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.

2. Kit Contents

2 x SmartRF05EB
5 x SmartRF05BB
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)

3. Assemble the boards

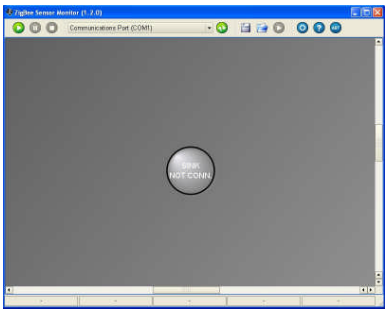
Assemble the boards that are included in the CC2530ZDK:

- 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.

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 .

5. Power up gateway device

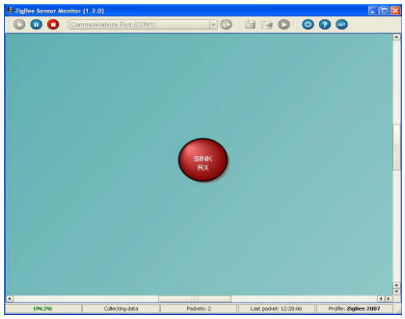
Make sure that P14 (the RS232 switch) is set in position *Enable* on this board.

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

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.

6. Connect with ZSensorMonitor

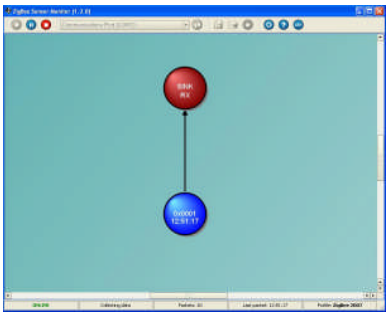


Choose correct COM port from the drop down list in the top and then press the play button in the ZSensorMonitor User Interface (in the upper left corner).

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

[1] **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.

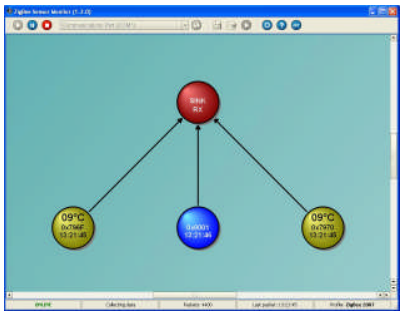
7. Power on collector device



Power up the other SmartRF05EB (Collector device). Press **joystick center** during power up[1]. 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.

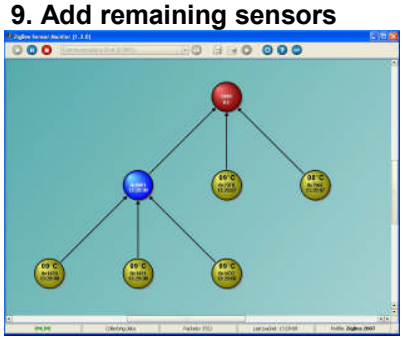
Press **joystick down** to start sending periodic reports from this device. The collector node will be displayed as a blue circle in the ZSensorMonitor as shown in the image.

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[1].
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).

9. Add remaining sensors



Add the 3 remaining sensors. Press **joystick center** during power up[1]. 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.

10. Demo of ZigBee Features

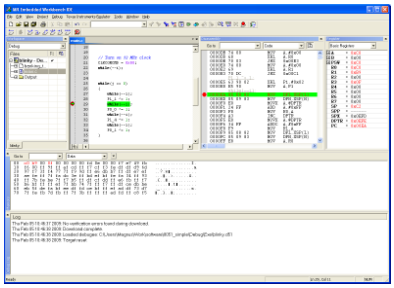
The resulting setup can be used to demonstrate two of the many benefits of the ZigBee protocol.

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.

11. IAR Embedded Workbench

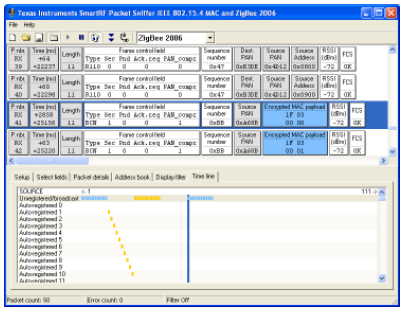
To develop software, program and debug the CC2530, you should use the IAR Embedded Workbench for 8051.



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

12. Packet Sniffer

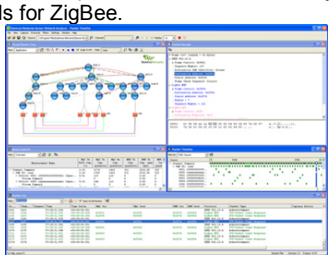
In order to debug RF protocols, one can use TI's SmartRF Packet Sniffer to capture packets.



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

13. Daintree Sensor Network Analyzer

The Sensor Networks Analyzer from Daintree Networks provides a more advanced packet sniffer and analyzer tools for ZigBee.



A free evaluation version is included in the kit. For more information please see Daintree Networks' website: www.daintreenetworks.com

A. References and more information

[1] CC2530 ZigBee Development Kit
www.ti.com/cc2530zdk

[2] CC2530 product web page
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

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

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

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