



# NERC Lessons Learned

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Lockout Relay Component Failure  
Causes Misoperation and Reportable  
Event



Midwest Reliability Organization



July 30, 2020

- An unnecessary trip caused BES equipment to be removed from service
- Caused by a misoperation of the lockout relay associated with a 345 kV breaker at Substation A
- Tripped (2) lines and XFMR
- A faulty lighted nameplate control circuit was found to be responsible

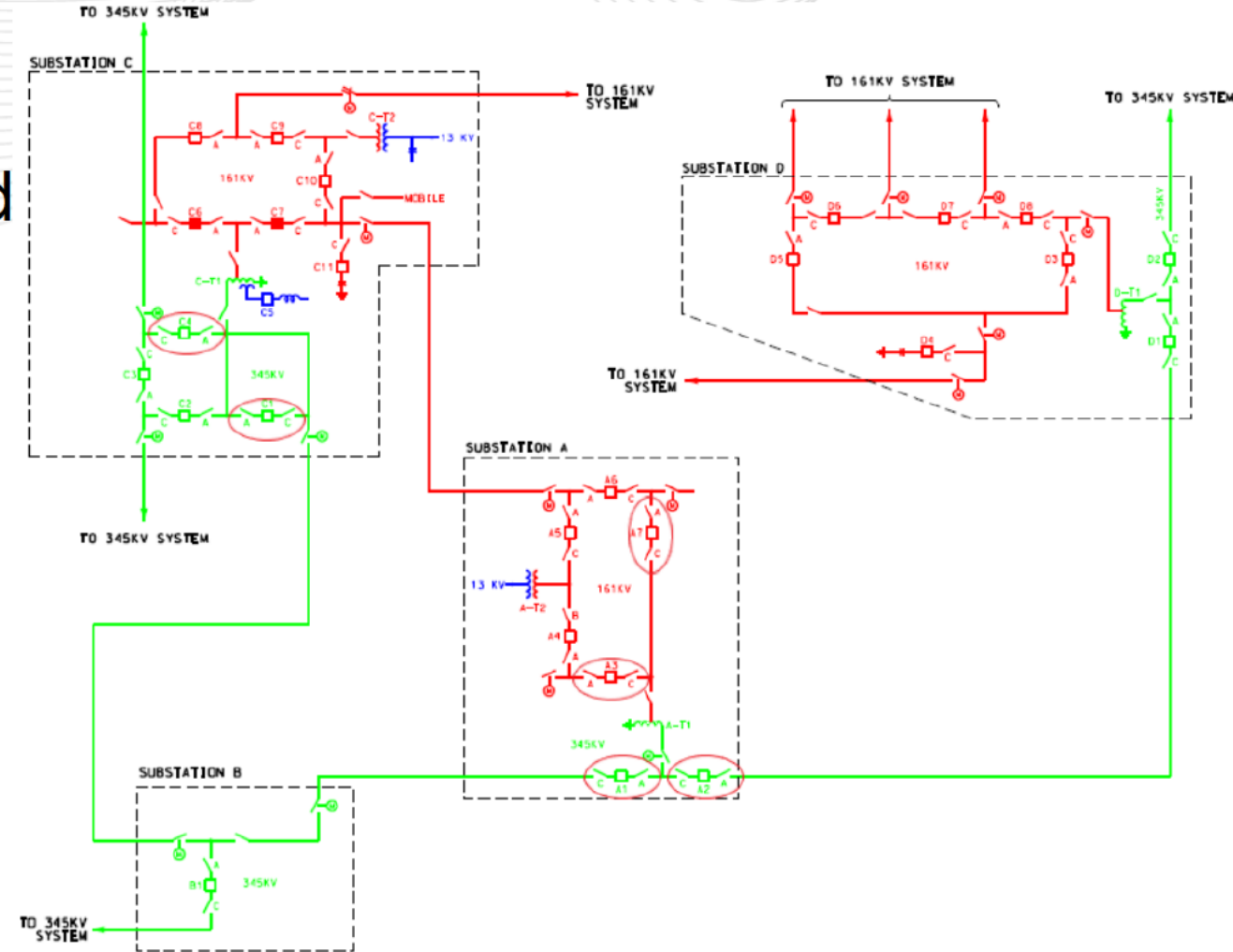


Figure 1: Diagram showing the breakers affected (circled) by the misoperation of the lockout relay [1]

- A 2014 product advisory note was found detailing potential issues with the circuit board
- The entity had no record of receiving the notice
- The entity surveyed to determine the locations of the affected products
- Replacement of either the circuit board or the entire lockout relay was done

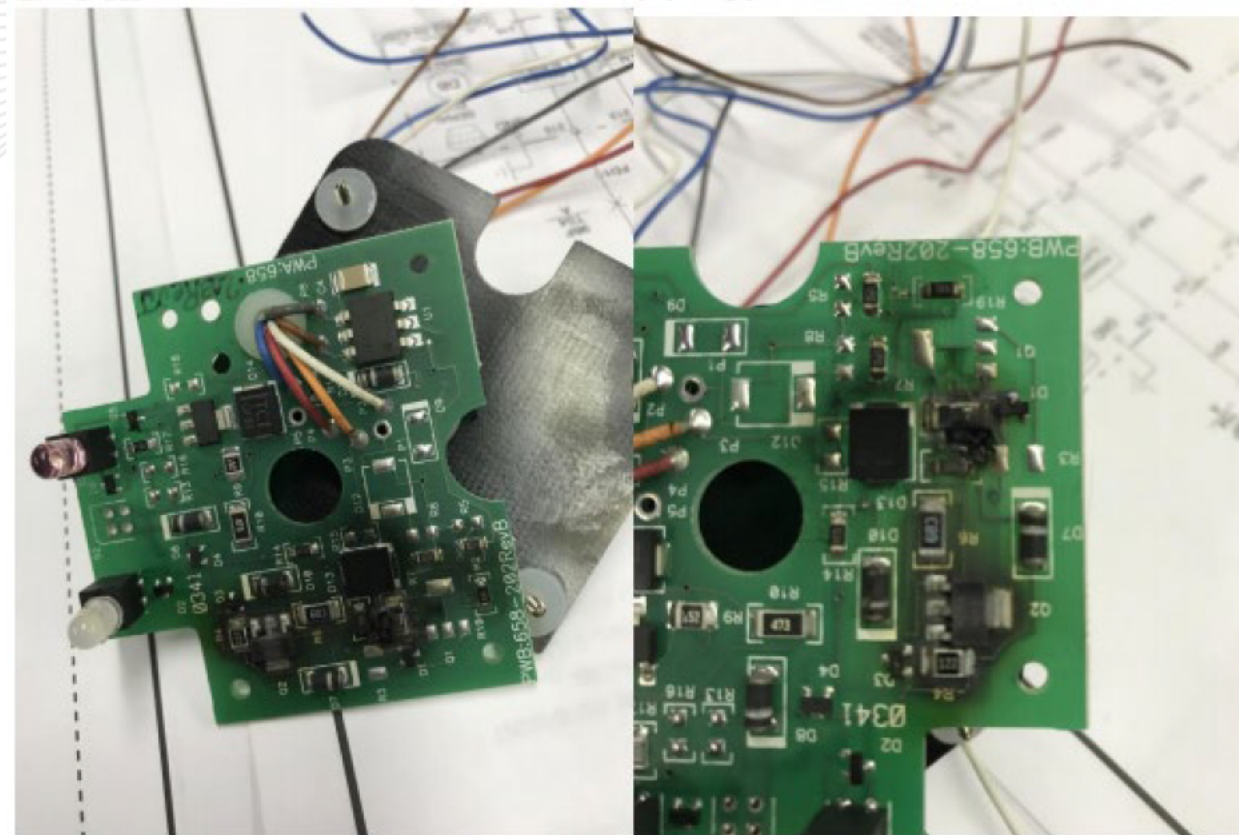


Figure 2: Diagram showing the faulty lighted nameplate control circuit board [1]

- Reach out to manufacturer for more information when needed from a product advisory to determine system risk and required corrective actions
- Develop procedures to log and review future advisory notes
- Survey manufacturers to ensure that all advisories are received, logged, and reviewed



Verification of AC Quantities during  
Protection System Design and  
Commissioning



ERO Team (Multi-Region)



July 30, 2020

- Expanded version of “Verification of AC Quantities during Protection System Commissioning” from March 11, 2014
- Lack of effective commission testing and quality checks of protection systems has led to preventable misoperations
- Issues with voltage and current instrument transformer wiring regularly occur
- These misoperations can increase the magnitude of a system disturbance

- Relays have been put in service with missing connections and incorrect CT ratios due to a lack of effective testing and checks
- Both have contributed to an increase in magnitude of system disturbances
- Affected relays must then be rewired and tested



- Develop effective procedures to perform quality checks on protection systems before installation
- Develop effective procedures to perform commission testing on protection systems, including installation testing and in-service testing
- Commissioning Testing Attachment includes:
  - In-Service Voltage, In-Service Current, Phase Current In-Service Current, Residual Current In-Service Current, Zero Sequence Current Polarizing In-Service Current, Transformer Neutral Differential (87TN) In-Service Current, Primary Current, Secondary Current, CT

1. Lockout Relay Component Failure Causes Misoperation and Reportable Event

[https://www.nerc.com/pa/rrm/ea/Lessons%20Learned%20Document%20Library/LL20200703\\_Lockout\\_Relay\\_Component\\_Failure\\_Causes\\_Misoperation.pdf](https://www.nerc.com/pa/rrm/ea/Lessons%20Learned%20Document%20Library/LL20200703_Lockout_Relay_Component_Failure_Causes_Misoperation.pdf)

2. Verification of AC Quantities during Protection System Design and Commissioning

[https://www.nerc.com/pa/rrm/ea/Lessons%20Learned%20Document%20Library/LL20200702\\_Commissioning\\_Testing.pdf](https://www.nerc.com/pa/rrm/ea/Lessons%20Learned%20Document%20Library/LL20200702_Commissioning_Testing.pdf)

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**NERC Lessons Learned**



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