

## Team Assignment #3 Testing BOE-BOT Servos

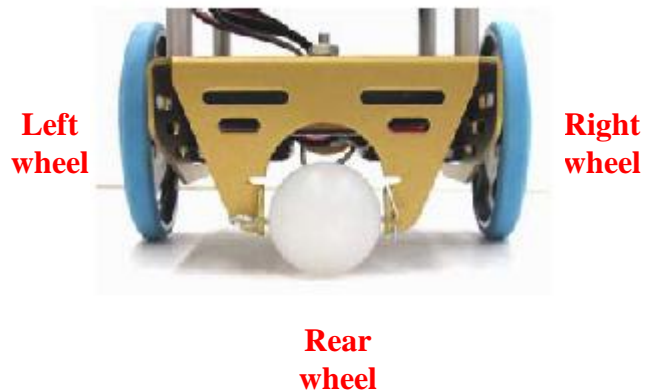
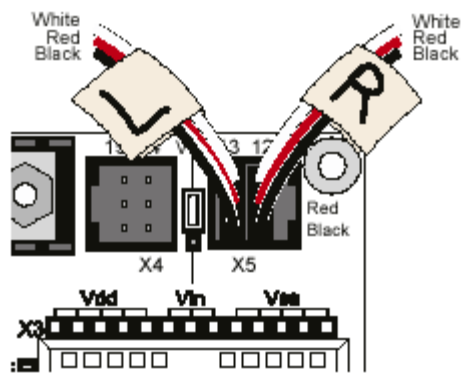
### Reading Assignment:

- 1) Refer to the following sections in Robotics Version 2.2 (follow link on Paul Gordy's web page or online at [www.parallax.com](http://www.parallax.com))
  - Chapter 2 – Your BOE-BOT's Servo Motors
- 2) Refer to various sections of BASIC Stamp Syntax and Reference Manual, Version 2.1 for information of PBASIC commands (follow link on Paul Gordy's web page or online at [www.parallax.com](http://www.parallax.com))
- 3) BOE-BOT Lecture #2 – Servos and the BOE-BOT

### Team Assignment:

- 1) Connecting the servos

Connect the two servos to the BOE-BOT as shown in the diagram below. Remember that the ping-pong ball wheel on the BOE-BOT is a rear wheel when you determine which is the left wheel and which is the right wheel.



- 2) Testing the left servo

Turn the servo on its side with the left wheel facing up. Put a piece of tape on the wheel to assist you in counting wheel revolutions. Use the program below to test the servo. Specifically:

- Begin by using a DURATION of 650.
- Run the program and count the number of wheel revolutions (to the nearest  $\frac{1}{4}$  revolution) that occur in 15 seconds (use a watch). You may need to increase the final value (50) in the FOR loop if the servo doesn't run long enough. Record the value in the table for the LEFT SERVO.
- Repeat the step above for each line in the table. If for some reason the servo doesn't seem to have reached its max speed using DURATIONS of 650 and 850, you may need to extend the range.
- Find the value of DURATION (or perhaps a range) where the servo is stopped and record it in the last line of the table.
- Ask your instructor to look over your table and verify that the information looks correct before proceeding.

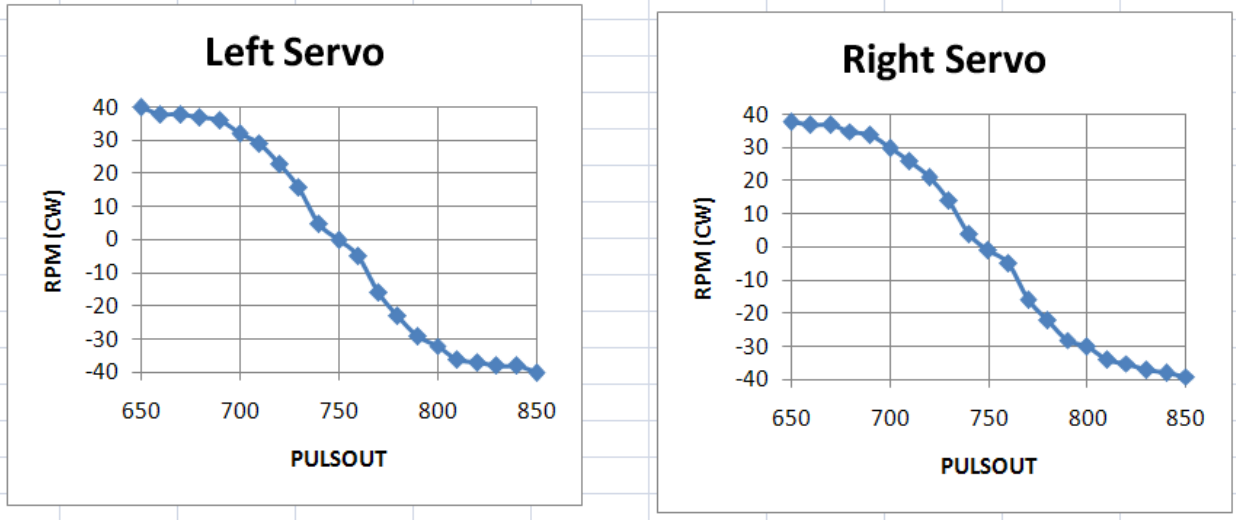
```
Counter VAR WORD      'Add plenty of comments to this program (see Report requirements)
FOR Counter = 1 TO 1000 'Adjust this number to that the servo will run for at least 15 seconds
  PULSOUT 13, DURATION 'Change DURATION from 650, 660, 670, etc.
  PAUSE 20
NEXT
```

2) Testing the right servo

Repeat the last step for the right servo. Be sure to change the output pin in the program from P13 to P12.

3) Analysis

- Type the two tables into Excel. Include information such as course number, team assignment number, BOE-BOT number, your team number, each team member's name (only if present), a descriptive title, and the filename (pick an appropriate filename).
- Graph CW RPM versus PULSOUT for each servo (use a separate graph for each servo). An example is shown below:



- If the BOE-BOT is to travel in a straight line at full speed, what values should be used for DURATION1 and DURATION2 in the program shown below?

```

Counter VAR WORD
FOR Counter = 1 TO 5000
  PULSOUT 13, DURATIONLEFT
  PULSOUT 12, DURATIONRIGHT
  PAUSE 20
NEXT
    
```

- For the program above, how fast is the BOE-BOT travelling in in/s, ft/s, and mph? Assume that the wheels have a diameter of 2.5 inches.
- For the program above, how long will it take the BOE-BOT to travel 10 feet?
- Copy the Excel table above to another sheet. Add columns for velocity in in/s, ft/s, and mph. Show what Excel formulas were used for the first line of calculations under the table.

Left Servo Wheel			
PULSOUT Duration	# Rev in 15 s	RPM	CW or CCW?
650			
660			
670			
680			
690			
700			
710			
720			
730			
740			
750			
760			
770			
780			
790			
800			
810			
820			
830			
840			
850			
	0	0	Stop

Right Servo Wheel			
PULSOUT Duration	# Rev in 15 s	RPM	CW or CCW?
650			
660			
670			
680			
690			
700			
710			
720			
730			
740			
750			
760			
770			
780			
790			
800			
810			
820			
830			
840			
850			
	0	0	Stop

4) **Report**

Organize your results into a report and submit a single typed report for the group to the instructor by the assigned due date. The report should consist of:

- A) A **title page** as shown below.
- B) Printouts for each of the two programs (for any DURATION value). Include comments **in all programs** specifying the course number, team assignment number, BOE-BOT number, your team number, each team member's name (only if present), the program number (Program 2A), and the filename (pick an appropriate filename). Include plenty of comments.
- C) Neatly present all information in the Analysis section.

EGR 120  
Introduction to Engineering  
**Team Assignment #3**  
Date

Group #N (your group number)

Attendance & Participation Record:

(list all team members and all dates when teams worked together in class on this assignment and check boxes to mark attendance)

Team Member	Date 1	Date 2
John Doe	✓	✓
etc		

Demonstration of Programs

Program	Successfully Demonstrated
1	✓
2	✓