

**MeshConnect Family**

**ZICM2410P0-KIT2  
User Guide  
Point-to-Point Demonstration**



**0007-05-08-02-001  
(Rev D)**

# Table of Contents

<b>1</b>	<b>INTRODUCTION &amp; PURPOSE .....</b>	<b>3</b>
1.1	DEFINITIONS .....	3
1.2	KIT CONTENTS.....	3
1.3	REFERENCED DOCUMENTS .....	4
1.4	COMPONENT AND DEMONSTRATION DESCRIPTION .....	4
1.5	INITIAL ASSUMPTIONS .....	4
<b>2</b>	<b>HARDWARE OVERVIEW – ZICM2410-EVB3 .....</b>	<b>5</b>
2.1	ZICM2410-EVB3 DEFAULT SETTINGS .....	5
<b>3</b>	<b>CONNECTING THE HARDWARE .....</b>	<b>6</b>
3.1	COM PORT ASSIGNMENT .....	6
3.1.1	<i>Registering the two USB driver devices on the evaluation boards.....</i>	<i>6</i>
3.1.2	<i>Identifying the COM port for each evaluation board.....</i>	<i>6</i>
<b>4</b>	<b>DEMONSTRATION: POINT-TO-POINT DATA.....</b>	<b>7</b>
4.1	DOWNLOADING FIRMWARE TO THE EVALUATION BOARDS .....	7
4.2	COMMAND LINE INTERFACE (CLI) MODE .....	7
4.2.1	<i>Entering CLI Mode.....</i>	<i>7</i>
4.2.2	<i>Connecting to the evaluation board to HyperTerminal.....</i>	<i>8</i>
4.2.3	<i>CLI Menu Items.....</i>	<i>9</i>
4.3	POINT-TO-POINT (P2P) MODE .....	11
4.3.1	<i>Tests and Demonstrations .....</i>	<i>11</i>
<b>5</b>	<b>DEMONSTRATION: POINT-TO-POINT VOICE / AUDIO.....</b>	<b>13</b>
5.1	DOWNLOADING FIRMWARE TO THE EVALUATION BOARDS .....	13
5.2	COMMAND LINE INTERFACE (CLI) MODE .....	13
5.2.1	<i>CLI Menu Items.....</i>	<i>14</i>
5.3	POINT-TO-POINT (P2P) MODE .....	14
5.3.1	<i>Tests and Demonstrations .....</i>	<i>14</i>
5.3.2	<i>Volume Control.....</i>	<i>16</i>
<b>6</b>	<b>RE-DOWNLOADING THE PRE-LOADED DEMO FIRMWARE.....</b>	<b>17</b>
<b>7</b>	<b>REVISION HISTORY .....</b>	<b>17</b>

## 1 INTRODUCTION & PURPOSE

The **ZICM2410P0-KIT2** provides a simple demonstration environment for the CEL **ZIC2410** ZigBee System-on-Chip device based on our single chip IEEE 802.15.4 compliant transceiver available in either an integrated circuit or module form.

This procedure instructs the user on how use firmware contained in the evaluation kit on two of the **ZICM2410-EVB3** evaluation boards. The firmware allows the execution of simple tests for FCC validation, manufacturing tests or a basic IEEE 802.15.4 communication demo.

### 1.1 DEFINITIONS

#### HARDWARE

- **ZICM2410P0-1**: CEL's IEEE 802.15.4 transceiver module.
- **ZICM2410-EVB3**: An evaluation board containing a **ZICM2410P0-1** for development and evaluation purposes. Using the CEL supplied software tools makes it possible to download user-created programs to the **ZIC2410**.
- **ZICM2410P0-KIT2**: CEL's IEEE 802.15.4 evaluation kit.
- **ZIC2410USB-WNA**: A Wireless Network Analyzer (WNA) used to wirelessly monitor detailed information on each layer from the MAC to the Application layer by capturing RF packet data in real time.

#### SOFTWARE TOOLS

- **Device-Programmer**. Software to download device firmware onto a **ZIC2410** through either of the Evaluation Boards
- **Packet-Analyzer**. Software using the **ZIC2410USB-WNA** to wirelessly monitor the packet traffic being communicated throughout a demonstration PAN network.

### 1.2 KIT CONTENTS

Table 1 – Major Components of the ZICM2410P0-KIT2 Demonstration Kit

Qty	Part	Description
3	<b>ZICM2410-EVB3</b>	Each Evaluation board contains a <b>ZICM2410Px-1</b> module one labeled as 'IEEE MAC Address: 00:1C:2C:00:00:CE:00:01', one labeled as 'IEEE MAC Address: 00:1C:2C:00:00:CE:00:02', and one labeled as 'IEEE MAC Address: 00:1C:2C:00:00:CE:00:03'.
1	<b>ZIC2410USB-WNA</b>	Wireless Network Analyzer USB dongle
4	Batteries	Size AA
1	Cable	USB(A) to USB(B) 6ft.
1	Software CD	Contains all software tools, user guides, and sample applications
2	Power Supplies	RLA48EL-110 AC/DC Power Supply

### 1.3 REFERENCED DOCUMENTS

<u>Category</u>	<u>filename [.pdf]</u>	<u>Document Name</u>
Hardware References	<i>zicm03_evb3_hwref</i>	<b>ZICM2410-EVB3 Evaluation Board Hardware Reference Guide</b>
	<i>zic20_usbwna_ug</i>	<b>ZIC2410-USBWNA User Guide</b>
Software Manuals	<i>zic00_devpro_sm</i>	<b>ZIC2410 User Guide Device-Programmer Software Manual</b>
	<i>zic13_pktanlz_sm</i>	<b>ZIC2410 User Guide Packet-Analyzer Software Manual</b>
	<i>zic11_getstrt_sm</i>	<b>ZIC2410 Getting Started Guide</b>
	<i>SNAP_QSG</i>	<b>SNAP Quick Start Guide</b>

### 1.4 COMPONENT AND DEMONSTRATION DESCRIPTION

This kit contains three evaluation boards with firmware pre-loaded to demonstrate a Synapse Wireless SNAP network. This document describes two demonstrations using only two of the evaluation boards to place the **ZICM2410** module in various operational modes to test or set various parameters or to link the two boards in a simple IEEE 802.15.4 point-to-point (P2P) network to perform simple Range and PER testing.

In order to change to the demonstration in this guide, two of the evaluation boards must be programmed with different firmware.

### 1.5 INITIAL ASSUMPTIONS

- 1) In order to interface a PC with the USB port on the evaluation boards, a driver file must be installed to the PC. The procedure for installing the driver set-up program is given in Section 3.1 of the CEL document "**ZIC2410 Getting Started Guide**".
- 2) This user guide also assumes that the CEL **Device-Programmer** software program has already been installed on the user's PC. If not, please follow the instructions given in Section 2.1 of the CEL document "**CEL Device-Programmer Started Software Manual**".
- 3) The user may wish to use the CEL **Packet-Analyzer** software program to view the over the air traffic produced by these demos. If so, it will need to be installed, the procedure for which can be found in Section 2.1 of the CEL document "**CEL Packet-Analyzer Software Manual**".
- 4) The user's PC should contain the Microsoft HyperTerminal program. To check, click 'Start' → 'All Programs' → 'Accessories' → 'Communications' → 'HyperTerminal'.

## 2 HARDWARE OVERVIEW – ZICM2410-EVB3

The ZICM2410-EVB3 is an evaluation board to which the ZICM2410P0-1 module has been mounted. A ZICM2410-EVB3 is used to connect to host programs on a PC, in order to download user applications to the ZICM2410. It is equipped with peripherals to enable it to demonstrate the capabilities of our product.

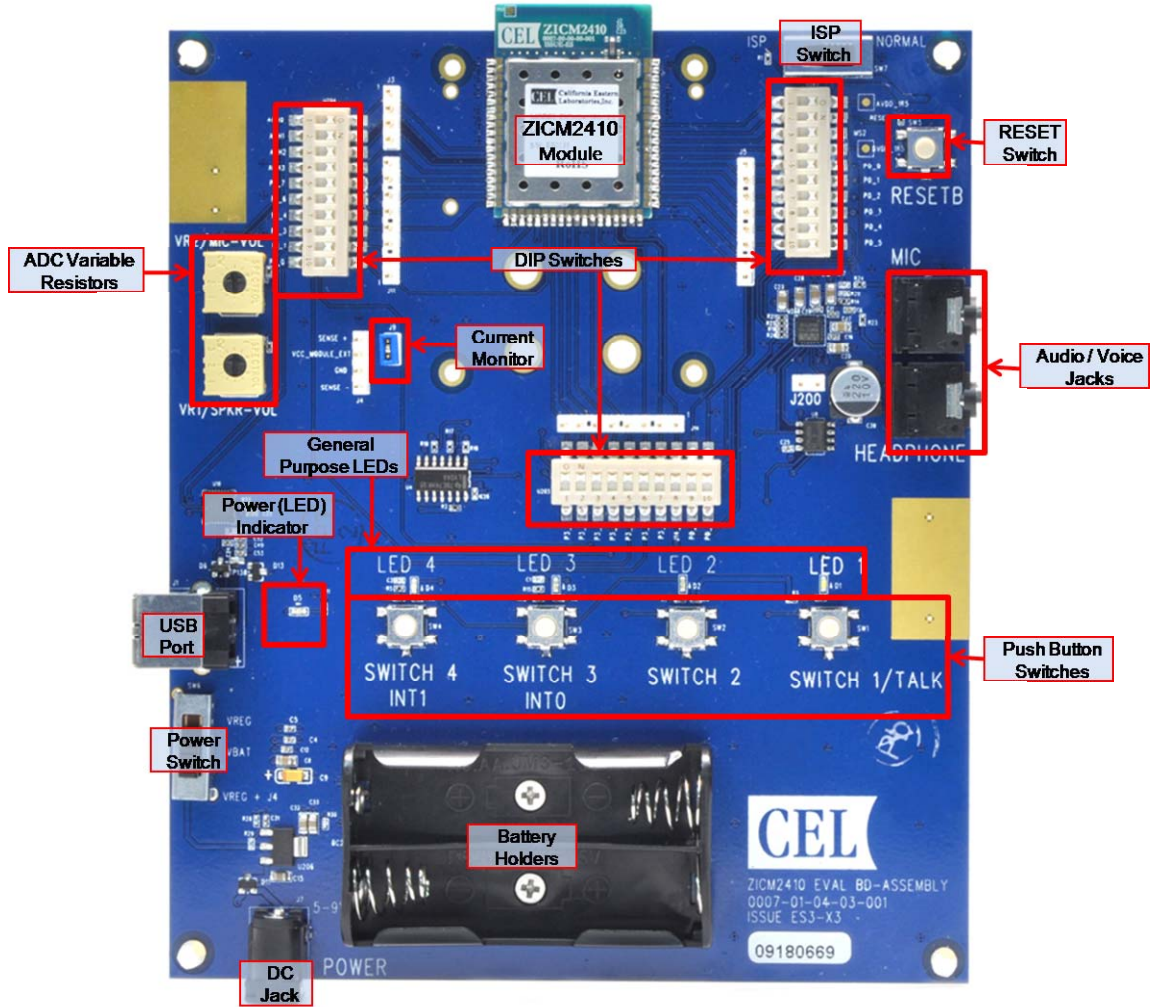


Figure 1 – Photo, ZICM2410-EVB3

### 2.1 ZICM2410-EVB3 DEFAULT SETTINGS

For normal operation of the evaluation board, the jumpers and DIP switches should be placed in the following locations:

Connector	Settings
J9	1-2
J200	Open
U203	1: ON, 2: ON, 3: ON, 4: ON, 5: ON, 6: ON, 7: ON, 8: ON, 9: ON, 10: ON
U204	1: ON, 2: ON, 3: ON, 4: ON, 5: ON, 6: ON, 7: ON, 8: ON, 9: ON, 10: ON
U205	1: ON, 2: ON, 3: ON, 4: ON, 5: ON, 6: ON, 7: ON, 8: ON, 9: ON, 10: ON

### 3 CONNECTING THE HARDWARE

#### 3.1 COM PORT ASSIGNMENT

##### ***3.1.1 Registering the two USB driver devices on the evaluation boards***

When each of the evaluation boards is powered and connected to the PC for the first time, the PC will respond that it has detected **two** pieces of new hardware. Follow the instructions in the **'Found New Hardware Wizard'** that will appear on the user's screen. A detailed procedure for this process can be found in Section 4.1.1 of the CEL document ***"ZIC2410 Getting Started Guide"***.

##### ***3.1.2 Identifying the COM port for each evaluation board***

The registration process causes the PC to assign a COM port number to each of the evaluation boards. It is necessary to determine this COM port number for each of the boards. Windows Device Manager can be used to do so, and to check that the hardware and associated drivers have been properly installed. A detailed procedure for this process can be found in Section 4.1.2 of the CEL document ***"ZIC2410 Getting Started Guide"***.

<p><b>NOTE:</b> It is important to take note here of the COM port that has been assigned to the evaluation board, as it will be needed later when establishing connections with the various software tools.</p>
---

## 4 DEMONSTRATION: POINT-TO-POINT DATA

The firmware loaded in Section 4.1 equips the evaluation boards to operate in two different modes: (1) the Command Line Interface (**CLI**) mode and (2) the Point-to-Point Test (**P2P**) mode. The **P2P** mode allows the boards to communicate with each other in a standalone configuration (not connected to the PC), while the **CLI** mode is a HyperTerminal based mode for modifying the settings and parameters of the **ZICM2410** module. When an evaluation board (with the Point-to-Point Data firmware programmed) is powered up or reset, it will enter the **CLI** mode unless either '**SWITCH1**' or '**SWITCH2**' is pressed within 5 seconds of initialization.

### 4.1 DOWNLOADING FIRMWARE TO THE EVALUATION BOARDS

The firmware for this demonstration is designed for use on the **ZICM2410-EVB3** evaluation boards. It may **NOT** function properly on other evaluation boards.

For the complete detailed description of firmware programming to a module, please refer to Section 3 of the CEL Document "**ZIC2410 User Guide Device-Programmer Software Manual**". A brief outline of the required steps for programming follows.

- 1) Open the CEL **Device-Programmer** software by double-clicking on the icon on the user's desktop.
- 2) Ensure that the evaluation board is connected to the PC through the USB cable and that power switch is on.
- 3) Put the evaluation board into programming (ISP) mode by moving the '**ISP Switch**' to the '**ISP**' position and pressing the '**RESETB**' switch.
- 4) In the **Device-Programmer**, select the '**Direct-DownLoad**' Method, and click the '**Setup-Connection**' icon.
- 5) In the '**Communication**' Window, select '**RS232 (Serial)**', the correct COM port and set the parameters (115200 8-N-1) in the '**Select Communication Mode**' dialog and click '**Connect**'.
- 6) Select '**Bank On**', and '**Bank-0**', and click on the '**File Open**' icon.
- 7) Locate the file **ZICM2410P0\_EVB3\_v1.09\_DATA.H00** in the directory \\ZIC2410\\Application Source Files\\ZICM2410P0\_EVB3\_v1.09\_DATA\\HEX\\ on the CEL CD.
- 8) Double-click on the file name and the screen will populate with the filename selected in '**Bank 0 Name**' and '**Bank 1 Name**'. '**Bank 3 Name**' will remain blank.
- 9) In the '**Select Modem Configuration Type**' screen, choose '**Not including hardware information**' and click on '**start rom program**'. The download is complete when a "**Success**" message appears.
- 10) Switch the '**ISP Switch**' to the '**NORMAL**' position and pressing the '**RESETB**' switch.

Repeat this procedure for the second evaluation board.

### 4.2 COMMAND LINE INTERFACE (CLI) MODE

The **CLI** is manufacturing software which provides the capability to test and validate the physical layer of the **ZICM2410P0-1** module. This mode can also be used in conjunction with the **P2P** mode to change some of the device parameters in order to customize the **P2P** mode tests.

#### 4.2.1 Entering CLI Mode

Either power up the evaluation board or press the '**RESETB**' button and wait longer than 5 seconds. The evaluation board will enter **CLI** mode, when the evaluation board is in **CLI** mode the green LED is illuminated.

#### 4.2.2 Connecting to the evaluation board to HyperTerminal

In order to connect to the PC in **CLI** mode, it is necessary to know the COM port number assigned to each evaluation board that the user wishes to connect. Please obtain the information (as described in Section 3.1.2) prior to proceeding.

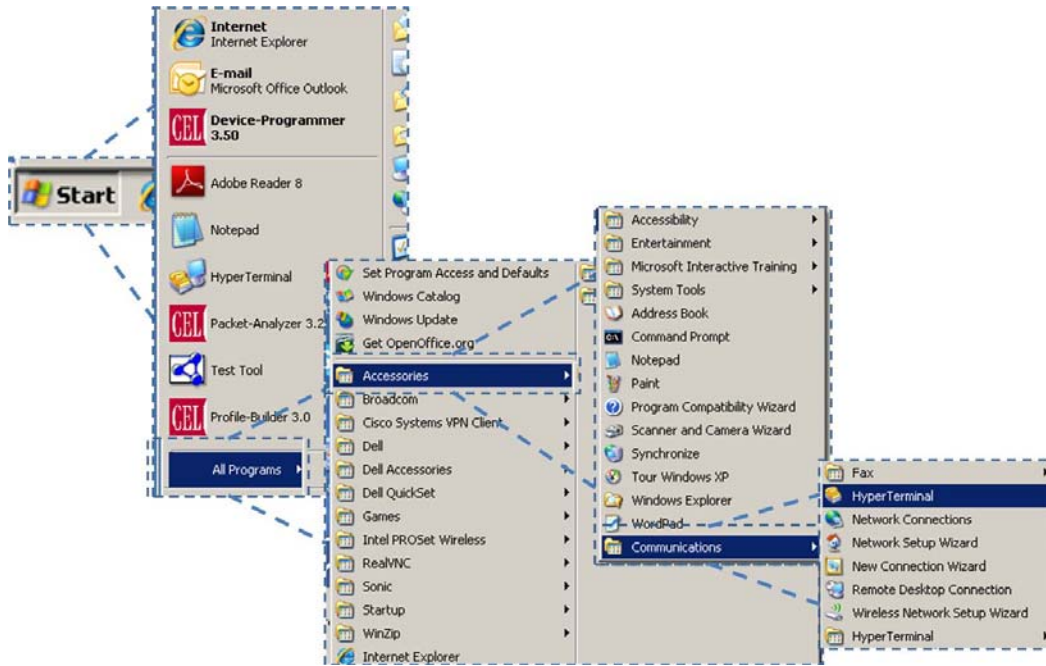


Figure 2 – Screens, Starting HyperTerminal

- 1) Connect an evaluation board to the PC through a USB cable and power up the board.
- 2) From the 'Start' menu, choose 'All Programs' → 'Accessories' → 'Communications' → 'HyperTerminal' as shown in Figure 2.
- 3) The program will open a 'New Connection' window and prompt for a name to be assigned for the connection. Enter a name, choose an icon and click 'OK' to proceed.
- 4) In the 'Connect To' window, choose the previously determined COM # from the pull down menu in the 'Connect using' field and click 'OK'.
- 5) The 'COM [#] Properties' window will appear as in Figure 3. Enter the parameter shown on the right and click 'OK'. A blank '[name] – HyperTerminal' screen will appear.

<b>Bits per second:</b>	'115200'
<b>Data bits:</b>	'8'
<b>Parity:</b>	'None'
<b>Stop bits:</b>	'1'
<b>Flow control:</b>	'None'

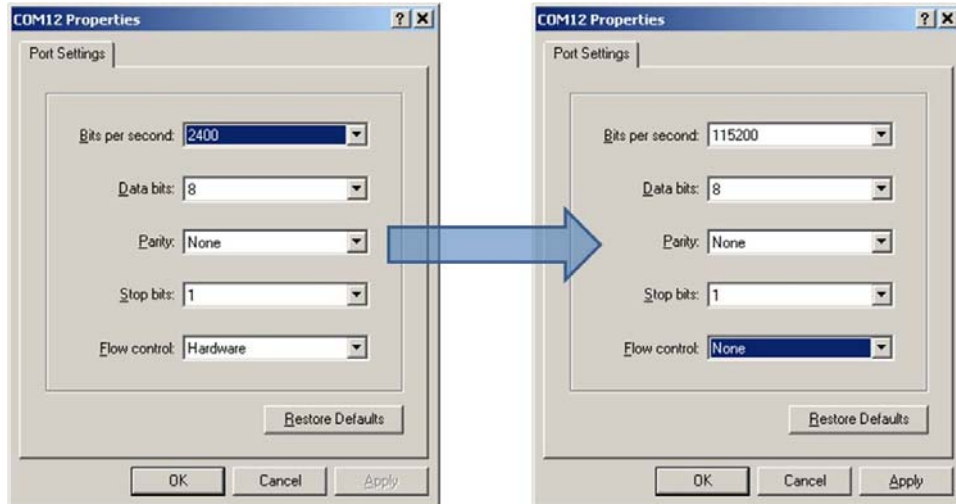


Figure 3 – Screens, COM [#] Properties Input

- 6) Press the **'RESETB'** button on the evaluation board. Within a few seconds the screen in Figure 4 will appear. (**Note:** typing **'H'** at almost any time will bring up this **'HELP Menu'**)

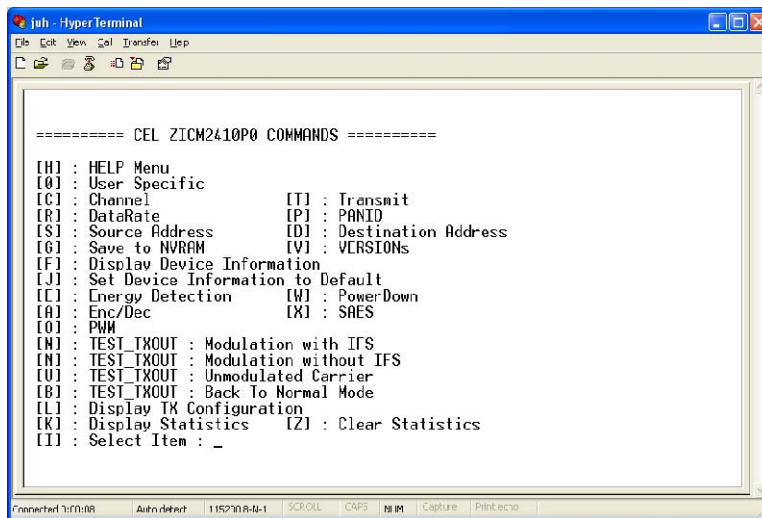


Figure 4 – Screen, HyperTerminal, CLI mode Menu

### 4.2.3 CLI Menu Items

Table 2 details the functions that are available for use through the HyperTerminal program when the module is configured for use in **CLI** mode.

**SLKPDZ**

Table 2 – CLI Mode Menu Items

Command	Function Name	Description
[H]	HELP Menu	Brings up the menu shown in Figure 4
[O]	User Specific	
[C]	Channel Change	Used to change the RF Channel in the 2.4GHz band from 11 (2405MHz) to 26 (2480MHz)
[R]	Data Rate Change	Used to change the Data Rate 0 for 250kbps, 1 for 500kbps or 2 for 1Mbps
[S]	Source Address	Used to change the MyAddr, Source Address, (16-bit IEEE Short

ZICM2410P0-KIT2 Point-to-Point Demonstration

Command	Function Name	Description
		Address) of the connected node.
[G]	Save to NVRAM	Saves Device Information to NVRAM on the evaluation board.
[F]	Display Device Information	Reads Device Information: <u>Data Rate</u> : 250kbps, 500kbps, or 1Mbps <u>Power Level</u> : 00 for highest level; 16 for lowest level <u>Channel</u> : 2.4GHz RF Channel from 11 to 26 <u>PAN ID</u> : the 16-bit network ID <u>DstAddr</u> : 16-bit Short Network Address of the destination node <u>MyAddr</u> : 16-bit Short Network Address of the source node
[J]	Set Device Information to Default	Sets the Device Information to the default values as follows: <u>Data Rate</u> = 0; <u>Power Level</u> = 00; <u>Channel</u> = 11; <u>PAN ID</u> = 0628 <u>DstAddr</u> = 8001; <u>MyAddr</u> = 8000; <u>MyIEEE</u> = 00 22 A3 00 00 00 80 01 <u>DstIEEE</u> = 00 22 A3 00 00 00 80 02
[E]	Energy Detection	Detects the energy of the operating channel.
[A]	Enc/Dec	Tests the Encoder and Decoder functions.
[O]	PWM	
[M]	TEST_TXOUT: Modulation with IFS	Sets the transmitter modulation type.
[N]	TEST_TXOUT: Modulation without IFS	
[U]	TEST_TXOUT: Unmodulated Carrier	
[B]	TEST_TXOUT: Back to Normal Mode	
[L]	Display TX Configuration	Displays the current transmitter configuration of the connected node.
[K]	Display Statistics	Displays the number of packets transmitted / received and the corresponding ACKs.
[I]	Select Item	Used to change any of the following items: 0x0003: RF Power 0x8001: PER Parameter 0x8002: PER Parameter 2 0x8003: DSN Check 0x8004: Register Write 0x8005: Register Read 0x8010: Display Rx Packet's RSSI 0x8011: Display Rx Packet
[T]	Transmit	Starts the module transmitting packets (typing 'X' stops the transmission).
[P]	PANID	Used to change the PAN ID of the IEEE wireless network.
[D]	Destination Address	Used to change the DstAddr, Destination Address, (16-bit IEEE Short Address) of the target node.
[V]	VERSION	Displays the versions of: <u>EVK</u> : Firmware loaded to the module <u>REG</u> : Hardware version <u>CHIP ID</u> : ZIC chip designator
[W]	Power Down	Power Down Reset function.
[X]	SAES	Standalone Advanced Encryption Standard: tests the Cipher Encryption/Decryption function.
[Z]	Clear Statistics	Clears the statistics and resets all counters to '0'.

### 4.3 POINT-TO-POINT (P2P) MODE

The **P2P** mode is embedded software with the capability to build and operate a simple IEEE 802.15.4 communications link between two evaluation boards.

The user may choose to use the **CLI** mode to change some of the device parameters in order to customize some of the **P2P** mode tests. However, this procedure assumes that any changes to the parameters saved into the NVRAM of either of the evaluation boards during **CLI** testing, have either been returned to the default condition, or changed to complementary settings on both of the evaluation boards.

#### 4.3.1 Tests and Demonstrations

For each of these Switch Tests, the evaluation boards can interchangeably be either the Transmitter or the Receiver. Therefore, the TX evaluation board is defined as the one whose 'Switches' the user is pressing and the RX evaluation board is the other, regardless of their addresses.

**Note:** For the four LEDs to consistently return correct indications on the RX evaluation board for the tests below, VR1 and VR2 should be turned all the way counterclockwise.

#### Range Test

- **Description:** The TX evaluation board repeatedly transmits packets over the default channel and requests an acknowledgement for each packet from the RX evaluation board.
- **Start / Stop #1:** Pressing '**SWITCH1**' within 5 seconds of reset initialization (LEDs off) on the TX evaluation board assigns the radio the default values listed below and begins transmitting packets. Pressing '**SWITCH1**' again ceases packet transmission.

<b>My Address (MyAddr):</b>	0x8000
<b>Destination Address (DstAddr):</b>	0x8001
<b>PAN ID:</b>	0x0628
<b>Channel #:</b>	11 (2405 MHz)
<b>Power Level:</b>	+8 dBm

- **Start / Stop #2:** Pressing '**SWITCH2**' within 5 seconds of initialization (LEDs off) reset on the RX evaluation board assigns the radio the default values listed below and begins receiving packets.

<b>My Address (MyAddr):</b>	0x8001
<b>Destination Address (DstAddr):</b>	0x8000
<b>PAN ID:</b>	0x0628
<b>Channel #:</b>	11 (2405 MHz)
<b>Power Level:</b>	+8 dBm

- **Indications:** On the TX evaluation board, LED1 (white) will blink for each packet being transmitted until stopped. If a receiver is within range and transmitting ACKs, LED2 (amber) will blink for each ACK received. On the RX evaluation board, LED2 will blink with the successful receipt of each packet.

### PER Test

- **Description:** The TX evaluation board transmits 200 packets with a defined message, each requesting an ACK of the integrity of the message. At the end of the transmission, the LEDs indicate the success / failure of the packet receipt.
- **Configuration:** Prior to beginning the PER test, it is necessary for both boards to enter 'CLI' mode and the following steps performed:
  - 1) Execute command [J]: *Set Device Information to Default*
  - 2) Execute command [G]: *Save to NVRAM*

On only one board, perform the following additional steps:

- 3) Execute command [S]: *Source Address* and set the source address to '0x8001'
  - 4) Execute command [D]: *Destination Address* and set the destination address to '0x8000'
  - 5) Execute command [G]: *Save to NVRAM*
- **Start Stop #1:** Power-on / Reset the RX evaluation board and wait until the LED3 (green) is illuminated.
  - **Start Stop #2:** Power-on / Reset the TX evaluation board and within 5 seconds of initialization (LEDs off) press 'SWITCH4'. LED4 (blue) is illuminated. Pressing 'SWITCH4' again will commence the PER test.
  - **Indications:** On the TX evaluation board, LED4 will blink once for each packet until all 200 packets have been transmitted. LED3 will blink once for each ACK received from the RX evaluation board. If all the packets were ACKed by the RX evaluation board as received correctly, LED4 will remain illuminated. If there are any errors in the acknowledgements (i.e. a NACK is received), LED3 will be illuminated. If an RF transmission error occurs, LED3 and LED4 will be illuminated. On the RX evaluation board, LED2 will blink with each received packet.

### Potentiometer Test

- **Description:** Adjusting the potentiometers (variable resistors) illuminates the LEDs by altering the duty cycle.
- **Start / Stop:** Turn 'VR1' and/or 'VR2' clockwise and then counter-clockwise.
- **Indication:** When 'VR1' is turned, the duty-cycle for LED1 (white) is altered, with the most counter-clockwise position being OFF and the most clockwise position being ON. The same holds true for 'VR2', however LED2 (amber) is used.

At the completion of this test, place 'VR1' and 'VR2' in the full counter-clockwise position to avoid erroneous LED illuminations for the other tests.

## 5 DEMONSTRATION: POINT-TO-POINT VOICE / AUDIO

The firmware loaded in Section 5.1 equips the evaluation boards to operate in two different modes: (1) the Command Line Interface (**CLI**) mode and (2) the Point-to-Point Test (**P2P**) mode. The **P2P** mode allows the boards to communicate with each other in a standalone configuration (not connected to the PC), while the **CLI** mode is a HyperTerminal based mode for modifying the settings and parameters of the **ZICM2410** module. When an evaluation board (with the Point-to-Point Voice / Audio firmware programmed) is powered up or reset, it will enter the **CLI** mode unless either '**SWITCH1**' or '**SWITCH2**' is pressed within 5 seconds of initialization.

### 5.1 DOWNLOADING FIRMWARE TO THE EVALUATION BOARDS

The firmware for this demonstration is designed for use on the **ZICM2410-EVB3** evaluation boards. It may **NOT** function properly on other evaluation boards.

For the complete detailed description of firmware programming to a module, please refer to Section 3 of the CEL Document "**ZIC2410 User Guide Device-Programmer Software Manual**". A brief outline of the required steps for programming follows.

- 1) Open the CEL **Device-Programmer** software by double-clicking on the icon on the user's desktop.
- 2) Ensure that the evaluation board is connected to the PC through the USB cable and that power switch is on.
- 3) Put the evaluation board into programming (ISP) mode by moving the '**ISP Switch**' to the '**ISP**' position and pressing the '**RESETB**' switch.
- 4) In the **Device-Programmer**, select the '**Direct-DownLoad**' Method, and click the '**Setup-Connection**' icon.
- 5) In the '**Communication**' Window, select '**RS232 (Serial)**', the correct COM port and set the parameters (115200 8-N-1) in the '**Select Communication Mode**' dialog and click '**Connect**'.
- 6) Select '**Bank On**', and '**Bank-0**', and click on the '**File Open**' icon.
- 7) Locate the file **ZICM2410P0\_EVB3\_v1.0\_VOICE.H00** in the directory \ZIC2410\Application Source Files\ZICM2410P0\_EVB3\_v1.0\_VOICE\HEX\ on the CEL CD.
- 8) Double-click on the file name and the screen will populate with the filename selected in '**Bank 0 Name**' and '**Bank 1 Name**'. '**Bank 3 Name**' will remain blank.
- 9) In the '**Select Modem Configuration Type**' screen, choose '**Not including hardware information**' and click on '**start rom program**'. The download is complete when a "**Success**" message appears.
- 10) Switch the '**ISP Switch**' to the '**NORMAL**' position and pressing the '**RESETB**' switch.

Repeat this procedure for the second evaluation board.

### 5.2 COMMAND LINE INTERFACE (CLI) MODE

The '**CLI**' mode included with the Voice / Audio application is similar to that of the '**CLI**' mode of the Point-to-Point Data application described previously in Section 4.2. This section will only outline the differences of the Voice / Audio '**CLI**'.

### 5.2.1 CLI Menu Items

Table 3 details the functions that are available for use through the HyperTerminal program when the module is configured for use in **CLI** mode.

**Table 3 – CLI Mode Menu Items**

Command	Function Name	Description
[H]	HELP Menu	Brings up the menu
[C]	Channel	Changes the RF Channel in the 2.4GHz band from 11 (2405MHz) to 26 (2480MHz)
[R]	Data Rate	Changes the Data Rate 0 for 250kbps, 1 for 500kbps or 2 for 1Mbps
[P]	PANID	Changes the PANID.
[W]	RF Power	Changes the RF Power.
[S]	Source Address	Sets 16-bits source address
[D]	Destination Address	Sets 16-bits destination address
[Q]	Sample Rate	Changes the sample rate from 8 kHz to 48 kHz
[Y]	Compression Schemes	Changes the compression schemes.
[V]	VERSION	Displays the versions of: <u>EVK</u> : Firmware loaded to the module <u>REG</u> : Hardware version <u>CHIP ID</u> : ZIC chip ID
[G]	Save to NVRAM	Saves Device Information to NVRAM on the evaluation board.
[J]	Set Device Information to Default	Sets the Device Information to the default values.
[F]	Display Device Information	Displays device information.
[E]	Exit and Start Audio	Exits and starts voice/audio.

## 5.3 POINT-TO-POINT (P2P) MODE

The **P2P** mode is embedded software with the capability to operate a full-duplex voice/audio communications link between two evaluation boards. There are two P2P applications: voice and audio.

### 5.3.1 Tests and Demonstrations

For each of these tests, the evaluation boards can be used interchangeably. In addition to the evaluation boards, the user will need to supply two headsets with 3.5 mm microphone / speaker mini-jacks. The evaluation board has been optimized for headsets with the following characteristics:

**Microphone Impedance:** 2.2 k $\Omega$   $\pm$  15%

**Headphone Impedance:** 32  $\Omega$   $\pm$  15%

Headsets which meet the aforementioned impedance criteria and have been extensively used with the voice / audio application are the TeknMotion TM-YB100A, TM-YP100A and TM-YW100A as well as the Cyber Acoustics AC-201. These headsets are readily available online retailers such as Amazon or Newegg.

**Note:** When running the Voice / Audio application for the first time, it is advised to turn both potentiometers (VR1 and VR2) as far as they can go in the clockwise direction and then back them off approximately ¼ of a

turn.
-------

### Voice Test

- **Description:** Goal is to establish a full-duplex voice-grade communication link between two evaluation boards at an 8 kHz sampling rate and a wireless data rate of 250 kbps.
- **Start / Stop #1:** Pressing '**SWITCH1**' within 5 seconds of reset initialization (LEDs off) on the evaluation board, the radio is assigned the default values listed below and begins transmitting / receiving packets.

<b>My Address (MyAddr):</b>	0x8000
<b>Destination Address (DstAddr):</b>	0x8001
<b>PAN ID:</b>	0x0628
<b>Channel #:</b>	11 (2405 MHz)
<b>Power Level:</b>	+8 dBm

- **Start / Stop #1:** Pressing '**SWITCH2**' within 5 seconds of reset initialization (LEDs off) on the evaluation board, the radio is assigned the default values listed below and begins transmitting / receiving packets.

<b>My Address (MyAddr):</b>	0x8001
<b>Destination Address (DstAddr):</b>	0x8000
<b>PAN ID:</b>	0x0628
<b>Channel #:</b>	11 (2405 MHz)
<b>Power Level:</b>	+8 dBm

- **Indications:** LED1 (white) or LED2 (amber) will illuminate on the evaluation boards once successful configuration has occurred by the pressing of '**SWITCH1**' and '**SWITCH2**' respectively. Once the LEDs are illuminated a communication link has been established and full-duplex voice communication should be possible.

### Audio Test

- **Description:** Goal is to establish a full-duplex audio-grade (music) communication link between two evaluation boards at a 16 kHz sampling rate and a wireless data rate of 500 kbps.
- **Start / Stop #1:** Press and hold '**SWITCH3**' while pressing and releasing '**SWITCH1**' within 5 seconds of reset initialization (LEDs off) on the evaluation board, the radio is assigned the default values listed below and begins transmitting / receiving packets.

<b>My Address (MyAddr):</b>	0x8000
<b>Destination Address (DstAddr):</b>	0x8001
<b>PAN ID:</b>	0x0628
<b>Channel #:</b>	11 (2405 MHz)
<b>Power Level:</b>	+8 dBm

- **Start / Stop #1:** Press and hold '**SWITCH3**' while pressing and releasing '**SWITCH2**' within 5 seconds of reset initialization (LEDs off) on the evaluation board, the radio is assigned the default values listed below and begins transmitting / receiving packets.

<b>My Address (MyAddr):</b>	0x8001
<b>Destination Address (DstAddr):</b>	0x8000
<b>PAN ID:</b>	0x0628
<b>Channel #:</b>	11 (2405 MHz)
<b>Power Level:</b>	+8 dBm

- **Indications:** LED1 (white) or LED2 (amber) will illuminate on the evaluation boards once successful configuration has occurred by the pressing of '**SWITCH1**' and '**SWITCH2**' respectively. LED3 (green) will also be illuminated to indicate that '**SWITCH3**' was pressed during configuration to enter "audio" mode. Once the LEDs are illuminated a communication link has been established and full-duplex audio communication should be possible.

### NVRAM Configuration

- **Description:** Uses the settings stored in the NVRAM for setting the configuration information. These settings may be changed via '**CLI**' mode and are not lost when power is removed from the evaluation board.
- **Start / Stop:** Pressing '**SWITCH4**' within 5 seconds of reset initialization (LEDs off) on the evaluation board, the radio is assigned the default values stored in the NVRAM and begins transmitting / receiving packets.
- **Indications:** LED4 (blue) will illuminate on the evaluation board once successful configuration has occurred by the pressing of '**SWITCH4**'. Once the LEDs are illuminated a communication link has been established and full-duplex communication should be possible.

### Soft Configuration

- **Description:** Uses the settings configured in a '**CLI**' mode session for setting the configuration information. These settings are not lost when power is removed from the evaluation board. The settings may be saved to the NVRAM using a '**CLI**' command.
- **Start / Stop:** Not pressing any switch within 5 seconds of reset initialization (LEDs off) allows the device to enter '**CLI**' mode. Once configured, use the '**CLI**' command [E] *Exit and Start Audio* to test the settings applied in the '**CLI**' session.
- **Indications:** LED3 (green) will illuminate on the evaluation board once '**CLI**' mode has been entered. Once the LED is illuminated and a communication link with the PC has been established, the system is ready to be configured.

### **5.3.2 Volume Control**

Both the microphone and speaker volumes are controlled by the variable resistors '**VR1**' and '**VR2**'. As labeled on the evaluation board, '**VR1**' controls the speaker (output) volume and '**VR2**' controls the microphone (input) volume. Turning the variable resistor clock-wise increases the volume, while turning counter-clockwise decreases the volume.

## 6 RE-DOWNLOADING THE PRE-LOADED DEMO FIRMWARE

To return the two evaluation boards to their pre-loaded SNAP software, the procedure is similar to that given in Section 4.1 and 5.1 above with the exception that the firmware downloaded to the evaluation boards is not the same for both evaluation boards and is done from the Synapse Portal interface. The following is the procedure for re-programming:

- 1) Ensure that the evaluation board is connected to the PC through the USB cable and that power switch is on.
- 2) Put the evaluation board into programming (ISP) mode by moving the '**ISP Switch**' to the '**ISP**' position and pressing the '**RESETB**' switch.
- 3) Open the **Synapse Portal** software by double-clicking on the icon on the user's desktop.
- 4) When the '**Connect to Port**' dialog is displayed click the '**Cancel**' button.
- 5) From the '**Options**' menu within *Portal*, select '**Firmware Upgrade...**'.
- 6) Select the corresponding '**Port**' and '**Firmware Image**', the current production level firmware being programmed to the module is **ZIC2410\_AES128\_SnapV2.4.10.sfi**.
- 7) Click the '**Upgrade**' button.
- 8) Switch the '**ISP Switch**' to the '**NORMAL**' position and pressing the '**RESETB**' switch.
- 9) Program the IEEE MAC address (found on the sticker on the underneath side of the evaluation board) using the procedure found in the *SNAP Quick Start Guide* located in the ZIC2410\Tools\SNAP directory on the Development Kit CD.

Repeat this procedure for the second evaluation board.

## 7 REVISION HISTORY

<b>Revision</b>	<b>Date</b>	<b>Description</b>
A	13Jan09	Released
B	11Jun09	General cleanup. Updated for the EVB3 evaluation board. Added Voice / Audio application details.
C	18Jun10	Modified to incorporate the ZIC2410-USBWNA as the replacement of the ZIC2410-WNA.
D	24Sep10	Corrected WNA Part Numbering. Removed references to ZigBee demonstrations and updated to preprogrammed software being Synapse Wireless SNAP software. Updated referenced software versions.