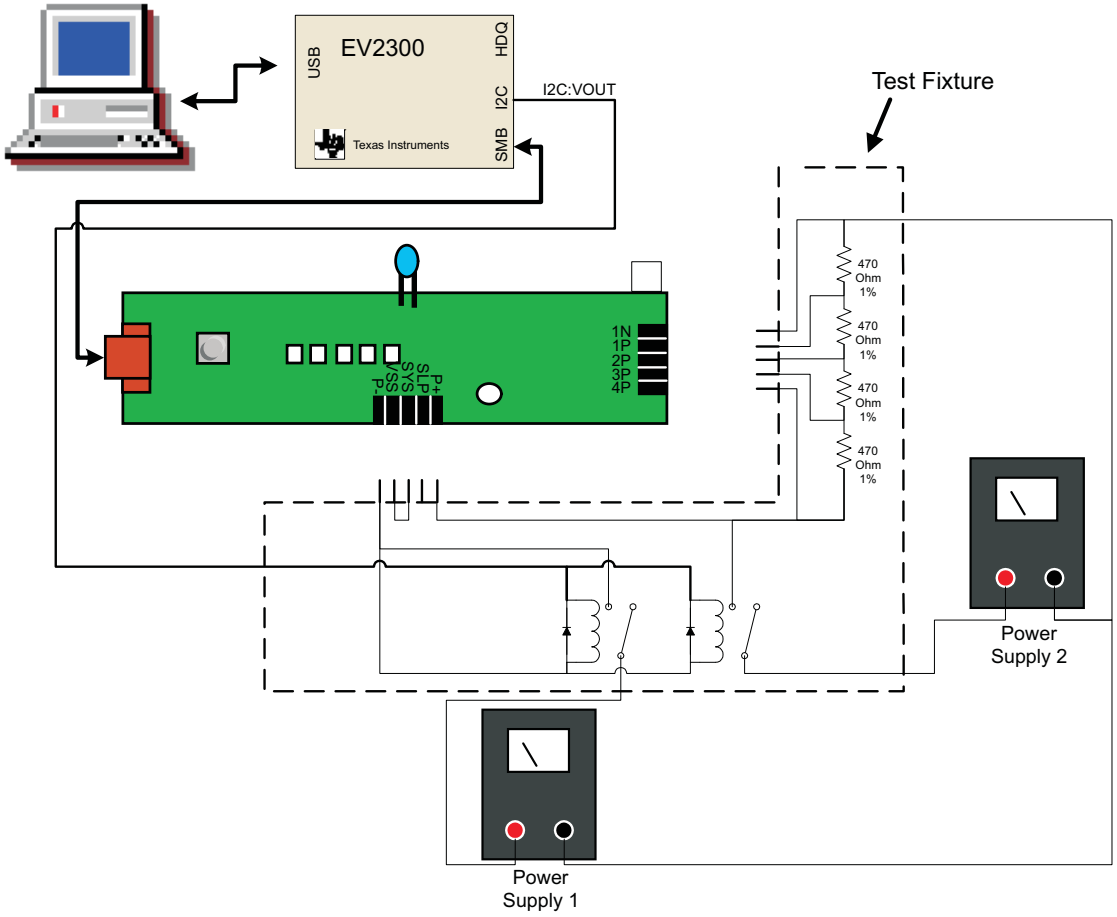
# Using bqTester Single Site Software

- **FEATURES**
  - Programs and calibrates smart battery modules based on the bq20zxx
  - Calibrates coulomb counter offset, voltage, temperature, and current
  - Programs
    - Serial number
    - Date
    - Pack Lot Number
  - Test software is Windows™ 2000 and Windows™ XP compatible.
  - Data-logging feature preserves calibration records.




bqTester single site software from Texas Instruments (TI) is designed to calibrate and program electronic smart battery modules based on the bq20z70, bq20z80, bq20z90, and future advanced battery gas gauges. The bqTester works with the TI EV2300 USB-based PC interface board for battery fuel gauge evaluation. The bqTester is open-source software and can be modified to suit the user's requirements.

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# 1 Minimum System Requirements

- Computer: PC or compatible
- Operating system: Windows™ 2000, or Windows™ XP. Operation with Windows™ 98SE may be possible but is untested and unsupported.
- Minimum video resolution is 640x480; recommended: 800x600 or above
- 1 available USB port
- 1 EV2300 USB-based PC interface board for battery fuel gauge evaluation from Texas Instruments
- 5-MB available hard drive space
- Visual Basic version 6.0 with Service Pack 5 is required if user wishes to alter program operation.

# 2 Software Installation

The **TI bq SingleStationTester Software.exe** executable file installs all required software, drivers, and DLL files for proper software operation. To install the software:

- **Do not** connect any EV2300s to the PC before installing the software. If any are connected, disconnect them now.
- It is recommended to check for software in the *bqTester Tool Folder* on the www.ti.com Web site. The Tool Folder is located at: http://focus.ti.com/docs/toolsw/folders/print/bqtester.html
- If installing software downloaded from the above Web site, then unzip the downloaded file into a temporary directory and go to **Start, Run**, and type: **C:\Yourdirectory\TI bqSingleStationTester Software.exe** and click **OK** (replace *C:\Yourdirectory* with the location where the file was unzipped).
- . The welcome screen shown in Figure 1 is displayed.


**Figure 1. Welcome Screen**

After a few seconds, the Single Site Setup Wizard will appear as shown in Figure 2.


**Figure 2. Single Site Setup Wizard**

Click *Next* to continue installing the Single Site software. The License Agreement box appears. After carefully reading the License Agreement, click *I Agree* to continue installation. Note: clicking *cancel* aborts the installation. After *I Agree* has been clicked, the Choose Components box appears as shown in Figure 3.

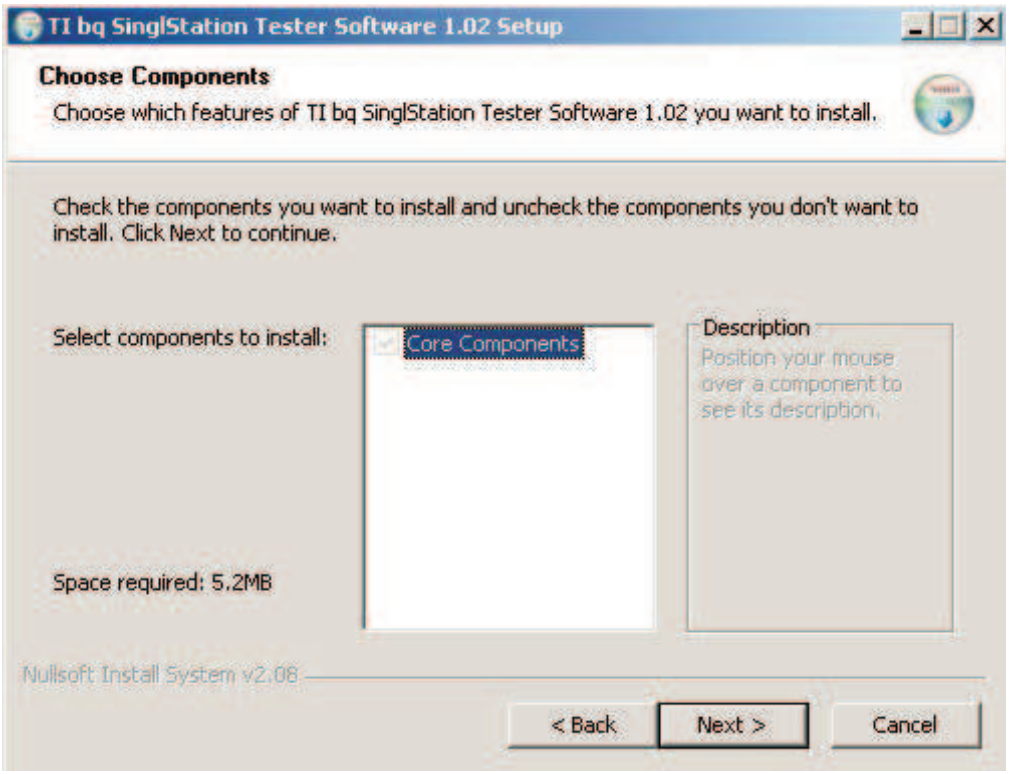


**Figure 3. Choose Components Box**

Notice that *Core Components*= is selected and grayed out. No other selections can be made. Click *Next* to proceed. The *Choose Start Menu Folder* box appears as shown in Figure 4.

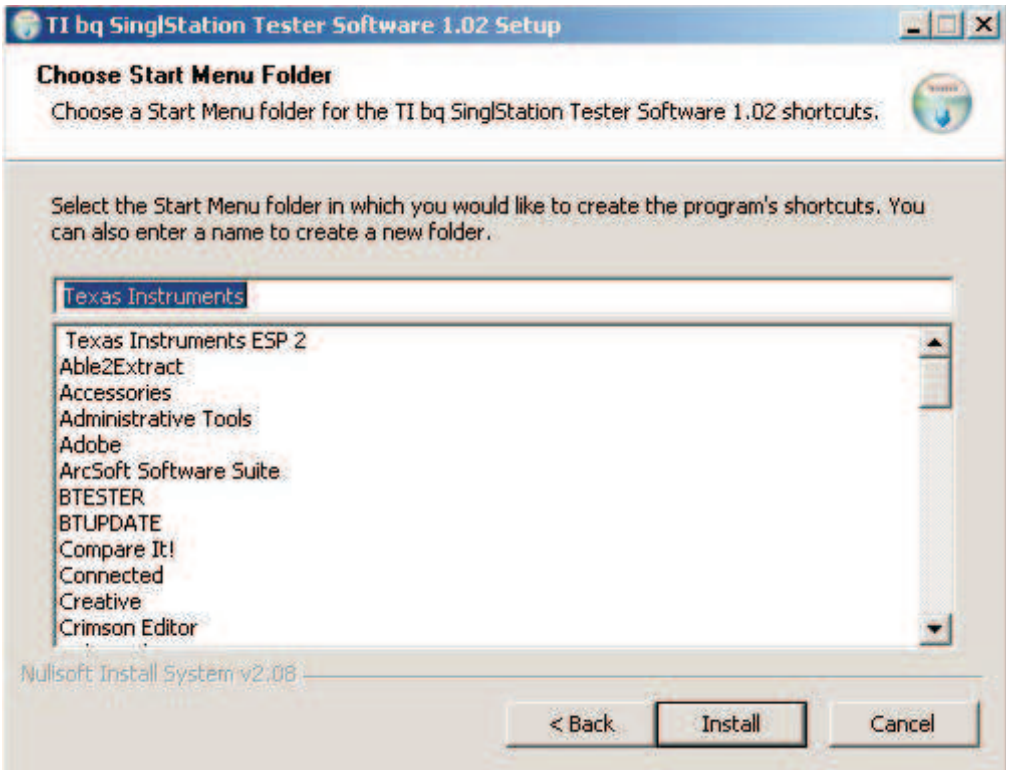


**Figure 4. Choose Start Menu Folder Box**

Choose the Start Menu folder where you want the program's shortcuts to be created. The default is Texas Instruments. After choosing the installation folder, click *Install*. A box is displayed showing the files being installed, followed by the Completing Setup Wizard as shown in Figure 5.

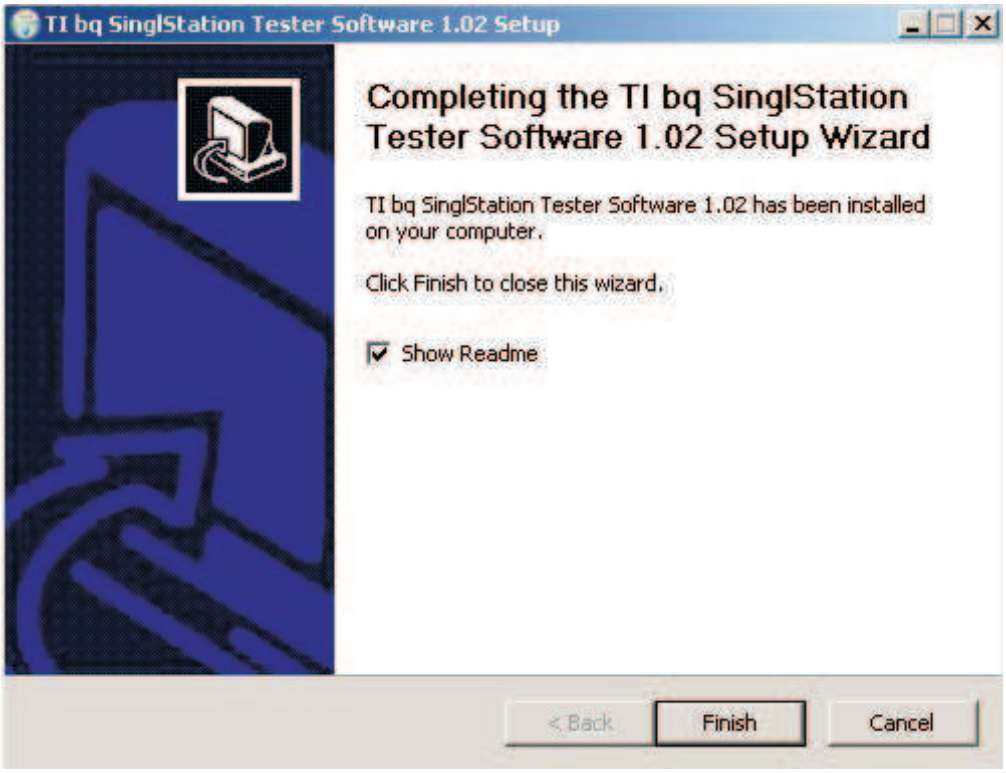


**Figure 5. Completing Setup Wizard Box**

Click *Finish* to complete installation. Be sure to check the *Show Readme* box if additional information is desired

## 2.1 EV2300 Driver to USB Port Association

Two drivers are associated with the EV2300. An instance of the two drivers must be associated with the EV2300 connected to the bqTester PC through any USB port. If an EV2300 is connected to the bqTester PC and the PC detects that it has not had an EV2300 connected to that particular USB port before, then the computer requires the following procedure to associate a copy of the drivers for that USB port. To associate an instance of the EV2300 drivers to any given USB port, connect an EV2300 to the bqTester PC. After a few seconds the Found New Hardware screen appears as seen in Figure 6. Note: if an EV2300 has been installed on the PC previously, the Found New Hardware screen does not appear and installation is complete.


**Figure 6. Found New Hardware Wizard**

Select *No, not at this time* and click *Next*. If the first screen that appears does not look like this screen, then it looks like the one shown in Figure 7.

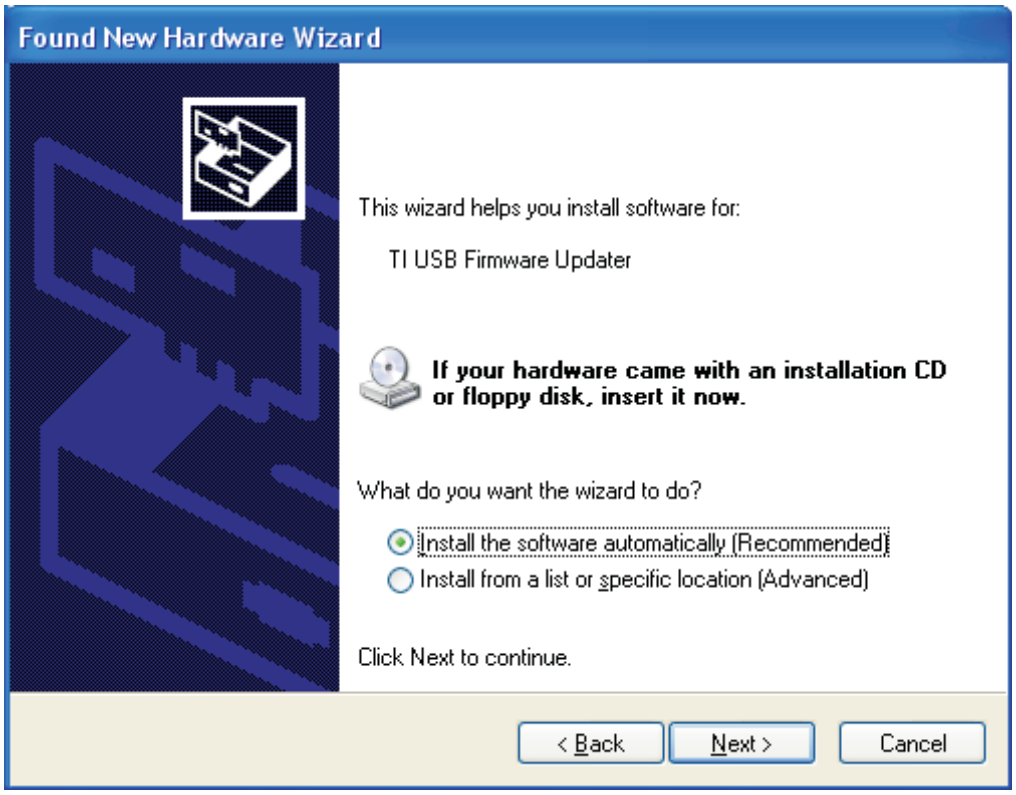


**Figure 7. Alternate Found New Hardware Screen**

Select *Install the software automatically (Recommended)* and click *Next*. This wizard is for the first of the two drivers (TI USB Firmware Updater) required for the EV2300. The Windows Logo Testing screen appears as shown in Figure 8.

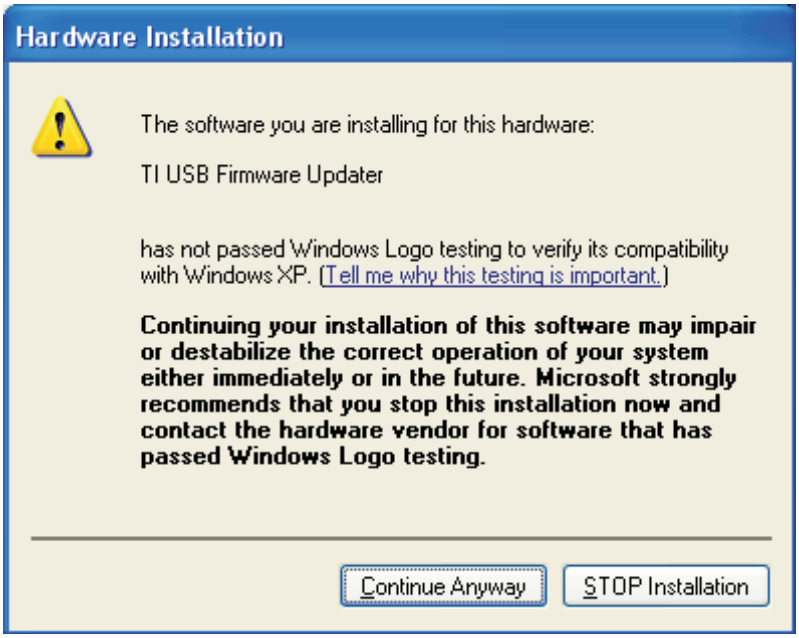


**Figure 8. Windows Logo Testing Screen**

Click *Continue Anyway* to proceed with the installation. It is common for the next screen to be the Confirm File Replace screen as shown in Figure 9.

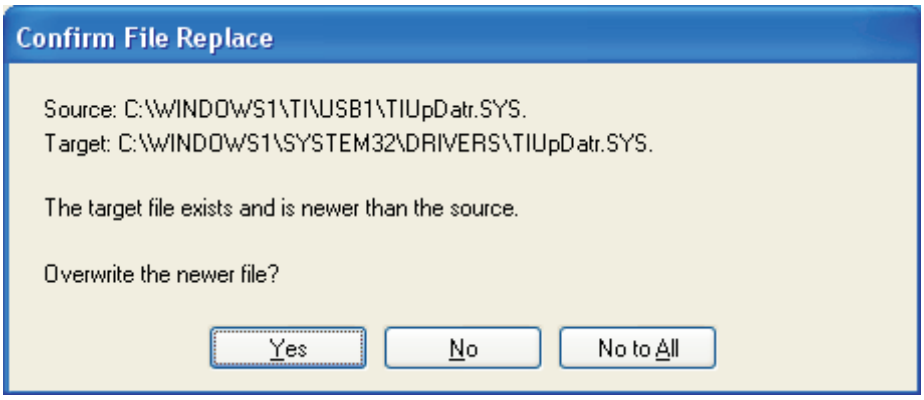


**Figure 9. Confirm File Replace Screen**

Click *No* to continue. If this screen does not appear, then the next screen is the *Completing the Found New Hardware Wizard* screen as seen in Figure 10.

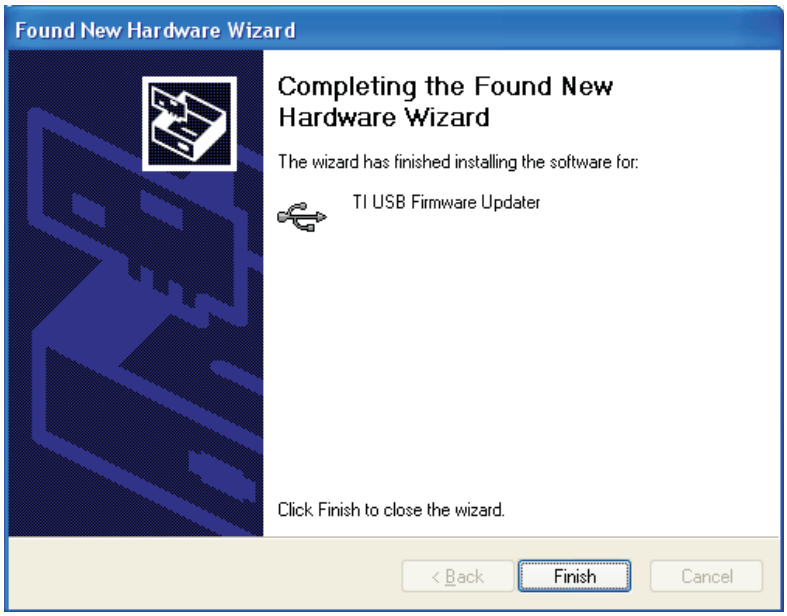


**Figure 10. Completing the Found New Hardware Wizard Screen**

The TI USB Firmware Update driver is now installed for the EV2300. Click *Finish* to exit the driver install wizard. After a few seconds, another Found New Hardware screen appears to start the installation of the final driver for the EV2300 as shown in Figure 11.

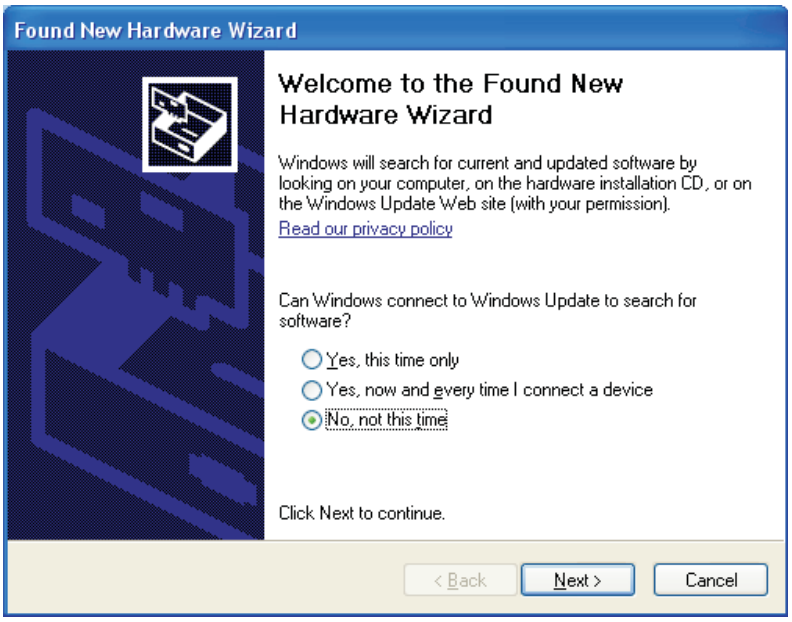


**Figure 11. Found New Hardware Wizard**

Select *No, not at this time* and click *Next*. If the screen that appears does not look like this, then it looks like the one shown in Figure 12.

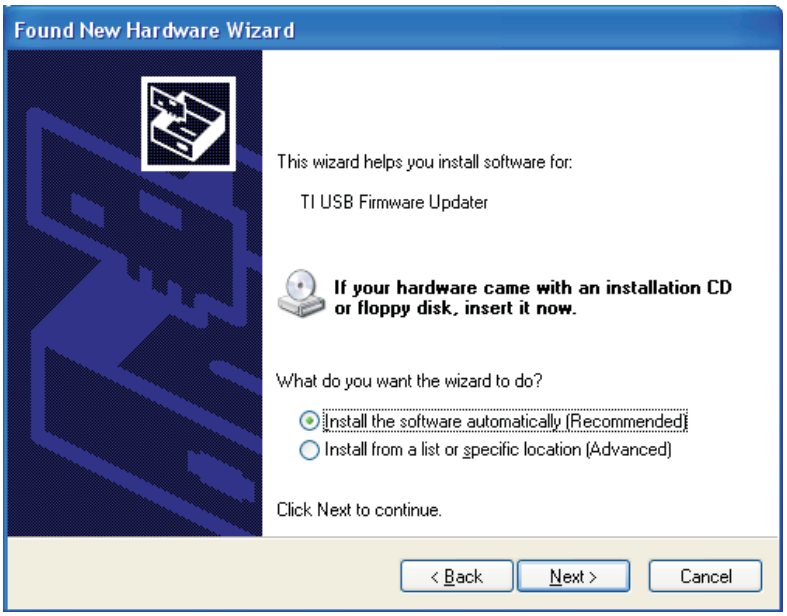


**Figure 12. Alternate Found New Hardware Screen**

Select *Install the software automatically (Recommended)* and click *Next*. This wizard is for the second of the two drivers (TI USB bq80XX Driver) required for the EV2300. The Windows Logo Testing screen appears as shown in Figure 13.

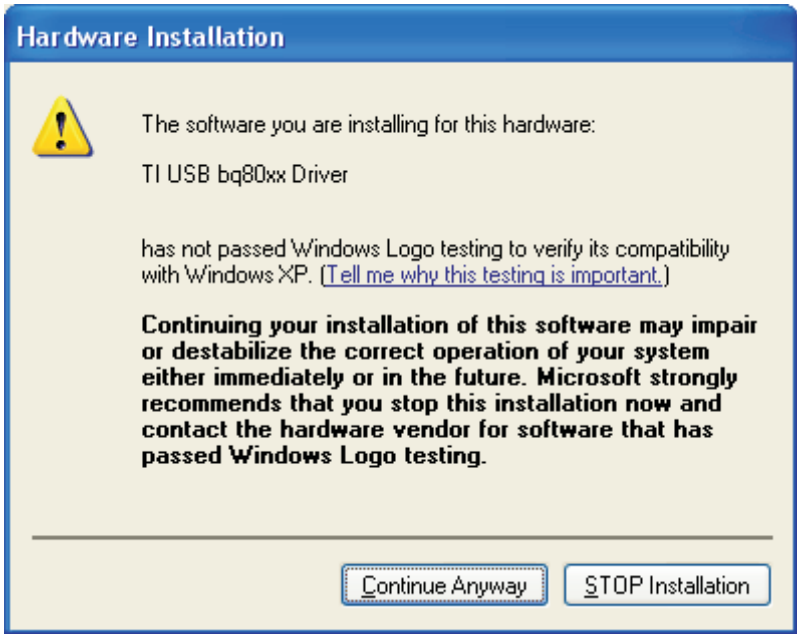


**Figure 13. Windows Logo Testing Screen**

Click *Continue Anyway* to proceed with installation. It is common for the next screen to be the *Confirm File Replace* screen as shown in Figure 14.

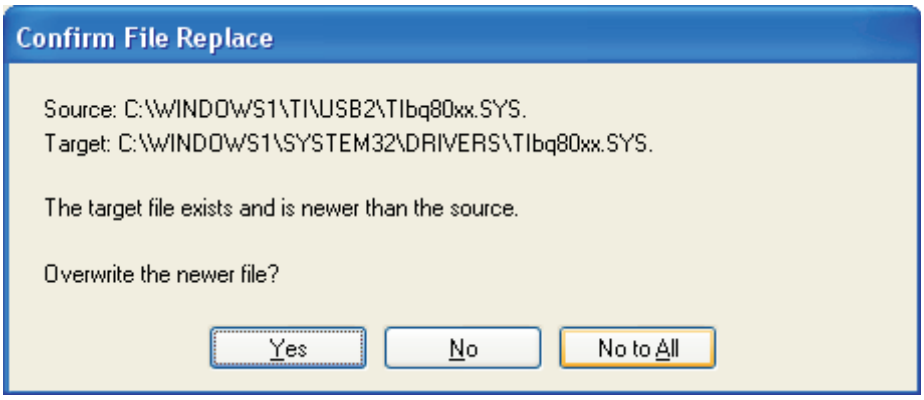


**Figure 14. Confirm File Replace Screen**

Click *No* to continue. If this screen does not appear, then the next screen is the *Completing the Found New Hardware Wizard* screen as seen in Figure 15.

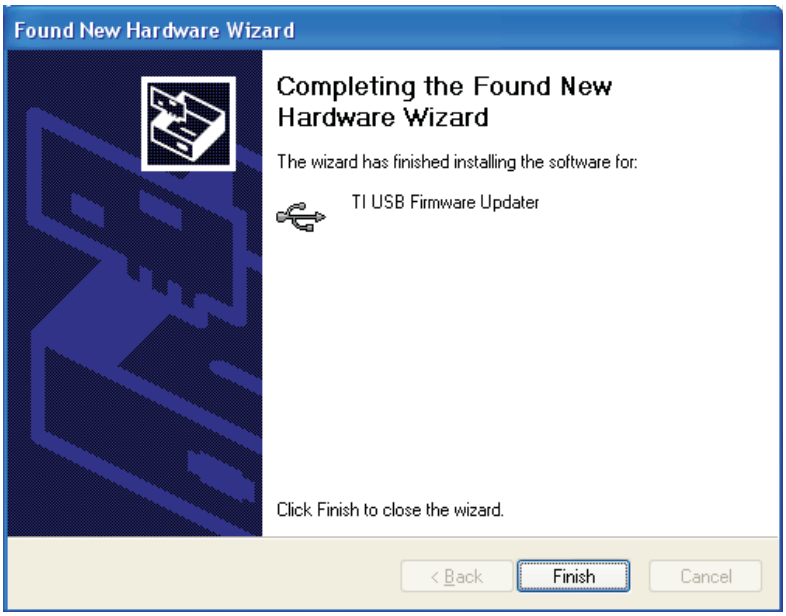


**Figure 15. Completing the Found New Hardware Wizard Screen**

The TI bq80xx Driver is now installed for the EV2300. Click *Finish* to exit the driver install wizard. At this point, the installation of the EV2300 is complete.

Source code in Visual Basic 6.0 format is available if the user wishes to modify the behavior of the bqTester. Contact TI for access to the source code.

# 3 Interface Connections

The bqTester software requires that the TI EV2300 USB-based PC interface board for battery fuel gauge evaluation interface be installed and running properly. The smart battery module should be connected to the EV2300 board and external power supplies as shown in Figure 16.

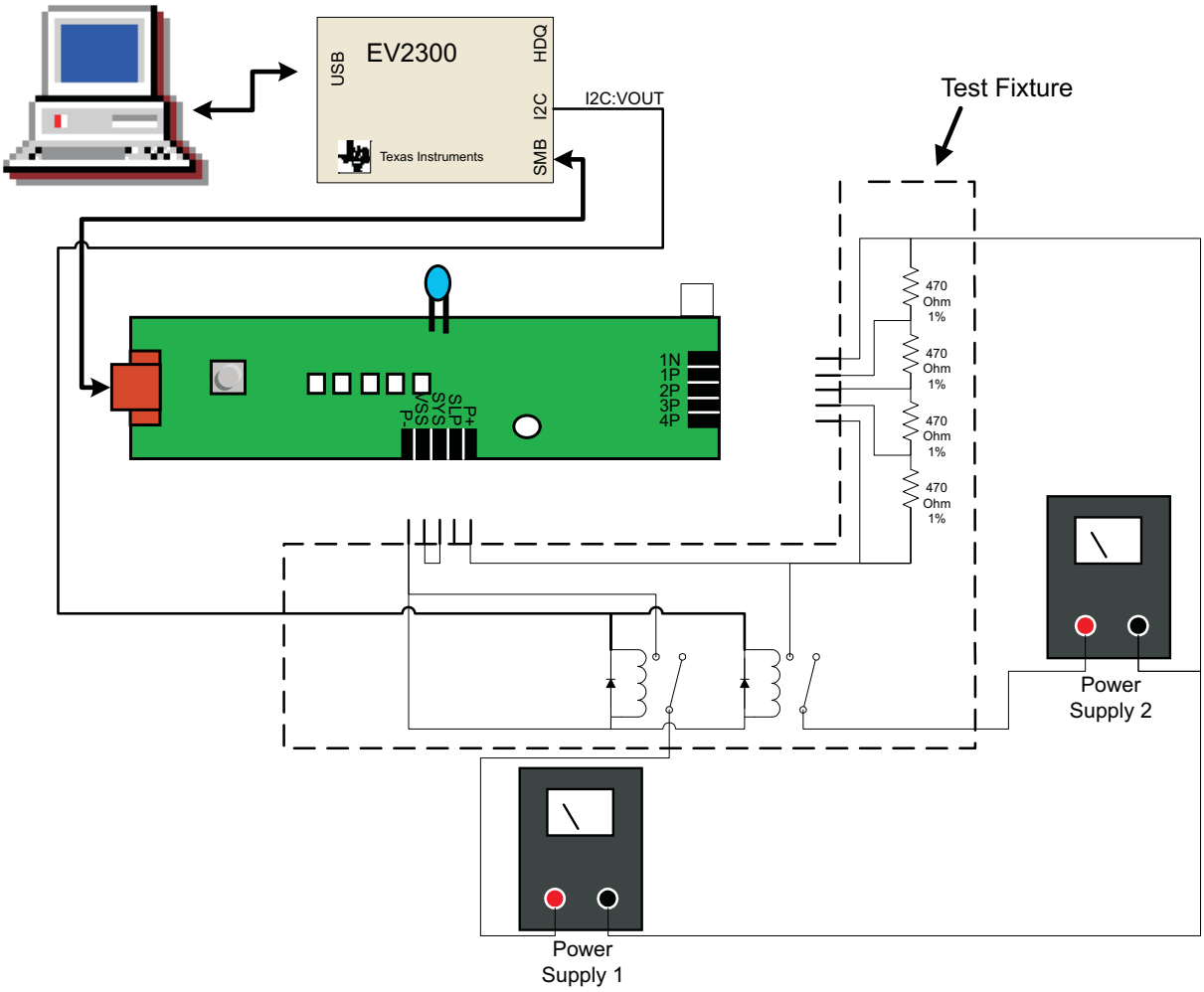


**Figure 16. Single Site Tester Interface Connections**

**Note:** Do not use actual battery cells with this software. Cells should be simulated with resistors as shown in Figure 16.

The relays used to validate this procedure are 10-A, 250-Vac relays with a 5-Vdc coil. Any brand can be used but the ones used during this test were Omron model G6RN-1. The diodes used were 1N4148. Set the power supply 1 Vdc to 3 Vdc and limit current to 2 A dc. Set power supply 2 to the voltage corresponding to the number of cells being simulated (e.g., 10.8 Vdc for 3 cells or 14.4 Vdc for 4 cells). A calibrated temperature probe also is needed to measure the actual temperature.

# 4 Testing

## *4.1 Creating the Golden Image File (mandatory procedure)*

After engineering development has been completed, a *golden* data flash image file must be made from an *Engineering Perfect* module. This *Golden* Image file is used as a default to program the Static Data Flash constants in all the bq20zxx-based smart battery modules using bqTester during production. It is important

that this process is completed. If it is not, then the Impedance Track™ algorithm may not function correctly. This section assumes the user's familiarity with Texas Instruments evaluation software for the bq20zxx modules because the user was most likely used it during the engineering development phase of this project. If unfamiliar with the software, then see the *bq20z80-001 EVM tool folder* that includes a user's guide for the EVM, application reports, and the latest EV software:

http://focus.ti.com/docs/toolsw/folders/print/bq20z80evm-001.html

### 4.1.1 Creating the "Engineering Perfect" Battery Pack

It is assumed at this point that an engineering prototype battery pack is complete and that all static data flash constants have been reviewed and verified for a particular battery pack model. Static data flash is all data flash constants that are not battery pack specific.

**Static Data examples:** Static data examples are Charging Voltage, Impedance Track resistance tables, and QMAX settings. Examples of nonstatic data include serial number, date, and calibration. It is also assumed that this Engineering Perfect battery pack was created using the correct chemistry support SENC file. For more information on this, see the multichemistry support application report *Support of Multiple Li-Ion Chemistries With Impedance Track™ Gas Gauges* (SLUA372).

At this point, the Impedance Track data must be verified. This data must be updated and accurate so that all battery packs produced have accurate Impedance Track tables in data flash *right out of the box*. To ensure that the Impedance Track tables are optimized, complete the following steps:

1. Using an EV2300 and the EV software appropriate for the device being used in this application (e.g., bq20z70, bq20z80, or bq20z90), ensure that the data flash locations **Qmax Cell 0–Qmax Cell 3**, and **Qmax Pack** have good estimates in them for the battery pack capacity. This information can be derived from the battery cell manufacturer data sheet. Also note that if more than one cell is connected in parallel, then the capacity increments by one cell capacity for every cell in parallel. For example, if a single-cell data-sheet capacity is 2400 mAh, and three parallel cells are used, set each value to 2400 x 3 = 7200 mAh.
2. Charge the pack to full. If it does not charge then ensure that Impedance Track is enabled by sending data 0x0021 to SMBus command 0x00 (*Manufacturer Access*).
3. When the pack is full, remove the charger, and let the pack relax for 2 hours.
4. Discharge the pack to minimal device acceptable voltage (also set as *Term Voltage* flash constant), at a typical rate for the target application. The exact rate is not critical.
5. Let the pack relax for at least 5 hours.
6. Repeat steps 2 through 5 for maximum accuracy.
7. Connect the pack to the EV software, go to the data flash screen, and ensure that **Update Status** is 0x06.
8. The battery pack is now *Engineering Perfect*.

### 4.1.2 Creating Golden GG file from Engineering Perfect Battery Pack

A GG file needs to be created with all the data from the *Engineering Perfect* battery pack that is used in creating the *Golden Image* File. The purpose of this GG file is to ensure that all the nonreserved data is saved so that it can be installed back into the module after the battery pack is put back into the original state with a new SENC file (discussed in the next section). You also want to change *usage* data to original values so th at all production battery packs do not report that they have been used. To make this Golden GG file, do the following:

1. Ensure that the *Engineering Perfect* battery pack is still connected to the EV2300 and that the EV software for the applicable device is open.
2. Go to the Data Flash screen in the EV software, and click the Read All button.
3. Select the File pulldown menu, click Export, and chose a (*.gg) file name for saving the prelearned defaults (example: optimized.gg).
4. Open the saved GG file from step 3 in a text editor such as Notepad, and change the value of Update Status from 06 to 02, which indicates that the parameters are learned but the Impedance Track feature is disabled (as should be the case for a new pack prior to calibration). Also, reset the *Cycle Count* field to 0 as shown in Figure 17.

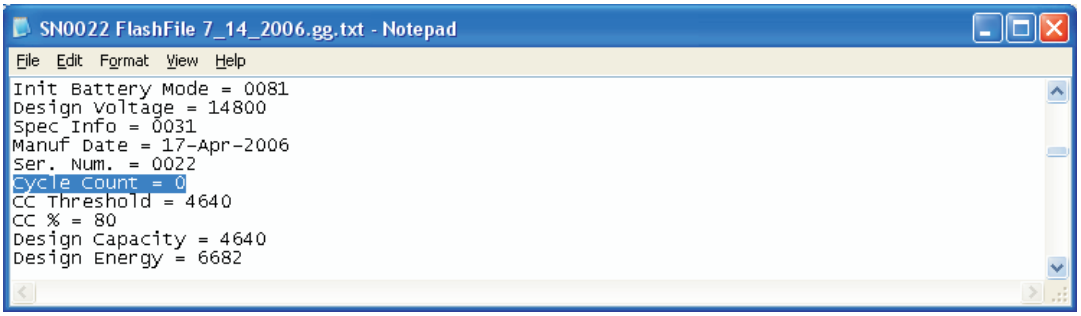


**Figure 17. Cycle Count Modification in GG File Using Notepad**

5. Save the file. This file is used in the following discussion.

**4.1.3** It is assumed that the proper Chemistry Support SENC file has been determined for this application during the Engineering and Development Phase of this project. For most applications (LiCoO2/graphitized carbon chemistry), the default SENC file for the applicable device (e.g., bq20z80, bq20z90, or bq20z70) is used. For more information on multichemistry support. see the TI application report *Support of Multiple Li-Ion Chemistries With Impedance Track™ Gas Gauges* (SLUA372).

The following instructions explain how to install the original chemistry supported SENC file into the *Engineering Perfect* battery pack. Do not worry about losing all the static data from this pack because it was stored as discussed previously.

1. Go to the product folder for the device being used in this application.
   Some Examples:
   a. For the bq20z70 go to: *bq20z70 Tools and Software Section*
   b. For the bq20z80 go to: *bq20z80 Tools and Software Section*
   c. For the bq20z90 go to: *bq20z90 Tools and Software Section*
2. Click on the Multi-Chemistry Support Software zip file pertaining to the device being used:
   Some Examples:
   a. For the bq20z70 go to: *bq20z70-V101 Multiple Li-Ion Chemistries Software*
   b. For the bq20z80 go to: *bq20z80-V102 Multiple Li-Ion Chemistries Software*
   c. For the bq20z90 go to: *bq20z90-V102 Multiple Li-Ion Chemistries Software*
3. Download the applicable zip file and extract to a temporary directory. An example would be C:\Temp\sluc058.zip
4. Ensure that the *Engineering Perfect* battery pack is still connected to the EV2300 and that the EV software for the applicable device is open. Then go to the Pro screen in the EV software as shown in Figure 18.

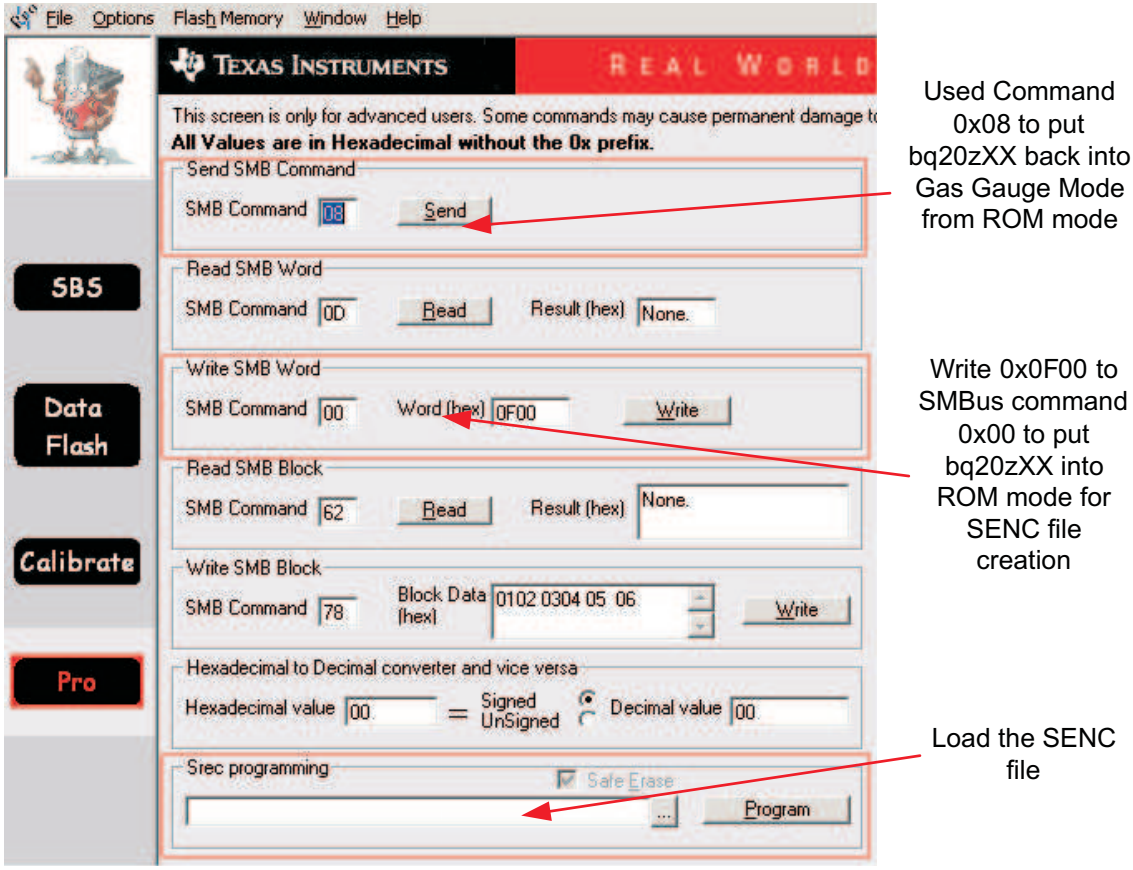


**Figure 18. EV Software Pro Screen**

5. Ensure that *Write SMB Word* frame has the SMBus Command set to 0x00 and the SMBus Word set to 0x0F00. If they are not, then change them.
6. Then click *Write*. This puts the bq20zxx module into ROM mode to prepare for writing the SENC file created in the previously discussed section.
7. Write the SENC file to the *Engineering Perfect* pack by clicking the browse (  ) button in the *Srec programming* frame.
8. In the file manager that pops up, locate and select the previously saved SENC file created in the previously discussed section.
9. Then click the *Program* button. The software will indicate when finished.
10. After writing is finished, ensure that the **SMB Command** is 0x08 in the *Send SMB Command* frame. If it is not, then change it to 0x08.
11. Click the *Send* button. This puts the bq20zxx back into Gas Gauge mode. Your factory default SENC file is now loaded.

### 4.1.4 Creating the Golden Image File

The final step in this process is creating the *Golden* Image file. This file includes all the static data in the data flash that is constant from one smart battery module to the next. It also has all the reserved data and *usage* data set to default states to ensure that all production packs start out in a new state. This process is mandatory for new designs. Without this process the Impedance Track Algorithm may not function properly. Follow these steps to create this file:

1. Ensure that the *Engineering Perfect* battery pack is still connected to the EV2300 and that the EV software for the applicable device is open. Then go to the Data Flash screen, open the *File* pulldown menu, and select *Import*.

2. In the file manager that pops up, locate and select the Golden GG file created in the preceding section and click the *Write All* button.
3. The *Engineering Perfect* battery pack now has all *Golden* data in it. The next step is to retrieve that data into a *Golden* image file.
4. Run the Data Flash reading software in the bqTester suite by double-clicking the TesterDFReader icon. The Data Flash reader screen appears as shown in Figure 19.

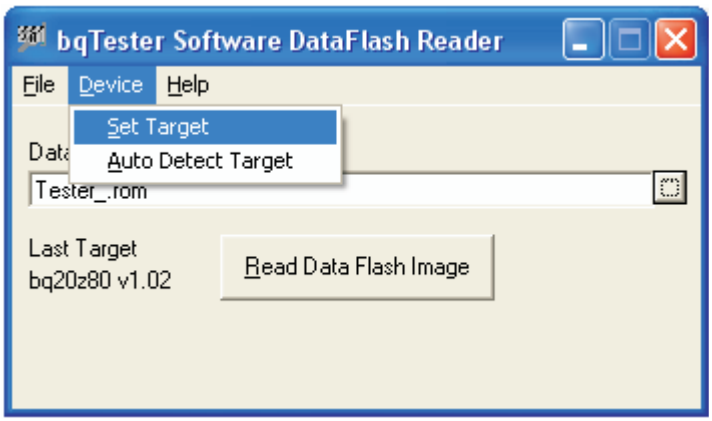


**Figure 19. Data Flash Reader Screen**

5. Select the device type being read from the Device pulldown menu.
6. Type in a complete path and file name with a .rom extension in the dialog box or click the browse button ( ). This is the file that contains the *Golden Image*.
7. Click the *Read Data Flash Image* button. This causes the software to read the data flash information from the bq20zxx-based smart battery module and store it in this file. This .rom file is now the *golden* data flash image file which is used to program all other similar bq20zxx-based smart battery modules in the production process.

### 4.1.5 Running the bqTester Software

Follow all instructions in Section 1 to install the software. After installation, double-click the bqTester icon on the PC desktop or launch the bqTester program from the Start menu. The single site tester main window appears as shown in Figure 20. Press the *Unlock Configuration button*. The default password is *bq20z80*. After entering the default password, two new buttons appear on the single site tester screen as shown in Figure 21. They are Global Configuration and VTI configuration.

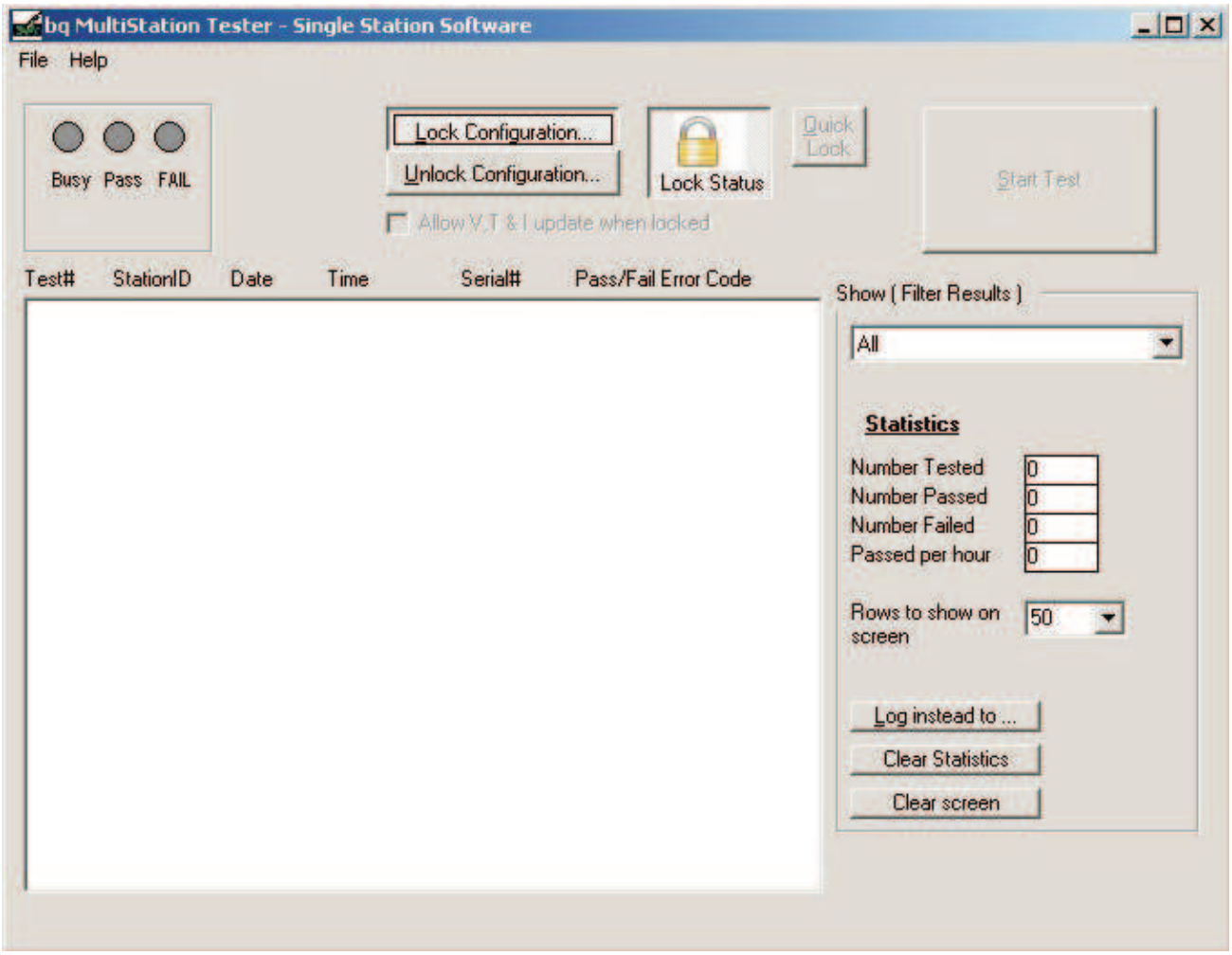


**Figure 20. bqTester Main Window**

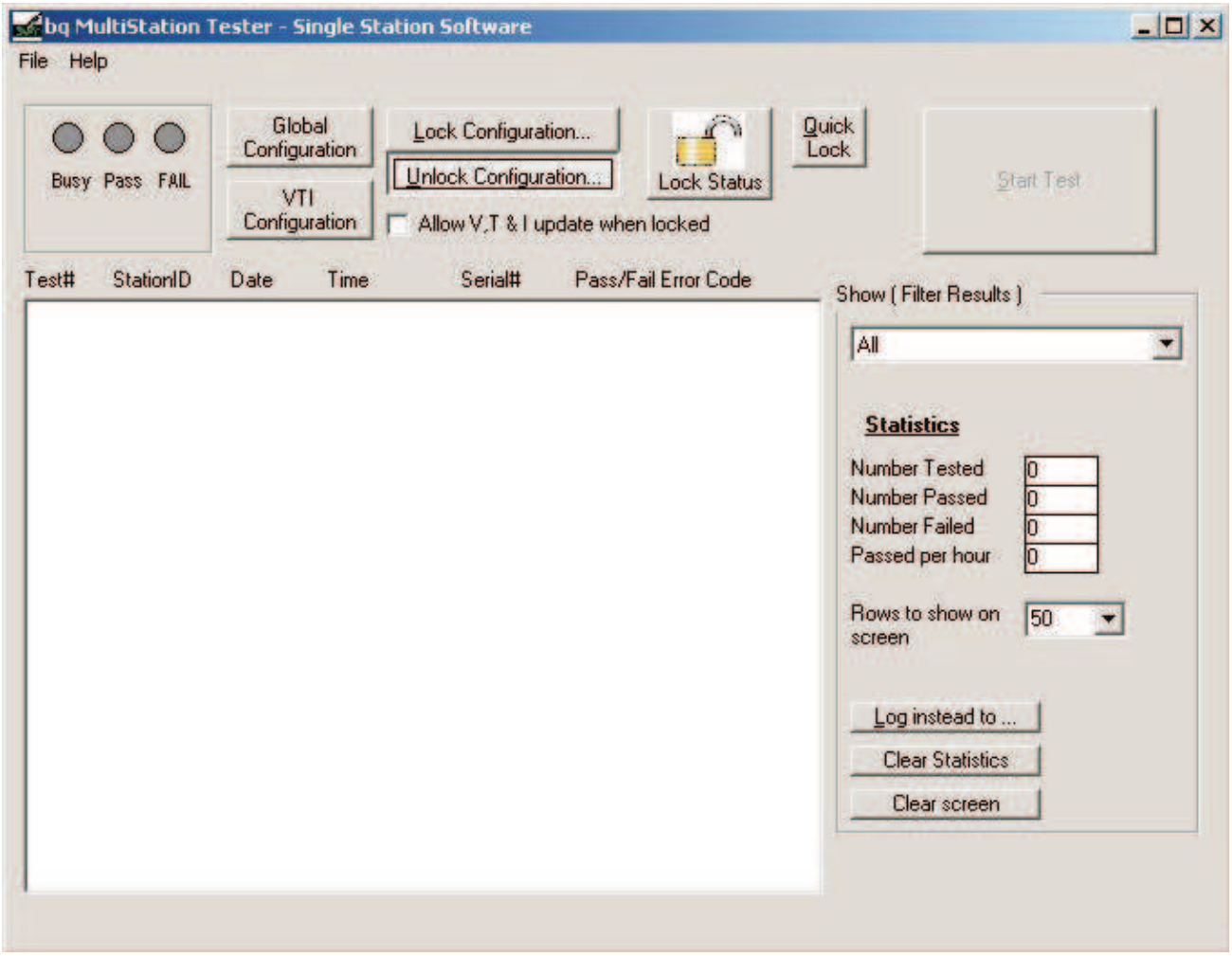


**Figure 21. bqTester Main Window Unlocked**

## 4.2 Setting Global Configuration Values

Pressing the Global Configuration button causes the bqTester Configuration window to be displayed as shown in Figure 22. In the global configuration screen, all numeric values are specified in signed decimal except for the serial number field which is unsigned with a maximum value of 65535.

### 4.2.1 Current Sense Resistor

This box contains two values. Enter the value of the sense resistor used in the Impedance Track-based smart battery pack in the Sense Resistor field. This value is entered in units of milliohms. Enter the desired acceptable percent error that the sense resistor can differ from the value listed in the Sense Resistor field in the % Error field. Note that the default value for this field is 25%. This test is intended only as a rough test to ensure that the sense resistor is mounted and not shorted; it is not intended to be a highly accurate test of the sense resistor value. This value must be specified as a positive integer value.

### 4.2.2 Voltage Reference/FSV

This box contains two values. The tester calibrates the voltage gain by manipulating the Full Scale Voltage Reference. Do not change the values in these fields.

### 4.2.3 Temperature Maximum Offset

This box contains one value and is in units of 0.1°C. Enter the maximum amount of offset that can be put into the module being tested, either positive or negative from 0. The default value of this field is 20, meaning that the calibrated offset entered in the data flash cannot exceed positive or negative 2°C.

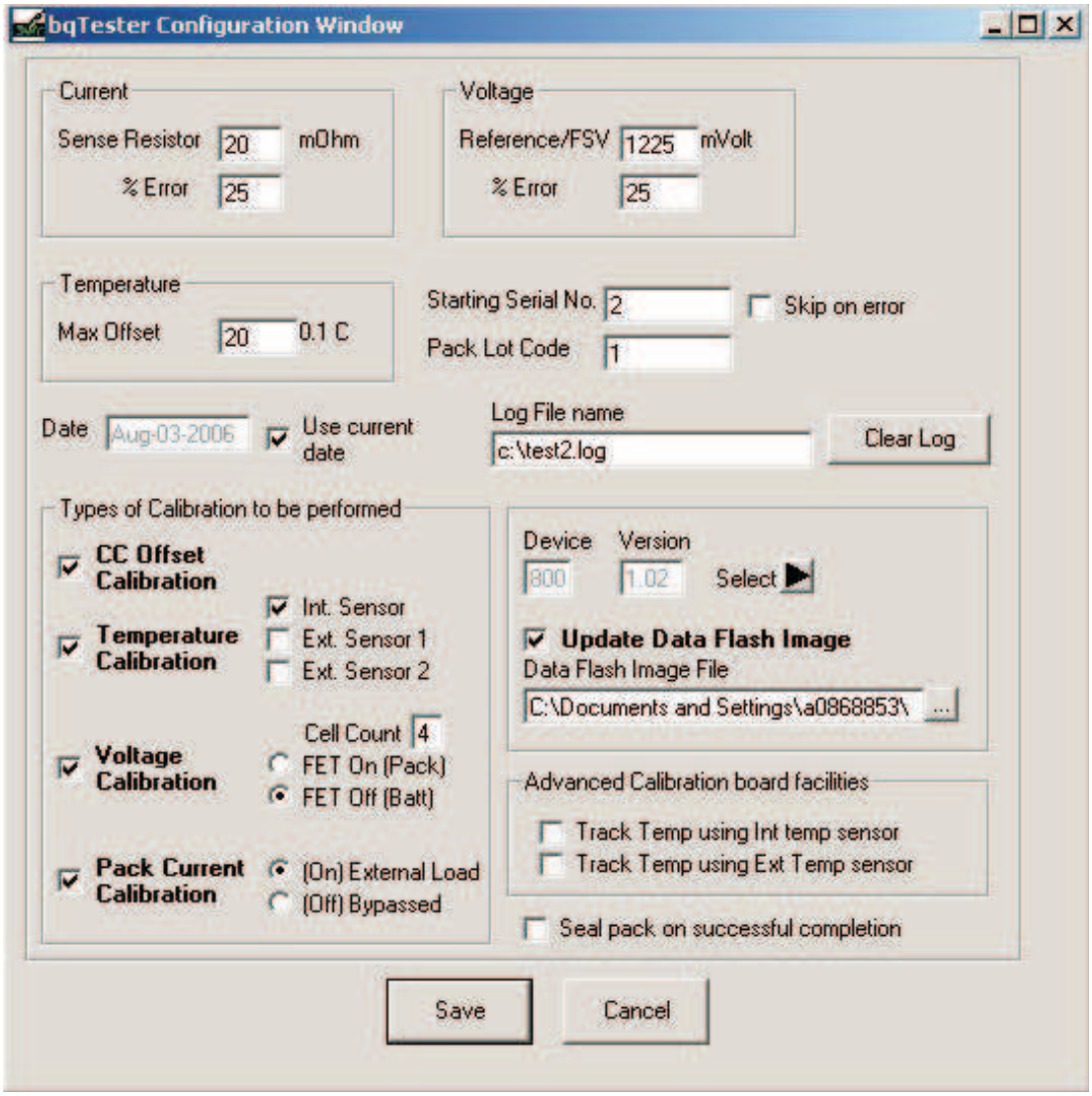


**Figure 22. Global Configuration Window**

### 4.2.4 Starting Serial Number

Enter the value for the serial number of the first Impedance Track-based smart battery module to be tested. This number is incremented by one as each new module is tested. If the Skip On Error check box is checked, the number is not incremented in the case of a module that fails the test. The default for this box is 1. This value must be specified as a positive integer value

### 4.2.5 Pack Lot Code

Enter the value for the Pack Lot Code of the group of Impedance Track-based smart battery modules currently being tested. This number does not change until it is changed manually and is programmed into each module tested. This value must be specified as a positive integer value.

### 4.2.6 Date

Enter the value for the desired date to be programmed into each Impedance Track-based smart battery module. If the Use Current Date check box is checked, the system date from the computer running the bqTester software is used.

### 4.2.7 Log File Name

Enter the complete path and file name to be used for the log file. This file contains all relevant test data for each Impedance Track-based smart battery module tested. If the Clear Log button is pressed, the log file contents are deleted.

### 4.2.8 CC Offset Calibration

This is the coulomb counter offset. No user-definable values are in this box. Select this calibration by placing a check in its selection box, or deselect it by removing the check. The default is checked. Note that if this test is disabled, the values from the gold data flash file are used and not the values currently in the part.

### 4.2.9 Temperature Calibration

This box shows the currently measured temperature and provides a box for the user to enter the actual temperature as measured by a calibrated meter. If the ambient air temperature changes, this value needs to be updated. This box also offers three different temperature probe selections. The proper selections should be made depending on the application. Temperature calibration can be selected by placing a check in its selection box or deselected by removing the check. The default is checked. Note that if this test is disabled, the values from the gold data flash file are used and not the values currently in the part.

### 4.2.10 Voltage Calibration

This box shows the currently measured voltage and provides a box for the user to enter the actual voltage being supplied to the part as measured by a calibrated meter. It also has a box for the user to enter the number of series cells being simulated. The default number of cells is 4. It also has a FET Control selection box. Select Off (Batt), and supply voltage to the simulation resistors as shown in Figure 16 (this configuration is the default). Never select On (Pack); it is only included for possible future use. To select voltage calibration, place a check in its selection box, or deselect it by removing the check. The default is checked. Note that if this test is disabled, the values from the gold data flash file are used and not the values currently in the part.

### 4.2.11 Pack Current Calibration

This box shows the currently measured current and provides a box for the user to enter the actual current being supplied to the part as measured by a calibrated meter. It also has a FET Control selection box. Always select On (External Load) and supply current to the Pack– and 1N (Batt–) inputs of the bq20zxx-based smart battery pack as shown in Figure 16 (this configuration is the default). Never select Off (Bypassed); it is only included for possible future use. To select Pack Current calibration, place a check in its selection box, or deselect it by removing the check. The default is checked. Note that if this test is disabled, the values from the gold data flash file are used and not the values currently in the part.

### 4.2.12 Device and Version

The correct Device and Version must be selected using the select (  ) button. Once the select button is pressed, select the proper device and firmware version of the modules to be tested form the dialog box that appears. If the device or version desired is not available, check the Texas Instruments Web site for an updated version of the bqTester software in the bqTester tool folder:

http://focus.ti.com/docs/toolsw/folders/print/bqtester.html

**Advanced Information:** For special/custom parts, it is possible that the part can be added to the file that holds all allowed parts compatible with bqTester. Using this option is sometimes tricky. It is recommended that TI be contacted before using this option to ensure that the bqTester has been tested with the requested device. The file to be edited is called *Targets* and is located in the directory that bqTester was installed. This file is shown in Figure 23.

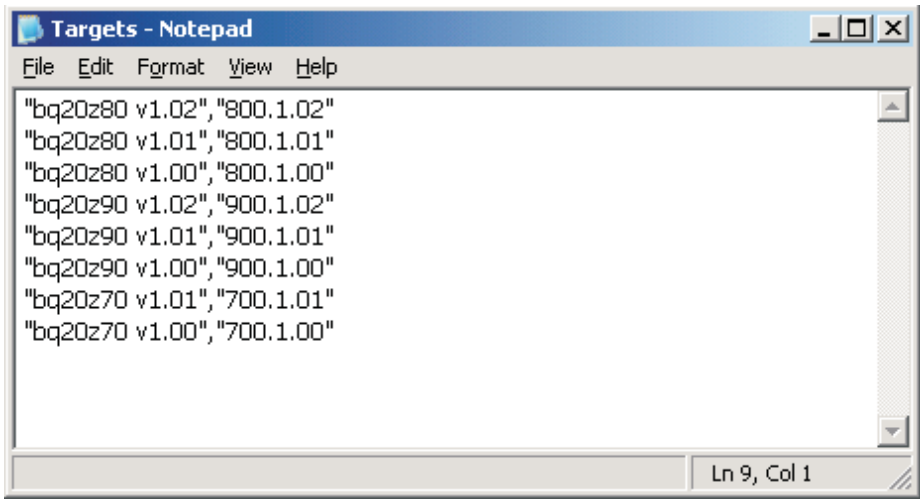


**Figure 23. Targets File**

### 4.2.13 Data Flash Image File

Input the location of the data flash Golden file that will be stored in all parts that will be tested when running the bqTester.exe program. Clicking the browse (…) button gives the option to browse for the Golden image file. If the *Update Data Flash Image* check box is not checked, then no data flash image will be installed in any parts. It is always recommended that an Image file be used.

### 4.2.14 Advanced Calibration Board Facilities

This frame contains two check boxes. These check boxes are not currently supported for single site testing. They are for use with the HPA169 calibration board when that functionality is added. Both should remain unchecked when using the single site tester software.

### 4.2.15 Seal Pack on Successful Completion

If checked, then the module is sealed on completion of the test.

### 4.2.16 Save

Clicking the Save button causes the current configuration settings to be saved.

## 4.3 VTI Configuration

Clicking the VTI Configuration button causes the VTI configuration box to be displayed as shown in Figure 24.

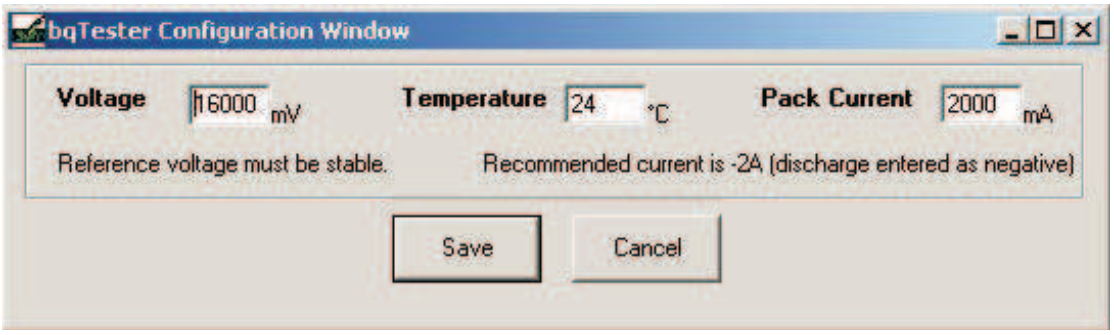


**Figure 24. VTI Configuration Box**

### 4.3.1 Voltage

Enter the voltage supplied by Power Supply 2 as seen in Figure 16. This voltage must be extremely stable. Set the voltage at 3.6 volts times the number of cells being simulated (e.g., 4 x 3.6 = 14.4 v for 4 cells). Measure this voltage with a calibrated meter.

### 4.3.2 Temperature

Enter the temperature near the module under test which has been measured with a calibrated meter.

### 4.3.3 Current

Enter the current supplied by Power Supply 1 as seen in Figure 16. A reasonable current setting is 2 amperes. This current value must be extremely stable. This voltage should be measured with a calibrated meter.

### 4.3.4 Save

Pressing the Save button causes the currently recorded values for V, T, and I to be saved.

## 4.4 Running the Test

### 4.4.1 Locking the Configuration

The test cannot be started until the Lock Configuration button has been clicked. First, check or uncheck the box called *Allow V, T, and I update while locked*. If selected, the user is able to change actual values for voltage, temperature, and current even though the configuration has been locked. If not selected, the user is unable to alter these values without unlocking the configuration. Note that the configuration must be currently unlocked to select this option. Once *Allow V, T, I*= while locked has been selected or deselected, click on *Lock Configuration*. This causes a password dialog to appear. Enter a password, and record it in a safe location for future reference. If you do not wish to enter the password every time the *Lock Configuration* button is pressed, check the box called *Quick Lock*. This causes555 the configuration to be locked with the current password. Notice that the Lock Status icon changes from an open lock to a closed lock. Also notice that the *Start* button is now active and testing can now begin.

### 4.4.2 Starting the Test

Click on the *Start* button to run the test. The software displays a busy indication and then indicates Pass or Fail. The software also displays information about each bq20zxx-based smart battery module tested and its Pass or Fail status. This same information is also recorded in a log file. The log file can be specified by pressing the *Log Instead To…* button. If a module fails, an error code is displayed and logged. Appendix A defines the error codes for the bqTester software. The information on the screen can be cleared by pressing the *Clear Screen* button. The statistical information can be cleared by pressing the *Clear Statistics* button.

## 5 Software Change Recommendations

1. Add new files when new functionality is added. Do not edit existing files.
2. Edit modSerial.bas to change the way serial numbers are generated.
3. Examples of how to use existing functions to read/write gas gauge constants can be found in the modGGDF.bas file. It is recommended that end-users use these functions for data flash access instead of writing their own.

# Appendix A Error Code Definitions

**Table A-1. Error Code Definitions**

| Error Code | Error # | Description | Most Probable Cause | Possible Action |
|---|---|---|---|---|
| NO_ERROR | 0 | Successful (No errors) | | |
| LOST_SYNC | 1 | EV2300 lost synchronization | EV2300 has outdated firmware or drivers are outdated. | Contact TI to get EV2300 with latest firmware. Ensure latest drivers for EV2300 installed. |
| NO_USB | 2 | USB Connection Missing | No EV2300 is connected. | Close program, reboot, and connect EV2300 first. |
| BAD_PEC | 3 | Bad PEC on SMBus | Possible Bad hardware. | Replace EV2300 / target board |
| WRONG_NUM_BYTES | 5 | Unexpected number of bytes sent/received | Unexpected hardware behavior. | May need assistance from TI |
| T2H_UNKNOWN | 6 | SMBus communication terminated unexpectedly / timed out or the bus was busy. | Wrong kind of target connected or target timing is off Trim oscillator | make sure that the target mode accepts the SMB command being sent |
| INCORRECT_PARAM | 7 | Invalid parameter type passed to function – especially Variant argument. | Incorrect parameter in call to function. Software Bug or overflow | Contact TI |
| TIMEOUT_ERROR | 8 | USB Timeout | No response on USB | EV2300 or driver problems or software is not supposed to wait for a response. |
| INVALID_DATA | 9 | AssemblePacket could not build a valid packet | Bad data / bad packet. Software found problem with data | Possible version incompatibility between BqTester and Module under test. |
| ERR_UNSOLICITED_PKT | 10 | Found an unsolicited non-error packet when looking for error packets | Unexpected packet received. The packet may be a response from a previous transaction that failed or that did not check the response. | Make corrections to software |
| COMPARE_DIFFERENT | 11 | Comparison failed and data read is different from srec | Flash comparison results in mismatch. Possible Flash failure or SMBus failure. | Module under test Flash failure |
| BQ80XRW_OCX_INTERNAL_ERROR | 12 | Problems with pointers being NULL etc. | Possible software bug or overflow. | Contact TI |
| USER_CANCELLED_OPERATION | 34 | User clicked on cancel button on progress bar dialog | | |
| DF_CHECKSUM_MISMATCH | 51 | Data Flash checksum mismatch | Flash comparison results in mismatch. Possible Flash failure or SMBus failure. | Module under test Flash failure |
| IF_CHECKSUM_MISMATCH | 52 | Instruction Flash checksum mismatch | Flash comparison results in mismatch. Possible Flash failure or SMBus failure. | Module under test Flash failure |
| OPERATION_UNSUPPORTED | 53 | Unsupported type | Software problem | Check that Module under test and bqTester versions are compatible. Then contact TI |
| ERR_TOO_MANY_QUERIES | 81 | Not used | | |
| ERR_BAD_QUERY_ID | 82 | Not used | | |
| BAD_CRC | 83 | Packet was corrupted during USB communication | Too much noise or bad connection | |
| ERR_TOO_MANY_RESPONSES | 84 | Not used | | |
| ERR_NO_QUERIES_TO_DELETE | 85 | Not used | | |
| ERR_QUERY_UNAVAILABLE | 86 | Not used | | |
| ERR_NO_RESPONSES_TO_DELETE | 87 | Not used | | |
| ERR_RESPONSE_UNAVAILABLE | 88 | Not used | | |
| ERR_TMMT_NO_RESPONSE | 90 | Not used | | |

**Table A-1. Error Code Definitions (continued)**

| Error Code | Error # | Description | Most Probable Cause | Possible Action |
|---|---|---|---|---|
| T2H_ERR_TIMEOUT | 92 | SMBus communication terminated unexpectedly / timed out or the bus was busy. | Wrong kind of target connected or target timing is off Trim oscillator | make sure that the target mode accepts the SMB command being sent |
| BUS_BUSY | 94 | SMBus communication terminated unexpectedly / timed out or the bus was busy. | Wrong kind of target connected or target timing is off Trim oscillator | make sure that the target mode accepts the SMB command being sent |
| T2H_ERR_BAD_SIZE | 95 | SMBus communication terminated unexpectedly / timed out or the bus was busy. | Wrong kind of target connected or target timing is off Trim oscillator | make sure that the target mode accepts the SMB command being sent |
| ERR_BAD_PAYLOAD_LEN | 97 | Packet was corrupted during USB communication or software sent in a bad packet | Bad USB connection | Check Version Compatibility and USB cable |
| ERR_TMMT_LIST_FULL | 98 | Not used | | |
| ERR_TMMT_BAD_SELECTION | 99 | Not used | | |
| UNKNOWN | 100 | Unexpected/unknown error | | Outdated software Contact TI |
| UNEXPECTED_ERROR | 110 | Should not happen | Unexpected error | Hardware not expected to respond to this error |
| OUT_OF_MEMORY | 111 | Not enough memory on PC | | Install more memory |
| SREC_OPEN_FAIL | 221 | Srec specified does not exist or cannot be opened | SREC targets a different device than the one detected on the SMBus | Ensure version compatibility between bqTester software and Module under Test. |
| SREC_BAD_START_RECORD | 222 | Srec not in expected format | SREC targets a different device than the one detected on the SMBus | Ensure version compatibility between bqTester software and Module under Test. |
| SREC_UNKNOWN_TYPE | 223 | Srec not in expected format | SREC targets a different device than the one detected on the SMBus | Ensure version compatibility between bqTester software and Module under Test. |
| SREC_BAD_CHECKSUM | 224 | Srec not in expected format | SREC targets a different device than the one detected on the SMBus | Ensure version compatibility between bqTester software and Module under Test. |
| SREC_BAD_RECORD_COUNT | 225 | Srec not in expected format | SREC targets a different device than the one detected on the SMBus | Ensure version compatibility between bqTester software and Module under Test. |
| SREC_DEV_MISMATCH | 226 | | SREC targets a different device than the one detected on the SMBus | Ensure version compatibility between bqTester software and Module under Test. |
| CONFIG_OPEN_FAIL | 227 | Config file not found / cannot be opened | | Redo StationSetup.exe configuration |
| CONFIG_UNEXPECTED_EOF | 228 | Config file not found / cannot be opened | | Redo StationSetup.exe configuration |
| CONFIG_BAD_FORMAT | 229 | Config file format incorrect | | Redo StationSetup.exe configuration |
| PCFG_DEVVER_MISMATCH | 231 | Config file device version not compatible | | Ensure version compatibility between bqTester software and Module under Test. |
| PCFG_DEV_MISMATCH | 232 | Config file device not compatible | | Ensure version compatibility between bqTester software and Module under Test. |
| PCFG_SRECDEVVER_MISMATCH | 233 | Srec not compatible with current hardware device | | Ensure version compatibility between bqTester software and Module under Test. |

## Table A-1. Error Code Definitions (continued)

| Error Code | Error # | Description | Most Probable Cause | Possible Action |
|---|---|---|---|---|
| PCFG_SRECDEV_MISMATCH | 234 | Srec not compatible with current hardware device | | Ensure version compatibility between bqTester software and Module under Test. |
| BCFG_DEVVER_MISMATCH | 235 | Srec not compatible with current hardware device | | Ensure version compatibility between bqTester software and Module under Test. |
| BCFG_DEV_MISMATCH | 236 | Srec not compatible with current hardware device | | Ensure version compatibility between bqTester software and Module under Test. |
| SMBC_LOCKED | 260 | Unused but reserved for backward compatibility | | |
| | 516 | Unused but reserved for backward compatibility | | |
| T2H_NACK | 772 | No response from target | Target not connected/not powered | Connect target and check is correct power is applied |
| SMBD_LOW | 1028 | Unused but reserved for backward compatibility | | |
| SMB_LOCKED | 1284 | Unused but reserved for backward compatibility | | |
| ERR_NOTHINGTODO | 5001 | Calling the function with specified values resulted in nothing being done | | |
| ERR_VOLTAGE_LESSTHANZERO | 5002 | Specified Voltage must be greater than 0 | | |
| ERR_TEMPERATURE_LESSTHANZERO | 5003 | Specified temperature must be greater than 0 | | |
| ERR_CURRENT_EQUALSZERO | 5004 | Specified current cannot be 0 | | |
| ERR_NOT_IN_CAL_MODE | 5010 | Gas gauge was not in Calibration mode/ could not be put in calibration mode | | |
| ERR_CALIBRATION_IN_FIRMWARE_ FLASHWRITE | 5020 | Error writing flash in calibration mode | | |
| ERR_CALIBRATION_IN_FIRMWARE_AFE | 5021 | Error in AFE calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ PACKV | 5022 | Error in Pack voltage calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ PACKG | 5023 | Error in Pack gain calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ VGAIN | 5024 | Error in Voltage gain calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ CCIGAIN | 5025 | Error in Current gain calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ TMPOFFEXT1 | 5026 | Error in external temperature 1 offset calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ TMPOFFEXT2 | 5027 | Error in external temperature 2 offset calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ TMPOFFINT | 5028 | Error in internal temperature offset calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ ADCOFF | 5029 | Error in ADC offset calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ BRDOFF | 5030 | Error in Board offset calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ CCIOFF | 5031 | Error in CC offset calibration | Value too large (Overflow) in firmware | |
| ERR_CALIBRATION_IN_FIRMWARE_ RSVD0 | 5032 | Reserved for future use | | |

**Table A-1. Error Code Definitions (continued)**

| Error Code | Error # | Description | Most Probable Cause | Possible Action |
|---|---|---|---|---|
| ERR_CALIBRATION_IN_FIRMWARE_RSVD1 | 5033 | Reserved for future use | | |
| ERR_CALIBRATION_IN_FIRMWARE_RSVD2 | 5034 | Reserved for future use | | |
| ERR_CALIBRATION_IN_FIRMWARE_RSVD3 | 5035 | Reserved for future use | | |
| ERR_CALIBRATION_IN_FIRMWARE_RSVD4 | 5036 | Reserved for future use | | |
| ERR_CALIBRATION_IN_FIRMWARE_RSVD5 | 5037 | Reserved for future use | | |
| ERR_CALIBRATION_IN_FIRMWARE_RSVD6 | 5038 | Reserved for future use | | |
| ERR_CALIBRATION_IN_FIRMWARE_UNDEFINED | 5039 | Unknown error code returned by hardware | Software is obsolete | |
| ERR_DF_RD_REQ_B4_WR | 5041 | Data flash cannot be written before reading the remaining values in a given class | | |
| ERR_INVALID_DATA_ENTERED | 5042 | Invalid data entered on screen | | |
| ERR_USB_ACQUIRE | 5043 | EV2300 is locked by another thread | Attempting to do multiple transactions possibly from different windows in background at the same time. Could also be a software problem. Stop scanning in SBS. | |
| NVALID_FILENAME | 65537 | | | Check File Name for Rom File and Log File |
| DEVICE_VERSION_MISMATCH | 65538 | Incompatible device/version | | Check Connections. Verify version compatibility between bqTester software and Module under Test. |
| RETURN_TO_ROM_FAILED | 65539 | Gas gauge could not be put in Rom mode | Hardware incompatibility | Check Connections. Verify version compatibility between bqTester software and Module under Test. |
| RUNGG_FAILED | 65541 | Gas gauge could not exit ROM mode | Hardware incompatibility | Check Connections. Verify version compatibility between bqTester software and Module under Test. |
| WRITEFLASH_GG_FAILED | 65542 | Writing to flash failed | Data Flash Failure | Module Repair |
| CALIBRATE_FAILED | 65543 | Calibration failed | Module hardware failure or Configuration failure | Module Repair or Check Testing Configuration Settings |
| POST_CAL_CHECKS_FAILED | 65544 | Post calibration checks failed | Module hardware failure or Configuration failure | Module Repair or Check Testing Configuration Settings |
| WRITESERIAL_FAILED | 65545 | Write serial number failed | Data Flash Failure | Module Repair/Retry Test |
| ERR_UNEXPECTED | 65552 | Unexpected value/response | Software does not know how to handle this | |
| ERR_FILE | 65553 | Error opening/processing File | Wrong File location settings. | Check all File location settings in bqTester Software |
| ERR_NOT_IN_ROM | 65554 | GG not in ROM mode when expected – communication failure? | Gas gauge could not be put in ROM | Check Connections. Verify version compatibility between bqTester software and Module under Test. |

**Table A-1. Error Code Definitions (continued)**

| Error Code | Error # | Description | Most Probable Cause | Possible Action |
|---|---|---|---|---|
| ERR_ENTER_CALMODE | 65555 | Cannot put GG in Cal mode | Gas gauge could not be put in Calibration mode | Check Connections. Verify version compatibility between bqTester software and Module under Test. |
| ERR_CUSTOM_FUNC | 65556 | User defined function returned error | | |
| BAD_FILE_FORMAT | 65557 | Header bad or format bad | Bad image file format | |
| ERR_WRITE_MFG_DATA | 65558 | Failed to write manufacturer data | Data Flash Failure | Module Repair/Retry Test |
| ERR_READ_DEV_VER | 65559 | Communication error reading device version | Hardware incompatibility | Check Connections. Verify version compatibility between bqTester software and Module under Test. |
| CAL_VOLT_LESSTHANZERO | 65600 | Calibration voltage must be greater than 0 | On screen values incorrect | Verify VTI and Configuration Settings |
| CAL_TEMP_LESSTHANZERO | 65601 | Calibration current must be greater than 0 | On screen values incorrect | Verify VTI and Configuration Settings |
| CAL_CURR_LESSTHANZERO | 65602 | Calibration current must be greater than 0 | On screen values incorrect | Verify VTI and Configuration Settings |
| WRITEFLASH_ROM_FAILED | 65560 | Failed to write flash while in ROM mode | | |
| SENSE_RES_CAL_HIGH | 65570 | Sense resistor value too high in post cal checks | Sense Resistor Hardware Failure, Connection Problem, Setting Problem, or HPA169 Power Supply Problem | Verify Sense Resistor Value, check current supply connections, and verify VTI and Configuration Settings. Try increasing tolerances if possible |
| SENSE_RES_CAL_LOW | 65571 | Sense resistor value too low in post cal checks | Sense Resistor Hardware Failure, Connection Problem, Setting Problem, or HPA169 Power Supply Problem | Verify Sense Resistor Value, check current supply connections, and verify VTI and Configuration Settings. Try increasing tolerances if possible |
| VOLT_CAL_HIGH | 65580 | voltage value too high in post cal checks | Module hardware failure, HPA169 Voltage power supply problem or Configuration failure | Verify Voltage circuit, voltage power supply, VTI, and Configuration Settings. Try increasing tolerances if possible |
| VOLT_CAL_LOW | 65581 | voltage value too low in post cal checks | Module hardware failure, HPA169 Voltage power supply problem or Configuration failure | Verify Voltage circuit, voltage power supply, VTI, and Configuration Settings. Try increasing tolerances if possible |
| TEMP_CAL_HIGH | 65590 | temperature value too high in post cal checks | Module hardware failure, HPA169 Temperature sensor Failure | Verify VTI settings, and Temperature sensor location |
| TEMP_CAL_LOW | 65591 | temperature value too low in post cal checks | Module hardware failure, HPA169 Temperature sensor Failure | Verify VTI settings, and Temperature sensor location |
| SEAL_CMD_FAILED | 65610 | Seal command failed | Communication Failure | Check Connections. Verify version compatibility between bqTester software and Module under Test. |
| ERR_READ_CB_INT_TEMP_SENSOR | 65611 | Error reading internal temperature sensor on HPA169 calibration board | Temperature sensor failure | Verify HPA169 calibration board temperature sensor connections or replace sensor |
| ERR_READ_CB_EXT_TEMP_SENSOR | 65612 | Error reading external temperature sensor on HPA169 calibration board | Temperature sensor failure | Verify HPA169 calibration board temperature sensor connections or replace sensor |

**Table A-1. Error Code Definitions (continued)**

| Error Code | Error # | Description | Most Probable Cause | Possible Action |
|---|---|---|---|---|
| ERR_CALIBRATION_OUTOFSPEC | 65613 | Time to recalibrate HPA169 calibration board | VTI calibration Timer expired | Calibrate VTI settings |
| ERR_TEST_ROUTINE | 65614 | Reserved | | |

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