

3 September 2026

The IEC C13/C14 Mains Connector

The IEC ‘standard’ 3 pole mains connector, first introduced in 1970, is rated at 10 amps (A), the C13 being a socket, the C14 the plug. It should not be confused with the similar ‘high-temperature’ or ‘kettle’ connector standard, in which a C15 plug incorporates a protrusion to prevent it engaging with a ‘cold device’ C13 socket.



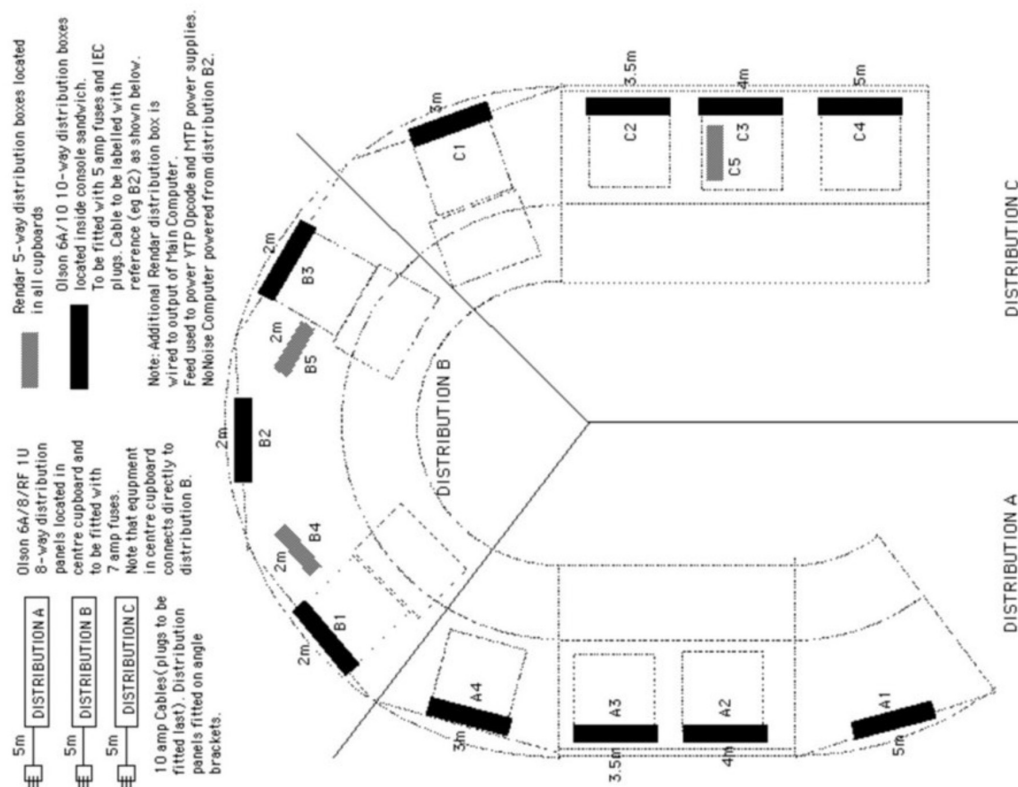
Unlike many mains connectors, the C13/C14 pairing uses a sensible size of contact pin, not as huge as a 13A plug, nor as tiny as the XLR-LNE, but probably closer in cross-section to that of an American mains plug. The connector engages without relying on the strength of the plug pins, the pins are well-protected within the shell and the design allows for shuttered sockets and optional locking connectors. It's a shame that the IEC connector could not have been adapted for use throughout Europe as a standard wall socket.

The issue of locking mains connectors is a moot point. When IEC inlets first arrived there was concern about the plugs falling out at a crucial moment. But what is more important: that moment or avoiding someone tripping over a 'locked' cable, possibly damaging the wiring and posing a further danger in the future?

In this respect, standard US and European wall sockets and plugs are safer than the British type. Trip over the cable to a 13A plug and it probably won't disengage and you will be injured. Trip over a US or European cable and the plug usually falls out.

In reality, the non-lockable IEC connectors rarely caused headaches. Later versions have a greater contact pressure, whilst various optional clips and locking connectors have also emerged.

Throughout the eighties more and more equipment arrived with C14 plugs on the rear panel, and by the time the 'circular' consoles arrived, the use of clumsy 13A plugs and sockets seemed inappropriate. Now, 10-way IEC power strips were available, accommodating all the devices in each rack, including low-voltage power supplies that were modified to incorporate IEC cables.



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Mains Connectors

The BBC has a rather chequered history when it comes to mains connectors, many of which fell at the wayside as time rolled on.

D&S Power Plugs and Sockets

In 1973 the Workshop's studios incorporated Dorman & Smith (D&S) plugs and sockets instead of 13 amp (A) plugs, so as to prevent wholesale thievery. Whether this solved the criminality is uncertain, but the D&S power strips at the Workshop were certainly unreliable. The plug was unusual in that the live 'pin' was actually a fuse, which could be unscrewed whenever a change was needed.



Swapping fuses in a 13A plug is messier, whilst 'selective fusing', choosing fuses to match each appliance, has all but disappeared, with some low-power devices often wrongly fitted with 13A fuses.

D&S connectors eventually became a headache, as every new appliance had to be fitted with a new plug. So the BBC decided, belatedly, to follow the rest of the country and use standard 13A plugs and sockets, usually of one of the types manufactured by MK.

EP4 Connectors

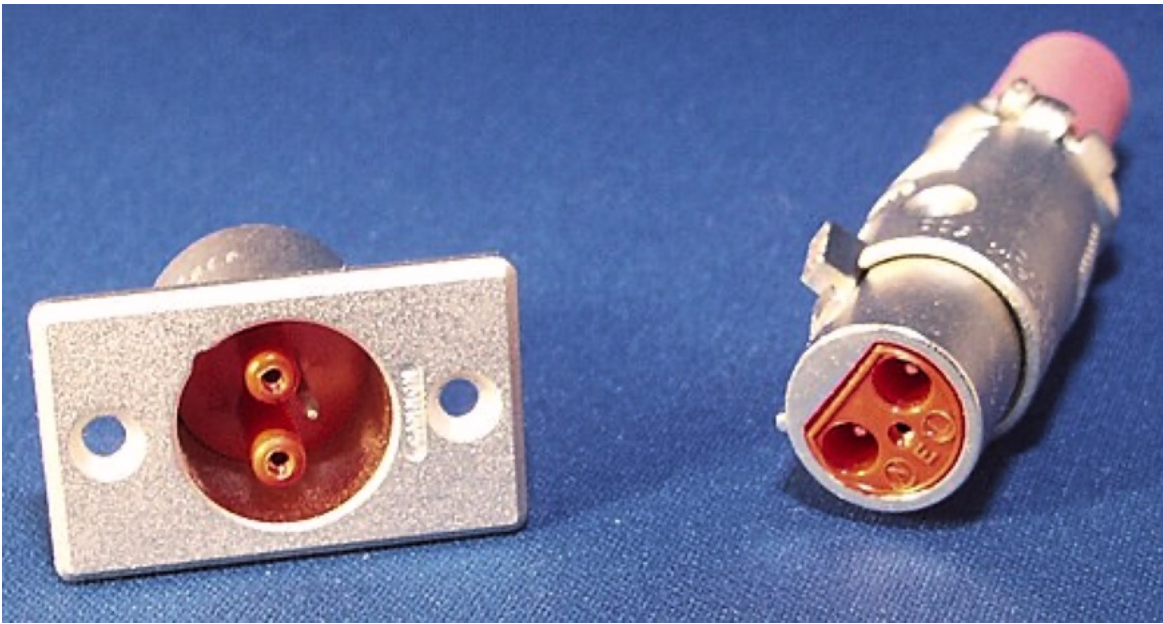


The rather large F&E (Film & Equipment) EP4 panel connector has served many purposes over the years. The Cannon EP4-14 is the chassis mounted male version, and the EP4-12 is the female version, the latter often attached to a mains lead in earlier days at the BBC.

Female panel connectors were commonly used for cue lights, typically operating via direct current (DC) at 50 volts (V), the voltage determined by equipment common to the BBC and the GPO.

And beyond its days at the BBC, these plugs and sockets, today manufactured by Amphenol, have been used for wiring up pairs of loudspeakers. It's very fortunate that the old and new uses of these connectors have never been combined.

XLR-LNE Connectors



Legend says these were jointly designed by the BBC and Cannon around 1968 in order to create a mains connector with the advantages of a standard XLR. What looks like a 'plug', on the left, has female contacts whilst the 'socket' has male contacts.

Oddly, the BBC decided to use the 'socket', with its more exposed contacts, for the mains supply and the rather better-protected 'plug' on the equipment, possibly because the plug required a smaller mounting hole, or perhaps because of a simple mistake. The connector is rated at 6 amps (A) and the earth contacts are designed to engage before the live and neutral pins.

A metal-shelled mains connector with a rather vicious latch does seem potentially dangerous, whilst the small pins, although gold-plated, do begin to show signs of damage if the connector is engaged with power applied. Some also consider that there is a risk of accidentally engaging a plug with standard audio XLRs, although this seems very difficult to do. The greater hazard is that a prong on the socket might inadvertently make contact with other metalwork.

This connector is no longer approved for domestic use, but even in the Workshop the latches were filed off to prevent disconnection, whilst others were replaced by modern IEC power connectors.

1 September 2026

The 3-pole XLR Connector

It would seem very simple to use a three-pole connector for audio signals, a pair of contacts for the balanced signal and one more for the screen circuit. In reality at the Workshop this almost became a nightmare.

Direction of Pins

In the commercial world XLRs are always wired with the male pins of a plug pointing in the direction of the signal, so a plug is an output, a socket an input. The BBC also used this convention for microphones, mainly because microphones always came with plugs, but with 'line level' circuits the BBC reversed the rules, so that outputs were on sockets, inputs on plugs. It may be that the Corporation feared that line level circuits at an outside broadcast could somehow get shorted out and needed protection by being shrouded within a socket. This resulted in ludicrous complications when connecting commercial equipment to BBC devices.

The Workshop eventually replaced the older and larger F&E (Film & Equipment) EP3 panel connectors, formerly used for loudspeaker circuits, with male XLRs, but special female-to-female cables had to be installed, since the BBC amplifiers also had male connectors.

The Workshop eventually adopted commercial practice, including reversing back the connectors on Studer A80 tape machines.

Polarity

The name XLR comes from the codes originally used by Cannon Electric when the connector first appeared, with X standing for the X-series, L for locking and R for the rubber around the female contacts. Today, the name is a handy acronym for the pin

connections: X (screen) = 1, L (line) = 2, R (return) = 3. The wire called 'line' is often known as 'hot' and the 'return' as 'cold'. Unfortunately this 'standard' was sent awry by audio engineers in the USA who decided pin 3 should be 'hot' and pin 2 'cold'. Worse still, some UK manufacturers, including Soundcraft, who provided several mixers for the Workshop, decided to follow suit.

With all circuits balanced, this reversal isn't a disaster: the connection still works, but a 'blowing' sound on a microphone may end up as a 'sucking' sound on the loudspeaker, which gives a entirely different impact. Of course, this may not happen if the wires get swapped again at another connection to the mixer. Fortunately, all Soundcraft mixers had a 'phase reverse' switch on each channel, allowing any reversal anomalies to be corrected.

The real problem came with equipment that had unbalanced circuits connected via XLRs, meaning that any unbalanced device with 'pin 3 hot' would fail to work with another that was 'pin 2 hot'. For a while, some equipment, such as the Fairlight CMI, were fitted with transformers, which fixed the problem, but the use of transformers always degraded sound quality and they were subsequently removed wherever possible, including from loudspeaker amplifiers. The Workshop operated with the 'pin 3 hot' convention for a time, but with newer installations it returned to the now international standard of 'pin 2 hot'.

The Workshop also had some unusual cables for conveying MIDI over XLRs, with DIN plug pins 4 and 5 connected to XLR pins 2 and 3 respectively, along with connected screens. This convention was based on pin 4, normally pulled up to +5 volts, being effectively the 'hot' connection, although the more modern standard is to connect the two data pins the other way round. In any event, all the cables must be wired the same way. Also, such cables must not be connected to XLR microphone cables carrying +48 volts of phantom power, as this can damage the circuitry.

10 August 2026

The Double-ENDER



For the first twenty years of its history most audio devices at the Radiophonic Workshop were connected by cords known as double-enders. Originating from the General Post Office (GPO) in the earlier years of the century, and used in many manual telephone systems, it featured a Post Office 316 jack plug at both ends, with separate wires to the tip, ring and sleeve (TRS), with the 'hot' circuit was on the tip, the 'cold' on the ring and the sleeve grounded.



The Post Office described it as a 'B-gauge' plug, having a 1/4-inch diameter. Unlike a modern plug, it has a tip smaller than the ring or sleeve, thereby preventing the plug shorting out the signal wires on insertion, which could have caused problems on a switchboard.

Different colours could be used for the body of the plug, but at the BBC the plugs were nearly always a shade of brownish-red known as

cerise. The usual cords were screened, this feature being indicated by an exterior blue colour, but other cord colours could be found, such as black, red or yellow, the latter for a phase reversal cord.

In terms of reliability these connectors were incredibly robust. The sockets exerted a huge amount of pressure on the un-plated brass plugs, thereby providing a self-cleaning action, especially necessary for a telephone exchange.

Unfortunately, they weren't suited to being left in-situ for long periods of time, as oxidation would build up, or when used with more modern 'compatible' plastic jacks that had gold-plated contacts that exerted a low pressure on the plug. Some engineers advocated polishing the plugs, but that only made the metal surface smoother and even more prone to oxidation problems.

Although the connector allowed creators of sound and music to connect devices easily on an ad hoc basis, it would sometimes be impossible to work out what had been connected to what, ending up with a vast ball of double-enders that needed to be disentangled.

The Workshop eventually switched over to using XLR connectors for connecting equipment, but in later years began following the commercial practice of also using standard jack plugs and other connectors. The Workshop even used standard jack plugs in jackfields designed for the PO316. Bad practice, perhaps, in terms of engineering ideology, but no problems were encountered.

Today, plated versions of the 316 are still available, but are rarely used on modern equipment.