Relay Protection Recommendations for Secondary Commissioning



Overview

Type tests are needed to prove that a protection relay meets the claimed specification and follows all relevant standards.

Key Takeaways

Relay protection ensures safe operation of power systems under fault conditions, while secondary commissioning verifies relay logic, settings, and trip functionality before energization.

Relay Protection Overview

Relay protection is a critical component of electrical power systems, designed to detect abnormal conditions such as overcurrent, short circuits, or voltage faults, and to isolate the affected section to prevent equipment damage and maintain system stability. Modern protection relays include digital, numerical, and electromechanical types, often with advanced software functionalities and communication capabilities like IEC 61850 and GOOSE messaging. Proper relay protection ensures that faults are cleared quickly, minimizing downtime and hazards to personnel.

Secondary Commissioning



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Secondary commissioning involves testing and verifying the relay's internal logic, settings, and trip circuits without applying high voltage or current to the system. This process is essential because wiring errors, incorrect CT/VT installation, or misconfigured relay settings can lead to nuisance tripping or failure to operate during faults. The main objectives of secondary commissioning are: Verify relay configuration and settings.

Check relay logic and timing. Test trip and alarm outputs. Detect faulty or improperly configured relays.

Secondary Injection Testing

The secondary injection test is a key method used during commissioning and maintenance. It involves injecting a simulated current or voltage signal directly into the relay to test its internal logic and output circuits. Unlike primary injection tests, secondary injection does not stress the entire system, making it safer and more efficient.

Steps typically include: Preparation: Disconnect relay outputs from the system and ensure proper safety measures. Signal Injection: Apply low-level current or voltage to the relay inputs. Verification: Measure relay response, trip times, and logic operation.

Settings Check: Confirm that relay settings match the design specifications. Documentation: Record results and adjust settings if necessary.

Tools and Software

Modern relays, such as ABB's Relion series, support secondary commissioning using configuration tools like PCM600, which allow engineers to map I/O, configure logic, and simulate faults digitally. Automated test systems, such as those from HV Hipot Electric, can perform multi-phase secondary injection tests, simulate faults, and provide real-time waveform analysis, reducing commissioning time and human error.

Best Practices

Perform type tests at the manufacturer to ensure relay compliance with IEC 60255 and IEEE C37. 90 standards. Conduct site commissioning tests to verify wiring, CT/VT installation, and relay logic.

Use secondary injection tests for safe, efficient verification of relay functionality. Document all settings and test results for future maintenance and troubleshooting. By following these procedures, utilities and engineers can ensure that protective relays operate reliably, faults are cleared promptly, and the power system remains safe and stable.

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Article Content

Installing and Maintaining Protective Relay Systems

Facilities need to perform installation tests, implement preventive maintenance programs, and perform comprehensive commissioning tests to verify the integrity of both existing protective relay systems

Protection Relay Testing and Commissioning

Type tests are needed to prove that a protection relay meets the claimed specification and follows all relevant standards. Since the basic function of a protection relay is to correctly function under

Practical handbook for relay protection engineers | EEP

Master the relay testing and commissioning workflow. A professional field guide covering secondary injection, logic mapping, and fault-free protection setup.

Protection Relay Testing for Commissioning

The purpose of this Standard Work Practice (SWP) is to standardise and describe the method for testing of Ergon Energy protection relays for commissioning purposes.

Testing and Maintenance of Protective Relays

The performance of protective relay is affected by maintenance. Basic requirements of sensitivity, selectivity, reliability and stability can be satisfied only if the maintenance is excellent.

Relay Testing and Commissioning Guide | PDF | Relay | Scada

The document provides recommendations for relay testing and best practices: 1. Perform comprehensive commissioning testing at installation to verify protection system performance,

Testing & Commissioning Protective Schemes

The purpose of the commissioning tests is to ensure that connections are correct, that the performance of current transformers and relays agrees with the expected results and that no

Practical handbook-for-relay-protection-engineers | PDF

The handbook for protection engineers includes guidelines on protective circuitry, protective relay principles, and testing procedures for switchgear and relays.

Relay Maintenance and Testing

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With microprocessor relays, the built-in, self-testing features can be expected to reveal most faults, but this alone does not meet regulatory requirements or cover the other components involved in the

Installing and Maintaining Protective Relay Systems

Ensuring that protection systems operate reliably is crucial, and a good preventive maintenance program ensures that protection and relay systems function properly without causing additional problems.

IEEE PSRC, WG I-25 May 10, 2017 Commissioning Testing of Protection

Communicating testing requirements - The commissioning agent is responsible for defining appropriate visual checks, measurements and tests required verifying the design and construction of a substation

CIGRE Surveyed Global Process Bus Experience. What Can We Learn?

CIGRE WG B5.69 published TB 949 — the most comprehensive survey of real-world IEC 61850 process bus deployments. 55 projects, 42 specialists from 29 organisations. Key findings and

Protection Relay Testing and Commissioning

The testing and verification of protection devices and arrangements introduces a number of issues. This happens because the main function of protection devices is related to operation under fault

Microsoft PowerPoint

Commissioning & Periodic Maintenance of Microprocessor Based Protection Relays In Industrial Facilities IEEE PES & IAS BOSTON Tuesday, April 26, 2022 Peter E. Sutherland, PhD, PE, IEEE

Joint Review of Protection System Commissioning Programs

Lack of independent review of protection system designs by the commissioning group prior to construction; Lack of centralized overarching PSC programs that serve as a tool for the

Relay Commissioning Guide: Testing & Procedures

E2 Relay Commissioning Network Protection & Automation Guide Network Protection & Automation Guide Chapter E2 Relay Commissioning 1.

Commissioning of protection relays using test equipment and software

Commissioning and maintenance With numerical protection relays commissioning and maintenance has become far less complicated as a result of the information provided by the devices

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Power System Protective Relays: Principles & Practices

Abstract: Protective relays and devices have been developed over 100 years ago to provide “last line” of defense for the electrical systems. They are intended to quickly identify a fault and isolate it so the

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

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