



- Multi-modal amplifier system (EEG, EMG, EOG & ECG)
- 1 to 16 bipolar/unipolar channels
- User selectable filter and range settings via robust DIP-switches
- Analog output for direct connection to PowerLab data acquisition units

The g.BSamp is to be used when recording 3 or more biopotential signals from a single subject using a single PowerLab unit.

This multichannel biosignal amplifier is a stand-alone signal-conditioning unit for biosignal data acquisition and real-time analysis. The multi-channel modules allow the simultaneous recording of EEG, EMG, EOG and ECG. The amplifier is supplied in either 8 or 16 channel configurations.

The modules are suitable for unipolar or bipolar recordings. Filter, range and notch settings are user-selectable and the unit is supplied with a medically-rated power supply and Sub-D to BNC analog output cable for connection to PowerLab.

Channel Configurations

ADInstruments supply the g.BSamp in 8- or 16-channel configurations that consist of 4 or 8 modules, respectively. Each module contains two amplifier channels that share a common ground input. A total of 2 independent grounds are provided on both the 8 and 16 Channel Bio Amps for the measurement of various biopotentials or measurements from 2 different subjects.

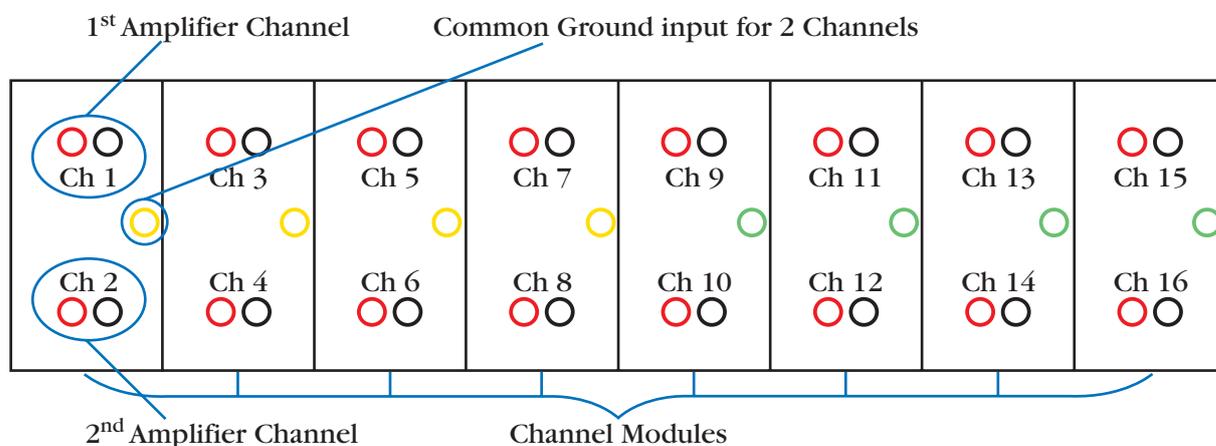


Figure 1. Schematic diagram of the 16 Channel Bio Amp.

Ground inputs that are internally (hardware) linked are indicated by the same color input connectors. If the user requires more channels of the same biopotential than are currently available with the internal ground linking (i.e. 16-channel EEG) then the independent grounds may be linked using an external jumper electrode.

Below is a schematic diagram of the g.BSamp unit for a 16-Channel Bio Amp, including 8 modules. Modules 1 to 4 share a common ground input whilst Modules 5 to 8 share a second common ground input. These ground inputs may be linked using an external electrode jumper cable at Module 4 and 5, thereby allowing 1 ground for a 16 channel recording of the same type of biopotential.

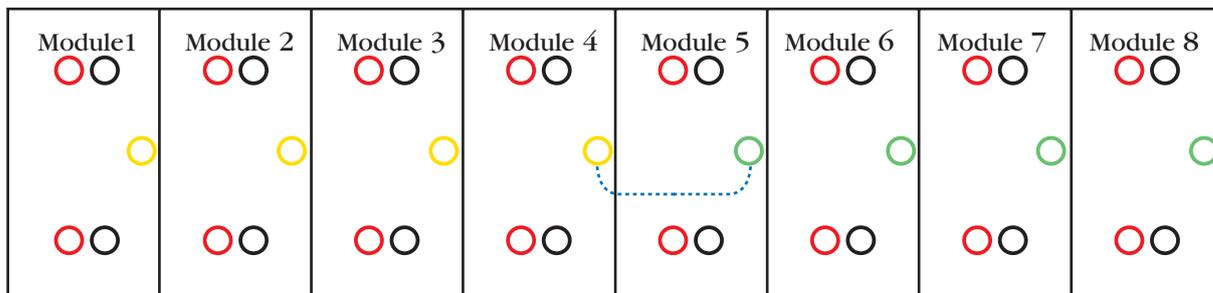


Figure 2. Diagram of the 16 Channel Bio Amp with possible electrode configurations.

- ≤ 16 same channels if module 4 and 5 grounds are linked ()
- ≤ 8 EEG/EOG and ≤ 8 ECG or EMG if the grounds are independent

NOTE: EEG and EOG channels may share a single ground to minimize noise. ECG and EMG may also share a common ground.

| Technical Details and Specification | | | | |
|-------------------------------------|--|---|----------------|--------------------|
| Input | Safety sockets for biosignal electrodes | | | |
| Output | Output voltage: ± 5 V; Output connector: 25 pin Sub-D with 8 or 16 BNC connections (1.5 m cable) | | | |
| Amplifier Module | 8 or 16 unipolar/bipolar amplifier systems are available | | | |
| | Noise level RTI: | 0.7 μ V _{ss} 0.28 μ V _{ss} for 0.1 to 10Hz | | |
| | CMRR: | > 110 dB | | |
| | Subject Isolation: | > 4 kV | | |
| | Input Impedance: | > 110 M Ω | | |
| | Signal Amplification: | μ V up to mV range | | |
| | Frequency Range: | 0.5 Hz to 1 kHz | | |
| Settings | Selectable filter and range settings via DIP-switches | | | |
| | Signal Type | Lo-Pass | Hi-Pass | Sensitivity |
| | g.BSamp Setting | 100 Hz/1 kHz | 0.5/2 Hz | 500 μ V/ 5 mV |
| | 50 or 60Hz notch filter: on/off switchable | | | |
| Physical Size | Length: 31 cm; Width: 25 cm; Height: 7 cm | | | |
| Weight | 2 kg | | | |

NOTE: The “g.BSamp setting” is a hardware setting on each of the amplifier channels. Further adjustment of the range/sensitivity and filter settings is applied using Chart software. The maximum output voltage is ± 10 V but linearity is only guaranteed for ± 5 V. The sensitivity settings on the back of the g.BSamp refer to a ± 5 V output.

Frequently Asked Questions

What is the difference between unipolar and bipolar recordings?

When using the g.BSamp, bipolar recordings are interchangeable with differential recordings, in that a single channel records the difference between two electrode sites (the red and black sockets) that share a common ground (yellow socket). For unipolar recordings in which the absolute value of a single electrode site is required, the active leads are connected to the red inputs of each channel while all of the black sockets are interconnected to a single reference electrode. Therefore, while bipolar (differential) channels each have their own reference, unipolar channels use a common reference electrode. For both bipolar and unipolar recordings, at least one ground electrode is required.

An example of a 16 channel unipolar EEG recording:

Connect all 16 black sockets with a shortcut-cable (= common reference electrode, e.g. at the left mastoid). Connect yellow and green ground sockets with a shortcut bridge (= ground electrode at right mastoid or nose ...). Connect the red sockets with the active electrodes 1 - 16 (F1, Fz, F2, C3, etc....)

Is the g.BSamp suitable for use on human subjects?

Yes, the g.BSamp is fully isolated and certified according to international safety standards (EN60601-1:1990+A1:1993+A2:1995+A12+A13:1996, EN60601-2-26 1994, EN60601-1-2//1993 and EN60601-2-25/1995+A1/1999). It also carries the CE mark indicating that it meets the European EMC Directive and is provided with a medical-grade power supply (see picture).

Can I use the multiple channel biological amplifier for clinical or diagnostic purposes?

No. The PowerLab and g.BSamp systems have been designed for use in teaching and research applications. They are NOT intended for clinical or critical life-care use and should NEVER be used for these purposes, nor for the prevention, diagnosis, curing, treatment, or alleviation of disease, injury, or handicap.

Is it possible to bypass all filters with a special DIP-switch setting?

No, for each type of filter (Low-Pass, High-Pass) there are two defined values that are specified by the g.BSamp hardware. These cannot be bypassed; however, alternative filters may be applied using the Input Amplifier settings in Chart. Only the notch filter can be set on or off.

What do the different colors of g.BSamp's ground sockets mean?

Different colors show that the ground inputs use separated ground potentials. Sockets of the same color are powered by the same supply and are internally connected. Internally (hardware) linked grounds cannot be separated; however, independent grounds may be linked using an external linking cable.

Is it possible to measure different types of biopotentials at the same time?

Yes, the g.BSamp can be used to measure different biopotentials on a single subject (EEG, EOG, EMG and/or ECG) or the same signals on 2 different subjects (provided that each subject has its own independent ground).

The g.BSamp is supplied with 2 independent grounds. It is recommended that EEG and EOG recordings share a similar ground, while ECG and EMG share an independent ground lead.

Can I control the range and filter settings of the g.BSamp using the Input Amplifier in Chart?

The **range/amplification** setting of the g.BSamp is selected using a DIP-switch on the back of the unit with 2 options available for each channel. The range pop-up menu in the Chart Input Amplifier dialog box may then be used to apply further amplification via the PowerLab unit. For example, if the amplification on the g.BSamp is set at 500 μV for an EEG channel then the g.BSamp will provide a voltage output of $\pm 5 \text{ V}$ for $\pm 500 \mu\text{V}$. Therefore, if the range is set at 2V in the Chart Input Amplifier dialog box, then a range of $\pm 200 \mu\text{V}$ will be recorded.

Similarly, the **filter** settings are determined by DIP-switches on the back of the g.BSamp with 2 options available for each type of filter. However, more filters are available in the Chart Input Amplifier dialog box. In addition, digital filtering may be applied once the data has been recorded in Chart. Minimal filtering should be applied to avoid signal aliasing.

All of the modules on the g.BSamp have the same hardware settings. Adjustment of these is required using the Input Amplifier in Chart depending on the biopotential that is being measured.

If the input to Chart from the g.BSamp is in volts then how do I convert the data into actual signal amplitude?

The easiest way to convert the output signal of the g.BSamp into the actual biopotential unit is to use the Units Conversion utility in Chart. For example, if the g.BSamp is set to provide an output of $\pm 5 \text{ V}$ for a gain setting of 500 μV , then the two-point calibration would be: Unit 1: 0 V = 0 μV ; Unit 2: 5V = 500 μV .