Relay protection jitter time



Overview

These curves can be used in conjunction with the motor time-current curve for a normal start to set protective relays and breakers for motor thermal protection during starting and running conditions.

Key Takeaways

Relay protection jitter time is the variation or uncertainty in the operating time of a protective relay, influenced by mechanical, electrical, and communication factors.

Definition and Importance

Jitter time in relay protection refers to the small, random variations in the time it takes for a relay to operate after detecting a fault. This variability can affect the coordination and selectivity of protection systems, potentially causing either delayed fault clearing or unintended tripping of upstream devices, which may impact system stability and reliability.

Factors Affecting Jitter

Relay Type: Electromechanical relays have moving parts, and their operating time depends on the speed of the moving components and the controlling and deflecting forces. Variations in these forces, friction, or mechanical wear contribute to jitter. Static and numerical relays have fewer moving parts, reducing mechanical jitter, but digital processing and communication delays can introduce timing variability.

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Settings and Multipliers: Time Setting Multiplier (TSM) adjusts the relay's operating time by controlling the travel distance of moving parts in electromechanical relays. Small variations in TSM or plug setting multiplier (PSM) can affect the relay's response time. Inverse time relays respond faster at higher fault currents, but the exact timing can vary slightly depending on current magnitude and network conditions.

Communication and Trip Circuits: In modern digital protection systems, Ethernet or serial communication delays can introduce jitter in the trip signal. Reduced latency and jitter in communication paths improve the reliability and speed of digital trip circuits. Auxiliary trip circuits and breaker actuation times also contribute to the total trip-circuit time, which includes the relay decision time plus any additional delays.

Measurement and Mitigation

Measurement: Jitter can be measured by repeatedly applying a fault signal and recording the variation in relay operating times. Lab testing and white-box/black-box testing of digital trip circuits are commonly used. Mitigation: Using numerical relays, minimizing mechanical components, optimizing communication paths, and proper calibration of TSM and PSM reduce jitter.

Ensuring relays are free from dirt and mechanical wear also helps maintain consistent operation.

Practical Implications

Excessive jitter can compromise selectivity, causing upstream relays to trip unnecessarily. Low jitter ensures predictable fault clearing, allowing higher line loading without risking network stability. In high-speed protection schemes, such as differential or distance protection, minimizing jitter is critical to maintain system reliability and safety.

In summary, relay protection jitter time is a key parameter in power system protection, representing the variability in relay operation due to mechanical, electrical, and communication factors. Proper relay selection, calibration, and system design are essential to minimize jitter and ensure fast, reliable fault clearing.

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Article Content

Power System Protective Relays: Principles & Practices

These curves can be used in conjunction with the motor time-current curve for a normal start to set protective relays and breakers for motor thermal protection during starting and running conditions.

Inverse Time Over Current (TOC/IDMT) relay trip time calculator.

See AlsoParametersWhat Is Inverse Time Overcurrent (TOC)?What Is Idmt?IEC 60255 IDMT (TOC) Trip CurvesE C37.112-1996 IDMT (TOC) Trip CurvesInverse Time Over Current (TOC), also referred to as Time Over Current (TOC), or Inverse Definite Minimum Time (IDMT), means that the trip time is inversely proportional to the fault current.See more on jcalc

Videos of Relay Protection Jitter Time

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Protective relay - Wikipedia

A definite time over-current (DTOC) relay is a relay that operates after a definite period of time once the current exceeds the pickup value. Hence, this relay has current setting range as well as time setting

Case Study: Defining and Measuring Protection Signal Transfer Speed ...

Mission-critical digital trip circuits that satisfy protection have strict latency, jitter, and availability requirements that are addressed by SLAs. Ongoing fulfillment of these metrics or key performance

Speed and Security Considerations for Protection Channels

This paper describes the communications requirements for various protection and control applications, including channel time, channel asymmetry requirements, and jitter.

The fundamentals of protection relay co-ordination and time ...

Among the various possible methods used to achieve correct relay co-ordination are those using either time or overcurrent, or a combination of both. The common aim of all three

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Power-Utility Time Synchronization (IEC 61850)

Precise time synchronization of protection relays, synchrophasors and other IEDs in the electric power industry is essential for assured power

Line Protection Operate Time: How Fast Shall It Be?

In this paper the real benefits of ultra-high-speed relay operate time are analyzed, considering the characteristics of the state-of-the-art circuit breakers and their interrupting time of 1.5-2 power system

Time Multiplier Setting (TMS): Formula, Calculation, & Example

TMS is a setting on overcurrent relays that controls how long the relay will take to operate once the fault current exceeds the pickup value. By adjusting the TMS, protection engineers can

Protection Basics

52 Time-overcurrent relay Instantaneous-overcurrent relay Directional-overcurrent relay Distance relay Differential relay Circuit breaker

Instantaneous and Time-overcurrent (50/51) Protection

How Does Instantaneous and Time-Overcurrent Protection Work? Overcurrent protection prevents damage from the overheating of critical components and

Time Delay Relay Protection Explained

A time delay relay plays a crucial role in modern electrical and automation systems, providing precise control over when electrical circuits activate or deactivate. Unlike standard relays

Protective Relay Basics

There are many types of protective relay functions, but this presentation will focus on the most common type, basic overcurrent device 50/51 (instantaneous and time overcurrent).

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Therefore, OR-2 must wait (certain time delay is applied) for the slowest relay protecting the lines and loads connected to the busbar 3 to operate. The ORs with fixed delay are called definite-time

Fundamentals of Modern Protective Relaying

Where it is desired to have more time delay before element operates for purpose of coordinating with other protective relays or devices, time overcurrent protective element is used.

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Distribution Automation Handbook

The operating time of definite time relays does not depend on the magnitude of the fault cur-rent, while the operating time of inverse time relays is shorter the higher the fault current magnitude is. The time

Time Synchronization of protection relays to IEEE 1588/PTP

2.2 Precision Time Protocol (PTP) IEEE 1588-2008 The Precision Time Protocol (PTP) was developed in 2002 to achieve a higher synchronization accuracy over Ethernet than the one so far provided by

The Role of Protection Relays in Power Systems and an

Protective relays are critical in power systems because they serve as decision-making devices that ensure the safe operation of power grid. They play a key role in power system protection.

Understanding the Impacts of Time Synchronization and Network

Understanding the Impacts of Time Synchronization and Network Issues on Protection in Digital Secondary Systems Arun Shrestha, Mauricio Silveira, Jaya Yellajosula, and Sathish Kumar

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