This worksheet is to be used with Squarebot, and should not be attempted before completion of the first transmitter lesson.

Working with Jumpers

Activating Autonomous Mode

Jumpers can be used to enable several programs built-in to the Vex controller. The choice of port for the jumper determines which code will be enabled.

1. You may have moved the motor connections around in previous exercises. Squarebot's left motor should now be plugged into motor port 3, while the right motor should be plugged into motor port 2.
2. Place a jumper clip on Analog/Digital port 13 to enable Autonomous Mode operation.
3. You must connect two bumper switches to Squarebot. The first bumper switch should be attached to the front face on the left side of the robot, while the other bumper switch should be attached to the front face on the right side of the robot. The left switch should be plugged into Analog/Digital port 11, while the right switch should be plugged into Analog/Digital port 12.
4. Place Squarebot on the floor, turn the Vex controller on, and observe what happens. Do not be afraid to let the robot run into things. Turn the controller off when you are done.
5. Approximately how much time elapses between the moment that the Vex controller is turned on and the time that Squarebot begins moving?
   _____
6. What do you think is the purpose of this time delay?
   _____
7. Describe Squarebot's action, both as a whole and in terms of its individual motors, under the following three conditions: no bumper sensors depressed, only bumper 11 depressed, only bumper 12 depressed.

No Bumper Depressed
Squarebot as a whole:
Left rear wheel:
Right rear wheel:

Only Bumper 11 Depressed
Squarebot as a whole:
Left rear wheel:
Right rear wheel:

Only Bumper 12 Depressed
Squarebot as a whole:
Left rear wheel:
Right rear wheel:

8. Would the program be equally effective if the wheels moved forwards, rather than backwards, each time an obstacle was hit?

   _____

9. Turn on the transmitter while the robot is running. Can you control the motors with the transmitter?

   _____

Four Wheel Drive in 23 Mode

10. Modify Squarebot for Four Wheel Drive.
11. The motors should be connected to the controller in the following fashion:
    Right rear motor: motor port 2
    Left rear motor: motor port 3
    Right front motor: motor port 7
    Left front motor: motor port 8
12. Place a jumper clip on Analog/Digital port 15 to enable Four Wheel Drive in 23 Mode.
13. Make sure that the transmitter is set to Drive Mode 23.
14. List the action, including direction of rotation, of the four wheels under the following conditions:

Right Joystick Up
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

Right Joystick Down
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

Left Joystick Up
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

Left Joystick Down
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

15. What happens when you move the joysticks along axes 1 and 4?
    _____
16. Which motor ports does channel 2 seem to control?
    _____
17. Which motor ports does channel 3 seem to control?
    _____
18. Let's imagine you removed the right rear motor from port 2 and plugged it into motor port 1. Which joystick do you think would control the motor? Which direction would you have to move that joystick?
    _____
19. Turn the Vex controller off and remove the jumper. Turn the robot back on and test the controls again. What is different?
    _____
20. What seems to be the function of the jumper when it is in Analog/Digital port 15?
    _____
21. Think of a situation where using Squarebot with a jumper in port 15 would be helpful.
    _____

Four Wheel Drive in 12 Mode

22. The Squarebot should still be arranged for four wheel drive.
23. The motors should be connected to the controller in the following fashion:
    Right rear motor: motor port 2
    Left rear motor: motor port 1
    Right front motor: motor port 7
    Left front motor: motor port 8
24. Place a jumper clip on Analog/Digital port 16 to enable Four Wheel Drive in 12 Mode.
25. Set the transmitter to Drive Mode 12.
26. List the action, including direction of rotation, of the four wheels under the following conditions:

Right Joystick Up
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

Right Joystick Down
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

Right Joystick Right

Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

Right Joystick Left
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

27. What does Squarebot do when you move the left joystick?
    _____
28. What do you think would happen if you removed the rear wheels from motor ports 1 and 2 and placed them in ports 3 and 4?
    _____
29. How is Squarebot's behavior different than it was in the last exercise under Drive Mode 23?
    _____
30. How is Squarebot's behavior different that it was when Drive Mode 12 was used back in the transmitter options menu?
    _____

Software 12 Mix

31. Squarebot should still be set up like it was in the previous exercise.
32. Place a jumper clip on Analog/Digital port 14 to enable Software 12 Mix Mode.
33. Set the transmitter to Drive Mode 23.
34. List the action, including direction of rotation, of the four wheel assemblies under the following conditions:

Right Joystick Up
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

Right Joystick Down
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

Right Joystick Left
Left front wheel:
Left rear wheel:

Right front wheel:
Right rear wheel:

Right Joystick Right
Left front wheel:
Left rear wheel:
Right front wheel:
Right rear wheel:

35. What does the robot do when you move the left joystick?
    _____
36. What do you think would happen if you removed the wheel assemblies from motor ports 1 and 2 and placed them in ports 3 and 4?
    _____
37. Which Drive Mode does Squarebot seem to be in? 12 or 23?
    _____
38. In a previous exercise, you chose the Drive Mode through the transmitter's options. How did you choose the Drive Mode in this exercise?
    _____
39. Is there any difference between the Drive Mode now when compared to the same Drive Mode when it is chosen through the transmitter options? (HINT: Pay close attention to the speed of the motors.)
    _____