Relay Protection Current Parallel Connection Method

Overview

Paralleling CTs for Line Current Differential Applications: Problems. It has been a common practice in power system protection to parallel CTs with trans.

Key Takeaways

Paralleling relays or current transformers (CTs) in protection schemes is possible but requires careful design to avoid measurement errors, unequal current sharing, and relay maloperation.

Parallel Connection of Relays

Paralleling mechanical relay contacts to increase current capacity is generally not recommended because differences in contact timing and resistance can lead to unequal current sharing, overheating, and premature relay failure. Even if multiple relays are used in parallel, the last contact to open may carry excessive current, causing arcing or contact damage. Some advanced methods use semiconductor devices across relay contacts to shunt transient currents and reduce arcing, allowing smaller relays to share a load safely.

However, this adds complexity and is application-specific. Parallel Connection of Current Transformers (CTs)In protective relay applications, especially line current differential (87) or bus protection, CTs are sometimes paralleled to feed a single relay when the number of CTs exceeds the relay inputs. While this practice has been used historically, it introduces several challenges: CT Saturation: Paralleled CTs may saturate unevenly during external faults, reducing relay security.

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Accuracy Issues: Differences in CT ratios, burden, and wiring can cause measurement errors. Relay Design Dependency: Low-impedance bus 87 relays can share CTs, but high-impedance bus 87 relays require dedicated CTs for each relay to maintain proper operation. System Configuration: The method of wiring CTs depends on transformer connections (delta or wye) and relay type (electromechanical vs digital).

Digital relays with internal compensation may allow more flexible CT connections.

Best Practices

Avoid paralleling contacts solely to increase ampacity; use relays rated for the required current. Use dedicated CTs for high-impedance or critical protection relays to ensure accuracy and security. Consider relay type and system configuration: Digital relays with internal compensation can tolerate some parallel CT connections, whereas electromechanical relays may require specific wiring (e.g., delta for wye windings).

Monitor for unequal current sharing and ensure proper burden matching when paralleling CTs. Use protective devices or semiconductor shunts if paralleling relays is unavoidable to reduce arcing and contact wear. In summary, while parallel connections of relays or CTs can be implemented in certain scenarios, careful attention to relay design, CT characteristics, and system configuration is essential to maintain protection reliability, accuracy, and safety.

Article Content

Paralleling CTs for Line Current Differential Applications: Problems ...

It has been a common practice in power system protection to parallel CTs with transmission relays due to typical bus configurations and limited current inputs to these relays.

The essentials of power systems: Relay protection and communication ...

In voltage differential busbar protection the CTs of all incoming and outgoing feeders are connected in series instead of connecting them in parallel. The secondaries of all CTs and differential

Protection of Complex Transmission lines parallel feeders, muti-ended ...

To overcome various problems that associated with parallel line protection, a variety of modern day improvements are available such as improved distance protection schemes, unit type protection,

Protection of parallel (double) circuit transmission lines in ...

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Distance protection performance problems are in the focus due to the fact that they are the most commonly used protection type for parallel transmission lines. The behavior of ground

Technical professionals provide easy-to-understand explanations of

Technical professionals explain in detail the unknowns when using PCB power relays with high current and high voltage, such as counter-electromotive force of coils, holding voltage application circuits,

Parallel transmission lines protection using creative Cos-Sin protection

In the proposed design, we measured the current signal only at the relay position. Apply a simple formula to combine three-phase power signals into one to reduce computational burden.

Protection of Lines or Feeder

The protection of parallel feeder requires to use directional relays and to grade the time setting of relay for selective tripping. There are two feeders connected in parallel from source to load.

Fundamentals of Modern Protective Relaying

A primary motor protective element of the motor protection relay is the thermal overload element and this is accomplished through motor thermal image modeling. This model must account for thermal

Mutual Impedance in Parallel Lines – Protective Relaying and Fault ...

Protective relaying considerations for preventing overreach and loss of directionality under certain power system operating conditions are illustrated and discussed. The paper illustrates

The essentials of power systems: Relay protection and

This is achieved by measuring the “summed” current of the parallel connection of all phase CT''s, or is calculated within the relay itself, (applicable

Transformer Protection Application Guide

Transformer Protection Application Guide This guide focuses primarily on application of protective relays for the protection of power transformers, with an emphasis on the most prevalent protection schemes

ABB Group

This document outlines ABB''s criteria for medium voltage protection in industrial applications.

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SEL-700G Generator Protection Relay Hands-On Exercises

Purpose In these exercises, you will develop SEL-700G settings to provide protection for a sample generator. Generator and transformer data along with single- and three-line diagrams are provided.

(PDF) Mutual Coupling Compensation Techniques Used for Distance ...

On multi-circuit lines, primarily if they operate in parallel, a zero-sequence mutual coupling should be considered when calculating settings for distance protection function.

Protecting a Relay Coil from a Surge

Just explained functions for protecting relays from surges. Hoping that you understood the case where a surge voltage is generated in a circuit with no protective circuit and where a surge

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

Optimal adaptive coordination of overcurrent relays in

In the conditions of dynamic changes of the distribution system, advanced equipment is needed for adaptive protection coordination of the relays.

Basics of Protective Relaying and Design Principles

Circuit Breakers (CBs), as well as Voltage and Current Transformers (VTs and CTs), are modeled as ideal elements. Appropriate relays are modeled using their generic description. The protective

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