NEUROSPEC
Research Neurosciences

ActiveRat EEG

Multi-cage / multi-channel EEG, EMG and activity monitor

ActiveRat is an elegant solution for collecting multi-channel EEG, EMG and activity (infrared detector) data from multiple freely-moving small animals. The system architecture incorporates amplification and 24- bit analog-to-digital conversion in a single, compact unit located inside or immediately adjacent to the animal housing. Up to 32 A/D boxes are synchronized but remain galvanically isolated from each other by means of a fiber-optic data daisy chain. Systems with more than 32 A/D boxes connected to a single host PC are also possible on a custom basis, with a proportional reduction in channels per cage and/or sample rate.

The fiber-optic daisy chain permits many meters distance between cages and between the last A/D box and the data acquisition PC (user-supplied), where data from all animals are displayed and stored. Each A/D box has an integrated low-capacitance DC-DC converter. So, all A/D boxes can be powered from a single un-isolated power supply. The galvanic isolation of each separate animal is still ensured by the internal DC-DC converter. The 2 input channels for IR detectors and extra logic input for a timing switch are coupled to the ADC circuitry via integrated low-capacitance optocoupler ensuring the galvanic isolation of each animal.

The RatView data acquisition software provided with the system manages the complex task of storing long-term records from multiple animals. The RatView software is a LabVIEW application, and it is provided as an executable that requires only the free LabVIEW runtime engine (provided) to operate. You do not need to have a LabVIEW programmer to operate the system. However, RatView is open-source software, meaning that the LabVIEW virtual instrument source code is provide with the system, and users are free to modify it to suit their own needs. A typical RatView software configuration will handle a total of 32*16+1=513 channels (last channel is sync channel). The switch data and the CMS in range data are encoded in the LSBs of channel 15 and 16 of each cage, so no channels are wasted for these extra bits.

Features

- 16 monopolar channels (referencing in software, for example to 7 differential leads)
- 24-bit A/D per channel, simultaneously sampled
- +-262 mV input range
- 2048 Hz maximum sample rate
- USB 2.0 interface to a single Windows XP SP2 host PC (user-provided)
- Remote acquisition review and control of acquisition via TCP/IP link
- Up to 32 cages per daisy chain. Systems with more cages are possible, and have been supplied on a custom basis. The maximum throughput total is 1 MSample/s, which is equivalent to 32 cages * 16 channels/cage * 2048 Sample/s or 64 cages * 16 channels/cage * 1024 Sample/s. Please inquire for more details.

A/D box Controls, Inputs, Outputs and Indicators

Front panel:

- 25-pole DIN input connector to rotor: channels 1-14, CMS, DRL, 5VDC
- 4 LED indicators: power (green), CMS in range (blue), sync (green), trigger (red)
- 5 pole DIN connector: PIR channel 1, PIR channel 2, ground, 5 VDC, trigger

Rear panel:

- Optic fiber input and optic fiber output
- Control to set the cage number (two digit up/down controls with number indication)
- Power Input: 13-15 VDC, 200 mA per AD-box

Infrared motion detector signals are handled by channel 15 and 16, so channels 1-14 remain available for animal electrodes. The Trigger input can be used for an external switch. This switch can be used to add timing pulses to the EDF/BDF file (extra channel added in software).

Additional Notes

- ActiveRat supports up to 7 differential EEG / EMG leads per animal.
- The minimal ActiveRat system configuration incorporates 8 A/D boxes with 16 channels each.
- PIR are channels for infrared motion detectors used in most labs to log activity of the animals. The PIR detectors are mains powered. Therefore, the two PIR inputs are coupled to the amplifier via analog optocouplers.
- The trigger switch (to log injection time of medicines) is also coupled via an optocoupler.
- Power input is coupled to amplifier/ADC circuitry via a DC-DC converter. Electrode inputs are galvanically floating (isolated from power input, and from PIR/Switch inputs).
- AD-box can interface directly with (implanted) passive electrodes (user-supplied). Alternatively, a miniature preamp can be used in the cable from rat to rotor.
- Video monitoring is currently not implemented.

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ActiveRat Specifications

Sample-rate per channel:	2048 Hz (lower sample rates possible on a custom basis)
Max. number of channels @ selected sample rate:	512
Bandwidth (-3dB):	DC - 400 Hz
Low-pass response	5th order sinc digital filter
High-pass response	fully DC coupled
Digitization:	24 bit, 4th order Delta-Sigma modulator with
Sampling skew:	< 10 ps
Absolute sample rate accuracy (over temp range: 0-70 C)	0.1 Hz
Relative sample rate accuracy (jitter)	< 200 ps
Quantization-resolution	LSB = 31.25 nV, guaranteed no missing codes
Gain accuracy:	1 %
Anti aliasing filter	fixed first order analog filter, -3dB at 3.6 kHz
Total input noise (Ze < 10 kOhm):, full bandwidth	0.8 uVRMS (5 uVpk-pk)
1/f noise (Ze < 1 MOhm):	1 uVpk-pk @ 0.1..10Hz
Amplifier current noise:	< 30 fArms
Input bias current:	< 1 nA per channel
Input impedance	300 MOhm @ 50 Hz (1012 Ohm // 11 pF)
DC offset:	< 0.5 mV
DC drift	< 0.5 uV per degree Celsius
Input range	+262 mV to -262 mV
Distortion	< 0.1 %

Channel separation	> 100 dB
Common Mode Rejection Ratio	> 80 dB @ 50 Hz
Isolation Mode Rejection Ratio	> 160 dB @ 50 Hz
Power Consumption	2.5 Watt per AD-box with 16 channels (12.5)
Leakage current, normal operation:	< 1 uA rms.
Leakage current, single fault	< 50 uArms
Trigger inputs:	1 input on A/D box, TTL level
PC interface:	USB 2.0
Size of A/D box (H x W x D)	190*140*46 mm
Weight of A/D box	< 0.5 kg
Warranty	3 years

PLEASE SEND YOUR ENQUIRE FOR OFFER TO:

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