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Using RTD Values in SELOGIC® Control Equations

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INTRODUCTION

Using temperature measurement sensors with SEL relays provides a very powerful method for detecting system health in substation equipment. While many SEL relays provide built-in logic to alarm and trip on a temperature measurement, the raw resistance temperature detector (RTD) values can also be used directly in SELOGIC® control equations to provide more complex control. Caution must be applied when using RTD values in SELOGIC control equations, however, as RTD faults can cause misoperations if not handled correctly. This application note provides solutions to prevent misoperations when using the raw RTD values in SELOGIC control equations.

RTD ERROR CODES

Because the RTD system measures sensor resistance, a short-circuit or open condition in the RTD system induces false temperature values. SEL devices recognize these fault conditions and issue an error code in place of the temperature measurement. The built-in logic disables any trip assertions when the RTD value is equal to one of these error codes. If the raw RTD value is used in custom SELOGIC control equations, the error code will be converted to a temperature value and the likely result is a false trip condition because the RTD value will read as multiple thousands of degrees Celsius.

Reference the SEL-2600 RTD Module Instruction Manual to see the specific data packet structure and what error codes are used for external RTD devices. For SEL relays with internal RTD cards, the error codes will be similar and can be found in the respective relay instruction manuals.

SEL SOLUTIONS

Built-In Logic

For many applications, using the trip and alarm logic specifically designed for RTD use can mitigate any issues. When used for transformer monitoring in an SEL-2414 Transformer Monitor, the thermal element automatically switches from measured to preset or calculated values when the SEL device detects a faulty RTD condition.

Custom Logic

When more advanced logic is required or the use of the thermal calculation is not needed, users can directly interface with the RTD values in SELOGIC control equations. It is important to build robust logic that can handle the RTD value during a faulted condition. One method of doing so is

to create an individual RTD health variable that ensures each RTD value is between –50° and +250°C. This variable can then be used to supervise the thermal trip condition, trigger data recording to determine the specific fault at the device, and send alarms to users to notify them that a faulted condition exists on the RTD system. For advanced methods to determine which RTD is faulty and trigger the Sequential Events Recorder (SER), contact your local SEL field application engineer.

MONITOR, TEST, AND VERIFY THE RTD SYSTEM

It is vital to test all operating modes when commissioning the system, including open and shorted RTD sensors. This step will help prevent any false trips from occurring. To aid in locating intermittent issues, such as a loose screw on a terminal block or water intrusion at the sensor, add alarm triggers to the SER. Having time-stamped fault data from the SER will allow the user to determine if weather or local switching had any impact.

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