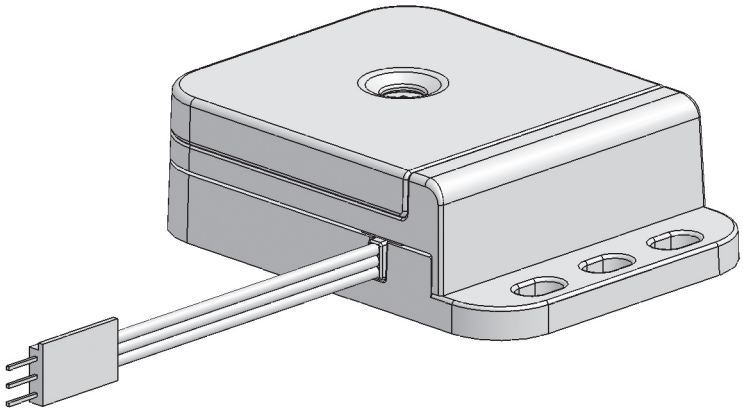
optical shaft encoder kit

Optical Shaft Encoder Kit

Optical shaft encoders are commonly used for position and motion sensing. Basically, a disc with a pattern of cutouts around the circumference is positioned between an LED and a light detector; as the disc rotates, the light from the LED is blocked in a regular pattern. This pattern is processed to determine how far the disc has rotated. If the disc is then attached to a wheel on a robot, it is possible to determine the distance that wheel traveled, based on the circumference of the wheel and the number of revolutions it made.

YOU MUST HAVE A PROGRAMMING KIT TO USE THIS SENSOR!

optical shaft encoder x 2



screw x 4 (8-32, 3/8")

keps nut x 4

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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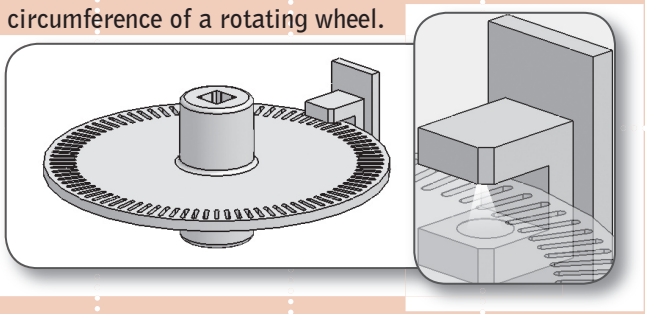
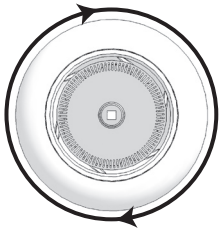
optical shaft encoder kit, continued

1 Technical overview

The optical shaft encoder uses an infrared light sensor to detect illumination from an infrared LED passing through slots cut in the circumference of a rotating wheel.

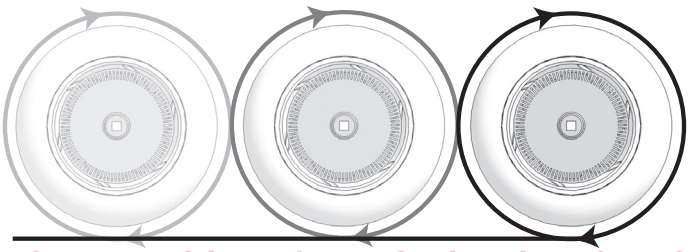


From basic geometry, we know that the circumference of a circle is equal to π (pi) times the diameter of the circle.



circumference = (diameter of wheel) x π (pi = approx. 3.14)

The distance travelled by a wheel, then, is simply the circumference of the wheel times the number of revolutions the wheel has made.



Distance = (circumference) x (number of revolutions)

For a standard wheel in the Vex Inventor's kit, the diameter is 2.75". So the distance the wheel travelled would be:

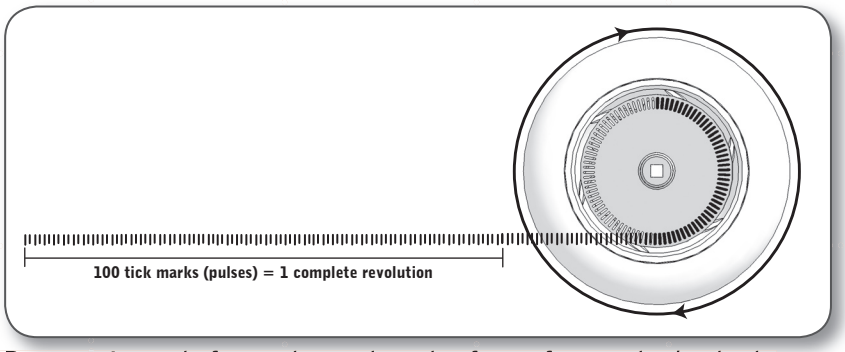
Distance = π x 2.75" x (number of revolutions)

accessories

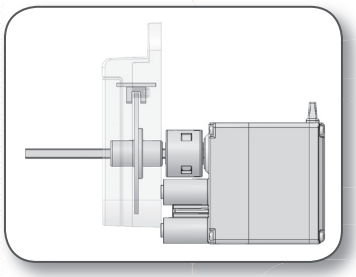
optical shaft encoder kit, continued

1 Technical overview, continued

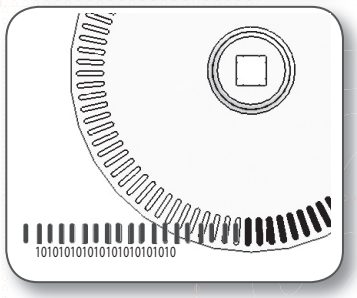
By knowing how many slots are cut into the encoder wheel, we can determine how many revolutions the robot wheel has made based on the number of times the light sensor has picked up illumination from the LED. The encoder wheel included in this kit has 100 slots.



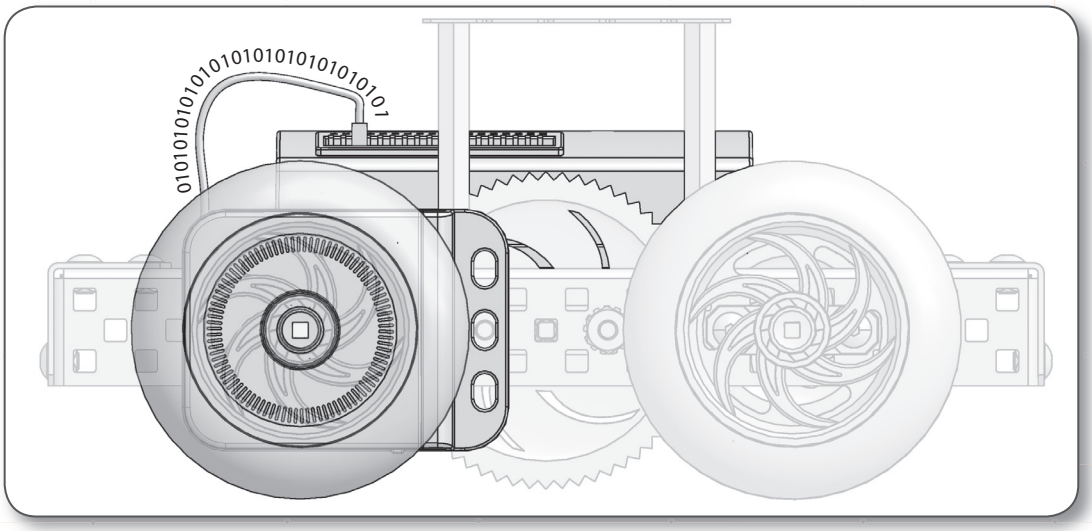
By mounting a shaft encoder on the axle of one of your robot's wheels, you'll be able to determine how many times that wheel has rotated. That, in turn, can be used to calculate the distance the robot has travelled, based on the diameter of the wheel.



The optical shaft encoder can detect up to 1700 pulses per second, which corresponds to 17 revolutions per second and 1020 rpm (revolutions per minute). Faster revolutions will not be interpreted correctly, resulting in erroneous positional data being passed to the microcontroller.



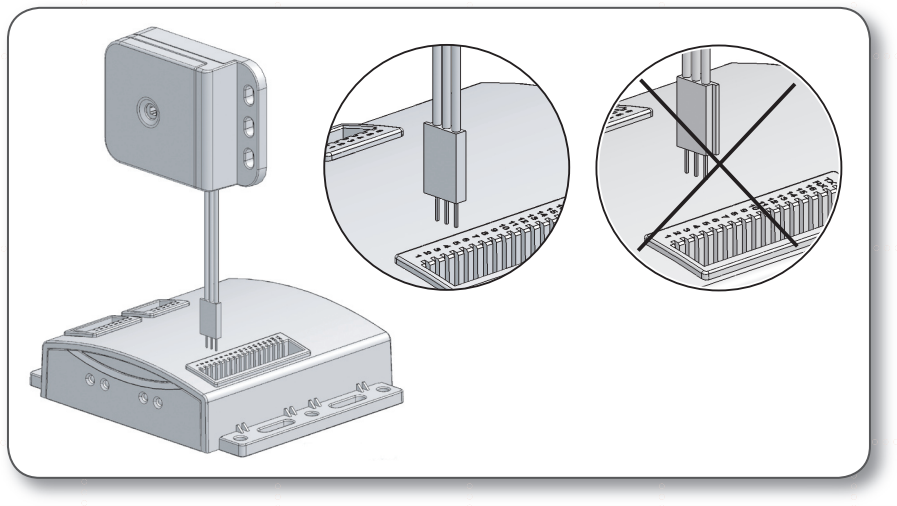
This is a digital sensor, which means that the signal it will pass to the Vex microcontroller will either be high (1) or low (0). The sensor output is low (0) when the light from the IR LED passes through a cutout segment of the encoder wheel and falls on the detector, and high (1) when the light is blocked by an opaque segment of the encoder wheel. This means that the Vex microcontroller will be receiving a string of 1's and 0's as your robot moves. The string of 1's and 0's will then be interpreted by your program and used to determine the robot's actions.



optical shaft encoder kit, continued

2 Reprogramming your microcontroller to read the sensor

You'll need to plug your shaft encoder into any port in the Analog/Digital bank on the Vex Microcontroller. Note that the connector is keyed to fit into the microcontroller port in a specific orientation; plugging it in backwards could damage or even destroy 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.