STBCEUG

Freedom Sensor Toolbox - Community Edition

Rev. 1.3 — 10 May 2018 User guide

1 Introduction

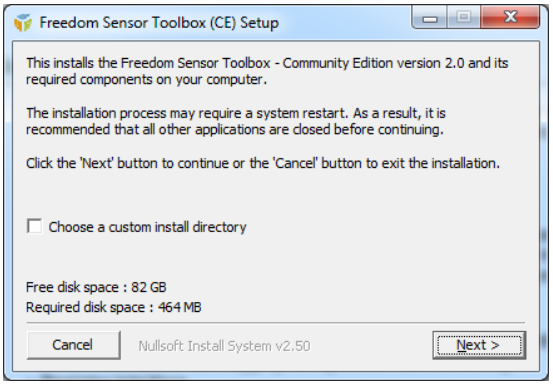
The Freedom Sensor Toolbox - Community Edition (STB-CE) is the visualization and evaluation software tool in the Sensor Toolbox ecosystem. It enables quick and easy demonstration and evaluation of NXP sensors.

Features

- **Out of Box Sensor Demonstration**
  Out of Box Sensor Demonstration enables quick visualization of sensor data and other sensor outputs based on preconfigured sensor settings in the firmware. The IoT Sensing SDK(ISSDK) based firmware and the GUI projects are automatically loaded, providing a plug and play experience.
- **Real Time Sensor Evaluation**
  Real Time Sensor Evaluation enables changing critical sensor settings (ODR, FSR, power modes) and data logging during sensor data streaming.
- **Register Interface**
  Register interface provides a register map for the sensors and allows quick read and write of different register bits, allowing detailed sensor evaluation.

2 Installing STB-CE

1. Download the **Freedom Sensor Toolbox (CE) installer** from www.nxp.com/sensortoolboxcommunityedition.
2. Run the installer (*FreedomSensorToolbox(CE)Installer.exe*).
3. In the Freedom Sensor Toolbox (CE) Setup dialog box, click **Next** to extract the installer and proceed with the installation process.



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a. The Freedom Sensor Toolbox installer downloads and installs the following runtime engines (if they are not currently installed).

- **Visual C++ Redistributable for Visual Studio 2012** (6.25 MB) installs the runtime components required for C++ DLLs built in Visual Studio 2012 to run.
- **Visual C++ Redistributable for Visual Studio 2013** (6.20 MB) installs the runtime components required to execute the applications using Visual Studio 2013 DLLs.
- **VISA Runtime Engine 17** (124 MB) installs the components required to communicate with instrumentation buses like Serial, GPIB, USB, and Ethernet.
- **LabVIEW 2017 32-bit Runtime Engine** (366 MB) installs the components for a LabVIEW built application/executable to run.
- **Microsoft .NET Framework 4.0** installs the components for a LabVIEW built application/executable to run.

Advanced Note for installation in multiple PCs: The runtime engines are downloaded to the *Dependencies* folder, parallel to the Freedom Sensor Toolbox Installer setup file. When installing on multiple computers, the runtime engines (*Dependencies* folder) can be manually copied from one PC to another to save download time.

b. The Freedom Sensor Toolbox installer installs the STB-CE application, along with the core plugins and sample projects, in the *C:\Program Files (x86)\NXP\Freedom Sensor Toolbox (CE)* folder.

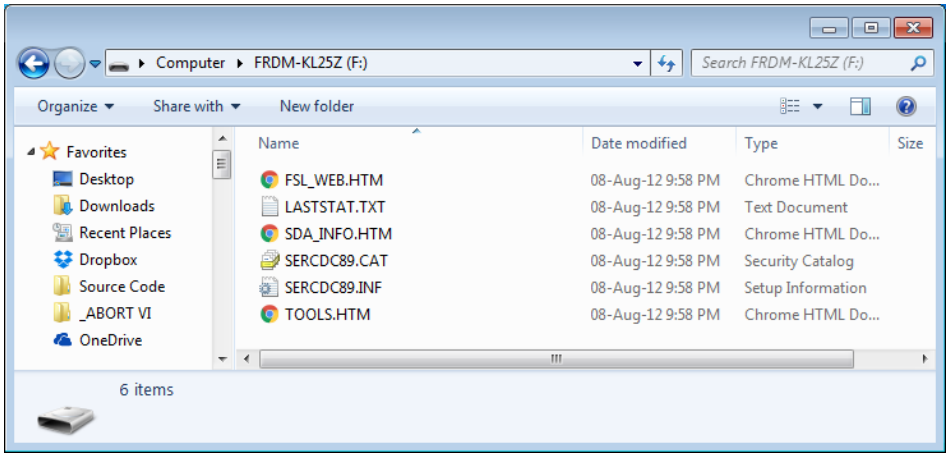
4. Complete the STB-CE installation.
   a. If the runtime engines were installed during setup, a dialog box appears indicating that the system needs to be restarted to complete the installation. When prompted to restart your computer, click **Yes**. Following the system restart, the application is ready to use.
   b. If runtime engines are already present in the system, a dialog box appears indicating that the installation has completed successfully. Click **OK**. The application is ready to use.

3 Connecting to a sensor demonstration kit

Refer to the GETTING STARTED tab to install the required drivers and get started with standard sensor demonstration kits.

All standard NXP sensor demonstration kits are available at www.nxp.com/sensorevaluationboards.

For FRDM Boards: After following the steps, the **Freedom board** is detected and a removable disk in Windows Explorer appears as a FRDM board virtual COM port under the Device Manager/Ports group. The drive name varies depending on the Freedom board connected.



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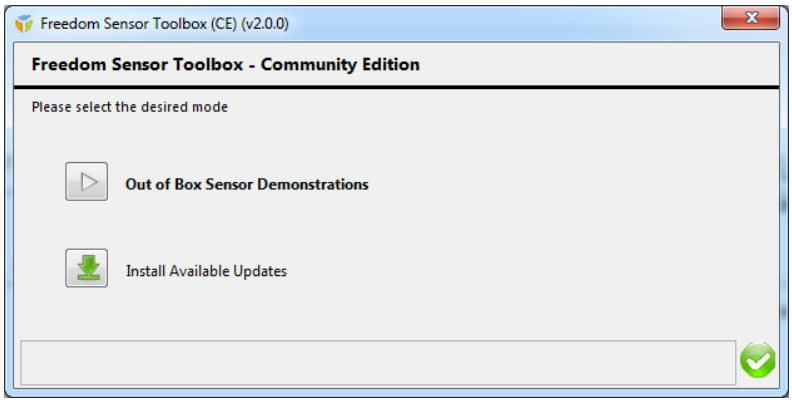
For the LPCXpresso54114 and QN908x_DK boards: Allow about 30 seconds for the board to enumerate for the first time. It is not necessary to check the Hardware Manager, however if this is done, there will be the following device:

- Ports
  - LPC-LinkII UCom Port

4 Running STB-CE

Run STB-CE by double clicking the **Freedom Sensor Toolbox (CE)** shortcut located on the desktop.



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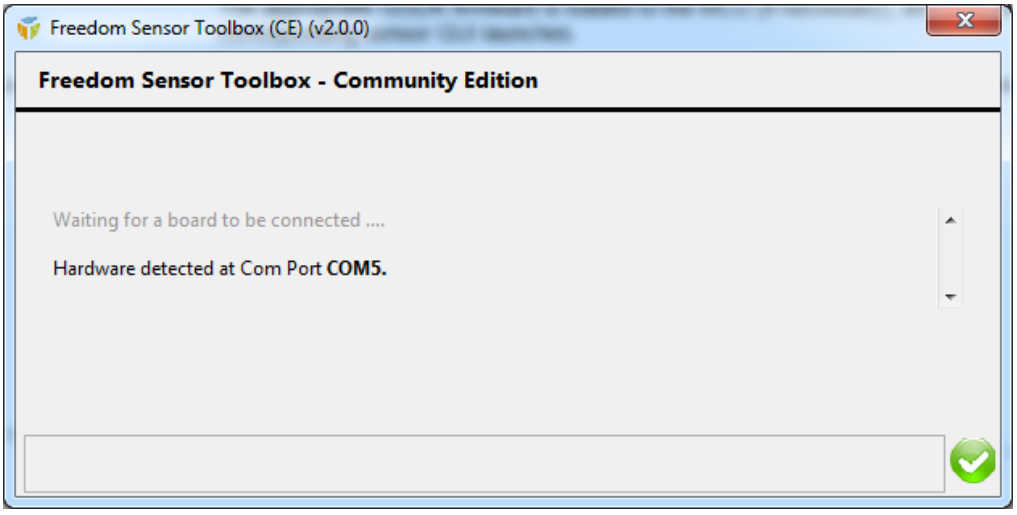
A selection window appears with two choices:

- **Out of Box Sensor Demonstration**
  Out of Box Sensor Demonstration includes automatic board detection, connection and running of the project.
- **Install Available Updates**
  Choosing Install Available Updates directs the user to NXP website for application, projects or plugins updates that include the latest version, installed version and package type information.

4.1 Launch the Sensor Demo GUI

1. Click the **Out of Box Sensor Demonstrations** icon.
2. If prompted, connect the sensor demonstration kit. STB-CE checks if any supported sensor demonstration kit is connected to the computer.



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3. Follow the on-screen prompts.
   The appropriate ISSDK firmware is loaded to the MCU (if necessary), and then the corresponding sensor GUI launches.

4.1.1 Relaunching the STB-CE software

1. Click the **Relaunch Auto Detection** icon , located in the upper right corner of the application window.
2. Disconnect and then reconnect the board or connect a different board.

4.2 Project window

The Project window consists of two screens that allow the user to communicate with the currently connected sensor demonstration kit.

- Form screen
- Register screen (Not applicable for FXLC95000, MMA8491, data logger and orientation GUIs)

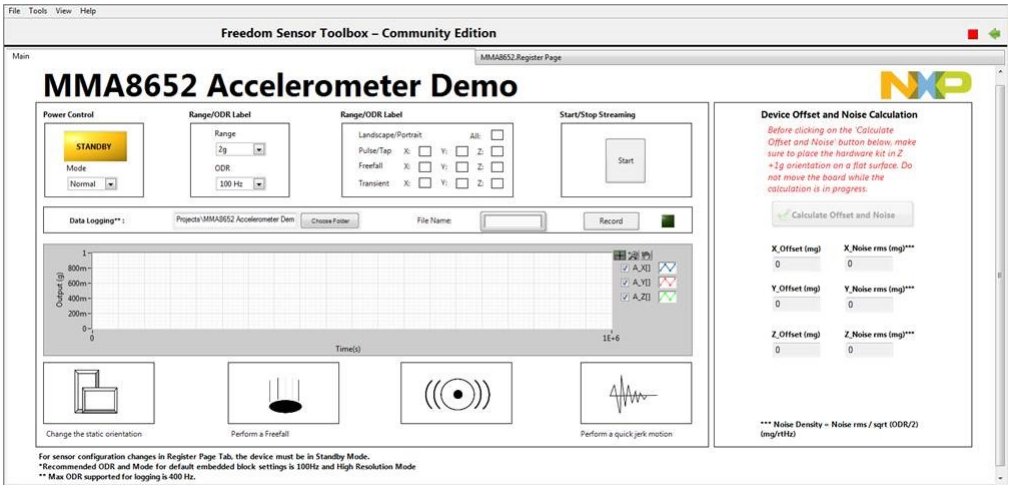

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Figure 1. Project window with two forms: Main and one register screen

4.2.1 Form screens

A form screen is a user interface screen consisting of widgets and analysis functions.

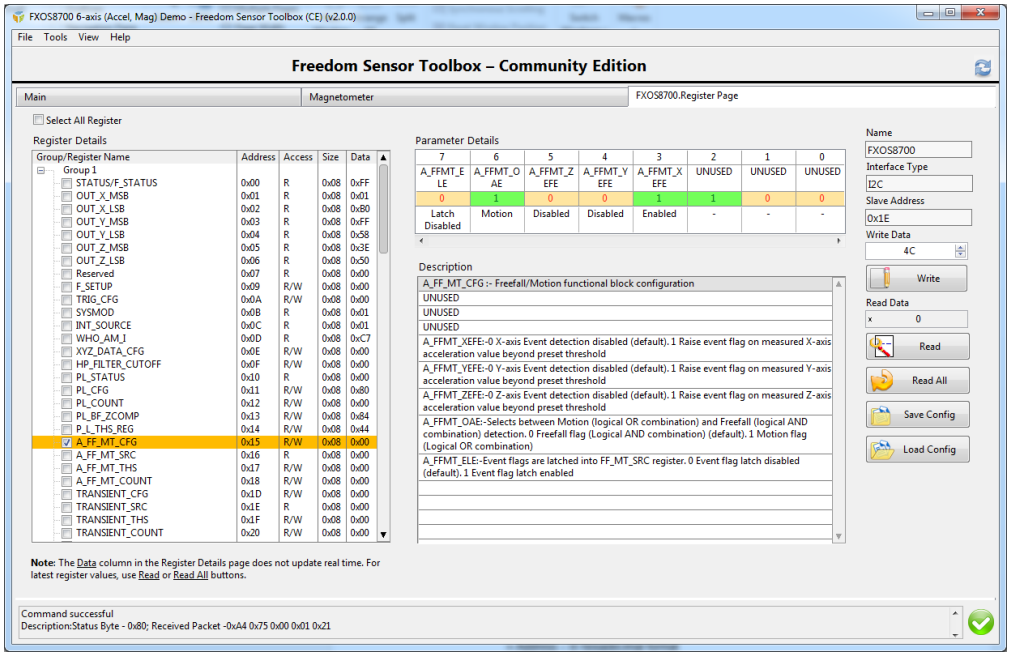
- **Widgets:** Widgets display data and provide interaction with the user. A form screen may contain multiple widgets.
- **Analysis Functions:** Analysis functions post process and analyze the data. These routines are added to a form to process data before producing a desired result.

Each project can contain any number of form screens.

4.2.2 Sensor register screens

A sensor register screen is a special predefined form that provides the user low-level access to the sensor registers. The sensor register screen consists of the following areas:

- Register Details
- Parameter Details
- Description
- Sensor Details
- Register Operations



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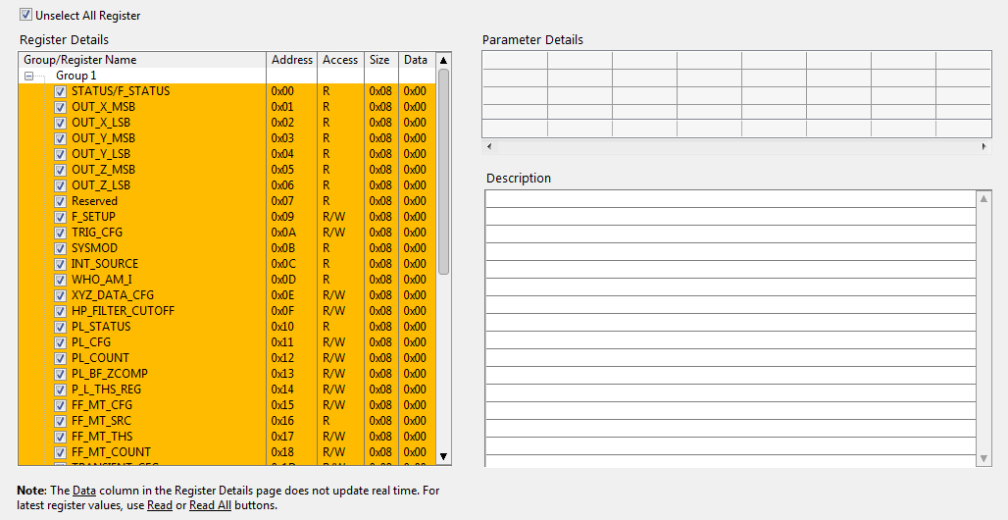
- **Register Details**
  The Register Details area lists the registers available in the selected sensor under groups, along with the following details for each register:
  – Name
  – Address – in hexadecimal format
  – Access – R, W or R/W
  – Size – in bits
  – Data – in hexadecimal format
  Use the check boxes to select single or multiple registers or use the Select All Register check box to select all the registers. Multiple selection allows the user to read from or write to a set of registers.
  NOTE: When more than one register is selected, no information is displayed in the Parameter Details area and the Description area.



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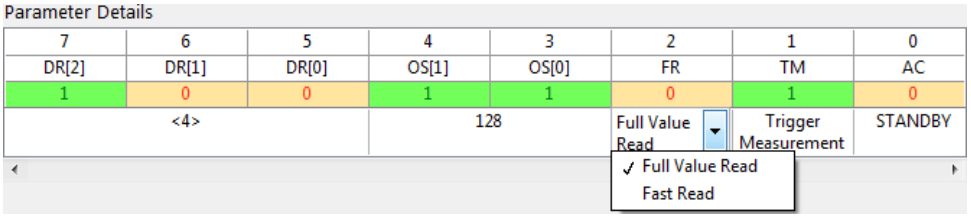
- **Parameter Details**
  The Parameter Details display the following parameter level (field level) details of the selected register.
  - Bit position
  - Parameter name
  - Bits value – 0 or 1. For any write register, user can click on each cell to toggle the bit value.
  - Parameter value – For any write register, clicking on this row will show a list or numeric control. The user can use this to easily update the parameter value.
    - If a parameter is of list type, when the user clicks on the parameter value row, a list of the choices is displayed. Each choice in the list has an equivalent numeric value. Choosing from the list automatically updates the parameter value and bit value.



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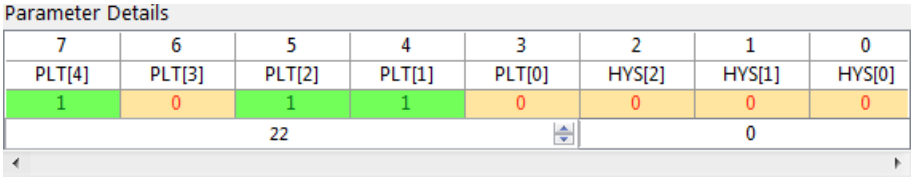
    - If a parameter is of numeric type, when user clicks on the parameter value row, a numeric control is displayed. The user can enter a numeric value directly using the numeric control. The minimum and maximum value supported is based up on the parameter size. Entering a value in the numeric control automatically updates the parameter value and the bit value.



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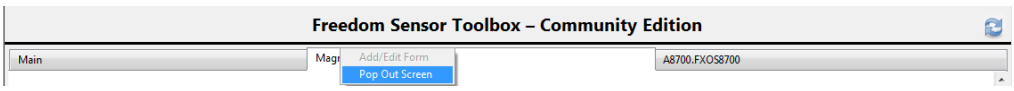
NOTE: When more than one register is selected, no information is displayed in the Parameter Details area.

- **Description**
  The Description area displays the information about the selected register and its parameters.
  NOTE: When more than one register is selected, no information is displayed in the Description area.
- **Sensor Details**
  The Sensor Details area displays the sensor name, interface type and slave address.
- **Register Operations** allows the user to send command and access the sensor registers. If the value is changed in the register, it will update the linked control in the form and vice versa.
  - **Write Data –** Used to get the value that needs to be written to the register(s) from the user. The value must be in hexadecimal format. If the parameter bits/values are changed, Write Data automatically updates.
  - **Write –** Clicking the **Write** button writes the value in Write Data to the selected register(s) in the sensor.
  - **Read Data –** Used to display the selected register's value, read from the sensor, in hexadecimal format.
  - **Read –** Clicking the **Read** button reads the value(s) of the selected register(s) from the sensor.
  - **Read All –** Clicking the **Read All** button reads the value of all the registers in the active sensor page from the sensor.
  - **Save Configuration –** Clicking the **Save Configuration** button saves the configuration of the selected register(s) in the active sensor page to the disk which can be loaded later.
  - **Load Configuration –** The **Load Configuration** button is used to load back the previously saved sensor configuration. On loading, sensor configuration updates based on the selected configuration file.

  NOTE: Each the register write operations is followed by the read operation of same register. This updates the register details with real time values.

4.2.3 Viewing multiple screens

To view multiple screens simultaneously, right-click the **Form Navigation** tab, and then select **Pop Out Screen**.



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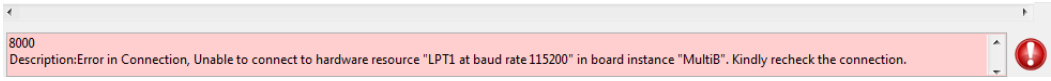
The form or register screen displays as a separate window. While this separate window is displayed, the corresponding tab in the GUI project window is disabled.

To restore the screen in the GUI project window, close the popped-out screen window.

4.3 Error window

When an error occurs, the status bar turns red and the error indicator turns to a red exclamation mark.



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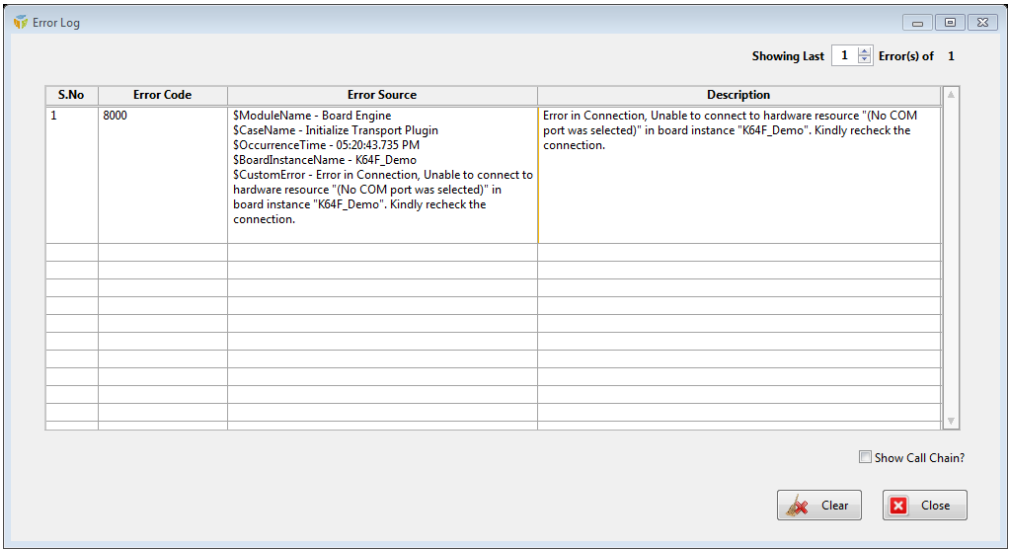
Clicking the error indicator opens the **Error Log** window.



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The **Error Log** window shows the details of any errors that have occurred in the application since the last project launch. Clicking the **Clear** button clears all the errors. Clicking the **Close** button closes the error log window.

NOTE: Show Call Chain is an advanced option. Checking this option shows the exact location of the error source.

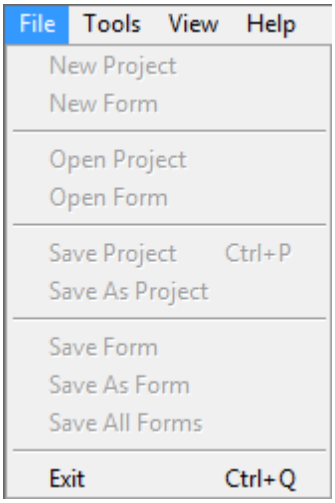
5 STB-CE menus

User can use the menu items in the STB-CE application to perform various actions on the projects, forms, and plugins. The STB-CE menu bar contains the File, Tools, View, and Help menus. Menu items are enabled depending on the current active screen.

5.1 File menu

In the Project Configuration screen, the **File** menu has access to Project/Form operations and Exit.

NOTE: Exit is the only menu option applicable to the out of box sensor demonstration.



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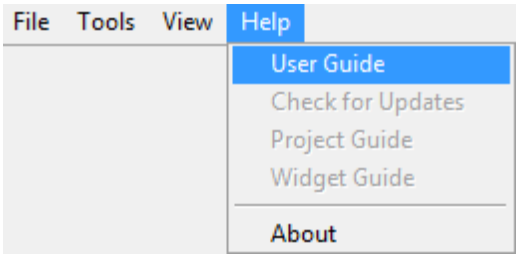
Exit – Choosing **Exit** closes the STB-CE application.

5.2 Help menu

The **Help** menu gives access to the **User Guide** and the **About** screen.



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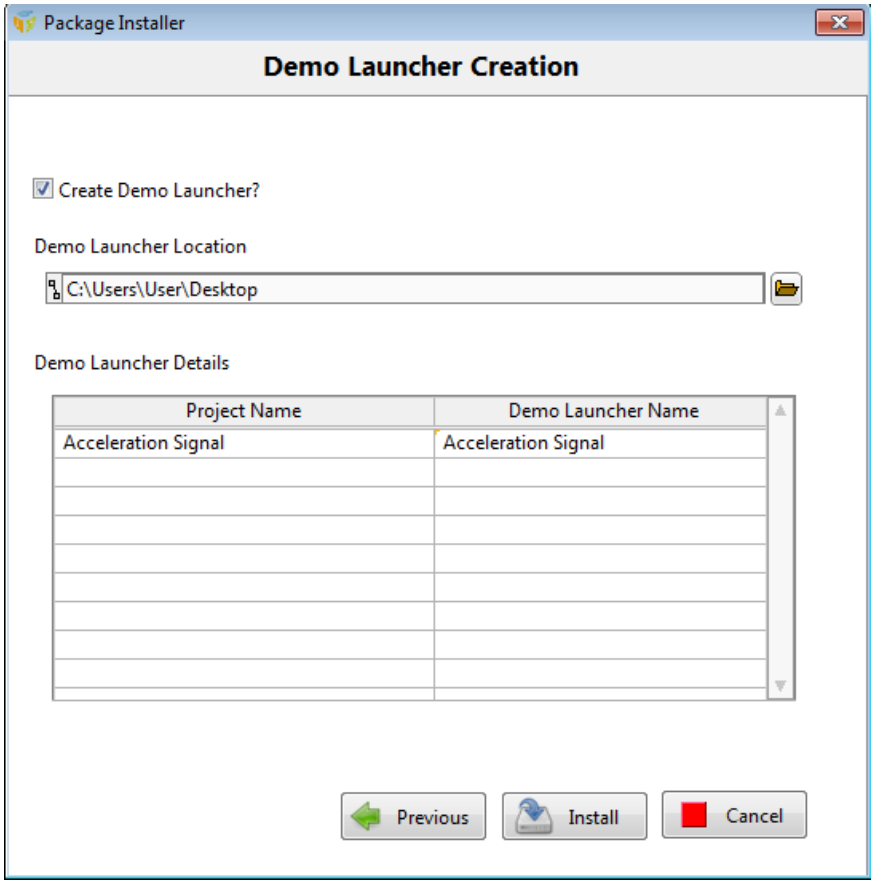
6 Run custom standalone projects

Apart from Out of Box Sensor Demonstrations, this tool also supports running standalone STB-CE GUI projects. A standalone project is provided by NXP as a separate package(*.stbpkg).



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During the project package installation, check **Create Demo Launcher** if a project shortcut is desired. Usually, the shortcut name is same as the project name, and its default location is on the desktop.

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Double click a project shortcut to directly launch the project in the STB-CE application.

NOTE: To successfully run the custom GUI project, the MCU must have the appropriate firmware loaded.

7 Troubleshooting guide

This chapter provides a general overview of troubleshooting software or communication problems, including information on troubleshooting system crashes and viewing system messages.

7.1 Freedom Boards getting 'bricked' on Windows 10

For Windows 10 systems, ensure the latest OpenSDA Bootloader and Firmware Application is on the FRDM board being used. The older versions of the OpenSDA drivers could get corrupted when the board is plugged on a Windows 10 machine. As a result, many boards might get not detected as a MSD or a COM port on Win 10. The latest versions of the OpenSDA software are compatible with Windows 10.

Obtain the latest OpenSDA drivers for FRDM boards from http://www.nxp.com/opensda. Locate the section "**Download – OpenSDA Bootloader and Application**" and select your FRDM Board from the dropdown list. Strictly follow the provided instructions to program the board.

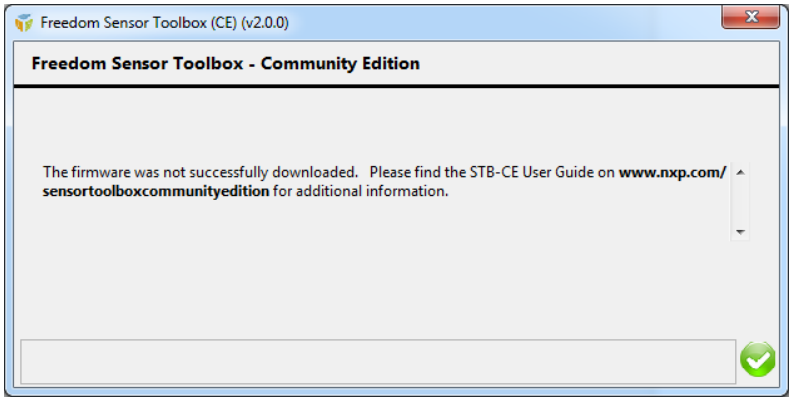
The FRDM Boards supported by STB-CE are:

- FRDM-K64F, FRDM-K22F, FRDM-KW41Z and FRDM-KE15Z: MBED/DAPLINK OpenSDA drivers (default)
- FRDM-KL25Z and FRDM-KL27Z: PEmicro OpenSDA drivers (default)
- RD-KL25-AGMP01: FRDM-KL25Z board with MBED/DAPLINK OpenSDA drivers (default)

Note: *The current FRDM-K64F, FRDM-K22F, FRDM-KL25Z and RD-KL25-AGMP01 boards come with an older version of OpenSDA drivers from the factory and* ***require*** *a mandatory OpenSDA update from the links above.*

7.2 Firmware not successfully downloaded message

The following message is displayed during the firmware download process, before auto-launching the GUI.



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This can happen when the default OpenSDA bootloader is not loaded on the Freedom based sensor demonstration kits. The default OpenSDA bootloader firmware for these kits is as follows:

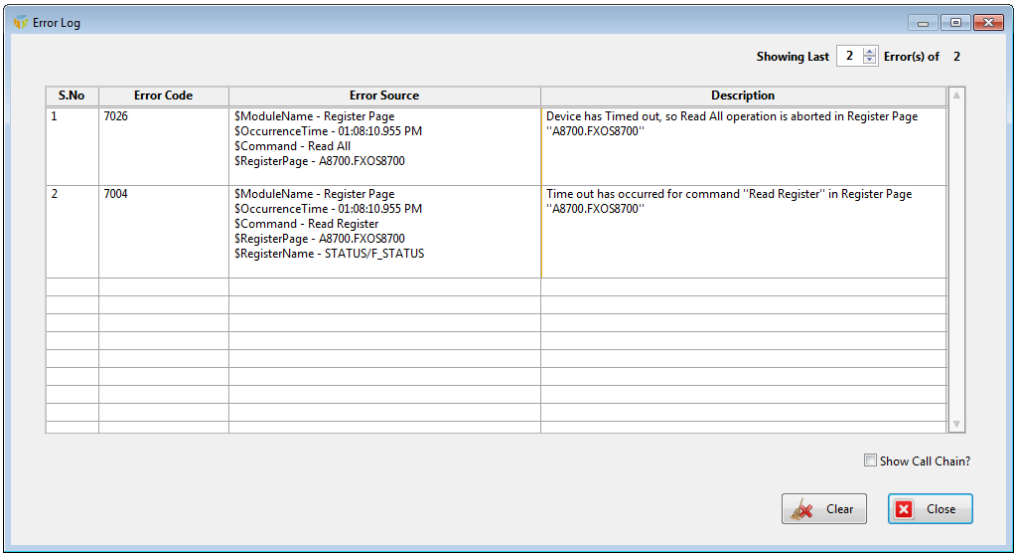
- **DAPLink:** FRDM-K22F, FRDM-K64F, FRDM-KW41Z, FRDM-KE15Z, RD-KL25-AGMP01
- **PEmicro:** FRDM-KL25Z, FRDM-KL27Z

Refer to the OpenSDA update to the FRDM boards to ensure that the latest and the correct OpenSDA firmware is loaded on the appropriate FRDM boards. The OpenSDA Update to the FRDM boards is available at http://www.nxp.com/OPENSDA. Choose the FRDM Board from the dropdown list, download the latest OpenSDA drivers and strictly follow the provided instructions to program the board.

Note: *In case of kits based on LPCXpresso54114 (such as LPCXpresso54114 with FRDM-STBC-AGM01 and LPCXpresso54114 with FRDM-STBC-AGMP03) the jumper JP5 on LPCXpressso54114 board should be left open without a shunt to avoid this firmware download error.*

7.3 Time out error message displays when issuing Read All or Read Register or Write Register operations

When issuing Read All, Read Register, or Write Register operations from the tool, the following time out error message may appear.



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This happens when the MCU board is unable to complete any register transaction with the sensor on the board. There are multiple scenarios for this problem:

- The jumper settings on the shield board are different from what is expected for the MCU and shield board combination. Find the recommended hardware settings for each sensor demonstration kit used with STB-CE in Table 1.
- The MCU's UART serial connection with Windows has not been established correctly. If the serial connection is not established, the tool will not be able to send a register command to the MCU and the sensor. Refer to Section 7.1 and Section 7.2 to update the latest OpenSDA drivers to ensure proper COM port detection.
- The MCU is unable to send a register command to the sensor. This is possible if the shield board has not been wired to the MCU correctly or the sensor demonstration kit does not match the sensor GUI being launched. A potential solution is to ensure that the correct sensor GUI is launched corresponding to the sensor demonstration kit available.

Table 1. Hardware settings

Demonstration kit	Recommended hardware settings
FRDM-K22F-AGMP03	FRDM-STBC-AGMP03 shield board • Ensure that the shunts on jumpers J7 and J8 are at 2-3 position (default) • Ensure that the shunt for jumper J9 is at 1-2 position (default) • Ensure that the shaft of the switch SW2 is towards ACCEL NORMAL • Ensure that the shaft of the switch SW3 is towards ACCEL-GYRO I2C
LPCXpresso54114 with FRDM-STBC-AGMP03	FRDM-STBC-AGMP03 shield board: • Ensure there are shunts on jumpers J7 and J8 to 1-2 position (default position 2-3) • Ensure the shunt for jumper J9 is at 1-2 position (default) • Ensure that the shaft of the switch SW2 is towards ACCEL NORMAL • Ensure that the shaft of the switch SW3 is towards ACCEL-GYRO I2C LPCXpresso54114 board - Ensure that the jumper JP5 is left open (default)
FRDM-KW41Z with FRDM-STBC-AGMP03	FRDM-STBC-AGMP03 shield board • Ensure that the shunts on jumpers J7 and J8 are at 1-2 position (default position 2-3) • Ensure that the shunt for jumper J9 is at 1-2 position (default) • Ensure that the shaft of the switch SW2 is towards ACCEL NORMAL • Ensure that the shaft of the switch SW3 is towards ACCEL-GYRO I2C
FRDM-KL27Z with FRDM-STBC-AGMP03[1]	FRDM-STBC-AGMP03 shield board • Ensure that the shunts on jumpers J7 and J8 are at 2-3 position (default) • Ensure that the shunt for jumper J9 is at 1-2 position (default) • Ensure that the shaft of the switch SW2 is towards ACCEL NORMAL • Ensure that the shaft of the switch SW3 is towards ACCEL-GYRO I2C
FRDM-K22F-AGM01	FRDM-STBC-AGM01 shield board • Ensure that the shunts on jumpers J5, J6 and J7 are at 2-3 position (default)
FRDM-K64F-AGM01	FRDM-STBC-AGM01 shield board • Ensure that the shunts on jumpers J5, J6 and J7 are at 2-3 position (default)
QN90980DK with FRDM STBC-AGM01	FRDM-STBC-AGM01 shield board • Ensure that the shunts on jumpers J6 and J7 are at 1-2 position (default) • Ensure that the shunt on jumpter J5 is at 2-3 position (default)
LPCXpresso54114 with FRDM-STBC-AGM01	FRDM-STBC-AGM01 shield board • Ensure that the shunts on jumpers J6 and J7 are at 1-2 position (default position is 2-3) • Ensure that the shunt on jumper J5 is at 2-3 position (default) LPCXpresso54114 board - Ensure that the jumper JP5 is left open (default)
FRDM-K64F with FRDM-FXS-MULT2B	FRDM-FXS-MULT2B shield board • Ensure that the shunts on jumpers J27 and J28 are at 2-3 position (default) • Ensure that the shunts on jumper J3 is at 2-3 position (default is Open) • Ensure that the shunts on jumper J4 is at 2-3 position (default is Open) • Esnure that the shunts on jumper J5 is left open (default is Open) • Ensure that the shunts on jumper J6 is at 2-3 positioin (default is Open)

Demonstration kit	Recommended hardware settings
FRDMKE15DP300x	FRDMSTBC-A8491 shield board • Ensure that the shunts on jumpers J7 and J8 are at 2-3 position (default) • Ensure that the shunts on jumpers J10 are at 2-3 position (default) • Ensure that the shunts on jumpers J11 and J12 are at 1-2 position (default) • Ensure that the jumpers J9, J13, J14 are left open (default)
FRDMSTBC-A845x with FRDM-K64F	FRDMSTBC-A845x shield board - Ensure that the shunts on jumpers J7 and J8 are at 2-3 position (default)
FRDM-K64F-AGM04	FRDM-STBC-AGM04 shield board - Ensure that the shunts on jumpers J7 and J8 are at 2-3 position (default)
FRDM KL25Z-P3115[1]	FRDMSTBC-P3115 shield board - Ensure that the shunts on jumpers J7 and J8 are at 2-3 position (default)
FRDMKL27-B3115[1]	FRDMSTBI-B3115 shield board - Ensure that the shunts on jumpers J7 and J8 are at 2-3 position (default)
FRDM KL25Z-A8491[1]	FRDMSTBC-A8491 shield board - Ensure that the shunts on jumpers J7 and J8 are at 2-3 position (default)
FRDM KL25Z-A8471[1]	FRDMSTBC-A8471 shield board - Ensure that the jumper J9 is left open (default)
FRDM-K22F-SA9500	FRDM-STBC-SA9500 shield board: • Ensure that the shunts on jumpers J8 and J9 are at 2-3 position (default) • Ensure that the shunt for jumper J10 is at 3-4 position (default) • Ensure that the switch SW1 in ON state.
FRDM-KL25Z	No recommended hardware settings
FRDM-KL27Z	No recommended hardware settings
RD_KL25-AGMP01	No recommended hardware settings

[1] For KL25Z and KL27Z based kits, if the shield board jumper settings are incorrect, the auto-detection will go ahead and open the GUIs corresponding to their respective on-board sensors. To open the GUIs corresponding to the sensor shield board, ensure the sensor shield boards have appropriate jumper settings, as mentioned above.

Note:

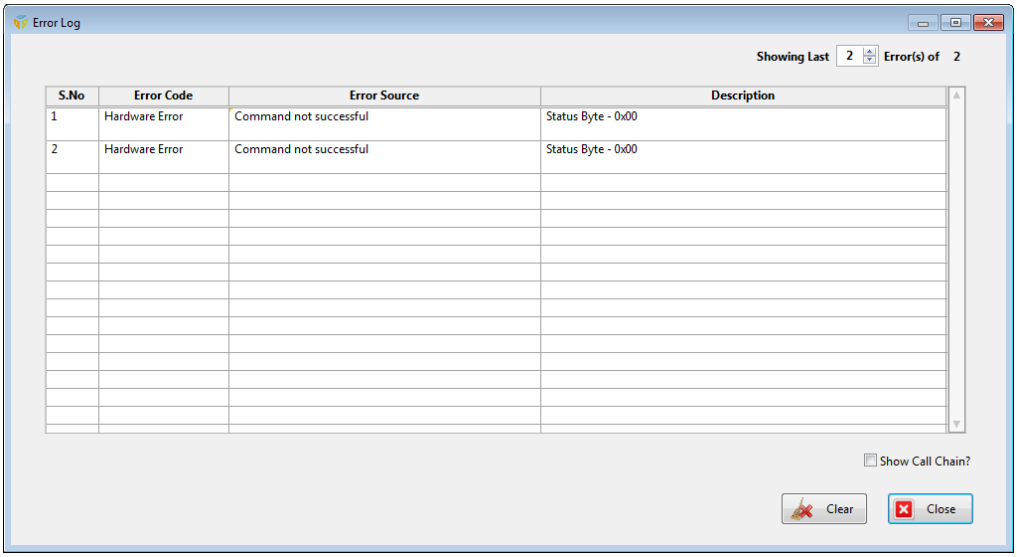
For the above kits, if the jumper settings are different from what is recommended, follow these steps:

1. *Close the error message, and then close the GUI.*
2. *Disconnect the kit from the PC.*
3. *Switch the jumper shunt positions to recommended settings.*
4. *Reconnect the kit to the PC.*
5. *Relaunch the GUI.*

7.4 Hardware error is displayed upon clicking Start Streaming

The following error message can appear under the following circumstance:

The GUI is closed while the sensor is streaming (without clicking the Stop Streaming button), and then the GUI is relaunched without power cycling the kit.



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When clicking Start Streaming while the sensor is already streaming, this hardware error occurs.

When this error occurs:

1. Clear the error message, and then close the diaglog window.
2. Continue to use the GUI as required.

To avoid this error, click Stop Streaming before closing the GUI.

7.5 LabVIEW Runtime Engine could not be found message appears during initial installation

The LabVIEW Runtime Engine could not be found message appears while installing STB-CE for the first time on a PC.

This error can occur when the PC has a 64-bit LabVIEW Runtime Engine installed prior to STB-CE Installation. STB-CE uses 32-bit Runtime Engine and displays this message when it identifies a previously installed 64-bit version.

Follow the instructions in the error message window to download and manually install the VISA Runtime Engine 5.4 and the LabVIEW 2017 Runtime Engine (32-bit). After performing the installation of these components, STB-CE is ready to use.

7.6 STB-CE Installer getting corrupted

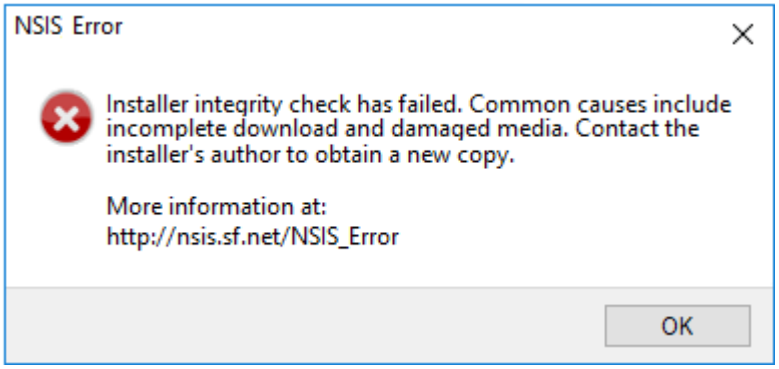
The STB-CE installer is built using NSIS. The NSIS error shown below may occur under one of the following conditions:

- Software files downloaded from the Internet are not complete.
- Downloaded software files have been modified from the original version.
- Your PC is infected with a virus.
- Physical media being used to install the program is damaged.
- Required hardware (For example, CD/DVD drive) is malfunctioning.

Use one of the following methods to fix this issue:

Method 1: Repeat the download and try installing again.

Method 2: Clear the cached data in your web browser and temporarily disable the antivirus software running on the computer. Download and install the executable files. Check if the issue persists.



8 Revision history

Table 2. Revision history

Revision number	Date	Description
v.1.3	20180510	Minor updates throughout the document with extensive changes to Section 7 "Troubleshooting guide" and support for new kits.
v.1.2	20170914	Changed Figure 1 title from Project window with two forms (Main, Magnetometer) and one register screen to Project window with two forms: Main and one Register Screen
v.1.1	20170912	Updated the document for STB v2.0 release
v.1	20170324	Initial version of the document

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