

Danville Signal Processing, Inc.

NEW GROUND-TO-GROUND TONE SUPPRESSION MODE

Danville has been delivering DSP-8200 family Tone Suppression Systems for Air Traffic Control for many years. In most cases, the system is configured to suppress all loud tones that may inadvertently reach an air traffic controller's ears while someone else is checking out a circuit. The algorithm that is used for this purpose is an adaptive filter which does not have prior knowledge of the test tone. This means that any tone (or tones) will be notched automatically. There are no "good" tones in this mode.

Ground-to-Ground circuits present a different challenge. In these circuits, certain signalling tones are acceptable (and required), therefore the standard tone suppression algorithm will not work. It will suppress all the tones including the signaling tones.

Danville has a new Ground-to-Ground tone suppression mode that addresses the unique challenges of Ground-to-Ground circuits. It is available in our DSP-8200d (Ver 2.2 firmware). In this mode, we specifically notch certain frequencies that are the most common test tones while passing the signaling tones. This greatly reduces the chance of a "tone incidence" while using circuits where no solution was previously available.

The most common test tones are 404 Hz, 1004 Hz, 2713 Hz, 2800 Hz and 3200 Hz. These are the frequencies that the Ground-to-Ground mode is designed to suppress.

A brickwall bandpass filter is first created that is flat to 2600 Hz. This allows the highest signaling frequency (2600Hz) to be passed without attenuation. By 2700 Hz, signals are attenuated by 50dB. This is a very sharp filter made possible by the use of digital signal processing. After the bandpass filter, the 404 Hz and 1004 Hz tones could still be present.

The next filtering stage creates fixed notches at 404 Hz and 1004 Hz. These notches are very narrow and do not affect the speech or other signaling tones. High level test tones can also overload a circuit. This causes the test signal to look like a square wave. This means that we also have to consider the odd harmonics of the test tone. We therefore have additional notch filters at 1212 Hz (3rd harmonic of 404 Hz) and 2020 Hz (5th harmonic of 404 Hz). The harmonics of the other test frequencies are attenuated by the brickwall bandpass filter. For example, the 3rd harmonic of 1004 Hz is 3012 Hz which is in the stop band of the bandpass filter.

The results of the Ground-to-Ground mode is that the vast majority of "tone incidences" may be avoided in circuits where no protection has previously available. A DSP-8200d Operating Manual is available for download at our website, www.danvillesignal.com.

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