

# CC2540 Mini Development Kit Quick Start Guide

## Opening the Box and Evaluating *Bluetooth*® Low Energy

### Kit Contents



- 1 x CC2540 USB dongle
- 1 x CC2540 Keyfob board
- 1 x Keyfob plastic case
- 1 x CC Debugger with cables
- 1 x CR2032 Battery
- Documentation

The RF boards in this kit are FCC and IC certified and tested to comply with ETSI/R&TTE over temperature from 0 to +35°C.



**Caution!** The kit contains ESD sensitive components. Handle with care to prevent permanent damage.

### Introduction

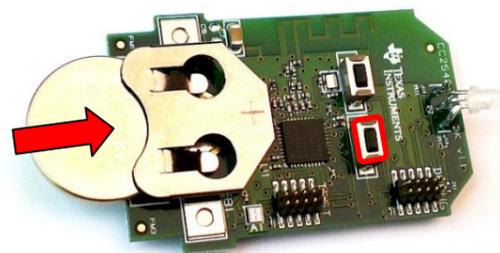
This document will guide you through the initial steps required in order to run the pre programmed *Bluetooth*® low energy demo application.

You will get familiar with the hardware in the box and some of the tools that can be used for developing your own software at a later stage. For the CC2540DK-MINI, there are two ways of getting started:

1. **Evaluate Using BTool.** BTool is a Windows application that allows you to control a central device using the serial interface and perform various BLE functions while connected to a peripheral device, such as the CC2540 Keyfob.
  2. **Evaluate Using iOS Device.** There are a couple of Apple iOS devices that support BT4.0 and Texas Instruments have created an iOS Application to evaluate a peripheral device, such as the CC2540 Keyfob. The iOS Application runs on:
    - iPhone 4S / 5
    - iPad 3
    - iPod Touch (5. gen)

### Hardware Setup

First, you will need to power up the CC2540 Keyfob. When you insert the CR 2032 battery, the LED will be lit green for one second.



You can toggle Advertisements on and off by pushing the right button on the CC2540 Keyfob. During advertisement, the LED will be blinking red.

**Warning!** This kit includes a non-rechargeable lithium battery. To minimize risk of personal injury and/or property damage due to potential of explosion/rupture of battery, **always make sure battery is completely removed from the CC2540 Keyfob when connected to an external power source.** External power source cannot exceed 3.6VDC. Dispose the battery properly and keep out of the reach of children at all times.

## Evaluate Using BTool

### 1. Download & Install BLE-Stack

The latest BLE software can be downloaded at [www.ti.com/ble-stack](http://www.ti.com/ble-stack).

After the BLE-Stack software installation is complete, the USB Dongle driver must be associated with the device in order to use the BTool application. To associate the USB Dongle driver, you must first connect the USB Dongle to the PC's USB port, or to a USB hub that connects to the PC

The first time that the dongle is connected to the PC, a message will pop-up, indicating that Windows does not recognize the device.

The driver is found in the folder Accessories\ Drivers in the default install directory. For more information on how to install the driver, please refer to the CC2540/41 Mini Development Kit User Guide, found at [www.ti.com/lit/swru270](http://www.ti.com/lit/swru270).

### 2. Identify the COM Port Number

Once the driver is installed, you need to determine which COM port Windows has assigned to the USB Dongle. Right-click on "Computer", listed in the Start Menu, and select "Properties".

The "System Properties" window should open up, where you can select "Device Manager".

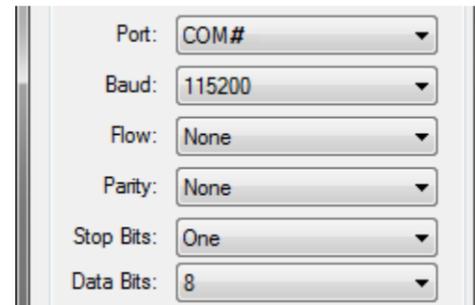
A list of all hardware devices should appear. Under the section "Ports (COM & LPT)", the device "TI CC2540 Low-Power RF to USB CDC Serial Port" should appear. Next to the name should be the port number (COM#)

Take note of this port number, as it will be needed in order to use BTool.

### 3. Start BTool

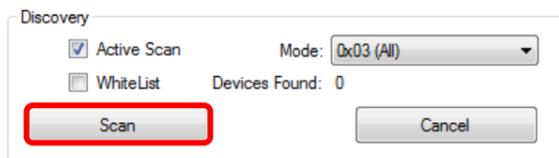
BTool is included as part of the installation of the BLE stack and can be found in the folder \Projects\BTool in the default install directory.

When you start up BTool, you will be prompted to set port settings. Select the options below and press "OK".



### 4. Connect to CC2540 Keyfob

Pressing the right button on the CC2540 Keyfob starts the advertisement. The device advertises for 30 seconds. In BTool, press SCAN button:

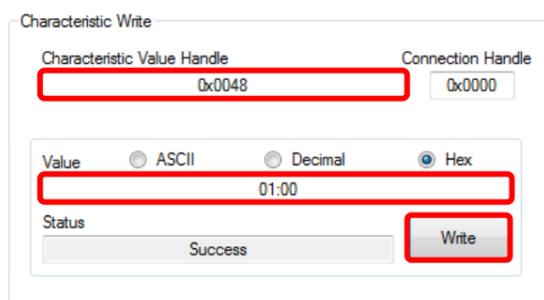


After the scanning is complete, choose the device to connect to and press "Establish".



### 5. Button Notifications

To notify when buttons are presses on the CC2540 Keyfob, notifications need to be enabled. This is done in the "Read/Write" Tab of BTool. Simply write 01:00 to character handle 0x0048.



If a button on the CC2540 Keyfob is now pushed, notifications will be sent and can be monitored in the BTool log window.

### 6. Enable Accelerometer

Similar to the button notifications, the notifications for the accelerometer data can be enabled. In this example we will only enable notifications for the x-axis.

First of all, the accelerometer need to be enabled, which is done by writing 01:00 to character handle 0x0034 in the "Read/Write" tab of BTool. To enable notifications for the x-axis, write 01:00 to character handle 0x003B. This will enable the CC2540 Keyfob to send notifications as you move it.



For more information about the Accelerometer Service please refer to the CC2540/41 Mini Development Kit User Guide, found at [www.ti.com/lit/swru270](http://www.ti.com/lit/swru270).

## 7. Immediate Alert

To sound the buzzer located on the CC2540 Keyfob, write the following value to handle 0x0028:

- 01:00 for low Alert
- 02:00 for high Alert
- 00:00 to turn off.

The buzzer will sound for 10 seconds.



## 8. Terminate Connection

To terminate the connection you will have three options:

- Press the "Terminate" button in BTool as indicated in the image below.
- Remove the battery from the CC2541 Keyfob, which will trigger a supervision timeout.
- Move the CC2540 Keyfob out of range (typically >10m), which will trigger a supervision timeout.



## 9. Source Code

The project and source code files for the pre programmed application (as well as many others) are included with the Bluetooth low energy (BLE) stack from Texas Instruments, which can be downloaded at [www.ti.com/ble-stack](http://www.ti.com/ble-stack).

The project implementing this demo is called Keyfobdemo (CC2540DK-mini Keyfob Slave configuration). The project can be modified as desired, and should provide a good framework for developing your own custom BLE applications.

More details on these projects can be found within the BLE Software Developer's Guide ([www.ti.com/lit/swru271](http://www.ti.com/lit/swru271)), which is also included with the stack installer. For troubleshooting please refer to the CC2540/41 Mini Development Kit User Guide, found at [www.ti.com/lit/swru270](http://www.ti.com/lit/swru270).

# Evaluate Using an iOS device (iPod, iPad, iPhone)

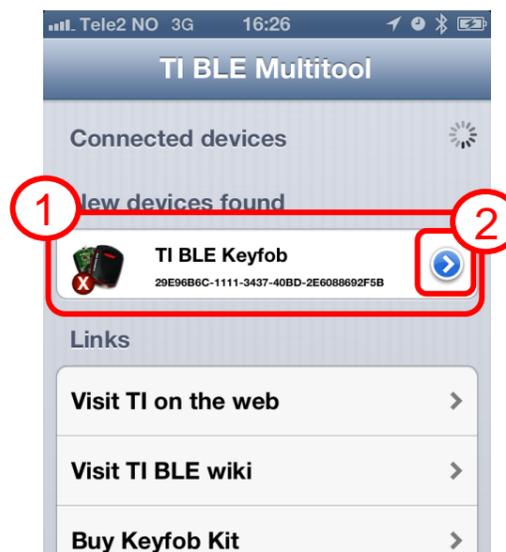
## 1. Download the Multitool app

The iOS app can be downloaded via iTunes (found at [www.apple.com/itunes](http://www.apple.com/itunes)) or App Store which is pre-installed on iOS devices.

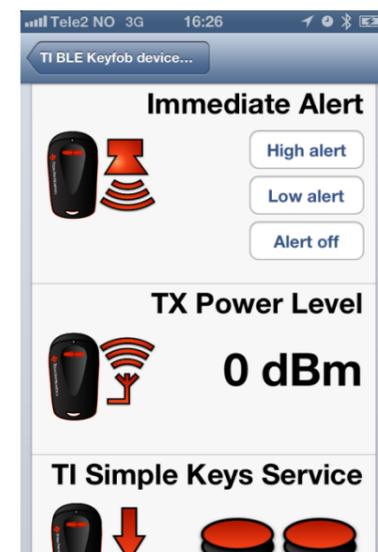
**TI BLE Multitool**  
By Texas Instruments Incorporated  
Open iTunes to buy and download apps.



## 2. Connect to CC2540 Keyfob



## 3. Evaluate the Application



# Additional Tools and Links

## BLE Packet Sniffer

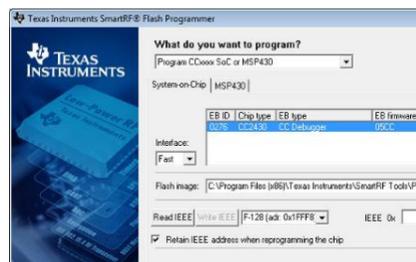
The CC2540 USB Dongle can be used as a BLE sniffer and monitor packets while the *Bluetooth*® low energy demo application is running.



The SmartRF Protocol Packet Sniffer software can be downloaded at [www.ti.com/tool/packet-sniffer](http://www.ti.com/tool/packet-sniffer)

## SmartRF Flash Programmer

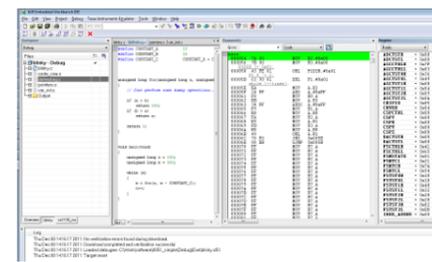
Texas Instruments has a simple tool which can be used to program and flash the CC2540.



SmartRF Flash Programmer can be downloaded at [www.ti.com/tool/flash-programmer](http://www.ti.com/tool/flash-programmer)

## IAR Embedded Workbench

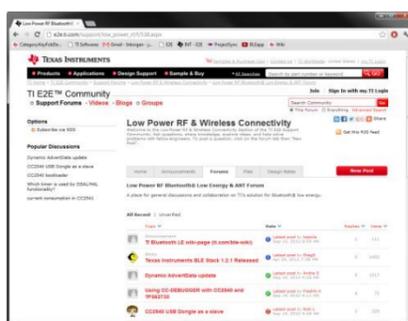
To develop software, program, and debug the CC2540, you should use IAR Embedded Workbench for 8051.



More information on IAR EW8051, including a free evaluation version download, can be found at [www.iar.com/ew8051](http://www.iar.com/ew8051).

## BLE E2E Forum

For additional help, visit the TI Bluetooth low energy E2E forum, [www.ti.com/ble-forum](http://www.ti.com/ble-forum), for instant support during your development.



## BLE Wiki

Our BLE Wiki contains application examples, guides and documentation covering those extra steps you might need help with. The Wiki is not only managed by Texas Instruments employees but also E2E community members. Anyone can share, edit and make use of the information posted here.

The Wiki is found at [www.ti.com/ble-wiki](http://www.ti.com/ble-wiki).

## Useful Links

TI BLE Stack and Software: [www.ti.com/ble-stack](http://www.ti.com/ble-stack)

CC2540/41 Development Kit User Guide: [www.ti.com/lit/swru270](http://www.ti.com/lit/swru270)

CC2540/41 BLE Software Developer's Guide: [www.ti.com/lit/swru271](http://www.ti.com/lit/swru271)

CC2540/41 User's Guide: [www.ti.com/lit/swru191](http://www.ti.com/lit/swru191)

CC2540 Product Page: [www.ti.com/product/cc2540](http://www.ti.com/product/cc2540)

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### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)