

Getting Started with OPEN-ROBOT & XBee®

This document will help get you started with your XBee equipped OPEN-ROBOT. You will be introduced to your robot along with the different sensors and where they are located. *This document assumes that you have already assembled your robot.*

Getting to Know OPEN-ROBOT:

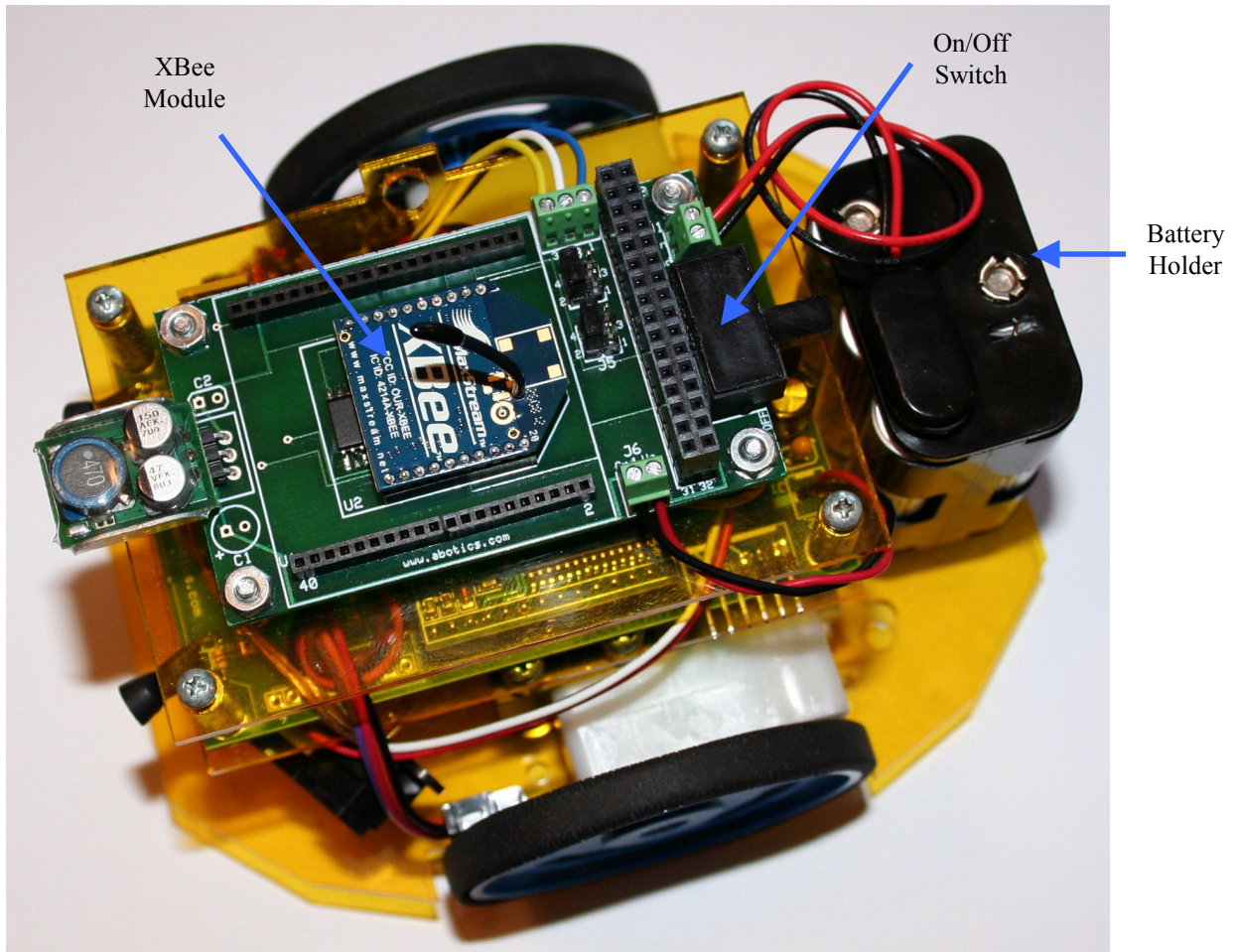


Figure 1. OPEN-ROBOT shown with XBee wireless module.

In figure 1 you can see the robot's on/off switch and the (6)-AA battery holder. Before we get started, remove the battery holder by unsnapping it from the robot's base plate. Firmly hold the robot with one hand while pulling the battery holder. Now load (6)-AA batteries into the holder while observing the proper insertion orientation. The negative (-) end of the each battery must be inserted such that it makes contact with the corresponding spring on the holder. ***Failure to do this will damage the robot's controller board.*** We recommend using 15-minute rechargeable AA-batteries, however, you can use regular alkaline batteries. After inserting the batteries snap the battery holder back onto the robot. You will feel the holder lock into place when you press it onto the robot's base plate.

Turn your robot on using the on/off switch. Once on you should observe a green LED on the controller board light up. If not be sure to check the orientation of each of the batteries and also make sure that they are fully charged if using rechargeable batteries.

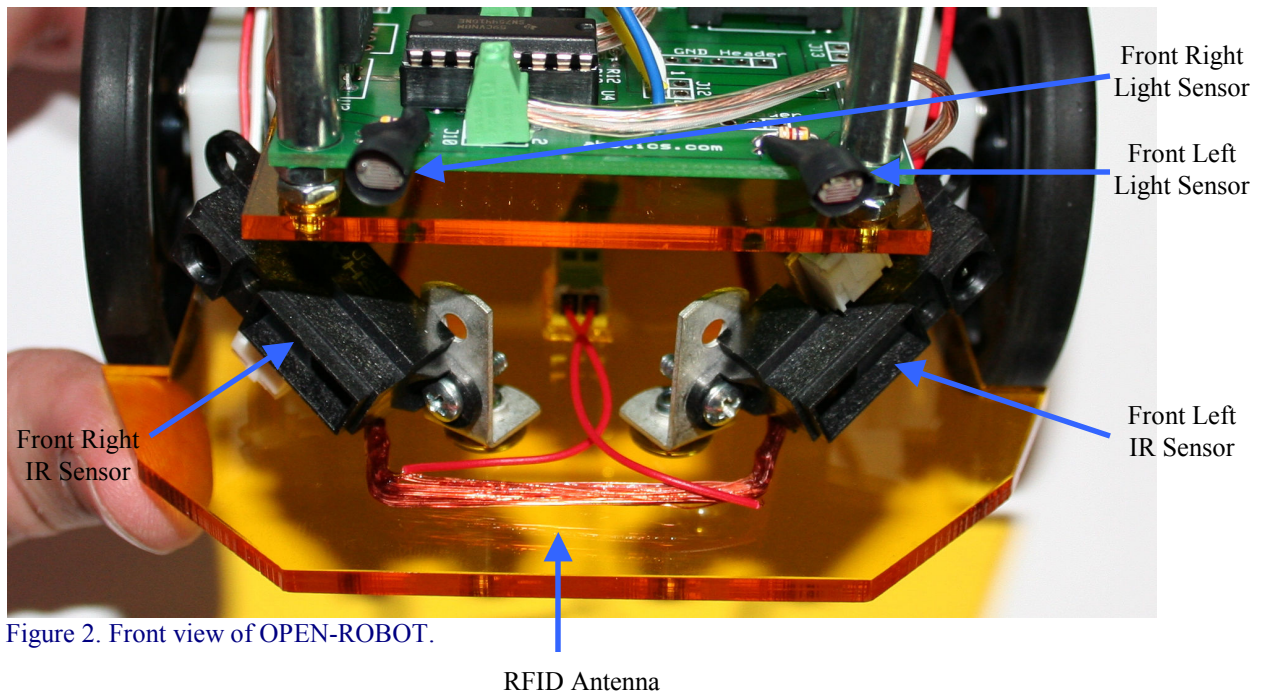


Figure 2. Front view of OPEN-ROBOT.

In figure 2 the front left infrared (IR,) front left light, front right IR, and front right light sensors can be seen. Additionally the RFID antenna is located on the robot's base plate. The IR sensors help the robot to see obstacles, other robots or even to follow walls. Ambient light levels can be sensed using the light sensors, which means the robot can sense whether it is light or dark in a given environment. Passive RFID tags can be read or written to with the RFID antenna. Tags can be used to store x-y coordinate information so that your robot can find its way in a room or small environment. The tags can also store virtual food so that your robot has to search out tags in a game of survival of the fittest. There are numerous other possible uses for the RFID tags and we have only touched on two.

Configure XBee Modules:

OPEN-ROBOT's PIC18F4520 communicates with a baud rate of 115,200 bits per second (BPS). However, the XBee modules are by default configured for 9,600 BPS, so we need to change these to 115,200 BPS so that they will work with OPEN-ROBOT. To do this you will need an XBee Explorer USB from SparkFun Electronics. You also need to download and install the necessary FTDI drivers:

http://www.sparkfun.com/commerce/product_info.php?products_id=8687
<http://www.ftdichip.com/FTDrivers.htm>

Once you have installed the FTDI drivers you then need to download and install the XBee X-CTU program:

<http://www.digi.com/support/kbase/kbaseresultdetl.jsp?kb=125>

The X-CTU program allows us to change the XBee's configuration parameters. Once you have the X-CTU installed, plug an XBee Explorer USB into your computer. Be sure you install one of your XBee modules into the Explorer USB prior to connecting to your computer. Go ahead and run the X-CTU program. You should have a screen similar to the one shown below.

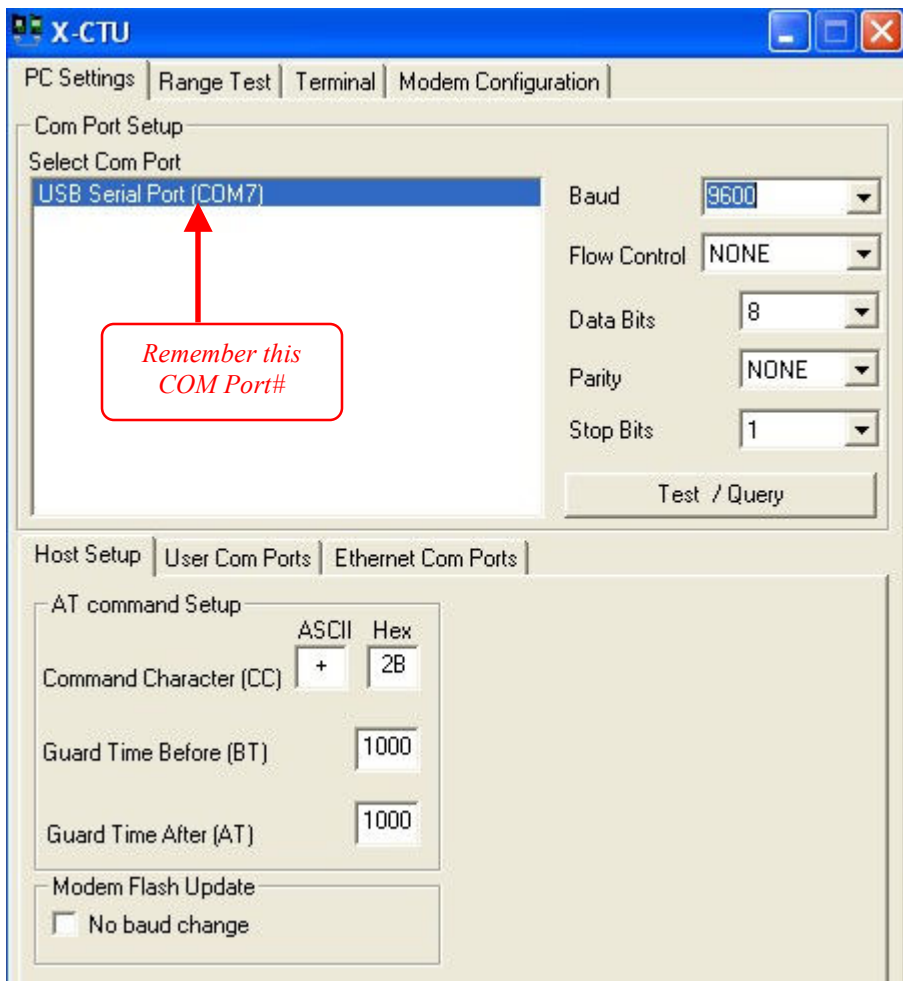


Figure 3. Open X-CTU program.

Be sure to select a Baud Rate if 9600 and then click on the [Modem Configuration](#) tab.

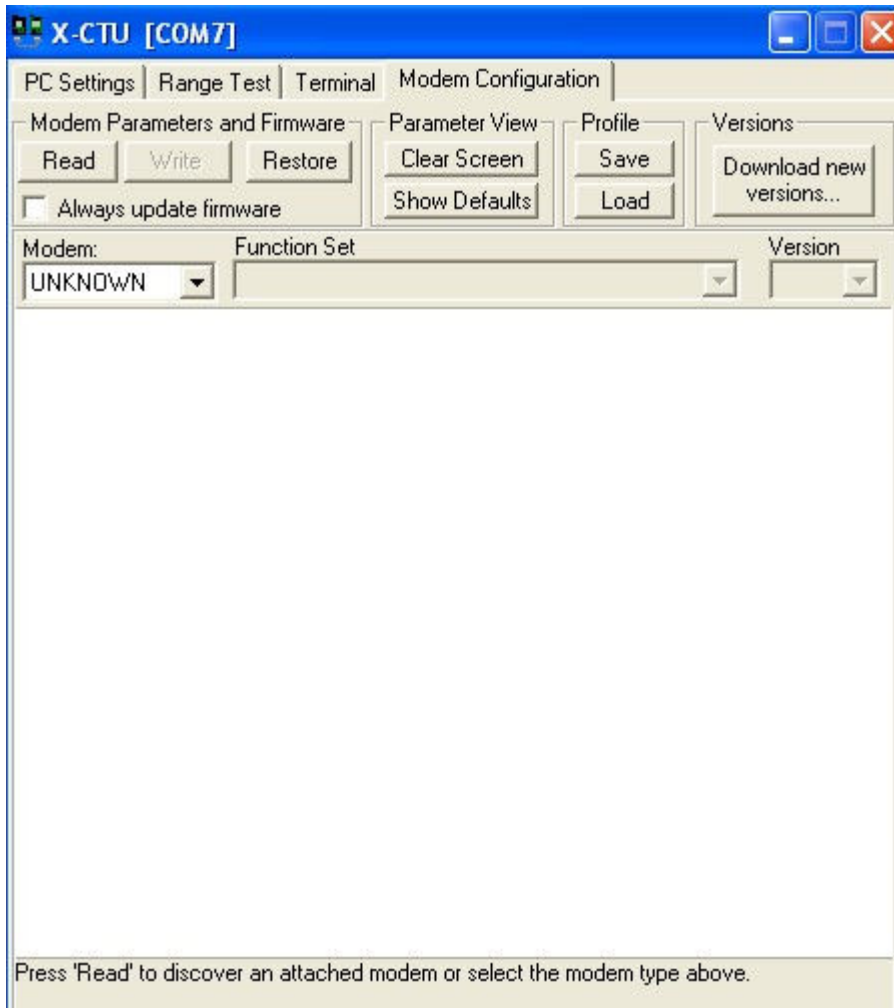


Figure 4. Configuration Tab.

Click on the Read button to read the current configuration of the attached XBee module. Then scroll down to the [Serial Interfacing](#) folder and click on the [Interface Data Rate](#).

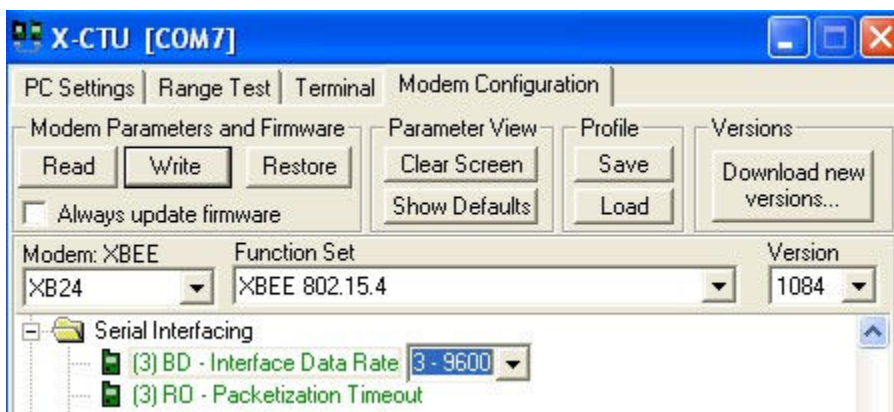


Figure 5. Scroll to Serial Interfacing.

Now select 115200 under the Interface Data Rate parameter.

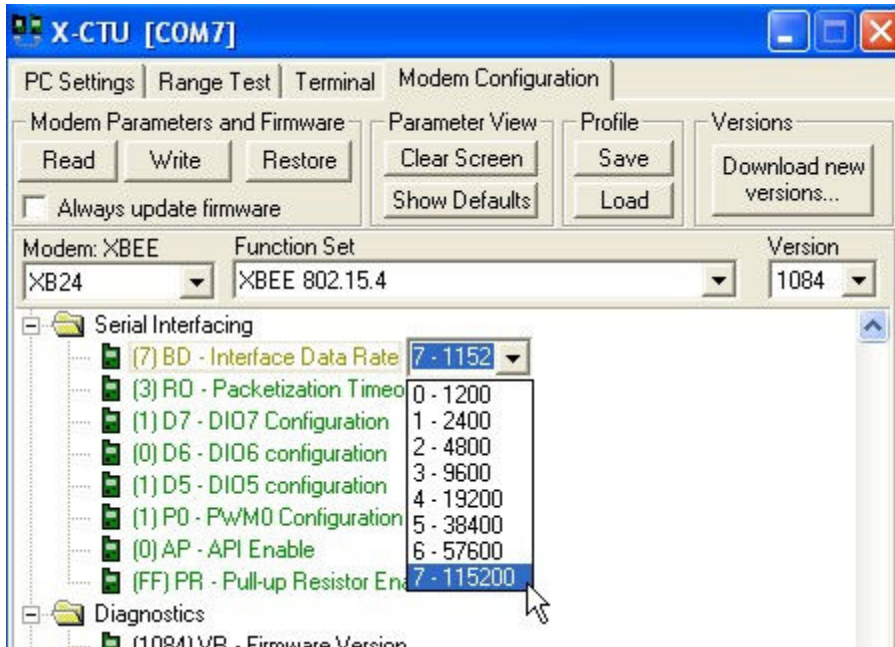


Figure 6. Select 115200 under Interface Data Rate.

Finally click on the Write button to save this parameter change to the XBee module.

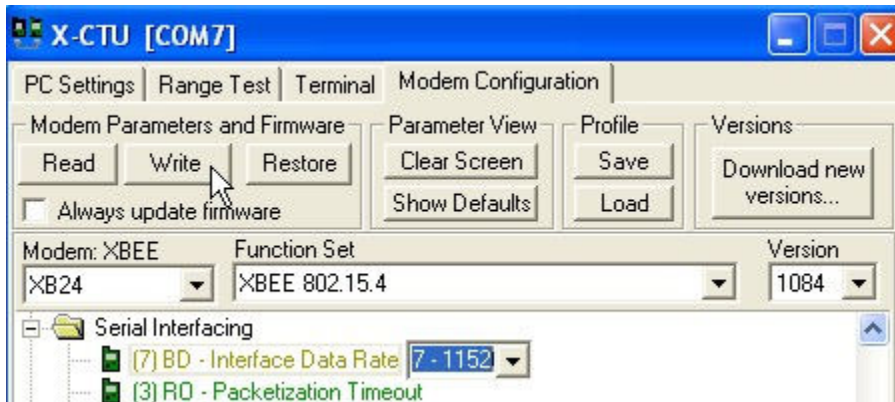


Figure 7. Click on Write button.

After clicking the Write button you should see the following printouts at the bottom of the screen as shown in figure#8 below.

“Setting AT Parameters..OK”
 “Write Parameters...Complete”

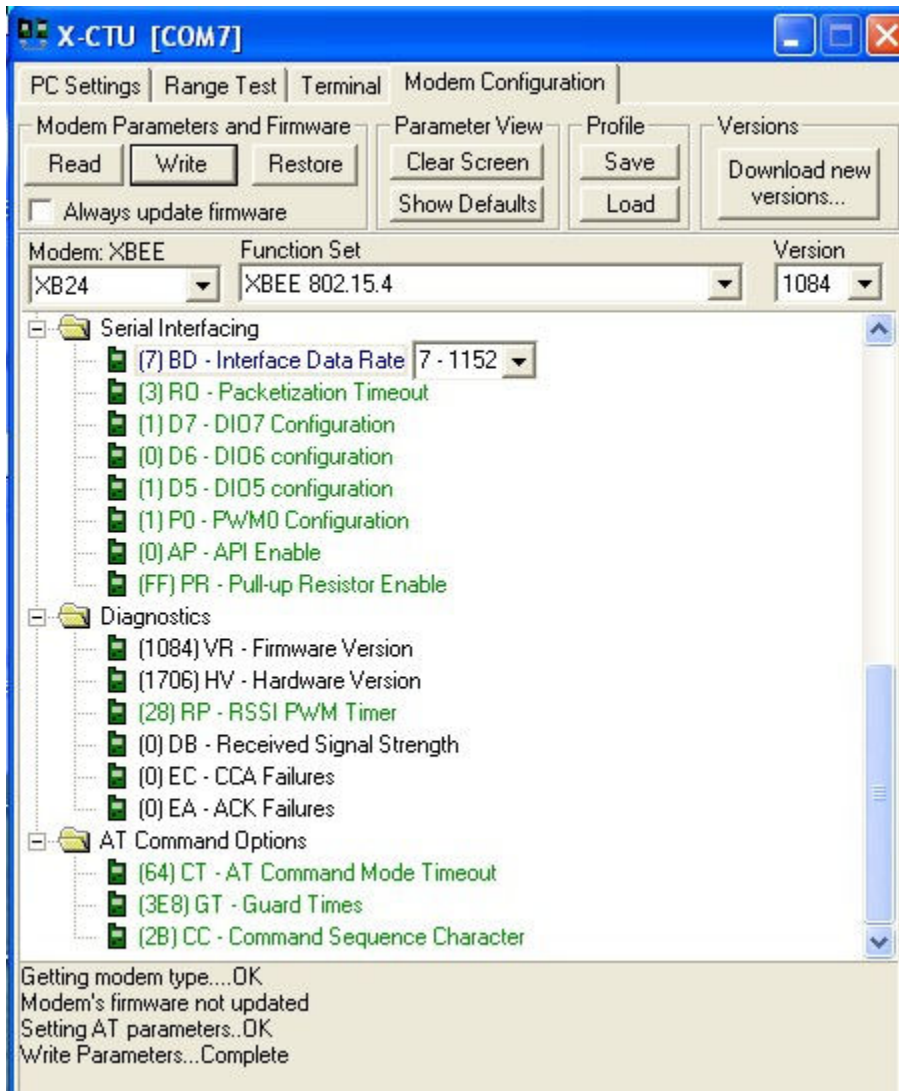


Figure 8. Interface Data Rate parameter change written to XBee module.

Connect Using the OPEN-ROBOT XBee/ZigBee Manual Control Program:

Download and install the [OPEN-ROBOT XBee/ZigBee Manual Control Program](http://www.abotics.com/OPEN_ROBOT_Software/OPEN_ROBOT_ZigBee_Installer.zip).

http://www.abotics.com/OPEN_ROBOT_Software/OPEN_ROBOT_ZigBee_Installer.zip

Run the installer and once the installation is complete go ahead and run the program. You should see a screen similar to the one shown below.

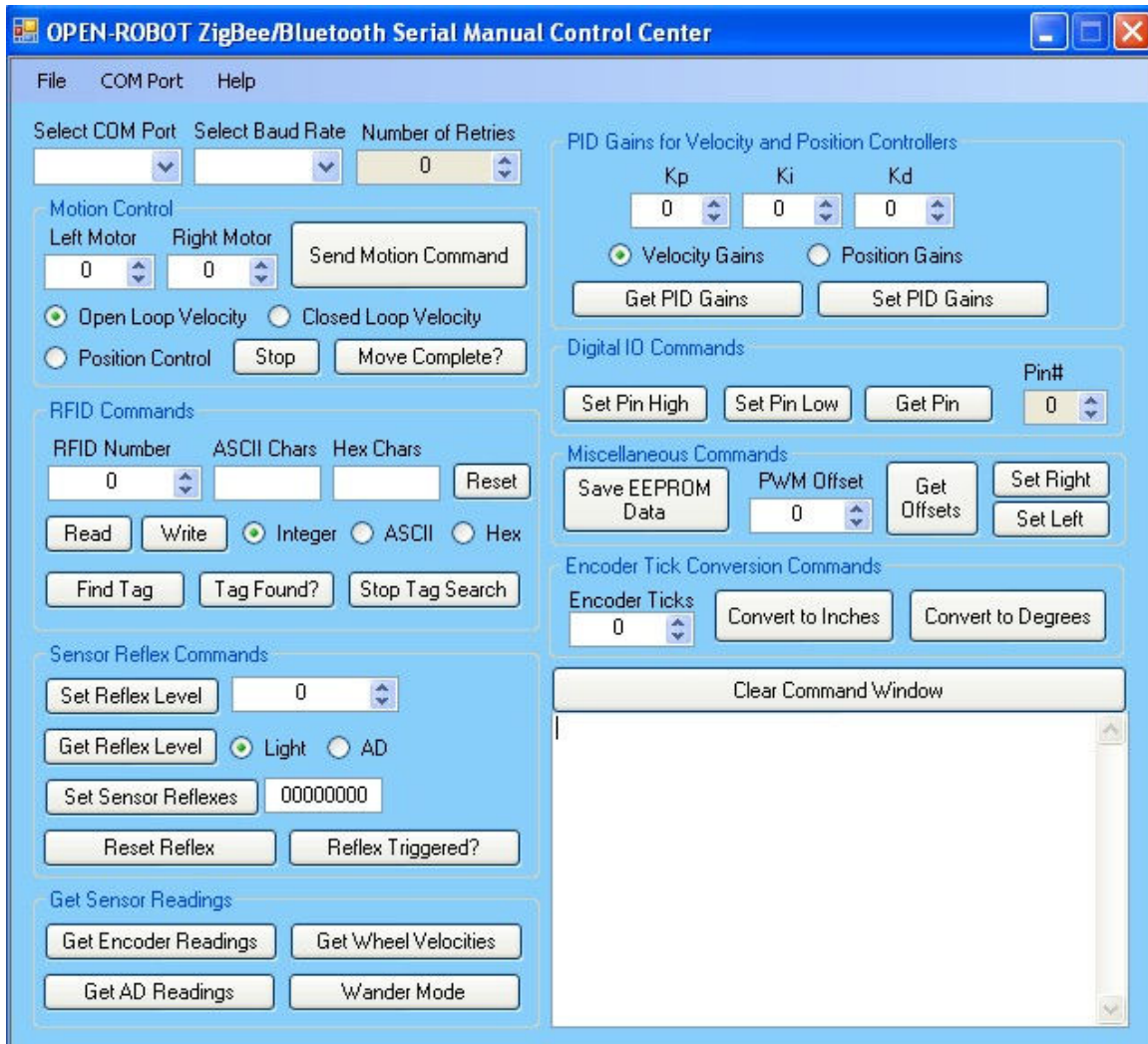


Figure 9. Use Manual Control program to test out OPEN-ROBOT.

Select the appropriate COM Port, set the baud rate to 115200 and set the number of retries to 1. Use the COM Port that was displayed when you ran the X-CTU program. For this example it happens to be COM7, but it may be different for you.



Figure 10. Configure COM Port.

From the **COM Port** menu select **Open**.

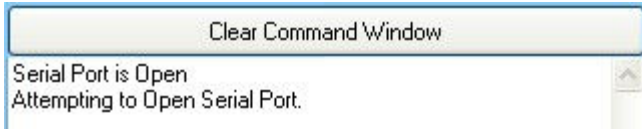


Figure 11. Open Serial Port.

Once the serial port is open you can command OPEN-ROBOT. Try getting the analog-to-digital sensor readings by clicking on the [Get AD Readings](#) button.

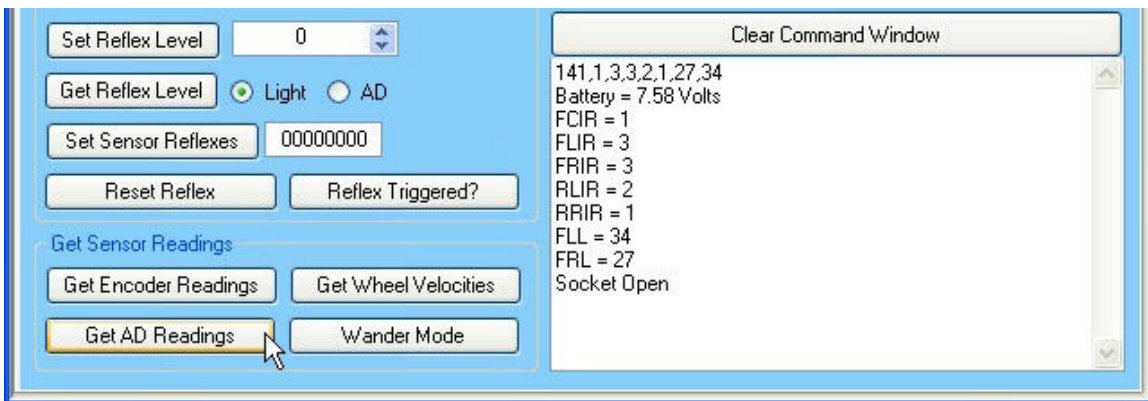


Figure 12. Get AD Sensor Readings.

Go ahead and try the other functions. If you are using your XBee equipped robot in a WiFi environment you may notice that OPEN-ROBOT fails to respond and you see a `READ_ERROR`. This is normal and happens because the XBee wireless packets sometimes get dropped. To counteract this we recommend setting the Number of Retries to at least 1.

Please send all questions and issues to abe@abotics.com