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GETTING A PERSPECTIVE ON NOISE IN AUDIO

ended) circuits which do not have an out-of-polarity signal. Balanced inputs and outputs can be active electronics or transformers. Twisting is applied to a pair of wires that carry a differential signal. If these wires are twisted, the input/wiring/output circuit will be better-balanced and less prone to EMI.

Most electric noise picked up on twisted pair — shielded or not — is common-mode. As common-mode signals do not pass through (while balanced — differential — input and differential mode signals do), this is a very powerful means of controlling EMI.

Magnetic pick-up does not occur on twisted pair wire because the current created in each successive loop (twist of wire) are in the opposite direction and cancel. Another way to visualize this is that the loop area of a twisted wire is zero, so there is no loop to pick up the magnetic field. Consequently, twisting balanced lines is the most effective and efficient way to control magnetic EMI.

Note that magnetic EMI sources (such as high-power wiring and transformers) must, in most cases, be within a few meters of the victim receiver to be a threat, whereas electric EMI can be many miles away, such as the case of high-power RF transmitters.

Separation & Routing

This method of EMI control consists of locating and running sensitive wiring and equipment in a way which maximizes the distance to EMI sources.

As mentioned, EMI field strength diminishes with distance. Generally, the field will be reduced by about 6 dB for each doubling in separation. The importance of the initial separation (the first 10cm) cannot be overstated.

In most cases it costs nothing to obtain good separation and routing, only good planning and implementation.

Isolation

Isolation can be achieved by using an intermediate interconnection device, such as an optical isolator or transformer, that eliminates a hard-wired connection between the output and the input. This will eliminate the possibility of any ground-related noise inputs. Transformers are therefore indispensable when it comes to EMI immunity in harsh environments.