

## Specification for Planar Lipid Bilayer Workstation

Workstation provided must be an integrated rig that includes most significant components required for the assembly of a working planar lipid bilayer measurement rig for Planar Lipid Bilayer recording. It must include the following components:

- Bilayer Clamp amplifier with detailed specifications as under
- Faraday Cage with Active Vibration Table to match with dimensions of the workstation
- 8-Pole Bessel Filter with detailed specifications as under
- Bilayer Stirplate with controller
- Halogen Lamp with controller
- Bilayer Perfusion System comprised of the bilayer perfusion head, a 60 ml solution reservoir with reservoir stand, a 30 ml aspiration syringe
- Headstage holder kit comprised of an HH-1 headstage holder and an MBB magnetic base.
- Accessories required for startup – stirbars, glass capillary tubing, PE tubing, BNC cables, etc.
- Polystyrene and Delrin cuvettes with 1 ml working volume and apertures of 150 micron, 200 micron and 250 microns.
- Bilayer chamber of 1 ml working volume
- Should be supplied with Stereozoom Microscope which can be mounted both horizontally or vertically & should have a drift free focusing range of 11.5cm, Zoom Range: 0.8x-5.0x
- Power Line Conditioner (220V, 50Hz) to supply stable & fluctuations free power to entire workstation
- Amplifiers and filters must be rack mountable. Table top rack to be provided

<b>Noise</b>	Measured with 8 pole Bessel filter at specified cutoff frequency		
	<b>Frequency Range</b>	<b>Open Input</b>	<b>100 pF at Input</b>
	DC to 1 kHz	0.060 pA RMS	0.82 pA RMS
	DC to 100 Hz	0.009 pA RMS	0.28 pA RMS
<b>Bandwidth</b>	75 kHz		
<b>Input Commands</b>	Hold	Digital; 1 or 10 mV steps to $\pm 400$ mV maximum	
	Command In	Front and rear external input, 10 V/V (applied voltage is attenuated by 10/100/1000 at the command electrode)	
<b>Junction Zero</b>	AutoZero or manual adjust. AutoZero lockout feature. Cycle time 1.5 s, correction to $\pm 120$ mV		
<b>Audio</b>	VCO with off switch and volume control, Internal speaker and external speaker output		

<b>Capacitance Test</b>	Triangle wave applied to command electrode; derived membrane capacitance read from meter up to 1000 pF; calibrated (1 mV/pF) square wave available at $I_m$ output; Cap Sync (rear panel) synchronized with input triangle wave	
<b>Gain</b>	Membrane current gain selectable from 0.5 to 1000 mV/pA in 1-2-5 steps	
<b>Filter</b>	4-pole Bessel selectable from 0.05 to 20 kHz in 1-2-5 steps, or bypassed for full amplifier bandwidth	
<b>Capacity Compensation</b>	Fast (0-10 $\mu$ s) and slow (0-2 ms) with adjustment of amplitude and time constant for each range. Maximum compensation 500 pF	
<b>Headstage</b>	Switching	
	Low Current Mode	50 gigohm feedback, 100 pA maximum current
	High Current Mode	500 megohm feedback, 20 nA maximum current
<b>I/O: Front panel</b>	Command Input	BNC input up to 10V. Attenuated by 10, 100 or 1000
	$I_m$ Output	Membrane current scaled by amplifier gain setting
	$V_c \times 10$ Output	Applied command voltage x10
<b>I/O: Rear panel</b>	$I_m$ Output	Membrane current scaled by amplifier gain setting.
	Cap Sync	TTL compatible
	Capacitance output	Reports calculated membrane capacitance scaled to 1 mV/pF
	Command Input	BNC input up to 10V. Attenuated by 10, 100 or 1000.
	Gain Telegraph	Stepped DC voltage 0.5 to 5.5 V in 0.5 V steps for gain settings of 0.5 to 1000 mV/pA. Telegraph value of 0 V for bypass mode.
	Filter Telegraph	Stepped DC voltage 0.5 to 4.5 V in 0.5 V steps for filter settings of 0.05 to 20 kHz. Telegraph value of 5.0 V for full bandwidth (bypass) mode.
	External speaker	Standard RCA jack
<b>Digital Meter</b>	3.5 digit LED	$\pm$ 1999 mV full scale
	Junction offset	$\pm$ 120 mV full scale
	Cap Test	0 to 1999 pF
	$V_c$	$\pm$ 1999 mV full scale

	$I_m$	$\pm 1999$ pA full scale
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### 8-pole Bessel Filter

<b>Input</b>	DC Differential
<b>Input Impedance</b>	1 M $\Omega$ each Channel
<b>Input Range</b>	$\pm 10$ V
<b>Input Offset</b>	2 Ranges, $\pm 100$ mV and $\pm 1.0$ V variable from zero with 10-turn control
<b>Offset Indicator</b>	20 LED Display
<b>Frequency Ranges</b>	Low: 0.1 to 199.9 Hz High: 10 to 19.99 kHz
<b>Low Range Resolution</b>	0.1 Hz
<b>High Range Resolution</b>	10 Hz
<b>Gains</b>	x1, x2, x5, x10, x20, x50, x100 and x200
<b>Gain Telegraph Output</b>	2.5 V to 6.0 V in 0.5 V steps, x1 Gain = 2.5 V
<b>Output Impedance</b>	50 M $\Omega$

- System must be compatible with major electrophysiology data acquisition systems
- Suitable computer, software, and an online UPS for power back up as required for optimal performance of the system.
- System must be warranted for a period of at least 12 months
- Comprehensive on-site demonstration and training should be provided
- Cost of extended warranty should be provided as optional item