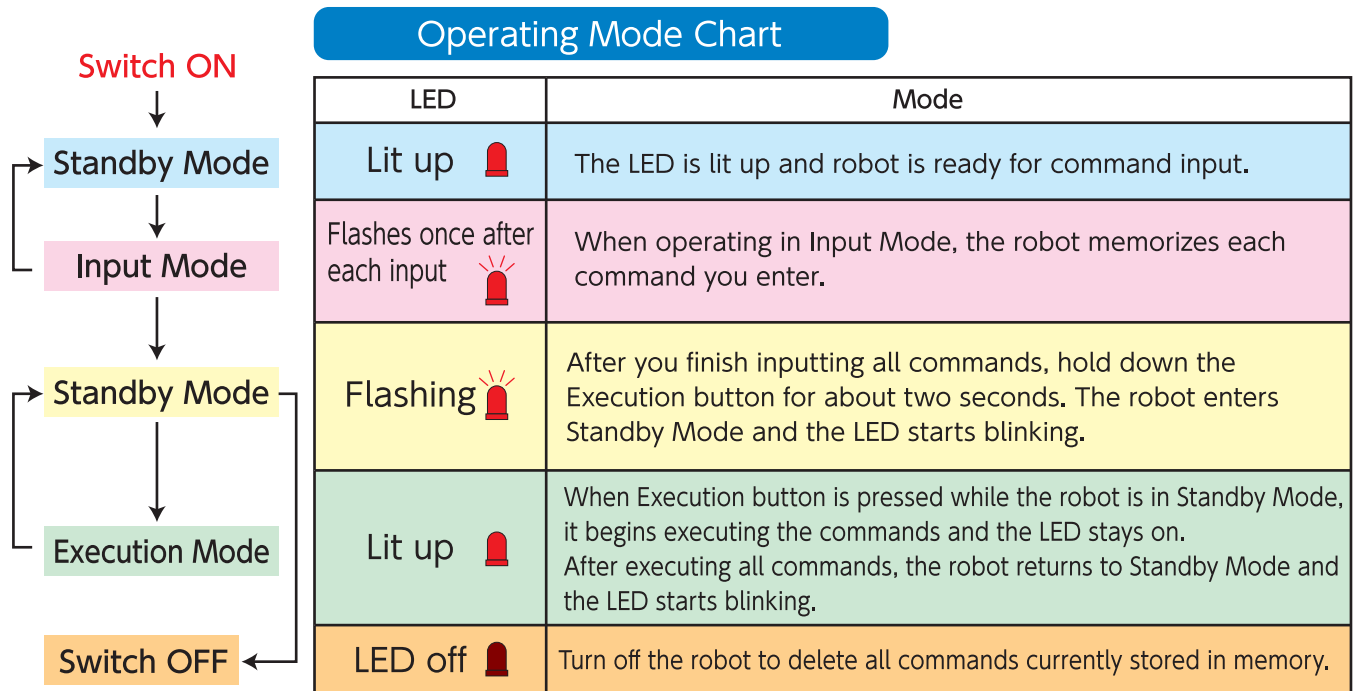


1. How to use the Push-Button Programmable Robot

① Operating Modes

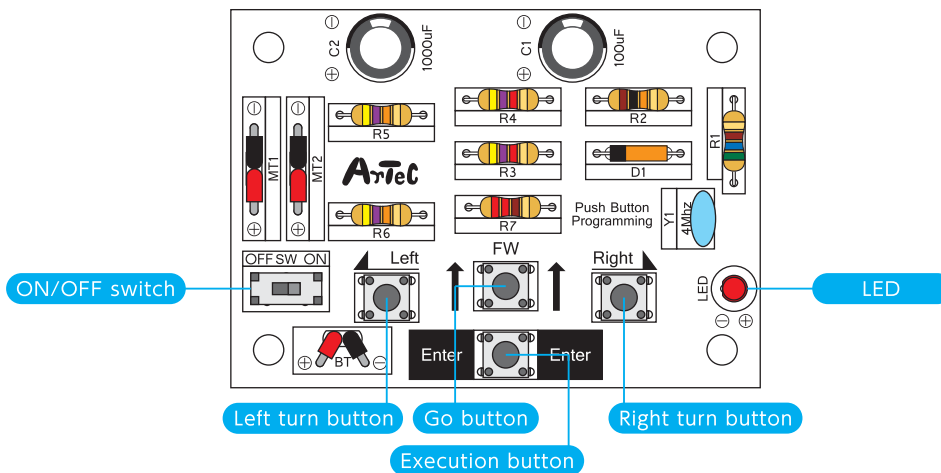
This robot has three different modes that it enters. They can be distinguished by the status of the LED.



Check!

I understand the robot's different operating modes.

② How to control the robot.



Buttons	Written on the board	Button name	Command
Action	Right	Right turn button	Pressing this button once makes the robot turn to the right for 0.5 seconds.
	FW	Go button	Pressing this button once makes the robot move forward for 0.5 seconds.
	Left	Left turn button	Pressing this button once makes the robot turn to the left for 0.5 seconds.
Execution button	Enter	Execution button	Used for switching modes. Operates three ways: single press, double press, and long press (holding down the button).

③ How to control the robot

The robot is programmed by entering commands one at a time. This is done via the four buttons "Go, Right turn" is two commands. Each command can have its own time span. The number of times you press an action button determines how many seconds the robot will execute that action. Each press of an action button means 0.5 seconds. Two presses would be 1 second, etc. To make the robot "Go forward for 5 seconds" in Step 1, you would press the Go button ten times in a row. After pressing the Go button ten times in Step 1, press the Execution button once to input the command. Next, input the right turn for Step 2. After you finish inputting all the commands, hold down the Execution button for about two seconds to enter Standby mode.

Step	Action	Sec.	Button push
1	Go	5 sec.	10 times



Step	Action	Sec.	Button push
2	Right turn	3 sec.	6 times

Input example

(Go 5 seconds.→Right 3 seconds.→Left 4 seconds.→Left 3 seconds.→Go 3 seconds.)

- Press Go button ten times. Press Execution button once. The LED will flash once to confirm receipt of your command.
- Press the Right turn button six times. Press the Execution button once. The LED will flash once to confirm receipt of your command.
- Press the Go button eight times. Press the Execution button once. The LED will flash once to confirm receipt of your command.
- Press the Left turn button six times. Press the Execution button once. The LED will flash once to confirm receipt of your command.
- Press the Go button six times. Press the Execution button once. The LED will flash once to confirm receipt of your command.
- Hold the Execute button down for two seconds. The LED will begin flashing continuously and the robot will enter Standby Mode.
- Pressing the Execution button again causes the robot to enter Execution Mode. The LED will remain lit and the robot will perform the commands you entered.
- End. The LED will flash repeatedly and the robot enters Standby Mode.

Check!
I understand how to control the robot.

④ How to cancel a command.

A command can only be canceled when the robot is in Input mode. For example, when you want to cancel the command in Step 4 (Left turn), first press the Execution button once to finish entering the command. Next, press the Execution button twice in a row. The LED will blink twice to confirm that the most recent command has been deleted. The program is now the same as it was after inputting Step 3. Further, when you press Execution button twice in a row again, the command in Step 3 input will be deleted. Each double press of the Execution button deletes the last command in your program. If necessary, you can delete all your commands one by one.

Step	Action	Sec.	Button push
1	Go	5 sec.	10 times

↓ Input mode

Step	Action	Sec.	Button push
2	Right turn	3 sec.	6 times

↓ Input mode

Step	Action	Sec.	Button push
3	Go	4 sec.	8 times

↓ Input mode

Step	Action	Sec.	Button push
4	Left turn	3 sec.	6 times

↓ Input mode

Check!
I understand how to cancel a command.

⑤ Specifications

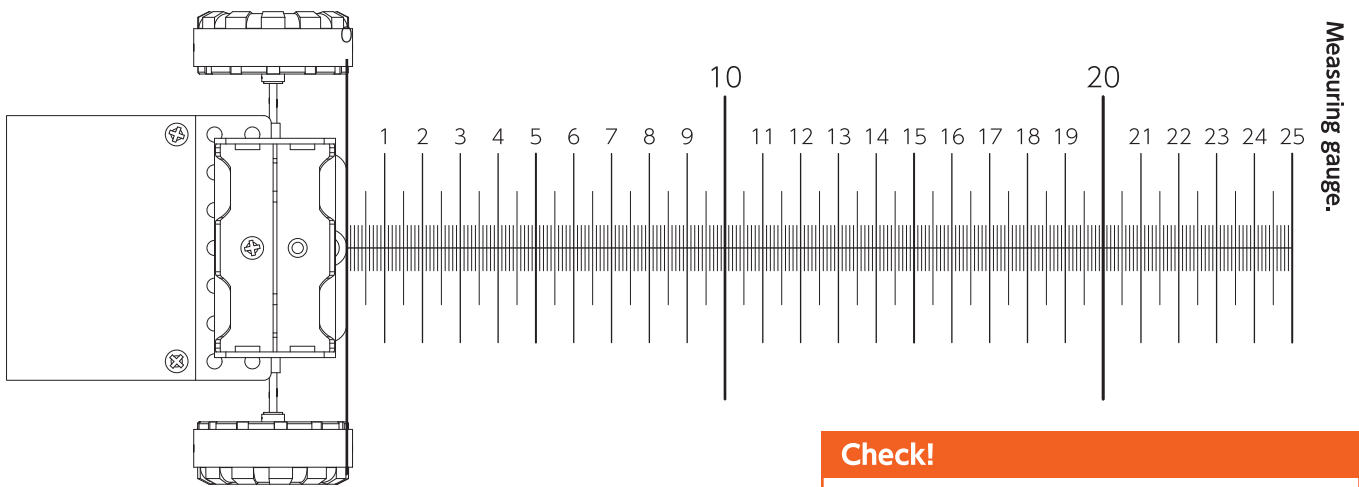
The Push-Button Programmable Robot store up to 360 actions (equivalent of 180 seconds) or 30 steps. Once 360 actions or 30 steps are entered, further input will not be accepted.

2. Learn how the robot moves.

The two motorized gear boxes move the robot. Each motorized gear box has slightly different properties, making its movements unique. This causes the robot to sway right and left when moving forward. The amount of energy remaining in the batteries also affects how the robot moves. Periodically measure the robot's movements on the gauge paper and make adjustments through command input.

① Measuring forward movement

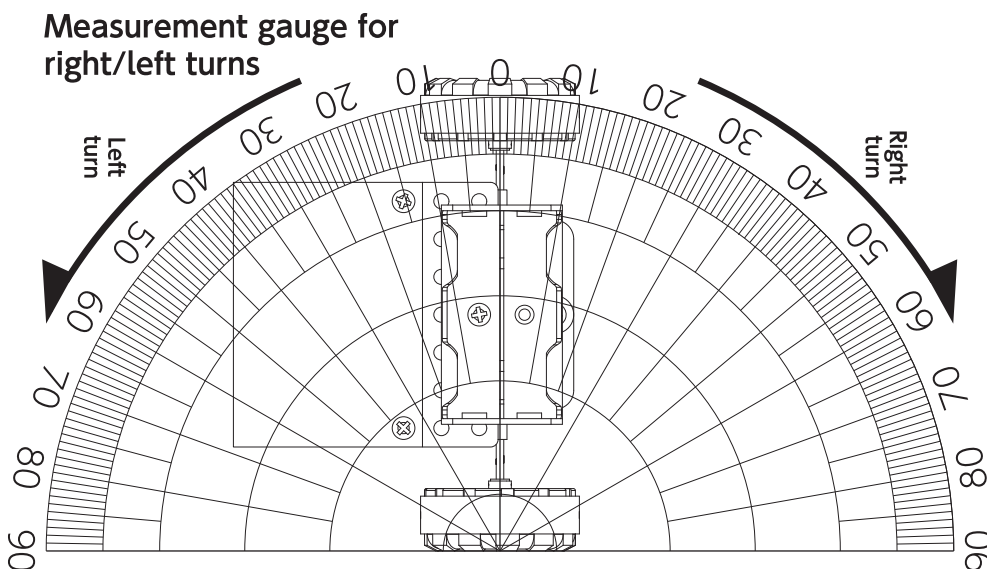
Measure the numerical values using the gauge on the back side of the course map. Record numerical data on how long it takes the robot to move forward a certain distance and how far it can travel in a given time.



Check!
I gathered data on the forward movement.

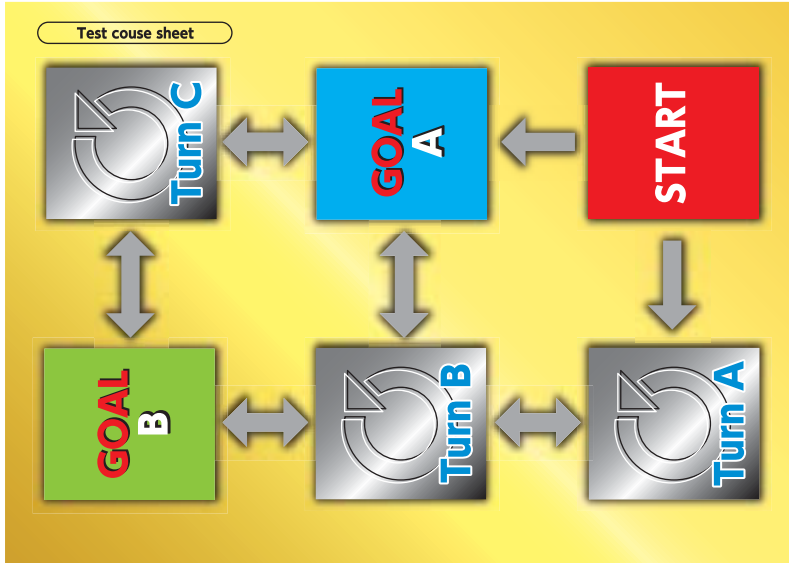
② Measuring right and left turn

Measure the numerical values using the gauge on the back side of the course map. Record numerical data on how long it takes the robot to move forward a certain distance and how far it can travel in a given time.



Check!
I gathered data on the right and left turns.

3. Let the robot run the course.



Let the robot run from the start to the goal. If you can make the robot run to the goal and stop within the goal square, you cleared the course. Use the data you recorded when you measured the performance of the robot in "2 Learn how the robot moves."

Course ①

Start → Goal A

Step	Action	Length / Direction	Sec.	Button push
1				

Check!
I cleared Course ①.

Course ②

Start → Turn A → Goal B

Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				

Check!
I cleared Course ②.

Course ③

Start → Turn C → Goal B

Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				

Check!

I cleared Course ③.

Course ④

Start → Turn A → Turn B → Goal A

Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				
6				
7				

Check!

I cleared Course ④.

Course ⑤

Start → Turn C → Goal B → Turn A → Start

Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Check!

I cleared Course ⑤.

Course ⑥

Start → Goal A → Turn B → Goal B → Turn C → Start

Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				

Check!
I cleared Course ⑥.

Course ⑦

Start → Turn A → Turn B → Goal A → Turn C → Goal B

Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Check!
I cleared Course ⑦.

4. Make your own course and let the robot run it.

Make your own course and let the robot run it. After you create a course, measure the route. Refer to the movement data you gathered and use it to input the commands.

Course map													

Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Step	Action	Length / Direction	Sec.	Button push
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

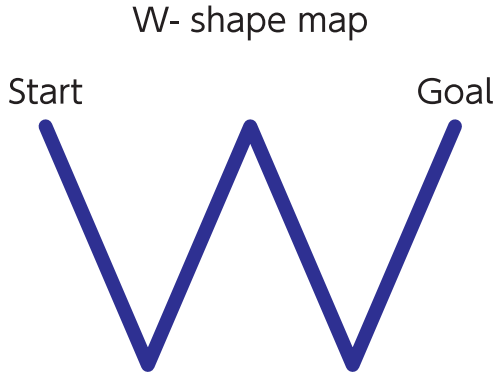
Check!

I made my own course and let the robot run all the way.

5. Let the robot run along the line of a pattern.

Let the robot run along the line of a pattern. Draw a pattern for each task and let the robot trace the line.

Task ①

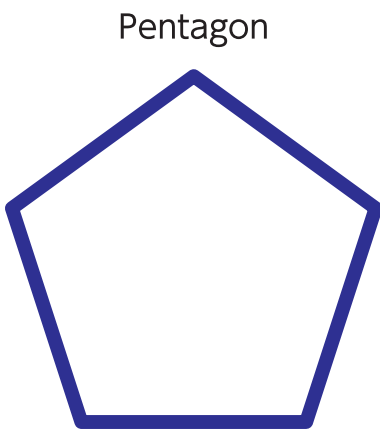


Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Check!

I drew a W-shape pattern and let the robot successfully trace it.

Task ②



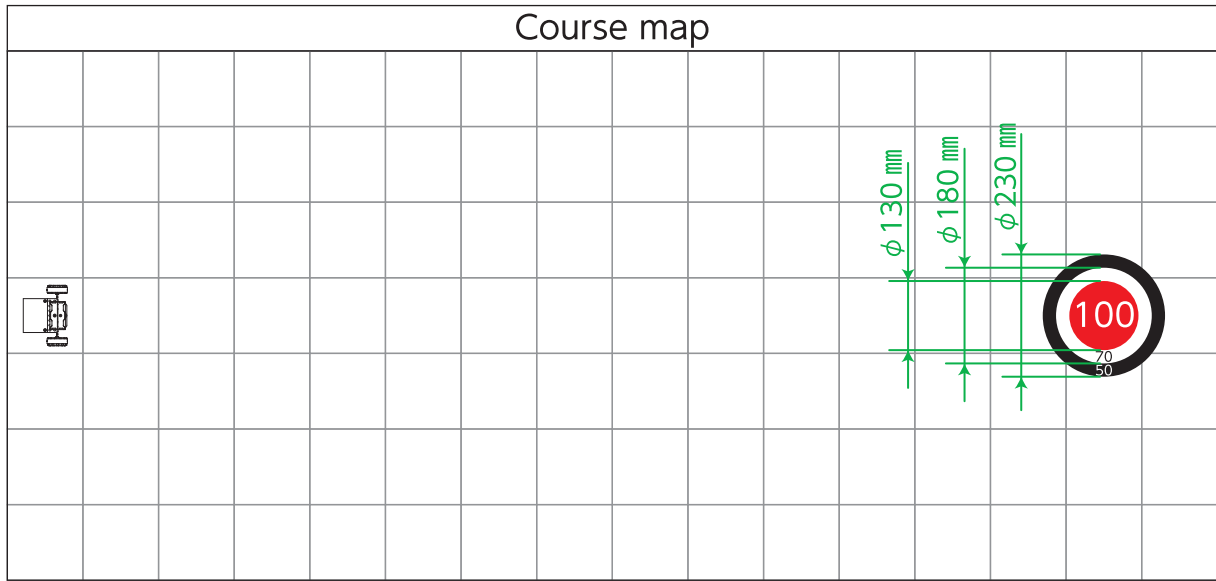
Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Check!

I drew a pentagon and let the robot trace successfully trace it.

6. Hit the target game! Get a good score!

Make a course with obstacles in front of the target to play hit the target game.



*The dimensions of the target are shown above for reference.
You are free to make your own course and target size.

Step	Action	Length / Direction	Sec.	Button push
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Step	Action	Length / Direction	Sec.	Button push
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

	1st	2nd	3rd	4th	5th	Total
Marks						

7. Review

- Why do you think measuring the robot's movement performance is necessary?

- List some control devices you see in everyday life. Describe how they are used.

- Based on your experience controlling the robot, write down your impressions. What control technique do you think would be nice to have?
