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SUBJECT: Forwards response to Section IV of Generic Ltr 86-05 re implementation of TMI Action Item II.K.3.5.

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Gentlemen:

In the Matter of the Application of) Docket Nos. 50-438
Tennessee Valley Authority) 50-439

BELLEFONTE NUCLEAR PLANT (BLN) - RESPONSE TO GENERIC LETTER NO. 86-05, IMPLEMENTATION OF TMI ACTION ITEM II.K.3.5, "AUTOMATIC TRIP OF REACTOR COOLANT PUMPS"

TVA has completed (1) a review of TVA's previous submittals on TMI Action Item II.K.3.5 for completeness and accuracy, and (2) a joint review with Babcock and Wilcox (B&W) of Generic Letter 86-05 for applicability. Our review indicates that a majority of the questions asked in Generic Letter 86-05 have been answered in previous submittals to NRC. The enclosure provides TVA's response to the questions raised in Section IV of Generic Letter 86-05 and updates TVA's previous submittals. An extension for this submittal was discussed with R. J. Auluck on March 28, 1988.

If you have any questions concerning the above, please telephone Dennis L. Terrill at (205) 574-8820.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. Gridley

R. Gridley, Director
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Regulatory Affairs

Enclosure
cc: See page 2

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Enclosure
Bellefonte Nuclear Plant
Response to Generic Letter 86-05 Request for Additional Information
on TMI Action Item II.K.3.5
Automatic Trip of Reactor Coolant Pumps (RCPs)

Question

A. Determination of RCP Trip Criteria

1. Identify the instrumentation to be used to determine the RCP trip setpoint, including the degree of redundancy of each parameter signal needed for the criterion chosen.

2. Identify the instrumentation uncertainties for both normal and adverse containment conditions. Describe the basis for the selection of the adverse containment parameters. Address, as appropriate, local conditions such as fluid jets or pipe whip which might influence the instrumentation reliability.

3. In addressing the selection of the criterion, consideration of uncertainties associated with the BWOG or plant specific supplied analyses values must be provided. These uncertainties include both uncertainties in the computer program results and uncertainties resulting from plant specific features not representative of the BWOG generic data group.

Response

1. Because the RCP trip requires coincidence of low subcooling margin and either low Reactor Coolant System (RCS) pressure or high Reactor Building (RB) pressure, several setpoints are involved: RCS pressure, RB pressure, and subcooling margin. The instrumentation listed in Table 1 represents one temperature string (typical of 6), one RB pressure string (typical of 3), and one RCS pressure string (typical of 3). This instrumentation is necessary to develop the RCP trip.

   Figure 1 illustrates the interconnection of the three redundant analog signal processing subsystems and the two redundant actuation subsystems required to perform the RCP trip. Three redundant measurements of Loop A Hot Leg Temperature (Th-A), Loop B Hot Leg Temperature (Th-B), RCS pressure, and RB pressure are used, one in each analog subsystem. The degree of redundancy is the same as for Engineered Safety Features Actuation System (ESFAS) High Pressure Injection (HPI) and Low Pressure Injection (LPI) trip functions. The single failure criterion of IEEE-279 is met.

2. Accident environmental conditions affect only the resistance temperature detectors (RTDs), which are located in the primary containment. The RTDs are being qualified by analysis to environmental conditions which equal or exceed those expected during an accident inside the primary containment. The design range uncertainties for the RTDs will also be applicable under accident conditions. The RCS and RB pressure transmitters are located in the annulus area and are not subjected to the accident environment of the primary containment; the annulus accident environment is slightly more severe than the annulus design range environment. The pressure

transmitters are qualified to accident environmental parameters which equal or exceed those specified for the annulus area. The design range uncertainties for the pressure transmitters are applicable under accident conditions. Equipment located in the control room remains within the design range environmental conditions during an accident. This equipment is qualified to environmental conditions which equal or exceed those specified for the control room. The RCP trip equipment's design range uncertainties are applicable under accident conditions.

A calculation was performed to estimate the expected RCP trip instrument string uncertainties for design and accident conditions. Transmitter uncertainties under conditions more severe than the annulus accident conditions were used. This was done to assure that the calculations bounded expected conditions. The methodology used in the resulting estimates is conservative. If the results of ongoing qualification indicate that RTD uncertainties are greater than the values used in the calculation, a new estimate of instrument string uncertainties will be made. The calculation yielded a design range uncertainty of 5.6°F and an accident condition uncertainty of 6.3°F.

A review of the instrumentation to be used in determining RCP trip setpoints, and the components required to trip the RCPs, has concluded that only the six RTDs located inside primary containment have a potential for pipe whip, or jet impingement interactions, resulting from a high energy line break (HELB). (The RTD listed in Tables 1 and 2, RTD 190-100-2/RC-TE-3A5, is typical of 6.) No other pipe whip or jet impingement effects are anticipated since all other equipment is located either in the control room or annulus. In the annulus region, all high energy lines are encased by a guard pipe to ensure that a rupture in the high energy line will not generate jet impingement, missiles, pipe whip, or other environmental interactions on safety-related equipment. The guard pipe is also intended to prevent pressurization of the annulus. In the Control Building, no high energy piping is allowed unless an analysis is performed to demonstrate that the effects of a pipe break, including pipe whip, jets, missiles, room pressurization, and other environmental effects are acceptable. The routing of instrument lines or conduits, associated with the subject instrumentation will be reviewed during the pipe rupture field evaluations which will be completed before fuel loading. Any unacceptable interactions will be dispositioned at that time.

3. A BLN-specific analysis was performed to determine the maximum time available for tripping RCPs in response to small break loss-of-coolant-accidents (SBLOCAs) of various sizes assuming availability of emergency feedwater. The analysis also determined the time elapsed until RCS saturation and ESFAS trip on low RCS pressure. The analysis was conservative, that is, assumptions were used that comply with the requirements of 10 CFR 50, Appendix K. The calculation showed that approximately three minutes are available before the RCP trip is required to meet the criteria of 10 CFR 50.46.

Instrument uncertainty estimates were calculated using uncertainty values specified for the Nuclear Instrumentation/Reactor Protection System (NI/RPS) and ESFAS signal processing equipment and the Tsat meter. The calculated uncertainty is such that under non-SBLOCA conditions, with a setpoint of "Tsat + 12°F," a trip of RCPs would not occur.

Question

B. Potential Reactor Coolant Pump Problems

Section 5.4 of the BWOG generic report discusses the various aspects of the essential service water systems for the B&W plants in a generic fashion. Each licensee needs to identify and describe the plant specific features to:

1. Assure that containment isolation, including inadvertent isolation, will not cause problems if it occurs for non-LOCA transients and accidents.

   a. Demonstrate that if water services needed for RCP operations are terminated, then they can be restored fast enough to prevent seal damage or failure once a non-LOCA situation is confirmed.

   b. Confirm that containment isolation with continued pump operation will not lead to seal or pump damage or failure.

2. Identify the components required to trip the RCPs, including relays, power supplies and breakers. Assure that RCP trip, when determined to be necessary, will occur. If necessary, as a result of the location of any critical component, include the effects of adverse containment conditions on RCP trip reliability. Describe the basis for the adverse containment parameters selected.

Response

1. Seal injection is the primary means of cooling the RCP seals. Seal injection to the RCPs will provide sufficient cooling for the RCP seals, with the RCP running or idle, without component cooling water being supplied to the RCP seal cooler. If the RCP is running, the controlled bleedoff flow path must be open so heat generated by the seals can be removed. The controlled bleedoff flow is a portion of the seal injection flow supplied to the RCP. If the RCP is running, component cooling water will provide seal cooling without seal injection.

   The seal injection flow path to the RCPs is not closed by containment isolation signals or by any ESFAS signals. If HPI is actuated by ESFAS, seal injection will continue regardless of whether one or both HPI trains operate. The controlled bleedoff flow path from the RCPs is not closed by the containment isolation function or by any ESFAS signals. The four individual controlled bleedoff lines combine into one common seal return line before penetrating the primary containment. The containment isolation valve inside primary containment for this line is a three-way valve (VYFB-051-B). There is also a containment isolation valve (VHFB-074-A) in the seal return line outside primary containment. Both valves receive ESFAS signals to close. The three-way valve inside primary containment changes position to block the flow path through the primary containment (for containment isolation) and to divert the seal return flow path to the reactor coolant drain tank inside primary containment. This provides double isolation of the seal return line penetrating primary containment and maintains an open controlled bleedoff flow path from the RCPs. This is discussed in Bellefonte's Final Safety Analysis Report (FSAR) Section 9.3.6.2.1 (item 18) and shown on FSAR Figures 9.3.6-4, -8, and -9. ESFAS signals, including containment isolation, will not interrupt seal injection or controlled bleedoff for the RCPs. Therefore seal cooling is provided without component cooling water whether the RCP is running or idle.

The results of testing performed for similar motors show that the BLN RCP motors are capable of operating without seal injection in excess of 30 minutes with loss of component cooling water. Because safety-grade component cooling water flow indication is provided in the control room, adequate time exists for the operator to reestablish component cooling water flow for continued RCP operation.

2. Table 2 lists the B&W-supplied components required to trip the RCPs; it also contains the Tsat meter and associated signal selector switches which are supplied by TVA. The Tsat meters receive 120V AC Class IE vital power as listed in Table 3. The components listed are typical for six wide range hot leg temperature strings, three RCS pressure strings, and three RB pressure strings, three Tsat meter inputs and six ESFAS analog subsystem outputs to two ESFAS digital subsystems. The system trip logic is two-out-of-three and is approximately as reliable as the ESFAS HPI and LPI trip functions.

   The RCP trip circuits, shown in Figure 2, receive trip signals from both ESFAS digital subsystems. In the event that any one pump is not properly tripped, a backup trip signal from the Solid State Control System (SSCS) will occur with both the normal and alternate switchgear feeds being tripped with manual transfer being selected. The RCP backup trip circuits are shown on Figure 3.

   See response to question A.2 for a discussion of environmental considerations.

<u>Question</u>

C. Operator Training and Procedures (RCP Trip)

   In response to NRC questions concerning the identification and management of primary system voids, the BWOG response identified potential changes to the ATOG procedures to incorporate proposed detection and management schemes.

   Each licensee should endorse this program as described and provide an implementation schedule for the revised ATOG.

   If a licensee does not endorse the provided proposal, then a suitable alternate proposal must be provided including an implementation schedule.

<u>Response</u>

The Base Abnormal Transient Operating Guidelines (ATOG) have been supplemented by additional guidance on prevention, detection, and mitigation of voids. The Inadequate Core Cooling ATOG also provides guidance on RCP restart, when necessary, with the RCS in a highly voided condition to prevent core damage.

Table 1

RCP TRIP SETPOINT GENERATION EQUIPMENT LIST

I. WIDE RANGE HOT LEG TEMPERATURE:

	Device No.	Loc.
A. RPS		
1. RTD 190-100-2 RC-TE-3A5	177HW	RB
2. Linear Bridge and Temp. Test A1-1-7	6629439A2	CR
3. Signal Converter A1-1-10	6629453A10002	CR
4. Analog Input Module A2-9-11	6631163D1	CR
5. Multiplex Input Module A2-9-12	6631044C1	CR
6. Optical Transmitter A2-10-11	6631314A2	CR
B. ESFAS Analog		
7. Optical Receiver AA2-10-5	6632614A2	CR
8. Multiplex Output Module AA2-9-2	6631408D1	CR
9. Analog Output Module AA2-9-4	6631174A1	CR

II. RB PRESSURE:

10. RB Pressure Transmitter RBS-PTS-1	N1KS69221	Annulus
11. Buffer Amplifier AA1-4-4	6621670A1024A3	CR
12. Bistable (RBP>4psi) AA1-4-7	6628492C1	CR

TABLE 1 (CONT'D)

		Device No.	Loc.
III.	RC PRESSURE:		
	13. WR Pressure Transmitter RC-PT2A3	N1KS69221	Annulus
	14. Buffer Amplifier AA1-2-4	66221670A1104A3	CR
	15. Bistable (RCP<1700 psi) AA1-2-9	6628492C1	CR
IV.	TVA-SUPPLIED EQUIPMENT:		
	16. Tsat Meter		CR

RB Reactor Building.

CR This equipment is in RPS and ESFAS cabinets located in the control room.

Table 2

AUTOMATIC RCP TRIP EQUIPMENT

		Device No.	Loc.
I.	RPS Subsystem:		
	Wide Range Hot Leg Temperature String:		
	1. RTD 190-100-2 RC-TE-3A5	177HW	RB
	2. Linear Bridge and Temp. Test A1-1-7	6629439A2	CR
	3. Signal Converter A1-1-10	6629453A10002	CR
	4. Analog Input Module A2-9-11	6631163D1	CR
	5. Multiplexed Input Module A2-9-12	6631044C1	CR
	6. Optical Transmitter A2-10-11	6631314A2	CR
II.	ESFAS Analog Subsystem:		
	Wide Range Hot Leg Temperature String:		
	7. Optical Receiver AA2-10-5	6632614A2	CR
	8. Multiplex Output Module AA2-9-2	6631408D1	CR
	9. Analog Output Module AA2-9-4	6631174A1	CR
	RB Pressure String:		
	10. RB Pressure Transmitter RBS-PTS-1	N1KS69221	Annulus
	11. Buffer Amplifier AA1-4-4	6621670A1024A3	CR
	12. Pressure/ Level Test AA1-4-1	6623705C1	CR
	13. Auxiliary Relay AA1-4-13	6623807D1	CR
	14. Bistable (RBP>4psi) AA1-4-7	6623492C1	CR

TABLE 2 (CONT'D)

RC Pressure String:

	Device No.	Loc.
15. WR Pressure Transmitter RC-PT2A3	N1KC69221	Annulus
16. Buffer Amplifier AA1-2-4	66221670A1104A3	CR
17. Pressure/Level Test AA1-2-1	6623705C1	CR
18. Bistable (RCP<1700 psi) AA1-2-9	6628492C1	CR
19. Auxiliary Relay AA1-4-13 *	6628807D1	CR

III. Input From Tsat Meter to ESFAS Analog Subsystem:

	Device No.	Loc.
20. Contact Buffer AA1-1-9	6628908A1	CR
21. Logic Buffer AA1-9-10	6629006A1	CR
22. Digital Input Module AA2-9-11	6631142A1	CR
23. Optical Transmitter AA2-10-11	6631314A2	CR
24. Optical Cable		CR

IV. ESFAS Digital Subsystem:

	Device No.	Loc.
25. Optical Receiver DA8-10-1	6632614A2	CR
26. Digital Output Module DA8-9-1	6631155B1	CR
27. Contact Output Module DA8-9-2	6631239A1	CR
28. 2/3 Trip Logic DA7-2-4	6629102A1	CR
29. Logic Test DA7-2-1	6628923A1	CR
30. Auxiliary Relay DA7-3-13	6628807D1	CR
31. Auxiliary Relay DA7-2-12	6628807D1	CR

TABLE 2 (CONT'D)

	Loc.
32. AC Power Main Distribution Panel	CR
33. Auxiliary Power Distribution Panel	CR
34. Tsat Meter	CR
35. WR Temp. channel select switch (TSM input).	CR
36. Power Supply +15 Volts	CR
37. Power Supply -15 Volts	CR
38. Power Supply -10 Volts	CR
39. Power Supply + 5 Volts	CR
40. Power Supply 24 Volts	CR
41. Auto/Manual Switch #	CR

RB Reactor Building.

CR These equipments are in RPS and ESFAS cabinets located in the control room.

* Same relay module.

\# Control room panel other that RPS or ESFAS cabinet.

Table 3

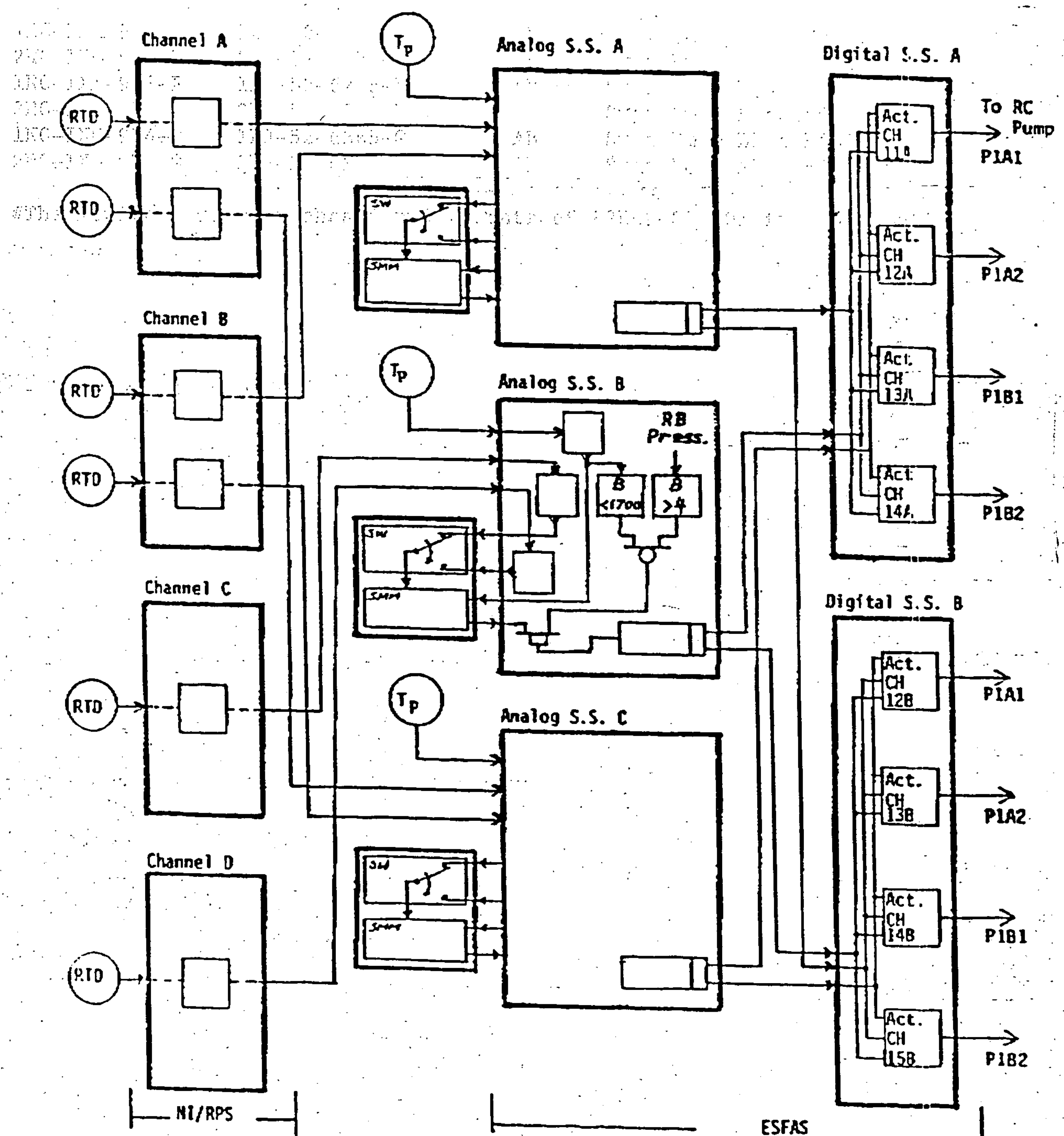
Saturation Monitor Power Source

Saturation Monitor Power Source - Heinemann, 2 Pole, 100 AMP Frame, 15A Trip Molded Case Breaker - Cat #CF2-Z70-1 - Contract 77K4-86932

#Monitor ID	Power Source	Building	Location	Distribution Cab.
1NC-IXM-972-D	1EJ-52-6072-D	AB	Swgr Rm & Elec Bd Area	1EJ-EDP-60-D
2NC-IXM-972-D	2EJ-52-6072-D	AB	Swgr Rm & Elec Bd Area	2EJ-EDP-60-D
1NC-IXM-973-F	1EJ-52-6265-F	AB	Swgr Rm & Elec Bd Area	1EJ-EDP-62-F
2NC-IXM-973-F	2EJ-52-6265-F	AB	Swgr Rm & Elec Bd Area	2EJ-EDP-62-F
1NC-IXM-974-G	1EJ-52-6365-G	AB	Swgr Rm & Elec Bd Area	1EJ-EDP-63-G
2NC-IXM-974-G	2EJ-52-6365-G	AB	Swgr Rm & Elec Bd Area	2EJ-EDP-63-G

#The monitors were purchased under contract 82K69-828101 from Combustion Engineering.

FIGURE 1

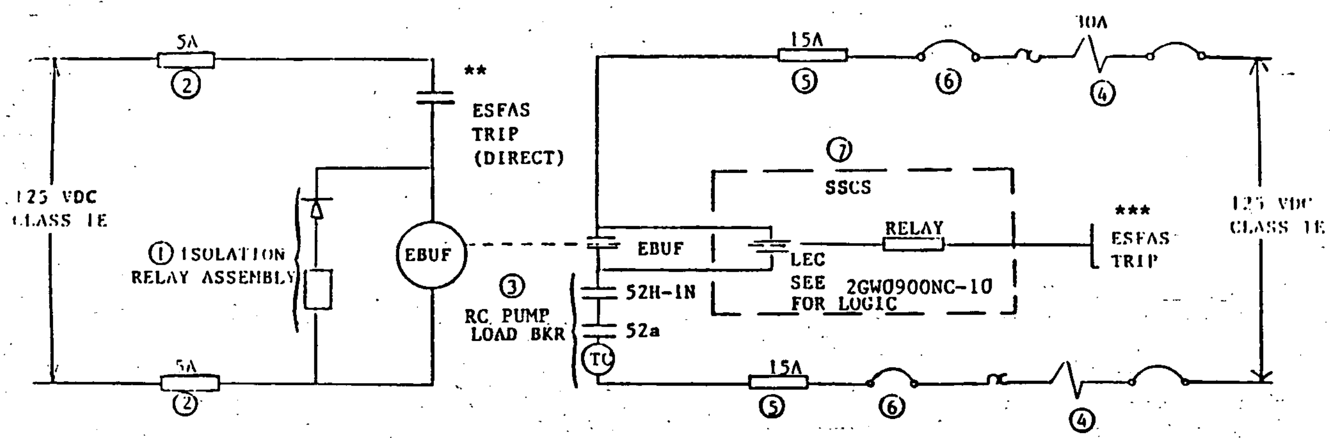


LEGEND

SW : High Auctioneering Switch
SMM: Saturation Margin Meter
B : Bistable
T_p : RC Press. Transmitter

Figure 2

RCP Trip Circuits - ESFAS Trip



ALL EQUIPMENT SHOWN IS IN A MILD ENVIRONMENT
*NOTE! Devices ②, ④, and ⑥ are shared as noted below.

① Isolation Relay Assembly - MK #PDF - Consolidated Controls Corporation
MK #BVH-1 - Sarkes-Tarzian 60C-IN 24B9 (or equal) IE rectifier
MK #BVA-6 - Ohmite 270-25-0230B (or equal) 25 watt resistor

RCP	Relay UNID	Building	Location	**ESFAS Trip (direct) ID
1A1	1NC-EBUF-005-S	AB	Swgr Rm	1101 (U1)
2A1	2NC-EBUF-005-S	AB	Swgr Rm	1101 (U2)
1A2	1NC-EBUF-006-S	AB	Swgr Rm	1302 (U1)
2A2	2NC-EBUF-006-S	AB	Swgr Rm	1302 (U2)
1B1	1NC-EBUF-007-S	AB	Swgr Rm	1301 (U1)
2B1	2NC-EBUF-007-S	AB	Swgr Rm	1301 (U2)
1B2	1NC-EBUF-008-S	AB	Swgr Rm	1501 (U1)
2B2	2NC-EBUF-008-S	AB	Swgr Rm	1501 (U2)

② Isolation Relay Power Source - Bussman MIC-5A Fuse - Contract 78K4-822578

RCP	Fuse UNID	Building	Location
1A1	1EU-EFU2-582A-D	AB	U1 Train A Instr Rm
2A1	2EU-EFU2-582A-D	AB	U2 Train A Instr Rm
1A2	1EU-EFU2-592A-E	AB	U1 Train B Instr Rm
2A2	2EU-EFU2-592A-E	AB	U2 Train B Instr Rm
1B1	*Shares 1A1's Fuse	AB	U1 Train A Instr Rm
2B1	*Shares 2A1's Fuse	AB	U2 Train A Instr Rm
1B2	*Shares 1A2's Fuse	AB	U1 Train B Instr Rm
2B2	*Shares 2A2's Fuse	AB	U2 Train B Instr Rm

Figure 2 (Cont'd)

③ RCP Load Breaker - ITE 15HK - 750-1200A CKT Breaker - Contract 75K5-85583

RCP	Breaker UNID	Building	Location	***ESFAS Trip (SSCS) ID
1A1	1NC-52-005	AB	Swgr Rm	1202 (U1)
2A1	2NC-52-005	AB	Swgr Rm	1202 (U2)
1A2	1NC-52-006	AB	Swgr Rm	1201 (U1)
2A2	2NC-52-006	AB	Swgr Rm	1201 (U2)
1B1	1NC-52-007	AB	Swgr Rm	1402 (U1)
2B1	2NC-52-007	AB	Swgr Rm	1402 (U2)
1B2	1NC-52-008	AB	Swgr Rm	1401 (U1)
2B2	2NC-52-008	AB	Swgr Rm	1401 (U2)

④ RCP Load Breaker Power Supply - 2 Pole 80A Trip Federal Pacific Cat #NE223030BEF - Contract 76K4-86932

RCP	TC Source UNID	Building	Location
1A1	1EU-72-53A4-G	AB	Swgr Rm and Elec Bd Area
2A1	2EU-72-53A4-G	AB	Swgr Rm and Elec Bd Area
1A2	1EU-72-52A4-F	AB	Swgr Rm and Elec Bd Area
2A2	2EU-72-52A4-F	AB	Swgr Rm and Elec Bd Area
1B1	*Shares 1A1's BKR	AB	Swgr Rm and Elec Bd Area
2B1	*Shares 2A1's BKR	AB	Swgr Rm and Elec Bd Area
1B2	*Shares 1A2's BKR	AB	Swgr Rm and Elec Bd Area
2B2	*Shares 2A2's BKR	AB	Swgr Rm and Elec Bd Area

⑤ RCP Load Breaker Control Fuse - Bussman 15A 250V FRN-15 Fuse - Contract 75K5-85583

RCP	TC Fuse UNID	Building	Location
1A1	1NC-EFU2-005A	AB	Swgr Rm
2A1	2NC-EFU2-005A	AB	Swgr Rm
1A2	1NC-EFU2-006A	AB	Swgr Rm
2A2	2NC-EFU2-006A	AB	Swgr Rm
1B1	1NC-EFU2-007A	AB	Swgr Rm
2B1	2NC-EFU2-007A	AB	Swgr Rm
1B2	1NC-EFU2-008A	AB	Swgr Rm
2B2	2NC-EFU2-008A	AB	Swgr Rm

⑥ RCP Load Breaker Control Power Disconnect - ITE Type E 100A 2 Pole Manual Breaker - Contract 75K5-85583

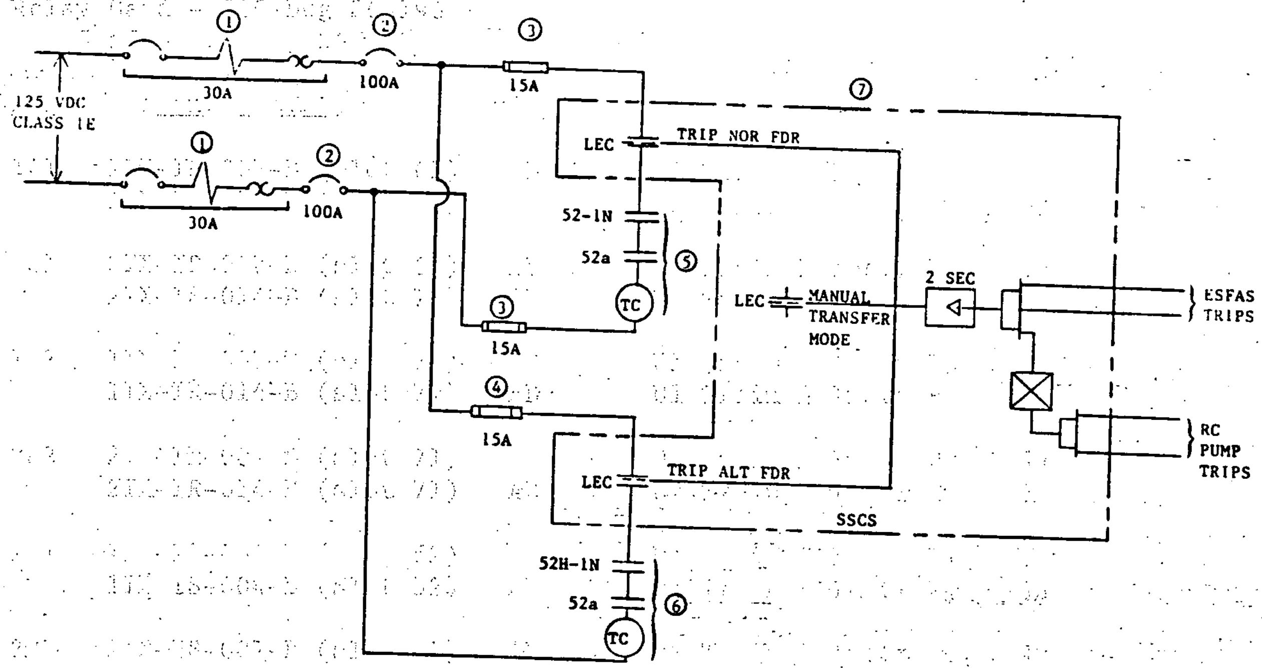
RCP	BKR UNID	Building	Location
1A1	1EA-72-02BB	AB	Swgr Rm
2A1	2EA-72-02BB	AB	Swgr Rm
1A2	1EA-72-01BB	AB	Swgr Rm
2A2	2EA-72-01BB	AB	Swgr Rm
1B1	*Shares 1A1's BKR	AB	Swgr Rm
2B1	*Shares 2A1's BKR	AB	Swgr Rm
1B2	*Shares 1A2's BKR	AB	Swgr Rm
2B2	*Shares 2A2's BKR	AB	Swgr Rm

(7) RCP Load BKR SSCS Control - Contract 75K3-85550
Relay Card - CCC Dwg S6N196
LEC Card - CCC Dwg S6N192

RCP	Cabinet (slot)	Building	Location	Type Module
1A1	1IX-IS-007-B (slot 61)	AB	U1 Train B Instr Rm	Relay card
	1IX-IS-014-B (slot 73)	AB	U1 Train B Instr Rm	LEC card
2A1	2IX-IS-007-B (slot 61)	AB	U2 Train B Instr Rm	Relay card
	2IX-IS-014-B (slot 73)	AB	U2 Train B Instr Rm	LEC card
1A2	1IX-IR-007-B (slot 71)	AB	U1 Train A Instr Rm	Relay card
	1IX-IR-014-B (slot 71)	AB	U1 Train A Instr Rm	LEC card
2A2	2IX-IR-007-B (slot 71)	AB	U2 Train A Instr Rm	Relay card
	2IX-IR-014-B (slot 71)	AB	U2 Train A Instr Rm	LEC card
1B1	1IX-IS-007-B (slot 62)	AB	U1 Train B Instr Rm	Relay card
	1IX-IS-004-B (slot 52)	AB	U1 Train B Instr Rm	LEC card
2B1	2IX-IS-007-B (slot 62)	AB	U2 Train B Instr Rm	Relay card
	2IX-IS-004-B (slot 52)	AB	U2 Train B Instr Rm	LEC card
1B2	1IX-IR-007-A (slot 72)	AB	U1 Train A Instr Rm	Relay card
	1IX-IR-004-A (slot 72)	AB	U1 Train A Instr Rm	LEC card
2B2	2IX-IR-007-A (slot 72)	AB	U2 Train A Instr Rm	Relay card
	2IX-IR-004-A (slot 72)	AB	U2 Train A Instr Rm	LEC card

Figure 3

RCP Trip Circuits - Backup Trip



① 13.8kV Swgr Feeder Breaker Control Power Feed - Federal Pacific 2 Pole, 100A Frame, 30A Trip, Cat #NE223030BEF - Contract 77K4-86932

RC Pumps	Swgr ID	TC Source UNID	Building	Location
1A2 & 1B2	1RA	1EU-72-5094-D	AB	Swgr Rm and Elec Bd Area
1A1 & 1B1	1RB	1EU-72-5194-E	AB	Swgr Rm and Elec Bd Area
2A2 & 2B2	2RA	2EU-72-5094-D	AB	Swgr Rm and Elec Bd Area
2A1 & 2B1	2RB	2EU-72-5194-E	AB	Swgr Rm and Elec Bd Area

② 13.8kV Swgr Feeder Breaker Control Power Disconnect - ITE Type E 100A 2 Pole Manual BKR - Contract 75K5-85583

RC Pumps	Swgr ID	TC Source UNID	Building	Location
1A2 & 1B2	1RA	1EA-72-01BA	AB	Swgr Rm
1A1 & 1B1	1RB	1EA-72-02BA	AB	Swgr Rm
2A2 & 2B2	2RA	2EA-72-01BA	AB	Swgr Rm
2A1 & 2B1	2RB	2EA-72-02BA	AB	Swgr Rm

③ 13.8kV Swgr Normal Feeder Breaker Control Fuse - Bussman 15A, 250V, FRN-15 Fuse - Contract 75K5-85583

RC Pumps	Swgr ID	Fuse UNID	Building	Location
1A2 & 1B2	1RA	1EA-EFU2-111A	AB	Swgr Rm
1A1 & 1B1	1RB	1EA-EFU2-121A	AB	Swgr Rm
2A2 & 2B2	2RA	2EA-EFU2-211A	AB	Swgr Rm
2A1 & 2B1	2RB	2EA-EFU2-221A	AB	Swgr Rm

Figure 3 (Cont'd)

RCP Trip Circuits - Backup Trip

④ 13.8kV Swgr Alternate Feeder Breaker Control Fuse - Bussman 15A, 250V, FRN-15 Fuse - Contract 75K5-85583

RC Pumps	Swgr ID	Fuse UNID	Building	Location
1A2 & 1B2	1RA	1EA-EFU2-112A	AB	Swgr Rm
1A1 & 1B1	1RB	1EA-EFU2-122A	AB	Swgr Rm
2A2 & 2B2	2RA	2EA-EFU2-212A	AB	Swgr Rm
2A1 & 2B1	2RB	2EA-EFU2-222A	AB	Swgr Rm

⑤ 13.8kV Swgr Normal Feeder Breaker - ITE 15HK-750-1200A Circuit Breaker - Contract 75K5-85583

RC Pumps	Swgr ID	BKR UNID	Building	Location
1A2 & 1B2	1RA	1EA-52N-111	AB	Swgr Rm
1A1 & 1B1	1RB	1EA-52N-121	AB	Swgr Rm
2A2 & 2B2	2RA	2EA-52N-111	AB	Swgr Rm
2A1 & 2B1	2RB	2EA-52N-121	AB	Swgr Rm

⑥ 13.8kV Swgr Alternate Feeder Breaker - ITE 15HK-750-1200A Circuit Breaker - Contract 75K5-85583

RC Pumps	Swgr ID	BKR UNID	Building	Location
1A2 & 1B2	1RA	1EA-52A-112	AB	Swgr Rm
1A1 & 1B1	1RB	1EA-52A-122	AB	Swgr Rm
2A2 & 2B2	2RA	2EA-52A-212	AB	Swgr Rm
2A1 & 2B1	2RB	2EA-52A-222	AB	Swgr Rm

⑦ RCP Backup SSCS Trip Control - Contract 75K3-85550
LEC Card - CCC Dwg S6N192
TDM Card - CCC Dwg S6N198
UMM Card - CCC Dwg S6N199

RC Pumps	Swgr ID	Cabinet (Slot)	Building	Location	Type Module
1A2 & 1B2	1RA	1IX-IR-008-A (31)	AB	U1 Train A Instr Rm	UMM
		1IX-IR-008-A (27)	AB	U1 Train A Instr Rm	TDM
		1IX-IR-008-A (13)	AB	U1 Train A Instr Rm	LEC
		1IX-IR-008-A (15)	AB	U1 Train A Instr Rm	LEC
		1IX-IR-008-A (14)	AB	U1 Train A Instr Rm	LEC
1A1 & 1B1	1RB	1IX-IS-008-B (29)	AB	U1 Train B Instr Rm	UMM
		1IX-IS-008-B (37)	AB	U1 Train B Instr Rm	TDM
		1IX-IS-008-B (13)	AB	U1 Train B Instr Rm	LEC
		1IX-IS-008-B (15)	AB	U1 Train B Instr Rm	LEC
		1IX-IS-008-B (14)	AB	U1 Train B Instr Rm	LEC
2A2 & 2B2	2RA	2IX-IR-008-A (31)	AB	U2 Train A Instr Rm	UMM
		2IX-IR-008-A (37)	AB	U2 Train A Instr Rm	TDM
		2IX-IR-008-A (13)	AB	U2 Train A Instr Rm	LEC
		2IX-IR-008-A (15)	AB	U2 Train A Instr Rm	LEC
		2IX-IR-008-A (14)	AB	U2 Train A Instr Rm	LEC

Figure 3 (Cont'd)

RC Pumps	Swgr ID	Cabinet (Slot)	Building	Location	Type Module
2A1 & 2B1	2RB	2IX-IS-008-B (29)	AB	U2 Train B Instr Rm	UMM
		2IX-IS-008-B (37)	AB	U2 Train B Instr Rm	TDM
		2IX-IS-008-B (13)	AB	U2 Train B Instr Rm	LEC
		2IX-IS-008-B (15)	AB	U2 Train B Instr Rm	LEC
		2IX-IS-008-B (14)	AB	U2 Train B Instr Rm	LEC