e-Gizmo
MECHATRONIX CENTRAL

MANUAL GUIDE

THE BEAST

VARIANTS:

THE BEAST STANDARD
- > Line follower
- > Maze Solver
- > Sumo fight

THE BEAST
- > with PS2 Controlled
- > with Pan Tilt

THE BEAST
- > with Bluetooth Controlled

THE BEAST*
- > with E-ARM (Robotic Arm)
- > with PS2 Controlled

THE BEAST*
- > with 3 Distance Sensors

THE BEAST *
- > with 3 IR Proximity Sensors

*Under development

Included:
- USB Cable Type A to mini B
- Samung Battery Charger

THE BEAST STANDARD

DESCRIPTIONS

VARIANTS:

- THE BEAST — has gizDuino PLUS Atmega644P microcontroller for basic entry level robot functions and open circuit board. The Open circuit enables the user to boarden the capabilities of prototyping by adding certain peripheral to the board.

> Line follower — to follow the black line on the track from start to finish line. It has digital line calibration to make it easy.

> Maze Solver — to solve the maze courses, you can upload the sketch given or modify it to remote control via wireless devices (Optional).

> Sumo fight — to fight with other opponents robots with in the ring, it has line/ outside avoidance.

>Optional
- Add wireless devices — you can add bluetooth, PS2 controller with UHF STD, Wifi.. etc to control it wirelessly.

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THE BEAST

SPECIFICATIONS

General Specifications:

- Battery: 2x7.4V Li-ion 1600 rechargeable
- On-board Peripherals:
  - IC ATmega644P w/ 64KB Flash memory
  - 2x, Beefy Motor Driver
  - 4x,WRF-370CH DCGeared Motors 131RPM
  - 3-Ch IR line sensor CNY70,10mm range
  - Mobot Shield
  - Serial LCD II 4x20 Display
  - 1x Distance Sensor
  - 1x SG-90 Servo Motor

Features:

- The most Poweful mobile robot as now. Can join in war robotics competitions.
- With 4x20 LCD Display for monitoring the Status of sensors.
- Single Distance sensor for detecting objects Or wall avoidance.
- Can detect black line to follows.
- 100% Arduino Board Compatible!
- Program it using Arduino IDE 100% code compatible
- Samsung Rechargeable with LED indicators If the batteries are full.
- Using Mobot Shield for Easy connections.
- Customized 2 rubber belts for each sides, 3 wheels on left and right.

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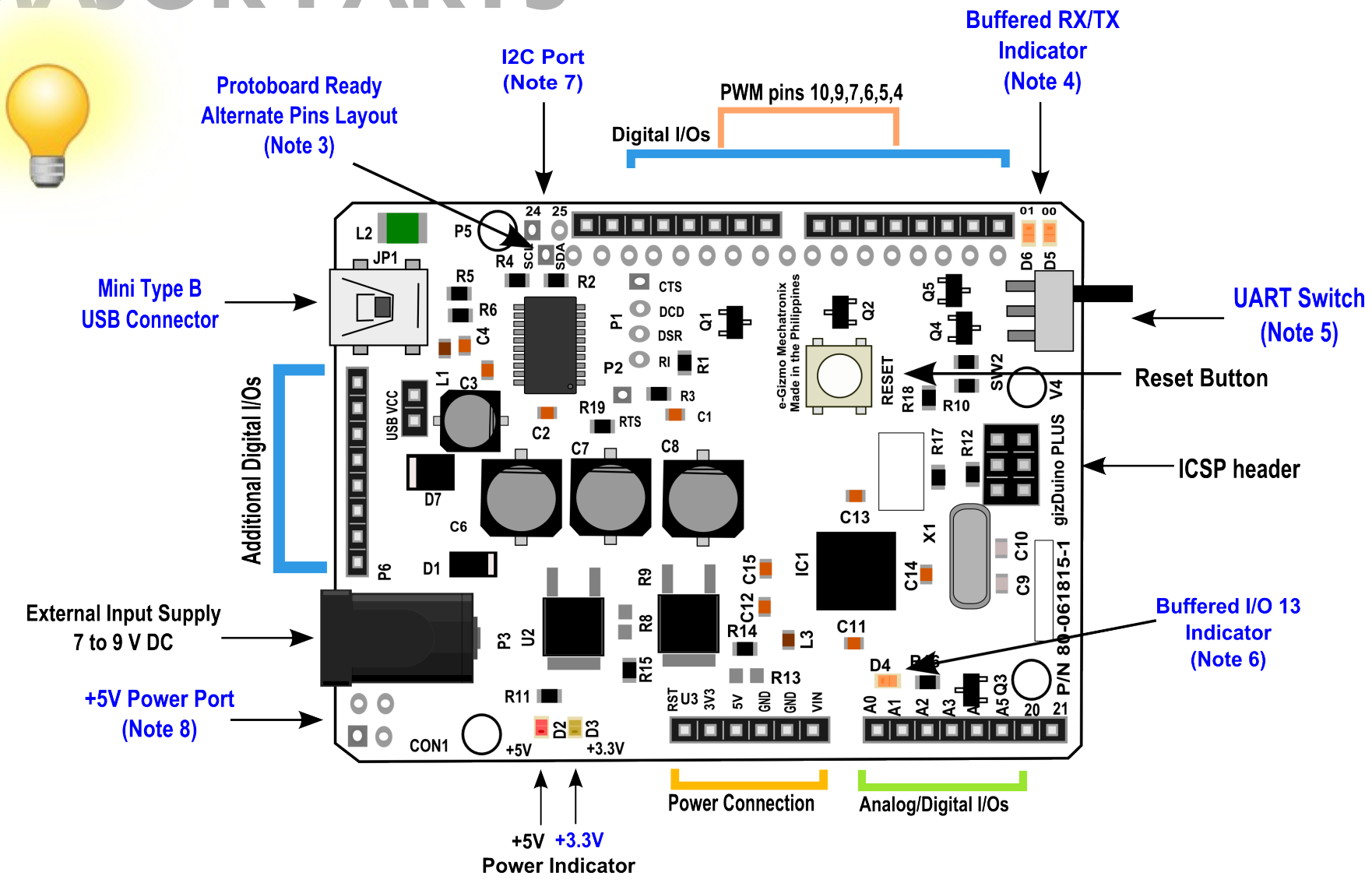
GizduinoPlus ATmega644P

MAJOR PARTS



GizduinoPlus ATmega644P

Pin Descriptions

Table 1.Power Connections

Pin Functions	*Descriptions*
RST	Reset the module
+3v3	+3.3v Power Supply
+5V	+5V Power Supply
GND	Ground
GND	Ground
VIN	Input Voltage = External Input Supply

Table 2.LED Indicators

LED Functions	*Descriptions*
D2	+5V Indicator
D3	+3.3v Indicator
D4	Digital Pin 13 Indicator
D5	Rx pin indicator
D6	Tx pin indicator

Table 3.Digital I/Os & Analog Inputs

Pin Functions	*Descriptions*
0	Digital pin 0/Rx
1	Digital pin 1/Tx
2	Digital pin 2
3	Digital pin 3
4	Digital pin 4/PWM
5	Digital pin 5/PWM
6	Digital pin 6/PWM
7	Digital pin 7/PWM
8	Digital pin 8
9	Digital pin 9/PWM
10	Digital pin 10/PWM/SS
11	Digital pin 11/MOSI
12	Digital pin 12/MISO
13	Digital pin 13/SCK
14	Digital pin 14/A0
15	Digital pin 15/A1
16	Digital pin 16/A2
17	Digital pin 17/A3
18	Digital pin 18/A4
19	Digital pin 19/A5

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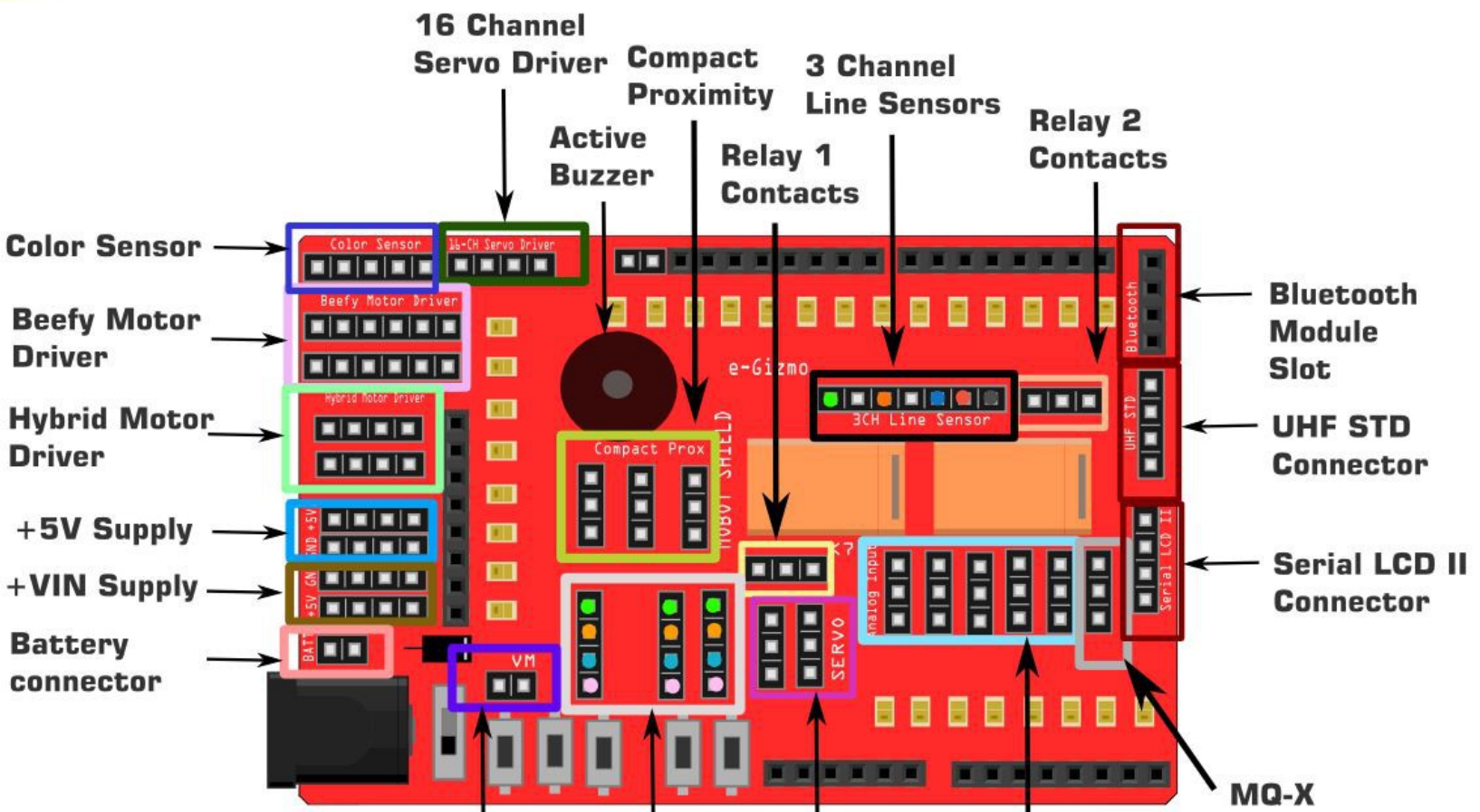
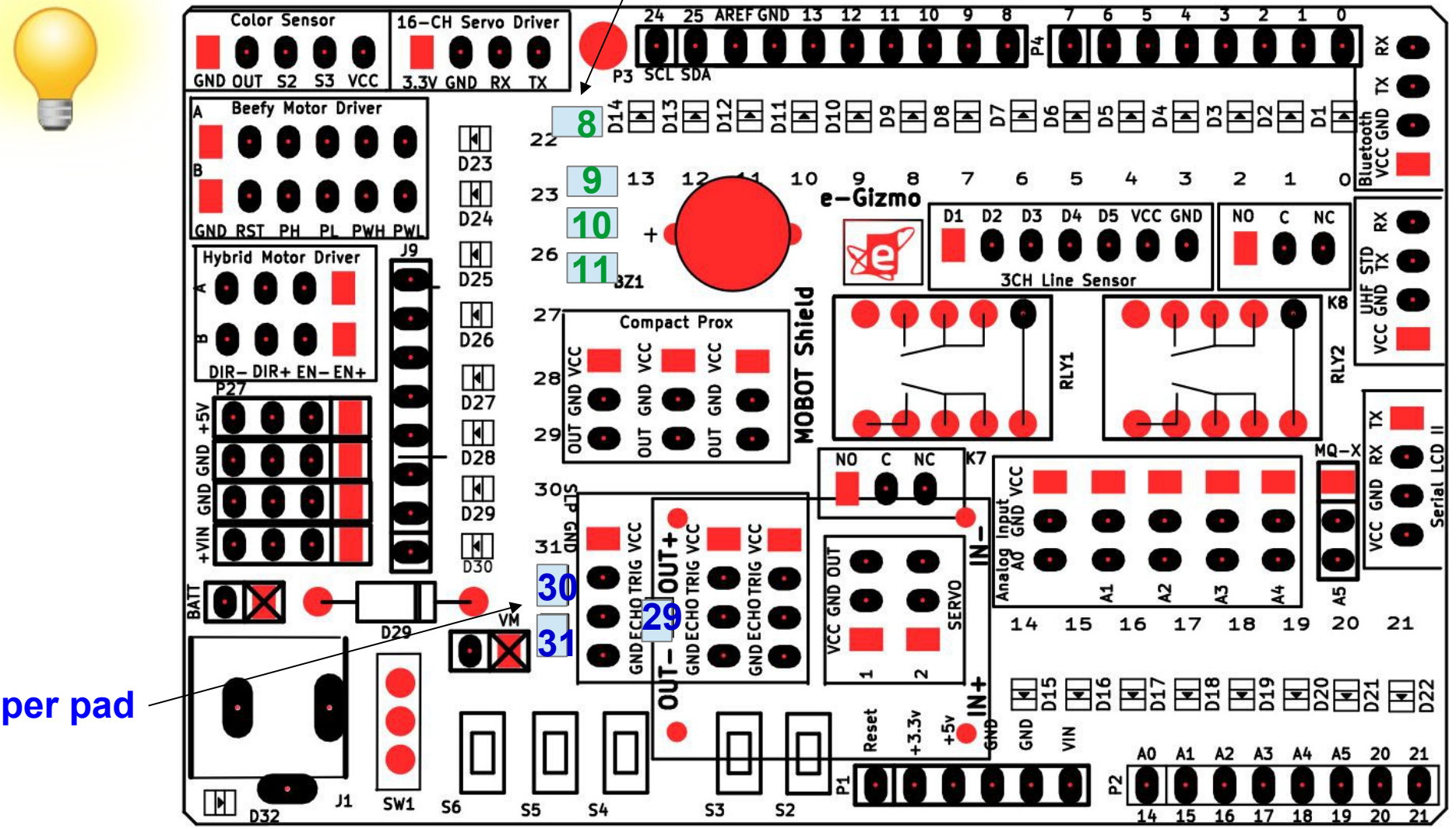
Mobot Shield

MAJOR PARTS



Mobot Shield

MAJOR PARTS



Mobot Shield

Pin Descriptions: Power

Table 1.Power Connections

Pin Functions	*Descriptions*	*Connected to gizDuino PLUS*
+5V	+5V Power Supply	+5V
GND	Ground	GND
GND	Ground	GND
+VIN	+VIN Power Supply	+VIN
BATT	Battery Connections	-
VM	Voltage Input	Jumper/Shorted

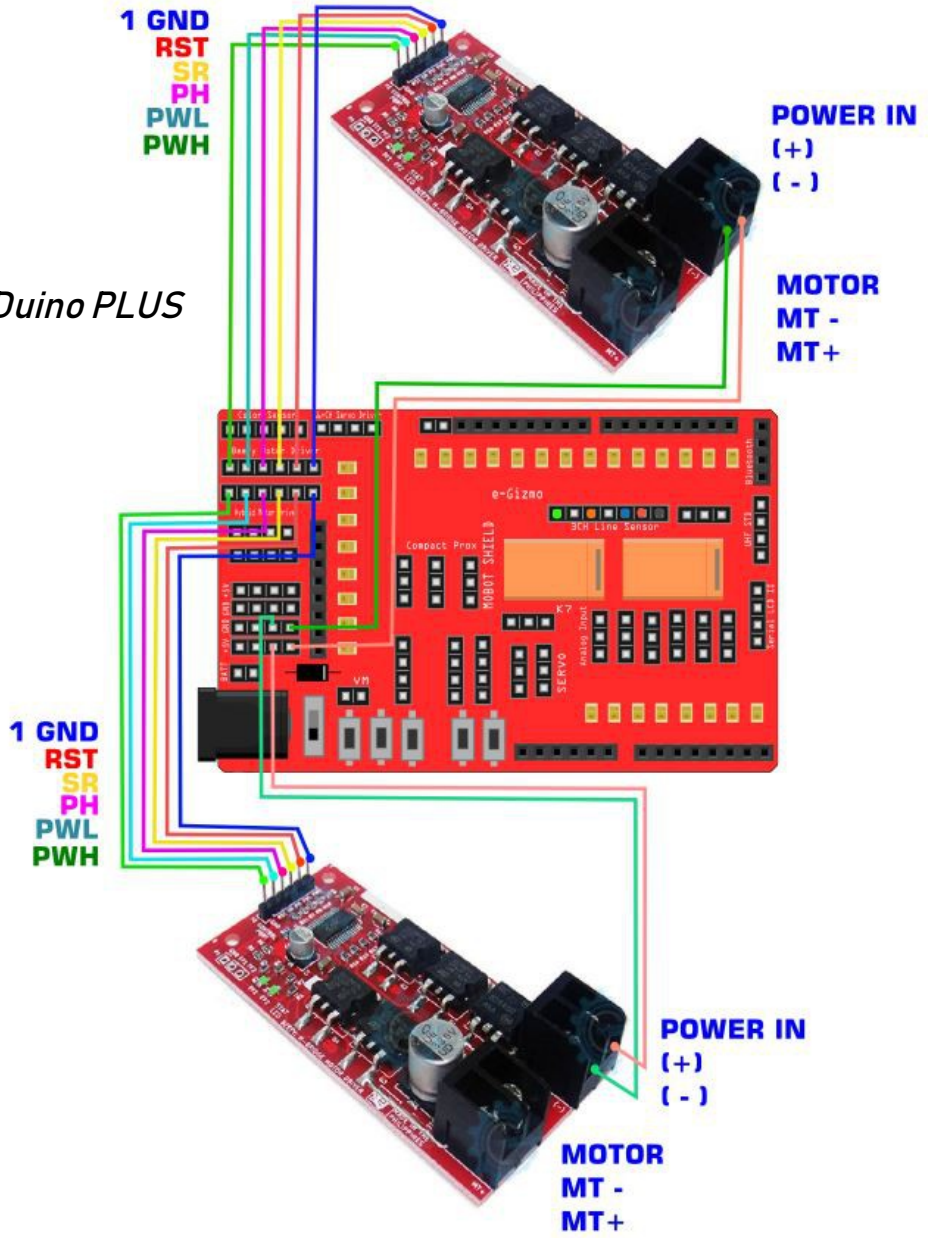
Mobot Shield

Wiring: Beefy Motor Driver

Table 2.Beefy Motor Driver Connections

"A"	*Beefy Motor Driver*	*Descriptions*	*Connected to gizDuino PLUS*
GND		Ground	GND
RST		Reset	+5V
PH/SR		+5V	+5V
PL/PH		Directions	Digital Pin 8
PWH/PWL		+5V	+5V
PWL/PWH		ON/PWM	Digital Pin 9

"B"	*Beefy Motor Driver*	*Descriptions*	
GND		Ground	GND
RST		Reset	+5V
PH/SR		+5V	+5V
PL/PH		Directions	Digital Pin 11
PWH/PWL		+5V	+5V
PWL/PWH		ON/PWM	Digital Pin 10

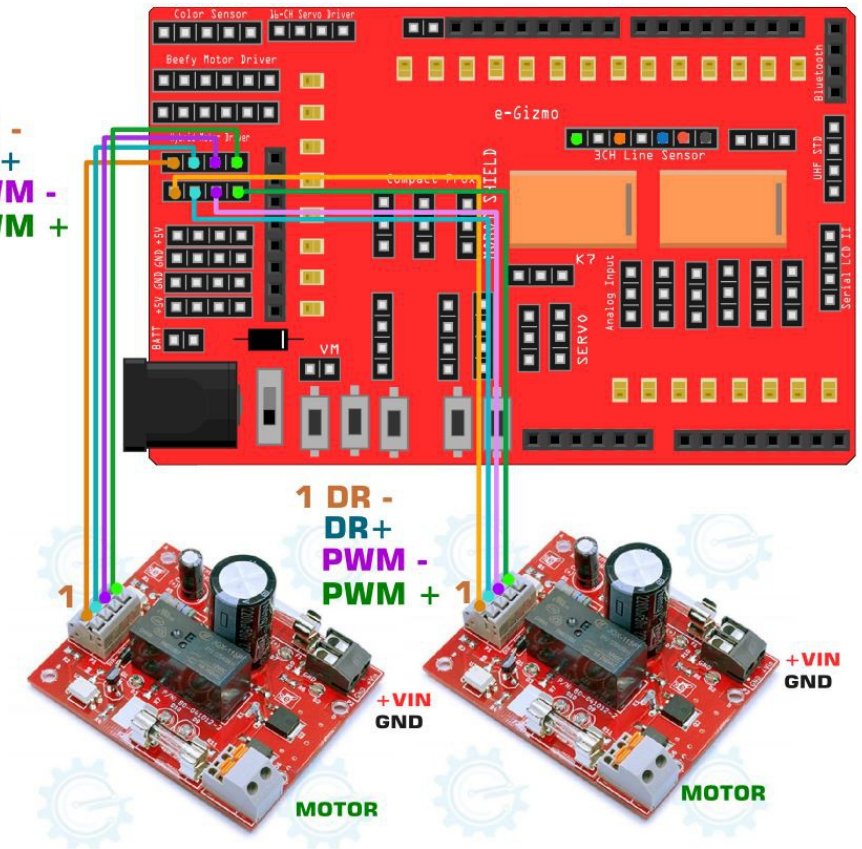


Mobot Shield

Wiring: Hybrid Motor Driver

Table 3.Hybrid Motor Driver Connections

"A" Hybrid Motor Driver	*Descriptions*	*Connected to gizDuino Plus*
DIR-	Low Direction	GND
DIR+	High Direction	Digital Pin 8
EN-	Low Enable	GND
EN+	Directions	Digital Pin 9
"B" Hybrid Motor Driver	*Descriptions*	
DIR-	Low Direction	GND
DIR+	High Direction	Digital Pin 11
EN-	Low Enable	GND
EN+	Directions	Digital Pin 10



Mobot Shield

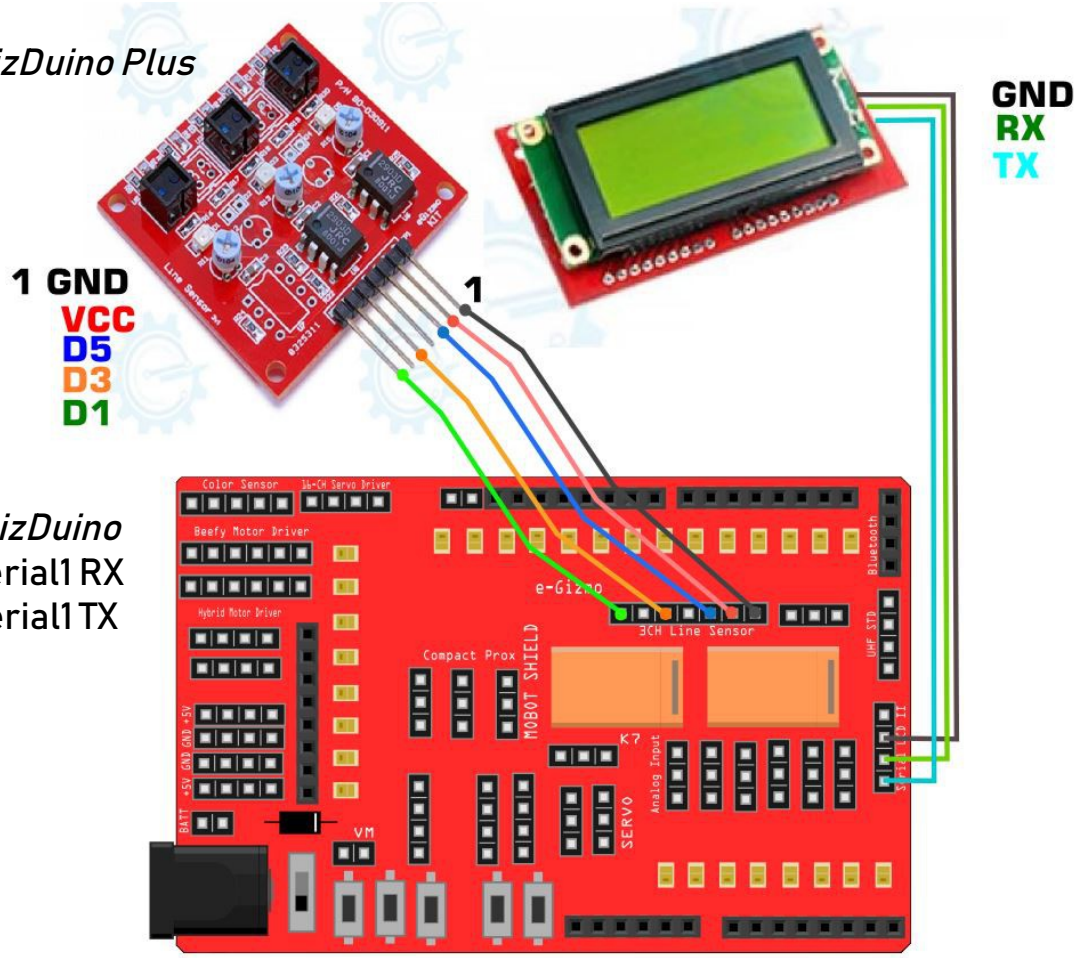
Wiring: 3Ch Line Sensors & Serial LCD II

Table 4. 3CHLine Sensor Connections

Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
D1	Line sensor 1	Digital Pin 7
D2	NC	-
D3	Line sensor 2	Digital Pin 6
D4	NC	-
D5	Line sensor 3	Digital Pin 5
VCC	+5V Supply	+5V
GND	Ground	GND

Table 5. Serial LCD II

Pin Functions	*Descriptions*	*Connected to gizDuino*
TX	Trasmit	Digital Pin 2/Serial1 RX
RX	Received	Digital Pin 3/Serial1 TX
GND	Ground	GND
VCC	+5V Supply (NA)	-



Mobot Shield

Pin Descriptions: UHF, Bluetooth & Servo

Table 6. UHF STD RX ONLY

Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
RX	Received	Digital Pin 1/Serial0 TX
TX	Trasmit	Digital Pin 0/Serial0 RX
GND	Ground	
VCC	+5V Supply	

Table 7. Bluetooth Module HC-05

Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
RX	Received	Digital Pin 1/Serial0 TX
TX	Trasmit	Digital Pin 0/Serial0 RX
GND	Ground	GND
VCC	5V Supply	+5V

Table 8. Servo Motors (Caution* VCC & GND Interchanged)

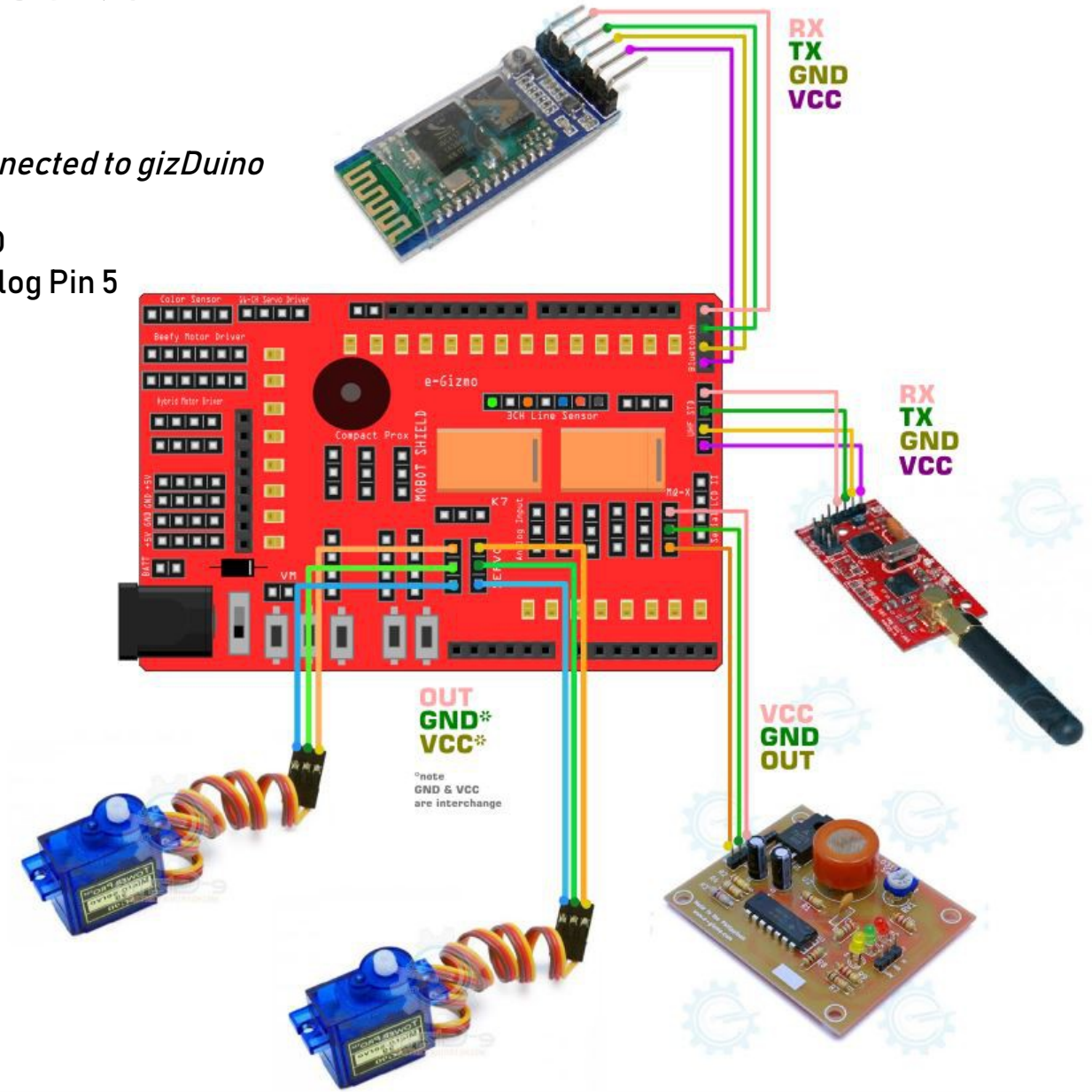
"Servo 1 "Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
OUT	Signal	Digital Pin 12
GND	Ground	GND
VCC	+5V Supply	+5V
"Servo 2"Pin Functions	*Descriptions*	
OUT	Signal	Digital Pin 4
GND	Ground	GND
VCC	+5V Supply	+5V

Mobot Shield

Wiring: UHF, Bluetooth, Servo & MQ-X Gas sensor

Table 9. MQ-X Gas Sensor Connections

Pin Functions	*Descriptions*	*Connected to gizDuino*
VCC	+5V Supply	+5V
GND	Ground	GND
OUT	Analog Output	Analog Pin 5



Pin Descriptions: Distance Sensors

Table 10. HC-SR04 Distance Sensor

"1"Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
VCC	+5V Supply	+5V
TRIG	Trigger	Digital Pin 30
ECHO	Echo	Digital Pin 31
GND	Ground	GND
"2"Pin Functions	*Descriptions*	
VCC	+5V Supply	+5V
TRIG	Trigger	Digital Pin 28
ECHO	Echo	Digital Pin 29
GND	Ground	GND
"3"Pin Functions	*Descriptions*	
VCC	+5V Supply	+5V
TRIG	Trigger	Digital Pin 26
ECHO	Echo	Digital Pin 27
GND	Ground	GND

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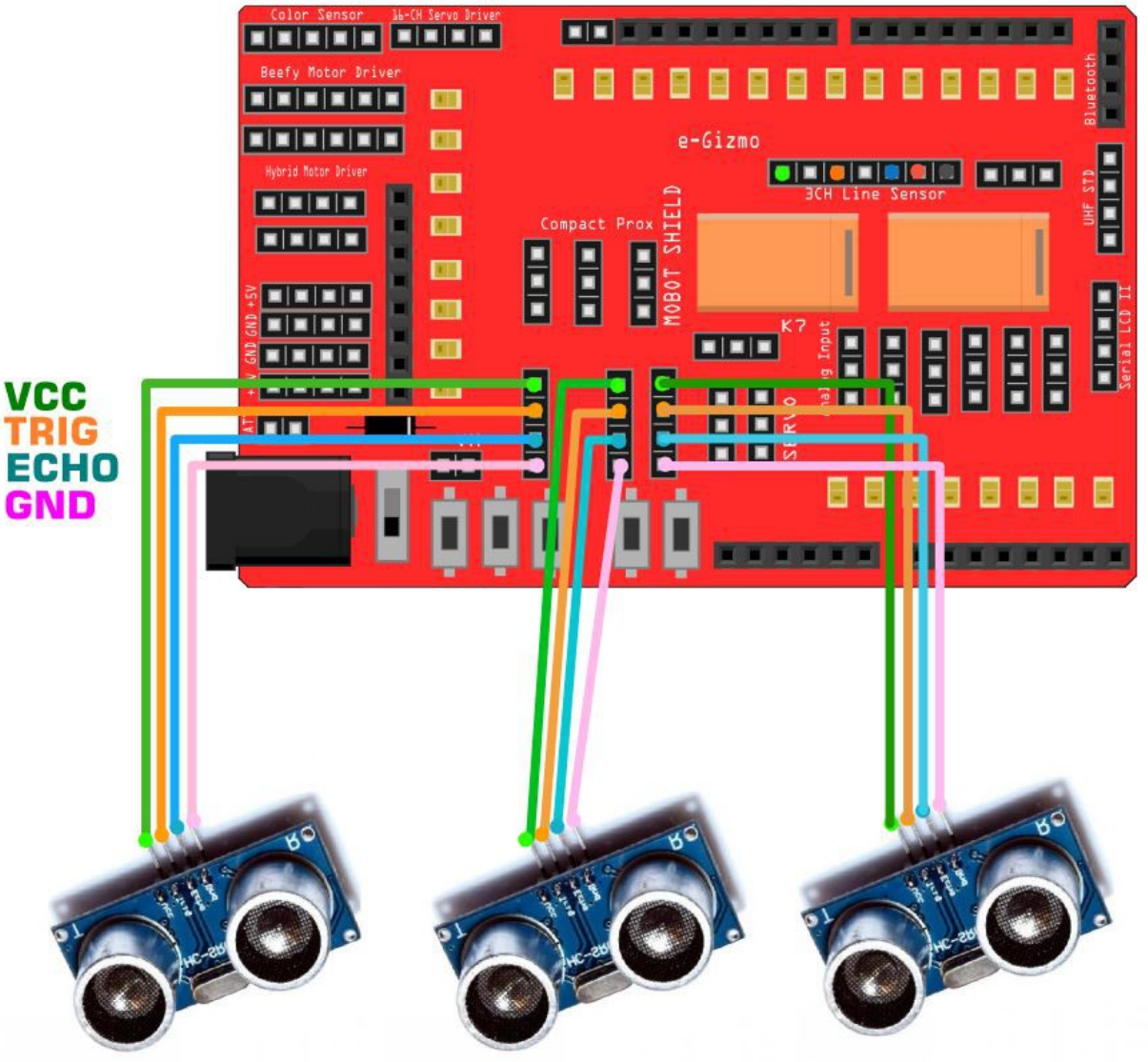
Mobot Shield

Wiring: Distance Sensors



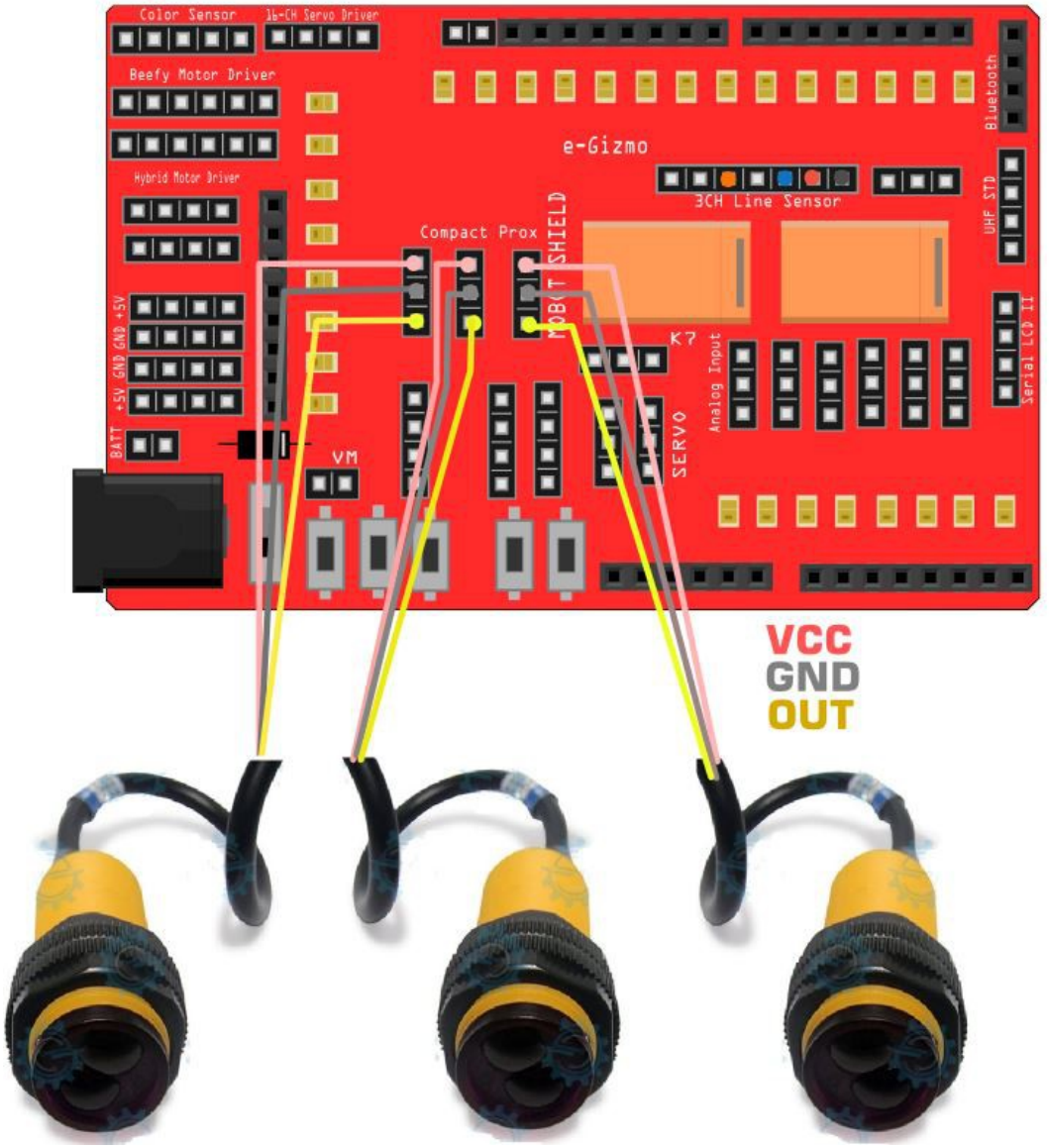
Pin Descriptions: Compact Proximity Sensors

Table 11. Compact Proximity Sensors

"1"Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
VCC	+5V Supply	+5V
GND	Ground	GND
OUT	Digital Output	Digital Pin 28
"2"Pin Functions	*Descriptions*	
VCC	+5V Supply	+5V
GND	Ground	GND
OUT	Digital Output	Digital Pin 27
"3"Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
VCC	+5V Supply	+5V
GND	Ground	GND
OUT	Digital Output	Digital Pin 26

Mobot Shield

Wiring: Compact Proximity Sensors



Mobot Shield

Pin Descriptions: Analog Inputs,16-Channel,Color Sensor

Table 12. Analog Inputs

Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
VCC	+5V Supply	+5V
GND	Ground	GND
INPUT	Analog Input	A0 to A4

Table 13. 16-Channel Servo Controller

Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
3.3V	3.3V Supply	-
GND	Ground	GND
RX	Receiver	Digital Pin 25
TX	Transmit	Digital Pin 24

Table 14. Color Sensor

Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
GND	Ground	GND
OUT	Output	Digital Pin 31
S2	S2	Digital Pin 30
S3	S3	Digital Pin 29
VCC	+5V Supply	+5V

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Pin Descriptions: Tact Switch buttons,Buzzer

Table 15. 4 Buttons

Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
S2	Tact Switch 2	Reset Button
S3	Tact Switch 3	Digital Pin 14
S4	Tact Switch 4	Digital Pin 15
S5	Tact Switch 5	Digital Pin 16
S6	Tact Switch 6	Digital Pin 17

Table 16. Buzzer

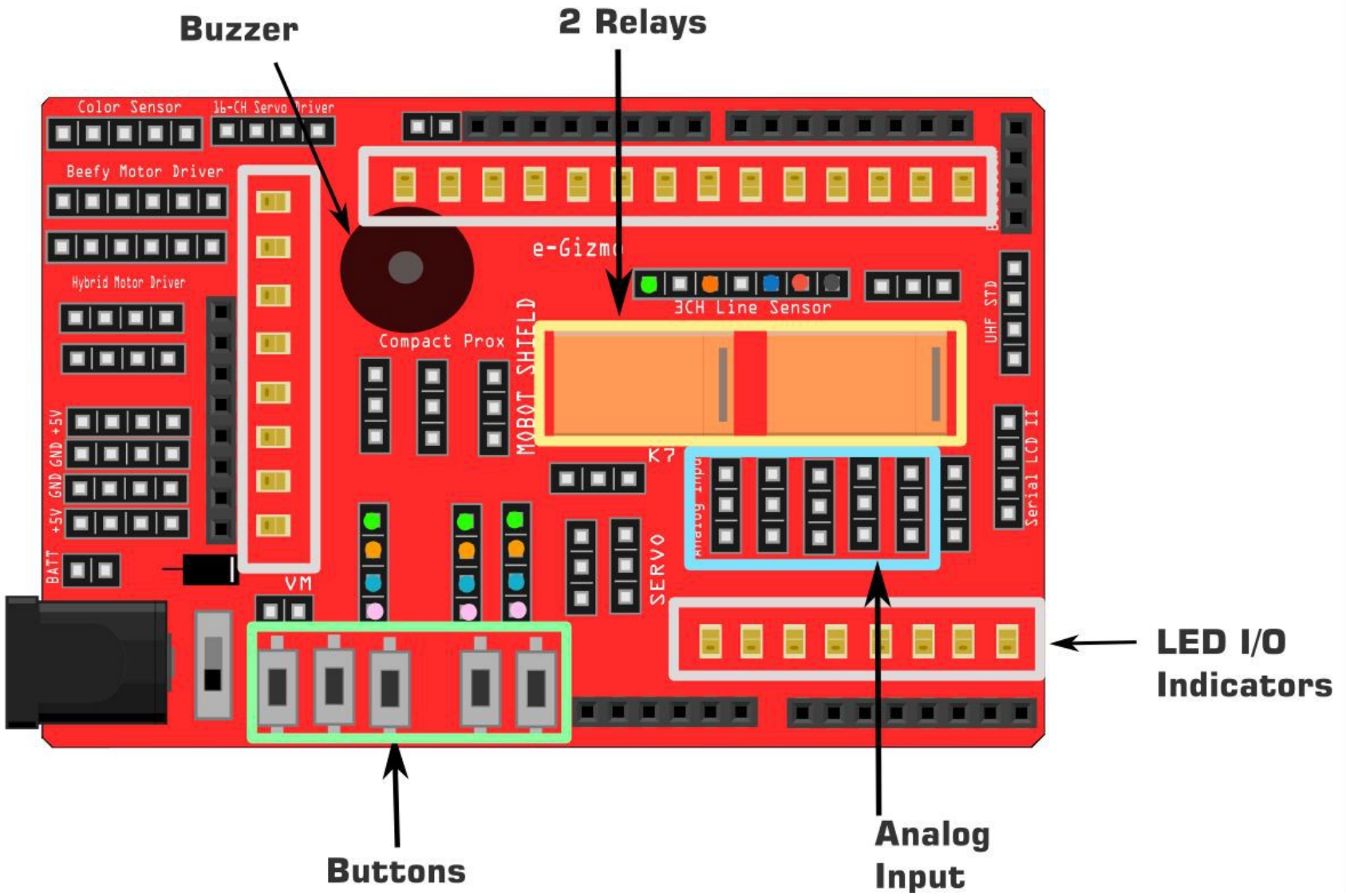
Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
Buzzer	Sound Alarm	Digital Pin 13

Table 17. Relays

Pin Functions	*Descriptions*	*Connected to gizDuino Plus*
K7	Relay	Digital Pin 20
K8	Relay	Digtial Pin 21

Mobot Shield

LED Indicators,Buttons, Buzzer & Relays:



Softwares and library

Arduino IDE

www.e-gizmo.net/oc/kits documents/ARDUINO IDE SOFTWARES

- Download Arduino 1.8.8 egizmo (Windows)
- Choose your Arduino IDE for your OS.

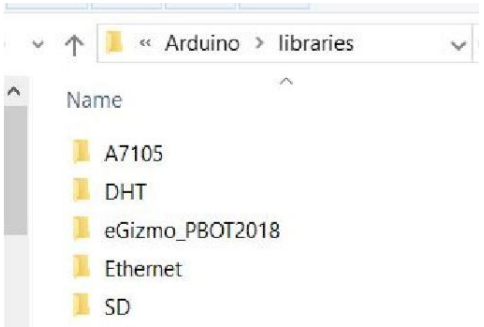
Drivers **Install this first!**

www.e-gizmo.net/oc/kits documents/ARDUINO IDE SOFTWARES

- Download Prolific Driver v10.0 (Windows)
- (For Mac OS users) Download md_PL2303_MacOSX or latest

Library **Add to My Documents>Arduino>libraries**

- Download and Unzip this before you move to libraries)



Libraries:

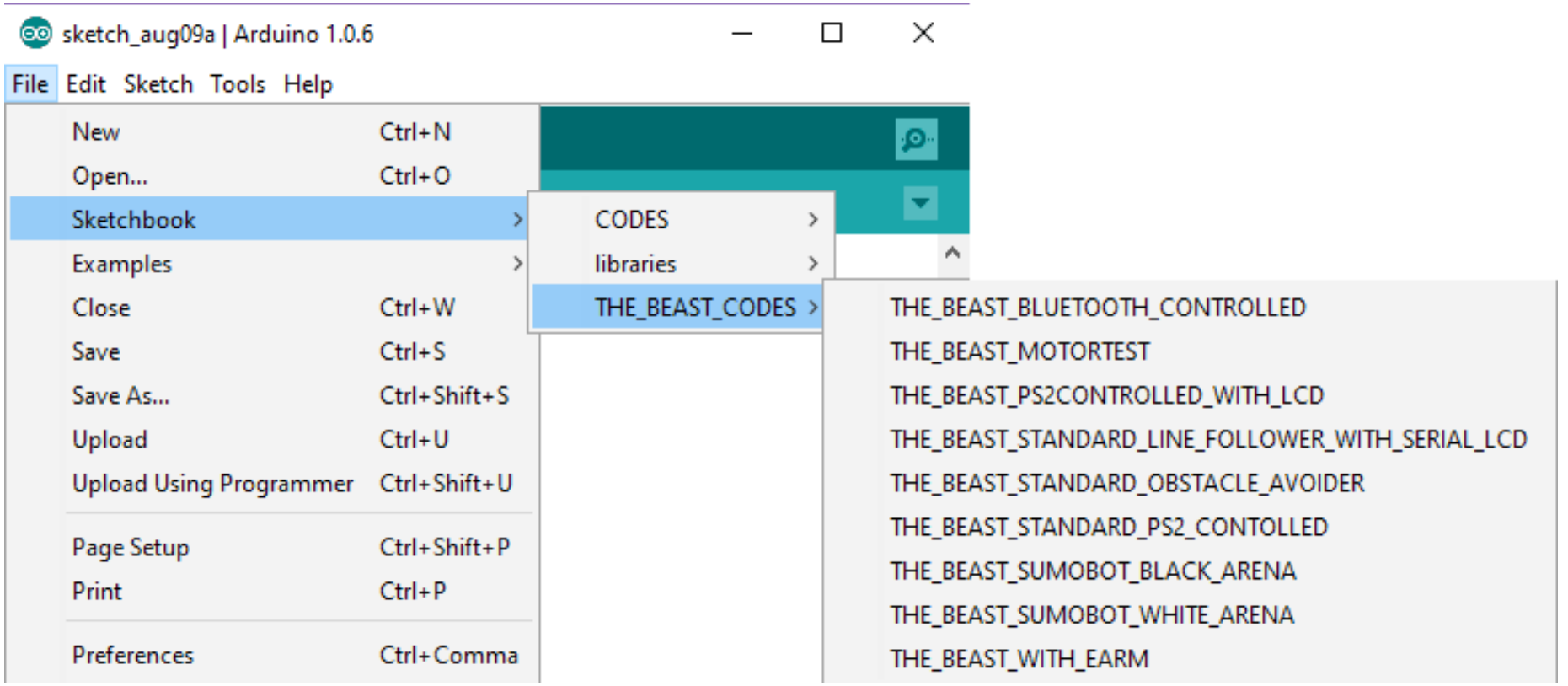
Servo
NewPing
Software Serial

Add Sample codes to Sketchbook

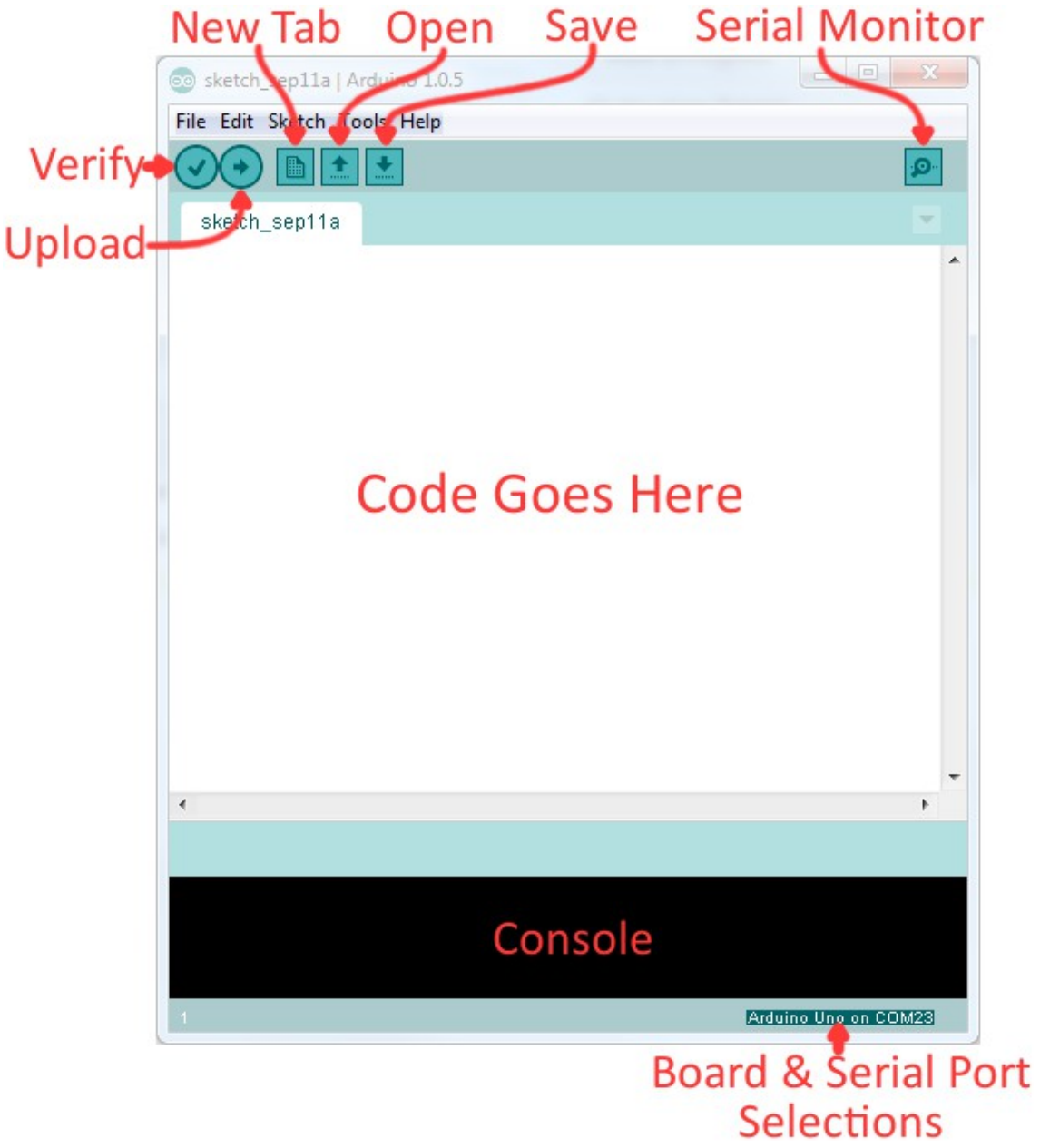
Downloads the Sample Codes from:
https://www.e-gizmo.net/oc/kits%20documents/THE%20BEAST%20ROBOT/THE_BEAST_CODES.zip

1. Then place it to My Documents>Arduino folder> (Place here and Unzip/Extract All)
2. Open the Arduino IDE. Go to> File> Sketchbook> THE_BEAST_CODES

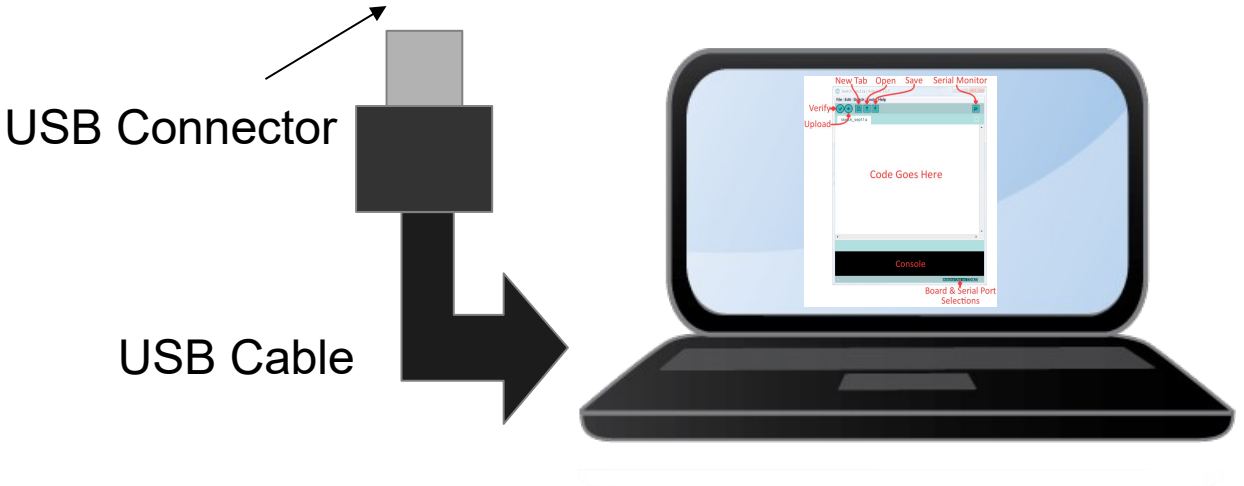
Note: Make Sure you already have the included libraries. Page 21



The Arduino IDE



Connect the BEAST to PC



Open Arduino IDE.

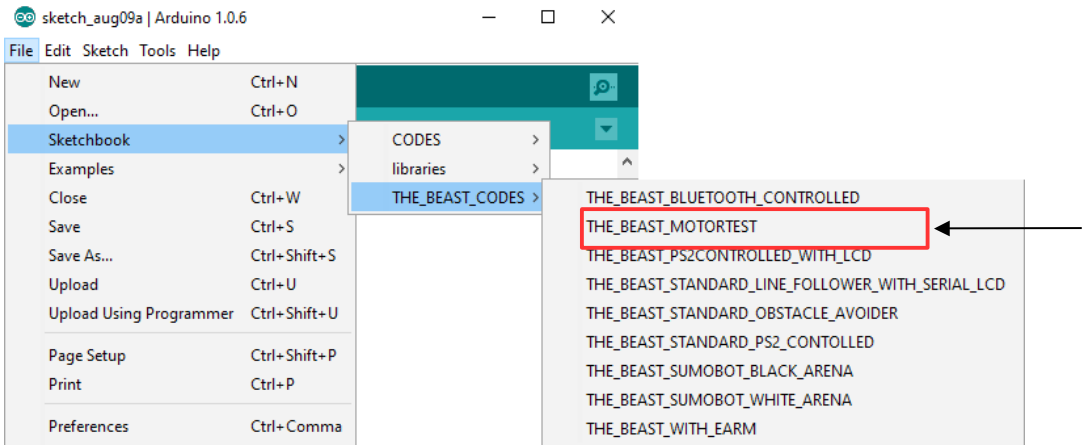
Motor Test

Uploading codes

On the Arduino IDE.

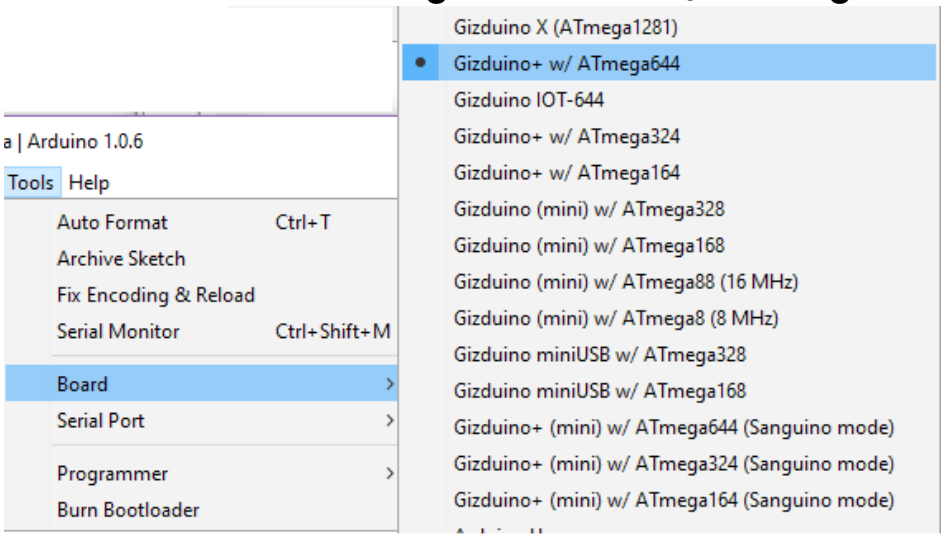
1. Motor Test codes

Go to File>Sketchbook>THE_BEAST..> MOTORTEST



2. Board select

Go to Tools>Boards>gizDuino + w/ Atmega644



3. Port select

Go to Tools>Port>COM#

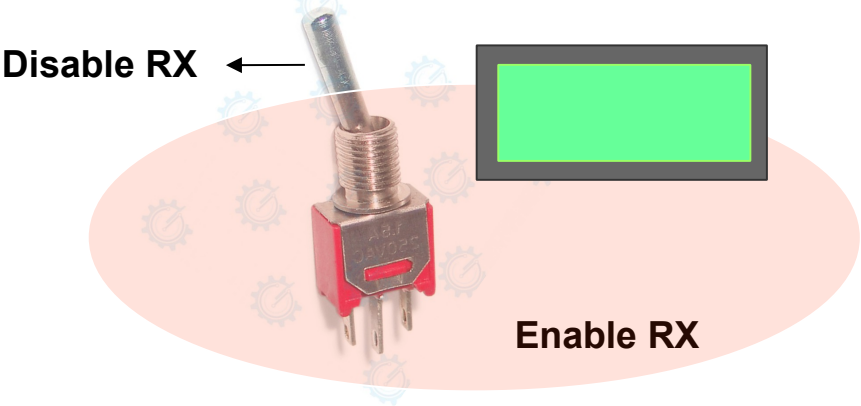
Select the correct port

Go to Device Manager

if you're not sure.

Tips for uploading:

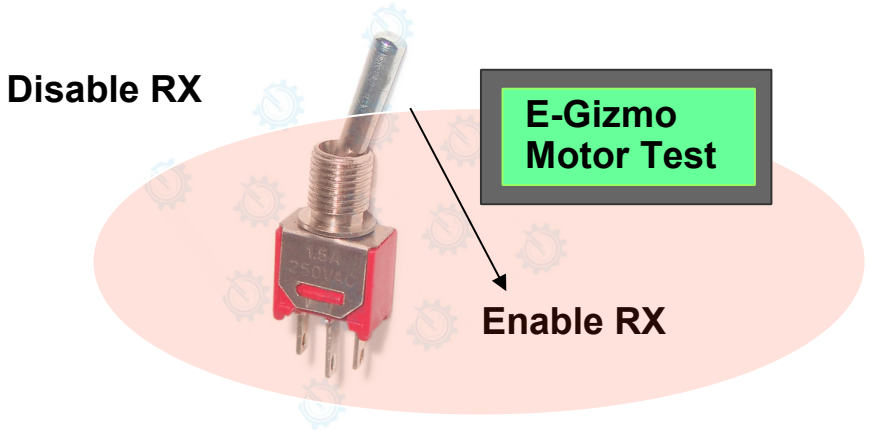
Disable the Rx pin by switching the Toggle Switch.



4. After you switched it. Click Upload.

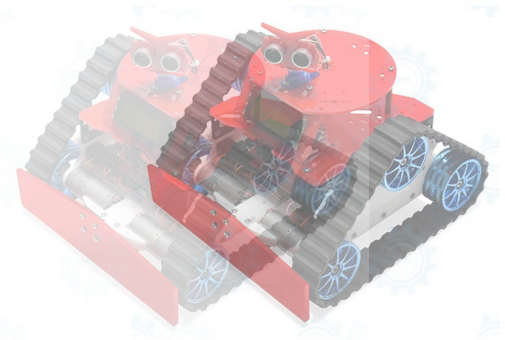
MOTOR TEST

1. After uploading your code for Motor Test.
   Enable the RX pin to show display on the LCD.



2. You can see the direction of motors will turn Forward,
   STOP, BACKWARD,STOP,TURN LEFT, STOP,
   TURN RIGHT & STOP.

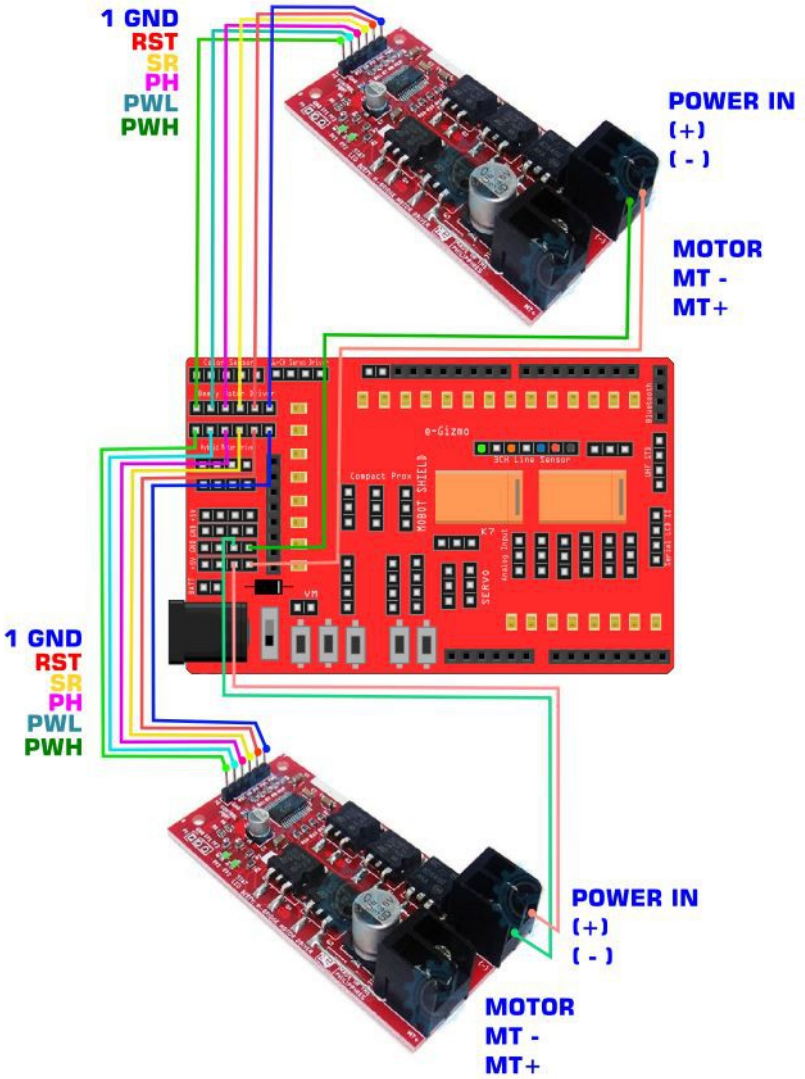
→ Move Forward



→ Backward

Pin assignments in Motor test

```
//Right
#define PH_MOTOR_2_DIRECTION          8
#define PWH_ON_SPEED_CONTROL_2        9
//Left
#define PWH_ON_SPEED_CONTROL_1        10
#define PH_MOTOR_1_DIRECTION          11
```

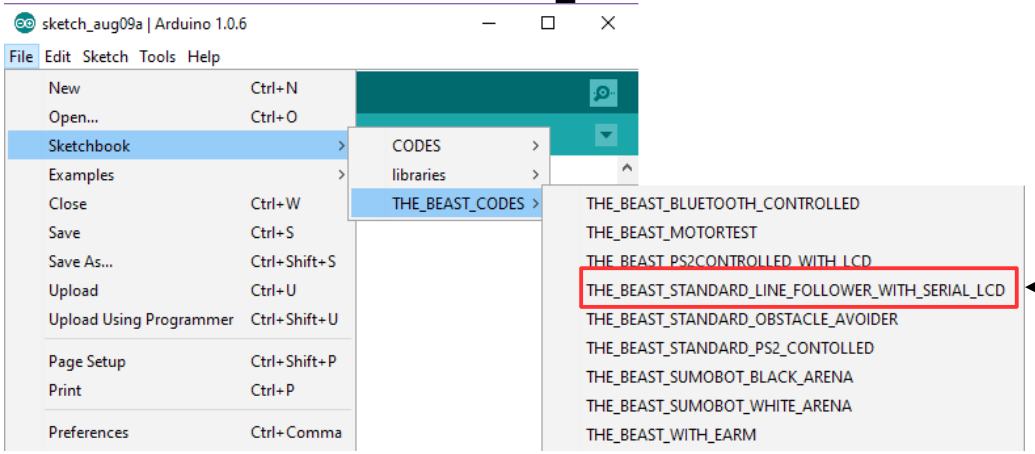


Line Follower Uploading codes

On the Arduino IDE.

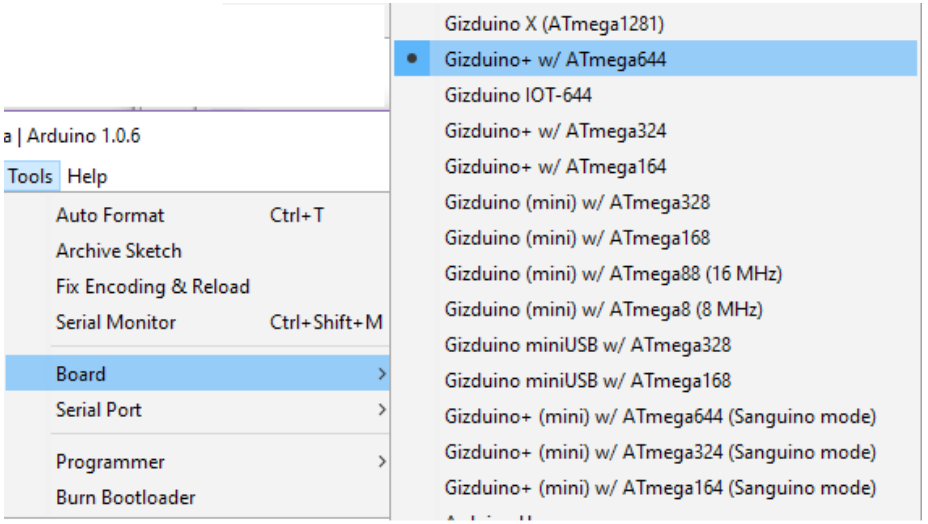
1. Line Follower codes

Go to File>Sketchbook>THE_BEAST..> LINEFOLLOWER



2. Board select

Go to Tools>Boards>gizDuino + w/ Atmega644



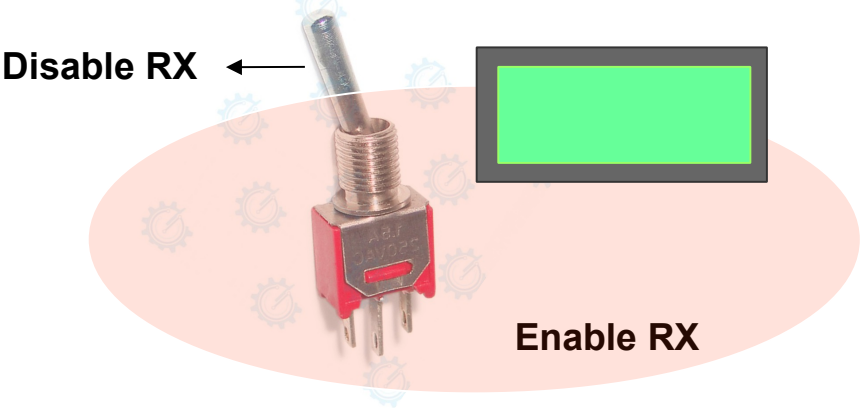
3. Port select

Go to Tools>Port>COM#

- Select the correct port
- Go to Device Manager if you're not sure.

Tips for uploading:

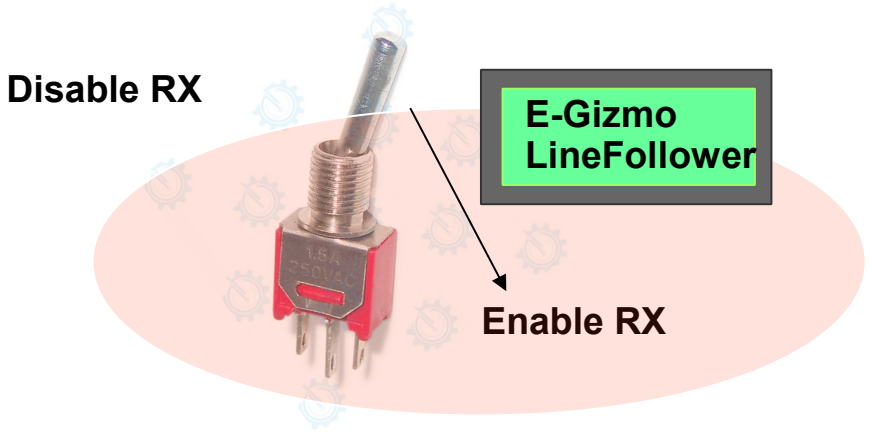
- Disable the Rx pin by switching the Toggle Switch.



4. After you switched it. Click Upload.

LINE SENSOR

1. After uploading your code for linesensors.
   Enable the RX pin to show display on the LCD.

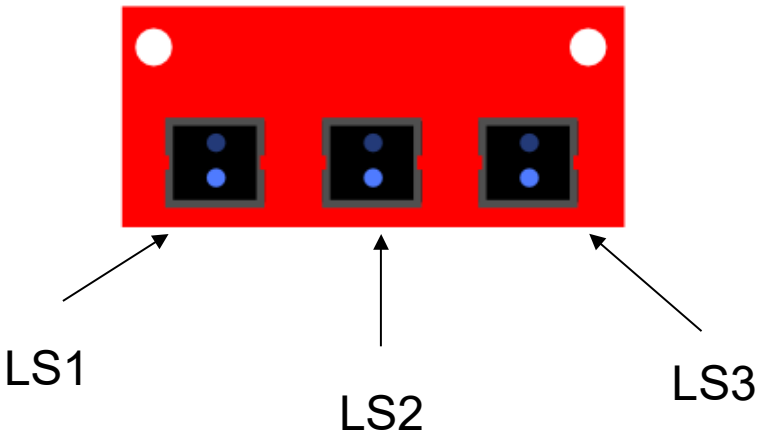


2. Place the BEAST to the "black
   line" to follow it.

Pin assignments in Line Sensor

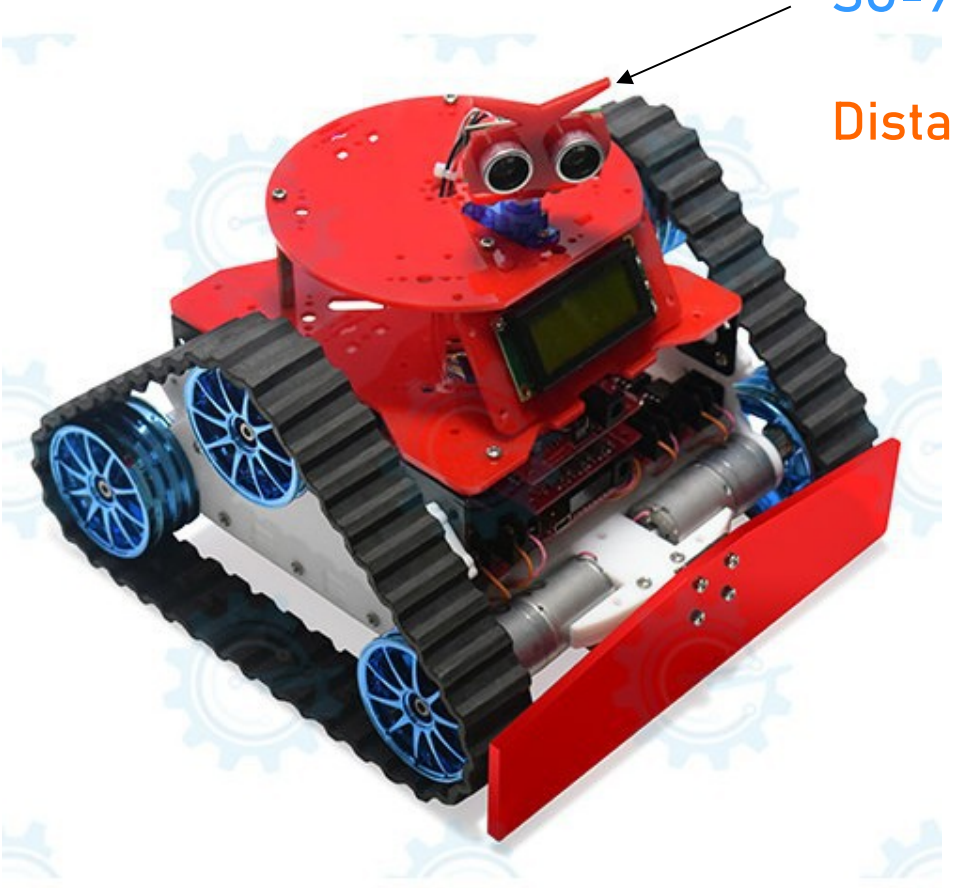
```
#define LEFT_LINE_SENSOR      7    // Line sensor left
#define CENTER_LINE_SENSOR    6    // Line sensor center
#define RIGHT_LINE_SENSOR     5    // Line sensor right
```

Reading Line Sensors Ouput:
Black = 1
White =0



MAZE/SUMO

DISTANCE SENSOR CONNECTIONS



SG-90 Servo : For Turning the Sensors
In 160 degrees directions.

Distance Sensor: Searching for Wall or Objects.

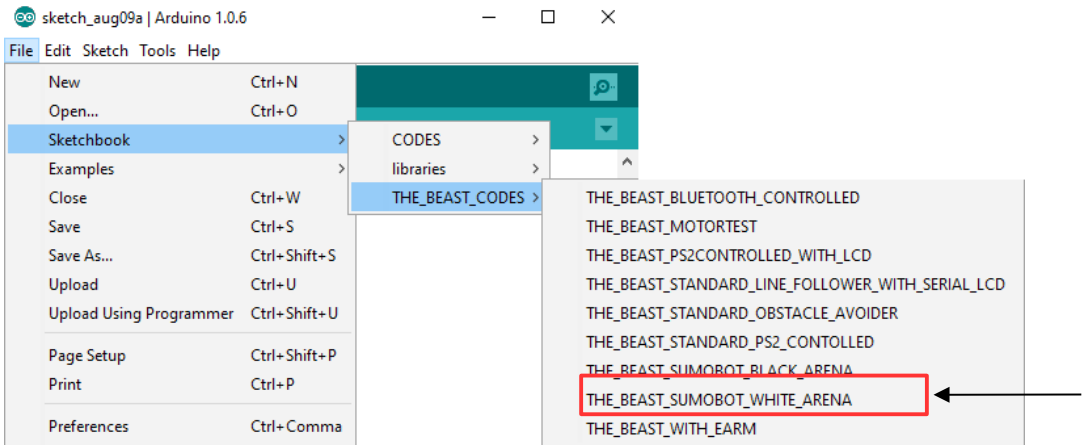
Sumo

Uploading codes

On the Arduino IDE.

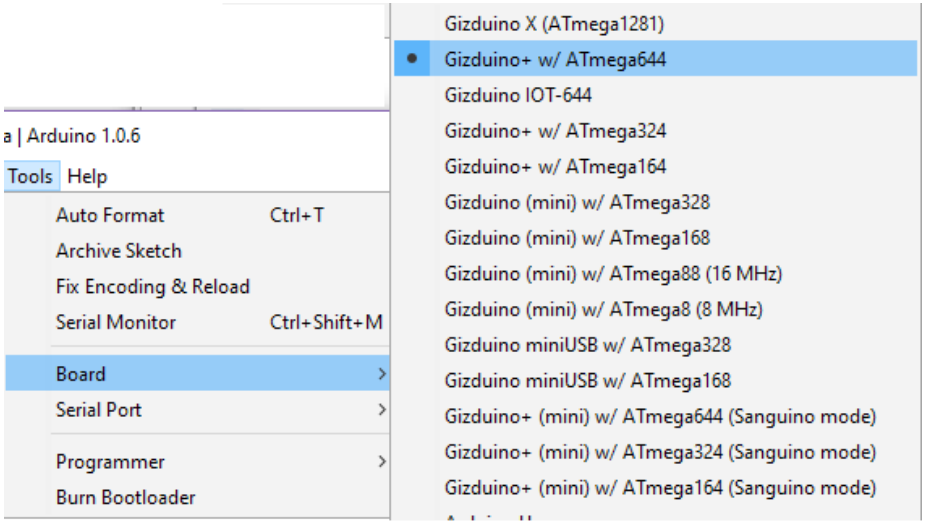
1. Sumo codes

Go to File>Sketchbook>THE_BEAST..> SUMO



2. Board select

Go to Tools>Boards>gizDuino + w/ Atmega644



3. Port select

Go to Tools>Port>COM#

Select the correct port

Go to Device Manager

if you're not sure.

Tips for uploading:

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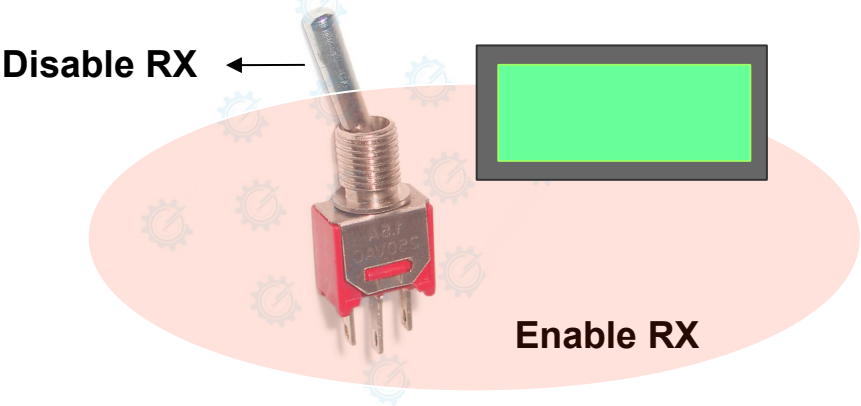
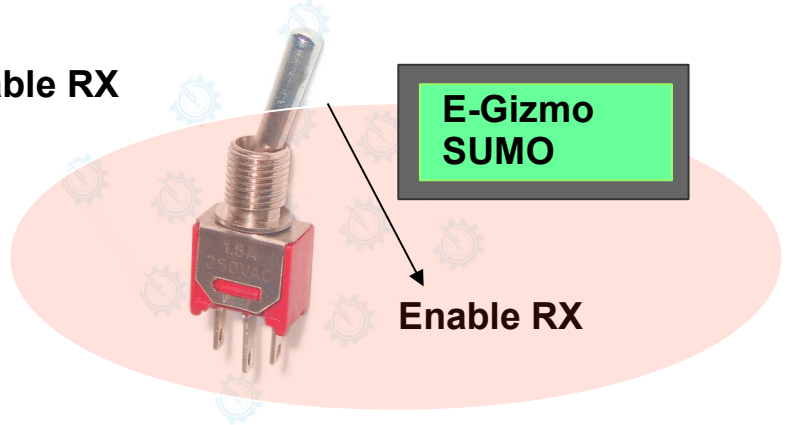


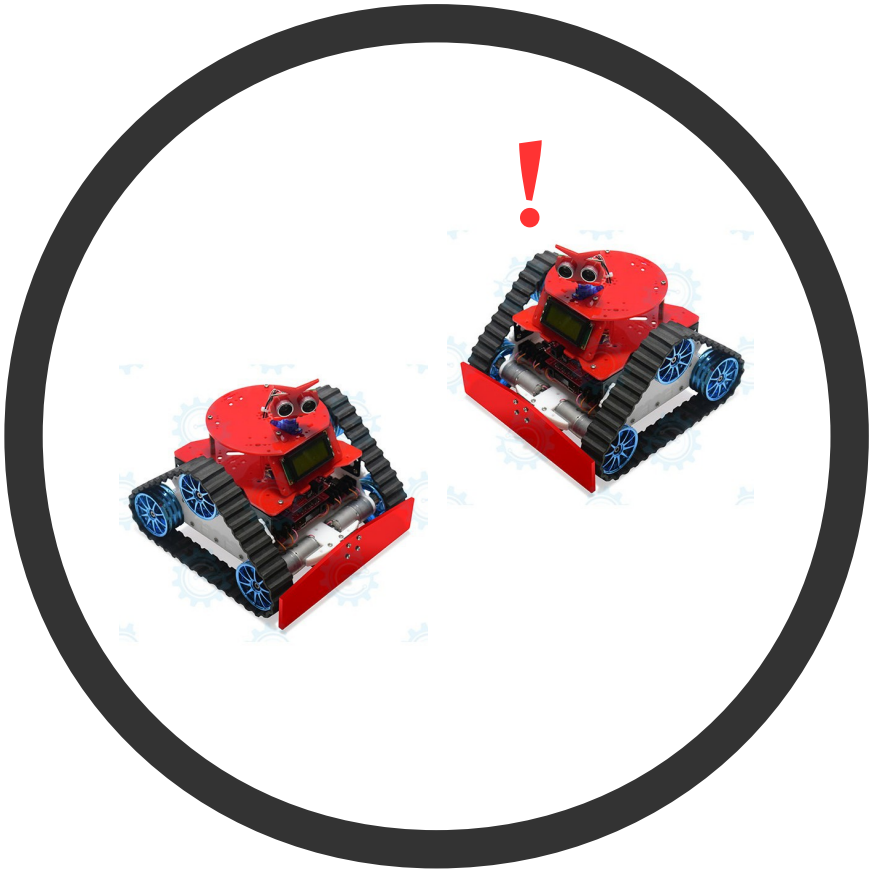
4. After you switched it. Click Upload.

SUMO FIGHTING

1. After uploading your code for linesensors.
   Enable the RX pin to show display on the LCD.



2. Place the BEAST to the Sumo Arena.



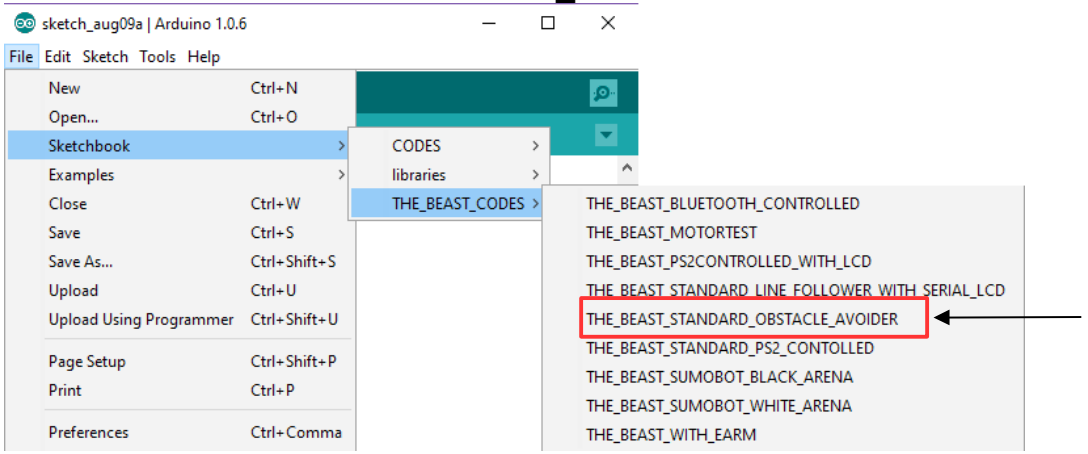
Obstacle

Uploading codes

On the Arduino IDE.

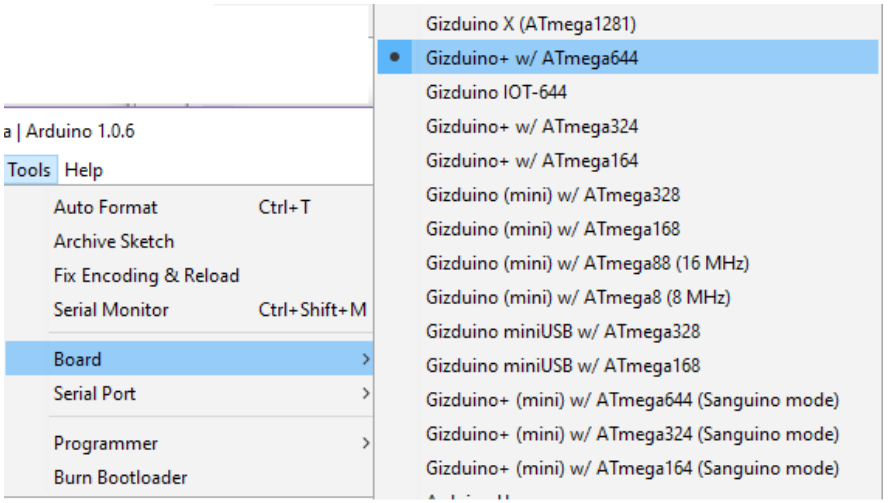
1. Maze codes

Go to File>Sketchbook>THE_BEAST..> OBSTACLE



2. Board select

Go to Tools>Boards>gizDuino + w/ Atmega644



3. Port select

Go to Tools>Port>COM#

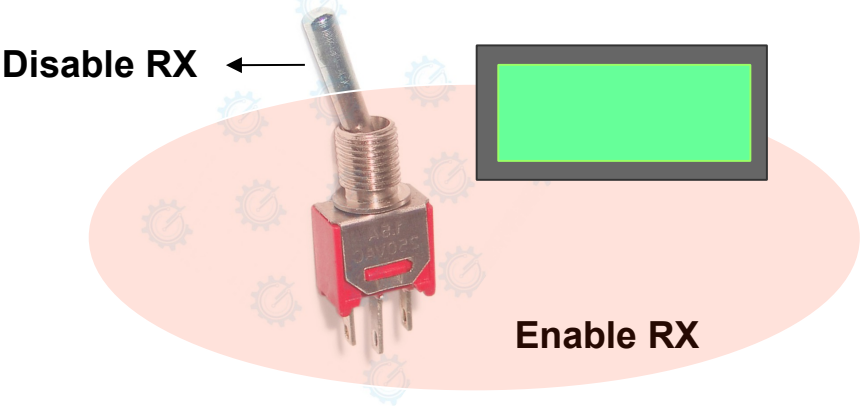
Select the correct port

Go to Device Manager

if you're not sure.

Tips for uploading:

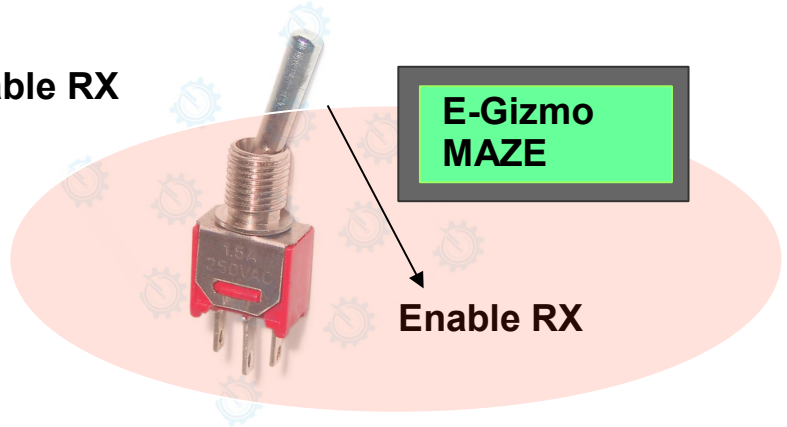
Disable the Rx pin by switching the Toggle Switch.



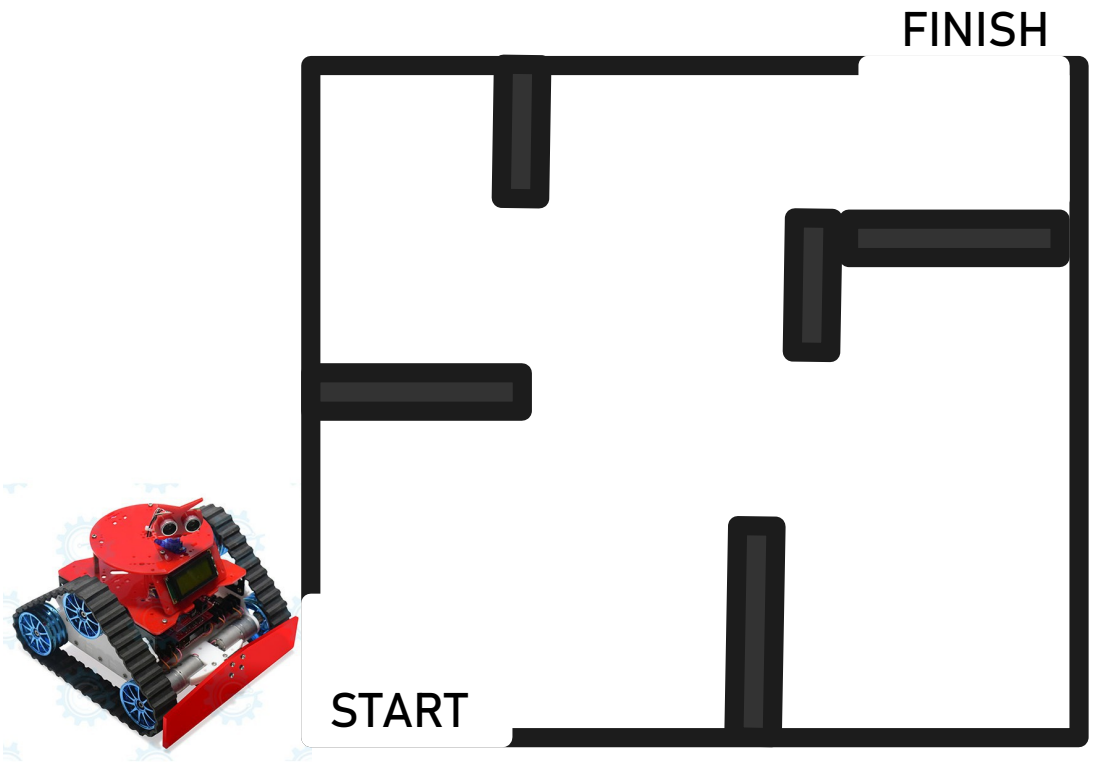
4. After you switched it. Click Upload.

OBSTACLE/MAZE SOLVER

1. After uploading your code for linesensors.
   Enable the RX pin to show display on the LCD.



2. Place the BEAST to the Maze obstacle.

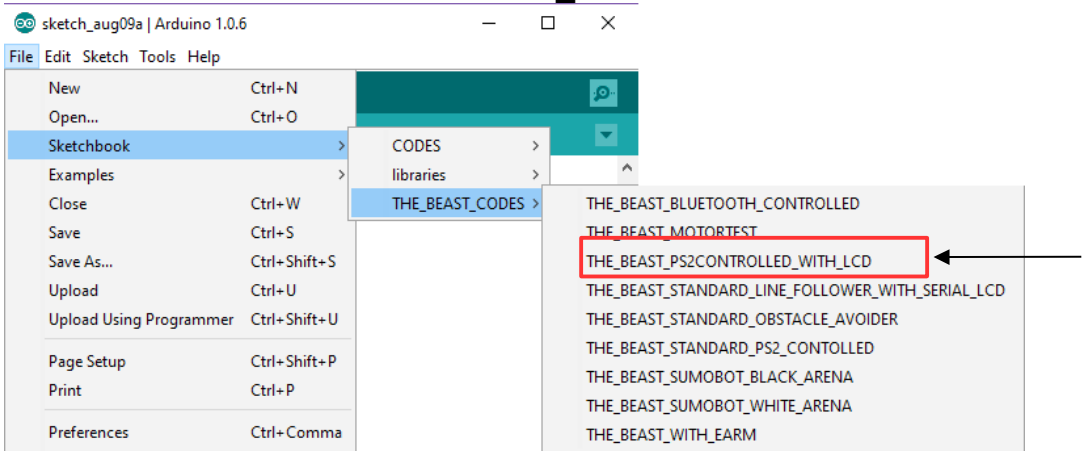


PS2 Controlled

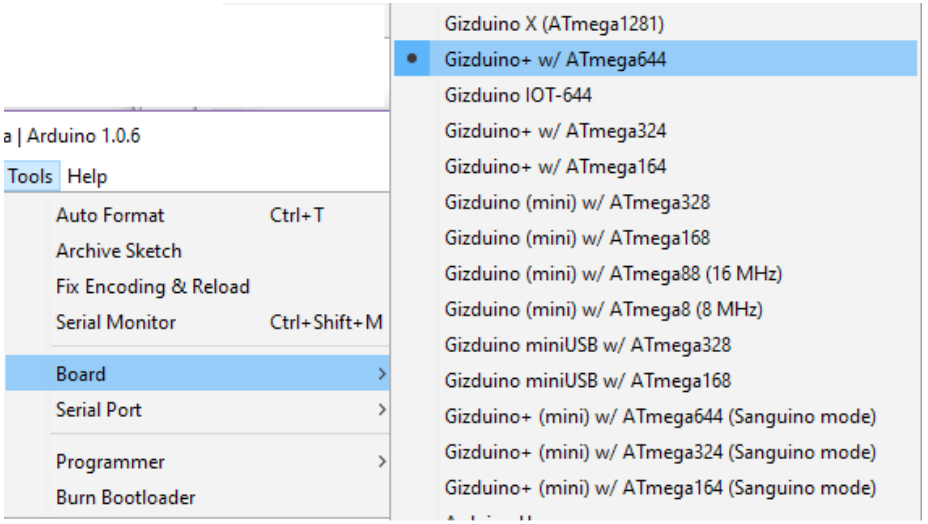
Uploading codes

On the Arduino IDE.

1. PS2 Controlled
   Go to File>Sketchbook>THE_BEAST..> PS2 CONTROLLED

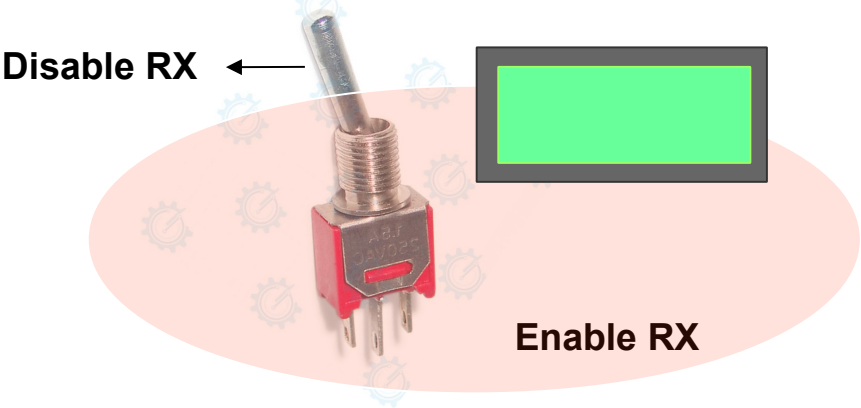


2. Board select
   Go to Tools>Boards>gizDuino + w/ Atmega644



3. Port select
   Go to Tools>Port>COM#
   Select the correct port
   Go to Device Manager
   if you're not sure.

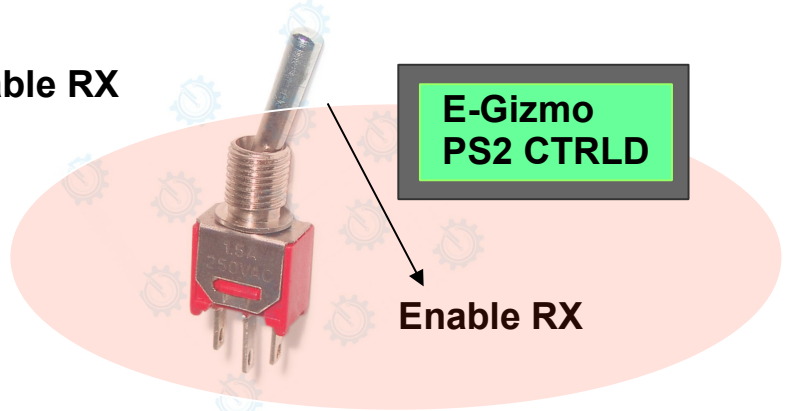
Tips for uploading:
Disable the Rx pin by switching the Toggle Switch.



4. After you switched it. Click Upload.

PS2 CONTROLLED

1. After uploading your code for linesensors.
   Enable the RX pin to show display on the LCD.



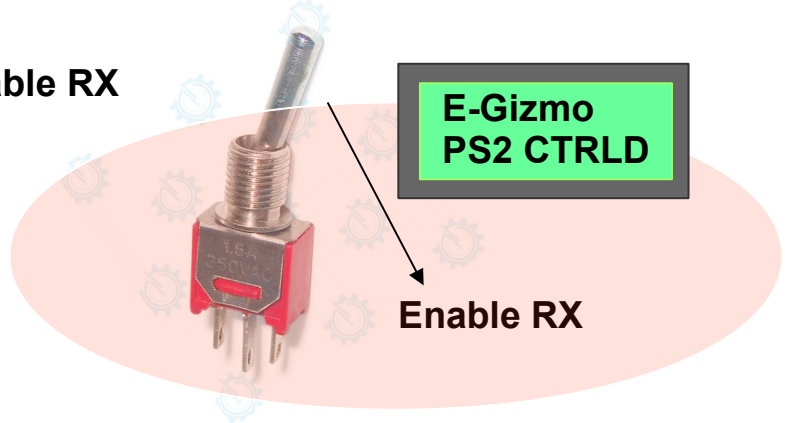
2. Use the PS2 Controlled Buttons & Joystick
   To Control the BEAST.

Note: Do not connect BT module while using the UHF. Only one wireless module at a time.

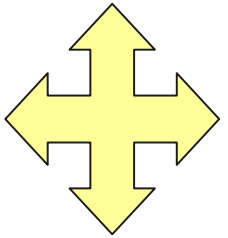
With UHF RX Only

PS2 CONTROLLED W/ PAN TILT

1. After uploading your code for linesensors.
   Enable the RX pin to show display on the LCD.



2. Use the PS2 Controlled Buttons & Joystick
   To Control the BEAST.



Pin assignment in Pan Tilt

```
myServo1.attached(12);  // Base Servo
myServo1.attached(4);   // Tilt Servo
```

*Note: VCC & GND of Servo
Was interchanged.

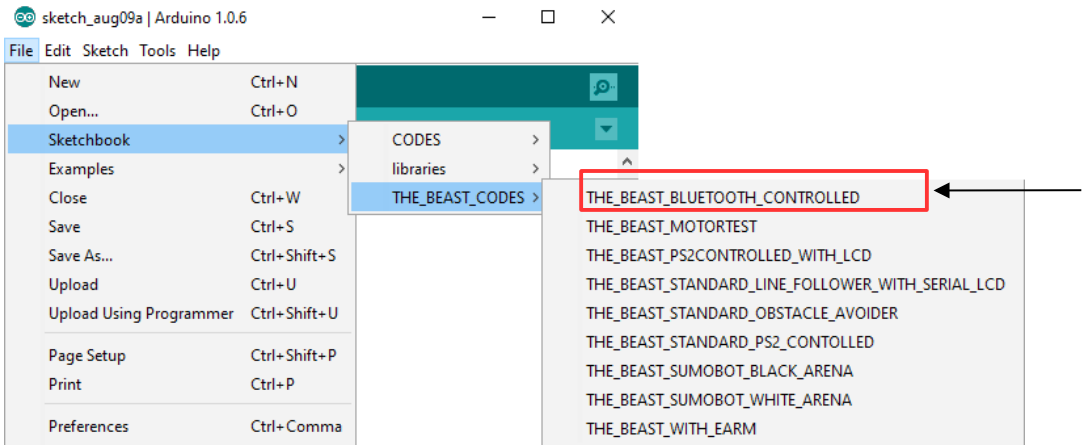
Bluetooth

Uploading codes

On the Arduino IDE.

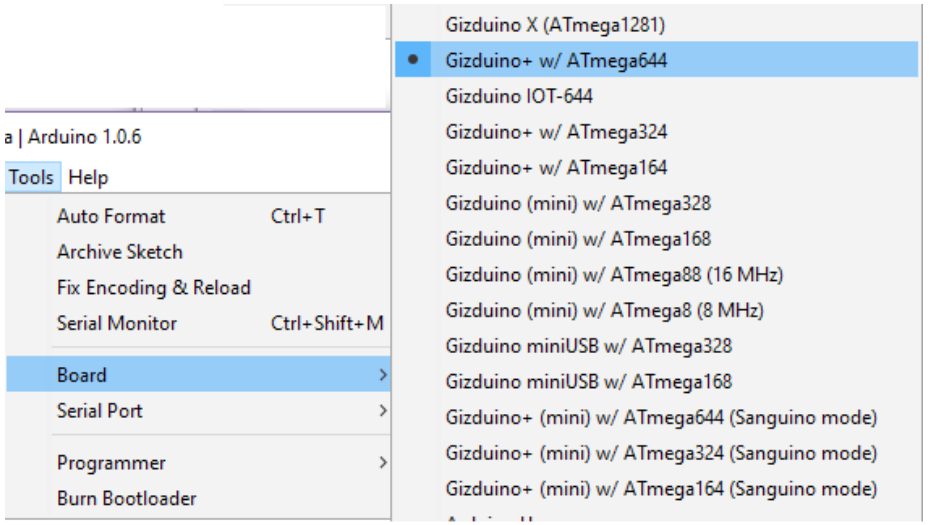
1. Bluetooth

   Go to File>Sketchbook>THE_BEAST..> BLUETOOTH



2. Board select

   Go to Tools>Boards>gizDuino + w/ Atmega644



3. Port select

   Go to Tools>Port>COM#

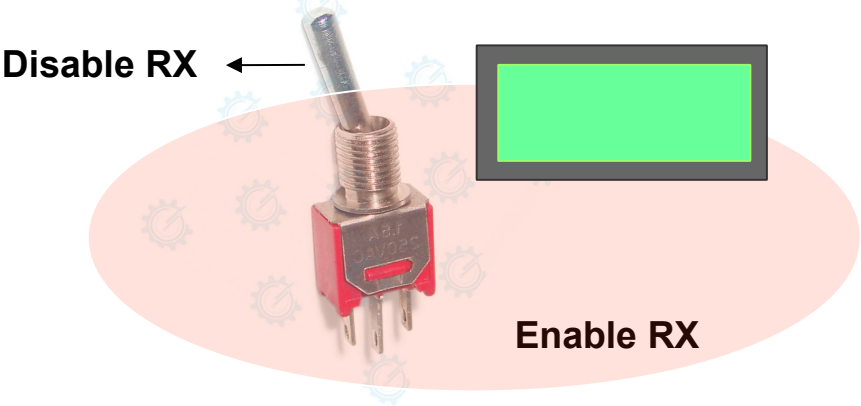
Select the correct port

Go to Device Manager

   if you're not sure.

Tips for uploading:

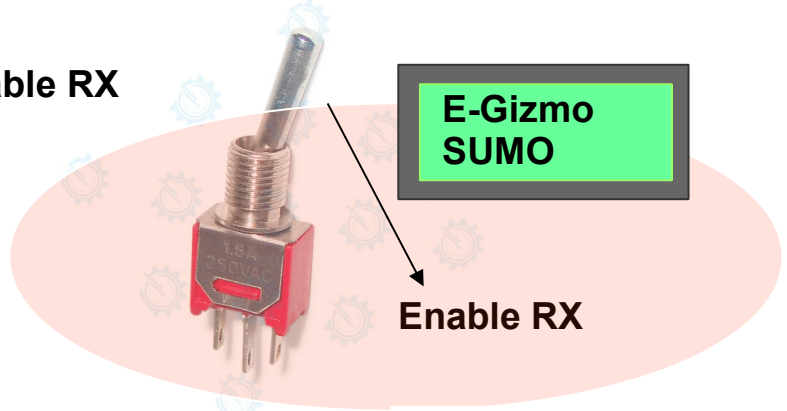
Disable the Rx pin by switching the Toggle Switch.



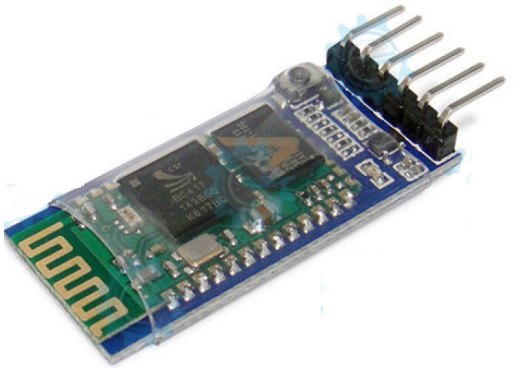
4. After you switched it. Click Upload.

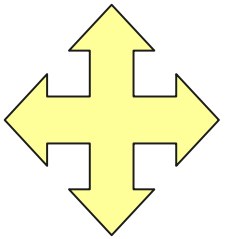
BLUETOOTH CONTROLLED

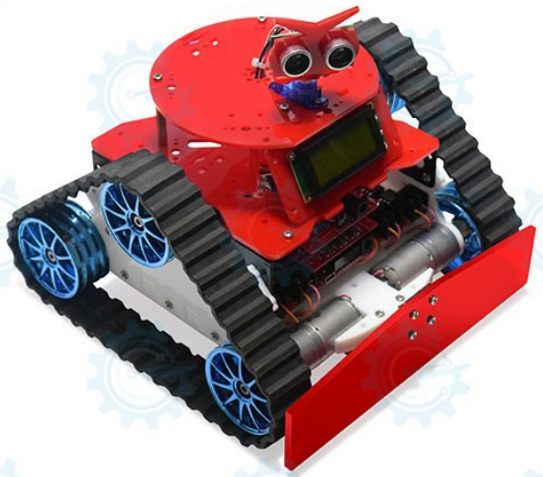
1. After uploading your code for linesensors.
   Enable the RX pin to show display on the LCD.



2. Use the HC-05 Bluetooth Module.
Note: Do not connect the UHF ,if you are
Using BT module.







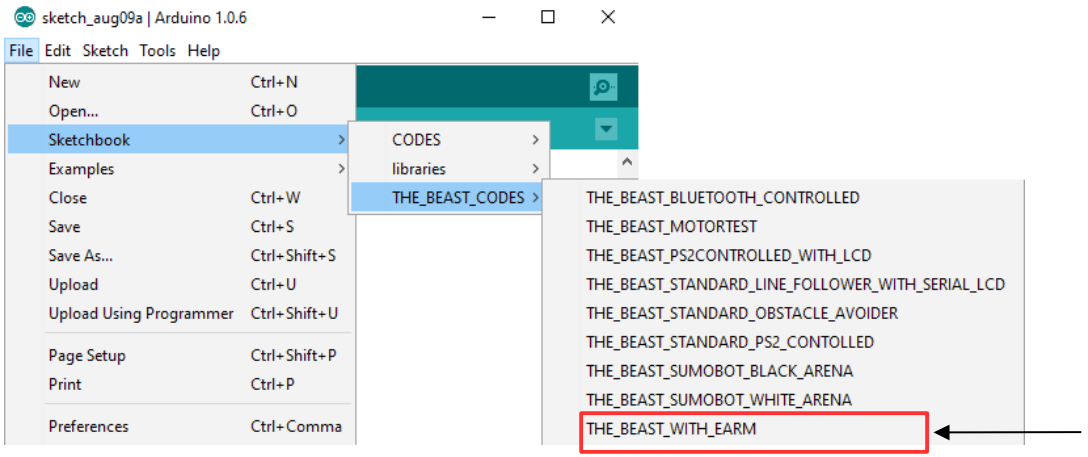
3. Download the e-BOT MINIBOT APP on Google Playstore.
- Follow the image instructions to Connect it to your Smartphone.
SSID: HC-05
Password: 1234 or 0000

With E-ARM

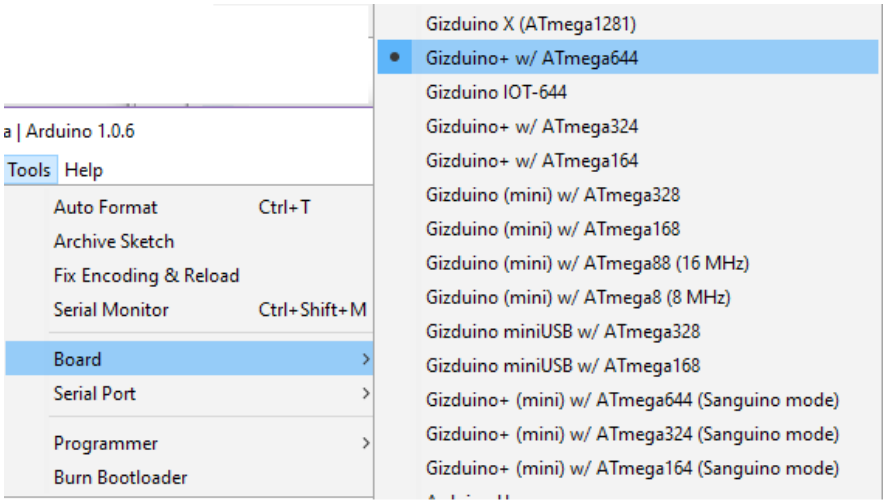
Uploading codes

On the Arduino IDE.

1. With E-ARM Robotic Arm
   Go to File>Sketchbook>THE_BEAST..> EARM

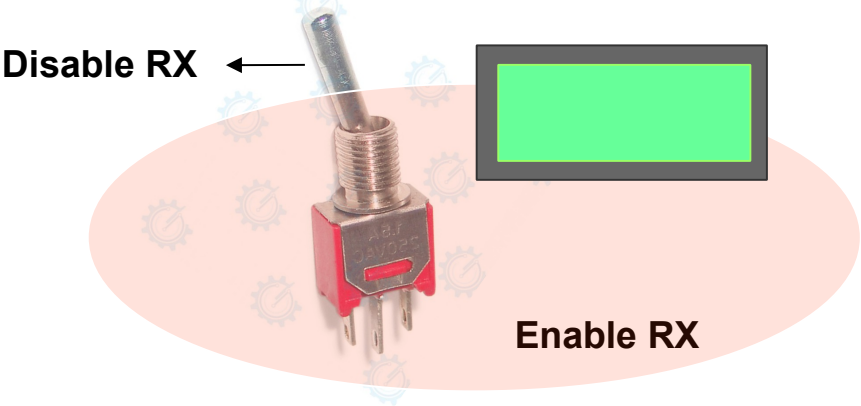


2. Board select
   Go to Tools>Boards>gizDuino + w/ Atmega644



3. Port select
   Go to Tools>Port>COM#
   Select the correct port
   Go to Device Manager
   if you're not sure.

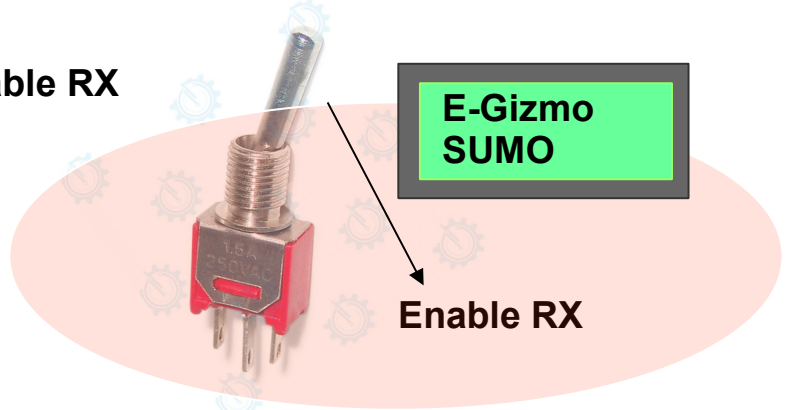
Tips for uploading:
Disable the Rx pin by switching the Toggle Switch.



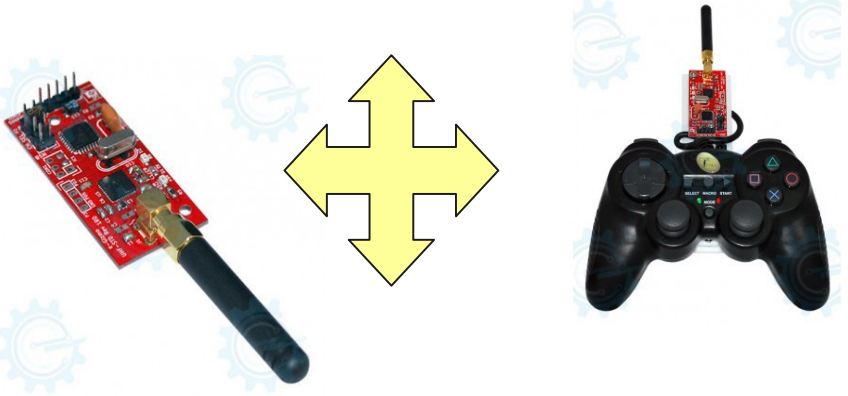
4. After you switched it. Click Upload.

THE BEAST WITH EARM

1. After uploading your code for linesensors.
   Enable the RX pin to show display on the LCD.

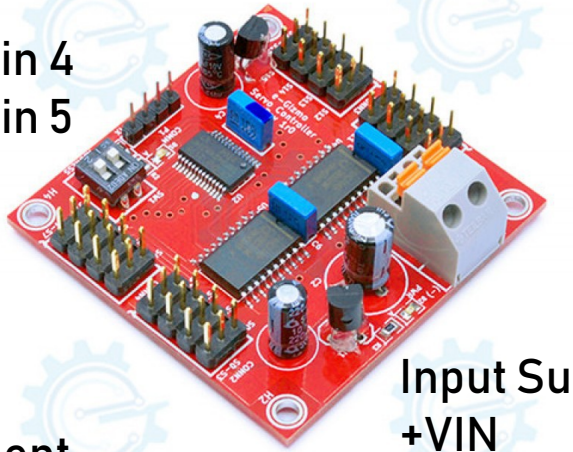


2. Use the PS2 Controller and UHF RX to
Control the BEAST.



3. Use 16-Channel Servo Controller to the EARM.

To gizduino
RX to TX Digital Pin 4
TX to RX Digital Pin 5
GND to GND



Input Supply
+VIN
GND

*Under development

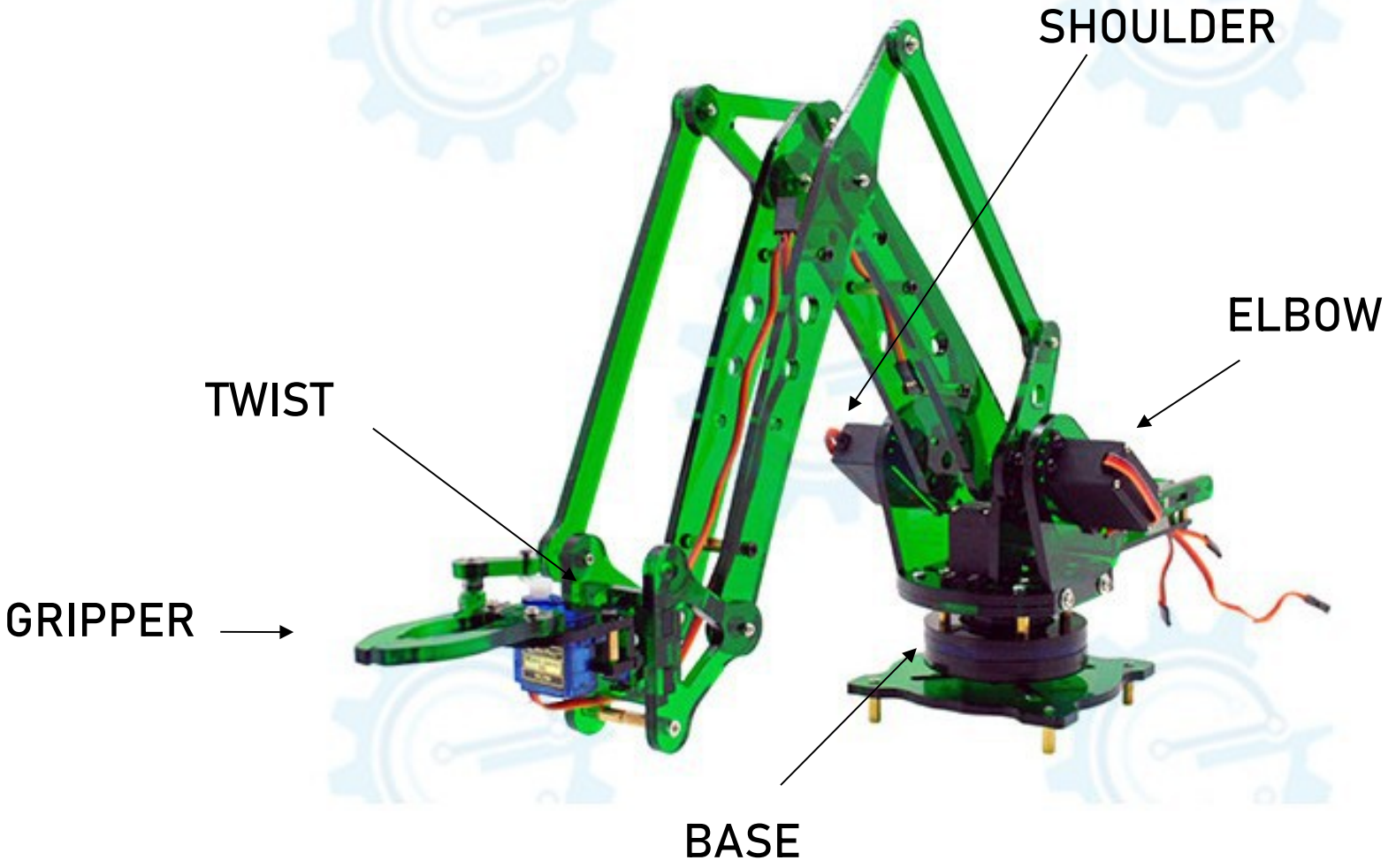
Pin assignment in EARM

```
#include"eGizmo_16ChannelServo.h" //Library
SoftwareSerial softSerial(4, 5); //pins used
eGizmo_16channelServo servoDriver(&softSerial);

int DEGREES = 5; // increment,decrement of degrees value
// Initial Position
int G_POS = 90;
int T_POS = 90;
int E_POS = 50;
int S_POS = 50;
int B_POS = 170;

 servoDriver.moveServo(0, G_POS);  //Gripper Servo 0
 servoDriver.moveServo(1, T_POS);   //Twist Servo 1
 servoDriver.moveServo(2, E_POS);  //Elbow Servo 2
 servoDriver.moveServo(3, S_POS);  //Shoulder Servo 3
 servoDriver.moveServo(4, B_POS);  //Base Servo 4
```

EARM major parts



E-ARM modified calibration

BASE	HOME = 170
GRIPPER	HOLD = 10, OPEN = 140*
TWIST	RIGHT= 160 ,HOME= 90 ,LEFT= 0
SHOULDER	UP = 160 ,HOME=50, DOWN=0
ELBOW	RETRACT =20,HOME= 50, EXTEND =160

* Do this at your own risk!!
You may use the Serial Monitor first to see the degree values,
Before setting it up. Do it for each servo until you find the correct degrees.

e-Gizmo
MECHATRONIX CENTRAL

For more info.

- Website: e-gizmo.net

Egizmo Tech blog: e-gizmo.net

- Facebook: eGizmoMechatronix
- Youtube Channel: e-Gizmo Mechatronix Central