

FAULT RECORDERS  
MAINTENANCE TEMPLATE

AM-CE-P034-R1038  
Rev. 5

*Revisions to this document shall be communicated in accordance with program document AM-EU-P034 to ensure alignment between Maintenance Templates and field work procedures.*

Fault Recorders					
Component Classification Categories					
Criticality	I	X			Digital Fault Recorders at Nuclear Switchyards
	II		X		Digital Fault Recorders at Non-Nuclear Switchyard Locations
Duty Cycle	Heavy Load	N/A	N/A		
	Normal Load	N/A	N/A		
Service Condition	In Service	X	X		
	Spare	N/A	N/A		
<b>Condition Monitoring Tasks</b>		<b>Task Frequencies</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
None		N/A	N/A	N/A	
<b>Failure Finding Tasks</b>		<b>Task Frequencies</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
Verify functional status of Digital Fault Recorder		1Y	AR	1a-b, 2a-b	
Visual verification of system clock accuracy		1Y	AR	1a, 2a	
<b>Maintenance and Testing Time Directed Tasks</b>		<b>Task Frequencies</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
None		N/A	N/A	N/A	
<b>Condition Directed Tasks</b>		<b>Task Frequencies</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
None		N/A	N/A	N/A	

## FAULT RECORDERS FAILURE MODES

<b>FAILURE MODE</b>	<b>FAILURE CAUSES</b>	<b>MAINTENANCE TASKS</b>
1. Fails to accurately monitor 1. Fails to accurately monitor 1. Fails to accurately monitor	1a. Digital Fault Recorder hardware 1a. Digital Fault Recorder hardware 1b. Wiring	Verify functional status of Digital Fault Recorder Visual verification of system clock accuracy Verify functional status of Digital Fault Recorder
2. Fails to operate properly 2. Fails to operate properly 2. Fails to operate properly	2a. Digital Fault Recorder hardware 2a. Digital Fault Recorder hardware 2b. Wiring	Verify functional status of Digital Fault Recorder Visual verification of system clock accuracy Verify functional status of Digital Fault Recorder

**FAULT RECORDERS  
MAINTENANCE TASK DEFINITIONS**

<b>TASK</b>	<b>DEFINITION</b>
Verify functional status of Digital Fault Recorder	Verification of the DFRs functional status, includes checking power supply lights, alarms, and status where applicable.
Visual verification of system clock accuracy	Verification that DFR clock is set to ensure that DFR events are time stamped (or synchronized) with the correct approximate time.

# FAULT RECORDERS MAINTENANCE BASIS

## Digital Fault Recorder Template Summary

The Preventive Maintenance program is documented via maintenance templates. Templates have been developed that address transmission, substation, and distribution equipment that is owned and maintained by Exelon Utilities. Each template documents the program tasks, frequencies, failure modes, and maintenance basis for the associated equipment. Tasks and associated frequencies are designed to address known failure modes of the equipment covered by the template. In general, the tasks included in the maintenance templates are the result of good industry practices, industry experience, manufacturer recommendations, and regulatory requirements.

### References:

PJM Relay Subcommittee - Relay Testing and Maintenance Practices  
PJM Relay Subcommittee - Guidelines For Performing Maintenance on Disturbance  
Qualitrol IDM DFR Maintenance Summary  
Qualitrol IDM DFR Health Check Procedure  
Qualitrol DME Operation and Service Manual

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### Boundary Definition

The boundary of a Digital Fault Recorder for the purpose of this document is defined to include the fault recorder, communication link and its associated wiring.  
Excluded from this treatment are: The power equipment such as transformers, circuit breakers, transmission lines etc.

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### Failure Experiences

N/A

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### Vendor Recommendations

N/A

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### Disposition of Vendor Recommendations

N/A

# FAULT RECORDERS MAINTENANCE BASIS

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## **Basis for Template Tasks**

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ComEd uses oscillography from relays for investigating disturbances. Essentially all of ComEd's 345kV and up lines and more than half of 138kV lines include microprocessor relays with oscillographic and sequence of events capability. Thus, DFRs are rarely used in practice. Ultimate goal is to retire and remove them from the system. DFR input signals are generally being removed during line upgrade projects. The work to physically remove the DFRs will be prioritized within the protection system performance upgrade program. ComEd's DFRs do include SCADA monitored failure and operate alarms.

### **Verify functional status of Digital Fault Recorder**

Performed to verify that applicable Universal Power Supply (UPS) and Digital Fault Recorder status lights are illuminated appropriately. This will identify defective equipment before it is called upon to operate.

### **Visual verification of system clock accuracy**

Verification that DFR clock is set to ensure that DFR events are time stamped (or synchronized) with the correct approximate time. Failure to have an accurately time stamped event record could delay or otherwise impact post-event analysis. Verifying the clock is set accurately will associate the fault data with the date and time that the event was triggered.

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## **Basis for Task Periodicity**

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DFRs are polled in multiple instances throughout the course of each year with adverse conditions identified and corrected through the Corrective Maintenance process. DFR analog input health is verified more frequently than the recommended annual Health Check procedure which ensures the DFR will function properly outside of a fault analysis situation.

**FAULT RECORDERS  
TEMPLATE DEVELOPMENT HISTORY**

<b>Revision 0</b>		<b>Date 08/13/2009</b>
Writer	Kevin Swiat (Real Time Analysis)	
Reviewer(s)	John Juna – Real Time Analysis; John Kruse – Real Time Analysis; Mark Lukas – Real Time Analysis; Linda Lynch - Real Time Analysis; Pat Mintus – Testing Group North; Mark Simon – Real Time Analysis	
Approver(s)	Jean Holderried (PECO FAM), Ron Donovan (ComEd FAM), Bill Forst (ComEd FAM)	
Reason Written	Procedure Review for NERC PRC-005-2 Compliance	

<b>Revision 1</b>		<b>Date 11/30/2010</b>
Writer	Chris Stefanski	
Reviewer(s)	Ken Wendt (Mgr. Material Condition)	
Approver(s)	Bill Fluhler , Bill Gannon, Nitin Patel, Jim Crane, Bill Sullivan	
Reason Written	Added note to ensure template changes are communicated to affected work groups.	

<b>Revision 2</b>		<b>Date 04/29/2011</b>
Writer	Chris Stefanski (Material Condition)	
Reviewer(s)	Ken Wendt, Drew Reindel, Jim Crane	
Approver(s)	Bill Fluhler (ComEd)	
Reason Written	Modified criticality definitions and incorporated 5X per year inspection task frequency.	

<b>Revision 3</b>		<b>Date 04/28/2013</b>
Writer	Chris Stefanski (Material Condition)	
Reviewer(s)	Ken Wendt, Bart Enright, Mike Moy, Bill Miller	
Approver(s)	Bill Fluhler (UFAM-ComEd)	
Reason Written	2 Year NERC Review; Clarify that <i>Test analog and event inputs</i> task is performed As Required. No change to current maintenance program.	

**FAULT RECORDERS  
TEMPLATE DEVELOPMENT HISTORY**

<b>Revision 4</b>		<b>Date 2/27/2015</b>
Writer	Kevin Swiat (Material Condition)	
Reviewer(s)	Bill Miller, Ken Wendt	
Approver(s)	Mike Moy (UFAM-ComEd)	
Reason Written	Modified maintenance task and intervals to align Nuclear DFR maintenance across EU, revised criticality definitions to align with EU standard. Removed the NERC Review Type, since it is no longer used as NERC evidence of compliance.	

<b>Revision 5</b>		<b>Date 2/2/2018</b>
Writer	Kevin Swiat (Material Condition)	
Reviewer(s)	Bill Miller	
Approver(s)	Mike Moy (UFAM-ComEd)	
Reason Written	3 year review: Minor formatting changes so that content appears when printed.	