multichannel systems

MEAS2/1 + MEA Switch USB Manual

::::MEA

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1 Introduction

1.1 About this Manual

This manual comprises all important information about the first installation and the proper usage of the MEAS2/1. It is assumed that you have a basic understanding of technical terms, but no special skills are required to read this manual.

Make sure you read the "Important Information and Instructions" prior to install or to operate the MEAS2/1.

1.2 Scope of Delivery

1	MEAS2/1 main device
1	USB 2.0 cable, type A - B
1	CD with MEA Switch USB program
1	Manual

2 Important Information and Instructions

2.1 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.

2.2 Guarantee and Liability

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

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.

2.3   Important Safety Advice

Warning: Make sure to read the following advice prior to installations of the device. If you do not fulfill all requirements stated below, this may lead to malfunctions, breakage, or even fatal injuries. 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.

Malfunctions which could impair safety should be rectified immediately.

This device is **no** medical instrument and **must not** be used on humans.

High Voltage

- When connecting an external power supply, do not mismatch the polarity of the power supply. A wrong connection may lead to fatal damage of the device.

- Use the lowest possible input supply voltage. Do not exceed the maximum input supply voltage of 12 V. The higher the input supply voltage, the more heat is produced by the device.

- Electrical cords must be properly laid and installed. The length and quality of the cords must be in accordance with local provisions.

- Only qualified technicians may work on the electrical system. It is essential that the accident prevention regulations and those of the employers' liability associations are observed.

- Each time before starting up, make sure that the mains supply agrees with the specifications of the product.

- Check the power cord for damage, each time the site is changed. Damaged power cords should be replaced immediately and may never be reused.

- Check the leads for damage. Damaged leads should be replaced immediately and may never be reused.

- Do not try to insert anything sharp or metallic into the case.

- Do not short-circuit the outputs of the device.

- Liquids may cause short circuits or other damage, even could lead to fatal injuries. Keep the device and the power cords always dry. Do not handle it with wet hands. Make sure the device and your experiment are set up in a way that makes it impossible that any liquid spills onto the device or flows into the device from the surface of the table.

Requirements for the installation and during operation

- The device must be set up on a rigid, vibration-free base.

- The device produces heat and can get hot during operation.

- Do not touch the device during operation and do not store flammable materials nearby.

- Do not place anything on top of device, and do not place it on top of another heat producing device.

- Do not open the case of the device.

3 First Use of the MEA Switch

3.1 Welcome to the MEAS2/1

The MEAS2/1 allows to acquire data from 60 single channels from **two** 60 channel amplifiers. If you have a 128-channel MC_Card or an USB-ME128-System, you can even pick 128 channels in total from two MEA pairs with the MEAS4/2 for four amplifiers. Selected channels are combined to a single electrode raw data stream that is delivered to the MC_Card or to an USB based data acquisition of the computer by a 68-pin MCS high grade cable. This is useful if you do not need all 60 electrodes on a MEA, for example, because the cell culture or the slice does not cover the whole MEA, but rather single electrodes.

The channel selection is mutually exclusive, that means, if you pick channel 21 on one MEA, you cannot select channel 21 on the other pair. The MEAS2/1 is software-controlled by the program **MEA_Switch** via USB port.

The MEAS2/1 does not replace a **Signal Grounding** Unit. That means, the channels that are not selected are only removed from the input data stream, but they are not grounded. If you have bad electrodes that produce noise, the noise can still interfere with your input signals.

You need an external power supply for operating the MEAS2/1, for example, the PS40W.

The following pictures shows the rear panel of the MEAS2/1 with the output channels, the USB port, and the power supply inputs.

3.2 Installing the Software

System requirements

Software: One of the following Microsoft Windows ® operating systems is required: **Windows 7** (32 or 64 Bit), **XP or Vista** with NTFS and SP3 (**English** and **German** versions supported). Other language versions may lead to software errors.

Hardware: Free USB port

Installing the software

Please check the system requirements before installing the software. Multi Channel Systems cannot guarantee that the software works properly if these requirements are not fulfilled.

Important: Please make sure that you have full control over your computer as an **administrator**. Otherwise, is possible that the installed software does not work properly.

1. Double-click **Setup**.exe on the installation volume. The installation assistant will show up and guide you through the installation procedure.

2. Follow the instructions of the installation assistant.

3.3 Setting Up and Connecting the MEAS2/1

Warning: Do not mismatch the polarity of the external power supply. A wrong connection may lead to fatal damage of the device. Use the lowest possible input supply voltage. Do not exceed the maximum input supply voltage of 12 V. The higher the input supply voltage, the more heat is produced by the device.

Important: If you use a complete MEA System, the MEA amplifier will usually be powered by the isolated power supply (IPS10W) that is integrated into the data acquisition computer. If you are using a MEAS2/1 , you will have to connect an **external power supply** to the MEAS2/1 for operating the amplifiers. The power is then distributed along the 68-pin MCS high grade cable. Please ask your local retailer for more information about the setup.

1. Connect the MEAS2/1 to a computer via the USB port with a standard USB 2.0 High Speed cable (Type A - B).

2. Connect the MEAS2/1 output to the MC_Card in your computer or to the USB-ME data acquisition via the provided 68-pin MCS standard cable.

3. Connect the two 60 channel amplifiers to the MEAS2/1 via the provided 68-pin MCS standard cables (see illustration "MEAS2/1 front panel"). Make sure that both cables are oriented to opposite sites to avoid a mechanical interference of the connectors (please see picture).

4. Connect the MEAS2/1 to an external power supply PS40W.

MEA S2/1 front panel
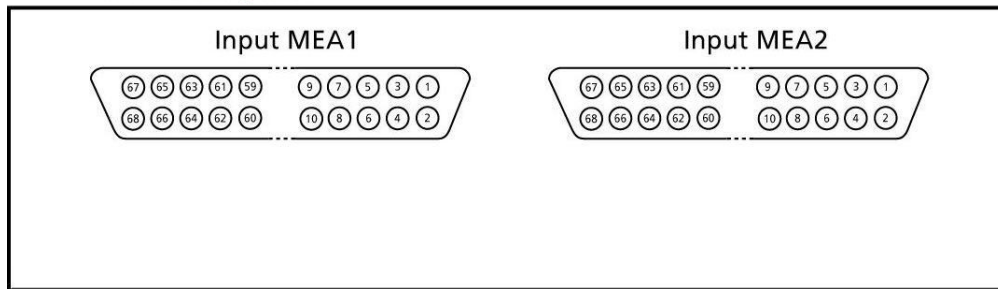
MEA S2/1 rear panel
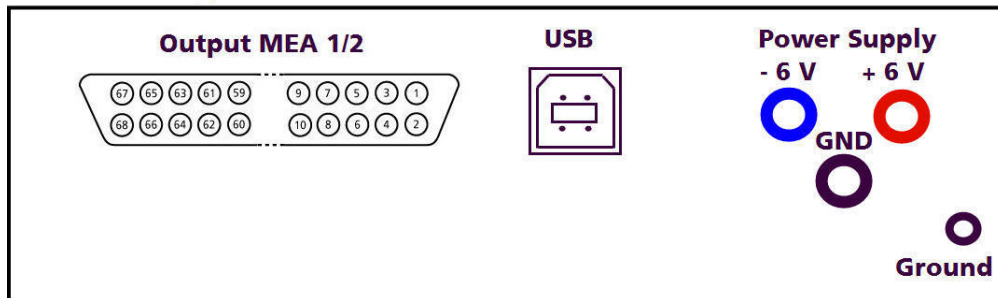
4   Operating the MEA Switch

4.1   Controlling the MEAS2/1

The 120 channels from two 60 channel amplifiers are reduced to 60 channels. You can decide from which of the two amplifiers a channel should be picked. The channel selection is mutually exclusive, that means, channels with the same channel number, for example No. 21, cannot be picked from both amplifiers. If you use a MC_Card with 128 channels or an USB-ME128-System, you can use a MEAS4/2 for two pairs of 60 channel amplifiers.
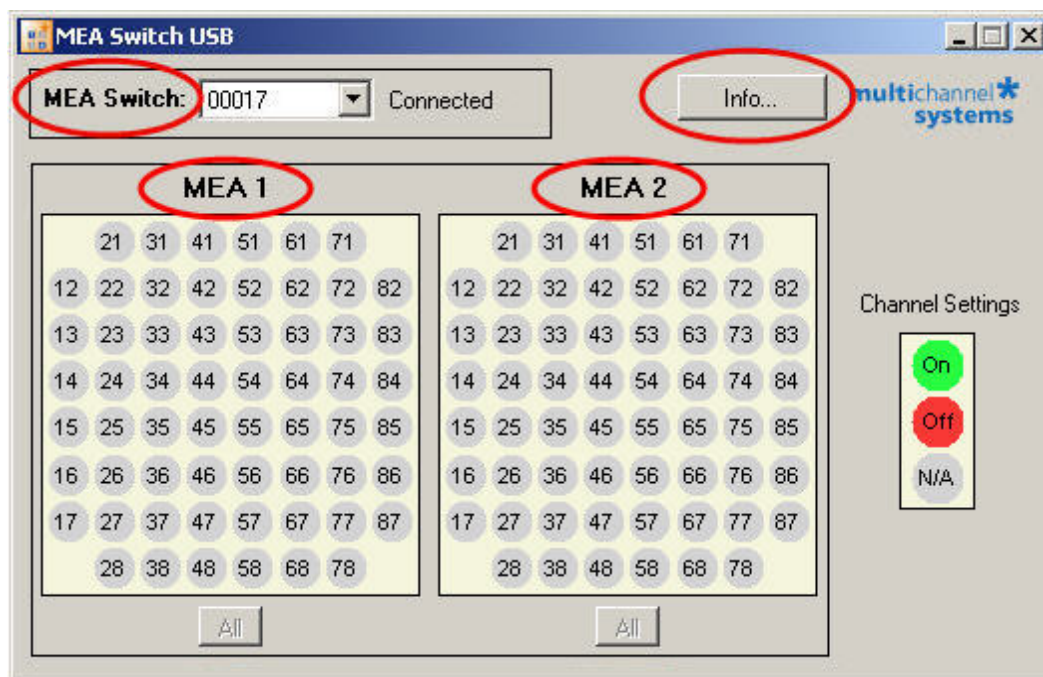
The operation of the MEAS2/1 is computer-controlled via USB port. You can easily make your selection with the MEA Switch USB software program.

Double-click the MEA Switch USB.exe file.

- OR -

Double-click the MEA Switch USB icon on your desk top.

The **MEA Switch USB** program starts.

The main window shows:

MEA Switch: Serial number of the device.

Info.... Information about the Version of the MEA Switch USB program.

MEA 1 / MEA 2 : MEA amplifier 1 to MEA amplifier 2 to which the MEAS2/1 is connected.

Electrode fields of the amplifiers in MEA standard 8 x 8 grid.

All: Button to select all electrodes from one amplifier, MEA 1 or MEA 2 respectively.

Channel Settings: The electrode channels colored in green are active (On), that means, they are detected in MC_Rack. The electrode channels colored in red are inactive (Off). The non selected channels appear in grey (N/A).

Start data acquisition program, for example, **MC_Rack**.

In MC_Rack choose in the **Channel Layout** dialog in Source Layout: 2 dim. MEA
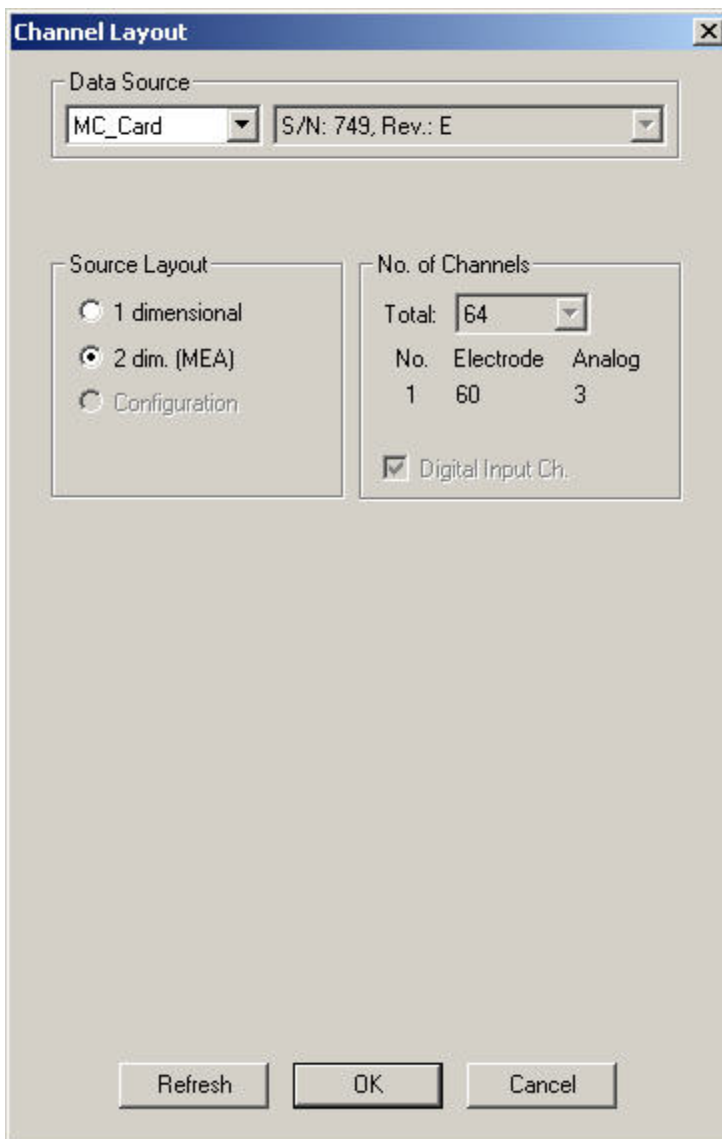
The MC_Rack data display shows the MEA standard grid 8 x 8.

4.2 Toggling Channels

Each channel of the data stream is either assigned to the left or the right MEA. You cannot select the same channel from both MEAs.

The buttons represent single channels and have a toggle function. Click a button to activate or deactivate a channel. Non-selected channels appear in grey.

The MEAS2/1 does not replace a **Signal Grounding** unit. That means, the channels that are not selected are only removed from the input data stream, but they are not grounded. If you have bad electrodes that produce noise, the noise can still interfere with your input signals.

1. Click a button to select a single channel or click **All** to select all channels. A selected channel button appears in green color. The corresponding channel on the other pair is deselected and colored in red.

2. Click a selected channel again to deselect it. The corresponding channel on the other pair is selected.

3. The non-selected channels appear in grey.
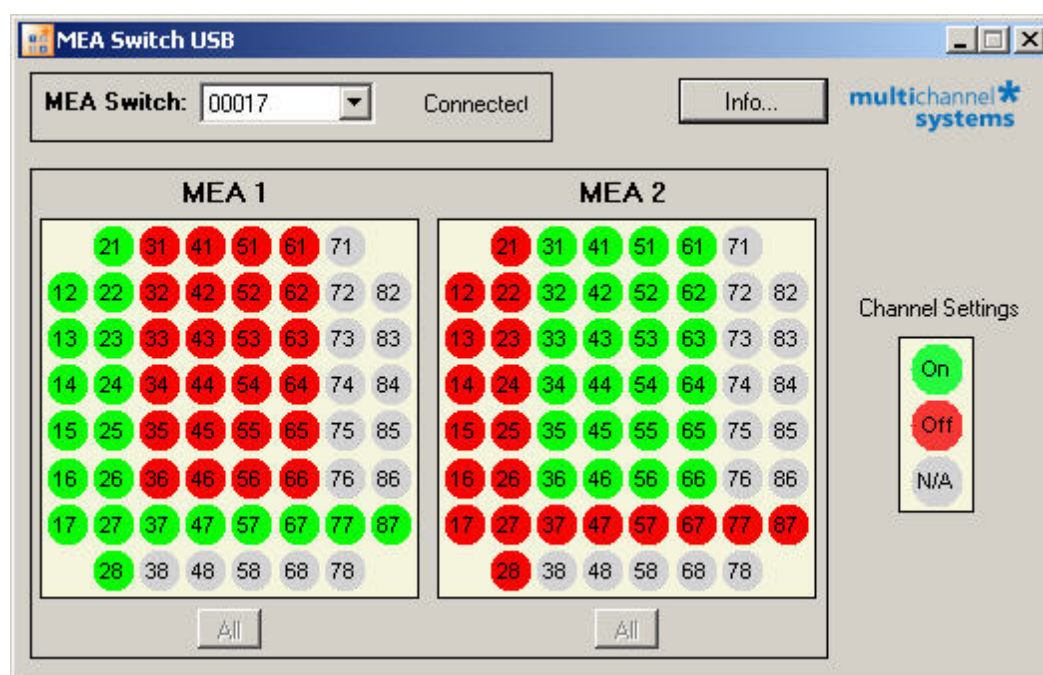
The function select "All" electrodes from one amplifier is useful, for example, for checking the condition of the cell culture or of the slice placed on MEA 1 or MEA 2 amplifier. However in this version of MEA Switch USB you have to save your channel assignment manually before clicking "All". Please see chapter "Printing the Channel Assignment".

4.3 Printing the Channel Assignment

In the data acquisition and analysis program MC_Rack, you cannot identify from which amplifier the data is acquired. The data is treated as if it was acquired from one amplifier. Therefore, you should save the present channel layout, for example, via screen shot to document your experiment. You can print the screen shot for your lab book or store it as a data file. Later versions of MEA Switch USB will feature a print function.

5 Troubleshooting

5.1 About Troubleshooting

The following hints are provided to solve special problems that have been reported by users. Most problems occur seldom and only under specific circumstances. Please check the mentioned possible causes carefully when you have any trouble with the product. In most cases, it is only a minor problem that can be easily avoided or solved.

If the problem persists, please contact your local retailer. The highly qualified staff will be glad to help you. Also please inform your local retailer, if other problems not mentioned here occur, even if you have solved the problem on your own. This helps other users, and it helps MCS to optimize the instrument and the documentation.

5.2 No Connection

The MEA Switch USB displays the main window after starting the program without any colors on the electrode fields and the error message "No Connection" appears.
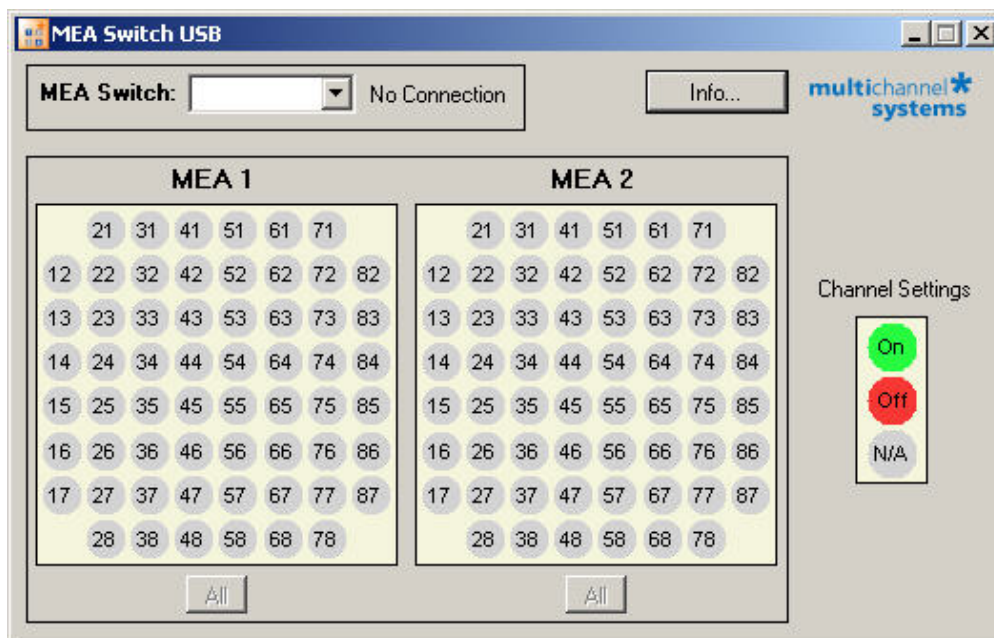
Possible causes:

? The USB cable is not plugged in correctly to the USB port of the computer and / or to the MEAS2/1.

→ Select another USB port from the data acquisition computer and test the connection again.

? The MEAS2/1 is not connected to a power supply.

→ Check all cables and connections.

? The MEAS2/1 is not connected to the computer.

→ Check the USB cable. Make sure the MEAS2/1 and the computer are connected directly with the provided USB cable. Make sure all cables are plugged in properly. Replace the cable if the problem persists.

5.3 Problems with Single Channels

You are not able to record signals from one MEA amplifier on single channels. You may also see wrong signals on single channels due to a crosstalk between different channels.

Possible causes:

? This can happen if the 68-pin MCS standard connectors are not carefully plugged into the MEAS2/1. Single pins may have a bad connection. If single pins have no (or a bad) connection, you are likely to see wrong signals due to a crosstalk between channels.

→ Carefully check all connections and cables. Make sure the connectors are plugged in so that both input cables are oriented to opposite sides, avoiding that the connectors and cables mechanically interfere with each other. See also chapter "Setting Up and Connecting the MEA Switch".

6   Appendix

6.1   Technical Specifications

Operating temperature	10 - 40 °C
Storage temperature	0 - 50 °C
Dimensions (W x D x H)	220 mm x 235 mm x 52 mm
Weight	950 g
Supply voltage	+/- 6 V (min +/- 5.7 V, max +/-12 V)
Supply current	-2 mA to +38 mA
Number of input channels	2 x 64 (MEAS2/1), 2 x 64 + 2 x 64 (MEAS4/2)
Input voltage	5 V
Number of output channels	60 (MEAS2/1), 2 x 60 (MEAS4/2)
Output voltage	5 V
Output impedance	300 Ω
Interface	USB 2.0 port
MEA Switch USB program	
Operating system	Microsoft Windows ® 7, XP or Vista with NTFS and SP3, English and German versions supported
Two versions are available, MEAS2/1 and MEAS4/2.	

6.2   Pin Layout

Electrode/analog input   68-Pin MCS Standard connector

67	65	63	61	59		9	7	5	3	1
68	66	64	62	60		10	8	6	4	2
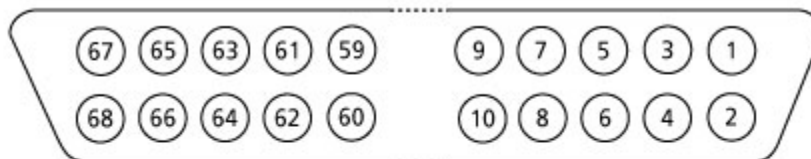
128 ch. expansion

Pin 1:	GNDP (power ground)	GNDP (power ground)
Pin 2:	GNDS (signal ground)	GNDS (signal ground)
Pin 3-66:	Channels 1-64	Channels 65-128
Pin 67:	Positive voltage supply	Positive voltage supply
Pin 68:	Negative voltage supply	Negative voltage supply

Note: The analog channel 64 is available **only** if the digital input channel is **not** selected in the **Channel Layout** dialog box of the MC_Rack program.
Please note that channels 61 to 64 and 125 to 128 are **not** used for the **MEA** System. Channels 61 to 63 can be used as additional analog input channels A1 to A3 via the additional BNC connectors.

6.3   Contact Information

Local retailer

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

User forum

The **Multi Channel Systems User Forum** provides the opportunity for you to exchange your experience or thoughts with other users worldwide.

Newsletter

If you are subscribed to the newsletter, 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

6.4   Ordering Information

This chapter shows you a selection of MCS products. For information on the whole product range, pricing and ordering information, please contact your local retailer.

MEA Switch

Product	Product Number	Description
MEAS4/2 for 4 amplifiers	MEAS4/2	The MEAS2/1 allows you to acquire data from 60 single channels from **two** 60 channel amplifiers. If you have a 128-channel MC_Card (MEA-120 System), or an USB-ME128-System you can even pick 128 channels in total from two MEA pairs with the MEA Switch for four amplifiers MEAS4/2. The selected channels are combined to one electrode raw data stream that is delivered to the data acquisition by a 68-pin MCS high grade cable.
MEAS2/1 for 2 amplifiers	MEAS2/1	

Spare Parts

Product	Product Number	Description
0.5 m 68-pin MCS high grade cable	C68x0.5M	For MEA- or ME-Systems
1 m 68-pin MCS high grade cable	C68x1M	
3 m 68-pin MCS high grade cable	C68x3M	

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