ZB-2510 Series User Manual

Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

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1. Introduction

What are the benefits of using ZigBee?

ZigBee is a specification based on the IEEE 802.15.4 standard for wireless personal area networks (WPANs). It is targeted at applications that require secure networking as well as high flexibility for network expansion anytime new nodes are to be added. It is also widely used in the industrial control field, in hospitals, labs and in building automation. Three topologies are defined in the IEEE 802.15.4 standard: Star, Cluster Tree and Mesh.

ZB-2510 Series

The ZB-2510 series are two ZigBee-based repeater modules included in the ICP DAS product line. The main difference between T and PA-version is the transmission range. The ZB-2510-T supports an extended transmission range of up to 100 meters, whereas the ZB-2510-PA can transmit to a maximum of 700 meters. Both modules are able to operate in broadcast and user-defined route modes. When the repeater is set to broadcast mode, the transmission route is constructed by the ZigBee Host. The repeater will forward any data that it receives using broadcast mode. The advantage of this mode is that the repeater can be deployed in a "haphazard" manner without any concern about positioning.

However, the main flaw of this mode is that if there are too many ZigBee slaves sending connection request at same time, incorrect ZigBee parent may response the ZigBee slave connection requests. It would be causing a ZigBee network may not get the best signal strength topology. In contrast, when the repeater is set to user-defined route mode, it can be constructed as the best ZigBee network in signal strength. The benefit of this mode is that the data transmission path can be defined by our-selves. We can use this feature to avoid the signal transmitted in the interference environment. However, if the main and redundant ZigBee repeaters have failure, the ZigBee will be invalid.

2. Specifications

Features:

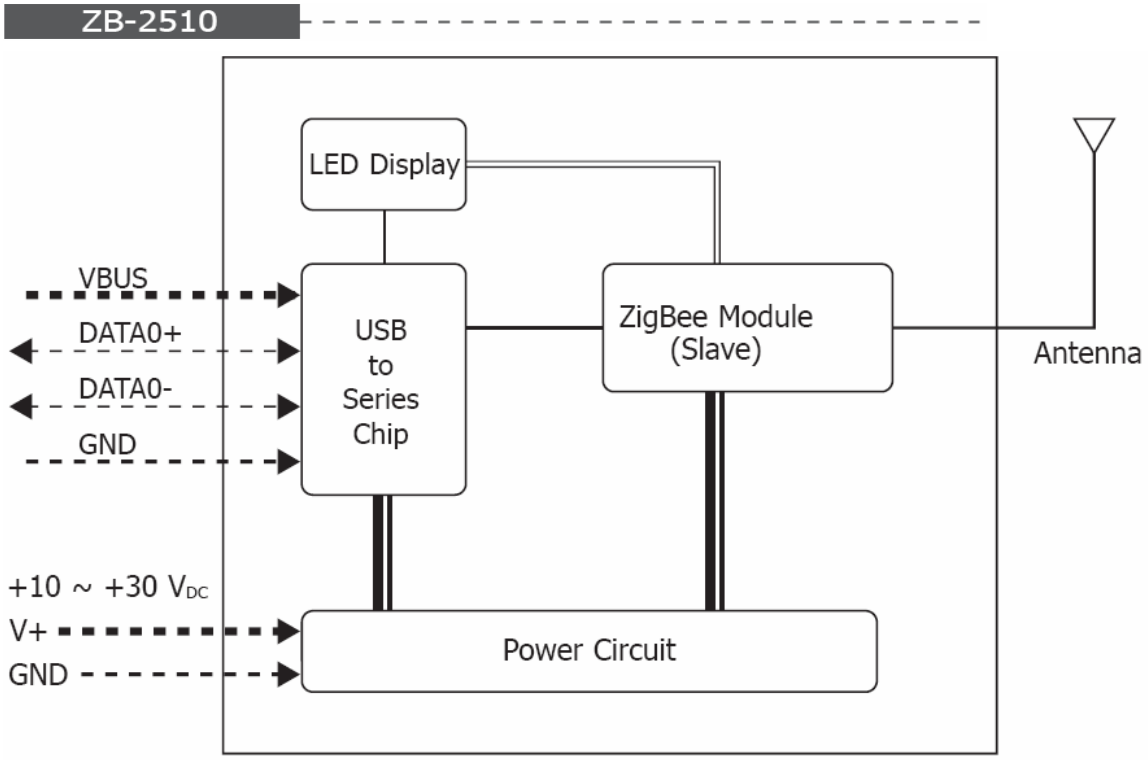
- ISM 2.4 GHz Operating Frequency.
- Full Compliance with 2.4 G IEEE802.15.4/ZigBee Specifications.
- Wireless transmission range up to 100 m (LOS) (ZB-2510/ZB-2510-T)
- Wireless transmission range typical for 700 meters, up to 1 km (LOS)(P/PA)
- USB Interface for configuration.
- GUI Configuration Software (Windows Version)
- DIN-Rail Mountable.

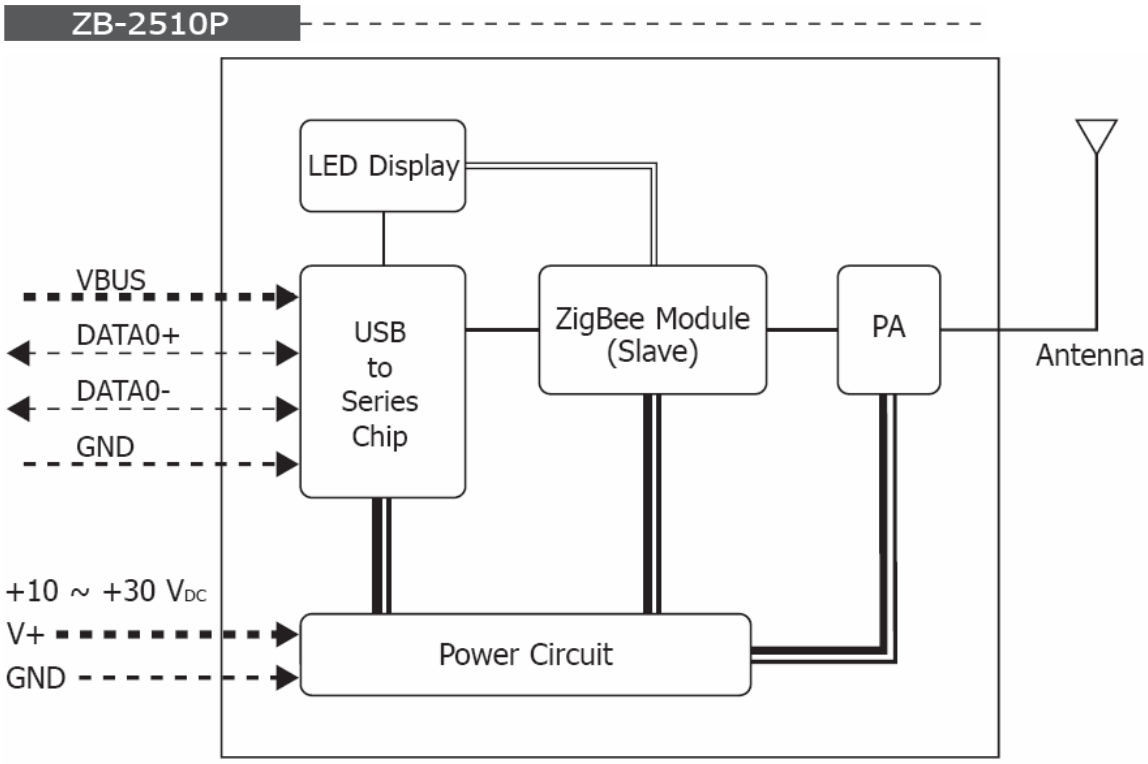
Specifications:

Modules	ZB-2510 / ZB-2510-T	ZB-2510P / ZB-2510-PA
Wireless		
RF Channels	16	
Receive Sensitivity	-102 dBm	
Transmit Power	9dBm /4 dBm	22 ~24 dBm, adjustable
Network Topology	Star, Mesh and Cluster tree	
Certification	TUV (ZCP)	
Antenna (2.4 GHz)	3 dBi Omni-Directional antenna	5 dBi Omni-Directional antenna
Transmission Range	100 m (LOS)	Typical for 700 meters, up to 1 km (LOS)
Setting Interface		
USB	Type B	
Included Cables	CA-USB18 (1.8 M Cable) x 1; USB Type A connector (Type A to Type B cable provided)	
Compatibility	USB 1.1 and 2.0 standard	
Supported Drivers	Windows 98/ME/2000/XP/Vista/Linux 2.6.19	
LED Indicators		
ZigBee Net State	Green	
ZigBee RxD	Yellow	
Power	Red	
Power		
Protection	Power reverse polarity protection.	
EMS Protection	ESD, Surge, EFT	
Required Supply Voltage	+10 V_{DC} ~ +30 V_{DC}	
Power Consumption	1.5 W	3 W
Connection	3-pin 5.08 mm Removable Terminal Block.	
Mechanical		
Casing	Plastic	
Flammability	UL 94V-0 materials	
Dimensions (W × L × H)	33 mm × 78 mm × 107 mm	
Installation	DIN-Rail	
Environment		
Operating Temperature	-25 ℃ ~ +75 ℃	
Storage Temperature	-40 ℃ ~ +80 ℃	
Relative Humidity	5 ~ 95 % RH, non-condensing	

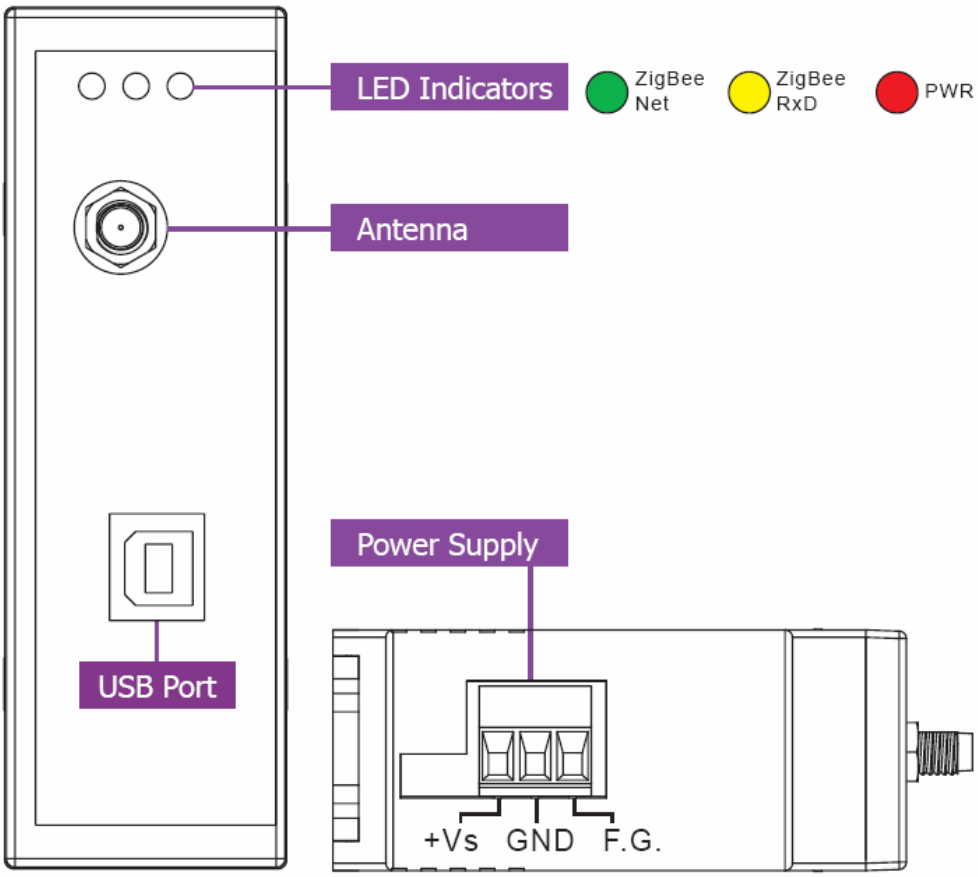
3. Product Description

3.1 Internal I/O Structure

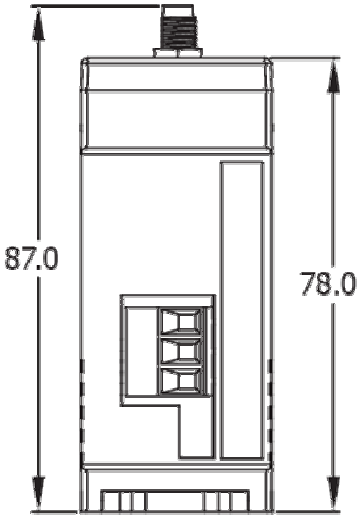




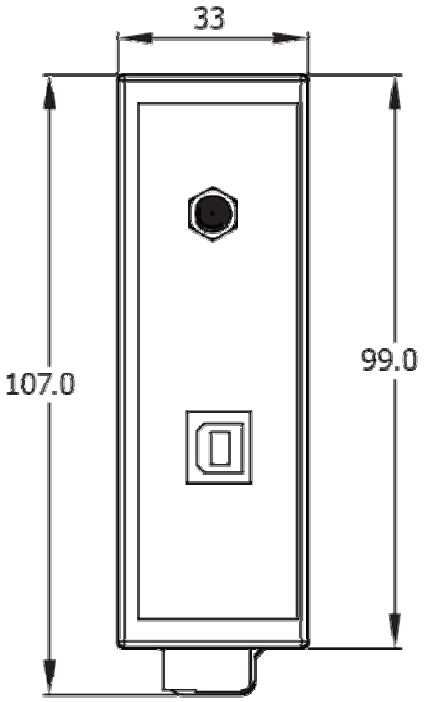
3.2 Appearance



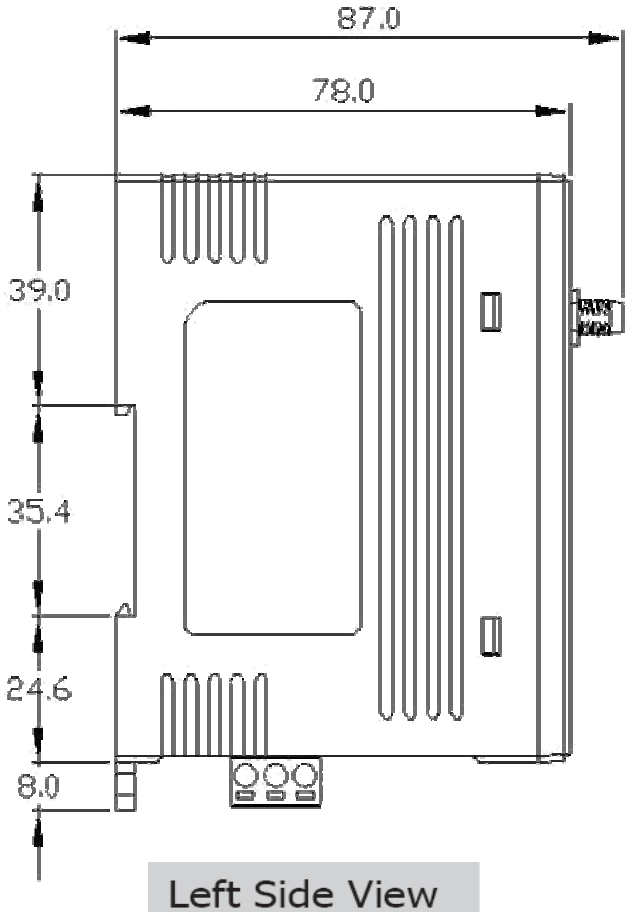
3.3 Dimensions (Units: mm)



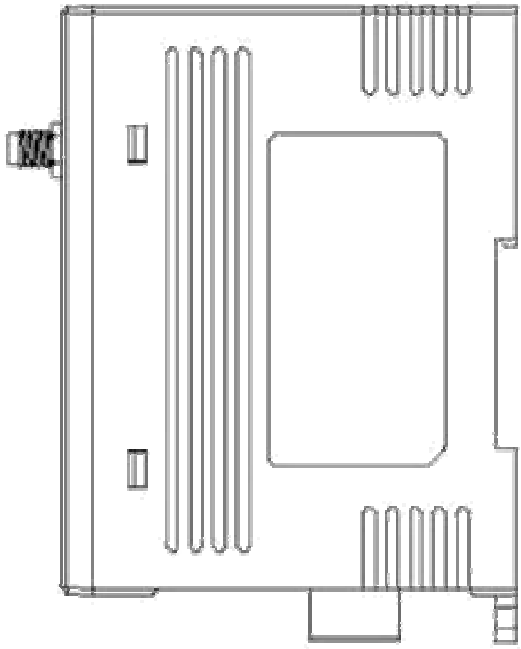
Bottom View



Front View



Left Side View



Right Side View

4. Operating Modes and Applications

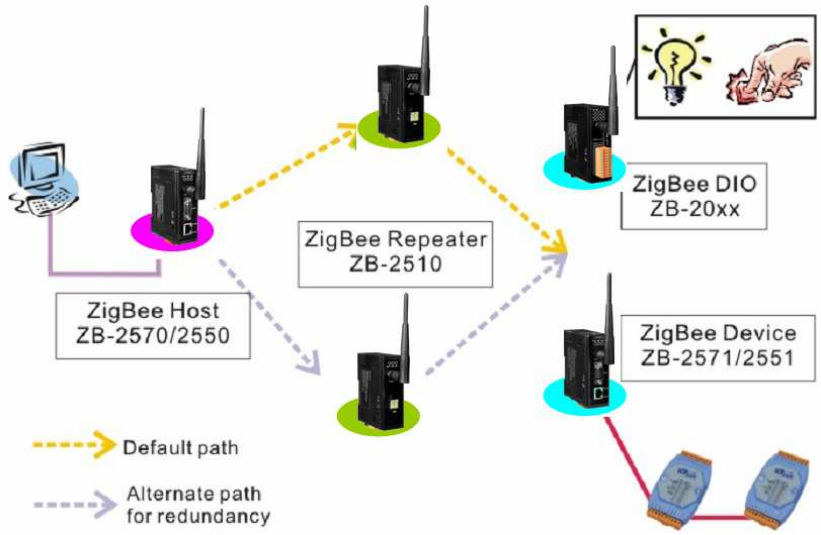
4.1 Introduction

Operating Mode	Description
Broadcast Mode	Establish used of the network routing path is automatically generated. Refer to Broadcast Mode
User-defined Route Mode (Typical)	Each repeater uses a unique routing path to forward data. The repeater path needs to be pre-configured. Refer to User-defined Route Mode
User-defined Route Mode (Back-up Route)	If a problem occurs on the current routing path, data will be automatically switched to another routing path. Two routing paths can be configured. Refer to User-defined Route Mode with a back-p Route

4.2 ZigBee Repeater usage

1. Broadcast Mode:

A diagram showing the typical usage for a ZigBee repeater that is forwarding data using broadcast mode is shown below:



In the initial stages of constructing a ZigBee network, the ZigBee Host will determine which repeater will be the forward spot of the default data transmission route. The designated repeater will forward the host data to the ZigBee Device and ZigBee DIO modules.

2. User-defined Route Mode:

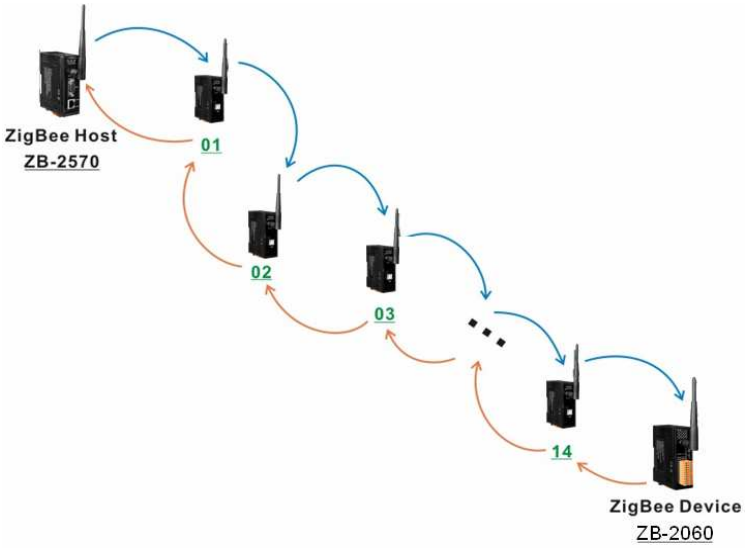
Any repeater operating in this mode needs to be configured using a unique repeater ID number and with a second repeater ID number (*1, *2) that defines where this repeater should forward data to when it receives the ZigBee Device data (*3).

Repeater ID	01	02	03	04			13	14
Repeater forwarding data received from the ZigBee device (*a)	00 (*b)	01	02	03	...	...	12	13

Repeater configuration table 1

*a: Data transmission to the ZigBee Device from the ZigBee Host is in the opposite direction.
*b: Repeater ID 00 is reserved for the ZigBee Host. Repeater IDs should be set beginning from 1.

By following the above configuration, the data transmission route for this mode will be as follows:

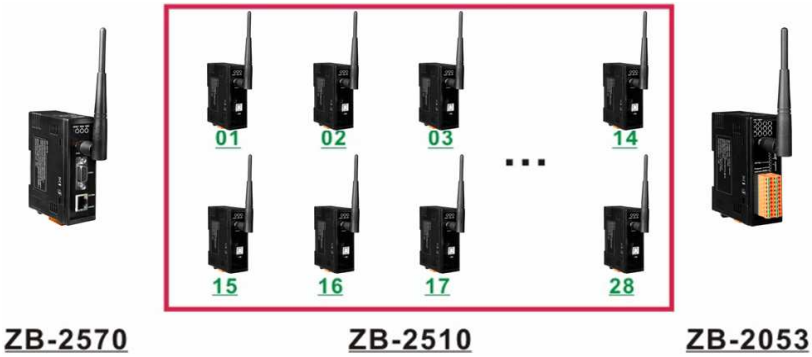


*1: ICP DAS provides two hardware and software versions that can be selected by the user depending on different environments.
*2: Not only does a unique PAN ID need to be set for the repeater, in the same way as any other ZigBee product, but a repeater ID number also needs to be set for use in user-defined route mode.
*3: Data transmission from the ZigBee Host to the ZigBee Device is in the opposite direction.

3. User-defined Route Mode with a back-up route:

User-defined route mode allows more flexibility in the ZigBee application and more expansion of the network. There are times when we need to consider an application where one or more repeaters in the ZigBee network are invalid. Communication between the host and the device will be disrupted, which will cause the data to be trapped at the failed repeaters. Even if a scanning device is used to locate and replace the invalid repeater, the entire system will be inactive while time is wasted waiting for the engineer to repair the problem. Sometimes, if the weather causes a device to be inoperable, or the engineer is a long distance from the location, the recovery time will be increased. Thus, the network self-recovery and redundancy functions are very important in this

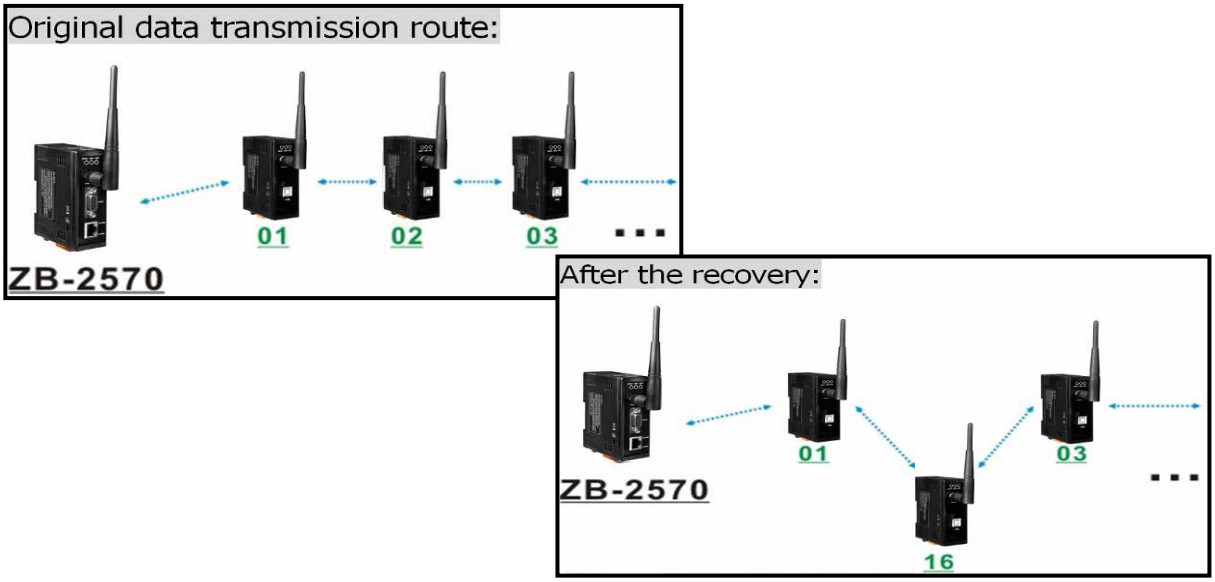
kind of application. The method used to implement the above functions in user-defined route mode is to add a secondary repeater ID number using the software utility, and then deploy two repeaters in each of the planned repeater locations.



Repeater ID	01,15	02,16	03,17	04,18	...	...	13,27	14,28
Repeater forwarding data received from the ZigBee device	00	01	02	03	...	...	12	13
Back up repeater ID	-	15	16	17			26	27

Repeater configuration table 2

The above figure shows an example application and configuration table. If the repeater with the ID number 02 in the above application is invalid, the data transmission route will switch to the secondary repeater if the ZigBee self-detection time has elapsed (*4).



*4: The user can define this value based on the system environment. The minimum timeout is 4 seconds. The network will attempt to forward the data to the secondary route if there is a problem with the ZigBee network.

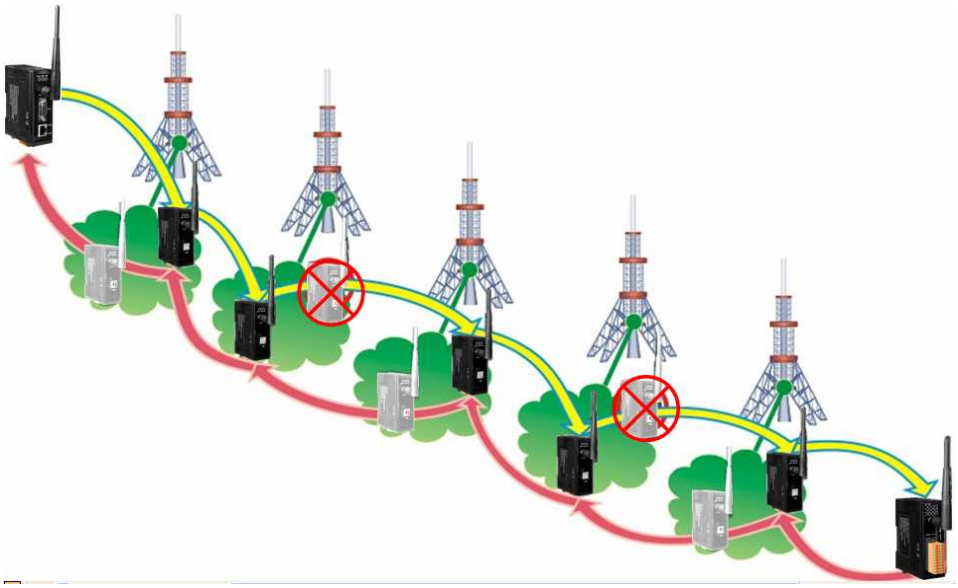
4.3 Applications

ZigBee repeater application 1

An example is as follows:

The locations of the repeater installation should be well planned. The repeater's forward route should be configured using user-defined route mode and then the locations of all devices should be set up.

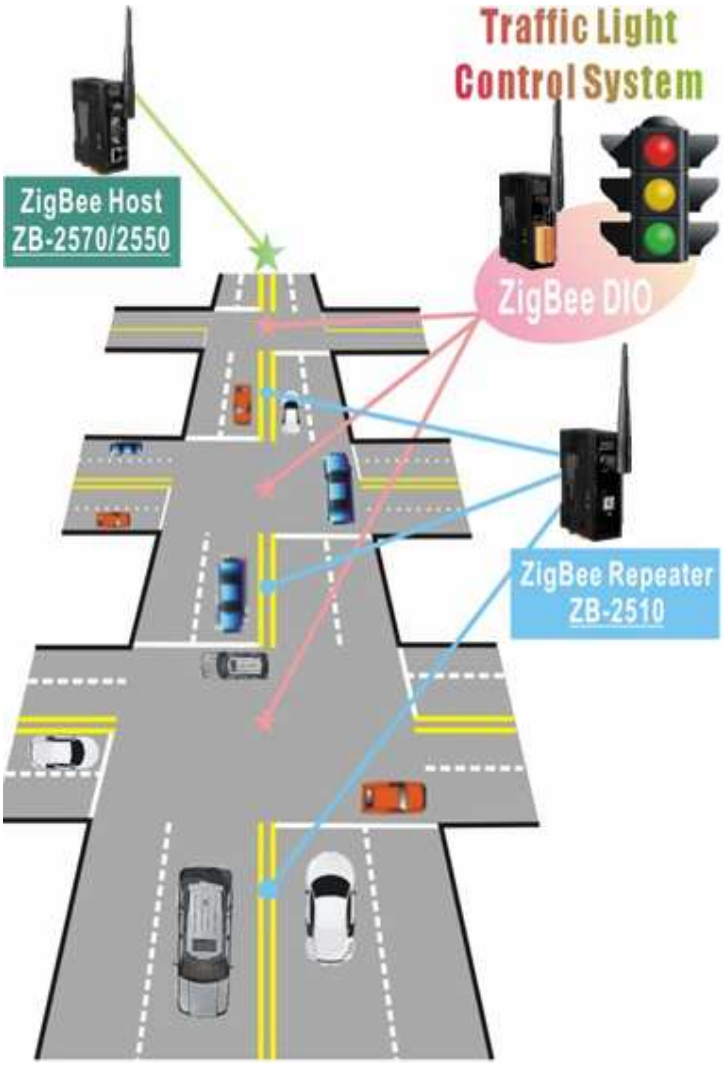
If a back-up route solution is added to the application, then the installation will be as follows:



If a repeater at any of the locations is invalid, the data transmission route will be switched to the back-up route based on the user-defined timeout so that the ZigBee network transmission can be recovered.

ZigBee repeater application 2

An example of an application based on a repeater and a ZigBee DIO module is as follows:



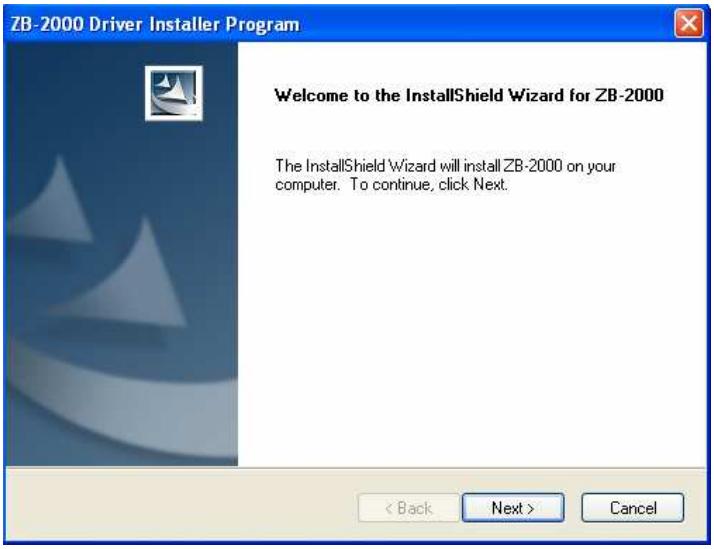
The ZigBee DIO module can control and monitor each traffic light at the intersection based on the traffic light control system. During non-rush hour periods, the traffic light control system can operate on a standalone basis. However, when the traffic light control system needs to be operated manually, the module also allows the system to be controlled by a remote host. The remote host can be used to manage the time and the sequence of all traffic light control systems. If the distance between two intersections is beyond the ZigBee DIO module's default transmission range, a ZigBee repeater can be added to extend the transmission range.

5. Quick Start for the ZB-2510 Series

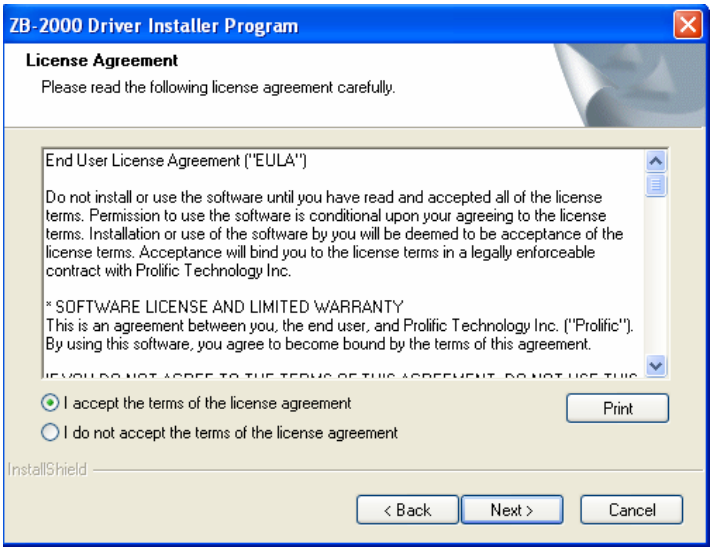
5.1 Installing the ZB-2000 Driver

1. Download the file from:
   http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb_2510/driver/
2. Uncompress the file and double click the **ZB-2000 DriverInstaller.exe** file to install the driver for the ZigBee repeater.

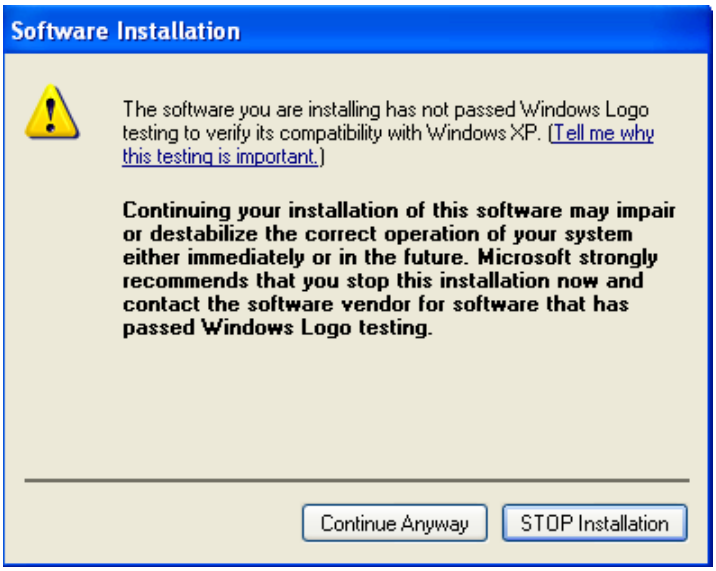
3. When the following screen is displayed, click the **Next>** button to continue the installation, or click **Cancel** exit the installation.



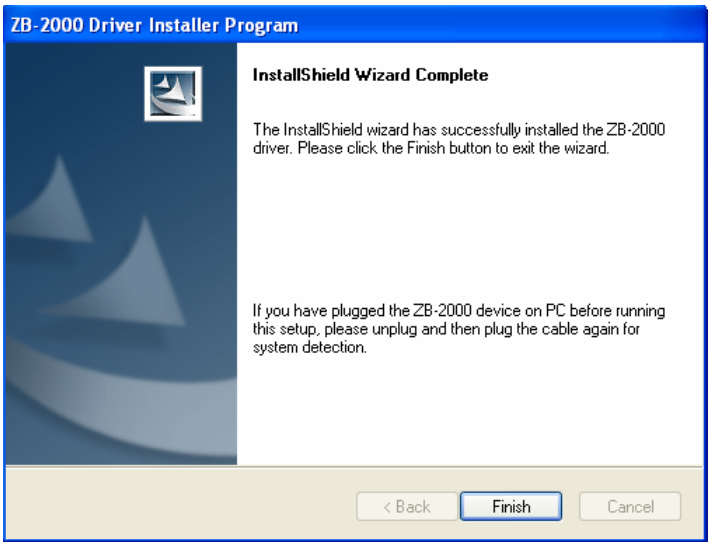
4. When the following screen is displayed, select the "I accept the terms of the license agreement." option, then click the **Next>** button to continue the installation, or click **Cancel** exit the installation.



5. When the following screen is displayed, click the **Continue Anyway** button to continue the installation, or click **STOP Installation** exit the installation.



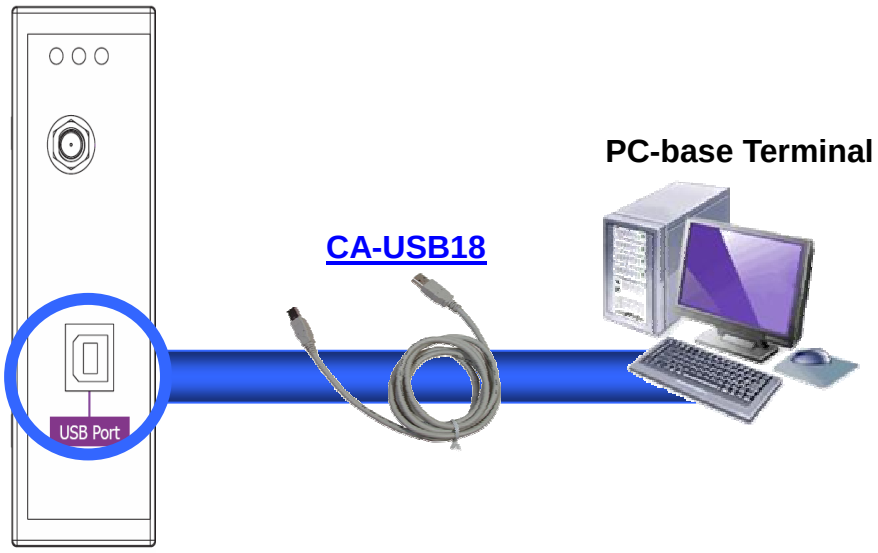
6. When the following screen is displayed, click the **Finish** button to finalize the software installation.



5.2 Installing the Hardware and Driver

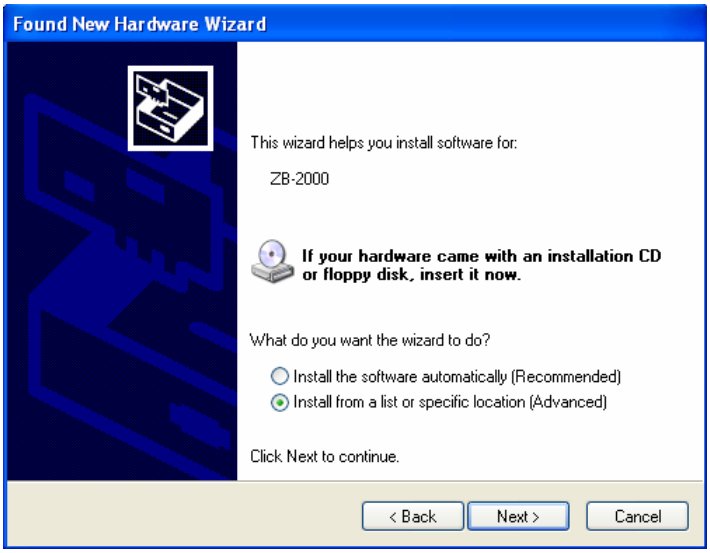
1. Hardware Installation:

ZB-2510 series

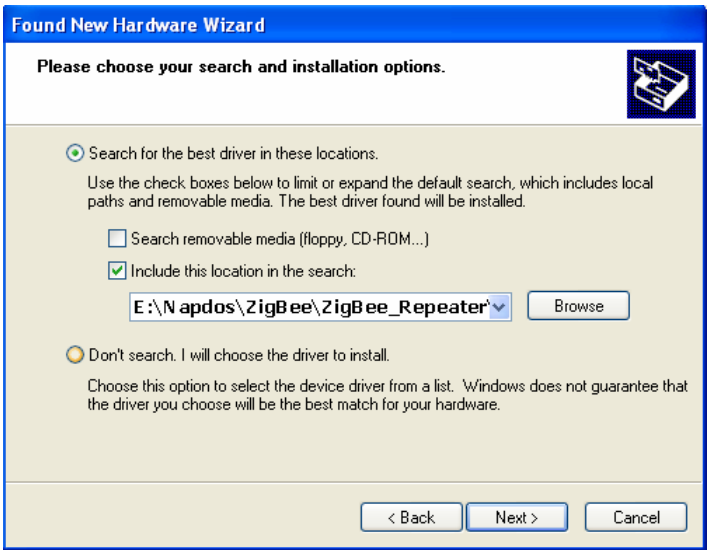


2. Windows will detect the new device and will initiate "the Found New Hardware Wizard" prompting you to install the software for the detected USB Device. Select the "Yes, now and every time I connect a device" option. Click the **Next** to button continue.

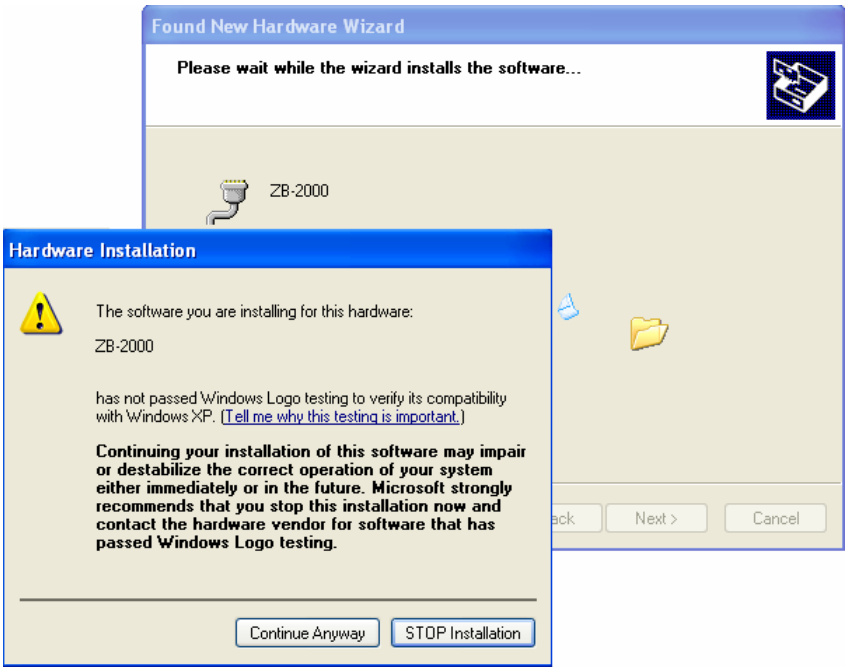
3. When the following screen is displayed, select the "Install from a list or specific location (Advanced)" Option, then click the **Next>** button to continue the installation, or click the **Cancel** button exit the installation.



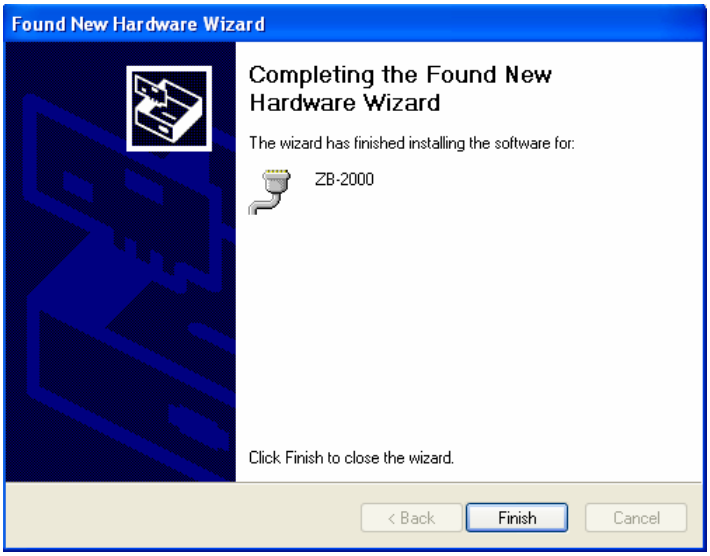
4. Browse to \\Napdos\ZigBee\ZigBee_Repeater\ZB_2510\Driver\ZB2000_Driver to locate the installation file, and click the **Next** button to begin the search.



5. When the following screen is displayed, click the **Continue Anyway** button to continue the installation, or click **STOP Installation** exit the installation.

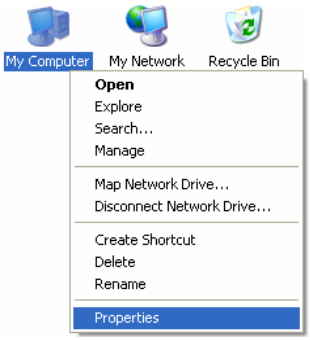


6. When the following screen is displayed, click the **Finish** button to finalize the software installation.



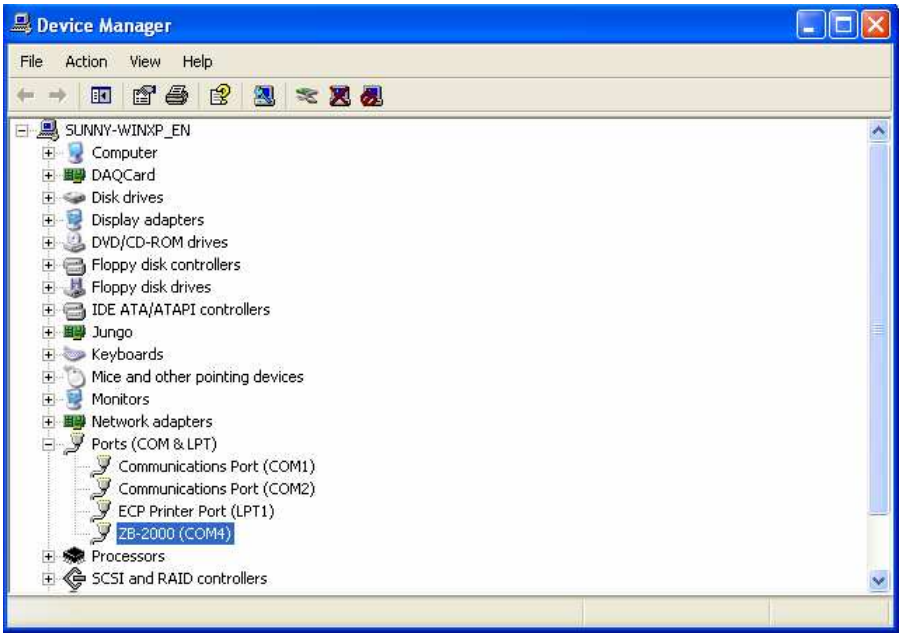
NOTE: When the driver installation is complete, unplug the USB cable, and then reconnect it.

7. Right click on My Computer and select Properties.



8. Select Device Manager from the System Properties dialog box.

9. Confirm whether the ZB-2000 (COM Number) is listed in the ports section.

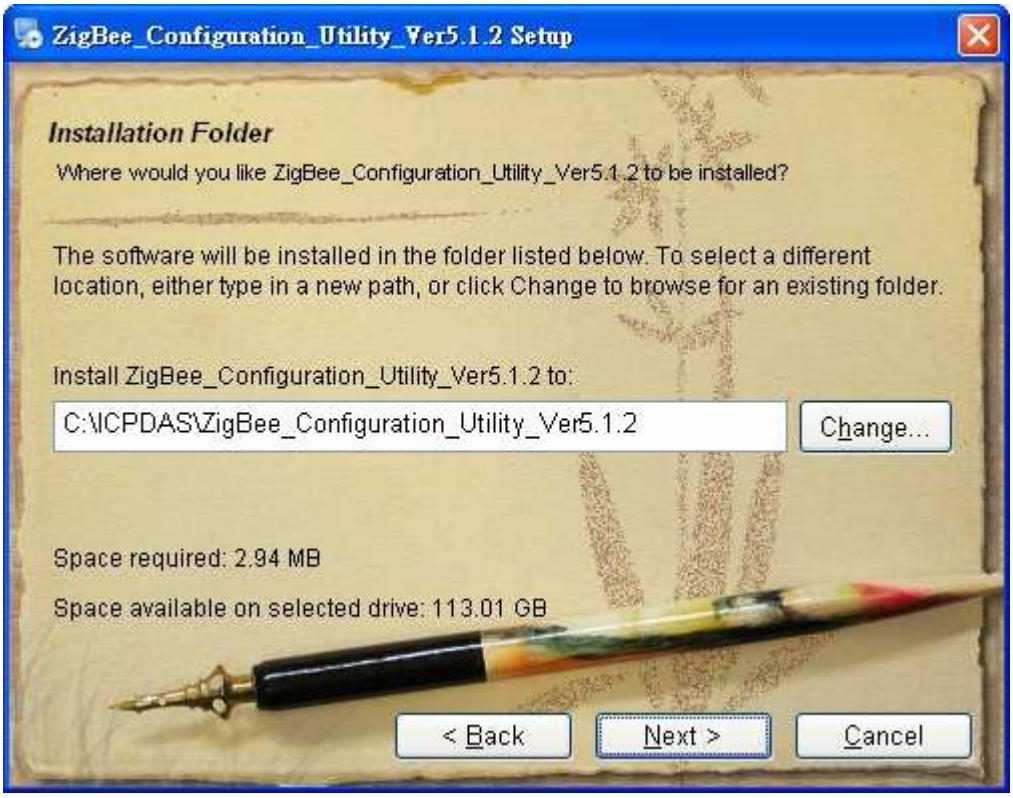


5.3 Installing the Configuration Tool

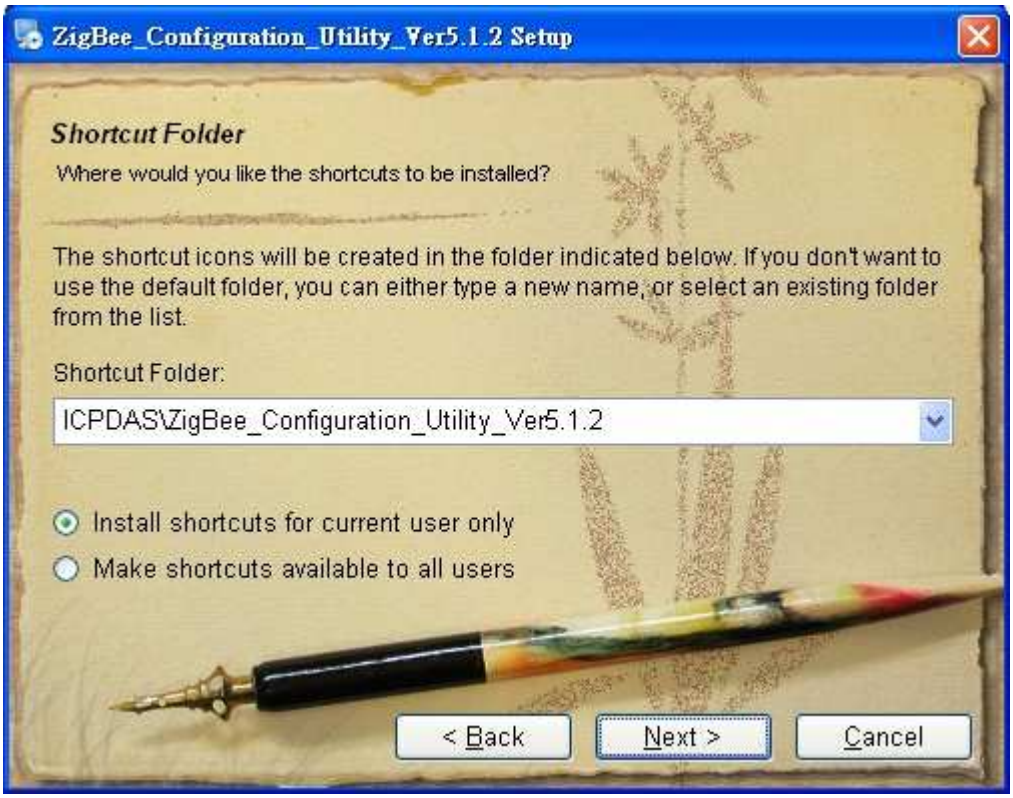
1. Download the file from:
   http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb_2510/utility/

2. Double click the **setup_zigbee_configuration_utility_ver_5.x.x.exe** file to install the configuration tool for the ZigBee repeater.

3. When the following screen is displayed, click the **Next>** button to continue the installation, or click **Cancel** exit the installation.



4. When the following screen is displayed, either click the '**Next>**' button to install the software into the default directory, or click the '**Change...**' button to install into an alternate location. Click the '**Cancel**' button to quit the installation.

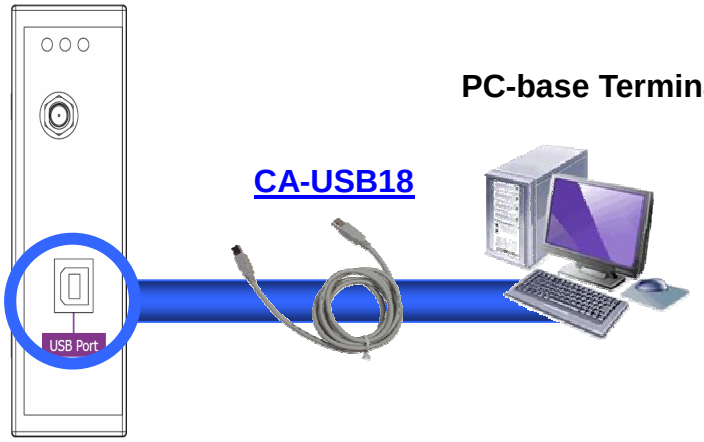


5. When the following screen is displayed, click the **Finish** button to finalize the software installation.

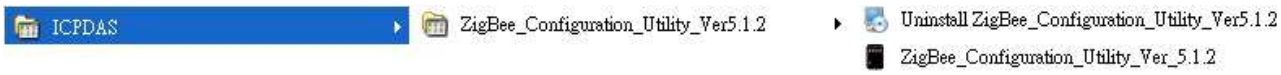
5.4 Quick Configuration for the ZB-2510 Series

1. Hardware Installation:

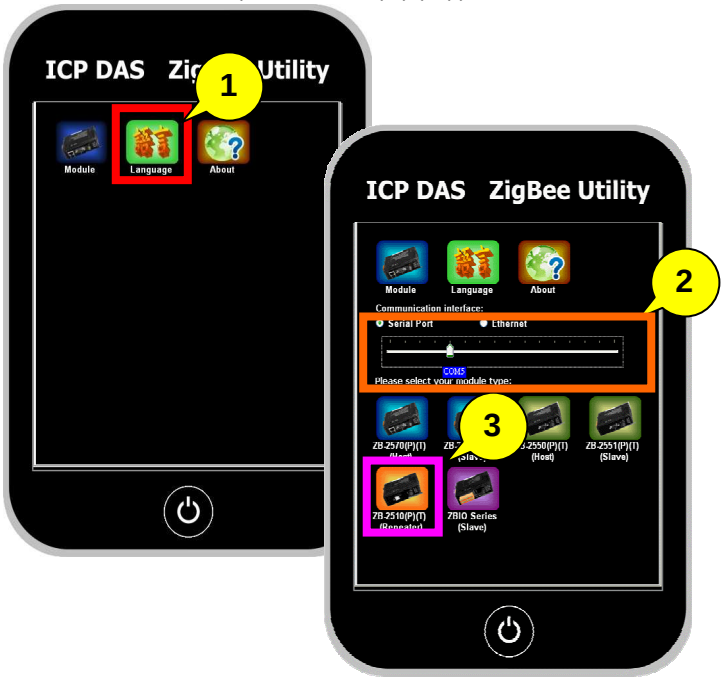
ZB-2510 Series - - - - - - - - - - - - - - - - -



2. After installing the ZigBee_Configuration_Utility_Ver_5.x.x, the executable file can be found at: Start:\ICPDAS\ZigBee_Configuration_Utility_Ver5.x.x



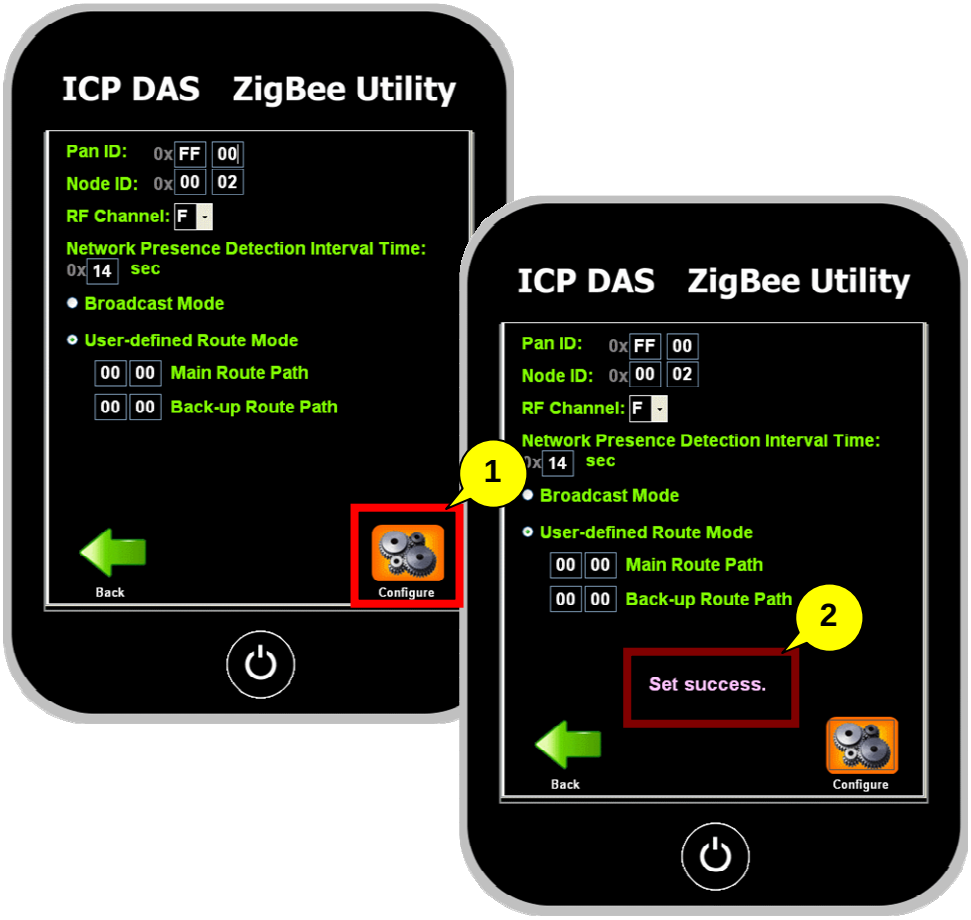
3. When the following screen is displayed:
   In the *Environment Settings* section:
   1. Choose the language.
   2. Scroll the interface parameters (COM Port number).
   3. Choose the module (ZB-2510(P)(T)).



4. When the following screen is displayed:

In the *Set the Parameters* section:

1. Set the ZigBee parameters. After entering the ZigBee parameter settings, click the **Configure** button.
2. When the following alert is displayed, it means that the configuration has been successful. Click the  button to continue the other configurations or click  button to exit configuration.



6. Appendix

1. Version Comparison

	Normal-version	T-version	P-version	PA-version
Transmission power	9 dBm	4 dBm	22 ~ 24 dBm	22 ~ 24 dBm
Antenna 2.4 GHz –	3 dBi Omni-Directional antenna	3 dBi Omni-Directional antenna	5 dBi Omni-Directional antenna	5 dBi Omni-Directional antenna
Transmission range (LOS)	100 m	100 m	700 m (Typical) 1 km (Max.)	700 m (Typical) 1 km (Max.)
ZB-100R/ZB-100T Supported	No	Yes	No	Yes
Supports Max. Slaves (Host)	60	256	60	256
Certification	No	CE/FCC,FCC ID	No	No

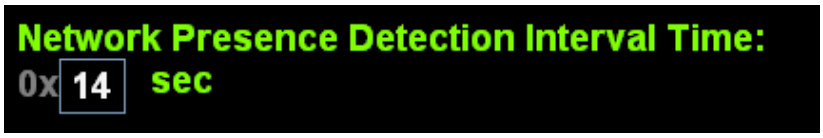
2. Set to Default:

1. In the set parameters dialog box (step 5 above.), click the default buttom.Click the **Default** button.

2. The ZB-2510 Series default settings:

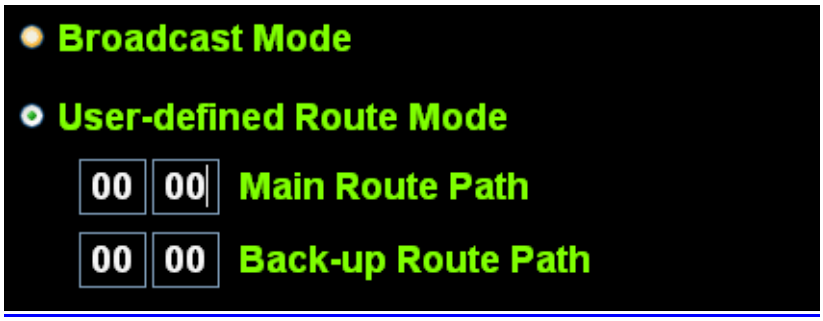
Pan ID	00 01
Node ID	00 01
RF Channel	1
Network Presence Detection Time Interval	20 sec
Route Paths Options	Broadcast Mode

3. Network Status Detection Time Setting:
   If setting value is 20, it means every 20 seconds a packet will be send to confirm the status of the network. If communication is disconnected, then self-recovery of the network will occur, if the value is set to 0, the mechanism will be turned off.



4. Route Path Options:
   Broadcast mode is automatically builds the network. User-defined Route mode builds the network based on the main route path or the back-up route path.
   Broadcast Mode:

   User-defined Route Mode:



5. Setting Tool download location:
   Website:
   http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb_2510/utility/
   CD path:
   \Napdos\ZigBee\ZigBee_Repeater\ZB_2510\Utility\
6. Document download location:
   Website:
   http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb_2510/document/
   CD path:
   \Napdos\ZigBee\ZigBee_Repeater\ZB_2510\Document\
7. Driver download location:
   Website:
   http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb_2510/driver/
   CD path:
   \Napdos\ZigBee\ZigBee_Repeater\ZB_2510\Driver\
8. ZigBee Products website:
   http://www.icpdas.com/products/GSM_GPRS/wireless/solutions.htm#6
9. Technical Service:
   If you have any questions, send a description of your problem to:
   service@icpdas.com

7. Ordering Information

ZigBee Repeater	
ZB-2510 CR	ZigBee Repeater (RoHS)
ZB-2510/S CR	ZigBee Repeater (RoHS) + GPSU06U-6 (Power Supply)
ZB-2510P CR	High Power Amplifier ZigBee Repeater (RoHS)
ZB-2510P/S CR	High Power Amplifier ZigBee Repeater (RoHS) + GPSU06U-6 (Power Supply)
ZB-2510-T CR	ZigBee Repeater (RoHS)
ZB-2510-T/S CR	ZigBee Repeater (RoHS) + GPSU06U-6 (Power Supply)
ZB-2510-PA CR	ZigBee Repeater (RoHS)
ZB-2510-PA/S CR	ZigBee Repeater (RoHS) + GPSU06U-6 (Power Supply)

8. Accessories

ZigBee Converter	
ZB-2550	RS-485/RS-232 to ZigBee Converter (Host)
ZB-2550-T	RS-485/RS-232 to ZigBee Converter (Host) (CE/FCC/FCC ID)
ZB-2550-PA	RS-485/RS-232 to ZigBee Converter (Host) (long range)
ZB-2551	RS-485/RS-232 to ZigBee Converter (Slave)
ZB-2551-T	RS-485/RS-232 to ZigBee Converter (Slave) (CE/FCC/FCC ID)
ZB-2551-PA	RS-485/RS-232 to ZigBee Converter (Slave) (long range)
ZB-2570	Ethernet/RS-485/RS-232 to ZigBee Converter (Host)
ZB-2570-T	Ethernet/RS-485/RS-232 to ZigBee Converter (Host) (CE/FCC/FCC ID)
ZB-2570-PA	Ethernet/RS-485/RS-232 to ZigBee Converter (Host) (long range)
ZB-2571	Ethernet/RS-485/RS-232 to ZigBee Converter (Slave)
ZB-2571-T	Ethernet/RS-485/RS-232 to ZigBee Converter (Slave) (CE/FCC/FCC ID)
ZB-2571-PA	Ethernet/RS-485/RS-232 to ZigBee Converter (Slave) (long range)
ZB-Repeater	
ZB-2510	ZigBee Repeater
ZB-2510-T	ZigBee Repeater (CE/FCC/FCC ID)
ZB-2510-PA	ZigBee Repeater (long range)
ZigBee AIO	
ZB-2015-T	Wireless 6-ch RTD Input Module with 3-wire RTD Lead Resistance Elimination (CE/FCC/FCC ID)
ZB-2017-T	Wireless 8-ch Analog Input Module with High Voltage Protection (CE/FCC/FCC ID)
ZB-2017C-T	Wireless 8-ch Current Input Module with High Common Voltage Protection (CE/FCC/FCC ID)
ZB-2018-T	Wireless 8-ch Analog Input Module with High Voltage Protection (CE/FCC/FCC ID)
ZB-2024-T	Wireless 4-ch Voltage/Current Output Module (CE/FCC/FCC ID)
ZB-2026-T	Wireless 4-ch Voltage Input, 2-ch Voltage Output and 2-ch Digital Output Module (CE/FCC/FCC ID)
ZigBee DIO	
ZB-2042-T	Wireless 4-ch PhotoMOS Relay Output and 4-ch Open Collector Output Module (CE/FCC/FCC ID)
ZB-2043-T	Wireless 14-ch Isolated Digital Output Module (CE/FCC/FCC ID)
ZB-2052	Wireless 8-ch Isolated Digital Input Module with 16-bit Counters
ZB-2052-T	Wireless 8-ch Isolated Digital Input Module with 16-bit Counters (CE/FCC/FCC ID)
ZB-2053-T	Wireless 14-ch Isolated Digital Input Module (CE/FCC/FCC ID) (long range)
ZB-2060	Wireless 6-ch Isolated Digital Input and 4-ch Relay Output Module
ZB-2060-T	Wireless 6-ch Isolated Digital Input and 4-ch Relay Output Module (CE/FCC/FCC ID)
ZB-2060-PA	Wireless 6-ch Isolated Digital Input and 4-ch Relay Output Module (long range)