

CASE STUDY

Turnkey Relay Retrofit

Engineering, Panel Assembly, Installation,
Testing & Startup

Summary :

inoLECT performed a turnkey project that included engineering and drafting, equipment demolition, installation, testing, and startup for ten (10) relaying panels for a transmission and distribution facility.

The Engineering Package included: Meter and Relay Diagrams, AC Schematics, Three Line Diagrams, Breaker Control DC Schematics, Breaker Failure DC Schematics, Lockout DC Schematics, Sequence of Events Recorder Diagrams, Alarm Summary Diagrams, Relay Elementary Drawings (Relay inputs, outputs, logic), Wiring Diagrams, Supervisory Interface Wiring Diagrams and Cable Schedules.

Solutions :

Relay panels were delivered directly to the substation by the inoLECT installation crew. The team assembled the panels, installed and terminated both ends of all panel-to-panel control cables inside the control building with ring-tongue type compression connectors, equipped with pre-insulated barrels. All installed control cables were marked with identification cable markers.



Assembly and Wiring - inoLECT Shop

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Installation

inoLECT's field service technicians were on site for the duration of the equipment demolition, installation, testing and start-up. They performed a job safety analysis prior to the start of the installation, which was available to the customer at all times. Complete delete lists were developed, which identified all wires and equipment to be demolished. All new equipment terminations were made with new wiring. Wiring was completed in a neat and orderly manner, to ensure easy inspection and maintenance.

Each terminal block, terminal, conductor, relay, fuse block, and other auxiliary devices were labeled to coincide with the identification indicated on the drawings. Front nameplates were installed directly above all test switches, identifying the test switch function for each switch. All wiring terminations were identified and printed on flame-resistance heat shrink conductor identification sleeves, and installed on the end of each internal conductor. Wiring identification corresponds directly with the detailed interconnection diagram, and all identification sleeves are easily viewable with both "to" and "from" connections printed on the sleeve.



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Testing

inoLECT ensured all testing conformed to the latest requirements, standards and codes issued by the following organizations: NETA (National Electrical Testing Association), ANSI (American National Standards Institute), NFPA (National Fire Protection Association), IEEE (Institute of Electrical and Electronics Engineers), NEC (National Electrical Code), Equipment Manufacturers standards, and the Customer's requirements. Prior to mobilization, inoLECT developed detailed, step-by-step testing procedures, test values, and acceptable results of equipment testing.

Protective Relays

inoLECT Performed the following:

- Set relays according to approved relay setting document.
- Tested relay analog to digital conversions through secondary injection tests for each CT and PT inputs.
- Tested relay inputs to verify correct operation.
- Tested relay outputs to verify correct operation.
- Function tested all relay programmed protection elements and verify relay element pickups and timing set points.
- Perform all manufacturers recommended tests.



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Installation Checkout Tests

- Measured, documented and confirmed magnitude and phase angle of all modified current circuits by injecting secondary current on all circuits and measuring current in each device.
- Measured, documented and confirmed magnitude and phase angle of all modified potential circuits by injecting secondary voltage on all circuits and measuring injected voltage in each device.
- Operated, documented and confirmed every trip/close/block signal on every modified circuit to verify a complete working system with a detailed, step-by-step test report.
- The “yellow line” method of recording that functional tests have been completed was also used. A yellow marker was used on one-lines, three-lines, and schematic drawings to mark the portions of control circuits, potential circuits, and current transformer strings that were tested and are functioning correctly.

Startup

inoLECT Performed the following:

- Startup support was provided to aid in equipment startup.
- In-service recording and validation of current and voltage magnitudes and phase angles was performed when equipment was online.
- In-service recording and validation of differential operating and restraint quantities was performed for differential relaying when equipment was online.



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The information presented in this case study contains merely general descriptions or characteristics of performance, which in case of actual use do not always apply as described or which may change as a result of further development of the products. Contact inoLECT, LLC with any questions pertaining to Relay Retrofit products and availability.