

## Getting a grip on the weakest mobile link

With everything set up to run, a sound or video failure at the start of a live broadcast is an engineer's nightmare. Mechanical connections are always the first suspects, but valuable minutes can still be lost picking out the single cable normally at fault from the tangle of wiring within and leading into the equipment.

The connections that take most stress are usually at the 'front end', for example the microphone plug, or wires trailing in a broadcast van or the studio. And the most common causes include people like news reporters in a hurry simply tripping over a wire and pulling out a connector. Finding the single offending cable can be difficult enough. Even worse is when the cause is not visible and somewhere within the equipment a critical connection has broken.

Connectors therefore need to grip the cable securely, protecting it and the delicate electrical contacts themselves from damage when strain is put on a wire. They also need to continue to protect after repeated (ab)use, when equipment is no longer new. With broadcast reputations at stake and schedules to keep, any equipment that is suspected of being unreliable needs immediate correction or replacement - particularly true of low-cost items like cables and connectors.

A relatively simple development from Pomona will now prevent a large proportion of these cable-related problems. The company has just introduced the XLR range of mobile broadcast audio cables and connectors with more than twice the pull strength of any previously available products. The new range features an innovative cable retention system with a clamping mechanism that withstands 45 kg (100 pounds) of pull without breaking or damaging the connector or its contacts.

The new cables suit broadcast and event audio applications, where the demand for high-quality connectors and cable assemblies has increased dramatically. For low-noise audio transmission, the XLR connectors feature nickel-plated bronze or brass with gold or silver plate finish. They also feature a smooth latching mechanism for easy, secure connections.

**Synopsis:** After this introduction, the article will discuss the cable retention system, Pomona's new XLR range, and the types of pull and accelerated lifetime tests Pomona puts the new cables through.

The article will be around 1400 words long, with a photograph and an exploded view of a connector.

### Cable clamp takes the strain

Most cables and connectors on the market (and Pomona has 200 in its broadcast range) have around 20 kg pull strength, which is more than enough for routine use. Audio cables in a studio, for example, are often plugged into a mixer and stay there undisturbed from one month to the next. Or they may be used to interconnect amplifiers in a stationary equipment rack, where they can also remain untouched for months.

Most mobile uses are far from routine, however. Virtually any type of portable operation adds stresses and strains on the cable. Audio cables for concerts and events need to be plugged and unplugged repeatedly, and each connection must be perfect. Similarly with 'front-line' newsgathering. When an outside broadcast truck arrives on location, the person setting up will normally quickly pull the cables out to the camera. When clearing up afterwards, the cable and connector are simply reeled in, often being roughly dragged along a pavement or kerb.

All this can severely stress the entire signal path through cable and connector, and all the separate elements must withstand this use. In particular, the cable must be securely clamped to the connector body on the "pull" side.

### Extra-duty mobile and high-end work

Pomona fits its new 45-kg pull-strength clamp (Figure 1) on its mobile and high-end cable assemblies and connectors.

The connector (Figures 2, 3) is designed for easy assembly, requiring no screws. The stripped audio cable is simply threaded through the boot and cable clamp. The cable is then soldered to the solder cups on the contact assembly (with Insulation Displacement Connectors, which require no soldering, the connector itself cuts through the insulation and makes the connection). Then the boot is screwed over the clamp, securely capturing the cable and contacts against the rugged casing. The result is an excellent electrical connection as well as a solid mechanical connection.

The strength of the clamp must of course be matched throughout the rest of the cable and connector construction. Pomona uses elastomer cables for repeated flexing, and polyester insulators for strength. Connectors have shock resistant zinc or aluminum alloy housings with a nickel finish. Contacts are variously bronze or brass with gold or silver plate finish. Alltake at least 1000 insertions.

Two of these types are designed for solder connections, one offering a nickel casing with silver plated contacts (5109 and 5110) and another offering black nickel casing with gold plated contacts (6852 and 6853). The other two types are IDC type XLRs, mentioned above, which allow fast connection of the cable without the need for solder. Again, these are offered with either a nickel casing (7273 and 7274) or a black nickel casing to reduce glare in the studio (7275 and 7276). Again, they have 45 kg pull strength.

In addition, for those studio applications where the connectors see less abuse, Pomona offers a value line of XLRs, with a variety of 3-, 4- and 5-pin types (5125A, 5126A, 6850, 6851, 7283, 7284, 7093 and 7094). There are also complete, ready-assembled male-to-female patch cords (6902 series) that use the clamp. This plug-and-play assembly has between 3 and 8 m of Belden low impedance 1172A four-conductor Star Quad audio cable.

### Testing cables for pull strength and kink resistance

The audio cables are 100% connectivity tested, with samples from the line being tested to destruction on a cable pull force gauge. They consistently withstand 45 kg, and it is the cable insulation that normally fails – not the wires.

Pomona also tests for resistance to kinks and bends. With the connector mated in a panel mount receptacle, it is stressed with a 1-kg weight and twisted through 180 degree bends repeatedly until it fails. Connections are checked electrically after each rotation and the test is stopped when the connection breaks.

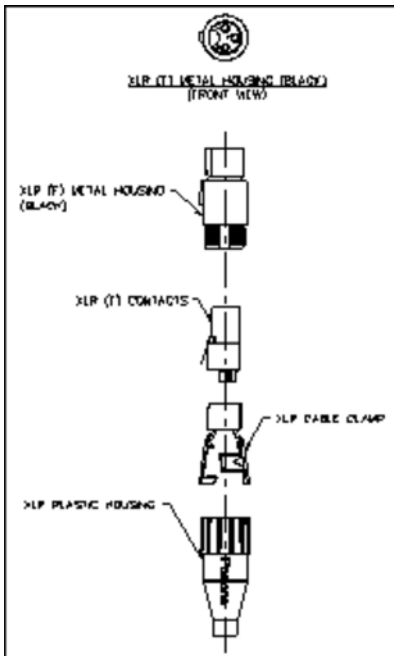
The worst results exceeded 30,000 bends, and some cables withstood up to 50,000 bends. As a comparison, leading Test & Measurement companies like Fluke consider 10,000 bends to show excellent performance (Pomona established its reputation in the professional Test & Measurement market before producing audio cables).



**Figure 1:** Pomona's connector construction showing cable clamp with 45 kg pull strength – double the previous industry standard.



**Figure 2:** The connector is designed for easy, yet rugged, attachment to the cable. IDC connectors that do not require soldering are also available.



**Figure 3:** Pomona's XLR connectors (shown here is the 3-pin female, type 5109) feature easy assembly, and need no screws.

**Table 1 :** The 45-kg pull-strength connectors aim at 'high-end' and mobile applications.

Type	5109	5110	6852	6853	7273	7274	7275	7276
Description	3-pin female solder	3-pin male solder	3-pin female solder	3-pin male solder	3-pin male XLR IDC	3-pin female XLR IDC	3-pin male IDC	3-pin female IDC
Mating cycles	1000	1000	1000	1000	1000	1000	1000	1000
Dielectric strength	1400 Vdc	1400 Vdc	1400 Vdc	1400 Vdc	1400 Vdc	1400 Vdc	1400 Vdc	1400 Vdc
Wire gauge	14 AWG max.	14 AWG max.	14 AWG max.	14 AWG max.	24 AWG max	24 AWG max	24 AWG max.	24 AWG max.
Pull strength	Up to 45 kg (100 lbs).	Up to 45 kg (100 lbs).	Up to 45 kg (100 lbs).	Up to 45 kg (100 lbs).	Up to 45 kg (100 lbs).	Up to 45 kg (100 lbs).	Up to 45 kg (100 lbs).	Up to 45 kg (100 lbs).
Cable O.D. range	3 mm to 6.5 mm	3 mm to 6.5 mm	3 mm to 6.5 mm	3 mm to 6.5 mm	3 mm to 5.85 mm	3 mm to 5.85 mm	3 mm to 5.85 mm	3 mm to 5.85 mm
Contact Resistance	< 3 m Ω typical	< 3 m Ω typical	< 3 m Ω typical	< 3 m Ω typical	< 3 m Ω typical	< 3 m Ω typical	< 3 m Ω typical	< 3 m Ω typical
Insulation resistance	> 1 GΩ	> 1 GΩ	> 1 GΩ	> 1 GΩ	> 1 GΩ	> 1 GΩ	> 1 GΩ	> 1 GΩ
Protection class	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40
Operating temperature	-25 ° C to +75 ° C	-25 ° C to +75 ° C	-25 ° C to +75 ° C	-25 ° C to +75 ° C	-25 ° C to +75 ° C	-25 ° C to +75 ° C	-25 ° C to +75 ° C	-25 ° C to +75 ° C
Operating Voltage	33 Vrms 70 Vdc	33 Vrms, 70 Vdc	33 Vrms, 70 Vdc	33 Vrms, 70 Vdc	33 Vrms, 70 Vdc	33 Vrms, 70 Vdc	33 Vrms, 70 Vdc	33 Vrms, 70 Vdc
Current Carrying Capacity	15 A	15 A	15 A	15 A	15 A	15 A	15 A	15 A