

# **ZcoRE3-2400**

**(ZcoRE3-2400/ZcoRE3(20)-2400)**

OEM Serial Wireless Transceiver Module

User Manual

Version 1.0

May, 2007

This manual covers the operations of the ZcoRE3-2400 family of serial OEM wireless transceiver modules. For the most part, operation of each product in the ZcoRE3-2400 family is identical; where operating differences exist, every effort has been made to clearly identify which product is being referred to.

This manual is produced for users of the ZcoRE3-2400 OEM wireless transceiver module from REnex Technology Limited. It covers the operating principles and capabilities of the ZcoRE3-2400 module. It is recommended that you read this document before using the ZcoRE3-2400 module in order to operate it correctly and optimize its performance.

## **WARRANTY**

**REnex Technology's ZcoRE3-2400 module is warranted against defect in materials and manufacturing for a period of two years from date of purchase. In the event of a product failure due to materials or workmanship, REnex will, at its discretion, repair or replace the product. REnex and its suppliers shall in no event be liable for any damages arising from the use of or inability to use this product. This includes business interruption, loss of business information, or other loss which may arise from the use of the product.**

## **WARNING**

**Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.**

## **REMINDING**

**This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

While using for ZcoRE3(20)-2400, precaution below is necessary:

### **PRECAUTION**

- 1. The installed antenna must not be located in a manner that allows exposure of the general population at a distance of less than 4cm.**
- 2. Mount the antenna in a manner that prevents any personnel from entering the area within 4cm from the central position of the antenna.**
- 3. It is recommended that the installer place radio frequency hazard warnings signs on the barrier that prevents access to the antenna.**
- 4. Prior to installing the antenna to the antenna connector, make sure the power is adjusted to the settings specified in section of this manual.**
- 5. During antenna installation, be sure that the power to the equipment is turned off in order to prevent any energy presence on the coaxial connector.**

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## **Terms:**

### **Coordinator:**

A FFD used for gateway. Only one coordinator per network.

### **FFD:**

Full Function Device. Sensor node with routing ability. FFD requires line power all time.

### **RFD:**

Reduce Function Device. A Sleeping node can only talk to a FFD or Coordinator. Can not relay the message. Can be a battery powered device.

### **RCM:**

Radio Communications Module

### **RDTE:**

Reader Data Terminal Equipment.

### **SDTE:**

Sensor Data Terminal Equipment.

### **RMCI:**

RAEMESH Module Command Interface.

### **RCM:**

Radio Frequency Communication Module, ZcoRE3-2400/ZcoRE3(20)-2400 OEM module

## 1. Introduction

The ZcoRE3-2400 serial OEM transceiver module is a small size, high performance wireless module, which is designed to provide a cost efficient solution for reliable data transmission and low power consumption. It is ideal for low data rate wireless applications, including sensor monitoring, building automation, security systems and any other application requiring low power consumption. The ZcoRE3-2400 module family includes devices that work at two different RF power, including 0dBm and 18dBm, to enable license-free operations in varies applications.

The ZcoRE3-2400 module offers data communication capabilities to application equipment via a standard UART interface. Using a pair of ZcoRE3-2400 wireless modules, users can transfer data between almost any type of equipment that use this interface.

The ZcoRE3-2400 module provides two power modes, normal working mode and sleep mode, which has very low power consumption since the device can neither transmit nor receive data in this mode. Switching to sleep mode whenever possible generally creates significant energy savings, which is important for battery-powered systems.

These modules are preloaded wireless sensor mesh network application (RAEMESH), which was developed based on EmberZnet 2.23 mesh stack. This documentation also describes the RAEMESH Module Command Interface (RMCI) for IEEE 802.15.4/Zigbee enabled RF Module (RCM), Including ZcoRE3 (20)-2400 and ZcoRE3-2400.

By using RMCI, users can easily integrate the mesh radio into a wide range of applications without pain to develop the mesh stack by themselves and no RF expertise is required.

### Features of ZcoRE3-2400:

- Mesh network
- ISM frequency bands – 2.4 GHz ~ 2.4835GH
- High receiver sensitivity - superior transmission range for a given RF power
- Designed to hazardous industrial requirements - may be used in instruments certified for intrinsic safety operation
- Low power consumption - conserves battery power
- Small size, light weight - easy to integrate
- Low cost - cost-efficient systems

### Application examples:

- Smart badges
- Remote monitoring and control
- Perimeter security/access control
- Medical instrumentation
- Environmental monitoring
- Sensor networks
- Diagnostic monitoring
- Industrial telemetry
- Automatic meter reading
- ...

## 2. Technical Parameters

**Table 2.1 Technical Parameters of ZcoRE3-2400/ZcoRE3(20)-2400**

<i><b>Radio Characteristics</b></i>	
RF Frequency Band	2.4 ~ 2.4835GHz
Number of Channels	16 channels
Channel Spacing	5 MHz
RF Data Rate	250 kbps
Modulation	OQPSK
Duplex	TDD
Maximum E.R.P.	1 (0 dBm) ~ 60 mW (18 dBm)
Receiver Sensitivity	-95 dBm at 10 <sup>-3</sup> BER
Receiver Classification	Class 2
Operating Range	Up to 1 km in line-of-sight(18dBm)*
Network Protocol	Zigbee & IEEE 802.15.4 compliant
Operating Mode	Mesh
Error Detection	CRC and ARQ
Radio Type Approval	<b>CE:</b> <u>EN300-328</u> <b>FCC:</b> <u>Part 15.247</u> <b>SRRC &amp; Middle-East :</b> (pending)
Intrinsic Safety Design	UL C1D1 / ATEX T4
<i><b>Miscellaneous</b></i>	
I/O Interface	Serial TTL with universal socket: 2 x 20 pins with 1.27 mm
I/O Option	Two digital I/O; one analog I/O; RS-232(TTL) for optional modules (Bluetooth, GPS, GPRS and WiFi)
Antenna Port Interface	Chip antenna(0dBm,18dBm)/MMCX female(18dBm)
Power Supply	3.3 ±.3V
Power Consumption	Normal working mode: Tx: 44 mA   230mA(18dBm)@ 3.3 V Rx: 35 mA   35mA(18dBm)@ 3.3 V Sleep mode: 9 uA   9 uA(18dBm) @ 3.3 V
Operating Temperature	-40° C to 75° C
Humidity	20% to 90% non-condensing
Dimensions (L × W × H)	46.5 mm x 26 mm x 10 mm
Weight	10 grams (0.35 ounce)

\*Depending on the interference environment.



### 3. Module Interface

The module interface includes the power input (3.3 V), power output (3.3 V), configuration button signal, serial ports (CMOS 3.3 V), A/D, I<sup>2</sup>C, test signal, JTAG and digital I/O, etc. These are integrated on a dual row, 20 pins per row, 1.27 mm pitch connector (J1). Refer to Table 3.1 for a detailed pin definition.

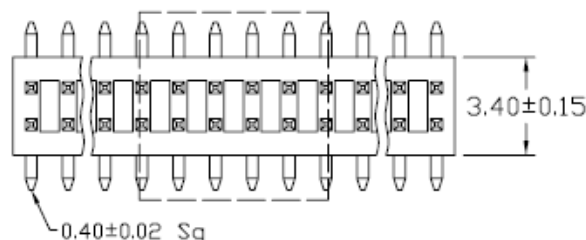
REnex can provide an evaluation kit for the ZcoRE3-2400/ZcoRE3 (20)-2400 module, which includes 4 modules and 4 evaluation mother board (refer to the ZcoRE3-2400 evaluation kit user manual for more details). The module interface and other important IO are provided on the module evaluation board.

The users can also design their own application board with the required module interface. Two of the most important interfaces are the *pin header interface* and the *RF interface* described below.

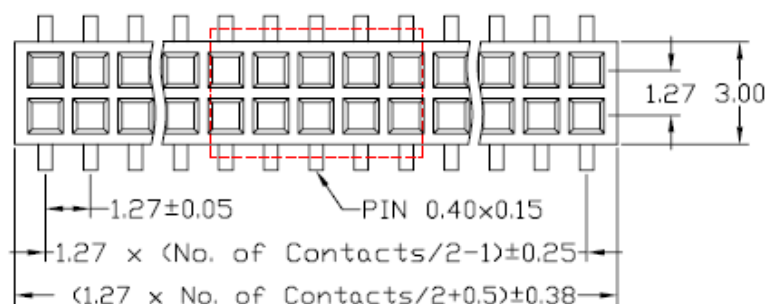
#### 3.1 1.27 mm Pin Header Interface

The pin header interface of the ZcoRE3-2400/ZcoRE3(20)-2400 is designed using a dual row 1.27 mm socket with a total of 40 pins. The *JVE 21N21040-40M00B-01G-2.2/5.8* will be mounted on when the module is shipped. Refer to the JVE datasheet for detailed socket information.

Users that want to use a different socket can also request that the pin header is not mounted. These users must make sure to match the PCB design of the interface. The following is a general drawing of the *JVE* socket (dimensions in mm).



To match the ZcoRE3-2400/ZcoRE3(20)-2400 interface using the JVE pin header, JVE 22p8702-40M00B-01G-4.5 is an appropriate housing. The following is a general drawing of the JVE housing (dimensions in mm).



The pin definition of the header interface is shown on Table 3.1; the input and output description is based on module side. The main serial port is port 1 which includes TxD1 (pin 5) and RxD1 (pin 7). It will be set as the default port in the factory. There are three UART ports which can be used on the module.

Pin 3 (RST) is the reset input; the module will reset if a low level signal is input.

The ZcoRE3-2400/ZcoRE3(20)-2400 module provides RFD two power modes, wakeup and sleep mode. In wakeup mode, the module can execute normal operations, transmit and receive data via the RF channel. A low level input on Pin 19 will put the RFD module enter sleep mode.

Pin 17, 28 and 30 can be used for temperature or battery voltage detecting input.

Pins 27, 32, 34, 36, 38 are reserved for In-System Programming (ISP), and also for firmware debugging. All these pins are dedicated to JTAG and cannot be used for any other IO functions.

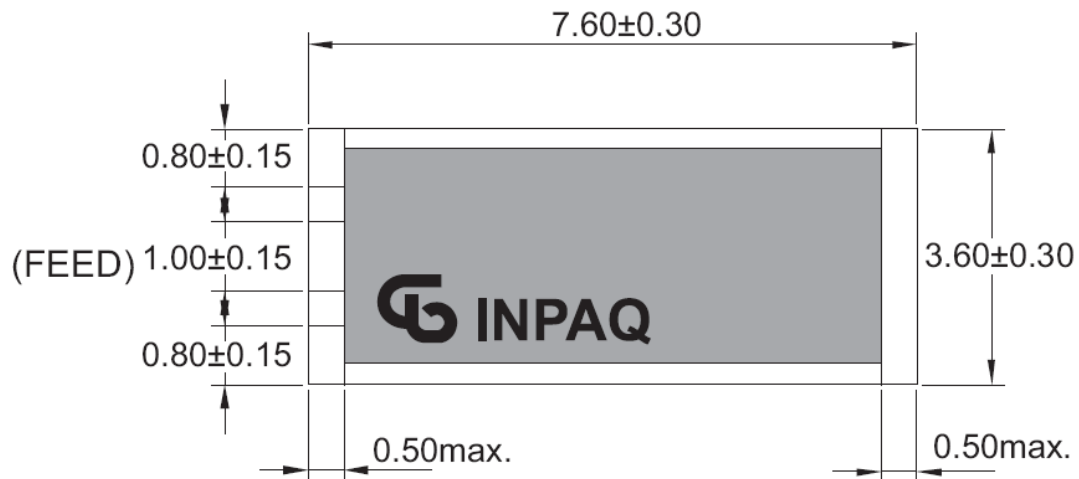
Table 3.1: Pin Definition of J1

Pin	Function	IN/OUT	Description	Remark
1	GND	COMM	Ground	
2	GND	COMM	Ground	
3	RST	IN	Reset signal input	External reset, active low
4	GND	COMM	Ground	
5	TxD1	OUT	UART1, transmit data	Default serial port
6	TxD0	OUT	UART0, transmit data	
7	RxD1	IN	UART1, receive data	Default serial port
8	RxD0	IN	UART0, receive data	
9	GPIO0	IN&OUT	General IO	
10	LED_2	OUT	LED control signal	Connect to LED for debugging
11	GPIO1	IN&OUT	General IO	
12	LED_3	OUT	LED control signal	Connect to LED for debugging
13	GPIO2	IN&OUT	General IO	
14	LED_4	OUT	LED control signal	Connect to LED for debugging
15	GPIO3	IN&OUT	General IO	
16	LED_5	OUT	LED control signal	Connect to LED for debugging
17	TEMP_EN_GPIO4	IN&OUT	Temperature /GPIO	Temperature Enable (active high)
18	PS_CS	IN	Reserved,	PACKET_TRACE_CS
19	GPIO5	IN	Reserved,	
20	PS_FRAME	IN	Reserved,	PACKET_TRACE_FRAME
21	BUZZER_GPIO6	IN&OUT	Buzzer or General IO	
22	3.3V_Vout	OUT	3.3V output	External power output, 20mA max
23	PS_DIR_GPIO7	IN&OUT	General IO	PACKET_TRACE_DIR
24	GND	COMM	Ground	
25	BUTTON_0_GPIO8	IN&OUT	Button 0 input/GPIO	
26	AREF	OUT	Reserved,	Reference level output
27	BUTTON_1_GPIO9	IN	Button 1 input/GPIO	
28	ATEMP_ADC1	IN&OUT	General IO/ADC1	Battery pack voltage input
29	DBG_SYNC_GPIO10	OUT	RF debug/GPIO10	
30	ADC2	OUT	ADC2	Temperature calibration
31	RF_SO	OUT	Reserved,	RF testing points
32	JTCK	IN	Reserved,	JTAG, common clock
33	RF_SI	IN	Reserved,	RF testing points
34	JTMS	IN	Reserved,	JTAG, mode selection
35	RF_SCLK	IN	Reserved,	RF testing points
36	JTDO	OUT	Reserved,	JTAG, serial data out of service
37	RF_SFD	IN	Reserved,	RF testing points
38	JTDI	IN	Reserved,	JTAG, serial data into service
39	3.3Vin	IN	3.3V, power input	
40	3.3Vin	IN	3.3V, power input	

### 3.2 RF Interface

Different RF interfaces are provided on the ZcoRE3-2400 module.

For the ZcoRE3-2400 module, only a chip antenna can be soldered on when the modem ship out. Refer to diagram below for detail information of chip antenna.



For the ZcoRE3(20)-2400 module, only the external antenna is available. P1 (refer to mechanical drawing) is designed on PCB board for the reversed SMA antenna connection via a special RF cable. The socket is user a right-angle straight MMCX (Miniature Microax RF Coaxial) connector which can be soldered on the top of PCB when the module is delivered. The maximum height of the MMCX socket is less than 4 mm. If customer would like to use a different socket, they may also elect not to have the MMCX socket soldered on. In that case, they should be sure to match the PCB design of the socket.

To connect with the SMA antenna, a MMCX-to-SMA converter RF cable is provided together with the ZcoRE3(20)-2400 module as option.

Refer to table and picture below for detail information of SMA antenna.

**Model: RO-IK-0504**

Electrical Item	Specifications	Remarks
Type of antenna	Dipole antenna	
Frequency range	2.40 ~ 2.48 GHz	
Electrical length	$1 / 2 \lambda$	
Nominal impedance	50 Ohm	

Polarization	Vertical	
V.S.W.R	Less than 2.0	
Peak gain	1.5 dBi	
Mechanical Item	Specifications	Remarks
Element	RG-316 cable	
Sleeve	Urethane	Black
Base	Nylon 66	Black
Connector	SMA male	Ni plate
Antenna total length	168 ± 3 mm	



### 3.3 RMCI interface

The module is pre-loaded with the EmberZnet bootloader (version:1005), which supports both over-the-air bootloading and serial bootloading of firmware update. The module contains RAEMESH application developed base on EmberZnet stack 2.23 and comply with the RAE System's RCS protocol. The module also has built-in RAEMESH Module Command Interface (RMCI). Section 6 is focused on the instruction on RMCI interface.

The RMCI command interface allows customer to easily access to low level mesh functionality without pain to develop the firmware. The module can be configured to a coordinator to hook up to a gateway or just a standalone regular full function node or a sleepy reduce function node. Make sure to configure the module to right mode before using.

### 3.4 Wakeup

If the radio is set to RFD mode, the Wakeup pin Pin19 is used to make the radio asleep and wakeup. A constant high on this pin will make the radio go to the sleep mode and a low level signal on this pin will wake-up the radio.

The Radio sleep mode is the power save mode with very low power consumption. (<60uA)

The Wakeup pin must be held up to 10ms before sending a data packet.

## 4. Power Supply

As OEM module, the power supply should be provided by the main equipment, in which the OEM module is built. Normally, a 3.0 ~ 3.6V DC power is required.

## 5. Module Configuration

### Enter Configuration Status

Via the TXD and RXD pins the command interpreter can be accessed. The RCM can buffer up to 128 bytes of incoming data in a software FIFO buffer and uses XON/XOFF flow control. See the datasheet of the Atmel Atmega 128L for more information about the build-in UART. Connect Pin5 (TXD1) and Pin7 (RXD1) to the customer board. Use the following settings for serial port.

	<b>Coordinator</b>	<b>FFD and RFD</b>
Bits per second	19,200	19,200
Data bits	8	8
Parity check	None	None
Stop bits	1	1
Flow control	None	None

### PC communication

Confirm that the serial port debugging software is installed on the PC. For example: sscm32.exe. Microsoft Hyper Terminal is not recommended for this application because it is not good to send characters and commands in Hex.

### Data packet

RCM will transmit any data in the { }, and all data in the {} will be transparently sent out without radio's interpretation. The maximum data packet is 50 bytes including {}.

The data in the {} can be any characters including '{', '}', '[' and ']'.

The interval between two data packets must be >50 ms for FFD and coordinator.

The interval between two data packets must be >1 s for RFD.

### For old RAEWATCH\_PSP

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When the sensor node sends data to gateway, the gateway will receive the data plus the last four digits of sensor node ID in the {}. When the gateway sends data to sensor node, the sensor node radio will only receive data in the {}.

**For RAEWATCH\_RCS**

The data in the {} will be untouched by either gateway or sensor node. You get what you send.

For RCS details, refer to: **904-E800-120 RAEWATCH WSN Communication Standard.doc**

Base on correct setting and connection, you will see following display on your screen when power is applied.

***Coordinator:***

EVENT: emberInit passed  
INIT: sink app 000D6F000002DF8 chan:0x1A, pwr:FF, panID:0x30FF  
EVENT: stack Status now EMBER\_NETWORK\_UP  
EVENT: setting multicast binding, status is 0x00

***FFD:***

EVENT: emberInit passed  
FFD SENSOR APP: joined to network  
000D6F000002DA5 chan:0x1A, pwr:FF, panID:0x30FF  
EVENT: stack Status now EMBER\_NETWORK\_UP  
EVENT: setting multicast binding, status is 0x00  
This is a free sensor.

***RFD (if there is a coordinator or FFD)***

EVENT: emberInit passed  
RFD Sleep SENSOR APP: joined to network  
000D6F000002DA5 chan:0x1A, pwr:FF, panID:0x30FF  
  
EVENT: stack Status now EMBER\_NETWORK\_UP  
EVENT: setting multicast binding, status is 0x00  
This is a free sensor.

***RFD (if there is no coordinator or FFD)***

EVENT: emberInit passed  
RFD Sleep SENSOR APP: joined to network  
000D6F000002DA5 chan:0x1A, pwr:FF, panID:0x30FF  
  
EVENT: stackStatus now MOVE\_FAILED. Lost the Parent (Coordinator)



## 6. RAEMESH Module Command Interface (RMCI)

### 6.1.1 Serial port setting

Between RDTE and RRCM: 38400 bps, 8N1

Between SDTE and SRCM: 19200 bps, 8N1

### 6.1.2 Package format

Packet format as listed below:

	SOP	Length	Command Code	Command Data	EOP
Byte	1	1	1	0~n	1

- The minimum length for one packet is 4 bytes long. The Length is 0x20 based. E.g. the total length of a packet without command data is 4, the Length byte is  $0x20 + 4 = 0x24$ .
- The SDTE or RDTE always initiate the communication with Radio module (RRCM, SRCM). Radio module responses to the command it received.
- The Command Code for packet sent from SDTE or RDTE to Radio module is even, the response from Radio module to SDTE or RDTE is 1 higher than the command code.
- Command Data can be empty.

Table 5.1: Byte definition of packet

Byte Number	Name	Comment
0	SOP	Radio Protocol beginning of packet. This is always '[' (0x5B)
1	Length	Total length of packet + 0x20, include '[' and ']'.
2	Command Code	0x20 ~ 0xFF.  **Excluding: 0x5A~0x5F and 0x7A~0x7F.  **0xF0~0xFF are reserved for common commands such as help, version etc.  Even for packet sent from SDTE or RDTE to RCM.  Odd for packet response from RCM to SDTE or RDTE.
3	Command Data	Hex
...	...	...
N+3	EOP	Radio protocol end of packet. This is always ']' (0x5D).

#### Notes:

1. Always perform a Network Joining for FFD before using it. A coordinator must be presented when perform the network joining. Command: 5B24505D.
2. Check RCM's information when turn on the radio. Command: 5B24605D.
3. Wait at least 5s for RCM to finish the initialization.

4. Check the Network Status of the RFD before sending the data at the first time. Command: 5B24205D.
5. It is recommend 1s interval between two data packets for RFD. Check [] for sending acknowledge in Unicast mode. There is no ACK for multicast mode.
6. For RFD, if there is no network, the RCM will automatically wake up every 1 minute to search for a new network. It can be interrupted at any time. RCM will keep in asleep if it has joined a network.
7. For debug purpose, check network status and Parent ID of RFD.

### 6.1.3 Quick review of RMCI

**5b24205d** = NETWORK\_STATUS

**5b24225d** = GET\_BINDING\_LIST

**5b24245d** = SYSCH\_ADVERTISE

**5b2526XX5d** = COM\_UNICAST\_RID. XX is the radio index

**5b24285d** = DEL\_RMT\_BINDING

**5b242c5d** = COM\_MULTI\_RID

**5b24305d** = GATEWAY\_ENABLE. Enable Coordinator function.

**5b24325d** = FFD\_ENABLE. Enable Full Functional Device function as a Router.

**5b2534XX5d** = CHAN\_RRCM\_CHANNEL. XX is channel number (0x0B-0x1A).

**5b2536XX5d** = DEL\_LOCAL\_BINDING. XX is the binding index started from 1.

**5b24385d** = RPT\_SENSOR\_POSITION.

**5b243E5d** = LEAVE THE NETWORK.

**5b24465d** = RFD\_ENABLE. Enable RFD function.

**\*\*PE7 High makes radio sleep. PE7 Low activates the radio.**

**5b24485d** = SOFT\_RST. Perform soft reset.

**5b244A5d** = RACTORY\_RST. Restore the radio to factory setting.

**5b244C5d** = VERSION\_CHK. Check the firmware version of the Radio.

**5b244E5d** = PRINT\_TOKEN. Print stack and application tokens.

**5b24505d** = JOIN\_FORM\_NETWORK. Form (Gateway) or Join (Sensor) a new network.

**5b24525d** = MULTICAST\_HELLO. Say HELLO to the world.

**5b24545d** = PRINT\_CHILD\_TABLE. Print Child table.

**5b24565d** = BOOT\_LOADER. Launch the standalone boot loader.

**5b24605d** = GET\_NODE\_INFO. Get Radio's information like EUI, channel and PANID.

**5b24625d** = BUTTON\_0\_PRESS. Press Button 0.

**5b24645d** = BUTTON\_1\_PRESS. Press Button 1.

**5b2566xx5d** = SET\_PROTOCOL. Set communication protocol.

**\*\*RAEWATCH: 0, RCS: 1, Transparent: 2.**

**5b24685d** = GET\_PARENT\_ID. Get the parent ID for RFD.

**5b24705d** = JIT\_MSG\_STATUS. Just In Time Message Status.

**5b24F05d** = HELP

**5b24F25d** = PRINT ASCII BINDING TABLE.

**5b2CF4xxxx000006F0D005d** = Pass the image to remote node through the Gateway.

**5b2CF6xxxx000006F0D005d** = Clone the Gateway image to a remote node.

Table 5.2.1: Detailed information of RMCI package

Command Name	CMD Code	CMD Data (bytes)	Response CMD Code	Response CMD Data (Bytes)	Description
NETWORK_STATUS Use on: Coordinator FFD RFD	0x20	None	0x21	STATUS(1)	Return the radio's network status 0x00: NO NETWORK 0x01: JOINING NETWORK 0x02: JOINED NETWORK 0x03: JOINED_NETWORK_NO_PARENT 0x04: LEAVING NETWORK
GET_BINDING_LIST Use on: Coordinator FFD RFD	0x22	None	0X23	Radio ID(8) Radio Index(1)	<b>For FFD and RFD:</b> Radio return with bound target ID with index=0x00. <b>For Coordinator:</b> Return bound node ID with index separately for each bound radio nodes. Start from 0 and up to 30. *: Use this command after SYNCH_ADVERTISE.
SYNCH_ADVERTISE Use on: Coordinator	0x24	None	0X25	None	Requests RCM to synchronize all radio nodes in the network to bind with the coordinator. Nodes are in the Unicast mode after executing this command. The maximum binding table size is 30 due to RAM limitation.
COM_UNICAST_RID Use on: Coordinator	0x26	Radio index(1)	0X27	None.	Requests RCM to send following data to specified radio nodes in Unicast mode per radio index. Using datagram.
DEL_RMT_BINDING Use on: Coordinator	0x28	None	0X29	None	Requests RCM to send a delete binding command to all nodes in network. All nodes in the network became to free nodes and will communicate in Multicast mode. RFD will not respond this command.
COM_MULTI_RID Use on: Coordinator	0x2C	None	0X2D	none	Requests to go back to multicast mode after using COM_UNICAST_RID. All data after this command will be broadcasted.
COOR_ENABLE Use on: FFD/RFD	0x30	None	0x31	None	Set the radio as a Coordinator so that the radio can be use on a Gateway device. Baud rate change to 38400 8N1

Table 5.2.2: Detailed information of RMCI package

Command Name	CMD Code	CMD Data (bytes)	Response CMD Code	Response CMD Data (Bytes)	Description
FFD_ENABLE Use on: Coordinator/RFD	0x32	None	0x33	None	Set radio to FFD. Always on and has router function.
CHG_RRCM_CHAN Use on: Coordinator	0x34	Channel Number(1)	0x35	None	Requests RCM in the Gateway to change its radio channel to specified channel. 0x0B to 0x1A total 15 channels. Corresponding to 11 to 26 of IEEE 802.15.4.
DEL_LOCAL_BINDING Use on: Coordinator/FFD/RFD	0x36	Binding index(1)	0x37	None	Deletes binding indexes stored in the radio. Binding index is from 1 to 30. Always 1 for FFD and RFD
RPT_LOCATION Use on: RFD	0x38	None	0x39	None	Report RFD parent's ID.
LEAVE_NETWORK Use on: Coordinator/FFD/RFD	0x3E	None	0x3F	None	Leave the current network
RFD_ENABLE Use on: Coordinator/FFD	0x46	None	0x47	None	Put a node into RFD. PE7 interrupt enable. Active low.
SOFT_RST	0x48	None	0x49	None	Reset the radio
FACTORY_RST Use on: Coordinator/FFD/RFD	0x4A	None	0x4B	None	Restore the RCM to factory defaults. Channel: 0x1A, Power: 0xFF, PanID: 0x30FF Sensor Node FFD. Baud rate: 19200 8N1
VERSION_CHK Use on: Coordinator/FFD/RFD	0x4C	None	0x4D	DS[0] = 'V' DS[1~n+1] Firmware Version [0~n]	Request Firmware Version. Return In ASCII. e.g.: " EZ2.23.0.0 " Send:5B244C5D Return:5B 2E 4D 45 5A 32 2E 32 33 2E 30 2E 30 5D

Table 5.2.3: Detailed information of RMCI package

Command Name	CMD Code	CMD Data (bytes)	Response CMD Code	Response CMD Data (Bytes)	Description
PRINT_TOKEN Use on: Coordinator/FFD/RFD	0x4E	None	0x4F		Print radio's Token information in ASCII. For PC debug
JION_FORM_NETWORK Use on: Coordinator/FFD/RFD	0x50	None	0x51	None	Coordinator: Form a network to allow the other nodes to join. FFD/RFD: Search the network and try to join the network.
MULTICAST_HELLO Use on: Coordinator/FFDRFD	0x52	None	0x53	None	Broadcast a "hello" to entire network
PRINT_CHILD_TABLE Use on: Coordinator/FFD	0x54	None	0x55	None	Print the child table in ASCII
BOOT_LOAD Use on: Coordinator	0x56	None	0x57	none	Start the bootloader to download the radio application
GET_NODE_INFO Use on: Coordinator/FFD/RFD	0x60	None	0x61	Radio ID(8) Channel(1) Power(1) PAN ID(2)	Get the node information: EUI, Channel, Power, PAN ID, Send: 5B24605D Return: 5B 30 61 00 0D 6F 00 00 00 2D A5 1A FF 30 FF 5D
BUTTON_0_PRESS Use on: Coordinator/FFD/RFD	0x62	None	0x63	None	Simulate Button Zero pressed
BUTTON_1_PRESS Use on: Coordinator/FFD/RFD	0x64	None	0x65	None	Simulate Button One Pressed
SET_PROTOCOL Use on: Coordinator/FFD/RFD	0x66	Protocol(1)	0x67	None	Set radio's protocol 0x00: RAEWATCH_PSP.(old version) 0x01: RAEWATCH_RCS. 0x02: Transparent Mode.

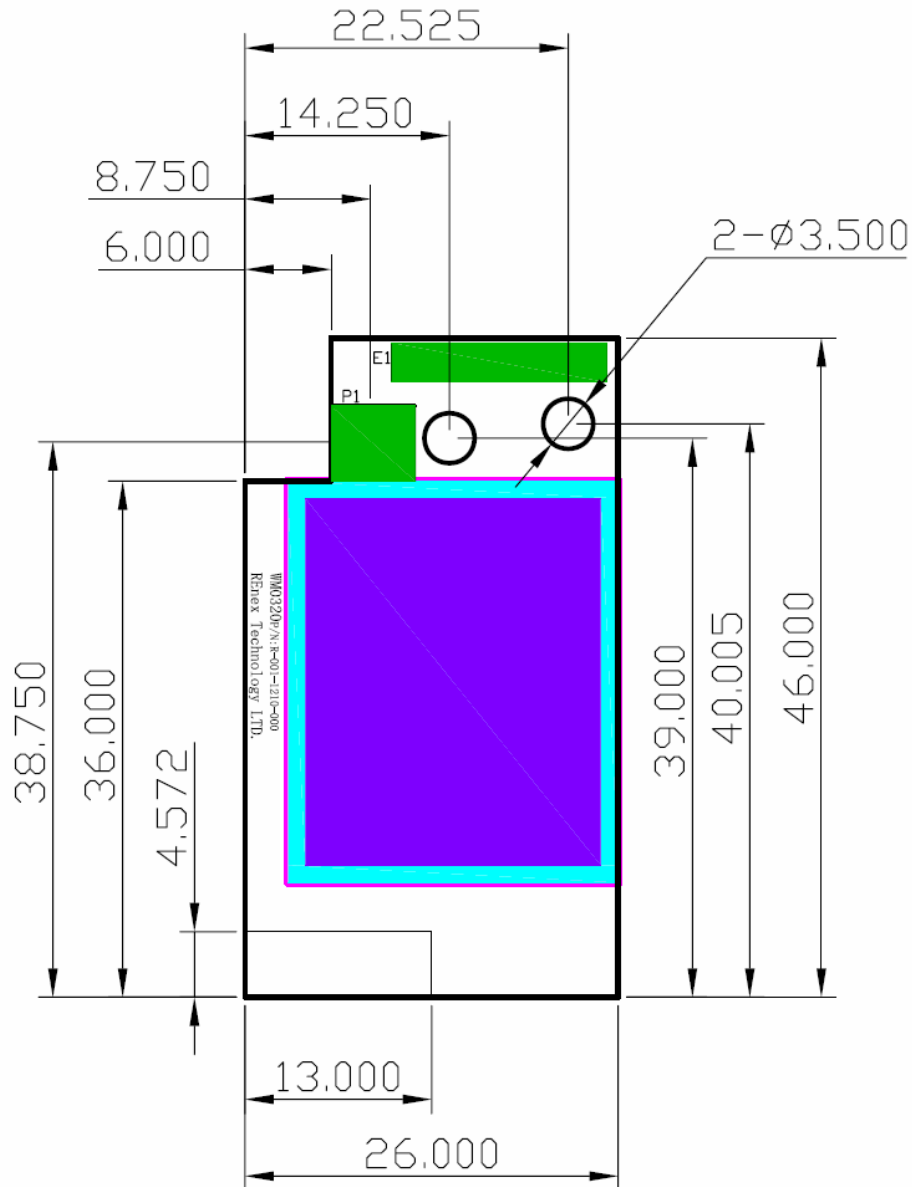
Table 5.2.4: Detailed information of RMCI package

Command Name	CMD Code	CMD Data (bytes)	Response CMD Code	Response CMD Data (Bytes)	Description
GET_PARENT_ID  Use on: RFD	0x68	None	0x69	Parent radio ID(8)	Get the parent ID for RFD Return: 5B 2C 69 00 0D 6F 00 00 00 2E CB 5D if no parent, return 5B 2C 69 00 00 00 00 00 00 00 5D
HELP Use on: Coordinator/FFD/RFD	0xF0	None	0xA1	None	List all RMCI commands in ASCII
PRINT_BINDING_TABLE Use on: Coordinator/FFD/RFD	0xF2	None	0xA3	None	List all bindings in a table in ASCII
BOOTLOAD_PASSTHROUGH Use on: Coordinator	0xF4	Remote Radio ID(8)	0xF5	None	Bootload remote node in pass through mode.
BOOTLOAD_CLONE Use on: Coordinator	0xF6	Remote Radio ID(8)	0xF7	None	Bootload remote node and update the firmware in clone mode. Fast way.

## 7. Mechanical Drawing

### 7.1 Top View

Units: mm

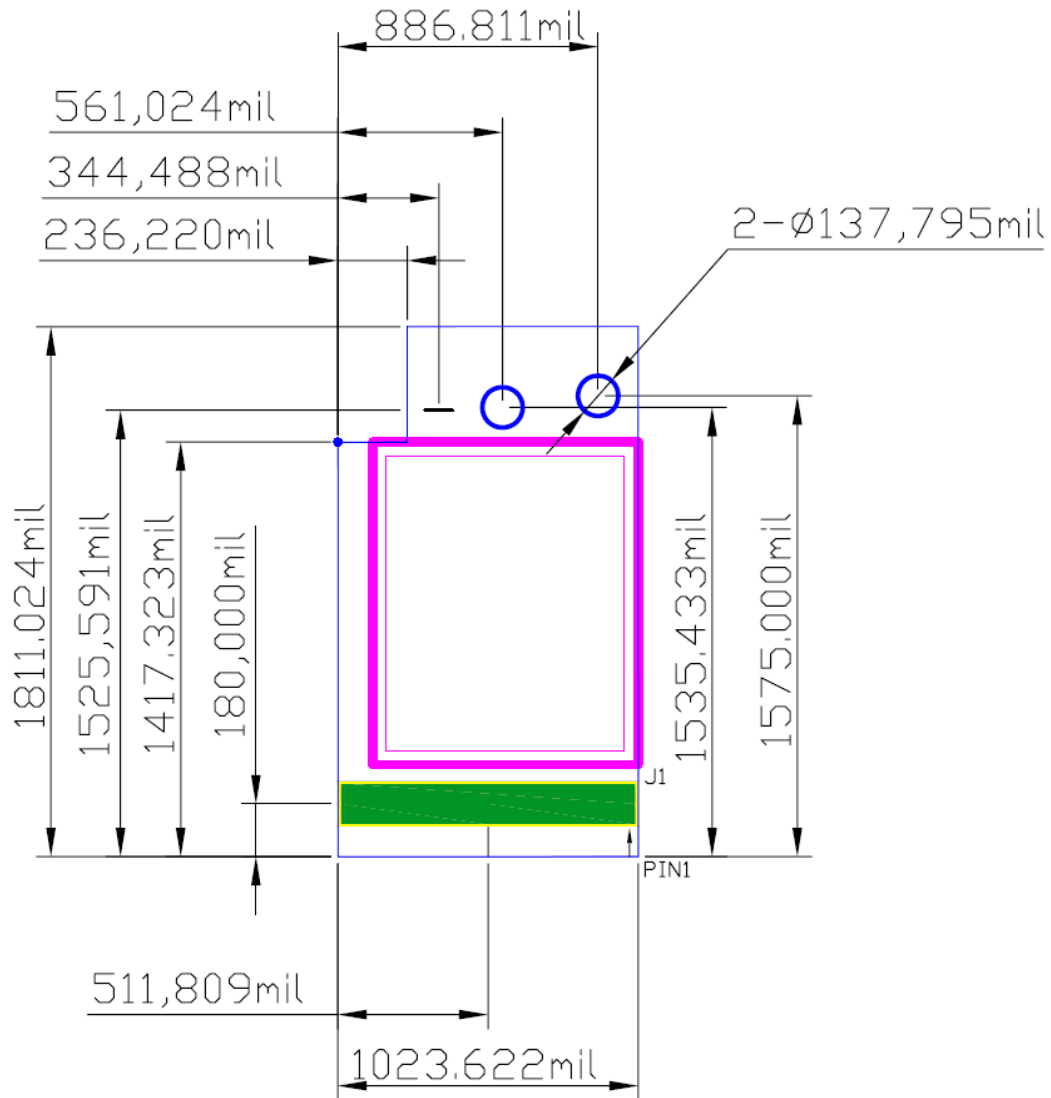


Note:

- 1: E1 is for the chip antenna and available only in ZcoRE3-2400. The length of the chip antenna is less than 7.3mm
- 2: P1 is the MMCX connector for SMA antenna (connect via an MMCX-SMA RF cable) and available only in ZcoRE3(20)-2400.
- 3: The height of the shield box on the top layer is less than 4.3mm from PCB board.

## 7.2 Bottom (top perspective)

Units: mil



## Note:

1. J1 is the application and power supply interface (1.27mm pin header) which can be used for board-to-board connection. Pay attention to the direction of socket.
2. There are two holes on board reserved for modem fixing.



## 8. Order Information

REnex provide series of ZcoRE3 OEM module that vary in RF output power and frequency as well as standalone modems to cover a variety of application in different countries and regions.

<b>Products</b>	<b>RF Power</b>	<b>Dimension</b>	<b>RF Regulation</b>	<b>Intrinsic Safety</b>	<b>Type</b>
<b>ZcoRE3-2400</b>	0 dBm	46.5 x 26 x 10 mm	Worldwide	C1D1/ATEX(T4)	OEM
<b>ZcoRE3(20)-2400</b>	18 dBm	46.5 x 26 x 10 mm	worldwide	C1D1/ATEX(T4)	OEM
<b>ZcoRE3-868*</b>	0 dBm	46.5 x 26 x 10 mm	Europe	ATEX(T4)	OEM
<b>ZcoRE3(20)-868*</b>	18 dBm	46.5 x 26 x 10 mm	Europe	ATEX(T4)	OEM
<b>ZcoRE3-915*</b>	0 dBm	46.5 x 26 x 10 mm	USA	C1D1	OEM
<b>ZcoRE3(20)-915*</b>	18 dBm	46.5 x 26 x 10 mm	USA	C1D1	OEM
<b>REmesh-2400*</b>	18 dBm	TBD	Worldwide	-	Standalone
<b>REmesh-868*</b>	18 dBm	TBD	Europe	-	Standalone
<b>REmesh-915*</b>	18 dBm	TBD	USA	-	Standalone

\*Available in 2007

Product Ordering Information for the **ZcoRE3-2400** series:

<b>Products</b>	<b>Part Number of REnex</b>
<b>ZcoRE3 -2400</b>	R-001-0003-410
<b>ZcoRE3(20) -2400</b>	R-001-0003-400

## Reference:

Ember: [www.ember.com](http://www.ember.com)

Atmel: [www.atmel.com](http://www.atmel.com)

FCC: [www.fcc.gov](http://www.fcc.gov)

Zigbee Alliance: [www.zigbee.org](http://www.zigbee.org)

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