

This simplified version provides a basic
Operation for one section of technique. For more techniques'
measurements methods, please refer to user manual of CHI 660E instruments.

Standard Operation Procedure: CHI 660 Electrochemistry Station

1. Scope

1.1 This document gives a brief introduction and the standard operation procedures (SOPs) for Cyclic voltammetry (CV) measurement to study a variety of redox processes by CHI 660E electrochemistry station.

For any other technique's measurement requirements, including setup fabrication, electrodes/electrolyte options, parameters setting and data processing etc., you are required to read through relevant materials for reference in advance and then carry out the experiments.

1.2 The in-house available features

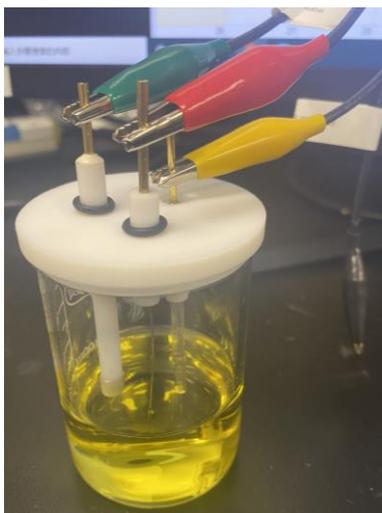
CHI 660E station is functioned with multi-purposed techniques for electrochemistry measurement e.g., cyclic voltammetry, linear sweep voltammetry, chronoamperometry, impedance spectroscopy, charge discharge characteristics provide powerful techniques for understanding reaction kinetics, sensing materials, corrosion, energy conversion and storage studies etc.

2. Preparation before testing

2.1 Most of the electrochemical technique's measurements can be implemented in a homemade quartz cell with a typical three-electrode setup, including working (targeted materials, conductive glass, carbon clothes etc.), reference (Ag/AgCl electrode or Saturated Calomel Electrode etc.), and auxiliary/counter (Pt wire, etc.) electrode. Please choose the appropriate electrodes for your experiments.

2.1.1 Connect clamps to the electrode

- green for the working electrode
- red for the counter electrode
- yellow for the reference electrode
- black for sensor electrode (for four-electrodes setup)



2.2 The Ag/AgCl reference electrode should be always well preserved in 1M KCl solution. Thus, the Ag/AgCl reference electrodes should be rinsed with the electrolyte solution employed in your system before testing.

2.3 Sonicate the Pt end in deionized (DI) water and then rinse with DI water and allow to air dry. (Notes: Pt wire should be pretreated when the surface appeared to be dull, which indicates the deposition of organic contaminants or inorganic-oxide layer. Please refer to attached website for detailed cleaning steps: <https://www.kanopytech.com/resource/18>)

3. Operation Instruments

Step 1. Turn on the computer.

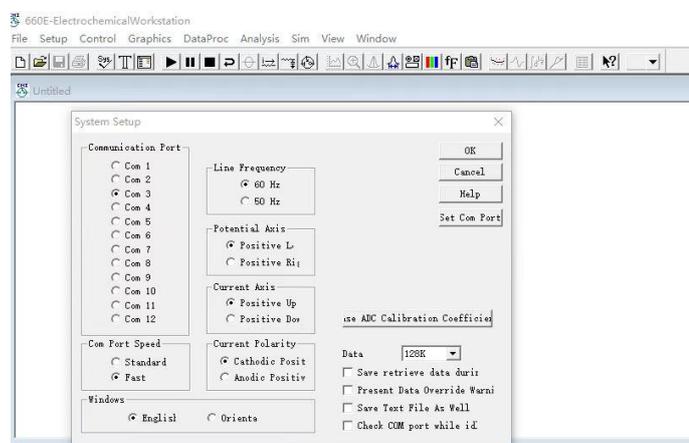
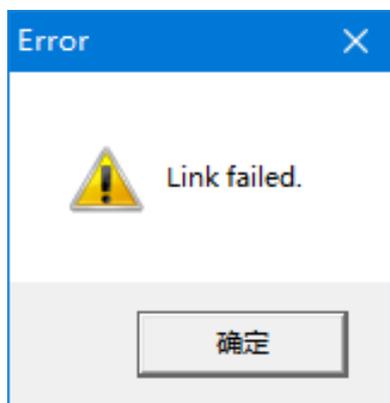
Step 2. Initializing the CHI660E station by pressing the button at the forward of the machine and the red light can be triggered.



Step 3. Double click the software “660E-2021” located on the desktop.

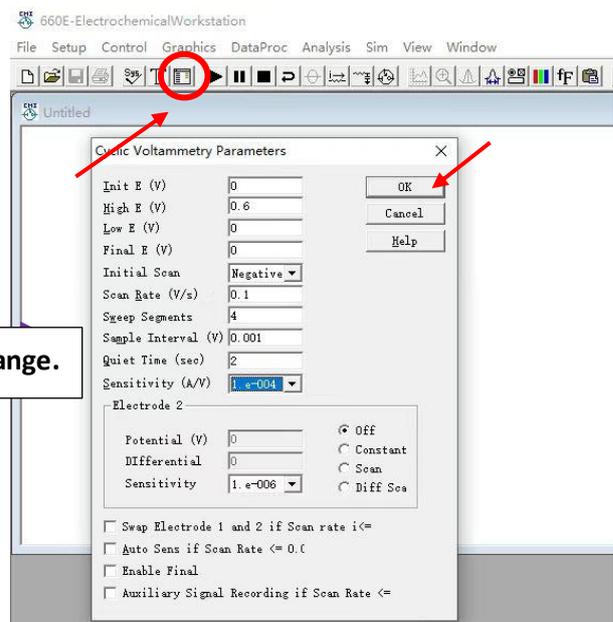
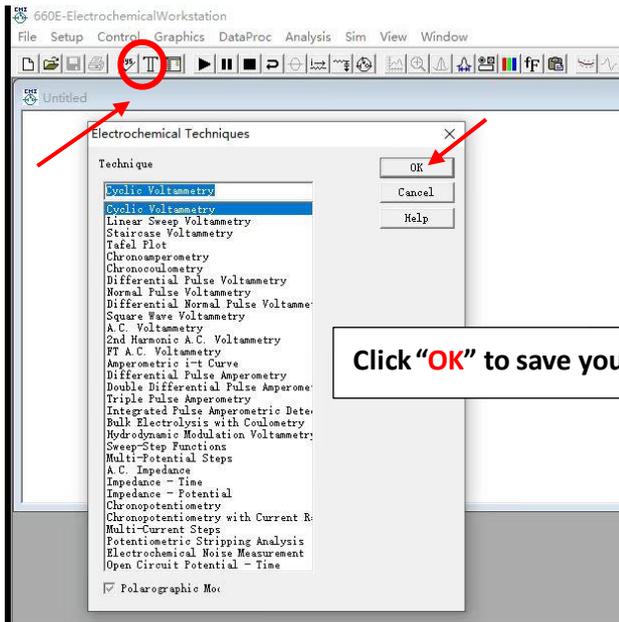


Step 4. If the “link failed” as shown below, please click the “System” to check the Serial port. The correct com port that connects with the machine is at “Com 3”, select the corresponding column frame and click “ok” to the next step.

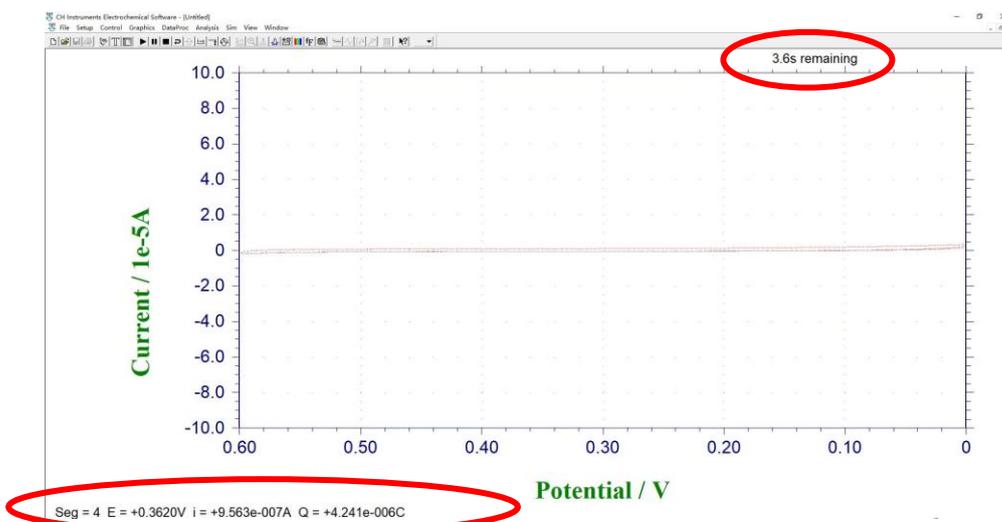
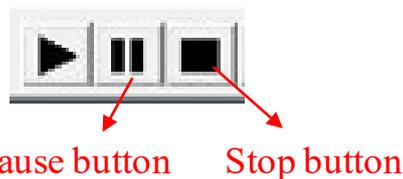


Step 5. Click the toolbar button  and select your program.

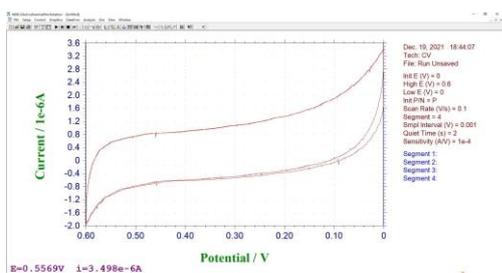
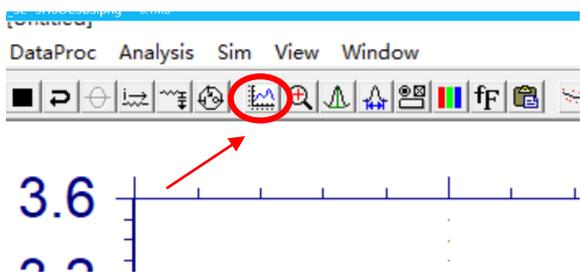
Step 6. Click the button  to set your parameters. For CV measurement, the electrode potential ramps linearly versus time in cyclical phases. You are required to set initial, high, low and final E to determine your potential window. “Initial scan polarization” depends on which direction you want to scan first, negative region or positive region. “Scan rate” is defined as the rate of voltage change over time during each of these phases, which is usually set as 0.1 V/s, also based on your needs. To perform “Sweep Segments” in CV measurements, you should define two or more frequency ranges. Set the “sensitivity” value larger than the desired current, otherwise the “**Overflow**” will appear and the current suddenly becomes a straight line as a warning. You are recommended to set a lower sensitivity, preferably 10^{-2} ~ 10^{-4} . Sample Interval and quiet time will stay as default.



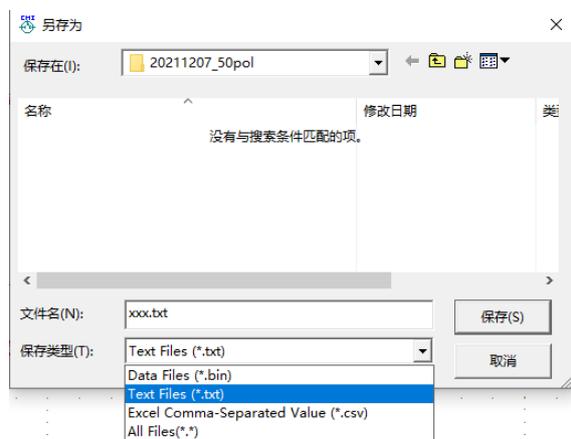
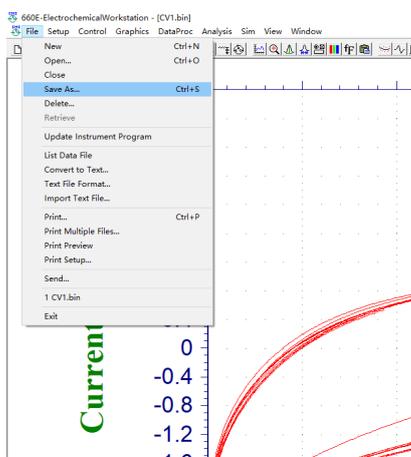
Step 7. Once the parameters are set, click the toolbar button  to play measurements. You can “Pause” and “Stop” during run time. During measurement, the CV curve scanning process and test duration can be monitored. The real-time E-I value and electric flux were given at the left corner of the homepage, as shown below.



You can click button  to find the detailed curve after testing completed.



Step 8. Click “Save as” and choose the file format. “TXT” should be better for origin. Please don’t forget to save the original data as “.bin”



Step 9. Close the software and turn off the electrochemistry workstation by pressing the switch button.

Step 10. After Experiments

- Rinse the working electrodes (glass carbon) and Pt counter electrode with DI water several times to remove the used electrolyte residue and air dried before putting back in a container.
- Used Ag/AgCl reference electrode should be cleaned and flushed with DI water, and put back to fresh 1M KCl solution.
- Cleaning the desk, taking away your things and register in the logbook.

4. Common Problems encountered, possible reasons and solutions:

Problems	Possible reasons	Solutions
Link failed	Cable disconnects	Connecting cable
	Serial port is incorrectly configured	Click toolbar “Setup”- “System” for reset
No current	Electrode wires disconnected	Check the connection
Data noisy	High impedance of reference electrode	To eliminate bubble in the electrode surface
	Weak signal	Increasing the sensitivity
	Ambient noise	Quiet environment