



## Sensors & Controls Application Note

### **Industry:**

Industrial Equipment Controls

### **Application:**

Process controls are used in a wide variety of industrial equipment including factory automation, test and measurement, processing equipment, environmental chambers, packaging equipment and numerous other applications. Process controls are the basis for human-to-machine interface (HMI) in manually setting up equipment and overriding computerized interface systems.

### **Statement of the Problem:**

In the design of next generation systems of process controls where lower cost is required, design engineers are utilizing digital encoders for an efficient and effective solution.

### **Solution:**

Rotary encoders are the most reasonably priced option for process controls that require frequent adjustment of various parameters, particularly if the instrument in use contains a microprocessor controller. Suitable rotary encoders costing approximately \$5 and commonly rated at 200,000 shaft revolutions are a great alternative solution to the more expensive precision potentiometers.

An advantage of using encoders over potentiometers in a digital circuit is that the signal produced by an encoder eliminates the analog-to-digital (A/D) conversion process. Many micro-controllers have multiplexed A/D converters on board and can be interfaced to a potentiometer. However, a 10-turn potentiometer would be needed to provide reasonable resolution. Use of rotary encoders reduces memory overhead, wiring and wire interconnects, and can provide greater MPU program speed.

In selecting an encoder for a process controller, the most important characteristics to consider are type of output signal desired, expected cycle life and switching capability. There are two basic technology classifications of encoders: *contacting (mechanical)* and *non-contacting*. Either technology will work in this application. However, the non-contacting type will provide longer life, higher resolution and reliability.

**Contacting encoder** technology offers the most cost-effective solution for many applications.

However, resolution and rotational life are limitations of contacting designs. Bourns offers a variety of contacting encoder models to suit lower cost applications, such as the EC and ES Series, PEC11, PEC12 and PEC16 models.

# APPLICATION NOTE

**Optical encoder** technology offers a higher resolution and longer rotational life. These devices can be used in both static and dynamic applications. Bourns® EN Series Optical Encoder is the perfect value-priced solution for your application.

Encoders are also frequently used in process controls as switches where each discrete binary number in the output signal is recognized as a specific instruction or setting for the digital system. In such cases, the system must recognize the position of the encoder after power-down of the system. For these applications, Bourns® Model EA **Absolute Contacting Encoder (ACE™)** is the perfect solution. Incremental contacting encoders can also be used in such applications. In this case, the designer must make additional software and hardware provisions for retaining the encoder position in a non-volatile memory.

Please contact your local Bourns Application Engineer or Bourns Sales Representative for additional information regarding Bourns® encoder products.

**Asia-Pacific:** Tel +886-2 256 241 17  
Fax +886-2 256 241 16

**Europe:** Tel +41-(0)41 768 55 55  
Fax +41-(0)41 768 55 10

**N. America:** Tel +1-909 781-5500 +1-951-781-5500 (after 7/17/04)  
Fax +1-909 781-5700 +1-951-781-5700 (after 7/17/04)