How to use ZigBee applications in LinPAC?

Applies to:			No. L6-005
Platform	Classification	Kernel version	Classification
LinPAC series	LP-51xx: V1.8.3 or later LP-8x3x: V1.2 or later LP-8x4x: V1.16 or later Others: All versions	All versions	Linux Applications

ZigBee is a specification based on the IEEE 802.15.4 standard for wireless personal area networks (WPANs). ZigBee operates in the ISM radio bands and uses a basic master-slave configuration that is suited to the dynamic mesh networks of many infrequently used devices that talk via small data packets. Up to 256 nodes are allowed.

The LinPAC series supports the ZigBee protocol. We can use the ZT-USBC module as a ZigBee converter that allows the USB interface to be converted to a personal area ZigBee wireless network. Use the LP-8441 with the ZT-USBC module to connect to the ZT-2043 module as an example to demonstrate the application of ZigBee, as illustrated in Figure 1.

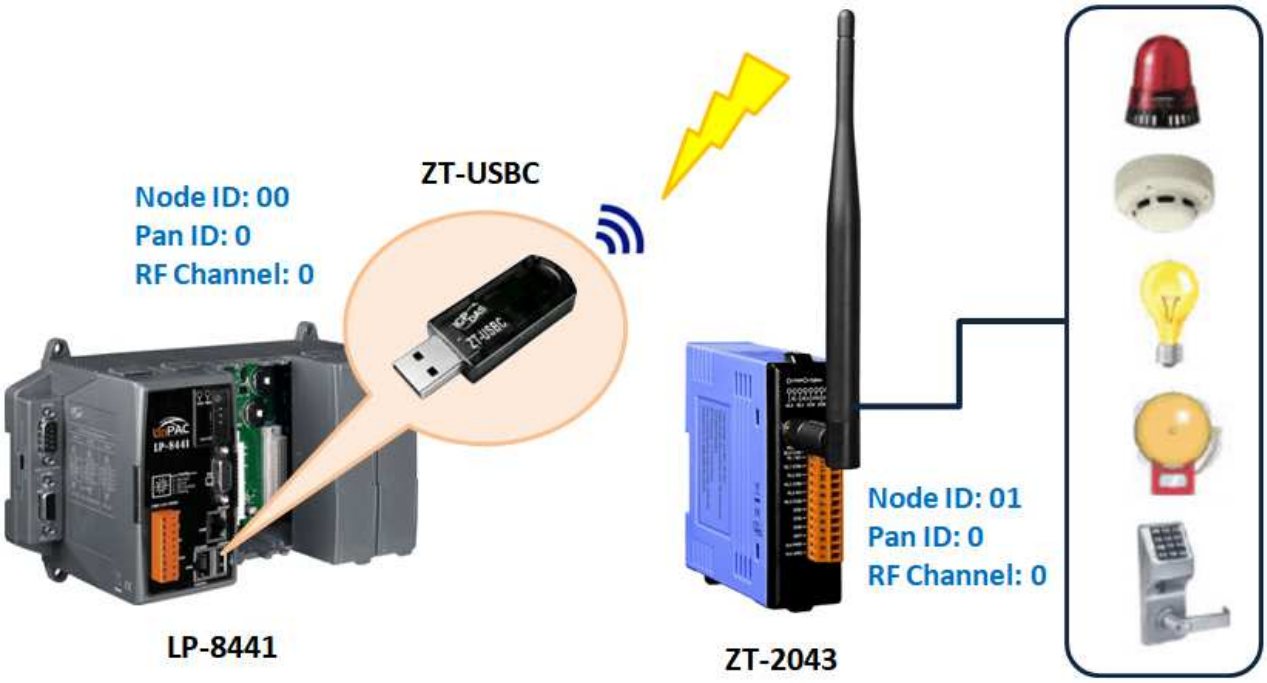


Figure 1. Application of Zigbee Technology using a LinPAC device

Refer to the following websites for more detailed information.

- ZT-USBC module: https://www.icpdas.com/en/product/ZT-USBC
- ZT-2043 module: https://www.icpdas.com/en/product/ZT-2043

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User can deploy ZigBee on the LinPAC series and configure it with the iztconfig.exe program, as illustrated in Figure 2.

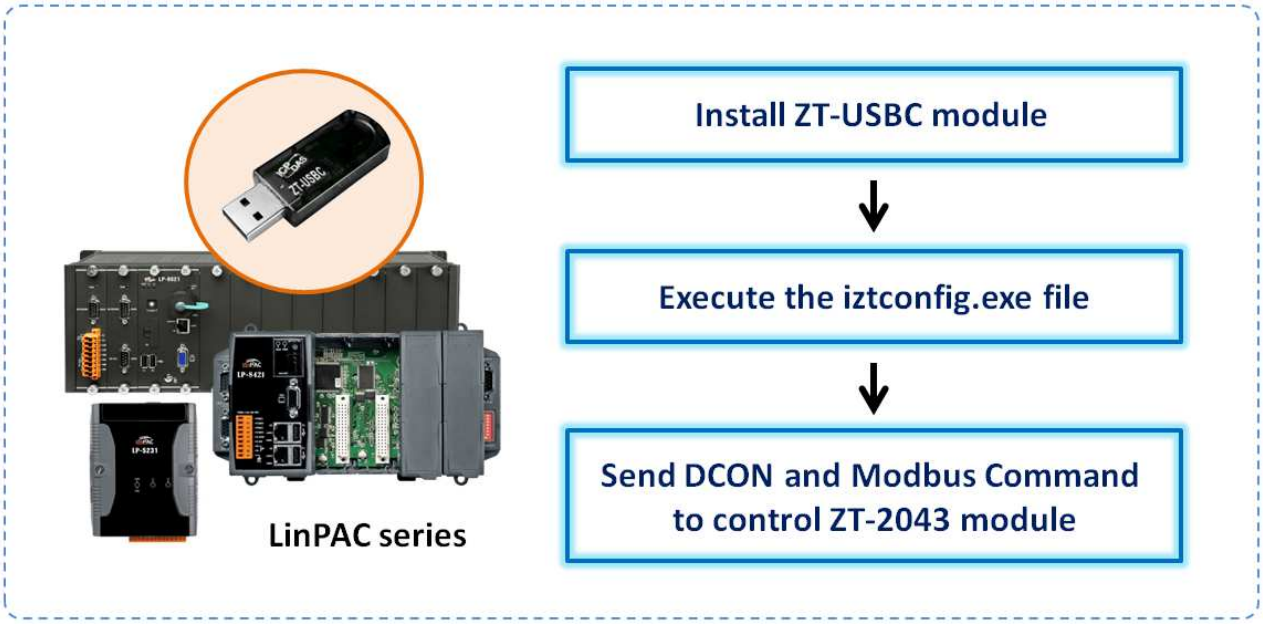


Figure 2. Flowchart illustrating how to configure ZigBee on a LinPAC device

Section 1: Install ZT-USBC module

The ZT-USB module is small-sized wireless ZigBee device that allows you to convert from a USB interface to a ZigBee wireless network. Install the ZT-USBC module on the LP-8441 module following the procedure described below:

Note: Before installing the ZT-USBC module, it is recommended that you first install the DCON Utility and the ZT2000 Configuration Utility on a Windows PC to configure both the ZT-USBC module and set the ZT-2043 module. For more detailed information, refer to ZT-USB series user manual, which you can download from:
https://www.icpdas.com/web/product/download/wireless/zigbee/converter/zt-usbc/document/manual/ZT-USB_Series_usermanual_en.pdf

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❒ Install the ZT-USBC driver

Before installing any drivers, you need to decide what version to use, as indicated in the table below:

Linux PAC(CPU/Linux kernel) \ Install Driver		usbserial.ko	ftdi_sio.ko
PXA270	Linux Kernel 2.6.19 (LP-51xx/8x4x)	√	√
	Linux Kernel 2.6.29 (LP-51xx/8x3x)	X	√
Am335x	Linux Kernel 3.2 (LP-22xx/52xx/8x2x/9x2x)	√	√
Others (X86…)	Linux Kernel 3.2	X	√
	Linux Kernel 4.14	X	√

Note: √= manually install; X= automatically installed at boot time

Step 1: Use the following command to check the kernel version, as illustrated in Figure 3.

Command: dmesg |grep "Linux version"*

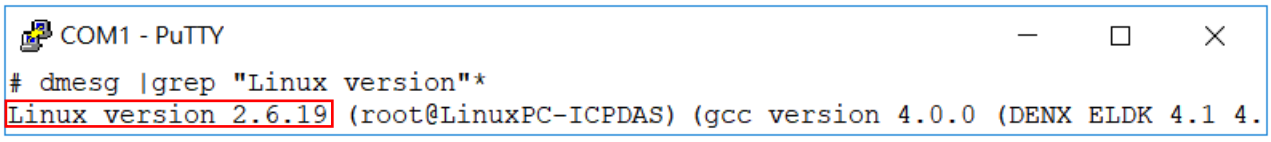


Figure 3. Identifying the Linux Kernel version number

Step 2: Use the following command to load the ZT-USBC driver into the kernel.

Command: sudo insmod /lib/modules/2.6.19/ftdi_sio.ko

Note: If the message '**Unknown symbol in module**' appears after installing ftdi_sio.ko (as illustrated in Figure 4), you need to install both **usbserial.ko** and **ftdi_sio.ko** into the kernel and then locate the USB serial port for the ZT-USBC module, as illustrated in Figure 5.

Command: sudo insmod /lib/modules/2.6.19/usbserial.ko
sudo insmod /lib/modules/2.6.19/ftdi_sio.ko

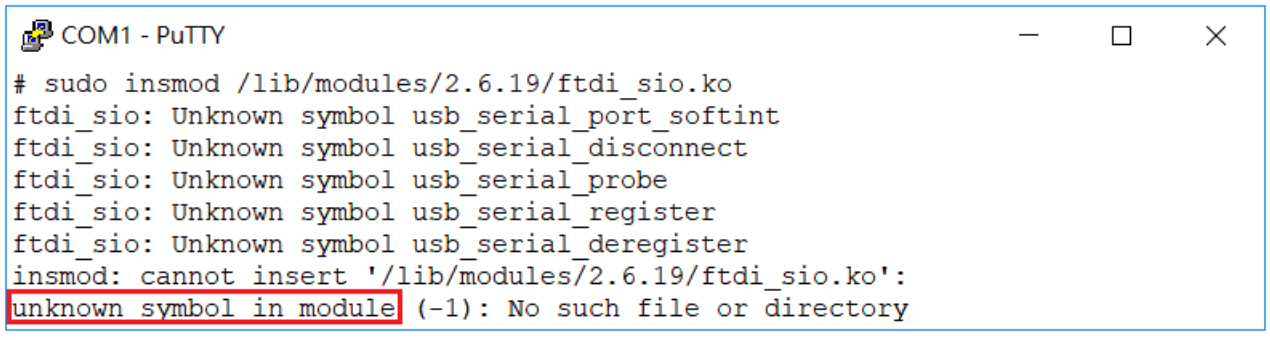


Figure 4. Failed to install ftdi_sio.ko

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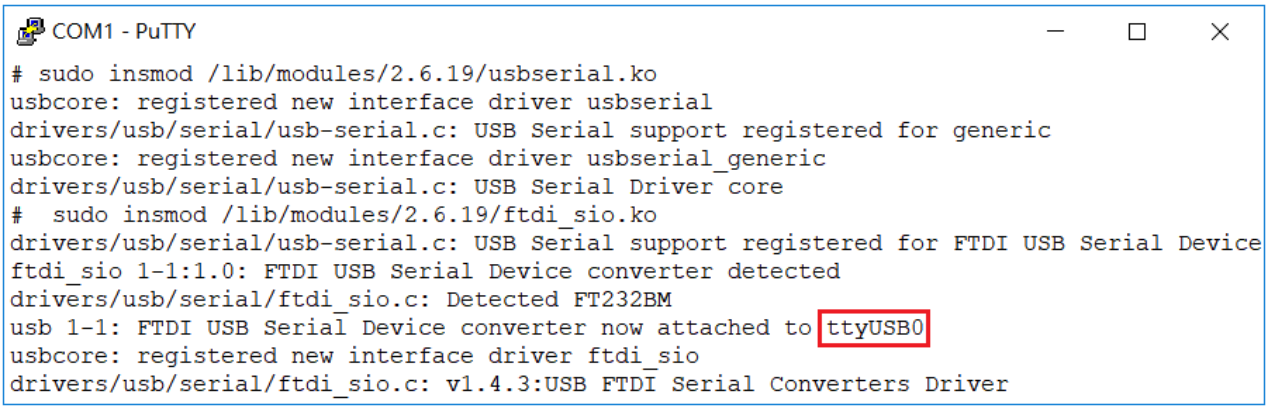


Figure 5. The default device port for the ZT-USBC module is 'ttyUSB0'

Step 3: Use the following command to verify that check kernel modules are loaded the ZT-USBC driver, as illustrated in Figure 6.

Command: lsmod

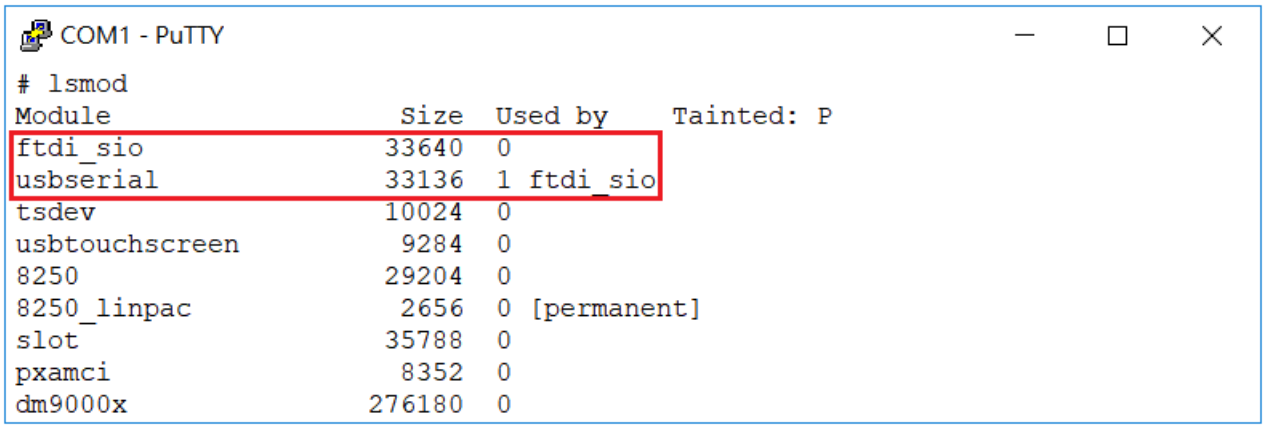


Figure 6. Display a list of loaded modules in the kernel

Step 4: Use the following command to verify that the Product ID and Vendor ID for the ZT-USBC device are written into the driver module, as illustrated in Figure 7.

Command: cat /proc/bus/usb/devices

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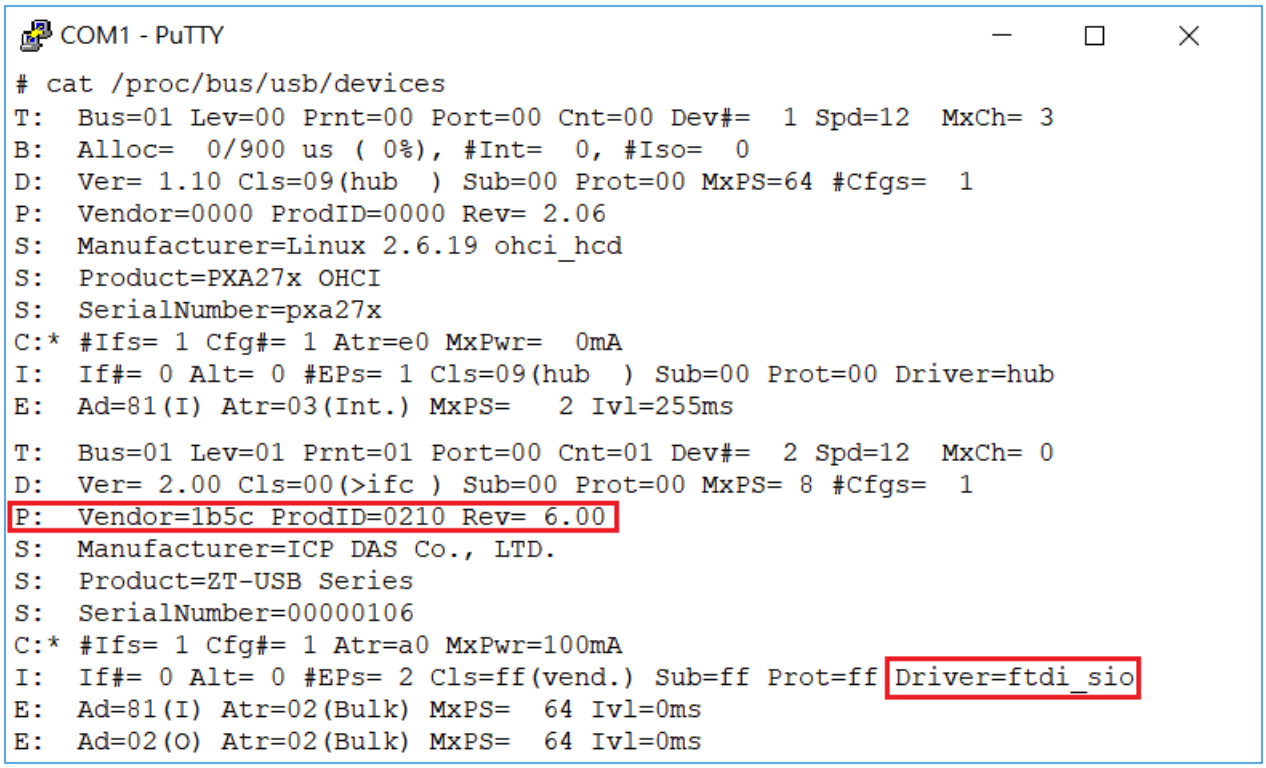


Figure 7. Verifying that a USB device is present

Note: If the version number for the LinPAC kernel is not **2.6.19**, you need to execute the command below to add the "Product ID" and "Vendor ID" once these steps are complete.

Command: echo "1b5c 0210" > /sys/bus/usb-serial/drivers/ftdi_sio/new_id

❒ Creating a symlink to the USB converter

To create a soft link to the device node of the ZT-USBC(/dev/ttyUSB0). For example, in order to communicate with the device via COM42 using the LinPAC SDK, you can remove /dev/ttyS40 and create a soft link for /dev/ttyUSB0 to /dev/ttyS40, as illustrated in Figure 8.

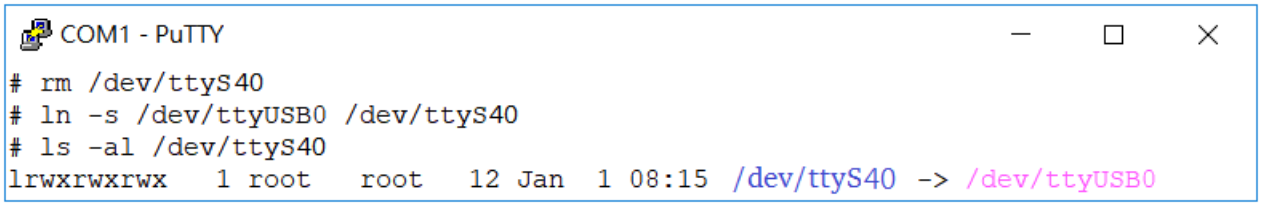


Figure 8. Creating a symlink between the ttyS40 and ttyUSB0

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Section 2: Execute the iztconfig.exe

The iztconfig.exe demo program illustrates how to configure the ZigBee wireless network. In this demo program, you set up the ZigBee wireless network in the LinPAC, which is described below:

❒ Use the following command to list the ZigBee configuration for the ZT-USBC module, as illustrated in Figure 9.

Command: iztconfig.exe -d <USB device>

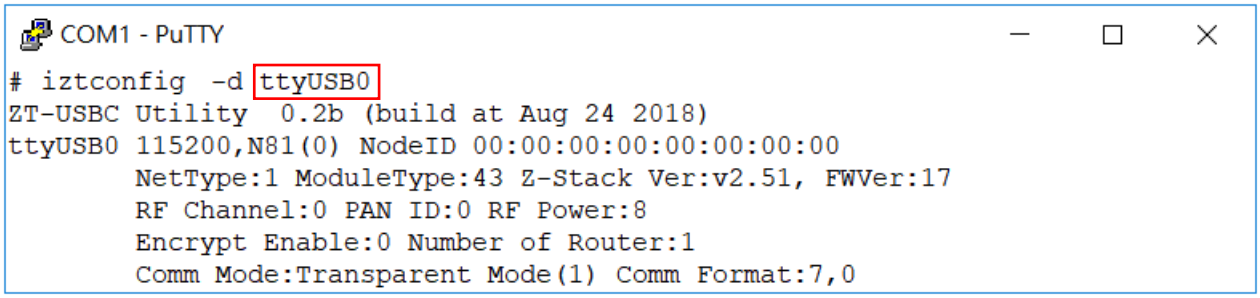


Figure 9. List the configuration for the ZT-USBC module using the iztconfig.exe command

❒ Use the following command to modify the communication parameters for the ZigBee, as illustrated in Figure 10.

Command: iztconfig.exe -d <USB device> -p <PAN ID> –r

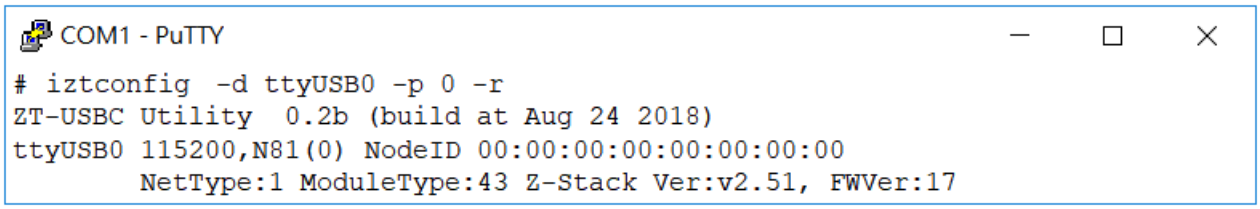


Figure 10. Setting the PAN ID to 0 for the ZT-USBC module

NOTE: You need to use the '-r' parameter to restart the ZT-USBC module to ensure that the module is set successfully.

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Section 3: Send DCON and Modbus command to control ZT-2043 module

The ZT-2043 offers 14 sink type Digital Output channels. To use the ZT-USBC module communicate with the ZT-2043 module, the 'Pan ID' and 'RF Channel must be the same if they are on the same ZigBee network. The ZT-2043 module will then send a request to join the ZigBee wireless network and start working.

NOTE: The configuration for the ZT-2043 module can be adjusted by using both the external rotary switch and the DIP switches. After completing the configuration, you must power off and power on the ZT-2043 module to ensure that the configuration is successful.

❒ Send a DCON command to the ZT-2043 module

Use the following command to send a DCON command to set or read the DO channel status on the ZT-2043 module, as illustrated in Figure 11.

```
Command: getsendreceive <slot> <comport> <timeout> <command> <baudrate>
```

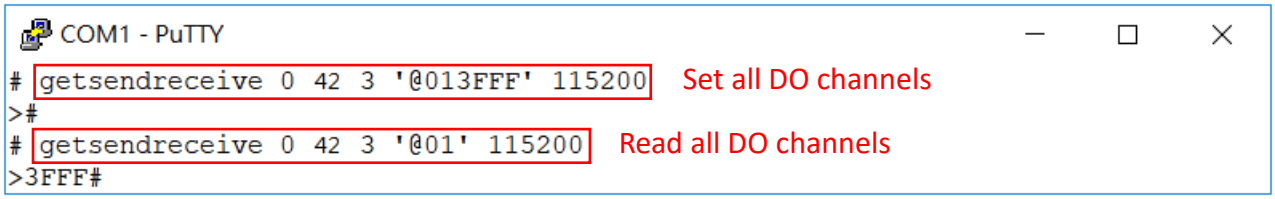


Figure 11. Sending a DCON command to control the ZT-2043 module

❒ Send Modbus command to ZT-2043 module

(1) Modify the 'setmodbus.c' and 'getmodbus.c' demo files, which can be found in the examples folder provided with the LinPAC SDK.

There two parts of the program will need to be modified and recompiled, as illustrated below:

➢ **setmodbus.c**

```
switch(function) {
    case FC05ForceSingleCoil:
    case FC15ForceMultipleCoil:
        szBuf[0] = wValue & 0xff;
        szBuf[1] = (wValue >> 8) & 0xff;
        break;
    case FC06PresetSingleRegister:
    case FC16PresetMultipleRegister:
        szBuf[0] = (wValue >> 8) & 0xff;
        szBuf[1] = wValue & 0xff;
        break;
    default:
        usage();
        return FAILURE;
}
```


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➢ **getmodbus.c**

```
if (RetValue == 0) {
    if((function==1)||(function==2)){
        //printf("%d", szBuf[0]);
        RetValue = (szBuf[0]|szBuf[1]<<8);
        printf("%ld", RetValue);
    }
    else {
        RetValue = (szBuf[0]<<8)|szBuf[1];
        printf("%ld", RetValue);
    }
} else if (RetValue == CmdError) {
    printf("Module at COM%d return error code %d !\n",comport,szBuf[0]);
    return FAILURE;
} else {
    printf("Module at COM%d error %d !\n",comport,RetValue);
    return FAILURE;
}
```

(2) Execute the demo programs to control the ZT-2043 module, as illustrated in Figure 12.

Use the following command to send a Modbus command to set the status of the DO channel on the ZT-2043 module.

Command:

./setmodbus <comport> <baudrate> <netid> <command> <addr> <count> <value> <timeout>

Use the following command to send a Modbus command to read the status of the DO channel on the ZT-2043 module.

Command:

./getmodbus <comport> <baudrate> <netid> <command> <addr> <count> <timeout>

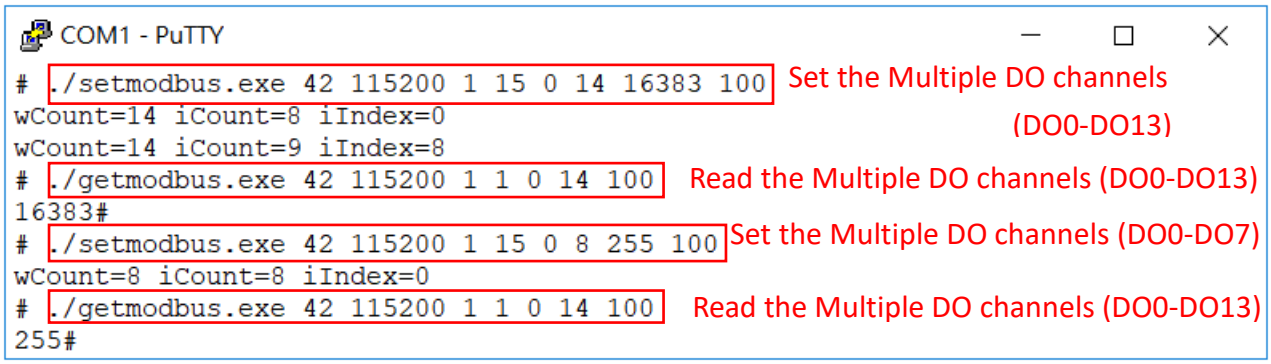


Figure 12. Sending Modbus command to control the ZT-2043 module

For more detailed information about the DCON and Modbus protocol, refer to Chapter 4 of the ZT-2000 DIO Series user manual, which you can download from:

http://ftp.icpdas.com.tw/pub/cd/usbcd/napdos/ZigBee/zt_series/document/zt_dio/zt-2000_dio_usermanual_0121_en.pdf

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