



2-Channel Miniature Preamplifier MPA2I Manual



Imprint

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1 Important Information and Instruction

1.1 Operator's Obligations

The operator is obliged to allow only persons to work on the device, who

- are familiar with the safety at work and accident prevention regulations and have been instructed how to use the device;
- are professionally qualified or have specialist knowledge and training and have received instruction in the use of the device;
- have read and understood the chapter on safety and the warning instructions in this manual and confirmed this with their signature.

It must be monitored at regular intervals that the operating personnel are working safely.

Personnel still undergoing training may only work on the device under the supervision of an experienced person.

1.2 Guarantee and Liability

The general conditions of sale and delivery of Multi Channel Systems MCS GmbH always apply. The operator will receive these no later than on conclusion of the contract.

Multi Channel Systems MCS GmbH makes no guarantee as to the accuracy of any and all tests and data generated by the use of the device or the software. It is up to the user to use good laboratory practice to establish the validity of his findings.

Guarantee and liability claims in the event of injury or material damage are excluded when they are the result of one of the following.

- Improper use of the device.
- Improper installation, commissioning, operation or maintenance of the device.
- Operating the device when the safety and protective devices are defective and / or inoperable.
- Non-observance of the instructions in the manual with regard to transport, storage, installation, commissioning, operation or maintenance of the device.
- Unauthorized structural alterations to the device.
- Unauthorized modifications to the system settings.
- Inadequate monitoring of device components subject to wear.
- Improperly executed and unauthorized repairs.
- Unauthorized opening of the device or its components.
- Catastrophic events due to the effect of foreign bodies or acts of God.

1.3 Important Safety Advice



Warning: Make sure to read the following advices prior to install or to use the device and the software. If you do not fulfill all requirements stated below, this may lead to malfunctions or breakage of connected hardware, or even fatal injuries.



Warning: Obey always the rules of local regulations and laws. Only qualified personnel should be allowed to perform laboratory work. Work according to good laboratory practice to obtain best results and to minimize risks.

The product has been built to the state of the art and in accordance with recognized safety engineering rules. The device may only

- be used for its intended purpose;
- be used when in a perfect condition.

Improper use could lead to serious, even fatal injuries to the user or third parties and damage to the device itself or other material damage.



Warning: The device and the software are not intended for medical uses and must not be used on humans. MCS assumes no responsibility in any case of contravention.

Malfunctions which could impair safety should be rectified immediately.

Any physical damage of the cable, such as a broken cable, causes a physical damage of the miniature preamplifier that cannot be repaired.

Protect the device from heat. Do not autoclave!

You can clean the connectors with distilled water in an ultrasonic bath, but keep the cable away from the fluid. Dry the device with compressed air.

Use and keep the device always in a dry environment. Do not expose it to fluids or vapor for a longer period of time.

2 Welcome to the MPA2I Miniature Preamplifier



The 2-Channel Miniature Preamplifier MPA2I is connected to the microelectrodes for providing the **initial tenfold amplification** stage.

It has additional common ground and **reference electrode inputs**. The reference electrode is ideally identical to the recording electrodes and placed into a comparable but inactive area or tissue. Background or noise signals that are picked up by both the reference electrode and the recording electrodes are removed.

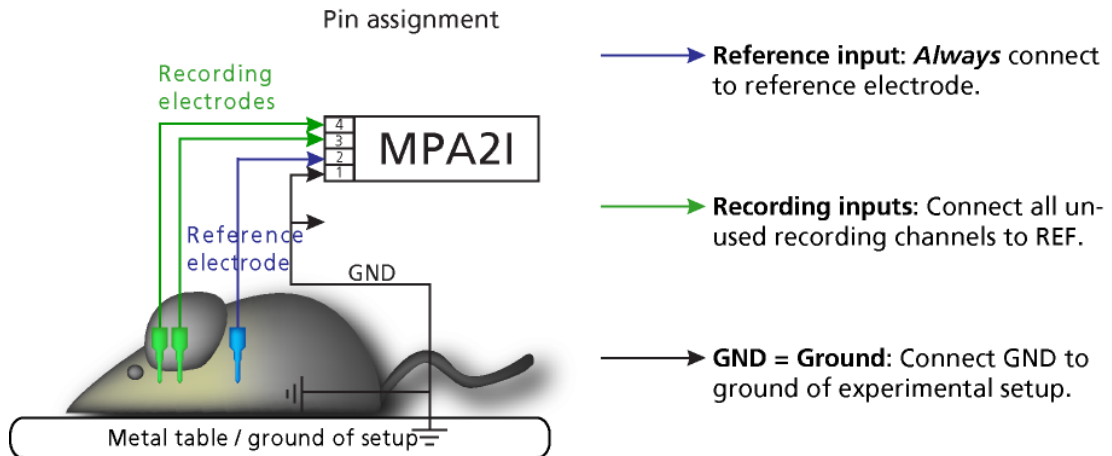
The metal case provides electrical shielding. Electrode damage is prevented by the very low bias current. The **high input impedance** ensures stable long-term recordings: Ideally, the input impedance would be infinite. As low voltages are generally recorded, a high current would flow if the input impedance were low. As a result, the amplifier would not be able to deliver the current, and the voltage would break down. The miniature preamplifier has a high input impedance to avoid this problem.

3 Setting Up and Connecting the MPA

3.1 General Setup Recommendations

In the following, you find general recommendations for the installation.

Miniature preamplifier setup



Important: It is important that the **complete setup** refers to a **single common ground**. The **reference input** has always to be connected. It is recommended to use a **reference electrode**. However, if you are not using a reference electrode, connect the reference input to ground (GND). Otherwise, noise picked up by the reference input will be subtracted from the recording signals. This will either lead to signal loss or to a very high noise level.

Ground the animal with a **ground electrode of large surface area**, for example, a liquid gel adhesive electrode, that is connected to the **ground** of the setup, for example, a large metal table or a **Faraday cage**, to avoid pickup of noise from the environment. The ground electrode is best positioned in an electrically inactive region, not near muscle, nor heart, for example, at the belly.

Connect the **GND input** or the **metal case** of the miniature preamplifier to the **common ground** of the setup. The GND input is internally connected to the metal case.

Connect the **reference electrode to the reference input** of the miniature preamplifier. Generally, a reference electrode is inserted into non-active tissue of the experimental model. The reference electrode should be identical to the recording electrode so that both electrodes see the same background noise. This is necessary because despite the grounding, the animal's body often has not exactly a potential of zero, due to the electrode impedance, for example. The background noise is then subtracted from the recording signal, increasing the signal to noise ratio. Please note that this may not work if the complete setup is not properly grounded.

Connect the **recording electrodes** to the **recording channels** of the miniature preamplifier. You can either use single electrodes or multitrodes with the miniature preamplifier. MCS provides adapters for standard probes.

Connect all unused recording channels to the **GND input** or to the **reference electrode**, if ground and reference are short circuited to avoid noise pickup. As the total amplifier gain generally lies in the range of 1000, even very small noise signals may generate high noise signals.

If you are not using a Faraday cage, it might be necessary to shield the complete setup with aluminum foil or similar to prevent electrical interference from the outside. Connect the aluminum foil to the ground of the setup (for example, the metal table).

Troubleshooting: If you observe problems with noise, check that the ground of the setup is connected to exactly the same ground as the data acquisition computer. For example, connect the metal table to the ground/earth wire of a free power outlet (of the same electrical system), as the computer is generally connected to ground/earth via the power plug, too. Also, connect the data acquisition computer's metal case with a thick ground wire to the ground of the setup, for example, the metal table, preferably with a 4 mm plug.

4 Service and Maintenance

Cleaning the Connectors



Warning: It is recommended to avoid the use of cleaning solutions to avoid corrosion. If a wet cleaning is required, use distilled water. Make sure that only the connectors touch the liquid; do not submerge the miniature preamplifier or the cable. Otherwise, you can fatally damage the electronics.

Clean the connectors with 70 % alcohol and cotton swabs from time to time.

If this does not provide satisfying results, insert only the connectors into a small beaker with acetone or alcohol and treat them in an ultrasonic bath for 10 to 20 s. Air-dry the miniature preamplifier for about 5 min before use.

You can also clean the connectors with distilled water in an ultrasonic bath. Dry the connectors with compressed air immediately after sonication and let the amplifier air dry for at least 6 h before use.

Sterilization



Warning: Do **not** autoclave or sterilize miniature preamplifiers by high heat (above 70 °C) or vapor. The resin is not heat-stable and may deform under heat. Vapor can lead to a corrosion of the electronics.

Miniature preamplifiers can be sterilized with standard methods that are **not** based on high heat or vapor, for example, with 70 % ethanol, UV-light, or by thermal sterilization in an oven at 56 °C with an incubation time of 8 hours.

5 Pin Layout

5.1 Power Supply

Supply voltage is applied to the output connector pins 8 and 15. The voltage source should supply a stable noise-free voltage. Do not exceed the maximum voltage.

Pin 8: -3 V to -8 V

Pin 15: +3 V to +8 V



Warning: Do not mismatch the polarity of the power supply. A false connection may damage the unit.

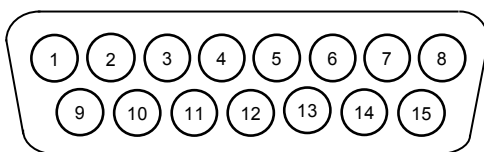
5.2 Input Connector



- 1 Ground (GND)
- 2 Reference input
- 3 Recording channel 1
- 4 Recording channel 2

5.3 Output Connector

(Male, Front View)



- | | |
|-------------------------------|----------------------------|
| 1 | Ground (GND) |
| 9 | Signal ground* |
| 2, 10 | Recording channels 1 and 2 |
| 3, 11, 4, 12, 5, 13, 6, 14, 7 | Ground (GND) |
| 15 | Positive supply voltage |
| 8 | Negative supply voltage |

* = Connected to the ground of the amplifier. The signal ground is used as the reference for the following filter amplifier.

6 Contact Information

Local retailer

Please see the list of official MCS distributors on the MCS web site.

Mailing list

If you have subscribed to the mailing list, you will be automatically informed about new software releases, upcoming events, and other news on the product line. You can subscribe to the list on the contact form of the MCS web site.

www.multichannelsystems.com

7 Technical Specifications MPA8I

Operating temperature	0° C to 50° C
Storage temperature	0° C to 50° C
Relative humidity	10 % to 85 % non-condensing
Dimensions (W x D x H)	12 x 31 x 3 mm
Weight	1.3 g w/o cable and plug, 21 g with cable and plug
Length of the cable	1.5 m
Maximum tensile strength of cable	20 N
Input connector type	Single-row precision sockets, 50 mil (1.27 mm) grid pattern, for 0.35 to 0.45 mm round pins
Supply voltage	± 3 V to ± 8 V DC
Supply current	$< \pm 2$ mA, typically ± 1 mA
Number of input channels	2
Input voltage	500 mV (with respect to a supply voltage of 5 V)
Input impedance	$10^{12} \Omega$ parallel to 10 pF
Input noise	$< 1.5 \mu\text{V}_{\text{RMS}}$ (1 Hz to 5 kHz, inputs short-circuited)
Noise density	$e_n = 15 \text{ nV} / \sqrt{\text{Hz}}$
Number of output channels	2
Output voltage	= supply voltage
Output current	max. = 10 mA
Output impedance	0 Ω
Bandwidth	DC to 50 kHz
Gain	10