



Inspection Camera Positioning Using the SEL-2440 DPAC

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INTRODUCTION

The SEL-2440 Discrete Programmable Automation Controller (DPAC) provides discrete inputs, discrete outputs, programmable logic, and flexible communications protocols and is designed for harsh environments. Industrial vision systems operate in locations where the product under view may change position in relation to the camera. In these locations, engineers can install a system to move the cameras as the product position changes. As an example, we will demonstrate the use of the DPAC as an Ethernet-enabled remote I/O device for an edge inspection system in a flat-rolled metal strip application in a steel mill. Other similar applications could include I/O for shape and steering actuators in cold mills and annealing lines, interfaces for position sensors on walking beams or conveyors in a hot mill, zinc pot discrete I/O for galvanizing facilities, or solution basement sensors in electro-tinning lines.

PROBLEM

The master controller for a vision-based metal strip inspection platform needs to be installed in a controlled area that is isolated from vibration, heat, and other environmental conditions near the production equipment. These systems use image-processing algorithms to continuously monitor metal surface quality, categorizing and quantifying various cosmetic or metallurgical defects. In order to improve performance and limit field wiring, users can install a remote controller module near the sensor cameras to convert Modbus[®] TCP messages to digital outputs that control the camera positioning motors, as shown in Figure 1 on the next page. The remote controller needs communications, digital outputs, and a rugged design to provide reliable performance in the harsh environments near the production equipment.

SEL SOLUTION

The DPAC provides Modbus TCP, DNP3 LAN/WAN (local-area network/wide-area network), and other communications protocols for integration with the vision system controller. Rugged contact outputs and preconfigured protocol maps complete the connections to the camera positioning motors.

Vision System Controller

The vision system controller receives images via Ethernet from the cameras at each edge of the metal strip. In continuously operating facilities, the manufacturing process does not stop when the metal strip width and thickness change. Because these changes happen frequently, the camera positions need to move accordingly in order to maintain image focus and avoid mechanical damage. For this example, we can use write single coil messages (05h) via Modbus TCP from the vision system controller in order to signal the DPAC when a camera needs to be moved in or out.

DPAC Configuration

For each camera, use two digital outputs from the DPAC. One output causes the motor to move “in” towards the strip. The second output causes the motor to move “out” from the strip. When using stepper motors, simply wire the DPAC outputs to forward and reverse “run” commands in the stepper index control.

The DPAC has a preconfigured Modbus map for coil addresses and physical digital outputs, so custom logic is not required in order to associate an output with a Modbus message. If the system includes limit switches or proximity detectors for sensing maximum camera travel, connect those sensors to the DPAC as digital inputs. Then create simple logic in the DPAC to halt the motor and notify the vision controller when the camera arrives at a physical limit. Digital inputs are also preconfigured for specific Modbus addresses in order to make integration convenient.

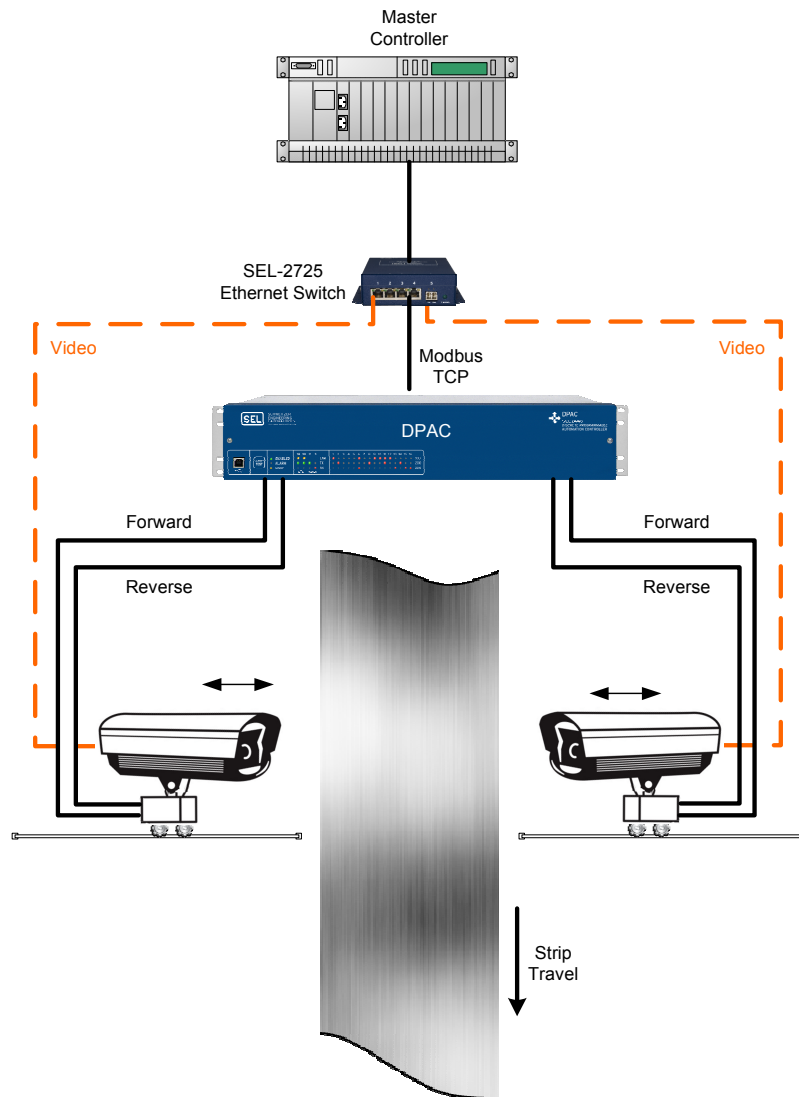


Figure 1 Inspection Camera Positioning With the DPAC