TI POWER

Introduction to BQStudio and TI tool chain for gauge evaluation

Battery Management Deep Dive Training

October 2020

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Battery Management Studio (BQStudio)

- Introduction
- Views
- Dashboard
- Chemistry
- Advanced features
- Troubleshooting
- Useful links

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Introduction

- Battery Management Studio (BQStudio) offers a full suite of robust tools to assist with the process of evaluating, designing with, configuring, testing, or otherwise utilizing TI Battery management products.
- Includes features that provide
  - full access to registers and data memory
  - support for real-time watching, graphing, and logging
  - an easy interface to send commands, direct low-level communication and I/O
  - automated and guided support for configuration, calibration, performing a learning cycle, and generating useful files for taking the device to production

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Installing BQStudio

- **Download BQStudio software from https://www.ti.com/tool/BQSTUDIO**
- **Complete Export Control Form to download**
- **Requires admin privileges for installation**
- **EV2400 does not require drivers**

- **BQSTUDIO-STABLE**
  - **Choose this if your product is on the list of supported devices**
- **BQSTUDIO-TEST**
  - **Is the latest untested release**
  - **Choose this only if your product is not supported by BQSTUDIO-STABLE or to work around any known issues in BQSTUDIO-STABLE**

Introduction to BQStudio

- **TI's proprietary Battery management GUI software**
- **Authenticate, monitor and control: gauges, chargers and monitors, protectors**
- **Helps users design BMS Fuel Gauges**
  - Real-time Gauge Dashboard for monitoring basic registers
  - Full register access and logging
  - Full data memory access and logging
  - Product configuration and monitoring tools
  - Import and export of product configurations
  - Calibration and test automation
  - Export of FS files for the target production environment
- **Is a collection of views to perform specific tasks**

Typical gauge evaluation flow

1. Program Chemistry
2. Program data flash parameters
3. Calibrate
4. Learning cycle and optimization using GPC tools
5. Create golden image
6. Program fresh packs with golden image

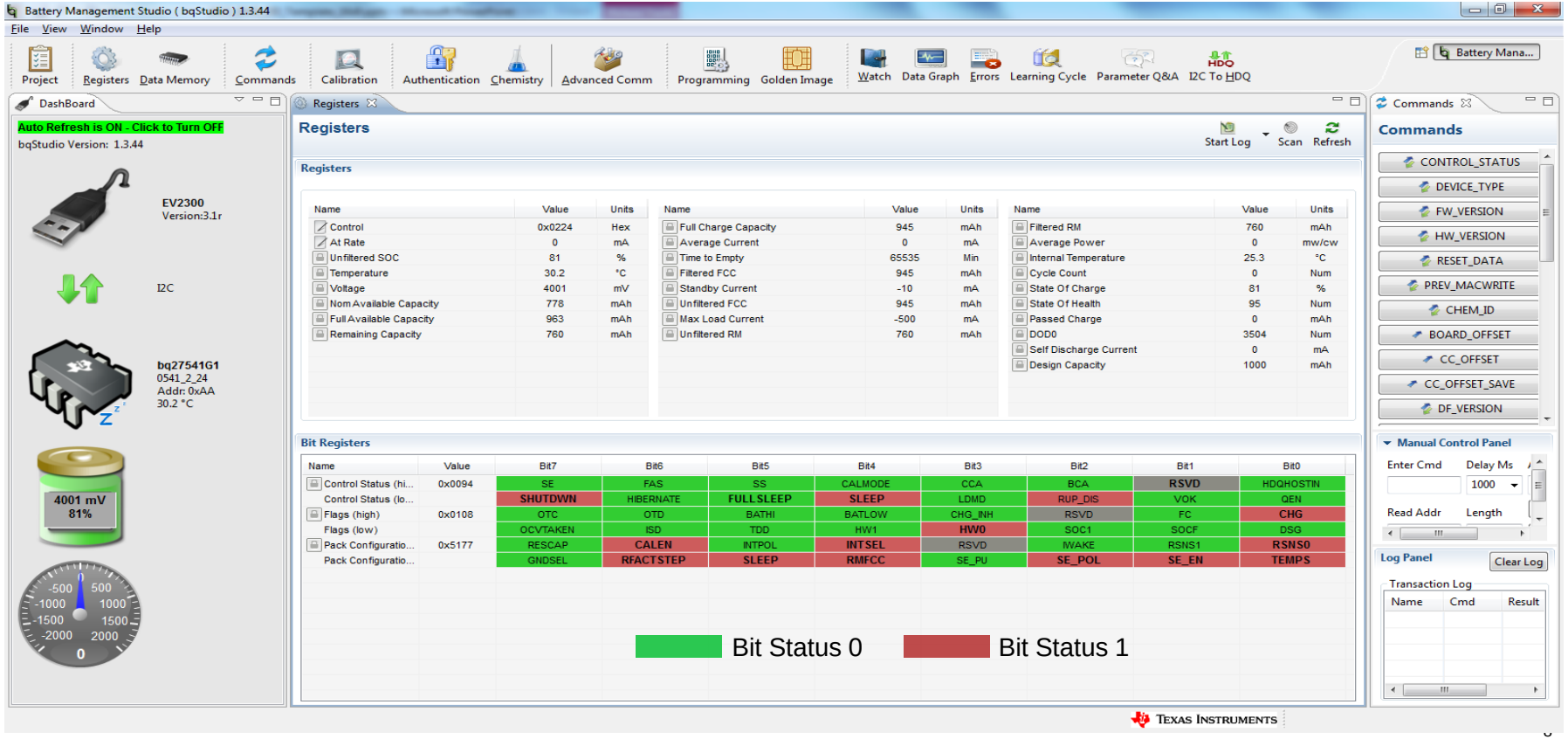
Views in Battery Management Studio

- **Each view is a tab**
- **Customized for specific device**
- **Toolbar and menu items to open corresponding tabs**

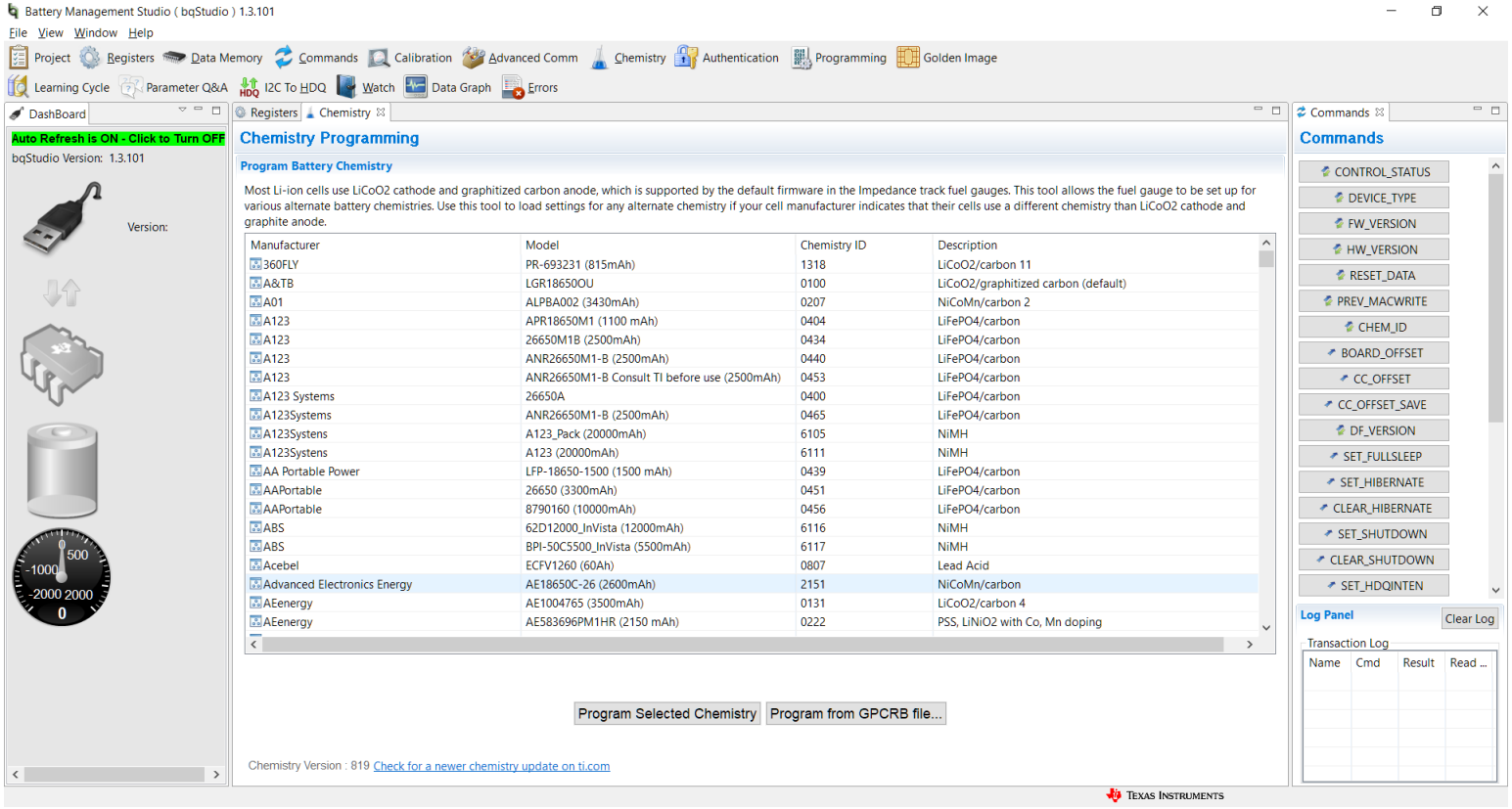
Common views are:

- **Registers**
  - Shows Charger registers or Gauge RAM Data registers
- **Advance Communication**
  - Allows low level read/write on I2C and SMBus communication bus
- **Calibration**
  - Calculates and stores the actual corrections
- **Data Flash**
  - Read/Write from/to non-volatile storage registers in the fuel gauge

Typical gauge view (Registers)



Typical gauge view (Chemistry)



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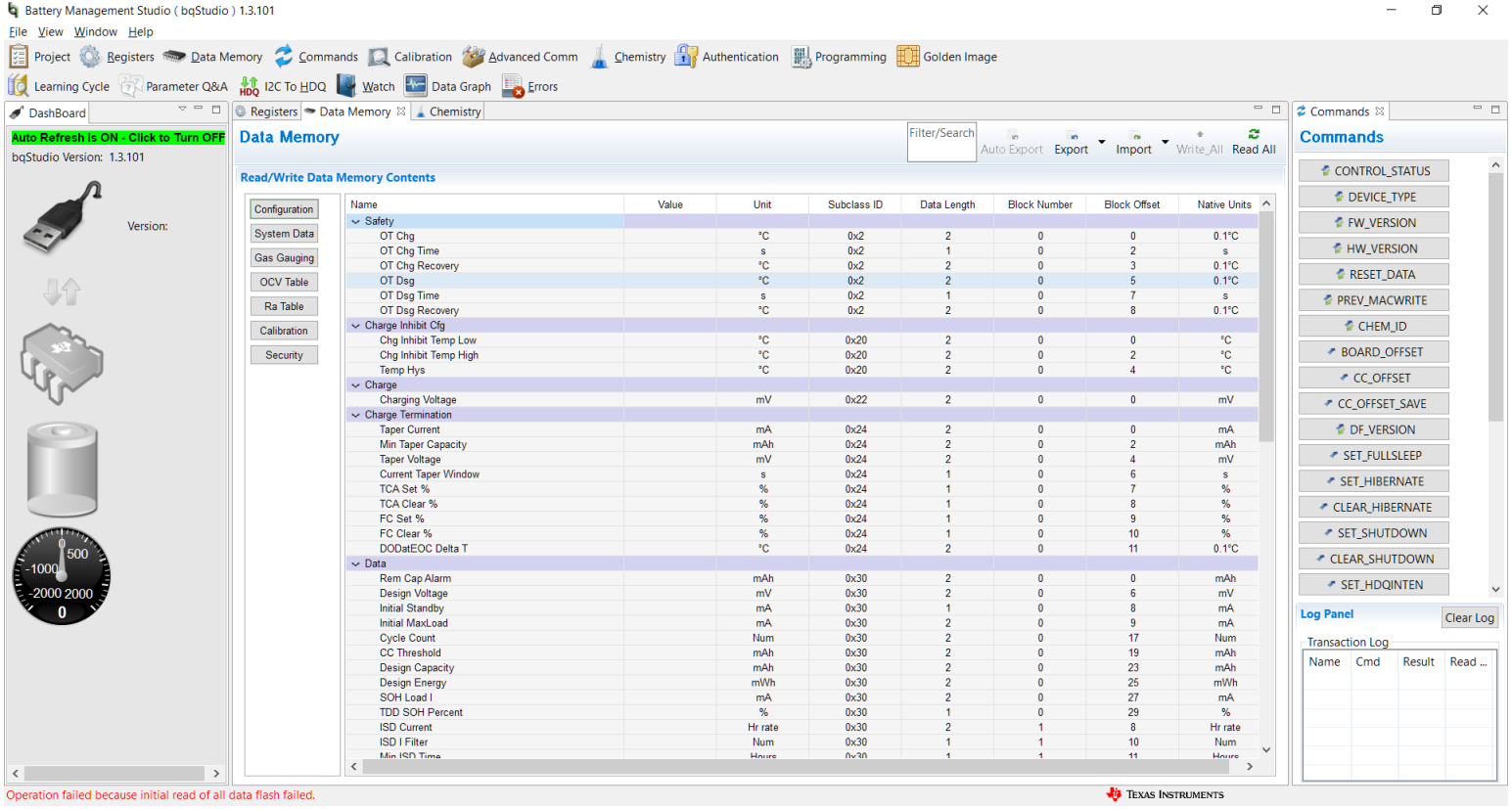
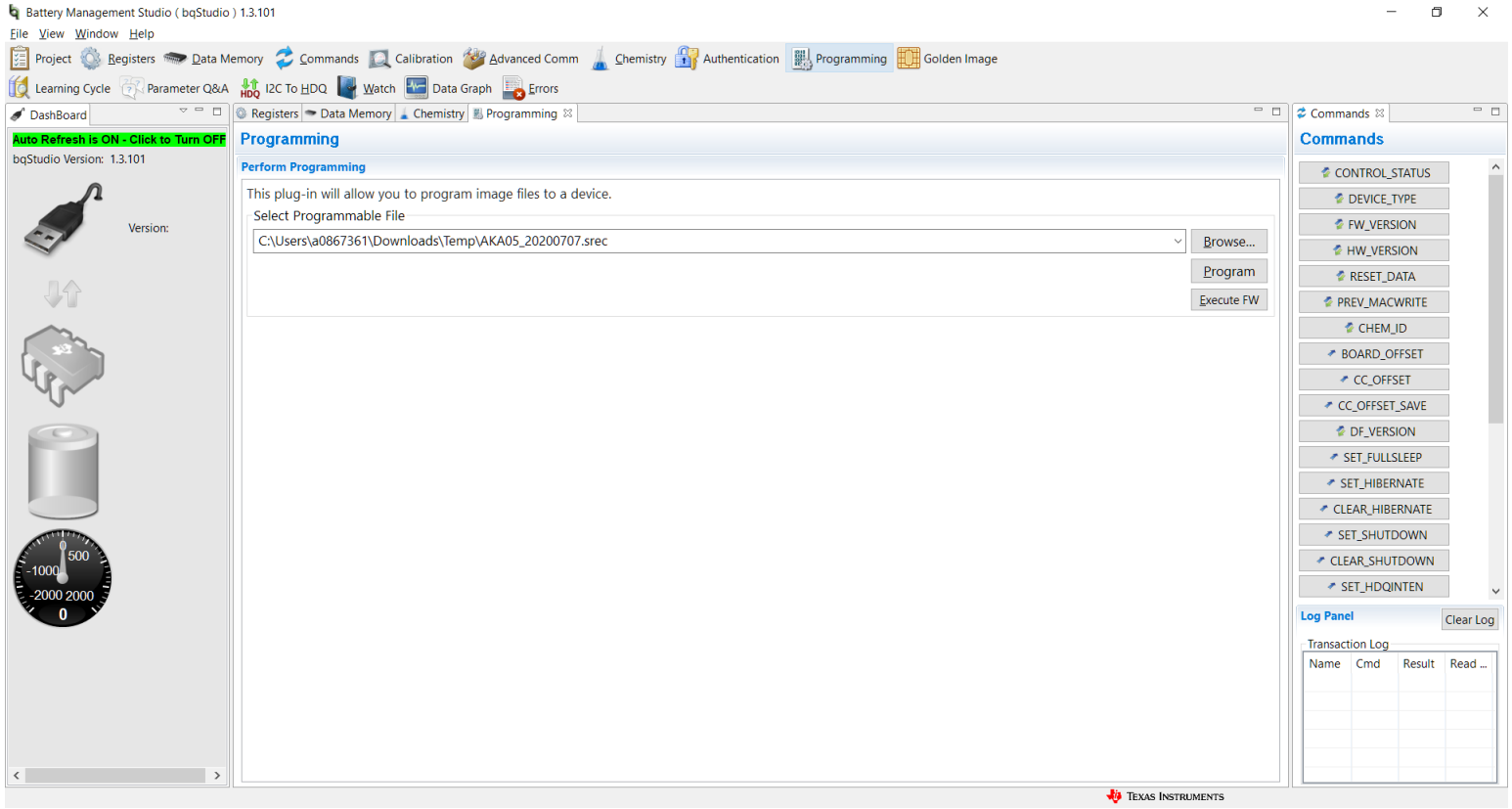
Typical gauge view (Data Memory)



Typical gauge view (Programming)



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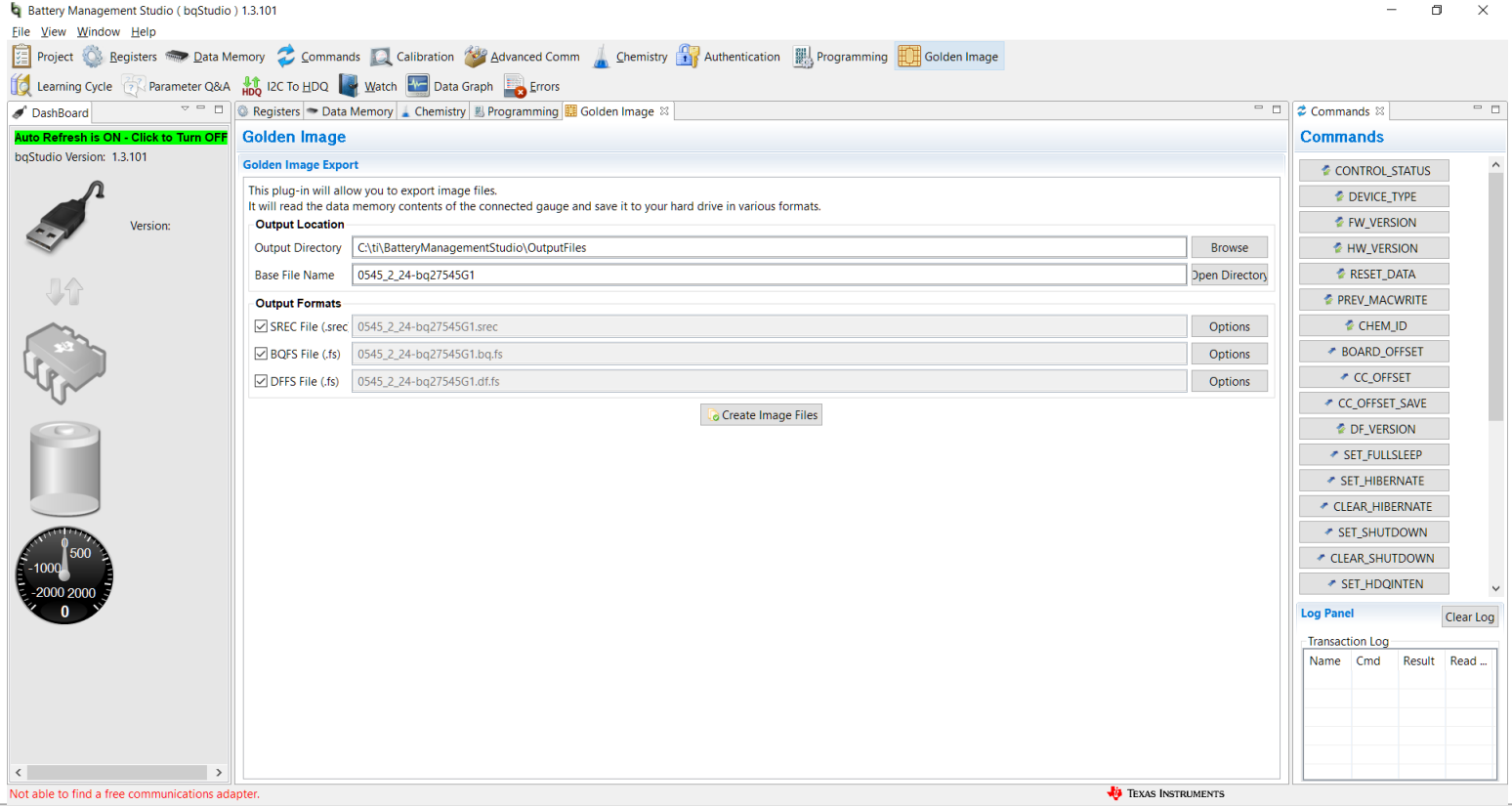
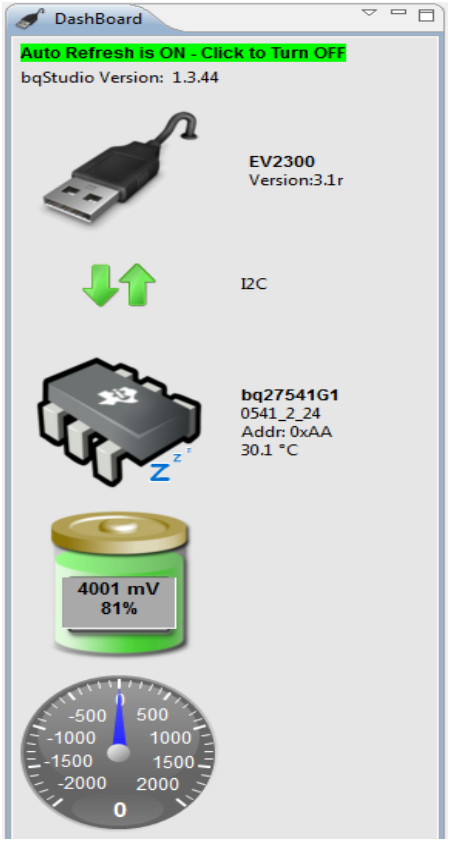
Typical single cell gauge view (Golden Image)



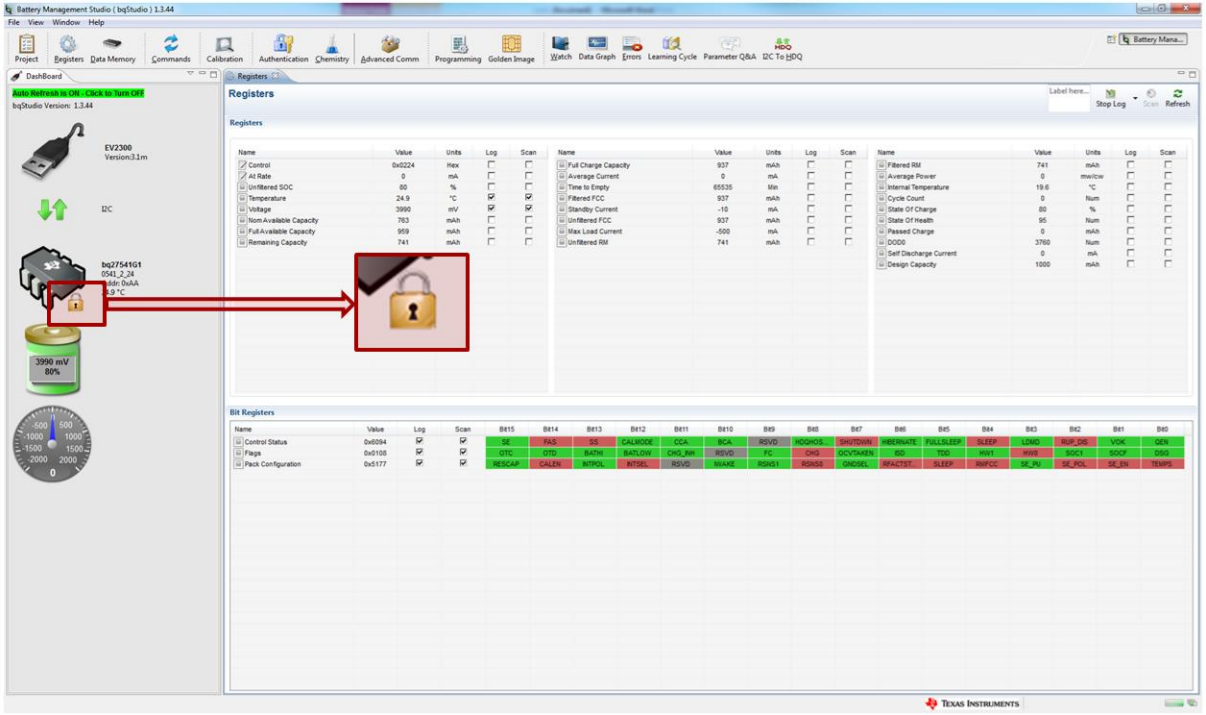
Dashboard

- **Visual panel shows status of connected hardware**:
  - Adapter type / Version i.e. EV2300 or 2400
  - Communication Protocol i.e. SMB's or I2C
  - Device Name & Version e.g. BQ28Z610
  - Voltage, Temperature, Current, RSOC
- **May also shows sleep and sealed status for select devices**
- **Background polling every 4 seconds**



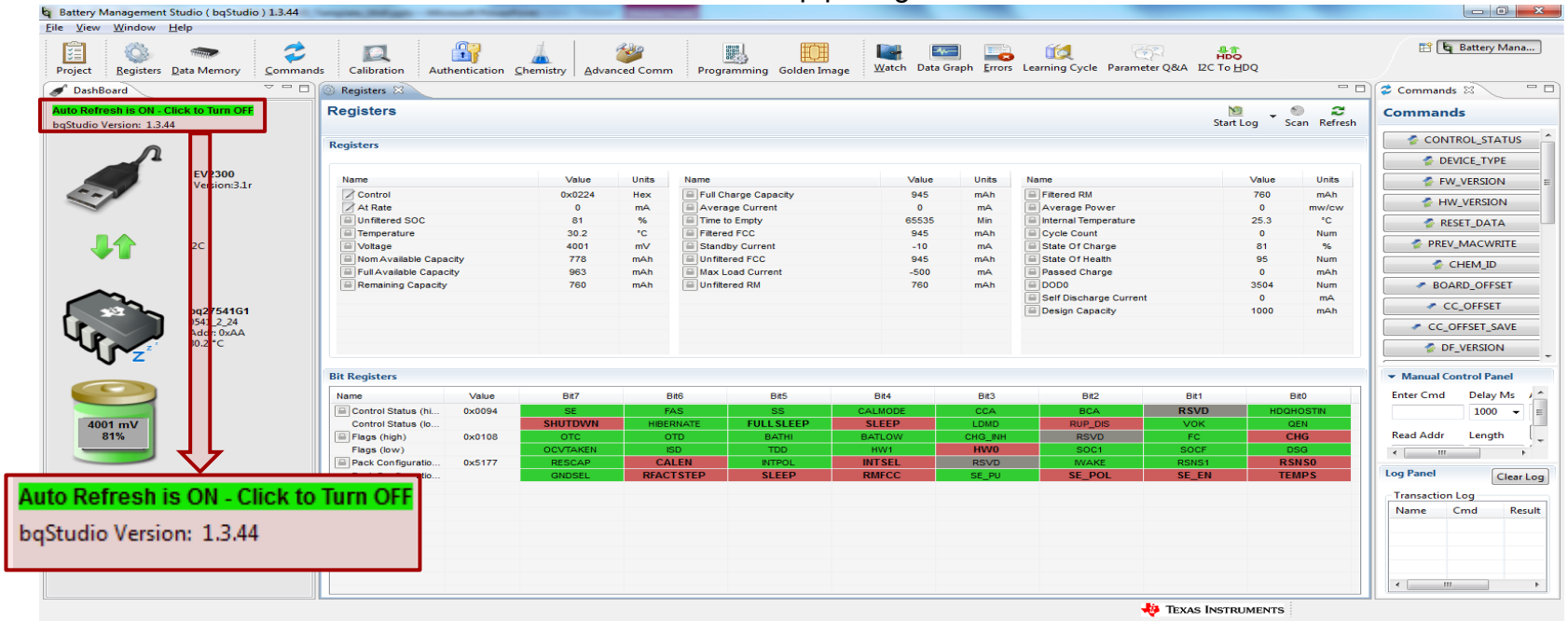
Tips: Sealed device

Lock is shown on the dashboard for sealed devices



Disabling dashboard timer

- Polling is active by default when BQStudio is started
- Click on "**Auto Refresh is ON – Click to Turn OFF**" to stop polling



Note: Restarting BQStudio will automatically re-enable/start the dashboard update timer

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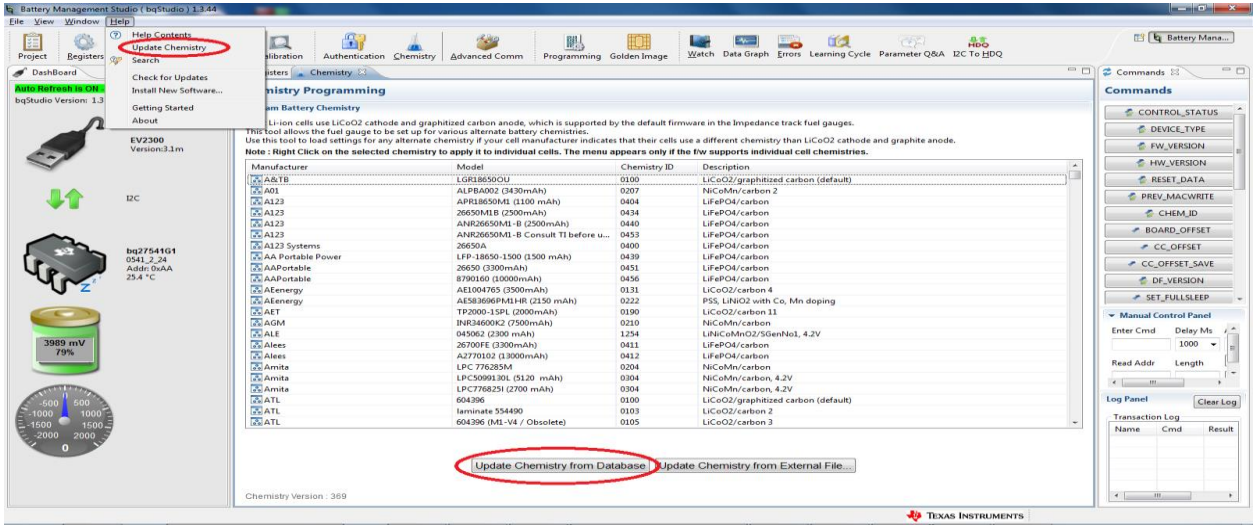
Chemistry database

- **Chemistry database stores the chemical characteristics of the battery**
- **Each chemistry identified by unique chemID**
  - TI maintains database of chemID
  - Associated with cell Manufacturer and Model
- **BQStudio programs chemistry tables for given chemID**

Updating chemistry database

- Download BQStudio chemistry updater from https://www.ti.com/tool/bqStudio or https://www.ti.com/tool/GASGAUGECHEM-SW



- In case chemistry id or battery is not listed after updating the chemistry database Go to http://www.ti.com/tool/GPCCHEM

Registers – Basic vs Advanced view

- Register Advanced view provides user with more capabilities

Basic View	Advanced View
Groups of 8 bits	Groups of 16 bits
All registers are logged and scanned	Customize registers to log and scan. (Default is identical to basic view)
	Additional label field for parallel EVM evaluation

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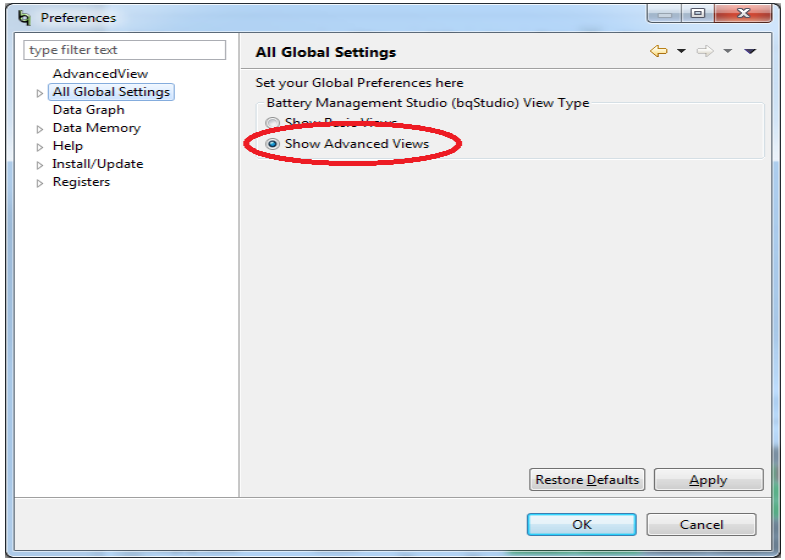
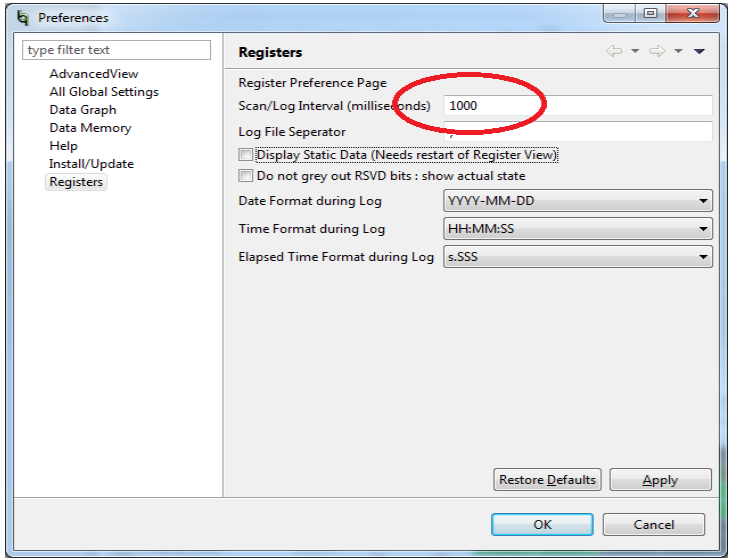
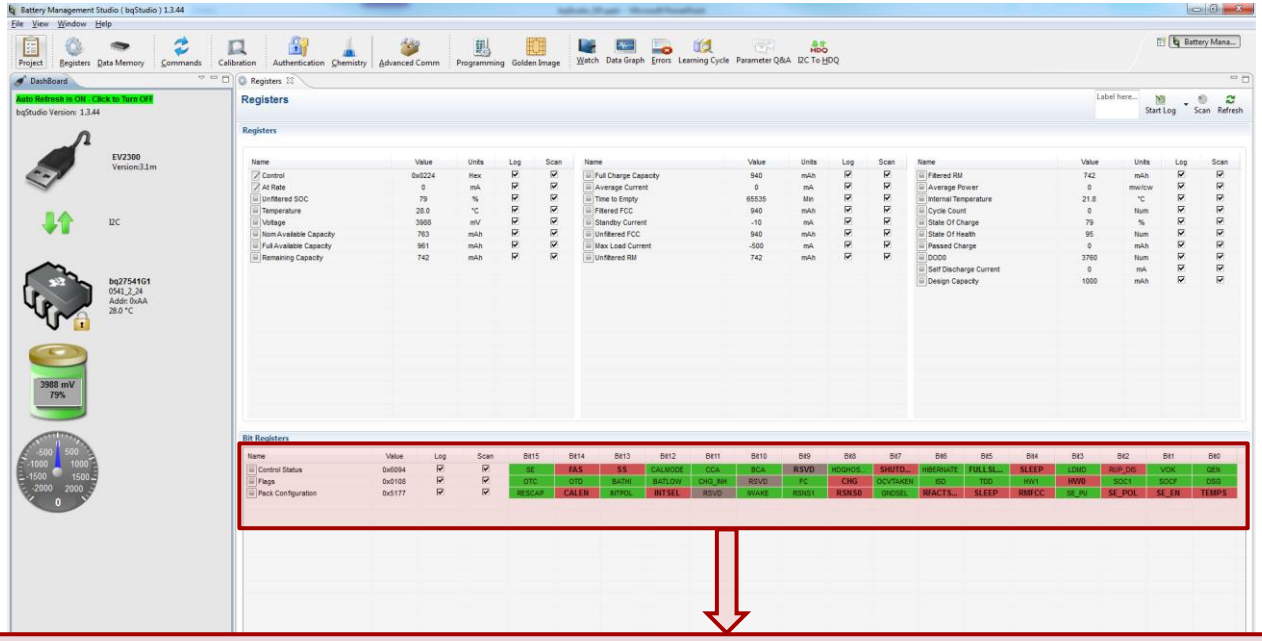
Logging at faster rate

- 1 register logged in ~35ms, approx. 28 registers logged in 1 second (Dashboard disabled)
- Logging less registers improves performance
- Select the registers to log from Registers Advanced view





Registers - Advanced view



Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
SE	FAS	SS	CALMODE	CCA	BCA	RSVD	HDQHOSTIN	SHUTDWN	HIBERNATE	FULLSLEEP	SLEEP	LDMD	RUP_DIS	VOK	QEN
OTC	OTD	BATHI	BATLOW	CHG_INH	RSVD	FC	CHG	OCVTAKEN	ISD	TDD	HW1	HW0	SOC1	SOCF	DSG
RESCAP	CALEN	INTPOL	INTSEL	RSVD	IWAKE	RSNS1	RSNS0	GNDSEL	RFACTSTEP	SLEEP	RMFCC	SE_PU	SE_POL	SE_EN	TEMPS

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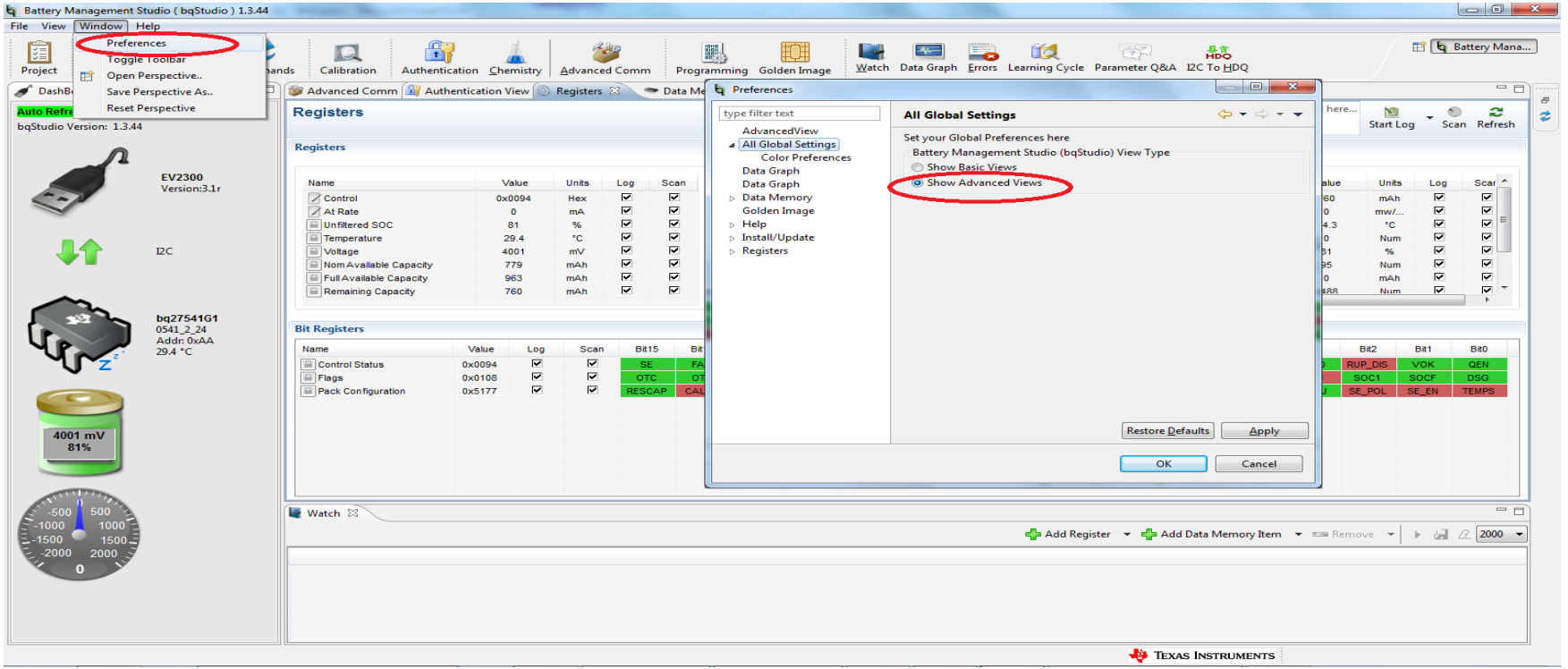
Configuring Advanced view

- Enable from BQStudio -> Window -> Preferences



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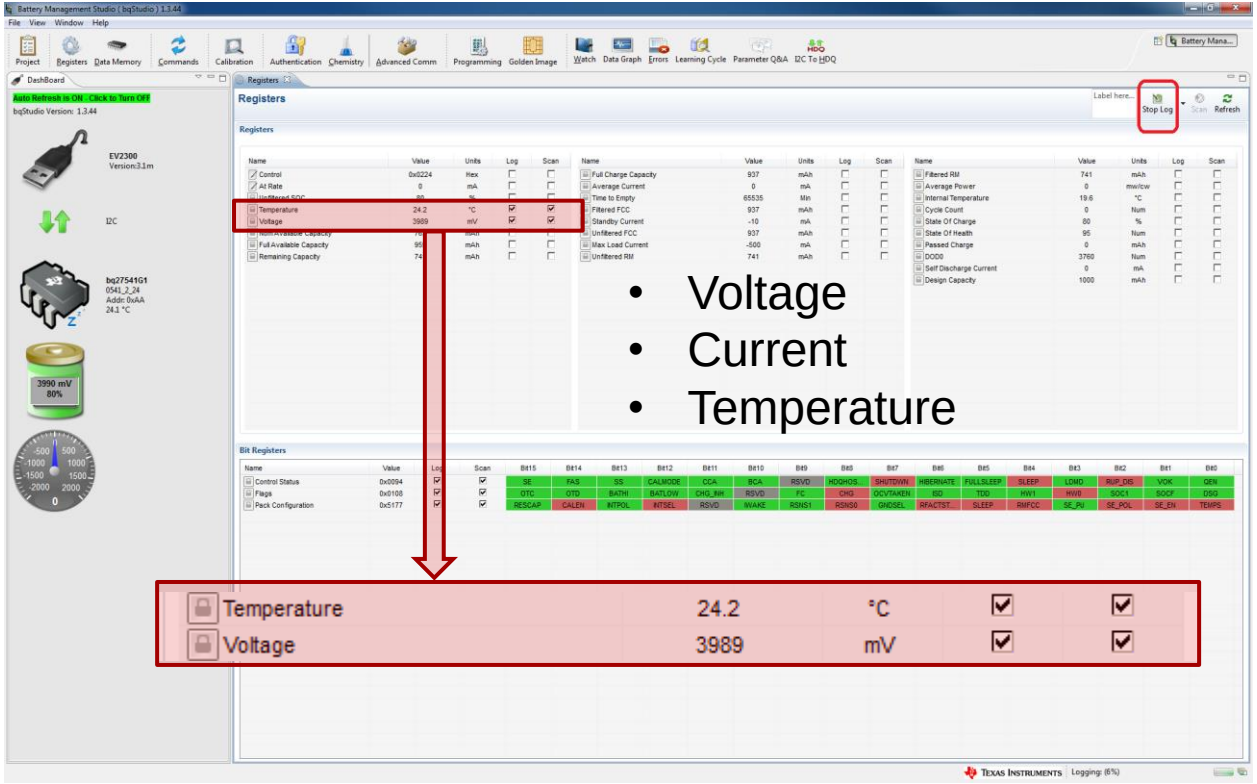
Recommended Registers to log



- Voltage
- Current
- Temperature

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Voltage, Current and Temperature logs – 1second.log

Sample,DateTime,ElapsedTime,Temperature,Voltage,LogRowTime(ms),LogStatus

1,2015-09-22 15:52:03,1.007,34.3,3993,32,SUCCESS

2,2015-09-22 15:52:04,2.001,34.3,3993,38,SUCCESS

3,2015-09-22 15:52:06,4.146,34.3,3993,30,SUCCESS

4,2015-09-22 15:52:07,5.001,34.3,3993,33,SUCCESS

5,2015-09-22 15:52:08,6.002,34.3,3993,31,SUCCESS

6,2015-09-22 15:52:10,8.150,34.3,3993,37,SUCCESS

7,2015-09-22 15:52:11,9.002,34.3,3993,27,SUCCESS

8,2015-09-22 15:52:12,10.002,34.3,3993,25,SUCCESS

9,2015-09-22 15:52:14,12.171,33.3,3993,25,SUCCESS

10,2015-09-22 15:52:15,13.002,33.3,3993,36,SUCCESS

11,2015-09-22 15:52:16,14.002,33.3,3993,34,SUCCESS

12,2015-09-22 15:52:18,16.187,33.3,3993,34,SUCCESS

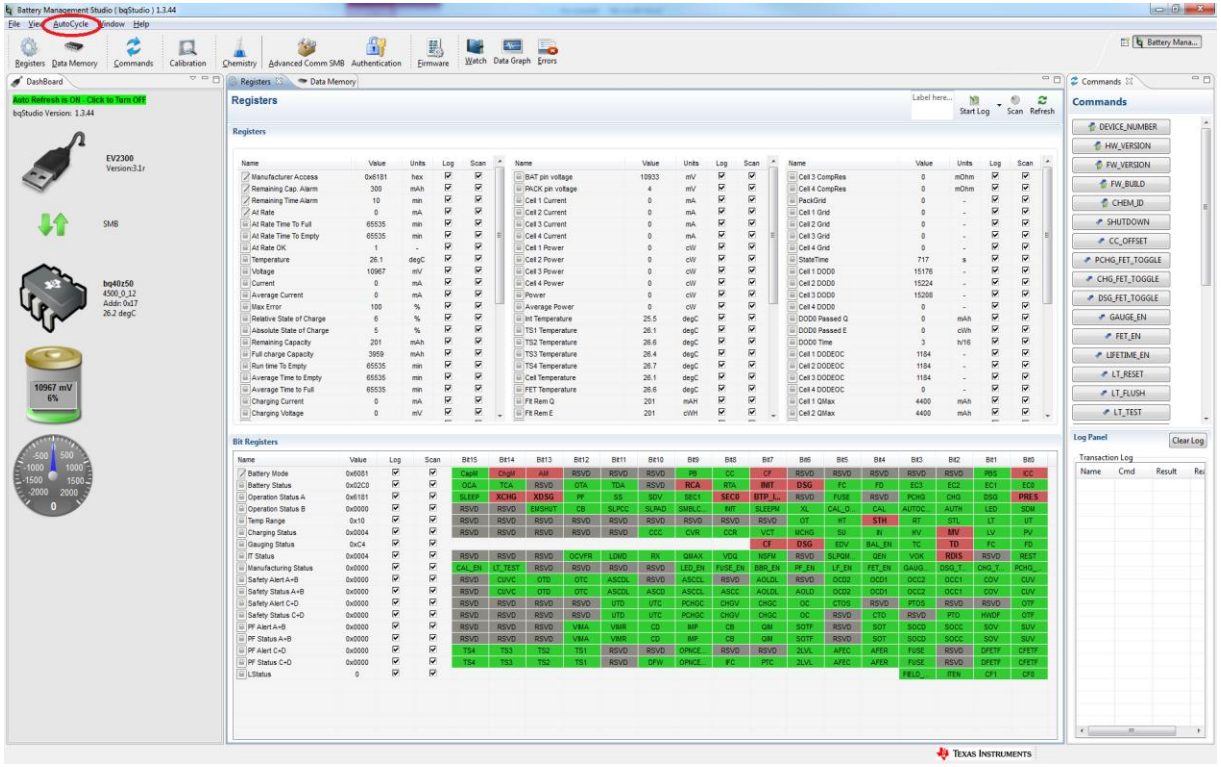
13,2015-09-22 15:52:19,17.003,33.3,3993,29,SUCCESS

14,2015-09-22 15:52:20,18.003,33.3,3993,27,SUCCESS

15,2015-09-22 15:52:22,20.167,33.3,3993,31,SUCCESS

16,2015-09-22 15:52:23,21.003,33.3,3993,37,SUCCESS

Auto cycle (SMBus gauges)



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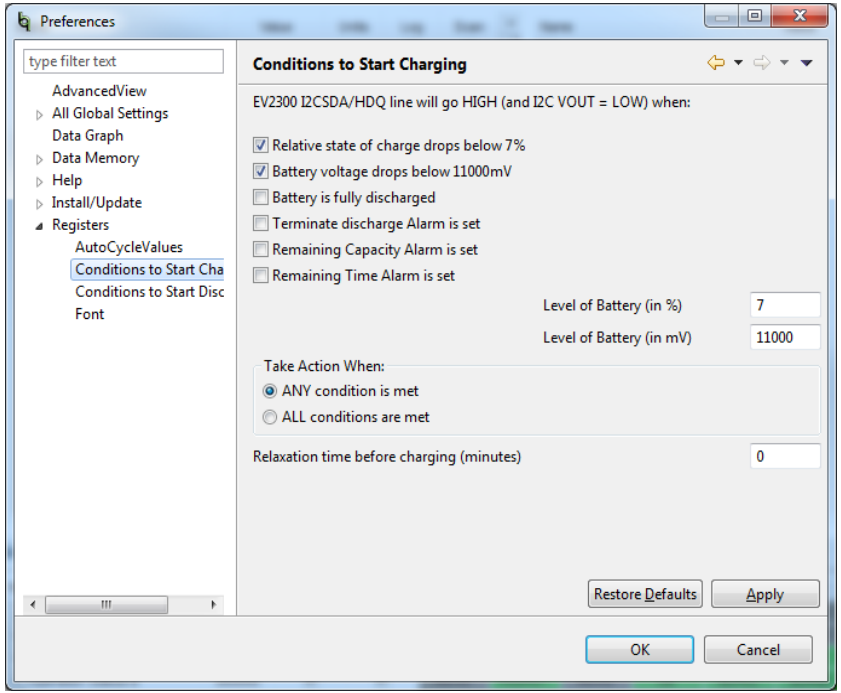
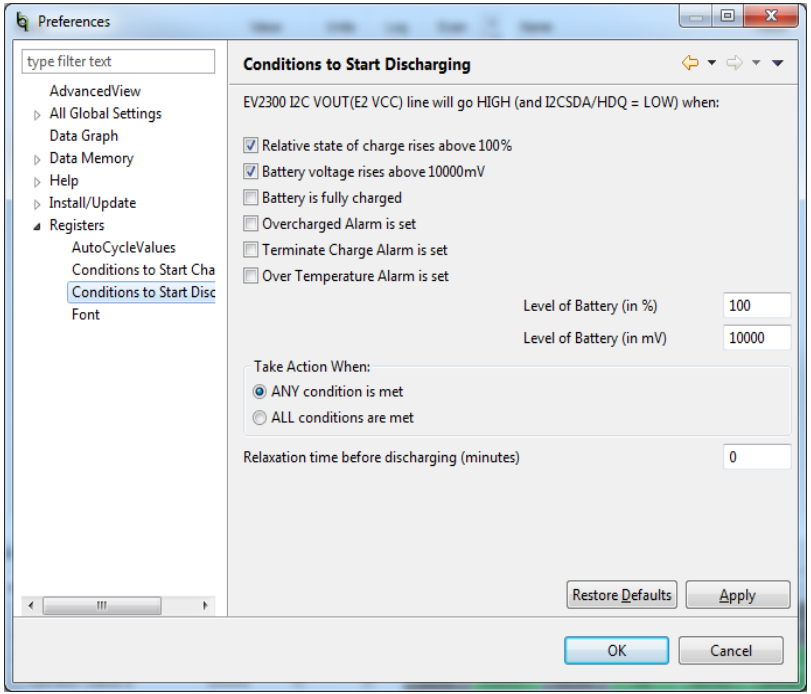
Configuring auto cycle

- Auto charging/discharging can be configured from Window –> Preferences -> Registers





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Troubleshooting

- **BQStudio does not autodetect target**
  - **Wake up the gauge**
  - **Check connections and follow steps in user guide**
  - **Missing BQZ file**
- **Dashboard related**
  - **Time sensitive tasks could be impacted, communication debug**
  - **Insert and removal of adapter / EVM quicker than 4 seconds not detected**
  - **Repeated detection of device in noisy communication conditions**
    - Logging can stop when new device detected

Useful Links

- **BQStudio**
  - https://www.ti.com/tool/BQSTUDIO
- **Chemistry updater**
  - https://www.ti.com/tool/GASGAUGECHEM-SW
- **Product pages have been updated to reflect the list of supported parts**
  - Know before you download if the part you are using is supported.
- **GPC tools landing page :** https://www.ti.com/tool/GAUGEPARCAL

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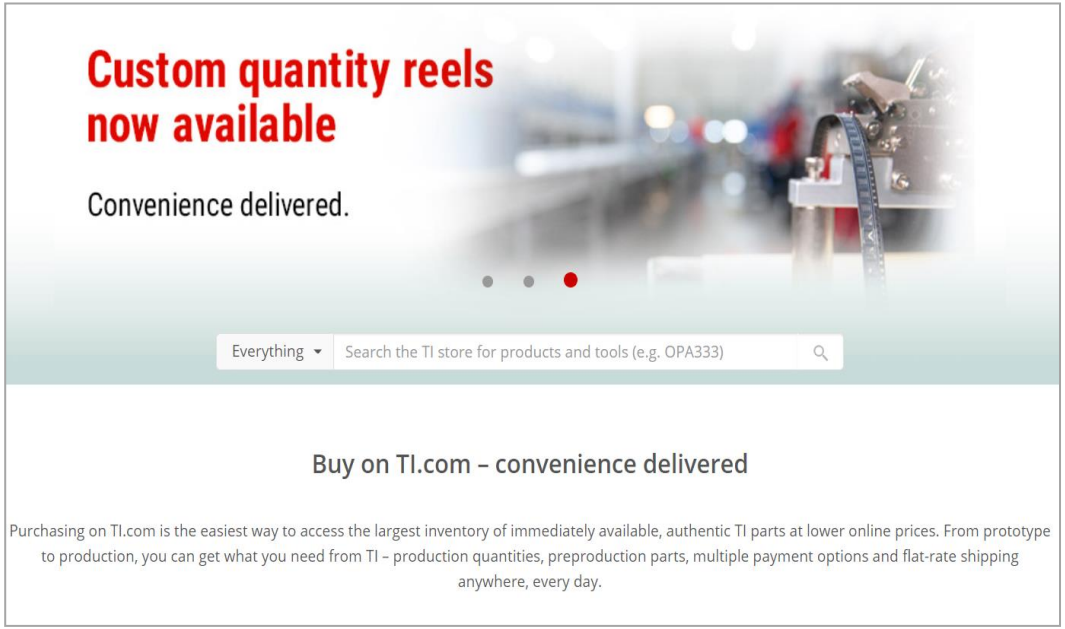

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