

Digitimer - Hum Bug Noise Eliminator

ELIMINATE 50/60HZ NOISE AND HARMONICS WITHOUT FILTERING



ELIMINATES ELECTRICAL INTERFERENCE

- Simple 50/60Hz Sine Waves
- Mixtures of 50/60Hz Harmonics
- Noise Spikes from Dimmers
- Complex Noise from Fluorescent Lamps

NO WAVEFORM DISTORTION

- No Frequency Loss
- No DC Voltage Shift
- No Signal Attenuation
- No Phase Error

The Problem

Signals recorded using biological sensors and other high impedance devices are often contaminated with 50/60 Hz noise corrupting the content of these signals and degrading the quality of subsequent data analysis. Electrical interference is notoriously difficult to remove without altering the original signal embedded within the noise.

In theory, proper attention to ground and appropriate shielding can eliminate electrical interference. In practice, noise remains a frequent and distressing problem in many laboratories.

Noise may come and go for no apparent reason and may appear during critical phases of data collection. The effort required to maintain noise at an acceptable level is both time consuming and frustrating.

The Traditional Approach

Faraday cages decrease the magnitude of environmental noise sources but this protection is often incomplete.

Notch or comb filters are occasionally used to suppress 50/60 Hz noise and harmonics but these filters will distort the input waveform if the frequency components of the signal overlap with the filtered frequencies.

A New Solution

Developed by Quest Scientific and now manufactured and exclusively available from Digitimer Limited, the Hum Bug provides a powerful technique to eliminate 50/60 Hz noise and harmonics from analogue signals without filtering. The Hum Bug constructs a noise replica in real time and continuously subtracts this replica from the input signal. It performs this function in the presence of biological activity even when noise characteristics evolve over time.

Simplicity

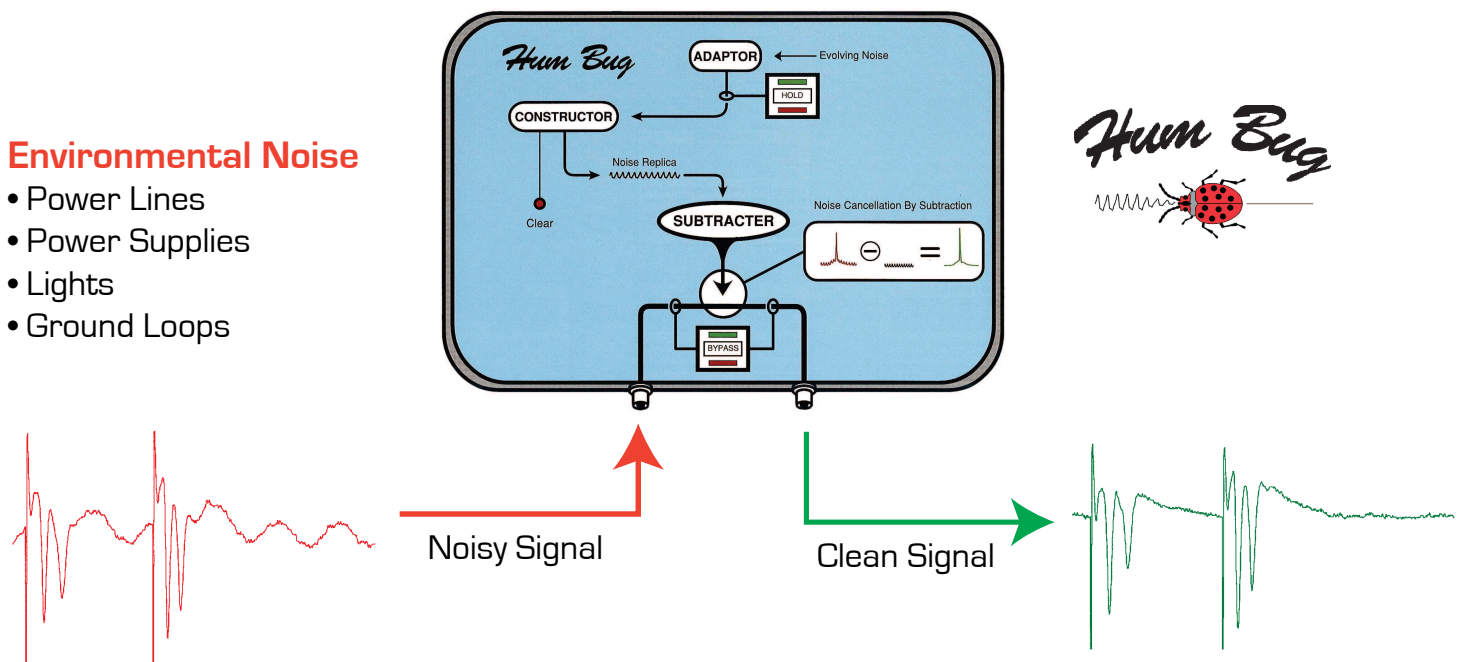
The Hum Bug is a real-time device. Simply connect it between your preamplifier and any analysis or recording equipment (oscilloscope etc.). It will automatically eliminate electrical interference while it lets the signal of interest pass through unchanged. No settings or adjustments are required. The front panel switches are only used if you wish to bypass noise cancellation (BYPASS), stop the adaptation process (HOLD), or clear the noise replica (CLEAR).

Advantages

The Hum Bug is not a filter. It does not create phase delays, amplitude errors, DC shifts or waveform distortion. It effectively eliminates 50/60Hz noise and harmonics without altering the frequency characteristics of the input signal even when these frequencies overlap with noise components.

Environmental Noise

- Power Lines
- Power Supplies
- Lights
- Ground Loops



Technical Overview

Theory of Operation: Principle operations of the Hum Bug are illustrated above. All functions occur in parallel as the signal passes in a direct analogue path between the input and output. The key innovation developed by Quest Scientific is the ability to effectively isolate noise from an input signal even when noise characteristics are evolving and the frequency components of the noise and input signal overlap.

Frequency Response: Biological signals pass through the Hum Bug unchanged for frequency components in the range of DC to greater than 500kHz.

Complex Noise: Electrical interference often generates a mixture of harmonics at multiples of 50/60Hz (e.g. 120Hz, 180Hz, 240Hz). The Hum Bug eliminates all harmonics with frequencies up to several kHz. Therefore, even the complex spikes generated by dimmers and fluorescent lamps are eliminated.

Applications: The Hum Bug can eliminate 50/60Hz noise from virtually any analogue signal. It is equally effective at removing noise associated with inadequate grounding, ground loops and electrical pickup. Common applications include noise elimination from signals recorded using microelectrodes, skin electrodes (ECG, EMG, EEG), high gain amplifiers, magnetic sensors and audio equipment.

Specifications

Dimensions: 6.5" x 7.5" x 1.3" (W x D x H)
Weight: 2.75kg
Power: 115-240 VAC
Input Protection: 50V peak to peak
Max. Input Signal: 5V average peak to peak

Max. Noise Amplitude: 1V peak to peak
Frequency Response: DC to >500kHz
Noise Cancellation: 50/60Hz and harmonics to 4kHz
Controls: Bypass, Hold and Clear
Display: LED indicates changing noise levels

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