

Logic testing starts by comparing all of the onsite documentation to the settings and making sure all drawings and the relay settings match as described in the "Review the Application" section of other books of *The Relay Testing Handbook* series. You can create your test plan based on the relay settings once all of the site documentation is reviewed. It is important to look at the settings objectively and look for inconsistencies inside the settings themselves. Look for impossible logic conditions and make sure that an element that is enabled and setup is also found in the output logic. Look for elements in the output logic that aren't turned on or set. If there are no obvious errors, note the logic for each output, including signals sent over communication channels and LED or front panel displays. Once you have a comprehensive list of all of the output logic, create a checklist for each output broken down into simple OR statements. For example, a simple SEL overcurrent relay might have the following settings.

- TRIP = 51P1T + 51N1T + 50P1 + 50N1
- (Trip Breaker) OUT101 = TRIP
- (Scada/Remote Trip Indication) OUT107 = TRIP
- (Front Panel Display) 52A = IN101, DP1 = 52A, DP_1 = Breaker Closed, DP_2 = Breaker Open

For those unfamiliar with SEL logic, the "Understanding Digital Logic" section located in other books in *The Relay Testing Handbook* series describes SEL and GE logic schemes in detail. Brief descriptions of the SEL codes above include:

- **51P1T**—Phase Inverse Time Overcurrent Trip
- **51N1T**—Neutral Inverse Time Overcurrent Trip
- **50P1**—Phase Instantaneous Overcurrent Pickup
- **50N1**—Neutral Instantaneous Overcurrent Pickup
- **DP_1**—Front Panel Display Point One
- **DP_2**—Front Panel Display Point Two

If you wish to combine traditional pickup and timing testing with logic testing, your test plan could look like the following test plans. It is important to note that you must apply the appropriate fault simulation to ensure the element operates during the timing test to prevent interference by other elements. If a phase-related element is enabled, a phase-to-phase or 3-phase test should be applied. If a ground related element is applied, a phase-to-ground test should be applied.