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COURSE BROCHURE

# Line Protection Settings and Fault Record Analysis Training Course

1 – 5 March 2027
Dar es Salaam

# Line Protection Settings and Fault Record Analysis Training Course

**Ref:** 2680_102203 **Date:** 1 – 5 March 2027 **Location:** Dar es Salaam **Fees:** 7900 GBP

Line Protection Settings and Fault Record Analysis is a 1-week training course for protection engineers, relay technicians and transmission operations engineers who calculate, test and verify relay settings on high voltage lines, and who build a line protection settings review file for their circuits. Denser networks and power electronic generation make every misoperation costlier today. Jupiter Prime Training delivers this course on line protection settings and fault record analysis.

## Why Line Protection Settings and Fault Record Analysis Matters Now

Three pressures shape line protection today. Inverter-connected generation supplies limited fault current that can confuse distance and directional elements. Grid owners face tighter clearing limits and less tolerance for unwanted trips. Experienced setting engineers are retiring, leaving settings files nobody has questioned for years. An organisation that calculates settings carefully and reads every disturbance record keeps faults short and selective; one that does not learns about weak settings after an outage.

## Who Gains Most from Line Protection Settings and Fault Record Analysis

- Engineers who calculate and issue line relay settings
- Technicians who prove relay behaviour by secondary injection
- Operations engineers who decide when a tripped line is restored
- Specialists who coordinate protection between neighbouring grid owners
- Asset engineers who plan relay replacement

A protection department gains most when setting engineers and test technicians attend together.

## Line Protection Settings and Fault Record Analysis Capabilities

Participants move from line impedance data to settings, and from recorded waveforms back to a judgement on each element.

- Calculate distance zone reaches and time delays — setting approval by the protection lead
- Specify line differential and pilot scheme parameters — channel planning with telecoms staff
- Apply directional earth fault and breaker failure logic — substation design teams
- Design auto-reclosing sequences — control room operators
- Test relay settings — commissioning sign-off
- Assess fault records to separate correct operation, misoperation and failure to operate — incident review boards

## Key Line Protection Settings and Fault Record Analysis Terms

- Distance zone — a reach of line impedance inside which the relay trips after a set delay.
- Apparent impedance — the impedance the relay calculates from measured voltage and current.
- Pilot scheme — a protection arrangement that exchanges signals between line ends so both breakers trip quickly for internal faults.
- Residual compensation factor — a setting that corrects earth fault impedance measurement for the earth return path of the line.
- Dead time — the interval between breaker opening and automatic reclosure.
- Disturbance record — a time-stamped capture of analogue waveforms and digital signals that a relay stores when a fault or trip occurs.

## Line Protection Settings and Fault Record Analysis Day by Day

### Day 1: Line Faults and Relay Inputs

- Symmetrical Components For Line Faults — Choosing Which Quantities Each Element Measures
- Line Impedance And Mutual Coupling Data — Accuracy Of Every Later Reach Setting
- Current And Voltage Transformer Performance — Saturation Risk During Heavy Faults
- Inverter-Connected Generation Fault Behaviour — Limits Of Conventional Distance Assumptions
- Protection Philosophy Documents — Agreeing Speed, Selectivity And Backup Duties

### Day 2: Distance and Earth Fault Settings

- Zone Reach And Timer Calculation — Coordination With Adjacent Lines And Transformers
- Quadrilateral And Mho Characteristics — Coverage Of Fault Resistance Versus Load Encroachment
- Residual Compensation And Parallel Line Effects — Earth Fault Reach Accuracy
- Directional Earth Fault Elements — Detecting High Resistance Faults Beyond Distance Reach
- Power Swing Blocking And Out-Of-Step Tripping — Response To System Instability

### Day 3: Differential, Pilot and Reclosing Schemes

- Line Differential Bias Characteristics — Sensitivity Against Charging Current And Transformer Errors
- Permissive And Blocking Pilot Schemes — Choosing Logic For Each Communication Channel
- Weak Infeed And Current Reversal Logic — Secure Tripping On Parallel Circuits
- Single-Pole And Three-Pole Auto-Reclosing — Supply Continuity Versus Equipment Stress
- Breaker Failure Protection Timers — Clearing Stuck Breakers Without Unwanted Busbar Trips

## Day 4: Testing and Fault Record Interpretation

- Secondary Injection Test Plans — Proving Each Zone, Timer And Scheme Signal
- End-To-End Scheme Testing — Confirming Both Line Ends Respond Together
- Oscillography Reading Techniques — Locating Fault Inception, Clearance And Reclosure
- Sequence Of Events Logs — Reconstructing Relay, Breaker And Channel Timing
- Fault Location From Recorded Impedance — Directing Line Patrols To The Damaged Span

## Day 5: Practising the Line Protection Settings Review File

- Misoperation Case Reconstruction — Linking Recorded Evidence To The Faulty Setting
- Settings Recalculation For A Reconfigured Line — Applying Distance And Earth Fault Methods
- Scheme Logic Revision After A Channel Change — Applying Pilot And Reclosing Choices
- Test Evidence Review Against Issued Settings — Applying Injection And End-To-End Results
- Line Protection Settings Review File — Recommendations For Approval And Retesting

## Applying Line Protection Settings and Fault Record Analysis After the Course

- Lead a check of zone reaches, residual compensation and timers on one critical line.
- Run a monthly review of disturbance records from line relays, classifying each trip as correct, misoperation or failure to operate.

## Line Protection Settings and Fault Record Analysis Questions FAQ

### What is line protection settings and fault record analysis, and why does it matter now?

Line protection settings and fault record analysis is the work of calculating relay settings for transmission lines and checking them against recorded faults. It matters because changing generation exposes settings never revisited.

### Which roles gain most from line protection settings and fault record analysis?

Protection engineers, relay test technicians and transmission operations engineers gain most from line protection settings and fault record analysis. Asset engineers planning relay replacement also benefit.

## How does a course on line protection settings and fault record analysis differ from a general power system protection course?

A course on line protection settings and fault record analysis concentrates on transmission line schemes only. A general protection course spreads time across generators, transformers and busbars instead.

## What will you bring back from line protection settings and fault record analysis?

You bring back a line protection settings review file built from a realistic case. It holds recalculated settings, revised scheme logic and fault record findings.

## Line Protection Settings and Fault Record Analysis: The Way Forward

The line protection settings review file brings calculations, test results and recorded fault evidence together. Its first use is deciding which line settings need reissuing after a network change. Setting engineers, test technicians and incident reviewers draw on it, and it is worth revisiting after the next significant fault to confirm the revised settings behaved as intended.