AXION BIOSYSTEMS

Imagine • Explore • Discover

MAESTRO PRO™

Hardware Guide

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Declaration of Conformity

This instrument meets the requirements for ANSI/UL 61010-1 and CAN/CSA-C22.2 No. 61010-1. The following standards were applied: IEC/EN 61326 (EMC) and IEC/EN 61010-1 (Safety).

The user is responsible for providing a compatible electromagnetic environment in order for the device to perform as intended. Do not use this device in close proximity to sources of strong electromagnetic radiation, (e.g. unshielded intentional RF sources), as these can interfere with proper operation.

This equipment has been designed and tested to the CISPR 11 Class A standard. In a domestic environment it may cause radio interference, in which case measures should be taken to mitigate the interference.

Thank you

Thank you for purchasing the Maestro Pro, Axion's powerful integrated system for neural and cardiac electrophysiology, and impedance-based cell analysis. Please contact us with any questions regarding system operation.

Intended Use:
The Maestro is intended for benchtop research experiments only; it is not intended for use in diagnostic procedures. Use only Axion Biosystems' culture plates with this system. If the equipment is used in a manner not specified by the manufacturer, the protection provided may be impaired.

Included Equipment & Symbols Used

1 Maestro Pro

1 Smart Plate

1 AxIS User Guide

1 Power Cable

1 Ethernet Cable

2 Air Filters

1 Door Cleaning Cloth

10 feet of CO2 polyurethane tubing (6mm outer diameter)

1 1/4" to 6mm tubing adapter

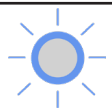
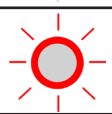
Warning Symbol in Manual

Power On/Off

USB

Ethernet

Plate Button Light Functions

	White then Blue Pulsing	Maestro is starting up.
	Blue	Maestro is open/closed without plate.
	Green Pulsing	Maestro is streaming with plate.
	Green	Maestro is closed with plate.
	Yellow Pulsing	Maestro is streaming but could not register a plate barcode.
	White Pulsing	Maestro is stimulating.
	Red Pulsing	Error.

Recommended Set-up Environment

The Maestro contains very sensitive electronic equipment that may pick up external environmental interference (e.g. table bumps, cell phone signals, power outlet emissions, etc.). The Maestro has many features that assist in mitigating this interference, but proper instrument placement can help. When choosing a location for the system, be sure it is:

- **Free from equipment that can cause mechanical table vibrations (i.e. imbalanced centrifuge, loud pump, etc.)**
- **Away from power supplies, generators, or high voltage power outlets.**
- **At least 6" of clearance in the back for proper fan ventilation.**

System Set-up Instructions

The Maestro is designed for quick and easy set-up.

1) **Power** - Plug the Power Cable into the back of the Maestro and the plug into a wall outlet.

WARNING: To avoid the RISK of electric shock, this equipment must only be connected to a SUPPLY MAINS with protective earth. Ensure detachable power cord has sufficient rating for the MAINS voltage.

2) **Data** - Install the Ethernet Cable to the back of the Maestro and plug into any open ethernet port on the back of the provided PC.

3) **CO_2** - Install the CO_2 supply line from a 2-stage regulator set to 15 psi (1 bar, 0.1 MPa) to the push-to-connect fitting on the back of the Maestro. CO_2 supply line must be 6mm outside diameter polyurethane, PVC, or Nylon tubing.

WARNING: High concentrations of carbon dioxide can cause asphyxiation. Use caution when working with concentrated gases.

WARNING: Maximum inlet pressure is 30 PSI. Exceeding this limit may cause damage to the system.

4) **Air filter** - Attach supplied filter to the Air Filter port on the back of the Maestro. Connect short tube from Air Filter to barb fitting below (see picture on page 15).

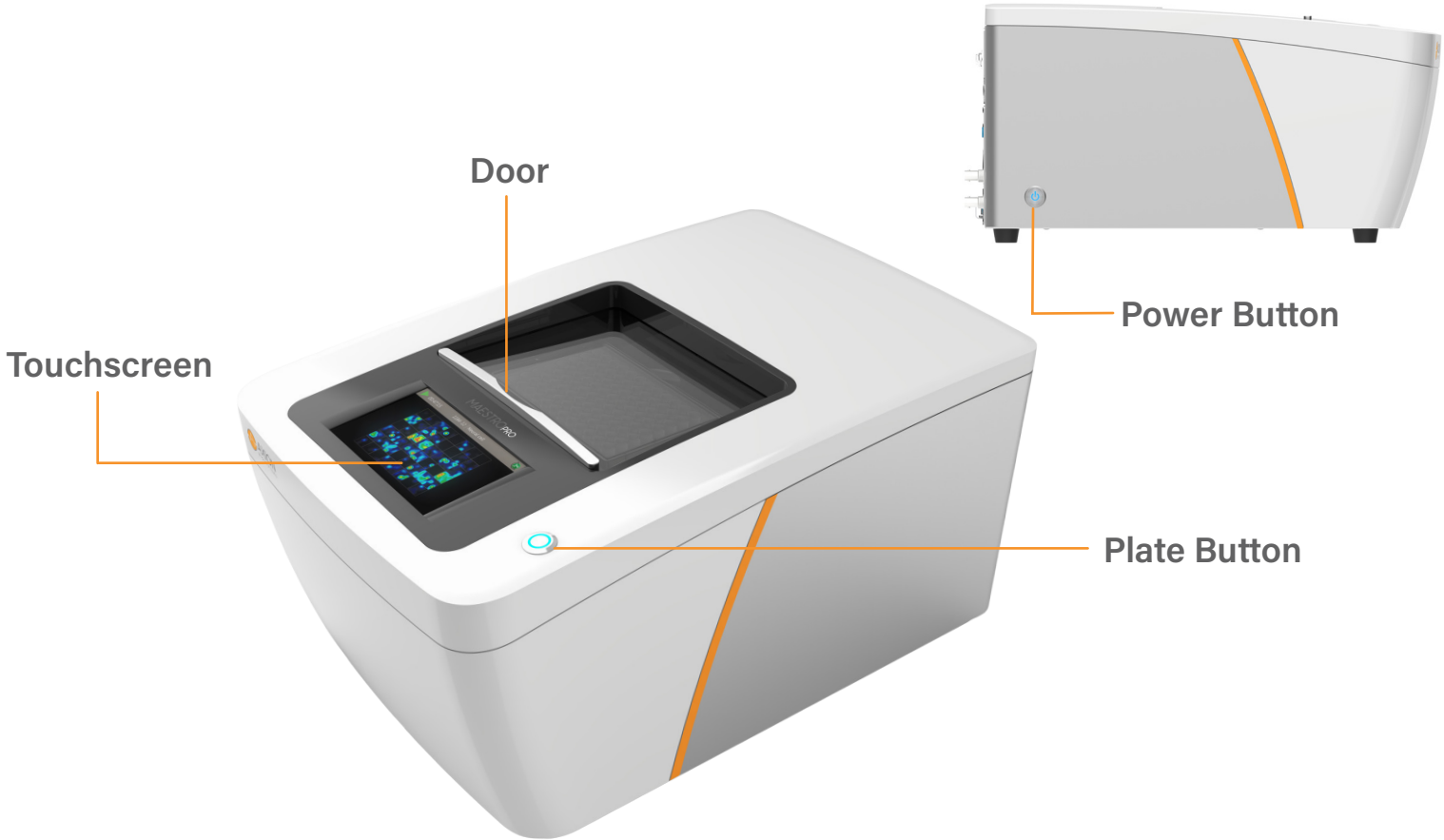
Working with the General Features

Power Button - Turns the system on/off. The system will take a minute to boot up or shut down.

Plate Button - Docks and undocks Axion plates. The button color indicates AxIS mode (ready, recording, stimulating, error).

Door - Opens automatically when the plate is ejected. To open or close the door while a plate is engaged, gently push handle. The door must be closed for proper CO_2 regulation and condensation control.

Touchscreen - Provides experimental information.


Door
Touchscreen
Power Button
Plate Button

Working with the Plate Chamber

Plate A1 Notch - Proper orientation of plate with A1 notch in top left.

Pogo Pin Connectors - Connects plate to Maestro electronics.

Heater Plate - Maintains temperature throughout experiment. Refer to the AxIS Navigator User Guide for details.


Plate A1 Notch
Heater Plate
Pogo Pin Connectors
MAESTROPRO
00:42:00
1184-12 | Neural cell
37.0 °C
5.0% CO2
Environment stable

Working with the Back Panel

Mains Power Switch - Use only when unplugging the system. Must be in the "I" position for the system to power up.

CO_2 Input - Connect 100% CO_2 (15 psi; 6 mm OD tubing).

Air Filter - Attach supplied air filter to luer lock fitting. Refer to the Air Filter Replacement page (p. 15).

Filter Input - Attach supplied tube to connect Air Filter and Filter Input.

Power Plug - Attach supplied power cable (110-240VAC).

Ethernet - Connect to computer Ethernet port.

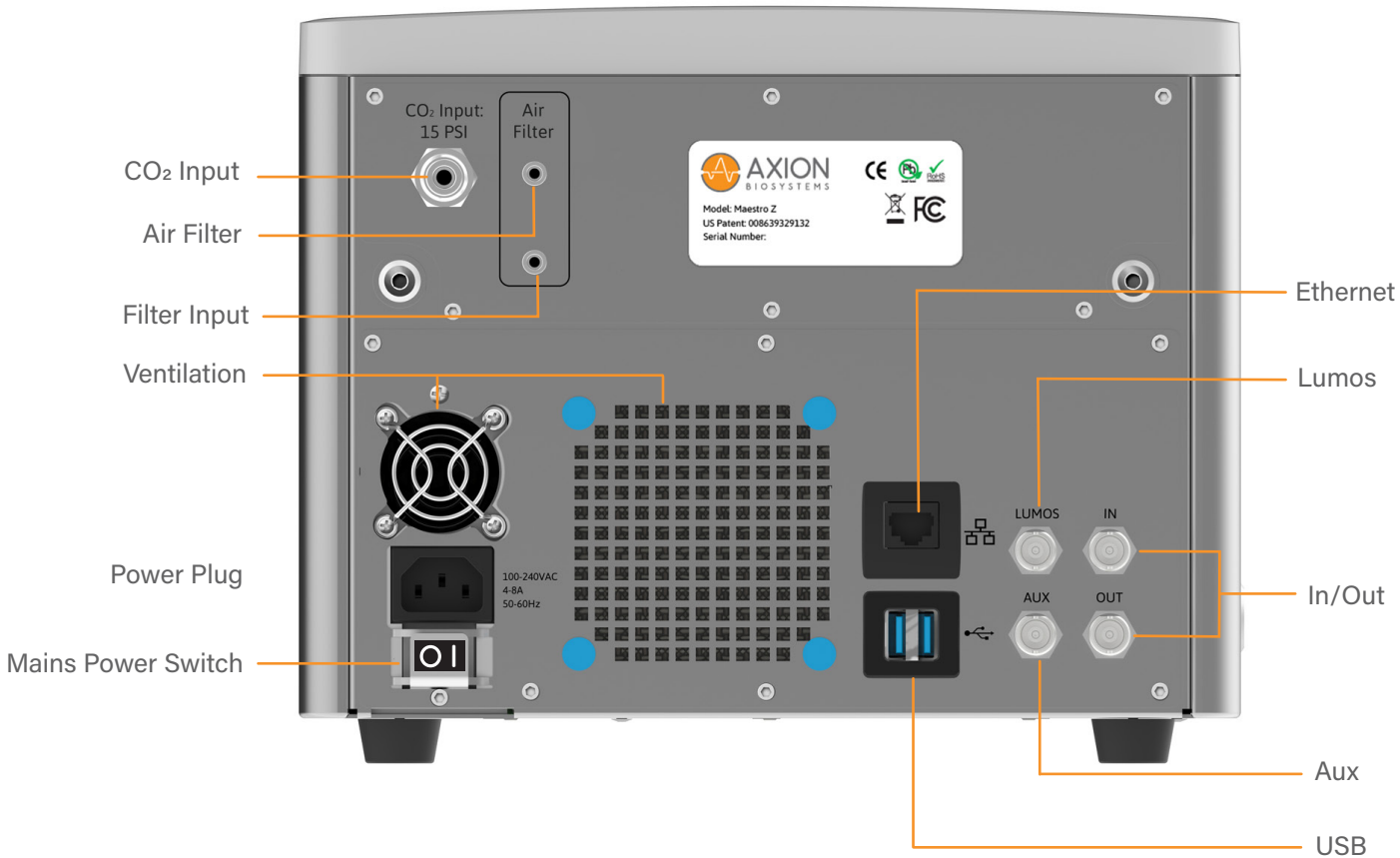
Lumos - When using a Lumos, connect to the SYNC output on Lumos.

In/Out - Future use.

Aux - Factory use only.

USB - When using Lumos, connect Lumos USB here.

Ventilation - Allow 6 inches space behind system for adequate airflow.


CO₂ Input
Air Filter
Filter Input
Ventilation
Power Plug
Mains Power Switch
Ethernet
Lumos
In/Out
Aux
USB
CO₂ Input: 15 PSI
Air Filter
AXION BIOSYSTEMS
Model: Maestro Z
US Patent: 008639329132
Serial Number:
100-240VAC
4-8A
50-60Hz
LUMOS
IN
AUX
OUT

System Use Instructions

1) Ensure that the Mains Power Switch is set to "I".

2) Push the Power Button.

3) Push the Plate Button to open the chamber and load the plate (ensuring correct orientation).

4) Close the chamber and activate gas control*.

5) For MEA experiments, push the play button in AxIS Navigator to display cellular activity. For detailed instructions on using the Maestro Pro for MEA experiments, please review the AxIS Navigator user guide, which can be found in the AxIS Navigator Help menu.

6) For impedance experiments, push **Measure Baseline** in AxIS Z to record the media-only baseline impedance. For detailed instructions on using the Maestro Pro for impedance experiments, please review the AxIS Z user guide, which can be found in the AxIS Z Help menu.

***Note: Opening the door will stop gas control.**

Maestro Care and Maintenance

Cleaning
Maestro cleaning can be done using a soft cloth and mild household cleaner to gently wipe any dust or contaminants from the system.

Pogo Pin Care
Do not immerse the system in liquids. If liquid reaches the Pogo Pins, they may corrode or stick, compromising use. If there is evidence of damage to the Pogo Pins, eject the plate, power off the system, and contact Axion Support to obtain replacement pins.

User Serviceable Parts
The Pogo Pins and external air filter are the only user serviceable parts. Please contact Axion Support at support@axionbio.com or 404-477-2557 for any other maintenance.

Storage
When the Maestro is not in use, Axion recommends leaving the Smart Plate engaged with the door closed.

Instrument Disposal
Contact Axion for secure disposal instructions.

Air Filter Replacement

The Maestro Pro's CO_2 controller requires clean air to maintain a stable environment for your cells.

To replace the air filter, twist luer fitting to remove the tube from the air filter, then twist filter counter-clockwise to remove it from the back of the Maestro. Twist the new filter in place on the Maestro until snug. Reattach tube to air filter with luer fitting.

The filter should be replaced every 3 months or more frequently in dirtier environments.

Filter type: 0.20 µm hydrophobic PTFE filter (Millipore Sigma SLFGL25BS)

Performance Maintenance Plans

The Maestro systems are a critical piece of equipment in your lab. Keep your systems operating without interruption and at peak performance.

Why purchase a Performance Assurance Plan?

- Ensures critical data accuracy
- Keeps systems at peak performance
- Maximizes productivity
- Reduces lab expenses
- Priority response
- Trained and qualified factory engineers
- Minimum instrument downtime
- Peace of mind

For pricing and maintenance plan tiers, please contact:

Axion Service Team
service@axionbio.com

Technical Specifications

Power Supply Specifications:

AC Voltage	100-240V
AC Current	8-4A
Frequency	60-50Hz

System Dimensions:

Size	280 x 452 x 225 mm (W x D x H)
Weight	30.6 lbs

Operating Environment:

Temperature	20-32°C
Max Relative Humidity	up to 80%
Altitude	up to 2000m

Environmental Controls:

Recommended CO_2 Pressure	10-15 psi (0.7 - 1 bar/0.06 - 0.1 MPa)
Max CO_2 Pressure	20 psi (1.4 bar/ 0.14 MPa)
Temperature Range	Ambient +7°C to 46°C
Temperature Resolution	+/- .1°C

Technical Specifications

Neural and Cardiac Recording:

Sampling Rate	12.5kHz (768 channels)
System Bandwidth	0.01 Hz - 5 kHz
System Gain	100 V/V - 1000V/V
MEA Viability Dynamic Range	5 kΩ - 100 kΩ

Neural and Cardiac Stimulation:

Stimulation Voltage (max)	+/-1.2 V
Stimulation Current (max)	+/- 250 µA
Simultaneous Stimulation Lanes	1
Simultaneous Stimulation Channels	768
Stimulus Phase Duration (min)	100 µs
Artifact Recovery Time Stimulating Channels	< 4 ms
Artifact Recovery Time Recording Channels	< 2 ms

Technical Specifications

Impedance:

Impedance Measurement Signal	+/- 5mV at 1, 10, 41.5 kHz
Impedance Measurement Repeatability	+/- (0.5% + 1 Ω)
Impedance Measurement Uniformity	+/- (1% + 1.5 Ω)
Impedance Sampling Rate	1 Sample/Minute (Automatic, All Wells)
Impedance Dynamic Range	50 Ω to 5 kΩ

System:

Device Storage	1 TB
Networking and Communication	Ethernet (1 Gb/s)
Experiment Management	Automatic Barcode-based Plate Tracking
Built-In Environment Chamber	0 - 10% CO_2, +/-0.1 % Ambient + 7°C to 46°C

Further Information

Systems

Discover the innovation behind the Maestro cell analysis platforms.
www.axionbiosystems.com/products

Software

Customize your Maestro to meet your assay needs with Maestro software modules.
www.axionbiosystems.com/software

Applications

Discover the functionality of your cells with MEA electrical network analysis and impedance-based cell analysis.
www.axionbiosystems.com/applications

Resources

Access the tools and content to drive your research.
www.axionbiosystems.com/resources

Distributed by STEMCELL Technologies Inc.

Have questions about the Maestro Pro?
We are here to help.

Contact STEMCELL Technologies at techsupport@stemcell.com

www.stemcell.com/info-maestro-pro

Notes