

## Article Overview

Relay protection commissioning involves systematic verification of installation, configuration, and operation to ensure relays function correctly within the protection scheme before energization.

### 1. Pre-Commissioning Preparation

Before energizing the system, ensure all equipment is installed according to design specifications. This includes verifying that the correct relays, CTs (current transformers), VTs (voltage transformers), and auxiliary supplies are in place. Remove all deliberate earth connections on wiring to prevent false trips during testing. Confirm that relay settings, programmable logic, and protection schemes are correctly entered and documented.

### 2. Verification of CT and VT Installation

- o Polarity Check: Each CT and VT should be tested to ensure primary and secondary polarities are correct. Use a low-voltage battery and a DC ammeter to verify the expected flick direction on energization.
- o Magnetization Curve: Measure the CT magnetization curve by energizing the secondary through a variable auto-transformer while keeping the primary open. Identify the knee-point voltage to ensure proper saturation characteristics.
- o Ratio and Phasing: Confirm CT and VT ratios and phasing match the protection scheme requirements.

### 3. Auxiliary Supply Testing

Test AC and DC auxiliary supplies for voltage variations, interruptions, and polarity issues. Relays should withstand short interruptions (up to 20-50 ms) without maloperation and recover automatically from longer interruptions. For DC supplies, check reverse polarity, superimposed AC waveforms, and voltage decay under load conditions.

### 4. Relay Functional Testing

- o Individual Relay Tests: Verify each relay's operation under simulated fault conditions, including overcurrent, underfrequency, and voltage fluctuations.
- o Logic and Programmable Settings: Confirm that programmable logic and protection functions are correctly implemented. Use relay front panels or software tools to simulate faults and validate responses.
- o Communication and Event Reporting: Test communication links, event recording, and synchrophasor measurements if available, ensuring accurate data capture and reporting.

### 5. End-to-End System Testing

# Relay Protection Commissioning Scheme

Perform site commissioning tests to validate the complete protection scheme. This includes:

- o Simulating faults across the system to verify correct tripping and coordination.
- o Testing breaker trip circuits and DC control circuits.
- o Ensuring that all relays operate in sequence according to the protection logic . Lab simulations with all relays and logic processors connected can provide a controlled environment for full end-to-end verification.

## 6. Documentation and Final Checks

Record all test results, relay settings, and any deviations observed during commissioning. Ensure that all equipment is restored to operational status and that the protection system is ready for live operation. Continuous monitoring and periodic testing are recommended to maintain system health over the relay's lifecycle .

## Key Considerations

- o Follow IEC 60255 and IEEE C37.90 standards for relay performance and testing .
- o Ensure safety and minimize risk to personnel and equipment during testing.
- o Use data analytics tools to analyze test results, identify trends, and optimize maintenance schedules . By following these steps, relay protection commissioning ensures reliable fault detection, system safety, and operational continuity in power distribution networks.

Protection relay testing and commissioning are critical steps in ensuring the reliability and safety of power systems. Properly tested

The testing & commissioning of the protection relays can be done by different testing software and hardware. In this training, we have

Relay protection circuitry This handbook covers the code of practice in protection circuitry including standard lead and

The purpose of the commissioning tests is to ensure that connections are correct, that the performance of current

We examine and suggest approaches for commissioning several applications: distribution bus protection, short line

One important complication of the technology shift is the increas-ing portion of the protection system design

that

E2 Relay Commissioning Network Protection & Automation Guide Network Protection & Automation Guide Chapter E2

Commissioning & Periodic Maintenance of Microprocessor Based Protection Relays In Industrial Facilities IEEE PES & IAS

Relay testing is the process of verifying that protective relays are calibrated correctly and functioning accurately. Commissioning, on

Download Citation | Commissioning of Protective Relay Systems | Performing tests on individual relays is a common

Commissioning an entire protective relay system is more complex than testing individual relays. Utilizing event report analysis

Commissioning tests at site are therefore invariably performed before protection equipment is set to work. The aims of

Ensuring that protection systems operate reliably is crucial, and a good preventive maintenance program ensures that protection and

Protection systems are made up of many different types and makes of relays however the relays can be grouped by the function they

Facilities need to perform installation tests, implement preventive maintenance programs, and perform comprehensive

Commissioning of Protective Relay Systems Karl Zimmerman, Schweitzer Engineering Laboratories, Inc.

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