

Biopotential Modules



Biopotential amplifier modules: ECG; EEG; EGG, EMG; EOG; ERS.

ECG100C - Electrocardiogram Amplifier module

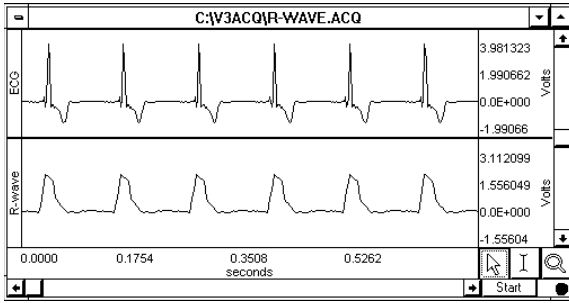
The electrocardiogram amplifier module (ECG100C) is a single channel, high gain, differential input, biopotential amplifier designed specifically for monitoring the heart's electrical activity, and for use in the following applications:

- Conventional electrocardiogram (12 lead ECG)
- Einthoven's triangle potential measurement (3 lead ECG)
- Transverse-plane ECG measurement (V1 through V6)
- Vectorcardiogram measurement
- Chaos investigations (heart rate variability)
- Heart arrhythmia analysis
- Exercise physiology studies

The ECG100C will connect directly to any of BIOPAC Systems, Inc.'s series of Ag-AgCl lead electrodes. The best choice for electrodes depends on the application, but typically the EL500 series (i.e., EL501, EL502, EL503) of adhesive/disposable snap electrodes are used in conjunction with the LEAD110/LEAD110S pinch lead. If reusable electrodes are required, the EL258 is typically used; when using EL258 electrodes, you will also need adhesive disks (ADD208) and electrode gel (GEL100). Use two shielded electrodes (EL208S) for the signal inputs and one unshielded electrode (EL258S) for the ground.

The ECG100C has built in drive capability for use with shielded electrode leads. If high bandwidth (resolution) ECG measurements are required, then shielded electrode leads are recommended. When the interference filter is switched on, shielded leads are typically not necessary. The ECG100C is designed to pass the ECG signal (P, Q, R, S, T waves) with minimal distortion.

The ECG100C has an additional R-wave detector function. When enabled, the output signal will produce a smoothed positive peak every time the R-wave is detected. This function is extremely useful for rate calculations when a well-defined peak is desired. The R-wave detector circuitry consists of a high Q (Q=5), 17Hz band pass filter followed by a full wave rectifier, followed by a 10.0Hz, three pole, low pass filter.

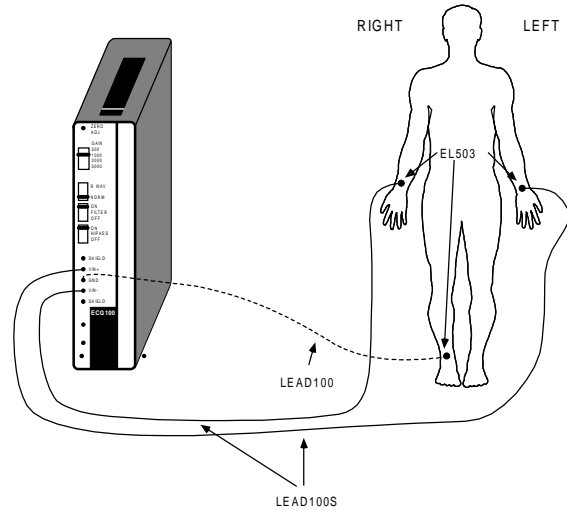


This graph (Raw ECG vs. R-wave) illustrates ECG data recorded with the ECG100C. The top waveform is a raw ECG wave, and the bottom waveform is the same signal processed using the R-wave detector in the ECG100C module. Enabling the R-wave detector is useful for calculating BPM and IBI, as it tends to remove any components of the waveform that might be mistaken for peaks.

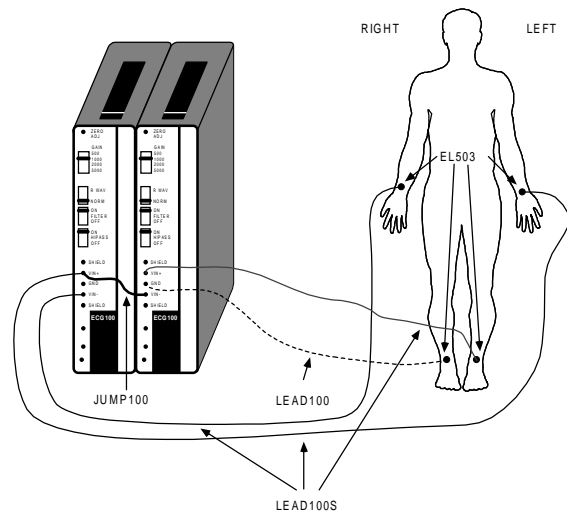
Recording a 12-lead ECG

- ❖ For full, simultaneous, 12-lead ECG recording, eight ECG100C amplifiers are required, along with a WT100C Wilson Terminal (see page 84). Two of the ECG100C are used to simultaneously record Leads I, II, III, aVR, aVL and aVF, while the remaining six ECG100C are used to generate the six precordial leads.
- ❖ To perform a standard 12-lead ECG recording using only three ECG100C amplifiers, use the TSD155C (page 84). The TSD155C multi-lead ECG cable is 3 meters long and incorporates a built-in Wilson Terminal for simultaneous recording of Leads I, II, III, aVR, aVL, aVF and one (movable) precordial lead [V1, V2, V3, V4, V5 or V6].

This figure shows the electrode connections to the ECG100C for the measurement of **Lead I**. Signals from this electrode montage can be used to calculate BPM (or IBI) and general-purpose ECG applications.



This figure shows the electrode connections to two ECG100C modules for recording a standard **two lead ECG** (Lead I and Lead III). Although only two channels are directly acquired, Lead II can be computed (either on-line or after the fact) by summing Lead I and Lead III. For this setup, the GND input on Lead I is internally connected to the GND input on Lead III, and the VIN+ on Lead I is connected to the VIN- on Lead III via a JUMP100C jumper lead.



Frequency Response Characteristics

The ECG100C includes a high pass filter that is used to stabilize the ECG baseline. When the **HP** switch is set to 1.0Hz, P and T wave amplitudes will be reduced somewhat, but the QRS wave will be virtually unchanged. The HP switch is usually ON when using the ECG100C for rate measurements only or when monitoring the ECG of an active subject.

The 0.05Hz and 1Hz lower frequency response settings are single pole roll-off filters.

Modules are factory preset for 50 or 60Hz notch options, depending on the destination country.

See the sample frequency response plots beginning on page 186:

35Hz LPN option (with 50Hz notch enabled)

35Hz LPN option (with 60Hz notch enabled)

100Hz LP option

ECG100C Calibration

The ECG100C is factory set and does not require calibration. To confirm the accuracy of the device, use the CBLCALC.

ECG100C Specifications

Gain:	500, 1000, 2000, 5000
Output Selection:	Normal, R-wave indicator
Output Range:	±10V (analog)
Frequency Response	
Low Pass Filter:	35Hz, 150Hz
High Pass Filter:	0.05Hz, 1.0Hz
Notch Filter:	50dB rejection @ 50/60Hz
Noise Voltage:	0.1µV rms - (0.05-35Hz)
Signal Source:	Electrodes (three electrode leads required)
Z (input)	
Differential:	2MΩ
Common mode:	1000MΩ
CMRR:	110dB min (50/60Hz)
CMIV--referenced to	
Amplifier ground:	±10V
Mains ground:	±1500 VDC
Input Voltage Range:	<u>Gain</u> <u>V_{in} (mV)</u>
	500 ±20
	1000 ±10
	2000 ±5
	5000 ±2
Weight:	350 grams
Dimensions:	4cm (wide) x 11cm (deep) x 19cm (high)

See also: JUMP100C

MEC series