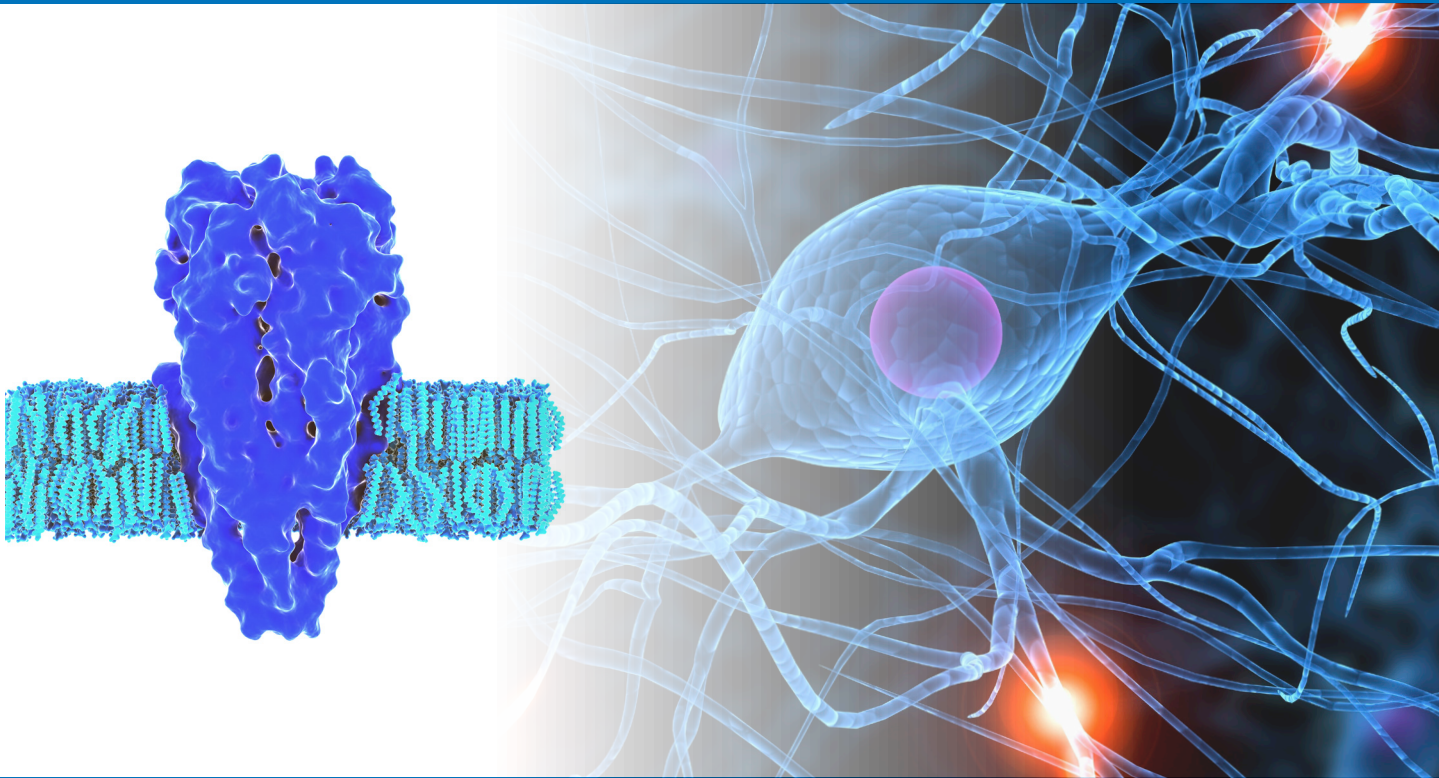


# In vivo & in vitro Electrophysiology

A modular portfolio meeting your needs from high throughput cell culture applications to recording in freely-moving animals



- Extracellular in vitro recording and stimulation
- Wireless and tethered in vivo recording and stimulation
- Automated RNA injection and TEVC recording

# Multiboot Interface Board

The Multiboot Interface Board facilitates operation of all MCS in vitro and in vivo headstages within the entire 2100 amplifier solution suite. This suite includes: MEA2100-HS, Multiwell-MEA-HS, CMOS-MEA-HS, MEA2100-Beta-Screen-HS, W2100-HS and ME2100-HS. The modular 2100 amplifier solution suite design makes it easy to modify your lab equipment generally with modest hardware upgrade investments.

## Universal Compatibility:



**MEA2100-Beta-Screen**  
Diabetes  
Electrophysiology



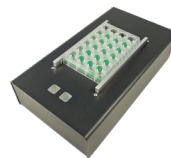
**W2100**  
Wireless In Vivo  
Electrophysiology



**ME2100**  
Tethered In Vivo  
Electrophysiology



**MEA2100**  
Flexible, modular,  
scalable single-well  
MEA Electrophysiology



**Multiwell-MEA**  
High throughput  
compound screening  
and functional  
cell monitoring



**CMOS-MEA**  
Subcellular Signal  
Propagation



= cardiomyocytes, organoids and whole heart	= Cell cultures and stem cell applications
= neuronal cultures, acute slices and organotypic tissue culture (OTC)	= Diabetes
= retina	= Acute tissue slices

# MEA2100-System

## Versatile in vitro recording system

The MEA2100-System is a versatile, up to 256-channel in vitro recording system with integrated stimulation, following the MCS-tradition of high-quality, low-noise amplifiers.

It is the complete setup for extracellular recordings from microelectrode arrays (MEAs), including everything you need for your experiment: interface board; MEA-headstage with integrated stimulation; MEAs; as well as temperature controller and perfusion heating. Thanks to its compact design, you can position the MEA-headstage on any inverted or upright microscope.

### Applications:

- Non-invasive extracellular multisite recording with microelectrode arrays from neuronal and cardiac slice preparations, islets of Langerhans or cultures, including stem cells and cell lines.
- Perfectly suited for basic research and validation experiments.

### Product Features:

- Integrated stimulation
- Filter bandwidth adjustable via software
- Variable contact unit
- Real-time signal detection and feedback
- Incubator ready



# Multiwell-MEA-System

## High throughput electrophysiology for screening

Featuring a 24- and 96-well plate format, the Multiwell-MEA-System from Multi Channel Systems is the perfect tool for medium and high throughput electrophysiology. Being based on the MEA2100-technology, it includes high-quality, low-noise amplifiers and freely-programmable stimulators.

One big advantage of the Multiwell-MEA-System is the high sampling rate. Your data is sampled at up to 50 kHz per channel. Thus, the accuracy of your data is guaranteed, whether you record from cardiac or neuronal samples.

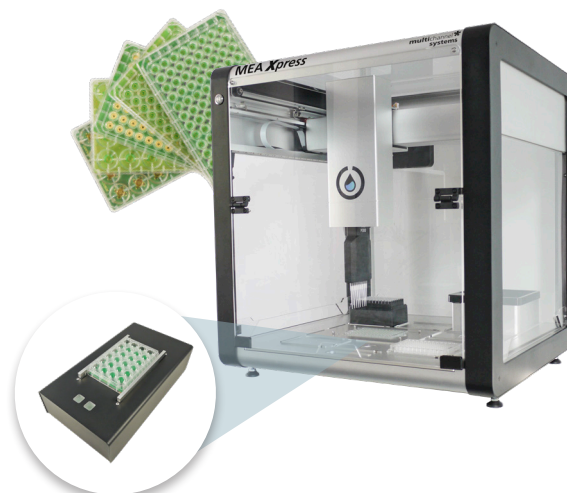
### Applications:

- Non-invasive extracellular multisite recording with microelectrode arrays from neuronal and cardiac cultures, including stem cells and cell lines.
- The ideal solution for drug screening and discovery as well as safety pharmacology in the field of cardiac and neuronal research.

### Product Features:

- 24- and 96-well plates
- Total of 288 channels
- Integrated stimulation

- Optional optical stimulation
- Fully climate controlled recording chamber
- Low cost well plates available
- Two headstages can be operated with one interface board
- Optional liquid handling



# CMOS-MEA5000-System

## Extracellular recordings and stimulation at the highest resolution

Based on complementary metal-oxide semiconductor technology, the CMOS-MEA5000-System from Multi Channel Systems opens up new possibilities in electrophysiological research.

With more than 4,000 recording sites, each of them sampled at 25 kHz, the chip allows extracellular recordings at a very high spatio-temporal resolution. By including amplification on the chip itself, noise is minimized and a high signal quality is guaranteed.

Stimulation sites are included in the chip and a stimulus generator in the headstage.

### Applications:

- Non-invasive extracellular multisite recording with active CMOS chip from neuronal cell cultures, slices or ex vivo retina. Allows recordings at sub-cellular level.

### Product Features:

- Active microelectrode arrays for recording and stimulation
- 4,225 recording and 1,024 stimulation sites
- Outstanding signal quality
- Versatile and powerful software
- 16 or 32  $\mu\text{m}$  pitch on chips available



# Multi Channel Suite

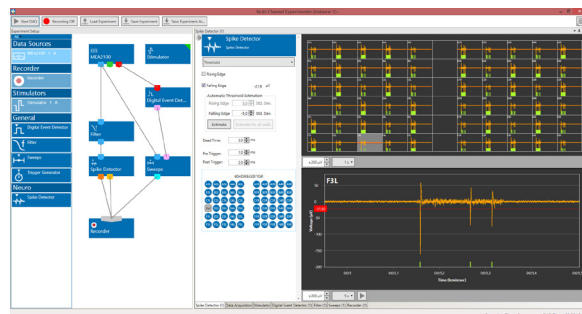
## Flexible and powerful software

The data acquisition and analysis program Multi Channel Suite is highly adaptable with unlimited possibilities.

With daily lab work in mind, the program is set up like an instrument rack on a workbench, allowing you to combine virtual instruments (e.g. recorder, filter, event detector, spike detector, stimulus generator or signal-triggered TTL pulse) in any way you want. The experimental set-up is very flexible and intuitive; all you have to do is choose the instruments by drag'n'drop and connect them, the way you want. Changes to the set-up are always possible.

Data is easily exported into HDF5 format, which is compatible with analysis tools like Matlab or Python, or you can analyze the recorded data in the Multi Channel Analyzer. This tool also offers the import of video data, which can be connected to the recorded data by time stamps.

The Multi Channel Suite is an easy-to-use, flexible, yet powerful tool for online and offline data analysis.



### Applications:

- Multi Channel Suite is a complete software solution for reliable acquisition and analysis of electrophysiological data.
- Real-time recording, graphing, and analysis of extracellular activity of excitable cells for in vivo and in vitro applications.

### Product Features:

#### Consists of three tools:

- Experimenter for recording and online analysis
- Analyzer for offline analysis
- DataManager for exporting to other programs (Python, Matlab, Neuroexplorer, etc.)
- Free software updates from our website
- Free support via email or phone

# W2100-System

## Telemetry in vivo recording system

The wireless system from Multi Channel Systems is 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 (customizable 0.1 Hz | DC), sampled at up to 40 kHz per channel simultaneously. 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 recording spikes, LFP, EEG, EMG, and ECoG.

Additional inputs to the interface board allow the synchronization of your data with external devices.

### Applications:

- Recording and stimulation of neuronal activity in freely-moving animals.

### Product Features:

- Wide transmission range (5 m)
- Options for electrical and optical stimulation
- Option to access analog data
- Parallel recordings with up to eight headstages
- Synchronized video-to-data recording possible
- Acceleration and rotation sensors



# ME2100-System

## Tethered in vivo recording system

The ME2100-System is a tethered in vivo recording system with up to 256 channels. It is the complete setup for anesthetized/head-fixed animals, including everything you need for your experiment.

The system consists of a signal collector unit for up to four headstages, which also contains a connector to control high power LEDs. Up to two signal collectors can be connected to one interface board, each signal collector unit providing up to 128 channels.

Headstages have 32 recording channels plus ground and reference inputs. Amplifier, stimulators, and A/D converters are all placed directly on the headstage, which allows low-noise, high-quality data acquisition.

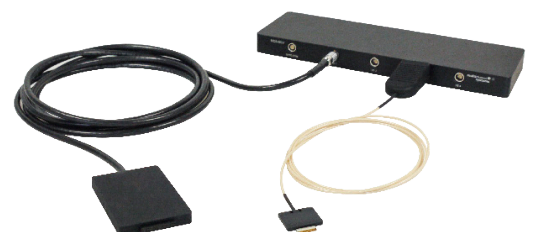
The stimulator units can be connected by software command to any of the recording channels, or to two connectors for external stimulation electrodes, which are also located on the headstage.

### Applications:

- Recording and stimulation of neuronal activity in anesthetized/head-fixed animals.

### Product Features:

- Up to eight 32-channel headstages
- Filter bandwidth adjustable via software
- Integrated stimulation
- Real-time feedback
- Programmable output for optical stimulation



# Roboinject

## Injection goes automatic

Until now, injection of nanoliter volumes into cells or embryos has been time-consuming and required highly qualified personnel in order to get satisfactory and reproducible results.

Multi Channel Systems is proud to present the Roboinject, the first and only commercially available fully-automated robot for compound injection into oocytes, eggs, and embryos using industry standard 96-, 384-, and custom well plates.

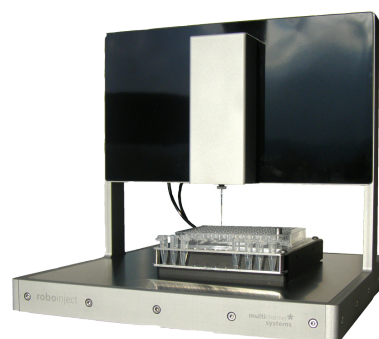
The automation of cell injection not only saves time and money, but also greatly enhances reproducibility of injection and survival of cells. It allows your highly qualified personnel to do away with routine work and concentrate on science.

### Applications:

- Injection of nanoliter volumes of compounds (e.g. DNA or RNA) into *Xenopus laevis* oocytes or other cells of similar size.

### Product Features:

- Fully automated injection using industry standard 96-, 384-, and custom well plates
- Sequential injection without user intervention
- Injection of up to 4 different samples per well and up to 8 different samples per plate
- Injection freely adjustable from 1 to 100 nl
- Variable injection depth and sample uptake speed
- Automated sample uptake (e.g. RNA or DNA)



# Roboocyte2

## Classical compound usage

Oocytes of the toad *Xenopus laevis* are widely used as an expression system for ion channels, transporters, and receptors in drug development. *Xenopus* oocytes are big, robust cells (about 1 – 1.2 mm in diameter), can be obtained in large numbers, and are easy to handle.

Nevertheless, the low throughput of manually performed electrophysiology prevents its use for secondary functional screening of drug targets. Therefore, Multi Channel Systems presented the first commercially available fully-automated system for *Xenopus* oocyte screening.

The Roboocyte2 is a fully-automated all-in-one solution for medium throughput screenings of ligand-gated and voltage-gated ion channels, as well as electrogenic transporters based on the well-established *Xenopus* oocyte expression system. All necessary tasks are accomplished by a single robot.

### Applications:

- Screening of ion channels and electrogenic transporters.

### Product Features:

- Recording of 96 oocytes without supervision

- TEVC recording of voltage-gated and ligand-gated ion channels and electrogenic transporters
- Flexible design of automated recording sequences
- Automated cell wash
- Automated compound application



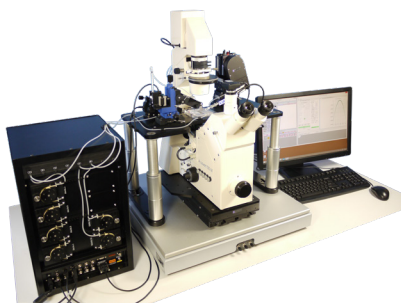
# PatchServer

## Pipette-based automatic Patch-Clamp system

The PatchServer is the only automatic Patch-Clamp system world-wide, directly based on the manual patch approach. It utilizes standard glass electrodes and emulates step-by-step the classical Patch-Clamp procedure.

Suspended cells are provided by a cell delivery system, caught by a “Catch pipette” and held in position until they are picked up by the recording pipettes.

The precise and fast automated pipette positioning is accomplished by our unique guidance system. Thus, the PatchServer makes it easy to generate high-quality electrophysiological data by automating the classical Patch-Clamp technique.



### Applications:

- Ultra-fast compound application for recording from ligand gated ion channels
- Selection of cells from Heterogeneous preparations, based on visual criteria (e.g. size, morphology, fluorescence)
- Works with spherical cells in suspension

### Product Features:

- Fully automated Patch-Clamping with standard glass pipettes
- Simultaneous, individual 4-channel recordings
- Low operating costs
- Cells can be visually identified and selected
- Piezo-driven sub-millisecond solution exchange (optional)

# HiClamp

## Non-destructive compound usage

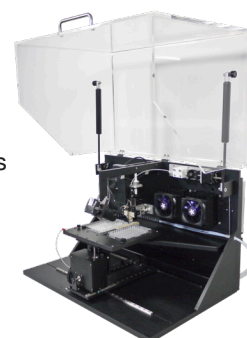
The HiClamp is built around an entirely new concept: Instead of applying solutions to the oocytes, the HiClamp carries each cell from one compound to the next. Oocytes are transferred automatically one after the other from a 96-well plate into a silver wire basket serving as the reference electrode. After automatic impalement of the intracellular glass microelectrodes, the basket is moved together with the oocyte from one compound-containing well to the next. Programmable washing steps effectively prevent cross-contamination between different compounds. The built-in digital amplifier guarantees a stable and accurate voltage-clamp resulting in precise and reproducible current recordings.

### Applications:

- Screening of ion channels and electrogenic transporters.

### Product Features:

- Fast drug application
- Minimal compound usage
- Non-destructive usage of compounds
- Works with 200 µl sample volume
- Fully-automated system





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[multichannelsystems.com](http://multichannelsystems.com) • [sales@multichannelsystems.com](mailto:sales@multichannelsystems.com)

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**Americas** (+1) 833 668 8632 • **Europe, Middle East, Africa** (+49) 7121 909 2525 • **Asia Pacific** (+86) 21 6226 0239