

This worksheet is to be used with the remote control test bed. If you do not already have one assembled, you can find building instructions in the Test the Kit link under “Overview.”

Working with the Transmitter

Default Transmitter Settings

You have the ability to adjust several settings on the Vex transmitter. We will begin by ensuring that we are working with the default settings.

1. Turn the transmitter on, and then hold down Mode and Select simultaneously until the transmitter beeps. The word CONFIG should appear on the screen. If you see a different word, press mode until you reach the config option.
2. Press select once. You should see the letters CL flashing on the screen.
3. Hold down the Data Input button in either direction for about two seconds. The transmitter will beep to indicate that it has been returned to default settings.
4. Hold down Mode and Select again to exit the menu.

We are now ready to begin experimenting with the transmitter.

5. Make sure that the number of the crystal in the transmitter matches that of the crystal in the receiver.
6. Turn on the Vex controller.
7. Perform the following actions and write down the testbed’s response (including direction of rotation.)
 - a. Push the right joystick up _____
 - b. Push the right joystick down _____
 - c. Push the right joystick to the right _____
 - d. Push the right joystick to the left _____
 - e. Push the left joystick up _____
 - f. Push the left joystick down _____
 - g. Push the left joystick to the right _____
 - h. Push the left joystick to the left _____

Before learning about the transmitter options, it is important to understand the naming system of the joystick axes. As described in the following list, each joystick axis is labeled as a channel. When you are editing a channel within the transmitter menu, think of it as editing the settings for the movement of a joystick in a particular direction.

Right joystick, horizontal axis: Channel 1

Right joystick, vertical axis: Channel 2

Left joystick, vertical axis; Channel 3

Left joystick, horizontal axis; Channel 4

Buttons on reverse side of transmitter; Channels 5 and 6

8. What motor port seems to be affected when you manipulate channel 2?

9. What motor port seems to be affected when you manipulate channel 3?

10. Do you see a pattern with the last two responses?

11. What happens when you manipulate channel 4?

12. Remove the motor assembly from port 3 and plug it into port 4.
13. Manipulate joystick channel 3. What happens?

14. Try manipulating channel 4 again. What happens this time?

15. What is the relationship between the joystick channels and the response of the motor ports?

Using the Reverse Option

16. You may have moved the motor assemblies around in the last part of the exercise. Let's return them to their original positions. The motor assemblies should be plugged into motor ports 2 and 3.
17. Enter the transmitter menu by holding down the Mode and Select buttons until it beeps. Press the Mode button until the word "REVERSE" appears on the screen.
18. Now, let's edit the settings for channel 2, which is the vertical axis of the right joystick. Press Select once. The number 2 should be flashing next to the "CH" on the screen. If there is a number other than 2, continue pressing select until you get to the 2.
19. There should be a small arrow beside the letters "STD." Press the Data Input button in the minus direction to make the small arrow move next to the letters "REV."
20. Perform the following actions and write down the test bed's response (including direction of rotation.)
 - a. Push the right joystick up _____
 - b. Push the right joystick down _____
 - c. Push the right joystick to the right _____
 - d. Push the right joystick to the left _____
21. Did any of the results differ from step 7? What do you think the Reverse menu does?

22. Using proper terminology, describe how to program the transmitter to use the reverse option.

23. Have another student follow the directions that you just wrote. Did you accurately describe how to program the transmitter?

24. When you are done experimenting, reset the transmitter to its default settings and exit the transmitter options menu.

Using the Scale Option

25. Enter the transmitter menu and press Mode until the word SCALE appears on the screen.

There are two types of scaling: linear and exponential. We will work with linear scaling first.

26. Press Select until you get to channel 2. Look at the large number on the lower portion of the screen. There should not be a plus or minus sign in front of the number. If you see either (or both,) press the select button until you reach channel 2 without the sign(s).
27. Before actually changing anything, press the right joystick up and observe the motor assembly's response.
28. Press down on the Data Input button until the percentage on the screen reaches 70.
29. Press the right joystick up and observe the motor assembly's response.
30. Press down on the Data Input again. This time, stop when the percentage on the screen reaches 30.
31. Press the right joystick up and observe the motor assembly's response.
32. What do you think linear scaling does?
33. The select button allows you to cycle through the channels and between linear and exponential scaling. To get a feel for the options that are available to you, press the select button several times to scroll through your choices.
34. As you may have noticed, you cannot change the scaling value for channels 3, 4, 5, or 6. What changes would you have to make to your test bed setup if you wanted to edit the linear scaling values for both of your motor assemblies?
35. When you are done, return the transmitter to its default settings.
36. Now, let's work with exponential scaling. Navigate to the Scale menu again and press select until you get to channel 2 with the plus/minus sign(s) appearing in front of the large number.
37. Press the Data Input button down until the value reaches -65%.
38. Press the right joystick all the way up. Is there any noticeable difference from standard settings?
39. Try pushing the right joystick just part of the way up. Note your observations.
40. Now, press the Data Input button up until the exponential scaling value reaches +65%.
41. Press the right joystick all the way up. Is there any noticeable difference from standard settings?

42. Try pushing the right joystick just part of the way up. Note your observations.
43. What do you think exponential scaling does?
44. Exponential scaling certainly changes the motors' response, but does it seem to have any effect on the maximum motor output?
45. Reset your transmitter settings when you are done experimenting.

Using the DRIVE option

46. Looking back at the lesson on default transmitter settings (questions 1-15,) what is the relationship between the number of the joystick channel and the number of the motor port that it controls?
47. Considering this relationship, is it possible to move two motors at once when only one joystick channel is being manipulated?
48. Enter the transmitter menu, and press Mode until the word DRIVE appears on the screen. You should see the number 23 flashing.
49. Press the Data Input button up to switch the number to 12. Notice that there are only two options in the drive menu. All of the previous exercises were done in mode 23.
50. Remove the motor assembly from port 3 and plug it into motor port 1.
51. Perform the following actions and write down the test bed's response.
- | | |
|-----------------------------------------|-------|
| a. Push the right joystick up | _____ |
| b. Push the right joystick down | _____ |
| c. Push the right joystick to the right | _____ |
| d. Push the right joystick to the left | _____ |
| e. Push the left joystick up | _____ |
| f. Push the left joystick down | _____ |
| g. Push the left joystick to the right | _____ |
| h. Push the left joystick to the left | _____ |

For the next three questions, imagine that you were using the transmitter to control a car-like robot, rather than this experimental test bed. Let's say that each motor assembly is one of the vehicle's back wheels.

52. If you were using Drive Mode 23, and the motors were plugged into ports 2 and 3, how many joysticks would you have to press to make both motors operate?
53. If you were using Drive Mode 12, and the motors were plugged into ports 1 and 2, how many joysticks would you have to press to make both motors operate?
54. Which Drive mode do you think you would prefer to use? Why?

55. When you are done experimenting, reset your transmitter settings and turn off your transmitter and Vex controller.