CBLCAL/C   Cable Calibrators for Biopotential Amplifiers

CBLCALC   Calibration Cable for 100C-series Biopotential Amplifiers

CBLCAL   Calibration Cable 100-B series Biopotential Amplifiers

Use CBLCAL/C to verify the calibration of the any of the Biopotential amplifiers. The cable (1.8m) connects between the amplifier input and the UIM100C D/A output 0 or 1. To verify the amplifier's frequency response and gain settings, create a stimulus signal using Acq*Knowledge* and monitor the output of the amplifier connected to the Calibration Cable. The Calibration Cable incorporates a precision 1/1000 signal attenuator.

Amplifier specification tests are performed at the factory before shipping, but a Calibration Cable can ensure users peace of mind by permitting precise frequency response and gain calibrations for exact measurements.

CBLCAL/C Calibration

Hardware Setup

1. Connect the MP150/100, UIM100C and biopotential amplifiers as normal.
2. Connect the CBLCAL/C between the selected amplifier and the UIM100C, inserting the single 3.5mm plug into the Analog Output "0" port on the UIM100C.
3. Connect the end containing several 2mm pins into the corresponding holes on the face of the biopotential amplifier.
4. Select a Gain setting of 1,000 for DA, ECG, EGG, EMG, and EOG, or 5,000 for EEG and ERS.
5. Turn all filters to the desired position.
6. Select an appropriate channel on the top of the amplifier being tested (usually channel one, as this is the default setup in the software).

Software Setup

1. Under **Channel Setup**, insure that the default is set to analog channel one (A1).
2. Under **Acquisition Setup**
    a) Choose a sampling rate of 2000Hz (or higher).
    b) Choose an acquisition period of at least 5 seconds.
    c) Choose Record Last mode.
3. Under **Stimulator Setup** (see figure below)
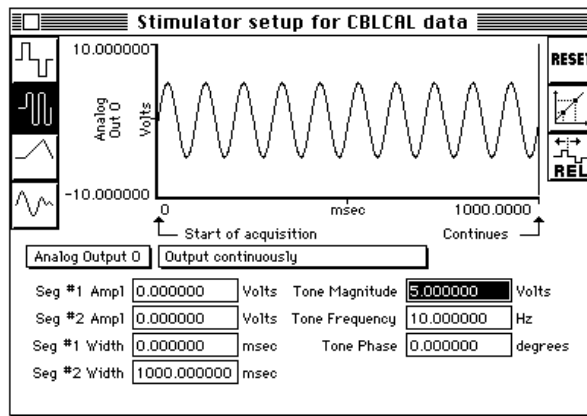
a) Select the sine wave for the shape of the output signal.

b) Set the "Seg. #1 Width' to zero. This means that the signal will be transmitted continuously starting at time-point zero.

c) Set "Seg. #2 Width" to 1,000 msec (one second). This is the length of the output signal.

d) Select "Analog Output: 0."

e) Select "Output continuously."

f) The most important settings are the signal magnitude and frequency. Set the magnitude to 5 Volts (i.e. 10V p-p) if the module gain setting is 1,000. If the lowest module gain setting available is 5,000, choose 1 Volt.

g) Set the frequency to 10Hz to check the gain calibration (on a sinusoidal signal, this setting is appropriate for all biopotential amplifiers).

Calibration Procedure

Acq*Knowledge* is now set-up to check for the proper calibration of biopotential amplifiers.

1. Start the acquisition. Theoretically, since you are in **record last** mode and are outputting a signal continuously, Acq*Knowledge* could acquire data forever.

2. Stop the acquisition when the waveform has stabilized.

3. Use the "I-beam" cursor to select the latter part of the record.

4. Perform all your calibration measurements on the latter part of the collected record.

a) Scale the waveform into some semblance of the one in the following figure.
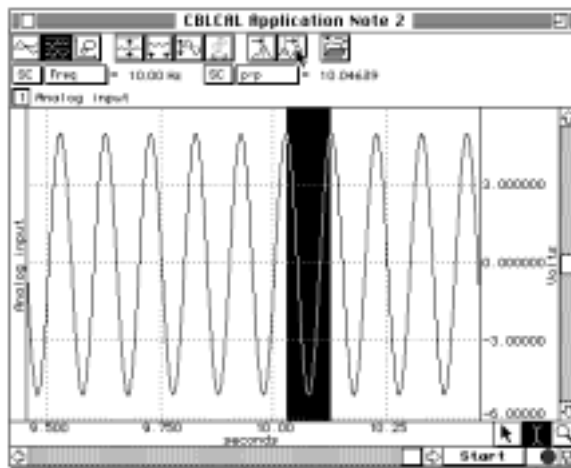
b) Select the Pk-Pk (peak to peak) measurement to determine amplitude. The measured voltage depends on the voltage input and the gain setting on the amplifier. Use the following formula to determine this number.

Measured Voltage =
(Stimulator Input Voltage) * (1/1,000) * (Biopotential Amplifier Gain Setting)

If the amplifier gain setting is 1,000, it will cancel the CBLCAL/C attenuation (1/1,000). Therefore, the measured voltage will equal the stimulator input voltage. In this example, assuming a gain setting of 1,000 and a stimulator input of 10V (pk-pk), the expected signal will be very close to 10V (p-p).

c) It is important that you measure the amplitude of the acquired waveform correctly. Highlight several peaks with the "I-beam" cursor.

d) Click the "peak detection" icon at the top of the graph window twice. This will precisely highlight one of the many peak-to-peak amplitudes.

e) Open one of the pop-up measurement, windows and select "p-p" to measure the amplitude of the waveform. This result indicates the vertical distance of the waveform between the two selected peaks (see figure above).

f) To verify the consistency of the difference in peak-to peak values, click the "peak detection" icon again. This will move the cursor to the next available peak below.

g) Repeat this several times to verify the subsequent peak heights. If your measured peak-to-peak height is 10.04 Volts, then you can ascertain that your acquired signal is ±5.02 Volts. If you output a 5 Volt magnitude signal with the stimulator, then measuring 5.02 Volts (0-pk) is considered accurate for any biopotential amplifier (the analog output stimulator is accurate to within ± .5%). To best determine the accuracy of the amplifier, you should consider an average of measurements.

JUMP100/C Jumper Connectors for Biopotential Amplifiers

JUMP100 — for all connections between all 100B-series Biopotential amplifiers

JUMP100C — for all connections between all 100C-series Biopotential amplifiers

These jumper connectors (10 cm long) are used to create a common reference between Biopotential amplifier modules. Link one reference electrode to multiple amplifier inputs using one jumper connector per amplifier. Jumper connectors are required when connecting the same reference electrode lead to two or more amplifiers, as in multi-lead ECG or unipolar EEG measurements.