ZT-2530M

User Manual

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1 Introduction

1.1 IEEE 802.15.4

ZigBee is a wireless communication technology based on IEEE 802.15.4 which specifies the physical layer and media access control for low-rate wireless personal area networks. This standard is intended for deployment on long-lived systems with low data rate requirements. ZigBee operates in the industrial, scientific and medical (ISM) radio bands 2405MHz ~2480MHz and breaks the band into 16 channels with a channel separation of 5MHz.

1.2 ZigBee Pro

ZigBee PRO, also known as Zigbee 2007, offers full wireless mesh, low-power networking capable of supporting more than 64,000 devices on a single network. It provides standardized networking designed to connect the widest range of devices, in any industry, into a single control network.

ZigBee PRO defines the network layer (NWK) which enables data transfer between devices that are not in the communication range of each other through the use of intermediate devices, hence making multi-hop communication possible. Responsibilities of the NWK layer include starting a network, coordinating joining and leaving a network, routing, discovering one-hop neighbors, and storing neighbor information.

Three types of devices are possible in a ZigBee network: Coordinator, router and end devices. Routers are capable of forwarding data on behalf of others and a coordinator is a router that starts the network and chooses key network parameters. Any device can connect to a router in the network, whereas, devices cannot connect to an end device.

1.3 ZT-2530M

ZT-2530M is a ZigBee Bridge used to connect two different ZigBee networks. The absorption of wireless signals by buildings and other obstacles in the urban environments significantly impair wireless transmission. Therefore, ICP DAS provides the new ZT-2530M - the ZigBee bridge, which is equipped with dual antennas and combined a ZigBee coordinator with a ZigBee router. It can be full hardware configuration, and be used to bridge the communication between indoor and outdoor units or divide complex network to enhance efficiency.

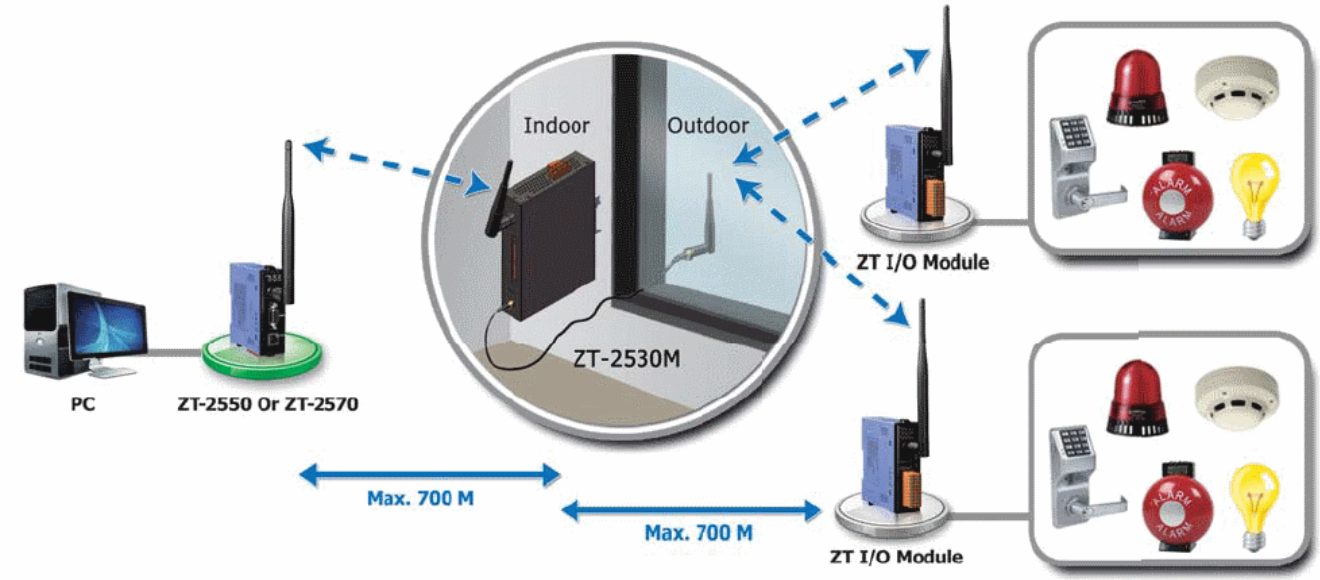
The ICP DAS ZigBee products are designed primarily to help users to build a wireless communication system in an environment where it is hard to physically wire up the devices. They are widely used in industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation, home automation and so on.

1.4 Applications

Indoor / Outdoor Communication

The wireless transmission distance may very based on terrain and antenna type used. The building materials or obstacles present have an effect on the wireless signal attenuation (loss or reduction). In most cases, control devices and monitor are installed in confined environments such as central control rooms or equipment cabinets; and some other devices are installed outside the central control room or house. The wireless communication systems need a resolution for passing signals through building materials.

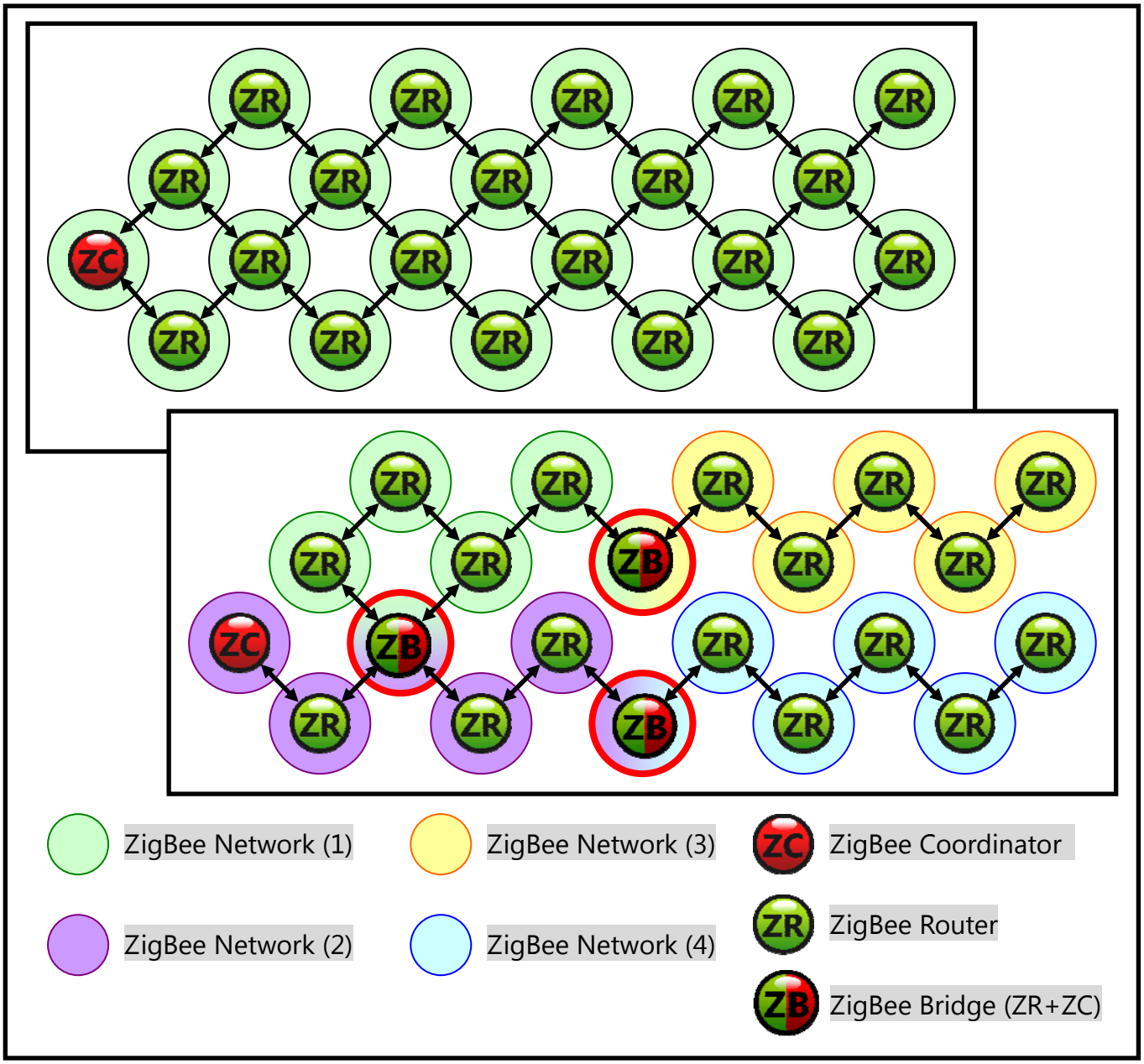
ZT-2530M resolves the issue of indoor-outdoor communication. It comes with dual antennas and combines the functions of a ZigBee coordinator with a ZigBee router in itself. The ZT-2530 can receive data form an existed Zigbee network like a ZigBee router and pass the data to another ZigBee network where ZT-2530M is the ZigBee coordinator. It not only extends the communication distance, but also bridges two networks inside and outside.



Grouping Sub-networks

ZigBee transfers data by using mesh topology. The main benefit of the mesh topology is that any node can communicate with any other node. It increases network reliability as it still functions even if one node is disabled, but too many devices on a ZigBee network may cause performance and management problems.

When network congestion occurs, users can easy to divide a big network to several sub-networks with the ZT-2530M. Propagating data within a limited sub-network can improve the communication performance.



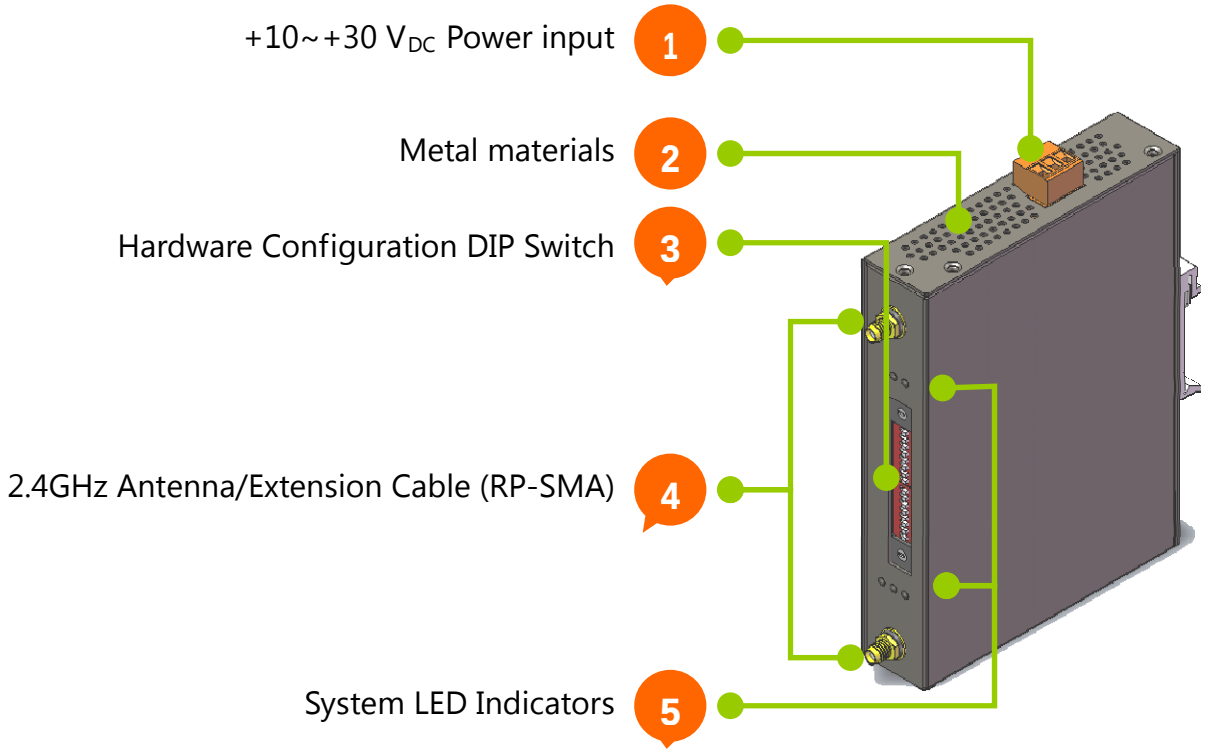
2 Hardware

2.1 Specifications

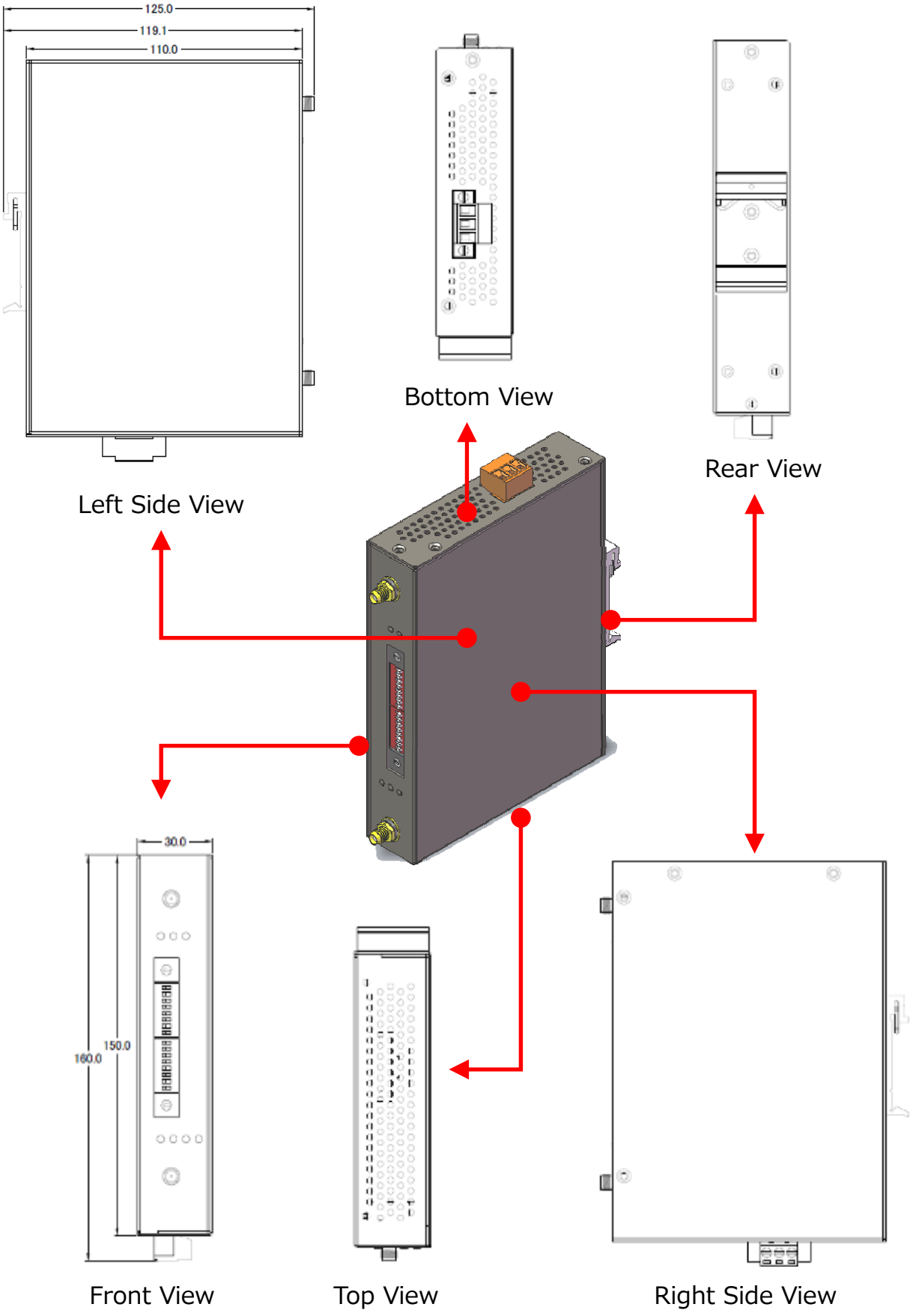
Models	ZT-2530M	
Wireless		
ZigBee Type	ZigBee Router	ZigBee Coordinator
RF Channel	16	
RF Transmit Power	11 dBm	
Antenna	2.4GHz – 5dBi Omni-Directional antenna * 2	
Transmit Range (LOS)	700 m (Typical)	
Max. Slaves Supported	255	
EMI Certification	CE/FCC, FCC ID	

Hardware	
LED Indicators	ZigBee Power
	ZigBee Net
	ZigBee TxD
	ZigBee RxD
Power	
Protection	Power Reverse Polarity Protection
EMS Protection	ESD, Surge, EFT
Input Range	$+10V_{DC}$ ~ $+30V_{DC}$
Consumption	1 W (Max.)
Mechanical	
Casing	Metal
Dimensions	33 mm x 78 mm x 107 mm (W x L x H)
Installation	DIN-Rail
Environment	
Operating Temperature	-25 °C ~ +75 °C
Storage Temperature	-30 °C ~ +80 °C
Relative Humidity	10 ~ 90% RH (Non-condensing)

2.2 Overview



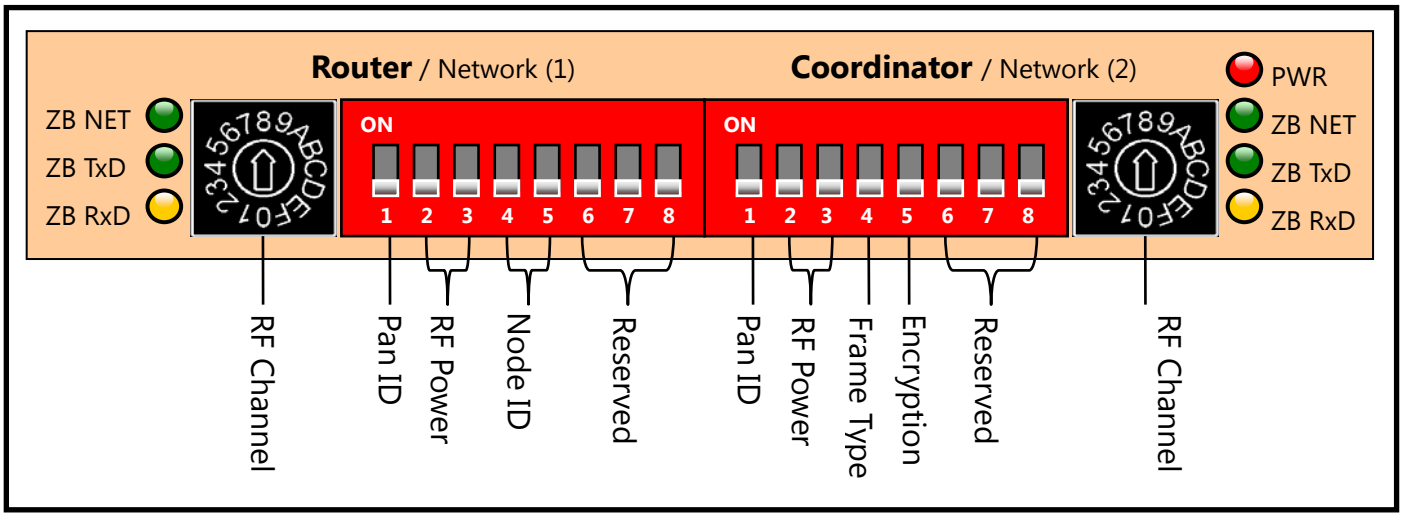
2.3 Dimension (Unit: mm)



3 Configurations

ZT-2530M can be full hardware configuration with the rotary switch and DIP switch on the front.

This section introduces the parameters used in the ZT-2530M to deploy the ZigBee networks.



After configuration, user can confirm the connection and communication quality via the state of LED indicators. Please refer the table as below.

LED Indicator	Status	Description
PWR (Red LED)	Power Indicator	
	Steady-on	The ZT-2530M is powered up.
	Off	The ZT-2530M is off.
ZB Net (Green LED)	On the Coordinator Side	
	Steady-on	The ZigBee network is Established.
	Flashing to Steady-on	Rejoining a ZigBee Network or The network is occupied.
	On the Router Side	
	Steady-on	The signal is strong.
	Flash (500ms)	The signal is available.
	Flash (1s)	The signal is weak.
	Flash (2s)	The signal is unstable or there is no available network.
ZB TxD (Green LED)	The Data Transferring Status	
	Flash	Transferring data.
	Off	Waiting for transferring data.
ZB RxD (Yellow LED)	The Data Receiving Status	
	Flash	Receiving data.
	Off	Waiting for receiving data.

1. RF Channel (Router and Coordinator)

- ZigBee offers 16 channels in the 2.4GHz band to exchange data wirelessly. All the devices in the same Zigbee network need be set to use the same RF channel to transfer data.

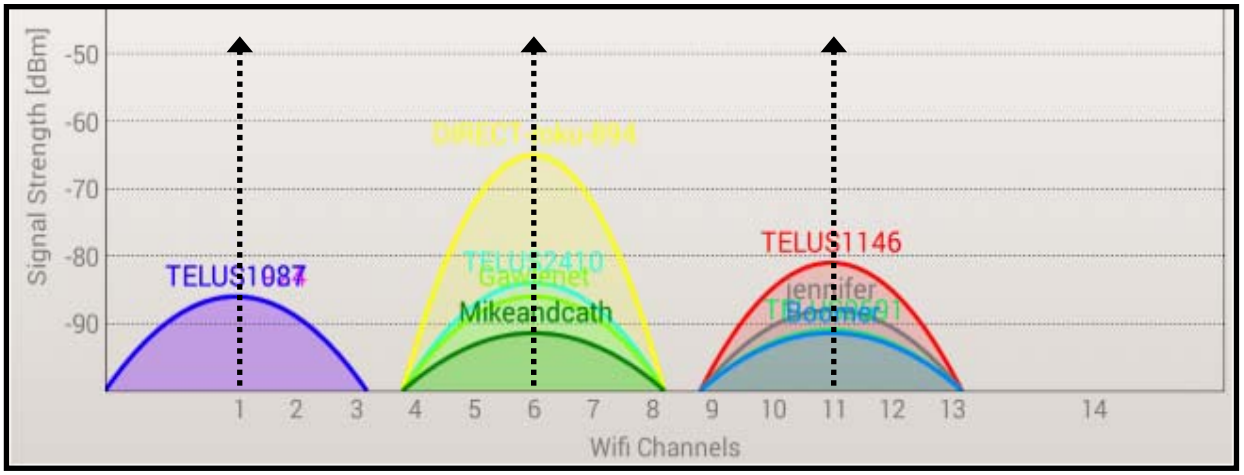
- Router / Network (1) and Coordinator / Network (2) are two divided networks which have to use different RF channel.

Rotary Switch Position	0	1	2	……	E	F
Frequency (MHz)	2405	2410	2415	……	2475	2480

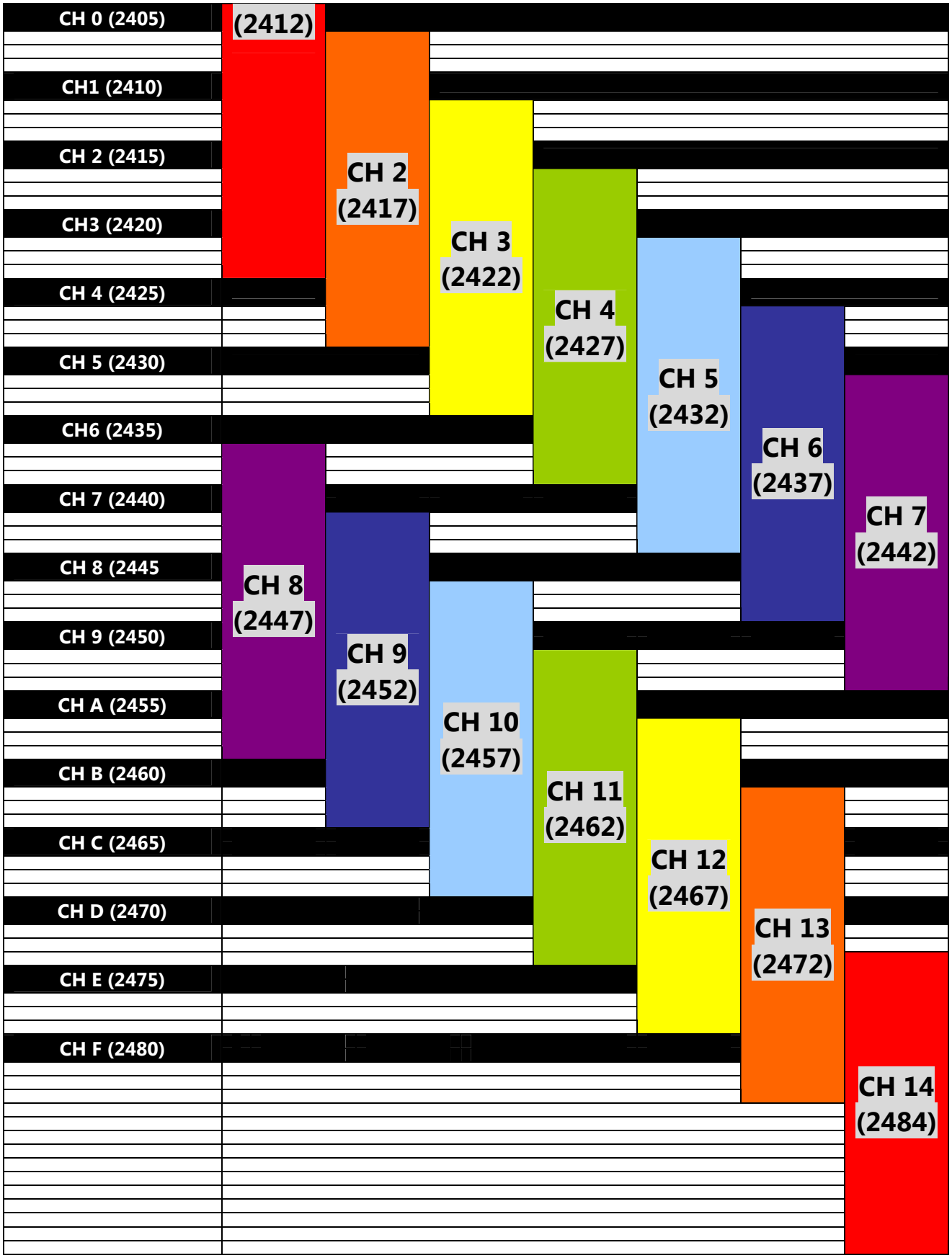
- To avoid interference with Wi-Fi devices, users can download free APP to scan the 2.4 GHz band for other devices in, and then set the ZigBee network to use a non-overlapping sub band. Please refer the chart of Wi-Fi and ZigBee channels as below.

- Examples

  The overlapping channels between 802.11(Wi-Fi) and 802.15.4(ZigBee) are shown in the following figure. The recommended channels are 0x04, 0x09, 0x0E and 0x0F shown in green color which does not overlap with the Wi-Fi channel.



RFU-2400/ZigBee	**WiFi**
CH 1	

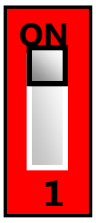


• RF channel spectrum of RFU-2400, IEEE 801.15.4 / ZigBee against WLAN, IEEE 802.11b/IEEE 802.11g

2. Pan ID (Router and Coordinator)

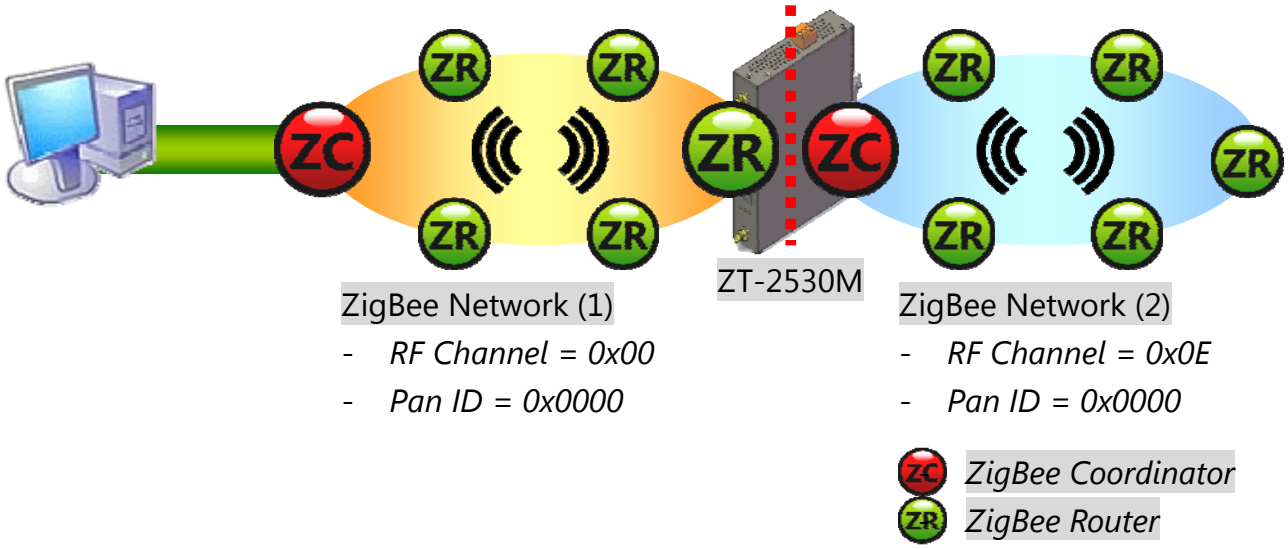
- Pan ID is the group identity of a ZigBee network; all the devices in the same network should have the same Pan ID.

- RF Channel is usually the first used to make a ZigBee network separate from another one; Pan ID is the second selection.

Pan ID		
	0x0000	0x0001

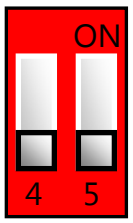
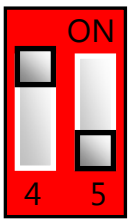
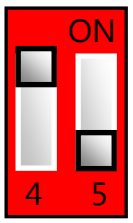
- The ZT-2530M is used to bridge two different ZigBee networks. Therefore, the Pan ID for Router / Network (1) needs be consistent with the Pan ID in network 1; and Pan ID for Coordinator / Network (2) needs be the Pan ID in network 2.

- The Pan ID in Network (1) can be the same as the Pan ID in Network (2).



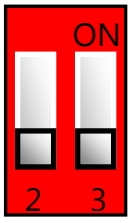
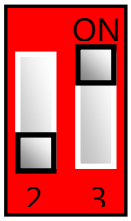
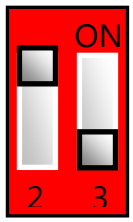
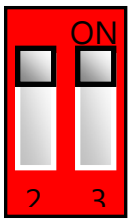
3. Node ID (Router)

- Node ID is used as a device identifier; the coordinator has a predefined node id [0000], and each device has a unique Node ID in the same zigbee network.
- The available Node ID for the ZT-2530M is 0x00F0~0x00F3.

Node ID				
	0x00F0	0x00F1	0x00F2	0x00F3

4. RF Power (Router and Coordinator)

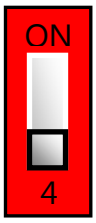
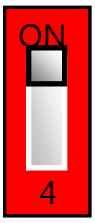
- Set the same RF Power for every device in a ZigBee network can improve the quality of communication.

RF Power				
	CE Compliant	FCC Compliant		Maximum Power
Internal Code	0x03	0x07	0x0B	0x0F

※ The RF power adjustment is at the user's sole risk. ICP DAS does not guarantee to pass CE and FCC certifications after the adjustment, nor assume any liability or responsibility for the adjustment.

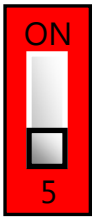
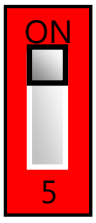
5. Frame Type (Coordinator)

- Frame Type is used to set the communication method in a ZigBee network. The coordinator of ZT-2530M supports two frame types: broadcast and unicast.
- Broadcast is the factory default setting and is used in most cases.
- Unicast is an advanced communication method used to improve data transfer performance under congestion on the network (2) where there are too many devices.
- Unicast is limit on DCON and Modbus protocols and only can be used to communicate with ZT-2000 series I/O modules or one I/O module after a ZT-2551/ZT-2571. Unicast does not support to communicate with two or more I/O modules after a ZT-2551/ZT-2571.

Frame Type		
	Broadcast (Default)	Unicast

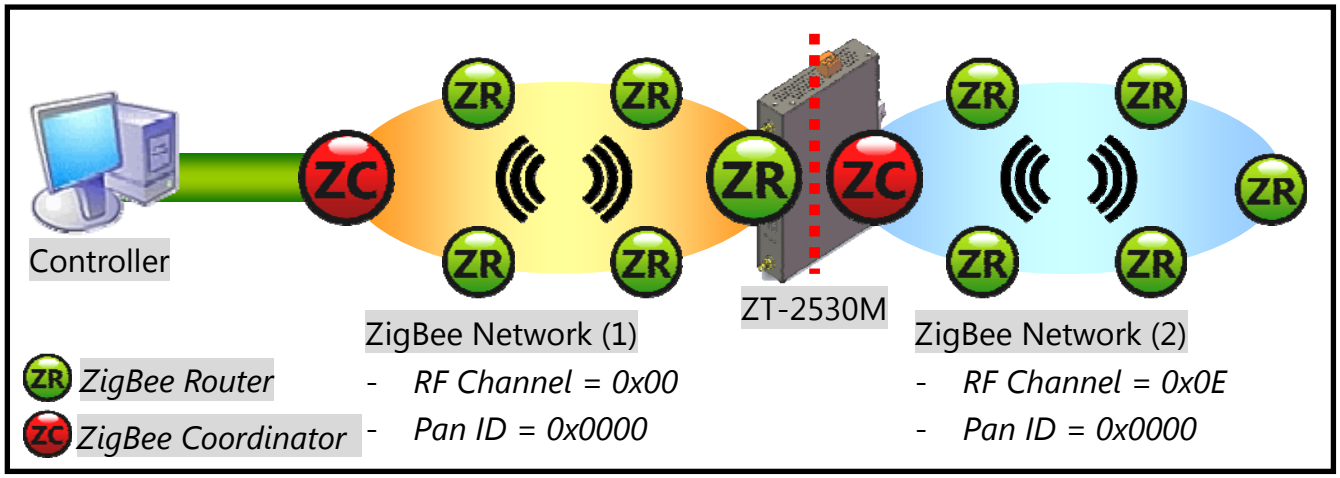
6. Encryption (Coordinator)

- The ZT-2530M supports the 128-bit AES (Advanced Encryption Standard) encryption to encrypt data on a ZigBee network.

Encryption		
	Disabled (Default)	Enabled

4 Configuration Examples

- Set the RF channel and Pan ID for the Router consistent with the Network(1).
- Set the RF channel and Pan ID for the Coordinator consistent with the Network(2).



- ZT-2550/ZT-2570

ZigBee Router / Network (1)				
Switch Type	Item	Status	Range	Comments
Rotary Switch	RF Channel	0	0	2405 MHz
DIP 1	Pan ID	OFF	0x0000	Pan ID is 0x0000
DIP 2	RF Power	OFF	0x00	0x01: RF Power is 0x07 (FCC, Default)
DIP 3		ON	0x01	
DIP 4	Node ID	OFF	0x00	0x00: Node ID is 0x00F0
DIP 5		OFF	0x00	

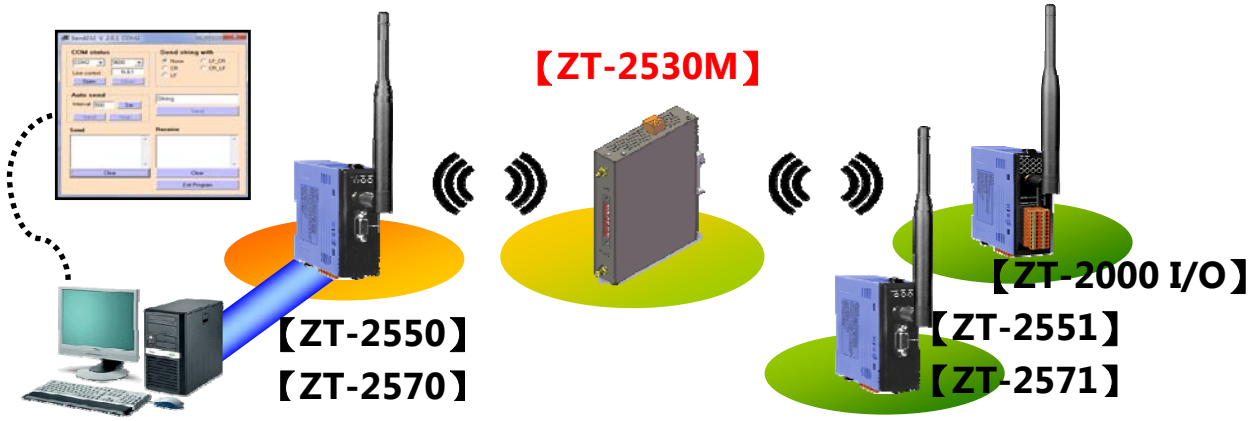
- The configurations of ZT-2530M (Coordinator) are different to the network (1). It establishes another network with ZT-2510, ZT-2551, ZT-2571 and ZT-2000 I/O devices.

ZigBee Coordinator / Network (2)				
Switch Type	Item	Status	Range	Comments
Rotary Switch	RF Channel	E	14	2475 MHz
DIP 1	Pan ID	OFF	0x0000	Pan ID is 0x0000
DIP 2	RF Power	OFF	0x00	0x01: RF Power is 0x07 (FCC, Default)
DIP 3		ON	0x01	
DIP 4	Encryption	OFF	Disable	Encryption is disabled
DIP 5	Frame Type	OFF	Disable	Broadcast

5 Communication Testing

1. Launch the user's software to confirm the communication takes place between the nodes coordinator (ZT-2550/ ZT-2570) , router and the end device.

2. Set the Pan ID/ Node ID/ RF Channel/ RF Power for the Router / Network (1) via the hardware rotary dip switches to be consistent with the original coordinator (ZT-2550/ZT-2570). Note that the Node ID should be unique in the first network.
3. Set the Pan ID/ RF Channel/RF Power for the Coordinator / Network (2) according to the users' requirements. The node devices in the second network have to have the same Pan ID/ RF Channel/RF Power settings, and each node needs to have a unique Node ID.
4. Run the same software in step 1 again to confirm the communication takes place.



Revision History

Revision	Date	Description
1.0.0	2015/07	First released

