

How are relay protection systems classified into upper and lower levels

Article Overview

Relay protection systems are classified into lower-level (primary) relays that directly protect equipment and upper-level (backup or supervisory) relays that provide secondary protection and system coordination.

Lower-Level (Primary) Protection

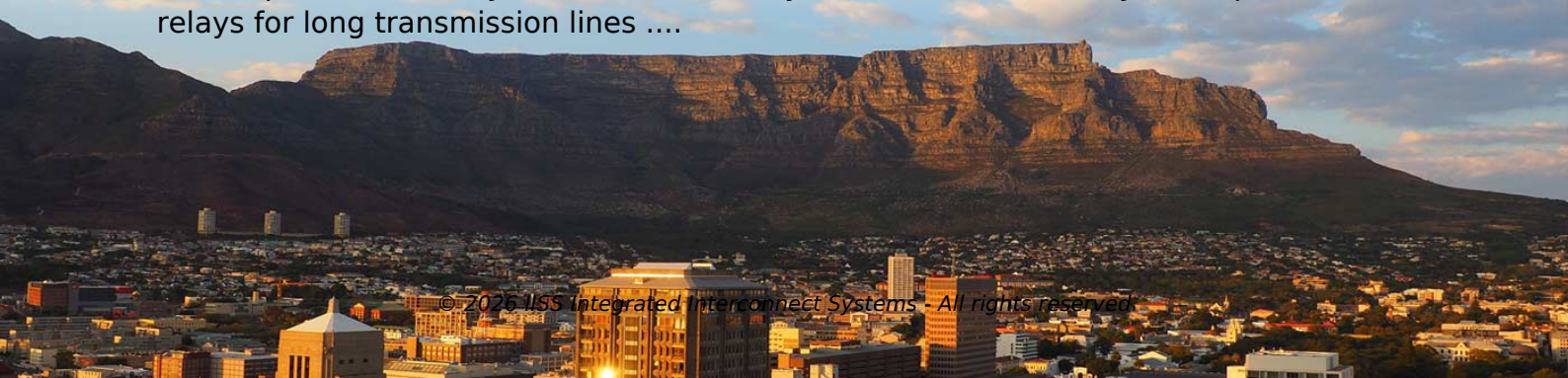
Lower-level relays, also called primary relays, are installed close to the equipment they protect, such as transformers, generators, feeders, or transmission lines. Their main functions include:

- Immediate fault detection: They sense abnormal conditions like overcurrent, overvoltage, under-voltage, or differential currents and operate quickly to isolate the faulted section .
- Direct tripping of circuit breakers: These relays send trip signals to breakers to disconnect the faulty equipment from the system .
- High selectivity and speed: They are designed to operate within milliseconds to prevent damage and maintain system stability .
- Examples: Overcurrent relays, differential relays, distance relays, and directional relays . Lower-level relays are typically connected through instrument transformers (CTs and PTs) to monitor electrical quantities safely and accurately .

Upper-Level (Backup or Supervisory) Protection

Upper-level relays, also known as backup or supervisory relays, provide secondary protection in case the primary relays fail or are unable to clear a fault. Their characteristics include:

- Delayed operation: They operate with intentional time delays to allow primary relays to act first, ensuring coordination .
- System-wide monitoring: They can monitor multiple zones or feeders and provide protection for larger sections of the network .
- Redundancy and reliability: They act as a safety net to prevent cascading failures and maintain overall system stability .
- Examples: Time-delayed overcurrent relays, bus differential relays, and pilot-wire relays for long transmission lines



Article Content

Jun 29, 2026

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

Oct 23, 2025

Protective Relaying Principles and Applications

Protective Relaying Principles and Applications The article provides an overview of protective relaying principles and their

Mar 30, 2026

Basic protection relay knowledge

On the other hand, unselective protection operation in the extra high voltage network – i.e. at the national grid level- may endanger

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Course description (1/3) Protections for electric power systems ...

Objectives This course provides the participants with an explanation of the more common protection devices and systems used in

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Hier sollte eine Beschreibung angezeigt werden, diese Seite lässt dies jedoch nicht zu.

Mar 20, 2026

Protective relay

OverviewRelays by functionsOperation principlesTypes according to constructionPower source

The various protective functions available on a given relay are denoted by standard ANSI device numbers. For example, a relay including function 51 would be a timed overcurrent protective relay. An overcurrent relay is a type of protective relay which operates when the load current exceeds a pickup value. It is of two types: instantaneous over current (IOC) relay and definite time overcurrent (DTOC) relay.

Aug 21, 2025

Types and Classification of Relays | PDF

Relays can be classified based on the quantity that activates them (current, voltage, etc.), their method of action on the switch, their

Dec 15, 2025

Types of Electrical Protection Relays or Protective Relays

Types of Protective Relays: Protective relays are categorized by their mechanism (electromagnetic, static,

Nov 09, 2025

Comparison of Protection Relay Types

This comparison summarize characteristics of all protection relay types described in previously published technical

Aug 04, 2025

Protective Relay: Advantages, Types & Applications

A protective relay can be classified based on three basic parameters – design, dimensions and operating range.

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Types of Protective Relays

Relay application practices can be classified according to relay characteristics and the special requirements of various elements.

Sep 25, 2025

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

Jun 12, 2026

Protective Relay Basics

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

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Types of Protective Relays and Their Functions in Power Systems

Overcurrent relays can be classified as instantaneous, definite time, or inverse time relays. Instantaneous relays act

May 29, 2026

Protective Relays: Types, Working Principle & Uses

Protective relay coordination is the process of setting relays so the device closest to the fault operates first, while

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Relays | Power System Protection 1: Principles and components

A protective relay is a relay which responds to abnormal conditions in an electrical power system, to control a circuit

Nov 18, 2025

Types of Protective Relays

Over-under Voltage Relays Directional Relays Current- Or Voltage-Balance Relays Distance Relaying Differential Relaying Pilot Wire Relaying The over-under voltage relays have characteristics similar to the overcurrent relays. The actuating quantity in the operating element is voltage instead of current. Voltage relays often combine the under-overvoltage elements in one relay, with contacts for either an undervoltage or overvoltage condition. These relays may be used to trip the breaker ...See more on [yourelectricalguide](#) Wikipedia

Protective relay - Wikipedia

Distance relays, also known as impedance relay, differ in principle from other forms of protection in that their performance is not

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Classification of Relays

In power system protective relaying, the most widely applied are electrical type relays. Generally speaking the classification of relays

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Types of Protective Relays

This article covers various types of protective relays, such as overcurrent, directional, and differential relays, highlighting their

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Understanding Protective Relays in Power Systems

Protective relays are critical components in power systems, providing essential protection for various elements such

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Introduction to Protective Relaying | Electric Power

Introduction to Protective Relaying What are Protective Relays, or Protection Relays?
Protective relays are

Jan 19, 2026

Protection Relay Types and Testing Procedures

This guide explores the different types of protection relays and their testing procedures, with a focus on tools like

Jul 28, 2025

Relay Classification in Power System Protection

Such relays are differentiated as over and under relays. Relays which respond to the actuating quantity when it exceeds a

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Relay Protection: Scheme Design And Coordination

Relay protection operates at the scheme level. A scheme defines how information is measured, compared, and acted upon across a

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Lecture 4

Reliability The protection system must provide its function when required to avoid damage to equipment, people or property

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Different Types of Protective Relays | 360training

Protective relays play a vital role in safeguarding electrical systems, ensuring safety, and preventing costly equipment

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Basic Theories of Power System Relay Protection

This chapter first introduces the basic theories of power system relay protection, summarizes the functions and basic requirements of

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PMU-based relays_v2.dvi

The protection principle of this relay is to compare the current inputs at both are high and low voltage sides of the transformer. Under

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Relays: How They Work, Types, Contacts & Power System Uses

A basic relay uses a control signal to open or close contacts, while a protective relay monitors power system

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What are different types of relays used in protection?

Common types of protection relays Overcurrent relay (OCR): Operates when the current exceeds a set value. Used

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UNIT 1 PROTECTIVE RELAYS

PROTECTIVE RELAYS PROTECTIVE RELAYING Requirement of Protective Relaying
Zones of protection, primary and backup

Contact Us

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