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10 CFR 50.90

W3F1-2018-0018

June 29, 2018

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Supplemental Information Supporting the License Amendment Request to Remove Technical Specification 3/4.3.2 Table 4.3-2 Note 3 Exemption for Testing Relays K114, K305, and K313
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

REFERENCES:

1. Email correspondence, NRC to Entergy, Waterford 3 - Acceptance of License Amendment Request to Revise Technical Specification 3/4.3.2 Table 4.3-2, January 17, 2018, [ADAMS Accession Number ML18018A016].

2. W3F1-2017-0067, License Amendment Request to Remove Technical Specification 3/4.3.2 Table 4.3-2 Note 3 Exemption for Testing Relays K114, K305, and K313, December 6, 2017 [ADAMS Accession Number ML17340B321].

3. Public Meeting with Entergy Operations, Inc. Regarding a Planned License Amendment Request to Revise Technical Specification 3.3.2, "Engineered Safety Features Actuation System Instrumentation," for Waterford Steam Electric Station, Unit 3 [ADAMS Accession Number ML17318A139].

4. Waterford Unit 3 - Licensee Presentation Slides for November 16, 2017, Category 1 Public Meeting Regarding Engineered Safety Features Actuation System [ADAMS Accession Number ML17318A123].

Dear Sir or Madam:

By letter dated December 6, 2017, Entergy Operations, Inc. (Entergy), submitted a license amendment request (LAR) for changes to Technical Specification 3/4.3.2 Table 4.3-2 (Engineered Safety Features Actuation System Instrumentation Surveillance Requirements) Note 3 (Reference 2). This LAR supports the Engineered Safety Features Actuation System (ESFAS) single point vulnerability trip hardening modification which will reduce the likelihood of an inadvertent component actuation caused by a single failure.

Since submitting Reference 2, Entergy has identified that a revision to the submittal is necessary. The supplemental information describing these two changes (original and revision) is provided in the Enclosure to this letter.

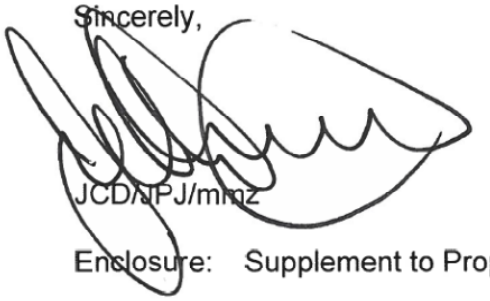
With respect to the original Entergy request (Reference 2), changes included in this letter have been evaluated and Entergy has determined that the changes do not invalidate the assessment of the "no significant hazards consideration" included in Reference 2. The changes do not affect the proposed amendment to the Technical Specification provided in Reference 2.

There are no new regulatory commitments contained in this supplement.

If you have any questions or require additional information, please contact John Jarrell, Regulatory Assurance Manager, at 504-739-6685.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 29, 2018.

Sincerely,



JCD/JPJ/mmz

Enclosure: Supplement to Proposed Technical Specification Change

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Enclosure to

W3F1-2018-0018

Waterford Steam Electric Station, Unit 3

Supplement to Proposed Technical Specification Change

(14 pages)

CHANGE 1

Single Point Failure Review of Engineered Safety Features Actuation System (ESFAS) Gang Operation Circuit [Main Steam Isolation System (MSIS) and Containment Spray Actuation System (CSAS)]

Reason for change:

During the Waterford 3 design review of the gang operation test circuit proposed for the ESFAS MSIS and CSAS, it was identified that the potential existed to create test equipment sneak circuits if gang relay (K411 or K212) contact(s) were to become stuck closed. These stuck contact(s) induced sneak circuits that could result in unexpected equipment actuation during online subgroup relay testing. Even though such gang relay contact failures are fully detectable by discrete (offline) subgroup relay testing, it was decided to even further harden the test circuits against the likelihood of these detectable gang relay contact failures.

Test Switch Function Description

Periodically, the subgroup relays are tested to ensure proper operation. To minimize plant impact, each ESFAS subgroup relay has an associated test relay located in the Auxiliary Relay Cabinets that allows for discrete testing. The test relay has a normally closed contact wired in series with the coil of the subgroup relay. The test relay is normally de-energized; therefore, the test relay contact is normally closed and power to the subgroup actuation relay is maintained under normal conditions (no MSIS or CSAS signal present).

During ESFAS MSIS or CSAS testing, Control Room operators align the ESFAS test selector switches at Control Panel CP-33 for the specific subgroup relay under test and the INITIATE ACTION pushbutton is depressed initiating the test. The INITIATE ACTION pushbutton provides power (6 VDC) to the selected subgroups' test relay. When the test relay is energized, its normally closed contact opens, thus de-energizing the subgroup relay.

When the subgroup relay de-energizes, its normally closed (shelf state) contact closes, thus providing 125 VDC power to the associated downstream Solenoid Operated Valve (SOV) associated with an Engineered Safety Feature function (for MSIS and CSAS this results in valve closure).

Note: A full actuation test (gang operation) of either CSAS or MSIS will only be performed when the plant is in Mode 4 (Hot Shutdown) (conditions allowing), Mode 5 (Cold Shutdown), or when defueled.

Before Sketch (Original Proposed Change)

The before sketch (see Enclosure page 3) depicts the scenario of a single K411 contact stuck closed (single K212 is similar) after performing gang operation achieving full actuation of the downstream SOV during a plant outage. In this scenario, the plant is in Mode 1 (Power Operation), the contact [unknowingly] remains stuck closed, and the discrete subgroup relay test is being performed. The rotary test switch is aligned to initiate K305 for discrete subgroup relay testing. When the INITIATE ACTION pushbutton is depressed, a full actuation would occur due to the stuck closed K411 contact. The dashed red arrows of the sketch shows the voltage path through the stuck K411 contact that ultimately energizes the gang operation test relay K511. The energizing of K511 triggers a full actuation. A single stuck contact or an entire stuck gang relay (K411 or K212) would have the same result in this circuit.

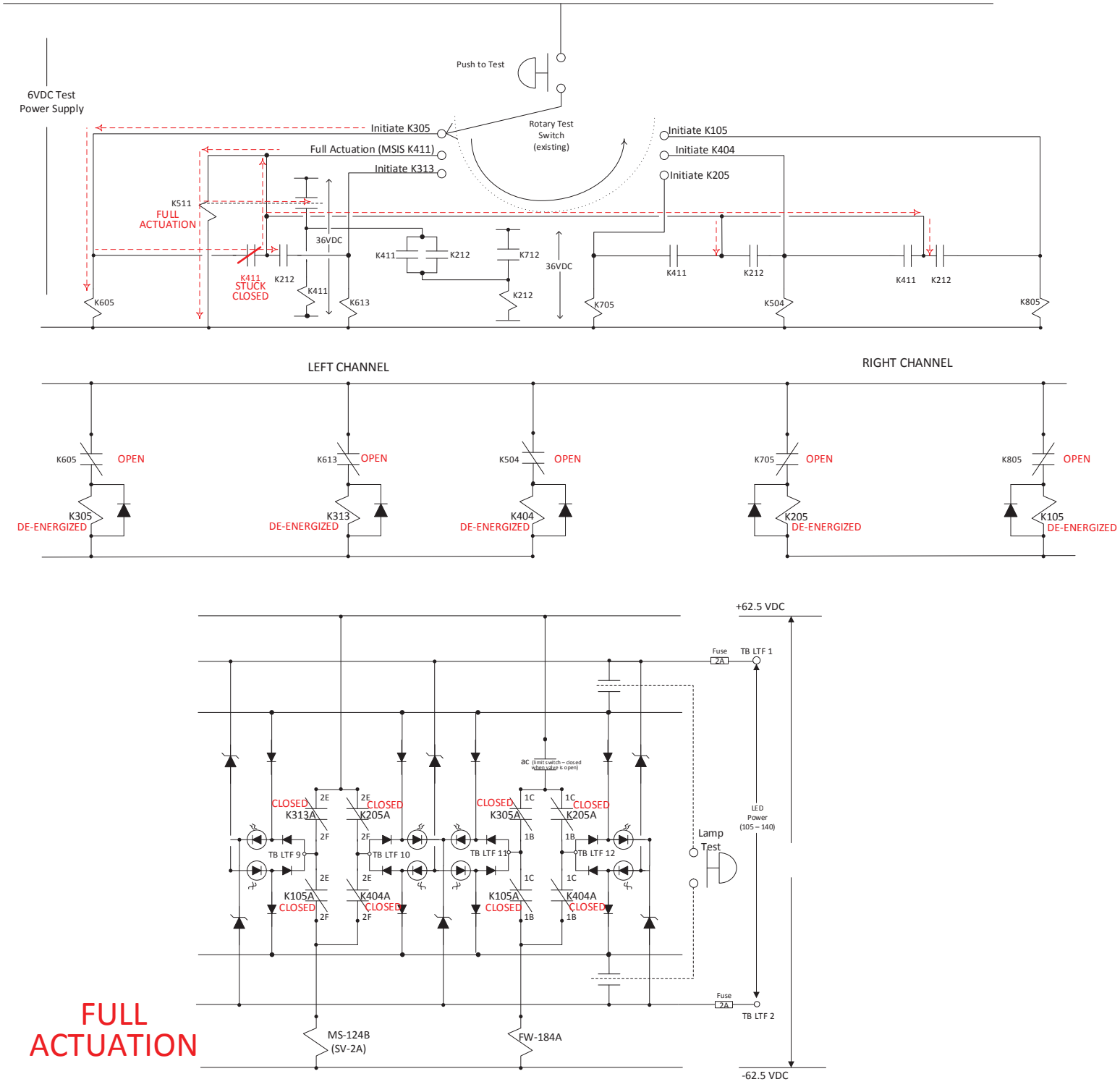
After Sketch (Final Design)
The after sketch (see Enclosure page 4) depicts the design which has been "hardened" against the voltage sneak paths described in the previous scenario. The addition of the K411 and K212 contacts block the voltage from the K511 coil during discrete subgroup relay testing, thus preventing full actuation of MSIS or CSAS under the condition of a single stuck gang relay contact (K411 or K212) scenario. The ESFAS MSIS and CSAS test circuits are also hardened for channel protection such that a stuck gang relay (all contacts for K411 or K212 closed) would not result in full actuation of MSIS or CSAS. The "left channel" is arranged with K411 contacts and the "right channel" is arranged with K212 contacts. In the scenario depicted, if all gang relay K411 contacts are stuck closed, a full actuation would not occur. The only result would be left channel subgroup relays actuate (K212 results are similar for right channel only). Full actuation requires both left and right channel subgroup relays to achieve full actuation. For the condition described, all left or right channel relays actuated would be detected by Light Emitting Diode (LED) Test Fixture indication. Under the described scenario, two LED lights will illuminate. If the circuit were operating properly and there are no stuck gang operated test relay contacts, only a single LED out of 4 per group for a given valve would illuminate.

Outage Precautions
As a precaution to guard against a stuck gang operated test relay or gang operated relay, Waterford 3 has adopted a proceduralized approach for testing MSIS and CSAS gang operation during refueling outages. Once full actuation of MSIS and CSAS is achieved under the offline surveillances using the gang operation feature provided, discrete subgroup relay testing is performed as previously described to ensure gang operation contacts have reset to the open position. A failure to reset gang operation will be manifested at the LED test fixture with more than 1 LED per group of 4 being illuminated. If detected, the failed gang operation test relay or gang operation subgroup relay can be replaced, thereby eliminating inadvertent actuation during Mode 1 testing.

Description of Change:
Diagrams illustrating the before/after system concept are provided on the following two pages. This design change does not affect the proposed amendment to the Technical Specification provided in the license amendment request.

SCENARIO: SINGLE K411 (SHOWN) OR K212 CONTACT IS STUCK CLOSED AFTER A FULL ACTUATION.

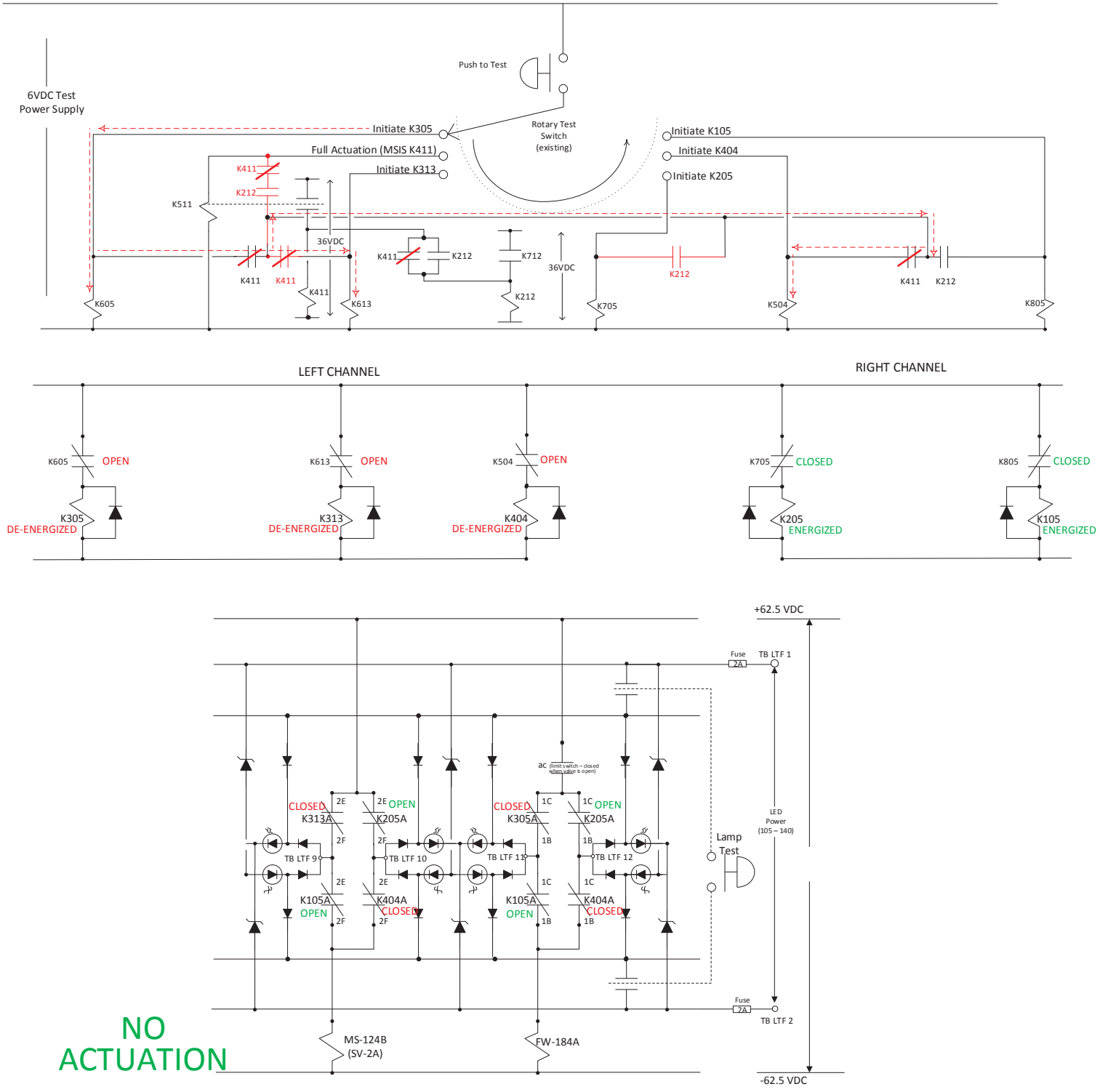
BEFORE



FULL ACTUATION

SCENARIO: ALL K411 (SHOWN) OR K212 CONTACTS ARE STUCK CLOSED AFTER A FULL ACTUATION.

AFTER



NO ACTUATION

CHANGE 2
Revision to Circuit Description and Schematics to Account for Cross Tie Between Power Supplies

Reason for change:
Errors were identified during the design development and design verification for the modification that required revision to design documents and the 10 CFR 50.59 evaluation. The 10 CFR 50.59 evaluation and the design documents were revised accordingly. A portion of the license amendment request which describes the ESFAS modification and some of the schematics provided were based on these documents. The necessary change to the information in the license amendment request is provided below. The changes do not affect the proposed amendment to the Technical Specification provided in the license amendment request.

Description of Change:
In the License Amendment Request, the following paragraph was provided on Page 7 of 20 of Attachment 1 of Reference 2:

> Assume relay A is the original relay. In series with the "A" contact is a newly installed "B" contact. If a short circuit would occur across the relay A coil, this would not cause an actuation to occur due to relay B having a separate negative and circuit breaker. The "A" contact would close while the "B" contact would remain open thus preventing the energization of the downstream ESF solenoid / relay. By paralleling 2 out of 2 with a second 2 out of 2, the actuation system can achieve a better result. The change in logic to address probability of failure to actuate (fail "on") is evaluated as equal to or better than that of the existing single subgroup relay. The existing configuration requires only one actuation relay per train to respond to its respective ESF actuation signal. The one actuation relay is actuated by one specific trip leg (valve group, refer to UFSAR figures 7.2-17 and 7.3-5). Failure of the valve group specific trip leg would result in failure of the actuation relay to respond. The proposed activity adds permissive relays to both the primary's trip leg and the other trip leg using both available trip paths (valve group / pump group). The resulting configuration requires successful actuation of both valve group and pump group trip paths and subsequent actuation of both primary and permissive or permissive and permissive subgroup relays. However, based on UFSAR Table 7.2-5 and sections 7.3.1.1.1.3, 7.3.1.1.2.2.3, 7.3.1.1.3.3, and 7.3.1.1.4.3, successful actuation of the Safety Injection System (SIS), Recirculation Actuation Signal (RAS), CSS (with exception of the valves addressed in this evaluation), and the Containment Isolation System (CIS), respectively, require a similar scheme. The successful actuation of BOTH valve group and pump group trip paths and their associated subgroup relays is required for successful system actuation. In that regard, this modification does not increase the probability of actuation failure of affected MSIS or CSS components any more than the probability of actuation failure of SIS, RAS, CSS, or CIS components as already described in the UFSAR and improves the probability by adding two subgroup paths: path 1 being A and B or path 2 being C and D, with either path providing successful actuation of downstream actuated device (valve).

The following is provided to replace the above paragraph in its entirety:

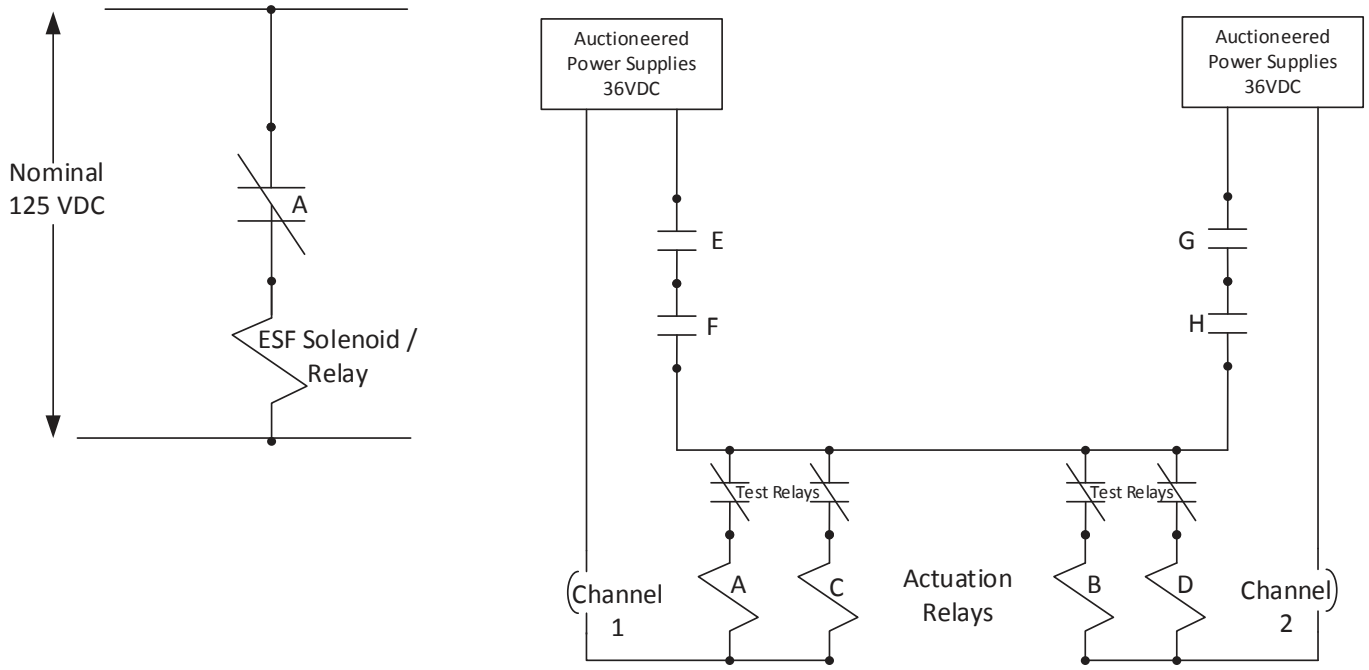
Assume relay A is the original relay. In series with the “A” contact is a newly installed “B” contact. If a short circuit would occur across the relay A coil, this would not cause an actuation to occur due to relay B having a separate negative and circuit breaker. The “A” contact would close while the “B” contact would remain open thus preventing the energization of the downstream ESF solenoid/relay. By paralleling 2 out of 2 with a second 2 out of 2, the actuation system can achieve a better result. The change in logic to address failure to actuate (fail “on”) is evaluated as equal to or better than that of the existing single subgroup relay. The existing configuration requires only one actuation relay per train to respond to its respective ESF actuation signal. The one actuation relay is actuated by both ESF trip legs (pump and valve groups, refer to UFSAR figures 7.2-17 and 7.3-5). Failure of the pump or valve group specific trip leg would result in failure of the actuation relay to respond. The proposed activity adds permissive relays to both trip legs of available trip paths (pump group / valve group). The resulting configuration maintains the requirement for successful actuation of both valve group and pump group trip paths and subsequent actuation of one of two sets of subgroup relays. All ESFAS functions require a similar scheme: the successful actuation of BOTH valve group and pump group trip paths and their associated subgroup relays for successful system actuation. There is no change to the failure modes as described in UFSAR 7.2-5.

The proposed LED test fixture has been evaluated for failure modes and none were identified that result in addition of a new failure mode to the ESFAS. There is no credible single failure within the LED test fixture that results in a failure to actuate when required or actuation when none is called for. Failures internal to the LED test fixture are detectible either by observation: LED illuminated when not required, LED not illuminated when required; or, by testing: different surveillance result than required when under test, preventive maintenance activity detects defective diodes.

Based on UFSAR Table 7.2-5 and sections 7.3.1.1.1.3, 7.3.1.1.2.2.3, 7.3.1.1.3.3, and 7.3.1.1.4.3, successful actuation of the Safety Injection System (SIS), Recirculation Actuation System (RAS), Containment Spray System (CSS) (with exception of the valves addressed in this evaluation), and the Containment Isolation System (CIS), respectively, require successful actuation of BOTH valve group and pump group trip paths and their associated subgroup relays for successful system actuation. In that regard, the proposed modifications make the MSIS and CSAS trip paths consistent with other ESFAS trip paths already described in the UFSAR. This modification does not degrade the ability of affected MSIS or CSAS components to actuate on an actual actuation signal by adding two subgroup paths (path 1 being A and B; path 2 being C and D), either path providing successful actuation of downstream actuated device (valve). Following modification, the ability of MSIS or CSAS components to actuate on an actual signal requiring protective ESF functions is consistent with the ability of SIS, RAS, CSS, or CIS components to actuate on actual signals requiring protective ESF functions.

On the following pages, the simplified schematic that was included in the license amendment request is provided; following each is the revised schematic (showing the cross tie) which replaces it.

From W3F1-2017-0067, Attachment 1, Page 6 of 20:



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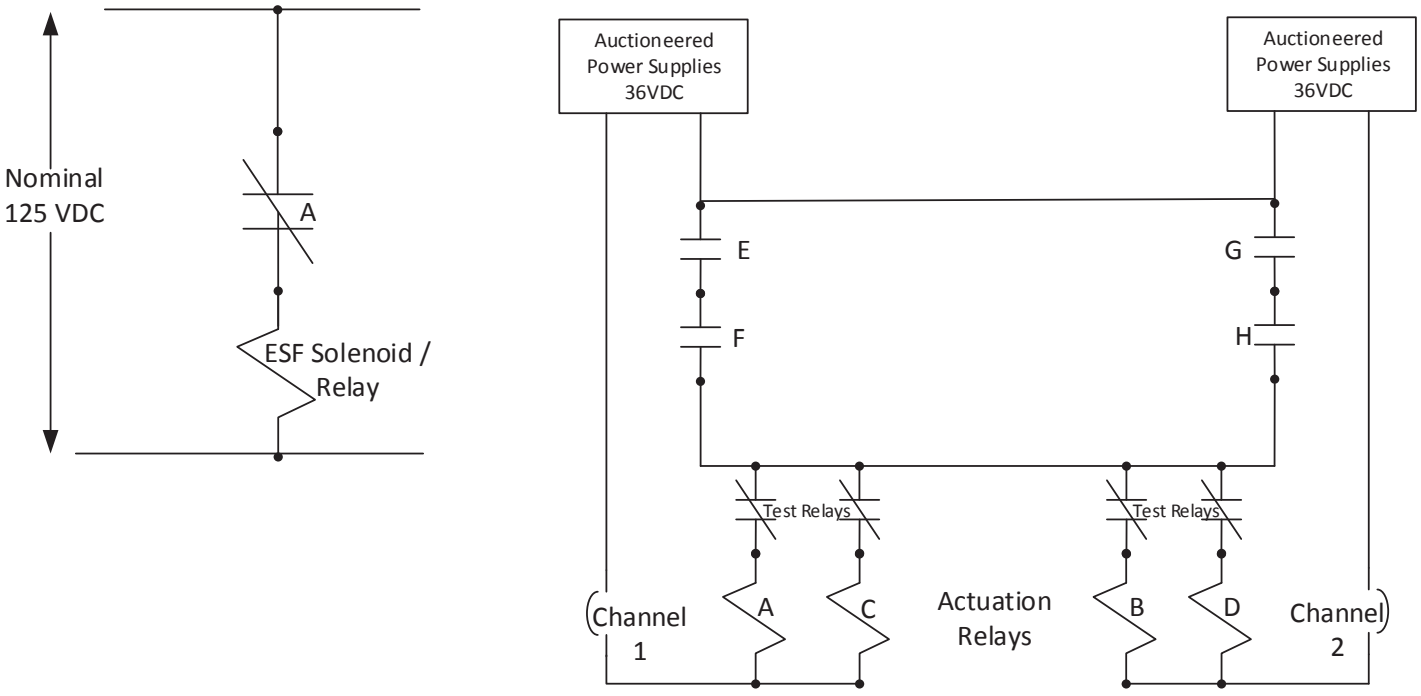

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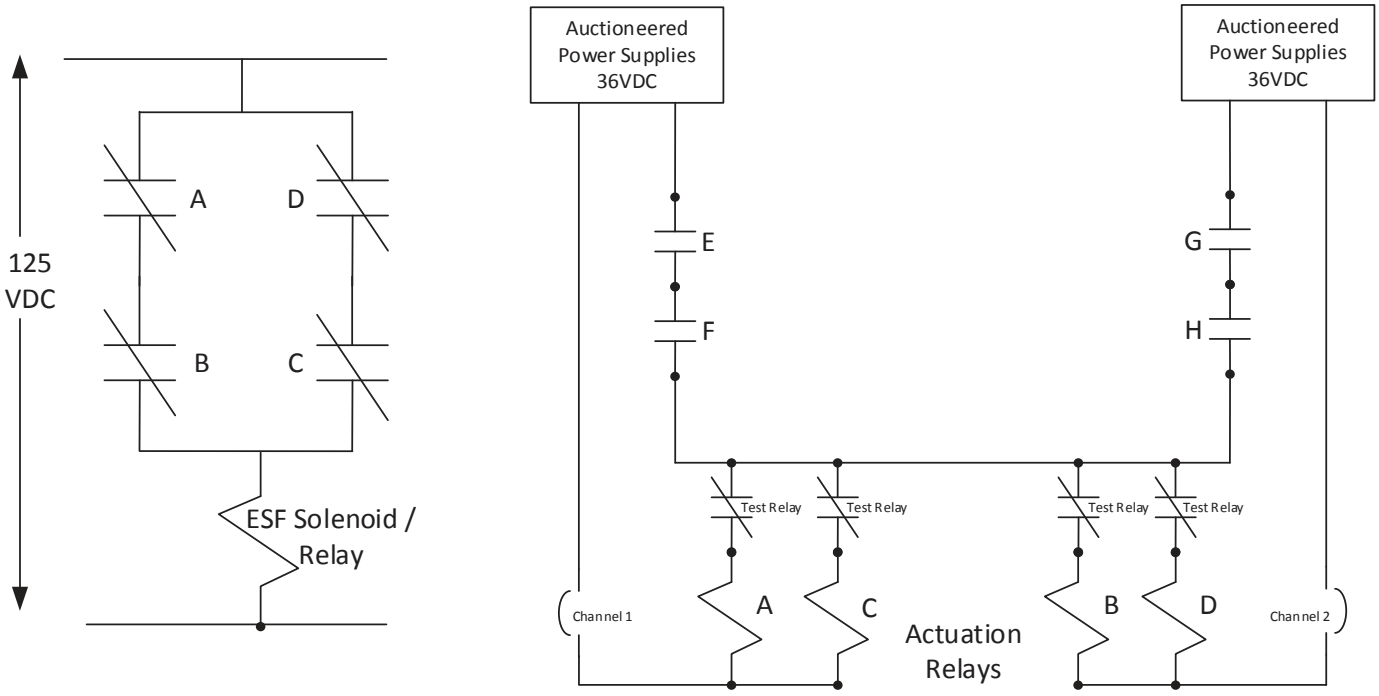

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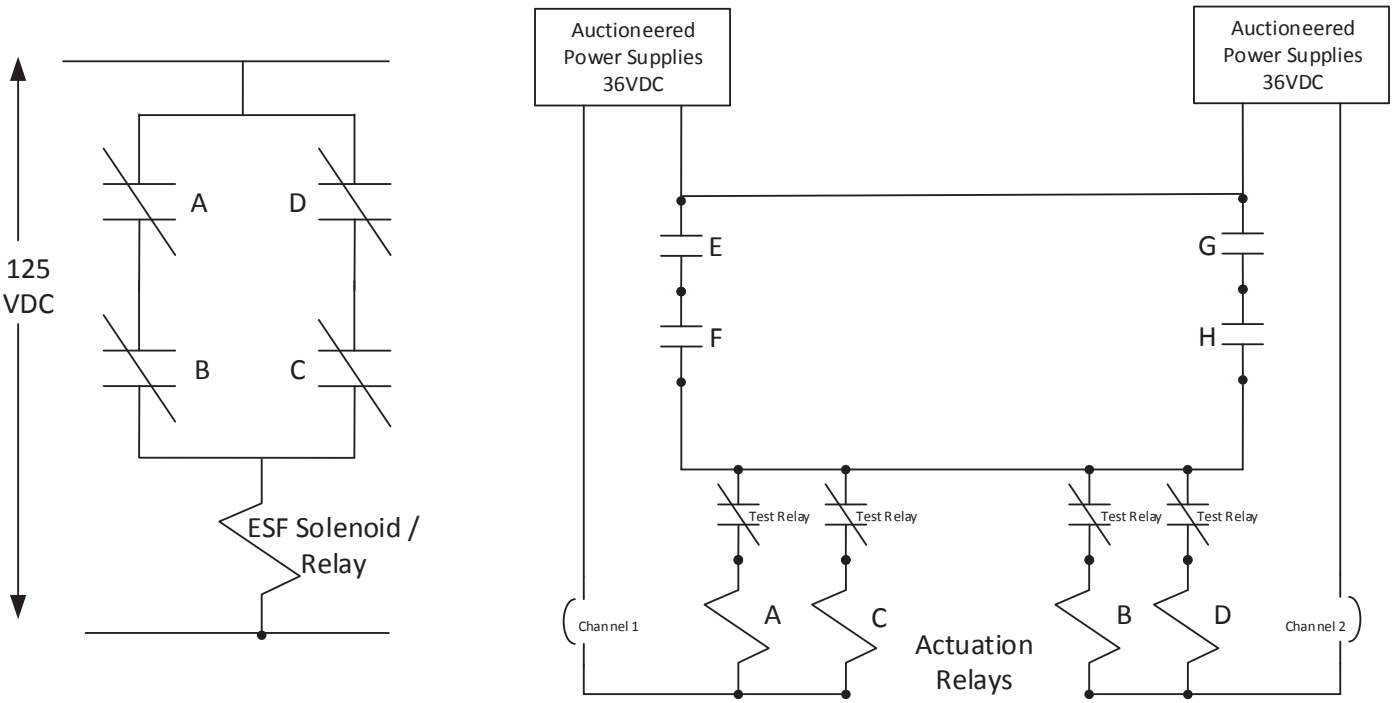

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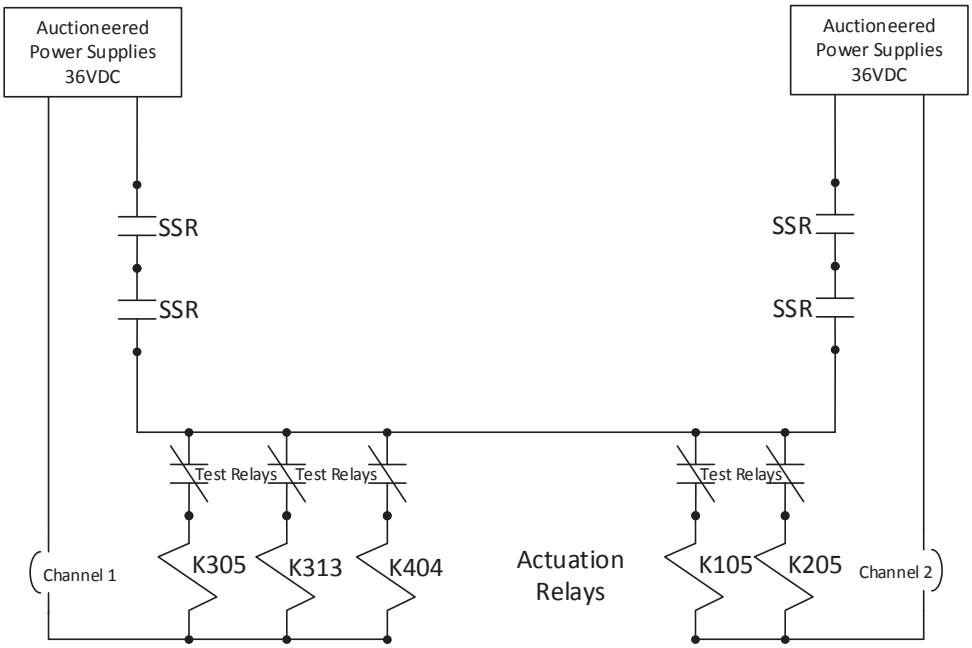

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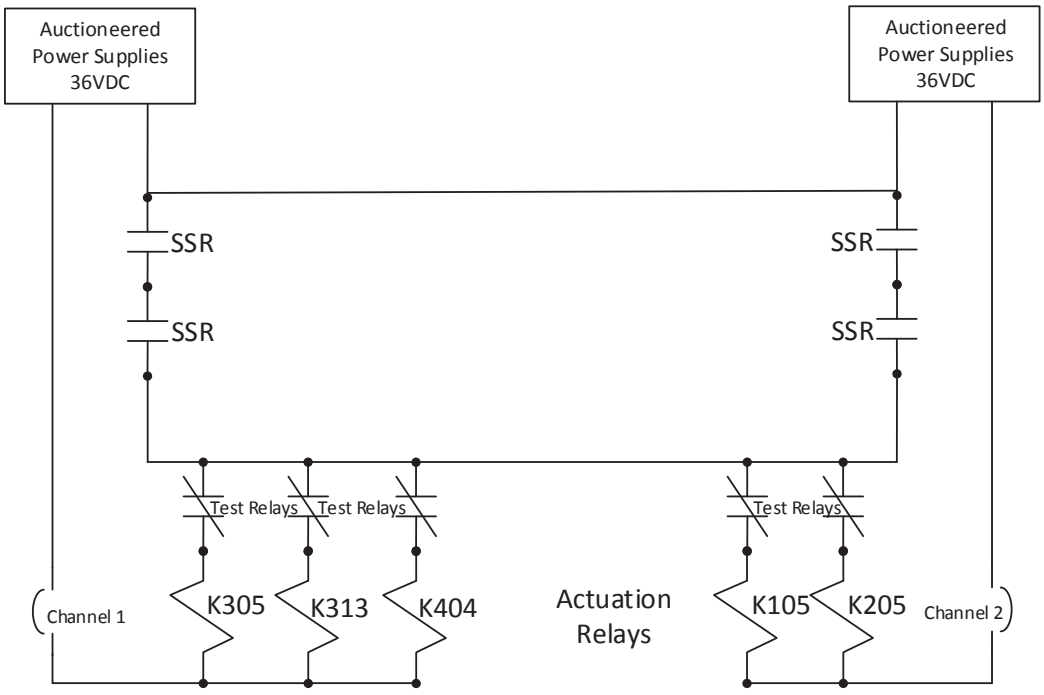

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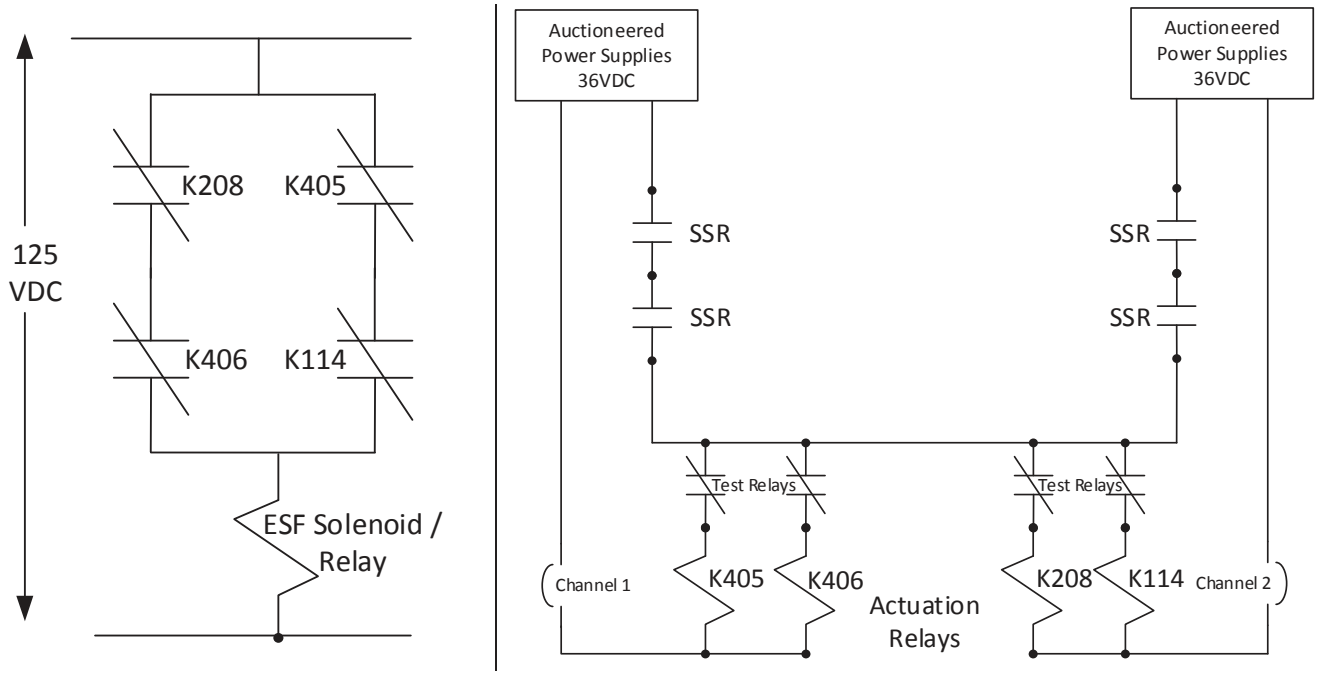

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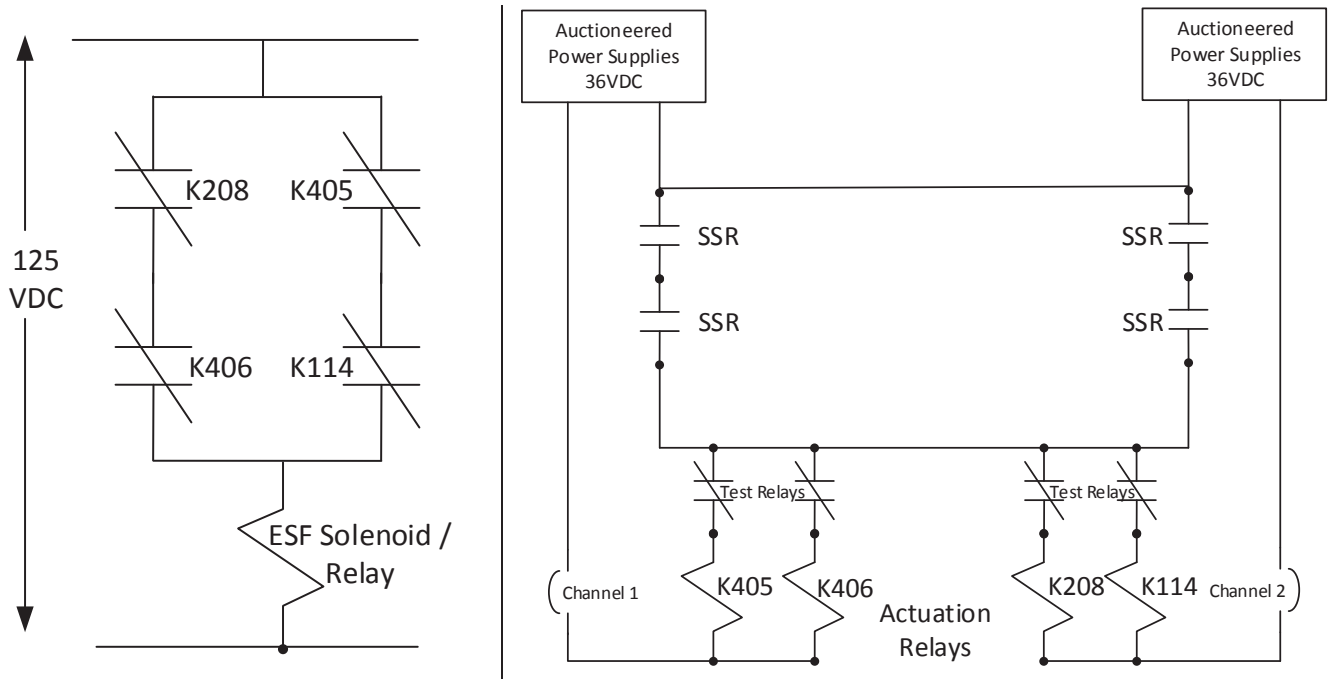

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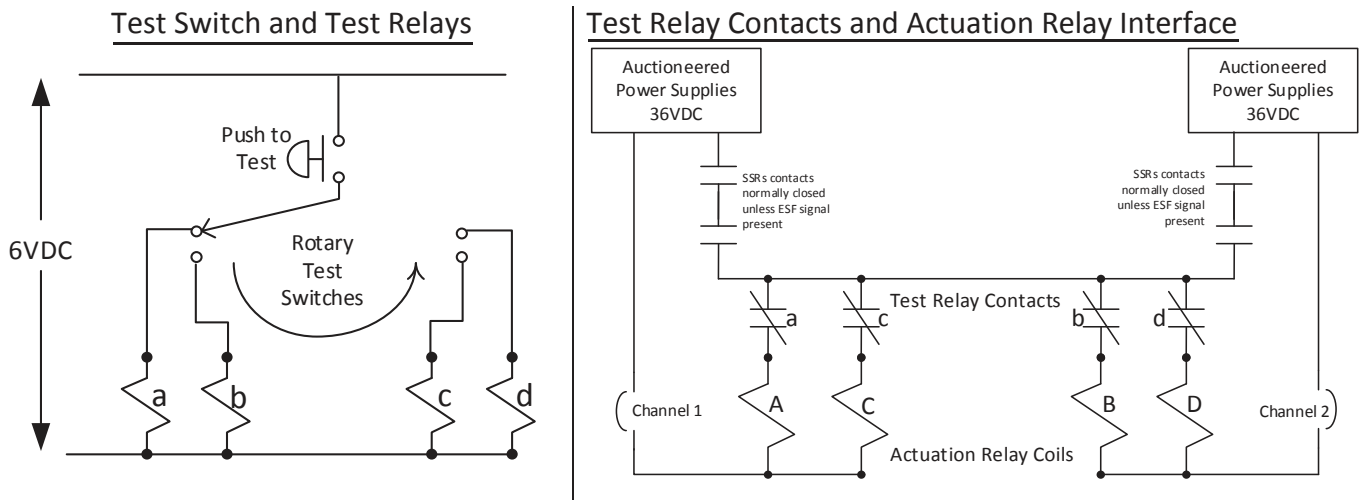

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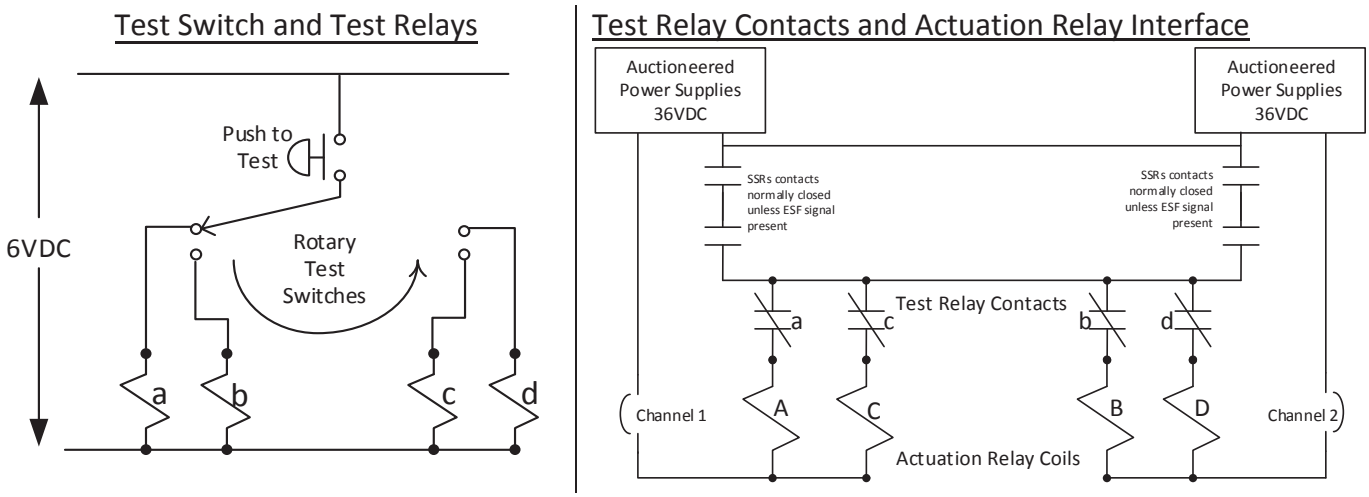

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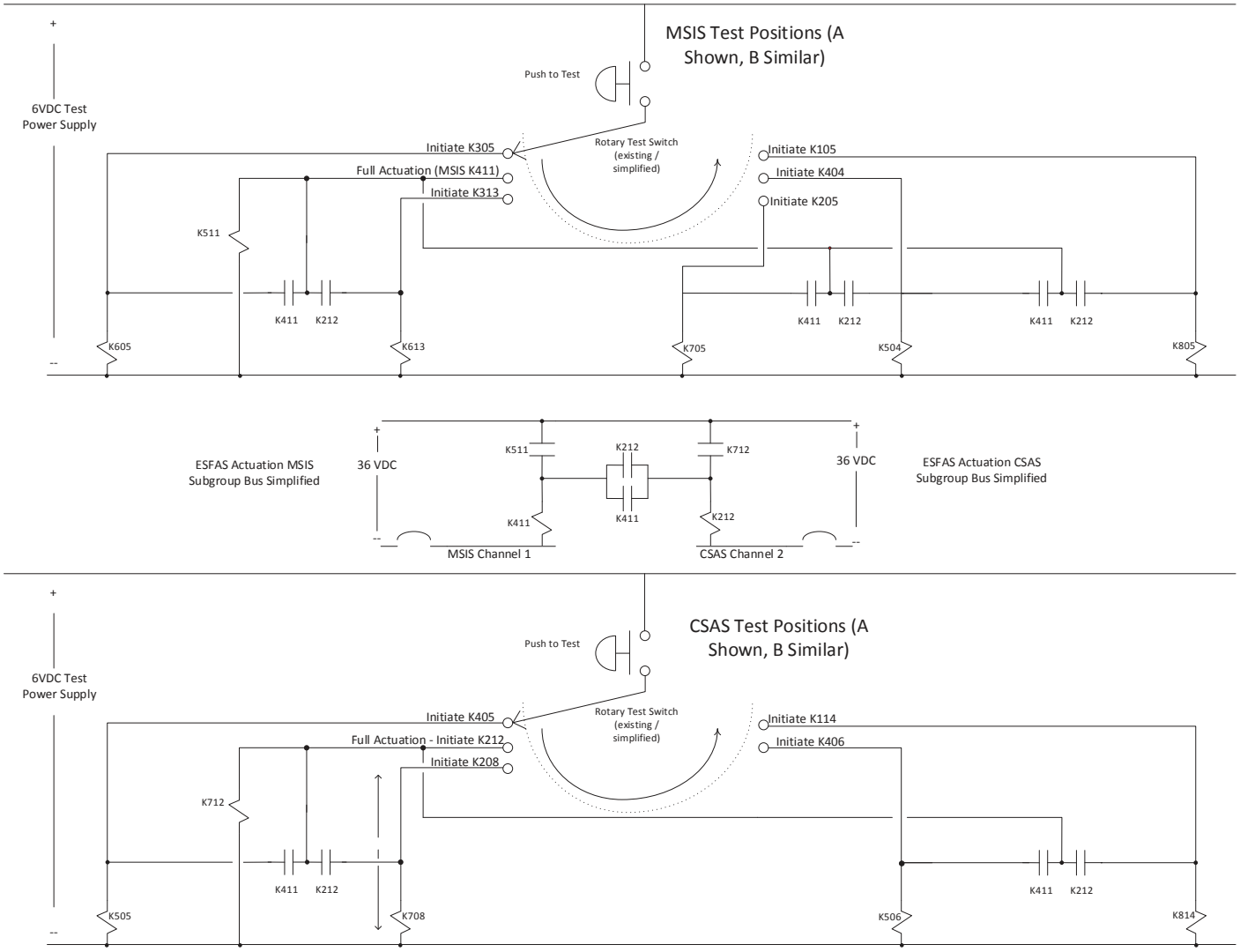

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