(almost) everything you ever wanted to know about…

the quality of audio connectors

Replies from **Rémy Mallard** (France)

From the rusty old (but original) DIN plug, to the shiny gold (but counterfeit) XLR… audio connectors come in many different shapes, sizes and qualities. We asked Rémy Mallard to tell us more.

photo : Shutterstock

Q *Why so many types of connectors?*

A The connector needs of professionals and consumers never stop evolving The manufacturers develop products that are 'better performing and oriented towards the future' which take account of new functions and electrical constraints, from EMC (Electro-Magnetic Compatibility) (linked to the nature and speed of the signals) and mechanical (increasing number of pins, different sizes for fixed and mobile use). After the 3-pin DIN and the 1-pin RCA/Cinch, here comes the era of the 29-pin HDMI connector which **also** supports video and Ethernet.

Q *Analog and Digital: same thing?*

A Whether analog or Digital, the quality of the connectors is paramount. With analog, you can sense a problem coming (reduced quality, noise). With digital, it is more subtle, because it can pass very quickly from 'everything is fine' to 'nothing works'. The signal rates (and associated clock frequencies) used give rise to problems of impedance, length and parasitic capacitance of cables and connectors. Ordinary cable and any old connector won't cut it any more; it's imperative to use cable with a matched impedance (50, 75 or 110 Ω for example) and suitable connectors. A digital symmetric AES link [1] needs a 110 Ω impedance cable and XLR connectors, and a digital asymmetric S/PDIF link needs a 75 Ω cable with BNC 75 Ω connectors (but often RCA/Cinch on consumer equipment, because they're cheaper). With HDMI, TMDS streams [2] pass over twisted pairs with a differential impedance of 100 Ω. With a theoretical speed of 48 Gbit/s of HDMI 2.1, the quality of the connectors (and indeed the cable) becomes even more critical!

Q *What are the differences between professional and consumer connectors?*

A A consumer connector has to be cheap; a professional connector has to be reliable. In fixed pro audio (recording studio, broadcast site) the lifetime of the links has to be long. And ageing of the cables and connectors must not cause problems. Cables or connectors of bad quality will degrade quicker over time (oxidization and/or degradation of dielectrics). In pro mobile audio (events, concerts), the connectors must not fail when they are walked on, they must stay locked on to equipment, and above all the wires must stay connected to their pins when a foot gets caught in the cable. To sum up, the connectors must be robust, and that's why you choose a metal-bodied connector rather than a plastic one. As an aside: even for amateur use, choose a metal bodied connector (including DIN and RCA/Cinch), because a conductive body connected to ground gives better protection against parasitics. For resistance to disconnection, several techniques exist: tongues that fold on to the cable, shells that are screwed together, or even jaws with teeth. But be careful with the last two solutions, these methods of fixing the cable only really work for the right diameter of cable!

Q *Do counterfeit connectors really exist?*

A What reputable brand is not a victim of counterfeiting? It's always nice to find an XLR connector from the manufacturer Neutrik that's 2 to 5 times cheaper than from your local supplier. Even if this raises some red flags ('that price difference must be hiding something'), strangely we are 'reassured' because the product is 'certified original' and carries the ticket of a known brand. And because it's cheaper, you think

Photo 1. The counterfeit male Neutrik connector fits well enough into the original female Neutrik connector, but screwing them together (a principal feature of this type of connector) is impossible!

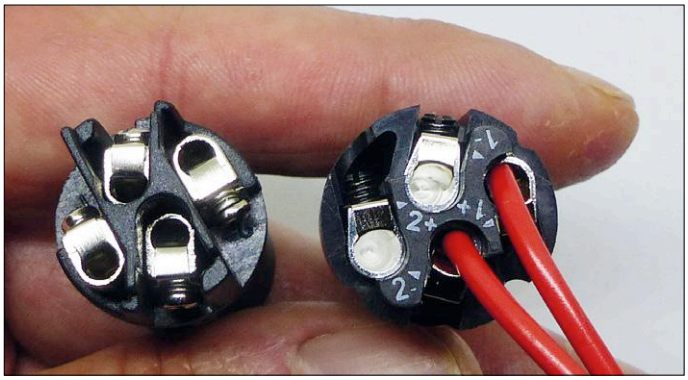

Photo 2. At left, a counterfeit Neutrik connector, at right an original Amphenol connector; on the copy, the tongue that presses on the cable is more likely to let it come out than to hold it in place!

you'll take the risk. But while the amateur can allow himself this lapse of judgment, the professional should think twice and take a deep breath before putting 'economy above all'. Over time, genuine connectors benefit from numerous mechanical and electrical improvements which the cheap copies don't get. At first glance, a counterfeit connector might look good. It's when it is in use (when for example it is removed for re-use elsewhere) that you figure out that quality pays dividends. Counterfeit connectors might look as sexy as the originals, but they're not as faithful!

Q *Do counterfeit connectors present any dangers?*

A Whenever low-energy signals are being carried (microphone or line level), the risk is limited to intermittent crackling noises, loss of level or complete cuts of the sound. But it causes more problems if the corrupted signals feed amplifiers of several kW. If the connectors carry high intensity currents (Speakon connectors for PA loudspeakers for example), the risk is higher (overheating). Real brand name power connectors are designed to guarantee the lowest possible contact resistance, as well as a uniform current distribution over the contact surfaces, to avoid hot spots that can end up burning out. And that guarantee even applies after many disconnections and reconnections, which in a live situation are often done in an intensely stressful environment and hence not always gently.

Q *Is it still worth making up your own audio cables?*

A Between the cheapo cables for less than $ 1 that are often quickly thrown away, and the top of the range ones for over $ 1000 that you'd never sell, is where my heart lies. The amateur who does not look beyond the technical jargon may be reluctant to make up his own cables. But he can, especially for 'easy' cables such as XLR, jack or RCA/Cinch cables. But recognize that it becomes much more complicated with an HDMI connector (take one apart and you'll understand). The advantage of making your own cables is that you can choose the cable and connectors. And if one day you have to repair it, you'll know how to. Sure, the level of degradation caused by an inappropriate cable can sometimes lead to a degradation of sound quality, moderate in analog (loss of high tones for example) or unacceptable in digital (clicks or complete loss). But don't let us exaggerate here: an S/PDIF cable made with a meter of standard shielded cable and a couple of (non-75 Ω) RCA plugs is usually fine… always try it. I'd say: if it works, you're laughing. ⏮

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Web Links

[1] AES3, communication standard for digital audio data: https://en.wikipedia.org/wiki/AES3

[2] TMDS, video data transmission standard: https://en.wikipedia.org/wiki/transition-minimized_differential_signaling

Who is Rémy Mallard ?

Rémy is passionate about sound, he built his own local radio at 14 and built his first (small) synthesizer at 15 (at the time, the Formant was too big for him). He worked for 23 years at TDF (TéléDiffusion de France) in the fields of satellite and TV broadcasting, then came back down to earth to immerse himself in TV and radio transmitters, and radio studios (maintenance, expertise and training). These days, he designs dedicated audio electronic systems and does professional audio training in a cinema / audiovisual school. He is also a voice-over actor and provides soundtrack analysis and validation. He maintains his own website sonelec-musique.com which since its creation in 2004 has offered numerous free articles, without adverts and with a dash of humor. For Remy is not always serious, if he's in the right place.