NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4)

Loss of Power to Group 2 Scram Solenoid Coils

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
									N/A	0 5 0 0 0
1 2	0 3	8 6	8 6	0 1 4	0 1	0 7	0 7	8 7	N/A	0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
4	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 0 1 0 0	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
	20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Robert G. Randall, Supervisor Technical Support	3 1 5 3 4 9 - 2 4 4 5

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On December 3, 1986 while recovering from a scram and containment isolation that occurred earlier in the day (Ref. LER 86-15), Nine Mile Point Unit 2 experienced a second scram to one-quarter of the control rods (1/4 core scram). Coincident with this second scram was a discharge of primary coolant from the scrammed control rods through the scram discharge volume (SDV) open drain valves, to the Reactor Building equipment drains. There were no radioactive releases to the environment.

Corrective Actions Taken:

(1) Additional licensed operator training on the Reactor Protection System has been requested.

(2) This LER will be added to the licensed operator training curriculum.

(3) Operating procedure N2-OP-96 and N2-OP-101C has been modified to require the Operator to initiate a manual reactor scram upon the condition that several control rods become mispositioned as in a quarter core scram event.

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TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

I. DESCRIPTION OF EVENT

On December 3, 1986 at 1543 while recovering from a scram and a containment isolation that occurred earlier on the same day (Ref. LER 86-15), Nine Mile Point Unit 2 (NMP2) experienced a second scram to one quarter of the control rods (1/4 core scram). The reactor was at ambient temperature and pressure at a 0% power level. The mode switch was in shutdown.

Coincident with this second scram was a discharge of primary coolant from the scrammed control rod drives through the scram discharge volume (SDV) open drain valves, to the Reactor Building (RB) equipment drains. This discharge path existed for approximately 37 minutes until power was restored to the RPS "B" channel completing the logic that allowed closure of the SDV vent and drain valves. By 1650 the scram was reset and the event was terminated. There were no radioactive releases to the environment.

The sequence of events leading up to the scram at 1543 is as follows:

(1) At 1509, NMP2 experienced a scram and a containment isolation due to the loss of both reactor protection system (RPS) uninterruptible power supplies (UPS). (UPS 3A is the power supply for RPS channel A and UPS 3B is the power supply for RPS channel B.) This event was caused by main steam isolation valve (MSIV) logic circuit problems and is described in LER 86-15.

(2) At 1521 power was restored by operations to RPS A by closing the UPS 3A electrical protection assembly (EPA) breakers.

(3) At 1528 the RPS A scram signal was reset by operations. A scram signal from RPS B (a half scram) still existed. (RPS B could not be reset since UPS 3B was out of service.) After RPS A was reset the Station Shift Supervisor (SSS) ordered an operator to isolate the main steam isolation valves (MSIV) logic circuits by opening breakers #3 and #4 on panel 2VBS*PNLB100 (B100) and breakers #3 and #4 on panel 2VBS*PNLA100 (A100). This action was to preclude any further problems from the MSIV logic circuits. (Due to circuit verification activities in process at the time of the scram it was thought that these circuits contributed to the prior event described in LER 86-15.)

(4) At 1543 circuit breaker #4 on panel 2VBS*PNLA100 (A100) was opened to de-energize panel 2VBS*PNLA106 (A106). This action not only de-energized the MSIV logic circuits but also de-energized the RPS A trip logic for the group 2 control rods. The loss of power to the group 2 trip logic along with the half scram signal from RPS B caused a scram of the group 2 control rods.

Coincident with this, the SDV vent and drain isolation valves did not close. This resulted in a discharge path from the scrammed group 2 rods through the SDV to the RB equipment drains.

II. CAUSE OF EVENT

(Refer to Figure 1)

This event was caused by personnel error. Instead of opening selective circuit breakers on panel A106 to de-energize the MSIV logic circuits, the operator opened the main feeder breaker to panel A106. This action de-energized a portion of RPS A which satisfied the logic to scram the group 2 control rods, but did not satisfy the logic necessary to isolate the SDV. (A detailed technical explanation is given in the "Additional Information" section).

A contributing factor to this event was insufficient training for operators on the unique power supply arrangements for RPS related circuits.

III. ANALYSIS OF EVENT

With the reactor at 0% power, (all control rods inserted) with no power history, and at ambient temperature and pressure, the quarter core scram signal with the coincident unisolated discharge through the SDV did not pose any threat to plant or public safety. The amount of leakage past the CRD seals to the SDV was easily made up by the CRD pumps. The variation in reactor water level was insignificant. If a reactor problem condition were sensed, a full scram with SDV isolation would have occurred either automatically or by manual scram initiation by operations.

Under normal (full power) operating conditions this event would not have occurred. Technical Specification section 3.4.7 provides requirements for MSIV operability while at power. The SSS would not, at any time, intentionally cause the MSIV's to become inoperable in violation of Technical Specifications. Therefore, manually de-energizing the MSIV logic circuits at power would not intentionally occur.

But, if for some other reason, the conditions which caused the event described in this report did occur at full power, MSIV closure would initiate a full scram (all control rods inserted) and SDV isolation. The sequence of events would be the same as the "closure of all MSIV's" event described in FSAR section 15.2.4.

IV. CORRECTIVE ACTIONS

(1) A training modification recommendation (TMR) has been submitted requesting additional licensed operator training on the RPS and the specific circuits relating to this event.

(2) This LER will be added to the licensed operator training curriculum.

(3) Operating procedure N2-OP-96 and N2-OP-101C has been modified to require the Operator to initiate a manual reactor scram upon the condition that several control rods become mispositioned, as in a quarter core scram event.

V. ADDITIONAL INFORMATION

No other LER's cover events similar to that discussed in this report. LER 86-10 covers a quarter core scram which occurred on 11/23/86, but the root cause of that event is still under investigation.

Technical details of the unisolated SDV is as follows:

Normally during a scram the SDV vent and drain valves will close to isolate the SDV. These valves close when both the A and B pilot solenoids are de-energized (see Figure 2). These pilot solenoids will de-energize when the following conditions are satisfied: (1) Relays K70A or K78B are energized for pilot solenoid A, Relays K70B or K78A are energized for pilot solenoid B, or (2) if the solenoid test pushbutton is depressed.

Relays K70A and K78A will energize if there is a scram signal on RPS A division 1. A scram signal on RPS A division 1 is present when the K14A or K14E and the K14J or K14N relays are de-energized. This satisfies the one out of two taken twice criterion for the RPS Logic.(See Figure 3)

Relays K70B and K78B will energize if there is a scram signal on RPS B division 2. A scram signal on RPS B division 2 is present when the K14B or K14F and the K14K or K14P relays are de-energized. The logic criterion is similar to that described above. (see Figure 4).

At the start of this event UPS 3B was de-energized which caused the relays K70B and K78B to be de-energized (since they receive power from UPS 3B).

Pilot solenoid B was also de-energized because it is powered from UPS 3B. But pilot solenoid A remained energized since there was not a scram signal on RPS A division 1 (relay K70A was de-energized) and because K78B was de-energized.

Since pilot solenoid A remained energized, the vent and drain valves did not close, causing the SDV to remain unisolated.

Eventually power was restored to UPS 3B, but the scram on RPS B was not reset. (Scram signals seal in and need to be reset). In addition to this, power was not yet restored to panel A106.

This arrangement allowed the K70B and K78B relays to energize thus causing both pilot solenoids A and B to de-energize. This enabled the SDV vent and drain valves to close finally isolating the SDV.

Technical details of the quarter core scram is as follows:

(Refer to Figures 1, 3, 4, 5, 6)

The group 2 control rods will scram when a scram signal is received from both RPS A division 2 and RPS B division 2. De-energizing a division will satisfy the logic to generate a scram signal from that division. A scram signal to the group 2 control rods will be generated if the K14K or K14P relays de-energize on RPS A along with the de-energization of the K14B or K14F relays on RPS B. This logic arrangement will de-energize both of the group 2 pilot scram solenoids (see figure 6) causing a scram of the control rods of that group. Once a scram signal is generated it seals in and needs to be reset by a reset control switch.

Since power was lost from UPS 3B, a scram signal from RPS B division 2 was present. (Both the K14B and the K14F relays were de-energized.) When panel A106 was de-energized, this de-energized RPS A division 2 generating a scram signal for that division. (Both the K14K and K14P relays were de-energized.) This resulted in the group 2 control rods receiving a scram initiation.

Identification of Components Referred to in this LER

Component	IEEE 803 EIIS Funct	IEEE 805 System ID
Breaker	52	EE
Scram Discharge Volume (SDV)	COL	JC
Relay	RLY	JC
Solenoid	SOL	JC
Logic Circuits	N/A	JC
Reactor Protection System	N/A	JC
Valve	V	JC
Contact	CNTR	JC

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TEXT *If more space is required, use additional NRC Form 366A's* (17)

FIGURE 1

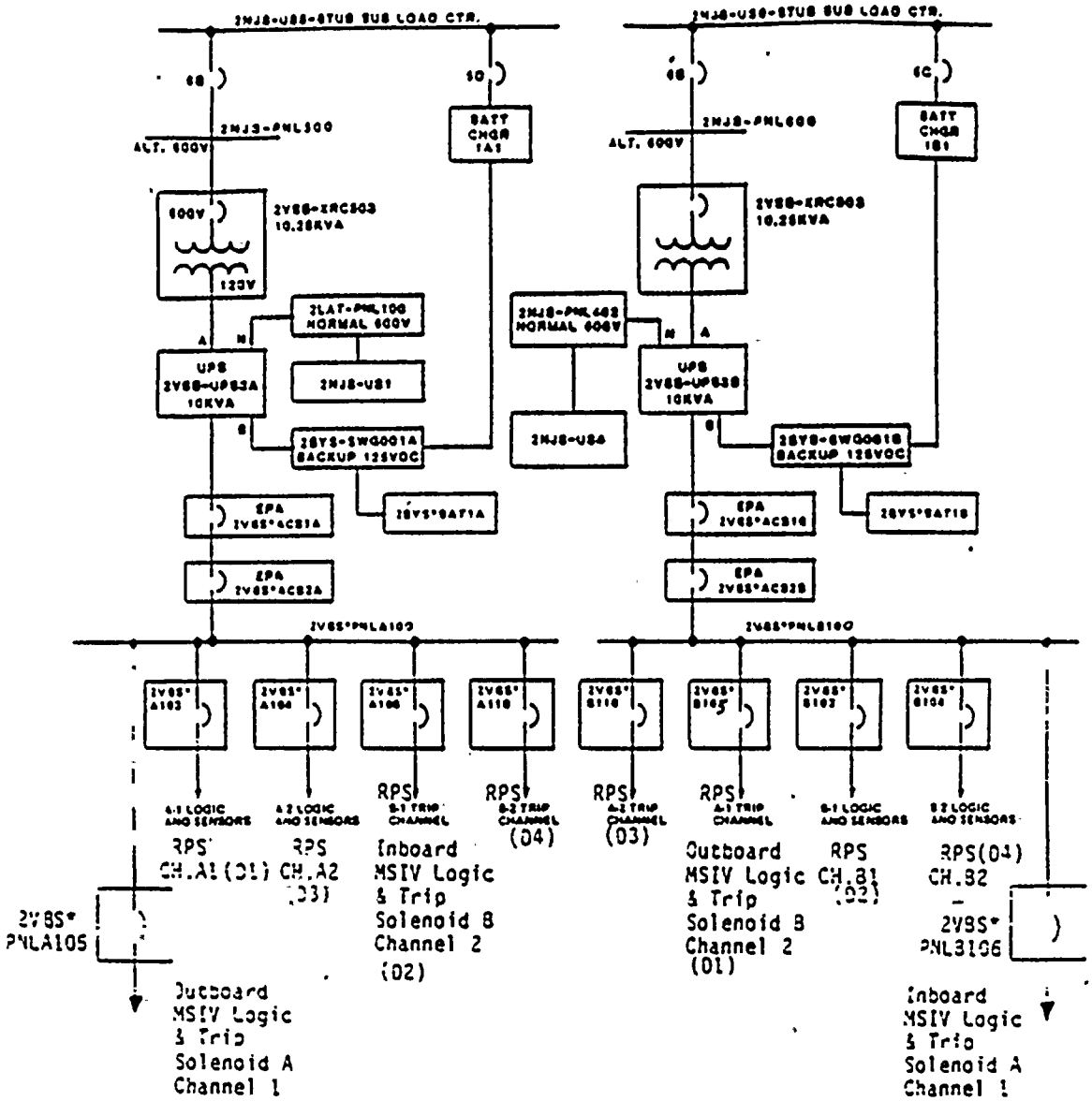

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FIGURE 2

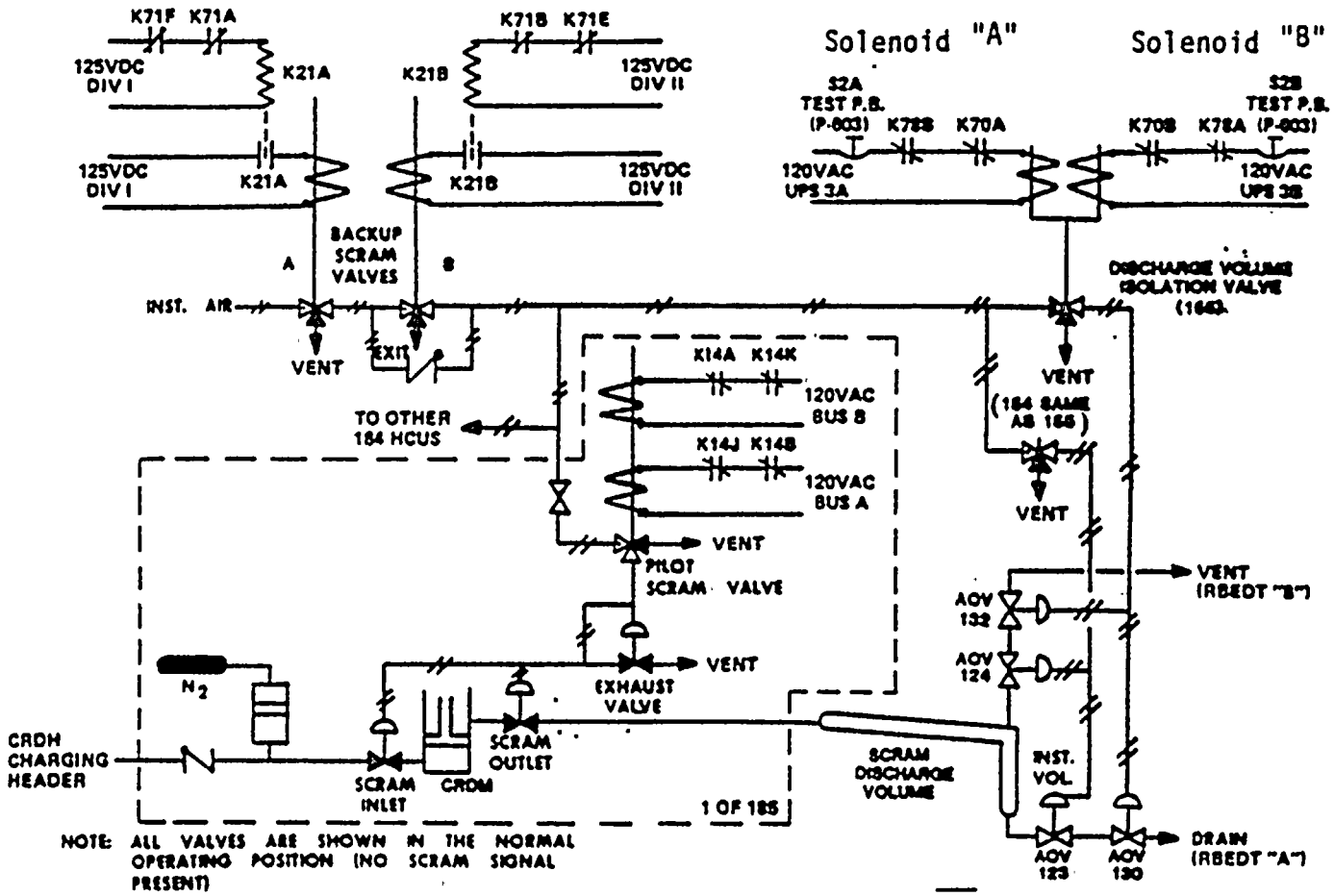

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FIGURE 3

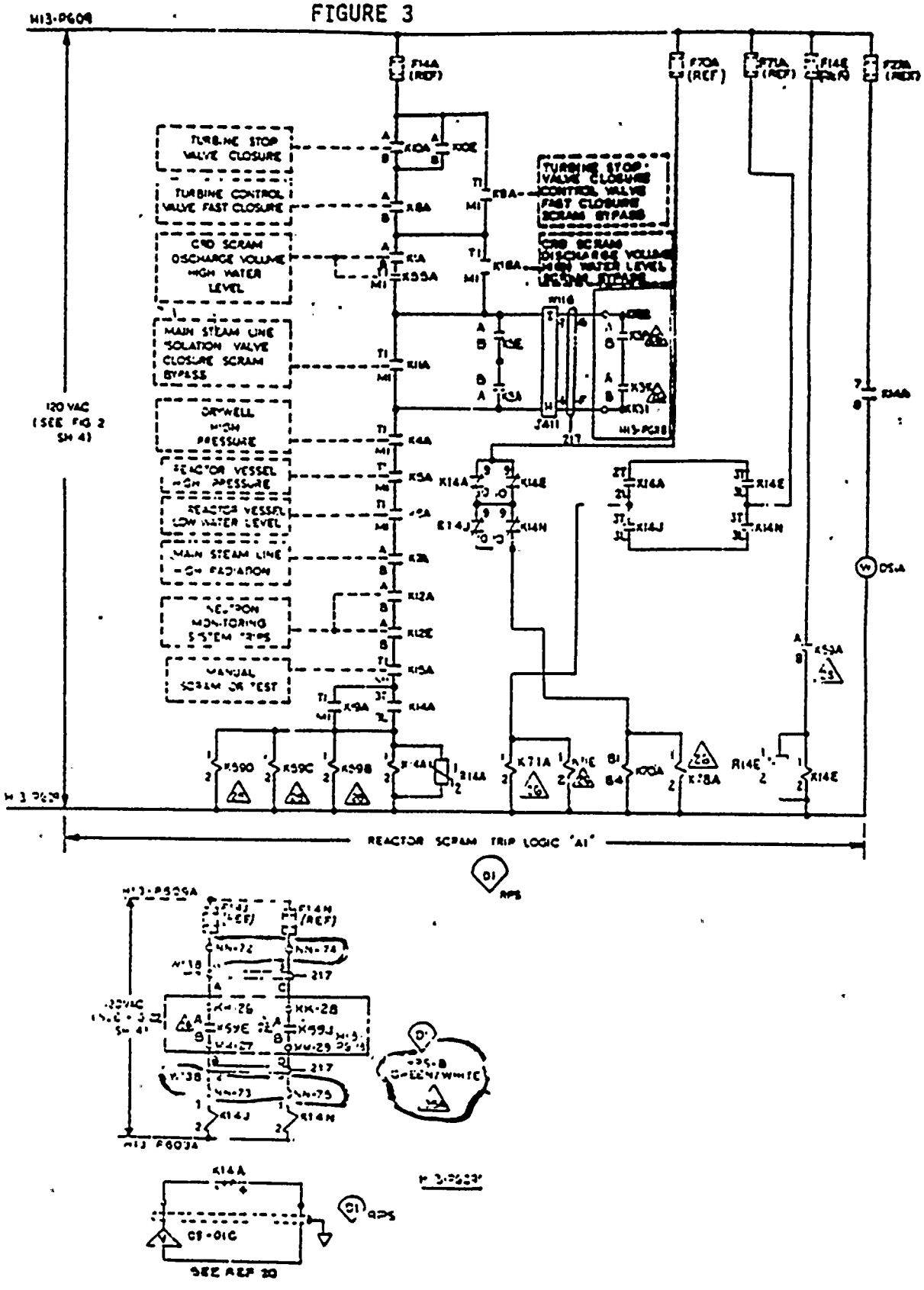

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FIGURE 4

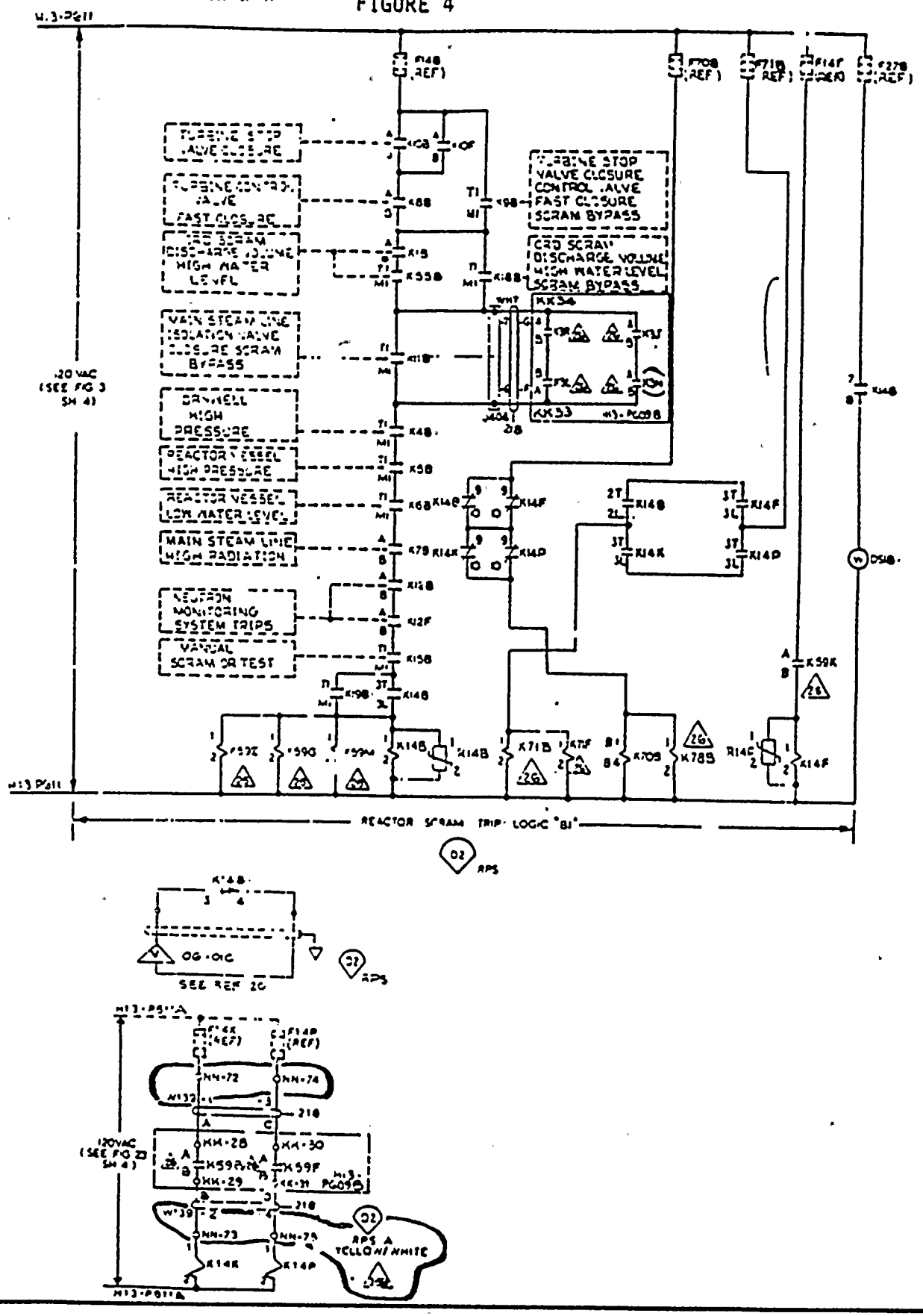

FIGURE 5

RPS / MSIV POWER SUPPLY

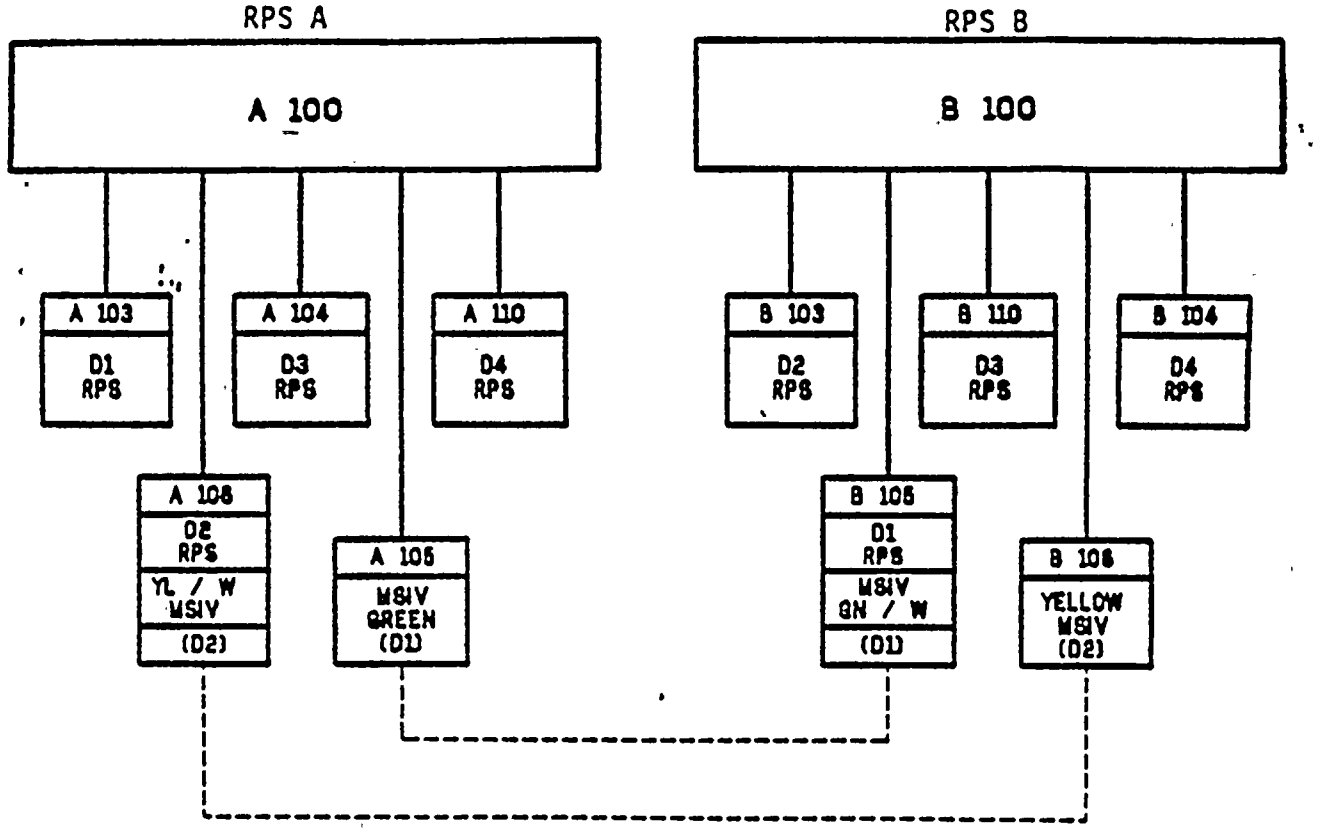

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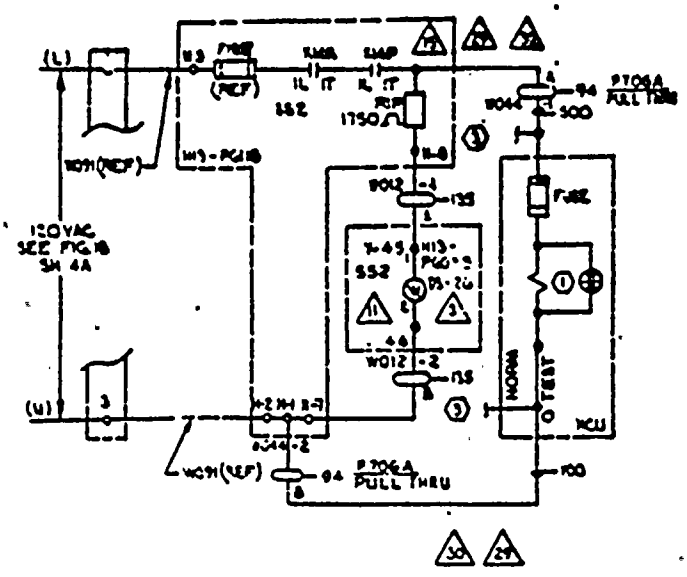
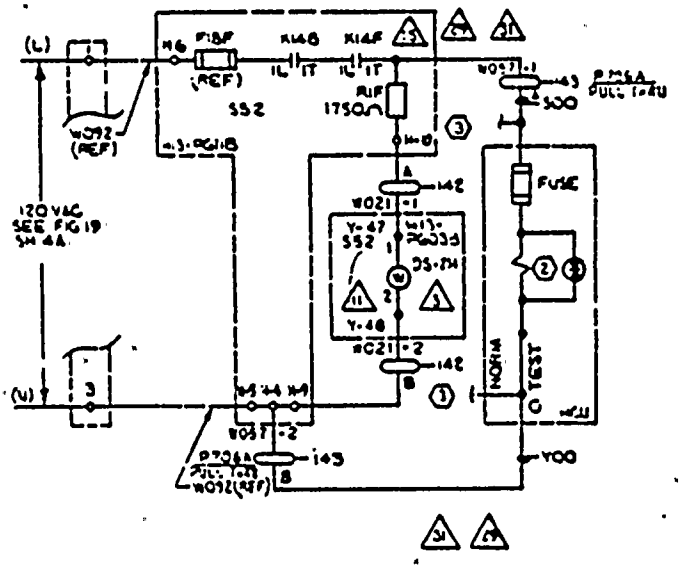
FIGURE 6



GROUP 2 (RPS A)

PILOT SCRAM VALVE SOLENOID
TYPICAL OF ④ SOLENOIDS
CAT 2RPS502



GROUP 2 (RPS B)

PILOT SCRAM VALVE SOLENOID
TYPICAL OF ④ SOLENOIDS
CAT 2RPS503