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	5 dBi Omni-Directional antenna
	antenna	
Transmission Range	100 m (LOS)	Typical for 700 meters, up to 1 km (LOS)
Setting Interface	1	
USB	Type B	
Included Cables	CA-USB18 (1.8 M Cable) x 1; 0	JSB 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/Vist	a/Linux 2.6.19
LED Indicators	· · · · · · · ·	
ZigBee Net State	Green	
ZigBee RxD	Yellow	
Power	Red	
Power		
Protection	Power reverse polarity protect	ion.
EMS Protection	ESD, Surge, EFT	
Required Supply	$+10 V_{DC} \sim +30 V_{DC}$	
Voltage		
Power Consumption	1.5 W	3 W
Connection	3-pin 5.08 mm Removable Ter	minal Block.
Mechanical		
Casing	Plastic	
Flammability	UL 94V-0 materials	
Dimensions ($W \times L \times$	33 mm × 78 mm × 107 mm	
H)		
Installation	DIN-Rail	
Environment		
Operating	-25 °C ∼ +75 °C	
Temperature		
Storage Temperature	<u> -40 ℃ ~ +80 ℃</u>	
Relative Humidity	<u> 5 ~ 95 % RH, non-condensing</u>]

3.1 Internal I/O Structure





3.2 Appearance



3.3 Dimensions (Units: mm)



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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	Each repeater uses a unique routing path to forward data. The repeater path needs to be
Mode	pre-configured.
(Typical)	Refer to User-defined Route Mode
	If a problem occurs on the current routing
User-defined Route	path, data will be automatically switched to another routing path. Two routing paths can
Mode	be configured.
(Back-up Route)	<u>Refer to User-defined Route Mode with a</u> <u>back-p Route</u>

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	
Repeater forwarding data					
received from the ZigBee	00 ^(*b)	01	02	03	
device ^(*a)					

13	14
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 **ZB-2510 Series User Manual, Ver. 1.2 Page 10** 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	
Repeater forwarding data					
received from the ZigBee	00	01	02	03	
device					
Back up repeater ID	-	15	16	17	

	13,27	14,28
•	12	13
	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.
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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.

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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: <u>http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb_2510/driver/</u>
- 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.

Softwar	e Installation
♪	The software you are installing has not passed Windows Logo testing to verify its compatibility with Windows XP. (<u>Tell me why</u> <u>this testing is important.</u>)
	Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the software vendor for software that has passed Windows Logo testing.
	Continue Anyway STOP Installation

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

ZB-2000 Driver Installer Program		
	InstallShield Wizard Complete	
	The InstallShield wizard has successfully installed the ZB-2000 driver. Please click the Finish button to exit the wizard.	
	If you have plugged the ZB-2000 device on PC before running this setup, please unplug and then plug the cable again for system detection.	
< Back Finish Cancel		

5.2 Installing the Hardware and Driver

1. Hardware Installation:



 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.

Found New Hardware Wizard		
	Welcome to the Found New Hardware Wizard Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission). Read our privacy policy	
	Can Windows connect to Windows Update to search for software? Yes, this time only Yes, now and every time I connect a device No, not this time Click Next to continue.	
	< Back Next > Cancel	

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.

Found New Hardware Wizard		
This wizard helps you install software for: ZB-2000 If your hardware came with an installation CD or floppy disk, insert it now. What do you want the wizard to do? Install the software automatically (Recommended) Install from a list or specific location (Advanced)		
Click Next to continue.		
< Back Next > Cancel		

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.

Found New Hardware Wizard		
Please choose your search and installation options.		
Search for the best driver in these locations.		
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.		
Search removable media (floppy, CD-ROM)		
Include this location in the search:		
E:\N apdos\ZigBee\ZigBee_Repeater Browse		
O Don't search. I will choose the driver to install.		
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.		
< Back Next > Cancel		

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.

Found New Hardware Wizard		
	Completing the Found New Hardware Wizard The wizard has finished installing the software for: ZB-2000	
	< Back Finish Cancel	

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.

System Re	estore	Automa	itic Updates	Remote
General	Compute	er Name	Hardware	Advanced
Device Man	ager			
	he Device Mar	nager lists all	the hardware devi	ces installed
X or	n your compute operties of any	r. Use the D device.	evice Manager to (change the
	- N		Device	lanagar
			Device	lanayer
Drivers				
Drivers	river Signing le	ts you make	sure that installed (drivers are
Drivers Di co	river Signing le ompatible with \ w Windows or	ts you make Windows. W	sure that installed (indows Update let: /indows Update for	drivers are s you set up r drivers
Drivers Discontinue Discontinue	river Signing le ompatible with \ ow Windows co	ts you make Windows. W onnects to W	sure that installed (indows Update let: /indows Update fo	drivers are s you set up r drivers.
Drivers Di cri ho	river Signing le ompatible with \ ow Windows co Driver Sig	ts you make Windows, W onnects to W gning	sure that installed (indows Update let: /indows Update fo Windows	drivers are s you set up r drivers. Update
Drivers Di cc hc	river Signing let ompatible with Y ow Windows or Driver Sig	ts you make Windows. W onnects to W gning	sure that installed (indows Update let: /indows Update fo Windows	drivers are s you set up drivers. Update
Drivers Drivers cc hc Hardware P	river Signing lei ompatible with \ ow Windows or Driver Sig rofiles	ts you make Windows. W onnects to W gning	sure that installed (indows Update let: /indows Update for Windows	drivers are syou set up r drivers. Update
Drivers Drivers Coc ho Hardware Pr di	river Signing lei ompatible with \ www.indows.co Driver Sig rofiles ardware profile fferent hardwar	ts you make Windows. W onnects to W ning s provide a v re configurati	sure that installed o indows Update let: /indows Update fo Windows)	drivers are s you set up drivers. Update
Drivers Drivers Control Hardware P Adi	river Signing lei ompatible with ' ow Windows or Driver Sig orfiles ardware profile fferent hardwar	ts you make Windows. W onnects to W gning s provide a v e configurati	sure that installed o indows Update let: /indows Update fo Windows // Windows // way for you to set u ions.	drivers are s you set up r drivers. Update p and store
Drivers Drivers Control Hardware Pi Adi	river Signing lei ompatible with ' ow Windows or Driver Sig orfiles ardware profile fferent hardwar	ts you make Windows. W onnects to W gning s provide a v e configurati	sure that installed of indows Update let: /indows Update for //indows Update for //windows	drivers are s you set up r drivers. Update p and store Profiles
Drivers Di cc hc hc hc hc hc hc hc hc hc hc hc hc h	river Signing le ompatible with ' bow Windows or Driver Sig offiles ardware profile fferent hardwar	ts you make Windows. W onnects to W ning s provide a v re configurati	sure that installed of indows Update let: indows Update for Windows	drivers are you set up drivers. Update p and store

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



5.3 Installing the Configuration Tool

- Download the file from: <u>http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb_2510/u</u> <u>tility/</u>
- 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 <u>Next</u>> button to continue the installation, or click <u>Cancel</u> exit the installation.

ZigBee_Configuration_Utility_Yer5.1.2 Setup	
Installation Folder Where would you like ZigBee_Configuration_Utility_Ver5.1.2 to be installed?	
The software will be installed in the folder listed below. To select a clocation, either type in a new path, or click Change to browse for an Install ZigBee_Configuration_Utility_Ver5.1.2 to:	different existing folder.
C:\ICPDAS\ZigBee_Configuration_Utility_Ver5.1.2	C <u>h</u> ange
Space required: 2.94 MB Space available on selected drive: 113.01 GB	
< <u>B</u> ack <u>N</u> ext >	<u>C</u> ancel

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



5. When the following screen is displayed, click the <u>Finish</u> button to finalize the software installation.



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5.4 Quick Configuration for the ZB-2510 Series

1. Hardware Installation:



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

💼 ICPDAS 🔹	TigBee_Configuration_Utility_Ver5.1.2	ы	Uninstall ZigBee_Configuration_Utility_Ver5.1.2
	Construction 224600 plants process plants 198000		ZigBee_Configuration_Utility_Ver_5.1.2

- 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.



	Normal-version	T-version	P-version	PA-version
Transmission power	9 dBm	4 dBm	22 ~ 24 dBm	22 ~ 24 dBm
	3 dBi	3 dBi	5 dBi	5 dBi
Antenna 2.4 GHz -	Omni-Directional	Omni-Directional	Omni-Directional	Omni-Directional
	antenna	antenna	antenna	antenna
Transmission range	100 m	100 m	700 m (Typical)	700 m (Typical)
(LOS)	100 m	100 m	1 km (Max.)	1 km (Max.)
ZB-100R/ZB-100T	Nie	Vec	Nie	Vec
Supported	INO	yes	INO	yes
Supports Max.	60	256	60	256
Slaves (Host)	00	200	00	200
Certification	No	CE/FCC,FCC ID	No	No

1. Version Comparison

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	20 sec
Interval	
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.

```
Network Presence Detection Interval Time:
0x 14 sec
```

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:



00 00 Main Route Path

00 00 Back-up Route Path

5. Setting Tool download location:

Website:

<u>http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb</u> _2510/utility/

CD path:

<u>\Napdos\ZigBee\ZigBee_Repeater\ZB_2510\Utility\</u>

6. Document download location:

Website:

http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb _2510/document/

CD path:

<u>\Napdos\ZigBee\ZigBee_Repeater\ZB_2510\Document\</u>

7. Driver download location:

Website:

http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_repeater/zb_2510/ driver/

CD path:

<u>\Napdos\ZigBee\ZigBee_Repeater\ZB_2510\Driver\</u>

- 8. ZigBee Products website: <u>http://www.icpdas.com/products/GSM_GPRS/wireless/solutions.htm#6</u>
- Technical Service: If you have any questions, send a description of your problem to: <u>service@icpdas.com</u>

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 Conver	ter
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	(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	(CE/FCC/FCC ID)
7B-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
Zigbee Dio	Wireless A-ch PhotoMOS Pelay Output and A-ch Open Collector Output Module
ZB-2042-T	(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)