Wireless-Systems

The all-in-one solution for wireless recording, and analyzing in vivo.

- 4, 8, 16 or 32 channels
- 16 bit resolution
- Lightweight headstage
- Wide effective recording range
- Excellent signal-to-noise ratio
- Options for electrical and optical stimulation
Wireless recording system

The Wireless-Systems from Multi Channel Systems are the all-in-one solution for amplifying, recording, and analyzing in vivo data from 4, 8, 16 or 32 channels. The amplifier bandwidth is 1 Hz to 5 kHz, sampled at 20 kHz per channel (up to 32 channels simultaneously, higher at less channels). With a resolution of 16 bit, the accuracy of your data is guaranteed. The systems include everything you need: Small-sized headstage with integrated A/D converter and LED lights for video tracking, digitized transmission, powerful receiver, interface board, and data acquisition software package. With its excellent signal-to-noise ratio, it is the ideal solution for spikes, LFP, EEG, ECG, EMG, and ECoG. Additional inputs to the interface board allow the synchronization of the data with external devices. Multi Channel Systems offers two different Wireless-Systems: The basic W-System and the advanced W2100-System. Most features are the same for both systems; however, the advanced W2100-System offers more possibilities e.g. regarding stimulation and sampling rate.

Digital data transmission

The Wireless-System converts the recorded signals into digital data already on the headstage. Therefore, the signal-to-noise ratio is much better and most importantly, independent from the distance between sender and receiver. The signal amplitude is independent of the distance, too, and your data arrives safely and completely at the receiver for further analysis. Thereby, the digital data transmission permits flexible long-term experiments in large environments.

Advanced W2100-System:
Modular setup of headstages

The wireless headstages are built in-house according to your needs. The level-based construction of the W2100-headstages makes custom-built headstages possible. Your headstage can consist of levels for amplification and A/D conversion, electrical or optical stimulation, motion sensors and many more which are currently under development. Indication for the battery condition is always included.

Parallel experiments

The Wireless-Systems offer the possibility to record from four headstages with one setup; with the basic system sequentially, with the advanced system simultaneously (at a reduced sampling rate). With the advanced system, you can connect two receivers to one interface board, thereby building a system for up to 8 headstages. With both systems, you can position four receivers in one room, thereby having a four-fold system with a total of 16 headstages, from which you can record in parallel (advanced system) or sequentially (basic system).
Energy-efficiency and flexibility

All devices of the Wireless-Systems are designed to be energy-efficient. The standard battery of the headstage permits continuous recording of all channels for approx. 2 hours (details on back side). Recharging is then realized via a USB charger.

When doing experiments with animals insensitive to weight, we also offer larger batteries, which provide longer recordings. Please contact Multi Channel Systems for more information on battery options.

For power-saving, the headstage switches to stand-by mode when the data acquisition is stopped. When recording continues, the headstage switches on automatically. Another possibility is to switch off the headstage completely via the data acquisition software. When switching on, you can use an infrared flashlight in order to not disturb the animal. Please see the graph below for switching possibilities.

Another possibility for energy-saving is provided by the software. It gives you the opportunity to switch off single channels, simply by deselecting them with one single mouse click. Apart from energy-saving, this feature also offers you the possibility for an even higher sampling rate (please see table on back side).

Differences between the Basic and the Advanced Wireless-System

Sampling rate

While the basic system can sample 32 channels at 5 kHz, the advanced Wireless2100-System samples them at 20 kHz per channel. Depending on the number of selected channels, the sampling rate can be increased (for details see table on back side).

Options for stimulation

With the Wireless2100-System, it will be possible to include electrical stimulation. There will be two pre-defined stimulation electrodes, the other electrodes can be used for recording.

For optogenetic experiments, we offer the programmable interface for synchronization of recording and light stimulation.

Parallel recordings

With the basic W-System, one setup can record from 4 headstages sequentially. The advanced W2100-System can do so simultaneously. With both systems, you can have 4 setups per room. Concluding, you can record simultaneously from 4 animals with the basic system and 16 animals with the advanced system (please note that the sampling rate will be reduced to approx. 1 kHz/ch).

Capabilities of the interface board

The interface board of the basic system only offers 4 in-/outputs.

The interface board of the advanced system on the other side offers various digital and analog inputs and outputs for synchronization with other instruments. Moreover, it includes a digital signal processor, which is freely programmable for individual analyses.
**Wireless-Systems: Technical specifications**

**Number of channels**
- 4, 8, 16 or 32

**Dimensions (W x D x H)**
- (Width + antennas; height + battery)
  - **Type of headstage**
    - W4-HS: 13 x 13 x 5 mm
    - W8-HS: 16 x 16 x 5 mm
    - W16-HS: 16 x 16 x 6.5 mm
    - W32-HS: 16 x 16 x 7.5 mm

**Weight (Headstage)**
- **Type of headstage**
  - W4-HS: 2.2 g
  - W8-HS: 2.8 g (OM), 3.1 g (SR)
  - W16-HS: 3.6 g
  - W32-HS: 3.7 g

**Battery**
- **Battery types and approx. weights**
  - **Capacity**
    - 30 mAh: 1.1 g
    - 100 mAh (standard): 3.0 g
    - 200 mAh: 4.6 g
    - 300 mAh: 6.8 g

**Battery life (until recharge)**
- e.g. 8 channels with 100 mAh battery: approx. 2 hours

**Resolution**
- 16 bit

**Input voltage range**
- ± 12.4 mV

**Sampling rate (kHz per channel)**
- (Ba=Basic Wireless-System, Ad=Advanced Wireless2100-System)
  - **Type of headstage**
    - W4-HS: 40 kHz/ch
    - W8-HS: 40 kHz/ch
    - W16-HS: 20 kHz/ch
    - W32-HS: 10 kHz/ch

**Bandwidth**
- 1 Hz to 5 kHz (0.1 Hz on request)

**Distance for wireless link**
- 5 m guaranteed (under normal circumstances)

**Control interface**
- USB 2.0

**Software:**
- **Operating system**
  - Windows 7 or 8 with NTFS
- **English and German versions supported**
- **MC_Rack program**
  - Version 4.1.0 and higher
- **MC_DataTool program**
  - Version 2.6.2 and higher
- **Multi Channel Suite**
  - under development
- **Data export**
  - ASCII (*.txt), binary file (*.raw) format

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