Common-mode interference of relay protection

Article Overview

Common-mode interference (CMI) in relay protection is unwanted voltage or noise appearing equally on both input lines, potentially causing maloperation or false tripping of protection relays.

Understanding Common-Mode Interference

Common-mode interference occurs when a signal or noise appears simultaneously and in phase on both conductors of a two-wire system, relative to a common ground . In relay protection systems, this can arise from:

• Inductive or capacitive coupling from nearby power lines or switching devices .
• Ground potential differences between the relay and the measurement point .
• Internal circuit design, such as fast-switching power electronics in inverters or half-bridge circuits . CMI is distinct from differential-mode signals, which are the intended voltage differences relays measure to detect faults.

Effects on Relay Protection

CMI can interfere with the accurate operation of protection relays, leading to:

• False tripping or failure to trip during actual faults.
• Erroneous readings in current or voltage measurements.
• Increased susceptibility to high-frequency transients or switching noise . Protectio...

Article Content

Jul 09, 2026

Protecting against common mode faults by using different protection relays

Traditionally it is considered preferable to have backup protection for power systems which should be designed to

Jun 12, 2026

Protective Relay Basics

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

Jan 20, 2026

Types and Revolution of Electrical Relays

Types and Revolution of Electrical Relays Introduction: Protective relays work in concert with sensing and control devices to

Sep 30, 2025

State-of-the-art in the industrial implementation of protective relay ...

This aids readers to become familiar with the principles used by most common protective relays. Moreover, a review

Mar 05, 2026

Introduction to Protective Relaying | Electric Power Measurement and ...

Electronic Protection Relays Later protective relay designs used electronic circuits rather than electromagnetic mechanisms to detect

Dec 09, 2025

Protective Relay Basics

The objective of this presentation is to convey a basic understanding of protective relays to an audience of engineers already familiar

Mar 03, 2026

Protection Relay Testing and Commissioning

The interference is applied across each independent circuit (differential mode) and between each independent circuit and ground

Apr 30, 2026

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

Mar 22, 2026

Common-Mode (CM) Electromagnetic Interference: Causes and

Learn more about common-mode (CM) electromagnetic interference and how to suppress it in your electronics.

Sep 10, 2025

Protecting against common mode faults by using different protection

We are looking at the protection of an asset with main and backup protection on separate multifunction relays;

Aug 16, 2025

Understanding Common-Mode Signals | Analog Devices

The following discussion defines a common-mode signal, reviews the common cable configurations, considers

Feb 10, 2026

Understanding Common Mode and Differential Mode Interference

Common Mode Interference is the unwanted voltage difference between a conductor and the reference ground.

Jan 18, 2026

PMU-based relays_v2.dvi

This report is divided in two parts. In the first part, the operating principles of relay applications and the main components of

Jul 11, 2026

Differential and Common Mode Noise 26

Since magnetic flux flows inside the ferrite core, common mode choke coils work as an inductor against common mode current.

Apr 30, 2026

Conductor conduction and common mode 2 | Guidelines for EMI

We describe here in detail the mechanisms that generate common mode noise and its countermeasures (ground strengthening).

Aug 10, 2025

How to reduce the impact of common mode interference on

Common Mode Interference is a common type of interference in electronic circuits and communication systems. It corresponds to

May 17, 2026

EM Interference: Common-Mode vs Differential-Mode

Surge protective devices are connected either in differential-mode configuration (between lines or line and neutral,

Apr 29, 2026

Common Mode Interference | What It Is & How to Reduce It

Common mode interference is one of the most pervasive challenges in precision measurement and signal processing. Found across

Sep 03, 2025

AN 1043: Common-Mode Noise: Sources and Solutions

If a system is connected and running but only produces erroneous data, common-mode noise may be the reason. This application

Sep 05, 2025

Practice and Analysis of Electromagnetic Interference Influence of ...

The relay protection devices are a critical element of the power system and is regularly subjected to high temperatures, high

Jul 25, 2026

IEEE Guide for Protective Relay Applications to Transmission Lines

Independence in the operating principles of the primary and backup protection systems is a technique that may be applied to reduce

Dec 23, 2025

Common-mode signal

High frequency common-mode signals (e.g., RF noise from a computing circuit) may be blocked using a ferrite bead clamped to the

May 26, 2026

IEEE Guide for Protective Relay Applications to Transmission Lines

IEEE-SA Standards Board Abstract: Information on the concepts of protection of ac transmission lines is presented in this guide.

Oct 27, 2025

Practical handbook for relay protection engineers | EEP

This handbook covers the code of practice in protection circuitry including standard lead and device numbers, mode of

Aug 02, 2025

AN 1043: Common-Mode Noise: Sources and Solutions

Common-mode interference is sometimes inherent in a system design, but most often it is inductively or capacitively coupled from an

Apr 25, 2026

Common-mode signal

Common-mode interference (CMI) is a type of common-mode signal. Common-mode interference is interference that appears on

May 24, 2026

Anti Interference Technology of Relay Protection System in Large

This paper divides the interference sources into different categories, lists and analyzes the anti-interference measures of substation

Aug 23, 2025

Anti-interference and Fault Analysis of Control System

There are various reasons for interference. The most important principle is that the wiring of strong current and weak

Jul 31, 2025

How to Reduce EMI Voltage Spiking and Arcing

How to Reduce EMI, Voltage Spiking and Arcing DC Motor and Switch Applications In applications that involve motors, switches, or

Oct 01, 2025

Basics of Protective Relaying and Design Principles

Perform power system simulations of selected faults and observe how a given protection principle (overcurrent, impedance, and

Jun 17, 2026

Understanding Common-Mode And Differential-Mode Interference

When identifying and controlling electromagnetic interference (EMI), discussion of common-mode and differentialmode interference

Jul 20, 2026

Electromagnetic interference

Electromagnetic interference (EMI), also called radio-frequency interference (RFI) when in the radio frequency spectrum, is a

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PROTECTIVE RELAYING AND POWER QUALITY

The application of power quality functions in protective relaying is possible due to the increased functional capability of modern

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Applied EMI/RFI Techniques

Note: The faster the rise time on a PWM device, the more noise it creates. A drive that has 4 kHz switching frequency has many

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