

**PJM RELAY SUBCOMMITTEE  
RELAY TESTING AND MAINTENANCE PRACTICES**

**Documentation to comply with:**

**NERC Planning Standard III.A.M4**

**NERC Planning Standard III.D.M5**

**NERC Planning Standard III.F.M6**

**August 18, 2006**

**Pennsylvania - New Jersey - Maryland (PJM) Interconnection  
Relay Subcommittee  
Relay Testing and Maintenance Practices**

**I. Scope**

This directive is intended to cover all protective relays, relay communication equipment, and disturbance monitoring equipment (collectively referred to as protection systems) associated with all 230kV and above transmission lines and associated facilities, all interconnection lines and facilities, all large (100MW and above) unit connected generators under automatic load control, and all other generators where failure may have an effect on the interconnection system. Protection systems are defined within the "PJM Protective Relaying Philosophy and Design Standards". Each protection system owner is responsible for maintaining a program that identifies the protection systems that are subject to this directive.

It should be recognized that these are **minimum** requirements for periodic testing and that more frequent or more thorough testing may be performed, should any protection system owner deem it justified.

**II. Objective**

The objective of a uniform Relay Test and Maintenance program is to insure the integrity of the protection system on a periodic basis after installation. Calibration testing is required to verify relay setting calibrations, configurations, and to identify any protection system defects. Functional testing is required to verify that the intent of the protection system is being carried out.

**III. Frequency of Testing**

In addition to installation testing, protection systems shall be periodically tested as follows:

<b>Protection Systems</b> (See Note 4)	<b>Calibration Test Frequency</b> (See Note 3)	<b>Functional Test Frequency</b> (See Note 3)
<b>Transmission Protection</b>		
Electro-mechanical & Solid State	4 Years	4 Years
Microprocessor Based	(See Note 1)	4 years
<b>Generator Protection</b>		
Electro-mechanical & Solid State	4 Years	4 Years
Microprocessor Based	(See Note 1)	4 Years
<b>Special Protection</b>		
Electro-mechanical & Solid State	4 Years	4 Years
Microprocessor Based	(See Note 1)	4 Years
<b>Frequency / Voltage Load Shedding</b>		
Electro-mechanical & Solid State	4 Years	4 Years
Microprocessor Based	(See Note 1)	(See Note 5)

**III. Frequency of Testing** (continued)

<b>Protection Systems</b> (See Note 4)	<b>Testing Frequency</b> (See Note 3)
<b>Disturbance Monitoring Equipment</b> Electro-mechanical, Solid State & Microprocessor Based	4 Years
<b>Relay Communication Channels</b>	(See Note 2)
- Power Line Carrier (PLC)	4 Years
- Leased Line	4 Years
- Microwave	4 Years
- Fiber Optic	4 Years

**Notes:**

- 1 - **Microprocessor based relays** - Periodic Calibration Testing does not apply. These relays are self monitoring. Regular retrieval and analysis of event records following system faults verifies operability. The analog metering, digital inputs, and outputs are verified with the Functional Tests.
- 2 - **Testing of the relay communication channels** - Relay communication channels shall be tested on the same frequency as the protection system of which they are a part.
- 3- **Test Frequency** - Interval since last date tested. A good faith effort shall be made to have all testing performed within the testing intervals shown plus a 10% grace period (see "Documentation", below).
- 4 - **Testing "for cause"** - All protective system trip operations should be analyzed for cause and corrective actions. Testing for cause is required in the event of an incorrect operation of a protection system.
- 5- **Functional Testing Frequency**- When underfrequency (UF) protection is part of line protection within a microprocessor relay for an individual circuit; the functional testing frequency is every 8 years. When a microprocessor relay with UF protection is used to trip multiple circuits; the functional testing frequency is every 4 years.

**IV. Procedure**

The instruction and maintenance books issued by the equipment manufacturer and/or individual testing methods developed by the protection system owners should be used as the basic source of information in testing and maintaining protection systems. Industry experiences and manufacturer service advisories that point out deficiencies in relay designs and relay scheme designs may require special test methods. It is important that these special test requirements are incorporated into the protection system owner's testing program. Each protection system owner is responsible for maintaining a program that documents the general testing procedures to be used.

**V. Documentation**

Each protection system owner is responsible for maintaining a program that documents the frequency of testing and the date last tested. A good faith effort shall be made to have all testing performed within the testing intervals shown above. However, in the event that testing was attempted within those intervals, but could not be completed due to circumstances beyond the control of the protection system owner, the contingency shall be documented, and a plan developed to complete the testing.

## **VI. Repairs and Replacements**

Spare parts or complete replacements should be stocked or available, as appropriate. Manufacturer recommended spare parts list along with company utilization experience should influence the spare parts inventory. Availability of spare parts and utilization experience should be major factors in determining equipment repair and replacement.

## **VII. Document Review Cycle**

This document is to be reviewed at least every 4 years.

<b>Original:</b>	01/17/67 - Relay Subcommittee
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