

# line follower kit

## Line Follower Kit

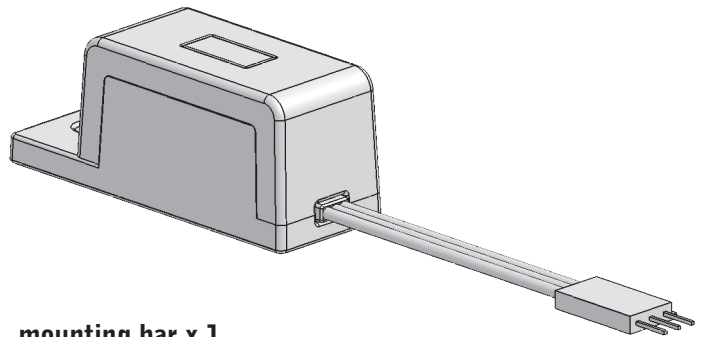
A line follower consists of an infrared light sensor and an infrared LED. It works by illuminating a surface with infrared light; the sensor then picks up the reflected infrared radiation and, based on its intensity, determines the reflectivity of the surface in question. Light-colored surfaces will reflect more light than dark surfaces, resulting in their appearing brighter to the sensor. This allows the sensor to detect a dark line on a pale surface, or a pale line on a dark surface.

You can use a line follower to help your robot navigate along a marked path, or in any other application involving discerning the boundary between two high-contrast surfaces. A typical application uses three line follower sensors, such that the middle sensor is over the line your robot is following.

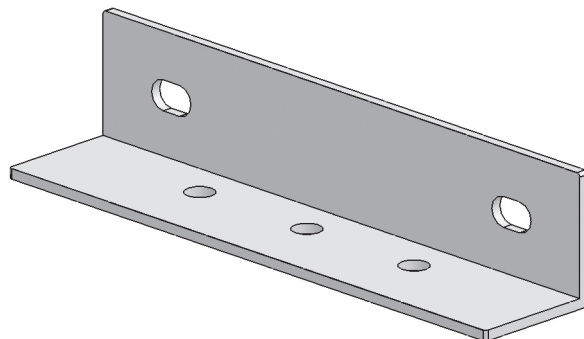
**INSERT THESE PAGES**  
at the **back of the**  
**Sensor Chapter** in your  
Vex Inventor's Guide.

**YOU MUST HAVE A**  
**PROGRAMMING KIT**  
**TO USE THIS SENSOR!**

line follower x 3



mounting bar x 1



screw x 5 (8-32, 3/8")



keps nut x 5



### Limited 90-day Warranty

This product is warranted by Innovation One against manufacturing defects in material and workmanship under normal use for ninety (90) days from the date of purchase from authorized Innovation One dealers. For complete warranty details and exclusions, check with your dealer.

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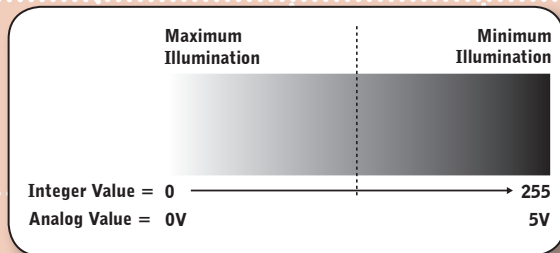
0405

## line follower kit, continued

### 1 Technical overview

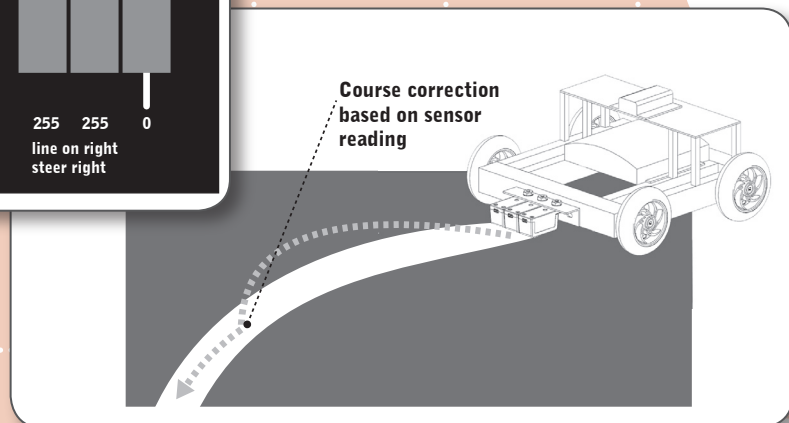
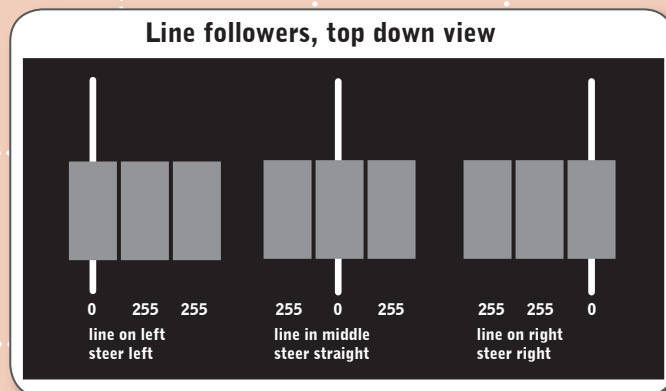
This is an analog sensor, meaning that its output covers a range of values (in this case, from zero to five volts) rather than being only high (five volts) or low (zero volts), as is the case for a digital sensor. This range of output from zero to five volts is sent to the microcontroller, which reads it as a range of integer values from 0 to 255. [For more detail, refer to the Sensors chapter in your Vex Inventor's Guide.]

For this particular sensor, sensor output will be low (around 0) when the infrared light bounces back to the detector – in other words, when the surface is pale or highly reflective – and high (around 255) when the light is absorbed and does not bounce back.



We can then set a threshold value in our code to act as a trigger for behaviors.

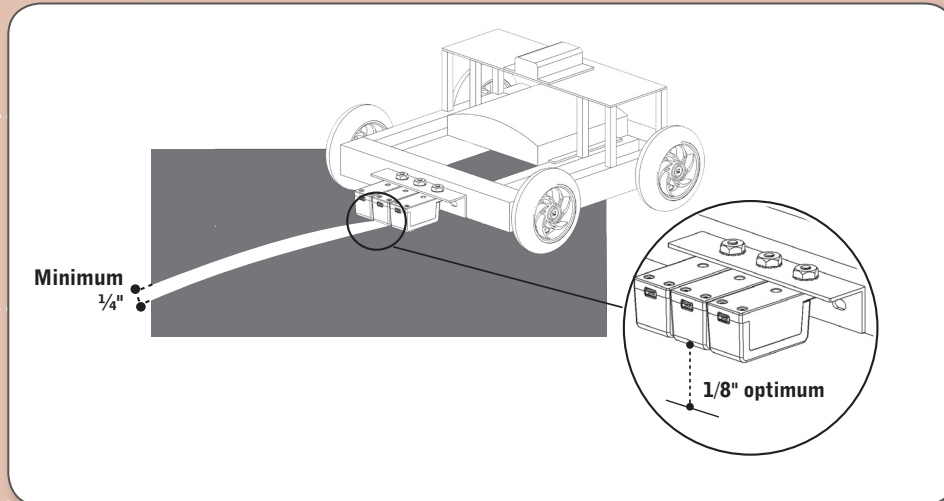
From this basic premise, we can build more complicated behaviors. For example, if you have three line sensors on the front of your robot [hint: use the mounting bar included in your kit!], then you can program your robot to follow a white line on a black surface. LineFollower\_Middle should always see white, and the other two — LineFollower\_Left and LineFollower\_Right — should always see black. If LineFollower\_Left starts seeing white, then your robot needs to steer back to the left. If LineFollower\_Right starts seeing white, then your robot needs to steer back to the right.



### line follower kit, continued

#### 1 Technical overview, continued

The optimal range for the line follower is approximately 0.02 to 0.25 inch. The minimum line width it can detect is 0.25".



Sensor output will be low (0V) when the infrared light bounces back to the detector – in other words, when the surface is pale or highly reflective – and high (+5V) when the light is absorbed and does not bounce back.

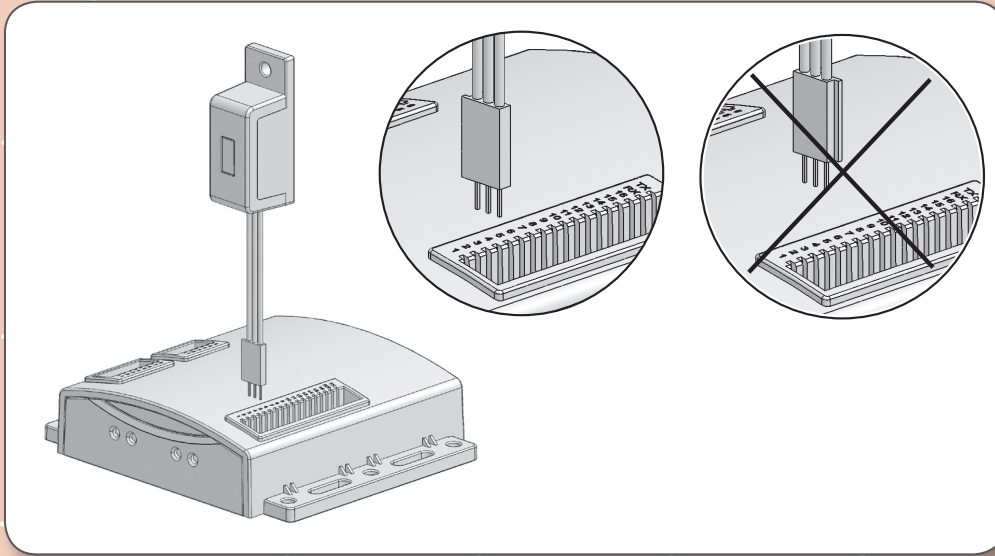
#### HELPFUL HINT:

Because the line follower uses an infrared LED to illuminate its target and an infrared sensor to detect the reflected light, it will actually work in low-light conditions or even in the dark! However, **this also means that it can easily become saturated** — in other words, everything will look white to it, like an over-exposed photograph — in environments where there is a lot of infrared radiation. You'll find environments like this in competition settings where tungsten lights are used for illumination. **To avoid saturating the infrared sensor,** consider mounting it underneath the robot or adding a cardboard shield to block ambient radiation.

### line follower kit, continued

#### 2 Reading data from the line follower: Reprogramming your microcontroller to read the sensor

Start by plugging your line follower into any port in the Analog/Digital bank on the Vex Microcontroller. Note that the connector is mechanically keyed to fit into the microcontroller ports in a specific orientation. Plugging it in backwards could result in damage to your sensor!



In order for your robot to be able to read the sensor, you will have to reprogram the microcontroller. Sample code to help you get started is available on the Vex website. Refer to the Programming chapter in your Vex Inventor's Guide for information on how to add or change code.