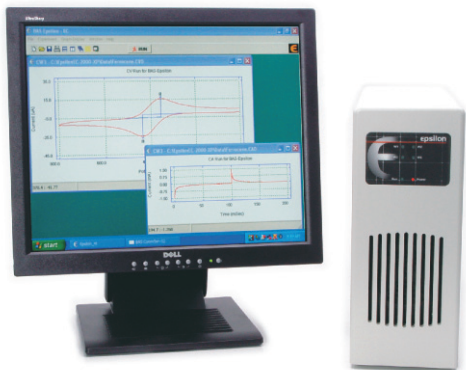


integrity  
ideas  
identify  
insightful  
ingenuity  
intuitive  
inquisiti  
integrated  
intelligent  
innovat  
ideas  
inquisitive  
identify

## epsilon™ Electrochemistry



  
**30 Years of Innovation**  
[www.bioanalytical.com](http://www.bioanalytical.com)

**epsilon** is a revolutionary new family of potentiostats/galvanostats designed to allow the user great flexibility in choosing their particular instrument. The most basic **epsilon** instrument can be used for standard techniques, as well as chronopotentiometry, making it ideal for the teaching lab or for materials characterization (e.g., characterization of transition metal complexes by cyclic voltammetry and controlled potential electrolysis, or of biosensors by cyclic voltammetry and constant potential amperometry). Pulse, square wave, and stripping techniques can be added by a software upgrade, and a second channel can be added by a hardware upgrade.

### Features

- Potentiostat, galvanostat and potentiometer
- PC-controlled
- Windows® multiple document interface
- Optically isolated circuitry for noise reduction
- USB connection
- Control of BASi accessories such as cell stands (C3, CGME, and RDE-2)
- Bipotentiostat option
- Wide current range
- Peak finding routine (auto and manual)
- File subtraction
- File overlay
- Positive feedback iR compensation
- Initiate experiments at open circuit potential
- Internal dummy cells for hardware self-test and troubleshooting
- Analog filters - automatic and manual control
- 50/60 Hz selection for noise minimization
- Digital smoothing
- Data file conversion to various text formats, including DigiSim® compatible format
- IUPAC/Polarographic conventions

## Techniques

---

### Basic

#### Cyclic Voltammetry and Linear Sweep Voltammetry

Scan rate: 1 mV/s - 10 V/s  
Step height: 100  $\mu$ V  
Peak analysis - tailing (peak potential and current reported)  
Optional software: DigiSim digital simulation

#### Chronoamperometry/Chronocoulometry

Single or double potential step  
Step time: 1 ms – 65 s  
Cottrell plot analysis (slope, intercept, and correlation coefficient reported)  
Digital integration of current for charge vs time  
Anson plot analysis (slope, intercept, and correlation coefficient reported)  
Resolution:  $\pm$  20  $\mu$ s

#### Controlled Potential Electrolysis

Electrolysis termination by time  
High resolution 20-bit data  
Data acquisition rate up to 20 Hz  
Optional auto termination by minimum current, final/initial current ratio or total charge

#### DC Potential Amperometry

High resolution 20-bit data  
Data acquisition rate up to 20 Hz

#### Chronopotentiometry

Potential resolution 20  $\mu$ V  
High resolution 20-bit data  
Data acquisition rate up to 20 Hz  
Optional auto termination by potential

#### Open Circuit Potential vs. Time

Potential resolution 20  $\mu$ V  
High resolution 20-bit data  
Data acquisition rate up to 20 Hz

### Basic Plus Option

#### Sampled Current Polarography

Staircase waveform

#### Normal Pulse Voltammetry/Polarography

Easy to change pulse width, period (drop time) and current sampling parameters

#### Differential Pulse Voltammetry/Polarography

Easy-to-change pulse width, period (drop time) and current sampling parameters  
Measurement of peak potential and current

#### Square Wave Voltammetry

Fastest of the common quantitative analysis techniques  
Excellent detection limits  
User-selectable frequency, amplitude, and current sampling  
Square wave frequency: 1 Hz - 2000 Hz  
Measurement of peak potential and current

#### Stripping Voltammetric Techniques

Combination of deposition (preconcentration) step followed by voltammetric (stripping) step  
Linear sweep, differential pulse, and square wave voltammetries available for stripping step  
Capable of anodic, cathodic, and adsorptive stripping determinations  
Measurement of peak potential and current with auto or manual definition of baselines

#### Double Potential Step Chronopotentiometry

Minimum step time: 1 ms  
Current range:  $\pm$  32 mA  
Resolution:  $\pm$  20  $\mu$ s  
Potential resolution: 20  $\mu$ V

### Bipotentiostat Option

#### Multichannel Amperometry

Constant potential amperometry on two channels  
Data acquisition up to 20 Hz  
High resolution 20-bit data

## Multichannel Cyclic Voltammetry

Both electrodes scanned identically  
Scan Electrode 1 and Constant Potential Electrode 2

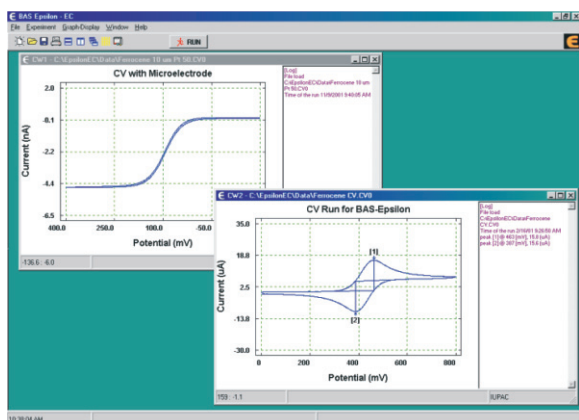
## Multichannel Chronoamperometry

Both electrodes stepped identically  
Step Electrode 1 and Constant Potential Electrode 2

## Methods Option

### Sequential Techniques

Sequence up to 6 techniques  
Insert delays and trigger in sequence  
Auto-repeat sequence up to 999 times



## Specifications

### Potentiostat

Compliance voltage:  $\pm 12$  V (Channel 1)  
Applied potential: Dynamic DAC:  
16 bit,  $\pm 3.275$  V @ 0.1 mV resolution  
Offset DAC: 8 bit,  $\pm 2.55$  V @ 10 mV resolution  
Maximum current: 100 mA  
Bandwidth: > 100 kHz  
Bias current: < 1 pA  
Electrometer input impedance: >  $10^{12}$   $\Omega$

### Galvanostat

Applied current: 1 nA - 50 mA  
Range:  $\pm 10$  V  
Measured potential resolution: 0.02 mV  
Maximum leakage current: 30 pA

### Current-to-voltage Converter

Full scale sensitivity:  
1 nA\*, 10 nA\*, 100 nA, 1  $\mu$ A, 10  $\mu$ A, 100  $\mu$ A,  
1 mA, 10 mA, 100 mA (\*secondary gain used)  
Filter (2 pole Bessel): 0.1, 1.0, 10, 100, 1.0 k, and 10 kHz  
Secondary gain: x1, x10, and x100  
Bandwidth: >100 kHz  
ADC resolution: 16 bit  
Sampling rate: 50 kHz (20  $\mu$ s/conversion)  
Data length: 32k points – fast

### I/O

Analog:  $E_{out}$ ,  $I_{out}$ , and  $E_{in}$   
Cell Stand port (control of C3 Cell Stand and CGME)  
Accessories port (RDE-2 control)  
PC (USB) port  
Trigger out: start and end of run  
Trigger in: start run

### Minimum PC Requirements

Windows 2000, XP or Vista  
Pentium III or higher  
512 MB RAM  
10 MB hard drive space available  
USB port  
CD-ROM drive

### Power Requirements

100/120/220/240 V  
50/60 Hz  
120 W

### Dimensions and Weight

16.75" (43 cm) X 5.25" (13 cm) X 12.75" (32.5 cm)  
1 channel - 20.2 lb. (9.2 kg)



### C3 Cell Stand

The C3 Cell Stand is a general-purpose accessory for electroanalytical experiments. It provides a base to support the cell vial and a mounted cell top to hold the electrodes. The base also contains a magnetic stirrer, and there are lines for inert gas purging. Stirring and gas purging are available by remote control by BASi EC **epsilon**. The standard package contains all accessories needed to run basic electrochemistry experiments.

### CGME

The CGME is a mercury drop electrode that can be used as a Dropping Mercury Electrode (DME), a Static Mercury Drop Electrode (SMDE) (e.g., for polarography), and a Hanging Mercury Drop Electrode (HMDE) (e.g., for anodic stripping voltammetry). The mercury drop is grown by opening a fast-response valve, and drop size is determined by the length of time the valve is open, which allows a wide range of drop sizes.



### RDE-2

The BASi RDE-2 is a rotator system for both fixed rotation rate and hydrodynamic modulation rotating disk electrochemical experiments. Rotation rates from 50 to 10,000 RPM are available with better than 1% accuracy. The rotator unit is manually raised and lowered, and can be inverted for spin-coating. Rotation functions can be controlled remotely using a BASi EC **epsilon**, or manually.

**epsilon Pricing: [www.bioanalytical.com](http://www.bioanalytical.com)**

### BASIC INSTRUMENT

- e2 Electrochemical Analyzer
- e2P Electrochemical Analyzer with PC

### CHANNEL OPTION

- 0 Single Channel
- 2 Bi-Potentiostat

### SOFTWARE PACKAGE OPTION

- 0 Basic Software Package
- 1 Basic Plus Package
- 2 Methods Option
- 3 Both Basic Plus and Methods Option

### CELL STAND OPTION

- 1 C3 Cell Stand
- 2 CGME
- 3 Both C3 and CGME
- 0 No Cell Stand

### RDE (ROTATING DISK ELECTRODE) OPTION

- 1 RDE-2
- 0 No RDE-2

### DIGITAL SIMULATION SOFTWARE OPTION

- 1 DigiSim
- 0 No DigiSim

### FUTURE OPTIONS

- 0 Future Options

For Example: e2-011100 is an **epsilon** Electrochemical Analyzer with a Single Channel, and includes the Basic Plus Package, C3 Cell Stand, and RDE-2.

***[echem@bioanalytical.com](mailto:echem@bioanalytical.com)***

**BAS** 2701 KENT AVENUE  
WEST LAFAYETTE  
INDIANA 47906  
BIOANALYTICAL 765.463.4527  
SYSTEMS, INC FAX 765.497.1102  
**[WWW.BIOANALYTICAL.COM](http://WWW.BIOANALYTICAL.COM)**

epsilon and DigiSim are registered trademarks  
of Bioanalytical Systems, Inc.