

2 Robot Pick and Place

NAME: _____

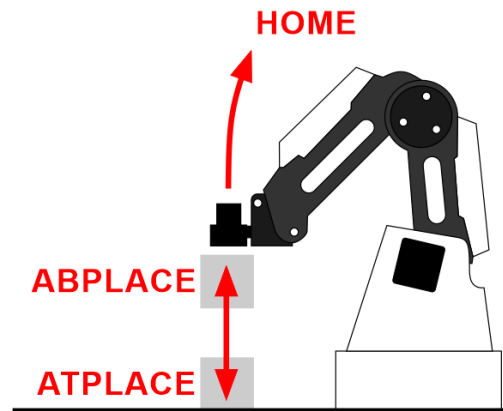
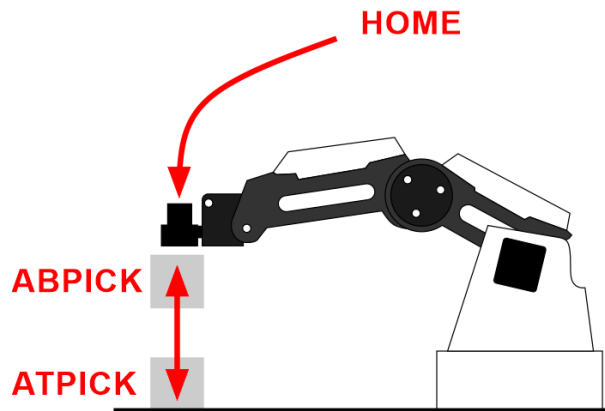
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INTRODUCTION

Robotic arms are excellent for performing pick and place operations such as placing small electronic components on circuit boards, as well as large boxes on pallets. A pick and place operation will require at least 5 points:

- Home
- Above the pick point
- At the pick point
- Above the pick point
- Above the place point
- At the drop point
- Above the place point
- Home



As a rule, always go to a position above the pick or place point first so that the robot can accurately and repeatedly place the object straight down in a linear motion, with no friction or interference.

KEY CONCEPTS

- How does a robot perform a **pick and place** operation?
- What **end effector** or **end of arm tooling** works best?
- What are Pick and Place **conventions** in industry?
- How do I attach the **Mechanical gripper** to the Dobot?
- How do I **record** positions with the Dobot?
- How do I easily edit a program in DobotStudio?

KEY VOCABULARY

- Relative positions
- Palletizing
- Pick and Place
- Home
- Linear movements
- Joint movements
- End effector
- End of Arm Tooling (EoAT)

EQUIPMENT & SUPPLIES

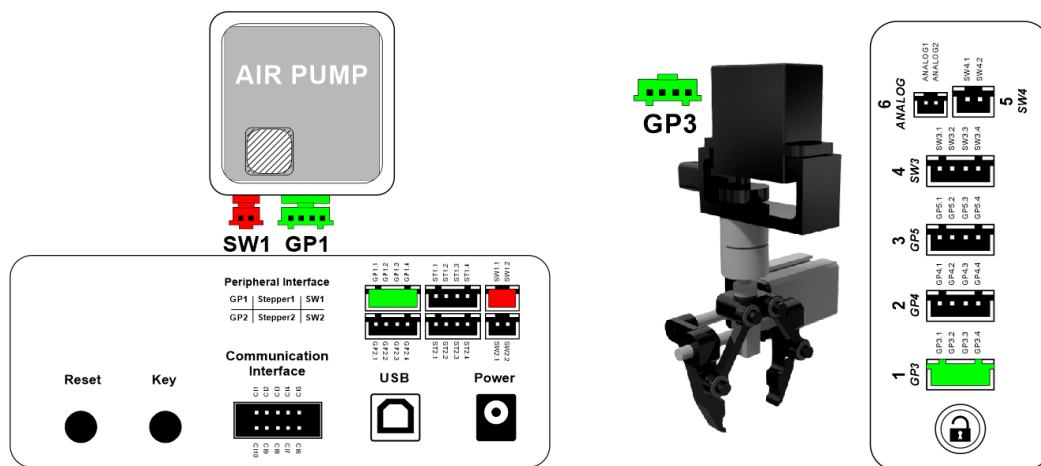
- Dobot Magician
- Dobot Field Diagram
- 1 inch cylinders or 1 inch cubes
- Pneumatic Gripper
- DobotStudio software
- Accompanying video: Pick & Place with the Dobot

PROCEDURE



Caution: NEVER wire anything to the Dobot Magician while it has power on. ALWAYS turn it off before making connections or damage to the robot could occur.

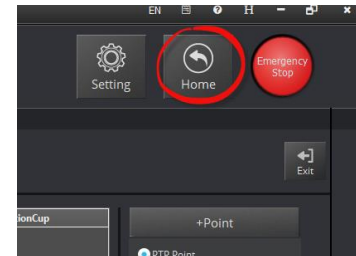
1. Attach the *Gripper* to the *rotational servo* and then attach it to the robot, and plug in the wires as shown below. See instructor for demo if the gripper is not already installed on the servo.



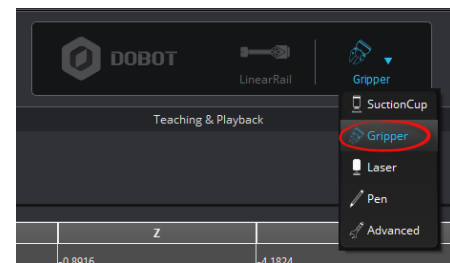
2. Open Dobot Studio software and connect the robot.



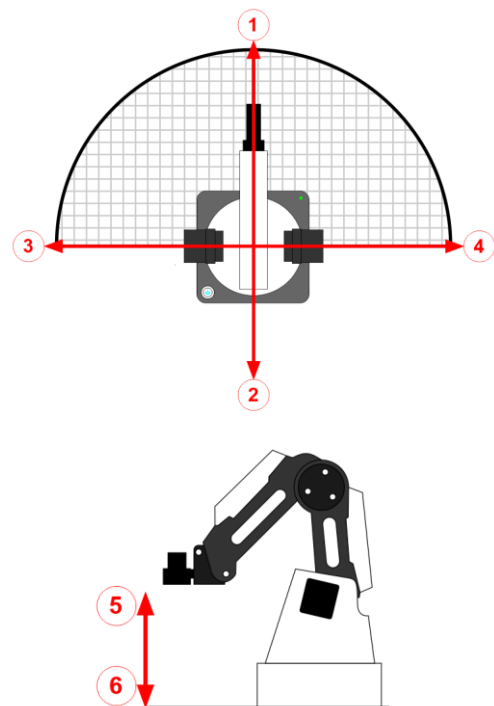
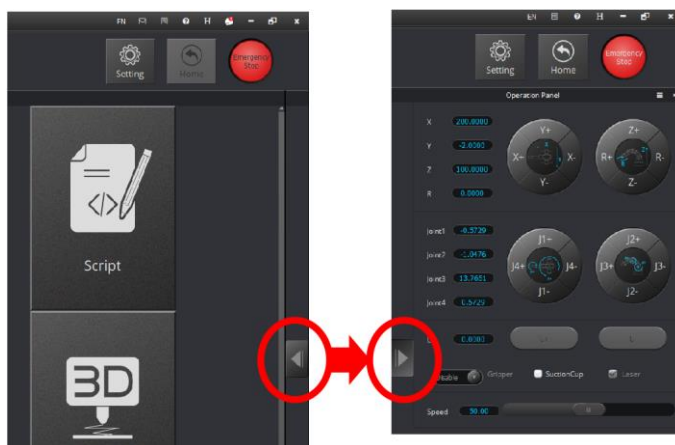
3. *Home* the robot making sure the robot's work envelope is clear.



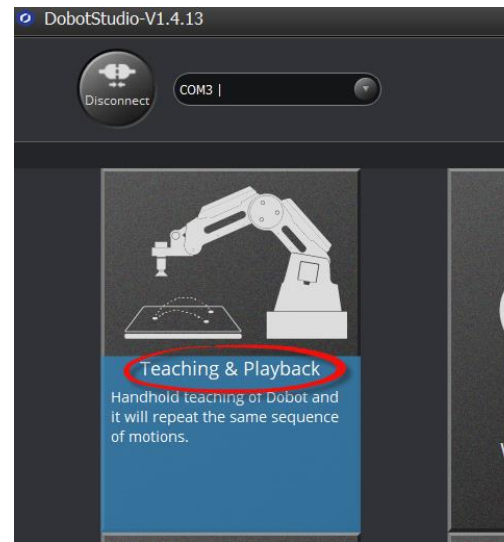
4. Be sure the *Gripper* is chosen as the accessory.



5. Open the *manual control panel*, and move the robot around. In the space below, draw a diagram showing the X and Y axis on the robot. Be sure to label the arrows as +/-.



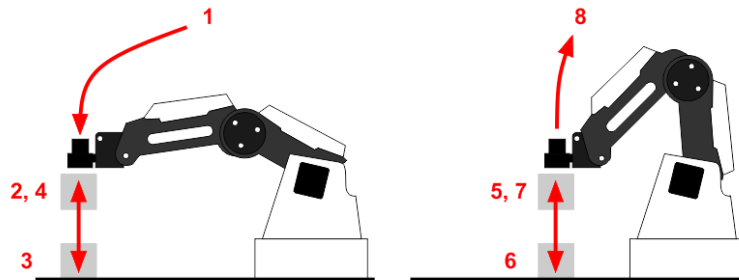
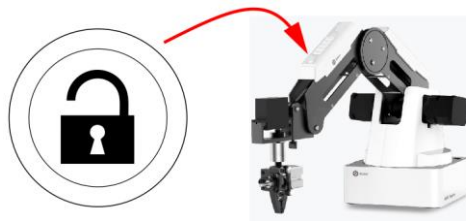
6. Now open the *Teach and Playback* module:



7. Place one of the $\frac{3}{4}$ " wooden cylinders on one of the squares of the field diagram.

8. Use the "Lock" button on the arm to record all the positions necessary to do a pick and place operation in this order:

- Home
- Above Pick
- At Pick
- Above Pick
- Above Place
- At Place
- Above Place
- Home

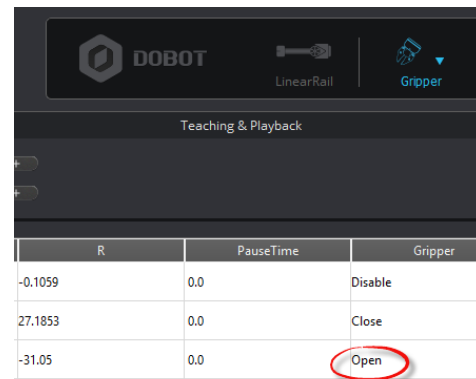


9. Name the positions in the *name column* of the program.

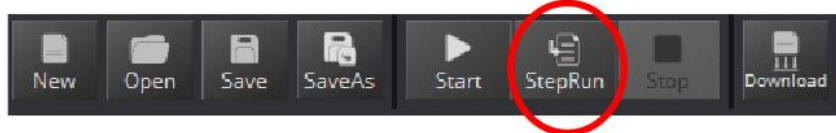


Be sure to name the positions something relevant so that others will be able to tell what the positions are. Example: A point named AbPick means the point above the place where it is picked up.

10. Be sure to open and close the gripper using the *gripper column* as shown.



R	PauseTime	Gripper
-0.1059	0.0	Disable
27.1853	0.0	Close
-31.05	0.0	Open



Use Step Run to run through your program 1 step at a time before trying to run the entire program. Make any edits as necessary as you go.

11. Hit the “Play” button to run your program and see what happens. *Did it work the first time? If not, what did you have to change to make it work?*

12. Change the position type of step #5 (above place) in the first column to *Move Linear* (MOVL). *Run the program. What changed?*

- Using the *options menu*, add another Home position between the Above Pick and the Above Place (steps 4 & 5)



Use Copy, Move Up, Paste, or Move Down commands. that you used before in the options menu as shown.

	MotionStyle	Name
1	MOVJ	Home
2	MOVJ	Above Pick
3	MOVJ	At Pick
4	MOVJ	Above Pick
5	MOVJ	Home
6	MOVL	Above Place
7	MOVJ	At Place
8	MOVJ	Above Place
9	MOVJ	Home



	MotionStyle	Name	X	Y	Z	R	PauseTime	FunctionCup	Trigger_IO	Condition	Value
1	MOVJ		202.0628	0.3735	18.2358	0.1059	0.0	SuctionCupC			
2	MOVJ		237.7551	-20.3704	-27.5754	-4.897	0.0	SuctionCupC			

Add values to the *PauseTime* Column to add a delay at the end of a step. *PauseTime* should be used when trying to ensure the gripper pressure has completely built up before picking up an object and used to ensure the gripper is completely open before moving away from a placed object.

- Save your work.

CONCLUSION

1. *How can you get the suction to turn on in time to pick up the part, or get it to shut off in time to drop it off correctly? Explain below after you have tried it in the program.*

2. *What happens if you replace the $\frac{3}{4}$ " cylinder with a $\frac{3}{4}$ " wooden cube? Run it and see. Describe below what happens.*

GOING BEYOND

Finished early? Try some of the actions below. When finished, show your instructor and have them initial on the line.

- | | |
|-------|---|
| _____ | 1. Have the robot reverse the process and put the cube back in its original place. |
| _____ | 2. Make the process happen multiple times. |
| _____ | 3. Adjust the speeds of each position to increase efficiency but not lose accuracy. |