

## Technical Bulletin 104

### Noise Effects on Encoder Signals

An Encoder will produce clean square wave signals, both with 50% duty cycle and in some Encoder models, a constant pulse width square wave. These signal waveforms are used by an associated device to determine speed, positioning, servo feedback, etc.

Electrical noise in a system can cause all sorts of problems, from simple miscounting, to complete servo system lockup. The source of this "noise" can be from main AC power, electrical motor cables, switching power supplies, solenoids, fluorescent lighting, relays, fans, etc.

Noise can be either radiated or conducted. Radiated noise can be induced into signal lines causing undesirable signal pulses. Conducted noise finds an electrical path onto the encoder cables from ground loops, power supplies, or any equipment connected to the system.

There are several methods which can be used to reduce noise:

- (1) Always route power and signal lines separately,
- (2) Signal lines should be twisted and shielded, and placed at least 12 inches from other signal lines, and from power leads,
- (3) Signal wire continuity should be maintained from the encoder to the controller/counter [i.e. avoid junctions, splices],

(4) Provide clean regulated power to encoder and associated equipment (+/- 2%),

(5) Ensure equipment (motors, drives, shafts, etc..) is properly grounded,

(6) Connect encoder cable shield to ground at controller/counter end, leaving the end near the encoder un-connected, and

(7) If possible, use differential line driver signal outputs with high quality twisted, shielded pair cable [Why? Answer: The complimentary signals greatly reduce common mode noise levels, as well as signal distortion resulting from long cable lengths].

For more details on differential outputs, please refer to the Technical Bulletin TB105 regarding Noise Suppression of Differential Signals, or call our technical support group for assistance on +44 (0)1978 262100