

## TB-107: Effect of Mechanical Jitter on Encoders

*In an encoder, mechanical jitter is any vibration in the assembly affecting the relationship between signal producing components (i.e., disc, sensor, and light source).*

Mechanical jitter can have many causes, such as cogging of the input shaft, excessive loading or runout, and vibration of the encoder induced by the application. Depending upon the severity of the vibration and the resolution of the encoder, this vibration can produce extra encoder pulses when the encoder is near a pulse edge. These are disruptive when precise positioning is required. On single channel encoders, the counter will likely misinterpret these pulses as forward shaft rotation.

This problem can be eliminated by selecting Encoders with quadrature output. This means there are two distinct output channels that are out of phase electrically by 90 degrees. One channel switches slightly before or after the other channel depending upon rotation direction.

By using a quadrature counter, position is determined by viewing both channels simultaneously. The counter detects which channel is switching first, and the counter will count up or down as necessary.

When using an encoder with quadrature outputs and a counter with quadrature inputs, mechanical jitter is not generally an issue. As the shaft vibrates back and forth, the counter will alternatively count up and down as pulses are received, resulting in a net result of zero counts from its position.

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