



mBot Ranger

3-in-1 Educational Robot Kit



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@Makeblock



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+Makeblock



Land Raider



Nervous Bird



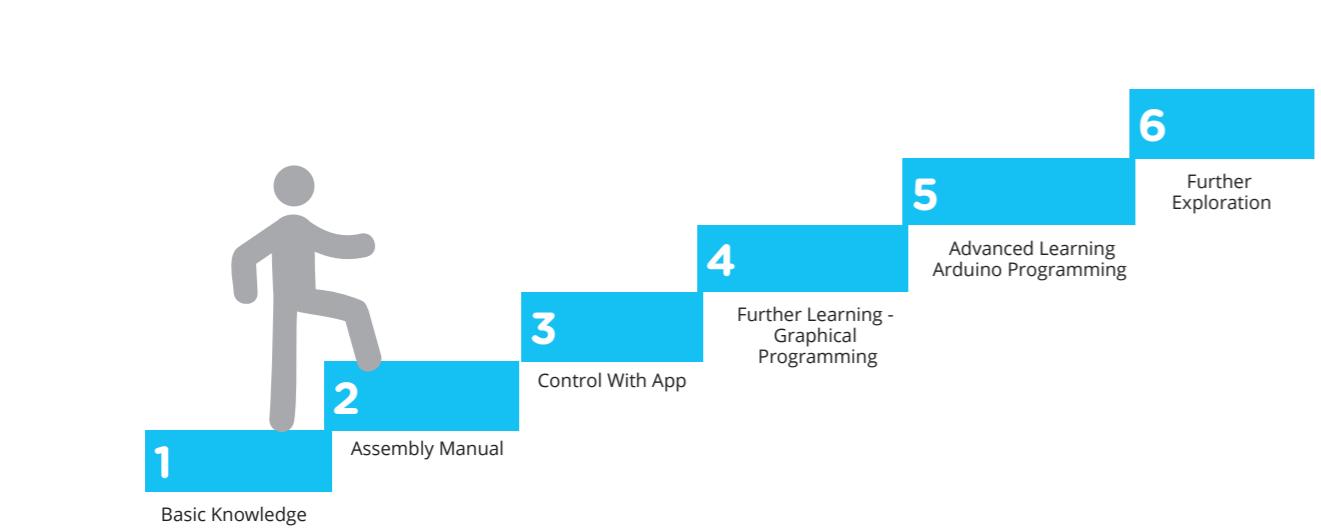
Dashing Raptor

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Quick Guide

mBot Ranger is a three-in-one STEM educational robot kit which supports three building forms: a robot tank, a three-wheeled racing car, and a self-balance car. Program and control mBot Ranger via smartphone, tablets, or computer to start your exploration in the world of robotics.



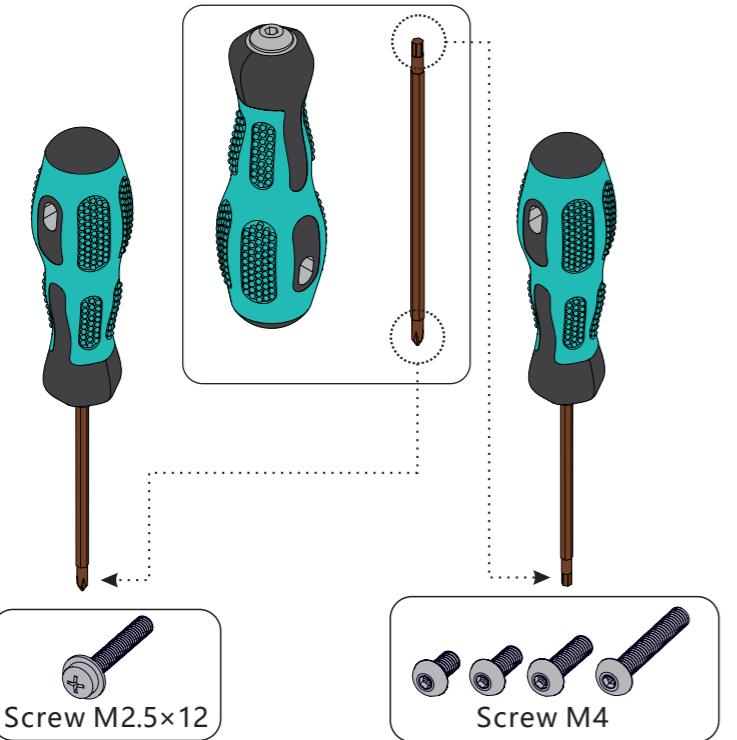
WARNING:CHOKING HAZARD - Small parts. Children should be accompanied by adults.

Parts List

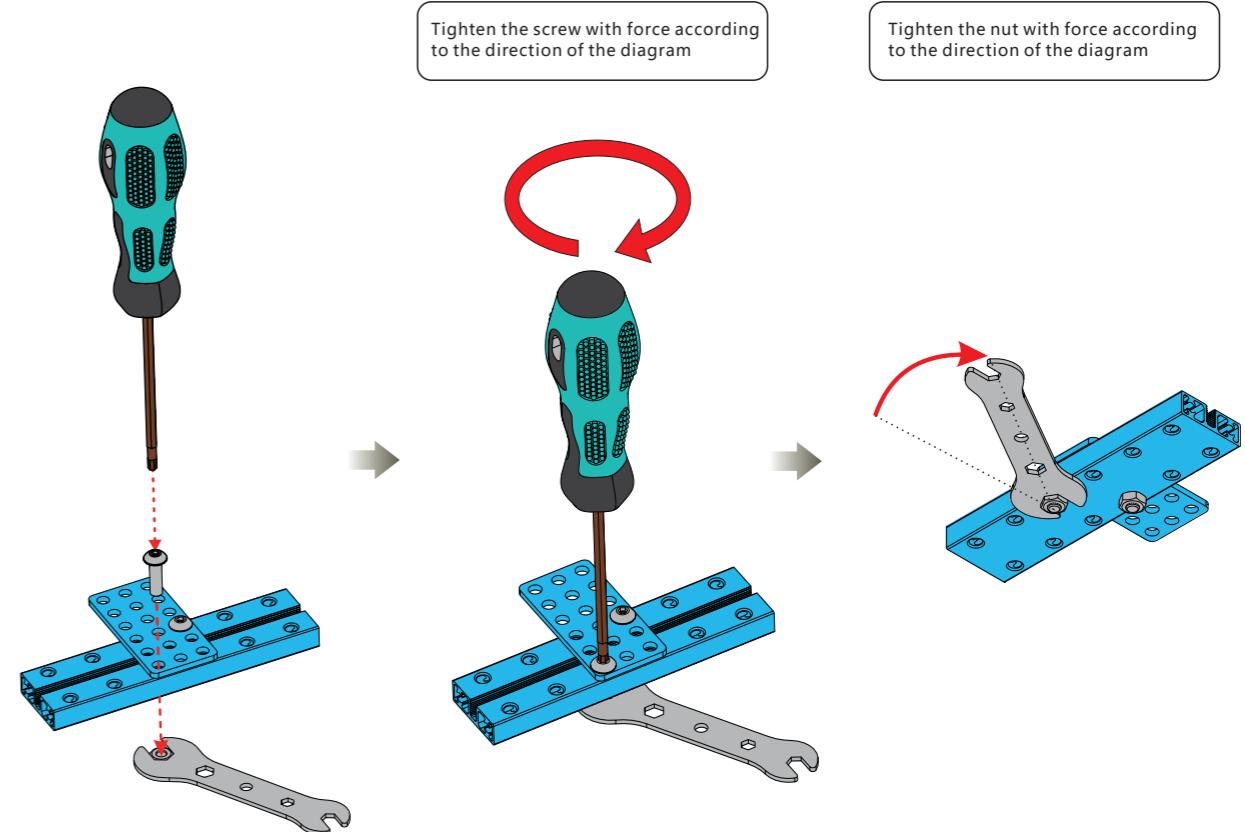
2 x Beam0824-112		2 x 90T Wheel		1 x USB Cable
1 x Beam0824-48		2 x 90T Tyre		2 x RJ25 Cable-20cm
2 x Plate 0324-88		2 x Track		1 x Wrench
2 x Plate 135°		4 x Plastic Spacer 4x7x10mm		1 x Hex & Cross Screwdriver
1 x Plate for Battery Holder		2 x 180 Encoder Motor		22 x Screw M4*8mm
1 x Plate T-type		8 x Copper Bush 4x8x4mm		4 x Screw M4*10mm
1 x Bracket 3x3		4 x Bruss Stud M4*30+6		6 x Screw M4*14mm
1 x Bracket U1		1 x Battery Holder		4 x Screw M4*25mm
1 x Mini Caster Wheel		1 x Me Auriga		2 x Screw M2.5*12mm
4 x 62T Wheel Without Step		1 x Ultrasonic Sensor		10 x Nut M4
2 x 62T Wheel		1 x Line Follower Sensor		2 x Encoder Motor Wire



Introduction to Tools



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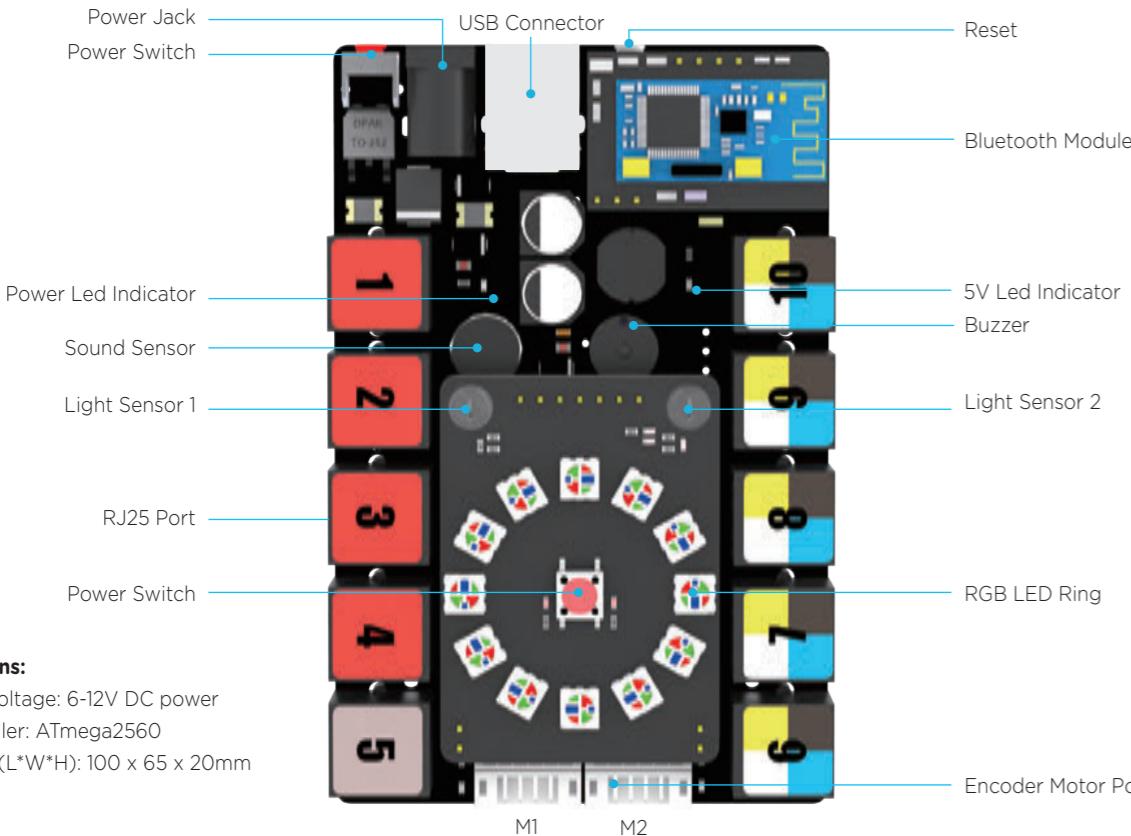


Tighten the screw with force according to the direction of the diagram

Tighten the nut with force according to the direction of the diagram

05

Me Auriga



Specifications:

Operating Voltage: 6-12V DC power

Microcontroller: ATmega2560

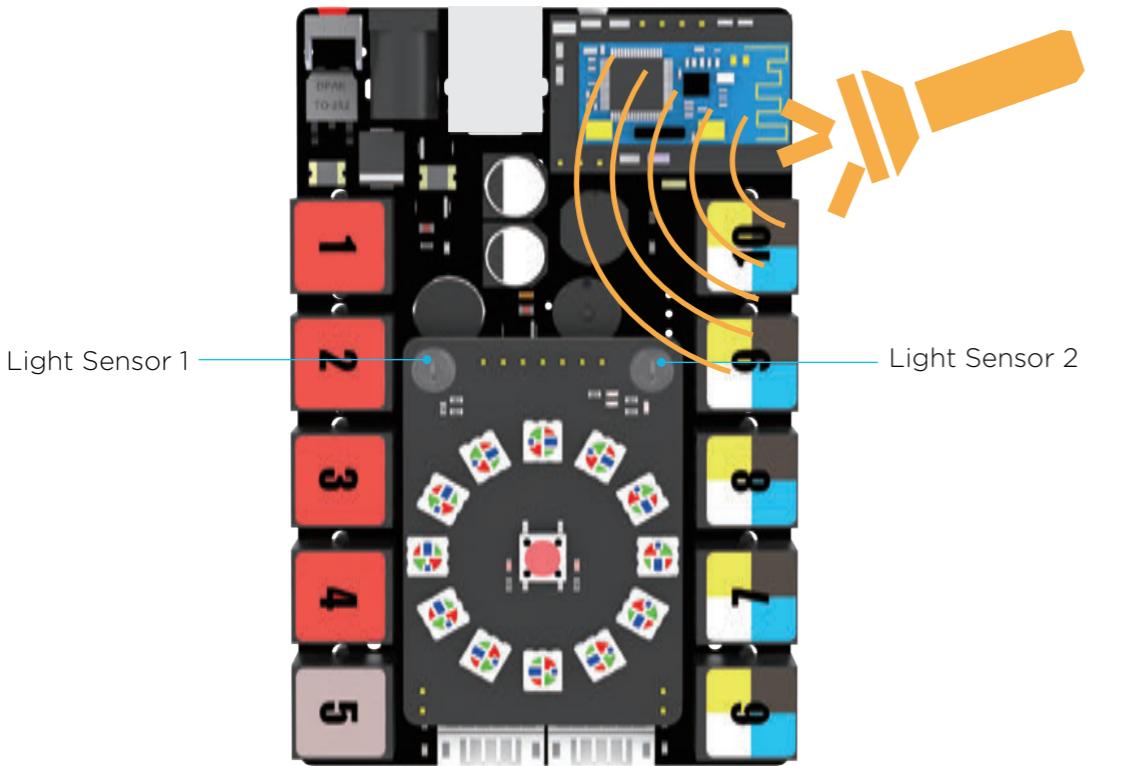
Dimensions (L*W*H): 100 x 65 x 20mm

Introduction to Interfaces of Me Auriga

Tag Color	Compatible Module Types	Typical Me Modules
1 2 3 4	(6-12V DC) Driven modules	Me Motor Driver Me Servo Driver Me Stepper Driver
5	Hardware serial port	Me Bluetooth Me Bluetooth Module (Dual-Mode)
6 7 8 9 10	One way digital interface Dual digital interface I ² C port Dual & one way analog interface	Me Ultrasonic Sensor Me RGB LED Me Limit Switch Me 7 Segment Serial Display Me PIR Motion Sensor Me Shutter Me Line Finder Me Infrared Receiver Decode Me 3 Axis Accelerometer and Gyro Sensor Me Potentiometer Me Joystick Me 4Button Me Sound Sensor ...

Light Sensor

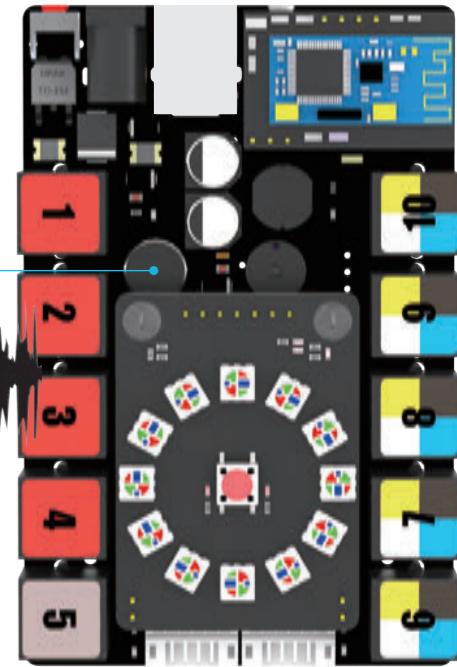
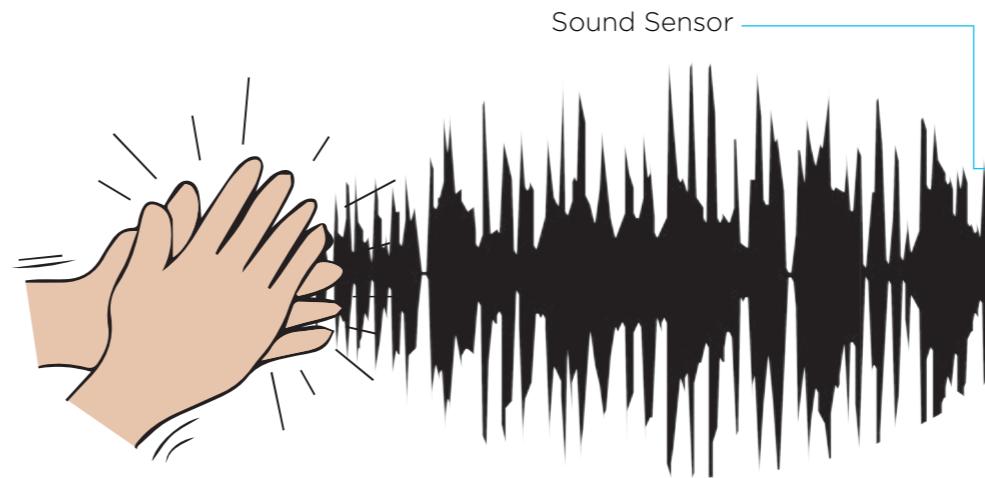
Me Auriga has two on-board light sensors. Each of Ranger's light sensors can measure how much light is shining on it. The more light shines on the sensors, the higher the signal it feeds back. Light sensors can be used to make an intelligent dimming lamp, a light-avoiding robot and a light-following robot.



08

Sound Sensor

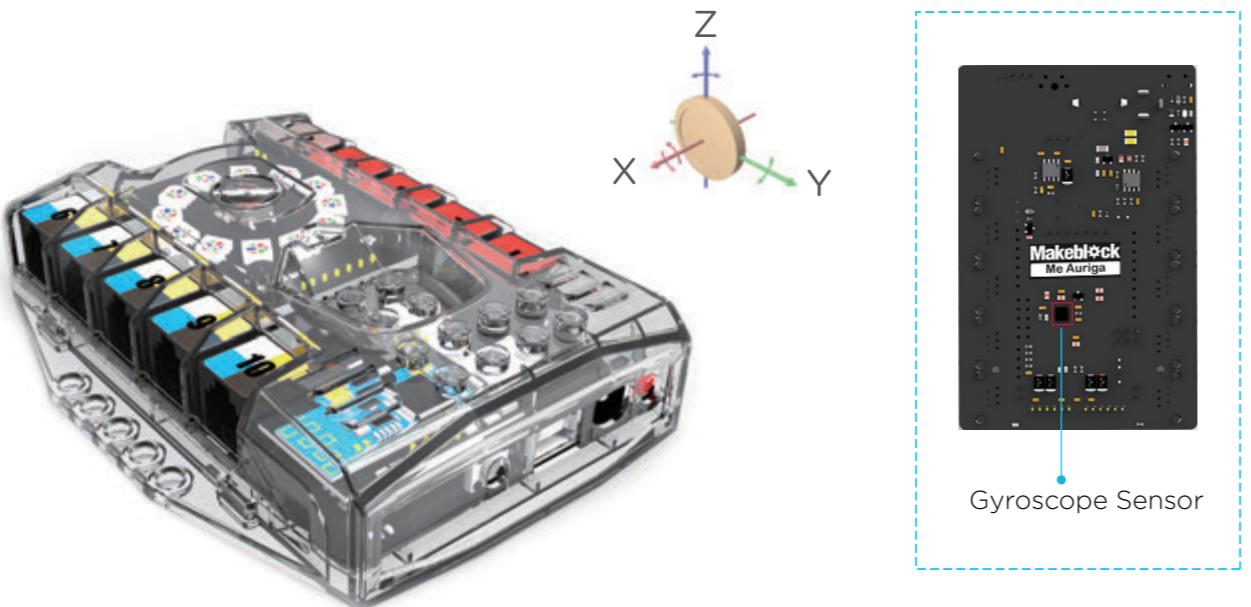
The sound sensor on Me Auriga is designed to detect the intensity of sound in the surrounding environment. Based on the LM386 power amplifier and the electret microphone, the sound sensor can output analog values ranging from 0 to 1023. It can be used in sound interactive projects, such as a voice operated switch.



09

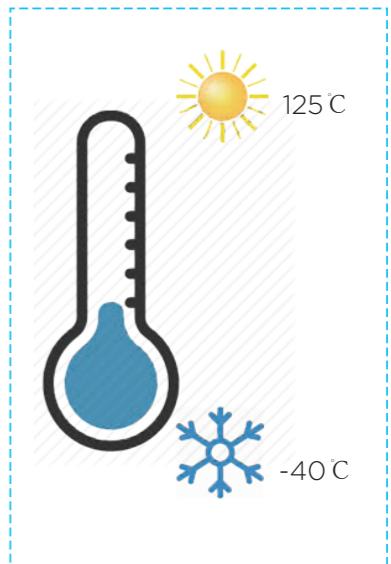
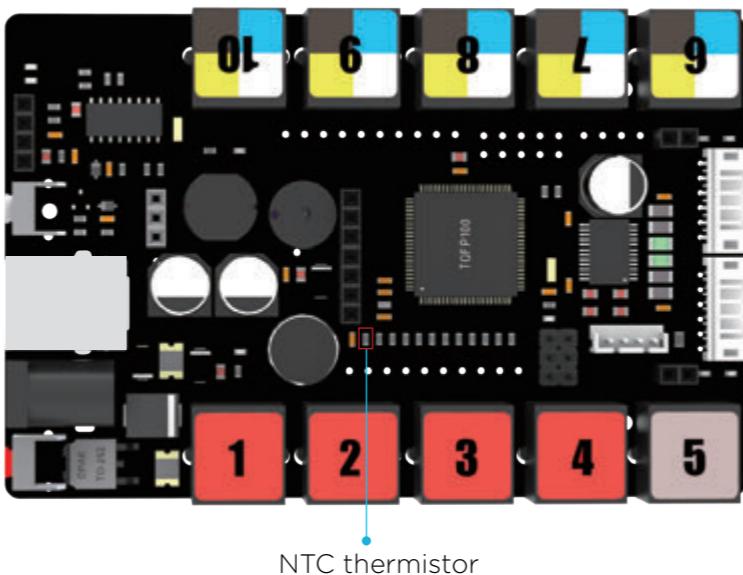
Gyroscope Sensor

Ranger's on-board gyro sensor is a motion processing module. It measures the angular rate and the acceleration information of your robot. Based on MPU-6050, this gyro sensor combines a 3-axis gyroscope, 3-axis accelerometer, and a Digital Motion Processor™ (DMP) capable of processing complex 9-axis Motion Fusion algorithms. It can be used together with encoder motor to build a self-balance car.



Temperature Sensor

The Ranger's on-board temperature sensor contains a tiny thermometer (a NTC thermistor) that detects the temperature of the surroundings.



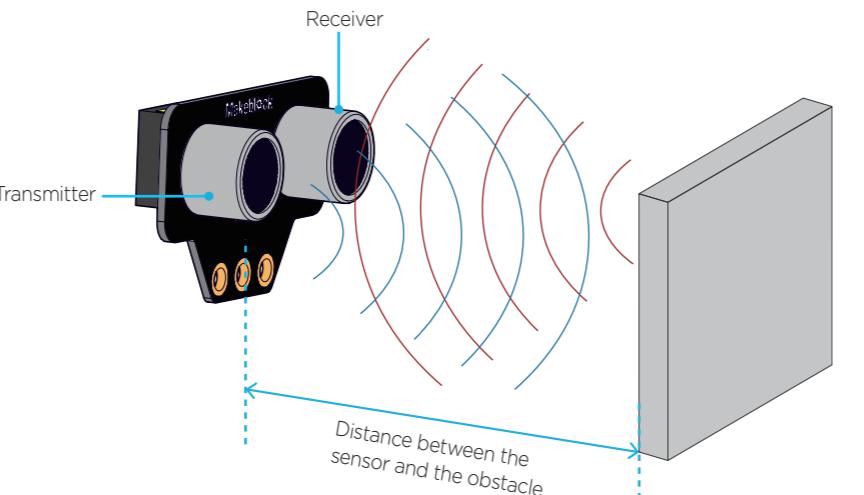
Me Ultrasonic Sensor

Me Ultrasonic Sensor is an electronic module that emits an ultrasonic wave and determines the distance between the sensor and an object based on the time it takes to send the signal and receive the echo. Ultrasonic sensors have numerous applications, such as parking assistance sensors in cars and proximity alarms. This Me Ultrasonic Sensor can be attached to the port with yellow tags on Me Auriga.



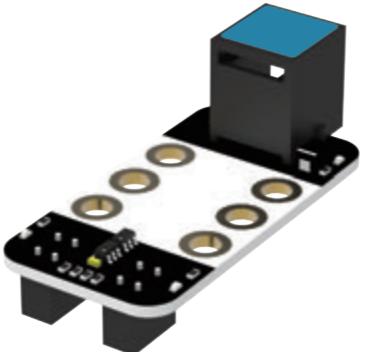
Specifications:

Operating Voltage: 5V DC
Detecting Range: 3cm-400cm
Detecting Angle: Prefer at 30 degree angle
Dimension (L*W*H): 56 x 36 x 31mm



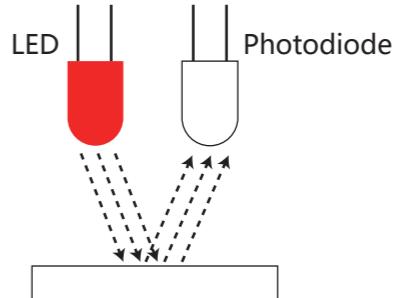
Me Line Follower Sensor

Me Line Follower module is designed for giving the robot the ability to detect lines or nearby objects. It has two sensors on the module and each sensor contains two parts - an IR emitting LED and an IR sensitive phototransistor. By measuring the amount of reflected infrared light, it can detect transitions from light to dark (lines) or even objects directly in front of it. This module can be connected to the port with blue tags on Me Auriga.

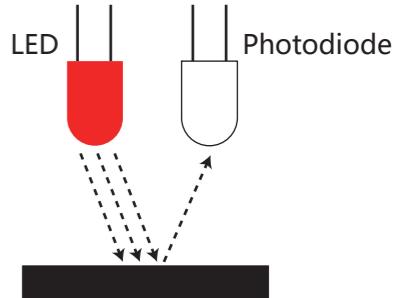


Specifications:

Operating Voltage: 5V DC
Detecting Range: 1-2cm
Dimension (L*W*H): 48 x 24 x 24mm



White surfaces reflect lots of infrared light back to the sensor.



But not much light reflects from black surfaces to the sensor

Battery Information

Battery for Ranger:

Option 1. 1.2V (6) AA rechargeable batteries. (Not included in this kit).

Option 2. 1.5V (6) AA alkaline battery (Not included in this kit). Energizer and DURACELL are recommended.

We recommend that you'd better use rechargeable batteries.

IMPORTANT BATTERY INFORMATION:

- Use only fresh batteries of the required size and recommended type.
- Do not mix old and new batteries, different types of batteries.
- Replace all batteries of the same type/brand at the same time.
- The supply terminals are not to be short-circuited.
- Remove exhausted batteries from the robot.
- Remove batteries if the robot is not going to be played with for some time.

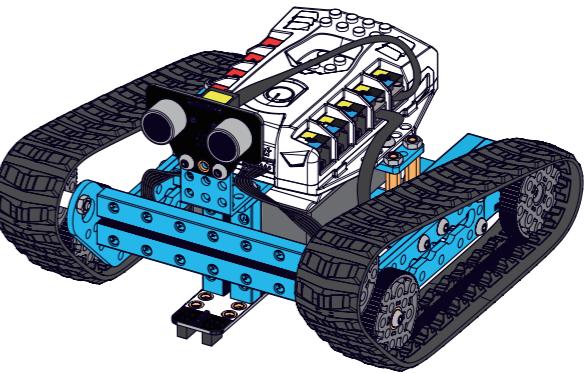


LOW BATTERY INDICATORS:

When the following phenomenon occurs, it means the Ranger batteries grow weak.

Land Raider & Dashing Raptor	If the robot moves very slowly, automatically restarts while turning, bumps into thing or doesn't move at all despite the motor speed being set to full power, the batteries are low.
Nervous Bird	If the robot easily loses its balance while moving or turning, the batteries are low.

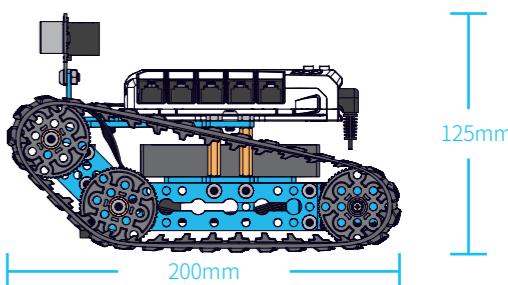
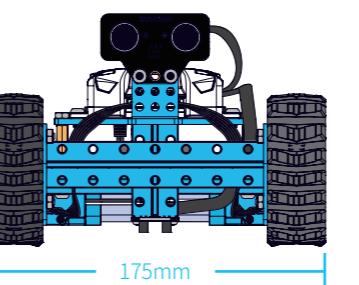
Land Raider



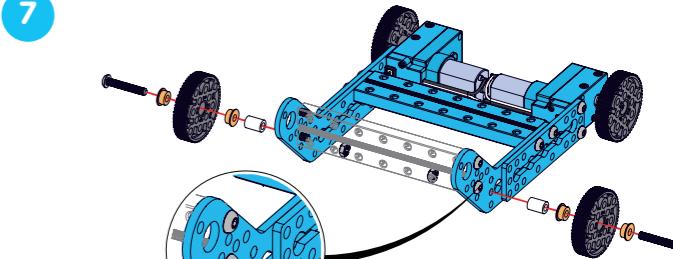
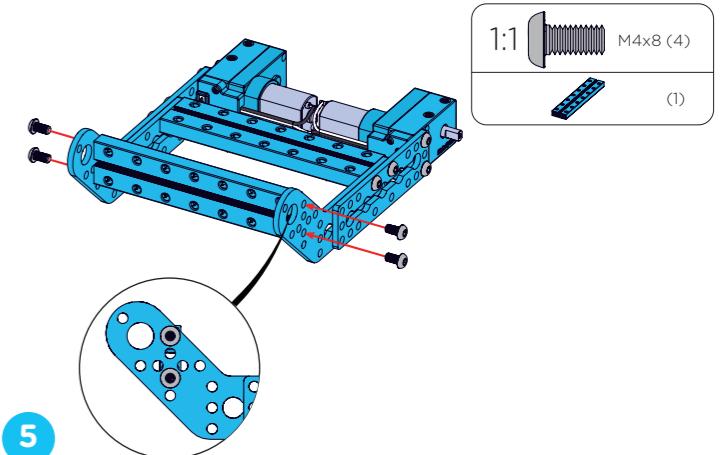
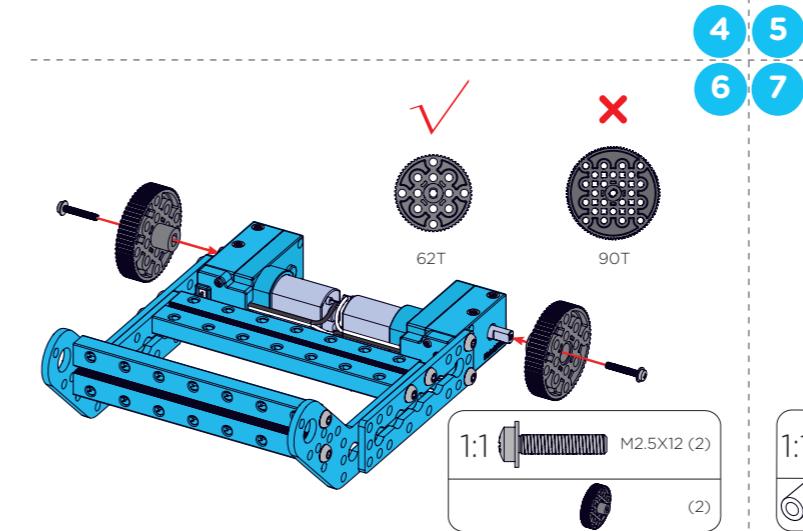
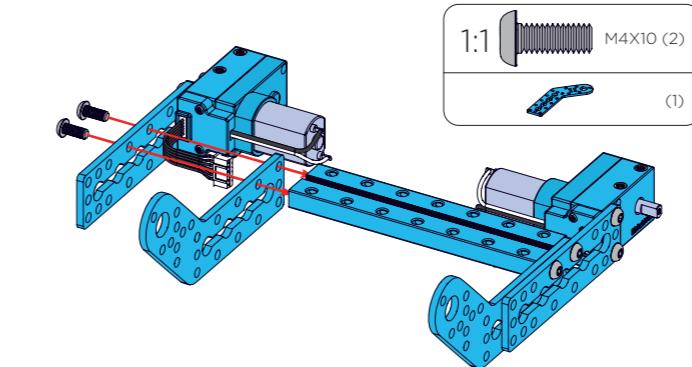
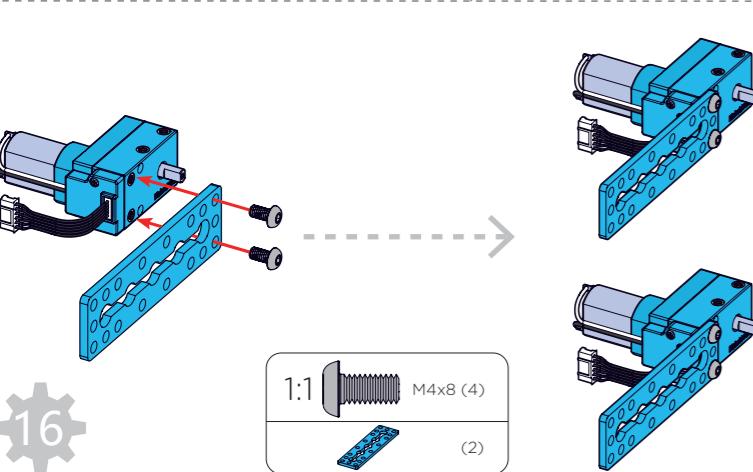
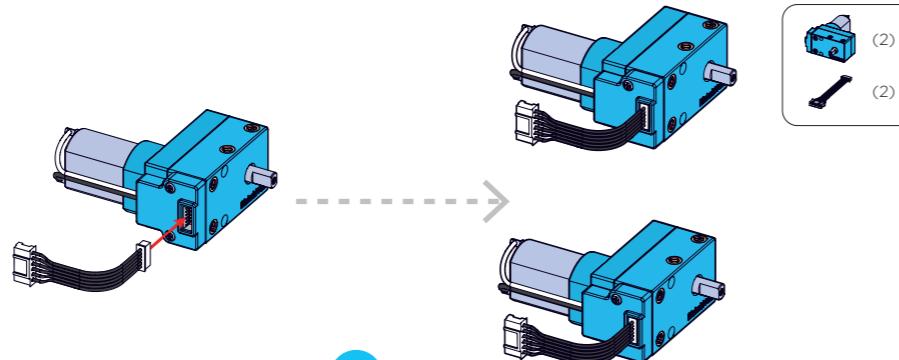
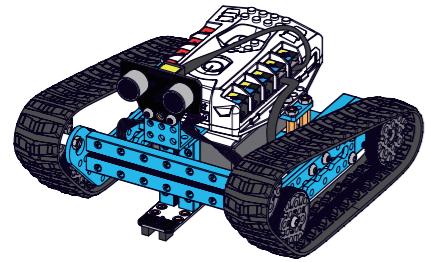
Product description

Land Raider is an all-terrain off-road tank robot which may realize climbing obstacle, obstacle avoidance, intelligent tracking and colorful light and let you feel the excitement of controlling tank to surmount obstacle. What is praiseworthy is that the app can be used to customize the way of playing robot and by simple drag of the graphical programming block, then you can use the self-contained sound sensor, gyroscope, line-follower sensor, light sensor, ultrasonic sensor, LED light and encoder motor and create your own way to play Land Raider!

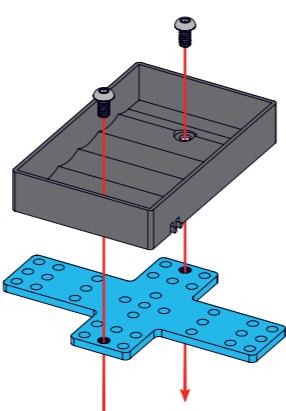
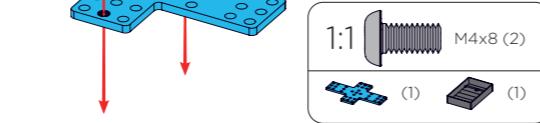
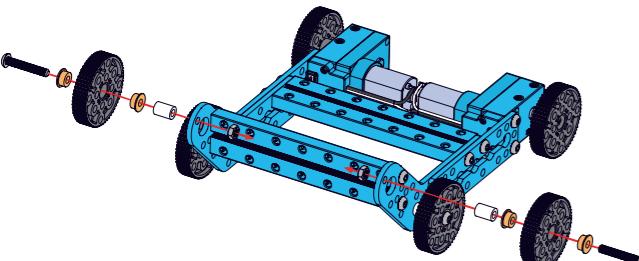
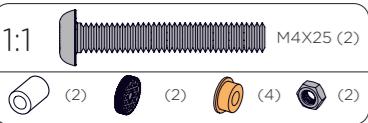
Product size



Assemble Land Raider

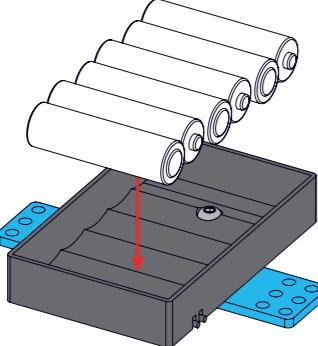
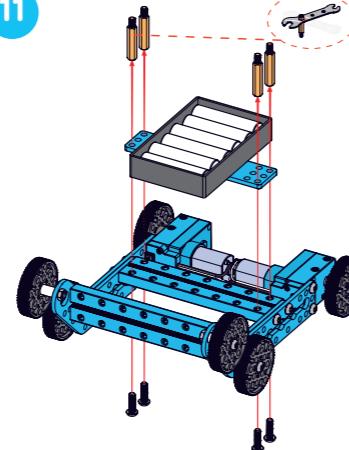
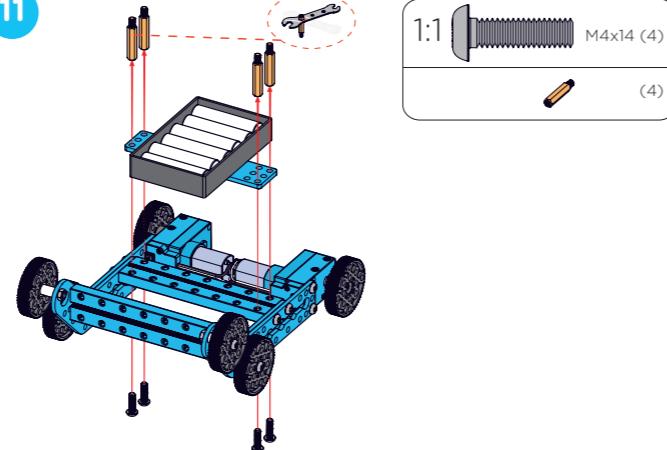


Note: please refer to the tool tips in page 5 and use wrench to tighten the nuts.

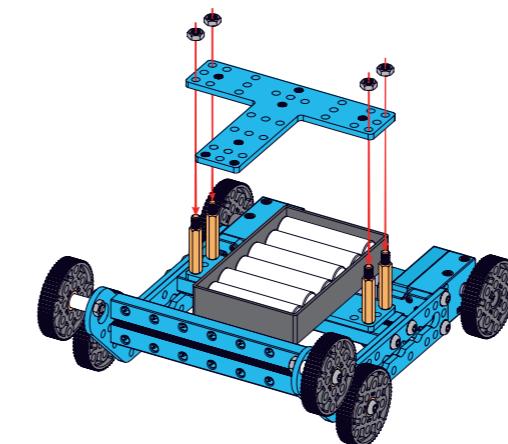
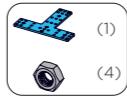


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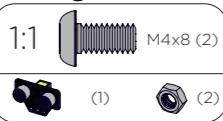
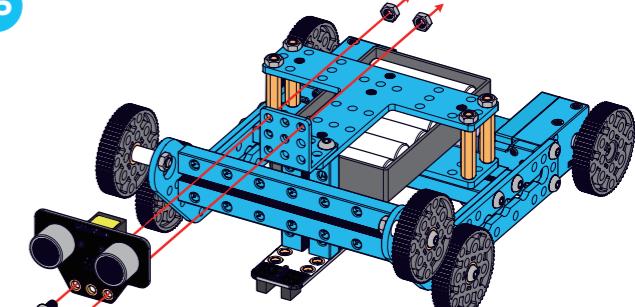
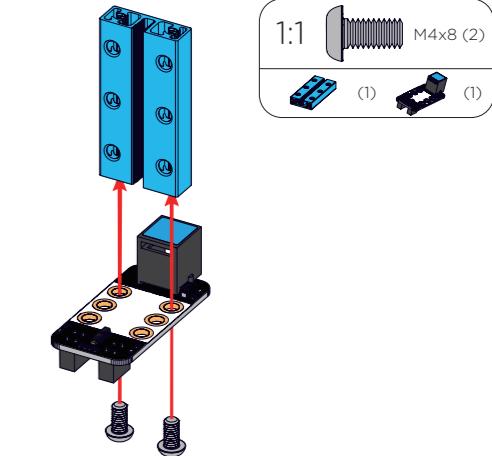
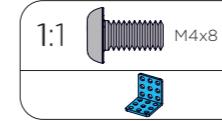
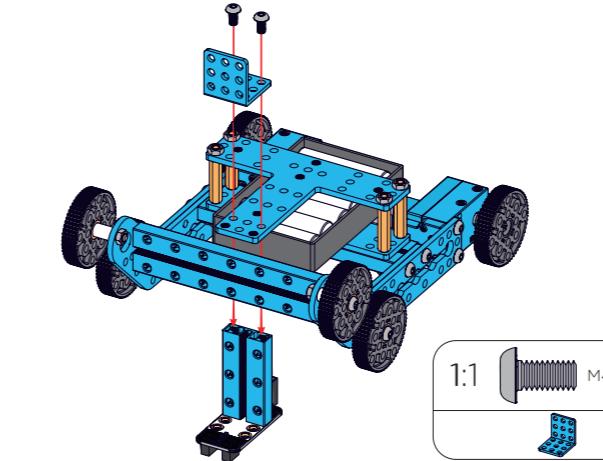


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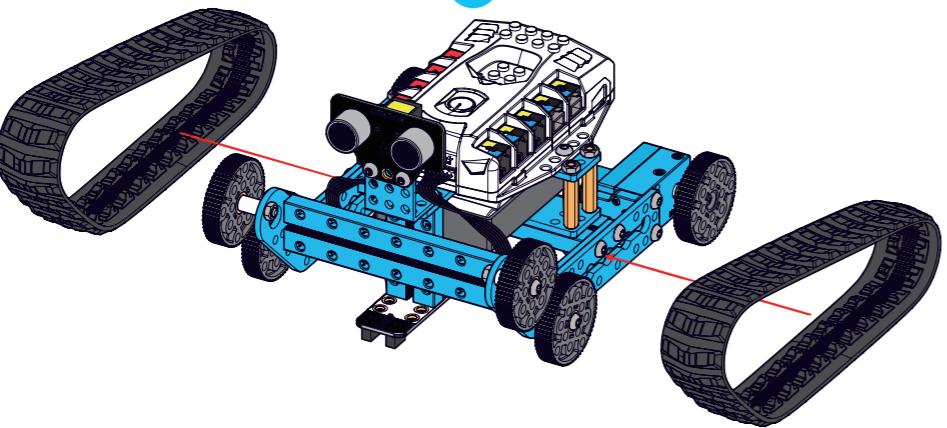
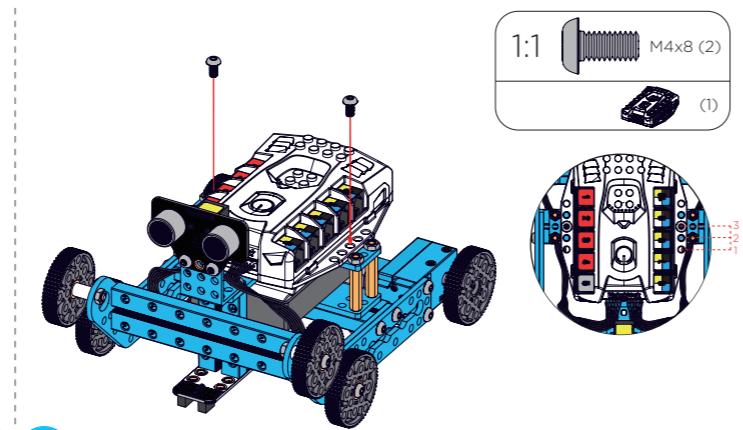
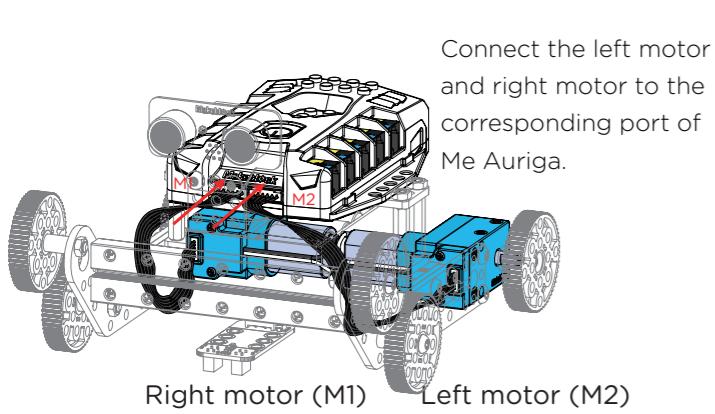


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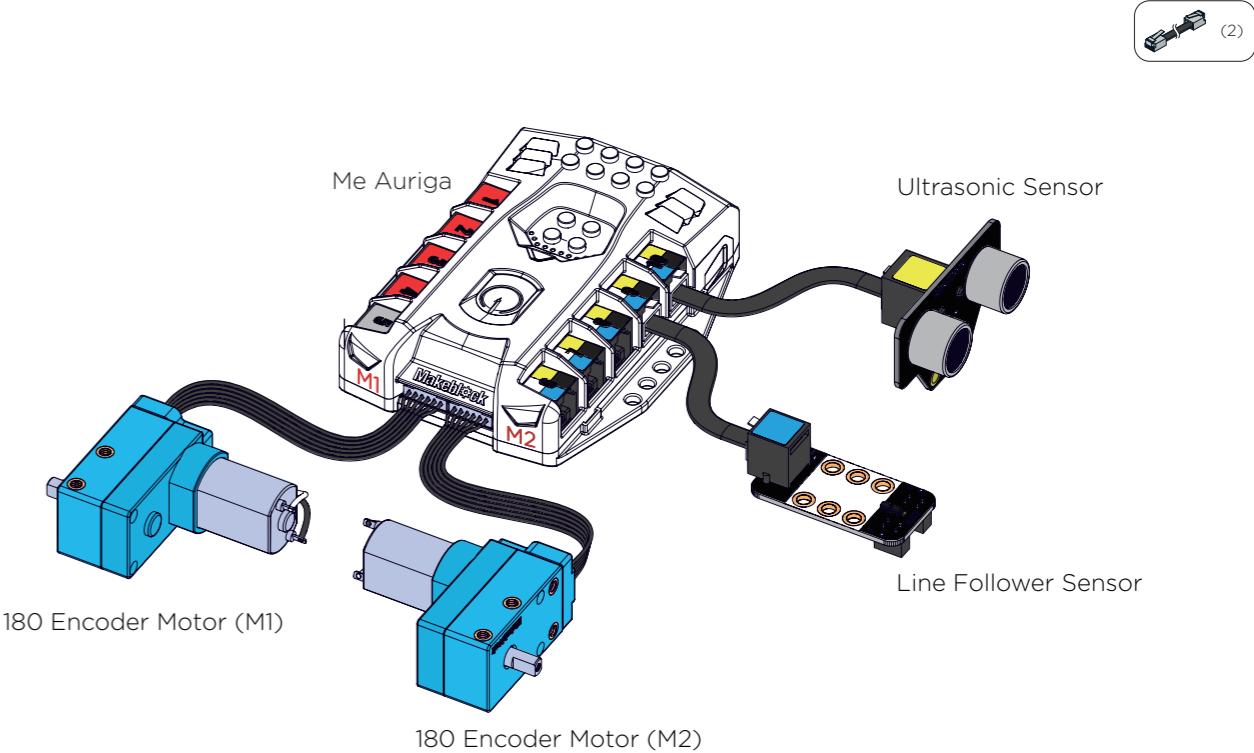
14 15



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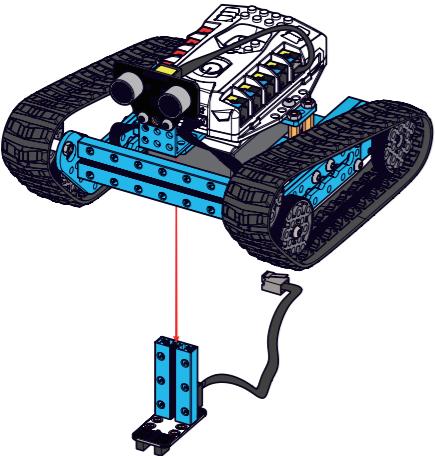
Wiring of Land Raider



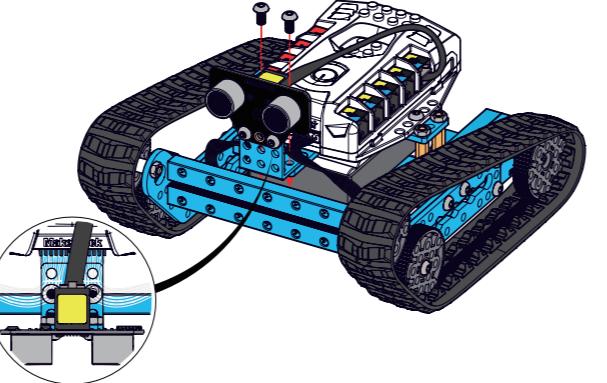
Please follow page 36 for controlling with App

Playing Tips

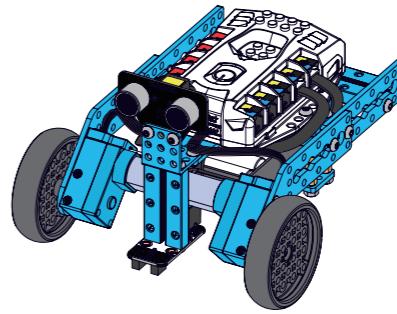
When you want to play Land Raider on rough terrain, please follow the instruction below to remove the line follower sensor. If not removed, may result in a malfunction or damage to the sensor.



1
2
3



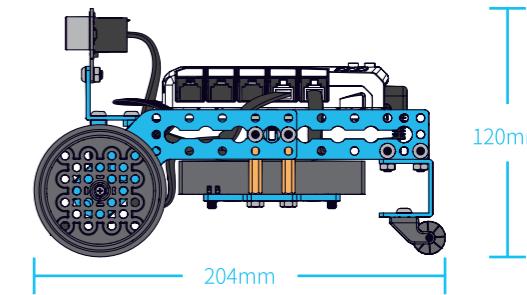
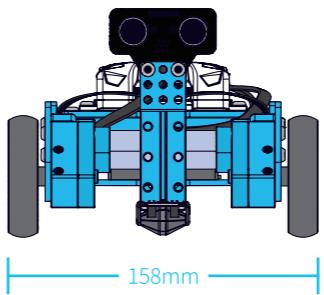
Dashing Raptor



Product description

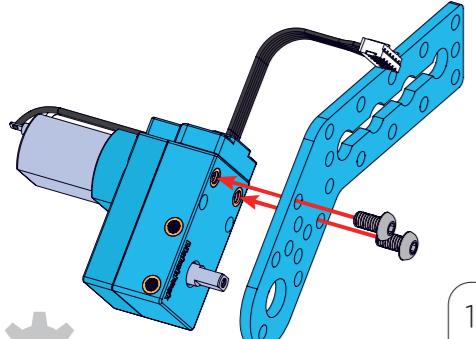
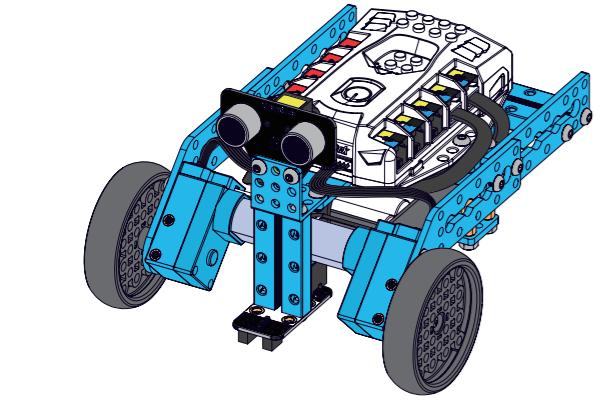
Dashing Raptor is a three-wheeled racing robot and you can use Makeblock App to control it to rapidly realize running rapidly, obstacle avoidance, intelligent tracking and colorful light effects and let you feel the excitement of controlling racing speed. What is praiseworthy is that the app can be used to customize the way of playing robot and by simple drag of the graphical programming block, then you can use the self-contained sound sensor, gyroscope, line-follower sensor, light sensor, ultrasonic sensor, LED light and encoder motor and create your own way to play Dashing Raptor!

Product size

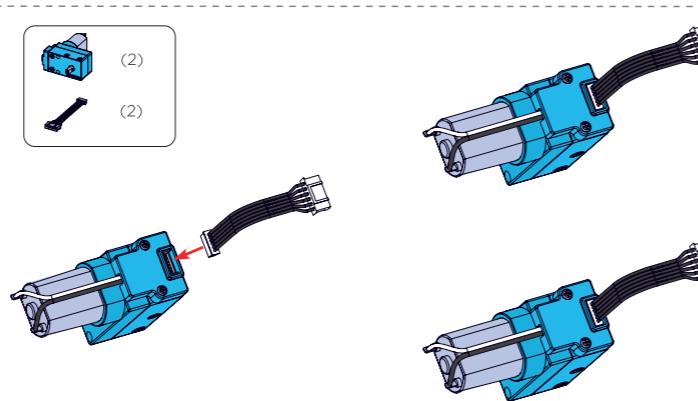


23

Assemble Dashing Raptor



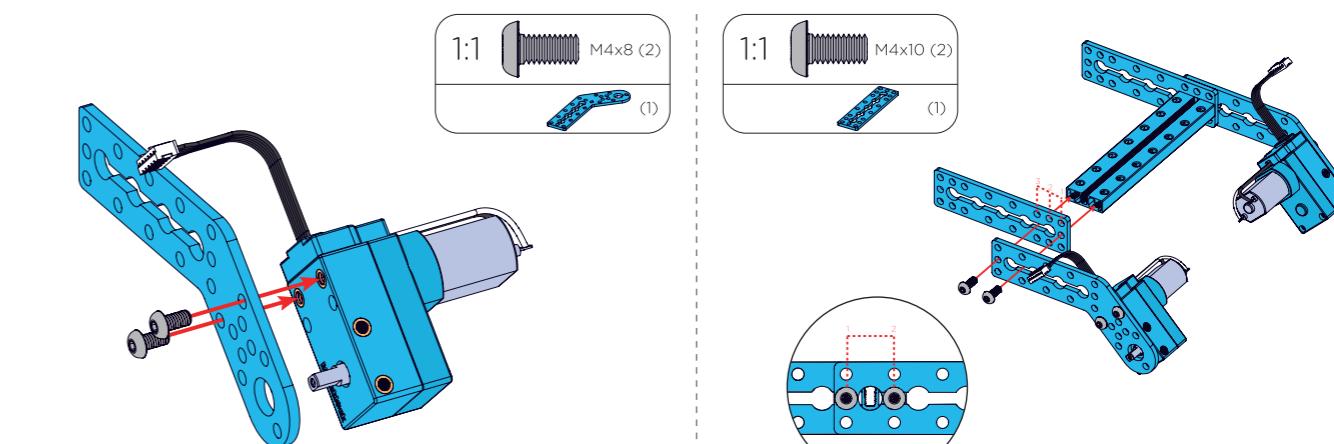
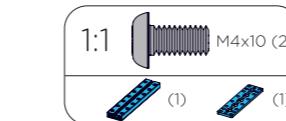
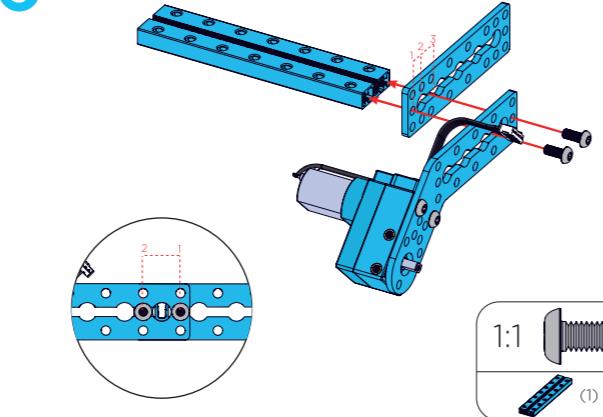
24



1

2

3

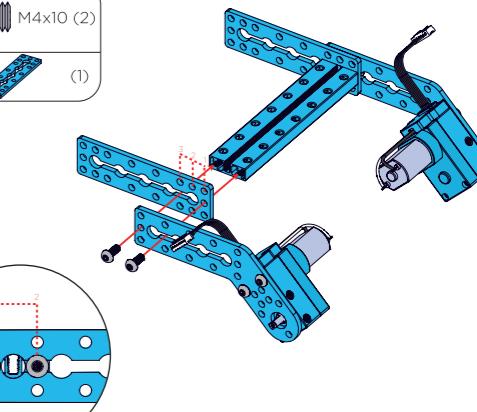
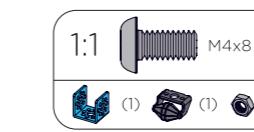
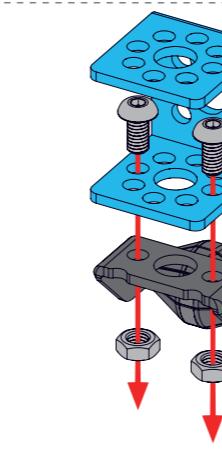


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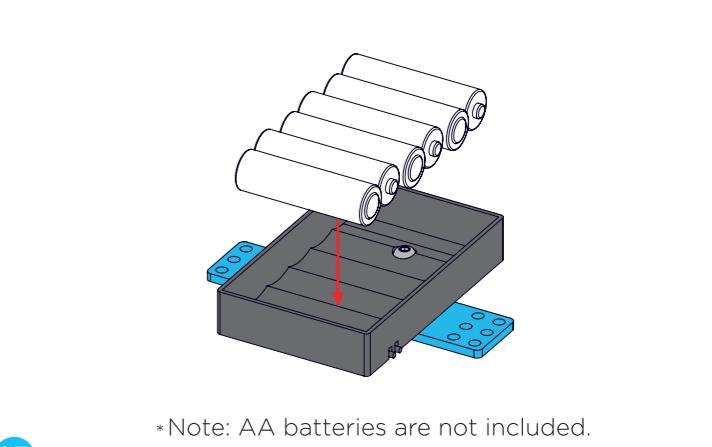
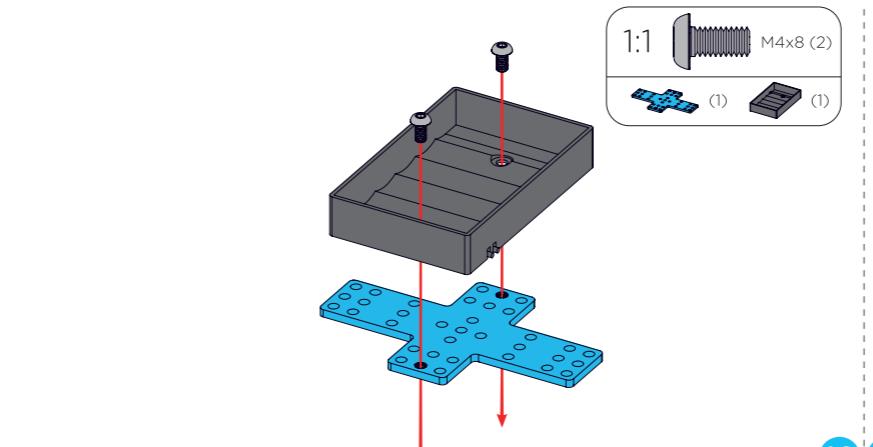
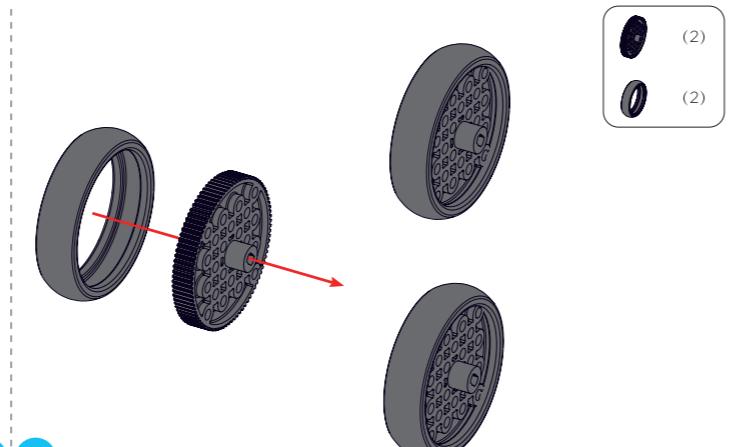
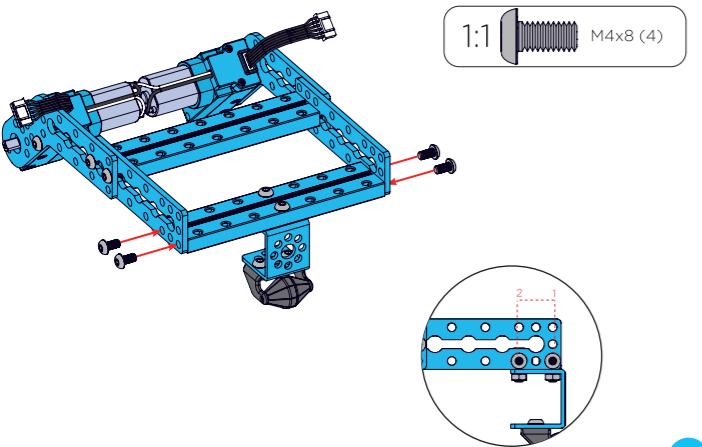
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6

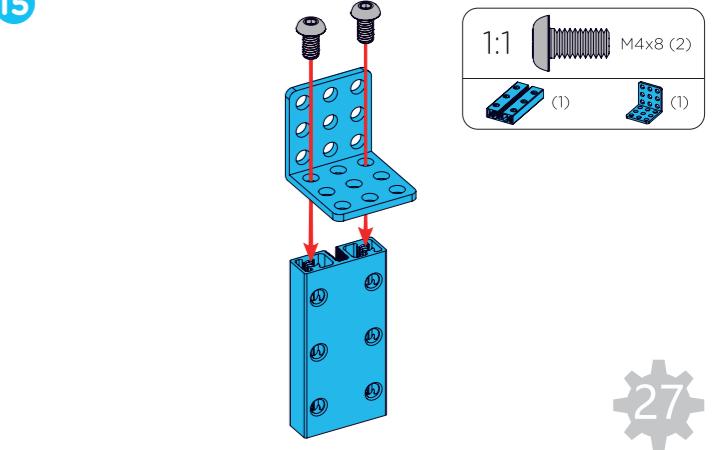
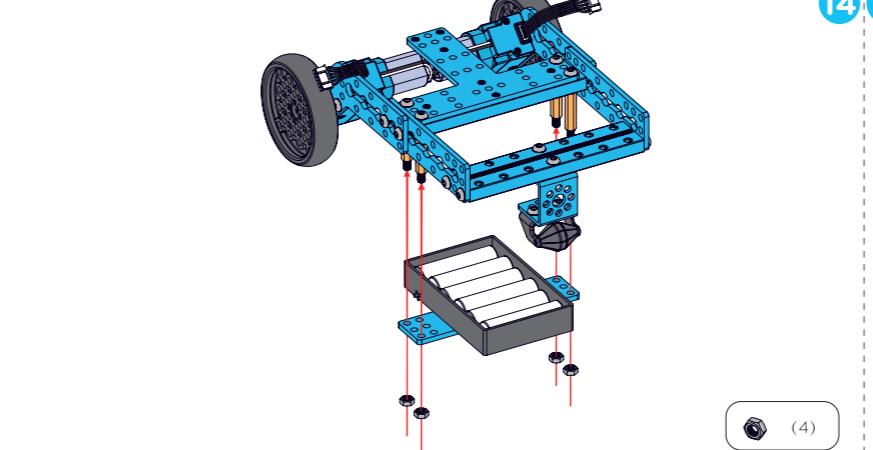
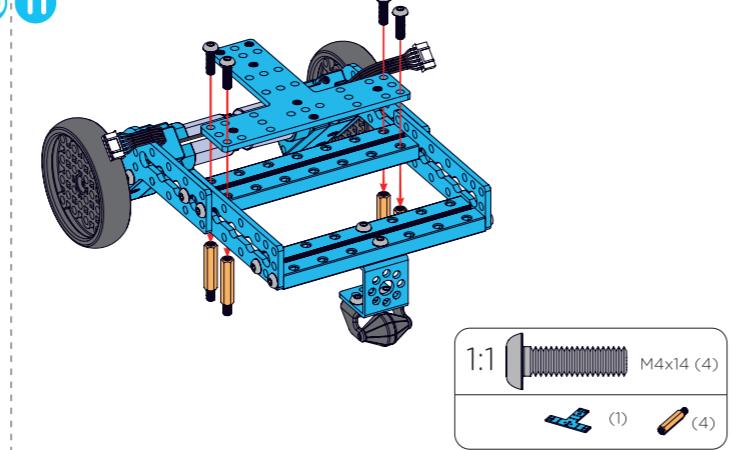
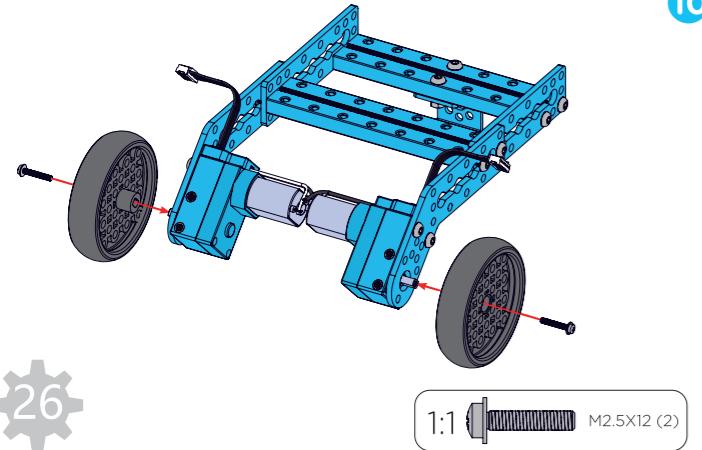
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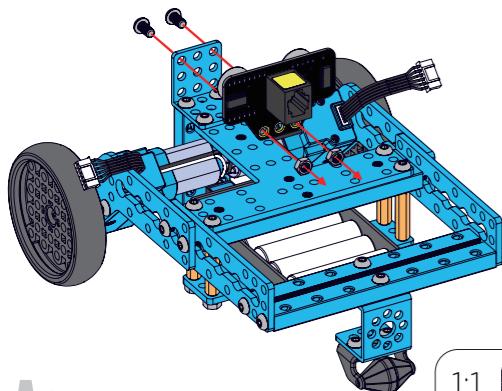
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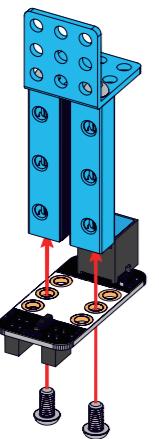
*Note: AA batteries are not included.



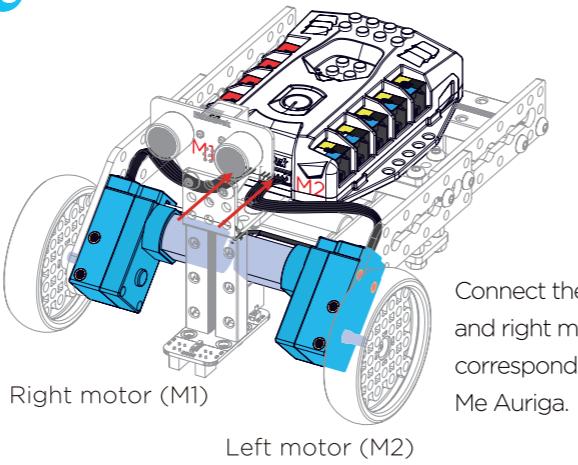
28



1:1
M4x8 (2)
(1)
(2)



1:1
M4x8 (2)
(1)



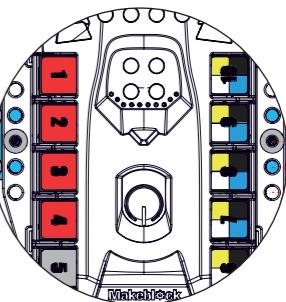
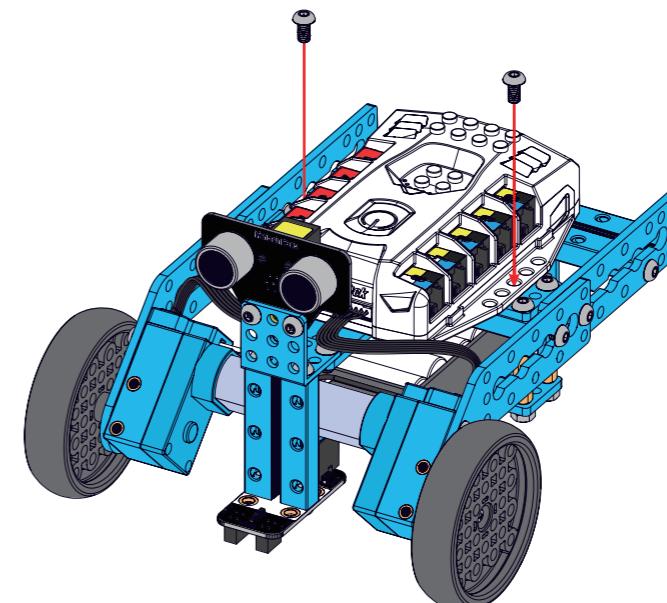
Right motor (M1)

Left motor (M2)

Connect the left motor and right motor to the corresponding port of Me Auriga.

16
17
18
19

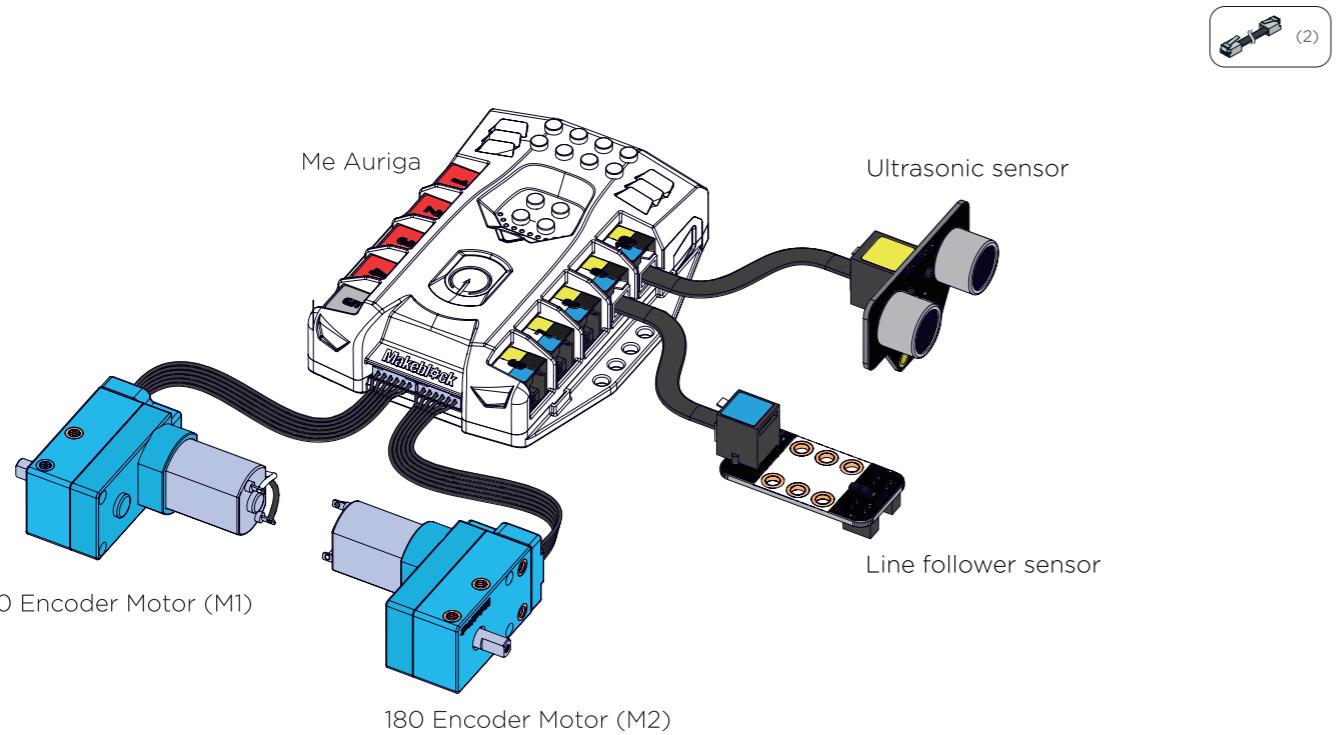
20



1:1
M4x8 (2)
(1)

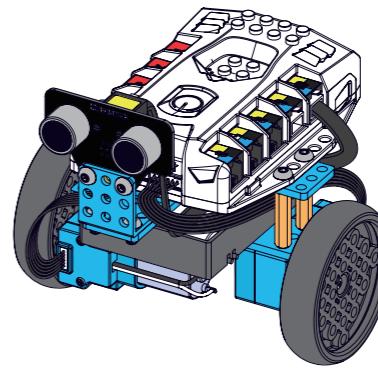
29

Wiring of Dashing Raptor



Please follow page 36 for controlling with App

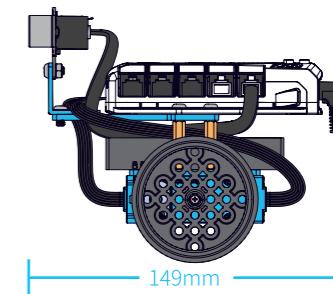
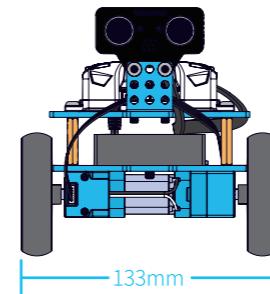
Nervous Bird



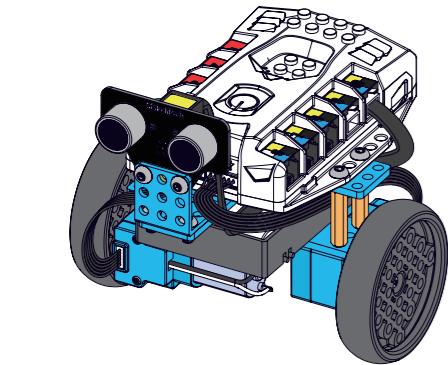
Product description

Nervous Bird is a two-wheeled self-balancing robot that can keep balance while moving. You can use Makeblock App to control this robot and feel the mysterious "self-balancing" technology. What is praiseworthy is that the app can be used to customize the way of playing robot and by simple drag of the graphical programming block, then you can use the self-contained sound sensor, line follower sensor, light sensor, ultrasonic sensor and create your own way to play Nervous Bird! Note: this robot only supports partial graphical programming blocks.

Product size



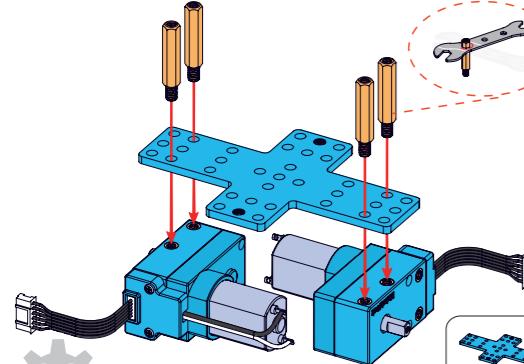
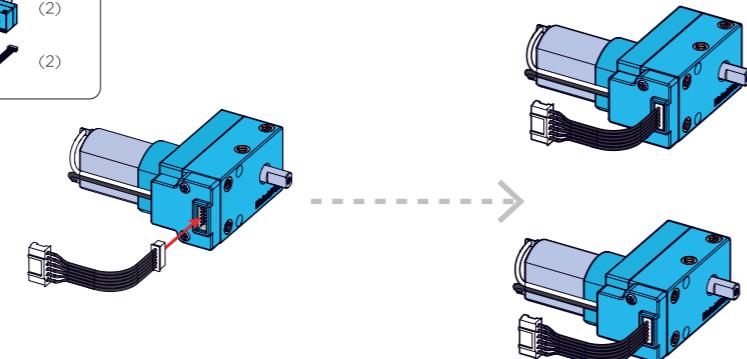
Assemble Nervous Bird



1:1
M2.5x12 (2)

(2)

(2)

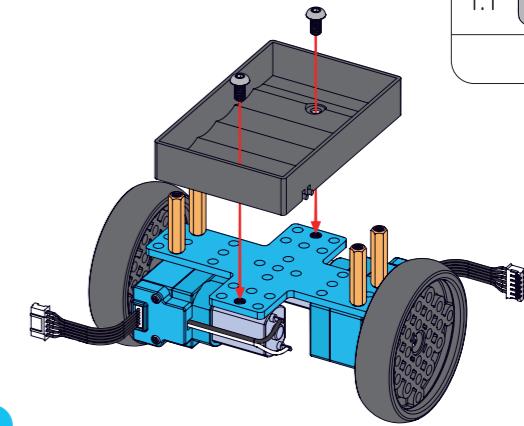
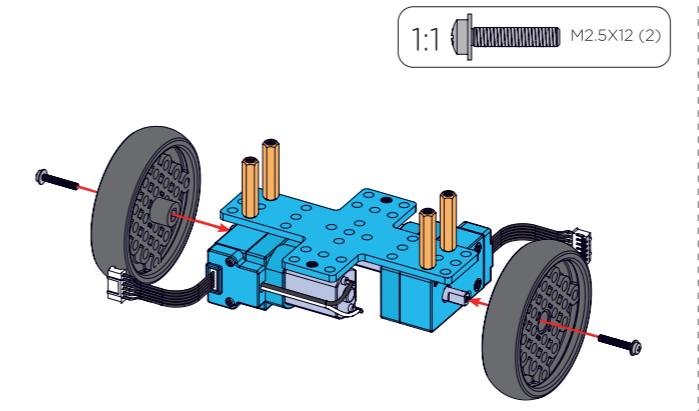


(1)

(4)

(2)

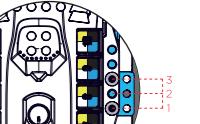
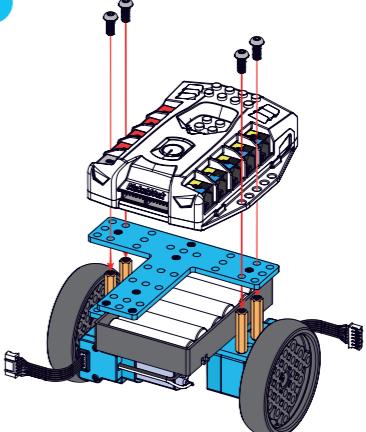
(2)



1:1
M4x8 (2)

(1)

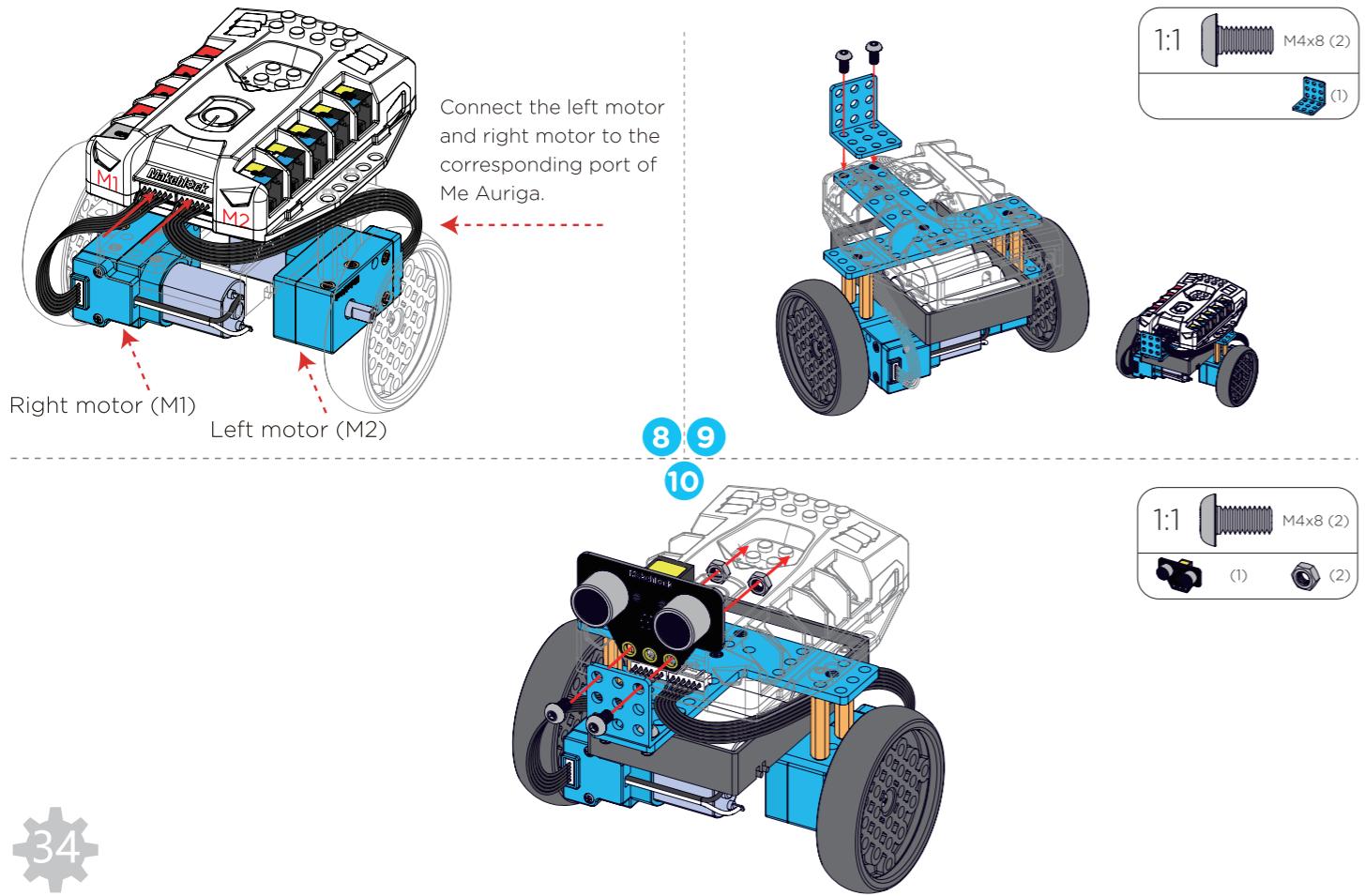
(1)



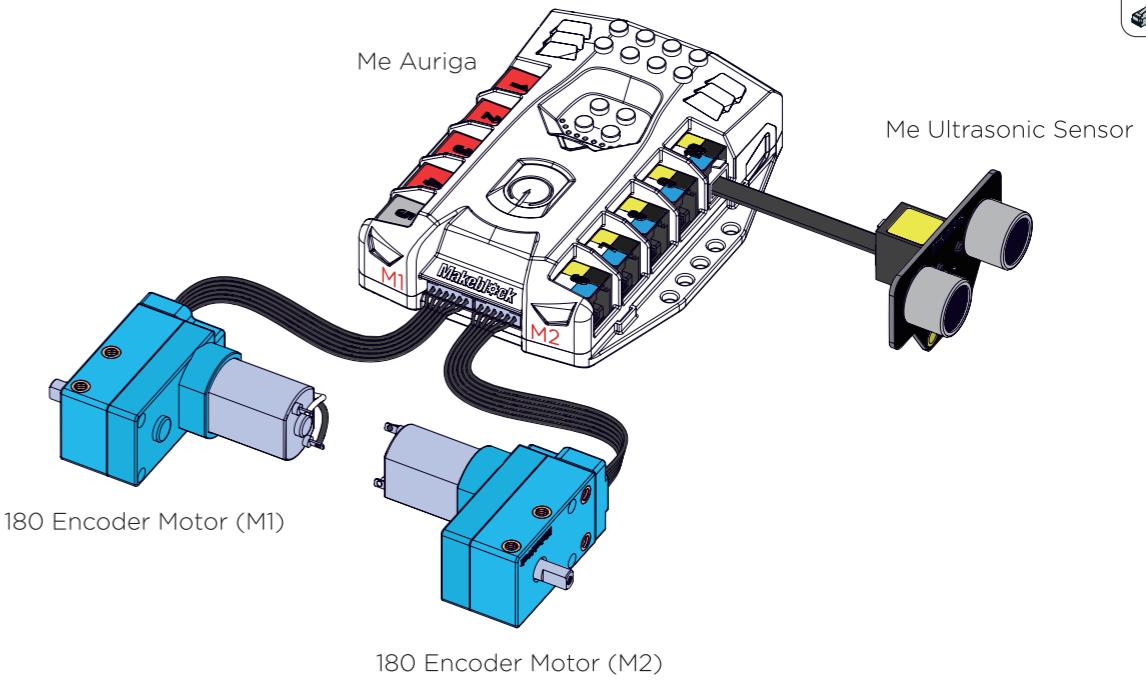
1:1
M4x8 (4)

(1)

(1)



Wiring of Nervous Bird



Please follow page 36 for controlling with App

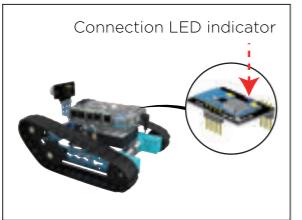
Control with App

1. App Download. Method 1: visit <http://d.makeblock.com>; Method 2: search "Makeblock" on the App Store or Google play.



<http://d.makeblock.com>

2. Bluetooth Connection. Make sure your robot is turned on. Open up your device's Bluetooth menu and choose the Robot ID. When the connection LED indicator on the robot's Bluetooth chip stops flashing, it means the robot has successfully paired with your device.



3. Play and learn. To get to know how to use the Makeblock App with mBot Ranger, please visit:
<http://learn.makeblock.com/en/ranger/>

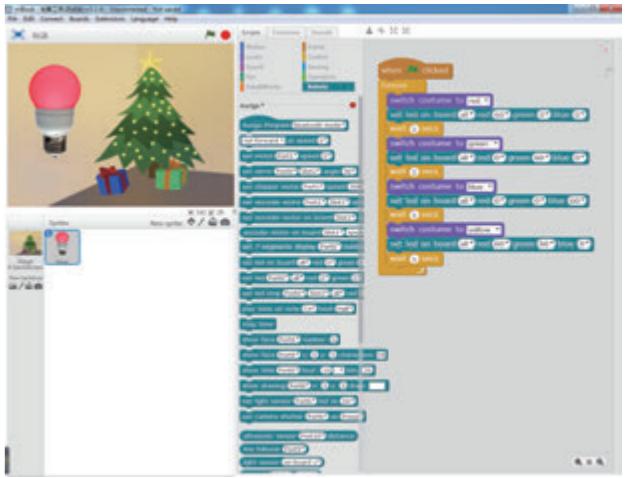
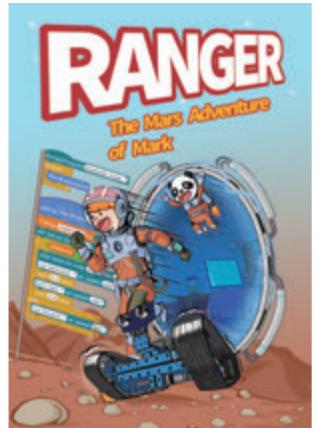
Further Learning - Graphical Programming

Introduction to mBlock

mBlock is an easy-to-use graphical programming environment based on Scratch 2.0 Open Source Code. It provides a quick way for you to program Arduino projects and create interesting interactions. mBlock is the ideal software to learn programming, control the robot, and realize multiple functions from the robot.

Know More: <http://www.mblock.cc/>

Required System: Windows/Mac



mBlock Online Courses for Ranger Robot Kit

Thanks to the cooperation of Scratch teachers, we are developing sixteen chapters about learning graphical programming with Ranger. This course will guide you to program Ranger in lots of interesting scenes.

Online Courses:

<http://learn.makeblock.com/ranger-online-course/>

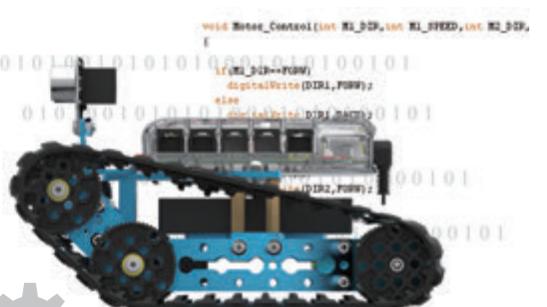
Advanced Learning - Arduino Programming (C Language)

Introduction to Arduino

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. The Arduino software consists of a development environment (IDE) and the core libraries. The IDE is written in Java and based on the processing development environment.

Know More: <https://www.arduino.cc>

Required System: Windows/Mac/Linux



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Online Tutorials

This online tutorial is great for beginners who want to learn the basics of writing code while having fun playing with Ranger.

Online Tutorials:

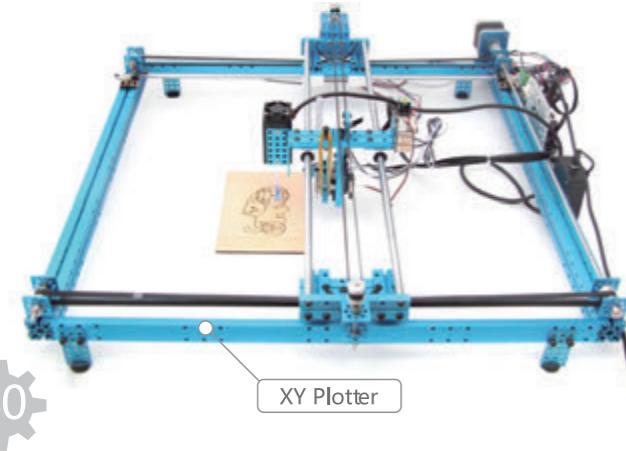
<http://learn.makeblock.com/ranger-arduino-programming/>

Further Exploration - Electronic Modules on Makeblock Platform

A photograph of a Makeblock Ultrasonic Sensor module, which is a small black rectangular board with two yellow pins on top.	<p>Ultrasonic Sensor measures distances from 3cm to 4m.</p> A diagram showing a grey vertical line representing a wall. A curved arrow originates from behind the wall and points towards the sensor, representing an ultrasound wave being emitted and reflected back to the sensor.	A photograph of a Makeblock Me Sound Sensor module, which is a small black rectangular board with a black cylindrical microphone on top.	<p>Me Sound Sensor measures volume. It could be used in a project that uses a voice operated switch.</p> A blue speaker icon with a grey waveform line passing through it, representing sound amplitude.
A photograph of a Makeblock Me 7-segment Serial Display module, which is a black rectangular board with four red 7-segment displays and several yellow pins.	<p>Me 7-segment Serial Display allows information such as time, speed or scores to be displayed.</p> A diagram of a 7-segment display with the numbers "16.0" in red segments. The display is mounted on a black base with yellow pins.	A photograph of a Makeblock Me RGB LED module, which is a small black rectangular board with three yellow circular RGB LEDs.	<p>Me RGB LED contains 4 programmable lights which can display lots of different colors.</p>  A diagram showing four overlapping circles in red, green, blue, and yellow, representing the color palette of the RGB LED.
A photograph of a Makeblock Me Joystick module, which is a black rectangular board with a black joystick and several yellow pins.	<p>Me Joystick can control the movement of a robot or a part of a robot.</p> A diagram of a joystick with four blue arrows pointing outwards from its top, representing directional control.	A photograph of a Makeblock Me Temperature Sensor module, which is a black cylindrical probe with a black protective套管.	<p>Me Temperature Sensor Module measures temperature, ranging from -55C to 125C.</p> A diagram of a thermometer with a red liquid column. To its left is a sun icon and to its right is a snowflake icon, representing temperature extremes.
A photograph of a Makeblock Me Passive IR Detector module, which is a black rectangular board with a black sensor and several yellow pins.	<p>Me Passive IR Detector Module detects infrared signals from humans or animals within 6 meters.</p> A diagram of a blue person icon with a wavy blue line extending from its head, representing an infrared detection range.	<p>See more on Makeblock platform</p> <p>http://www.makeblock.com</p>	

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Further Exploration - More Kits on Makeblock Platform



XY Plotter



Ultimate 2.0



mGiraffe 3D Printer Kit

Troubleshooting

Q1: How do I turn the robot on?

Press the red button on the top of the mainboard to turn the robot on.

Q2: How do I turn the robot off?

Press and hold the red button on the top of the main board for 3-8 seconds.

Q3: I've turned the robot on but it still doesn't work. Why not?

- a)The batteries are dead. Try changing or charge them.
- b)The wires are faulty. Try replacing them.

Q4: The robot turns left when I drive right and vice-versa.

Switch the motor wires over (from M1 to M2 and vice-versa).

Q5: There are noises after I get the Land Raider running.

- a)Check if the driven wheels are correctly installed.
- b)Grease the bearings of the driven wheel

Q6: The self-balance car doesn't work

- a)Try changing or charge the batteries.
- b)Check that the robot has been correctly assembled, especially the wheels.
- c)Learn how to use the Makeblock App with the self-balance car at <http://learn.makeblock.com/en/ranger/>

Q7: I can't connect the App to my robot via Bluetooth.

- a)Check <http://learn.makeblock.com> to find out compatibility for your device.
- b)Try restarting the App and the main control board.

Q8. I want to know whether the mainboard is powered by USB 5V power or 6-12V power.

There is a 5V LED indicator and a 6-12V LED indicator on the main board. Please refer to page 6 of this manual.

Q9: Why do the M4 nuts keep coming loose?

The M4 nuts will come loose if you run the robot for a long time. Please use a wrench with a screwdriver to tighten the nuts.

Q10: Why can't I read the values of the ultrasonic sensor and the line follower sensor?

Check that the sensors are correctly connected to the appropriate ports.

Q11: Why does the light sensor show a high value in a dark area?

Check that the RGB LED is not interfering with the reading.

Q12: Why is the line follower sensor unable to detect a black line?

- a) Sunlight is affecting the readings of the sensor.
- b) The sensor is sensing outside of its optimum range of 1-2cm.

Q13: Why do the RGB LEDs randomly flash when I restart the robot?

The chip in the RGB LED has memory function. Please restart your robot after 10 seconds.

Q14: How do I use the Ranger test pad?

Please refer to online tutorials at <http://learn.makeblock.com/en/ranger/>

Q15: How do I know when it's time to replace the batteries?

Land Raider & Dashing Raptor - If the robot moves very slowly, automatically restarts while turning, bumps into things or doesn't move at all despite the motor speed being set to full power, the batteries are low.

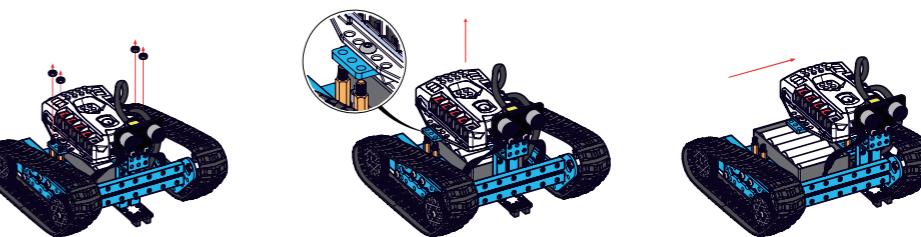
Nervous Bird - If the robot easily loses its balance while moving or turning, the batteries are low.

Q16: How to replace all batteries?

Method 1: use screw M3*8 and M3 nuts to change conveniently. Video tutorials: <https://youtu.be/X8SJz6PCh4I>.

Method 2: Remove the main board by following below illustrations.

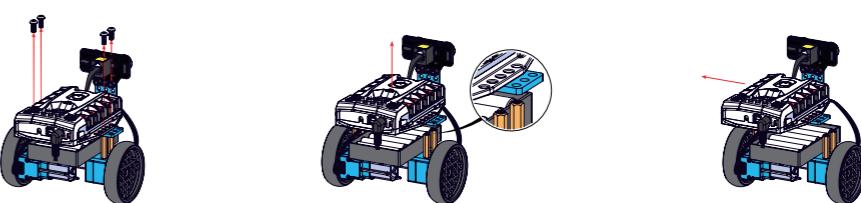
1. Land Raider.



2. Dashing Raptor.



3. Nervous Bird.



Warning:

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help. "This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body."

FCC ID: 2AH9Q-RANGER

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.