September 29, 2022

TECHNICAL SPECIFICATION CHANGE TO SUPPORT ELIMINATION OF ENGINEERED SAFETY FEATURES ACTUATION SYSTEM SINGLE POINT VULNERABILITY

WATERFORD 3

Technical Specification Change to Support Elimination of Engineered Safety Features Actuation System Single Point Vulnerability

Pre-Submittal Meeting

Agenda

- ESFAS Design
- PPS Design
- Issue of Concern
- Background
- Planned Modification
- Technical Specification Change
- Closing

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ESFAS Design

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ESFAS Design

- Engineered Safety Features Actuation System (ESFAS) is part of the Plant Protection System (PPS)
- The PPS can be broken down into two subsystems;
  - Reactor Protective System (RPS)
  - ESFAS
- The ESFAS generates actuation signals for the Engineered Safety Features (ESF) and ESF support systems to mitigate the consequences of accident conditions.

ESFAS Design

The following is a list of the ESFAS signals:

- Safety Injection Actuation Signal (SIAS)
- Containment Isolation Actuation Signal (CIAS)
- **Containment Spray Actuation Signal (CSAS)**
- **Main Steam Isolation Signal (MSIS)**
- Recirculation Actuation Signal (RAS)
- Emergency Feedwater Actuation Signal for SG 1 (EFAS-1)
- Emergency Feedwater Actuation Signal for SG 2 (EFAS-2)

PPS Design

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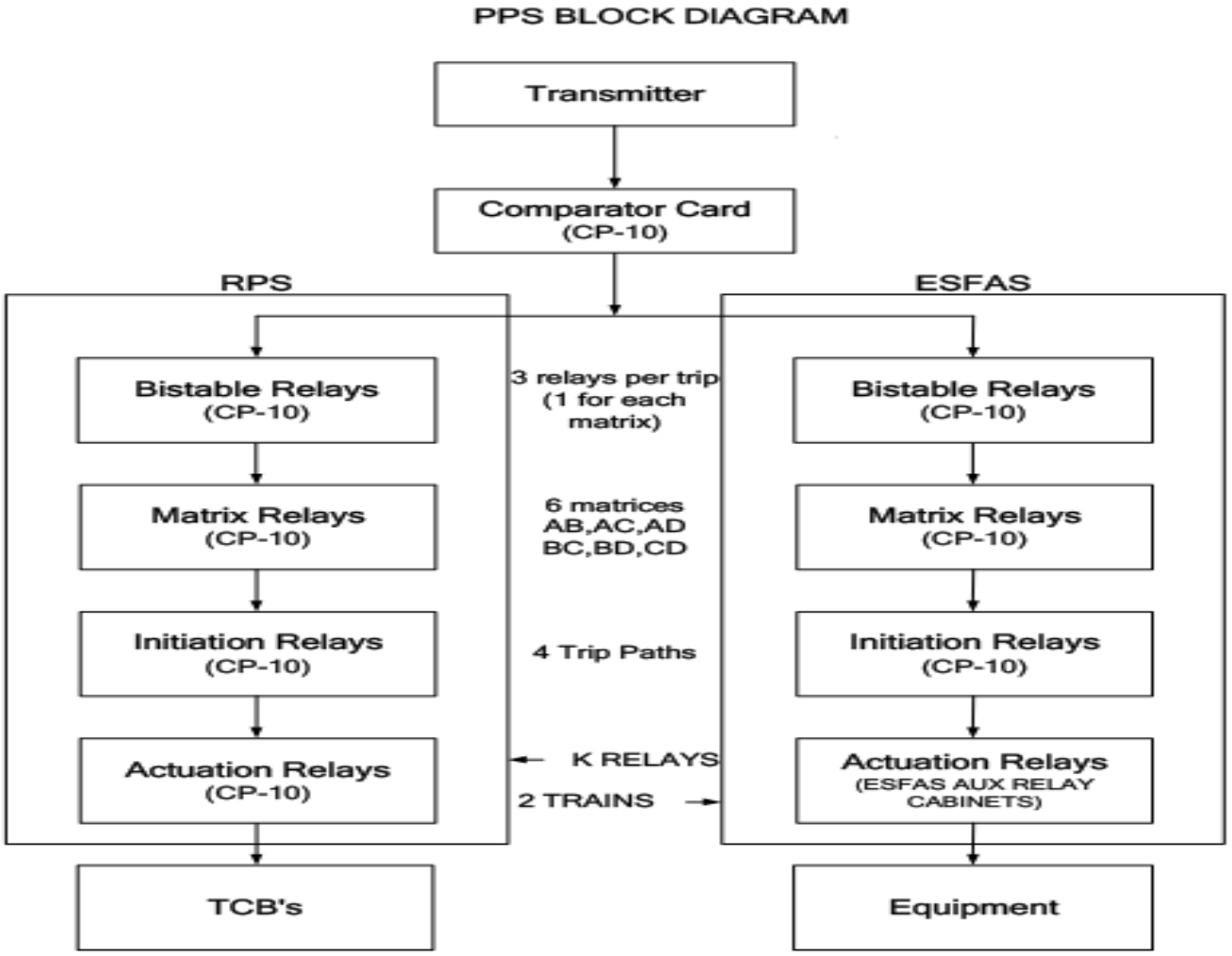
PPS Design



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Issue of Concern

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Issue of Concern

The following ESFAS signals have SPV identified in their circuitry (1 out of 1 Logic):

- Main Steam Isolation Signal (MSIS)
  - K305A or B and K313A or B Actuation Relay failure will close Main Steam Isolation Valve (MSIV), Feedwater Isolation Valve (FWIV), Feedwater Regulating Valve, and Feedwater Startup Regulating Valve
    - Closure of a single MSIV will result in asymmetric steam generator transient (ASGT), resulting in a Core Protection Calculator (CPC) Auxiliary Trip (reactor trip) on Low DNBR and High Local Power Density.
    - If closure of both MSIVs are affected, then there will be a complete loss of heat sink, and the RCS pressure safety limit will be challenged, resulting in a reactor trip on High Pressurizer Pressure.

Issue of Concern

- Containment Spray Actuation Signal (CSAS)
  - K114A or B Actuation Relay failure will close Component Cooling Water (CCW) flow to the non-critical loop.
  - This will result in loss of CCW flow to the Reactor Coolant Pumps (RCPs) and the Control Element Drive Mechanism (CEDM) cooling coils. Loss of seal cooling to the RCP can result in serious RCP seal damage, with the potential for a small break LOCA.

Background

Background

- A license amendment request (LAR) was submitted on December 6, 2017 (ML17340B321) as supplemented by letter dated June 29, 2018 (ML18180A271) to support installation of the new design in RF-22 (2019).
- The LAR was later withdrawn (ML18354B283) due to parts unavailable to implement design change during RF-22.
- Before this LAR was withdrawn, the NRC staff had conducted a partial review of the technical aspects of the request. This review is documented in an internal memorandum, which is located under ADAMS Accession No. ML18362A312 (not publicly available).
- Proposed resubmitted LAR makes no technical changes to previous (withdrawn) LAR submittal as supplemented.

Planned Modification

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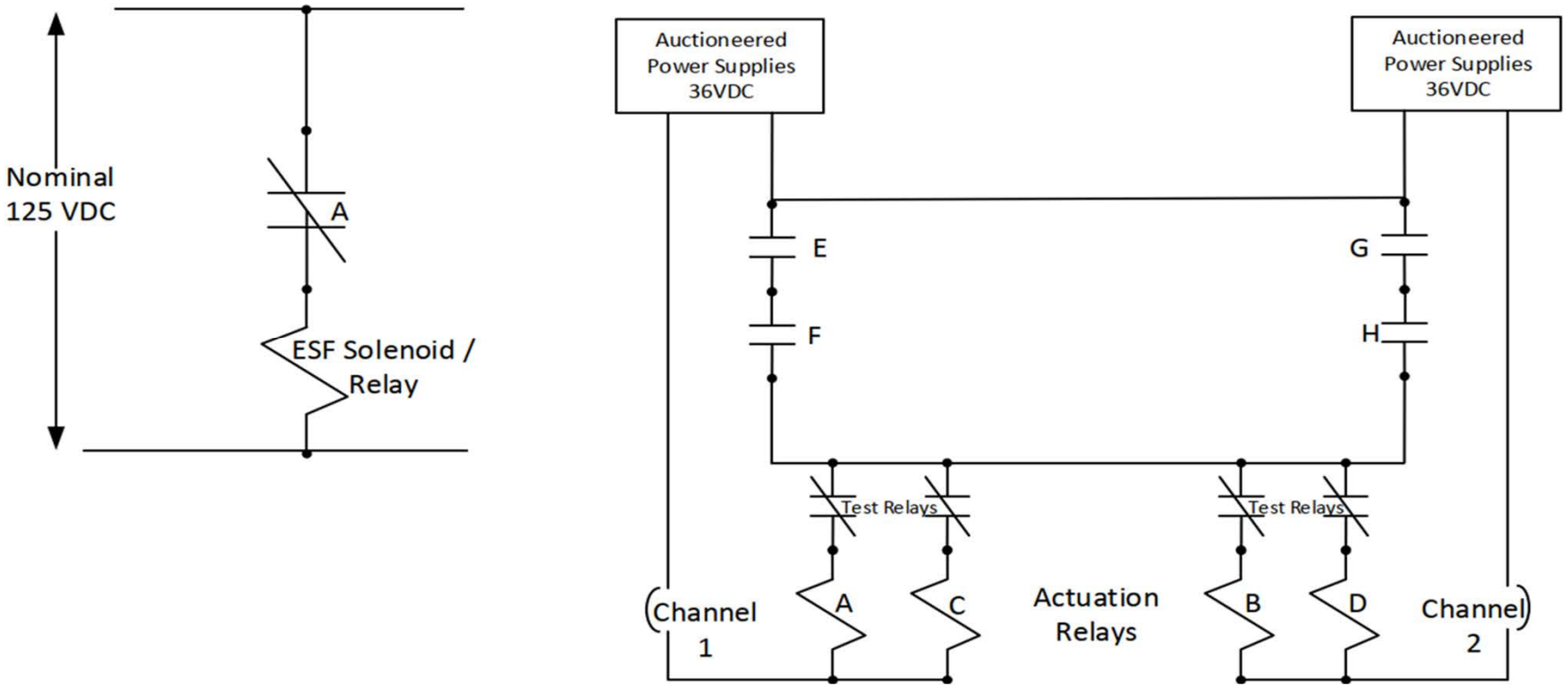
Planned Modification
Modify ESFAS MSIS and CSAS Circuits

- Revise the ESFAS Actuation Circuit from a 1 out of 1 logic (Slide 14) to a parallel 2 out of 2 logic (Slide 15).
  - Removed the SPV from the circuit
  - Parallel 2 out of 2 logic meets the Reg Guide 1.22 requirements
- Add an LED Test Fixture with an LED to illuminate when an ESFAS Actuation Relay Contact closes.
  - Provides indication of failed relay
  - Provides safe means to test without need for intrusive maintenance using meters for voltage and continuity checks
- Modification will be implemented under 10 CFR 50.59

1 out of 1 Logic - Simplified View



Note: This circuit diagram is not a design drawing and is provided for discussion purposes only.

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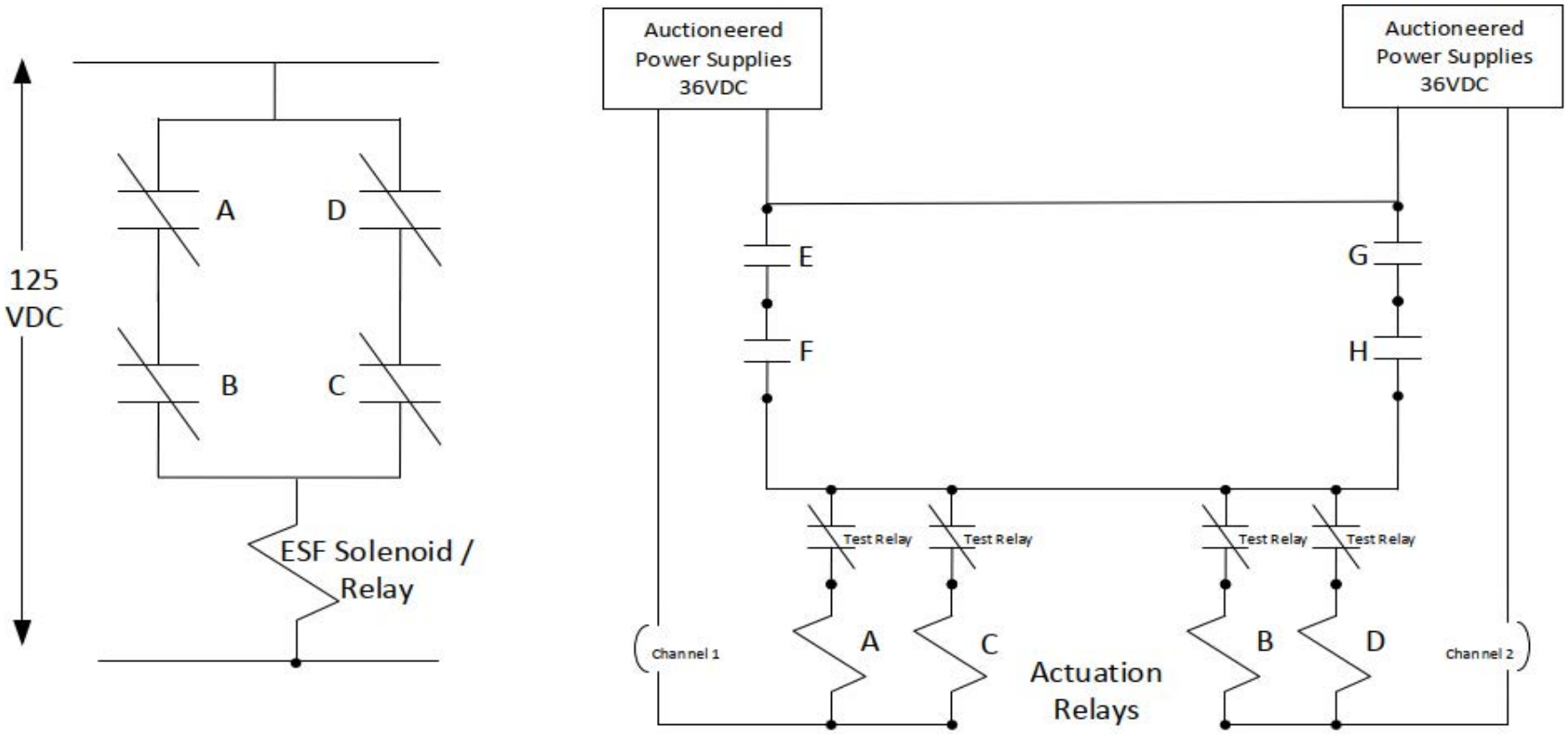
Parallel 2 out of 2 Logic (Trip Hardening) - Simplified View



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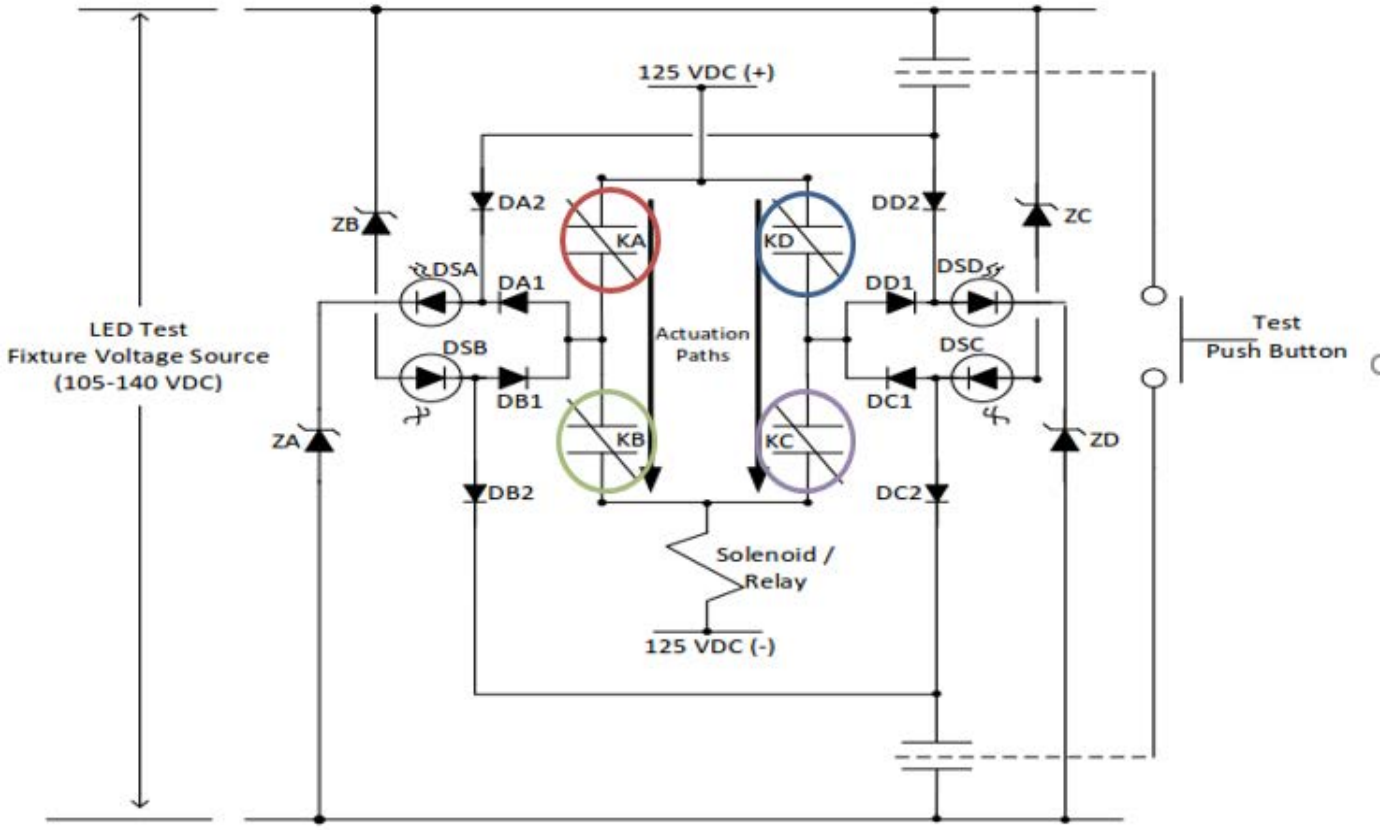
Resolution – Parallel 2 out of 2 Logic With Test Panel



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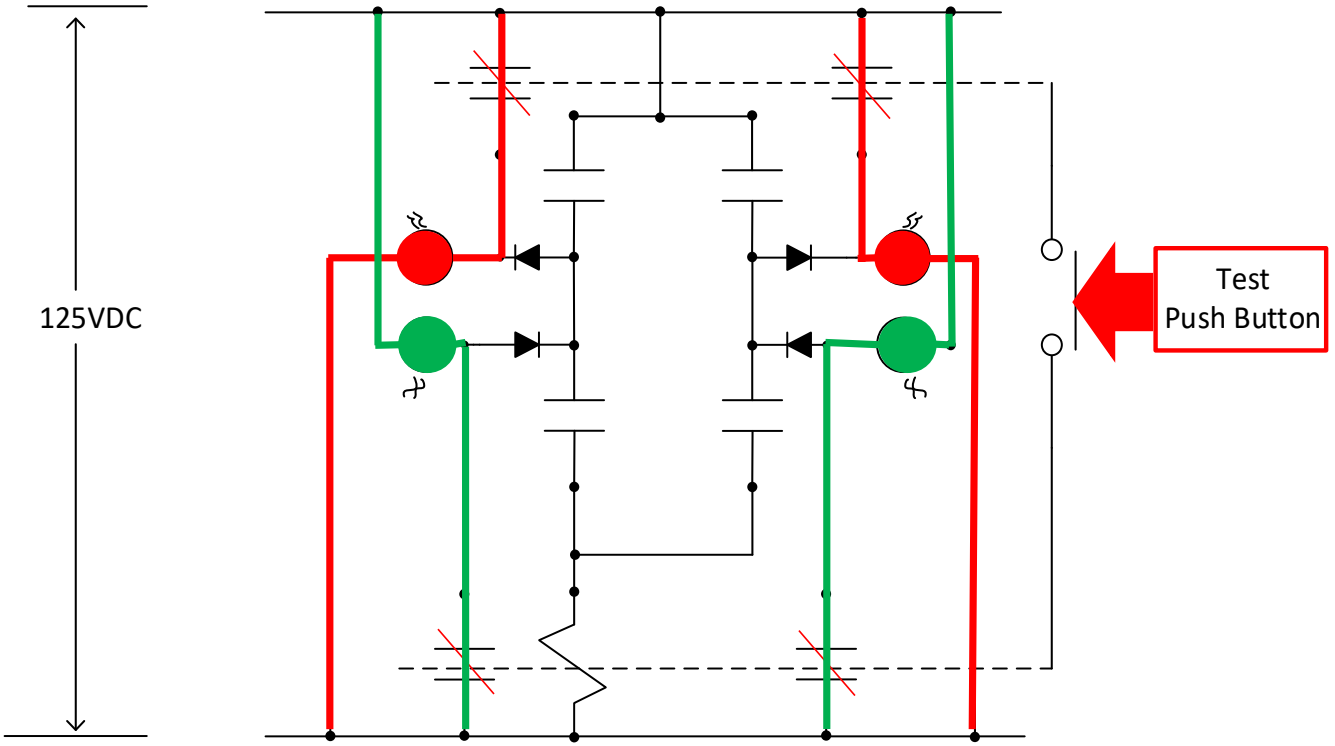
Testing LED Lights



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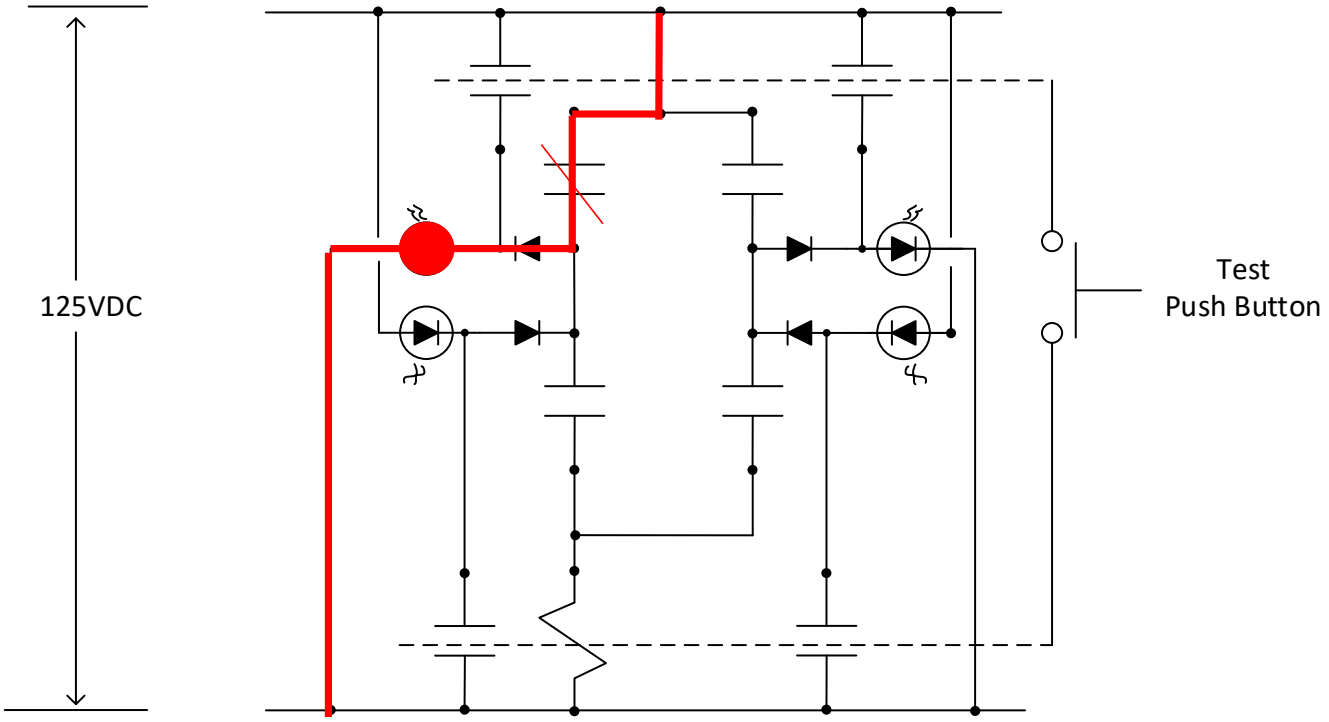
Testing of Actuation Relay



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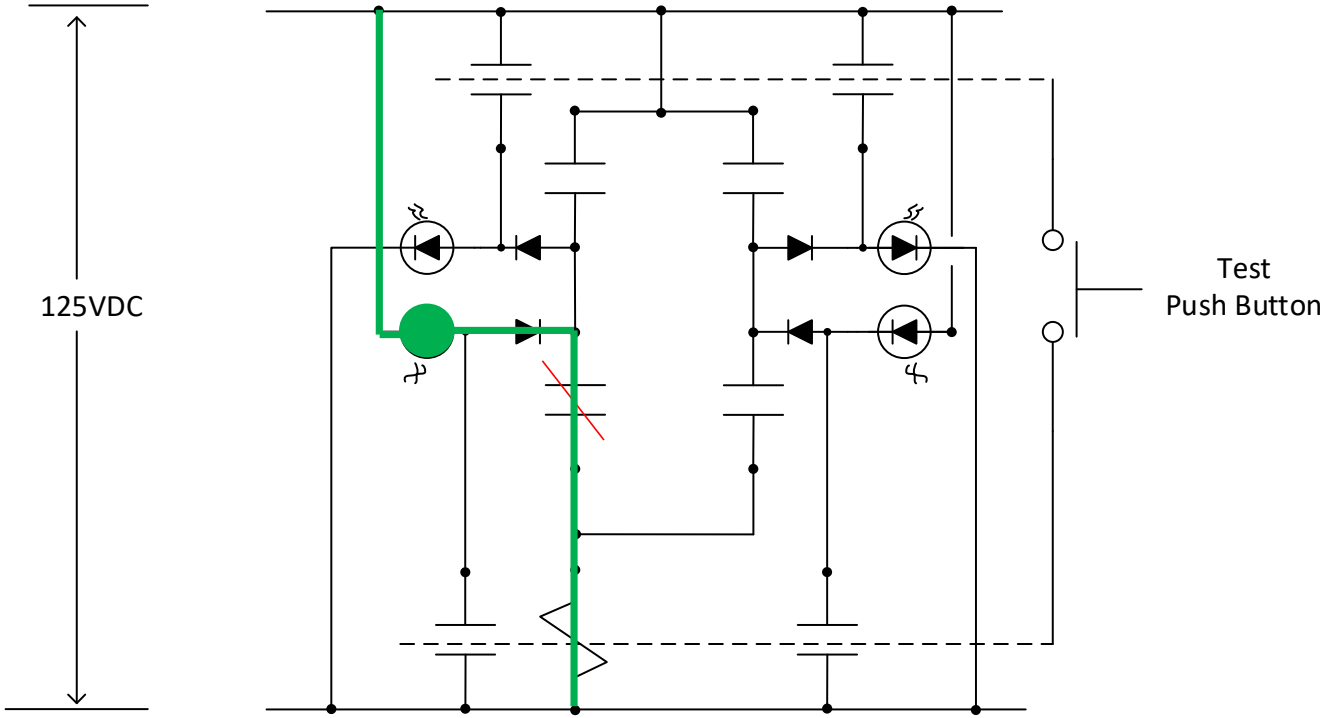
Testing of Actuation Relay



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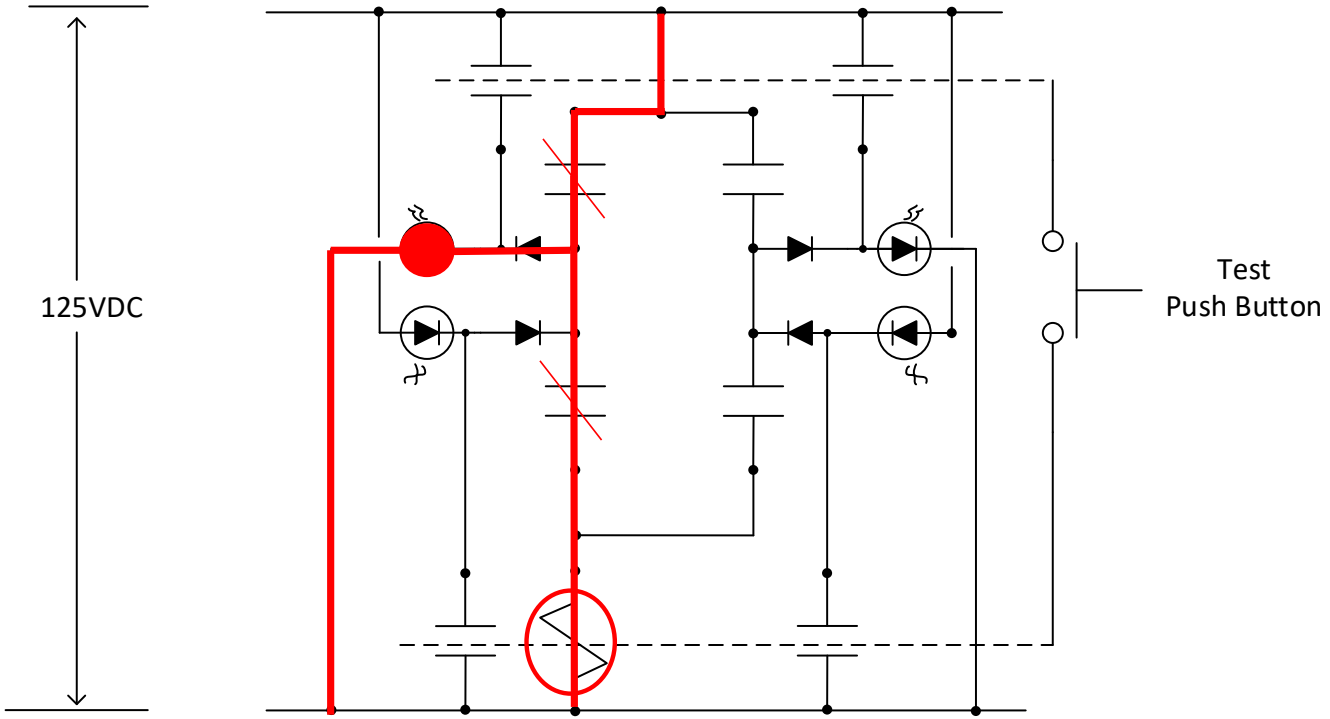
ESFAS Actuation



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Technical Specification Change

Technical Specification Change

- Remove ESFAS Relays K305, K313, K114 from Technical Specification Table 4.3-2 Note 3 which removes the exemption from online testing that was necessary because of the previous 1 out of 1 logic.
- This will change the test frequency of ESFAS Relays K305, K313, K114 (and the added MSIS & CSAS Relays) to the frequency established by the Surveillance Frequency Control Program.

Technical Specification Change

Markup of Current Technical Specification Table 4.3-2 Note 3

TABLE NOTATION

(1) Each train or logic channel shall be tested in accordance with the Surveillance Frequency Control Program.

(2) Testing of Automatic Actuation Logic shall include the energization/deenergization of each initiation relay and verification of the OPERABILITY of each initiation relay.

(3) A subgroup relay test shall be performed which shall include the energization/deenergization of each subgroup relay and verification of the OPERABILITY of each subgroup relay. Relays K109, ~~K114,~~ K202, K301~~, K305,~~ K308 and ~~K313~~ are exempt from testing during power operation but shall be tested in accordance with the Surveillance Frequency Control Program and during each COLD SHUTDOWN condition unless tested within the previous 62 days

(4) Using installed test switches.

(5) To be performed during each COLD SHUTDOWN if not performed in the previous 6 months.

(6) Each train shall be tested, with the exemption of relays, K110, K410 and K412, in accordance with the Surveillance Frequency Control Program. Relays K110, K410 and K412 shall be tested in accordance with the Surveillance Frequency Control Program.

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Closing

Closing

- The planned ESFAS circuit modification will:
  - Eliminate identified Single Point Vulnerability
  - A single failure of a component in the test circuit will not cause an actuation.
  - Allow for non-intrusive, safe method for testing on-line
  - Identify a failure of an ESFAS Actuation Relay
  - Comply with Reg. Guide 1.22
  - Be implemented under 10 CFR 50.59

Closing

- LAR updates TS testing requirements consistent with Surveillance Frequency Control Program and Reg. Guide 1.22 to support planned ESFAS circuit modification
- LAR does not request NRC approval of modification
- Proposed resubmitted LAR makes no technical changes to previous LAR submittal
- Expected submittal date is October 2022
- LAR approval needed to support startup from Fall 2023 refueling outage (RF-25)

Conclusion

Thank you for your time and attention.
Questions?

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