

3pi Wireless Robot Set II

Quick Start Guide

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BiPOM Electronics, Inc.

www.bipom.com

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1. Overview

Thank you for purchasing **3pi Wireless Robot Set II** from BiPOM Electronics.

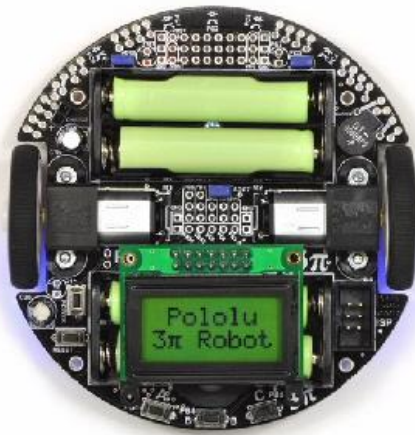
3pi Wireless Robot Set II is a robotics development set that has everything that you need to get started with wireless robotics. It is a microcontroller board, a robot, a wireless system, all in one.

Package Contents

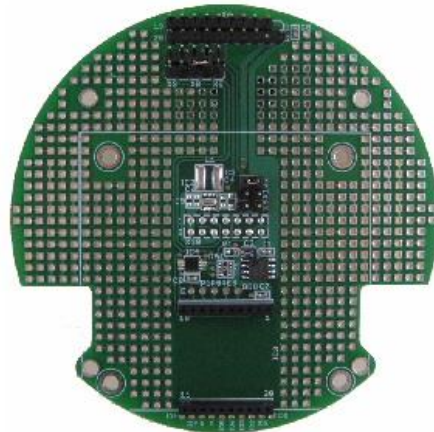
3pi Wireless Robot Set II includes:

- BRD-EXP-PLLU3PI-ZB board
- BRD-USBXB-1 board
- Two sets of mapped XB24-ACI-001 XBee industry standard Zigbee modules
- Pololu 3pi Robot (batteries not included)
- Pololu USB AVR Programmer
- Programmer Ribbon Cable
- USB Cable A to Mini-B 6feet (1.8meters)
- USB Cable A to Mini-B 3feet (0.9meters)
- 3pi Expansion Set Hardware
 - ü Female connectors are already soldered to 3pi Robot
 - ü Male connectors are already soldered to BRD-EXP-PLLU3PI-ZB board

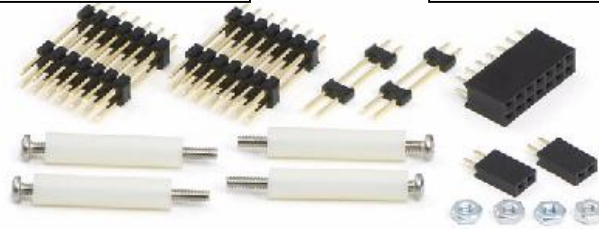
Figure 1 shows the package contents (cables not shown):



POLOLU 3PI ROBOT



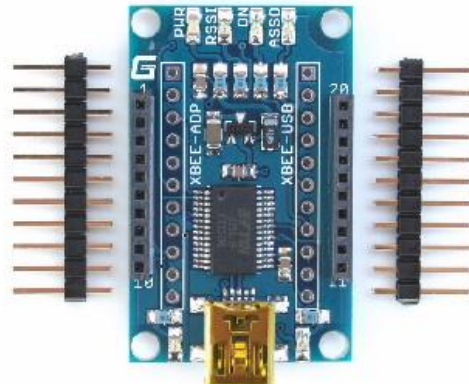
BRD-EXP-PLL3PI-ZB



3PI EXPANSION SET HARDWARE



POLOLU USB AVR PROGRAMMER



BRD-USBXB-1



**XB24-ACI-001
XBee 802.15.4 OEM RF Modules**

Figure 1

2. Hardware Setup

Pololu 3pi Robot that comes with **3pi Wireless Robot Set II** already comes with 2x7 female expansion connector soldered. This eliminates a major step in getting started with the set.

XBee (Zigbee) radio modules that come with the set 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 set.

Setting up the robot is simple:

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

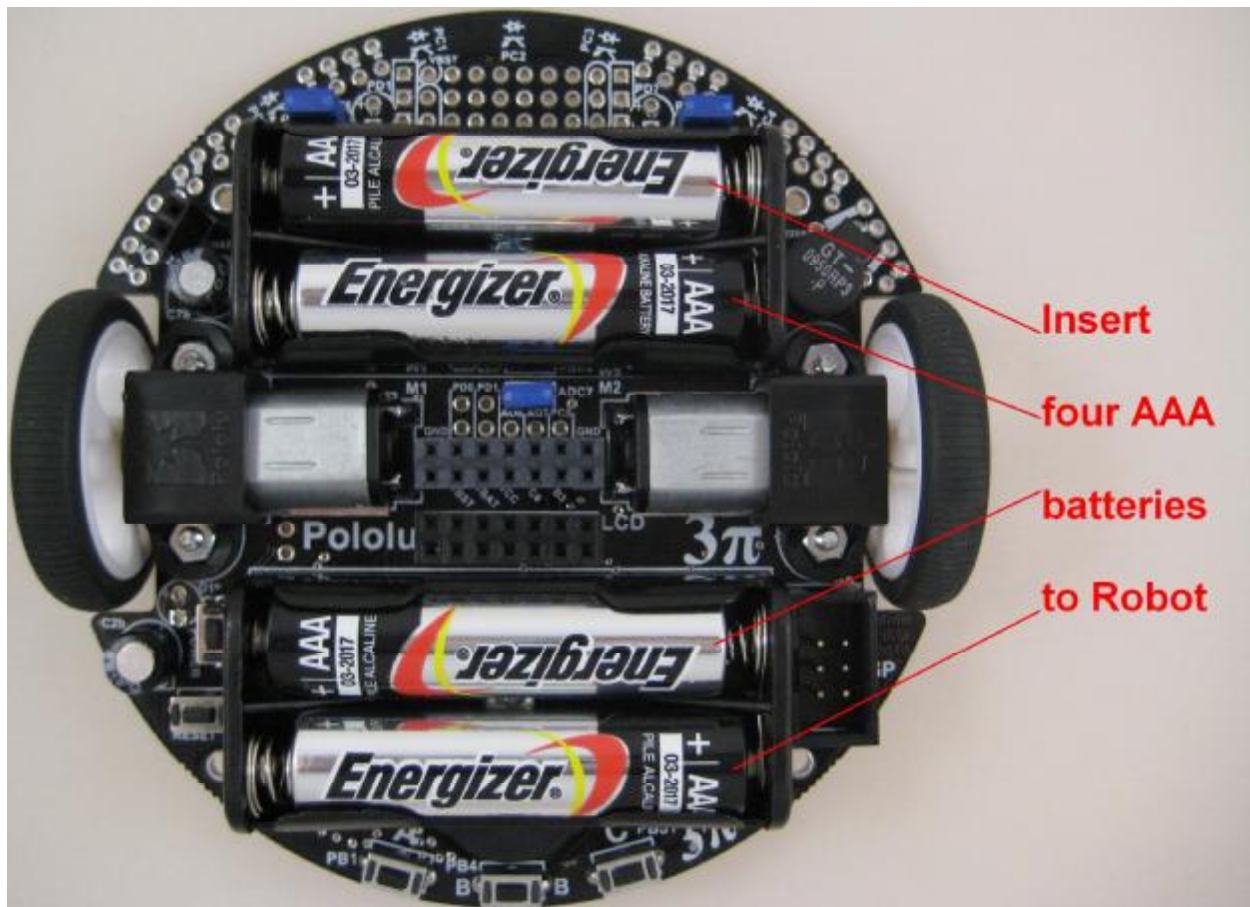
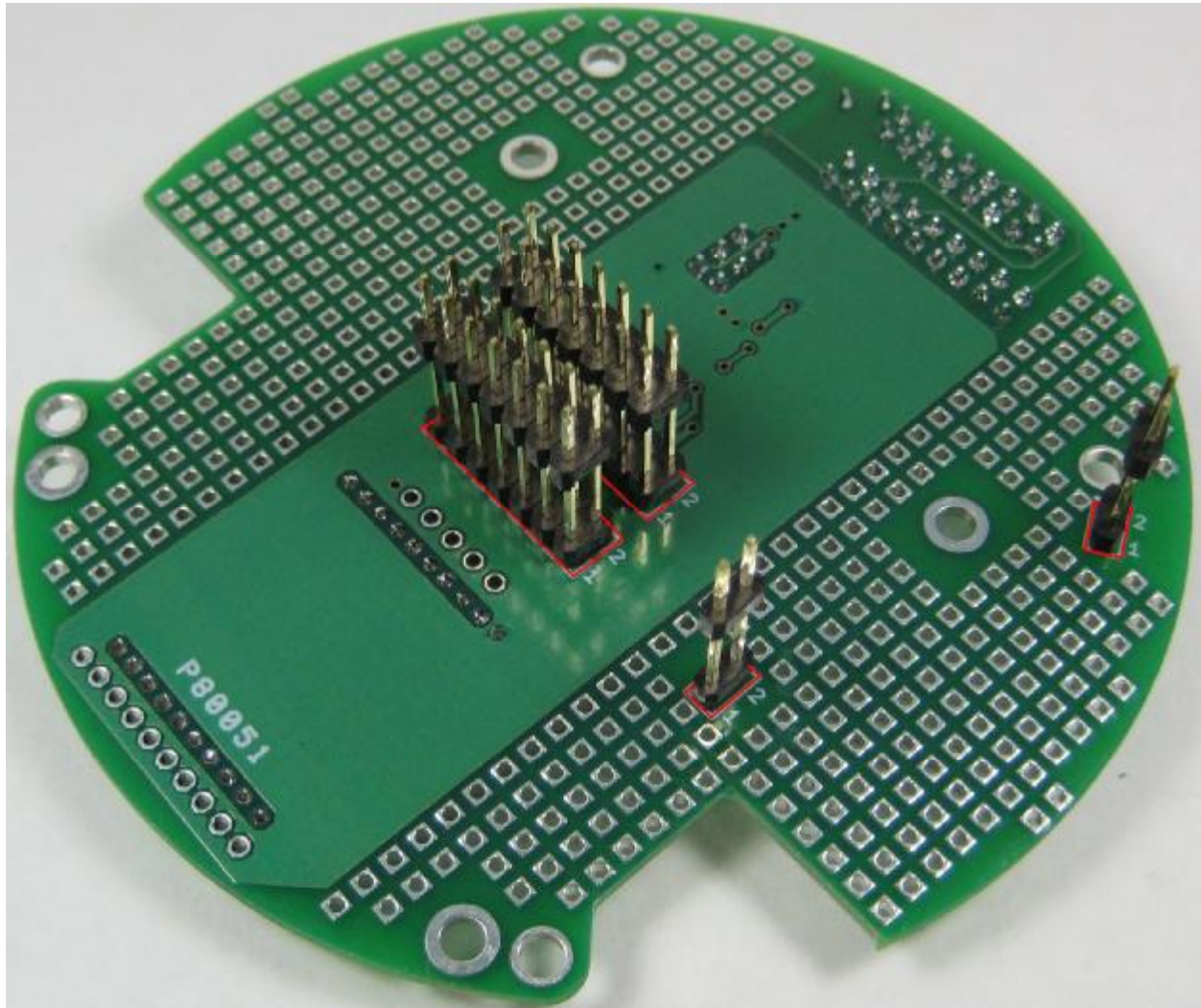


Figure 2

- The two 2x7 and two 2x1 male Expansion connectors for the top board and the 2x7 and 2x1 female Expansion connectors for the robot are soldered at the factory for the **3pi Wireless Robot Set II** set. 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 Wireless Robot Set II** set and can be used by the user if additional functionality is needed on these connectors.



**Bottom view of 3pi expansion board rev. 1.05
(Soldered male connectors shown with red marks).**

- Insert the Zigbee wireless expansion board BRD-EXP-PLL3PI-ZB on to the robot's female expansion connectors (in yellow rectangles) in Figure 3 below:

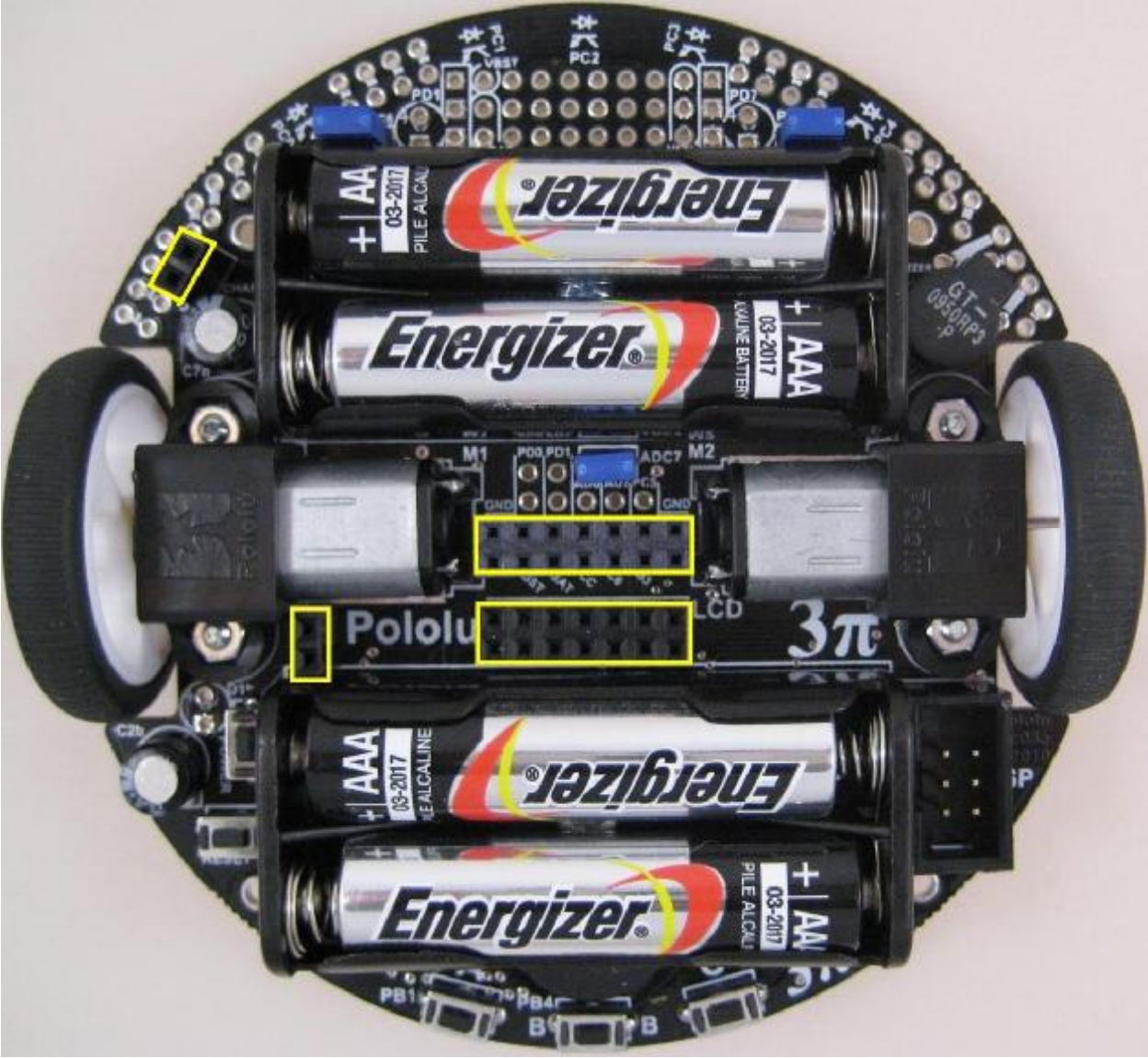


Figure 3

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

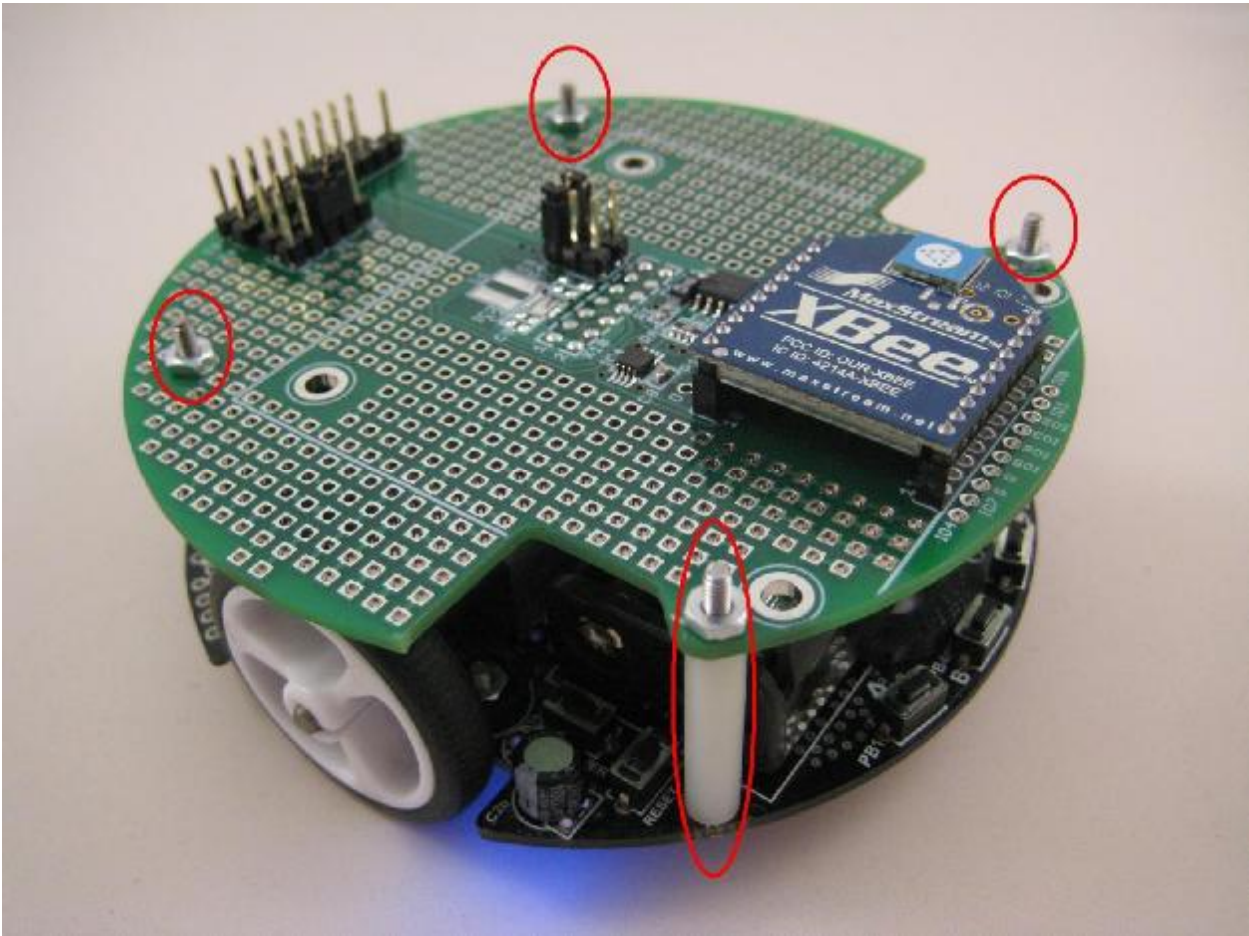


Figure 4

3. Software Setup

3.1 Robot Side

On the robot side, the set 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 Wireless Robot Set II** set 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 millivolts
- Drive robot's motors
- Play a musical sequence
- Display messages on robot's LCD display
- Run through an automatic calibration sequence

3.2 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

3.2.1 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.

3.2.2 Installation of 3pi Robot Control Panel

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

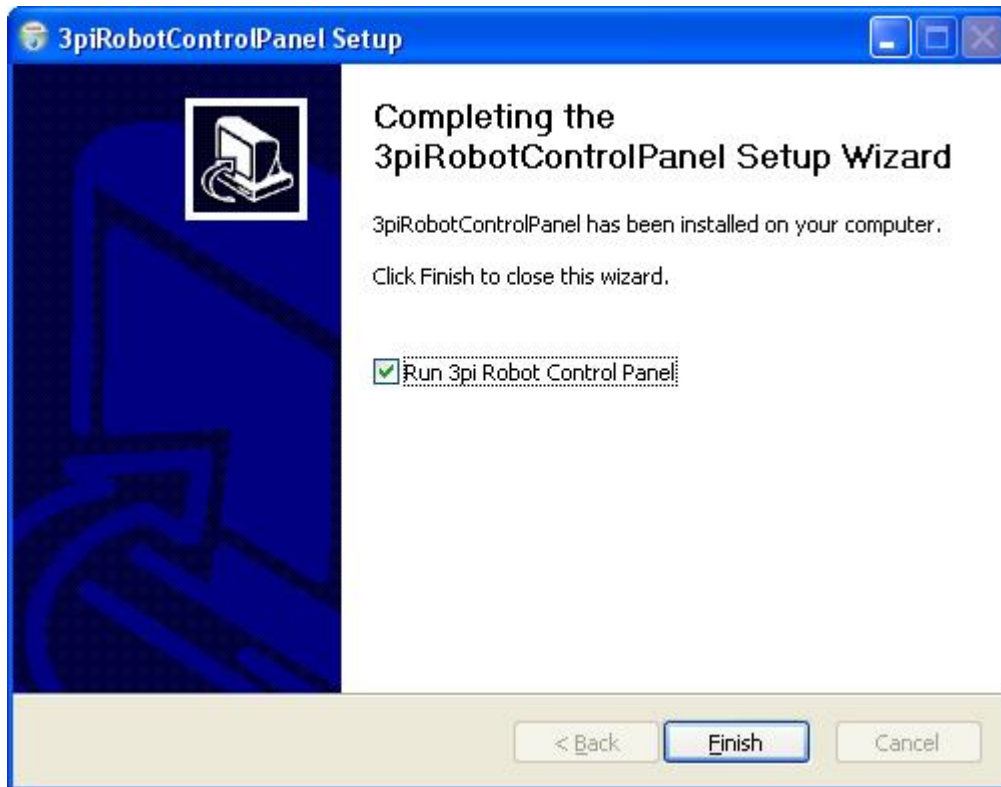
http://www.bipom.com/web_softwares/3415761.html

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



Please click “Run” to start installing the program.

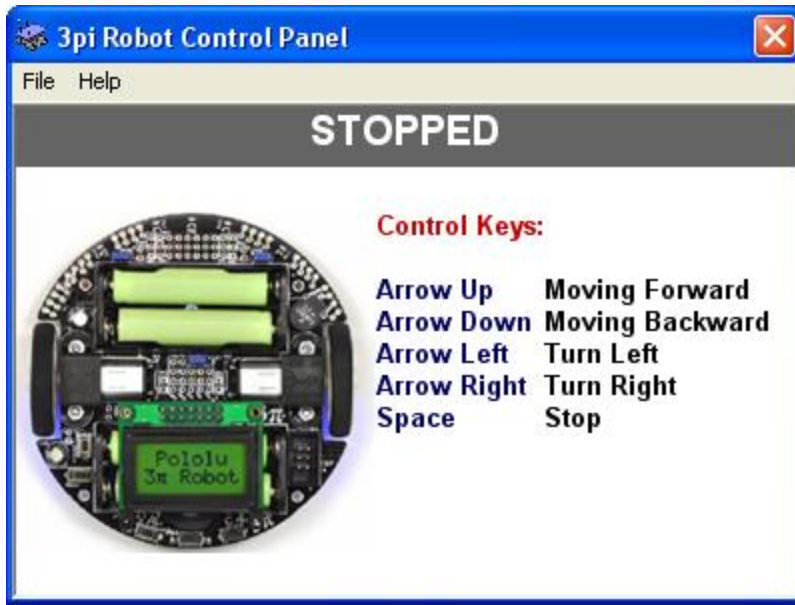
Follow the on screen instructions of setup wizard to complete installation of the program.



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.

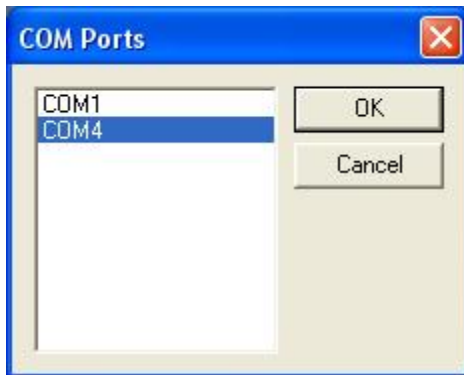


The main window of the software is shown above.

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

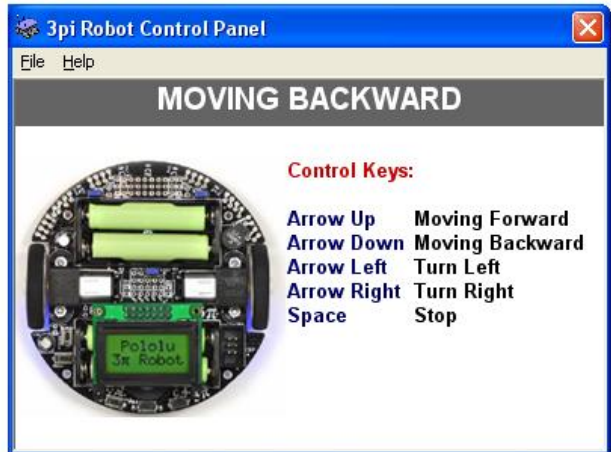
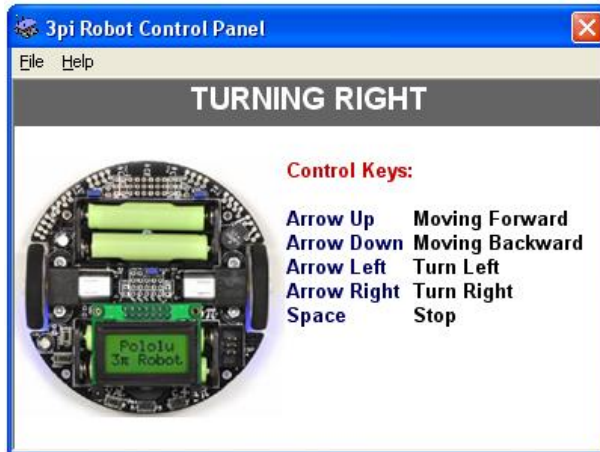
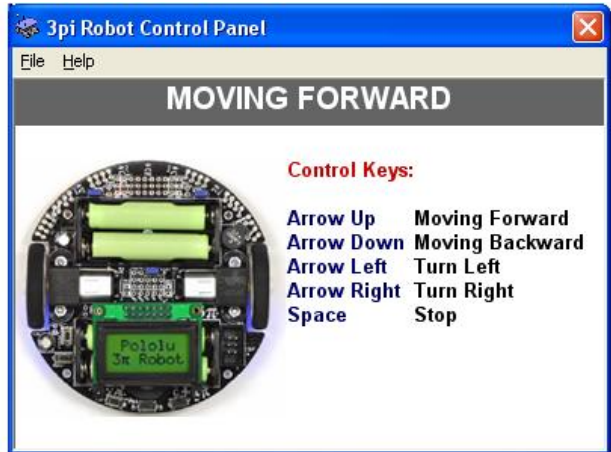
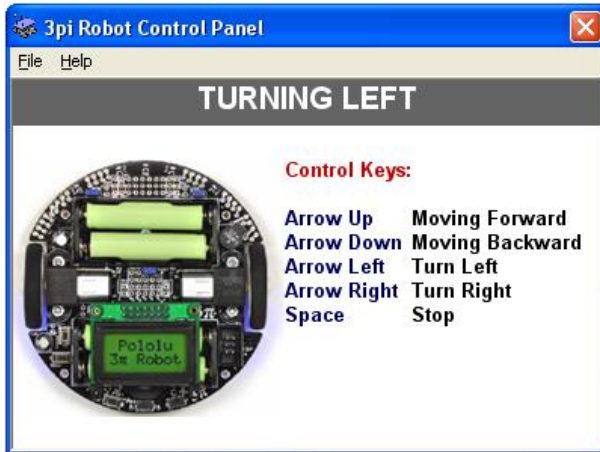
The selection COM port is the same port in which your BRD-USBXB-1 board connected to PC.

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.

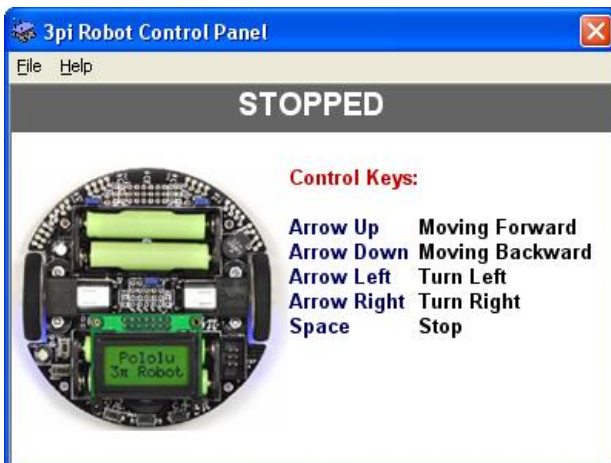


After choosing the correct COM port in the program, 3pi robot can now be turned on by pushing the power button.

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



Above are some screenshots of moves of the “3pi Robot Control Panel”.



Above is the screenshots of the “3pi Robot Control Panel”. Pressing the “Space” key only stops the robot from moving, but 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 Wireless Robot Set II** 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 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

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 (the folder) 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

3pi Robot Control Commands

This section is for 3pi users that wish to control the robot from their PC through the serial port. This can be a wired or wireless serial port. Commands are the same for either case. Serial port settings are 115200 baud and 8 data bits, No Parity, 1 Stop bit. Each command has its own identifier and can contain an optional parameter. The software “3pi Robot Control Panel” that comes with the kit uses the following commands:

STOP: Turns off motors on the robot

FORWARD: Sets forward speed of left or right motor

BACKWARD: Sets backward speed of left or right motor

Robot command identifiers:

CMD_STOP	= 0xBC
CMD_M1_FORWARD	= 0xC1
CMD_M2_FORWARD	= 0xC5
CMD_M1_BACKWARD	= 0xC2
CMD_M2_BACKWARD	= 0xC6

Speed parameters:

SPEED_MAX	= 127
SPEED_MIN	= 0

Stop command does not have any parameters.

To send commands, simply send 1 byte command identifier to the serial port. For speed commands, send 1 byte speed value directly after command identifier.

Sample C code below shows usage of these commands:

...

```
char CmdBuffer[8];
int idx = 0;

switch(Key)
{
case KEY_FORWARD:
    // set half of full speed forward
    CmdBuffer[idx++] = CMD_M1_FORWARD;
    CmdBuffer[idx++] = SPEED_MAX / 2;
    CmdBuffer[idx++] = CMD_M2_FORWARD;
    CmdBuffer[idx++] = SPEED_MAX / 2;
    break;

case KEY_BACKWARD:
    // set half of full speed backward
    CmdBuffer[idx++] = CMD_M1_BACKWARD;
    CmdBuffer[idx++] = SPEED_MAX / 2;
    CmdBuffer[idx++] = CMD_M2_BACKWARD;
    CmdBuffer[idx++] = SPEED_MAX / 2;
    break;

case KEY_LEFT:
    // set right motor to 1/4 speed backward
    // stop left motor to turn robot around left wheel
    CmdBuffer[idx++] = CMD_M2_FORWARD;
    CmdBuffer[idx++] = SPEED_MAX / 4;
    CmdBuffer[idx++] = CMD_M1_FORWARD;
    CmdBuffer[idx++] = 0;
    break;

case KEY_RIGHT:
    // set left motor to 1/4 speed backward
    // stop right motor to turn robot around right wheel
    CmdBuffer[idx++] = CMD_M1_FORWARD;
    CmdBuffer[idx++] = SPEED_MAX / 4;
    CmdBuffer[idx++] = CMD_M2_FORWARD;
    CmdBuffer[idx++] = 0;
    break;

case KEY_STOP:
    // stop the robot
    CmdBuffer[idx] = CMD_STOP;
    break;

default:
    break;
}

// send command to port
if(idx > 0)
    ComPort.Send(CmdBuffer, idx);
```

...