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How Is Noise Controlled?

Noise – it's a word that many designers fear and dread, as it is commonly thought to be a universal foe to electrical systems. However, we've previously broken down those misconceptions. As it turns out, noise can be a very important and positive design tool when added to a system intentionally. When added on purpose, designers can measure how noise affects the system, and thus strengthen and/or alter their design scheme. To achieve this, designers use a device called a noise generator, which as you can tell by its name, generates known amounts of noise into the system. A basic and generally accepted noise model is known as Additive White Gaussian Noise (AWGN). An AWGN channel adds randomly generated white noise into a system over a normal distribution and is typically generated by a Zener diode in a reversed-biased circuit.

Let's single out the word "white" in AWGN for a quick second. White noise's Power Spectral Density (the measure of a signal's power compared to frequency) is constant across all frequencies. Therefore, most noise diodes provide a fixed output power level. These characteristics make noise sources quite useful when analyzing and testing electronic systems. Now, noise generators aren't just wildly producing noise. They can become controllable devices for generating AWGN with specific power levels and frequencies when combined with certain devices. Let's take a quick look at three of these devices that can control noise levels.

One way to control generated noise is with an amplifier, which is an electronic device or circuit that produces and increased version of its input signal. In other words, an amplifier is used to increase the amplitude of a signal. It's important to note that amplifiers do not change additional parameters of the waveform, such as frequency or wave shape. Overall, an amplifier can increase the noise power sent through the system.

On the other hand, we have precision attenuators, which are also used to control noise. Unlike amplifiers, attenuators are electronic devices that reduce the power of a signal without distorting or diminishing the integrity of the waveform. The last noise-controlling electronic device we'll discuss today is a filter, which performs signal processing functions to remove unwanted frequency components from the signal and/or enhance desired frequency components in the signal.

Noise generators provide the highest level of control over noise sources by offering a wide range of attenuation, amplification, filtering, and switching to generate the exact noise output for any application. Now that you know noise is actually a positive design tool and it can be controlled, there is nothing more to fear. It's time to start incorporating and controlling these important devices into your designs to continue pushing the forefront of technology.