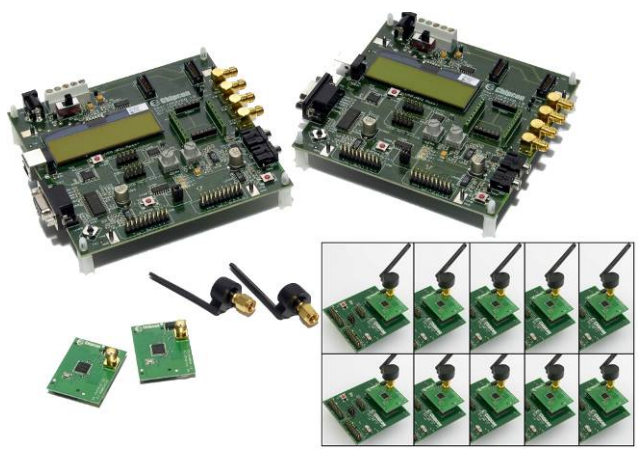
Chipcon Products from Texas Instruments

CC2431DK/ZDK Quick Start Instructions

Revision 1.3, 2007-06-08

Location Engine

1. Kit Contents



- 2 SmartRF04EB(EB)
- 2 CC2430EM(EM)
- 12 antennas
- 10 SOC_BB (Battery board)
- 10 CC2431EM
- 2 USB cables
- 1 RS232 Serial cable

2. Definitions

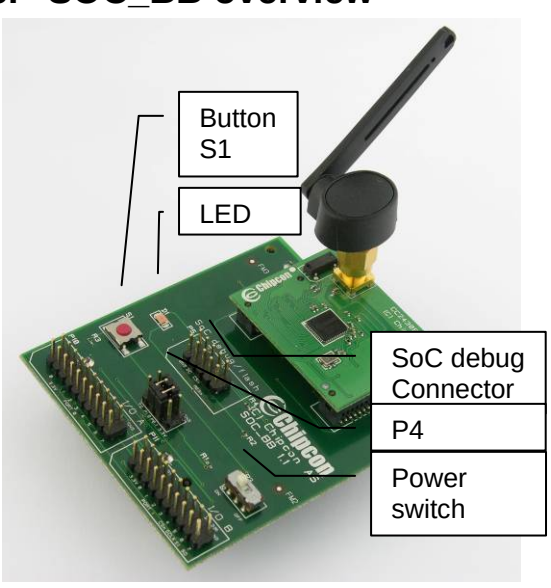
Location Dongle: Network coordinator connected to a PC with **RS232 serial cable**. Use SmartRF04EB with CC2430EM or CC2431EM programmed as Network coordinator for location dongle. Use hex file **LocDongle_EB.hex**

Reference nodes: Network nodes with known location. Use SOC_BB (Battery board) with CC2431EM or CC2430EM programmed as ZigBee routers for reference nodes. Use hex file **RefNode_BB.hex**

Blind nodes: Network nodes that calculates it position based on coordinates from the reference nodes. Use SOC_BB (Battery board) with CC2431EM programmed as ZigBee routers for blind nodes. Use hex file **BlindNode_BB.hex**

All EM modules must be placed in the SmartRF04EB for programming hex files. Both the USB cable and RS232 cable must be plugged to the board to allow programming and running the Z-location engine PC software.

3. SOC_BB overview



- Two Jumpers should be mounted on P4:
  - P1.0 <-> LED
  - P0-1 <-> PUSH

4. Installing software

Download following SW:

- **Z-location Engine PC SW**

from the CC2431DK product page on the TI web site: http://focus.ti.com/docs/toolsw/folders/print/cc2431dk.html
Extract and install the program on the development PC

Hex files are included for both ZigBee nodes and TIMAC nodes with the Z-location engine SW at: **C:\Program Files\Chipcon\Z-Location Engine**

Explanation to the hex file names:

- MAC in the file name means TIMAC files
- ZC in the file name means ZigBee Coordinator
- ZR in the file name means ZigBee Router
- EB in the file name means SmartRF04EB
- BB in the file name means Battery Board

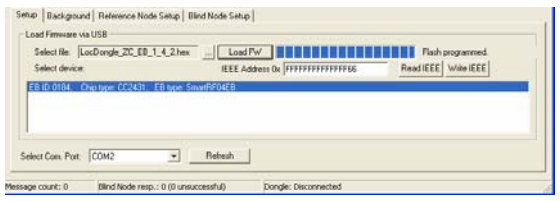
At the end of the hex file name there is a version number that links to the TIMAC and Z-stack version.

5. Program EM in EB

It is recommended to plug the EM modules into the SmartRF04EB board for programming

- Insert one CC2430/31EM into one of the SmartRF04EB boards
- Connect the USB **and** RS232 cables to a PC, the board is powered from the USB port
  - The USB connection is used for programming and power to the board
  - The RS232 is used for serial communication between the Z-location PC SW and the location dongle
- Turn on the main power switch
- The connector mating is locked to only one position; hence EM cannot be inserted the wrong way. Do not force the EM

6. Programming location dongle

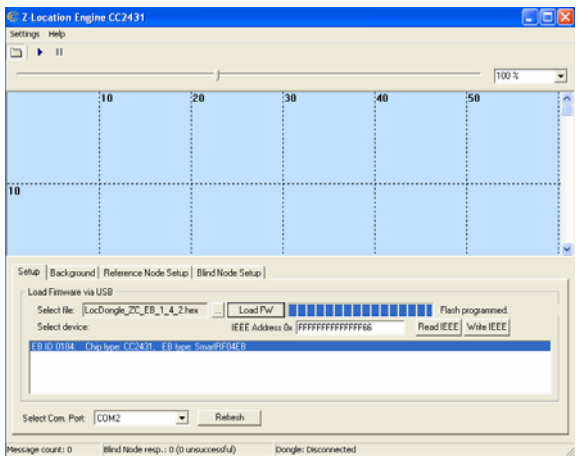


- **Start the Z-location SW**
- If the SmartRF04EB is connected with USB port to the PC, the board should show up in the device list
- Click the **Setup** tab
- Read the IEEE address to confirm it is any value except all FF
- Locate the LocDongle hex file at: **C:\Program Files\Chipcon\Z-Location Engine**
- Click **Load FW** to program the **Location Dongle** hex file on one 2430/31EM in the SmartRF04EB board

7. Setting up a network

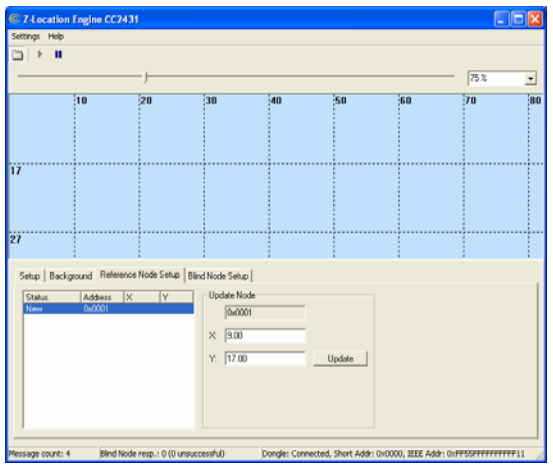
- A fast blinking green/red LED after programming indicates that the node has no IEEE address.
  - Use the programming interface to program the IEEE address
  - The IEEE address can be any value except only FFs
- The yellow LED is on and coordinator information is displayed on the LCD when the coordinator dongle is working . Verify that the LCD is showing “ZigBee Coord” and “Network ID: 1200
- Insert each one of the reference nodes in the EB board and program with the **Reference node** hex files
- Place each of the reference nodes on the SOC_BB boards
- **ZigBee nodes**: The red LED is on when the nodes connect to the network coordinator
- **TIMAC nodes:** The red LED blinks slowly when the nodes connect to the network coordinator
- Insert the blind nodes in the EB board and program with the **Blind node** hex file. Note that the blind node must be a CC2431

8. Run Z-location engine



- Make sure the location dongle is powered by DC power or USB cable and connected to a PC with RS232 serial cable
- Start Z-Location Engine, Select Windows [Start Menu] -> [Programs] -> [Chipcon] -> Z-Location Engine
- Select the correct COM port on the bottom of the screen
- Start the location engine by clicking the play arrow on the top toolbar
- Insert batteries in the SOC_BB boards and turn on one reference node at a time

9. Setup reference node

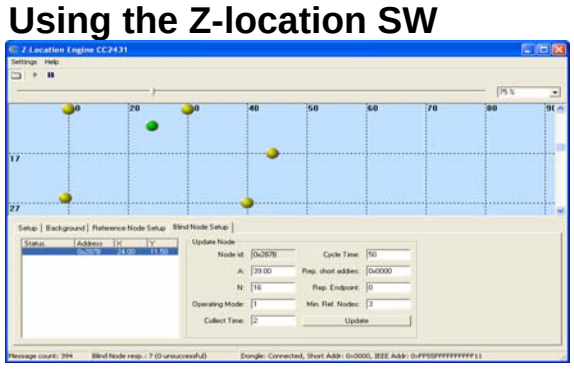


- Select the “Reference Node Setup” tab in the Z-Location Engine. The node will be displayed and marked “new”
- Double click on the node in the list.
- Right click in the “blue” location window at the same place as the node is located physically. Accept the new position with the “Update” button
- Repeat the setup for each reference node until all nodes are configured

9. Start a blind node

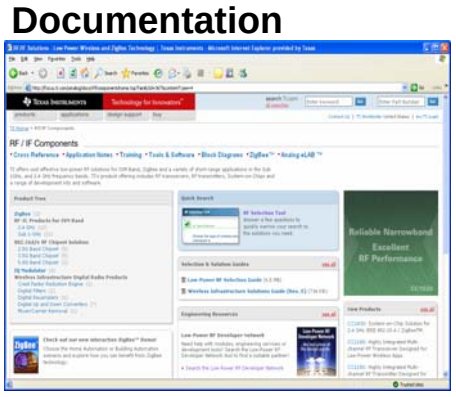
- After all reference nodes are configured the blind node can be powered
- The blind node will automatically be displayed in the “blue” location window. If the blind node is moved it will be shown at a new position in the location window

9. Using the Z-location SW



- The blind node parameters can be configured in the blind node tab
- **Cycle time** configures the update rate of the location in 100ms interval. I.e. 30 gives 3 second update rate
- Refer to the CC2431DK/ZDK User Manual for details about other options

10. Documentation



- www.ti.com/lpw
- CC2431 product page: http://focus.ti.com/docs/prod/folders/print/cc2431.html
- CC2431DK quick start guide
- CC2431DK User Manual
- Location engine application notes

10. Technical information

The example code is using 2.4GHz channel 16(0x10)

- ZigBee code is using PANID 0x1200
- TIMAC code is using PANID 0x11CC

11. Difference between ZigBee and TIMAC location systems

The TIMAC location dongle will give nodes short addresses incrementally starting a 0. The ZigBee coordinator will give each node unique short addresses.

TIMAC implements point-to-point communication. This means that all nodes must be in range of each other and the blind node must be within range of the location dongle connected to the PC

The Z-stack location example allows routing of packets in larger networks where messages can be routed through several nodes to reach the PC it reports to.

TIMAC and Z-stack nodes are not interoperable.

Both the 2431ZDK and 2430DK location example codes are available from www.ti.com as source code. The TIMAC object code can be downloaded from the TIMAC product page at: http://focus.ti.com/docs/toolsw/folders/timac.html

The ZigBee location source code is part of the Z-Stack object code that can be downloaded from the Z-stack product page at: http://focus.ti.com/docs/toolsw/folders/z-stack.html

12. Tips

Loading a map as background picture in Z-location makes it easier to place the reference nodes without measuring all distances. Use the background tab and load the map as a bmp file.

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