

# Protective Relay Testing

## Why Test?

The Recommended Practice for Electrical Equipment Maintenance, ANSI/NFPA 70B, states:

“8.9.7.2 Since protective relays...play such an important part in the prevention of hazard to personnel and plant equipment, THEY SHOULD BE GIVEN FIRST LINE MAINTENANCE ATTENTION. Furthermore, since the only time they operate is during an abnormal electric power system condition, THE ONLY WAY TO ASSURE CORRECT OPERATION IS BY A COMPREHENSIVE INSPECTION, MAINTENANCE AND TESTING PROGRAM.”

A relay may only need to operate for 0.15 seconds in its 30+ year life. Failure to operate as intended can result in extensive damage, extended power outages, and loss of life.

NETA  
(INTERNATIONAL ELECTRICAL TESTING ASSOCIATION)  
reports show  
12% Failure Rates  
on Protective Relays Tested

A comprehensive testing program should simulate fault and normal operating conditions of the relay. Acceptance testing, commissioning, and start-up will include control power tests, CT and PT tests, and any other device testing associated with the protective relay. Routine preventive maintenance testing will also be required.

## How Often?

Most manufacturers recommend annually. Operating experience determines frequency (environment, level of reliability expected, age, failure rates, etc.). The typical interval recommended by ANSI/NFPA 70B is one to three years.

## Which Tests?

Different for each type of relay. Determined by manufacturer's recommendations and special application considerations. NETA procedures include:

- Inspection for mechanical problems
- Pickup on each operating element
- Timing at three points on curve
- Target and seal-in operation
- Special tests for restraint, directional overcurrent, and other special operating elements
- Insulation tests
- Actual breaker trip test
- Peripheral and auxiliary device tests
- Function test

## Test Equipment, Information and Expertise Required

- Calibrated current and voltage sources (1 and 3 phase) must not have excessive distortion of waveform
- Calibrated timing devices with start/stop circuits
- Phase shifters and phase angle meters
- Test jacks, relay cases, and test leads
- Manufacturer's literature and curves
- Thorough knowledge of test equipment and relays
- Power system short circuit and coordination study with recommended protective device settings

