

# Robot Navigation Using Xbee

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## Overview

This document provides supporting material for a project on “Robot Navigation using Xbee”. The project is built using Pt-51 Board, UART and two Xbees .

## Learning Objective

1. Understand the interface of UART and Xbee.
2. Understand the system design.

## Problem Statement

In this project, you have to navigate robot using wireless remote. For wireless communication you have to use Xbee modules. You need two Pt-51 board, one as receiver and another for transmitter.

## System Description

You will need two Xbee modules - one as transmitter and another as receiver. At transmitter end, Pt-51 board reads DIP switch inputs for robot direction. It sends switch value to Xbee module over UART.

At receiver end, Xbee module receives data from transmitter Xbee. It sends the data to receiver side Pt-51 board. Pt-51 decides motor control signals based on received data.

Direction command	Switch position(P1.3 to P1.0)
Forward	1111
Reverse	0110
Right turn	X011/0111
Left turn	1110 / 110X
Stop	X00X

X means don't care. 1 means ON and 0 means OFF.

## Project Flow

1. Configure Xbee(refer appendix) using X-CTU software.
2. Test Xbee communication using X-CTU software.
3. Configure UART for transmitter and receiver. Check the UART communication using any serial terminal software(e.g. RealTerm)
4. Establish UART communication between Xbee module and Pt-51.
5. Verify communication between two Pt-51 board using Xbee.
6. Write code for switch read and motor control for transmitter end and receiver end respectively.

## Intermediate Milestones

1. Successful full-duplex Xbee communication using X-CTU software.
2. Successful UART communication between Xbee and Pt-51 board.

## References

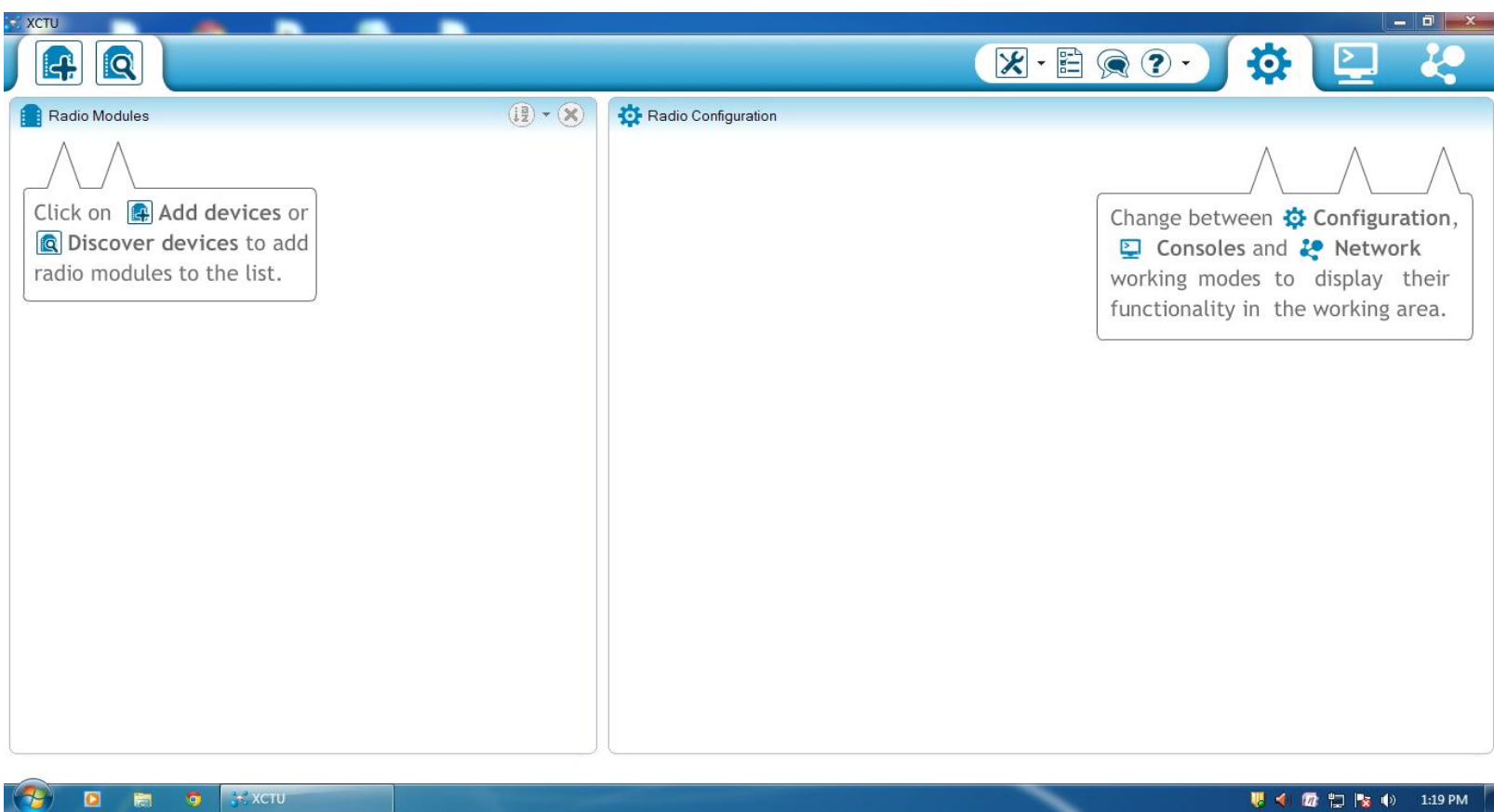
## Appendix:

### Brief summary of solution:

- 1) Configure two XBEE modules using X-CTU software for peer to peer communication. Verify if these modules are in same network in X-CTU software.
- 2) Establish UART communication between 89C51 micro-controller and XBEE module. Verify if baud rate are matched enough and hence data is not erroneous.
- 3) Write code on PT-51 to transmit data using XBEE module and write another code on another PT-51 to receive data using another XBEE. (peer to peer communication)

# 1. Configuring XBEE module in X-CTU software

Figure 1 : Open X-CTU



**Figure 2: Add device in X-CTU. Select correct serial port (here COM6 is selected)**

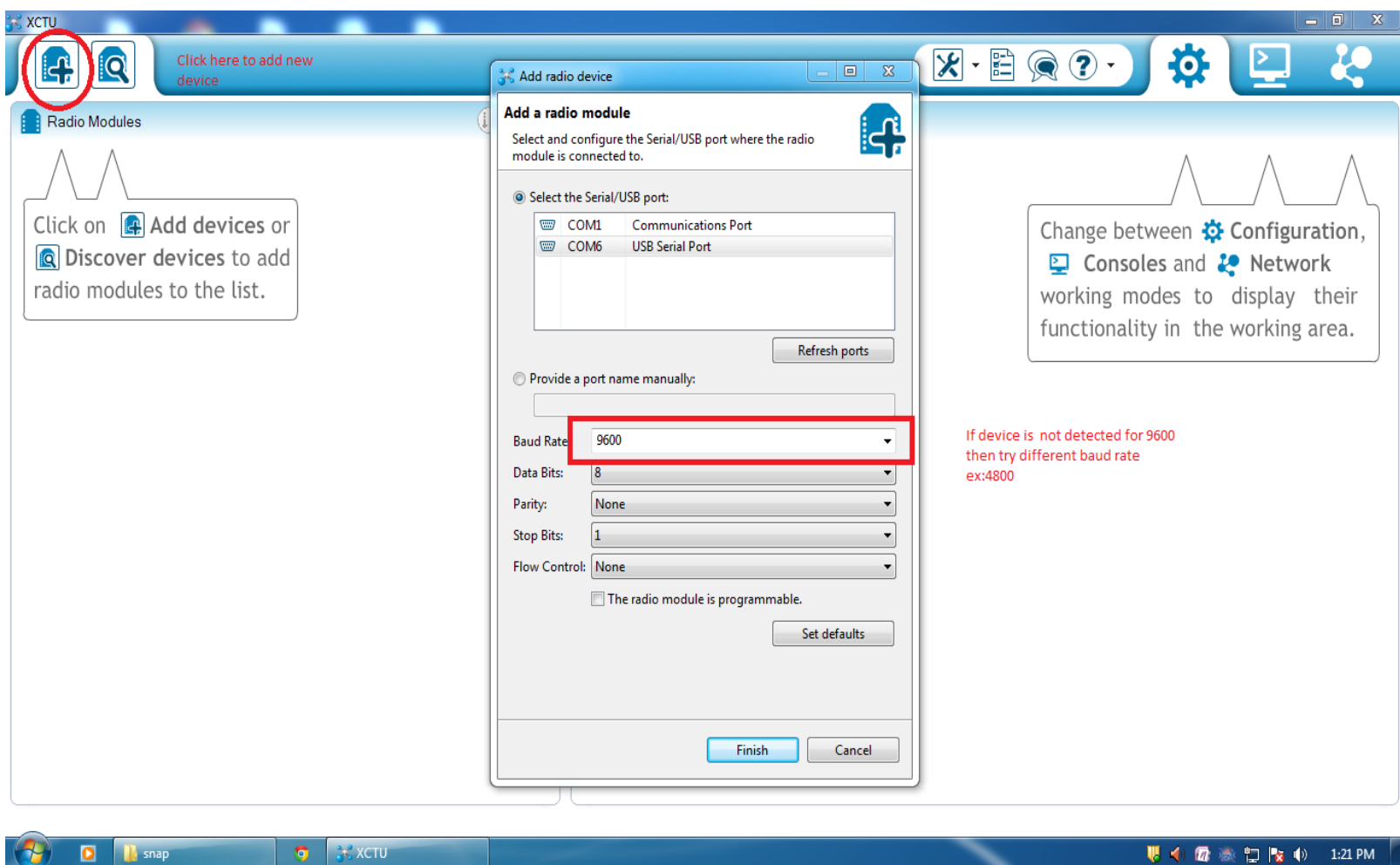


Figure 3: After searching X-CTU will show device connected to Serial Port

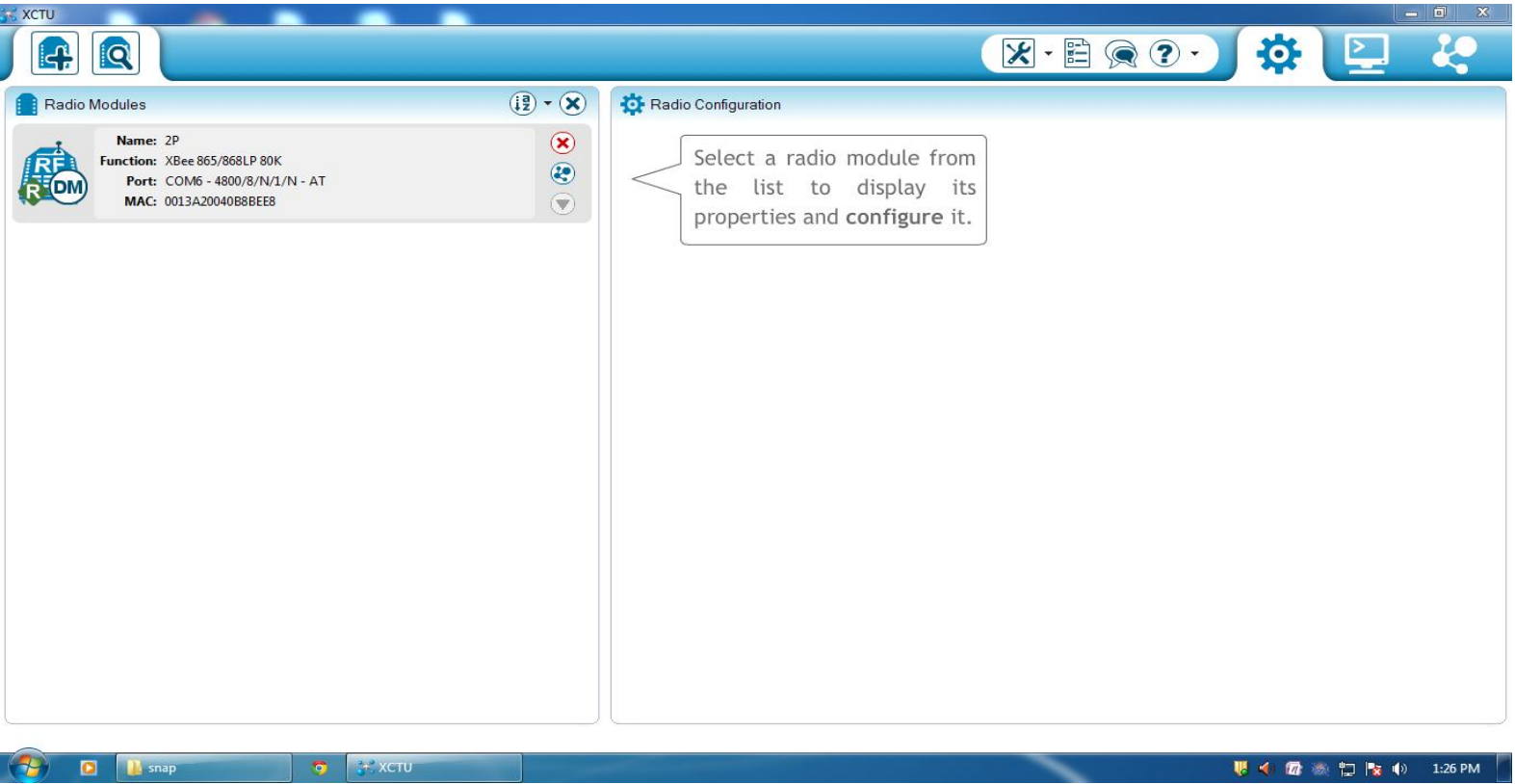
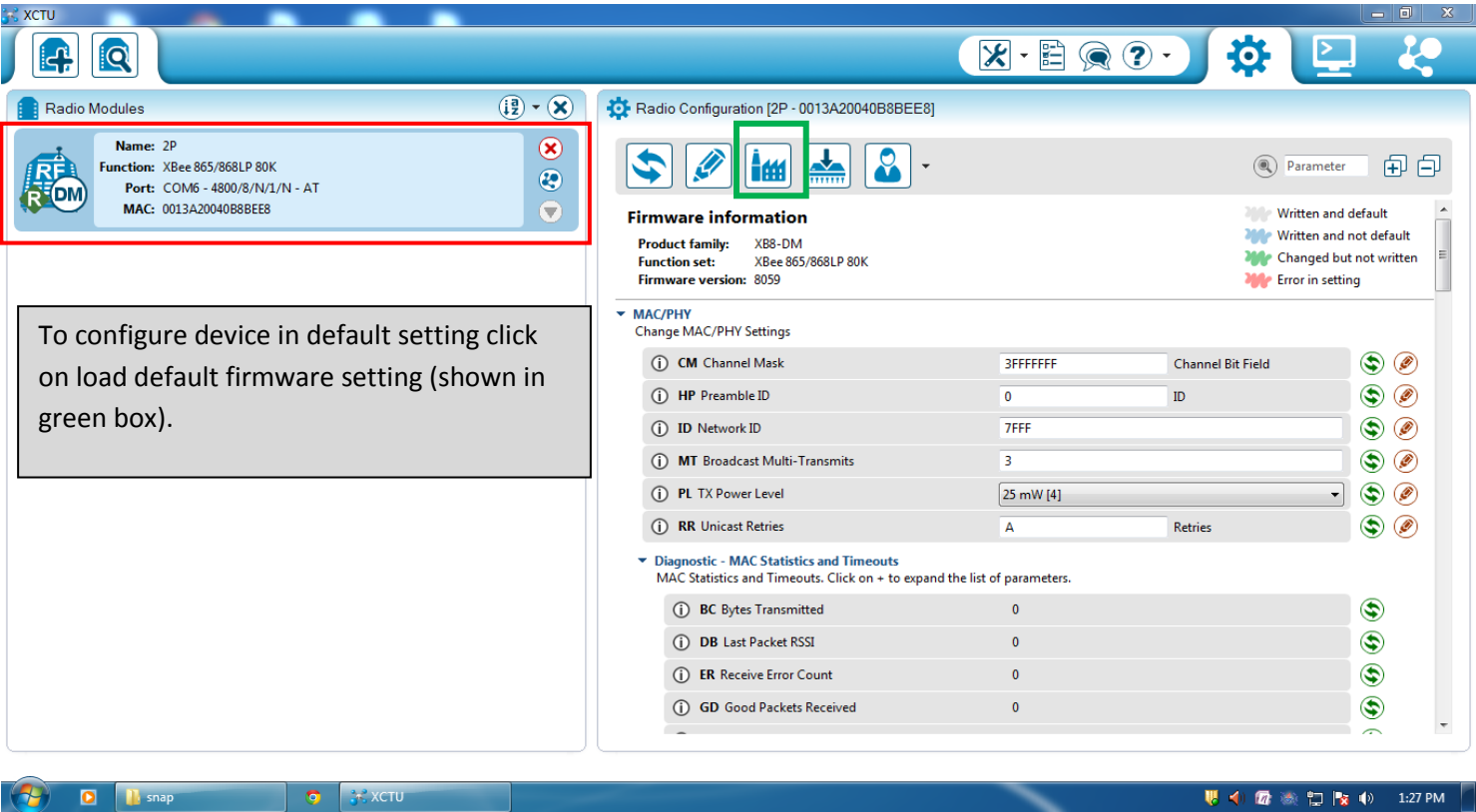


Figure 4: Click on red box to show setting of device



**Figure 5: Write MAC address of other node as destination address. Click on “Write the settings to the radio module”. Baud rate should be same as microcontroller UART baud rate.**

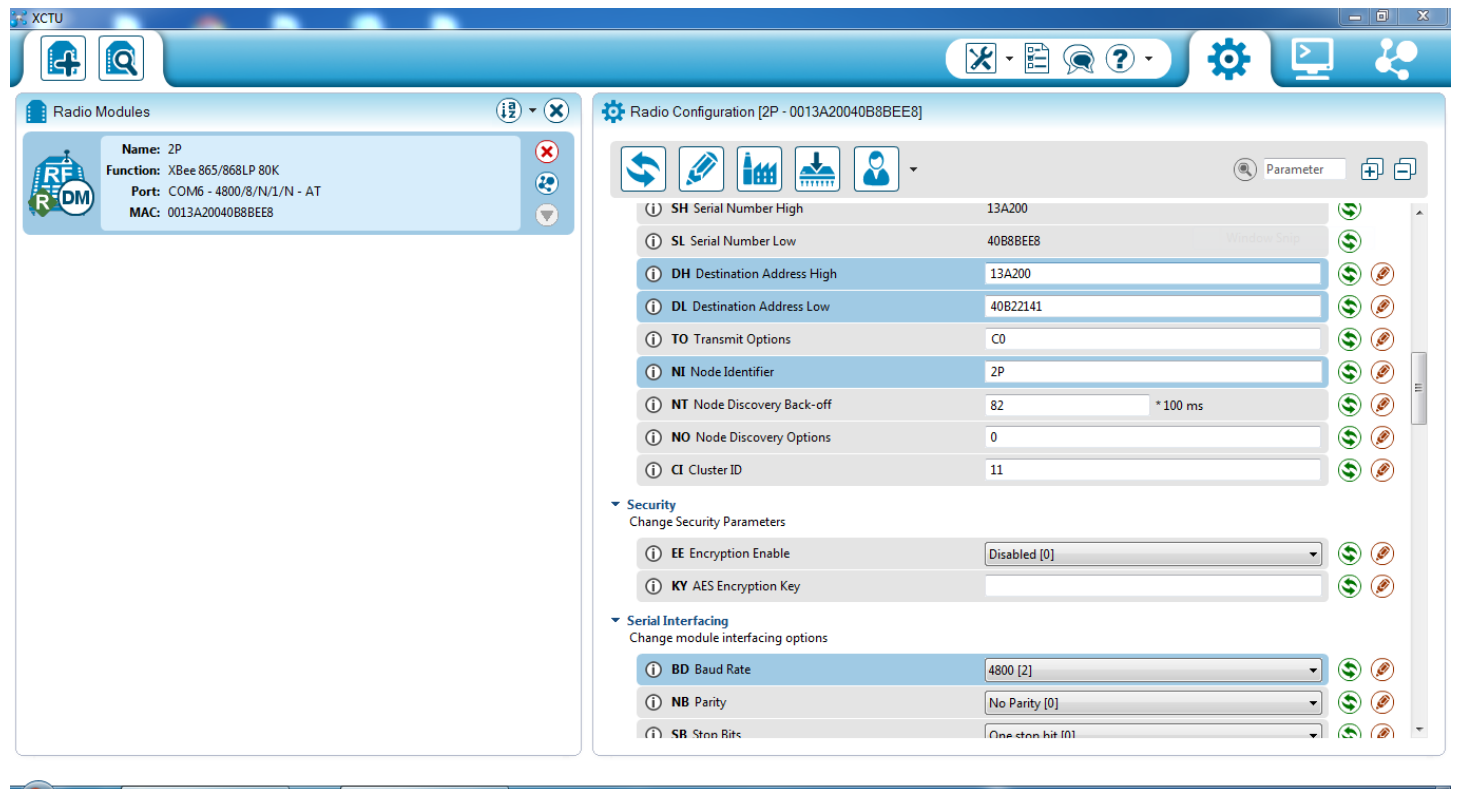
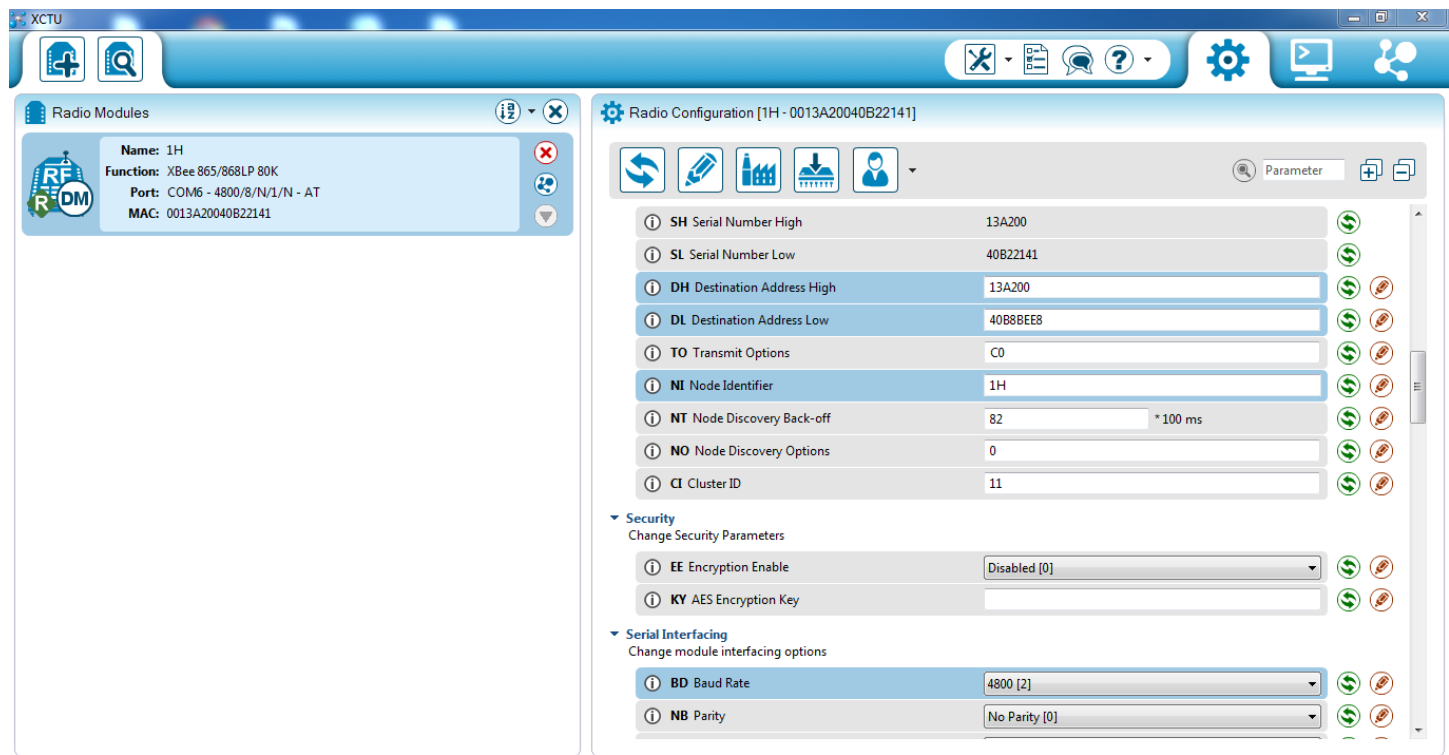


Figure 6: Write MAC address of previous device as destination address. Click on write button. Baud rate should be same as microcontroller UART baud rate.





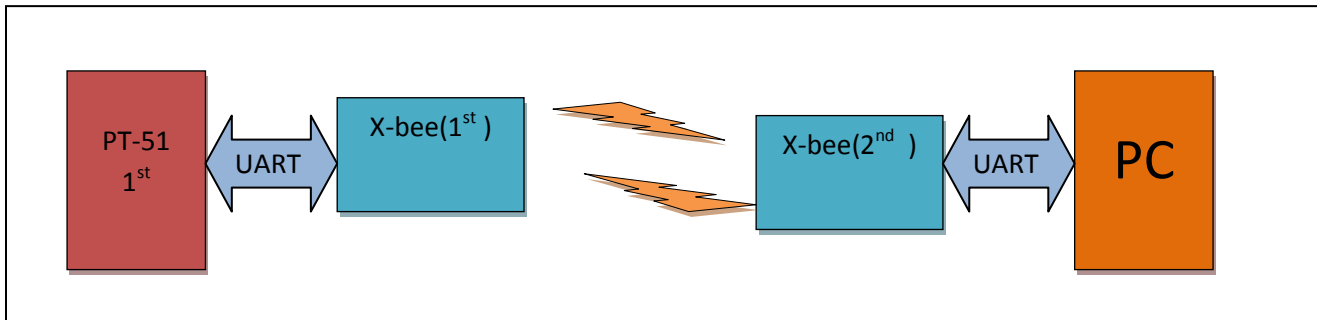
## 2. UART Communication between XBEE module and 89C51 micro-controller:

(For UART configuration please refer uploaded serial document on WEL lab site.)

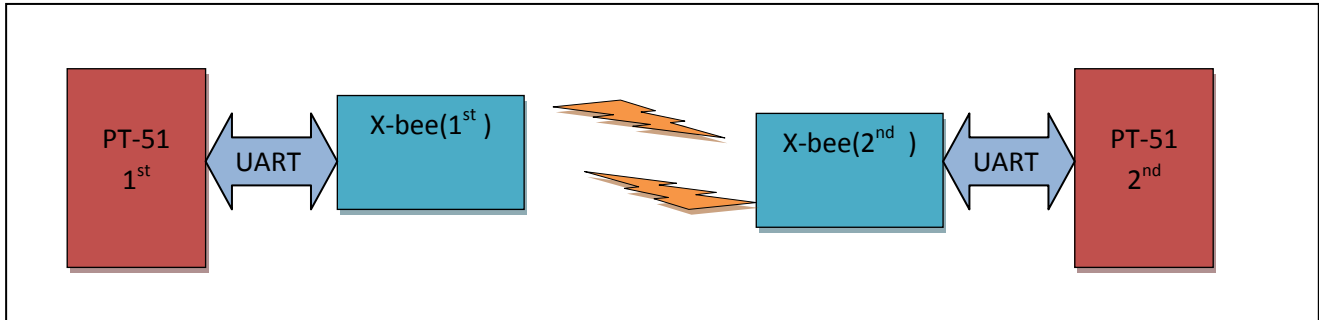
1) Following is guideline for establishing UART communication with XBEE:

- Connect pre-configured XBEE module with PT51 board and another (2<sup>nd</sup>) module to PC.
- Module connected to PC as a UART (Using USB to serial converter). Monitor XBEE UART using any RS 232 serial monitoring software.
- Send any data on Tx of UART from micro controller side.
- Check if known data is received reliably on serial monitoring software. If not, change the baud rate value to a new and more accurate value and repeat the process.

Once reliable connection is established between XBEE module and microcontroller, write code for end application.



### 3. Following is guideline for writing code for end application:



#### Transmitter:

Write a code to transmit any specific character as command (EX: L) on UART of micro controller.

#### Receiver:

Write a code which will receive character. Then check this character matches with desired character. If match found then perform work related to that command.

#### For example:

We want to toggle led on remote pt-51 board (2<sup>nd</sup>).

We assume L is our command. So 1<sup>st</sup> PT-51 will send 'L' character on UART whenever we want to toggle led.

On 2<sup>nd</sup> PT-51 will monitor received data on UART. When it will get 'L' in received buffer, it will toggle led.

(Note: Configure UART baud rate of micro- controller to **4800** to communicate with XBEE. You can try other baud rate also.)