**Deuteron Technologies Ltd**

*Electronics for Neuroscience*

# SpikeLog128 Specification


This document provides specifications and instructions that are specific to the SpikeLog128 neural logger. General instructions for use of Deuteron's neural loggers and related software is available on Deuteron's website www.deuterontech.com

## General description

SpikeLog128 is a single board neural logger that provides 128 channels of neural recording. It also logs data from a "9-axis" motion sensor. SpikeLog128B hardware can also connect to external sensors and log data coming from them.

The main blocks of this logger are:

- Four 32-hannel digitizing amplifier array ICs
- A digital radio IC that uses sub GHz ISM band radio frequencies
- A MicroSD memory card; up to 512HGz is presently supported
- A microcontroller
- A logic block designed to move bulk data rapidly between digital sections of the logger
- Two battery chargers
- A 9-axis motion sensor IC

The neural inputs connect via two 70-pin connectors. Electode assemblies if use with this logger must either be terminated with a matching pair of 70 pin loggers, or, more usually, the logger plugs into an adapter that connects between the electrode assembly and a matching pair of 70-pin connectors.

## Basic capabilities

| Function | Properties | Detail |
|---|---|---|
| **Presentation** | Single circuit board, vertical orientation | No standard housing |
| **Neural recording** | 64 channels | 32000 samples per second |
| **Motion sensor** | Optional. “9-Axis”; 3D-accelerometer, 3D-gyroscope and 3D-magnetometer | Gyro and accelerometer: 1000 samples per second per axis. Magnetometer: 110 samples per second per axis |
| **Data recording** | To removable MicroSD card | Cards up to 512GB are supported |
| **Wired data streaming** | None | |
| **Radio data streaming** | Preview only | Limited to about 100Kbytes per second |

# Specifications

## File formats

If configured for neural data only, Deuteron's "Flat" file format can be used. Systems that support motion sensor recording, audio recording, or both use deuteron's "block" file format.

## Neural Recording

| Function | Properties | Detail |
|---|---|---|
| **Signal range** | 10mV p-p | |
| **Digital resolution** | 0.2µV | |
| **Random noise** | 2.4µV | For 7kHz bandwidth |
| **Input capacitance** | 14pF | |
| **Preamplifier bandwidth** | Low limit :0.2 to 500Hz<br>High limit: 200Hz to 10kHz | Fully software selectable |
| **Analog filters** | Low-pass: 3rd order. High-pass: 1st order | |
| **Sampling rate** | 32000 samples per second, each channel | Fixed sampling rate |
| **Connector** | Pair of HiroseDF40C-70DP-0.4V(51) | Spacing between connector center lines is 25.00mm |
| **Reference channels** | Ground is the default reference, but one of seven channels, or ground, in each bank can be selected to be a reference channel. | There are four banks of 32 signals. The voltage of the selected reference channel is subtracted from all the channels in that bank before the signals are amplified |

## Motion Sensor

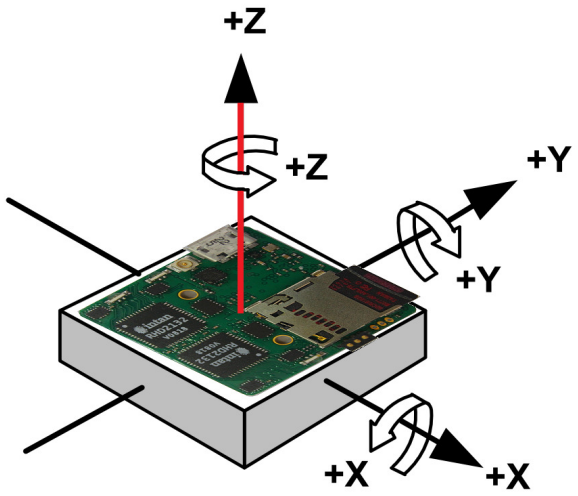
Note: Motion sensor functions are available only in software versions that support block file format.

| Function | Properties | Detail |
|---|---|---|
| **Accelerometers** | | |
| **Number of axes** | 3 | |
| **Data rate for each axis** | 1000 ± 10 | Samples per second |
| **Measurement ranges** | ±2g, ±4g, ±8g, ±16g | 4 software-selectable ranges |
| **Resolution** | 61µg, 123µg, 246µg, 492µg | 16-bit, according to range |
| **Noise PSD** | 300µg / sqrt Hz | |
| **Gyroscopes** | | |
| **Number of axes** | 3 | |
| **Data rate for each axis** | 1000 ± 10 | Samples per second |
| **Measurement ranges** | 250°/s, 500°/s,1000°/s, 2000°/s | 4 software-selectable ranges |
| **Resolution** | 0.076°/s, 0.015°/s, 0.031°/s, 0.061°/s | 16-bit, according to range |
| **Noise PSD** | 0.01 (°/s) / sqrt Hz | |
| **Magnetometers** | | |
| **Number of axes** | 3 | |
| **Data rate for each axis** | 111 ± 3 | Samples per second |
| **Measurement range** | ±4.8 | mT |
| **Resolution** | 0.6µT | 14 bit |
| **Uncorrected zero error** | 300 | µT |

## Physical and electrical

| Function | Properties | Detail |
|---|---|---|
| **Dimensions** | 30 x 30 x 4mm | Except for Micro-SD connector |
| **Mass** | 4.4g | Including microSD card |
| **Battery voltage** | 3.7V | Designed for any lithium polymer protected cell above 100mAh |
| **Charger current** | 300mA | Suitable for cells 300-1200mAh, other currents available on request |
| **Charger connector** | Micro USB | 5V supply required |
| **SD card socket** | Push-in Push out | |
| **Current consumption** | 102mA | Typical when recording, motion sensor off. |
| **Memory card capacities** | 8GB – 512GB | |

## Co-ordinate axes for Accelerometer and Gyroscope

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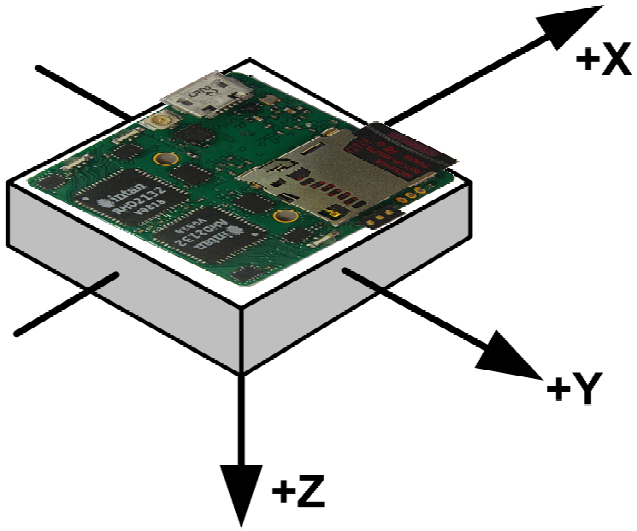
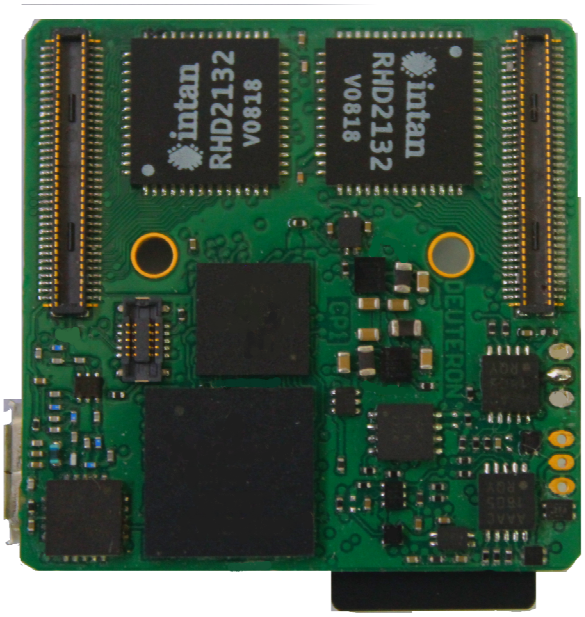


## Rear View

For front view see first page of this specification



# Available adapters

## SpikeLog128 for Cereport Adapter

Cereport is an elastomer-based mount developed in academia and sold commercially by Blackrock.Below is a view of the Cereport adapter assembled to the SpikeLog128 board, as well as two views of the complete logger for use on monkeys enclosed in a strong plastic housing that holds the logger, adapter, battery and radio antenna. The memory card can be inserted and removed via a slot in the housing.  Full documentation for the Cereport adapter is provided in a separate document.