Line differential protection RED670
Relion® 670 series version 2.2

Application
- Phase segregated current differential protection with excellent sensitivity for high resistive faults
- For line protection applications on multi-breaker arrangements in three terminal application or five terminals in single-breaker arrangements
- Full scheme distance protection in parallel with differential scheme
- Easy integration to conventional or digital substations

Features
- Fully IEC 61850 compliant, Edition 1 and Edition 2
- Extensive I/O capability
- Protection, monitoring and control of several primary objects integrated in one IED
- Extensive self-supervision including analog channels
- Six independent parameter setting groups
- Ethernet interface for fast and easy communication with PC and SA system
- Large number of Ethernet ports to support several system topologies and redundancy methods
- Large HMI for visualization of single line diagrams
- Settings via IEC 61850 for some protections
- Cyber security support for compliance to NERC CIP and IEC 62351-8 with Centralized Account Management

Pre-configured solutions
- Pre-configured and type-tested solutions including default settings for:
  - Single breaker, 1/3 phase tripping, 2-3 line ends
  - Multi breaker, 1/3 phase tripping, 2-5 line ends
  - Multi-breaker, 1/3 phase tripping, 2-3 line ends
  - Single-breaker, 1/3 phase tripping, with distance protection

Most important protection functions
- Line differential protection
  - Phase segregated line differential protection with charging current compensation for up to five line terminals
  - Power transformers can be included in the protected zone
  - Suitable for multiplexed, route switched, as well as dedicated fiber, communication networks using C37.94 protocol
  - Time synchronization with the echo-method, PTP or built-in GPS
  - Master-master or master-slave line differential communication arrangement
- 3-phase high impedance differential protection for tee-feeders
- Additional security logic
- Distance protection
  - Full-scheme distance protection with quadrilateral, Mho compensation characteristics for up to six zones and with load encroachment discrimination
  - Series/non-series compensated lines
  - Power swing detection
  - Phase preference logic
  - Pole slip protection

Voltage functions
- Two step phase- and residual overvoltage protection with definite and inverse time characteristics
- Two step undervoltage protection with definite and inverse time characteristics
- Voltage three-phase differential for capacitor banks
- Radial feeder protection
- Overexcitation protection
- Loss of voltage check

Current functions
- Instantaneous phase- and residual overcurrent protection
- Four step phase- and residual directional overcurrent protection
- Four step directional negative sequence overcurrent protection
- Sensitive directional earth-fault protection
- Thermal overload protection
- Breaker failure protection
- Stub protection
- Pole discordance protection
- Voltage controlled/restraint overcurrent protection

Power functions
- Directional under- and overpower protection

Secondary system supervision
- Fuse failure supervision
- Fuse supervision based on voltage differential
- Current circuit supervision
- Current/Voltage/Real Value based delta supervision

Frequency functions
- Under- and overfrequency protection
- Rate-of-change frequency protection

Multi-purpose function
- Multi-purpose filter with possibility to detect, alarm, and trip for special operating conditions, e.g. Sub-Synchronous Resonance (SSR)
- General current and voltage protection
- Scheme communication
- Scheme communication logic
- Phase segregated scheme communication logic for distance protection
- Current reversal and weak-end infeed logic
- Local acceleration logic

**Control functions**
- Autorecloser for single or multiple breakers
- Synchronizing, synchrocheck and energizing check
- Control and interlocking for up to 15 switching devices
- Selectable operator place allocation
- Software based multi-position selector switches

**Logic**
- Tripping and trip matrix logic
- Extensive logic block library for application customization

**Monitoring**
- Phasor monitoring for up to 8 phasor values
- Adjustable breaker monitoring with capability to handle multiple breaker types
- Monitor mechanical stresses on transformer via advanced transformer through fault monitoring and reporting functionality
- Disturbance recorder with disturbance report
  - 100 disturbances
  - 40 analog channels (30 physical and 10 derived)
  - 352 binary channels
  - All protection settings during a disturbance
- Event list for 1000 events
- Event and trip value recorders
- Fault locator
- Event counters
- Current/Voltage based harmonic monitoring (up to 5th order) including total harmonic distortion
- Running hour meter
- Supervision of AC and mA input quantities
- Large HMI with virtual keyboard, function push buttons, and three color LED indications with alarm descriptions

**Measurements**
- U, I, P, Q, S, f and cos ϕ
- Frequency measurement with accuracy of ± 2 mHz
- Inputs for mA measuring

**Metering**
- Energy metering function for energy statistics
- Pulse counting support for energy metering

**Communication**
- IEC 61850-8-1 including GOOSE messaging
- IEC 62439-3 Parallel Redundancy Protocol (PRP)
- IEC 62439-3 High-availability Seamless Redundancy (HSR)
- IEC/UCA 61850-9-2LE Process bus for up to 8 MUs
- Phasor monitoring reporting via IEEE 1344 and C37.118
- IEC 60870-5-103, DNP 3.0, SPA, LON protocols
- Remote end communication for signal transfer
  - 64 kbps: 3 analogs & 8 binary or 192 binary
  - 2 Mbps: 9 analogs & 192 binary
- Engineering, testing, commissioning and maintenance
  - Protection and control IED manager, PCM600, for configuration, parameterization, Ethernet port/protocol configuration, online debugging and disturbance handling
  - Forcing of binary inputs and outputs for faster and easier test and commissioning
  - Flexible product naming by mapping utility IEC 61850 model to that of 670 series model

**Hardware**
- 1/1 x 19”, 3/4 x 19” or 1/2 x 19” 6U height case selected according to the number of required I/O modules
- Power supply modules from 24 to 250 V DC ± 20 %
- TRM modules each with 12 analog inputs protection class and optionally measurement
- Up to 14 I/O modules in 1/1 x 19” case
- Binary input module with 16 inputs
- Binary output module with 24 outputs
- Static binary output module with 6 static and 6 change-over outputs
- Binary input/output module with 8 inputs and 12 outputs
- mA input module with 6 transducer channels
- Connector types: compression or ring-lug
- Accurate time-synchronization through PTP (IEC/IEEE 61850-9-3), GPS, SNTP, DNP 3.0, IEC 60870-5-103 or IRIG-B
- Remote end data communication modules for C37.94, galvanic X.21 up to 10 m, fiber for direct connection up to 130 km or via multiplexer
- Up to six Ethernet ports (optical LC or RJ45) that can be freely configured as single or redundant pairs

**Accessories**
- COMBITEST test system
- COMBIFLEX auxiliary relays
- Mounting kits

**Documentation**
- Role based documentation for high efficiency in engineering, commissioning, operations and maintenance

Technical details are available in the RED670 Product Guide.

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