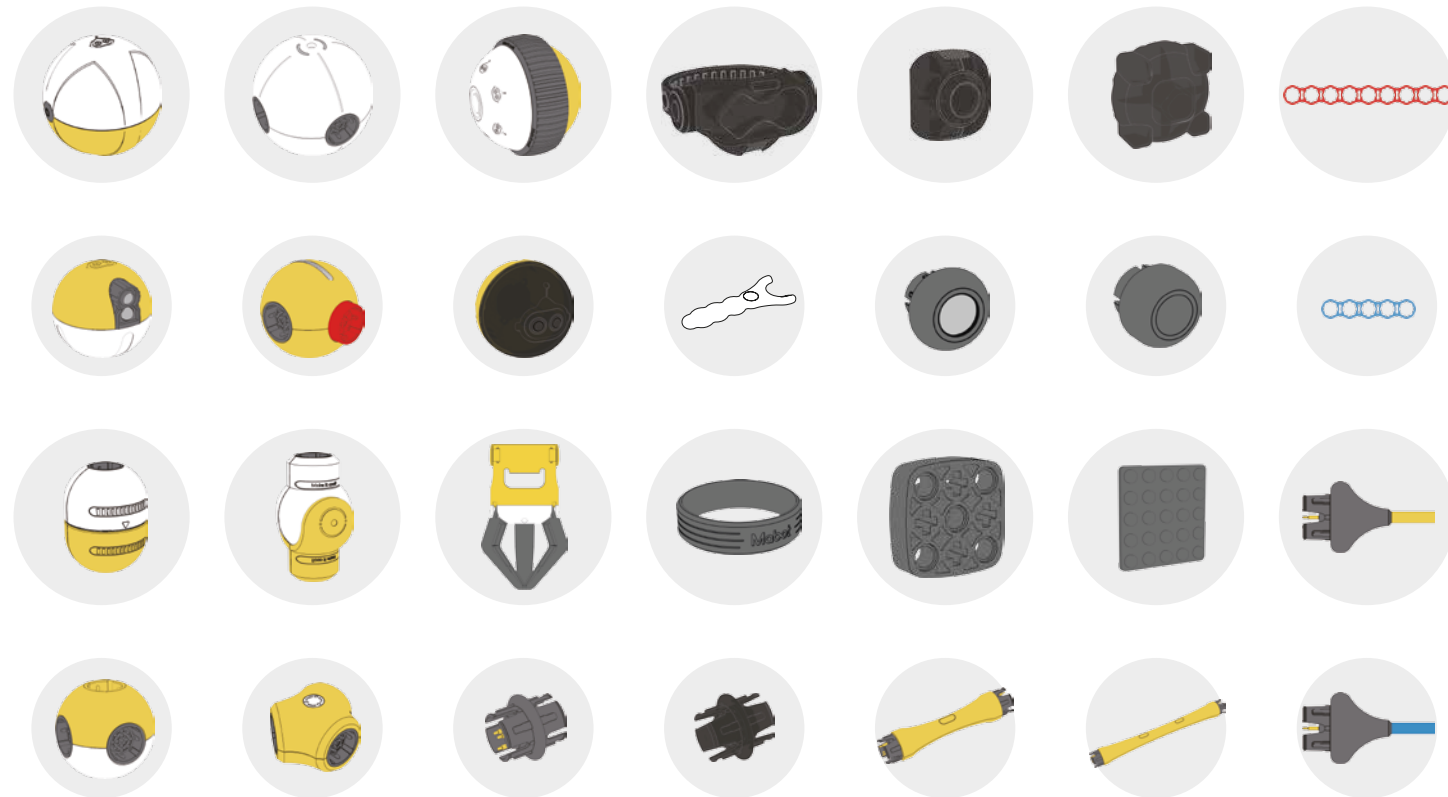


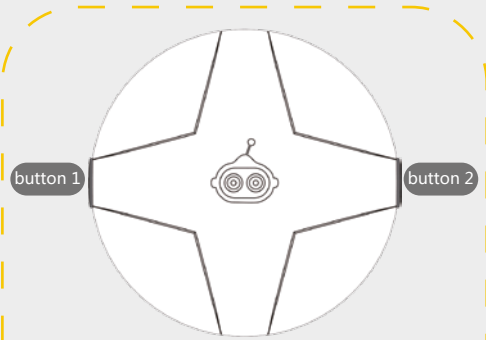
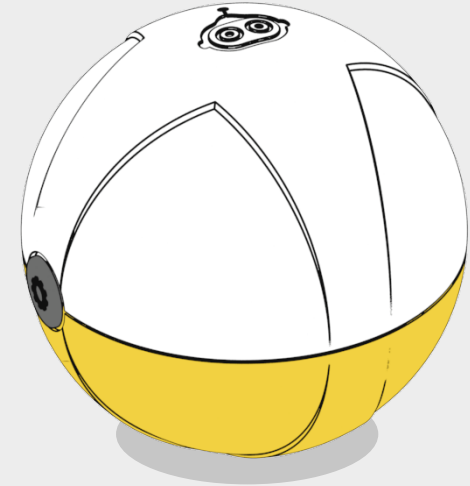
Mabot Encyclopedia

Welcome to the world of Mabot !

Warning: "This product contains a small ball which may present a choking hazard.
Not suitable for children under 3 years."



This specification covers the functions of all modules of the Mabot robot products,
not the list of packages that consumers buy.



Operating Instruction :
There are two buttons on the control ball; button 1 and button 2 share the same function: they can both start or stop Mabot GO or other built-in programs from the Mabot IDE coding card. ;

1

Control Ball

The operating hub of Mabot for controlling performance of other electronic components.

- It has modules for Bluetooth connection and a three-bracket gyroscope;
- The Micro-USB port is for firmware upgrades only;
- It can display the status of the device;
- It can display different color lights;
- Each control ball has only one port.

Working Status :

- To start the system: Lampshade flashes once to show that it has entered breathing mode (transform from a bright state to a dark state), simultaneously chiming the tones for 'Do Mi' from the buzzer;
- When the bluetooth is connected successfully: the lampshade flashes twice, chiming "Do Re Me" from the buzzer;
- Downloading official programs: After successfully downloading, the lampshade will flash green three times, playing a 'Do Mi' progression from the buzzer; if downloading fails, the lampshade will flash red three times;
- Ready for self-balancing: the lampshade will flash blue three times playing 'Ti Ti' from the buzzer.

Light instructions:

- The white shade of the control ball is the lampshade. The default color of the lampshade is white and and it can indicate 8 different colors: Red Orange Yellow Green Cyan Blue Purple White
- Light activity: on, gradual pulse, flashing, and off.

Drive Ball

The module that can move on flat surfaces.

- It can display different color light;
- It can rotate clockwise and counter-clockwise;
- Each drive ball has one connector.

Indicator light instruction:

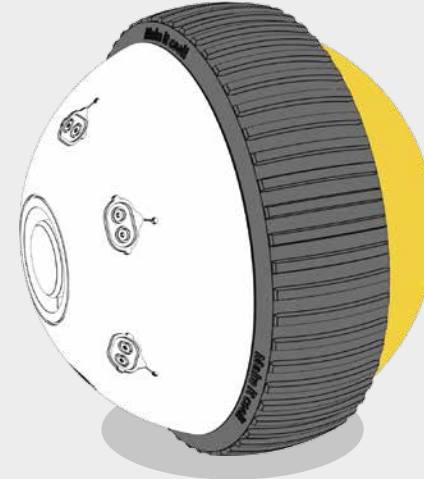
- The white cover of the drive ball is the lampshade. The default color of the lampshade is white and and it can indicate eight colors: Red Orange Yellow Green Cyan Blue Purple White
- Light modes: on, gradual pulsing, flashing, and off.

Operation parameters:

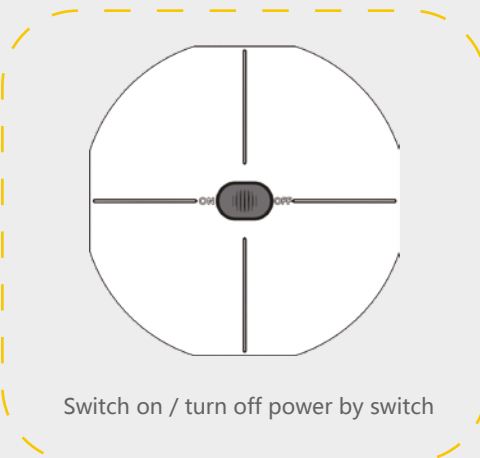
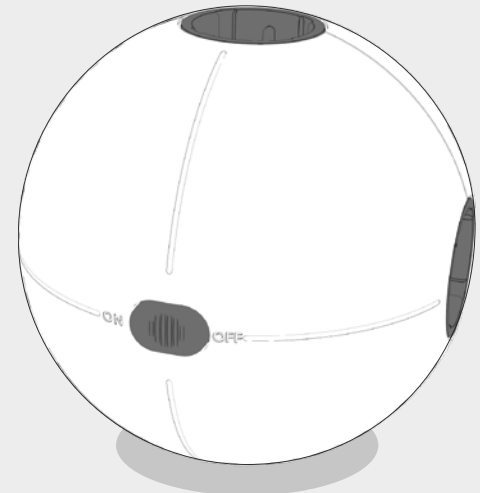
- Load-free rotate speed: 255rpm;
- Stalling torque: 1.2kg.cm;
- Load limit: 0.9 kg.

Attention:

- When the drive ball is loaded over its weight limit, it may lead to abnormal rotation. Unloading is needed for proper functioning or the ball will be damaged.
- No foreign matter should be placed between two balls to impede rotation.



2



Switch on / turn off power by switch

Battery Ball

The power supply module of Mabot.

- The micro-USB supports a device charging function;
- Battery indicator lights on both sides of the charging port;
- Every battery ball has four ports, on each side of the ball.

Battery parameters:

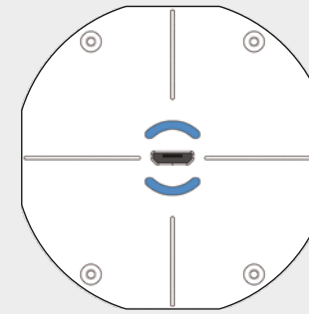
- Typical capacity: 640mAh;
- Standard voltage: 7.4V;
- Recommended charge temperature: room temperature

Instruction to the switch:

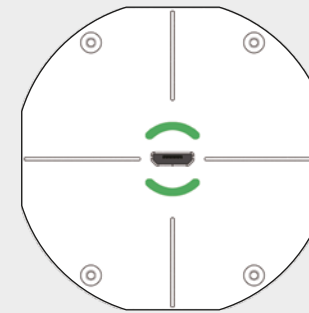
- When the Mabot is off, press and hold the power-on button for 2 second to boot up; the indicator light of the battery ball will turn on;
- When the Mabot is on, press and hold the button for 3 seconds to shut it down; the indicator light of the battery ball will turn off.

Instructions for the indicator lights of the battery ball:

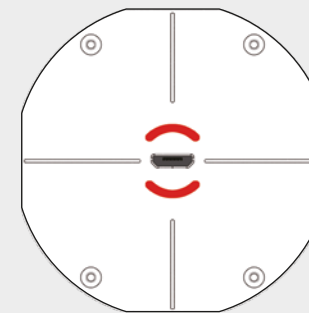
- When the light is green, it means that the battery ball is near full charge;
- When a red indicator light appears, it means that the battery is low;
- When the battery ball is low on power, certain modules of the Mabot may become unresponsive;
- The battery ball will show a blue light while charging. A green light means it is fully charged.



Charging



High power



Low power

Charge and general instructions:

- Service time — the more power-hungry devices connected to a single battery ball (such as rotate joint ball, swing joint ball, drive ball), the shorter amount of time it will operate.
(e.g. When the Mabot starter robot runs continuously at its highest rate with the control ball and drive ball lights on, the battery ball can continue working for around 50 minutes.)
- Charging time—It usually takes two hours to fully charge. The time spent varies based on power adapter standards (5V and 1A power adapters are recommended).

Attention:

- **Never use a damaged battery ball;**
- **Never insert any sharp metal into the connectors, as it may cause short circuiting or permanent damage;**
- **Keep the battery ball off when not in use. Please charge and check the battery ball every fourth months to keep in working condition.**
- **Please use under adult supervision. Remove the charger immediately after charging has completed.**
- **The battery ball can be turned on while charging. Shutting the device down before charging is suggested for extended times.**



Color Mode



Reflective light mode



Environmental light mode

Color Sensor

It can detect the color and intensity of light.

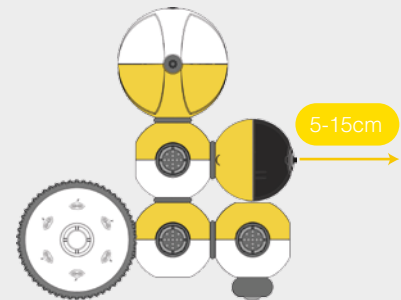
- Colors options:
Red
Orange
Yellow
Green
Blue
Purple
White
Black
- Levels of light: 0 (extremely dark) to 100 (extremely bright);
- Detection angle: the lamp head is perpendicular to the object
- Detection distance: 1 cm;
- Each color sensing ball has one port.

Mode instructions: Three status of color sensing ball:

- Color mode: When lamp base is white, it catches the color detected by the color sensing ball sensor.
- Reflected light intensity mode: When lamp base turns red ,it measures reflected light' s intensity from the objects exposed to it;
- Environmental light intensity mode: When lamp base turns off, it can measure the light intensity of environmental light through the sensor.
- When in color mode or reflected light intensity mode, make sure the color sensing ball is at a right angle and is not touching the surface of the object being detected (e.g.: a line-tracking robot from the package).

Attention:

- Please do not smear or paste things onto the lamp or it will compromise the detector' s sensitivity.
- Mirror and dark colored objects will compromise the detector' s normal status.
- The parameters above are for reference only. Do not stare at the lamp for extended periods.



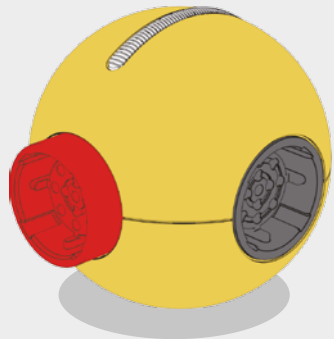
Infrared Sensor

It can detect if there is any obstacle ahead.

- Angle of detection: The lamp head and object are perpendicular.
- It can measure distances using infrared light, measuring between 5~15cm (the parameter is based in the test results done on a white A4 piece of paper);
- Each infrared sensing ball has one input.

Attention:

- Please do not smear or paste things onto the black cover or it will compromise the detector' s sensitivity.
- Mirror and dark colored objects will compromise the detector' s ability to operate.
- The parameters are for reference only.



Touch Sensor

It can check whether the red button of the touch sensing ball is under pressure.

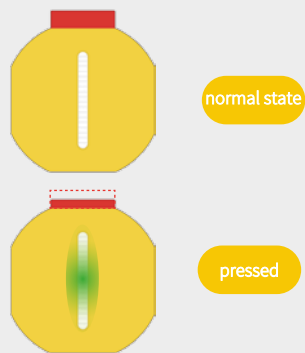
- It can detect if the red button of the touch sensing ball is under pressure.
- The indicator light is above the touch button;
- The touch button does not transmit signals or electrical current.
- Every color sensing ball has four ports, on each side of the ball.

Instructions:

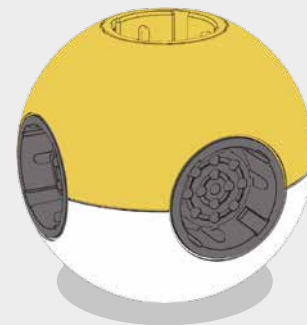
- When the button is pressed past 2.2mm, the light will flash green.
- Pressure on the button should not be more than 1kg.

Attention:

Manually damaging or pulling the button by force is strictly prohibited.



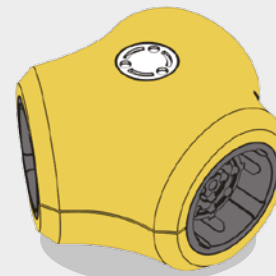
The light is green and flickering when the displacement is 2.2mm from the initial position.



6-Port Connection Ball

6-port connection ball is used to connect other balls, to secure the structure, to connect electrical currents, and to transmit signals.

- Every 6-port connection ball has 6 connections, each at a 90° angle.



3-Port Connection Ball

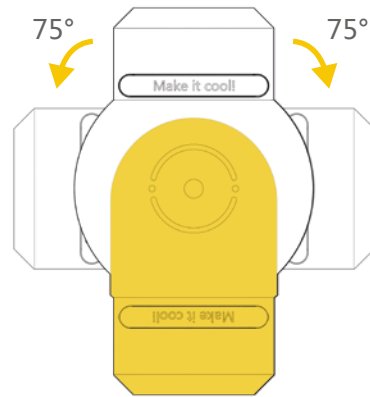
3-port connection ball is used for connecting other module balls, to secure the structure, to connect electrical current, and to transmit signals.

- Every 3-port connection ball has 3 connectors, each at a 120° angle.

Swinging Joint

This module can swing objects to left and right.

- Can swing approximately 75°;
- Load torque: 0.55 kg/cm;
- Load limit: 0.32kg;
- Each swing joint ball has two connections.



Attention:

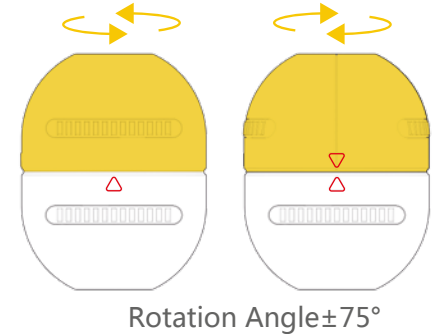
- Don't break off the module with hands when it is energized, or it will damage the module. the loaded object is restricted by weight. If the loaded object cannot rotate normally, the object should be taken down immediately, or it might be damaged. No foreign matter obstructs the rotation between the two hemispheres.



Rotating Joint

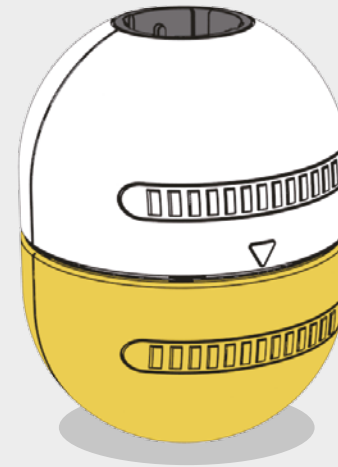
It can rotate objects horizontally.

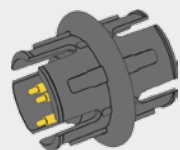
- The rotary angle is $\pm 75^\circ$;
- Load torque: 0.55 kg.cm;
- Load limit: 0.55kg;
- Every rotate joint ball has two connection points.



Attention:

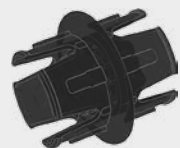
- Don't break off the module with hands when it is energized, or it will damage the module. the loaded object is restricted by weight. If the loaded object cannot rotate normally, the object should be taken down immediately, or it might be damaged. No foreign matter obstructs the rotation between the two hemispheres.





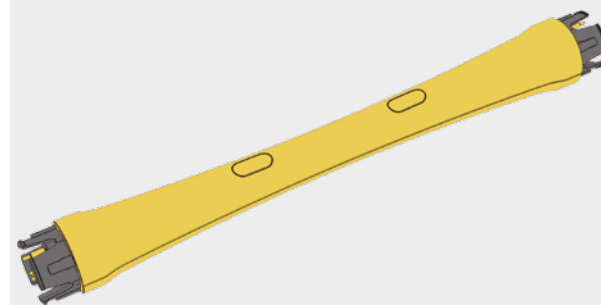
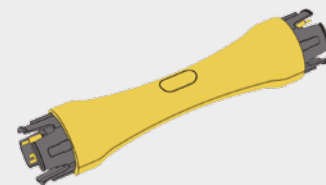
Small Connector

Small connector is used to connect all the module balls, to secure the structure, to connect electrical current, and to transmit signals.



Structural Connector

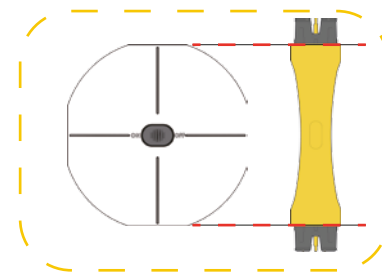
Structural connector is used to connect all the module balls, to secure structures, but not to connect electrical current or to transmit signals.



Medium Connector

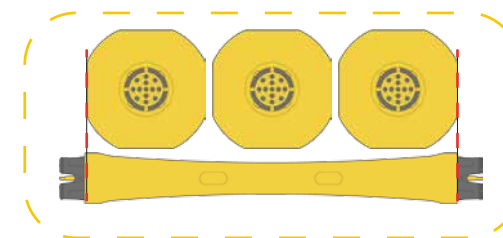
Medium rod connector is used to connect all the module balls, to secure structure, to connect electrical current, to transmit signals, and to enrich the Mabot' s functionality.

Length: equal length to one battery ball.



Long Connector

Length: three unit lengths of one port .



5-Hole Beam



5-hole beam is used to secure structure, decorate and develop.

- It can connect at the angle of 45° or 90°.
- It has 5 connectors.

9-Hole Beam



9-hole beam is used to secure structure, decorate and develop.

- It can connect at the angle of 45° or 90°.
- It has 9 connectors.

Data Cord



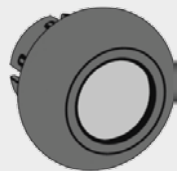
Communication cord is for signal transmission between modules only, not for electric current transmission.

How to use it: When a majority modules are power-consuming (such as rotate joint ball, swing joint ball, drive ball) in the Mabot, the exported electric current from one single battery ball may not meet the power requirement, so one needs to group power-consuming modules with different battery balls for respective power supply. The communication cord can transmit commanding signals between multiple battery packs.

Power Cord

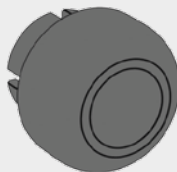


Power cord is for transmission of both electrical current and signal.



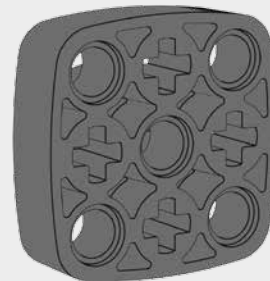
Wheel Plug

Wheel plug is for structure supporting or resistance decrease
(it is used as a driven roller).



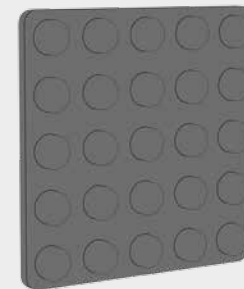
Rubber Plug

Rubber plug is for structure supporting or resistance decrease
(it is used as the robot' s foot).



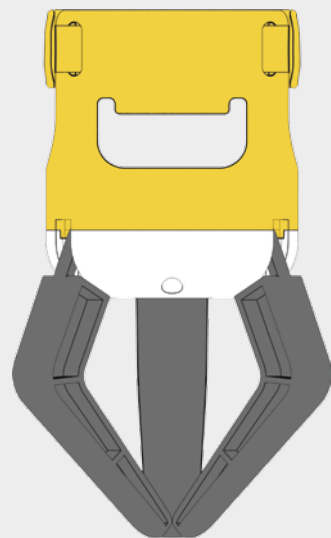
Lego Adapter A

The adapter of LEGO package & EV3 package.



Lego Adapter B

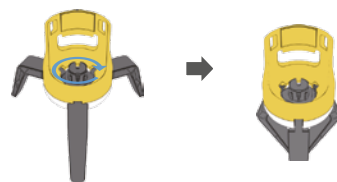
The adapter of LEGO nano-blocks.



Clipper

It can draw objects in by controlling rotate joint balls.

- ① turn as illustrated position to tuck the clippers.



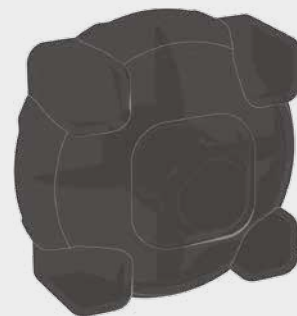
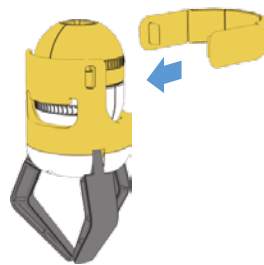
- ② turn the rotata joint balls to make the two arrows touch.



- ③ vertically insert the rotata joint balls and lock.



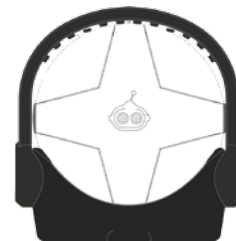
- ④ make sure the clippers are tuckes up when finished.



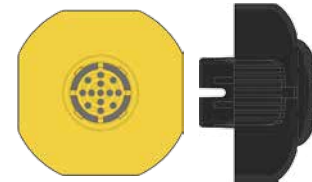
Accessories

The Accessories can make Mabot even cooler.

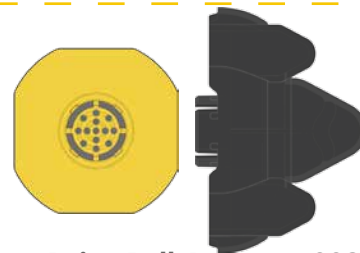
Control Ball Accessory 001



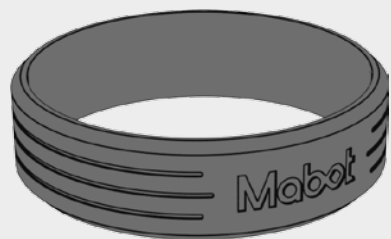
Make sure the button is still clickable when both sides of the YJ-001 and the control ball are connected. The accessories help to make the Mabot cooler.



Connection Ball Accessory 001

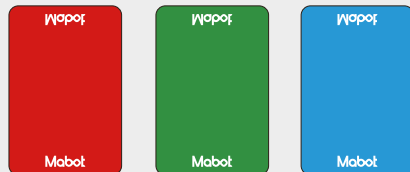


Drive Ball Accessory 002



Rubber Ring

This rubber ring is used for rotate joint ball to help secure objects.



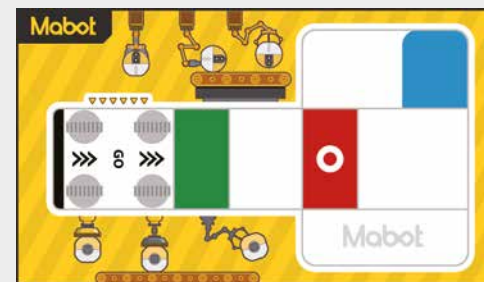
Color Card

The color card consists of three colors: red, green, and blue.



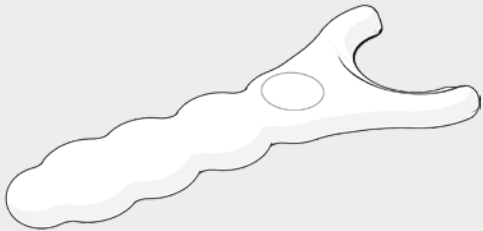
Tracking Map

This map is used for tracking robot.



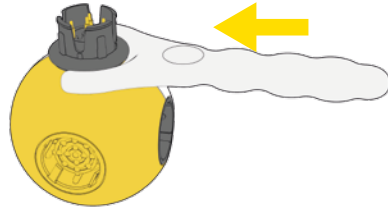
Engineering Vehicle Map

Gameplay accessories of engineering vehicle.



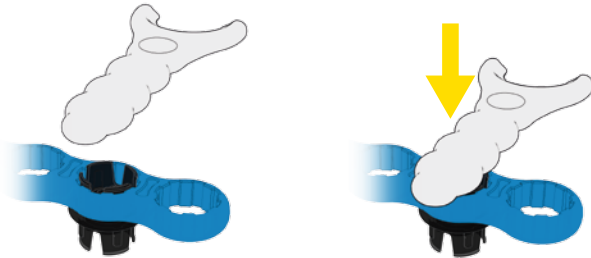
Disassembly Tool

Instructions of disassembly tool:



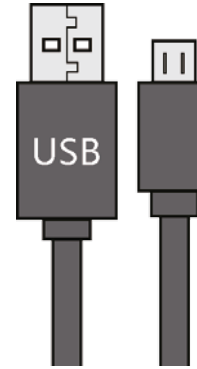
Scenario 1:

- Insert the disassembly tool into the gap between the connecting rod and connecting ball;
- Push inward to detach the connecting rod.



Scenario 2:

- Place and press the handle of the disassembling rod onto the protruding section of connecting rod S on the bridge;
- Push down on the handle to detach the connecting rod.



USB Cable

Use the USB Cable to insert the micro-USB end into the port of the Control Ball. It is used for upgrading wired firmware and downloading user-defined programs on PC. Used for charging.

Upgrading firmware

Please check for updates and download the latest firmware version to upgrade.

Website: www.bellrobot.com

- Master control firmware upgrade

Light: It will flash green then red. When the upgrade is complete, the light will turn to the default color of power-on (other colors indicate abnormal downloading) .

- Firmware upgrade of function balls

Light: It will flash red then green. When the upgrade is complete, the light will turn to default color of power-on (other colors indicate abnormal downloading) .

Attention: please do not cut off the power during upgrading or it may cause upgrading failures and/or damage the control ball.

Cautions

- Not suitable for children under 3 years old. Contains tiny objects and presents a choking hazard.
- Please operate the device between 10°C-40°C. Operating outside this temperature range will risk malfunction.
- Please do not place the device close to heat sources or open flames, such as electrical heating, microwaves, ovens, burners, candles, or other such locations;
- Do not use microwaves, hair dryers, or other external heating devices to dry the device;
- Do not place any component in water or other liquids;
- Keep the surface clean. Do not use strong chemical products, detergents, or cleaning agents to clean the device or components. Please use clean and soft cloth for cleaning;
- Do not bump, toss, or kick the Mabot, or it may damage its mechanical functions;
- There are built-in undetachable batteries. Please do not change the batteries on your own, as it may damage the battery or device;
- Please do not dispose of the battery in the garbage; please use proper recycling methods as laid out by local regulations.
- Do not use sharp metal objects, such as pliers and needles, to insert into the tiny holes of the connectors;
- Do not damage the metal of connecting rods;
- Once the device malfunctions, please promptly contact the manufacturer. Please do not disassemble or remold the device and its components, or it will void the warrant.

App

App function introduction: using BLE (low power bluetooth) connection technology, it can be installed and used in ios9 and above systems, Android 4.40 and above. You can explore Mabot's more behavioral patterns and game play with your mobile App.



MabotGO :

The application is downloaded from the app Store, google Play, and the Apple Store search Mabot Go.

Mabot Go is an App that allow users to build and control the robots. By following the instructions of each robot, kids can build and play games with the robots, make the robots perform in many fun and educational ways, and find much more fun in learning STEM skills. And even more innovatively, Mabot allows kid to build their own robots with imagination, explore every possible ways to control and play with the robots.



Mabot IDE :

The application is downloaded from the app Store, google Play, and the Apple Store search Mabot IDE.

Mabot IDE is a graphic programming app specially designed for STEAM education. Kids can make magic robots simply drag and drop colored blocks. By exploring and learning the concepts of sensor, sorting, events, loop, condition, operation, and variables, kids can exercise and improve their problem-solving skills, logical thinking ability, and creativity. Program with Mabot IDE, make your Mabot dance, accomplish missions, or do whatever you want to bring your Mabot to 'life'.

FAQ

- **Q: [Module] What are the two switches on the control ball for?**

A : So far the two buttons share the same function: on and off.

- **Q: [Module] Why is there no response when I press the power button on the battery ball?**

A: Please check whether the battery ball has been charged. If its battery is low, please charge it (for details please refer to the battery module instruction).

- **Q: [Module] Once the charger is connected, the control ball flashes red once, then the lamp-shades of the control ball and the drive ball turn off. What happened?**

A: Method 1: Please restart the battery ball;

Method 2: Check and download the latest version of the firmware. Connect the control ball to upgrade;

Method 3: If neither of the above works, please contact our customer service for assistance.

- **Q: [Module] Why does the light of the battery turn red after assembly when it is fully charged?**

A: This may be because a single battery ball can not provide sufficient power. Therefore, indicating light suggests malfunctioning. Try to be powered separate power-consuming modules into different groups to respectively.

- **Q: [Module] Why does the infrared sensing ball fail to avoid obstacles or follow?**

A: Method 1: Please check if the distance is beyond the effective range;

Method 2: Please check if there is anything smeared or pasted on the black cover. If so, wipe it off with a dry, clean cloth.

- **Q: [Module] Why isn' t the button of the touch sensing ball working?**

A: Method 1: Please debug on your cell phone;

- **Q: [Module] Why can' t the color sensing ball identify a certain color accurately?**

A: Step 1: Please do not smear or paste foreign objects on the lampshade. If something is already applied, please wipe it off with a dry, clean cloth;

Step 2: Please make sure the detection is executed at a 90° angle and is close enough (within 10mm) to the detected object;

Step 3: The lamp cap should not touch the surface of the detected object;

Method 2: If the cellphone test displays normal status, then adjust the grammatical modules in the application.

- **Q: [Module] After assembling and following the instruction, why can' t the modules of the function balls (such as color sensing ball and infrared sensing ball) be detected when the power is on?**

A: Method 1: Please check whether the connecting rod is loose; one can unplug and replug or change the connecting rods;

Method 2: Use adjustment function to troubleshoot. If it fails, please contact customer service for assistance.

- **Q: [Module] What are the differences between the blue connecting wire and yellow connecting wire?**

A: The blue wire is communication cord, only for signal transmission between modules, electric current transmission excluded; Yellow wire is the communication and electricity transmission wire, for electric current and signal transmission between modules.

- **Q : [Connection] Why is the Mabot not able to get connected via Bluetooth?**
A: Please refer to the instruction to Bluetooth of the Mabot Starter Robot Quick Guide.
- **Q: [Connection] Why does my cellphone keep disconnecting after connecting to the Mabot?**
A: Method 1: please connect Mabot in a short distance. A long distance between your cellphone and the Mabot may can make unstable connection;
Method 2: Please check whether the battery ball is in low power. If it is, please charge it promptly.
- **Q: [Connecting] Why does my Mabot lose control but the light is still right?**
A: Please restart your battery ball and APP the reconnect. Chances are the Mabot and the App have disconnected but the feedback delays a bit thus delaying the notification.
- **Q: [Connecting] Why is the battery ball out of control when in power?**
A : Please try other connectors. If the problem remains, please contact our customer service for help.
- **Q: [Assembling] Why is the direction of moving forward and rotating of the Mabot opposite to expectations?**
A: Please check if the direction of the mirroring drive ball is correct on the dashboard (Mabot Go or Mabot IDE).
- **Q: [Assembling] Why does Mabot self-balance malfunction?**
A: Step 1: Please check whether the battery is fully charged. Please charge when in low battery;
Step 2: Please check the direction of the control ball placement;
Step 3: Please check if the script has been downloaded;
Step 4: Please check in the dashboard (Mabot Go or Mabot IDE) whether the direction of the mirroring drive ball is correct.
- **Q: [Assembling] Why can't the Mabot self-balance robot be in control? After downloading**

scripts, the Mabot keeps out of control and the light keeps red.

A: Because the Mabot is not switched on in a laid down status. Please lay the Mabot flat on a smooth surface and start again.

- **Q: [Assembling] Why can't the Mabot self-balance robot stay balanced and fall down easily?**
A: Possibly because it's in low battery or no battery level. Please charge promptly if insufficient.
- **Q : [Assembling] Why can't I modify the Mabot self-balance robot?**
A: The weight changes by adding other components thus breaking balance. So the self-balance module cannot be modified for now.
- **Q: [Assembling] Why line-tracking robot cannot detect the black route?**
A: Step 1: Avoid exposure to strong light. Please move to other environment to operate.
Step 2: Please do not smear or paste objects onto the lightshade. If there are any, please clean with dry and clean cloth;
Step3: Line-tracing robot doesn't start at the specified spot, so please check the default spot is on the right of the black line on the map;
Step4: Please make sure there are no mirrors on the black route.
- **Q: [Assembling] Other questions:**
A: Step 1: Please refer to the default assembling instruction for step-by-step review for any possible mistakes;
Step 2: Please check if the connecting rod is loose. The rod can be pulled out and inserted or changed;
Step 3: Please adjust and troubleshoot step by step on your cellphone;
Step 4: If the problem remains, please contact our customer service for help.

FCC Regulatory Compliance Statement

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.

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.

Warning: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure Compliance

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

ISED Regulatory Compliance

This device contains licence-exempt transmitter that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).

Operation is subject to the following two conditions:

This device may not cause interference.

This device must accept any interference, including interference that may cause undesired operation of the device.

L' émetteur exempt de licence contenu dans le présent appareil est conforme aux CNR d' Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.

L' exploitation est autorisée aux deux conditions suivantes:

L' appareil ne doit pas produire de brouillage;

L' appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d' en compromettre le fonctionnement.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux radiations IC CNR-102 établies pour un environnement non contrôlé. Cet émetteur ne doit pas être situé ou fonctionner conjointement avec une autre antenne ou un autre émetteur.

CAN ICES-3 (B)/NMB-3(B)

Declaration for EU Regulatory Compliance

Operation Frequency: 2.402-2.480GHz, Max. RF power transmitted:4dBm

This device in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU. All essential radio test suites have been carried out.

1. Caution: Risk of explosion if battery is replaced by an incorrect type.Dispose of used batteries according to the instructions.
2. The product shall only be connected to a USB interface of version USB 2.0 .
3. Adapter shall be installed near the equipment and shall be easily accessible .
4. The plug considered as disconnect device of adapter .
5. The device complies with RF specifications when the device used at 0mm form your body.



Product Name: Mabot

Age of application: 6+

Manufacturer: Shenzhen Bell Creative Science and Education Co., Ltd.

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