PCS-921

Breaker Failure Relay

The PCS-921 numerical relay provides protection for circuit breakers, which includes breaker failure protection, pole discrepancy protection, dead zone protection, phase/ negative sequence overcurrent protection, earth-fault protection, overvoltage protection, undervoltage protection, frequency protection, single and/or three-pole auto-reclosing and synchronism check functions. The PCS-921 relay employs the programmable logic, configurable I/Os and definable 3-color LEDs to provide flexibility for specific applications. Frequency tracking is used to minimize the sampling error caused by system frequency fluctuation. The PCS-921 relay adopts the advanced multi-processor platform, providing the interfaces to station bus and process bu s respectively and supporting IEC 61850-8-1 MMS, GOOSE and IEC 61850-9-2 Sampling Value. In addition, the RJ-45 faceplate port serves for testing and setting in effort to make commissioning and maintenance easier.

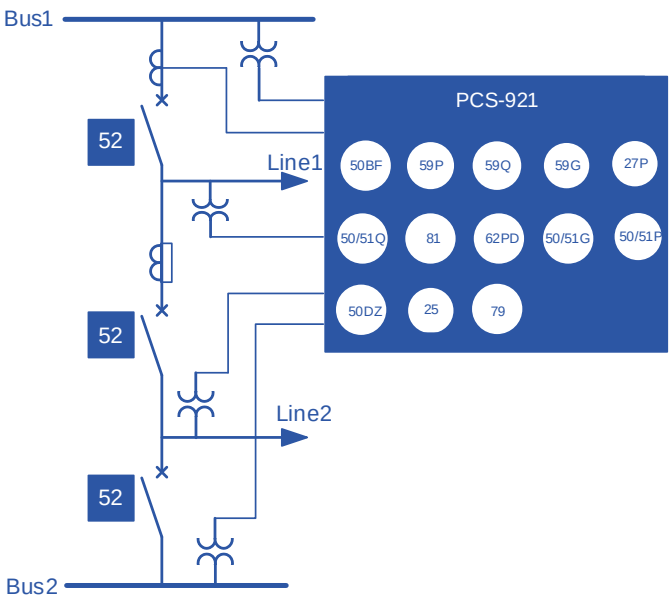

Figure 1 PCS-921 Functional Block Diagram

Functions

Protection and Control

- Breaker failure protection (50BF)
  Re-tripping and adjacent breaker tripping will be executed if the internal/external tripping command is received and the overcurrent element does not drop off. To improve the sensitivity of generator/transformer protection, the phase overcurrent, neutral and negative-sequence overcurrent elements are provided.

- Pole discrepancy protection (62PD)
  Pole discrepancy is detected by breaker auxiliary contacts. Furthermore, asymmetrical current element is selected as an additional criteria.

- Dead zone protection (50DZ)
  The adjacent breakers are tripped if a fault between CT and breaker (dead zone) is detected via the initiating binary input from external protection, breaker auxiliary contacts and overcurrent element.

- Four-stage phase overcurrent protection (50/51P)
  Selectable time characteristics (definite-time or inverse-time) and directional elements (forward, reverse or non-directional) are provided. A harmonic blocking function is integrated to restrain each stage independently.

- Four-stage earth fault protection (50/51G)
  Selectable time characteristics (definite-time or inverse-time) and directional elements (forward, reverse or non-directional) are provided. A harmonic blocking function is integrated to restrain each stage independently.

- Four-stage negative sequence overcurrent protection (50/51Q)
  Selectable time characteristics (definite-time or inverse-time) and directional elements (forward, reverse or non-directional) are provided.

- Three-stage undervoltage protection and overvoltage protection (27P/59P)
  Selectable time characteristics (definite-time or inverse-time) and voltage element (Phase voltage or phase-to-phase voltage, “1-out-of-3” or “3-out-of-3” logic) are provided.

- One-stage negative sequence overvoltage protection (59Q)
  Negative sequence overvoltage protection is a simple pure overvoltage protection.

- Three-stage residual overvoltage protection (59G).
  Selectable time characteristics (definite-time or inverse-time) are provided.

- Four-stage underfrequency protection and overfrequency protection (81)
  Underfrequency protection and overfrequency protection will be blocked for undervoltage condition and frequency abnormality condition. The df/dt element also is provided for the supervision of underfrequency protection.

- Synchronism check (25)
  The criteria can be set as frequency difference, voltage difference, and phase angle difference. Hence, the checking condition can be selected as live-bus to dead-line, dead-bus to live-line or dead-bus to dead-line.

- Single and/or three-pole auto-reclosing (79)
  Up to 4 shots can be selected for single-/three- pole auto-reclosing.

- Voltage and current drift auto adjustment
  The relay continuously and automatically traces voltage and current drifts and adjusts the zero point.

- Frequency tracking
  Frequency tracking is provided to accommodate the frequency shift in the power system.

Monitoring and Measurement

- VT circuit supervision (VTS)
- CT circuit supervision (CTS)
- Self diagnostic
- Event recorder including 1024 change-of-binary-input events, 1024 supervision events, 256 control logs and 1024 operating logs
- Disturbance recorder including 32 disturbance records with waveforms (The format of disturbance recorder is compatible with COMTRADE.)
- Clock synchronization using IRIG-B, SNTP, PPS (Pulse-Per-Second) and PPM (Pulse-Per-Minute), IEEE1588

Communication

- Up to four 10Base-T/100Base-TX copper Ethernet ports using IEC 61850, DNP3.0 or IEC 60870-5-103 over TCP/IP
- Up to two 100Base-FX optical Ethernet ports using IEC 61850, DNP3.0 or IEC 60870-5-103 over TCP/IP (Sharing two copper Ethernet ports)
- Two RS-485 serial ports using IEC 60870-5-103
- One RS-485 serial port for clock synchronization
- Optional Sampling value and GOOSE communication module with six/eight optical Ethernet ports using IEC 61850-9-2 and IEC 61850-8-1 GOOSE

User Interface

- HMI interface with large-size LCD and 9-button keypad on the front panel
- Support setup up to 40 users and allow each user to own different password and access authority
- Provide some function shortcuts key, which can be configured by PCS-Explorer and be fulfilled by combination key of devices' keypad, to execute some operation quickly.

- One front RJ-45 port for testing and setting
- One RS-232 or RS-485 rear port for printer
- Language selection – English + selected language
- Assistant software - PCS-Explorer

Features

- A unique two-out-two logic is adopted in hardware design to improve security. Coordinating with the redundant scheme, this solution improves both security and dependability of protection system. The two independent data acquisition paths are provided to prevent mal-operation caused by component failure. One works as a fault detector and the other is designed for protection logic. Tripping outputs are supervised by both data acquisition paths.
- Comprehensive flexibility is provided via the modular hardware design, scalable function library, programmable logics, configurable I/Os and definable LEDs. This allows users to create customized schemes for specific projects. Two fixed LEDs and 18 definable 3-color LEDs (Green/Yellow/Red) are provided.
- The relay is designed based on NR Electric's well-established and proven hardware platform with multiprocessor architecture. The multi-CPU technology supports parallel operation of CPU modules.
- The relay is fully compatible with IEC 61850, it includes station bus communication and process bus communication. The relay provides up to 6 Ethernet ports for process bus with IEC 61850-9-2 Sampling Value and IEC 61850-8-1 GOOSE, as well as up to 4 Ethernet ports for station bus with IEC 61850-8-1 MMS.