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Touchless Encoder (TLEN R2) – User Guide

Thanks for purchasing the Touchless Encoder board! This small board is the quickest way to measure speed or position on almost any rotating or sliding mechanism. Simply mount the PCB facing the object to be measured, and apply a contrasting mark to the object – Electrical Tape or black permanent marker work well on metallic surfaces. Silver marker or white paint work well on dull ones. Most targets can be measured accurately between 0.5 and 1.5in. When connected to a 5V supply, the TLEN sensor will output a pulse (High-Bright/Reflective. Low-Dark) for each mark on the object being measured. This enables the sensor to be used for speed sensing, counting rotations, or basic object detection. As a speed sensor, the TLEN R2 is rated up to 30,000RPM, but will often perform acceptably to >40,000RPM.

Installation:

1. Mount the TLEN PCB within 0.5-1.5in of the target to be measured using either #6-32 or smaller screws, or double-sided tape.
2. Apply 'contrast' to the object to be measured (see paragraph above).
3. Connect the TLEN board to a digital input such as an open DIO port on the NI RoboRIO.
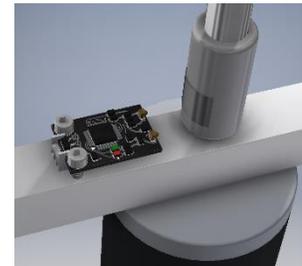
Notes:

- The TLEN is intended to be mounted using #6-32 or smaller screws. These screws clamp down on the 3-pin connector, using it as a spacer. Make sure not to overtighten these screws and crush the connector.
- When first powered on, you may notice the LEDs flashing without detecting anything. This is normal and indicates normal function and firmware version.
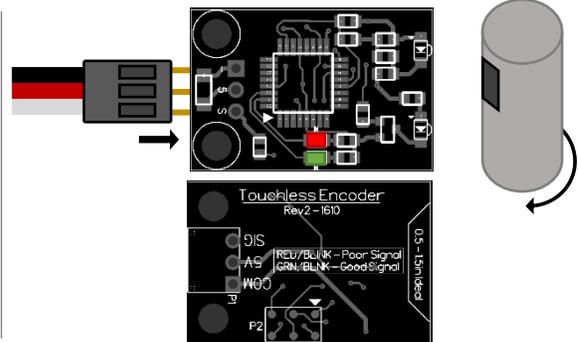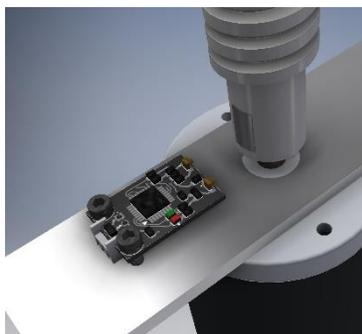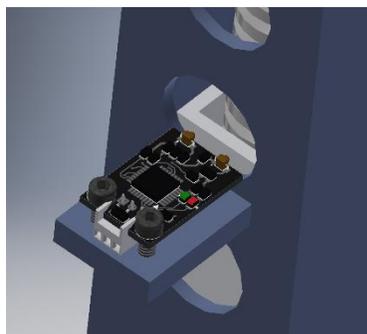
Pinout:

P1 – 3pin 0.1"
1. COM
2. +5V
3. SIG OUT

LEDs
1. GRN – Object/Mark Detected
2. RED – Marginal Signal

Examples:

Rotation counting on a lead screw.

Optical limit switch on sliding mechanism.

Wheel speed/rotation counting – Multiple marks to increase resolution.

Touchless Encoder (TLEN R2) – Advanced Guide

  The TLEN board is designed to suit as many applications as possible out of the box. However, occasionaly some tweaking may be necessary to get the exact functionality required. Below is an overview of common tip and tricks for getting the most out of your Touchless Encoder board.

- **Improving Detection (Contrast)**
    - Some of the best contrasting surfaces we've found consist of 3M "33+" Black Electrical Tape and 3M Retro-reflective 'Scotchlite' tape (same type used on FIRST Vision Targets). Using the electrical tape for a dark surface and reflective tape as a light surface gives very good results.
    - If measuring the speed of a rotating shaft, for example, try wrapping the shaft in electrical tape and using a silver marker/paint pen or a strip of reflective tape as contrast.
    - For mounting the sensor, we recommend trying the sensor by hand first. Determine the location that gives the best signal using the onboard LEDs while moving the device to be measured by hand. When a good position is found, mark it, then mount the board permanently.

- **Dealing with Ambient Light**
    - The TLEN board has been designed to ignore changes in ambient lighting, but light sources with high IR content (such as halogen lamps or the Sun) shining directly on the board can occasionaly cause problems.
    - If problems are experienced with ambient light, try rearranging things to prevent the light from striking directly on the top of the PCB, particularly the detectors on the edge of the PCB.
    - Adding a cover for the top of the PCB, or even a piece of electrical tape over the detectors ('D1' and 'Q1') can often solve the problem.

- **Measuring High Speeds**
    - The TLEN board is rated to provide reliable output to 30,000RPM in most situations. However, accuracy could be affected by other conditions such as mark size, contrast, ambient light, and distance. These factors could affect operation *negatively or positively* from the 30,000RPM benchmark.
    - To get the most performance out of the TLEN board, make sure to use the best contrast possible (see "Improving Detection"), the largest marks possible (50% dark, 50% reflective for example), reduce ambient light, and stay within the 0.5 – 1.5in distance.
    - Often when measuring high speeds, instantaneous readings aren't as imprtant as accuracy over several measurements. Apply some averaging to the readings in software to increase overall accuracy.
    - Following these guidelines, accuracy within a few percent has been achieved at speeds up to 60,000RPM.