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COMMISSIONING OF TRANSLAY PILOT WIRE PROTECTION SCHEME

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Engineering Procedure

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Document control

Version	Date	Summary of change
	August 2002	Last Technical Review
2.0	May 2010	Application of TMA 400 format
2.1	April 2013	Update template

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1 Introduction

The most common type of 'unit' protection used on the RailCorp high voltage network is Translay pilot wire protection. This publication sets out the general requirements for the testing and the recording of test results during the commissioning of a new Translay pilot wire protection scheme. The relevant sections of this publication shall also apply when an existing Translay pilot wire protection scheme is re-commissioned following any alterations to the system.

2 Scope and Application

"Translay" protection schemes exist throughout the RailCorp high voltage network and are a very important element in the overall protection of the high voltage system.

The most common "Translay" scheme used in the RailCorp network is that using HMB4 relays made by GEC Alsthom. Refer to Figure 1. These relays use the output of current transformers (CT's) to represent the 3 phase currents in the form of a single phase voltage. The voltages produced by each relay are proportional to the current flowing in the transmission line being protected. A relay is installed on each end of the line. Under normal conditions, the voltages produced by the HMB4 relay at each end of the feeder should have the same magnitude and phase and negligible ac current should flow around the pilot circuit.

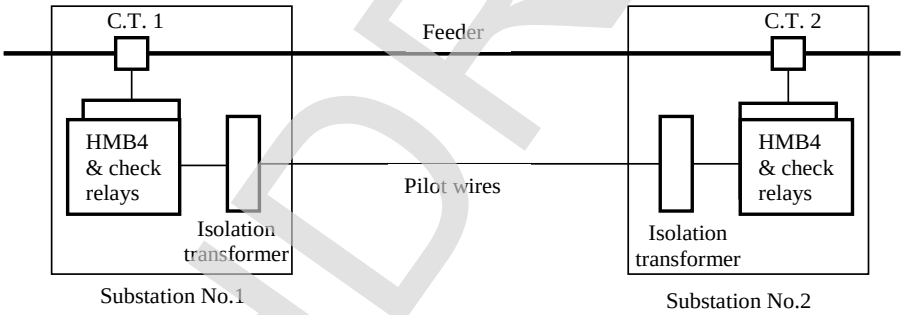

Figure 1 - HMB4 pilot wire scheme between two substations

Note: Pilot wire relay detects faults between CT1 and CT2 only.

When a fault occurs on a feeder, ac current flows in the pilots due to the imbalance of the currents at each end and the corresponding difference in pilot voltage produced by each relay.

A d.c. pilot supervision current does, however, normally flow around the pilot circuit. This is injected onto the pilots at a pilot isolation transformer at one of the substations. The substation at which the current is injected is referred to as the "sending end" substation.

In addition, RailCorp has adopted the practice of installing current check relays in pilot wire schemes. By installing the trip contacts of these current check relays in series with the trip contacts of the HMB4 relays, the circuit breakers are then only operated when both relays detect a fault. This practice effectively ensures that no ACCB trips arise from the pilots being tampered with or failing.

Hence an ACCB will only trip if the HMB4 operates and the fault current is of sufficient magnitude to pick-up the current check relays.

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3 Definitions & Abbreviations

ACCB Alternating Current Circuit Breaker

CT Current Transformer

EOC Electrical Operating Centre

4 Pre-Commissioning Procedure

In substations where one bus section ACCB provides protection for two feeders, a check shall be carried out to ensure the connections between the bus section and the rectifier current transformers are correct.

5 Commissioning Procedure

5.1 Pilot Circuit Measurements and Testing

Measure and record the pilot insulation resistance.

- Pilot no.1 to earth.
- Pilot no.2 to earth.
- Pilot no.1 to Pilot no.2.

The insulation resistance shall be greater than 5 MΩ.

Measure and record the pilot circuit capacitance. The pilot capacitance shall be in the order of 0.05 μF/km.

Measure and record the pilot loop resistance.

5.2 HMB4 Loop Resistance Compensation and Sensitivity

Compensation shall be set on the HMB4 relay to ensure the relay is working within its designed loop resistance of 1000 Ω.

5.3 Supervision Relay Adjustment

Adjust the SJA pilot supervision unit to ensure that the output from its Wheatstone bridge circuit is at a minimum under normal pilot conditions. The voltage shall be set as close to zero as possible achievable, at least within 20 mV.

Measure and record the voltage from the SJA pilot supervision unit.

5.4 Verifying Phasing Between Substations

Tests shall be conducted to verify that, for each phase, current entering the feeder at one end and leaving the feeder at the other results in the output of both HMB4 relays being of essentially the same phase and magnitude.

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6 Post Commissioning Procedure

6.1 Verifying Failure Alarms

Verify, and record, by means of simulated failures, such as opening links and fuses, all relevant alarms and flags, including:

- pilot circuit failure relay flag
- open pilot alarm at EOC
- supervisory supply failure relay flag
- HMB4 flags
- current check relay flag

6.2 Supervision Relay Re-Adjustment

Check and record the dc voltage across the test terminals of the supervision relay to ensure that the voltage has not changed significantly.

Adjust and record the voltage if the potentiometer is required to be readjusted for minimum dc voltage.

7 Data Set associated with the Equipment

The results of the Pre-commissioning, Commissioning and Post Commissioning procedures shall be recorded and maintained by the Maintenance Provider responsible for the installation in which the pilot wire protection equipment is installed. These results include:

- Pilot insulation resistance;
  - Pilot no. 1 to earth;
  - Pilot no. 2 to earth;
  - Pilot no. 1 to Pilot no. 2;
- Pilot circuit capacitance;
- Pilot loop resistance;
- SJA pilot supervision voltage;
- Verification of alarms and flags;
  - pilot circuit failure relay flag;
  - open pilot alarm at EOC;
  - supervisory supply failure relay flag;
  - HMB4 flags;
  - current check relay flag;
  - Supervision relay dc test voltage.

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