



4000
MultiRecord Extracellular Amplifier

**INSTRUCTION MANUAL
FOR
MULTIRECORD EXTRACELLULAR
AMPLIFIER**

MODEL 4000

**A-M Systems
PO Box 850
Carlsborg, WA 98324
U.S.A.
360-683-8300 800-426-1306
FAX: 360-683-3525
<http://www.a-msystems.com>**

WARNING

THIS EQUIPMENT IS NOT INTENDED FOR USE WITH HUMAN SUBJECTS IN ANY WAY.

Document

The information contained in this manual was as accurate as possible at the time of publishing, but is subject to change without notice and should not be construed as a commitment by A-M Systems. Changes may have been made to the hardware or firmware it describes since publication. A-M Systems reserves the right to change specifications as required. For the latest information please check our website (<http://www.a-msystems.com>) or contact A-M Systems, directly.

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Safety

This instrument is provided with terminal for protective grounding. Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under Safety Symbols. Do not operate the instrument with its cover removed. Replace fuse only with specified type.

Supply Voltage

This equipment can be operated between 100V – 240V, max 0.9A, and 50-60Hz.

WARNING

Do not attach a line voltage that does not match the line voltage specified on the rear panel.

Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective earth conductor of the (mains) power cord. The mains plug must only be inserted in a socket outlet with a protective earth contact.

Service should be performed by trained personnel only. To avoid dangerous electric shock, do not perform any service unless qualified to do so.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a safety hazard.

to refer to the instruction manual in order to protect against damage to the product.

WARNING

The Warning symbol calls attention to a procedure or practice, which, if not correctly performed could result in injury. Do not proceed beyond a Warning symbol until the indicated conditions are fully understood and met.

CAUTION

The Caution symbol calls attention to a procedure or practice, which, if not correctly performed could result in damage to the product. Do not proceed beyond a caution until the indicated conditions are fully understood and met.

Safety Symbols



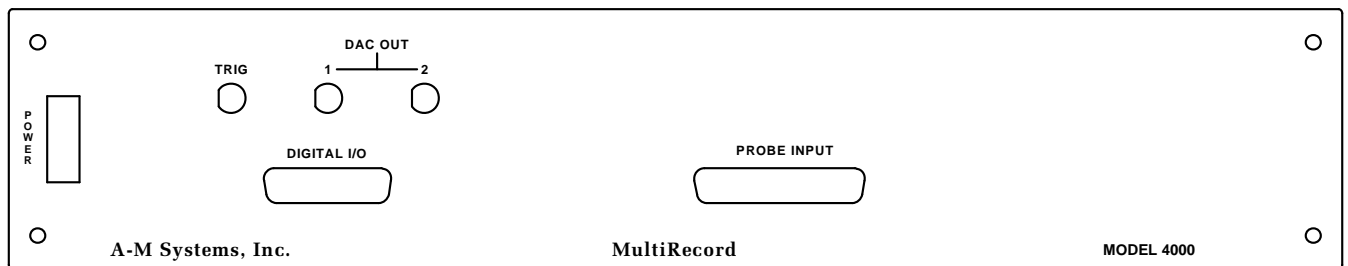
The product is marked with this symbol when it is necessary for you

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1. General Description

The Model 4000 contains 32 low noise, high gain full-featured extracellular amplifiers, or channels, designed for amplifying microvolt-level input signals. All parameters are controlled by the Datawave Sciworks Data Acquisition and Analysis System running on a personal computer running a supplied Windows® operating system via the rear panel USB connector.

Each channel has significant signal conditioning capabilities, including low and high pass filtering, a line-frequency notch filter, and gain. Each channel records differentially between its input lead and a designated reference: either ground or an external reference electrode.

Up to eight Model 4000s can be controlled by a single Sciworks System. In addition, pass through connectors to the trigger and DAC I/O ports of the Sciworks System are available at the front panel of the Model 4000. See your Datawave Instruction manual for detailed information re the functionality of these connectors.

The Model 4000 16-Channel Extracellular Amplifier is not intended for clinical or operating room measurements in human subjects.

2. Front and Rear Panels

This chapter describes the front and rear panel controls and connectors on the Model 4000.

When you receive your Model 4000, confirm that everything in the packing list is included. Make sure there are no obvious signs of internal damage, such as rattling. Pick up the amplifier and tilt in gently from side to side, and listen for anything that might be loose. If you hear any suspicious noises, contact A-M Systems immediately.

Front Panel

Power

The Model 4000 has an illuminated power supply switch that will light when line power is passing through it. If it does not light then there is no line power to the amplifier.

Figure 1. Power switch



Probe Input

This DB37 connector is the connection point for the TBSI headstage. It is directly compatible with either a M-Series 30-Channel Headstage or a T-Series 32-Channel Headstage output cable.

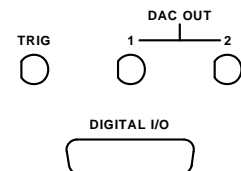
Figure 2. Probe Input



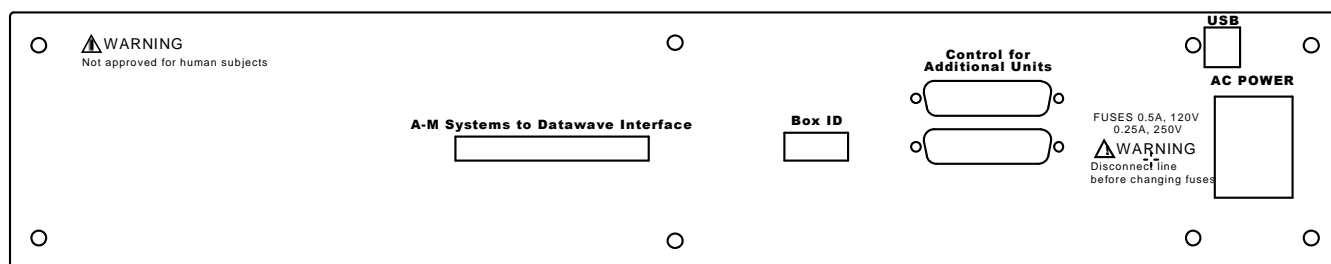
Datawave Sciworks Passthrough Connectors

These connectors provide easy access to a variety of functions generated by Datawave Sciworks. For additional information on their functionality, please refer to the Datawave Sciworks Instruction Manual.

Figure 3. Sciworks Passthrough Connectors



Rear Panel



WARNING

AC Power Input

This instrument has a terminal for protective grounding. Before applying power, verify that the correct safety precautions are taken. In addition, note the external markings on the instrument that indicate line voltages. Do not operate the instrument with its covers removed. Replace fuse only with specified type. Check that the correct voltage for your country is indicated on the back of the unit. Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective earth conductor of the (mains) power cord. The mains plug must only be inserted in a socket outlet with a protective earth contact. It accepts AC voltage from 100 to 240V, 50 to 60Hz, and a maximum draw of 0.9A.

Datawave Sciworks Control Cable

This 68 pin high density connector is the input port for the data transfer between the Model 4000 and the Datawave Sciworks Data Acquisition and Analysis System.

Figure 4. Sciworks Data Cable



USB Connector

This connector enables a personal computer running the Datawave Sciworks Data Acquisition and Analysis System to control the Model. It must only be connected to “BoxID = 1”

Figure 5. USB Connector



Box ID

This 8 position slide switch assigns the unit identifier to each Model 4000 in your system. If you have only a single Model 4000, this value should be set to “1”. If you have more than one Model 4000, then each unit should have a unique number.

Figure 6. Box ID



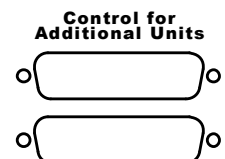
The BOX ID will determine the channel assignments recorded by the Model 4000 as seen by the Datawave Sciworks System.

BOX ID	TBSI M-SERIES HEADSTAGE CHANNELS	TBSI T-SERIES HEADSTAGE CHANNELS
1	1-30	1-32
2	31-60	33-64
3	61-90	65-96
4	91-120	97-128
5	121-150	129-160
6	151-180	161-192
7	181-210	193-224
8	NA	125-256

Control for Additional Units

These DB25 connectors enable multiple units to be controlled by a single Datawave Sciworks System. These connectors are equipotent, i.e., either can serve as an input/output to any other Model 4000 unit.

Figure 7. Control for Additional Units



3. Instrument Operation

After unpacking your instrument and verifying that it is configured for the proper AC Power line values, turn the instrument on using the front panel power switch.

High Pass

Each channel has a High Pass filter that can be set to any of the following values: 0.3, 1.0, 3.0, 10.0, 30.0, 100.0, 300.0, and 500.0 Hz.

Low Pass

Each channel has a Low Pass filter that can be set to any of the following values: 0.1, 0.3, 0.5, 1.0, 3.0, 5.0, 10.0, and 20.0 kHz.

Gain

The gain of each channel can be set to any of the following values: 1, 2, 5, 10, 20, 50, 100, 200. This does not include the gain of the headstage being used in conjunction with the Model 4000.

Notch

A filter can be introduced or removed from each channel's signal path in order to reduce AC line frequency noise if necessary. ON implements the filter. OFF removes the filter. The NOTCH filter can be tuned for the AC line frequency in the country where the Model 4000 is being used by setting the appropriate value in the Datawave Sciworks System.

Ref

Each Channel can either record differentially by comparing the input signals on its (+) leads versus ground or the headstages reference. This is determined by the setting on the Datawave Sciworks System.

Note that all of the channels will either be grounded or referenced to the external connector. It is not possible to have some channels grounded, and some channels referenced to the headstages reference input.

Mode

Each channel can be turned off if not in use by the Datawave Sciworks System

4. Specifications

Noise:	5 μ V rms maximum (10Hz-10kHz, inputs shorted)
Input Impedance:	> 100kOhms @ 1kHz
Inter-channel Crosstalk:	>90dB at 1kHz
Common Mode Rejection (CMR):	100dB
Rated Output	
Voltage:	\pm 11V
Current:	5mA
High Pass Filter	
Cut-Off Frequencies (Hz):	0.3, 1.0, 3.0, 10.0, 30.0, 100, 300, 500
Cut-Off Rate:	40dB / decade
Low Pass Filter	
Cut-Off Frequencies (kHz):	0.1, 0.3, 0.5, 1.0, 3.0, 5.0, 10.0, 20.0
Cut-Off Rate:	40dB / decade
Gain (not including gain of headstage)	1, 2, 5, 10, 20, 50, 100, 200
Notch Filter	
Frequency:	50Hz or 60Hz (User Selected)
Rejection:	>30dB

5. Warranty

What does this warranty cover?

A-M Systems warrants to the Purchaser that the Instrument, excluding cables, Head stage Probes and any other accessories shipped with the Instrument, (hereafter the “hardware”) is free from defects in workmanship or material under normal use and service for the period of one (1) year. This warranty commences on the date of delivery of the hardware to the Purchaser.

What are the obligations of A-M Systems. under this warranty?

During the warranty period, A-M Systems agrees to repair or replace, at its sole option, without charge to the Purchaser, any defective component part of the hardware. To obtain warranty service, the Purchaser must return the hardware to A-M Systems or an authorized A-M Systems distributor in an adequate shipping container. Any postage, shipping and insurance charges incurred in shipping the hardware to A-M Systems must be prepaid by the Purchaser and all risk for the hardware shall remain with purchaser until such time as A-M Systems takes receipt of the hardware. Upon receipt, A-M Systems will promptly repair or replace the defective unit, and then return the hardware to the Purchaser, postage, shipping, and insurance prepaid. A-M Systems may use reconditioned or like new parts or units at its sole option, when repairing any hardware. Repaired products shall carry the same amount of outstanding warranty as from original purchase, or ninety (90) days which ever is greater. Any claim under the warranty must include a dated proof of purchase of the hardware covered by this warranty. In any event, A-M Systems liability for defective hardware is limited to repairing or replacing the hardware.

What is not covered by this warranty?

This warranty is contingent upon proper use and maintenance of the hardware by the Purchaser and does not cover batteries. Neglect, misuse whether intentional or otherwise, tampering with or altering the hardware, damage caused by accident, damage caused by unusual physical, electrical, chemical, or electromechanical stress, damage caused by failure of electrical power, or damage caused during transportation are not covered by this warranty. Products may not be returned to A-M Systems for service, whether under warranty or otherwise, which are contaminated by infectious agents, radioactive compounds or other materials constituting a health hazard to employees of A-M Systems

What are the limits of liability for A-M Systems under this warranty?

A-M Systems shall not be liable for loss of data, profits or savings, or any special, incidental, consequential, indirect or other similar damages arising from breach of contract, negligence, or other legal action even if the company or its agent has been advised of the possibility of such damages, or for any claim brought against you by another party. THIS EQUIPMENT IS NOT INTENDED FOR CLINICAL MEASUREMENTS USING HUMAN SUBJECTS. A-M SYSTEMS DOES NOT ASSUME RESPONSIBILITY FOR INJURY OR DAMAGE DUE TO MISUSE OF THIS EQUIPMENT. Jurisdictions vary with regard to the enforceability of provisions excluding or limiting liability for incidental or consequential damages. Check the provision of your local jurisdiction to find out whether the above exclusion applies to you.

This warranty allocates risks of product failure between the Purchaser and A-M Systems. A-M Systems hardware pricing reflects this allocation of risk and the limitations of liability contained in this warranty. The warranty set forth above is in lieu of all other express warranties, whether oral or written. The agents, employees, distributors, and dealers of A-M Systems are not authorized to make modifications to this warranty, or additional warranties binding on the company. Accordingly, additional statements such as dealer advertising or presentations, whether oral or written, do not constitute warranties by A-M Systems and should not be relied upon. This warranty gives you specific legal rights. You may also have other rights which vary from one jurisdiction to another.

Approved:

Approval Date: 3/4/09

Revision History

Rev	Date	Description
1	3/5/09	Initial Document Release