

Cutting Signal Noise with Leviton's Triple Stage Compensation

Crosstalk refers to unwanted signal noise transmitted from one pair to other pair, causing electrical interference. This can lead to data transmission issues such as reduced data rates, poor communication or even loss of communication, and it can eventually degrade the overall performance of your networks. This noise level becomes stronger as the frequency of the signal increases, and it can become a significant problem in Category 6A networks if not properly addressed. **Poor quality connectivity can often be the culprit, so choosing the right product is critical to achieve optimal network performance.**

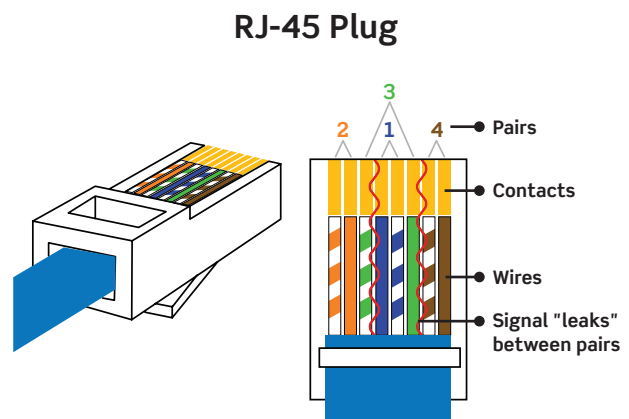
Compensating for crosstalk

Every Category 6A plug has eight contacts which make up the four pairs of the connector. Because of the arrangement of the contacts and their associated wiring, the signal transmitted on one pair **“leaks”** or couples over to other pairs, causing unwanted **crosstalk**. This is a direct result of the unequal physical (and therefore electrical) exposure of one pair’s contacts to another.

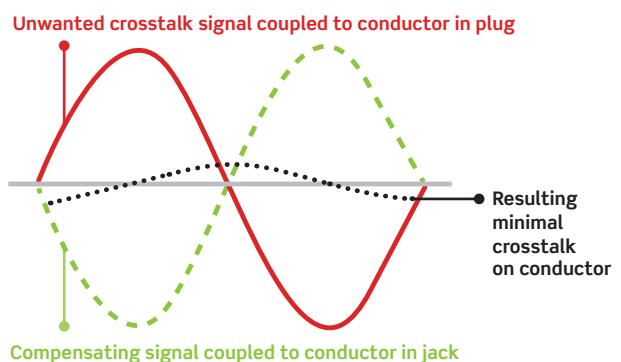
The less than optimal contact arrangement has remained unchanged over the years in order to preserve backwards compatibility to the billions of existing RJ-45 plugs and jacks used for both telecommunication and data transmission over the past four decades.

To cancel out or compensate for this undesirable noise inherent in the plug, the jack must inject additional noise onto the conductors of the pairs that exactly matches the original noise, but is opposite in polarity. In doing so, the noise generated in the plug is largely canceled out, leaving the plug/jack combination with only a very minimal amount of noise. This is similar in principle to how noise canceling headphones operate.

The diagram to the right shows how the jack cancels out unwanted noise generated in the plug.



Noise Compensation



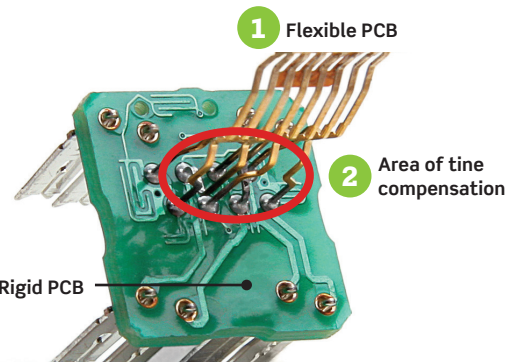
Industry standards define just how much noise is caused by the plug and the maximum amount of leftover noise that is allowed when the plug and jack are mated together. Manufactures are left to come up with the right amount of noise canceling in the jack to satisfy the requirement. When this type of compensation is applied properly, an extremely small amount crosstalk is left on the pairs, resulting in a very low-noise plug/jack combination. There are two forms of compensation which occur in the plug: **capacitive** and **inductive**. Since both happen in the plug, both are also used in the jack to more closely mimic the original noise and therefore more effectively cancel it out.

Leviton Triple-Stage Crosstalk Compensation

Leviton uses **patented triple stage compensation** in our Atlas-X1™ Category 6A jacks and Cat 6A 110-style patch panels to cancel out unwanted electrical noise that is inherently generated in any RJ-45 plug. The result is a plug/jack combination that **exceeds the industry requirements** for crosstalk performance and provides users with a **more reliable signal** transmission.



The first stage of compensation is provided by a tiny but effective **flexible printed circuit board (PCB)** that is attached directly to the tines of the jack, very close to the point where the tines of the jack contact the spades of the plug. Locating it in this position allows for the compensation to be very effective, even at high frequencies. The flex circuit has on it compact compensating capacitors that connect to the tines in a such way that they inject noise that is similar but opposite in polarity to the noise generated in the plug, thus compensating for it. A flexible PCB is used so that the capacitors can remain connected to the tines as they move up and down to accommodate the plug contacts and slight variations in their heights.



The second stage of compensation is provided by the **tines in the jacks**. The tines initially need to be positioned to line up with their respective contacts in the plug. But after making contact with the plug, the two tines for pairs 1, 2, and 4 swap positions. This arrangement again injects noise that is similar to the noise generated in the plug but opposite in polarity, thus compensating for it. This is very similar to how the first stage's compensation works, but in this stage, in addition to capacitive compensation, there is also inductive compensation applied.



Finally, the third stage of compensation is applied on the **rigid PCB in the jack**. This compensation is different from the first two stages in that it applies noise that is actually the same polarity as the originating noise which occurs in the plug, but at a much lower level. This stage is primarily capacitive compensation. It is positioned electrically and physically a little farther away from the first two stages of compensation.

The **patented three stages of compensation** operate together to better align the compensating noise generated in the jack with unwanted noise generated in the plug across the entire frequency range over which the connectors operate. The result is a low-noise plug/jack combination that exceeds the **industry requirements** for crosstalk performance.



Learn more about the features in the Atlas-X1 Jack at [Leviton.com/AtlasX1](https://www.leviton.com/AtlasX1).