


Stduino Bluetooth Module HC-05

Manual

This manual explains the Stduino Programming Environment at  Artec®. As the Stduino Programming Environment develops, this manual is revised. You can find the full manual below.

- Installing Stduino Software

http://artec-kk.co.jp/stduino/docs/en/Stduino_setup_software.pdf

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1. About your Bluetooth Module

1.1. Overview

Your Bluetooth Module uses the V2.0 + EDR Bluetooth standard and supports SPP (Serial Port Profile) for serial connection (UART) with your Studuino.

1.2. Specifications

Module	HC-05
Operating Voltage	3.3-5V
Version	V2.0+EDR
Profile	SPP
Interface	UART
Communication Range	Approx. 10 m

※ ★ Insufficient battery power may result in inaccurate measurements. Try changing your batteries if this happens.

※ ★ This product is not radio frequency or wireless certified.

Use in an open space to prevent interference.

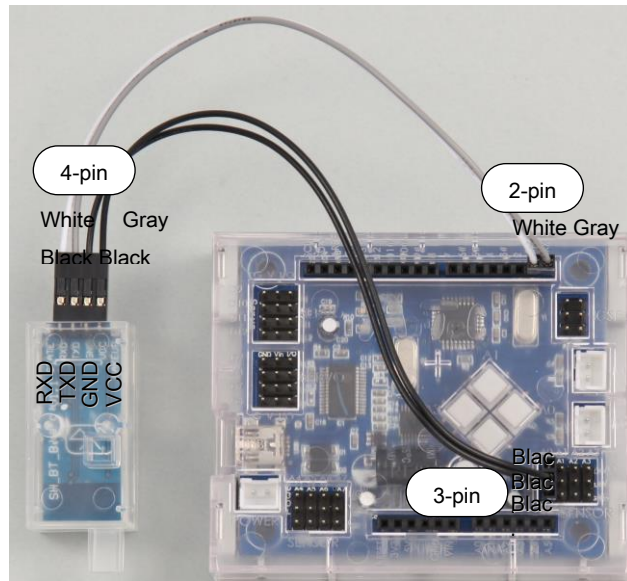
Unauthorized radio and wireless broadcasting may be in violation of federal and state law.

2. Connecting to Studuino

- ① Use the four-wire 15 cm Bluetooth Module connecting cable (product 086883, sold separately).
- ② The white wire of the 4-pin cable connects to the RXD pin of your Bluetooth Module, while the black wire connects to the VCC pin.
- ③ The gray wire of the 2-pin cable connects to 0RX and the white wire connects to 1TX on your Studuino.
- ④ The two black wires of the 3-pin cable connect to the V and G pins of any connector from A0 to A7 on your Studuino.



Bluetooth Module



Make sure the cables are inserted correctly!

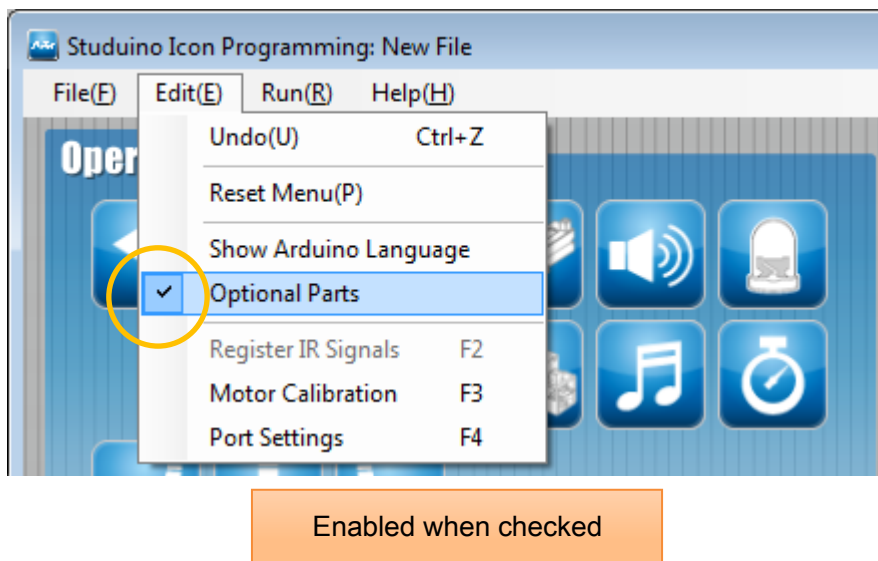
3. Pairing with a PC, Smartphone, or Other Device

Your module needs to be paired with a PC, smartphone, or other device in order to communicate. If you're prompted to enter a PIN, use 1234.

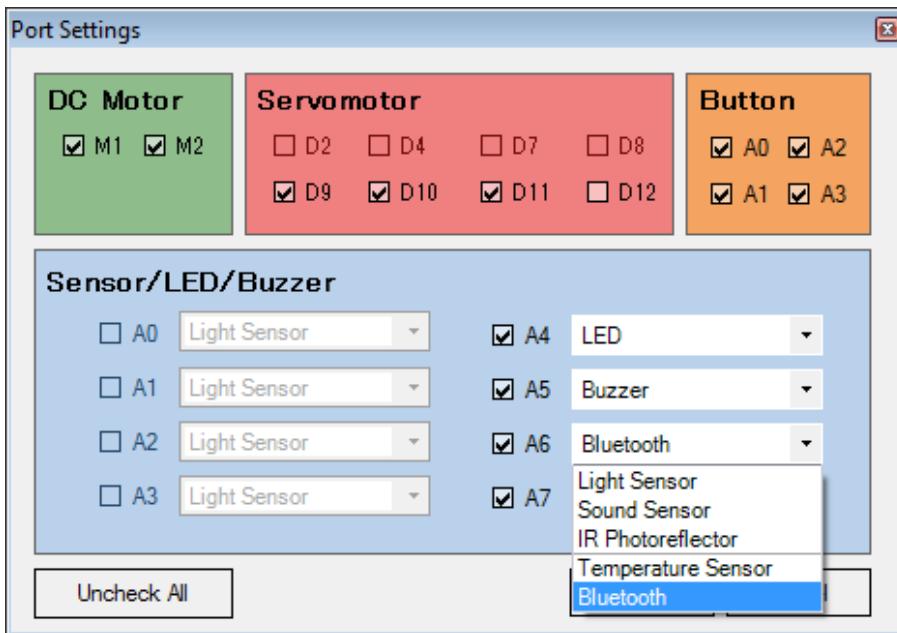
4. In the Studuino Icon Programming Environment

Familiarize yourself with the basics of the Studuino Programming Environment by reading the [Studuino Programming Environment Manual](#) and the [Icon Programming Environment Guide](#). **Using your Bluetooth Module with insufficient battery power may cause sudden interruptions in communication. Always use batteries with enough power.**

From the Edit menu click Optional Parts. A check will appear beside this option when enabled.

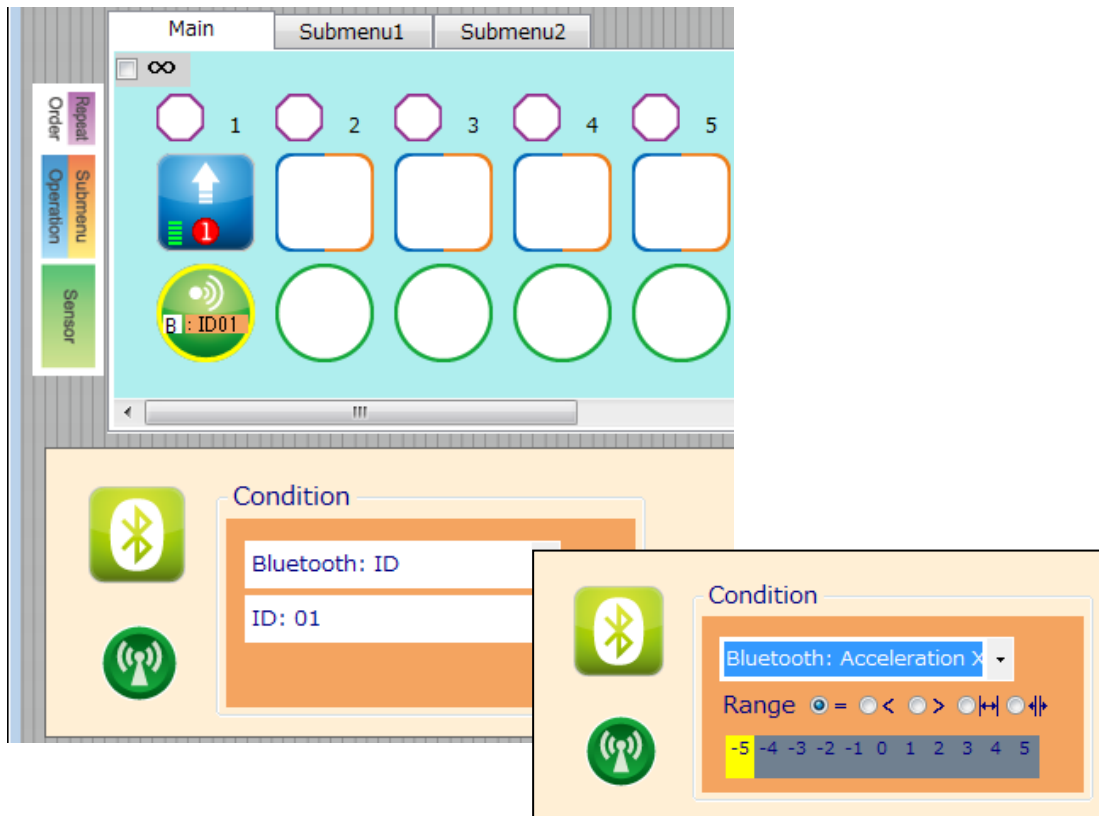


Bluetooth modules can be used with connectors A0-A7. Bluetooth modules use any connector from A0 to A7. Port Settings are made for the black wire of the cable. Make sure the gray and white wires are connected to 0RX and 1TX. (See **エラー! 参照元が見つかりません。** .エラー! 参照元が見つかりません。.)



Shown connected to A6

Drag and drop the icons shown below and choose one of the four Bluetooth: [***] conditions. Selecting Bluetooth: ID as a condition allows you to choose from a number of IDs, while the Bluetooth: Accelerometer X, Y, and Z options allow you to use the values from an Accelerometer as conditions.



Bluetooth accelerometer values are the values from the accelerometer of the device you are using. These values can be checked in the application Accelerometer Settings screen rather than the Sensor Viewer. Acceleration values have a range of ± 2 g (g = gravitational acceleration = $9.8[\text{m/s}^2]$) shown as 11 steps from -5 to 5. See the [Bluetooth Application Guide](#) for details.

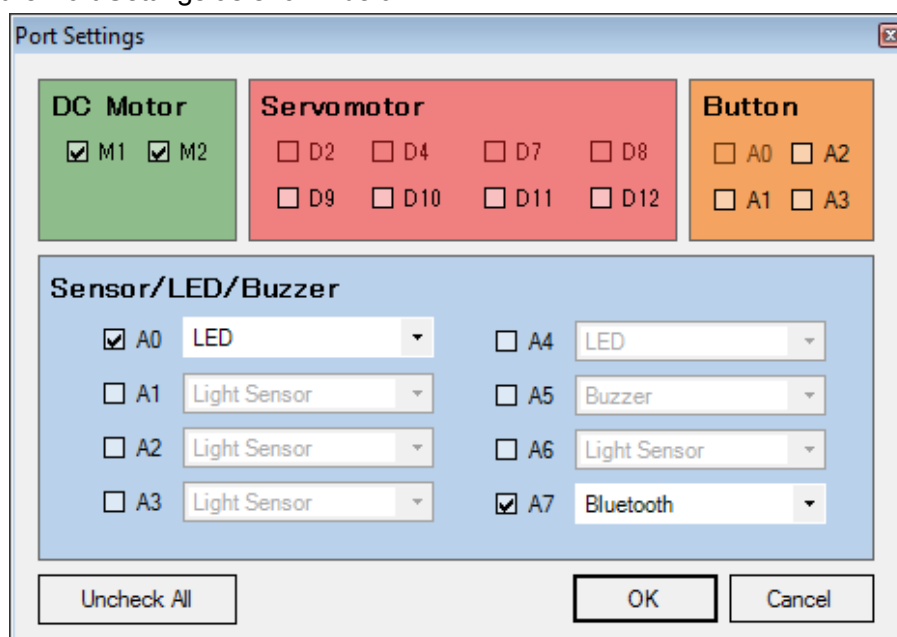
4.1. Sample Program

Familiarize yourself with the basics of the Studuino Programming Environment by reading the [Studuino Programming Environment Manual](#) and the [Icon Programming Environment Guide](#).

See the Bluetooth Application Guide for details on using the application.

Make a DC Motor run using the accelerometer of your device and turn LEDs on or off by using the buttons of the application.


- ① Set the Port Settings as shown below.




- ② Check the Repeat Indefinitely box, place icons, and set them as shown below.




No. 1


 Speed Slow Fast Time sec Brake ON OFF

 Condition
 Bluetooth: Acceleration X
 Range = < > |<|> |<|>
 -5 -4 -3 -2 -1 0 1 2 3 4 5

Action: Forward, Speed: 6, Time: 0.1 sec, Brake: OFF
Condition: Bluetooth: Accelerometer X < 0


No. 2

 Speed Slow Fast Time sec Brake ON OFF

 Condition
 Bluetooth: Acceleration X
 Range = < > |<|> |<|>
 -5 -4 -3 -2 -1 0 1 2 3 4 5

Action: Backward, Speed: 6, Time: 0.1 sec, Brake: OFF
Condition: Bluetooth: Accelerometer X > 0


No. 3

 Speed Slow Fast
6

Rotation
 Clockwise
 Counterclockwise


Time sec

Brake
 ON
 OFF

 Condition
Bluetooth: Acceleration Y
Range = < > <> <|> <|>|
-5 -4 -3 -2 -1 0 1 2 3 4 5

Action: Right Turn, Speed: 6, Time: 0.1 sec, Brake: OFF
Condition: Bluetooth: Accelerometer Y > 0


No. 4

 Speed Slow Fast
6

Rotation
 Clockwise
 Counterclockwise




Time sec

Brake
 ON
 OFF




 Condition
Bluetooth: Acceleration Y
Range = < > <> <|> <|>|
-5 -4 -3 -2 -1 0 1 2 3 4 5

Action: Left Turn, Speed: 6, Time: 0.1 sec, Brake: OFF
Condition: Bluetooth: Accelerometer Y < 0

No. 5

 Switch <input checked="" type="radio"/> ON <input type="radio"/> OFF Connector A0
 Condition Bluetooth: ID ID: 01 
Action: LED, Switch ON, Connector A0 Condition: Bluetooth: ID01

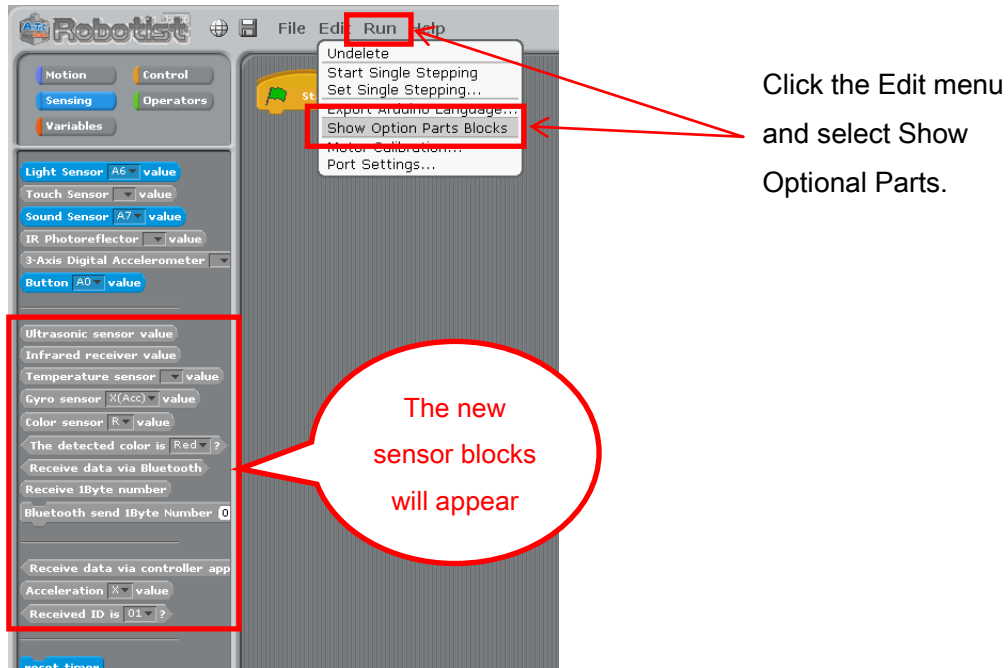
No. 6

 Switch <input type="radio"/> ON <input checked="" type="radio"/> OFF Connector A0
 Condition Bluetooth: ID ID: 02 
Action: LED, Switch OFF, Connector A0 Condition: Bluetooth: ID02

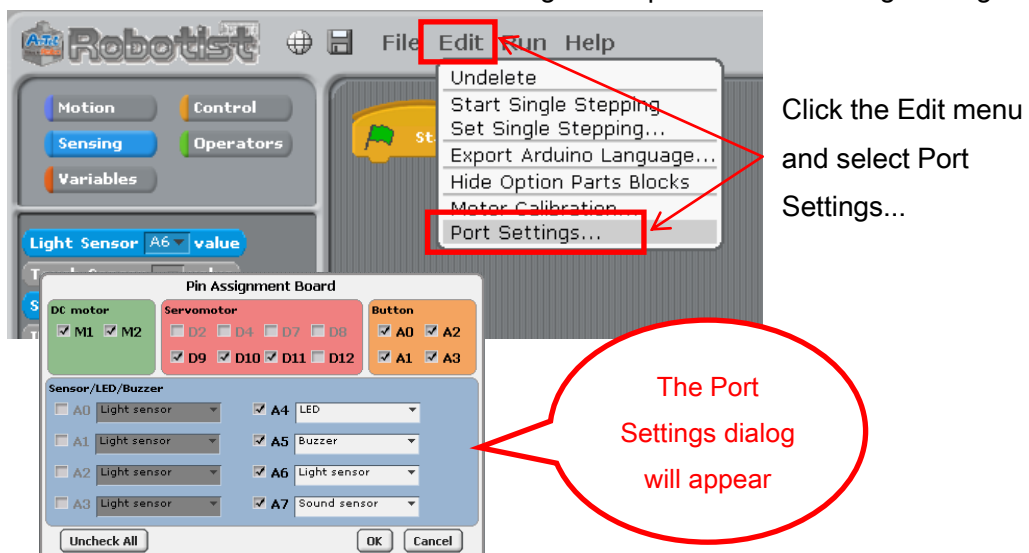
5. In the Studuino Block Programming Environment

To use your Bluetooth Module in the Block Programming Environment you will need to make sure the Bluetooth block is available and active. Follow the steps below to do this:

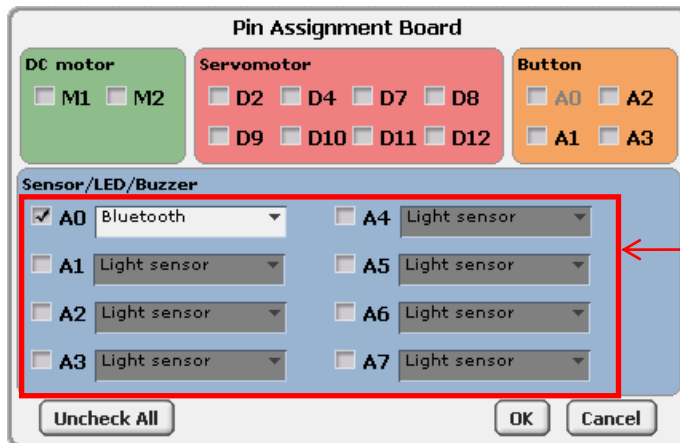
- ① From the Edit menu, choose Show Optional Parts to display the new sensor blocks.



- ② Click the Edit menu and choose Port Settings... to open the Port Settings dialog.

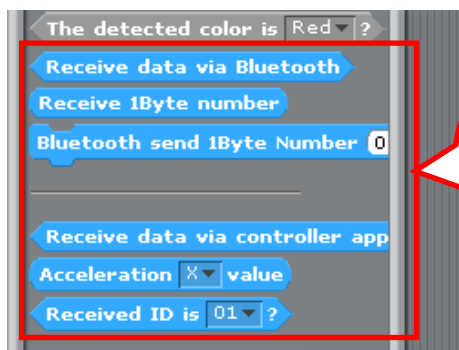


- ③ Your Bluetooth Module can use any connector from A0-A7. Under the Sensor / Buzzer / LED section of the Port Settings dialog, check any box from A0 to A7 and use the combo box to select Bluetooth. Click OK. The following sections assume the Bluetooth Module is connected to A0.



Only one port at a time from A0 to A7 can be used with a Bluetooth Module

- ④ The Bluetooth block will become active.



Receive data via Bluetooth, **Receive 1Byte number**, and **Bluetooth send 1Byte Number 0** are basic blocks used to send and receive 1 byte packets of data via Bluetooth. The **Receive data via controller app**, **Acceleration X value**, and **Received ID is 01** blocks are used to receive data from Artec's controller application.

5.1. Sample Program Using a Bluetooth Module

5.1.1. Sample Program Using Basic Bluetooth Blocks

This section shows a program from the perspective of both the Android application and Studuino. The Android device sends LED ON/OFF commands and Servomotor angles to Studuino, while the Studuino sends Gyroscope values to the Android device.

[Android]

Sends LED ON/OFF command and Servomotor angles to Studuino

Receives Gyroscope values from Studuino

[Studuino]

Sends Gyroscope values to Android device

Receives LED and Servomotor data from Android device

Let's take a look at the processes of a Studuino program. In this example, the Android device sends data to your Studuino in 2 byte packets. The 1st byte is the command ID and the 2nd byte is the command data. Your Studuino sends 1 byte packets to your Android device.

The sendGyroValue function first sends a gyroID(150) indicating the gyroscope sensor value before sending acceleration and angle values (from 0-100) for the X, Y, and Z axes in 1 byte packets.

The getBluetoothCommand function will save any data received from an Android device to a command list, dividing processes by command ID for any 2 byte packet it receives. In this example, the command IDs are determined to be the following:

- 200: Servomotor action
- 201: Action for LED on A1
- 202: Action for LED on A2
- 203: Action for LED on A3

The command list is cleared after processing the command data in the 2nd byte.

```

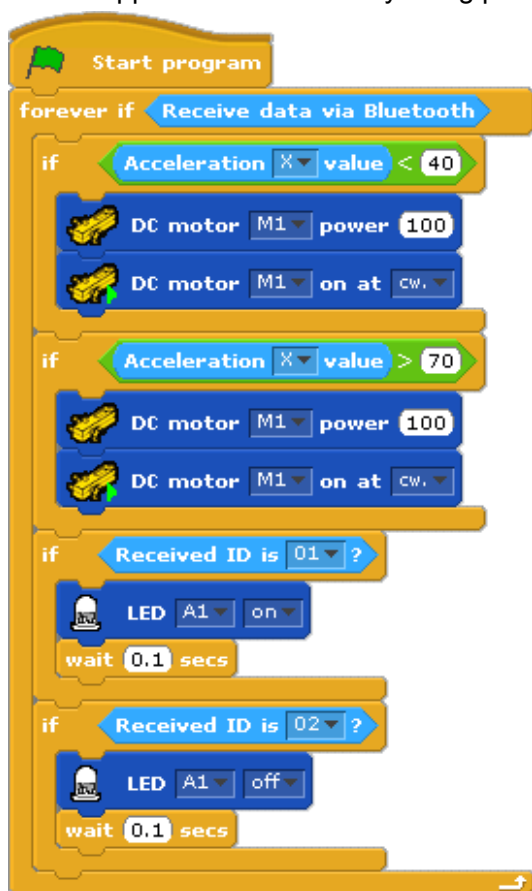
sendGyroValue function
Bluetooth send 1Byte Number gyroID
Bluetooth send 1Byte Number Gyro sensor X(Acc) value
Bluetooth send 1Byte Number Gyro sensor Y(Acc) value
Bluetooth send 1Byte Number Gyro sensor Z(Acc) value
Bluetooth send 1Byte Number Gyro sensor X(Gyro) value
Bluetooth send 1Byte Number Gyro sensor Y(Gyro) value
Bluetooth send 1Byte Number Gyro sensor Z(Gyro) value
  
```

```

getBluetoothCommand function
if Receive data via Bluetooth
  add Receive 1Byte number to command
  if length of command = 2
    if item 1 of command = 200
      Set servomotor D9 to item 2 of command degrees
    if item 1 of command = 201
      if item 2 of command = 1
        LED A1 on
      else
        LED A1 off
    if item 1 of command = 202
      if item 2 of command = 1
        LED A2 on
      else
        LED A2 off
    if item 1 of command = 203
      if item 2 of command = 1
        LED A3 on
      else
        LED A3 off
  if length of command = 0
    delete 1 of command
  
```

5.1.2. Sample Program Using the Control Application







The picture below shows a sample program using the control application. The picture below shows a program using a Bluetooth block. The Bluetooth block is meant to be used with Artec's control application on Android devices. The **Receive data via controller app** block receives different types of data from the application and uses that data to control your robot. The **Acceleration X value** block retrieves values of 0-100 from the Accelerometer of your Android device, and the **Received ID is 01?** block checks whether or not the icons of the control application are currently being pressed.



See the [Bluetooth Application Guide](#) for details on using the application.

5.2. A Note on Bluetooth Blocks

The Bluetooth block will not be able to retrieve the values from the control application when in Test mode. This is due to Bluetooth using serial communication between your Android device and PC. While in Test mode your PC has sole use of the Studuino serial port, which disables communication between Studuino and your Android device. In Test mode, the

 ,  , and  blocks always return Yes, the  ,  , and  block does nothing.