NPort Z2150 Series User's Manual

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www.moxa.com/product

NPort Z2150 Series User's Manual

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Table of Contents

1

Introduction

The following topics are covered in this chapter:

❑ **Overview**
❑ **Package Checklist**
❑ **Product Features**
❑ **Product Specifications**
❑ **Serial Port Pin Assignments**

Overview

The NPort Z2150 provides a reliable wireless serial converter with support for serial-to-ZigBee communications. The following architecture is the application overview for the NPort Z2150. The Z2150 can act as ZigBee Coordinator, ZigBee Router, or ZigBee End Device. Any serial device can be connected by the Z2150 and exchange data via PAN.
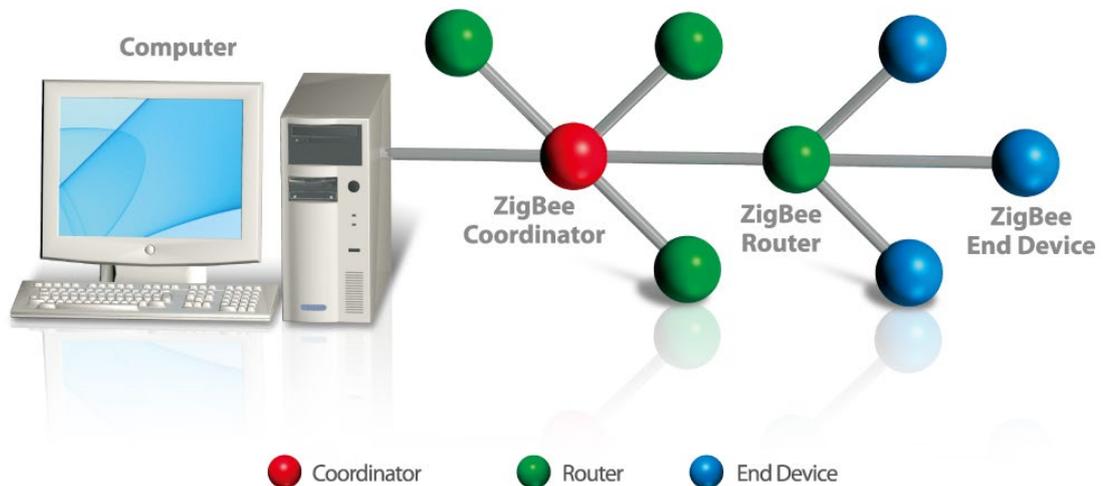
Package Checklist

Before installing the NPort Z2150, verify that the package contains the following items:

Standard Accessories

• NPort Z2150

• 2.4 GHz omni-directional antenna

• Documentation and software CD

• Quick installation guide (printed)

• Warranty card

Optional Accessories

• DK-35A: DIN-rail mounting kit (35 mm)

NOTE: Please notify your sales representative if any of the above items are missing or damaged

Product Features

• Instant connection of any serial device to a ZigBee network
• RS-232/422/485 ports supporting baudrates up to 230.4 kbps
• Friendly configuration with serial console
• Secure data access with AES
• Supports End Device, Router, and Coordinator roles.

Product Specifications

ZigBee Interface
RF Standard: 802.15.4/ZigBee compliant

Frequency Band: 2.4 GHz

RF Data Rate: 250 kbps

Rx sensitivity: -96 dBm

Tx Power: 4.5 dBm (Max)

Transmission Distance: Up tp 100 m (open space)

Antenna: 2 dBi

RF Channel: 16 channels

Device Type: Coordinator, Router, End Device

Network Topology: Star, Mesh, Cluster tree

Security: 128-bit AES encryption algorithms

Hardware
DIP Switch: Console/Operation Mode

SW1: Pull high/low resister, Termination for RS-422/485.

Reset Button: Reset to default

Serial Interface
Number of Ports: 1

Serial Standards: RS-232/422/485

Connector: DB9 male

Serial Line Protection: 1 kV surge protection

RS-485 Data Direction Control: ADDC (Automatic Data Direction Control)

Serial Communication Parameters
Data Bits: 8

Stop Bits: 1, 2

Parity: None, Even, Odd

Flow Control: RTS/CTS

Baudrate: 50 bps to 230.4 kbps

Serial Signals
RS-232: TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND

RS-422: TxD+, TxD-, RxD+, RxD-, GND

RS-485-4w: TxD+, TxD-, RxD+, RxD-, GND

RS-485-2w: Data+, Data-, GND

Software
Windows Real COM Drivers: Windows 95/98/ME/NT/2000, Windows XP/2003/Vista/2008/7/8/8.1/10 (x86/x64), Windows 2008 R2/2012/2012 R2 (x64), Windows Embedded CE 5.0/6.0, Windows XP Embedded

Configuration: ZigBee Configuration Utility

Firmware Upgrade: ZigBee Configuration Utility

Physical Characteristics
Housing: Aluminum

Weight: 340 g (0.75 lb)

Dimensions:

Without ears: 52 x 80 x 22 mm (2.05 x 3.15 x 0.87 in)

With ears: 75.2 x 80 x 22 mm (2.96 x 3.15 x 0.87 in)

Environmental Limits
Operating Temperature:

Standard Models: 0 to 55°C (32 to 131°F)

Wide Temp. Models: -40 to 75°C (-40 to 167°F)

Storage Temperature: -40 to 75°C (-40 to 167°F)

Ambient Relative Humidity: 5 to 95% RH

Power Requirements

Input Voltage: 12 to 48 VDC

Input Current: 45 mA @ 12 V

Connector: Power Jack with Screw

Standards and Certifications

Safety: UL 60950-1

EMC: EN 55032/24

EMI: CISPR 32, FCC Part 15B Class A

EMS:

IEC 61000-4-2 ESD: Contact: 4 kV; Air: 8 kV

IEC 61000-4-3 RS: 80 MHz to 1 GHz: 3 V/m

IEC 61000-4-4 EFT: Power: 1 kV; Signal:0.5 kV

IEC 61000-4-5 Surge: Power: 1 kV; Signal: 1 kV

IEC 61000-4-6 CS: 150 kHz to 80 MHz: 3 V/m; Signal: 3 V/m

IEC 61000-4-8 PFMF

IEC 61000-4-11 DIPs

Radio: CE (ETSI EN 301 893, ETSI EN 300 328, ETSI EN 301 489-1-17, ETSI EN 301 489-1)

Reliability

Automatic Reboot Trigger: Built-in WDT (watchdog timer)

MTBF (mean time between failures)

Time: 2,542,774 hrs

Standard: Telcordia (Bellcore) Standard TR/SR

Warranty

Warranty Period: 5 years

Details: See www.moxa.com/warranty

Serial Port Pin Assignments
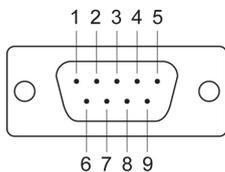
Pin	RS-232	RS-422/ RS-485 (4W)	RS-485 (2W)
1	DCD	TxD-(A)	–
2	RXD	TxD+(B)	–
3	TXD	RxD+(B)	Data+(B)
4	DTR	RxD-(A)	Data-(A)
5	GND	GND	GND
6	DSR	–	–
7	RTS	–	–
8	CTS	–	–
9	–	–	–

2

Getting Started

The following topics are covered in this chapter:

❑ **Overview**

❑ **Panel Layout**

❑ **LED Indicators**

❑ **DIP Switch**

❑ **Pull High/Low Resistors for RS-422/485**

❑ **Function Block**

❑ **Connecting the Hardware**

❑ **Connecting the Power**

❑ **Connecting to a Serial Device**

Overview

This chapter presents the hardware features of the NPort Z2150 and explains how to connect the hardware.

Panel Layout
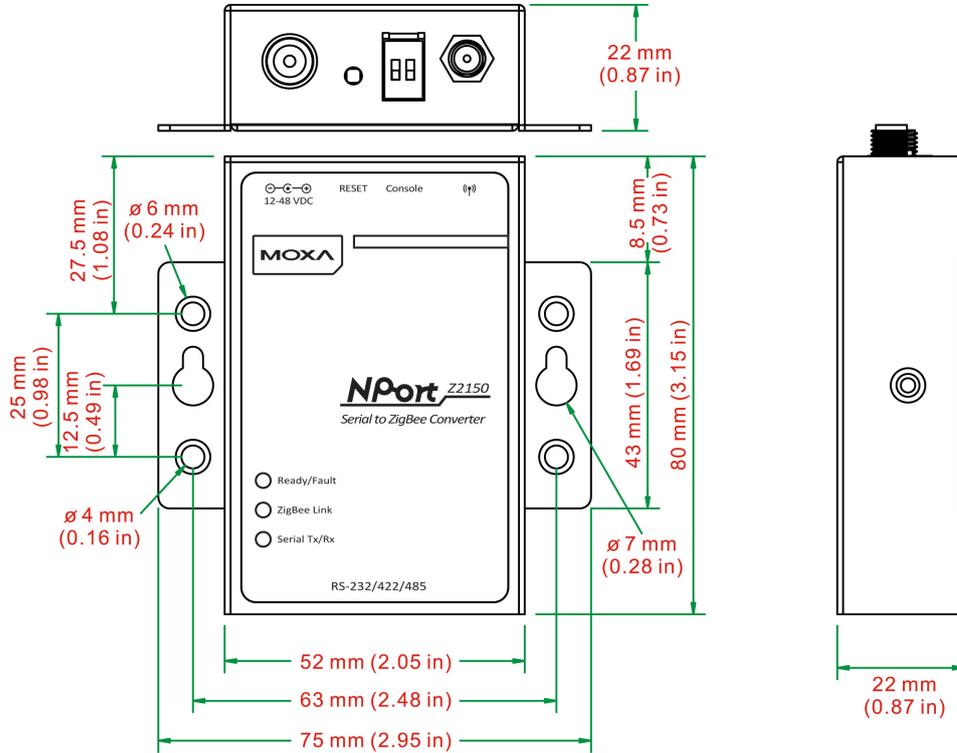
LED Indicators

There are three LEDs on NPort Z2150. The LED descriptions are as follows:

LED Name	LED Color	Descriptions	
Ready	Green	On:	System power on
		Flashing:	1) Device locating
			2) Reset button pushed down
Fault	Red	On:	System power on
		Flashing:	1) If ZigBee LED is off, it means Node ID conflict
			2) If ZigBee LED is on, it means Destination Node ID disappeared
ZigBee	Green (Coordinator)	On:	Initialized ZigBee PAN successfully
		Blinking:	ZigBee Tx/Rx
		Off:	Initialized ZigBee PAN fail
	Green (Router)	On:	Joined ZigBee PAN successfully
		Blinking:	ZigBee Tx/Rx
		Off:	Failed to join ZigBee PAN
	Green (End Device)	On:	Joined ZigBee PAN successfully
		Blinking:	ZigBee Tx/Rx
		Off:	Failed to join ZigBee PAN/Parent node removed.
Serial Tx	Green	Serial data output to serial port	
Serial Rx	Orange	Serial data input from serial port	

DIP Switch

Serial Connection	1
Console Mode	ON
Operation Mode	OFF

NOTE   **Reserved 2 for future usage.**

Pull High/Low Resistors for RS-422/485

You may need to set the pull high/low resistors when termination resistors are used for certain RS-422 or RS-485 environments.
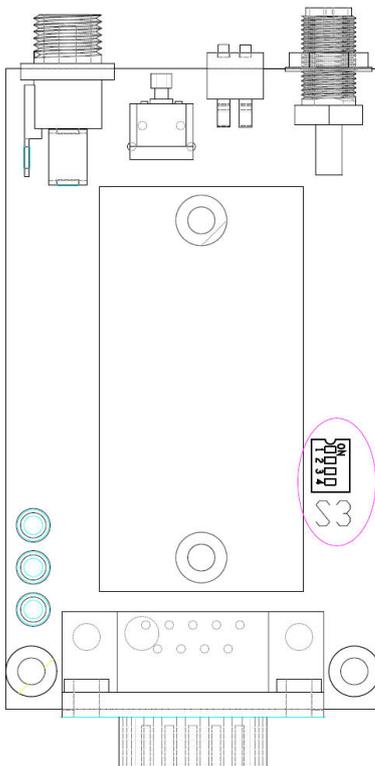
	SW	1	2	3	4
		Pull High	Pull Low	Terminator	Reserved
	ON	1KΩ	1KΩ	120KΩ	–
Default	OFF	150KΩ	150KΩ	–	–

⚠ **ATTENTION**

Do not use the 1 KΩ setting while in RS-232 mode. Doing so will degrade the RS-232 signals and reduce the effective communication distance.

Function Block
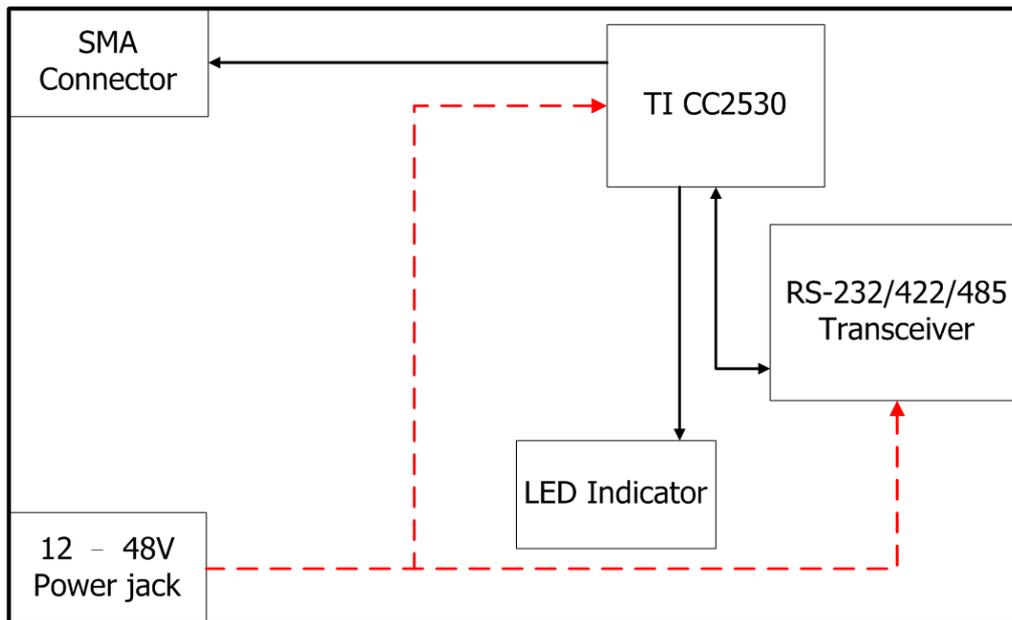
Connecting the Hardware

⚠️ **ATTENTION**

Before connecting the hardware, follow these important wiring safety precautions:

Disconnect power source

Do not install or wire this unit or any attached devices with the power connected. Disconnect the power before installation by removing the power cord before installing and/or wiring your unit.

Follow maximum current ratings

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size.

If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

Use caution - unit may get hot

The unit will generate heat during operation, and the casing may feel hot to the touch. Take care when handling unit. Be sure to leave adequate space for ventilation.

The following guidelines will help ensure trouble-free signal communication with the NPort.

- Use separate paths to route wiring for power and devices to avoid interference. Do not run signal or communication wiring and power wiring in the same wire conduit. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.
- Keep input wiring and output wiring separate.
- Label all wiring to each device in the system for easier testing and troubleshooting

Connecting the Power

Connect the VDC power line (12 to 48 V) to the NPort's power jack. If power is properly connected, the "Ready" LED will initially glow red. When the system is ready, the "Ready" LED will turn green.

Connecting to a Serial Device

Use a serial cable to connect your serial device to the serial port on the NPort.

2-5

3

Installing and Configuring the Software

The following topics are covered in this chapter:

❏ **Overview**

❏ **ZigBee Configuration Utility**

❏ **Configuring NPort Device**

❏ **Import/Export**

❏ **Upgrading NPort Firmware**

❏ **Refresh**

❏ **Options**

Overview

This chapter describes how to install and use the ZigBee Configuration Utility. These items are located on the Documentation & Software CD that is provided with the NPort Z2150.

ZigBee Configuration Utility is a utility for the management of NPort device servers over serial ports. You may also use ZigBee Configuration Utility to upgrade the firmware.

ZigBee Configuration Utility

Installing ZigBee Configuration Utility

1. The main installation window will open when you insert the Document & Software CD. Click **[INSTALL UTILITY]** to proceed. Once the program starts running, click **[Yes]** to proceed.
2. The installation wizard will open. Click **[Next]** to proceed.
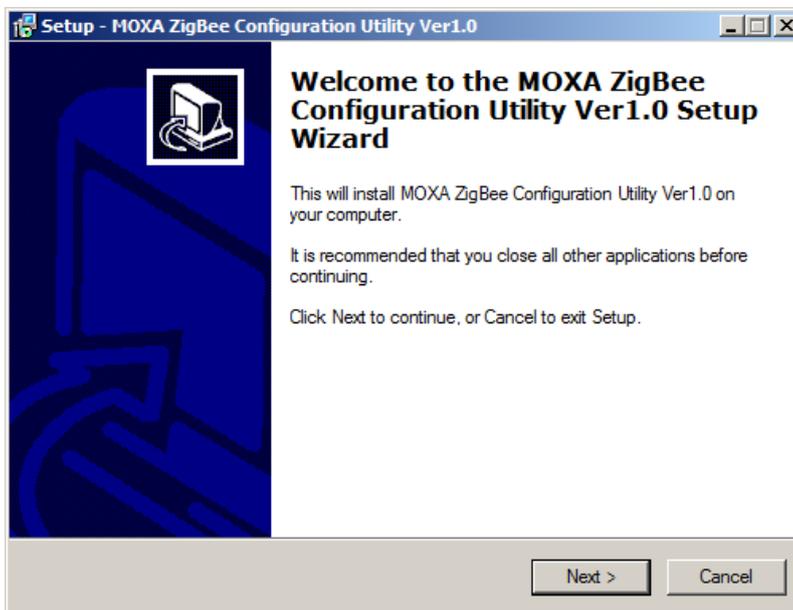
3. Select a destination directory and click **[Next]** to proceed.
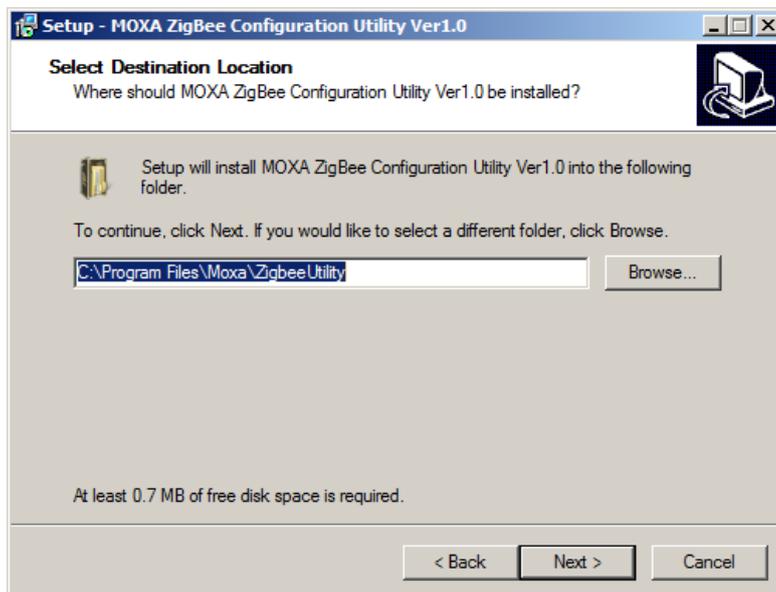
4. Verify the installation parameters and click **Install** to proceed.
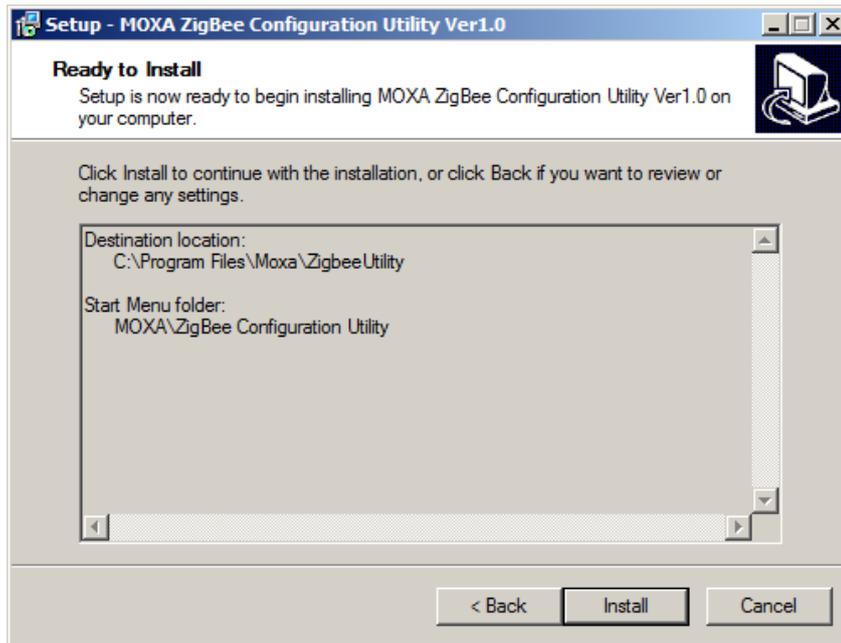
5. The wizard will begin installing the files. After the files have been installed, click **[Finish]** to complete the installation.
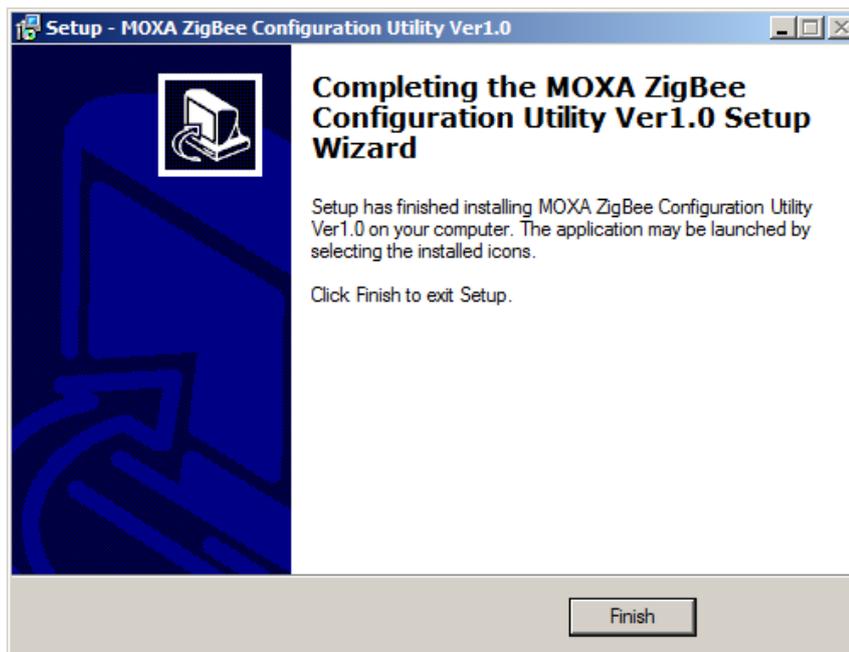
Finding NPort Z2150 Series on Serial

You can use **ZigBee Configuration Utility** to look up or set configuration settings of any NPort on the serial. All NPort units with SW1 ON (in Console mode) that are connected to the serial COM port of a PC can be found and configured.

1. In ZigBee Configuration Utility, click **Add** on the main toolbar.
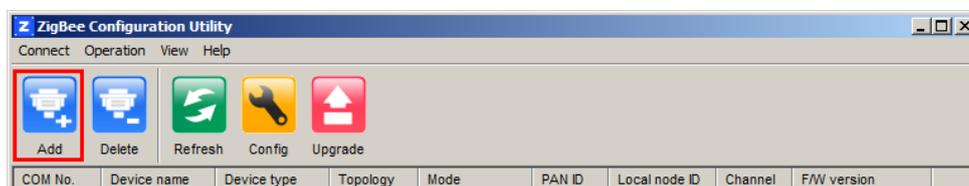
2. Select the COM port number which is connected to the NPort device, and click **Connect** to find device. In addition, you can select multiple target COM ports.
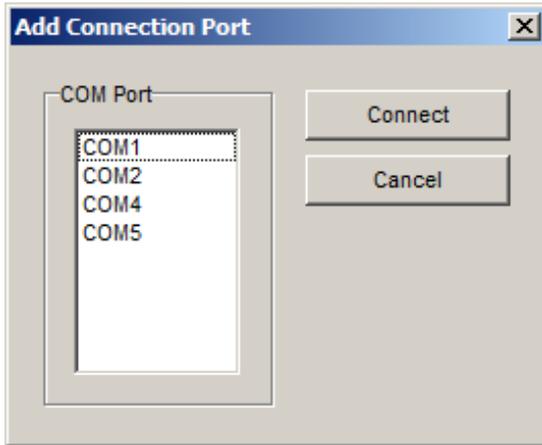
3. The utility will search for NPort device servers.
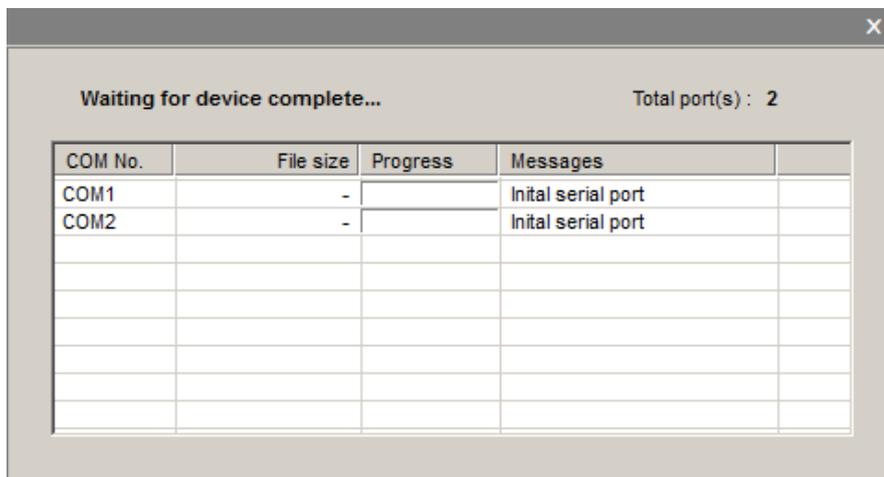
4. When the search is complete, NPort units that were found will be listed in the main window.
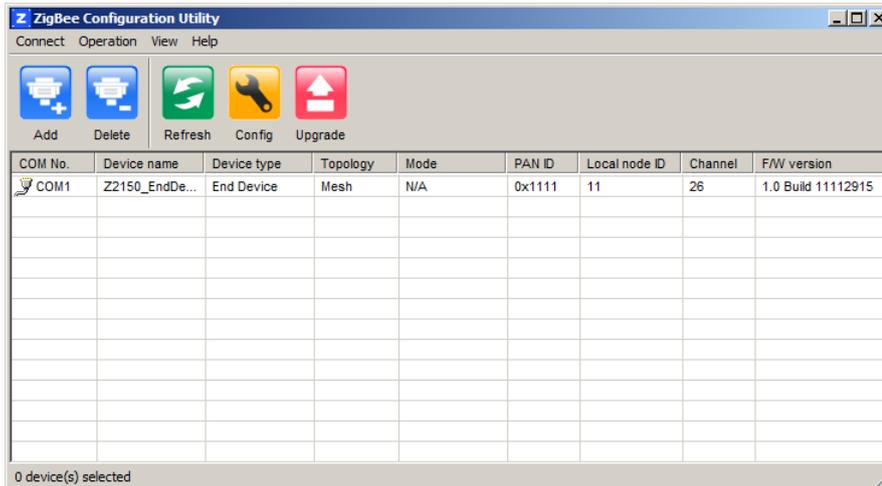
Removing target COM port

After configuring the NPort device, you might want to remove the target COM port from the device list.

1. Select the devices which you would like to remove. You can select multiple ports
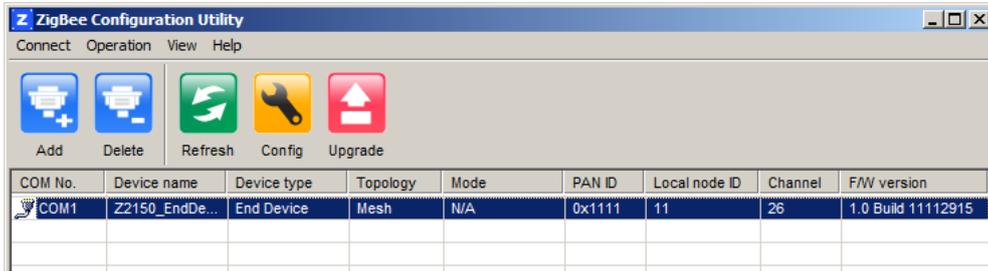
2. Click **Delete** on the main toolbar.
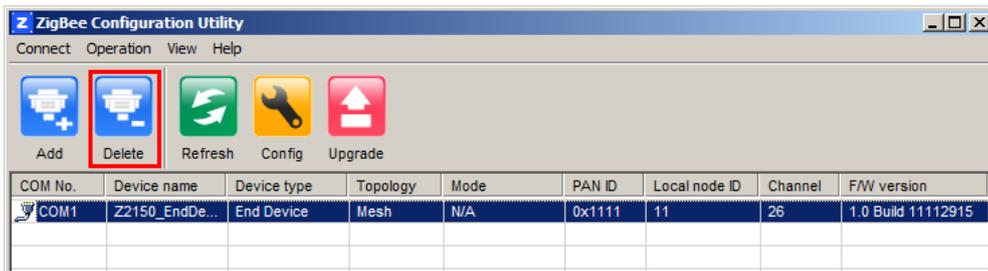
3. Click **Yes** to confirm you want to delete these selected COM port. If you want to cancel the action, click **No**.
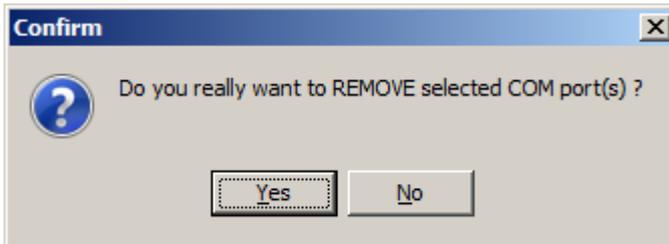
4. The selected COM ports will be removed from the device list.
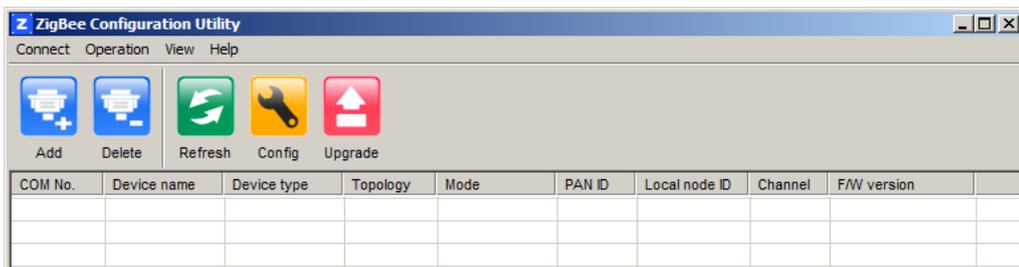
Configuring NPort Device

1. Once ZigBee Configuration Utility has found NPort device servers on the serial, you can modify any unit's configuration. Select the desired NPort in the main window and click **Config** on the main toolbar
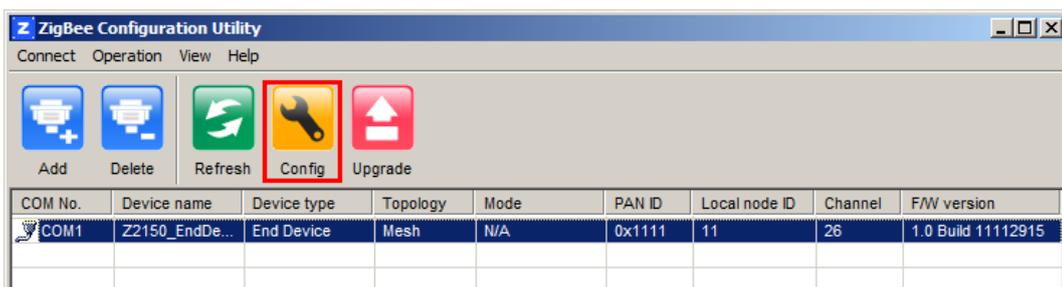
2. In the **General** tab, you can change the device name. It acts like a nickname for the target NPort device.
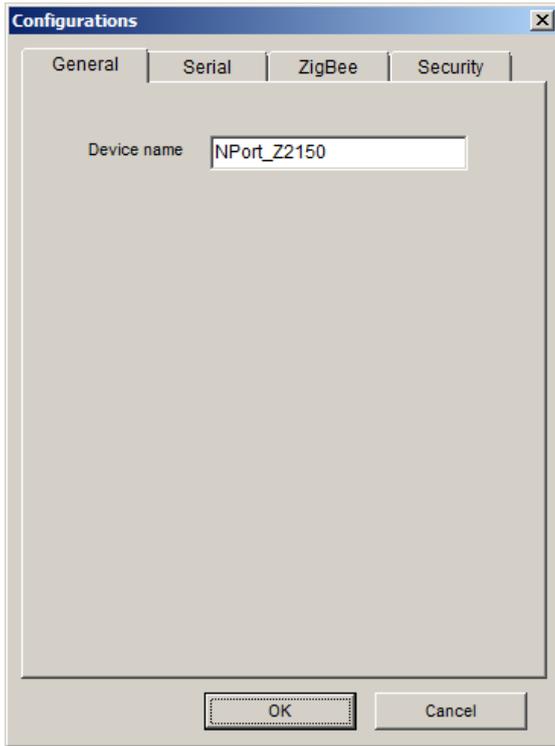
3. In the **Serial** tab, you can configure Baud Rate, Parity, Stop Bit, and Interface Mode.

Serial Port	Description
Baud Rate	50 bps to 230400 bps
Parity	None, Odd, Even
Data Bits	8
Stop Bits	1, 2
Interface	RS-232, RS-422, RS-485
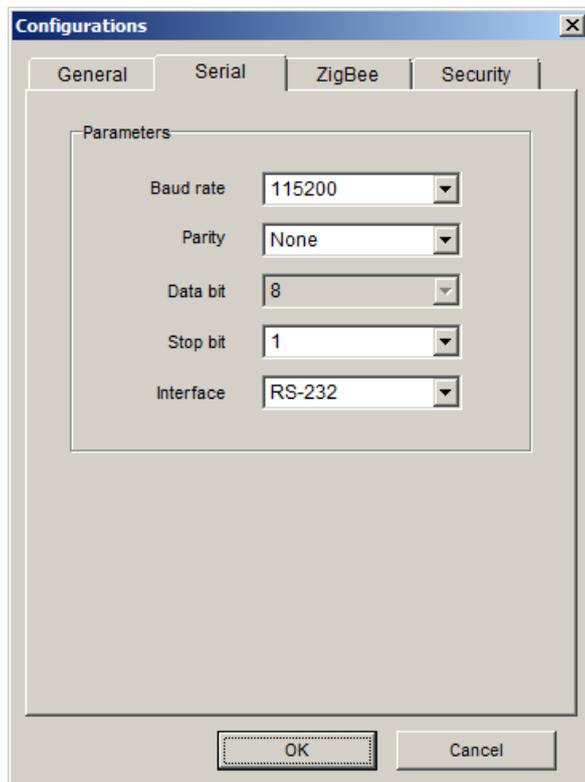
4. In the **ZigBee** tab, you can configure ZigBee parameters. The details of parameters are in the table below.

Parameter		Description
Device type		The device can take three different device types: Coordinator, Router, and End Device.
PAN ID		The PAN identifier. The range is from 0 to 0xFFFD.
Channel		The 2.4GHz channel. The range is from 11 to 26.
Topology		Supports three kinds of topology: Star, Tree and Mesh.
Output power		Supports -20, -16, -12, -8, -4, -1.5, 1, 4.5 dBm. Default value is 4.5
Device Type	**Advanced Settings**	**Description**
Router/ End Device	Local node ID	The identifier for each ZigBee node. The range is from 0 to 99. (Default value is 0 for a Coordinator of NPort Z2150 or Z3150)
	Destination Node ID	Assign the identifier of desired ZigBee node. The range is from 0 to 99.
Coordinator	Mode	Transmission mode: Transparent or Addressable Transparent: All data comes in via the serial port, Coordinator will broadcast to the desired ZigBee node. Addressable: All data comes to the Coordinator via the serial port, the Coordinator will send to the desired ZigBee node directly.
	Start Byte	The head of addressable mode command format on Coordinator. Default value is # (0x23)
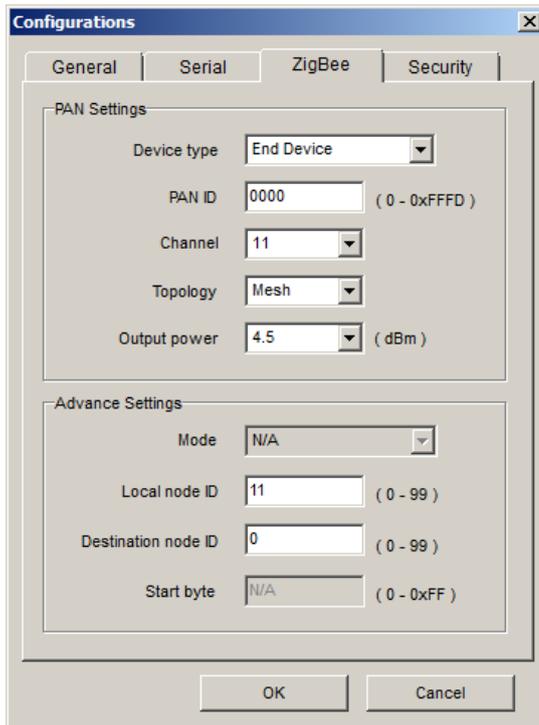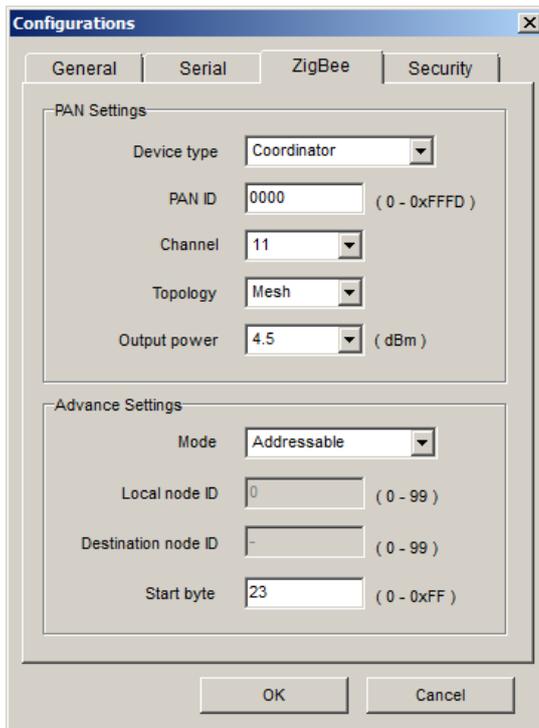
5. On the **Security** tab, you can enable 128-bit AES encryption for Zigbee security. After enabling security, you must enter the 16-byte key with a combination of 32 HEX codes (from 0-9, A-F) for AES encryption. Finally, click **OK** to enable the new configuration.

6. The selected NPort will be restarted by ZigBee Configuration Utility with the new configuration.
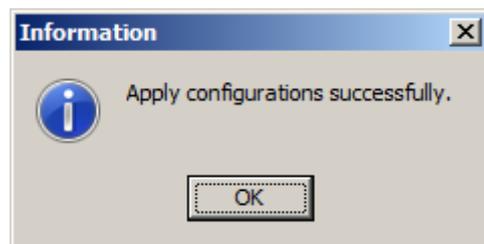
Import/Export

Exporting a Configuration

1. Once ZigBee Configuration Utility has found NPort device servers on the serial port, you can export any unit's configuration. Right-click the desired NPort in the main window and select Export.
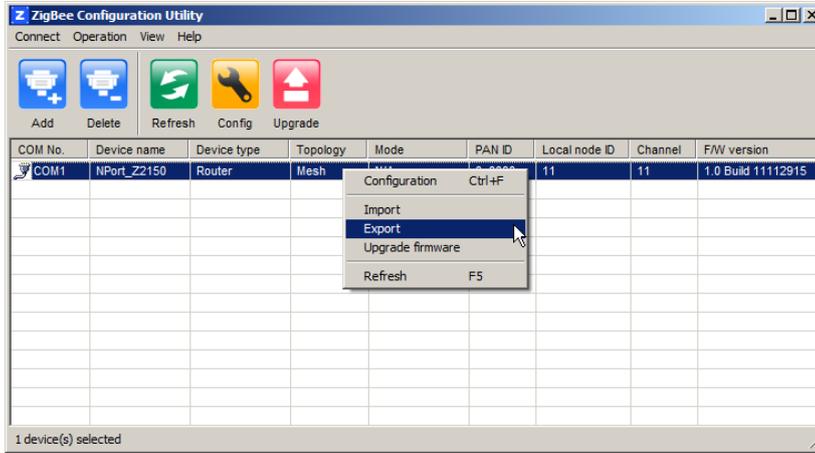
2. Select the export directory and click **OK** to proceed.
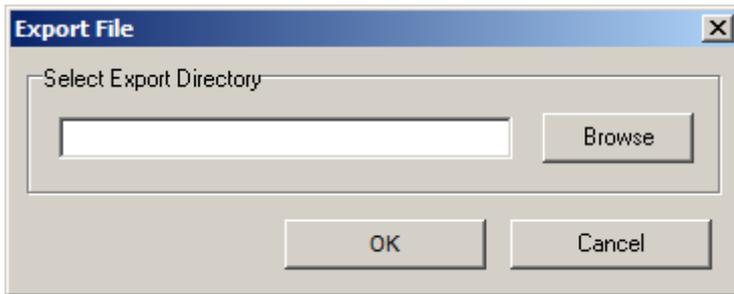
3. A message will pop up confirming a successful export.
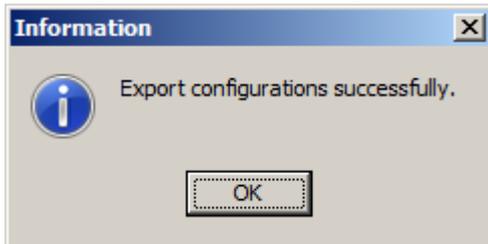
4. The configuration file will be saved in the .txt format.
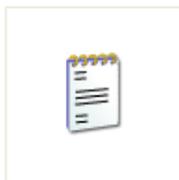
Importing a Configuration

1. Once ZigBee Configuration Utility has found NPort device servers on the serial port, you can import a config file to any unit. Right-click the desired NPort in the main window and select **Import**.
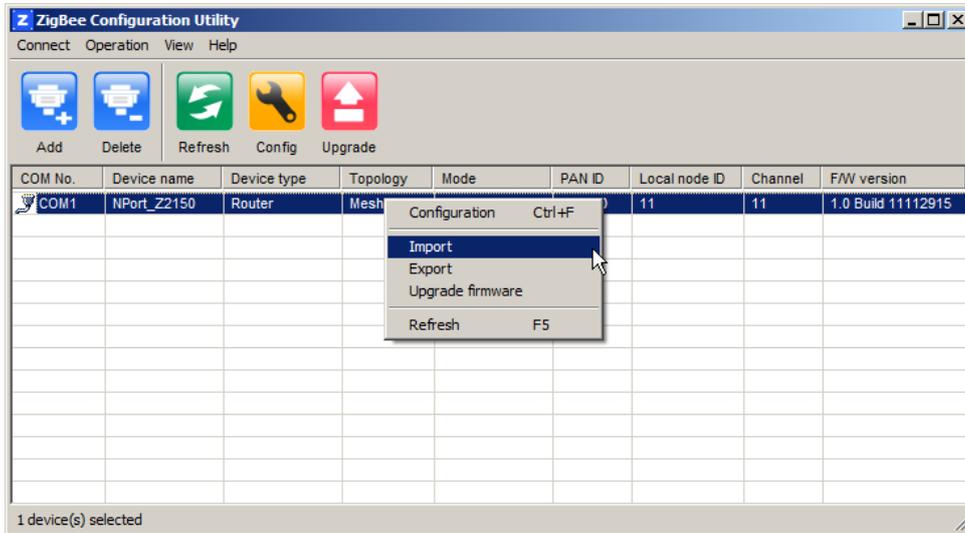
Select the file to import and click OK to proceed.
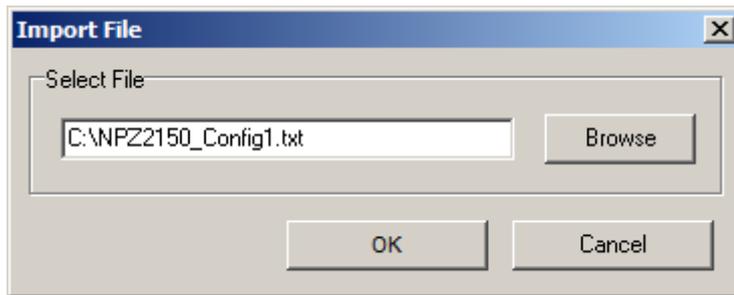
If you import the configuration file successfully, the following message will pop up.

Upgrading NPort Firmware

Once ZigBee Configuration Utility has found NPort device servers on the serial port, you can upgrade any unit's firmware.

1. Select the desired NPort in the main window and click **Upgrade firmware**.
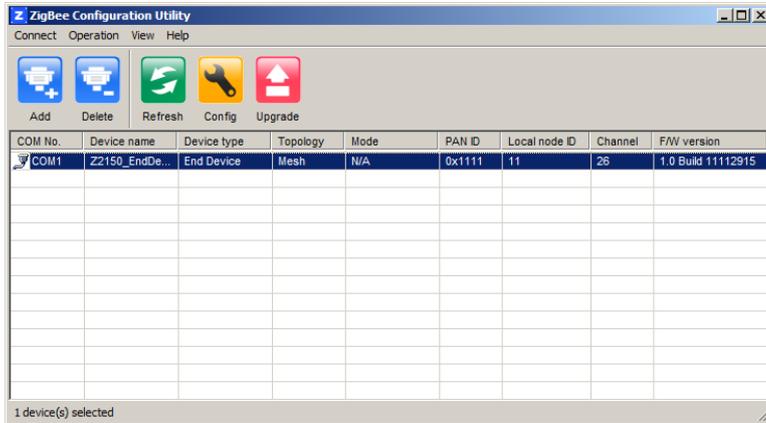
Select the new firmware file and click OK to proceed. To obtain the latest firmware for the NPort Z2150, visit www.moxa.com.
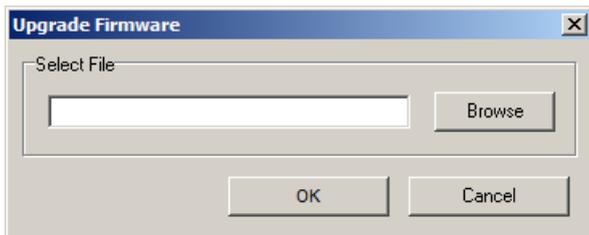
The utility will begin upgrading the firmware for the selected unit. Do not disconnect or power off the unit while the firmware is being upgraded.
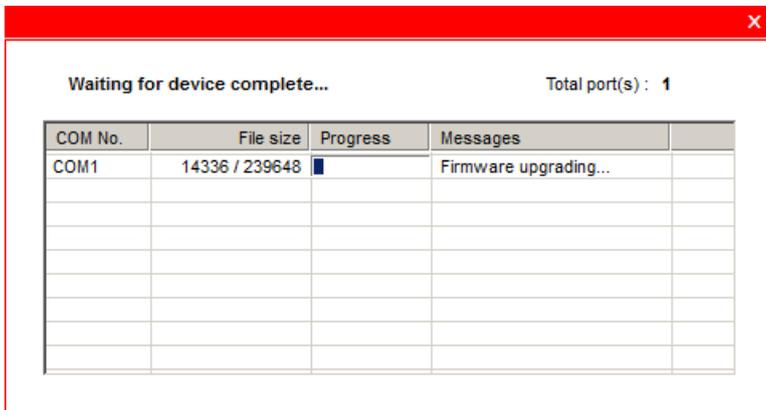
2. When the displayed status is "OK".
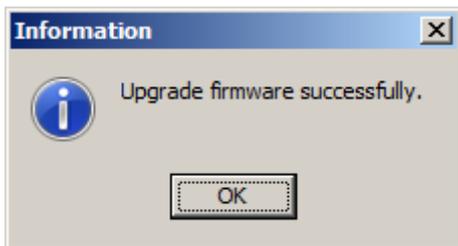
⚠️ **ATTENTION**

ZigBee Configuration Utility supports upgrading the firmware of multiple units simultaneously.

Refresh

1. Once ZigBee Configuration Utility has found NPort device servers on the serial port, you can monitor all unit statuses manually. Right-click the desired NPort in the main window and select Refresh.
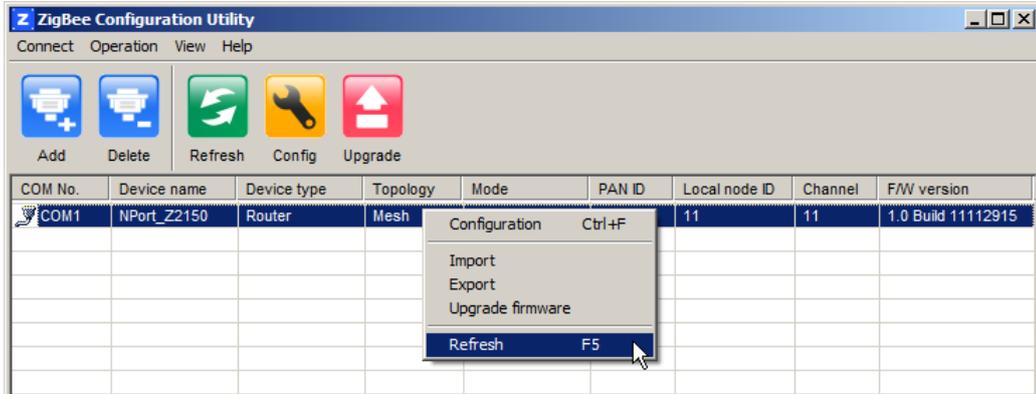
2. After clicking the Refresh button, the desired NPort device will update its information. This way, you can monitor the status of devices. Moreover, the monitor items is defined to what you selected in the Option window.

Options

1. In ZigBee Configuration Utility, click **View → Options** on the menu bar.
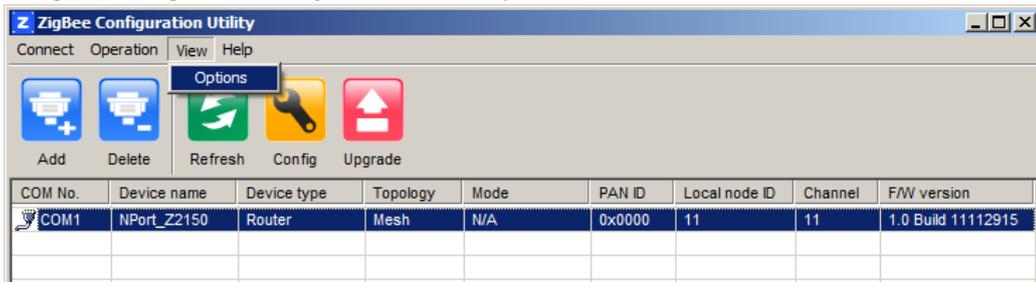
2. Select or de-select items. Use the single arrowhead buttons to move highlighted items from one box to the other. Use the double arrowhead buttons to move all items in one box to the other.

A
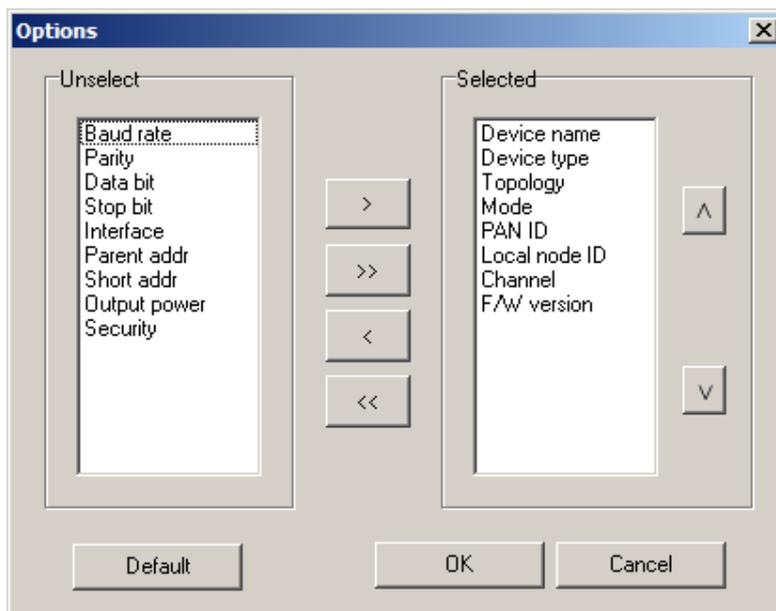
ZigBee Introduction

The ZigBee standard is a set of low-data-rate, short-range wireless networking communication protocols. ZigBee supports a maximum data rate of 250 kb/s and works in the 868 MHz, 915 MH and 2.4 GHz frequency bands. ZigBee is particularly common in battery-powered and energy-limited applications where those qualities are valued. In many ZigBee applications, the ZigBee wireless devices spend most of their time in power-saving or sleep mode, so they can go years between battery replacements.

Home patient monitoring is a good example of a typical ZigBee application. The heart rate and blood pressure sensors worn at home by patients are often connected to a worn ZigBee device that periodically transmit sensor data to a local server, such as a home PC, for initial analysis. The local server can then use an Internet connection to forward this medical data on to medical professionals for more detailed analysis.

Device Type

The ZigBee standard uses slightly different terminology:

ZigBee coordinator: An IEEE 802.15.4-2003 PAN coordinator.

ZigBee end device: An IEEE 802.15.4-2003 RFD or FFD participating in a ZigBee network, which is neither the ZigBee coordinator nor a ZigBee router.

ZigBee router: An IEEE 802.15.4-2003 FFD participating in a ZigBee network, which is not the ZigBee coordinator but may act as an IEEE 802.15.4-2003 coordinator within its personal operating space, that is capable of routing messages between devices and supporting associations.

Network Topology

The ZigBee network layer (NWK) supports star, tree, and mesh topologies. In a star topology, the network is controlled by one single device called the ZigBee coordinator. The ZigBee coordinator is responsible for initiating and maintaining the devices on the network. All other devices, known as end devices, directly communicate with the ZigBee coordinator. In mesh and tree topologies, the ZigBee coordinator is responsible for starting the network and for choosing certain key network parameters, but the network may be extended through the use of ZigBee routers. In tree networks, routers move data and control messages through the network using a hierarchical routing strategy. Tree networks may employ beacon-oriented communication as described in the IEEE 802.15.4-2003 specification. Mesh networks allow full peer-to-peer communication. ZigBee routers in mesh networks do not currently emit regular IEEE 802.15.4-2003 beacons. This specification describes only intra-PAN networks, that is, networks in which communications begin and terminate within the same network.

In the star topology, every device in the network can communicate only with the PAN coordinator. A typical scenario in a star network formation is that an device, programmed to be a PAN coordinator, is activated and starts establishing its network. The first thing this PAN coordinator does is select a unique PAN identifier that is not used by any other network in its radio sphere of influence—the region around the device in which its radio can successfully communicate with other radios. In other words, it ensures that the PAN identifier is not used by any other nearby network.
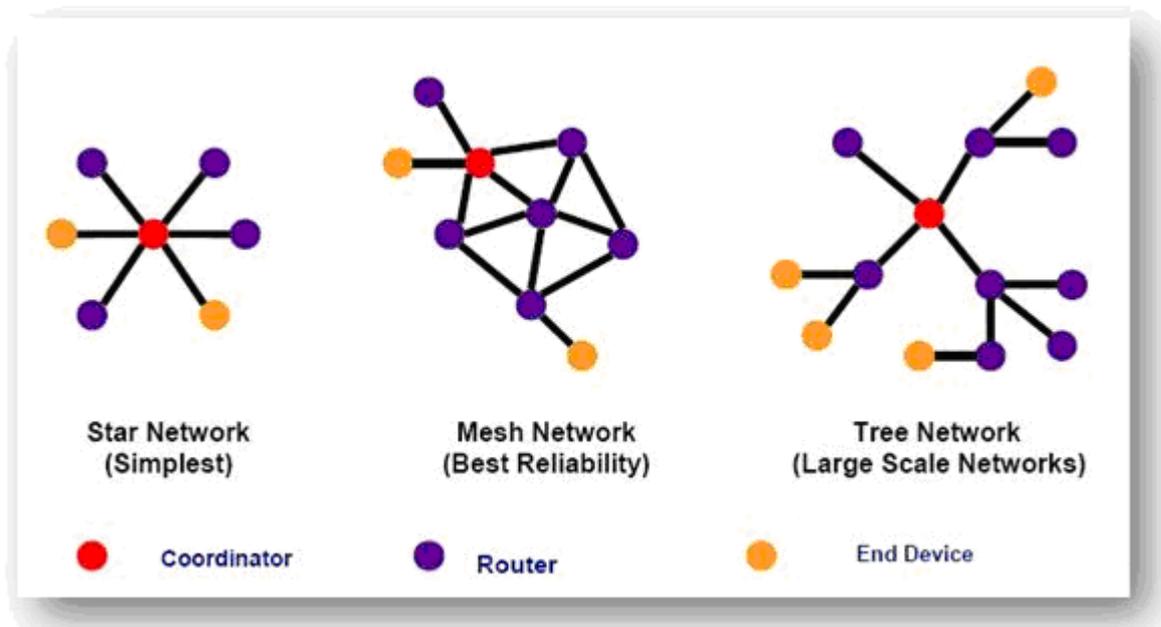
In a Mesh topology each device can communicate directly with any other device if the devices are placed close enough together to establish a successful communication link. Any devices in a peer-to-peer network can play the role of the PAN coordinator. One way to decide which device will be the PAN coordinator is to pick the first device that starts communicating as the PAN coordinator. In a peer-to-peer network, all the devices that participate in relaying the messages are devices because devices are not capable of relaying the messages. However, an device can be part of the network and communicate only with one particular device (a coordinator or a router) in the network.

ZigBee supports a tree topology. In this case, a ZigBee coordinator (PAN coordinator) establishes the initial network. ZigBee routers form the branches and relay the messages. ZigBee end devices act as leaves of the tree and do not participate in message routing. ZigBee routers can grow the network beyond the initial network established by the ZigBee coordinator.

NOTE	Please refer to the book: "ZigBee Wireless Networks and Transceivers"