

Primary and secondary protection in relay protection

Article Overview

Primary protection acts as the first line of defense to clear faults quickly, while secondary (backup) protection provides a safety net if primary protection fails.

Primary Protection

Primary protection is designed to detect and isolate faults in the power system immediately at the location of the fault. It is the main protection system and operates with the following characteristics:

- o Fast response: It clears faults quickly to minimize damage and maintain system stability .
- o Selective operation: Only the faulty section is disconnected, leaving the rest of the system operational .
- o Connection: Relays are connected to the secondary side of current transformers (CTs), which step down the line current to a manageable level for the relay, typically 5A nominal .
- o Time settings: Primary relays are set with minimal time delay to ensure rapid fault clearance.
- o Reliability: The service record of primary relays is very high, with over 90% of operations being correct under normal conditions .

Secondary (Backup) Protection

Secondary or backup protection is activated when primary protection fails due to relay malfunction, circuit breaker failure, or CT/PT issues. Its main features include:

- o Delayed operation: Backup relays are set with a time delay relative to primary relays to avoid unnecessary tripping .
- o Coverage: It may disconnect a larger portion of the system than the primary relay to ensure fault isolation .
- o Redundancy: Acts as a safety net during maintenance or testing of primary relays, ensuring continuous protection .
- o Coordination: Time-current settings are coordinated with primary relays to prevent simultaneous operation and maintain system stability .

Setting Considerations

- o CT ratio selection: Choose a CT ratio slightly higher than the line rating to ensure accurate relay operation without saturation .
- o Relay class and accuracy: Class C relays are commonly used for low-leakage and reliable operation; numerical relays allow more flexibility in settings .
- o Time-current coordination: Primary relays operate first, and secondary relays are set with incremental delays

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to provide backup without interfering with normal operation . In summary, primary protection ensures fast and selective fault clearance, while secondary protection provides reliability and system security in case of primary failure. Proper coordination of CTs, relay types, and time-current settings is essential for effective power system protection .

Protective relays and devices have been developed over 100 years ago to provide "last line" of defense for the electrical systems.

Introduction to relay protection Protection is the branch of electric power engineering

Remote back-up protection is provided by protection that detects an un-cleared primary system fault at a remote

2. Back-up protection: It is the second line of defense in case of failure of the primary protection. It is designed to operate with

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The types of protective relays that exist are overcurrent, electromechanical, directional, distance, pilot, and differential

If the primary protection operation falls into trouble, then secondary protection disconnects the faulty part from the system. Moreover,

The current and voltage signals, the power supply of the relay, the output to the breaker should all be independent of the primary

: a secondary relay to protect a power system against faults in the event of failure of the primary relay to function as

Primary protection quickly responds when a fault occurs in the power system while the secondary protection operates

Closed and Open Zones In electrical power system protection, the terms "closed" and "open" zones of protection refer

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

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Learn how protective relays detect faults, trip breakers, coordinate protection zones, and

It is evident that when back-up relaying functions, a larger part is disconnected than when primary relaying functions correctly.

Backup protection relays provide secondary protection in case primary protection relays fail to operate or if there's a delay in their

Primary protection is designed to provide fast and selective protection within a specific zone, while backup protection

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