



CAMBRIDGE RESEARCH SYSTEMS

BlueGain



The BlueGain philosophy is to create cost effective, simple and flexible devices

BlueGain biomedical amplifiers are a range of wirelessly connected amplifiers for directly measuring patient bio-potentials.

BlueGain_{EOG} has been configured to record electrooculograms (EOG) and communicate these signals via Bluetooth to a host computer, performing the minimum amount of processing. An infrared sensor allows data to be synchronised with external events.

■ **Linked in to external events.**

In some situations it can be difficult to accurately tie external event indicators to the recorded analog data stream particularly when a stimulus generator and the recording device are operated independently. To help with this, BlueGain implements a separate infra red marker channel that operates without destroying the benefits of wireless communication. A supplementary unit connected to the stimulator generates infra-red pulses that are received by a sensor located on the front of the BlueGain unit and recorded as events directly into the data stream with a resolution of 100µs.

Flexible signal processing



In the BlueGain philosophy, the analog signals are amplified then digitised directly within the range DC to the maximum pass frequency of the system. All subsequent signal processing such as DC removal and 30Hz low pass filtering is performed digitally by the host computer. This means that you are completely in control and never stuck with incorrect algorithms or the wrong frequency response.



Safe

BlueGain_{EOG} uses a wireless Bluetooth connection to galvanically isolate the subject, along with touch proof electrode connections ensuring the device is completely safe to use for research.

■ **Simple Analog front-end**

Each of the analog input channels is amplified by a high quality instrumentation amplifier before being simultaneously sampled and digitised with 16bit resolution at 10kHz. BlueGain's flexible signal processing scheme means that all large blocking capacitors and other unreliable discrete elements have been completely removed from the signal path resulting in even better fidelity. The high intrinsic over sampling rate of the ADCs allows multiple samples to be accumulated before transmission to the host computer giving a further two bits of signal resolution.

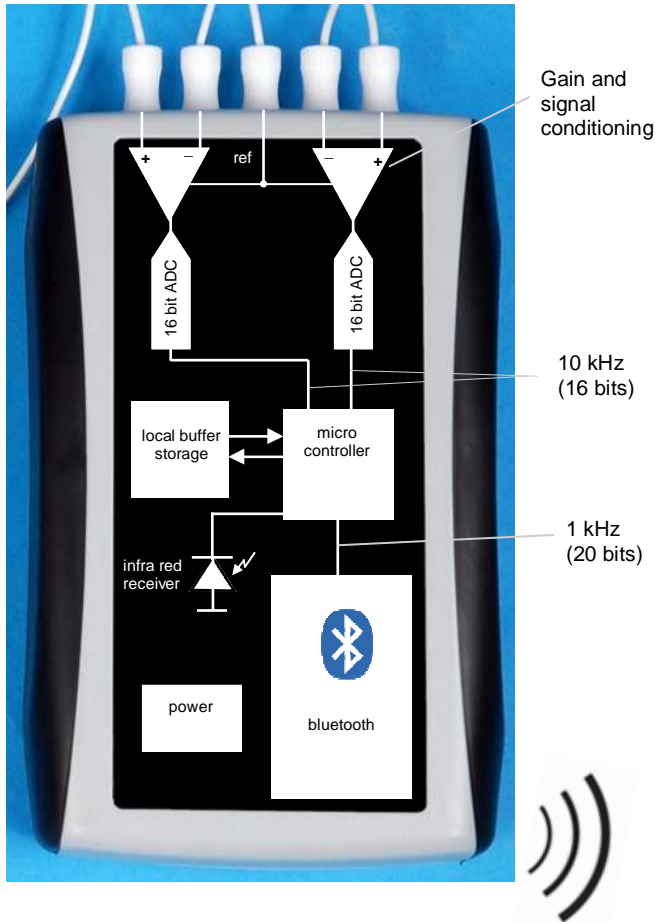
Accurate and reliable



Each data point in the BlueGain system is stamped with its sample time so that the host computer can verify the integrity of the data stream. A 3 second on-board memory provides temporary buffering in the event that data transmission is delayed by the host computer thereby ensuring that data will only be lost in exceptional circumstances. Battery life is extended by an auto power down feature that turns the system off after data transmission has been completed.

■ **Convenient**

BlueGain_{EOG} works with the minimum amount of disruption to a subject's natural behavior. The wireless set up and arm band give complete freedom of movement without distraction.



- Two fully differential analogue input channels.
- Digitisation at 10 kHz
- 20 bit 1 kHz per channel data stream to host computer.
- Bluetooth wireless communication
- Infrared external event synchronisation
- Internal buffering handles host computer latency



bluetooth signal



Technical Specification

Analog Characteristics	
Input Voltage Range	0 to 80 mV
Frequency Response	DC to 150 Hz
CMRR	110 db
Input Current	tbd
Input Noise	tbd
Isolation Technique	Bluetooth Radio
Battery Life	Typically 75 hours with lithium AA Cells (2 required)

Digital Characteristics	
Digitisation	16 bits each channel, simultaneous sampling on each channel
Sample Rate	10 kHz max
Resolution	122 nV
Data Rate to Host	1 kHz per channel (10 samples internally accumulated to form each data point)
Internal storage	3.5s at 1 kHz
Bluetooth Service	RFCOM
Infra red marker channel	Marker resolution 100 μ s (1 ADC sample)

Other Features	
Auto power down	
Regulatory	Not currently a medical device—but watch this space!
Provided with package	BlueGain device Armband with Velcro fastening, Bluetooth USB adapter Sample pack of electrodes

Physical Characteristics	
Enclosure Dimensions	ABS Box with battery compartment 110 x 67 x 26 mm
Weight	157g
Patient Connection	1.5mm Touch proof connectors