

Whisker Kit Instructions (#28134)

Instructions for using bumper switches with your Parallax Boe-Bot

The bumper switches in this kit look like whiskers (or antennae) when they're mounted on the Boe-Bot. Whiskers increase the Boe-Bot's ability to sense the world around it by giving it tactile sensitivity. The Boe-Bot can use these whiskers to navigate only by touch. Whiskers can also be used along with either or both of the Boe-Bot's two types of sight, light intensity and/or object detection.



Boe-Bot with whiskers¹

Parts List

Verify that your Whisker Kit has all components listed below. Parallax part numbers are included in case you want to replace or reorder any of the pieces.

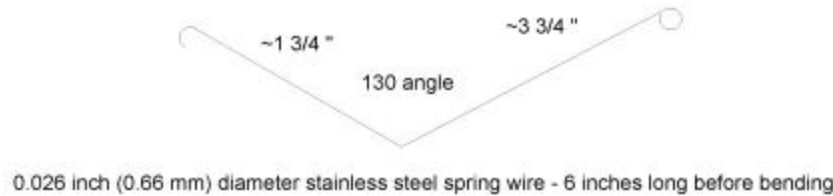
- (2) 10K ohm resistors (#150-01030)
- (2) 3-pin headers (#451-00303)
- (2) 3/8" 4/40 male/female standoffs (#700-00049)
- (2) 1/4" 4/40 size screws (#700-00028)
- (2) Boe-Bot bumper wires (#700-00010)
- (2) Nylon washers size #4 (#700-00015)



¹ Pictured Boe-Bot is using the Board of Education Rev. B, due for release in July 2000. The Board of Education Rev. B. has built-in servo connects and power supply capacitors. The power supply capacitors replace the large 3300 uF capacitor that was required with the Board of Education Rev A.

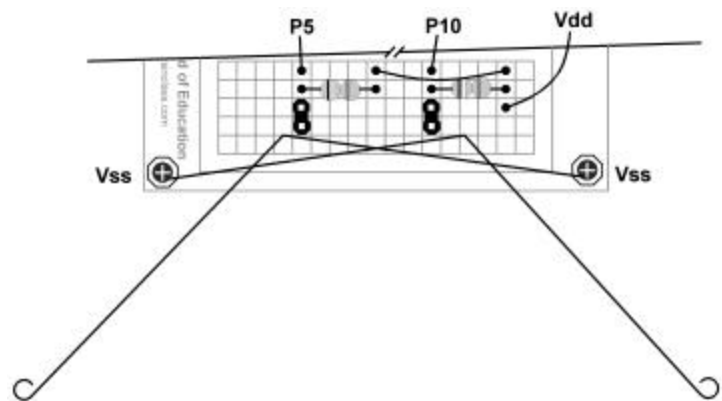
Hardware and Circuits

Below is a whisker diagram in case you decide to build your own. Any firm yet springy wire will do the job.



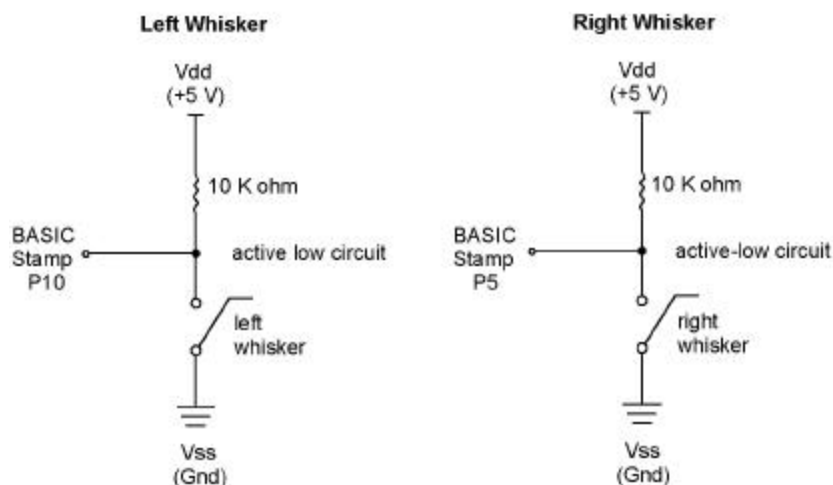
Whiskers are just physical extensions that actuate normally open switches, and they're easy to build. Here's how:

- Remove the two front screws that hold your Board of Education to the front standoffs.
- Screw in the male/female standoffs included in the whiskers kit in place of the screws that were removed in step (a).
- Sandwich the open ended loop of each whisker between the top of the standoff and the nylon washers included in the kit.
- Use the screws from step (a) to attach the nylon washers and whiskers to the standoffs from step (b).
- Each whisker should hang over the breadboard so that it could touch one of the three pin headers when pressed. See Whiskers diagram.



Whiskers wiring diagram (note that the three-pin header has been cut down to two-pin size in this drawing)

The Whisker schematics are shown below. This schematic does not show the servos. If you want to use the sample code on the next page, make sure to also connect the servo control lines to P14 (right servo) and P15 (left servo).





BASIC Stamp Boe-Bot Navigation Using Whiskers

Whiskers.bs2 is a simple roaming program example that uses Whiskers instead of infrared for object detection. This program listing makes the Boe-Bot travel straight ahead while monitoring the whiskers to see if they have bumped into an obstacle. As soon as an obstacle is detected, the Boe-Bot backs up, turns, and continues forward until another obstacle is encountered.

When a whisker is pressed, due to an obstacle, the normally open switch closes. When this happens, the output signal goes from high to low. I/O pins P10 and P5 are set to input and used to monitor the states of these switches. The two whiskers may be in one of four states:

- (1) Both high – no objects detected
- (2) Left low, right high – object detected on the left, turn right.
- (3) Right low, left high – object detected on the right, turn left.
- (4) Both low – indicates a head-on collision with a wide object such as a wall.

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' Whiskers.bs2 - Simple program for detecting objects
' with a BASIC Stamp II in a Boe-Bot

' Constant and Variable Definitions
'-----
servo_left      con    15      ' left servo on P15
servo_right     con    14      ' right servo on P15
whisker_left     var    in10    ' left whisker on P10
whisker_right    var    in5     ' right whisker on P5
counter         var    word    ' loop counter variable

' Main Program
'-----
check_whiskers:      ' check each whisker
  if whisker_left = 0 and whisker_right = 0 then back
  if whisker_left = 0 then right
  if whisker_right = 0 then left

drive_servos:        ' drive forward
  pulsout servo_left,850
  pulsout servo_right,650
  pause 10
  goto check_whiskers

back:                ' backwards if both switches close
  for counter = 0 to 100
    pulsout servo_left,650
    pulsout servo_right,850
  next
  return
  goto drive_servos

left:                ' turn left if right switch closes
  gosub back
  for counter = 0 to 50
    pulsout servo_left,650
    pulsout servo_right,650
  next
  goto drive_servos
```



```
right:                                ' turn right if left switch closes
  gosub back
  for counter = 0 to 50
    pulsout servo_left,850
    pulsout servo_right,850
  next
goto drive_servos
'-----
```

Whiskers Tips

Problem	Possible Solution
Boe-Bot backs up too far/not far enough. Boe-Bot turns too far/not far enough.	Adjust the <code>for</code> . . . <code>next</code> arguments in the program listing. They may be increased or decreased to increase or decrease how far the Boe-Bot rotates when it turns as well as how far it backs up.
Boe-Bot drives up side of wall because whiskers didn't catch hold of an object.	Increase the resistance of a whisker against the surface of an object by bending whiskers in a different angle. Alternatively, try dipping the whiskers in a coating material such as rubber cement.
Dead-center object isn't detected by whiskers.	Bend whiskers inward.
Robot gets stuck in corners.	Try the <code>random</code> command to decide whether to turn left or right after hitting an object.
Switches don't appear to work properly.	<p>Check your wiring and connections. Use the Debug terminal to display the state of the bumper switches as seen by the BASIC Stamp 2. This can be done by replacing the contents of the <code>check_whiskers</code> routine with the following segment of code:</p> <pre>check_whiskers: debug home debug bin ? in5 debug bin ? in10 goto check_whiskers</pre> <p>Note: When a bumper is pressed the Debug terminal should display a 0 instead of a 1.</p>