

# ZigBee Wireless Application: How to remotely control I/O and acquire data?

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ICP DAS announces the new ZigBee wireless solution to meet the requirement of the remote (long/short distance) communication systems that need communicate via RS-232 or RS-485 but are in the unable (or difficult) wiring areas, such as factories, no rural areas, reservoirs, expensive cities, inside the building, school and so on. ICP DAS new released **ZB-2550P** and **ZB-2551P** wireless Converters, RS-232/RS-485 to ZigBee, will help you to solve above problems, reduce the wiring cost, and achieve the mission of remote I/O control and data acquisition.

(This document can be download at [www.icpdas.com](http://www.icpdas.com) > FAQ > Software > ISaGRAF > 110)

The ZigBee wireless solution may apply to the communication systems that used RS-232 or RS-485 originally. For example: Applications like PC/HMI to I/O, Machine to Machine, PAC to I/O, PC/HMI to PAC controllers, any application that constructed with one Host and multi-slave.

ICP DAS also provides ZB-2550P/ZB-2551P plus ISaGRAF PAC for the wireless application.  
( [http://www.icpdas.com/products/GSM\\_GPRS/wireless/solutions.htm#6](http://www.icpdas.com/products/GSM_GPRS/wireless/solutions.htm#6) )

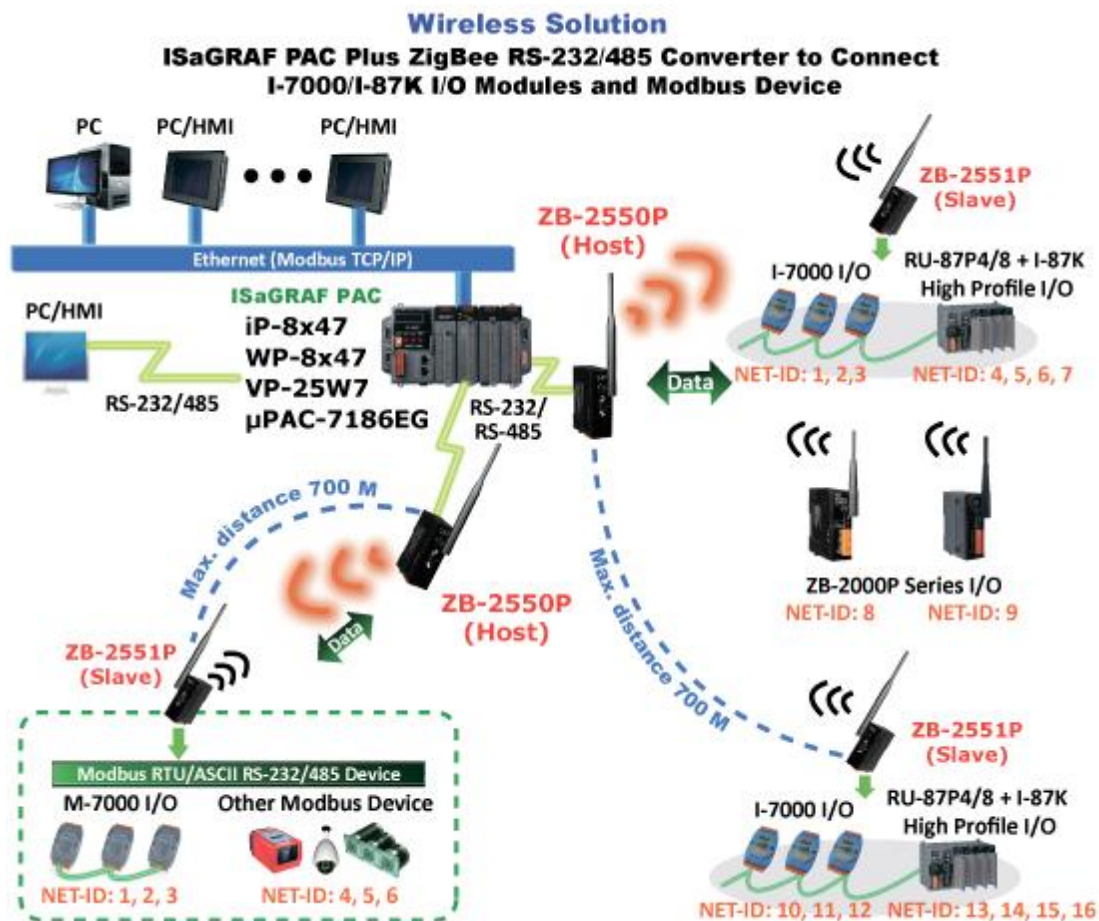


Fig-1

## NOTE:

Please care about the communication delay while using the ZigBee wireless communication. The ZigBee converter need more time to convert the RS-232/485 signals to wireless radio signals than pure RS-232/485 communication. Recommend to set the communication timeout setting to be at least 250 ms or more. And the baud rate is suggested to be set as 9600 bps or more to avoid the problem that the data transmission speed via RS-232/485 could not keep pace with the speed via wireless transmission.

## **1.1 : ISaGRAF PAC plus ZB-2550P/ZB-2551P wirelessly connect to I-7000/I-87K/ZB-2000P series I/O modules or other Modbus RTU/ASCII slave devices**

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In the application of Fig-1 (previous page), we change the I/O data transmission method from using RS-485 to wireless (using Host:ZB-2550P + Slave:ZB-2551P) to connect to I-7000 series, RU-87P4/RU-87P8 + I-87K high profile I/O or I-87K4/5/8/9 + I-87K I/O modules. By the same way, we can also replace the RS-232/RS-485 by wireless (ZB-2550P & ZB-2551P) to connect to Modbus RTU slave or Modbus ASCII slave devices or I/O modules.

One WP-8xx7 supports one of its COM2:RS-485 or COM3: RS-232/485 to connect to I-7000 series, RU-87P4/RU-87P8 + I-87K high profile I/O or I-87K4/5/8/9 + I-87K I/O modules. (For  $\mu$ PAC-7186EG, supports COM2: RS-485; for iP-8xx7, supports one of COM2: RS-485 or COM3: RS-232/485; for VP-25W7, supports one of COM2: RS-485 or COM3)

For more information about ISaGRAF PAC connecting I-7000 series, RU-87P4/RU-87P8 + I-87K high profile I/O or I-87K4/5/8/9 + I-87K I/O, please refer to the Chapter 6 of the “User’s Manual of ISaGRAF PAC”. The file names are:

“user\_manual\_i\_8xx7.pdf” & “user\_manual\_i\_8xx7\_appendix.pdf” at

WP-8xx7 CD-ROM: \Napdos\isagraf\wp-8xx7\english\_manu\ or

I-8000 CD-ROM: \Napdos\isagraf\8000\english\_manu\ or

VP-25W7 CD-ROM: \Napdos\isagraf\vp-25w7\english\_manu\ or

[http://www.icpdas.com/products/PAC/i-8000/getting\\_started\\_manual.htm](http://www.icpdas.com/products/PAC/i-8000/getting_started_manual.htm)

Please refer to the following web site for more application figures and detail specifications:

[http://www.icpdas.com/products/PAC/i-8000/data%20sheet/data%20sheet\\_c.htm](http://www.icpdas.com/products/PAC/i-8000/data%20sheet/data%20sheet_c.htm)

### **NOTE:**

Make sure the driver version of your ISaGRAF PAC is correct for using ZB-2550P / ZB-2551P.

<http://www.icpdas.com/products/PAC/i-8000/isagraf-link.htm>

WP-8xx7 / 8xx6 : 1.09 or newer version

VP-25W7 : since the release date (about August, 2009)

iP-8xx7 : 1.03 or newer Version

$\mu$ PAC-7186EG : 1.06 or newer Version

One WP-8xx7 (or VP-25W7) supports up to ten RS-232/RS-485 ports to connect to Modbus RTU slave or Modbus ASCII slave devices or I/O. (While iP-8xx7 or  $\mu$ PAC-7186EG supports up to 2 ports). For more information about the ISaGRAF PAC using Modbus RTU/ASCII Master COM ports to connect Modbus RTU slave or Modbus ASCII slave devices or I/O, please refer to the Chapter 8 of the “User’s Manual of ISaGRAF PAC”.

### **IMPORTANT NOTE:**

- The typical transmission distance between the ZB-2550P and ZB-2551P or between the ZB-2550P and ZB-2000P series I/O is 700 meters. The communication quality is concerns with the environment and atmospheric conditions. If the application environment is in the situations of rains, snows, high humidity, or precipitous terrain such as mountainsides, depressions, or around by obstacles such as buildings, metal objects, or a signal transmitter, or other objects, or the noise source...and so on, the communication quality can be reduced, when serious can be unable to communicate or the communication distance can be shortened. For those troubles shooting, please refer to Section 1.3 .
- Before using the ZB-2550P/2551P/2510P or ZB-2550/2551/2510, user must setup the ZigBee configuration. For the detail setup instructions, please refer to Section 1.4 .

## 1.2 : PC / HMI plus ZB-2550P/ZB-2551P wirelessly connect to ISaGRAF PACs

In the application of the below Fig-2, the original RS-232/RS-485 connections between the PC/HMI and ISaGRAF PACs are changed to be ZigBee wireless connection.

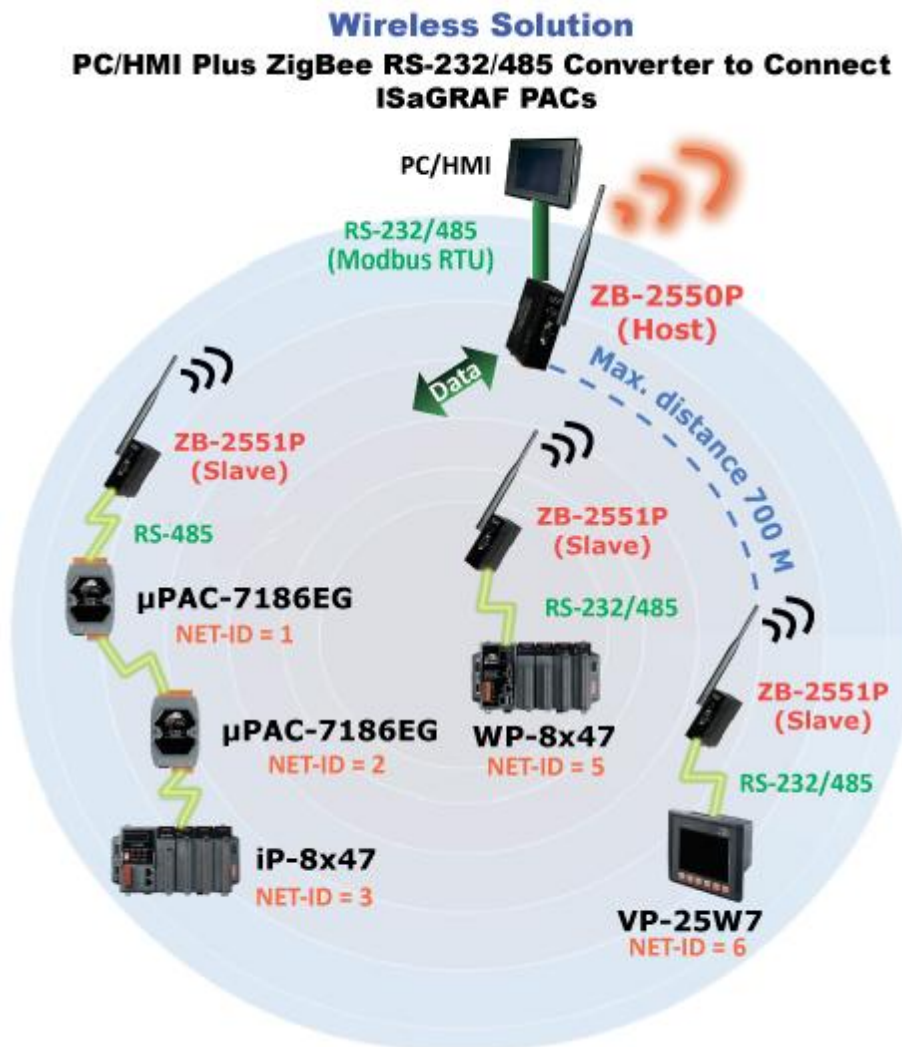


Fig-2

The WP-8x7/VP-25W7 supports up to five COM ports (RS-232 or RS-485) as Modbus RTU slave ports. The iP-8x7/μPAC-7186EG supports up to two COM ports as Modbus RTU slave ports. For more information about setting Modbus RTU slave port, please refer to the “Getting Started” manual of each ISaGRAF PAC model. (The “Getting Started” manual is in the CD-ROM or [http://www.icpdas.com/products/PAC/i-8000/getting\\_started\\_manual.htm](http://www.icpdas.com/products/PAC/i-8000/getting_started_manual.htm) )

### **IMPORTANT NOTE:**

- The typical transmission distance between the ZB-2550P and ZB-2551P or between the ZB-2550P and ZB-2000P series I/O is 700 meters. The communication quality is concerns with the environment and atmospheric conditions. If the application environment is in the situations of rains, snows, high humidity, or precipitous terrain such as mountainsides, depressions, or around by obstacles such as buildings, metal objects, or a signal transmitter, or other objects, or the noise source...and so on, the communication quality can be reduced, when serious can be unable to communicate or the communication distance can be shortened. For those troubles shooting, please refer to Section 1.3 .
- Before using the ZB-2550P/2551P/2510P or ZB-2550/2551/2510, user must setup the ZigBee configuration. For the detail setup instructions, please refer to Section 1.4 .

### 1.3 : How to select ZigBee series products

The ZigBee wireless communication product series by ICP DAS conforms to 2.4G IEEE802.15.4/the ZigBee standard, the signal frequency is ISM 2.4GHz. The communication quality is concerns with the environment and atmospheric conditions. If the application environment is in the situations of rains, snows, high humidity, or precipitous terrain such as mountainsides, depressions, or around by obstacles such as buildings, metal objects, or a signal transmitter, or other objects, or the noise source...and so on, the communication quality can be reduced, when serious can be unable to communicate or the communication distance can be shortened. Therefore it is necessary to conduct a preliminary test at the worksite. The problems occurred in every area will not be all the same, some can be solved by adding the antenna to extend the communication distance; some can be solved by adding ZigBee Repeater to bypass the disturbance objects(like radio tower). The following is the product list for user selection.

#### ZigBee Converter and Repeater:

[http://www.icpdas.com/products/GSM\\_GPRS/wireless/solutions.htm#6](http://www.icpdas.com/products/GSM_GPRS/wireless/solutions.htm#6)

We recommend you to choose the model with strong signal like ZB-2550P, ZB-2551P & ZB-2510P.

Model Number	Description
ZB-2550P	RS-485/RS-232 to ZigBee Converter (Host), long distance (about 700 m)
ZB-2551P	RS-485/RS-232 to ZigBee Converter (Slave), long distance (about 700 m)
ZB-2510P	ZigBee Repeater, long distance (about 700 m)
ZB-2550	RS-485/RS-232 to ZigBee Converter (Host), about 100 m
ZB-2551	RS-485/RS-232 to ZigBee Converter (Slave), about 100 m
ZB-2510	ZigBee Repeater, about 100 m

**Antenna:** [http://www.icpdas.com/products/GSM\\_GPRS/wireless/external\\_antenna.htm](http://www.icpdas.com/products/GSM_GPRS/wireless/external_antenna.htm)

- For ZB-2550P, ZB-2551P and ZB-2510P only to extend the wireless communication distance. (Larger than 5 dBi at least)
- The ZB-2550/ZB-2551/ZB-2510 cannot use the following antennas. These ZigBee products have no amplifier inside. The communication may become worse if add below antennas. (NOTE: Adding an antenna does not guarantee to reach the maximum communication distance. The communication distance can be shortened, if in the bad environment or atmospheric conditions. Please conduct a preliminary test at the worksite to confirm the actual communication state.)

Model Number	Description
ANT-8	Gain: 8 dBi , 1 Km external antenna (Omnidirectional)
ANT-15	Gain: 15 dBi , 9 Km external antenna (Omnidirectional)
ANT-18	Gain: 18 dBi , 12 Km external antenna (Directional)
ANT-21	Gain: 21 dBi , 15 Km external antenna (Directional)
ANT-15YG	Gain: 15 dBi , 9 Km external antenna (Directional)

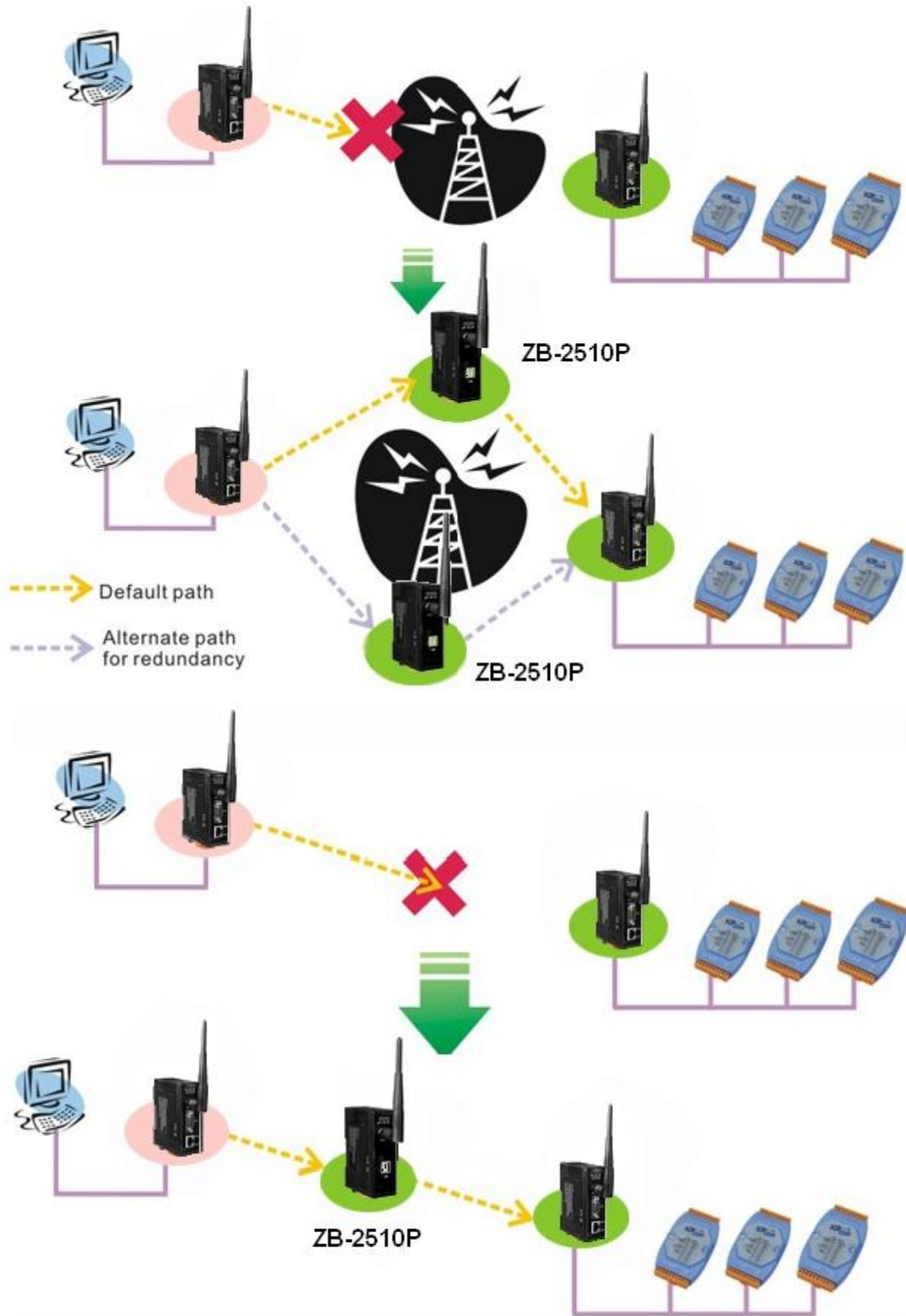
If there is noise source in the worksite (like the radio tower), user can choose ZB-2510P to bypass it. (This is not guaranteed for every case. It needs worksite test to confirm.) Please see the two figures in the next page.

Please refer to the following website for more products information about ZigBee:

[http://www.icpdas.com/products/GSM\\_GPRS/zigbee/zigbee\\_introduction.htm](http://www.icpdas.com/products/GSM_GPRS/zigbee/zigbee_introduction.htm)



The occasions using ZB-2510P (ZigBee Repeater):



## 1.4 : How to use ZB-255x-Utility to configure the ZB-2550P / ZB-2551P / ZB-2510P

User must complete the product configuration before using the ZB-2550P/2551P/2510P or ZB-2550/2551/2510 products. Please install ZB-255x-Utility and ZB-257x-Utility to PC.

The Utilities are in the CD-ROM of ZigBee product case:

ZB-255x-Utility: \ZigBee\ZigBee\_Converter\ZB\_255x\Utility\  
ZB-257x-Utility: \ZigBee\ZigBee\_Converter\ZB\_257x\Utility\  
The Utilities download site: [ftp://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee\\_converter/](ftp://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_converter/).

**NOTE:** Please use ZB-257x-utility to configure ZB-2510 / 2510P repeater.

First, unzip the .zip file then execute the .exe file inside it to install the utility to PC.

Next, in the ZigBee power off situation, set Dip Switch to “ZBSET” , then give 24V to power on.

Next, connect the RS-232 port of PC to the COM0: RS-232 of ZigBee product by using the cable CA-0915 or CA-0910N provided in the product case of the ZB-2550/2550P or ZB-2551/2551P.

PC --- ZB-2550/ZB-2550P: CA-0915 cable (9-Pin Dsub Male to 9-Pin Dsub Female )

PC --- ZB-2551/ZB-2551P: CA-0910N cable (9-Pin Dsub Female to 9-Pin Dsub Female, 2,3 cross)

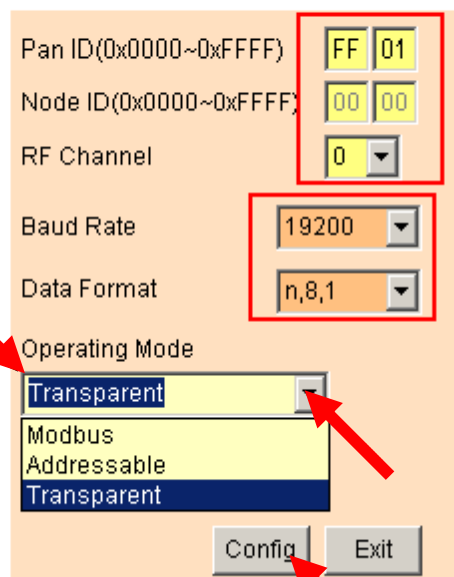
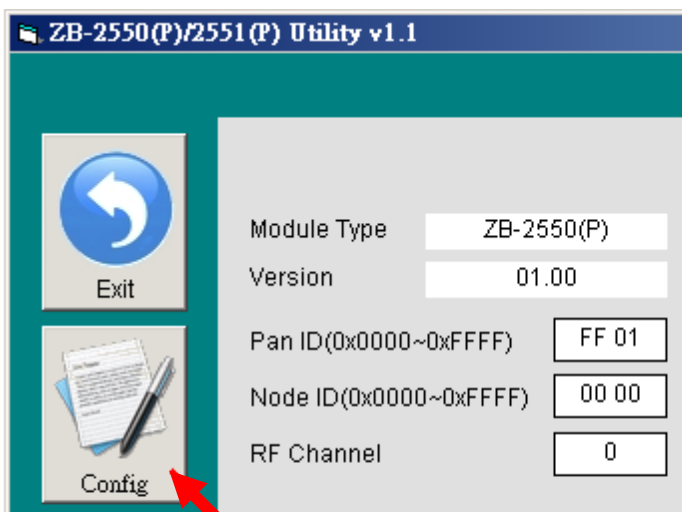
Next, run the “ZB-255x-Utility” on PC. Select the favorite language and the proper RS-232 COM port number that PC used to connect to the ZigBee product, and then click “Connect” and “OK”.



Then, the configuration windows will display. Click “Config” button to configure the ZigBee product. After finish the configuration, remember to turn off the power of ZigBee, set Dip Switch to “Run”, and then power it on.

**NOTE:**

1. Each ZigBee network must include one (and only one) ZigBee Host: ZB-2550P, and one or more ZigBee Slave: ZB-2551P, and may include some ZigBee Repeaters: ZB-2510P. To communicate well, all ZigBee products in the same network must be set to the same “Pan ID” and the same “RF Channel”.
2. When using ZigBee Slave: ZB-2551P, user must set “Node ID” (one extra setting than ZB-2550P). The ZB-2551P and ZB-2510P in the same network must be set to the different “Node ID”.
3. If two or more different ZigBee networks are very close to each others, then user must set the different “Pan ID” or different “RF Channel” for them, otherwise these different ZigBee networks can disturb mutually. For example of the Fig-1: There are two ZigBee networks, one connect to I-7000 and I-87K I/O modules, another connect to Modbus RTU slave devices. User can set the “Pan ID” as 0xFF01 and the “RF Channel” as 0 for the first ZigBee network, and then set the “Pan ID” as 0xFF01 but the “RF Channel” as 1 for the second ZigBee network. (Also may set different “PAC ID”, such as one is 0xFF01, another is 0xAA02, but the “RF Channel” all set to be the same, for instance all are 0.)



Please set the “Operating Mode” as “Transparent” if the ZigBee product is for connecting to I-7000, I-87K and ZB-2000P series I/O modules.

Please set the “Operating Mode” as “Modbus” if the ZigBee product is for connecting to Modbus RTU / Modbus ASCII controllers, devices or I/O modules.

