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MCE100C MICRO-ELECTRODE AMPLIFIER

The MCE100C is an extremely high input impedance, low noise, differential amplifier that accurately amplifies signals derived from mini and micro-electrodes. Mini and micro electrodes are characterized by small surface contact areas that result in high electrode to tissue contact impedance. A number of selectable options make the amplifier module useful for general-purpose recording of cortical, muscle and nerve action/resting potentials.

See also
Application Note #AH-190
Using the MCE100C Micro-electrode Amplifier
www.biopac.com
and
Applications (Appendix)
in the ñAcq*Knowledge* Software Guideò

The MCE100C is useful for measuring biopotentials (voltage signals) from the following types of electrodes:

Catheter-based
Fluid-filled glass
Ion selective
Needle (all types)
Nerve chamber (NERVE1)

When performing voltage measurements using Ion Selective Microelectrodes, the adjacent shield output, associated with either the Vin+ or Vin- input, is the buffered output of the input signal (1x gain) at the Vin+ or Vin- port. These shield outputs can be used to measure reference electrode voltages (against a remote non-polarizable Ag/AgCl -indifferent- electrode) and the output of the MCE100C can be used to measure the differential voltages between a pair of ISM electrodes, one of them being the reference.

Generally considered, best performance is obtained when the mini or micro-electrode recording is performed in a shielded environment. The smaller the contact area of electrode, the higher the requirement for shielding. The MCE100C provides options for driven (voltage following) or grounded shields. Voltage following shields are useful for minimizing electrode lead input capacitance, to extend frequency response, when shielded cables are used. Grounded shields are useful for minimizing feedback noise and employed when distant shielding is utilized (Faraday cage or spiral shielding).

For special recording cases, as included options, the MCE100C provides manual controls for input capacity compensation (0-100pF) and clamp (I-bias) current zeroing (±100nA). In addition, the MCE100C incorporates an external voltage control to vary the clamp current proportionally to the control voltage (100 mV/nA), if required.

For very accurate (less than ±10 mV error) reference or differential voltage measurements, it's important to first calibrate out amplifier offset voltages by shorting the various inputs together to obtain a true 0 volt input for each measurement type.

An MP160/150A D/A output channel can drive this external voltage control to change clamp currents automatically during recording. The MCE100C also includes a clamp current monitor output so the clamp current can easily be recorded by another MP160/150 input channel.

For general-purpose recording, without input capacity compensation or a current clamp, use standard shielded or unshielded electrode leads terminating in 1.5 mm female Touchproof sockets.

Add simple input capacity compensation and current clamp control by connecting the respective signal ports to the [Vin+] input of the MCE100C using the JUMP100C jumper connectors.

For the best performance and shielding, use the MCEKITC to interface a micro-electrode lead cable to the MCE100C.

Current Clamping can be enabled/disabled, by connecting/disconnecting the "I CLMP" port to either differential input of the MCE100C. Negative Capacity Compensation can be enabled/disabled, by connecting/disconnecting the "NEG C" port to either differential input of the MCE100C.

- See Application Note 190 for details: http://www.biopac.com/Manuals/app_pdf/app190.pdf

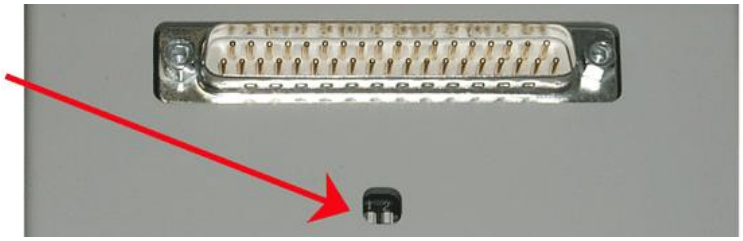
FREQUENCY RESPONSE PLOTS

The 0.5 Hz high pass lower frequency response setting is a single pole roll-off filter.

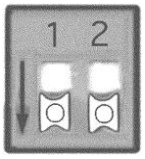
Modules can be set for 50 Hz or 60 Hz notch options to match the wall-power line frequency of the destination country. The proper setting reduces noise from interfering signals when the notch filter is engaged. Generally, wall-power line frequency is 60 Hz in the United States and 50 Hz in most of Europe; if necessary, contact BIOPAC to determine the correct line frequency, adjust the bank of switches on the left panel of the amplifier module.

- The 50/60 Hz notch on the MCE100C is only engaged when the 100 Hz HPN high pass notch filter switch is set to ONð see *Amplifer Filtering* for details.

Line Frequency switch bank is on the left panel of biopotential and transducer amplifiers

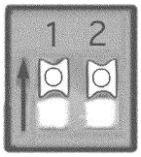


50 Hz



Both switches DOWN

60 Hz



Both switches UP

See also: Sample frequency response plots

100 Hz HPN (with 50 Hz notch)
100 Hz HPN (with 60 Hz notch)
3 kHz LP
30 kHz LP

MCE100C CALIBRATION

No calibration required. Use the CBLCALC to verify accuracy.

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MCE100C SPECIFICATIONS

Gain & Input Voltage:	Gain	Vin (mV)
	10	±1000
	50	±200
	200	±50
	1000	±10
Output Range:	±10 V (analog)	
Offset Voltage (DI):	Differential Input:	±5 mV maximum (Vin+ to Vin-)
Offset Voltage (SE):	Driven Shield to Input:	±15 mV typical (Vin+ or Vin- to Adjacent Shield)
Low Pass Filter:	3 kHz, 30 kHz	
High Pass Filter:	DC, 0.5 Hz, 100 Hz	
CMRR:	92 dB typical; see Shield Drive Operation	
CMIV ï referenced to:	Isolated ground:	±10 V
	Mains ground:	±1500 VDC
Notch Filter:	50 dB rejection (50/60 Hz)	
Noise Voltage:	2.1 µV rms ï (DC-3000 Hz)	
Noise Current:	0.1 fA/√Hz	
Input Bias Current:	±3 fA (typical), ±100 fA (maximum)	

Note: Current Clamping and Negative Capacity Compensation Disabled

Z (input)	
Differential:	10 E15 Ω
Common mode:	10 E15 Ω
Capacit. Comp (Neg):	Input capacitance compensation (0-100 pF) ï manual control
I Clamp (I CLMP port):	Adjustable (±100 nA) - voltage control
I Clamp Control:	Input 3.5 mm phone jack (100 mV/nA)
I Clamp Monitor:	Output 3.5 mm phone jack (100 mV/nA)
Signal Source:	Micro-electrodes
Weight:	350 grams
Dimensions:	4 cm (wide) x 11 cm (deep) x 19 cm (high)
Input Connectors (front panel):	Seven 1.5 mm Touchproof sockets (Vin+, Gnd, Vin-, 2 of shield, I-clmp, neg C)