

Article Overview

A substation relay protection configuration table organizes relays, protection functions, and settings for transformers, feeders, and busbars to ensure selectivity, sensitivity, and reliability.

Key Components of a Relay Protection Configuration Table

o Protection Zones

- o Transformer Protection: Differential protection (REF), overcurrent, over-/undervoltage, frequency, and thermal monitoring (SEL-487E, SEL-387E) to protect generator step-up (GSU) and power transformers .
- o Busbar Protection: Differential or sectionalized bus protection, often using double-bus or bus-tie configurations with tie-breaker relays to isolate faults without tripping the entire system .
- o Feeder Protection: Overcurrent, directional overcurrent, and distance protection for outgoing feeders, coordinated with upstream and downstream relays .

o Relay Types and Functions

- o Overcurrent Relays (51/50): Time-delayed and instantaneous tripping for phase and ground faults .
- o Differential Relays (87T, 87B): Transformer and bus differential protection to detect internal faults .
- o Voltage/Under-Over Voltage Relays (27/59): Protect against abnormal voltage conditions .
- o Frequency Relays (81U/81O): Overfrequency and underfrequency protection for generators and critical loads .
- o Directional Power Relays: Monitor forward/reverse power flow to prevent reverse power conditions .
- o Thermal/RTD Monitoring: Tracks transformer winding temperature and through-fault duty to prevent insulation damage .

o Settings and Coordination

- o CT/PT Ratios: Ensure relay inputs match system voltage and current levels .
- o Pickup Current and Time Dial: Set for overcurrent relays to balance sensitivity and selectivity .
- o Zone Reach and Impedance: For distance relays, define the protected line segment without overreaching .
- o Differential Thresholds and Harmonic Restraint: Prevent false tripping during transformer inrush .
- o Coordination with Breakers: Relays are configured to trip the correct breaker(s) based on fault location and type .

o Example Table Structure

Protection	Zone	Relay	Type	Function	CT/PT	Ratio	Pickup/Threshold	Time	Delay	Notes	Transformer
HVSEL-487E	Differential, Overcurrent, Thermal	5A	CT	/	110V	PT120%	0.2s	Includes	volts/hertz		
protectionTransformer	LVSEL-387E	Differential, Overcurrent	5A	CT	/	110V	PT110%	0.3s	REF	element	
standardBusbar	87BD	Differential	5A	CT	100%	Instantaneous	Double-bus	with	tie-breaker	Feeder	
151/50	Overcurrent	5A	CT	150%	0.5s	Directional	enabled	Feeder	267	Directional	Overcurrent5A

CT120%0.4sCoordinated with downstream relaysGenerator81O/81UOver/Under FrequencyN/A60Hz +-0.5HzInstantaneousProtects prime and standby unitsCapacitor Bank59/27Over/Undervoltage5A CT / 110V PT105%0.2sThree-phase protectionno Implementation Notes

- o Use centralized or decentralized bus protection schemes with GOOSE messaging for fast communication .
- o Apply multi-layer logic functions using relay configuration tools (e.g., PCM600 for ABB REU615) to combine protection, control, and alarm functions .
- o Ensure coordination studies are performed to prevent nuisance tripping and maintain system reliability . This configuration table provides a structured approach to substation relay protection, ensuring that all critical components are monitored, faults are cleared selectively, and system stability is maintained.

The relay coordination and setting calculation for a case study substation is applied to clear the faulty feeder. The simulation is done

Relay Setting Calculations for Substation. This document provides relay setting calculations for the Rusayl-09 primary substation and

Working Group Assignment Report on common practices in the representation of protection and control relaying. The

PROTECTION RELAY TESTING AND COMMISSIONING The testing and verification of protection devices and arrangements

Relay settings, coordination curves, and settings tables are discussed in detail. The excel sheet of the coordination settings also is

RELAY SETTING CALCULATION QATIF 115/13.8KV SUBSTATION NO.2 Doc. No.: Rev. No.: EE-221424 A 2.4

A centralized substation protection and control system is comprised of a high-performance computing platform capable of providing

Welcome to the Protection Application Handbook in the series of booklets within the LEC support programme of BA THS BU

The results demonstrate that using the digital twin helps confirm the correct configuration of the protection devices. This study is

The schematics for the 69kV, 138kV, and 69kV line relays, as well as all of the transformer protection, have

been

Protective relays are most often applied with other protective and auxiliary relays as a system rather than individually. The following

On single-ended substations, deleting the secondary main circuit breaker might be possible as the medium-voltage

Scope Modern protection relays Multifunctional protection Product benefits Provide continuity of power to consumers Protection of

Recommended References: IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus -

Configure three SEL-487B Bus Differential and Breaker Failure Relays on a per-phase basis for large system bus protection. This

Apply advanced protection and monitoring with flexible communications to two-, three-, and four-terminal transformers. Protect and

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