Santiago Canyon College
Applied Robotics & Embedded Programming
Advanced Remote Control Projects

Controlling your BOE-BOT with a Wireless 802.11G Network
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This project is designed to show you how to control your Boe-Bot via Wi-Fi wireless networks. To do this without disrupting the school network, I am going to have you connect your laptop to a wireless router. You will make sure the router assigns the correct IP address to your laptop so you can send commands to it.

To communicate to the router, you connect the laptop to the router with a network cable called a patch cable or CAT-5 cable. You will use a program called Tera Term to both configure the WiFly module and to also send keystrokes to the router. When you press f then enter, the bot will move forward. Pressing b then enter makes it back up. Pressing L for left and R for right make it turn. I have included a simple BS2 program, similar to the XBEE project that interprets the keystrokes and makes the servo move. The program uses PWM (pulse width modulation) like any Boe-Bot program.

Before you can control the bot, your WiFly radio must be configured. This is similar to the way you configure XBEE radios. However, we will use Tera Term to configure and save those settings inside your WiFly.

Getting Started

Here is a list of the items you will need for this project:

1. A laptop/Desktop to control your BOE-BOT with Parallax BS2 software installed
2. Parallax SIP adapter #32402 See it [here](#)
3. SparkFun [WiFly Rn-XU radio](#) .
4. BOE-BOT (serial or USB)
5. Sparkfun [XBEE USB Explorer](#)
6. Wireless TCP/IP router.
7. Cat-5 patch cable.
8. Latest copy of Tera Term software. I am using 4.73
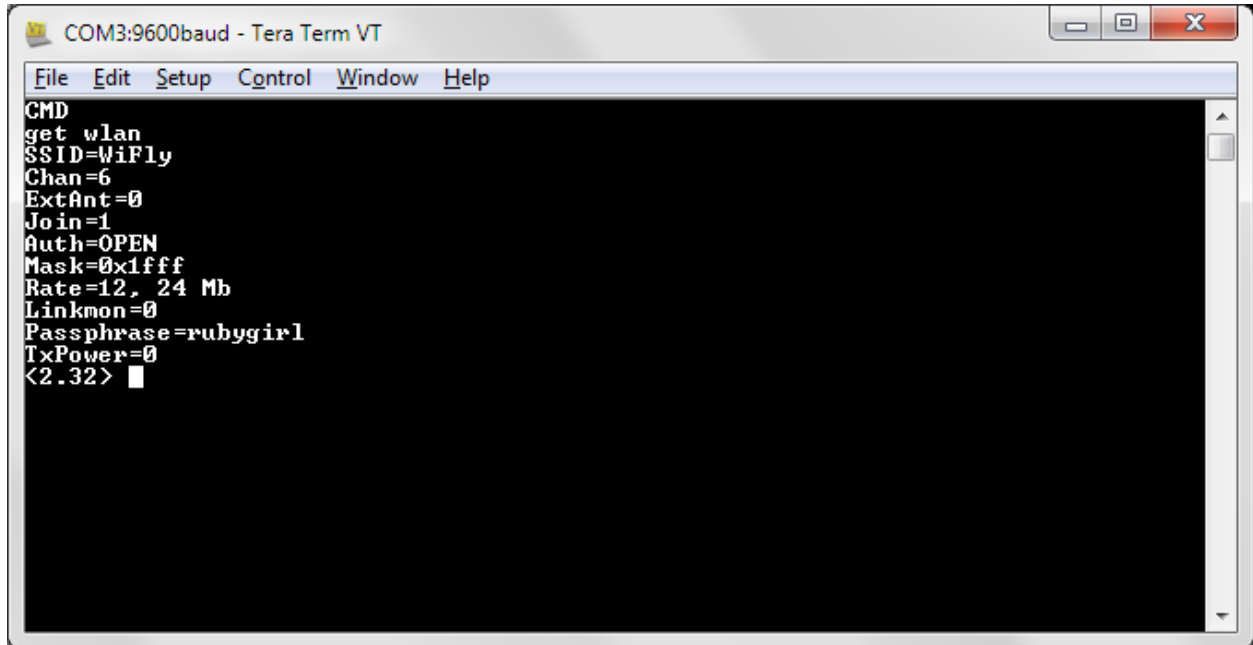
WiFly Configuration & Communication

1. Place your new WiFly module into the Sparkfun XBEE Explorer and plug it into a USB slot on your laptop so you can configure it.
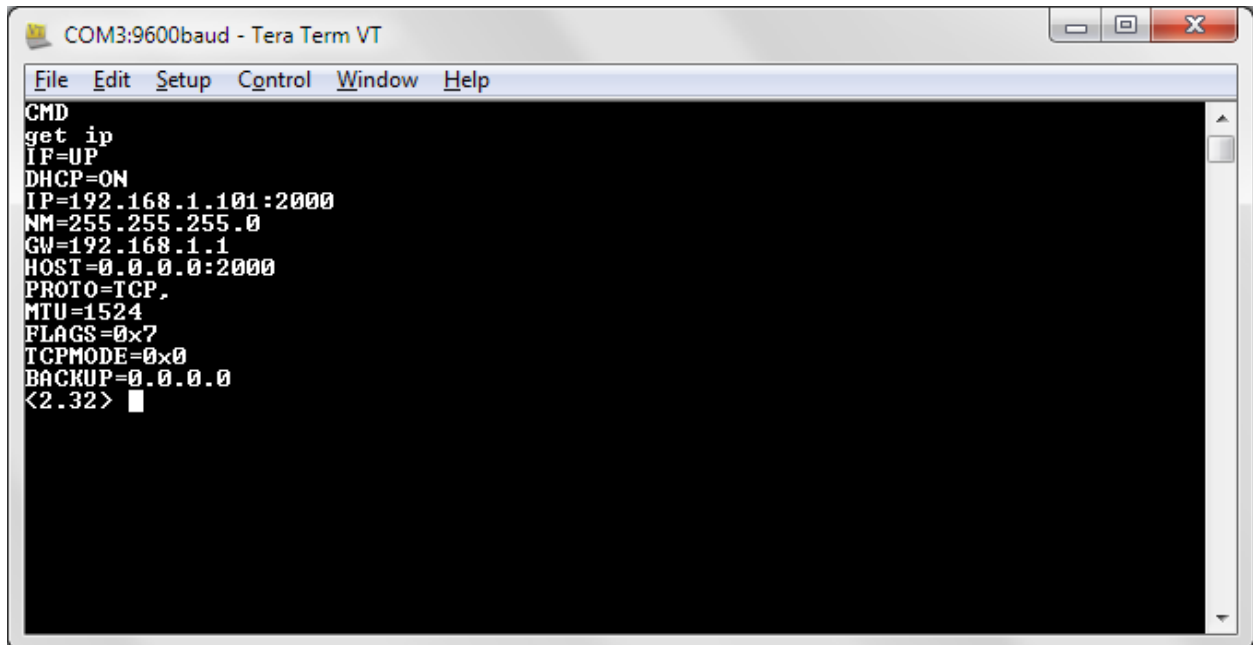2. Start Tera Term (TT) and choose Serial connection. Click OK.
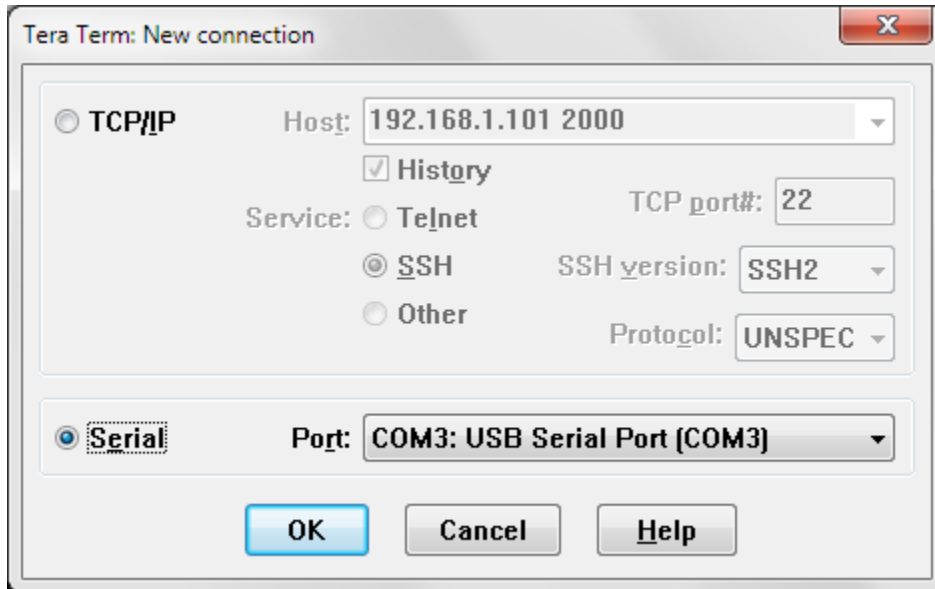
3. Type **$$$**. You should see CMD in the window. This puts TT into command mode so you can configure your WiFly module. To exit command mode type the word exit then press Enter.
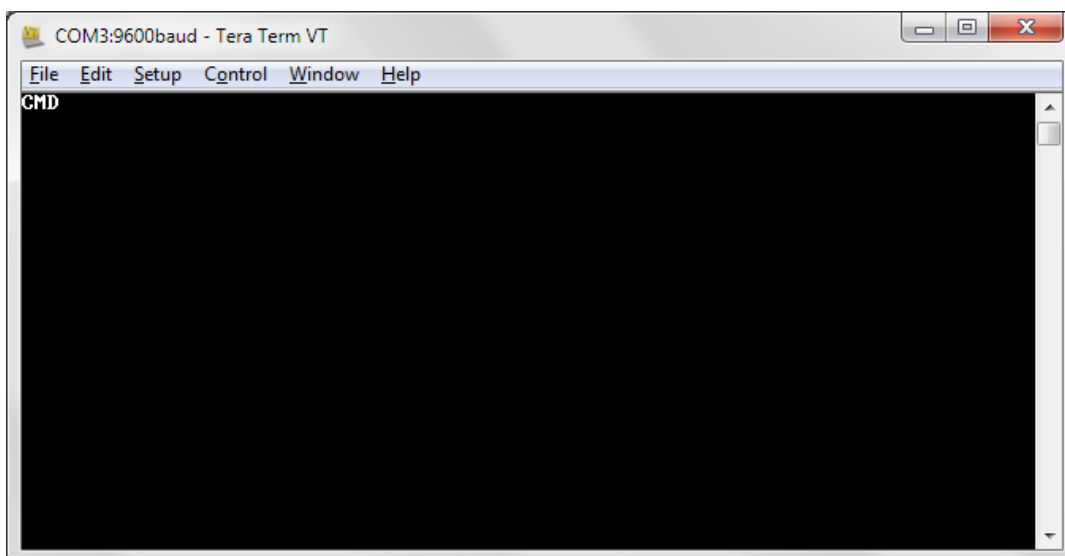
4. For practice, type in **get wlan** then Enter. Type everything in lower case! You will see some configuration information. Now type **get ip** to see basic IP configuration.

```
COM3:9600baud - Tera Term VT

File  Edit  Setup  Control  Window  Help
CMD
get wlan
SSID=WiFly
Chan=6
ExtAnt=0
Join=1
Auth=OPEN
Mask=0x1fff
Rate=12, 24 Mb
Linkmon=0
Passphrase=rubygirl
TxPower=0
<2.32>
```
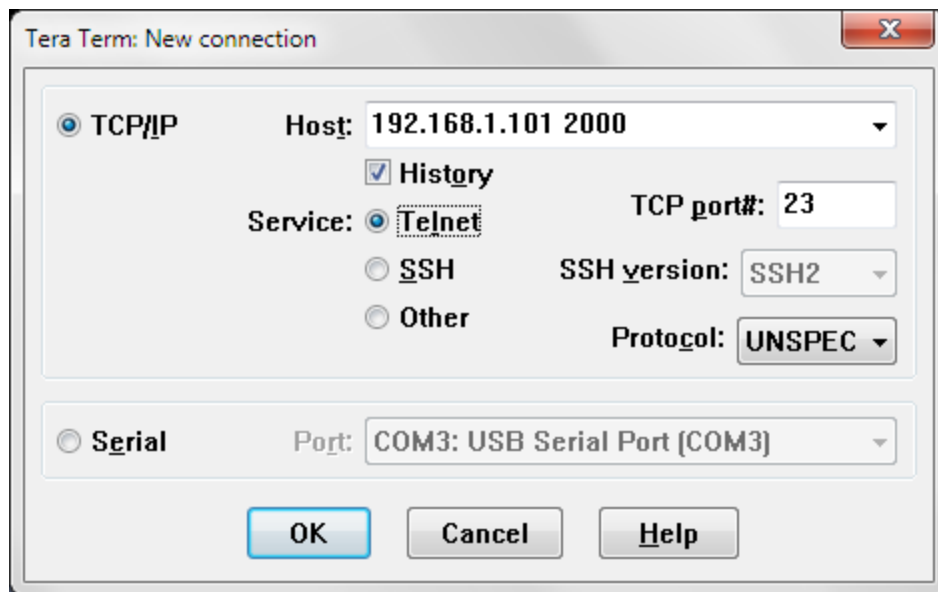
```
COM3:9600baud - Tera Term VT

File  Edit  Setup  Control  Window  Help
CMD
get ip
IF=UP
DHCP=ON
IP=192.168.1.101:2000
NM=255.255.255.0
GW=192.168.1.1
HOST=0.0.0.0:2000
PROTO=TCP,
MTU=1524
FLAGS=0x7
TCPMODE=0x0
BACKUP=0.0.0.0
<2.32>
```

- Use these commands to configure your device. Be sure to press Enter. You should see AOK on the screen if all is well. Make sure you are in command mode!
- Set ip address 192.168.1.101 (write this down!). Choose an IP you want just make sure your network ID is the same as the router. In my case it is 192.168.1
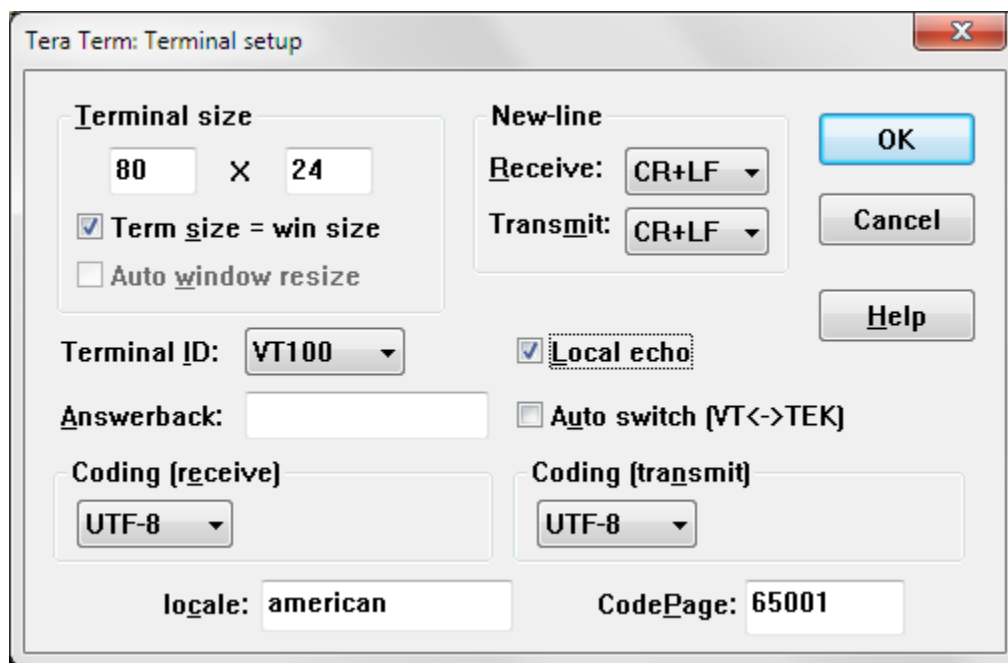
- Set ip netmask 255.255.255.0
- Set ip gateway 192.168.1.1 or whatever yours is
- Set wlan channel 6   The channel your wifi router is using. This is the default.
- Set wlan join 1   Tells WiFly to join your network automatically
- Set wlan ssid myssid
- save   This saves everything into memory on the WiFly.

5. Use **get ip** and **get wlan** to check your settings. Re-enter any values that did not get saved.
6. Now, type **exit** to get out of command mode. Close Tera Term and put your WiFly into the SIP adapter on your BOE.
7. Download my "BS2 basic moving" program into the BOE.
8. Now we will make sure your computer is set up.

Configuring your laptop for wireless communication

1. For my project, I have connected my laptop to a Linksys Wireless-G router. I set the router to assign IP addresses by setting DHCP on. The router, by default, is on the 192.168.1 network and its IP is 192.168.1.1 This router is connected to my home network via a CAT-5 cable. This way, I can isolate my BOE-Bot onto a separate network so it won't interfere with my home or school network.
2. I connect my laptop to the router via CAT-5 cable and I turn my wireless on the laptop OFF. Make sure you use a port OTHER than the uplink/internet port on your router. Just use any of the other ports. Once connected, on your desktop, click the start button, type CMD, enter. You will see the command window and you then type **IPConfig** then Enter to see the IP of the laptop. Make sure your computer has an IP that is on the same network as the router. To make sure, type **ping 192.168.1.1** then Enter in the command window to make sure you get four reply messages. If your network uses a different network ID then change it to match the network you are on.
3. Since I want to be able to demo this project in my classroom, I am using this Linksys wireless router because I can connect it to any existing network without a hassle.
4. Now let's try running the BOE-BOT via our wireless network. Remember, in my case I am going to communicate to my Linksys router via a cable from my laptop. Then the router will wirelessly transmit my keyboard commands to the BOE-Bot.
5. Launch Tera Term. In the connection dialog choose TCP/IP connection. Type in the IP address of your newly configured WiFly that you wrote down…I hope. Tera Term uses port 2000 by default. Make sure to add this using a space after your IP…not a colon.
6. Check Telnet then click OK. You should see a Hello message right away. This means we can "talk" to our router.

Tera Term: New connection

- TCP/IP Host: 192.168.1.101 2000
  - ☑ History
  - Service: ⦿ Telnet   TCP port#: 23
  - ○ SSH   SSH version: SSH2
  - ○ Other   Protocol: UNSPEC
- Serial   Port: COM3: USB Serial Port (COM3)

OK   Cancel   Help

7. Now, to make things easier, select Setup | Terminal from Tera Terms menu. Click Local echo and select CR+LF in the Receive/Transmit dropdowns. Then click OK.

Tera Term: Terminal setup

Terminal size
80 X 24
☑ Term size = win size
☐ Auto window resize

New-line
Receive: CR+LF
Transmit: CR+LF

OK
Cancel
Help

Terminal ID: VT100   ☑ Local echo
Answerback: ☐ Auto switch (VT<->TEK)

Coding (receive)
UTF-8

Coding (transmit)
UTF-8

locale: american   CodePage: 65001

8. Let's try moving the BOE-BOT! Make sure the robot is on and the switch is in position 2 so the servos will respond. In the Tera Term window, type f then enter to go forward a little ways. Do the same for b (back), l (left) and r (right). Be sure to press ENTER after each command.
9. TA-DAH!! There you have it (I hope). A wireless BOE-BOT using your own TCP/IP network! Look at the code in my .BS2 program. I put in a lot of comments to explain how to set things up. Notice that I am sending the same commands to the BOE as I did when I used the XBEE modules. The BOE-BOT is interpreting my keystrokes to move the servos. The information however, is

coming from a different place. Instead of an RF XBEE radio device, we are using a WiFi radio. All we have done is to change the method of communication to the Basic Stamp.

10. In this project, I chose to use an OPEN wireless connection with no encryption. I recommend you do that just to make sure things work. You can lock it down afterwards if you want to. Look at the WiFly documentation I included to see the commands for WPA and WEP. It shows how to add your passphrase also. You will notice that the default password on the WiFly is rubygirl1. I never changed mine.

11. Happy computing!!!!