

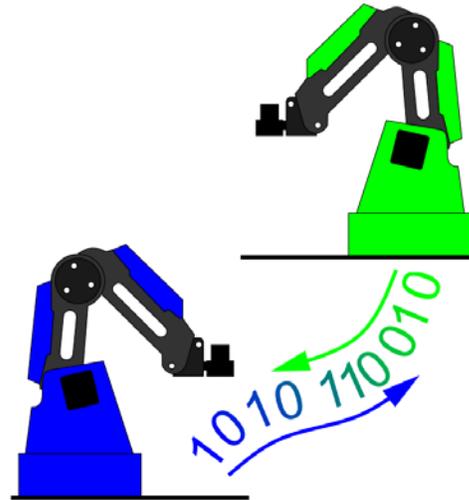
# 6 Handshaking: Dobot to Dobot

NAME: \_\_\_\_\_ Date: \_\_\_\_\_ Section: \_\_\_\_\_

## INTRODUCTION

Robotic arms need to communicate with other robots in a work cell, or factory. This is called **HANDSHAKING** and can be done between different machines, devices and robots. It is a very simple form of communication and is done with simple ones and zeros; or “ons” and “offs”.

In this activity you will learn how to make a robot handshake with another robot. Robot 1 will pass a part into another robot’s work envelope and then send a signal and go to a safe position. The other robot will then receive the signal, get the part, and place it somewhere else.



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

## KEY VOCABULARY

- Handshake
- Signal
- Pull down resistor
- Optical Isolator
- Text
- Current limiting resistor

## EQUIPMENT & SUPPLIES

- Robot Magician
- Dobot Field Diagram
- 1" x 3/4" cylinders or 3/4" cubes
- Servo extension cables
- Dobot Input/Output Manual
- Breadboard/wire/4N25 Optical Isolator and 100 ohm & 4.7K ohm resistors
- DobotStudio software
- RobotC or other VEX control software
- Pneumatic Gripper or Suction Cup Gripper
- Handshake module
- VEX bump switch or limit switch
- VEX, PIC, Arduino may all be used in this activity, but wiring may vary.



## PROCEDURE

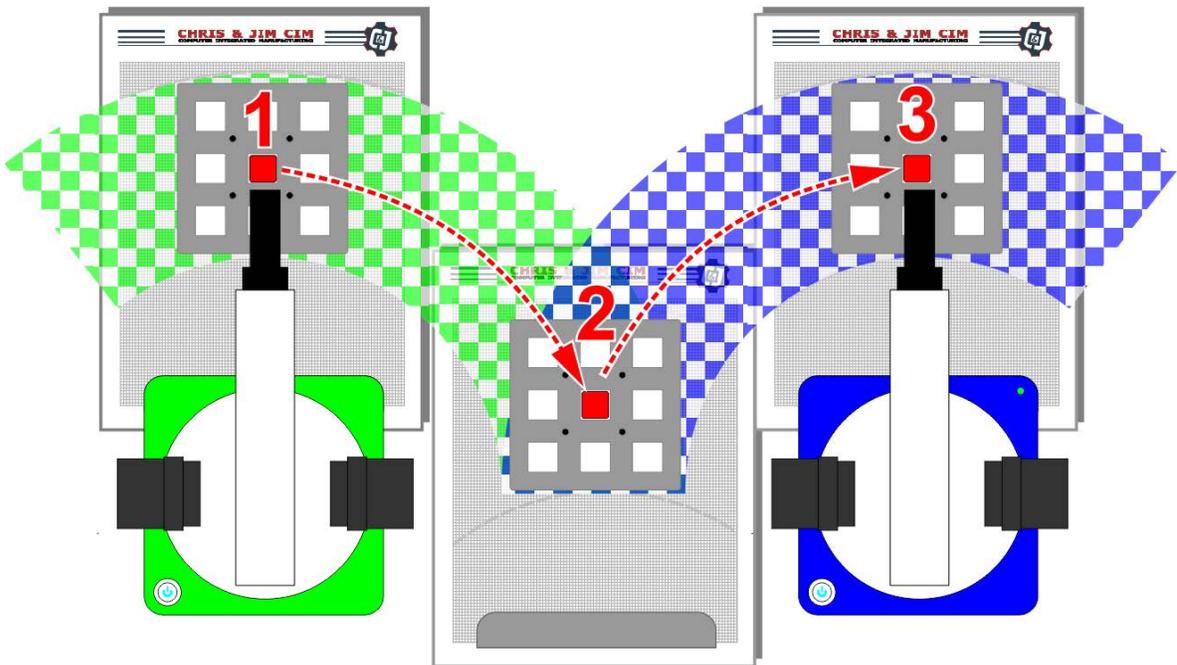


**Open Loop System Block Diagram:** Robot #1 acts as the input for robot #2. Robot #2 does not communicate back to robot #1 so there is no feedback. The Handshake Module acts as the device that helps make the handshake happen safely.



**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. Be sure to ask your instructor if you have any questions.

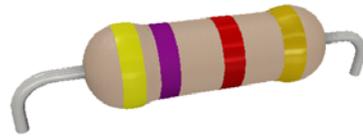
1. Set up both robots with suction cups and place a Dobot field diagram, taped to the work surface, between the two robots.
2. Wire the robot 1 to robot 2 through the handshake controller as shown below. Be sure that wires are not going to be pulled out by the motion of the robots.





100 Ω - INPUT SIDE

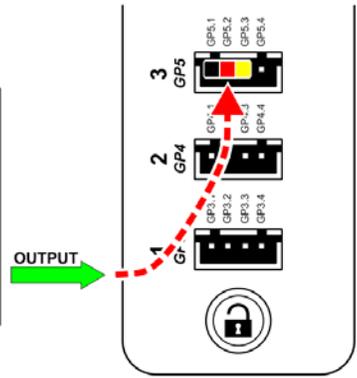
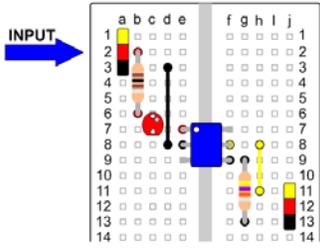
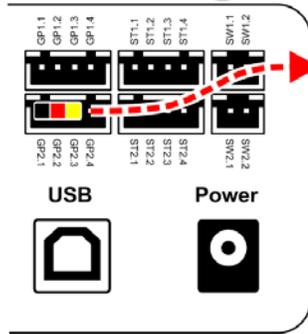
BROWN	BLACK	BROWN	GOLD
1	0	X10	5%



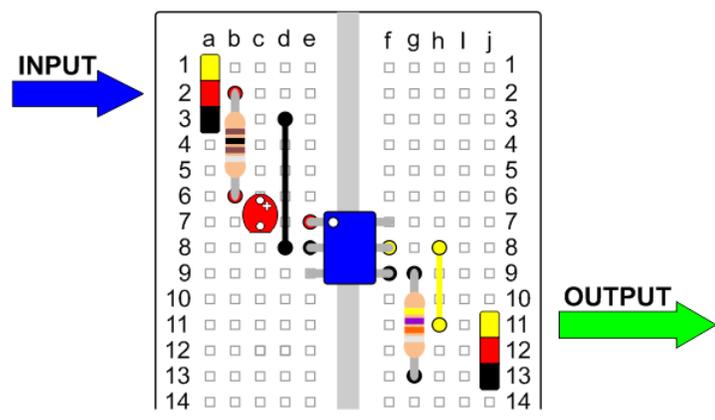
4.7k Ω - OUTPUT SIDE

YELLOW	VIOLET	RED	GOLD
4	7	X100	5%

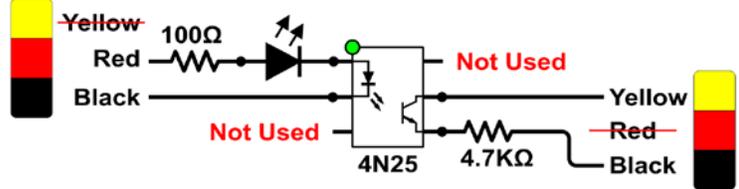
# ROBOT1 Send Signal



# ROBOT2 Receive Signal



HANDSHAKE MODULE



Wire Robot #1 so that GP2 is wired to the input of the handshake module. Then wire the output of the handshake module to the Input of robot #2. This is labelled #3 on the arm. Please refer to the wiring diagram above. You can use servo extension cables to do the wiring.



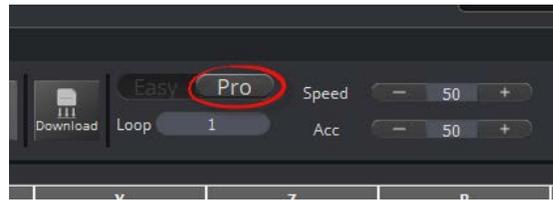
Notice that on the **INPUT** to the handshake module you will use the RED and BLACK wires to trigger the Optical Isolator. On the **OUTPUT** side you will use the YELLOW and BLACK wires to trigger the input on the other robot.



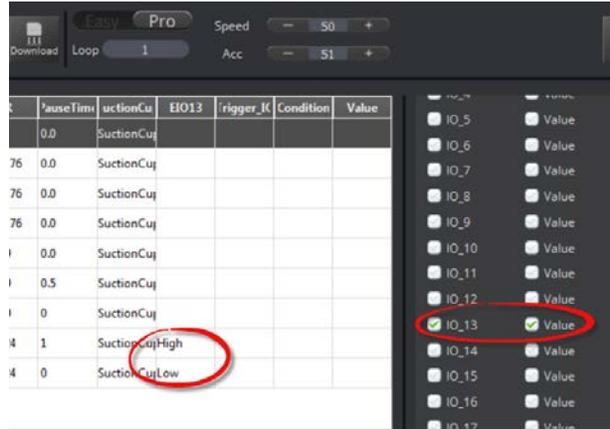
- Be sure you are in Pro mode in the DobotStudio software.



*When you re-open this program if you do not switch to Pro mode, it will not use the inputs and outputs and the program will ignore them!*



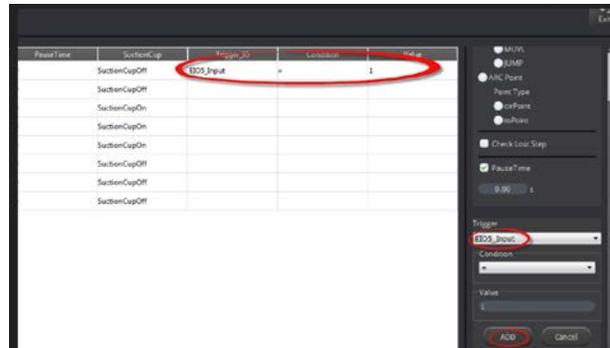
- Set up the Dobot Studio program for robot # 1 so that it moves the part from its position into the work envelope of the second robot. It needs to send a signal to EIO13 for 1 second (high), then turn the signal off (low)



Be sure to use EIO13 as an output on the last two lines of code. Turn it on in the first one and pause for 1 second, then off on the second step. Use copy and paste to do this.

Also, add a check next to IO\_13 as shown, then TEACH the position. This will add it to your program.

- Set up the DobotStudio program for robot # 2 so that it waits until robot #1 sends a signal to pick it up, then place it somewhere else. Be sure to use EIO5 as the trigger input, and set it at High for 1 second, then turn it off in the next step.



***Be sure to consult the Dobot Input/Output manual if you want to use other inputs and outputs, as damage to your robot or your other equipment may result.***





## GOING BEYOND

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

\_\_\_\_\_ 1. Add an input switch to the first robot to start the whole process.

\_\_\_\_\_ 2. Make the robots **palletize** three **cubes** as the diagram below shows. Start with three cubes on the first pallet, use the second pallet as a buffer to do the hand off, and then have the second robot place them on pallet 3. Be sure to adjust the **roll angle** accordingly.

