

# 3pi Robot Complete Quick Start Guide

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**BiPOM Electronics, Inc.**

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## 1. Overview

Thank you for purchasing **3pi Robot Complete** kit from BiPOM Electronics.

**3pi Robot Complete** is a robotics development kit that has everything that you need to get started with wireless robotics. It is a microcontroller board, a robot, a wireless system, all in one.

### Package Contents

**3pi Robot Complete** includes:

- BRD-EXP-PLLU3PI-ZB board
- BRD-USBXB-1 board
- Two XB24-ACI-001 XBee industry standard Zigbee modules
- Pololu 3pi Robot (batteries not included)
- Pololu USB AVR Programmer
- Mini USB Cable
- Programmer Ribbon Cable
- 3pi Expansion Kit Hardware

Figure 1 shows the package contents:

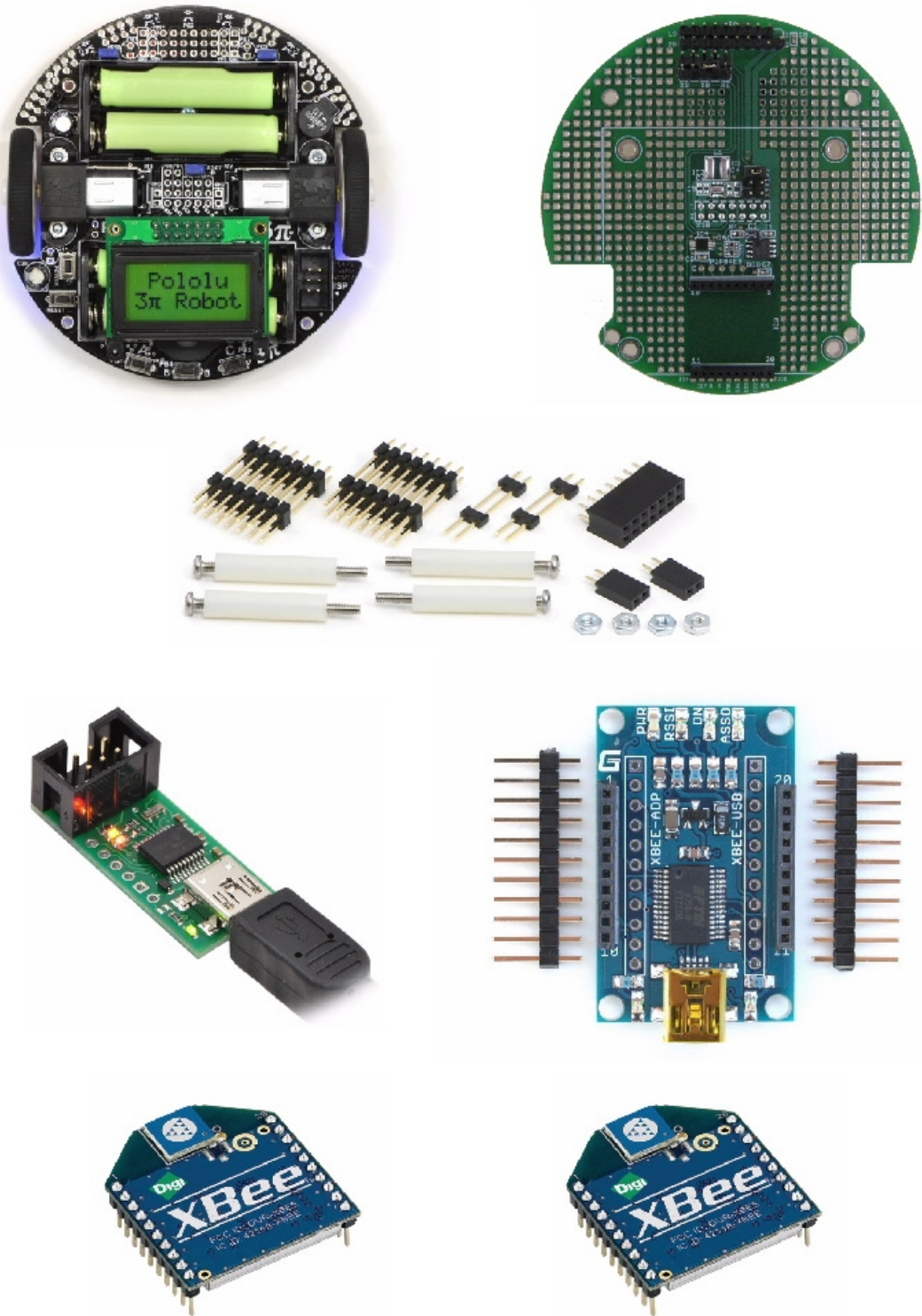


Figure 1

## 2. Hardware Setup

Pololu 3pi Robot that comes with **3pi Robot Complete** kit already comes with 2x7 female expansion connector soldered to it. This eliminates one more step for you to get started with the kit.

XBee (Zigbee) radio modules that come with the kit are mapped to each other (paired) and factory configured to work at 115200 baud. XBee module configuration and mapping should not be changed by the user to ensure proper operation with the kit.

Setting up the robot is simple:

- Insert 4 AAA batteries to the robot as shown below in Figure 2:

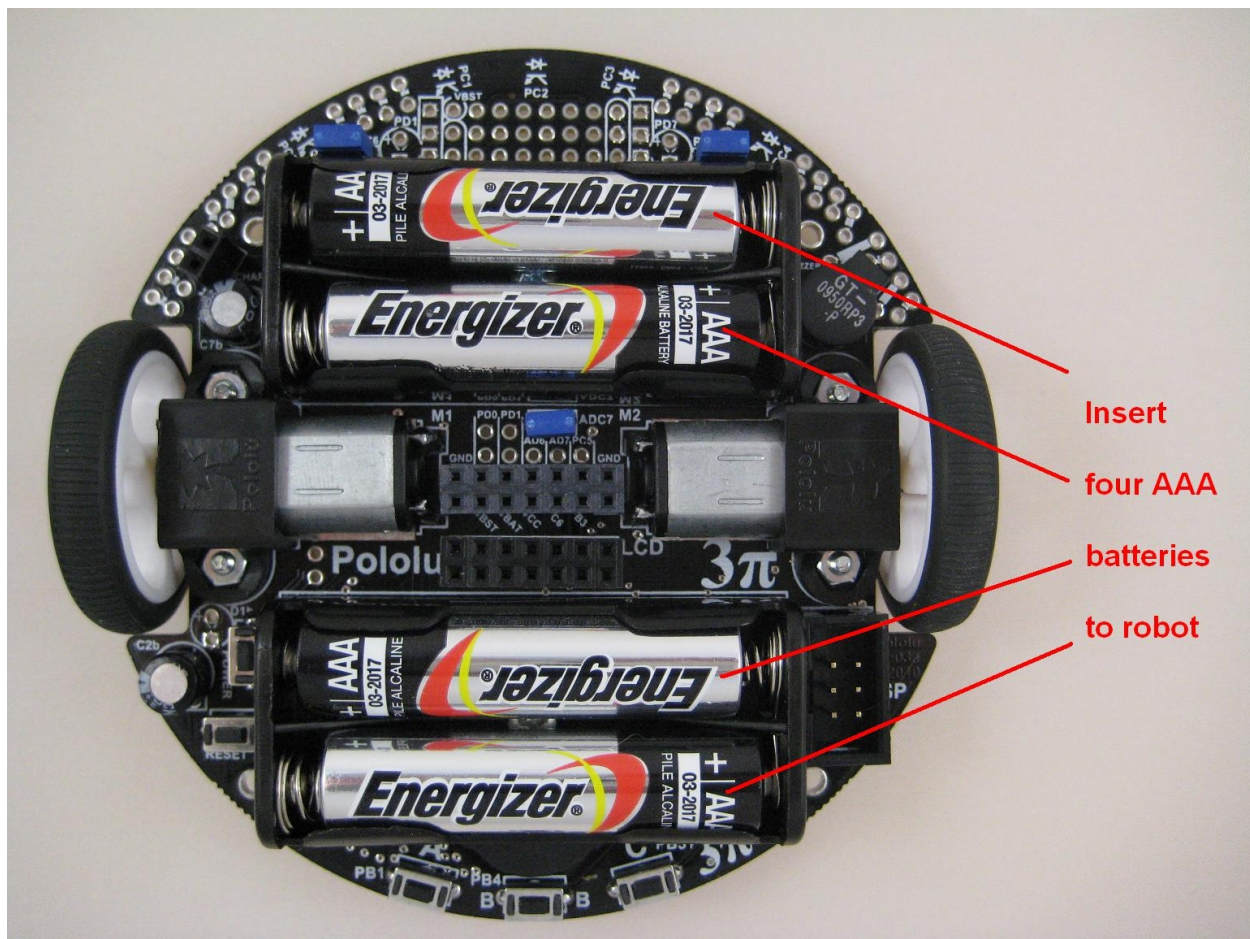


Figure 2

- Insert the Zigbee wireless expansion board BRD-EXP-PLL3PI-ZB on to the robot's expansion connector (in red rectangle) in Figure 3 below:

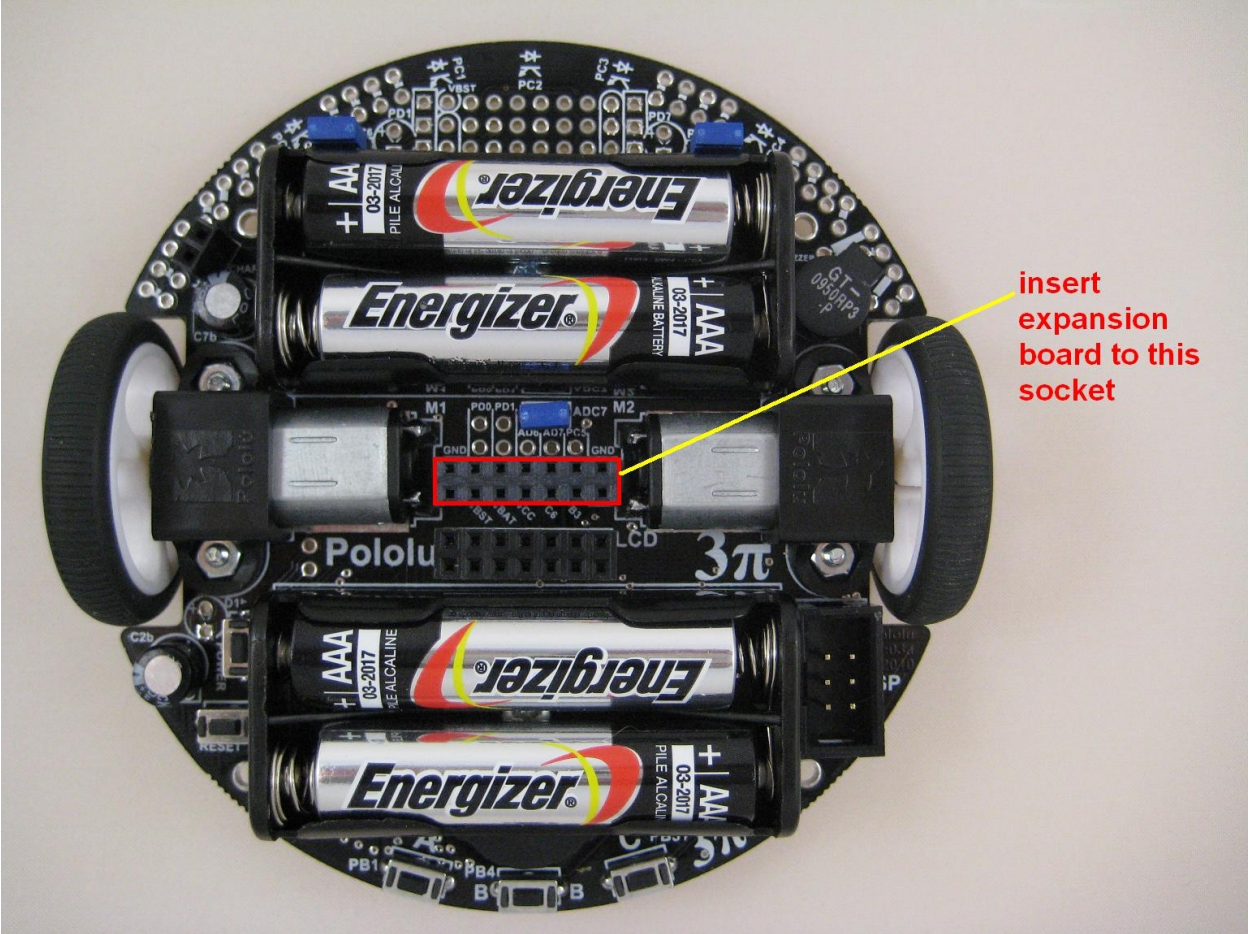


Figure 3

- Complete the hardware set up by adding 4 plastic stand offs and metal bolts as shown in Figure 4 (red circled).

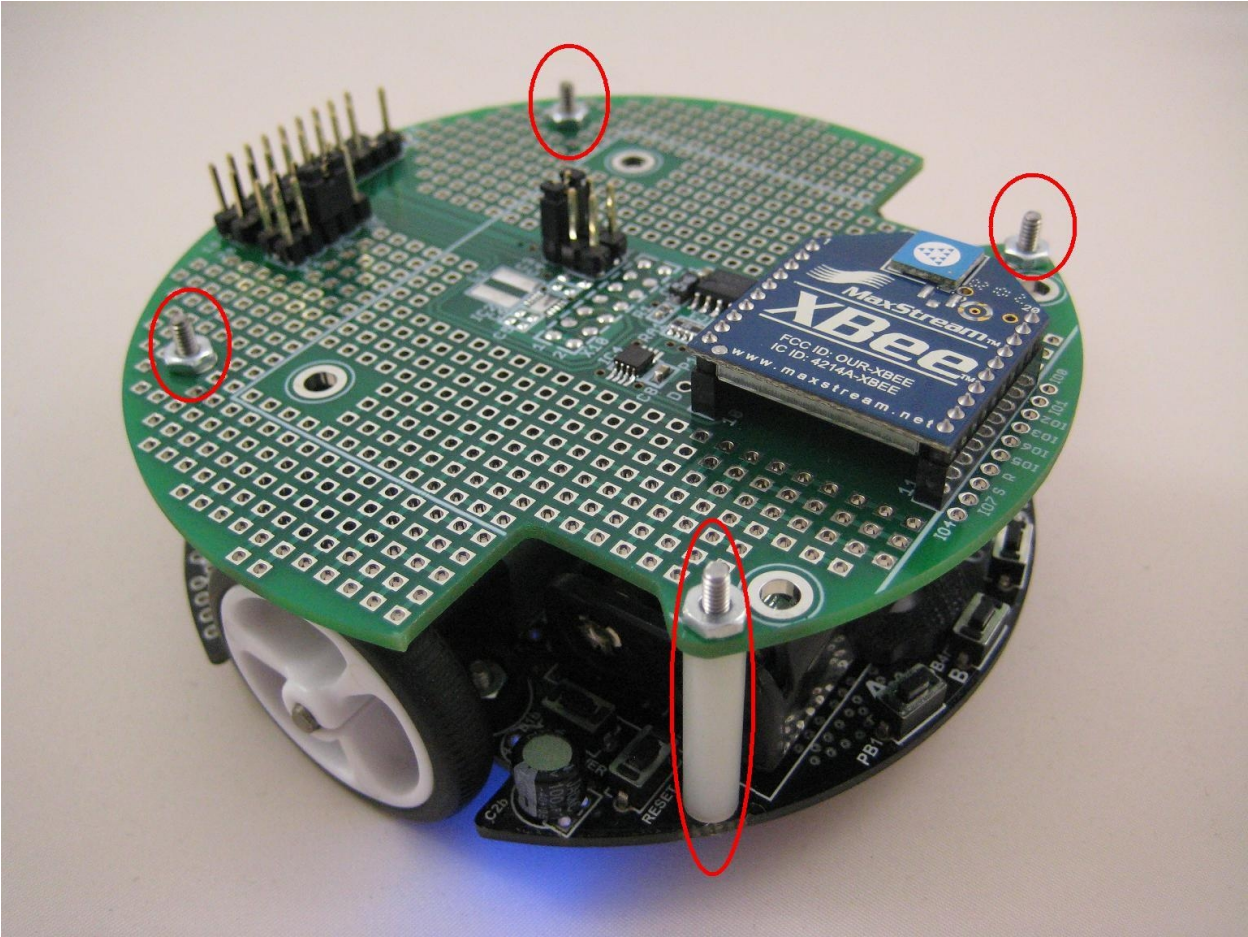


Figure 4

## 3. Software Setup

### 4.1 Robot Side

On the robot side, the kit comes preconfigured out of the box. There is nothing to set up.

3pi Robot runs a **SLAVE** firmware to respond to requests coming over the wireless link. The 3pi Robot that comes with **3pi Robot Complete** kit has this firmware preprogrammed at the factory. If you change this firmware and want to restore it at any time, please refer to Appendix A for instructions on how to download the **SLAVE** firmware to the 3pi Robot.

**SLAVE** firmware supports the following features:

- Send the version of the slave firmware
- Read the line sensors and send their values
- Send the raw (uncalibrated) sensor values
- Send the calibrated sensor values
- Compute the position of a black line using the `read_line()` function and send the value
- Send the trimmer value
- Send the battery voltage in milivolts
- Drive robot's motors
- Play a musical sequence
- Display messages on robot's LCD display
- Run through an automatic calibration sequence

## 4.2 PC Side

On the PC side, software setup involves 2 steps:

1. Installation of FTDI driver software for USB dongle for **BRD-USBXB-1** board
2. Installation of 3pi Robot Control Panel

### 4.2.1 Installation of FTDI Driver

Please download the FTDI chip driver file “CDM20600.exe” from the link below.

<http://www.ftdichip.com/Drivers/CDM/CDM20600.exe>

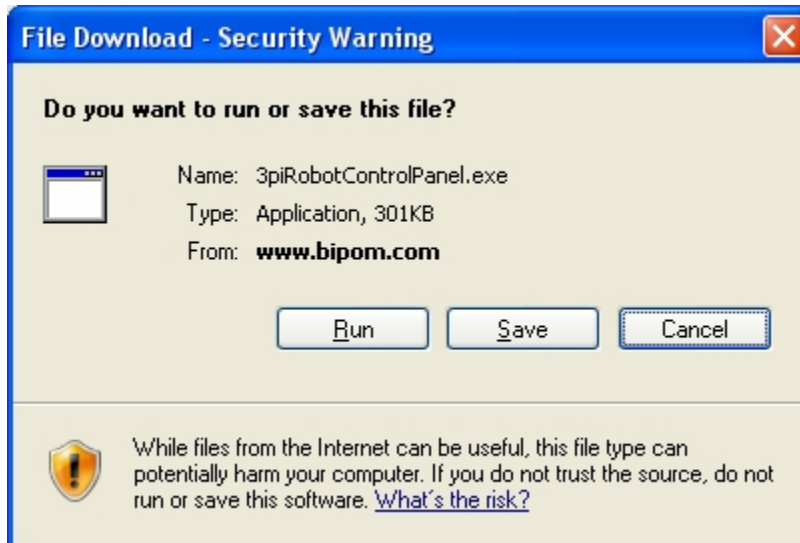
Start the installation of this driver by double clicking on “CDM20600.exe”. And then follow the on screen instructions to complete the installation.

### 4.2.2 Installation of 3pi Robot Control Panel

“3piRobotControlPanel.exe” can be downloaded from the link below.

[http://www.bipom.com/web\\_softwares/3415761.html](http://www.bipom.com/web_softwares/3415761.html)

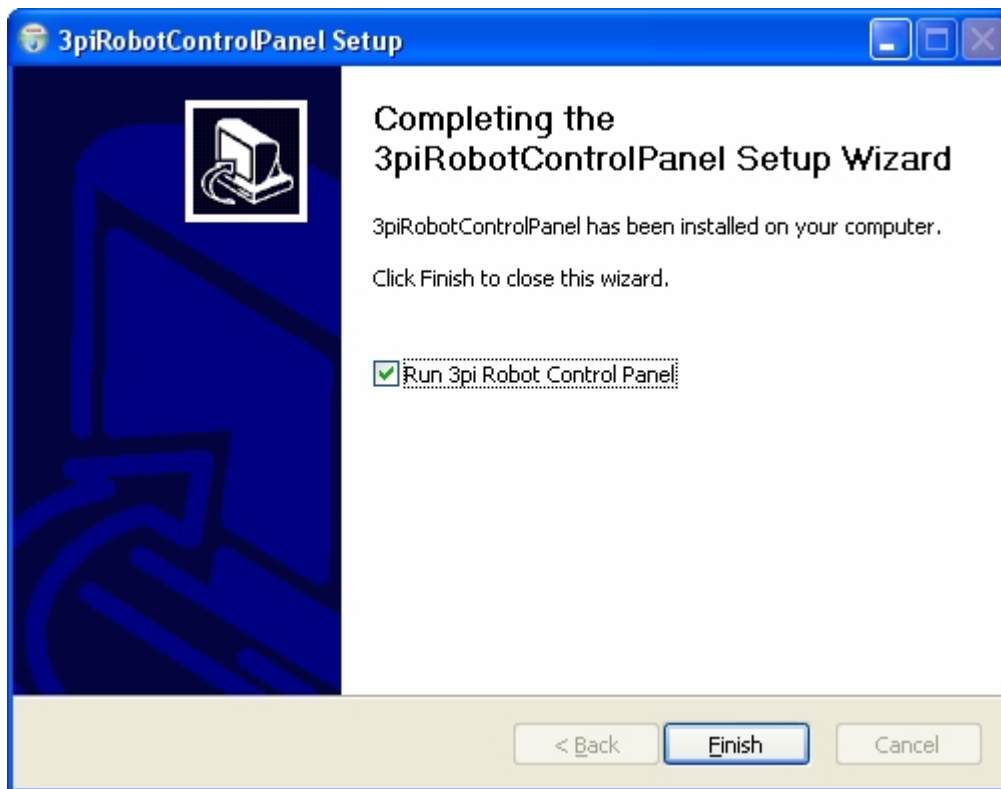
Please . At first, you may see a message window appearing as shown below.



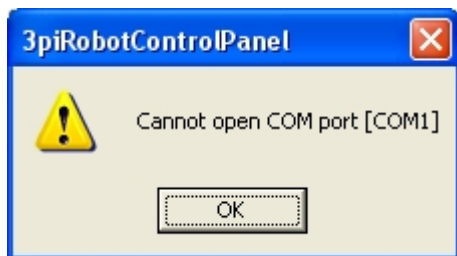
Please click “Run” to start installing the program.

Follow the on screen instructions of setup wizard to complete installation of the program.

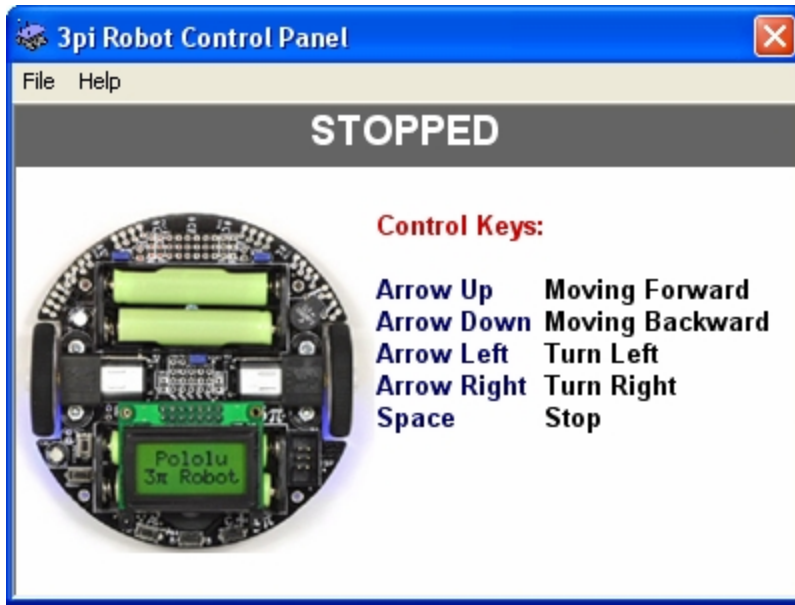




Please check the "Run 3pi Robot Control Panel" option and click "Finish" to start the program.



You may see a warning window similar to the one above. This is due to configuration of PC's communication port. Please click "OK" to proceed with configuration of the software.

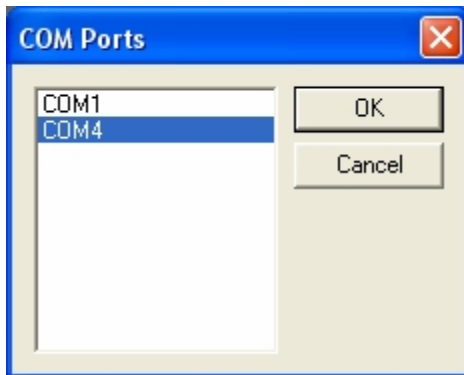


The main window of the software is shown above.

Please select your COM (Communication Port) by choosing File > Select COM Port...

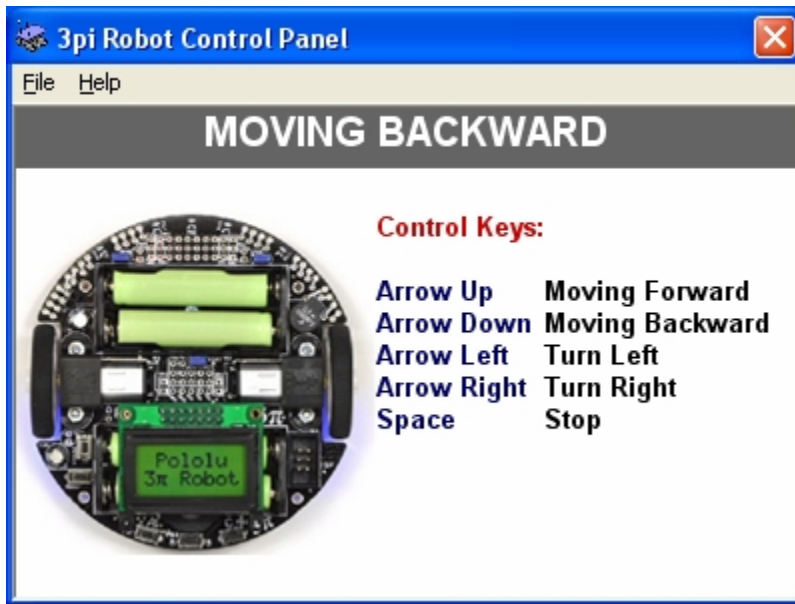
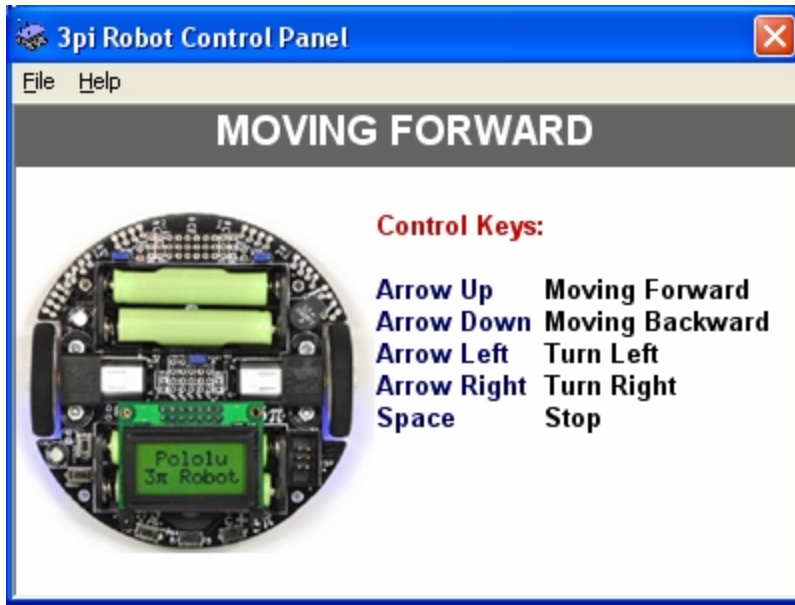
The selection COM port is the same port in which your BRD-USBXB-1 board connected to PC.

Please note that COM ports numbered above COM9 may not work with the program. If this is the case, try choosing a COM port numbered below COM9. This can be done by modification of that COM port within "Device Manager" or physically choosing a different port in your PC.

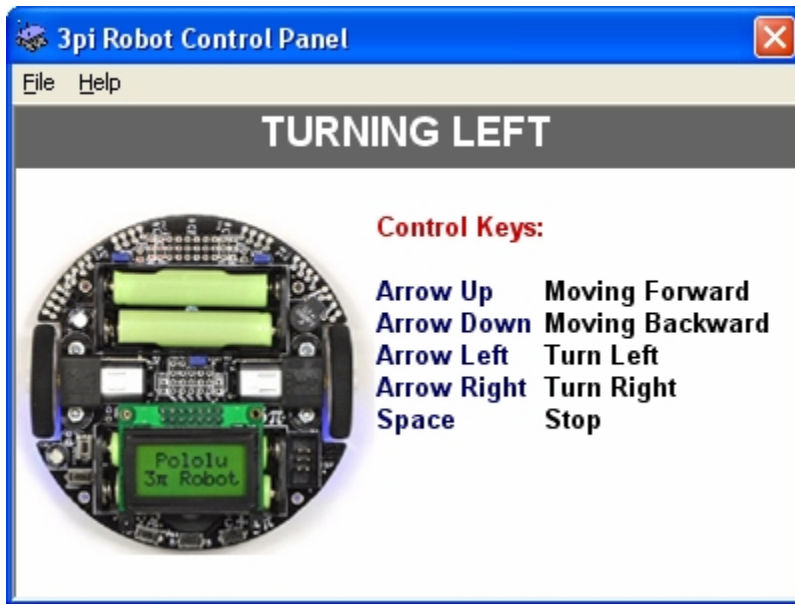
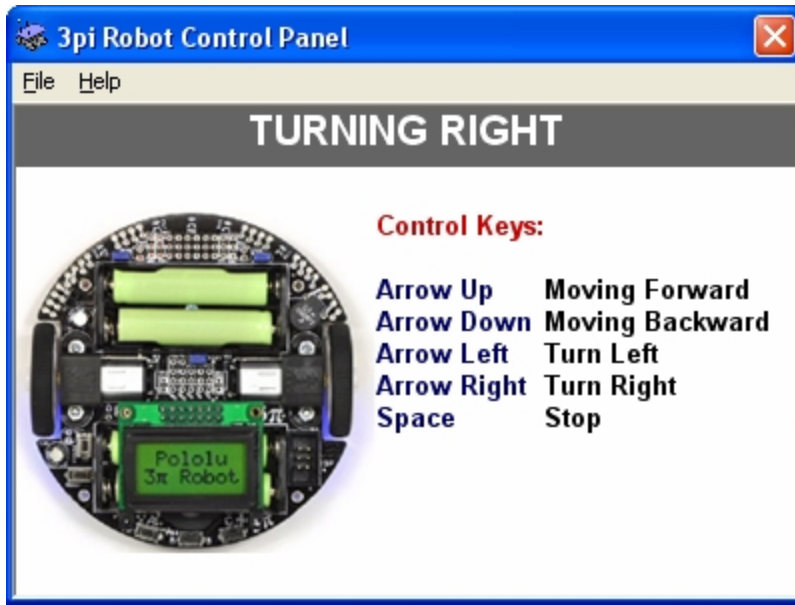


After choosing the correct COM port in the program, 3pi robot can now be turned on by pushing the power button.

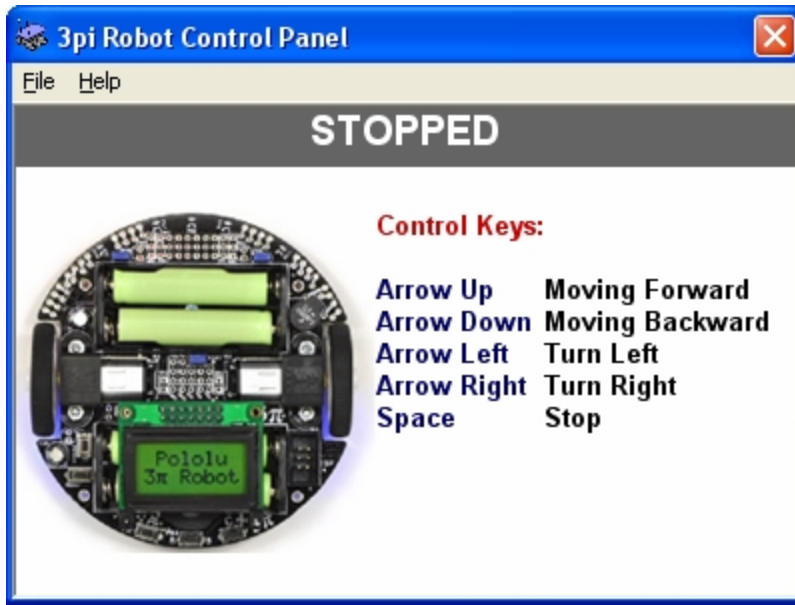
3pi Robot can now be remotely controlled via this program by using arrow and space bar buttons of your keyboard.



Above are two screenshots of forward and backward moves of the "3pi Robot Control Panel".



Above are two screenshots of right and left turns of the "3pi Robot Control Panel".



Above is the screenshot of stopping or no moves of the “3pi Robot Control Panel”. Pressing the “Space” key only stops the robot from moving, and it does not turn the robot off, the robot is still on.

Please, select “Help > Open Web Page” to learn more about 3pi Robot.

## Appendix A

### Restoring SLAVE firmware

The **SLAVE** firmware that is preprogrammed to 3pi Robot as part of **3pi Robot Complete** is the standard slave software that comes with Pololu software package.

Please visit <http://www.pololu.com/docs/0J21/10.a> to obtain more information. In order to simplify this step Bipom provides a complete package to run/build the slave firmware. Please download [http://www.bipom.com/support/pololu/pololu\\_package.zip](http://www.bipom.com/support/pololu/pololu_package.zip) and unzip to any folder. Download the pre-compiled firmware (slave.hex) to Pololu 3pi Robot board using Pololu USB AVR Programmer and Atmel AVR Studio.

## Appendix B

### Installing drivers for Pololu USB AVR Programmer

Please first download the drivers “pgm03a\_windows\_091222.zip” for this hardware from the link below.

[http://www.pololu.com/file/0J198/pgm03a\\_windows\\_091222.zip](http://www.pololu.com/file/0J198/pgm03a_windows_091222.zip)

Save this file and unzip the file to a folder first. And then connect the hardware to your PC's USB port with the provided cable. When Windows detects the new hardware, choose to install the driver for the hardware manually. Choose the path where you already unzipped the driver files for driver installation. There will be three different driver installations, so please follow up and choose the same unzipped driver files folder for each driver.

## Appendix C

### Soldering Additional Connectors

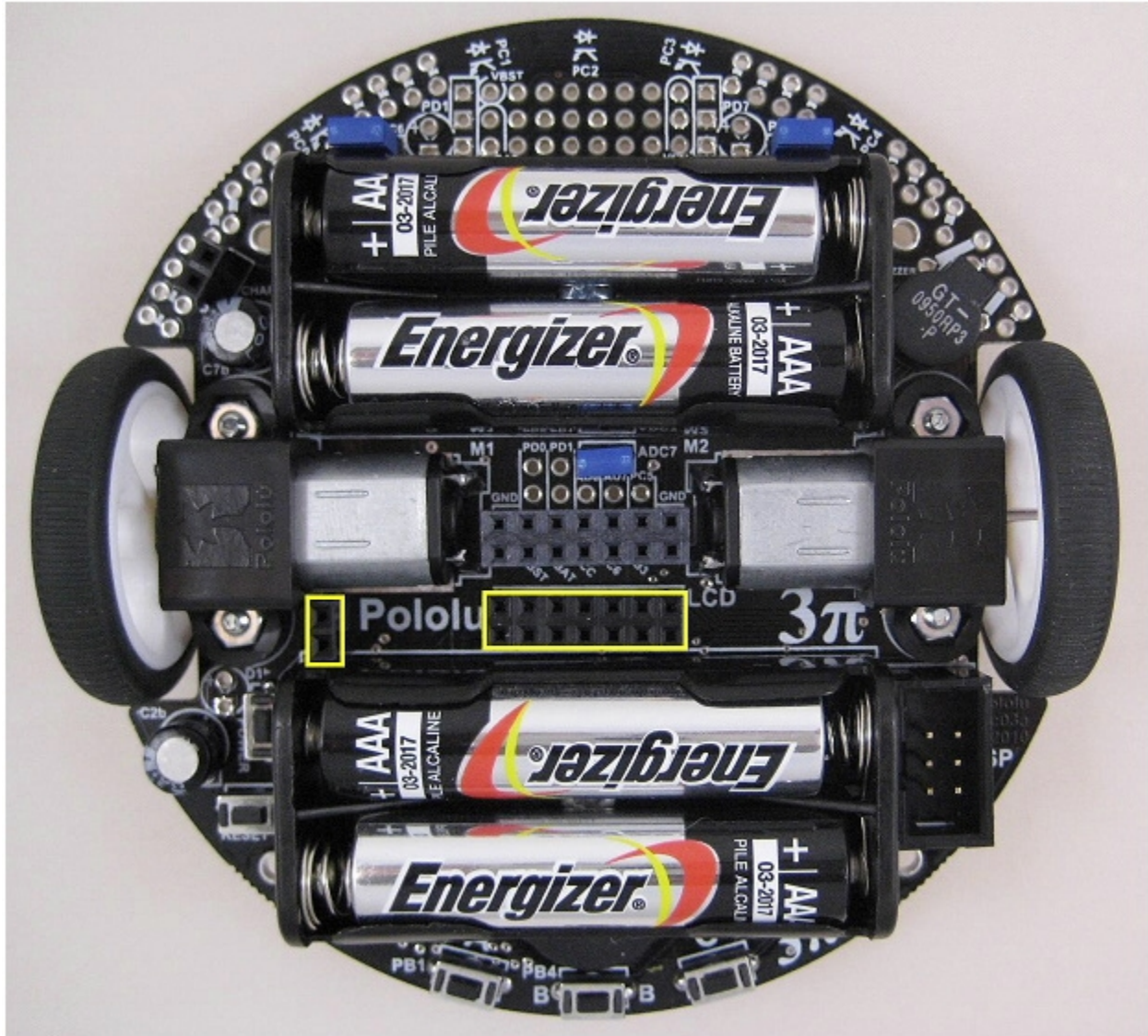
The male Expansion connector for the top board and the female Expansion connector for the robot are soldered at the factory for the 3pi Robot Complete kit. So no user action is needed to add the Expansion connector.

LCD connector, CHARGE connector and PUSH connector between the robot and the top board are part of the 3pi Robot Complete kit and can be soldered by the user if additional functionality is needed on these connectors.

We recommend that you fully assemble the 3pi and its expansion kit **before you solder anything**. This will ensure that once everything is soldered in, the expansion platform will align properly with the base. We suggest that you assemble your expansion kit in the following order:

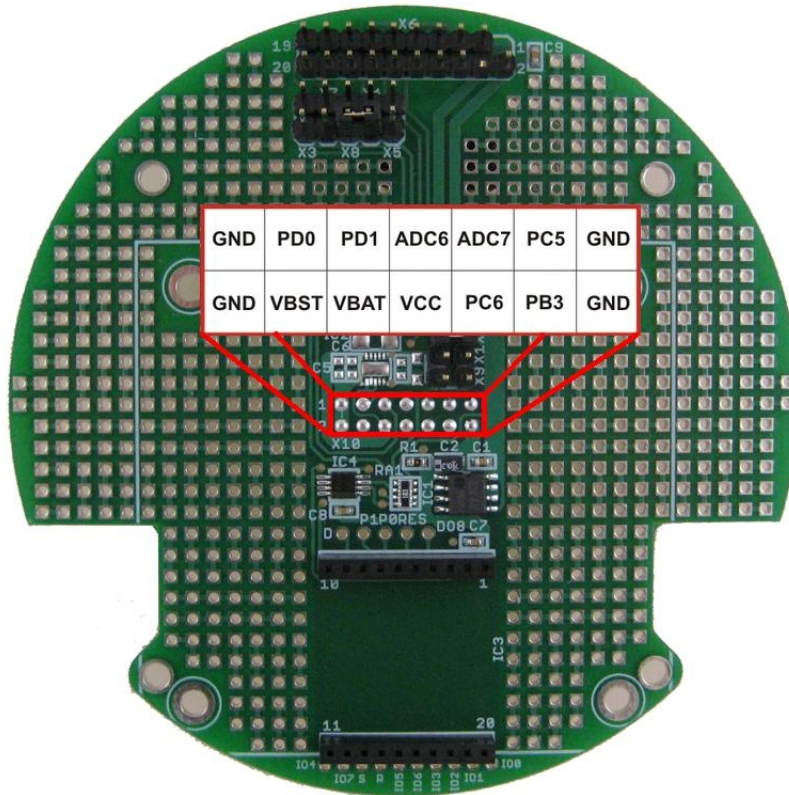
- 1) Place the 2×7 female header and one of the 2×1 female headers into the proper holes in the 3pi base as shown below (see the yellow rectangles).





**Pololu 3pi robot with expansion kit female headers marked by yellow rectangles.**

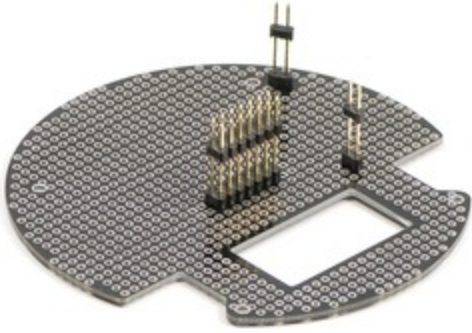
2) Insert the long ends of the 2×7 and one 2×1 extended male header into these female headers, and insert an extended 2×1 male header into the battery charge port. Place the expansion PCB so the tops of these male headers seat in the proper places, as marked by the rectangles in the picture below. Note that the expansion PCB mounts with the silkscreen facing up.



**Solder connections for male headers on the 3pi expansion kit with cutouts.**

3) Slip a nylon spacer between the base and the expansion PCB so that it lines up with the mounting hole on the base. Insert a screw from the underside of the base up through the base's mounting hole, the spacer, and the mounting hole on the expansion board. Holding the head of the screw against the base, twist the nut onto the other side, but don't tighten it all the way. Repeat this process for the three remaining screws, and then tighten them together so that the expansion PCB is aligned well with the base.

4) With the screws holding everything in place, you can now solder the female headers to the base and the male headers to the expansion PCB. Once everything is soldered in, you can remove the screws and pull the expansion PCB off of the base; it should look like the one in the picture below.



**Bottom view of 3pi expansion kit with cutouts (black solder mask version).**

After assembly you will have a single 2×1 female header left over. You can use this to create your own battery charge port on the expansion PCB.