

BMS Software and Solutions : Windows 10 Test plan report

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Introduction

Many BMS products have associated software that is essential to evaluation of the product. Software that is made available is typically created in the year of product release. With passage of time the operating systems used to create and evaluate the product become obsolete. There are multiple layers of compatibility provided on the new operating system for use with older programs and it is usually possible to continue use the software on newer system. The objective of the Windows 10 test plan is to test previously released software on Windows 10, explore the different modes / settings that need to be tweaked and document a procedure which may apply to many similar software releases

Test coverage

Hardware:

Microsoft Surface 3
Resolution: 1920 x 1280
Full-size USB 3.0
Aspect ratio: 3:2
2GB RAM with 64GB storage
Quad Core Intel® Atom™ x7-Z8700 processor (2MB Cache, 1.6GHz with Intel Burst™ technology up to 2.4GHz)
Touch screen (virtual) keyboard input

TI products to test with:
USB cable
EV2300 (FW v3.1m)
EV2400 (FW v0.18)
SMBus cable
Bq40z50-R1 EVM
Bq27421 EVM
Bq30z554-R1
Power supplies / batteries for EVMs

Software:

Windows 10

EV2300 64 bit drivers

- At http://e2e.ti.com/support/power_management/battery_management/m/videos_files/458983
- Literature number: not assigned, link http://e2e.ti.com/support/power_management/battery_management/m/videos_files/458983/download

- Filename:
\\dlev1171\toolreleases\EV2x00\Drivers\EV2300a_Device_Driver_Installer_Multilanguage_0.6.exe

Bq Evaluation software (bqEVSW) v0.0.93

- On product page <http://www.ti.com/tool/bq30z554evm> as of 1/7/2016
- <http://www.ti.com/lit/zip/sluc516>
- Filename: \\dlev1171\bqEVSW\bqEVSWSetup00.09.92_bq30z554v0.11R1d.exe

Battery Management Studio (bqStudio) v1.3.45

- At <http://www.ti.com/tool/bqstudio> as of 1/7/2016
- Literature number: sluc525
- Filename:
[\\dlev1171\toolreleases\EVSW_SDK\OfficialbqSBBReleases\1.3.45\BatteryManagementStudio-1.3.45_Build5-windows-installer.exe](http://www.ti.com/tool/bqstudio)

Support components to enable specific TI software (bqEVSW) to work with EV2400

- At <http://www.ti.com/tool/EV2400> as of 1/14/2016
- Literature number sluc291
- Filename: <http://www.ti.com/lit/zip/sluc291> or
\\dlev1171\toolreleases\EV2x00\EV2400\EV2400_Support_Components_20110524.zip
-

Software installers

Software installers obtained from Texas instruments to be run on store bought PC/Tablet hardware. This ensures that no dependencies were pre-installed accidentally. The hardware requires a network connection to create an account with Microsoft in order to setup the PC/Tablet hardware.

Installers will be copied to the PC/tablet using a portable flash USB memory.

Assumption: No software dependencies are installed automatically by virtue of having an internet connection.

Test Procedure

Copy all installer files to a Flash USB drive. Attach Flash drive to Microsoft Surface USB. Copy all installer files to Windows 10 "Desktop" of Microsoft Surface. Eject the Flash drive and remove it.

Run installers in the following order

1. EV2300 drivers
2. bqStudio
3. bqEVSW

Verify operation of bqStudio before bqEVSW is installed

Take screenshots of installations and messages.

Make connections: For each EVM (Bq40z50-R1, Bq27421, Bq30z554-R1 EVMs)

1. Connect EV2300 to USB port
2. Connect Power supplies / batteries to EVM for power
3. Wake up Fuel gauge if required to allow Fuel gauge to communicate
4. Connect SMBus cable from EV2300 to EVM
5. Test with product recommended bqStudio or bqEvaluation software
6. Repeat the above test with EV2400

Note if the installer automatically asks for administrator privileges or if it must be manually run with administrator privileges.

Close software and restart from shortcut, note if behavior is different. If different then launch as administrator and note if it functions as desired.

Check if bqEvaluation software requires EV2400 support components to function. Note in such case. bqStudio is not expected to require the EV2400 support components.

Test Results Documentation

Document the need to install all software as administrator.

Document if installed software needs to be run as administrator(if it requires elevated privileges).

The installation order above is expected to be the worst case installation scenario. Check if the order in which software is installed can cause issues and document observations. Make a recommendation in the documentation to install the EV2300 driver first as it does not make sense to use the software without the possibility of a recognized EV2300 connection.

Results - Pass

Setup:

The following files were copied from a Flash drive to "Desktop" on Windows 10 PC. Folder name is "Windows10Testing". All installers were run from this location.

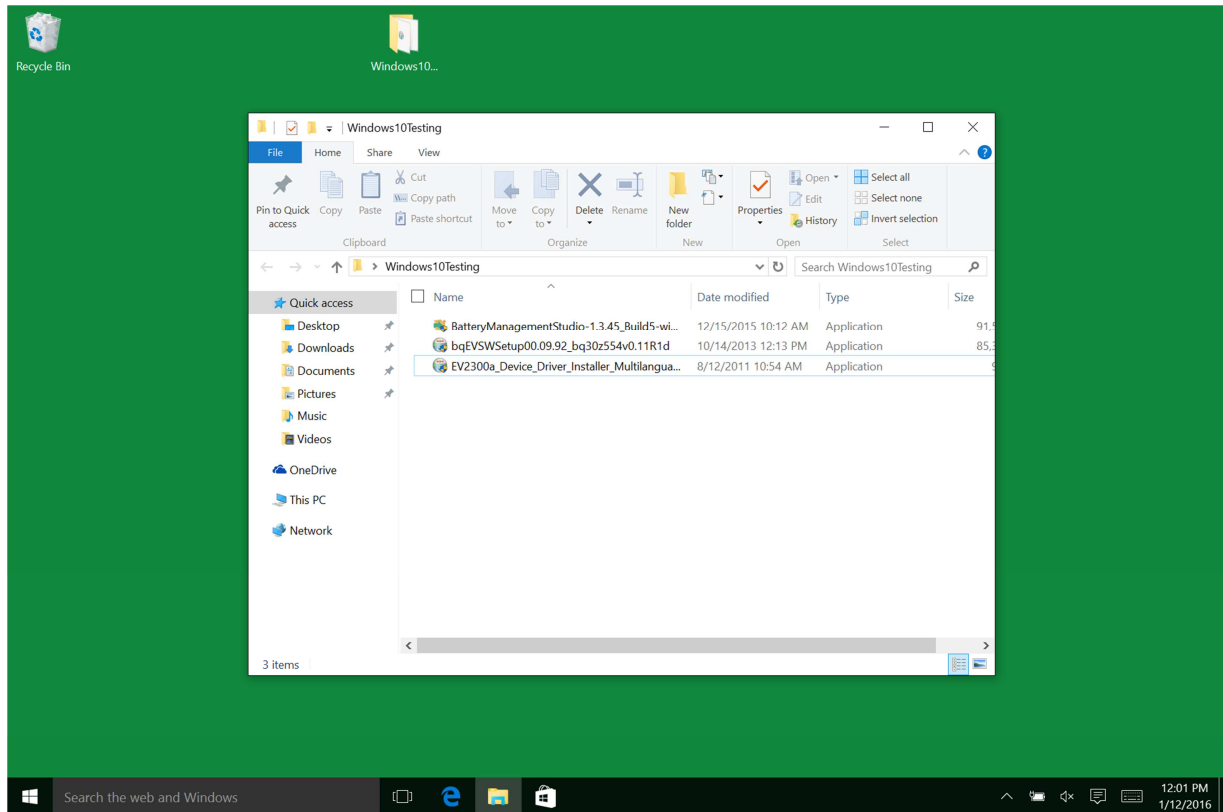


Figure 1: Files copied to Microsoft Surface running Windows 10

Installing EV2300 64 bit drivers

EV2300 64 bit driver installer automatically requests administrator privileges.

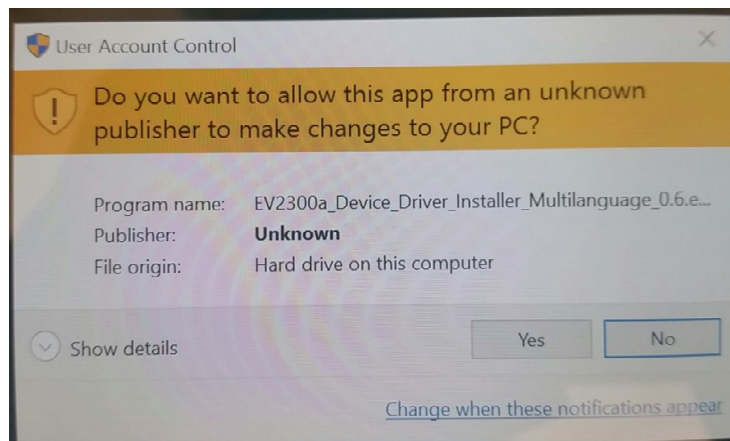


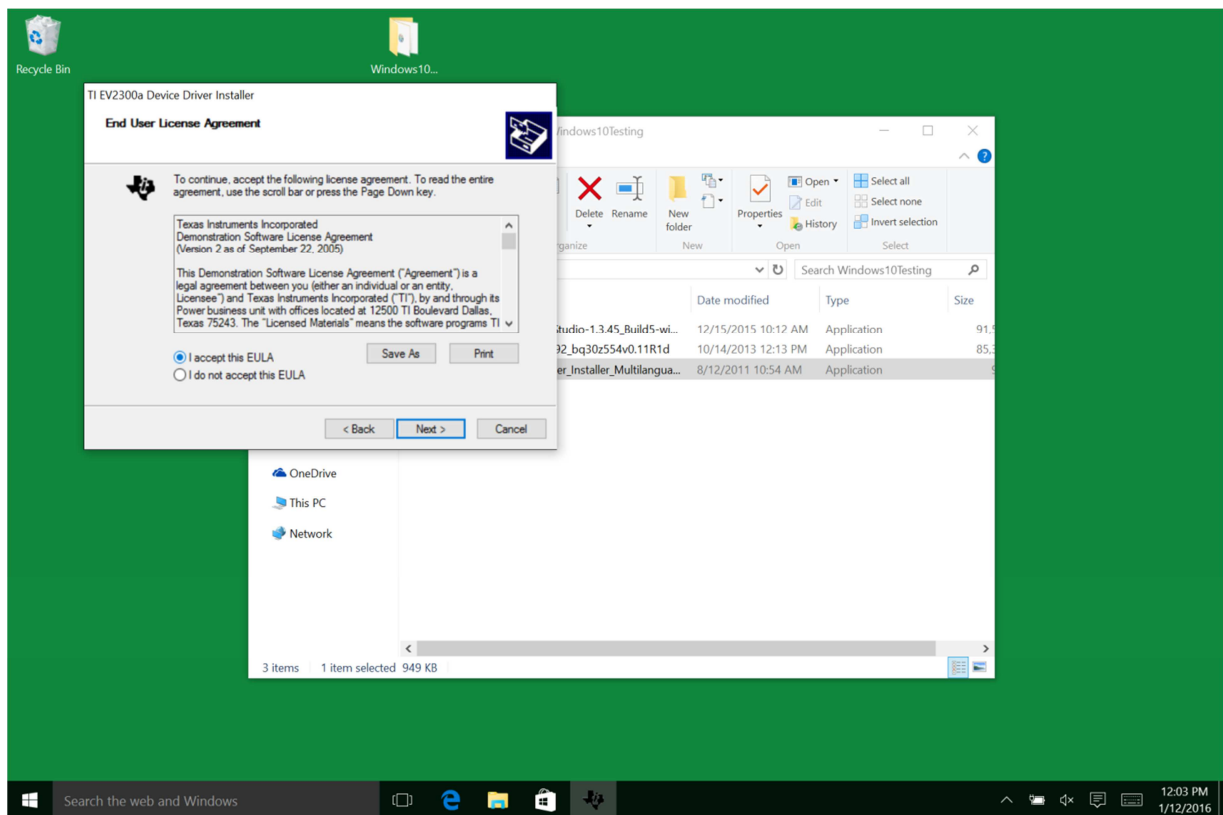
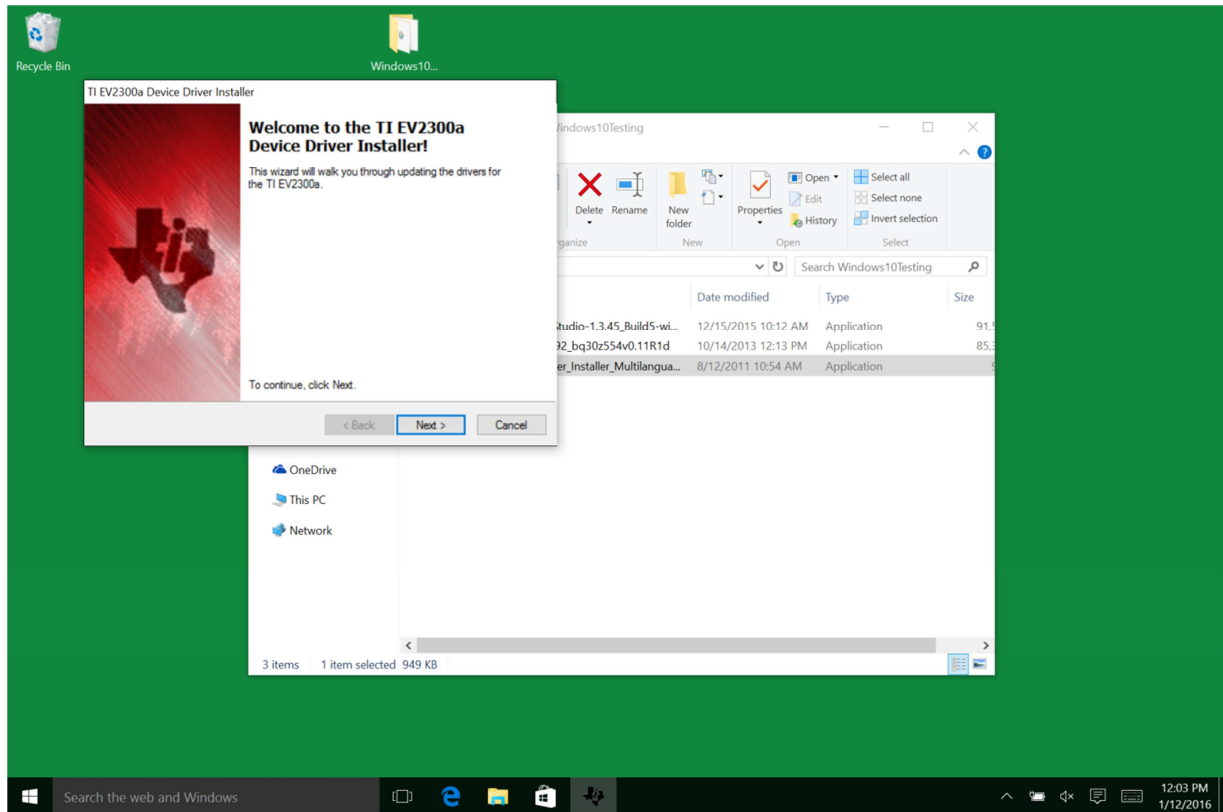
Figure 2: EV2300 64 bit driver Installer requests administrator privilege

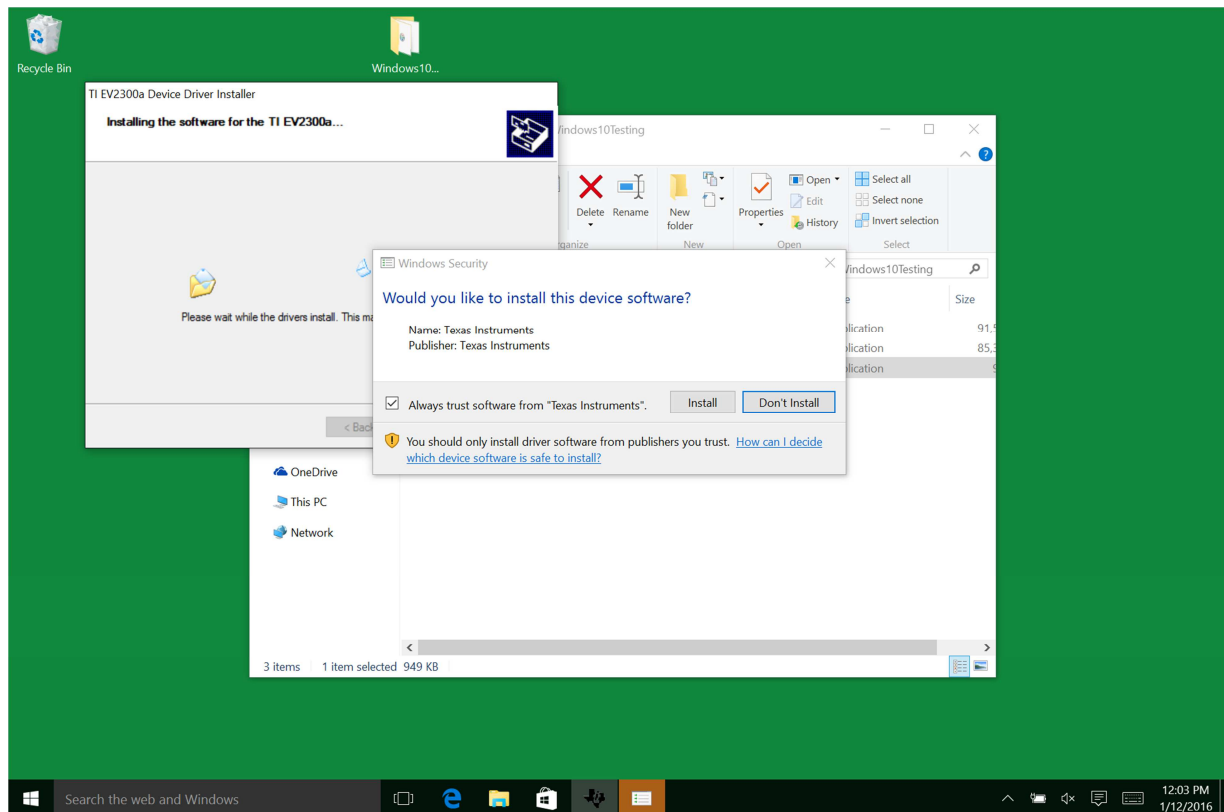
Picture 1b: Installer requests administrator privilege. Select "Yes"

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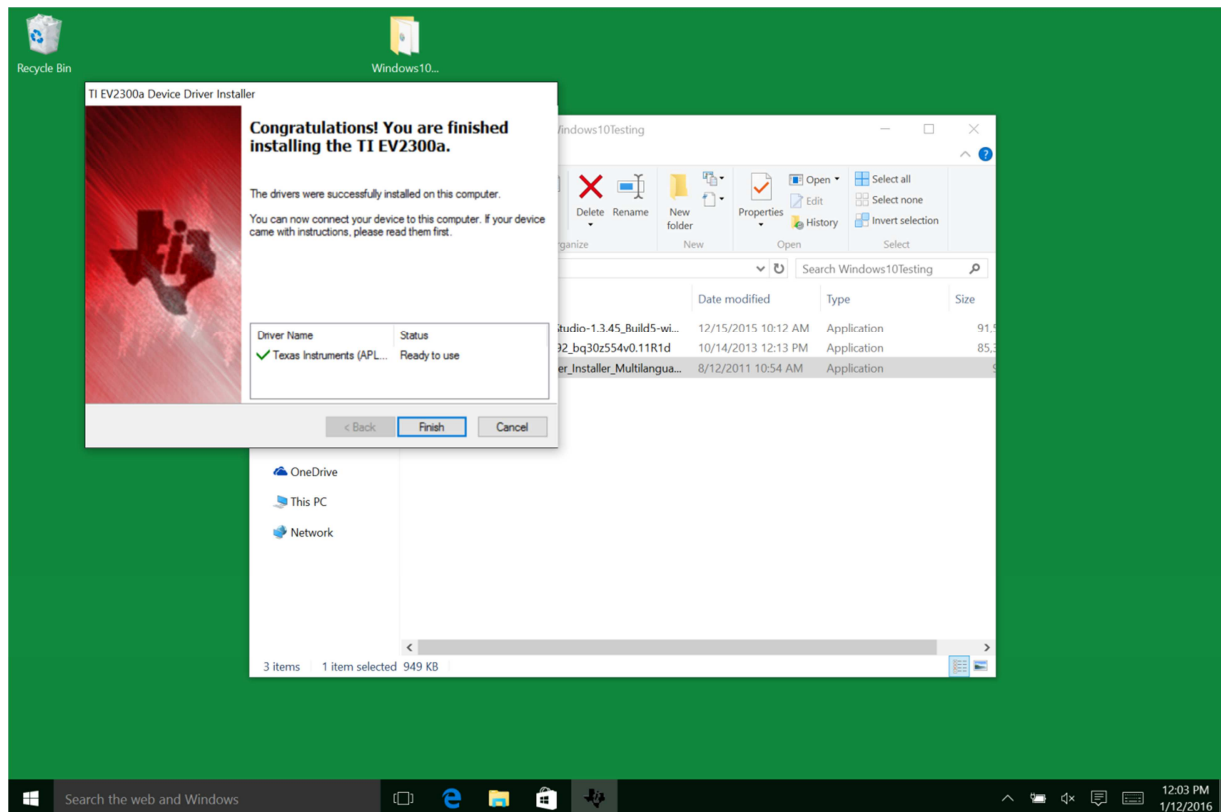
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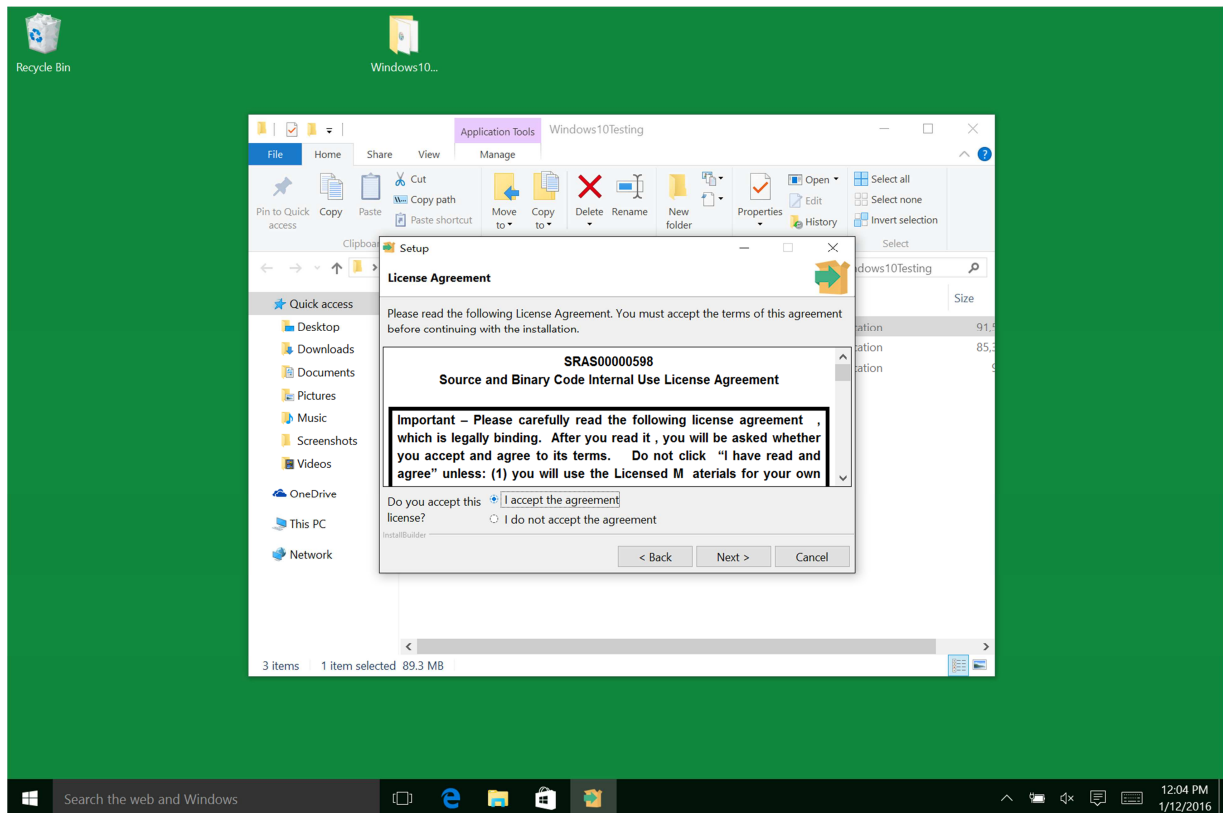
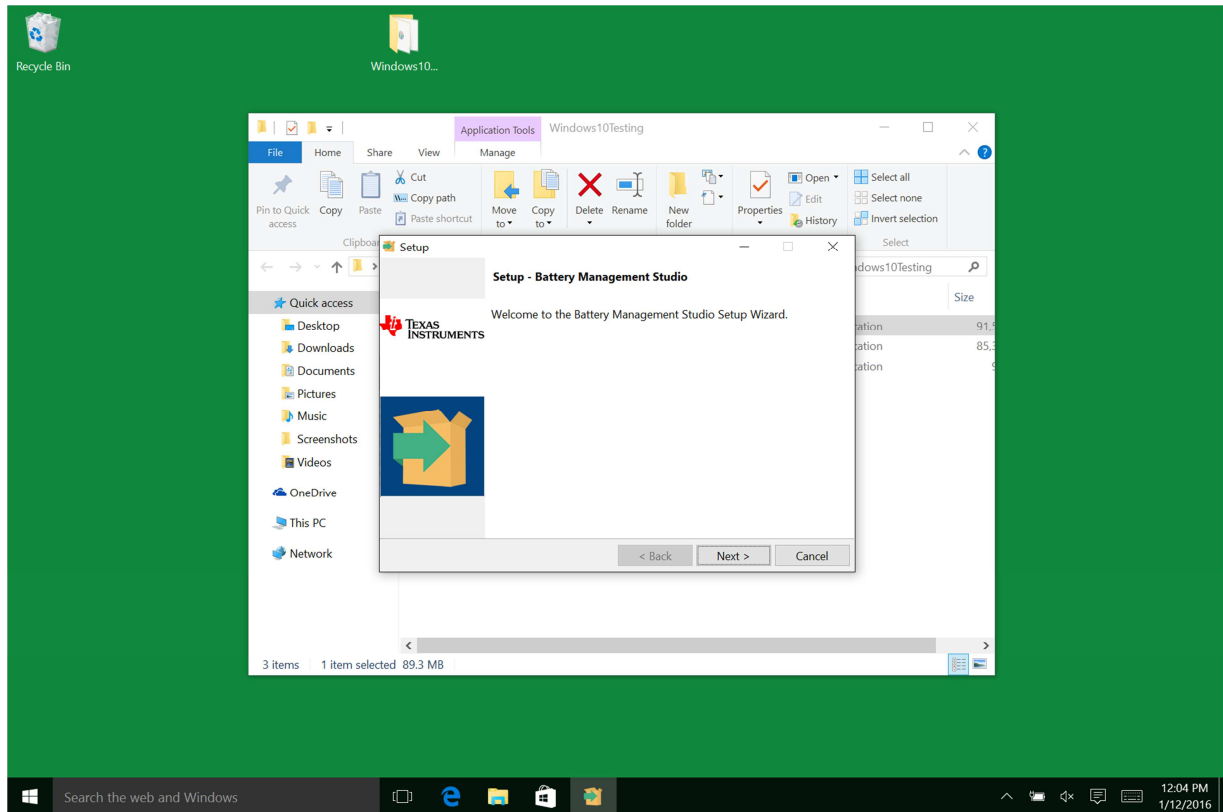


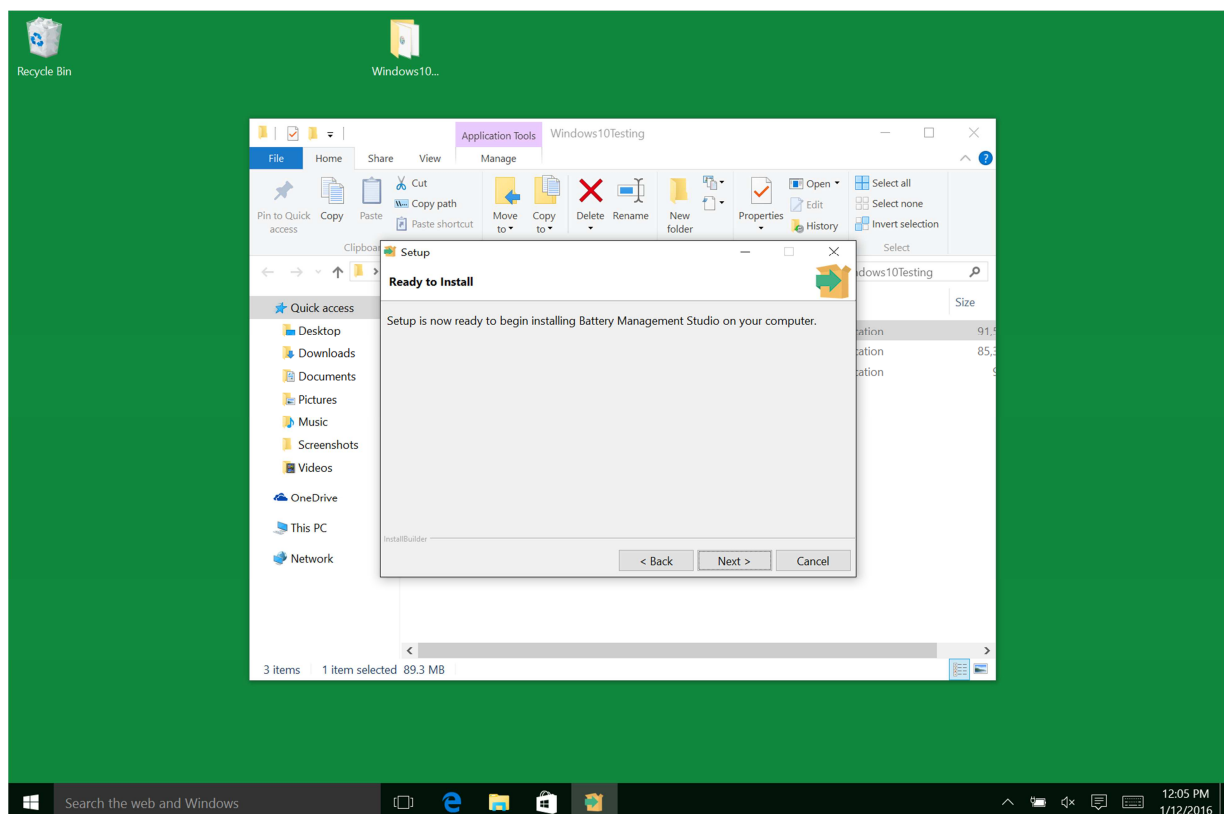
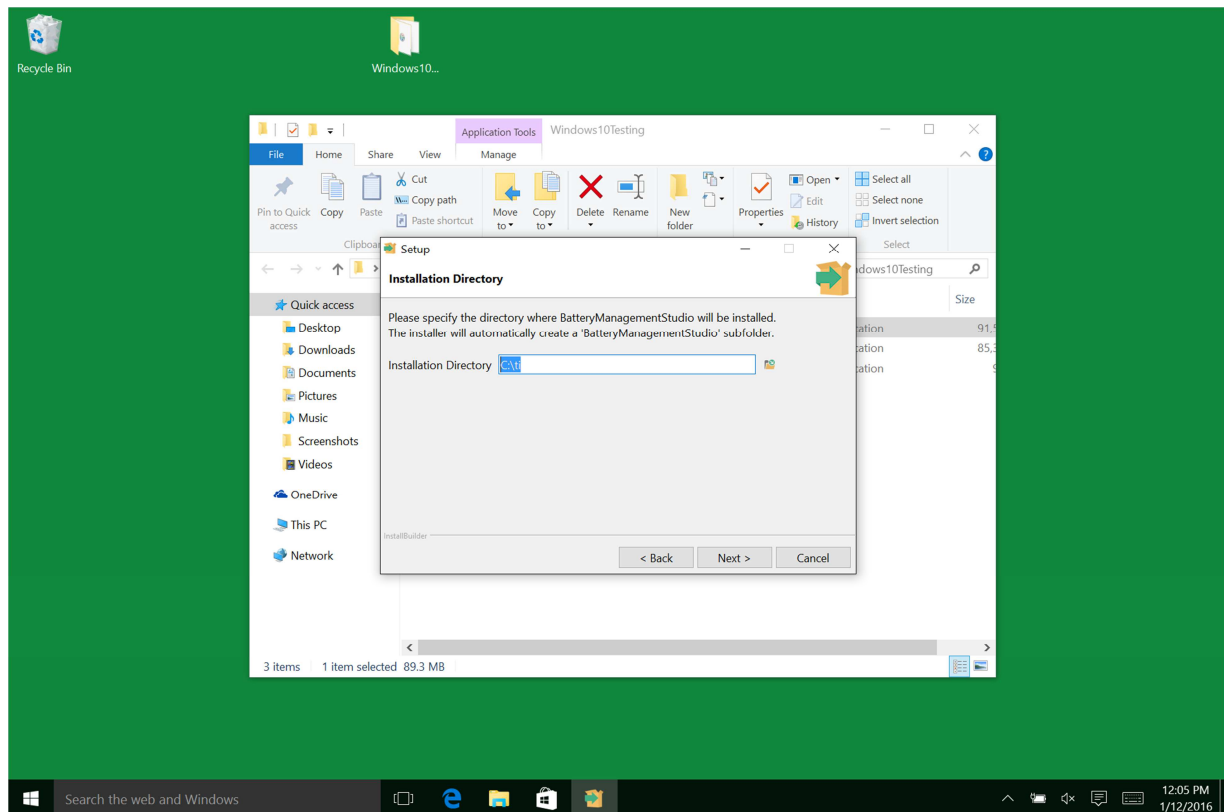
Select "Install".

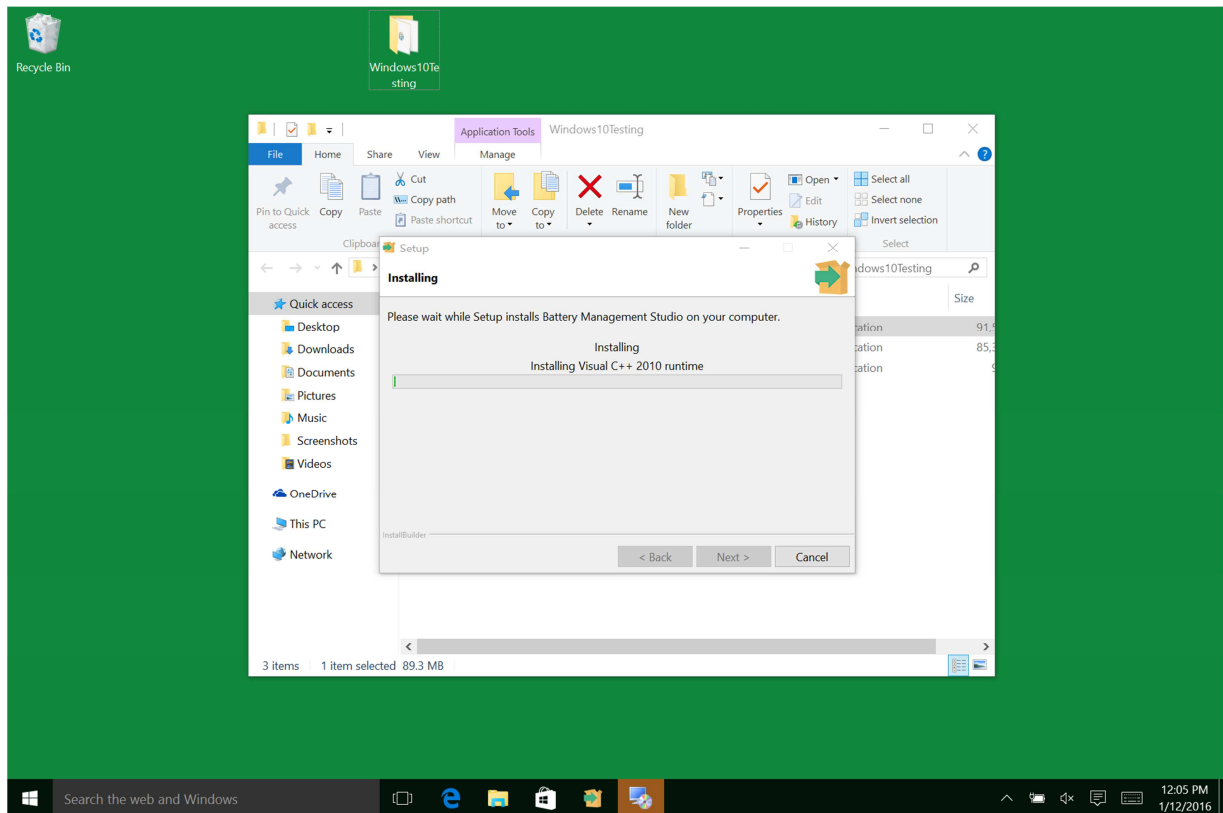
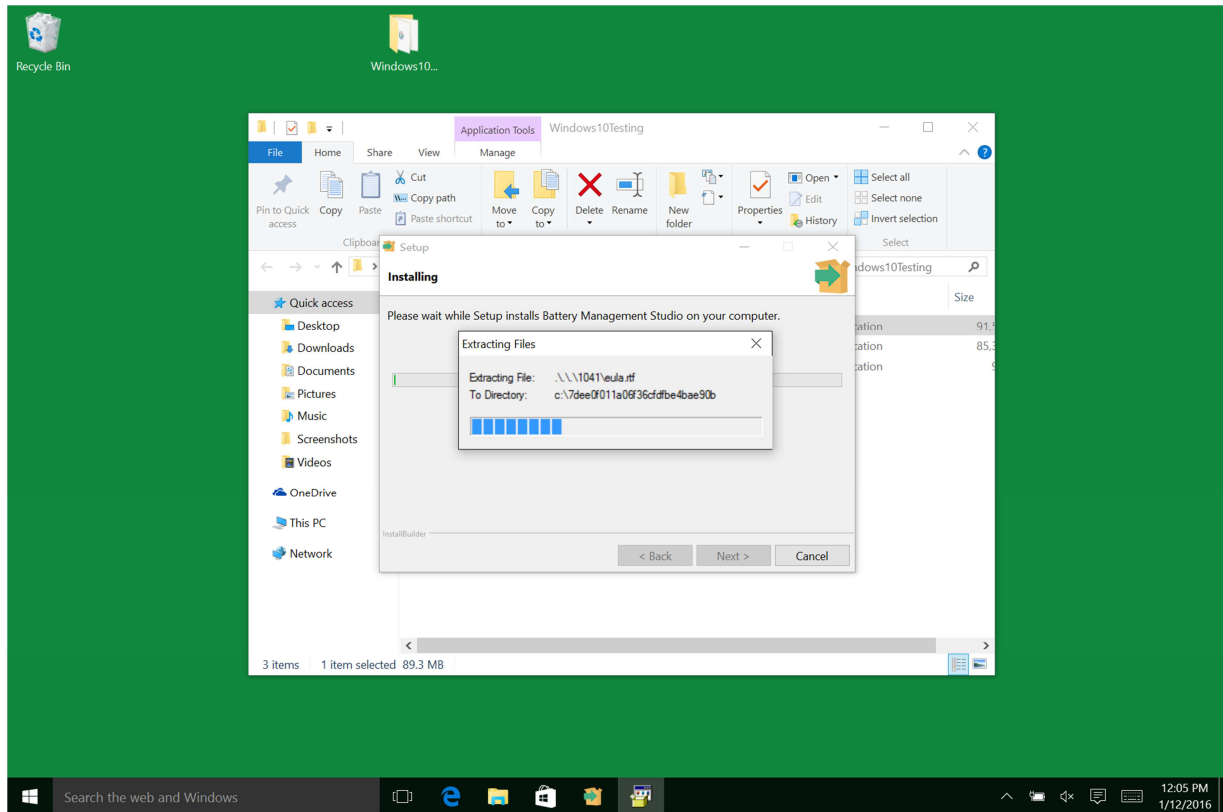


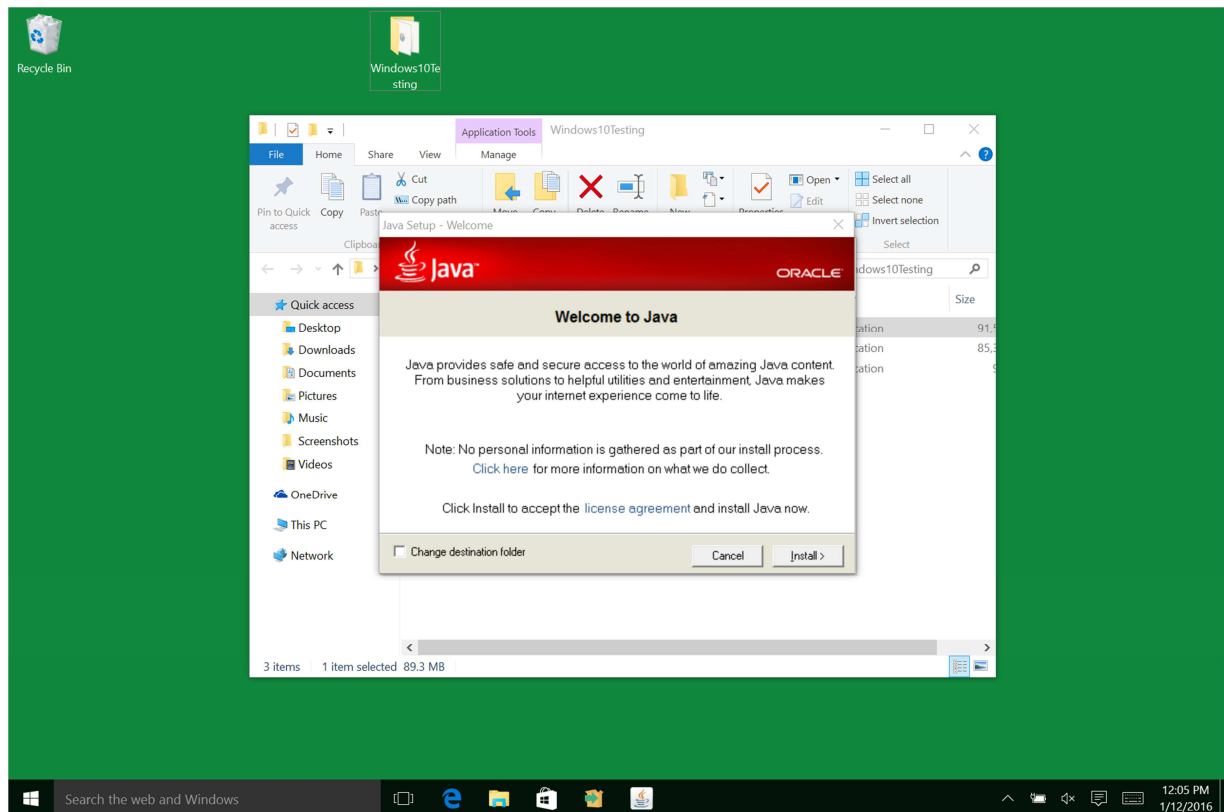
Installing Battery Management Studio

Battery Management Studio installer automatically requests administrator privileges. A message similar to the one shown in Figure 2 is displayed.

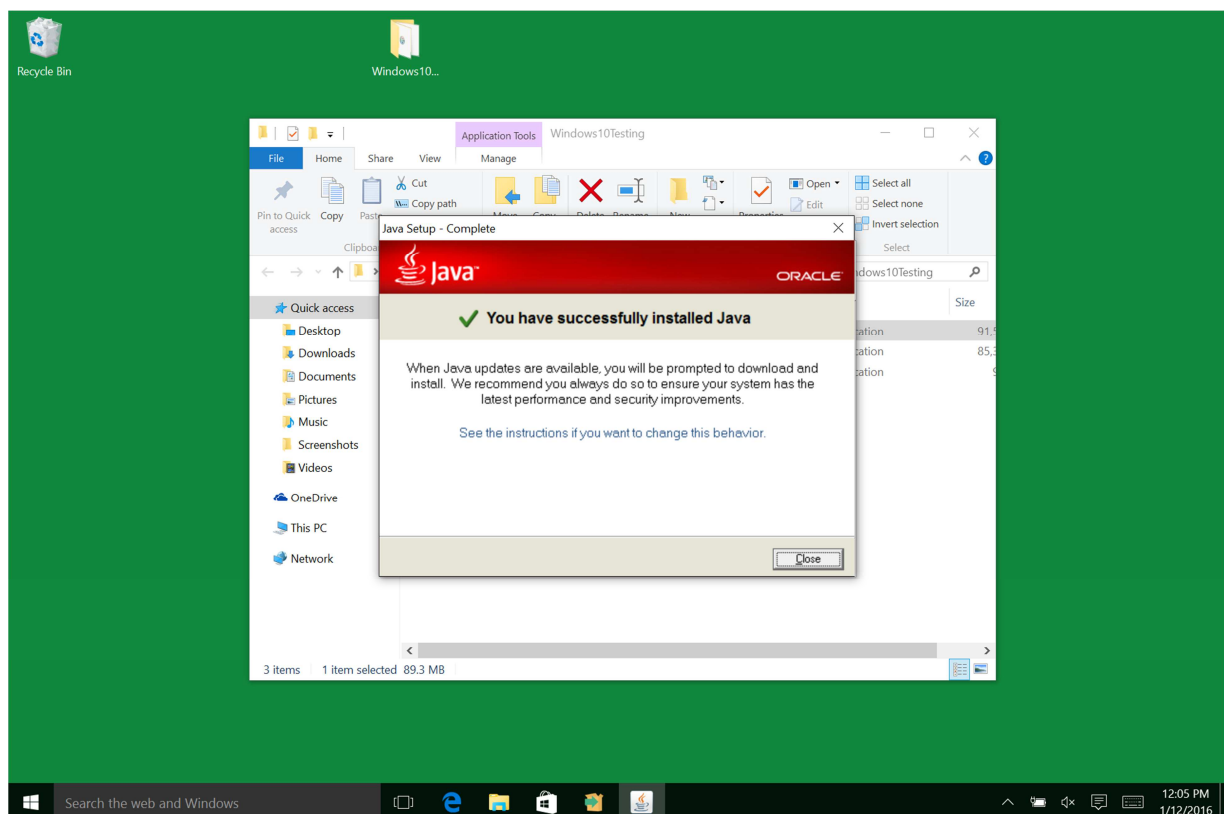
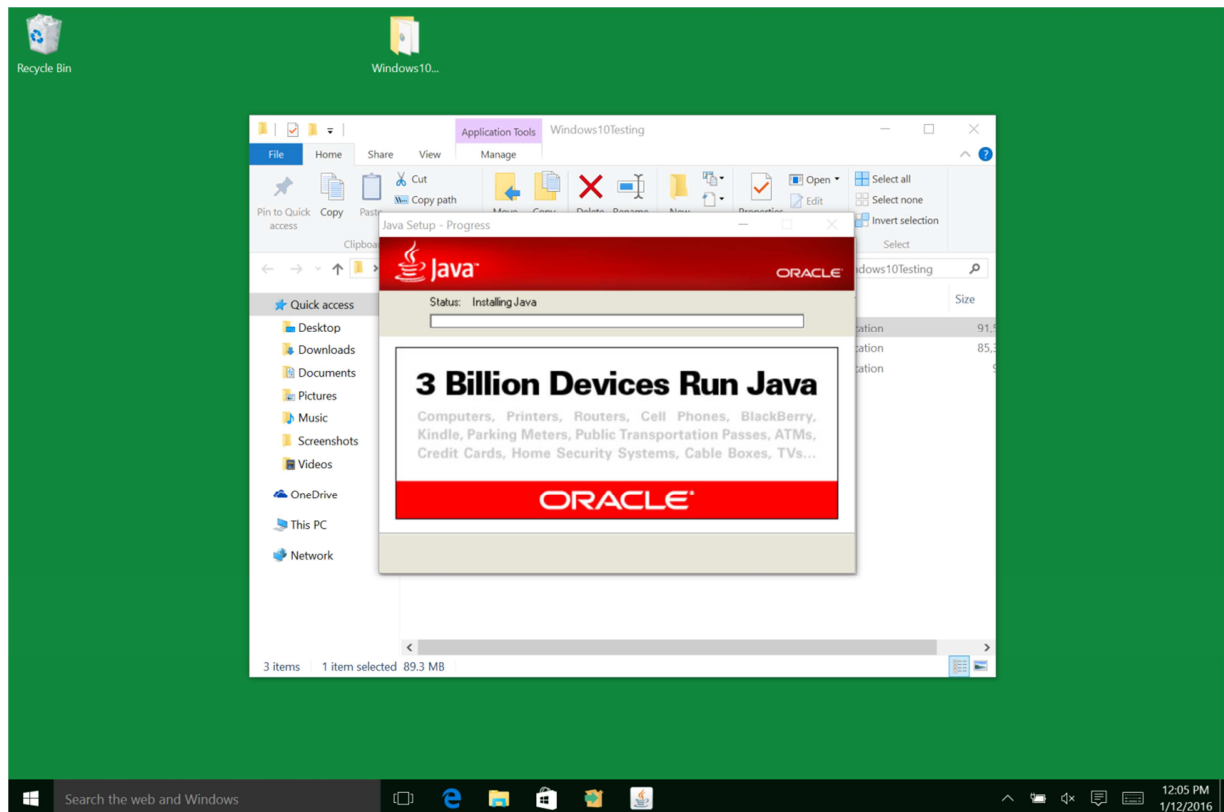






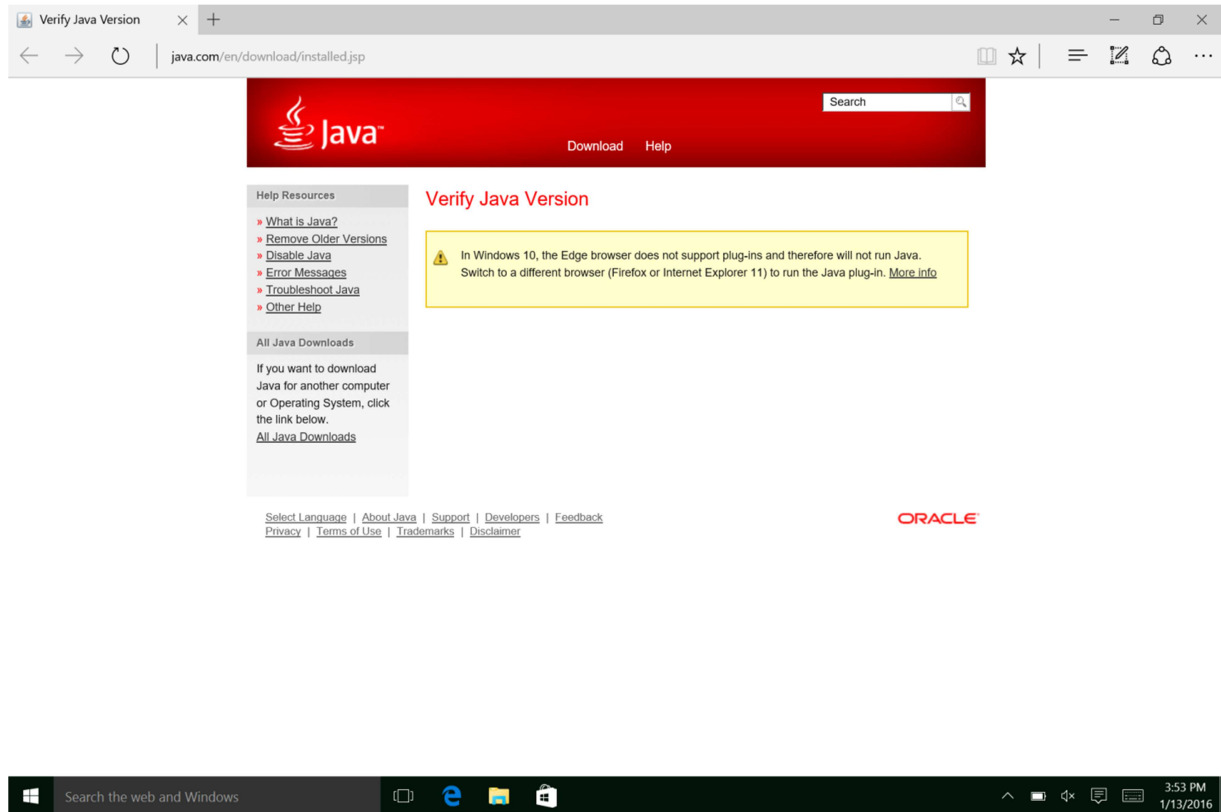


Select "Install".




Click “Close”.

You should see the screen below, just close the window to see bqStudio installation continue.



Important: If by any chance you are using a different browser and see the below screen, then the recommendation is to close the window without verifying Java. DO NOT remove older versions of Java. The browser typically uses Java as a plugin. Disabling use of Java in the browser does not impact

bqStudio. bqStudio uses an older version of Java and may not run if older versions of Java are removed.



Search

Download Help

Help Resources

- » [What is Java?](#)
- » [Remove Older Versions](#)
- » [Disable Java](#)
- » [Error Messages](#)
- » [Troubleshoot Java](#)
- » [Other Help](#)

All Java Downloads

If you want to download Java for another computer or Operating System, click the link below.


[All Java Downloads](#)

Verify Java and Find Out-of-Date Versions

Check to ensure that you have the recommended version of Java installed on your Windows computer and identify any versions that are out of date and should be uninstalled.

Agree and Continue

By clicking Agree and Continue, you acknowledge that you have read and accepted the [license terms](#) for the verify and find old versions feature.

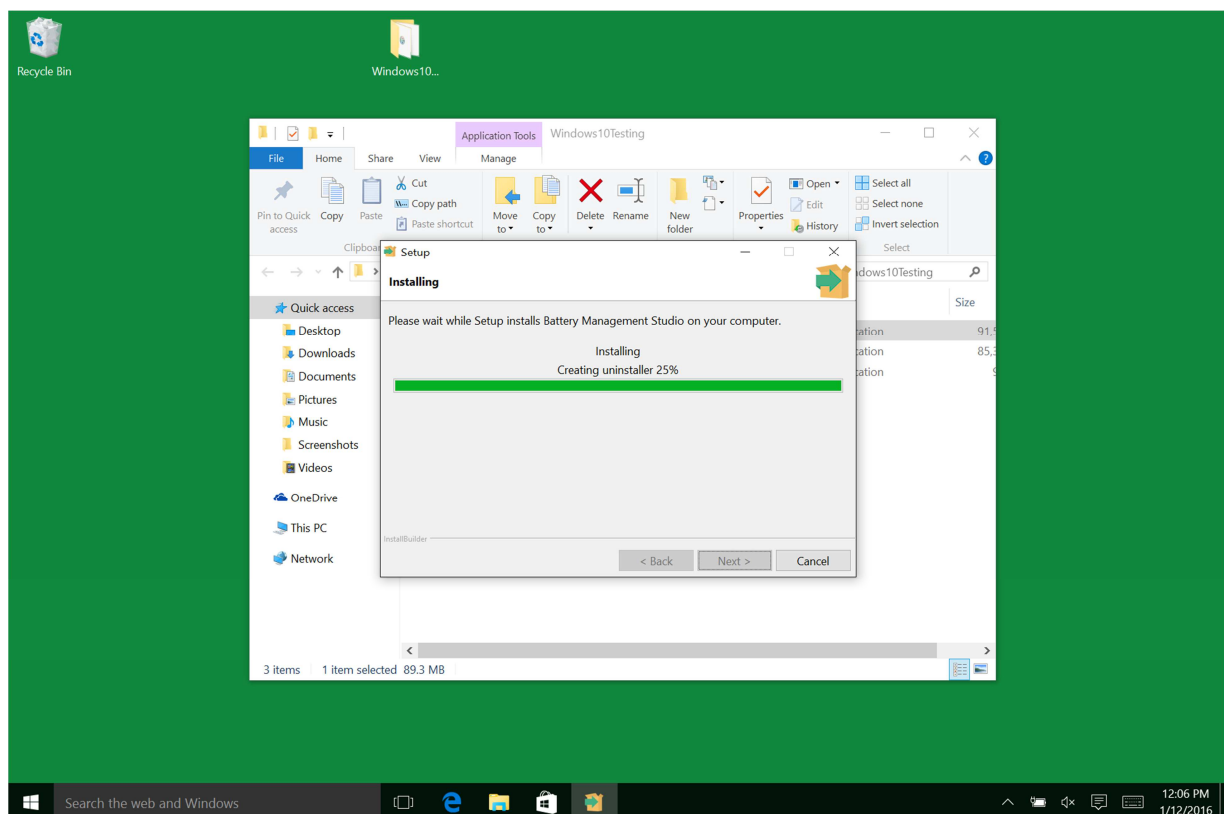
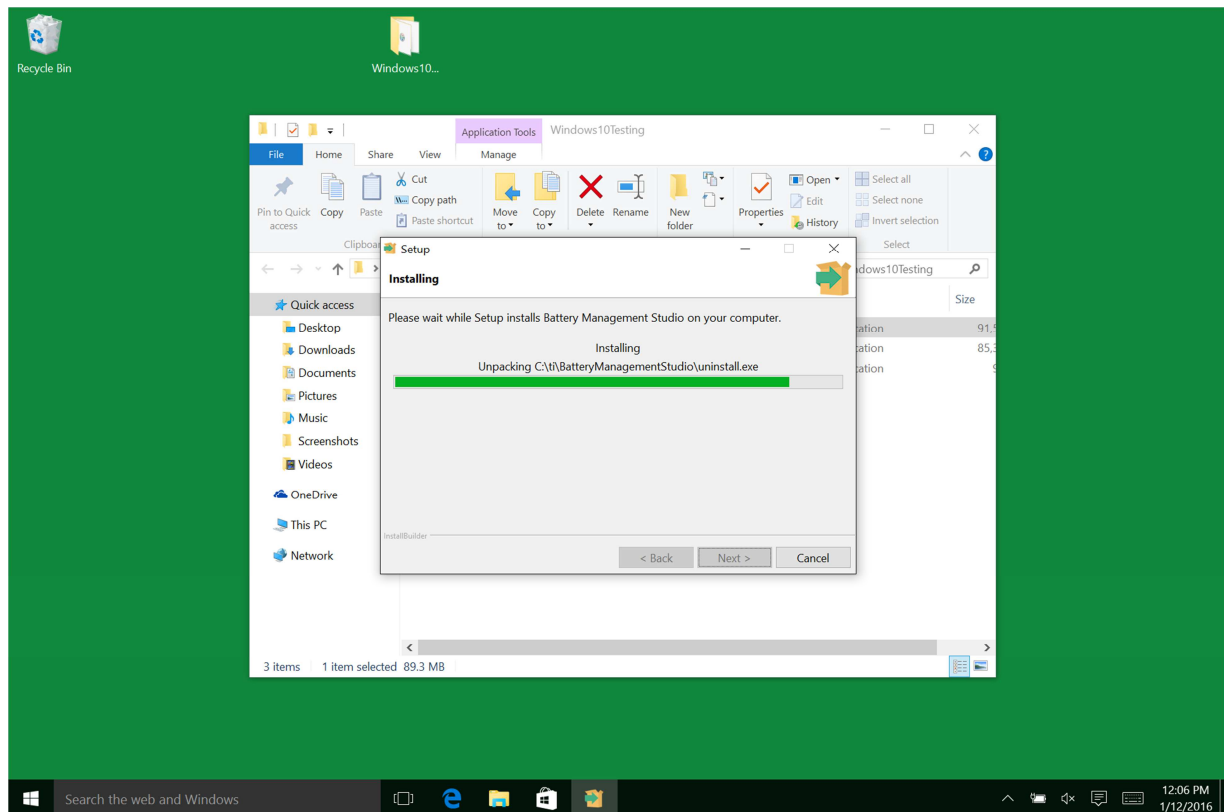
 After clicking the button, the Java detection app will ask for permission to run. Click **Run** to allow the application to continue.

If you recently completed your Java software installation, **restart your browser** (close all browser windows and re-open) to **enable the newly installed Java version** in the browser. Javascript must also be enabled.

If you prefer to simply verify your Java version and not accept the license terms, you can do so from the [verification page](#).

Select Language | [About Java](#) | [Support](#) | [Developers](#) | [Feedback](#)

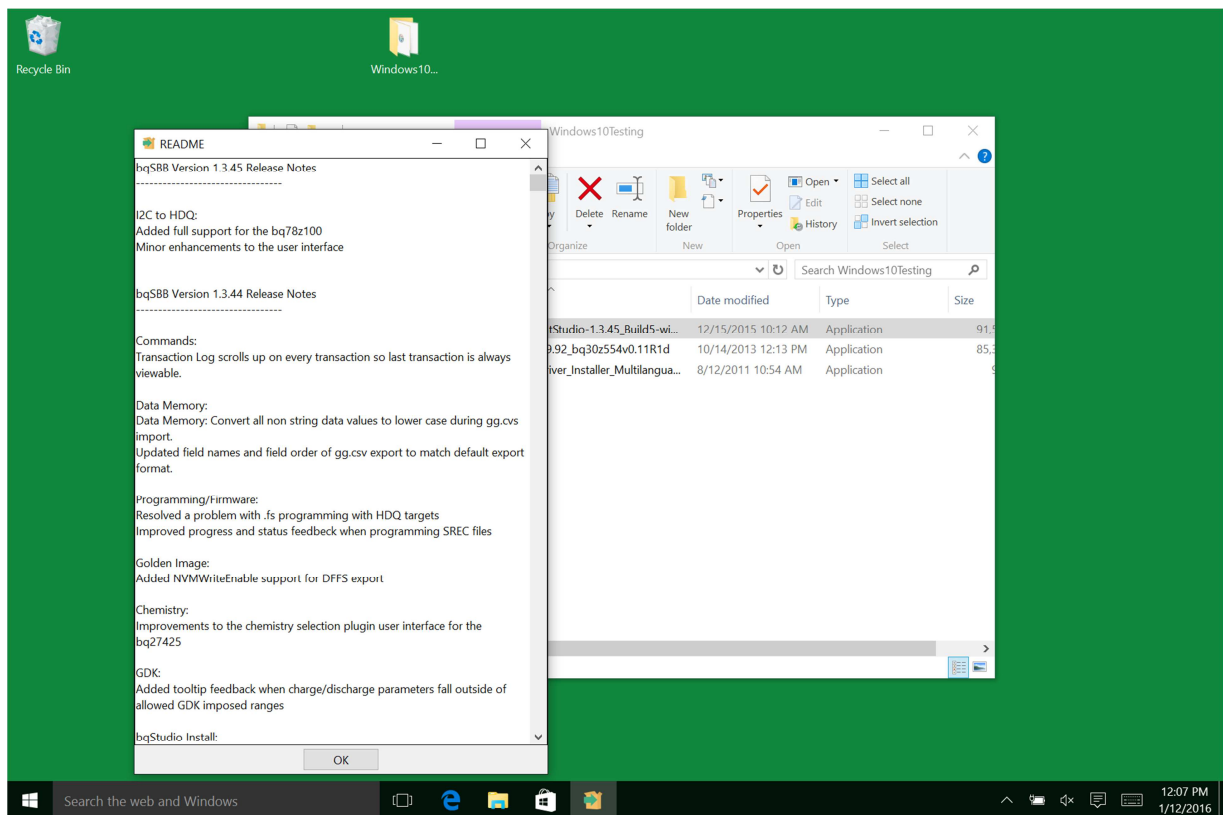
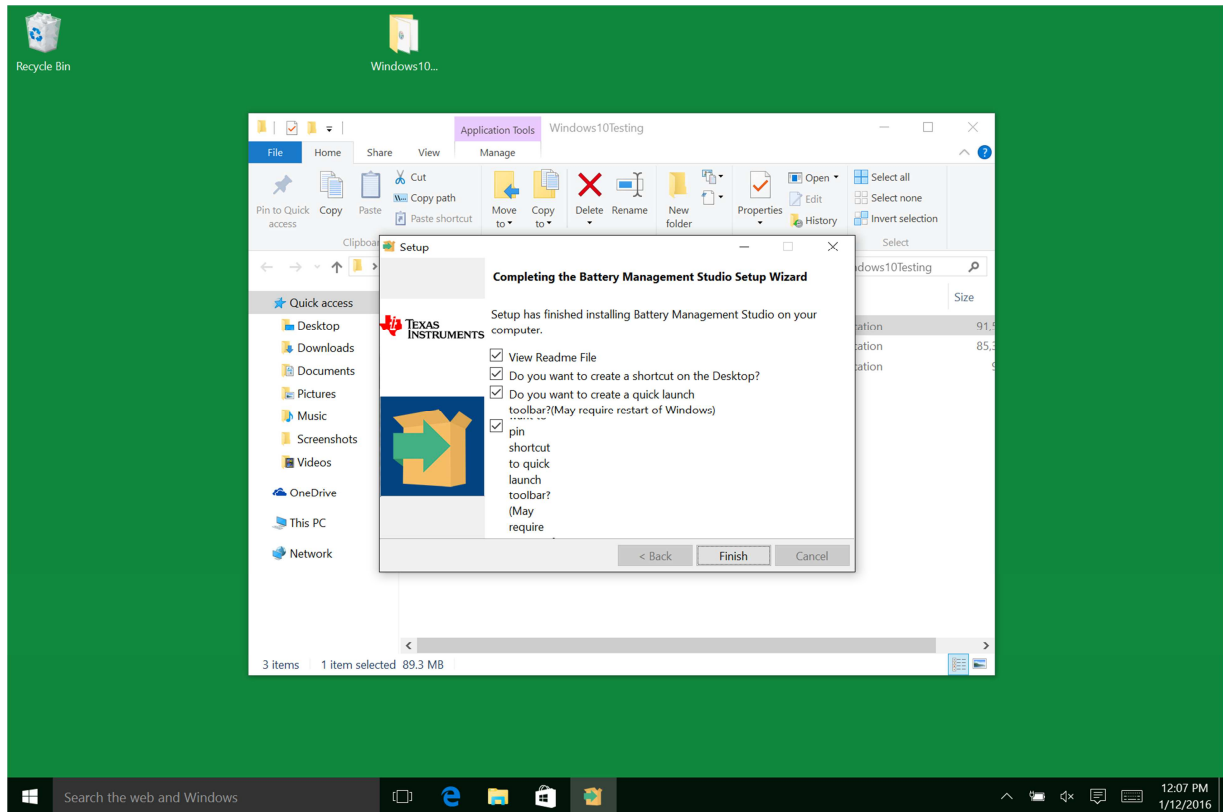
ORACLE

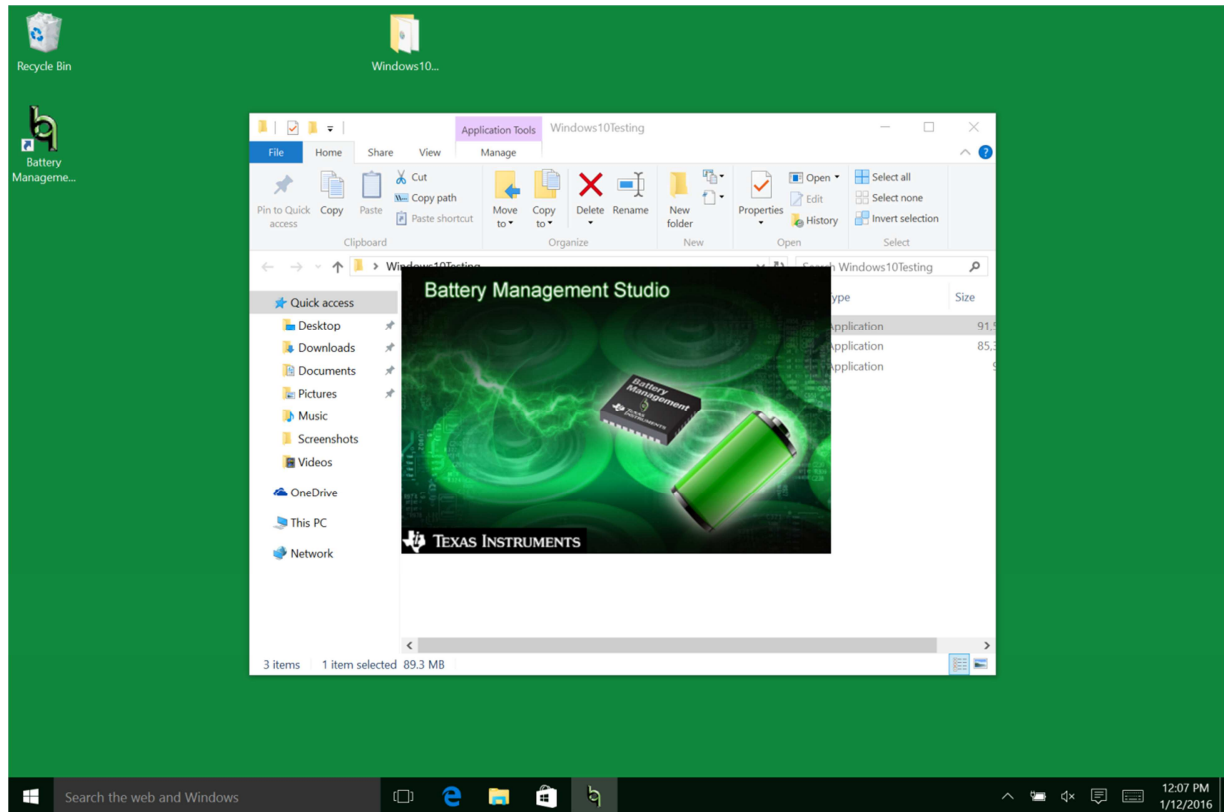


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At this point the EV2300 was not connected, therefore Battery Management Studio (bqStudio) did not detect a connected device and prompted to select from a list of devices. Selected "Cancel" to close bqStudio.

Closed bqStudio.

bqStudio and EV2300 with bq27421-G1A

Connected EV2300, Windows showed a small progress bar on taskbar indicating that the EV2300 was found and drivers being loaded.

Figure 1 shows the EV2300 setup with bq27421 connected to Microsoft Surface PC/tablet running Windows 10. The bq27421 is powered from Vcc of EV2300 to simulate a single cell of 3.3V

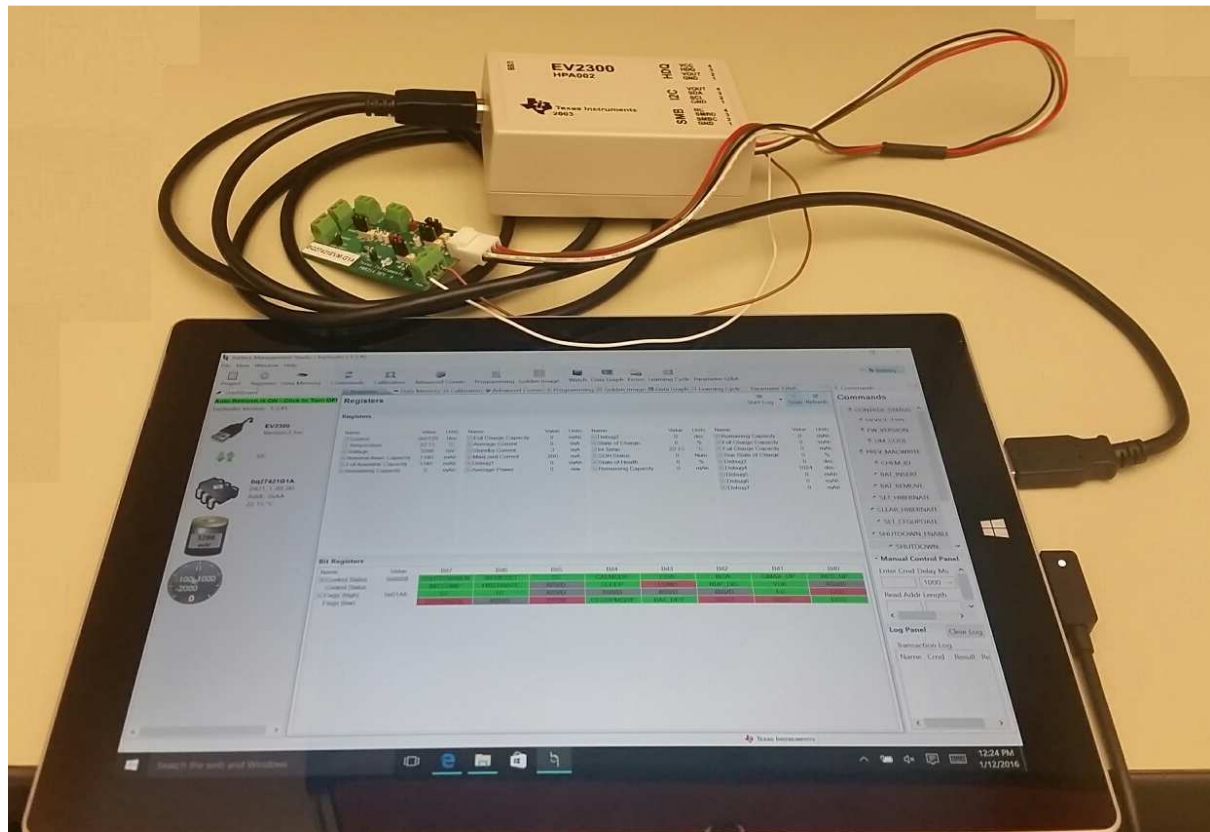


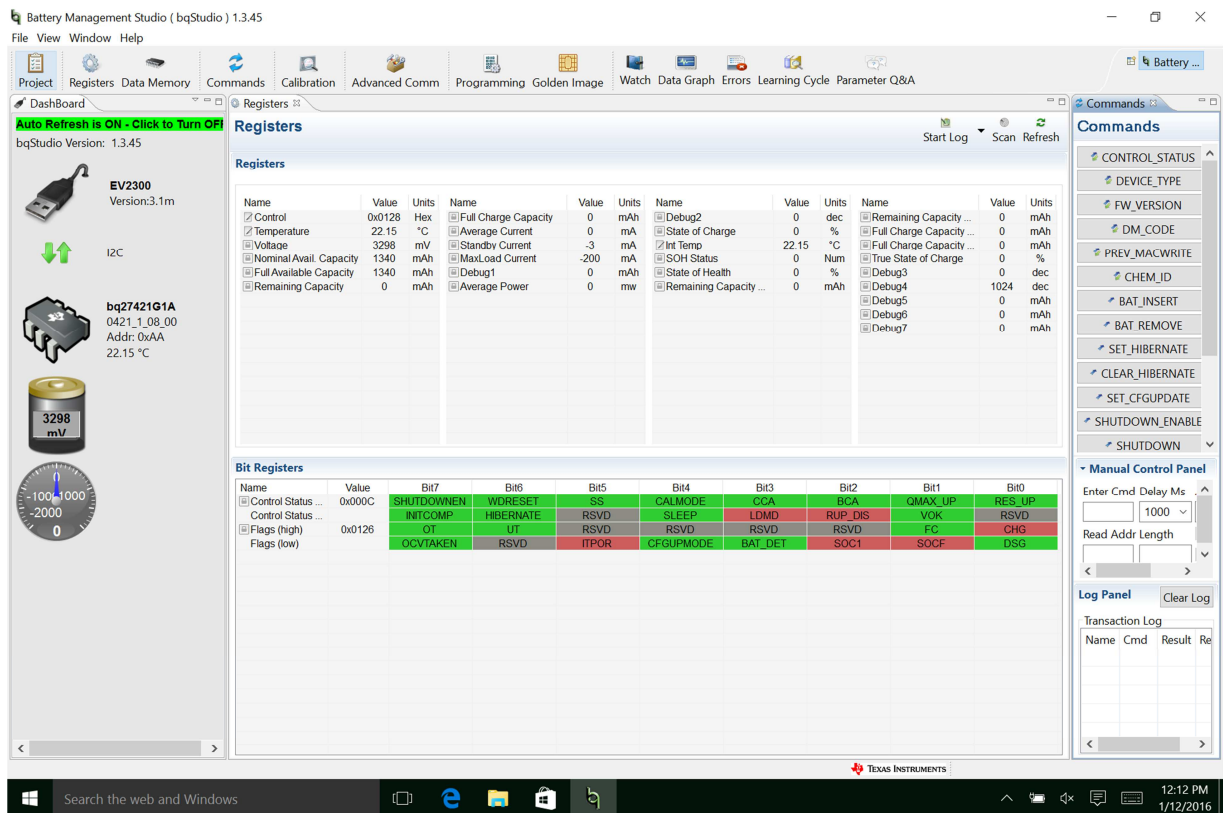
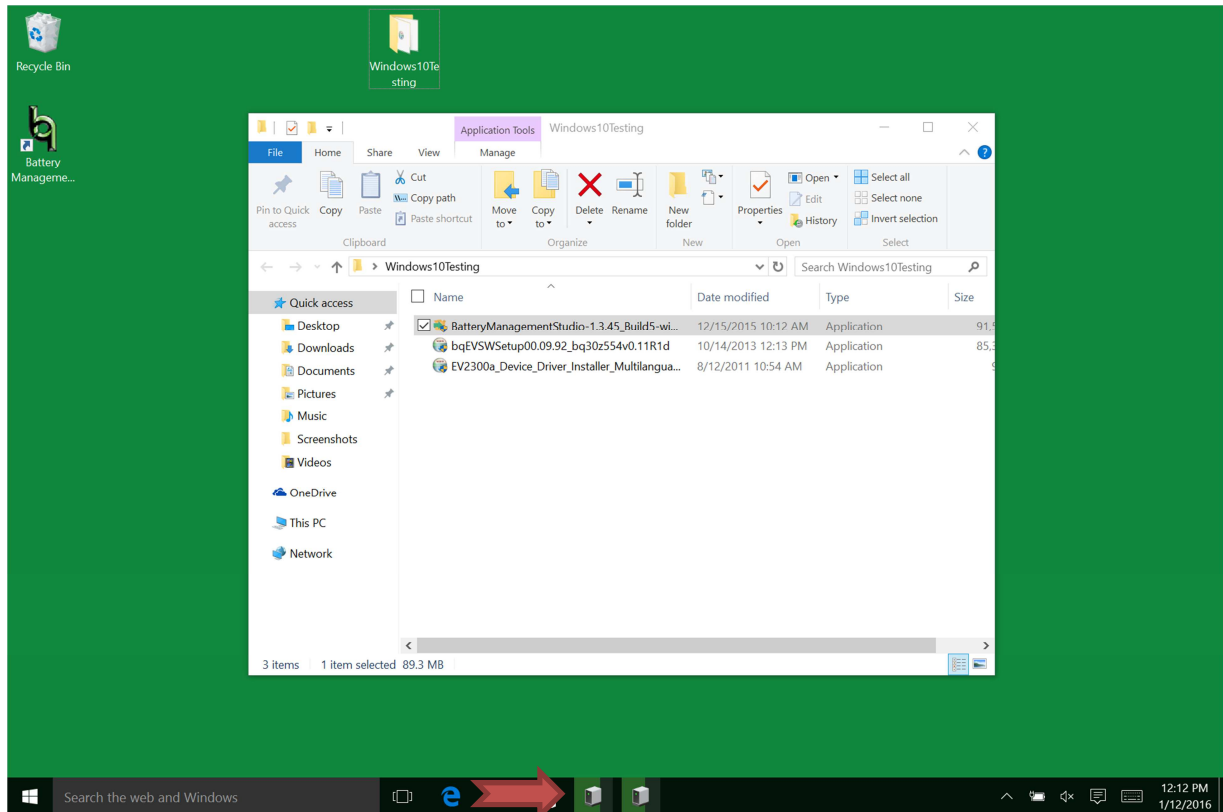
Figure 3: EV2300 setup with bq27421 connected to Microsoft Surface PC/tablet running Windows 10.

Picture : EV2x00 Device driver being loaded

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Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Project Registers Data Memory Commands Calibration Advanced Comm Programming Golden Image Watch Data Graph Errors Learning Cycle Parameter Q&A

Auto Refresh is ON - Click to Turn OFF
bqStudio Version: 1.3.45

EV2300
Version:3.1m

I2C

bq27421G1A
0421_1_08_00
Addr: 0xAA
22.15 °C

3298
mV

0

Data Memory

Filter/Search Auto Export Export Import Write All Read All

Read/Write Data Memory Contents

Configuration	Name	Value	Unit
Gas Gauging	Over Temp	55.0	°C
	Under Temp	0	°C
	Temp Hys	5.0	°C
Charge Termination	TCA Set %	99	%
	TCA Clear %	95	%
	FC Set %	-1	%
	FC Clear %	98	%
	DODatEOC Delta T	5.0	°C
Data	Design Voltage	3600	mV
	Initial Standby	-3	mA
	Initial MaxLoad	-200	mA
Discharge	SOC1 Set Threshold	10	%
	SOC1 Clear Threshold	15	%
	SOCF Set Threshold	2	%
	SOCF Clear Threshold	5	%
Registers	OpConfig	2518	Flag
	OpConfigB	0f	Flag
Power	Hibernate I	3	mA
	Hibernate V	2200	mV

Commands

- CONTROL_STATUS
- DEVICE_TYPE
- FW_VERSION
- DM_CODE
- PREV_MACWRITE
- CHEM_ID
- BAT_INSERT
- BAT_REMOVE
- SET_HIBERNATE
- CLEAR_HIBERNATE
- SET_CFGUPDATE
- SHUTDOWN_ENABLE
- SHUTDOWN

Manual Control Panel

Enter Cmd Delay Ms: 1000

Read Addr Length:

Log Panel Clear Log

Transaction Log

Name	Cmd	Result	Re
------	-----	--------	----

12:13 PM 1/12/2016

Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Project Registers Data Memory Commands Calibration Advanced Comm Programming Golden Image Watch Data Graph Errors Learning Cycle Parameter Q&A

Auto Refresh is ON - Click to Turn OFF
bqStudio Version: 1.3.45

EV2300
Version:3.1m

I2C

bq27421G1A
0421_1_08_00
Addr: 0xAA
22.15 °C

3299
mV

0

Calibration

Perform Calibration

Select the type of calibration to perform and enter the actual input

Board Offset

☐ Calibrate Board Offset

Voltage

Applied Voltage

mV ☐ Calibrate Voltage

Calibrate Gas Gauge

Commands

- CONTROL_STATUS
- DEVICE_TYPE
- FW_VERSION
- DM_CODE
- PREV_MACWRITE
- CHEM_ID
- BAT_INSERT
- BAT_REMOVE
- SET_HIBERNATE
- CLEAR_HIBERNATE
- SET_CFGUPDATE
- SHUTDOWN_ENABLE
- SHUTDOWN

Manual Control Panel

Enter Cmd Delay Ms: 1000

Read Addr Length:

Log Panel Clear Log

Transaction Log

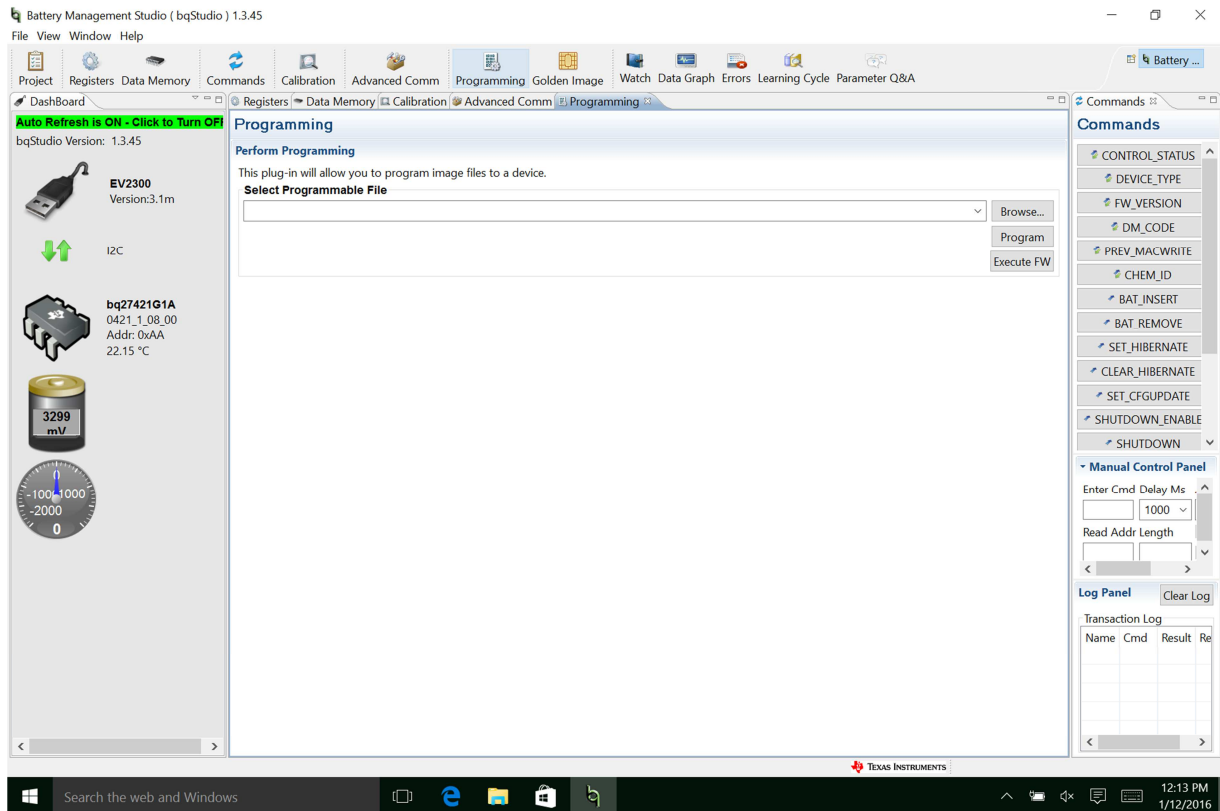
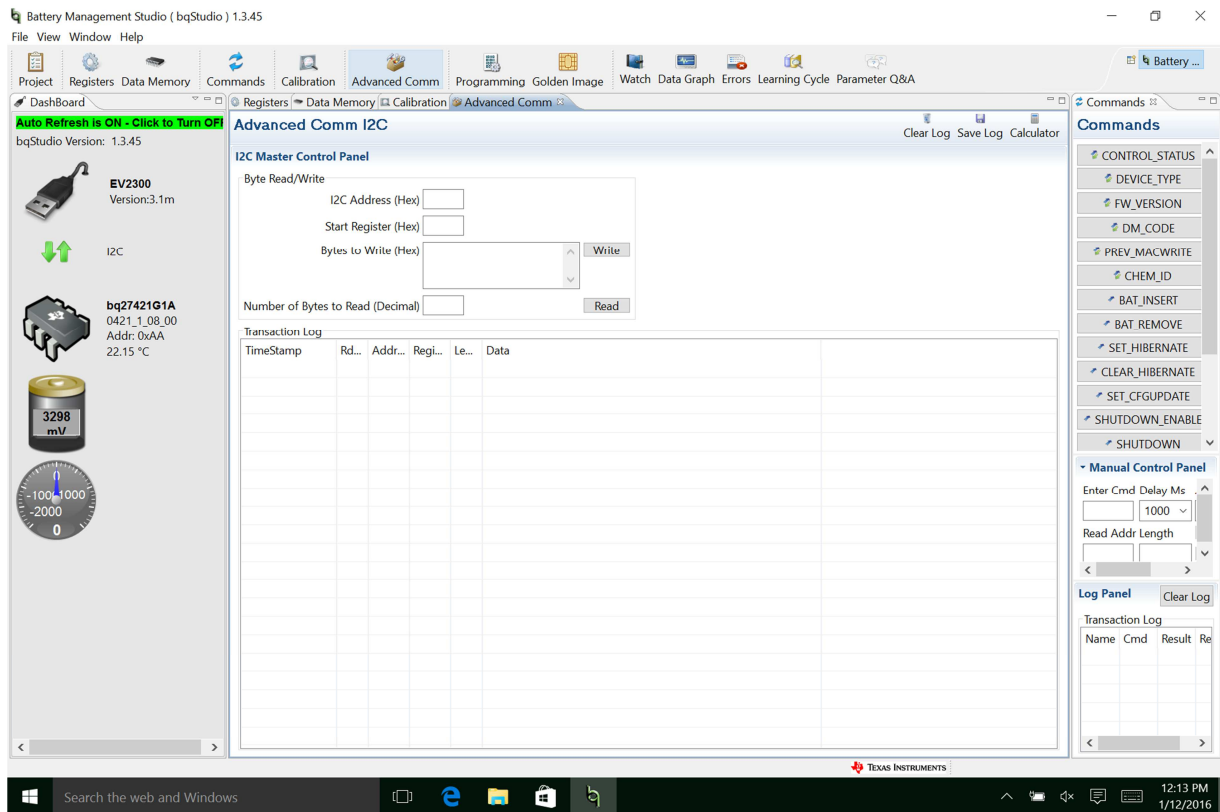
Name	Cmd	Result	Re
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12:13 PM 1/12/2016

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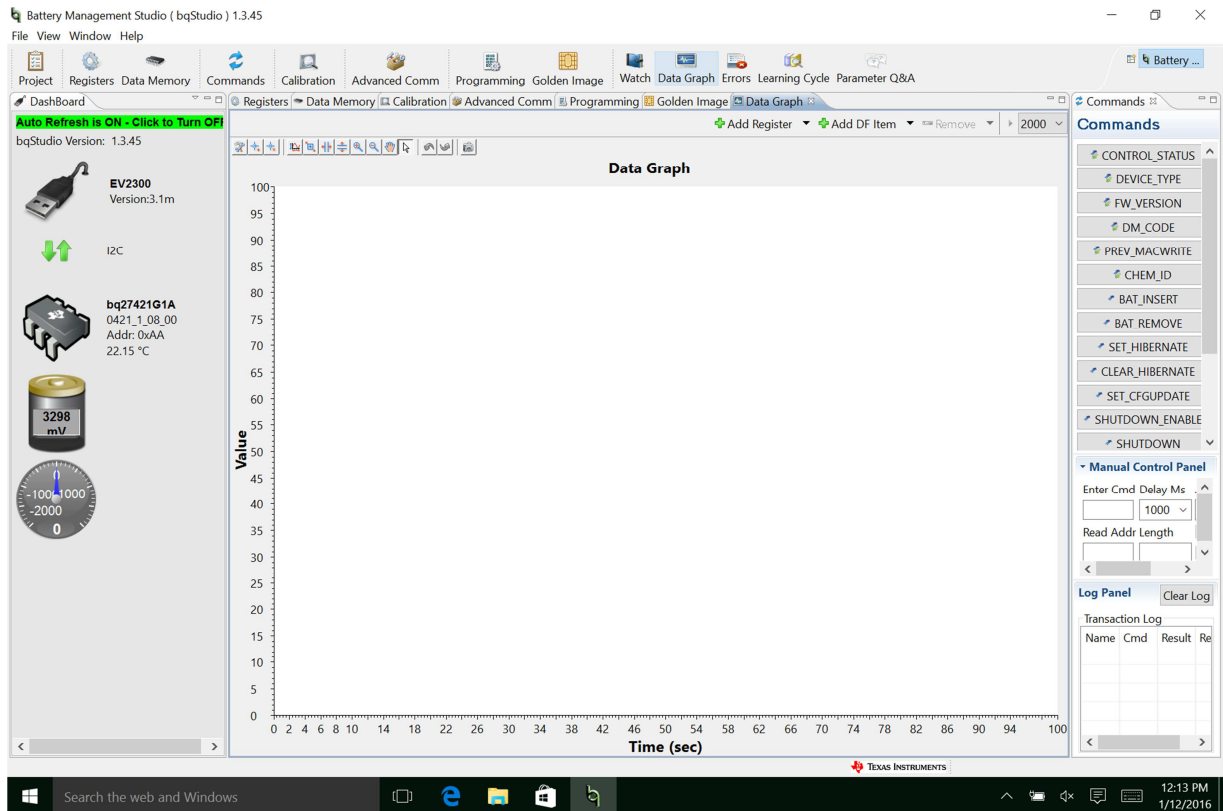
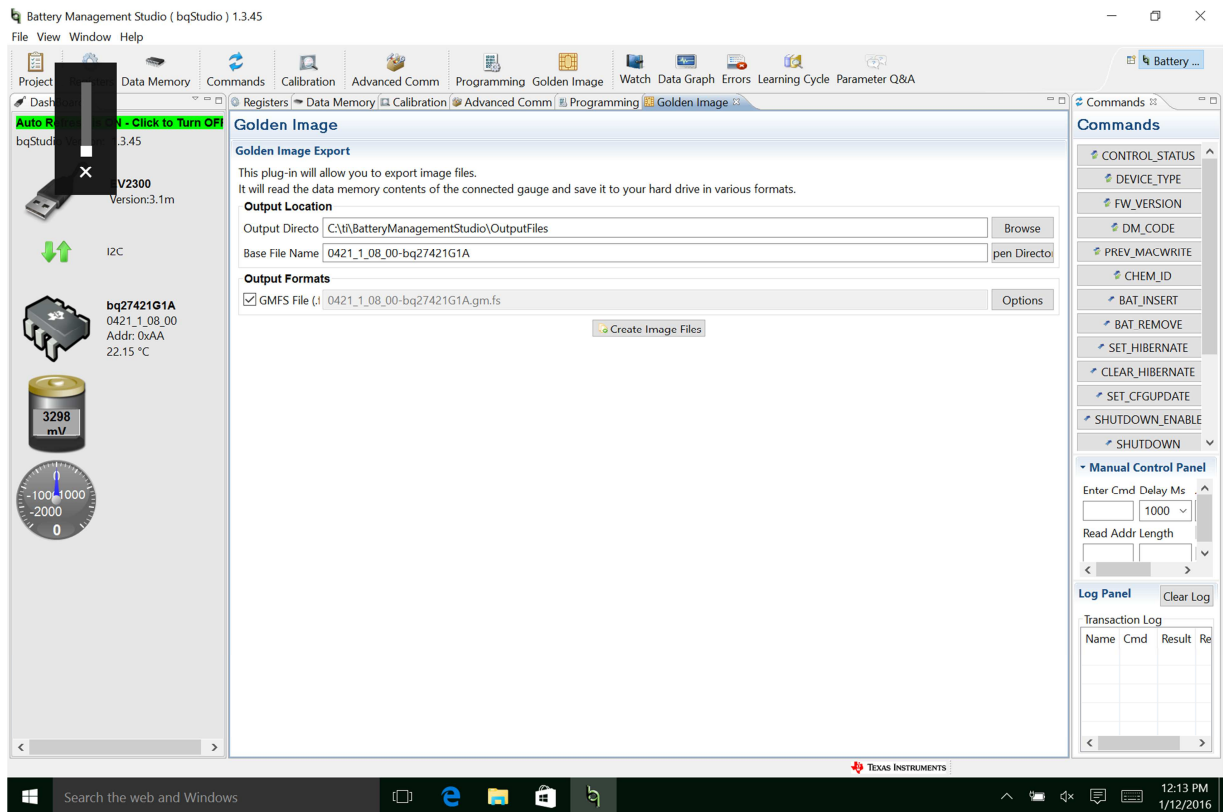
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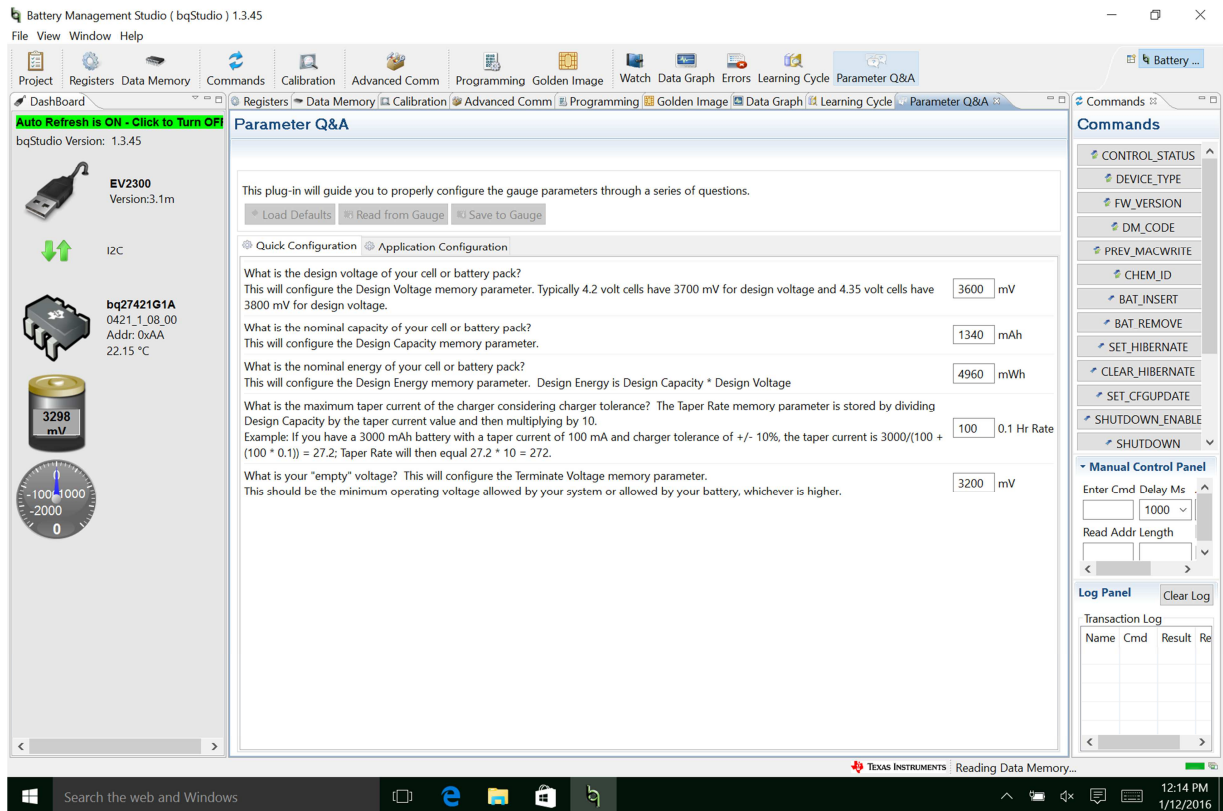
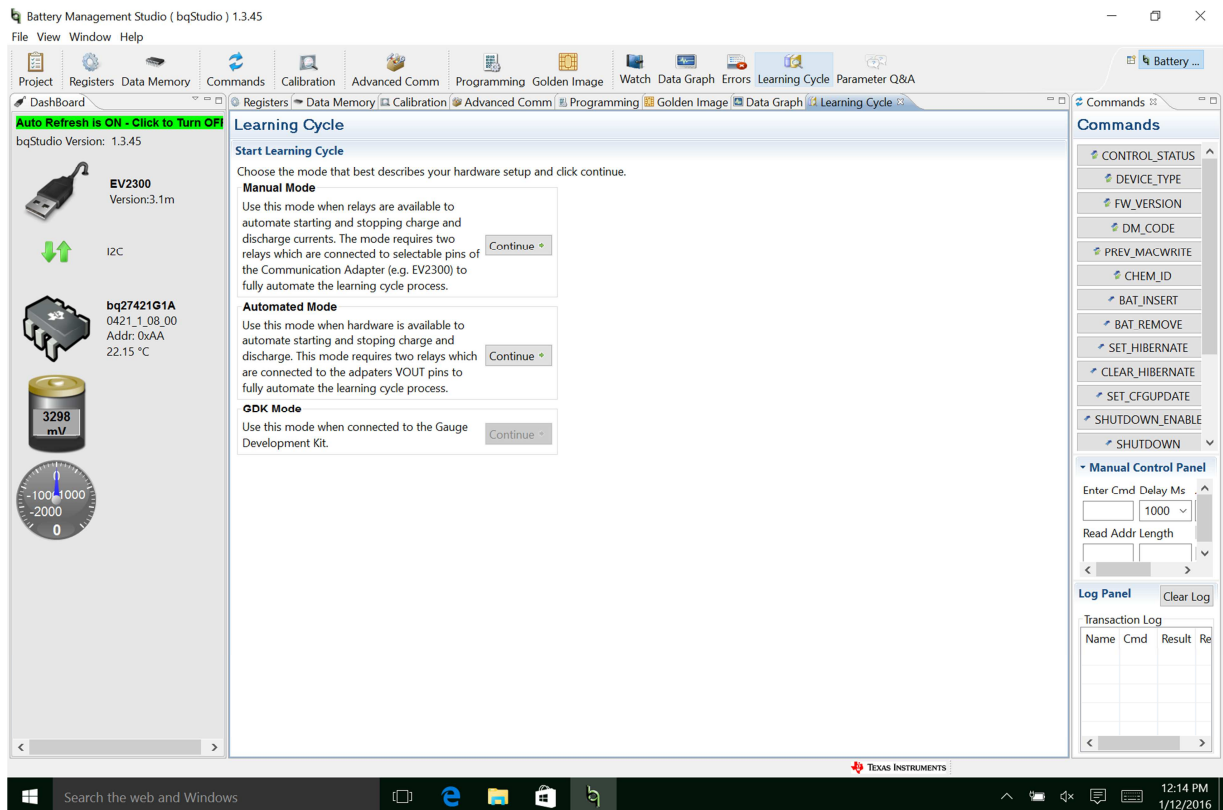
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Executed the following actions that require full communication to be exercised.

1. Read Data Flash
2. Calibrate

Actions were successful. Correct data was shown as in screenshots below.

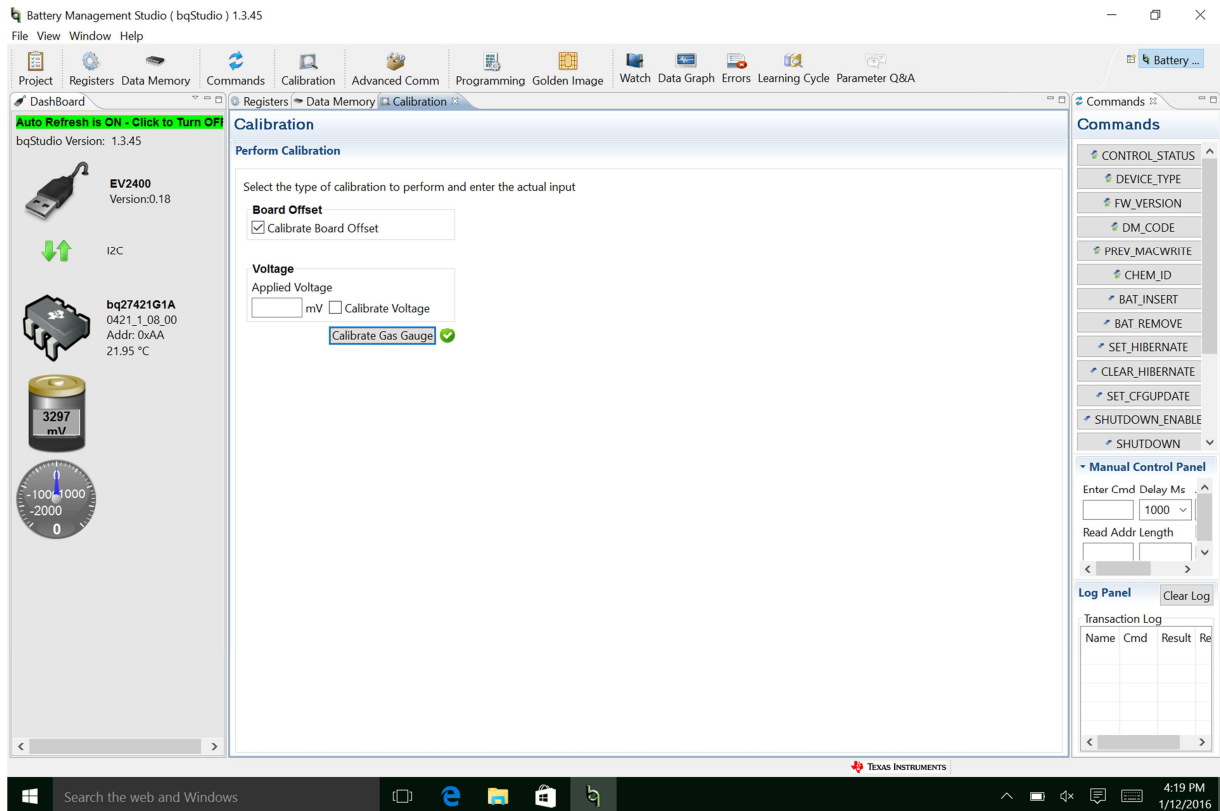
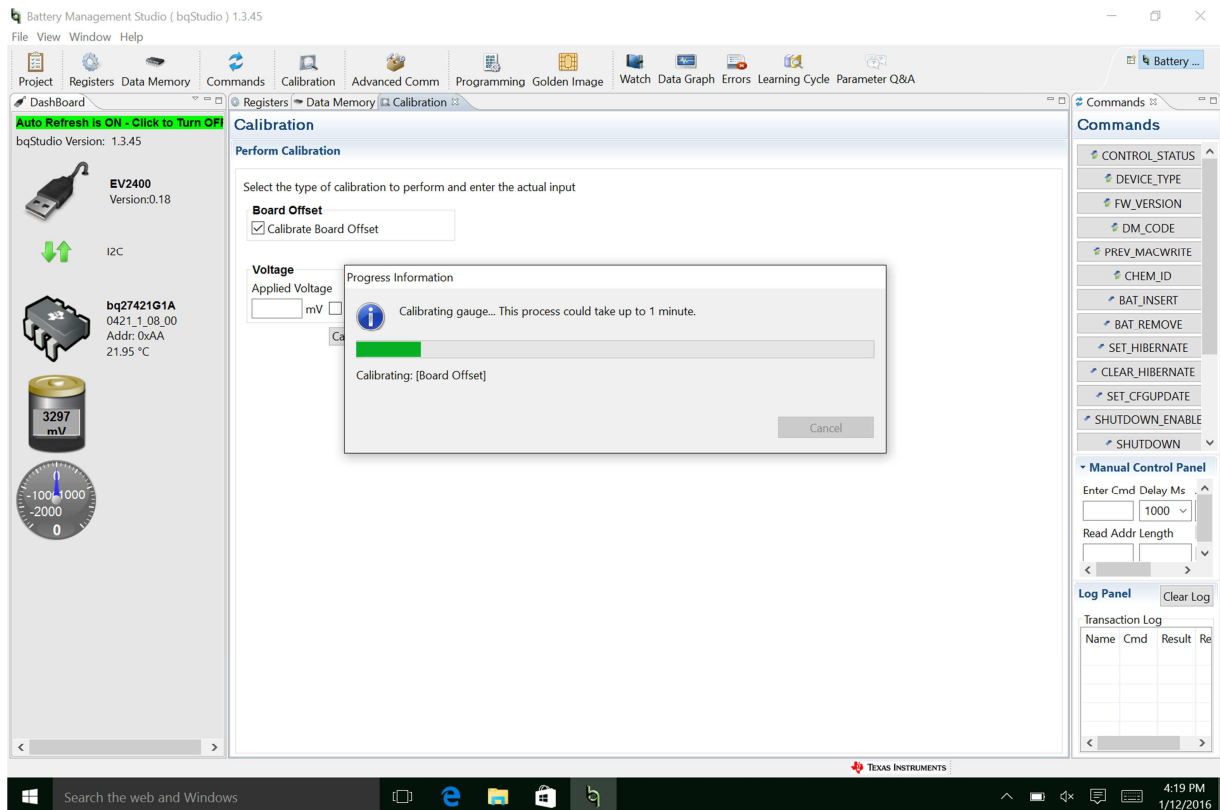
The screenshot displays the Battery Management Studio (bqStudio) 1.3.45 interface. The main window is titled "Data Memory" and shows the "Read/Write Data Memory Contents" table. The table lists various parameters and their values. The left sidebar shows the device information: EV2400 Version:0.18, I2C, bq27421G1A 0421_1_08_00 Addr: 0xAA 21.95 °C, and a battery icon with 3297 mV. The right sidebar shows the "Commands" panel with a list of commands and a "Log Panel" section.

Name	Value	Unit
Configuration		
Safety		
Over Temp	55.0	°C
Under Temp	0	°C
Temp Hys	5.0	°C
Charge Termination		
TCA Set %	99	%
TCA Clear %	95	%
FC Set %	1	%
FC Clear %	98	%
DODatEOC Delta T	5.0	°C
Data		
Design Voltage	3600	mV
Initial Standby	-3	mA
Initial MaxLoad	-200	mA
Discharge		
SOC1 Set Threshold	10	%
SOC1 Clear Threshold	15	%
SOCF Set Threshold	2	%
SOCF Clear Threshold	5	%
Registers		
OpConfig	25f8	Flag
OpConfig8	0f	Flag
Power		
Hibernate I	3	mA
Hibernate V	2200	mV

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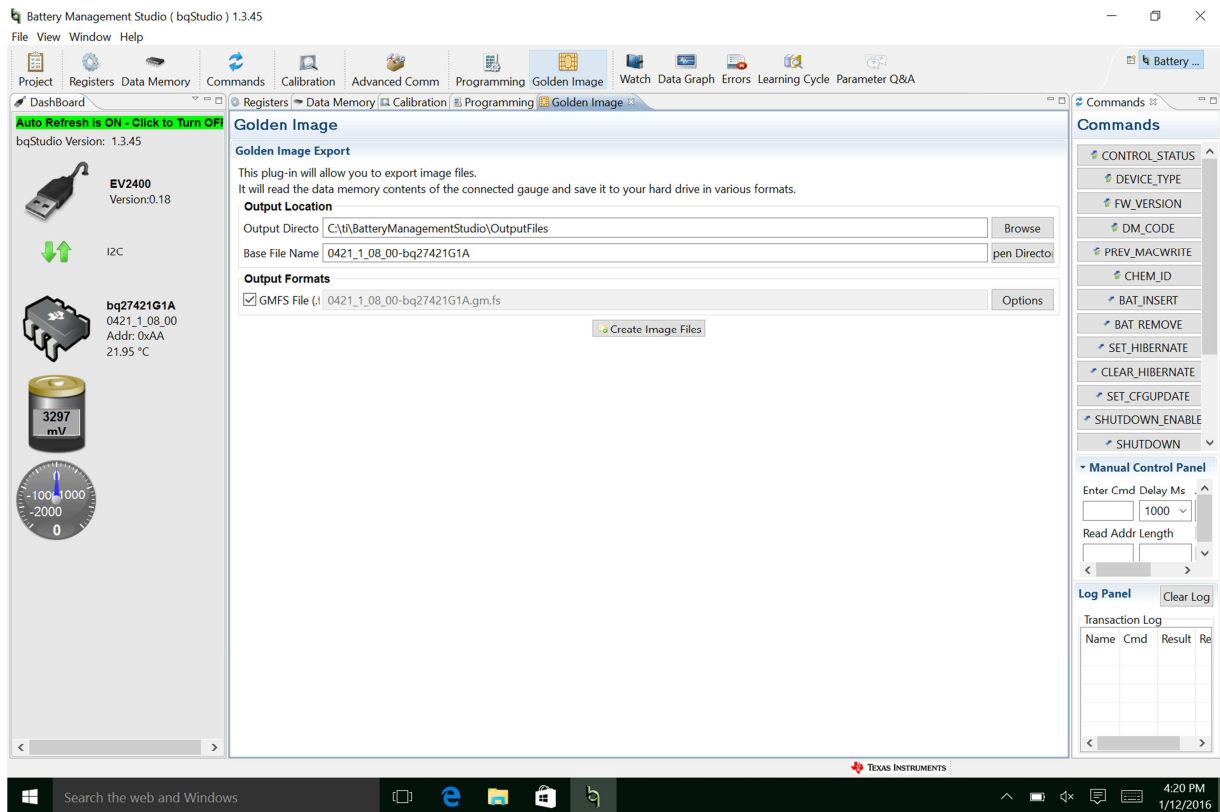
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bqStudio and EV2400 with bq27421-G1A

Connected EV2400, Windows showed a small progress bar on taskbar indicating that the EV2300 was found and drivers being loaded.

bqStudio and EV2300 connected to bq40z50-R1

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Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Registers Data Memory Commands Calibration Chemistry Advanced Comm SMB Authentication Firmware Watch Data Graph Errors

Dashboard

Auto Refresh is ON - Click to Turn OFF

bqStudio Version: 1.3.45

EV2300
Version:3.1m

SMB

bq40z50R1
4500_1.06
Addr: 0x17
28.5 degC

10189 mV

Registers

Name	Value	Un...	Name	Value	Un...	Name	Value	Un...	Name	Value	Un...
Manufacturer Access	0x980	hex	Cell 4 Voltage	0	mV	Initial E	1077	c...	Cell 3 DODEOC	1184	-
Remaining Cap. Al...	300	m...	BAT pin voltage	10190	mV	True Full Chg Q	902	m...	Cell 4 DODEOC	0	-
Remaining Time Al...	10	min	PACK pin voltage	0	mV	True Full Chg E	1077	c...	Cell 1 QMax	4400	m...
At Rate	0	mA	Cell 1 Current	-4	mA	T_sim	30.5	d...	Cell 2 QMax	4400	m...
At Rate Time To Full	65535	min	Cell 2 Current	-6	mA	T_ambient	28.5	d...	Cell 3 QMax	4400	m...
At Rate Time To E...	65535	min	Cell 3 Current	-11	mA	Cell 1 RaScale	1000	-	Cell 4 QMax	4400	m...
At Rate OK	1	-	Cell 4 Current	0	mA	Cell 2 RaScale	1000	-	Cell 1 QMax DOD0	0	-
Temperature	28.4	d...	Cell 1 Power	-1	cW	Cell 3 RaScale	1000	-	Cell 2 QMax DOD0	0	-
Voltage	10189	mV	Cell 2 Power	-2	cW	Cell 1 RaScale	0	-	Cell 3 QMax DOD0	0	-
Current	-3	mA	Cell 3 Power	-4	cW	Cell 1 CompRes	0	m...	Cell 4 QMax DOD0	0	-
Average Current	1	mA	Cell 4 Power	0	cW	Cell 2 CompRes	0	m...	QMax Passed Q	0	m...
Max Error	100	%	Power	-3	cW	Cell 3 CompRes	0	m...	QMax Time	156	h/...
Relative State of C...	0	%	Average Power	1	cW	Cell 4 CompRes	0	m...	Temp k	1.0	-
Absolute State of C...	0	%	Int Temperature	28.5	d...	PackGrid	0	-	Temp a	1000	-
Remaining Capacity	0	m...	TS1 Temperature	292.2	d...	Cell 1 Grid	0	-	Cell 1 Raw DOD	16120	-
Full charge Capacity	902	m...	TS2 Temperature	291.9	d...	Cell 2 Grid	0	-	Cell 2 Raw DOD	16384	-
Run time To Empty	65535	min	TS3 Temperature	292.1	d...	Cell 3 Grid	0	-	Cell 3 Raw DOD	4464	-

Bit Registers

Name	Value	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Battery Mode (...)	0x0081	CapM	ChgM	AM	RSVD	RSVD	RSVD	PB	CC
Battery Mode (...)	0x0081	CF	RSVD	RSVD	RSVD	RSVD	RSVD	PBS	ICC
Battery Status (...)	0x5A00	OCA	TCA	RSVD	OTA	TDA	RSVD	RCA	RJA
Battery Status (...)	0x5A00	INT	DSG	FC	FD	EC3	EC2	EC1	EC0
Operation Stat...	0x6980	SLEEP	XCHG	XDSG	PF	SS	SDV	SEC1	SEC0
Operation Stat...	0x6980	BTP_INT	RSVD	FUSE	RSVD	PCHG	CHG	DSG	PRES
Operation Stat...	0x0000	RSVD	PSSHUT	EMSHUT	CB	SLPCC	SLPAD	SMBLCA	INIT
Operation Stat...	0x0000	SLEEPM	XL	CAL_OFFSET	CAL	AUTOCALM	AUTH	LED	SOM
Temp Range (...)	0x10	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD
Temp Range (...)	0x0008	RSVD	OT	HT	STH	RT	STL	LT	UT
Charging Stat...	0x0008	RSVD	RSVD	RSVD	RSVD	RSVD	CLC	CVR	CCR
Charging Stat...	0x0008	VCT	MOHG	SU	IN	HV	MV	LV	PV
Gauging Status	0x05	CF	DSG	EDV	BAL_EN	TC	TD	FC	FD
IT Status (high)	0x0001	RSVD	RSVD	RSVD	OCVFR	LDMD	RX	GMAX	VDQ
IT Status (low)	0x0000	NSFM	RSVD	SLPQMAX	GEN	VOK	RDIS	RSVD	REST
Manufacturing ...	0x0000	CAL_EN	LT_TEST	RSVD	RSVD	RSVD	RSVD	LED_EN	FUSE_EN
Manufacturing ...	0x0000	BRR_EN	PF_EN	LF_EN	FET_EN	GAUGE_EN	DSG_TEST	CHG_TEST	POHG_TEST
Safety Alert A...	0x0000	RSVD	CUVC	OTD	OTC	ASCDL	RSVD	ASGCL	RSVD
Safety Alert A...	0x0000	APL_P	RSVD	PCR2	PCR1	PCR3	PCR4	PCR5	PCR6

Commands

Log Panel

Transaction Log

Name Cmd Result Re

Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Registers Data Memory Commands Calibration Chemistry Advanced Comm SMB Authentication Firmware Watch Data Graph Errors

Dashboard

Auto Refresh is ON - Click to Turn OFF

bqStudio Version: 1.3.45

EV2300
Version:3.1m

SMB

bq40z50R1
4500_1.06
Addr: 0x17
28.5 degC

10195 mV

Data Memory

Read/Write Data Memory Contents

Name	Value	Unit
Cell Gain	12101	-
Pack Gain	49669	-
BAT Gain	35227	-
CC Gain	1.036	mOhm
Capacity Gain	1.036	mOhm
CC Offset	0	-
Coulomb Counter Offset Samples	64	-
Board Offset	0	-
CC Auto Config	07	hex
CC Auto Offset	63	-
Internal Temp Offset	0	°C
External1 Temp Offset	0	°C
External2 Temp Offset	0	°C
External3 Temp Offset	0	°C
External4 Temp Offset	0	°C
Int Gain	-12143	-
Int base offset	6232	-
Int Minimum AD	0	-
Int Maximum Temp	6232	0.1degK
Coeff a1	-11130	-
Coeff a2	19142	-
Coeff a3	-19262	-
Coeff a4	28203	-
Coeff a5	892	-
Coeff b1	328	-

Commands

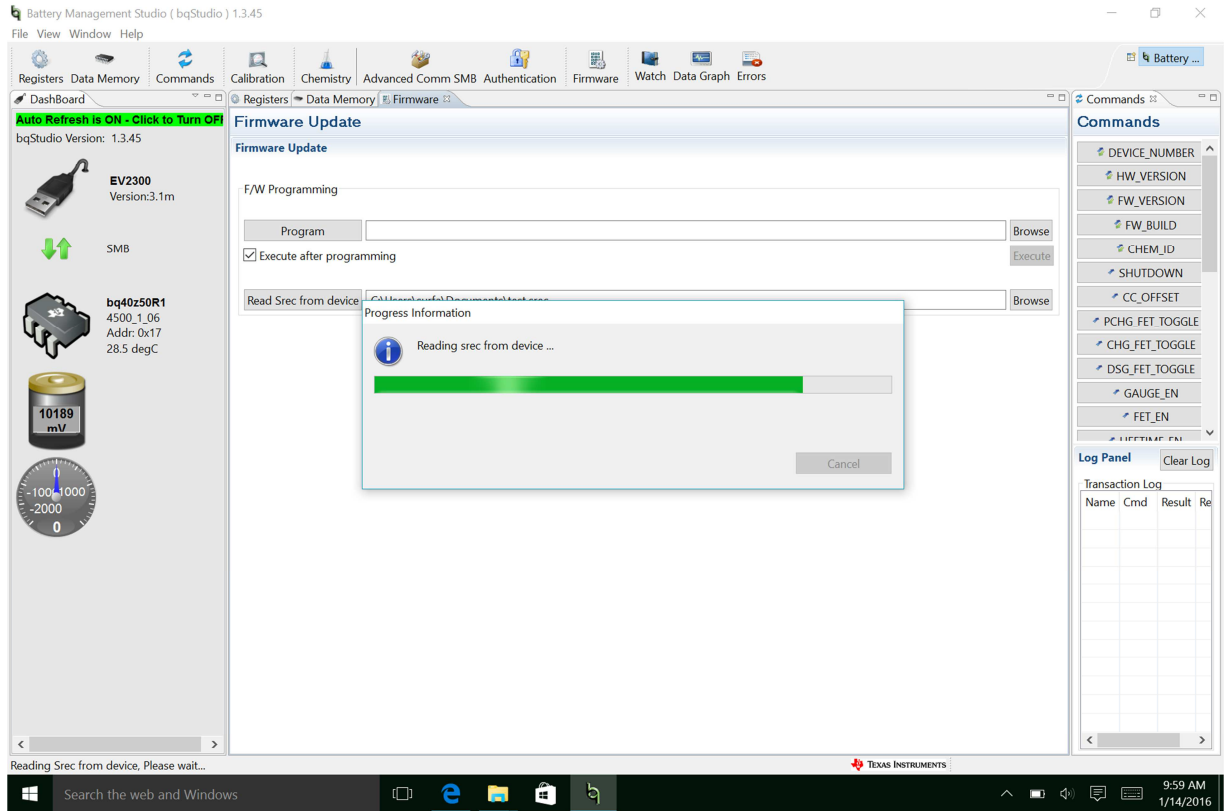
Log Panel

Transaction Log

Name Cmd Result Re

BMS Software and Solutions

Windows 10 test plan report



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Windows 10 test plan report

Last updated: Monday, January 25, 2016 by Shirish Kavoor

Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Registers Data Memory Commands Calibration Chemistry Advanced Comm SMB Authentication Firmware Watch Data Graph Errors

Auto Refresh is ON - Click to Turn Off

bqStudio Version: 1.3.45

EV2300
Version:3.1m

SMB

bq40z50R1
4500_1_06
Addr: 0x17
29.4 degC

10130
mV

-100 1000
-2000
-3

Chemistry Programming

Program Battery Chemistry

Most Li-ion cells use LiCoO2 cathode and graphitized carbon anode, which is supported by the default firmware in the Impedance track fuel gauges. This tool allows the fuel gauge to be set up for various alternate battery chemistries. Use this tool to load settings for any alternate chemistry if your cell manufacturer indicates that their cells use a different chemistry than LiCoO2 cathode and graphite anode.

Note : Right Click on the selected chemistry to apply it to individual cells. The menu appears only if the fw supports individual cell chemistries.

Manufacturer	Model	Chemistry ID	Description
360FLY	PR-693231 (815mAh)	1318	LiCoO2/carbon 11
A&TB	LGR18650OU	0100	LiCoO2/graphitized carbon (default)
A01	ALPBA002 (3430mAh)	0207	NiCoMn/carbon 2
A123	APK18650M1 (1100 mAh)	0404	LiFePO4/carbon
A123	26650M1B (2500mAh)	0434	LiFePO4/carbon
A123	ANR26650M1-B (2500mAh)	0440	LiFePO4/carbon
A123	ANR26650M1-B Consult TI ...	0453	LiFePO4/carbon
A123 Systems	26650A	0400	LiFePO4/carbon
A123Systems	A123 (20000mAh)	6105	NIMH
AA Portable Power	LFP-18650-1500 (1500 mAh)	0439	LiFePO4/carbon
AAPortable	26650 (3300mAh)	0451	LiFePO4/carbon
AAPortable	8790160 (10000mAh)	0456	LiFePO4/carbon
Acebel	ECFV1260 (60Ah)	0807	Lead Acid
AEnergy	AE1004765 (3500mAh)	0131	LiCoO2/carbon 4
AEnergy	AE583696PM1HR (2150 mAh)	0222	PSS, LINO2 with Co, Mn doping
AET	TP2000-1SPL (2000mAh)	0190	LiCoO2/carbon 11
AGM	INR34600K2 (7500mAh)	0210	NiCoMn/carbon
AIISPU	3872C8 (5100mAh)	1335	LiCoO2/carbon 11
AIISPU	856360 (4750mAh)	3636	LiMn2O4 (Co.Ni)/carbon, 4.35V
ALE	045062 (2300 mAh)	1254	LiNiCoMnO2/SGenNo1, 4.2V

Update Chemistry from Database Update Chemistry from External File...

Chemistry Version : 463

Commands

Log Panel Clear Log

Name	Cmd	Result	Re
------	-----	--------	----

4:15 PM
1/13/2016

bqStudio and EV2400 connected to bq40z50-R1

BMS Software and Solutions

Windows 10 test plan report

Last updated: Monday, January 25, 2016 by Shirish Kavoor

Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Registers Data Memory Commands Calibration Chemistry Advanced Comm SMB Authentication Firmware Watch Data Graph Errors

Auto Click to turn off dashboard auto refresh
bqStudio version: 1.3.45

EV2400
Version:0.18

SMB

bq40z50R1
4500_1_06
Addr: 0x17
29.3 degC

10144 mV

-100 1000
-2000
-3

Registers

Name	Value	Un...	Name	Value	Un...	Name	Value	Un...	Name	Value	Un...
Manufacturer Access	0x980	hex	Cell 4 Voltage	0	mV	Initial E	3808	c...	Cell 3 DODEOC	1184	-
Remaining Cap. Al...	300	m...	BAT pin voltage	14089	mV	True Full Chg Q	3377	m...	Cell 4 DODEOC	0	-
Remaining Time Al...	10	min	PACK pin voltage	2	mV	True Full Chg E	3808	c...	Cell 1 QMax	4400	m...
At Rate	0	mA	Cell 1 Current	3	mA	T_sim	29.3	d...	Cell 2 QMax	4400	m...
At Rate Time To Full	65535	min	Cell 2 Current	7	mA	T_ambient	29.1	d...	Cell 3 QMax	4400	m...
At Rate Time To E...	65535	min	Cell 3 Current	10	mA	Cell 1 RaScale	1000	-	Cell 4 QMax	4400	m...
At Rate OK	1	-	Cell 4 Current	0	mA	Cell 2 RaScale	1000	-	Cell 1 QMax DOD0	0	-
Temperature	29.3	d...	Cell 1 Power	1	cW	Cell 3 RaScale	1000	-	Cell 2 QMax DOD0	0	-
Voltage	10142	mV	Cell 2 Power	2	cW	Cell 4 RaScale	0	-	Cell 3 QMax DOD0	0	-
Current	-3	mA	Cell 3 Power	4	cW	Cell 1 CompRes	0	m...	Cell 4 QMax DOD0	0	-
Average Current	1	mA	Cell 4 Power	0	cW	Cell 2 CompRes	0	m...	QMax Passed Q	0	m...
Max Error	100	%	Power	4	cW	Cell 3 CompRes	0	m...	QMax Time	0	h...
Relative State of C...	0	%	Average Power	1	cW	Cell 4 CompRes	0	m...	Temp k	1.0	-
Absolute State of C...	0	%	Int Temperature	29.2	d...	PackGrid	0	-	Temp a	1000	-
Remaining Capacity	0	m...	TS1 Temperature	293.9	d...	Cell 1 Grid	0	-	Cell 1 Raw DOD	16122	-
Full charge Capacity	3377	m...	TS2 Temperature	293.6	d...	Cell 2 Grid	0	-	Cell 2 Raw DOD	16384	-
Run time To Empty	65535	min	TS3 Temperature	293.7	d...	Cell 3 Grid	0	-	Cell 3 Raw DOD	13760	-

Bit Registers

Name	Value	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CapM	0x6081	ChgM	AM	RSVD	RSVD	RSVD	RSVD	PB	CC
CF	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	PBS	ICC
OCA	TCA	RSVD	OTA	TDA	RSVD	RSVD	RSVD	RCA	RIA
INT	DSG	FC	FD	EC3	EC2	EC1	EC0	SEC1	SEC0
SLEEP	XCHG	XDSG	PF	SS	SDV	SDV	SDV	SEC1	SEC0
BTP_INT	RSVD	FUSE	RSVD	PCHG	CHG	DSG	DSG	PRES	PRES
RSVD	PSSHUT	EMSHUT	CB	SLPCC	SLPAD	SMBLICAL	INIT	INIT	INIT
SLEEPM	XL	CAL_OFFSET	CAL	AUTOCALM	AUTH	LED	SOM	SOM	SOM
Temp Range (...	0x10	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD
Temp Range (...	0x0004	RSVD	OT	HT	STH	RT	STL	LT	UT
Charging Stat...	0x0004	RSVD	RSVD	RSVD	RSVD	RSVD	CCC	CVR	CCR
VCT	MOHG	SU	IN	HW	MV	LV	PV	PV	PV
Gauging Status	0x05	CF	DSG	EDV	BAL_EN	TC	TD	FC	FD
IT Status (high)	0x0004	RSVD	RSVD	RSVD	OCVFR	LDMD	RX	GMAX	VDQ
IT Status (low)	0x8000	NSFM	RSVD	SLPQMAX	GEN	VOK	RDIS	RSVD	RESE
Manufacturing ...	0x0000	CAL_EN	LT_TEST	RSVD	RSVD	RSVD	LED_EN	FUSE_EN	FUSE_EN
Manufacturing ...	0x0000	BRR_EN	PF_EN	LF_EN	FET_EN	GAUGE_EN	DSG_TEST	CHG_TEST	POHG_TEST
Safety Alert A...	0x0000	RSVD	CUVC	OTD	OTC	ASCDL	RSVD	AGCL	RSVD
Safety Alert A...	0x0000	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD

Commands

Log Panel

Transaction Log

Name Cmd Result Re

Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Registers Data Memory Commands Calibration Chemistry Advanced Comm SMB Authentication Firmware Watch Data Graph Errors

Auto Refresh is ON - Click to Turn Off
bqStudio Version: 1.3.45

EV2400
Version:0.18

SMB

bq40z50R1
4500_1_06
Addr: 0x17
29.3 degC

10152 mV

-100 1000
-2000
3

Basic Calibration

Perform Calibration

Select the types of calibration to perform and enter the actual input

Current Calibration

Applied Current

Temperature calibration

Sensor Applied temperature Calibrate

Temperature 26 deg C

Calibrate Gas Gauge

Voltage calibration

Applied Cell 1 voltage

Applied Battery Voltage

Applied Pack voltage

Calibrate Battery Voltage

Calibrate Pack Voltage

Commands

Log Panel

Transaction Log

Name Cmd Result Re

BMS Software and Solutions

Windows 10 test plan report

Last updated: Monday, January 25, 2016 by Shirish Kavoor

Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Registers Data Memory Commands Calibration Chemistry Advanced Comm SMB Authentication Firmware Watch Data Graph Errors

Dashboard

Auto Refresh is ON - Click to Turn OFF

bqStudio Version: 1.3.45

EV2400
Version:0.18

SMB

bq40z50R1
4500_1_06
Addr: 0x17
29.2 degC

10126 mV

-100 1000
-2000
-3

Read/Write Data Memory Contents

	Name	Value	Unit
Voltage	Cell Gain	12101	-
	Pack Gain	49669	-
	BAT Gain	35227	-
Current	CC Gain	1.036	mOhm
	Capacity Gain	1.036	mOhm
	Current Offset		
Temperature	Internal Temp Offset	0	°C
	External1 Temp Offset	0	°C
	External2 Temp Offset	0	°C
	External3 Temp Offset	0	°C
Internal Temp Model	Int Gain	-12143	-
	Int base offset	6232	-
	Int Minimum AD	0	-
	Int Maximum Temp	6232	0.1degK
Cell Temperature Model	Coeff a1	-11130	-
	Coeff a2	19142	-
	Coeff a3	-19262	-
	Coeff a4	28203	-
	Coeff a5	892	-
	Coeff b1	328	-

Commands

Log Panel

Transaction Log

Name Cmd Result Re

4:43 PM
1/13/2016

Battery Management Studio (bqStudio) 1.3.45

File View Window Help

Registers Data Memory Commands Calibration Chemistry Advanced Comm SMB Authentication Firmware Watch Data Graph Errors

Dashboard

Auto Refresh is ON - Click to Turn OFF

bqStudio Version: 1.3.45

EV2400
Version:0.18

SMB

bq40z50R1
4500_1_06
Addr: 0x17
29.2 degC

10128 mV

-100 1000
-2000
4

Read/Write Data Memory Contents

	Name	Value	Unit						
Configuration	Charging Configuration	00	hex						
	FET Options	20	hex						
	Sbs Gauging Configuration	04	hex						
	Sbs Configuration	20	hex						
	Power Config	00	hex						
	IO Config	00	hex						
	LED Configuration	00d0	hex						
	Temperature Enable	05	hex						
Temperature Enable									
Ter X	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
DA	MSB	RSVD	RSVD	RSVD	TS4	TS3	TS2	TS1	TSInt
SC									
SO									
Ba									
IT Gauging Configuration		04te	hex						
Fuse	PF Fuse A	00	hex						
	PF Fuse B	00	hex						
	PF Fuse C	00	hex						
	PF Fuse D	00	hex						
	Min Blow Fuse Voltage	3500	mV						
BTP	Init Discharge Set	150	mAh						
	Init Charge Set	175	mAh						
SMBus	Address	16	-						
	Address Check	ea	-						
Protection	Protection Configuration	00	hex						
	Enabled Protections A	ff	hex						

Commands

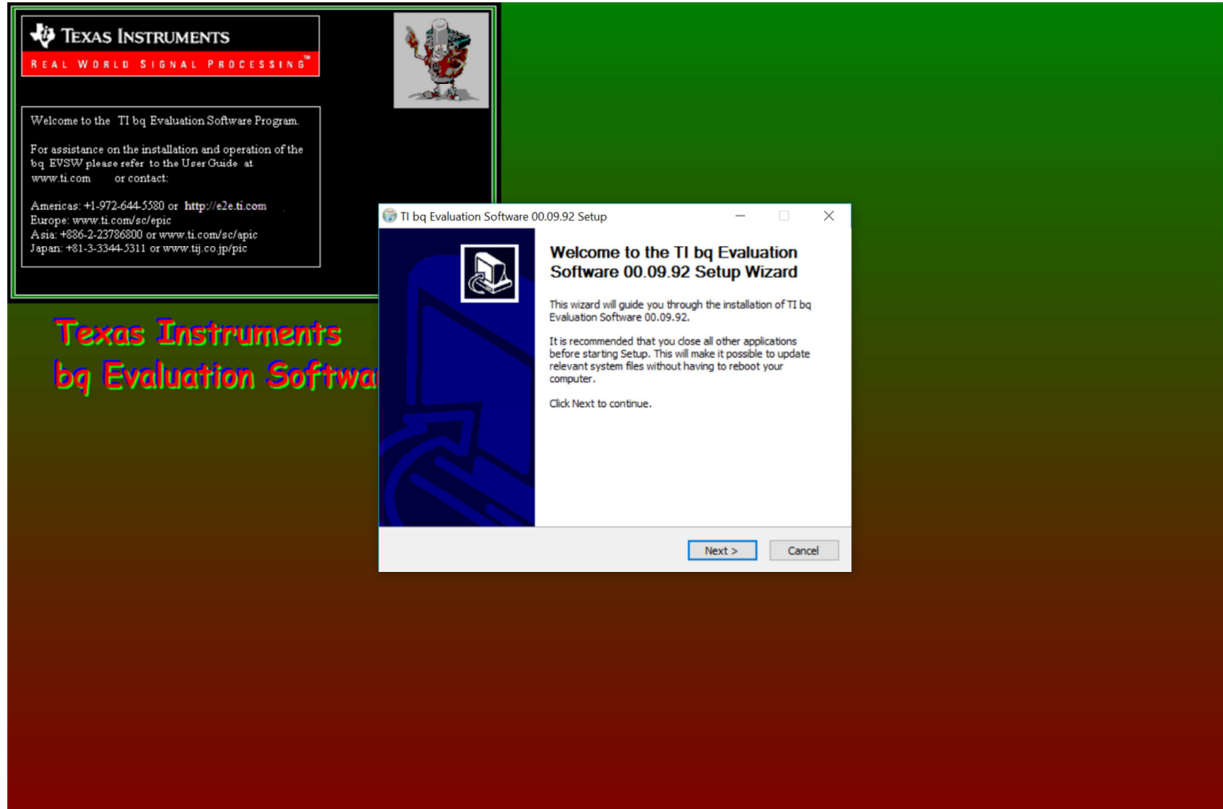
Log Panel

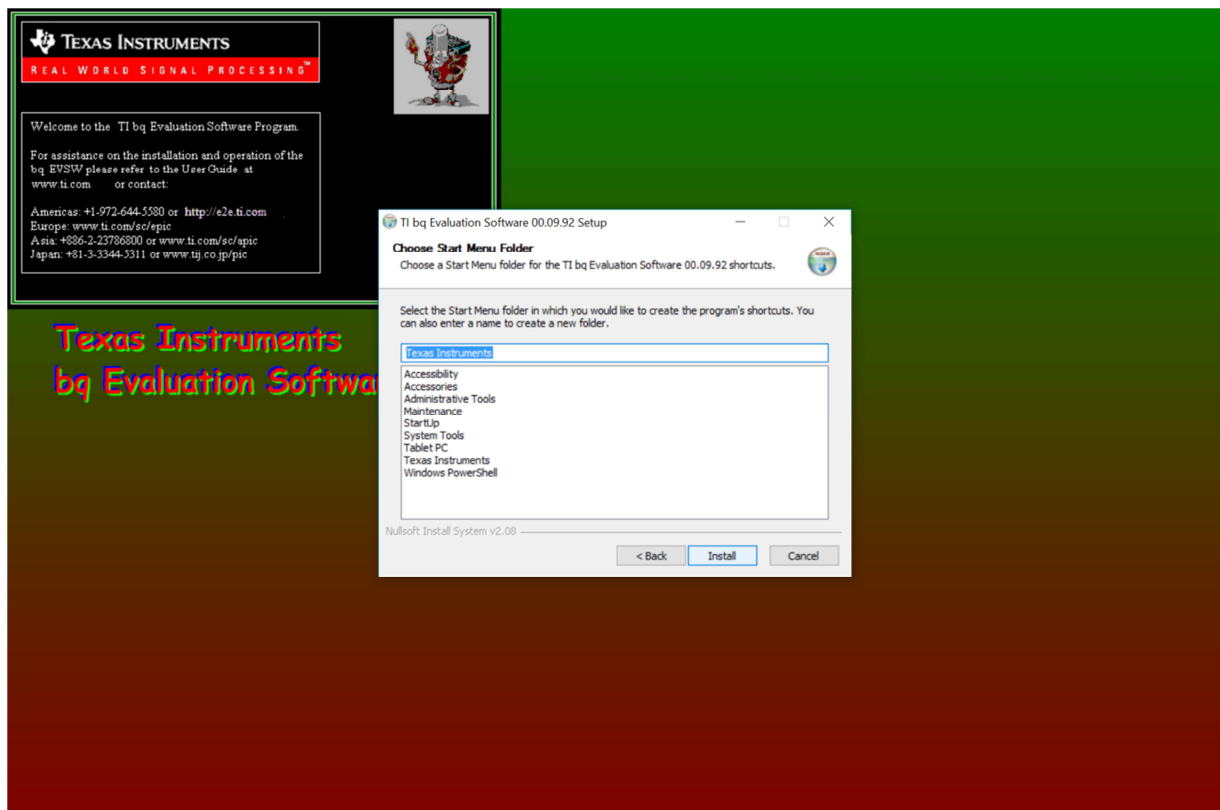
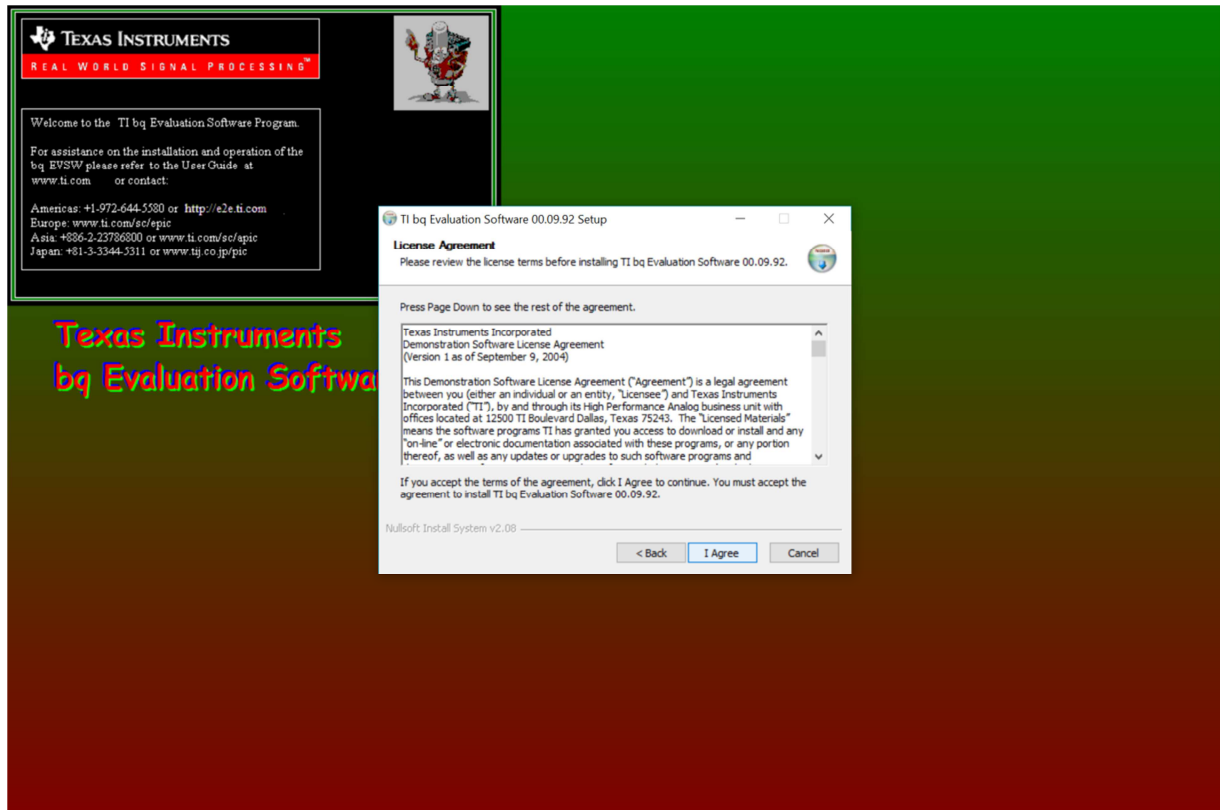
Transaction Log

Name Cmd Result Re

4:43 PM
1/13/2016

Installing bq Evaluation software

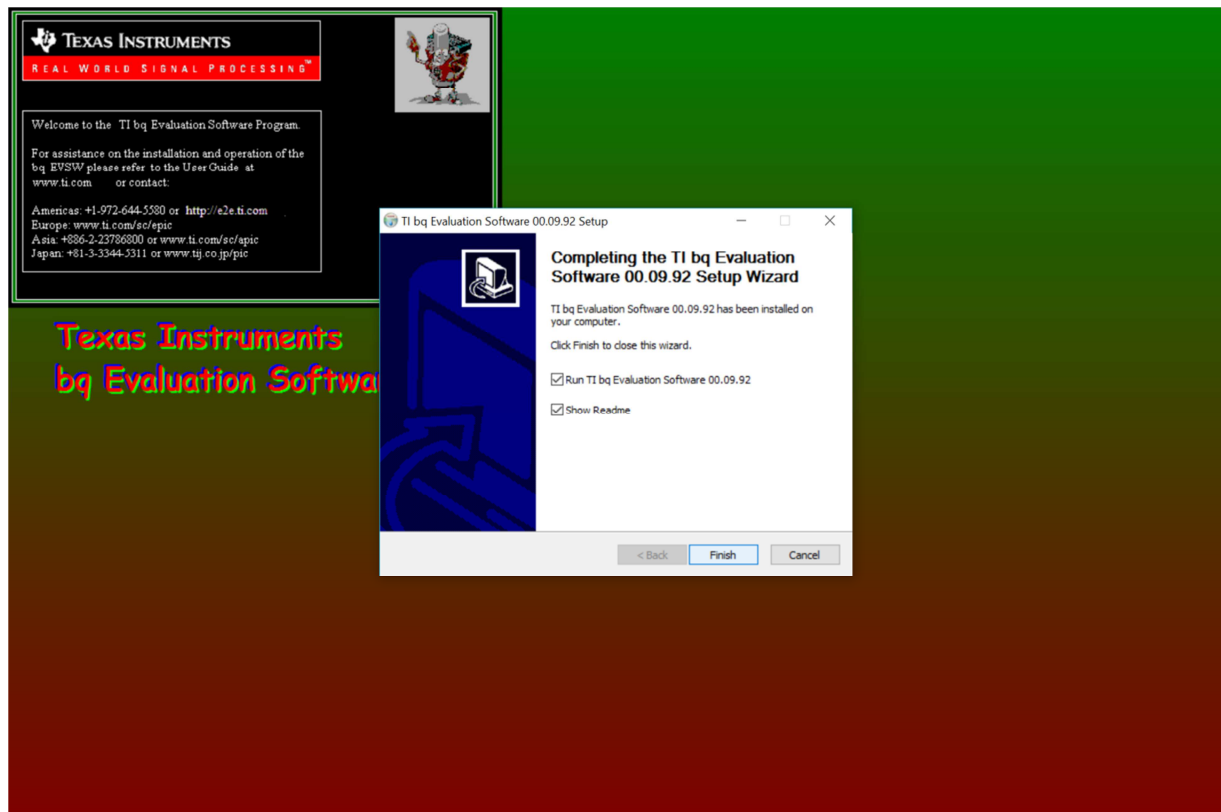




BMS Software and Solutions

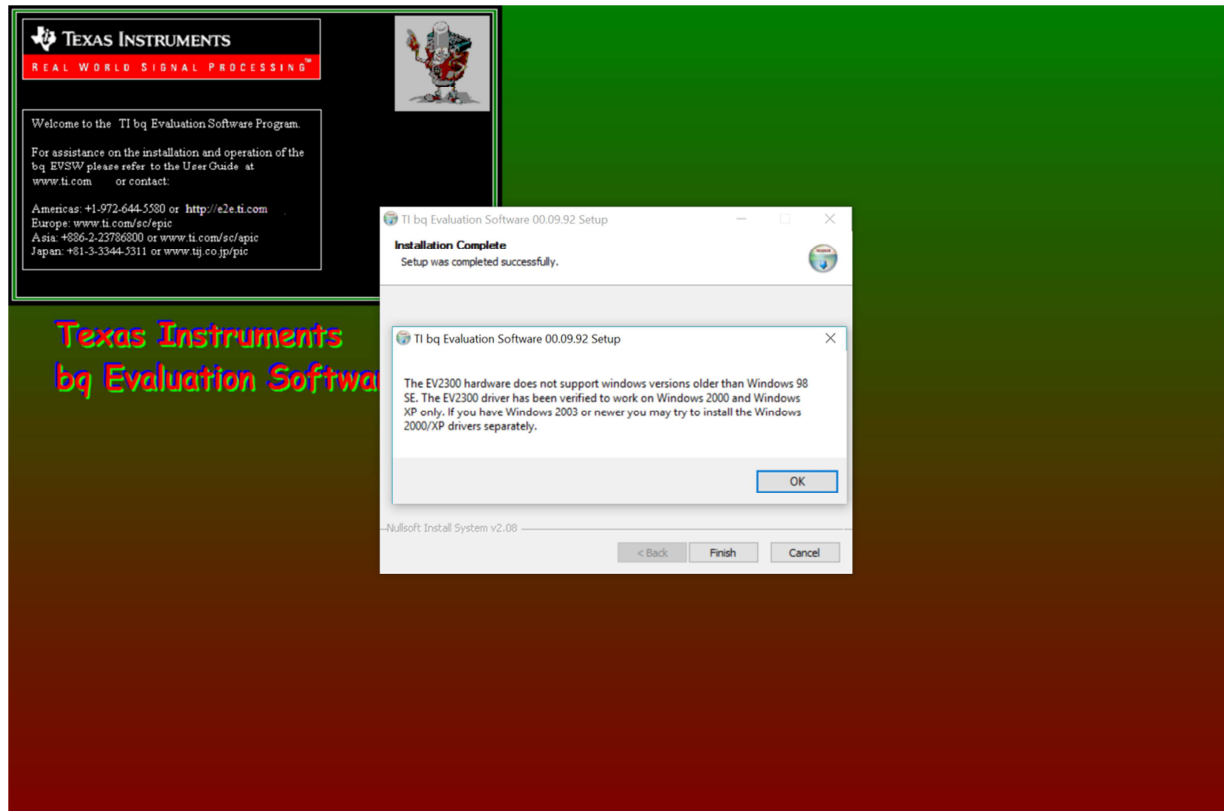
Windows 10 test plan report

Last updated: Monday, January 25, 2016 by Shirish Kavoor



Quirk:

bqEvaluation software: The following message is shown after installation and can be ignored. bqEVSW was created when Windows 7 did not exist and therefore does not recognize it.



bqEVSW and EV2300

Note: EV2300 drivers were previously installed

BMS Software and Solutions

Windows 10 test plan report

Last updated: Monday, January 25, 2016 by Shirish Kavoor

Texas Instruments bq Gas Gauge Evaluation Software - bq30z554R1 v0.11 - [SBS Data]

File Options AutoCycle View Window Help

TEXAS INSTRUMENTS REAL WORLD SIGNAL PROCESSING™

Refresh Start Logging Stop Logging Keep Scanning Write 2 word Command Graphs...

Name	Value	Unit	Log	Scan
Manufacturer Access	0000	hex	✓	✓
Remaining Cap. Alarm	300	mAh	✓	✓
Remaining Time Alarm	10	min	✓	✓
Battery Mode	6081	hex	✓	✓
At Rate	0	mA	✓	✓
At Rate Time To Full	65535	min	✓	✓
At Rate Time To Empty	65535	min	✓	✓
At Rate OK	0	-	✓	✓
Temperature	23.95	degC	✓	✓

Name	Value	Unit	Log	Scan
Voltage	8202	mV	✓	✓
Current	-4	mA	✓	✓
Average Current	-4	mA	✓	✓
Max Error	100	%	✓	✓
Relative State of Charge	0	%	✓	✓
Absolute State of Charge	0	%	✓	✓
Remaining Capacity	0	mAh	✓	✓
Full charge Capacity	4289	mAh	✓	✓
Run time To Empty	0	min	✓	✓

Name	Value	Unit	Log	Scan
Average Time to Empty	0	min	✓	✓
Average Time to Full	65535	min	✓	✓
Charging Current	0	mA	✓	✓
Charging Voltage	0	mV	✓	✓
Battery Status	48B0	hex	✓	✓
Cycle Count	0	-	✓	✓
Turbo Power	-1800	cWh	✓	✓
Turbo Current	-6507	mA	✓	✓

Version: 2.0.1
bq30z554SBS

SBS **Data Flash** **Pro** **Calibrate** **Seal Auth** **bqCHEM**

100%
0%
Fuel Gauge 0%

Scan Off Device: bq30z554 R1, FW version: V0_11_BLD0069

Communication OK. SBS Task Progress: 100% Task Completed. 10:15 AM 1/14/2016

Texas Instruments bq Gas Gauge Evaluation Software - bq30z554R1 v0.11 - [Data Flash Constants]

File Options Data Flash View Window Help

TEXAS INSTRUMENTS REAL WORLD SIGNAL PROCESSING™

Read All Write All Write All, Erase ... Right click on constant name for more information All View

Name	Value	Unit
State	-	-
Qmax Cell 0	4400	mAh
Qmax Cell 1	4400	mAh
Qmax Cell 2	4400	mAh
Qmax Cell 3	4400	mAh
Qmax Pack	4400	mAh
Update Status	00	-
Cell 0 Chg Voltage at EoC	4200	mV
Cell 1 Chg Voltage at EoC	4200	mV
Cell 2 Chg Voltage at EoC	4200	mV
Cell 3 Chg Voltage at EoC	4200	mV
Current at EoC	250	mA
Avg I Last Run	-2000	mA
Avg P Last Run	-3022	cW
Delta Voltage	0	mV

Name	Value	Unit
Max Avg I Last Run	-2000	mA
Max Avg P Last Run	-3022	cW
IT Cfg	-	-
Load Select	7	-
Load Mode	0	-
Ra Filter	50.0	%
Ra Max Delta	15	%
Design Resistance	42	mOhms
Reference Grid	4	-
Resistance Parameter Filter	65142	-
Term Voltage	9000	mV
Term Voltage Delta	300	mV
User Rate mA	0	mA
User Rate cW	0	cW
Reserve Cap-mAh	0	mAh

Name	Value	Unit
Reserve Cap-cWh	0	cWh
Remcap Smoothing Filter	250	-
Fast Scale Start SOC	10	%
Turbo Cfg	-	-
Min Turbo Power	0	cW
Pack Resistance	30	mOhms
System Resistance	0	mOhms
Max Current Rate	-4	C
High Frequency Resistance	20	mOhms
Reserve Energy %	2	%
Current Thresholds	-	-
Dsg Current Threshold	100	mA
Chg Current Threshold	50	mA
Quit Current	10	mA

Communication OK. DF Task Progress: 100% Task Completed. 10:15:34 AM 1/14/2016

BMS Software and Solutions

Windows 10 test plan report

Last updated: Monday, January 25, 2016 by Shirish Kavoor

Texas Instruments bq Gas Gauge Evaluation Software - bq30z554R1 v0.11 - [Pro (Advanced) Screen]

File Options Flash Memory Window Help

TEXAS INSTRUMENTS REAL WORLD SIGNAL PROCESSING™

This screen is only for advanced users. Some commands may cause permanent damage to the hardware. Please use caution.
All Values are in Hexadecimal without the 0x prefix. Target Address: 17

Send SMB Command
SMB Command: 03 Send

Read SMB Word
SMB Command: 00 Read Result (hex): None

Write SMB Word
SMB Command: 00 Word (hex): 0F00 Write

Read SMB Block
SMB Command: 78 Read Result (hex): None
Result (ASCII):

Write SMB Block
SMB Command: 78 Block Data (hex): 0102 0304 05 06 Write

Hexadecimal to Decimal converter and vice versa
Hexadecimal value: 00 Signed Unsigned Decimal value: 00

Spec programming
☒ Safe Erase Program

100%
0% Fuel Gauge 0%

Communication OK. DF Task Progress: 100% Task Completed. 10:15:38 AM

Search the web and Windows

Texas Instruments bq Gas Gauge Evaluation Software - bq30z554R1 v0.11 - [Host Calibration]

File Window Help

TEXAS INSTRUMENTS REAL WORLD SIGNAL PROCESSING™

Voltage and Temperature Current ☐ Check for continuous updates.

Please ensure that scanning/communication is off on all other open windows.

Voltage and Temperature Calibration

Calibrate Voltage and Temperature as indicated below

Voltage: Enter actual cell voltages using stack ground as reference. Cells configured for use are active. Check voltage calibration checkbox.

Temperature: Enter actual sensor temperatures. Check to include in calibration. Click Voltage/Temperature calibration button to calibrate.

☐ Voltage Calibration

Measured voltage	Enter actual voltage	Cell Count
3317 mV	Cell 1: 4000 mV	3
6270 mV	Cell 1 + 2: 8000 mV	
8203 mV	Cell 1 + 2 + 3: 12000 mV	
8203 mV	Cell 1 + 2 + 3 + 4: 16000 mV	
14408 mV	Battery Voltage: 12000 mV	

Ensure voltage reference is stable. Calibration with cells connected is not recommended unless cells are in a state of rest. If using resistors simulating cells, series resistance must be less than 300 ohms. Configured number of cells in Dataflash available for calibration only. Battery voltage is usually top stack voltage.

☐ Internal Temp: 15.3 °C

☐ Ext 1 Temp: 24.0 °C

☐ Ext 2 Temp: 23.8 °C

Pack Calibration

Measured voltage	Enter actual voltage
109 mV	12000 mV

Calibrate Pack Voltage

Current Values

Parameter	Value
Voltages	----
Cell Voltage 1	3317
Cell Voltage 2	2953
Cell Voltage 3	1933
Cell Voltage 4	0
Battery Voltage	14408
Pack Voltage	109
Temperatures	----
Internal Temp	15.3
TS1 Temp	24.0
TS2 Temp	23.8
Cell Temp	23.8
FET Temp	23.8

Raw Calibration Dataflash Values

Parameter	Value
Cell Scale 0	20451
Cell Scale 1	20468
Cell Scale 2	20520
Cell Scale 3	20517
Pack Gain	49000
Battery Gain	49000
CC Gain	0.942
Capacity Gain	280932.625
Current Offset	-7204
CC Offset Samples	64
Board Offset	0
Int Temp Offset	0
Ext 1 Temp Offset	0
Ext 2 Temp Offset	0

Continue calibrations on second page

Version: 0.1.0.8 bq8050 Hostcal

100%
0% Fuel Gauge 0%

Communication OK. DF Task Progress: 100% Task Completed. 10:15:45 AM

Search the web and Windows

BMS Software and Solutions

Windows 10 test plan report

Last updated: Monday, January 25, 2016 by Shirish Kavoor

Texas Instruments bq Gas Gauge Evaluation Software - bq30z554R1 v0.11 - [Host Calibration]

File Window Help

TEXAS INSTRUMENTS REAL WORLD SIGNAL PROCESSING™

Voltage and Temperature Current

Please ensure that scanning/communication is off on all other open windows.

Coulomb Counter Offset Calibration

Calibrate Coulomb Counter ☒ Ensure that no load current is flowing.

Board Offset Calibration

Calibrate Board Offset ☒ Ensure that no load current is flowing.

Pack Current Calibration

Calibrate Pack Current

Measured current: 0 mA Enter actual current: -2000 mA

Apply a 2 Ampere discharge load. Discharge current is a negative value. Charge current is positive. A voltage applied between Cell ground and Pack- will force current through sense resistor.

Back to first page

Current Values

Parameter	Value
Voltages	
Cell Voltage 1	3315
Cell Voltage 2	2952
Cell Voltage 3	1820
Cell Voltage 4	0
Battery Voltage	14409
Pack Voltage	110
Temperatures	
Internal Temp	15.5
TS1 Temp	24.1
TS2 Temp	24.0
Cell Temp	24.1
FET Temp	24.0

Raw Calibration Dataflash Values

Parameter	Value
Cell Scale 0	20451
Cell Scale 1	20468
Cell Scale 2	20520
Cell Scale 3	20517
Pack Gain	49000
Battery Gain	49000
CC Gain	0.942
Capacity Gain	280932.625
Current Offset	-7204
CC Offset Samples	64
Board Offset	0
Int. Temp Offset	0
Ext 1 Temp Offset	0
Ext 2 Temp Offset	0

100% Fuel Gauge 0%

Communication OK. DF Task Progress: 100% Task Completed. 10:21:42 AM

Texas Instruments bq Gas Gauge Evaluation Software - bq30z554R1 v0.11 - [Auth]

File Window Help

TEXAS INSTRUMENTS REAL WORLD SIGNAL PROCESSING™

Seal/UnSeal/Full Access Authentication Change Key

Seal/Unseal/Full Access

All displayed data is most significant digit first.

Key (128 bits): 0123456789ABCDEF FEDCBA9876543210

Random Number from device: []

Random Number + Key: []

Digest: []

Select mode:

☐ Seal

☒ Unseal

☐ Full Access

Current Device Mode: Full Access

Go

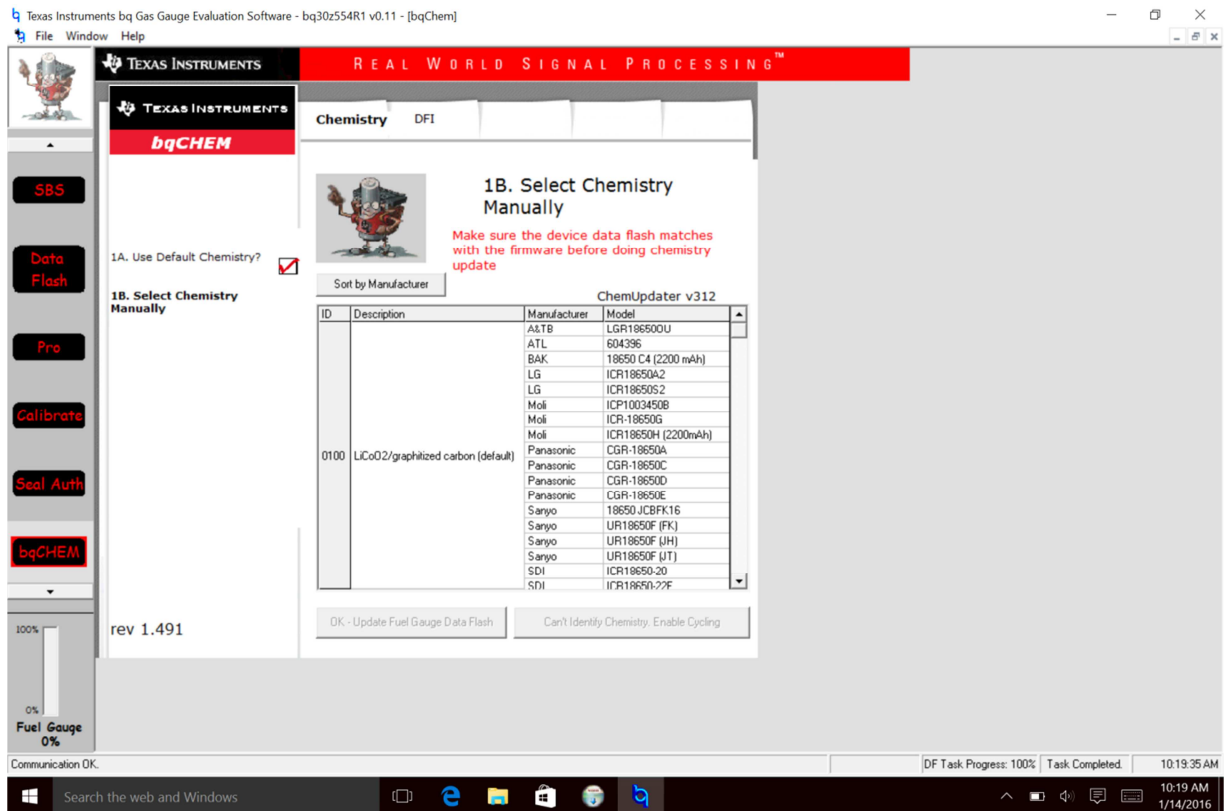
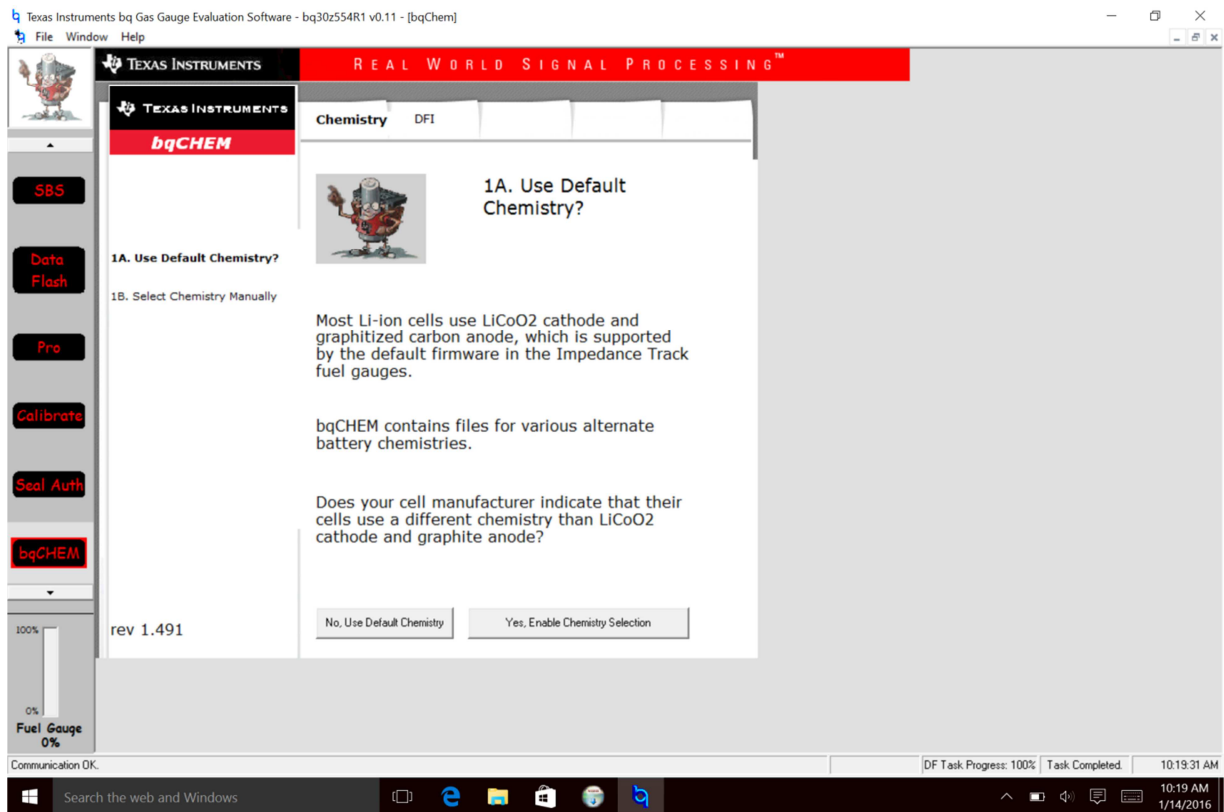
100% Fuel Gauge 0%

Communication OK. DF Task Progress: 100% Task Completed. 10:19:21 AM

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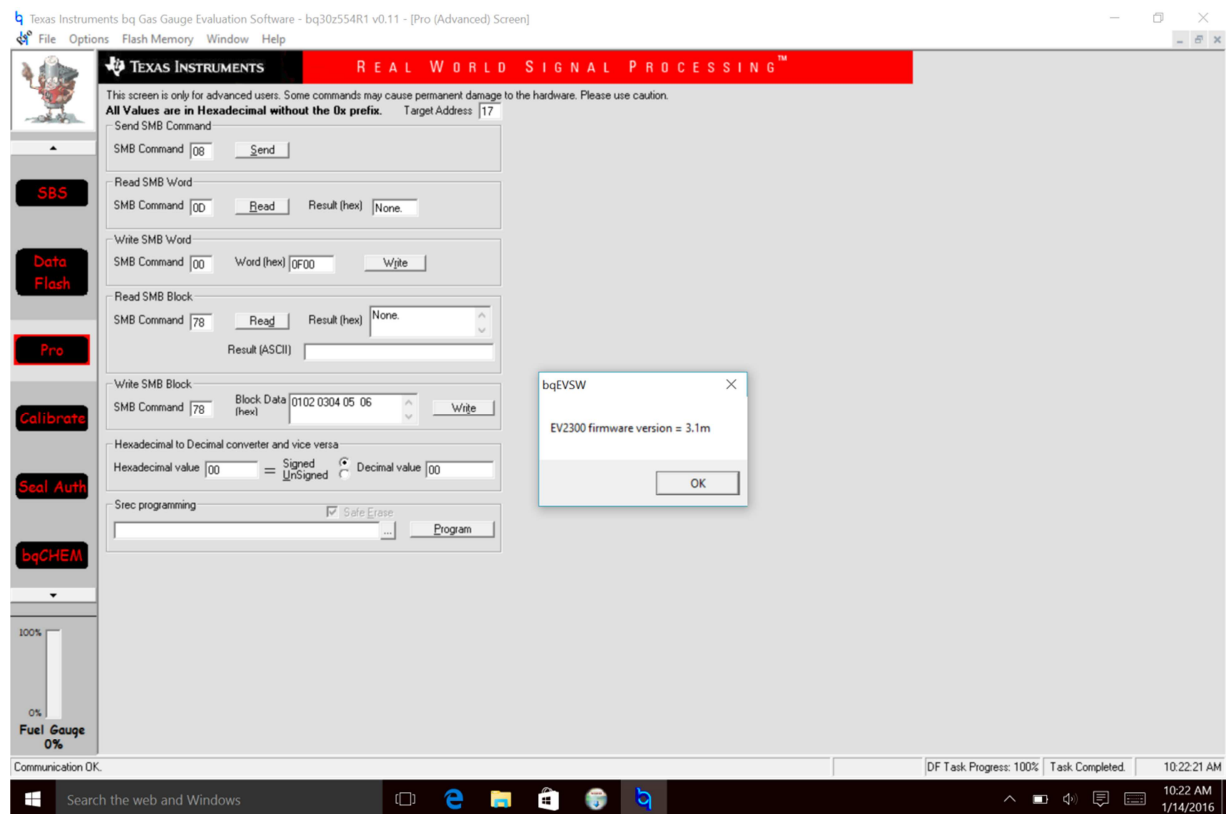


All screens in bq EVSW were identical for EV2300 and EV2400.

Screenshots with EV2x00 information

EV2x00 information was obtained from the “Pro” functionality menu Window->GetEV2300 Version.

The EV2300 firmware is reported as 3.1m

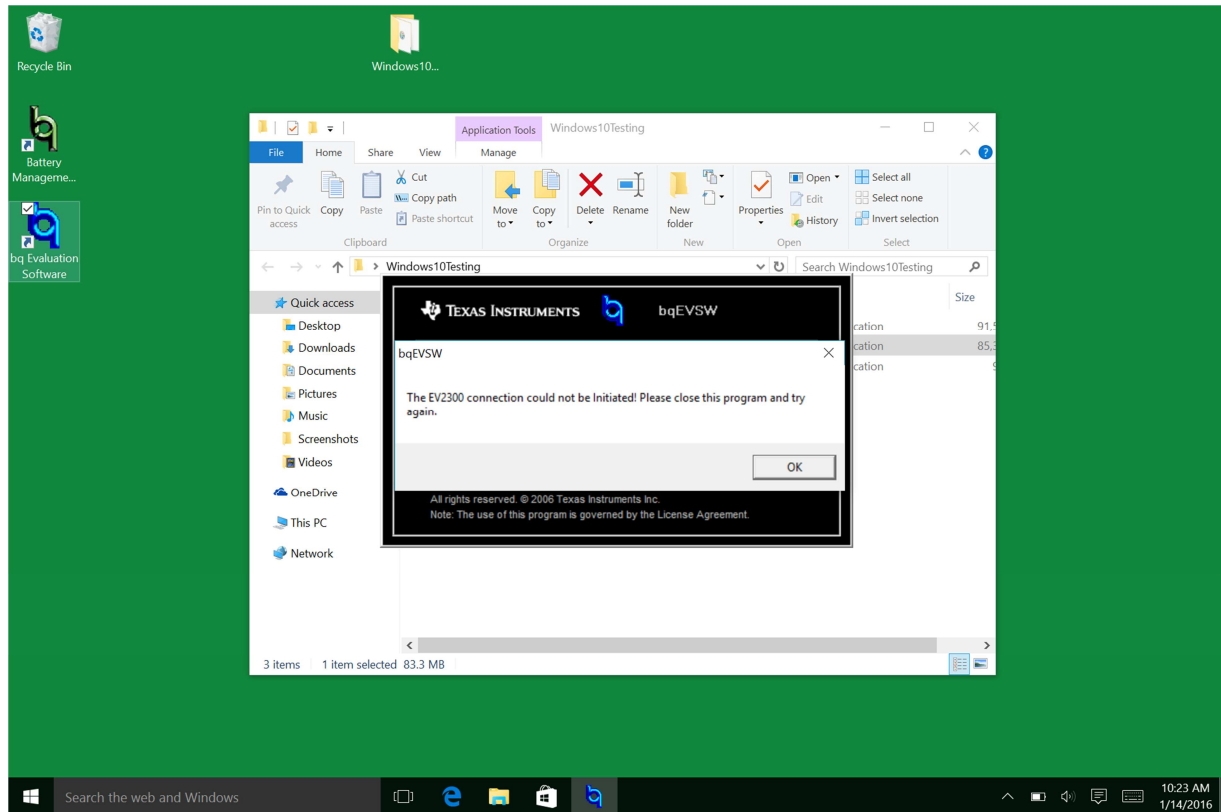


bqEVSW and EV2400

Results – Fail (Workaround available)

Bq Evaluation software did not work with EV2400 out of the box.

Errors shown when used with EV2400 (support components not installed)



How to enable EV2400 use from bqEVSX

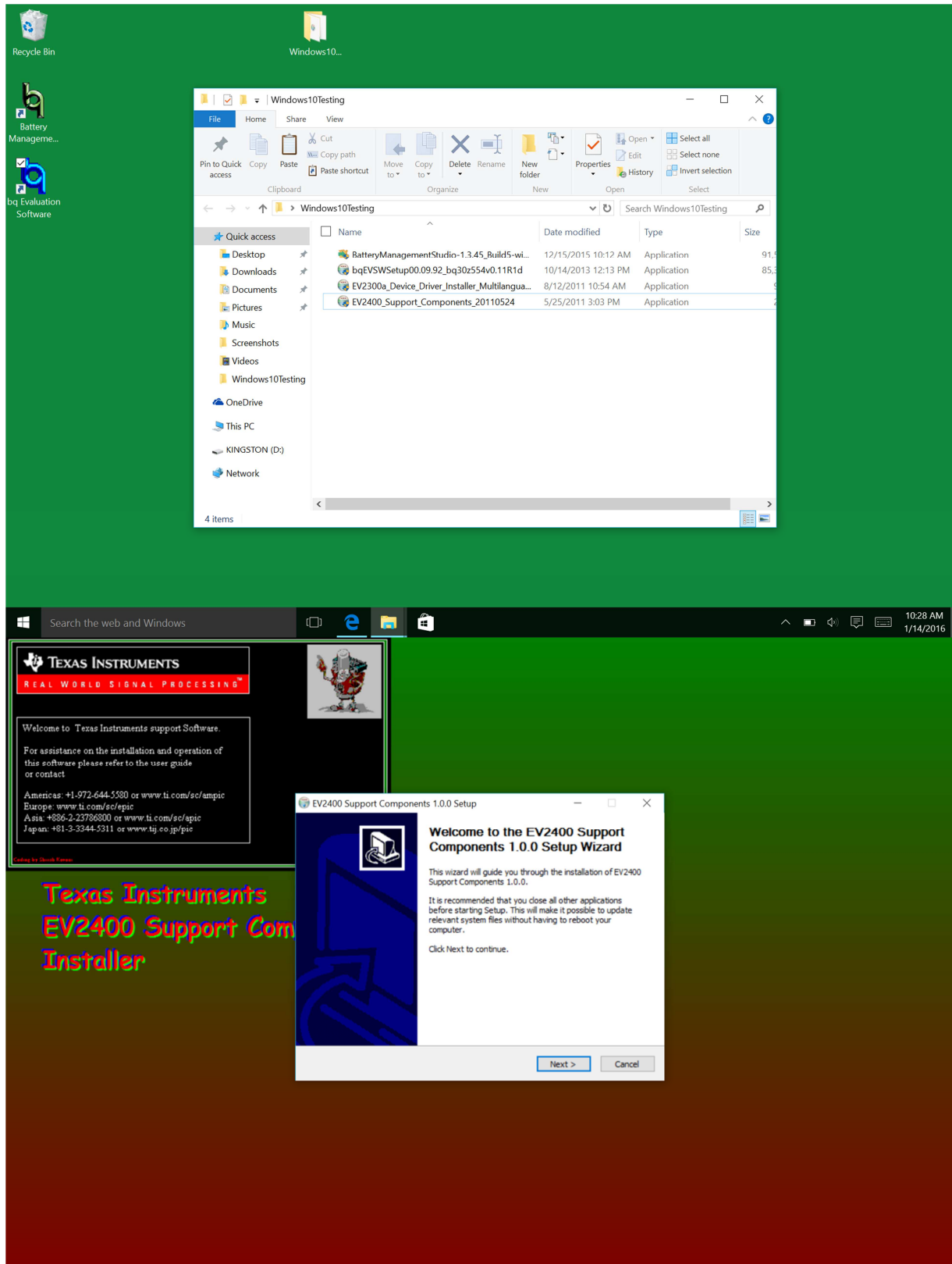
The EV2400 support components must be installed to allow bqEVSX to work with EV2400. The support components software may need to be reinstalled after every new installation/upgrade of bqEVSX for other products.

Installing EV2400 support components

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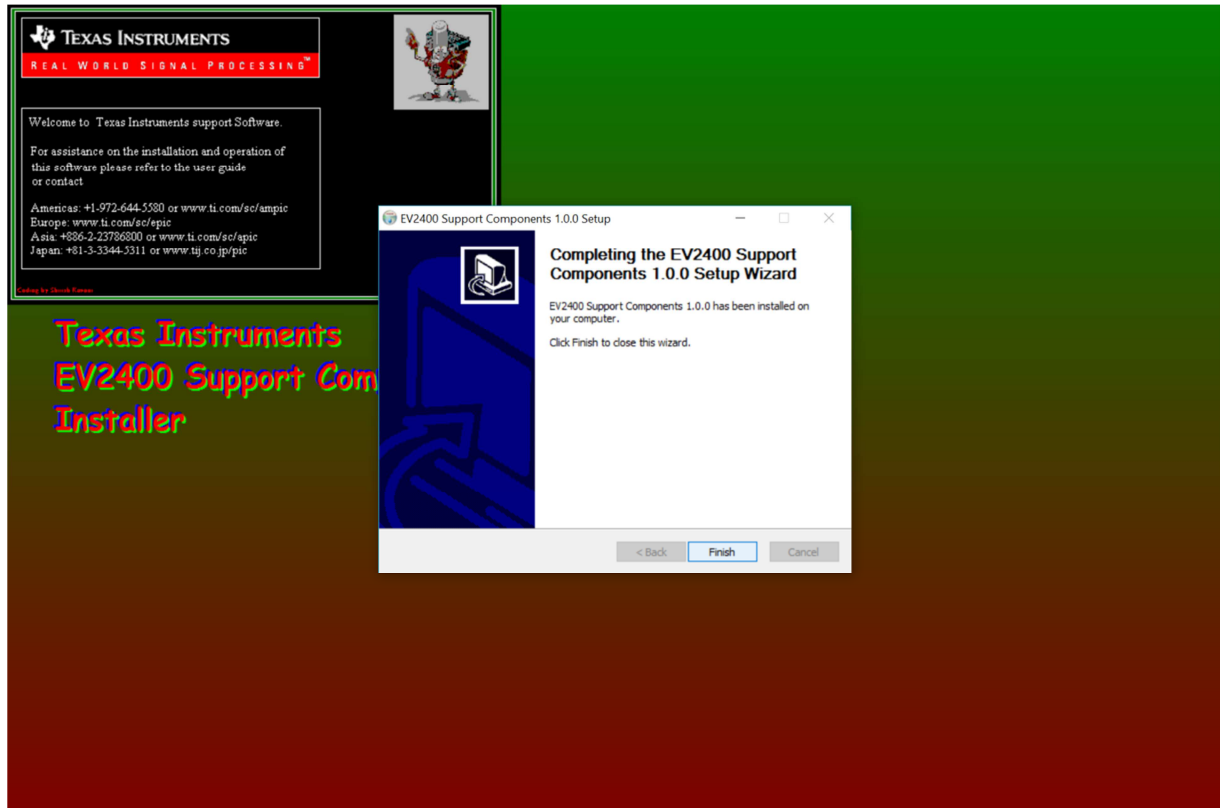
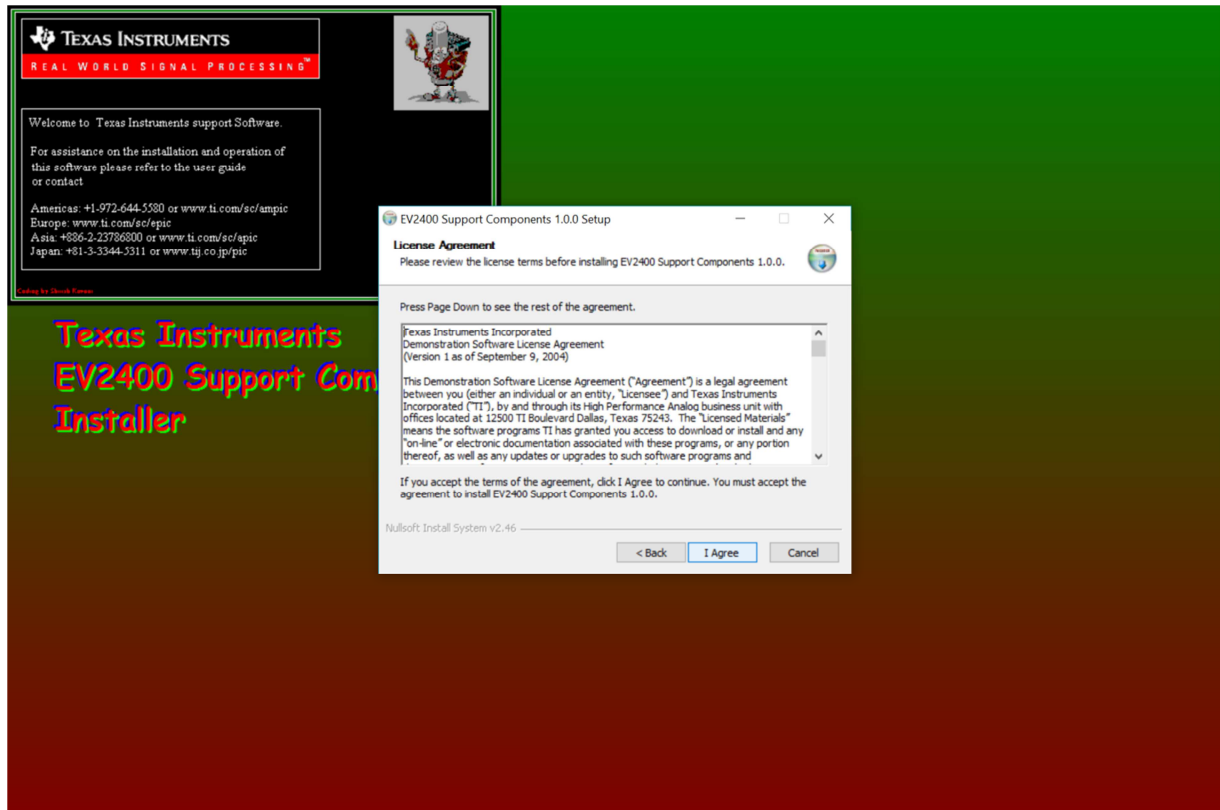
Last updated: Monday, January 25, 2016 by Shirish Kavoor



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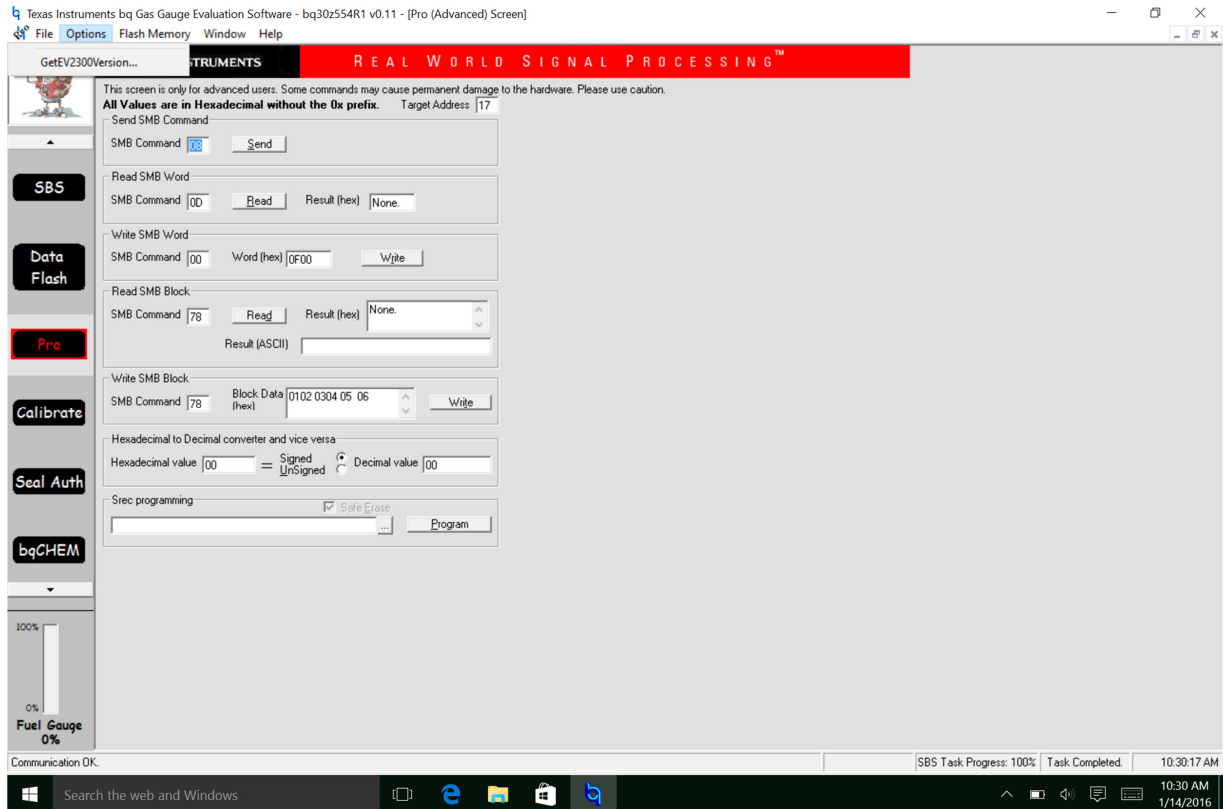
Last updated: Monday, January 25, 2016 by Shirish Kavoor



Results : After installing EV2400 support components - Pass

bqEVSW using EV2400

All bqEVSW functionality with EV2400 is identical to EV2300 screenshots when support components are installed.



EV2x00 information was obtained from the “Pro” functionality menu Window->GetEV2300 Version.

The EV2300 firmware is reported as 3.1m

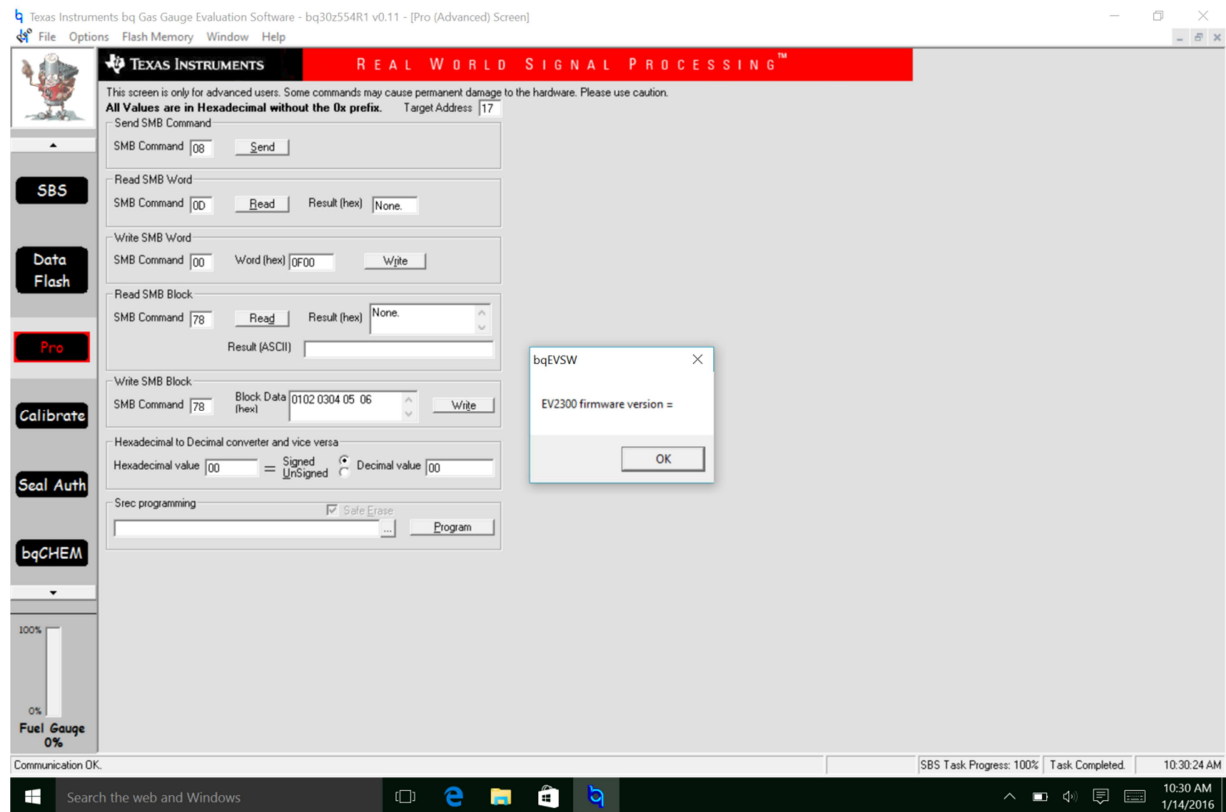
Screenshots with EV2x00 information

The EV2400 firmware is reported as 0.05 for old EV2400 boxes. We recommend updating to v0.18 firmware. Our testing was performed with EV2400 FW v0.18. bqEVSW will show an empty version number when using v0.18 as shown in the screenshot below

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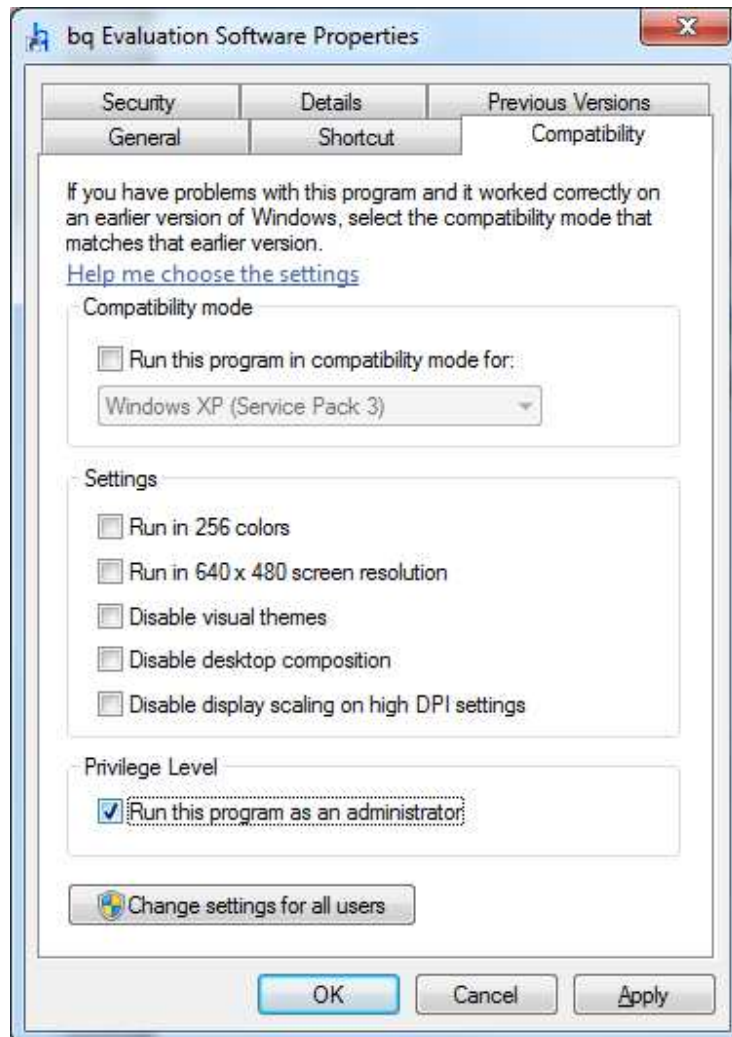
Last updated: Monday, January 25, 2016 by Shirish Kavoor



Recommendations

- Always run all installer programs as “administrator”. Right click on executable and select “Run as administrator”
- Run bqEVSW as administrator everytime. A simple way is to automatically do this from the shortcut is to update the shortcut. Right click on shortcut and select “Properties”, then choose

the tab with this option, then select “Run this program as administrator” and Apply.



- Ensure that security policy allows USB device drivers to be loaded automatically