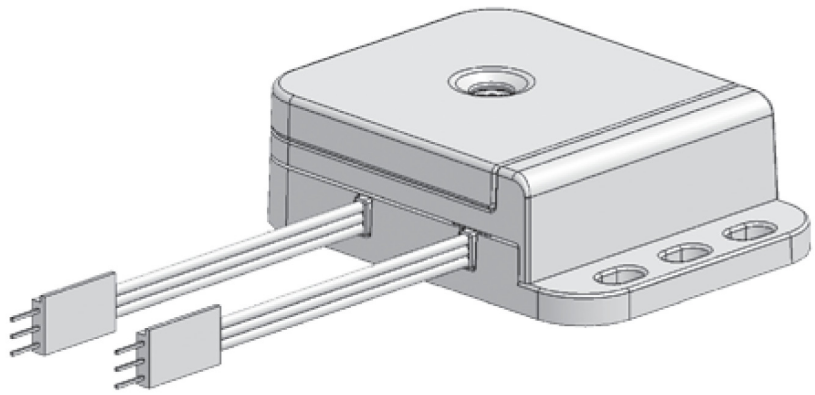
Optical Shaft Encoder (2-pack)

Basic 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.

With the Quadrature Encoder, there are 2 output channels. Only one output can be used as a basic Optical Shaft Encoder. The term quadrature refers to the situation where there are two output channels; that is, two square waves 90 degrees out of phase with each other, being outputted by the unit. The two output channels of the Quadrature Encoder can be used to indicate both position and direction of rotation.

Optical Shaft Encoder x 2



accessories

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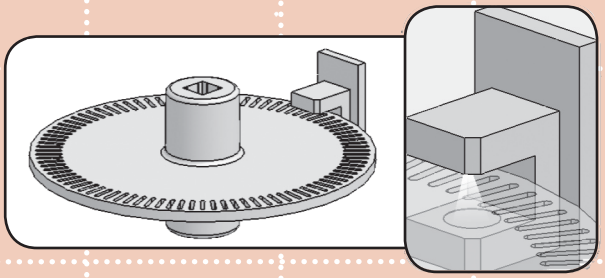
For More Information, and additional Parts & Pieces refer to:
www.VEXrobotics.com

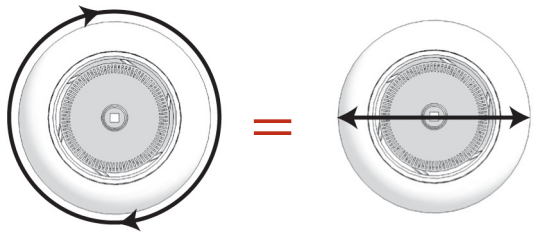
Optical Shaft Encoder (2-pack), continued

1 Technical Overview

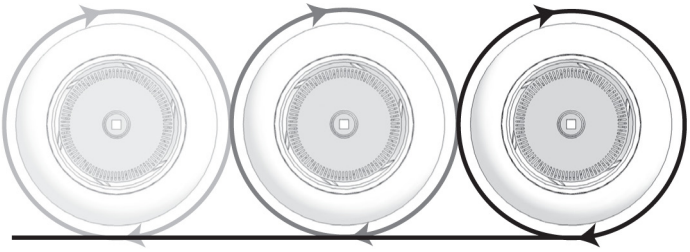
The Optical Shaft Encoder uses an infrared light sensor to detect illumination from an infrared LED passing through slots cut in the circumference of a rotating wheel.



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



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)

Assuming we use a wheel with a diameter of 2.75″, the distance the wheel travelled would be:

distance = 8.64″ x (number of revolutions)

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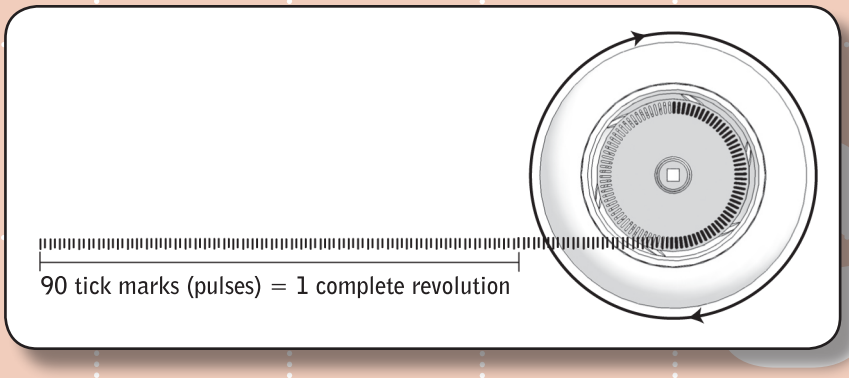
Optical Shaft Encoder (2-pack), continued

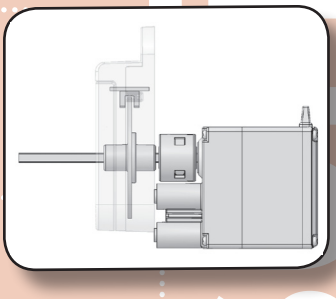
1 Technical overview continued

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 90 slots.

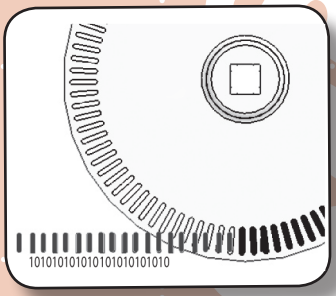
By mounting a shaft encoder on the axle of one of your robot's wheels, you'll be able to determine how many times that wheel has rotated. That, in turn, can be used to calculate the distance the robot has travelled, based on the diameter of the wheel.

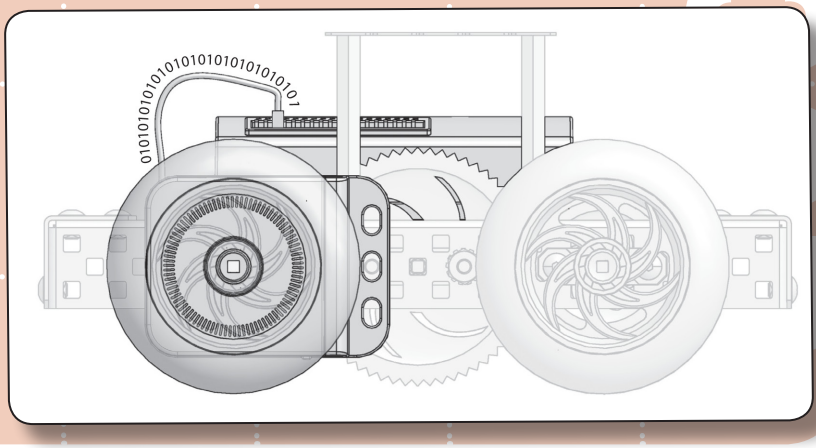


The Optical Shaft Encoder can detect up to 1700 pulses per second, which corresponds to 18.9 revolutions per second and 1133 rpm (revolutions per minute). Faster revolutions will not be interpreted correctly, resulting in erroneous positional data being passed to the Microcontroller.



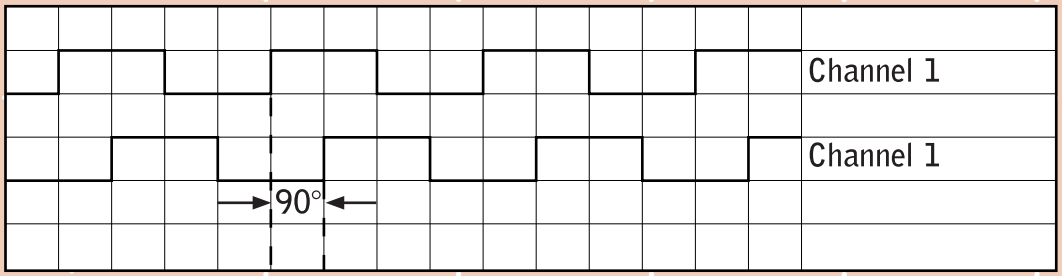
This is a digital sensor, which means that the signal it will pass to the VEX Microcontroller will either be high (1) or low (0). The sensor output is low (0) when the light from the IR LED passes through a cutout segment of the encoder wheel and falls on the detector, and high (1) when the light is 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 (2-pack), continued

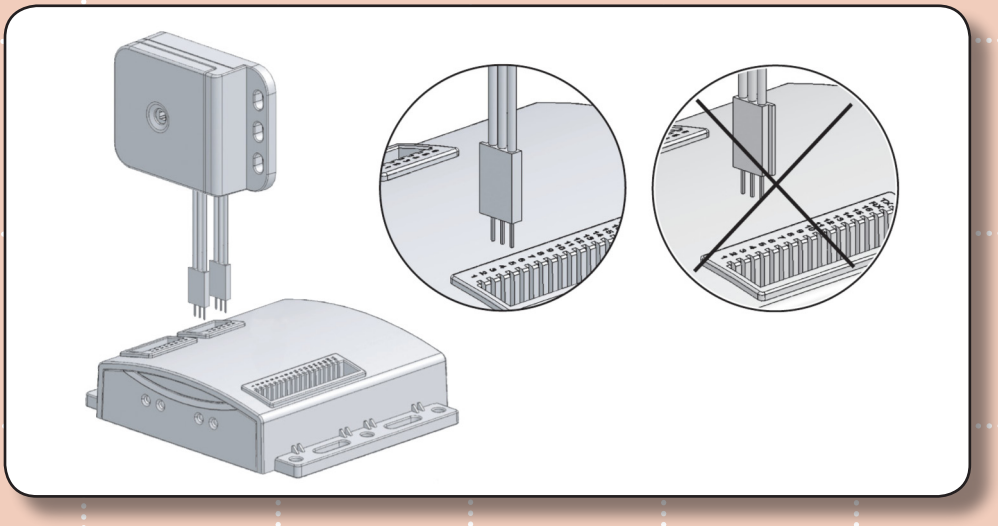
With the Quadrature Encoder, you will use both outputs (Channel 1 and Channel 2) to determine of the direction of rotation. The channels are separated in phase by 90 degrees as shown below.



For example, if channel 1 leads channel 2, the wheel is rotating clockwise. Likewise, if channel 2 leads channel 1, the wheel is rotating counter-clockwise. By monitoring the relative phase and number of pulses of channel 1 and 2, you can determine how fast, how far, and what direction your robot is traveling.

2 Reprogramming your Microcontroller to read the sensor

You'll need to plug your shaft encoder into any port in the Interrupt bank on a VEX Microcontroller. Depending on your specific application, you may be able to use any port in the Analog/Digital bank. 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.