

# Updating Firmware With the bq2750x and EVM

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ABSTRACT

This application report provides the procedure to update bq2750x firmware and the learned golden image (\*.DFI file) in bq27500 data flash from the previous firmware version.

#### Save Data Flash Content Before and After Firmware Update

**Note:** If the data flash has no learned value that needs to be saved, proceed to the section entitled *Update Firmware in the EVM*.

Before the firmware can be updated, the original data flash content must be saved as an old Data Flash Image (DFI) file to prevent loss of the learned data flash value. Once the firmware is updated, the original data flash content is lost. Instead, a default DFI is copied to the device during the firmware update. Assume that the original data flash content is generated from the learning cycle. It is critical that the data flash content is set back to the previous contents. The two methods to update the data flash after a firmware update follow.

- 1. Begin by proceeding through bqEASY to generate new data flash contents.
- This method is time consuming but it is less likely to generate a compatibility issue when running the new firmware.
- 2. Update the data flash using the old DFI file.

The DFI file saved from the previous firmware version has a different checksum than that of the current firmware version. Hence, the old version DFI cannot be directly used in new firmware. If bqEASY is used to configure the same battery pack, the only differences are the resistance Ra value and the Qmax value.

To update the old DFI file, perform the following steps.

1. Create DFI file (see Figure 1).

Figure 1 is the user interface in bqEASY step 3F to save the DFI file to the default directory: C:\Program Files\Texas Instruments\bq Evaluation Software\Plugins\Projects with file name:\_0500\_01xx\_CONFIGURED.dfi. This file can be renamed and used to update the same batch of devices which had a firmware update that also requires data flash update.



Save Data Flash Content Before and After Firmware Update



Figure 1. Create New DFI File

 Load the old DFI file into the device with the old firmware version that matches the old DFI version using step 1B of bqEASY (see Figure 2).

Texas Instru	ments by Gas Gauge Evaluation Softwa Help	re - bq27500 v1.05 - [bqEasy]
Ada	TEXAS INSTRUMENTS	REAL WORLD SIGNAL PROCESSING
1	TEXAS INSTRUMENTS	bgEASY-HH (v1.12) 1. Setup 2. Configure 3. Calbrate 4. Chemistry 5. Cycle
DataRAM	Impedance Track Configuration Wizard 0000 0000 Communication Status DK	1B. Load .DFI File
Data Flash I2C Pro	1A. Project Name 1B. Load .DF1 File 🛛 🗹	Its important to initialize the Impedance Track gas gauge with the correct default dataflash image file (.DFI). If you know that this is already the case, then skip this step by clicking "Keep Existing Dataflash Image" Dataflash Image File Options
Calibrate bqEASY		Use: bq27000_0_00.dfi (recommended)     Select DFI file manually     Browse
100%	Back Next 🕥	Solected Default DFI file: C:\Program Files\Texas Instruments\bq Evaluation Software\Plugins\Device Defaults\bg27500 1 05.dfi Program Datallash Image Keep Existing Datallash Image
Communication Of	ς	SBS Task Progress: 100% Task Completed. 03:37:02 PM

Figure 2. Load the DFI File

3. Go to the Data Flash screen and read all the data flash contents, and export the data flash into the old.gg file (see Figure 4). Modify the old.gg file to the new.gg file by opening the old.gg file and changing the firmware version in the file header.



- 4. Set the device into ROM mode, and program the new firmware as described in the section entitled *Update Firmware in the EVM* of this document.
- Because the chemistry is already identified from the previous learning cycle, the chemistry can be programmed into the device directly from the chemistry table. In order to do this, go to step 4B of bqEASY to select the chemistry manually (see Figure 3).



Figure 3. Load Chemistry

6. Go to Data Flash screen and Import the new.gg file into the device (see Figure 4). After loading the new.gg file, click the *Write All* button to write these data flash values into the device. Because the data flash configuration may not be the same between old firmware version and new firmware version, an error message may occur.



Calibration     Security       Configuration     System Data       Name     Value       IT Cfg     -       Load Select     num       Terminate Voltage     mV       User Rate-mA     mA       Bin     Reserve Cap-mAh       Reserve Cap-mAh     mAh       Cig Current Threshold     -       Cig Current Threshold     mA       Cig Relax Time     Sec       Cig Relax Time     Sec       Cig Relax Time     Sec       ASY     Asy	port ose Data Flash	All <u>W</u> rite All	Write	All, <u>P</u> reserve				
Configuration     System Data     Gas Gauging     Default Ra Tables     Ra Tables       Name     Value     Unit     If cfg     -     -       Load Select     num     TE nable     hex     -       Terminate Voltage     mW     MW     App Status     fig       User Rate-mA     mA     Qmax Cell 0     mAh       User Rate-mA     mA     Qmax Cell 0     mAh       Cycle Court 1     num     Cycle Court 1     num       Reserve Cap-mAh     mAh     Qmax Cell 1     mAh       Chg Current Threshold     -     -     Cycle Court 1     man       Chg Current Threshold     mA     Cell 0 Chg dod tEoC     mam       Drag Relax Time     Sec     Avg I Last Run     mA'       Chg Relax Time     Sec     Avg I Last Run     mA'       ASY     Astrona     Sec     Sec     Sec		Calibration	γ	Security		-0/20		1
Name     Value     Unit       IT Cfg     -     -       Load Select     num       Terminate Voltage     mV       User Rate-mA     mA       Ban     Reserve Cap-mAh       Reserve Cap-mAh     mAh       Cycle Count 0     num       Dig Current Threshold     -       Ch Crycle Fattern Threshold     mA       Chg Current Threshold     mA       Chg Current Threshold     mA       Chg Relax Time     Sec       Chg Relax Time     Sec       ASY     Quit Relax Time		Configuration	Sys	tem Data	Gas Gauging	1 Defau	It Ra Tables	Ra Tables
RAM     IT Cfg     -       Lodd Select     num       Terminate Voltage     mV       User Rate-mA     mA       User Rate-mW     mW       Reserve Cap-mAh     mAh       Cycle Court 0     num       Update Status 0     hex       Reserve Cap-mAh     mAh       Cycle Court 1     num       Update Status 0     hex       Reserve Cap-mAh     mAh       Cycle Court 1     num       Update Status 1     hex       Cycle Court 1     num       Update Status 1     hex       Cycle Court 1     num       Update Status 1     hex       Quit Current     mA       Cell 0 Chg dod at EoC     num       Quit Relox Time     Sec       Sy     Sec	Na	ne	Value	Unit	Name	Value	Unit	
Load Select     rum       Terminate Voltage     mV       App Status     fg       User Rate-mW     mA       User Rate-mW     mW       Reserve Cop-mAh     mAh       Ugdt Setrect     -       Cycle Court 0     num       Dig Current Threshold     mA       Chg Current Threshold     mA       Chg Relax Time     Sec       Ayg I Last Run     mW       Avg I Last Run     mW       Avg I Last Run     mW	AM IT	Cfg	1	1	State			
Terminate Voltage     mV       User Rate-mA     mA       User Rate-mW     mWV       Reserve Cap-mAh     mAh       Reserve Cap-mAh     mAh       Reserve Cap-mAh     mAh       Dig Current Threshold     -       Chg Current Threshold     mA       Cell OChg dod tEoC     num       Cell Chg dod tEoC     num       Chg Relax Time     Sec       Quit Relax Time     Sec       Sec     Sec	Loc	ud Select		num	IT Enable		hex	
a     User Rate-mA     mA       User Rate-mW     mW       user Rate-mW     mW       Bh     Wester Rate-mW     mW       Reserve Cop-mWh     mWh       Reserve Cop-mWh     mWh       Current Threshold     mA       Chg Current Threshold     mA       Quit Current     mA       Dig Relax Time     Sec       Quit Relax Time     Sec       Quit Relax Time     Sec	Tei	minate Voltage		mV	App Status		flg	
Image: Second	Use	r Rate-mA		mA	Qmax Cell 0		mAh	
Image: Section of the section of t	a Use	r Rate-mW		mW	Cycle Count 0		num	
Reserve Cap-mWh     mWh       Current Thresholds     -       Chg Current Threshold     mA       Chg Current Threshold     mA       Quit Current     mA       Dsg Relax Time     Sec       Quit Relax Time     Sec       Quit Relax Time     Sec	Res	erve Cap-mAh		mAh	Update Status 0		hex	
Pro     Cycle Court 1     num       Dsg Current Threshold     mA     Update Status     hex       Quit Current     mA     Cell 0 Chg dod of EoC     num       Quit Current     mA     Cell 1 Chg dod of EoC     num       Dsg Relax Time     Sec     Avg I Last Run     mA       Quit Relax Time     Sec     Ny I Last Run     mW	Res	erve Cap-mWh		mW/h	Qmax Cell 1		mAh	
Pro     Dig Current Threshold     mA       Chg Current Threshold     mA       Cguit Current     mA       Dig Relax Time     Sec       Chg Kelax Time     Sec       Quit Relax Time     Sec	Cu	rent Thresholds			Cycle Count 1		num	
Pro     Chg Current Threshold     mA       Quit Current     mA       Dsg Relax Time     Sec       Quit Relax Time     Sec       Quit Relax Time     Sec         Soc     Avg P Last Run         NSY	Dsg	Current Threshold		mA	Update Status 1		hex	
Quit Current     mA       bgs Relax Time     Sec       Quit Relax Time     Sec       Quit Relax Time     Sec         Sy     Value         Isy     Value         Coll     Cell       Charles     Sec         Cell     Cell	Pro Che	Current Threshold		mA	Cell 0 Chg dod at EoC		num	
Avg I Last Run mA Avg I Last Ru	Qu	it Current		mA	Cell 1 Chg dod at EoC		num	
Chg Relax Time     Sec.       Quit Relax Time     Sec.       ISY     Image: Sec.	Dsg	Relax Time		Sec	Avg I Last Run		mA	
rate Quit Relox Time Sec	Che	Relax Time		Sec	Avg P Last Run		mW	
	cote Qu	it Relax Time		Sec				
	157							

Figure 4. Export and Load \*.gg File

- 7. Go to bqEASY step 3F (see Figure 1), and read the DFI under the updated firmware version. (Caution: Skipping this step will cause corrupted DFI)
- 8. Generate Golden Image file (see Figure 5).

In order to generate the Golden Image file, the *Update Status* has to be set to **02** from the learning cycle.Figure 5 is the user interface in bqEASY step 5B to generate the Golden Image DFI file to the default directory: C:\Program Files\Texas Instruments\bq Evaluation Software\Plugins\Projects with file name: \_0500\_01xx\_GOLDEN.dfi . bqEASY also updates the necessary data flash contents when generating the golden image before saving the DFI file. This file can be renamed and used in mass production.





Figure 5. Create New Golden Image File

## Update Firmware in the EVM

- 1. Disable the scanning in DataRAM before updating the firmware.
- 2. Power up the evaluation module (EVM) by applying 4 Vdc between Pack+ and Pack-. This step is unnecessary if the cell is already attached.
- 3. Start the EV Software.
- 4. Navigate to the I2C Pro screen.
- 5. Put the device into ROM mode by setting the *Write I2C Data Block* section as: *I2C Command: 00 Data Block (hex): 000f*, and click the *Write Data* button (see Figure 6).

Data Flash	Write I2C Data Block		
	12C Command 00	Data Block	Write Data
I2C Pro			

Figure 6. Command to Set the Device in ROM Mode for Firmware Programming

6. In the *bq275xx Programming* section, enter the path and file name for the new firmware file (\*.senc). If needed, click the (...) button to browse for the file location (see Figure 7).

C:V



Read to \*.senc

file

## Figure 7. Programming the Firmware (Encrypted SREC)

- 7. Click the *Program* button to program the firmware (see Figure 7). All flash-constants information including calibration will be lost; so, export it beforehand into a (\*.gg) file or \*.DFI file
- 8. Once programming is finished, execute the program by clicking *Execute Program on bq8032* button (see Figure 7).
- 9. Close and restart the EV Software so that the new version of firmware is recognized.

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