

ICHIBOT

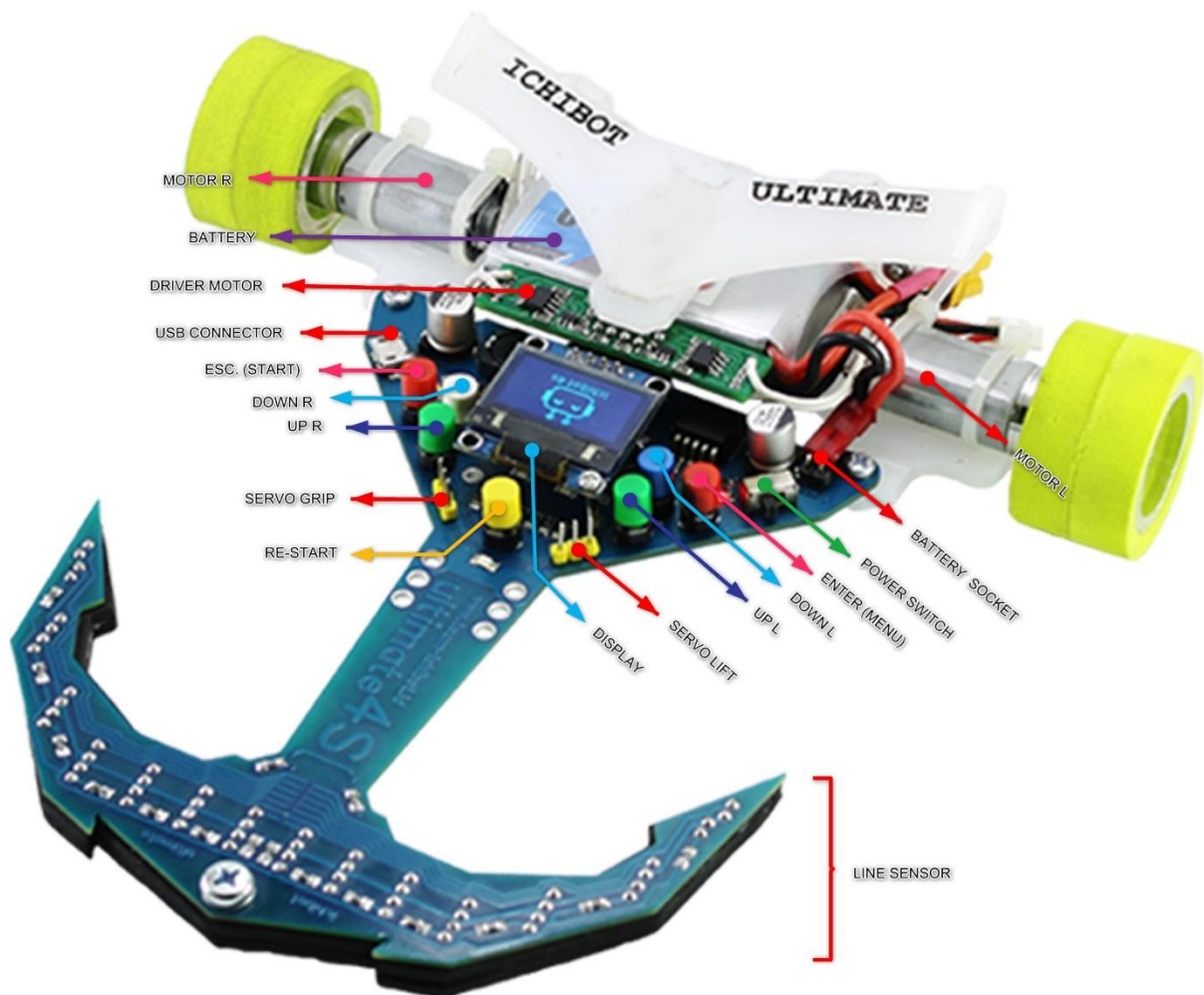
Exclusive Toys For Teenagers

ICHIBOT LF ULTIMATE 4S

USER MANUAL REV.02

ICHIBOT LINE FOLLOWER ULTIMATE 4S

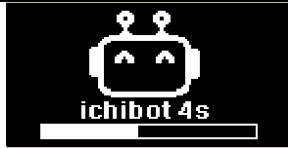
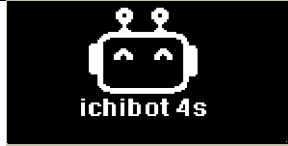



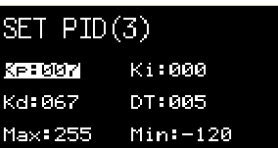

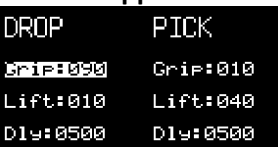
OVERVIEW




















Name	Function
Power Switch	Turn ON / Off Robot
LCD Display	Show Menu Panel
Servo Lift	Connector to Servo Gripper
Servo Grip	Connector to Servo Gripper
USB Connector	Update Firmware / Programming
Driver Motor	Motor Controller
Battery	Robot Power Supply

Name	Function
Button Enter / Menu	Enter menu
Button UP L	Next Menu
Button Down L	Prev. Menu
Button ESC / Start	Back to Prev. Menu / Runnig Robot
Button UP R	Increase Value
Button Down R	decrease Value
Button Re-Start	Restart Robot

DISPLAY MENU IN LCD PANEL

No.	DISPLAY	FUNCTION	INFO
1	<p>Loading page</p> 	The opening image display, Wait until loading is complete.	
2	<p>Screen saver</p> 	Display Screen Saver to save power, press any key to return to the main menu, this view can be replaced with another image via Serial Menu	
3	<p>Notifications</p> 	Robot notification if not already registered, free registration follow the instructions at the following link: www.team-ichibot.id	
4	<p>Home Screen</p> 	<p>Display the main menu, press the navigation key to move the menu, press the left button to set the pointed value. Press enter key to enter sub menu.</p> <p>Menu: Control panel</p>  <p>Menu: Set PID</p>  <p>Menu: Advance Panel</p>  <p>Menu: Gripper</p> 	<p>In main menu, just press START BUTTON to running robot.</p> <p>V : Robot Speed (0 – 255) Press enter when cursor in V position to enter Control Panel.</p> <p>STOP AT i: stop the robot in the position of the selected index and P: Number.</p> <p>Clear P: return all setup in selected Plan to default</p> <p>Clear Set: return all setup in Control Panel to default</p> <p>Set PID (3): (3) is the memory number of the pid settings (there are 1-5) that can be set by themselves.</p> <p>Kp: Proportional Kd: Derivative Ki: Integral DT: Time Sampling MAX: Maximum Speed MIN: Minimum Speed COPY: to copy the selected plan to another plan. (N) copy as normal, (I) inverse robot movement directions.</p> <p>Lost Mem : Activate or Deactivate Memory for last edge sensor detected</p> <p>Inverse P: set custom inverse Plan Menu</p> <p>Gripper : menu to set the DROP and PICK positions</p>

No.	DISPLAY	FUNCTION	INFO
		Menu: Blower 	Blower : menu to set the Fan / Fire Extinguisher Speed If use Active LOW fan extinguisher mode, inverse Speed Value
5	Battery indicator 	Battery indicator. Button "UP-R" : Mode Percentage  Mode Voltage  Button "DOWN-R" : to Select cell Battery used.  	
6	Auto maze solving 	Ichibot is default name of the robot, you can replace it with another name through the Serial Menu . Press button OKL (MENU) to see auto maze configuration. Press button UPR/DOWN R to change to MAZE R run mode or MAZE L run mode 	 Run with data in P: (Number)  Run with Maze Left Rule  Run with Maze Right Rule Booster : Booster Speed Slower : Slower Speed after booster LW : Line Width Back Home : return to start position after find finish block.
7	Plan Setting 	Plan Robot settings. menu to set the direction of robot motion, each plan contains 99 index settings. Press the "MENU" button to enter the other page views. Menu: Set Plan Page 1  Menu: Set Plan Page 2 	i: Index Number (there is 0-99) each index contains setting for: Set Plan Page 1 M : Mode Sensor BLACK / WHITE / LEFT / RIGHT / FORWARD / PICK / DROP / BLOW / UNBLOW/P01-100 : robot action if it detects lines according to sensor mode. B : Brake delay before do Action L : Speed Motor Left R : Speed Motor Right D : Duration of action, its can use D (Delay) or E (Motor Encoder) Set Plan Page 2 SA : Speed A, first speed change after the action. TA : Duration of SA, its can use D (Delay) or E (Motor Encoder)

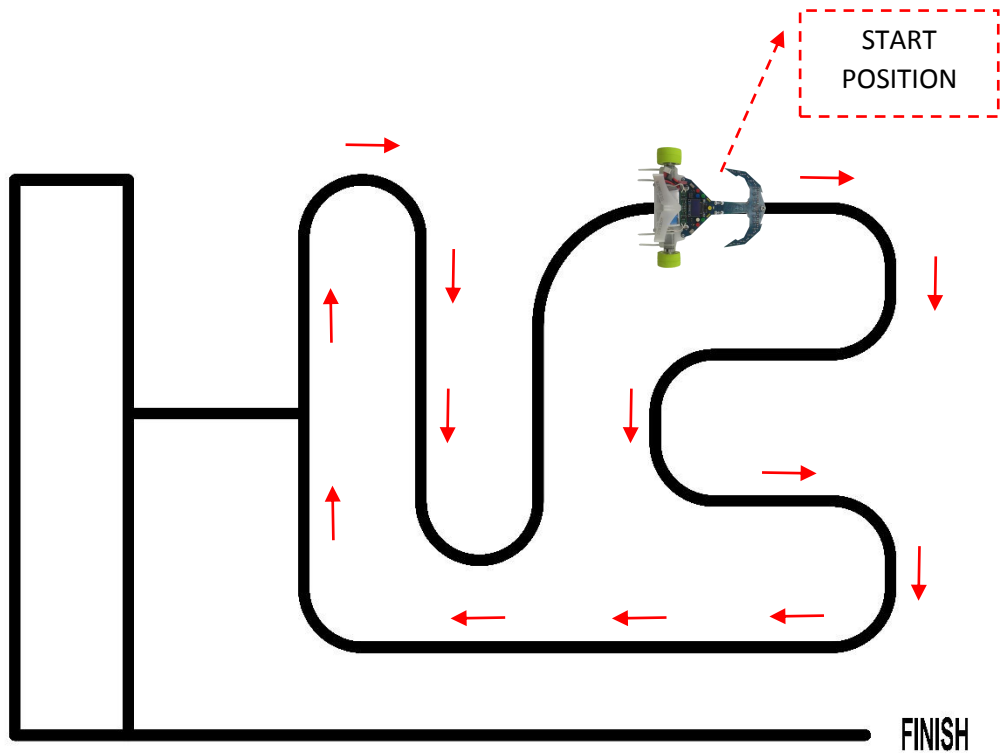
No.	DISPLAY	FUNCTION	INFO
		<p>Hidden index menu in menu Set Plan Page 1 select the pointer on "i:" then press and hold the menu button.</p> <p>Menu: Hidden index menu</p> <pre>SET PLAN:01 - i:00 COPY PASTE INSERT REMOVE INVERSE CLEAR</pre>	<p>SB: Speed B, Second speed change after the SA done, after SB done speed back according to V.</p> <p>TB: Duration of SB, its can use D (Delay) or E (Motor Encoder)</p> <ul style="list-style-type: none"> After SB done Speed robot will back to normal speed (V)
8	<p>Calibrate sensor</p> 	<p>Sensor calibration menu. to adjust the sensor values, in order to detect light and dark lines. Press Button OK L to show :</p> <p>Menu: Auto Calibrate sensor</p> <pre>Calibrate Memory: 0 Sensor Sensivity:50% Put the sensor on the white and then black line (SAVE) (CANCEL)</pre> <p>Press Button UP R to show :</p> <p>Menu: Manual Calibrate sensor</p> <pre>CALMEM:00 WHITE 9:00 █----- Read : 0 Min: 0 limit: 35 Max:1023</pre>	<p>Calibrate Memory : there is 0-2 memory space to save sensor calibration results.</p> <p>Sensor Sensivity: percentage of sensor sensitivity</p> <p>CALMEM : Calibrate Memory</p> <p>WHITE / BLACK : line Color Mode</p> <p>Read : sensor value real time</p> <p>Limit : Limit Calibrate Value</p> <p>Min : Minimum sensor value</p> <p>Max : Maximum sensor Value</p>
9	<p>Line Color mode</p> 	<p>Menu to instantly change line color mode</p>	<p>Black: dark colored lines with bright backgrounds.</p> <p>White: bright colored lines with dark backgrounds.</p>
10	<p>Check point</p> 	<p>Menu to set start position point through checkpoint.</p> <p>Menu: Checkpoint</p> <pre>CHECKPOINT P:01 CP:001 i:00 BLACK SA:160 SB:060 TA:0000 D TB:0000 D</pre>	<p>CP: Checkpoint Number</p> <p>I: Index Value in this CP</p> <p>Black / white : line color in this CP</p> <p>SA: Speed A in this CP</p> <p>SB: Speed B in this CP</p> <p>TA: Timer A in this CP</p> <p>TB: Timer B in this CP</p>

No.	DISPLAY	FUNCTION	INFO
11	Factory Reset	<ol style="list-style-type: none"> 1. Turn OFF robot 2. Press UPL and UPR 3. Turn ON Robot 4. Wait until lcd display show this <div style="background-color: black; color: white; padding: 5px; margin: 5px 0;"> <pre>factory reset! press START BUTTON...</pre> </div> 5. Release button UPL and UPR 6. Press START button 7. Wait until Reset Completed. 	Clear all control panel setting and plan setting to default.

EXAMPLE SIMPLE TRACK SETTING



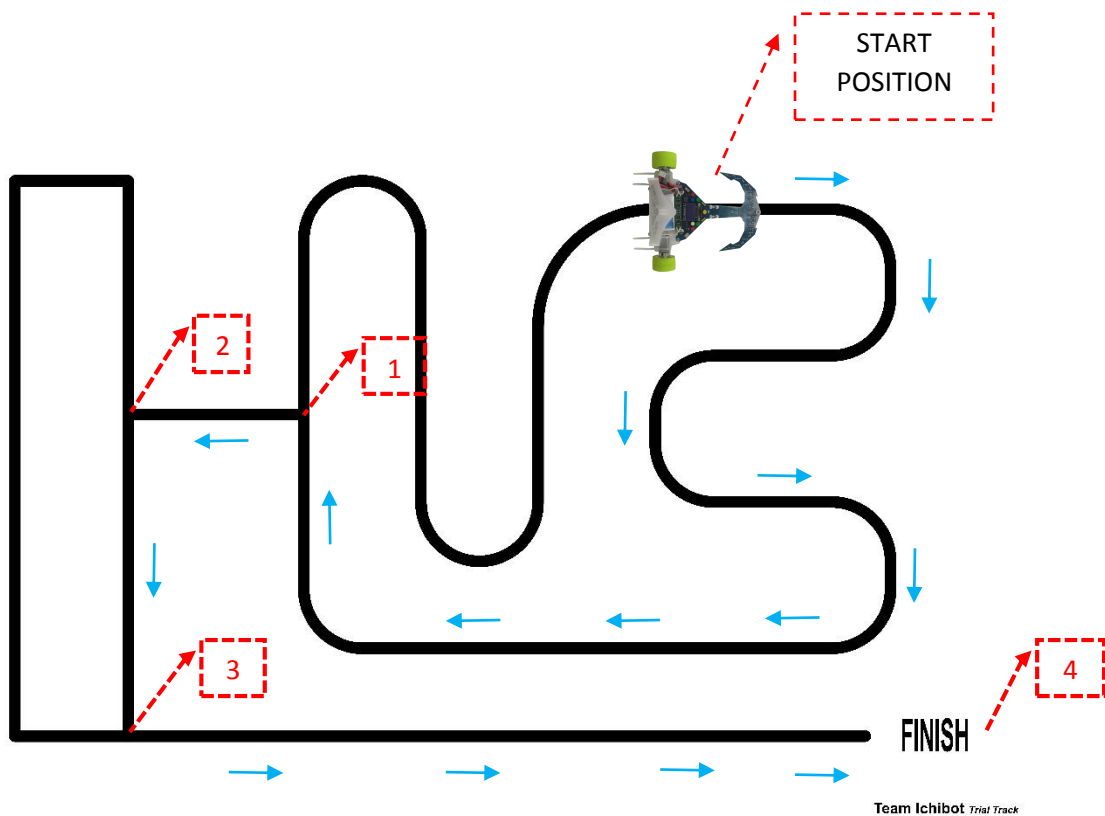
instructions on how to hold the robot.
Be careful do not touch the controller chip
because it will cause the work process is
interrupted.



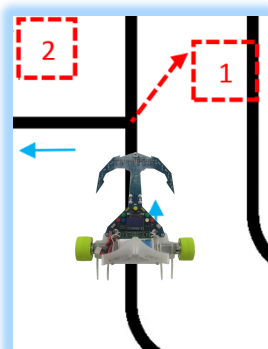
Team Ichibot Trial Track

look at the picture, if the robot is run in the start position and **without setting** then the robot will follow the circle line continuously and will not turn to the finish line.

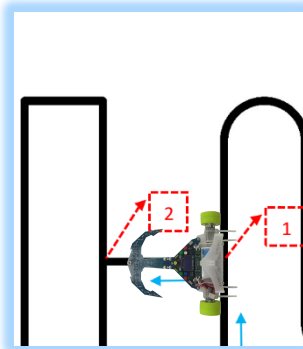
EXAMPLE SIMPLE TRACK SETTING



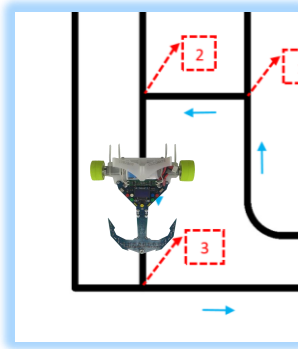
if we choose the fastest path from the start point to the finish point the robot will be faced at the 3-position branching lines and a condition for stopping the robot at the finish point.



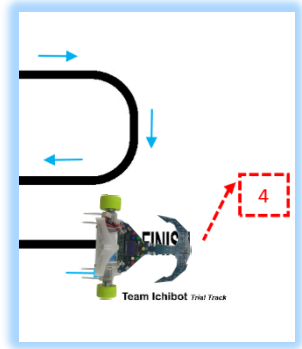
CASE 1
Robot Must turn left



CASE 2
Robot Must turn left



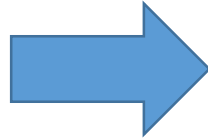
CASE 3
Robot Must turn left



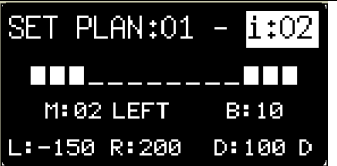
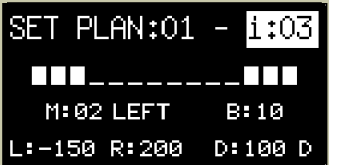


CASE 4
Robot Must Stop

EXAMPLE SIMPLE TRACK SETTING

To solve this case, In **Main Menu** Select pointer to “**P:**” and adjust “**P**” Value to **01** then press **Enter** Button, so LCD display will show **Plan Menu**. You can make many Plan just choose the menu plan number.



CASE	SETTING MENU	EXPLANATION
Case 0 (start Position)		<p>In i:00 or start position, sensor mode (M:00) can not be replaced so leave it default.</p> <p>Select Action BLACK because we start on the black line.</p> <p>let the other settings default because in this case we do not set the direction of motion in the start position.</p> <p>select menu in the index setting (i:00) and increase the value to (i:01) then we will setup for the next case (case 1).</p>
Case 1		<p>in this case the robot must turn left when the left sensor touches the line.</p> <p>then we select the sensor mode on M: xx, we select the middle sensor and the left sensor. because if we choose a mode that uses the left sensor only, it is feared when the robot runs from the starting point and the left robot sensor will touch the line in the middle of the road so that the robot will perform the action is not in the proper position. by selecting the sensor mode conditions on the two sensor positions then it will be safer.</p> <p>Next select the action: LEFT because the robot must turn left.</p> <p>set the L, R and D values by default, or adjust according to the values you get for your robot. see the explanation below.</p>

CASE	SETTING MENU	EXPLANATION
		select menu in the index setting (i:01) and increase the value to (i:02) then we will setup for the next case (case 2) .
Case 2	 <pre> SET PLAN:01 - i:02 ■■■-----■■■ M:02 LEFT B:10 L:-150 R:200 D:100 D </pre>	<p>in this case the robot must turn left when the left sensor or the right sensor touches the line.</p> <p>we select the M: xx sensor mode that uses the left and right sensors. You may choose either just left or right sensor only for robot requirements to perform the action.</p> <p>Next select the action: LEFT because the robot must turn left.</p> <p>set the L, R and D values by default, or adjust according to the values you get for your robot next select menu in the index setting (i: 00) and increase the value to (i: 02) then we will setup for the next case (case 3).</p>
Case 3	 <pre> SET PLAN:01 - i:03 ■■■-----■■■ M:02 LEFT B:10 L:-150 R:200 D:100 D </pre>	<p>in this case the robot faces the same case as the previous case. so setting as before.</p> <p>increase the value to (i: 03) then we will setup for the next case (case 4).</p>
Case 4 (Finish Position)	 <pre> SET PLAN:01 - i:04 ----- M:14 FORWARD B:10 L:000 R:000 D:100 D </pre>	<p>at the finishing point there is no line for the reference to stop so setting the sensor mode at M: 14 where no sensor touches the line.</p> <p>select the FORWARD action and empty the L and R values. then back to the main menu and go to the control panel.</p>
Set Stop index	 <pre> CONTROL PANEL STOP i:04 LOOP i:99 SET PID ADVANCED CLEAR P:01 CLEAR SET </pre>	<p>setting the value of stop index at position i: 04, so that robot stop after doing action i: 04.</p> <p>go back to the main menu and put the robot on the start line then press the start button to run the robot.</p>

ROBOT ACTION

when faced with the choice of where the direction of robot motion we must determine the condition of the sensor first on the PLAN index settings. then determine the direction of robot movement. the sensor condition has been determined by the sensor mode selection (from M: 0 to M: 14). wherever the sensor position from which the sensor mode condition is fulfilled robot will perform the ACTION and will increase the INDEX value.

Sensor Mode

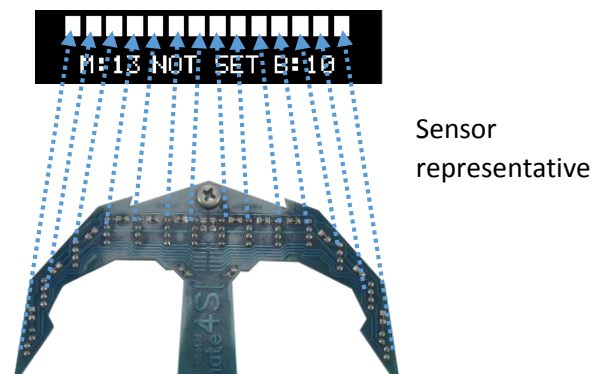
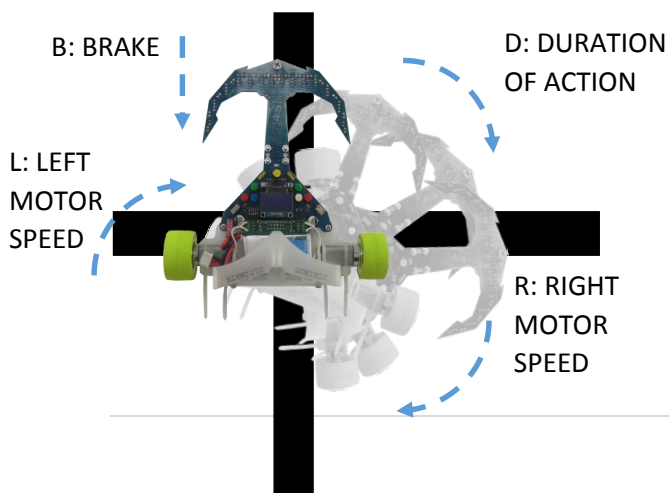
MODE SENSOR	DISPLAY	EXPLANATION
0	XXXXXXXXXXXXXXXX M:00 NOT SET B:10	not using the sensor, the robot performs the action immediately without seeing the condition of the sensor.
1	■■-----■■ M:01 NOT SET B:10	if one of the left active sensor blocks detects the line, and one of the right sensor blocks also detects the line then the robot will perform the action.
2	■■■-----■■■ M:02 NOT SET B:10	if one of the left active sensor blocks detects the line, and one of the right sensor blocks also detects the line then the robot will perform the action.
3	■■----- M:03 NOT SET B:10	if one of the blocks activated left sensor detects the line, then the robot will take action.
4	■■■----- M:04 NOT SET B:10	if one of the blocks activated left sensor detects the line, then the robot will take action.
5	■■■■----- M:05 NOT SET B:10	if one of the blocks activated left sensor detects the line, then the robot will take action.
6	■■-----■■■ M:06 NOT SET B:10	if one of the left sensor blocks is activated and one of the middle sensor blocks detects the line, then the robot will perform the action.
7	---■■----- M:07 NOT SET B:10	if one of the left sensor blocks is activated and one of the middle sensor blocks detects the line, then the robot will perform the action.
8	-----■■■ M:08 NOT SET B:10	if one of the right activated sensor blocks detects the line, then the robot will perform the action.
9	-----■■■ M:09 NOT SET B:10	if one of the right activated sensor blocks detects the line, then the robot will perform the action.
10	-----■■■■ M:10 NOT SET B:10	if one of the right activated sensor blocks detects the line, then the robot will perform the action.

MODE SENSOR	DISPLAY	EXPLANATION
11		if one of the right sensor blocks is activated and one of the middle sensor blocks detects the line, then the robot will perform the action.
12		if one of the right sensor blocks is activated and one of the middle sensor blocks detects the line, then the robot will perform the action.
13		if all the sensors detect the line, then the robot will do the action.
14		if all the sensors do not detect the line, then the robot will do the action.

Robot Action

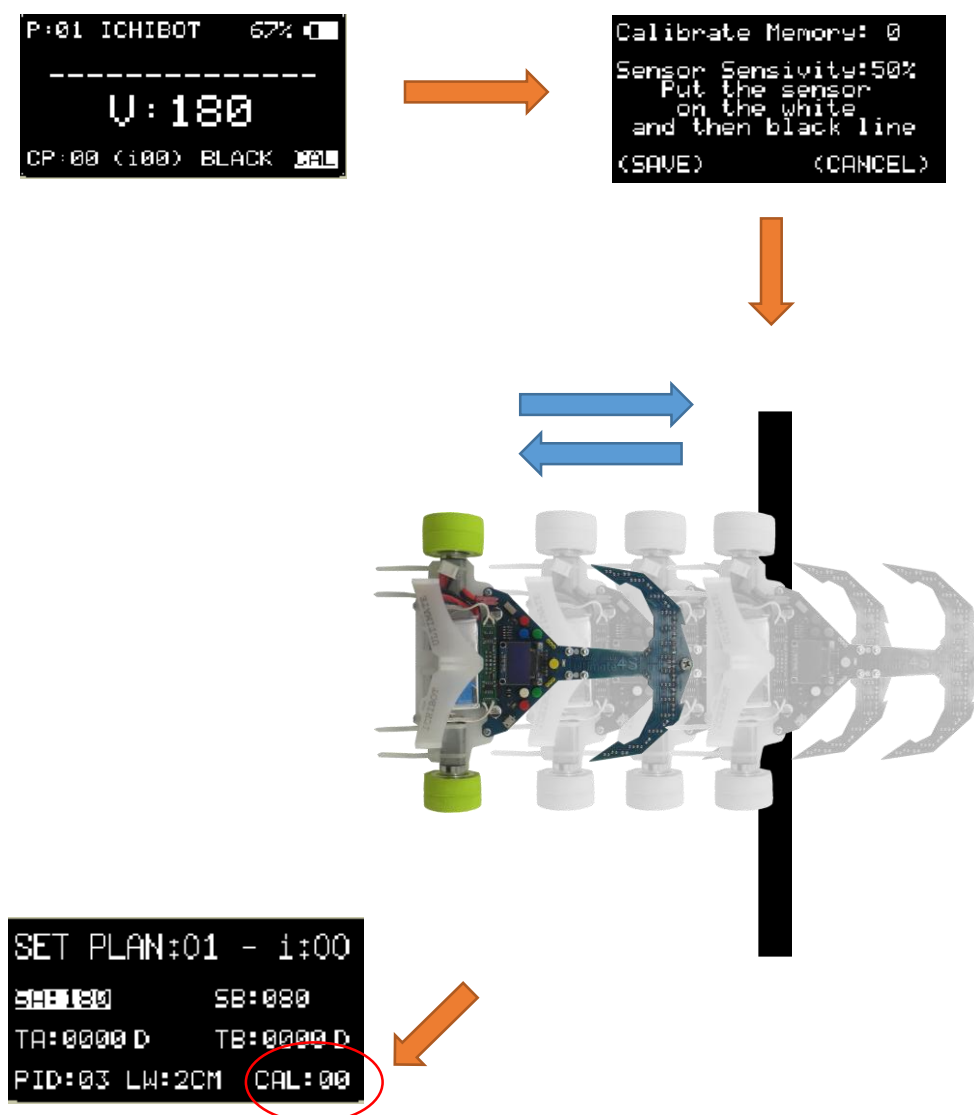
No.	ACTION	EXPLANATION
1	NOT SET	action not yet selected.
2	FORWARD	instant settings to choose straight ahead
3	LEFT	instant settings to perform the action turn left
4	RIGHT	instant settings to perform the action turn right
5	PICK	Instant settings for action take items in griper mode.
6	DROP	instant setting for action put items on griper mode.
7	BLOW	instant setting for the action to turn on the fan if the added fire extinguisher fan. Its automatic turn off when finish do ACTION.
8	BLACK	instant setting to change the line color mode to a black (dark) line with a white (light) track background.
9	WHITE	instant setting to change the line color mode to a white (light) line with a black (dark) track background.
10	P01-i00	Jump to P:(Target) - i:(target), press enter to change target Number

Robot movement during action is based on the values of L, R, D and B not based on the ACTION text. so you can choose LEFT or RIGHT but use it to stop.

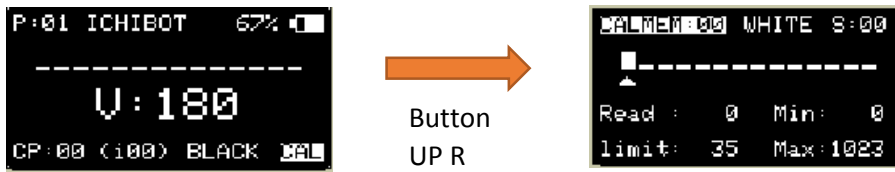


HOW TO CALIBRATE SENSOR

calibration is required before starting to play the ichibot LF 4s robot, so the sensor can adjust to the light of the room. on the main menu select **CAL** then push the robot forward and backward across the transverse line in front of it at least 5 times. press **enter button** to save calibration result. do not lift the robot before it is saved. the default calibration result is stored in memory 0. You can calibrate the sensor in the position of the other line and save it to another memory. in the settings menu of the index action you can specify the calibration memory option that will be used in the index action.

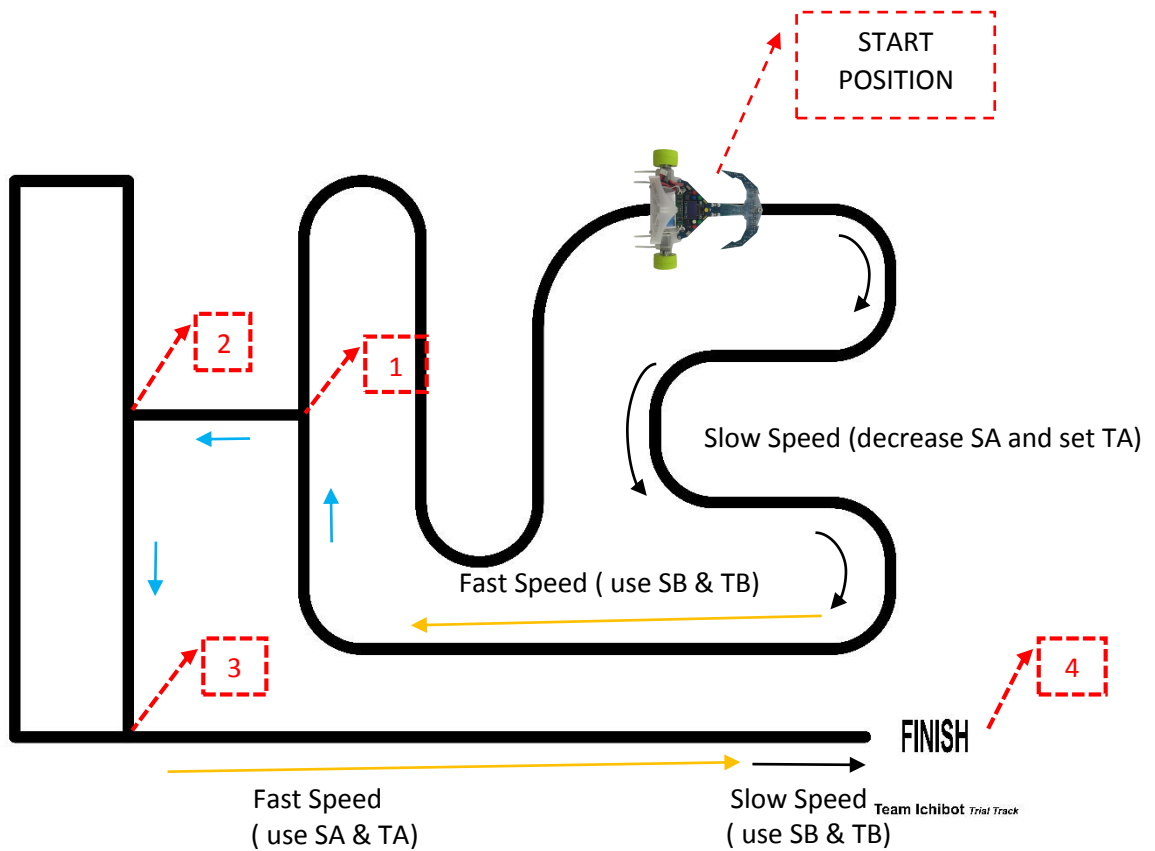


MANUAL CALIBRATE SENSOR



if there is an error sensor you can confirm it with the manual calibration menu. "Read" value is the value of sensor readings in realtime. the "limit", "max" and "min" values are the values of the automatic calibration results, you can change the value with the button settings. to shift the position of the sensor use the menu button (enter)

SET THE SPEED CHANGE



```

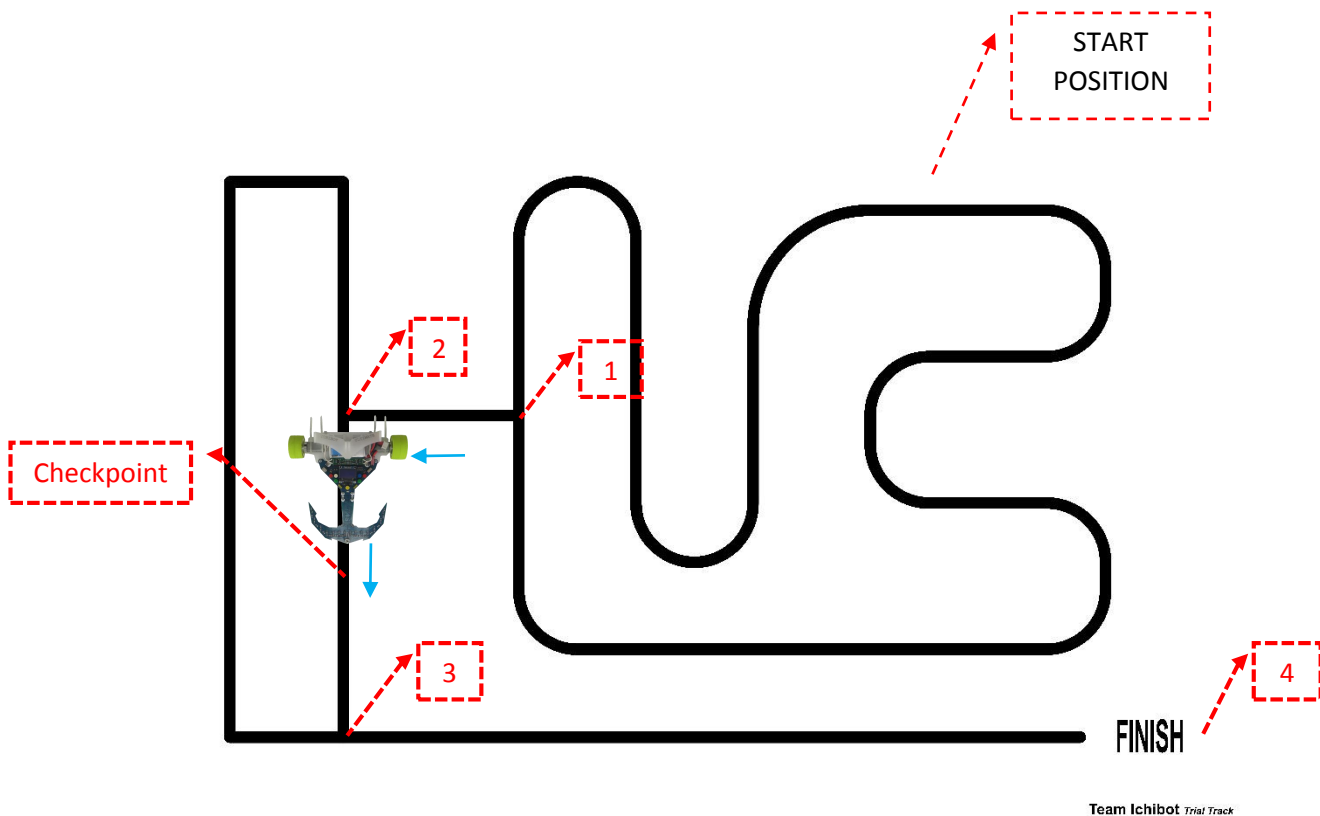
SET PLAN:01 - 1:00
SAB:00 SB:080
TA:0000 D TB:0000 D
PID:03 LW:2CM CAL:00
    
```

TIPS: use low PID numbers for zigzag paths and high PID numbers for precision of robot positions on the line.

to get the best time record then we need to set the speed of the robot, when encountering a long straight line then increase the speed when it encounters a curved line then lower the speed. For example in the previous case from start point to encounter the curved line then in setting index 0 (i:00) set the value of speed A (SA) below velocity V (example: 70) and set the value of timer A (TA) so that robot use SA speed until finish curved line. then set the speed B (SB) at high speed (example: 180) and set the timer B (TB) value to finish before the intersection. in index 3 use SA to increase speed and SB to lower the speed before touching the finish line.

WHEN "TIMER A (TA)" ACTIVE THEN DETECTION "SENSOR INDEX" WILL BE OFF, ROBOT WILL NOT DETECT THE NEXT INDEX AS "TA" ON.

START FROM CHECK POINT



```
CHECKPOINT P:01
CP:01 i:02 BLACK
SA:160 SB:060
TA:0000 D TB:0000 D
```



```
P:01 ICHIBOT 67%
> U:000 <
CP:01 (i02) BLACK CAL
```

if it has set many indexes and wants to start after a certain index, just set the CP value and set the previous index. then on the main menu set CP value and run the robot from that point.

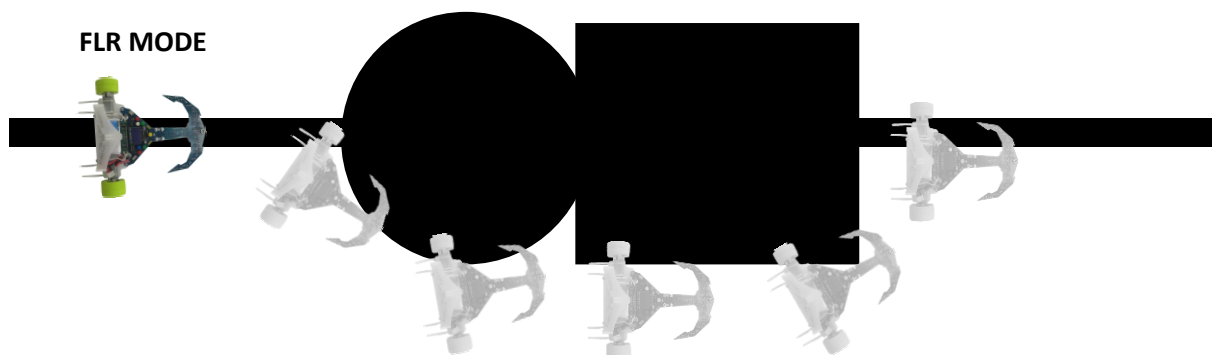
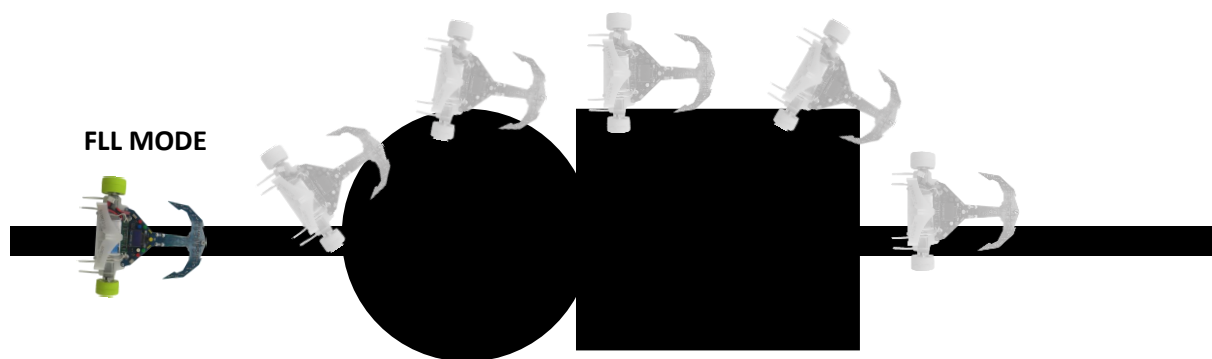
SET RUN MODE (RM)

- FLL (FOLLOW LINE - CENTER)
- FLL (FOLLOW LINE - LEFT)
- FLR (FOLLOW LINE - RIGHT)

```
SET PLAN:01 - i:01
SA:255      SB:255
TA:0000 D   TB:0000 D
PID:03 RM:FLC CAL:00
```

Recommendations:

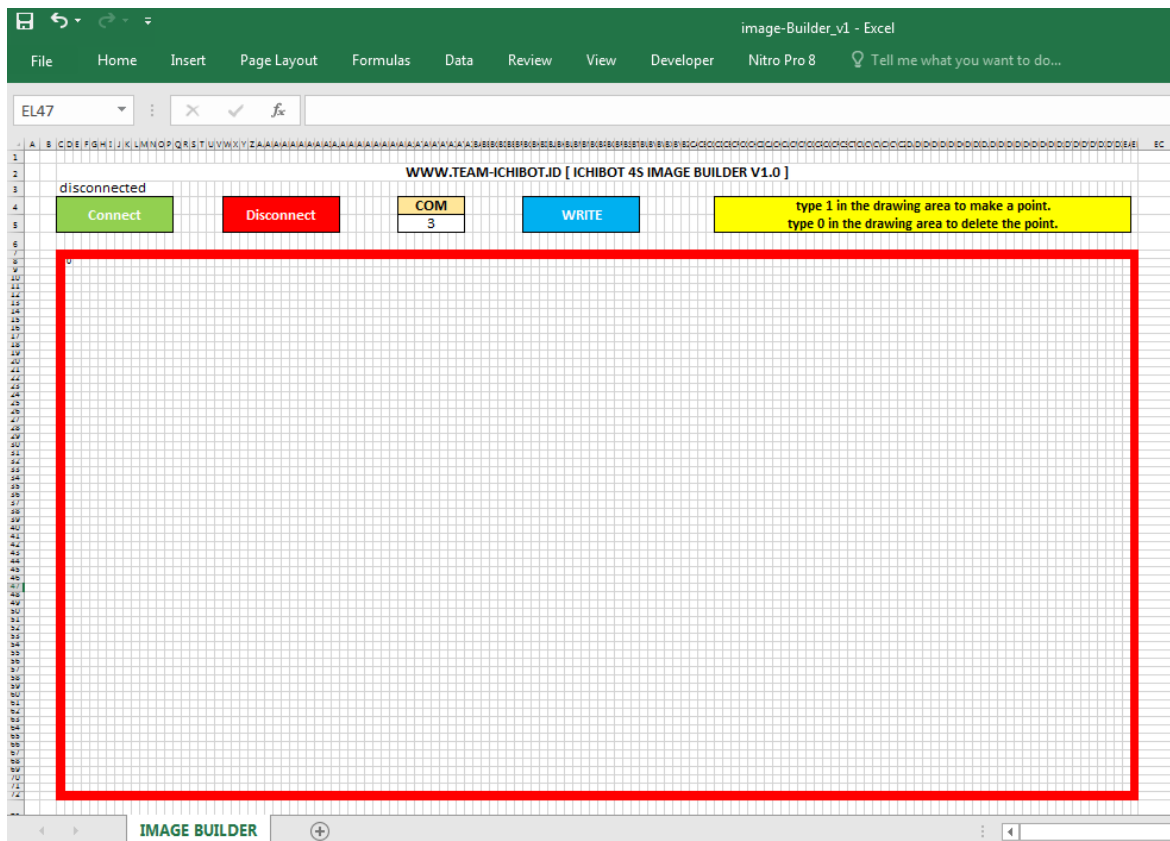
- use PID 5 for FLR or FLL
- use PID 3 for FLC
- if use FLL Mode robot will running along the left edge of the line.
- If use FLR Mode robot will running along the left edge of the line.
- If use FLC Mode robot will running along the Center of the line.
- Activate TA and SA, robot will not detect next index action as long as TA active.

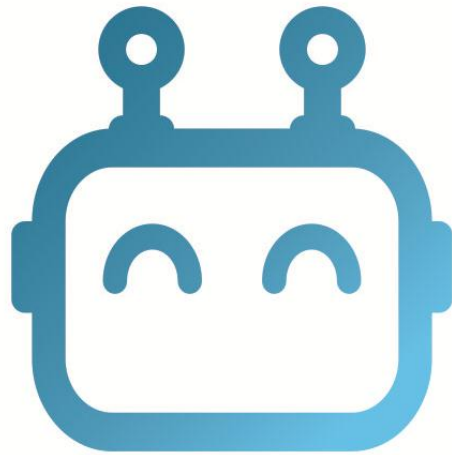


CREATE CUSTOM LOGO



You can change the logo on the home screen as you wish. download the image builder and follow the instructions in the following link <https://team-ichibot.id/download/>





ICHIBOT

Exclusive Toys For Teenagers

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