Simple Guide to Chemical ID Selection Tool (GPC)

This user's guide is provided as a simple guide for the GPC Chemical ID Selection tool. This document includes a summary of the tool, requirements, how to submit data, and examples.

Contents

1 Tool Summary

The Gauging Parameter Calculator (GPC) Golden GG Maker is a math calculation tool that helps the battery designer to select the best chemical ID for a given battery to use with Impedance Track gauges..

The battery pack must use one of TI's Impedance Track algorithm-based fuel gauges. It requires a log file of a charge / relaxation / discharge /relaxation test that can be created with various test equipment such as Maccor or Arbin battery testers or by using TI's Battery Management Studio (bqStudio) software with an evaluation board connected through USB.

This guide describes how to obtain the required log file without the use of a TI EVM or TI bqStudio software.

2 Required Data

The GPC tool requires a single .zip file containing one configuration file, one data file, as input. The name of the .zip file is not important. The .zip file should contain the following files:

- config.txt
- roomtemp_rel_dis_rel.csv

2.1 Configuration File (1 Each)

The configuration file is a text file named config.txt and is an ASCII text dictionary containing the following information:

- ProcessingType = 2 <Determines the type of tool used. Value should be 2 for chemistry ID selection tool>
- NumCellSeries = <Number series cells>
- VoltageColumn = <Zero-based column number for the voltage data in your data logs>
- CurrentColumn = <Zero-based column number for the current data in your data logs>
- TemperatureColumn = <Zero-based column number for the temperature data in your data logs>
- ElapsedTimeColumn = <Zero-based column number for the elapsed time data in your data logs>

Typical settings are:

ProcessingType=2
NumCellSeries=1
ElapsedTimeColumn=0
VoltageColumn=1
CurrentColumn=2
TemperatureColumn=3

2.2 Data Log File

The required test consists of the following steps:

1. Test is performed at room temperature. Optional: If the cell was at a different temperature before, let it relax for 2 hr at room temperature prior to the test.
2. Charge using CC/CV charging to full, using taper current, for example C/100. Use nominal CC charge rate and CV voltage. If another charging method is specified by the cell maker, use that method.
3. Let the battery relax for 2 hrs to reach full equilibrium open circuit voltage (OCV).
4. Discharge the battery at C/10 rate until the minimal voltage, as specified by the cell manufacturer, is reached.
5. Let the battery relax for 5 hrs to reach full equilibrium OCV.

The result is exemplified in Figure 1:

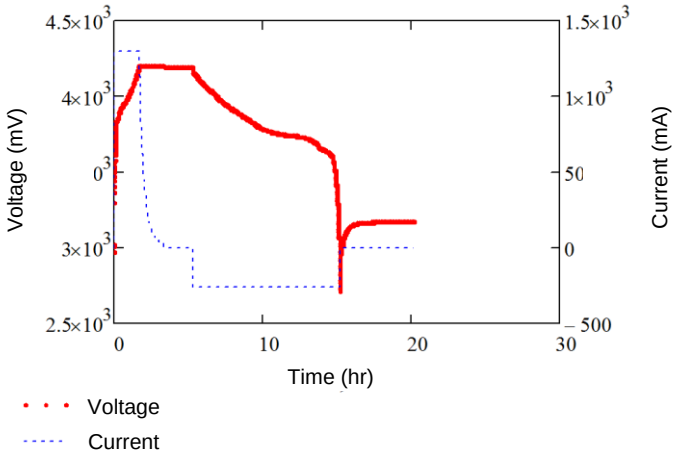

Figure 1. Voltage and Current Profiles of the Test Required for Chemical ID Selection

Data logging should store data into a file containing the following columns, in a coma-separated (CSV), tab separated, or space separated format:

- Time (in seconds elapsed)
- Voltage (in millivolts)
- Current (in milliamps where discharge current is negative)
- Cell temperature (measured by a thermistor attached to the surface of the cell, in degrees Celsius). One decimal place is acceptable.

If the original data format is not one of the supported formats (for example Microsoft® Excel®), the data file must be saved as .csv. Any text that is not part of the data-columns, such as the log file header generated by bqStudio or EV Software, as well as empty lines should be removed from the file prior to submission. One row of column names can remain, (the tool will skip it), as long as it has just one name per column.

An easy recording method utilizes TI's bqStudio software utility called GPC Packager that reads data directly from a TI fuel-gauge.

The columns can be in any order since the column positions are defined in the config.txt file. The log file can have some other data columns that are not used in this tool (no need to remove them), as long as the size of the zip file prepared for submission does not exceed 2MB. Note that since it is a compressed file, you can sometimes squeeze it some more by utilizing different compression settings in your archiver program.

The sampling interval can be from 5 to 100 s.

The initial charging portion is not required; however, the charging should be performed shortly before the relaxation period. Relaxation data is required both before and after the discharge.

The precision of the measurements is important. In particular, current measurement should be better than 0.1% of range accuracy, and for voltage measurement, 1 mV, at room temperature. 16-bit ADC is recommended.

The data log should be renamed as: **roomtemp_rel_dis_rel.csv** prior to submission of the file, regardless of actual text format.

2.2.1 Example Config.txt File

```
ProcessingType=2
NumCellSeries=2
ElapsedTimeColumn=0
VoltageColumn=1
CurrentColumn=2
TemperatureColumn=3
```

2.2.2 Excerpted Example Data Log

In the following excerpt, the columns are:

```
elapsed time (sec), voltage (mV), current (mA), temperature (C)


20.02833  2975.308     0       28.95893
30.04369  2974.984     0       28.88429
40.05915  2975.308     0       28.91459
50.09006  2974.984     0       28.73499
60.13664  2975.308     0       28.74904
70.20198  3008.069    99.9098  28.89834
80.20158  3023.314    99.9098  28.77718
90.23994  3300.643  1300.396   28.79125
100.2554  3360.975  1300.396   28.79125
110.2708  3404.115  1300.221   28.58133
120.2859  3439.146  1300.572   28.59754
```

3 Data Submission

The zip file created as previously described needs to be submitted to the GPC tool through the web-interface here:

https://www.ti.com/powercalculator/docs/gpc/gpcUpload.tsp

After processing, an E-mail with a report that indicates the selectedd chemical ID is sent to the E-mail address you will provide when logging in.

The report contains the selected chemical ID, as well as a list of chemical IDs which satisfy “less than 3%” error criteria. This could be useful, for example, to verify that the ID you used earlier is still suitable.

If any format or other errors are present, they will be reflected in the report.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265