

National Grid
Commissioning
Handbook
Procedure 22

**Application and Setting of Protection
Relays Used for Commissioning
Purposes**

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1 PURPOSE

The purpose of this procedure is to outline the recommended practice for the application and setting of commissioning relays used for protecting unproven plant and to provide a proven fast protection during stage 2 commissioning of new equipment.

This document should be used in conjunction with the National Grid protection settings policy outlined within PS(T)010, Application and Setting of Protection.

2 GENERAL OVERVIEW

Any items of equipment protecting a circuit that have not previously completed stage 2 commissioning tests (i.e. on load tests) must be considered unproven. To guard against phase and earth faults occurring on initial energisation this equipment must be energised using proven plant and protection.

This applies to all parts of the protection system including current transformers, connecting wiring and protective relays. If any of these parts of the protection system are modified or changed during construction work it shall be subject to stage 2 commissioning tests to reprove the connections and the protection equipment.

3 STAGE 2 COMMISSIONING PRINCIPLES

3.1 General Principles

A circuit must not be energised using either an unproven circuit breaker or solely protected by unproven protection.

3.2 Primary Plant Arrangements

If a new circuit, a new circuit breaker or a new plant item is being energised for the first time it must be energised using a proven circuit breaker. The equipment must also be protected by a proven protection. If, for example the equipment is within the protective zone of an existing differential protection such as a mesh corner protection or a busbar protection it is considered to be protected by a proven protection. This is provided the new equipment does not itself form part of the protection system.

3.3 Protection Arrangements

All equipment being energised must be protected by a proven protection system. If any part of a protection system has been disturbed during construction work and has not been suitably proven during stage 1 testing it must be subject to stage 2 commissioning tests. Generally any work on the dc & tripping circuitry can be proven during stage 1 testing whilst any work on the current transformer (CT) circuits needs to be proven during stage 2 testing. Hence if the CT circuits of a protection have been disturbed during construction work the protection system must be considered as being unproven.

When considering the protection arrangements of a circuit or equipment being energised for the first time the status of the main protections for that plant item must be considered. If the equipment is not protected by a proven protection a commissioning relay must be used. This can either take the form of a temporary commissioning overcurrent relay fitted to the energising circuit breaker or by applying temporary commissioning settings to an existing relay. **The commissioning relay(s) must operate for both phase & earth faults.**

3.4 Typical Scenarios

3.4.1 New circuit.

Where a new circuit is being energised for the first time it must be considered as being unproven in its entirety and a commissioning relay must be applied to the energising circuit breaker and to any other circuit breakers which infeed to the circuit being commissioned.

3.4.2 Circuit Breaker Replacement.

If a circuit breaker has been replaced it must be considered unproven and hence must be energised from a proven circuit breaker.

3.4.2.1 Live Tank Design (No Integral CTs)

If both the old and the new circuit breakers are of a live tank design with separate existing post CT's the protection systems can be considered as being proven. If the new circuit breaker is within the protective zone of an existing proven protection that operates the energising circuit breaker, such as a mesh or busbar differential protection there is no need to use a dedicated commissioning relay.

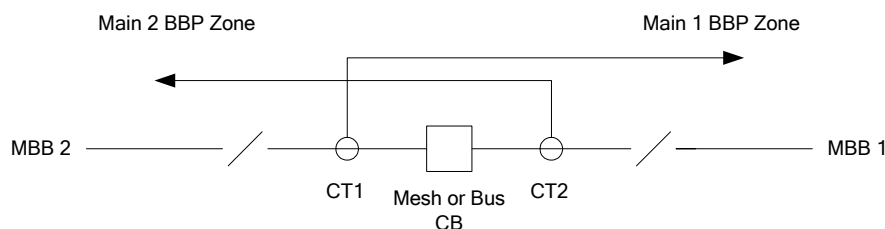
3.4.2.2 Dead Tank Design (Integral CTs)

If the old circuit breaker is of a dead tank design and the new one a live tank design it may also be necessary to also install a set of post CT's to replace the CT's integral to the old dead tank circuit breaker. In this case the old protections must be considered unproven and subject to stage 2 commissioning tests and a commissioning relay must be applied to trip the energising circuit breaker. If a bus section/coupler or mesh circuit breaker is being replaced the details in clause 3.4.3 will also apply.

3.4.3 Bushing or Post Current Transformer replacement.

Bushings are generally fitted with current transformers so they can be considered along with Post Current Transformers. If the current transformers associated with a protection are replaced the protection must be considered unproven and undergo stage 2 commissioning tests. Commissioning relays must be fitted to the circuit breakers that infeed to the replacement CT.

The situation where CTs on a mesh corner or bus section/coupler are changed must be carefully considered. If both CTs either side of the circuit breaker are changed at the same time this will render both overlapping protection zones unproven until load tests have been completed.



For example considering the scenario above, if both CT1 & CT2 are replaced both Main 1 BBP Zone and Main 2 BBP Zone must be considered unproven. This would require an outage on both busbars and commissioning overcurrent relays to be fitted to the energising circuit breakers on each side. If this was a mesh circuit breaker both the adjacent mesh corners would have to be taken out of service which could create difficulties for Market Operation in securing demand for that particular substation.

The CT replacement work should therefore be planned to change each CT during two **separate** successive outages. In this scenario one of the busbars can be kept in service and on mesh systems only a single mesh corner outage would be required to stage 2 commission the CT.

Again, considering the example above if CT1 was replaced, if it faulted during energisation the fault would be cleared by Main 2 busbar protection, tripping all infeeds to CT1. As CT1 is unproven during the initial energisation consideration must also be given to the possibility of Main 1 BBP operating for a fault on CT1. In this circumstance either a Risk of Trip is required on Main 1 BBP for the initial energisation or (preferably) the Main 1 BBP core within CT1 should be disconnected and shorted on initial energisation. The mesh/section CB and the Main Bar 1 side disconnector should be open during this initial energisation and a commissioning relay is not required at this point in the switching programme.