



Solartron 1287A

PROCEDURE FOR A FUNCTIONAL CHECK

[HTTP://WWW.AMETEKSI.COM/SUPPORT-CENTER/SOLARTRON-ANALYTICAL/USER-TESTS](http://www.ameteki.com/support-center/solartron-analytical/user-tests)



This is a basic test procedure used to ensure that the generator and input channels are working on the potentiostat in question. Before performing the test procedure, it is important to note the three modes in which the Solartron Analytical 1287A operates:

- Normal Mode: During normal mode, neither the “SET UP” key, nor the “NUMBER RETURN” key will be illuminated. This indicates that the function of the key pressed is as labeled.



- Setup Mode: During setup mode, the light on the “SET UP” key will be illuminated, indicating that the function of the key pressed corresponds to the labels above the keypad, not the labels on the keypad.



- Number Mode: During number mode, the light on the “NUMBER RETURN” key will be illuminated, indicating that the function of the key pressed corresponds to the numbers/labels below the keypad, not the labels on the keypad.



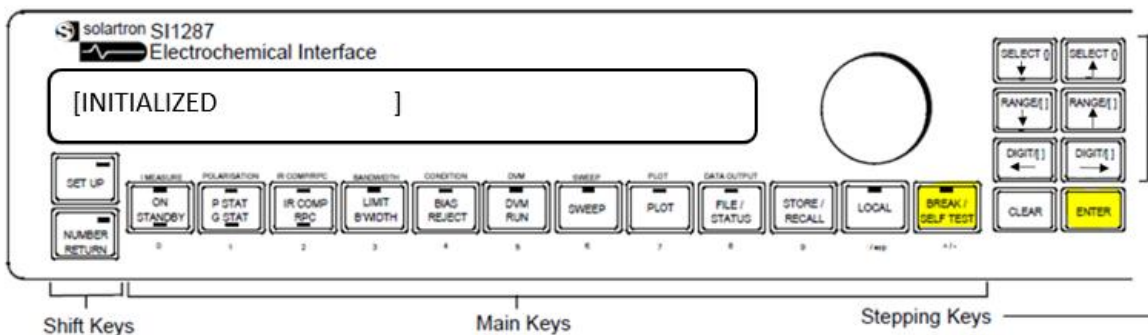
Throughout this document, the mode will be indicated by a red box to the left of the diagram as shown below (“SET UP” mode, for example). Please ensure that the 1287A is in proper mode throughout the testing procedure. As the mode will toggle throughout the procedure, the lights on the buttons will indicate the current mode.

SET UP

The following steps outline the procedure for performing a basic bench test on the Solartron Analytical 1287A:

NORMAL

- Step 1: Initialize the 1287A by pressing “BREAK/SELF TEST” five times, then press “ENTER”.

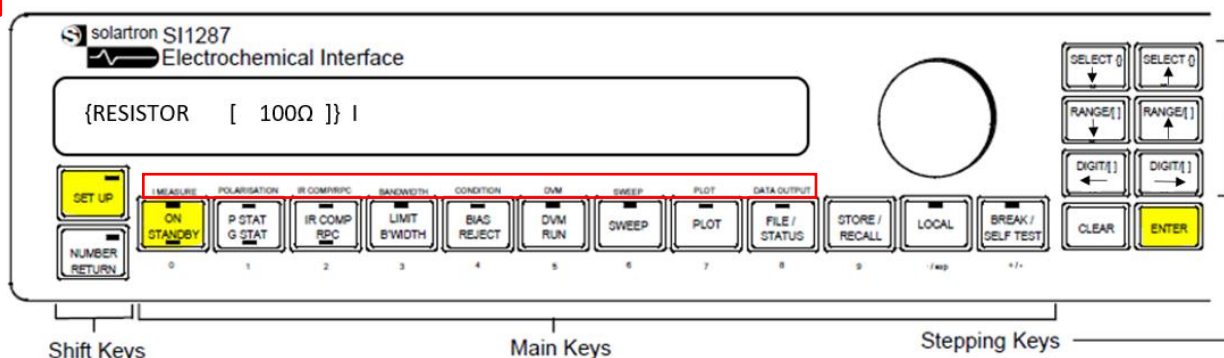


- Step 2: Using input cables, connect RE1 & RE2 to the LO/EARTH socket as shown below.



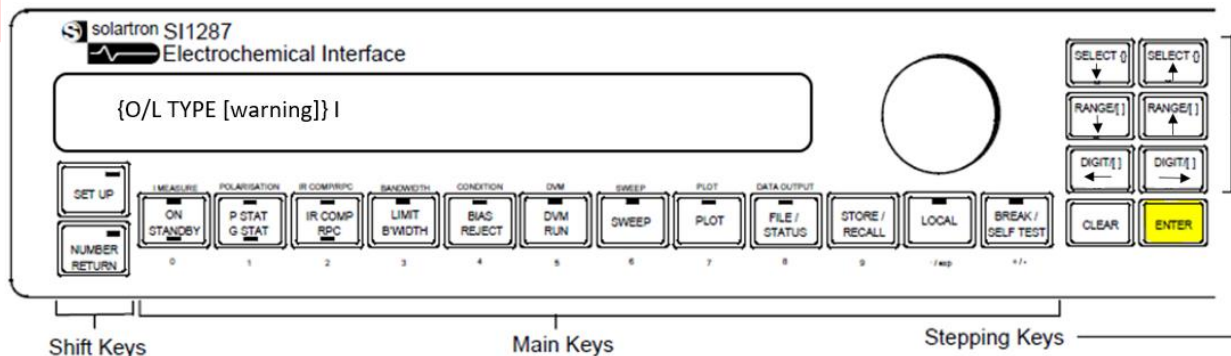
SET UP

- Step 3: Press “SET UP”, followed by “ON STANDBY” (IMEASURE). Use the rotary knob to select “100Ω”, and press “ENTER”.



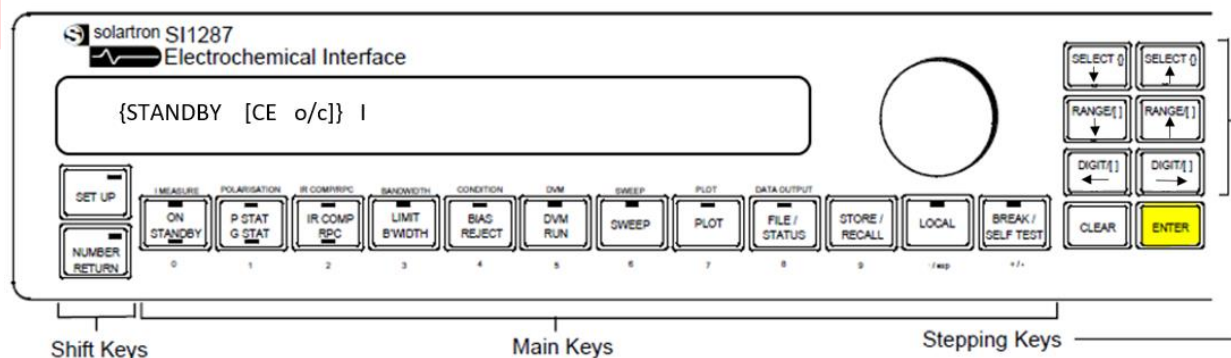
SET UP

- Step 4: Use the rotary knob to select “warning”, and press “ENTER”.



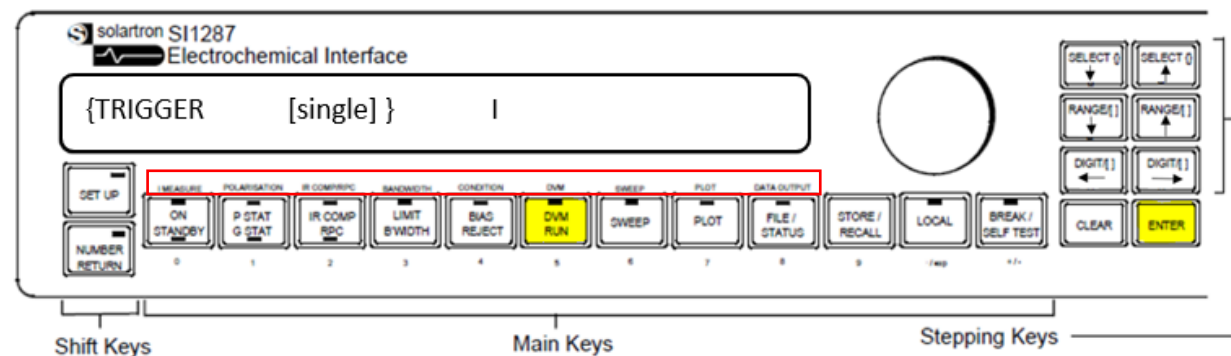
SET UP

- Step 5: Use the rotary knob to select “CE o/c”. Press “ENTER”.



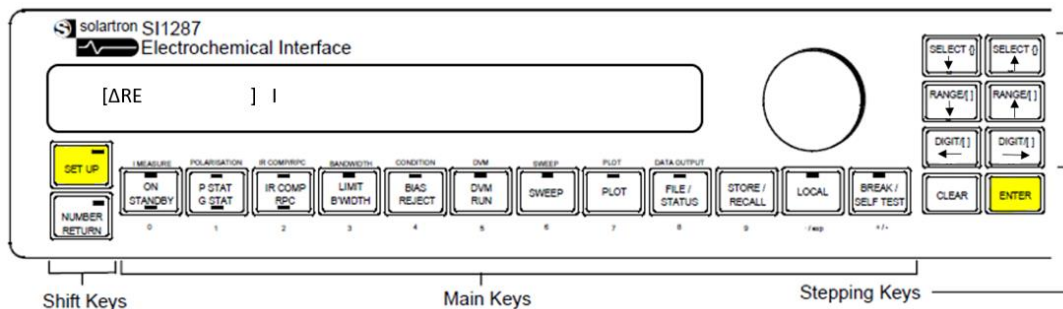
SET UP

- Step 6: Press “DVM RUN” key, followed by “ENTER” two times.



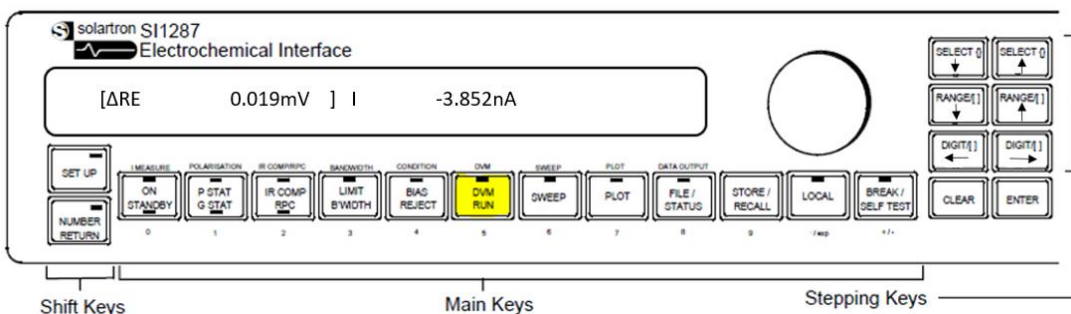
SET UP

- Step 7: Use the rotary knob to select “recycle”, and press “ENTER”. Press “SET UP” to exit the set up mode and enter normal mode.



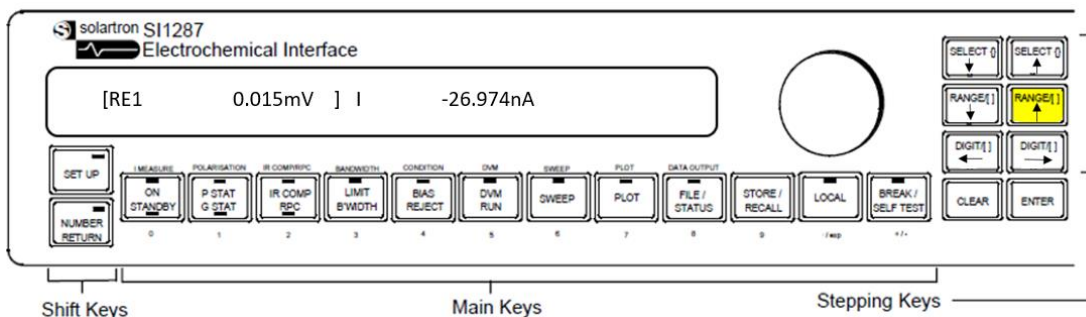
NORMAL

- Step 8: Press “DVM RUN”. This should display “ΔRE” and “I”. The values should be as follows:
 - ΔRE between -100μV to 100μV Result: _____
 - I between -500nA to 500nA Result: _____



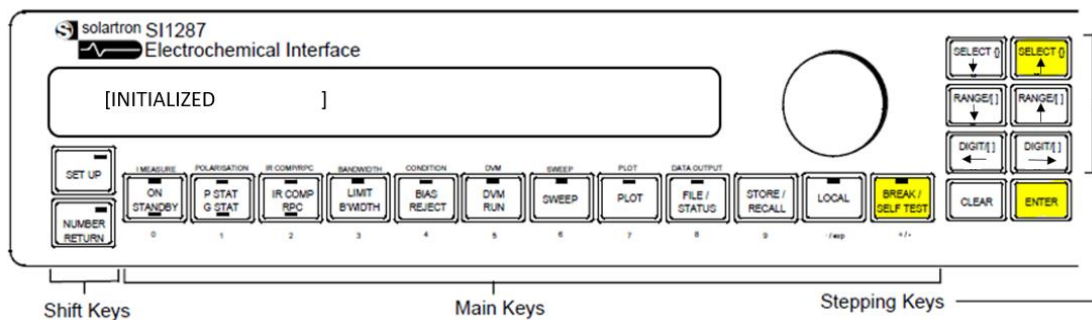
NORMAL

- Step 9: Press “RANGE↑” to display RE2 result. Then, press “RANGE↑” to display RE1 result. The values should be as follows:
 - RE2 between -100μV to 100μV Result: _____
 - RE1 between -100μV to 100μV Result: _____



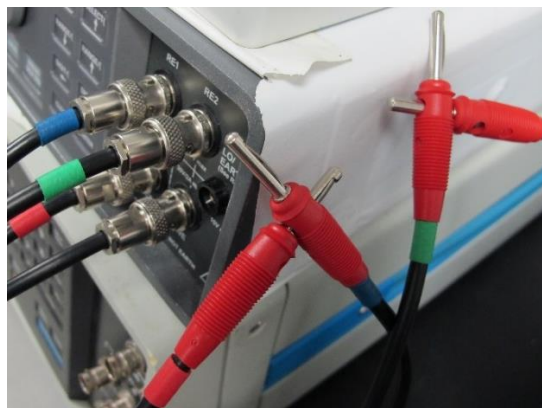
NORMAL

- Step 10: Press “BREAK/SELF TEST”, followed by “SELECT↑” two times. Then, press “ENTER” to initialize the instrument.



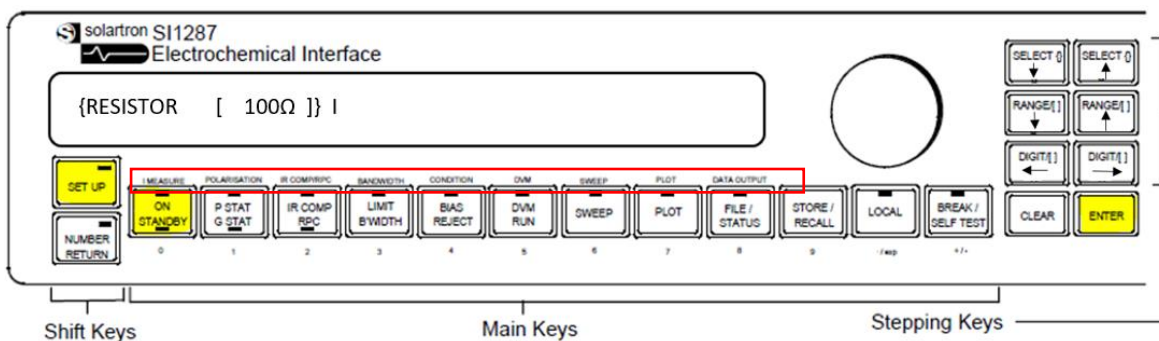
PStat Check

- Step 11: Connect the RE1 cable to the CE cable and the RE2 cable to the WE cable, as shown below.



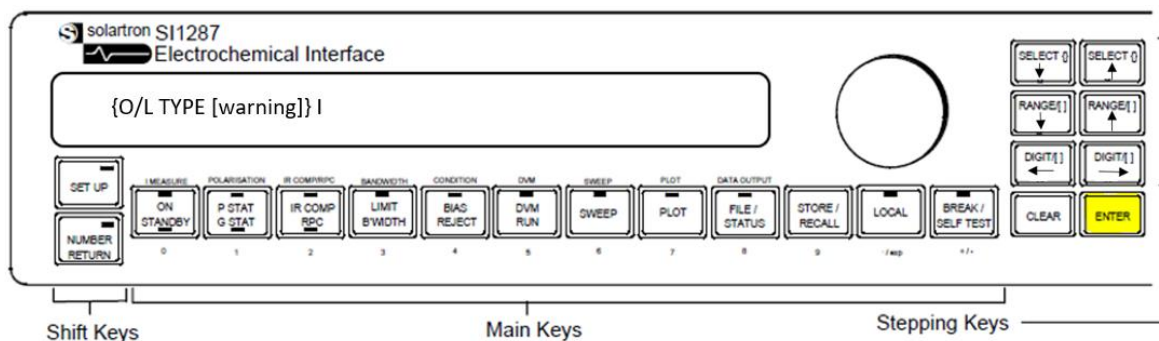
SET UP

- Step 12: Press “SET UP”, followed by “ON STANDBY” (IMEASURE). Use the rotary knob to select “100Ω”, and press “ENTER”.



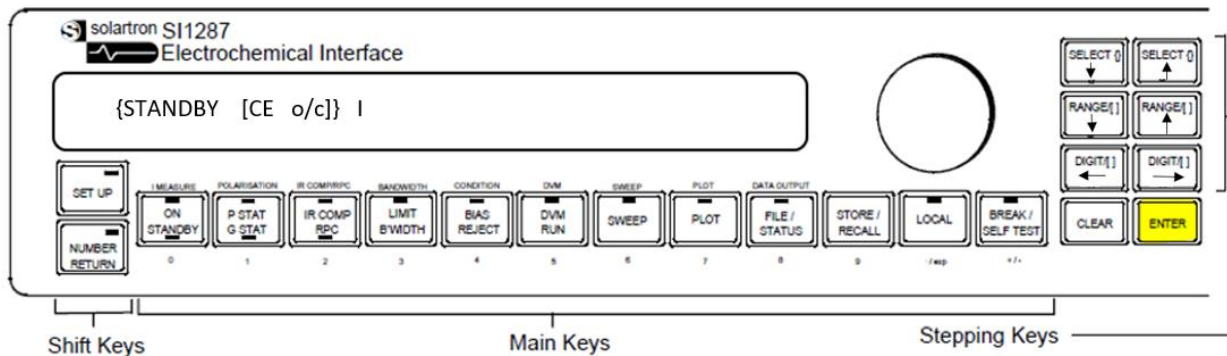
SET UP

- Step 13: Use the rotary knob to select “warning”, and press “ENTER”.



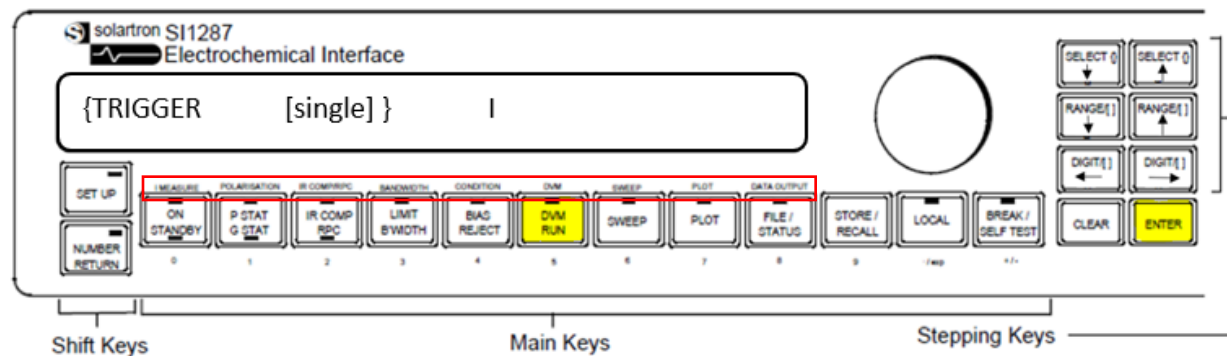
SET UP

- Step 14: Use the rotary knob to select “CE o/c”. Press “ENTER”.



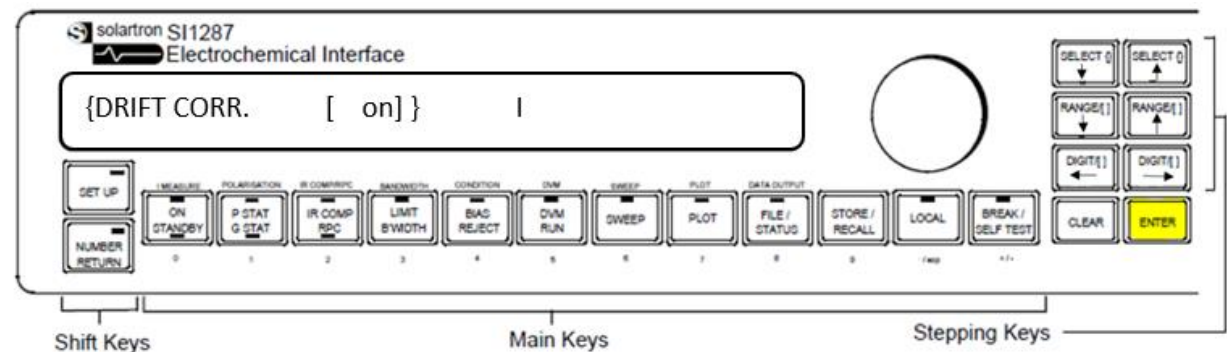
SET UP

- Step 15: Press “DVM RUN” key, followed by “ENTER” two times.



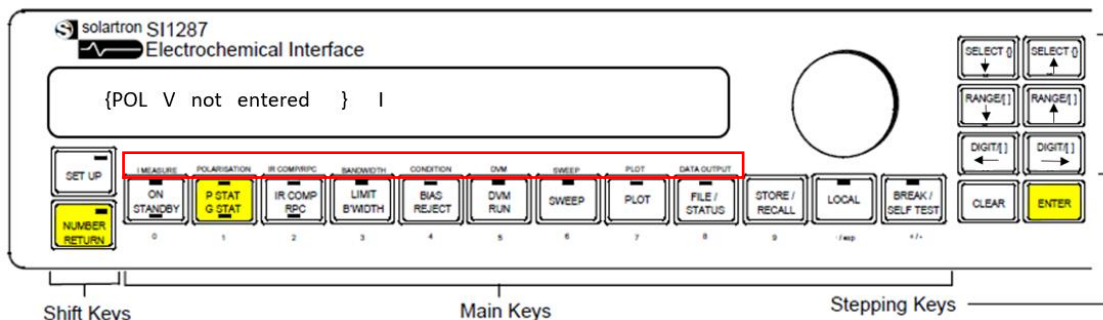
SET UP

- Step 16: Use the rotary knob to select “recycle”, and press “ENTER”.



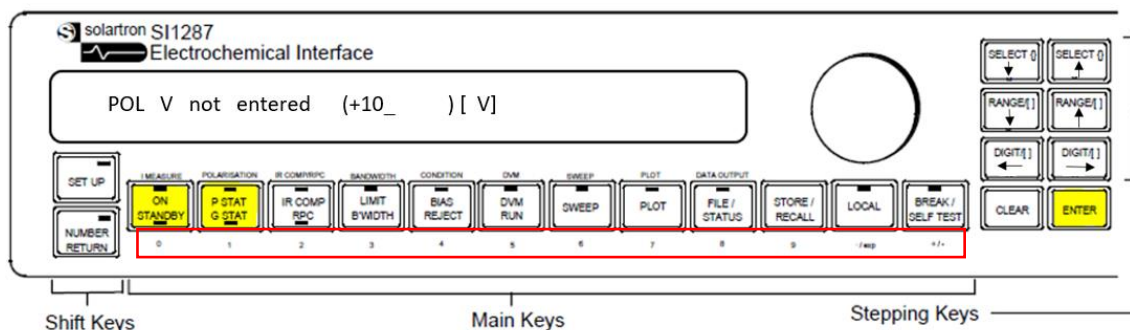
SET UP

- STEP 17: Press “PSTAT GSTAT” (POLARIZATION), followed by “NUMBER RETURN”, which changes the mode to number mode.



NUMBER

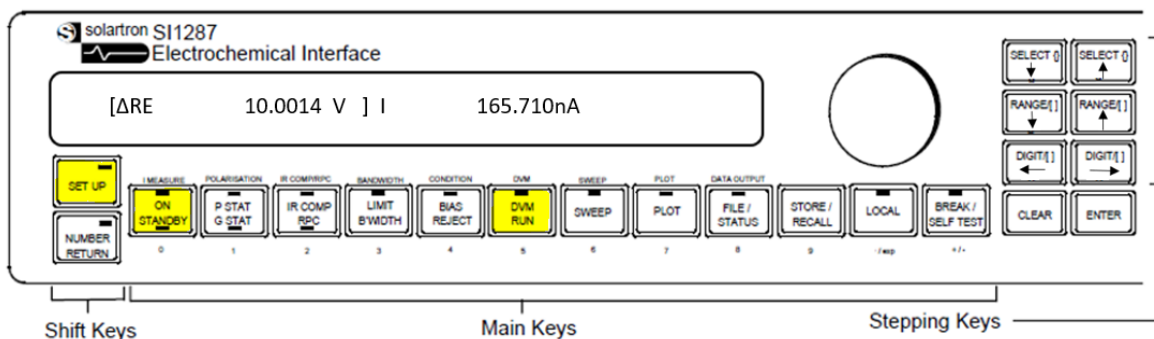
- Step 18: Press “PSTAT GSTAT” (1), followed by “ON STANDBY” (0), followed by “ENTER” to input “+10” volts. “ENTER” will toggle the mode back to set up mode.



NORMAL

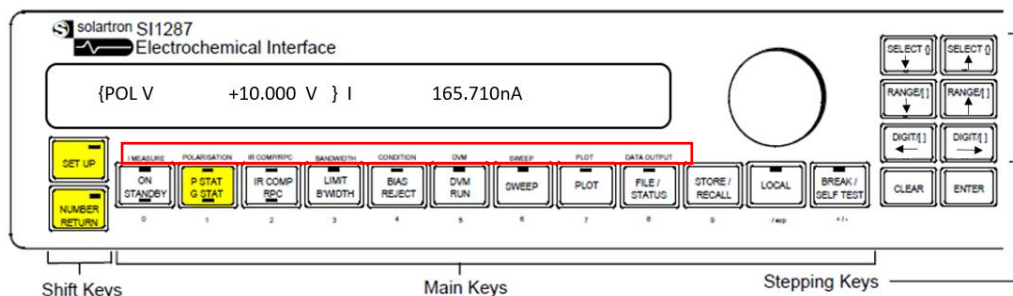
- Step 19: Select “SET UP” to toggle to normal mode, followed by “DVM RUN”, followed by “ON STANDBY”. This should display “ΔRE” and “I”. The values should be as follows:

- $\Delta RE = 10V \pm 22mV$ Result: _____
- $I = 0nA \pm 500nA$ Result: _____



SET UP

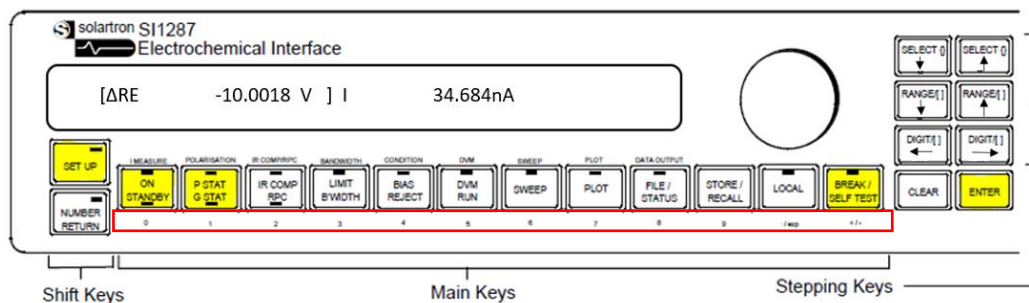
- Step 20: Press “SET UP”, followed by “PSTAT GSTAT” (POLARIZATION), followed by “NUMBER RETURN”. “NUMBER RETURN” will toggle the 1287A to number mode.



NUMBER

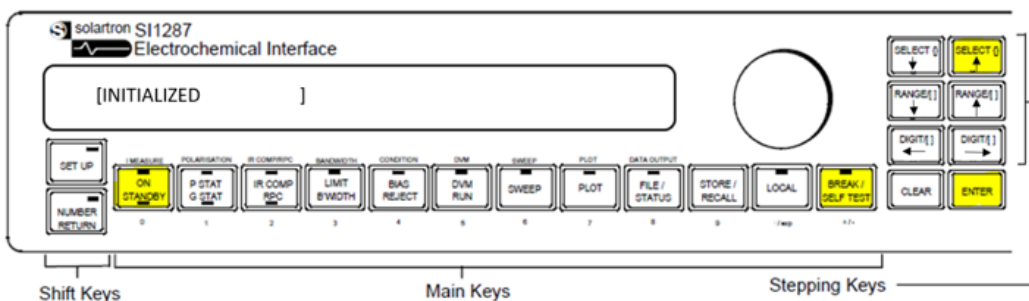
- Step 21: Press “BREAK/SELF TEST” (+/-), followed by “PSTAT GSTAT” (1), followed by “ON STANDBY” (0) to select “-10” volts. Then select “ENTER” to switch to set up mode, followed by “SET UP” to toggle back to normal mode. This should display “ΔRE” and “I”. The values should be as follows:

- ΔRE=-10V +/- 22mV Result: _____
- I=0nA +/-500nA Result: _____



NORMAL

- Step 22: Select “ON STANDBY”, followed by “BREAK/SELF TEST”, followed by “SELECT↑” two times. Then, press “ENTER” to initialize the instrument.



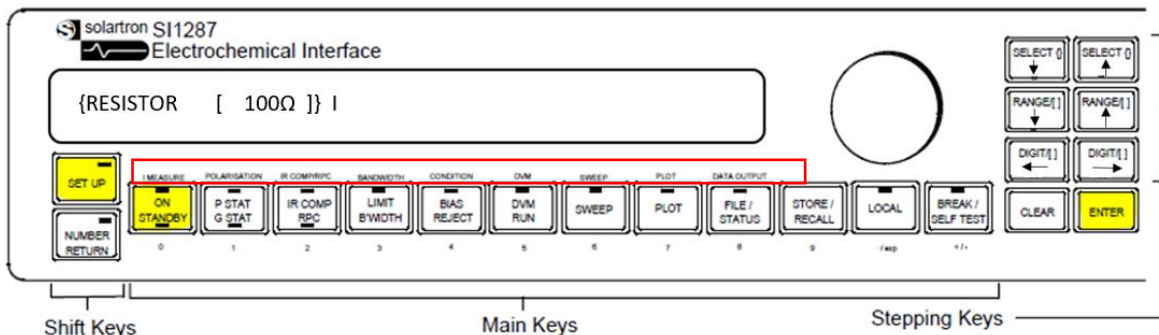
GStat Check

- Step 23: Connect RE1, CE, RE2, and WE input cables together as shown below.



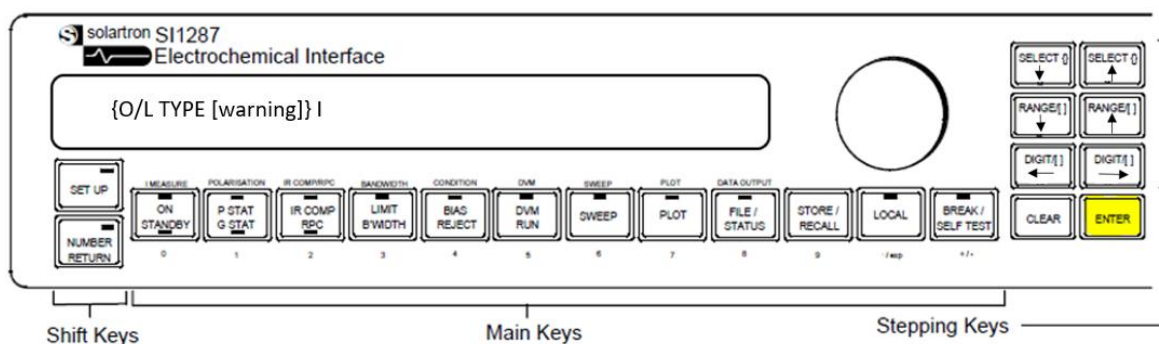
SET UP

- Step 24: Press “SET UP”, followed by “ON STANDBY” (IMEASURE). Use the rotary knob to select “100Ω”, and press “ENTER”.



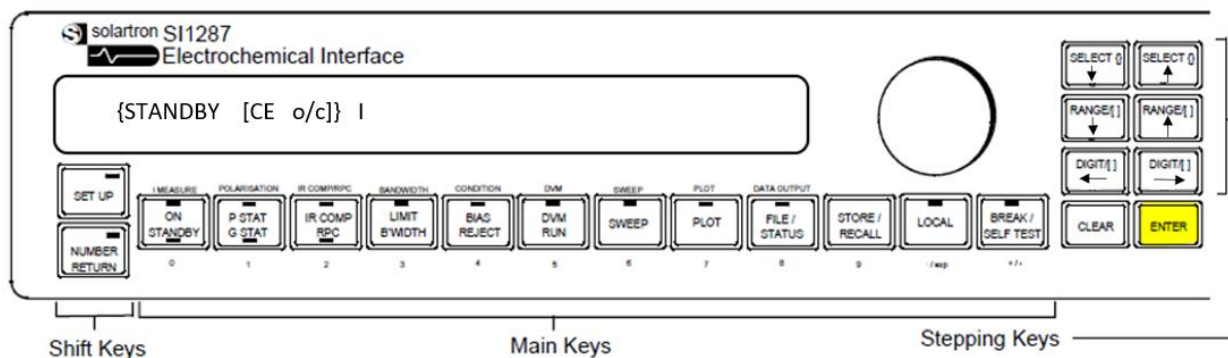
SET UP

- Step 25: Use the rotary knob to select “warning”, and press “ENTER”.



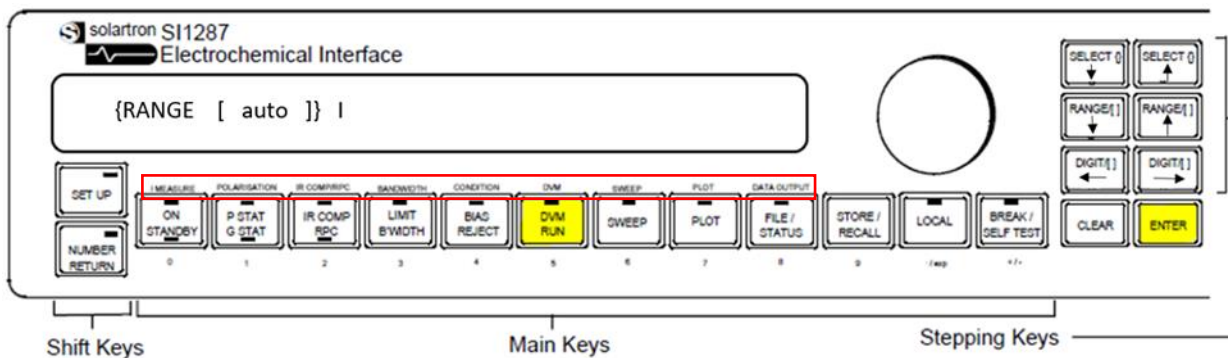
SET UP

- Step 26: Use the rotary knob to select “CE o/c”. Press “ENTER”.



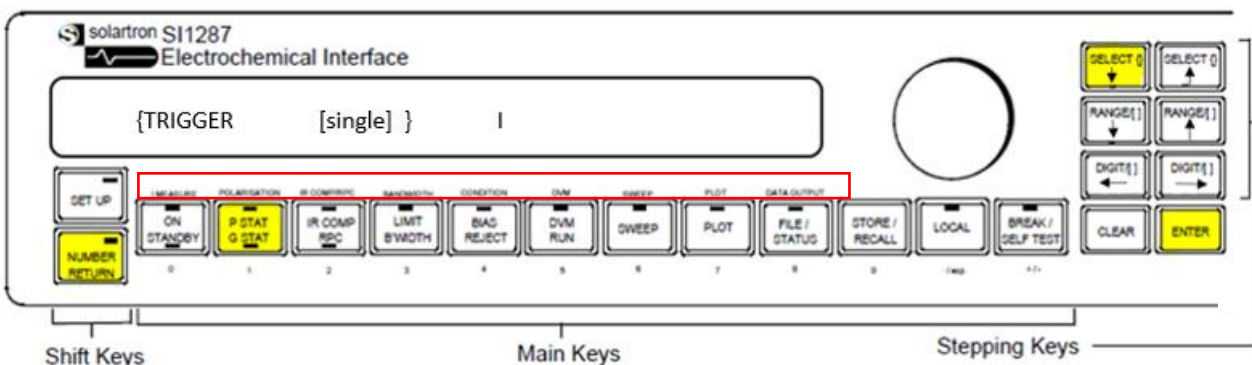
SET UP

- Step 27: Press “DVM RUN” (DVM) key, followed by “ENTER” two times.



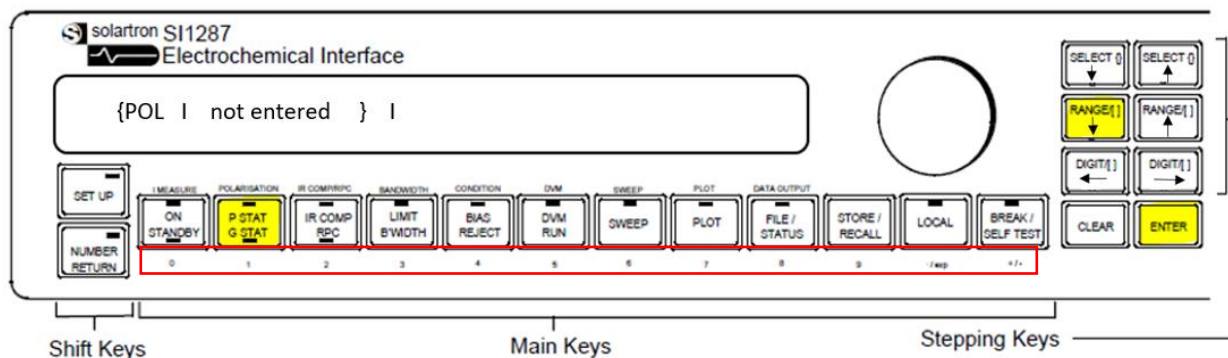
SET UP

- Step 28: Use the rotary knob to select “recycle”, and press “ENTER”.



NUMBER

- Step 29: Press “PSTAT GSTAT”(POLARIZATION), followed by “SELECT↓”, followed by “NUMBER RETURN”. “NUMBER RETURN” will toggle to number mode. Press “PSTAT GSTAT”, followed by “Range↓”, followed by “ENTER” to select 1mA GSTAT polarization.



NORMAL

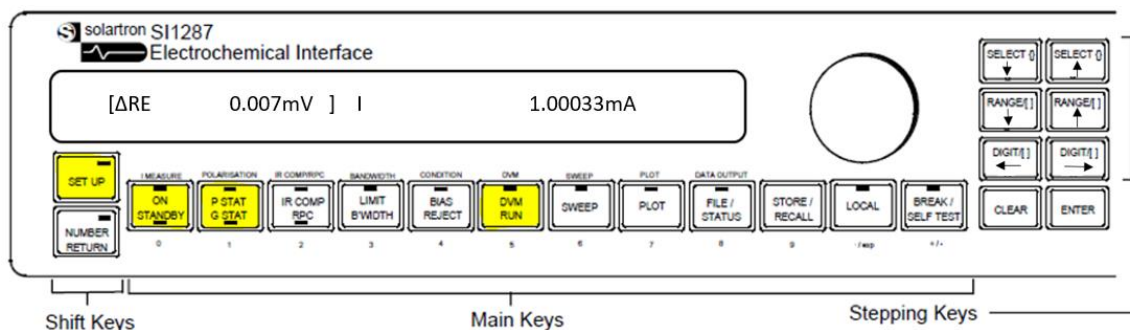
- Step 30: Select “SET UP” to toggle to normal mode, followed by “DVM RUN” to start measurement, followed by “PSTAT GSTAT”. This will switch the 1287A to Galvanostat mode, which will be indicated by the light on the panel as seen below (When in potentiostat mode, the light above PSTAT will be illuminated).



NORMAL

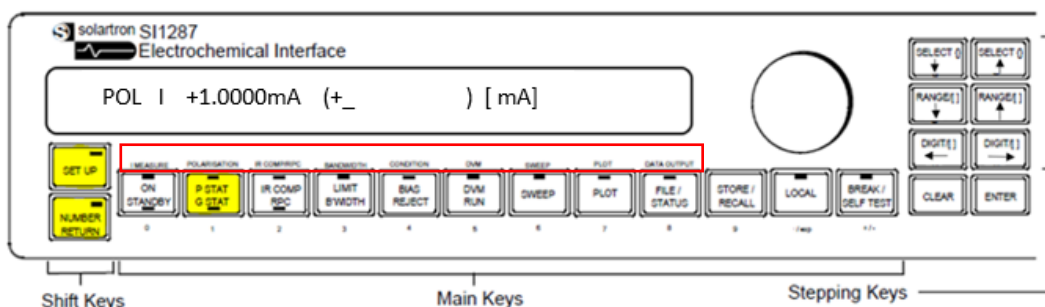
- Step 31: Then, press “ON STANDBY”. This should display “ΔRE” and “I”. The values should be as follows:

- $\Delta RE = 0V \pm 100\mu V$ Result: _____
- $I = 1mA \pm 3\mu A$ Result: _____



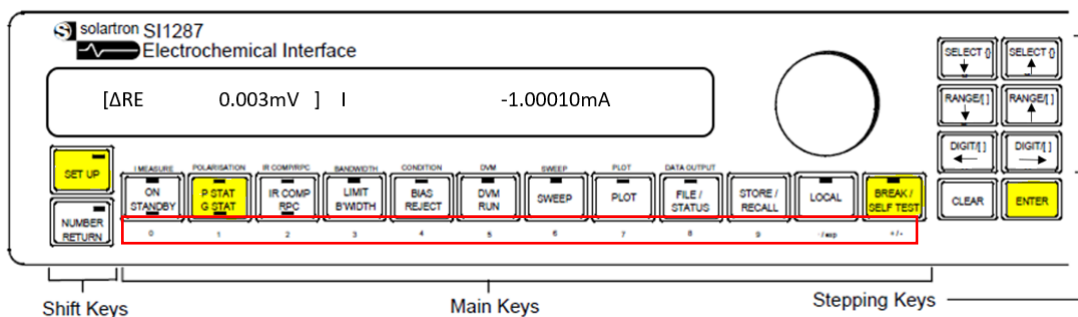
SET UP

- Step 32: Press “SET UP”, followed by “PSTAT GSTAT” (POLARIZATION), followed by “NUMBER RETURN” to enter number mode.



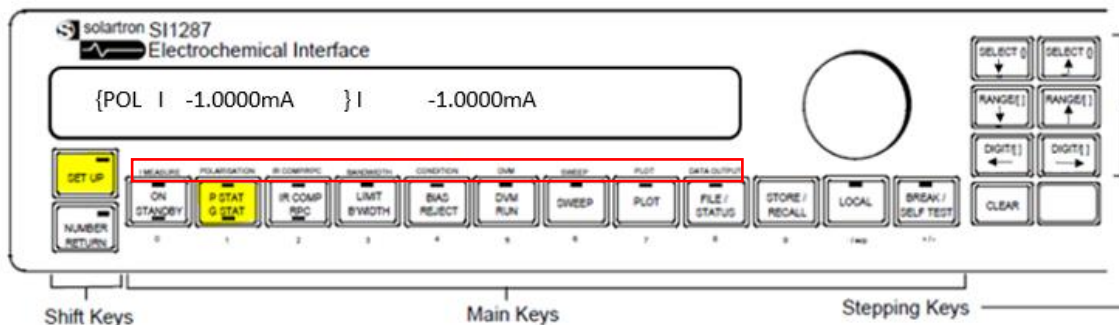
NUMBER

- Step 33: Press “BREAK/SELF TEST” (-), followed by “PSTAT GSTAT” (1), to select “-1” volts. Then select “ENTER”, followed by “SET UP” (“ENTER” will toggle to set up mode, and “SET UP” will toggle back to normal mode-normal mode is necessary to view measurements). This should display “ΔRE” and “I”. The values should be as follows:
 - $\Delta RE = 0V \pm 100\mu V$ Result: _____
 - $I = -1mA \pm 3\mu A$ Result: _____



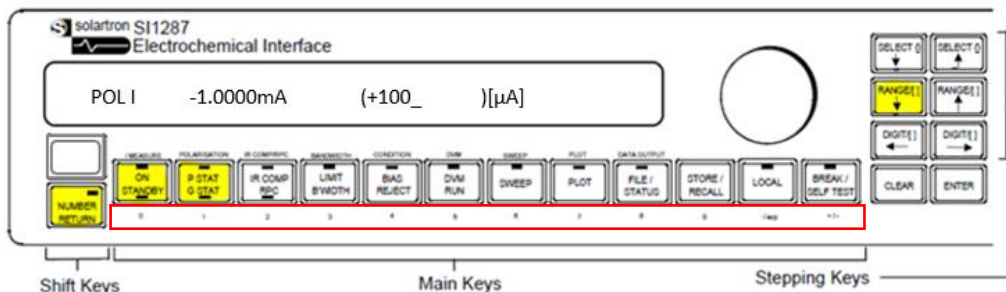
SET UP

- Step 34: Press “SET UP”, followed by “PSTAT GSTAT” (POLARIZATION).



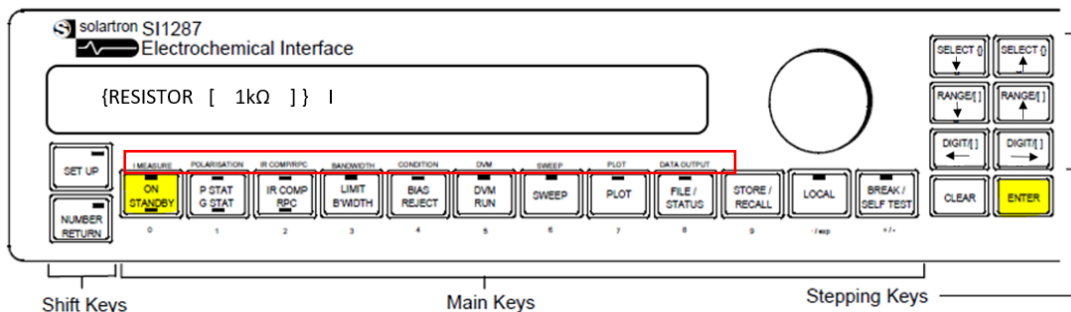
NUMBER

- Step 35: Press “NUMBER RETURN” to enter number mode. Then, select “PSTAT GSTAT” (1), followed by “ON STANDBY” (0) two times, followed by “RANGE↓” to select 100μA input.



SET UP

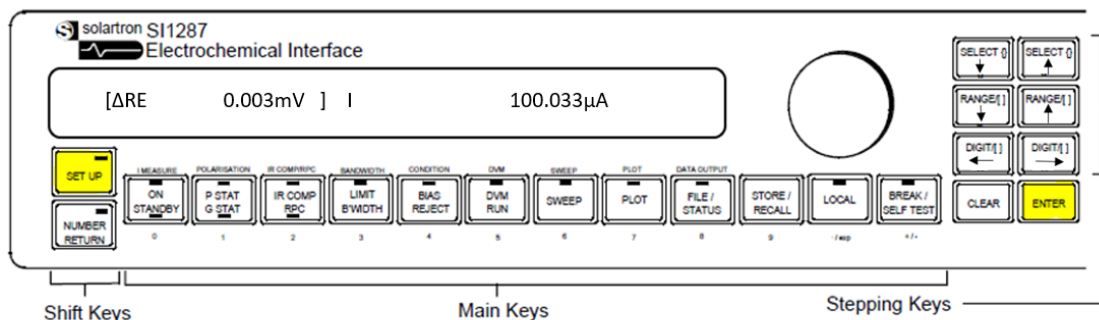
- Step 36: Select “ENTER”, which will toggle back to set up mode, followed by “ON STANDBY” (IMEASURE), followed by “ENTER” two times. Use the rotary knob to select 1kΩ.



NORMAL

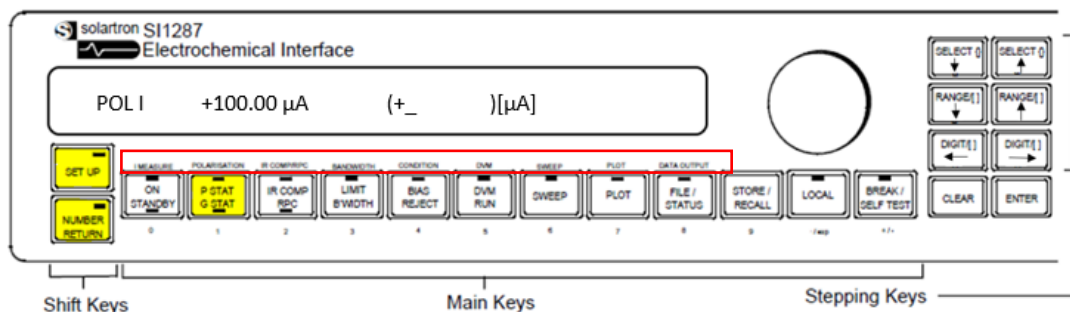
- Step 37: Press “ENTER”, then “SET UP” to switch to normal mode for viewing measurements. This should display “ΔRE” and “I”. The values should be as follows:

- $\Delta RE = 0V \pm 100\mu V$ Result: _____
- $I = 100\mu A \pm 0.3\mu A$ Result: _____



SET UP

- Step 38: Press “SET UP” to enter set up mode, followed by “PSTAT GSTAT” (POLARIZATION), followed by “NUMBER RETURN”. “NUMBER RETURN” will toggle the 1287A to number mode.



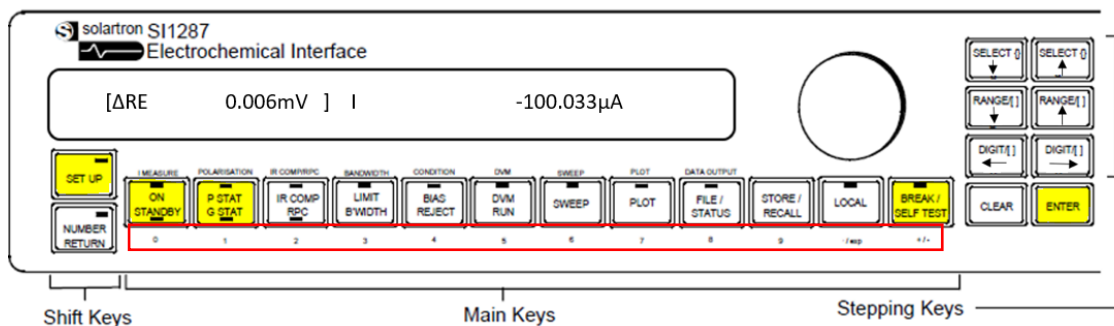
NUMBER

- Step 39: Press “BREAK/SELF TEST” (-), followed by “PSTAT GSTAT” (1), followed by “ON STANDBY” (0) two times to select “-100” μA. Then select “ENTER” to toggle back to set up mode, followed by “SET UP” to switch to normal mode. This should display “ΔRE” and “I”. The values should be as follows:

- ΔRE=0V +/- 100μV
- I=-100μA +/-0.3μA

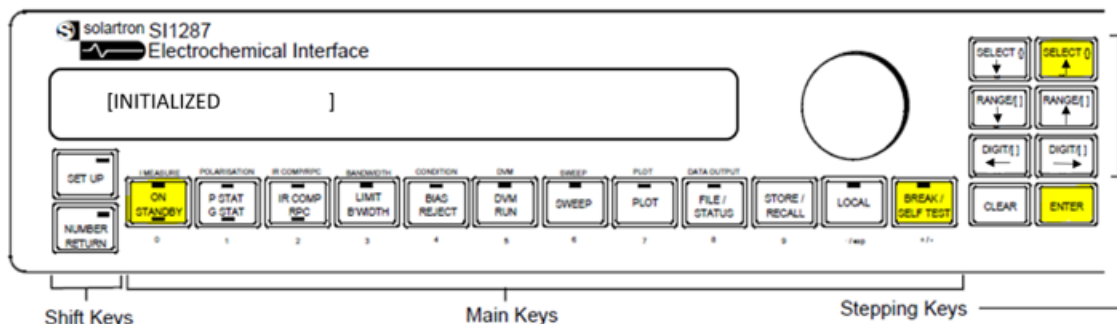
Result: _____

Result: _____



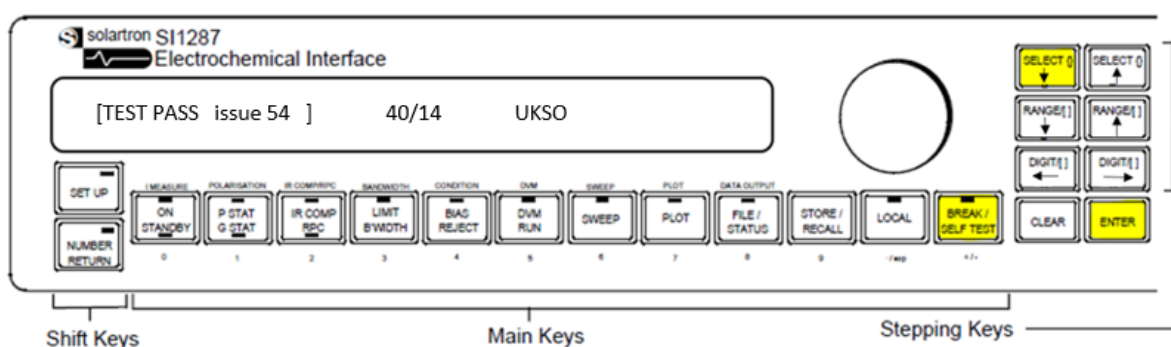
NORMAL

- Step 40: Press “ON STANDBY”, followed by “BREAK/SELF TEST”, followed by “SELECT↑” two times. Then press “ENTER” to initialize the instrument.



Final Test

- Step 41: As a final check, press the “BREAK/SELF TEST” key, followed by “SELECT↓” two times. Press “ENTER” to begin the test. Lights will move down the display panel. Press “ENTER” again, and lights will move across the display. Press “ENTER” a third time, and alpha-numeric characters will display. Press “ENTER” a fourth time, and the machine will prompt the user to press all keys, then press “ENTER”. Instrument should display a message similar to below, indicating that the potentiostat has passed the display test. The message display indicates the software issue, the week, the year, and the site of the last calibration, respectively.





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Solartron 1287A

DUMMY CELL TEST-CYCLIC VOLTAMMETRY

[HTTP://WWW.AMETEKSI.COM/SUPPORT-CENTER/SOLARTRON-ANALYTICAL/USER-TESTS](http://www.ameteksi.com/support-center/solartron-analytical/user-tests)



Why Run a Dummy Cell Test?

Before beginning a dummy cell test, please ensure that the Solartron Analytical 1287A is connected and communicating with your PC. If you are unsure or need assistance with this, please refer to AMETEK®/ Solartron at: <http://www.ameteksi.com/support-center/solartron-analytical/user-tests>.

Additionally, it is imperative that the software corresponding to the Solartron Analytical 1287A, CorrWare and CView, be downloaded onto the connected PC. This can be found at: <http://www.ameteksi.com/products/software/corrware-corrview-software>.

When working with the Solartron Analytical 1287A, as with all Solartron Analytical potentiostats, it is important to perform a dummy cell test to ensure that the equipment is ready to use and is working properly. Running a dummy cell test with known parameters and expected results can help to determine whether a potentiostat that is supplying questionable data is damaged.

A properly working potentiostat that outputs questionable data can indicate any of the following:

- Faulty ethernet connection
- Noise interference (could be from power outlet, or from pumps, heaters, etc.)
- Bad connection to the experiment (i.e.-something may have disconnected mid-experiment)
- Broken or corroded cables
- Unreliable reference electrodes
- Insufficient integration time during the experiment
- Measurements taken outside the specified range of the apparatus

Disqualifying the notion that the potentiostat is responsible is a crucial step to determining the cause of erroneous data. Running a successful dummy cell test and obtaining experimental results that match expected theoretical results indicates that the potentiostat is not damaged, as well as the need to explore other potential causes of misinformation. The following is a guide which outlines the steps of performing one of many dummy cell experiments, cyclic voltammetry.

Background-Cyclic Voltammetry

Each Solartron Analytical 1287A includes a dummy cell labeled “12861 ECI TEST MODULE”. The test module contains a known series of resistors and capacitors inside. The equivalent circuitry is outlined below in Figure 1:

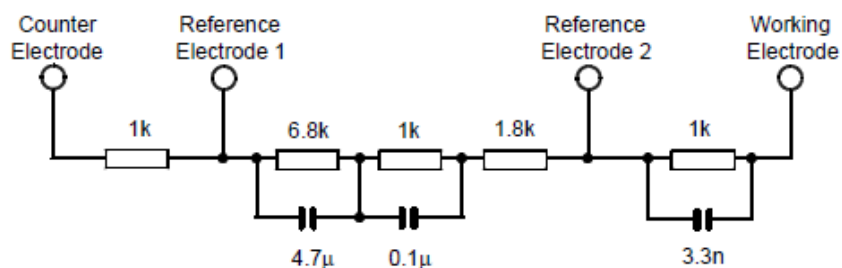


Figure 1

The dummy cell test can be performed with any simple and predictable experiment. One of the easiest tests to evaluate equipment using DC circuits is cyclic voltammetry. This is called “cyclic voltammogram” in the CorrWare software that accompanies the Solartron Analytical 1287A potentiostat. In cyclic voltammetry, the potential is ramped across the dummy cell. When the potential reaches a set value, it is ramped in the opposite direction. During this time, the potentiostat measures current across the resistors and outputs the data. Typically, this experiment is run for several cycles (Figure 2).

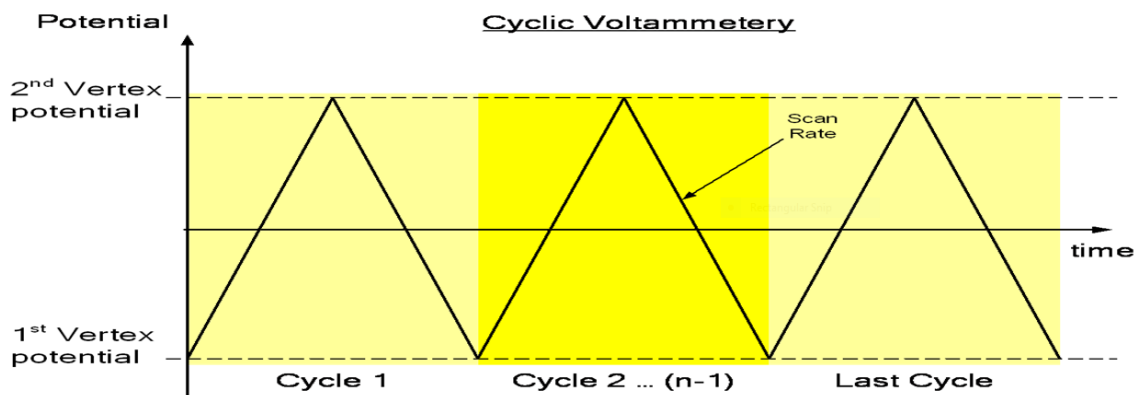


Figure 2

Cyclic voltammetry is useful for a dummy cell test, due to the predictability of the cell behavior and ease of calculation. The following equation, also referred to as Ohm’s Law, is used to approximate cell behavior, where V =potential, measured in volts; I =current, measured in amps; and R =resistance, measured in Ohms:

$$V=IR$$

Eqn 1 (Ohm’s Law)

Experimental Setup-Physical Equipment

To set up a cyclic voltammetry experiment, connect BNC cables between the Solartron Analytical 1287A and the 12861 ECI Test Module. The red labeled cable corresponds to the counter electrode, CE. The blue labeled cable corresponds to reference electrode #1, RE1. The green labeled cable corresponds to reference electrode #2, RE2. The black cable corresponds to the working electrode, WE.

Each cable running from the potentiostat should join its corresponding electrode as shown in Figure 3 below. (i.e. -CE to CE, RE1 to RE1, etc.)



Figure 3

The potential that is selected within the software will be applied to the circuitry within the test module. The resulting current will be plotted against the voltage. The actual measurement is taken between the reference electrodes, as shown in Figure 4.

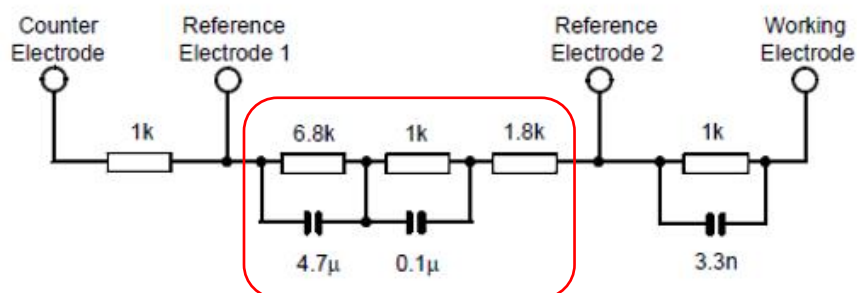


Figure 4

Experimental Setup & Run-Software

Open CorrWare and select “Experiments”, followed by “Insert New Experiment” in the upper left corner of the screen (Figure 5).

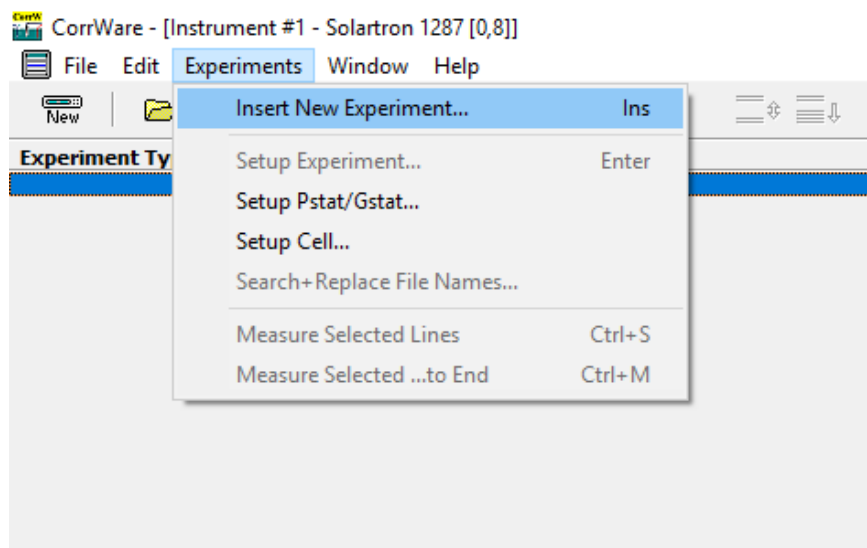


Figure 5

Select “Cyclic Voltammogram”, and click “OK” (Figure 6).

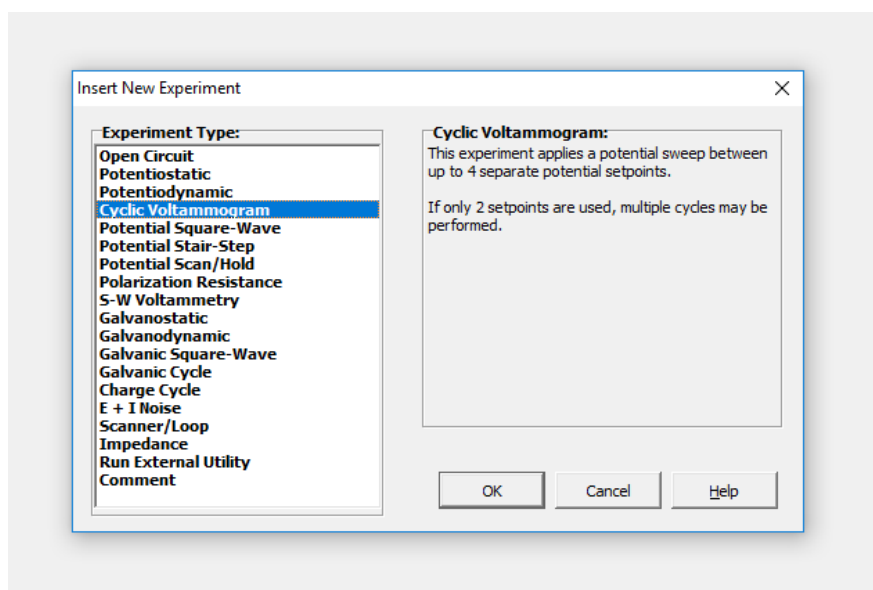


Figure 6

The following window (Figure 7) will appear with parameters set for a generic cyclic voltammetry experiment. Keep the parameters as they are, but be sure to select “All Cycles” below “Save Data From:” so that all cycles are recorded. Set a name and destination for the data file. Click “OK”.

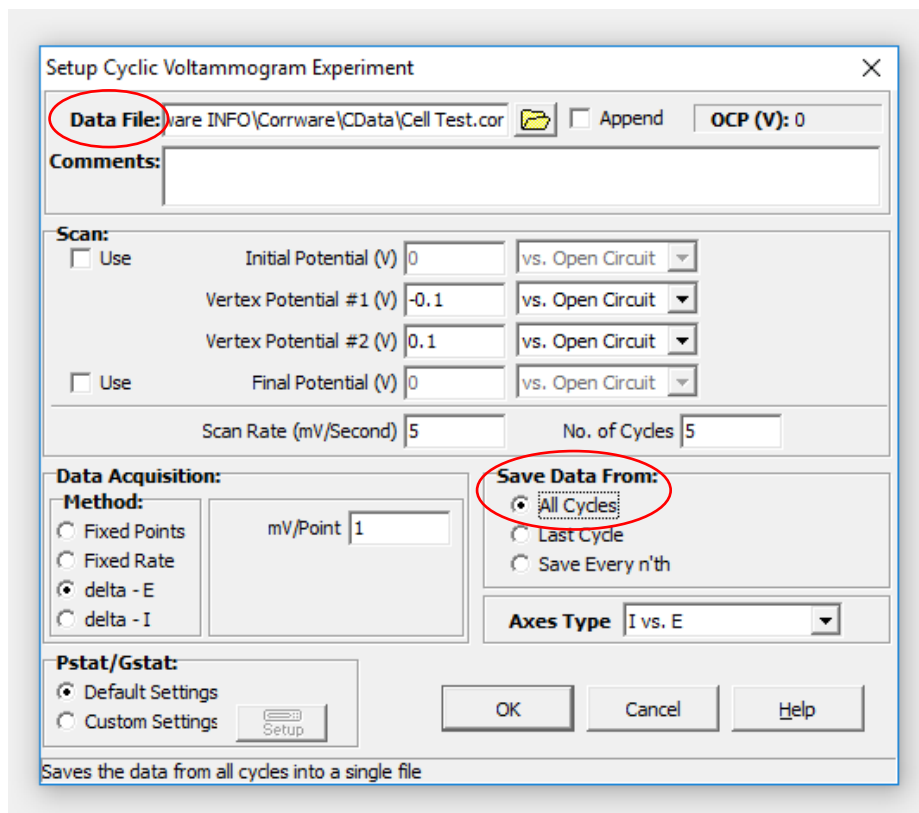


Figure 7

The following (Figure 8) will now appear on the screen. Click “Measure Selected” to begin running the experiment.

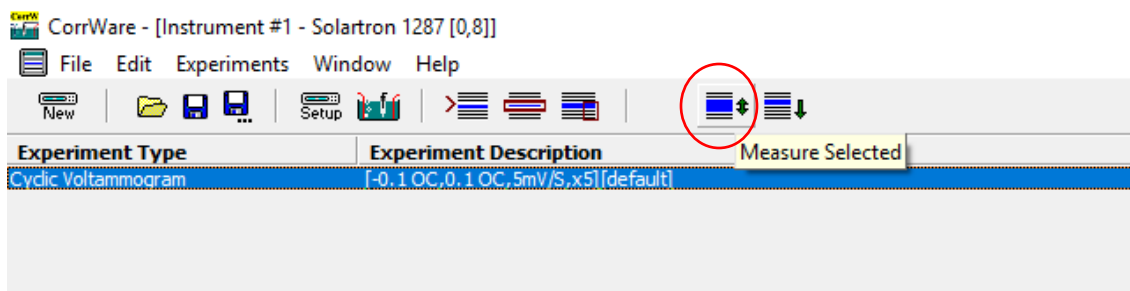


Figure 8

A window will appear after the experiment is complete (Figure 9). At this point, CView must be used to retrieve graphical data.

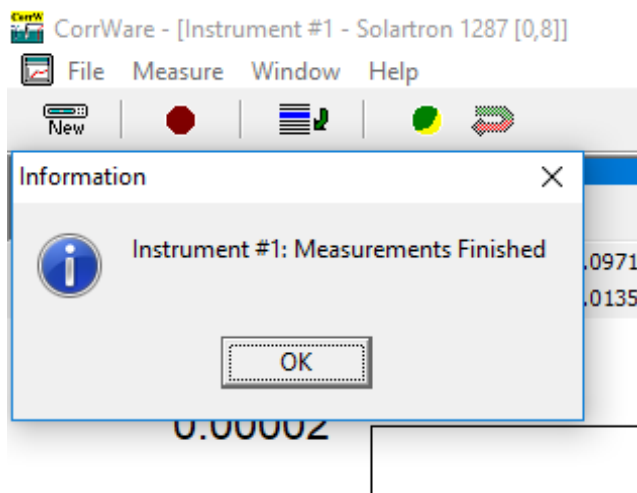


Figure 9

Using CView to View Data

To use CView to view the data, open the program and click on “File”, then “Data Files”. This will display a menu that prompts one to select a data file. Select your file, and click the arrow directed to the right to add file to “Files to Plot” (Figure 10). This should move the file beneath the “Files to Plot” heading as shown in Figure 11. Click “OK”.

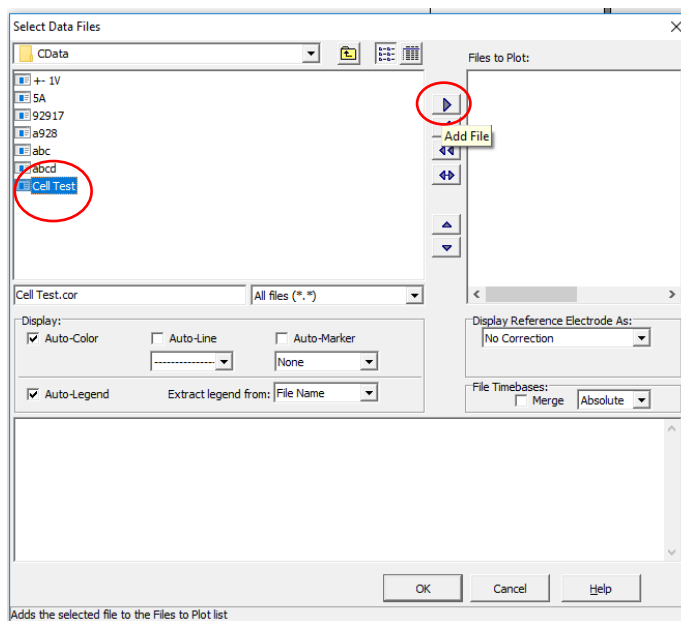


Figure 10

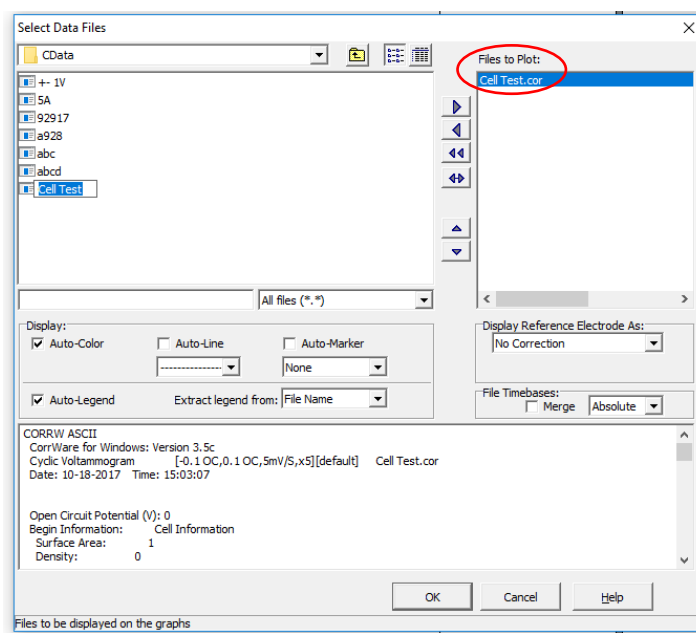


Figure 11

The file should now be added to the drop-down box on the task bar. Click on the arrow next to the drop-down box and select the data file prepared (Figure 12).

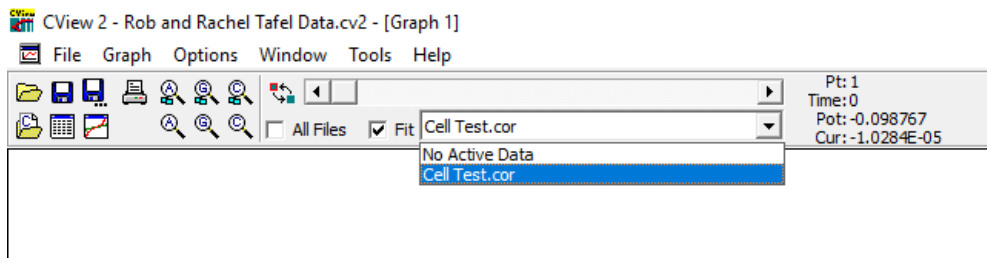


Figure 12

A plot of I versus E will automatically display. By right clicking, and highlighting "Standard Axes", the axes of the graph can be changed as seen below (Figure 13).

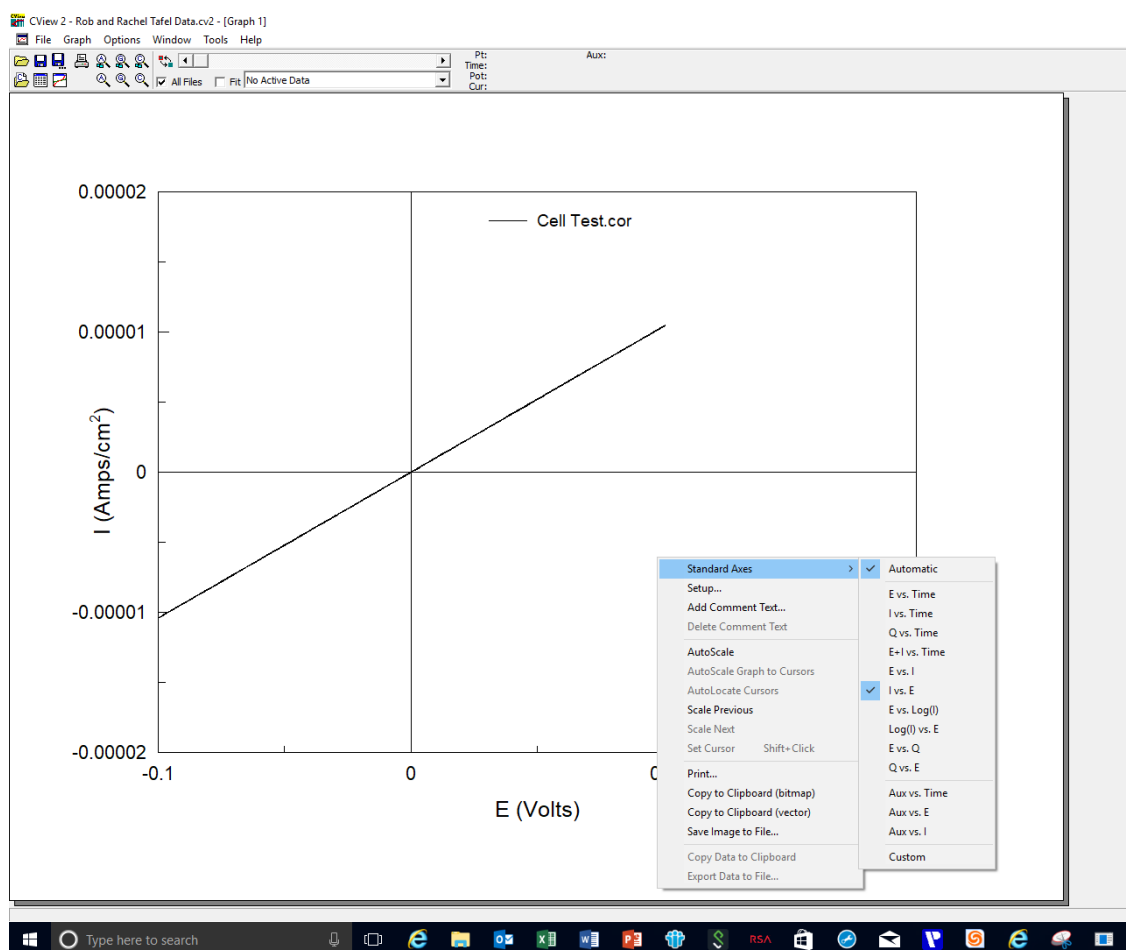


Figure 13

Actual data values from the graph can be retrieved by clicking on “Data Values” as seen below (Figures 14 & 15).

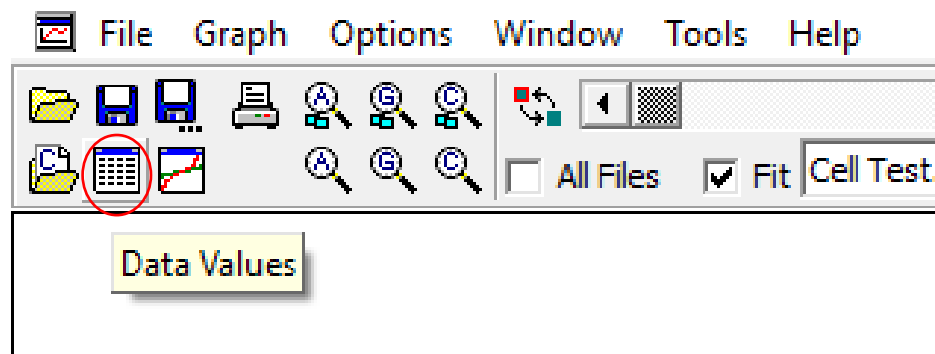


Figure 14

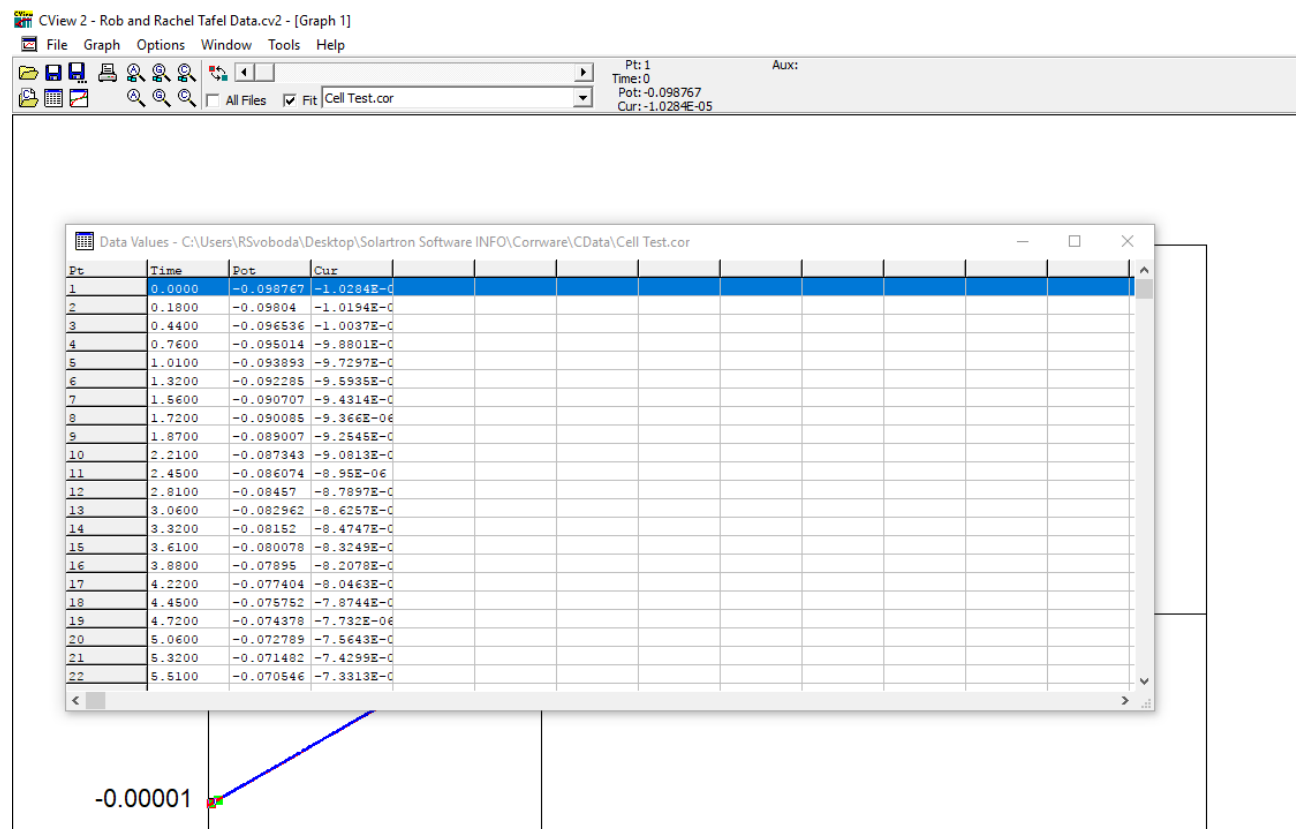


Figure 15

Evaluating CView Experimental Data

Potential versus current from the data in Figure 15 can be copied and pasted into an Excel spreadsheet by right clicking on the data and selecting “Copy All to Clipboard” (Figure 16).

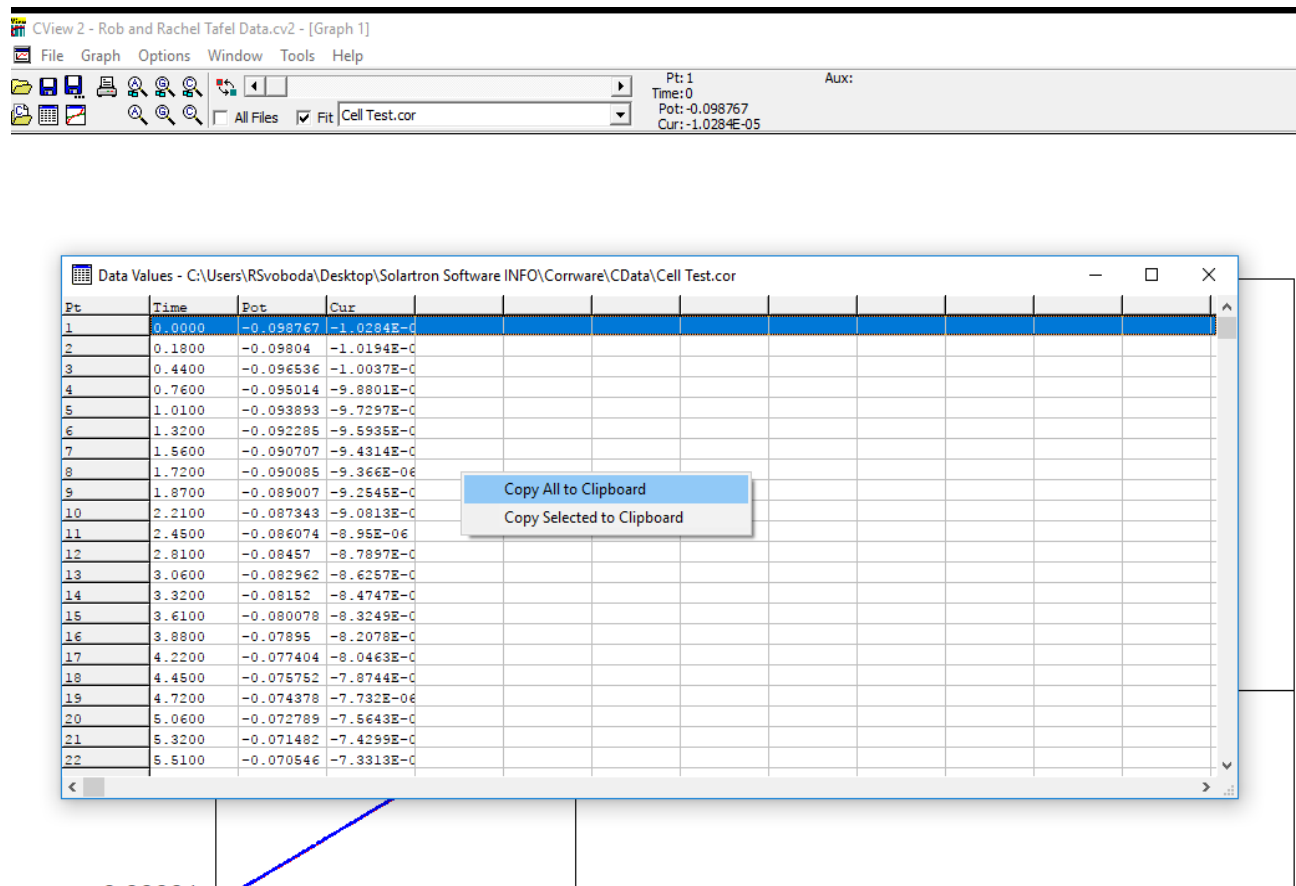


Figure 16

Referring to the circuitry schematic in Figure 4, it can be deduced that the resistance being measured using the connections outlined in Figure 3 is approximately 9.6k Ω . Using Ohm's Law, $V=IR$ (eqn 1), and substituting the voltage applied, along with experimental resulting current, the formula can be rearranged to $R=V/I$ and used to solve for resistance (Figure 17).

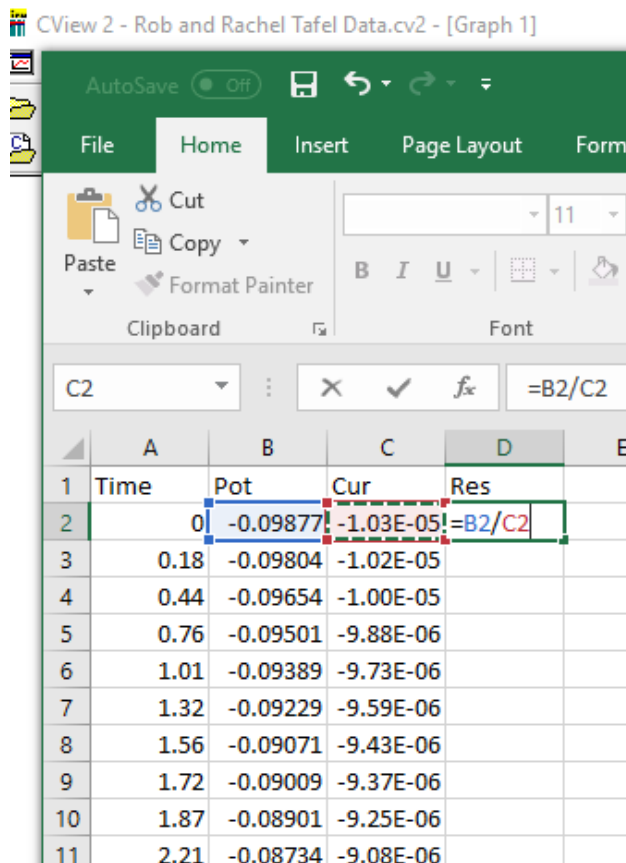
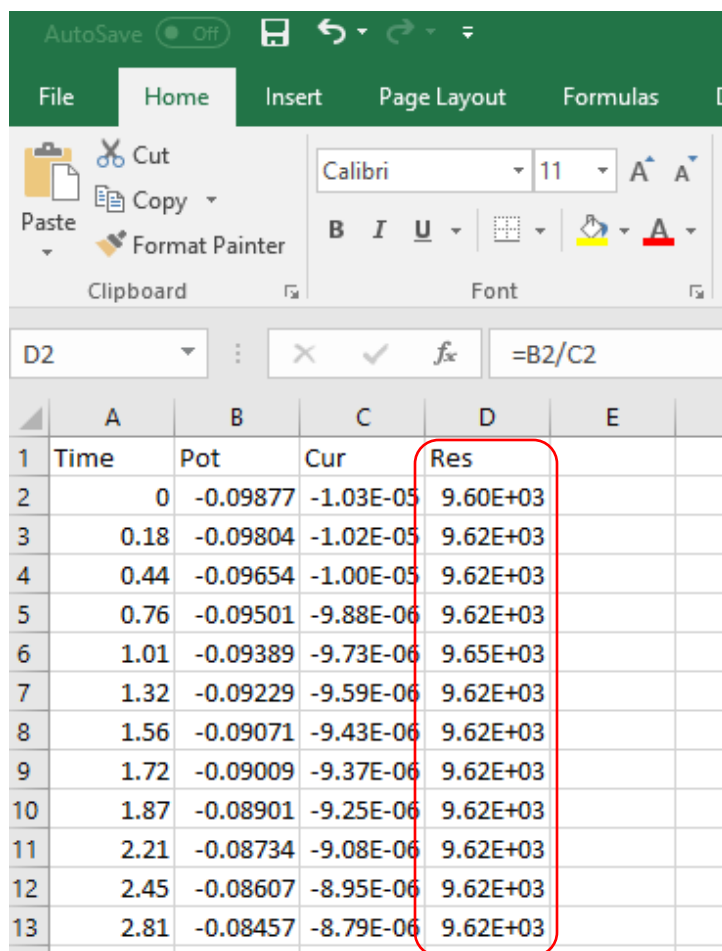


Figure 17

The resistance within the spreadsheet (or manual calculations) should be approximately $9.6\text{k}\Omega$ (Figure 18). If the data from the experiment matches the expected/calculated results, as shown below, it can be inferred that the potentiostat is in good working order. In this case, other causes for misinformation should be explored.



	A	B	C	D	E
1	Time	Pot	Cur	Res	
2	0	-0.09877	-1.03E-05	9.60E+03	
3	0.18	-0.09804	-1.02E-05	9.62E+03	
4	0.44	-0.09654	-1.00E-05	9.62E+03	
5	0.76	-0.09501	-9.88E-06	9.62E+03	
6	1.01	-0.09389	-9.73E-06	9.65E+03	
7	1.32	-0.09229	-9.59E-06	9.62E+03	
8	1.56	-0.09071	-9.43E-06	9.62E+03	
9	1.72	-0.09009	-9.37E-06	9.62E+03	
10	1.87	-0.08901	-9.25E-06	9.62E+03	
11	2.21	-0.08734	-9.08E-06	9.62E+03	
12	2.45	-0.08607	-8.95E-06	9.62E+03	
13	2.81	-0.08457	-8.79E-06	9.62E+03	

Figure 18



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1017RevA



Solartron 1287A

CONNECTIONS/COMMUNICATIONS

[HTTP://WWW.AMETEKSI.COM/SUPPORT-CENTER/SOLARTRON-ANALYTICAL/USER-TESTS](http://www.ameteki.com/support-center/solartron-analytical/user-tests)



When working with the Solartron Analytical 1287A, as with all Solartron Analytical potentiostats, it is important to run a connections and communications check to ensure that the equipment is ready to use with the computer chosen. The following is a guide to ensure proper connections and communications:

Powering Up the Instrument

1. Does the instrument power up?
 - 1.1. To confirm, after flipping the power switch on the back of the apparatus to the “on” position, the display on the front panel of the 1287A should become active and should read “Power Restored”. Additionally, fans on the back of the equipment should begin running.
 - 1.2. If the instrument does not power up:
 - a. Confirm that the outlet is working with other electrical instruments.
 - b. Try another power cable.
 - c. Check the fuse in the rear panel of the 1287A. The fuse can be found and checked as shown in Figure 1, below. Should the fuse be blown, replace and retry. If the fuse fails again, please contact help at AMETEK®/Solartron Analytical at <http://www.ameteksi.com/contact-us/contact-technical-support>.

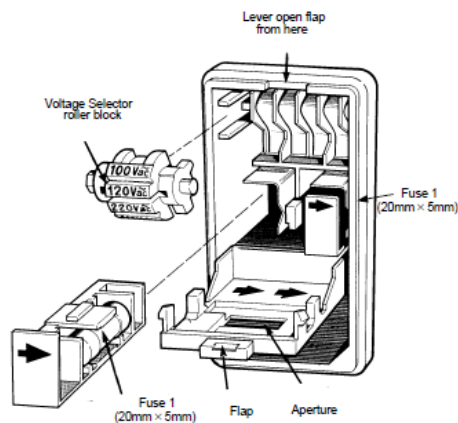


Figure 1

Potentiostat Communications-Passed

2. Is the potentiostat communicating with your PC?
 - 2.1. To verify communications, download the latest version of CorrWare from <http://www.ameteksi.com/products/software/corrware-corrview-software> . Open the program and click “file”, then “new instrument”.
 - a. If the apparatus is new, it will be necessary to install it by clicking an “undefined” line item and selecting “Modify Instrument”. Upon clicking “Modify Instrument”, the 1287A should show in the window. Select the apparatus.

If the instrument has been previously configured, the 1287A will appear in the list when “New Instrument” is selected.

Click on “modify instrument”, then “Test GPIB”. If the test passes, you should see a message as shown in figure 2 below. This indicates working communication between the potentiostat and your PC, and you should be ready to proceed with using the 1287A.

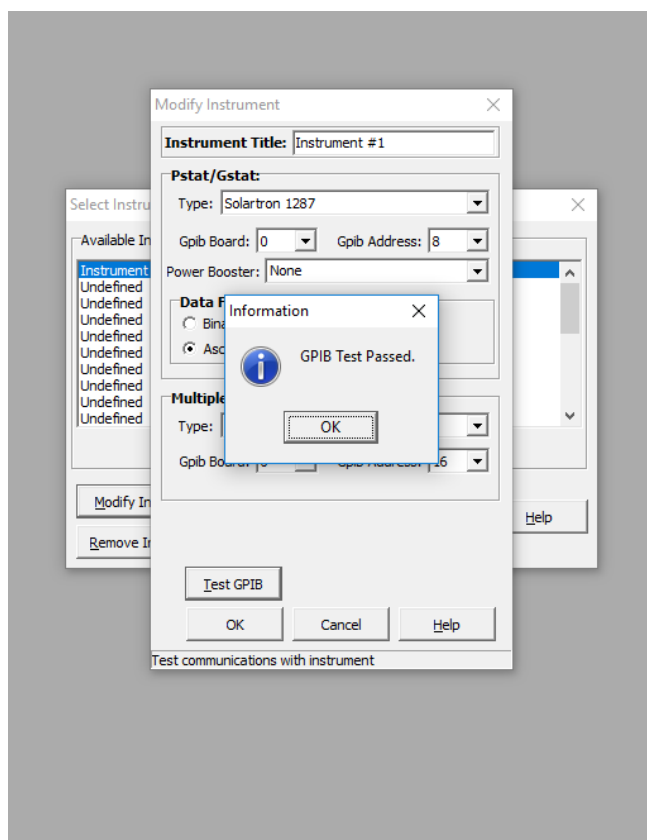


Figure 2

Potentiostat Communications-Failed

- b. If the test fails, an error message will display (Figure 3), followed by a second message that indicates the GPIB address of any instrument that is connected to the PC (1287A in this case) as shown below (Figure 4):

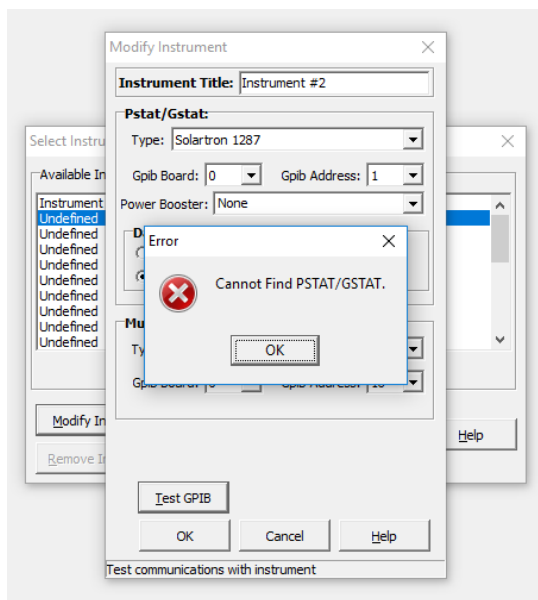


Figure 3

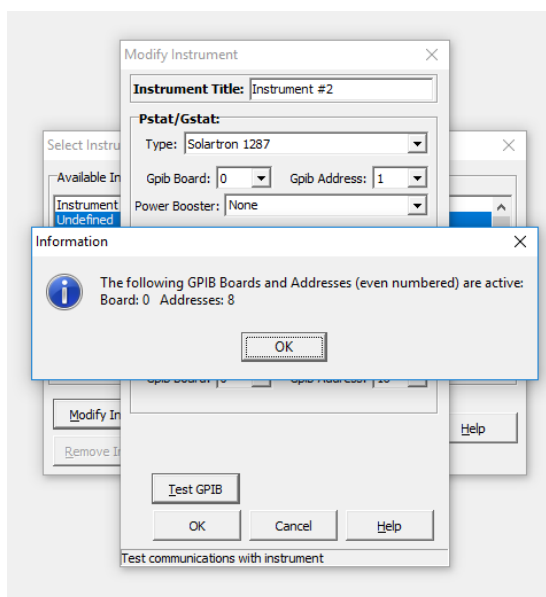


Figure 4

Checking the GPIB Address of the 1287A

- If the communications test fails, a status test should be performed directly on the 1287A to determine which GPIB address is being used by the 1287A. To do this, click on the File/Status button in the “main keys” section on the front panel of the equipment as shown in Figure 5.

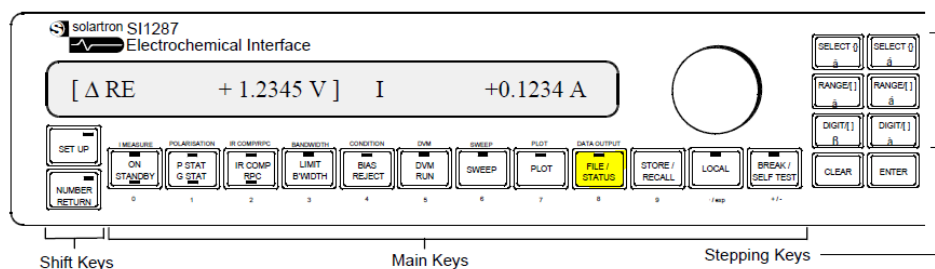


Figure 5

- As the text on the screen is shown in curly brackets, use the arrows in curly brackets {} (Figure 6) in the “stepping keys” section to run through the selections until reaching the word “status” (press down arrow 3x).

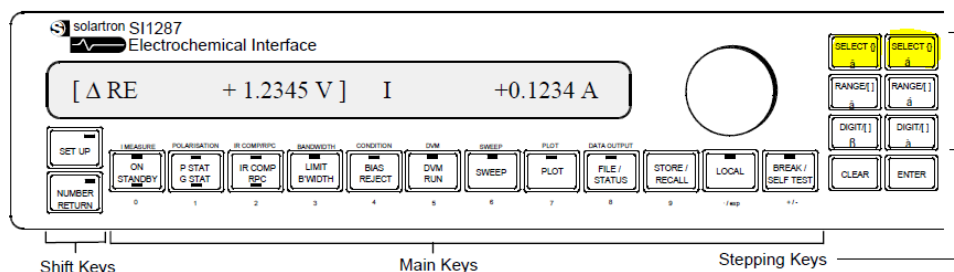


Figure 6

- Click “enter”. “[Free Memory...]” will display. Use the square bracket arrow keys (because the text on the front display is now in square brackets-Figure 7) to select “GPIB address” (press up arrow 2x).

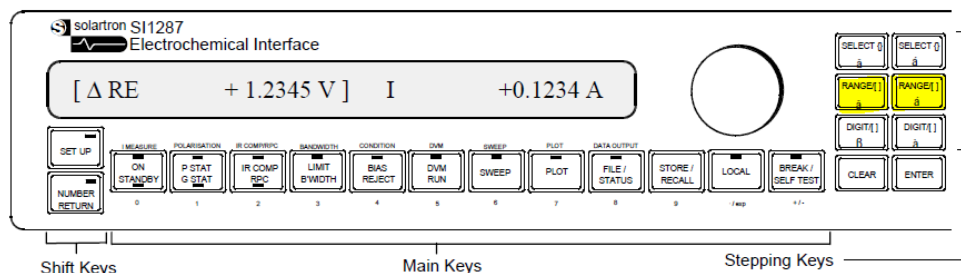


Figure 7

This will then display the GPIB address to which the 1287A is connected.

Matching PC & 1287A GPIB Addresses

4. If the GPIB test in CorrWare failed, the address displayed on the 1287A likely does not match the GPIB address shown in the CorrWare software. The address must be changed in the CorrWare software to proceed.

4.1 To change the GPIB address in the CorrWare software:

- a. Open CorrWare and click “New” in the upper left corner.
- b. Select your instrument and click “modify”.
- c. The GPIB address can be changed to match the address determined from the direct status test with the 1287A using the drop-down box shown in Figure 8.
- d. After choosing the appropriate address, click “Test GPIB”. You should now see a screen as shown in Figure 2, indicating that the test passed. If the test fails, please see section 5 for common causes of connection and communication failures and contact help at Ametek/Solartron at <http://www.ameteksi.com/contact-us/contact-technical-support> if needed.

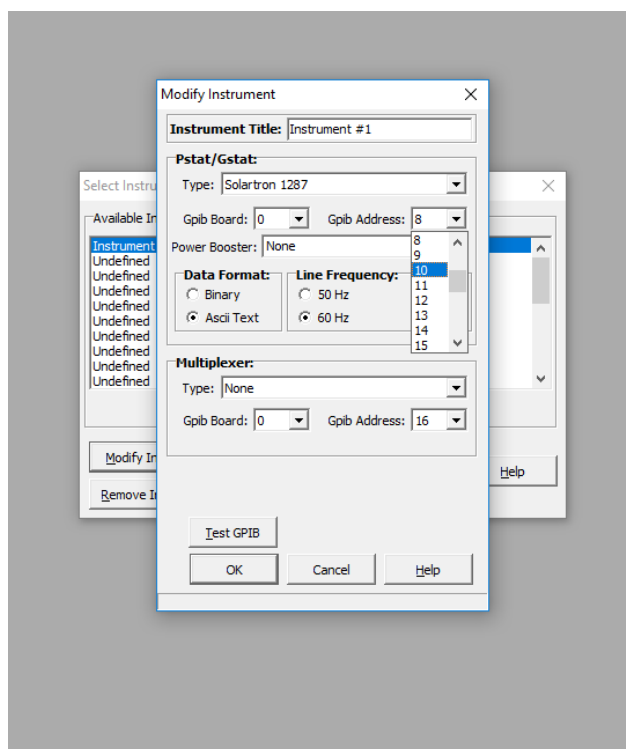


Figure 8

If Communications Still Not Achieved, Verify the Following:

- 5.1 Is a National Instruments USB-GPIB in use? The USB-GPIB must be this brand.
- 5.2 Are the GPIB cables connected completely? If these are not screwed in completely, there may be difficulties with communications to the PC.
- 5.2 Is another piece of equipment being used in conjunction with the 1287A (i.e.-FRA or additional potentiostat)?
 - a. If so, the GPIB addresses for the two instruments may have been swapped. This usually leads to "Error 01" messages being displayed on the instrument when the "Test GPIB" button is clicked. The addresses can be changed by opening each instrument in CorrWare under "new" (as outlined in section 2) and swapping the GPIB numbers. Remember to click "Test GPIB" after switching the numbers to verify the connection.



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