

VIRTUAL CHANNEL COMPUTATIONS:

When defining a Virtual Channel. The user must select a computation from a drop-down list. The list will include but may not be limited to:

- **Arithmetic computations:** Addition, subtraction, multiplication and division, which can be performed between two channels or between one channel and a constant.
- **Boolean computations:** Comparator (“Less than”, “Greater than” or “Equal to” a given constant or another data channel), to compare a signal value to a constant or another data channel. Operators (AND, OR and NOT), to combine 2 Boolean channels into a single channel.
- **Signal percentage:** Expresses a value as a percentage of a given constant.
- **Time percentage:** Computes the on-going percentage of session time during which a Boolean channel (i.e. comparator) is “in condition” (1 or 0, as defined by the user).
- **Digital filters:** Option of IIR (Butterworth, Chebyshev or Elliptic) The user is also able to define the order as well as the filter’s cut-off frequencies for low-pass, band-pass and high-pass filters. The digital filter settings dialog box includes controls for graphing the filter’s frequency response curve. It is also possible to test its output with a simulated wave of a user defined frequency and amplitude.
- **Noise removal filter:** 50 and 60 Hertz notch filter.
- **Signal smoothing computations:** Damper filter and Smoothing average with user-defined averaging window and time period.
- **Counter:** A counter computation can be defined to increment each time the output of a source Boolean channel is 1. This way, events, such as threshold crossings, or the occurrences of multiple signal conditions (instantaneous or held for a given time period), can be counted.
- **Statistical computations:** Maximum, Minimum, Mean, Standard Deviation, Variance and Variability.
- **Discrete summation:** Used to define a channel for computing an on-going summation of a given channel when the Boolean channel is True and is used to trigger the summation.
- **Rate from time period:** Used to compute a rate (per minute) from a time period (interval). To be used in conjunction with channels that output a time period.
- **IBI from BVP:** Used to compute the time between beats (period) from a BVP signal.
- **IBI from EKG:** Used to compute the time between beats (period) from an EKG signal.
- **Respiration period:** Used to calculate the time between breaths (period) from a respiration signal.

- **Amplitude from BVP:** Used to compute the BVP signal's vertical span (amplitude), at every beat.
- **Respiration amplitude:** Used to compute the Respiration signal's vertical span (amplitude), at every breath.
- **Heart rate Max – Heart rate min:** Calculates the difference between the maximum and minimum heart rate values obtained during a complete breath cycle.
- **Skin resistance:** Used to convert the output of a SC physical channel (skin conductance) into a measure of resistance.
- **FFT and Power Spectrum:** These two computations allow users to convert a time-domain signal (raw EEG, raw EMG or IBI channel) into its frequency components (frequency spectrum). Three time windows are available: 1 or 2 seconds (approximately), for EEG and EMG, and 64 seconds, for IBI.
- **Average amplitude:** Takes an FFT or Power spectrum channel as input and determines the moment-to-moment Average Amplitude for all frequencies between user-defined low and a high cut-off frequencies.
- **Total amplitude:** Takes an FFT or Power spectrum channel as input and determines the moment-to-moment total amplitude within a user-defined band (between low and a high cut-off frequencies).
- **Median Frequency:** Takes an FFT or Power spectrum channel as input and determines the moment-to-moment Median Frequency.
- **Peak frequency:** Takes an FFT or Power spectrum channel as input and determines the moment-to-moment Peak Frequency.
- **Power Percentage:** Takes an FFT or Power spectrum channel as input and determines the moment-to-moment percentage of total power represented by a user-defined band within the spectrum (between low and a high cut-off frequencies).
- **RMS Non-Sliding Window and RMS Sliding Window:** The 2 computations calculate the root mean square of a bipolar input channel (ex. raw EEG or raw EMG) for non-sliding window or sliding window correspondingly.
- **Magnitude:** Computes the absolute value of an input channel.
- **Peak to peak amplitude:** Calculates the peak-to-peak amplitude of a bipolar input channel (ex. raw EEG or raw EMG).
- **Coherence:** Computes the coherence between two raw EEG or raw EMG input channels.
- **Comodulation:** Computes the comodulation correlation between two FFT or Power Spectrum channels.
- **Comodulation Maximum Shift:** Computes comodulation (correlation) phase shift.

- **Signal Change Speed and Acceleration:** Used to derive the velocity (speed) and acceleration from a signal input. Can take input from a goniometer adapter physical channel (angle = position).
- **Force sensor graduation:** Allows you to define the range of a force sensor connected to a Force Sensor Adapter (not unit specific).
- **Linear transformer:** Allows you to map Input and Output minima and maxima. Used for interfacing external devices connected to the Voltage Isolator.
- **Timer:** Used to calculate the time elapsed between two events (ex. Boolean channels) or between the beginning of a step and the occurrence of a single event.
- **Periodic Impulse:** Sets a single impulse each time when input is True and Time Period setting is 0, or sets a series of impulses with period between them equal Time Period when input is True and Time Period is Greater than 0.
- **Convert Boolean to Float:** Sets output to 0 when input is False or to 1 when input is True