Principle of Old-style Relay Protection Devices



Overview

Traditionally, protective relays were electromechanical devices utilizing induction disk, coils, contacts, and solenoid elements to determine protective characteristics.

Key Takeaways

Understanding old-style relay settings involves analyzing parameters like PSM, TSM, EL, OL, and MF to determine how the relay detects faults, coordinates with other relays, and trips circuit breakers. Key Relay Settings1.

PS

M – Plug Setting Multiplier (Current Setting Multiplier) PSM indicates how many times the actual current exceeds the relay's pickup current. It is crucial for inverse definite minimum time (IDMT) relays, as it determines the basic operating time based on the fault current. A higher PSM results in faster tripping, while a lower PSM delays operation.

Correct PS

M selection ensures the relay responds appropriately to overcurrent conditions without unnecessary trips, following IEC 60255-151 standards. 2.

TS

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M – Time Setting Multiplier TSM scales the base operating time derived from the relay's characteristic curve. It allows coordination between upstream and downstream relays, ensuring the downstream relay trips first while the upstream relay provides backup.

Lower TS

M values produce faster tripping, and higher values delay operation to maintain selectivity, in accordance with IEC 60255-3. 3.

O

L – Overload Setting OL defines the thermal overload threshold for equipment protection. It ensures that the relay trips if the current exceeds safe operating limits for a prolonged period, preventing damage to motors, transformers, or conductors. 4.

E

L – Earth Leakage / Earth Fault Setting EL sets the pickup current for detecting ground faults.

Proper E

L adjustment ensures that the relay responds to earth faults without false tripping due to normal leakage currents. 5.

M

F – Multiplying Factor MF is used for scaling or metering purposes, adjusting the relay's response according to CT ratios or system-specific factors. It ensures that the relay interprets secondary currents correctly relative to primary system currents.

Interpreting Relay Operation

Definite Time vs. Inverse Time: Definite time relays trip after a fixed delay regardless of fault magnitude, while inverse time relays trip faster for higher fault currents. Protected Zone: Each relay protects a defined section of the network.

Settings must ensure the relay operates only for faults within its zone, maintaining stability and selectivity. Coordination: By adjusting PSM and TSM, engineers can create a time grading scheme, where downstream relays trip first and upstream relays act as backup. Testing and Verification: Old-style relays require manual testing using secondary injection or simulation of fault currents to verify that the settings produce the expected trip times and coordination.

Practical Tips

Always refer to the relay's nameplate and characteristic curves to interpret settings accurately.

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T ratios and system voltages to ensure PSM and MF are correctly applied. Document all settings and coordination studies to maintain system reliability and facilitate troubleshooting. Consider the relay's age and mechanical condition, as electromechanical relays may drift over time, affecting pickup and timing accuracy.

By understanding these parameters and their interactions, engineers can effectively interpret old-style relay protection devices, ensuring reliable fault detection, proper coordination, and safe operation of electrical systems.

Article Content

Protective Relay Basics

Traditionally, protective relays were electromechanical devices utilizing induction disk, coils, contacts, and solenoid elements to determine protective characteristics.

Protective Relay: Working, Types, and Applications

Learn about protective relays, their working principle, types, and applications in power systems. Discover how relays protect transformers,

Protective Relays: Types, Working Principle & Uses

Protective relays have evolved from electromechanical devices to microprocessor-based numerical relays. The core purpose is the same: detect abnormal conditions and initiate protection.

Power System Protective Relays: Principles & Practices

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 balance of

History of Global protection Relay

Explore the evolution of protective relays from 1880s electromechanical designs to today''s smart relays with AI. Learn about key milestones from ABB, Siemens, and PILZ in

Protective relay

Distance relays, also known as impedance relay, differ in principle from other forms of protection in that their performance is not governed by the magnitude of the current or voltage in the protected circuit

The Good Old Electromechanical Protective Relay

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These relays are usually instantaneous in action, with no intentional time delay, closing as soon after pickup as the mechanical motion permits. We can add time delay by means of a bellows, dashpot, or

Evolution of Protective Relays in Power Systems | PDF | Relay

This document summarizes the evolution of protective relays over the past century. It discusses how protective relays have progressed from early electromechanical devices in the 1900s to modern

Westinghouse Protective and Control Relays from 1924 Silent Sentinels

The relay operates on the induction principle, the operating element being very similar to that of the CO relay. The winding of this element is so connected that under normal conditions of operation no

History of protection engineering

In contrast to the previous protection systems, the Buchholz relay (Fig. 7) was the first to use a device that did not activate the deviation of the current, voltage or power state from the

IEEE Guide for Protective Relay Applications to Transmission Lines

The impact of different electrical parameters and system performance considerations on the selection of relays and protection schemes is discussed. The purpose of this guide is to provide a reference for

Protective Relays: Types, Working Principle & Uses

Protective Relays A practical guide to how protective relays detect faults, trip circuit breakers, coordinate protection zones, and improve power system reliability. By Turn2Engineering

Protective relay

Electromechanical protective relays at a hydroelectric generating plant. The relays are in round glass cases. The rectangular devices are test connection blocks, used for testing and isolation of

Evolution of Protection Relays: From Electromechanical to Digital Relay ...

Today, digital relays provide features such as self-testing, waveform analysis, and rapid fault response, which far surpass the capabilities of early devices. The following table illustrates the

What is Protection Relay?

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A protection relay is a crucial component of electrical systems that safeguard infrastructure, employees, and equipment from electric problems and malfunctions. It functions as a

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Perform power system simulations of selected faults and observe how a given protection principle (overcurrent, impedance, and differential) works. Set the relays for a given power system. Verify by

History of protection engineering

When the term “relay” was used, however, one was more likely to think of the station in the stagecoach era, where the exhausted horses were replaced by fresh, more productive horses.

Types of Electrical Protection Relays or Protective Relays

Key learnings: Protective Relay Definition: A protective relay is an automatic device that senses abnormal conditions in electrical circuits and triggers actions to isolate faults. Types of

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