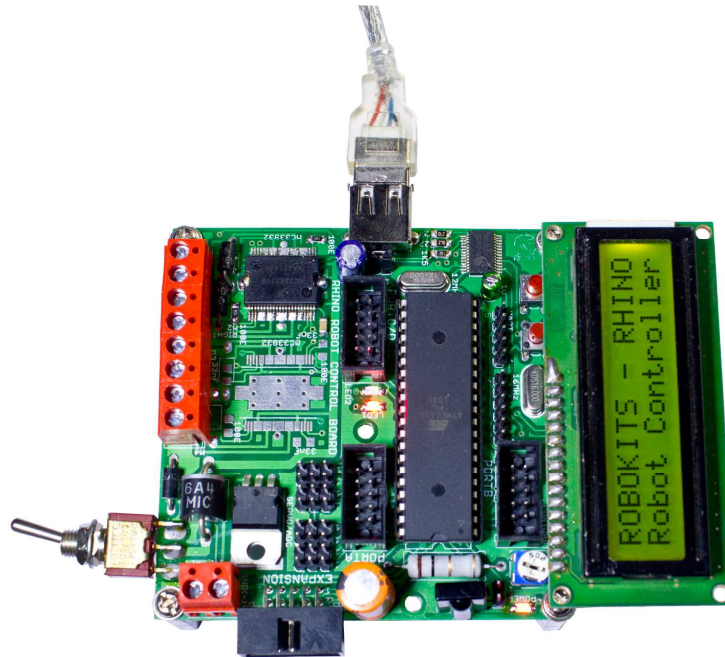


## **Rhino Robot Control Board**

**Bluetooth Based Android Phone/Tablet Controlled Robot**



## **RAN1114 : Bluetooth Based Android Phone/Tablet Controlled Robot**

**Robokits India**

<http://www.robokits.co.in> &  
<http://www.robokitsworld.com>  
[info@robokits.co.in](mailto:info@robokits.co.in)

Rhino Robot Control Board is our most powerful, versatile and most easy to use robot control board. In this first part of tutorials and application notes series you will learn about basic elements of Rhino Board and Quick C – IDE software which is specially developed software for this board.

We also hereby assume that you have gone through [Rhino Board Manual](#), [Quick C IDE user manual](#) and [Quick C IDE library reference](#). It's not necessary for you to understand everything written in those documents but you should have an overview so that you can use them as reference for some part in this document.

One of the main advantages of making Robots using Rhino Board is it allows easy programming and hardware interfacing of external device. For example, in this tutorial you will find that using preprogrammed libraries for Ultrasonic Distance Sensors and Servos makes the task and programming very easy.

## Bluetooth Communication

To use Bluetooth with Rhino Robot Control Board we need a Bluetooth-UART module which can receive data on Bluetooth from a android device and send it to Rhino board on UART lines.

For this we will use our Bluetooth-UART module, details of the module is available here - [http://robokits.co.in/shop/index.php?main\\_page=product\\_info&products\\_id=354](http://robokits.co.in/shop/index.php?main_page=product_info&products_id=354).

For Android we have a application which can be downloaded from here. This application utilizes the Bluetooth on SPP (Serial Port Profile) on phone and sends serial data to Bluetooth device. The Bluetooth device needs to be paired from Bluetooth settings menu. The name of Bluetooth Device is Robokits\_Bluetooth and pairing key is 0000. The device connects on 9600 baud rate by default.

Android application needs to be installed into phone. The application is an apk file which could be copied to phone using a USB cable or Wi-Fi and then it could be installed. Once installed, this app will enable to phone to connect Bluetooth Serial device and communicate with it. It will also be able to send robot control commands based on either touch or tilt control selected.

## This tutorial covers

- **Making an Android Phone or Tablet Controlled Robot which is communicating on Bluetooth.**
- **Install an application on phone for Bluetooth control of robot.**

## Required Items

REQUIRED ITEM	SUGGESTED ITEM/USED IN THIS TUTORIAL
<b>Roundbot (Includes Chassis, motors, wheels, battery, Rhino Board)</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=315">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=315</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=315">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=315</a>
<b>Bluetooth UART Module</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=354">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=354</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=354">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=354</a>
<b>Jumper Wires</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=324">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=324</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=324">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=324</a>

OR

REQUIRED ITEM	SUGGESTED ITEM/USED IN THIS TUTORIAL
<b>Rhino Board</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=312">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=312</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=312">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=312</a>
<b>Robot Chassis</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=378">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=378</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=378">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=378</a>
<b>Motors</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=50">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=50</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=50">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=50</a>
<b>Battery</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=69">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=69</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=69">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=69</a>
<b>Wheels</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=297">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=297</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=297">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=297</a>
<b>Bluetooth UART Module</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=354">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=354</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=354">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=354</a>
<b>Jumper Wires</b>	<a href="http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=324">http://robokits.co.in/shop/index.php?main_page=product_info&amp;products_id=324</a> or <a href="http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=324">http://robokitsworld.com/index.php?main_page=product_info&amp;products_id=324</a>

- An Android device with Bluetooth is required. Android version should be greater than 2.2. There might be some compatibility issues, please check android application on your device before going for this project.
- It's not necessary to use the same items, you can use any similar items. However some coding may need to be changes as per hardware if it's different this listed above.

**Items used for in this tutorial**



**Roundbot – Autonomous / RC Indoor Robot (Servo is not part of standard package)**



**Bluetooth UART Module**





**Jumper Wires (For Connecting Bluetooth Module to Rhino Board)**



**Inside view**

We have chosen 'RoundBot' for this tutorial, as this robot is designed for indoor use and it runs very well on flat surfaces. It comes with battery, motors, wheels and Rhino Board and its very compact compared to other robots and robot chassis. Due to its round shape it can go through indoor items like chairs, tables and other furniture without getting trapped in some corner.

We have chosen Android because it's most preferable smart phone OS these days and its widely used. Apart from this a phone or tablet based on android already has a touch screen and orientation sensor which we can use to control the robot. We have made our custom application for this tutorial and its available for download here :  
[http://robokits.co.in/downloads/Robokits\\_BT\\_Touch.apk](http://robokits.co.in/downloads/Robokits_BT_Touch.apk)

## Objective

The problem statement for this tutorial is to make a robot which could be controlled wirelessly by an Android device via Bluetooth. Android device should send commands depending on either Tilt control or Touch control. The Rhino board on robot should receive the commands and process them properly to maneuver the robot by changing speeds and directions of motors.

## Software installation on Android Device

Software for Android is available here in APK format, its compatible with Android 2.2 and above.

Download : [http://robokits.co.in/downloads/Robokits\\_BT\\_Touch.apk](http://robokits.co.in/downloads/Robokits_BT_Touch.apk)

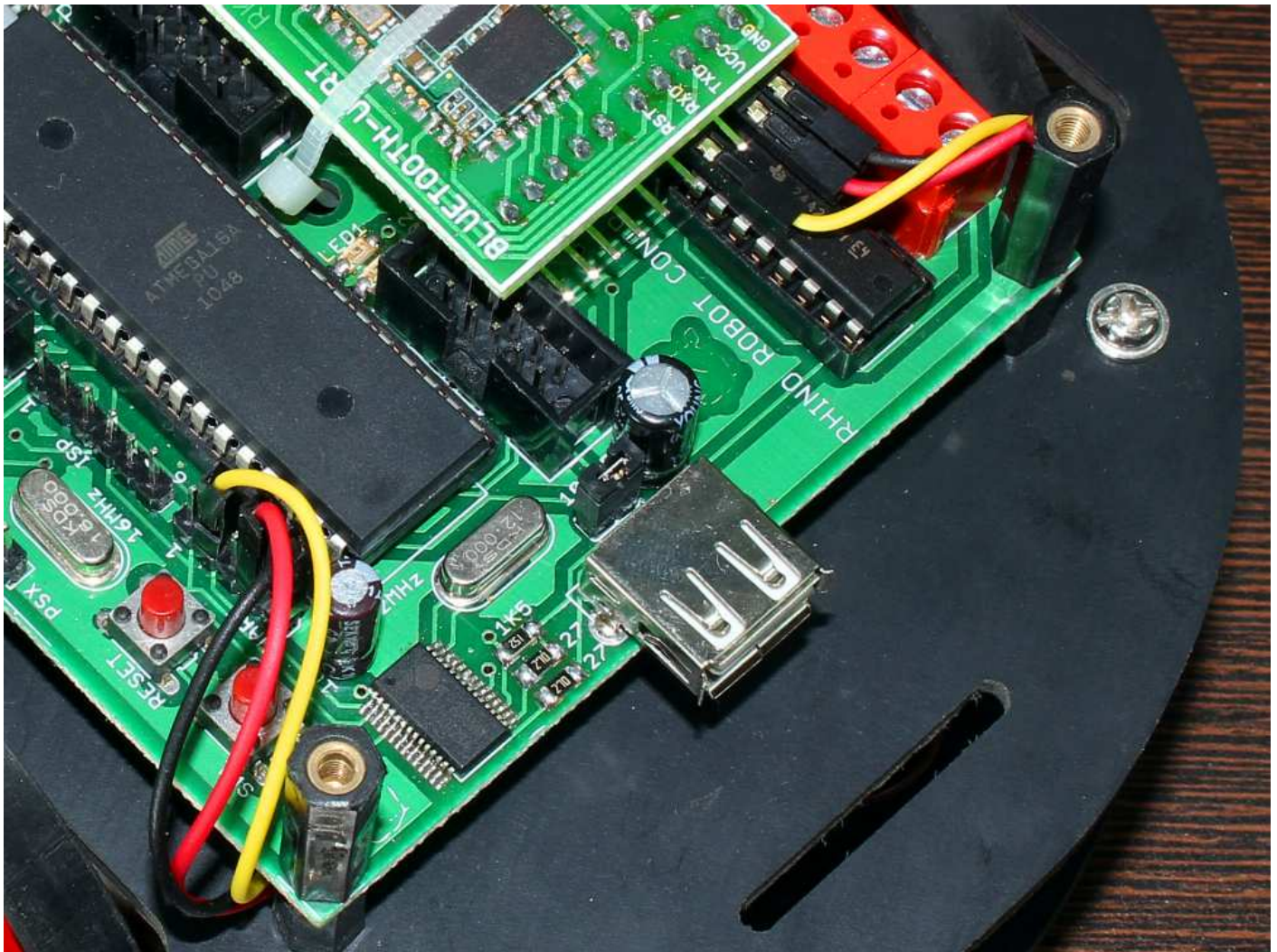
To use this software first you will need to allow 'Unknown Sources' from security settings. This setting could be in different menu or format depending upon the Android build. This is to allow an application which is not downloaded from Google Play Store.

Once Unknown Sources option is enabled, either download the APK file directly to your device or copy from computer to the device by WiFi, USB cable or Bluetooth.

Install the file on Device and launch software after installation. Once software has started you should see values of Roll, Pitch and Yaw changing on screen when you tilt your device in different directions. When you Disable tilt control check box you will see touch control, you can touch anywhere on Green circle and verify that the values are changing. Once this is verified your application should work properly but before that hardware setup should be done on Robot's side.



## Rhino Board and Bluetooth UART Connections



Connection	Rhino Board UART Connector	Bluetooth UART Pin
GND	Pin 5	GND Pin (1)
VCC (+5V)	Pin 4	VCC Pin (2)
RXD	Pin 2	RXD Pin (4)

Use 3 jumper wires to make connections as above. GND and VCC are for UART power and third connection is for data.



## Rhino Code

### Code 1 : Android Controlled Robot Via Bluetooth

Open **021 - Bluetooth Based Android Phone Controlled Robot** program in sample codes folder.

Library used : UART, IO Notations

This code uses **UART\_GETCHAR();** function to take one byte input from UART. Then it matches the input character with if conditions. If the character matches it takes actions accordingly. The loop will wait until a byte is received.

If condition checks for W, S, A, D or O characters input if any of them is received specific motor control commands are executed.

All processing is done on android software, software calculates Pitch and Roll of device and sends W for forward, S for backward, A for Left turn and D for right turn, if the device is steady it will send O to stop. Same commands are sent for touch controls also.

- Once this code is flashed and all the connections are checked, close top lid of the robot.
- Power on robot and you can see an LED blinking on Bluetooth Module.
- When you pair this device with Android device, LED blinking rate will slow down.
- After pairing start software on Android device, search for device and connect to Robokits\_Bluetooth.
- Control the robots using either touch or tilt method.

For video demo visit : <http://www.youtube.com/watch?v=G5XCzvLOTb8>





## Service and Support

Service and support for this product are available from Robokits India. The Robokits Web site (<http://www.robokits.co.in>) maintains current contact information for all Robokits products.

### Limitations and Warrantees

The **Rhino Robot Control Board** is intended for personal experimental and amusement use and in no case should be used where the health or safety of persons may depend on its proper operation. Robokits provides no warrantee of suitability or performance for any purpose for the product. Use of the product software and or hardware is with the understanding that any outcome whatsoever is at the users own risk. Robokits sole guarantee is that the software and hardware perform in compliance with this document at the time it was shipped to the best of our ability given reasonable care in manufacture and testing. All products are tested for their best performance before shipping, and no warranty or guarantee is provided on any of them. Of course the support is available on all of them for no cost.

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