Volume

1

GREEN ENERGY RESEARCH, INC.
User Manual GER-Lite™ Software

REV110809

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Introduction

Nearly everything we use today requires some sort of energy source to power it.

We take for granted the so-called 120 or 240 Volt "alternating current" electrical outlets built into the walls in our homes, schools and offices because it is nearly always there. We find out about power mostly when we don't have it-when we overload an electrical outlet and the circuit breaker turns off the flow of electricity, we realize that too much power was being used.

We use portable devices with small power sources called batteries that have a set amount of energy stored in them that lasts a limited time. Once the energy is consumed, we typically dispose of the old batteries replacing them with new ones.

Some batteries are designed to allow you to recharge and reuse them many times. Recharging uses another source of energy-typically your 120Volt AC outlet or an automotive battery to "refill" the small rechargeable battery in the portable device, like your cell-phone or iPod.

So we have the sense that power, energy, voltage, current and time are somehow all related. These parameters can be used to explain how an air conditioner can consume more energy than another or more than your cell-phone or iPod. We can measure these parameters and build relationships between them to understand the importance of more efficient energy production.

As we know today, there are new energy sources in development such as Fuel Cells, Photo-Voltaic panels, Wind generators that all promise to be more efficient, less polluting and RENEWABLE, unlike our present power generated from burning fossil fuel.

The GER-Lie™ is a data acquisition and control software designed to conduct experiments with batteries and small fuel cells that are either hydrogen or methanol powered.

The experiments (labs) are designed for high school and two year colleges and fit into the chemistry, physics, and environmental science curriculums.

All the software and hardware required for the experiments is contained in one box and does not require any other supporting software and/or components.

Installation

Please insert your GER-Lite™ CD into your laptop or desktop computer CD reader.

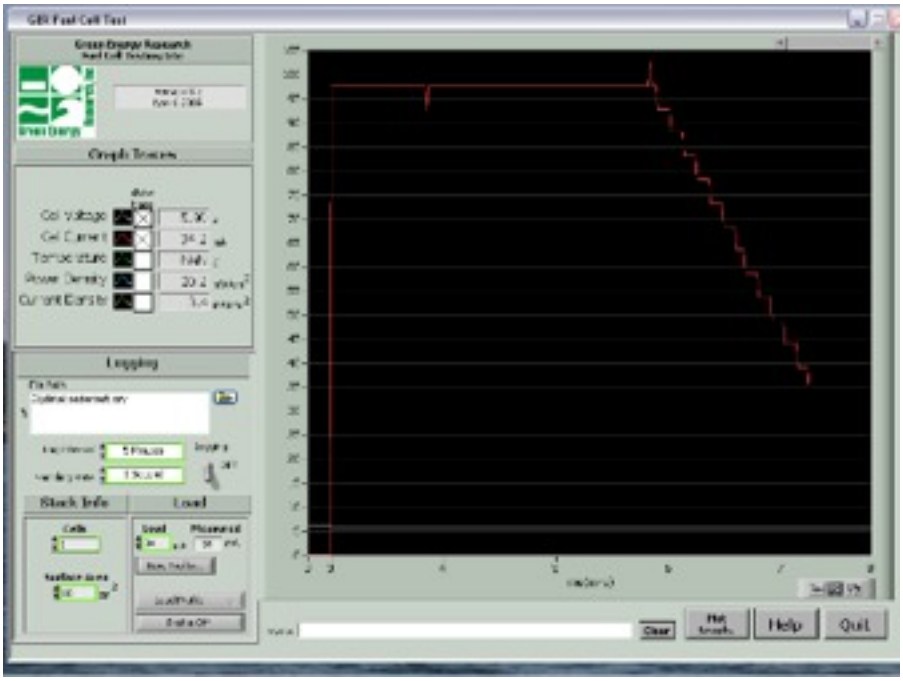
- Double-Click on "My Computer" and select the CD drive that contains the installation disc. Double click on the installation disk and verify it contains two folders: one is named "GERLITEINST114" and the other "USB Driver."

- Connect the electronic loader EL02 to any USB port on a HUB, your laptop or PC. The loader blue LED should light up. Double-click on the USB Driver folder. In the folder there are several files, Double-click on "USB to Analog Interface.INF" file. This driver installs automatically into the \DRIVERS \system32 directory. To verify that the driver is installed, RIGHT click on "My Computer" then left click on "Properties". Click on "Hardware" then on "Device Manager". Scroll down to "PORTS (COM & LPT)". Click on the + sign. You should see several ports among which you should see "USB to Analog Interface (COM _). The number will mean the port where the electronic loader is plugged-in.

- Now Double-click on folder "GERLITEINST114" and locate the "SETUP.EXE" file. Double-click on the file. Once the "Installer Wizard" loads, please follow the instructions until you are prompted with a "Finish" button. The final screen will look as below (FIG 1.) with the LOAD control panel "grayed out".

- IT WILL TAKE THE PROGRAM SEVERAL MINUTES TO SCAN ALL THE PORTS LOOKING FOR THE LOADER. ONCE THE LOADER IS LOCATED, and is connected to any voltage source, such as

a battery or a fuel cell, the voltage will appear in the “Cell Voltage” box..

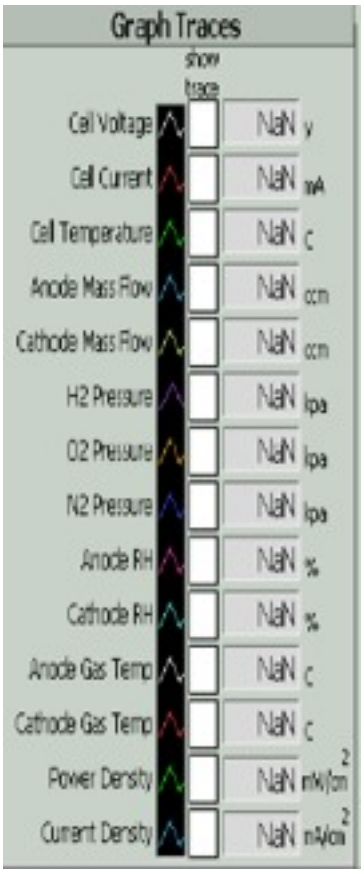


(FIG 1.) Screen layout

Once the software has started up, you will see the Version and revision date in the upper left hand corner of the screen (FIG 2.).

(FIG 2). Version information.

(FIG 3). Graph Trace selection screen.

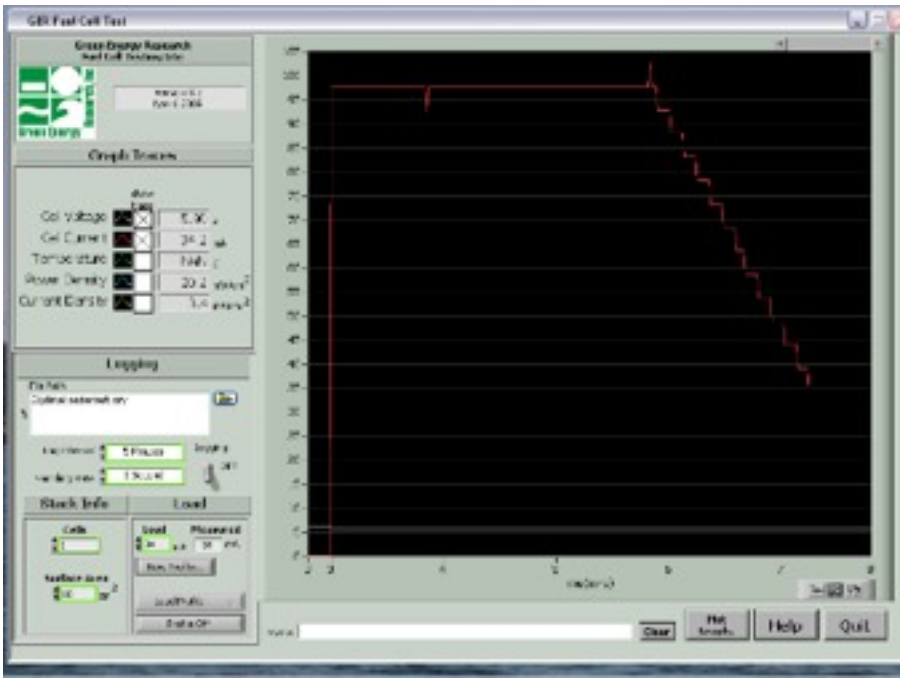


Selecting Graph Traces

On the Left side of the screen, in the "Graph Traces" section, you can select the sensor signal you wish to display on the graphic screen by clicking on the "Show Trace" box.. The actual measured value is displayed alongside with the engineering units such as Volts, mA, etc. (FIG 3.)

NOTE: Graph Trace screen from GER-Pro software.

. (FIG 4). Graph Trace area



The colored graph traces will appear on the screen above. (FIG 4.)

The X-axis is always time. The Y-axis is multi-functional and is scaled automatically, so you can view various traces at the same time. By pointing and RIGHT clicking on the scale you can select other graphing and ranging formats.

You can “re-wind” the chart by clicking on the cursor in the upper right hand corner.

Selecting Data Logger

If you wish to record the data from your experiment for extended periods of time (the Log interval settings are 5, 15, 30 minutes, 1 hour, and CONTINUOUS)) for future use and manipulation by another application, such as Microsoft EXCEL, you can.

On the Data Logger Control panel select the LOG INTERVAL, the SAMPLING RATE (1 ,5,10,60 seconds), click on the ON-OFF switch to initiate the data logging. The data is automatically saved in a CSV format in C:\logging\csv . You can save it in a different file by clicking on the "Browse" icon or simply typing over the File Path.. The most recent data is saved towards the bottom of the Excel spreadsheet.

Once you stop your manual data logging by turning the toggle switch to the OFF position, this will also FREEZE the CHART. The "Freeze Chart" button will be GREEN. Don't forget to click on it to restart the chart and the time clock.

NOTE: While you are logging date into the .csv file, please DO NOT open Excel as this will stop the data logging.

(FIG 5) . Data Logger Control panel

Selecting Cell Parameters

The two variables that are measured to determine the performance or efficiency of a fuel cell are Power Density and Current Density. Both depend on the active surface area of the MEA and the number of cells. These parameters MUST be entered manually into the system BEFORE starting your experiment, so the display and all graph

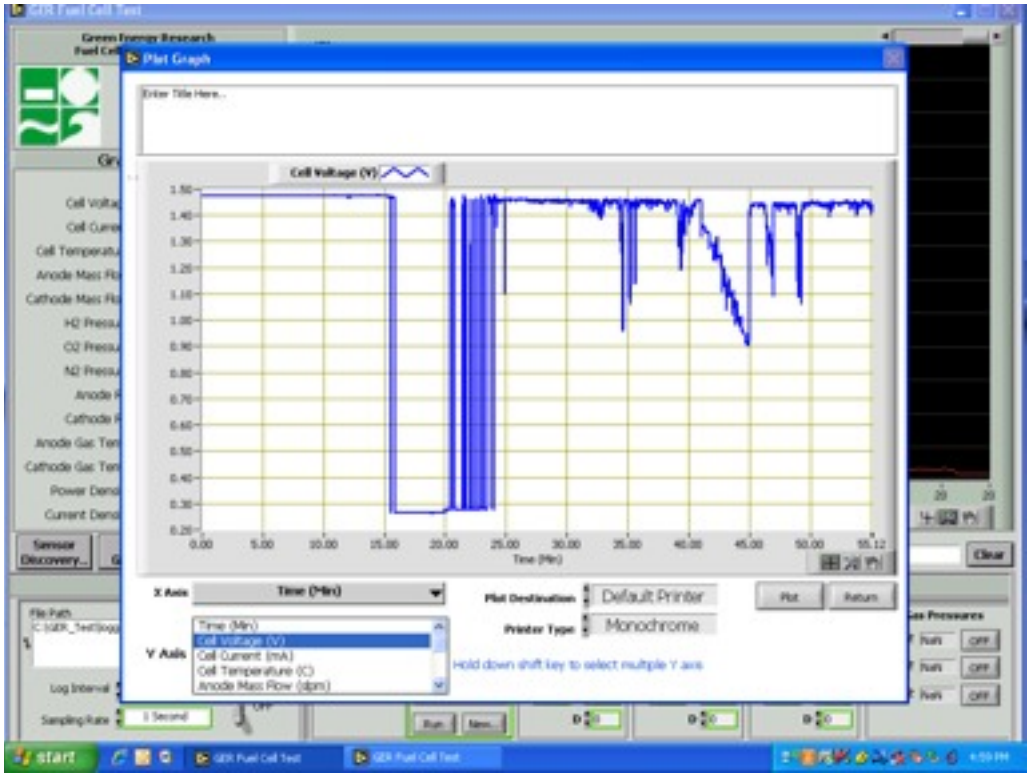
(FIG 6). Cell Parameters

Selecting Electronic Load Parameters

(FIG . 7) Electronic Load Control

This part of the screen (FIG 7.) controls the electronic load connected to the fuel cell. The electronic load will enable you to obtain the polarization and the power density plots. You can change the parameters manually, by incrementing the current values or automatically by using the "LOAD PROFILE" button. When the program is installed it automatically creates a directory C:\GER-Test\Profiles and creates a default profile called "default.csv". You can edit this file directly or you can add your own profile by clicking "NEW" and entering a list of load and time values. After naming a new profile, it will be added to the pull-down list

Selecting Plot Graph



(FIG 8). Plot Graph Utility.

Once you have acquired all your data and would like to display it visually, the most informative and most common format is a GRAPH or X-Y PLOT where you can relate one parameter to another, and as you know, once you have a relationship between the parameters, you can derive an equation between the two. Once you have an equation, you have a MODEL and with a model you can PREDICT future behavior or test your model against new data sets.

In the “Plot Graph” utility (FIG 8.) you can:

- Select any of the ten sensor outputs on the X or the Y axis.

For example, to obtain a POLARIZATION curve, you would select VOLTAGE as your Y-axis and CURRENT DENSITY as your X-axis.

To obtain a POWER DENSITY curve you would select POWER DENSITY as your Y-axis and your CURRENT DENSITY as your X-axis.

- Select MULTIPLE Y-axis parameters. For example if you wish to plot RH curves vs. temperature or any other parameter.

- Select either a mono chrome or a color print, it will print to any printer you have installed on your PC or Laptop.

- Please NOTE that the GRAPH PLOT utility will start capturing data from the moment you have selected a variable to trend. If you wish to obtain a plot of a specific event or a short interval of time, select the variables to be graphed just before starting your experiment.

- **NOTE: Graph Plot Utility is the same as in GER-Pro, which has many more sensor options.**