Model 1400 Series Four-Channel Potentiometer / Four-Channel Potentiostats

The model 1400 series is a computerized four-channel potentiometer and four-channel potentiostat. The system contains a digital function generator and multiplexed data acquisition circuitry. The instrument can work with eight independent cells or eight working electrodes in the same solution with common reference and counter electrodes.

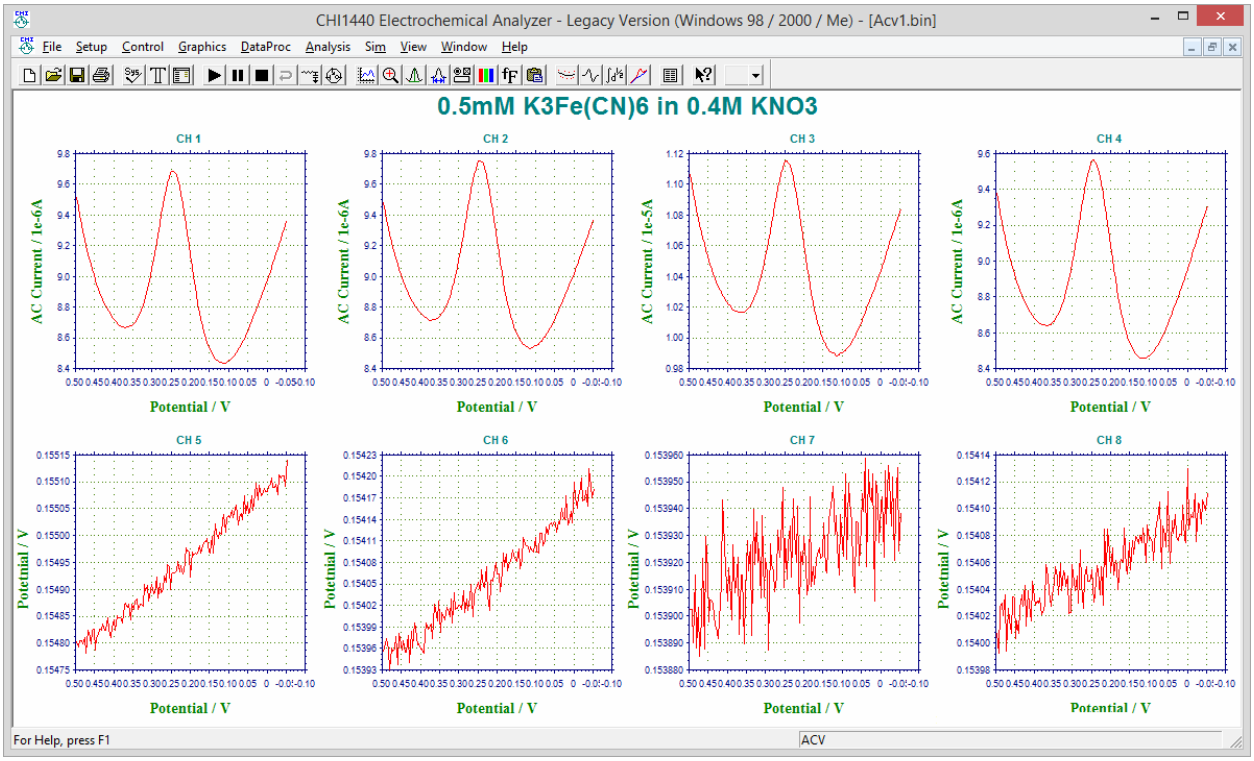
The potentiometer has high input impedance and low input bias current. The input range is ±10 V, allowing dc coupled or ac coupled. A gain of 10 is also allowed. The potentiostat has a potential control range of ±10 V and the current range is ±10 mA. The instrument is capable of measuring current down to picoamperes. Each electrode can be individually controlled, including on/off control, potential, and sensitivity settings; each can be set to an independent potential or the same potential as the primary channel, so that they can sweep or step potentials together with the primary channel. The instrument allows eight independent cells, simultaneous or sequential measurements, fast waveform generation and data acquisition speed (1M Hz @ 16-bit), and easy software update using flash memory.

The model 1400 series can be use for array electrode characterization and sensor studies which require simultaneous measurement at a combination of sensors requiring techniques such as amperometry or voltammetry with sensors employing open-circuit methods, such as ion selective electrodes.

The analyzer is essential for real-time sensing at sensor arrays employing combinations of sensors for real-time detection of analytes in flux in cellular metabolism, either in 2D or 3D culture. The combination of open circuit potential with other methods allows for the addition of ion sensors such as H+, K+, and Cl-, with sensors critical to metabolism, such as glucose, lactate, and oxygen. Additional sensing can be achieved through the Macro function in the Analyzer program, allowing for switching between amperometric and voltammetric measurements at the same electrodes, or conductivity measurements to determine salinity at additional electrodes in the array. This flexibility allows for a wide range of sensors measurements schemes.

Many electrochemical techniques are available in the 1400 series. The parameters for all channels must be set before running an experiment; you cannot alter parameter settings during experiments. During a run, you can toggle between single and multi-data set display (parallel or overlay plots). After a run, you can choose data from any channel for parallel or overlay plotting.

The instrument can be controlled by an external PC running Windows XP or after. It is easy to install and use. The instrument connects to your PC using USB (default) or serial port connectivity; no plug-in card or other hardware is required on the PC side. The commands, parameters, and options have been written using terminology that most chemists are familiar with. A customizable toolbar allows quick access to the most commonly used commands. A comprehensive help system provides context-sensitive information from each dialog box.



The instrument provides many powerful functions, such as straightforward file handling, extensive experimental control, flexible graphics, various data analyses, and efficient digital simulation. Additional features include macro commands, working electrode conditioning, color, legend and font selection, data interpolation, visual baseline correction, data point removal, visual data point modification, signal averaging, Fourier spectrum, and a convenient technique-specific electrochemical equation viewer. The maximum data length is 128K – 16384K points (selectable) if real-time data transfer is allowed.

Differences of 1400 Series Models (Potentiostatic Function Only)

Functions	*1400*	*1410*	*1420*	*1430*	*1440*
Cyclic Voltammetry (CV)	●	●	●	●	●
Linear Sweep Voltammetry (LSV) &	●	●	●	●	●
Chronoamperometry (CA)				●	●
Chronocoulometry (CC)				●	●
Differential Pulse Voltammetry (DPV) &			●	●	●
Normal Pulse Voltammetry (NPV) &			●	●	●
Square Wave Voltammetry (SWV) &			●	●	●
AC Voltammetry (ACV) &					●
2nd Harmonic AC Voltammetry (SHACV) &					●
Fourier Transform AC Voltammetry (FTACV)					●
Amperometric i-t Curve (i-t)	●	●		●	●
Differential Pulse Amperometry (DPA)		●		●	●
Triple Pulse Amperometry (TPA)		●		●	●
Sweep-Step Functions (SSF)				●	●
Multi-Potential Steps (STEP)				●	●
Open Circuit Potential - Time (OCPT), total 5 channels	●	●	●	●	●
Full version of CV simulation and fitting program				●	●
Limited version of CV simulation and fitting program	●	●	●		

&: Corresponding stripping mode can be performed.

Specifications

Four-channel Potentiometer:
Input potential range: ±10 V
Input impedance: 1×10^{13} ohm
Input bias current: <=1 pA
Dc and ac coupling
Gain selection: 1 or 10

Four-channel Potentiostat:
Potential range (all channels): ±10 V
Applied potential accuracy: ±1 mV, ±0.01% of scale
Potentiostat rise time: < 2 µs
Applied potential noise: < 10 µV rms
Compliance voltage: ±12 V
Current range (each channel): 10 mA
Reference electrode input impedance: 1×10^{12} ohm
Sensitivity scale: 1×10^{-9} - 0.001 A/V in 7 ranges
Measured current resolution: 0.0015% of current range, minimum 0.3 pA
Input bias current: < 50 pA
Fast waveform updating rate: 5 MHz @ 16-bit
Current low-pass filters

- CV and LSV scan rate:
  0.000001 to 5000 V/s (sequential scan)
  0.000001 to 25 V/s (8 channel simultaneous scan)
  Potential increment during scan: 0.1 mV @ 1,000 V/s
- CC and CA pulse width: 0.0001 to 1000 sec
- CA and CC sample interval:
  1e-6 to 50 s (sequential step)
  8e-5 to 50 s (8 channel simultaneous step)
- DPV and NPV pulse width: 0.001 to 10 sec
- SWV frequency:
  1 to 100 KHz (sequential scan)
  1 to 3125 Hz (8 channel simultaneous scan)
- ACV frequency:
  1 to 10000 Hz (sequential scan)
  1 to 312 Hz (8 channel simultaneous scan)
- SHACV frequency:
  1 to 5000 Hz (sequential scan)
  1 to 250 Hz (8 channel simultaneous scan)
- FTACV frequency: simultaneously acquire 1st, 2nd, 3rd, 4th, 5th, and 6th harmonics ACV data
  0.1 to 50 Hz (sequential scan)
  0.1 to 34 Hz (8 channel simultaneous scan)
- i-t sample interval:
  1e-6 s to 100 s (sequential step)
  8e-5 s to 100 s (8 channel simultaneous step)

Other features:

- Fast data acquisition: up to 1 MHz @ 16-bit for single channel, 12.5K Hz for 8 channel simultaneous
- Independent cells or a multi-working electrode cell
- Simultaneous eight channel measurements or sequential single channel measurements for higher speed and better signal averaging
- Current and potential analog output
- Cell control: purge, stir, knock
- Maximum data length: 128K-4096K selectable
- Dimensions: 14.25”(W) × 9.25”(D) × 4.75”(H)