

# CC2530ZDK Quick Start Guide

## 1. Introduction

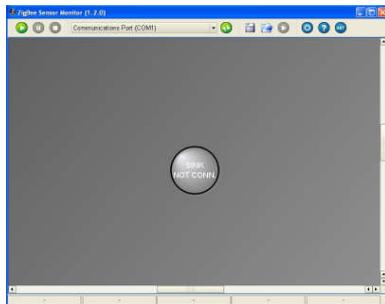
This guide describes how to set up a ZigBee® sensor network demo (consisting of sensor nodes and collector nodes) using the preprogrammed devices of the CC2530ZDK.

The sensors periodically report their temperature and the collector nodes ensure that the data gets routed to the collector node that functions as gateway. The collector node configured as gateway is connected to the PC running the PC application that visualizes the network topology and the sensor data. More information about the demo and the source code can be found on the CC2530ZDK product page [1].

The ZDK contains 2 CC2530EM's programmed as collector devices (both can be used as gateway), and 5 CC2530EM's programmed as sensor devices.

The following steps describe how to install & run the demo. Additionally, it is shown how to get started with setting up the development environment.

## 4. Install ZSensorMonitor



The ZSensorMonitor software can be downloaded from the CC2530ZDK product page [1].

Install it on your PC and launch the application (zsensormonitor.exe). A shortcut can be found under the Texas Instruments folder on the Program menu.

Connect a serial cable from one of the SmartRF05EB boards to the PC. This will be the gateway node.

If you experience any problem (e.g. with launching the ZSensorMonitor), please consult the ZigBee Sensor Monitor User's Guide (ZSensorMonitor User's Guide.pdf). It can be found under the Texas Instruments folder on the Program menu.

## 2. Kit Contents



2 x SmartRF05EB (the large boards)  
5 x SmartRF05BB (the battery boards)  
2 x CC2530EM (labeled COLLECTOR)  
5 x CC2530EM (labeled SENSOR)  
1 x CC2531 USB Dongle  
7 x 2.4 GHz Antennas  
Cables  
Batteries  
Documentation

The USB dongle is not directly used in this demo. It can be used for over the air packet sniffing (see also Step 12)

## 5. Power up gateway device



Make sure that P14 (the RS232 switch) is set in position *Enable* on this board.

Power up the gateway device (the SmartRF05EB connected to the PC with serial cable). Press and hold **joystick center** during power up.<sup>1</sup>

After power up LED 1 and 2 are blinking to indicate that the gateway device is trying to connect to a network. Press **joystick up** on the device. This will start up a new PAN and this node will be the ZigBee Coordinator. LED 1 will be switched on.

Press **Joystick right** on the device. This will make the device accept binding requests and configure this node as the gateway node. LED 2 will be switched on.

## 3. Assemble the boards



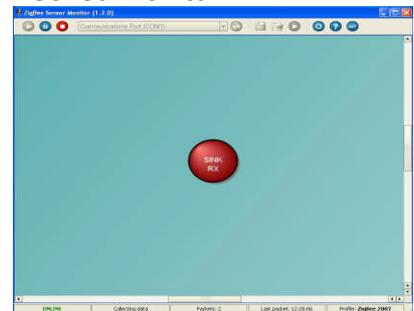
Assemble the boards that are included in the CC2530ZDK:

- Connect an antenna to each of the CC2530EM's
- Mount the 2 Collector EM's on top of SmartRR05EB's.
- Mount the 5 Sensor EM's on the SmartRF05 Battery Boards.

Place the batteries in the sockets underneath the boards. Wait with powering up the boards until instructed.

On the EB boards set jumper P11 in position for battery power. Place the *EM Selection* switch on each of the EB's and BB's in position SoC/TRX.

## 6. Connect with ZSensorMonitor

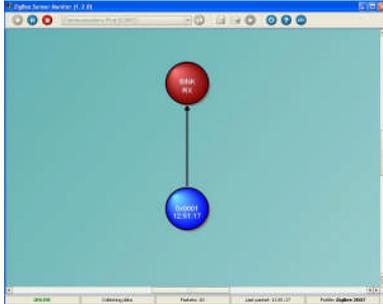


Choose correct COM port from the drop down list in the top and then press the play button in the ZSensorMonitor User Interface (in the upper left corner).

The node symbol will turn red to indicate that the gateway node is detected by the ZSensorMonitor application.

<sup>1</sup> Press the joystick like a button and keep it pressed while powering up the board. Do not release the joystick until a few seconds after power up. This will ensure a fresh startup, i.e. bypass the network and binding information stored in Non Volatile memory.

**7. Power on collector device**



Power up the other SmartRF05EB (Collector device). Press **joystick center** during power up<sup>1</sup>. The green LED 1 will blink shortly during connecting to the network. The red LED 2 will blink to indicate it is in process of discovery and binding. LED 1 and LED 2 will both be switched on when the device has joined the network and bound to the gateway.

Press **joystick down** to start sending periodic reports from this device. The collector node will be displayed as a blue circle in the ZSensorMonitor as shown in the image.

**10. Demo of ZigBee Features**

The resulting setup can be used to demonstrate two of the many benefits of the ZigBee protocol.

**Range extension**

The topology in the figure of Step 9 illustrates that ZigBee can be used to extend the range of a network by using hops between communicating nodes.

**Self-healing**

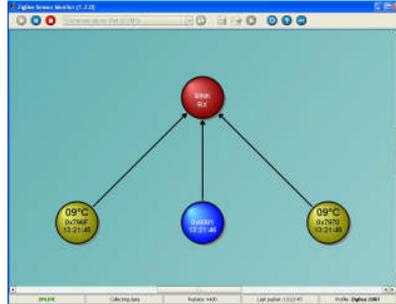
To demonstrate the self-healing feature of ZigBee you can simply turn off the collector device that is not connected to the PC; then the sensors will join the gateway device (if in radio range) as the gateway does not allow new devices to join, but it does allow re-joins of nodes that are already in the network.

**A. References and more information**

- [1] CC2530 ZigBee Development Kit [www.ti.com/cc2530zdk](http://www.ti.com/cc2530zdk)
- [2] CC2530 product web page [www.ti.com/cc2530](http://www.ti.com/cc2530)

The Low Power RF Online Community has forums, blogs and videos. Use the forums to find information, discuss and get help with your design. Join us at [www.ti.com/lprf-forum](http://www.ti.com/lprf-forum)

**8. Add 2 sensor nodes**



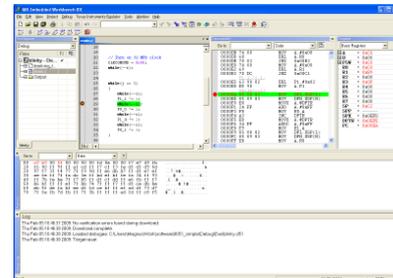
Add 2 of the sensor nodes (SmartRF05 Battery boards) to achieve the topology shown above. Power them up one by one and press **joystick center** during power up<sup>1</sup>.

After the LED's start blinking rapidly press **joystick down** to start the reporting. The two sensor nodes will appear in the ZSensorMonitor as soon as their first report is received.

Press **joystick left** on the gateway node (device connected to the PC). The gateway will then not accept new joining requests in order to achieve the desired topology (see step 9).

**11. IAR Embedded Workbench**

To develop software, program and debug the CC2530, you should use the IAR Embedded Workbench for 8051.



A free evaluation version of IAR EW8051 is included in the kit. See also [www.iar.com/ew8051](http://www.iar.com/ew8051). (See the Z-Stack™ release notes for details regarding which version to use.)

**B. Software references**

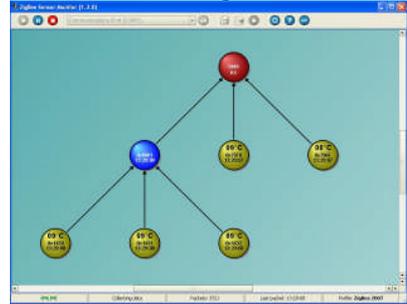
**Z-Stack™ Software**

In order to start software development for ZigBee applications on CC2530, TI's ZigBee compliant protocol stack is required. You can find it on the Z-stack™ product page: [www.ti.com/z-stack](http://www.ti.com/z-stack)

**Sensor Demo source code**

Source code and IAR projects for the Sensor Demo can be found in the Sensor Demo software package on the CC2530ZDK product page: [www.ti.com/cc2530zdk](http://www.ti.com/cc2530zdk)

**9. Add remaining sensors**



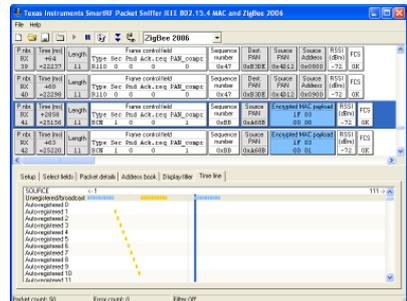
Add the 3 remaining sensors. Press **joystick center** during power up<sup>1</sup>. These sensors will not join the gateway but the other Collector device since the gateway is not accepting join requests.

After the LED's start blinking rapidly press **joystick down** to start reporting from each of the sensors. All of the nodes will appear in the ZSensorMonitor that will display the reported temperature.

**Congratulations!** You have successfully setup a small ZigBee network and the sensor demo application.

**12. Packet Sniffer**

In order to debug RF protocols, one can use TI's SmartRF Packet Sniffer to capture packets.



The packet sniffer software can be found in the Tools & Software section of the CC2530 product page [2]. It can be used with the CC2531 USB dongle or the SmartRF05EB with a CC2530EM

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

<b>Products</b>		<b>Applications</b>	
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>	Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>	Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Energy	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>	Space, Avionics & Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>	Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless-apps">www.ti.com/wireless-apps</a>

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2010, Texas Instruments Incorporated