

Verify the sensitivity of relay protection

Article Overview

Relay protection sensitivity is verified by testing whether the relay reliably operates for internal faults while remaining stable under normal or through-fault conditions.

Overview of Sensitivity Verification

The sensitivity of a protective relay ensures it can detect internal faults within the protected zone without being triggered by external disturbances. Verification involves injecting controlled currents into the relay and monitoring its response to confirm it operates at the minimum required fault current and correctly discriminates between internal and external faults .

Step-by-Step Procedure

o Prepare Test Equipment

- o Primary Injection Test Kit: Injects large currents directly into CT circuits.
- o Secondary Injection Test Kit: Simulates relay inputs with controlled currents and voltages.
- o Ensure all CTs and relay terminals are correctly connected and polarity is verified .

o Stability Test

- o Inject primary current through one set of CTs with one current directed inward and the other outward.
- o At the relay terminal, no operational current should be observed, confirming stability under through-fault conditions .

o Sensitivity Test

- o Reverse the polarity of one CT secondary or inject current into only one CT.
- o Gradually increase the primary current until the relay operates.
- o Record the minimum primary current required to trigger the relay, which indicates the relay's sensitivity .

o Differential Relay Checks

- o Measure CT secondary currents and differential current at the relay.
- o A zero differential current under normal conditions confirms proper CT wiring and stability.
- o When testing sensitivity, a small differential current should trigger the relay, confirming it can detect internal faults .

o Repeat for All Phases and Tap Settings

- o Perform tests for minimum and maximum tap settings of transformers.
- o Ensure the relay responds correctly across all operational conditions .

o Documentation

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- o Record all measurements on the test form.
- o Verify that all readings fall within manufacturer-specified tolerance limits .

Additional Considerations

- o High-impedance differential relays require careful attention to CT connections and bias settings.
- o Pilot wire protection requires end-to-end testing to ensure proper relay operation and communication between both ends of the feeder .
- o Follow manufacturer guidelines and relevant standards such as IEC 60255 and IEEE C37 series for accurate testing . By following these procedures, engineers can confirm that the relay is sufficiently sensitive to internal faults, stable under external disturbances, and correctly wired, ensuring reliable protection of the electrical system .

How to Test Protective Relays Correctly Usually I try to keep my posts as simple and practical as possible. This post is a little

Effective relay protection in HV/MV substations requires a thorough approach encompassing calculations, precise

Selectivity Selectivity is a mandatory requirement for all protection, but the importance of it depends on the application. For example,

Protection Function Testing Procedure: Step-by-step guide for stability, sensitivity & differential relay tests ensuring

Based on simple examples of the generator-transformer unit protection from symmetrical short circuits, it was shown that the

A protective relay is an electrical component that is designed to trip a circuit breaker when a fault is encountered or

The issues related to the fulfillment of the requirements for selectivity and sensitivity of the overcurrent protections are still relevant

In order to make the verification and management of relay protection value more scientific and effective, an orderly check of the relay

Abstract--This paper describes several commonly applied line protection schemes, including distance schemes, directional

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Verify protection schemes during commissioning and maintenance to ensure reliable

Abstract: Protective relays and devices have been developed over 100 years ago to provide "last line" of defense for the electrical

Protective relays and monitoring relays detect or monitor for abnormal power system conditions. Protective relays detect defective

Protection Relay Testing Procedures: Protection relay testing involves a series of comprehensive procedures to

Introduction to relay protection Protection is the branch of electric power engineering

Terminology in relay protection It's not unusual to see graduates and engineers from other disciplines experience

This online protective relay testing seminar follows Chris Werstiuk (author of The Relay Testing Handbook) as he tests a relay from

Web: <https://bssoda.pl>

