall blocks and floor decouplers

Conductors: Confidential/superconductor/silver

Dielectrics: Proprietary

Jacket & Shielding: Proprietary

Available configurations: Custom solution item

Available terminations: RCA, EMC XLR, mains, XLR digital, and loudspeaker terminations

Standard lengths: Custom

Pricing: £48,884 per 0.83m interconnect: complete 17-item cable systems start at £2,500,000, Ex VAT

Black Cat Cable The Matrix

Pure copper micro-magnet wire braided together in opposing, cascading helices to form a matrixed tubular architecture are inserted by hand into a teflon tube of air, surrounded by a shield of bare copper wire, all within a nylon-braided jacket.

The Matrix is a truly outstanding single-ended interconnect and also forms a nearly perfect architecture for a balanced interconnect.

All processes are performed in-house on our own machinery.

All cables are terminated personally by the designer, Chris Sommovigo.

Black Cat Cable is manufactured, terminated, packaged, and shipped from our little workshop in the seaside town of Yugawara, Kanagawa, JAPAN.

www.BlackCatCable.com



Technical Specifications

Type: Interconnect cable

Conductors: 16 individually enameled pure copper conductors, braided into cascading, opposing helices

Dielectrics: Air & Teflon

Jacket & Shielding: Jacket: braided nylon multifilament yarn. Shielding: braided bare copper

Available configurations: Both single-ended and balanced

Available terminations: RCA, XLR

Standard lengths: 1.0m, + 0.5m increments

Pricing: USD\$1,050 @ 1.0mpr + USD\$300 per additional 1/2m pair

Black Rhodium Aria

Black Rhodium's extensive research into the factors that influenced sound quality demonstrated the need to reduce distortion caused by magnetic interaction between current carrying cables and mechanical vibration caused within the conductors. The design of Aria cable specified increased insulation thickness to reduce 'proximity effect' magnetic field distortion and the use of the Graham Nalty Vibration Stabilisers to reduce distortion caused by mechanical vibration. To complement these measures, and further upgrade sound quality, cables and connectors are processed with a Deep Cryogenic Treatment and the pins of connectors are plated in rhodium. Further complementary sound enhancing technology is applied to extend the listener's musical enjoyment, so Aria can reproduce music – beautifully.

www.blackrhodium.co.uk

Technical Specifications

Type: Interconnect cable

Conductors: 19 cores, deep cryogenically treated, silver-plated copper

Dielectrics: PTFE

Jacket & Shielding: Low microphony conductive layer over each conductor, silver plated copper braided screen, black polyester braid

Available configurations: Balanced construction for XLR terminations, semi-balanced with RCA

Available terminations: RCA to RCA, XLR to XLR

Standard lengths: 1m pair and 1.5m pair

Pricing: £1,000 for 1m pair, plus £300 per additional stereo metre



Brandt Audio C3.3 (XLR)

The XLR C3.3 is part of a hand made family of interconnect cables, balanced and unbalanced, each different in its composition, but all identical in their architecture and manufacturing.

www.brandt-audio.com

Technical Specifications

Type: Co-axial interconnect cable

Conductors: Mix of Litz OFC copper & PTFE silver-plated copper of different diameters

Dielectrics: As above

Jacket & Shielding: Cotton, no shielding

Available configurations: Standard or "Luxe" finish

Available terminations: Balanced XLR (Neutrik) or unbalanced RCA (red copper ETI)

Standard lengths: 1.25m

Pricing: From CHF 1'600 to CHF 3'500 + tax according to the model and finish



Cardas Audio Clear Cygnus Interconnect

Clear Cygnus Interconnect benefits greatly from the latest developments in the Clear product line, including a more economical version of Clear Beyond Interconnect cable's air-tube suspension. This cable replaces Clear Light Interconnect and brings added performance to the table without adding much to the price. Clear Cygnus is more detailed, but also slightly richer with better low frequency performance. Clear Cygnus performs well in any system at any length, in both single ended and balanced configurations. If you want Cardas musicality but with a neutral tonal balance, look no further.

www.cardas.com

Technical Specifications

Type: Interconnect cable

Conductors: Four Cardas 25.5 AWG Kevlar core, Matched Propagation conductors

Dielectrics: PFA, PTFE, LDPE, Kevlar

Jacket & Shielding: Spiral shield, Alcryn jacket

Available configurations: Both single ended and balanced, and also can be configured as a phono cable

Available terminations: Cardas GRMO RCA, Neutrik XLR

Standard lengths: Typically sold in half-metre increments, beginning at 0.5 metres

Pricing: 1.5 meter pair = USD\$990





Cardas Audio
Established 1987



CARDAS CLEAR CYGNUS SPEAKER

Clear Cygnus

***New from
Cardas***

www.cardas.com



CARDAS CLEAR CYGNUS INTERCONNECT

Clearer Audio Silver-line Optimus Reference Interconnect

The Silver-line Optimus Reference Interconnect is our flagship high-end, analogue interconnect and is hand-built in our workshop. Of a pseudo quad-balanced design, it features the very best 6N Ohno Continuous Cast (OCC) Silver (99.9999%) conductors, insulated in exceptionally low-loss foamed polyethylene. The Silverline Optimus Reference Interconnect features an active six-layer copper/silver shielding system and a final passive silver-plated nylon braid shield; further, our Super Suppressor ferrite rings attenuate any radio frequency interference (RFI) on the cable line without affecting the delicate audio signal. The Silver-line Optimus Reference Interconnect can be terminated with Eichmann Silver Bullet RCAs, WBT 0152 Ag nextgen RCAs, or Neutrik XX-Series XLRs.

www.cleareraudio.com



Technical Specifications

Type: Interconnect cable

Conductors: 6N Ohno Continuous Cast (OCC) Silver (99.9999%) Quad Balanced

Multi-strand-solid conductor

Dielectrics: Foamed Polyethylene (FPE)

Jacket & Shielding: Six-layer hybrid silver/copper active shielding system with outer silver-plated nylon braid

Available configurations: Single-ended and XLR

Available terminations: Eichmann Silver Bullet RCAs, WBT 0152 Ag nextgen RCAs and Neutrik XX-Series XLRs

Standard lengths: From 0.5m pair with additional 0.25m increments thereafter

Pricing: £895.00 for 0.5m pair plus £230.00 per additional 0.25m pair. Free worldwide delivery

DH Labs/Silver Sonic Air Matrix Interconnect

The Air Matrix Interconnect is the cable of choice for over 25 Pro-Audio Recording and Mastering studios around the world. It is a favorite among recording engineers because it delivers exceptional resolution, while remaining completely "uncolored" and neutral. The cable is Made in USA, and features the finest high-purity materials available. Ultra low inductance makes this cable ideal for long lengths.

<http://silversonic.com/docs/products/AirMatrix.html>

Technical Specifications

Type: Interconnect cable

Conductors: Continuous Crystal Copper/Silver Coated with polished surface finish

Dielectrics: PTFE Teflon Foam

Jacket & Shielding: Foil shield w/ Drain wire

Available configurations: Single Ended or Balanced w/ HC Alloy connectors

Available terminations: Not specified

Standard lengths: All lengths available

Pricing: Begins at USD\$245.00





Clearer Audio

AWARD-WINNING HAND-BUILT CABLES

**“It is good enough that it makes you think
you upgraded source, amp, and speakers.”**

Silver-line Optimus Reference Interconnect
Alan Sircom, Hi-Fi+, Issue 139

Order Direct
Free UK (Mainland) Delivery
60 Day Money Back Guarantee

Phone: 01702 543981
Web: www.cleareraudio.com
Email: enquiries@cleareraudio.com



GamuT Reference interconnect cable

Most interconnects include a layer of shielding which is designed to screen the cable's conductors from external electro-magnetic interference. But there's a down side, since this shielding also causes internal electro-magnetic energy to be reflected back in, resulting in time smearing and loss of dynamic response.

GamuT's 'smart screen' solution is essentially a shield-but-not-a-shield. In other words, it's selective about what it screens. It's extremely effective at preventing interference from high frequency noise, yet it doesn't create inductance and so the problem of dynamic compression simply doesn't figure. In essence, there is no shielding below 100kHz. But go above that and you're covered, so your valuable audio equipment is fully protected.

www.gamutaudio.com



Technical Specifications

Type: Interconnect cable

Conductors: Silver-plated oxygen-free copper conductors

Dielectrics: Teflon insulation

Jacket & Shielding: Bespoke tight-weave fabric wrap incorporating carbon fibre nano-strands, designed to eliminate static; flexible outer sheath

Available configurations: Both single-ended or balanced.

Available terminations: Highest quality rhodium-plated Furutech connectors, choice of RCA or XLR

Standard lengths: 1m, 1.5, 2m, 3m; custom lengths also available

Pricing:

1m: £2,300;
1.5m: £2,700;
2m: £3,000;
3m: £3,900 (per pair)

HiDiamond Italy Srls Genesis Signal Cable Big

It uses the new 4VRC999%AG© technology.

Our Genesis Big signal cable is a definite step forward compared to the known and appreciated 4VRC© technology.

Big is today the new top of the range and is the best signal cable that HiDiamond has ever produced.

www.hidiamond.eu

Technical Specifications

Type: Interconnect cable

Conductors: Graphite/Copper /Silver 4VRC999%AG©

Dielectrics: XLPE

Jacket & Shielding: External jacket 18mm

Available configurations: Single-ended

Available terminations: In Fibre Carbon Rhodium or with WBT-0152 Ag

Standard lengths: 1m + 1m

Pricing:

€3900 euro fibre carbon;
€4,500 euro in WBT



High Fidelity Cables CT-1 Reveal – Magnetic Signal Conductors

The goal of Reveal was to share the benefits of our patented magnetic conduction technology with more listeners around the world. With this technology, electrons that constitute an audio signal are powerfully guided by an array of magnets to the extreme center of the conductor, thus defeating “skin-effect”. This novel application allows for less signal loss from end-to-end. To make such benefits more accessible, we needed lower pricing while retaining the performance of our previous USD\$1,600 entry-level interconnects that first garnered accolades from the late Harry Pearson. Our new R&D “revealed” we could not only beat it, but also magnetically outperform competitors’ conventional electrical wiring at laughably lower prices. From this lesson, the Reveal series was born.

www.highfidelitycables.com/products/rca/ct1reveal/



Technical Specifications

Type: Interconnect cable

Conductors: Solid-core coaxial using ferromagnetic permalloy with mu-metal and powerful neodymium waveguides

Dielectrics: Pure Teflon

Jacket & Shielding: We apply a Faraday cage to trap the powerful EM wave created by our technology

Available configurations: Both single-ended RCA and balanced XLR

Available terminations: Proprietary RCA connectors with perforated pins and XLR connectors

Standard lengths: 1–4 metres in .5 metre increments with custom lengths available

Pricing: USD\$699 for 1m/pair (USD\$150 for each additional 0.5m)

Purist Audio Design Neptune Interconnects

These cables deliver a large soundstage, with stunning detail in the mid-range. The Neptune line gives an award-winning performance, with positive reviews from many top names in the audiophile community. Our Fluid shielded cables have been a favourite of audiophiles for years, and we have upped the ante with the Neptune line. The Neptune interconnects are crafted around 22 AWG single crystal copper conductors, and we have improved the connectors with beryllium copper, and increased the thickness of the gold plating.

www.puristaudiodesign.com



Technical Specifications

Type: Interconnect cable

Conductors: Single Crystal Copper

Dielectrics: Polypropylene

Jacket & Shielding: Foil shielding, with interior Fluid dampening

Available configurations: Single-ended (RCA) and Balanced (XLR)

Available terminations: Gold RCA, Gold 3-Pole XLR

Standard lengths: 1m, 1.5m, additional available

Pricing:
USD\$1,900.00 for 1m RCA and
USD\$2,000.00 for 1m Balanced

What you need to know about modern technology and sound quality

We have to stop and think. Everyone walks around with their cellphone. When you sit down and listen to your music, you might be controlling your server with an iPad or an Android device. Think about the other devices in your home. Your music server is computer-based. The DAC has a processor. All of these devices generate RF and EMI. Even though the device itself is shielded and attempts to block these fields from escaping, you still have a field around them that acts as a radiator for RF and EMI.

So often, people talk about how their system is bright, or does not sound natural. Much of this is due to problems caused by improperly shielded cables, mechanical vibrations, and other noises. When we originally came out with our first cable in 1986, 30 years ago, we saw this problem would keep growing and it has. Increasingly, it isn't only the adults in the household who possess cellphones and electronic devices, it is the whole family. Electronics are a greater and greater part of our everyday lives.

Purist Audio Design concerns itself with the details. Our catch phrase, "Connecting you to the music" is more than that. It's a

means. How often do you sit down and listen to your music, and find yourself fatigued? When you listen with Purist cables, you listen for hours, thinking "one more song." We pay attention to details because we're music lovers and audiophiles, ourselves.

Purist Audio Design began in a garage as part of an audiophile's dream. Jim Aud put together what he learned from his time in the US Air Force and NASA, and worked to make music better. Now, Purist ships around the world. Yet, if you call us you'll still talk to Jim or other members of his family. You'll talk to real people, real audiophiles who share the same passion you do.

Let us connect you to the music.



**Purist Audio
Design**

Russ Andrews TT-1™ turntable interconnect

The Russ Andrews TT-1 is an analogue interconnect cable designed to be used with turntables that feature RCA outputs. TT-1 is derived from the Select range of Kimber Kable interconnects and is a fully shielded, high-purity copper, coax-based design. Unlike most coax designs, which use a solid core conductor, TT-1 uses a stranded core for optimisation of analogue signal transfer and flexibility.

TT-1 comes with its own, separate 2.5mm² pure copper grounding wire for use where the turntable requires a ground connection through the use of a ground terminal.

www.russandrews.com/tt1

Technical Specifications

Type: Interconnect cable

Conductors: Stranded, pure copper

Dielectrics: Not specified

Jacket & Shielding: Single braided copper shield, Techflex jacket

Available configurations: Single ended

Available terminations: Kimber UltraPlate Phono (RCA) connectors

Standard lengths: 0.5m and 1m

Pricing:

0.5m – £109.00;

1m – £135.00



Signal Projects Lynx Series

“Our third-tier series cable with the spirit of our flagship.” Lynx is based on the design and quality standards of our higher models and are intended to overlap the increased requirements of high performance audio products at a high value price point. The high purity copper conductors (99.99997%), effective dielectric materials and sophisticated geometry provide excellent measurement resulting in the accurate reproduction of music with clarity, neutral dynamics and impressively balanced response.

<http://signalprojects.com>

Technical Specifications

Type: Interconnect cable (Analogue and Digital Cables)

Conductors: Solid Core Copper

Dielectrics: Polytetrafluoroethylene, Polyolefin

Jacket & Shielding: Braided Copper

Available configurations: Balanced (XLR) or Single Ended (RCA)

Available terminations: High Quality Gold Plated Terminations

Standard lengths: 1M (Standard); Available in Additional 0.5M Increments

Pricing:

USD\$1,030 /1M,

USD\$235 per 0.5M Additional.

(Same price for XLR or RCA)



Wavelength Audio Video dba The CablePro Vitality RCA Audio Interconnect cable

CablePro VITALITY RCA cables are all about music, not musical reproduction. They have the uncanny ability to reveal the finest details while exposing the core of the music ... the pace, rhythm, and timing.

Although CablePro VITALITY RCA cables are priced well within the means of any music lover, they still deliver more pure listening pleasure than almost any other cable. If you seek value and exceptional musical performance, CablePro's VITALITY RCA cables may be just right for your system.

VITALITY RCA cables will jolt you out of that musical malaise. Buy a pair today and get ready to enjoy your system like never before.

www.thecablepro.com



Technical Specifications

Type: Interconnect cable

Conductors: Two for single-end RCA cables, three for balanced XLR cables

Dielectrics: XLPE (cross-linked polyethylene)

Jacket & Shielding: Braided sleeve, shielded or unshielded

Available configurations: Single-ended or balanced

Available terminations: Puresonic RCA, CablePro copper XLR, Puresonic top-line XLR

Standard lengths: 2 ft. to 15ft., custom lengths available on request

Pricing: 2-foot pair USD\$230.00, add USD\$20.00 per additional pair-foot

The Chord Company Sarum T Analogue

The Sarum T interconnect (part of the new Sarum T range) builds on the success of the acclaimed Sarum Super ARAY cable (*Hi-Fi+* interconnect cable of the year 2016) and introduces Chord's breakthrough proprietary insulation material, Tylon[®], bringing a major performance upgrade.

Previously exclusive to the flagship ChordMusic range, Tylon[®] brings the remarkable benefits of Chord's proprietary dielectric to a new price level. Previous Sarums featured PTFE and the upgrade to Tylon[®] introduces a raft of performance benefits.

Tylon[®] is the best-performing dielectric The Chord Company has used in over 32 years of UK design and manufacturing. It is the most neutral and phase-stable insulation material available and remains the biggest step forward in insulation performance since PTFE.

www.chord.co.uk

Technical Specifications

Type: Super ARAY RCA interconnect cable with Tylon[®]

Conductors: Micro-polished silver-plated conductors

Dielectrics: Proprietary Chord Company Tylon[®]

Jacket & Shielding: Polyethylene & Silver-plated copper.

Available configurations: Single-ended and balanced (digital versions also available)

Available terminations: RCA, XLR & DIN (digital versions also available)

Standard lengths: 1m as standard, custom lengths available to order

Pricing: £2,100 per metre, additional metres £1,000



ANTICABLES

RECLAIM THE MUSIC LOST IN YOUR EXISTING CABLES



With awards from the best audio publications, and hundreds of testimonials from the global audio community, the ANTICABLES products have established themselves as the lowest price to highest performance leader in the cable business. ANTICABLES products are affordable enough to fit into an entry level system budget, yet perform high enough to sound better than cables costing many times more.

WWW.ANTICABLES.COM

+1 651.735.0534

Van Damme Silver Series Session Grade Lo-Cap 55pF Instrument cable

Originally specified and engineered as a high-end guitar cable, with a no compromise approach to materials and electrical characteristics, these cables are increasingly being used as Hi-Fi Interconnects.

The cable has a 0.49mm² centre conductor of stranded silver plated oxygen free copper wire, foamed polyethylene dielectric and a dual screen of conductive thermoplastic and a silver plated oxygen free copper braid. Great attention has been paid to maintaining the 55pF/metre capacitance, ensuring a minimum of high frequency loss.

With a 4-star review from Guitarist magazine, and multiple endorsements from notable guitar players when used as a guitar lead, this cable provides precision performance and aural fidelity without the usual hyperbole. Available in the United Kingdom from Van Damme Distributor VDC Trading Ltd.

www.vdctrading.com/shop/van-damme-cable/audio/Single-Channel-Analogue-Audio-Cable/van-damme-silver-series-session-grade-instrument/

Technical Specifications

Type: Interconnect cable

Conductors: Silver plated ultra-pure oxygen free copper 7 × 9 × 0.10mm plait

Dielectrics: Foamed polyethylene.

Jacket & Shielding: Conductive thermoplastic screen, silver plated ultra-pure oxygen free copper braid 24 × 10 × 0.10m, clear PVC jacket

Available configurations: Bulk cable

Available terminations: Bulk cable

Standard lengths: 100m reels, or by the metre

Pricing: Not specified



Vertere Acoustics Pulse D-Fi Analogue Interconnect Cable – New Generation

True high-end performance at entry level, Pulse D-Fi Analogue Interconnect Cable complements any hi-fi stereo setup, maximising dynamics, detail, and clarity. Similar to the Pulse D-Fi Tonearm Cable, Pulse D-Fi stereo Analogue Interconnect Cable is configured internally to allow best performance with full dynamics, detail, clarity, and emotional narrative of the music and background ‘darkness’ – D-Fi brings the music.

D-Fi interconnects are available with Vertere proprietary RCA or balanced XLR connectors.

www.vertereacoustics.com



Technical Specifications

Type: Interconnect Cable

Conductors: High Purity Copper, Silver, Tin-plated

Dielectrics: PTFE and PVC

Jacket & Shielding: Special PVC, Main Braid shield + Inner Wrap shield

Available configurations: Single ended and true Balanced

Available terminations: Vertere Proprietary RCA and XLR connectors with ×3 thickness Gold plated contacts

Standard lengths: 1.00m (Additional lengths in 0.5m steps)

Pricing:
£160.00 per pair, thereafter
£35.00 per subsequent stereo
0.5 metre

Vertere Acoustics Pulse-HB Analogue Interconnect Cable

Preserving the signal from source to amplifier with complete integrity, Pulse-HB Interconnect Cable is Vertere's absolute reference.

For all stereo interconnect applications, Vertere's Pulse-HB Analogue Interconnect Cable is the absolute reference connection. Internally, the conductors are configured and optimised differently to the tonearm cable to provide unrestricted dynamics while preserving the intricate low-level detail. The internal signal conductors preserve even the most intricate harmonic structure of the music as well as the most dynamic signals all occurring simultaneously.

Pulse-HB combines real, instantaneous dynamics with total clarity at all volume levels and settings. This level of detail, accuracy, control, and dynamics, elevates the experience of listening to music to a live performance standard. Pulse-HB is truly exceptional and without peer.

www.vertereacoustics.com



Technical Specifications

Type: Interconnect cable

Conductors: High Purity Copper, Silver, Tin-plated

Dielectrics: PTFE and PVC

Jacket & Shielding: Special PVC, Main Braid shield + Inner Wrap shield

Available configurations: Single ended and true Balanced

Available terminations: Vertere HB Reference 23.95ct Gold/5 micron+

Standard lengths: 1.15m (Additional lengths in 0.5m steps)

Pricing:
£5,800 per pair, thereafter
£800 per subsequent stereo
0.5 metre

WyWires Diamond Series Interconnect Cable

Our Diamond series interconnects cables contain a complex structure of Litz wire along with solid core. In total, Diamond Series interconnects have six discrete conductor groups in order to provide the most accurate frequency response, spatial characteristics, and realistic dynamics. The noise floor is extremely low! This is due to the use of carbon fibre, Mylar shielding and a proprietary carbon material to absorb and dissipate electromagnetic interference.

www.wywires.com

Technical Specifications

Type: Interconnect cable

Conductors: Copper Litz wire and solid core

Dielectrics: PTFE, cotton, and air dielectric

Jacket & Shielding: Mylar shielding and Techflex

Available configurations: Single ended and balanced

Available terminations: Furutech RCA and XLR

Standard lengths: Four feet or 1.2 Metres

Pricing: USD\$4495



SOLID GROUND

Ansuz Mainz8 Power Distributor can be seen as the heart of an optimized system. The Mainz8 features star grounding and the unique Ansuz Sparkz and NSC technologies. The Mainz8 will definitely improve your listening environment.

MAINZ8 POWER DISTRIBUTOR

Ansuz Mainz8 Power Distributor is a Mains and Ground distribution unit. It has 8 Dedicated mains outlets and features an extremely low impedance star grounding system. When using the Mainz8 try to connect the Main Ground to your pre- or integrated amplifier where your sources are connected. Doing this will minimize the ground potential between your devices and thus minimize ground current and signal induced fluctuations.

ANSUZ MAINZ8
POWER DISTR.

ansuz^o
ACOUSTICS

ANSUZ DARKZ
CABLE LIFTER

ANSUZ SPARKZ
HARMONIZER

ANSUZ MAINZ
POWER CABLE



ANSUZ D-LEVEL

WHAT'S NEXT IN DIGITAL/NETWORK CABLES?



COOL DIGITAL/NETWORK CABLES COMING SOON

Ansuz Acoustics Ansuz d-tc digital cables

The Ansuz d-tc-series cables are handmade in Denmark. The whole idea is to combine simple physics with the best materials available – and nothing else, seeking best value for capacitance and inductance, resulting in the best and most authentic performance. This goes for Ansuz cables as well as our power distributors and resonance controls. The Ansuz d-tc interconnects need a separate power box to supply low current for the Tesla technology. It connects up to 14 interconnects and will contribute to the entire loop of cables with stellar performance. Michael Børresen, one of the owners of Ansuz, developed the Ansuz family of cables. Ansuz has received considerable recognition from the most well known specialists in the high-end field.

www.ansuz-acoustics.com

Technical Specifications

Type: Digital cable

Conductors: Ground wire: Double shielding silver-plated copper+double Inverted Helix Coils
Conductors: 1mm Ø _shielded, silver-plated copper

Dielectrics: Charged Dielectric technology, Active Tesla Coil Technology, Active Noise Suppression Coil Technology

Jacket & Shielding: See Dielectrics, above

Available configurations: Single-ended or semi-balanced XLR

Available terminations: RCA, BNC, and XLR

Standard lengths: Custom-made, minimum 1.0m

Pricing: Starting at USD\$12,600



Audience AU24 SX

A family of high-performance digital audio signal cables.

www.audience-av.com

Technical Specifications

Type: Digital audio signal cables

Conductors: Stranded 6 nines OCC (mono crystal) copper

Dielectrics: Cross-linked polyethylene (XLPE)

Jacket & Shielding: AES/EBU has soft PVC jacket with OCC copper braided shield. S/PDIF has XLPE jacket

Available configurations: Single-ended and balanced

Available terminations: Low mass tellurium copper XLR and RCA

Standard lengths: Any length

Pricing: AES/EBU is USD\$1,225 first 1.0m and USD\$400 per metre thereafter or portion thereof. S/PDIF is USD\$1,035 for first 1.0m and USD\$290 per metre thereafter or portion thereof



Audio Acoustics Resonance Digital

The world's first resonance-controlled digital cable, available in RCA Mono, RCA stereo, EMC Balanced XLR Mono and Stereo versions.

www.audioacoustics.co.uk

Technical Specifications

Type: Digital and analogue interconnects

Conductors: 7-nines silver Litz, Teflon-coated superconductor

Dielectrics: Audio Acoustics resonance membranes

Jacket & Shielding: 4 kV silicon dielectric

Available configurations: 1m Mono, 1m Stereo, 1m EMC Balanced mono/stereo, +m thereafter

Available terminations: Custom RCA silver, EMC XLR

Standard lengths: 1m

Pricing: 1m stereo RCA £1,995; 1m XLR balanced £2,995; 1m mono RCA £1,395; 1m XLR balanced £1,595



Black Rhodium Allegro

Between 2013 and 2015, Black Rhodium carried out extensive research to determine the engineering factors that most influenced the sound quality of high-end cables. A range of high-end cables was launched. Black Rhodium has enabled a wider range of consumers to appreciate this technology in Allegro by carefully applying selected measures to be used. These include the use of the Graham Nalty Vibration Stabiliser to reduce the effects of mechanical vibrations in cables and a large ferrite to reduce RFI generated in the braided cable screen. The sound of Allegro is further enhanced by the use of Graham Nalty Straight Line Connector RCA plugs, whilst BNC connectors can also be supplied.

www.blackrhodium.co.uk

Technical Specifications

Type: Digital audio cable

Conductors: Single solid core conductor 0.65mm diameter with silver-plated copper braided screen

Dielectrics: PTFE

Jacket & Shielding: Silver-plated copper braided screen with plastic sheath and expandable over-sheath

Available configurations: Coaxial screened cable to 75 Ohm impedance

Available terminations: RCA or BNC

Standard lengths: 1m, with other lengths available to order

Pricing:
£180 for 1m plus
£40 per additional metre



CELEBRATING QUICKSTEP

HI-FI WORLD'S BEST LOUDSPEAKER CABLE AWARD 2016

Capture the Excitement, Emotion and Drama of your Music

Exclusive connectors
GN1 'Straight Line Contact'
Loudspeaker Plugs



Hi-Fi World Best
Loudspeaker
Cable Award 2016 *

The **exclusive technology** of our very best cables
can now be enjoyed by a much larger audience!

EXCLUSIVE FEATURES

- Balanced Sound ✓
- Musically Entertaining ✓
- Stunning Clarity ✓
- Sharp Definition ✓
- Authentic Imaging ✓
- Excellent Timing ✓
- Effortlessly Open ✓

Read the reviews in full at
www.blackrhodium.com to
discover how these reviewers
describe the outstanding
Quickstep sound quality.

"Quicksteps were surprisingly balanced in tonal terms while
the design offered a naturalistic reflection of the music that
was entertaining and extremely natural in its approach."

Paul Rigby- theaudiophileman.com



* "They get out of the way of the signal that few others do
at this price and allow you to hear the music unsullied and
in all its glory."

Jon Myles, Hi-Fi World



"For sound per pound this is an excellent choice for the
audiophile offering a detailed soundstage with exceptional
speed, and a sound that was very open and effortless."

Janine Elliot, Hi-Fi Pig



Go buy your own Quickstep Cable NOW at your
nearest Black Rhodium Dealer or via
www.blackrhodium.co.uk

Hear QUICKSTEP at these dealers

Analogue Seduction 01733 350 878 | Audio T Swansea 01792 474 608

DoGood Audio 01515 253 845 | Ian Harrison 01283 702 875

Homesound 01316 621 327 | MCRU 01484 540 561 | Planalogue 01865 693 032

Cardas Audio Clear Network

Cat 7 network cable employing ultra-pure Cardas copper and the highest quality dielectric materials.

www.cardas.com

Technical Specifications

Type: Cat 7 Network Cable

Conductors: 8 × 24 AWG Cardas Copper

Dielectrics: Skin-Foam-skin PE

Jacket & Shielding: Multiple foil shields & tinned copper braided shields, TPR outer jacket

Available configurations: N/A

Available terminations: Telegartner RJ45

Standard lengths: Typically sold in half-metre increments starting at 0.5 metres, custom lengths available

Pricing: 1.5 metre = USD\$340



Clearer Audio Silver-line Optimus Reference 75 Digital Interconnect

The Silver-line Optimus Reference 75 Digital Interconnect is our flagship high-end digital interconnect hand-built in our workshop. Of a coaxial design, it features 6N Ohno Continuous Cast (OCC) Silver (99.9999%) conductors for the signal line and 6N Silver-plated OCC Copper (99.9999%) for two conducting braids (used for the return path and shielding). To maximise performance, the signal conductors are insulated in foamed polyethylene (FPE) and to the specific diameter required to provide a true 75Ω characteristic impedance. The cable is terminated with the WBT 0152 Ag Pure Silver nextgen RCA plug, which provides a true 75Ω characteristic impedance and ensures the very best in digital data transfer.

www.cleareraudio.com

Technical Specifications

Type: 75Ω digital coaxial

Conductors: 6N Ohno Continuous Cast (OCC) Silver (99.9999%)
Multi-strand-solid

Signal Conductor

Dielectrics: Foamed Polyethylene (FPE).

Jacket & Shielding: Six layer hybrid silver/copper active shielding system with outer silver-plated nylon braid

Available configurations: Single-ended

Available terminations: RCAs and BNCs (available Summer 2017)

Standard lengths: From 0.5m with additional 0.25m increments thereafter

Pricing:

£495.00 for 0.5m plus

£120.00 per additional 0.25m

Free worldwide delivery



DH Labs/Silver Sonic NEW Glass Master Premium Toslink

The New DH Labs Premium GLASS MASTER Toslink offers 300 strands of proprietary glass fibers, and delivers the widest bandwidth and frequency response in the industry. Glass fiber optical cable is the highest quality digital optical medium available, with significantly higher acceptance angle than standard plastic fiber.

"To the Audiophile that simply wants the best (Toslink) they can get, there's no question that this cable is it!" - Derrick Lilly - The Sound Apprentice - 1/19/17

<http://silversonic.com/docs/products/GlassMasterToslink.html>



Technical Specifications

Type: Toslink Digital Optical Cable

Conductors: Custom Machined Gold Plated Connector with Polished Optical Grade Lens

Dielectrics: N/A

Jacket & Shielding: Cladding

Available configurations: Not specified

Available terminations: Not specified

Standard lengths: 0.5m to 6.0m

Pricing: Begins at USD\$165

Ensemble SUPREMO 75™

A cable can make or break the quality of a system—especially in the digital domain, not to forget video and CATV. Ensemble has a long-standing experience in designing these types of cables.

The new SUPREMO 75 is at the limits of best possible transmission characteristics:

- Absolute freedom from interference,
- Ultra-fast signal transmission, extended bandwidth,
- Negligible signal attenuation (0.044 dB/m – 50 MHz),
- No phase shift (standing wave ratio VSWR 5-30 MHz 1.044),
- High-frequency spikes suppression, and
- Very low capacitance (54 pF).

www.ensembleexperience.com



Technical Specifications

Type: Digital signal transmission cable, precise 75 ohm

Conductors: Single, high purity copper conductor

Dielectrics: Extremely low dielectric absorption

Jacket & Shielding: Quadruple-shielded, durable, hard-wearing, transparent sleeve

Available configurations: Not specified

Available terminations: RCA (Ensemble Allino™ all-copper plug), or BNC, or F-type

Standard lengths: 1m, 1.5m, and 2m

Pricing:

1m RCA-RCA , £ 340;

1m BNC-BNC, £ 310

HiDiamond Genesis Big XLR Cable

It uses the new 4VRC999%AG© technology.

Our Genesis Big XLR signal cable is a definite step forward compared to the known and appreciated 4VRC © technology.

Big is today the new top of the range and is the best XLR cable HiDiamond has ever produced.

An absolute reference component, designed to provide maximum transparency in all frequency ranges.

www.hidiamond.eu

Technical Specifications

Type: XLR

Conductors: Number of conductors: 12

Conductor materials: Graphite / Copper / Silver 4VRC999% © AG.

Dielectrics: XLPE

Jacket & Shielding: External jacket 18 mm

Available configurations: Balanced

Available terminations: Finished with proprietary HiDiamond connectors in Rhodium/Carbon Fibre

Standard lengths: 1m

Pricing: €4,300 euro



High Fidelity Cables CT-1 Reveal – Magnetic Digital Conductors

The goal of Reveal was to share the benefits of our patented magnetic conduction technology with more listeners around the world. With this technology, electrons that constitute a digital S/PDIF audio signal are guided by an array of magnets to the extreme center of the coaxial conductor, thus defeating “skin-effect”. This novel application allows for less signal loss from end-to-end. To make such benefits more accessible, we needed lower pricing while retaining the performance of our previous USD\$800 entry-level SPDIF cable that first garnered accolades from reviewers around the world. Our new R&D “revealed” we could not only beat it, but also magnetically outperform competitors’ conventional electrical wiring at laughably lower prices. Hence, the Reveal series was born.

www.highfidelitycables.com/products/digital/reveal/



Technical Specifications

Type: S/PDIF digital signal cable

Conductors: Solid-core coaxial using ferromagnetic permalloy with mu-metal and powerful neodymium waveguides

Dielectrics: Pure Teflon

Jacket & Shielding: We apply a Faraday cage to trap the powerful EM wave created by our technology

Available configurations: S/PDIF RCA and AES3

Available terminations: 75OHM RCA with perforated pins and pro-grade AES3

Standard lengths: 1–4 metres in 0.5 metre increments with custom lengths available

Pricing:
USD\$399 for 1m RCA
(USD\$75 for each additional 0.5m),
USD\$549 for 1m AES3
(USD\$100 for each additional 0.5m)

iFi Audio/AMR Gemini 3.0

The Gemini3.0 is a next generation dual-path USB3.0 cable; with separate cables and connectors on the host side for USB audio signals and power/ground. It has been precisely manufactured with tightly controlled impedance to the USB organisation specifications. FINAL USB connectors machined from solid-aluminium shells provide impeccable end-to-end RF shielding. Gold-plated connections make for years of steadfast service.

www.ifi-audio.com

Technical Specifications

Type: Dual-Path USB 3.0 Cable

Conductors: OFHC Copper with alloy plating for long-lasting protection

Dielectrics: Foamed PE

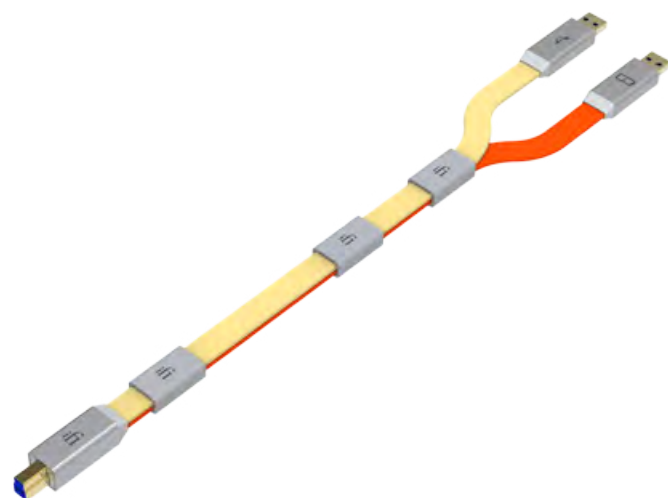
Jacket & Shielding: 100% Foil-Shield coverage

Available configurations: Dual USB3.0 A plugs on Host side, single USB2.0 or USB3.0 B plug on DAC side

Available terminations: FINAL USB connectors, gold-plated contacts, machined from solid aluminium shells

Standard lengths: 0.7m and 1.5m

Pricing: US\$549/€599/£549



Nordost Valhalla 2 USB 2.0

The Valhalla 2 USB 2.0 is revolutionary in terms of USB cable design. Its innovative layout allows the two signal wires to run parallel, compared to the standard twisted-pair configuration, shortening the signal path and drastically increasing transfer speeds. Another advantage to a twin-axial design is the ability to separate the power (positive) and ground (negative) legs of the cable, isolating them from signal and each other, minimizing the effects of harmful interference. The Valhalla 2 USB also isolates the signal conductors, covering each power leg with a finely-braided, silver shield, as well as enclosing both signal conductors in their own braided, silver shields. Each shield is connected to the metal plated back shell, completely ridding the cable of any EMI or RFI and eliminating noise.

www.nordost.com

Technical Specifications

Type: USB

Conductors: Constructed using four, 19 AWG solid core, silver-plated copper conductors suspended in Dual Mono-Filament

Dielectrics: Its dielectric constant is 1kHz-500MHz is 2.05

Jacket & Shielding: 100% Total coverage, dual-layer silver foil and braid, with full metal HOLO:PLUG® backshell

Available configurations: Mechanically tuned length, Dual Mono-Filament, Flat, Twin-axial design, with individually shielded power and signal conductors

Available terminations: Gold-plated HOLO:PLUG® Type A or B USB 2.0

Standard lengths: 1, 2, 3, 4, 5, 6, and 7-metre lengths

Pricing: Suggested retail is USD\$3499.99 for a 1-metre length. Additional metre increments are USD\$1,200





NORSE 2 CABLES

SUPERIOR TECHNOLOGY, SUPERIOR PERFORMANCE

MONO-FILAMENT TECHNOLOGY • MECHANICALLY TUNED LENGTHS • ASYMMETRICAL GROUNDING
SILVER-PLATED, OFC CONDUCTORS • EXTRUDED FEP INSULATION

NORDOST
MAKING THE CONNECTION

HEIMDALL 2



FREY 2



TYR 2



Purist Audio Design 30th Anniversary USB

Our 30th Anniversary USB isolates data and power in order to produce a cleaner, more powerful signal, but does so in a way that allows you to keep your existing equipment! Rare for USBs, it provides full performance up to 5.0 meters! It features advanced, passive filtering, and provides exquisitely detailed musicality from red book standard through DSD.

www.puristaudiodesign.com

Technical Specifications

Type: Digital cable

Conductors: Proprietary

Dielectrics: Proprietary

Jacket & Shielding: Passive filtering

Available configurations:
See Terminations, below

Available terminations: USB A, USB B,
USB A to USB Mini

Standard lengths: 1m–5m

Pricing: USD\$1,500 for 1m



Signal Projects Atlantis

“Our sixth-tier level series cable, four levels down from our flagship series.” Atlantis is designed to expand the overall response of audio electronics, sources, and speakers to true reference levels while perfecting tonal balance and a more realistic soundstage. Our brand-new Atlantis series represents the perfect tradeoff of reference performance and high value.

<http://signalprojects.com>

Technical Specifications

Type: Digital Cable

Conductors: Hybrid Stranded and Solid
Core Copper

Dielectrics: Polytetrafluoroethylene,
Polyolefin

Jacket & Shielding: Braided Copper in
Proprietary “PSDTwist Configuration”

Available configurations: AES/EBU or
75 Ohm RCA

Available terminations: Rhodium

Standard lengths: 1M (Standard);
Available in Additional 0.5M
Increments

Pricing: 75 Ohm RCA: USD\$2,580/1M
and USD\$390 per additional 0.5M;
USD\$2,830/1M XLR and
USD\$435 per additional 0.5M



Wavelength Audio Video dba The CablePro VITALITY Coaxial Digital cable

The CablePro VITALITY Digital Coaxial Cable uses the highest purity, cryogenically treated mono-crystal, OCC Copper conductor material. The unique geometry we've selected for this cable provides exceptionally low noise, for a musical and detailed presentation that is easy on the ears without sacrificing low-level information retrieval.

Each strand that makes up the conductor is pulled from a single copper crystal. This lack of crystal boundaries lends itself to an easy, natural sound that represents music exceptionally well.

VITALITY combines a number of unique advances in wire, wire geometry, and connectivity to bring you a cable that is uniquely beautiful in every way. From Puresonics low-mass, super conductive RCA plugs, to the cryogenically treated, specially configured wire we use, no step is overlooked to bring you a flexible, musical, cable of high value, that makes VITALITY a wise choice for any music lover!

www.thecablepro.com



Technical Specifications

Type: Digital coaxial cable

Conductors: Dual concentric coax, Ohno Continuous Cast Copper

Dielectrics: XLPE (cross-linked polyethylene)

Jacket & Shielding: Braided sleeve, shielded cable

Available configurations: Single-ended or balanced

Available terminations: Puresonic RCA, CablePro copper XLR, Puresonic top-line XLR

Standard lengths: 2ft. to 15ft

Pricing: 2 foot \$275.00, \$20.00/ additional foot

The Chord Company Epic Streaming cable

The Epic Streaming cable, part of the midrange Epic line up, offers incredible performance for its modest price. It has been designed to carry extremely high-frequency data signals and uses high-quality silver-plated conductors, high-speed insulation materials, and high-density shielding.

Crucially, the Epic Streaming cable benefits from a version of Chord's proprietary Tuned ARAY conductor geometry, which was originally developed for the (then) flagship Sarum range and in this instance, has been especially enhanced for streaming cables. Each of the four conductor pairs uses a hard-skin dielectric material with interference-eliminating shielding.

Finishing touches include high-precision RJ45 connectors with gold-plated contacts that are modified to directly solder the conductors to the contact pins. All cables are hand-made to order.

www.chord.co.uk

Technical Specifications

Type: Tuned ARAY Digital streaming cable

Conductors: Silver-plated copper

Dielectrics: Hard-skin dielectric

Jacket & Shielding: PVC & Tinned copper.

Available configurations: Streaming RJ45

Available terminations: High-quality, precision-made RJ45

Standard lengths: 1m as standard, custom lengths available to order

Pricing: £450 per metre, additional metres £50



Transparent Audio High Performance Ethernet

Transparent High Performance Ethernet Cable is specifically designed for the transfer of digital audio signals over home networks. Years of development and prototyping have resulted in a impedance-optimized low-loss cable geometry. Refined terminations are designed specifically to lock noise out and preserve signal integrity.

High Performance Ethernet Cable is an expression of Transparent's commitment to design innovation and sophistication. Enable your network-connected music components to operate at their maximum potential.

<http://transparentcable.com>

Technical Specifications

Type: Ethernet cable for audio

Conductors: Large solid OFHC copper conductors

Dielectrics: Low loss, low noise proprietary dielectrics

Jacket & Shielding: Heavy jacket and fillers are optimized for vibration control. Unshielded.

Available configurations: N/A

Available terminations: RJ-45

Standard lengths: .5m to 15m, custom lengths available

Pricing: USD\$275/1m



Vertere D-Fi USB Digital Cable V3 – New Generation

Leader in its class, taking sound quality to higher levels, Pulse D-Fi USB Digital Cable provides optimal connection for a whole range of digital devices.

The Pulse D-Fi USB Digital Cable, class leading USB interconnect, is available with type A, type B, mini and Micro USB connectors to provide connection to almost all digital devices.

Internal conductor connections are specially done to ensure optimum performance: Marvel at the unexpected boost of digital audio.

Taking sound quality to the highest level in its class, Pulse D-Fi Double USB Digital Cable also eliminates interference, thanks to its separate power line.

www.vertereacoustics.com

TECHNICAL SPECIFICATIONS

Type: USB 2.0 Single Cable & Double D Cable

Conductors: High Purity Copper, Silver, Tin-plated

Dielectrics: PTFE and PVC

Jacket & Shielding: Special PVC, Main Braid shield + Inner Wrap shield

Available configurations: USB 2.0 Type A & B / Micro-B & Mini

Available terminations: D-Fi Proprietary

Standard lengths: 1.00m (Additional lengths in 0.5m steps)

Pricing: £85 per Single Cable & £160 per Double Cable, thereafter £35 per subsequent Stereo 0.5 metre



Vertere Pulse-HB USB Digital Cable V3

Transforming the sound of computer audio with unsurpassed performance, Pulse-HB USB Digital Cable is hand-crafted with unique proprietary construction.

Based on Pulse-HB Technology, the Pulse-HB Hand-built USB Digital Cable utilises a proprietary shielded Data conductor pair and a separate shield wrapped Power conductor. Carefully twisted together they are then overall shield braided and outer jacketed to produce this amazing USB cable.

Every Pulse-HB Hand-built USB cable is meticulously tested and listened with against the original master reference cable to ensure the best performance from computer audio.

www.verteareacoustics.com

Technical Specifications

Type: USB 2.0 Data/Digital Cable

Conductors: High Purity Copper, Pure Copper, Tin-plated

Dielectrics: PTFE and PVC

Jacket & Shielding: Special PVC, ×2 Main Braid + Inner Wrap

Available configurations: USB 2.0 Type A/Type B

Available terminations: Vertere Reference Special

Standard lengths: 1.00m (Additional lengths in 0.5m steps)

Pricing:
£1350 per Cable; thereafter,
£300 per subsequent Linear 0.5 metre



Vertere Pulse-HB Ethernet Data Cable

To ensure the best audio performance from NAS drives, streamers and other suitable devices, Pulse-HB Ethernet Cable (RJ45 connector) is based on Vertere's special data conductor pair.

Pulse-HB Ethernet Cable utilises four data conductor pairs as used in the construction of the Hand-built USB cable. The use of such high quality, fully shielded data conductor pairs provides the best musical performance from NAS drives, streamers and similar devices.

The Ethernet cable is terminated with highest quality RJ45 connectors with our unique internal shielding configuration.

www.verteareacoustics.com

Technical Specifications

Type: CAT 5/6/7 Ethernet Data/Digital Cable

Conductors: High Purity Copper, Pure Copper, Tin-plated

Dielectrics: PTFE, PVC + Outer Weave

Jacket & Shielding: Main Braid + ×4 Inner Braid/Foil

Available configurations: RJ45, RJ45

Available terminations: Vertere Reference Special

Standard lengths: 1.50m (Additional lengths in 0.5m steps)

Pricing:
£1350 per Cable; thereafter,
£300 per subsequent Linear 0.5 metre



Vertere Pulse-HB AES/EBU Balanced Digital Cable V3

Optimised for best audio performance, Pulse-HB AES/EBU Balanced Digital Cable provides lifelike dynamics and resolution when partnered with almost any DAC.

Pulse-HB AES/EBU Balanced Digital Cable utilises special data conductor pair and double shielded for optimum performance. The use of such high quality, fully shielded data conductor pair provides the best musical performance from CD transports, streamers and similar devices.

The AES/EBU cable is terminated with Vertere reference XLR connectors that ensure unparalleled connection providing a highest level of resolution, control and dynamic.

www.vertereacoustics.com

Technical Specifications

Type: AES/EBU Balanced Digital Cable

Conductors: High Purity Copper, Silver, Tin-plated

Dielectrics: PTFE and PVC

Jacket & Shielding: Main Braid + Inner Wrap

Available configurations: True Balanced

Available terminations: Vertere Reference 23.95ct Gold/5 micron+

Standard lengths: 1.00m (Additional lengths in 0.5m steps)

Pricing:

£1850 per Cable; thereafter,

£300 per subsequent Linear 0.5 metre

SUBSCRIBE

hi-fi+



1 YEAR
SUBSCRIPTION
**Save
16%**

2 YEAR
SUBSCRIPTION
**Save
25%**

Hi-Fi+ is the leading magazine for all music lovers. We strive to present you with reviews of the best equipment to enhance your listening experience. Each month the magazine brings you reviews of new equipment by some of the audiophile world's leading writers. If you are looking to buy some new speakers, or build a system from scratch, *Hi-Fi+* is the place to go. Visit our website and subscribe to receive each copy direct to your door.



SUBSCRIPTION RATES

UK, Western Europe & Rest of the World

ONE YEAR SUBSCRIPTION /12 ISSUES

Within the UK	£50
Western Europe, USA & Canada	£60
Rest of the World	£80

TWO YEAR SUBSCRIPTION /24 ISSUES

Within the UK	£90
Western Europe, USA & Canada	£105
Rest of the World	£140

SPECIAL OFFER

Save 16% (1 year subscription)

Save 25% (2 year subscription)

www.hifiplus.com

WHAT'S NEXT IN SPEAKER CABLES?



COOL SPEAKER CABLES COMING SOON

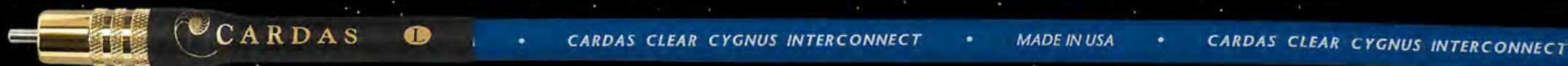


Cardas Audio

Established 1987



Clear Cygnus ***New from Cardas***



www.cardas.com

Ansuz Acoustics Ansuz d-tc speaker cables

The Ansuz d-tc-series cables are handmade in Denmark. The whole idea is to combine simple physics with the best materials available – and nothing else, seeking best value for capacitance and inductance, resulting in the best and most authentic performance. This goes for Ansuz cables as well as our power distributors and resonance controls. The Ansuz d-tc interconnects need a separate power box to supply low current for the Tesla technology. It connects up to 14 interconnects and will contribute to the entire loop of cables with stellar performance. Michael Børresen, one of the owners of Ansuz, developed the Ansuz family of cables. Ansuz has received considerable recognition from the most well known specialists in the high-end field.

www.ansuz-acoustics.com



Technical Specifications

Type: Speaker Cable

Conductors: Ground wire: 2 × 1mm Ø shielded silver-plated copper.
Conductors: 4 × 1mm Ø shielded, silver-plated copper

Dielectrics: Charged Dielectric technology, Active Tesla Coil Technology, Active Noise Suppression Coil Technology

Jacket & Shielding: See Dielectrics, above

Available configurations: Custom-made

Available terminations: Banana plugs or spade lugs

Standard lengths: Custom-made, minimum 3.0m

Pricing: Starting at USD\$16,000

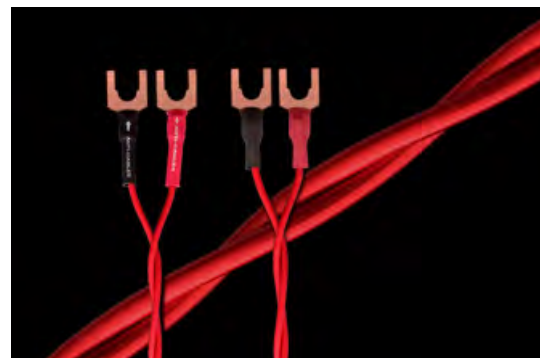
AntiCables Level 2.1 Performance Series Speaker Wires

ANTICABLES finished a six-month research project collaborating with material scientists and the US facility that draws the wire to their specification. The outcome of the project is their new "dot.1" version of their longest loved product, the red coated speaker wires.

The new Level 2.1 Speaker Wires are made using this improved wire drawing process, which greatly reduce the dislocation density of the copper. This new Reduced Dislocation Density (RDD™) wire made such a difference, it sounds even better than the former Level 3 Speaker Wires. The lower cost product actually leap-frogged the former twice-as-expensive offering.

Improvements: perceived increased volume, midrange more real, less grain noise, smoother highs, bass weight and articulation, more exciting and involving.

www.anticables.com



Technical Specifications

Type: Non-Jacketed Speaker "Wires" (not cables)

Conductors: Twisted pair of our new #12-gauge "Reduced Dislocation Density" (RDD™) copper wire

Dielectrics: Very thin (0.001") proprietary red coating for the industry's lowest Dielectric Effect Distortion

Jacket & Shielding: Non-jacketed for best sound (see above)

Available configurations: Single-Wire, Bi-Wire, and Doubled-up #9-gauge Level 3.1 versions available

Available terminations: Solid Copper Spade lugs, BFA Banana plugs, Medium Spade lugs, Vintage Spade lugs, and Bare Wire Ends

Standard lengths: In one-foot increments from 3 to 50 feet

Pricing: Only USD\$16/ft pair, or USD\$30 ft pair for Bi-Wire and Doubled-up versions

ANTICABLES

RECLAIM THE MUSIC LOST IN YOUR EXISTING CABLES



With awards from the best audio publications, and hundreds of testimonials from the global audio community, the ANTICABLES products have established themselves as the lowest price to highest performance leader in the cable business. ANTICABLES products are affordable enough to fit into an entry level system budget, yet perform high enough to sound better than cables costing many times more.

WWW.ANTICABLES.COM

+1 651.735.0534

Audience Au24 SX loudspeaker cables

This new loudspeaker cable is a low mass and low eddy current design. It is a heavier gauge than its predecessor in the Audience Au24 cable lineage. This new Au24 SX loudspeaker cable has a richer palate and is more dynamic yet more relaxed at the same time.

www.audience-av.com



Technical Specifications

Type: Speaker Cable - dual coax, 16 AWG loudspeaker cable

Conductors: Stranded 6 nines purity OCC (mono crystal) copper, double cryogenically treated

Dielectrics: High quality cross-linked polyethylene (XLPE)

Jacket & Shielding: High quality cross-linked polyethylene (XLPE)

Available configurations: Single, bi-wire and tri-wire for mono, stereo, and LCR

Available terminations: Spade lugs, banana plugs, or pins

Standard lengths: Any length

Pricing: Standard single wire is USD\$2,425 for first meter and USD\$575 per extra meter or portions thereof. Bi-wire is USD\$3,715 for first meter and USD\$890 per extra meter or portions thereof

Audio Acoustics WOW Resonance Statement Finest Silver Resonance Controlled Membrane Super Conductor

The Wow is the world's first and only resonance-controlled loudspeaker superconductor.

The cables use the finest diamond-drawn silver Litz conductors, which are then Teflon-coated, that each number of strands are wound round by hand a few millimeters at a time with our proprietary developed resonance controlling membrane. Then, the process is repeated two further times with a non-disclosed application followed by silver crimping and silver spades and terminations with industrial space age cleaners and materials eliminating oxidation, EMC, and "other" application of conductivity. Substantial investment in finite material assembly coupled with great patience yields a truly remarkable product that takes several months to become a true work of art.

www.audioacoustics.co.uk

Technical Specifications

Type: Hand made loudspeaker cable

Conductors: Non-disclosed custom silver Litz

Dielectrics: Teflon and other industrial materials

Jacket & Shielding: Three-layer proprietary Audio Acoustics resonance control membranes

Available configurations: 1m stereo, 1m bi-wired, 2m bi-wired

Available terminations: 8mm spade lugs, silver platinum-coated only

Standard lengths: 1m, 1.25m, 2m, single and bi-wired

Pricing: 1m stereo, £22,200; 1m bi-wired, £44,400; 2m bi-wired, £88,800





Cardas Audio
Established 1987



CARDAS CLEAR CYGNUS SPEAKER

Clear Cygnus

***New from
Cardas***

www.cardas.com



CARDAS CLEAR CYGNUS INTERCONNECT

Audioplan Musicable ULS 88A (UK distribution by Ikon Audio Consultants)

This is the Audioplan Loudspeaker cable reference. The Ultimate Loudspeaker Cable ULS 88A is a result of 30 years of Audioplan development and represents the pinnacle of their achievement for loudspeaker cables.

www.Audioplan.eu

Distributed in the UK by:
www.IkonAudioConsultants.com)



Technical Specifications

Type: Speaker Cable. Features eight new Aeromer insulated, CRC2-damped hollow conductor strands of silver-plated pure copper. Balanced, directionally optimized construction around a microphonic damped inner core with $2 \times 7 \text{ mm}^2$ cross section. Flexible, mechanically and electrically optimized braided jacket.

Capacitance: 670 pF/m

Inductance: 0.025 $\mu\text{H}/\text{m}$

Loop resistance: $< 0.01 \text{ Ohm}/\text{m}$

Exterior dimensions: 14.6mm

Conductors: See above

Dielectrics: See above

Jacket & Shielding: See above

Available configurations: See above

Available terminations: Available with silver-plated copper banana plug terminations or spade lugs (other connectors on request)

Standard lengths: All practical lengths

Pricing: UK RRP £1,135 for 1.4m Stereo pair with banana plugs (extra 1m £695 per stereo pair)

Brandt-Audio CRISTAL 1.3 +++

Very refined hand-made coaxial speaker cable with mix of wires organized in a spatial architecture.

www.brandt-audio.com

Technical Specifications

Type: Unique coaxial speaker cable to optimizes the speaker-amplifier pair's performances in a few settings

Conductors: Mix of Litz OFC copper and PTFE silver-plated copper of different diameters

Dielectrics: As above

Jacket & Shielding: Maple wood and Nylon (cotton on request), no shielding

Available configurations: Not specified

Available terminations: Banana plugs on main connectors & spade lugs on others or spade lugs on all terminations (red copper)

Standard lengths: 2.5 meters (others lengths available on request)

Pricing: From CHF 3'250 to CHF 3'500 + tax according to the model



Cardas Audio Clear Cygnus Speaker

It wasn't easy to improve upon Clear Light Speaker without giving up its incredible value, but we did it! Clear Cygnus is more revealing, more holographic, and more refined. Matched Propagation conductors help to provide a very open and dynamic sound. In addition it can be internally bi-wired which wasn't an option with Clear Light.

www.cardas.com

Technical Specifications

Type: Speaker Cable

Conductors: Two concentric, Kevlar core, Matched Propagation Conductors (4X15.5 AWG)

Dielectrics: PTFE tape and Electro-Dissipative dielectric tape, Kevlar

Jacket & Shielding: Alcryn jacket

Available configurations: Single wire & Bi-wire

Available terminations: Silver/rhodium plated, pure billet copper spade lugss or banana plugs, forged in a 2-stage, solder-less process

Standard lengths: Sold in half-metre increments, starting at 0.5 metres
Custom lengths are available

Pricing: 1.5 metre = USD\$1080

Clearer Audio Silver-line Optimus Reference Speaker Cable

The Silver-line Optimus Reference Speaker Cable is our flagship high-end speaker cable designed to provide the highest levels of performance. The speaker cable features 6N Ohno Continuous Cast (OCC) Silver (99.9999%) multi-strand conductors ($4 \times 2.5\text{mm}^2$ for a total of 10mm^2 , which can be configured in full range, bi-wire, and bi-amp) insulated in exceptionally low-loss foamed polyethylene (FPE) dielectric. The speaker cable features a five-layer silver/copper shielding system (Dual-layer copper foil, 6N Silver-plated OCC Copper braid, Dual-layer copper foil, Silver-plated OCC Copper braid and Silver-plated nylon braid). The speaker cable is terminated with WBT Ag silver connectors (0661/0681 6m/8mm spades or 0610 bananas).

www.cleareraudio.com

Technical Specifications

Type: Speaker Cable

Conductors: 6N Ohno Continuous Cast (OCC) Silver (99.9999%) Multi-strand-solid

Conductor: ($4 \times 2.5\text{mm}^2$)

Dielectrics: Foamed Polyethylene (FPE)

Jacket & Shielding: Six-layer hybrid silver/copper active shielding system with outer silver-plated nylon braid

Available configurations: 2-2 (full range), 2-4 (bi-wire), or 4-4 (bi-amp)

Available terminations: WBT 0661/0681 (6mm/8mm) Ag Spades / WBT 0610 Ag

Banana Plugs

Standard lengths: From 1m pair with 0.25m increments thereafter

Pricing: £1,480.00/m plus termination cost (WBT Ag connectors £45.00 each). Free worldwide delivery





Clearer Audio

AWARD-WINNING HAND-BUILT CABLES

**“It is good enough that it makes you think
you upgraded source, amp, and speakers.”**

Silver-line Optimus Reference Interconnect
Alan Sircom, Hi-Fi+, Issue 139

Order Direct
Free UK (Mainland) Delivery
60 Day Money Back Guarantee

Phone: 01702 543981
Web: www.cleareraudio.com
Email: enquiries@cleareraudio.com



HiDiamond Genesis Speaker Cable Big

It uses the new 4VRC999%AG© technology, which places it a decisive step ahead of the always excellent and appreciated standard 4VRC © technology. This is the biggest, most perfect signal cable that HiDiamond can offer today. It is an absolute reference component where there is a requirement for maximum transparency in all frequency ranges to deliver a perfect signal with no introduction of noise output, which would ruin the end result.

www.hidiamond.eu

Technical Specifications

Type: Speaker Cable Conductors: Copper / Silver 4VRC999%AG©

Number of conductors: 18

Dielectrics: XLPE

Jacket & Shielding: External jacket, mm.290

Available configurations: Mono-wiring

Available terminations: In Fibre Carbon Rhodium banana plug connectors WBT-0610 Ag, spade lug connectors WBT -0681 Ag

Standard lengths: 3m + 3m

Pricing:
€5,800 in fibre carbon;
€6,400 in WBT



High Fidelity Cables CT-1 Reveal – Magnetic Speaker Conductors

The goal of Reveal was to share the benefits of our patented magnetic conduction technology with more listeners. With this technology, electrons that constitute an audio signal in your speaker cables are guided by an array of magnets to the extreme center of the conductors, thus defeating “skin-effect”. This novel application allows for less signal loss from end-to-end. To make such benefits more accessible, we needed lower pricing while retaining the performance of our previous USD\$2,400 entry-level speaker cables that first garnered accolades from reviewers around the world. Our new R&D “revealed” we could not only beat it, but also magnetically outperform competitors’ conventional electrical wiring at laughably lower prices. Hence, the Reveal series was born.

www.highfidelitycables.com/products/speaker/reveal/

Technical Specifications

Type: Speaker Cable

Conductors: Solid-core coaxial using ferromagnetic permalloy with mu-metal and powerful neodymium waveguides

Dielectrics: Pure Teflon

Jacket & Shielding: We apply a Faraday cage to trap the powerful EM wave created by our technology

Available configurations: Positive and negative pair

Available terminations: Banana plug and spade lug terminations

Standard lengths: 1–4 metres in 0.5 metre increments with custom lengths available

Pricing: USD\$999 for 1m/pair (USD\$200 for each additional 0.5m)



Purist Audio Design 25th Anniversary Speaker Cables

A cable whose no-holds-barred design will show off what your system can do. It is strong across the audio spectrum. However, it will also reveal any weaknesses: the 25th does not disguise or mask. The speaker cable features enhanced Ferox shielding, and utilizes a combination of silver-stranded and solid-core copper single crystal in a four-conductor configuration. Sit back, relax, and listen!

www.puristaudiodesign.com

Technical Specifications

Type: Speaker Cable

Conductors: Single Crystal Silver, Single Crystal Copper

Dielectrics: F.E.P./P.E. Teflon, Polyethylene

Jacket & Shielding: Ferox

Available configurations: Standard speaker and bi-wire

Available terminations: Purist Audio Design Spade Lugs or Banana Plug (Interchangeable)

Standard lengths: 1.5m and up

Pricing: USD\$17,715 for 1.5m



Signal Projects Hydra

Signal Project's Mid-tier series of cables. Designed for optimal mid-priced value, the conductors of the Hydra series are based upon a hybrid design philosophy, which in combination with our three-layer insulation and advanced shielding will provide significantly increased conductivity, superb balance beyond audible frequencies, and exceptional detail resulting in a wide soundstage with accuracy.

<http://signalprojects.com>

Technical Specifications

Type: Speaker Cable

Conductors: Hybrid Stranded and Solid Core Copper

Dielectrics: Polytetrafluoroethylene, Polyolefin

Jacket & Shielding: Braided Copper in Proprietary "PSDTwist Configuration"

Available configurations: Single Pair or Bi-Wire Configurations.

Available terminations: Rhodium Spade lugs or Z-Plug Style Banana plug terminations

Standard lengths: 2M (Standard); Available in Additional 0.5M Increments

Pricing: USD\$3,570/2M, USD\$530 per 0.5M Increments. (Same Price for single or Bi-Wire)



What you need to know about modern technology and sound quality

We have to stop and think. Everyone walks around with their cellphone. When you sit down and listen to your music, you might be controlling your server with an iPad or an Android device. Think about the other devices in your home. Your music server is computer-based. The DAC has a processor. All of these devices generate RF and EMI. Even though the device itself is shielded and attempts to block these fields from escaping, you still have a field around them that acts as a radiator for RF and EMI.

So often, people talk about how their system is bright, or does not sound natural. Much of this is due to problems caused by improperly shielded cables, mechanical vibrations, and other noises. When we originally came out with our first cable in 1986, 30 years ago, we saw this problem would keep growing and it has. Increasingly, it isn't only the adults in the household who possess cellphones and electronic devices, it is the whole family. Electronics are a greater and greater part of our everyday lives.

Purist Audio Design concerns itself with the details. Our catch phrase, "Connecting you to the music" is more than that. It's a

means. How often do you sit down and listen to your music, and find yourself fatigued? When you listen with Purist cables, you listen for hours, thinking "one more song." We pay attention to details because we're music lovers and audiophiles, ourselves.

Purist Audio Design began in a garage as part of an audiophile's dream. Jim Aud put together what he learned from his time in the US Air Force and NASA, and worked to make music better. Now, Purist ships around the world. Yet, if you call us you'll still talk to Jim or other members of his family. You'll talk to real people, real audiophiles who share the same passion you do.

Let us connect you to the music.



**Purist Audio
Design**

Wavelength Audio Video dba The CablePro VITALITY Speaker cable

CablePro VITALITY speaker cable sounds like music, not musical reproduction. VITALITY has no impact on the signal, subsequently the sound of your system is abundantly clear and musical. VITALITY speaker cables, like all VITALITY cables, allow your system to achieve its maximum sonic capability by staying out of the way sonically.

Some of you may be surprised by the diminutive nature of VITALITY. It simply isn't necessary for speaker cables to be huge. CablePro VITALITY speaker cables are flexible, compact, and help your system reveal its musical charms. It's a bit of a technical marvel, but what really sets VITALITY apart, is that it allows your system to make listening to music a joyful, enlightening experience.

VITALITY is made with the highest purity, cryogenically treated, mono-crystal copper, and an exceptionally low loss dielectric. High conductivity, mechanical termination, no solder used.

www.thecablepro.com



Technical Specifications

Type: Speaker Cable

Conductors: Ohno Continuous Cast Copper cryogenically treated

Dielectrics: XLPE (cross-linked polyethelene)

Jacket & Shielding: Braided sleeve

Available configurations: Standard, Biwire, Triwire

Available terminations: Puresonic BFA/Banana plugs or Puresonic Multi-Spade lugs (fits ¼"-5/16" posts)

Standard lengths: 3ft. to 15ft

Pricing: 3-foot pair, USD\$380; add \$30 per additional pair-foot

The Chord Company Sarum T Analogue

The Sarum T interconnect (part of the new Sarum T range) builds on the success of the acclaimed Sarum Super ARAY cable (*Hi-Fi+* interconnect cable of the year 2016) and introduces Chord's breakthrough proprietary insulation material, Taylon®, bringing a major performance upgrade.

Previously exclusive to the flagship ChordMusic range, Taylon® brings the remarkable benefits of Chord's proprietary dielectric to a new price level. Previous Sarums featured PTFE and the upgrade to Taylon® introduces a raft of performance benefits.

Taylon® is the best-performing dielectric The Chord Company has used in over 32 years of UK design and manufacturing. It is the most neutral and phase-stable insulation material available and remains the biggest step forward in insulation performance since PTFE.

www.chord.co.uk



Technical Specifications

Type: Super ARAY RCA interconnect cable with Taylon®

Conductors: Micro-polished silver-plated conductors

Dielectrics: Proprietary Chord Company Taylon®

Jacket & Shielding: Polyethylene & Silver-plated copper.

Available configurations: Single-ended and balanced (digital versions also available)

Available terminations: RCA, XLR & DIN (digital version also available)

Standard lengths: 1m as standard, additional metres £1,000, custom lengths available to order

Pricing: £2,100 per metre

Vertere Acoustics Pulse-Xmini Loudspeaker Cable

High-performance Pulse-Xmini Speaker Cable is based on Pulse-X with Vertere's unique multiple conductors for enhanced signal transmission.

Based on Pulse-X, the Pulse-Xmini Speaker Cable also utilises multiple conductors to provide enhanced signal transmission. With both signal conductor set being identical and shielded, it can be configured for 'balanced' or 'single' ended use depending on shield management and shield connection.

www.vertereacoustics.com



Technical Specifications

Type: Speaker Cable

Conductors: High Purity Copper, Silver, Tin-plated

Dielectrics: PTFE and PVC

Jacket & Shielding: 2 x Main Braid for Signal

Available configurations: 4mm Banana plugs, Spade lugs.

Available terminations: Vertere with 3 x Thickness Gold Plated Contacts

Standard lengths: 2.00m (Additional lengths in 0.5m steps)

Pricing:
£435 per Pair; thereafter,
£60 per subsequent Stereo 0.5 metre

WyWires Diamond Series Speaker Cable

Our Diamond series speaker cables contain a complex structure of Litz wire along with solid core. In total, Diamond Series speaker cables have eight discrete conductor groups in order to provide the most accurate frequency response, spatial characteristics, and realistic dynamics. The noise floor is extremely low! This is due to the use of carbon fibre, Mylar shielding and a proprietary carbon material to absorb and dissipate electromagnetic interference,

www.wywiress.com

Technical Specifications

Type: Speaker Cable

Conductors: Litz wire and Solid core

Dielectrics: PTFE, cotton, and air

Jacket & Shielding: Mylar and Techflex

Available configurations: Single wire only

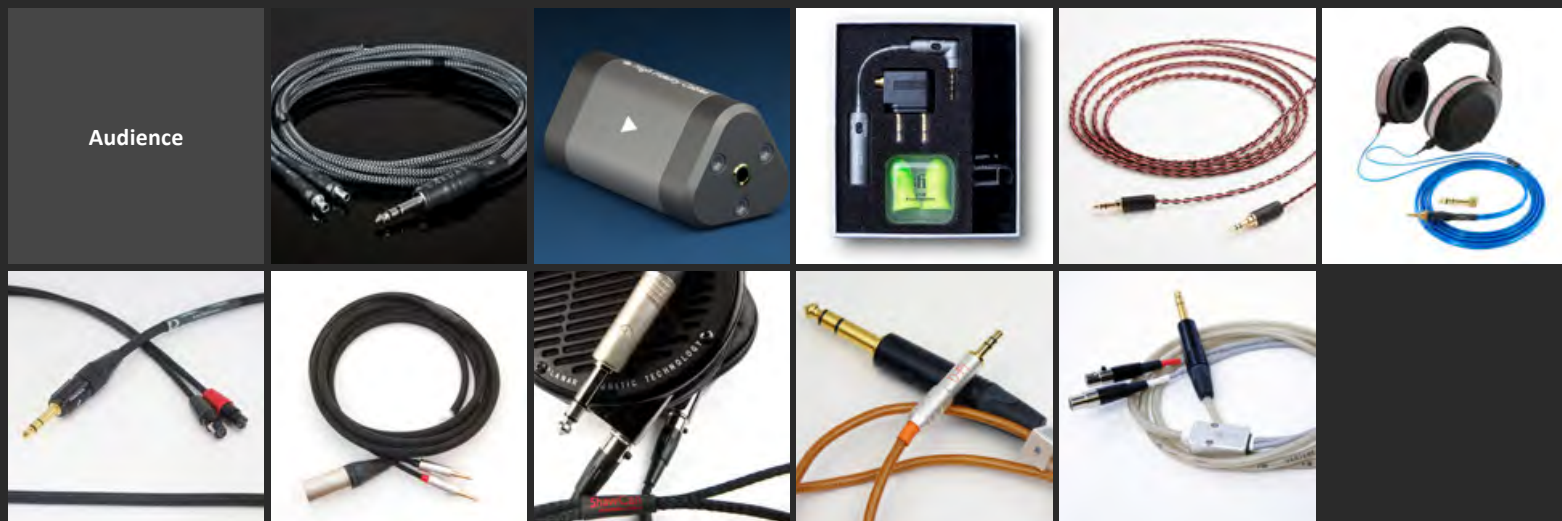
Available terminations: Proprietary spade lugs and banana plugs

Standard lengths: 2.5 metres or 8 feet

Pricing: USD\$7995



WHAT'S NEXT IN HEADPHONE/PERSONAL AUDIO CABLES?



COOL HEADPHONE/PERSONAL AUDIO CABLES COMING SOON

Audience Au24 SX

Specialised headphone signal cable: a flexible, low mass, low eddy current design.

www.audience-av.com

Product image not available.

Technical Specifications

Type: Headphone signal cable

Conductors: Copper, double cryogenically treated

Dielectrics: high quality cross-linked polyethylene (XLPE)

Jacket & Shielding: high quality cross-linked polyethylene (XLPE)

Available configurations: Single-ended and balanced headphone cables

Available terminations: Terminations available for most all headphone connector types

Standard lengths: 2.0m

Pricing: USD\$1,200

Cardas Audio Clear Headphone Cable

Our flagship headphone cable, designed like a miniature pair of Cardas Clear speaker cables, with a separate cable for each channel, with custom machined hardware to hold it all together. New for 2017, Clear Headphone is available with a number of new terminations for today's most popular headphones.

www.cardas.com



Technical Specifications

Type: Headphone Cable

Conductors: 4× 25.5 AWG concentric, Kevlar core, Matched Propagation headphone conductors

Dielectrics: PFA

Jacket & Shielding: Extruded TPE, fabric outer braid

Available configurations: Single ended or balanced

Available terminations: Source end terminations included 1/4" phone, 2× 3-pin XLR or single 4-pin XLR. Dual 1/8" TRS for Ayre/Pono also available. Headphone end terminations include nearly any headphone for which connectors are available. Recently added terminations include Alpha Dog, Nighthawk/Night Owl, Focal, and AKG.

Standard lengths: Sold in half-metre increments, starting at 0.5 metres, available in custom lengths

Pricing: 1.5 metre = USD\$600



Cardas Audio
Established 1987



CARDAS CLEAR CYGNUS SPEAKER

Clear Cygnus

**New from
Cardas**

www.cardas.com



CARDAS CLEAR CYGNUS INTERCONNECT

High Fidelity Cables (Magnetic Innovations LLC) Trinity Go – Portable Magnetic Waveguide

Introducing the first truly portable magnetic conduction device specifically made for critical headphone listening while on-the-go. The Trinity Go features our extremely powerful neodymium waveguide modules found in our patented room systems—miniaturized to a module that clips to your belt, pocket or bag. The magnetism created within is strong enough to attract the electrons of any audio signal to the very center of the headphone conductors, preserving all of the details the signal is carrying. This model features directional 1/8-inch input and output jacks on either end.

www.highfidelitycables.com/products/trinity

Technical Specifications

Type: Portable waveguide signal conditioner

Conductors: An array of powerful magnets act as the actual conductors within the waveguide module itself

Dielectrics: N/A

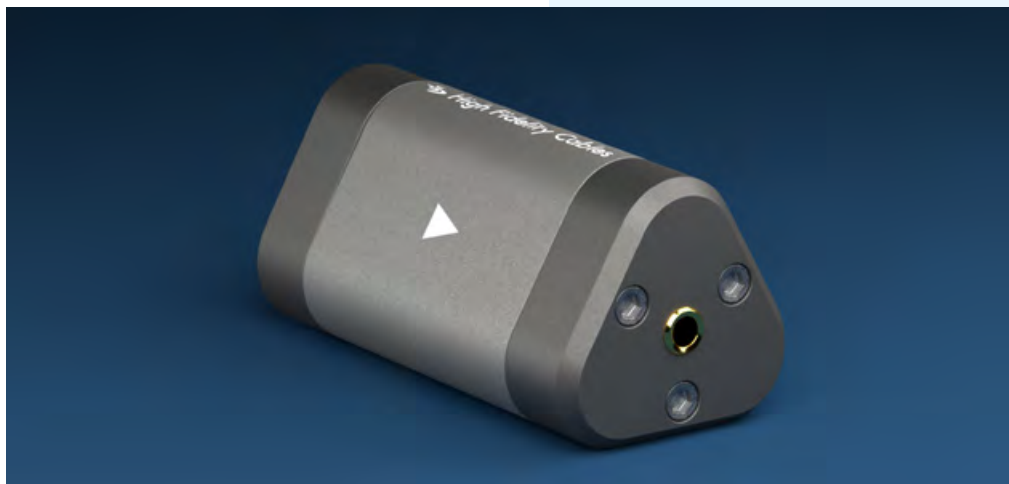
Jacket & Shielding: We apply a Faraday cage to trap the powerful EM wave created by our technology

Available configurations: N/A

Available terminations: Directional 1/8" input and output connections on either end

Standard lengths: 2" x 2" triangle shape with belt clip

Pricing: USD\$299



iFi Audio/AMR iEMatch

For Smartphones to in-flight entertainment systems to powerful amplifiers, the iEMatch removes the 'hiss' and achieves a better dynamic range by allowing for a higher level on the digital volume control. Benefits:

- Reduce Background Noise – improve resolution and clarity
- Improve Dynamic Range – improve contrast, dynamics and lower distortion
- Optimise Volume Control – increase usable range

www.ifi-audio.com

Technical Specifications

Type: Attenuating headphone adapter

Conductors: 5N single crystal copper cable, silver-plated

Dielectrics: Extra soft PU

Jacket & Shielding: Extra soft PU

Available configurations: User selectable Single-Ended/Balance connections

Available terminations: 3.5mm, gold-plated

Standard lengths: 20cms

Pricing: USD\$49 (ex-tax)/
€49 (incl. VAT)/£49 (incl. VAT)



Kimber Kable Kimber AXIOS-8 headphone cable

UK distribution by Russ Andrews

AXIOS-8 is a new headphone cable from Kimber Kable. AXIOS utilises eight individually insulated conductors allowing Kimber to create a headphone cable, which gives many of the benefits of the original AXIOS cables, but at a lower cost.

Like the original cables, the specially developed woven design of AXIOS-8 features Kimber's very flexible pure copper conductors and FEP insulation; AXIOS-8 is also hand-braided to give a seamless, woven transition at the point where the cable splits. All connectors feature hand-polished Gaboon ebony wood accents.

AXIOS is available for a wide range of headphones – see compatibility at

<https://axios.kimber.com/>

Distributed in the UK by
www.russandrews.com



Technical Specifications

Type: Headphone cable

Conductors: Eight (24 AWG) OFHC stranded copper conductors

Dielectrics: FEP (Fluorinated Ethylene Propylene)

Jacket & Shielding: Braided construction rejects RFI

Available configurations: Available in the most common 'Y' format (1Y) and also balanced format (2Y)

Available terminations: Custom machined plugs for each headphone end. 2.5mm, 3.5mm, 6.35mm (¼") jack and XLR amplifier options

Standard lengths: 1.2m, 2m, and 3m

Pricing: 1.2m – £599.00; 2m – £665.00; 3m – £747.50; for Sennheiser HD800 add £100.00

Nordost Blue Heaven Headphone Cable

The Blue Heaven Headphone Cable offers a unique combination of technological innovation, pliability and strength to make the best interface for mid to high level headphones. Nordost uses 34 AWG 7/42 conductors, which are twisted into a Litz construction, increasing flexibility, eliminating triboelectric noise within the cable and improving upon its mechanical damping. Our proprietary Micro Mono-Filament technology is then applied, which involves individually wrapping each conductor with a strand of FEP before being encased in extruded FEP insulation, drastically improving the cable's dielectric. The Blue Heaven Headphone Cable is terminated with a 3.5mm stereo mini plug and is provided with a threaded 3.5mm to 6.3mm (1/4in) stereo phono adapter that easily and securely screws onto the original termination.

www.nordost.com

Technical Specifications

Type: Aftermarket headphone cable

Conductors: 4 × 34 AWG

Dielectrics: Not specified

Jacket & Shielding: Not specified

Available configurations: 7 strand twisted Litz design with Micro-Mono Filament

Available terminations: Terminated with a 3.5mm Stereo Mini Connector, supplied with a screw-on 1/4" Stereo Phono Adapter

Standard lengths: Available in 1.25 and 2 metre lengths

Pricing: Suggested retail is USD\$399.99 for a 1.25 metre length and USD\$499.99 for a 2 metre length



Purist Audio Design Impresa

The Impresa delivers a natural, organic sound that fully immerses you into the music! The Impresa is designed to be the missing link for headphones like the Sennheiser HD800, Audeze, and HiFiMan! Have a different set of headphones? No problem, give us a call or email!

www.puristaudiodesign.com

Technical Specifications

Type: Headphone

Conductors: Oxygen Free Copper
0.999999% Pure

Dielectrics: Microporos

Jacket & Shielding: Braid

Available configurations: Built to suit

Available terminations: Designed for headphones like Sennheiser HD800, Audeze, and HiFiMan. We can also do custom!

Standard lengths: 1.5m and up

Pricing: USD\$680 1.5m HiFiMan, USD\$750 1.5m Audeze, and USD\$800 1.5m Sennheiser HD800



Wavelength Audio Video dba The CablePro VITALITY Headphone Upgrade cable

The CablePro VITALITY Upgrade Cable is designed for headphones from AKG, Audeze, Audioquest, Beyerdynamic, HifiMAN, OPPO, and Sennheiser, just to name a few.

VITALITY headphone upgrade cables have a magnificently balanced tone, and they expose the fundamental core of music ... the pace, rhythm, and timing. This is where the fun is! VITALITY headphone replacement cables will help you enjoy the kind of musical involvement you may be missing. Combining your top-of-the-line cans with a VITALITY upgrade cable is the recipe for musical joy.

The CablePro VITALITY upgrade cable for high-end headphones provides a spectacular boost in transparency that makes listening enlightening and joyful. If musical pleasure is your goal this may be the perfect cable for you.

www.thecablepro.com

Technical Specifications

Type: Headphone replacement cable

Conductors: Depends on configuration of headphones

Dielectrics: XLPE (cross-linked polyethelene)

Jacket & Shielding: Braided sleeve, proprietary geometry cancels noise without shielding

Available configurations: Not specified

Available terminations: Virtually every type of connector associated with headphones and headphone amps

Standard lengths: 5 feet, 10 feet, 15 feet, and 20 feet

Pricing: Depends on headphones. 5ft. length USD\$250-\$550



GutWire Audio Grounding Cables



An extremely effective and simple way to improve the sound of any audio system. A single cable to enable the proper grounding of electronic components.

Simply attach the RCA (or XLR) connector end to any spare input socket on your integrated amplifier or pre-amplifier. The mains plug end goes into any spare wall socket, or into a mains distributor. This creates the shortest route to ground from the circuit boards and introduces a different ground potential into the system.

It takes moments to hear the sound stage increase in size, both depth and width, that the tonal balance has more weight to it and the sound is more natural, less "hifi". Increased transparency provides more resolution of detail and a sharper focus of images.

Far more effective than passive grounding boxes, wooden or metal, which also require the use of multiple additional cables. No compression of dynamics, or added colouration, which can occur with alternative systems.

An elegant and simple solution; a single cable does it all.

Two models available:

Perfect Ground – UK or Schuko plug	£399
Ultimate Ground – Schuko plug	£650
Ultimate Ground – Furutech UK plug	£699

Audition a cable in your own system; full refund if not completely satisfied.

UK exclusive from The Audio Consultants.

GutWire Audio Cables hand made in Canada
UK Distribution by Epicurean Audio

The Chord Company ShawCan headphone cable

The new ShawCan headphone cable distils 32 years of UK cable design and manufacturing into a dedicated headphone product. It features high-quality silver-plated conductors with PTFE insulation with a composite design shield that also helps to minimise unwanted mechanical noise — an inherent problem with headphone cables. The conductors are enclosed in a black outer jacket that is more than just a braid to tidy the conductors: it is cleverly designed to further reduce mechanical noise.

ShawCan headphone cable also uses an adapted version of Chord's unique Tuned ARAY conductor geometry, designed specifically for headphone applications. The configuration has allowed Chord to make a headphone product that carries a musical signal far more coherently than conventional cable designs.

www.chord.co.uk

Technical Specifications

Type: Super ARAY headphone cable

Conductors: High-quality silver-plated

Dielectrics: PTFE

Jacket & Shielding: High-quality carbon composite shield and acoustic-dampening outer braid

Available configurations: Single-ended and balanced designs

Available terminations: 3.5mm mini-jack to: 1 mono/2 stereo mini-jack; 2-pin IEM; 2 mini XLR, HD800, LEMO and many other connector types

Standard lengths: 1.5m, plus custom lengths available to order

Pricing: £275 to £350, additional metres £80



Vertere Acoustics D-Fi Headphone Cable V3 – New Generation

Pulse-D-Fi Headphone Cable will transform the performance of your headphones combining high-end quality with flexibility and its distinctive appearance.

High-end performance with unparalleled clarity and dynamics are the hallmarks of D-Fi headphone cable. This extraordinary cable provides musical performance of high-end quality with ultimate flexibility – it can partner almost any headphone with a detachable cable.

D-Fi headphone cable is available with Vertere's proprietary 3.5mm Jack as standard. 2.5mm and ¼" gold plated jack and mini XLR connectors are also available.

www.vertereacoustics.com



Technical Specifications

Type: Headphone Cable

Conductors: High Purity Copper, Silver, Tin-plated

Dielectrics: PTFE and PVC.

Jacket & Shielding: Main Braid + Inner Wrap

Available configurations: 2.5mm, 3.5mm, ¼" Jack & Mini XLR

Available terminations: D-Fi with x3 Thickness Gold Plated Contacts.

Standard lengths: 1.00m (Additional lengths in 0.5m steps)

Pricing: £75 per Cable; thereafter, £17.50 per subsequent Stereo 0.5 metre

Vertere Acoustics Pulse-HB Headphone Cable

Pulse-HB Hand-built Headphone Cable provides unparalleled lifelike performance by keeping the signal from source to headphone absolutely intact.

The Pulse-HB Hand-built Headphone cable is available for many high-end high quality headphones taking their performance to new levels. Balanced configuration of the Pulse-HB ensures performance and flexibility. Use of Vertere Reference and other specialised Connectors provides compatibility with most brands

www.vertereacoustics.com

Technical Specifications

Type: Headphone Cable

Conductors: High Purity Copper, Silver, Tin-plated

Dielectrics: PTFE and PVC

Jacket & Shielding: Main Braid + Inner Wrap

Available configurations: 2.5mm, 3.5mm, ¼" Jack & Mini XLR and several others

Available terminations: Vertere XLR Reference (23.95ct Gold/5 micron+) and/or other connectors

Standard lengths: 1.50m (Additional lengths in 0.5m steps)

Pricing: £1,400 per Cable; thereafter, £400 per subsequent Linear 0.5 metre



hi-fi+

BACK ISSUES!



Complete your collection

Read previous reviews of the UK's best loved audio magazine

POSTAGE & PACKING

UK: £1/Magazine

Europe: £3/Magazine

Rest of World: £5/Magazine

UK orders are sent by Parcel Post, please allow 2 weeks for delivery.

Overseas orders are sent by air mail.

ORDER TODAY!

www.hifiplus.com

WHAT'S NEXT IN POWER CHORDS?



COOL POWER CHORDS COMING SOON

Ansuz Acoustics ApS Ansuz d-tc power cords

The Ansuz d-tc-series cables are handmade in Denmark. The whole idea is to combine simple physics with the best materials available – and nothing else, seeking best value for capacitance and inductance, resulting in the best and most authentic performance. This goes for Ansuz cables as well as our power distributors and resonance controls. The Ansuz d-tc interconnects need a separate power box to supply low current for the Tesla technology. It connects up to 14 interconnects and will contribute to the entire loop of cables with stellar performance. Michael Børresen, one of the owners of Ansuz, developed the Ansuz family of cables. Ansuz has received considerable recognition from the most well known specialists in the high-end field.

www.ansuz-acoustics.com



Technical Specifications

Type: Power Cord

Intended Applications: Not specified

Conductors: Ground wire: 2 × 1mm Ø shielded silver-plated copper.
Conductors: 4 × 1mm Ø shielded, silver-plated copper.

Dielectrics: Charged Dielectric technology, Active Tesla Coil Technology, Active Noise Suppression Coil Technology

Jacket & Shielding: See Dielectrics, above

Available terminations: EU or US

Standard lengths: Custom-made, minimum 2.0m

Pricing: Starting at USD\$20,000

Audience Au24 SX powerChord

Product Description: Au24 SX powerChord is the result of a full-year R&D effort and is known for the ultra coherent sound it makes possible. The IEC connectors are very high quality, while plugs are Furutech Fi-50M NCF (R) types. The powerChord cable is almost as wide as the plug, yet is very flexible. Au24 SX powerChord is available in both 10 AWG and 13 AWG.

There are two 13 AWG wires per leg in the 10 AWG SX powerChord. Historically Audience has not shielded power cords due to reduction in dynamics. However, we found the optimal solution is to shield the ground legs only (each of the two ground wires is shielded and then insulated with hand wrapped Teflon).

www.audience-av.com



Technical Specifications

Type: Power Cord

Intended Applications: power cord for any high end audio component

Conductors: 6 nines purity OCC (mono crystal) copper, double cryogenically treated

Dielectrics: high quality cross-linked polyethylene (XLPE)

Jacket & Shielding: High quality cross-linked polyethylene (XLPE) jacket, braided copper shielding on ground leg only

Available terminations: US, Euro, and UK.

Standard lengths: Any length

Pricing: 10 AWG is USD\$4,600 at 6 ft., +/- USD\$180 per foot. 13 AWG is USD\$3,500 at 6 ft, +/- USD\$150 ft

SOLID GROUND

Ansuz Mainz8 Power Distributor can be seen as the heart of an optimized system. The Mainz8 features star grounding and the unique Ansuz Sparkz and NSC technologies. The Mainz8 will definitely improve your listening environment.

MAINZ8 POWER DISTRIBUTOR

Ansuz Mainz8 Power Distributor is a Mains and Ground distribution unit. It has 8 Dedicated mains outlets and features an extremely low impedance star grounding system. When using the Mainz8 try to connect the Main Ground to your pre- or integrated amplifier where your sources are connected. Doing this will minimize the ground potential between your devices and thus minimize ground current and signal induced fluctuations.

ANSUZ MAINZ8
POWER DISTR.

ansuz^o
ACOUSTICS

ANSUZ DARKZ
CABLE LIFTER

ANSUZ SPARKZ
HARMONIZER

ANSUZ MAINZ
POWER CABLE



ANSUZ D-LEVEL

Audio Acoustics Zero Point Five/ Trans power cord

A high quality high-end resonance controlled mains cable at a budget cost.

www.audioacoustics.co.uk

Technical Specifications

Type: Power Cord

Intended Applications: All ancillaries

Conductors: Copper with very heavy
7 nines silver plating.

Dielectrics: Proprietary construction

Jacket & Shielding: Resonance membrane
4Kv silicon

Available terminations: Mains / USA / EU

Standard lengths: 1m, 1.5m, 2m

Pricing: 1m, £1,995; 1.5m, £2,995



Audioplan PowerCord Ultimate UK distribution by Ikon Audio Consultants

This is the reference PowerCord from Audioplan.

www.Audioplan.eu

Distributed in the UK by:
www.IkonAudioConsultants.com



Technical Specifications

Type: Power Cord

Power supply: 240 V ~

Load capacity: 25 A

Construction: $8 \times 1.25 \text{ mm}^2 + 1 \times 5.0 \text{ mm}^2$

Attenuation: Sicomin, CRC, and CDC
technology

Length: 1.5 m, (other lengths to order)

Connections: Furutech 1363 Rhodium UK
Plug and ATL IEC (other connections
available on request)

Intended Applications: Not specified

Conductors: See above

Dielectrics: See above

Jacket & Shielding: See above

Available terminations: Supplied with
Rhodium Furuteck UK plug & ATL
IEC socket (or Euro specification
on request)

Standard lengths: Supplied in 1.5m length
(longer lengths available on request)

Pricing: UK RRP £625 for 1.5m length
(£225 per additional meter)

Clearer Audio Silver-line Optimus Reference Power Cable

The Silver-line Optimus Reference Power Cable is our flagship high-end power cable. It features large 6N OCC Silver (99.9999%) multi-strand conductors for the live and neutral lines (4N Silver-plated OFC for the less critical earth line). With a rating of 30A the power cable is highly capable of powering not only front-end components but also the most demanding of amplifiers.

The Silver-line Optimus Reference Power Cable is shielded using a six layer active copper/silver hybrid shielding system with additional copper foil shielding for the live, neutral and earth lines. In addition, the power cable is fitted with our Super Suppressors which attenuate RFI and other noise that is on the mains line.

www.cleareraudio.com



Technical Specifications

Type: Power Cord

Intended Applications: For use with any component from sources, pre-amplifiers to very powerful amplifiers

Conductors: 6N OCC Silver (99.9999%) 3mm² conductor for live and neutral (4N SPOFC for earth)

Dielectrics: CL3 rated Polyvinylchloride (PVC)

Jacket & Shielding: Six layer silver/copper active shielding system with individually shielded live, neutral, and earth lines

Available terminations: Furutech UK, Euro SCHUKO, US and Australian/NZ plugs

Furutech IECs and Figure 8. Neutrik PowerCon

Standard lengths: From 1m with 0.25m increments

Pricing: £1,195 for 1m plus £240 per additional 0.25m (terminated with Furutech Gold connectors)

Crystal Cable THE ULTIMATE DREAM

Crystal Cable's new THE ULTIMATE DREAM incorporates the highest level of technical advancements and construction, to provide unrivaled sound quality, purity and exceptional musical experience. THE ULTIMATE DREAM'S seven unique conductors form an error-free yet very flexible configuration.

Six of them are made of our revolutionary all-monocrystal silver and gold technology.

The unique construction connects the 6 pure monocrystal silver cores as well as the multilayer monocrystal copper /silver / gold shield. The center silver-gold core adds a remarkably low ground impedance to clean up any ground-loop noise. THE ULTIMATE DREAM power cable delivers in every respect; listening to music becomes life-like, warmer, cleaner, more detailed and there seems to be so much more of it. Our engineers' dream has come true.

www.crystalcable.com/cables/monocrystal/the-ultimate-dream/



Technical Specifications

Type: Power Cord

Intended Applications: Power cord for all Hi-Fi purposes

Conductors: 7 conductors.

Materials: monocrystal silver cores, multilayer monocrystal copper/silver/gold shield

Dielectrics: Ultra-strong multi section Teflon-Peek-Kapton over all six monocrystal cores

Jacket & Shielding: Monocrystal copper & silver/gold precision mesh shield: Dual Kapton PEEK layer

Available terminations: IEC10/16/20A US/EUR/UK

Standard lengths: 1, 1.5, and 2m

Pricing: 1m = €9500, 1.5m = €11.900, 2m = €14.300



Clearer Audio

AWARD-WINNING HAND-BUILT CABLES

**“It is good enough that it makes you think
you upgraded source, amp, and speakers.”**

Silver-line Optimus Reference Interconnect
Alan Sircom, Hi-Fi+, Issue 139

Order Direct
Free UK (Mainland) Delivery
60 Day Money Back Guarantee

Phone: 01702 543981
Web: www.cleareraudio.com
Email: enquiries@cleareraudio.com



GutWire Audio Cables SV-8

Solid-core 16 AWG 101% IACS Pure copper with air dielectrics, utilizing rare earth compositions for better sound and RF & EMI blocking. Shield-grounding system for fine-tuning of sound.

www.gutwire.com

Technical Specifications

Type: Power Cord

Intended Applications: Power Amps

Conductors: 101% IACS pure copper

Dielectrics: Air

Jacket & Shielding: Black & Copper braided shielding

Available terminations: 15A & 20A IEC, US, UK, Schuko AC

Standard lengths: 6 ft

Pricing: £1,499



HiDiamond Genesis Power Bi

It uses the new 4VRC999%AG© technology, which takes a decisive step ahead of the always excellent and appreciated standard 4VRC © technology. The biggest, the most perfect signal cable that HiDiamond can offer today. This is an absolute reference component where the requirement is for maximum transparency in all frequency ranges to bring a perfect signal with no introduction of noise output, which would ruin the end result.

www.hidiamond.eu

Technical Specifications

Type: Power Cord

Intended Applications: For all components

Conductors: Graphite/Copper /Silver 4VRC999%AG©. Number of conductors: 4 × 6.5mm

Dielectrics: XLPE

Jacket & Shielding: External jacket mm. 20

Available terminations: Finished with HiDiamond proprietary plugs Schuko or USA plug

Standard lengths: 1.5m

Pricing: €3,900



GutWire Audio Grounding Cables



An extremely effective and simple way to improve the sound of any audio system. A single cable to enable the proper grounding of electronic components.

Simply attach the RCA (or XLR) connector end to any spare input socket on your integrated amplifier or pre-amplifier. The mains plug end goes into any spare wall socket, or into a mains distributor. This creates the shortest route to ground from the circuit boards and introduces a different ground potential into the system.

It takes moments to hear the sound stage increase in size, both depth and width, that the tonal balance has more weight to it and the sound is more natural, less "hifi". Increased transparency provides more resolution of detail and a sharper focus of images.

Far more effective than passive grounding boxes, wooden or metal, which also require the use of multiple additional cables. No compression of dynamics, or added colouration, which can occur with alternative systems.

An elegant and simple solution; a single cable does it all.

Two models available:

Perfect Ground – UK or Schuko plug	£399
Ultimate Ground – Schuko plug	£650
Ultimate Ground – Furutech UK plug	£699

Audition a cable in your own system; full refund if not completely satisfied.

UK exclusive from The Audio Consultants.

GutWire Audio Cables hand made in Canada
UK Distribution by Epicurean Audio

High Fidelity Cables (Magnetic Innovations LLC) CT-1 Reveal – Magnetic Power Conductors

The goal of Reveal was to share the benefits of our patented magnetic conduction technology with more listeners. With this technology, electrons that constitute your AC supply to your entire system are guided by an array of magnets to the extreme center of the conductors, thus defeating “skin-effect”. This novel application allows for less signal loss from end-to-end. To make such benefits more accessible, we needed lower pricing while retaining the performance of our previous USD\$2,000 entry-level speaker cables that first garnered accolades from reviewers around the world. Our new R&D “revealed” we could not only beat it, but also magnetically outperform competitors’ conventional electrical wiring at laughably lower prices. Hence, the Reveal series was born.

www.highfidelitycables.com/products/power/reveal/

Technical Specifications

Type: Power Cord

Intended Applications: 15 amps supply to any audio component, favouring source first

Conductors: Solid-core coaxial ferromagnetic permalloy/mu-metal terminated with neodymium waveguides. Hot, neutral and ground all treated separately

Dielectrics: Pure Teflon

Jacket & Shielding: We apply a Faraday cage to trap the powerful EM wave created by our technology

Available terminations: IEC male and female (Schuko TBD)

Standard lengths: 1–4 metres in 0.5 metre increments with custom lengths available

Pricing: USD\$999 for 1m (USD\$175 for each additional 0.5m)



iFi Audio Groundhog

The Groundhog solves a common, bothersome issue found in audio systems from headphone setups, to computer audio systems to vinyl systems - that is, the lack of a “Ground” as it is known in the USA or “Earth” as it is more commonly referred to in Europe. Even where these noises are not obviously audible, the lack of a Ground/Earth connection can impair sound quality, signal-to-noise ratio and resistance to radio frequency and other interference issues.

By using the Groundhog, your system is now solidly linked with Ground/Earth, and where unwanted noise, if caused by a missing ‘Ground/Earth’, will be gone. Additionally, often a significant improvement in sound quality may be observed.

www.ifi-audio.com

Technical Specifications

Type: Ground/Earth kit that adds back the ‘missing Ground/Earth’ of many modern audio systems

Intended Applications: From headphone setups, to computer audio systems to vinyl systems

Conductors: 4N OFHC Copper

Dielectrics: Solid Polyethylene

Jacket & Shielding: PVC

Available terminations: In each Groundhog kit: IEC > RCA (male)
DC spade > RCA (female)
USB > RCA (female)
3.5mm > RCA (female)

Standard lengths: Each cable is ~25cm long

Pricing: US\$49/€69/£49



IsoTek EVO3 Initium

EVO3 Initium is IsoTek's new award-winning entry level power cable. Designed to replace the free standard power leads supplied with most audio and AV products, it offers an easy-to-achieve system upgrade at an extremely affordable price. Initium uses high quality materials with intelligent construction to deliver a power cable of outstanding performance and mechanical integrity, which will not degrade over time or challenge your bank balance. It includes bespoke audiophile-grade IsoTek moulded connectors featuring solid OFC conductors with robust nickel plating.

www.isoteksystems.com

Technical Specifications

Type: Power Cord

Intended Applications: Suitable for CD players, amps, tuners, Blu-ray players, music servers, TVs, soundbars, and more

Conductors: 99.9999% OFC conductors offer exceptional purity, enhanced conductivity and longevity

Dielectrics: Polyethylene insulation, cotton filler and paper wrap, combined to deliver exceptional dielectric properties

Jacket & Shielding: PVC outer jacket designed for both flexibility and mechanical strength

Available terminations: Available with UK, US, EU Swiss, and Australian mains plugs – to C15 IEC connector

Standard lengths: 1.5m standard

Pricing: £75 per 1.5 metre terminated cable

Purist Audio Design 30th Anniversary Power Cord

We took everything we learned from our stunning 25th Anniversary Power Cord and dialed it up to 11! The 30th Anniversary is a no-holds-barred design with a custom wire bundle with 8 AWG finely stranded SCS (single Crystal Silver) conductors, Contego for improved shielding and dampening, improved AC power conditioning circuitry, and terminated with the Furutech's NCF (Nano Crystal2 Formula) connectors! This cable is specifically built for the most demanding, most detailed, and most revealing systems.

www.puristaudiodesign.com

Technical Specifications

Type: Power Cord

Intended Applications: AC Power Cable for Audiophile-grade Systems.

Conductors: Single Crystal Silver

Dielectrics: Teflon

Jacket & Shielding: Contego

Available terminations: Furutech NCF (U.S. or Euro & 15A or 20A)

Standard lengths: 1m and up

Pricing: USD\$15,000 for 1m



What you need to know about modern technology and sound quality

We have to stop and think. Everyone walks around with their cellphone. When you sit down and listen to your music, you might be controlling your server with an iPad or an Android device. Think about the other devices in your home. Your music server is computer-based. The DAC has a processor. All of these devices generate RF and EMI. Even though the device itself is shielded and attempts to block these fields from escaping, you still have a field around them that acts as a radiator for RF and EMI.

So often, people talk about how their system is bright, or does not sound natural. Much of this is due to problems caused by improperly shielded cables, mechanical vibrations, and other noises. When we originally came out with our first cable in 1986, 30 years ago, we saw this problem would keep growing and it has. Increasingly, it isn't only the adults in the household who possess cellphones and electronic devices, it is the whole family. Electronics are a greater and greater part of our everyday lives.

Purist Audio Design concerns itself with the details. Our catch phrase, "Connecting you to the music" is more than that. It's a

means. How often do you sit down and listen to your music, and find yourself fatigued? When you listen with Purist cables, you listen for hours, thinking "one more song." We pay attention to details because we're music lovers and audiophiles, ourselves.

Purist Audio Design began in a garage as part of an audiophile's dream. Jim Aud put together what he learned from his time in the US Air Force and NASA, and worked to make music better. Now, Purist ships around the world. Yet, if you call us you'll still talk to Jim or other members of his family. You'll talk to real people, real audiophiles who share the same passion you do.

Let us connect you to the music.



**Purist Audio
Design**

Puritan Audio Laboratories Puritan Studio Master Mains Cables

Puritan Studio Master Grade Mains Cables with Proprietary Dissipative Technology take mains cable performance to a new level. Ordinary cables act as an antenna routing interference straight into your system. Shielded cables capture this interference but send it to earth, your signal earth! Puritan Studio Master Cables capture interference and absorb it into a unique dissipative shield where it is converted, through multiple attenuation paths, into harmless micro heat energy, preventing EMI reaching the internal conductors and significantly limiting the dumping of interferences to ground. Soft silicone dielectric insulation, a high pliancy silicone sheath, and a soft fabric outer covering provide a complex strata of vibration absorption. These cables enable an expanded soundstage with punchy dynamics and great finesse.

www.puritanaudiolabs.com

Technical Specifications

Type: Power Cord

Intended Applications: For mains connection of all components in the system

Conductors: 20 Amp Rated Extreme Purity Plated Copper

Dielectrics: Silicone

Jacket & Shielding: Silicone base with proprietary dissipative shielding

Available terminations: UK BS1363, EU SCHUKO, US Australia, Switzerland to IEC C13 - C19

Standard lengths: 1.0m, 1.5m, 2.0m, 3.0m. Plus Custom lengths to order

Pricing: From £72 for 1M length



Russ Andrews Yello Power cable

Yello Power is the first in our range of power cables, which are all made with Kimber's unique braided cable geometry that is proven to reduce Radio Frequency Interference. Made with eight separately insulated copper conductors (four live and four neutral), the cable is woven around a central earth core and terminated with high performance mains and IEC connectors. The figure-of-8 version uses the WATTGATE 340 EVO connector. UK versions are fitted with a high-performance Russ Andrews 13A fuse.

Careful choice of conductor material and insulation, coupled with its unique woven construction, results in a modest-cost yet high performance power cable. Yello Power is suitable for entry-level and high-end systems alike.

www.russandrews.com/yello



Technical Specifications

Type: Power Cord

Intended Applications: All Hi-Fi/Home Cinema components

Conductors: Eight stranded, pure copper conductors (giving 2.62mm² each for live and neutral)

Dielectrics: PVC

Jacket & Shielding: Braided construction rejects RFI; Techflex outer covering.

Available terminations: UK 13A, Euro (Schuko), USA power plug types; IEC (C14) and Figure-of-8 (C7)

Standard lengths: 1.0m, 1.5m, 2.0m

Pricing: £60 for 1.0m length with IEC, £15 for each additional 0.5m, £30 upcharge for WATTGATE figure-of-8

Siltech Triple Crown Power

Triple Crown's interconnect and speaker cables Siltech introduced a radical new cable topology, which sets a new world standard for sound quality. To create the Triple Crown Power cable advanced Multiphysics (COMSOLtm) and measuring equipment by FW Bell (3D Gauss) and Audio Precision (THD) was used.

This results in an exceptional musical performance. It's total lack of distortion, it's subjective addition of one full octave of bass with excellent stability creates a new ultra-realistic full bodied listening experience. The Siltech Triple Crown cable is balanced for both switching (digital) and non-switching (analog) loads. This ensures that over a very wide operating power range, magnetic interference with other nearby cables or electronics is minimized over an extreme wide frequency and current range.

www.siltechcables.com/cables/triple-crown



Technical Specifications

Type: Power Cord

Intended Applications: All purpose super silent powercable for 1W-8000W

Conductors: Ultra low loss with 7 large cross-section cores of high-monocrystal silver purity S8

Dielectrics: Ultra rigid multi section cross-linked Teflon-Air Peek Kapton.

Jacket & Shielding: Full safety shield and HF shield

Available terminations: IEC 10A/16A/20A US/EUR/UK

Standard lengths: 1.5m

Pricing: 1.5m = €12,900

The CablePro (from Wavelength Audio Video) CablePro VITALITY Power cord

CablePro VITALITY power cable comes in four different versions. Different components have different needs for AC current. Source components need a little, big amps need a lot. Now you can buy only what you need and get stellar sound quality.

CablePro VITALITY power cords are exceptionally quiet, well balanced, and unusually flexible. Our unique geometry allows the power cord to reject noise entry, and eliminates radiation of noise from the power cable as well. The sound is stellar, more expressive in every way, and allows your system to produce music that is insightful and fun.

CablePro VITALITY power cords are a synergistic blend of components, design, and build, combining to make your listening experiences as enjoyable as possible.

www.thecablepro.com



Technical Specifications

Type: Power Cord

Intended Applications: Main power interface for high performance audio/video products

Conductors: Variable, depending on current capability

Dielectrics: XLPE (cross-linked polyethelene)

Jacket & Shielding: Braided sleeve, low noise geometry

Available terminations: U.S. plug, IEC jack. Other configurations available on request

Standard lengths: 3ft. to 15ft

Pricing: 3ft./5A = USD\$300.00; pricing for other configurations based on current capacity

The Chord Company Signature ARAY Power

Fitted with Chord's new silver-plated mains and IEC plugs, and using an ARAY conductor configuration, along with a dual-layer shield featuring and a 95% coverage high-density braid, the Signature ARAY Power Cable eliminates device noise giving music an open platform to breathe.

It has been created using the knowledge gained from developing high-frequency-effective shielding. Its high-quality design is consistent in performance from system to system, regardless of price.

Its UK mains and IEC plugs are Chord's own design, which sets Chord power cables apart. Further features include heavily silver-plated contacts fitted with silicone damping to minimise vibration between the top and bottom section of the mains plug and more silver-plating on the IEC as well. Fit at the source for best results.

www.chord.co.uk



Technical Specifications

Type: Power cord

Intended Applications: All electronics with a non-captive power lead

Conductors: ARAY conductor configuration

Dielectrics: Extruded PVC

Jacket & Shielding: Dual-layer foil shield, high-density braid

Available terminations: IEC & UK, US, Euro mains plugs

Standard lengths: 1m, custom lengths to order

Pricing: £550 per metre, additional metres £100

Transparent Audio REFERENCE Power Cord

Power cords provide the lifeblood of any great audio system, serving as the first and most important link a component sees in the power chain. Transparent's REFERENCE Power Cord supplies power with more dynamic freedom and less noise.

Generation 5 cable geometry minimizes the harmful impacts of vibrations on the cable. Advanced termination techniques guarantee optimal power delivery and free your components from restriction and instability, resulting in a more realistic musical experience.

The REFERENCE Power Cord's breakthrough network technology optimizes the performance of the power cable at all standard lengths, and reduces noise to previously unachievable levels. The network module utilizes carbon fiber reinforce polymer for unprecedented resonance dampening.

<http://transparentcable.com>

Technical Specifications

Type: Power Cord

Intended Applications: Audio and video component power cord

Conductors: Heavy stranded 10 AWG OFHC copper conductors

Dielectrics: Low noise proprietary

Jacket & Shielding: Vibration dampening pressure extruded jacket and fillers, unshielded

Available terminations: All international connector and plug types

Standard lengths: 2m

Pricing: USD\$1,100



Vertere Acoustics Pulse-HB Mains Power Cable

Designed to ensure cleanest power delivery, Pulse-HB Mains Power Cable, is an absolute reference product ideal for powering any hi-fi system component.

Both Live and Neutral conductors incorporate Vertere proprietary Multi conductor construction and are individually shielded. In addition, Pulse-HB Mains Power cable utilises an overall shield covering Live, Neutral and Earth conductors to further enhance its performance. From milliamps to over 25 amps, this extraordinary mains power cable ensures optimum performance from almost any hi-fi equipment.

Pulse-HB Mains Power Cable is available with special gold plated Vertere connectors for UK, Europe and US mains supply with termination to standard IEC or 20A IEC.

www.vertereacoustics.com



Technical Specifications

Type: Power Cord

Intended Applications: UK, EU, US, IEC & 20A IEC

Conductors: High Purity Copper, Silver, Tin-plated

Dielectrics: PTFE, PVC + Special Outer Weave

Jacket & Shielding: x2 Inner Braid, Main Braid + Foil

Available terminations: Vertere with 3x Thickness Gold Plated Contacts

Standard lengths: 2.00m (Additional lengths in 0.5m steps)

Pricing: £2,000 per Cable; thereafter, £250 per subsequent Linear 0.5 metre

Vibex V3 Power Cord

"The V3 is our latest (and Greatest) power cord." The V3 is designed for high current applications but is equally at home with powering preamplifier and source components. The end goal of the V3 is to provide cohesive, non-current limiting performance while maintaining the ultimate in musicality. Vibex Products are manufactured in Spain.

<http://www.vibex.es/>

Technical Specifications

Type: Power Cord

Intended Applications: Amplifiers (High or Low Current), Preamplifiers, Sources, & Power Products

Conductors: OFC7N Copper

Dielectrics: Teflon

Jacket & Shielding: Proprietary

Available terminations: Schuko, 10A/15A or 20A IEC, B.S. 13A, and USA 120V 15/20A, and Neutrik Powercon

Standard lengths: 1.5M (Standard); Available in 0.5M Increments

Pricing: USD\$1,430/1.5M, USD\$200 per 0.5M Increments



WHAT'S NEXT IN POWER PRODUCTS?



COOL POWER PRODUCTS COMING SOON

Audience aR-TOSSOX power conditioners

Highest quality low impedance passive power conditioners in 2, 6 and 12 outlets. Filter capacitors are Teflon, wiring is Audience Au24 SX power wire, outlets are rhodium over copper. Comes standard with Audience powerChord SE-i and upgradable to Au24 SE-i powerChord or Au24 SX powerChord.

www.audience-av.com

Technical Specifications

Type: Ultra high quality passive power conditioner

Intended Applications: Not specified

Isolation & Filter Technologies: Highest quality, lower impedance, passive. Every outlet is individually filtered and isolated.

Regeneration Capabilities, if applicable: N/A

Maximum Current Delivery: 2,400 watts at 120V and 4,800 watts at 240V

Number of Power Outlets, Isolation Zones: 2, 6 and 12 outlet options. Each outlet is an isolation zone

Available Configurations: US models: 2, 6, 12 outlets. UK models: 2, 4 and 8 outlets

Pricing: From USD\$2,300 to USD\$11,195



Audioplan FineFilter S 3

UK distribution by Ikon Audio Consultants

The FineFilter is a system filter for Audio Visual systems and improves system performance substantially.

The FineFilter S is built with such low impedance, that even the largest power amps can be operated without loss of dynamics. This is achieved by over specifying all parts, manual wiring, manually auditioning and custom building components when necessary. The built-in safety reserve is typical for Audioplan: The components of the FineFilter S can take 25 Amps. This ensures that even the most extreme current peaks can flow without being limited by the filter or themselves producing interference due to saturation or overload effects (long-term stability). The filter is used to filter out audio interference, which could otherwise reach the system through the power mains.

www.Audioplan.eu

Distributed in the UK by:
www.IkonAudioConsultants.com

Technical Specifications

Type: Power filter system

Intended Applications: The FineFilterS is a universally applicable system wide filter for audio and video systems

Isolation & Filter Technologies: Not specified

Regeneration Capabilities, if applicable: Not applicable

Maximum Current Delivery: 25 A

Number of Power Outlets, Isolation Zones: One outlet

Available Configurations: Supplied with Audioplan PowerCord S 0.85m (longer lengths available on request) with MK tough plug & IEC socket (or Euro specification). Furutech FI 1363 Rhodium plug supplied on request at extra cost

Pricing: UK RRP £575



AudioQuest Niagara 7000 (North America and UK versions)

Measuring 3RU and weighing nearly 90lbs, the AudioQuest Niagara 7000 (UK) Low-Z Power | Noise-Dissipation System is an AC power component that linearly dissipates AC and RF noise across more than 23 octaves (2kHz to over 5GHz) via common mode, differential mode, and ground noise filtering. Further, it can supply in excess of 90 amps peak of current reserve (up to 25mS) to any power amplifier, ensuring performance that will surpass even 50-amp dedicated AC service outlets. With Niagara's numerous proprietary components and patented technologies, up to one-third of the low-level signal that can be lost to noise-masking effects are revealed.

www.audioquest.com/niagara-7000



Technical Specifications

Type: Low-Z Power | Noise-Dissipation System

Intended Applications: Audiophile 2-channel systems, home theatre applications

Isolation & Filter Technologies: Common mode, differential mode, ground, two symmetrical isolation transformers for source components

Regeneration Capabilities, if applicable: N/A

Maximum Current Delivery: North American model (20 amps RMS 120VAC); UK model (13 amps RMS 240VAC)

Number of Power Outlets, Isolation Zones: North American model (12 outlets total: 4 high current, 8 source); UK model (11 outlets total: 3 high current, 8 source)

Available Configurations: North American 120VAC, 20A; UK 240VAC, 13A; EU 230VAC, 16A

Pricing: \$7995 (USA); £7495 (UK); €8995 (EU)

Computer Audio Design (CAD) Ground Control GC1

Singled out as a 'Hot Product' at the Munich High End Show, the Computer Audio design Ground Control GC1 is an innovative new approach to reducing noise in a hifi system for audibly improved performance. CAD's Ground Control tackles high frequency noise reduction in two key areas: mains earth and signal ground, with remarkable results. Crucially, the CAD GC1 is entirely passive; it does not connect to any power source. The techniques that CAD use convert high frequency noise into heat and have no effect on the mains impedance at all, thus reducing noise without affecting power delivery in any way, nor diluting the pace, rhythm and timing that crucially makes music, music.

<http://www.computeraudiodesign.com>



Technical Specifications

Type: Ground (Earth) noise sink

Intended Applications: Reduction of high frequency noise on the signal ground plane and/or mains earth

Isolation & Filter Technologies: Ultra-high frequency noise sink: bespoke compressed 'sandwich' of specialist materials convert noise into heat

Regeneration Capabilities, if applicable: N/A

Maximum Current Delivery: N/A – no effect on current delivery

Number of Power Outlets, Isolation Zones: N/A

Available Configurations: N/A – GC1 is passive device that fits in parallel to existing mansion distribution system

Pricing: £1,650 including one cable, terminated with a choice of spade, banana, XLR, USB, or RCA connectors; additional cables £250

CELEBRATING QUICKSTEP

HI-FI WORLD'S BEST LOUDSPEAKER CABLE AWARD 2016

Capture the Excitement, Emotion and Drama of your Music

Exclusive connectors
GN1 'Straight Line Contact'
Loudspeaker Plugs



Hi-Fi World Best
Loudspeaker
Cable Award 2016 *

The **exclusive technology** of our very best cables
can now be enjoyed by a much larger audience!

EXCLUSIVE FEATURES

- Balanced Sound ✓
- Musically Entertaining ✓
- Stunning Clarity ✓
- Sharp Definition ✓
- Authentic Imaging ✓
- Excellent Timing ✓
- Effortlessly Open ✓

Read the reviews in full at
www.blackrhodium.com to
discover how these reviewers
describe the outstanding
Quickstep sound quality.

"Quicksteps were surprisingly balanced in tonal terms while the design offered a naturalistic reflection of the music that was entertaining and extremely natural in its approach."

Paul Rigby- theaudiophileman.com



* "They get out of the way of the signal that few others do at this price and allow you to hear the music unsullied and in all its glory."

Jon Myles, Hi-Fi World



"For sound per pound this is an excellent choice for the audiophile offering a detailed soundstage with exceptional speed, and a sound that was very open and effortless."

Janine Elliot, Hi-Fi Pig



Go buy your own Quickstep Cable NOW at your
nearest Black Rhodium Dealer or via
www.blackrhodium.co.uk

Hear QUICKSTEP at these dealers

Analogue Seduction 01733 350 878 | Audio T Swansea 01792 474 608

DoGood Audio 01515 253 845 | Ian Harrison 01283 702 875

Homesound 01316 621 327 | MCRU 01484 540 561 | Planalogue 01865 693 032

Cardas Audio 4181US Duplex Outlet

The Cardas 4181US Duplex Outlet features copper contacts plated with rhodium over silver, and spring tensioners for excellent grip. A newly improved ground lug makes for easier installation. Can be used as a normal duplex outlet, or electrically separated into two discrete outlets, each fed its own hot, neutral & ground.

www.cardas.com



Technical Specifications

Type: Duplex US Power Outlet

Intended Applications: Upgrade the outlets in your listening room, also available to OEM customers for use in power distribution equipment

Isolation & Filter Technologies: By default, the 4181US is a typical duplex, albeit made with superior materials. Removing the hot, neutral & ground jumpers separates it into two independent outlets

Regeneration Capabilities, if applicable:
N/A

Maximum Current Delivery: N/A

Number of Power Outlets, Isolation Zones:
Two

Available Configurations: See above

Pricing: USD\$150

Clearer Audio Silver-line Optimus Reference Power-HUB

The Silver-line Optimus Reference Power-HUB is a purist power supply solution with full star wiring and passive filtering. To maximise performance the HUB is hard-wired with our Silver-line Optimus Reference Power Cable and fully star wired internally with the same Reference 6N OCC silver conductors throughout. The HUB features passive filtering through our Super Suppressors (a total of 4 before each socket). These attenuate RFI and other conducted noise that is already on the power line and reduces cross-contamination of noise between components. A passive surge protection system is fitted which protects across all three channels. For optimal performance the HUB is fitted with a Furutech gold mains plug and Furutech gold sockets as standard.

www.cleareraudio.com



Technical Specifications

Type: Power distribution block with three channel surge protection and passive filtering

Intended Applications: For use with all components from source to very powerful amplifiers

Isolation & Filter Technologies:
Purist power supply solution with passive filtering

Regeneration Capabilities, if applicable:
N/A

Maximum Current Delivery: Maximum 30A up to 300Vac (subject to country-specific current limits)

Number of Power Outlets, Isolation Zones:
4-way and 6-way.

Available Configurations: 250V with Furutech UK sockets. SCHUKO and US sockets

Available: Summer/Autumn 2017

Pricing: £2,195 for 4-way with 0.5m inlet. 6-way additional £350. Additional inlet £240 per 0.25m increment.



Clearer Audio

AWARD-WINNING HAND-BUILT CABLES

**“It is good enough that it makes you think
you upgraded source, amp, and speakers.”**

Silver-line Optimus Reference Interconnect
Alan Sircom, Hi-Fi+, Issue 139

Order Direct
Free UK (Mainland) Delivery
60 Day Money Back Guarantee

Phone: 01702 543981
Web: www.cleareraudio.com
Email: enquiries@cleareraudio.com



Core Power Technologies EQUI=CORE 1800

Full 1800 watts of clean, balanced power supplied to 4 × duplex Hubbell outlets.

Benefits:

- Clean power from any mains
- You can hear the difference
- You can safely use this tech to greatly improve your audio or video.

www.corepowertechnologies.com

Technical Specifications

Type: Balanced AC Power Source from any mains

Intended Applications: Audio and Video Systems

Isolation & Filter Technologies: Balanced Power + Isolation

Regeneration Capabilities, if applicable: N/A

Maximum Current Delivery: 1800 watts / 15 amps

Number of Power Outlets, Isolation Zones: 4 × Hubbell Duplex

Available Configurations: We offer Hubbell Hospital Grade Outlets as standard

Pricing: Not specified



Furutech FI-50 series NCF power connectors

High performance, anti-resonance mains power connectors

www.furutech.com

Technical Specifications

Type: Mains power connectors

Intended Applications: Mains connectors for state-of-the-art power cable termination

Isolation & Filter Technologies: Alpha-treated (cryogenic and demagnetization process) conductors, floating field electrical damping, NCF anti-resonance connector body

Regeneration Capabilities, if applicable: N/A

Maximum Current Delivery: Not limited; i.e., 16A (in 230/240 UK & EU)

Number of Power Outlets, Isolation Zones: N/A

Available Configurations: 10A & 16A IEC plugs & UK, EU (Schuko) & US mains plugs

Pricing: FI-50 NCF, £278; FI-52 NCF, £300; FI-UK NCF, £135; FI-E50 NCF, £278



GutWire Audio Cables Ultimate Ground

Ground cable for your system component.

An ingenious and simple way to help improve the grounding of your system.

Ultimate Ground will lower the noise floor of your system; it opens up the soundstage, fosters greater (wider) extension at high and low frequency extremes, promotes better focus, and allows lightning fast dynamics.

www.gutwire.com

Technical Specifications

Type: Ground Cable

Intended Applications: All components except speakers

Isolation & Filter Technologies: Rare Earth Element Composition

Regeneration Capabilities, if applicable: N/A

Maximum Current Delivery: N/A

Number of Power Outlets, Isolation Zones: N/A

Available Configurations: RCA, XLR, Spade, UK, Schuko

Pricing: £650



HiDiamond HDX2

Power distribution system that eliminates all noise. Features:

- 4VRC® Copper internal wiring star connection to ensure maximum performance
- Power supply 230V/50 Hz max 2300W
- Network Filter 230V/60A RFI interference suppressor cell double shielded
- Unipolar Switch resettable 10A circuit breaker Disruptor

www.hidiamond.eu

Technical Specifications

Type: Power Distributor

Intended Applications: For all components

Isolation & Filter Technologies: 4VRC® Copper internal wiring star connection to ensure maximum performance and Network Filter 230V/60A RFI interference suppressor cell double shielded

Regeneration Capabilities, if applicable: Unipolar Switch resettable 10A circuit breaker Disruptor: Surge suppressor of over-voltage gas discharger Siemens

Maximum Current Delivery: 2300 Watts

Number of Power Outlets, Isolation Zones: Five Schuko or six USA plugs

Available Configurations: Power supply 230V/50 Hz max 2300W

Network Filter: 230V/60A RFI interference suppressor cell double shielded

Five Schuko or Six USA socket Hi-Quality

Pricing: €1,460, not including the power cable



GutWire Audio Grounding Cables



An extremely effective and simple way to improve the sound of any audio system. A single cable to enable the proper grounding of electronic components.

Simply attach the RCA (or XLR) connector end to any spare input socket on your integrated amplifier or pre-amplifier. The mains plug end goes into any spare wall socket, or into a mains distributor. This creates the shortest route to ground from the circuit boards and introduces a different ground potential into the system.

It takes moments to hear the sound stage increase in size, both depth and width, that the tonal balance has more weight to it and the sound is more natural, less "hifi". Increased transparency provides more resolution of detail and a sharper focus of images.

Far more effective than passive grounding boxes, wooden or metal, which also require the use of multiple additional cables. No compression of dynamics, or added colouration, which can occur with alternative systems.

An elegant and simple solution; a single cable does it all.

Two models available:

Perfect Ground – UK or Schuko plug	£399
Ultimate Ground – Schuko plug	£650
Ultimate Ground – Furutech UK plug	£699

Audition a cable in your own system; full refund if not completely satisfied.

UK exclusive from The Audio Consultants.

GutWire Audio Cables hand made in Canada
UK Distribution by Epicurean Audio

High Fidelity Cables (Magnetic Innovations LLC) MC-0.5 Magnetic Power Conditioning Plug

This unique device simply plugs into any open AC outlet to apply magnetic conduction to system AC. Once inserted, each conditioning plug delivers a dramatically cleaner, clearer music signal with better dynamics, realism and musicality. Although moderately priced in comparison to some power conditioning products, the MC-0.5 will offer an improvement to all audio systems and are cumulative in their effect when multiples are added. It also works with conventional power conditioners to restore extra realism, speed and clarity. Although meant for audio systems this device can be used with anything including video systems. To lower your system's noise floor, start at the wall.

www.highfidelitycables.com/products/conditioner/mc05/



Technical Specifications

Type: Power conditioner

Intended Applications: Applies magnetic conduction into a system's AC via any open AC outlet

Isolation & Filter Technologies: Magnetic conduction applied separately to hot, neutral, and ground

Regeneration Capabilities, if applicable: N/A

Maximum Current Delivery: 15 Amps

Number of Power Outlets, Isolation Zones: One plug per open outlet, cumulative in effect, no point of diminishing return

Available Configurations: IEC and Schuko

Pricing: USD\$299 each, two for USD\$549, four for USD\$999

iFi Audio/AMR iGalvanic3.0

Galvanic isolation is one of the holy grails in audio. Where many have tried but struggled to achieve Galvanic Isolation on USB2.0, iFi audio has leapt ahead of the industry with Galvanic Isolation on USB3.0 (5GHz Super-Speed, beyond DSD512/768k).

REclock®/REgenerate®/REbalance® the USB signal both before and after the galvanic isolation stage.

Galvanic isolation/system shield of USB Power & Ground, eliminate Ground Loops, RF noise Transmission etc.

www.ifi-audio.com



Technical Specifications

Type: USB3.0 galvanic isolation for computer audio systems

Intended Applications: Locate between Computer Audio Source and DAC

Isolation & Filter Technologies: Galvanic isolation on USB3.0. Eliminate ground loops, Radio Frequency noise transmission

Regeneration Capabilities, if applicable: REgenerate®/REclock®/REbalance® before and after the Galvanic Isolation stage

Maximum Current Delivery: 900mA

Number of Power Outlets, Isolation Zones: On USB3.0, USB 'B' for input and USB 'A' for output. Backwards compatible with USB2.0

Available Configurations: N/A

Pricing: USD\$259 (ex-tax)/€269 (incl. VAT)/£259 (incl. VAT)

IsoTek EVO3 Genesis One

The EVO3 Genesis One is one of a trio of products in IsoTek's new Mosaic series of compact power cleaning systems that deliver cutting-edge performance in an elegant slender format. Mosaic balances ultimate power conditioning, voltage stabilisation and mains sine wave generation in a series of components that you can mix and match to suit all of your audio or AV system needs. The Genesis One is a single output mains regenerator designed to feed one hi-fi component with perfectly clean stable mains supply. It is ideal for front-end components up to a maximum of 100W. Multiple Mosaic units can be linked together using IsoTek's link cable, avoiding the need for multiple power cables from wall sockets for every unit.

www.isoteksystems.com



Technical Specifications

Type: Power regenerator

Intended Applications: Single front-end components; suitable for all audio or AV systems; multiple units can be linked

Isolation & Filter Technologies: Unique single cell mains generation system combining class-D amplification and linear power supply

Regeneration Capabilities, if applicable: Dedicated single outlet delivers totally clean low distortion reconstructed mains sine wave with better than 85dB of noise reduction

Maximum Current Delivery: 100W of totally clean power for all front-end components

Number of Power Outlets, Isolation Zones: 1 mains power outlet, plus a linking outlet to allow daisy-chaining extra units

Available Configurations: Available with 100 to 240V and UK, EU, US, Australian, Swiss and South African connectors according to country of use

Pricing: £1,995 or £2,495 with optional display showing operational status

Puritan Audio Laboratories PSM136 Studio Master Mains Purifier

The Puritan PSM136 Studio Master Power Conditioner and Management System has 39 finely tuned filter elements with six fully independent outputs to comprehensively remove all interference types whilst preserving full dynamic power. It removes DC offset, provides a cleansed star earth to all outputs further lowering noise, it will elevate any system into a new dimension. Definition takes an enormous stride forward, individual instruments gain air between them with their sound and timbre becoming believable, the sound-stage will move out of your speakers and into the room with gains in three dimensionality with clarity definition and space between the instruments for them to interrelate rather than muddle each other. Your listening will become a far more engaging and pleasurable experience.

www.puritanaudiolabs.com



Technical Specifications

Type: Power Conditioner and Grounding Management System

Intended Applications: Connection of a full system in a cohesive manner with pure power and grounding management

Isolation & Filter Technologies: Not specified

Regeneration Capabilities, if applicable: Not specified

Maximum Current Delivery: 15 amps

Number of Power Outlets, Isolation Zones: Six Independently conditioned 8-Amp Outlets

Available Configurations: UK BS1363, EU SCHUKO, US, Australia, and Switzerland

Pricing: £995 including 2M Studio Master Dissipative Technology Connecting Cable

Russ Andrews PowerPurifier™

PowerPurifier is a new approach to mains purification; a one-box, rack-friendly solution with the potential to combat three key areas of mains contamination - spikes and surges, mains noise and Wi-Fi interference.

The core model delivers highly effective broadband power conditioning thanks to its UltraPurifier™ filter and SuperClamp™ surge protection, and the PowerPurifier can be customised by adding extra spike protection (the MegaClamp™) and more specialised filtering (Mains Zapperator™ and up to four ClarityMains™ modules) either from new or later by the user.

The intelligent, modular design of the PowerPurifier makes it really easy to incorporate most of our power conditioners in a single, convenient box that is plugged in close to your Hi-Fi or Home Cinema.

www.russandrews.com/powerpurifier



Technical Specifications

Type: Power conditioner

Intended Applications: All Hi-Fi and Home Cinema systems

Isolation & Filter Technologies: Passive non-inductive, non-resonant differential and common mode noise filter

Regeneration Capabilities, if applicable: N/A

Maximum Current Delivery: As a parallel device, PowerPurifier does not impact on current delivery to a system

Number of Power Outlets, Isolation Zones: No outlets (see above)

Available Configurations: 100–240V AC, 10A IEC mains input for your choice of power cable

Pricing: Core PowerPurifier: £329; additional MegaClamp modules: £180/each; Mains Zapperator: £142; ClarityMains: £114. Top specification model: £1,107

Wavelength Audio Video dba The CablePro Revelation Power strip

The CablePro Revelation power strip takes AC power delivery to another level. No filters, no circuit breakers, no fuse, nothing compromises the AC signal. Plug into a Revelation power strip to enhance the performance of any system.

The Revelation uses eight high conductivity, 20 amp, and industrial-specification outlets. It is hard-wired in a true parallel configuration with Teflon insulated, stranded, 12 gauge silver-plated Oxygen Free Copper conductor, housed in a Dark Bronze custom aluminum alloy chassis, and assembled with Brass and Bronze hardware to minimize resonance and eliminate any magnetic interactions.

Quiet, dynamically adept, and ever so transparent, the Revelation power strip lets your system be as musical as it can be.

www.thecablepro.com



Technical Specifications

Type: High performance AC power strip

Intended Applications: Eight-outlet AC power delivery system

Isolation & Filter Technologies: None

Regeneration Capabilities, if applicable: None

Maximum Current Delivery: 15A with stock power cord, 20A with appropriate power cord

Number of Power Outlets, Isolation Zones: Eight

Available Configurations: U.S. plugs only, 110-120V

Pricing: USD\$350 - \$620, depending on optional upgrades selected

Transparent Audio OPUS Power Isolator

Noise impacts every high fidelity audio system. Twenty-three years of technical development, materials research, and critical listening have culminated in Transparent's paramount technology to eliminate power line noise: the OPUS PowerIsolator.

The OPUS PowerIsolator snuffs out broadband AC power line noise without restricting current or introducing phase shift. Its groundbreaking design features a full carbon fiber chassis engineered to control vibration and eliminate electromagnetic field interactions for unrestricted power delivery. Crafted to work in perfect harmony with its included OPUS Power Cord, the OPUS PowerIsolator is ready to deliver limitless current and noise-free, in-phase power.

<http://transparentcable.com>

Technical Specifications

Type: Power conditioner with surge protection

Intended Applications: Power conditioning for ultimate level systems

Isolation & Filter Technologies:
Parallel-wired, Power Factor Correct noise filtration.

Regeneration Capabilities, if applicable:
N/A

Maximum Current Delivery: 20A

Number of Power Outlets, Isolation Zones:
Two (2) U.S.; Two (2) E.U.;
Two (2) U.K.

Available Configurations: Any international configuration

Pricing: USD\$15,950



Vibex Generalife

The Generalife is a state-of-the-art power conditioner/distribution block product aimed at reducing unwanted RFI/EMI contamination in the home and audio components. Vibex products are separated from other power distribution products by having no current limitation effects and maintaining the original sonic signature of a high-performance audio system while enhancing musicality. Further, the Generalife competes with the very best of products at a significantly higher value price and small footprint.

<http://www.vibex.es/>

Technical Specifications

Type: Power conditioner

Intended Applications: Primary DC power Filter for Audio systems (six outlets)

Isolation & Filter Technologies: Material based w/no metal fasteners, "Single Leg Inductor" with enhanced grounding

Regeneration Capabilities, if applicable:
N/A

Maximum Current Delivery: 25A

Number of Power Outlets, Isolation Zones:
Six isolated outlets w/ spring-loaded interference covers

Available Configurations: Schuko, U.S., 13A.B.S.

Pricing: USD\$1,795



Vibex Granada

The Granada is the culmination of 15 years of research in power filtering and energy control systems. All equipment is susceptible to D.C. on the mains, including components with very small transformers. The Granada removes all levels of D.C. efficiently resulting in one of the largest improvements attainable in audio system performance. The Granada also incorporates advanced energy control and dissipation via its Krion material construction. This provides dampening and minimizes mechanical and electrical resonances. The ultimate result is a non-current limiting conditioner maintaining accuracy in a system's performance while providing the ultimate in musicality.

<http://www.vibex.es>



Technical Specifications

Type: D.C Filtration and Isolation

Intended Applications: Complete Audio Systems Applications for Both High and Low Current Components

Isolation & Filter Technologies: Krion and Elastomer Materials with Dual Level Grounding. D.C Filtration

Regeneration Capabilities, if applicable:
N/A

Maximum Current Delivery: 30A

Number of Power Outlets, Isolation Zones:
Eight

Available Configurations: Schuko, U.S. 120V, 13A B.S.

Pricing: USD\$3,150 (USD\$2,995 if Purchased with Complimenting "Alhambra" A.C. Filter)

Vibex Alhambra

The Alhambra is our highest performance full power conditioner to date. The Alhambra is intended as a complimentary component to the flagship Granada D.C. Filter and can be directly coupled via its protruding downward oriented IEC. In conjunction with the Granada, this combination two-part system represents the ultimate in power conditioning performance for all audio systems. The Alhambra also incorporates advanced energy control and dissipation via its Krion material construction. Current is filtered using a simple but effective internal A.C. filtration circuit design. The ultimate result is a non-current limiting conditioner requiring no maintenance and maintaining accuracy in a system's performance while providing the ultimate in musicality.

<http://www.vibex.es>



Technical Specifications

Type: A.C Current Conditioning

Intended Applications: Complete Audio Systems Applications for Both High and Low Current Components

Isolation & Filter Technologies: Krion and Elastomer Materials with Dual Level Grounding. Single-Leg Inductor Filtration

Regeneration Capabilities, if applicable:
N/A

Maximum Current Delivery: 30A

Number of Power Outlets, Isolation Zones:
N/A. Designed to Integrate with Vibex's Granada (eight outlets)

Available Configurations: Schuko, U.S. 120V, 13A B.S.

Pricing: USD\$2,150 (USD\$1,995 if Purchased with Complimenting "Granada" D.C. Filter)

Wyred 4 Sound PS-1 Modular Linear Power Supply

The PS-1 is an all-new linear power supply designed to replace the inferior “wall-wart” used with DC-powered devices. It’s revolutionary design is in its modularity: the PS-1 utilizes independent “power modules”; each module powers one device. The PS-1 can accommodate four power modules, thus up to four devices can be powered at once. What’s more, each device can be a different voltage! The PS-1 grows with your audio system: as you add new DC-powered devices, purchase affordable power modules instead of expensive, separate linear power supplies. We are also developing higher current power modules for devices such as routers, NAS drives, etc.

Power up to four devices with just one power supply. That’s the beauty of the PS-1!

<https://wyred4sound.com/products/upgrades-mods-accessories/ps-1-modular-linear-power-supply>



Technical Specifications

Type: Multi-voltage, multi-output R-core linear power supply for DC-powered devices

Intended Applications: To supply power to low/medium current DC-powered devices

Isolation & Filter Technologies:
Not specified

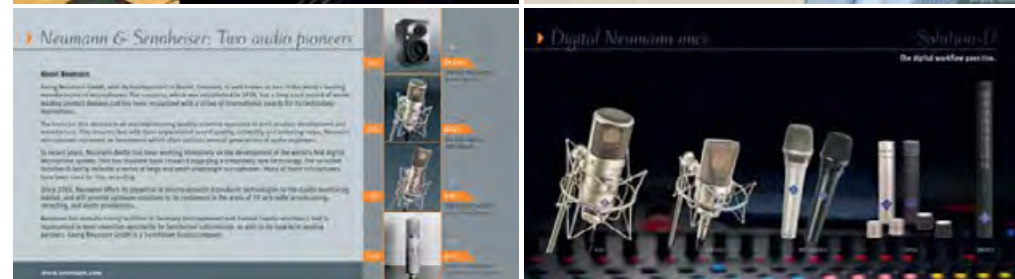
Regeneration Capabilities, if applicable:
N/A

Maximum Current Delivery: 24V/4A
(based on options or modules)

Number of Power Outlets, Isolation Zones:
Power up to four devices at once

Available Configurations: 115V- 230V available AC voltage. Each power module comes with one DC cable to connect to your device

Pricing: \$499, which includes one power module. Additional power modules available



AVAILABLE EXCLUSIVELY FROM

hi-fi+

We at *Hi-Fi+* are proud and excited to bring you the new *True Classics* double CD, priced at £17.99 +p&p.

This deluxe recording features 18 of the best known classical works, beautifully played by the Colorado Symphony and conducted by Scott O'Neill. They have also been recorded to highlight the best sound quality, thanks to the work of producer Wolfgang Fraissinet, who – being CEO

of audio engineering experts Neumann – probably knows more about microphones than almost anyone else in the business. This must have double CD in its exclusive presentation case is perfect for any music lover or audiophile.

To purchase please visit www.hifiusplusstore.com

MASTER DESIGNERS: MAKING AFFORDABLE CABLES GREAT AGAIN



HI-FI+ INTERVIEWS SIX EXPERTS FROM THE AUDIO CABLE INDUSTRY

Paul Speltz of ANTICABLES

Hi-Fi+: How and when did you first discover that differences in audio cables could actually affect the sound of hi-fi systems? Were you surprised at the time?

Paul Speltz: That would have been too long ago for me to remember specifically. You see, in addition to running the ANTICABLES, I am also an electronic engineer in the telecom industry. For 32 years I have been a board level designer, creating circuitry used to transfer an analog signal from point A to point B over long distances. Understanding signal transmission has been my job for years, so I feel like I have always known cables matter, even before I started DYI'ing my own audio cables back in the 90's.

What was the first range of cable products you designed and when did it enter the market? How did it compare to other cables at the time?

Our first product was the ZERO-Autoformers, which when used with mono block amplifiers took the place of speaker cables. They were first introduced early 2001. The "ZEROS" were used to increase the impedance of any speaker, so it would be "easier" for an amplifier to drive.

Improvements were made to the autoformer's lead out wire. Long story short, the wire was so good, it in itself became its own product called "Anti-Cable Speaker Wires". I named them this because the

un-jacketed red coated wire didn't look like, cost like, or sound like typical speaker cables. Since "cable" is basically wire with thick jacketing, and since it didn't use thick jacketing, they were the Anti-Cables.

I should explain. Every time I tried dressing up my good sounding wire with jacketing so it looked like a speaker cable, it sounded like a speaker cable. Jacketing causes dielectric effect distortion that time smears the music signal and makes cables sound like cables. I decided to give up the jacketing, call them the "Anti-Cables", and sell them in their naked form. The product was so popular that ANTICABLES later became the business name.

How has the audio cable industry evolved over the past several years? What are the pros and cons of the path the industry has taken?

This answer might be a bit dated, and may offer little insight, but the ability to sell direct to customers still feels the biggest change to me. It is what enabled me to go into business years ago.

The "cons" are, there are a lot more competitors, and a lot more for the consumer to sort through. The "pros" are, the competition keeps me on my toes. I am constantly looking for ways to push for even higher performance and greater



value to remain competitive, and the customer benefits.

Some audio cable manufacturers focus primarily on premium-priced products, but your firm offers some ranges of cables that are far more sensibly priced. What led you to create ranges of value-minded cables?

Through the years, I personally was not willing to spend the asking price of some of the cable offerings I wanted in my system, so I now get a kick out of being able to offer higher performing cables at lower than typical prices.

I do not base our product prices on where they "fit" in the marketplace. In other words, I don't say since our product "X" sounds better than their product "Y", we should ask more for it. Instead, I base our asking price on the cost of materials, the cost of labor, and add on enough margin to cover business expenses.

Also, since I still hold my original career job as the Senior Electronic Engineer for a telecom/security equipment manufacturer, I don't need to sell cables to "pay the mortgage", so I am able to keep the ANTICABLES as a fun business.

What do you personally consider to be the 'sweet spot' product (or products) in your range in terms of maximum performance per dollar (\$), pound (£), or euro (€)? What sets those products apart?

Our original "speaker wires", from 14 years ago, have been through 11 improvements

and are now called our Level 2.1 Speaker Wires. Anyone asking where to start with our products in their system will probably hear me recommending these, (or our Level 3.1 which is the same speaker wire, but doubled up). At the cost of only \$8/ft. per speaker, they offer ridiculously good sound for the cost.

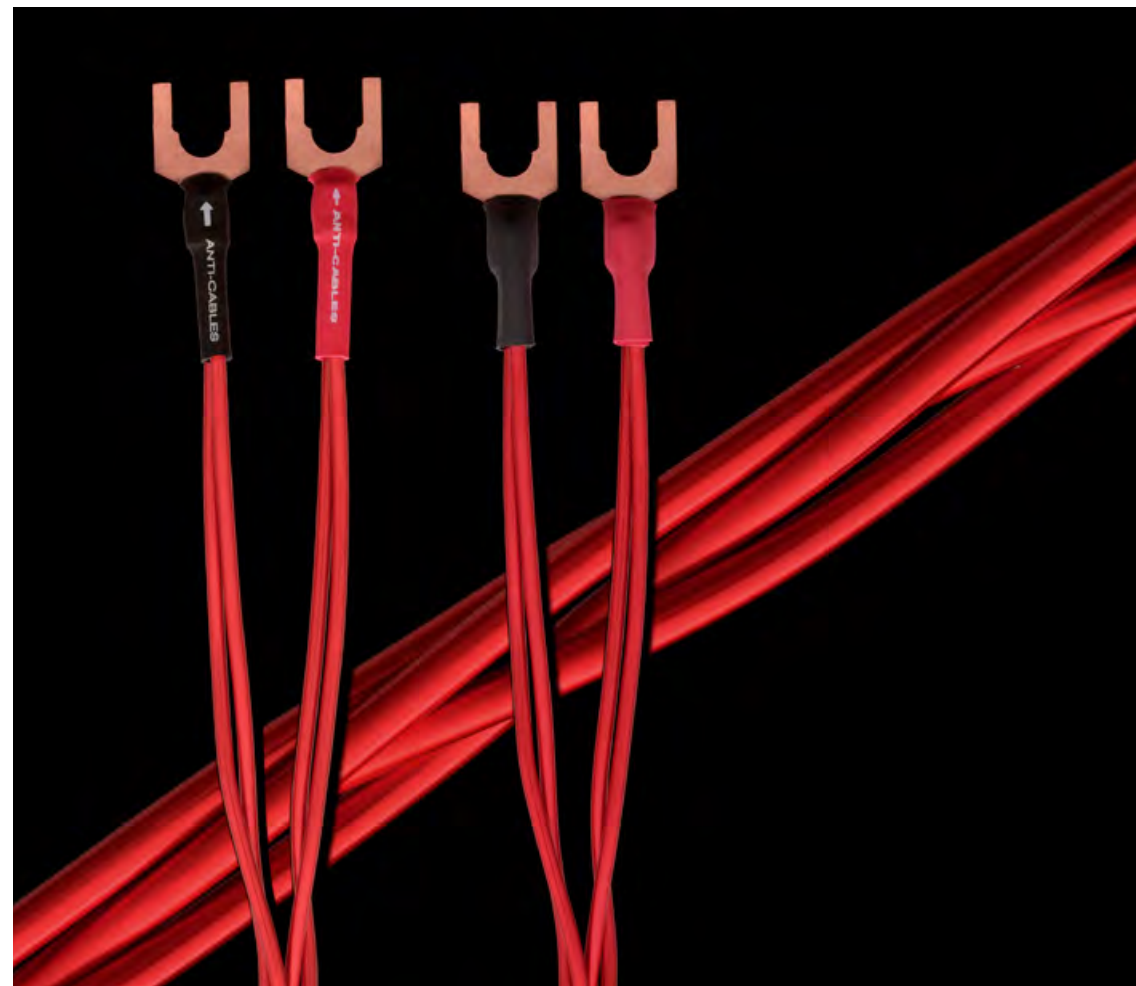
Customers that fall in love with these speaker wires typically come back next for interconnects, and then finish out with our power cords.

Might I say, don't underestimate the importance of a properly designed power cord. As a second sweet spot, I'd consider our Level 3 Power Cord, which was our #1 selling product for 2016, because of its cost to performance ratio.

In developing value-minded audio cables, which design parameters have the greatest impact on overall sound? Conductors? Dielectrics? Geometry? Shielding and Jacket Design? Connectors? Other variables?

Initially, I have to say the largest impact was dielectric material. After all, the name ANTICABLES came from the fact that we offered red coated wire, instead of thick plastic jacketed cable, and the reason for doing so was to eliminate as much dielectric effect distortion as possible.

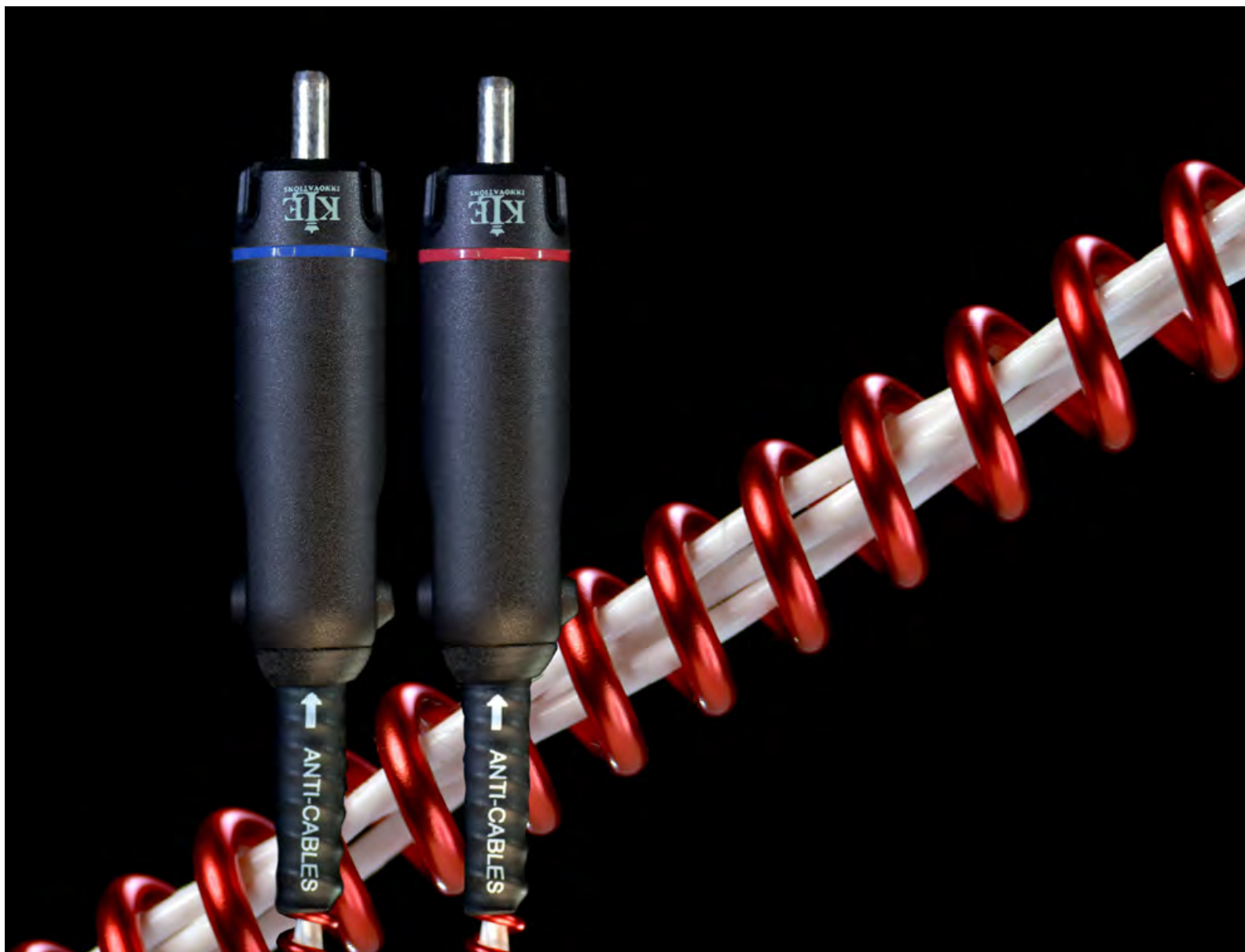
More recently you will hear me tell customers that "everything matters". I even did a shoot-out between corrosion inhibitors, which are audibly distinguishable, even on



the contacts of our AC power cord, in a well resolving system.

Our most significant recent improvements have been with metallurgy. Not only the

material itself, but also the wire drawing process, which required me bringing on a Material Scientist for assistance.



As an audio cable designer, how do you strike a balance between performance on the one hand and price on the other? Is it possible to optimize both?

Designing anything from a railroad bridge to an audio interconnect requires first knowing all the variables. Second, understanding that optimizing one variable may de-optimize other variables. For example, heavy shielding increases capacitance, but the goal for an audio interconnect is to have very low capacitance, but it also needs to be shielded, so there is no way to ideally optimize both. So...

Third is to prioritize the importance of each variable. This is where designers have different opinions, because we all come from a different set of experiences. Then finally, design towards achieving the highest optimization of the highest priority variables.

Following this strategy allows me to find that balance.

Manufacturers sometimes speak in figurative terms about the 'special sauce' that makes their products different and better than those of their competitors. If you are at liberty to say, what's your 'special sauce'?

My answer to this question might actually be the better answer to your previous question, as well.

My special sauce is that I design towards simplicity. Having a less-is-more focus gives me best results and costs less as well. If I find a design is getting complicated, I'll reset and

COMING SOON!

hi-fi+

GUIDE TO PERSONAL AUDIO



start over. For example, instead of trying to band-aid fix dielectric effect distortion by adding batteries, I simply got rid of as much dielectric material as possible to address the problem.

We have two admittedly loaded questions for you. Just how close do your value-minded cables come to the performance of your flagship models? What characteristics do they have in common and what are the most noticeable differences?

My largest number of offerings is with RCA analog interconnects, so taking those, I'd say there is a notably large difference in performance between Level 1 and Level 6.2 RCA ICs. What they do have in common is their tonality, in which I strive for neutrality.

What is gained as you walk up the levels is increased resolution. What is achieved with increased resolution, is it gets you closer and closer to the music. Closer to the feeling of real musicians playing real instruments.

What do you think the next 'great leaps forward' in audio cable design will be? How do you think audio cables will be different five years from now?

Tough question... Because of good things I had heard from trusted audiophiles that speak highly of their \$15,000 speaker cables that use integral magnets, I had wondered if magnets would be the next new frontier.

But directly comparing a similarly priced magnet-based RCA interconnects to our

Level 6.2 RCA interconnects, the magnetic ICs did nothing better than our less expensive Level 6.2 ICs, so I am not sure that is where the next great leap will be achieved, but it is still quite interesting.

I think rather than a great leap, I feel the industry will continue to make gradual incremental improvements. I'd personally like to see more improvements in connector metallurgy. The compromise here is the better sounding metals are too malleable for contacts, and the harder machineable metal alloys are not the best sounding conductors. The solution may reside in a housing design that can manage the better sounding softer metal when used in a connector. +



ANTICABLES

RECLAIM THE MUSIC LOST IN YOUR EXISTING CABLES



With awards from the best audio publications, and hundreds of testimonials from the global audio community, the ANTI-CABLES products have established themselves as the lowest price to highest performance leader in the cable business. ANTI-CABLES products are affordable enough to fit into an entry level system budget, yet perform high enough to sound better than cables costing many times more.

WWW.ANTICABLES.COM

+1 651.735.0534

John McDonald of Audience



Hi-Fi+: How and when did you first discover that differences in audio cables could actually affect the sound of hi-fi systems? Were you surprised at the time?

John McDonald: In the very early 80's I was the vice-president of Sidereal Akustic Audio Systems, which was best known for making high quality film capacitors by the name SiderealKaps. It was in the pursuit of making the best audio quality capacitors that we experimented with different lead

wires. It was then that it became apparent that different quality wires had differing sound qualities.

What was the first range of cable products you designed and when did it enter the market? How did it compare to other cables at the time?

Strangely enough, the very first cable product designed by Audience was a power cord trademarked powerChord. The first powerChord was released soon after the company was formed in 1997. The late Richard Smith then projected that the powerChord would be one of the best selling power cords of all times which has proven to be true. It has since been improved through various incarnations, now the powerChord SE-i. Promptly following the release of the powerChord was a range of interconnects and loudspeaker cables trademarked Au24, which have also evolved over the years. The latest and best of this line is now the Au24 SX. Over the years the Au24 lines have been the recipients of an abundance of stellar reviews citing them as some of the most natural and musical cables regardless of price. In a recent (Jan '17) equipment report cable survey in The Absolute Sound, Neil Gader characterised the latest Au24 SX cables as "The Insider-The Au24 SX struck a fluid and natural balance of ease, articulation, and immersiveness."



How has the audio cable industry evolved over the past several years? What are the pros and cons of the path the industry has taken?

Unfortunately, starting a cable business has about the lowest threshold of all audio products. The upside to this brings diversity and a wide range of cable products to choose from. The downside is the challenge of sorting through the good and the not so good. The strongest downside statement that I can make is that price does not necessarily reflect quality.

Some audio cable manufacturers focus primarily on premium-priced products, but your firm offers some ranges of cables that are far more sensibly priced. What led you to create ranges of value-minded cables?

Very recently Audience has introduced a line of audio cables branded OHNO named after Dr. Ohno, the inventor of OCC (mono crystal) wire. OHNO unbalanced interconnects; for example, sell for \$199 at 1 meter. The OHNO cables have already received high recognition awards including a 2015 Product of the Year award and 2016 Golden Ear award in

The Absolute Sound as well as a HiFiCritic Best Buy award. The OHNO cables were very pointedly created to offer a true high performance and extremely high value cable product line. The purpose was a) to offer a low price product that would give consumers a taste of what Audience offers and b) extend an opportunity for folks who might otherwise be put off by the high cost of most high performance cable products.

What do you personally consider to be the 'sweet spot' product (or products) in your range in terms of maximum performance per dollar (\$), pound (£), or euro (€)? What sets those products apart?

I can say in all honesty, I feel that all Audience cable products hit a sweet spot. I take pride in offering a wide price range of truly outstanding cable products. Audience has never put a product on the market just to fill a spot. If it is not truly a highly musical product we have no interest in selling it. Our very best Au24 SX cable products are our most expensive, naturally, while our lower priced lines are still superb particularly for their price. You simply cannot go wrong with Audience cables. It is simply a matter of an individual's affordability.

In developing value-minded audio cables, which design parameters have the greatest impact on overall sound? Conductors? Dielectrics? Geometry? Shielding and Jacket Design? Connectors? Other variables?

Well, that is a very difficult question to answer because all of the parameters listed are of great importance. Having said that, if forced to pick just one, I would say geometry comes in first place of importance.

As an audio cable designer, how do you strike a balance between performance on the one hand and price on the other? Is it possible to optimise both?

The way to strike a balance between performance and price is to attempt to be as reasonable as possible while still trying to make enough profit to support a company.

Manufacturers sometimes speak in figurative terms about the 'special sauce' that makes their products different and better than those of their competitors. If you are at liberty to say, what's your 'special sauce'?

Each cable product that is made by Audience has its own special sauce. However, there is really nothing secret or mysterious about Audience cables. They are all designed based on solid engineering principals. Having said that, Audience cable designs do incorporate

some fairly esoteric concepts like engineering to minimize eddy current resistance and double cryogenically treating. As such, Audience, in 1998, was the first company to challenge the bigger is better marketing image, which has since been adopted by more and more companies with lower mass cable products. Price as I previously asserted and size do not necessarily equate to quality. If there is a secret sauce at Audience it is paying close attention to every aspect of cable design and construction – the devil is in the details.

We have two admittedly loaded questions for you. Just how close do your value-minded cables come to the performance of your flagship models? What characteristics do they have in common and what are the most noticeable differences?

I do not mind the question. Subjectively I would say that our least expensive





OHNO cables at \$199 for a 1 meter set of unbalanced compared to our most expensive Au24 SX unbalanced cables at \$1,800 for a 1 meter set are easily 80% as good. They are both made with the same six nines OCC copper and jacketed in flexible yet extremely high-quality cross-linked polyethylene (XLPE) material. So the sound between these two lines has a lot in common. The difference between the two is primarily in terms of

geometry. Whereas the OHNO line is made with a fairly simple design, the Au24 SX is much more sophisticated and very difficult to make. If I had to summarize the difference in character between these two cables in one word it would be coherence and all that implies.

What do you think the next 'great leaps forward' in audio cable design will be? How do you think audio cables will be different five years from now?

We are always pressing the limits and looking for ways to make better products. For now, however, I prefer to keep those innovations close to my chest. +

George Cardas of Cardas Audio

Hi-Fi+: How and when did you first discover that differences in audio cables could actually affect the sound of hi-fi systems? Were you surprised at the time?

George Cardas: Well, this goes way back, but best I can recall it went something like this: Sometime around 1982-ish I was rocking an all analogue quadrasonic audio system using Heil AMT1 Air Motion Transformers wired with lamp cord.

In a quest to improve the system I went to the local car stereo emporium and purchased a roll of Monster parallel twin and rewired the speaker system. This made a big difference, but not in my opinion a positive one. But the light was on; cables made a difference! And a big one. So I returned to the auto stereo store and purchased another roll of cable—this time it was Monster HotWires, and proceeded to rewire the system with that. Wow, now THAT made a difference, and in my mind a very positive one. At this point I was more than surprised—I was incredulous on many levels. I was full of wonder and questions, and obsessed with solving the puzzle. Why so big a difference? Why was there a difference in musicality?? And if one product was so profoundly better than the other, why on earth were they both being sold?

What was the first range of cable products you designed and when did it enter the market? How did it compare to other cables at the time?

Quadlink was our first real run of cable and it was introduced in 1987. It was an immediate hit. It was unique in its musicality and ability to resolve inner detail without the harshness associated with the other cables at the time. It was regarded as dark and musical in character, and was noticeably superior on the crude digital offerings of that era. As to personal head-on comparisons, I can't rightly say, as I rarely, if ever, listened to the products of others.

How has the audio cable industry evolved over the past several years? What are the pros and cons of the path the industry has taken?

The cable industry was a real basket of snakes for many years, and sorted itself in many directions, with hundreds of people trying to get a cut of the pie. The fact that the cables sounded so different from each other made for a ready market, because comparisons were easy. At first, sales were often based on little else other than differences either in sound or look or price. But as the Internet became ubiquitous, the cables began sorting themselves by character of sound, with a few cables generating a following among listeners, and dealers serving the various markets. The number



of manufacturers sharing the market was sorted from many to just a few, and the general quality rose dramatically. Several manufacturers addressed various issues, and real "audio cables" were developed as a species distinctly different from video cables, or the free cables that came in the box. The music industry finally committed to actual audio cable. The detractors, who spoke only to defend their education or mind set, became the sideshow rather than the cable manufacturers themselves. In the end the collective listeners are sorting the market and the cream is rising to the top.

Some audio cable manufacturers focus primarily on premium-priced products, but your firm offers some ranges of cables that are far more sensibly priced. What led you to create ranges of value-minded cables?

I have a very deep understanding of transmission lines, and try to apply what I have learned to cables at all levels. I have always produced value minded cables—I have an objective of helping bring music to as many seekers as I can. We have always had extremely affordable cable for the DIY market and entry-level audio. That said if you want to push the envelope well past the point of diminishing return, you might find that the last little details are in the pot of gold at the end of the rainbow. For the few that wish to chase this goal it is not going to be cheap. But all in all, the vast majority of our cable (in terms of feet sold) falls in the very affordable range.

What do you personally consider to be the 'sweet spot' product (or products) in your range in terms of maximum performance per dollar (\$), pound (£), or euro (€)? What sets those products apart?

Iridium Speaker & Interconnect are far and away the best performance per dollar—what sets these cables apart is the fact that we have made them actual transmission lines, matching conductor signal propagation to dielectric velocity. We don't go to heroics to reduce dielectric constant with the use of air dielectrics at this end of the product line, but they perform and they're affordable.

In developing value-minded audio cables, which design parameters have the greatest impact on overall sound? Conductors? Dielectrics? Geometry? Shielding and Jacket Design? Connectors? Other variables?

It is hard to generalize as there are many ways to approach perfection, and what matters at the end of the day is subjective. But matching signal propagation to charge dissipation is key. This relationship can be approached or destroyed in many ways, and there are many different trade-offs. An approach that simply reduces stored energy hits a dead end street at some point. You have to have a good overall design, simplify its construction, and produce a large volume to have a great affordable cable. Over the years we have paid for our strand layering machinery, dramatically increased our volume, and held our profit margins tight on low and mid range products.



As an audio cable designer, how do you strike a balance between performance on the one hand and price on the other? Is it possible to optimize both?

It's all about time for us. A product that must pass through the machines 47 times and have 200 strands individually stripped prior to termination is going to cost way more than the product that has six passes and can be stripped and tinned in one operation. We simply reduce the number

of passes through the machinery, and terminate faster. Less machine time, quicker termination, and higher volume. The cost of two layers of shielding is way less than four, and the performance difference is slight. A conductor that has six layers is far cheaper, and sonically a soldered or crimped connection is vastly cheaper than a forged one-piece connection, but again the difference might be slight to some. Cumulatively there are many things we

can change that make little difference by themselves and still produce an awesome air dielectric matched-propagation low-noise cable.

Manufacturers sometimes speak in figurative terms about the ‘special sauce’ that makes their products different and better than those of their competitors. If you are at liberty to say, what’s your ‘special sauce’?

We are very obvious here—anyone can look at our conductors and our attention to detail on all levels, on our website and in our magazine ads. We are proud of what we do and not at all hesitant to put it on display in detail. That, my friend, is our special sauce.

We have two admittedly loaded questions for you. Just how close do your value-minded cables come to the performance of your flagship models? What characteristics do they have in common and what are the most noticeable differences?

It is all relative; the setup and resolution of the associated equipment is important, as are the demands of the speakers, etc. Our flagship speaker cable might not perform as well with a high efficiency system in a small room, but have noticeably better dynamic resolution with big inefficient speakers in a large room, for instance. A totally tweaked turntable is far more demanding to cable than an 80's CD player. And entry-level cables are definitely more forgiving—all our cables are loved for their musicality. The biggest and most noticeable thing at the high end of the line is dynamic range of resolution (the gap between the largest and smallest

detail that can be resolved at the same time). Essentially you pay the biggest price for the smallest details.

What do you think the next ‘great leaps forward’ in audio cable design will be? How do you think audio cables will be different five years from now?

Great leaps forward I don't see at the high-end. The leap is with cables like Parsec, where features of the most resolute cables in our flagship line are incorporated in the more affordable cables, through volume and innovation. As more people become aware of the importance of cables, the ability to serve their needs at an affordable price point will develop as well. +



Ray Kimber of Kimber Kable

Hi-Fi+: How and when did you first discover that differences in audio cables could actually affect the sound of hi-fi systems? Were you surprised at the time?

Ray Kimber: On the occasion of first hearing sonic differences in speaker cable I was more than surprised ... I was blind-sided. In the 1970s, I was heavily involved in pro audio in Hollywood, California with an emphasis on large dance clubs. We had a problem with disco lighting systems causing noise in the sound system. I had a thought that counter-rotating the conductors would lower the noise, but how do you counter-rotate two conductors? The answer was from my years as a Boy Scout, as I am an Eagle Scout. Anyway, there is a (time wasting) craft activity called “boondoggling”, so recalling those experiences of plaiting/braiding I purchased 12 little rolls of 20 gauge stranded hook-up wire from Yale Electronics on Sunset Blvd., and got busy. Days later I had a pair of cables, about 15' if I recall correctly.

A system was used to evaluate audible noise, consisting of a Technics 1200 Turntable with an Ortofon disco cartridge, a Bozak CMA102DL mixer/preamp, a BGW750 amplifier, and Electro-Voice PI 15-3 loudspeakers. We had a Diversitronics 50S2 strobe and an Ekkor LS4 lighting controller to induce noise.

This system was already hooked up most of the time for casual listening of a wide range of music, so I was very familiar with how it sounded. I hooked up the cable, put the needle on the record and within a few seconds was trying to figure out why it sounded so different—better. The character of the change made me at first suspect that the Ortofon rep had dropped off a new super-cartridge and someone had installed it, but not so. After close examination it appeared that the system was as expected (unchanged) so I started the record again, with the same improved result. I stopped again to figure out why, since in my mind I didn't consider the cables because the gauge size was equivalent to the Belden we had always used. I played again and then stopped again, and again. I finally put back the original cable with the resultant return to “normal”. I then metered the two sets of cables to assure myself that the DCR was identical—it was. I sat for a while looking at the ceiling, just thinking.

Finally I snapped out of it and went for the noise testing and as expected the noise (with my home-made cables) was much lower. I continued to install big disco systems for many years while also selling Kimber Kable, but by the mid 90s we got too busy making cable so the Sound and Lighting business was moved off to others.



What was the first range of cable products you designed and when did it enter the market? How did it compare to other cables at the time?

The first Kimber Kable models were 8PR and 4PR; they were available in both black/red and black brown color combinations. We still have 8PR and 4PR for sale today, albeit with improved conductors and insulation. I was literally unaware of any other “audiophile” cable when I developed my first models. A few months later some friends and I took a day trip to CES, I think in 1978. It was during that trip that I saw some other cables, but based on their geometry didn’t think they would work to reject noise. I had been technically curious enough about why my initial cables sounded so much better that I devised a crude experiment to try and figure it out.

I used a “normal” receiver of the day and modified the current limiting circuit so I could see if minimizing or disabling the protection circuit would react differently with the different speaker cables; it did. Next I modified the negative feedback loop to minimize or disable the loop and again the different cables sounded different. Specifically it was noise higher than the audible band, like undetected RF, that seemed to be affecting the protection and feedback circuits. And of course if the noise was in the audible band then the Kimber Kable was quieter and sounded better.

How has the audio cable industry evolved over the past several years? What are the pros and cons of the path the industry has taken?

The audiophile cable market has certainly evolved. Among established companies I think the instances of eye-rolling claims of materials and performance has dropped. For a while I was guessing that we might see a claim for 20N copper, in response I claimed that Kimber Kable had Unobtainium, emblazoned right across the top of our brochure at the time.

A new troubling trend is counterfeit product and trademark theft. On these subjects I was invited to testify in front of the US Senate Finance Committee in 2014. A few months ago we received a call from an irate customer, lets call him Mr. Smith, who was convinced that he had been sold counterfeit Kimber Kable from Amazon USA, and from an authorized KK dealer to boot! We had him send us the cable; it was counterfeit, but in genuine packaging (yes we have fake packaging in the market too). This was a very trusted dealer, and at the end of the day this was the story. Via Amazon, the dealer had sold the product to a customer. Lets call him Mr. Adams, and that customer returned it using Amazon. The packaging appeared intact and Amazon shipped it to Mr. Smith. We never determined if Mr. Adams or Mr. Smith switched in the fake Kimber Kable. We did replace the cable to Mr. Smith.



At the time we had around 1000 listings on Amazon. Looking closely, we could not identify many of the sellers, more than that we had fake pictures AND fake products jumbled together with authorized and unauthorized dealers. As I write this we have exactly one KK product on Amazon, from a completely new and unknown seller, I assume it is a fake product. All KK dealers are now forbidden to use Amazon because our experience has been that crooks can and do use Amazon-authorized dealers as camouflage. The sandal manufacturer Birkenstock also experienced problems with sales of counterfeit products, leading the firm to discontinue authorized sales through Amazon.

Some audio cable manufacturers focus primarily on premium-priced products, but your firm offers some ranges of cables that are far more sensibly priced. What led you to create ranges of value-minded cables?

Over the years we have developed products resulting from a combination of continual curiosity, new manufacturing capability and customer desires. While we certainly have premium priced products I am proud to have many products that fit nearly any budget.

What do you personally consider to be the 'sweet spot' product (or products) in your range in terms of maximum performance per dollar (\$), pound (£), or euro (€)? What sets those products apart?

The sweet spot in my opinion is the Hero interconnect and 8TC loudspeaker cables.

The Hero interconnect is available in both single-ended and balanced configurations with a variety of connector options. The 8TC loudspeaker cable is available with many termination options. Many customers are calling after inheriting a good quality 1970s-80s receiver, for those folks I recommend 4TC because it is sized to fit the same push-and-release connectors as bare wire. Those push connectors are really designed to work best with bare stranded wire. A pin adaptor is not as good as the bare wire because it behaves like a rod with two knife-edge contacts. I also don't worry about oxidation of the bare wire because at the point of contact, the copper is sufficiently pressed to form a gas-tight junction. I am not a fan of "tinning" stranded wire for the sake of just doing it, as solder has a fraction of the conductivity of bare copper.



In developing value-minded audio cables, which design parameters have the greatest impact on overall sound? Conductors? Dielectrics? Geometry? Shielding and Jacket Design? Connectors? Other variables?

Everything matters when designing value minded cables. For the best value we try and use our manufacturing strengths and use conductors that are shared with other existing products. It is more economical if you use existing building blocks. Let me talk about my attitude regarding shielded cables, as many customers notice that most of our interconnects are provided without shielding. Lets consider a 2-conductor cable that hums. I think that two things have to be true; first that the geometry of the cable acts sufficiently like an antenna to pick up noise in the first place. Second, there is sufficient impedance along the length of the cable to allow a noise signal to exist; there can be no voltage/signal at zero ohms. So consider a two-conductor cable that hums, add a shield and the hum stops—but wait, there has been no change in the underlying facts that the cable behaves like an antenna and has sufficient series impedance to allow the noise voltage to exist. Now you play music through the shielded cable and the two conductors still act like an antenna except it is transmitting a portion of the musical signal to the shield and dumping it to ground. Cost for the shield and jacket is added with a costly fidelity penalty in my opinion, a double whammy—higher cost and lower fidelity.

As an audio cable designer, how do you strike a balance between performance on the one hand and price on the other? Is it possible to optimise both?

You ask the question of striking a balance between performance and price. More important to me is the retained value in the used market and I think that used Kimber Kable holds value quite well for many years. I don't believe in routinely replacing models just for the sake of being "new". Unless there is some new conductor or insulator material available we are dealing with, products should have a good long-term confidence of performance and of secondary market value.

Manufacturers sometimes speak in figurative terms about the 'special sauce' that makes their products different and better than those of their competitors. If you are at liberty to say, what's your 'special sauce'?

We try to not talk about or claim secret sauces; however, I do like a good homemade fry sauce! (Started in Utah.)

We have two admittedly loaded questions for you. Just how close do your value-minded cables come to the performance of your flagship models? What characteristics do they have in common and what are the most noticeable differences?

We have a consistent design philosophy from our lowest budget cables to our most expensive; the braided geometry has low series inductance and good noise rejection. There are "finishing touches" for some of our cables that add to the price without adding to sonic performance. But without the "finishing

touches" the cable would look crude and, well, unfinished. For those products I think we present a "pride of offer" to meet a "pride of ownership" and therefore a good value.

What do you think the next 'great leaps forward' in audio cable design will be? How do you think audio cables will be different five years from now?

A five-year prediction? We will still need mains cables and need to convey power from amplifier to drivers. So on the loudspeaker side unless there is some new magical electroacoustic transducer we will see only slow refinements. On the signal side I think we will see steady progress to very high resolution digital.

Finally I can share a definite answer about the optimal length of speaker cables. First, if the cable is long enough to reach between the amplifier terminals and the speaker terminals it will work better than if they are too short. Second, if the cables are very much longer than needed it is very beneficial—to me. +

COMING SOON!

hi-fi+

GUIDE TO ANALOGUE

Watch for it
in your inbox



Joe Reynolds of Nordost

Hi-Fi+: How and when did you first discover that differences in audio cables could actually affect the sound of hi-fi systems? Were you surprised at the time?

Joe Reynolds: Typically, when you create a new product, you try and solve a problem, or fulfil a need in the market. When we entered the audio cable industry, we were originally thinking of our product more in terms of form, than of function. Our first cable was the Flatline Gold Speaker Cable. First and foremost, this cable was designed to be durable. We also wanted Flatline Gold to be as thin as possible (it ended up being thinner than a credit card), so that it could fit in walls and under carpets. It wasn't until we heard back from our customers that we truly started to appreciate the sonic benefits of our cable design. That is when we started to do more research, expanded on our original ideas, and made improvements to the initial product. Through that research, we began to develop the basic philosophies and principles that all Nordost cables are based on today.

What was the first range of cable products you designed and when did it enter the market? How did it compare to other cables at the time?

The first products that Nordost developed were the Flatline Gold and Super Flatline Speaker Cables, which entered the market in 1991. Nordost designs were radically

different from any other cable on the market. In order to make these first two products, we used solid core conductors, arranged in a flat geometry. The cables were then extruded in FEP (Teflon), a technique that we later patented, which dramatically decreased their capacitance, three to five times lower than conventional cable designs, and dramatically increased signal speeds. This unique design and technology resulted in cables with extremely wide bandwidth, without the roll-off that you would typically find in the higher frequencies.

How has the audio cable industry evolved over the past several years? What are the pros and cons of the path the industry has taken?

In the past several years, there has been a lot of change in the audio cable industry. However, I don't think cable manufacturers had as much to do with that change as the acceptance and understanding of the hi-fi community did. Today, audio cables are finally starting to be viewed as an important component within a stereo system, and not just a necessary accessory. I think that Nordost, as well as a handful of reputable, technology-based cable companies, has been successful in showing consumers the impact that quality cabling can have on the fidelity of a system. On the other hand, there are also some companies out there who are capitalizing on this "cable



movement”, and see the cable industry as a fast way to make money, without regard for performance. Unfortunately these few bad apples give cable manufacturers in general a bad name, and leave customers disappointed. It is important that end-users do their research to ensure that they are purchasing a legitimate product and not being taken advantage of.

Some audio cable manufacturers focus primarily on premium-priced products, but your firm offers some ranges of cables that are far more sensibly priced. What led you to create ranges of value-minded cables?

We have spent years and countless resources in order to develop our Reference and Supreme Reference ranges of cables, and I am confident that those ranges are the absolute best cables in the industry. However, I understand that not everyone has the budget for, or a system worthy of, the best audio cables that money can buy. The fact of the matter is that there are relatively simple changes that you can make in cable construction that have a substantial impact on sound quality. The two major factors to consider are the quality of goods used, and precision of manufacturing (which we can easily ensure, since all Nordost cables are manufactured in the USA). Nordost’s entry-level Leif Series may not have all the technology, proprietary connectors, bells, or whistles as its higher priced options, but it is a well-made, well thought-out range of products. It shares the same sonic identity as our premium products, which makes it great value for the money.

What do you personally consider to be the ‘sweet spot’ product (or products) in your range in terms of maximum performance per dollar (\$), pound (£), or euro (€)? What sets those products apart?

I don’t think that a “sweet spot” in a cable range can be determined in terms of dollar amounts. What is important to look at is the amount of technology that is offered, compared to the cable’s price. This will be different in every brand. At Nordost, we make a point to “trickle down” the technology that we developed for our reference ranges into our more affordable cable lines, in order to maintain a consistent design philosophy throughout our cable ranges. As you advance up our line of products, you also achieve more demonstrable differences in audio performance. If you asked me what the “sweet spot” was in our line of products, I would say our Heimdall 2 Range. Heimdall 2 cables offer proprietary technology used in our reference cables such as Mono-Filament technology and mechanically tuned lengths, at reasonable prices.

In developing value-minded audio cables, which design parameters have the greatest impact on overall sound? Conductors? Dielectrics? Geometry? Shielding and Jacket Design? Connectors? Other variables?

Every facet of design matters in cable construction. Developing new technology, including purpose-built connectors that allow for 100% shielding, was a huge factor with our Odin 2 range. This doesn’t change when you are talking about value-minded



“affordable” cabling, but your resources do change. In our Leif series, which still offers tremendous performance, we concentrate on the precision of manufacturing. You can’t overestimate manufacturing techniques. You would be amazed at the beneficial electrical characteristics of a cable that are achieved simply by the precise spacing of conductors.

As an audio cable designer, how do you strike a balance between performance on the one hand and price on the other? Is it possible to optimise both?

Like I have said before, not everyone has the budget for, or a system worthy of, the best audio cables that money can buy. Obviously the performance of one of our reference cables will blow away the performance of our entry-level cables. That level of performance will come at a higher premium, just like in the watch industry, car industry... all industries really. However, that doesn’t mean that even our White Lightning cables aren’t exceptional. When you are ready to invest in hi-fi audio cables, it is up to you to determine how much value you are willing to put on performance.

Manufacturers sometimes speak in figurative terms about the ‘special sauce’ that makes their products different and better than those of their competitors. If you are at liberty to say, what’s your ‘special sauce’?

Nordost is not a company that is founded on one great idea, but many. Therefore, it is difficult to pinpoint one specific element that is responsible for making our product

stand out. Things that help to separate us from our competitors are our proprietary Mono-Filament technology, purpose-built HOLO: PLUG® Connectors, FEP extrusion, TSC shielding, asymmetrical grounding, and mechanically tuned lengths. We also use the best materials available for each cable design, and pay meticulous attention to our precise manufacturing processes. Last, but not least, we are proud to achieve something that is especially rare in our industry: all of our products are made in the USA.

We have two admittedly loaded questions for you. Just how close do your value-minded cables come to the performance of your flagship models? What characteristics do they have in common and what are the most noticeable differences?

It’s actually not a loaded question at all for us, and a simple one to answer. Nordost purposely only builds nine cable models. The reason for that is we start our design goals with the very first cable. So, when you insert a White Lightning cable into a system, you can hear where our focus lies— low capacitance designs with a linear frequency response. When you can start with that, you can start to hear just what the electronics designers and speaker engineers intended their products to sound like. We are taking away that midrange frequency bloat that high capacitance cables create.

From there, it’s a linear progression, never introducing something that will change the overall tonal balance, but introducing improvements to enhance what we started.



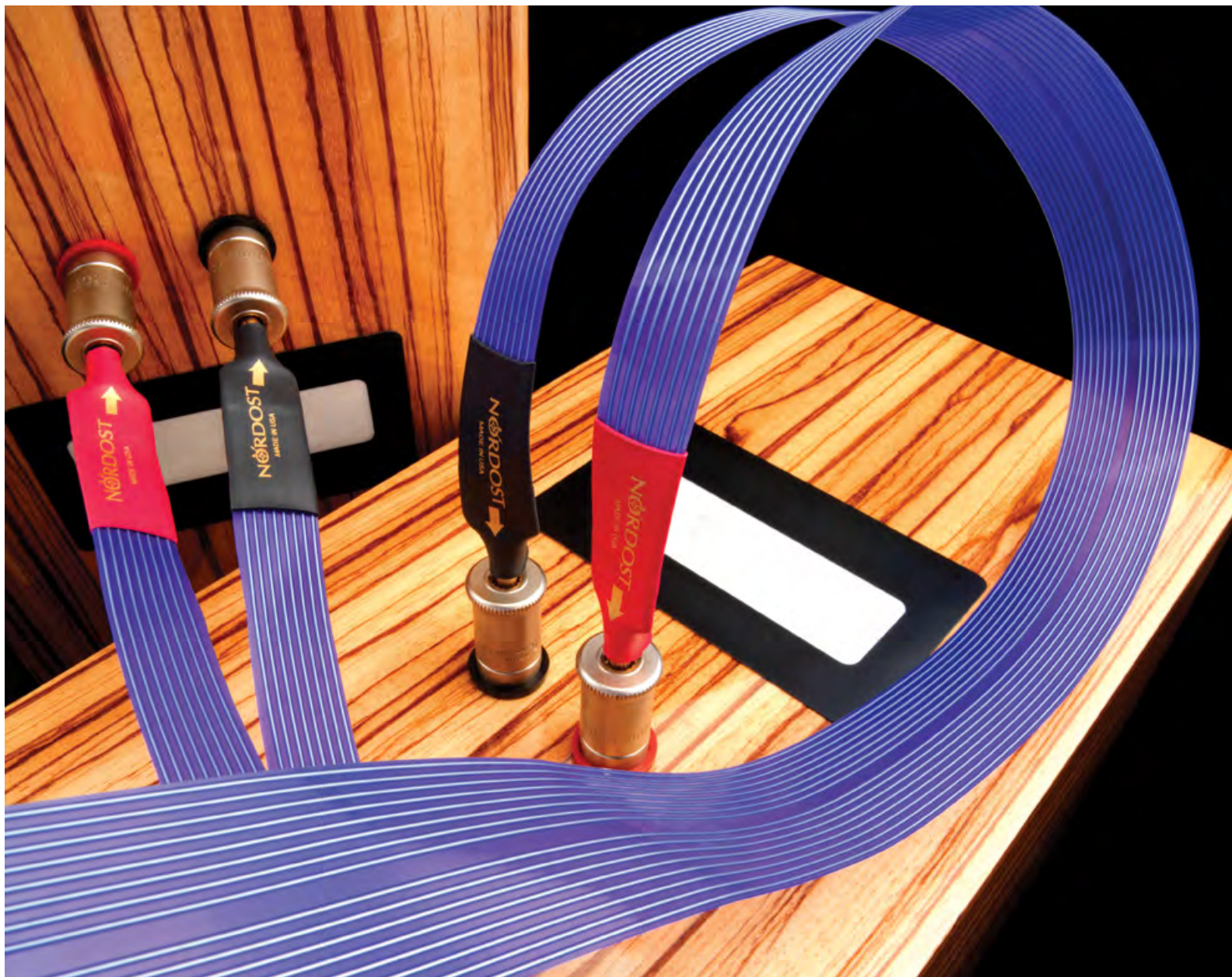
Every time you go up a level, it’s like peeling layers away. One step up and you hear more “weight” or “body” to the music, because we either added more conductors or increased the gauge of individual conductors. You also

get better imaging characteristics with each step. Adding features like Mono-Filament and Dual Mono-Filament increase the resolution of each step in the line. We don’t change construction design as we go up, we

simply add more to what you start with, and that maintains the characteristics. They all have linear frequency response and great resolution characteristics in common, which provides a wide and spacious soundstage.

What do you think the next ‘great leaps forward’ in audio cable design will be? How do you think audio cables will be different five years from now?

That is a very hard question to answer. We only just recently came up with our new, flagship cable, Odin 2. In order to bring this cable to the unmatched level that it has attained, we put everything that we have developed over the past 26 years of research and development into this range. Right now, I don’t know what we could possibly do to improve upon the Odin 2. Now, if you had asked me this same question five years ago, I would have probably said the same thing. But since we are constantly in the midst of researching new ways to improve upon cable design, maybe you will just have to ask me again in five more years. +





NORSE 2 CABLES

SUPERIOR TECHNOLOGY, SUPERIOR PERFORMANCE

MONO-FILAMENT TECHNOLOGY • MECHANICALLY TUNED LENGTHS • ASYMMETRICAL GROUNDING
SILVER-PLATED, OFC CONDUCTORS • EXTRUDED FEP INSULATION

NORDOST
MAKING THE CONNECTION

HEIMDALL 2



FREY 2



TYR 2



Caelin Gabriel of Shunyata Research

Hi-Fi+: How and when did you first discover that differences in audio cables could actually affect the sound of hi-fi systems? Were you surprised at the time?

Caelin Gabriel: I worked as part of a team tasked with developing low-level signal acquisition systems for Military applications in different countries around the world. Later, in civilian life, I was involved with the development of high-speed networking devices like the 1GB/s fibre-channel interfaces and the present 100MB/s and 1GB/s Ethernet devices in the computer industry. These work experiences wreaked havoc with simple engineering truths. It became obvious long before I began building power cords and cabling for my own audio system that details related to cable and power systems were extremely important. Power and signal cabling represent by far, the longest path signals must travel within a high-resolution audio, video or medical system.

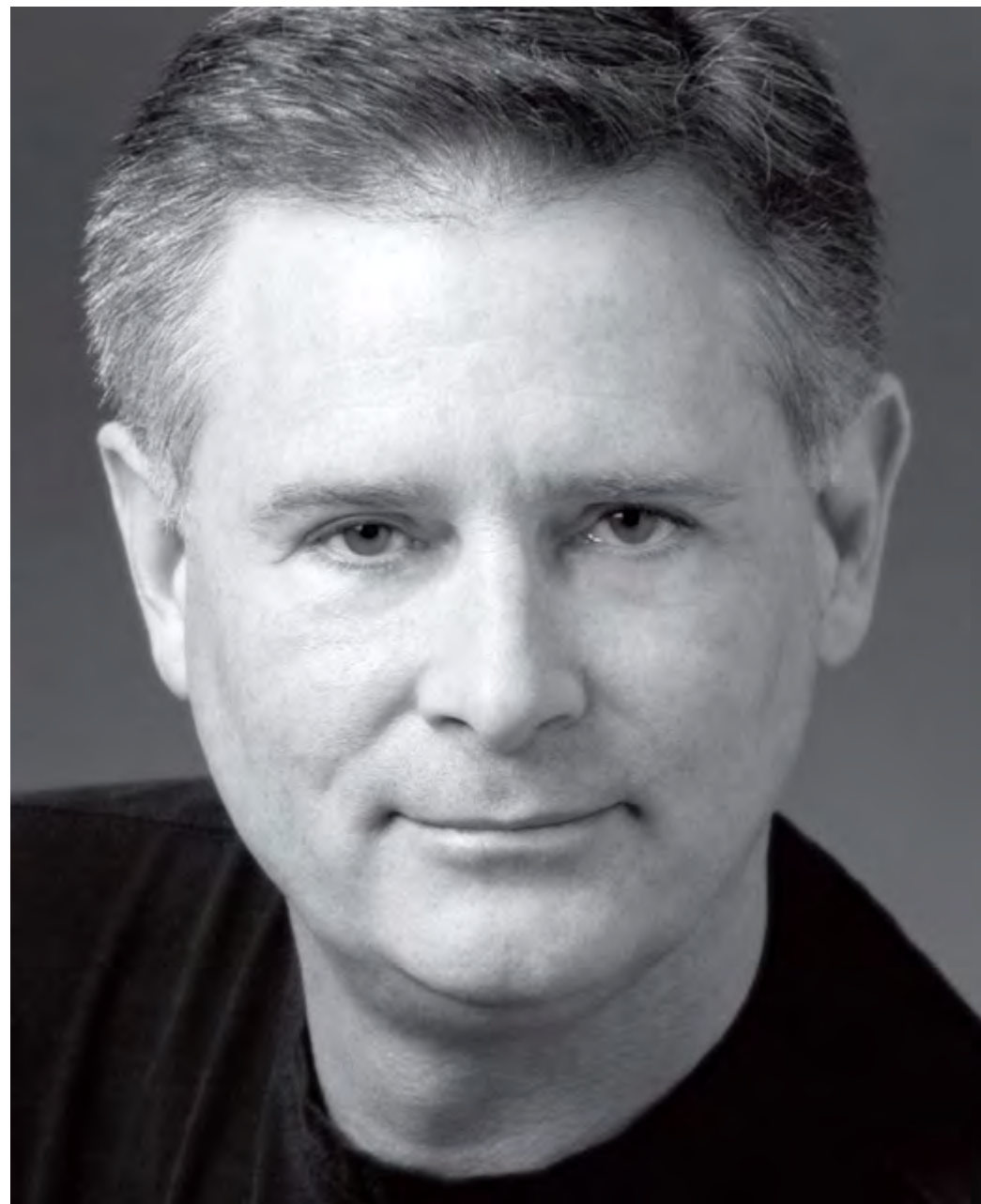
What was the first range of cable products you designed and when did it enter the market? How did it compare to other cables at the time?

My first commercial product was introduced in 1998 and was called the King Cobra power cord. It was an extremely complicated design that took me the better part of an entire day to construct by hand. The market response to the design was significant, which led me

(and my family) to believe that we could carve out a small, but sustainable business by making finely crafted products with special construction techniques, materials, and plausible science. There were a number of early reviews of the King Cobra power cord that compared it to many more expensive models. The results gave me the early idea of pricing very high-performance cable products more modestly as another competitive edge in a small market.

How has the audio cable industry evolved over the past several years? What are the pros and cons of the path the industry has taken?

We see consistently escalating retail prices in the cable industry for top-performance models, that approach new car pricing for an 8' length of speaker cables or a 6' power cord. Despite the extremely high prices, I notice there is a general lack of published science, patents, or technologies that stand up to scrutiny or explain why products cost into the mid five-figures. Shunyata Research's niche is first and foremost our focus on value, whether the products are our finest performance products or our most affordable. We design all of our own parts and explain their importance and construction. We have seven published patents and many more pending. There are hundreds of pages available on our web site and in print explaining our design philosophy,



science, and use of measurement. The challenge facing the cable market as we see it is truth in retail pricing and scientific credibility. In a few small ways, I feel we have advanced the concept of well-reasoned retail pricing and bringing real science into the consciousness of this market segment.

Some audio cable manufacturers focus primarily on premium-priced products, but your firm offers some ranges of cables that are far more sensibly priced. What led you to create ranges of value-minded cables?

The growth and longevity of Shunyata Research is directly related to our commitment to manufacturing affordable products that deliver an extremely high level of performance. We achieved success through more than ten-years of creating our own custom-made parts. Our most value-oriented products rely heavily on measurement, explainable science, and material refinements. We understand that our greatest market exposure will be through customer's experience with our most cost-effective products, so those have to be the finest products we make in terms of absolute value and performance. You could think of our Venom Series of signal cabling and power products as our proof of concept and our proof of commitment to our craft and our customers. Our affordable Venom Series of products are the vanguard of quality that is the embodiment of our company ethos. We are comfortable with how they perform and our feedback, media reviews, and awards over the past ten years have been worth the investment.





What do you personally consider to be the ‘sweet spot’ product (or products) in your range in terms of maximum performance per dollar (\$), pound (£), or euro (€)?

What sets those products apart?

It’s very difficult to select a single product or product range because at each price point, we compete in the market by hitting lower retail prices with obvious performance, measurement, and design advantages compared to competitive products. If forced to choose a favorite cable-set for a relatively high-performance system, I would have to say our Alpha range of signal and power cord products. Alpha Series use patented technology that measurably improves signal transfer and the Alpha NR power cord measurably reduces noise at the component’s power supply. Alpha models are designed using all custom-manufactured parts, superior, hollow-core geometry conductors and have proven themselves competitive with products costing four to five times their retail price.

In developing value-minded audio cables, which design parameters have the greatest impact on overall sound? Conductors? Dielectrics? Geometry? Shielding and Jacket Design? Connectors? Other variables?

We control every variable possible in the Venom range of power and signal cables. Nothing is left to chance and there are no off-the shelf materials or parts used in their construction. Our Venom power cord conductors are made with the highest purity OFE copper on the market. We designed our own custom-molded AC connectors so that the connectors could accommodate large-gauge power conductors and possess superior contact integrity.

Venom signal cables use Ohno Continuous Cast Copper, which is made into a hollow core wire geometry called VTX. All the Venom cable dielectrics were chosen through careful listening evaluations and the shielding elements were selected to achieve 100% coverage. We designed all of our own RCA, XLR and STIS (Interchangeable) speaker cable terminals because of the importance of the connections. This allows customers to choose their preferred speaker cable termination or change when needed. The material and custom-design costs invested are estimable, but that is the reason for our reputation as a very credible science-minded manufacturer of high-performance cabling systems.

As an audio cable designer, how do you strike a balance between performance on the one hand and price on the other? Is it possible to optimise both?

We started with a specific pricing model that considered a standard mark-up between parts/materials cost and retail pricing in order to break even and perhaps earn a reasonable profit. In the beginning, this model dictated that if a part you designed or purchased cost you a penny, then that had to add five cents toward a retail price. This was referred to as a X5 table. 15 years ago, this was the norm for many industries. As vendor costs and US hand labor has gone up, so has the X table. Today, it’s probably closer to a X6 table. We still follow that table, generally speaking. With our most affordable products, we earn less and with our highest performance, entirely customized hand-made products, we earn a little more so there is a balance. The trend we are seeing, mainly in the cable business, is that the normal X table of old has exploded into X20, X30, and up. Why, because some cable makers compete by increasing discounts to dealers, or adding upgrade programs, trade-in programs, rewards for exclusive business, and the list goes on. Our success in the market is predicated on offering the highest value products at each price-level that out-perform those with inflated retail prices.

Manufacturers sometimes speak in figurative terms about the ‘special sauce’ that makes their products different and better than those of their competitors. If you are at liberty to say, what’s your ‘special sauce’?

Our products’ most compelling attributes are their complete parts customization and the patented, measurable, and explainable science used to design them. If there is one “special sauce”, it would be the 18 year commitment to manufacturing products that deliver on the promise of consistently obvious performance improvement at retail pricing that does not strain the laws of credulity, even at the highest end of the performance ladder. You could point to any number of individual design attributes or perhaps one patent that is particularly relevant, but with Shunyata, it comes down to the accumulation of all the patents, pending patents, and the custom-designed parts, measurement analysis such as the peak-current (DTCD) analyzer, noise-measurements, proprietary filter designs, etc. The special sauce is 18 years of parts, design, research, measurement, and simple, straightforward, no BS pricing policies.

We have two admittedly loaded questions for you. Just how close do your value-minded cables come to the performance of your flagship models? What characteristics do they have in common and what are the most noticeable differences?

Our most affordable cables must approach reference performance level in our estimation or there is little value to

expending the effort, cost and more than 12 years in developing the affordable Venom range of products to represent what is the best attribute of our company. Yes, in extremely high-performance, high-resolution systems, our more expensive products are carefully designed to perform at a higher level. Because each system and listener is unique, the value equation relative to differences has to fall on the individual. Since our products have been on the market for 18 years, there have been many reviews, customers, and dealers who have weighed in on the value of our products at each price level. Even the medical industry, heart-surgeons, and hospitals have weighed in on the value of Shunyata products so we always prefer to let the market determine our products true worth and value. If history were the guide, I would say we’ve been very successful in providing value-oriented products that come tantalizingly close to “reference” level performance in a good system. Most of our dealers and distributors offer evaluations and money-back auditions, so we are comfortable with the idea that if people take the time to listen, they will find a very high-value match for their system at any of our price points.

What do you think the next ‘great leaps forward’ in audio cable design will be? How do you think audio cables will be different five years from now?

With the proliferation of digital systems and components, Wi-Fi and more RFI and EMI surrounding system environments, cable and power systems will have to evolve so

that high-frequency noise is isolated from other noise-sensitive components in the system. Shunyata is working on a number of cable and power system components now that should address the issues related to noisy environments, because it’s not the noise coming from outside the home or system that poses the greatest threat to high-resolution; rather, it’s the noise that surrounds the system itself that detracts from performance. Our designs focus on isolating component-to-component noise interference and we see that as a big part of the design evolution to come. Our research into these and other areas will continue, because it’s what we do best. +



MASTER DESIGNERS: TWELVE AUDIO 'POWER BROKERS'



HI-FI+ INTERVIEWS TWELVE MASTERFUL AUDIO POWER PRODUCT DESIGNERS

Michael Børresen of Ansuz Acoustics

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Michael Børresen: All the trouble I've ever been in started out as fun, from a young age I've had the hobby of building things. My father had/has a really good tool shop, so from a very early age I had access to all the machinery needed to manufacture speaker cabinets. So most every week there was a new enhanced performance project in the pipeline. Internal wiring of the contraptions was most often electrical wire bought from the local store. At one point I needed a certain size coil and decided to wind one myself on the lathe; that coil changed my perception / understanding of the influence of identical induction values of the coil, because it sounded so different, I had the feeling that the wire gauge was more significant than the exact value of induction. This led me to replace all my standard power cords from standard to cords I built from thick solid core copper wall installation wire. The revelation was that the thicker cores was less of a filter and gave me more music.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

I entered professionally into the world of Hi-fi about 15 years ago; the first many years I made my living not only by designing the Raidho speakers, but also by doing design work for other manufacturers.

In that capacity I designed a number of different power products, mainly regarding power distribution systems. The first power products I designed in my own name were the current range of Ansuz Mainz power cables and the Ansuz Mainz (A&D) power distribution bars. These products were and still are ahead of their time in the way they deal with or treat high frequency noise on the mains lines. In Ansuz we use specialized versions of the coils developed by Nicolas Tesla; when put to use they have a unique ability to reduce and reshape the voltage-noise spikes that are so extensively present on the mains 50–60 Hz sine waves. Frankly speaking there are only two ways of dealing with noise on the mains. One is this Tesla-coil based parallel reshaping, compensating path we exclusively use in Ansuz. All other paths will inherently involve filtering with some element serial resistance or inductance. In my experience serial inductance and resistance is much worse than any amount of noise present





on the mains supply lines as it compresses the expression of the music.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

Ideally power supply sections should be able to deal with all noise aspects on the mains supply lines, but nothing in this (audio) world is ideal; components and transformers all have parasitic elements in their electrical properties. Transformers have capacitance between windings, while diodes and solid-state devices all have parasitic capacitances on their bases/gates. These unwanted but

very real and present parasitic elements simply let most all of the mains voltage-noise bleed through the power supply sections and directly into the audio circuits. For music reproduction the solution is not so straightforward; filtering with inductance may reduce the noise, but will also reduce the instant current draw capability and thus plainly reduce the dynamic headroom leaving your system dull and utterly lifeless. I have yet to hear a mains filter/regeneration unit that will improve musical performance of any music system.

The method we have found in Ansuz is merely a method of reshaping and to some extent reducing the mains noise so the leading edge of the noise component is far



less steep. This softer noise figure is so much better dealt with, and can be removed by the power supplies of your system, and this method will not add induction or resistance to your power lines and thus lets you avoid compression of the music performance.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

For me there is little doubt that looking at the mains feed as a 50/60 Hz voltage is a huge misconception. What drives the speakers is current, current through the voice coil make the speaker cones move and creates the music. With today's more efficient amplifiers as much as 90% of the music's current signal is present also on the mains side of the music system. Your system simply sucks current with the music signal and the voltage is just the carrier of the current. With that in mind it's quite easy to understand why induction in any power products is so damaging to music performance. Inductance is simply put a brake or a limit on current transients. Inductance will simply prevent your speaker getting the transient current they really need to perform music well.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

Making a good audio system is all about creating the right foundation, this being a good mechanical foundation and a good electrical foundation. The electrical foundation has two absolutes that are truly essential and then a few additional items that are very desirable.

The two essential absolutes are very low mains system induction/resistance and very good grounding between your Hi-Fi components. Minimum induction gives you the least amount of musical compression and good ground between your components secures the common reference between the components so that ground currents will not clutter their sound. The very desirable additional items involve having a non-inductive means of dealing with supply noise on the power lines.

So to sum it up, a good Hi fi system essentially needs a good mechanical rack, good mechanical decoupling devices, and a good electrical and ground distribution system, with super low induction, resistance, and a low impedance star-ground system.

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a ‘general case’ recommendation.)

This is a question with no correct answer, but what we have seen is that with a good foundation even a very modest system will perform really well and most often musically kill a far more expensive system that has been carelessly set up.

In a way it's like a chain where there will always be a weakest link, and you can never make the system exceed the performance of your mains setup, like you can never build a building taller than the designed foundation allows you to.

My home system is in structure quite modest, a good integrated amplifier and a good pair of monitors. My mains system is as good as it gets and my next upgrade will be there too. It's simply the place where you get the most benefit for the money. Sometime you can really get surprised about the sheer musical qualities of even modestly priced electronics when you really give them a good platform to perform on.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

I simply don't believe in it. Quite frankly adding filters also means adding induction or introducing current limitations. Noise is certainly less important for music than added compression. To say it boldly I have never heard any conditioner or power regenerator that will leave you with more music.

That said there may be some future merit in battery based storage devices as they may even extend the possible instant current draw above what is possible with a direct mains feed. As a concept that idea may hold some promise, but to be honest my experience with such systems is for now very limited.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

I believe that the most essential for a designer in any field is to get a firm practical and deeply rooted theoretical grasp on the mechanisms that govern the area he works in. In Audio we need to look at everything. It's remarkable that we as humans can sense/hear so much. Everything matters, but some things matter more than others. To navigate and consistently design high performing products requires that you have the skill set to look through and be able to



digest just how things work. Basic knowledge of what current is and how it moves through wires is not hard to comprehend, but at a quantum level the nuances and complexity grows a 1000-fold. Did you know that electron migration through cables is very, very slow, like a few centimetres an hour, yet the speed of current flow is very close to the speed of light? Duality and wave-like behaviour seem to be the order of the day.

In a nutshell, what things make your firm's audio power products different to and better than your competitors' products?

I believe that in our design we target the main essentials of power distribution to a hi-fi system. The main focus is the ability to deliver current without any restrictions and tie your hi-fi components together in the optimum ground configuration. In that respect we're very basic, but as with everything the devil is in the details. Our mains systems have the absolutely lowest possible induction and also have a designed ranking of ground resistance-spread to your components. On top of that we have the unique noise shaping of the unwanted Voltage noise elements of the mains feed; this shaping allows the power supply section of your hi-fi components to do their job and feed your circuits with clean and noise-free power.

The Ansuz power distribution system is designed so it will always work as intended regardless of your choice of audio components.

What do you think the next 'great leaps forward' in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

I'm quite confident that time will teach us a lot more about current flow at the quantum level and that will give us the chance to make even better power products for hi-fi systems.

If you look at the main developments within amplifier technology we see a clear move towards higher efficiency components, equipped with switch and resonant mode supplies and also a further development within the Class D amplifier technologies. This future will make music systems even more sensitive to current constriction and thus place even higher demands on the performance of your mains distribution systems and cable looms.

With extensive Solar- and Wind-power we may even see local grid stabilising battery banks in most every home. For that greener reality, we'll most likely see developments of high performing mains inverters based on switching or resonant mode technology. +



Garth Powell of AudioQuest

Hi-Fi+: How and when did you first discover that specialized audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Garth Powell: Twenty years ago I joined an electronics manufacturer in Northern California (Furman Sound Incorporated). They already had a formidable position manufacturing AC power products for broadcast, professional audio, and music industry applications.

I received a loan of their finest pro-studio AC power product featuring balanced power, advanced surge suppression, and differential filtering. I brought home this 30kg+ beast, connected my 2-channel system to the appropriate AC outlets, and dropped the needle on an album I loved. I was shocked—not by the improvement I expected and was told I would surely experience, but by how much information was either gone or distorted. The bass was weak and bloated, and the highs were either bright or dull depending on the octave or system drive level. Yes, portions of the background were “blacker,” but the soundstage had collapsed. I thought I had broken the unit, but a full investigation an hour later proved otherwise.

I was new to the company, and could not state that their prized product was flawed in any way (at least in my application), so I

returned the unit early in the morning and avoided the other engineers. Weeks later, when I was finally cornered, I offered my assessment. As I was the only “audiophile” who had ever worked there, my opinions were suspect at best, and clearly I believed in voodoo ...

To defend myself and my worth as an engineer (and to satisfy my curiosity), I spent the next two years testing, experimenting, and learning why that unit had sonically failed my system and what could be changed to achieve the opposite result. That research was the genesis of every AC product I’ve designed since.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design ‘ahead of its time’?

For this interview I’m going to dispense with other audio products I’ve created for small startup companies, and focus on AC power products. That first design would be the Furman “IT-Reference” AC power conditioner, which debuted in 1999.

Though crude by my current standards, it was built like a brick, featured an early version of my Transient Power Correction for its power amplifier outlets, and the source components (only) were filtered linearly for over 20 octaves by a massive symmetrical



power isolation transformer with multiple tapped secondary windings and Faraday screens for increased isolation.

It was unlike anything else at that time in its implementation of some old and some unique technologies, but the first goal was to maintain the best balance of materials and design criteria so that the result was always consistent and always positive.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

The power supply of any power amplifier or any source component is absolutely critical to the component's circuitry and, ultimately, its performance. Virtually all premium component manufacturers are well aware of this, and most do an exemplary job of providing appropriate power supplies for their products. The problem (and cause of many misunderstandings), comes from the fact that these power supplies are converting (i.e., rectifying) alternating current into direct current. That's fortunate, or else we would experience both hum and a "noise-to-signal" ratio in our audio systems.

Unfortunately, as excellent as many of these DC power supplies are, they cannot turn a sufficient amount of AC and airborne RF (radio frequency) noise, into heat through loss. Though some are more efficient at this than others, it's not enough when



you consider the potential dynamic range of today's best audio software. If we take an honest look at the unweighted (no bandwidth filters used on the test bench) self-noise and induced noise of even the finest audio products, it is considerable when compared with the lowest level audio signals. If we then look at a studio condenser or ribbon microphone, or a moving-coil cartridge, and adjust the potential dynamic range for its highest output, you'd need circuits and supplies that are noise-free at about a microvolt. That's not possible, not if we're honest... So, we need to take advantage of everything we can do to filter, eliminate, or drain these distorted signals away from the audio circuitry, and it simply can't be done entirely in the DC domain.

The other consideration is ground. If the product has an AC safety ground attached to it, and since ground will typically bypass the DC power supply, the AC power and airborne-induced RF noise present on the AC ground leg will, in most cases, find its way to the signal ground return of the audio circuits. Since the ground impedance can never be zero, we will not be able to eliminate all induced noise. This is where effective linearized filtering and efficient draining schemes are crucial. In fact, we have a patent on one.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

The number one canard would be that these products hinder the performance of a power amplifier via current compression.

And given that the majority of AC power products increase the AC line impedance, that's a fair assessment. An AC regenerator does so because of the amplification circuitry that synthesizes the new AC waveform from DC, and because the supply will start to clip at about 41% above its rated RMS current output. At double to triple its RMS output, it's a mess. An isolation transformer or choke-based filter is an inductive device; it may be large and heavy, but it will create a phase lag for the current transient that's supplying the power amplifier during audio transients—current compression. Battery isolation systems are no better: The battery might be massive, but that topology's inverter will be the system's limiter.

The reason most power amplification manufacturers have yielded the best results from a dedicated AC service outlet (ideally, with large copper conductors fed from the breaker panel) is that even a modest home will have a 200+ amp service feeding the breaker panel. You must understand the current transients that help to buffer and stabilize even the finest power amplifier supplies are incredibly fast. You will not trip



the wall service breaker, but the current transient may be many times higher than the breaker's current rating.

The difference with AudioQuest's Niagara 5000 and 7000 is that the high current outlets feature a transient power correction technology that lowers the impedance of the current transient below what you could expect to find from a 50-amp dedicated AC line, and it supplies the power amplifier up to 90 amps peak current reserve up to about 25mS—just enough to get the amp's power

supply stable from even the worst audio transient signal.

In short, the power amplifier has the ultra-low impedance supply and buffer it so desperately needs, and it can work with greater efficiency. The result is tighter, more extended, better-defined bass.

If talking to a customer who owned no specialized audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

I've spent years studying the problem with both AC current and RF noise. With today's digital audio workstations, it's become possible to create difference files that can isolate these performance differences numerically and visually with spectrum analysis. In the past, we could measure reduced RF and self-noise, but the argument was always made that "those distortions cannot make it past my product." I can now demonstrate that up to one-third of the low-level signals present on our high-resolution software (digital, tape, or vinyl) can be masked or permanently lost to AC and RF noise. Once this information is lost, it cannot return via better speakers, amplifiers, DACs, or phono cartridges. Improving those components is worthwhile, but you are simply making more of the remaining signal!

I would ask any customer to consider a proper AC power system as a foundational product from which all existing and future components will significantly benefit.

In the end, it's not about decibels of noise reduction or levels of available current. It's about the experience we strive for with music reproduction: How much do you wish to leave on the table?

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

If you were starting from no system at all, I'd say between 10 to 15% (not including the AC power cables). However, for those with existing systems, the numbers may change because we're never working within a linear equation when considering matters of "value."

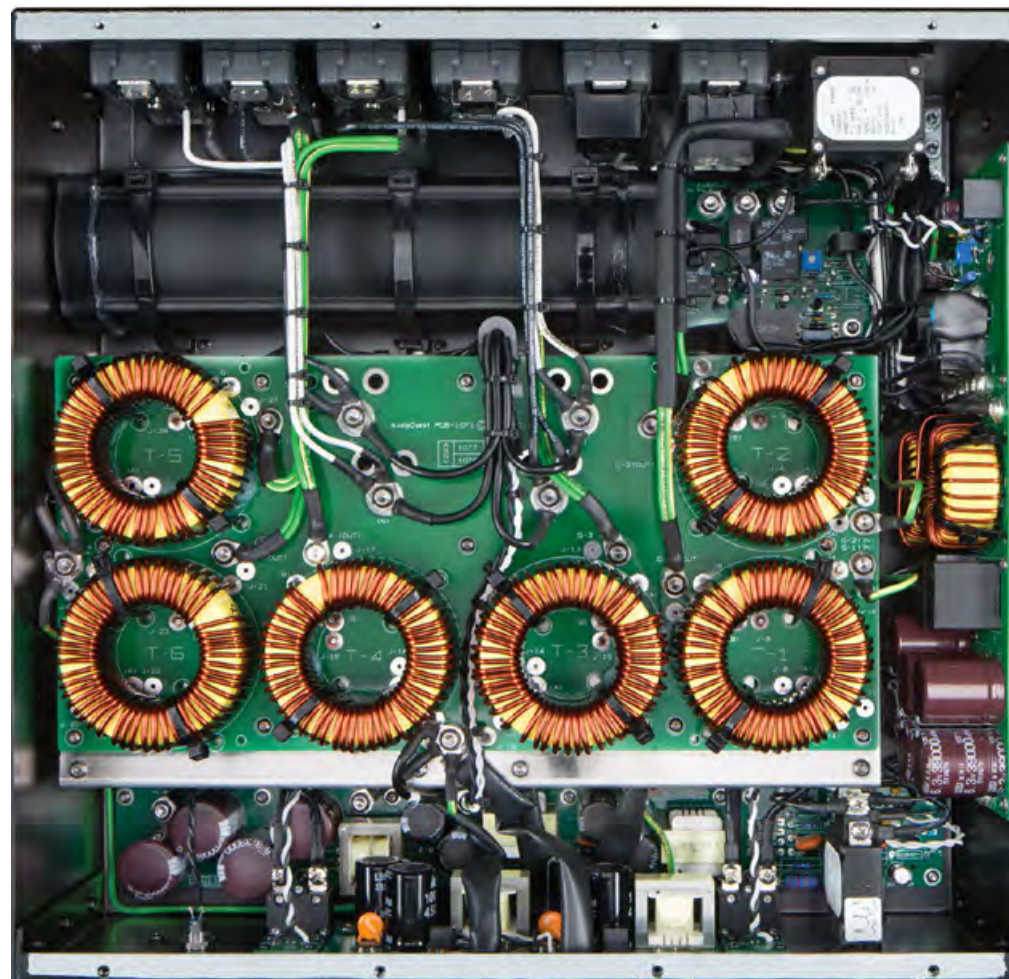
For some, the entire notion of an audiophile system seems extreme. For others, it fuels our passion for music and enriches our lives. Compared to making other upgrades or taking a more frugal path, you might find better "value" from regaining the information that was lost to the greatest extent possible—even if the power product in question goes beyond 30% of the existing system's sale price.

Ultimately, it's up to the individual.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

I've already touched on some of the possible downsides of these approaches, but I can also speak to the positives.

Power Isolation Transformers: There are three types of induced noise on an AC line: symmetrical (common-mode), asymmetrical (differential-mode), and ground. Power isolation devices deal with common-mode



over the widest frequency range possible, and typically do so very evenly (linearly). They do not help the other two types of noises however, and they raise impedance (best left to source components with constant-current power supplies).

Power Conditioning: Typically, this approach provides some common-mode and differential-mode filtering. Beyond that, who knows? “Power conditioning” is a very broad term for a wide variety of technologies that can range from great to ghastly.

Power Regeneration: This approach converts an AC signal to DC, and then, typically via amplification, synthesizes a clean, low-distortion signal. On paper, it looks the best, and it always supplies the closest rendering of a 60 or 50 Hertz sine wave. The common misunderstanding is that even an AC service with 20% harmonic distortion will be fed to a component power supply that will rectify the AC waveform into DC with 0% harmonic distortion! The nearly perfect sine wave doesn’t help unless you’re feeding an AC synchronous motor. Further, this topology current limits, and, for low-current source components, most of its noise reduction efficiency vanishes once the amplifier is past its frequency bandwidth (typically below even AM radio frequencies, let alone those from a cell tower). The noise reduction is far from linear.

Battery-Based AC Power: The best versions use a regeneration amplifier post the battery, but that makes them susceptible to the same problems described above.



However, most of these have a simple DC-to-AC inverter post the battery, and that’s not great: non-linear noise reduction and current limiting. Yes, a battery seems to be a “pure approach to a complex problem.” However, even the systems that can take Line and Neutral offline for a fixed amount of time by law and safety concerns retain ground, but the battery can’t isolate that! Also, a great deal of RF noise from cell towers and satellites will get passed by the battery or will be induced post the battery. Without an effective means of draining the noise, this approach will not render the best results where noise reduction or dissipation is concerned. Where the power amplifier is concerned, even a 60-amp battery system (and the room to cool its regeneration amplifier) could never equal your home’s 200- to 400-amp mains transformer.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what

aspects of design would you encourage them to focus upon first and foremost?

Listen to everything, measure everything, make only one change at a time, assume your ideas are wrong. Turn failures into opportunities, learn from everything and everyone. I’ve reverse-engineered most of my competitors—not to copy them, but you never know what may inspire you to move in a new or unorthodox direction.

Make certain the design is linear (consistent with frequency to the greatest extent possible). Otherwise, your product will be both system and frequency dependent in its efficacy.

In a nutshell, what things make your firm’s audio power products different to and better than your competitors’ products?

I like and respect all of my competitors. I have my own value system and design ecology, which hopefully fits with those of AudioQuest and most importantly those of our customers.

We have patents, as well as many proprietary technologies. I can tell you that most of what we have created could have been done decades ago if the need and understanding were there. The success of our products cannot be found in any one specific part, technology, or idea. Instead, we’ve taken a holistic approach: Everything was listened to, designed, and measured to elicit the result desired. If one small, seemingly insignificant portion of these designs is misapplied, the performance falls—significantly! Beyond all, we focus on attention to detail, honoring the music, and the implementation of real, verifiable science.

What do you think the next ‘great leaps forward’ in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

Unlike software and digital hardware, we are dealing with a crude technology from the late 19th century. It demands large robust parts that will not be replaced by surface-mount multilayer boards and high-speed processors; the voltage and the currents involved are far too high. What will change are the technologies required to address ever-increasing radio noise.

Much of what I have implemented in AudioQuest’s Niagara Series would not have been necessary 40 years ago. Today, we live with the noise caused by cell towers, server rooms, and switching power supplies. Tomorrow, we will surely face other concerns. +

Mark Schifter of Core Power Technologies

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Mark Schifter: This was many years ago – back in my Audio Alchemy days. The first unit was an Audio Power Industries “Wedge”. I was stunned. This was back in 2003 I believe.

Power is really “foundational” and I am a firm believer.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design ‘ahead of its time’?

The Core Power Technologies EQUI=CORE 300. This was in 2014 when we built the first prototypes.

I had known about Balanced Power and Common Mode of course—but this proved it out in spades

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

How much can your one piece of equipment do?

Just supplying good power to the various sections (determined by design) is a large enough responsibility...

Getting the best power from your mains to the equipment itself is where we step in.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

We need to raise some foundational points, here.

First, the mains are bad—bad everywhere... and we need to all understand this.

Second, power is getting worse by the year—not better. This is a proven fact.

Third, getting good/clean Balanced Power to your gear is essential for best results.

There is no better way to say it: good power = good sound (and video too)...

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?



Start with one of our smaller units and find out for yourself what good/clean power can do for your system results.

Try our 50-watt unit (we have 50, 150, and 300-watt units with Integrated Power Cords—

and 1200 and 1800-watt units with 8 Hubbell outlets)... maybe on your DAC or phono stage and listen for yourself. The lowering of your noise floor here will simply stun.

Try it...

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a ‘general case’ recommendation.)

In rough terms... I would say 10 to 15%. Good place to start...

This is (per your question) a “general case” answer...

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

‘Power Conditioning’ often means using poorly designed Inductors or MOVs, etc., etc. Often units with this tech rob the bass and create a blurring effect.

Regenerators are fine and dandy for lower power needs—but they absolutely are NOT my first choice for whole system/large-scale needs. Very inefficient...

Power Isolation and Balanced Power (they are really very close to the same thing) is my way to go. Deal with the foundation first. Get good power to your gear.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

Best use of materials and efficient manufacturing. Whatever you invent must be repeatable and reliable...

We are blessed to have the two best guys I know designing and engineering our products—Doug Goldberg and John Leveault. These guys have a combined 75+ years of experience in climbing the power products learning curve. My job is to package their designs well and safely.

Use materials that make sense and will deliver both repeatable and reliable results... and do so efficiently. Then, price the products right and watch your company grow.

Above all, put safety first in all things.

In a nutshell, what things make your firm’s audio power products different to and better than your competitors’ products?

We satisfy the need for repeatable and reliable results—and we price our gear appropriately. Our margins provide safety for the end user as well as the company.

We do not overcharge—we are fair.

We believe that there are some superb products out there... Certainly guys like Ted (Denney) at Synergistic Research make superb products that are rooted in the right things.

Our products are science based; we are believers in dealing with the problems of delivering clean mains power using science-based tech. There are some real interesting products out there that cost a ton and have questionable return on investment. Let the buyer beware...

Start with Clean/Balanced Power for best results.

What do you think the next ‘great leaps forward’ in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

I can’t say for sure right now, but ask me what’s changed five years from now and we should be able to look back to today and see how things have evolved. +



Nic Poulson of ISOL-8

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Nic Poulson: This was back in 2001 when my friend Keith Martin and I were discussing making some kind of mains product for his Hi-Fi accessory magazine. I began working on various ideas and early the following year we began Isotek and launched our first product, the SubStation.

I can't remember if we were surprised or not. I think I had been in the industry long enough by then that nothing really surprised me.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

The original SubStation was quite radical at the time.

It was the first product manufactured that not only dealt with mains borne noise, but



also heavily reduced Component Cross Contamination.

This is the concept that every item in your system produces it's own noise. So having individual filters on all the conditioner's outlets reduces the ability of any noise generated from one product plugged into the conditioner, from injecting this noise into the others products. I called this Component Cross Contamination.

It was also modular. As it was largely isolation transformer based design, you could specify what power ratings were needed for each outlet. Within its chassis you could have more smaller lower power modules, fewer larger higher power or a mixture of both. It was optimised for your specific system.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

In an ideal world I would agree. However, to implement conditioning properly takes a great deal of “real estate” and money. Rarely is either of these available within a product.

Secondly it is a good idea not to let the noisy mains even enter the product’s chassis in the first place.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

I think the “big one” for many is the notion of dynamic constriction. Power conditioning as a genre is becoming grown up now. In it’s infancy there were issues here. It is an area we work on continually, and when a conditioner is correctly specified for a system (that is to say big enough) it will actually increase the system’s dynamic range by lowering the noise floor.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

There are no rules here. We make no bones about it; mains conditioners are accessories.

We have to offer conditioners that suit anything from a single product up to an entire system, and to cover everything from a budget to a statement system. Therefore we have to make a wide range of conditioners in both performance and price to suit.

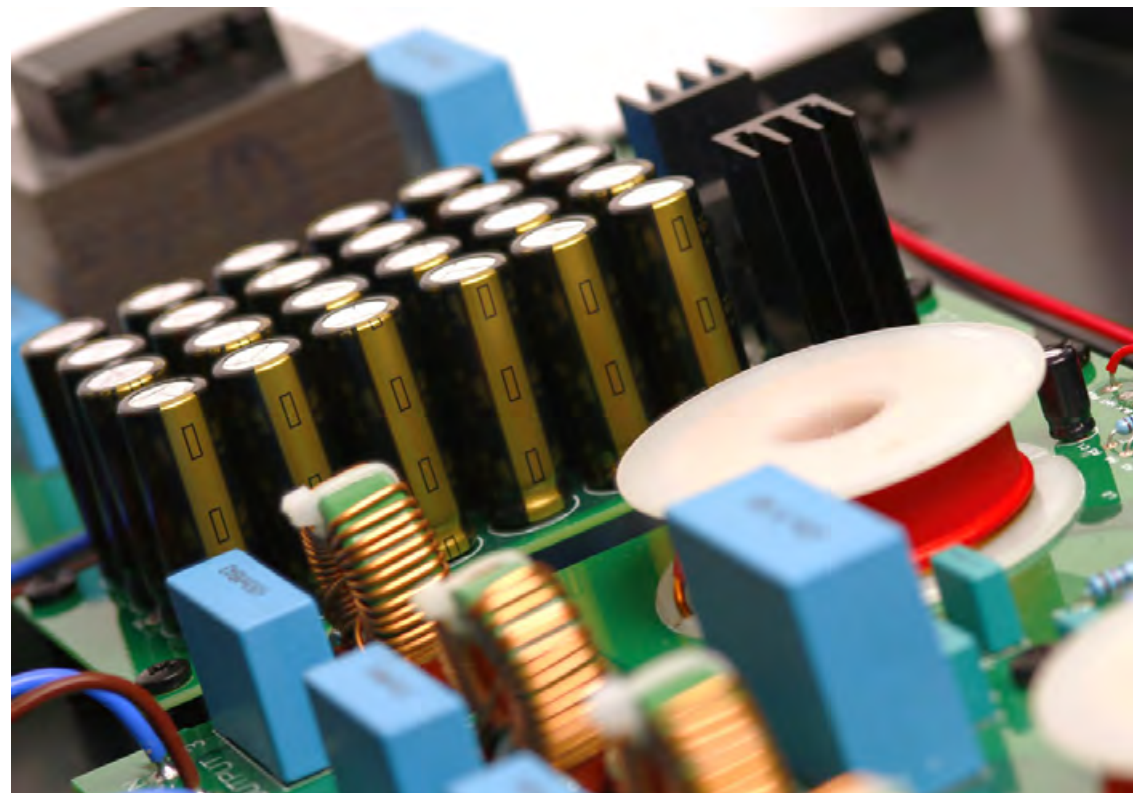
Each of our products from the PowerLines, through the MiniSubs, SubStations to our PowerStations, gives continual increases in performance.

So, I think it’s all about what he or she wants to achieve from their upgrade. This is where we all (shops, magazines, and manufacturers) come in with education, and where we urge people to try our products before they buy.

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a ‘general case’ recommendation.)

I think if you are starting from afresh with a whole system, then a figure of 10% is a good place to start. But if you already have a system and want to improve it’s overall performance, then a figure of 15% or even more will bring ever-larger improvements.

It is always worth remembering that the conditioner should improve the performance of every single component that is plugged into it.



Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

ISOL-8 has designed and manufactured all three technologies. All have merits. The best of conditioners generally offer the best performance for your money. Regeneration can deliver the best overall performance but it can only really be used successfully for

source components. We have made (as have others) regeneration for power amps but they cannot achieve the overall performance of a properly designed low impedance passive conditioner.

The awareness of regeneration is broadening now. Our PowerStation Twin channel was the first two-channel regenerator on the market some 12 years ago. It has been in continual production



ever since. It took our idea of reducing Component Cross Contamination to regeneration with two independent channels, each with its own precision oscillator, power amplifiers, and output transformers.

There are more regenerators on the market now. For me, many of them are not “regenerators”. I believe they should be called “correctors”. They do not regenerate a new sine wave. They add or subtract to the input waveform to give a sine wave, but by its very definition, this relies on feedback and has all the subsequent detrimental issues associated with feedback. However, you do get more Watts for your Dollar.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

I have always approached design, whether for amplifiers (with ISOL-8's sister company Trilogy), in civil and military airport landing light control systems or in mains conditioning in the same way. There is no single focus point.

It is the sum of the whole.

That is not to say we don't have core beliefs; we do.

I've already mentioned Cross Contamination. But others include:

- DC blocking. This is becoming a greater issue all the time. All our larger conditioners have this feature built in.
- Lowering the frequency to which we attenuate noise. Unfortunately this needs larger and therefore more expensive components.

Looking at both series mode as well as common mode filtering. To implement series mode properly is very costly. Indeed in our flagship SubStation conditioners we use Mundorf copper foil inductors for this duty. Many companies that say they attenuate series mode noise only use capacitors in parallel. However, this has only very limited results.

Different practical circuits and components are used depending on whether they are intended to drive amplifiers or source products. They are both very different and need to be dealt with in different ways.

Physical layouts to avoid interactions.

Very high quality parts.

We pride ourselves with being class leading in these areas.

In a nutshell, what things make your firm's audio power products different to and better than your competitors' products?

I am English: do you really expect me to answer this one? (Smiles in a reserved, British way.)

What do you think the next 'great leaps forward' in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

ISOL-8 has always been an engineering led Company. We believe in strong R&D.

But mains conditioning is simple science and as such I honestly don't see great leaps forward happening. We continue to look at all the areas we can improve upon in circuits, layouts, materials and components.

But none of us know what's round the corner... +

Keith Martin of IsoTek Power Systems

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Keith Martin: Personal experimentation in the mid 1990s showed that power could influence an audio components performance, in both positive and negative ways. We were playing with a regenerative device producing about 45 watts to power a Garrard turntable; there is no mystery why this should work, any distortion will cause vibration of the motor which will be heard as the motor is coupled to the stylus via a rubber wheel, turning the platter. The big surprise was the improvement this same device made to a Quad CD67. At the time this was hard to explain; nevertheless CD playback was dramatically improved. Our current Genesis system is a dramatic evolution of this early prototype.

At this time there was a lot of mixed thinking, sketchy science, and some voodoo solutions about mains power and power cleaning. Therefore our starting point was to research and experiment heavily to try to understand the fundamental issues of mains noise and the influence a noisy power line made to sensitive audio electronics. The cause and effect combined with results from removing unnecessary contamination.

Thus IsoTek was born with a singular aim: to create a better solution to the problem of poor mains quality, which restricts the performance of all audio and AV systems. We were driven by a desire to design components that improve sonic definition and detail without dynamic restrictions—to remove this unnecessary noise without removing the heart, soul or emotion from a performance.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

IsoTek's first product was called SubStation, a modular space frame chassis into which users could specify the filter or isolation transformer modules needed for their audio system. It was a fully customisable solution that could be individually configured—a wonderful idea and very idealistic. Its greatest strength was also its greatest commercial weakness. To order the SubStation one would need to become an expert in understanding power consumption and which module worked best for each component. The bespoke nature of manufacture made finished goods stock holding impossible as well as export sales through distributors.

SubStation was a commercial cul-de-sac and an idealistic dream. It was IsoTek's first



product and it did receive extremely positive reviews in all of the English audio magazines, winning the *Hi-Fi News* best in category award for a power conditioner.

Substation entered the market in 2001, and was in many ways ahead of its time, certainly in its approach. It defined the care IsoTek wished to give customers, as well as the belief that each component should have its own dedicated clean supply. It was the springboard from which IsoTek's concepts and understanding developed. This concept has been reborn with a practical finesse in our new Mosaic One Series.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

It is true that some consumers believe this and it seems to be based on the rigid way electronics are perceived and taught, except perhaps in military applications. I guess it is a bit like Organic foods; many designers don't believe it's worth the effort. But in true high fidelity audio we know that every bit counts.

Generally the electrical engineering team working on a product will have a budget based on price point, and this will probably be driven by the bill of materials, the cost of parts used in the design. The influence of sales and marketing will adjust this as they are motivated by customer perception. If the budget is tight compromises will be made.

Generally it is the areas of less perceived value that are cut, as a potential customer is likely to consider greater value in a remote control than a better power supply. Secondly, it is unlikely that the primary focus would be the power supply anyway.

With an IsoTek product you know that the budget and 100% of the specialist knowledge and understanding has been applied for the primary purpose of improving power and therefore performance through cleaner input power. Power is the start point of any audio system and there is good argument that some aspects of power cleaning are better handled externally.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

The most common statement we hear is, "power products kill dynamics"—this statement often being made by an individual who has read prejudices rather than had practical experience with a power cleaning system designed specifically for audio usage. It is for this reason that we have two full time International Product Trainers who support our worldwide distributors. They travel from audio show to dealer event conducting practical informative A/B demonstrations.

Power products don't kill dynamics, but they have to be designed correctly in the first place, built for purpose, not taken



from another industry and applied to audio. You can drink wine from a plastic cup; it will work, but it's far better from the appropriate wine glass. Personally I only drink Coca Cola from the original glass bottle; it tastes a lot better compared to the same drink from aluminum cans or two-litre plastic bottles. Products need to be appropriately designed.

With regards to basic knowledge, like the air we breathe power is essential for the

function of your audio system. If you can improve this input then everything you own will benefit. If you were to set up life support or run an accurate measuring laboratory, power stability, distortion and mains noise reduction would be mandatory.

As we purchase more electrical items so we increase the Differential Mode noise created by power consumption. We seek cheaper communications, so Common Mode noise increases due to Wi-Fi and wireless networks.

A common misconception is that mains noise doesn't matter. It does and its removal can benefit audio or AV systems. Keep an open mind and listen to what you hear without prejudice.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

So we presume the customer has a specialized audio system but has not considered improving the power supply to their equipment. The most logical starting point would be from the IsoTek Discovery Range, this being the Polaris 6-way distribution and filtration block (£395) and a full loom of Initium power cables (£74.95/each). The removal of £1.00 black power cables, given free with electronics, which are designed down to a price not up to a quality, would also be a logical place to start.

This would be an inexpensive and highly effective upgrade, as the complete audio system would be improved and protected. The same amount of money could easily be spent on a single new interconnect cable, which would give improvements between two components but with an IsoTek power upgrade the complete system benefits. As budget permits consider upgrading the Polaris to the Aquarius (£1,495) and perhaps also look at improving power cables to source components as well as amplifiers.



A dedicated high amperage line for the audio system from the fuse box would be another recommendation, as this would reduce the Differential Mode noise created by electrical items already in use around your home.

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

A ballpark statement would be around 15%, for a power distribution system and replacement of all power cables. We'd strongly recommend applying one style of power cable throughout, a common loom. Mixing and matching technologies from various manufacturers often gives mixed results. Keep logic and budget in mind and look for specialist brands in the category. You wouldn't expect a beer producer to have specialist knowledge of wine, so choose brands wisely.

Regarding budget, it would be preferable to replace all free black cables with Initium rather than a single very expensive cable for one component. Consider using these cables with a power filter and distribution system. Consider power to be a system upgrade, not just for a component.

There are however always exceptions to the percentage rule. Common Mode and Differential Mode noise will be far greater if living in densely populated locations, or apartment buildings. Therefore the argument for clean power is greater.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

It comes down to appropriate usage and the best solution to provide the ideal cure for the problem encountered. There is no magic bullet, and we all know that with most things in life it's about a balanced approach.

Generally we've found full mains sine wave generation best for low power electronics, but only if THD is kept very low. It is hard to make true generation systems that work well above 300 watts. These systems are also less able to supply transient power. Therefore the recommendation for sine wave generators would be source components, DAC, pre amplifiers, music servers etc. IsoTek produces the Genesis range of components for this purpose.

For higher current applications we suggest Titan and Super Titan, which offer massive transient power and feature specialized low impedance filter networks that typically come into play above 1kHz. However for asymmetry, often referred to as DC on the mains, we have filtering ability down to 5Hz.

Battery systems unfortunately don't tend to work well. Very humble phono stages seem to benefit. Generally in audio most battery systems seem to be disliked—possibly because they promise much but don't really give any bonus. Interestingly many argue zinc batteries best and lead acid worse. This is the crazy world of audio as technically zinc would be a very bad choice as it is noisy.

IsoTek believe the Genesis full sine wave generation system combined with Super Titan delivering low impedance and high current is the best all around solution, for a system that balances technologies correctly for the purpose intended.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

It was interesting to witness the many headphone brands materialize due to market demand in the category! Did these brands exist because they really believed in what they were doing, or were they simply cashing in on market demand?

Believe in what you are doing and why you're doing it. Pursue your purpose and never give up. Some designs succeed while others fail, but in failure there is greater opportunity to learn so much more. Our designs are driven by almost two decades of passion and dedication in the specialist category of audio power.

Before starting one must try to understand the problem; how best to tackle it takes years of research and development. We focus on the quality of materials usage and components, which mostly have to be made from concepts of engineering rather than being bought from a standard electrical supplier.

Many folklore beliefs have been tested, understood and rejected. If we had to coach someone the message would be listen and keep an open mind; there are no textbooks to help you. More is found from testing and the experience gained.

In a nutshell, what things make your firm's audio power products different to and better than your competitors' products?

Rigorous research and genuine innovation. At IsoTek we don't develop for development's sake, we don't try to jump on popular, quick buck, bandwagons. We spend a huge amount of time continuously in research and development to further our understanding and improve the solutions we've already created.

I think the most important aspect is the passion we have for creating something better. We seek to experiment and learn through both technical and practical experience—to benefit from the combination between strict electrical understanding and the emotions created through listening. We pursue the art of the science. Music has feeling and it should touch your soul. We try

our best to create solutions that let the audio electronics you already own work at their absolute best.

What do you think the next 'great leaps forward' in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

Putting power and its importance truly in the hands of the individual, not just for improved audio performance, but combining with control systems to use this resource wisely.

For more information, visit:
www.isoteksmartpower.com +

Bjorn Bengtsson of Nordost

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Bjorn Bengtsson: Nordost's most sought after products are our power cords. We have always maintained that the AC/Mains is the most important cable in your system (starting with the power cord coming from your wall, leading into your distribution block), since it lays a strong foundation for your system to be built upon. Building on this foundation theory, we decided to start researching new, additional ways to improve upon a system's power. Before we developed our QRT product range, we tried many different "power conditioner" designs, and found that, without exception, they all compressed the dynamic range of the music and limited the peak current of electronics—so we decided to go in a different direction. With QRT, we were able to find a near field approach for our first QX Power Purifiers, which use a proprietary circuit design that incorporates field generators to remove noise and cure waveform inaccuracies and voltage fluctuations on the AC line. During the initial R&D process, we were able to identify several other design aspects that would lead to later QRT products. For example, we discovered that adding a small amount of signal, similar to the dither used in recording studios, and harmonic overtones

to the AC line has a positive effect on sonic performance, which became the basis the QV2 AC Line Harmonizer. We also found that properly grounding audio components was very important in order for a system to work effectively.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

The first power products we designed were the QX2 and QX4 Power Purifiers, which were first released in 2009. Our QX products address the problem of AC contamination and the harmful effects that this contamination can have on sound systems, such as frequency variations, and EMF and RF interference (noise). QX technology was, and still is, ahead of its time—there are no other products like it on the market. Sometimes our QX2 and QX4 products are labelled as "power conditioners", but this just a misconception. Power conditioners typically reconstruct the AC line, which impedes the power line. Nordost's QX Power Purifiers use field generators so that the AC line remains intact and the peak current of the electronics are not limited, all while stripping the current of EMI and RF interference and improving the consistency and regularity of the AC waveform. When you use QX units in your sounds system, you will notice a lower noise floor, greater



dynamic range and dimensionality, as well as a measurable signal-to-noise increase of 15%.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

In most cases, those consumers are not wrong. Today there are several high-end audio components that have excellent power supplies, and if you add a power conditioner to the line, you run the risk of compressing the dynamic range of music. Interestingly enough, there are several amplifier manufacturers that state in their owners' manuals not to use a power conditioner before their product. In some cases your hi-fi system may even lose the true, visceral musical experience that was intended by the amplifier designer. However, as you read above, QRT products are NOT power conditioners. In our long experience, and after multiple listening tests over the years, we have found that conventional power conditioning approaches simply do not work (much in the same way putting network filters on cables will compress music).





What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

The most basic knowledge I would want to impart to people is the importance of grounding. Although this isn't a misconception (I would hope that in most cases people will all agree that proper grounding will improve sound quality), I do think that there is an underestimation of the impact that good grounding will have on the fidelity of an audio system. Grounding is a problem that we have already addressed with products such as our QBASE AC distribution unit and our QLINE Ground Wire. However, we are looking to further improve upon this issue in the near future.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

The first step that you should take when looking to invest in audio power equipment is a high quality distribution block. Our QBASE units address the problem of the conflicting flows of signal and ground paths in a typical system, which create noise on the line. By using a unique method that we call "star-earth topology", Nordost controls ground flow by lifting the impedance level of every outlet except for one (the "primary earth" outlet) by .5 Ohm. This creates an uninterrupted, straight-line AC distribution

path from the wall to each individual component, which has a significantly positive impact on your soundstage, by lowering the noise floor without any high frequency compression. If you are using US, EU, or AUS connectors, then Nordost provides both eight- and four-outlet units (QB8 and QB4). However, if you are using UK connectors, Nordost provides a six-outlet unit (QB6).

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

I think the concept of allotting a certain percentage of your total budget for certain categories such as power products, cables, or any component, for that matter, is misguided. Every system is different, and more specifically in the case of power, the AC signal feeding every system can be drastically different. It is truly up to each individual to listen to their system, diagnose weaknesses, experiment with possible treatments, and then evaluate how the improvements they hear line-up with the value they are willing to invest on solving their problem. You need to make up your own mind about the level of performance that is valuable to you. At Nordost, we have always said that customers should be able to demo our products in their home environment, so that they can make an informed decision before their purchase, and we are confident that they will hear a difference.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

All of our competitors use either power isolation, power conditioning, or power regeneration. In my opinion, in most cases this does not work and the reason is simple. Audio components and amplifiers derive their amplification process from the AC/ Mains signal that is supplied to them. Most amplifier manufactures make their power supplies to enhance the amplification process in the circuit design. When another circuit is introduced between the amplifier and the AC/Mains, it can compromise the performance of the amplifier. The solution of a large capacity battery-based power supply, on the other hand, is a very interesting and effective idea.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

When we approach power product design, as we have with each one of our QRT products, our philosophy has always been to alleviate the impact of poor quality AC power, in order to reach a “distortion-less condition”, without limiting the peak current of electronics. In order to achieve this, designers almost have to perform a balancing act. It is important not to enhance some aspects of a sound system’s performance at the expense of taking away from other aspects.

In a nutshell, what things make your firm’s audio power products different to and better than your competitors’ products?

Nordost takes a totally different approach to power products than any of our competitors. As our QRT range evolved, we were forced to develop some truly unique ideas and proprietary technology in order to stay true to our design philosophy. We were also able to incorporate our patented Mono-Filament cabling into our QBASE, QX, QVIBE, and QLINE products, which is an advantage that no other power product on the market can boast. Lastly, just like with all of our products, Nordost’s QRT range is made in the USA, which allows us to ensure the high level of production quality and the extreme precision necessary to manufacture power products of this calibre.

What do you think the next ‘great leaps forward’ in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

In the coming years, I believe that dealing with AC quality is going to be pushed from an afterthought to a necessity. The introduction of new technologies is having a huge impact on the electrical grid, causing it to become polluted and distorted. This is having an increasingly large impact on the quality of your home sound system. I think that more and more high-end audio component

manufacturers will make improvements to their internal power supplies, or will provide a power supply as an external component, in order to make an effort to provide “clean power” for their products. On our end, Nordost intends to continue our research to try to make improvements on system grounding. +





NORSE 2 CABLES

SUPERIOR TECHNOLOGY, SUPERIOR PERFORMANCE

MONO-FILAMENT TECHNOLOGY • MECHANICALLY TUNED LENGTHS • ASYMMETRICAL GROUNDING
SILVER-PLATED, OFC CONDUCTORS • EXTRUDED FEP INSULATION

NORDOST
MAKING THE CONNECTION

HEIMDALL 2



FREY 2



TYR 2



Paul McGowan of PS Audio

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Paul McGowan: I first discovered the impact of power upon audio performance in the mid-1970s, when my partner Stan noticed that larger power transformers made a significant improvement to the sound quality of preamplifiers. Go figure: it made no sense. Later, we introduced the first large, external power supplies as add-on options for high-end audio equipment, a trend which is still popular today.

With respect to add-on power conditioning, my initial introduction dates back to the early 1990s when I tried the MIT Z Stabilizer, Bruce Brisson's interesting box. This helped a lot in terms of fullness and spatial properties of the sound. It wasn't the be-all and end-all; it had limitations in that it restricted the sound, but what it did right, it did really well.

In 1995, I started wondering what would happen if, instead of placing an intrusive series filter inline with the AC power, we actually made our own perfect AC. This was when the Power Plants came into being, and that was the start of the high-end aftermarket AC power revolution.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

The very first one was called the Power Sonic, and that was introduced in 1979, if memory serves correctly. The Power Sonic was an isolation transformer. It mostly improved aspect of sonics like fullness and imaging, but had the unfortunate effect of limiting dynamics. It was certainly ahead of its time—there was nothing else like it until George Tice came out with his Power Blocks, many years later.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

Basically, they're right—in my opinion. Every product should be power factor corrected and regenerate its own new AC as we do in the Power Plant. That said none do (with the exception of the old Mark Levinson 30 series tower amps that had built in regenerators). The reason others and we don't do this, is one of practicality. In many cases the cost of the parts and real estate (chassis space) needed to pull this off properly are prohibitive—often more than the cost of the initial product.



What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

Most people believe noise is the biggest sonic culprit in AC power, and that is simply not true. Most modern audio equipment effectively ignores AC line noise. The biggest problems in AC power are the flat-topping of the AC waveform and fluctuating voltage levels.

Flat-topping of the AC waveform is common—and it matters because most of our equipment consumes AC power only at the peak of the AC power cycle, right where the flat-topping matters. This flat-topping robs our equipment of needed energy at the very moment it's needed most. Power conditioners cannot fix this problem; in fact, they can only make it worse.

Voltage fluctuations are not good either, especially when they are dynamic in nature. This particularly has an impact upon power amplifiers. As power amps demand peak current on loud passages of music, they draw down the AC power levels in the wall (because of the resistance in the wire feeding the sockets). Basically, this robs the equipment of its most precious resource right when it needs it most

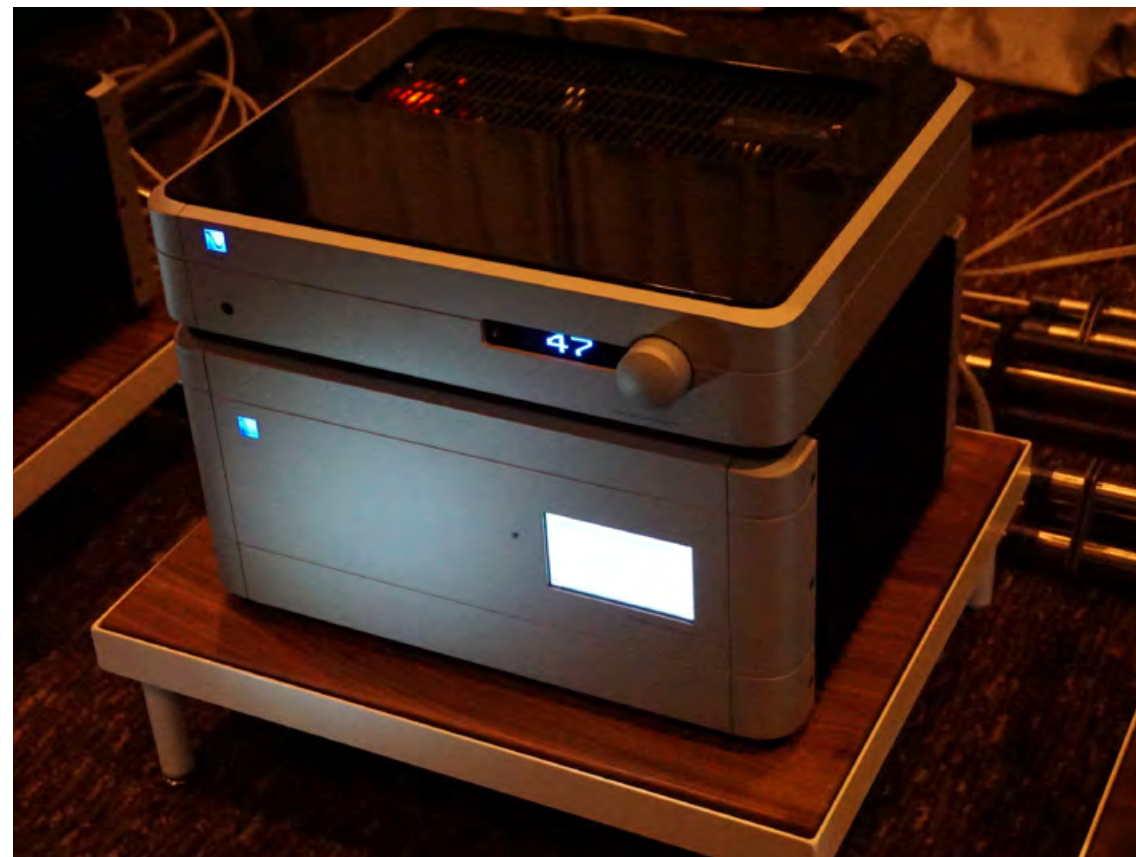
Again: power conditioners exacerbate this problem; regenerators fix it.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

I would always recommend getting the power foundation right first—and that means a regenerator, a Power Plant, not a conditioner. There are other regenerators, such as those found in sine wave UPS devices, but they often cause more damage than improvement. The simplest among them don't produce sine waves—rather, they generate stepped square waves. These are to be avoided. The next step up in UPS is the “pure” sine wave UPS or double conversion devices. These are fine for some applications, but not for products which have a low power factor, as most of today's stereo products do. Anything less than a PF of 1 will cause the UPS output to have a blip on the top of its output, resulting in more distortion than what originally came out of the wall.

There's room for other products, like those that are parallel devices, though they have little impact on noise or power purity.

If the customer wants an improvement, he or she should choose one with the lowest possible insertion loss.

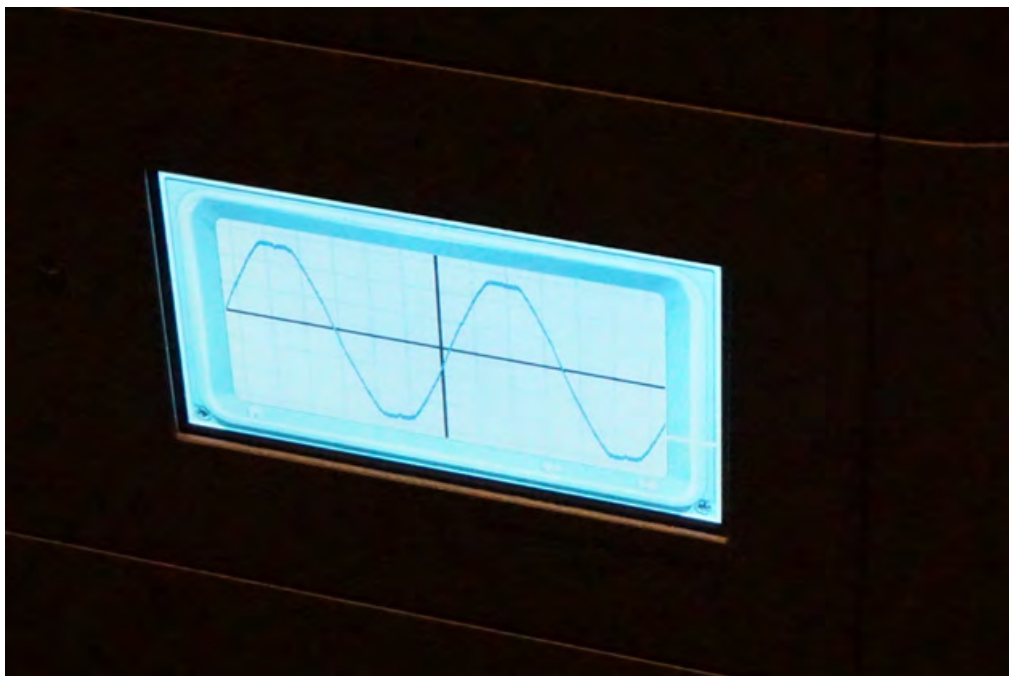


In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

The smartest thing any audiophile can do is get the foundation of AC power right first, before venturing out and populating the rest

of the system. It's like building a house: you need a strong foundation on which to build. Once you have invested in that foundation, everything else sounds and performs to its best.

I recommend 10% to 20% of total investment be spent on getting the AC right.



Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

Isolation vs. power regeneration is a no-brainer: regeneration is the way to go. Isolation transformers make the real problems of AC power worse. They achieve their isolation by magnetically coupling, which is always limiting and never improves upon the source impedance of the AC receptacle.

The goal is to have at least a magnitude lower impedance than that which was seen at the wall socket. The only way to do this is with energy storage and active regeneration. Transformers can't store the energy needed to provide peak current demands—which can average 30 amps or so—to fix the missing energy at the peak of the sine wave. A properly built regenerator has the extra power reserve available in its capacitor banks. Isolation transformers do not.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

Pay attention to what matters. AC power is getting worse, and the number of neighbours sharing a common power transformer on a utility pole is increasing, in most service areas.

Designers should focus on solving these problems in two ways

First, stereo manufacturers themselves should strive to achieve as close to a power factor of 1 on their products. The closer we get to a high power factor the less damage we do to the AC power

Second, responsible manufacturers of devices purported to fix the AC power products should own up to the fact that simple low pass filters—whether parallel or series—don't address the actual problems inherent in AC power.

In a nutshell, what things make your firm's audio power products different to and better than your competitors' products?

Ours is based on proper regeneration of the AC sine wave. Our products fix the problems that matter: replacing the missing energy at the peak of each sine wave, regulating the voltage under long term and dynamic conditions to within a tenth of a volt, and lowering by an order of magnitude the output impedance of the AC wall outlet.

A common misconception about regenerators is that they restrict dynamics, and that users are better off going straight into the wall socket with benefit of the regenerator. The truth is just the opposite. Plugging straight into the AC wall socket restricts dynamics when compared to the output of a Power Plant, which allows even a 15-amp circuit to deliver peaks of 70 amps

If customers want dynamics, bass, clarity and the purity of low distortion AC, then a Power Plant AC regenerator is necessary and always preferred over isolation transformers, power conditioners, and especially, going straight into the wall socket.

What do you think the next 'great leaps forward' in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

Hard to say. We're working on bigger, better forms of regenerators with gentler AC input characteristics.

I hope someday we can move away from low power factor pure analogue supplies with their huge mass of iron and heat. I'd love to see SMPS (switch-mode power supplies) in all products, but they are still too noisy and often don't yet sound good. +

Mike Lester of Puritan Audio

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Mike Lester: I have been a massive Hi-Fi enthusiast since my teens, devouring every magazine in print and building speaker, amplifier, and other projects, which led on to the first audio power-conditioning product I built. The conditioner used ferrite components and other parts salvaged from old radios and which was from a 1976 HiFi Answers Practical Project article entitled “Suppressing Interference”, authored by K. Thompson.

I haven’t looked back since regarding the importance of clean mains to overall system satisfaction. And although my thoughts and reasoning’s have been much refined, as indeed have the challenges changed stupendously, my devotion to the purity of the mains input to my systems has been constant.

Back in the 1970’s before every appliance, every light bulb, and every gadget had a high frequency electronic switching supply, the name of the game was simply to eliminate the interference from fridges and thermostats switching on and off and the occasional police radio break through. Today matters are much less simple with the

massive and ever increasing pollution assault on our mains supply that we have from the switching power supplies in virtually every product we and our neighbours have connected, and this in addition to the new airborne pollution from mobile phones, Wi-Fi, etc.

Whilst I have always fed my systems via a variety of my evolving filter designs I have been surprised, even shocked in more recent years at the tremendous degradation in the system performance and musical enjoyment when the conditioner is removed from circuit.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design ‘ahead of its time’?

As a company, we came to the market from a different angle: As designers and manufacturers of electronic switching products, investing in our own sophisticated interference and emissions measurement facility, we developed over decades of intense research an in-depth knowledge of how to stop the disturbances from our switching products getting out into the world, contaminating the supply and disrupting the performance of anything else connected to it. Turning this knowledge and discipline on its head we have employed our great expertise to the other side of the



equation, cleansing our horrifically polluted mains into sparkling clean and balanced condition to enable audio equipment to perform to 100% of its potential.

Our first consumer product off of the design board was a six-output box intended to take care of all of the major ill's afflicting our mains supply and was designed to provide highly effective removal of both common and differential mode interferences over an exceptionally wide bandwidth. The product rebalanced the mains to remove DC components avoiding transformer saturation and hum, cleansed the earth line, and provided a central star grounding point to further lower the noise floor, plus it ensured equal directness of power paths to each output and prevented any output from cross interfering with another. The final design aim was to achieve a price point below £1,000. All design aims were accomplished with our £995 PSM136, which—covering all bases and aspects—is all the purifier most users will ever need.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

The cost, bulk, and weight involved in properly cleansing mains and removing imbalance would add considerably to the cost and bulk of each individual audio component and would only cover a few of the array of benefits achieved

by connecting audio components via an intelligently designed mains purifying power management system.

Addressed by our independent purification systems are the cross contamination of high frequency interference from each component, the vicious way in which power amplifiers snap at power thus creating low frequency supply modulation, the imbalance caused by unwelcome DC intrusions, the status of the earth path, where it is desirable for all component grounds to be connected to a single point, and connection of each Hi-Fi component without “daisy chaining” (where connected components taking power downstream of others have their power modulated by components connected upstream from them). Daisy chaining happens with ordinary and many expensive power strips, it also still happens if you have diligently installed a dedicated audio spur with a series of wall outlets. The outlet farthest downstream from the distribution board will have its power modulated by everything connected above and each component will be sending its own switching noise to all of the others. Our power strips and boxes cover all bases, they provide exceptional removal of common and differential mode disturbances with individually conditioned output stages to eliminate cross contamination distortions and removal of DC imbalances with earth routing properly arranged and equal power direct routing, ensuring that no one component is modulating the demand from another.



What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

Dynamics, dynamics, and dynamics. The most common “misconception”, which was fuelled by poorly designed and specified, cheaply built (but not necessarily cheaply sold!), exploitative products is that mains purifiers or conditioners squash dynamics sucking the very life and soul out of the music. Precisely, and very often spectacularly, the very opposite is the case with intelligently designed and specified equipment. By my use of the term “intelligently designed” I mean that the rules for arresting and diverting undesirable content at any frequency are and have been very well known since the dawn of our understanding of electricity. To create circuits to remove undesirable frequencies from kilohertz to gigahertz and beyond, eliminating glitches, pops, fizz, and hash is very simple and well understood. To do it very well, taking the performance beyond removing just the immediately audible artefacts and going on to enhance the entire soundstage involves, in tandem with employing established design techniques and laboratory instruments, the use of the most incredible and sophisticated measuring apparatus known to audiophile mankind—our ears. Every component stage, every component value, every component construction technique, and every material has to be listened to and assessed. With

the design and favoured components established, every way of laying out the design has to be listened to and evaluated in a meticulous manner to arrive at the end product which—if executed correctly following these painstaking steps—will reward with greater dynamics, greater detail, enhanced tonal purity, a broader and deeper soundstage, plus a better, more natural, and wholly more enjoyable listening experience.



If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

When considering where to start when assembling your first serious audio system, where to allocate expenditure and what to budget, a little forward thinking is advisable:

With audio we have to look at the entire chain of connected equipment that ultimately delivers the sound pressure waves

into our ears and the very first link in that chain, the true source, is the mains power input and it pays very great dividends to ensure that this first component is correct, as it is this item that will make it possible for all of the other components to deliver their best performance.

Fortunately a correctly engineered power management purifier will last many decades and will not become outmoded. And with our highly specified products available at very realistic pricing, making an investment



In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

If we consider that a system may consist of two or three source components, a pre amplifier, and two monoblocs, there are already six items requiring connection to power.

The use of an exotic mains lead for each component could add up to a quite eye-watering sum before splashing out on a more sensible and managed interface with the mains supply.

With Puritan an investment in our £995 PSM136 (which comes with its own lead), enhanced with six of our superb (£72) dissipative technology vibration absorbing leads, would provide a very high integrity supply to all connected components, and

provide a superbly solid basis for a lifetime's adventures in Hi-Fi.

So here we have a £1427 expenditure to have to have six components connected into a pure, balanced, and coherent supply.

If the remainder of the system components cost is £5000, 22% of the overall cost would have been spent on the power supply system—but remember, rubbish in = rubbish out—and the very first thing you are putting in is the mains. If you start with the first component in the chain—namely, the raw mains power served up in a rough, distorted, noisy way, how could the rest of the system be expected to recover and perform? But consider also that this mains set up is built to last and last and will be a fantastic performer and in a £10,000 system it will represent 12% of the overall cost; if that system elevates to £20,000 just 6%, and in a £50,000 system less than 3%.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

Isolation transformers' ability to deliver punchy dynamic power is constrained by size and whilst by their nature they eliminate the presence of DC components, common mode interference reduction with a shielded transformer is a measly 10dB and a balanced transformer can only manage 20dB, meaning differential mode attenuation is totally miserable.

I have never achieved a convincing performance from any transformer configuration, finding that as one aspect improves another is compromised.

In contrast Puritan connects directly to the vast power of the grid as restricted by your local, yes, transformer, but this transformer will be huge! If you can tap into and tame this fabulously powerful resource, purifying out the rubbish, leaving you with unadulterated brute power—you have the ultimate solution.

Power Regeneration consists of a mains-frequency oscillator inputting a power amplifier to output at mains voltage, a power amp feeding a power amp would need to be a colossal affair unless for low power demand applications. Joy perhaps for the headphones brigade?

Batteries can provide tremendous instantaneous power, but battery voltage is not constant across the discharge cycle and to keep a trickle charge to keep the battery near peak charge would defeat the object of a pure chemical power supply. If you look to voltage regulation to manage the discharge cycle, we come back to electronic switching noise from the regulators. Plus it should be remembered that batteries are not noiseless; their chemical reactions produce artefacts, which ideally should be cleansed out.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

You need to study the electrical and electronic skills inside out but this is only the start... As with all Hi-Fi components it is the sound that matters and at the end of the day, only the sound: The sonic ability to convey the emotion, glory, passion, guts, and joy of a performance.

First and very foremost you need to have a undying passion for music and an interest and an ear for how music can be reproduced very, very well to convey a glimpse of what the artists, engineers, and producers intended. Whilst it does not matter particularly what styles you prefer, you should have a tolerance for listening to all (OK, most) musical genres. If you will only ever listen deeply to techno, how will you appreciate if a solo acoustic instrument sounds convincing, or if a naturally recorded vocal sounds natural or whether the majesty of an orchestra is being conveyed in a great or in a mediocre way? You should strive to keep the “calibration” of your ears up to date by going to live acoustic recitals and concerts. (Oh yes, and conversely if you only ever listen to acoustic ensembles, how will you understand a system’ ability to punch an outstanding techno or thrash groove?)

Having kept your ears trained you should listen to as much and as many “Hi-Fi” systems as ever you can—compare and contrast, tune your ears into understanding what is good and what is not, learn what approaches a perpetual nirvana and what is merely a soon-to-pass gratification.

In a nutshell, what things make your firm’s audio power products different to and better than your competitors’ products?

We understand in great depth the extraordinary contribution that the first component in the chain, the mains power in, makes to the overall experience from an audio system.

We continuously strive to deliver a product range which is capable of delighting not only the most well-heeled aficionado at whatever level of system they have invested, but also, by ensuring that those same products, with their tremendous attention to detail and rock solid engineering, are available at real world pricing, so that the more down-to-earth Hi-Fi enthusiast can also bathe in the glory of the power provided by our products.

The sheer level of engineering, innovation, and value provided by our ranges provides a new benchmark for this section of the industry. Not content to offer stock solutions we invest massively in R&D to provide even more highly innovative solutions.

In the field of mains cables our materials research has been ingeniously applied to address and resolve the problems related to getting power from the wall to your equipment with full dynamic authority, vanishingly low noise, and with the elimination of vibration distortions.

Mostly, we are a totally audio passionate company with an intense focus and pride to ensure that our products are not only technically innovative and superior in technology with superb construction and materials, but that they also represent tremendous value for money enabling modestly investing audio enthusiast to enjoy our efforts and super system owners to feel highly contented at having made such a phenomenal upgrade for such a reasonable cost.

What do you think the next ‘great leaps forward’ in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

The sheer power available from the mains is alluring, addictive, and if correctly treated, very highly effective and from this viewpoint it is hard to find a convincing alternative path to stray to. That said the colossal problem of the ever-increasing interference and disturbances burden placed into our mains and into the air would present greater and greater problems.

We remain dedicated to ever-increasing perfection of our mains purification power management systems to enable audiophiles to gorge on the vast instantaneous power available straight out of the wall, exploiting the full power and glory available on tap in a highly refined but power undiluted form.

A very great focus of our most recent research has been into the problem of the massive increase in airborne interference, also focussing on cable-carried vibration-induced distortions. We have been working with materials technologists to develop a cohesive solution to both of these problems as they effect and can be corrected within mains cables. First, we are looking to produce an advanced innovative cable screening material which, through resistive attenuation paths, burns up interference rather than using the usual conductive screening method to capture it and dump it untreated into the common signal ground, thereby polluting the signal path. Second, our material technologists have been developing optimised primary and secondary insulation materials for superior dielectric performance combined with considerable vibration-deadening and absorption properties. Our further tuning and refinement of dissipative technology and vibration distortion control material will bring increasing enhancements in this product range. +

Wolfgang Meletzky of Stromtank

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Wolfgang Meletzky: It was about twenty years ago that I recognized that the quality of the AC power grid had a remarkable influence on overall sound quality. I wouldn't say I was surprised. The industry had begun investigating many areas that were previously unexplored and found great avenues for improvement. As one of the two signals in an audio system, the other being the music, it made perfect sense that we could make vast improvements in performance with the right approach.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

Our first audio power product, the STROMTANK S5000, was premiered at CES 2016. The STROMTANK S5000 is an independent power source. The STROMTANK S5000 disconnects the audio system from the grid and provides a perfect AC signal from the included 16 LiFePo4 batteries. We found this method to be far superior to the typical approach of conditioning or regenerating the existing AC power signal coming from the grid. Only when a system is completely isolated from

the AC grid can you completely eliminate the negative impact the AC grid has on sound performance.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

The power supply section in an audio component is designed for best sound quality. It is nearly impossible to add all of the required circuitry for ideal power conditioning. This is true from an engineering, size, and cost point of view. Even if feasible, the result would still include connection to the AC grid. A specially designed power product isolating the system from the AC grid is the only way to guarantee the best sound possible.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

Most people think that because everything turns on and works that the AC grid is providing an ideal signal. It should be a pure sine wave, with no distortion, no high frequencies harmonics, and stable in frequency and amplitude. Unfortunately, this is not often the case.



What you have to keep in mind is the fact that the AC supply in your home is part of a large electrical network. Everything connected to the grid from residential and commercial customers adds electrical anomalies to the AC signal. The AC grid is also used by data communications equipment. For normal electrical usage, these anomalies have no effect. However, for high-resolution audio systems, these distortions are audible and limit the potential of your audio performance.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

I would suggest that someone focus on upgrading power cords first, connected to a high quality power/extension strip. From there, move to a power conditioner and then to the ultimate, the STROMTANK S5000.

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

Depending on the system resolution capabilities, I recommend spending between ten and thirty percent of your budget for power products.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

Properly designed, all of these power products can help improve the AC signal and subsequently, the sound of an audio system. However, all of these products are still connected to the AC grid. They cannot address all of the AC grid's issues as they are still interacting with the grid.

Creating your own AC voltage is the only way to truly address the degradations introduced by the AC grid. This is the reason why we are using high performance LiFePO4 batteries in combination with a pure sine wave converter. Regardless of what happens with the electricity from the power company, your system is unaffected.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

My philosophy is to attack a problem at its core. Trying to apply a bandage to a problem does not address the underlying issue. That is the design philosophy, regardless of the application, that I would encourage a new designer to embrace.

With STROMTANK, the issue we recognized is AC grid irregularities. Our solution was to completely disconnect from it—addressing the issue at its core!



In a nutshell, what things make your firm's audio power products different to and better than your competitors' products?

As I mentioned before, the STROMTANK S5000 generates its own AC voltage signal from batteries that are recharged under the control of multiple microprocessors. Once charged, the disconnection is done by an internal power relay. A pure sine wave converter supplies the audio equipment with clean AC power for several hours of listening time.

For longer, higher power listening sessions, the STROMTANK S5000 can be switched to hybrid function. In this function, the

audio system is AC supplied by the grid and the battery. The battery power converter activates an active filtering of the AC input current from the grid.

What do you think the next 'great leaps forward' in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

We think that we are the "great leap forward." The STROMTANK S5000 is at the cutting edge of power products. Going forward, battery power will be the new standard in AC power products. +

Ted Denney of Synergistic Research

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Ted Denney: Back in the early 1990's I had a Taiwanese distributor who kept asking for power cords. At the time I had never really considered that power cords could make a meaningful difference because the ones I had heard did not. As fate would have it I was developing new speaker cables and one design, that did not sound particularly good as a speaker cable, seemed like it might fit the bill as a power cord so I reworked it for high current and voltage, terminated it with a wall and IEC plug, and tried it on a power amplifier and DAC and was blown away by the improvement in sound. That cable went on to become the original AC Master Coupler selling over 15,000 units.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

My first power product was the original AC Master Coupler of 1993. At that time I was still living in my original factory, sleeping on a futon, cooking with an electric hot plate, and working 90+ hours, 7-days a week because I could not afford rent for an apartment and some nights I'd go to bed hungry because I did not have enough money for food. Then

one day in 1994 I got a fax from The Absolute Sound (I had no idea they even knew who Synergistic Research was). It seems Brian Damkroger had penned a review, the first review Synergistic Research had ever received, and it launched Synergistic Research. I can still remember the quote, "Power cords. They can't possibly make a difference, can they? The answer is Yes. Unequivocally, resoundingly, and oh my, Yes". Six months later I moved out of my factory, bought a used car, and so began my new life as a recognized cable designer.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

Before I invented and patented the Electromagnetic Cell I believed a properly designed component's power supply, fed by a high performance power cord, was all that was necessary for top performance. In fact all power conditioners I had heard to that point limited current in some way, with benefits coming as a trade off in lost dynamics, and in extreme cases, lost resolution. Then ten years ago I got an idea for a new way of conditioning AC without the traditional obstacles of chokes, transformers, and components in the AC signal path that limit peak current on demand. I envisioned a





new way of conditioning AC using differential fields with a parallel ground plane outside the AC path so, no loss of current on demand. In fact the better your components and their power supplies, the better your system sounds. With a PowerCell delivering clean unlimited power, your system delivers its peak performance potential.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

Many people think peak power, or clean power means a perfectly stable AC voltage with adequate current to drive their system. And while this is true at some level, there's more to 'electricity' than just current and voltage. After all, that's what a properly

designed power supply does, right? The PowerCell is different because it conditions AC at a Quantum level through the use of differential EM fields, the Earth's Schumann resonance, and a parallel ground plane that conditions electricity at the electron level to fundamentally change the nature of electricity versus the direct wall connection. And because the PowerCell's EM Cells act as super capacitors to store energy, they deliver additional peak power when music demands.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

It is best to start with good quality power cords if you want your system to sound its best. People who have listened to different power cords already know that a power cord can make or break the overall performance of their systems. They also know that no matter which power conditioner they use, they still need upgraded power cords for optimal system performance. This is why we recommend people start with power cords and then add a power conditioner when they are ready to make that investment. That's why we manufacture power cords that are affordable and yet powerful enough to transform the performance of any system. This is also why we make our cables available for people to try before they buy, so there's no risk. Then after you have a full loom of SR power cords (or another power cord better than stock) we recommend people either try our V8 PowerBlock, PowerCell

8, or PowerCell 12. The combination of SR power cords and SR conditioning can be the single biggest contributor to overall system performance and we guarantee this or your money back.

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

Any system, no matter how expensive or inexpensive it may be, needs clean conditioned power with upgraded power cords if a holographic sound field and timbral accuracy is the goal. To this end we manufacture different levels of power conditioners and power cords that do not limit current and dramatically transform system performance, and we make them available for people to audition so they can gauge their return on investment, picking the proper level for their system and budget.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

PowerBlocks and PowerCells are best classified as power conditioners as this is what they do; they condition power. PowerCell 12's also isolate power between two banks of six outlets per bank so you can separate digital from analog components, or high current amplifiers from the rest of your system. For people who live in areas with wildly



fluctuating power and voltage, an increasingly rare phenomena in modern western societies, a voltage regulator or battery back up may be needed but again, this is highly irregular. Because SR power conditioners do not limit current they can be used downstream from either voltage regulators, or battery systems for a dramatic improvement in system performance, especially a system's ability to create a holographic soundstage, which is

often compromised especially when powered by batteries.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

The less you place in the signal path, the better. Properly designed audio components

already have adequate power supplies that regulate voltage and store current for peak demand. There really is no reason to add an additional layer of the same technology found in the power supplies when designing a line conditioner. The next generation of cutting edge designers will apply quantum principals to their circuits as opposed to simply baking a slightly better cake using the same old EE recipes of the 1950's.

In a nutshell, what things make your firm's audio power products different to and better than your competitors' products?

Synergistic Research power cords employ a host of patented and proprietary technologies like UEF and Active Shielding so they function like power conditioners with increasing levels of complexity and exotic materials. Each level of SR power cord is voiced to a specific system type so our less expensive power cords (and interconnects and speaker cables) can actually outperform our more expensive models when systems are less than ultra high end. PowerBlock and PowerCell line conditioners condition AC without limiting current through our patented Electromagnetic Cell technology. In fact systems and amplifiers sound more dynamic when powered by our line conditioners than they do when plugged directly to the wall. All Synergistic Research products share a house sound of transparency, holographic realism, and musicality so as you add additional SR products to your system, each new entry strengthens prior SR purchases to create musical system performance that exceeds the sum of its parts.

What do you think the next 'great leaps forward' in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

That's for us to know, and for you to find out! +

Kevin Main of Torus Power

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Kevin Main: Like so many audio/video enthusiasts, I hadn't really given much thought to the performance improvements that can be realized by focusing on the electrical supply powering the equipment until I first tried a Torus Power unit on my 2-channel audio system. I always thought that purchasing good quality components would be the best path to high performance, but when I tried the Torus Power isolation transformer on my system the difference was instantly audible, and significant. The system came alive with improved imaging, a wider, more open soundstage, improved definition of vocals, and better bass attack. I was stunned at the differences and wanted to learn more. I tried the Torus Power isolation transformer on my theatre system and saw the same improvements plus it improved the video performance dramatically. The colour fidelity and separation was dramatically improved, there was less video noise, and the blacks were darker. The improvements were astounding.

Since that time, I have heard many knowledgeable people talk about similar performance improvements when using Torus Power products, and I have been

involved in hundreds of projects using Torus Power as the foundation for providing clean, regulated power to high performance audio, video, and control systems. Every time the results are fantastic.

It would be accurate to say that I am a big believer in using a Torus Power isolation transformer as the power foundation for any high-performance audio/video or control system.

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

In 2004 we designed the RM 20 Power Isolation Unit for audio & video systems. At the time, we had spent more than 20 years designing and manufacturing toroidal transformers for many notable audio companies for use in the amplifiers and other components these companies were manufacturing. We had built a reputation for our design and engineering as making the best toroidal transformers available, and our founder, Howard Gladstone, felt that our technology and expertise designing toroidal transformers could easily be extended to manufacturing a high-performance power isolation units for the audiophile marketplace. The product extension was natural for us, and before long our new RM 20 power isolation unit was winning awards



and getting critical acclaim from reviewers. Our approach and design was different from other companies manufacturing power conditioners at the time, and the timing turned out to be very good. We believe that using an isolation transformer as the foundation for power supplied to audio/video systems is the best approach. The isolation transformer electrically isolated the audio/video system from everything else and provides its own power foundation as the starting point for performance. Our design also uses state of the art protection for connected equipment, but it is primarily the performance benefits that make us different. Other companies focus on conditioning the power line to reduce noise. We take a different approach by completely isolating the audio & video equipment to provide the best foundation. This has proven to be a good strategy for us.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

I wouldn't say that the consumers are wrong. What I would explain to the consumers is that the power supplies in audio equipment are designed and used for a different purpose than power isolation components. Consider that when building an amplifier for example, designers and engineers must consider the complete design from the power supply right through to the output devices that are being used. The power

supply is only a part of the equation, and only a part of the cost. The power supplies are usually sourced from an OEM company to provide the required power for the unit to perform its primary task of amplifying sound. In many cases, an accountant can have as much say, or even more say than an engineer in the design of the finished product, because manufacturers are often trying to reduce the cost of raw materials used in building products. In some cases, even sales & marketing gets involved to build a finished product that will sell at a specified price point.

Our products are designed differently, and we use proprietary technology and designs. We are designing units to isolate the incoming power to the other components and the end result when using Torus Power is that the other audio and video components are able to perform to their maximum capability.

We find the best results are obtained when a specialized product like Torus Power is used to isolate the incoming power and provide the quietest background for the audio components.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

The biggest single misconception that we hear from consumers, and even from





manufacturers, is the belief that audiophiles should not plug an amplifier into a power conditioner because it will restrict the current available to the amplifier and reduce the performance. This misconception stems from years of using power conditioning products that are not designed for dynamic loads like amplifiers have. While that still holds true with many power conditioners on the market, that is not the case for Torus Power products. Our products are designed and engineered specifically for use with dynamic loads, and our performance does not disappoint. A power amplifier benefits from a lower noise floor and clean power more than any other single component. We have over 35 years of

experience designing toroidal transformers for audio amplifiers... we know what it takes for an audio amplifier to perform at its highest capability, and we design all our products to be used with amplifiers.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

The starting point for us with any customer is the equipment that the customer owns now, or is planning on purchasing in the future. We start by performing a load calculation of the customer's equipment.

We look at the power consumption rating of each component in the system and then we match the Torus Power isolation transformer to the power consumption for optimum performance.

In some cases, the starting point might be a 15A or 20A isolation transformer for a modest hi fi system, but in other cases it could be a larger, more powerful unit like a 60A or 90A isolation transformer, or even larger. In every case we match the power solution to the system... that is the best way!

The beauty of the Torus Power product line is that we have solutions ranging from 5 amps all the way up to 300 amps. This means that we can specify a solution for a modest 2-channel audio system all the way up to a high performance, dedicated home cinema with multiple audio racks and equipment valued well into the \$millions. This is what makes us unique. We have a history of building products for use in recording studios that can handle all the electronic components in the entire studio. So, whether it is one 15 or 20 amp unit that is required, or multiple larger units to drive a large audio system with multiple power amplifiers, or a large home or professional cinema, we can provide a great solution with Torus Power.

In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

It depends. We normally see a budget of between 5% to 15% reserved for the power foundation of a system. In some cases, however we have customers who realize the importance of providing a strong foundation of power and they will often look at Torus Power products without being limited to a percentage of the system cost. When we recommend a Torus Power solution it is not based on a specific budget, but rather we base our solution on the equipment being used in the system and the performance benefits that will be derived. In general though, I would say that 10% is always a good starting point, as that ensures that there will be a focus on the power delivery system and it will be part of the solution. From there we can massage the budget based on the specific equipment in the system.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

There are different benefits to each power delivery approach. Power regeneration does a fantastic job at eliminating noise on the power line, but does not work well on dynamic equipment like amplifiers. Power conditioning tends to focus on noise filtering and protection, but there is such a wide range of solutions in this category. Some power conditioning solutions are very good, while others are not really performance minded solutions. We chose power isolation because it provides the best of all solutions...

very good noise filtering, exceptional protection against voltage spikes and sags, and terrific dynamic capability for use with amplifiers. Power isolation is the foundation of our business, so of course, we believe it is the best approach.

We also get involved in many projects with large capacity battery-based power supplies. Combining large capacity battery-based power supplies with Torus Power isolation transformers is something we see quite often in large automation projects and it adds a level of reliability to the overall system that is desirable. Of course, the battery technology is evolving and we are anxious to see new solutions enter the marketplace as the technology progresses.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

At Torus Power, our products are engineered to perform and protect like no other. So, this is the foundation for us. It starts with performance. Every product is built to be the highest performing product in the category and that is why we use toroidal isolation as the foundation for every product we make. Each model we make is designed with a massive isolation transformer at the heart of the product. This also gives us the foundation for the ultimate protection against voltage fluctuations that are very common. When you use an isolation transformer as part

of a power delivery system that includes voltage regulation, series mode surge suppression, and transient voltage surge suppression, you really have the ultimate solution. This is our focus. If we were coaching a designer new to the field, we would encourage them to look to performance and protection as the starting point of any design strategy.

In a nutshell, what things make your firm's audio power products different to and better than your competitors' products?

There are several things that make Torus Power different than others in the category. First, by using toroidal isolation as the foundation for our products, we are different, and this allows us to focus on performance and dynamic capability, meaning that our products are designed to be used with power amplifiers and dynamic loads. In addition to that is the overall scale of our product line. We are unique in the fact that we can provide a great power solution for a moderate 2-channel audio system all the way up to a high power, multiple channel, home cinema that could cost \$millions to design and build. We are scalable. Finally, we use multiple layers of protection for connected equipment rather than a single point of protection. This means that even the most expensive systems will be protected at multiple points from voltage problems.

These are the design philosophies that mould our product solutions and our business



What do you think the next 'great leaps forward' in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

There is no doubt that our category will continue to grow and evolve in the coming years. There are new technologies such as whole home battery solutions that are being developed, and these technologies will certainly become part of the offering in our category in the coming years. Changes in products and technologies are necessary in any product category, and this on-going change is what challenges companies to innovate and develop better solutions. We look forward to working hard to earn our business tomorrow, and in the years that follow. +

Steve Elford of Vertex AQ

Hi-Fi+: How and when did you first discover that specialised audio power products could beneficially affect the sound of hi-fi systems? Were you surprised by the discovery at the time?

Steve Elford: I first discovered the basic principle that the quality of a power loom can affect sound quality way back in the mid 1990's. Using only standard mains leads I could hear great benefits if I carefully cleaned with a good contact cleaner all the plug pins, fuses, and even the contacting parts of mains sockets. Interestingly, I found that it was not only the live and neutral contacts that mattered, but also all the Earth contacts. And yes, this was a nice surprise at the time, as my then modest system made considerable gains in transparency and musicality just for the cost of a bottle of Caig Deoxit.

I also discovered little things like having a big 'birdsnest' of mains and signal leads behind the system was robbing some performance, and so too was the common connection of noisy items such as video players (back in the day!). Clearly there were interactions occurring here that were robbing performance. Was it noise coming from these other items? How was it getting in and could I do anything much to stop it? Organizing of course was part of the answer, tidy-up and simplify, and get non-hi-fi items away from the system where possible.

Then of course I popped in a couple of better quality mains leads and heard yet further improvements. There was definitely something in this!

What was the first audio power product you designed, what did it do, and when did it enter the market? Was it a design 'ahead of its time'?

The first mains product from Vertex AQ came on the market in 1999. It was the basic Jaya shunt mains filter. This simple product was actually a very significant part of our brand development because it also addressed the problem of vibration and microphony within filter circuits. Let me explain.

As well as researching the issues of power and power conditioning in the early days, I also studied the problem and effect of vibration in audio systems. I realized that hi-fi components were sensitive to vibration; some of their circuits suffered from microphony. Part of the answer to the problem is proper support racks and shelving of course, but I found ways in which we could apply treatments directly to the offending circuits within a component, with clearly audible improvement—particularly with the mains and power supply sections!

When we applied such treatment to a simple shunt filter circuit, as a standalone product, it brought a significant performance



differential. So we had a simple, small product that sounded great for the price. And being a shunt filter it simply plugged into an unused adjacent socket. And frankly many customers were amazed with it—it almost seemed magic how it worked, although it was not inline with anything. Basically it was 'shunting' noise from the live to ground, and not behaving microphonically in the process. Furthermore, adding another one or two Jaya filters into a system's loom, in different locations, would quieten the whole network with great results.

Some consumers believe that the power supply sections of audio components should be responsible for handling power conditioning and noise isolation tasks. Are they wrong and if so, what are they missing?

Firstly, it's not totally wrong to expect internal power supplies to perform well under all operating conditions, but actually that's hard, and expensive. By far the biggest part of our Aletheia DAC designs are the power supplies—they're incredibly expensive and complex with input conditioning, a custom mains transformer, very high quality rectification, then a first stage voltage regulator, followed four second stage regulators, all discrete components and hand built. But you can still hear the difference in mains cables and external conditioning!

One of the simple facts is that if you don't pre-condition the mains then RFI noise will get into the component through the input wiring and radiate inside the box before it

gets to the power supply circuits. At 'Wi-Fi frequencies' noise is incredibly pervasive, easily jumping between conductors and around casework. Always better to try and stop it getting in.



Another factor at a system level is the issue of vibration, particularly down Earth lines. One problem is that usually the negative outputs of a power amp are connected to Earth, but also to the voice coils of your loudspeakers. This introduces the vibration of the actual musical program into the Earth wiring and straight into all the ground wiring of all your component's circuit boards, literally shaking everything!

The internal power supplies can do nothing to stop this pollutant, but a set of Vertex mains cables also absorbs vibration on the Earth lines, preventing this particular problem and bringing a very worthwhile performance improvement.

What would you say are the most common misconceptions that consumers (and perhaps audio journalists, as well) hold regarding audio power products? What basic knowledge would you want to impart to us all?

Well, the first misconception is "how can the last couple of metres of mains lead make any difference to 50 miles of cable between me and the power station?" The answer is mains leads will make a huge difference because of the way noise, and vibration too, travel around and between your system's components—one component polluting another through the mains loom. And if you

are using any form of conditioning then it's effect right at the component will be better if the cables are better.

Another one is "one big mains conditioner is all that is needed within a system. It will surely stop everything bad passing through to the system, giving pure mains". Not so in our experience. Firstly, an aggressive in-line filter with high impedance can 'slug' the sound. The highest sound quality in our opinion, for the same overall budget, always comes with the use of multiple smaller filters, and good mains cables.

And there are two final big piece of the jigsaw here that people find hard to take on board initially. One is that component power supplies and mains products are all hugely microphonic. And mains leads, being thick metal conductors are great at conducting acoustics right into these sensitive parts. That is why all the Vertex AQ mains cables and other power products contain acoustic absorption treatments to significantly reduce this problem. The second is that screening cables is nowhere near as effective as using EMI absorptive insulation to deal with radiated electrical noise.

If talking to a customer who owned no specialised audio power equipment of any kind, what would you recommend as a logical and rational upgrade strategy? What should be the starting point, etc.?

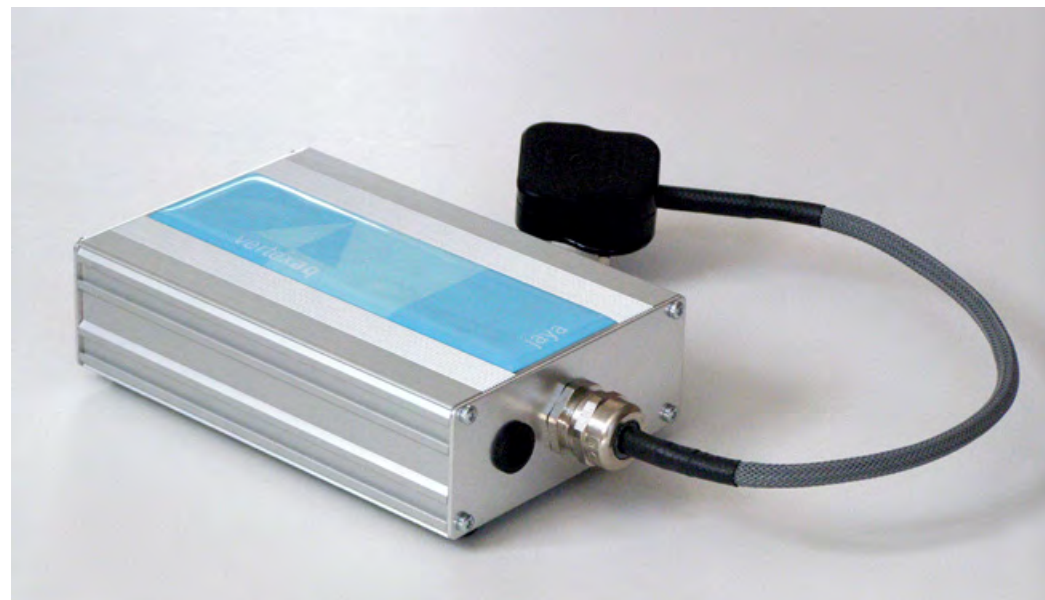
We have a lot of product variants in the Vertex AQ range, which enables our dealers to really tailor the starting point and upgrade path for

every customer. And according to the type of system and the problems it exhibits, the recommendations will always be different.

If we assume a fairly simple system with conventional mains cables and a distribution block then the first recommendation might be one of our Taga distribution blocks. The Taga has great quality wiring and connectors, and also contains one of our shunt filters and an acoustic absorption module. So the Taga gives an all-round performance boost and provides a good central hub to then go on and later upgrade to Vertex AQ cables—both as an input to the Taga and then cables feeding the components, delivering a huge amount more performance.

If the system is more serious, and maybe already has expensive mains cables from another brand that the customer wanted to keep, then the recommendations would be more towards one of our higher-end balanced distribution blocks or 'full-on' Aletheia balanced conditioners. These are extremely capable units and offer exceptional performance with their balanced mains outputs.

Customers also add things like extra Jaya shunt filters, in unused wall sockets for example. Here the principle is that a few extra pre-filter points lowers the noise floor further around the mains loom giving a real worthwhile improvement in blacker backgrounds, fine detail, tonal accuracy, and soundstage layering.



In rough terms, what percentage of the total budget for a hi-fi system do you think should be reserved for power products? (The answer may be system dependent, so we are looking for a 'general case' recommendation.)

This is a question that I really don't like to be honest. It's far too simplistic. It suggests firstly the scenario of a customer arriving at a dealers, with a fixed budget, who is going to buy a whole system! Not that common these days I don't think. But if that was so then it also depends on the size of the budget. You could say for a small budget (up to £4k) then spend 15% on the mains products. This customer is going to have to spend enough of his budget to get some sensible entry-level main components here. But triple that spend to

£12k and I can think of some actual examples where the best overall results deployed about 30% of the budget on mains products.

But of course most scenarios are down the way a little bit, when someone has established a serious collection of main components and is looking to maximize the latent performance of his system. Then the cost of a big mains component might be in the same order as the cost of one of the other components, and its cost is considered in that way—as a component outright, not part of an accessories budget. Here you can still do a percentage equation of course and maybe generally were still around the 20–30% region overall. The point is that in a

very well sorted serious systems the spend on mains components would typically be higher than people might imagine.

Power isolation, power conditioning, and power regeneration: How do you weight the merits of these approaches. Also, what do you make of the idea of very large capacity battery-based power supplies?

Wow, now there's a heavy debate!

First we don't do power regeneration. It has its place for sure as an option to consider where voltage drop is a significant issue. But we're not convinced in its application as a low noise source—we feel we can usually hear RFI artifacts in the sound quality with such machines. And unfortunately such devices, which are essentially big 50Hz power amplifiers, seem to suffer with reliability problems. I guess they are doing a lot of work and as such are susceptible to simply wearing out or breaking down.

Subtle power conditioning, using parallel 'shunt' filters seems to us to be a very sensible, cost effective tool in the arsenal. Employing passive EMI absorption and anti-microphony treatment on shunt filters gives a very sweet and open sound without any noticeable negatives that you can get with other filter types.

And we do isolation too. In some of our top products we employ very high quality custom designed isolation transformers. They are very low microphony and with their naturally balanced output give a truly great result.

We've never really been taken with the idea of battery power supplies. When we've listened to them we didn't feel they were offering much more than a well set up Vertex AQ mains loom and conditioners. And battery systems are very expensive and not an easy ownership proposition. Good to see perhaps for the ultra purist, but not a great proposition for most hi-fi manufacturers and customers alike.

What are the key elements of your audio power product design philosophy? If you were coaching a designer new to field, what aspects of design would you encourage them to focus upon first and foremost?

The key elements of our products design philosophy are RFI/EMI reduction, and use of anti-vibration techniques. And the first place to start with a new designer would be to get him/her to experiment with these concepts actually inside the design of a few basic hifi components. When you hear how performance improves if you lower microphony on a voltage regulator, or absorb



stray radiation near a DAC processor, you 'get it' as they say. And you find out how these damaging artifacts sound—microphony tends to blur the timing of music and RFI/EMI noise tends to harden the sound and lose fine detail and imaging.

Then as you move to designing a power product you can experiment with these principles, creating a well-balanced design with good cost and performance tradeoffs and also the best repeatability of performance in different systems. One of the things we pride ourselves with at Vertex AQ is that all our products perform very consistently wherever they are used. By tackling a combination of effects you get a more successful product line.

In a nutshell, what things make your firm's audio power products different to and better than your competitors' products?

Well I always shy away from saying our products are 'better' than some of our top competitors out there. I think our products

deliver a great solution to power issues at their price points. And we have a lot of ways for customers to start on the Vertex AQ ladder and slowly upgrade successfully. I think where we really are leading is when a system gets a well thought out application of Vertex AQ products, its performance grows into a very well rounded result where pace, timing, detail, imaging, and stability all become world class in our view.

In terms of what makes them different then it's definitely how we combine our RFI/EMI treatments and anti-vibration techniques. I don't think any other manufacturer does it so extensively and coherently as we do.

What do you think the next 'great leaps forward' in audio power products will be? How do you think power products will be different five years from now? Or will they be different at all?

That's a tricky question to answer. My crystal ball is a bit foggy right now but if I was to take a punt I think improvements might come from two areas. One may be new parts coming onto the market (such as capacitors) that may offer usefully better performance or lower cost, or both. The other may be improvements in passive EMI absorption techniques. EMI absorption technology is driven by the defence and medical sectors; it's mightily expensive at first and we have to wait for that to flow down and become more affordable. But without giving too much away it's something we at Vertex AQ always keep a close eye on! +

Audio Cable Upgrades:

What do they do and how much do they cost?

Nicholas Ripley

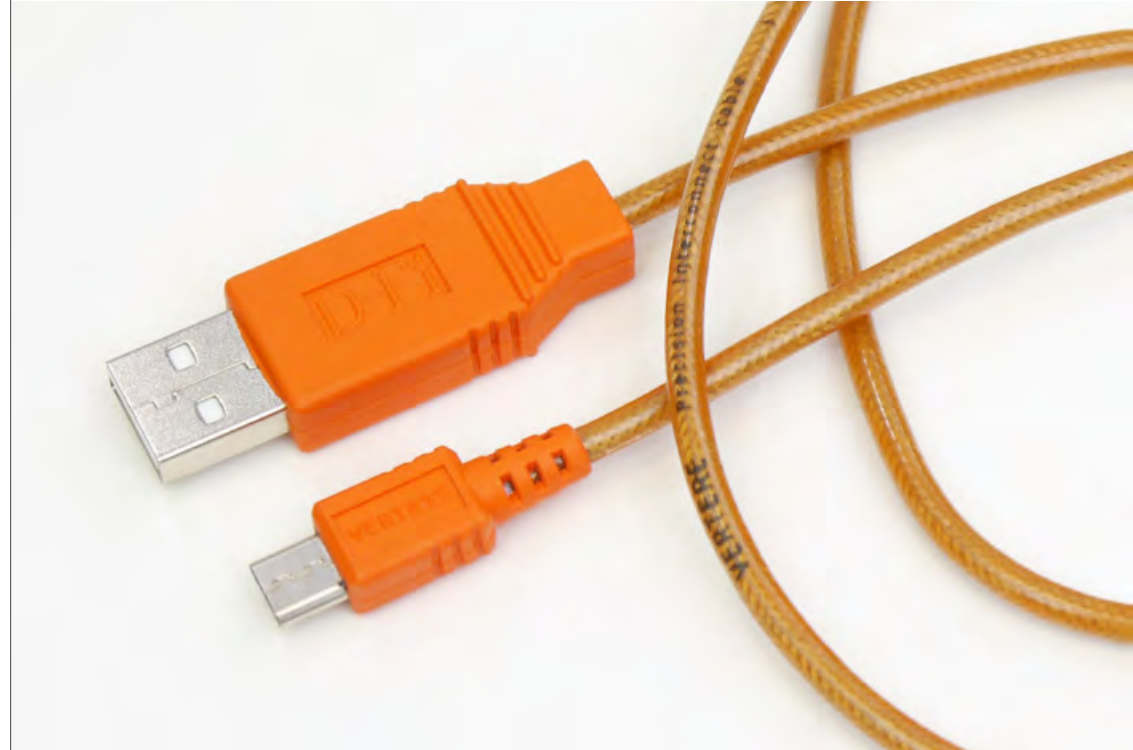
In the minds of many audiophiles, simply swapping cables can change a system for the better, can make it a lot worse, or can even transform a system. Done correctly, such changes can be a revelation: incorrectly, they lead to a whole lot of 'meh!'

The problem, in part, is there are many conflicting and contradictory ideas underpinning the ethos of different cable designs (and designers), and those ideas don't automatically work together in harmony. How do you work out precisely what is right for you?

The two broadest approaches to cable upgrades could be defined as 'piecemeal' and 'systemic'. The 'piecemeal' approach begins and ends with the specific component you are looking to upgrade. It is designed to bring out the particular strengths (or reduce the significance of the weaknesses) of a specific component, and pays little or no attention to the performance criteria of devices up or down stream, assuming those devices are a given, are treated with the same degree of consideration, and that the output of one device does not in any

way alter the characteristics of another. This was the prevailing system 'infrastructure' design until the early 21st Century, and is still very popular.

Recently, many have adopted a more 'systemic' approach to this aspect of system design. This means using the same cable designs throughout the whole system, and that usually means the same brand, or even a specific 'family' of cables within a brand. The idea behind this is not necessarily about resistance, capacitance, or inductance of the cables matching one another (because any such consistency in cables is outweighed by the differences in input and output impedance between devices). Instead, it is about controlling problems like countering radio frequency interference from external sources, or electromagnetic interference especially from mains-borne sources. The concept is that by making the cables connecting to each component in the system consistent in their RF and EMI rejection, they will make the system behave in a more synergistic manner. This has become more of an issue in recent years, as Wi-Fi and cellular telephony have gone from being a





Regardless of broad approach, an important consideration is to determine precisely what you should and shouldn't be listening out for when trying new cables. In many respects, the worst way of choosing cables of any description is to think of them as compensating tone controls. A dark-sounding cable with a rolled-off treble will 'slug down' the high frequencies of a bright-sounding source for example, but this should be considered a method of last resort to balance out an otherwise-uneven system sound. In most cases, however, you will have chosen equipment with a sound you like, with a performance that is evenly balanced (or at least balanced to your tastes), and that therefore has no need of additional tone shaping. What then?

Ideally, you should listen at first using a combination of fast A-B swaps, then later after living with the cable for a longer period



of time, and then listening to the changes made by its subtraction. Adding a cable or cable system into your audio signal chain will create potentially big changes in the overall sound of a system, typically in improved detail, the clarity of the midrange, frequency extension, dynamic range, micro-dynamics, soundstage size, and stability of instruments within that soundstage. Sometimes such differences are minor, sometimes fairly significant. The problem is in some respects we can get wrapped up in 'change' and overlook whether that change is for the better or the worse.

This matter of 'better/worse change' is where the longer-term listen is so important. You will have an understanding of the basic changes the cable makes through those A-B swaps, but then listening to your system with the cable (or cables) in place—without swapping and without intense 'attentive' listening—for several days gets you acclimated to way the cable performs with your system. Then, by removing these cables and replacing them with what you had



before and listening again soon after, you get a better idea of whether your prospective new cable is mere a change or an actual improvement. Typically, a cable that offers a 'change' will frequently appear to have better individual aspects of performance (for example, a wider soundstage), while one that offers an 'improvement' tends toward a more holistic and coherent system performance. There is no definitive answer here because some are prepared to sacrifice a more balanced overall presentation for impressive individual aspects of performance. I would go with the more holistic approach now, but in the past have focused on soundstage width, depth, and height, and a greater sense of detail.

An important aspect here is trying to find pieces of music that highlight cable changes



in the A-B testing, but then abandoning that process during the longer term listening for playing all kinds of music you enjoy. Music that is best for determining cable differences are generally relatively simple, well-recorded pieces with few instruments and a natural acoustic. Rob Wasserman and Jennifer Warnes' 'Ballad of a Runaway Horse' [Duets, MCA] is extremely good for determining cable differences in A-B testing, but a more musically diverse range of recordings is required to listen past the initial impressions to assess longer term sonic benefits—or lack thereof.

Cable length is an important consideration, too. Generally cables connecting components to the preamplifier (or integrated amplifier) should be no longer than about 1.5m in

length. Some companies prefer shorter cables, while others feel the cable is best designed for a specific length and try to recommend people buying at that length. In connecting preamplifier to power amplifier, and from power amplifier to loudspeakers, generally try to keep both sets of cable below 5m long, as beyond this length the series resistance of the cables can begin to undermine the high frequency performance of the system. In fully balanced systems using XLR cables and amplifiers that are run in balanced operation, the length of cable between preamp and power amplifier can extend up to around 45m, although a pair of 45m XLR-XLR cables at the top-end of the cable world would cost in excess of a quarter of a million dollars!

Before selecting the cables for a given system, it's worth checking whether the electronics are best suited for longer interconnects and shorter speaker cables, or shorter interconnects and longer loudspeaker cables. For example, from experience, Naim Audio equipment benefits from short cables between preamplifier and power amplifiers, and longer loudspeaker cables, where a company like Audio Research generally works best with shorter speaker cables and long runs of interconnect between pre and power.

There are differences of opinion when it comes to expenditure and how the balance of the funds should be spent. Naturally, those who can afford the best should buy the best throughout, although if you end up buying dozens of metres of the very best cable, that is a fairly profound (some might say 'profane') amount of money. The rest of us need to spend more wisely. Typically, I would recommend spending slightly more on cables that have the greatest 'demand' placed upon them (such as the interconnects between preamplifier and power amplifier, loudspeaker cables), but where possible, go for balance throughout.

The old adage of spending the equivalent of 10%–15% of the total cost of your system on cables has long been forgotten, but it's actually a good starting guideline. Spending less than that is likely imposing a limit on the performance of the system. However, spending more can often unearth significant performance upgrades on any system. That

being said, if you have a \$10,000 cable to bring out the best from a 20 year old CD player that cost \$100 when you bought it, your priorities might be a little off!

The interesting part in this is describing the process of choosing a cable is more complicated than actually choosing a cable. Try a few cables, and you will be surprised at how much more you can get from your audio system, whatever its cost! +



Audio Power System Upgrades

Nicholas Ripley

To some the most controversial aspect of audio system design, the bit between the power company and the sockets at the back of the components in your system, can make a big difference to that system's performance. How big a difference does depend on a range of factors, however, and in an international context these factors can become very difficult to deal with. We have different voltages, different modes of getting power to the inlet, power that is relatively pure or 'dirty' power that is influenced by external sources. We also have the ingress of wireless sources to contend with at different

frequencies and to different amounts depending on where in the world you live. Dealing with specifics in this respect is beyond the scope of any general feature like this, so the adage 'if in doubt, ask' holds true at a local level.

We'll start at the IEC socket first and work backwards. Aftermarket power cords practically didn't exist 20 years ago, but since then all our electronics have been dunked in an ever-thicker soup of electromagnetic and radio-frequency interference. The power inlet is especially prone to being affected by these distortions, and steps made to prevent this at that first metre or so back from the IEC socket can make a significant difference in terms of inner detail and the noise floor of a system. As a consequence, a good power cord can frequently allow a system to play louder or even give the appearance of playing louder with greater dynamic range and more micro-dynamic finesse. How big a change largely depends on the amount of wireless sources in the area, and the ability for the equipment to reject such interference. For many today, this is a primary stage of system building, arguably even more important than getting the best possible interconnect (any audio replay system can be considered to be modulated



alternating current, and therefore relies on the AC it receives).

A stage back from the power cord, both in terms of distance from the system component and arguably in order of importance, come the active components in the chain, commonly called 'power conditioners'. These can be neatly divided into four main types of power products—power filters, isolation transformers, multi-faceted conditioners, and power

regenerators—but often with some crossover between these four design elements.

The names are relatively self-explanatory: a filter applies some kind of block between power outlet at the wall and power inlet at the component. This is often a DC offset filter (which often manifests itself in humming power supplies in afflicted products), to overcome effects of the AC signal not crossing over at a perfect 0V. There are also 'noise clamps' designed to



eliminate localised hum from the power supplies of refrigerators, computers, TVs, and so on. These clamp filters can be very effective, but some can be too heavy handed and undermine the dynamic range of a system. They are best used on the offending humming power supply than in the power path of the audio system.

A power isolation transformer, too, is fairly self-explanatory, and usually damn heavy! They use a large—often toroidal—transformer between the power outlet and

the equipment, to act on the incoming AC, smoothing out ripples from localised power and spikes from the power company. They also act to regulate (to a certain extent) the voltage of an AC power outlet, which can be especially useful in places where the power grid can be somewhat variable, as it will ultimately prolong the life of the equipment in the system. From an audio performance perspective, once again the key feature sonically is a lower noise floor, and the best can improve the dynamic range of the system. However, the less good models will actually reduce the dynamic range of many systems, because they lack sufficient power rating to deliver suitable current to the amplifier.

A power conditioner is in essence the product of adding together filtration and one or more power isolation transformers in one box. Depending on the company manufacturing the device in question, this can be a one-stop-shop for your power needs, or a 'jack-of-all-trades, master-of-none' design. Personally, I favour this approach over the piecemeal system of separate filters and transformers, as it generally means the manufacturer has taken a more considered design approach, and some of these units are designed for specific regions as a result. In fairness, standalone transformers without some kind of filtration are rare, and in most cases you will be looking at a power conditioner.

The ultimate active approach is the power regenerator. Once again, the name is apt



as a regenerator rebuilds a more accurate, localised version of the power input specifically for the audio system. It does this by combining an oscillator that runs at the local AC frequency (50Hz or 60Hz, depending on country) driving a high-current power amplifier to deliver a 50 or 60Hz output of the correct voltage to drive the audio system. The power from the wall powers nothing apart from the regenerator itself. This should represent the ultimate in pure power, free from noise, harmonic distortion, DC offset,

or any other deleterious effects from mains. However, some designers argue that it is all but impossible to build regenerators large enough to satisfy the huge instantaneous current demands that large power amplifiers can and do impose. Once again, power regenerators should help to lower the noise floor of the system, help improve low-level detail, improve midrange clarity, and more. Not all systems respond so well to a power regenerator, as some of the more demanding systems draw a lot of power from the wall



and some regenerators cannot cope, but the best of them act as a firewall between the power beyond the system and your audio system itself.

When properly designed, power filters, isolation transformers, power conditioners, and power regenerators ought not to limit current delivery to the system in any way, but in practice many designs are somewhat undersized for the jobs they do. In practice, this often means certain power products may work well with low power-draw preamplifiers or source components, but less well with full-sized power amplifiers. It would be fair to say the 'Holy Grail' for power product designers would be power conditioners or regenerators that effectively remove noise, yet offer ample and unimpeded current delivery.

Continuing the move further back from the power inlets of the audio system, it's not uncommon to improve the quality of the power outlets at the wall, and the cables behind the wall itself. This becomes difficult to generalise, of course, because each

country has its own take on sockets, legal requirements, electrical safety, and so on. But there are options worth exploring.

A relatively recent development that is not directly connected with the power itself is the independent or parallel grounding unit. These are connected to the electronics in the audio system through spare inputs or outputs or the casing of components, to provide a clean ground point alongside the mains voltage and ground. Often, there is no direct electrical connection to such boxes. Such parallel grounding systems can and do improve the overall performance of a system, often in subtle but important aspects such as improving the harmonic structure of the overall sound.

This is a lot of equipment to take in, and a lot of equipment in very different aspects of power. Where do you start?

We think the best place to start is in pragmatism. If your system is regularly afflicted by significant power problems such as surges or rattling transformers from DC offset problems, a power conditioner or even a power regenerator will provide the biggest direct improvements. If the system is on a more even keel, then a simple range of power cords may prove more promising in the system.

We would also recommend a more joined-up approach, using power cords from the same 'family' within the same brand where possible to ensure the nature of the RF and

EM filtering they provide is consistent. This would apply even for those using a power regenerator or conditioner, as the ingress of RF and EM interference has a large airborne component.

When it comes to prices, with regard to active components, it's important not to undermine performance through excessive cost-cutting. Lower cost conditioners can reduce the dynamic range of a system, and using a lower power but cheaper regenerator in a more power-hungry system will prove unnecessarily expensive as it will likely break down repeatedly under the excess load. Typically, good conditioners and regenerators tend to cost in low thousands of dollars and cheaper options are not recommended. As to cables in a system, this is more of a movable feast. One person's 'good power cords' are the ones supplied with the product, while another's cost more than the product itself. We would recommend spending up to \$200 on a power cord for products costing up to \$2,000 per device (adopting the long-discounted 10% rule) but beyond that, realistically you can go as high or as low as you think fit.

Some think the power is the first and most important part of a system. Some think it's the last aspect to address, and some dismiss it as entirely unimportant. The only way to judge for yourself is to try! +



Power and Cable upgrade strategies

Alan Sircom

In the old days, things were easy. Exotic signal cables didn't exist and you simply wired everything together with the cables that came in the box and some bell-wire for loudspeaker cables. There are still people who wire up their audio system in this way, with absolutely no consideration for the potential improvements to be had from better cables.

The first real developments in the potential in cable performance began in the mid-to-late 1970s. Audiophiles began experimenting with different gauges of wire in their loudspeaker cables and with different layouts of those wires. Soon a small underground market for better speaker cables began, and many of today's most successful cable brands began in earnest in the late 1970s and early 1980s. Not long after discovering that different loudspeaker cable designs could make a potential difference to the sound quality, people began to discover there was more to interconnect cables than a simple coaxial design, and another underground market was born.

For many years, this was the status quo. Audiophiles experimented with aftermarket interconnects and loudspeaker cables, and

the sceptics and cynics scoffed at the idea. Then came digital audio and at first the idea of using anything other than a cheap coaxial cable was dismissed. Digital is all 'ones' and 'zeros' and 'bits is bits', so what is the point of a better cable in this context? But listeners did their tests and concluded that although a digital data stream is all 'ones' and 'zeros' the electrical interface those bits are passed through acts somewhat like a form of high-speed analogue interconnect. Once again, the audiophiles experimented and the cynics scoffed.

The idea of an aftermarket power cord making a difference really didn't register until the late 1990s. A few companies were experimenting with power cords almost from the first days of aftermarket cables, but the majority of cable systems were concentrated on signal cables. Gradually, as the Twentieth Century drew to a close, it became clear that all those cellular telephones were creating a mild form of interference that was hard to fully shield, and the aftermarket power cord market began to take shape. We now exist in an environment where every possible cable connected to an audio or audio video system can be purchased as an aftermarket and deluxe version, and this poses several



important questions about how to approach strategically the means whereby a good system gets better through creative use of cable.

Aside from those who take a more haphazard stance, many of those who adopt the idea of a cable system adopt one of about three different cable strategies. The idea is viewing the system in terms of one of a number of break points where the concept of cable

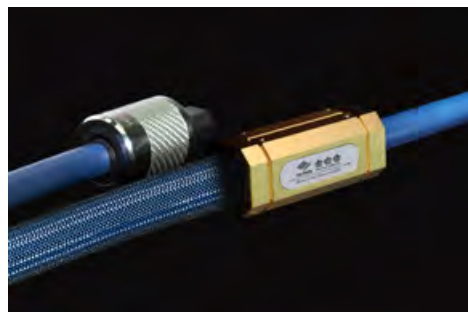
coherence (where the performance of one cable is sympathetic to the others) does not necessarily cross a particular divide. For example, many feel that it is important to get the power-side cables from a specific brand, and the signal cables from a specific brand, but they don't need to be the same specific brand. Others feel a natural divide is between the digital and analogue sides, especially the USB or Ethernet cables and the rest of the signal path. And then there



are those who advocate a complete and coherent cable loom from the same brand. Let's explore each in turn.

The logical divide between power-side and signal-side cables is fairly understandable; one set is in the signal path, the other helps create a signal path by feeding it power. Furthermore, the potential influences upon the cable notionally come from very different places—predominantly from the interfaces in an interconnect cable and from external elements in the power-cord world. As a result, many feel justified to say that it's perfectly feasible to focus greater attention on one side of this divide than the other. And, somewhat strangely, it's often not the side you would expect.

Many feel the most important upgrades you can make to a system today start at the wall itself. The 'power first' school of cable system design contends that as any system effectively is 'playing power', the power cords and associated components before



the power inlets are vital in giving what follows a solid foundation with which to work. Creating a bedrock of good, consistent, and coherent power delivery allows the listener to create a system that is capable of transformation. It certainly gives a darker, quieter background with an absence of noise upon which to build.

It is very possible to get carried away by such an approach, however, and end up spending tens of thousands of dollars on power products, and in the process spend more than the cost of the electronics. In a few circumstances where radio frequency and electromagnetic interference are unusually significant (in an apartment in a major city, for example), this somewhat extreme cable approach actually works well enough to be justifiable. In most cases though, a sense of proportion is required.

On the other hand, the idea of upgrading sections of the cables of an existing system has some obvious fascination. Generally



we'd recommend not looking at individual sub-systems in upgrade terms, but if you are going to upgrade one sub-system at a time, we'd recommend looking at the power-side, or alternatively digital cables.

The advantage to experimenting with digital cables independently to the other cables elsewhere in the rest of the system is they are frequently buffered from that system. USB, for example, requires galvanic isolation to perform at its best; otherwise noise from the +5V rail can undermine the performance of the chipset. That isolation allows the cable to have less interaction with EMI and RF characteristics of other cables in the system. This allows the listener to experiment with the sonic benefits of a digital or USB cable without having to rewire the whole system. Once you have the digital side of the system sorted, you can then use sonic improvements made on the digital side of the system to help make informed decisions on the cable strategy you wish to pursue for the rest of the system. This is both hard to achieve and

not recommended for final, close listening, but it can be a useful strategy in making a shortlist of cables to suit.

Most people, however, tend to adopt a signal-cable-first strategy, which typically includes digital and analogue cables, and loudspeaker cables. In part, this signal-side approach occurs because there is some resistance to thinking that power cords can make a major difference in performance. Not only does that make people adopt a signal-side strategy as a matter of course, but it is a circular argument: power cords make less of a difference so I'll pay them little attention because they make less of a difference.

There are advantages to adopting a signal-side first approach, however. The differences are less fundamental and paradoxically more immediate and identifiable, with more obvious detail improvements and soundstage enhancements and greater dynamic range.



Generally, too, you can concentrate on creating an accurate balance of performance properties that you can then apply back to the more subtle underpinnings of the power cords.

The advantages can also be read in the negative, too. It's possible to be so carried away with detail changes that you miss the bigger picture, and end up with a more impressive, but less cohesive and musically integrated sound. Care in listening tests tends to overcome this problem.

Generally, however, the best way to approach a cable upgrade is by taking the 'whole loom' approach, treating the cables as a single component in the system and changing all of them at once for models from the same range within a brand, or at least from the same brand. Not all cable companies consider their cables in combination and some look at them as standalone entities. But companies that do consider the cables as a systemic component in the audio system do tend to make products that work in harmony with one another.

Buying the whole loom from a single manufacturer may not be a single purchase, however, especially as the costs involved can escalate. You may want to plan a migration from one cable system to another. Where to start is difficult to say definitively, because different companies have different approaches to cable strategy. We would argue that starting with the power cords as first step in the whole migration process is advantageous because of that

aforementioned 'foundational' effect. However, whatever migration methodology you chose, you are advised to run through the migration process relatively quickly. Some of the middle steps in that process can actually make the system perform worse before it starts to perform better, and this may make your system temporarily difficult to live with and enjoy. Staying at one of these unfortunate 'knees' in the learning curve of your new system for too long could undermine your interest in playing music through the system!

The advantage to the whole loom approach is that it gives you the complete upgrade in one, enhancing the foundation of power cords, and the filigree effects of interconnect and speaker cables, with the coherence and system synergy benefits such a 'ducks in a row' system enhancement can bring.

All these methodologies are fine, but they invariably involve spending money. Sometimes lots of money. Often this isn't the right way. Many times, swapping cables is a perfect excuse for keeping a chip in the audiophile game, so that you can continue to enjoy the thrill of the chase of audio perfection without changing too many components. And sometimes, the cables are used as tone shaping filters, but that way madness lies! If you try to balance out the uneven tone of one product by relying upon the counterbalancing effects of a cable—or any other product, for that matter—you will be unlikely to end up with a good sounding system. Instead, you'll be focused



on how near or how far you are to that perfect balance.

Often, the best cable upgrade is no upgrade at all. If your system sounds fine as is, why change? Many systems benefit from little more than periodic maintenance of the cable connections rather than changing cables altogether.

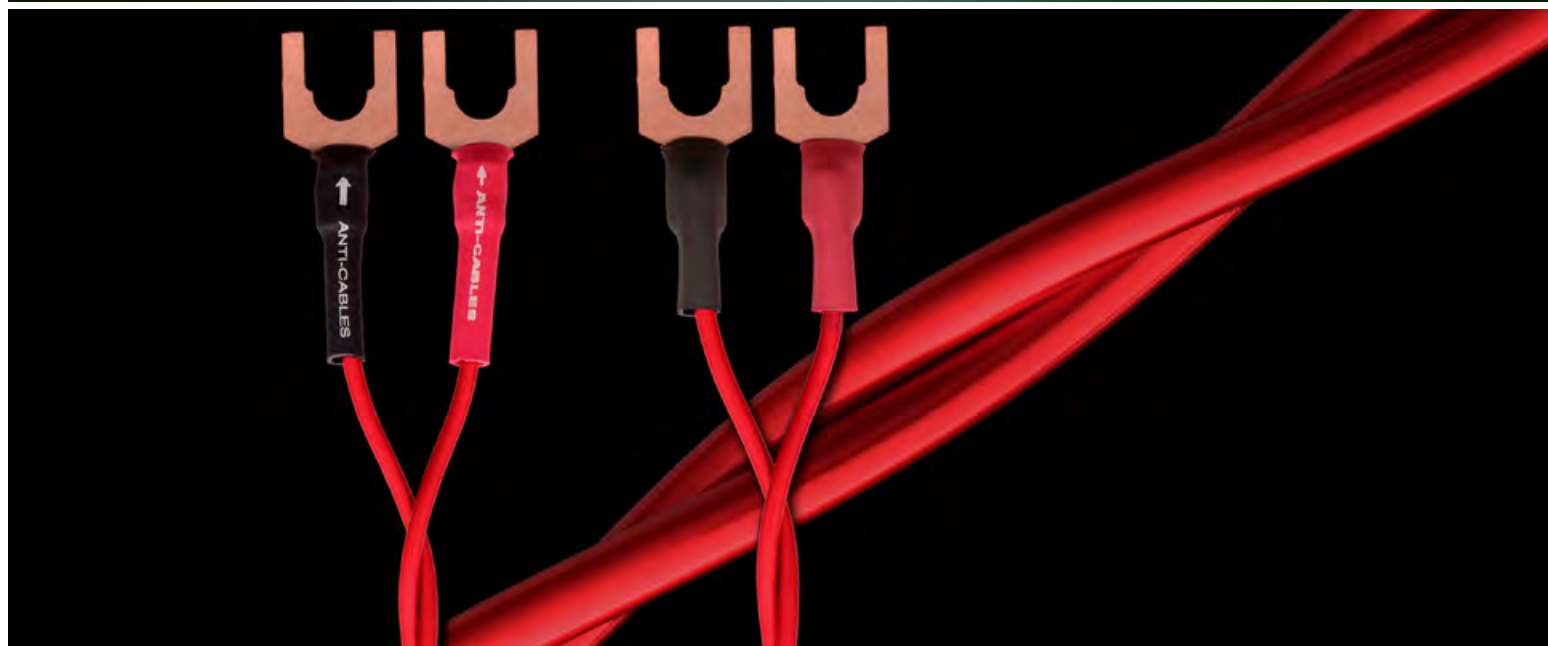
There is something you can learn from changing cables, which applies even when you don't change a thing. Simply plugging and unplugging your cables a few times can

act as a form of contact cleaner, exposing the freshly scrubbed gold-plated surface of a phono socket to the same on a phono plug. If you want to take this further, try using a contact cleaner, such as Caig Deoxit or Blue Horizon Clean-IT, on the connectors. Also, remember to tighten any RCA plugs or sockets in place, because this too can slightly improve the overall presentation. This last is not a major improvement, it must be said!

If you have cables from more than one brand in your system, try swapping them around.

For example, if you have cables from Brand X between CD and preamp, and Brand Y between preamp and power amplifier, try swapping Brand X with Brand Y. This, in fairness, is just as likely to speed your way to buying all new cables, as it is to finding the long-lost secret to great sound hidden in your system. Remember in all these settings that cables can be directional, both in design and tone. I don't recommend trying them reversed (although it will not harm the system), but it's important to remember the direction in which they travel when rebuilding the system. Whatever cables you use, it's best to retire them after a few decades, due to oxidation effects.

We often spend too much or too little on cables. Some are never satisfied, and change cables more regularly than most people change their socks. Others will still use a cable that was once copper and is now a light shade of verdigris. Your best bet is to tow a middle path. Pick out a good cable strategy that suits you. Then find a good series of cables that fit that strategy. Listen. Buy. Repeat every couple of decades to see just what changed in audio. +



HIFI+ AUDIO CABLES & POWER PRODUCTS REVIEW INDEX

CABLES AND POWER PRODUCTS 2012 TO PRESENT

➤ Audience AU24SE	Interconnects,loudspeaker cables	Hi-Fi+ 120
➤ Audience AU24e	High-Z phono cable	Hi-Fi+ 92
➤ Audiomica Europa Ultra Reference	Loudspeaker cables	Hi-Fi+ 119
➤ Audiomica Genimides Ultra Reference	Interconnects	Hi-Fi+ 119
➤ Audioplan Powerstar SIII, FineFilter S, and Powerplant 100s	Power distribution block, power line filter, and power transformer	Hi-Fi+ 147
➤ Audioquest Carbon	USB cable	Hi-Fi+ 123
➤ Audioquest Diamond	USB cable	Hi-Fi+ Blog
➤ Audioquest Earth, Castle Rock & NRG-4	Interconnects, loudspeaker cables, and mains cables	Hi-Fi+ 121
➤ Black Rhodium Tempo and Samba	Interconnect and loudspeaker cables	Hi-Fi+ 98
➤ Black Rhodium Ace & Star	USB cables	Hi-Fi+ 113
➤ Black Rhodium Athena DCT++ CS	Loudspeaker cables	Hi-Fi+ 122
➤ Black Rhodium Thunder, Hercules, and Titan	Loudspeaker cables and mains cables	Hi-Fi+ 137
➤ Cardas Clear/Clear M/Clear Beyond	Interconnects, loudspeaker cables, and mains cables	Hi-Fi+ 91
➤ Cardas Audio Clear Reflection	Interconnect and loudspeaker cables	Hi-Fi+ 122
➤ Cardas Audio Clear Sky/Parsec	Interconnect cables	Hi-Fi+ 106
➤ Cardas Audio Clear Beyond	Interconnect cables	Hi-Fi+ 145
➤ Chord Company Sarum TA	Analogue and digital interconnect cables	Hi-Fi+ 107
➤ Chord Company Sarum/Sarum TA	Cable system	Hi-Fi+ 115
➤ Chord Company Sarum T	Cable system (part of broader system review)	Hi-Fi+ 147
➤ Clearer Audio Silver-Line Optimus Reference	Interconnect cables	Hi-Fi+ 139
➤ Crystal Cable Absolute Dream	Cable system	Hi-Fi+ 128
➤ Crystal Cable Absolute Dream	Cable System-Part 1	Hi-Fi+ 95
➤ Crystal Cable Absolute Dream	Cable System-Part 2	Hi-Fi+ 96
➤ Crystal Cables Dreamline Plus	Cable system	Hi-Fi+ 111
➤ Dynamique Shadow/Aurora	Interconnects and loudspeaker cables	Hi-Fi+ 115
➤ Ecosse La Prima Donna	Interconnects	Hi-Fi+ 91
➤ Ecosse Big Red UC	Mains cable	Hi-Fi+ 91

↑ [CLICK TO READ LINKED REVIEWS](#)

HIFI+ AUDIO CABLES & POWER PRODUCTS REVIEW INDEX

CABLES AND POWER PRODUCTS 2012 TO PRESENT

➤ Ensemble Luminoso and Espressivo	Interconnects, loudspeaker cables, and mains cables	<i>Hi-Fi+</i> 97
➤ Ensemble Incanto and Dalvivo	Interconnects, loudspeaker cables, and mains cables	<i>Hi-Fi+</i> 130
➤ Epiphany Audio EPH-02D/Atratus	Headphone amp/interconnect cable	<i>Hi-Fi+</i> 109
➤ Fono Acustica Armonico	Audiophile USB cable	<i>Hi-Fi+</i> 103
➤ Fono Acustica Armonico	Mains cable	<i>Hi-Fi+</i> 92
➤ Fono Acustica Virtuoso	Loudspeaker cables	<i>Hi-Fi+</i> 136
➤ Gutwire Uno-S/Chime3/C-Clef2	Cable system	<i>Hi-Fi+</i> 102
➤ Gutwire USBc-1	USB cable	<i>Hi-Fi+</i> 123
➤ High Fidelity Cables CT-1 & CT-1E	Interconnect cables	<i>Hi-Fi+</i> 111
➤ In-Akustik 1203	Interconnect and loudspeaker cables	<i>Hi-Fi+</i> 118
➤ Isotek EVO3 Elite	Mains cable	<i>Hi-Fi+</i> 112
➤ Isotek EVO3 Initium	Mains cable	<i>Hi-Fi+</i> 135
➤ Jade Audio Moontails	Interconnect cables	<i>Hi-Fi+</i> 101
➤ JSA Type 2	Passive headphone conditioner	<i>Hi-Fi+</i> 126
➤ LessLoss DFPC Reference	Mains cable	<i>Hi-Fi+</i> 110
➤ Kimber Select 2416 CU	USB cable	<i>Hi-Fi+</i> 145
➤ Mad Scientist Audio Yanam	Interconnect cables	<i>Hi-Fi+</i> 131
➤ MCRU The Ultimate III	High power mains cable	<i>Hi-Fi+</i> 108
➤ Moon Audio Black Dragon Premium Focal Utopia	Headphone cable (specifically for Focal Utopia)	<i>Hi-Fi+</i> 144
➤ Nordost Blue Heaven	Cable system	<i>Hi-Fi+</i> 87
➤ Nordost Blue Heaven	USB cable	<i>Hi-Fi+</i> 123
➤ Nordost Blue Heaven and Heimdall 2	Headphone cables	<i>Hi-Fi+</i> 145
➤ Nordost Heimdall 2	Cable system	<i>Hi-Fi+</i> 106
➤ Nordost Odin 2	Cable System	<i>Hi-Fi+</i> 128
➤ Nordost QKore 1, QKore 3, and QKore 6	Parallel grounding units	<i>Hi-Fi+</i> 147
➤ Nordost Valhalla 2	Cable system	<i>Hi-Fi+</i> 112
➤ Nordost White Lightning Anniversary	Cable system	<i>Hi-Fi+</i> 89
➤ Oriton Black Bullets	Cable accessories	<i>Hi-Fi+</i> 94

↑ [CLICK TO READ LINKED REVIEWS](#)

HIFI+ AUDIO CABLES & POWER PRODUCTS REVIEW INDEX

CABLES AND POWER PRODUCTS 2012 TO PRESENT

➤ Oriton Symphony Orange	Interconnect cable	<i>Hi-Fi+</i> 109
➤ Purist Audio Design Genesis Praesto Revision	Interconnect cables	<i>Hi-Fi+</i> 97
➤ Purist Audio Desing 30th Aniversary	USB cable	<i>Hi-Fi+</i> 139
➤ REL Bassline Blue	Subwoofer cable	<i>Hi-Fi+</i> 114
➤ Signals Project Lynx	Interconnect Cables	<i>Hi-Fi+</i> 129
➤ SLiC Eclipse C	Interconnect cable	<i>Hi-Fi+</i> 121
➤ Snake River Audio Cables	Interconnects, loudspeaker cables, and mains cables	<i>Hi-Fi+</i> 99
➤ Snake River Audio Boomslang	Digital interconnect cables	<i>Hi-Fi+</i> 106
➤ Snake River Audio Mamushi Reference	Loudspeaker cable	<i>Hi-Fi+</i> 117
➤ Studio Connections	Interconnects, loudspeaker cables, and mains cables	<i>Hi-Fi+</i> 126
➤ Synergistic Research Ground Block and Cables	Grounding blocks and cables	<i>Hi-Fi+</i> 136
➤ Tellurium Q Black	S/PDIF and USB digital cables	<i>Hi-Fi+</i> 116
➤ Tellurium Q Graphite	Interconnect and loudspeaker cables	<i>Hi-Fi+</i> 94
➤ Tellurium Q Black	Mains cable	<i>Hi-Fi+</i> 94
➤ Tellurium Q Black Diamond	Loudspeaker and interconnect cables	<i>Hi-Fi+</i> 110
➤ Tellurium Q Silver Diamond	Loudspeaker and interconnect cables	<i>Hi-Fi+</i> 141
➤ Torus Power Tot AVR	Isolating power transformer	<i>Hi-Fi+</i> 141
➤ Van Damme UP-LCOFC	Loudspeaker cable	<i>Hi-Fi+</i> 114
➤ Van den Hul 3T The Rock	Interconnect cables	<i>Hi-Fi+</i> 101
➤ Vertere Cables D-Fi	Minijack-to-phono cable	<i>Hi-Fi+</i> 93
➤ Vertex AQ Pico	Grounding blocks	<i>Hi-Fi+</i> 121
➤ Vertex AQ Aneto Silver/Hi-Rez	DC offset blocking filters	<i>Hi-Fi+</i> 134
➤ ZenSati Authentica	Interconnects, loudspeaker cables, and mains cables	<i>Hi-Fi+</i> 146

↑ [CLICK TO READ LINKED REVIEWS](#)

ENCYCLOPAEDIA CABLEXICON

DIGITAL TERMINOLOGY EXPLAINED, *Hi-Fi+* Staff



High-end audio cables, much like other categories of audio components, have gradually developed a specialised vocabulary all their own. And, as sometimes happens with other types of audio products, 'cable speak' can at first seem confusing if not dauntingly obscure to the uninitiated. But not to worry; help is on the way. The *Hi-Fi+* team has assembled this 'Encyclopaedia Cablexicon' document to explain cable terminology in a manner that interested laymen will be able to understand (or at least that's the plan). Enjoy.

Analogue Interconnects (or Interconnects)

Analogue interconnects are audio cables specifically designed to carry low-level analogue audio signals from source components to amplification components, or from preamplifiers to power amplifiers.

Typically, analogue interconnects come in two forms: single-ended cables (in most cases fitted with RCA jacks at both ends) or balanced cables (usually fitted with a male three-pin XLR plug at one end and female three-pin XLR socket at the other end).



Image courtesy of AudioQuest

Balanced Interconnects

The majority of interconnects are single-ended cables that have two conductors—one carrying $+/-$ signals and the other serving as a ground.

Balanced cables, however, are different in that they have three conductors—one for the $+$ signal, one for the $-$ signal, and one serving as a ground.

When properly executed, balanced audio circuits offer either higher output than or lower noise levels than equivalent single-ended circuits, which allows longer runs of cables and that is why pro-audio equipment is almost universally balanced in operation. However, balanced circuits are inherently more complex to design and manufacture than equivalent single-ended circuits, and likewise balanced cables are more complex (and usually more costly) than their single-ended counterparts.

Some common balanced connector types include XLR connectors (much like the connectors you might see on professional microphones), TRS or 'tip-ring-sleeve' connectors (which look like $\frac{1}{4}$ -inch phone plugs and are more commonly seen in pro-sound rather than high-end home audio applications), and AES/EBU connectors (which are used for balanced digital audio applications).

Bi-Wiring

Some loudspeakers are configured to allow bi-wiring, which means that instead of having just one $+/-$ pair of connection terminals, the speakers—usually, but not always, two-way designs—instead have two sets of terminal, where one set is for the low-frequency driver and the other for the high-frequency driver.

When choosing to bi-wire, users would run two complete sets of speaker cables to each loudspeaker—one routed to the low-frequency driver terminals and the other to the high-frequency driver terminals. In theory, this practice can yield a purer, clearer, and more tightly focused sound overall.

Several technical explanations are offered to explain the ostensible benefits of bi-wiring, but opinions on the efficacy of bi-wiring can and do vary among high-end cable designers



Image courtesy of AudioQuest

(see the Designer Interview section of this Guide for proof of this).

When choosing not to bi-wire, users would instead run a single primary set of speaker cables to their loudspeakers—typically to the terminals for the low-frequency driver, and then would run a set of short 'jumper' cables (ideally identical in configuration to the main cables) from the low-frequency driver terminals to their adjacent high-frequency driver terminals.

Capacitance/Resistance/Inductance

These three electrical characteristics are the basic building blocks of all high-end cable designs; they are the essential variables that cable designers seek to manipulate in their quest for higher performance and better sound.

Capacitance is the ability of a cable (or a capacitor) to store an electrical charge. Generally speaking, most designers consider that lower capacitance is better. The train of thought is that one does not want an audio cable to absorb and store an electrical charge from the music signals being passed through the cable, because such charges will inevitably be released (or dissipated) later on in time, thus 'smearing' the sound of the music.

Inductance is the property of cable (or an inductor) to resist changes in current flowing through the cable through the process of inducing an electromotive force (EMF), which

actively resists current changes. Generally speaking, most designers consider that lower inductance is better, since ideally one would want cables to allow current changes to occur in a natural or free-flowing manner as required by changes in the music signal.

Resistance is a measure of the difficulty to pass an electrical current through a conductor—in this case a cable. Generally speaking, most designers consider that lower resistance is better, since the lower the resistance the less energy is dissipated within the cable when driving current through the cable. This factor can be especially important in designing cables that are meant to conduct very low-level audio signals with minimum signal loss and distortion.

Coaxial Cable

A type of cable construction often used in digital or single-ended interconnects with a central +/- signal conductor surrounded by a central +/- signal conductor surrounded by an insulating (dielectric layer), in turn surrounded by a outer conductive shield or sheath used as a ground or 'return', with a protective insulation jacket on the outside. The central conductor and the conductive sheath both share the same axis; hence the term 'coaxial'.

Conductors

Technically, conductors are materials that permit electrons to flow freely and that allow electrical current to flow in one or more directions. Wires, in turn, are conductors that can carry electricity over their entire length. Conductive materials used in audio

cables include copper, silver, gold, rhodium, and in some recent exotic designs, graphene. At least one manufacturer uses liquid metal conductors in the form of slurry containing gallium, indium, and tin.

Depending on which designer one asks, the exact composition of wires, both in terms of the conductive materials used, the metallurgy of the wire, and even the cross-sectional characteristics of the conductors, are thought to have significant impact on sound quality.

Stranded-Core designs: In many cases the wires used in audio cables are composed of multiple, bundled, small-diameter strands of conductive materials—collectively known as stranded-core designs.



Image courtesy of The Chord Company

Solid-Core designs: In other typically higher-end audio cables, wires use solid-core conductors that are considerably larger in cross-sectional area than the tiny conductive strands used in stranded-core designs. The size and shape of the solid-core conductors used are thought to have impact on sound.

Thus, at least one famous cable manufacturer touts use of 'rectangular solid core' conductors, while another uses solid-core conductors whose also rectangular cross section uses so-called 'Golden Section' proportions.

In a 'big picture' sense, the better the conductors an audio cable employs, the better it will sound.

Crystal/Monocrystal Conductors

The overwhelming majority of audio cables use metal conductors, but what few listeners realise is that the wires within those cables have a crystalline structure (many equate 'crystals' with gemstones, but metals are crystalline, too).

Under normal circumstances, drawn metal wires contain numerous metal crystals butted up against one another and many audio purists believe that the junctures between these crystals have a subtle, adverse effect upon sound quality.

However, one important development is the advent of manufacturing techniques that allow wire makers to produce monocrystal wires, where one metal crystal spans the

entire length of the wires (meaning there are no crystal-to-crystal junctions to affect the sound in any way).

Cables featuring monocrystal conductors are highly prized for high-purity/high-accuracy applications, even though they are typically more expensive to make than conventional multi-crystal conductors.

Dielectrics

In simple terms, dielectrics are insulators—the materials or other related systems used to provide insulation for the conductors found in audio cables.

Dielectrics are important because they have much to do with the cable's capacitance and thus resulting sound quality (see Capacitance/Inductance/Resistance, above). The ideal would be to have dielectrics that absorb no electrical charges at all.

Some common dielectrics include fluorinated ethylene polypropylene (FEP), polyethylene, polytetrafluoroethylene (PTFE, aka Teflon), and others—many of which are available either as solid or as "foamed" materials. Several manufacturers have experimented with insulation systems that use air or a vacuum as dielectrics (because, in theory, a perfect vacuum would be an ideal insulator, though for obvious reason vacuums are very difficult to manage in a cable context).

Dielectric Bias System (DBS)

DBS is AudioQuest's trade name for a system (co-developed with loudspeaker designer Richard Vandersteen) for applying a bias voltage (via a small battery) across the dielectrics of audio cables, effectively making them highly resistant to accepting music-induced electrical charges. One claimed advantage of DBS is that it obviates the need for lengthy cable 'break-in' periods.

Digital Interconnects

Audio cables specifically designed for carrying low-level digital signals (or files) from digital source components (e.g., a CD transport, music server, or streamer) to a digital audio component capable of decoding those signals.

At first glance, it is tempting to think of digital interconnects as being 'just like' analogue interconnects, but in fact the two cable types have significantly different 'mission profiles'. Analogue cables must accurately convey analogue signals ranging in frequency from a few Hz on up into the kHz range.



Image courtesy of The Chord Company

Digital cables, instead, are expected to transfer square wave signals (representing digital 'ones' and 'zeroes') in the MHz range, loading into digital components whose input impedances are potentially quite different to analogue components.

Some common digital interface types include:

- AES/EBU (Audio Engineering Society/European Broadcasting Union)—a quiet, balanced digital audio interface that uses XLR-type connectors.
- Ethernet—a reliable, well-documented, wide-bandwidth multipurpose digital connection borrowed from the computer world, which typically uses RJ-45-type connectors and sockets.
- S/PDIF (Sony/Philips Digital Interface Format)—a popular and robust digital audio interface that typically uses coaxial wires with RCA-type plugs.
- TOSLINK (Toshiba Link)—a popular and robust digital audio interface that, instead of wires, uses fibre-optic connections that



Image courtesy of The Chord Company

typically use EIAJ/JEITA RC-5720 optical connectors. Note: TOSLINK is essentially a fibre-optic implementation of the S/PDIF standard.

- USB (Universal Serial Bus)—an enormously popular, multi-purpose digital interface that has in recent years come to be the digital interface of choice for many high-end (and not-so-high-end) digital audio components. The USB specification allows for many types of connectors, but the ones most commonly seen in audio applications are: USB Type A (as found on many PCs and other digital sources), USB Type B (as found on many high-end audio DACs), and USB Mini A and Mini B (as found on many smartphones and small, portable digital audio components).

Directionality in cables

Although the subject is considered somewhat controversial, the fact is that most if not all audio cables (or more accurately, the conductors within those cables) exhibit directionality—meaning that signal flow works and sounds better running in one direction than the other. The technical explanations behind this are somewhat complex, but according to AudioQuest founder Bill Low:

"All drawn metal has a directional impedance variation at higher RF/EMI noise frequencies. By 'law', energy must follow the path of least resistance, so we employ this impedance variation as a mechanism for consciously directing noise either to Earth or to whichever attached

circuit is less vulnerable to noise. The key is to direct noise to where it will do the least damage."

What is more, some cable designs use asymmetrical shielding schemes (where noise blocking outer sheaths might be, for instance, connected to ground only at one end of a given cable), adding a further directional element.

Given this, expect to see markings (arrows, marker rings, and the like) on many high-end audio cables to indicate the preferred direction of signal flow. Some speaker cables, for instance, even provide terminations marked 'speaker end' or 'amplifier end'.

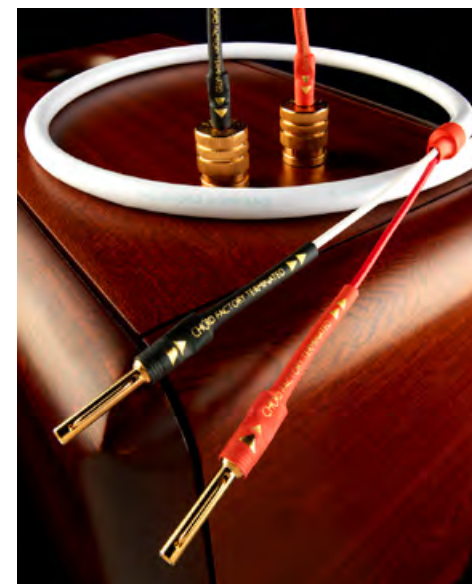


Image courtesy of The Chord Company

Gauge (or Wire Gauge)

The gauge of a cable, typically expressed as AWG (American Wire Gauge), is an indicator of the cross sectional area of the wires used in the cable. AWG ratings are arranged so that the lower the AWG number, the more cross sectional surface area the cable possesses. A giant power cord, for instance would have a very low AWG number, while the tiny run-out wires in a tonearm headshell would have a very high AWG number. Note: AWG numbers are considered useful indicators of a cable's current carrying capacity (the lower the AWG or gauge number, the higher the current load the cable can bear).

Hospital Grade Power Plugs/Sockets

In discussions of American AC power distribution, we often encounter references to 'hospital grade' mains sockets and plugs. The reference is to specifications for mains sockets and mains cable plugs designed for use in 'mission critical' hospital applications (you wouldn't want an AC plug to fail on a respirator, now would you?).

Hospital grade socket and plugs specify materials that can withstand both chemical and physical abuse and, in the case of plugs, also specify relatively tight-fitting connector pins that, by design, are extremely difficult to dislodge.

There is no direct UK equivalent to the 'hospital grade' socket (in part because the three-pin socket used in the UK is hard to

dislodge), but audiophiles in the UK often opt for unswitched 13A designs in place of standard switched models.

There is much debate over whether hospital grade mains connections are necessary or beneficial for audio applications, but many purists choose to use them (both for mains cables and for power distribution components)—if only as a precautionary measure.

Litz wire

Litz wire is a specific cable configuration that uses bundles of multiple small-diameter, individually insulated strands of conductors, where the strands are typically twisted along the length of the cable. The main intent behind Litz wire is to mitigate the sonic problems associated with skin effect (see 'Skin Effect', below).

The most common result of skin effect is a tendency for a cable's AC resistance to increase at higher frequencies, potentially causing at least some degree of audible treble roll-off. Happily, Litz wire overcomes this problem for the most part.

A few power amplifiers designed to be used with conventional stranded loudspeaker cable have been known to 'struggle' with the low resistance of Litz wire. In most cases, these problems are now historic.

Mains/Power Jacks and Plugs

Often, we think of our own AC connections as the norm, forgetting that there actually numerous international standards for power distribution voltages, frequencies, and the sockets and plugs to deliver electrical power. The US Department of Commerce International Trade Association has identified 15 specific types of power plugs/socket in use worldwide (these plug socket combinations are assigned identifying letters from A through O).

The tricky part, however, is that various countries and regions use these 15 types of power plugs, some grounded and other not, in sometimes unusual or unexpected combinations. On page 92, we provide a table showing commonly used power



Image courtesy of Isotek

plug/socket combinations for the UK, Europe, North and South America, and the Pacific Rim.

One upshot of all this diversity is that high-end audio power cable manufacturers must potentially create very broad ranges of models in order to address the needs of the worldwide market.

Ohno Continuous Casting (OCC)

Under 'Crystal/Monocrystal Conductors', above, we mentioned that 'monocrystal conductors are highly prized for high-purity/high-accuracy applications'. The man who successfully developed the manufacturing process that makes it possible to fabricate



Image courtesy of Isotek

Mains/Power Jacks and Plugs

Country or Region	Mains Voltage	Mains Frequency	Grounded Connector	Non-Grounded Connector
Australia	230V	50Hz	(Type I) Grounded AS-3112	Not applicable
Brazil	127V/220V	60Hz	(Type N) Grounded IEC 60906-1, NBR 14136	(Type C) Non-Grounded CEE7/16 Europlug
China	220V	50Hz	(Type I) Grounded AS-3112	(Type C) Non-Grounded CEE7/16 Europlug, (Type A) Non-Grounded NEMA 1-15
Denmark	230V	50Hz	(Type K) Grounded SRAF 1962/DB, DS 60884-2-DI (Type F) CEE 7/4, (Type E) CEE 7/7	(Type C) Non-Grounded CEE7/16 Europlug
France, parts of Europe	230V	50Hz	(Type E) French-style Schuko	(Type C) Non-Grounded CEE7/16 Europlug
Germany, parts of Europe	230V	50Hz	(Type F) Grounded CEE7/4 Schuko	(Type C) Non-Grounded CEE7/16 Europlug
India	230V	50Hz	(Type D) Grounded BS-546 'Small' and, rarely, "Large"	(Type C) Non-Grounded CEE7/16 Europlug
Israel	230V	50Hz	Grounded SI 32 (IS 16A-R)	(Type C) Non-Grounded CEE7/16 Europlug
Italy	230V	50Hz	(Type L) Grounded CEI 23-16/VII, (Type F) CEE 7/4 Schuko	(Type C) Non-Grounded CEE7/16 Europlug
Japan	100V	50Hz/60Hz	(Type B) Grounded NEMA 5-15	(Type A) Non-Grounded NEMA 1-15, Non-Grounded JIS C 8303
North America	120V	60Hz	(Type B) Grounded NEMA 5-15	(Type A) Non-Grounded NEMA 1-15
Russian Federation, parts of Europe	220V	50Hz	(Type F) CEE 7/4 Schuko	(Type C) Non-Grounded CEE7/16 Europlug
South Africa	230V	50Hz	(Type D) Grounded B-546 'Small', (Type M), Grounded B-546 'Large', (Type N) Grounded IEC 60906-1	(Type C) Non-Grounded CEE7/16 Europlug
Switzerland	230V	50Hz	(Type J) Grounded SEV-1011	(Type C) Non-Grounded CEE7/16 Europlug
Taiwan	110V	60Hz	(Type B) Grounded NEMA 5-15	(Type A) Non-Grounded NEMA 1-15
UK, Ireland, Malta, Malaysia	230V	50Hz	(Type G) Grounded BS-1363	Not applicable

monocrystal wires is Dr Atsumi Ohno, and his famous process is called Ohno Continuous Casting, typically abbreviated 'OCC', not to be confused with the familiar psychological acronym, OCD.

Plugs, Lugs & Jacks for analogue audio cables

Audio cables use a wide variety of connectors, with certain connectors optimised for interconnects and others for speaker cables. When thinking about connectors it is helpful at times to remember that for plugs and lugs there is always a corresponding jacket, socket, or terminal to complete the connection.



Image courtesy of AudioQuest

Banana plugs and jacks: Banana plugs are extremely popular as terminations for loudspeaker cables. (The spring-loaded connector surfaces of the male Banana plug look somewhat like miniature, metal 'bananas'—hence, the name.) Banana plugs typically connect to loudspeaker cable-binding posts that, by design, have banana jacks bored into their outer ends. Banana plugs are very easy to use, allowing simple push-to-connect, pull-to-disconnect operations.

Banana plugs typically make a 'press-fit' connection with their associated sockets. Note, however, that some banana plugs are 'locking' designs, with thumbscrews that, when tightened, clinch the plugs for an extremely tight fit within their jacks.

BFA connectors: Built For Audio/British Federation of Audio terminations are a variation on the theme of the 4mm banana plug (effectively built inside out and coated in ABS), designed to express safety concerns raised because the similarity of this plug to the live and neutral terminals in a EU 'Schuko' AC terminal. The 4mm banana plug is (notionally at least) 'banned' in the EU, which is why amplifiers include little red and black inserts that prevent their use, but you can remove these inserts with a penknife and continue to use banana plugs as before.

BNC connectors: Male BNC (Bayonet Neill-Concelman) connectors are sometimes used on coaxial interconnect cables for use with components fitted with female BNC

connectors, although BNC interfaces are relatively uncommon in high-end audio applications and components. Male BNC connectors use a quick-connect, quick-disconnect, twist-to-lock collar or 'nut' that latches on to two bayonet locking pins found on the female BNC connector.

BNC connectors are desirable in settings where it is important (or even critical) that cable connections do not work loose and where a 'fail-safe' locking mechanism is therefore required.

RCA plugs and jacks: RCA plugs are the de facto standard terminations for analogue interconnects and for coaxial S/PDIF digital interconnects. Corresponding, RCA jacks are the standard socket fittings for single-ended analogue and coaxial S/PDIF interfaces on audio components. RCA plugs provide a central post, carrying +/- audio signals, and an outer sleeve that serves as a ground, or 'return'.

As with banana plugs (see above), RCA plugs make press-fit connections with their associated sockets. However, many audiophile-grade RCA plugs feature 'locking' mechanisms, most of which work on the principle of firmly clamping the plug's outer sleeve against the mating surface on the RCA jack.

Spade lugs: Spade lugs vie with banana plugs as the most popular terminations for loudspeaker cables. Spade lugs, as their name suggests, look almost like miniature,

metal garden implements. Typically, spade lugs provide a sturdy wire receptacle at one end (where the cable's conductors attach to the lug), and a flat, thick, two-pronged metal connecting surface at the other end, which is designed to fit around the central shaft of a traditional loudspeaker binding post.

Loudspeaker cable-binding posts have threaded metal shafts, traditionally fitted with beefy metal locking nuts or collars. To make firm connections using spade lugs, one would first back off the binding post's locking nut, then insert the spade lug so that its prongs fit on either side of the binding post shaft, and finally tighten down the locking nut or collar as firmly as feasible to clinch the spade lug in place.

Some contend that spade lugs offer inherently superior connections to banana plugs owing to their robust construction and large surface area, but one point to bear in mind is that it takes two hands to connect spade lugs properly—one hand to hold the spade lug in place against the binding post shaft while the other tightens the locking nut. Also, users should be aware that—depending upon cable positioning—the weight of the speaker cables can apply torque on the spade lugs, causing the binding post locking collars to become loose over time.

XLR connectors: XLR connectors are the de facto standard for use in all types of balanced analogue and digital interconnects. In traditional, loudspeaker-based audio systems, the most common variant would be

three-pin XLR connectors where, as noted under ‘Balanced Interconnects’ and ‘Digital Interconnects’ above, one pin carries the + signal, another carries the – signal, and the third serves as the ground, or ‘return’.

By convention, three-pin XLR output jacks provide a socket with three outward-facing pins, while XLR input jacks provide a socket with three pin receptacles. To accommodate this convention, XLR cables are invariably set up with different connectors on each end, with a distinct signal input end (providing receptacles for the pins from the audio component’s XLR output socket) and a signal output end (providing outward-facing pins that plug in to the receptacles of the audio

component’s XLR input sockets). Virtually all XLR sockets and plugs feature spring loaded mechanical latches that lock the connectors firmly in place (typically the latches feature thumb-actuated release catches).

In headphone-based systems, however, one might encounter both three-pin or four-pin XLR connectors, where the four-pin variant is a stereo (two-channel) connector, providing two sets of +/– connections pins. Some higher-end headphones ship with balanced signal cable sets terminated either with dual three-pin XLR connectors (as used, for example, on the Abyss AB-1266) or with single four-pin XLR cables (as used, for example, on top-tier Audeze or HiFiMAN headphones).

Power Cords/Mains Cables

You might think all mains cables are created equal (or nearly so), but in our experience, high-performance mains cables can and do have a profound effect on sound quality. Indeed, several leading edge cable designers would say that, if you could only improve one cable in your entire system, it should be the mains cable that runs from your wall sockets to whatever power distribution component you choose to use.

The key differentiators between ‘garden-variety’ power cords and the high-performance models we recommend include: higher gauge conductors, conductors fashioned from superior and very high-purity materials, more sophisticated dielectrics, superior internal geometries (often focused on blocking noise), superior shielding

schemas (again, focused on blocking noise), and ultra high-quality plugs at both ends of the cables.

Purity of Conductors

High-purity conductors are thought to have a direct and significant impact on sound quality and for this reason a number of purity-related acronyms and terms have come into play. Here are three you might encounter frequently:

- **HPC (high purity copper):** Manufacturers who use copper conductors and have been selective in their choice of materials suppliers will often say that their cables feature HPC conductors. Caveat emptor: The term HPC implies that care was used in choosing sources of copper wire, but it does not tell you precisely how pure the copper actually is (although some manufacturers might clarify this point with additional specifications).
- **OFC (oxygen free copper):** Oxygen is one of the most common ‘contaminates’ of pure copper, so manufacturers who have taken steps to source copper that is very low in oxygen content will often tout their use of OFC conductors. In many cases, references to OFC conductors will feature supplementary specifications to indicate the exact-level of purity.
- **‘Five-Nines’ or ‘Six-Nines’ conductors:** These slang terms indicate levels of purity, expressed as, for example, 99.999% or 99.9999% pure metal, whether referencing copper, silver, or other metals. Obviously, more ‘nines’ describe conductors of higher

purity, higher cost, and—it is thought—higher sound quality.

Skin Effect

Skin effect is the tendency for an alternating current (AC), or an alternating music signal, to flow or become concentrated mostly near the outer surface (or skin) of a conductor. The higher the frequency of the signal the thinner the functional depth of the skin being used to pass the signal, which means that the AC resistance of the cable tends to increase at higher frequencies. This is why some cables can exhibit a certain degree of treble roll-off.

Certain cable geometries (for example, woven Litz wire geometries) can, however, mitigate the problem of AC resistance increasing at high frequencies owing to skin effect. The point is that it pays to seek out cables whose designs minimise or eliminate skin effect problems in the audio range.

Speaker Cables

Some audiophiles draw a distinction between ‘signal-bearing’ cables (namely, interconnects) versus ‘power-bearing’ cables (namely, speaker cables). Stated another way, speaker cables are responsible for delivering the often high-wattage output of amplifiers to our loudspeakers and doing so with high bandwidth, minimum noise, low distortion and colouration, and maximum delivery of current as demanded by the loudspeaker.

To meet these demands, speaker cables place the same emphasis on geometries,



Image courtesy of AudioQuest

materials, conductors, and noise-blocking shields as interconnects do, but with the added demand of being able to handle potentially very high levels of power (power = voltage x amperage).

Some speaker cable terms you may encounter are these:

- **(Internal) Bi-wire cable:** A speaker cable that internally has double runs of conductors, with a single pair of +/- connections at the amplifier end and a double set of +/- connections at the loudspeaker end. In this configuration, the double runs of conductors are housed within a common sheath or jacket.
- **'Shotgun' cable:** A speaker cable that provides double runs of conductors, each housed in its own sheath or jacket, where there is a single +/- set of connections and a double set of +/- connections at the speaker end. The term 'shotgun' comes from the fact that the dual-runs of conduction, each in its own jacket, look somewhat like the barrels of a double-barrel shotgun. +



Image courtesy of AudioQuest