



## LESSON FOUR: TOUCH SENSORS



### OBJECTIVES



- Modify and program a car to move forward, touch an obstacle, turn around, and cross a finish line.
- Use a touch sensor to signal a car to change direction.



### MATERIALS



- LEGO Team Challenge kit (one to two groups of students per kit)
- ROBO LAB software 1.5 or higher- Pilot Level 4
- Cars from Lesson One
- Pilot Level 4 Plan Sheet - *Resource Section*
- Pilot Level Icon sheet - *Resource Section*
- Rubrics (optional) - *Resource Section*
- Journal Resource page or paper
- Computers
- Infrared towers



### TIME



Two to three forty-five minute class periods.



### VOCABULARY



touch sensor

obstacle

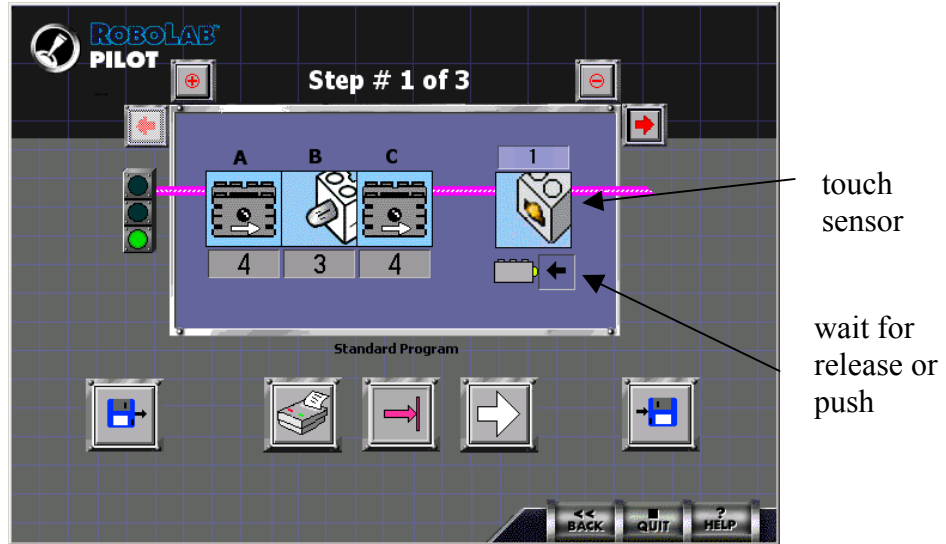
wait for push

wait for release


# PROCEDURE

## Introduction

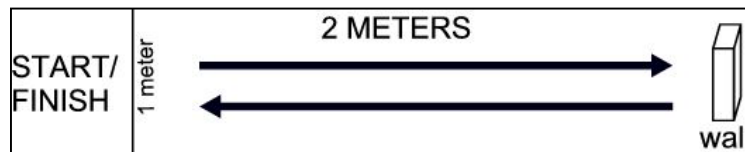
1. Show students a touch sensor and ask for ways they might use one on their car. Look at Pilot Level 4 and determine when students would use a light sensor icon with an arrow pointing *toward* the sensor and when students would use an icon with an arrow pointing *away* from a sensor.



2. Assign the design challenge:



Modify and program your group's car to roll forward from a "starting" line, sense an obstacle such as a wall, turn around, and then travel back across the "starting" line.



3. Discuss ways students might attach touch sensors so that the sensors will not fall off from impact with the obstacle.
4. Discuss speeds the cars should travel so they do not ram against obstacles and break.

### **Designing**

5. Students will need to modify cars to include a touch sensor.
6. Provide each group with a Pilot Level 4 Plan Sheet and Icon Sheet. Students will cut out icons they need and place them on the plan sheet to show what their program will look like.

### **Programming and Testing**

7. Once ROBOLAB plan sheets are approved, students may program on the computer. Go to designated area to test cars. Revise programs until cars can complete the task or time is up.
8. Hold a demonstration so groups can present their cars.



## **ASSESSMENT**

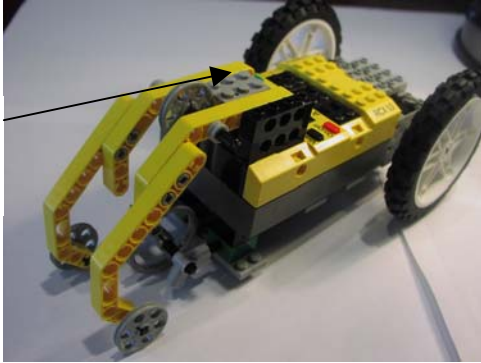


1. Each group's car should be able to move forward, gently hit an obstacle such as a wall, turn around, and travel across a finish line.
2. Each member of the group should be able to explain the program, problems that occurred during the project, and how the group solved the problems.
3. Students should individually record their experiences in a journal, on the Journal Entry Resource page, or paper. Lower grade level students may illustrate their responses. Suggested journal questions:
  - a. Explain your ROBOLAB program. How was your group able to make the car complete the task?
  - b. How did your group modify the car to include a touch sensor? What problems, if any, did you experience?
  - c. Describe what your car did when you tested it for the class. Was your group satisfied with the outcome? Why or why not? How would you improve your car?
  - d. Explain the vocabulary words your group used while completing the project.

## EXTENSION IDEA

Program a car to roll across an elevated flat surface, such as a table, without falling off. The car should move forward, sense the edge of the surface, stop, turn around, and travel in the opposite direction until reaching another table edge. A touch sensor should be placed on the car so that when it reaches a drop off, an arm or other structure will move to press or release the sensor. More than one touch sensor can be used. The vehicle should keep moving without falling off the edge of the surface.

Touch sensor



Touch sensor

In this example a touch sensor is released when the car reaches the edge of a surface.



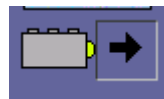
1. Students may place the touch sensor directly in front of the car. Students will discover that the touch sensor will need to be reinforced to prevent it from falling off from the impact on the obstacle. Also try placing a LEGO piece in front of the touch sensor. When the LEGO piece makes contact with the wall, it will press the touch sensor causing the car to change direction.
2. Students will discover that the car may perform the entire task more easily if they make it back up from the wall before turning.
3. New icons:



Touch Sensor



Wait for push- wait for touch sensor to be pushed in before next action.



Wait for release- wait for touch sensor to be released before next action.