

## Model 1600

# Neuroprobe Intracellular Amplifier



The Model 1600 Neuroprobe Amplifier is designed to meet the exacting requirements of intracellular recording and stimulation. The instrument consists of a high input-impedance amplifier combined with current injection and bridge balance circuitry, allowing simultaneous stimulation and recording through the same electrode. The Model 1600 makes possible extremely precise recordings during current injection without requiring an external bridge or a differential input oscilloscope. A digital meter displays membrane potential, injected current, or electrode impedance.

The Neuroprobe Amplifier's advanced current injection system allows external switching of both internal and external current sources. The total current from all sources can be displayed on the digital meter prior to injection. An Iontophoresis Adapter is available to allow for the application of high voltages for iontophoretic injection of drugs or dyes, or for any other application where greater current levels are required.

The Model 1600 Head Stage can be conveniently adapted to a wide variety of experimental situations and comes complete with a mounting rod and bracket for a standard micromanipulator and a standard 2 mm connector for a half-cell microelectrode holder.

Common applications for the Model 1600 Neuroprobe Intracellular Amplifier include, but are not limited to:

- Intracellular recording of single cell action potentials
- Current Clamp
- Dye Injection
- Ultra-low noise extracellular recordings

The Model 1600 Neuroprobe Intracellular Amplifier has been an industry leader for over 25 years, and is still among the quietest recording amplifiers available on the market.



*x10 Headstage Probe*

- Digital display of membrane potential, injected current, or electrode resistance
- Square-wave generator for testing electrode resistance and capacitance compensation
- Current injection system adjustable to 0.1 nA resolution
- Simultaneous stimulating and recording by a single electrode
- Transient and DC balance controls
- Low-pass and Notch filters
- Includes rack mount hardware
- 3-year warranty

# Model 1600

## Neuroprobe Intracellular Amplifier



### Application

#### Notes:

*extracellular recording of action potentials*

While the Model 1600 Neuroprobe Intracellular Amplifier was designed to record intracellularly, many researchers utilize the Model 1600 in their extracellular recordings. The high input impedance of the amplifier results in extremely low noise recordings. The output of the Model 1600 Neuroprobe Amplifier is then routed to an additional gain amplification stage and perhaps a high pass filter before ultimately being recorded by a digitizing data acquisition system. For more information, contact A-M Systems or your distributor.

### Specifications

Current Input Impedance	10 <sup>11</sup> ohms
Current Input Capacitance	Adjustable to zero
Current Input Range	+/-10 V; Up to 200 V when using the optional Iontophoresis Adapter
Current Injection	10 nA / V or 100nA / V
Input Bias Current	Adjustable to zero
Frequency Response	DC to 325 kHz
Low Pass Filter	1, 2, 5, 10, 20, 50, and 100 kHz; -12 dB / octave
Notch Filter	50 Hz or 60 Hz
Capacity Compensation	-4 pF to 30 pF
Noise	0 ohm source: 13 microvolts rms (10 Hz to 50 kHz) 1 megohm source: 79 microvolts rms (10 Hz to 50 kHz) 20 megohm source: 310 microvolts rms (10 Hz to 50 kHz)
DC Balance	Low range: up to 500 megohms High range: up to 50 megohms
Outputs	x1 or x10 gain
Current Monitor	Low range: 10 mV / nA High range: 1 mV / nA

### References

Mason AC, Oshinsky ML, and Hoy, RR (2001) Hyperacute directional hearing in a microscale auditory system. *Nature* 410: 686-690

Person AL and Perkel DJ (2007) Pallidal neuron activity increases during sensory relay through thalamus in a songbird circuit essential for learning. *J Neuroscience* 27(32):8687-8698

Yoon AC et al. (2008) Determining CA<sup>2+</sup>-sensor binding time and its variability in evoked neurotransmitter release. *J Physiology* 586:1005-1015

### Ordering Information

For use on 220 V / 50 Hz power systems: Product #680105 *Country-specific power cords are not supplied.*

For use on 110 V / 60 Hz power systems: Product #680100

*Optional:* Iontophoresis Adapter: Product #682000

One product #681500 Headstage probe *must* be purchased at time of ordering for proper operation of the instrument.

All units include a product manual and rack mounts.

### Distributed By:

**A-M Systems**  
131 Business Park Loop  
PO Box 850  
Carlsborg, WA 98324  
USA

Toll-free: **800-426-1306 (USA)**  
Phone: **360-683-8300**  
FAX: **360-683-3525**  
E-Mail: **sales@a-msystems.com**  
Website: **www.a-msystems.com**